Edition 01/2025

OPERATING INSTRUCTIONS

SINAMICS/SIMOTICS

SINAMICS S210 servo drive system

SINAMICS S210 converter with firmware V6.4, Article No. 6SL5310-1B...
SIMOTICS S-1FK2 and S-1FT2 servomotors
www.siemens.com

SIEMENS

SIEMENS

SINAMICS/SIMOTICS

SINAMICS S210 servo drive system with SIMOTICS S-1FK2 and S-1FT2

Operating Instructions

Valid for converters with Article No. 6SL5310-1B...

Original instructions
01/2025, FW V6.4
A5E52380168B AD

Legal information

Warning notice system

This manual contains notices you have to observe in order to ensure your personal safety, as well as to prevent damage to property. The notices referring to your personal safety are highlighted in the manual by a safety alert symbol, notices referring only to property damage have no safety alert symbol. These notices shown below are graded according to the degree of danger.

⚠ DANGER
indicates that death or severe personal injury **will** result if proper precautions are not taken.

⚠ WARNING
indicates that death or severe personal injury **may** result if proper precautions are not taken.

⚠ CAUTION
indicates that minor personal injury can result if proper precautions are not taken.

NOTICE
indicates that property damage can result if proper precautions are not taken.

If more than one degree of danger is present, the warning notice representing the highest degree of danger will be used. A notice warning of injury to persons with a safety alert symbol may also include a warning relating to property damage.

Qualified Personnel

The product/system described in this documentation may be operated only by **personnel qualified** for the specific task in accordance with the relevant documentation, in particular its warning notices and safety instructions. Qualified personnel are those who, based on their training and experience, are capable of identifying risks and avoiding potential hazards when working with these products/systems.

Proper use of Siemens products

Note the following:

⚠ WARNING
Siemens products may only be used for the applications described in the catalog and in the relevant technical documentation. If products and components from other manufacturers are used, these must be recommended or approved by Siemens. Proper transport, storage, installation, assembly, commissioning, operation and maintenance are required to ensure that the products operate safely and without any problems. The permissible ambient conditions must be complied with. The information in the relevant documentation must be observed.

Trademarks

All names identified by ® are registered trademarks of Siemens Aktiengesellschaft. The remaining trademarks in this publication may be trademarks whose use by third parties for their own purposes could violate the rights of the owner.

Disclaimer of Liability

We have reviewed the contents of this publication to ensure consistency with the hardware and software described. Since variance cannot be precluded entirely, we cannot guarantee full consistency. However, the information in this publication is reviewed regularly and any necessary corrections are included in subsequent editions.

Siemens Aktiengesellschaft
Digital Industries
Postfach 48 48
90026 NÜRNBERG
GERMANY

A5E52380168B AD
Ⓟ 02/2025 Subject to change

Table of contents

Introduction 1

1.1 Service and Support

1.1.1 ID link and Siemens Online Support

You can find additional information about the product:

- via ID link
- using the Siemens Industry Online Support
  - Website: SIOS (https://support.industry.siemens.com/cs/ww/en/)
  - App Industry Online Support (for Apple iOS and Android)

Product-specific information via ID link

The QR code on your product and on the product packaging contains the ID link.

ID link is a globally unique identifier according to IEC 61406-1.

You can use the ID link to access product data, manuals, Declarations of Conformity, certificates and other information about your product.

Figure 1-1 QR code with ID link included

The ID link is characterized by a frame with a black corner at the bottom right.

Content of Siemens Online Support

- Product support
- Global forum for information and best practice sharing between users and specialists
- Local contact persons via the contact person database (→ Contact)
- Product information
- FAQs (frequently asked questions)
- Application examples
- Manuals

- Downloads
- Compatibility tool
- Newsletter with product selection
- Catalogs/brochures
- Certificates

1.1.2 Spare parts services

The online spare part service "Spares on Web (https://www.sow.siemens.com)" offers spare parts for the product.

1.2 About SINAMICS

Description

With the SINAMICS converter series, you can solve drive tasks from low voltage through to DC voltage. All Siemens drive components, such as converters, motors, and controls, are matched to each other and can be integrated into your existing automation systems.

You can find more information via the SINAMICS YouTube playlist (https://www.youtube.com/playlist?list=PLw7lLwXw4H53rtHeTeifKtVMr2aXTYt0X).

1.3 About this manual

1.3.1 Content

Description

These operating instructions provide a summary of all of the information required to safely and reliably operate the converter-motor combination.

The operating instructions enable the target groups being addressed to mount, install, connect, and commission the converter and motor safely and in the correct manner.

To illustrate possible application areas for our products, typical use cases are listed in this product documentation and in the online help. These are purely exemplary and do not constitute a statement on the suitability of the respective product for applications in specific individual cases. Unless explicitly contractually agreed, Siemens assumes no liability for such suitability. Suitability for a particular application in specific individual cases must be assessed by the user, taking into account all technical, legal, and other requirements on a case-by-case basis. Always observe the descriptions of the technical properties and the relevant constraints of the respective product contained in the product documentation.

1.3.2 Target group

Description

These operating instructions are intended for persons who perform different tasks in the drive environment, e.g. for:

- Planning engineers
- Project engineers
- Machine manufacturers
- Commissioning engineers
- Electricians
- Installation personnel
- Service technician
- Warehouse personnel

1.3.3 Standard scope

The functions of the system as delivered can only be found in the order documents.

Further functions may be executable in the system, which are not explained in this documentation. However, there is no entitlement to these functions in the case of a new delivery or service.

This documentation does not contain all detailed information on all types of the product. Furthermore, this documentation cannot take into consideration every conceivable type of installation, operation and service/maintenance.

The machine manufacturer must document any additions or modifications they make to the product themselves.

1.3.4 Websites of third-party companies

This document may contain hyperlinks to third-party websites. Siemens is not responsible for and shall not be liable for these websites and their content. Siemens has no control over the information which appears on these websites and is not responsible for the content and information provided there. The user bears the risk for their use.

1.4 SINAMICS documentation

Description

Comprehensive documentation on the SINAMICS converter series can be found at Siemens Industry Online Support (https://support.industry.siemens.com/cs/ww/en/ps/13205/man).

Figure 1-2 The SINAMICS converter family

You have the option of either displaying the documents or downloading them in the PDF and multimedia format.

The converter documentation essentially comprises the following manuals:

Table 1-1 SINAMICS documentation

Information	Documentation class	Content
Basic information	Operating instructions	Comprehensive collection of all information necessary for the safe operation of products, plant units, and complete plants (IEC/ IEEE 82079-1)
	Product Information	Information that only becomes known shortly before or even after start of delivery and is therefore not included in the associated user documentation
General information	Configuration Manual industrial cybersecurity	Information on the security functions and safe converter operation
Information about the optional components	SINAMICS Smart Adapter operating instructions	Installing a local wireless network with the SINAMICS Smart Adapter to commission and diagnose the converter using an operating unit

1.5 Important product information

1.5.1 Names of drive technology terms

Overview

This manual contains simplified names of drive technology terms which have other names in normal usage or in a different context.

Description

Drive, frequency converter, AC/AC converter, servo converter or converter is the name for an electronic device for variable speed control of an electric motor. The electric motor is available in different versions as an induction motor, synchronous motor or synchronous reluctance motor.

In this document, Siemens uses the names "converter" and "drive" to mean the same thing and regardless of whether a converter or servo converter is meant.

A drive system means all of the components that are required to implement a drive task.
For instance, a drive system comprises line-side switchgear, rectifier transformers, converters, output filters, motors, encoders, conductors, monitoring equipment, open-loop and closed-loop controlling systems.

In this document, Siemens uses the term "drive system" regardless of whether a converter or servo converter is meant in the context of a motor and cables.

A drive line-up is a system of converters that are supplied via a shared DC link or that communicate via DRIVE-CLiQ with a shared Control Unit, e.g. SINAMICS S210, S120 or S220.

In this document, Siemens uses the term "converter" regardless of whether a single converter or a drive line-up is meant.

1.5.2 Use for the intended purpose

Requirement

⚠ WARNING
Death or serious injury if not used for the intended purpose
Not used for the intended purpose can result in hazardous states.
• Carefully observe the description for intended use

WARNING

Non-intended use of the motor

If the motor is not used for the intended purpose, then this can result in death, serious injury and/or material damage.

- Carefully observe the description for intended use
- Do not use the motors in hazardous areas (where there is a risk of explosion), if the motors have not been expressly released and authorized for these types of applications. Carefully observe any special supplementary notes that may be attached.
- Make sure that the conditions at the location of use comply with all the rating plate data.
- Make sure that the conditions at the location of use comply with the conditions specified in this documentation. When necessary, take into account deviations regarding approvals or country-specific regulations.

Note

It cannot be guaranteed that EMC emission limits are complied with if the products are connected to an isolated line supply grounded through a high ohmic connection or a line supply with grounded line conductor.

- Draw-up an EMC plan to comply with the EMC requirements of the intended application.

Description

The products described in this document, together with software, accessories and options, form an electric drive to supply low-voltage, three-phase motors.

The products are professional devices for stationary indoor use in industrial, light-industrial and commercial applications and are intended for supply from a non-public (industrial) low-voltage network. The products are not intended for use in residential areas and are not intended for supply from a public low-voltage network.

The products must be correctly transported and stored and must be installed, commissioned and maintained by professionals who have adequate knowledge to implement the safety, security and EMC measures in accordance with the specifications described in this manual and recognized state-of-the-art engineering practice.

You may only use the products when the following requirements are complied with:

- All regulations and directives that are applicable at the place of final use, especially with regard to electrical safety, functional safety and electromagnetic compatibility (EMC).
- All instructions, notes, technical specifications, safety information and security information contained in this document and other supporting documentation.

The products are part of a machine or system. They must guarantee the safety of persons and material assets as well as electromagnetic compatibility by applying suitable measures when designing the system.

Perform a risk assessment of the complete application including third-party products and implement adequate safety and security measures before using the product.

Products without protective enclosure (IP00 or IP20) are intended for installation in control panels or control cabinets that provide the required level of protection.

Any other use that is not expressly permitted can result in malfunctions and unpredictable hazards.

The motor is only approved for converter operation.

1.5.3 Firmware updates and constraints

Description

Firmware updates and constraints for the converters with the current firmware are available in SIOS:

Updates and constraints for SINAMICS S210 (https://support.industry.siemens.com/cs/ww/en/view/109812303)

1.5.4 Open-source software (OSS)

Description

The license conditions and copyright information of the open-source software components used by the device are saved on the device itself. You can download license and copyright information onto your PC via the support page of the integrated web server.

1.5.5 Compliance with the General Data Protection Regulation

Description

Siemens complies with the principles of the **General Data Protection Regulation (EU),** in particular the principle of data minimization ("privacy by design"). For this SINAMICS product, this means:

- **User management and access control (UMAC)**
  The product processes or stores the following personal data:
  - Login data for user management and access control:
    User name, group, password, role, rights.

  The data for user management and access control is stored in the converter and optionally on a memory card.
- **Support data (optional)**
  For optimal support in service cases, the end user or machine manufacturer (OEM) can optionally store contact data (header, email address, telephone number, homepage) in the converter.
  If this data is created, the author must give thought to data protection consent for this optional data. Siemens takes no responsibility for this data.
  This support contact data can be read and is freely accessible in, for example, the user interface as well as in the diagnostics report. This data is not encrypted.

This data is used for user management and access control (UMAC) and for the support function. The storage of this data is appropriate and limited to what is necessary, as it is essential to identify the authorized operators and service contact.

The personal data is also available as part of the backup system to ensure fast recovery of use cases.

The above-mentioned personal data cannot be stored anonymously or pseudonymized, as it serves the purpose of identifying the operating personnel. The anonymization or pseudonymization, e.g. of the login data, must be performed using suitable login names and contact data by the plant/machine operator.

Our product does not provide any functions for automatically deleting personal data. Individual UMAC data can be deleted manually by authorized personnel as soon as this is deemed recommended/required.

Fundamental safety instructions

2

2.1 General safety instructions

⚠ WARNING

Electric shock and danger to life due to other energy sources

Touching live components can result in death or severe injury.

- Only work on electrical devices when you are qualified for this job.
- Always observe the country-specific safety rules.

Generally, the following steps apply when establishing safety:

1. Prepare for disconnection. Notify all those who will be affected by the procedure.
2. Isolate the drive system from the power supply and take measures to prevent it being switched back on again.
3. Wait until the discharge time specified on the warning labels has elapsed.
4. Check that there is no voltage between any of the power connections, and between any of the power connections and the protective conductor connection.
5. Check whether the existing auxiliary supply circuits are de-energized.
6. Ensure that the motors cannot move.
7. Identify all other dangerous energy sources, e.g. compressed air, hydraulic systems, or water. Switch the energy sources to a safe state.
8. Check that the correct drive system is completely locked.

After you have completed the work, restore the operational readiness in the inverse sequence.

⚠ WARNING

Risk of electric shock and fire from supply networks with an excessively high impedance

Excessively low short-circuit currents can lead to the protective devices not tripping or tripping too late, and thus causing electric shock or a fire.

- In the case of a conductor-conductor or conductor-ground short-circuit, ensure that the short-circuit current at the point where the converter is connected to the line supply at least meets the minimum requirements for the response of the protective device used.
- You must use an additional residual-current device (RCD) if a conductor-ground short circuit does not reach the short-circuit current required for the protective device to respond. The required short-circuit current can be too low, especially for TT supply systems.

WARNING

Risk of electric shock and fire from supply networks with an excessively low impedance

Excessively high short-circuit currents can lead to the protective devices not being able to interrupt these short-circuit currents and being destroyed, and thus causing electric shock or a fire.

- Ensure that the prospective short-circuit current at the line terminal of the converter does not exceed the breaking capacity (SCCR or Icc) of the protective device used.

WARNING

Electric shock if there is no ground connection

For missing or incorrectly implemented protective conductor connection for devices with protection class I, high voltages can be present at open, exposed parts, which when touched, can result in death or severe injury.

- Ground the device in compliance with the applicable regulations.

WARNING

Electric shock due to connection to an unsuitable power supply

When equipment is connected to an unsuitable power supply, exposed components may carry a hazardous voltage. Contact with hazardous voltage can result in severe injury or death.

- Only use power supplies that provide SELV (Safety Extra Low Voltage) or PELV- (Protective Extra Low Voltage) output voltages for all connections and terminals of the electronics modules.

WARNING

Electric shock due to damaged motors or devices

Improper handling of motors or devices can damage them.

Hazardous voltages can be present at the enclosure or at exposed components on damaged motors or devices.

- Ensure compliance with the limit values specified in the technical data during transport, storage and operation.
- Do not use any damaged motors or devices.

WARNING

Electric shock due to unconnected cable shields

Hazardous touch voltages can occur through capacitive cross-coupling due to unconnected cable shields.

- As a minimum, connect cable shields and the cores of cables that are not used at one end at the grounded housing potential.

WARNING

Arcing when a plug connection is opened during operation

Opening a plug connection when a system is in operation can result in arcing that may cause serious injury or death.

- Only open plug connections when the equipment is in a voltage-free state, unless it has been explicitly stated that they can be opened in operation.

WARNING

Electric shock due to residual charges in power components

Because of the capacitors, a hazardous voltage is present for up to 5 minutes after the power supply has been switched off. Contact with live parts can result in death or serious injury.

- Wait for 5 minutes before you check that the unit really is in a no-voltage condition and start work.

NOTICE

Damage to equipment due to unsuitable tightening tools.

Unsuitable tightening tools or fastening methods can damage the screws of the equipment.

- Only use screw inserts that exactly match the screw head.
- Tighten the screws with the torque specified in the technical documentation.
- Use a torque wrench or a mechanical precision nut runner with a dynamic torque sensor and speed limitation system.
- Adjust the tools used regularly.

WARNING

Electromagnetic interference due to inadequate shield support

A lack of adequate shield support for the power cables can cause malfunctions and impermissibly high levels of interference.

- Use the shield connection plates supplied or recommended.
- Use the shield connection clips recommended.

WARNING

Active implant malfunctions due to electromagnetic fields

Converters generate electromagnetic fields (EMF) in operation. Electromagnetic fields may interfere with active implants, e.g. pacemakers. People with active implants in the immediate vicinity of an converter are at risk.

- As the operator of an EMF-emitting installation, assess the individual risks of persons with active implants.
- Observe the data on EMF emission provided in the product documentation.

WARNING

Active implant malfunctions due to permanent-magnet fields

Even when switched off, electric motors with permanent magnets represent a potential risk for persons with heart pacemakers or implants if they are close to converters/motors.

- If this affects you, maintain the minimum distances specified in the Information for use.
- When transporting or storing permanent-magnet motors always use the original packing materials with the warning labels attached.
- Clearly mark the storage locations with the appropriate warning labels.
- IATA regulations must be observed when transported by air.

WARNING

Improper lifting and transportation operations

Improper lifting and transportation of the motor may cause death, severe bodily injury, or damage to property.

- When disassembling the motor, watch out for imminent movements when the motor is released.
- Use all lifting equipment, industrial trucks, and load handling devices in accordance with the regulations.
- Only use lifting equipment and load handling devices with maximum capacities which match the weight of the motor.
- Do not attach any additional loads to the lifting equipment.
- To hoist the motor, use suitable cable-guidance or spreading equipment, particularly if the motor is equipped with built-on assemblies.
- Do not attach lifting equipment to the power connector or signal connector of the motor.
- Do not stand in the slewing range of hoisting gear or under suspended loads.
- When placing down the motor, ensure that it cannot roll away.
- If anything is unclear, please contact the machine manufacturer, stating the machine type and serial number.

⚠ CAUTION
Symptomatic respiratory and skin reaction to chemicals
A newly purchased product might contain traces of substances that are identified as sensitizers.
Sensitizers are substances which can cause sensitization in the lungs and skin after exposure to them.
Once sensitized, individuals can have severe reactions to further exposure, even in small amounts. In the most extreme cases, individuals might develop asthma or dermatitis respectively.
• If the product has a strong smell, keep it in a well-ventilated area for 14 days.

⚠ WARNING
Unexpected machine movement caused by radio devices or cellphones
Using radio devices, cellphones, or mobile WLAN devices in the immediate vicinity of the components can result in equipment malfunction or faults and damage to the devices. Malfunctions may impair the functional safety of machines and can therefore put people in danger or lead to property damage.
• Avoid operating radio devices, cellphones and mobile WLAN devices in the direct vicinity of converters and operating units.
• Scan the machine readable code, e.g. a QR code, from a greater distance or switch off the converter power supply before scanning.
• Only operate built-in devices with the control cabinet doors closed.
• When control cabinet doors are open, only qualified electrical personnel are allowed to carry out service and maintenance work.

⚠ CAUTION
Radio frequency interference in residential areas
When you operate EMC category C2 devices in residential areas, the devices can cause radio frequency interference.
When you operate EMC category C3 or C4 devices in residential areas, it is to be expected that the devices will cause radio frequency interference.
• Do not operate EMC category C2 devices in residential areas.
• Do not operate EMC category C3 or C4 devices in public low-voltage networks supplying residential buildings.

NOTICE

Damage to motor insulation due to excessive voltages

When operated on systems with grounded line conductors or in the event of a ground fault in the IT system, the motor insulation can be damaged by the higher voltage against ground. If you use motors that have insulation that is not designed for operation with grounded line conductors, you must perform the following measures:

- IT system: Use a ground fault monitor and eliminate the fault as quickly as possible.
- TN or TT systems with grounded line conductor: Use an isolating transformer on the line side.

WARNING

Fire due to inadequate ventilation clearances

Inadequate ventilation clearances can cause overheating of components with subsequent fire and smoke. This can cause severe injury or even death. This can also result in increased downtime and reduced service lives for devices/systems.

- Ensure compliance with the specified minimum clearance as ventilation clearance for the respective component.

NOTICE

Overheating due to inadmissible mounting position

The device may overheat and therefore be damaged if mounted in an inadmissible position.

- Only operate the device in admissible mounting positions.

WARNING

Unrecognized dangers due to missing or illegible warning labels

Dangers might not be recognized if warning labels are missing or illegible. Unrecognized dangers may cause accidents resulting in serious injury or death.

- Check that the warning labels are complete based on the documentation.
- Attach any missing warning labels to the components, where necessary in the national language.
- Replace illegible warning labels.

NOTICE
Device damage caused by incorrect insulation resistance tests
High test voltages can damage the device. • Measure the insulation resistance of low voltage circuits of machines or systems only with ≤ 500 V DC. • Measure the insulation resistance of SELV circuits of machines or systems only with ≤ 250 V DC.

NOTICE
Device damage caused by incorrect voltage tests
High test voltages can damage the device. Capacitive leakage currents can distort the test results. • Disconnect the components before carrying out a voltage test on the machine. 1)

1) The components are voltage tested in accordance with the IEC 61800-5-1 product standard and must be disconnected during testing in accordance with IEC 60204-1:2021 Section 18.4.

WARNING
Unexpected movement of machines caused by inactive safety functions
Inactive or non-adapted safety functions can trigger unexpected machine movements that may result in serious injury or death. • Observe the information in the appropriate product documentation before commissioning. • Carry out a safety inspection for functions relevant to safety on the entire system, including all safety-related components. • Ensure that the safety functions used in your drives and automation tasks are adjusted and activated through appropriate parameterizing. • Perform a function test. • Only put your plant into live operation once you have guaranteed that the functions relevant to safety are running correctly.

WARNING
Malfunctions of the machine as a result of incorrect or changed parameter settings
As a result of incorrect or changed parameterization, machines can malfunction, which in turn can lead to injuries or death. • Protect the parameterization against unauthorized access. • Handle possible malfunctions by taking suitable measures, e.g. emergency stop or emergency off.

WARNING

Injury caused by moving or ejected parts

Contact with moving motor parts or drive output elements and the ejection of loose motor parts (e.g. feather keys) out of the motor enclosure can result in severe injury or death.

- Remove any loose parts or secure them so that they cannot be flung out.
- Do not touch any moving parts.
- Safeguard all moving parts using the appropriate safety guards.

WARNING

Danger to life caused by machine movement and loose objects

Machine movement and loose objects that can fall out or be ejected can cause death or severe bodily injury.

- Be sure to complete all assembly and adjustment work on the machine.
- Make sure that there are no people in the danger zone of the machine when it is switched on.
- Before switching on, check that there are no loose objects in or on the motor that can fall or be flung off.
- Before switching on, check that all safety guard covers for touch protection are installed and all safety equipment functions correctly.

WARNING

Uncovered rotating or live parts

Covers over rotating or live parts and covers that ensure the motor degree of protection or are required for air guidance, and thus for cooling, must be closed during operation.

Death, serious bodily injury, or material damage may result if the required covers are removed.

- Do not remove covers while the motor is running.

WARNING

Changed operating behavior

Changes in the machine's performance compared with normal operation, such as higher power consumption, higher temperature or vibrations, unusual noises or odors, or monitoring equipment responses, indicate that the machine functioning is impaired. Impaired machine functioning can cause faults that may result directly or indirectly in death, serious bodily injury, or property damage.

- Immediately inform the maintenance personnel.
- If in doubt, shut down the motor immediately, taking into account the plant-specific safety regulations.

NOTICE
Motor damage in the event of uneven running or abnormal noises Improper handling during transportation, storage, or assembly can damage the motor. A damaged motor may run unevenly or make abnormal noises during operation. If you operate a damaged motor, this may result in damage to the winding or bearings, or even total destruction of the system. • Switch the motor off in case of uneven running or abnormal noises. • Identify the cause.

NOTICE
Motor damage when the maximum speed is exceeded The maximum speed n_{max} is the highest permissible motor operating speed. The maximum speed is specified on the rating plate (nameplate). Impermissible speeds can cause damage to the motor. • Enable speed setpoint monitoring in the control unit or drive so as not to exceed the maximum speed n_{max}.

⚠ WARNING
Fire due to incorrect operation of the motor When incorrectly operated and in the case of a fault, the motor can overheat resulting in fire and smoke. This can result in severe injury or death. Further, excessively high temperatures destroy motor components and result in increased failures as well as shorter service lives of motors. • Operate the motor according to the relevant specifications. • Only operate the motors in conjunction with effective temperature monitoring. • Immediately switch off the motor if excessively high temperatures occur.

NOTICE
Wear of the holding brake due to impermissible voltage supply Operating the holding brake outside the permissible voltage range at the motor connection will damage the brake. • Only operate the holding brake within its permissible voltage range.

CAUTION

Burns and thermal damage caused by hot surfaces

Temperatures above 100 °C may occur on the surfaces of motors, converters, and other drive components.

Touching hot surfaces may result in burns. Hot surfaces may damage or destroy temperature sensitive parts.

- Ensure that temperature-sensitive parts do not come into contact with hot surfaces.
- Mount drive components so that they are not accessible during operation.

Measures when maintenance is required:

- Allow drive components to cool off before starting any work.
- Use appropriate personnel protection equipment, e.g. gloves.

2.2 Equipment damage due to electric fields or electrostatic discharge

Electrostatic sensitive devices (ESD) are individual components, integrated circuits, modules or devices that may be damaged by either electric fields or electrostatic discharge.

NOTICE

Equipment damage due to electric fields or electrostatic discharge

Electric fields or electrostatic discharge can cause malfunctions through damaged individual components, integrated circuits, modules or devices.

- Only pack, store, transport and send electronic components, modules or devices in their original packaging or in other suitable materials, e.g conductive foam rubber of aluminum foil.
- Only touch components, modules and devices when you are grounded by one of the following methods:
  - Wearing an ESD wrist strap
  - Wearing ESD shoes or ESD grounding straps in ESD areas with conductive flooring
- Only place electronic components, modules or devices on conductive surfaces (table with ESD surface, conductive ESD foam, ESD packaging, ESD transport container).

2.3 Warranty and liability for application examples

Application examples are not binding and do not claim to be complete regarding configuration, equipment, or any eventuality which may arise. Application examples do not represent customer-specific solutions, but merely serve to provide assistance with typical tasks.

As the user you yourself are responsible for ensuring that the products described are operated correctly. Application examples do not relieve you of your responsibility for safe handling when using, installing, operating and maintaining the equipment.

2.4 Cybersecurity information

Siemens provides products and solutions with industrial cybersecurity functions that support the secure operation of plants, systems, machines and networks.

In order to protect plants, systems, machines and networks against cyber threats, it is necessary to implement – and continuously maintain – a holistic, state-of-the-art industrial cybersecurity concept. Siemens' products and solutions constitute one element of such a concept.

Customers are responsible for preventing unauthorized access to their plants, systems, machines and networks. Such systems, machines and components should only be connected to an enterprise network or the internet if and to the extent such a connection is necessary and only when appropriate security measures (e.g. firewalls and/or network segmentation) are in place.

For additional information on industrial cybersecurity measures that may be implemented, please visit
https://www.siemens.com/cybersecurity-industry.

Siemens' products and solutions undergo continuous development to make them more secure. Siemens strongly recommends that product updates are applied as soon as they are available and that the latest product versions are used. Use of product versions that are no longer supported, and failure to apply the latest updates may increase customer's exposure to cyber threats.

To stay informed about product updates, subscribe to the Siemens Industrial Cybersecurity RSS Feed under
https://new.siemens.com/cert.

Further information is provided on the Internet:

Configuration Manual Industrial Cybersecurity (https://support.industry.siemens.com/cs/ww/en/view/109975311)

WARNING

Unsafe operating states resulting from software manipulation

Software manipulations, e.g. viruses, Trojans, or worms, can cause unsafe operating states in your system that may lead to death, serious injury, and property damage.

- Keep the software up to date.
- Incorporate the automation and drive components into a state-of-the-art, integrated industrial cybersecurity concept for the installation or machine.
- Make sure that you include all installed products in the integrated industrial cybersecurity concept.
- Protect files stored on exchangeable storage media from malicious software by with suitable protection measures, e.g. virus scanners.
- Carefully check all cybersecurity-related settings once commissioning has been completed.

2.5 Residual risks of power drive systems

When assessing the machine or system-related risk in accordance with the respective local regulations (e.g. EC Machinery Directive), the machine manufacturer or system integrator must take into account the following residual risks emanating from the control and drive components of a drive system:

1. Unintentional movements of driven machine or system components during commissioning, operation, maintenance, and repairs caused by, for example,
   - Hardware faults and/or software errors in the sensors, control system, actuators, and connections
   - Response times of the control system and of the drive
   - Operation and/or environmental conditions outside the specification
   - Condensation/conductive contamination
   - Parameterization, programming, cabling, and installation errors
   - Use of wireless devices/mobile phones in the immediate vicinity of electronic components
   - External influences/damage
   - X-ray, ionizing radiation and cosmic radiation
2. Unusually high temperatures inside and outside the components, including open flames, as well as emissions of light, noise, particles, gases, etc. due to fault conditions, e.g.:
   - Component failure
   - Software errors
   - Operation and/or environmental conditions outside the specification
   - External influences/damage
   - Short circuits or ground faults in the intermediate DC circuit of the converter
3. Hazardous shock voltages caused by, for example:
   - Component failure
   - Influence during electrostatic charging
   - Induction of voltages in moving motors
   - Operation and/or environmental conditions outside the specification
   - Condensation/conductive contamination
   - External influences/damage
4. Electrical, magnetic and electromagnetic fields generated in operation that can pose a risk to people with a pacemaker, implants or metal replacement joints, etc., if they are too close
5. Release of environmental pollutants or emissions as a result of improper operation of the system and/or failure to dispose of components safely and correctly

6. Influence of network-connected and wireless communications systems, e.g. ripple-control transmitters or data communication via the network or mobile radio, WLAN or Bluetooth.
7. Motors for use in potentially explosive areas:
When moving components such as bearings become worn, this can cause enclosure components to exhibit unexpectedly high temperatures during operation, creating a hazard in areas with a potentially explosive atmosphere.

For more information about the residual risks of the drive system components, see the relevant sections in the technical user documentation.

Overview 3

3.1 System overview

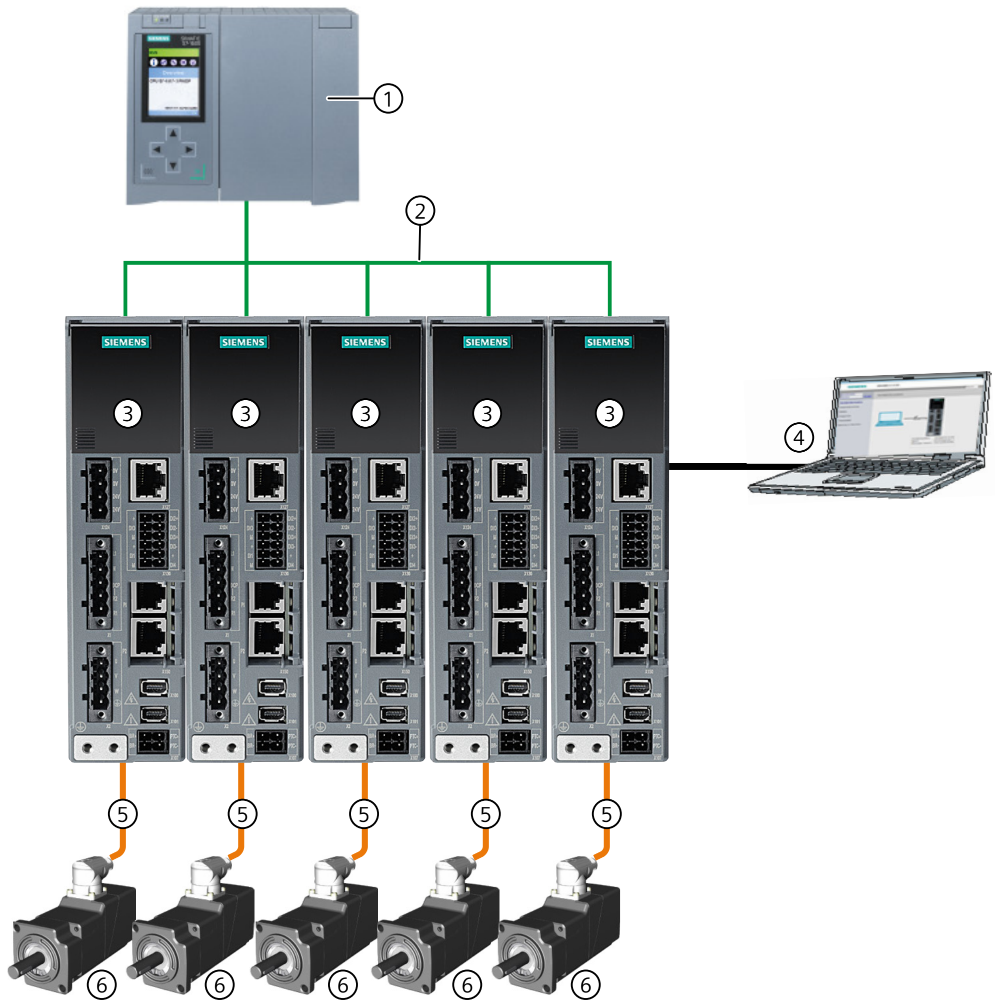
The drive system comprises the following system components tailored to one another:

- SINAMICS S210 converter with firmware V6.1 or higher
- SIMOTICS S-1FK2 or S-1FT2 motor
- OCC MOTION-CONNECT cable (OCC = "One Cable Connection")

SIMOTICS S-1FK2 and SIMOTICS S-1FT2 servomotors with mounted planetary gearbox are optionally available. More information is provided in the relevant Configuration Manual.

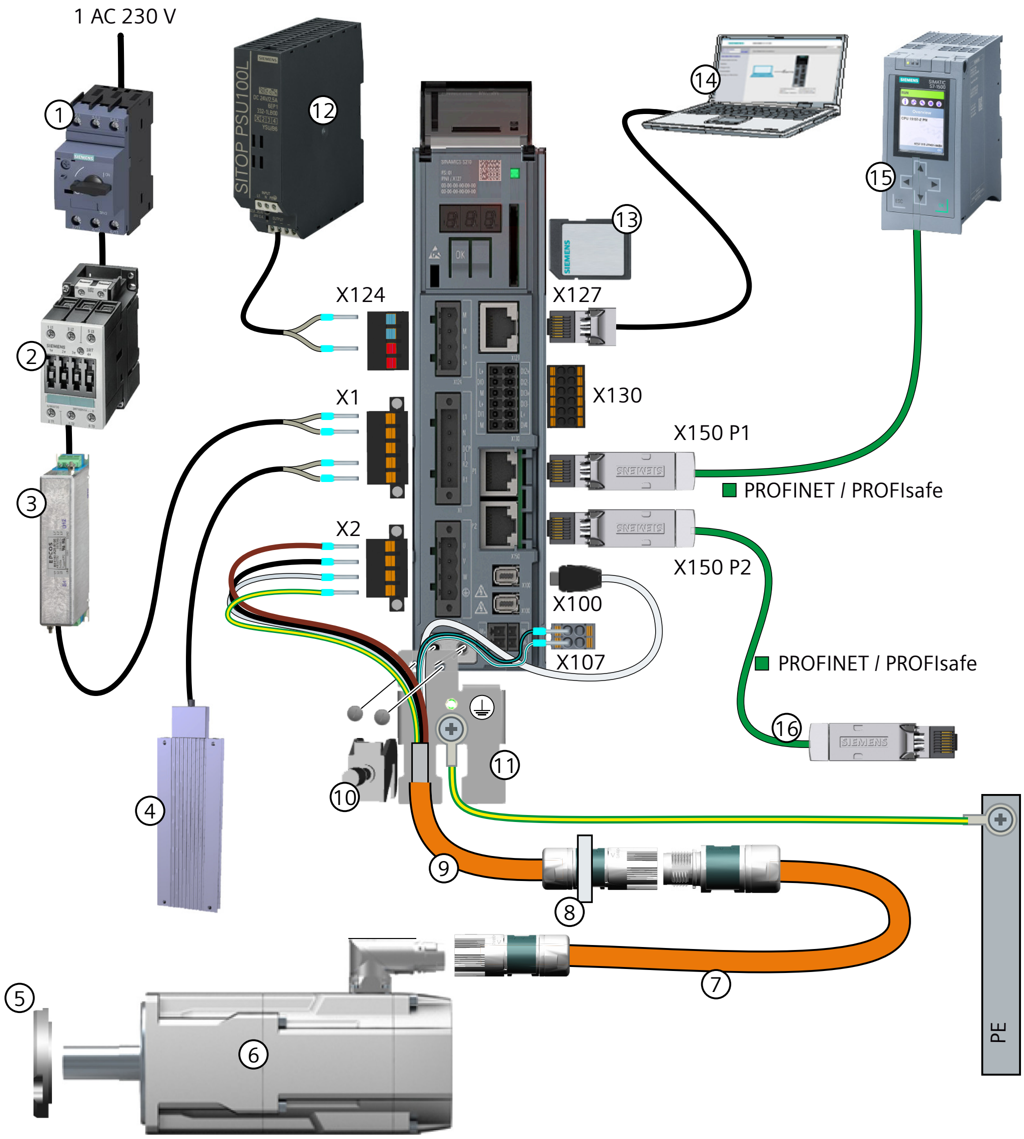
The converter and the motor are intended for use with a higher-level controller (PLC). Connection to the controller is via PROFINET.

Prefabricated MOTION-CONNECT cables in various lengths are available to simply connect the motor to the converter and to ensure safe and reliable operation.



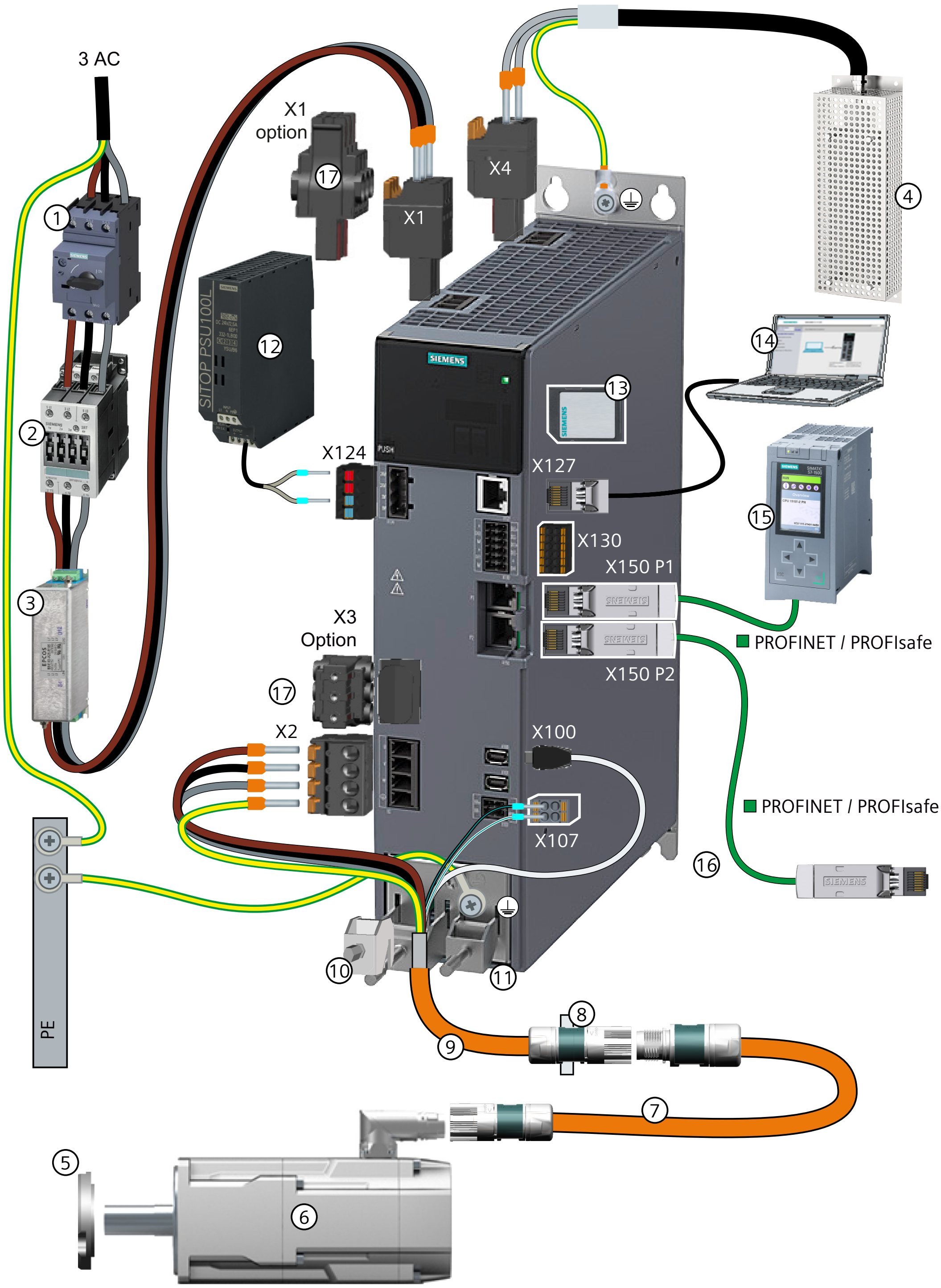
① Controller (PLC), e.g. SIMATICS S7-1500
② Communication between the converter and the controller via PROFINET
③ SINAMICS S210 converter
④ Operating unit, e.g. a PC with a LAN connection to the web server in the converter
⑤ OCC MOTION-CONNECT cable for the power connection, the motor holding brake, and the encoder
⑥ SIMOTICS S-1FK2 or 1FT2 motor

Figure 3-1 System



①	Fuse or circuit breaker	⑨	OCC connection cable for motor, motor holding brake and encoder
②	Line contactor (optional)	⑩	Shield clamp
③	Line filter (optional)	⑪	Shield plate
④	External braking resistor (optional)	⑫	24 V power supply
⑤	Shaft sealing ring for IP65 (optional)	⑬	SD card (optional)
⑥	1FK2 or 1FT2 servomotor	⑭	Operating unit, e.g. PC with a LAN connection to the web server in the converter
⑦	OCC extension cable (optional)	⑮	Controller, e.g. SIMATIC S7-1500
⑧	Mounting flange for control cabinet bushing (optional)	⑯	PROFINET/PROFIsafe to the next participant

Figure 3-2 System components and accessories for converters with 1 AC line connection



① ... ⑯	Same as in the previous figure
⑰	X1: Connector for AC coupling (optional)
	X3: Connector for DC link coupling (optional)

Figure 3-3 System components and accessories for converters with 3 AC line connection

3.2 Commissioning tools

Overview

The web server and Startdrive commissioning tools are available for commissioning and configuring the converter.

Description

Web server

The web server commissioning tool is an **online tool** for the complete life cycle of a drive application. The web server is integrated in the SINAMICS converter.

The web server offers functions for online commissioning, for diagnostics, for local operation and monitoring as well as for carrying out service and maintenance work. This means that the web server is suitable as universal tool for SINAMICS drives locally and directly **online**.

Startdrive

The Startdrive commissioning tool is an **offline and online tool** to support all usage phases of a drive application. Startdrive is installed on an external system (e.g. PC with Windows 11 Professional) and is integrated in the TIA Portal.

Startdrive provides all functions that are required for editing drive applications both offline and online. As a consequence, the entire engineering process for configuring, commissioning, optimizing and maintaining & updating drive solutions while operational is addressed both **offline and online**.

3.3 The scope of supply for the system components

You must order the following components individually.

Motor

Included in the scope of supply:

- A "Safety instructions" sheet
- A sheet referencing links to product information
- A second rating plate

Converter

The components listed below are included in the scope of delivery:

For all converters

- A "Safety instructions" sheet
- A warning label for affixing in the control cabinet
- X2: Connector for motor connection
- X107: Connector for motor holding brake
- X124: Connector for 24 V DC supply voltage
- X130: Connector for digital inputs

For converters with 1 AC line connection

- Shield plate
- X1: Connector for line connection and external braking resistor (jumper for internal braking resistor is included)

For converters with 3 AC line connection

- The shield plate for frame size FSA
  For frame sizes FSB and FSC, the shield connection is integrated in the converter itself.
- X1: Connector for line connection
- X4: Connector for external braking resistor (jumper for internal braking resistor is included)
- X3: Cover for DC link connection

Note

All connectors are designed so that they cannot be inadvertently interchanged.

MOTION-CONNECT cable (OCC cable)

The scope of supply for the prefabricated MOTION-CONNECT cables includes:

- MOTION-CONNECT cable with assembled connectors for connecting motors and encoders
- A shield clamp for the connection of the shield to the shield plate of the converter
- A safety data sheet

Details of the MOTION-CONNECT OCC cables can be found in Chapter "Determining the article number of a prefabricated OCC MOTION-CONNECT cable (Page 819)".

Optional accessories

The optional accessories are listed in Chapter "Accessories (Page 785)".

3.4 Motor

The SIMOTICS S-1FK2 and SIMOTICS S-1FT2 motors, called "1FK2" or "1FT2" in the following, are permanent-magnet excited compact synchronous motors with an integrated encoder and a high degree of protection.

Both motor series comply with standards EN 60034 and EN 60204-1 and the Low-Voltage Directive 2014/35/EU.

In this document, "1F☐2" represents the validity for both 1FK2 and 1FT2.

Dynamic versions

- 1F☐21 "High Dynamic" with low moment of inertia for a maximum acceleration capability in applications involving low load moments of inertia
- 1F☐22 "Compact" with medium moment of inertia and precise positioning and synchronous operation characteristics for applications with a high and variable load moment of inertia

Torque range

- 0.16 Nm ... 3.6 Nm for a 1 AC 230 V line supply
- 0.16 Nm ... 50 Nm for a 3 AC 240 V line supply
- 0.64 Nm ... 50 Nm for a 400 V 3 AC line supply

Degree of protection

- IP64
- IP65 with radial shaft sealing ring
- IP67 with radial shaft sealing ring only for 1FT2, with the exception of frame size 20.

You can find more information on the degree of protection in Chapter "Degree of protection (Page 531)".

Cooling

The motors are available in naturally cooled and force-ventilated versions.

Naturally ventilated motors, 1FK2 and 1FT2	Force-ventilated motors, only 1FT2
Frame sizes 020 ... 100	Frame size 080
The motors are designed for operation without external ventilation and the heat is dissipated through the motor surface.	The motors are cooled using a mounted 24 V DC fan. This allows a higher motor power to be utilized. The air flows from NDE to DE

If the ambient temperature exceeds 40 °C (104 °F) or the installation altitude 1000 meters above sea level, you must reduce torque and power of the motor (derating).

Information on derating can be found in Chapter "Derating factors (Page 529)".

Observe the instructions for mounting the motor in Chapter "Cooling (Page 526)".

Bearing version

The motors have deep groove ball bearings with life-long lubrication.

The average bearing service life is designed for 25000 operating hours.

The motors have spring-loaded bearings in the NDE direction. For version with holding brake, the NDE bearing is a locating bearing.

The permissible axial and radial forces can be found in the technical specifications in Chapter "Axial and radial forces (Page 537)".

Shaft extension

The motors are available with two different shaft extensions.

- Cylindrical shaft without feather key
- Cylindrical shaft with feather key (half-key balancing)

You can find more information in Chapter "Shaft extension (Page 534)".

Encoder

The encoder resolution is 22 bits / 26 bits per revolution (single-turn). An optional multiturn encoder is available that is equipped with an additional 12-bit revolution counter (traversing range of 4096 revolutions).

The encoder designations are as follows:

- AS22DQC: Absolute encoder single-turn, 22 bit
- AM22DQC: Absolute encoder, 22 bit + 12 bit multiturn
- AS26DQC: Absolute encoder, singleturn, 26 bit (only for 1FT2)
- AM26DQC: Absolute encoder 26 bit + 12 bit multiturn (only for 1FT2)

You can find more information in Chapter "Available encoders (Page 543)".

Holding brake

The 1F☐2 servomotor is available with integrated holding brake.

The holding brake closes in the current-free state and locks the motor shaft at a standstill. When current flows, the holding brake opens and releases the motor shaft.

SINAMICS S210 controls the holding brake without any additional devices.

The holding brake is not a working brake for braking the rotating motor. Limited EMERGENCY STOP operation is permissible.

Holding brake data are provided in Chapter "Holding brake data (Page 545)".

Planetary gearboxes

The motors are available with various mounted planetary gearboxes.

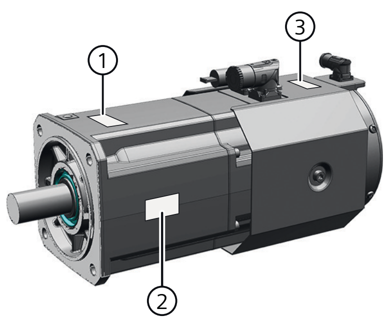
You can find more information in Chapter "Option, planetary gearbox (order code Axx, Bxx, Cxx, Hxx or Jxx) (Page 548)".

3.4.1 Data on the conformity and rating plate

3.4.1.1 Plates on the motor

Positions of the conformity and rating plates on the motor

The following plates are attached to the motor.



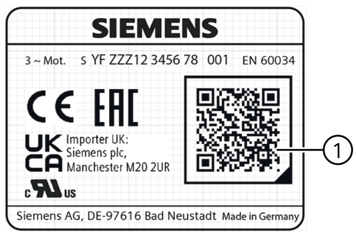
① Motor rating plate
② Conformity plate
③ Fan rating plate (only for force-ventilated motors)

Figure 3-4 Position of the plates (example illustration)

3.4.1.2 Conformity plate with ID code

Description

The motors can be fitted with a conformity plate.



① ID link

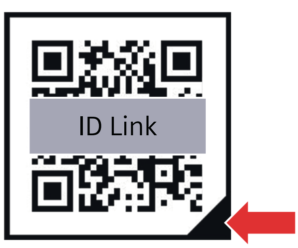
Figure 3-5 Conformity plate with ID link

Digital product information as ID link

The identification link (ID link) according to IEC 61406 provides you with digital information about your product.

The ID link is a globally unique identifier and is located as a QR code on the product.

You can recognize the ID link by the frame with a black corner at the bottom right.



In addition to the digital rating plate, the following product information is provided:

- Technical data
- FAQs
- Manuals
- Certificates
- Product announcements
- Application examples

3.4.1.3 Rating plate data on the motor and optional fan

Motor rating plate

The rating plate contains the article number and the technical data of the motor.

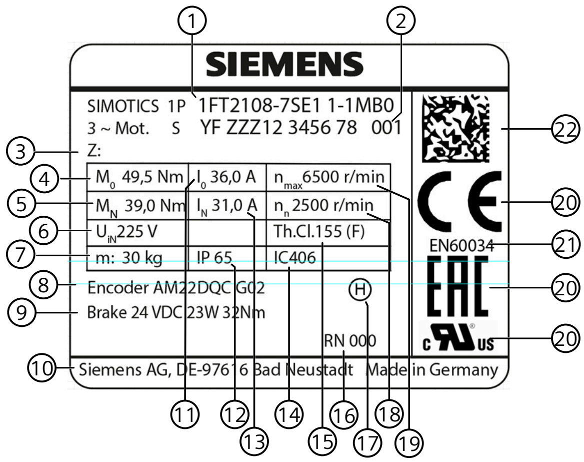
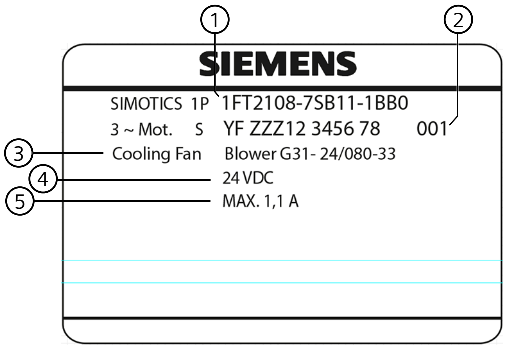


Figure 3-6 Rating plate 1FT2 for S120 (example illustration)

Position	Description / technical specifications	Position	Description / technical specifications
1	Article number	12	Degree of protection
2	ID No., serial number	13	Rated current I_N
3	Order codes as a supplement to the article number.	14	Cooling method according to EN 60034-6
4	Static torque M_0	15	Temperature class of the insulation system
5	Rated torque M_N	16	Revision
6	Induced voltage at rated speed U_{IN}	17	Type of balancing (only for motors with feather key)
7	Motor weight m	18	Rated speed n_N
8	Marking of encoder type	19	Maximum permissible mechanical speed of the motor n_{max}
9	Data of the holding brake	20	Certifications
10	Manufacturer's address	21	Standard for all rotating electrical machines
11	Stall current I_0	22	Data matrix code

Fan rating plate (only for force-ventilated motors)



① Motor Article No.
② Serial number of the motor
③ Fan designation
④ Nominal voltage of the fan
⑤ Maximum permissible current of the fan

Figure 3-7 Rating plate for the fan (example illustration)

3.5 Motor-converter combinations for 1FK2

3.5.1 Motor-converter combinations for 1 AC 200 ... 240 V

The following table lists recommended combinations of converters with a 1 AC 200 V ... 240 V line connection and motors with the associated connecting cables.

Motor		Converter		OCC cable	
Article number (digits 1 ... 10)	Torque M_0 / Nm	Rated power P_N / kW	Article number 6SL5310-1BB10-...	Connector size	Article number 6FX☐002-8Q...
High Dynamic, naturally cooled					
1FK2102-0AG	0.16	0.1	...1CF0	M12	...N04... (0.38 mm² / AWG22)
1FK2102-1AG	0.32				
1FK2103-2AG	0.64	0.2	...2CF0		
1FK2103-4AG	1.27	0.4	...4CF0		
1FK2104-4AF		0.2	...2CF0	M17	...N08... (0.75 mm² / AWG18)
1FK2104-4AK		0.4	...4CF0		
1FK2104-5AF	2.4				
1FK2104-5AK		0.75	...8CF0		
1FK2104-6AF	3.2				
Compact, naturally cooled					

Motor		Converter		OCC cable	
Article number (digits 1 ... 10)	**Torque M_0 / Nm**	**Rated power P_N / kW**	**Article number 6SL5310-1BB10-...**	**Connector size**	**Article number 6FX☐002-8Q...**
1FK2203-2AG	0.64	0.2	...2CF0	M12	...N04... (0.38 mm² / AWG22)
1FK2203-4AG	1.27	0.4	...4CF0		
1FK2204-5AF	2.4			M17	...N08... (0.75 mm² / AWG18)
1FK2204-5AK		0.75	...8CF0		
1FK2204-6AF	3.2				
1FK2205-2AF	3.6	0.75	...8CF0		

3.5.2 Motor-converter combinations for 3 AC 200 ... 240 V

The following table lists recommended combinations of converters with a 3 AC 200 V ... 240 V line connection and motors with the associated connecting cables.

Motor		Converter		OCC cable	
Article number (digits 1 ... 10)	**Torque M_0 / Nm**	**Rated power P_N / kW**	**Article number 6SL5310-1BE1...**	**Connector size**	**Article number 6FX☐002-8Q...**
High Dynamic, naturally cooled					
1FK2102-0AG	0.16	0.24	...0-4DF.	M12	...N04... (0.38 mm² / AWG22)
1FK2102-1AG	0.32				
1FK2103-2AG	0.64	0.45	...0-8DF.		
1FK2103-4AG	1.27	0.6	...1-0DF.		
1FK2104-4AF		0.24	...0-4DF.	M17	...N08... (0.75 mm² / AWG18)
1FK2104-4AK		0.6	...1-0DF.		
1FK2104-5AF	2.4	0.45	...0-8DF.		
1FK2104-5AK		0.9	...1-5DF.		
1FK2104-6AF	3.2	0.6	...1-0DF.		
1FK2105-4AF	5	0.9	...1-5DF.		
1FK2105-6AF	8	1.2	...2-0DF.		
1FK2106-3AF	9	3.0	...5-0DF.	M23	...N11... (1.5 mm² / AWG16)
1FK2106-4AF	12				
1FK2106-6AF	16	4.2	...7-0DF.		
Compact, naturally cooled					
1FK2203-2AG	0.64	0.45	...0-8DF.	M12	...N04... (0.38 mm² / AWG22)
1FK2203-4AG	1.27	0.6	...1-0DF.		

Motor		Converter		OCC cable	
Article number (digits 1 ... 10)	Torque M_0 / Nm	Rated power P_N / kW	Article number 6SL5310-1BE1...	Connector size	Article number 6FX☐002-8Q...
1FK2204-5AF	2.4	0.45	...0-8DF.	M17	...N08... (0.75 mm² / AWG18)
1FK2204-5AK		0.9	...1-5DF.		
1FK2204-6AF	3.2	0.6	...1-0DF.		
1FK2205-2AF	3.6				
1FK2205-4AF	6	0.9	...1-5DF.		
1FK2206-2AF	6.5			M23	...N11... (1.5 mm² / AWG16)
1FK2206-4AF	12	2.1	...3-5DF.		
1FK2208-3AC	18				
1FK2208-4AC	22	3.0	...5-0DF.		
1FK2208-5AC	27	4.2	...7-0DF.		
1FK2210-3AB	30	2.1	...3-5DF.		
1FK2210-3AC		4.2	...7-0DF.		
1FK2210-4AB	40	3.0	...5-0DF.		
1FK2210-4AC		4.2	...7-0DF.		

3.5.3 Motor-converter combinations for 3 AC 380 ... 480 V

The following table lists recommended combinations of converters connected to a 3 AC 380 V ... 480 V line supply and motors with the associated connecting cables.

Motor		Converter		OCC cable	
Article number (digits 1 ... 10)	Torque M_0 / Nm	Rated power P_N / kW	Article number 6SL5310-1BE1...	Connector size	Article number 6FX☐002-8Q...
High Dynamic, naturally cooled					
1FK2103-2AH	0.64	0.4	...0-4DF.	M17	...N08... (0.75 mm² / AWG18)
1FK2103-4AH	1.27	0.75	...0-8DF.		
1FK2104-4AF		0.4	...0-4DF.		
1FK2104-4AK		1.0	...1-0DF.		
1FK2104-5AF	2.4	0.75	...0-8DF.		
1FK2104-5AK		1.5	...1-5DF.		
1FK2104-6AF	3.2	1.0	...1-0DF.		
1FK2105-4AF	5	1.5	...1-5DF.		
1FK2105-6AF	8	2.0	...2-0DF.		
1FK2106-3AF	9	5.0	...5-0DF.	M23	...N11... (1.5 mm² / AWG16) ...N21...[1] (2.5 mm² / AWG14)
1FK2106-4AF	12				
1FK2106-6AF	16	7.0	...7-0DF.		
Compact, naturally cooled					

Motor		Converter		OCC cable	
Article number (digits 1 ... 10)	Torque M_0 / Nm	Rated power P_N / kW	Article number 6SL5310-1BE1...	Connector size	Article number 6FX☐002-8Q...
1FK2203-2AK	0.64	0.4	...0-4DF.	M17	...N08... (0.75 mm² / AWG18)
1FK2203-4AK	1.27	0.75	...0-8DF.		
1FK2204-5AF	2.4	0.75	...0-8DF.		
1FK2204-5AK		1.5	...1-5DF.		
1FK2204-6AF	3.2	1.0	...1-0DF.		
1FK2205-2AF	3.6				
1FK2205-4AF	6	1.5	...1-5DF.		
1FK2206-2AF	6.5			M23	...N11... (1.5 mm² / AWG16) ...N21...[1] (2.5 mm² / AWG14)
1FK2206-4AF	12	3.5	...3-5DF.		
1FK2208-3AC	18				
1FK2208-4AC	22	5.0	...5-0DF.		
1FK2208-5AC	27	7.0	...7-0DF.		
1FK2210-3AB	30	3.5	...3-5DF.		
1FK2210-3AC		7.0	...7-0DF.		
1FK2210-4AB	40	5.0	...5-0DF.		
1FK2210-4AC		7.0	...7-0DF.		

1) Optionally available with 2.5 mm² due to derating in a warm environment

3.6 Motor-converter combinations for 1FT2

3.6.1 Motor-converter combinations for 1 AC 200 ... 240 V

The following table lists recommended combinations of converters with a 1 AC 200 V ... 240 V line connection and motors with the associated connecting cables.

Motor		Converter		OCC cable	
Article number (digits 1 ... 10)	Torque M_0 / Nm	Rated power P_N / kW	Article number 6SL5310-1BB10-...	Connector size	Article number 6FX☐002-8Q...
High Dynamic					
1FT2102-0AG	0.16	0.1	...1CF0	M12	...N04... (0.38 mm² / AWG22)
1FT2102-1AG	0.32				
1FT2103-2AG	0.64	0.2	...2CF0		
1FT2103-4AG	1.27	0.4	...4CF0		
1FT2104-4AF		0.2	...2CF0	M17	...N08... (0.75 mm² / AWG18)
1FT2104-4AK		0.4	...4CF0		
1FT2104-5AF	2.4				
1FT2104-5AK		0.75	...8CF0		
1FT2104-6AF	3.2				
1FT2104-6AH	3.2[2]	0.75	...8CF0		

Motor		Converter		OCC cable	
Article number (digits 1 ... 10)	**Torque M_0 / Nm**	**Rated power P_N / kW**	**Article number 6SL5310-1BB10-...**	**Connector size**	**Article number 6FX☐002-8Q...**
Compact					
1FT2203-2AG	0.64	0.2	...2CF0	M12	...N04... (0.38 mm² / AWG22)
1FT2203-4AG	1.27	0.4	...4CF0		
1FT2204-5AF	2.4			M17	...N08... (0.75 mm² / AWG18)
1FT2204-5AK		0.75	...8CF0		
1FT2204-6AF	3.2				
1FT2205-2AC		0.4	...4CF0		
1FT2205-2AF	3.6	0.75	...8CF0		
1FT2205-2AH	3.6				

1) Optionally available with 0.82 mm²

2) The converter only uses the motor up to 3.2 Nm.

3.6.2 Motor-converter combinations for 3 AC 200 ... 240 V

The following table lists recommended combinations of converters with a 3 AC 200 V ... 240 V line connection and motors with the associated connecting cables.

Motor		Converter		OCC cable	
Article number (digits 1 ... 10)	**Torque M_0 / Nm**	**Rated power P_N / kW**	**Article number 6SL5310-1BE1...**	**Connector size**	**Article number 6FX☐002-8Q...**
High Dynamic, naturally cooled					
1FT2102-0AG	0.16	0.24	...0-4DF.	M12	...N04... (0.38 mm² / AWG22)
1FT2102-1AG	0.32				
1FT2103-2AG	0.64	0.45	...0-8DF.		
1FT2103-4AG	1.27	0.6	...1-0DF.		
1FT2104-4AF		0.24	...0-4DF.	M17	...N08... (0.75 mm² / AWG18)
1FT2104-4AK		0.6	...1-0DF.		
1FT2104-5AF	2.4	0.45	...0-8DF.		
1FT2104-5AK		0.9	...1-5DF.		
1FT2104-6AF	3.2	0.6	...1-0DF.		
1FT2104-6AH	3.6	0.9	...1-5DF.		
1FT2105-4AF	5	0.9	...1-5DF.		
1FT2105-4AH		2.1	...3-5DF.		
1FT2105-6AF	8	1.2	...2-0DF.		
1FT2106-3AF	9	3.0	...5-0DF.	M23	...N11... (1.5 mm² / AWG16)
1FT2106-4AF	12				
1FT2106-6AF	16	4.2	...7-0DF.		
1FT2108-4AC	25				
1FT2108-5AB	30				
1FT2108-7AB	37.5				

Motor		Converter		OCC cable	
Article number (digits 1 ... 10)	**Torque M_0 / Nm**	**Rated power P_N / kW**	**Article number 6SL5310-1BE1...**	**Connector size**	**Article number 6FX☐002-8Q...**
High Dynamic, force-ventilated					
1FT2108-5SB	38.7[1)]	4.2	...7-0DF.	M23	...N11... (1.5 mm² / AWG16)
Compact, naturally cooled					
1FT2203-2AG	0.64	0.45	...0-8DF.	M12	...N04... (0.38 mm² / AWG22)
1FT2203-4AG	1.27	0.6	...1-0DF.		
1FT2204-5AF	2.4	0.45	...0-8DF.	M17	...N08... (0.75 mm² / AWG18)
1FT2204-5AK		0.9	...1-5DF.		
1FT2204-6AF	3.2	0.6	...1-0DF.		
1FT2205-2AC		0.45	...0-8DF.		
1FT2205-2AF	3.6	0.6	...1-0DF.		
1FT2205-2AH		0.9	...1-5DF.		
1FT2205-4AF	6	0.9			
1FT2206-2AC		0.6	...1-0DF.	M23	...N11... (1.5 mm² / AWG16)
1FT2206-2AF	6.5	0.9	...1-5DF.		
1FT2206-2AH		1.2	...2-0DF.		
1FT2206-3AB	9	0.9	...1-5DF.		
1FT2206-3AF		1.2	...2-0DF.		
1FT2206-4AC	12	0.9	...1-5DF.		
1FK2206-4AF		2.1	...3-5DF.		
1FT2206-4AH		3.0	...5-0DF.		
1FT2208-2AF	12.5	2.1	...3-5DF.		
1FT2208-3AB	18	1.2	...2-0DF.		
1FT2208-3AC		2.1	...3-5DF.		
1FT2208-3AF		3.0	...5-0DF.		
1FT2208-4AB	22	2.1	...3-5DF.		
1FT2208-4AC		3.0	...5-0DF.		
1FT2208-4AF		4.2	...7-0DF.		
1FT2208-5AB	27	2.1	...3-5DF.		
1FT2208-5AC		4.2	...7-0DF.		
1FT2210-2AC	22	3.0	...5-0DF.		
1FT2210-2AF		4.2	...7-0DF.		
1FT2210-3AB	30	2.1	...3-5DF.		
1FT2210-3AC		4.2	...7-0DF.		
1FT2210-4AB	40	3.0	...5-0DF.		
1FT2210-4AC		4.2	...7-0DF.		
1FT2210-5AB	50				
Compact, force-ventilated					

Motor		Converter		OCC cable	
Article number (digits 1 ... 10)	Torque M_0 / Nm	Rated power P_N / kW	Article number 6SL5310-1BE1...	Connector size	Article number 6FX☐002-8Q...
1FT2208-3SB	22	2.1	...3-5DF.	M23	...N11... (1.5 mm² / AWG16)
1FT2208-3SC		3.0	...5-0DF.		
1FT2208-3SF		4.2	...7-0DF.		
1FT2208-4SB	28	3.0	...5-0DF.		
1FT2208-4SC		4.2	...7-0DF.		
1FT2208-5SB	35	3.0	...5-0DF.		

1) The converter only uses the motor up to 38.7 Nm.

3.6.3 Motor-converter combinations for 3 AC 380 ... 480 V

The following table lists recommended combinations of converters connected to a 3 AC 380 V ... 480 V line supply and motors with the associated connecting cables.

Motor		Converter		OCC cable	
Article number (digits 1 ... 10)	Torque M_0 / Nm	Rated power P_N / kW	Article number 6SL5310-1BE1...	Connector size	Article number 6FX☐002-8Q...
High Dynamic, naturally cooled					
1FT2103-2AH	0.64	0.4	...0-4DF.	M17	...N08... (0.75 mm² / AWG18)
1FT2103-4AH	1.27	0.75	...0-8DF.		
1FK2104-4AF	1.27	0.4	...0-4DF.		
1FT2104-4AK	1.27	1	...1-0DF.		
1FT2104-5AF	2.4	0.75	...0-8DF.		
1FT2104-5AK	2.4	1.5	...1-5DF.		
1FT2104-6AF	3.2	1	...1-0DF.		
1FT2104-6AH	3.6	1.5	...1-5DF.		
1FT2105-4AF	5	1.5	...1-5DF.		
1FT2105-4AH		3.5	...3-5DF.		
1FT2105-6AF	8	2	...2-0DF.		
1FT2106-3AF	9	5	...5-0DF.	M23	...N11... (1.5 mm² / AWG16) ...N21...1) (2.5 mm² / AWG14)
1FT2106-4AF	12				
1FT2106-6AF	16	7	...7-0DF.		
1FT2108-4AC	25				
1FT2108-5AB	30				
1FT2108-7AB	37.5				
High Dynamic, force-ventilated					
1FT2108-5SB	38.7 2)	7.0	...7-0DF.	M23	...N11... (1.5 mm² / AWG16)
Compact, naturally cooled					

Motor		Converter		OCC cable	
Article number (digits 1 ... 10)	Torque M_0 / Nm	Rated power P_N / kW	Article number 6SL5310-1BE1...	Connector size	Article number 6FX☐002-8Q...
1FT2203-2AK	0.64	0.4	...0-4DF.	M17	...N08... (0.75 mm² / AWG18)
1FT2203-4AK	1.27	0.75	...0-8DF.		
1FT2204-5AF	2.4	0.75	...0-8DF.		
1FT2204-5AK		1.5	...1-5DF.		
1FT2204-6AF	3.2	1	...1-0DF.		
1FT2205-2AC		0.75	...0-8DF.		
1FT2205-2AF	3.6	1	...1-0DF.		
1FT2205-4AF	6	1.5	...1-5DF.		
1FT2205-2AH	3.6	1.5			
1FT2206-2AC	6	1	...1-0DF.	M23	...N11... (1.5 mm² / AWG16) ...N21...[1] (2.5 mm² / AWG14)
1FT2206-2AF	6.5	1.5	...1-5DF.		
1FT2206-2AH		2	...2-0DF.		
1FT2206-3AB	9	1.5	...1-5DF.		
1FT2206-3AF		2	...2-0DF.		
1FT2206-4AC	12	1.5	...1-5DF.		
1FT2206-4AF		3.5	...3-5DF.		
1FT2206-4AH		5	...5-0DF.		
1FT2208-2AF	12.5	3.5	...3-5DF.		
1FT2208-3AB	18	2	...2-0DF.		
1FT2208-3AC		3.5	...3-5DF.		
1FT2208-3AF		5	...5-0DF.		
1FT2208-4AB	22	3.5	...3-5DF.		
1FT2208-4AC		5	...5-0DF.		
1FT2208-4AF		7	...7-0DF.		
1FT2208-5AB	27	3.5	...3-5DF.		
1FT2208-5AC		7	...7-0DF.		
1FT2210-2AC	22	5.0	...5-0DF.		
1FT2210-2AF		7.0	...7-0DF.		
1FT2210-3AB	30	3.5	...3-5DF.		
1FT2210-3AC		7	...7-0DF.		
1FT2210-4AB	40	5	...5-0DF.		
1FT2210-4AC		7	...7-0DF.		
1FT2210-5AB	50				
Compact, force-ventilated					
1FT2208-3SB	22	3.5	...3-5DF.	M23	...N11... (1.5 mm² / AWG16)
1FT2208-3SC		5	...5-0DF.		
1FT2208-3SF		7	...7-0DF.		
1FT2208-4SB	28	5	...5-0DF.		
1FT2208-4SC		7	...7-0DF.		
1FT2208-5SB	35	5	...5-0DF.		

[1] Optionally available with 2.5 mm² due to derating in a warm environment

2) The converter only uses the motor up to 38.7 Nm.

3.7 Converter

The converter is a single-axis device (complete converter with integrated infeed). It is characterized by a compact design, side-by-side installation and high overload capability.

The converter is intended for use with 1FK2 and 1FT2 motors and is available in the following versions:

- Line supply voltage 1 AC 230 V (200 V ... 240 V)
  Power range 0.1 kW ... 0.75 kW
- Line supply voltage 240 V 3 AC (200 V ... 240 V) and 400 V 3 AC (380 V ... 480 V)
  Power range when connected to 400 V 3 AC: 0.4 kW ... 7 kW

Control mode

Servo control, optimized for 1F☐2 motors

Safety Integrated Functions

The converter offers the following Safety Integrated Functions:

Table 3-1 Safety Integrated Functions

Functions	Abbr.	Brief description
Safe Torque Off	STO	Safe Torque Off according to stop Category 0
Safe Stop 1	SS1	Safe stopping process according to category 1
Safe Stop 2	SS2	Safe stopping process according to Stop Category 2
Safe Operating Stop	SOS	Safe monitoring of the drive position at standstill
Safe Brake Control	SBC	Safe brake control
Safe Brake Test	SBT	Safe Brake Test
Safely-Limited Speed	SLS	Safe speed monitoring
Safe Speed Monitor	SSM	Safe output signal to monitor speed limits
Safe Direction	SDI	Safe monitoring of the direction of motion
Safely-Limited Acceleration	SLA	Safe monitoring of the acceleration limit value

You can find more information in Chapter "Selection of the Safety Integrated Functions (Page 415)".

Integrated braking resistor

In order to absorb the regenerative load of the motor, converters have an internal braking resistor (exception: 100 W device)[1)].

If the internal braking resistor is not sufficient, you have the option of connecting an external braking resistor.

More information:

- "Configuring the braking resistor (Page 90)"
- "Connecting the converter (Page 126)"

[1)] An internal braking resistor is not required for normal operation (as a result of the available DC link capacitance).

DC link coupling (devices of the 3 AC series only)

For devices of the 3 AC series, the DC links of up to 6 converters can be coupled. This means that energy balancing between axes is possible, and the braking energy of an axis can be used by other axes when accelerating. This also reduces the dissipated heat in the control cabinet because the braking energy no longer has to be converted into heat in the braking resistor.

More information:

- "DC link coupling (for converters with 3 AC line connection) (Page 97)"

Communicating with the controller via PROFINET

The converter supports the following functions:

- RT (real time)
- IRT (isochronous real time) with the telegrams 5 and 105
- MRP (media redundancy) with RT
- MRPD (seamless media redundancy) with IRT
- Shared device
- PROFIsafe
- PROFIenergy
- Automatic telegram selection
- DFP (Dynamic Frame Packing)

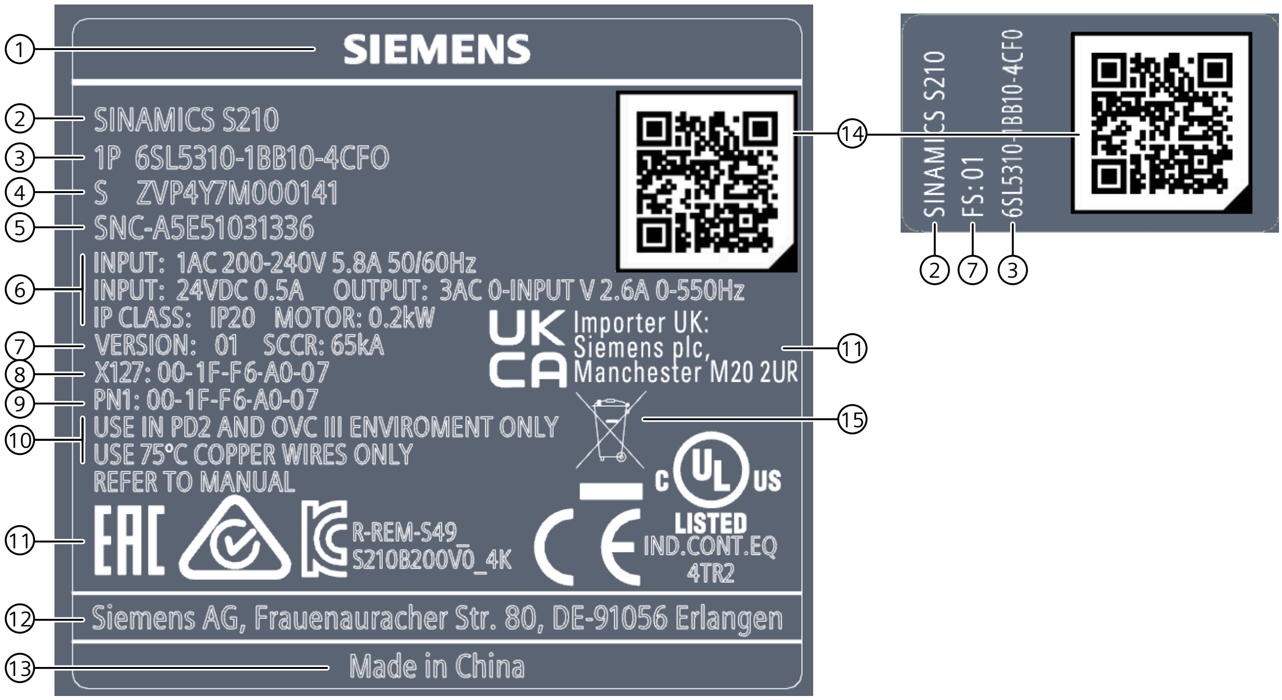
More information on PROFINET is available on the Internet:

- SIMATIC Function Manual PROFINET with STEP 7 (https://support.industry.siemens.com/cs/ww/en/view/49948856)

Commissioning, operator control and monitoring and data backup

- Web server (integrated in the converter):
  "Commissioning (web server) (Page 155)"
- Startdrive (commissioning tool):
  "Commissioning (Startdrive) (Page 207)"

Nameplate, information plate and date of manufacture - 1 AC



①	Manufacturer	⑨	MAC address of the PROFINET interface
②	Product designation	⑩	Environmental conditions
③	Article number	⑪	Certificate examples
④	Serial number	⑫	Manufacturer's address
⑤	Material number	⑬	Production location
⑥	Electrical data and degree of protection	⑭	ID link
⑦	Function release/version	⑮	Note on disposal
⑧	MAC address of the service interface		

Date of manufacture

The date of manufacture of the converter is coded in the serial number:

S Z V $\boxed{P}$ $\boxed{4}$ Y 7 M 0 0 0 1 4 1

Month of manufacture

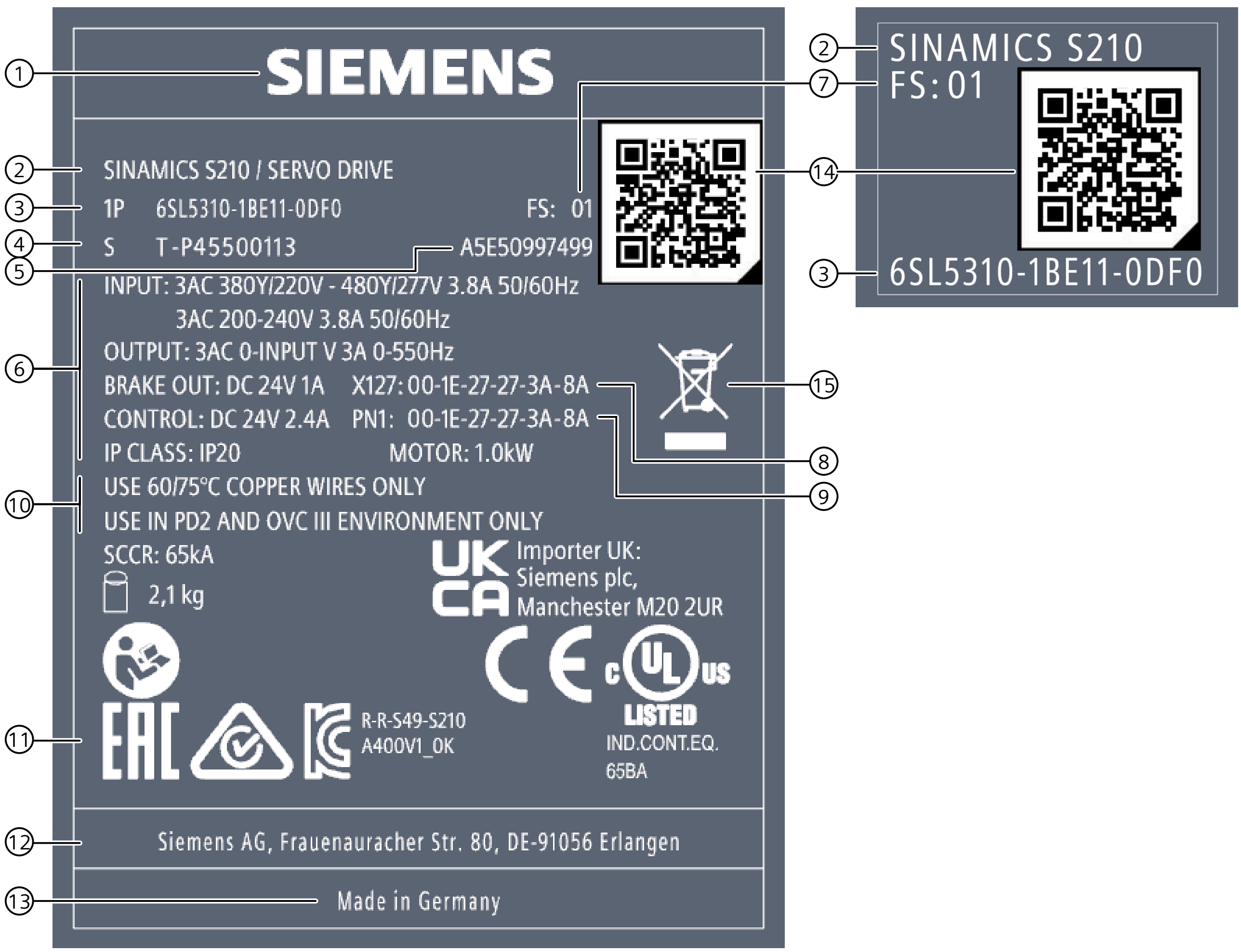
1	January	2	February	3	March	4	April
5	May	6	June	7	July	8	August
9	September	O	October	N	November	D	December

Year of manufacture

E	2014	F	2015	H	2016	J	2017	K	2018	L	2019	M	2020
N	2021	P	2022	R	2023	S	2024	T	2025	U	2026	V	2027
W	2028	X	2029										

Figure 3-8 Date of manufacture (example April 2022)

Nameplate, information plate and date of manufacture - 3 AC



①	Manufacturer	⑨	MAC address of the PROFINET interface
②	Product designation	⑩	Environmental conditions
③	Article number	⑪	Certificate examples
④	Serial number	⑫	Manufacturer's address
⑤	Material number	⑬	Production location
⑥	Electrical data and degree of protection	⑭	ID link
⑦	Function release/version	⑮	Note on disposal
⑧	MAC address of the service interface		

Date of manufacture

The date of manufacture of the converter is coded in the serial number:

S T - P 4 5 5 0 0 1 1 3

Month of manufacture

1	January	2	February	3	March	4	April
5	May	6	June	7	July	8	August
9	September	O	October	N	November	D	December

Year of manufacture

J	2017	K	2018	L	2019	M	2020	N	2021	P	2022	R	2023
S	2024	T	2025	U	2026	V	2027	W	2028	X	2029		

Figure 3-9 Date of manufacture (example April 2022)

3.8 Connection system

The motor is connected to the converter by a MOTION-CONNECT cable.

The cable uses all-in-one cable technology (One Cable Connection, OCC cable). As a result of its flexibility and low diameter, it permits very tight bending radii.

The OCC cables are available in the following variants:

- MOTION-CONNECT 500
  – Cost-effective solution for mainly fixed installation
  – Suitable for low mechanical loading
- MOTION-CONNECT 800PLUS
  – Fulfills the requirements for use in cable carriers
    - Tested for horizontal traversing paths up to 50 m
    - Not self-supporting
  – Suitable for high mechanical loading
  – Oil-resistant

The OCC cables can be supplied in lengths by the decimeter.

Extensions and cabinet bushings are available for the OCC cables.

You will find more information under:

- "Technical data and properties of the connection system (Page 756)"
- "Determining the article number of a prefabricated OCC MOTION-CONNECT cable (Page 819)"

Configuring

4

4.1 Permissible line supplies and connection options

4.1.1 Converters with 1 AC line connection

The converter is designed for grounded TN and TT line systems and non-grounded IT line systems according to IEC 60364-1 (2005).

You can find more information in Chapter "Line connection conditions for the S210 converter system with the motors 1FK2/1FT2 (Page 521)".

Connecting a converter to a 1 AC IT line system

You must remove the grounding screw when operating the converter on an IT line system. This means that you remove the connection of the integrated line filter to ground.

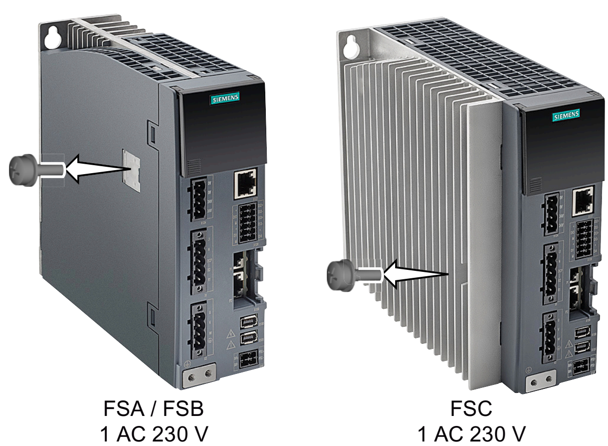


Figure 4-1 Removing the grounding screw

For converters, sizes FSA and FSB, the grounding screw is located behind a plastic cover.

- Open the cover.
- Remove the grounding screw and reclose the cover.
  Keep the grounding screw in a safe place in case it must be reinstalled.
  Type: M3, tightening torque: 0.8 Nm

WARNING

Electric shock when the grounding screw is removed

As a result of the capacitors, a hazardous voltage is present at the grounding screw for up to 5 minutes after the supply voltage has been switched off.

Contact with live parts can result in death or serious injury.

- After switching off the supply voltage, wait for 5 minutes before you check that the device really is in a no-voltage condition and start work.

4.1.2 Converter with 3 AC line connection, 6SL5310-1BE1.-.DF0

The converter is designed for grounded TN and TT line systems and non-grounded IT line systems according to IEC 60364-1 (2005). Specific measures are required when connecting to IT line systems.

You can find more information in Chapter "Line connection conditions for the S210 converter system with the motors 1FK2/1FT2 (Page 521)".

WARNING

Electric shock when operating the converter without grounding screw

If the converter is operated without a grounding screw, there is a risk of electric shock through contact with live parts when the cover is open or missing.

- Do not open the cover and do not remove the grounding screw.

NOTICE

Destruction of the converter when operated without grounding screw

Operating the converter with 3 AC line connection without grounding screw will destroy it.

- Do not remove the grounding screw.

4.1.3 Converter with 3 AC line connection, 6SL5310-1BE1.-.DF1

The converter is designed for grounded TN and TT line systems and non-grounded IT line systems according to IEC 60364-1 (2005).

You can find more information in Chapter "Line connection conditions for the S210 converter system with the motors 1FK2/1FT2 (Page 521)".

Connecting a converter to a 3 AC IT line system

You must remove the grounding screw when operating the converter on an IT line system. This means that you remove the connection of the integrated line filter to ground.

Figure 4-2 Converter 3 AC (6SL5310-1BE1.-.DF1) - removing the grounding screw

The grounding screw is located behind a plastic cover.

- Open the cover.
- Remove the grounding screw and reclose the cover.
  Keep the grounding screw in a safe place in case it must be reinstalled.
  Type: M3, tightening torque: 0.8 Nm

WARNING

Electric shock when the grounding screw is removed

As a result of the capacitors, a hazardous voltage is present at the grounding screw for up to 5 minutes after the supply voltage has been switched off.

Contact with live parts can result in death or serious injury.

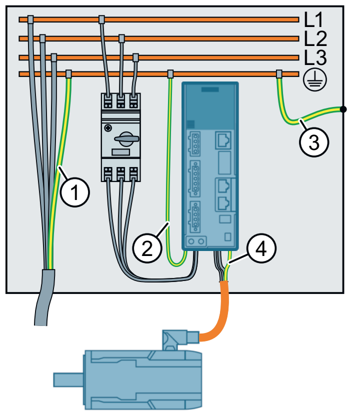
- After switching off the supply voltage, wait for 5 minutes before you check that the device really is in a no-voltage condition and start work.

4.1.4 Permissible line system configurations for motors

In combination with the drive system, the motors are generally designed for grounded TN and TT line systems and non-grounded IT line systems.

You can find more information in Chapter "Line connection conditions for the S210 converter system with the motors 1FK2/1FT2 (Page 521)".

4.1.5 Minimum cross-section of the protective conductor



① The protective conductor (PE) must be dimensioned in accordance with the local installation rules for equipment with increased discharge currents. As a minimum, one of the following conditions must be satisfied:

- The protective conductor is routed so that along its complete length it is protected against mechanical damage.
- The protective conductor has a cross-section ≥ 10 mm² Cu.
  For a cross-section < 10 mm² copper, a 2nd protective conductor with the same cross-section is provided.
- When establishing the connection using an industrial plug connector according to EN 60309, the insulated conductor of a multi-conductor cable must have a cross-section ≥ 2.5 mm² Cu.
- As an insulated conductor of a multi-conductor cable, the protective conductor has a cross-section ≥ 2.5 mm² Cu.

② The protective conductor must be dimensioned in compliance with local installation rules.

- If each converter is individually protected, the protective conductor with the same cross-section must be routed in the same way as the line connecting cable to the converter.
- If a group of converters is connected via the AC coupling, the protective conductor must be implemented as follows:
  - Group protection according to IEC: as a minimum 6 mm² Cu[1)]
  - Group protection according to NEC/CEC: AWG 8 Cu[2)]

③ The cable cross-section must be dimensioned in compliance with local installation rules.

④ Same cross-section as the line conductor of the motor cable. The protective conductor is part of the OCC cable.

[1)] According to IEC 60364-5-54, Chap. 543.1.2

[2)] According to NEC (NFPA 70) Table 250.122 / CEC (CSA 22.1.18) Rule 10-6149

Figure 4-3 Protective connection concept

4.1.6 Connection options for converters with 1 AC line connection

Basic connection options

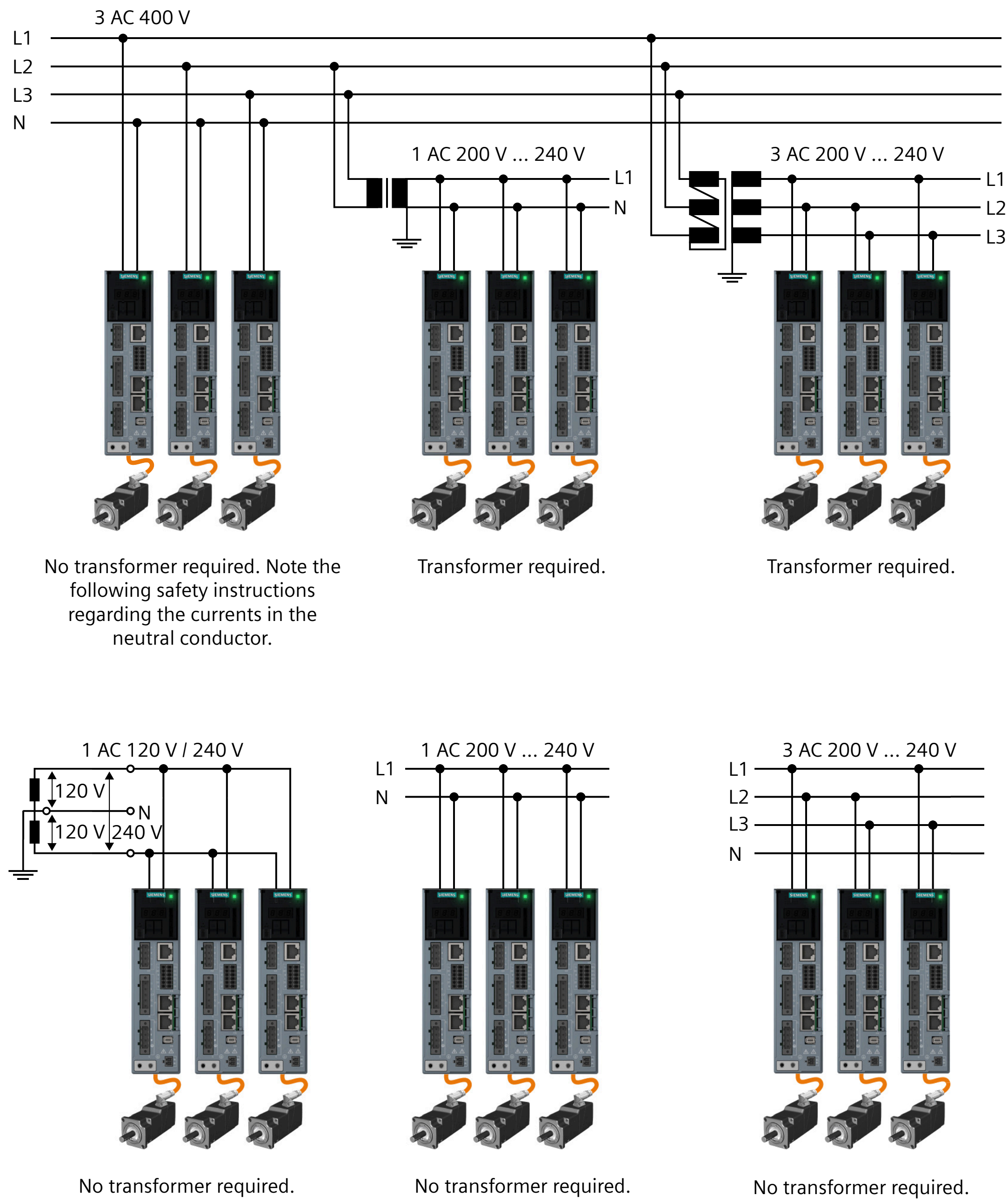


Figure 4-4 Connection options

WARNING

Neutral conductor fire caused by high currents

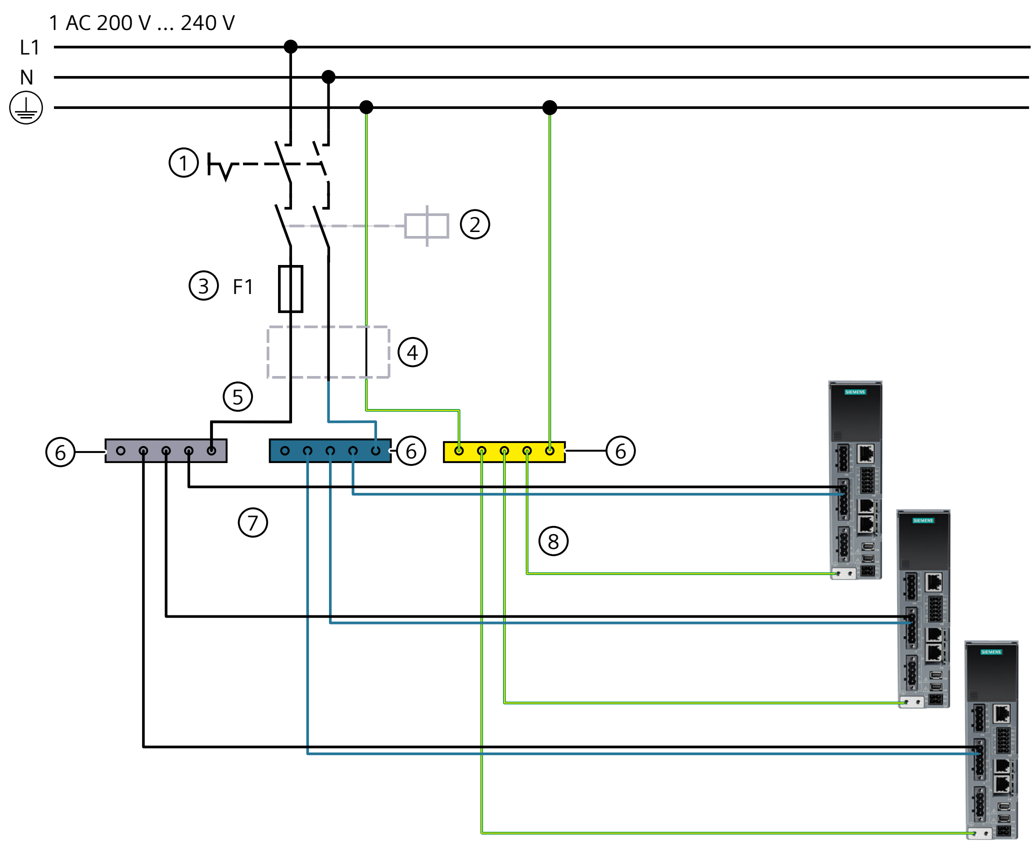
If you connect the converter without an isolating transformer to a supply system with 400 V 3 AC between the N-conductor and a line conductor (L1, L2 or L3), the harmonic currents in the N-conductor can add up to values that are greater than the currents in the line conductors. This heats up the N-conductor and can cause a fire.

- Take the harmonic currents into account when dimensioning the line connecting cables, e.g. according to DIN VDE 100-520 Insert 3.

Connection examples and cable cross-sections

The protective devices should be provided to protect the cable in the case of a short-circuit or ground fault. Overload converter protection is integrated in the converter itself.

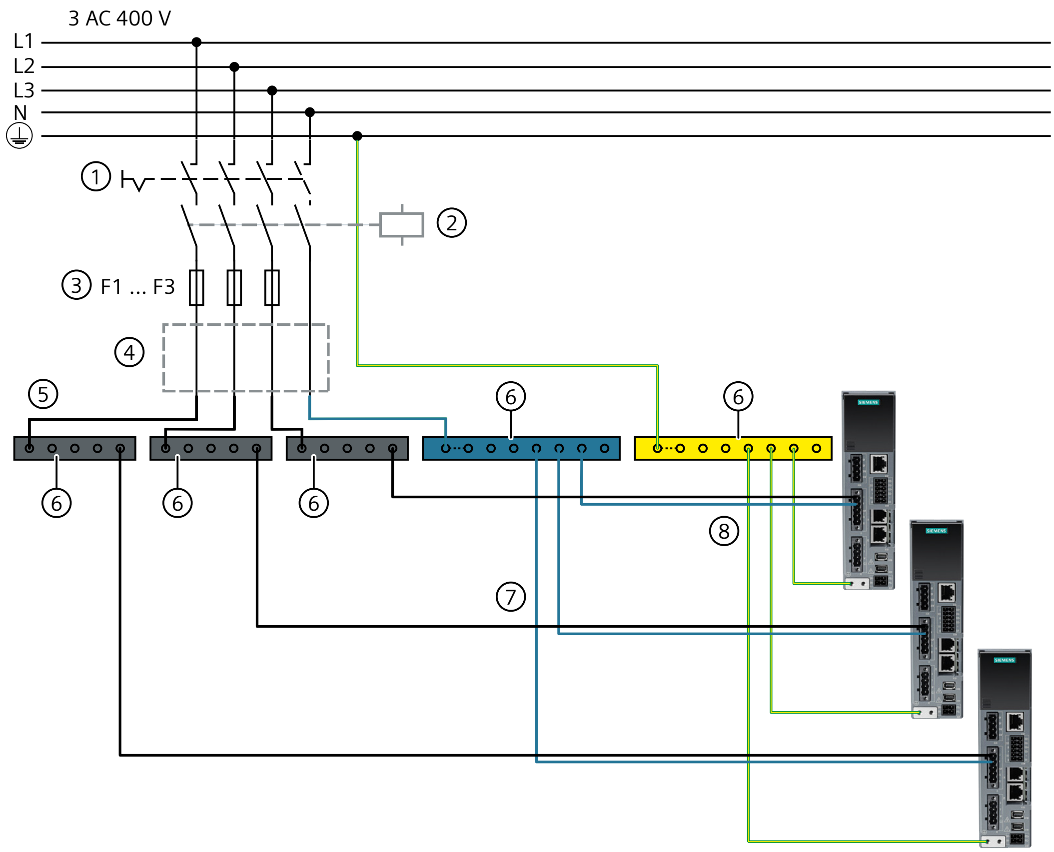
Connecting devices to line voltage 1 AC 230 V



①	Line disconnecting device	e.g. load disconnector
②	Line contactor	optional
③	Protective device for fault protection	e.g. fuses, circuit breakers, miniature circuit breakers (see Product Information "Protective Devices for SINAMICS S210 (https://support.industry.siemens.com/cs/ww/en/view/109815356)")
④	Line filter (optional)	6SL3203-0BB21-8VA1 rated current 18 A In conjunction with the line filter, the sum of the rated input currents must not exceed 18 A. The rated current of the protective device ③ must be appropriately adapted.
⑤	Cable to the distribution block	Depending on the installation conditions (type of cable routing and ambient temperature) and the local regulations with reference to the total rated input currents. The same cross-section should be used for the protective conductor.
⑥	Distribution block	
⑦	Line connection	0.75 mm^2 ... 2.5 mm^2 / AWG 18 ... AWG 12 in accordance with the installation conditions (type of cable routing and ambient temperature) and the local regulations
⑧	Protective conductor connection	Same cross-section as the line connecting cable ⑦

Figure 4-5 Example for connecting devices to a line voltage of 1 AC 230 V

Connecting devices to line voltage 3 AC 400 V



①	Line disconnecting device	e.g. load disconnector
②	Line contactor	optional
③	Protective device for fault protection	e.g. fuses, circuit breakers, miniature circuit breakers (see Product Information "Protective Devices for SINAMICS S210 (https://support.industry.siemens.com/cs/ww/en/view/109815356)")
④	Line filter (optional)	from third-party manufacturers
⑤	Cable to the distribution block	Depending on the installation conditions (type of cable routing and ambient temperature) and the local regulations with reference to the total rated input currents. The same cross-section should be used for the protective conductor.
⑥	Distribution block	
⑦	Line connection	0.75 mm² ... 2.5 mm² / AWG 18 ... AWG 12 in accordance with the installation conditions (type of cable routing and ambient temperature) and the local regulations
⑧	Protective conductor connection	Same cross-section as the line connecting cable ⑦

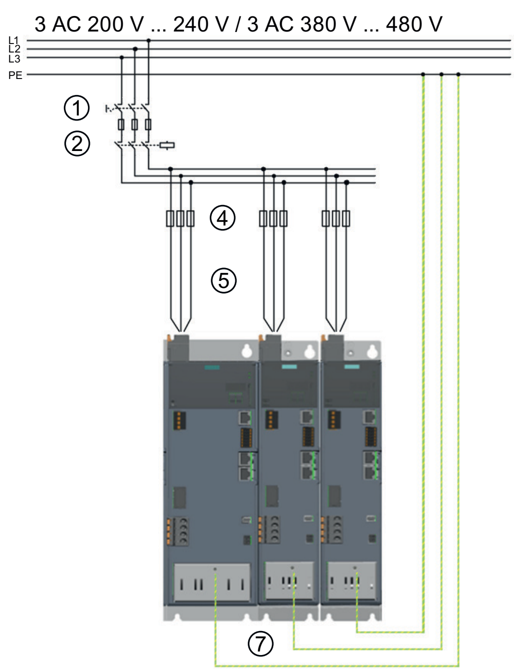
Figure 4-6 Example for connecting devices to a line voltage of 3 AC 400 V

4.1.7 Connection options for converters with 3 AC line connection

You can connect each converter individually via the standard terminals and the protective devices assigned to them in accordance with the local installation regulations or you can connect a group of converters via the optional AC coupling and a common protective device.

In addition, you can couple the DC links of up to 6 converters to exchange energy within this drive line-up. To couple the DC links, the line connections of the coupled converters must also be connected.

Individual connection using standard terminals



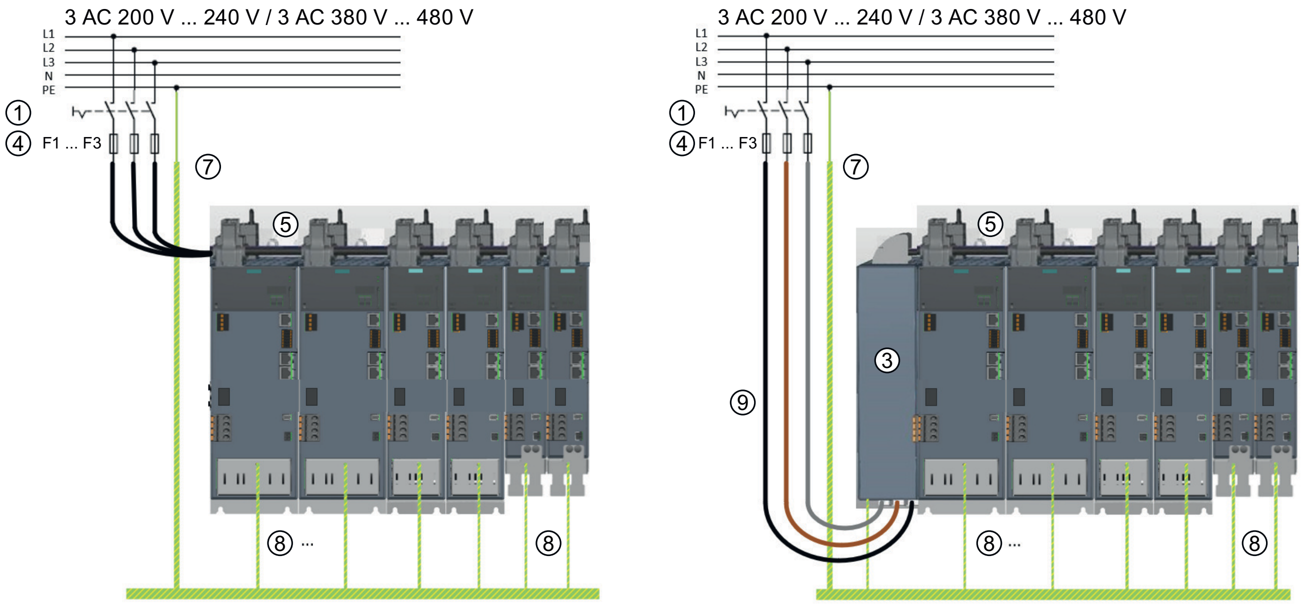
①	Line disconnecting device	e.g. load disconnector
②	Line contactor	optional
④	Protective device for fault protection	e.g. fuses, circuit breakers, miniature circuit breakers (see Product Information "Protective Devices for SINAMICS S210 (https://support.industry.siemens.com/cs/ww/en/view/109815356)")
⑤	Line connection	1.5 mm² ... 6 mm² / AWG 16 ... AWG 10 in accordance with the conditions in the installation (type of cable installation and ambient temperature) and the local regulations
⑦	Protective conductor connection	Same cross-section as the line connecting cable ⑤

Figure 4-7 Individually connected converters via standard terminals

Common connection via an AC coupling

You can connect a group of converters via a common protective device if you order the connector kit for AC coupling 6SL3260-2DC10-0AA0 (AC link) for each converter. It is not permissible that the sum of the rated input currents of the converter exceed the continuous current carrying capacity of the cables and/or the rated current of the optional line filter; see Section "Connecting DC links via the DC link coupling".

The connector in the connector kit for the AC coupling (16 mm^2/AWG 6) replaces the line connector contained in the scope of delivery of the converter (6 mm^2/AWG 10). The single-core cable is routed through this connector and electrical contact with the cable is made with a set screw. In this way, the line connections of a phase are connected via a cable for all converters (see also Chapter "Establishing the AC coupling and the DC link coupling (Page 141)").



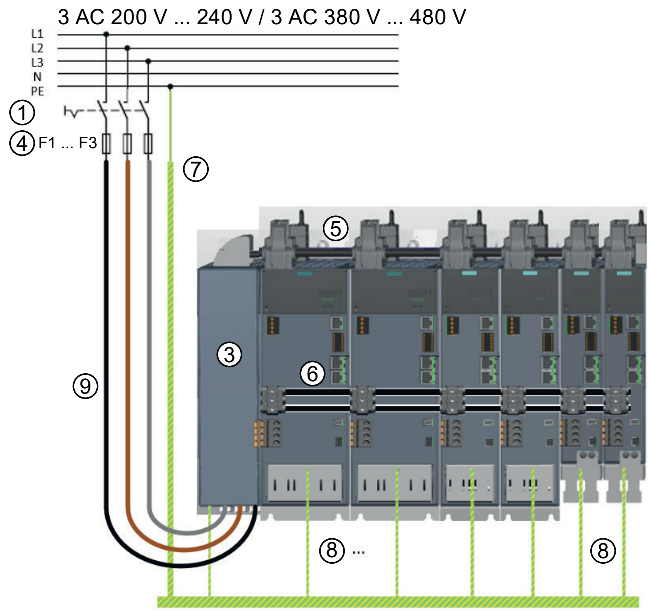
①	Line disconnecting device	e.g. load disconnector
③	Line filter (optional)	6SL3203-0BE23-5HA0: Rated current 35 A 6SL3203-0BE26-5HA0: Rated current 65 A
④	Protective device for fault protection	e.g. fuses, circuit breakers, miniature circuit breakers (see Product Information "Protective Devices for SINAMICS S210 (https://support.industry.siemens.com/cs/ww/en/view/109815356)")
⑤	Cables for the AC coupling	For permissible cables for IEC, UL and CSA applications, see Chapter "Establishing the AC coupling and the DC link coupling (Page 141)"
⑦	Protective conductor	For the cross-section according to ⑨ minimum cross-section, see ⑧
⑧	Protective connection	Group protection according to IEC: • 6 mm² / AWG 10 Group protection according to NEC/CEC: • 6 mm² / AWG 10 for overcurrent protective devices up to 60 A • 10 mm² / AWG 8 for overcurrent protective devices up to 100 A
⑨	Cable to the line filter	Depending on the installation conditions (type of cable routing and ambient temperature) and the local regulations with reference to the total rated input currents.

Figure 4-8 Converter with AC coupling (without/with line filter)

DC links coupled via the DC link coupling

You can couple the DC links of up to 6 converters to exchange energy within this drive line-up. To couple the DC links, the line connections of the coupled converters must also be connected. For each converter, order connector kit 6SL3260-2DC00-0AA0 for the AC and DC link coupling (AC and DC link).

The following figure shows the basic structure of such a system.



①	Line disconnecting device	e.g. load disconnector
③	Line filter (optional)	6SL3203-0BE23-5HA0: Rated current 35 A 6SL3203-0BE26-5HA0: Rated current 65 A
④	Protective device for fault protection	e.g. fuses, circuit breakers, miniature circuit breakers (see Product Information "Protective Devices for SINAMICS S210 (https://support.industry.siemens.com/cs/ww/en/view/109815356)")
⑤	Cables for the AC coupling	For permissible cables for IEC, UL and CSA applications, see Chapter "Establishing the AC coupling and the DC link coupling (Page 141)"
⑥	Cables for the DC link coupling	same as ⑤
⑦	Protective conductor	For the cross-section according to ⑨ minimum cross-section, see ⑧
⑧	Protective connection	Group protection according to IEC: • 6 mm² / AWG 10 Group protection according to NEC/CEC: • 6 mm² / AWG 10 for overcurrent protective devices up to 60 A • 10 mm² / AWG 8 for overcurrent protective devices up to 100 A
⑨	Cable to the line filter	Depending on the installation conditions (type of cable routing and ambient temperature) and the local regulations with reference to the total rated input currents.

Figure 4-9 Converters with AC coupling and DC link coupling

Note that for the cables for the line connection ⑤ and for coupling the DC links ⑥, only the specified cable types are permissible to achieve degree of protection IP20 and ensure reliable contacting.

The cables for the AC coupling ⑤ of a drive line-up must be loaded with no more than 65 A due to the plug-in connector. Calculate the permissible current-carrying capacity of the cables in accordance with the local installation regulations and make sure that the total of the rated input currents of all devices that are connected to a common AC coupling does not exceed the calculated current-carrying capacity of the cables or the optional line filter.

Example of a calculation according to IEC 60364-5-52:

- Cross-section: 16 mm^2
- Insulating material: PVC
- No. of loaded conductors: 3
- Type of cable installation: E
- Ambient temperature: 50 °C
- Current carrying capacity: 56.8 A

Ambient temperature [°C]	Max. current at 70 °C cables [A]	Max. current at 90 °C cables [A]
40	65.0	65.0
45	63.2	65.0
50	56.8	65.0

For end use in the USA or Canada, the relevant national standards that apply there must be observed in installations.

The common protective device must disconnect the power supply of the drive line-up in the event of a fault without thermally overloading the AC coupling.

For suitable protective devices, see Product Information "Protective devices for SINAMICS S210 (https://support.industry.siemens.com/cs/ww/en/view/109815356)".

The selection of the protective device can be as follows with estimation:

- Calculate the input current of group I_{L_group} as the total of the rated input currents (see Chapter "Specific data of the converter with 3 AC line connection (Page 754)").
- The input current of group I_{L_group} must be less than the current-carrying capacity I_Z of the AC coupling.
- The rated current I_N of the protective device should be 25% greater than the previously calculated input current of the group. However, the maximum permissible rated current of the largest protective element according to "Protective devices for SINAMICS S210" must not be exceeded.

4.1.8 Line connection via protection and monitoring equipment

4.1.8.1 Overcurrent protective devices (mandatory)

Standard fuses for IEC and UL

Examples of suitable fuses are provided in the technical data.

Permissible protective devices are described for 3 connection types (1 AC, 3 AC and 3 AC with AC coupling) in the subsequent chapters with connection options for converters.

More detailed information is provided in the product information "Protective Devices for SINAMICS S210 (https://support.industry.siemens.com/cs/ww/en/view/109815356)".

For installation in conformance with UL and cUL, additional information is provided in the Appendix: UL Markings (Page 1255)".

4.1.8.2 Residual current devices (optional)

Residual current circuit breakers (RCCB) can be used in addition to overcurrent protective devices.

Using residual current circuit breakers for converters with 1 AC line connection

- Only use super-resistant (short time-delayed) type A or type B residual current circuit breakers.
- Use a residual current circuit breaker with a rated fault current of 300 mA.
- Carefully ensure that the loop impedance is maintained corresponding to local installation regulations.
- Only operate the system with the internal line filters or recommended external line filters.
- Ensure that the switching elements (disconnector unit, contactors) for connecting and disconnecting the drive system have a delay time of max. 35 ms between the closing/ opening of the individual main contacts.

Using residual current circuit breakers for converters with 3 AC line connection

- Only use super-resistant (short time-delayed) type B residual current circuit breakers.
- Use a residual current circuit breaker with a rated fault current of 300 mA.
- Carefully ensure that the loop impedance is maintained corresponding to local installation regulations.
- Only operate the system with the internal line filters or recommended external line filters.
- Ensure that the switching elements (disconnector unit, contactors) for connecting and disconnecting the drive system have a delay time of max. 35 ms between the closing/ opening of the individual main contacts.
- Install separate residual current circuit breakers for each converter or for a group of converters when using an AC coupling.

WARNING

Electric shock or fire when using unsuitable residual current devices

In the case of a fault, converters with 3 AC line connection can generate smooth DC fault currents, which means that type A or AC residual current circuit breakers cannot be used.

- Use the recommended type B residual current circuit breakers to protect converters.
- If higher-level residual current circuit breakers are used, then these must also be type B devices.

Typical converter leakage currents

Note

Nuisance tripping of residual current circuit breakers

For unfavorable line supply conditions, as a result of the inherent system, converters can generate capacitive discharge currents. These capacitive discharge currents can cause a residual current circuit breaker to unnecessarily trip (nuisance tripping).

Typical leakage currents for converters with 1 AC line connection

Table 4-1 Decision-making support/guide values for leakage currents of 1 AC devices[1)]

Device	I_{cm}, typical 50 Hz component up to 240 V	I_{cm}, typical 60 Hz component up to 240 V	I_{cm}, typical Complete frequency spectrum for 50 Hz, up to 240 V
Frame size FSA	13 mA	15 mA	70 mA (maximum @ 8 kHz)
Frame size FSB	13 mA	15 mA	70 mA (maximum @ 8 kHz)
Frame size FSC	13 mA	15 mA	70 mA (maximum @ 8 kHz)
1 AC line filter (18 A)	7 mA	8 mA	A statement is not possible, as this depends heavily on the system
Supplementary filter (for additional load, three-phase)	40 mA	48 mA	

1) Actual values can deviate significantly from the data as a result of the dependency of the leakage current on the load, cable length, line voltage and frequency, component tolerances as well as the protective conductor connection.

By removing the grounding screw of the integrated line filter, for an appropriate configuration, multiples of the leakage currents of the complete frequency spectrum can occur from the table above.

Typical leakage currents for converters with 3 AC line connection

Table 4-2 Decision-making support/guide values for leakage currents of 3 AC devices[1)]

Device	I_{cm}, typical 50 Hz component up to 480 V	I_{cm}, typical 60 Hz component up to 480 V	I_{cm}, typical Complete frequency spectrum for 50 Hz, up to 480 V
Frame size FSA	10 mA	12 mA	85 mA (maximum @ 8 kHz)
Frame size FSB	15 mA	17 mA	100 mA (maximum @ 750 Hz)
Frame size FSC	24 mA	29 mA	100 mA (maximum @ 750 Hz)

Device	I_{cm}, typical 50 Hz component up to 480 V	I_{cm}, typical 60 Hz component up to 480 V	I_{cm}, typical Complete frequency spectrum for 50 Hz, up to 480 V
3 AC line filter (35 A and 65 A)	9 mA	11 mA	A statement is not possible, as this depends heavily on the system
Supplementary filter (for additional load, three-phase)	40 mA	48 mA	

[1] Actual values can deviate significantly from the data as a result of the dependency of the leakage current on the load, cable length, line voltage and frequency, component tolerances as well as the protective conductor connection.

By removing the grounding screw of the integrated line filter, for an appropriate configuration, multiples of the leakage currents of the complete frequency spectrum can occur from the table above.

4.2 Configuring the motor

4.2.1 Configuration sequence

Motion Control

Drives are optimized for motion control applications. They execute linear or rotary movements within a defined travel cycle. All movements should be optimized in terms of time.

As a result, drives must meet the following requirements:

- High dynamic response, i.e. short rise times
- Capable of overload, i.e. a high reserve for accelerating
- Wide control range, i.e. high resolution for precise positioning.

The following table "Configuring procedure" is applicable for synchronous and induction motors.

General configuring procedure

The function description of the machine provides the basis for configuration. The components are selected according to physical interdependencies and the selection process is usually carried out in the following sequence of steps:

Table 4-3 Configuration sequence

step	Description of the configuring activity	
1.	Clarify the drive type	Refer to the next Chapter
2.	Define the constraints and incorporate them into the automation system	
3.	Define the load case, calculate the maximum load torque and determine the motor	
4.	Define the converter required	See the Catalog
5.	Repeat steps 3 and 4 for additional axes	
6.	Determine line-side power options (main switch, fuses, line filters, etc.)	
7.	Define other system components (e.g. braking resistors)	
8.	Calculate the current demand of the components for the 24 V DC power supply - and specify the power supplies (SITOP devices, Control Supply Modules)	
9.	Determine the connection system components	
10.	Configure the drive line-up components	
11.	Calculate the required cable cross sections for power supply and motor connections	
12.	Inclusion of mandatory installation clearances	

Also observe the recommended combinations of converters and motors with the associated connecting cables in Chapters "Motor-converter combinations for 1FK2 (Page 52)" and "Motor-converter combinations for 1FT2 (Page 55)".

More information

We recommend using the "SIZER" configuration software to select the converter.

You can find additional information about SIZER on the Internet:

TIA Selection Tool (https://www.siemens.com/tia-selection-tool)

4.2.2 Clarify the drive type

Procedure

- Select the motor on the basis of the required torque (load torque), which is defined by the application, e.g. traveling drives, hoisting drives, test stands, centrifuges, paper and rolling mill drives, feed drives or main spindle drives.
  Gearboxes to convert motion or to adapt the motor speed and motor torque to the load conditions must also be taken into account when selecting the motor.
- Determine the torque to be provided by the motor based on the following mechanical data:
  - The load torque specified by the application
  - Masses to be moved
  - Diameter of the drive wheel
  - Leadscrew pitch, gear ratios
  - Frictional resistance data
  - Mechanical efficiency
  - Traversing distances
  - Maximum velocity
  - Maximum acceleration and maximum deceleration
  - Cycle time

4.2.3 Define the boundary conditions and incorporate them into the automation system

Description

When configuring, take into account the following:

- The line system configuration when using specific motor types and/or line filters
- Rated values of the motor
- The ambient temperatures and the installation altitude of the motors and drive components
- Heat dissipation from the motors

Other conditions apply when integrating the drives into an automation environment such as SINUMERIK, SIMATIC or SIMOTION.

For motion control and technology functions (e.g. positioning), as well as for synchronous operation functions, the corresponding automation system, e.g. SIMATIC S7-1500 or SIMOTION D is used.

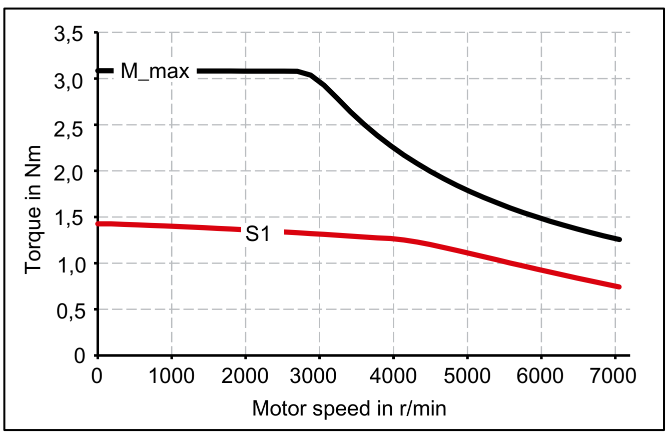
4.2.4 Define the load case, calculate the maximum load torque and determine the motor

Description

The motors are defined based on the motor type-specific limiting characteristics.

The characteristics define the torque or power curve with respect to the speed. The characteristics are available in Chapter "Technical data and properties of the motor (Page 522)".

The characteristics take into account the motor limits based on the DC link voltage. The DC-link voltage is dependent on the line voltage.



*M*_max	Curve of the maximum torque
S1	S1 characteristic

Figure 4-10 Characteristics for synchronous motors

Procedure

1. Determine the load that is specified by the application itself.
   Use different characteristics for the different loads.
   The following operating scenarios have been defined:
   – Duty cycle with constant ON duration
   – Free duty cycle
2. Determine the characteristic torque and speed operating points of the motor for the defined load.

3. Calculate the acceleration torque of the motor.
   Add the load torque and the acceleration torque. to obtain the maximum required torque.
4. Verify the maximum motor torque with the limiting characteristic curves of the motors.
   The following criteria must be taken into account when selecting the motor:
   - Compliance with the dynamic limits
     All torque-speed points of the load must be below the relevant limiting characteristic curve.
   - Compliance with the thermal limits
     At average motor speed, the effective motor torque must be below the S1 characteristic (continuous motion) during the load.

❒

Duty cycles with constant ON duration

For duty cycles with constant ON duration, there are specific requirements for the torque characteristic curve as a function of the speed, for example:

M = constant, $M \sim n^2$, $M \sim n$ or P = constant

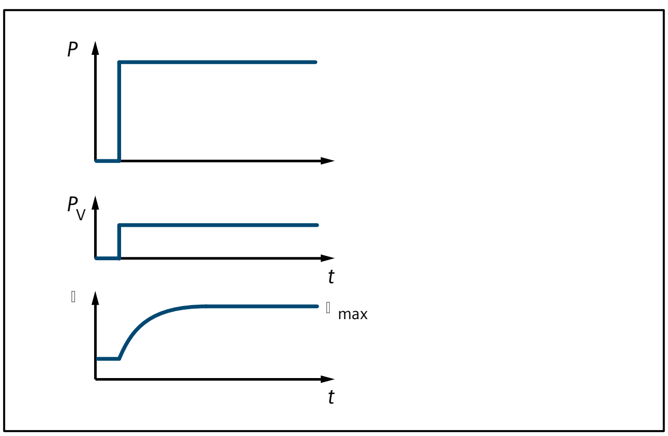
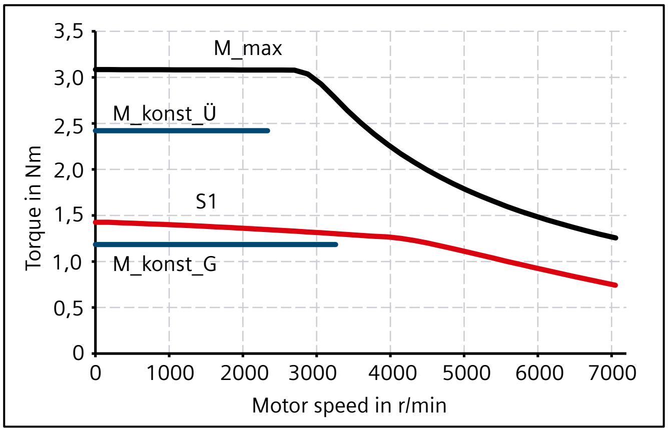


Figure 4-11 S1 duty (continuous motion)

The drives with this load cycle typically operate at a stationary operating point.

Procedure

1. Configure a base load for the stationary operating point. The base load torque must lie below the S1 characteristic.
2. In the event of transient overloads (e.g. during acceleration), configure an overload. Calculate the overload current in relation to the required overload torque. The overload torque must lie below the M_max characteristic.
   In summary, the motor is configured as follows:



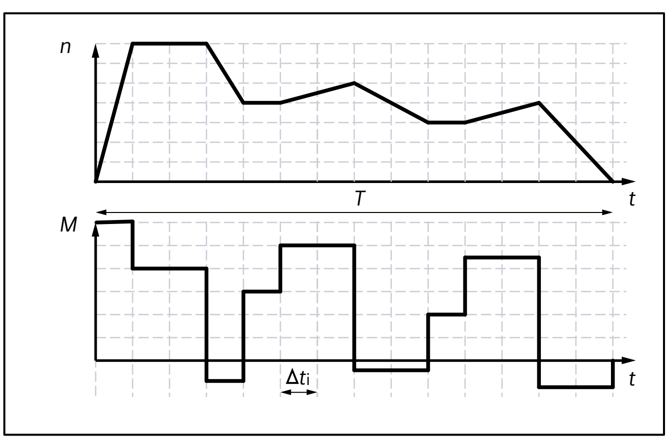
*M*_max	Curve of the maximum torque	*M*_const_O	Curve of the overload torque
S1	S1 characteristic	*M*_const_B	Curve of the base load torque

Figure 4-12 Motor selection for a duty cycle with constant switch-on duration

3. Select a motor that satisfies the requirements of S1 duty.

Free duty cycle

A free duty cycle defines the curve of the motor speed and the torque over time.



n	Speed	*T*	Cycle time
M	Torque	Δt_i	Time interval
t	Time		

Figure 4-13 Example of free duty cycle

Procedure

Determine the required motor torque as follows:

- Define a load torque for each time slice. For acceleration phases, also take into account the average load moment of inertia and motor moment of inertia. If required, take a frictional torque into account that opposes the direction of motion.
- With mounted gearbox:
  Determine the load torque and the acceleration torque that must be supplied by the motor. Take the gear ratio and gear efficiency into account.

Note

A higher gear ratio increases positioning accuracy in terms of encoder resolution. For any given encoder resolution, as the gear ratio increases, so does the resolution of the machine position to be detected.

The following formulas can be used for duty cycles outside the field-weakening range.

For the motor torque in a time slice Δt_i the following applies:

$$M_{\text{Mot, i}} = (J_M + J_G) \cdot \frac{2\pi}{60} \cdot \frac{\Delta n_{\text{Last, i}}}{\Delta t_i} \cdot i + \left(J_{\text{Last}} \cdot \frac{2\pi}{60} \cdot \frac{\Delta n_{\text{Last, i}}}{\Delta t_i} + M_{\text{Last, i}} + M_R\right) \cdot \frac{1}{i \cdot \eta_G}$$

The motor speed is: $n_{\text{Mot, i}} = n_{\text{Last, i}} \cdot i$

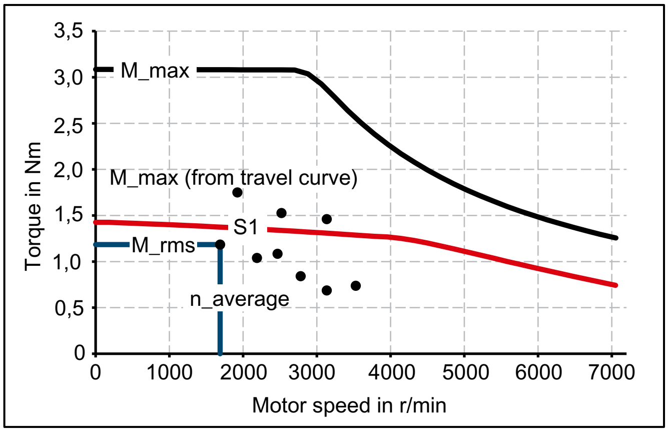
The effective torque is obtained as follows: $M_{\text{Mot, eff}} = \sqrt{\frac{\sum M_{\text{Mot, i}}^2 \cdot \Delta t_i}{T}}$

The average motor speed is calculated as follows: $n_{\text{Mot, mittel}} = \frac{\sum \frac{n_{\text{Mot, i, A}} + n_{\text{Mot, i, E}}}{2} \cdot \Delta t_i}{T}$

J_M	Motor moment of inertia
J_G	Gearbox moment of inertia
J_{load}	Load moment of inertia
n_{load}	Load speed
i	Gear ratio
η_G	Gearbox efficiency
M_{load}	Load torque
M_R	Frictional torque
T	Cycle time
A; E	Initial value, final value in time slice Δt_i
t_e	ON duration
Δt_i	Time interval

The effective torque M_{eff} must lie below the S1 characteristic.

The maximum torque M_{max} is produced during the acceleration operation. M_{max} must lie below the voltage limiting characteristic curve. In summary, the motor is configured as follows:



*M*_max	Curve of the maximum torque	S1	S1 characteristic = M_0
*M*_eff	Effective torque	●	Points from the traversing profile
,*n*_mean	Mean speed		

Figure 4-14 Motor selection for duty cycle

Defining the motor

By varying, you can find the motor that satisfies the conditions of the operating mode (duty cycle).

- Determine the motor current at base load. The calculation depends on the type of motor (synchronous motor or induction motor) and the operating mode (duty cycle) used.

Note

When configuring according to duty cycle with constant ON duration with overload, the overload current is calculated in relation to the required overload torque.

- Comply with the thermal limits of the motor.
- Configure the other properties of the motor through the available motor options.

4.3 Configuring the braking resistor

The converters are equipped with a Braking Module that converts the regenerative energy of the servomotor into heat using an integrated braking resistor. Regenerative energy is produced, for example, when braking the connected mechanical system.

If the motor feeds back more energy than can be dissipated by the internal braking resistor, then the converter shuts down with fault F30002 (DC link overvoltage). In this case, you will require an external braking resistor.

If you know the moment of inertia of your system (referred to the motor shaft), then calculate the braking energy that occurs according to the information provided in Chapter "Calculating the braking energy (Page 91)".

Table 4-4 Braking power and braking energy with the internal braking resistor

Article number	Rated power in kW	Continuous braking power in W	Peak power in kW	Braking energy in kJ
Converter with line connection 200 V ... 240 V 1 AC				
6SL5310-1BB10-1CF0	0.1	5[1)]	0.35	0.01
6SL5310-1BB10-2CF0	0.2	10	0.6	0.15
6SL5310-1BB10-4CF0	0.4	20	1.3	0.325
6SL5310-1BB10-8CF0	0.75	40	2.4	0.60
Converters with 3 AC 200 ... 240 V line connection				
6SL5310-1BE10-4DF.	0.4	50	0.6	0.3
6SL5310-1BE10-8DF.	0.75	50	0.8	0.3
6SL5310-1BE11-0DF.	1.0	50	0.8	0.3
6SL5310-1BE11-5DF.	1.5	100	1.6	0.6
6SL5310-1BE12-0DF.	2.0	100	1.6	0.6
6SL5310-1BE13-5DF.	3.5	325	5.0	1.95
6SL5310-1BE15-0DF.	5.0	325	5.0	1.95
6SL5310-1BE17-0DF.	7.0	325	5.0	1.95
Converter with line connection 3 AC 380 V ... 480 V				
6SL5310-1BE10-4DF.	0.4	50	1.2	0.30
6SL5310-1BE10-8DF.	0.75	50	2.4	0.30
6SL5310-1BE11-0DF.	1.0	50	3.0	0.30
6SL5310-1BE11-5DF.	1.5	100	5.7	0.60
6SL5310-1BE12-0DF.	2.0	100	6.0	0.60
6SL5310-1BE13-5DF.	3.5	325	15.0	1.95
6SL5310-1BE15-0DF.	5.0	325	19.0	1.95
6SL5310-1BE17-0DF.	7.0	325	19.5	1.95

1) The 1 AC 200 ... 240 V 100 W device is not equipped with an internal braking resistor. An internal braking resistor is not required for normal operation as a result of the available DC link capacitance.

4.3.1 Calculating the braking energy

To find out whether you require an external braking resistor, calculate the braking energy according to the following formula:

$$W = \frac{1}{2}\,(J_{mot} + J)\,\frac{4\pi^2}{3600}\,(n_1^2 - n_2^2)$$

W / J	Braking energy
J_{mot} / kgm²	Moment of inertia of the servo motor • Technical data and characteristics of the 1FK2 connected to 230 V 1AC, 240 V 3AC, naturally cooled (Page 558) • Technical data and characteristics of the 1FK2 connected to 3 AC 400 V, 3 AC 480 V, naturally cooled (Page 592) • Technical data and characteristics of the 1FT2 connected to 1 AC 230 V, 3 AC 240 V, naturally cooled (Page 620) • Technical data and characteristics of the 1FT2 connected to 400 V 3AC, 480 V 3AC, naturally cooled (Page 684)
J / kgm²	Moment of inertia of the driven mechanical system in relation to the shaft of the servomotor
n_1 / r/min	Initial speed
n_2 / r/min	Speed after braking

Note

As the friction is not taken into account in the above formula, less energy is fed back to the servo drive system in practice than that calculated in the formula.

Example

An 1FK2104-5AK1... servomotor with low moment of inertia (with integrated holding brake) with mechanical system is fed from a SINAMICS S210 6SL5310-BB10-8CF0. It is to be braked from 3000 r/min to 600 r/min

Moment of inertia of the servomotor 1FK2104-5AK1...	$J_{mot} = 0.65 \times 10^{-4}$ kgm²
Moment of inertia of the driven mechanical system	$J = 4 \times 10^{-4}$ kgm²

$n_1 = 3000$ r/min $\quad n_2 = 600$ r/min

$\Rightarrow W = 22.03$ J (1 J = 1 Ws)

The braking energy that can be absorbed by the integrated braking resistor (600 J) is higher than the actual braking energy (22.03 J). In this case, therefore, no external braking resistor is required.

4.3.2 Requirements placed on the external braking resistor

WARNING

Risk of fire caused by continuous overload

An explosion or a fire could occur if the external braking resistor is continuously overloaded (for example as the result of a defective Braking Module). This can result in severe injury or death and/or the enclosure could melt.

- Use only braking resistors that are intrinsically safe.
- Use only a braking resistor with temperature monitoring and connect the temperature monitoring to digital input DI4 of the converter.

NOTICE

Damage to the converter due to its maximum load being exceeded

If the maximum permissible continuous power, peak power or braking energy is exceeded, the converter may be damaged.

- Only ever operate the converter within its maximum permissible working range.

Load cycles for braking resistors

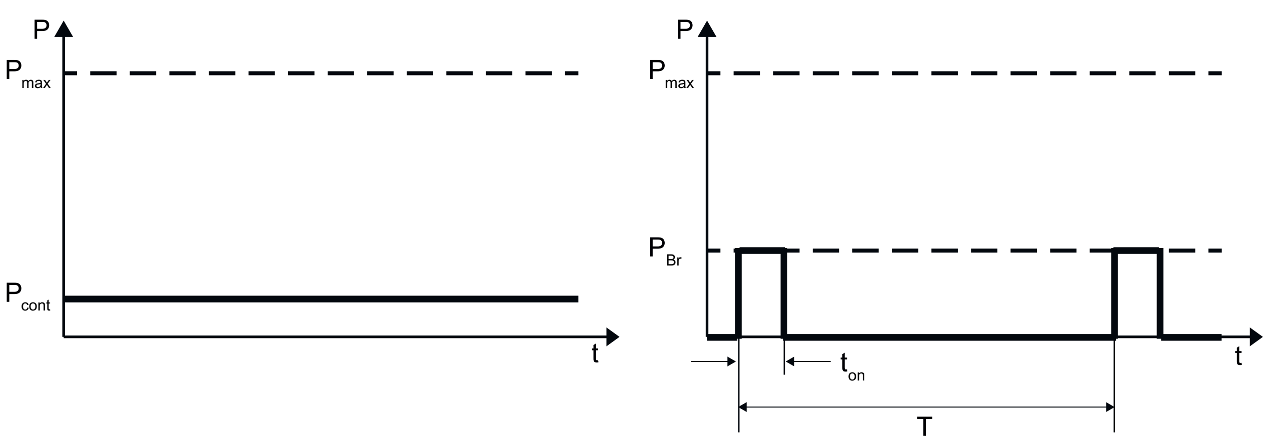


Figure 4-15 Peak power, continuous power and duty cycle of the braking resistor

$P_{Br} \leq P_{max}$
$E_{Br} = P_{Br} \cdot t_{on}$
$E_{Br} \leq E_{max}$
$T \geq E_{Br} / P_{cont}$

P_{max} [kW]: Maximum peak power
P_{cont} [kW]: Maximum continuous power
P_{Br} [kW]: Application-specific braking power
E_{max} [kJ]: Maximum braking energy
E_{Br} [kJ]: Application-specific braking energy
t_{on} [s]: Braking duration
T [s]: Cycle duration

Observe the following points when calculating the braking power:

- The braking power required in the application must not exceed the maximum peak power (according to the following tables).
- The required braking energy results from the product of the required braking power and the duty cycle (integral of the braking power over time).
- The required braking energy must not exceed the maximum braking energy (according to the following tables).
- The average braking power (arithmetic mean of the braking cycle) must not exceed the maximum continuous power (according to the following tables).

Resistance data for an external braking resistor

Table 4-5 Resistance data for an external braking resistor

Converter		Braking resistor			
Article number	**Rated power in kW**	**Minimum resistance in Ω**	**Maximum continuous power in W**	**Maximum peak power in W**	**Maximum braking energy in kJ**
Line voltage 200 ... 240 V 1 AC					
6SL5310-1BB10-1CF0	0.1	300	50	350	0.7
6SL5310-1BB10-2CF0	0.2	150	100	600	1.3
6SL5310-1BB10-4CF0	0.4	100	200	1300	2.3
6SL5310-1BB10-8CF0	0.75	50	380	2400	3.8
Line voltage 200 ... 240 V 3 AC					
6SL5310-1BE10-4DF.	0.4	100	200	600	1
6SL5310-1BE10-8DF.	0.75	100	380	1200	1
6SL5310-1BE11-0DF.	1.0	100	500	1700	1
6SL5310-1BE11-5DF.	1.5	50	880	2900	20
6SL5310-1BE12-0DF.	2.0	50	1000	3800	20
6SL5310-1BE13-5DF.	3.5	15	1750	7500	25
6SL5310-1BE15-0DF.	5.0	15	2500	9500	25
6SL5310-1BE17-0DF.	7.0	15	3250	12500	25
Line voltage 380 ... 480 V 3 AC					
6SL5310-1BE10-4DF.	0.4	200	200	1200	8
6SL5310-1BE10-8DF.	0.75	200	380	2400	8
6SL5310-1BE11-0DF.	1.0	200	500	3400	8
6SL5310-1BE11-5DF.	1.5	100	880	5700	80
6SL5310-1BE12-0DF.	2.0	100	1000	7600	80
6SL5310-1BE13-5DF.	3.5	30	1750	15000	100
6SL5310-1BE15-0DF.	5.0	30	2500	19000	100
6SL5310-1BE17-0DF.	7.0	30	3250	25000	100

Examples of suitable intrinsically safe braking resistors from a third-party supplier

Table 4-6 Examples of suitable intrinsically safe braking resistors from a third-party supplier

Converter		Braking resistor, Michael Koch GmbH[1]				
Article number	Rated power in kW	Order designation with temperature sensor 190 °C	Continuous power in W for CE	Continuous power in W for UL	Maximum peak power in W	Maximum braking energy in kJ
Line voltage 200 ... 240 V 1 AC						
6SL5310-1BB10-1CF0	0.1	BWG250047TS-190[2]	50	50	350	0.7
6SL5310-1BB10-2CF0	0.2	BWG250047TS-190[2]	100	100	600	1.1
6SL5310-1BB10-4CF0	0.4	BWG250047TS-190[2]	100	100	1300	1.8
6SL5310-1BB10-8CF0	0.75	BWG500027TS-190	200	200	2400	2.7
Line voltage 200 ... 240 V 3 AC						
6SL5310-1BE10-4DF.	0.4	BWG500027TS-190	200	200	600	0.9
6SL5310-1BE10-8DF.	0.75	BWG600014TS-190[3]	380	240	1200	0.8
6SL5310-1BE11-0DF.	1.0	BWG600014TS-190[3]	400	240	1700	0.8
6SL5310-1BE11-5DF.	1.5	BWD500027K03LIP65IS	600	600	2900	14.5
6SL5310-1BE12-0DF.	2.0	BWD500027K03LIP65IS	600	600	3800	13.9
6SL5310-1BE13-5DF.	3.5	BWD600014K03LIP65IS	1200	720	7500	18.7
6SL5310-1BE15-0DF.	5.0	BWD600014K03LIP65IS	1200	720	9500	17.8
6SL5310-1BE17-0DF.	7.0	BWD600014K03LIP65IS	1200	720	12500	18.2
Line voltage 380 ... 480 V 3 AC						
6SL5310-1BE10-4DF.	0.4	BWG500100TS-190	200	200	1200	5.2
6SL5310-1BE10-8DF.	0.75	BWG600047TS-190	380	240	2400	6.2
6SL5310-1BE11-0DF.	1.0	BWG600047TS-190	400	240	3400	6.1
6SL5310-1BE11-5DF.	1.5	BWD500100K03LIP65IS	600	600	5700	30.4
6SL5310-1BE12-0DF.	2.0	BWD500100K03LIP65IS	600	600	7600	30.4
6SL5310-1BE13-5DF.	3.5	BWD600047K03LIP65IS	1200	720	15000	50.0
6SL5310-1BE15-0DF.	5.0	BWD600047K03LIP65IS	1200	720	19000	47.5
6SL5310-1BE17-0DF.	7.0	BWD600047K03LIP65IS	1200	720	25000	41.7

1) Can only be directly sourced from Michael Koch GmbH

2) This resistor can be directly ordered through Siemens by specifying the following Article number: GXK:BWG250047TS-190

3) This resistor can be directly ordered through Siemens by specifying the following Article number: GXK:BWG600014TS-190

Remark relating to braking resistors:

- Braking resistors from Michael Koch GmbH
  The resistance values of the braking resistors deviate from the listed general values in Table "Resistance data for an external braking resistor".
  The braking resistors have been tested in conjunction with SINAMICS S210 converters and are approved.
- Braking resistors from other manufacturers
  Braking resistors from other manufacturers should be dimensioned according to Table "Resistance data for an external braking resistor".

4.3.3 Connecting an external braking resistor

Connecting an external braking resistor

Use shielded cables to connect power to the external braking resistor.

How you connect an external braking resistor and the temperature monitoring is described in the following Chapters:

- For converters with 1 AC line connection: "Connecting a 1 AC braking resistor (Page 134)"
- For converters with 3 AC line connection: "Connecting a 3 AC braking resistor (Page 143)"

Setting the temperature monitoring of the external braking resistor

Connect the temperature monitoring of the external braking resistor at digital input DI4: "Connecting the digital input (Page 144)".

If you have connected an external braking resistor with temperature monitoring, then you must activate the temperature monitoring.

Activate the DI4 digital input "Temperature monitoring of the external braking resistor".

The converter switches the motor off as soon as the external braking resistor is too hot or when no external braking resistor is connected (wire break).

F7860 power unit: Thermal overload of external braking resistor

Cause: The external braking resistor is thermally overloaded. Its use is therefore disabled.

Note: The monitoring of the external braking resistor configured via DI4 of X130 has tripped.

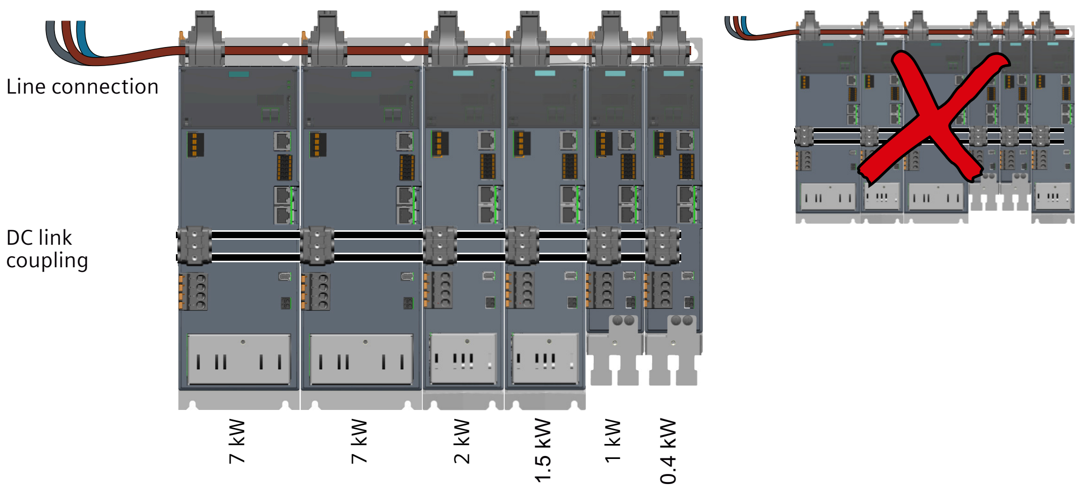
4.4 DC link coupling (for converters with 3 AC line connection)

Using connector X3 you can connect the DC links of up to six converters with one another.

With the DC link coupling, energy recovered by drives operating in the generating mode does not have to be converted into heat via the braking resistor, but is instead used by drives operating in the motoring mode.

Prerequisites and conditions for the DC link coupling

- It is permissible to couple the DC links of converters with different power ratings.
- The converters must be mounted with decreasing power ratings starting from the line supply infeed.



- All converters whose DC links are coupled, must also be coupled on the line side (AC coupling).
- The coupled converters must be housed in the same control cabinet.
- Only a 1-row setup is permissible. It is not possible to distribute the coupled converters over 2 or more rows.
- You are not recommended to create a common DC link coupling for devices with Article No. 6SL5... and devices with Article No. 6SL3....

Note

- For a DC link coupling, line connection via the standard connector is not permissible.
- Feeding in DC power directly at the DC link is not permissible!

Establishing the DC link coupling

1. Mount the converters, without any lateral intermediate spaces, with decreasing power ratings starting from the line supply infeed.
   If a line filter is used, you must connect the line supply infeed from the left-hand side.
2. Establishing the AC and DC link coupling:
   Use the connectors and cables that are described in the following chapters:
   – "Establishing the AC coupling and the DC link coupling (Page 141)"
   – "Connectors and cables for the AC coupling and DC link coupling (Page 787)"

Additional external braking resistors for the DC link coupling

The entire braking power of all converters coupled in a group is always available for braking.

If you require an external braking resistor for your system in spite of a DC link coupling, then you must connect this to the converter with the highest power rating. You can find more information in Chapter:

- "Configuring the braking resistor (Page 90)"

Special features for converters with a 200 V ... 240 V 3 AC line connection

- The DC link coupling is only permissible for converters of the same frame size. Otherwise, the above mentioned points apply.

4.5 Vertical axis

4.5.1 Setting SS1 in conjunction with vertical axes

Requirement

One of the two Safety Integrated Functions "Safe Stop 1 with time control" (SS1-t) or "Safe Stop 1 with acceleration monitoring" (SS1-a) is enabled.

Settings

With a vertical axis, if you use the Safety Integrated Functions "Safe Stop 1 with time control" (SS1-t) or "Safe Stop 1 with acceleration monitoring" (SS1-a), then you must set p9556 as follows:

Table 4-7 SS1 setting

Parameter	Setting value	Description
p9556	p9556 > p1135 + p1228 + r1217	This setting prevents the vertical axis from sagging after the transition to STO.

Result

After the correct setting is made, SS1-t and SS1-a behave as follows:

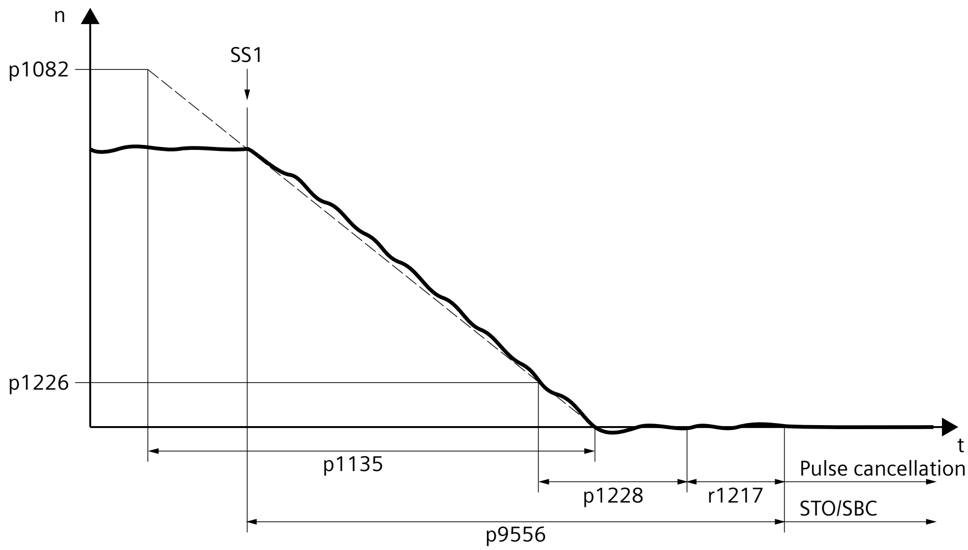


Figure 4-16 Correct setting of p9556 for SS1-t and SS1-a

- By immediately specifying n_set = 0, the converter brakes along the OFF3 down ramp (p1135).
- Once standstill has been detected, the converter closes the motor holding brake.
  The converter detects standstill in the following cases:
  - If the speed actual value falls below the speed threshold (p1226).
  - When the monitoring time (p1227), which was started when the speed setpoint ≤ speed threshold (p1226), has expired.
- At the end of the holding brake closing time (r1217), the converter cuts off the motor torque (pulse cancellation).
- The converter is in the "switching on inhibited" state.

Parameters

The following list contains parameters to set SS1-t and SS1-a in conjunction with a vertical axis.

Number	Name	Unit
p1135[0]	OFF3 ramp-down time	[s]
r1217[0]	Motor holding brake closing time	[ms]
p1226[0]	Threshold for zero speed detection	[rpm]
p1227[0]	Zero speed detection monitoring time	[s]
p1228[0]	Pulse cancellation delay time	[s]
p9556	SI transition time SS1 to STO	[ms]

4.5.2 Automatically configuring weight compensation

Function description

With a vertical axis without mechanical weight compensation, electronic weight compensation can be set by offsetting the torque limits (p1532). The torque limits specified in p1520 and p1521 are shifted by this offset value. The offset value can be read in r0031 and transferred in p1532.

To reduce compensation after a brake has been released, the torque offset can be interconnected as a supplementary torque setpoint. As a result, the holding torque is immediately specified after the brake is released.

Automatically configuring weight compensation

We recommend that this function is used for vertical axes with an almost constant force due to weight. Start the automatic determination of the force due to weight using p1558 = 1. As soon as the technique has been started, the torque, which is required to hold the axis, is measured and entered into p1532.

The measurement can be started when the pulses are inhibited or the pulses are enabled (p1558 = 1). If the measurement was started with the pulses inhibited, it is only executed after the pulses have been enabled. In both cases, after starting, alarm A07991 (Drive: motor data identification activated) is output. The alarm is automatically withdrawn after the motor data identification routine has been successfully completed.

If the force due to weight is not constant: To prevent the axis from dropping after the brake is released, specify the torque offset as an additional torque setpoint (M_ADD) via the supplementary telegram 750. The supplementary telegram 750 must be configured in the PLC. As a result, the holding torque is specified when the brake is released.

Product: SINAMICS S210, Version: 604030000, Language: eng
Objects: S210

---

r0031 **Actual torque smoothed / Torque actual val**

Data type: FloatingPoint32 | **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Parameter group: Brake control, Mode signals / displays
Not relevant for motor type: -
Dyn. index [0...n]: - | **Calculated:** -
Unit: Nm | **Unit group:** - | **Unit selection:** -

Description: Displays the smoothed torque actual value.
Dependency: See also: r0080

---

p1520[0] **Torque limit upper / M_limit upper**

Data type: FloatingPoint32 | **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Operation
Parameter group: Torque limiting, Limits
Not relevant for motor type: Synchronous or reluctance motor with starting cage
Dyn. index [0...n]: - | **Calculated:** automatic

Unit: Nm	**Unit group:** -	**Unit selection:** -
Type of signal interconnection:	Source numeric	**Scaling:** p2003
Min:	**Max:**	**Factory setting:**
-1000000.00 [Nm]	2e+07 [Nm]	0.00 [Nm]

Description: Setting the upper torque limit.
This setting is made as part of the basic commissioning.

Dependency: See also: p1521, p1532, r1538, r1539

p1521[0] Torque limit lower / M_limit lower

Data type: FloatingPoint32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Operation	
Parameter group:	Torque limiting, Limits	
Not relevant for motor type:	Synchronous or reluctance motor with starting cage	
Dyn. index [0...n]:	-	**Calculated:** automatic
Unit: Nm	**Unit group:** -	**Unit selection:** -
Type of signal interconnection:	Source numeric	**Scaling:** p2003
Min:	**Max:**	**Factory setting:**
-2e+07 [Nm]	1000000.00 [Nm]	0.00 [Nm]

Description: Sets the lower torque limit
This setting is made as part of the basic commissioning.

Dependency: See also: p1520, p1532, r1538, r1539

p1532[0] Torque limit offset / M_max offset

Data type: FloatingPoint32	**Visible in:** Extended display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Operation	
Parameter group:	Torque limiting	
Not relevant for motor type:	Synchronous or reluctance motor with starting cage	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: Nm	**Unit group:** -	**Unit selection:** -
Type of signal interconnection:	Source numeric	**Scaling:** p2003
Min:	**Max:**	**Factory setting:**
-100000.00 [Nm]	100000.00 [Nm]	0.00 [Nm]

Description: Sets the offset for the torque limit.
The setting allows electronic weight equalization to be used for vertical axes.
Parameters p1520 and p1521 are offset by the set value in the same direction.

Dependency: See also: p1520, p1521

⚠ DANGER

If the offset is set higher/lower than the lower/upper torque limit, then the unloaded drive can accelerate up to the maximum speed.

r1538 Upper effective torque limit / M_max upper eff

Data type: FloatingPoint32	**Visible in:** Standard display
Read permission:	Read drive data or acknowledge messages

Parameter group:	Torque limiting	
Not relevant for motor type:	Synchronous or reluctance motor with starting cage	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: Nm	**Unit group:** -	**Unit selection:** -
Type of signal interconnection:	Source numeric	**Scaling:** p2003

Description: Displays the currently effective upper torque limit.

Note
The value in r1538 may not exceed the value in p1520.

r1539 Lower effective torque limit / M_max lower eff

Data type: FloatingPoint32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Parameter group:	Torque limiting	
Not relevant for motor type:	Synchronous or reluctance motor with starting cage	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: Nm	**Unit group:** -	**Unit selection:** -
Type of signal interconnection:	Source numeric	**Scaling:** p2003

Description: Displays the currently effective lower torque limit.

Note
The value in r1539 may not exceed the value in p1521.

p1558 Measure/precontrol hanging/suspended axis force due to weight / Meas/prectr weight

Data type: Integer16	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Operation	
Parameter group:	Motor data identification routine	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
-1	1	0

Description: Setting to start/reset the measurement of the force due to weight for a hanging axis.

The measurement can be started when the pulses are inhibited or the pulses are enabled (p1558 = 1). If it was started when the pulses were inhibited, then it is only executed after the pulses have been enabled.

For the measurement, the torque to hold the axis is determined and entered into p1532.

Further, this value is used internally for the precontrol.

Value:

-1:	Reset values
0:	Inactive
1:	Start measurement and activate precontrol

Dependency: The pulse enable is withdrawn at the end of the measurement.

See also: p1532

Note
For master control with speed setpoint input from the commissioning tool, the torque precontrol channels are deactivated, so that the weight equalization entered here is not active.

4.6 Application examples

You can find SINAMICS application examples in the Siemens Industry Online Support (https://support.industry.siemens.com/cs/ww/en/view/60733299).

4.7 Configuring communication to the controller

To ensure that communication between the PLC and converter is possible, configure the converter or converters in the PLC, and activate the topology-based initialization. When powering up, the converter takes the PROFINET device name as well as the IP address from the PLC.

The converter also imports the telegram settings from the PLC.

The converter supports a standard telegram with 2 supplementary telegrams and a PROFIsafe telegram.

More information

The converter supports reading and writing parameters via acyclic communication.

The converter can simultaneously establish a total of 8 acyclic connections via the integrated PROFINET interface.

4.8 Functions that require licensing

4.8.1 Using functions that require a license

Overview

The firmware functions that are included when the converter is supplied can be expanded using functions that require a license.

Requirement

A Siemens memory card with the appropriate license file must be inserted in the converter to operate the converter with a function that requires a license.

Description

For some functions that require a license, operation in the Trial License mode without a memory card is possible for a limited time. The Trial License mode is only permissible while commissioning and in the case of service.

Functions that require a license can be accessed in the following ways:

- Memory card with license as Z option
  The memory card can be ordered from the factory with licenses pre-installed.
  - The license file is permanently assigned to the memory card. The license file is provided as a ZIP file.
  - The certificates of license (eCoL) are stored with the license file on the memory card.
- Allocate a license to an existing Siemens memory card
  Use "Web License Manager" to assign an additional license to a particular memory card and create a new license file for the memory card.
  - The license file is created in the Web License Manager using the certificates of license, assigned to an existing memory card, and made available to download as a ZIP file. Use the commissioning tool to upload the license file to the memory card.
  - The certificates of license (eCoL) can be transferred to the memory card manually if necessary.

Certificates of license and license files differ as follows:

Type	Description
Certificate of license (eCoL)	• Provided as a PDF for each license purchased. • Contains the delivery note number and license number. • Necessary in order to create the license file in the Web License Manager. • It is not contained in the license file.
License file	• Provided as a ZIP file. • Contains serial number of the memory card in the file name. Cannot be transferred to other memory cards. • Necessary in order to activate licenses for functions that require licensing in the commissioning tool. • Contains a signature file. The converter uses the signature file to verify the authenticity of the licenses.

More information

Web License Manager can be found on the Internet:

Web License Manager (http://www.siemens.com/automation/license)

4.8.2 System responses to under-licensing (ramp-up)

Requirement

- A memory card is present and inserted into the converter.
  Licenses for functions requiring licensing must be assigned to a memory card.
  You can find more information in Chapter "Creating the license file using the Web License Manager and downloading (Page 105)".

Description of function

Licensing is automatically checked during ramp-up of the converter.

Insufficient licensing is indicated as follows on the converter:

- F13000 License not adequate
- READY LED red light flashing at 2 Hz

4.8.3 System responses to under-licensing (operation)

Requirement

- A memory card is present and inserted into the converter.

Description of function

Insufficient licensing is indicated as follows on the converter:

- A13002 licensing not sufficient in operation

Possible cause:

- The memory card is defective or was removed.
- Functions requiring licensing were activated during operation and the licensing is not sufficient.

Possible consequence:

- If the cause is not eliminated, fault F13000 is output automatically at the next restart. The function that requires licensing can no longer be used.

4.8.4 Creating the license file using the Web License Manager and downloading

Requirement

The following information is required to create a license file in the Web License Manager:

- License number and delivery note number of the license
- Product designation
- Serial number of the memory card
  The serial number is on the memory card.
  Alternative: Copy the serial number from the license overview in the commissioning tool you are using, and then paste the number in the Web License Manager.

Procedure

Proceed as follows to create a license file:

1. Call the following link: Web License Manager (http://www.siemens.com/automation/license)
2. Click on "Direct access".
3. Enter the license number and delivery note number of your license. Then click "Next".
4. Enter the serial number of the memory card.
5. Select the product you are using. Then click "Next".
   In the "Already assigned licenses" column, you can see which licenses of a particular memory card have already been assigned and how often.
   In the "Additional licenses to be assigned" column, activate the licenses you want and specify how many additional licenses you require.
6. Activate the additional licenses that are required. Then click "Next".
   This page shows a summary of the selected licenses for checking.
7. To start the assignment, click "Assign".
   The licenses are assigned to the specified memory card.
   The license file is displayed and is available to download.
8. Download the license file to the KEYS/SINAMICS directory of your operating unit.

Result

The license file is stored in the KEYS/SINAMICS directory of your operating unit.

4.8.5 Downloading the license file at a later time

Requirement

The license file has already been created in the Web License Manager.

Procedure

To display the license file so you can download it, proceed as follows:

1. Call the following link: Web License Manager (http://www.siemens.com/automation/license).
2. In the navigation, click the "Display license key" option in the "User menu".
3. Enter the serial number of the memory card you are using in the "Hardware serial number" field.
   OR
   In the "License number" field, enter your license number.
4. Click the "Display license key" button.
   The license file is displayed and is available to download.
5. Download the license file to the KEYS/SINAMICS directory of your operating unit.

Result

The license file is stored in the KEYS/SINAMICS directory of your operating unit.

4.8.6 Transferring the license file to the converter and activating it

Overview

Check the license status for the converter at the license overview page. All functions that require licensing for the converter are listed in a table. The table also shows which functions are enabled and whether licenses are missing for individual functions.

You can call the license overview page from the web server or the Startdrive project of the converter.

The procedure is described below using Startdrive as an example.

Requirement

- A memory card is plugged into the converter.
- The license file is in the KEYS/SINAMICS directory of your operating unit.
- The data in the converter and in the Startdrive project is consistent.
- There is an online connection between the operating unit and the drive.

Procedure

1. Call the license overview page.
2. Click the "Activate the license key file" button.
   A corresponding dialog opens.
3. Select the license file in the file system of your operating unit.
4. Close the load dialog.
   The licenses are checked.
   After a check has been successfully completed, dialog "Licensing" opens.
5. Click on the "Activate " button.
   The dialog closes.

Alternatively, you can also directly copy the license file and eCoLs to the memory card, directory "KEYS/SINAMICS" or "KEYS/SINAMICS/eCoL".

Result

The licenses are active. The license status for the converter is updated.

4.8.7 Restoring licensing after the memory card is removed

Overview

When a license file is loaded into the converter, the license file is stored retentively on the memory card.

If you remove the memory card from the converter and perform a restart, the function requiring licensing is blocked after ramp-up.

Requirement

The license file has been loaded into the converter.

Procedure

Proceed as follows to start using blocked functions again:

1. Reinsert the memory card into the converter.
2. Perform a restart.
3. Check the license status on the license overview page.

4.8.8 Loading certificates of license (eCoL) into the file directory of the operating unit

Overview

Use this function to back up the certificates of license (eCoL) contained on the memory card to your operating unit.

Requirement

- The memory card contains certificates of license.

Procedure

1. Click on the "Save eCoL archive" button.
2. Select directory KEYS/SINAMICS in your operating unit and then confirm the selection.

Result

The license certificates are stored in the KEYS/SINAMICS directory of your operating unit.

Installing 5

5.1 EMC-compliant installation of a machine or system

The converter is designed for operation in industrial environments.

Reliable and disturbance-free operation is only guaranteed for EMC-compliant installation.

More information

More information about EMC-compliant installation is available in the Internet:

- EMC installation guideline (https://support.industry.siemens.com/cs/ww/en/view/60612658)

5.2 Installing the motor

⚠ WARNING
Fire due to inadequate cooling Inadequate cooling can cause the motor to overheat, resulting in smoke and fire. Possible consequences can be serious injury or death. This can also result in increased failures and reduced service lives of motors. • Comply with the specified cooling requirements for the motor.

Note

Required checks

The checklists below do not purport to be complete. It may be necessary to perform additional checks and tests in accordance with the situation specific to the particular installation site.

- Install the motor as described in the following chapters of the operating instructions.
- Thoroughly familiarize yourself with the safety instructions and observe the checklists below before starting any work.

Table 5-1 Checklist prior to installation

Check	OK
General checks	
Are all necessary components of the configured drive available?	
Are the ambient conditions in the permissible range? • Section "Permissible environmental conditions for the motor (Page 524)"	

Table 5-2 Checklist to check the mechanical system

Check	OK
Checking the mechanical system	
Is the motor free of visible damage?	
Have the mounting surfaces (e.g. flange, shaft) on the customer machine and on the motor been cleaned?	
Are the mounting surfaces free of corrosion?	
Do the mounting dimensions (e.g. shaft diameter, shaft length, true run) on the customer machine meet the specification?	

5.2.1 Mounting instructions for the motor

NOTICE
Damage to shaft sealing rings caused by solvent
If shaft sealing rings come into contact with solvents when preservation coating is removed, the shaft sealing rings can be damaged. • Avoid contact between solvents and shaft sealing rings.

NOTICE
Damage to the motor due to radial eccentricity at the shaft extension
Radial eccentricity and axial forces at the shaft extension can damage the motor. • Mount the motor in such as way that no radial eccentricity and axial forces occur at the shaft extension.

- Adhere to the specifications on the rating plate.
- Observe the warning and information plates on the motor.
- Check the permissible ambient conditions (e.g. temperature, installation altitude) at the installation location.
- Thoroughly remove any anti-corrosion agents from the shaft extension. Use commercially available solvents.
- Ensure that power losses are adequately dissipated. See Chapter "Cooling (Page 526)".
- If the motor is installed vertically with the shaft extension facing up, ensure that no liquid can enter the upper bearing.
- Carefully ensure that the flange is in even contact with the mounting surface.
- Use hexagon socket head cap screws with a property class of at least 8.8.
- When tightening the fastening bolts avoid any uneven stressing.
- Observe the tightening torques for the fixing screws (see table below).

Tightening torques for fastening bolts

The general tolerance for the tightening torque is 10%. The tightening torque is based on a friction coefficient of $\mu = 0.14$.

Table 5-3 **The data apply to 1FK2 and 1FT2 motors.**

Motor	Bolt DIN 7984	Washer ISO 7092 in mm	Tightening torque for bolts (not for electrical connections)
1F☐2102	M4	4 (d2 = 8)	2.2 Nm
1F☐2☐03	M5	5 (d2 = 9)	4 Nm
1F☐2☐04 1F☐2205	M6	6 (d2 = 11)	8 Nm

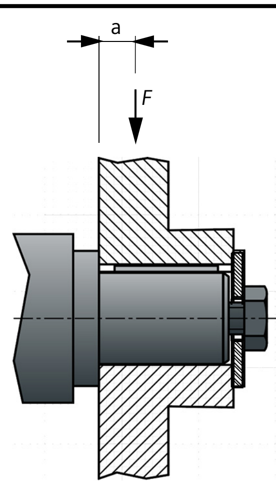
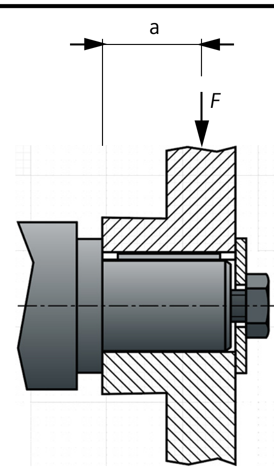
Motor	Bolt DIN 7984	Washer ISO 7092 in mm	Tightening torque for bolts (not for electrical connections)
1F□2105 1F□2□06	M8	8 (d2 = 15)	20 Nm
1F□2□08	M10	10 (d2 = 18)	35 Nm
1F□2□10	M12	12 (d2 = 20)	60 Nm

5.2.2 Attaching the output elements

Description

Reduce the bending torque load applied to the shaft and the bearing by appropriately arranging the output elements.

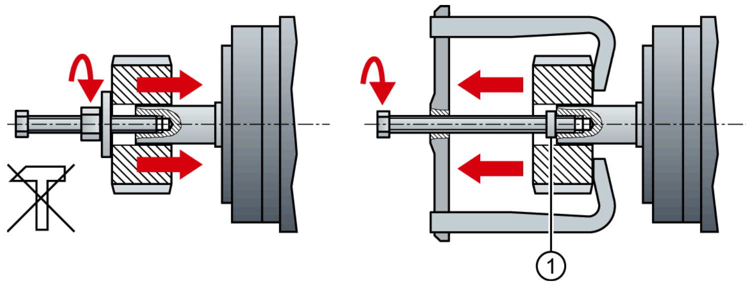
- Mount the output elements as close as possible to the motor bearing.

Optimal	Unfavorable
	
Low stress on shafts and bearings	High stress on shafts and bearings

Mount or remove the power output elements (e.g. couplings, gear wheels, belt pulleys) using suitable devices only (see figure).

- Use the threaded hole in the shaft extension.
- If required, heat up the output elements before mounting or removing.

- When removing the output elements, use an intermediate disk to protect the centering in the shaft extension.



1 Intermediate washer/disk (to protect the centering in the shaft extension)

Figure 5-1 Pulling on and pulling off drive output elements

- If necessary, completely balance the motor together with the output elements according to ISO 1940.

Note

Motors with feather key are half-key balanced. The motors have been balanced with half a feather key.

The motor dimensions can be found in section "Dimension drawings (Page 759)".

5.3 Installing the converter

5.3.1 Installation conditions

When installing the converter carefully observe the conditions listed below in order to guarantee reliable, continuous and trouble-free operation.

- The converter is designed for installation in a control cabinet.
- The converter is certified for use in environments with degree of pollution 2 without condensation; i.e. in environments where no conductive pollution/dirt occurs. Condensation is not permissible.
- The converter fulfills degree of protection IP20 according to IEC 60529.
- EMC-compliant installation
  Chapter: EMC-compliant installation of a machine or system (Page 109)

Note

Keep the cover of the operator panel closed to protect the operator controls and the SD card.

Additional requirements for plants and systems in the United States / Canada (UL/cUL)

A label with the following number is provided with the device: A5E36790112.

Note the instructions on the label and attach the label in a clearly visible location close to the converter in the control cabinet.

Installation notes

- Install the converter vertically with the flap for the LED display facing upwards.

Figure 5-2 Mounting position of the converter

- Maintain the minimum clearances to other components.
- Use the recommended fastening elements and comply with the specified torques.

Clearances to cabinet panels and other components

Leave a minimum 100 mm clearance to other devices at the top and bottom. A lateral clearance between several SINAMICS S210 converters is not mandatory.
Observe a lateral clearance of at least 10 mm to other devices.

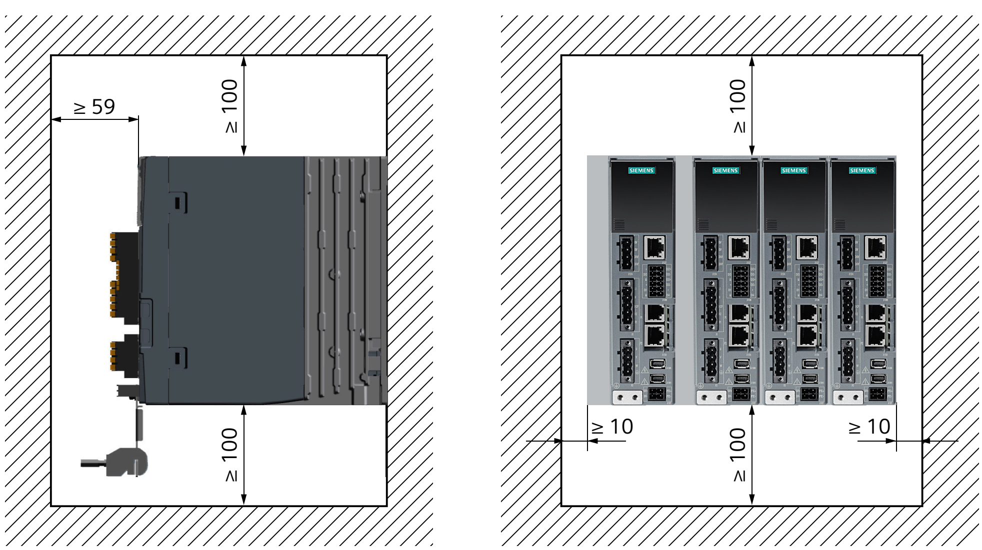


Figure 5-3 Clearances to cabinet panels and other components for converters with 1 AC line connection

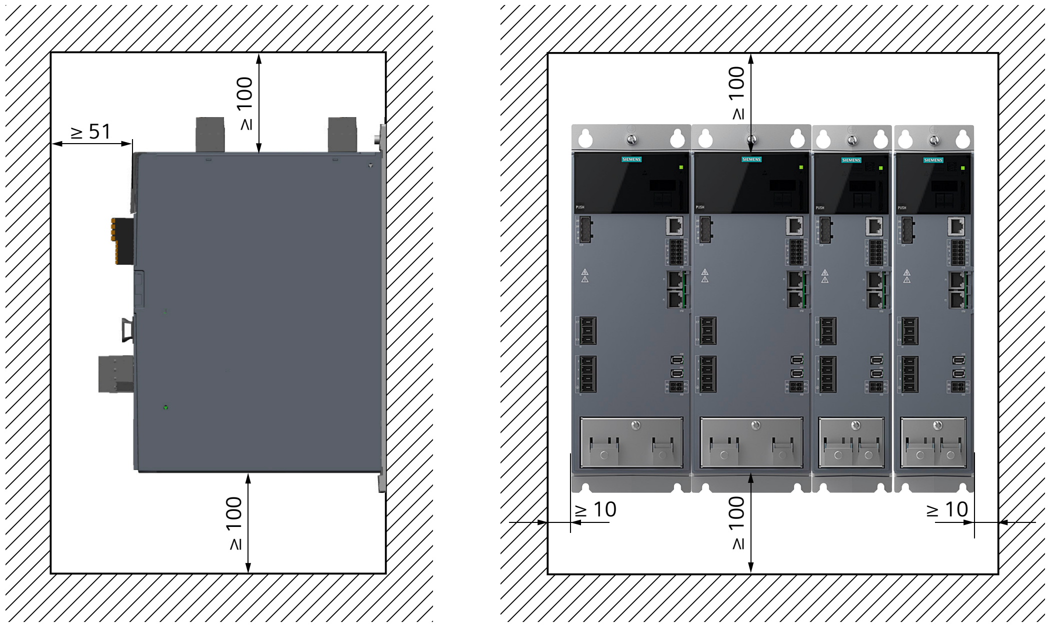


Figure 5-4 Clearances to cabinet panels and other components for converters with 3 AC line connection

5.3.2 Dimensions and drilling dimensions

Dimension drawings and drilling dimensions for converters with 1 AC line connection

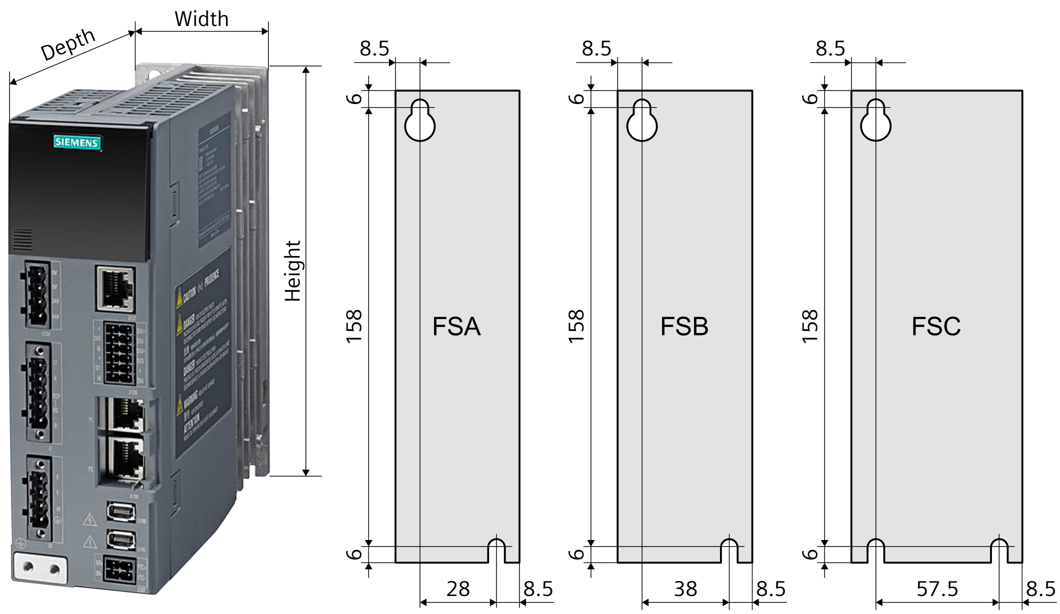


Figure 5-5 Dimension drawing and drilling dimensions

Table 5-4 Dimensions and mounting

Frame size	Width	Height	Depth	Weight	Fixing
FSA	45 mm	170 mm	172.4 mm	1.1 kg	2 x M5 / 4 Nm
FSB	55 mm	170 mm	172.4 mm	1.2 kg	2 x M5 / 4 Nm
FSC	74.5 mm	170 mm	197.4 mm	1.9 kg	3 x M5 / 4 Nm

Dimension drawings and drilling dimensions for converters with 3 AC line connection

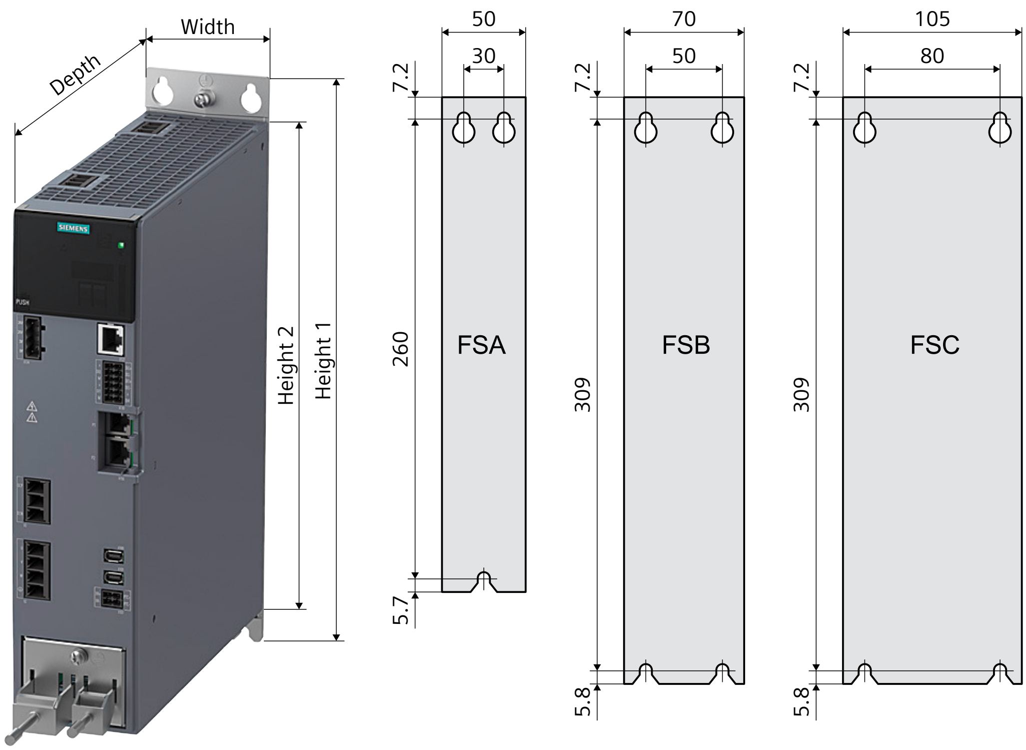


Figure 5-6 Dimension drawing and drilling dimensions

Table 5-5 Dimensions and mounting

Frame size	Width	Height 1	Height 2	Depth	Weight	Fixing
FSA	50 mm	272.9 mm	231 mm	223.3 mm	2.1 kg	3 x M5 / 4 Nm
FSB	70 mm	322 mm	280 mm	223.3 mm	3.3 kg	4 x M5 / 4 Nm
FSC	105 mm	322 mm	280 mm	223.3 mm	5.0 kg	4 x M5 / 4 Nm

5.4 Connecting the converter and the motor

You can find general information in chapter "Permissible line supplies and connection options (Page 67)".

5.4.1 Cable lengths

Cable lengths for the converter connections

Type of connection	Connection via	Permissible cable length
Control voltage 24 V DC	X124	30 m
External braking resistor for converters with 1 AC line connection	X1 (R1, DCP)	10 m
External braking resistor for converters with 3 AC line connection	X4 (R1, DCP)	10 m
Service interface	X127	10 m
Digital inputs	X130	30 m
Connection to the control system via PROFINET	X150 P1 X150 P2	100 m
Motor power connections	X2	50 m
Motor encoder	X100	50 m
2nd encoder (direct measuring system)	X101	50 m
Motor holding brake	X107	50 m

Cable lengths for connecting the motor to the converter

The motor is connected to the converter using a one cable system (OCC - one cable connection) via the MOTION-CONNECT cable. The MOTION-CONNECT cable includes the power connections for the motor, the encoder connection and the connections for the motor holding brake.

The permissible cable lengths for the various EMC categories are given in Chapter:

- "Electromagnetic compatibility according to IEC 61800-3 (Page 744)"

Ordering information for MOTION-CONNECT cables is provided in Chapter:

- "Determining the article number of a prefabricated OCC MOTION-CONNECT cable (Page 819)"

Ordering information for external line filters is provided in Chapter:

- "Technical data (Page 799)"

5.4.2 Connecting a MOTION-CONNECT cable at the motor

NOTICE
Destruction of the motor if it is directly connected to the three-phase line supply
The motor will be destroyed if it is directly connected to the three-phase line supply. • Only operate motors with the permitted converters.

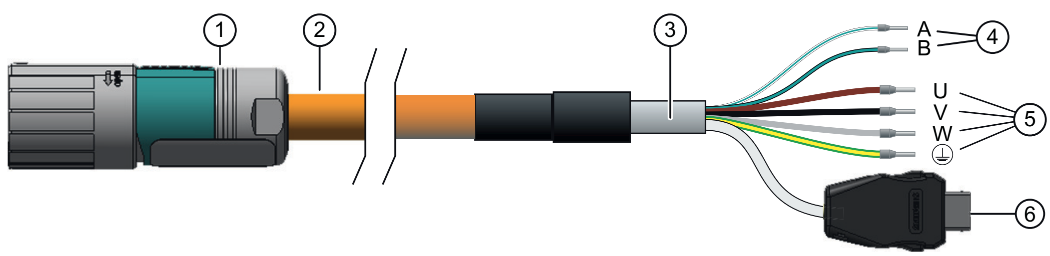
The manufacturer of the system/machine is responsible for ensuring that installation is performed correctly.

Ensure that the associated warning labels in the appropriate national language are attached.

The motors have SPEED-CONNECT M12, M17 or M23 connectors that can be rotated.

You connect the motor to the converter using a MOTION-CONNECT OCC cable. The cables for the power, the holding brake, the encoder and the shielding are integrated in the OCC cable.

- Use the prefabricated MOTION-CONNECT OCC cables from SIEMENS. This reduces the installation time and costs, and increases the operational reliability of the drive.



① Round connector M12, M17 or M23, 10-pole
② MOTION-CONNECT OCC cable
③ Shielding
④ Cables for a holding brake, A (WT) = "-", B (BK) = "+"
⑤ Power cables
⑥ SIEMENS IX connector for signal line

Figure 5-7 MOTION-CONNECT OCC (example)

- Check that the sealing surfaces of the connectors have not been damaged.

Clearance required when connecting the motor

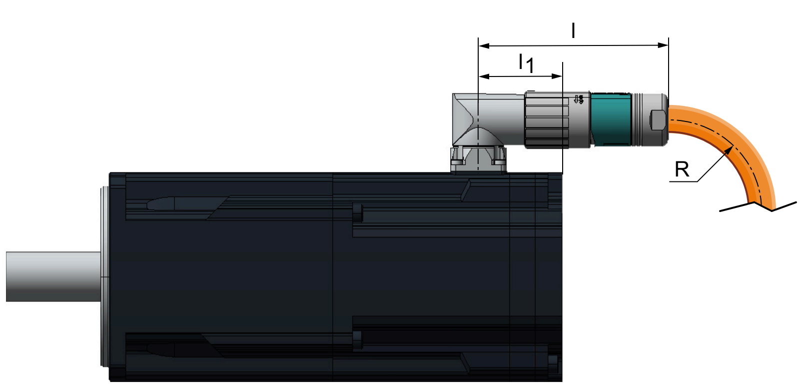


Figure 5-8 Example

Table 5-6 Clearance required when connecting the motor

<table>
<tr><th rowspan="3">Motor</th><th rowspan="3">Connec-tor size</th><th colspan="2">Distance, point of rotation to NDE</th><th rowspan="2">Length of the plug connection</th><th colspan="2">Minimum bending radius, static</th></tr>
<tr><th>Without brake</th><th>With brake</th><th>MC500</th><th>MC800 PLUS</th></tr>
<tr><th colspan="2">l_1 / mm</th><th>l / mm</th><th colspan="2">R_{static} / mm</th></tr>
<tr><td>1F□2□02</td><td rowspan="2">M12</td><td colspan="2">33</td><td rowspan="2">61</td><td rowspan="2">23.5</td><td rowspan="2">28.2</td></tr>
<tr><td>1F□2□03-□□G</td><td colspan="2" rowspan="3">23</td></tr>
<tr><td>1F□2□03-□□H</td><td rowspan="5">M17</td><td rowspan="5">70</td><td rowspan="5">25.5</td><td rowspan="5">30.6</td></tr>
<tr><td>1F□2□03-□□K</td></tr>
<tr><td>1F□2□04</td><td colspan="2">26</td></tr>
<tr><td>1F□2205</td><td>28</td><td>34</td></tr>
<tr><td>1F□2105</td><td colspan="2">34</td></tr>
<tr><td>1F□2□06</td><td rowspan="3">M23</td><td>41</td><td>53</td><td rowspan="3">99</td><td rowspan="3">30.7</td><td rowspan="3">36.9</td></tr>
<tr><td>1F□2□08</td><td colspan="2">39</td></tr>
<tr><td>1F□2□10</td><td colspan="2">43</td></tr>
</table>

Rotation range of the OCC connector on the motor

The data apply to 1FK2 and 1FT2 motors.

You can rotate the motor connector. Use a suitable socket connector as lever to rotate the connector.

Note

A maximum of 10 rotations are permitted so as not to impair the degree of protection of the motor.

Table 5-7 Rotational range of the connector ①

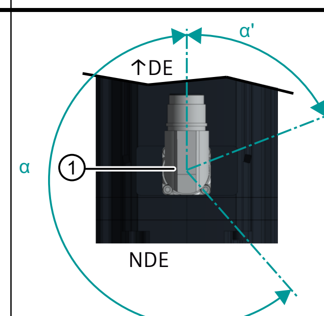
Motor	Angle α	Angle α'	Connector size	Drawing
1F□2□02 1F□2□03-□□G	261°	45°	M12	

Table 5-8 Rotational range of the connector 1

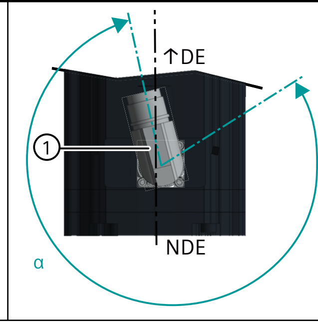
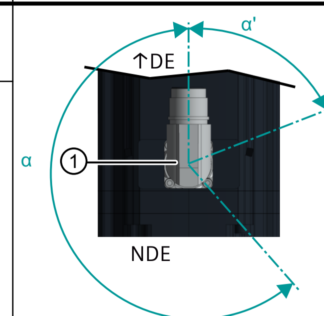
Motor	Angle α	Connector size	Drawing
1F☐2☐03-☐☐H	10° - 295°	M17	
1F☐2☐03-☐☐K			

Table 5-9 Rotational range of the connector 1

Motor	Angle α	Angle α'	Connector size	Drawing
1F☐2☐04	205°	80°	M17	
1F☐2☐05	255°	35°		
1F☐2☐06 1F☐2☐08 1F☐2☐10	312°	13°	M23	

5.4.3 Connecting the fan

Description

The 1FT2 motor can be optionally equipped with a fan.

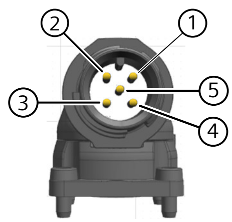
The chapter describes how to connect the fan.

Requirement

The motor with the fan has been correctly mounted.

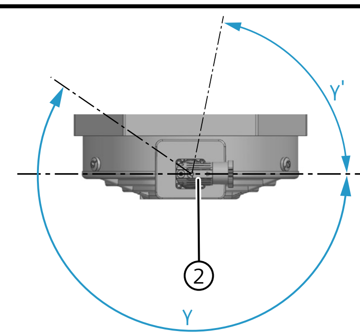
Fan connector versions

In the force-ventilated version, the 1FT2 is equipped with a fan, which is connected to 24 V DC via a 5-pin M12 round connector, A-coded according to IEC 61076-2-101. The maximum current drawn by the fan is 1.1 A at 24 V DC ± 10 %.

M12 fan connector, 5-pin, A-coded according to IEC 61076-2-101		
	1	+ 24 V DC
	2	-
	3	GND
	4	-
	5	-

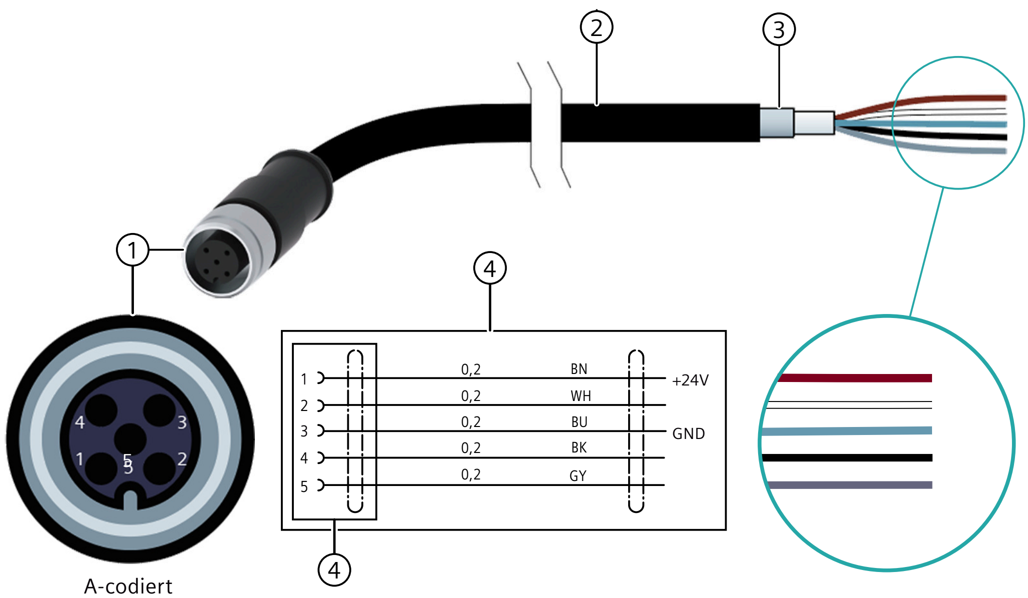
The fan connector can be rotated through a certain range.

Table 5-10 Rotational range of the fan connector ② (only for force-ventilated motors)

Motor	Size of the fan connector ②	Angle γ	Angle γ'	Drawing
1FT2☐08	M12	225°	81°	

Connection diagram of the fan cable for a force-ventilated 1FT2

The connection is established using a fan cable with M12 connector, 5-pin, A-coded according to IEC 61076-2-101.



①	Round connector with socket, M12, 5-pin, A-coded according to IEC 61076-2-101
②	Fan cable
③	Protective braided shield
④	Connection diagram
⑤	Connector pin assignment

The cores at pins 2, 4 and 5 are not used.

Sources where the fan cable can be purchased

SIEMENS Industry Mall (https://mall.industry.siemens.com/mall/de/de/Catalog/product?mlfb=3SX5601-3SB55)

Third-party connecting cables for the fan are available, for example, from the following suppliers.

- Phoenix company (https://www.phoenixcontact.com/de-de/produkte/sensor-aktor-kabel-sac-5p-100-purm12fs-sh-1500758)
- IMF company (https://www.ifm.com/at/de/product/EVC708)

5.4.4 Connecting the power cable to the motor

The chapter describes how you connect a power cable to the motor.

Overview

The motors are equipped with SPEED-CONNECT connectors.

The optional fan has a round connector with screw lock.

You can connect quick-connection cables with SPEED-CONNECT as well as conventional cables with screw locks (fully threaded) to the motor connector.

Note

We recommend cables with SPEED-CONNECT because they are easier to use.

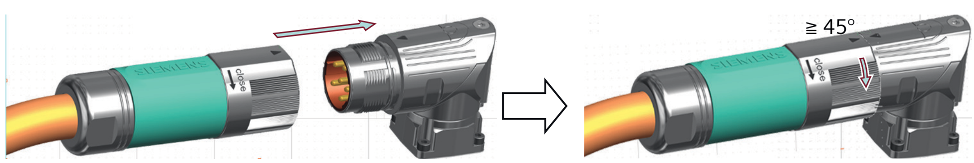
Establishing a SPEED-CONNECT connection (does not apply to the fan connection)

Procedure

Note

- Only tighten the connector by hand.
- Do not use any wrenches or similar tools.

1. Ensure that the union nut of the SPEED-CONNECT connector is rotated to the end stop in the direction of the "open" arrow.
2. Align the SPEED-CONNECT connector so that the triangles on the top of the connectors are opposite one another.



3. Push the power connector onto the motor connecting socket as far as it will go.
4. Turn the union nut by hand in the direction of "close" by at least 45° (position A) or up to the end stop (position B)

A Minimum locking

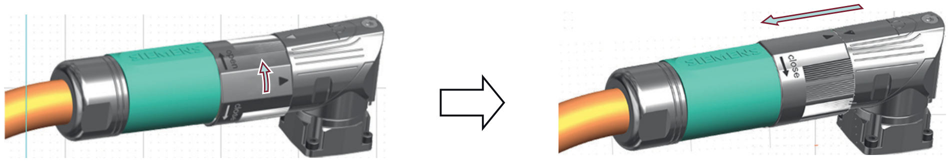
B Maximum locking up to the end stop

Note

A secure connection is only guaranteed from position A onward.

Releasing a SPEED-CONNECT connection

Procedure



1. Turn the union nut of the SPEED-CONNECT connector in the direction of "open" to the end stop. The triangles on the top of the connectors must be opposite one another.
2. Withdraw the connector.

Note

Pull out the connector at the connector itself, do not pull on the cable.

Description of how to route cables in a damp environment

If you are operating the motor in damp environments, carefully follow the subsequent instructions for routing the connecting cables.

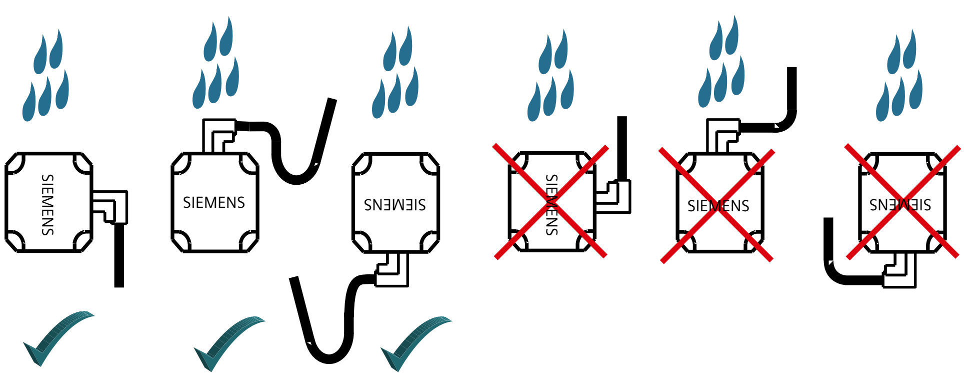


Figure 5-9 Permissible and impermissible cable routing when connecting in damp environments

5.4.5 Connecting the converter

Install the converter so that you are compliant with local regulations for erecting and installing low-voltage systems.

Carefully observe the following product memorandum about protection against electric shock:

Ensure protection against electric shock in the motor circuit of a converter according to IEC/EN 61800-5-1 through automatic shut down in the case of a fault according to IEC/EN 60364-4-41 (VDE 0100-410) (https://support.industry.siemens.com/cs/ww/en/view/103474993)

Notes for connecting up the converter

Operating displays for converter operation

If, when switching over a function from ON to OFF, an LED or other similar display is not lit or not active; this does not indicate that the device is switched-off or in a no-current condition.

Shield plate

For converters, frame sizes FSB and FSC with 3 AC line connection, the shield plate is integrated in the converter itself. For the other converters, the shield plate is included in the accessories pack of the converter.

Fixing connecting cables

Fix all of the connecting cables using shield clamps or suitable cable ties to the converter shield plate.

Power connections

NOTICE
Property damage due to loose power connections Insufficient tightening torques or vibration can result in loose power connections. This can result in damage due to fire, device defects, or malfunctions. • Tighten all power connections to the specified torque. • Check all power connections at regular intervals, particularly after equipment has been transported.

Connection of motor holding brake, connector X107

Also connect the insulated conductors for the motor holding brake to the connector at X107, even when you are using a motor without holding brake.

Shielded cables

Shielded cables are required for connecting the OCC cable, the external braking resistor and the digital inputs to ensure that the drive functions perfectly.

Use the converter shield support to connect the shield at the converter. We recommend connecting the shield using the shield clamp that is provided with the prefabricated OCC cable used to connect the motor (see the following diagram).

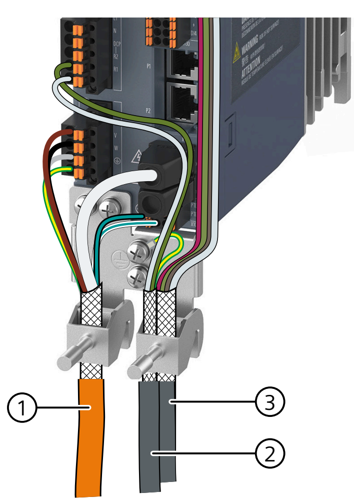
Use shielded cables to establish the following connections:

- Cable between the converter line filter (only for 1 AC 230 V)
- Cable between the converter and motor
- Cable between the converter and external braking resistor
- Signal cables if they are routed next to cables with high levels of noise and interference

NOTICE
Damage/fault caused by connecting several loads to the same line infeed point
For loads not belonging to the SINAMICS S210 drive system, make sure that a sufficient EMC interference suppression is provided. If several such loads are connected to the same line infeed point, this may result in damage or faults. • Provide interference suppression for such loads using appropriate line filters. To prevent mutual interference, it is not permissible that this line filter is equipped with capacitors with respect to ground on the line side. A series B84144A*R120 filter from EPCOS is recommended for a 24 V power supply with a 3-phase connection.

Cable routing and shielding must be compliant with the EMC zone concept.

- Connect the shield at the converter. We recommend that the shield of the preassembled OCC connecting cable is connected with the shield terminal on the shield connection plate of the converter (see ① in the diagram).
- Use cables with finely-stranded, braided shields.
- Carefully ensure that the shield is not interrupted or broken.



① OCC connection cable to the motor
② Connecting cable for external braking resistor
③ Connecting cable for the digital inputs

Figure 5-10 Shield support with shield plate and shield clamps for prefabricated OCC cable shown using an example of a converter with 1 AC line connection

Connections and operating elements of the converter with 1 AC line connection

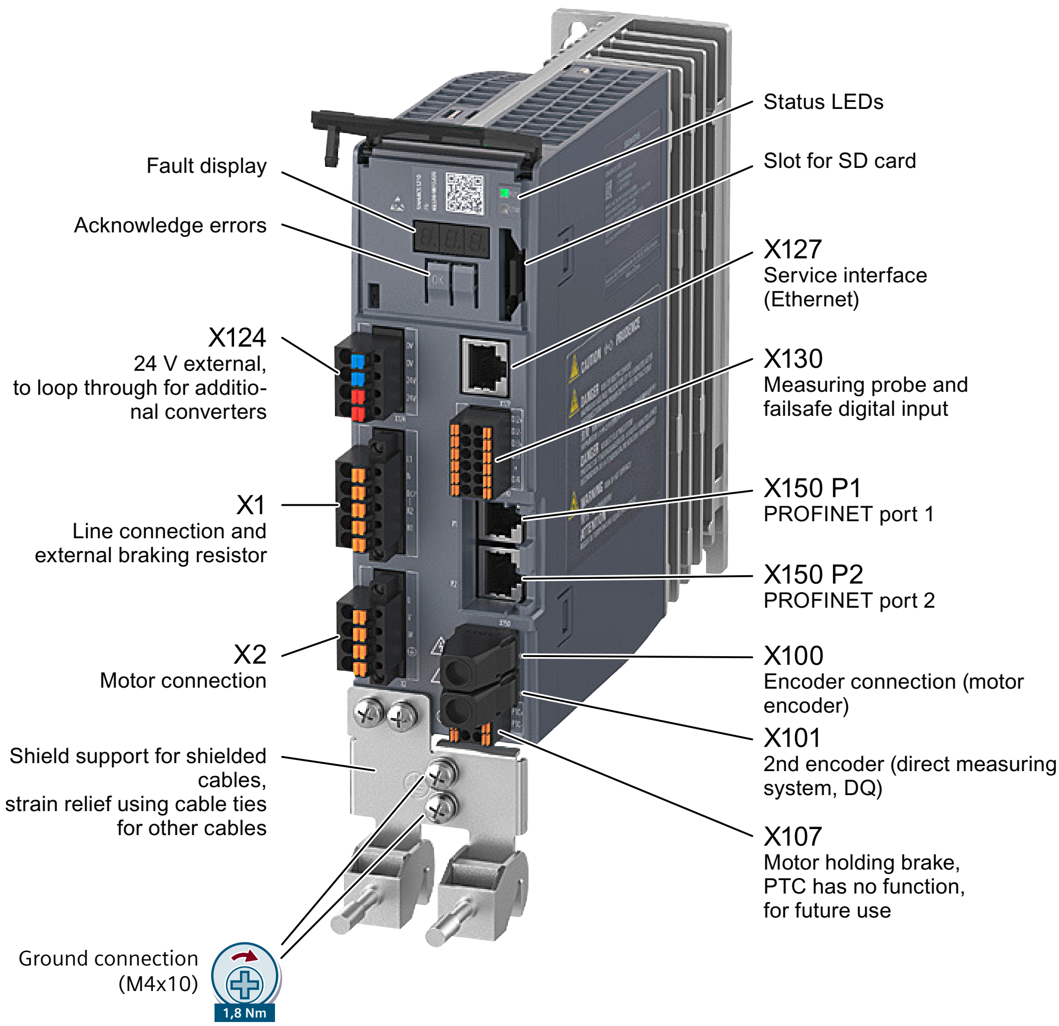


Figure 5-11 Connections and operating elements of the converter with 1 AC line connection

Connectors X1, X2, X107, X124 and X130 are included in the scope of delivery of the converter.

Encoder connector X100 is included with the OCC cable.

You require Ethernet cables with RJ45 connectors to connect service interface X127, as well as for PROFINET ports X150 P1 and X150 P2.

Connections and operating elements of the converter with 3 AC line connection

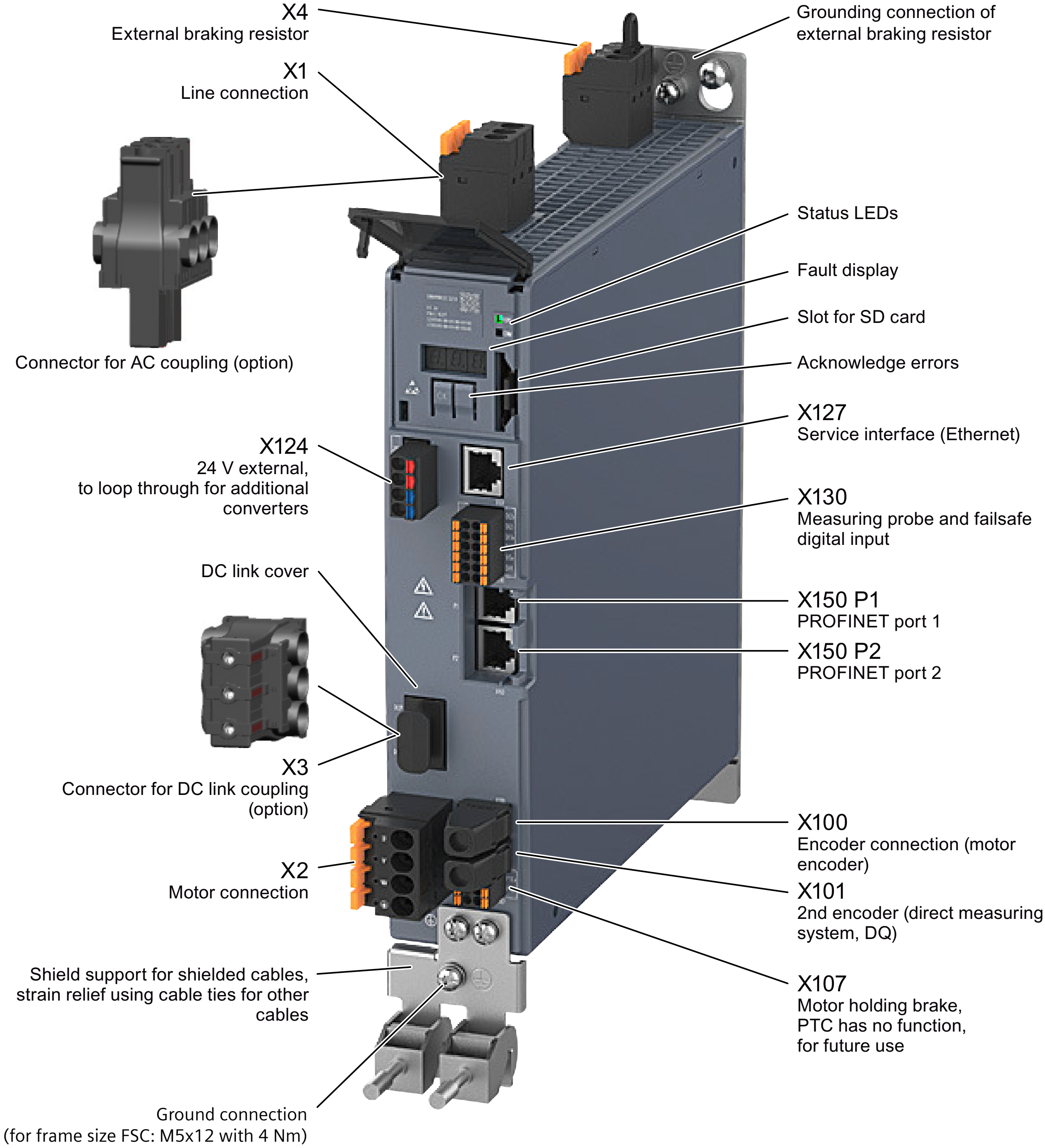


Figure 5-12 Connections and operating elements of the converter with 3 AC line connection

Connectors X1 standard, X2, X4, X107, X124 and X130 are included in the scope of delivery of the converter.

Encoder connector X100 is included with the OCC cable.

You require Ethernet cables with RJ45 connectors to connect service interface X127, as well as for PROFINET ports X150 P1 and X150 P2.

You must order the connectors for AC coupling X1 and for DC link coupling X3 separately as required:
see Chapter "Connectors and cables for the AC coupling and DC link coupling (Page 787)".

5.4.6 Converters with 1 AC line connection

5.4.6.1 Connecting the MOTION-CONNECT cable to the converter

In addition to the motor connections, the MOTION-CONNECT cable from the motor to the converter also includes the conductors for the encoder and the motor holding brake.

NOTICE
Damage to the device by connecting other motors or devices Connecting other devices (motors, encoders) can destroy the converter or the connected device. • Only connect 1FK2, 1FT2 and 1FS2 motors to the converter. • Use only MOTION-CONNECT cables from Siemens or cables that you have fabricated yourself with the correct pin assignment.

Connecting the motor cable to the converter

Connect conductors U, V, W of the MOTION-CONNECT cable to connector X2 of the converter as shown below.

Connect the shield of the MOTION-CONNECT cable to the shield plate through a large surface area. Use commercially available clamps, the clamps supplied with the prefabricated cable or the shield connection clamps supplied as accessories.

The terminals are spring-loaded terminals.

Color coding for MOTION-CONNECT cables:

- Phase U = brown
- Phase V = black
- Phase W = gray

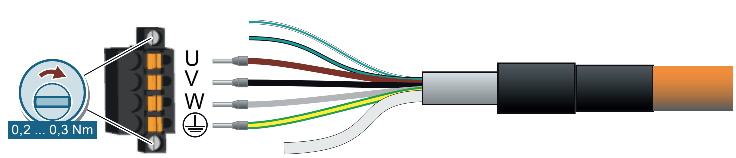


Figure 5-13 X2 - motor connection

Permissible conductor cross-sections for single-conductor connection or for connecting flexible cables with end sleeves:

- 0.2 mm² ... 2.5 mm²
- AWG: 26 ... 12
- Insulation stripping length: 10 mm

Connecting the encoder to the converter

The cables and the connector for the encoder connection are part of the MOTION-CONNECT cable from the motor to the converter.

Insert the Siemens IX plug-in plug socket X100 as shown below.

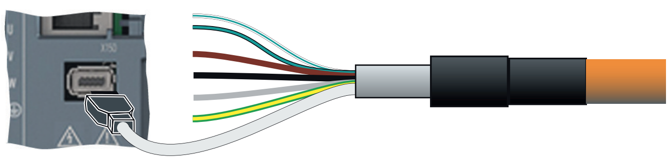


Figure 5-14 X100 - encoder connection (motor encoder)

At connection X101, a 2nd encoder can be connected as direct measuring system. Drive-CLiQ (DQ) rotary encoders can be connected via a separate encoder cable (see Chapter Encoder cable for a direct measuring system (2nd encoder connection) (Page 804)).

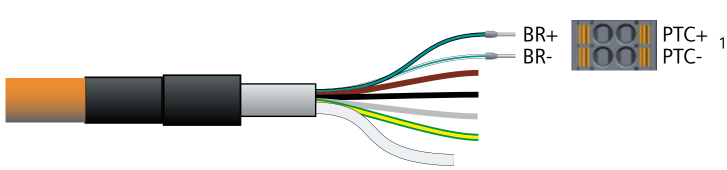
For mechanical strain relief, the encoder cable for the 2nd encoder must also be fixed at the shield plate.

Connecting the motor holding brake

The cables for the motor holding brake are part of the MOTION-CONNECT cable from the motor to the converter.

Connect the cables as shown below to the connector X107 of the converter.

The terminals are spring-loaded terminals.



1) no function, for future use

Figure 5-15 X107 - Motor holding brake connection

Permissible conductor cross-sections:

- For single-conductor cables or for flexible cable conductors with end sleeves without protective collars or long end sleeves with protective collars:
  - 0.25 mm² ... 1.5 mm²
  - AWG: 24 ... 16
- For flexible cables with end sleeves with protective collars:
  - 0.25 mm² ... 0.75 mm²
  - AWG: 24 ... 19
- Insulation stripping length: 10 mm

Note

Connection of motor holding brake, connector X107

Connect the conductors for the motor holding brake to connector X107 even if you are using a motor without holding brake.

5.4.6.2 Connecting the converter to the line supply

Connect the line feeder cable as shown below to the connector X1 of the converter. Connect the protective conductor with a cable lug and an M4 screw to the shield plate of the converter.

The terminals are spring-loaded terminals.

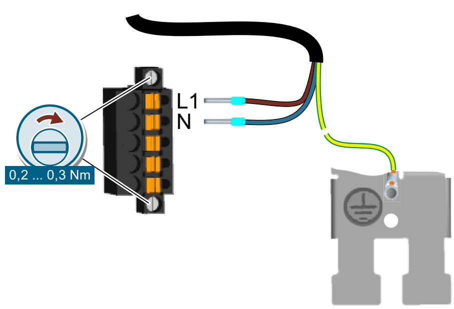


Figure 5-16 X1 - line connection 1 AC

The shield plate is fixed with two M4x10 screws with a tightening torque of 1.8 Nm.

Permissible conductor cross-sections for single-conductor connection or for connecting flexible cables with end sleeves:

- 0.2 mm² ... 2.5 mm²
- AWG: 26 ... 12
- Insulation stripping length: 10 mm

5.4.6.3 Using several single-phase converters in machines and plants

Overview

Evaluate the input currents of single-phase converters in your machine or plant in terms of harmonics and unbalance.

Description

In unfavorable cases, the harmonic currents of several converters in the neutral conductor (N) add up to a value greater than the currents of the line conductors (L1, L2, L3). The current-carrying capacity of the neutral conductor must be sufficient for this. IEC 60364-5-52:2019, Section 524, provides recommendations for dimensioning the neutral conductor. If no more precise information is available, the standard recommends dimensioning the neutral conductor for 1.45 times the current-carrying capacity of the line conductors.

WARNING

Fire caused by neutral conductor (N) overload

The neutral conductor can heat up due to the load from harmonic currents and cause a fire.

- Consider the harmonic currents when dimensioning the neutral conductor.

WARNING

Electric shock caused by PEN conductor overload

In TN-C supply networks, the protective function of the PEN conductor can be adversely affected by exposure to harmonic currents.

- Consider the harmonic currents when dimensioning the PEN conductor.

5.4.6.4 Connecting a braking resistor

You can either use the internal braking resistor or connect an external braking resistor.

Using the internal braking resistor

If you are using the internal braking resistor, terminals DCP and R2 must be jumpered at connector X1.

The jumper is included in the scope of delivery of the converter.

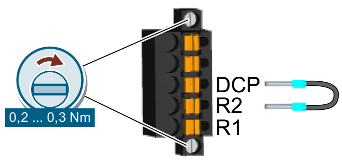


Figure 5-17 X1 - connection for using the internal braking resistor

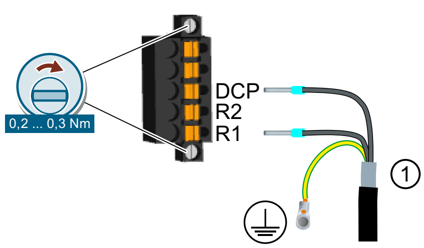
Using an external braking resistor

If you are using an external braking resistor, terminals DCP and R2 must not be jumpered at connector X1. Connect the braking resistor via the DCP and R1 terminals.

The converter shield plate is used for the protective conductor connection and the shield support.

The terminals are spring-loaded terminals.

The permissible cable length is 10 m.



1 Shield

Figure 5-18 X1 - connection for using an external braking resistor

Permissible conductor cross-sections for single-conductor connection or for connecting flexible cables with end sleeves:

- 0.2 mm^2 ... 2.5 mm^2
- AWG: 26 ... 12
- Insulation stripping length: 10 mm

5.4.7 Converter with 3 AC line connection

5.4.7.1 Connecting the MOTION-CONNECT cable to the converter

In addition to the motor connections, the MOTION-CONNECT cable from the motor to the converter also includes the conductors for the encoder and the motor holding brake.

NOTICE
Damage to the device by connecting other motors or devices
Connecting other devices (motors, encoders) can destroy the converter or the connected device. • Only connect 1FK2, 1FT2 and 1FS2 motors to the converter. • Use only MOTION-CONNECT cables from Siemens or cables that you have fabricated yourself with the correct pin assignment.

Connecting the motor cable to the converter

Connect conductors U, V, W of the MOTION-CONNECT cable to connector X2 of the converter as shown below.

Connect the shield of the MOTION-CONNECT cable to the shield plate through a large surface area. Use commercially available clamps, the clamps supplied with the prefabricated cable or the shield connection clamps supplied as accessories.

The terminals are spring-loaded terminals.

Color coding for MOTION-CONNECT cables:

- Phase U = brown
- Phase V = black
- Phase W = gray

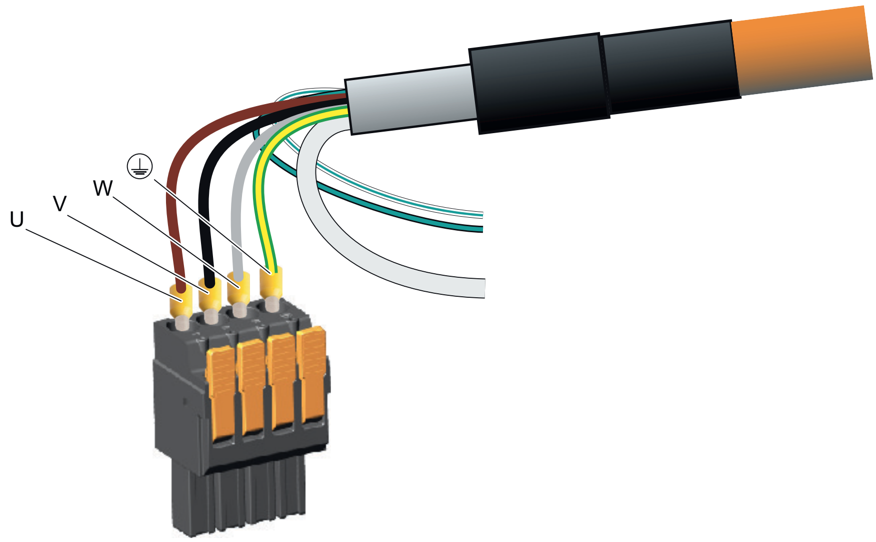


Figure 5-19 X2 - motor connection

Permissible conductor cross-sections for single-conductor connection or for connecting flexible cables with or without end sleeves:

- 0.75 mm² ... 6 mm²
- AWG: 18 ... 10
- Insulation stripping length: 18 mm

Connecting the encoder to the converter

The cables and the connector for the encoder connection are part of the MOTION-CONNECT cable from the motor to the converter.

Insert the Siemens IX plug-in plug socket X100 as shown below.

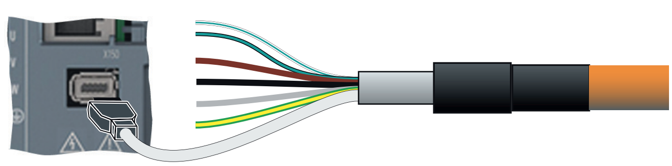


Figure 5-20 X100 - encoder connection (motor encoder)

At connection X101, a 2nd encoder can be connected as direct measuring system. Drive-CLiQ (DQ) rotary encoders can be connected via a separate encoder cable (see Chapter Encoder cable for a direct measuring system (2nd encoder connection) (Page 804)).

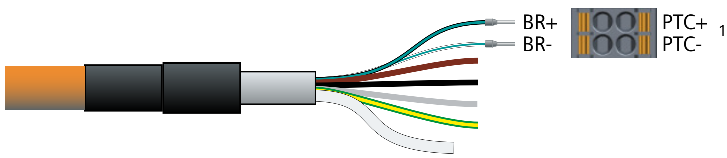
For mechanical strain relief, the encoder cable for the 2nd encoder must also be fixed at the shield plate.

Connecting the motor holding brake

The cables for the motor holding brake are part of the MOTION-CONNECT cable from the motor to the converter.

Connect the cables as shown below to the connector X107 of the converter.

The terminals are spring-loaded terminals.



1) no function, for future use

Figure 5-21 X107 - Motor holding brake connection

Permissible conductor cross-sections:

- For single-conductor cables or for flexible cable conductors with end sleeves without protective collars or long end sleeves with protective collars:
  - 0.25 mm² ... 1.5 mm²
  - AWG: 24 ... 16
- For flexible cables with end sleeves with protective collars:
  - 0.25 mm² ... 0.75 mm²
  - AWG: 24 ... 19
- Insulation stripping length: 10 mm

Note

Connection of motor holding brake, connector X107

Connect the conductors for the motor holding brake to connector X107 even if you are using a motor without holding brake.

5.4.7.2 Connecting the converter to the line supply

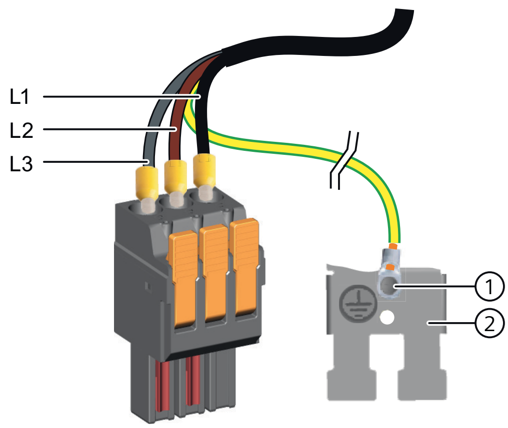
The converter is supplied with connectors for connecting it to the line supply.

If you connect several converters in parallel, the optional connectors for the AC coupling are available to connect to the line supply. This significantly reduces the wiring costs.

Both connection options are shown below.

Connecting a converter with standard terminals

The terminals are spring-loaded terminals.



L1, L2, L3	Cores of the line connecting cable
①	M4x10 screw to fasten the protective conductor and the shield plate
②	Shield plate

Figure 5-22 X1 - line connection with standard terminals (example for frame size FSA)

The shield plate for frame size FSA is fixed with two M4x10 screws with a tightening torque of 1.8 Nm.

For frame sizes FSB and FSC, the shield connection is integrated in the converter itself.

The protective conductor for frame size FSC is fixed with one M5x12 screw with a tightening torque of 4 Nm.

Permissible conductor cross-sections for single-conductor connection or for connecting flexible cables with or without end sleeves:

- 0.75 mm^2 ... 6 mm^2
- AWG: 18 ... 10
- Insulation stripping length: 18 mm

Note

Connector X4 for braking resistor

Insert connector X4 even if you are not using an external braking resistor. In this case, you need to bridge the terminals DCP and R2 to use the internal resistor with the supplied jumper. Otherwise, pre-charging of the converter will not take place.

You can find more detailed information in the section "Connecting a braking resistor (Page 143)".

Connecting a converter with terminals for the AC coupling

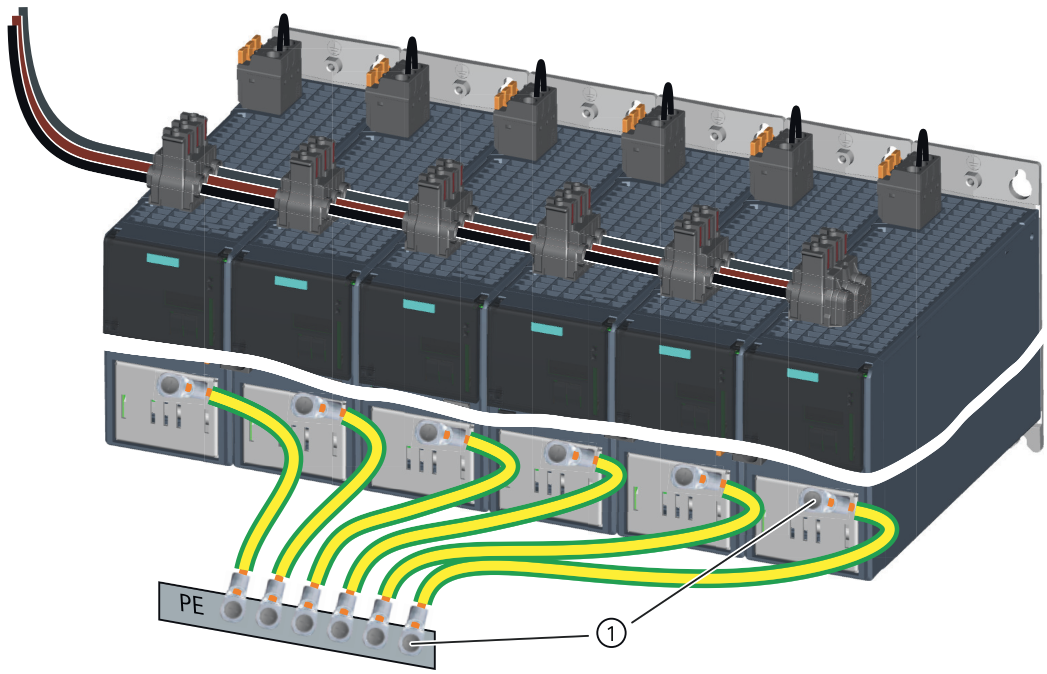
The connectors for the AC coupling are not included in the scope of delivery of the converter.

Ordering data:

- "Connectors and cables for the AC coupling and DC link coupling (Page 787)"

The permissible cables for the AC coupling as well as the installation instructions are provided in section:

- "Establishing the AC coupling and the DC link coupling (Page 141)"



① M4 for frame sizes FSA and FSB
M5 for frame size FSC

Figure 5-23 X1 - line connection with AC coupling

5.4.7.3 DC link coupling

The connectors for the DC link coupling are not included in the scope of delivery of the converter.

Ordering data:

- "Connectors and cables for the AC coupling and DC link coupling (Page 787)"

The permissible cables for the DC link coupling as well as the installation instructions are provided in Chapter:

- "Establishing the AC coupling and the DC link coupling (Page 141)"

You can find the prerequisites for the DC link coupling in Chapter:

- "DC link coupling (for converters with 3 AC line connection) (Page 97)"

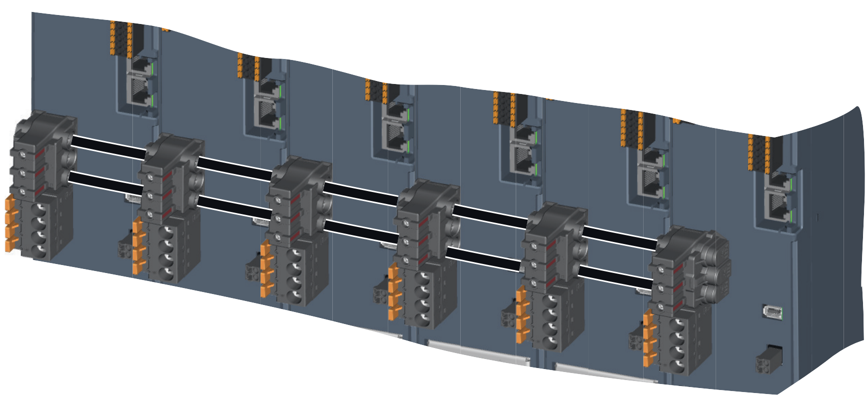


Figure 5-24 X3 - connection of the coupling

If no DC link coupling is used, seal the socket in the device with a DC link cover.

5.4.7.4 Establishing the AC coupling and the DC link coupling

The connection of the individual converters for the AC coupling and the DC link coupling are established by inserting the cables, together with their insulation through the openings of the connector one after the other. The electrical contact is established when tightening the screw connections of the individual connectors with the specified torque.

Permissible cables for the AC coupling and DC link coupling

The cables required for the AC coupling and DC link coupling are standard cables, and therefore not included in the scope of delivery.

Permissible cables for IEC applications:

Use the following cables for the AC coupling and for the DC link coupling:

- 16 mm², Class 5 (finely stranded, PVC-insulated), H07V-K + H07V2-K according to DIN EN 50525-2-31
- HELUTHERM® 145 [helukabel.com]: 16 mm², Class 5 (finely-stranded, crosslinked polyolefin-copolymer, halogen-free)
- Outer diameter 6.7 mm ... 8.1 mm

Permissible cables for UL and cUL applications:

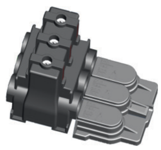
Only use copper cables for 60/75 °C with the following properties for the AC coupling and the DC link coupling:

- AWG 6, copper conductor with PVC insulation, with or without nylon jacket, 19 strands
- Types: MTW, THHW, THW, THW-2, THHN, THWN-2, TW, TWN
- CSA types: TW, TWU, TWN75, TW75, TWU75, T90. It is not permissible that other cables are used.

You can also use cables with a higher rated temperature value. It is not permissible to reduce the conductor cross-section.

Establishing the coupling

1. Thread the insulated cables through the connector, allow the cables to protrude by 3 mm ... 5 mm at the end connectors.
   Markings are provided on the end caps showing the permissible amount of protrusion. To do this, place the end cap on the connector as shown in the diagram and then shorten the conductors appropriately.

2. Tighten the screws with a torque of 3 Nm to establish an electrical contact. Please note that you must tighten the screws so that the red marking on the connector is no longer visible. The electrical contact has not been reliably established if the red marking is still visible.
3. For the AC coupling, close and seal the connector of the last converter using an end cap. For the DC link coupling, close and seal the connectors of the first and last converters using end caps.

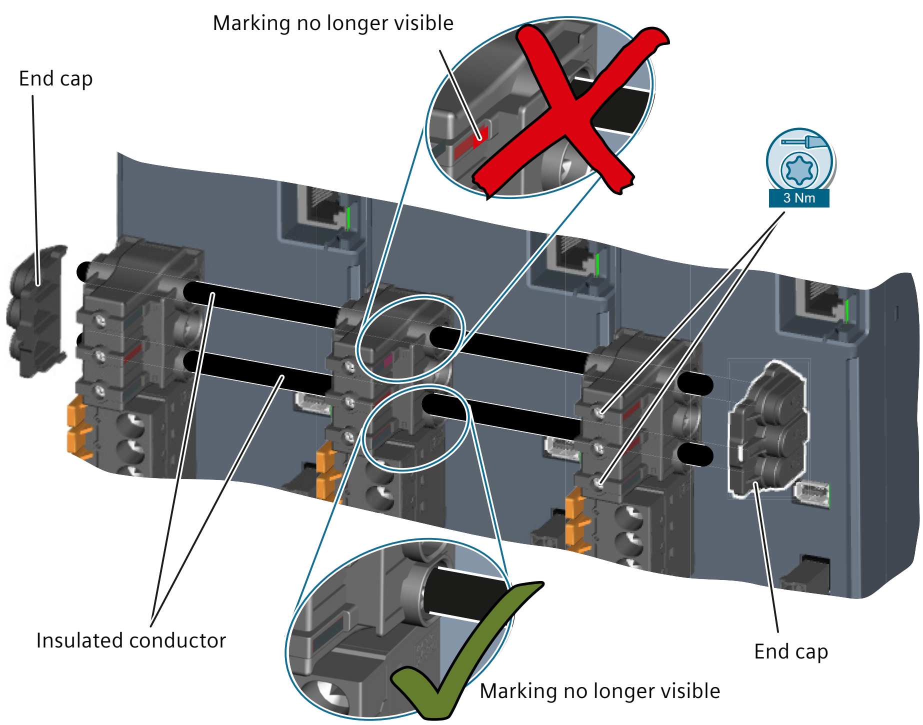


Figure 5-25 Establish a coupling - example for a DC link coupling

Note

The cables for the AC coupling and the DC link coupling may only be used once to establish a connection.

Further, comply with the notes provided in the documentation supplied with the contactors.

5.4.7.5 Connecting a braking resistor

You can either use the internal braking resistor or connect an external braking resistor.

Using the internal braking resistor

If you are using the internal braking resistor, terminals DCP and R2 must be jumpered at connector X4.

The jumper is included in the scope of delivery of the converter.

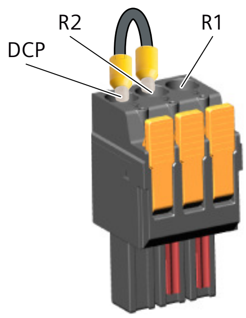


Figure 5-26 X4 - connection for using the internal braking resistor

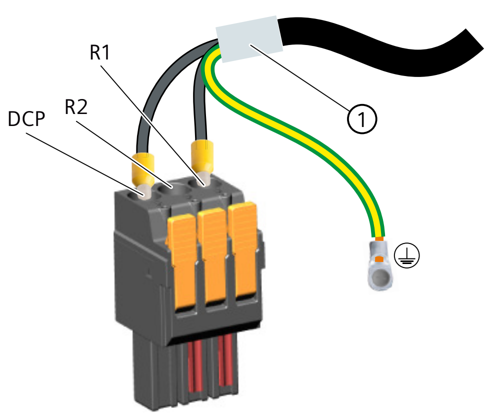
Using an external braking resistor

If you are using an external braking resistor, terminals DCP and R2 must not be jumpered at connector X4. Connect the braking resistor via the DCP and R1 terminals. Pre-charging of the converter then takes place via the external braking resistor.

The protective conductor is connected at the upper grounding connection of the device. The shield support is realized at the rear panel of the electrical cabinet; the shield must be connected through a large surface area.

The terminals are spring-loaded terminals.

The permissible cable length is 10 m.



① Shield

Figure 5-27 X4 - connection for an external braking resistor

Permissible conductor cross-sections for single-conductor connection or for connecting flexible cables with or without end sleeves:

- 0.75 mm² ... 6 mm²
- AWG: 18 ... 10
- Insulation stripping length: 18 mm

5.4.8 Additional connections at 1 AC / 3 AC converters

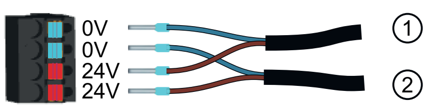
5.4.8.1 Connecting digital inputs and the external 24 V supply

Connecting the external 24 V supply

Connect a 24 V power supply to the converter.

The terminals are spring-loaded terminals.

Permissible cable length: 30 m



① 24 V external

② Loop-through for additional converters

Figure 5-28 X124 - 24 V external (connection at converters with 1 AC line connection)

Note

Connecting converters with 3 AC line connection

For converters with 3 AC line connection, the mounting position of the connector is rotated 180°.

Maximum current for looping through via the internal jumper (blue-blue, red-red): 24 A.

Permissible conductor cross-sections for single-conductor connection or for connecting flexible cables with end sleeves:

- 0.2 mm² ... 2.5 mm²
- AWG: 24 ... 12
- Insulation stripping length: 10 mm

For several converters, connect the interfaces with the previous or next converter by looping through the cables (see the following diagram).

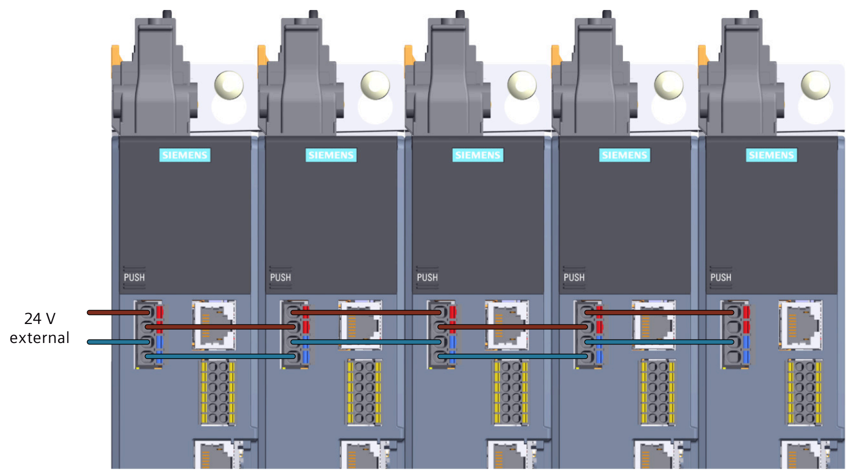


Figure 5-29 X124 power supply for several converters

Connecting digital inputs

Digital inputs DI 0 and DI 1 are high-speed digital inputs and can be used as measuring probes.

Digital inputs DI 2 and DI 3 form a failsafe digital input.

You can connect the temperature monitoring for an external braking resistor to DI 4.
When you use the temperature monitoring function, the converter shuts down the motor if the external braking resistor temperature becomes too high.

The terminals are spring-loaded terminals.

Permissible cable length: 30 m

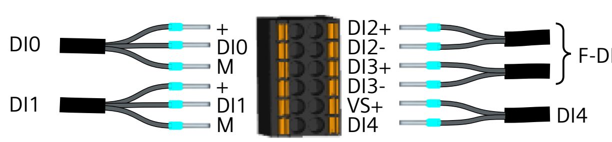


Figure 5-30 X130 - connector for digital inputs

Note

Switchable voltage source VS+

A switchable voltage source is available at the terminal marked with "VS+".

Via this terminal, adjustable dark pulses can be generated that can be used to diagnose the control circuits for the failsafe digital inputs. For additional information, see Chapter "Self-test of the failsafe digital input (F-DI) (Page 426)."

When using dark pulses via terminal "VS+", the power supply for the temperature monitoring of an external braking resistor must be realized via a terminal marked "+", or must be externally provided.

Permissible conductor cross-sections:

- For single-conductor connection:
  - 0.2 mm^2 ... 1.5 mm^2
  - AWG: 24 ... 16
- For flexible cables with end sleeves:
  - 0.25 mm^2 ... 1.5 mm^2
  - AWG: 24 ... 16
- For flexible cables with end sleeves with protective collars:
  - 0.25 mm^2 ... 0.75 mm^2
  - AWG: 24 ... 19
- Insulation stripping length: 10 mm

The three terminals marked with "+" and "VS+" are provided as power supply for external sensors. They are short-circuit-proof and provide a max. of 50 mA per sensor. A sensor short-circuit interrupts the power supply for all three sensors.

5.4.8.2 Connecting service interface and PROFINET

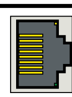
Connect your operating unit, for example a PC, via an Ethernet cable to the service interface (socket X127).

The transmission rates are 10 Mbit/s or 100 Mbit/s.

Connect the converter with PROFINET cables with RJ45 FastConnect connectors or with PROFINET patch cables (see accessories) via the sockets X150 P1 and X150 P2 to the PROFINET network.

Figure 5-31 RJ45 FastConnect connector

Table 5-11 Pin assignment for X127, X150 P1 and X150 P2

	Pin	Pin assignment	Explanation
	1	RXP	Receiving data +
	2	RXN	Receiving data -
	3	TXP	Sending data +
	4	Reserved	-
	5	Reserved	-
	6	TXN	Sending data -
	7	Reserved	-
	8	Reserved	-

Permissible cable length for the service interface (terminal X127): 10 m

Permissible cable length for PROFINET (terminals X150 P1 and X150 P2): 100 m

LED states

For diagnostic purposes, the PROFINET interface X150 P1/P2 features a green and a yellow LED.

The following status information is displayed:

Table 5-12 LED states of PROFINET interface X150 P1/P2

LED	Color	Status	Description
Link port	-	Off	Missing or faulty link
	Green	Continuous light	10 or 100 Mbit link is available
Activity port	-	Off	No activity
	Yellow	Flashing light	Sending or receiving data

5.4.9 Connection examples

Connection example for converters with 1 AC line connection

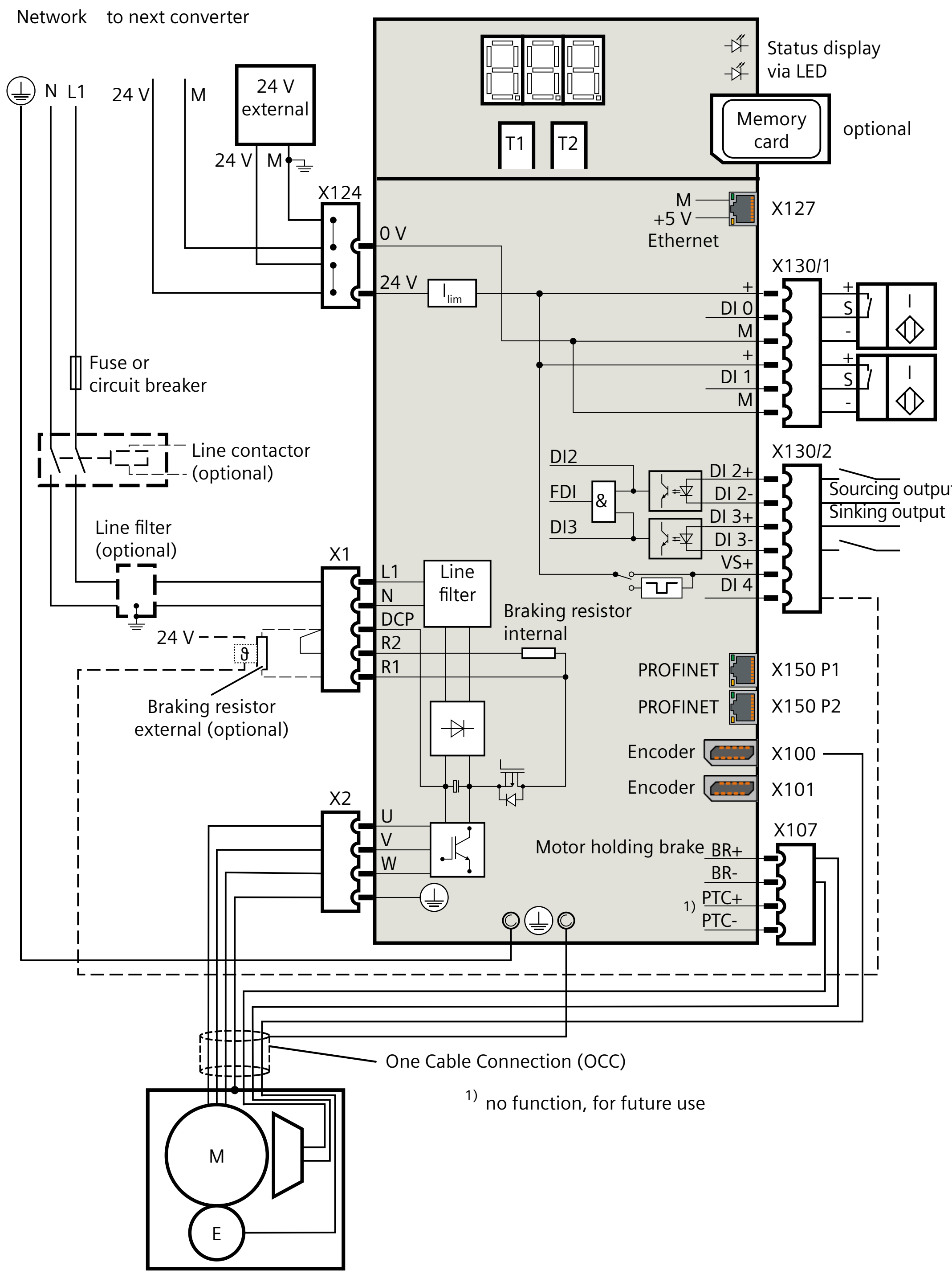


Figure 5-32 Connection example for converters with 1 AC line connection

Connection example for converters with 3 AC line connection

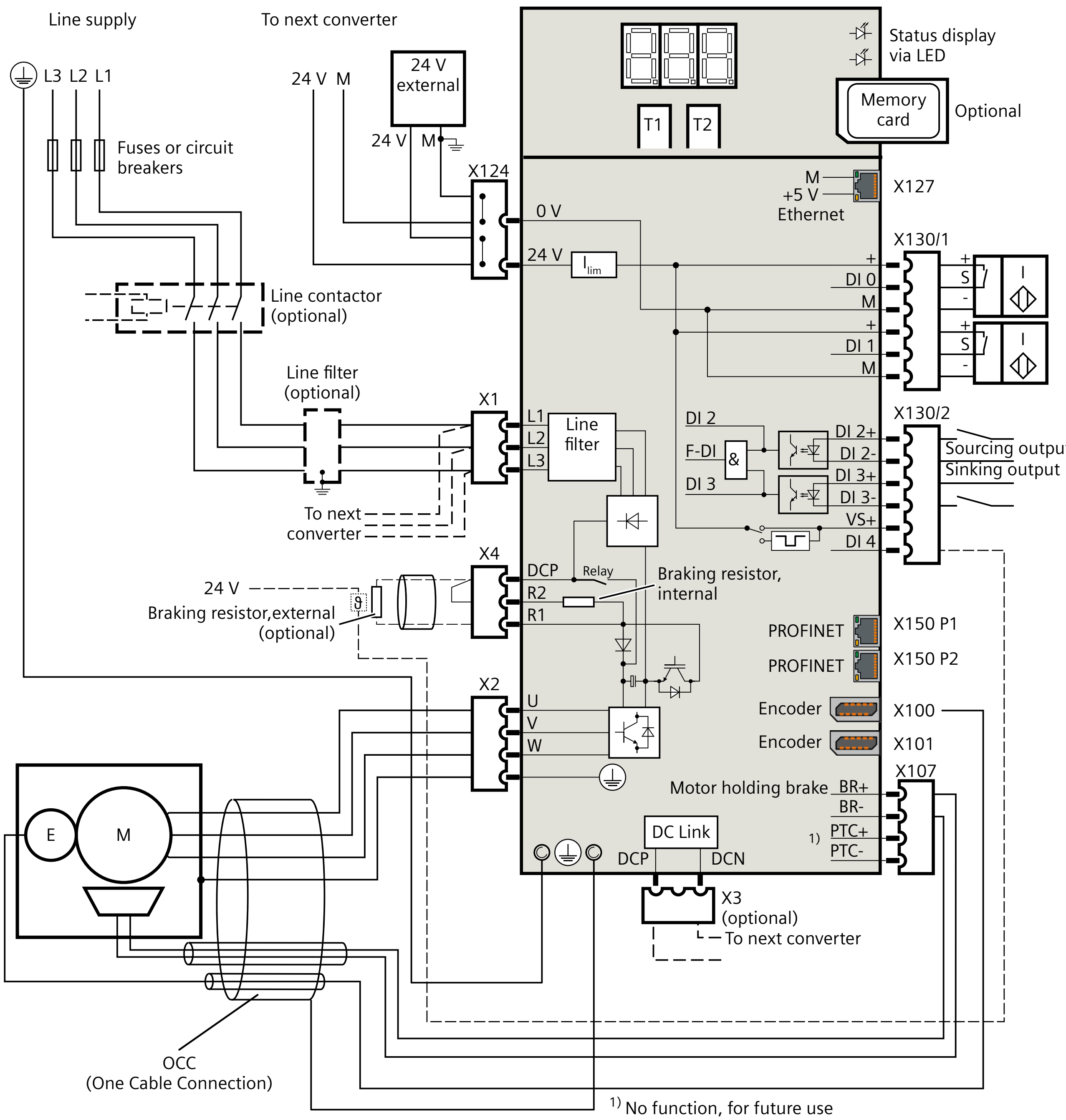


Figure 5-33 Connection example for converters with 3 AC line connection

5.4.10 Connecting failsafe digital inputs

Requirement

WARNING

Unexpected movements due to long connecting cables

If a connection cable at a failsafe digital input is too long, then overvoltages can damage the failsafe digital input. It is possible that a damaged failsafe digital input can no longer detect the signals of the connected sensor. This may impair the functional safety of the machine or the system and therefore endanger people or lead to material damage.

- Use a surge protection device for cable lengths > 30 m.

Description

The failsafe digital input is suitable for connecting the following devices:

- safety sensors, e.g. emergency stop control devices and light curtains.
- Pre-processing devices, e.g. failsafe controls and safety relays.
  Conditions for the quiescent current for PP or PM-switching failsafe digital outputs:
  The quiescent current must not be greater than 0.5 mA.

When setting an F-DI as NC/NC contact (see P10040), the following applies:

The converter expects signals with the same state at its failsafe digital input:

- 1 signal: The safety function is deselected.
- 0 signal: The safety function is selected.

When setting an F-DI as NC/NO contact (see p10040), the following applies:

The converter expects signals with complementary state at its failsafe digital input:

- 1 signal at the NC contact/ 0 signal at the NO contact: The safety function is deselected.
- 0 signal at the NC contact/ 1 signal at the NO contact: The safety function is selected.

Table 5-13 Category that can be achieved according to EN ISO 13849-1 when setting an F-DI as NC/NC contact

Category	Supply voltage	Application	Result
Cat 3	With or without using the internal supply voltage; however, without enabled self-test using specified dark pulses (p10018 = 0, p10041 = 0)	Local use, e.g. EMERGENCY STOP	The converter self-test detects errors in the circuits of the failsafe digital input.
Cat 4	Exclusive use of the internal supply voltage for PP circuit with enabled self-test using specified dark pulses at the internal supply voltage (p10041 = 1, p10018 > 0)	Protected cable routing, e.g. within a control cabinet	The converter self-test detects errors in the circuits of the failsafe digital input. The self-test of the connected cables with internally specified dark pulses detects the following errors: • Short-circuit to ground • Short-circuit to 24 V supply voltage
	Without using the internal supply voltage, but with test pulses of the connected external device (p10041 = 3)	Depending on the connected external device	

When setting an F-DI as an NC/NO contact, contact, the application on the machine or system must switch the F-DI into a safe state (safety function is selected) at least once within a maximum time interval so that it can be fully tested by the converter and the desired PL and category according to EN ISO 13849-1 can be achieved. The following PL /categories can be achieved depending on the time interval:

- at least once per year: PL d / Category 3
- at least every three months: PL e / Category 3
- at least daily: PL e / Category 4

Note

In the NO contact path, in addition to switch failures, power supply failures as well as interruption of the cabling with respect to functional safety must be suitably taken into account.

It is recommended that the F-DI is used as NC/NC contact.

5.4.11 Connection examples of the failsafe digital input

Interconnection for an EMERGENCY STOP button with 24 V internal

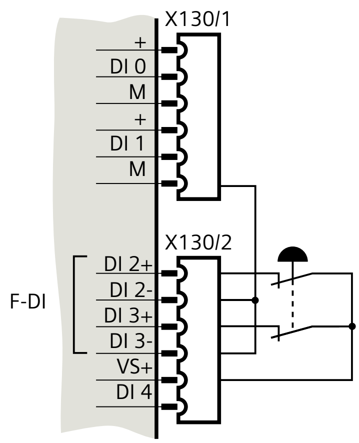


Figure 5-34 Interconnection for an EMERGENCY STOP button with 24 V internal

Uses of the interconnection:

- Self-test using dark pulses specified via terminal VS+
- Category 4 according to ISO 13849-1 can be achieved (local use, e.g. EMERGENCY STOP)
- Short-circuit detection (with respect to ground and 24 V)

Interconnection for an EMERGENCY STOP button with 24 V DC external

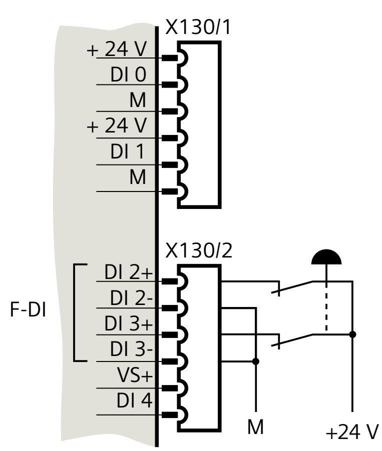


Figure 5-35 Interconnection for an EMERGENCY STOP button with 24 V DC external

Uses of the interconnection:

- Self-test using internal test signals
- Category 3 according to ISO 13849-1 can be achieved (local use, e.g. EMERGENCY STOP)

Interconnection of the failsafe digital input with a failsafe digital output

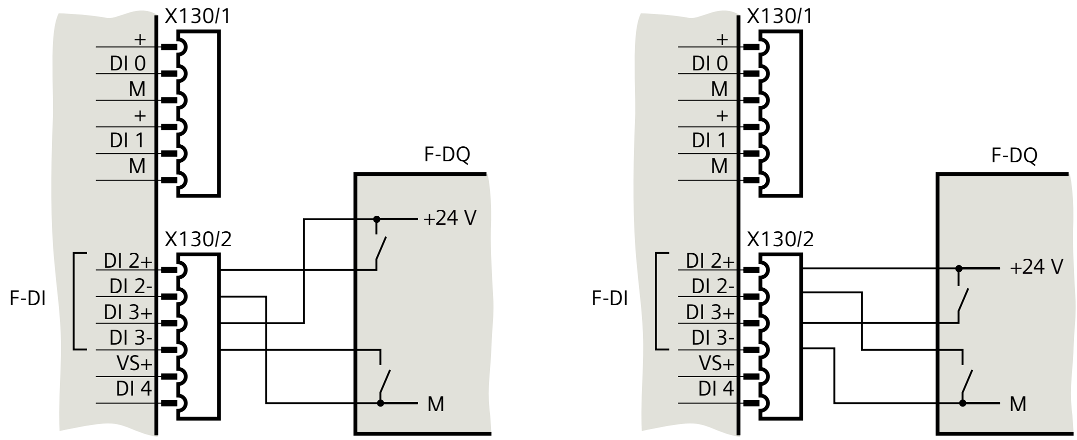


Figure 5-36 Interconnection of the failsafe digital input with a failsafe digital output

Uses of the interconnection:

- Self-test using dark pulses specified via F-DQ
- Category 4 according to ISO 13849-1 can be achieved (local use, e.g. EMERGENCY STOP)

Commissioning (web server) 6

6.1 Introduction

Description

The web server commissioning tool is integrated in the converter.

The web server supports you throughout the service life of the application:

- Online commissioning
- Diagnostics
- Operator control and monitoring
- Service and maintenance
- Support

The settings made are applied after commissioning has been completed and transferred to the converter.

The web server has multi-level Industrial Cybersecurity functionality.

More information

More information about industrial cybersecurity functionality is provided on the Internet:

Industrial Cybersecurity Configuration Manual (https://support.industry.siemens.com/cs/ww/en/view/109810578)

6.2 Requirements for commissioning

Description

- You have correctly installed the converter and the motor.
- You have mounted the motor, including an encoder that might be required, onto the mechanical system.
- You have connected the motor to the converter.
- You have connected the converter and the operating unit via service interface X127 or PROFINET interface X150.
- You have switched on the converter supply voltage.
- The converter has ramped up.

6.3 Fundamentals

6.3.1 Supported operating units

Description

The following operating units are supported for the connection with the web server:

- Programming device, PC, notebook
- Tablet, smartphone
  Mobile end devices are connected to the converter via SINAMICS Smart Adapter.
  More information about the SINAMICS Smart Adapter can be found in Chapter "SINAMICS Smart Adapter (Page 786)".

As a result of the responsive design, content is adapted to the display size of the operating unit.

6.3.2 Supported browsers

Description

The web server supports the following browsers:

Browser[1)]	**Version**
Apple Safari	≥ Version 15.0
Google Chrome	≥ Version 83
Microsoft Edge	≥ Version 88
Mozilla Firefox	≥ Version 91

1) Whichever browser you use, we recommend using the most up-to-date version.

6.3.3 Communication interfaces

Description

The following interfaces are available for accessing the converter:

Interface	Information
Service interface X127	Default access to Startdrive and the web server is via service interface X127.
	Ethernet interface X127 is intended for commissioning and diagnostics, which means that it must always be accessible. The SINAMICS Smart Adapter establishes a point-to-point connection to a mobile end device via WLAN.
	Default settings: • IP address: 169.254.11.22 • Subnet mask: 255.255.0.0 • Data transfer via HTTPS is activated in the factory setting.
	Constraints: • Only local access is permitted. • Only local networking in a closed and locked electrical cabinet is permitted. • For remote access to the electrical cabinet, you must apply additional Industrial Cybersecurity measures to prevent misuse through sabotage, data manipulation by unqualified persons and interception of confidential data.
PROFINET interface X150	• Converters are connected to several components, such as an operating unit or a higher-level control system, via PROFINET interface X150. • The network at PROFINET interface X150 must be located in a secure protection zone. Access to cables and open connections must be implemented in a protected fashion, such as in a control cabinet. • The IP addresses of the service interface X127 and the PROFINET interface X150 must not be in the same subnet. • Configured IP addresses are stored in SINAMICS SDI Standard: "Support" menu > "Scan IP Address".

More information

More information about the supported protocols is available on the Internet:

SINAMICS Industrial Cybersecurity Configuration Manual (https://support.industry.siemens.com/cs/ww/en/view/109975311)

6.4 Getting Started

6.4.1 Calling the web server

Overview

The converter is commissioned via the user interface of the web server.

Requirement

Before calling the web server, the following points apply:

- You have connected the converter to the operating unit via the service interface X127.
- Guest access to the web server is active.
  If guest access is not permitted, you must log on with your user name and password when calling the web server.

Procedure

To access the web server via service interface X127, enter the IP address of the converter into the web browser, e.g. https://169.254.11.22.

If you do not know the IP address, then at the SINAMICS SDI standard navigate to menu "Support" > "Scan IP Address".

More information

To access the integrated web server, you must assign PROFINET interface X150 a valid IP address via the control system. The IP addresses of X127 and X150 must be different.

6.4.2 Settings for brand-new converters

Overview

The basis settings are required before performing first commissioning for a brand-new converter.

Requirement

The operating unit is connected to the converter via service interface X127.

The web server can be accessed via service interface X127 using the configured IP address (default: 169.254.11.22).

Description of function

If the web server is called, a forwarding function starts automatically to define the basic settings. When doing, this several function views are run through.

The function views contain the following settings:

- Basic settings (Page 159)
- Security settings (Page 159)

6.4.3 Basic settings

Overview

Initial basic settings are defined in the function view.

Requirement

The web server is being called for the first time.

Description of function

The basic settings are as follows:

- Preferred language of the user interface
- Converter date and time; either manually or via NTP
  To synchronize the date and time with the NTP server of the control, the SNTP library must be integrated into the PLC.

After these entries have been made, using the "Next" button, you can continue to the Security Wizard.

6.4.4 Security Wizard

Overview

The Security Wizard offers the following settings:

- User Management & Access Control (UMAC)
- Access to the integrated web server via the fieldbus or service interface
- Drive data encryption

Requirement

NOTICE
Data manipulation due to inadequate protection
An inadequately protected drive makes it easier for potential attackers to access the drive data. Data manipulation can cause the drive to malfunction or damage it. • Only use the low security settings in exceptional cases, and only if this can be justified after an information security risk analysis. • Configure the security settings for the converter for full protection.

Procedure

One of the following options can be selected:

- "Configure security settings"
  Comprehensive protection against data manipulation requires that security settings are configured.
- "Continue with low security settings"
  If you continue with low security settings, then UMAC is initially deactivated. We recommend that you configure the security settings before the converter goes into operation. You can also access the security settings via menu "Protection & Security (Page 198)".

Select "Configure security settings"

Define the settings for UMAC:

- "Activate User Management & Access Control"
  If UMAC is activated, UMAC can only be deactivated by completely restoring the converter factory settings.
  You can find more information about the full reset to factory settings in section "Full reset of all device settings (Page 503)".
- "Administrator setup"
  Specify the user name and password of the administrator.
  Runtime role "Drive Administrator" is assigned to the administrator.
- "Guest access configuration"
  Specify the following:
  – Without logging in, the user is allocated read rights.
  – Without logging in, the user may acknowledge messages.
- "Web server activation"
  Define the interface to the web server:
  – The factory setting to access the web server is service interface X127 with HTTPS protocol.
  – It is also possible to activate PROFINET interface X150 with HTTPS protocol.

  If both these interfaces are deactivated, it will not be possible to access the web server.

- "Drive data encryption"
  Assign an additional password for encryption of the drive data.
  The function encrypts the following data in the backup file and on the memory card of the converter:
  - UMAC user data
  - Passwords

  To use "Drive data encryption" independent of UMAC, deselect option "Activate UMAC for the drive " on page " Activate User Management & Access Control".
- "Summary"
  Check the configured settings.

More information

More information about "Drive data encryption" can be found on the Internet:

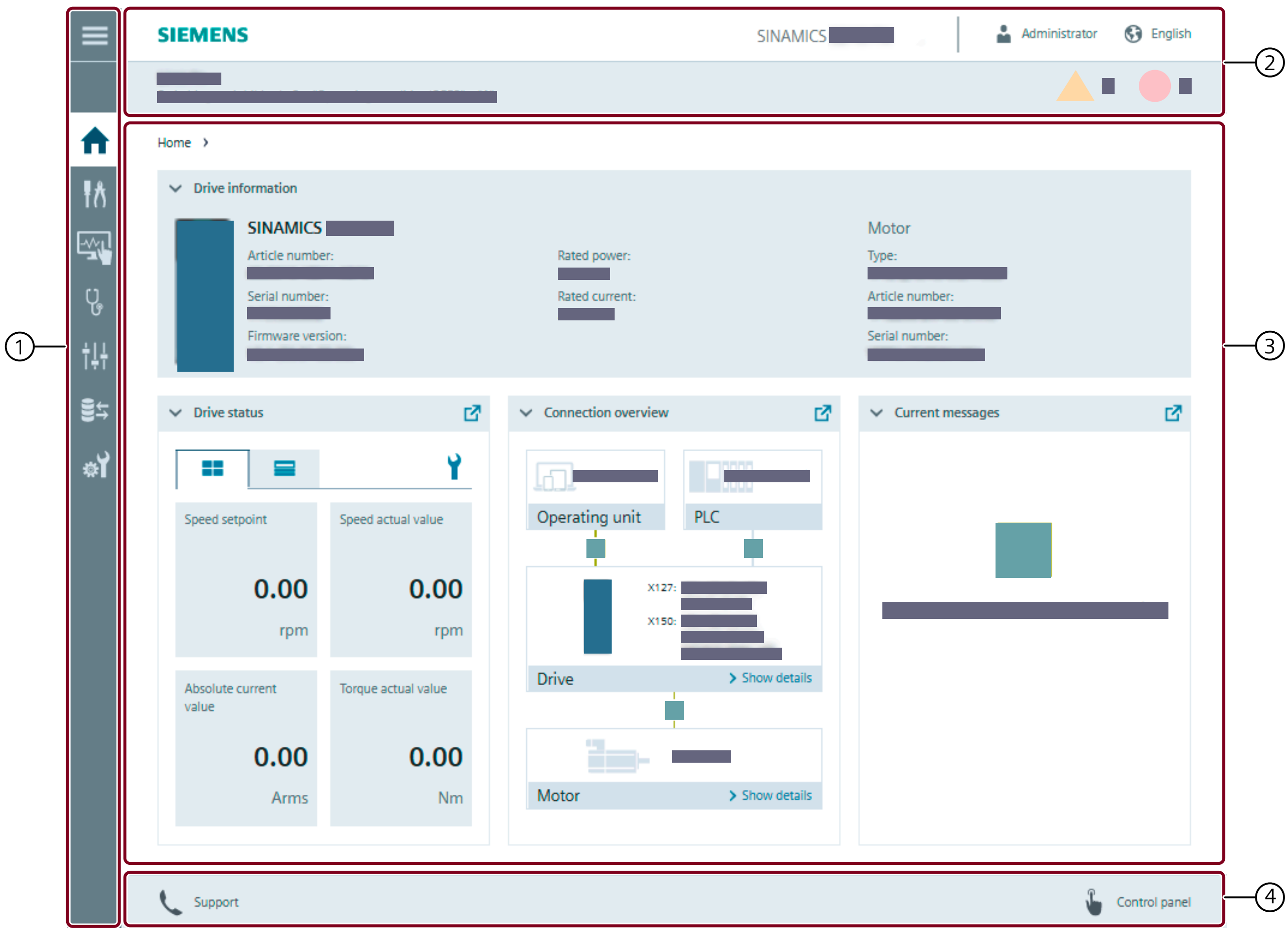
SINAMICS Industrial Cybersecurity Configuration Manual (https://support.industry.siemens.com/cs/ww/en/view/109975311)

6.4.5 Home page

Description

The web server user interface can differ from the diagram below, as the web server adapts the display to the display size of the operating unit.

Product-specific information and settings are covered over in the diagram.



① Navigation bar

The navigation bar provides access to converter functions and menus.

② Status bar

The status bar displays the converter product name and the converter status. Log in at the status bar and select the user interface language.

③ Main window

The main window provides information about converter functions and allows settings to be made.

④ Action bar

When manual saving is activated in menu "System" > "Settings", then symbol is also shown in the action bar.

Figure 6-1 Structure of the web server

6.4.6 Making the product documentation available for the web server information system

Overview

For selected topics, you can use the information system of the web server to directly access the product documentation. To do this, you must make the product documentation available on a prepared memory card.

Requirement

Requirements:

- You have an empty memory card on which you can save the product documentation.
- You have connected a suitable memory card reader to your PC.

Procedure

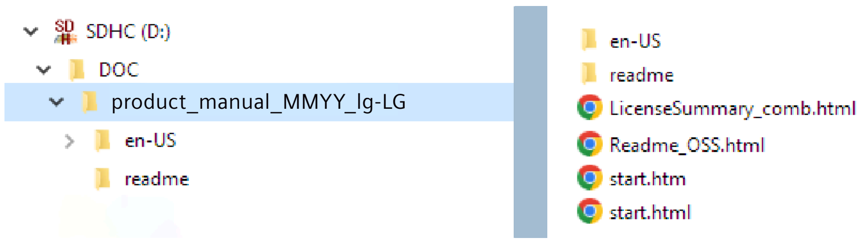
To make the project documentation available for the web server information system, proceed as follows:

1. Download the product documentation to your PC
   The project documentation for the web server information system can be found on the Internet:
   Download from Siemens Industry Online Support (https://support.industry.siemens.com/cs/ww/en/view/109818069)
   ZIP archive "Multimedia document" is located under "Download".
   The multimedia document contains file "product_manual_MMYY_lg-LG.zip".

Explanation of file name "product_manual_MMYY_lg-LG.zip"		
	Example	**Explanation**
product	S200, G220	Abbreviated converter name
manual	op_instr (= operating instructions)	Abbreviated product documentation
MMYY	0324	Month and year that the manual was published
lg-LG	en-US (= US English)	Language code

2. Unzip the file into a folder with the ZIP file name, e.g. "product_manual_MMYY_lg-LG".
3. Insert a memory card into the SD card reader of your PC.
4. In the root directory of the memory card, create a folder called "DOC".

5. Copy the unzipped folder, e.g. "product_manual_MMYY_en-US", into directory "DOC" on the SD card.



6. Eject the memory card from the PC.
7. Remove the memory card from the reader.
8. Insert the memory card into the converter.

Result

You have made the product documentation in one language available for the web server information system.

For selected topics, you can access the content of the product documentation via the context-sensitive information system.

You can copy the product documentation in other languages to the memory card if there is sufficient space available on the memory card.

6.4.7 Using the web server information system

Overview

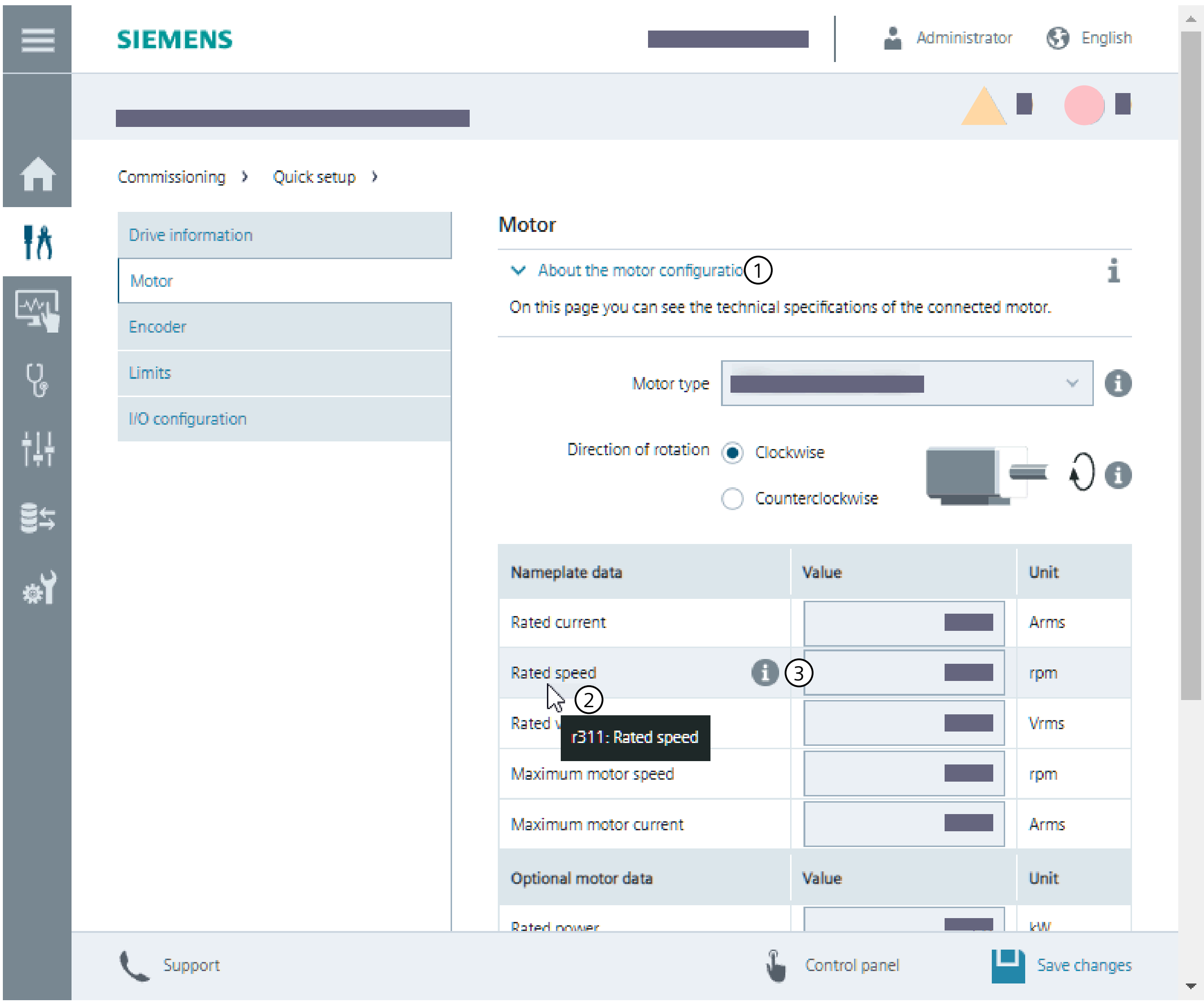
The web server supports you using an integrated multi-stage information system.

Requirement

If you have provided the product documentation for the web server information system, then the web server also displays linked content of the manual.

Description

Product-specific information and settings are covered over in the following diagrams.



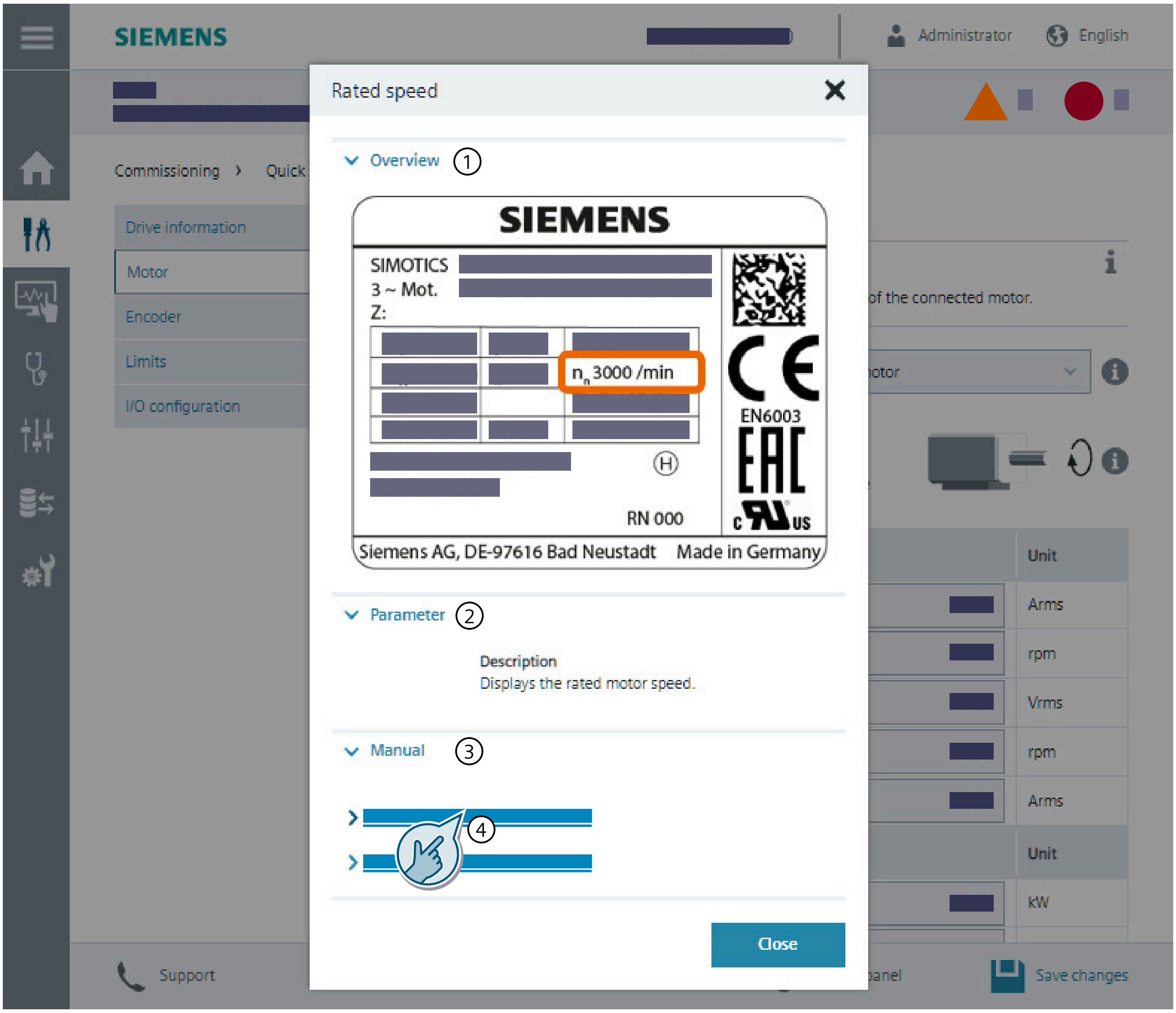
① Clicking or tapping on the header or on the associated icon displays or hides general information about the function of the current view.

② Point with the mouse pointer or tap on the setting you need information about.
The setting is highlighted and the assigned info icon appears.
If you hold the mouse pointer or keep the tap pressed on the setting for longer, a tooltip with the context-sensitive short information is displayed.

③ When you move the mouse pointer to the info icon, the icon and the mouse pointer change their appearance.
If you now click or tap on the info icon, a context-sensitive help window appears with detailed information.

Figure 6-2 Information in the current view

The web server provides more detailed information about a setting in a context-sensitive help window.



Clicking or tapping on the header or the associated icon does the following:

① Displays and hides general information about the meaning or function of the setting.

② Displays and hides detailed information about the parameter.

③ Displays and hides links to the operating instructions.

④ A click or tap on a link displays the linked information of the operating instructions.

Figure 6-3 Product-dependent information in a context-sensitive help window

6.4.8 Reloading pages

Procedure

If the web server does not respond, or if buttons are inactive or are not labeled, although the converter is not fully utilized with internal calculations, reload the web server pages as follows:

- At the PG/PC via <F5>
- At the tablet PC or smartphone via

6.5 Functions and menus

6.5.1 Commissioning

6.5.1.1 Commissioning sequence

Overview

The web server guides users step-by-step through the drive commissioning.

Description of function

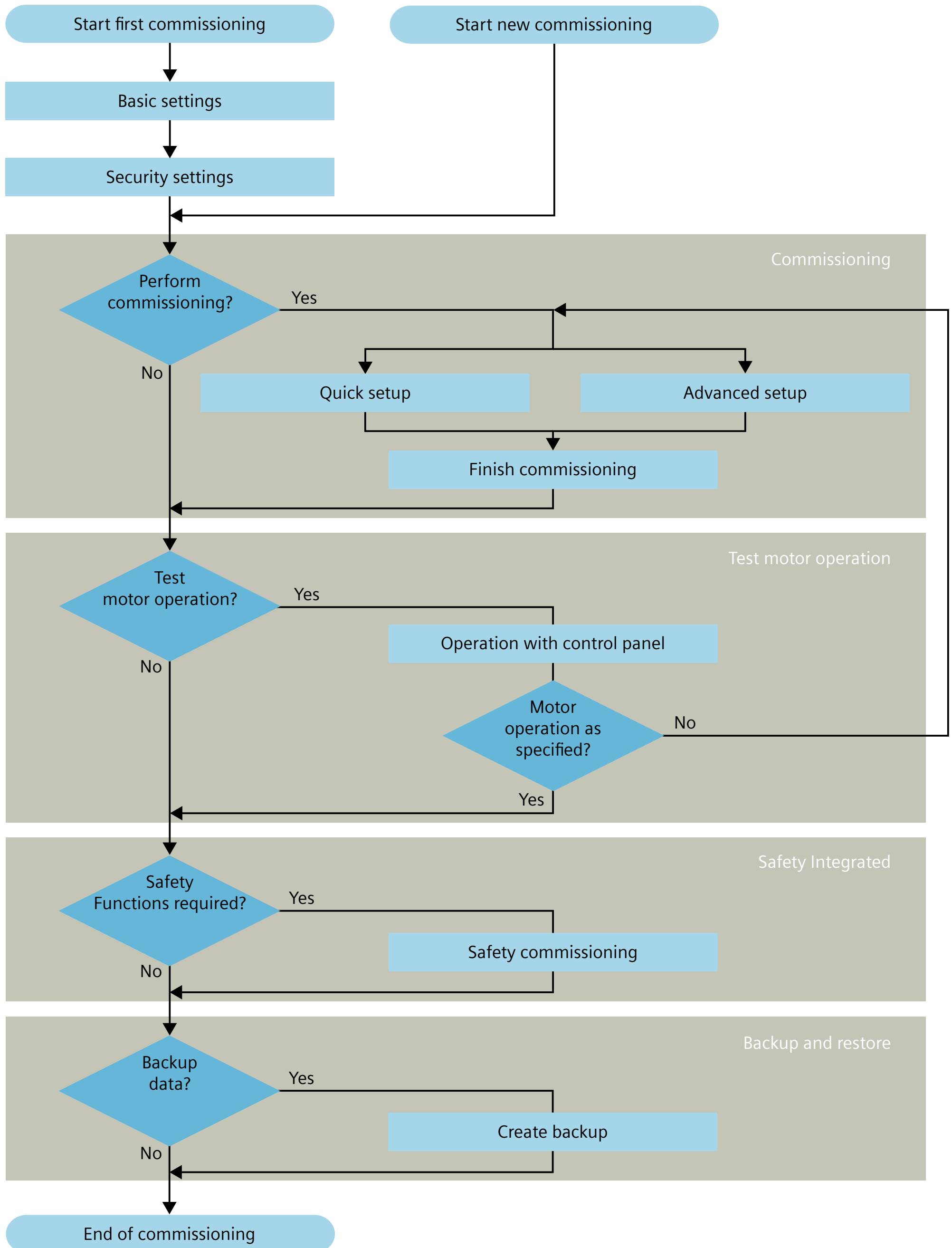


Figure 6-4 Commissioning sequence

Commissioning involves the following steps:

- Basic settings:
  If the converter has already been commissioned, then the web server jumps to the basic settings.
  The following settings are required for a brand-new converter:
  – Language, date, time
- Security settings:
  The settings are configured with the help of the Security Wizard.
  You can find more information in section "Security Wizard (Page 159)".
- Commissioning
  Commissioning menu
  The web server has 2 commissioning modes:
  – Quick commissioning
  – Advanced commissioning

  In the read mode, the web server provides an overview of the commissioning.
  This allows operators to become familiar with the commissioning steps, individual drive options, and functions or to check settings. Configuration is not possible.
- Optimize motor:
  Menu "Commissioning" > "Optimization"
  The optimization measures the mechanical drive train using short test signals and adapts the controller parameters to the existing mechanical system.
- Safety Integrated commissioning:
  Menu "Commissioning" > "Safety Integrated"
  Setting of the Safety Integrated Functions
- Test motor operation:
  Action bar > "Control panel"
  Test of motor operation using the control panel in jog mode or continuous operation
- Backup:
  Menu "Backup and restore"
  We recommend backing up the drive settings after commissioning.

More information

Information about user management and the settings can be found on the Internet:

Industrial Cybersecurity Configuration Manual (https://support.industry.siemens.com/cs/ww/en/view/109810578)

6.5.1.2 Commissioning

Overview

Important converter parameters are set during commissioning. After commissioning has been completed, the converter knows, for example, the data of the connected motor and has adapted its control interfaces to the specific requirements.

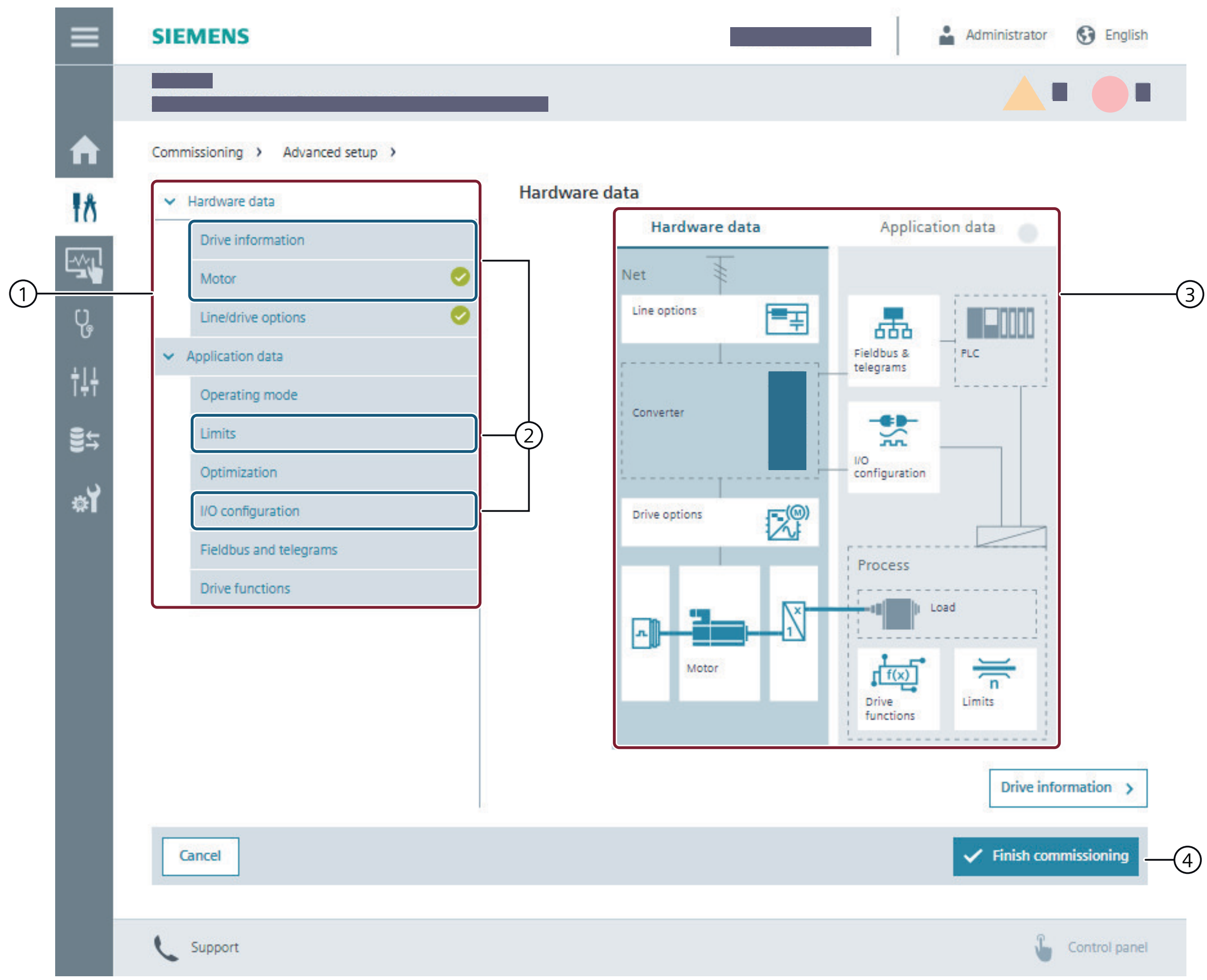
Requirement

The following requirements apply:

- No other user controls the converter via the control panel.
- No other user has started commissioning.
- When UMAC is activated, then the required rights are assigned, for example, role "Drive Engineer and Service" is assigned.

Description of function

Product-specific information and settings are covered over in the diagram.



①	Navigation through advanced commissioning
②	Reduced navigation by quick commissioning
③	Function views of the individual commissioning steps
④	Control bar to cancel or complete commissioning
✔	All values entered are valid.
👁	The drive has overwritten the manually changed values. Check values.
✎	Once commissioning has been completed, at least one of the values will have to be changed.

Figure 6-5 Advanced commissioning using the web server

The web server has 2 commissioning modes:

- Quick commissioning
  Quick commissioning comprises the basic settings that are required to commission the converter. For example, this includes motor data, limit values and the configuration of inputs and outputs.
- Advanced commissioning
  The advanced commissioning contains all settings of the quick commissioning, plus additional options and functions.
  With advanced commissioning, drive options and functions that match the specific application can be configured.

The commissioning wizard runs through the commissioning menu.
The converter creates a restore point when commissioning is started. The converter saves the changes after every commissioning step. If you cancel commissioning before it has been completed, then the converter is reset to the restore point.

Table 6-1 Web server commissioning menu

Commissioning step	Description
Hardware data	
Drive information	The web server provides an overview of the drive system: • Converter • Motor • Option modules, if used Information about the individual components is read out of the drive and displayed. The drive name can be edited.
Motor	The motor data are either entered or taken from the system. If the motor is connected via the DRIVE-CLiQ connection, for example, this is detected during startup. The motor data is transferred directly. If the motor is not detected, the preset motor data is based on the drive information. The following options are available for defining the motor configuration: • Check and correct the preset motor data against the nameplate of the connected motor Information about the data set can be retrieved using the symbol. • Specify the motor type used, for example, by selecting or actually entering the motor ID. The web server only continues the commissioning process after confirmation that the motor data matches the connected motor.
Line and drive options	Filter on the motor side or braking resistor
Application data	
Operating mode	Operating mode for closed-loop motor control
Limit values	Maximum speed, maximum acceleration of the motor
Optimization	Instant in time for starting optimization for constant or speed-dependent load

Commissioning step	Description
I/O configuration	Function of the digital and analog inputs and outputs of the converter Selecting preconfigured default settings Configuring the fieldbus and telegram corresponding to the settings of the higher-level control system
Drive functions	Other drive functions

The converter retentively saves the settings after commissioning has been successfully completed.

6.5.1.3 Optimization

Overview

Once quick setup or advanced setup has been completed the drive settings are optimized using the One Button Tuning (OBT) function.

With OBT, the mechanical drive train is measured using short test signals. In this way, the controller parameters are optimally adapted to the existing mechanical system.

Requirement

To reduce the stress on the mechanical system, before OBT, the torque limit can be reduced, and after OBT has been completed, the previous value can be set again.

NOTICE
Material damage caused by an impermissible direction of motion of the motor
One Button Tuning runs the motor in both directions. Impermissible directions of motion can damage the machine or installation. • If a particular direction of motion of the motor is impermissible, do not carry out One Button Tuning.

Description of function

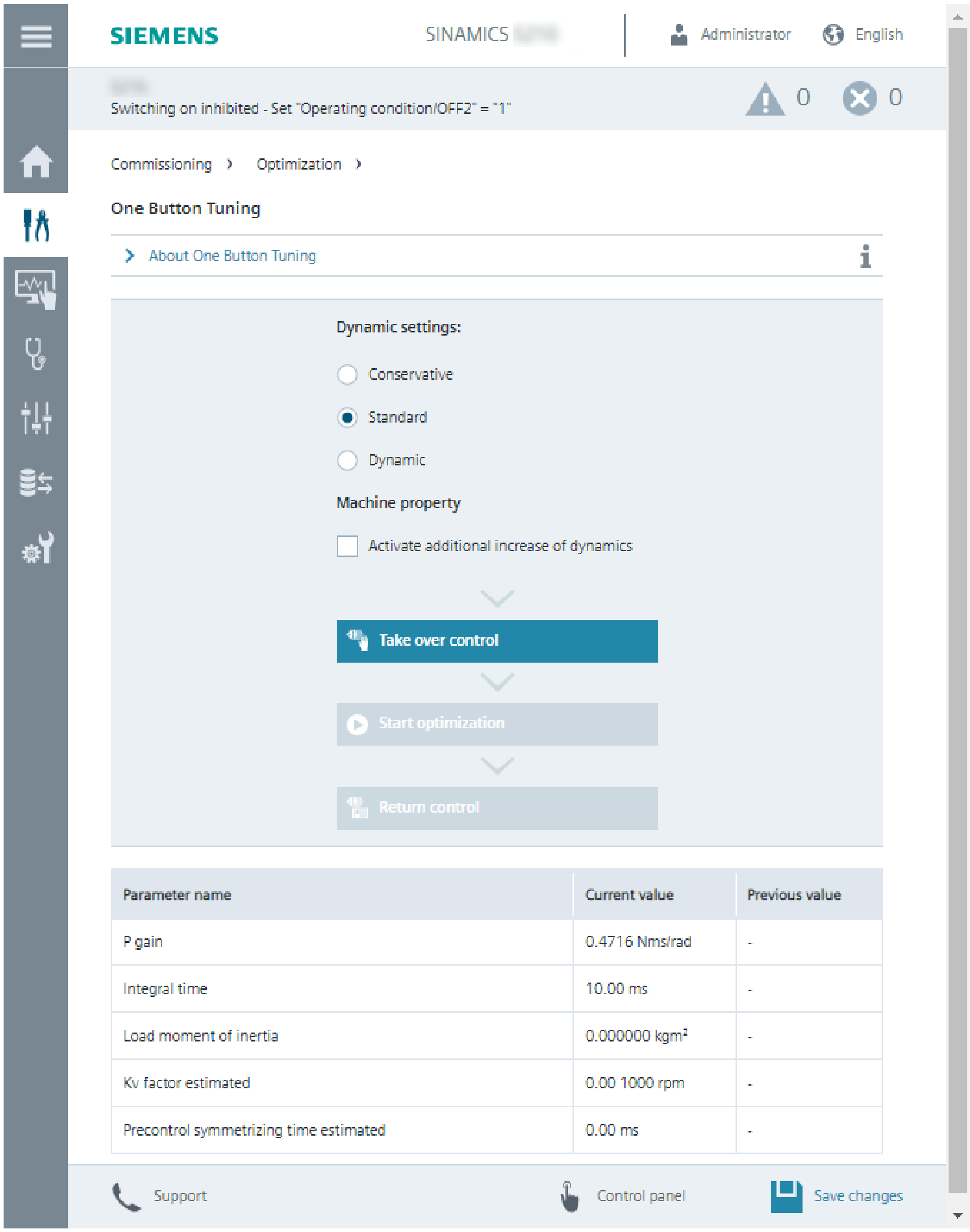


Figure 6-6 One Button Tuning

The optimum controller settings are determined using the following settings:

- Take over control and relinquish control:
  Take over master control before starting to optimize the controller.
  Relinquish master control back to the converter once the controller has been optimized.
- Select dynamic response settings:
  - Dynamic
    100% dynamic response; speed control with fast torque precontrol
  - Conservative
    60% dynamic response; speed control without torque precontrol
  - Standard
    80% dynamic response; speed control with torque precontrol
- Machine property:
  The "Activate additional increase of dynamics" option increases the proportional gain of the optimized speed control. The dynamic response is increased. The speed controller becomes faster.
  If the dynamic factor is increased too much, the speed controller may become unstable.
- Start optimization:
  - Enter the angle of rotation (rotation limit) through which the motor and the connected machine are permitted to turn for the required measurements (e.g. 360°) without the mechanical system being damaged. Sensible controller parameters are obtained from an angle > 90°.
    When a negative angle is entered, then the motor moves in the opposite direction.
  - The table shows how the settings have been changed by OBT.

If OBT was not successful, repeat the optimization with other settings.

6.5.1.4 Testing the converter configuration

Overview

After commissioning, the web server allows you to test the converter configuration set up in jog mode or continuous motion via the control panel.

Description

To test the configuration, the control panel must be open and the speed setpoint entered.

There are 2 ways of opening the control panel:

- Button "Finish quick setup" > Dialog query with selection option "Open control panel"
- Action bar > "Control panel"

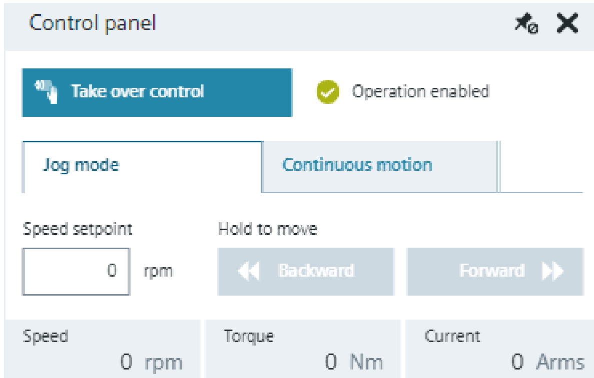


Figure 6-7 Testing the converter configuration via the control panel

More information

You can find more information in Chapter "Control panel (Page 205)".

6.5.1.5 Safety Integrated commissioning

Overview

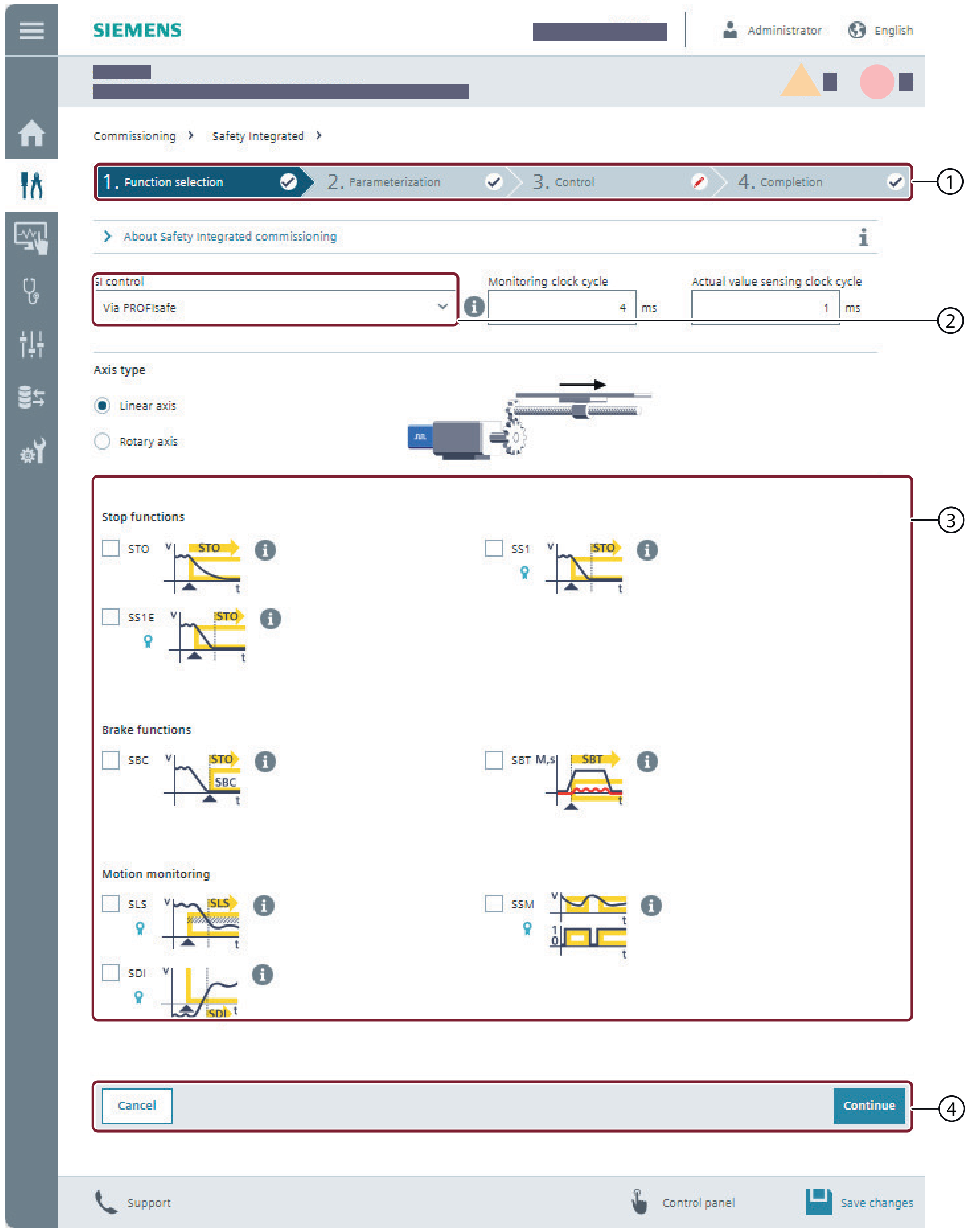
Commissioning the Safety Integrated Functions of the converter includes the following:

- Selecting the functions
- Parameterizing the functions as required for the application
- Control of the functions

Requirement

- The drive system has been configured. The components are wired.
- The converter and motor are completely created in the device configuration.
- Web server access is active.
  Commissioning using the web server is only possible if access to the web server via interfaces X127 and X150 was selected in the security settings.
- The appropriate license is available for Safety Integrated Functions requiring a license.
- Function rights have been assigned with the role "Drive Safety Engineer".
- Safety commissioning with the web server is not possible if one of the following functions has already been configured via Startdrive: SS2, SS2E, SOS, SLA, SIC, SCC.

Function description



① Step display of the Safety Integrated commissioning Wizards
② Control type
③ Function selection
④ Navigation

Figure 6-8 Safety Integrated commissioning using the web server (example)

Changes to Safety Integrated settings are only possible in the "Safety Integrated commissioning" mode. The drive is in the safe state as soon as the commissioning mode is active. Safe Torque Off (STO) is active.

Commissioning of Safety Integrated must be completely run through. No settings are applied if an interruption occurs during commissioning.

The activated user management protects against unauthorized changes to Safety Integrated settings. Logon takes place when the web server starts. After this, only authorized users have the necessary rights to change Safety Integrated settings. The "Safety Integrated application" right is a component of the "Drive Safety Engineer" role.

When starting Safety Integrated commissioning, the converter creates a restore point. The converter saves the changes after every commissioning step. The converter is reset to the restore point if quick setup is canceled.

For fast navigation through Safety Integrated commissioning, for example to check the settings, the web server has a read mode.

Safety Integrated commissioning involves the following steps:

1. Function selection
   - Selecting the Safety Integrated control type
   - Monitoring cycle: Value is set to 4 ms in the factory and cannot be changed.
   - Actual value acquisition cycle: Value is set to 1 ms in the factory and cannot be changed.
   - Selecting the axis type
     When switching over the axis type, the units are also changed.
   - Selecting the available Safety Integrated Functions depending on the control type
   - License symbol
     The license symbol shows the Safety Integrated Functions that require a Safety Extended license. Safety Integrated can be used in the Trial License mode for test purposes.
2. Parameterization
   Configuration of the activated Safety Integrated Functions
   - Function-dependent display of the converter parameters
     The function view shows a graphic of the function. The parameters of the function are listed in the context-sensitive table.
     The parameter values can be changed. When required, additional parameters are displayed.
   - Actual value acquisition/mechanical system
     The actual value acquisition/mechanical system can be viewed if Safety Integrated motion monitoring functions were activated.
     The parameter values can be changed.
3. Control
   Parameterizing the control type
4. Completion
   The configurations are completed and applied by clicking on "Finish":
   - The subsequent parameterizations are made
   - Checksums are calculated

More information

You will find detailed information in Chapter "Safety Integrated (Page 362)".

6.5.2 Operator control and monitoring

6.5.2.1 Drive status

Overview

Function view "Drive status" shows the current status of the converter.

Description of function

Product-specific information and settings are covered over in the diagram.

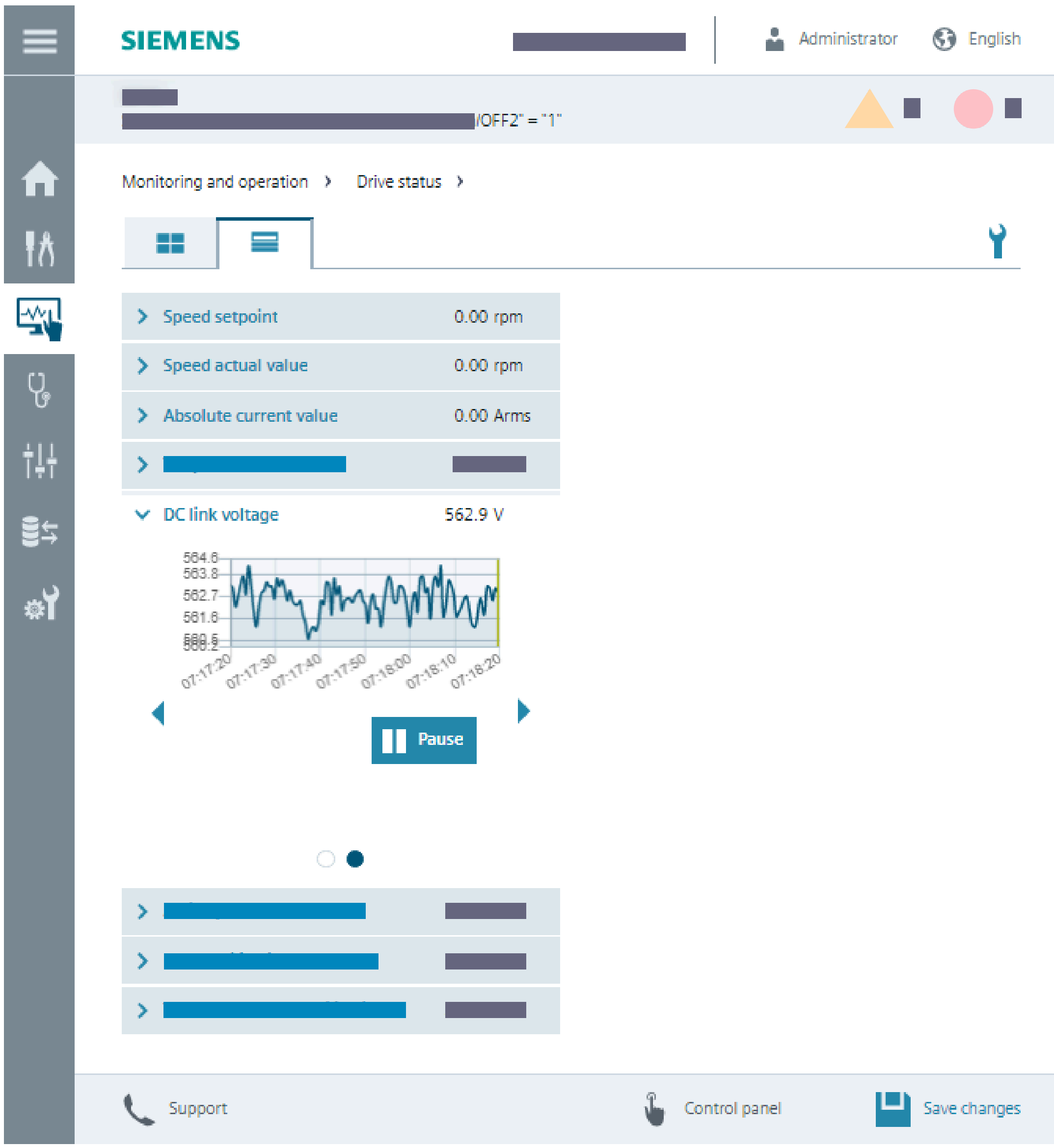


Figure 6-9 Drive status

The drive information displayed is preset in the factory setting, and when required, can be adapted using symbol . If user management is active, the "Edit web server configuration" right is required in order to make changes.

Values are indicated as follows:

- Factory setting: 8 values are displayed
- It is possible to display all values completely

The drive status is displayed as follows:

- : Individual values are continuously displayed
- : Individual values and trend diagrams are continuously displayed

6.5.2.2 Inputs/outputs

Overview

The function view "Inputs/outputs" shows the status of the digital inputs offered by the converter.

Description of function

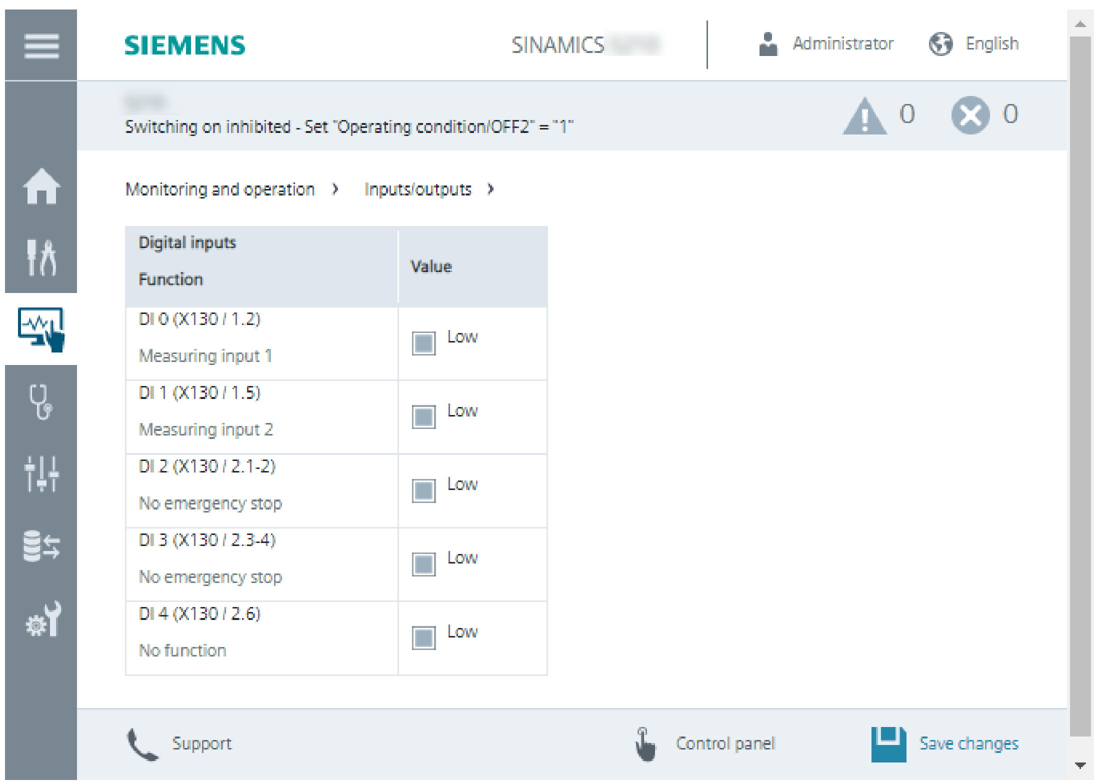


Figure 6-10 Inputs/outputs

6.5.3 Diagnostics

6.5.3.1 Messages

Overview

Function view "Messages" shows active and historical messages.

Description of function

Product-specific information and settings are covered over in the diagram.

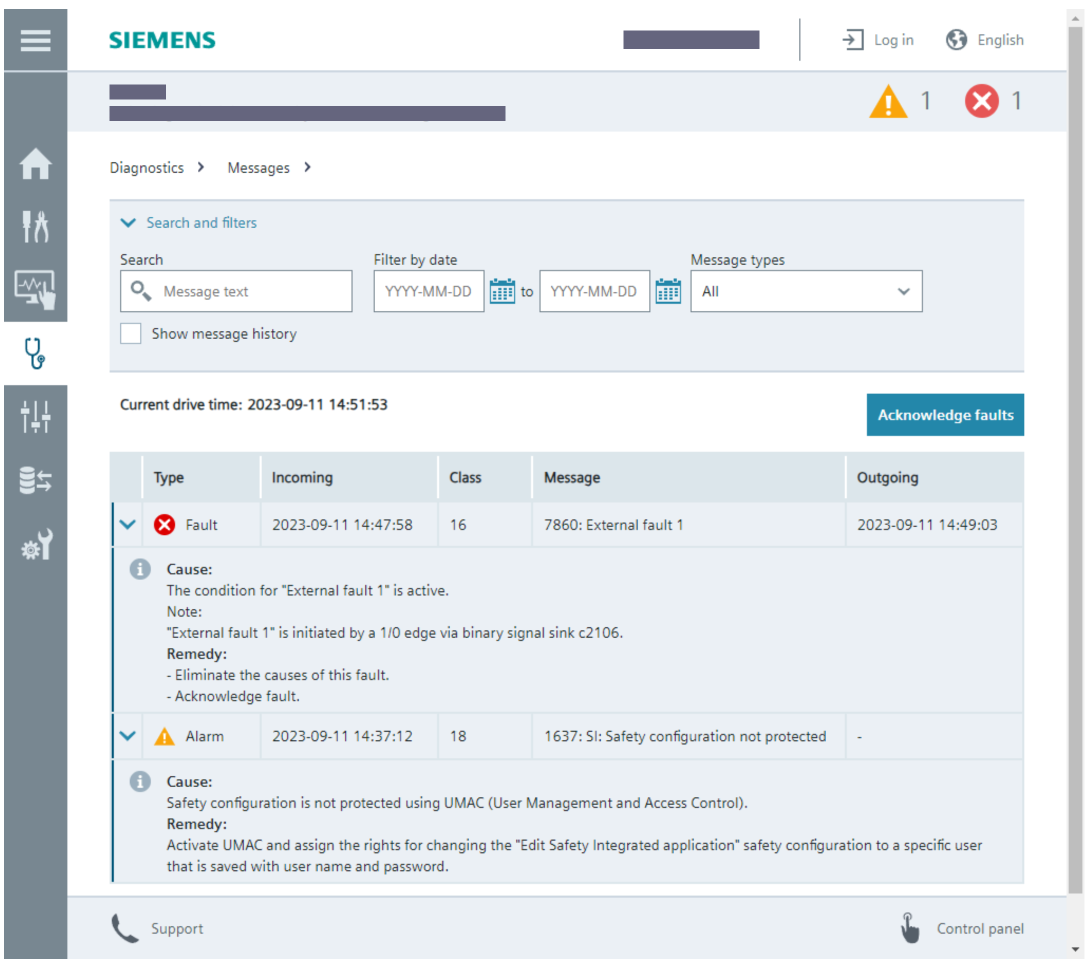


Figure 6-11 Messages

Using search and filter options, the number of alarms and faults can be restricted.

The message history can optionally be viewed.

Selecting messages

Search	Enter a keyword
Filter by date	Select a date or time interval
Message types	Select the message type that should be displayed: • All • Faults • Alarms

Displaying messages

Type	Displaying the message type: • Alarm • Fault
Incoming	Time that the message was received
Class	Assign the message to a message class according to PROFIdrive The message number is output on all operating units, e.g. PC or SIMATIC HMI.
Message	Specification of the message number with message text
Gone	Time when the message went • Faults are given the status "Outgoing" if the following are true: – The causes have been eliminated. – The message has been acknowledged.
›	Selection for more information: • Description of the message with cause and remedy

6.5.3.2 Diagnostics buffer

Overview

Function view "Diagnostic buffer" provides information about all system-relevant operations, e.g. commissioning, new ramp-up, generation of a certificate.

Description of function

Product-specific information and settings are covered over in the diagram.

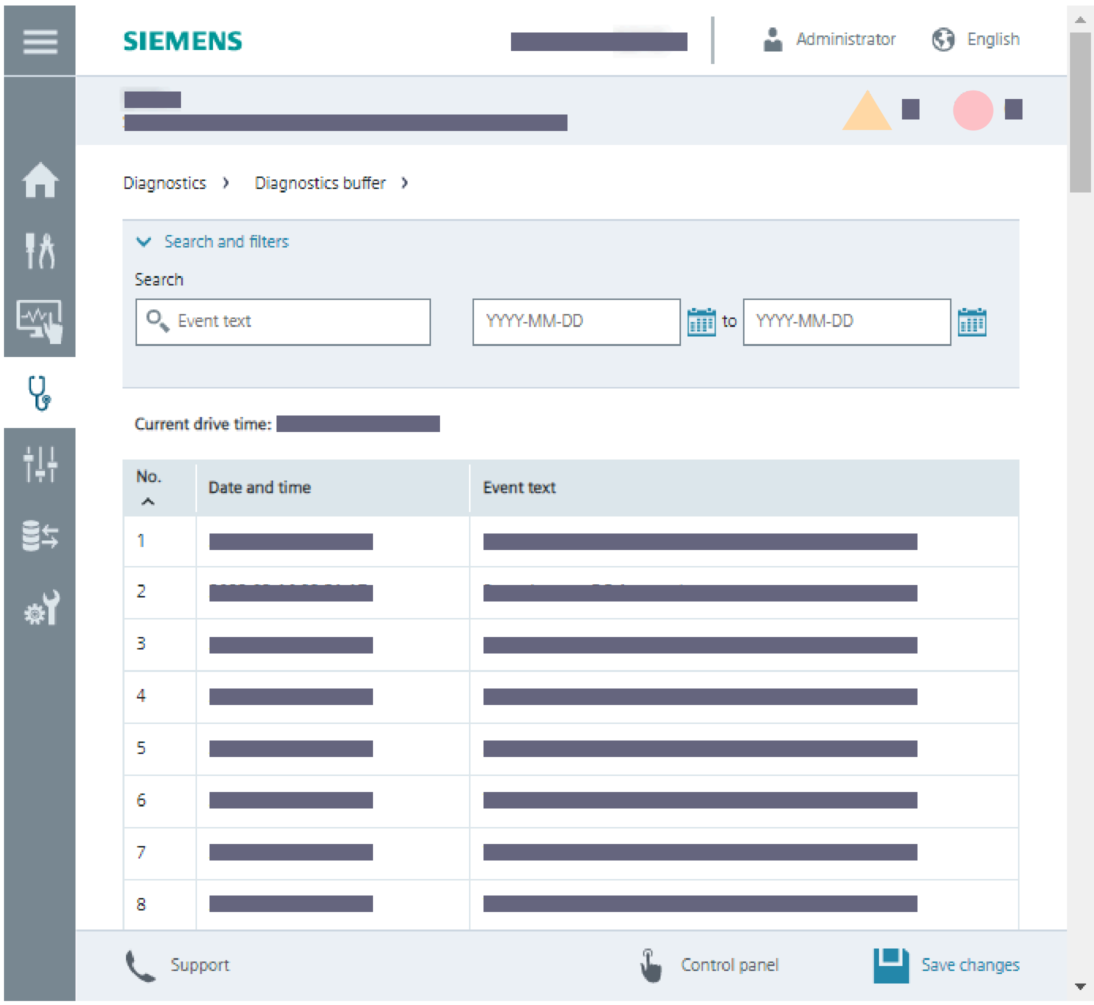


Figure 6-12 Diagnostic buffer

Reading out the diagnostic buffer facilitates converter diagnostics and supports fault analysis.

The search can be limited by searching for keywords and using the filter function according to date.

The diagnostic buffer can only be cleared by performing a manual reset to factory settings with a memory card. For more information, refer to the Chapter "Restoring the converter to factory settings (Page 502)".

The diagnostic buffer is kept when restoring factory settings via menu "Backup and restore".

6.5.3.3 Safety Integrated

Overview

The "Safety Integrated" function status provides information about the Safety Integrated Functions that have been enabled.

Description of function

Product-specific information and settings are covered over in the diagram.

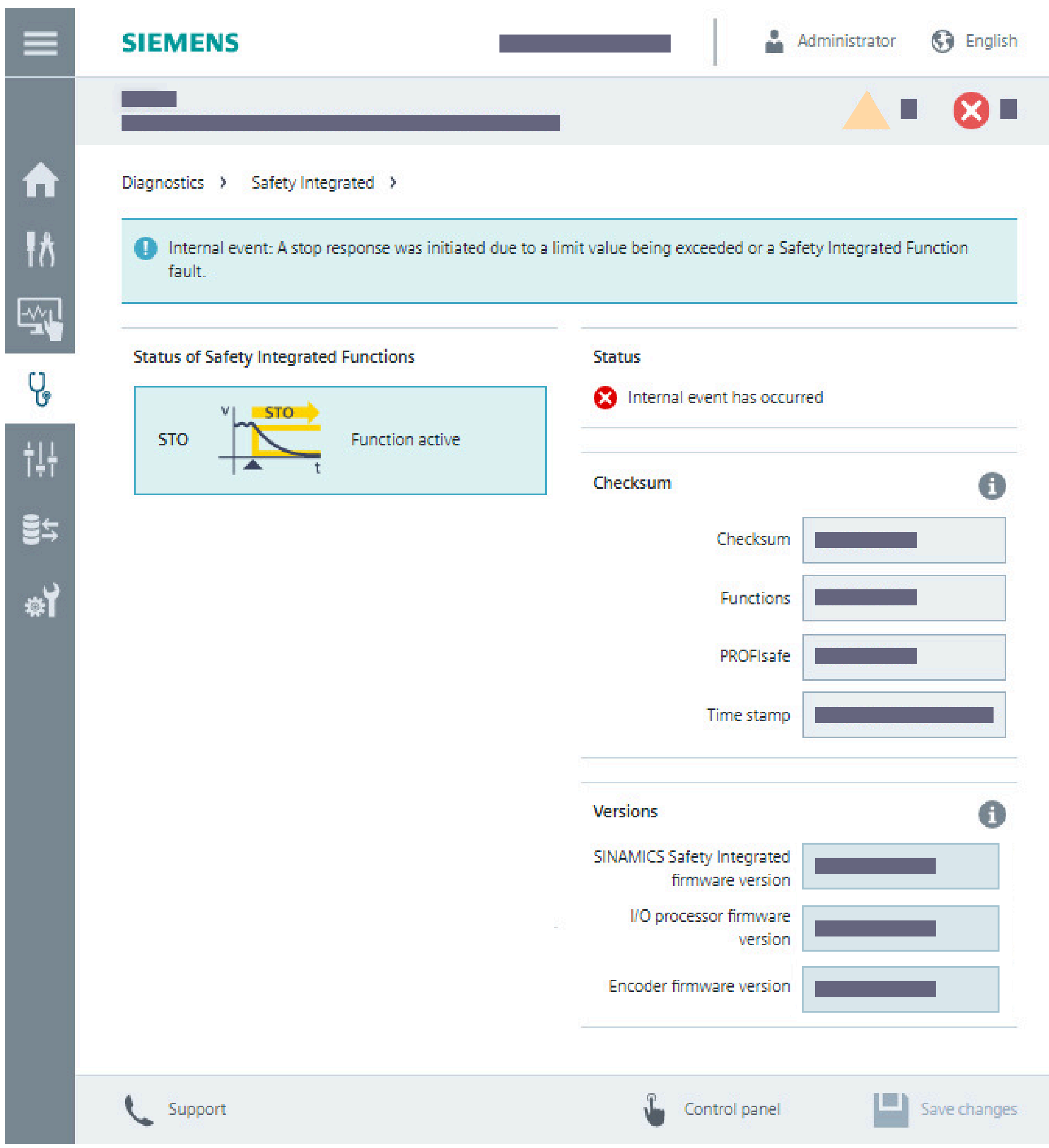


Figure 6-13 Safety Integrated

The following content is displayed:

- "Status of Safety Integrated Functions"
  The status of the enabled Safety Integrated Functions is displayed.
- "Status"
  Displays the internal events (limit violations, system errors)
- "Checksums"
  - "Checksum"
    Displays the functional checksum of the converter to track changes (safety logbook)
  - "Functions"
    Displays the checksum over the checksum-checked parameters to configure the converter
  - "PROFIsafe"
    Displays the checksum of the PROFIsafe parameterization
  - "Time stamp"
    The time stamp indicates when the update was made.
- "Versions"
  Displays the safety-relevant software versions of the corresponding components

6.5.3.4 Connection overview

Overview

Function view "Connection overview" provides information about the connections in the drive system.

Description of function

Product-specific information and settings are covered over in the diagram.

Figure 6-14 Connection overview

The individual components with IP address and additional details are graphically displayed in the connection overview.

6.5.3.5 Communication

Overview

The "Communication" function view provides information about the activated fieldbus protocol.

Description of function

Product-specific information and settings are covered over in the diagram.

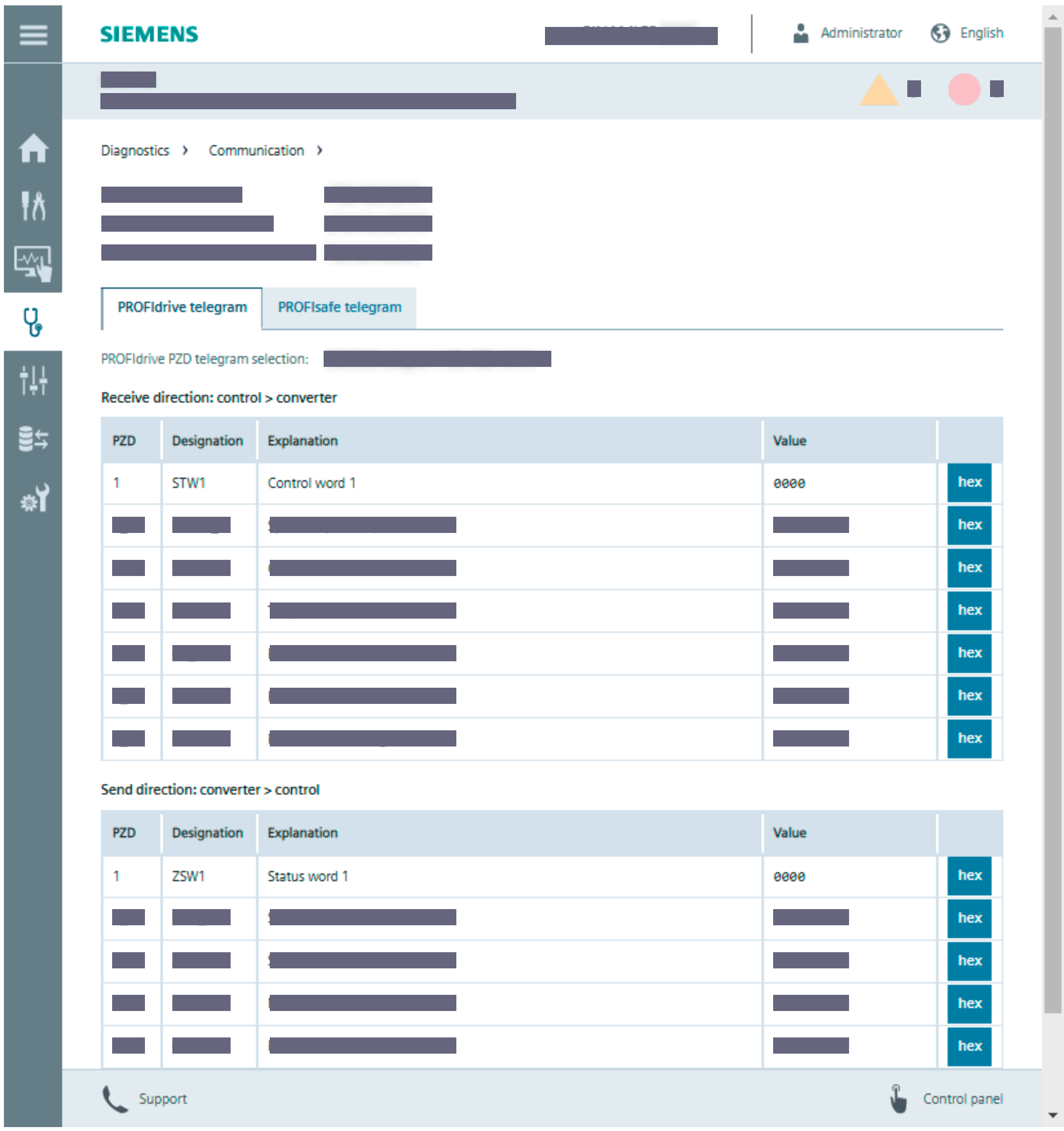


Figure 6-15 Communication

Depending on the chosen fieldbus, the following telegrams are displayed:

- PROFINET
  - PROFIdrive telegrams
  - PROFIsafe telegrams
- EtherNet/IP
  - PROFIdrive telegrams

The telegrams have the following contents:

- PROFIdrive telegram: Process data of the set telegram in the send and receive directions PROFIdrive telegrams are selected by users with corresponding function rights during converter commissioning as part of advanced setup.
- PROFIsafe telegram: Process data of the set telegram in the send and receive directions. PROFIsafe telegrams are selected by users with corresponding function rights during Safety Integrated commissioning.

The telegrams are displayed in hex format. The display of individual values is switched between binary, decimal and hex format by clicking on the button to the right of the value.

6.5.3.6 Status word and control word

Overview

The function view "Control/status word" provides information about the current status of the sequence control system.

Description of function

Product-specific information and settings are covered over in the diagram.

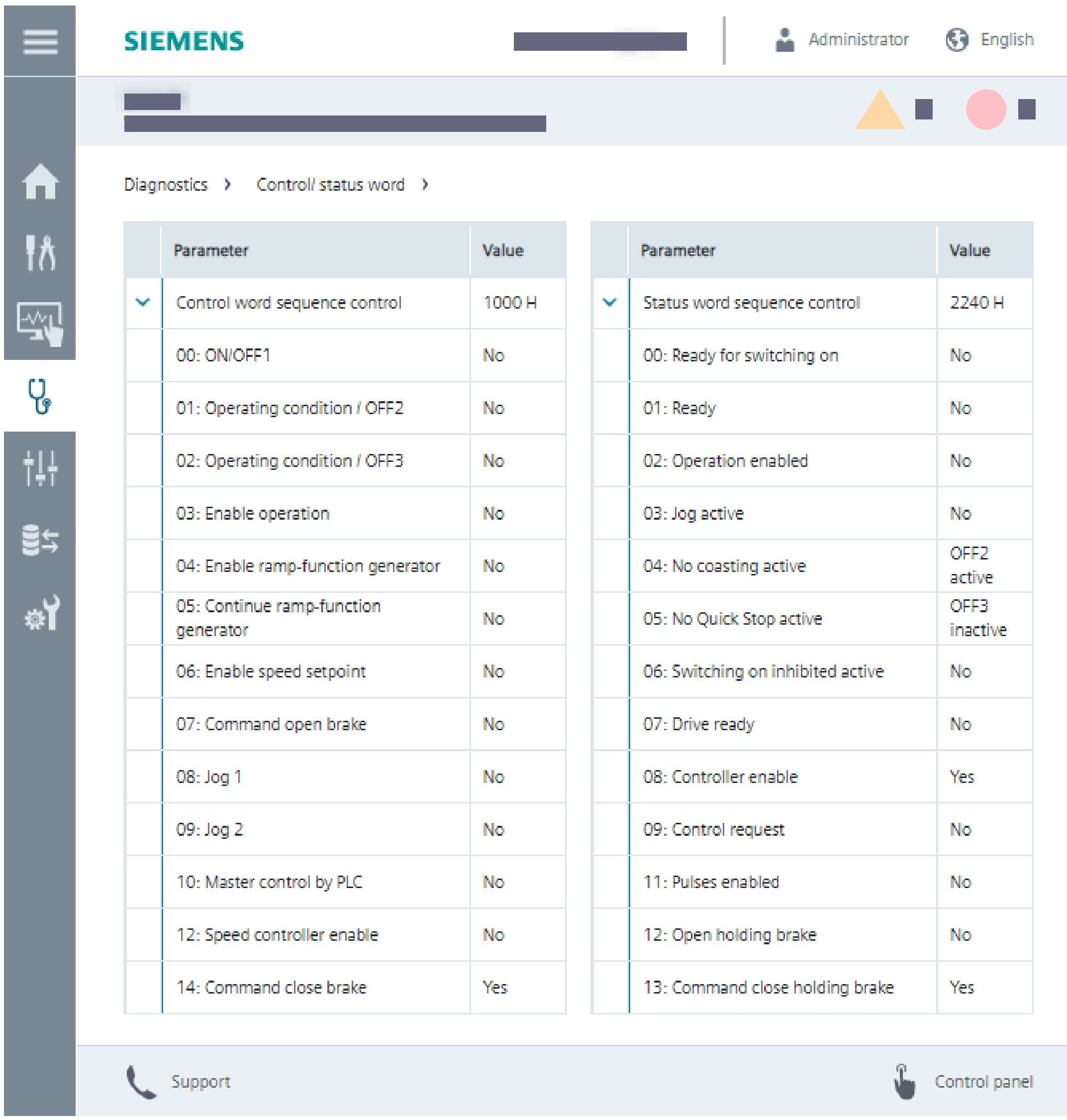


Figure 6-16 Control and status word

The control and status word is indicated by all sequence control states. This also includes states that are not available, which prevent the motor from being switched on and switched off. Diagnostics supports fault analysis.

6.5.4 Parameters

6.5.4.1 Parameter list

Overview

The "Parameter list" function view contains the converter parameters and enables the targeted modification of specific parameter values.

Description of function

Product-specific information and settings are covered over in the diagram.

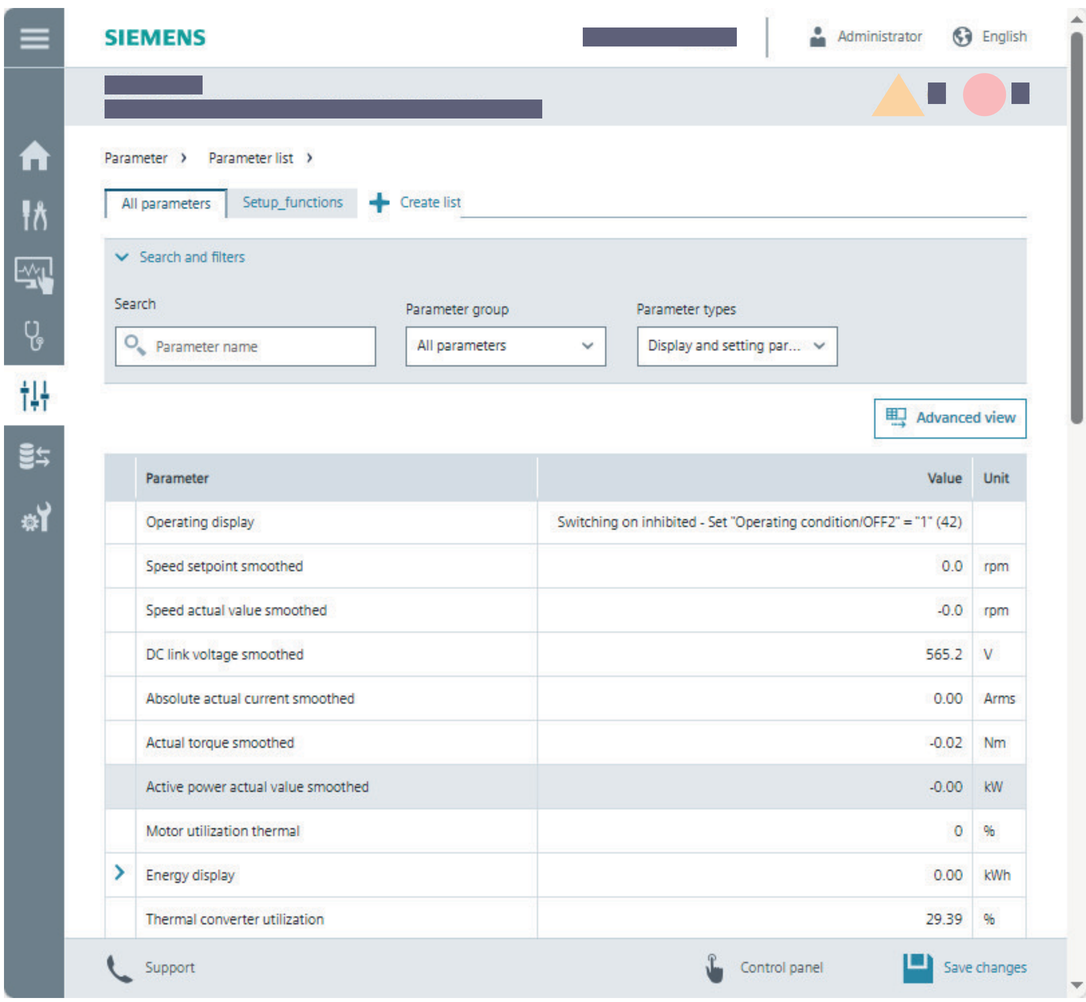


Figure 6-17 Parameter list in the extended view

The function view shows the following:

- Parameter list
  Depending on the setting in the "System" menu > Settings, the parameter list shows either all parameters or just the standard parameters.
- User-defined parameter list (optional)
  - The user-defined parameter list contains selected parameters and is created using the "+ Create list" tab.
  - "Setup_functions" parameter list
    The "Setup_functions" parameter list is intended for parameters that can only be configured with the converter in commissioning mode. It is not currently possible to access these parameters from the advanced setup menu. Suggestions are contained in the factory setting.
    Additional parameters can be added to the parameter list. This allows uniform access to the parameters of a drive function, for example.
    Starting the advanced setup automatically activates commissioning mode.
    So that the user-defined parameter list can be used during advanced setup, it is created and managed with the name "Setup_functions".

  You can find more information in chapter "User-defined parameter list (Page 193)".

The parameter list offers the following options:

- Toggling between two list views
  - Show as "Simple view" and "Advanced view" with parameter numbers
- Searching parameters
  - Search by parameter number or text search within parameter names
- Filtering the parameter list
  - Parameter groups: Only show the parameters that are assigned to a particular function.
  - Parameter types: display and/or adjustable parameters
- Changing parameter values directly in a parameter list
  - Exception: blocked parameters

p	Adjustable parameters	Are read/write.
		The adjustable parameter can only be parameterized in the active commissioning mode. Depending on the parameter, changes are possible in the quick setup or Safety Integrated commissioning.
		The adjustable parameter can only be parameterized when the user has the appropriate function rights.
r	Display parameters	Can only be read and cannot be edited.
c	Display parameters	Can only be read and cannot be edited.

6.5.4.2 User-defined parameter list

Overview

A user-defined parameter list is a combination of specific parameters from the standard parameter list of the converter. These can be used to configure frequently used user functions, for example.

Description of function

With the user-defined parameter lists, the web server provides the following functions:

- Creating up to 20 user-defined parameter lists
- Configuring list properties
  - Name
  - Position or sequence of the tabs
  - Comment
  - Delete list
- Exporting and importing user-defined parameter lists
  Export:
  - Export one or several user-defined parameter lists.
  - The web server exports the lists exclusively as a json file.
  - Export files generated by the web server can be imported into a Startdrive project.

  Import:
  - The list import function in the web server exclusively imports json files.
  - User-defined parameter lists exported via the web server or Startdrive as a json file can be imported into another drive of the same type via the web server.
    Requirement: same drive type and same firmware version

6.5.5 Backup and restore

Overview

In the "Backup and restore" function view, you can back up parameters and other settings and restore the settings again if necessary.

Description of function

Product-specific information and settings are covered over in the diagram.

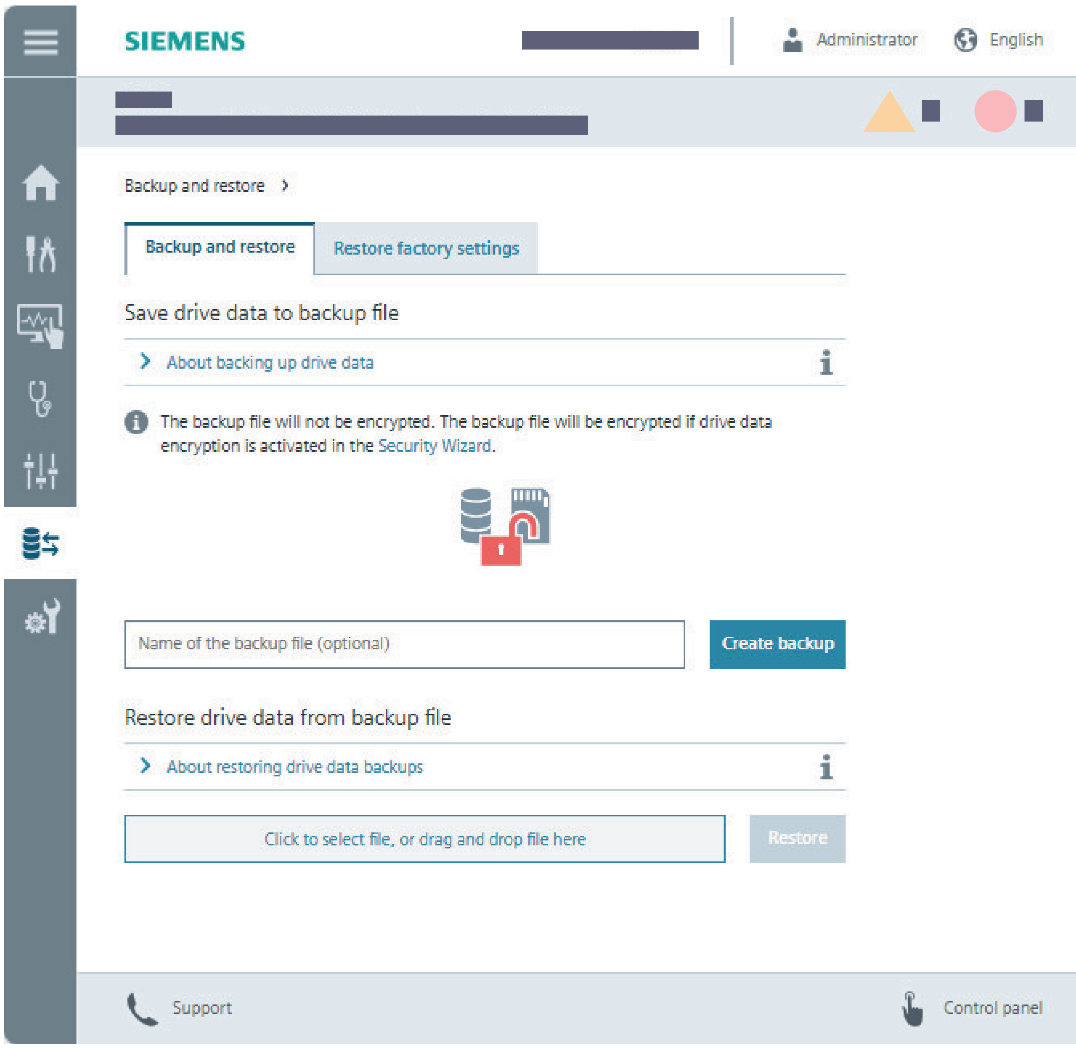


Figure 6-18 Backup and restore

The following functions are available:

Backup and restore

- Save drive data to backup file
  You back up the settings to a file after commissioning.
  The drive data are encrypted in the backup file if function "Drive data encryption" is activated in the Security Wizard.
- Restore drive data from backup file
  When replacing a device or for series commissioning, you load the backed-up settings to the converter.

Restore factory settings

- Restore factory settings
  The user-specific parameterization of the converter is deleted.
- Restore Safety Integrated to factory settings
  You only restore the settings of the Safety Integrated Functions to factory settings. All other settings remain unchanged.

More information

If you want to restore the converter to factory settings with the memory card, see the information in chapter "Full reset of all device settings (Page 503)".

6.5.6 System

6.5.6.1 Settings

Overview

The function view "Settings" offers basic settings for the web server and the converter.

Requirement

- To edit the web server settings you will need the "Edit web server configuration" right.
- To edit the drive settings you will need the "Edit device configuration or drive applications" right.

Description of function

Product-specific information and settings are covered over in the diagram.

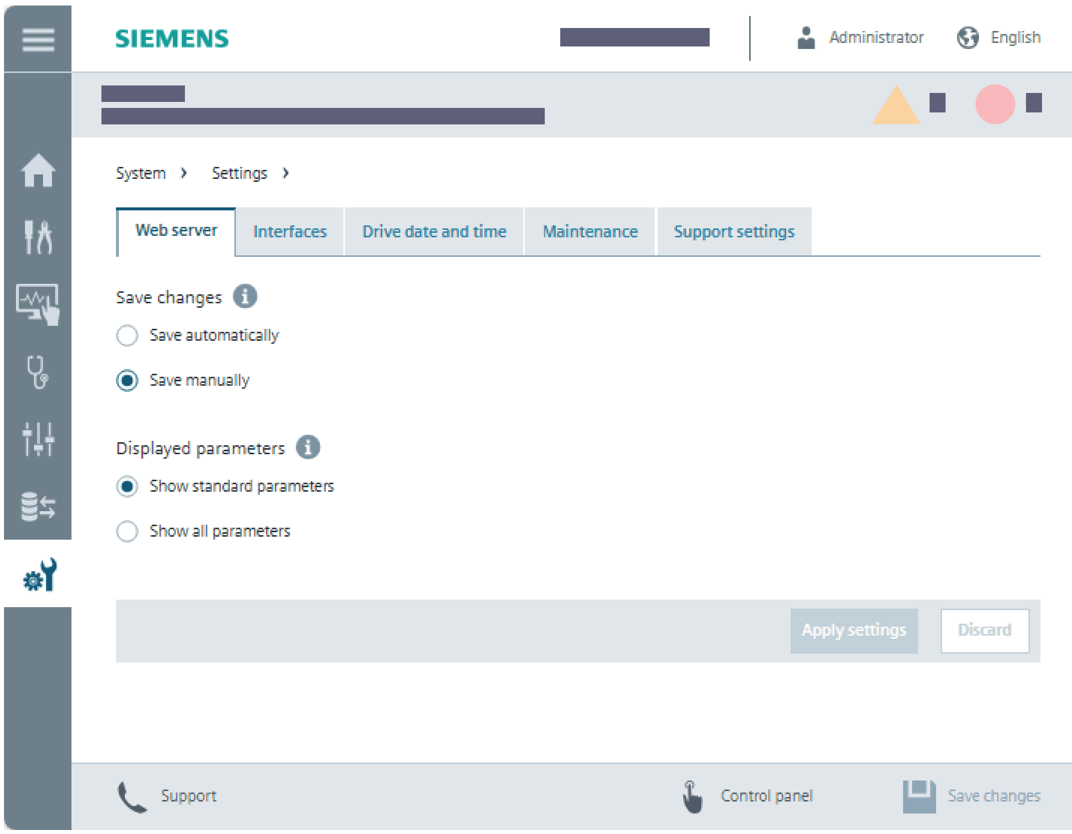


Figure 6-19 Settings

Web server

The web server offers options for saving changes and displaying parameters.

Interfaces

The web server provides information about the status and the settings of the interfaces of the converter:

- The settings of service interface X127 are configurable.
- The interface settings for the X150 fieldbus interface are displayed. Changes can only be made in advanced setup.

Drive date and time

The web server provides options for setting the date format and for obtaining the date, time and time zone of the converter.

Maintenance

The web server displays the wear of the converter fan.

Support settings

The web server provides the option to store additional support and hotline data. The web server displays these data in the function view "Support".

6.5.6.2 User management

Overview

In the "User management" function view, you manage users and configure their roles and rights for accessing the converter.

Requirement

- You activated user management (UMAC) in "Configure security settings".
- You are logged into the web server and have the necessary rights to manage users.

Description of function

Product-specific information and settings are covered over in the diagram.

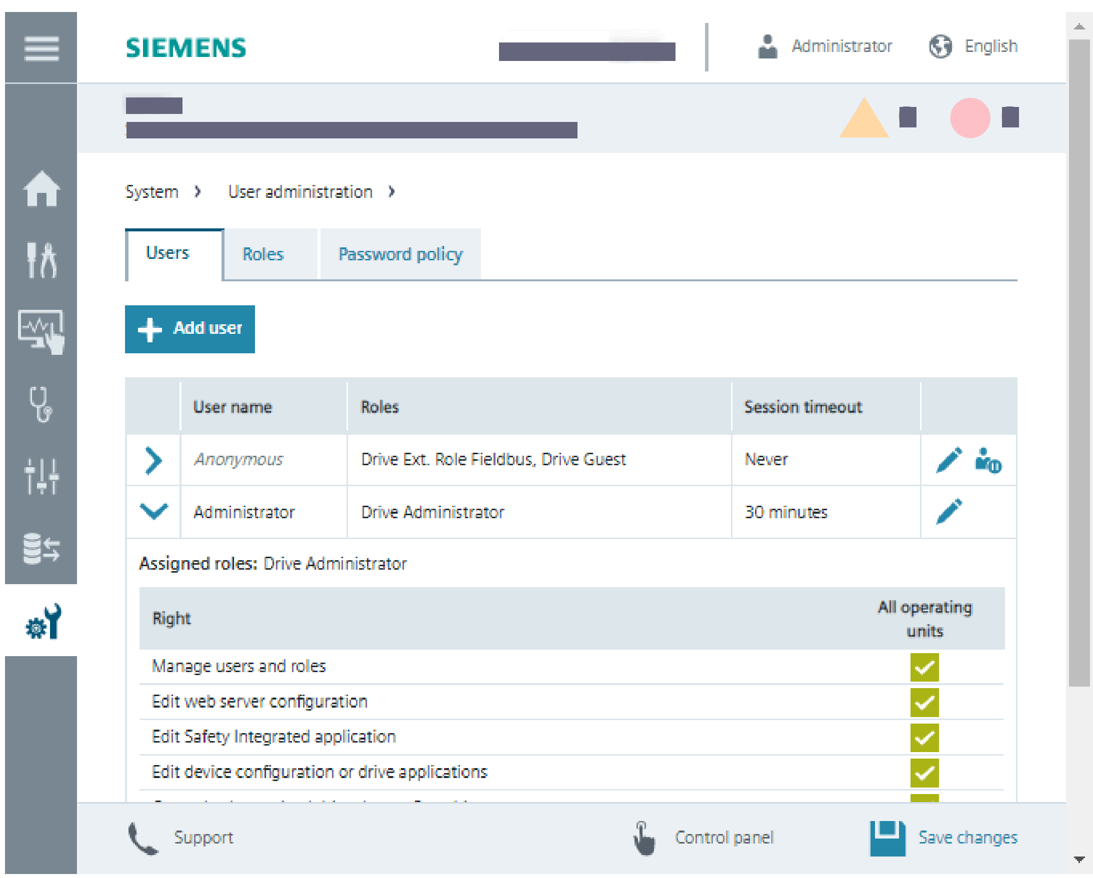


Figure 6-20 User management

Users

Under "Users", the web server provides a summary of the created users and offers the following functions:

- Create new user accounts
- Change existing user accounts
- Activate or deactivate user accounts

Roles are assigned to give users read or write access to certain functions.

Roles

Under "Roles", the web server provides a summary of the existing roles and the assigned rights.

Password policy

Under "Password policy", you specify the requirements a password must meet. You define the password complexity and the time to password expiry (if any).

More information

More information about user management and the settings can be found on the Internet:

Industrial Cybersecurity Configuration Manual (https://support.industry.siemens.com/cs/ww/en/view/109810578)

6.5.6.3 Protection & Security

Overview

In the "Protection & Security" function view, you configure basic security settings using the Security Wizard.

Requirement

- You are logged into the web server.
- If you have activated UMAC, then you have the rights to edit drive data.

Description of function

Product-specific information and settings are covered over in the diagram.

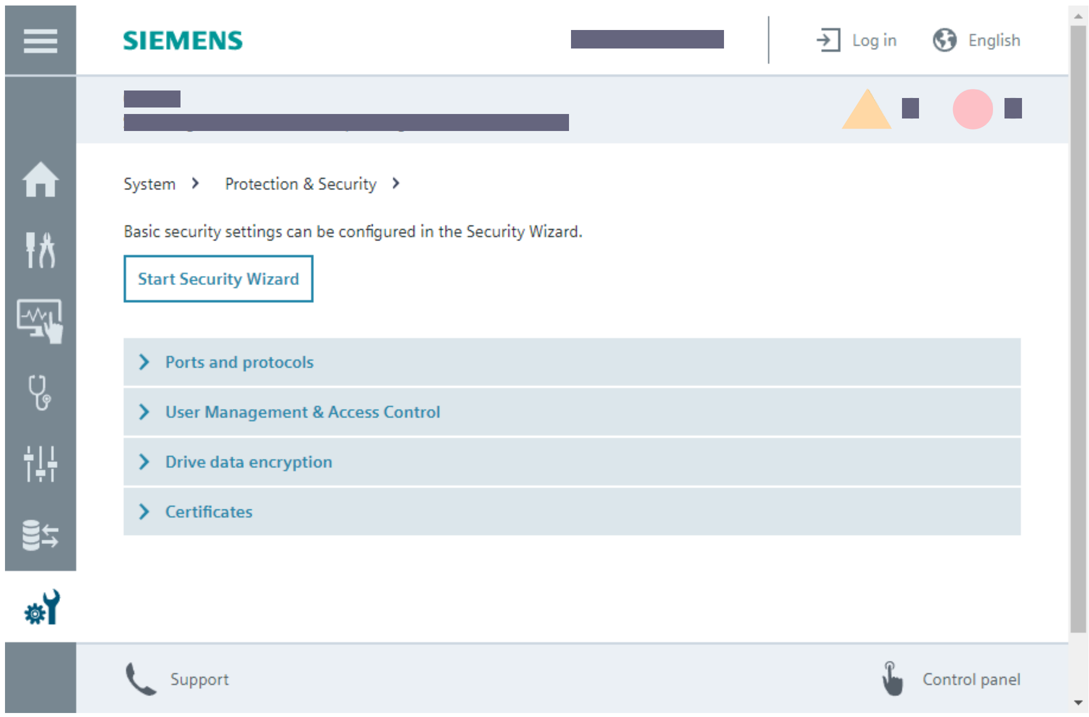


Figure 6-21 Protection & Security

Start Security Wizard

The Security Wizard guides you through the converter security settings. They include User Management & Access Control and web server activation.

Ports and protocols

The web server provides an overview of the available ports and protocols and their status.

User Management & Access Control

The web server provides an overview of the settings in user management.

Drive data encryption

The web server displays whether the converter encrypts sensitive drive data.

Certificates

The web server provides an overview of the issued certificates. The certificates are required for secure communications via HTTPS.

More information

More information on configuring secure communications can be found in the Internet:

Industrial Cybersecurity Configuration Manual (https://support.industry.siemens.com/cs/ww/en/view/109810578)

6.5.6.4 Licenses

Overview

You must purchase licenses for supplementary functions and options.

Use the function view "Licenses" to manage the licenses for drive functions and options.

Requirement

- You are logged into the web server and have the necessary rights to edit drive data.
- The operating panel is connected online with the drive.

Description of function

Product-specific information and settings are covered over in the diagram.

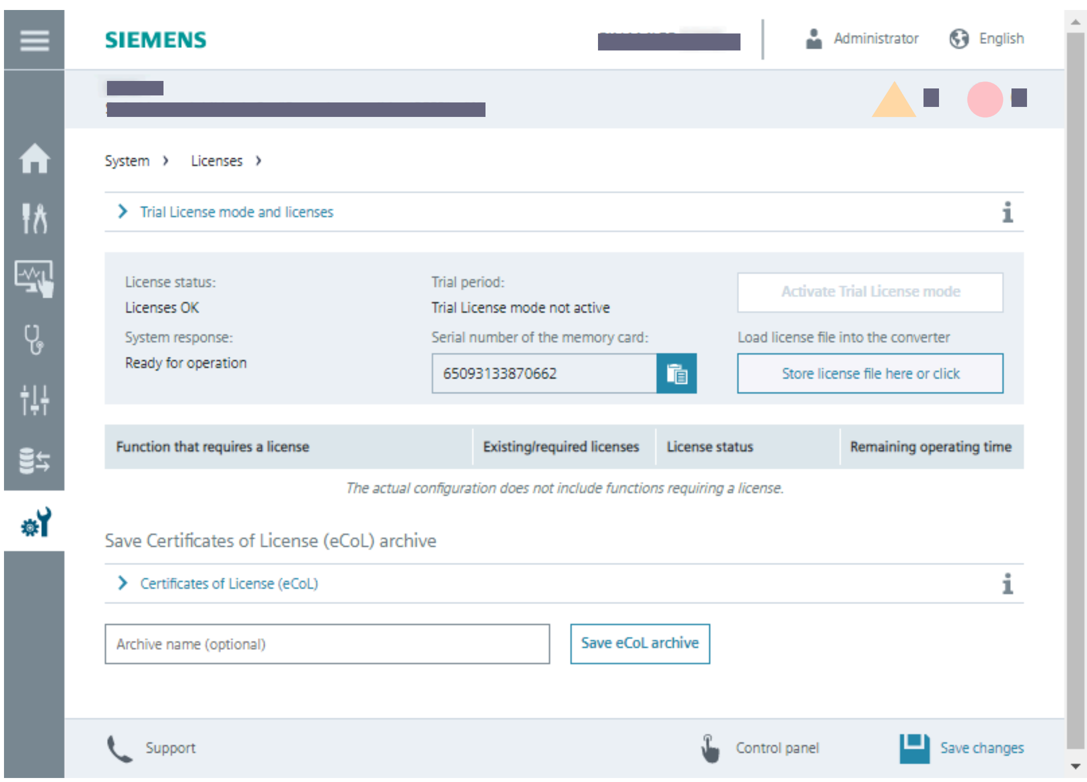


Figure 6-22 Licenses

The function view "Licenses" offers the following functions:

- Display the installed functions requiring licenses
- Read and copy the serial number of the SD card inserted into the converter
- Load and activate purchased licenses

Load and activate licenses

Under "Trial License mode and licenses", you upload license files created with the Web License Manager.

In Trial License mode, you can try out functions for a specified period.

Using functions/options requiring a license

The web server provides an overview of the options that require licensing and their license status.

Certificates of License (eCoL)

Under "Certificates of License (eCoL)", you transfer a license from the memory card into the file system of the operating unit.

More information

- You can find more information about creating and managing license files in Chapter "Functions that require licensing (Page 103)".
- More information about the licensing process or on the Trial License mode is provided in the TIA Portal information system. There, search for the key term "Managing supplementary functions that require a license".

6.5.6.5 Firmware update

Overview

You can perform a firmware update in the web server:

- For an upgrade, the converter settings are retained.
- For a downgrade, the converter is restored to factory settings.

Requirement

You have saved the ZIP file with the firmware to a drive, which you can access using the operating panel.

Description of function

This function view "Firmware update" displays the current version of the firmware and of the web server.

To copy a different firmware version to the converter, load the ZIP file containing the firmware from the file system of the operating panel.

6.5.6.6 About web server

Overview

The "About web server" function view contains information about the web server and links to more information.

Description of function

Under "Versions" you can see the revision levels of the web server and the loaded firmware.

Under "Third-party software" there is a link to information about any third-party software used. The license conditions are loaded to the operating panel in the file "READ_OSS.ZIP". You can display the HTML file included in the ZIP file using your browser.

There are more links to information about:

- Cookie policies
- Industrial Cybersecurity
- Privacy policy

6.5.7 Support

6.5.7.1 Support

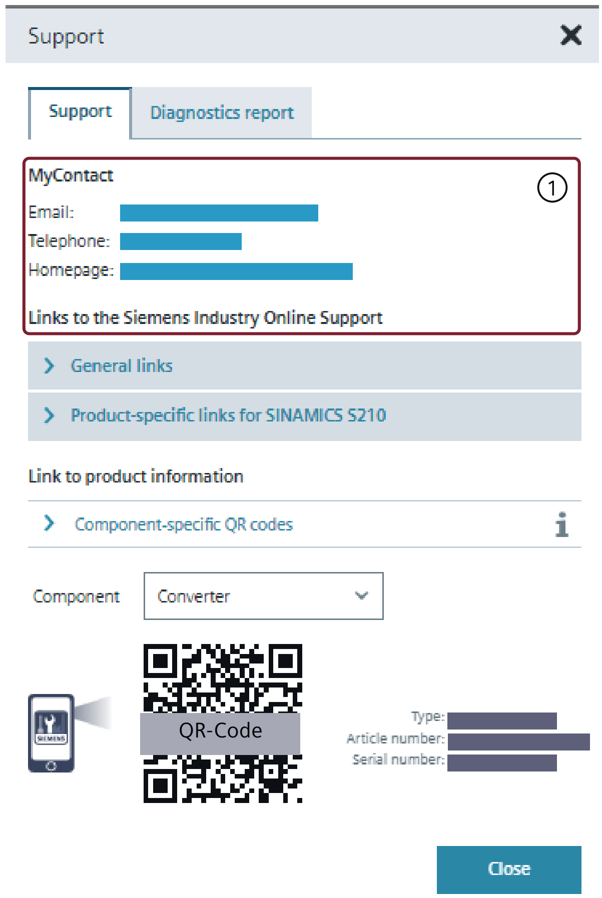
Overview

The action bar of the web server contains a support dialog

Description of function

The support dialog contains links to additional information for the converter.

Product-specific information and settings are covered over in the diagram.



① Display of additional support and hotline data
For more information about configuration, see Chapter "Settings (Page 195)".

Figure 6-23 Support information

6.5.7.2 Diagnostics report

Overview

The action bar of the web server contains a diagnostics report.

Function description

The diagnostics report helps technical support by providing basic information on the current state of the converter, for example, in the event of a fault.

The diagnostics report always contains the drive, motor, and encoder data and optionally an overview with errors and messages that have occurred. The time stamps at the top of the report correspond to the local time at the operating panel with technical support and the local time at the converter.

The diagnostics report is provided for downloading and sending as a ZIP file in the Downloads folder of the operating unit used.

If you select the "Write email to" check box, an email with standard text is additionally generated. The email must be updated with the relevant letter text and the diagnostics report as an attachment and sent to the recipient. This function is only available on operating units that support an email application. An Internet connection is required to send emails.

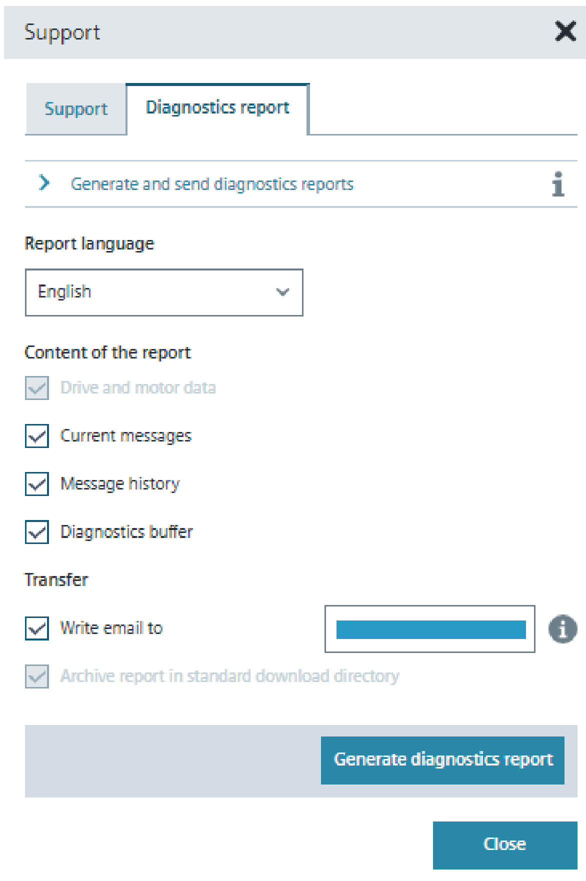
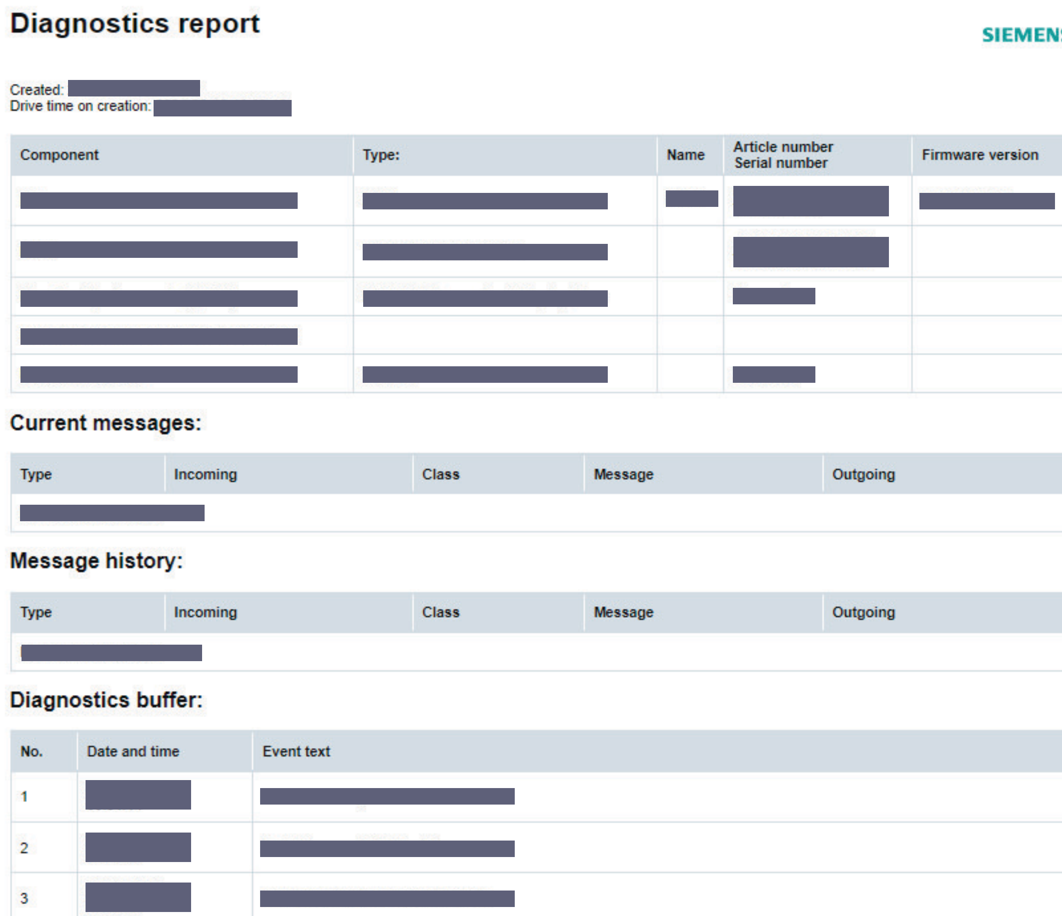


Figure 6-24 Diagnostics information

For more information about configuration, see Chapter "Settings (Page 195)".

The following diagram shows a printout of a diagnostics report.



Diagnostics report

SIEMENS

Created: [redacted]
Drive time on creation: [redacted]

Component	Type:	Name	Article number Serial number	Firmware version
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]		[redacted]	
[redacted]	[redacted]		[redacted]	
[redacted]				
[redacted]	[redacted]		[redacted]	

Current messages:

Type	Incoming	Class	Message	Outgoing
[redacted]				

Message history:

Type	Incoming	Class	Message	Outgoing
[redacted]				

Diagnostics buffer:

No.	Date and time	Event text
1	[redacted]	[redacted]
2	[redacted]	[redacted]
3	[redacted]	[redacted]

Figure 6-25 Diagnostics report printout

6.5.8 Control panel

Overview

The control panel moves the motor using the operating unit, bypassing the higher-level controller, for example to test the converter settings after commissioning.

Requirement

WARNING

Unexpected motor movement through incorrect operation

If the control panel is active, the safety shutdowns of the higher-level controller have no effect. The "Stop with space bar" function is not guaranteed in all operating states. Incorrect operation by untrained personnel may result in unexpected motor movement which can cause death or serious injuries.

- Only use the control panel for commissioning, diagnostics and service purposes.
- Only use the control panel if you are trained and authorized accordingly.
- Install an EMERGENCY STOP for the drive which is independent of the higher-level controller.

Description of function

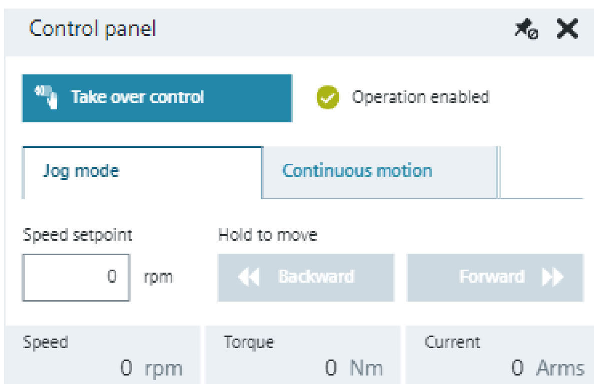


Figure 6-26 Control panel

The "Take over control" dialog deactivates the signals of the higher-level controller and switches the source for enables and the setpoint value to the control panel.

Note

Drive responds immediately

Although all enable signals are removed before returning the master control, the setpoints and commands still come from the original parameterized sources after the master control is returned.

The control panel offers the following operating modes to move the motor:

- Jog mode moves the motor while the direction buttons are pressed.
- Continuous operation starts the motor when a direction button is pressed.

7 Commissioning (Startdrive)

7.1 Introduction

Description

You configure devices and commission your converter in the Startdrive commissioning tool.

Further information about the Startdrive commissioning tool can be found in the information system of the TIA Portal.

7.2 Requirements for commissioning

Description

- TIA Portal version V20 or higher is installed on your operating unit.
- Startdrive version V20 or higher is installed on your operating unit.
  You will find the download page at the following link (https://support.industry.siemens.com/cs/ww/en/view/109821373).
- You have all of the required licenses to use the TIA Portal without any restrictions.
- Your converter is connected with a SIMATIC S7 controller. Alternatively, a SINUMERIK control system can be used.

7.3 Basics

7.3.1 Communication interfaces

Description

The following interfaces are available for accessing the converter:

Interface	Information
Service interface X127	Default access to Startdrive and the web server is via service interface X127.
	Ethernet interface X127 is intended for commissioning and diagnostics, which means that it must always be accessible. The SINAMICS Smart Adapter establishes a point-to-point connection to a mobile end device via WLAN.
	Default settings: • IP address: 169.254.11.22 • Subnet mask: 255.255.0.0 • Data transfer via HTTPS is activated in the factory setting.
	Constraints: • Only local access is permitted. • Only local networking in a closed and locked electrical cabinet is permitted. • For remote access to the electrical cabinet, you must apply additional Industrial Cybersecurity measures to prevent misuse through sabotage, data manipulation by unqualified persons and interception of confidential data.
PROFINET interface X150	• Converters are connected to several components, such as an operating unit or a higher-level control system, via PROFINET interface X150. • The network at PROFINET interface X150 must be located in a secure protection zone. Access to cables and open connections must be implemented in a protected fashion, such as in a control cabinet. • The IP addresses of the service interface X127 and the PROFINET interface X150 must not be in the same subnet. • Configured IP addresses are stored in SINAMICS SDI Standard: "Support" menu > "Scan IP Address".

More information

More information about the supported protocols is available on the Internet:

Industrial Cybersecurity Configuration Manual (https://support.industry.siemens.com/cs/ww/en/view/109810578)

7.3.2 Protected communication

Description

If the Startdrive project and the converter are unprotected, access is possible via both interfaces. This enables unrestricted access from the project or a higher-level controller to the drive data.

Non-authorized users can manipulate the drive data. To avoid the risk of data manipulation, we recommend protecting access to the project and the converter.

More detailed information about cybersecurity settings is provided in the Configuration Manual SINAMICS Industrial Cybersecurity (https://support.industry.siemens.com/cs/ww/en/view/109810578).

7.3.3 Loading data from the drive into the project

Overview

If you change the configuration of a converter in the online mode, then the configuration deviates from the data in the Startdrive project. To update project data, load the drive data from the converter into the project.

Requirement

- A project with a matching drive is created and is open in Startdrive.
- The converter and SIMATIC S7 controller are in offline mode.
- For activated user management (UMAC) in Startdrive:
  The function rights for editing drive data and the hardware configuration are activated for your user account.
  You also need the function right "Edit Safety Integrated application of the drive" for editing Safety Integrated data.
- For activated user management (UMAC) in the converter:
  The "Create backup or load drive data to Startdrive" function right is activated for your user account.

Details on this topic are provided in the Configuration Manual SINAMICS Industrial Cybersecurity (https://support.industry.siemens.com/cs/ww/en/view/109810578) in Chapter "Security settings in Startdrive".

Procedure

1. Click on icon (Upload from device) in the toolbar.
   The "Upload preview" dialog opens. Startdrive checks whether all requirements for loading have been met. In the event of any obstructions, these are displayed as messages in the dialog.
2. Check the messages. If necessary, activate the actions in column "Action".
   As soon as uploading becomes possible, the "Upload from device" button is enabled.
3. Click the "Upload from device" button.
   The data, except for the UMAC configuration, is loaded from the converter into the project. The drive data is saved with the project.

7.3.4 Loading project data into the drive

Overview

Load the data from your Startdrive project into a drive.

Requirement

- A project has been created.
- A drive has been created and completely configured in the project.
- Optional: There is an active online connection between the drive and operating unit.
- For activated user management (UMAC) in Startdrive:
  The following function rights are activated for your user account:
  - "Download to drives"
  - "Manage users and roles" (the UMAC configuration must be loaded to the drive)
- For activated user management (UMAC) in the converter:
  Depending on which data is loaded to the converter, you require the corresponding function rights for your user account.

Details on this topic are provided in the Configuration Manual SINAMICS Industrial Cybersecurity (https://support.industry.siemens.com/cs/ww/en/view/109810578) in Chapter "Security settings in Startdrive".

Procedure

1. Select a drive in the project tree.
2. Click on icon (Load to device) in the toolbar.
   – If you have already established an online connection, then the "Load preview" dialog opens.
   This dialog displays alarms and proposes actions necessary for loading.
   – If you have still not established an online connection, then the "Extended loading" dialog opens.
   Using this dialog, establish an online connection to the required drive.
3. Check the messages in the "Load preview" dialog.
   The "Save parameterization retentively" action is enabled by default.
4. Click "Load".
   The project data is downloaded into the drive.

7.3.5 Saving changes in the project

Overview

Project data that are not saved are lost when closing the project. The entire project must be saved in order for the settings to take effect permanently.

Requirement

- Project protection is active
  The following function rights for editing drive data are activated for your user account:
  – "Open and edit the project"
  – "Edit hardware configuration"
  – "Edit drive applications"
  – "Edit drive Safety Integrated application"
  – "Manage users and roles"

  Details on this topic are provided in the Configuration Manual SINAMICS Industrial Cybersecurity (https://support.industry.siemens.com/cs/ww/en/view/109810578) in Chapter "Security settings in Startdrive".

Procedure

In the toolbar, click on the icon .

OR

Select the "Project > Save" or "Project > Save as" menu.

7.3.6 Retentively saving changes

Overview

You have created and fully configured a drive in the project and you wish to save your settings in the converter.

Parameter assignments of your drive are always volatile and are lost when the drive is switched off. Information is subsequently provided as to how you can retentively save online data or offline data.

Requirement

- A project has been created.
- For activated user management (UMAC):
  The function rights for editing drive data are activated for your user account.
  Details on this topic are provided in the Configuration Manual SINAMICS Industrial Cybersecurity (https://support.industry.siemens.com/cs/ww/en/view/109810578) in Chapter "Security settings in Startdrive".

Retentively saving online data

You are connected online with the drive; save your configuration as follows:

1. In the function view of the active Startdrive project, click on icon (retentively save data of the complete device).
   OR
2. In the project tree of your drive device, double-click on "Online & Diagnostics".
   - In the secondary navigation select menu "Functions > Backup/Restore".
   - In the "Retentively save RAM data" area, click "Save".

The system checks whether a memory card is available. If an appropriate memory card is detected, then the parameter values are retentively saved to the memory card.

Retentively saving offline data

When retentively saving data, it is important that the settings made are not only saved on your operating unit in the Startdrive project, but also permanently saved on the drive memory card (also known as "save retentively" or "RAM to ROM"). An online connection must be established to the drive for this purpose.

1. Establish an online connection to your drive.
2. Load the project data into your drive.
3. Click the icon in the function view of the active Startdrive project.
   The current project settings are stored retentively on the memory card of the drive.

7.3.7 Using parameter lists and user-defined lists

Overview

Users configure a drive in Startdrive as standard using specific configuration views. For the configuration, experienced users preferably take the parameter lists or user-defined lists.

Requirement

- For activated user management (UMAC):
  The function rights for editing drive data are activated for your user account.
  Details on this topic are provided in the Configuration Manual SINAMICS Industrial Cybersecurity (https://support.industry.siemens.com/cs/ww/en/view/109810578) in Chapter "Security settings in Startdrive".

Parameter list

The following functions are available:

- Monitoring parameter values
- Editing parameter values directly from the parameter view
  Only parameters with a light grey background can be directly edited in the parameter list. Other parameters are locked in the parameter list and cannot be edited.
- Exporting parameters as CSV
- Comparing parameter settings:
  - Offline - Factory setting
  - Online - Offline
  - Online - Factory setting

User-defined list

You compile the selected parameters in a user-defined list. This involves an excerpt with specific parameters, from an underlying parameter list.

User-defined lists are only created and edited in the project tree.

You use user-defined lists for the following purposes:

- Compiling the most important parameters
- Assigning parameters to parameter groups with comments for users
- Carrying out series commissioning based on saved parameter values
- Documentation of the drive with listed parameters and setting values

Opening and reading parameter lists in the web server

Parameter lists are exported in the json format. You can import and open lists and view parameter values if you access the converter using the web server.

Example

In the following application, you create a user-defined list with the objective of accepting parameter values for an additional drive.

1. You create a user-defined list with parameter values for a configured drive.
2. You open the list in another drive with the same hardware configuration.
3. You compare the parameter values of the drive with the saved values.
4. You apply the required parameter values for the drive.

More information

Detailed information about handling parameter lists and user-defined lists is provided in the TIA Portal information system.

7.4 Procedures for device configuration and commissioning

7.4.1 Overview

Note

Only in the offline mode

The drive components can only be combined and specified in the offline mode. In the online mode, all corresponding setting ranges are marked in the device view and in the inspector window.

Note

User management and Industrial Cybersecurity

SINAMICS drives of the latest generation generally have extended protection. This usually has the effect that, as a user, you have to log in to view or edit the drive data offline as well as online.

The most important protective measures in brief:

- Project protection can be activated for Startdrive projects in the TIA Portal (offline). If project protection is activated, corresponding rights are required for access. Once project protection has been activated, it cannot be deactivated.
- A "Security Wizard" usually appears when creating new drives in the project. With the help of this wizard, you can already make the most important security settings for this drive within the project when creating the drive. After loading the project data into the drive, the protection settings become effective there.
- To access a protected drive online, you ALWAYS need the corresponding access rights. This also applies if no project protection is activated for the Startdrive project.

Detailed information on this topic is provided in the Configuration Manual SINAMICS Industrial Cybersecurity (https://support.industry.siemens.com/cs/ww/en/view/109810578) in Chapter "Security settings in Startdrive".

Note

Editing mode required for online commissioning

If you want to make important settings online, activation of the editing mode is mandatory. Restore points that are required as a return point following a cancellation of the current online parameterization are automatically created by the editing mode in the "guided quick startup" (and in the "Parameterization" area) during configuration.

No separate editing mode is necessary in the "Rotate & optimize" area.

Note

Telegram configuration offline

In the guided quick startup, telegram settings can in principle only be made offline.

7.4.2 Simple basic parameterization (offline)

Overview

The following workflow represents the simplest form of commissioning.

Procedure

1. Create or open project with Startdrive.
2. Create device configuration in Startdrive offline.
   - Insert the SINAMICS drive into the project and specify it
   - Create and specify SINAMICS components
   - Make detailed settings for drive and components
   - Optional: Configure user management and make protection settings for the drive
3. Make basic settings offline via the guided quick startup.
4. Load project data into the target device.
5. Establish an online connection between Startdrive and the target device.
6. Optimize commissioning.

Result

The motor turns.

More information

Detailed information can be found in the information system of the TIA Portal in Chapter "Configuring SINAMICS S210 drives".

7.4.3 Simple basic parameterization (online)

Overview

The basic parameterization can also be carried out in online mode as an alternative to offline mode.

Procedure

1. Create or open project with Startdrive.
2. Create device configuration in Startdrive offline.
   - Insert and specify the SINAMICS drive in the project.
   - Create and specify SINAMICS components.
   - Make detailed settings for the drive and components.
   - Optional: Configure user management and make protection settings for the drive.
3. Load project data to the target device.

4. Establish an online connection between Startdrive and the target device.
5. Make basic settings online via the guided quick startup in the editing mode.
   – Make basic settings in the quick startup steps.
   – Optimize commissioning.

Result

The motor turns.

More information

Detailed information can be found in the information system of the TIA Portal in Chapter "Configuring SINAMICS S210 drives".

7.4.4 Basic parameterization together with a SIMATIC controller

Overview

SINAMICS drives are frequently operated with SIMATIC or SINUMERIK controls. To speed up commissioning the individual components, the drive and control can be commissioned together in a Startdrive project.

Procedure

1. Create or open project with Startdrive.
2. Create device configuration in Startdrive offline.
   – Insert and specify the SINAMICS drive in the project.
   – Create and specify SINAMICS components and make detailed settings.
   – Insert and specify the SIMATIC controller in the project.
   – Network the SIMATIC controller and drive.
   – Optional: Configure user management and protection settings for the drive and control system.
   – Insert a technology object into the SIMATIC controller.
   – Interconnect the technology object with the drive.
3. Load project data to the target devices.
4. Establish an online connection between Startdrive and the target device.
5. Make basic settings online via the guided quick startup in the editing mode.
   – Make basic settings in the quick startup steps.
   – Optimize commissioning.

Result

The motor turns.

More information

Detailed information can be found in the information system of the TIA Portal in Chapter "Configuring SINAMICS S210 drives".

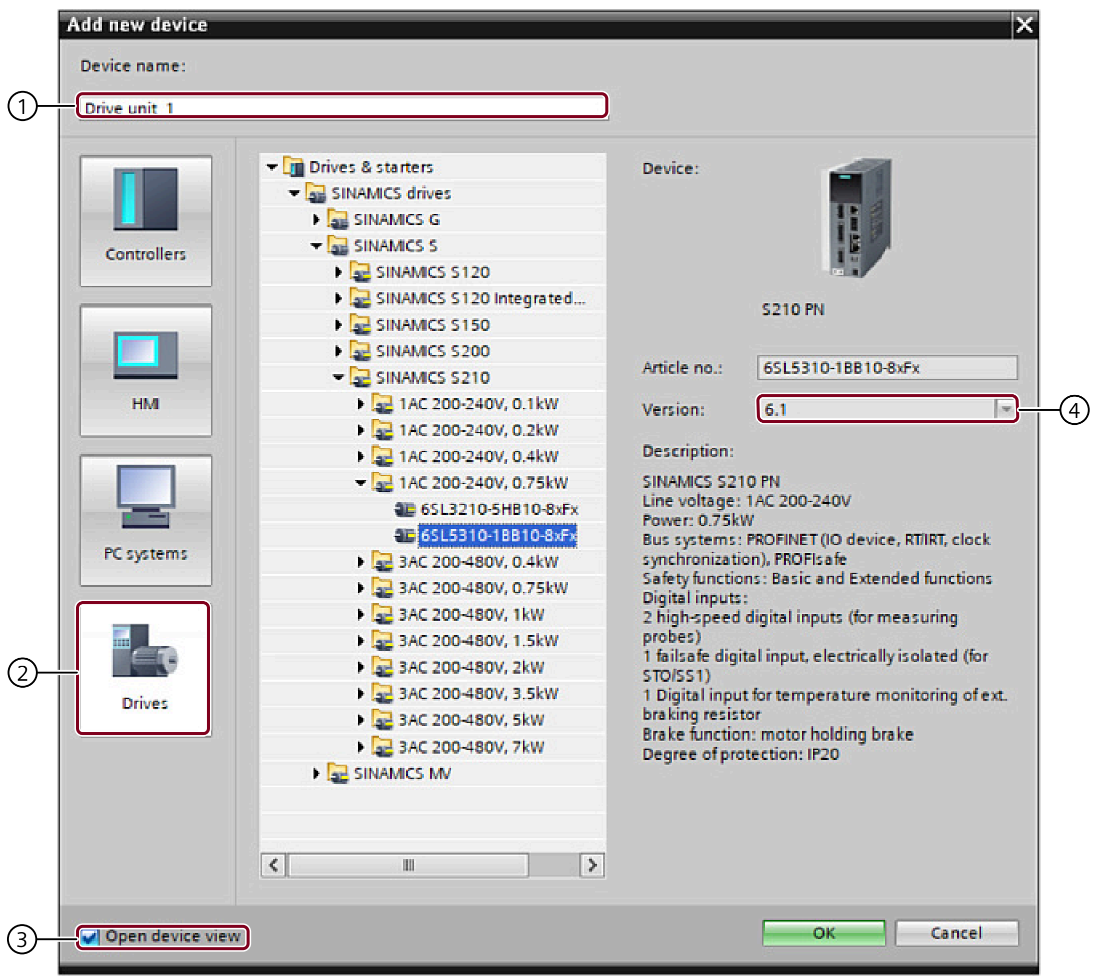
7.5 Combining and configuring devices in the project

7.5.1 Converter

7.5.1.1 Inserting a converter into the project

Overview

You either add a new converter to the project view or to the portal view. For the latest generation of SINAMICS converters, you can define the security settings for access to the drive data at the time of setup.



① "Device name" input field (default: drive unit_x)
② "Drives" button
③ Enable/disable the "Open device view" option
④ Firmware version drop-down list

Requirement

- A new project has been created.
  OR
  An existing project is open.
- For activated user management (UMAC):
  The function rights for editing drive data are activated for your user account.
  Details on this topic are provided in the Configuration Manual SINAMICS Industrial Cybersecurity (https://support.industry.siemens.com/cs/ww/en/view/109810578) in Chapter "Security settings in Startdrive".

Procedure

1. Double-click "Add new device" in the project tree.
   The corresponding dialog opens.
2. Click the "Drives" button ② to display the available S210 converters.
3. Expand the "SINAMICS S210" entry in the displayed list.
   A list of all available SINAMICS S210 converters is displayed.
4. Expand the entry (e.g. 200-240 V 1AC, 0.1 kW) for the relevant S210 converter.
   The selected S210 converter is displayed with the corresponding article number.
5. Click on the desired SINAMICS S210 converter.
   When a SINAMICS S210 converter is created, the latest firmware version ④ is always suggested.
6. If the firmware version on the converter memory card deviates from the displayed firmware version, then change the firmware version via the drop-down list "Version" ④.
   It will not be possible to go online later if the firmware versions do not match.
   OR
   Install the corresponding firmware version on your converter.
7. Assign a different device name in the input field ① if required.
8. Click "OK".
   If the "Open device view" option ③ is activated, the converter is automatically created and displayed in the device view.

Result

The inserted converter is displayed in the device view and can be configured.

7.5.1.2 Optional: Replacing a converter

Overview

In the device configuration and the project tree of an S210 drive, at any time, you can replace the current device by a device with another power rating. When replacing the drive, previous configurations of the motor and/or the encoder are kept if both devices are compatible with one another.

Requirement

- A project has been created.
- An S210 Control Unit has been inserted in the device configuration.
- For activated user management (UMAC):
  The function rights for editing drive data are activated for your user account.
  Details on this topic are provided in the Configuration Manual SINAMICS Industrial Cybersecurity (https://support.industry.siemens.com/cs/ww/en/view/109810578) in Chapter "Security settings in Startdrive".

Replacing a device via the project tree

1. In the project tree, select the drive to be replaced. Open context menu "Change device". Dialog "Change device - S210" opens:

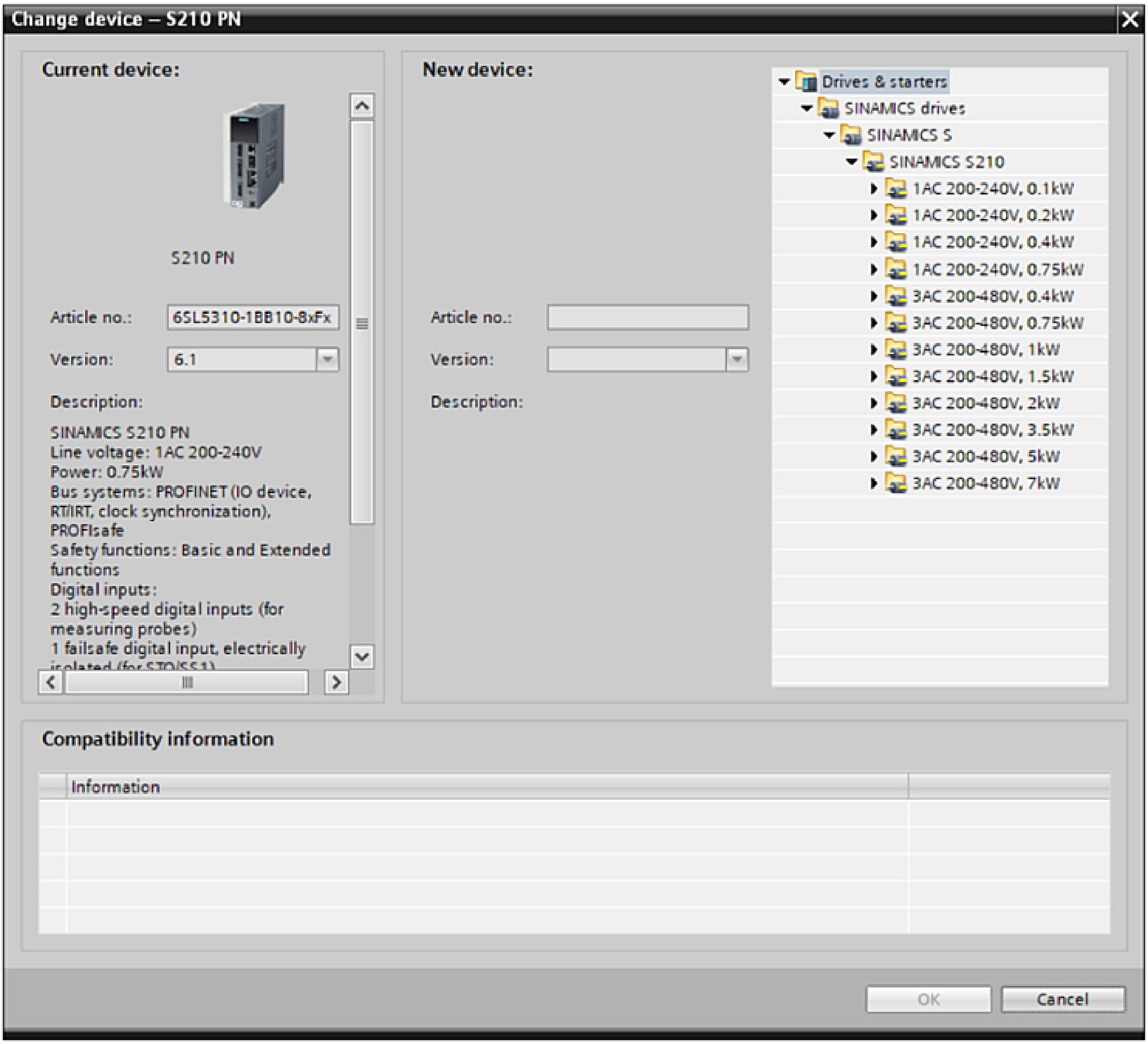


Figure 7-1 Changing the device using the project tree

The data of the current drive are displayed on the top left. At the top right, the replacement devices that are applicable are displayed in a hardware catalog.

2. In the hardware catalog of dialog "Change device", select the replacement device required. Now, only the most important data of the new device are displayed at the center of the dialog in the field "New device". You can compare these data with the data of the current device (left-hand side).
   If both drives are not fully compatible, then the corresponding information is displayed in the "Compatibility information" field. This can mean that you must possibly assign another motor if you still go ahead and accept the required replacement device.
3. Click on "OK" to accept the new drive.

Replacing a device using the hardware catalog

1. In the hardware catalog, select the new S210 drive. In the device view, drag the drive to the placeholder for the current drive.
   The "Change device" dialog opens:

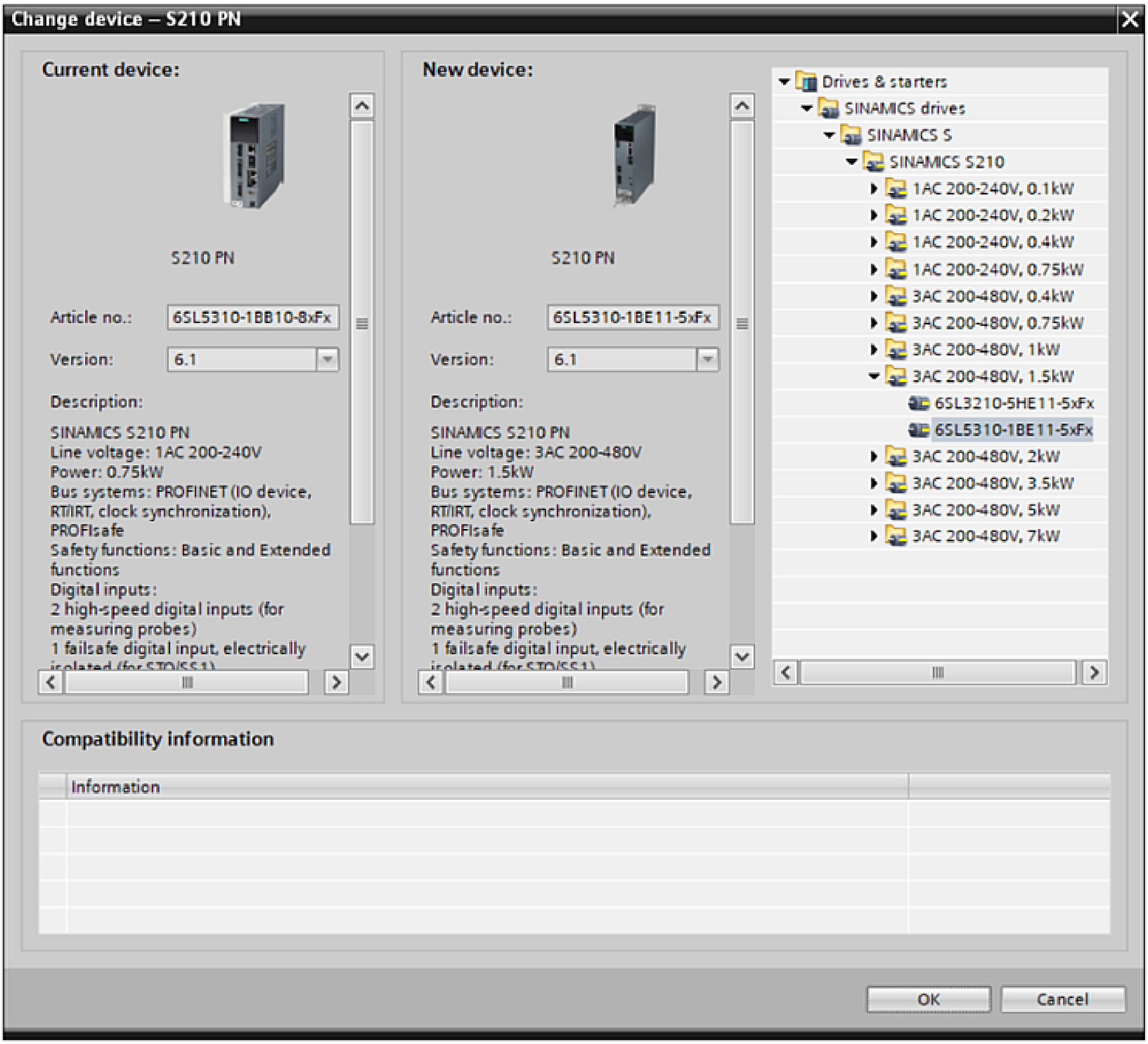


Figure 7-2 Changing the device using the hardware catalog

   In the dialog, the most important data of the existing drive and the new drive are compared. If both drives are not fully compatible, then the corresponding information is displayed in the "Compatibility information" field. This can mean that you must possibly assign another motor if you still go ahead and accept the required replacement device.

2. Click on "OK" to accept the new drive.

Result

The current drive is replaced by the required replacement device.

If the two drives are not completely compatible with one another, then in the device navigation, the placeholder for the motor is displayed unspecified. You must reassign an appropriate motor power.

7.5.1.3 Making detailed converter settings

Overview

You can configure the following details for the SINAMICS S210 drive:

Group	Settings
General	• Product information Name data • Catalog information Brief description, description of the components included, firmware version used • Identification & Maintenance Information and data to identify and localize a drive within a plant or system.
PROFINET interface [X150]	• General • Ethernet addresses Subnet, IP address, subnet mask, PROFINET names • Telegram configuration – Telegrams of the closed-loop drive control: Send, receive, Safety Integrated Details are contained in Chapter "Configuring telegrams (Page 280)". • Advanced options – Interface options – Media redundancy – Clock cycle synchronization for local modules (isochronous mode) – Real time settings – Port [X150 P1] and port [X150 P2]
Module parameters	• Activation of channel diagnostics
Protection & Security	• Wizard for security settings • User Management & Access Control • Ports and protocols You can find more information in Chapter "Setting the fieldbus configuration (Page 226)". • Drive data encryption • Syslog server – Syslog server – Trusted servers • Certificate management **Note**: Information about these protection settings is provided in the Configuration Manual "SINAMICS Industrial Cybersecurity" or in the information system of the TIA Portal.
Ethernet commissioning interface [X127]	• General • Ethernet addresses: – Subnet, IP address, subnet mask

Group	Settings
Time synchronization/Time	• Option "Synchronize with NTP server" If the drive is connected to a controller in the device configuration, the option "Use PLC as NTP server" is activated automatically. If the drive is connected to a PLC, the IP address of the PLC is displayed. In this case, the IP address and the time zone of the NTP server can be changed. • Option "No synchronization" In this case, NTP synchronization is not managed in the project. You can configure this synchronization separately for the drive in online mode with the Online & Diagnostics function "Set time".
Hardware settings	• Supply voltage • Braking resistor
Web server	• Enabling access to the PROFINET interface [X150] and/or the service interface [X127] via HTTP or HTTPS.

Requirement

- A new project has been created.
  OR
  An existing project is open.
- A SINAMICS S210 drive has been created in the project.
- For activated user management (UMAC):
  The function rights for editing drive data are activated for your user account.
  Details on this topic are provided in the Configuration Manual SINAMICS Industrial Cybersecurity (https://support.industry.siemens.com/cs/ww/en/view/109810578) in Chapter "Security settings in Startdrive".

Procedure

1. Select the S210 drive in the device view and open the inspector window.
2. In the secondary navigation of the inspector window, select the desired detail menu (see list in the summary).
3. Make the required detail settings in the white fields. Default settings are usually available in most detail menus.
   The gray fields are corrected automatically in accordance with their setting. Fields with a gray background cannot be edited directly.

Result

You have made the detailed settings for the drive in your device configuration.

7.5.1.4 Setting the fieldbus configuration

Overview

The drive communication is performed optionally via PROFINET or EtherNet/IP.

Requirement

- A new project has been created.
  OR
  An existing project is open.
- A SINAMICS S210 drive is created in the project.
- For activated user management (UMAC):
  The function rights for editing drive data are activated for your user account.
  Details on this topic are provided in the Configuration Manual SINAMICS Industrial Cybersecurity (https://support.industry.siemens.com/cs/ww/en/view/109810578) in Chapter "Security settings in Startdrive".

Procedure

1. Select the S210 drive in the device view and open the inspector window.
2. Navigate to "Protection & Security" > "Ports and protocols" in the secondary navigation of the Inspector window.
3. In the "Fieldbus and related protocols configuration" area, select the communications you require.
   The fields with a white background show the necessary detail settings.
   The fields with a gray background are corrected automatically in accordance with their setting and cannot be edited directly.
4. Save the settings.

Result

You have configured drive communications.

7.5.1.5 Specifying a motor

Overview

The drive that has just been inserted in the project has a placeholder for the required motor (standard motor type: "1FK2"). You must specify this placeholder in the configuration.

Note

Different motor types

If your converter is connected to a motor, type "1FT2", "1FS2" or a DRIVE-CLiQ motor, then the motor placeholder must first be exchanged before specifying the motor. Proceed as described in the following chapter: "Optional: Replacing the motor (Page 230)".

Requirement

- A project has been created.
- An S210 drive is inserted in the device configuration.
- For activated user management (UMAC):
  The function rights for editing drive data and configuring in the inspector window are activated for your user account.
  Details on this topic are provided in the Configuration Manual SINAMICS Industrial Cybersecurity (https://support.industry.siemens.com/cs/ww/en/view/109810578) in Chapter "Security settings in Startdrive".

Procedure

1. Double-click on the white motor placeholder (MOT) in the drive. The inspector window is displayed.
2. If required, select the "Motor - Selection 1Fxx" entry in the secondary navigation in the inspector window.
3. In the list, select the motor power rating and an associated encoder based on the article number. Then specify whether the motor should be equipped with a holding brake - or not. A DRIVE-CLiQ encoder is automatically assigned to all motors in the list.

Result

The motor placeholder is assigned the data of the selected motor. The white area turns gray.

The motor has been added. The assigned encoder and the encoder evaluation are automatically also added and specified.

You can then carry out the basic parameterization, or alternatively, you can carry out the guided quick startup.

7.5.1.6 Adding and specifying an encoder

Overview

A DRIVE-CLiQ encoder is always automatically inserted and specified with the motor placeholder. You can insert and specify a second encoder in parallel to the first encoder. Only X101 is available as a free DRIVE-CLiQ interface on the Control Unit.

Requirements

- A project has been created.
- A Control Unit has been inserted in the device configuration.
- A motor has been inserted.
- With protection activated (UMAC):
  Corresponding function rights of your user account (see Industrial Cybersecurity Configuration Manual (https://support.industry.siemens.com/cs/ww/en/view/109810578))

Procedure

1. Open the "Measuring systems" entry in the hardware catalog.
2. Drag the unspecified "DRIVE-CLiQ encoder" into the light gray frame area of the Control Unit in the device view. An encoder and a Sensor Module are created.

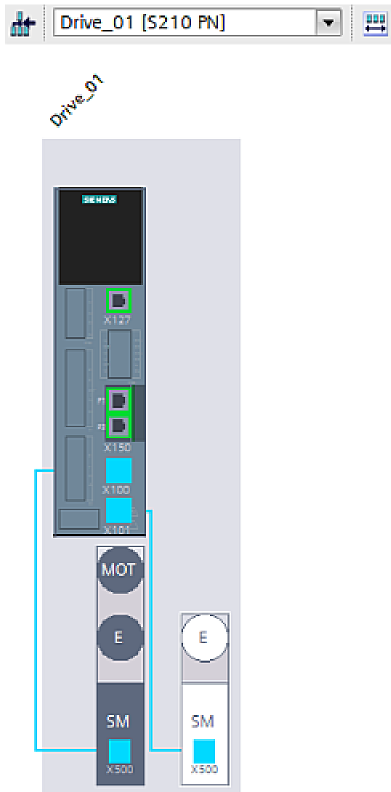


Figure 7-3 Inserting an encoder S210

When the encoder placeholder is inserted, a DRIVE-CLiQ connection to a free DQ interface of the Control Unit is automatically established (X101).

3. Click the unspecified encoder in the device view.

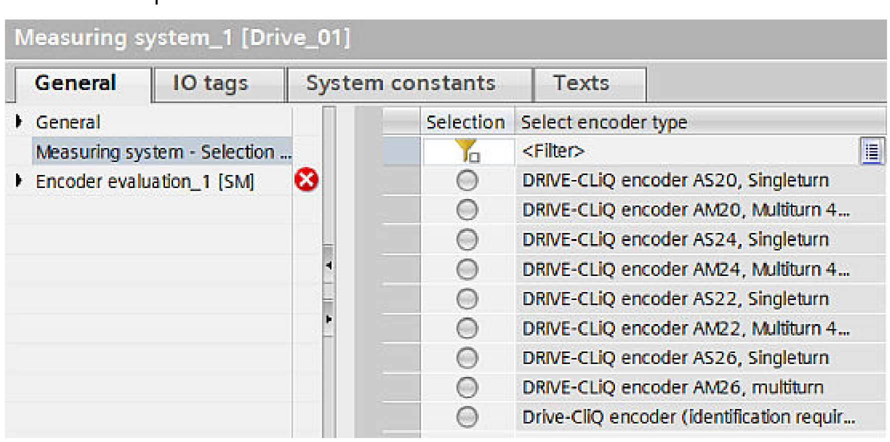


Figure 7-4 Specifying the encoder

4. In the secondary navigation of the Inspector window, select the "Measuring system - Selection..." entry.
   As long as no encoder is selected, this mandatory entry is marked with the symbol ⊗.
5. Select the desired DRIVE-CLiQ encoder in the measuring system list based on the article number.
   The data of the selected encoder is assigned to the encoder placeholder. The white area turns gray.
   Furthermore, a Sensor Module (encoder evaluation) is inserted and automatically specified. For each DRIVE-CLiQ encoder type there is always only one specific Sensor Module.

Result

The second encoder has been inserted and specified. For the two encoders being used, an encoder data set (EDS) is automatically created for each encoder and these are each assigned a drive data set; however, these cannot be exchanged.

7.5.1.7 Optional: Replacing the motor

Overview

When creating an S210 drive in the device configuration, a motor placeholder is always used for motor type "1FK2". If you want to use another motor type, e.g. "1FS2", from the motor list, you can replace the motor placeholder before specifying.

Requirement

- The drive is offline.
- A project has been created.
- An S210 drive is inserted in the device configuration.
- For activated user management (UMAC):
  The function rights for editing drive data and configuring in the inspector window are activated for your user account.
  Details on this topic are provided in the Configuration Manual SINAMICS Industrial Cybersecurity (https://support.industry.siemens.com/cs/ww/en/view/109810578) in Chapter "Security settings in Startdrive".

Replacing a motor using the hardware catalog

1. In the hardware catalog, select the required motor type. Drag the corresponding placeholder in the device view onto the placeholder for the currently used motor type.
   Dialog "Change device - XYZ motor" opens:

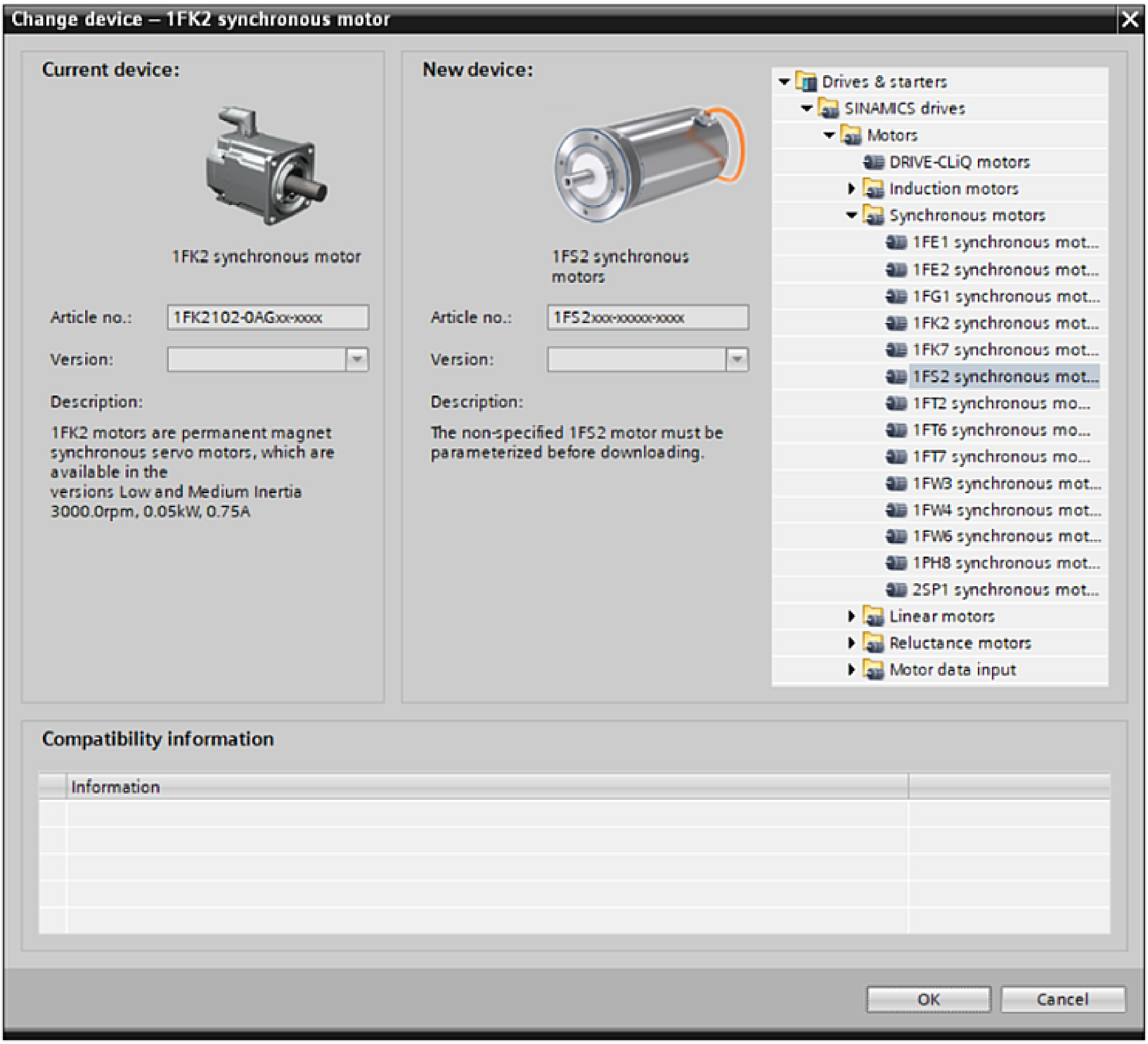


Figure 7-5 Replacing the motor placeholder using hardware selection

In the dialog, the most important data of the used motor type and the new motor type are compared.
If the two types of motors are not fully compatible, the corresponding information is displayed in the "Compatibility information" field.

Note

For DRIVE-CLiQ motors, when loading the project data (see "Loading project data into the drive (Page 210)") to the drive device, the motor and encoder data are automatically read from the hardware being used. It is not possible (or necessary) to specify the motor data at this point.

However, for consistency reasons, after loading to a drive device and reading from the hardware, ensure that the project data is again transferred to the Startdrive project (see "Loading data from the drive into the project (Page 209)").

2. To accept the new motor type, click "OK".
3. Click on the unspecified motor in the device view.
4. If required, select the "Motor - Selection" entry in the secondary navigation in the inspector window.
5. In the list, select your motor based on the article number.
   The motor placeholder is assigned the data of the selected motor. The white area turns gray. If you have selected a motor with encoder, the encoder and the encoder evaluation are also added automatically.

Replacing a motor using the context menu

1. In the device configuration, select the motor placeholder of the drive. Open context menu "Change device".
   Dialog "Change device - XYZ motor" opens:

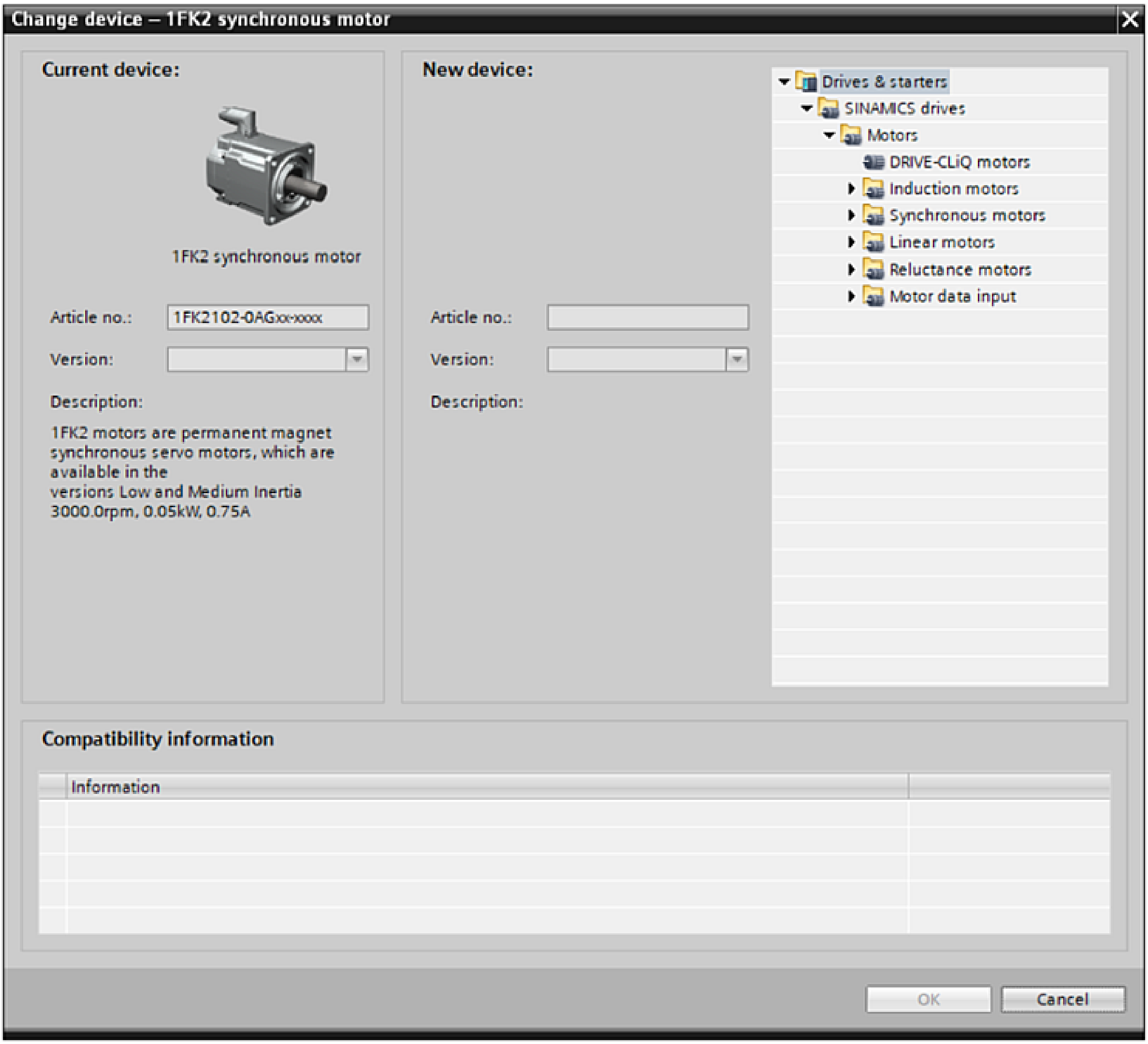


Figure 7-6 Manually changing the motor placeholder

   The data of the current motor type are displayed at the top left. The motor types that are applicable are displayed in a hardware catalog at the top right.

2. In the hardware catalog, select the motor placeholder of the required motor type.
   The most important data of the new motor type are displayed at the center of the dialog in the field "New device". You can compare these data with the data of the current motor type (left-hand side).
   If both motor types are not fully compatible, then the corresponding information is displayed in the "Compatibility information" field.

Note

For DRIVE-CLiQ motors, when loading the project data (see "Loading project data into the drive (Page 210)") to the drive device, the motor and encoder data are automatically read from the hardware being used. It is not possible (or necessary) to specify the motor data at this point.

However, for consistency reasons, after loading to a drive device and reading from the hardware, ensure that the project data is again transferred to the Startdrive project (see "Loading data from the drive into the project (Page 209)").

3. Click on "OK" to accept the motor type.
4. Click on the unspecified motor in the device view.
5. If required, select the "Motor - Selection" entry in the secondary navigation in the inspector window.
6. In the list, select your motor based on the article number.
   The motor placeholder is assigned the data of the selected motor. The white area turns gray. If you have selected a motor with encoder, the encoder and the encoder evaluation are also added automatically.

Result

The motor has been added. If you had already inserted and specified an encoder before replacing the motor, you must do this again at this point. When replacing the motor, the encoder is deleted from the device configuration, since the encoder settings always refer to the motor used.

7.5.2 Control and technology object

7.5.2.1 Inserting a SIMATIC S7 controller into the project

Overview

If, in addition to the SINAMICS drive, you also wish to use a SIMATIC S7 controller in the device configuration, then create an appropriate PLC in your project.

Note

Other control systems

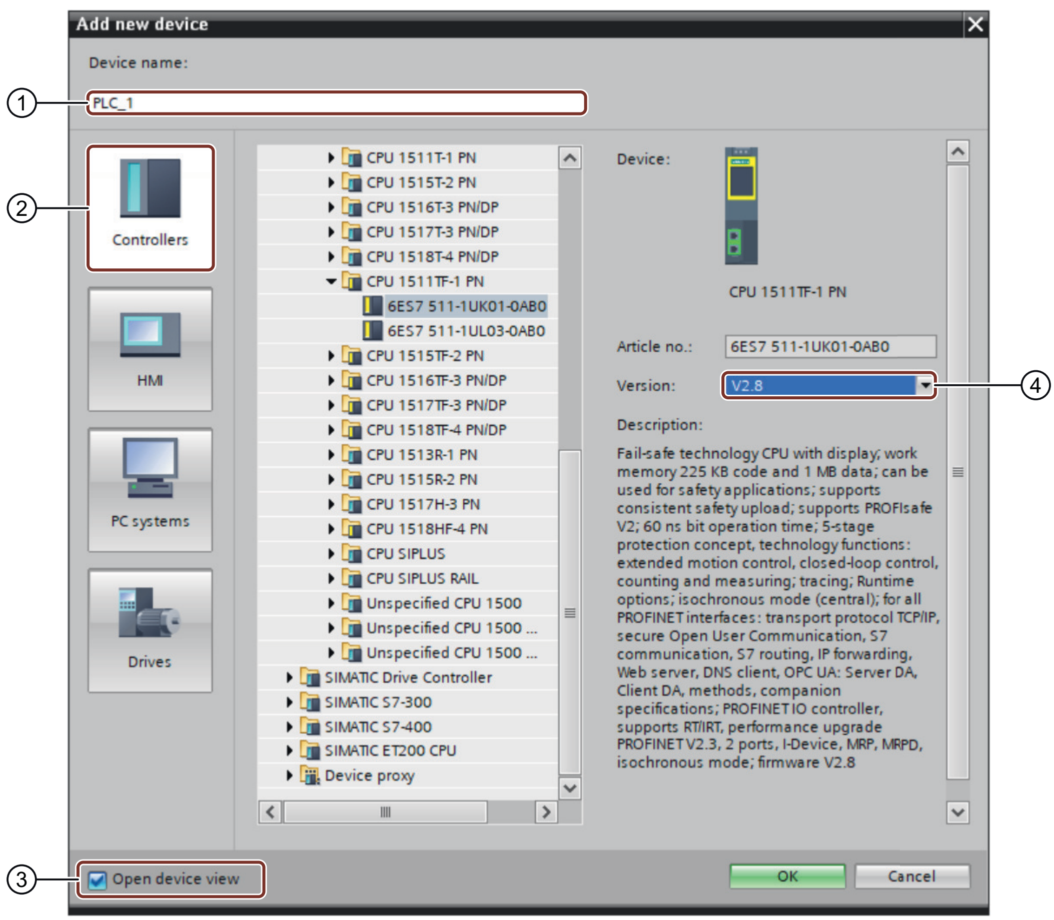
As an alternative to a SIMATIC S7 controller, a SINUMERIK ONE or a SINUMERIK MC can be used. The procedure remains the same.

Requirement

- A new project has been created.
  OR
  An existing project is open.
- For activated user management (UMAC):
  The function rights for editing drive and control system data are activated for your user account.
  Details on this topic are provided in the Configuration Manual SINAMICS Industrial Cybersecurity (https://support.industry.siemens.com/cs/ww/en/view/109810578) in Chapter "Security settings in Startdrive".

Procedure

1. Double-click "Add new device" in the project tree.
   The corresponding dialog opens.



① "Device name" input field (default: PLC_xx)
② "Controller" button
③ Enable/disable the "Open device view" option
④ Firmware version drop-down list

2. Click the "Controllers" button ② to show the available controllers.

3. Expand the required controller type (e.g. SIMATIC S7-1500) and select the required CPU (e.g. CPU 1511TF-1 PN) in the list.
   When the CPU is expanded, the component is displayed with its article number.
   The current firmware version ④ is always suggested when creating a SIMATIC S7 controller.
4. If the firmware version on the memory card of your SIMATIC S7 controller differs from the displayed firmware version, then change the firmware version via the drop-down list "Version" ④.
   It will not be possible to go online later if the firmware versions do not match.
5. Assign a different device name in the input field ① if required.
6. Click "OK".
   If the "Open device view" option ③ is activated, the SIMATIC S7 controller is automatically created in the project and then displayed in the device view.

Result

The inserted SIMATIC S7 controller is displayed in the device view and can be configured.

7.5.2.2 Networking a SIMATIC S7 controller and a converter

Overview

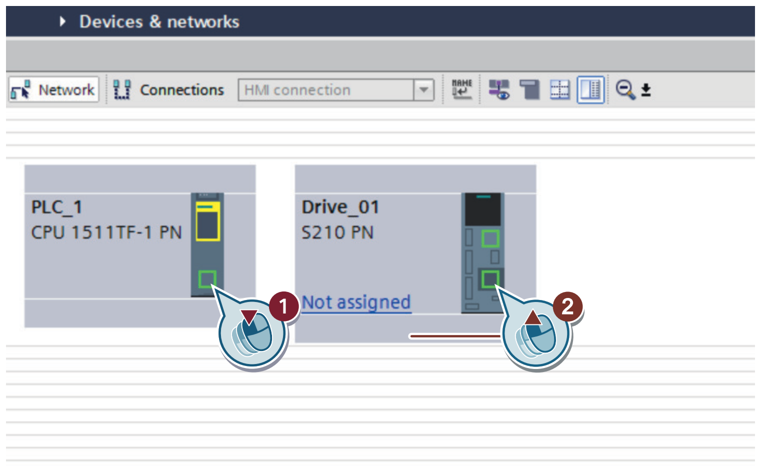
After inserting a SIMATIC S7 controller and a converter into the project, network the components in the network and topology view.

Requirement

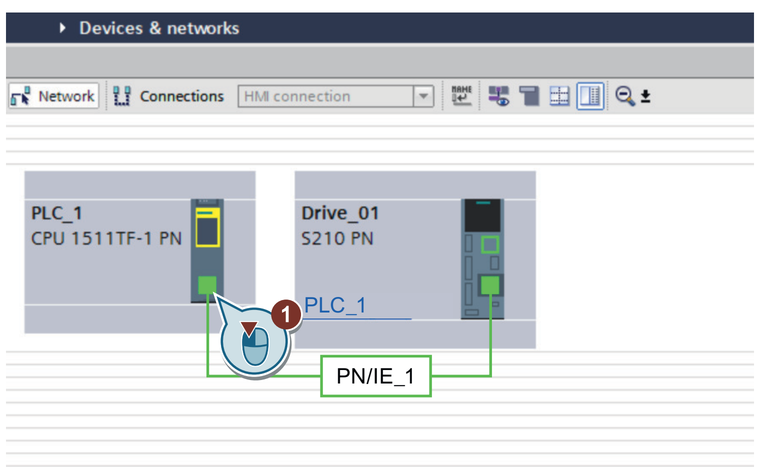
- A project is open.
- The project includes at least one drive and one control system.
- For activated user management (UMAC):
  The function rights for editing drive and control system data are activated for your user account.
  Details on this topic are provided in the Configuration Manual SINAMICS Industrial Cybersecurity (https://support.industry.siemens.com/cs/ww/en/view/109810578) in Chapter "Security settings in Startdrive".

Procedure

1. Open the network view by double-clicking on "Devices & networks" in the project tree.
2. Draw a connection between the PROFINET interface of the controller and the PROFINET interface X150 of the converter.
   The PROFINET connection is established, and the converter is assigned to the controller.

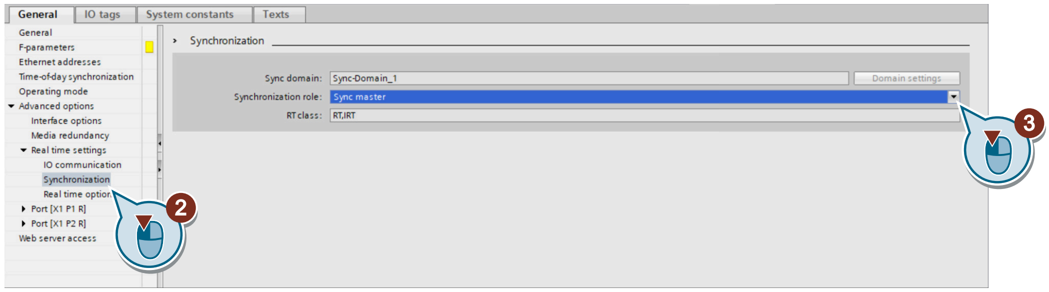


3. Click on the PROFINET interface_1 [X1].

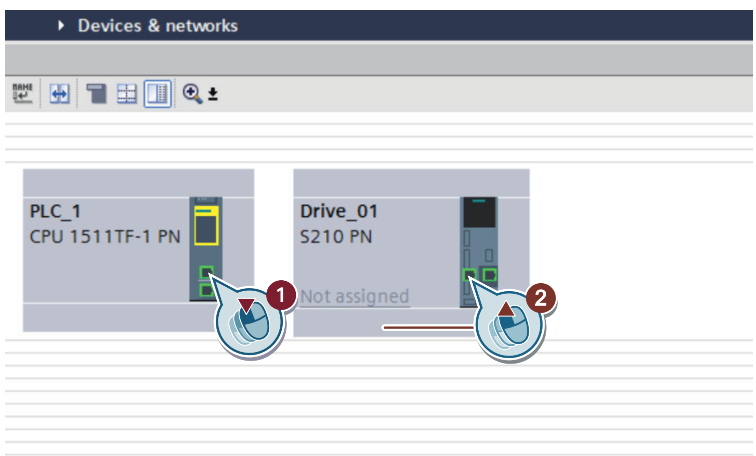


4. Open menu "Advanced options".
   The menu item is in the secondary navigation, in tab "General".
5. Open menu "Realtime settings".

6. Open menu "Synchronization" with a double-click.



7. Select the "Sync master" setting ③ from the "Synchronization role" drop-down list.
8. Switch to the topology view.
9. Draw a connection between Port_1 [X1.P1] of the controller and Port_1 [X150.P1] of the converter.



Result

The SIMATIC S7 controller and the SINAMICS S210 converter are networked with one another in the network and topology view.

7.5.2.3 Inserting a technology object into the SIMATIC S7 controller

Overview

Through the technology object, Motion Control functions such as positioning and synchronous axes are available to you. For this reason, insert a new technology object (TO) in the SIMATIC S7 controller. In the "Configuration" function view, you can directly assign the inserted SINAMICS drive and go to the drive configuration.

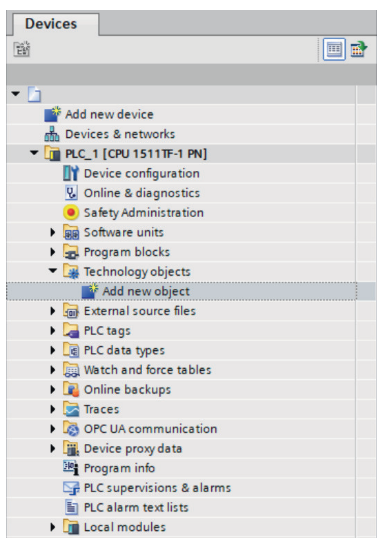
Positioning is the most frequent application for SINAMICS drives. To be able to perform positioning tasks in the SIMATIC S7 controller, you need to insert the Motion Control function "TO_PositioningAxis". Inserting a TO is described below based on the example of the Motion Control function "TO_PositioningAxis".

Requirement

- A SINAMICS drive is created and specified.
- A control system (e.g. SIMATIC S7-1500) is created and networked with the drive.
- For activated user management (UMAC):
  The function rights for editing drive and control system data are activated for your user account.
  Details on this topic are provided in the Configuration Manual SINAMICS Industrial Cybersecurity (https://support.industry.siemens.com/cs/ww/en/view/109810578) in Chapter "Security settings in Startdrive".

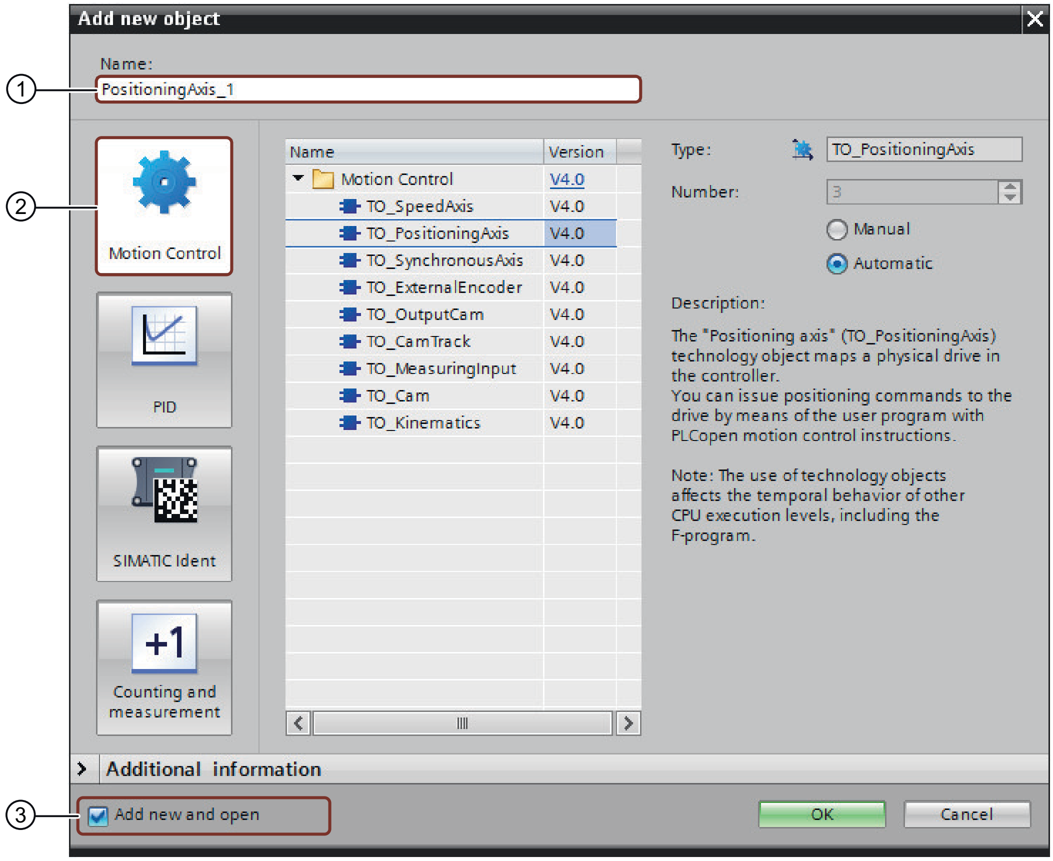
Procedure

1. In the project tree, open the menu for the SIMATIC S7 controller.



2. Open menu "Technology objects".

3. Open menu "Add new object" with a double-click.
   The corresponding dialog opens.



① "Object name" input field
② "Motion Control" button
③ Enable/disable "Add new and open" option

4. Click on "Motion Control" ②.
5. Select object "TO_PositioningAxis".
6. If required, assign another name for the object in input field ①.
7. Click "OK".

Result

The "TO_PositioningAxis" technology object has been inserted and can be configured.

7.5.2.4 Interconnecting the technology object and drive

Overview

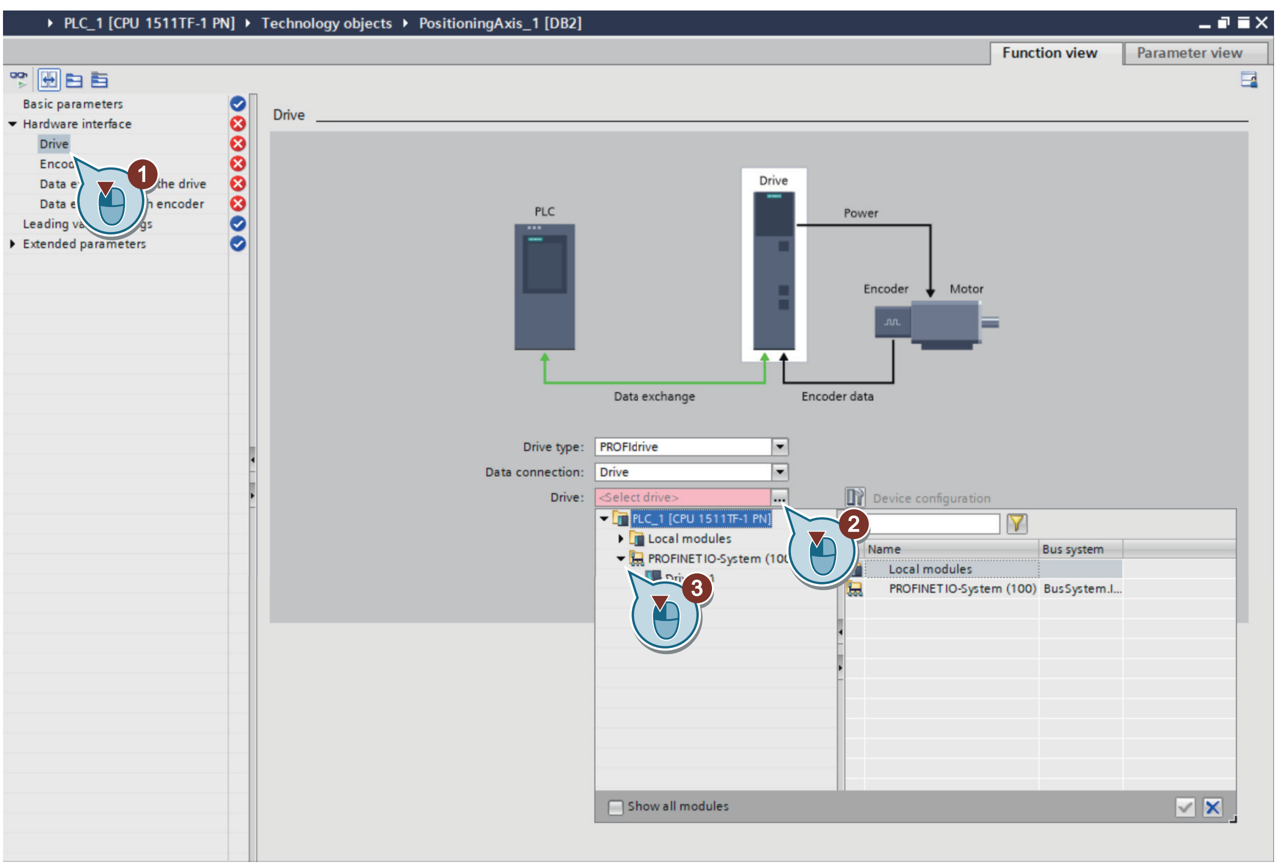
The inserted technology object "TO_PositioningAxis", must be interconnected with the SINAMICS drive.

Requirement

- A SINAMICS drive is created and specified.
- A control system (e.g. SIMATIC S7-1500) is created and networked with the drive.
- For activated user management (UMAC):
  The function rights for editing drive and control system data are activated for your user account.
  Details on this topic are provided in the Configuration Manual SINAMICS Industrial Cybersecurity (https://support.industry.siemens.com/cs/ww/en/view/109810578) in Chapter "Security settings in Startdrive".

Procedure

1. In the project tree, double-click the "Configuration" entry under the created technology object.
2. In the secondary navigation, select menu "Hardware interface" ①.
   The corresponding function view opens.



3. Open the selection list in the "Drive" selection box ②.
4. Expand the "PROFINET IO system (100)" entry ③.
5. Click on the displayed converter (in this case: "Drive unit_1").
   Telegram 105 is automatically preset.

6. Click on the checkmark icon to confirm the selection.
   The "Device configuration" setting option is enabled. In addition, the "Drive configuration" setting option is displayed and enabled.
7. To get to the basic parameter assignment of the converter, click the green arrow icon .

7.6 Carrying out guided quick startup

7.6.1 Overview

Overview

Using the "guided quick startup", you make the basic settings for the drive in Startdrive that are used to avoid the following detailed settings as far as possible. All drive settings are pre-assigned according to the required application using these basic settings.

Note

Significance of the note symbols

Settings of individual steps can have an impact on previous settings made in other steps. In this case, an appropriate note with the following icon appears at the active quick startup step. In this case, check and correct the corresponding settings.

Additional markings:

The icon designates information or a context-sensitive note for users.

The icon identifies an area of the step where an entry is urgently required.

Requirements

- The drive has been completely created and specified in the device configuration.
  Without a complete specification, the guided quick startup cannot be used and a message appears.
- If a control is also used, it must be connected to the drive in the topology view and in the network view. The connection between the devices must also be configured.
- Optional: The operating unit is connected to the drive via LAN (physically online).
- For activated user management (UMAC):
  The function rights for configuring in the quick startup are activated for your user role. Details on this topic are provided in the Configuration Manual SINAMICS Industrial Cybersecurity (https://support.industry.siemens.com/cs/ww/en/view/109810578) in Chapter "Security settings in Startdrive".

Quick startup areas

You can define the following basic settings in the steps with the same name:

- **Connection to PLC**
  This step indicates that the drive in the project can only be operated with a controller. Here, you define the additional Safety Integrated Functions that you wish to use.
- **Application**
  In this step you define the converter control mode. When the "Positioning" control mode is activated, then make the detailed settings, for example, the motion type, the measuring unit, encoder settings for the closed-loop position control or the values for a modulo correction.
- **Limits**
  The settings in step "Limits" are also dependent on the selected control mode.
  - "Closed-loop speed control":
    Here, you define the minimum and maximum values of the motor used: Torque, speed, operating times.
  - "Positioning":
    In this case, make the settings for the traversing profile, alternative ramp-down times, for jerk limitation and/or for traversing range limitation.
- **Application settings**
  Step "Application settings" is only active when the "Positioning" control mode is activated. In this case, make the detailed settings for active or passive homing.
- **I/O configuration**
  Here, you configure the digital (in some cases failsafe) inputs and outputs that are used.
- **Telegrams**
  Based on the selected control mode, preferred telegrams are suggested. You can define different telegrams and/or make detailed settings. Telegram settings can only be made offline.
- **Rotate & Optimize**
  In this step, you optimize the motor in online operation. "One Button Tuning" is available for this purpose.
- **Overview**
  Here you will find a compilation of all settings made after completing the configuration in the guided quick startup.
  - Offline mode: When required, you can load these settings directly to the drive.
  - Online mode: When required, you can load these settings directly to the Startdrive project.

More information

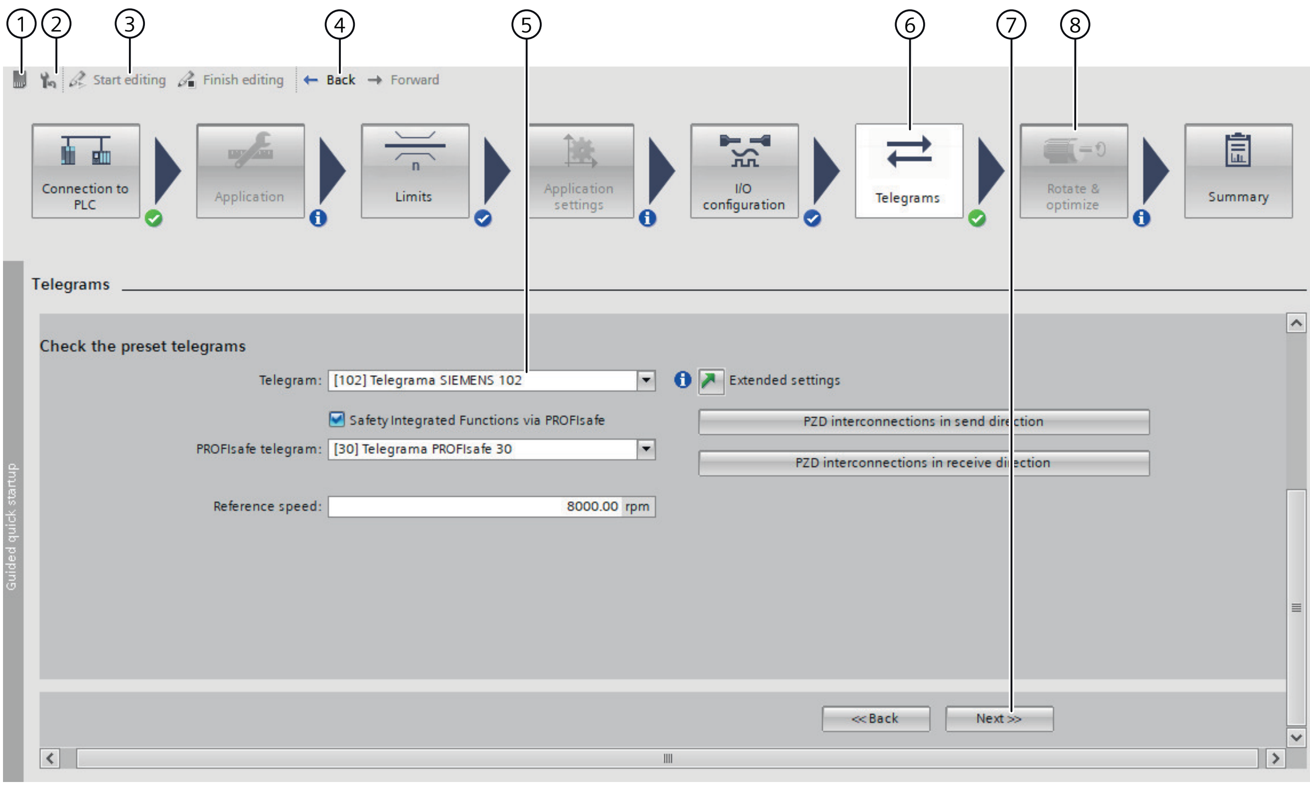
Detailed information on the topic of "Guided quick startup" can be found in the information system of the TIA Portal.

7.6.2 User interface

Overview

The "Guided quick startup" is a commissioning wizard that you can use to set the most important basic settings of the S210 drive centrally.

Structure



① Icon: Saves data retentively (in the online mode)
② Icon: Restores the factory settings (in online mode)
③ Buttons: Start or exit the editing mode (in the online mode)
④ Buttons: Jump to the next or previous step.
⑤ Detailed setting of active quick startup step.
⑥ Active quick startup step: Button is brightened
⑦ Quick startup buttons:
- Back/Next: are always displayed.
- Cancel/finish: only displayed in online mode.

⑧ Inactive quick startup step: One of several possible steps

Figure 7-7 Example: Guided quick startup in offline mode

Status display after changes

Changes to individual settings can also affect settings in the guided quick startup. Status symbols indicate the change state of the particular step:

Icon	Meaning
	The system defaults in this step are valid.
	The settings made in this step are valid. The settings were made directly in this step, or are the consequences of settings in another step.
	The program changed the settings in this step. Possible causes are: • Subsequent changes were made in other steps, which are not automatically valid. • The device configuration was subsequently changed. The changes influence the original settings. Check the settings of this step.

Status indicator in the quick startup steps

Settings of individual steps can also impact settings in previous steps. In this case, an appropriate note with the following icon appears for the active quick startup step. In this case, check and correct the corresponding settings.

Additional markings:

The icon designates information or a context-sensitive note for users.

The icon identifies an area of the step where an entry is urgently required.

7.6.3 Editing mode (only online)

Overview

If you want to work with the guided quick startup in online mode, you need restore points in case commissioning is aborted. Restore points are stored retentively on the memory card of the converter.

Restore points are automatically created when activating or exiting the editing mode and also when switching from one step into the next step of the quick startup.

Note

Behavior when the online connection is terminated

If the connection to the drive is re-established after the online connection has been terminated, the program reverts to the stored data of the last restore point.

Requirement

- The drive has been completely created and specified in the device configuration.
- If a control is also used, it must be connected to the drive in the topology view and in the network view. The connection between the devices must also be configured.
- There is an active online connection between the drive and the operating unit.
- No other access from another operating unit to the selected drive is active.

Activating/exiting the editing mode

Settings in the guided quick startup can be made online only in an "editing mode".

Display	Status	Description
	The editing mode is not yet activated.	Proceed as follows to activate editing mode: • In the toolbar of the step, click on the button Start editing. OR • Click in the step below the button Start editing. You can configure the settings.
	The editing mode is active.	To exit the editing mode, proceed as follows: • In the toolbar of the step, click on the button Finish editing. OR • Click in the step below the button Finish editing. Editing has been finished. A new restore point is assigned automatically. The current configuration is saved retentively.

Note

Message in case of multiple access

The editing mode can only be activated if the drive is not simultaneously accessed by another PC via Startdrive or the web server.

If another access is active, activation of the editing mode will be denied. An appropriate message is displayed.

Note

Message when editing factory settings in the online mode

A message is displayed if a drive still has the factory settings, and the editing mode of the guided quick startup is started. This states that the motor data are based on the rated power of a standard motor.

Therefore, check the motor data online in dialog "Show motor data". When required, correct the motor data and close the dialog.

Completing online commissioning

1. To complete online commissioning in the guided quick startup, click on button Finish editing .
   All settings made in the quick startup are then saved retentively. You are provided with an overview of all of the settings made in the last "Overview" step.

Canceling online commissioning

1. If you want to cancel online commissioning via the guided quick startup, click on the "Cancel" button.
   A confirmation prompt appears.
2. If you really want to cancel, click on "OK".
   All settings made in the quick startup are then discarded. Then the previous settings are restored via the last restore point.

7.6.4 Connection to PLC

Overview

In the quick startup step "Connection to the PLC", you define whether you wish to commission and/or operate the drive together with a control system, and whether you also wish to use Safety Integrated Functions.

Startdrive then makes default settings to speed up commissioning.

Requirement

- The drive has been completely created and specified in the device configuration.
- Optionally, a controller (PLC) also can be created in the device configuration and networked with the drive.
- For activated user management (UMAC):
  The function rights for configuring in the quick startup are activated for your user role. Details on this topic are provided in the Configuration Manual SINAMICS Industrial Cybersecurity (https://support.industry.siemens.com/cs/ww/en/view/109810578) in Chapter "Security settings in Startdrive".

Procedure

The setting "Define the connection to the PLC" is automatically preassigned with "Yes". SINAMICS S210 drives can only be operated together with a PLC. For this reason, this setting cannot be changed.

1. Specify whether motion control is to be executed by the drive or by a connected controller. The controller is set by default. The activated area of the switch is marked blue ( ). Click on the white part of the switch if you wish to change the active setting ( ).
2. If you wish to use Safety Integrated Functions with PROFIsafe, also activate option "Safety Integrated Functions via PROFIsafe".
3. Click on "Next" to display the next quick startup step.

Result

Startdrive defines the default settings of the setup based on what you have specified.

7.6.5 Application

Overview

In the quick startup step "Application", you define in detail in which application area the S210 drive is to be used. You define:

- The control mode of the application
- The motion type of the drive
- Detailed settings for the encoder type of the position control used
- The modulo correction

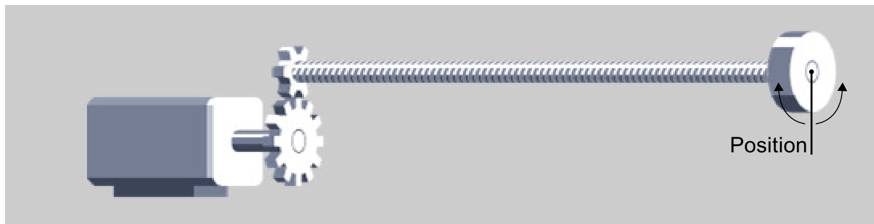
Requirements

- The drive has been completely created and specified in the device configuration.
- In the quick startup step "Connection to PLC", it is defined that the SINAMICS drive executes the motion control.
- With protection activated (UMAC):
  Corresponding function rights of your user account. Details on this topic are provided in the Configuration Manual SINAMICS Industrial Cybersecurity (https://support.industry.siemens.com/cs/ww/en/view/109810578) in Chapter "Security settings in Startdrive".

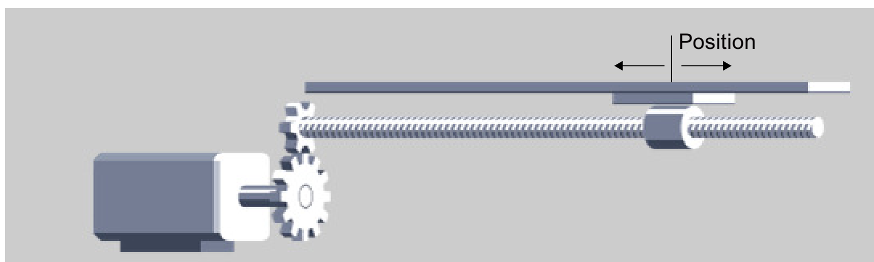
Procedure

As soon as the S210 drive acts as motion control (default setting), speed control is no longer possible, only the "Positioning" control mode.

1. Select the motion type that you wish to use for the drive when positioning.
   - Rotary motion

   - Linear motion

2. Then select the measurement units for position and velocity.
   The length unit "LU" is used in the factory setting. The units that can be set depend on the motion type.
   All values are reset to the default values when changing the measurement unit and the axis type.
3. Select the required encoder in field "Encoder system" (p2502) if 2 encoders are created for the drive.
4. Use the settings for the motor encoder used for the position control:
   - Acquire the number of motor revolutions (p2504) and load revolutions (p2505).
5. If you wish to apply modulo correction:
   - To do this, activate option "Modulo correction activation" (c2577).
   - Define the modulo range (p2576).
6. Click on "Next" to display the next quick startup step.

Result

Startdrive defines the default settings of the setup based on what you have specified. The telegrams that match the selected application area are also preset.

When control mode "Positioning" is activated, then the additional quick startup step "Application settings" is activated. In this step, you define the settings for active homing or for an absolute encoder adjustment.

Note

Alternatively, the "Positioning" control mode can also be activated in the "Function selection" function view.

7.6.6 Limits

7.6.6.1 Limits when closed-loop speed control is activated

Overview

You define the basic properties of the closed-loop drive control using the "Limits" quick startup step.

Designation	Number	Description
Upper speed limit	p1083	Maximum speed for the positive direction. The set value must be less than or equal to the maximum speed (p1082).
Lower speed limit	p1086	Maximum speed for the negative direction. The set value must be less than or equal to the maximum speed (p1082).
Torque limit up-per	p1520	Defines the upper torque limit or torque limit when motoring.
Torque limit low-er	p1521	Defines the lower torque limit or the torque limit when generating
Quick stop Ramp-down time (OFF3)	p1135	The OFF3 ramp-down time is effective from the maximum speed down to the motor standstill.

The limits can be defined online as well as offline.

Note

Displaying the actual motor data

Using button "Display motor data", you can open a dialog window with the same name that displays the actual motor data of your drive.

Requirements

- The motor used in the device configuration of the drive has been completely specified and configured.
- Control mode "Closed-loop speed control" is activated in the quick startup step "Application" Other settings are displayed when "Positioning" is activated.
- For activated user management (UMAC):
  The function rights for configuring in the quick startup are activated for your user role. Details on this topic are provided in the Configuration Manual SINAMICS Industrial Cybersecurity (https://support.industry.siemens.com/cs/ww/en/view/109810578) in Chapter "Security settings in Startdrive".

Procedure

1. When required, adapt the specified default values (see the table above).
2. Click on "Next" to display the next quick startup step.

7.6.6.2 Limits when positioning is active

Overview

The following settings are displayed in quick startup step "Limits" if a basic positioner is used in the drive for positioning. You define the following limits for EPOS in the lower part of the step:

- Traversing profile
  Defines the maximum traversing profile limitation referred to the velocity.
- Ramp-down times
  Defines the maximum ramp-down time referred to the maximum speed.
- Jerk
  Jerk limitation delays the acceleration.
- Position limits
  The traversing range is dynamically limited by the software limit switch, or alternatively, via the hardware limit switch.

Note

Displaying the actual motor data

The actual motor data of the drive are shown in dialog "Show motor data". The dialog can be opened using button "Show motor data". The following values can be configured:

- Supply voltage (p0210).
- Motor ambient temperature (p0613)
- Direction of rotation (p1821)

Requirements

- The motor used in the device configuration has been completely specified and configured. This basic parameterization cannot be performed without complete configuration.
- Control mode "Positioning" is activated in the quick startup step "Application". When "Speed control" is active other settings are displayed.
- With protection activated (UMAC): Corresponding to the function rights of your user account (see Configuration Manual SINAMICS Industrial Cybersecurity (https://support.industry.siemens.com/cs/ww/en/view/109810578) in Chapter "Security settings in Startdrive").

Specifying the maximum traversing profile limitation

1. Correct the specified value in LU for the maximum velocity in the "Max. velocity" field (p2571). The maximum velocity defines the maximum travel velocity [1000 LU/min]. A change immediately limits the velocity of an active traversing block. The "Corresponds to speed" field displays the converted speed, the "Max. speed" field displays the maximum speed. The limitation acts when positioning (jogging, processing the traversing blocks, direct setpoint input, home position approach).
2. Correct the specified value in LU for the acceleration at "Max. acceleration" (p2572). The "Corresponds to ... ramp-up time" field displays the converted ramp-up time.
3. Correct the specified value in LU for the deceleration at "Max. deceleration" (p2573). The "Corresponds to ... ramp-down time" field displays the converted ramp-down time. The maximum acceleration and maximum deceleration specify the maximum acceleration for increasing the velocity and the maximum deceleration for reducing the velocity. Both values act when positioning (jogging, processing the traversing blocks, direct setpoint input, home position approach).
4. Save the settings.

Specifying the ramp-down time in relation to the maximum speed

The velocity, acceleration and deceleration limitation values do not apply for faults or for a safe stop. Instead, the ramp-down times for OFF1 and OFF3 are used. The proposed ramp-down time is displayed in the "Ramp-down time in relation to max. speed" field.

1. If you want to apply this ramp-down time in OFF1, click the "Accept values" button. The ramp-down time is now applied to the "OFF1 ramp-down time" (p1121) field.
2. Enter the required value in field "Ramp-down time (OFF3)" (p1135).
3. Save the settings.

Specifying the maximum jerk limitation

A jerk limitation delays the acceleration. Proceed as follows:

1. Activate option "Jerk limitation". (p2575)
2. Enter a value for the maximum jerk limitation under "Max. jerk" (p2574).
   The converted values for the rounding times are displayed in the fields below the diagram.
3. Save the settings.

Defining position limits

The settings of the position control words and position status words of telegrams 111 or 112 define whether a SW limit switch or a HW limit switch is active.

1. Acquire the values for the negative end position (p2580) and the positive end position (p2581) of the SW limit switch.
   Both values are preassigned with the factory settings.
2. Save the settings.

Result

Startdrive defines the default settings of the setup based on what you have specified. These default settings have an effect on the following EPOS settings in the guided quick startup.

7.6.7 Application settings

7.6.7.1 Fundamentals

Requirements

- The drive has been completely created and specified in the device configuration.
- In the quick startup step "Connection to PLC", it is defined that the SINAMICS drive executes the motion control.
- "Positioning" as control mode is defined in the quick startup step "Application".
- With protection activated (UMAC):
  Corresponding to the function rights of your user account (see Configuration Manual SINAMICS Industrial Cybersecurity (https://support.industry.siemens.com/cs/ww/en/view/109810578) in Chapter "Security settings in Startdrive").

Overview

Make the positioning settings for EPOS in quick startup step "Application settings". The positioning settings listed depend on the defined application area. You can make the following EPOS settings:

- Active homing
- Absolute encoder adjustment

You can make additional EPOS settings via function view "Parameterization". Example:

- Passive homing
- Configuring limits
- Configuring monitoring functions
- Configuring direct setpoint input (MDI)
- Configuring and using traversing blocks
- Jog

In addition, in the same function view you can also see the status of all EPOS functions.

7.6.7.2 Configuring active homing

Overview

With an incremental measuring system, the drive can be homed without requiring a higher-level control. Active homing can be used to traverse to a home position.

The drive itself controls and monitors the homing cycle. There are 3 homing modes for active homing.

Requirements

- The drive has been completely created and specified in the device configuration.
- In the quick startup step "Connection to PLC", it is defined that the SINAMICS drive executes the motion control.
- "Positioning" as control mode is defined in the quick startup step "Application".
- With protection activated (UMAC):
  Corresponding to the function rights of your user account (see Configuration Manual SINAMICS Industrial Cybersecurity (https://support.industry.siemens.com/cs/ww/en/view/109810578) in Chapter "Security settings in Startdrive").

Procedure

In the quick startup step "Application settings", the detailed settings for the homing mode "Active homing" are opened.

1. Optional: If the detailed settings are hidden, expand them with a mouse click.
2. Activate the required homing mode in field "Homing mode selection".

①	Use the encoder zero mark and reference cam
②	Use the encoder zero mark
③	Use the external zero mark via digital input

3. Optional (for ① and ③):
   For home position approach, enter the approach velocity to the reference cam in field "to the reference cam" (p2605).
4. Enter an approach velocity in field "To the zero mark" (p2608).
   For home position approach, this approach velocity is applicable after detecting the reference cam to search for the zero mark.
5. Optional (for ③):
   From drop-down list "Digital input of the external zero mark" (p0494) select the input terminal to connect a zero mark replacement.
   This parameter supplies incorrect measured values during an active measurement. In this particular case, it is not permissible to write to the parameter.
6. Enter the required home position offset for the home position approach in field "Home position offset" (p2600).
7. If you want to perform the adjustment immediately after the home position approach, activate the option of the same name (p2584.3).
8. Click on "Next" if you do not wish to make any additional EPOS settings.
   The quick startup step "I/O configuration" is displayed.

Result

Drive configuration continues based on the selected positioning settings. The approach direction and the home position are specified by the selected telegram.

7.6.7.3 Configuring absolute encoder adjustment

Overview

Absolute encoders must be adjusted during commissioning. When the machine is switched off, the position information of the encoder is retained. The absolute encoder is therefore first adjusted to the home position, e.g. by jogging.

Requirements

- The drive has been completely created and specified in the device configuration.
- In the quick startup step "Connection to PLC", it is defined that the SINAMICS drive executes the motion control.
- Control mode "Positioning" is activated in the quick startup step "Application".
- An online connection to the drive has been established.
- With protection activated (UMAC):
  Corresponding to the function rights of your user account (see Configuration Manual SINAMICS Industrial Cybersecurity (https://support.industry.siemens.com/cs/ww/en/view/109810578) in Chapter "Security settings in Startdrive").

Setting the home position coordinate

1. In quick startup step "Application settings", open the detailed settings for homing mode "Absolute encoder adjustment".
   The absolute encoder adjustment settings are displayed.
2. Optional: Establish an online connection to the drive if an online connection does not already exist.
3. Correct the home position value in the field "Home position coordinate" (p2511).
4. Click on "Set" (p2507 = 2).
   Status display "Home position set" (r2684.11) is then updated. When the adjustment is correct, entry "Absolute encoder adjusted" is displayed in field "Absolute encoder adjustment state".

Resetting the home position coordinate

1. In quick startup step "Application settings", open the detailed settings for homing mode "Absolute encoder adjustment".
   The absolute encoder adjustment settings are displayed.
2. Click on "Reset" (p2507 = 1).
   Status display "Home position set" (r2684.11) is then updated. After the reset, entry "Absolute encoder not adjusted" is displayed in field "Absolute encoder adjustment state".
3. Optional: Then set a new home position coordinate.

Result

Drive configuration continues based on the selected positioning settings. Click on "Next" if you do not wish to make any additional EPOS settings.

The quick startup step "I/O configuration" is displayed.

7.6.8 I/O configuration

Overview

In quick startup step "I/O configuration", make the basic settings for the digital inputs of the drive:

- Digital inputs DI 2 and DI 3
- 2 fast digital inputs (DI 0 and DI 1) as measuring probes for evaluation in the control
- Digital input DI 4 for monitoring the temperature of an optional external braking resistor

The function of the digital inputs DI 0 (≙ activate measuring probe 1) and DI 1 (≙ activate measuring probe 2) is already pre-configured and activated.

Requirement

- The motor used in the device configuration of the drive has been completely specified and configured.
- You do not want to manage the digital inputs via a technology object of the control system.
- For activated user management (UMAC):
  The function rights for configuring in the quick startup are activated for your user role. Details on this topic are provided in the Configuration Manual SINAMICS Industrial Cybersecurity (https://support.industry.siemens.com/cs/ww/en/view/109810578) in Chapter "Security settings in Startdrive".

Procedure

If you are not using any measuring probes, then you can deactivate them manually using the corresponding drop-down lists. However, measuring probes are generally available. The default setting is correct in these cases.

1. Optional: For DI 0 or DI 1, deactivate the measuring probe.
2. In the drop-down list "Activate equivalent zero mark", select whether you wish to use an external zero mark and whether this external zero mark should apply for DI 0 or DI 1.
3. In the drop-down list on the right for DI4, select whether the temperature monitoring of the external braking resistor should be activated or not. Temperature monitoring is deactivated as default setting.
4. Click on the button to the right of "F-DI" if you wish to configure the failsafe digital input. The Safety Function view "Control" then opens. For additional settings, refer to Chapter "Control (Page 416)".
5. Click on "Next" to display the next quick startup step.

7.6.9 Telegrams (only offline)

Overview

The telegrams of the drive were preconfigured by the specifications previously defined in the guided quick startup.

In quick startup step "Telegrams", you can optimize these default settings if this is necessary for your drive.

Requirement

- The motor used in the device configuration of the drive has been completely specified and configured.
- Optionally, a controller (PLC) also can be created in the device configuration and networked with the drive.
- Telegrams can only be configured offline.
- For activated user management (UMAC):
  The function rights for configuring in the quick startup are activated for your user role.
  Details on this topic are provided in the Configuration Manual SINAMICS Industrial Cybersecurity (https://support.industry.siemens.com/cs/ww/en/view/109810578) in Chapter "Security settings in Startdrive".

Procedure

The default telegrams are displayed in the "Telegrams" quick startup area.

1. Select the desired standard telegram from the "Telegram" drop-down list.
2. If you have not yet activated a PROFIsafe telegram in the quick startup area "Connection to PLC", then you can activate a PROFIsafe telegram here. For this purpose, activate the option "Use Safety Integrated Functions via PROFIsafe".
3. If, instead of the suggested PROFIsafe telegram, you wish to use another PROFIsafe telegram, then select the telegram in the "PROFIsafe Telegram" drop-down list.
4. Correct the preset reference speed (p2000) in the field with the same name.
5. Click on icon  "Extended settings" if you wish to optimize the settings of the telegrams used in the telegram configuration.
   The properties of the PROFINET interface are displayed in the inspector window. Make the required settings under "Telegram settings (Page 280)".
6. Switch back to the quick startup step "Telegrams".
7. If you wish to display the PZD interconnection of the telegrams, click on button "PZD interconnections in the send direction" or "PZD interconnections in the receive direction".
8. Click on "Next" to display the next quick startup step.

Result

The telegrams for communication are configured.

7.6.10 Rotating & optimizing

Overview

Optimize the converter online in quick startup step "Rotate & Optimize". To do this, use either the control panel or One Button Tuning (OBT).

Offline, no settings can be made. After an optimization, you can view the corresponding data offline.

Note

Alternatively: Operate the drive from the control panel

If you wish to traverse the drive, click on the "Use control panel" button. Instead of One Button Tuning, the control panel is now displayed in the quick startup step. Proceed as described in the following chapter: "Traversing the drive from the control panel with speed setpoint (Page 284)".

Requirement

- The motor used in the device configuration of the drive has been completely specified and configured.
- Direct optimization required:
  - There is an active online connection between the drive and the operating unit.
  - The editing mode (Page 245) is activated.
- For activated user management (UMAC):
  The function rights for configuring in the quick startup and using the control panel are activated for your user account.
  Details on this topic are provided in the Configuration Manual SINAMICS Industrial Cybersecurity (https://support.industry.siemens.com/cs/ww/en/view/109810578) in Chapter "Security settings in Startdrive".

Procedure

1. If master control is still not active, then under "Master control", click on "Activate" The "Activate master control" message window is opened. Make the required settings there and then click on "OK".
2. Choose the dynamic response setting for the OBT based on the mechanical system of your machine.
   The OBT optimizes the drive based on the selected dynamic response setting.
   - Conservative
     Slow closed-loop speed control – low mechanical load.
   - Standard
     Best compromise between fast closed-loop speed control and low mechanical load.
   - Dynamic
     Fast speed control – high mechanical load.

3. In the "Distance limit" field, enter the angle through which the motor and the connected machine are permitted to turn for the required measurements (e.g. 360°) without the mechanical system being damaged.
   The angle should be at least 60° in order to determine useful controller parameters. Longer traversing distances result in better optimization results.
4. If you want to perform extended settings, click on the "Extended settings" button.
   The "Machine property" dialog opens. You obtain information about the conditions under which you can increase the speed control dynamic performance. If you wish to increase the dynamic response, activate option "Set the current setpoint filter with loop compensation".
5. Start the OBT.
   – Check the optimization results.
   – Deactivate the master control.

   The individual steps are described in detail in Chapter "Perform One Button Tuning (Page 286)".
6. Click on "Next" to display the next quick startup step.

Result

The result of the optimization is displayed in the "Status" area. If optimization was successful, the appropriate LED lights up green. The "Optimization result" list compares the settings changed by the optimization with the earlier settings prior to optimization.

If optimization was not successful, repeat the optimization, possibly with modified data.

7.6.11 Overview (offline)

Overview

After completing the commissioning steps in the guided quick startup, here, you will find a compilation of all settings that were made offline.

If necessary, you can load the settings made offline from the overview into the device.

Requirement

- The drive has been completely created and specified in the device configuration.
- For activated user management (UMAC):
  The function rights for configuring in the quick startup are activated for your user account. Details on this topic are provided in the Configuration Manual SINAMICS Industrial Cybersecurity (https://support.industry.siemens.com/cs/ww/en/view/109810578) in Chapter "Security settings in Startdrive".

Optional: Downloading project data to the device

1. In function view "Overview", click on "Download".
   To transfer the protected project data, you must log into the device with your user data.
2. Proceed as described in Chapter "Loading project data into the drive (Page 210)".

7.6.12 (Online) overview

Overview

After completing the commissioning steps in the guided quick startup, here, you will find a compilation of all settings that were made online. You can sort and export the corresponding information or also compare it with the factory settings.

Requirement

- The drive has been completely created and specified in the device configuration.
- There is an active online connection between the drive and the operating unit.
- The online configuration was completed.
- For activated user management (UMAC):
  The function rights for configuring in the quick startup are activated for your user account. Details on this topic are provided in the Configuration Manual SINAMICS Industrial Cybersecurity (https://support.industry.siemens.com/cs/ww/en/view/109810578) in Chapter "Security settings in Startdrive".

Optional: Uploading project data from the device

1. After the online commissioning has been completed, if you want to transfer the current project data into the TIA project of your operating unit, click on "Finish".
   Icon (Upload from device) is subsequently displayed in function view "Overview".
2. Click on icon  (Upload from device).
3. Proceed as described in the following chapter: "Loading data from the drive into the project (Page 209)".

7.7 Configuring the converter

7.7.1 Fundamentals

Overview

After carrying out the basic configuration of devices in the project, make the extended settings for commissioning.

The following areas are provided in display area "Parameterization":

- **Basic parameter assignment**
  Here you can view the preassigned basic parameters of the converter, and if necessary you can change individual values. If the motor brake is available, then you can also set that this brake is forced open.
- **Inputs/outputs**
  Here you can configure the digital inputs of the converter.
- **Safety Integrated**
  Here, you can activate and configure the available safety functions.

Note

Guided quick startup

You can also easily configure the settings of the basic parameterization and the digital inputs using the guided quick startup.

Details are contained in Chapter "Carrying out guided quick startup (Page 242)".

Note

Telegram configuration

You configure the telegrams used in the drive configuration in the inspector window in the telegram configuration. The most important settings are listed in Chapter "Configuring telegrams (Page 280)".

7.7.2 Carry out the basic parameterization

Overview

You can parameterize the most important operating parameters in the basic setting.

These include:

- Device supply voltage
- Direction of rotation
- Forced opening of the brake
  Only if the motor being used is equipped with a holding brake.

Note

Basic parameterization is also possible online

For the S210 control module, basic parameterization is possible both offline and online.

Requirement

- The drive has been completely created and completely specified in the device configuration.
- For activated user management (UMAC):
  The function rights required to read the drive data are activated for your user account. Details on this topic are provided in the Configuration Manual SINAMICS Industrial Cybersecurity (https://support.industry.siemens.com/cs/ww/en/view/109810578) in Chapter "Security settings in Startdrive".

Procedure

1. The device supply voltage is preset and depends on the selected drive version.
   If you wish to specify a different line voltage, correct the specified line voltage in the input field with the same name (p0210).
2. The motor ambient temperature is preassigned with 40 °C. Correct the value in input field "Motor ambient temperature" (p0613) if a different ambient temperature prevails.
   Based on the motor ambient temperature, the underlying temperature model calculates the thermal motor utilization.
3. The last set motor direction of rotation is displayed in the drop-down list "Direction of rotation" (p1821[0]). If you wish to set the opposite direction of rotation, select the required direction of rotation from the drop-down list:
   – [0] clockwise
   – [1] counterclockwise
4. If you use control mode "Closed-loop speed control", when required change the default limits (see Chapter "Basic parameterization/limitations (Page 264)").
5. Then save the project to accept the settings.

Activating/deactivating forced opening of the brake

If the motor being used has a standard motor holding brake, then you can activate forced opening of the brake.

As default setting, a motor holding brake in an S210 drive is controlled depending on the operating state of the drive. When the pulses are canceled the brake automatically closes.

You can change this default setting, and instead, activate forced opening of the brake. The motor holding brake is then always opened.

1. Click on button "Force open brake" (p1215 = 2).
   The motor holding brake is now permanently opened.
2. If you wish to reactivate the motor holding brake, click on button "End forced opening of brake".

7.7.3 Basic parameterization/limitations

Overview

You can parameterize the most important operating parameters in the basic settings in the "Limitations" area. These include:

- Speed limit
- Torque limit
- Ramp-down times (following an OFF1 command and for a fast stop OFF3)

Requirements

- The drive has been completely created and completely specified in the device configuration.
- The "Speed control" control method is active.
  When "Positioning" is active as method of control, then the speed control limits are not displayed in the basic parameterization.
- With protection activated (UMAC):
  Corresponding function rights of your user account (see Industrial Cybersecurity Configuration Manual (https://support.industry.siemens.com/cs/ww/en/view/109810578))

Procedure

1. The positive and negative speed limits are preassigned.
   If you want to change this pre-assignment, correct the values in the "Positive speed limit " (p1083[0]) or "Negative speed limit" fields (p1086[0]).
2. If you want to define the fixed upper or motor torque limit, enter an appropriate value in the "Torque limit upper" field (p1520[0]).
3. If you want to define the fixed lower torque limit or torque limit when generating, enter an appropriate value in the "Torque limit lower" field (p1521[0]).
4. A ramp-down time in which the speed setpoint is ramped down from maximum speed to standstill following an OFF3 can be specified for the down ramp.
   In this case, enter a ramp-down time in the "Quick stop (OFF3 ramp-down time)" field (p1135).
5. Then save the project to accept the settings.

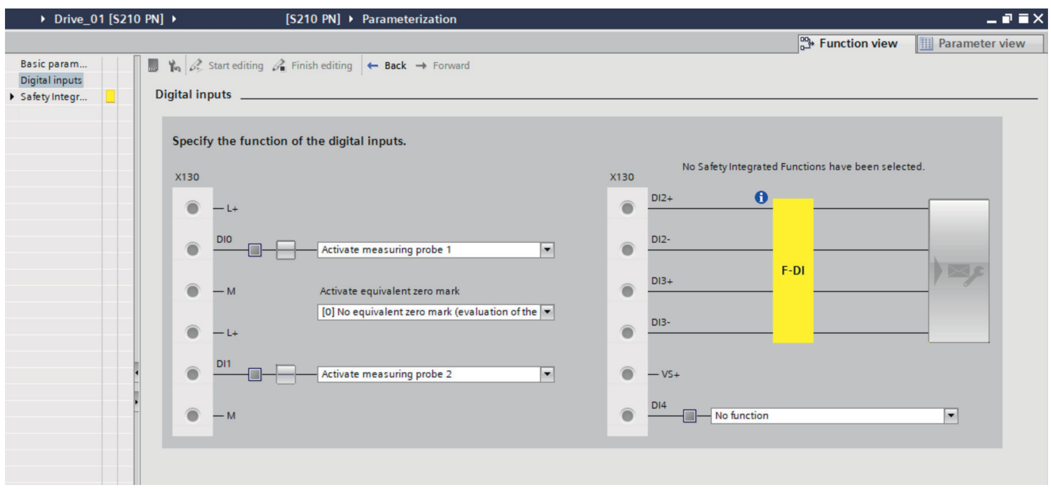
Result

Startdrive defines the default settings of the setup based on what you have specified.

7.7.4 Configuring digital inputs via technology object

Pre-assignment of the digital inputs DI 0, DI 1 and DI 4

The function of the digital inputs DI 0 (≙ activate measuring probe 1) and DI 1 (≙ activate measuring probe 2) is already pre-configured and activated.



Requirement

- The drive has been completely created and completely specified in the device configuration.
- For activated user management (UMAC):
  The function rights required to edit the drive data are activated for your user role.
  Details on this topic are provided in the Configuration Manual SINAMICS Industrial Cybersecurity (https://support.industry.siemens.com/cs/ww/en/view/109810578) in Chapter "Security settings in Startdrive".

Procedure

If you are not using any measuring probes, then you can deactivate them manually using the corresponding drop-down lists. However, measuring probes are generally available. The default setting is correct in these cases.

1. In the drop-down list "Activate equivalent zero mark", select whether you wish to use an external zero mark and whether this external zero mark should apply for DI 0 or DI 1.
2. In drop-down list "Activate overtemperature monitoring for external braking resistor", select whether the temperature monitoring of the external braking resistor should be activated or not.

3. Click on the button to the right of "F-DI" if you wish to configure the failsafe digital input. The safety interconnection screen form "Control" then opens. For additional settings, refer to Chapter "Control (Page 416)".
4. Then save the project to apply the settings.

7.7.4.1 Configuring a measuring probe using the technology object

Requirement

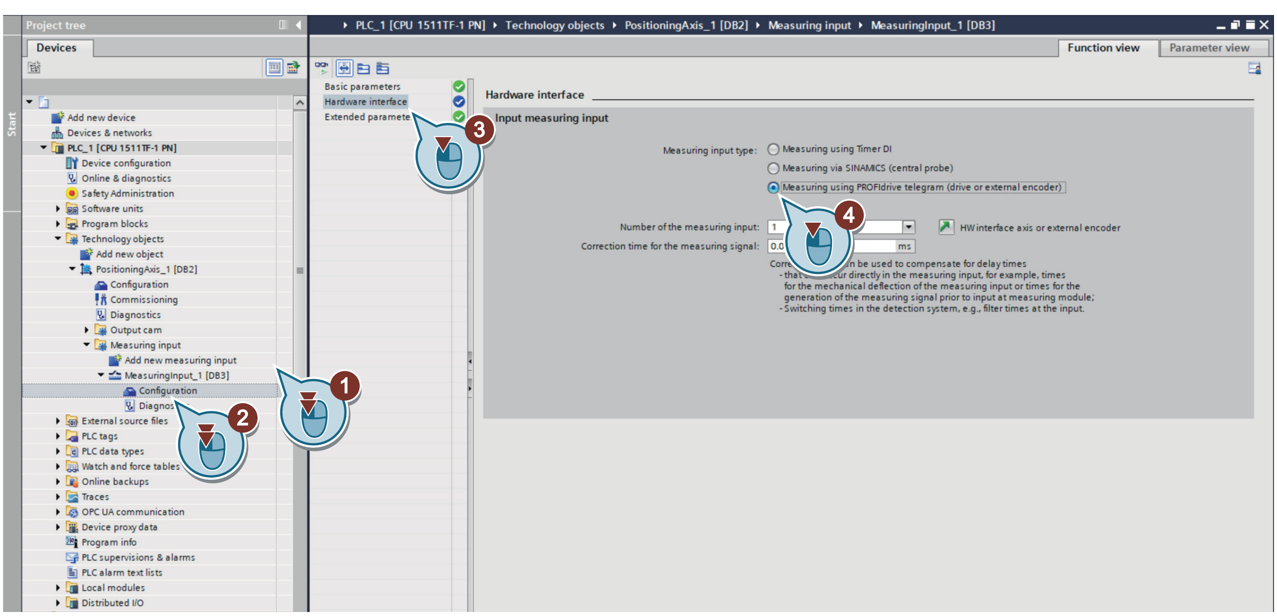
- The project includes a control system, and is connected to the converter.
- A technology object "PositioningAxis_1" is created for the control system and is active.

Procedure

If you want to configure the measuring probes for the digital inputs of the drive using technology objects, proceed as follows:

1. In the project tree, expand the follow entries in the order specified below:
   - Technology objects
   - PositioningAxis_1
   - Measuring probes

   The "Add new measuring probe" entry is displayed.
2. Double-click the "Add new measuring probe" entry ①.
   A new measuring probe is created and additional functions are displayed.



3. Double-click the "Configuration" entry ②.
   The corresponding function view opens in the device view.

4. Click the "Hardware interface" option ③ in the secondary navigation.
   The corresponding function view is displayed.
5. Select the measuring probe type "Measuring using PROFIdrive telegram (drive or external encoder)" ④.
   A measuring probe of the type "Measuring using PROFIdrive telegram (drive or external encoder)" is created.
   You can configure a maximum of 2 measuring probes to an actual value or an encoder. For the measurement, only one measuring probe can be active.
6. To correct the measuring time point, set a correction time.

Result

A measuring probe of the type "Measuring using PROFIdrive telegram (drive or external encoder)" is created and can be used.

7.7.5 Safety Integrated

7.7.5.1 Fundamentals for Safety Integrated commissioning

Overview

Commissioning the Safety Integrated Functions of the converter includes the following configurations:

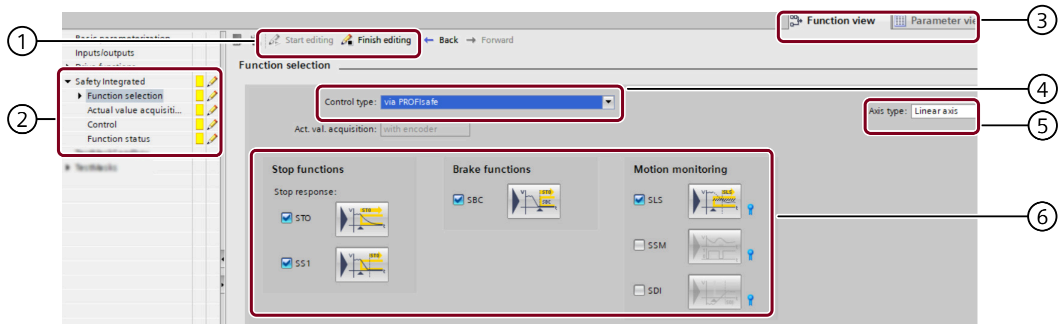
- Function selection
- Parameterizing the functions as required for the application
- Control of the functions

Requirement

The converter is completely created in the device configuration.

You have the function rights necessary for changing Safety Integrated settings.

Function description



① Editing mode
② Secondary navigation
③ Function view / Parameter view
④ Control type
⑤ Axis type
⑥ Function selection

Figure 7-8 Overview of Safety Integrated commissioning (example)

Changes to Safety Integrated settings are only possible in the Safety Integrated editing mode. The activated user management protects against unauthorized changes to Safety Integrated settings. When starting the editing mode, Startdrive checks whether the security rights required are available.

Commissioning steps

- Function selection:
  - Selecting the Safety Integrated control type
  - Selecting the axis type
    When switching over the axis type, the units are changed.
  - Selecting the available Safety Integrated Functions depending on the control type
    The stop responses (STO and SS1) shown in the function selection must always be parameterized. The reason is that the stop responses must stop the motor in the case of a fault and for a limit value violation. If you also want the functions to be controlled via PROFIsafe and/or F-DI, then an additional enable is required through appropriate selection.
    The selection enables the function. The enabled function then appears in the secondary navigation as a subpoint of the function selection.
  - License symbol
    The license symbol shows the Safety Integrated Functions that require a Safety Extended license. For test purposes, there is a Trial License mode for Safety Integrated.
- Parameterization of the enabled Safety Integrated Functions
  - Function-dependent display of the converter parameters
    A function view is offered for every enabled Safety Integrated Function. The function view of the particular function is available in the drop-down list for function selection in the secondary navigation. The function view shows a graphic and the important setting parameters. If additional parameters must be set/observed for the particular function, it is necessary to switch to parameter view. Parameter view has two views: "Standard" and "Extended". Different parameters appear depending on whether the "Standard" view or "Extended" view is selected.
    Changes in the parameter view become effective after the editing mode is ended in the function view.
  - Actual value acquisition/mechanical system
    The actual value acquisition/mechanical system can be viewed if Safety Integrated motion monitoring functions were activated.

- Parameterization of the selected control type
  The parameterization of the control type determines the settings for PROFIsafe and the failsafe digital input (F-DI).
- Function status
  The function status shows the following values:
  – Function status of the enabled functions

Display	Function status
	Function is active
	Function is not active

Safety Integrated Function status of an enabled function

  – Status of Safety Integrated in the device
  – Checksums
    Offline: Shows the checksums calculated when Safety Integrated commissioning was completed.
    Online: Shows the current status of all configured Safety Integrated Functions as well as the checksums calculated when Safety Integrated commissioning was completed.
  – Software versions in the converter

Navigation tips

The secondary navigation of the parameterization can be used to navigate between the various commissioning steps.

Alternatively, "Next" and "Back" buttons are available at the lower edge of the screen form.

More information

For detailed information, see Chapter "Safety Integrated (Page 362)".

7.7.5.2 Starting/exiting Safety Integrated editing mode

Overview

You must start the editing mode in order to make changes to the Safety Integrated settings. This applies to both offline and online configurations.

The system behaves differently depending on whether you are working online or offline.

Requirement

The converter is completely created in the device configuration.

Procedure

1. Click on Start editing to activate editing mode.
   If you are working online: If the current Safety Integrated settings deviate from the factory settings, you will be prompted to select which basis you want to use for the configuration:
   – Based on the current settings
   – Based on the factory settings

   If you are working offline, this prompt does not appear.
2. Click on Finish editing to exit the editing mode.
   If you are working online: The checksums are calculated for the parameterization carried out, and saved directly in the converter. This activates the parameterization, and can be executed at the machine.
   If you are working offline: The checksums are calculated for the parameterization carried out, and saved in the project.

Note

Loss of settings if commissioning is canceled in the online configuration

If you do not close editing mode with "Finish editing", the following applies:

You can discard the Safety Integrated settings made using the "Cancel" button. As a result, the Safety Integrated settings from before editing mode was started are restored.

7.7.5.3 Permanently saving Safety Integrated parameterization

Requirement

You have configured the Safety Integrated commissioning or made changes to the parameterization.

You are in the online configuration.

Procedure

Proceed as follows to permanently save the Safety Integrated parameterization:

1. Exit the editing mode.
2. To save the Safety Integrated parameters permanently in the drive, retentive saving is necessary.
   In the toolbar of the function view, click on the icon .
3. Observe the messages in the diagnostics window.

4. Restart the system if necessary.
5. Then establish consistency between the drive and Startdrive project:
   – Load the settings from the drive into the Startdrive project. To do this, click the icon .
   – Click on button "Go offline" to terminate the online connection.
   – Save the Startdrive project.

7.7.5.4 Security for Safety Integrated

Overview

Only authorized and authenticated personnel may change Safety Integrated settings. You protect these settings using the project protection and the user management (UMAC) of the Totally Integrated Automation Portal (TIA Portal).

Function description

It is possible to create specific users and roles in the user management of the TIA Portal. Based on the assigned function rights, users are authorized to make changes to the settings in Safety Integrated Functions.

The following roles can make changes in Safety Integrated without the need to modify other settings:

- Drive Safety Engineer
- Engineering Administrator

The system checks the UMAC status before each change to the Safety Integrated settings. An fault message is displayed if function rights are not available or authentication is not possible.

More information

More detailed information is provided in the Configuration Manual "SINAMICS Industrial Cybersecurity (https://support.industry.siemens.com/cs/ww/en/view/109810578)" in Chapter "Security settings in Startdrive".

7.7.6 Perform Safety Integrated acceptance test

7.7.6.1 Acceptance test - notes

Note

Conditions for the acceptance test

As far as possible, the acceptance tests are to be carried out at the maximum possible machine speed and acceleration rates to determine the maximum braking distances and braking times that can be expected.

Note

Acceptance test for Safety Integrated Functions

In the function selection, the Safety Integrated acceptance test offers you the testable functions for selection, depending on the device type and its settings.

Note

Trace recordings

Trace recordings are used to analyze the machine response during a test run. Based on the signal characteristics, a check can be made as to whether the machine response corresponds to the expectations of the test engineer. The recorded signals can be used to evaluate delay times and over-travel distances, for example. The trace recordings are automatically parameterized and performed by the tool.

Note

Non-critical alarms

When evaluating the alarm buffer you can tolerate the following alarms:

- A01699 SI: Test brake output necessary
  This alarm occurs after the time in p9659 has expired.

You do not need to include these alarms in the acceptance report.

Note

No acceptance test with alarm A01796

If the alarm A01796 is active, the pulses are safely canceled, and an acceptance test is not possible.

Note

Consistency between the offline project and drive

The acceptance test is performed after commissioning has been completed. After this, it is no longer permissible that any parameters are changed in the drive.

If the S210 was commissioned online: Before the acceptance test, upload the drive to establish consistency between the offline project and the drive. This means that all checksums are consistent.

The results of the acceptance test are saved in the project.

Without additional changes to the project or to the drive parameterization, all checksums are kept unchanged.

A change to the checksums should be taken into consideration in the following cases:

- If the drive parameterization (offline or online) is changed after performing the acceptance test, then the functional checksums are changed.
- If drive components are replaced, then the hardware-specific checksums are changed.

After any changes, the acceptance test (complete or partial) must be performed again. Recommendations are described in the drive documentation.

The Safety Integrated acceptance test report can be exported at any time. When doing this, a check is not made as to whether the project is consistent between offline and online.

For the final documentation of the acceptance report, ensure that there are no inconsistencies in the system.

Note

Startdrive supports the consistency check

The consistency check in Startdrive is performed automatically and permanently online. The result of the consistency check is shown as an icon next to the acceptance test in the secondary navigation.

The following states are displayed:

: The online and offline comparison values are identical.

: The online and offline comparison values are different. The consistency between the offline project and the drive must be established using "Download to device" or "Upload from device".

: An error occurred during the consistency check.

7.7.6.2 Acceptance test - overview

Overview

The Safety Integrated acceptance test wizard supports you when running through the acceptance test.

Description of function

The wizard provides the following support:

- The wizard guides you step-by-step through the acceptance tests for the individual Safety Integrated Functions.
- The wizard explicitly asks you for the entries and actions that you must go through.
- The wizard creates the trace recordings needed for analyzing the machine behavior during the tests.
- The wizard creates the required acceptance report.

7.7.6.3 Preparing the acceptance test

Requirement

- There is an active online connection between the drive and the operating unit.
- The drives to be tested are fully configured and operational.
  A subsequent change means that a new acceptance test must be performed.
- For active user management (UMAC): You have the required function rights for Safety Integrated.

Procedure

Proceed as follows to prepare for the acceptance test:

1. Click "Acceptance test" in the project tree.
2. Select all Safety Integrated Functions to be tested for the desired drive in the secondary navigation.
   The active functions are automatically preselected. Depending on the specific requirement, change this preselection and either select or deselect functions.
3. To define the function selection for the Safety Integrated acceptance test, click "Apply".
   Entries are displayed in the secondary navigation for the functions to be tested. Navigate with these settings to the individual tests.

Optional: Resetting test results

1. To delete all tests performed for this drive so far, click the "Reset test results" button.
   As a consequence, the initial state is restored. New acceptance tests are possible before the initial state.

7.7.6.4 Performing the acceptance test (example)

Overview

After accepting the function selection in step "Prepare acceptance test", the functions to be tested are displayed in the secondary navigation. Work through the tests from top to bottom or in any order.

The status of the individual tests is shown as follows:

- Blue: The test for this function has still not been performed.
- Green: The test was successfully performed.
- Red: The test was canceled with an error. The test can be repeated by preselecting the function.

The guided wizards have the same distribution for each acceptance test. The workflow, which represents the individual test steps and their state, is located in the upper area.

These states have the following meaning:

- Blue: Active test step
- Green: Test step completed

The instructions for the various steps of the acceptance test are displayed in the area below the workflow.

Requirement

- The drive has been completely created and specified in the device configuration.
- The Safety Integrated Functions of the selected drive have been completely configured.
- There is an active online connection between the drive and operating unit. The project data in the project and drive are consistent.
- For active user management (UMAC): You have the required function rights for Safety Integrated.

Procedure

Proceed as follows to execute each acceptance test:

1. Click on a Safety Integrated Function to be tested.
2. Enter a test designation. This designation also appears later in the acceptance report.
3. Change the trace settings for this test or use the default settings.
   The preassignment is appropriate for the majority of applications. By changing the trace settings, you adapt the test to the mechanical conditions of the machine. Example: The mechanical system of the axis has a very high moment of inertia. As a consequence, longer ramp times are required for accelerating and braking.
4. Once you have completed all the preparations, click on "Start test".
   The wizard for the selected test opens.
5. Comply with the safety instructions and notes on the pages of the function view of the acceptance test wizard until the test has been (successfully) completed.
6. Follow the instructions and click on "Next".
7. Exit the acceptance test via "Finish".

Result

You can see the test status in the secondary navigation.

Note

Acceptance test canceled

If you open another window during the acceptance test, the acceptance test is canceled and is marked as "failed" in the acceptance report.

Remedy:

- Open the other window with function "Unpin" as separate window. Using "Embed", you reintegrate the separate window at a later point in time.

7.7.6.5 Completing the acceptance test with report

Overview

The overview under "Create report" lists all drives and their current test status.

You have the option of creating the acceptance report at any time. For example, intermediate states can be documented, even though some tests are still open or were ended with errors.

Requirement

- For active user management (UMAC): You have the required function rights.
- For a final acceptance report: You have successfully completed all acceptance tests. All tests are marked positive with a green checkmark.

Procedure

Proceed as follows to create an acceptance report:

1. In the "Completion" screen form, select the drives for which you wish to create a report.
   The drive instances to which the results were transferred are also displayed in the list as subentries that can be opened. These drive instances are always included in the acceptance report with the selection of the respective main drive.
2. Click on "Create".
   The "Save As..." dialog is displayed.
   - When selecting a drive, the file name of the acceptance report is preassigned the drive designation as default setting.
   - When selecting several drives, a dialog is displayed to select the directory where the report is saved. For each selected drive, a report is saved with the name of the drive.
3. Depending on the specific requirement, enter the file name of the report.
4. Click on "Save".

Optional: Creating a function table

You can use the function table to create a user-defined overview that is documented in the acceptance report in addition to the results of the acceptance test.

Table 7-1 Function table

Column	Explanation
Operating mode	Select one of the specified operating modes from the drop-down list to map the required scenario.
Description	Enter an explanatory comment for the selected operating mode.
Protective device	Select the applied protection mechanism from the drop-down list.
Version	Enter an explanatory comment on the protective device being used.
Axis	Select the relevant drive from the drop-down list.
Monitoring	Select the safety function being used from the drop-down list.

Result

The acceptance report is created as table in the "xlsx" format. You can open the report in Microsoft Excel as well as in other spreadsheet programs (e.g. LibreOffice).

The report is in the form of several individual tables:

- Cover page: Introduction with the machine description
- Drive_x - overview: Documentation of parameters for this drive
- Drive_x - function test: Documentation of all test data and traces for this drive
  Test status color coding:
  - Red: Failed
  - Yellow: Not tested
  - Green: Test successful
- Completion: Summary and signatures

Note

Correct display of the acceptance report

How the acceptance report is actually displayed, depends on Microsoft Windows and the spreadsheet program used.

- Microsoft Excel
  If the following is configured in the display settings of Microsoft Windows, then the display of the report is correct:
  Control Panel > Appearance and Personalization > Display > Make text and other items larger or smaller > Option "Smaller – 100%"
- LibreOffice
  The display of the acceptance report is independent of Microsoft Windows and is always correct.

7.7.6.6 Transferring acceptance test results

Overview

To simplify additional acceptance tests, transfer the results of successfully performed tests to drives with the same functionality.

Requirement

- You have successfully performed the acceptance tests.
- For active user management (UMAC): You have the required function rights.

Procedure

Proceed as follows to transfer the results of an acceptance test:

1. Open the page of function view "Result transfer" for a drive for which you have successfully completed the acceptance test.
2. Click on "Determine" to determine suitable drives.
   - After initial determination, the button changes to "Refresh".
   - The acceptance test wizard lists all of the drives that could be involved.
3. Select the drives to which you want to transfer the results.
   The selected drives become instances of the tested drive.
4. Click on "Apply".
   The transfer status is displayed in the function view.
5. You disconnect instances from the tested drive using "Deselect" and "Apply".

7.7.6.7 Optional acceptance test functions

Overview

Startdrive provides additional functions for the acceptance test. More details on these functions can be found in the TIA Portal information system.

Description of function

Safety Activation Test

You test the control signals in the automation topology using the "Safety Activation Test".

The "Safety Activation Test" tests the following:

- Is the defined signal path correctly run through from the sensor through the evaluation up to the drive and/or actuator?
- Are there wiring errors or other errors present?

You can use the acceptance test to test the Safety Integrated Functions in the SINAMICS drive for proper parameterization.

Test cases that define the input conditions (system states) and the expected system responses are defined for this purpose. Wizards are available for the tests. The results of the acceptance test are included in the acceptance report.

User-defined texts

You describe the instructions of the individual test steps together with the terminology using user-defined texts. Align the operating instructions to address the specific operation of your machine. A screen form shows the instruction texts for the individual steps of all test cases. These are marked with the "System" description.

Depending on the specific requirement, either filter the test cases of the current drive or the sum of all test cases for the drives in the project.

Multiuser Engineering

The acceptance test is possible in the multi-user engineering. The following individual functions are available:

- The acceptance test for an axis is performed in a local session, and is checked into the test results of the server session.
  In the server session, the potentially available test results of this axis are overwritten with the results from the local session.
- The "Safety Activation Test" for a drive is performed in a local session and is checked into the test results of the server session.
  In the server session, test results potentially available for this drive are overwritten with the results from the local session.

7.7.7 Configuring telegrams

7.7.7.1 Calling the telegram configuration

Overview

The "Telegram configuration" function is part of the device configuration, and is displayed in the inspector window.

You can either call this function via the project tree or for Startdrive S drives, also via direct links from the communication screen forms.

Information about the telegrams used in the converter is provided in Chapter "PROFINET communication (Page 317)".

Requirement

- The drive has been completely created and specified in the device configuration.
- The offline mode is activated.
- For activated user management (UMAC):
  The function rights required to configure telegrams in the inspector window are activated for your user role.
  Details on this topic are provided in the Configuration Manual SINAMICS Industrial Cybersecurity (https://support.industry.siemens.com/cs/ww/en/view/109810578) in Chapter "Security settings in Startdrive".

Procedure

1. Open the drive in the project tree and double-click on entry "Device configuration".
   The device configuration opens.
2. Select the S210 drive in the device configuration.
3. Select the entry "Telegram configuration" in the "Properties" tab of the inspector window.
   The settings for the telegram configuration are displayed below the respective fieldbus interface.

7.7.7.2 Telegram settings

Overview

The dialog box for the telegram configuration is structured as follows:

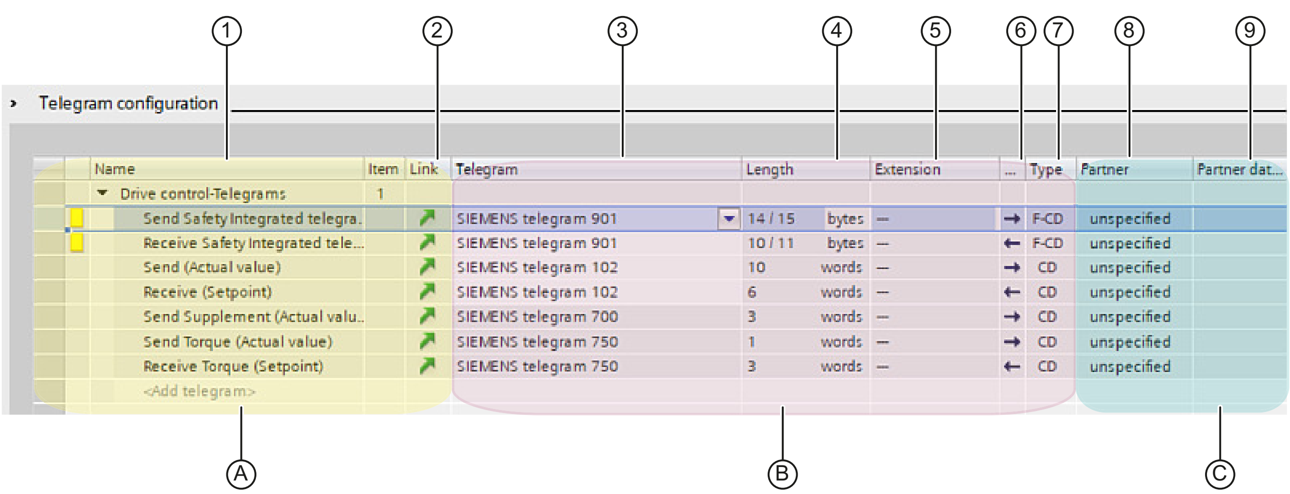


Figure 7-9 Telegram configuration

Number	Description
A	Area for drive objects (setpoints, actual values and safety components)
B	Area for the interfaces
C	Area for the communication partners of the drive (e.g. controller or another drive)

Number	Description	
①	Drive object display	
②	Link to the communication screen forms of the particular drive object	
③	Drop-down list with the available telegrams	
④	Length of the telegram	
⑤	Telegram extension	
⑥	Communication direction (send direction → /receive direction ←)	
⑦	Type of communication	
		CD = Controller - Device for PROFINET IO
		F_ = PROFIsafe-specific extension (safety telegram)
⑧	Name of the partner (controller)	
⑨	Partner data area	

More information

Detailed information on configuring telegrams is also provided in the TIA Portal information system.

7.7.7.3 Adding telegrams

Overview

You can add the following telegrams once, as long as they are still not available in the telegram list of the drive object:

- PROFIsafe telegram
- Supplementary telegram

Requirement

- A drive and a partner are created in the project, and connected via a fieldbus. The drive is selected and the parameter editor is open.
- For activated user management (UMAC):
  The function rights required to configure telegrams in the inspector window are activated for your user role.
  Details on this topic are provided in the Configuration Manual SINAMICS Industrial Cybersecurity (https://support.industry.siemens.com/cs/ww/en/view/109810578) in Chapter "Security settings in Startdrive".

Procedure

To add a telegram, proceed as follows:

1. Open the following menu path from the secondary navigation of the inspector window: "Properties > PROFINET interface > Telegram configuration".
2. Click on entry "Add telegram" (at the required drive object).
A drop-down list opens. All telegram types that have not been assigned yet can be used.
3. Select the required telegram type.
The entries for the telegram are created.
4. If required, now change the telegram type.
5. Save the project.

Result

Telegram is added.

7.8 Optimizing commissioning

7.8.1 Establishing online connection

Overview

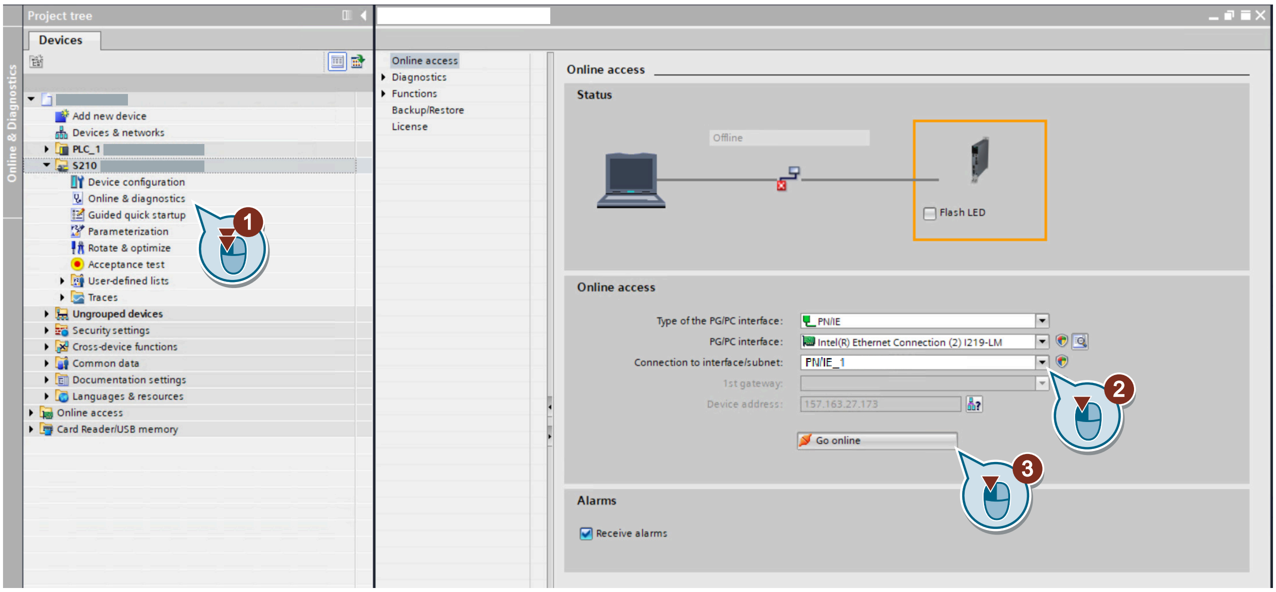
Before you traverse your drive from the control panel or optimize the axis, you need to establish an online connection to the drive.

Requirement

- The configuration is loaded into the SIMATIC S7 controller.
The drive can therefore be accessed in the PROFINET network via the SIMATIC S7 controller and your operating unit is connected to the corresponding PROFINET interface of the controller (e.g. X1).
- For activated user management (UMAC):
The function rights required to edit the drive data are activated for your user account. Details on this topic are provided in the Configuration Manual SINAMICS Industrial Cybersecurity (https://support.industry.siemens.com/cs/ww/en/view/109810578) in Chapter "Security settings in Startdrive".

Procedure

1. In the project navigation, under the S210 drive, double-click on entry "Online & diagnostics". The "Online access" function view is displayed.



2. Select the PROFINET network in the "Connection with interface/subnet" drop-down list.
3. Click the "Go online" button.

Result

The online connection to the drive is established.

7.8.2 Traversing the drive from the control panel with speed setpoint

Overview

Traverse the drive from the control panel and test the settings made. The control panel can only be activated for one drive.

By activating the control panel, you assume master control of the drive. Although all enable signals are removed before returning the master control, the setpoints and commands still come from the original parameterized sources after the master control is returned.

WARNING

Risk of death if the safety instructions for the control panel are not carefully complied with

The safety shutdowns from the higher-level controller have no effect with this function. The **Stop with space bar** function is not guaranteed in all operating states. Incorrect operation by untrained personnel – without taking into account the appropriate safety instructions – can therefore result in death or severe injury.

- Make sure that this function is only used for commissioning, diagnostic and service purposes.
- Make sure that this function is only used by trained and authorized skilled personnel.
- Ensure that EMERGENCY OFF circuit is always implemented as hardware circuit.

Note

Drive responds immediately

Although all enable signals are removed before returning the master control, the setpoints and commands still come from the original parameterized sources after the master control is returned.

Requirement

- The drive has been completely created and specified in the device configuration.
- There is an active online connection between the drive and the operating unit.
- Display area "Rotate & Optimize" was opened via the project tree.
- For activated user management (UMAC):
  The function rights required to edit the drive data and to use the control panel are activated for your user account.
  Details on this topic are provided in the Configuration Manual SINAMICS Industrial Cybersecurity (https://support.industry.siemens.com/cs/ww/en/view/109810578) in Chapter "Security settings in Startdrive".

Procedure

You can traverse the drive using both the control panel of the technology object and the control panel of the drive itself.

Proceed as follows to traverse the drive from the control panel of the drive:

1. Select the "Control panel" function in the secondary navigation.
   The corresponding function view is displayed.
2. Click the "Activate" button to enable master control for the drive.
   The "Activate master control" message window is displayed.

3. Read the alarms carefully and check the value for the monitoring time.
   The monitoring time specifies the time during which the connection from your operating unit to the drive is cyclically monitored. The monitoring time is preset to 2000 ms and should only be changed if required.
4. Confirm the monitoring time with "OK".
   The message window closes and the control panel is enabled. The drive enables are set automatically.
5. In the "Speed" input field, enter a value ≤ the maximum speed.
6. Traverse the drive in the desired direction using the controller buttons.
7. Click the "Deactivate" button to disable master control.
   The "Deactivate master control" dialog window is displayed.
8. Confirm deactivation of master control with "Yes".

Result

The current values of various parameters are displayed under "Actual values". Enables and faults are displayed under "Drive status". In addition to "Active fault", the currently pending fault is displayed.

7.8.3 Perform One Button Tuning

Overview

For One Button Tuning (OBT), the mechanical drive train is measured using short test signals. This means that you optimally adapt the controller parameters to the mechanical system being used. Using this optimization routine, you can determine the optimum controller settings with just a few entries.

Requirement

- The drive has been completely created and specified in the device configuration.
- There is an active online connection between the drive and the operating unit.
- Display area "Rotate & Optimize" was opened via the project tree.
- For activated user management (UMAC):
  The function rights required to edit the drive data and to use the control panel are activated for your user account.
  Details on this topic are provided in the Configuration Manual SINAMICS Industrial Cybersecurity (https://support.industry.siemens.com/cs/ww/en/view/109810578) in Chapter "Security settings in Startdrive".

Procedure

1. Select the "One Button Tuning" function in the secondary navigation.
   The corresponding function view is displayed.
2. Select the desired setting (e.g. "Conservative") in the "Dynamic settings" area.
   The "Standard" setting is selected by default.
3. Enter a value (e.g. 360) in the input field "Path limit from 0° to".
   Sensible controller parameters are obtained from an angle > 90°.
4. Confirm the entry with "Enter".
   The error icon is then hidden.
5. Click the "Activate" button to enable master control for the drive.
   The "Activate master control" message window is displayed.
6. Read the alarms carefully and check the value for the monitoring time.
   The monitoring time specifies the time during which the connection from your operating unit to the drive is cyclically monitored. The monitoring time is preset to 2000 ms and should only be changed if required.
7. Confirm the monitoring time with "OK".
   The message window is closed and One Button Tuning is activated.
8. Click the "Start" button to start the optimization.
   Optimization of the drive is performed. After optimization is completed successfully, the green status icon appears and the changed values are shown in the "Current value" column in the "Result of optimization" area.

   NOTICE

   Unpredictable drive response when making manual changes after One Button Tuning

   Manual changes of the calculated values can lead to unpredictable behavior of the drive. This can damage the drive.

   - After the One Button Tuning, carefully check that the optimized values are not subsequently changed manually.
   - Always first restore the factory settings if you do not want to use the values optimized using One Button Tuning.

9. Click the "Deactivate" button to disable master control.
   The "Deactivate master control" dialog window is displayed.
10. Confirm deactivation of master control with "Yes".
11. Click the memory card icon to store the result of the optimization permanently in your drive.
12. To load the data from your drive into the project, first select the drive unit in the project tree and then click the icon (Upload from device) in the toolbar.
13. Click the icon (Save project) to store the result of the optimization permanently in your drive.

Result

You have performed the optimization routine and saved the result of the optimization permanently in your drive and project.

7.8.4 Terminating the online connection

Overview

After you traverse your drive from the control panel or optimize the axis, you need to disconnect the online connection to the drive.

Requirement

- For activated user management (UMAC):
  The function rights required to edit the drive data are activated for your user account. Details on this topic are provided in the Configuration Manual SINAMICS Industrial Cybersecurity (https://support.industry.siemens.com/cs/ww/en/view/109810578) in Chapter "Security settings in Startdrive".

Procedure

1. Click on the S210 drive in the project tree.
2. Click on "Disconnect online connection" in the menu bar.

Result

The online connection to the drive is disconnected.

7.9 Using online diagnostic functions

7.9.1 Diagnostics icons

Overview

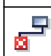
Faults, alarms and any maintenance that is required are indicated using diagnostic icons.

Description of function

The icons are displayed in the following areas of the TIA Portal:

- Project tree
- Device view
- Device overview

The icons are displayed in both the line as well as topology views.

Icon	Meaning
	No fault or maintenance required
	Maintenance required
	Maintenance requirement for a subordinate component
	Maintenance request
	Maintenance request for a subordinate component
	Fault/error
	Fault/error on a subordinate component
	Connection error to the device
	Establish a connection
	The diagnostic status is determined
	The configured device and the actual device have incompatible types.
	The device is only available in the offline configured device configuration and has been deactivated.

7.9.2 Display messages

Overview

The diagnostic icons, which are displayed in the network and topology views, are assigned to specific messages.

Requirement

- For activated user management (UMAC):
  The function rights required to read the drive data are activated for your user account. Details on this topic are provided in the Configuration Manual SINAMICS Industrial Cybersecurity (https://support.industry.siemens.com/cs/ww/en/view/109810578) in Chapter "Security settings in Startdrive".

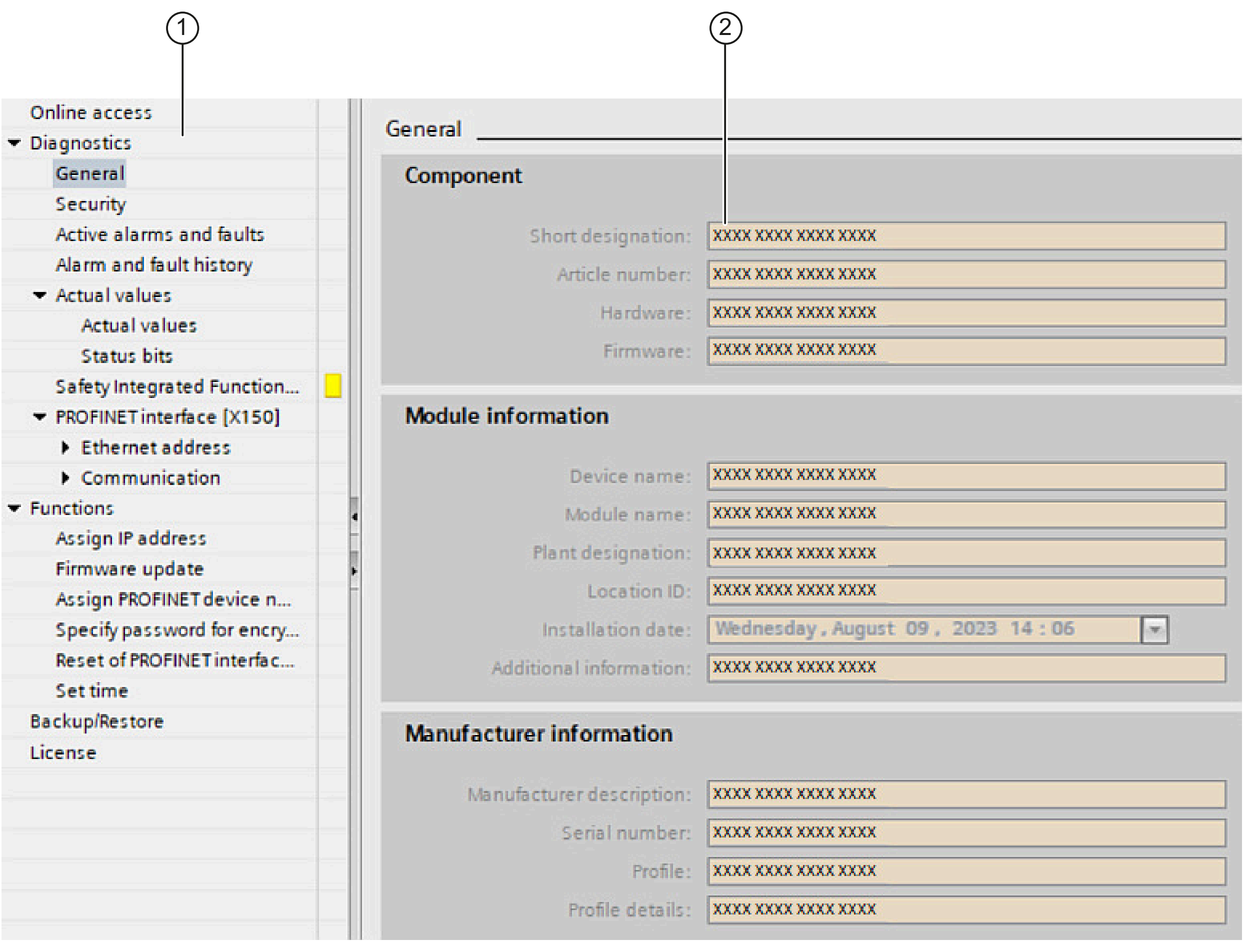
Procedure

1. Double-click on a diagnostics icon, for example .
   The inspector window opens.
2. Click the "Message display" tab.
   All current messages are displayed.

7.9.3 Calling Online & Diagnostics

Overview

In the diagnostics view, you can see important information about the drive or make important basic settings.



① Secondary navigation

② Function view für online diagnostics and important basic functions

Figure 7-10 Example: Online & diagnostics made anonymous

Requirement

- For activated user management (UMAC):
  The function rights required to read the drive data are activated for your user account. Details on this topic are provided in the Configuration Manual SINAMICS Industrial Cybersecurity (https://support.industry.siemens.com/cs/ww/en/view/109810578) in Chapter "Security settings in Startdrive".

Procedure

1. In the project tree, double-click on menu "Online & 'Diagnostics".
   Diagnostics and diagnostic functions are displayed in the secondary navigation and can be called from here.
2. Select the "Online access" entry in the secondary navigation.
3. Select the network interface of your operating unit.
4. Click on "Go online".
   The online connection to the drive is established.
5. Click on "Go offline" in the menu bar.
   The online connection to the drive is disconnected.

7.9.4 Diagnostics

Requirement

- There is an online connection between the drive and the operating unit.
  Diagnostics information can only be read out in online mode.
- For activated user management (UMAC):
  The function rights required to read the drive data are activated for your user account. Details on this topic are provided in the Configuration Manual SINAMICS Industrial Cybersecurity (https://support.industry.siemens.com/cs/ww/en/view/109810578) in Chapter "Security settings in Startdrive".

Function description

You call the individual diagnostic information in the secondary navigation of the diagnostics view.

The following information on the connected drive is provided in the diagnostics view:

- General:
  Information about component, module and manufacturer is displayed.
  - This means that you identify the drive, and the most important drive data are displayed.
- Security:
  Information about security settings of the connected drive is displayed.
  You can find more information in Chapter "Security (Page 293)".

- Active alarms and faults:
  Information about active alarms and faults is displayed.
  - For a fault, the status signal ZSW1.3 is sent. Faults must be acknowledged once the cause has been resolved. To do this, use the function icon at the top of the function view (/).
  - For an alarm, status signal ZSW1.7 is set. The alarm is also entered into the alarm buffer. Alarms are self-acknowledging.
- Alarm and fault history:
  - The message history records all alarms and faults.
  - Using the function icons in the function view, you can either delete the fault buffer ( ) or export to a CSV file ( ).
- Actual values:
  Information about the most important parameter actual values and status bits is displayed.
- Safety Integrated Function status:
  Information about the current status of Safety Integrated Functions is displayed.
  You can find more information in Chapter "Fundamentals for Safety Integrated commissioning (Page 267)", in "Function status".
- PROFINET interface (X150):
  - Ethernet address:
    Information about IP parameters (IP address and subnet mask) and network connection (MAC address) is displayed.
  - Communication:
    Information about send and receive directions (PZDs of telegrams e.g. 105) is displayed. More detailed information on PZDs and telegrams is provided in Section "Communication (Page 294)".
- Maintenance
  Information about the energy usage of the motor and fan wear.
  You can find detailed information on this topic in Chapter "Maintenance (Page 295)".
- Overview of firmware versions
  Shows the firmware used internally and externally for all drive software components.

You call the individual diagnostic information in the secondary navigation of the diagnostics view.

7.9.5 Security

Requirement

- There is an online connection between the drive and the operating unit.
  Diagnostics information can only be read out in online mode.
- The user administration (UMAC) is activated for the project and drive. The following applies: The function rights required to read the drive data are activated for your user account.
  Details on this topic are provided in the Configuration Manual SINAMICS Industrial Cybersecurity (https://support.industry.siemens.com/cs/ww/en/view/109810578) in Chapter "Security settings in Startdrive".

Function description

A summary of the active security settings of the connected converter is displayed in diagnostics view "Security".

- Logged-in user:
  - The user that is logged into the drive.
    OR
  - No logged-in user, as UMAC is not active.
    In this case, we recommend activating UMAC.
- Ports & protocols:
  Displays the activation state for the interfaces of the following areas:
  - Web server access
  - Fieldbus and associated protocols
  - S7 commissioning reports
  - DHCP configuration
- User management & access control settings:
  Shows the UMAC settings activated for the drive. Shows, for example, whether UMAC is active and what rights the user account "Anonymous" has.
- Drive data encryption
  Indicates whether the UMAC data in the drive are additionally encrypted.

You can only change the displayed security settings offline in the inspector window of the converter in the project.

7.9.6 Communication

7.9.6.1 Receive direction

Requirement

For activated user management (UMAC):

The function rights required to read the drive data are activated for your user account.

Details on this topic are provided in the Configuration Manual SINAMICS Industrial Cybersecurity (https://support.industry.siemens.com/cs/ww/en/view/109810578) in Chapter "Security settings in Startdrive".

Function description

As standard, the components and interconnections of PROFIdrive telegrams in the receive direction for the converter are displayed in this function view (e.g. 105, 700 or 750).

You can add additional telegrams via the telegram configuration ( ). The content of the selected telegram is then displayed in the "PROFIsafe" or "Supplementary data" area.

Telegram structure

The process data in the receive direction are created automatically.

Only those telegrams available for the converter are offered. The following information of the displayed telegrams is displayed:

- The numbering and arrangement of the process data (PZD).
- Value of the process data (PZD)
- Switching the value of the process data to a different representation (hex, bin, dec)
- List of the control words that are transmitted in the telegram

7.9.6.2 Send direction

Requirement

For activated user management (UMAC):

The function rights required to read the drive data are activated for your user account.

Details on this topic are provided in the Configuration Manual SINAMICS Industrial Cybersecurity (https://support.industry.siemens.com/cs/ww/en/view/109810578) in Chapter "Security settings in Startdrive".

Function description

As standard, the components and interconnections of PROFIdrive telegrams in the send direction for the converter are displayed in this function view (e.g. 105, 700 or 750).

You can add additional telegrams via the telegram configuration (). The content of the selected telegram is then displayed in the "PROFIsafe" or "Supplementary data" area.

Telegram structure

The interconnections for the process data in the send direction are created automatically for the standard and manufacturer-specific telegrams.

The following information of the displayed telegrams is displayed:

- List of the status words that are transferred in the telegram.
- Value of the process data (PZD)
- Switching the value of the process data to a different representation (hex, bin, dec).
- Numbering and arrangement of the process data.

7.9.7 Maintenance

7.9.7.1 Displaying the motor energy consumption

Overview

The energy values and the process energy values of the motor are displayed in the "Power consumption" function view. Information is provided regarding the energy balance and the energy that the motor draws and feeds back.

Requirements

- There is an active online connection between the drive and the operating unit.
  Diagnostics information can only be read out in online mode.
- With protection activated (UMAC):
  Corresponding to the function rights of your user account (see SINAMICS Industrial Cybersecurity (https://support.industry.siemens.com/cs/ww/de/view/109975311))

Procedure

1. Click on "Reset all displays" if you want to reset all energy displays.

Result

The energy values are newly acquired and displayed after the reset.

7.9.7.2 Displaying the wear of the heat sink fans

Overview

The wear of the heat sink fan is displayed in the "Power unit fan" function view. It is recommended that the fan is replaced if the wear counter is 100 %. After replacement, the wear meter can be reset to zero.

Requirements

- There is an active online connection between the drive and the operating unit.
  Diagnostics information can only be read out in online mode.
- With protection activated (UMAC):
  Corresponding function rights of your user account (see Industrial Cybersecurity Configuration Manual (https://support.industry.siemens.com/cs/ww/en/view/109975311))

Procedure

1. Switch off the drive and replace the heat sink fan.
2. Switch the drive on again. Check that there is an active online connection.
3. Call up the "Power unit fan" function view again in the Startdrive project.
   The wear of the replaced fan is still displayed in the "Wear meter" field (r0277).
4. Click "Reset" next to the field.

Result

The wear counter is thus reset to zero and then records the wear of the current fan.

7.9.8 Functions

Overview

In the "Functions" area, you can call the following functions via the secondary navigation of the diagnostic view and make settings within them:

- Assign IP address
- Firmware update
- Assign PROFINET device name
- Reset PROFINET interface parameters
- Set time

7.9.8.1 Resetting PROFINET interfaces

Overview

To restore the converter to the delivery state, you need to reset the PROFINET interfaces of the converter in addition to restoring the factory settings.

If the converter is connected to a SIMATIC S7 controller while the PROFINET interfaces are being reset, the controller assigns new interface parameters to the converter immediately after the reset. To prevent this, switch the controller to "Stop" mode before the reset or terminate the connection between controller and converter.

Requirement

- The connection between the converter and control system is disconnected.
- For activated user management (UMAC):
  The function rights required to edit the drive data are activated for your user account. Details on this topic are provided in the Configuration Manual SINAMICS Industrial Cybersecurity (https://support.industry.siemens.com/cs/ww/en/view/109810578) in Chapter "Security settings in Startdrive".

Procedure

1. In the secondary navigation, open menu "Functions".
2. Click on menu "Reset of PROFINET interface parameters".
   The corresponding function view opens.
3. Select one of the following options:
   – Retain I&M data
     If the option "Retain I&M data" is active, the I&M1 to I&M3 data are retained.
   – Delete I&M data
     If the option "Delete I&M data" is active, the I&M1 to I&M3 data are deleted.
4. Click on the "Reset" button.

Result

The parameters of the PROFINET interfaces are reset. The reset data are displayed in the "Online access" function view.

More information

More information on restoring the factory settings is provided in Chapter "Restore factory settings (Page 302)".

Overview

Option "Synchronize with an NTP server" is deactivated when the "Set time" diagnostics view is called up for the first time.

Function description

The following options are available for operating a drive:

- Synchronize with NTP server
  - NTP via an assigned control
  - NTP via IP address
- No synchronization, set time manually

You set the drive time in the diagnostics view as a direct function. If a time has already been set, it is displayed in the "Current drive time" area. If it is a synchronized time, the NTP server used is also displayed in the "Time source" field.

Alternatively, you can set the time settings offline in the inspector window of the drive. However, these settings are only transferred to the drive when the drive data are loaded.

The icon indicates if the time settings between the drive and project differ. In this case, proceed as follows:

- If you wish to keep the time in the project, reload the data into the drive (download).
- If you wish to keep the time in the drive, load the data into the project (upload).

7.9.8.2 Setting the time with synchronization (NTP server)

Requirement

- There is an online connection between the drive and the NTP server.
  The direct functions can only be performed in online mode.

Procedure

1. If the "Synchronize with NTP server" option is not enabled, enable this option.
   By default, the "Use PLC as NTP server" option is now enabled. If the drive is connected to a PLC, the IP address of the PLC is displayed.
2. Disable the option "Use PLC as NTP server".
   The input field for the IP address is cleared.
3. Enter the IP address of the desired NTP server in the "IP address" field.
4. Select the time zone of your country in the "Time zone" area.
   Example: For Central Europe, use the time zone "GMT+01:00".
5. Then click "Apply".

Result

The set time is directly transferred to the drive. The current time settings are displayed in the "Current drive time" area.

7.9.8.3 Setting the time with synchronization (PLC as NTP server)

Requirement

- The drive is operated with a controller.
- There is an online connection between the drive and the operating unit.
  The direct functions can only be performed in online mode.

Procedure

To synchronize the time, proceed as follows:

1. If the "Synchronize with NTP server" option is not enabled, enable this option.
   By default, the "Use PLC as NTP server" option is now enabled. If the drive is connected to a PLC, the IP address of the PLC is displayed.
2. Select the time zone of your country in the "Time zone" area.
   Example: For Central Europe, use the time zone "GMT+01:00".
3. Then click on "Apply".
4. Integrate the SNTP library into the PLC to synchronize the time.
   You will find more information on NTP server functionality of SIMATIC S7-CPUs on this Internet page (https://support.industry.siemens.com/cs/ww/en/view/82203451).

Result

The set time is directly transferred to the drive. The current time settings are displayed in the "Current drive time" area.

7.9.8.4 Setting the time without synchronization

Overview

An unsynchronized time of the drive is used if the drive is operated without NTP synchronization.

Requirement

- There is an online connection between the drive and the operating unit.
  The direct functions can only be performed in online mode.

Procedure

1. Activate the option "No synchronization, set time manually".
   You can then choose whether to copy the time from your operating unit or enter the time manually.
2. If you want to use the time from your operating unit, activate the option "Use time from PG/PC".
   - Or -
   If you want to set the time manually, proceed as follows:
   – In the "Drive time" area, set the current calendar day, the current year, and the desired time.
   – Select the time zone of your country in the "Time zone" area.
     Example: For Central Europe, use the time zone "GMT+01:00".
3. Then click "Apply".

Result

The set time is directly transferred to the drive. The current time settings are displayed in the "Current drive time" area.

7.9.9 Backup and restore

Overview

Perform the following actions in function view "Backup/Restore":

- Restart the drive now
- Retentively save the drive data in the converter
- Restore the drive data to factory settings
  Security and interface settings are excluded.
- Restore Safety Integrated settings to factory settings

7.9.9.1 Restart the drive now

Requirement

- There is an online connection between the project and the drive (see Chapter "Establishing online connection (Page 283)").
- The drive is switched on and has voltage.
- For activated user management (UMAC):
  The function rights required to edit the drive data are activated for your user account.
  Details on this topic are provided in the Configuration Manual SINAMICS Industrial Cybersecurity (https://support.industry.siemens.com/cs/ww/en/view/109810578) in Chapter "Security settings in Startdrive".

Procedure

1. In the secondary navigation, click on menu "Backup/Restore".
   The corresponding function view opens.
2. In the "Restart the drive" field, click on "Restart".

Result

The drive is restarted. The restart is finished when the RDY and COM LEDs on the drive light up green.

7.9.9.2 Retentively saving the drive data

Requirement

- There is an online connection between the project and the drive (see Chapter "Establishing online connection (Page 283)").
- Optional memory card is inserted (for a parameter backup).
- For activated user management (UMAC):
  The function rights required to edit and save the drive data are activated for your user account.
  Details on this topic are provided in the Configuration Manual SINAMICS Industrial Cybersecurity (https://support.industry.siemens.com/cs/ww/en/view/109810578) in Chapter "Security settings in Startdrive".

Procedure

1. In the secondary navigation, click on menu "Backup/Restore".
   The corresponding function view opens.
2. Click on the "Save" button in the "Save RAM data retentively" field.

Result

Drive data are retentively saved in the drive.

If you have inserted an SD card in the drive, the drive data are stored on the memory card in addition.

7.9.9.3 Restore factory settings

Overview

With this function, you restore the user-specific parameterization of the converter to factory settings.

The following data are retained when the factory settings are restored:

- Communication interface settings
- Security settings
- Language setting
- Date and time

In the following cases it may be necessary to restore the converter to factory settings:

- Incomplete commissioning
- If the motor is changed
- If there is uncertainty regarding the previous parameterization and/or the previous use of the converter

Requirement

- There is an online connection between the project and the drive.
  You can find more information in Chapter "Establishing online connection (Page 283)".
- For activated user management (UMAC):
  The function rights required for "Restore factory settings" are activated for your user account. Details on this topic are provided in the Configuration Manual SINAMICS Industrial Cybersecurity (https://support.industry.siemens.com/cs/ww/en/view/109810578) in Chapter "Security settings in Startdrive".

Procedure

1. In the secondary navigation, click on menu "Backup/Restore".
   The corresponding function view opens.
2. Click the "Start" button in the "Restore factory setting" field.

Result

The converter is reset and then restarted. If the "RDY" and "COM" LEDs on the converter light up green, resetting is complete.

More information

For a full reset of the converter, proceed as described in Chapter "Full reset of all device settings (Page 503)".

7.9.9.4 Restoring the Safety Integrated factory settings

Overview

It is not always necessary to reset all of the converter settings. A separate reset function exists for Safety Integrated settings, which explicitly only restores Safety Integrated settings to factory settings.

Requirement

- There is an online connection between the project and the drive (see Chapter "Establishing online connection (Page 283)").
- For activated user management (UMAC):
  The function rights required to edit drive settings and Safety Integrated settings are activated for your user account.
  Details on this topic are provided in the Configuration Manual SINAMICS Industrial Cybersecurity (https://support.industry.siemens.com/cs/ww/en/view/109810578) in Chapter "Security settings in Startdrive".

Procedure

To restore the Safety Integrated factory settings, proceed as follows:

1. In the secondary navigation, click on menu "Backup/Restore".
   The corresponding function view opens.
2. In field "Restore Safety Integrated factory setting", click on "Start".

Result

The current Safety Integrated settings in the converter are reset. The converter is then restarted. When both LEDs on the converter are lit green, the Safety Integrated settings of the converter have been reset to factory settings.

7.9.10 Overview of licenses

Overview

In the online mode, in function view "License", you can view information about options/functions that require licensing and also perform the following actions:

- View status of individual licenses.
- Load license file.
- Display and copy serial number of the memory card being used.
- Activate Trial License mode.

Requirement

- For activated user management (UMAC):
The function rights required to edit the drive data are activated for your user account. Details on this topic are provided in the Configuration Manual SINAMICS Industrial Cybersecurity (https://support.industry.siemens.com/cs/ww/en/view/109810578) in Chapter "Security settings in Startdrive".

Function description

Element	Description
General license status	Indicates the current license status (e.g. you do not have all of the licenses you need).
System response	Displays the system response to the current license status, e.g. "Blocks the drive from being switched on again."
Trial period	Displays of the Trial License status; e.g. "Trial License mode not active".
Serial number of the memory card	Serial number of the memory card and button to copy the serial number
Activate Trial License mode	Button for activating Trial License mode
Activate the license key file	Button for loading a license file
Save eCoL archive	Button for saving the license certificates to the file system of the operating unit
Table columns	
Status	The following icons indicate the status: License is complete. Trial License mode is active. License is not available or the memory card with license is not inserted (under licensed).
Function that requires licensing	List of all used system options/functions subject to licensing
Existing/required licenses	The required number of licenses compared with the number of licenses included with the license key. For operation, the number of available licenses ≥ the number of licenses required.
License status	Displays the current status of the function subject to licensing.
Remaining operating time	Displays the remaining operating time of a trial period.

Trial License mode

Licenses for functions requiring licensing can either be ordered together with an SD card for an S210 drive or, when ordered later, can be assigned to an existing SD card via the Web License Manager. Most of the functions that require licensing can also be operated for a limited period of time in Trial License mode.

Before you activate Trial License mode, make sure to read the information and notes in the "About the licensing process" dialog.

More information

- More information about the license file and about extending licenses is provided in Chapter "Functions that require licensing (Page 103)".
- Additional information about the licensing process or on the trial license mode is provided in the TIA Portal information system. There, browse for S210 drives using the keyword phrase "Managing supplementary functions that require a license".

7.9.11 Certificate management

Requirement

- There is an online connection between the drive and the operating unit.
  Direct functions can only be read out in the online mode.
- For activated user management (UMAC):
  The function rights required to read the drive data are activated for your user account. Details on this topic are provided in the Configuration Manual SINAMICS Industrial Cybersecurity in Chapter "Security settings in Startdrive".

Function description

Renew the existing certificates of a protected drive in the certificate management.

More information

More information about certificate management is provided in the Configuration Manual SINAMICS Industrial Cybersecurity in Chapter "Certificates for protected communication".

7.9.12 Updating the firmware in the Startdrive project

Overview

You upgrade the converter firmware directly in the Startdrive project.

Note

Firmware version in Startdrive project and drive

Online connections between the Startdrive project and drive are only possible if the firmware versions in the project and the drive are the same.

- Create a new project if your current project works with a firmware version that is older than the firmware version of the drive. Set the firmware version of the project to the currently upgraded version of the drive. Apply all of the other settings from the old project.
- If you are using an old Startdrive version, it may be necessary to install a new Startdrive version that supports the firmware version.

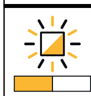
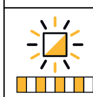
Requirement

- For an update via an online connection:
  A physical connection between the Ethernet interface of your operating unit and the Ethernet or PROFINET interface of your drive.
- For activated user management (UMAC):
  The function rights required for the firmware update are activated for your user account. Details on this topic are provided in the Configuration Manual SINAMICS Industrial Cybersecurity (https://support.industry.siemens.com/cs/ww/en/view/109810578) in Chapter "Security settings in Startdrive".

Procedure

1. Open the Online access entry in the project tree.
2. Select the network interface of your operating unit.
3. Double-click "Update accessible devices".
   The accessible device is displayed with the IP address.
4. Call the "Online & diagnostics" function for the displayed device.
   An online connection to the selected participant is established and the "Online access" function view opens.
5. Expand the "Functions" entry in the secondary navigation.
6. Click the "Firmware update" entry.
   The corresponding function view opens.
   In the "Online data" area, the article number of the drive and the firmware version currently in use are displayed.
7. Click the "Browse" button in the "Firmware loader" area.
   A selection dialog opens.

8. Select the firmware file with the required version in the file system of your operating unit.
   The firmware file is displayed in the line with the same name in the "Firmware loader" area.
9. Check in the "Firmware version" field whether you have selected the required firmware version.
10. In the "Status" field, check that the firmware can be read.
11. Optional: Activate the option "Restart drive automatically".
    If this option is activated, there is no need to restart the drive manually after the firmware update. Step 13 is omitted in this case.
12. To load the firmware to the drive, click on "OK".
    – The status of the firmware update is displayed in the "Status" field.
      The new firmware is installed. The installation may take up to 15 minutes or longer.
    – If the firmware is loaded, then the connected DRIVE-CLiQ components are updated. The progress is displayed via the LED on the DRIVE-CLiQ component.

RDY	Explanation of LED displays
 (0.5 Hz)	Firmware of the connected DRIVE-CLiQ components being updated: • Do not switch off the power supply. • Do not disconnect the motor from the converter.
 (2 Hz)	Firmware of the DRIVE-CLiQ components has been updated: • Waiting for POWER ON of the respective component. **Remedy**: Switch the component off and on again.

Note

Check that the firmware has been updated

Startdrive displays an appropriate message when completing the update. After the message has been displayed, using the LEDs, check whether the converter update has been completed.

13. Optional: If you have not activated the option "Restart drive automatically...", switch the converter off and on again.
14. Optional: Call the catalog information using the secondary navigation in the inspector window. Check whether the new firmware version is installed.

More information

Additional information about available firmware versions can be found on this website: (https://support.industry.siemens.com/cs/ww/en/view/109812303)

7.10 Checking using the trace function

Overview

In a trace configuration, depending on the SINAMICS S drive being used, define the following:

- Signals to be recorded
- Recording duration
- Trigger conditions

Requirement

- For activated user management (UMAC):
  The function rights required for trace configuration are activated for your user account. Details on this topic are provided in the Configuration Manual SINAMICS Industrial Cybersecurity (https://support.industry.siemens.com/cs/ww/en/view/109810578) in Chapter "Security settings in Startdrive".

Function description

The trace configuration for S210 drives is characterized by the following special features and device-specific default settings:

- Preset trace signals:
  For the first trace that you create for an S210 drive, the first four signals are preassigned with the following parameters, which are typical for Motion Control applications:
  - r0062 (Speed setpoint after filter)
  - r0061[0] (Actual speed unsmoothed: Encoder 1)
  - r0080 (Torque actual value)
  - r0479[0] (Diagnostics encoder position actual value Gn_XIST1: Encoder 1)

  No signals are preset for other traces you create for an S210 drive.

  Note

  Other lines are not preassigned. When further signals are inserted, the cycle is changed to 4 ms.

- Possible cycle times**:**
  In the "Cycle" input field of the trace configuration, you can enter the cycle time with which the trace should be recorded. The possible cycle times for an S210 drive depend on the number of signals to be recorded:
  - Up to four signals: 0.0625 ms minimum recording cycle
  - As of five signals: 4.0 ms minimum recording cycle
- Selecting signal bits based on plain text descriptions**:**
  By selecting a trigger variable, you can display individual signal bits based on plain text descriptions (e.g. "Drive control.control word sequence control.ON / OFF1") in the trace configuration and select them directly. A description of how you can select an individual signal bit and set a trigger event is provided below using the "Drive control.control word sequence control" trigger variable as an example.

More information

Additional information on the trace function and configuration in the TIA Portal is provided in the TIA Portal information system.

7.10.1 Example: Selecting signal bits and setting the trigger event

Destination

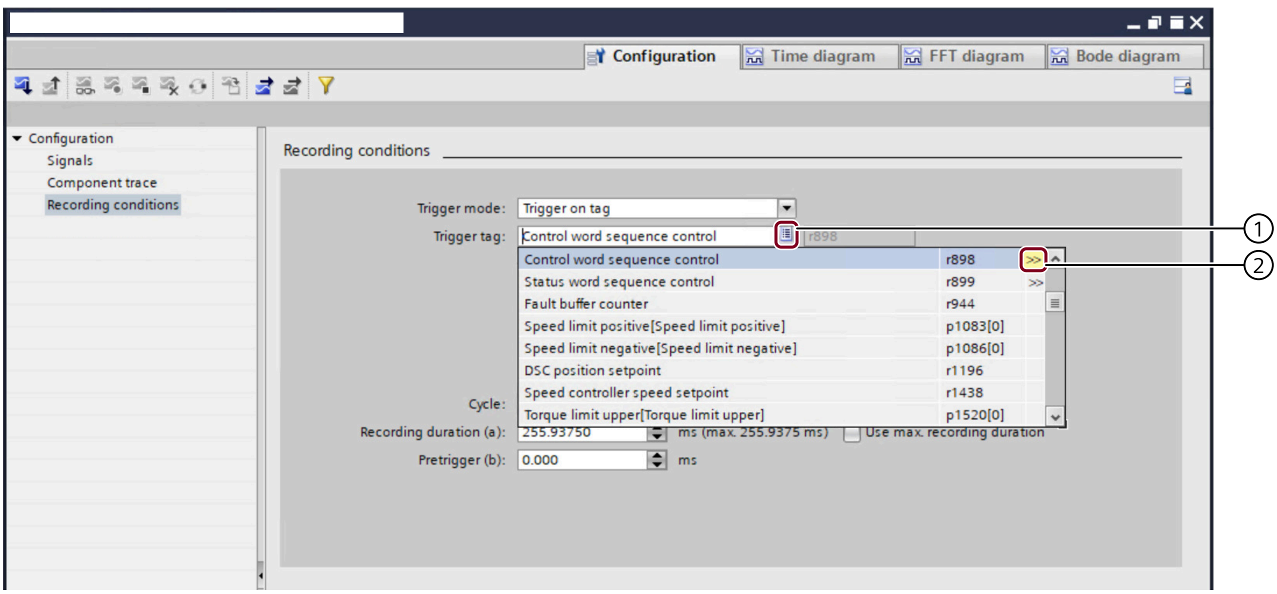
You want to make the basic settings for evaluating a trace.

Requirement

- For activated user management (UMAC):
  The function rights required for trace configuration are activated for your user account. Details on this topic are provided in the Configuration Manual SINAMICS Industrial Cybersecurity (https://support.industry.siemens.com/cs/ww/en/view/109810578) in Chapter "Security settings in Startdrive".

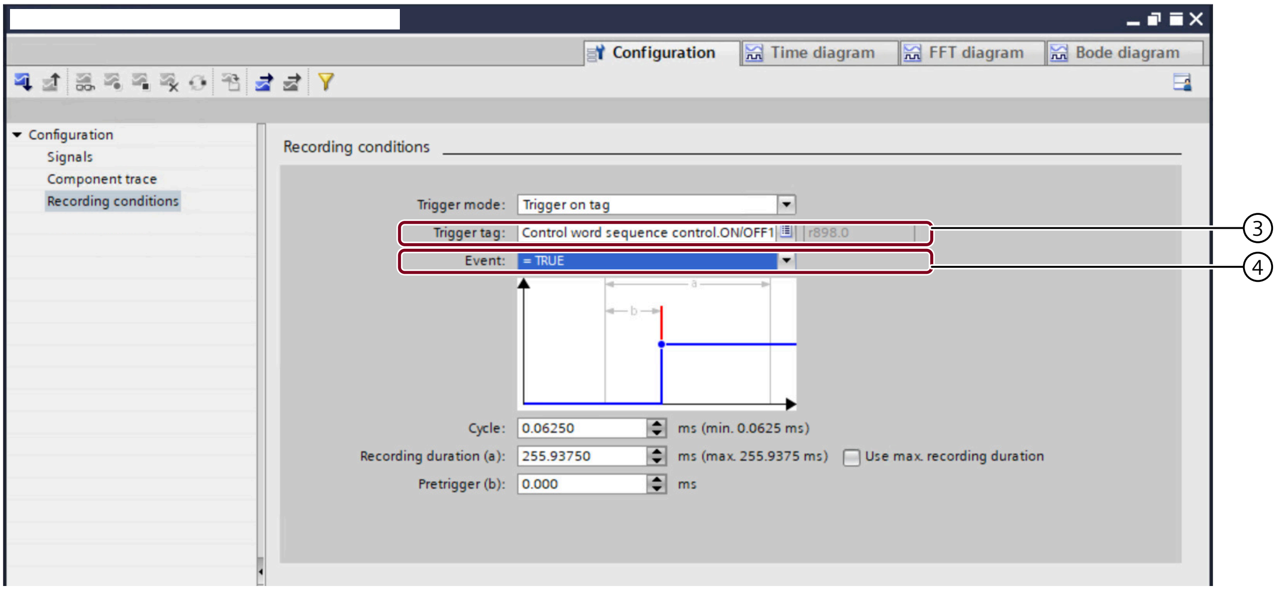
Procedure

1. Define a trigger mode (e.g. "Trigger on tag") via the "Trigger mode" drop-down list.
2. To open the signal selection table, click on the icon ① in the "Trigger tag" input field.



   The signal selection table is displayed.
3. In the signal selection table, scroll to the desired signal (e.g. "control word sequence control").
4. To open the bit selection table, click on the >> icon ② in the row with the desired signal.
   The bit selection table shows the bits of the selected signal in plain text (e.g. "control word sequence control.ON / OFF1").

5. Select the required bit.
   The selected bit is displayed in the "Trigger tag" input field ③.



6. To show the "Event" input field, press "Enter".
   The "Event" input field is displayed with a preset trigger event ④.
7. Select the desired trigger event, if necessary, using the drop-down list in the "Event" input field.
   The selected trigger event is displayed in the "Event" input field.

8 Series commissioning

Overview

For series commissioning, transfer the data and settings of converter 1 to converter 2 or other converters.

Requirement

Converter 2 must comply with the following requirements:

- The rated power of converter 2 corresponds to the rated power of converter 1.
- The firmware version of converter 2 is higher than or equal to the firmware version of converter 1.
- The machines that are commissioned via series commissioning are identical in terms of the application, converter and motor.
- Converter 2 has the factory setting.

Description of function

There are two options when carrying out series commissioning of the converter:

- Series commissioning with memory card
- Series commissioning using commissioning tools

8.1 Series commissioning with memory card

Overview

"Series commissioning using a memory card" makes it possible to transfer the settings of converter 1 to converter 2 or additional converters using a memory card.

Procedure

Proceed as follows to perform series commissioning using a memory card:

1. Switch off the supply voltage of converter 1.
2. Insert an empty SD card with a maximum capacity of 32 GB (e.g.: 6SL5970-0AA00-0AA0) into the card slot of converter 1.
3. Switch on the supply voltage of converter 1.
4. Commission the converter.

5. Save the settings retentively at the end of commissioning.
   This means that you save the settings retentively not only in converter 1 but also to the memory card.
6. Switch off the supply voltage of converter 1.
7. Remove the memory card from converter 1.
8. Switch off the supply voltage of converter 2.
9. Insert the memory card into converter 2.
10. Switch on the supply voltage of converter 2 and wait until the RDY LED lights green.
    Converter 2 takes the settings of converter 1 from the memory card, including the following settings:
    – User management
    – Access control
    – IP configuration
    – Device name
11. Switch off the supply voltage of converter 2.
12. Remove the memory card from converter 2.

Repeat steps 8 to 12 for all additional converters to which you wish to transfer these settings.

8.2 Series commissioning using the web server

Overview

For series commissioning using the web server, you transfer the settings of converter 1 to converter 2 or to other converters.

Requirement

Procedure

Proceed as follows to perform series commissioning using the web server:

1. Switch on the converter supply voltage and use your operating unit, e.g. a PC, to perform commissioning.
   You can find more information in Chapter "Commissioning (web server) (Page 155)".
2. Save the settings at the end of commissioning via .
3. Call the "Backup and restore" menu.

4. Click the "Create backup" button.
   A name can be optionally assigned to the backup file.
   The drive data is backed up. The backup file is saved in the download folder of your operating unit.
   Optional: Place the backup file in a protected location in the operating unit.
5. Connect your operating unit to the next converter.
6. Switch on the converter supply voltage.
7. Enter the IP address of the converter, e.g. https://169.254.11.22, in the browser.
8. Select the option "Exit the Security Wizard and continue with low security settings".
   User management and access control (UMAC) is not activated.
   You can configure the security settings at a later time, see Chapter "Protection & Security (Page 198)".
9. In the navigation, select "Backup and Restore" and load the parameter settings to the converter using "Restore drive data from backup file".
   The converter accepts the parameters (including from user management and access control) from the file and restarts.
10. Call the "Backup and restore" menu.
11. Navigate to the "Restore drive data from backup file" area.
12. Use the "Click to select file, or drag and drop file here" button to select the backup file
13. Click the "Restore" button.
    The backup file is loaded to the converter.

Repeat steps 5 to 13 for all converters to which you want to transfer these settings.

Functions 9

9.1 PROFINET communication

9.1.1 Standard telegrams and manufacturer-specific telegrams for closed-loop speed control

9.1.1.1 Telegram 3

Overview

The telegram is suitable for closed-loop speed control of a drive and the control of 1 position encoder.

Description of function

Process data	Telegram 3			
	Control → Converter		Converter → Control	
	Signal	Explanation	Signal	Explanation
PZD01	STW1	Control word 1	ZSW1	Status word 1
PZD02	NSOLL_B	32-bit speed setpoint	NIST_B	Speed actual value 32-bit
PZD03				
PZD04	STW2	Control word 2	ZSW2	Status word 2
PZD05	G1_STW	Control word for encoder 1	G1_ZSW	Status word from encoder 1
PZD06	---	Not assigned	G1_XIST1	Position actual value 1 from encoder 1
PZD07	---			
PZD08	---		G1_XIST2	Position actual value 2 from encoder 1
PZD09	---			

9.1.1.2 Telegram 4

Overview

The telegram is suitable for closed-loop speed control of a drive and the control of 2 position encoders.

Description of function

Process data	Telegram 4			
	Control → Converter		Converter → Control	
	Signal	Explanation	Signal	Explanation
PZD01	STW1	Control word 1	ZSW1	Status word 1
PZD02	NSOLL_B	32-bit speed setpoint	NIST_B	Speed actual value 32-bit
PZD03				
PZD04	STW2	Control word 2	ZSW2	Status word 2
PZD05	G1_STW	Control word for encoder 1	G1_ZSW	Status word from encoder 1
PZD06	G2_STW	Control word for encoder 2	G1_XIST1	Position actual value 1 from encoder 1
PZD07	---	Not assigned		
PZD08	---		G1_XIST2	Position actual value 2 from encoder 1
PZD09	---			
PZD10	---		G2_ZSW	Status word from encoder 2
PZD11	---		G2_XIST1	Position actual value 1 from encoder 2
PZD12	---			
PZD13	---		G2_XIST2	Position actual value 2 from encoder 2
PZD14	---			

9.1.1.3 Telegram 5

Overview

The telegram is suitable for the closed-loop speed control with DSC and closed-loop position control of a drive and to control 1 position encoder.

Requirement

Isochronous mode with PROFINET IRT (isochronous real-time)

Function description

Process data	Telegram 5			
	Control → Converter		Converter → Control	
	Signal	Explanation	Signal	Explanation
PZD01	STW1	Control word 1	ZSW1	Status word 1
PZD02	NSOLL_B	32-bit speed setpoint	NIST_B	Speed actual value 32-bit
PZD03				
PZD04	STW2	Control word 2	ZSW2	Status word 2
PZD05	G1_STW	Control word for encoder 1	G1_ZSW	Status word for encoder 1
PZD06	XERR	Position controller deviation	G1_XIST1	Position actual value 1 from encoder 1
PZD07				

Process data	Telegram 5			
	Control → Converter		Converter → Control	
	Signal	Explanation	Signal	Explanation
PZD08	KPC	Gain factor for the position controller	G1_XIST2	Position actual value 2 from encoder 1
PZD09				

9.1.1.4 Telegram 6

Overview

The telegram is suitable for the closed-loop speed control with DSC and closed-loop position control of a drive and to control 2 position encoders.

Requirement

Isochronous mode with PROFINET IRT (isochronous real-time)

Function description

Process data	Telegram 6			
	Control → Converter		Converter → Control	
	Signal	Explanation	Signal	Explanation
PZD01	STW1	Control word 1	ZSW1	Status word 1
PZD02	NSOLL_B	32-bit speed setpoint	NIST_B	Speed actual value 32-bit
PZD03				
PZD04	STW2	Control word 2	ZSW2	Status word 2
PZD05	G1_STW	Control word for encoder 1	G1_ZSW	Status word for encoder 1
PZD06	G2_STW	Control word for encoder 2	G1_XIST1	Position actual value 1 from encoder 1
PZD07	XERR	Position controller deviation	G1_XIST2	Position actual value 1 from encoder 1
PZD08				
PZD09	KPC	Gain factor for the position controller	G2_ZSW	Status word from encoder 2
PZD10				
PZD11	---	Not assigned	G2_XIST1	Position actual value 1 from encoder 2
PZD12	---		G2_XIST2	Position actual value 2 from encoder 2

9.1.1.5 Telegram 102

Overview

The telegram is suitable for closed-loop speed control of a drive and the control of 1 position encoder.

Description of function

Process data	Telegram 102			
	Control → Converter		Converter → Control	
	Signal	Explanation	Signal	Explanation
PZD01	STW1	Control word 1	ZSW1	Status word 1
PZD02	NSOLL_B	32-bit speed setpoint	NIST_B	Speed actual value 32-bit
PZD03				
PZD04	STW2	Control word 2	ZSW2	Status word 2
PZD05	MOMRED	Torque reduction	MELDW	Message word
PZD06	G1_STW	Control word for encoder 1	G1_ZSW	Status word from encoder 1
PZD07	---	Not assigned	G1_XIST1	Position actual value 1 from encoder 1
PZD08	---			
PZD09	---		G1_XIST2	Position actual value 2 from encoder 1
PZD10	---			

9.1.1.6 Telegram 103

Overview

The telegram is suitable for closed-loop speed control of a drive and the control of 2 position encoders.

Description of function

Process data	Telegram 103			
	Control → Converter		Converter → Control	
	Signal	Explanation	Signal	Explanation
PZD01	STW1	Control word 1	ZSW1	Status word 1
PZD02	NSOLL_B	32-bit speed setpoint	NIST_B	Speed actual value 32-bit
PZD03				
PZD04	STW2	Control word 2	ZSW2	Status word 2
PZD05	MOMRED	Torque reduction	MELDW	Message word
PZD06	G1_STW	Control word for encoder 1	G1_ZSW	Status word from encoder 1
PZD07	G2_STW	Control word for encoder 2	G1_XIST1	Position actual value 1 from encoder 1
PZD08	---	Not assigned		
PZD09	---		G1_XIST2	Position actual value 2 from encoder 1
PZD10	---			
PZD11	---		G2_ZSW	Status word from encoder 2
PZD12	---		G2_XIST1	Position actual value 1 from encoder 2
PZD13	---			
PZD14	---		G2_XIST2	Position actual value 2 from encoder 2
PZD15	---			

9.1.1.7 Telegram 105

Overview

The telegram is suitable for the closed-loop speed control with DSC and closed-loop position control of a drive and to control 1 position encoder.

Requirement

Isochronous mode with PROFINET IRT (isochronous real-time)

Function description

Process data	Telegram 105			
	Control → Converter		Converter → Control	
	Signal	**Explanation**	**Signal**	**Explanation**
PZD01	STW1	Control word 1	ZSW1	Status word 1
PZD02	NSOLL_B	32-bit speed setpoint	NIST_B	Speed actual value 32-bit
PZD03				
PZD04	STW2	Control word 2	ZSW2	Status word 2
PZD05	MOMRED	Torque reduction	MELDW	Message word
PZD06	G1_STW	Control word for encoder 1	G1_ZSW	Status word for encoder 1
PZD07	XERR	Position controller deviation	G1_XIST1	Position actual value 1 from encoder 1
PZD08				
PZD09	KPC	Gain factor for the position controller	G1_XIST2	Position actual value 2 from encoder 1
PZD10				

9.1.1.8 Telegram 106

Overview

The telegram is suitable for the closed-loop speed control with DSC and closed-loop position control of a drive and to control 2 position encoders.

Requirement

Isochronous mode with PROFINET IRT (isochronous real-time)

Function description

Process data	Telegram 106			
	Control → Converter		Converter → Control	
	Signal	Explanation	Signal	Explanation
PZD01	STW1	Control word 1	ZSW1	Status word 1
PZD02	NSOLL_B	32-bit speed setpoint	NIST_B	Speed actual value 32-bit
PZD03				
PZD04	STW2	Control word 2	ZSW2	Status word 2
PZD05	MOMRED	Torque reduction	MELDW	Message word
PZD06	G1_STW	Control word for encoder 1	G1_ZSW	Status word for encoder 1
PZD07	G2_STW	Control word for encoder 2	G1_XIST1	Position actual value 1 from encoder 1
PZD08	XERR	Position controller deviation		
PZD09			G1_XIST2	Position actual value 2 from encoder 1
PZD10	KPC	Gain factor for the position controller		
PZD11			G2_ZSW	Position actual value 2 from encoder 1
PZD12	---	Not assigned	G2_XIST1	Position actual value 1 from encoder 2
PZD13	---			
PZD14	---		G2_XIST2	Position actual value 2 from encoder 2
pZD15	---			

9.1.1.9 Telegram 999

Overview

The telegram length and the assignment can be freely configured.

Function description

To comply with the PROFIdrive profile, PZD01 must be configured as control word 1 (STW1) and status word 1 (ZSW1).

Process data	Telegram 999			
	Control system → Converter		Converter → Control system	
	Signal	Explanation	Signal	Explanation
PZD01	STW1	Control word 1	ZSW1	Status word 1
PZD02	...	Freely assignable	...	Freely assignable
PZD03	...		...	
. . .				
PZD31	...		...	
PZD32	...		...	

9.1.2 Standard telegrams and manufacturer-specific telegrams for the basic positioner

9.1.2.1 Telegram 7

Overview

The telegram is suitable for the basic positioner with selection of the traversing block.

Function description

Process data	Telegram 7			
	Control → Converter		Converter → Control	
	Signal	Explanation	Signal	Explanation
PZD01	STW1	Control word 1	ZSW1	Status word 1
PZD02	SATZANW	Selects the traversing block	AKTSATZ	Currently selected traversing block

9.1.2.2 Telegram 9

Overview

The telegram is suitable for the basic positioner with direct setpoint input (MDI).

Description of function

<table>
<tr><th rowspan="3">Process data</th><th colspan="4">Telegram 9</th></tr>
<tr><th colspan="2">Control system → Converter</th><th colspan="2">Converter → Control system</th></tr>
<tr><th>Signal</th><th>Explanation</th><th>Signal</th><th>Explanation</th></tr>
<tr><td>PZD01</td><td>STW1</td><td>Control word 1</td><td>ZSW1</td><td>Status word 1</td></tr>
<tr><td>PZD02</td><td>SATZANW</td><td>Selects the traversing block</td><td>AKTSATZ</td><td>Currently selected traversing block</td></tr>
<tr><td>PZD03</td><td>STW2</td><td>Control word 2</td><td>ZSW2</td><td>Status word 2</td></tr>
<tr><td>PZD04</td><td rowspan="2">MDI_TARPOS</td><td rowspan="2">Position setpoint for direct setpoint input (MDI)</td><td rowspan="2">XIST_A</td><td rowspan="2">Actual position value (32 bits)</td></tr>
<tr><td>PZD05</td></tr>
<tr><td>PZD06</td><td rowspan="2">MDI_VELOCITY</td><td rowspan="2">MDI velocity</td><td rowspan="2">-</td><td rowspan="2"></td></tr>
<tr><td>PZD07</td></tr>
<tr><td>PZD08</td><td>MDI_ACC</td><td>MDI accelerating torque</td><td rowspan="2">-</td><td rowspan="2"></td></tr>
<tr><td>PZD09</td><td>MDI_DEC</td><td>MDI braking torque</td></tr>
<tr><td>PZD10</td><td>MDI_MOD</td><td>Selects the positioning mode in the case of direct setpoint input (MDI)</td><td>-</td><td></td></tr>
</table>

9.1.2.3 Telegram 111

Overview

The telegram is suitable for the basic positioner with direct setpoint input (MDI).

Description of function

Process data	Telegram 111			
	Control → Converter		Converter → Control	
	Signal	Explanation	Signal	Explanation
PZD01	STW1	Control word 1	ZSW1	Status word 1
PZD02	POS_STW1	Control word 1 for basic positioner	POS_ZSW1	Status word 1 for basic positioner
PZD03	POS_STW2	Control word 2 for basic positioner	POS_ZSW2	Status word 2 for basic positioner
PZD04	STW2	Control word 2	ZSW2	Status word 2
PZD05	OVERRIDE	Override in the positioning mode (4000 hex ≙ 100%)	MELDW	Status word for messages
PZD06 PZD07	MDI_TARPOS	MDI target position	XIST_A	Position actual value in INT32
PZD08 PZD09	MDI_VELOCITY	MDI velocity	NIST_B	Speed actual value
PZD10	MDI_ACC	MDI acceleration (4000 hex ≙ 100%)	FAULT_CODE	Number of the actual fault
PZD11	MDI_DEC	MDI delay (4000 hex ≙ 100%)	WARN_CODE	Number of the actual alarm
PZD12	Not assigned	-	Not assigned	-

9.1.2.4 Telegram 112

Overview

The telegram is suitable for basic positioners with direct setpoint input (MDI) with physical and LU units, override, position actual value and velocity actual value.

Description of function

Process data	Telegram 112			
	Control → Converter		Converter → Control	
	Signal	Explanation	Signal	Explanation
PZD01	STW1	Control word 1	ZSW1	Status word 1
PZD02	POS_STW1	Control word 1 for basic positioner	POS_ZSW1	Status word 1 for basic positioner
PZD03	POS_STW2	Control word 2 for basic positioner	POS_ZSW2	Status word 2 for basic positioner
PZD04	STW2	Control word 2	ZSW2	Status word 2
PZD05	OVERRIDE	Override in the positioning mode (4000 hex ≙ 100%)	Reserved	---
PZD06	MDI_TARPOS_F	MDI target position	XIST_F	Position actual value
PZD07				
PZD08	MDI_VELOCITY_F	MDI velocity	VIST_F	Velocity actual value
PZD09				
PZD10	MDI_ACC_F	MDI acceleration	MELDW	Message word
PZD11			FAULT_CODE	Fault code
PZD12	MDI_DEC_F	MDI delay	WARN_CODE	Alarm code
PZD13			---	---
PZD14	Reserved	---	---	---
PZD15		---	---	---
PZD16	REF_COORDINATE	Homing position	---	---
PZD17			---	---

9.1.2.5 Telegram 113

Overview

The telegram is suitable for basic positioners, basic positioners with direct setpoint input (MDI) with physical and LU units, override, position actual value and velocity actual value.

Description of function

Process data	Telegram 113			
	Control → Converter		Converter → Control	
	Signal	Explanation	Signal	Explanation
PZD01	STW1	Control word 1	ZSW1	Status word 1
PZD02	POS_STW1	Control word 1 for basic positioner	POS_ZSW1	Status word 1 for basic positioner
PZD03	POS_STW2	Control word 2 for basic positioner	POS_ZSW2	Status word 2 for basic positioner
PZD04	STW2	Control word 2	ZSW2	Status word 2

Process data	Telegram 113			
	Control → Converter		Converter → Control	
	Signal	Explanation	Signal	Explanation
PZD05	OVERRIDE	Override in the positioning mode (4000 hex ≙ 100%)	Reserved	---
PZD06	MDI_TARPOS_D	MDI target position	XIST_D	Position actual value
PZD07				
PZD08				
PZD09				
PZD10	MDI_VELOCITY_F	MDI velocity	VIST_F	Velocity actual value
PZD11				
PZD12	MDI_ACC_F	MDI acceleration	MELDW	Message word
PZD13			FAULT_CODE	Fault code
PZD14	MDI_DEC_F	MDI delay	WARN_CODE	Alarm code
PZD15			---	---
PZD16	Reserved	---	---	---
PZD17			---	---
PZD18	REF_COORDINATE_D	Homing position	---	---
PZD19			---	---
PZD20			---	---
PZD21			---	---

9.1.3 Supplementary telegrams

9.1.3.1 Telegram 700

Overview

Supplementary telegram 700 transfers the status of Safety Integrated Functions to the higher-level control, independently of PROFIsafe.

Description of function

Process data	Telegram 700			
	Control → Converter		Converter → Control "Safety Info Channel"	
	Signal	Explanation	Signal	Explanation
PZDn+1	---	Not assigned	S_ZSW1B	Status word 1B Status of the Safety Integrated Functions
PZDn+2	---		S_V_LIMIT_B	Actual limitation to the setpoint speed
PZDn+3	---			

The Safety Info Channel enables the higher-level control to react promptly to the selection of a Safety Integrated Function.

Transfer of telegram 700 is not failsafe. A PROFIsafe telegram is required for failsafe transfer.

9.1.3.2 Telegram 701

Overview

Telegram 701 transfers the status of Safety Integrated functions.

Function description

Process data	Telegram 701			
	Control → Converter		Converter → Control	
	Signal	Explanation	Signal	Explanation
PZDn+1	S_STW1B	Control word of safety functions	S_ZSW1B	Status word of safety functions
PZDn+2	S_STW3B	Control word of safety functions	S_ZSW2B	Status word of safety functions
PZDn+3	---	Not assigned	S_V_Limit_B	Actual limiting of the setpoint speed
PZDn+4	---			
PZDn+5	---		S_ZSW3B	S_ZSW3B: Status word of safety functions

Transfer of telegram 701 is not failsafe. For failsafe data transfer, use a PROFIsafe telegram.

9.1.3.3 Telegram 750

Overview

Supplementary telegram 750 is suitable for controlling the drive torque, e.g. for the electronic counterweight of a vertical axis.

Function description

Process data	Telegram 750			
	Control system → Converter		Converter → Control system	
	Signal	Explanation	Signal	Explanation
PZDn+1	M_ADD1	Acceleration compensation	M_ACT	Actual torque
PZDn+2	M_LIMIT_POS	Positive torque limit	---	Not assigned
PZDn+3	M_LIMIT_NEG	Negative torque limit	---	

9.1.4 Control words, status words and message word for closed-loop speed control

9.1.4.1 Control word 1 and status word 1

Overview

Control word 1 (STW1) activates the converter drive functions.

Status word 1 (ZSW1) signals the status of the converter to the higher-level control.

Requirement

STW1.10 must be set in order for the drive object to accept the process data (PZD).

If telegram 5, 6, 105 or 106 is selected, then STW1.4 and STW1.6 must be set to 1.

Function description

Control word 1 (STW1)		
Control → Converter		
Bit	Drive function	Explanation
00	0 = OFF1	The motor brakes with the ramp-down time p1121 of the ramp-function generator. The converter switches off the motor at standstill.
	0 → 1 = ON	The converter goes into the "Ready" state. If, in addition, bit 3 = 1, the converter switches on the motor.
01	0 = OFF2	Switch off the motor immediately, the motor then coasts down to a standstill.
	1 = No OFF2	The motor can be switched on (ON command).

Control word 1 (STW1)				
Control → Converter				
Bit	**Drive function**		**Explanation**	
02	0 = Quick stop (OFF3)		Quick stop: The motor brakes to a standstill with the OFF3 ramp-down time p1135.	
	1 = No quick stop (OFF3)		The motor can be switched on (ON command).	
03	0 = Inhibit operation		Immediately switch off motor (cancel pulses).	
	1 = Enable operation		Switch on motor (pulses can be enabled).	
04	0 = Inhibit RFG		The converter immediately sets its ramp-function generator output to 0.	
	1 = Do not inhibit RFG		The ramp-function generator can be enabled.	
05	0 = Stop RFG		The output of the ramp-function generator stops at the current value.	
	1 = Enable RFG		The output of the ramp-function generator follows the setpoint.	
06	0 = Inhibit setpoint		The converter brakes the motor with the ramp-down time p1121 of the ramp-function generator.	
	1 = Enable setpoint		Motor accelerates to the setpoint with the ramp-up time p1120.	
07	0 → 1 = Acknowledge faults		Acknowledge fault. If the ON command is still active, the converter switches to the "switching on inhibited" state.	
08	Reserved			
09	Reserved			
10	0 = No control by PLC		Converter ignores the process data from the fieldbus.	
	1 = Control via PLC		Control via fieldbus, converter accepts the process data from the fieldbus.	
11	Reserved			
12	Telegrams 102, 103, 105, 106	Telegrams 3, 4, 5, 6	Unconditionally open motor holding brake	--
	1 = Open holding brake	Reserved		
13	Reserved			
14	Telegrams 102, 105	Telegrams 3, 5	Switch-over from speed to torque control	--
	1 = Torque control active 0 = Closed-loop speed control active	Reserved		
15	Reserved			

<table>
<tr><th colspan="5">Status word 1 (ZSW1)</th></tr>
<tr><th colspan="5">Converter → Control</th></tr>
<tr><th>Bit</th><th colspan="2">Status</th><th colspan="2">Explanation</th></tr>
<tr><td>00</td><td colspan="2">1 = Ready for switching on</td><td colspan="2">Power supply switched on; electronics initialized; pulses inhibited.</td></tr>
<tr><td>01</td><td colspan="2">1 = Ready for operation</td><td colspan="2">Motor is switched on (ON/OFF1 = 1), no fault is active. With the command "Enable operation" (STW1.3), the converter switches on the motor.</td></tr>
<tr><td>02</td><td colspan="2">1 = Operation enabled</td><td colspan="2">Motor follows setpoint. See control word 1, bit 3.</td></tr>
<tr><td>03</td><td colspan="2">1 = Fault present</td><td colspan="2">The converter has a fault. Acknowledge fault using STW1.7.</td></tr>
<tr><td>04</td><td colspan="2">1 = OFF2 inactive</td><td colspan="2">Coast down to standstill is not active.</td></tr>
<tr><td>05</td><td colspan="2">1 = OFF3 inactive</td><td colspan="2">Quick stop is not active.</td></tr>
<tr><td>06</td><td colspan="2">1 = "Switching on inhibited" active</td><td colspan="2">It is only possible to switch on the motor after an OFF1 followed by ON.</td></tr>
<tr><td>07</td><td colspan="2">1 = Alarm active</td><td colspan="2">Motor remains switched on; no acknowledgement is necessary.</td></tr>
<tr><td>08</td><td colspan="2">1 = Speed deviation within the tolerance range</td><td colspan="2">Setpoint / actual value deviation within the tolerance range.</td></tr>
<tr><td>09</td><td colspan="2">1 = Control requested</td><td colspan="2">The automation system has been requested to take over control of the converter.</td></tr>
<tr><td>10</td><td colspan="2">1 = Comparison speed reached or exceeded</td><td colspan="2">Speed is greater than or equal to the corresponding comparison speed of 5 r/min.</td></tr>
<tr><td rowspan="2">11</td><td>Telegrams 102, 103</td><td>Telegrams 3, 5</td><td rowspan="3">Internal diagnostics for automation systems with integrated SINAMICS functionality</td><td rowspan="2">Comparison value for current or torque has been reached or exceeded.</td></tr>
<tr><td>1 = Alarm class bit 0</td><td>1 = Torque limit reached</td></tr>
<tr><td>12</td><td>1 = Alarm class bit 1</td><td>1 = Holding brake open</td><td>Signal to open and close a motor holding brake.</td></tr>
<tr><td>13</td><td>Reserved</td><td>0 = Alarm, motor overtemperature</td><td>--</td><td>Motor temperature alarm threshold reached</td></tr>
<tr><td rowspan="2">14</td><td rowspan="2">1 = Torque control active</td><td>1 = Motor rotates clockwise</td><td rowspan="2">Switched over from speed to torque control</td><td>Internal converter actual value > 0.</td></tr>
<tr><td>0 = Motor rotates counter-clockwise</td><td>Internal converter actual value < 0.</td></tr>
<tr><td>15</td><td>Reserved</td><td>0 = Alarm, converter thermal overload</td><td>--</td><td>Converter temperature alarm threshold reached</td></tr>
</table>

9.1.4.2 Control word 2 and status word 2

Overview

Control word 2 (STW2) activates the converter drive functions.

Status word 2 (ZSW2) signals the status of the converter to the higher-level control.

Description of function

Control word 2 (STW2)		
Control → Converter		
Bit	**Drive function**	
00	Reserved	
01	Reserved	
02	Reserved	
03	Reserved	
04	Reserved	
05	Reserved	
06	Telegrams 102, 105	Telegrams 3, 5
	1 = Speed controller integrator disable	Reserved
07	Reserved	
08	1 = Travel to fixed stop	
09	Reserved	
10	Reserved	
11	Reserved	
12	Controller sign-of-life bit 0	
13	Controller sign-of-life bit 1	
14	Controller sign-of-life bit 2	
15	Controller sign-of-life bit 3	

Status word 2 (ZSW2)		
Converter → Control		
Bit	**Status**	
00	Reserved	
01	Reserved	
02	Reserved	
03	Reserved	
04	Reserved	
05	1 = Open holding brake	1 = Alarm class bit 0
06	1 = Speed controller integrator disable	1 = Alarm class bit 1
07	Reserved	
08	1 = Travel to fixed stop active	
09	Reserved	

Status word 2 (ZSW2)		
Converter → Control		
Bit	Status	
10	Telegrams 102, 105	Telegrams 3, 5
	Reserved	1 = Pulses enabled
11	Reserved	
12	Device sign-of-life bit 0	
13	Device sign-of-life bit 1	
14	Device sign-of-life bit 2	
15	Device sign-of-life bit 3	

9.1.4.3 Encoder control word and encoder status word

Overview

The encoder 1 control word (G1_STW) activates the encoder functions.

The encoder 1 status word (G1_ZSW) signals the status of the encoder to the higher-level control.

The following table is also applicable for the encoder 2 control word (G2_STW) and the encoder 2 status word (G2_ZSW)

Function description

Control word 1 (G1_STW)		Status word 1 (G1_ZSW)	
Control → Converter		Converter → Control	
Bit	Encoder function	Bit	Encoder status
00	Request function 1	00	Function 1 active
01	Request function 2	01	Function 2 active
02	Request function 3	02	Function 3 active
03	Request function 4	03	Function 4 active
04	Request command bit 0	04	Value 1
05	Request command bit 1	05	Value 2
06	Request command bit 2	06	Value 3
07	Mode	07	Value 4
08	Reserved	08	Measuring probe 1 deflected
09	Reserved	09	Measuring probe 2 deflected
10	Reserved	10	Reserved
11	Reserved	11	Acknowledge encoder fault active
12	Reserved	12	Reserved
13	Request absolute value cyclically	13	Cyclic absolute value
14	Request parking encoder	14	Parking encoder active
15	Acknowledge encoder fault	15	Encoder fault

9.1.4.4 Safety Info Channel status word 1B

Overview

The converter signals the status of the Safety Integrated Functions to the higher-level control using Safety Info Channel status word 1B (S_ZSW1B).

Function description

Safety Info Channel status word 1B (S_ZSW1B)	
Converter → Control	
Bit	**Safety status**
00	STO active
01	SS1 active
02	SS2 active
03	SOS selected
04	SLS active
05	SOS selected
06	SLS selected
07	Internal event
08	SLA selected
09	Select SLS Bit 0
10	Select SLS Bit 1
11	Reserved
12	SDI positive selected
13	SDI negative selected
14	Reserved
15	Safety message active

Parameters

The following list contains the parameters of function "Safety Info Channel status word 1B".

Number	Name	Unit
r9734.0...15	SI Safety Information Channel status word S_ZSW1B	

9.1.4.5 Safety Info Channel status word 2B

Overview

The converter signals the status of the Safety Integrated Functions to the higher-level control using Safety Info Channel status word 2B (S_ZSW2B).

Function description

Safety Info Channel status word 2B (S_ZSW2B)	
Converter → Control	
Bit	**Safety status**
00	Reserved
01	Reserved
02	Reserved
03	SS1E active
04	Reserved
05	Reserved
06	Reserved
07	Reserved
08	SDI positive selected
09	SDI negative selected
10	Reserved
11	Reserved
12	Reserved
13	Reserved
14	Reserved
15	Reserved

Parameters

The following list contains the parameters of function "Safety Info Channel status word 2B".

Number	Name	Unit
r9743.3...9	SI Safety Information Channel status word S_ZSW2B	

9.1.4.6 Safety Info Channel status word 3B

Overview

The converter signals the status of the Safety Integrated Functions to the higher-level control using Safety Info Channel status word 3B (S_ZSW3B).

Function description

Safety Info Channel status word 3B (S_ZSW3B)	
Converter → Control	
Bit	**Safety status**
00	Brake test selected
01	Setpoint input, drive/external
02	Active brake

Safety Info Channel status word 3B (S_ZSW3B)	
Converter → Control	
Bit	**Safety status**
03	Brake test active
04	Brake test result
05	Brake test completed
06	Reserved
07	Current load sign
08	Reserved
09	Reserved
10	Reserved
11	SS2E active
12	Reserved
13	Reserved
14	Reserved
15	Acceptance test mode selected

Parameters

The following list contains the parameters of function "Safety Info Channel status word 3B".

Number	Name	Unit
r10234.0...15	SI Safety Information Channel status word S_ZSW3B	

9.1.4.7 Safety Control Channel control word 1B

Function description

Safety control word 1B (S_STW1B)	
Failsafe controller → Converter	
Bit	**Meaning**
00	Reserved
01	Reserved
02	Reserved
03	Reserved
04	Reserved
05	Reserved
06	Reserved
07	Reserved
08	Reserved
09	Reserved
10	Reserved
11	Reserved

Safety control word 1B (S_STW1B)	
Failsafe controller → Converter	
Bit	**Meaning**
12	Reserved
13	Close brake from control
14	Reserved
15	Reserved

Parameters

The following list contains the parameters of function "Safety Info Channel control word 1B".

Number	Name	Unit
c10250	SI Safety Control Channel control word S_STW1B	

9.1.4.8 Safety Control Channel control word 3B

Function description

Safety control word 3B (S_STW3B)		
Failsafe control → Converter		
Bit	**Drive function**	**Explanation**
00	Selection of the safe brake test	Selection for signal change 0 1
01	Start the brake test sequence	
02	Select the brake	0 signal: Brake 1 is selected 1 signal: Brake 2 is selected
03	Select the direction of rotation	0 signal: positive direction of rotation 1 signal: negative direction of rotation
04	Select the torque	0 signal: positive torque 1 signal: negative torque
05	Feedback from the external brake	0 signal: Brake is open 1 signal: Brake is closed
06	Reserved	
07	Reserved	
08	Reserved	
09	Reserved	
10	Reserved	
11	Reserved	
12	Reserved	
13	Reserved	
14	Reserved	
15	Reserved	

Parameters

The following list contains the parameters of function "Safety Info Channel control word 3B".

Number	Name	Unit
c10235	SI Safety Control Channel control word S_STW3B	

9.1.4.9 Message word

Overview

The message word (MELDW) signals the status of the converter to the higher-level control.

Description of function

Message word (MELDW)	
Converter → Control	
Bit	**Status**
00	Reserved
01	Torque utilization < threshold 2
02	|n_actual| < speed threshold 3
03	|n_actual| < speed threshold 2
04	Reserved
05	Reserved
06	No warning motor overtemperature
07	No warning converter overtemperature
08	n-target/actual deviation within tolerance
09	Reserved
10	Reserved
11	Servo enable
12	Drive ready
13	"Pulses enabled"
14	Reserved
15	Reserved

9.1.5 Control words, status words and message word for basic positioner

9.1.5.1 Control and status word 1

Requirement

Function "Basic positioner" is active.

Description of function

Control word 1 (STW1)		
Control system → Converter		
Bit	**Drive function**	**Explanation**
0	0 = OFF1	The motor brakes with the ramp-down time p1121 of the ramp-function generator. The converter switches off the motor at standstill.
	0 → 1 = ON	The converter goes into the "ready" state. If, in addition, bit 3 = 1, the converter switches on the motor.
1	0 = OFF2	Switch off the motor immediately, the motor then coasts down to a standstill.
	1 = No OFF2	The motor can be switched on (ON command).
2	0 = Quick stop (OFF3)	Quick stop: The motor brakes with the OFF3 ramp-down time p1135 down to standstill.
	1 = No quick stop (OFF3)	The motor can be switched on (ON command).
3	0 = Inhibit operation	Immediately switch off motor (cancel pulses).
	1 = Enable operation	Switch on motor (pulses can be enabled).
4	0 = Reject traversing job	Axis brakes down to standstill with the maximum deceleration. Converter rejects the actual traversing block.
	1 = Do not reject traversing task	Axis can be started or travel to set position.
5	0 = Intermediate stop	Axis brakes down to standstill with the specified deceleration override. Converter remains in the actual traversing block.
	1 = No intermediate stop	Axis can be started or continue to travel to the set position.
6	0 → 1: Activate traversing job	The converter starts axis travel to the set position.
	0 → 1: Setpoint transfer MDI	
7	0 → 1: = Acknowledge faults	Acknowledge fault in the converter. If the ON command is still active, the converter switches to the "switching on inhibited" state.
8	1 = jogging bit 0	Jog 1
9	1 = jogging bit 1	Jog 2
10	0 = No control by PLC	Converter ignores the process data from the fieldbus.
	1 = Control via PLC	Control via fieldbus, converter accepts the process data from the fieldbus.
11	0 = Stop homing	---
	1 = Start homing	The converter does not start referencing.
12	Reserved	
13	0 → 1: External block change	The axis goes to the next traversing block.
14, 15	Reserved	

<table>
<tr><th colspan="4">Status word 1 (ZSW1)</th></tr>
<tr><th colspan="4">Converter → Control system</th></tr>
<tr><th>Bit</th><th colspan="2">Drive function</th><th>Explanation</th></tr>
<tr><td>0</td><td colspan="2">1 = Ready for switching on</td><td>Power supply switched on; electronics initialized; pulses inhibited.</td></tr>
<tr><td>1</td><td colspan="2">1 = Ready for operation</td><td>Motor is switched on (ON command = 1); no fault is active. With the command "Enable operation" (STW1.3), the converter switches on the motor.</td></tr>
<tr><td>2</td><td colspan="2">1 = Operation enabled</td><td>Motor follows setpoint. See control word 1, bit 3.</td></tr>
<tr><td>3</td><td colspan="2">1 = Fault present</td><td>The converter has a fault. Acknowledge fault using STW1.7.</td></tr>
<tr><td>4</td><td colspan="2">1 = OFF2 inactive</td><td>Coast down to standstill is not active.</td></tr>
<tr><td>5</td><td colspan="2">1 = OFF3 inactive</td><td>Quick stop is not active.</td></tr>
<tr><td>6</td><td colspan="2">1 = "Switching on inhibited" active</td><td>It is only possible to switch on the motor after an OFF1 command and an additional ON command.</td></tr>
<tr><td>7</td><td colspan="2">1 = Alarm active</td><td>Motor remains switched on; no acknowledgment is necessary.</td></tr>
<tr><td>8</td><td colspan="2">1 = Following error in tolerance</td><td>The actual difference between the actual position and the position setpoint is within the permissible tolerance p2546.</td></tr>
<tr><td>9</td><td colspan="2">1 = Control requested</td><td>The automation system has been requested to take over control of the converter.</td></tr>
<tr><td>10</td><td colspan="2">1 = Target position reached</td><td>The axis has reached the target position.</td></tr>
<tr><td>11</td><td colspan="2">1 = Home position set</td><td>The axis is homed.</td></tr>
<tr><td>12</td><td colspan="2">0 → 1 = Acknowledgment, traversing block active</td><td></td></tr>
<tr><td>13</td><td colspan="2">1 = Setpoint is stationary</td><td></td></tr>
<tr><td rowspan="2">14</td><td>Telegram 7, 9</td><td>Telegrams 111 112</td><td></td></tr>
<tr><td>Reserved</td><td>1 = Axis accelerates</td><td></td></tr>
<tr><td rowspan="2">15</td><td>Telegram 7, 9</td><td>Telegrams 111 112</td><td></td></tr>
<tr><td>Reserved</td><td>1 = Axis brakes</td><td></td></tr>
</table>

9.1.5.2 Control and status word 2

Requirement

Function "Basic positioner" is active.

Control word 2 and status word 2 are available in telegrams 9, 111, 112 and 113.

Control word 2 (STW2)

Control word 2 (STW2)	
Control system → Converter	
Bit	**Drive function**
0	Reserved
1	Reserved
2...6	Reserved
7	Reserved
8	Reserved
9...11	Reserved
12	1 = master sign-of-life bit 0
13	1 = Master sign-of-life bit 1
14	1 = Master sign-of-life bit 3
15	1 = Master sign-of-life bit 4

Status word 2 (ZSW2)	
Converter → Control system	
Bit	**Drive function**
0	1 = Drive data set DDS effective bit 0
1	1 = Drive data set DDS effective bit 1
2...4	Reserved
5	1 = alarm class bit 0
6	1 = alarm class bit 1
7	Reserved
8	1 = Travel to fixed stop active
9	Reserved
10	1 = pulses activated
11	Reserved
12	Device sign of life, bit 0
13	Device sign of life, bit 1
14	Device sign of life, bit 2
15	Device sign of life, bit 3

9.1.5.3 Control and status word 1 for the positioner

Requirement

Function "Basic positioner" is active.

Function description

Positioning control word 1 (POS_STW1)		
Control system → Converter		
Bit	**Drive function**	**Explanation**
0	Traversing block selection, bit 0	Selecting the traversing block
1	Traversing block selection, bit 1	
2	Traversing block selection, bit 2	
3	Traversing block selection, bit 3	
4	Traversing block selection, bit 4	
5	Traversing block selection, bit 5	
6	Reserved	---
7	Unconditionally open holding brake	The converter opens a connected holding brake
8	0 = Relative positioning is selected	The converter interprets the set position as the set position relative to the starting position.
	1 = Absolute positioning is selected	The converter interprets the set position as absolute set position relative to machine zero point.
9	01 = Absolute positioning for rotary axis in the positive direction	Selection of the positioning type for a rotary axis.
10	10 = Absolute positioning for rotary axes in negative direction	
	00, 11 = Absolute positioning for a rotary axis through the shortest distance	
11	Reserved	---
12	1 = Continuous acceptance	The converter accepts position setpoint changes immediately.
	0 = MDI block change with control word 1, bit 6	The converter accepts a changed position setpoint with the signal change 0 → 1 of control word 1, bit 6.
13	Reserved	---
14	1 = Select Set up	Toggling the axis operating mode between "Set up" and "Positioning".
	0 = Select positioning	
15	1 = Activate MDI	The converter receives its position setpoint from an external control.
	0 = Deactivate MDI	

Positioning status word 1 (POS_ZSW1)		
Converter → Control system		
Bit	Drive function	Explanation
0	Active traversing block bit 0 (2^0)	Number of the currently selected traversing block.
1	Active traversing block bit 1 (2^1)	
2	Active traversing block bit 2 (2^2)	
3	Active traversing block bit 3 (2^3)	
4	Active traversing block bit 4 (2^4)	
5	Active traversing block bit 5 (2^5)	
6	Reserved	---
7	Open holding brake	The converter opens the holding brake
8	1 = STOP cam minus active	The axis is currently located at a STOP cam.
9	1 = STOP cam plus active	
10	1 = Jogging active	The converter is in the jogging mode.
11	1 = Home position approach active	The converter is presently executing a home position approach.
12	1 = Flying homing active	The converter homes when passing the reference cam.
13	1 = Traversing block active	The converter receives its position setpoint from a traversing block.
14	1 = Set up active	The axis is in the "Set up" operating mode.
15	1 = MDI active	The converter receives its position setpoint from an external control.
	0 = MDI inactive	

9.1.5.4 Control and status word 2 for the positioner

Requirement

Function "Basic positioner" is active.

Function description

Positioning control word 2 (POS_STW2)		
Control system → Converter		
Bit	Drive function	Explanation
0	1 = Activate follow-up mode	The converter continuously corrects the position setpoint to follow the position actual value.
1	1 = Set home position	The converter accepts the home position coordinate in its position actual value and setpoint.
2	1 = Reference cam active	The axis is currently located at the reference cam.
3	1 = encoder adjustment	The absolute encoder is adjusted
4	Reserved	---

Positioning control word 2 (POS_STW2)		
Control system → Converter		
Bit	**Drive function**	**Explanation**
5	1 = Incremental jogging active	If the jogging command is active, the converter positions the axis by the specified traversing path in a positive or negative direction.
	0 = Jogging velocity active	If the jogging command is active, the converter positions the axis with the jog velocity in the direction of the beginning or end of the traversing range.
6	Reserved	---
7		
8	1 = Selects homing using flying homing	Select the homing type.
	0 = Selects homing via the home position approach	
9	1 = Starts home position approach in the negative direction	Select the start direction for automatic homing.
	0 = Starts home position approach in the positive direction	
10	1 = Selects probe 2	Edge of the probe input, with which the converter references its actual position value.
	0 = Selects probe 1	
11	1 = Probe falling edge	Select the edge of the probe input, with which the converter references its actual position value.
	0 = Probe, rising edge	
12	Reserved	---
13		
14	1 = Software limit switch active	The converter evaluates its software limit switch.
15	1 = STOP cams active	Converter evaluates the stop cams.

Positioning status word 2 (POS_ZSW2)				
Converter → Control system				
Bit	**Drive function**		**Explanation**	
0	1 = Follow-up mode active		The converter is in the follow-up mode.	
1	1 = Velocity limiting is active		The converter limits the velocity of the axis.	
2	Telegram 111	Telegrams 112 and 113	Telegram 111	Telegrams 112 and 113
	1 = Setpoint is stationary	1 = Position setpoint reached	During a positioning operation, the setpoint no longer changes.	The closed-loop position control has reached the target position.
3	1 = Print index outside outer window		The discrepancy between the actual position and the home position was greater than permitted during flying homing.	
4	1 = Axis traverses forwards		The axis traverses in the positive direction.	
	0 = Axis is stationary or traverses backwards		---	

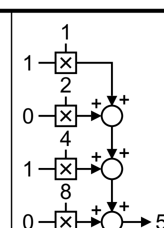
Positioning status word 2 (POS_ZSW2)		
Converter → Control system		
Bit	**Drive function**	**Explanation**
5	1 = Axis traverses backwards	The axis traverses in the negative direction.
	0 = Axis is stationary or traverses forwards	---
6	1 = Software limit switch, minus actuated	The axis is outside the permitted traversing range.
7	1 = Software limit switch, plus actuated	
8	1 = Position actual value ≤ cam switching position 1	Feedback of the cam sequencer in the converter.
	0 = Cam switching position 1 passed	
9	1 = Position actual value ≤ cam switching position 2	
	0 = Cam switching position 2 passed	
10	1 = Direct output 1 active	The converter sets these signals in the actual traversing block.
11	1 = Direct output 2 active	
12	1 = Fixed stop reached	The axis is at the fixed stop
13	1 = Fixed stop clamping torque reached	The axis is at the fixed stop and has reached the clamping torque.
14	1 = Travel to fixed stop active	The converter moves the axis to a fixed stop.
15	1 = Traversing command active	Feedback signal indicating as to whether the converter is currently moving the axis.
	0 = Axis stationary	

9.1.5.5 Control word block selection

Requirement

Function "Basic positioner" is active.

Function description

Control word block selection			
Control system → Converter			
Bit	**Drive function**	**Explanation**	
0	Traversing block selection, bit 0	Example for selecting traversing block number 5:	
1	Traversing block selection, bit 1		
2	Traversing block selection, bit 2		
3	Traversing block selection, bit 3		
4	Traversing block selection, bit 4		
5	Traversing block selection, bit 5		
6...14	Reserved		
15	0 = Deactivate MDI	Switching over traversing blocks to direct setpoint input.	
	1 = Activate MDI		

Actual traversing block		
Converter → Control system		
Bit	**Drive function**	**Explanation**
0	Actual traversing block, bit 0	---
1	Actual traversing block, bit 1	
2	Actual traversing block, bit 2	
3	Actual traversing block, bit 3	
4	Actual traversing block, bit 4	
5	Actual traversing block, bit 5	
6...14	Reserved	
15	0 = MDI active	---
	1 = MDI not active	

9.1.5.6 Control word MDI mode

Requirement

Function "Basic positioner" is active.

Function description

Selecting the MDI mode		
Control system → Converter		
Bit	**Meaning**	**Remarks**
0	0 = Relative positioning is selected	The converter interprets the set position as the set position relative to the starting position.
	1 = Absolute positioning is selected	The converter interprets the set position as absolute set position relative to machine zero point.
1	01 = Absolute positioning for rotary axis in the positive direction	Selection of the positioning type for a rotary axis.
2	10 = Absolute positioning for rotary axes in negative direction	
	00, 11 = Absolute positioning for a rotary axis through the shortest distance	
3...15	Reserved	

9.2 EtherNet/IP communication

9.2.1 Ethernet/IP fieldbus

Overview

The Ethernet Industrial Protocol (EtherNet/IP) is an open standard for industrial networks used by the converter to communicate with a higher-level control system.

Requirement

- Converter with Ethernet interface X150.
- Setting the communications protocol EtherNet/IP:
  Startdrive: You will find the settings in Chapter "Setting the fieldbus configuration (Page 226)".
  Web server: You will find the settings in Chapter "Commissioning (Page 167)".
- Following selection of EtherNet/IP in the commissioning tool, the power supply must be switched off and then switched on again or a hardware reset must be performed via p0972.

Description of function

EtherNet/IP, which uses the Common Industrial Protocol (CIP), transfers data as TCP/IP packets.

EtherNet/IP is used to transmit cyclic I/O data and acyclic parameter data.

The higher-level control system accesses converter process data and parameters via EtherNet/IP objects:

- Cyclic communication of process data with "assembly objects"
- Acyclic communication for writing and reading converter parameters with "class objects"

EtherNet/IP always provides a basic Ethernet functionality:

- Commissioning access
- DCP, for example for setting the IP address
- SNMP for identification

9.2.2 Supported objects

Overview

The higher-level control system accesses converter process data and parameters via EtherNet/IP objects.

Description of function

Table 9-1 EtherNet/IP objects

Class		Name	Required object	SINAMICS object
1 hex	1	Identity object	x	-
4 hex	4	Assembly object [1)]	x	-
6 hex	6	Connection management object	x	-
47 hex	71	Device Level Ring (DLR) object	x	-
48 hex	72	Quality of service (QoS) object	x	-
F5 hex	245	TCP/IP interfacing object [2)]	x	-
F6 hex	246	Ethernet link object [2)]	x	-
109 hex	265	LLDP management object	x	-
10A hex	266	LLDP data table object	x	-
32C hex	812	Siemens drive object	-	x
32D hex	813	Siemens motor object	-	x
401 hex	1025	Parameter object	-	x

1) The assembly object is assigned a cycle in the control system.

2) Part of the EtherNet/IP system management

9.2.3 Cyclic communication

9.2.3.1 Generic I/O module

Overview

A generic I/O module provides cyclic communication between controller and converter.

Description of function

The following are required for cyclic communication between controller and converter:

- The controller has a generic I/O module with all network parameters created: IP address, subnet mask, standard gateway, station names.
- The converter has been configured with the same network parameters as the controller using a commissioning tool.
- The number of process data items has been configured in the controller's generic module to match the telegram selected in the converter:
  - Input 101 = sum of all converter send data
  - Output 102 = sum of all converter receive data
  - Configuration 1 = 0 and configuration 103 = 0

The converter supports 4 ms as the minimum value for RPI (Requested Packet Interval).

More information

An application example for the integration of the converter into a Rockwell control system can be found on the Internet:

Application example (https://support.industry.siemens.com/cs/ww/en/view/109824950)

The application description is also valid for the converter described in this manual.

9.2.3.2 "Assembly object" class

Overview

The "assembly object" enables cyclical communication between controller and converter.

Description of function

The "assembly object" has object class 04 hex.

Table 9-2 Class attributes

Attribute ID	Service[1]	Type	Name
1	get	UINT16	Revision
2	get	UINT16	Maximum instance
3	get	UINT16	Number of instances

[1] Supported service: Get attribute single

Table 9-3 Instance attributes

Attribute ID	Service[1]	Type	Name	Value/explanation
3	get	Array of UINT8	Assembly	1 byte field

[1] Supported service: Get attribute single

9.2.4 Acyclic communication

9.2.4.1 "Identity object" class

Overview

The "identity object" enables the controller to access selected converter data.

Function description

The "identity object" has object class 01 h.

Table 9-4 Class attributes

Attribute ID	Service[1)]	Type	Name
1	get	UINT16	Revision
2	get	UINT16	Maximum instance
3	get	UINT16	Number of instances

1) Supported services: Get attribute single, get attribute all

Table 9-5 Instance attributes

Attribute ID	Service[1)]	Type	Name	Value/explanation
1	get	UINT16	Vendor ID	1251
2	get	UINT16	Device: Siemens device	0C hex
3	get	UINT16	Product code	9110 (S210)
4	get	UINT16	Revision	-
5	get	UINT16	Status	See the following table
6	get	UINT32	Serial number	Bits 0 ... 19: consecutive number; bits 20 ... 23: production identifier bits 24 ... 27: month of manufacture (0 = Jan, B = Dec) bits 28 ... 31: year of manufacture (0 = 2002)
7	get	Short String	Product name	Max. length 32 bytes

1) Supported services: Get attribute single, get attribute all

Table 9-6 Explanation of attribute ID 5 of the previous table

Byte	Bit	Name	Description
1	0	Assignment	0: Converter is not assigned to a controller 1: Converter is assigned to a controller
	1	-	Reserved
	2	Configuration	0: Ethernet/IP basic settings 1: modified Ethernet/IP settings
	3	-	Reserved
	4 ... 7	Extended device status	0: Self-test or status not known 1: Firmware update active 2: At least one I/O connection with error 3: No I/O connections 4: Incorrect configuration in the ROM 5: Fatal fault 6: At least one I/O connection is active 7: All I/O connections in the quiescent state 8 ... 15: Reserved
2	8 ... 11	-	not used
	12 ... 15	-	Reserved

9.2.4.2 "Connection management object" class

Overview

The "connection management object" enables communication diagnostics.

Description of function

The "connection management object" has object class 06 hex.

Table 9-7 Class attributes

Attribute ID	Service[1)]	Type	Name
1	get	UINT16	Revision
2	get	UINT16	Maximum instance
3	get	UINT16	Number of instances

1) Supported services: Get attribute single, get attribute all

Table 9-8 Instance attributes

Attribute ID	Service[1)]	Type	Name	Value/explanation
1	get	UINT16	Open Requests	Counters
2	get	UINT16	Open Format Rejects	Counters
3	get	UINT16	Open Resource Rejects	Counters

Attribute ID	Service[1)]	Type	Name	Value/explanation
4	get	UINT16	Open Other Rejects	Counters
5	get	UINT16	Close Requests	Counters
6	get	UINT16	Close Format Rejects	Counters
7	get	UINT16	Close Other Rejects	Counters
8	get	UINT16	Timeouts	Number of bus errors

1) Supported services: Get attribute single, get attribute all

9.2.4.3 "Device Level Ring object" class

Overview

The "Device Level Ring object" provides the interface for configuration and status information of an Ethernet ring topology.

Description of function

The "Device Level Ring object" has object class 47 hex.

Table 9-9 Class attributes

Attribute ID	Service [1)]	Type	Name
1	get	UINT16	Revision
2	get	UINT16	Maximum instance
3	get	UINT16	Number of instances

1) Supported services: Get attribute all, get attribute single

Table 9-10 Instance attributes

Attribute ID	Service [1)]	Type	Name	Value/explanation
1	get	UINT8	Network topology	0: Linear topology 1: Ring topology
2	get	UINT8	Network status	0: Normal 1: Ring fault 2: Unexpected loop detected 3: Partial network fault 4: Rapid fault/restore cycle

Attribute ID	Service [1]	Type	Name	Value/explanation
10	get	STRUCT of:	Active supervisor address	
		UINT32	Supervisor IP address	0: No IP address configured for drive
		ARRAY of 6 UINT8	Supervisor MAC address	
12	get	DWORD	Capability flags	

[1] Supported services: Get attribute all, get attribute single

9.2.4.4 "Quality-of-service object" class

Overview

The "Quality-of-service object" controls data traffic with different relative priority or other delivery flags.

Description of function

The "Quality-of-service object" has object class 48 hex.

The "Quality-of-service object" supports no class attributes.

Table 9-11 Instance attributes

Attribute ID	Service[1]	Type	Name	Value/explanation
4	get, set	UINT8	DSCP Urgent	Factory setting: Priority 55
5	get, set	UINT8	DSCP Scheduled	Factory setting: Priority 47
6	get, set	UINT8	DSCP High	Factory setting: Priority 43
7	get, set	UINT8	DSCP Low	Factory setting: Priority 31
8	get, set	UINT8	DSCP Explicit	Factory setting: Priority 27

[1] Supported services: Get attribute single, set attribute single

9.2.4.5 "TCP/IP interfacing object" class

Overview

The "TCP/IP interfacing object" class enables configuration of the Ethernet interface.

Description of function

The "TCP/IP interfacing object" has object class F5 hex.

Table 9-12 Class attributes

Attribute ID	Service[1)]	Type	Name
1	get	UINT16	Revision
2	get	UINT16	Maximum instance
3	get	UINT16	Number of instances

1) Supported services: Get attribute all, get attribute single

Table 9-13 Instance attributes

Attribute ID	Service[1)]	Type	Name	Value/explanation
1	get	UINT32	Status	Fixed value: 1 hex 1: Configuration acknowledged, by DHCP or saved values
2	get	UINT32	Configuration Capability	Fixed value: 94 hex 4 hex: DHCP supported, 10 hex: Configuration can be adjusted, 80 hex: ACD-capable
3	get, set	UINT32	Configuration Control	1 hex: Saved values 3 hex: DHCP
4	get	UINT16	Physical Link	Path Size (in WORDs); fixed value: 2 hex
		UINT8		Path (20 hex, F6 hex, 24 hex, 05 hex, where 5 hex is the number of instances of F6 hex: 4 physical ports plus an internal port).
5	get, set	STRING	Interface Configuration	r61000 Name of Station
		UINT32		r61001 IP address
6	get, set	UINT16	Host Name	Host Name Length
		STRING		-
10	get, set	UINT8	Select ACD	local OM flash: 0: Disabled, 1: Enabled
11	get, set	UINT8	Last Conflict Detected	local OM flash ACD Activity
		UINT8		local OM flash Remote MAC
		UINT8		local OM flash ARP PDU

1) Supported services: Get attribute all, get attribute single, set attribute single

9.2.4.6 "Ethernet link object" class

Overview

The "Ethernet link object" enables communication diagnostics.

Description of function

The "Ethernet link object" has object class F6 hex.

Table 9-14 Class attributes

Attribute ID	Service[1)]	Type	Name
1	get	UINT16	Revision
2	get	UINT16	Maximum instance
3	get	UINT16	Number of instances

1) Supported services: Get attribute all, get attribute single

Table 9-15 Instance attributes

Attribute ID	Service[1)]	Type	Name	Value/explanation
1	get	UINT32	Interface Speed	0: link down, 10: 10 Mbps, 100: 100 Mbps
2	get	DWORD	Interface Flags	Bit 1: Link-Status Bit 2: Duplex Mode (0: Half duplex, 1 duplex) Bit 3 ... 5: Automatic state identification Bit 6: Reset required Bit 7: Local hardware fault (0 = ok)
3	get	ARRAY	Physical Address	Ethernet MAC address

Attribute ID	Service[1)]	Type	Name	Value/explanation
4	get, get_and_clear	Struct of	Interface Counters	Optional, required if the "Media Counters Attribute" is implemented.
		UINT32	In Octets	Received octets
		UINT32	In Ucast Packets	Received Unicast packets
		UINT32	In NUcast Packets	Received non-Unicast packets
		UINT32	In Discards	Incoming packets, not processed
		UINT32	In Errors	Incoming packets with errors
		UINT32	In Unknown Protos	Incoming packets with unknown protocol
		UINT32	Out Octets	Sent octets
		UINT32	Out Ucast Packets	Sent Unicast packets
		UINT32	Out NUcast packets	Sent non-Unicast packets
		UINT32	Out Discards	Outgoing packets, not processed
		UINT32	Out Errors	Outgoing packets, with errors
5	get, get_and_clear	Struct of	Media Counters	Media-specific counters
		UINT32	Alignment Errors	Structure received, which does not match the number of octets
		UINT32	FCS Errors	Structure received, which does not pass the FCS check
		UINT32	Single Collisions	Structure successfully transmitted, precisely one collision
		UINT32	Multiple Collisions	Structure successfully transmitted, multiple collisions
		UINT32	SQE Test Errors	Number of SQE errors
		UINT32	Deferred Transmissions	First transmission attempt delayed
		UINT32	Late Collisions	Number of collisions that occurred delayed by 512 bit timers to the request
		UINT32	Excessive Collisions	Transmission unsuccessful as a result of intensive collisions
		UINT32	MAC Transmit Errors	Transmission unsuccessful as a result of an internal MAC sublayer transmission error.
		UINT32	Carrier Sense Errors	Number of errors when attempting to send a request frame, where the transmission condition was lost or was not assigned
		UINT32	Frame Too Long	Structure too large
		UINT32	MAC Receive Errors	Transmission unsuccessful as a result of an internal MAC sublayer receive error.
6	get, set	Struct of	Interface Control	-
		UINT16	Control Bits	-
		UINT16	Forced Interface Speed	-

Attrib-ute ID	Service[1)]	Type	Name	Value/explanation
10	get	String	Interface_Label	Interface-Label
11	get	-	Interface Capability	Bit 0: Manual Setting Bit 1: Auto-negotiate Bit 2: Auto-MDIX Bit 3: Manual Speed/Duplex Bits 4 – 31: Reserved Rest: Speed/Duplex options

1) Supported services: Get attribute all, get attribute single, set attribute single, get_and_clear

9.2.4.7 "LLDP management object" class

Overview

The "LLDP management object" contains administration information for the LLDP protocol.

Description of function

The "LLDP management object" has object class 109 hex.

Table 9-16 Class attributes

Attrib-ute ID	Service [1)]	Type	Name
1	get	UINT16	Revision
2	get	UINT16	Maximum instance
3	get	UINT16	Number of instances

1) Supported services: Get attribute all, get attribute single

Table 9-17 Instance attributes

Attrib-ute ID	Service [1)]	Type	Name	Value/explanation
1	get, set	Structure of:	LLDP Enable	
		UINT16	Array Length	Number of bits in "LLDP Enable Array"
		ARRAY of BYTE	LLDP Enable Array	Enables the generation of LLDP frames, both globally and by port, and the processing of re-ceived LLDP frames globally.

Attribute ID	Service 1)	Type	Name	Value/explanation
2	get, set	UINT16	msgTxInterval	0: Reserved 1...3600: Message transfer interval for LLDP frames 3601...65535: Reserved
3	get, set	UINT8	msgTxHold	0: Reserved 1...100: Multiplier for transfer of LLDP frames 101-255: Reserved
4	get	WORD	LLDP Datastore	Bits: 0: LLDP data table object 1: SNMP1 2: NETCONF YANG 3...15: Reserved
5	get	UINT32	Last Change	Time of last change to an entry in the local LLDP database

1) Supported services: Get attribute all, get attribute single, set attribute single

9.2.4.8 "LLDP data table object" class

Overview

The "LLDP data table object" contains a record of all neighboring active devices implementing LLDP.

Description of function

The "LLDP data table object" has object class 10A hex.

Table 9-18 Class attributes

Attribute ID	Service 1)	Type	Name
1	get	UINT16	Revision
2	get	UINT16	Maximum instance
3	get	UINT16	Number of instances

1) Supported services: Get attribute all, get attribute single

Table 9-19 Instance attributes

Attribute ID	Service [1)]	Type	Name	Value/explanation
1	get	UINT16	Ethernet Link Instance Number	0: Unknown 1...65535: Number of the Ethernet link instance
2	get	ETH_MAC_ADDR	MAC address	The neighboring MAC address received from the CIP MAC address, the chassis ID or the port IDTLV
3	get	SHORT_STRING	Interface Label	The neighboring interface label received from the CIP interface label, chassis ID or Port ID TLV
4	get	UINT16	Time to Live	Number of seconds for which the adjacency information is to be considered valid.
5	get	Structure of:	System Capabilities TLV	Bitmaps of the capabilities that define the principal functions of the neighboring system
		WORD	System Capabilities	Functions of the neighboring device according to the firmware currently installed
		Array of WORD	Enabled Capabilities	Functions currently enabled on the neighboring device
6	get	Structure of:	IPv4 Management Addresses	The IPv4 management addresses of the neighboring device
		UINT8	Management Address Count	The number of management addresses implemented
		ARRAY of UINT32	Management Address	IPv4 management addresses of the neighboring device
7	get	Structure of:	CIP Identification	CIP identification TLV of the neighboring device, where applicable
		UINT16	Vendor ID	
		UINT16	Device Type	
		UINT16	Product Code	
		BYTE	Major Revision	
		UINT8	Minor Revision	
		UINT32	CIP Serial Number	

Attribute ID	Service [1]	Type	Name	Value/explanation
8	get	Structure of:	Additional Ethernet Capabilities	TLV for Ethernet preemption support from the neighboring device
		BOOL	Preemption Support	0: Not supported 1: Supported
		BOOL	Preemption Status	0: Not enabled 1: Enabled
		BOOL	Preemption Active	0: Not active 1: Active
		UINT8	Additional Fragment Size	0: 64 octets 1: 128 octets 2: 192 octets 3: 256 octets 4: 55 = Reserved
9	get	UINT32	Last Change	Time of last change to an attribute in this instance

[1] Supported services: Get attribute all, get attribute single

9.2.4.9 "Siemens drive object" class

Overview

The "Siemens drive object" class enables access for the controller to selected converter parameters.

Function description

"Siemens drive object" has object class 32C h.

Table 9-20 Class attributes

Attribute ID	Service[1]	Type	Name
1	get	UINT16	Revision
2	get	UINT16	Maximum instance
3	get	UINT16	Number of instances

[1] Supported services: Get attribute single, get attribute all

Table 9-21 Instance attributes

Attribute ID	Service[1)]	Type	Name	Value/explanation
3 ... 18	get	WORD	STW1	c2050[0] control word 1 (STW1) Bit-by-bit access: Attribute ID 3 = STW1.0 Attribute ID18 = STW1.15
20 ... 35	get	WORD	ZSW1	c2053[0] status word 1 (ZSW1) Bit-by-bit access: Attribute ID 20 = ZSW1.0 Attribute ID 35 = ZSW1.15
36	get	REAL	Actual Speed	r0063 actual speed value
38	get, set	REAL	Ramp Down Time	p1121[0] OFF1 ramp-down time
40	get, set	REAL	Speed MAX Limit	p1082[0] maximum speed
42	get, set	REAL	OFF3 Ramp Down Time	p1135[0] OFF3 ramp-down time
50	get	REAL	Speed setpoint	r0020 speed setpoint
53	get	REAL	DC Link Voltage	r0026[0] DC link voltage
54	get	REAL	Actual Current	r0027 current actual value
55	get	REAL	Actual Torque	r0031 torque actual value
56	get	REAL	Output power	r0032 actual active power value
58	get	REAL	Power Unit Temperature	r0037[0] power unit temperature
59	get	REAL	Energy kWh	r0039 energy indicator
62	get	WORD	Control Word 1	r0898 control word sequence control
63	get	REAL	Motor Speed (Encoder)	r0061 speed actual value
64	get	UINT32	Digital Inputs	r0722 digital inputs status
70	get	UINT16	Fault Code 1	r0947[0] fault number 1
71	get	UINT16	Fault Code 2	r0947[1] fault number 2
72	get	UINT16	Fault Code 3	r0947[2] fault number 3
73	get	UINT16	Fault Code 4	r0947[3] fault number 4
74	get	UINT16	Fault Code 5	r0947[4] fault number 5
75	get	UINT16	Fault Code 6	r0947[5] fault number 6
76	get	UINT16	Fault Code 7	r0947[6] fault number 7
77	get	UINT16	Fault Code 8	r0947[7] fault number 8
79	get	UINT16	Alarm Code 1	r2122[0] alarm code
80	get	UINT16	Alarm Code 2	r2122[1] alarm code
81	get	UINT16	Alarm Code 3	r2122[2] alarm code
82	get	UINT16	Alarm Code 4	r2122[3] alarm code

[1)] Supported services: Get attribute single, set attribute single

9.2.4.10 "Siemens motor object" class

Overview

The "Siemens motor object" class enables read access for the controller to the motor data.

Function description

The "Siemens motor object" has object class 32D h.

Table 9-22 Class attributes

Attribute ID	Service[1)]	Type	Name
1	get	UINT16	Revision
2	get	UINT16	Maximum instance
3	get	UINT16	Number of instances

1) Supported services: Get attribute single, get attribute all

Table 9-23 Instance attributes

Attribute ID	Service	Type	Name	Value/explanation
3	get	INT16	Motor Type	p0300 motor type
6	get	REAL	Rated Current	p0305 rated motor current
7	get	REAL	Rated Voltage	p0304 rated motor voltage
8	get	REAL	Rated Power	p0307 rated motor power
11	get	REAL	Max Speed	p0322 maximum motor speed
13	get	REAL	Torque Constant	p0316 motor torque constant
14	get	REAL	Inertia	p0341 motor moment of inertia
15	get	REAL	Base Speed	p0311 rated motor speed

1) Supported services: Get attribute single

9.2.4.11 "Parameter object" class

Overview

The "Parameter object" class enables write and read access for the controller to all converter parameters.

Description of function

The "Parameter object" has object class 401 h.

Table 9-24 Class attributes

Attribute ID	Service[1)]	Type	Name
1	get	UINT16	Revision
2	get	UINT16	Maximum instance
3	get	UINT16	Number of instances

1) Supported services: Get attribute all, get attribute single

Example

In the following example, the controller reads the value of parameter r2050[10].

"Get attribute single" service with the following values:

- Class = 401 h
- Instance = 2050 = 802 h ≙ parameter number
- Attribute = 10 = A h ≙ index 10

Example

In the following example, the controller writes value = 500 to parameter p1520[0].

"Set attribute single" service with the following values:

- Class = 401 h
- Instance = 1520 = 5F0 hex ≙ parameter number
- Attribute = 0 = 0 h ≙ index 0
- Data = 500.0 (value)

9.3 Safety Integrated

9.3.1 Machinery directive

Overview

The basic safety and health requirements specified in Annex I of the Directive must be fulfilled for the safety of machines.

Description

The protective goals must be implemented responsibly to ensure compliance with the Directive.

Manufacturers of a machine must verify that their machine complies with the basic requirements. This verification is facilitated by means of harmonized standards.

IEC 61800-5-2 Adjustable-speed electrical power drive systems Part 5-2 is relevant for the Machinery Directive: Safety requirements - Functional safety.

Within the context of EN 61508, IEC 61800-5-2 considers adjustable-speed electrical power drive systems (PDS), which are suitable for use in safety-related applications (PDS(SR)).

IEC 61800-5-2 places requirements on PDS(SR) as subsystems of a safety-related system. This therefore permits the implementation of the electrical/electronic/programmable electronic elements of a PDS(SR) taking into account the safety-relevant performance of the safety function(s) of a PDS.

Manufacturers and suppliers of PDS(SR) can prove to users (e.g. integrators of control systems, developers of machines and plants etc.) the safety-relevant performance of their equipment by implementing the specifications stipulated in standard IEC 61800-5-2.

9.3.2 Functional safety

Overview

A system or machine is considered functionally safe if the safety-relevant parts of the protection and control equipment function correctly.

Description

Safety, from the perspective of the object to be protected, cannot be split-up. The causes of danger and therefore also the technical measures to prevent them can vary widely. This is why a differentiation is made between different types of safety (e.g. by specifying the cause of possible hazards). "Functional safety" is involved if safety depends on the correct function.

To ensure the functional safety of a system or machine, the safety-related parts of the protection and control devices must function correctly. In the case of a fault, systems must respond in such a way that either the plant remains in a safe state or it is brought into a safe state. In this case, it is necessary to use specially qualified technology that fulfills the requirements described in the associated Standards. The requirements to implement functional safety are based on the following basic objectives:

- Avoiding systematic faults
- Controlling random faults or failures

Benchmarks for establishing whether or not a sufficient level of functional safety has been achieved include the probability of hazardous failures, the fault tolerance and the quality that is to be guaranteed by avoiding systematic faults. This is expressed in the standards using specific classification. In IEC 61800-5-2, IEC 62061 "Safety Integrity Level" (SIL) and EN ISO 13849-1 "Category" and "Performance Level" (PL).

9.3.3 Safety Integrated Functions

Overview

Safety Integrated Functions are used to reduce risk in safety-related applications.

Requirement

WARNING

Unsafe operation as a result of inadequate measures applied to minimize risk

Safety Integrated can reduce the level of risk associated with systems and machines. Machines or plants, however, can only be operated safely in conjunction with Safety Integrated if the machine OEM carefully complies with the following:

- The machine OEM precisely knows the safety instructions and residual risks specified in the technical user documentation and complies with the documented constraints for Safety Integrated.
- Carefully constructs and configures the system or machine. A careful and thorough acceptance test must then be performed by qualified personnel and the results documented.
- Implements and validates all the measures required in accordance with the system or machine risk analysis using programmed and configured Safety Integrated Functions or by other means.
- The use of Safety Integrated does not replace the risk assessment of the system or machine by the machine manufacturer as specified by the EU Machinery Directive.
  In addition to using Safety Integrated Functions, additional risk reduction measures must be implemented.

WARNING

Unexpected automatic start of the motor

An EMERGENCY STOP must stop the motor involved according to stop category 0 or 1 according to EN 60204-1 using Safety Integrated Function STO or SS1.

Dangerous operating states can occur if the motor automatically starts when the EMERGENCY STOP is reset.

- After stopping according to stop Category 0 or 1, avoid that the motor automatically starts again.
- If the risk analysis permits it, the motor may automatically start after deselecting a Safety Integrated Function for motion monitoring. An automatic start is possible when a protective door is closed, for example.

WARNING

Undesirable motor motion after changing the hardware or software

Unsafe operating states can occur after changing or replacing hardware or software components.

- Close all protective devices after changing or replacing.
  Persons must not be present in the danger zone.
- Depending on whether a change or replacement was carried out, perform either a reduced or a complete acceptance test.
- Before you enter the hazardous area, test all drives by briefly moving them in both directions of motion to ensure that the closed-loop response is stable.

WARNING

Unexpected machine motion immediately after switching on the supply voltage

The Safety Integrated Functions cannot be selected immediately after switching on the supply voltage. The Safety Integrated Functions can only be selected after the system has completely run-up. As a consequence, there is an increased risk of an accident while the system runs-up. Accidents can result in death or severe injuries.

- Close all protective devices before the system runs up.
  Persons must not be present in the danger zone.

WARNING

Unsafe operation as encoder monitoring is deactivated

Deactivated or incorrectly parameterized hardware and software monitoring functions of the encoder can result in unsafe operating states.

- Activate the encoder monitoring functions in the Sensor Module.
- Carefully parameterize the encoder monitoring functions.
- Depending on the fault type and the responding monitoring function, activate stop function category 0 or 1 according to EN 60204-1.

WARNING

Unexpected motor movements due to manipulated connecting cables

The manipulation of the connecting cables can cause unexpected motor movements in a machine or plant. Particularly in machines or plants in which Safety Integrated Functions are used to minimize risks, manipulation can result in serious personal injury or death.

- Prevent unauthorized access to the converter, for example by using a lockable control cabinet.
- Protect the cables inside and outside the control cabinet against manipulation by taking one of the following measures:
  - Sheathe the cables to the motors, encoders and sensors.
  - Route the cables in empty conduits.

WARNING

Unexpected machine movement after inserting a memory card

If a memory card without Safety Integrated Functions is inserted in the converter instead of a memory card with active Safety Integrated Functions, then deactivate the Safety Integrated Functions when the supply voltage is switched on the next time. Deactivated Safety Integrated Functions or Safety Integrated Functions that have not been adapted can trigger unexpected machine movements that may result in serious injury or death.

- Only insert a memory card with the required settings into the converter.
- Prevent unauthorized persons from accessing the converter.
- Protect configurations with active Safety Integrated Functions against changes by assigning roles using user management (UMAC).

Note

Fault of Safety Integrated Functions in the case of non-EMC-compliant installation

A non-EMC-compliant installation of your machine/system can result in sporadic faults in Safety Integrated Functions.

- Install the drive so that it is EMC-compliant.

Note

Protection against manipulation by unauthorized third parties

Safety Integrated Functions protect against hardware and software faults, but not against manipulation by unauthorized third parties.

Protective measures against unauthorized manipulation are described in the Startdrive Operating Instructions and online help. The measures address the following issues:

- Parameter configuration of the Safety Integrated Functions
- Connection
- Hardware components

Description

In comparison to standard converter functions, Safety Integrated Functions have an especially high degree of fail-safety. The Performance Level (PL) and Safety Integrity Level (SIL) of the corresponding standards are a measure of fail-safety.

Safety Integrated Functions are accordingly suitable for reducing risk in safety-related applications. If the risk analysis of the machine or the system indicates a special hazard potential in the application, an application is safety-related.

Safety Integrated means that the functions are integrated into the converter and can be executed without need of external components.

The converter performs a cyclic data comparison of the monitoring channels and identifies limit value violations of Safety Integrated Functions. Faults that are detected result in a safety message with a subsequent stop response.

The Safety Integrated Functions are in conformance with the following standards:

- Safety Integrity Level (SIL) 3 to IEC 61800-5-2
- Performance Level (PL) e according to EN ISO 13849-1
- Category 3 or 4 according to EN ISO 13849-1

9.3.4 Certification

Description

The Safety Integrated Functions comply with:

- Safety Integrity Level (SIL) 3 to IEC 61800-5-2
- Performance Level (PL) e to ISO 13849-1
- Category 3 or 4 to ISO 13849-1

The Safety Integrated Functions correspond to functions according to IEC 61800-5-2 and IEC 61800-5-3.

The individual Safety Integrated components have the following certifications:

Table 9-25 Certifications for the converter Safety Integrated component

Converter	SIL	PL	Category
Control via PROFIsafe	SIL3	PL e	Category 4
Control via F-DI	SIL3	PL e	Category 3 or 4 1)
Stop functions STO, SS1, SS1E, SS2, SS2E, SOS	SIL3	PL e	Category 4
Safe Brake Control (SBC)	SIL3	PL e	Category 3 or 4 2)
Safe Brake Test (SBT)	-	PL d	Category 2 or 3
Motion monitoring functions SLS, SDI, SSM, SLA	SIL3	PL e	Category 3

1) Depends on the parameterized diagnostic function (online self-test)

2) Dependent on the interval of the brake output test

Independent institutes also certify Safety Integrated Functions. A list of currently certified components is available on request from your sales partner.

9.3.5 PFH values

Description

The probability of failure for Safety Integrated Functions must be specified in the form of a PFH value (probability of failure per hour) according to IEC 61800-5-2, IEC 62061 and EN ISO 13849-1. The PFH value of a Safety Integrated Function depends on the safety concept of the converter and its hardware configuration, as well as on the PFH values of other components used for this Safety Integrated Function.

More information

The PFH values can be found under: PFH values (https://support.industry.siemens.com/cs/ww/en/view/76254308)

You can map the PFH values of all Safety Integrated components from Siemens using the "Safety evaluation" function in the TIA selection tool: Safety evaluation (http://www.siemens.com/safety-evaluation-tool)

9.3.6 Usage time when using Safety Integrated Functions

Requirement

WARNING

Unexpected motor response when the service life is exceeded

If the service life is exceeded, the probability of failure of the Safety Integrated Functions increases. This can result in unexpected motor movement and as a consequence can cause accidents involving death or severe injury.

- Take the converter out of service once the service life has been exceeded.

Description

You may not operate converters with active Safety Integrated Functions for longer than 20 years. The 20 years starts when the device is delivered. The service life cannot be extended. This is the case even if a service department checks the converter – or in the meantime, the converter was decommissioned.

A defective converter with active Safety Integrated Functions cannot be repaired and must be replaced by a brand new converter.

9.3.7 Stop functions

9.3.7.1 Safe Torque Off (STO)

Overview

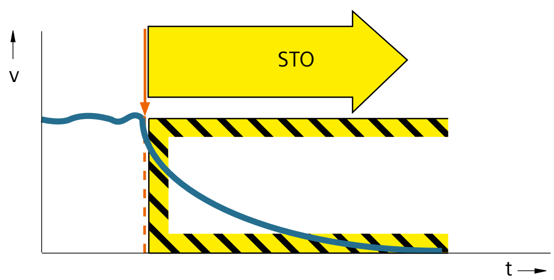


Figure 9-1 Overview STO

The Safe Torque Off (STO) function prevents the torque-generating supply of energy to the motor and prevents the motor from unexpectedly starting.

Requirement

STO is enabled in the function selection.

WARNING

Unexpected motor movement through active Safe Torque Off

When the Safe Torque Off (STO) function is active, then the motor can move unexpectedly, e.g. a suspended load can accelerate the motor. Unexpected movements can lead to damage to property, risk to persons, severe injury and death.

- Take account of the way the Safe Torque Off (STO) function works when you perform risk assessments of the machine or system.
- Prevent movements of the motor, for example by using a holding brake.

WARNING

Danger due to short, limited motion

If two power transistors simultaneously fail in the power unit (one in the upper and one in the lower inverter bridge), then this can cause brief, limited movement.

The maximum movement can be:

- Synchronous rotary motors: Max. movement = 180° / no. of pole pairs
- Synchronous linear motors: Max. movement = pole width

Description of function

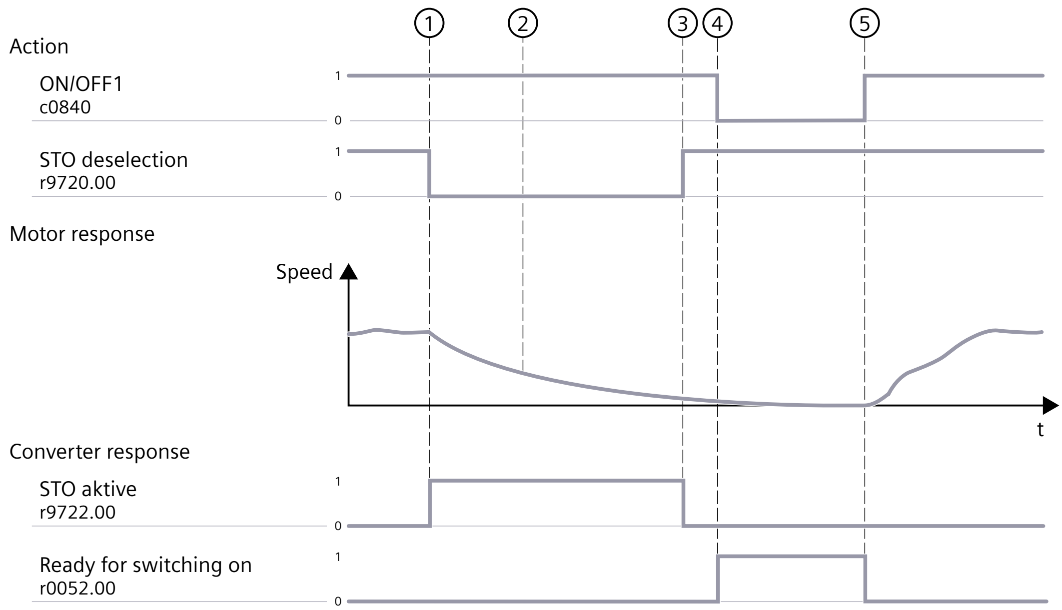


Figure 9-2 Flow diagram STO

Action		Motor / converter response
1	Selection of STO	• The converter detects selection of STO and signals the status "STO active" (r9722). • The converter interrupts the torque-generating energy supply to the motor. • The "switching on inhibited" status prevents the motor from restarting automatically.
2	Coast down	• The motor coasts down to a standstill.
3	Deselection of STO	• The converter detects deselection of STO.
4	Signal change at ON/OFF1 from 1 to 0	• The converter is ready to start again.
5	Signal change at ON/OFF1 from 0 to 1	• The motor starts again.

Example

Applications include all machines and systems with moving axes (for example, conveyor technology, handling).

With STO, maintenance work on the machine with an open protective door is possible, for example. An EMERGENCY STOP with electromechanical disconnection is not required.

9.3.7.2 Safe Stop 1 (SS1)

Overview

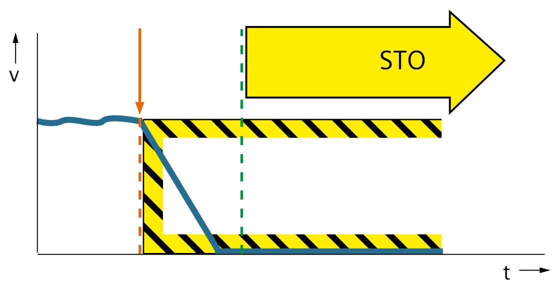


Figure 9-3 Overview SS1

Safe Stop 1 (SS1) stops a dangerous movement of a machine component.

Note

SS1 cannot be interrupted

- If SS1 is deselected again during this time, the STO function is selected and deselected again by the drive immediately after the delay time has elapsed or the speed has dropped below the shutdown speed. This terminates the SS1 function normally. It cannot be interrupted.
- During the delay time, SS1 cannot be deselected by withdrawing the control command, therefore fulfilling the requirements of EN 60204-1 relating to an EMERGENCY STOP function in stop Category 1.

Requirement

SS1 is enabled in the function selection.

WARNING

Unexpected motor movement through active Safe Torque Off

There may be unexpected motor movements if the Safe Torque Off (STO) function is active. For instance, the motor can coast down to a standstill or a hanging load may accelerate the motor. Unexpected movements can lead to damage to property, risk to persons, severe injury and death.

- Consider the functionality of the SS1 function in the risk assessment of the machine or plant.
- Prevent movements of the motor, for example, by using a holding brake.

Description of function

With Safe Stop 1 (SS1), the converter stops a dangerous movement of an electrically driven machine component. After stopping, the Safe Torque Off (STO) function prevents the machine component from restarting.

Table 9-26 Versions of the function

Abbreviation	Brief description
SS1-t	Safe Stop 1 with time control
SS1-a	Safe Stop 1 with acceleration monitoring (SAM)
SS1-r	Safe Stop 1 with braking ramp monitoring (SBR)

Example

Table 9-27 SS1 application example

Example	Possible solution
A converter must brake a motor as quickly as possible after the Emergency Stop pushbutton has been actuated. It is not permissible that the stationary motor undesirably restarts.	Select SS1 via a failsafe digital input or via PROFIsafe.

9.3.7.3 Safe Stop 1 with time control (SS1-t)

Overview

With SS1-t, the converter stops the motor along the OFF3 ramp within the set delay time. After the delay time elapses, irrespective of the current speed, the converter activates the Safe Torque Off (STO) function.

Description of function

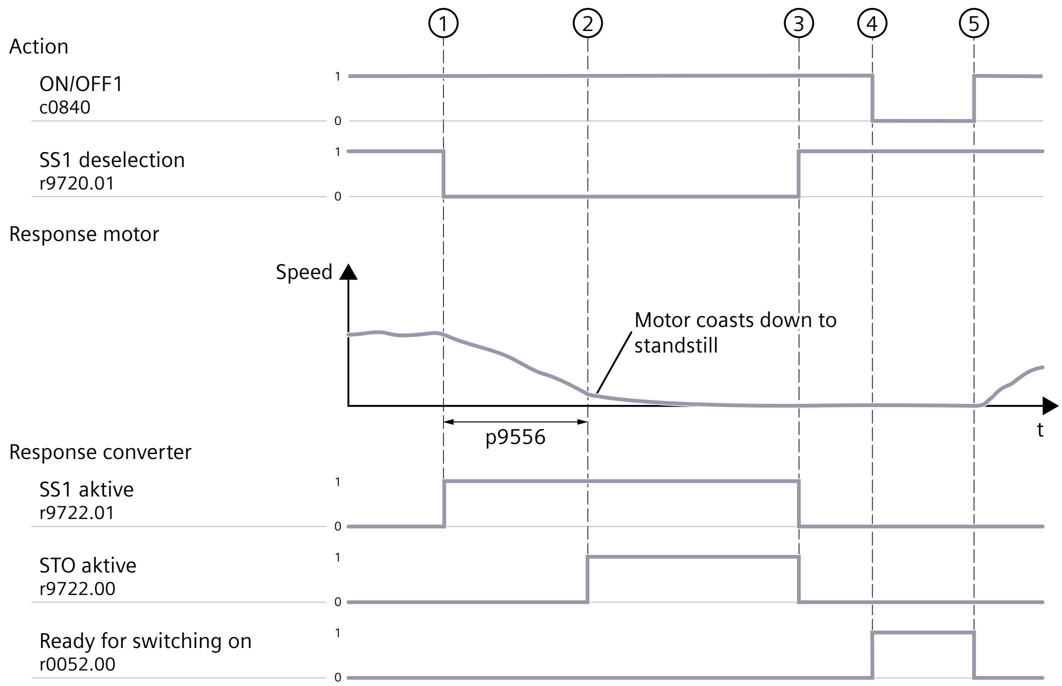


Figure 9-4 Flow diagram Safe Stop 1 with time control (SS1-t)

	Action	Motor / converter response
1	Selection of SS1	• The converter detects selection of SS1 and signals the status "SS1 active" (r9722.01). • The converter starts the transition time SS1 to STO (p9556). • The converter stops the motor along the OFF3 ramp. Stopping along the OFF3 ramp is not monitored. • Deselecting SS1 after the time 1 does not interrupt the stopping of the motor.
2	Transition to STO	• The transition time from SS1 to STO (p9556) has elapsed. • The converter activates STO and signals status "STO active" (r9722) and status "SS1 active". • The converter activates STO even if SS1 is deselected in the meantime. • STO interrupts the torque-generating supply of energy to the motor and prevents the motor from restarting. • The motor coasts down to a standstill.
3	Deselection of SS1	• The converter detects when SS1 is deselected. • The converter deactivates STO.
4	Signal change at ON/OFF1 from 1 to 0	• The converter is ready to start again.
5	Signal change at ON/OFF1 from 0 to 1	• The motor starts again.

9.3.7.4 Safe Stop 1 with acceleration monitoring (SS1-a)

Overview

SS1-a with Safe Acceleration Monitor (SAM) monitors whether or not the motor inadmissibly accelerates when braking. After the defined time interval has elapsed or the speed falls below the defined shutdown velocity, Safe Torque Off (STO) becomes active.

Description of function

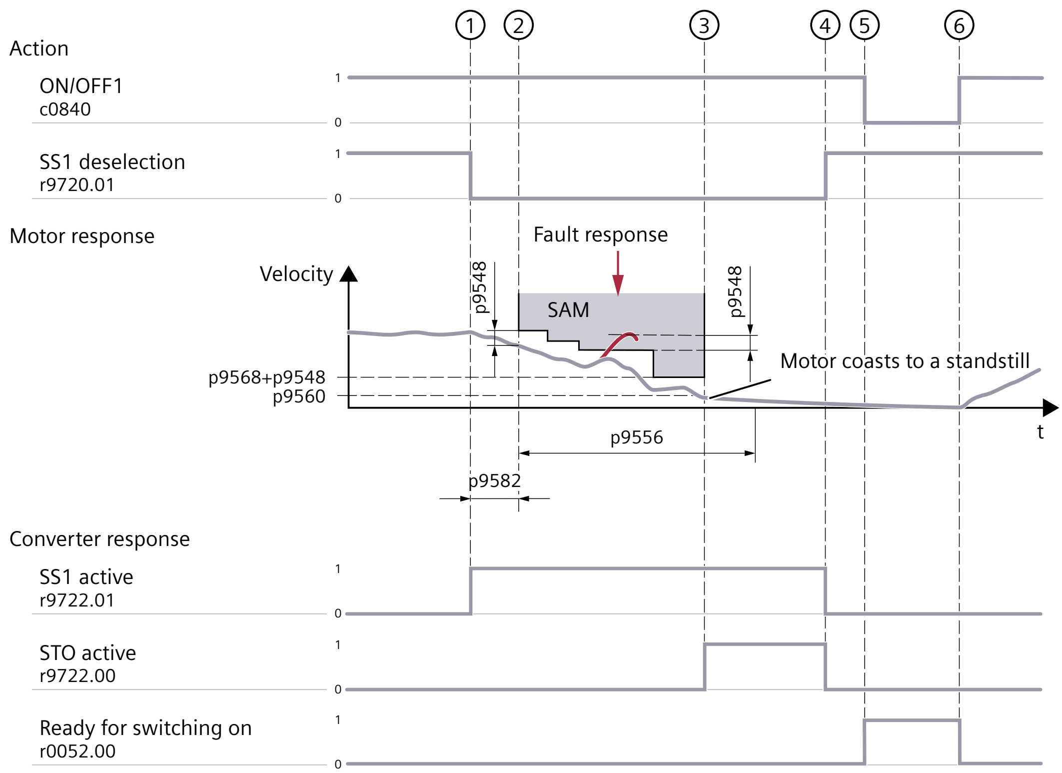


Figure 9-5 Flow diagram Safe Stop 1 with acceleration monitoring (SS1-a)

Action		Motor / converter response
1	Selection of SS1	• The converter detects selection of SS1 and signals the status "SS1 active" (r9722.01). • The converter starts the transition time SS1 to STO (p9556) and the SAM delay time (p9582). • The converter stops the motor along the OFF3 ramp. • Deselecting SS1 after the time 1 does not interrupt the stopping of the motor.

②	Braking along an OFF3 ramp with SAM monitoring	• The SAM delay time elapses. With SAM, the converter monitors whether the motor impermissibly accelerates. • The SAM monitoring follows the motor velocity as it decreases: The converter reduces the SAM monitoring step-by-step when the following applies: Absolute value of the motor velocity + p9548 < previous SAM monitoring It is not possible to increase the SAM monitoring. • If the motor velocity exceeds the SAM monitoring by more than the velocity tolerance (p9548), then the converter signals a fault and activates STO. • If the motor velocity reaches the SAM limit value (p9568), then the converter limits the value for the SAM monitoring to p9568 + p9548.
③	Transition to STO	• The SAM monitoring is exited if the transition time from SS1 to STO (p9556) elapses or if the following applies: Motor velocity < STO shutdown velocity (p9560) • The converter activates STO. • The converter activates STO even if SS1 is deselected in the meantime. • The converter signals status "STO active" (r9722). • STO interrupts the torque-generating supply of energy to the motor and prevents the motor from unexpectedly restarting. • The motor coasts down to a standstill.
④	Deselection of SS1	• The converter detects when SS1 is deselected. • The converter deactivates STO.
⑤	Signal change at ON/ OFF1 from 1 to 0	• The converter is ready to start again.
⑥	Signal change at ON/ OFF1 from 0 to 1	• The motor starts again.

9.3.7.5 Safe Stop 1 with braking ramp monitoring (SS1-r)

Overview

With SS1-r, while braking, the converter monitors whether the speed of the motor remains below a defined ramp using Safe Brake Ramp monitoring (SBR).

Description of function

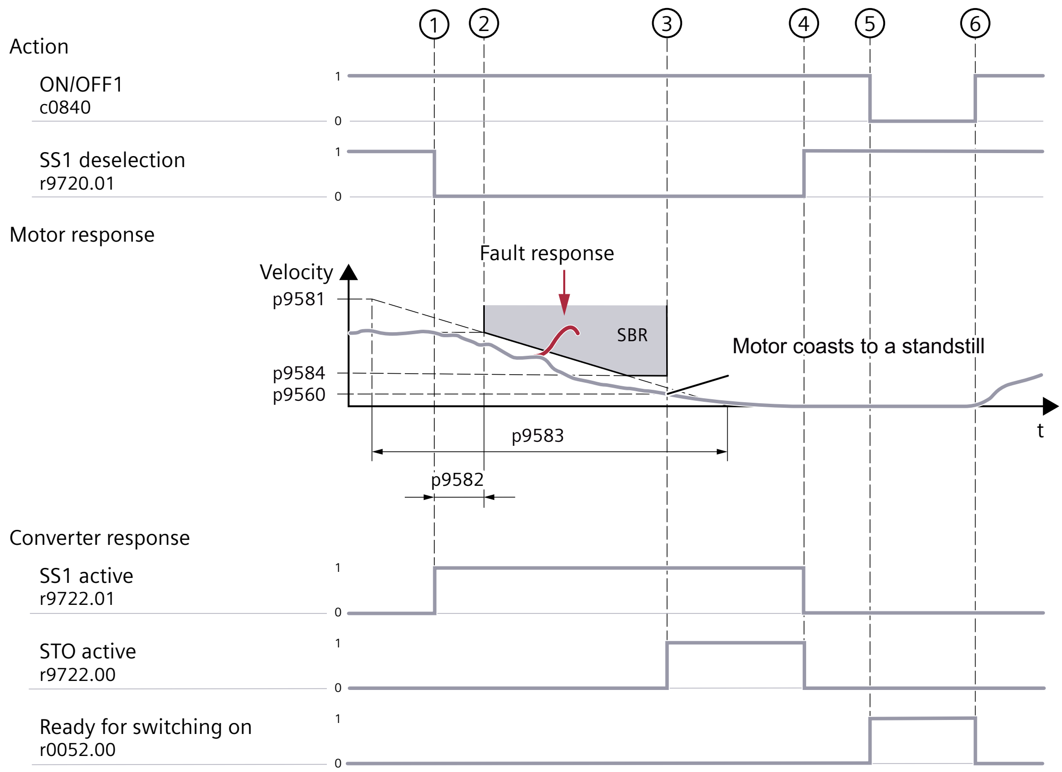


Figure 9-6 Flow diagram Safe Stop 1 with braking ramp monitoring (SS1-r)

Action		Motor / converter response
1	Selection of SS1	• The converter detects selection of SS1 and signals the status "SS1 active" (r9722.01). • The converter stops the motor along the OFF3 ramp. • Deselecting SS1 after the time 1 does not interrupt the stopping of the motor. • The converter starts the SBR delay time p9582.
2	Braking along an OFF3 ramp with SBR monitoring	• The SBR delay time has elapsed. • The converter starts the SBR monitoring. SBR monitoring starts with the velocity value at time 1. p9583 and p9581 define the gradient of the SBR monitoring. When reaching the SBR velocity limit (p9584), then SBR monitoring is frozen. Braking continues. • The converter monitors whether the motor exceeds the set safe OFF3 ramp when braking. • If the motor speed fails to follow the OFF3 ramp (braking ramp), the converter signals a fault and activates STO.

③	Transition to STO	• SBR ends as soon as the actual speed value is below the STO shutdown velocity (p9560). • The converter activates STO. • The converter activates STO even if SS1 is deselected in the meantime. • The converter signals status "STO active" (r9722). • STO interrupts the torque-generating supply of energy to the motor and prevents the motor from unexpectedly restarting. • The motor coasts down to a standstill.
④	Deselection of SS1	• The converter detects when SS1 is deselected. • The converter deactivates STO.
⑤	Signal change at ON/OFF1 from 1 to 0	• The converter is ready to start again.
⑥	Signal change at ON/OFF1 from 0 to 1	• The motor starts again.

9.3.7.6 Setting the SS1 transition time

Description

Select the SS1 transition time so that before the torque is shut down with STO, the motor can completely ramp down along the OFF3 ramp, and if parameterized, the motor holding brake can close. The OFF3 ramp-down time must be oriented to the actual braking capacity of the system or machine.

Set the SS1 transition time as follows:

With parameterized motor holding brake

SS1 transition time (p9556) ≥ OFF3 ramp-down time (p1135) + pulse cancellation delay time (p1228) + motor holding brake closing time (r1217)

Without parameterized motor holding brake

SS1 transition time (p9556) ≥ OFF3 ramp-down time (p1135) + pulse cancellation delay time (p1228)

9.3.7.7 Safe Stop 1 with external stop

Overview

> **WARNING**
>
> **Unexpected motor movement through active Safe Torque Off**
>
> There may be unexpected motor movements if the Safe Torque Off (STO) function is active. For instance, the motor can coast down to a standstill or a hanging load may accelerate the motor. Unexpected movements can lead to damage to property, risk to persons, severe injury and death.
>
> - Consider the functionality of the SS1 function in the risk assessment of the machine or plant.
> - Prevent movements of the motor, for example, by using a holding brake.

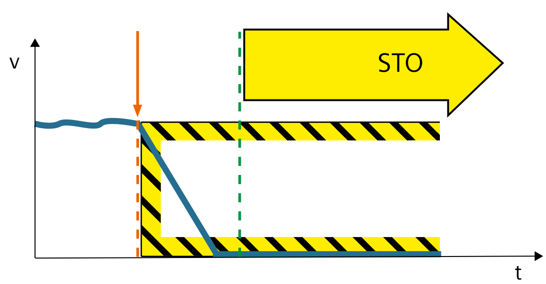


Figure 9-7 Overview SS1E

Note

SS1E cannot be interrupted

- If SS1E is deselected again within the delay time, the drive selects and then deselects the STO function after the delay time elapses or after the shutdown velocity is undershot. This exits the SS1E function normally, and it cannot be interrupted.
- During the delay time, SS1E cannot be deselected by withdrawing the control command, therefore fulfilling the requirements of EN 60204-1 relating to an EMERGENCY-STOP function in stop Category 1.

Function description

The "Safe Stop 1" function with external stop (SS1E) initiates function "Safe Torque Off" (STO) after a predefined time interval has elapsed. The higher-level control system specifies the brake response. The higher-level failsafe control detects when SS1E is selected via the fail-safe Profisafe telegram. A non-fail-safe controller detects when the stop function is selected from the non-fail-safe Safety Info Channel (SIC) in telegram 700 or 701. This function corresponds to stop category 1 according to EN 60204-1.

Table 9-28 Versions of the function

Abbreviation	Brief description
SS1E-t	Safe Stop 1 with external stop with time control
SS1E-a	Safe Stop 1 with external stop with acceleration monitoring (SAM)
SS1E-r	Safe Stop 1 with external stop with brake ramp monitoring (SBR)

Applications

Safe Stop 1 with external stop (SS1E) is suitable for use with drive line-ups where drive-autonomous braking at the respective OFF3 ramp is detrimental to the application.

Drive groups are drives that are coupled through material, for example.

9.3.7.8 Safe Stop 1 with external stop with time control (SS1E-t)

Overview

When safety function SS1E-t is used, the motor is stopped by the user program of a higher-level control system. When selecting SS1E-t, the converter starts a safety-relevant delay time. Using an appropriate user program, the higher-level control system must stop the motors involved within the safety-relevant delay time. After the safety-relevant delay time has elapsed, the converter activates the STO function and safely interrupts the energy supply to the motor (independent of the actual speed).

Description of function

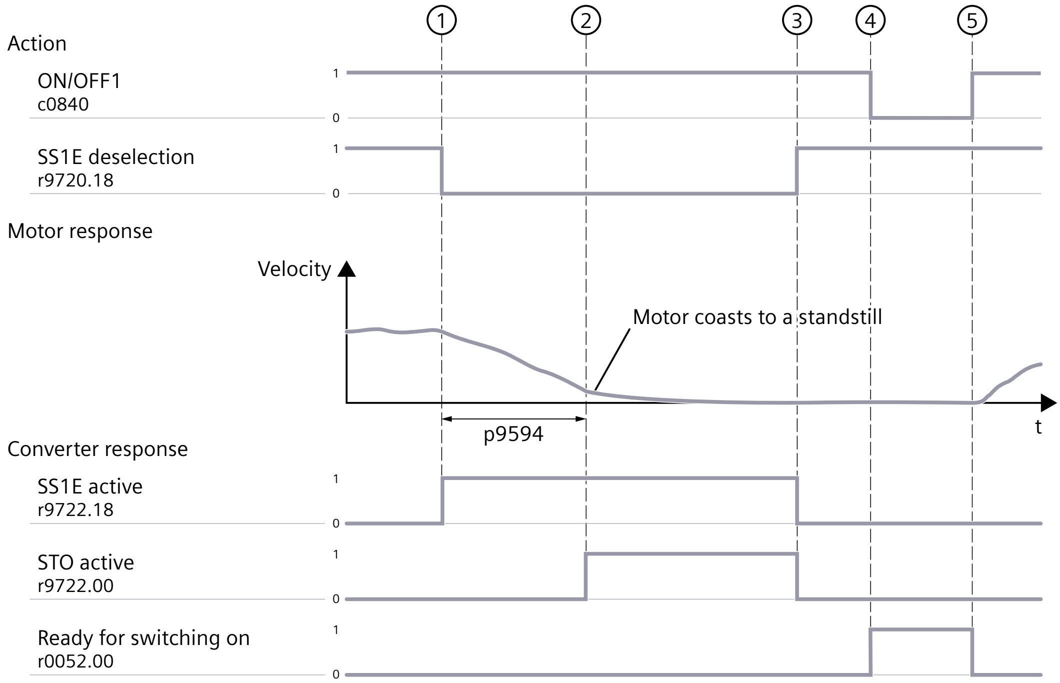


Figure 9-8 Description of function: SS1 with external stop (SS1E-t)

Action		Response motor / controller
1	Selection of SS1E	• The converter detects when SS1E is selected and signals status "SS1E active" (r9722.18 and r9743.03). • The converter starts the transition time SS1E to STO (p9594). • The control system initiates stopping using the external setpoint input.
2	Transition to STO	• The transition time SS1E to STO (p9594) elapses. • The converter activates STO and signals status "STO active" (r9722.00 and r9734.00). SS1E active remains active. • STO interrupts the torque-generating supply of energy to the motor and prevents the motor from restarting. • The motor coasts down to a standstill.
3	Deselection of SS1E	• The converter detects when SS1E is deselected. • The converter deactivates STO.
4	Signal change at ON/ OFF1 from 1 to 0	• The converter is ready to start again.
5	Signal change at ON/ OFF1 from 0 to 1	• The motor starts again.

9.3.7.9 Safe Stop 1 with external stop with acceleration monitoring (SS1E-a)

Overview

With SS1E-a, the higher-level control stops the motor via the user program. The higher-level failsafe control detects when SS1E-a is selected via the failsafe Profisafe telegram. With Safe Acceleration Monitor (SAM) the converter monitors whether or not the motor inadmissibly accelerates when braking. After the delay time elapses or the defined shutdown velocity is fallen below, the converter activates the Safe Torque Off (STO) function.

Description of function

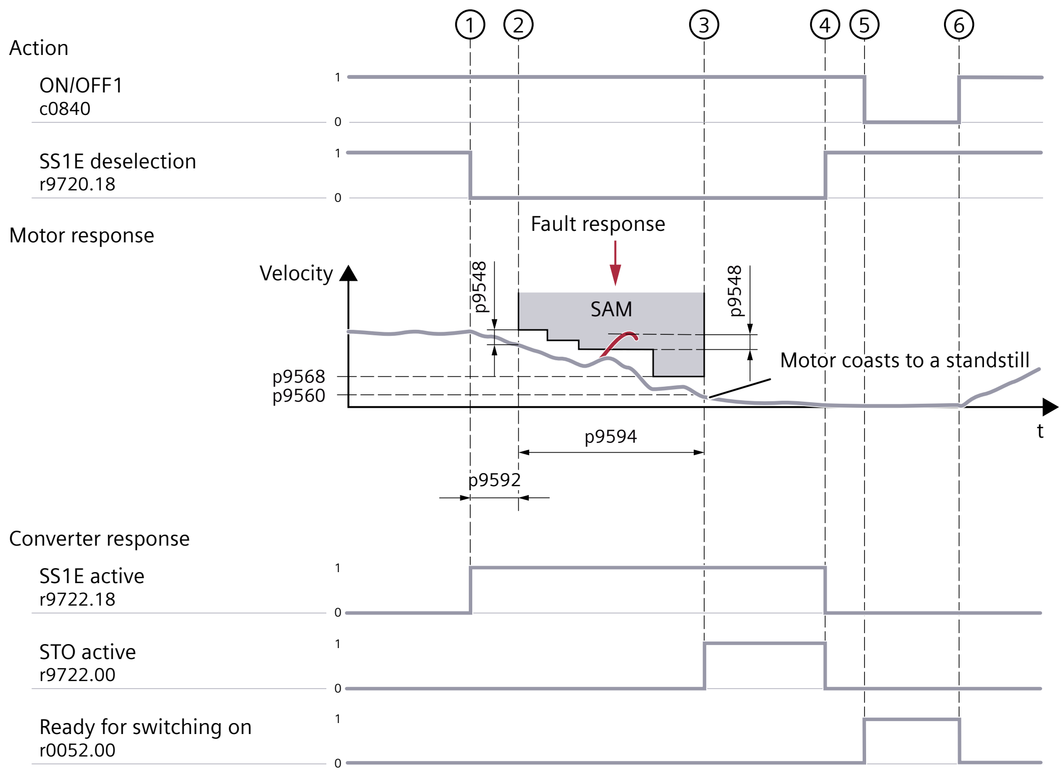


Figure 9-9 Description of function: SS1E with SAM

Action		Motor/drive response
1	Selection of SS1E	• The converter detects when SS1E is selected and signals status "SS1E active" (r9722.18 and r9743.03). • The drive starts the transition time SS1E to STO (p9594) and the SAM delay time (p9592). • The higher-level control initiates the stopping process via the external setpoint input.

②	Braking along the OFF3 ramp with SAM monitoring	• The SAM delay time elapses. With SAM, the converter monitors whether the motor impermissibly accelerates. • The SAM monitoring follows the motor velocity as it decreases: The converter reduces the SAM monitoring step-by-step when the following applies: Absolute value of the motor velocity + p9548 < previous SAM monitoring It is not possible to increase the SAM monitoring. • If the motor velocity exceeds the SAM monitoring by more than the velocity tolerance (p9548), then the converter signals a fault and activates STO. • If the motor velocity reaches the SAM limit value (p9568), then the converter limits the value for the SAM monitoring to p9568 + p9548.
③	Transition to STO	• SAM ends when the motor velocity falls below the STO shutdown velocity (p9560) or the SS1E to STO (p9594) transition time expires. STO is then activated. • The drive identifies when STO is selected and signals status "STO active" (r9722.00 and 9734.00). SS1E still remains active. • STO interrupts the torque-generating supply of energy to the motor and prevents the motor from unexpectedly restarting. • The motor coasts down to a standstill.
④	Deselection of SS1E	• The converter detects when SS1E is deselected. STO is simultaneously deactivated.
⑤	Signal change at ON/OFF1 from 1 to 0	• The converter is ready to start again.
⑥	Signal change at ON/OFF1 from 0 to 1	• The motor starts again.

9.3.7.10 Safe Stop 1 with external stop with brake ramp monitoring (SS1E-r)

Overview

When function SS1E-r is active, the motor is stopped via the user program of a higher-level control system. The converter monitors the stopping process using Safe Brake Ramp monitoring.

Description of function

The higher-level failsafe control detects when SS1E-r is selected via the failsafe Profisafe telegram. With Safe Brake Ramp monitoring (SBR), the converter monitors whether the velocity of the motor remains below a defined OFF3 ramp. The converter activates the Safe Torque Off (STO) function after the specified shutdown velocity is fallen below.

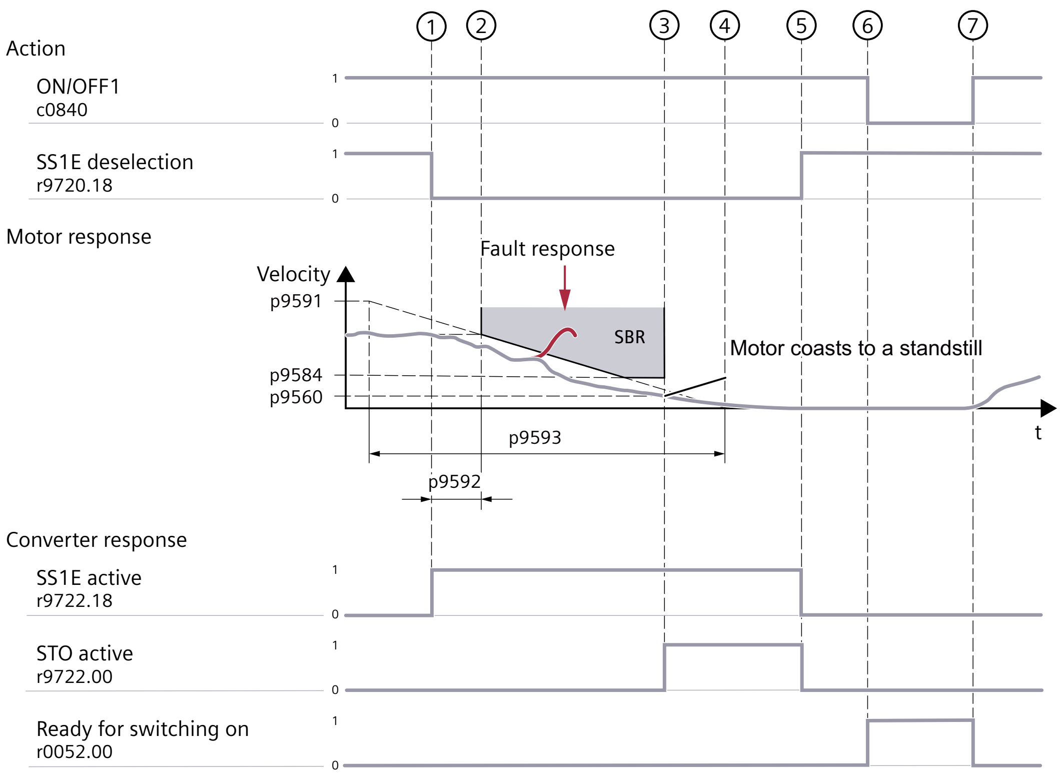


Figure 9-10 Description of function: SS1E with SBR

Action		Motor/drive response
1	Selection of SS1E	• The drive identifies when SS1E is selected and signals status "SS1E active" (r9722.18 and r9743.03). • The higher-level control issues the setpoint to stop the motor. • The drive starts the SBR delay time (p9592).
2	Motor brakes along the braking ramp with SBR monitoring	• The SBR delay time elapses. • The drive initiates monitoring of motor velocity with SBR. • If the velocity of the motor is greater than the SBR monitoring, the converter reacts with a stop. • The SBR velocity limit (p9584) defines the minimum value of the SBR monitoring. Braking continues.

③	Transition to STO	• SBR ends after one of the following two conditions: – If the motor velocity is less than the STO shutdown velocity (p9560) – After time p9593 has elapsed. • The drive activates STO and signals status "STO active" (r9722.0 and r9734.00). SS1E still remains active. • STO interrupts the torque-generating supply of energy to the motor and prevents the motor from unexpectedly restarting. • The motor coasts down to a standstill.
④	Latest possible transition to STO	• The drive now activates STO if the motor velocity has still not fallen below the STO shutdown velocity (p9560).
⑤	Deselection of SS1E	• The drive detects when SS1E is deselected and activates STO.
⑥	Signal change at ON/OFF1 from 1 to 0	• The drive is again ready to start.
⑦	Signal change at ON/OFF1 from 0 to 1	• The motor starts again.

9.3.7.11 Setting the SS1E transition time

Description

Select the SS1E transition time so that before the torque is shut down with STO, the motor can completely ramp down along the OFF3 ramp, and if parameterized, the motor holding brake can close. The braking time must be oriented to the actual braking capacity of the system or machine.

Set the SS1E transition time as follows:

With parameterized motor holding brake

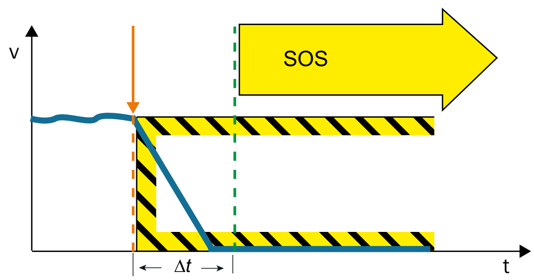
SS1E delay time (p9594) ≥ braking time + pulse cancellation delay time (p1228) + motor holding brake closing time (r1217)

Without parameterized motor holding brake

SS1E transition time (p9594) ≥ braking time + pulse cancellation delay time (p1228)

9.3.7.12 Safe Stop 2 (SS2) - overview

Overview



Function "Safe Stop 2 (SS2)" brings the motor to a standstill, keeps the motor active at the standstill position and monitors the standstill position using function "Safe Operating Stop (SOS)". SS2 corresponds to stop category 2 according to EN 60204-1.

The following function variants are available:

Abbreviation	Brief description
SS2-t	Safe Stop 2 with time-controlled activation of SOS
SS2-a	Safe Stop 2 with safe acceleration monitoring (SAM)
SS2-r	Safe Stop 2 with safe brake ramp monitoring (SBR)

If the higher-level control issues the speed setpoint, when function SS2 is active, then the specified speed setpoint and the actual speed value of the motor differ. The speed difference must not lead to a fault response of the higher-level control, which would interrupt function SS2 and, as a consequence, the independent braking process of the motor.

9.3.7.13 Safe Stop 2 with time control (SS2-t)

Overview

With SS2-t, the converter stops the motor along the OFF3 ramp within the set delay time. After the delay time elapses, irrespective of the actual speed, the converter activates the Safe Operating Stop (SOS) function.

Description of function

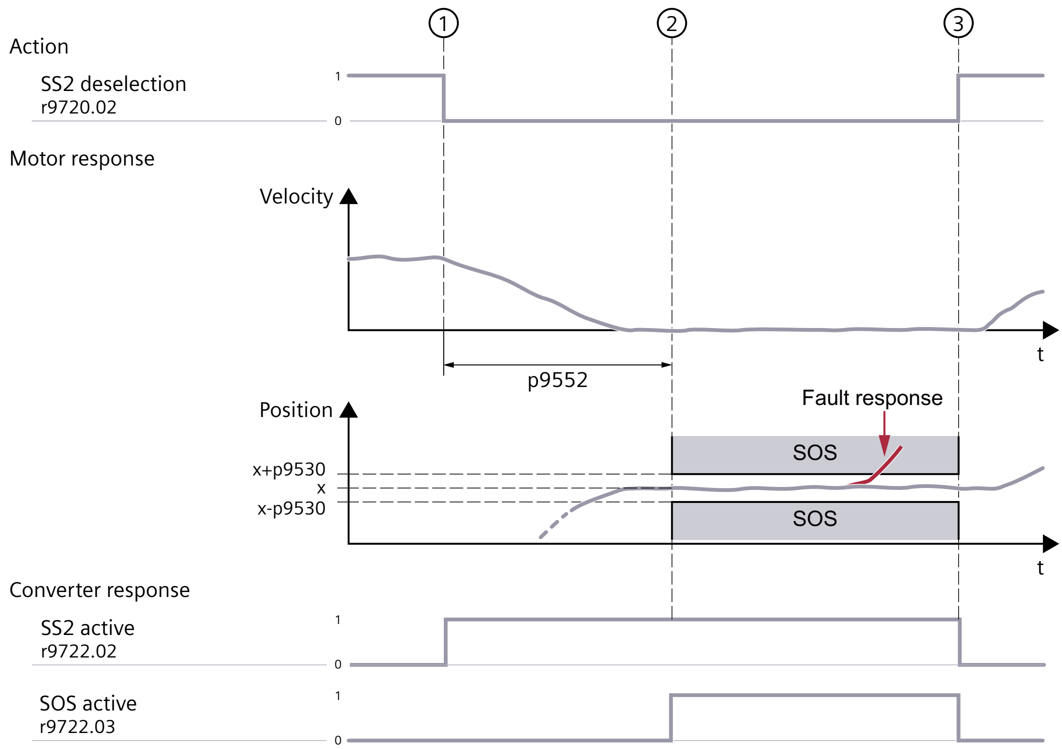


Figure 9-11 Description of function: SS2 with time control

Action		Motor / converter response
1	Selection of SS2	• The converter detects selection of SS2 and signals status "SS2 active" (r9722.02). • The converter starts the transition time SS2 to SOS (p9552). • The converter stops the motor along the OFF3 ramp. Stopping along the OFF3 ramp is not monitored.
2	Transition to SOS	• The transition time SS2 to SOS (p9552) elapses. • The converter activates SOS and signals status "SOS selected" (r9722.03) and status "SS2 active" (r9722.02). • Function SOS safely monitors standstill of the motor using the standstill tolerance (p9530). The motor closed-loop control remains active. • If the standstill tolerance is violated, then the converter responds with SS1 and then transitions into STO.
3	Selection of SS2	• The converter detects when SS2 is deselected and signals status "SS2 not enabled" and "SOS not selected". • The motor closed-loop control follows the actual setpoint.

9.3.7.14 Safe Stop 2 with acceleration monitoring (SS2-a)

Overview

With SS2-a, the converter stops the motor along the OFF3 ramp within the set delay time. With Safe Acceleration Monitor (SAM) the converter monitors whether or not the motor inadmissibly accelerates when braking. After the delay time elapses, the converter activates the Safe Operating Stop (SOS) function.

Description of function

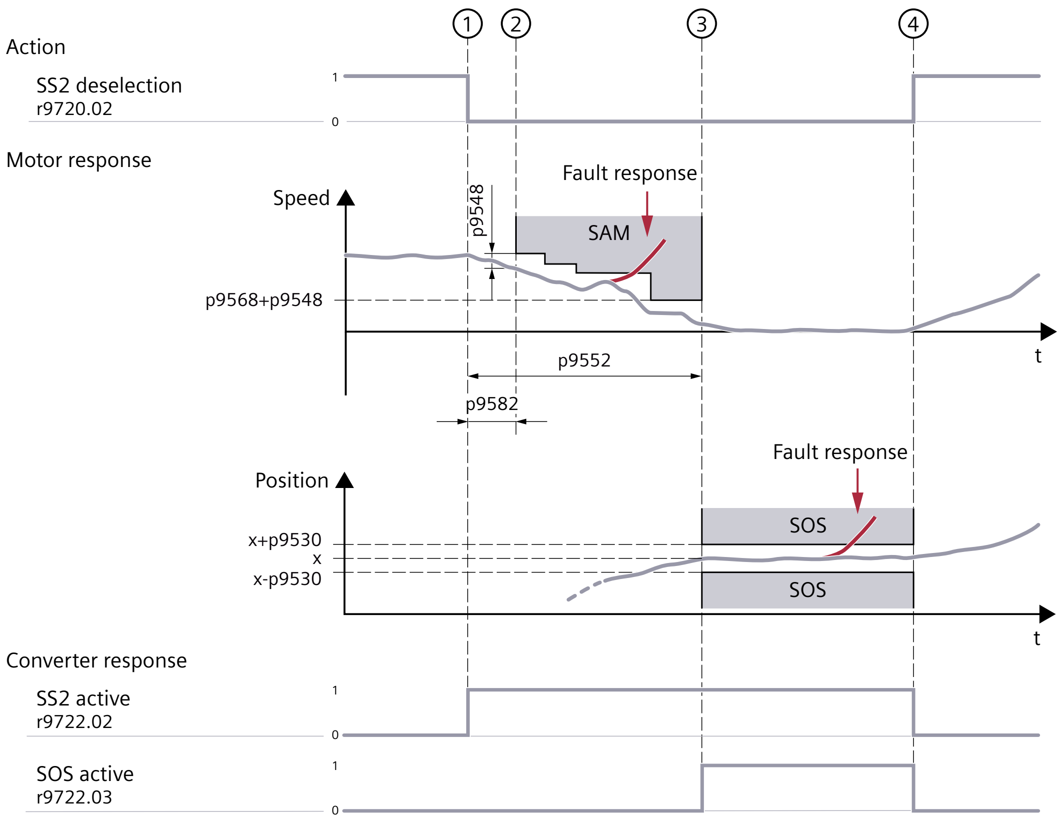


Figure 9-12 Description of function: SS2 with SAM

Action		Motor / converter response
1	Selection of SS2	• The converter detects when SS2 is selected and signals status "SS2 active" (r9722.02). • The converter starts the SAM delay time (p9582). • The converter starts the SS2 delay time (p9552). • The converter brakes the motor along the OFF3 ramp.

②	Braking along the OFF3 ramp with SAM monitoring	• The SAM delay time elapses. With SAM, the converter monitors whether the motor impermissibly accelerates. • The SAM monitoring follows the motor velocity as it decreases: The converter reduces the SAM monitoring step-by-step when the following applies: Absolute value of the motor velocity + p9548 < previous SAM monitoring It is not possible to increase the SAM monitoring. • If the motor velocity exceeds the SAM monitoring by more than the velocity tolerance (p9548), then the converter signals a fault and activates STO. • If the motor velocity reaches the SAM limit value (p9568), then the converter limits the value for the SAM monitoring to p9568 + p9548.
③	Transition to SOS	• The SS2 delay time (p9552) elapses. The SS2 delay time must be dimensioned to allow the motor to brake down to standstill from every speed of the operating process within this time. • The converter activates SOS and signals status "SOS active" (r9722.03) and status "SS2 active" (r9722.02). • The converter safely monitors standstill of the motor using the SOS function. The motor remains in closed-loop control and monitors the standstill tolerance (p9530). • If the standstill tolerance is violated, then the converter responds with SS1 and then transitions into STO.
④	Selection of SS2	• The converter detects when SS2 is deselected and signals status "SS2 not active" and "SOS not active". • The motor closed-loop control follows the actual setpoint.

9.3.7.15 Safe Stop 2 with brake ramp monitoring (SS2-r)

Overview

With SS2-r, the converter stops the motor along the OFF3 ramp within the set delay time. With Safe Brake Ramp monitoring (SBR), the converter monitors whether the speed of the motor remains below a defined braking ramp. After the delay time elapses, the converter activates the Safe Operating Stop (SOS) function.

Description of function

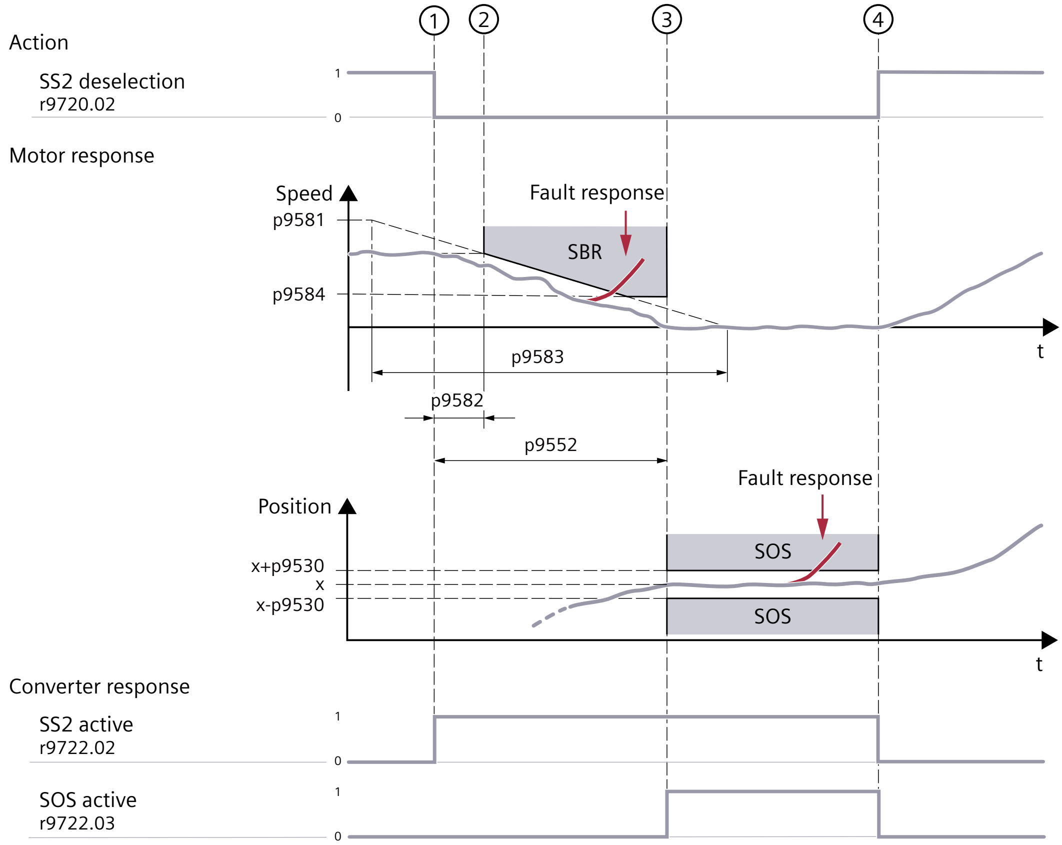


Figure 9-13 Description of function: SS2 with SBR

	Action	Motor / converter response
1	Selection of SS2	• The converter detects selection of SS2 and signals status "SS2 active" (r9722.02). • The converter starts the SBR delay time (p9582). • The converter starts the SS2 delay time (p9552). • The converter brakes the motor along the OFF3 ramp.
2	Braking along an OFF3 ramp with SBR monitoring	• The SBR delay time elapses. • The reference velocity (p9581) and the SBR monitoring time (p9583) define the gradient of the SBR monitoring. • When the motor brakes, the converter monitors that the motor does not exceed the SBR monitoring. • When reaching the SBR velocity limit (p9584), then SBR monitoring is frozen. Braking continues.

③	Transition to SOS	• The SS2 delay time (p9552) elapses. The SS2 delay time must be dimensioned to allow the motor to brake down to standstill from every speed of the operating process within this time. • The converter activates SOS and signals status "SOS active" (r9722.03) and status "SS2 active" (r9722.02). • The converter safely monitors standstill of the motor using the SOS function. The motor remains in closed-loop control and monitors the standstill tolerance (p9530). • If the standstill tolerance is violated, then the converter responds with SS1 and then transitions into STO.
④	Selection of SS2	• The converter detects when SS2 is deselected and signals status "SS2 not active" and "SOS not active". • The motor closed-loop control follows the actual setpoint.

9.3.7.16 Setting the SS2 transition time

Description

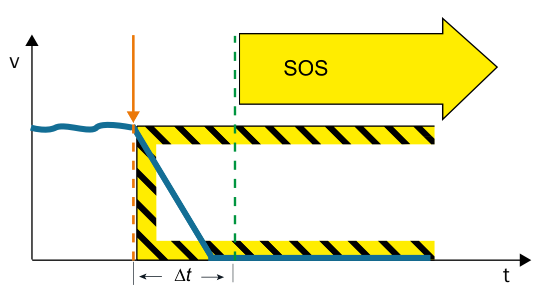
Select the SS2 transition time so that before SOS is deactivated, the motor can completely ramp down along the OFF3 ramp. The OFF3 ramp-down time must be oriented to the actual braking capacity of the system or machine.

Set the SS2 transition time as follows:

SS1 transition time (p9552) ≥ OFF3 ramp-down time (p1135)

9.3.7.17 Safe Stop 2 with external stop (SS2E) - overview

Overview



When function "Safe Stop 2 with external stop (SS2E)" is active, then the higher-level control brings the motor to a standstill by using a suitable setpoint input. The converter monitors stopping using function SS2E and monitors the standstill position using function "Safe Operating Stop (SOS)". SS2E corresponds to stop category 2 according to EN 60204-1.

The following function variants are available:

Abbreviation	Brief description
SS2E-t	Safe Stop 2 with external stop and time control (time until SOS enabled)
SS2E-a	Safe Stop 2 with external stop and safe acceleration monitoring (SAM)
SS2E-r	Safe Stop 2 with external stop and safe brake ramp monitoring (SBR)

Example

Safe Stop 2 with external stop (SS2E) is suitable for a group of drives. Although they can be stopped together, they have different acceleration rates or are stopped in a specified sequence with respect to time.

These are drives that are mechanically connected to each other through a material web, for example.

9.3.7.18 Safe Stop 2 with external stop with time control (SS2E-t)

Overview

When safety function SS2E-t is used, the drive is stopped via the user program running in a higher-level control system. When selecting SS2E-t, although the safe delay time is started, OFF3 is not activated. Using an appropriate program, the control system must then stop the drives involved within the delay time. After the delay time elapses, the converter activates the Safe Operating Stop (SOS) function.

Description of function

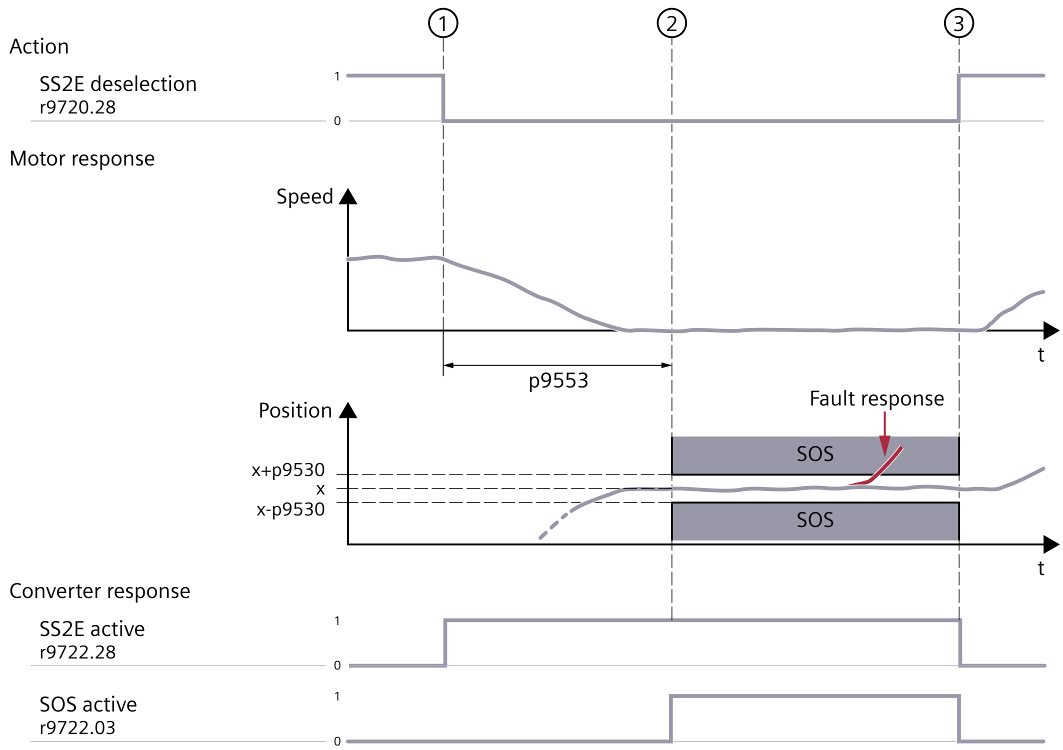


Figure 9-14 Description of function: SS2E with time control

Action		Motor / converter response
1	Selection of SS2E	• The converter detects when SS2E is selected and signals status "SS2E active" (r9722.28 and r10234.11). • The converter starts the transition time SS2E to SOS (p9553). • The higher-level failsafe control detects when SS2E-t is selected via the failsafe Profisafe telegram.
2	Transition to SOS	• The transition time SS2E to SOS (p9553) elapses. • The converter activates SOS and signals status "SOS selected" (r9722.03 and 9734.05). Status SS2E active remains active. • Function SOS safely monitors standstill of the motor using the standstill tolerance (p9530). The motor closed-loop control remains active. • If the standstill tolerance is violated, then the converter responds with SS1 and then transitions into STO.
3	Deselection of SS2E	• The converter detects when SS2E is deselected and signals status "SS2E not enabled" and "SOS not selected". • The motor closed-loop control follows the actual setpoint.

9.3.7.19 Safe Stop 2 with external stop with acceleration monitoring (SS2E-a)

Overview

With SS2E-a, the motor is stopped via the user program running on a higher-level control system. The higher-level failsafe control detects when SS2E-a is selected via the failsafe Profisafe telegram. With Safe Acceleration Monitor (SAM) the converter monitors whether or not the motor inadmissibly accelerates when braking. After the delay time elapses, the converter activates the Safe Operating Stop (SOS) function.

Description of function

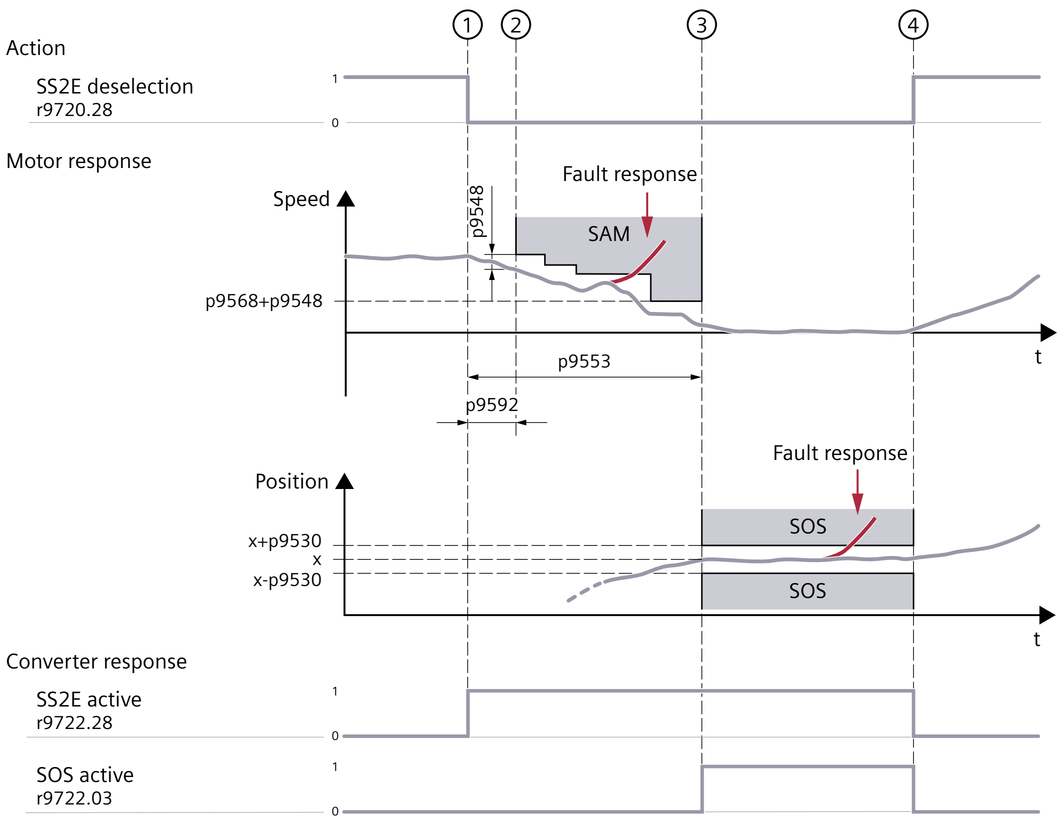


Figure 9-15 Description of function: SS2E with SAM

Action		Motor / converter response
1	Selection of SS2E	• The converter detects when SS2E is selected and signals status "SS2E active" (r9722.28 and r10234.11). • The converter starts the SAM delay time (p9592). • The converter starts the SS2E delay time (p9553). • The higher-level control initiates the stopping process via the external setpoint input.

②	Braking with SAM monitoring	• The SAM delay time elapses. With SAM, the converter monitors whether the motor impermissibly accelerates. • The SAM monitoring follows the motor velocity as it decreases: The converter reduces the SAM monitoring step-by-step when the following applies: Absolute value of the motor velocity + p9548 < previous SAM monitoring It is not possible to increase the SAM monitoring. • If the motor velocity exceeds the SAM monitoring by more than the velocity tolerance (p9548), then the converter signals a fault and activates STO. • If the motor velocity reaches the SAM limit value (p9568), then the converter limits the value for the SAM monitoring to p9568 + p9548.
③	Transition to SOS	• The SS2E delay time (p9553) elapses. The SS2E delay time must be dimensioned to allow the converter to brake the motor to a standstill from every speed of the operating process within this time. • The converter activates SOS and signals status "SOS selected" (r9722.03 and 9734.05) and status "SS2 active" (r9722.02 and r9734.02). • The converter safely monitors standstill of the motor using the SOS function. The motor remains in closed-loop control and monitors the standstill tolerance (p9530). • If the standstill tolerance is violated, then the converter responds with SS1 and then transitions into STO.
④	Deselection of SS2E	• The converter detects when SS2E is deselected and signals status "SS2E not active" and "SOS not active". • The motor closed-loop control follows the actual setpoint.

9.3.7.20 Safe Stop 2 with external stop with brake ramp monitoring (SS2E-r)

Overview

When function SS2E-r is enabled, the motor is stopped via the user program of a higher-level control system.

Description of function

The higher-level failsafe control detects when SS2E-r is selected via the failsafe Profisafe telegram. With Safe Brake Ramp monitoring (SBR), the converter monitors whether the velocity of the motor remains below a defined braking ramp. After the delay time elapses, the converter activates the Safe Operating Stop (SOS) function.

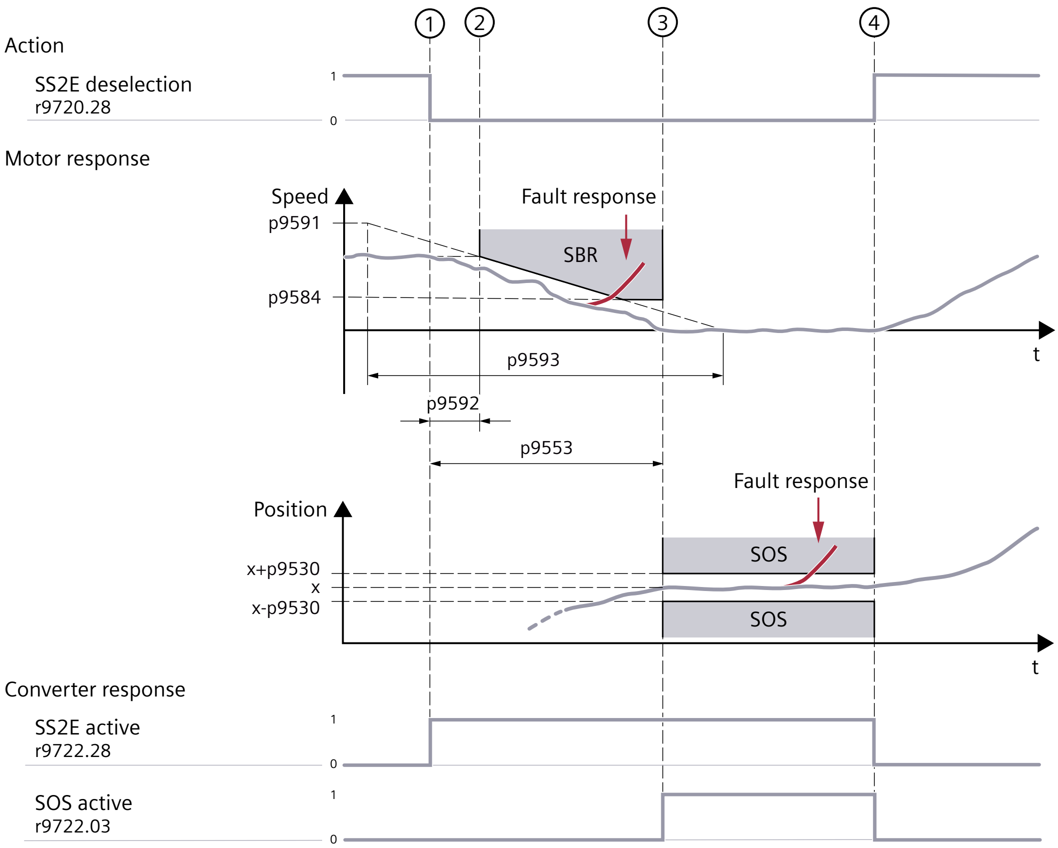


Figure 9-16 Description of function: SS2E SBR

Action		Motor / converter response
1	Selection of SS2E	• The converter starts the SS2E delay time (p9553). • The converter starts the SBR delay time (p9592). • The higher-level control initiates the stopping process via the external setpoint input.
2	Braking with SBR monitoring	• The SBR delay time elapses. • The reference velocity (p9591) and the SBR monitoring time (p9593) define the gradient of the SBR monitoring. • When the motor brakes, the converter monitors that the motor does not exceed the SBR monitoring. • The SBR velocity limit (p9584) defines the minimum value of the SBR monitoring. Braking continues.

3	Transition to SOS	• The SS2E delay time (p9553) elapses. The SS2E delay time must be dimensioned to allow the motor to brake down to standstill from every speed of the operating process within this time. • The converter activates SOS and signals status "SOS active" (r9722.03 and r9734.05) and status "SS2E active" (r9722.28 and 10234.11). • The converter safely monitors standstill of the motor using the SOS function. The motor remains in closed-loop control and monitors the standstill tolerance (p9530). • If the standstill tolerance is violated, then the converter responds with SS1 and then transitions into STO.
4	Deselection of SS2E	• The converter drive detects when SS2E is deselected and signals status "SS2E not enabled" and "SOS not enabled". • The motor closed-loop control follows the actual setpoint.

9.3.7.21 Setting the SS2E transition time

Description

Select the SS2E transition time so that before STO is activated, the motor can completely ramp down along the OFF3 ramp. The braking time must be oriented to the actual braking capacity of the system or machine.

Set the SS2E transition time as follows:

SS2E transition time (p9553) ≥ braking time

9.3.8 Safe Brake Management

9.3.8.1 Safe Brake Control (SBC)

Overview

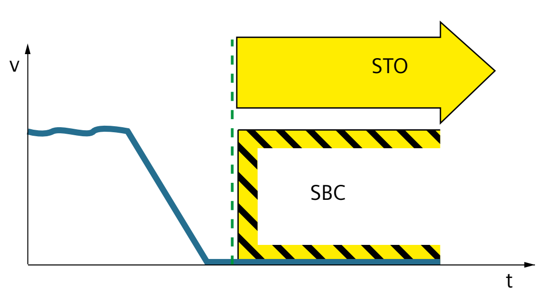


Figure 9-17 Overview SBC

Safe Brake Control (SBC) safely controls a holding brake. External logic or switching elements not required, as the function is integrated in the converter.

Requirement

> **⚠ WARNING**
>
> **Unexpected movement as a result of a mechanically defective holding brake**
>
> Function "SBC" does not detect mechanical defects, worn or dirty holding brakes. Undetected defects, wear or pollution can trigger unexpected movement of the motor. Unexpected motor movements can result in severe injury or death.
>
> - Test the function of the holding brake.
> - Replace a defective, worn or dirty holding brake.

Safe Brake Control (SBC) and in addition a stop function, e.g. STO, are enabled for function selection.

Function description

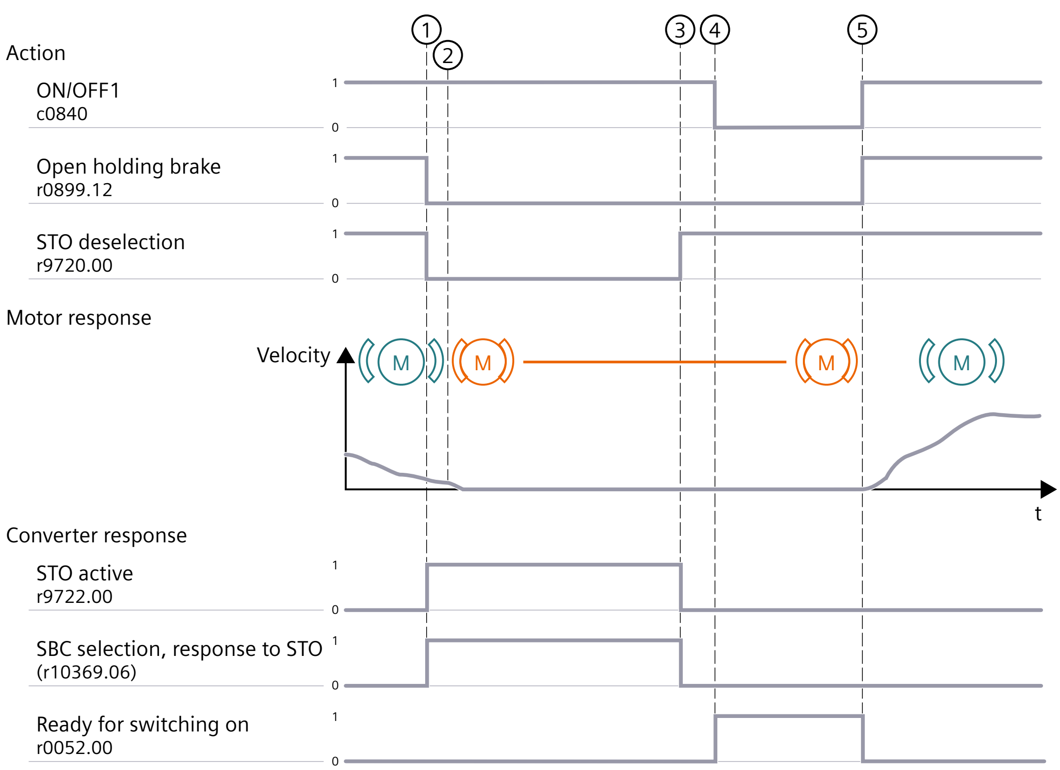


Figure 9-18 Safe Brake Control (SBC) when selecting STO

Action		Motor / converter response
1	Selection of STO	• The converter detects selection of STO and signals the status "STO active" (r9722.0). • The converter interrupts the torque-generating energy feed to the motor. • The motor coasts down. • The converter selects SBC as response to STO. • The converter interrupts the current to the holding brake.
2	Selection of SBC	• The holding brake is closed. • With SBC, the converter ensures that the brake current is interrupted and the holding brake remains closed.
3	Deselection of STO	• The converter detects deselection of STO. • The converter deselects SBC. • The holding brake remains (unsafely) closed.
4	Ready for switching on	• The converter receives the OFF1 command. • The motor is ready to start.
5	Open brake	• The converter receives the ON command. • The converter switches on the motor. • The converter opens the brake. • At the end of the brake opening time the motor accelerates to the setpoint. • When the holding brake is open, SBC detects an interrupted cable or short-circuit in the brake winding. The converter switches off the brake current if there is a fault in the brake control.

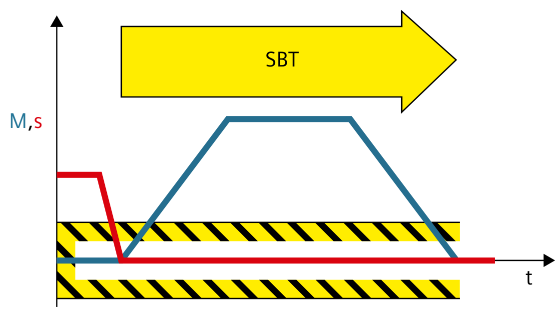
Example

SBC is suitable for applications where the converter must maintain a safe position, even when the motor is in a no-current condition.

SBC prevents that hanging or pulling loads sag. Hanging or pulling loads include e.g. hoisting gear, elevators for persons or winders.

9.3.8.2 Safe Brake Test (SBT)

Overview



The diagnostic function "Safe Brake Test" (SBT) checks the required holding torque of a motor holding brake.

With SBT, the converter tests the closed brake using a specified test torque or a specified force.

In conjunction with SBC, SBT is suitable for implementing a "safe brake". A "safe brake" detects mechanical faults and brake wear. An automatic brake test reduces maintenance costs and increases safety and availability of the plant or machine.

The "Safe Brake Test" (SBT) diagnostic function meets the requirements for category 2 according to EN ISO 13849-1.

SBT is not described in EN 61800-5-2.

Requirement

Diagnostic function "SBT" has the following requirements:

- Speed control with encoder
- The motor is switched on when selecting diagnostic function "SBT".
- When selecting diagnostic function "SBT", the speed actual value is < 1 % of the maximum speed (p1082) and when SBT is active, is < 10 % of the. maximum speed.
- The motor holding brake is open.

Function description

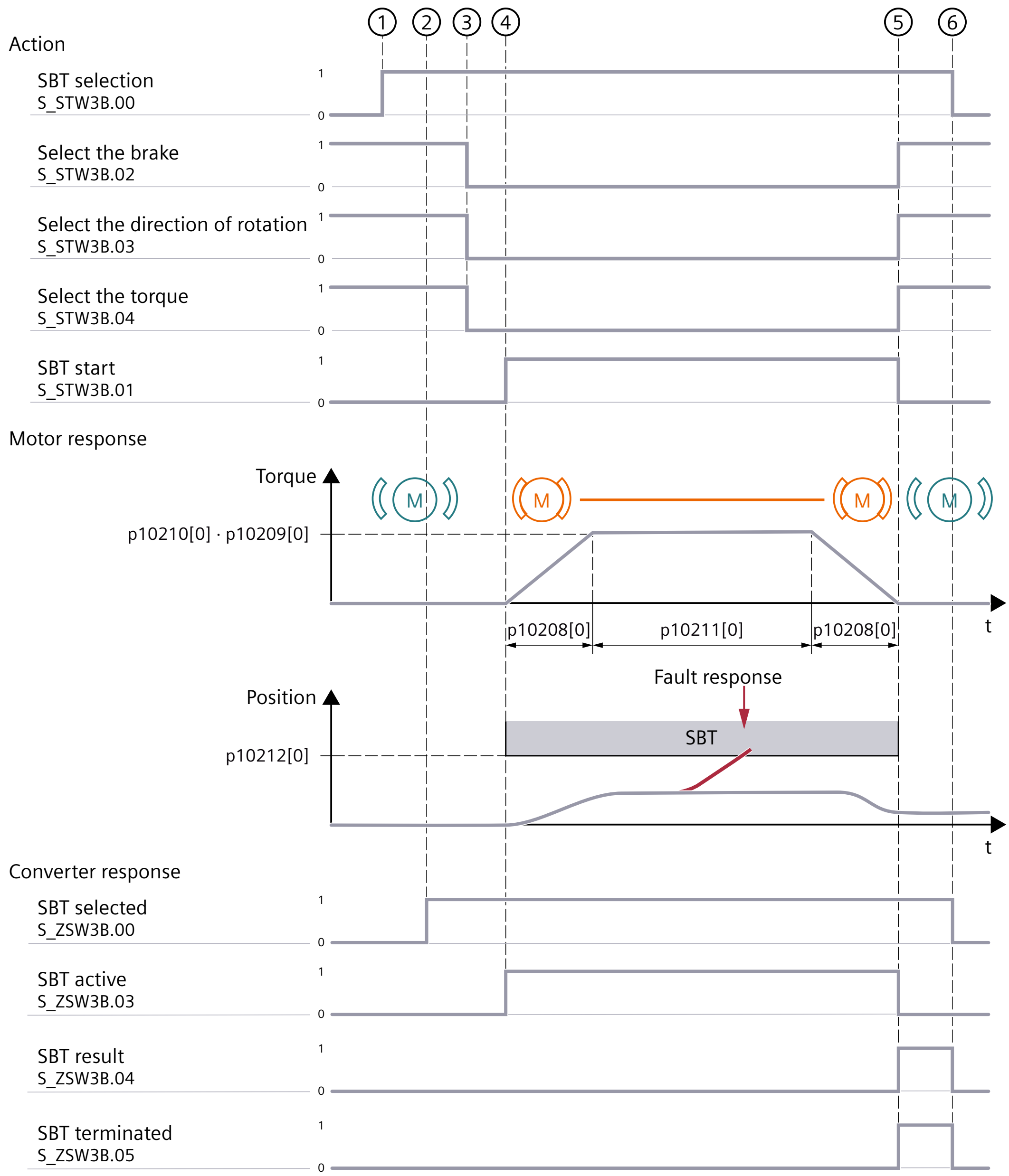


Figure 9-19 Sequence: SBT

	Action	Motor/drive response
1	Selection of SBT	• The higher-level control selects diagnostics function SBT via the Safety Control Channel (SCC) in telegram 701 by switching from a 0-signal to a 1-signal.
2	SBT is selected	• Via the Safety Info Channel (SIC), in telegram 701 the converter signals to the higher-level control that SBT is selected.

③	Section of the test conditions	• The higher-level control transfers the following test conditions to the converter: – Select the brake – Direction of rotation – Torque direction
④	Start of SBT	• The higher-level control starts SBT. • The converter signals status "SBT active". • The converter closes the motor holding brake. • The converter establishes the test torque p10210[0] · p10209[0] against the closed motor holding brake. • The converter monitors the motor position. The converter immediately exits SBT if the motor position changes by more than the position tolerance p10212[0]. • The converter establishes the test torque.
⑤	End of SBT	• The converter opens the brake. • The converter signals "SBT terminated" • With "SBT result" = 1 signal, the converter signals that the motor holding brake was successfully tested. • With "SBT result" = 0 signal, the converter signals that the motor holding brake was not successfully tested. In this case, the brake must be maintained or replaced.
⑥	Deselection of SBT	• The higher-level control deselects SBT.

9.3.8.3 Test of brake output

Overview

To meet the requirements of the ISO 13849-1 and IEC 61800-5-2 standards in terms of timely fault detection, the converter must test its brake output regularly - at least once a year - for correct functioning.

Description of function

To test the brake output of the converter, the SBC (Safe Brake Control) function must be activated within a defined time interval. The time interval depends on the required Safety Integrity Level (SIL) and on the desired Performance Level (PL) category:

- SIL2 / PL d / Category 3: 1 year
- SIL3 / PL e / Category 3: 3 months
- SIL3 / PL e / Category 4: 1 day

A timer is available to test the brake output for the safe brake control using SBC. In the standard, this is preset to 2160 h ≙ 3 months (p9659). The remaining time is shown in r9660. Message "Test brake output required" is output after the timer elapses. After the next time that the brake is either closed or opened, the message is withdrawn and the monitoring time is reset. In operation, the monitoring time is reset each time the brake is actuated.

9.3.9 Motion monitoring

9.3.9.1 Safely-Limited Speed (SLS)

Overview

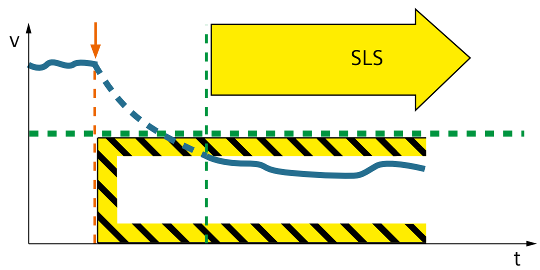


Figure 9-20 Overview SLS

With Safely-Limited Speed (SLS), the converter monitors the motor speed. The converter stops the motor if the motor speed is too high.

Function description

Safely-Limited Speed (SLS) has 4 independent SLS limit values that can be switched between during operation. If the motor speed violates the currently selected SLS limit value, the converter initiates a set stop response.

This figure illustrates the change from a higher SLS limit value to a lower SLS limit value. For the change from a lower SLS limit value to a higher SLS limit value, there is no SLS delay time. The new SLS limit value is active immediately.

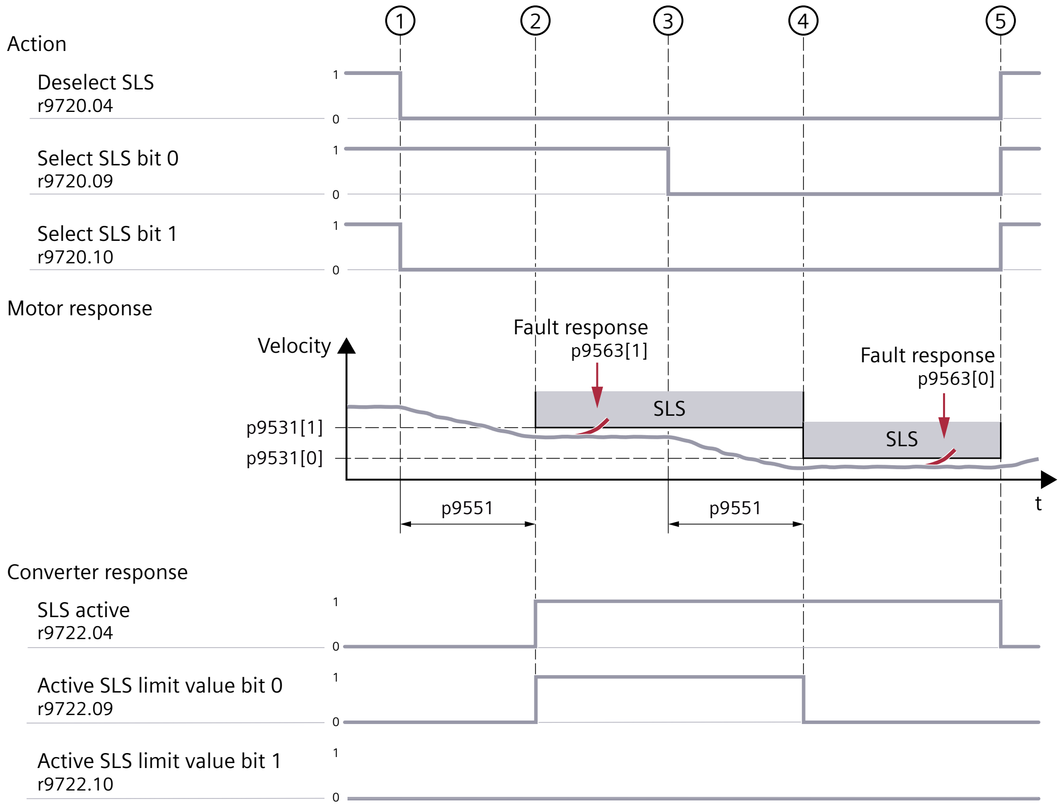


Figure 9-21 SLS with change between two SLS limit values

Action		Motor / converter response
①	Selection of SLS	• The converter detects the selection of SLS. • The converter detects when limit value SLS2 is selected (p9531[1]). • The converter starts the SLS delay time (p9551). • The motor follows the setpoint of the higher-level control and brakes. [1)] The actual speed must remain below the SLS2 limit value until the SLS delay time has elapsed.
②	Activation of the SLS limit value	• Monitoring of the SLS2 limit value (p9531[1)] is effective once the SLS delay time (p9551) has elapsed. • The converter signals status "SLS active" (r9722.04) and the active SLS level (r9722.09 = 1, r9722.10 = 0). • If the motor speed violates the SLS2 limit value, the converter initiates the set stop response p9563[1].

③	Change to SLS1 limit value	• The converter detects when limit value SLS1 is selected (p9531[0]). [1)] • The converter starts the SLS delay time (p9551). The SLS2 limit value remains while the SLS delay time is active. • The motor follows the setpoint of the higher-level control and brakes. The actual speed must remain below the SLS1 limit value until the SLS delay time has elapsed.
④	Activation of the SLS limit value	• Monitoring of the SLS1 limit value (p9531[0]) is effective once the SLS delay time (p9551) has elapsed. • The converter signals the active SLS level (r9722.09 = 0, r9722.10 = 0). • If the motor speed violates the SLS1 limit value, the converter initiates the set stop response p9563[0].
⑤	Deselection of SLS	• The converter detects deselection of SLS. • The motor follows the setpoint issued by the higher-level control.

1) Recommendation for setting the SLS limit values: SLS1 limit value < SLS2 limit value < ... < SLS3 limit value.

Example

SLS is suitable for machines where hazards due to excessive speeds are possible. In the following work steps, the use of SLS is particularly useful for direct contact between man and machine:

- During commissioning
- During setup
- For maintenance work

Table 9-29 Application examples SLS

Example	Solution
Setup mode: The machine operator must enter the dangerous area of a machine and manually introduce material into a machine part.	With SLS, the converter monitors the speed of the machine component.
To protect the drill chuck from destruction, a turning machine must not exceed a certain maximum speed of the machine part.	

9.3.9.2 SLS with variable speed limit value

Overview

The SLS1 limit value is scalable during operation via PROFIsafe.

Requirement

The SLS1 limit value is selected via PROFIsafe.

p9604.9 is set: Transfer of the SLS limit value via PROFIsafe is enabled.

Description of function

The signal S_SLS_LIMIT_A in the PROFIsafe telegram scales the SLS1 limit value.

The S_SLS_LIMIT_A scaling has the value range 1 ... 32767.

The scaled SLS1 limit value is calculated as follows: Scaled SLS1 limit value = S_SLS_LIMIT_A / 32767 · p9531[0]

Before the higher-level control (F-CPU) selects an SLS limit value or changes the SLS1 limit value, the control must reduce the motor speed according to the changed SLS limit value.

Also for the scaled SLS1 limit value, the SLS2, SLS3 and SLS4 limit values can be selected using r9720.09 and r9720.10.

An invalid value in S_SLS_LIMIT_A results in the stop response parameterized in p9563[0].

9.3.9.3 Limitation of the speed setpoint for SLS

Overview

For Safely-Limited Speed (SLS), it is useful to limit the speed setpoint with the higher-level control.

Description of function

The higher-level control receives the value for the required limitation of the speed setpoint from the Safety Info Channel (SIC) in telegram 700.

With SLS active, the converter sends the required setpoint limit r9733 in the S_V_LIMIT_B signal of telegram 700.

The converter calculates r9733 as follows:

- r9733[0] = p9531[x] · p9533 (converted from the load to the motor side)
- r9733[1] = -p9531[x] · p9533 (converted from the load to the motor side)
  [x] = selected SLS limit value

p9533 is the weighting factor to determine the setpoint limit from the selected actual speed limit in percent.

Conversion factor from the motor to the load side:

- Motor type = rotary and axis type = linear: p9522/(p9521 · p9520)
- Otherwise: p9522/p9521

9.3.9.4 Safe Speed Monitor (SSM)

Overview

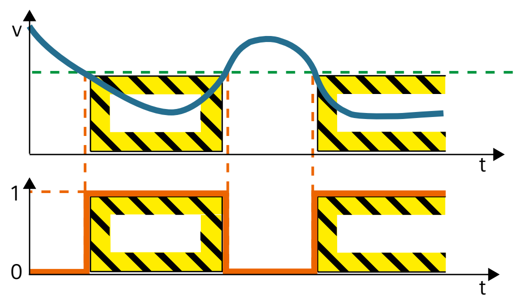


Figure 9-22 Overview SSM

Safe Speed Monitor (SSM) detects when the velocity falls below a velocity limit in both directions of motion.

If the velocity of the motor exceeds the SSM limit, a message is output but no stop response.

The converter provides a safety-related signal for further processing.

Description of function

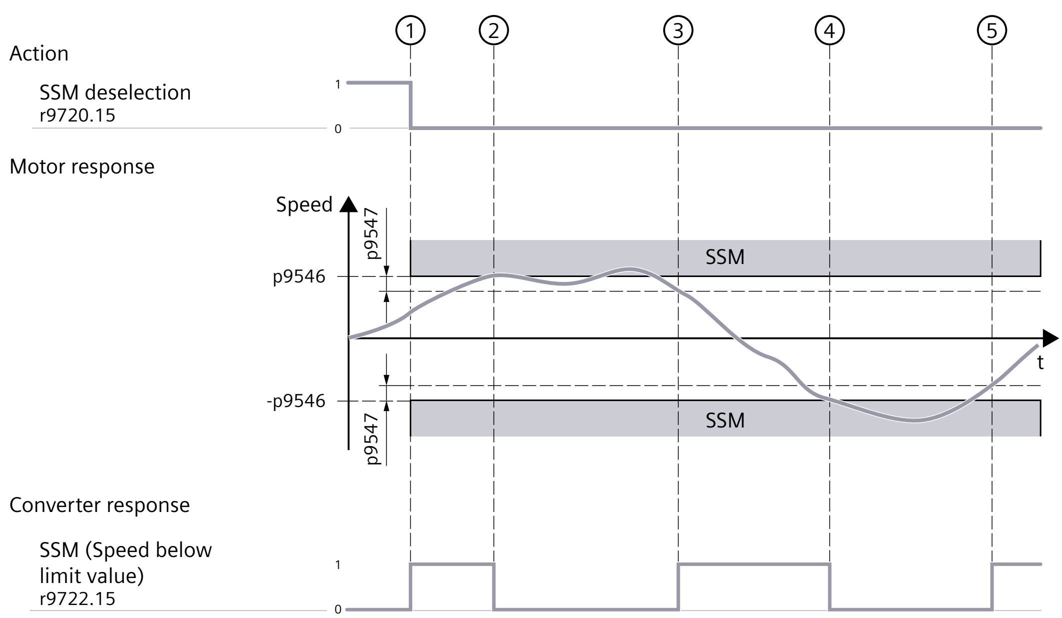


Figure 9-23 SSM

	Action	Motor / converter response
①	Selection of SSM	• The converter detects when SSM is selected. • If the speed of the motor is between the speed limit and the negative speed limit, the converter sets the signal "Speed below limit value" (p9722.15 = 1). • p9507.09 defines the initial value of the SSM signal after switching on the supply voltage: – p9507.09 = 0 means "SSM status signal when running up initialized to '1'". – p9507.09 = 1 means "SSM status signal when running up initialized to '0'".
②	Exceeding the velocity limit	• If the velocity of the motor exceeds the velocity limit, then the converter resets signal "Speed below limit value" = 0 (p9722.15).
③	Falling below the velocity limit	• If the velocity of the motor falls below the velocity limit minus the hysteresis, then the converter sets signal "Speed below limit value" = 1 (p9722.15).
④	Falling below the negative velocity limit	• If the velocity of the motor falls below the negative velocity limit, then the converter resets signal "Speed below limit value" = 0 (p9722.15).
⑤	Exceeding the negative velocity limit	• If the velocity of the motor exceeds the negative speed limit plus the hysteresis, then the converter sets signal "Speed below limit value" = 1 (p9722.15).

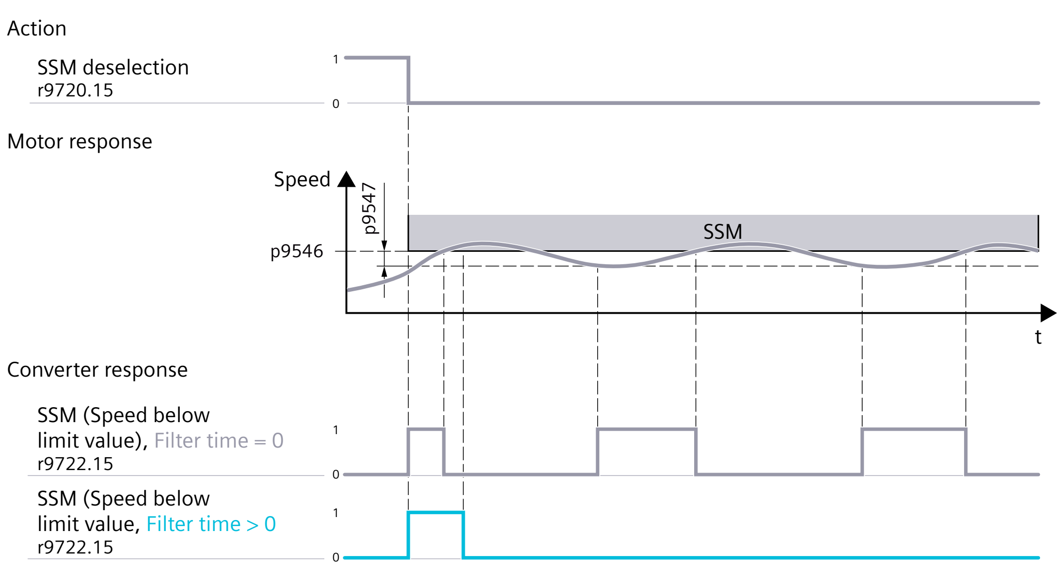


Figure 9-24 Principle of operation of the signal filter

The signal filter with filter time (p9545) smooths the speed measured value.

The filter reduces signal changes of the SSM feedback when monitoring speeds that lie just below the speed limit.

A filter time > 0 results in the SSM feedback signal being delayed.

Example

SSM is suitable for enabling access to the machine by way of safe SSM feedback. The safe state of the SSM feedback means that r9722.15 = 1. For example, it is possible to unlock safety doors only when the speed falls below critical levels.

9.3.9.5 Safe Direction (SDI)

Overview

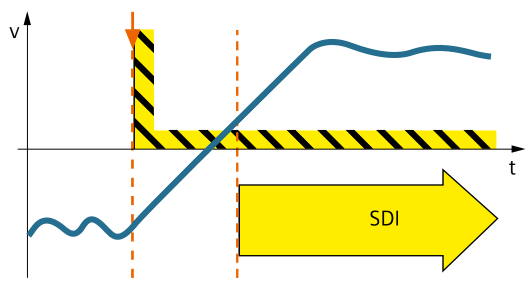


Figure 9-25 Overview SDI

With Safe Direction (SDI), the converter monitors the direction of motion of the motor. If the motor moves in the inhibited direction, then the converter stops the motor with an SDI-specific stop response.

The following SDI variants are available, depending on the direction of motion:

- SDI positive (SDI+)
- SDI negative (SDI-)

Function description

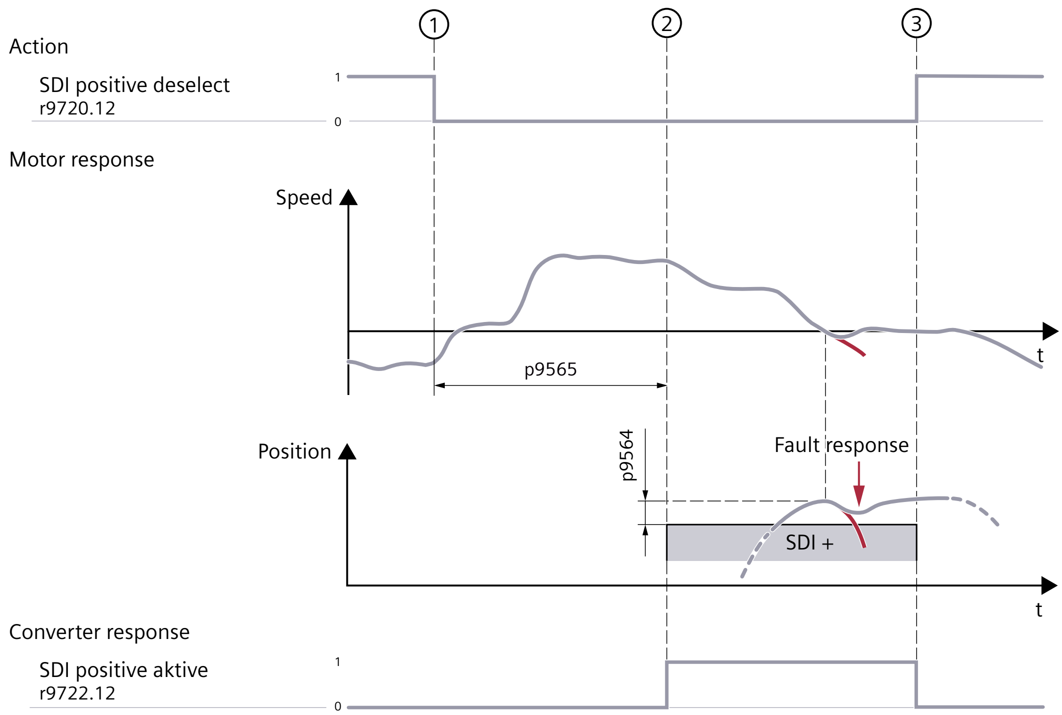


Figure 9-26 SDI+ with tolerance violation and direction of movement monitoring

Action		Motor / converter response
①	Selection of SDI+	• The converter detects the selection of SDI+. • The converter starts the SDI delay time (p9565).

②	Activation of SDI+	• After the SDI delay time has expired, the converter monitors the direction of motion of the motor. • The converter reports the status "SDI positive active" (r9722.12). • The converter continuously calculates the position of the motor. • As soon as the motor moves in the inhibited direction, the converter stores the current position and monitors the discrepancy between the current position and the stored position. • The converter sets r9733[1] = 0 (setpoint speed limitation negative).[2)] • If the discrepancy between the current position and the stored position is greater than the SDI tolerance p9564, the converter brakes the motor with the set stop response (p9566) and outputs a safety message [1)].
③	Deselection of SDI+	• The converter detects when SDI+ is deselected. • The converter stops monitoring the motion direction. • The motor can now be moved in both directions.

1) The following steps are required to acknowledge the safety message:

- Deselect SDI and select it again
- Safe acknowledgment

2) The converter automatically brakes the motor.

9.3.9.6 Limitation of the speed setpoint for SDI

Overview

For Safe Direction (SDI) it makes sense to limit the speed setpoint with the higher-level control.

Description of function

The higher-level control receives the value for the required limitation of the speed setpoint from the Safety Info Channel (SIC) in telegram 700.

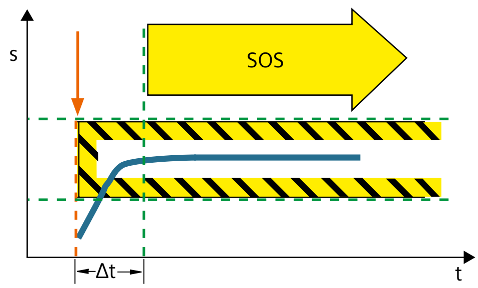
With SDI active, the converter sends the required setpoint limit r9733 in the S_V_LIMIT_B signal of telegram 700.

The converter calculates r9733 as follows:

- For SDI negative (SDI-): r9733[0] = 0
- For SDI positive (SDI+): r9733[1] = 0

9.3.9.7 Safe Operating Stop (SOS)

Overview



When safety function "Safe Operating Stop" (SOS) is active, the higher-level control stops the motor and the converter safely monitors the motor position for standstill.

Requirement

SS2 or SOS is enabled in the function selection.

WARNING
Unexpected motor movement as a result of mechanical forces When function "Safe Operating Stop (SOS)" is active, mechanical forces, which are higher than the maximum motor torque, result in a fault response. As a consequence of fault response "Safe Stop 1 (SS1)" (stop category 1 according to EN 60204-1), it is possible that the motor unexpectedly moves, which can result in death and severe injury. • Take appropriate measures to prevent undesirable motion and use, e.g. a brake with safety-relevant monitoring.

Description of function

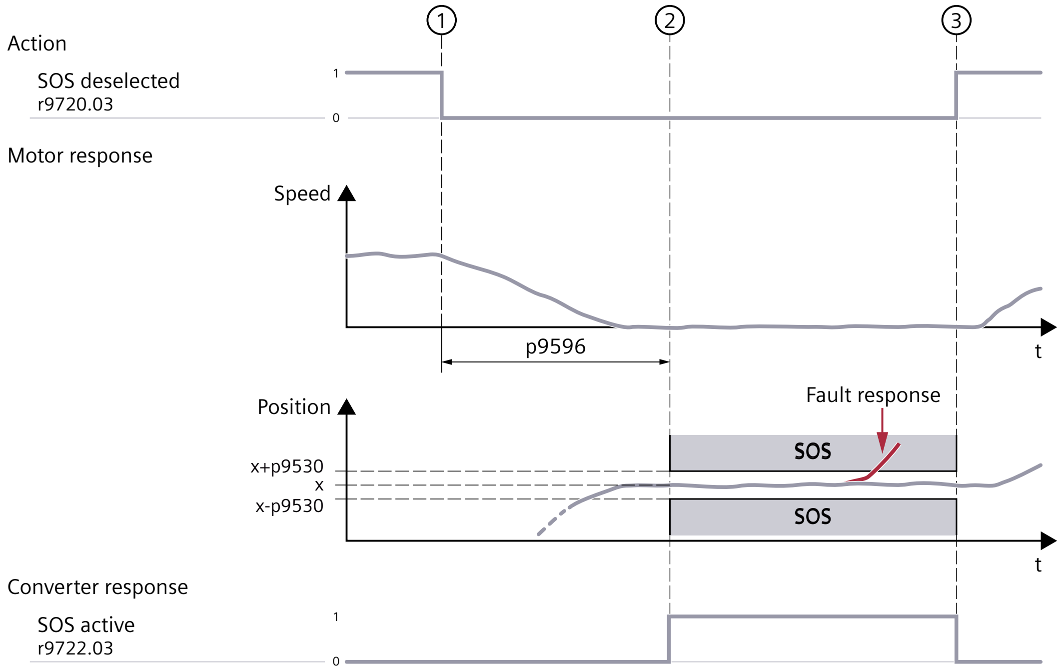


Figure 9-27 Description of function: SOS

Action		Motor / converter response
1	Selection of SOS	• The converter detects when SOS is selected and signals status "SOS selected" (r9722.03) • The higher-level control initiates stopping using an external setpoint input. • The converter starts the SOS delay time (p9596).
2	Start SOS	• The SOS delay time (p9596) elapses. The SOS delay time must be dimensioned to allow the motor to brake down to standstill from every speed of the operating process within this time. • The converter activates SOS and signals status "SOS active" (r9722.03). • Function SOS safely monitors standstill of the motor using the stand-still tolerance (p9530). The motor closed-loop control remains active. • If the standstill tolerance is violated, then the converter responds with SS1 and then transitions into STO. The standstill tolerance must be set suitable for the application in order not to influence additional drive monitoring functions.
3	Deselection of SOS	• The converter detects when SOS is deselected and signals status "SOS not active". • The motor closed-loop control follows the actual setpoint.

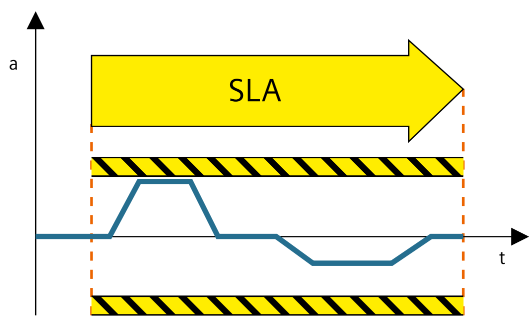
Example

SOS is suitable for the following applications:

- Machine parts must be safely monitored that they actually are at a standstill.
- A holding torque is required.

9.3.9.8 Safely-Limited Acceleration (SLA)

Overview



Safety Integrated Function "Safely-Limited Acceleration" (SLA) monitors that the drive does exceed a preset acceleration limit.

Description of function

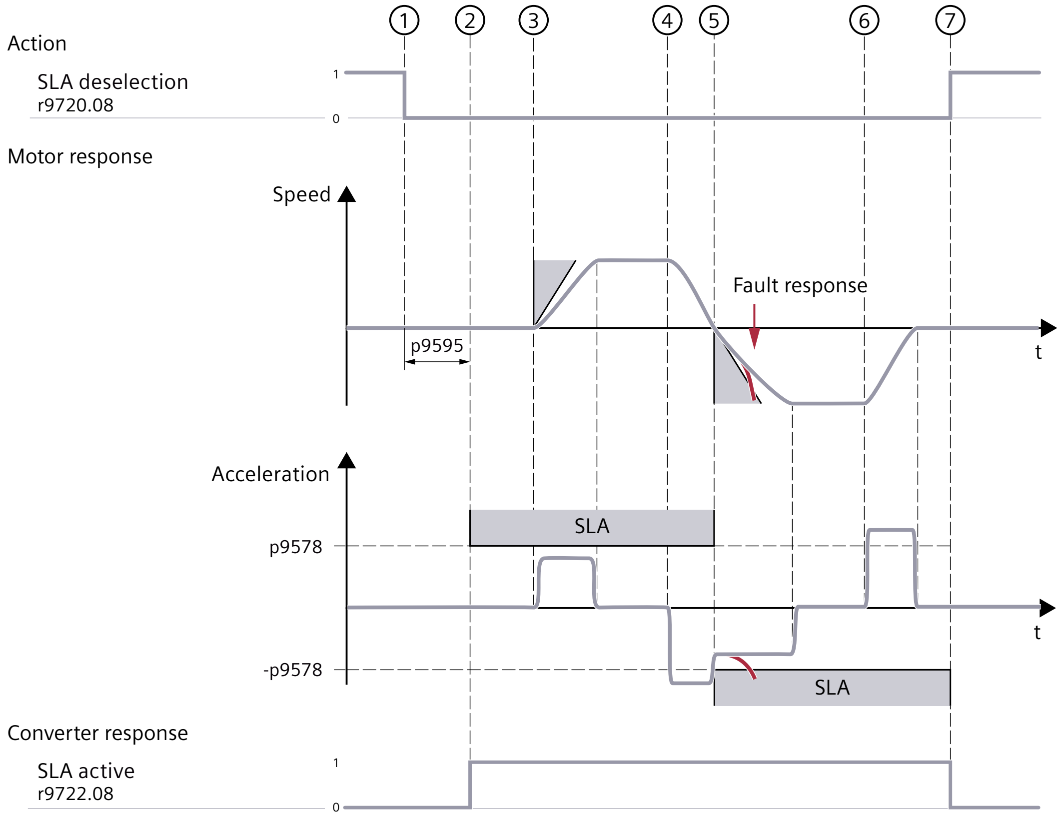


Figure 9-28 SLA

Action		Motor / drive response
1	Selection of SLA	• The converter detects when SLA is selected. • The converter starts the SLA delay time (p9595).
2	Activation of SLA	• Once the SLA delay time (p9595) elapses, monitoring of the SLA limit value (p9578) becomes active. • The converter signals status "SLA active" (r9722.08). • The signal filter (p9576) smooths the measured acceleration value. An active filter causes the SLA stop response to be initiated later.
3	The motor accelerates in the positive direction	• When accelerating, the converter monitors that the defined SLA limit is not exceeded. • If SLA detects that the acceleration limit has been exceeded, the converter initiates the configured stop response (p9579).
4	The motor brakes	• The acceleration of the braking operation is not monitored.
5	The motor accelerates in the negative direction	• When accelerating, the converter monitors that the defined SLA limit is not exceeded. • If SLA detects that the acceleration limit has been exceeded, the converter initiates the configured stop response (p9579).

⑥	The motor brakes	• The acceleration of the braking operation is not monitored.
⑦	Deselection of SLA	• The converter detects when SLA is deselected. • The converter stops monitoring the acceleration.

Acceleration limit

- You define the acceleration limit to be monitored using parameter p9578. This limit value applies to a positive and negative direction of rotation.
- When setting p9578, the following rule must be complied with:
  - p9578 ≥ 10 · r9790[1]
- The possible acceleration resolution is shown by the drive in r9790:
  - r9790[0] = resolution, coarse
  - r9790[1] = resolution, fine

  The actual accuracy of the acceleration detection depends on the type of actual value acquisition, the gear ratios as well as the quality of the encoder being used.
- The drive indicates the velocity limit corresponding to the actual acceleration in r9714[3].
- r9789 allows the diagnosis of the finer resolution acceleration monitoring offered. Index 0 indicates the actual acceleration determined. Index 1 and 2 indicate the current limit values of the SLA monitoring.

Example

SLA is suitable for machines for which the permissible acceleration may not be exceeded, for example in the setup mode.

9.3.10 Selection of the Safety Integrated Functions

Overview

In the function selection, the available Safety Integrated Functions are available depending on the control type.

The function selection offers the following setting options:

- Selection of each individual function
- Axis type

The converter automatically restarts after changes to the configuration.

Function description

Safety Integrated Functions requiring a license are marked in the function selection using the symbol. You require the Safety Extended license for the corresponding functions. Safety Integrated is available in the Trial License mode for test purposes.

The functions available for selection depend on the selected control type:

Table 9-30 Safety Integrated Functions for every control type (p9603)

Control type	STO	SS1 [1]	SS1E [1]	SS2	SS2E	SOS	SBC	SBT	SLS	SSM	SDI	SLA
PROFIsafe	x	x	x	x	x	x	x	x	x	x	x	x
PROFIsafe and EMER-GENCY STOP via terminals [2]	x	x	x	x	x	x	x	x	x	x	x	x
Terminals [2]	x	x	x	-	-	-	x	-	-	-	-	-

1) SS1-t and SS1E-t do not require a license. SS1-a, SS1-r, SS1E-a and SS1E-r require a license.

2) SLS, SSM, SDI, SS2, SS2E, SOS, SBT and SLA cannot be controlled via terminals. When switching over to this control type, the system automatically deactivates these functions.

Safety Integrated Functions are enabled with default settings after function selection (p9604). The default settings can be parameterized.

The stop responses STO and SS1 shown in the function selection must always be parameterized because the stop responses stop the motor in the case of a fault and for a limit value violation. If the STO and SS1 functions are also to be controlled via PROFIsafe and/or F-DI, then STO and SS1 must additionally be enabled in the function selection.

The function selection displays the actual value acquisition cycle and the monitoring cycle. The actual value acquisition cycle (p9511) and the monitoring cycle (p9500) cannot be changed.

Selecting the axis type (p9502) influences the display in the function view for the actual value acquisition/mechanical system and changes the units.

9.3.11 Control

9.3.11.1 PROFIsafe configuration

Overview

After PROFIsafe has been configured, Safety Integrated Functions can be selected and deselected, and safety faults can be safely acknowledged using PROFIsafe telegrams.

Function description

The PROFIsafe configuration encompasses the following settings:

Table 9-31 PROFIsafe settings

Settings	Explanation
PROFIsafe telegram number (p9611)	Selection of the PROFIsafe telegram The Safety Info Channel is available in a supplementary telegram for non-safety-related diagnostics of the Safety Integrated Functions in the higher-level control system.
F-source address (p9613) F-destination address (9610) F-monitoring time (p9614)	When using PROFIsafe address type 1, the uniqueness of the PROFIsafe address is only guaranteed as a result of the F-destination address. When using PROFIsafe address type 2, the uniqueness of the PROFIsafe address is guaranteed as a result of the combination of F-source address and F-destination address. The PROFIsafe address must be unique throughout the network and the CPU. The PROFIsafe address is unique if these conditions are satisfied: • The F-source address of the F-CPU is unique throughout the network. • The F-destination address of the converter is unique throughout the complete CPU. Within the monitoring time, a valid and current PROFIsafe telegram must be received from the F-CPU. This therefore secures the following: • Detection of faults and failures • Initiation of responses, which keep the F-system in a safe state or transition it into a safe state
Response to a PROFIsafe failure (p9612)	Selection options for communication failure between STO and SS1

More information

More information about telegrams and how to assign control and status words is provided in the Appendix under Communication telegrams (Page 317).

9.3.11.2 Telegram 30

Overview

Via a PROFIsafe telegram, the higher-level failsafe control activates the Safety Integrated Functions of the converter and receives feedback on the status of the Safety Integrated Functions.

Description of function

The converter receives data cyclically from the higher-level failsafe control and sends its send data cyclically back to the failsafe control.

Process data	Telegram 30			
	Failsafe control → Converter		Converter → Failsafe control	
	Signal	Explanation	Signal	Explanation
PZD01	S_STW1	Safety control word 1	S_ZSW1	Safety status word 1

9.3.11.3 Telegram 901

Overview

Via the PROFIsafe telegram, the higher-level failsafe control activates the Safety Integrated Functions of the converter and receives feedback on the status of the Safety Integrated Functions.

Function description

The converter receives data cyclically from the higher-level failsafe control and sends its send data cyclically back to the failsafe control.

Process data	Telegram 901			
	Failsafe control → Converter		Converter → Failsafe control	
	Signal	Explanation	Signal	Explanation
PZD01	S_STW2	Safety control word 2	S_ZSW2	Safety status word 2
PZD02				
PZD03	S_SLS_LIMIT_A	Variable limit value for SLS	S_SLS_LIMIT_A_ACTIVE	Variable limit value for SLS
PZD04	---	Not assigned	S_CYCLE_COUNT	Counter value
PZD05	---		S_XIST16	Safe position value

9.3.11.4 Telegram 902

Overview

Via the PROFIsafe telegram, the higher-level failsafe control activates the Safety Integrated Functions of the converter and receives feedback on the status of the Safety Integrated Functions.

Description of function

The converter receives data cyclically from the higher-level failsafe control and sends its send data cyclically back to the failsafe control.

Process data	Telegram 902			
	Failsafe control → Converter		Converter → Failsafe control	
	Signal	Explanation	Signal	Explanation
PZD01	S_STW2	Safety control word 2	S_ZSW2	Safety status word 2
PZD02				
PZD03	S_SLS_LIMIT_A	Variable limit value for SLS	S_SLS_LIMIT_A_ACTIVE	Variable limit value for SLS
PZD04	---	Not assigned	S_CYCLE_COUNT	Counter value
PZD05	---		S_XIST32	Safe position actual value
PZD06	---			

9.3.11.5 Safety control word 1 and safety status word 1

Overview

The higher-level control activates the Safety Integrated Functions of the converter using safety control word 1 (S_STW1).

The converter signals the status of the Safety Integrated Functions to the higher-level control using safety status word 1 (S_ZSW1).

Function description

Safety control word 1 (S_STW1)			
Failsafe control → Converter			
Bit	Safety Integrated Function	Explanation	
00	STO	1	Deselect STO
		0	Select STO
01	SS1	1	Deselect SS1
		0	Select SS1
02	SS2	1	Deselect SS2
		0	Select SS2
03	SOS	1	Deselect SOS
		0	Select SOS
04	SLS	1	Deselect SLS
		0	Select SLS
05, 06	Reserved		
07	Failsafe acknowledgment	0	-
		1 → 0	Acknowledge "Internal event" for a 1 → 0 signal change

Safety control word 1 (S_STW1)					
Failsafe control → Converter					
Bit	**Safety Integrated Function**	**Explanation**			
08	SLA	1	Deselect SLA		
		0	Select SLA		
09	SLS limit value bit 0	Select SLS limit value		Bit 1	Bit 0
10	SLS limit value bit 1		SLS1 SLS2 SLS3 SLS4	0 0 1 1	0 1 0 1
11	Reserved				
12	SDI positive	1	Deselect SDI with positive direction of rotation		
		0	Select SDI with positive direction of rotation		
13	SDI negative	1	Deselect SDI with negative direction of rotation		
		0	Select SDI with negative direction of rotation		
14	Reserved				
15	SSM	1	Deselect SSM		
		0	Select SSM		

Safety status word 1 (S_ZSW1)				
Converter → Failsafe control				
Bit	**Safety status**	**Explanation**		
00	STO active	1	STO is active	
		0	STO is not active	
01	SS1 active	1	SS1 is active	
		0	SS1 is not active	
02	SS2 active	1	SS2 is active	
		0	SS2 is not active	
03	SOS active	1	SOS is active	
		0	SOS is not active	
04	SLS active	1	SLS is active	
		0	SLS is not active	
05, 06	*Reserved*			
07	Internal event	1	The converter signals an "internal event"	
		0	Fault-free operation	
08	SLA active	1	SLA is active	
		0	SLA is not active	
09	Active SLS limit value bit 0		Bit 1	Bit 0
10	Active SLS limit value bit 1	SLS1 SLS2 SLS3 SLS4	0 0 1 1	0 1 0 1
11	SOS active	1	SOS is active	
		0	SOS is not active	

Safety status word 1 (S_ZSW1)			
Converter → Failsafe control			
Bit	Safety status	Explanation	
12	SDI positive active	1	SDI positive direction of rotation is active
		0	SDI positive direction of rotation is not active
13	SDI negative active	1	SDI negative direction of rotation is active
		0	SDI negative direction of rotation is not active
14	*Reserved*		
15	Status SSM	1	Absolute value of the speed is less than or equal to the SSM limit value
		0	Absolute value of the speed is greater than the SSM limit value

9.3.11.6 Safety control word 2 and safety status word 2

Overview

The higher-level control activates the Safety Integrated Functions of the converter using safety control word 2 (S_STW2).

The converter signals the status of the Safety Integrated Functions to the higher-level control using safety status word 2 (S_ZSW2).

Function description

Safety control word 2 (S_STW2)			
Failsafe control → Converter			
Bit	Safety Function	Explanation	
00	STO	1	Deselect STO
		0	Select STO
01	SS1	1	Deselect SS1
		0	Select SS1
02	SS2	1	Deselect SS2
		0	Select SS2
03	SOS	1	Deselect SOS
		0	Select SOS
04	SLS	1	Deselect SLS
		0	Select SLS
05, 06	Reserved	–	–
07	Failsafe acknowledgment	0	–
		1 → 0	Acknowledge "Internal event" for a 1 → 0 signal change
08	SLA	1	Deselect SLA
		0	Select SLA

Safety control word 2 (S_STW2)					
Failsafe control → Converter					
Bit	**Safety Function**	**Explanation**			
09	SLS level bit 0	Select SLS level		Bit 1	Bit 0
10	SLS level bit 1		Level 1 Level 2 Level 3 Level 4	0 0 1 1	0 1 0 1
11	Reserved	–	–		
12	SDI positive active	1	Deselect SDI with positive direction of rotation		
		0	Select SDI with positive direction of rotation		
13	SDI negative active	1	Deselect SDI with negative direction of rotation		
		0	Select SDI with negative direction of rotation		
14	Reserved	–	–		
15	SSM	1	Deselect SSM		
		0	Select SSM		
16, 17	Reserved	–	–		
18	SS1E	1	Deselect SS1E		
		0	Select SS1E		
19 ... 27	Reserved	–	–		
28	SS2E	1	Deselect SS2E		
		0	Select SS2E		
29 ... 31	Reserved	–	–		

Safety status word 2 (S_ZSW2)			
Converter → Failsafe control			
Bit	**Safety status**	**Explanation**	
00	STO active	1	STO is active
		0	STO is not active
01	SS1 active	1	SS1 is active
		0	SS1 is not active
02	SS2 active	1	SS2 is active
		0	SS2 is not active
03	SOS active	1	SOS is active
		0	SOS is not active
04	SLS active	1	SLS is active
		0	SLS is not active
05, 06	Reserved	–	–
07	Internal event	1	The converter signals an "internal event"
		0	Fault-free operation
08	SLA active	1	SLA is active
		0	SLA is not active

Safety status word 2 (S_ZSW2)				
Converter → Failsafe control				
Bit	**Safety status**	**Explanation**		
09	Active SLS level bit 0		Bit 1	Bit 0
10	Active SLS level bit 1	Level 1 Level 2 Level 3 Level 4	0 0 1 1	0 1 0 1
11	Reserved	–	–	
12	SDI positive active	1	SDI positive direction of rotation is active	
		0	SDI positive direction of rotation is not active	
13	SDI negative active	1	SDI negative direction of rotation is active	
		0	SDI negative direction of rotation is not active	
14	Reserved	–	–	
15	Status SSM	1	The absolute value of the speed is less than the SSM limit	
		0	The absolute value of the speed is equal to or greater than the SSM limit	
16, 17	Reserved	–	–	
18	SS1E active	1	SS1E is active	
		0	SS1E is not active	
19 ... 23	Reserved	Re-served	–	
24	F-DI 0	1	F-DI 0 has 1 signal	
		0	F-DI 0 has 0 signal	
25 ... 27	Reserved	–	–	
28	SS2E active	1	SS2E is active	
		0	SS2E is not active	
29	SOS selected	1	SOS is selected	
		0	SOS is deselected	
30, 31	Reserved	–	–	

9.3.11.7 Transferring the F-DI status via PROFIsafe

Overview

The configuration of the transfer of the F-DI status defines the input mode of an F-DI, and activates the transfer of an F-DI state to the F-control.

Requirement

A PROFIsafe telegram with transfer of the F-DI status is set.

The F-DI to be transferred is fully configured:

- Discrepancy time
- Input filter
- Self-test

Description of function

c10050 selects the F-DI whose status the converter transfers to the F-control via PROFIsafe.

9.3.11.8 Control via PROFIsafe and EMERGENCY STOP via terminals

Overview

For "Control via PROFIsafe and EMERGENCY STOP via terminals", the higher-level control selects and deselects the Safety Integrated Functions via a PROFIsafe telegram.

In addition, an F-DI of the converter is assigned a stop function for EMERGENCY STOP.

Description of function

Using PROFIsafe, Safety Integrated Functions can be selected and deselected, and safety faults can be safely acknowledged.

EMERGENCY STOP is permanently assigned to F-DI 0. The following functions can be selected:

- Safe Torque Off (STO)
- Safe Stop 1 (SS1)
- Safe Stop 1 with external stop (SS1E)

9.3.11.9 Control via terminals

Overview

The F-DI configuration includes the following steps:

- Assignment of Safety Integrated Functions to a failsafe digital input (F-DI)
- Defining the input modes of an F-DI

Description of function

The F-DI configuration allows the assignment of Safety Integrated Functions to the F-DI. After configuring the F-DI, the interconnected Safety Integrated Function can be selected and deselected.

In the F-DI configuration, it is also possible to set the input modes of an F-DI (p10040). The setting defines whether the F-DI should operate as NC contact/NC contact (default setting) or as NC contact/NO contact.

If the signal to select a Safety Integrated Function (c10026 ... c10035) is interconnected with the "Statically selected" value, then the Safety Integrated Function is continuously selected. After the converter supply voltage has been switched on, the Safety Integrated Function is permanently active.

9.3.11.10 Discrepancy time

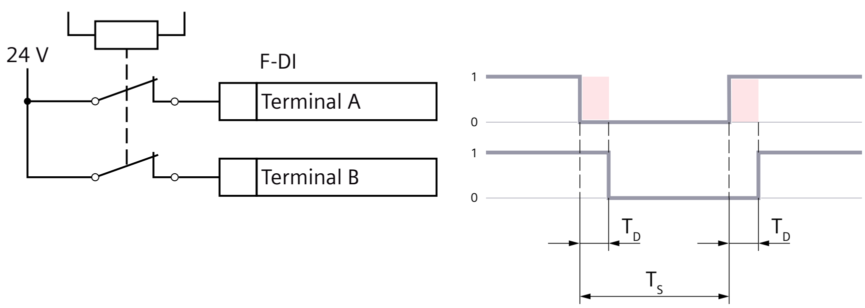
Overview

The converter tolerates brief, different logical signal states at a fail-safe digital input.

Description of function

With electromechanical sensors, e.g. EMERGENCY STOP buttons or position switches, the two sensor contacts do not switch at exactly the same time.

During time T_D, the input signals of the F-DI have a different logical signal state.



T_D Temporary discrepancy

T_S Shortest switching interval to be expected

Figure 9-29 Signal states at the F-DI when switching a relay

There is an adjustable maximum discrepancy time p10002 so that the converter does not respond to a brief discrepancy with a safety message.

As a consequence, the converter tolerates a brief discrepancy. A permanent discrepancy signifies an error in the F-DI interconnection. In this case, after the discrepancy time has elapsed, the converter responds with a safety message.

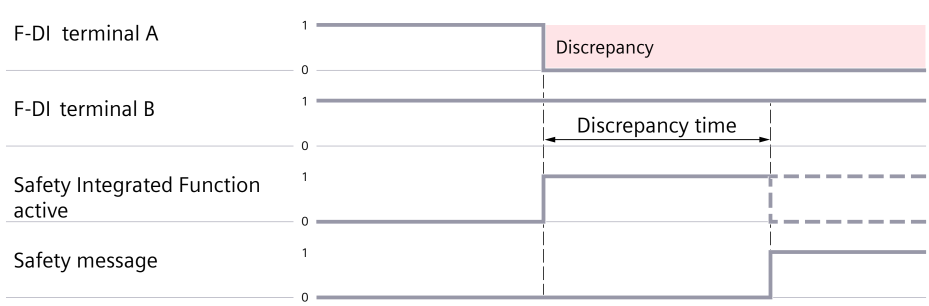


Figure 9-30 Safety message for continuous discrepancy at F-DI terminals

A signal change at the F-DI terminal activates the Safety Integrated Function, which is assigned to the F-DI.

The safety message deactivates the Safety Integrated Function and the converter is stopped. The Safety Integrated Function remains active if the previously active Safety Integrated Function and the stop function are identical.

For p10002 the following applies:

- p10002 > T_D, to tolerate a brief discrepancy.
- p10002 < T_S, to be able to acquire even short signal changes at the F-DI.

The maximum discrepancy time p10002 does not extend the converter response time when a signal at the F-DI changes.

9.3.11.11 Input filter

Overview

The input filter suppresses unwanted brief signal changes at a failsafe digital input (F-DI).

Description of function

If a failsafe digital input (F-DI) is interconnected with an electromechanical sensor, for example, then contact bounce leads to brief signal changes. In this case, an immediate response of the converter to signal changes is not desirable. Too many signal changes within a specific time result in a converter fault.

During the filter time (p10017) of the input filter, the converter ignores signal changes.

The input filter lengthens the response time of the Safety Integrated Function interconnected with the F-DI.

9.3.11.12 Self-test of the failsafe digital input (F-DI)

Overview

To detect faults at an early stage, the converter continuously tests its shutdown paths, functions and interfaces.

Various modes are available to test a failsafe digital input (F-DI):

- Self-test with internal test signals
- Self-test using specified dark pulses
- Self-test using externally specified dark pulses

Function description

The self-test checks with test signals at the input terminals of the F-DI whether the F-DI can be switched to the failsafe state (to "low"). If the converter does not detect a feedback signal, then it triggers a fault response.

The debounce time (p10017) prevents a converter response to the dark pulse. If the debounce time is shorter than the test signal or dark pulse length, then the converter interprets the dark pulse as a switching operation.

Self-test with internal test signals

The converter internally generates test signals for the input circuit of the F-DI (p10041 = 0).

The test signal length and the test cycle cannot be changed.

The self-test using internal test signals meets the following requirements:

- Safety Integrity Level (SIL) 3 to IEC 61800-5-2
- Performance Level (PL) e to ISO 13849-1
- Category 3 to ISO 13849-1

Self-test using specified dark pulses

The converter provides the switchable voltage source VS+ at terminal block X130. VS+ generates dark pulses, to diagnose the control circuit, for example.

The self-test using specified dark pulses with VS+ (p10041 = 1) offers additional short-circuit detection between ground and 24 V.

The dark pulse length of the switchable power supply (p10018) can be parameterized. The test cycle has a fixed value of 5 seconds.

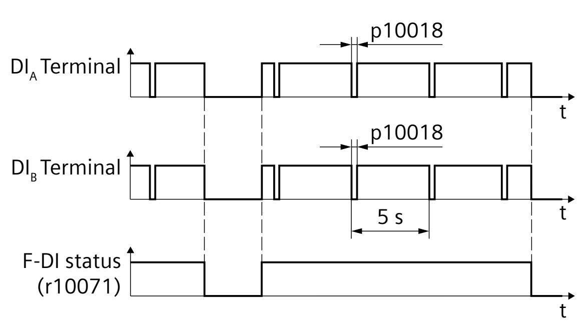


Figure 9-31 Dark pulses through switchable power supply

For the debounce time:

- p10017 > dark pulse length p10018 + 2 ms

The self-test using specified dark pulses meets the following requirements:

- Safety Integrity Level (SIL) 3 to IEC 61800-5-2
- Performance Level (PL) e to ISO 13849-1
- Category 4 to ISO 13849-1

Self-test using externally specified dark pulses

An electronic control, e.g. F-PLC, generates dark pulses at the input terminals of the F-DI (p10041 = 3).

The dark pulse length is determined by the control. The maximum wait time for dark pulses (p10019) can be parameterized.

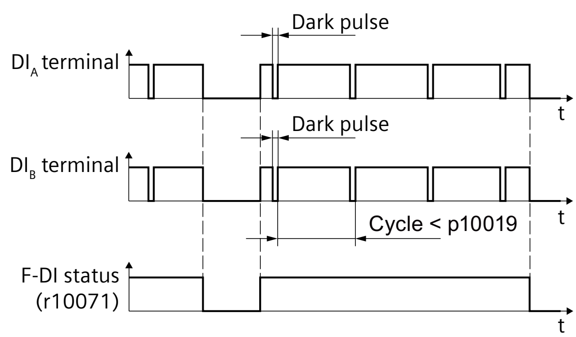


Figure 9-32 Dark pulses through control

For the debounce time:

- p10017 > dark pulse length (p10018) + 2 ms
  The test pulse length of the external control must be checked and the debounce time must be adapted.

The self-test using externally specified dark pulses meets the following requirements:

- Safety Integrity Level (SIL) 3 to IEC 61800-5-2
- Performance Level (PL) e to ISO 13849-1
- Category 4 to ISO 13849-1

9.3.12 Checksums of Safety Integrated Functions

Overview

The checksums correspond to a fingerprint or the parameterized Safety Integrated functionality of the converter.

Function description

Once commissioning has been completed, the converter calculates the checksums.

Functional checksum (r9780) and time stamp (r9781 and r9782) are used to track changes (safety logbook). The checksum is updated after completing the Safety Integrated commissioning.

Based on the checksum of functions (p9799 and r9798) and PROFIsafe (p9797 and r9796), it can be identified whether the parameterization of the Safety Integrated Functions or the PROFIsafe parameterization was changed.

An acceptance test is required after changing the checksums. The system outputs the appropriate messages to indicate that an acceptance test is required. The checksums are used for documentation purposes within the scope of an acceptance test.

The parameterization can be transferred to several devices by separating the checksums for function and communication. When transferring the parameterization to several devices, you must check whether the device is correctly assigned in the communication group.

9.3.13 Acceptance - completion of commissioning

Overview

The machine manufacturer is responsible in ensuring that the plant or machine functions perfectly. As a consequence, after commissioning, the machine manufacturer must check those functions which represent an increased risk of injury or material damage, or have them checked by specialist personnel. This acceptance or validation is specified in the European Machinery Directive and comprises 2 parts:

- **Acceptance test:** Check the safety-relevant functions and machine parts after commissioning.
- **Documentation:** Generate an "Acceptance report" that describes the test results.

More information on validation is given for example in EN ISO 13849-1. The acceptance test requirements (configuration check) for the safety functions of electric drives are based on IEC 61800-5-2.

Description

Acceptance test of the machine or plant

The acceptance test checks whether the safety-relevant functions in the plant or machine function correctly. The documentation of the components used in the Safety Integrated Functions can also provide information about the tests required. Testing the safety-relevant functions includes, e.g. the following:

- Is all safety equipment, such as protective door monitoring devices, light barriers or EMERGENCY STOP buttons, connected and ready for operation?
- Does the higher-level control respond as expected to the safety-relevant feedback signals of the drive?
- Do the drive settings match the configured safety-relevant function in the machine?

Acceptance test of the converter

The acceptance test of the converter is a part of the acceptance test of the entire machine or plant.

The acceptance test of the converter verifies whether Safety Integrated Functions have been set to match the configured Safety Functions of the machine. The acceptance test documents the settings with which the real function fulfills the intended functionality.

Documentation

The documentation encompasses the following:

- Result of the acceptance tests
- Settings of the Safety Integrated Functions

The documentation must be signed.

Persons authorized to perform the acceptance test

Personnel from the machine manufacturer, who, on account of their technical qualifications and knowledge of the safety functions, are in a position to perform the acceptance test in the correct manner are authorized to perform the acceptance testing of the converter and the motor.

9.3.14 Acceptance after series commissioning

Overview

When the project is transferred to other machines (series commissioning) a reduced acceptance test of the Safety Integrated Functions is necessary.

Description of function

In series commissioning, the reduced acceptance test involves the following steps:

- Test of the EMERGENCY STOP function (STO or SS1) and the SBC function that is potentially used
- A general test of the actual value acquisition by switching on and operating briefly with traversing in both directions
- Only for motion monitoring functions - testing the safe actual value acquisition:
  Brief movement of the motor with the motion monitoring functions active (e.g. SLS) in both directions.
- Countersigned acceptance report with the following content:
  - New converter data (HW/SW version)
  - Changed checksum
  - Time stamp

9.3.15 Acceptance after a component has been replaced

Overview

After making changes to the machine, a new acceptance test must be performed with documentation.

Requirement

WARNING

Unexpected movement due to incorrect component replacement

After a component has been replaced, connections or functions may be defective. This can lead to unexpected movements of motors that may result in death or serious injury.

- After component replacement, run a simplified function test.

The faulty component was replaced.

Function description

The following table shows the converter response after a component replacement and the resulting action required:

Table 9-32 Response after a component has been replaced

Replaced component	Control type	Converter response (alarm)	User action Save by copying from RAM to ROM (p0977 = 1) 1)	Diagnostic parameters
Motor	All	A01641.5 = 1	Yes	r9776.2 = 1
Converter	All	A01641.0 = 1	Yes	r9776.2 = 1

1) The condition for saving is: There is no firmware update active on the converter.
Without saving, the converter signals the fault again after the next POWER ON.

Acceptance test and acceptance report

Alarm A01641 reports which component was replaced.

Each time a component is replaced, a function test must always be carried out so that incorrect connections or wiring can be ruled out.

Replacing a motor

The converter reports motor replacement with the alarm A01641. If the replaced motor is of the same type with the same integrated encoder and sensor, the converter does not trigger a stop response. Motor operation is not restricted. The message is deleted after saving by copying from RAM to ROM and restarting the converter. If fault F01646 is also signaled, then this can be cleared using a standard acknowledgment or a POWER ON.

A reduced acceptance test of the Safety Integrated Functions is required:

- A general test of the actual value acquisition by switching on and operating briefly with traversing in both directions after a component has been released.
- Only for motion monitoring functions - testing the safe actual value acquisition:
  With the motion monitoring functions active (e.g. SLS), briefly move the motor in both directions.

- Only for motion monitoring functions and after the encoder has been replaced:
  Test the encoder parameterization (a trace recording is not required)
- Countersigned acceptance report with the following content:
  - New converter data (HW/FW version)
  - Changed checksum
  - Time stamp

Converter replacement

Replacement of a converter is indicated after running up as the checksums change and alarm A01641 is output. No additional stop response is initiated, and operation of the drive is not restricted as a result. The message is deleted after saving by copying from RAM to ROM and restarting the converter.

A reduced acceptance test of the Safety Integrated Functions is required:

- Test of the EMERGENCY STOP function (STO or SS1) and the SBC function that is potentially used
- A general test of the actual value acquisition by switching on and operating briefly with traversing in both directions
- Countersigned acceptance report with the following content:
  - New converter data (HW/FW version)
  - Changed checksum
  - Time stamp

9.3.16 Responses to safety faults and alarms

9.3.16.1 Stop responses

Function description

The converter triggers a fault reaction in response to certain events:

- Stop response SCF
  The converter detects a discrepancy in the Safety Integrated monitoring channels, e.g. an error in the result and data comparison.
  If at least one safety function is selected, then the stop response SS1 or SS1E takes place after time p9555.
  From V6.3 and higher, parameter p9561 "SI SCF stop response", is available, with which the user can set whether an SS1 or a SS1E should be initiated after SCF. Time p9555 therefore delays the transition to the stop response SS1 or SS1E.
- Stop response STO, SS1, SS1E, SS2, SS2E
  The converter detects a limit violation, for example involving the Safely-Limited Speed (SLS) function. The stop response is settable.
  If stop response SS1 or SS1E is set, stop response STO automatically follows when the motor comes to a standstill.

It is not possible to select a stop response externally, for example via PROFIsafe.

All stop responses bring the motor to a standstill.

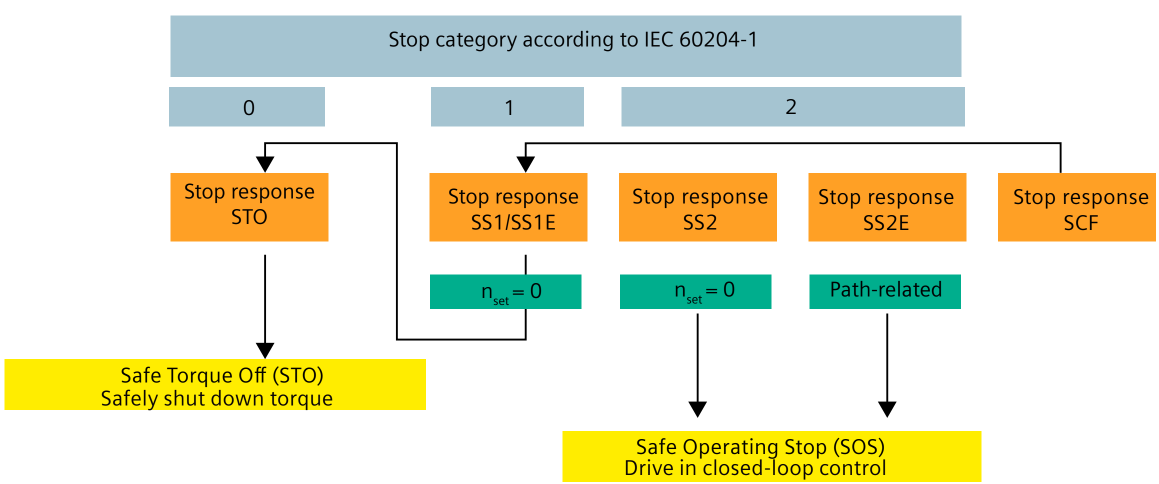


Figure 9-33 Stop responses

9.3.16.2 Fail-safe acknowledgment of safety messages

Overview

In the event of safety messages, e.g. due to limit value violations of the motor with active Safety Integrated Functions, the converter detects an internal event.

A safety message requires a failsafe acknowledgement.

Requirement

You checked and eliminated the cause of the internal event.

Procedure

You must acknowledge safety messages with a failsafe signal. You have the following options for failsafe acknowledgement:

Via PROFIsafe

Acknowledge the fault with bit 7 of safety control words 1 or 2:

- Bit 7 = 0 → 1 → 0

By selecting and deselecting STO/SS1/SS1E

Select Safety Integrated function STO, SS1 or SS1E and then deselect again:

- Via F-DI = 1 → 0 → 1
  or
- With bit 0 or 1 of the PROFIsafe safety control word 1 or 2: Bit 0 or 1 = 1 → 0 → 1

By switching the supply voltage on and off

Temporarily switch the power supply of the converter off and on again.

Note

Additional acknowledgement via the "standard" acknowledgement signal

Safety Integrated uses its own message type (C) by default. With p3117 you have the option of reparameterizing safety messages as Alarm (A) or Fault (F). In this case, you must additionally acknowledge the internal event with the "Standard" acknowledgement signal.

9.3.17 Response times

9.3.17.1 Monitoring cycle and PROFIsafe cycle

Description

The Safety Integrated Functions are executed in the monitoring cycle (p9500).

The PROFIsafe telegrams are evaluated in the monitoring cycle.

9.3.17.2 Definition of WCDT and OFDT

Description

Two different response times are relevant for the Safety Integrated Functions:

- Worst Case Delay Time (WCDT):
  Maximum response time until stop response in fault-free drive system.
- One Fault Delay Time (OFDT):
  When the drive system has an active fault, a safety function is requested during the few milliseconds in which the converter has still not detected the fault or is still responding to the fault.

9.3.17.3 Response times - independent of the control type

Technical data

The following response times of the monitoring functions are independent of the control type.

The response times of Safety Integrated Functions are defined as follows:

- Safe Direction (SDI) and Safely-Limited Speed (SLS), Safe Operating Stop (SOS) and Safely-Limited Acceleration (SLA): The response time is the time between a limit value being violated and initiating the respective stop function.
- Safe Speed Monitor (SSM): The response time is the time between a limit value being violated up to sending the information via PROFIsafe.

Table 9-33 Technical data - Response times

Function	Unit	Response time when a fault occurs	Worst case response time
SOS and SDI	ms	3 · p9500 + t_R	2 · p9500 + t_R
SLS	ms	3.5 · p9500 + t_R	2.5 · p9500 + t_R

Function	Unit	Response time when a fault occurs	Worst case response time
SSM (output at the bus)	ms	3.5 · p9500 + p9545 [1)] + t_K2	2.5 · p9500 + p9545 [1)] + t_K2
SLA	ms	4 · p9500 + p9576 + t_R	3 · p9500 + p9576 [1)] + t_R

1) The signal filter, whose delay depends on the actual value characteristic, is also incorporated in the response times. In a first approximation (e.g. for a ramp-shaped signal increase), the value of the filter time that has been set can be used as basis to calculate the response time.

p9500: Monitoring cycle (factory setting: 4 ms)

t_R: t_R depends on the relevant stop response initiated after the limit is breached:
- STO: 0.5 ms
- SS1: 2 ms

p9545: SSM filter time

t_K2: Time for the internal converter communication when sending a PROFIsafe telegram
- For isochronous communication: t_K2 =T_{dp}. Determine T_{dp} from the bus configuration on the control side.
- For non-isochronous communication: t_K2 = 4 ms

p9576: SLA filter time

9.3.17.4 Response times when controlling via PROFIsafe

Technical data

The response times are converter-internal response times. Program runtimes in the F-CPU and the transmission time via PROFINET have not been taken into account. Consider the following with regard to the calculation of the response times between F-CPU and converter: Safety Integrated Functions are only selected after the PROFIsafe monitoring time (F_WD_Time) has elapsed, e.g. due to communication faults. The PROFIsafe monitoring time (F_WD_Time) must therefore also be included as a relevant component in the calculation when an error occurs. If the response time is to be determined based on control via PROFIsafe, then F_WD_Time must be added to the times specified here.

Notes regarding understanding the following table

The specified response times for delay time for a fault and worst case delay time are applicable for the time from when the PROFIsafe telegram is received up until the function is actually initiated.

Device Acknowledgement Time (DAT): Time between receiving a PROFIsafe telegram and sending a response to this telegram

State change at the failsafe digital input (F-DI): Response time when switching an F-DI up to sending the F-DI state in the PROFIsafe telegram to the F-CPU.

Table 9-34 Technical data - Response times

Response time	Value
DAT	2 · p9500 + t_K1 + t_K2
State change F-DI	p10017 + (2 · p9500) + 3.5 ms + t_K2

Function	Unit	Response time when a fault occurs	Worst case response time	Final state
STO and SBC	ms	3 · p9500 + t_K1 + 0.5ms	2 · p9500 + t_K1 + 0.5ms	STO active
SS1 and SS2	ms	3 · p9500 + t_K1 + 2ms	2 · p9500 + t_K1 + 2ms	Brake ramp started
SS1E and SS2E	ms	3 · p9500 + t_K1	2 · p9500 + t_K1	Bit is set in the SIC

p9500: Monitoring cycle (factory setting: 4 ms)

If an isochronous PROFIsafe telegram is used, and synchronism with the F-CPU is optimally set, then p9500 can be reduced from 2 cycles to one cycle. Optimally matched: bus clock cycle = p9500. The F-PLC receives one PROFIsafe telegram per cycle from the converter, and the converter receives one PROFIsafe telegram per cycle from the F-CPU.

p10017: Debounce time of the F-DI (factory setting: 4 ms)

t_K1: Time for the internal converter communication when receiving a PROFIsafe telegram

- For isochronous communication: t_K1 = T_o. Determine T_o from the bus configuration on the control side.
- For non-isochronous communication: t_K1 = 4 ms

t_K2: Time for the internal converter communication when sending a PROFIsafe telegram

- For isochronous communication: t_K2 = bus cycle time.
  The bus cycle time is the send clock of the PROFINET controller.
- For non-isochronous communication: t_K2 = 4 ms

9.3.17.5 Response times when controlling via terminals

Technical data

The following response times are applicable for stop functions for control via terminals of the failsafe digital input (F-DI). The response time of a stop function is the time between the selection of the stop function and the initiation of a stop response.

Table 9-35 Technical data - Response times

Function	Unit	One Fault Delay Time	Worst Case Delay Time	Final state
STO and SBC	ms	p10017 + 3 · p9500 + 3.5ms	p10017 + 2 · p9500 + 3.5 ms	STO and SBC active
SS1	ms	p10017 + 2 · p9500 + 5.5ms	p10017 + 2 · p9500 + 5.5ms	Brake ramp started
SS1E	ms	p10017 + 3 · p9500 + 3.5ms	p10017 + 2 · p9500 + 3.5ms	Bit is set in the SIC

p10017: Debounce time des F-DI (factory setting: 4 ms)

p9500: Monitoring cycle (factory setting: 4 ms)

9.4 Technology functions

9.4.1 Basic positioner

9.4.1.1 Overview of the basic positioner

Overview

Position control means controlling the position of an axis. An "axis" is a machine or system component that comprises the converter with active position control and the driven mechanical system.

The basic positioner (EPOS) is a positioner integrated in the converter and calculates the traversing profile for the time-optimized traversing of the axis to the target position for the position controller. With the basic positioner (EPOS), the positioning tasks can be transferred to the converter and thus relieve the higher-level control system.

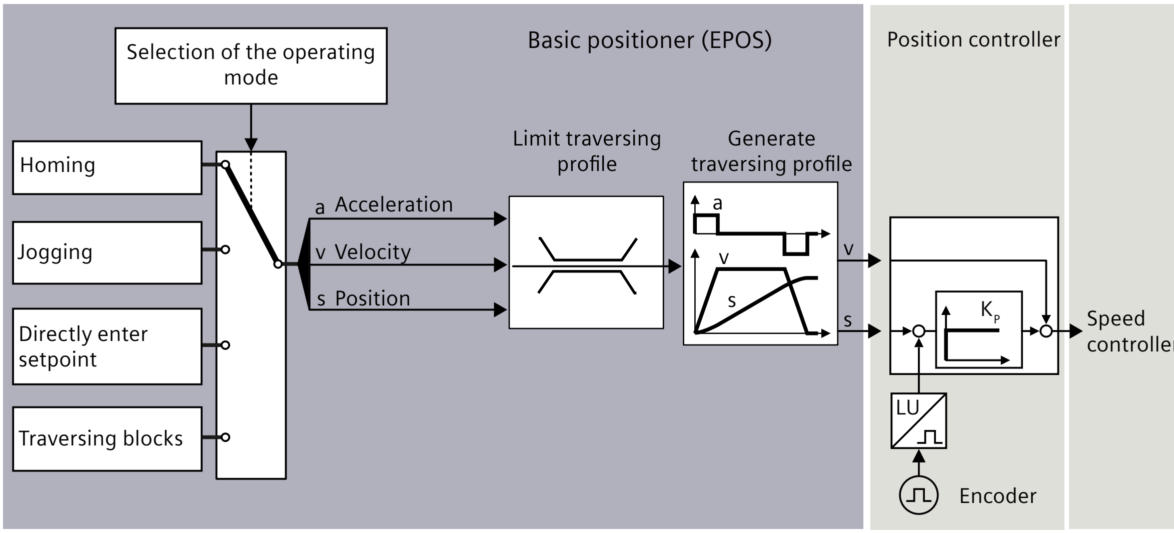


Figure 9-34 Basic positioner and position control

Description of function

The following functions can be carried out by using the basic positioner:

- **Limits**
  - Limiting the traversing range: specification of the possible traversing range through the configuration of positive and negative software limit switches, and positive and negative hardware limit switches
  - Limiting the traversing profiles: restriction of the dynamic travel response through limitation of the maximum velocity, acceleration, deceleration, and jerk
- **Monitoring**
  - Position/standstill monitoring: monitoring of the axis positioning motion and monitoring of the axis position after a traversing motion
  - Following error monitoring: monitoring of the maximum deviation between the actual value and the setpoint
- **Homing**
  Homing establishes the home position measurement in the converter to the machine. Possible homing types are:
  - Active homing
  - Passive homing
  - Absolute encoder adjustment
- **Traversing blocks**
  Position, velocity, and acceleration are saved in different traversing blocks in the converter. The external control selects a traversing block.

- **Direct setpoint input (MDI)**
  The external control specifies the setpoints (position, velocity, and acceleration) for the axis.
- **Jogging**
  This function is used to traverse the axis in jog mode.

More information

For more information about configuring the basic positioner (EPOS) in Startdrive, see the information system of the TIA Portal.

9.4.1.2 Axis type

Overview

Axes in your actual application can be configured with different motion control applications:

- For speed control applications: flexible control of the speed and direction of rotation of rotary axes
- For positioning control applications: relative/absolute positioning of rotary or linear axes (depending on mechanics)

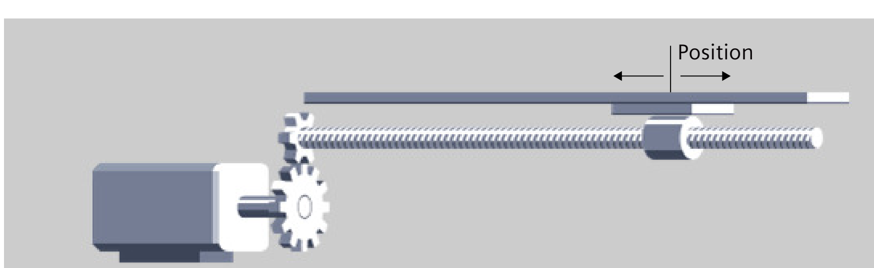
Description of function

Linear axis

A linear axis is an axis whose traversing range is limited in both motor directions of rotation by the mechanical system of the machine, for example:

- Stacker crane
- Elevating platform
- Tilting station
- Gate/door drive
- Conveyor belt
- Roller conveyor

For linear axes, the position of the axis is specified as a linear measure, for example, millimeters (mm).

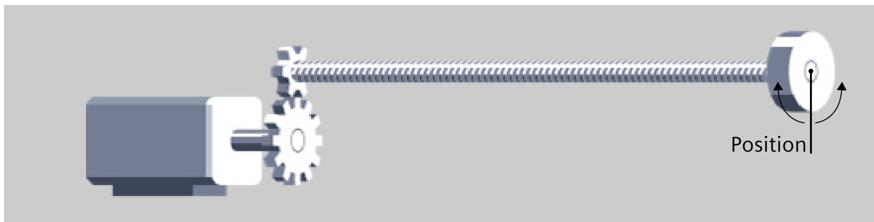


Rotary axis

A rotary axis is an axis with an infinite traversing range, for example:

- Rotary table

For rotary axes, the position of the axis is specified as an angular measure, for example, degrees (°).



9.4.1.3 Units of measurement

Overview

In addition to physical units, the converter also supports the length unit (LU) for positioning operation.

Description of function

- **Physical units (default setting)**
  The converter provides the physical units for position, speed, acceleration/deceleration, and jerk. You can select the desired physical units according to the actual axis type via relevant parameters during commissioning.

Axis type	Available physical units	
	Position	Velocity
Linear axis	km, m, **mm**, μm, nm, in, ft, mi	km/h, km/min, m/h, m/min, m/s, mm/h, mm/min, **mm/s**, in/min, in/s, ft/min, ft/s, mi/h
Rotary axis	**degree (°)**	**degree (°)/s**

Note:

Units in bold are the default units.

The acceleration is set accordingly as the position/s² measurement unit.

The jerk is set accordingly as the position/s³ measurement unit.

Note

If you have moved the motor axis after servo-off, make sure that you set POS_STW2.0 to 1 before you enable servo-on; otherwise, the motor may overspeed and the fault F07452 occurs.

- **Length Unit**
  The converter calculates the position actual value of the axis using the neutral position unit LU (Length Unit). The length unit LU is independent of whether the converter controls the position of an elevating platform or the angle of rotary table.

Note

If you change the axis type from linear axis to rotary axis or vice versa, the units will be set to default units automatically.

The settings you made will not be converted when changing the units.

9.4.1.4 Load gear position tracking

Overview

Position tracking enables the load position to be reproduced when using gearboxes. It can also be used to extend the position range.

Requirement

- Using an absolute encoder

Description of function

Position tracking of the load gear is activated via parameter p2720.0 = 1 and is only relevant for a motor encoder. The load gear ratio is entered via parameters p2504 and p2505. Position tracking can be activated with rotary axes (modulo) and linear axes.

Position tracking for the load gear can only be activated once for each motor data set MDS.

The load actual position value in r2723 (must be requested via G1_STW.13) comprises the following information:

- Encoder pulses per revolution (p0408)
- Virtual number of stored revolutions of a rotary absolute encoder (p2721)
- Load gear ratio (p2504/p2505)

Note

The sum of p0408 and p2721 is limited to 32 bits.

Features

- Configuration of p2720
- Virtual multiturn via p2721
- Tolerance window for monitoring the position at switching on p2722
- Input of the load gear via p2504 and p2505
- Display via r2723

Note

If position tracking of the load gear is activated with parameter p2720[0] = 1 (position gear load tracking) after the encoder is adjusted (p2507 = 3), the adjustment will be reset.

If the encoder is adjusted again when load position tracking is active, the load gear position will be reset (overflows).

The permissible position tracking range is mapped on the reproducible encoder range of EPOS.

It is possible to activate position tracking for several DDS.

Virtual multiturn (p2721)

The virtual multiturn resolution is used to set the number of resolvable load rotations for a rotary absolute encoder with activated position tracking. It can be edited only for rotary axes.

With a rotary absolute encoder (p0404.1 = 1) with activated position tracking (p2720.0 = 1), parameter p2721 can be used to enter a virtual multiturn resolution.

Note

If the gear ratio is not equal to 1, then p2721 always refers to the load side. The virtual resolution, which is required for the load, is then set here.

In the case of rotary axes, the virtual multiturn resolution (p2721) is preset to the multiturn resolution value of the encoder (p0421) and can be altered.

Example: Single-turn encoder

Parameter p0421 is preset to p0421 = 1. However, parameter p2721 can be altered subsequently, e.g. the user can program p2721 = 5. As a result, the encoder evaluation initiates five load rotations before the same absolute value is achieved again.

Example: Multiturn encoder

For a linear axis, the value for p2721 is set to 262144 for an encoder with p0421 = 4096. This means that +/- 131072 encoder revolutions or load revolutions can be reproduced.

Tolerance window (p2722)

After switching on, the difference between the stored position and the current position is determined and initiated depending on the following:

Difference within the tolerance window -> the position is reproduced based on the current actual encoder value.

Difference outside the tolerance window -> an appropriate fault (F07449) is output.

Note

When the fault F07449 occurs, click the reset button in Startdrive to reset the position tracking first and then acknowledge the fault.

The tolerance window is preset to quarter of the encoder range and can be changed.

Note

The position can only be reproduced if, in the powered-down state, the encoder was moved through less than half of the range that it can represent. For the standard encoder, this is 2048 revolutions or half a revolution for single-turn encoders.

Note

The ratio stamped on the gear rating plate is often just a rounded-off value (e.g. 1:7.34). If, for a rotary axis, it is not permissible to have any long-term drift, then the actual ratio of the gearbox teeth must be requested from the gearbox manufacturer.

Example

Position range extension

With absolute encoders without position tracking, it must be ensured that the traversing range around 0 is less than half the encoder range, because beyond this range, no unique reference remains after switching on and off (see description on parameter p2507). This traversing range can be extended using the virtual multiturn (p2721).

The following diagram illustrates an absolute encoder that can represent eight encoder revolutions (p0421 = 8).

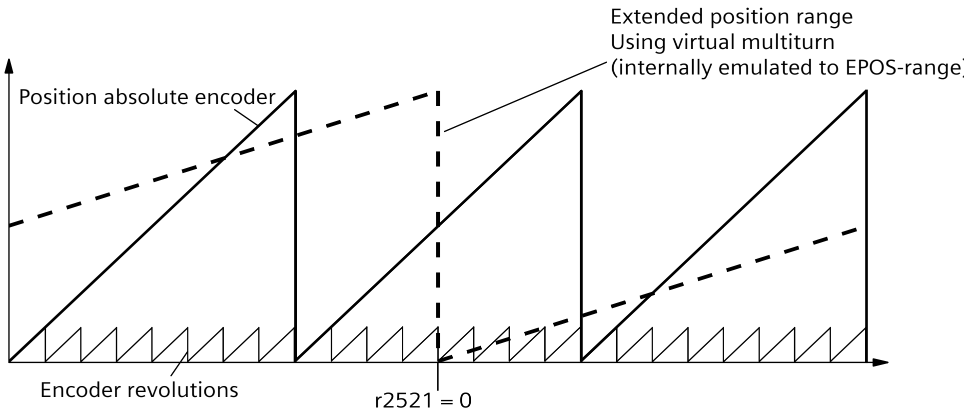


Figure 9-35 Position tracking (p2721 = 24), setting p2504 = p2505 =1 (gear ratio = 1)

In this example, this means:

- Without position tracking, the position for +/- 4 encoder revolutions around r2521 = 0 LU can be reproduced.
- With position tracking, the position for +/- 12 encoder revolutions (+/- 12 load revolutions with load gear) can be reproduced (p2721 = 24).

Practical example:

For a linear axis, the value for p2721 is set to 262144 for an encoder with p0421 = 4096. This means that +/- 131072 encoder revolutions or load revolutions can be reproduced.

For a rotary axis, a value for p2721 = p0421 is set for an encoder.

9.4.1.5 Limiting the traversing range

Overview

The traversing range of a linear axis can be limited using either the software limit switch or the hardware limit switch.

Requirement

NOTICE

Damage to the machine when passing a hardware limit switch

The machine can be damaged when a hardware limit switch is passed.

- Monitor axis motion, and manually stop the axis in time, e.g. by issuing an EMERGENCY STOP.

The traversing range limiting by using hardware limit switch is only active when the hardware limit switches are activated (c2568 = 1).

The traversing range limiting by using software limit switch is only active when the following preconditions are met:

- The software limit switches are activated (c2582 = 1).
- The home position is set (r2684.11 = 1).
- The modulo correction is not active (c2577 = 0).

Description of function

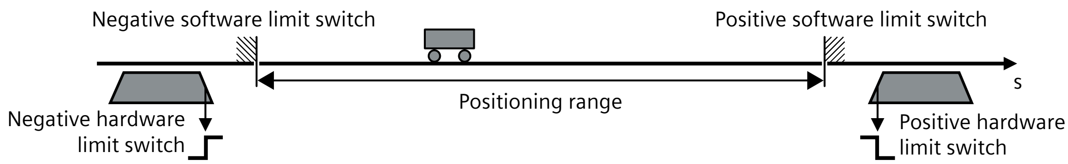


Figure 9-36 Software and hardware limit switches

If the position setpoint is beyond a software limit switch, the motor stops according to the travel profile before the software limit switch. During the braking process, the converter signals the warning A07479 or A07480.

Activated hardware limit switches are evaluated on the converter using c2569 (negative hardware limit switch) and c2570 (positive hardware limit switch) and they are low active. When triggering the hardware limit switch, the converter brakes the axis with the OFF3 ramp-down time, switches the motor off and outputs fault F07491 or F07492. After the fault is acknowledged, the motor is switched on again. In order to bring the axis back into the valid traversing range, you must move the axis away from the hardware limit switch, for example, by using the jogging function.

9.4.1.6 Limiting the traversing profiles

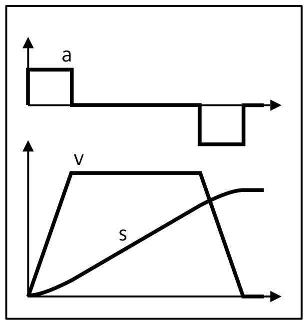
Overview

The traversing profile is the acceleration, velocity and position characteristics of an axis when being positioned. You can influence the traversing profile by limiting the velocity, the acceleration, or the jerk (= change of the acceleration over time).

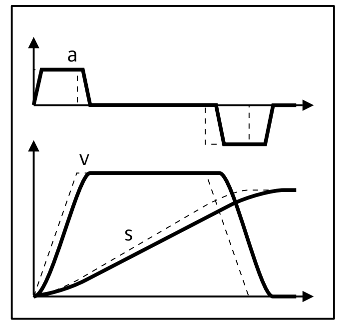
Description of function

If the axis must traverse more slowly or must accelerate at a lower rate or "softly", then you must set the relevant limits to lower values. The lower that one of the limits is, the longer the converter needs to position the axis.

- **Without jerk limitation**



- **With jerk limitation**



Jerk limitation is not active when messages are generated with stop responses OFF1/OFF2/OFF3.

In the event of a fault with stop response OFF1, the motor brakes with the OFF1 ramp-down time p1121. The acceleration in the event of a fault can therefore be greater than the acceleration in positioning. In order to comply with the mechanical boundary conditions even in the event of a fault, we recommend that the OFF1 ramp-down time p1121 is not related to the maximum speed p1082, but to the maximum positioning speed.

9.4.1.7 Velocity limiting by Safety Integrated Functions

Overview

The appropriate signal interconnection prevents an active Safety Integrated Function with motion monitoring from influencing positioning operation.

Description of function

If the velocity of the motor when positioning is higher than the monitoring limit of an active Safety Integrated Function, then the converter stops the motor and cancels the positioning operation.

The interconnection of the active setpoint velocity limiting r9733 and the speed limits of the converter prevent a Safety Integrated Function from canceling a positioning operation:

- c1051 is interconnected with r9733[0]
- c1052 is interconnected with r9733[1]

9.4.1.8 Jog

Overview

It is possible to change over between jog incremental and jog velocity. The traversing distances p2587 and p2588 and velocities p2585 and p2586 are entered according to the jog signals c2589 and c2590. The traversing distances are only effective for a "1" signal at p2591 (jog incremental). For p2591 = "0", the axis moves with the specified velocity.

Description of function

Jog incremental

In the case of incremental jogging, input a relative traversing distance and a velocity setpoint into the converter. With the signals "Jogging 1" or "Jogging 2" the converter positions the axis by the respective travel path.

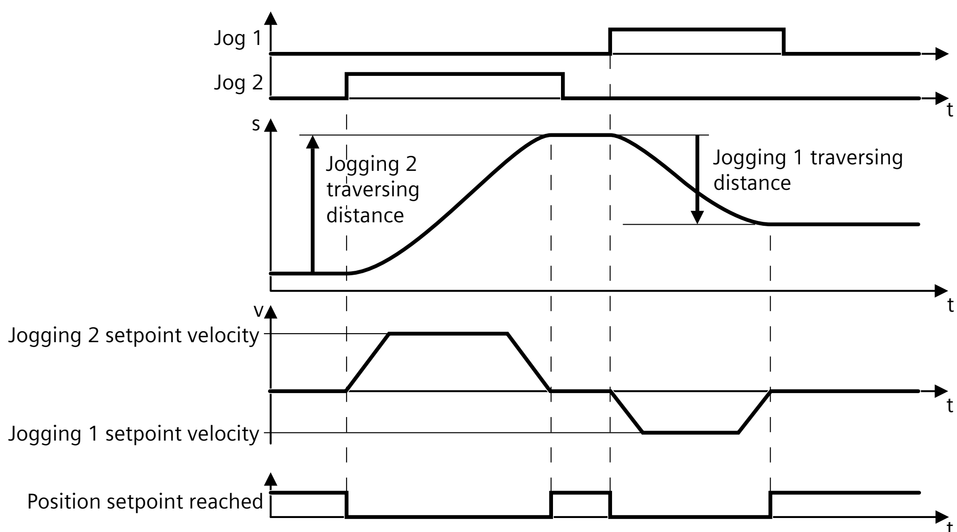


Figure 9-37 Jog incremental

Jog velocity

Only input a setpoint velocity for the converter for velocity jog. With the signal "Jogging 1" or "Jogging 2", the converter accelerates the axis to the relevant setpoint velocity. The converter stops the axis when the respective "Jog" signal returns to zero.

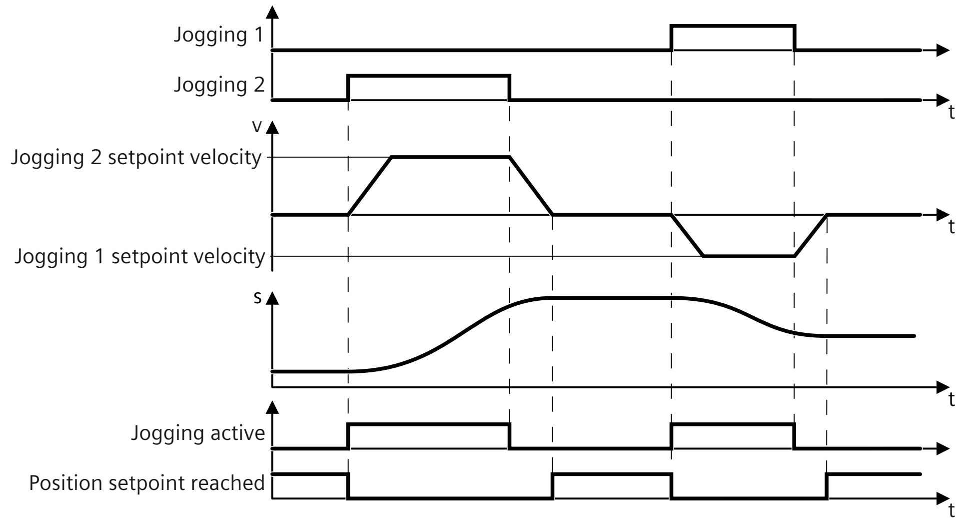


Figure 9-38 Jog velocity

Selecting a jogging mode

When telegrams 7, 9, 111, 112 and 113 are used, select a jogging mode with the control words STW1.8 and STW1.9:

Control word		Description
STW1.8	STW1.9	
0	0	No jogging channel activated
1	0	Jog 1 signal source rising edge active
0	1	Jog 2 signal source rising edge active
1	1	Keep old setpoint

When telegrams 111, 112 and 113 are used, select a jogging mode with the control word POS_STW2.5:

Control word	Signal	Description
POS_STW2.5	1	Activate "Jog incremental"
	0	Activate "Jog velocity"

Note

When telegrams 7 and 9 are used, endless jogging is fixed.

Setting jogging setpoints

When telegrams 7 and 9 are used, set the following jogging setpoint with the appropriate parameters:

- Velocity (p2585, p2586)

When telegrams 111, 112 and 113 are used, set the following jogging setpoints with the appropriate parameters:

- Velocity (p2585, p2586)
- Incremental (p2587, p2588)

9.4.1.9 Overview for homing

Overview

Homing establishes the reference between the coordinate origin of the drive axis and the machine zero point. Homing is a requirement for display of the correct position for the technology object and for absolute positioning.

Absolute encoders retain their position information, even after the supply has been switched off.

The converter offers various ways of homing the axis:

- Active homing - with all encoder types
- Passive homing - with all encoder types
- Absolute encoder adjustment - with absolute encoders

Description of function

Homing can occur by means of an independent homing motion (active homing), the detection of a homing mark during a motion initiated (passive homing) or a direct position assignment.

- **Active homing**
  The converter automatically traverses the axis to a defined home position.
- **Passive homing**
  The converter corrects its position actual value while traversing (homing during traversing).
- **Absolute encoder adjustment**
  The converter takes the reference point coordinate as the new axis position.

9.4.1.10 Terms for homing

Overview

After switching on the machine, the reference between the coordinate origin of the drive axis and the machine zero point must be established for positioning. This progress is called homing. The following terms are relevant to the homing.

Description

Homing mark

A homing mark is an input signal, on whose occurrence a known mechanical position can be assigned to the actual values.

A homing mark can be the zero mark of an encoder or an external zero mark via digital input.

Reference cam

If there are several zero marks in the traversing range, the reference cam is used to select a specific zero mark before or after the reference cam.

The reference cam is evaluated with the settings of the telegrams 111, 112 and 113 via the higher-level control system. Alternatively, there is also the possibility to evaluate the reference cam via a digital input of the converter. For this purpose, a digital input must be parameterized as the reference cam selection 2 (p11550 = 1).

Homing mark position

This is the position assigned to the homing mark.

With active homing, the homing mark position corresponds to the home position minus home position offset.

With passive homing, the homing mark position corresponds to the home position.

Reversing cam

A reversing cam causes the converter to change the search direction when referencing. After reaching a reversing cam, the converter continues to search for the reference cam in the opposite direction.

Home position

At the end of the active homing motion, the axis arrives at the home position.

Home position offset

The difference between the home position and the homing mark position is the home position offset.

Approach velocity

Up to three parameterizable approach velocities are available:

- to the reference cam
- to the zero mark
- to the home position

9.4.1.11 Active homing

Overview

Three homing modes are available for active homing:

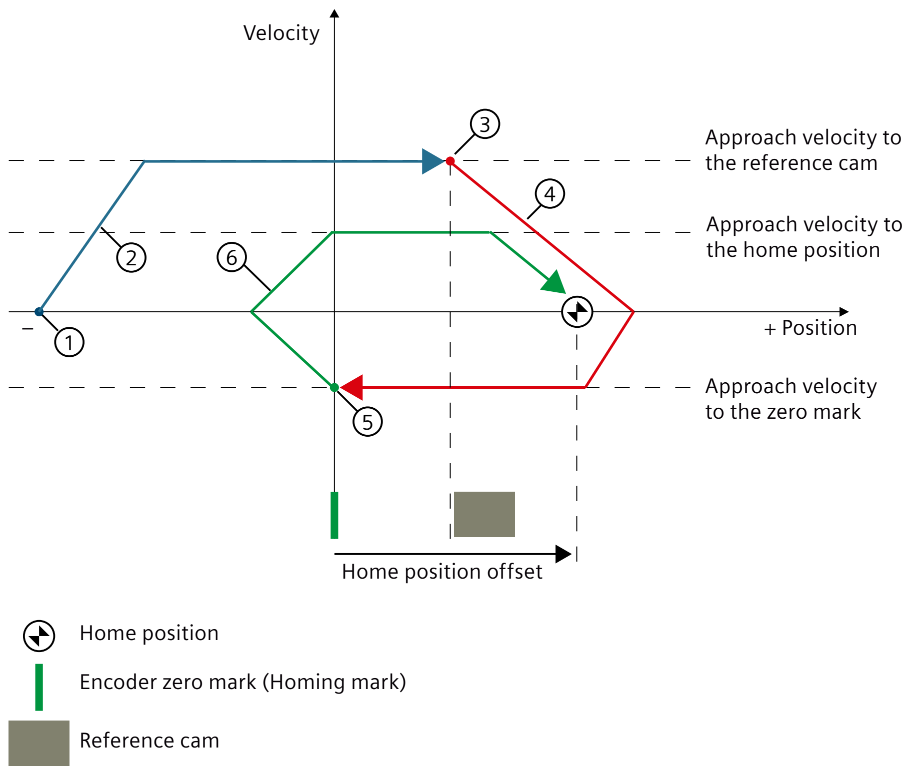
- Use encoder zero mark and reference cam
- Use encoder zero mark
- Use external zero mark via digital input

Description of function

Active homing by using encoder zero mark and reference cam

The following figure shows an example of the homing motion with the following settings:

- Active homing with reference cam and encoder zero mark
- Homing in the positive direction
- Positive home position offset



Motion sequence

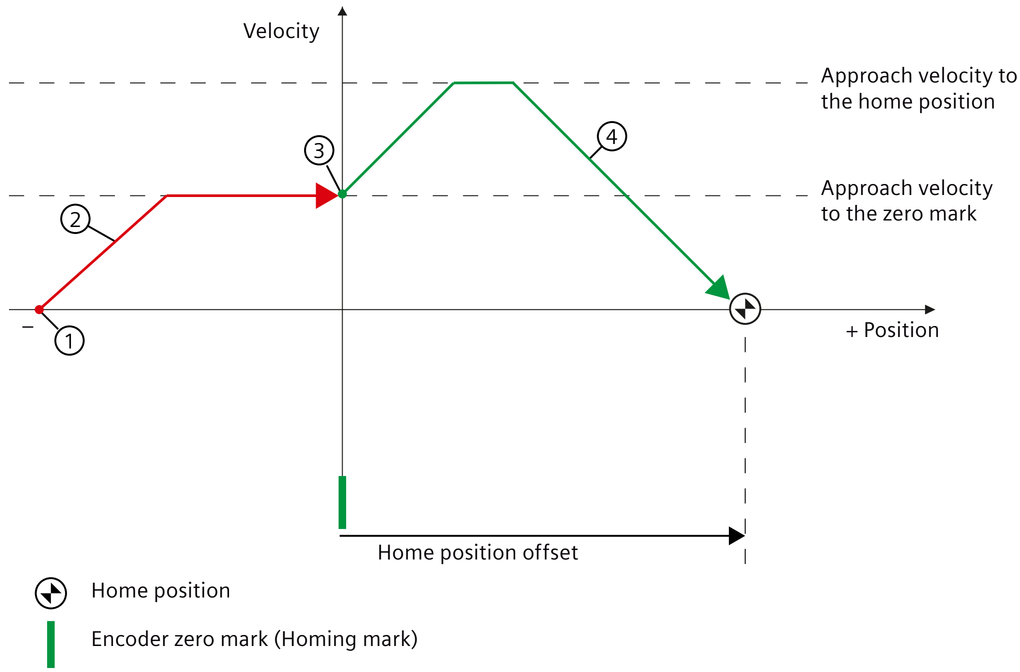
① Start of active homing
② Approach to the reference cam in approach direction with the corresponding approach velocity
③ Enable detection of the reference cam and homing mark detection
④ Approach to the homing mark with the corresponding approach velocity
⑤ Detection of the homing mark
⑥ Approach to the home position with the corresponding approach velocity

Figure 9-39 Example: active homing in positive direction by using encoder zero mark and reference cam

Active homing by using encoder zero mark

The following figure shows an example of the homing motion with the following settings:

- Active homing with encoder zero mark
- Homing in the positive direction
- Positive home position offset



Motion sequence

1. Start of active homing
2. Approach to the homing mark in the homing direction with the corresponding approach velocity to the zero mark
3. Detection of the homing mark
4. Approach to the home position with the corresponding approach velocity to the home position

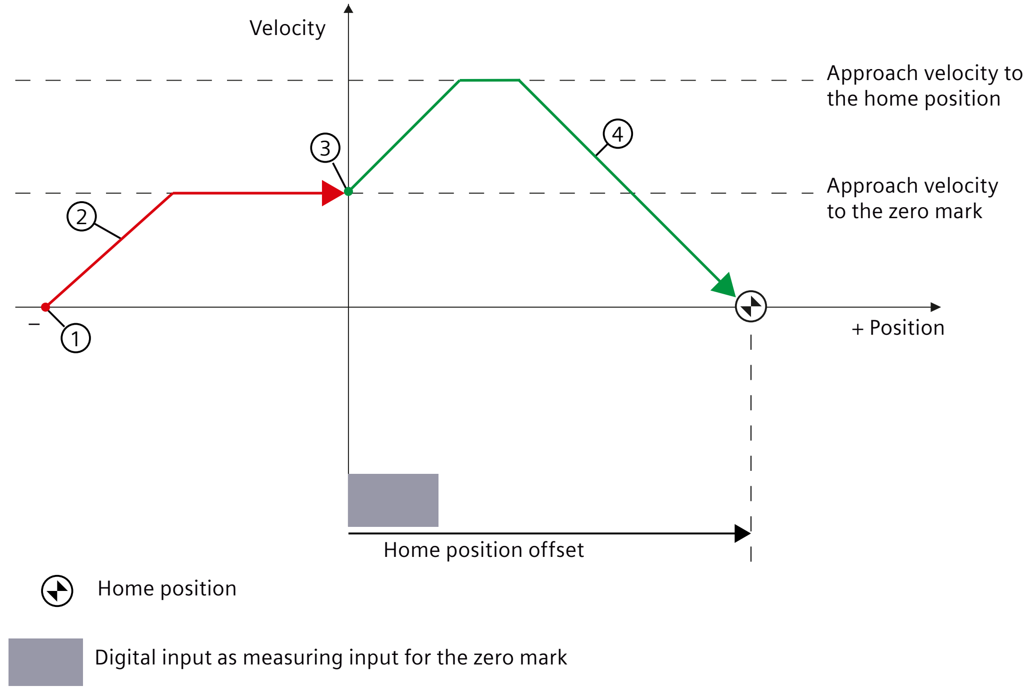
Figure 9-40 Example: active homing in positive direction by using encoder zero mark

Active homing by using external zero mark via digital input

The following figure shows an example of the homing motion with the following settings:

- Active homing with digital input
- Approach in the positive direction

- Homing mark on the negative side of the digital input
- Positive home position offset



Motion sequence

① Start of active homing

② Approach to the homing mark in the homing direction with the corresponding approach velocity to the zero mark

③ Detection of the homing mark via digital input

④ Approach to the home position with the corresponding approach velocity to the home position

Figure 9-41 Example: active homing in positive direction by using external zero mark via digital input

9.4.1.12 Passive homing

Overview

Passive homing is used to dynamically modify the current position value to zero when the axis is working in any positioning state. The function can be used in every mode (jog, traversing block, direct setpoint specification for positioning / setup) and is superimposed over the active operating mode.

Description of function

Note

The "Passive homing" function is superimposed on an active operating mode, it is therefore not an active mode. In contrast to the home position approach, the function can be carried out superimposed by the machine process.

As standard, for passive homing, measuring probe evaluation is used; when enabled, the measuring probe is selected and the measuring probe edge evaluation is active. (In the default settings, measuring probe 1 is always the measuring probe and the measuring probe evaluation is always the 0/1 edge.)

9.4.1.13 Measuring probe evaluation and homing mark search

Overview

The converter supports the "homing mark search" and the "measuring probe evaluation" in position control.

Description of function

The "homing mark search" and the "measuring probe evaluation" functions mode can be defined via c2510 (measuring probe evaluation selection) and c2511 (measuring probe evaluation edge). In the default settings, measuring probe 1 is always the measuring probe and the measuring probe evaluation is always the 0/1 edge.

The probe signals are recorded via the encoder status and control word. To speed up signal processing, direct measuring probe evaluation can be activated by selecting the input terminals for probes 1 or 2.

The system outputs a message if the same probe input is already being used (see also p0488, p0489).

The appropriate function is started using a 0/1 edge via the encoder control word. Status bit r2526.1 (homing active) signals that the function is active (feedback from the encoder status word). Status bit r2526.2 (measured value valid) shows the presence of the required measurement r2523.

Once the function is completed (position determined for homing mark or measuring probe), r2526.1 (homing active) and r2526.2 (measured value valid) remain active and the measurement is provided by r2523 until the corresponding encoder control word is reset (0 signal).

If the function (homing mark search or measuring probe evaluation) has not been completed yet, while the encoder control word is reset, then the function is interrupted and the status bit r2526.1 (homing active) is reset via the encoder status word.

If the homing mark search and the measuring probe evaluation functions are simultaneously set, this causes the active function to be interrupted or no function is enabled. Alarm A07495 "homing function interrupted" occurs and remains until the signals at the inputs are reset. The alarm is also generated if a fault is signaled using the encoder status word during an activated function (homing mark search or measuring probe evaluation).

If the "position control" function module is selected, these parameters (c2510 to c2511) are preassigned with "0". If the "basic positioner" function module is selected, the "homing mark search" (for the homing position searching) and "measuring probe evaluation" (for the passive homing function) functions are initiated by the "basic positioner" function module and feedback (r2526, r2523) returned to this.

9.4.1.14 Absolute encoder adjustment

Overview

The function is only available when using a motor with the absolute encoder. When commissioning the absolute encoder for the first time, a mechanical axis position is aligned with the encoder absolute position and then the system is synchronized.

After the drive has been switched off, the encoder position information is retained. This means that the axis does not have to be readjusted when the drive powers up.

Description of function

Absolute encoder adjustment (via telegram 112 or 113)

Requirement

The absolute encoders must be adjusted the first time that they are commissioned.

For the absolute encoder adjustment, the machine axis must be moved to the desired position first. This can be done as follows:

- In jog mode or manually.
  A position marking, a fixed stop, or the measuring distance between the axis and the fixed home position can be used as a reference. Once the desired position of the axis is reached, the absolute encoder adjustment can be performed. You must save the settings in the device permanently.
- With the active homing.
  You must select the option during configuration of the active homing.

When using the telegram 112 or 113, the absolute encoder adjustment can be initiated via the position control word 2, bit 3 (POS_STW2.3).

Note

After being commissioned for the first time, carefully ensure that the drive train and its configuration cannot be mechanically changed or modified. When mechanical changes are made, the synchronization between the encoder actual value and the machine zero is lost. In this particular case, it is crucial that the axis is readjusted.

Absolute encoder adjustment (via Startdrive)

Requirement

The function is only available when the converter is online in Startdrive.

- Setting the absolute encoder adjustment status
  You can perform the absolute encoder adjustment (p2507 = 2) and the status "Home position set" (r2684.11) is updated. When the adjustment is correct, "Absolute encoder adjusted" is displayed.
- Resetting the absolute encoder adjustment status
  You can also reset the status "Absolute encoder adjusted" (p2507 = 1) and the status display for the absolute encoder adjustment is then updated. The adjustment is deactivated. After the reset, "Absolute encoder not adjusted" is displayed.

9.4.1.15 Setting the home position

Condition

The function is only available when the converter is online in Startdrive.

Description of function

Setting the home position

You can set the home position (p2507 = 2) and the status "Home position set" (r2684.11) is updated. When the adjustment is correct, "Absolute encoder adjusted" is displayed.

Resetting the home position

You can also reset the home position (p2507 = 1) and the status display for the absolute encoder adjustment is then updated. The adjustment is deactivated. After the reset, "Absolute encoder not adjusted" is displayed.

9.4.1.16 Positioning and standstill monitoring

Overview

Positioning and standstill monitoring is used to monitor the axis positioning motion and the axis position after a traversing motion.

Description of function

As soon as the setpoint for the position within a positioning operation no longer changes, then the converter sets the "Setpoint stationary" signal to 1. With this signal, the converter starts to monitor the position actual value:

- As soon as the axis has reached the positioning window, the converter signals that the target has been reached, and maintains the axis in closed-loop control.
- If the axis does not come to a standstill within the standstill monitoring time, the converter reports fault F07450.
- If the axis does not enter the positioning window within the positioning monitoring time, the converter reports fault F07451.

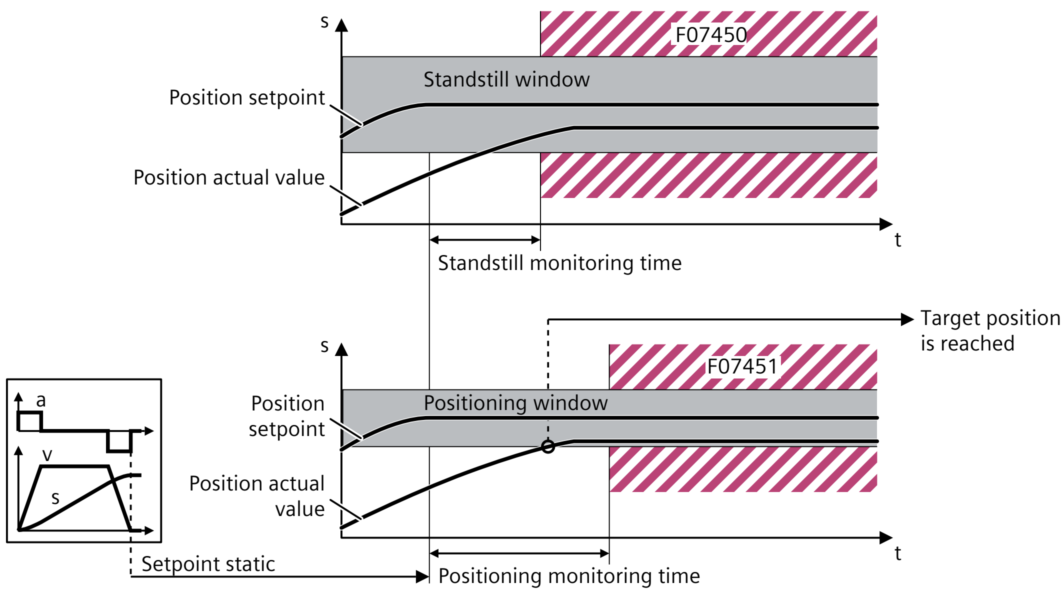


Figure 9-42 Standstill monitoring and positioning monitoring

9.4.1.17 Following error monitoring

Overview

Following error monitoring is used to monitor the maximum deviation between the actual value and the position setpoint.

Description of function

The following error is the deviation between the position setpoint and the position actual value while the converter is positioning the axis. The converter reports fault F07452 if the following error is too high. If you set the tolerance to 0, monitoring is deactivated.

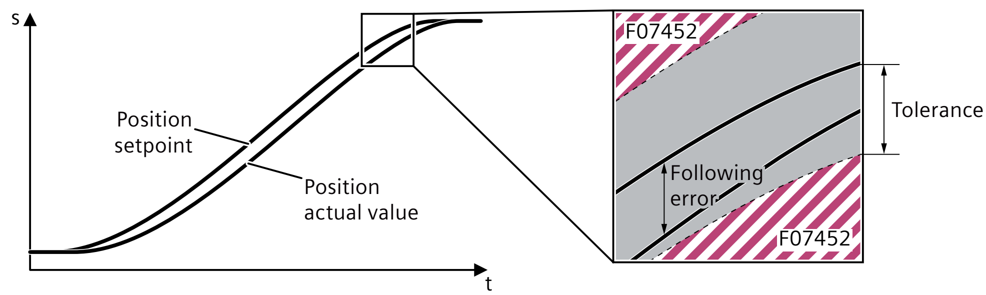


Figure 9-43 Following error monitoring

9.4.1.18 Traversing block tasks

Overview

A traversing block describes a positioning instruction for the drive. Up to 32 different traversing blocks can be saved in the converter. All parameters which describe a traversing task are effective during a block change.

Description of function

Activating the traversing block function

When telegrams 111, 112, and 113 are used, the traversing block function can be configured with the PROFINET control word POS_STW1.15:

Control word	Signal	Description
POS_STW1.15	1	MDI selection.
	0	Traversing block selection.

When telegrams 7 and 9 are used, the traversing block function can be configured with the PROFINET control word SATZANW.15:

Control word	Signal	Description
SATZANW.15	1	MDI selection.
	0	Traversing block selection.

Traversing blocks are parameterized using parameter sets that have a fixed structure:

- **Traversing block number (p2616[0...31])**
  Each traversing block must have a traversing block number assigned to it. The traversing blocks are executed in the sequence of the traversing block numbers. Numbers containing the value "-1" are ignored so that the space can be reserved for subsequent traversing blocks, for example.
- **Task (p2621[0...31])**
  1: POSITIONING
  2: FIXED ENDSTOP
  3: ENDLESS_POS
  4: ENDLESS_NEG
  5: WAIT
  6: GOTO
  7: SET_O
  8: RESET_O
  9: JERK
- **Motion parameters**
  – Target position or traversing distance (p2617[0...31])
  – Velocity (p2618[0...31])
  – Acceleration override (p2619[0...31])
  – Deceleration override (p2620[0...31])

- **Task mode (p2623[0...31])**
  Processing a traversing task can be affected by the parameter p2623 (task mode).
  Value = 0000 cccc bbbb aaaa
  - aaaa: Identifiers
    000x → hide/show block (x = 0: show, x = 1: hide)
  - bbbb: Continuation condition
    0000, END: 0/1 edge at STW1.6
    0001, CONTINUE_WITH_STOP:
    The exact position parameterized in the block is approached (brake to standstill and positioning window monitoring) before block processing can continue.
    0010, CONTINUE_ON-THE-FLY:
    The system switches to the next traversing block "on the fly" when the braking point for the current block is reached (if the direction needs to be changed, this does not occur until the drive stops within the positioning window).
    0011, CONTINUE_EXTERNAL:
    Same as "CONTINUE_ON-THE-FLY", except that an instant block change can be triggered up to the braking point by a 0/1 edge. If an external block change is not triggered, a block change is triggered at the braking point.
    0100, CONTINUE_EXTERNAL_WAIT:
    Control signal "External block change" can be used to trigger a flying changeover to the next task at any time during the traveling phase. If "External block change" is not triggered, the axis remains in the parameterized target position until the signal is issued. The difference here is that with CONTINUE_EXTERNAL, a flying changeover is carried out at the braking point if "External block change" has not been triggered, while here the drive waits for the signal in the target position.
    0101, CONTINUE_EXTERNAL_ALARM:
    This is the same as CONTINUE_EXTERNAL_WAIT, except that alarm A07463 "External traversing block change in traversing block x not requested" is output when "External block change" is not triggered by the time the drive comes to a standstill. The alarm can be converted to a fault with a stop response so that block processing can be canceled if the control signal is not issued.
  - cccc: positioning mode
    The POSITIONING task (p2621 = 1) defines how the position specified in the traversing task is to be approached.
    0000, ABSOLUTE:
    The position specified in p2617 is approached.
    0001, RELATIVE:
    The axis is traveled along the value specified in p2617
    0010, ABS_POS:
    For rotary axes with modulo offset only. The position specified in p2617 is approached in a positive direction.
    0011, ABS_NEG:
    For rotary axes with modulo offset only. The position specified in p2617 is approached in a negative direction.
- **Task parameter (command-dependent significance) (p2622[0...31])**

Traversing block tasks

- **POSITIONING**
  The POSITIONING task initiates motion. The following parameters are evaluated:
  - p2616[x] Block number
  - p2617[x] Position
  - p2618[x] Velocity
  - p2619[x] Acceleration override
  - p2620[x] Deceleration override
  - p2623[x] Task mode

  The task is executed until the target position is reached. When the task is activated, the converter is already located at the target position, then for the block change enable (CONTINUE_ON-THE-FLY or CONTINUE_EXTERNAL), the next task is selected in the same interpolation cycle. For CONTINUE_WITH_STOP, the next block is activated in the next interpolation cycle. CONTINUE_EXTERNAL_ALARM causes a message to be output immediately.
- **FIXED STOP**
  The FIXED STOP task triggers a traversing movement with reduced torque to fixed stop. The following parameters are relevant:
  - p2616[x] Block number
  - p2617[x] Position
  - p2618[x] Velocity
  - p2619[x] Acceleration override
  - p2620[x] Deceleration override
  - p2623[x] Task mode
  - p2622[x] Task parameter clamping torque [0.01 Nm] with rotary motors.

  Possible continuation conditions include END, CONTINUE_WITH_STOP, CONTINUE_EXTERNAL, CONTINUE_EXTERNAL_WAIT.

- **ENDLESS POS, ENDLESS NEG**
  Using these tasks, the axis is accelerated to the specified velocity and is moved until:
  - A software limit switch is reached.
  - A hardware limit switch signal has been issued.
  - The traversing range limit is reached.
  - Motion is interrupted by the control signal "no intermediate stop / intermediate stop" (STW1.5).
  - Motion is interrupted by the control signal "do not reject traversing task / reject traversing task" (STW1.4).
  - An external block change is triggered (with the appropriate continuation condition).

  The following parameters are relevant:
  - p2618[x] Velocity
  - p2619[x] Acceleration override
  - p2623[x] Task mode

  All continuation conditions are possible.
- **JERK**
  Jerk limitation can be activated (command parameter = 1) or deactivated (task parameter = 0) by means of the JERK task. p2575 "Active jerk limitation" must be set to zero. The value parameterized in "jerk limit" p2574 is the jerk limit.
  A precise stop is always carried out here regardless of the parameterized continuation condition of the task preceding the JERK task.
  The following parameters are relevant:
  - p2622[x] Task parameter = 0 or 1

  All continuation conditions are possible.
- **WAIT**
  The WAIT task can be used to set a waiting period which should expire before the following task is processed.
  The following parameters are relevant:
  - p2622[x] Task parameter = delay time in milliseconds ≥ 0 ms, but is rounded-off to a multiple of numeral 8
  - p2623[x] Task mode

  Regardless of the parameterized continuation condition which is parameterized for the task that precedes the WAIT task, a precise stop is always executed before the waiting time expires. The WAIT task can be executed by an external block change.
  Possible continuation conditions include END, CONTINUE_WITH_STOP, CONTINUE_EXTERNAL, CONTINUE_EXTERNAL_WAIT, and CONTINUE_EXTERNAL_ALARM. The fault message is triggered when "External block change" has still not been issued after the waiting time has elapsed.

- **GOTO**
  Using the GOTO task, jumps can be executed within a sequence of traversing tasks. The block number which is to be jumped to must be specified as task parameter. A continuation condition is not permissible. If there is no block with this number, then alarm A07468 (jump destination does not exist in traversing block x) is output and the block is designated as being inconsistent.
  The following parameters are relevant:
  – p2622[x] Task parameter = Next traversing block number

  Any two of the SET_O, RESET_O and GOTO tasks can be processed in an interpolation cycle and a subsequent POSITION and WAIT task can be started.
- **SET_O, RESET_O**
  The tasks SET_O and RESET_O allow up to two binary signals (output 1 or 2) to be simultaneously set or reset. The number of the output (1 or 2) is specified bit-coded in the task parameter.
  The following parameters are relevant:
  – p2616[x] Block number
  – p2622[x] Task parameter = bit-coded output:
  – 0x1: Output 1
  – 0x2: Output 2
  – 0x3: Output 1 and output 2

  Possible continuation conditions are END, CONTINUE_ON-THE-FLY and CONTINUE_WITH_STOP, and CONTINUE_EXTERNAL_WAIT.
  Any two of the SET_O, RESET_O and GOTO tasks can be processed in an interpolation cycle and a subsequent POSITIONING and WAIT task can be started.

Intermediate stop and reject a traversing task

When telegrams 7, 9, 111, 112, and 113 are used, perform an intermediate stop with the PROFINET control word STW1.5:

Control word	Signal	Description
STW1.5	1	No intermediate stop.
	0	Intermediate stop.

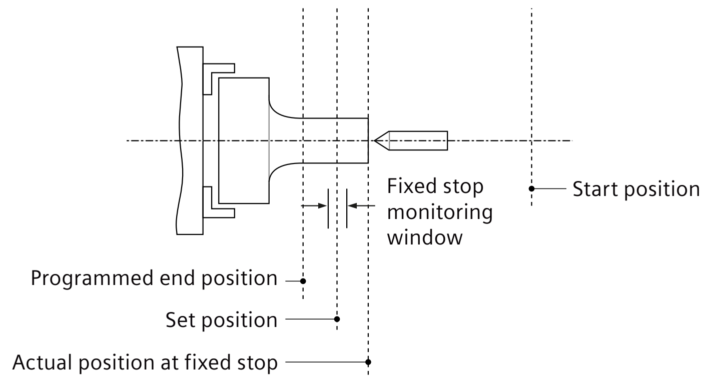
When telegrams 7, 9, 111, 112, and 113 are used, reject a traversing task with the PROFINET control word STW1.4:

Control word	Signal	Description
STW1.4	1	Do not reject a traversing task.
	0	Reject a traversing task (ramp-down with the maximum deceleration).

9.4.1.19 Travel to fixed stop

Overview

The function can be used to move the motor to a fixed stop at a specified torque without a fault being signaled. The specified torque is built up and remains applied after the motor reaches the fixed stop.



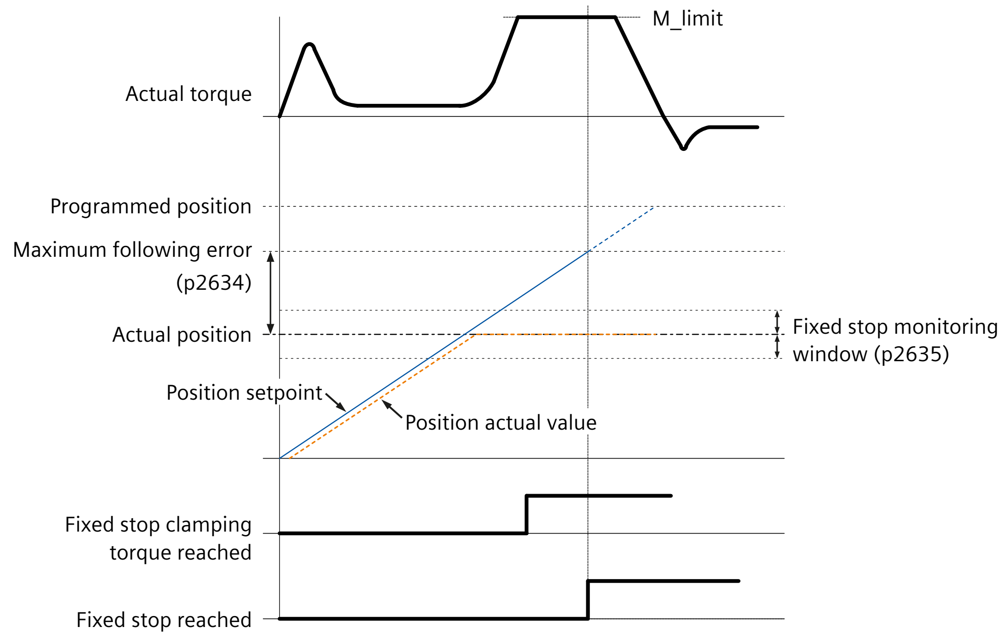
Description of function

In positioning mode, travel to fixed stop is started when a traversing block is processed with the FIXED STOP task. You can set the required clamping torque of the FIXED STOP function by the task parameter p2622.

An adjustable monitoring window for travel to fixed stop prevents the drive from traveling beyond the window if the fixed stop should break away.

From the start position onwards, the target position is approached with the parameterized speed. The fixed stop (the workpiece) must be between the start position and the braking point of the axis; that is, the target position is placed inside the workpiece. The preset torque limit is effective from the start, i.e. travel to fixed stop also occurs with a reduced torque. The preset acceleration and delay overrides and the current speed override are also effective.

Dynamic following error monitoring (p2546) in the position controller is not effective when traveling to the fixed stop. As long as the drive travels to the fixed stop or is in fixed stop, the "Travel to fixed stop active" status bit r2683.14 is set.



Fixed stop is reached

As soon as the axis comes into contact with the mechanical fixed stop, the closed-loop control in the drive raises the torque so that the axis can move on. The torque increases up to the value specified in the task and then remains constant. If the actual position following error exceeds the value set in parameter p2634 (Fixed stop: maximum following error), fixed stop is reached.

Once the "Fixed stop reached" status has been detected, the traversing task "Travel to fixed stop" is ended. The program advances to the next block depending on the task parameterization.

If the axis leaves the position that has been detected as the fixed stop by more than the selected monitoring window for the fixed stop (p2635), the speed setpoint is set to 0, and fault F07484 "Fixed stop outside of the monitoring window" is triggered with the reaction OFF3 (quick stop). The monitoring window can be set using the parameter p2635 ("Fixed stop monitoring window"). It applies to both positive and negative traversing directions and must be selected such that it will only be triggered if the axis breaks away from the fixed stop.

Fixed stop is not reached

If the brake application point is reached without the "Fixed stop reached" status being detected, then the fault F07485 "Fixed stop is not reached" is output with fault reaction OFF1, the torque limit is canceled and the drive cancels the traversing block.

9.4.1.20 Direct setpoint input (MDI)

Overview

The "direct setpoint input (MDI, Manual Data Input)" function allows for positioning (absolute, relative) and setting-up (endless position-controlled) by means of direct setpoint inputs (e.g. via the PLC using process data). A higher-level control provides the converter with the position setpoint and traversing profile.

Description of function

During traversing, the motion parameters can also be influenced (on-the-fly setpoint acceptance) and an on-the-fly change can be undertaken between the "setting-up" and "positioning" modes. The "direct setpoint specification" mode (MDI) can also be used if the axis is not homed in the "setting-up" or "relative positioning" modes.

"Setting-up" mode

The higher-level control selects the mode "Set-up":

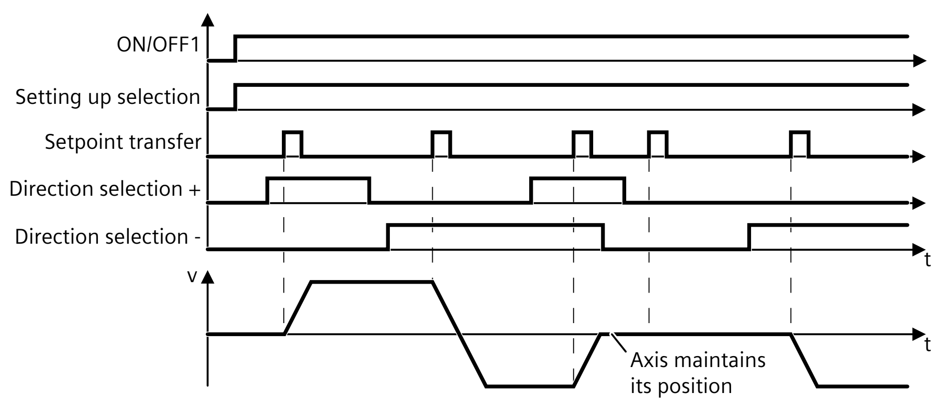


Figure 9-44 Set up axis with direct setpoint input (MDI)

"Positioning" mode

The higher-level control specifies the value of the setpoint either as a relative or an absolute position setpoint:

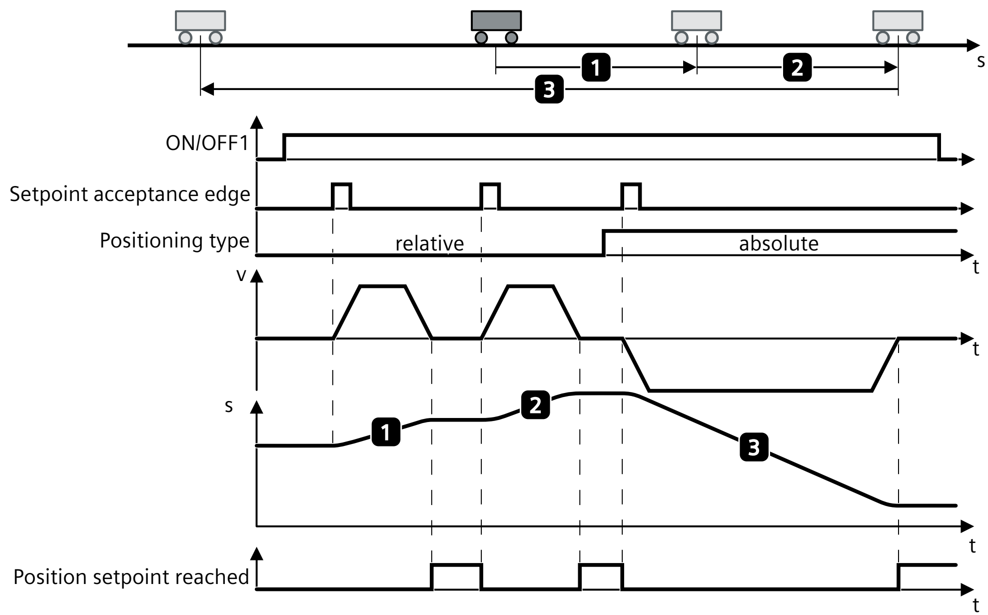


Figure 9-45 Position axis with direct setpoint input (MDI)

Activating the direct setpoint input function

When telegrams 111, 112, and 113 are used, the direct setpoint input function can be configured with the PROFINET control word POS_STW1.15:

Control word	Signal	Description
POS_STW1.15	1	MDI selection.
	0	Traversing block selection.

When telegrams 7 and 9 are used, the direct setpoint input function can be configured with the PROFINET control word SATZANW.15:

Control word	Signal	Description
SATZANW.15	1	MDI selection.
	0	Traversing block selection.

Selecting a working mode

In "Positioning" mode, the parameters (position, velocity, acceleration and deceleration) can be used to carry out absolute or relative positioning.

In "Setting-up" mode, using parameters (velocity, acceleration and deceleration) endless closed-loop position control behavior can be carried out.

When telegrams 111, 112, and 113 are used, select a working mode with the PROFINET control word POS_STW1.14:

Control word	Signal	Description
POS_STW1.14	1	Select "setting-up" mode.
	0	Select "positioning" mode.[1)]

1) Telegrams 7 and 9 can only work in "positioning" mode.

Selecting a positioning type in "positioning" mode

When telegrams 111, 112, and 113 are used, select a positioning type with the PROFINET control word POS_STW1.8:

Control word	Signal	Description
POS_STW1.8	1	Select absolute positioning.
	0	Select relative positioning.

When telegram 9 is used, select a positioning type with the PROFINET control word MDI_MOD.0:

Control word	Signal	Description
MDI_MOD.0	1	Select absolute positioning.
	0	Select relative positioning.

Selecting an absolute positioning direction in "positioning" mode

When telegrams 111, 112, and 113 are used, select an absolute positioning direction with the PROFINET control words POS_STW1.9 and POS_STW1.10:

Control word		Description
POS_STW1.9	POS_STW1.10	
0	0	Absolute positioning through the shortest distance.
0	1	Absolute positioning/MDI direction selection, positive.
1	0	Absolute positioning/MDI direction selection, negative.
1	1	Absolute positioning through the shortest distance.

When telegram 9 is used, select an absolute positioning direction with the PROFINET control words MDI_MOD.1 and MDI_MOD.2:

Control word		Description
MDI_MOD.1	MDI_MOD.2	
0	0	Absolute positioning through the shortest distance.
0	1	Absolute positioning/MDI direction selection, positive.
1	0	Absolute positioning/MDI direction selection, negative.
1	1	Absolute positioning through the shortest distance.

Selecting a direction in "setting-up" mode

When telegrams 111, 112, and 113 are used, select a direction with the PROFINET control words POS_STW1.9 and POS_STW1.10

Control word		Description
POS_STW1.9	POS_STW1.10	
0	1	MDI direction selection, positive.
1	0	MDI direction selection, negative.

Selecting an MDI transfer type

When telegrams 111, 112, and 113 are used, select an MDI transfer type with the PROFINET control word POS_STW1.12:

Control word	Signal	Description
POS_STW1.12	1	Continuous transfer.
	0	Activate MDI block change with of a traversing task (STW1.6).

Setting MDI setpoints

When telegrams 9, 111, 112, and 113 are used, set MDI setpoints with the following PROFINET control words:

- Position setpoint
  - MDI_TARPOS in telegrams 9, 111: 1 hex = 1 LU
  - MDI_TARPOS_F in telegram 112: LU or MU as floating-point number
  - MDI_TARPOS_D in telegram 113: LU or MU as double integer
- Velocity setpoint
  - MDI_VELOCITY in telegrams 9, 111: 1 hex = 1000 LU/min
  - MDI_VELOCITY_F in telegrams 112, 113: floating-point number
- Acceleration override
  - MDI_ACC in telegrams 9, 111: 4000 hex = 100%
  - MDI_ACC_F in telegrams 112, 113: floating-point number
- Deceleration override
  - MDI_DEC in telegrams 9, 111: 4000 hex = 100%
  - MDI_DEC_F in telegrams 112, 113: floating-point number

Intermediate stop and reject an MDI task

When telegrams 7, 9, 111, 112, and 113 are used, perform an intermediate stop with the PROFINET control word STW1.5:

Control word	Signal	Description
STW1.5	1	No intermediate stop.
	0	Intermediate stop with parameterized deceleration MDI_DEC (telegrams 9, 111, 112, and 113).

When telegrams 7, 9, 111, 112, and 113 are used, reject an MDI task with the PROFINET control word STW1.4:

Control word	Signal	Description
STW1.4	1	Do not reject a traversing task.
	0	Reject a traversing task (ramp-down with the maximum deceleration).

9.4.2 Vibration suppression

9.4.2.1 Operating principle

Overview

The low-frequency vibration suppression function uses a configurable setpoint filter to minimize vibrations in the natural frequency range of the moving mechanism.

Requirement

- The basic positioner (EPOS) function is enabled.
- The Basic Vibration Suppression function is activated.

Description of function

To absorb oscillations, the configurable setpoint filter changes the command variable of an axis so that there is as little oscillation as possible excited in the damped natural frequency range of the moving mechanical system. While this does slightly delay the motion sequence, with correct parameterization, the additional travel time is significantly less than the wait time for the oscillation levels in the mechanical system to be within the tolerance range.

Low-frequency natural frequency oscillations above 10 Hz can be eliminated.

9.4.2.2 Methods to determine the frequency

Overview

The natural frequency is set in p31585. This value cannot be changed during motion. Frequency f_d must be determined by making the appropriate measurements.

Requirement

License is required if you want to determine the frequency using the measuring function via Startdrive.

Procedure

You can use the following three methods to determine the natural frequency of the mechanical system via Startdrive.

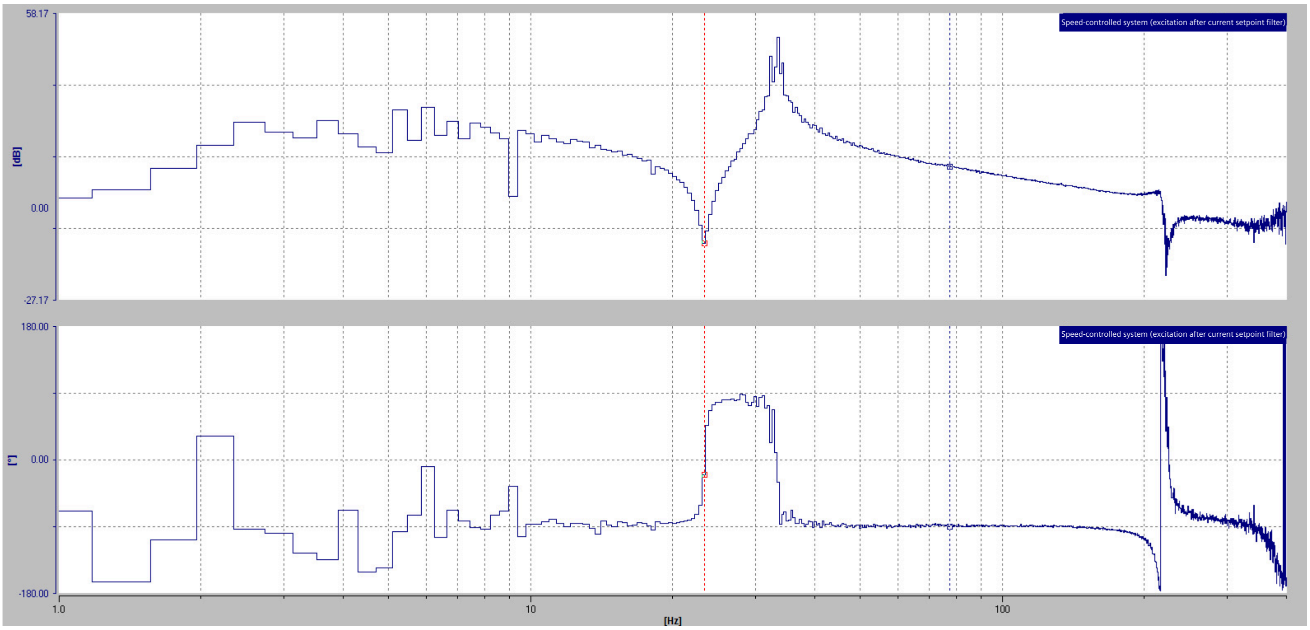
Empirically determining the frequency if the natural frequency to be absorbed is approximately known

1. Set the estimated frequency (p31585).
2. Check the effect of the filter while traveling with different load levels.
3. Repeat step 1 and step 2 with a different frequency until the frequency with the optimum filter effect has been found.

Use the lowest value if you determine several values for the frequency.

Determining the frequency using the measuring function in the frequency domain

1. Double-click "Add new measuring function".
2. Select "Speed-controlled system (excitation after current setpoint filter)" in the drop-down list.
3. Parameterize the measuring function:
   - Amplitude
     From experience, practical values lie in the range 1% ... 5%. The value is scaled to p2003.
   - Offset
     From experience, values in the range 0.5% ... 1% of the maximum axis velocity are sufficient.
   - Ramp-up time
     This value should be generously dimensioned corresponding to the offset that has been set (e.g. 200 ms ... 500 ms).
   - Measuring period
     Set the highest possible number of measuring periods (e.g. number = 4). Ensure that the available travel distance of the axis is sufficient for the offset velocity that has been set. Observe displayed measuring time.
   - Bandwidth
     Select this value so that the expected natural frequency can be displayed with a good resolution (e.g. bandwidth < 400 Hz).
4. Perform the measuring function.
   - Assuming control priority
   - Switch on the drive
   - Start the measuring function
5. Evaluate the result.
   After the measuring function has been completed, the result is automatically displayed in the Bode diagram.



The Bode diagram shows the absolute value (top) and the phase (bottom) of the complex transfer function in a logarithmic scale.

The natural frequency f_d to be damped can be identified by the notch in the absolute value diagram (zero position). A positive phase rotation also occurs at this position. You can shift to the notch with a colored measuring cursor, which displays the natural frequency to be damped.

Determining the frequency in the time domain using traversing motion

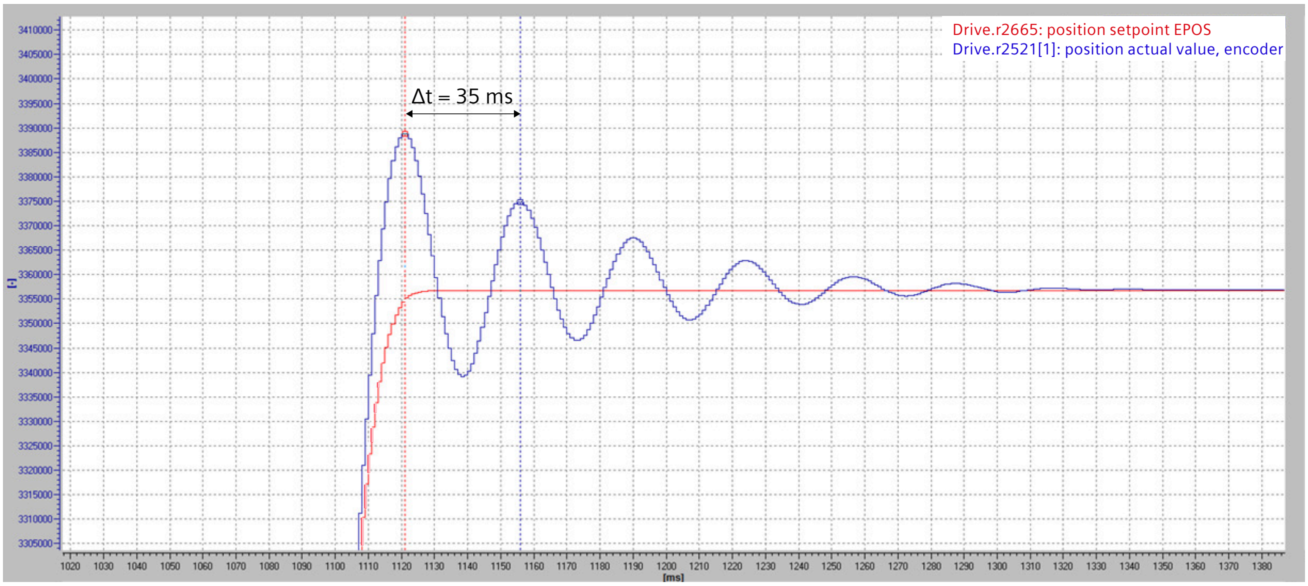
Use the dynamic positioning method to determine the natural frequency to be absorbed. The actual values with respect to time are recorded in a trace.

Then, calculate the low-frequency natural frequency, which is determined from the inverse of the time period of the oscillation at the motor, namely f_d = 1 / time period.

The following parameters are recommended as measuring variables:

- r2665: EPOS position setpoint
- r2521[1]: LR position actual value, encoder

The following diagram shows a positioning operation to determine the frequency.



In the diagram above, the time period is marked using a colored measuring cursor, which shows dT = 34.966 ms (≈ 35.0 ms).

The frequency of the natural oscillation to be damped is calculated as follows:

fd = 1 / time period = 1 / 0.0350 s = 28.6 Hz

Alternatively, you can use the velocity or the torque as measurement variables.

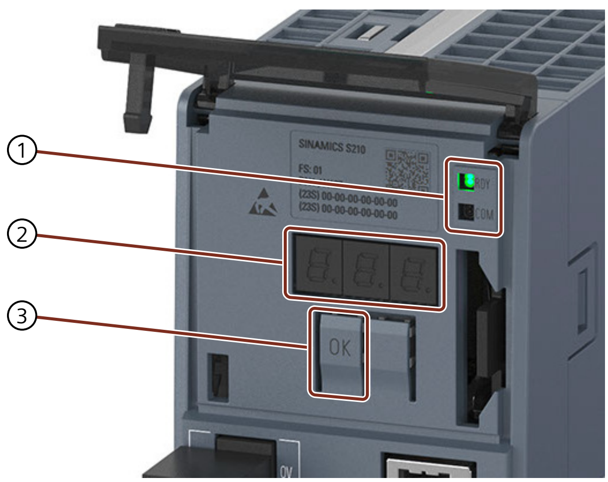
- Recommended parameter for velocity:
  - r2666: EPOS velocity setpoint
  - r0061[0]: Unsmoothed speed actual value, encoder
- Recommended parameter for current:
  - r0080: Actual torque value

10 System messages

10.1 LED

10.1.1 LEDs on the converter

The status of the converter is displayed via the three-digit display as well as by the "RDY" and "COM" LEDs.



① LED display
② Three-digit display
③ OK button

Display and operating elements on the converter

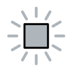
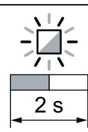
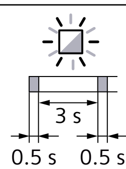
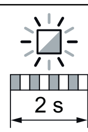
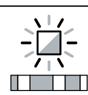
- Status display via LEDs
  The converter displays the current operating state via two LEDs.
  - RDY: converter state
  - COM: communication state

  During ramp-up, the LEDs assume different states.
  The converter is ready for operation when the "RDY" LED is permanently green.
  The LEDs always operate independently of one another, except when updating the firmware.
- Status display via the three-digit display
  Normally, the display is dark.
  During ramp-up, "210" appears as a reference to the SINAMICS S210 converter.
  Faults are shown according to the message classes defined in PROFIdrive. If PROFIdrive diagnostics is active, the faults are simultaneously transferred to the control system.
  More detailed information about alarms and faults is provided by the web server of the converter.
- OK button
  You can acknowledge the faults whose cause has been corrected with the OK button.

10.1.2 Explanation of icons

Response of the LEDs

The following tables explain the LED icons.

Icon	Description
	LED is bright
	LED is OFF
	LED flashes slowly
	LED flashes in alternating order 3 times quickly - 2 s pause - ...
	LED flashes briefly every 3 s
	LED flashes quickly
	LED flashes with variable frequency

10.1.3 LED LNK

Behavior of the LEDs when powering up and during operation of the converter

LNK	Description	Remedy
 Green	The Ethernet-based fieldbus link (X150) is successfully established.	
	The Ethernet-based fieldbus link (X150) has not been established.	• Establish the missing or interrupted Ethernet-based fieldbus link • Switch on connected and linked devices

10.1.4 LED RDY and LED BF

Response of the LEDs

RDY	BF	Description	Remedy
Green	Not relevant	Converter is ready for operation and is fault free.	
Not relevant	Green	Cyclic communications running.	
Green	Green	Possible causes • Temporary state after the supply voltage is switched on. firmware being loaded and initialized. • Firmware is being updated. • All user-defined settings are reset to the factory setting.	
Green		Firmware update completed The converter is waiting.	Switch the converter supply voltage off and on.
Green		All user-defined settings are reset to the factory setting.	Switch the converter supply voltage off and on.
Green	Not relevant	PROFIenergy energy saving mode is active.	
Orange		Commission or restore factory settings using the commissioning tool	
Orange	Orange	Possible causes • Temporary state after the supply voltage is switched on • Restart	
Orange		Converter detection via DCP flashing.	

RDY	BF	Description	Remedy
Red		Possible causes • Converter signals a fault. • Firmware error • No license	Appropriate remedies: • Check message display, rectify cause of fault • Activate required license
	Red	No fieldbus connection: • No data exchange or configuration error • Data exchange lost • Data is being exchanged, but there are no setpoints (controller in the stop state)	Possible remedies: • Check message display and rectify cause of fault. • Check operating mode of controller (PLC)
	Red	Firmware update signals an error.	Possible remedies: • Switch the converter supply voltage off and on, and repeat the firmware update. • Firmware update via memory card: Replace memory card and repeat firmware update. • Contact Support/Hotline.
		Reset of all user-defined settings to the factory setting unsuccessful.	Possible remedies: • Check the memory card with the empty file called RESET.TXT • Switch off and switch on the converter supply voltage and reset all user-defined settings to the factory setting. • Contact Support/Hotline.

	Red	Possible causes
		• BIOS error
		  – General error
		  – Loading error
		• File error:
		  – Memory card is not available or is faulty.
		  – File corrupt
		• CRC error
			Possible remedies:
			• Switch the converter supply voltage off and on.
			• Check memory card if available
			• Reload firmware
			• Contact Hotline/Support.

10.2 Message classes in accordance with PROFIdrive

The message classes according to PROFIdrive are shown in the converter display.

Example: Message class 4: F04

Message class	PN[1] (hex)	Explanation of the message class according to PROFIdrive - cause and remedy.
1	9000	**Hardware fault/software error** A hardware or software malfunction has been identified. • Carry out a POWER ON for the relevant component. • If it occurs again, replace again.
2	9001	**Line fault** A line supply fault has occurred (phase failure, voltage level, ...). • Check the line supply/fuses. • Check the supply voltage. • Check the wiring.
3	9002	**Supply voltage fault** An electronics power supply fault (24 V) has been identified. • Check the wiring. • Check the voltage level.
4	9003	**DC link overvoltage** The DC link voltage has assumed an inadmissibly high value. • Check the dimensioning of the system (line supply, voltages). • Check the infeed settings.
5	9004	**Power electronics fault** An inadmissible operating state of the power electronics has been identified (overcurrent, overtemperature, IGBT failure, ...). • Check compliance with the permissible load cycles. • Check the ambient temperatures (fan).
6	9005	**Electronic component overload** The temperature in the component has exceeded the highest permissible limit. • Check the ambient temperature / control cabinet ventilation.
7	9006	**Ground fault / inter-phase short-circuit detected** A ground fault / inter-phase short-circuit has been identified in the power cables or in the motor windings. • Check the power cables (connection). • Check the motor.
8	9007	**Motor overload** The motor was operated outside the permissible limits (temperature, current, torque, ...). • Check the load cycles and set limits. • Check the ambient temperature / motor cooling.

Message class	PN[1)] (hex)	Explanation of the message class according to PROFIdrive - cause and remedy.
9	9008	**Communication error to the higher-level controller** The communication to the higher-level controller is faulted or interrupted. • Check the state of the higher-level controller. • Check the communication connection/wiring. • Check the bus configuration / clock cycles.
10	9009	**Safety monitoring channel has identified an error** A safe operation monitoring function (Safety) has detected an error.
11	900A	**Actual position value / actual speed value incorrect or not available** An illegal signal state was detected while evaluating the encoder signals (track signals, zero marks, absolute values, ...). • Check the encoder / state of the encoder signals. • Observe the maximum permissible frequencies.
12	900**B**	**Internal (DRIVE-CLiQ) communication error** The internal communication between the SINAMICS components is faulted or interrupted. • Check the DRIVE-CLiQ wiring. • Ensure an EMC-compliant design.
13	900C	**Infeed fault** The infeed is faulted or has failed. • Check the infeed and its environment (line supply, filters, fuses, ...). • Check the infeed control.
14	900D	**Braking controller / Braking Module faulted** The internal or external Braking Module is faulted or overloaded (temperature). • Check the connection/state of the Braking Module. • Comply with the permissible number of braking operations and their duration.
15	900E	**Line filter faulted** The line filter monitoring has identified an excessively high temperature or other inadmissible state. • Check the temperature / temperature monitoring. • Check the configuration to ensure that it is permissible (filter type, infeed, thresholds).
16	900F	**External measured value / signal state outside of the permissible range** A measured value / signal state read in via the input area (digital/analog/temperature) has assumed an inadmissible value/state. • Identify and check the relevant signal. • Check the set thresholds.
17	9010	**Application / technology function faulted** The application / technological function has exceeded a (set) limit (position, speed, torque, ...). • Identify and check the relevant limit. • Check the setpoint specification of the higher-level controller.

Message class	PN[1)] (hex)	Explanation of the message class according to PROFIdrive - cause and remedy.
18	9011	**Error in the parameterization/configuration/commissioning sequence** An error in the parameter assignment or in a commissioning run was identified, or the parameter assignment does not match the prevailing device configuration. • Determine the precise cause of the fault using the commissioning tool. • Adapt the parameterization or device configuration.
19	9012	**General drive fault** Group fault. • Determine the precise cause of the fault using the commissioning tool.

1) "Channel Error Type" of the PROFINET channel diagnostics. When channel diagnostics is activated, then the fault texts are indicated in the PLC.

10.3 Alarms

Alarms

Alarms have the following properties:

- Alarms have no direct influence on the drive.
- Alarms disappear again when the cause is eliminated.
- Alarms cannot be acknowledged.
- Alarms are displayed as follows:
  - In the PLC according to the PROFIdrive message class
  - On the drive via LEDs
  - At the drive using the three-digit display according to the PROFIdrive message class
  - In the web server
    You can find more information on the display of alarms in Chapter "Messages (Page 182)".
  - In Startdrive
    You can find more information on the display of alarms in Chapter "Display messages (Page 289)".

Alarm code or alarm value describe the cause of the alarm.

More information

You can find more information on alarms in Chapter "Overview of faults and alarms (Page 1083)".

10.4 Faults

Faults

Faults have the following properties:

- A fault may cause the motor to switch off.
- Faults must be acknowledged.
- Faults are displayed as follows:
  - In the PLC according to the PROFIdrive message class
  - On the drive via LEDs
  - At the drive using the three-digit display according to the PROFIdrive message class
  - In the web server
    You can find more information on the display of faults in Chapter "Messages (Page 182)".
  - In Startdrive
    You can find more information on the display of faults in Chapter "Display messages (Page 289)".

Acknowledge fault

Before you can acknowledge a fault, you must have resolved the cause of the fault.

To acknowledge, you have the following options:

- Acknowledging via the PLC
- Acknowledging via the OK button under the front cover
- Switching off the converter power supply and switch on again
- Acknowledging via the web server or Startdrive
- The Safety Integrated error is acknowledged by selecting/deselecting the STO function. As a result of the extended message acknowledgment, possibly active messages of other Safety Integrated Functions are simultaneously acknowledged. You must also execute the standard acknowledgment mechanism.

You can only acknowledge faults detected by the internal converter monitoring of hardware and firmware by switching the supply voltage off and on again. In the list of faults, you will find the information on limitations when acknowledging at the corresponding fault codes.

More information

You can find more information on faults in Chapter "Overview of faults and alarms (Page 1083)".

Service and maintenance 11

11.1 Safety Integrated acceptance test after component replacement

Overview

After a component has been replaced or the firmware updated, a reduced acceptance test of the safety functions must be performed.

Description

Depending on the measure performed, the following acceptance tests and documentation are required:

<table>
<tr><th rowspan="2">Measure</th><th rowspan="2">Converter message after component replacement</th><th colspan="2">Reduced acceptance test</th></tr>
<tr><th>Acceptance test</th><th>Documentation</th></tr>
<tr><td>Converter replacement</td><td>Yes</td><td rowspan="4">• Testing the EMERGENCY-STOP function STO or SS1
• A general test of the actual value acquisition by switching on and operating briefly with traversing in both directions</td><td rowspan="2">• Supplement converter data
• Supplement hardware version and firmware version in the converter data.
• Log new checksums
• Countersignature</td></tr>
<tr><td>Encoder replacement</td><td>Yes</td></tr>
<tr><td>Replacing a motor</td><td>No</td><td rowspan="2">No change</td></tr>
<tr><td>Gearbox replacement</td><td>No</td></tr>
<tr><td>Replacing safety-related I/O devices (e.g. Emergency Stop switch).</td><td>No</td><td>Check the control of the safety functions affected by the components that have been replaced.</td><td>No change</td></tr>
<tr><td>Converter firmware update</td><td>No</td><td>No</td><td>• Supplement firmware version in the converter data
• Log new checksums
• Countersignature</td></tr>
</table>

11.2 Service and maintenance for the motor

Requirement

WARNING

Risk of injury if protective devices are removed.

Operation without functioning protective devices can cause death or severe injury.

- Operate the motor, even in test operation, only with functioning protective devices.

Procedure

If there are deviations from normal operation or if faults occur, proceed as follows.

1. Identify the fault using the following table.
   You should also take account of the messages of the converter.

Fault	Fault cause (see "Fault causes and remedial measures" key table)														
Motor does not start	A	B													
Motor starts slowly	A		C		F										
Humming sound when starting			C		F										
Humming sound in operation	A		C		F										
High temperature rise under no-load operation				D		I									
High temperature rise under load	A		C			I									
High temperature rise of individual winding sections					F										
Uneven running							J	K							
Grinding sound, running noise									L						
Radial vibrations										M	N	O	P		R
Axial vibrations												O		Q	R

2. Rectify the fault using the following table.

No.	Fault cause	Remedial measures
A	Overload	Reduce load
B	Interruption of a phase in the supply cable / motor winding	Check the frequency converter and supply cables, measure the winding resistances and insulation resistances, repair after consultation with manufacturer
C	Interrupted phase in the feeder cable after switching on	Check the frequency converter, supply cables and the winding resistances
D	Converter output voltage too high, frequency too low	Check the settings on the frequency converter, perform automatic motor identification
F	Winding short-circuit or phase short-circuit in stator winding	Measure the winding resistances and insulation resistances, repair after consultation with the manufacturer, if required, replace the motor
I	Heat dissipation impeded by deposits	Clean the surface of the drives and ensure that the cooling air can flow in and out unimpeded
	Cooling air inlet/outlet is blocked by foreign bodies	Remove the reason for the blocking and ensure that the cooling air can flow in and out unimpeded
J	Insufficient shielding for motor and/or encoder cable	Check the shielding and grounding
K	Excessive drive controller gain	Adjust the controller
L	Rotating parts are grinding	Determine cause and adjust parts
	Foreign bodies inside the motor	Replace the motor
	Bearing damage	For SH20... SH50, replace the motor; for SH63 ... SH100, replace the bearings and encoder
M	Rotor not balanced	Replace the motor

No.	Fault cause	Remedial measures
N	Rotor out of true, shaft bent	Consult the manufacturer
O	Poor alignment	Align motor set, check coupling
P	Coupled machine not balanced	Re-balance coupled machine
Q	Shocks from coupled machine	Check coupled machine
R	Fault originating from the gear-box	Adjust/repair gearbox

If the fault still cannot be resolved after taking the measures stated above, please contact the manufacturer or the Siemens Service Center.

11.2.1 Replacing the motor bearings

Motor bearings are wearing parts. They must be replaced after a defined number of operating hours.

At medium loads, the motor bearings last approx. 25000 h.

The procedure for replacing the motor bearing depends on the size of the motor.

- For 1F☐2☐03 ... 1F☐2☐05 motors, it is not possible to replace the motor bearings. Replace these motors in their entirety.
- Replacement of the motor bearings is only intended as from 1F☐2☐06.

Especially favorable ambient conditions, such as low average speed, low radial force (transverse force) and vibration load can prolong the interval until motor replacement.

Note

Premature bearing and motor replacement

Harsh operating conditions, e.g. continuous operation at n_{max}, high vibration/shock loads, frequent reversing operation reduce the bearing or motor service life by up to 50 %.

The maintenance and repair of the motor can be performed in authorized Siemens Service Centers all over the world.

Contact your personal Siemens representative if you would like to take advantage of this service.

11.2.2 Replacing the motor

Requirement

The new motor has the same article number as the motor to be replaced.

Note

A motor with a singleturn encoder AS22DQC (1F☐2☐☐☐_☐☐☐☐☐-☐S☐☐) can be replaced by an otherwise identical motor with a multiturn encoder AM22DQC (1F☐2☐☐☐_☐☐☐☐☐-☐M☐☐) without having to recommission the drive system.

- Replace the motor following steps 1 to 3 as explained below.

Replacing a motor with a motor with another article number

If the converter has already been operated with a motor, and you wish to replace this motor by another motor with a different article number, then after replacing the motor, you must commission the converter again.

Procedure

1. Verify absence of operating voltage to the converter.

WARNING
Danger to life due to unintentional starting of the drive unit
Unintentional starting of the drive unit can cause death or severe injury. • Make sure that the drive unit cannot be started accidentally. • Post a warning notice to this effect at the point where the switch is located.

2. Replace the motor.

CAUTION
Burns as a result of touching hot surfaces
In operation, the motor enclosure can reach high temperatures, which can cause burns if touched. • Do not touch any hot surfaces. • Allow the motor to cool down before starting any work. • Use the appropriate personnel protection equipment, e.g. gloves.

   – Release the motor connector. You will find detailed information in Chapter "Connecting the power cable to the motor (Page 123)".
   – Release the motor mounting screws.
   – Remove the motor.
   – Mount and install the new motor. You will find detailed information in Chapter "Installing the motor (Page 109)".
3. Switch the converter on.

If you are using a different motor type (a motor with a different article number), then you must also carry out the following steps:

1. Reset the converter to factory settings.
   You can find more information in Chapter "Restoring the converter to factory settings (Page 502)".
2. Commission the converter. You can find more information in the following chapters:
   – "Commissioning (web server) (Page 155)"
   – When using "STARTDRIVE" in Chapter "Optional: Replacing the motor (Page 230)"
   – "Series commissioning (Page 313)"

11.3 Service and maintenance for the converter

11.3.1 Backing up and restoring drive data

11.3.1.1 Automatically backing up drive data using a memory card and restoring this data

Overview

An inserted memory card backs up all drive data and in the case of service, after a converter has been replaced, guarantees that the system or machine is immediately ready for operation again.

Description of function

The drive backs up changed drive data both in its internal memory as well as on the inserted memory card.

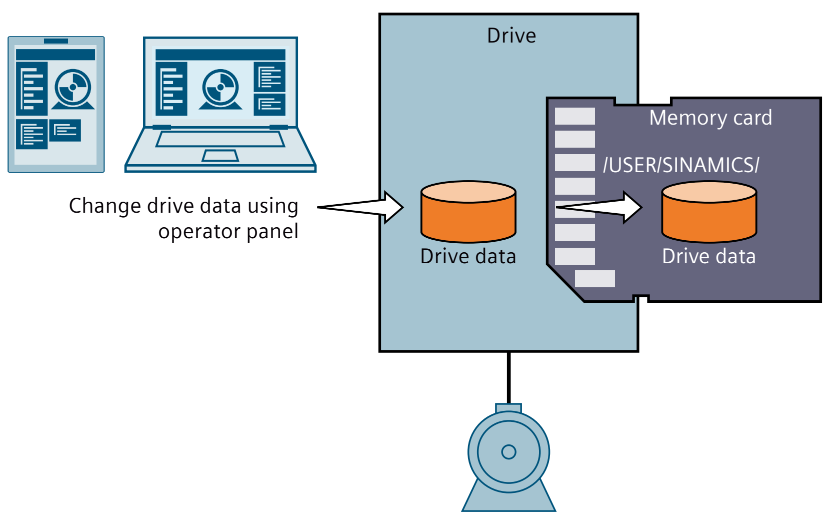


Figure 11-1 Drive data backed up on the memory card

The drive data comprise the following components:

- Changed parameters
- UMAC settings

The drive data are on the memory card in directory /USER/SINAMICS/.

After inserting an empty memory card for the first time, the drive creates directory /USER/SINAMICS/.

After the supply voltage has been switched on, the drive loads the drive data from the memory card into its internal memory.

Automatically loading the drive data from the memory card allows a converter to be replaced without using an operator panel.

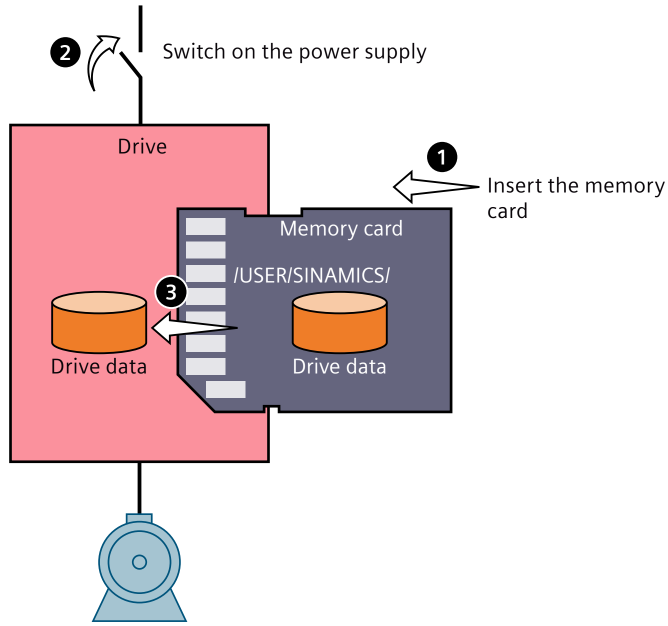


Figure 11-2 Automatically loading drive data from a memory card after a converter has been replaced

11.3.1.2 Backing up drive data to the backup file

Overview

A backup file backs up the drive data and allows the drive data to be restored if service is required. A backup file can be created by loading from the drive and offline from the TIA project.

Requirement

You have either configured the drive in a TIA project or you are connected online with the drive using a commissioning tool.

Procedure

The following options are available to save the drive data to a backup file:

- Load backup file online via web server or Startdrive from the drive:
  Using function "Backup/restore" → "Save drive data to backup file", back up the drive data in a backup file on the operator panel, e.g. on a PC.

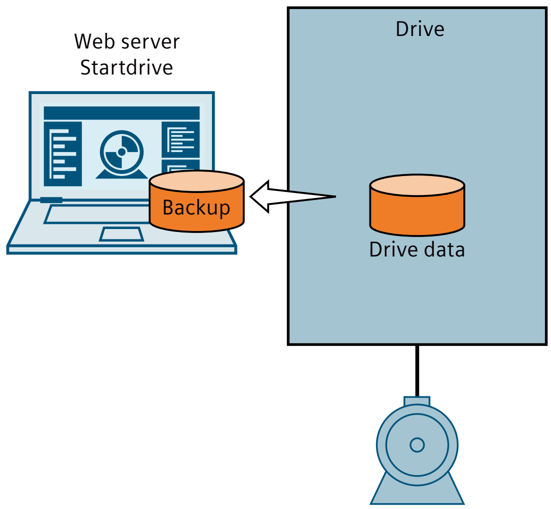


Figure 11-3 Creating a backup file online

- Exporting a backup file from the TIA project offline:
  In the TIA project, drag and drop the configured drive to "Card Reader/USB Memory" in the project tree. There, drag and drop the drive to a subdirectory in the "Removable Data Media" folder or a subdirectory in the "Reader_x" folder and follow the instructions.

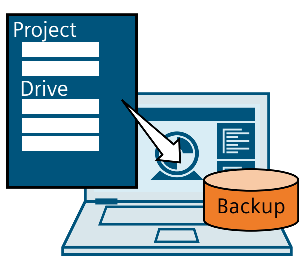


Figure 11-4 Creating a backup file from the TIA project offline:

Result

The backup file contains the following drive data:

- Changed parameters
- UMAC settings
- Drive data

11.3.1.3 Save backup file to memory card

Overview

A memory card with backup file allows drive data to be automatically restored after the card is inserted into the drive. The memory card can be created with and without Startdrive.

Requirement

Requirements:

- A memory card (SD card) is inserted in the card reader of your PC.
- You have either configured the drive using Startdrive or you already have the backup file of your drive.

Procedure

The following options are available to create a memory card with a backup file:

- Create a memory card with backup file offline using Startdrive:
  In the TIA project, drag and drop the configured drive to "Card Reader/USB Memory" in the project tree. There, drag and drop the drive to a subdirectory in the "Reader_x" folder and follow the instructions.
  Startdrive creates directory /BACKUPFILE_NEXT_START/ and saves the backup file there.

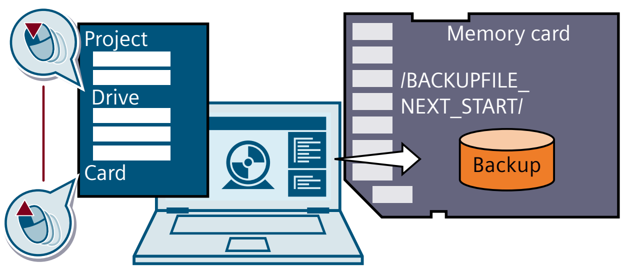


Figure 11-5 Creating a memory card with backup file using Startdrive

- Create a memory card with backup file without Startdrive:
  The backup file can be received by email, stored in a cloud or locally.
  Create directory /BACKUPFILE_NEXT_START/ on the memory card and copy the backup file to this directory.

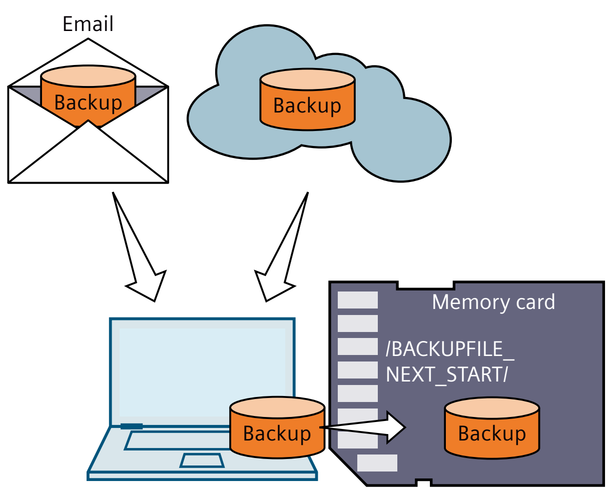


Figure 11-6 Saving the backup file to the memory card without using Startdrive

Result

The memory cards contains the backup file with the following drive data:

- Changed parameters
- UMAC settings
- Drive data

11.3.1.4 Restoring drive data from a backup file

Overview

A backup file backs up the drive data and allows the drive data to be restored if service is required. The drive data can be restored online using a commissioning tool or via a memory card.

Requirement

You have either configured the drive using Startdrive or you already have the backup file of your drive.

Procedure

The following options are available to restore the drive data from a backup file:

- Restore drive data online using a web server or Startdrive:
  Using function "Backup/restore" → "Restore drive data from backup file", transfer the backup file from an operator panel to the drive. The drive accepts the content of the backup file into the drive data on its internal memory.

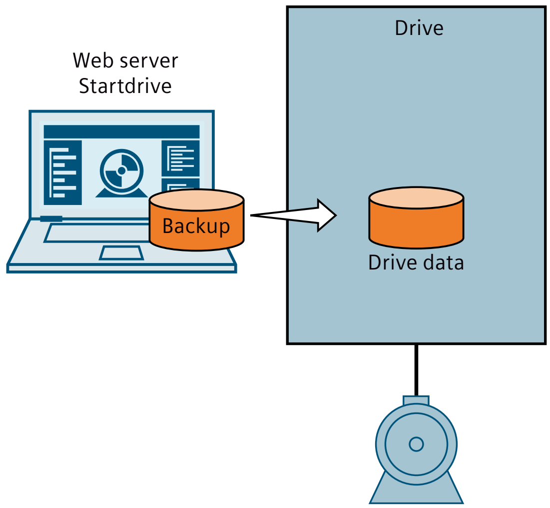


Figure 11-7 Restoring drive data from a backup file online

- Restoring drive data using a memory card:
  After the supply voltage has been switched on, the drive accepts the drive data from a backup file into its internal memory.

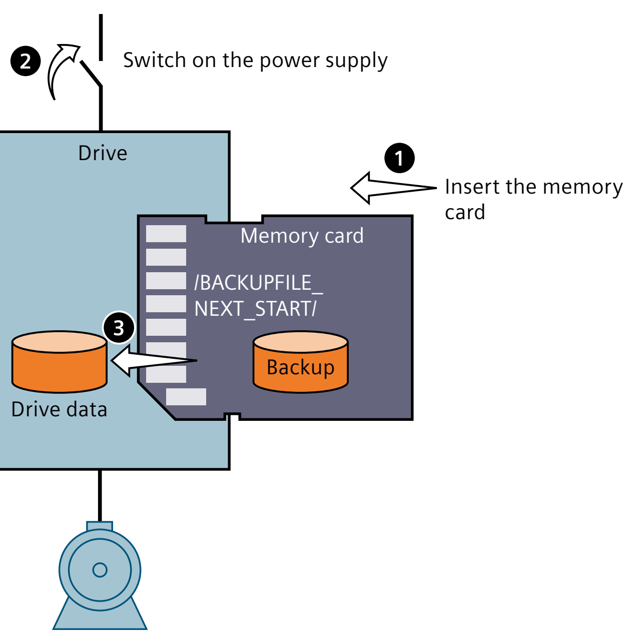


Figure 11-8 Restoring drive data using a backup file on a memory card

After accepting the drive data:

– The drive deletes the backup file and directory /BACKUPFILE_NEXT_START/

– The drive backs up the drive data from the memory card in directory /USER/SINAMICS/

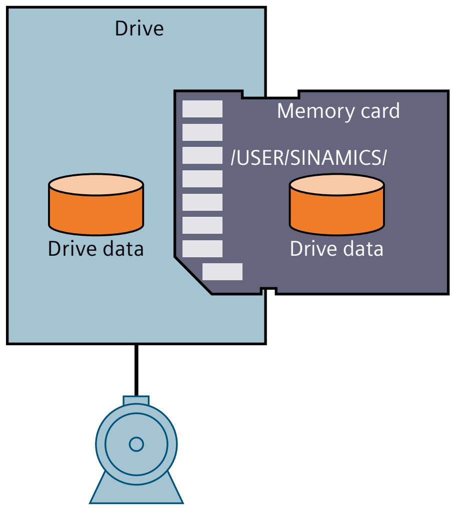
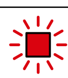


Figure 11-9 Memory card after restoring the drive data

Result

The LEDs signal the drive status:

RDY	BF	Explanation
	not relevant	The drive has accepted the following drive data from the backup file into its internal memory: • Changed parameters • UMAC settings
	□	The drive signals a fault. Check the cause of the fault.

11.3.1.5 Backup file with drive data encryption

Overview

Restoring drive data from a backup file with encrypted data is only possible if you know the backup password.

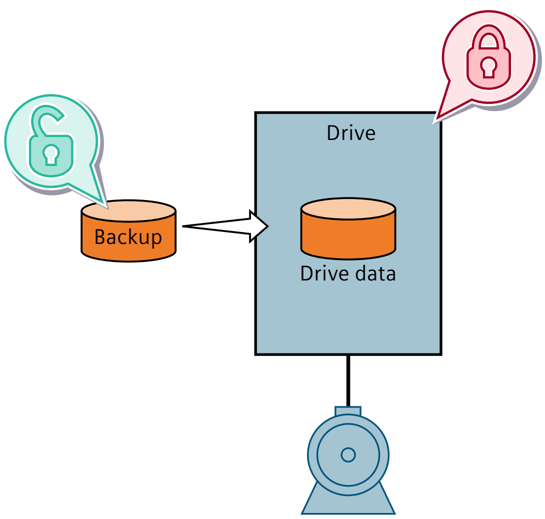
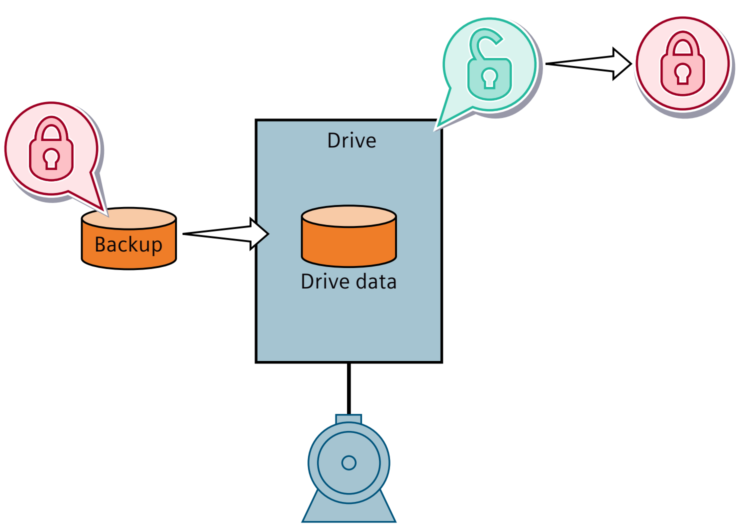
Requirement

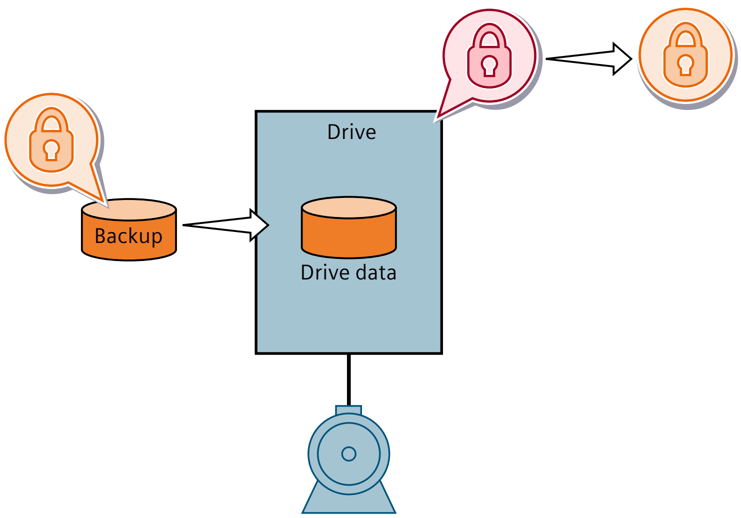
Required runtime authorizations with active user management (UMAC):

- "Create backup or load drive data to Startdrive"
- If the backup file contains Safety Integrated Functions settings:
  "Edit Safety Integrated application"

Description of function

Procedures vary depending on which of the following drive data encryption scenarios applies:

Encryption	Password to be entered to restore the drive data	Result
The backup file is unencrypted. The drive data is encrypted. 	None	The drive data is restored from the backup file data. The drive password is retained after the drive data has been restored.
The backup file is encrypted. The drive data is unencrypted. 	Backup password	The drive data is restored from the backup file data. The drive data is encrypted. The drive handles the backup file password.

Encryption	Password to be entered to restore the drive data	Result
The backup file and the drive data are encrypted. The backup password and the drive password are different, or the backup file was created with a different drive. 	Backup password	The drive data is restored from the backup file data. The drive data remains encrypted. The drive handles the backup file password.

11.3.2 Restoring the converter to factory settings

11.3.2.1 Restoring factory settings via a commissioning tool

Description

The reset to factory settings with a commissioning tool (web server, Startdrive) only deletes the user-specific parameterization of the converter, for example motor data.

The following settings are retained with the reset:

- Activation and settings of User Management & Access Control
- The "IP configuration" and "Device name" communication settings of the service interface (X127) and PROFINET interface (X150)
- Installed firmware on the converter

The reset to factory settings with the commissioning tool is described in the following chapters:

- Web server: Backup and restore (Page 193)
- Startdrive: Restore factory settings (Page 302)

11.3.2.2 Restore Safety Integrated to factory settings

Overview

It is not always necessary to reset all of the converter settings. A separate reset function exists for Safety Integrated settings, which exclusively restores Safety Integrated settings to factory settings.

Requirement

You have the rights required for active user management (UMAC):

- Edit device configuration or drive applications
- Edit Safety Integrated application

Procedure

1. Call the "Backup and restore" menu.
2. Click on the "Reset Safety Integrated" button.
3. Acknowledge the confirmation prompt.
4. Wait: the converter resets its Safety Integrated settings.
5. Wait: the converter restarts.
6. The converter is ready for operation and the "RDY" and "BF" LEDs light up green.

Result

The Safety Integrated settings for the converter have been reset.

11.3.2.3 Full reset of all device settings

Overview

The following user-defined settings are stored in the converter:

- Parameterization of the converter
- Activation and settings of User Management & Access Control
- Communication settings "IP configuration" and "Device name" of the following interfaces:
  - Service interface (X127)
  - PROFINET interface (X150)
- Self-generated certificates
- User-defined parameter lists in the web server

In the following cases it may be necessary to reset all user-defined converter settings to the factory setting:

- The available credentials do not allow the necessary configuration of the converter (no password for example).
- Before recommissioning of the converter, for example if the application use of the converter changes.
- Before the converter is sold or disposed of, in order to erase all user-defined settings.

Requirement

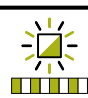
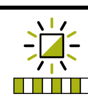
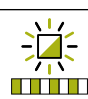
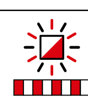
The following preconditions apply when completely resetting all device settings:

- You can access the converter manually.
- All electrical connections from the converter to the motor are disconnected.
- The PROFINET connection to the control system and other devices is disconnected.
- You have an empty writable SD card with max. 32 GB; e.g. 6SL5970-0AA00-0AA0.

Procedure

Proceed as follows to perform a full reset of all device settings of the converter:

1. Create an empty file called RESET.TXT in the root directory of the memory card.
   When you write text "KEEP_COMM" in upper case letters as shown to file RESET.TXT, then the settings for the communications interfaces are kept after the reset.
2. Switch off the converter supply voltage.
3. Wait until all LEDs on the converter are dark.
4. Insert the memory card into the converter.
5. Switch on the converter supply voltage.
6. The converter deletes the user-defined settings.
7. The user-defined settings are deleted.

RDY	BF	Description
		Factory settings are being restored
		Factory settings have been restored
		Restoring factory settings unsuccessful

8. Remove the memory card.
9. Switch off the converter supply voltage.

Result

The result depends on the content of file RESET.TXT:

File RESET.TXT is empty	File RESET.TXT contains text "KEEP_COMM"
All user-defined converter settings are deleted. The converter firmware is unchanged. After all device settings have been completely reset, access to the web server is possible via the service interface (X127) and via the PROFINET interface (X150). For access via the service interface (X127), use the secure transmission protocol HTTPS. If Option Module OM-IIoT is inserted, then the settings of interface X128 to the edge device are deleted.	The converter firmware is unchanged. The setting of the communications interfaces, e.g. the setting of service interface (X127) or the fieldbus interface, is unchanged. All other user-defined converter settings are deleted.

11.3.3 Converter firmware update

Requirement

NOTICE
Damage to equipment during firmware update due to voltage supply interruption
If the firmware is being updated, interrupting the power supply or disconnecting the motor can result in defects or cause the devices to malfunction. • Do not switch off the converter's supply voltage while the firmware update is running.

Description

Firmware updates change the settings in the converter according to the relative firmware version:

- If the converter is upgraded to a more recent firmware version, the converter settings are retained.
- Downgrading to an older firmware version resets the converter to the factory settings.

The following options are available for a firmware update:

- Firmware update via memory card (Page 506)
- Firmware update via web server (Page 201)
- Firmware update via Startdrive (Page 306)

11.3.4 Firmware update via memory card

Overview

The converter firmware can also be updated using a memory card.

Requirement

You have downloaded the corresponding firmware update file from the Internet and saved onto an empty memory card.

Alternatively, the firmware can be ordered on a memory card.

Procedure

Proceed as follows to update the firmware using a memory card:

1. Switch off the converter supply voltage.
2. Insert the memory card with the appropriate firmware into the converter.
3. Switch on the converter supply voltage.
4. The new firmware is installed. The process requires approx. 2 minutes.

RDY	BF	Explanation of LED displays
		The firmware is being updated. Do not switch off the converter supply voltage.
	-	Firmware update completed

5. Switch off the converter supply voltage.
6. Remove the memory card.
7. Switch on the converter supply voltage.
   If required, the firmware of the connected DRIVE-CLiQ components is updated. An appropriate active converter alarm signals that a restart is required.

RDY	Explanation of LED displays
	Firmware of the connected DRIVE-CLiQ components being updated. • Do not switch off the converter supply voltage. • Do not interrupt the DRIVE-CLiQ connection between the converter and the DRIVE-CLiQ component.
	Firmware of the DRIVE-CLiQ components has been updated: • Remedy: Switch off the DRIVE-CLiQ component supply voltage and then on again.

8. Check whether the new version has been installed. The converter firmware version is displayed in a commissioning tool.

More information

You can find information about the firmware versions on the Internet:

Firmware versions (https://support.industry.siemens.com/cs/ww/en/view/109812303)

11.3.5 BIOS update via memory card

Overview

A BIOS update may be required after a firmware update. Not every firmware update also has a corresponding BIOS update. If a BIOS update is necessary, this is indicated as part of the firmware update.

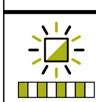
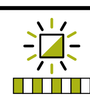
Requirement

You have downloaded the appropriate BIOS update file from the Internet and saved onto an empty memory card.

Procedure

Proceed as follows to update the BIOS using a memory card:

1. Switch off the converter supply voltage.
2. Insert the memory card into the converter.
3. Switch on the converter supply voltage.
4. The new BIOS is installed. The process takes approx. 10 seconds.

RDY	BF	Explanation of LED displays
		BIOS is being updated. Do not switch off the converter supply voltage.
	-	BIOS update completed

5. Switch off the converter supply voltage.
6. Remove the memory card.
7. Switch on the converter supply voltage.

More information

You can find information about the BIOS versions on the Internet:

Updates and constraints for SINAMICS S210 (https://support.industry.siemens.com/cs/ww/en/view/109812303)

11.3.6 Replacing fans - only for converters with 3 AC line connection

The fan module is installed in the lower section of the converter.

Operating period of the fan

The average operating period of the fan is 40,000 hours. However, in practice the operating period may be shorter. Especially a dusty environment can block up the fan.

Parameter r0277 is used to display the fan wear as a percentage of the operating period.

The alarm A30042 appears if the maximum operating period will shortly be reached or has already been exceeded.

The alarm value is contained in r2124 (interpret as a binary value):

- Bit 0 = 1: The wear counter has reached 99%, and after the remaining 1% has elapsed, bit 0 is cleared and bit 2 is set.
- Bit 2 = 1: The wear counter has exceeded 100%.

The fan must be replaced in good time to ensure that the converter remains ready for operation.

You can find the article number for the replacement fan in Chapter "Spare parts (Page 805)".

Replacing fans

CAUTION

Injury caused by a rotating fan

Touching a fan while it is rotating can result in injury.

- Switch off the supply voltage to the converter.
- Wait until the fan is stationary before work on it.

Proceed as follows to remove the fan module:

1. Switch off the converter power supply.
2. If necessary, remove the converter. To do so, loosen all connections at the converter.

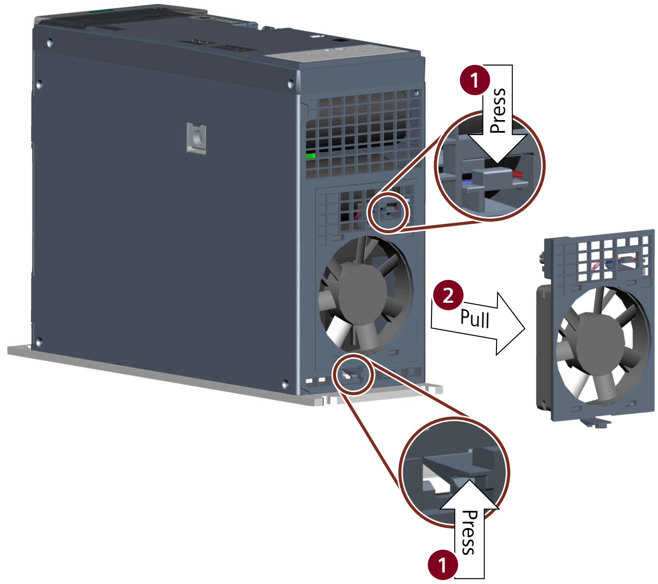
   WARNING

   Electric shock as a result of a residual charge in power components

   After the power supply has been switched off, it takes up to 5 min. until the capacitors in the converter have discharged so that the residual charge is at a non-hazardous level.

   - Check the voltage at the converter connections before releasing the connections at the converter.

3. Remove the fan as shown in the diagram.



4. Install the new fan in the reverse order.
5. Set the wear counter (r0277) of the fan to 0 using an operating unit such as a PC with access to the web server.

11.3.7 Forming the DC link capacitors

Requirement

If the cabinet is commissioned within two years of its date of manufacture, the DC link capacitors do not need to be reformed. The date of manufacture can be taken from the serial number on the nameplate.

NOTICE
Damage caused by supply voltage after a long storage time
After being in storage for more than two years, the converter may be damaged when the supply voltage is switched on. • Form the DC link capacitors of the converter.

Storage period

The storage period starts from the production date and not from the date on which the equipment was shipped.

The production date can be derived from the following assignment to the serial number (e.g. S ZV-**P4**Y7M000141 for April 2022, ST-**P4**55500113 for April 2022):

Table 11-1 Production year and month

Symbol	Year of manufacture	Symbol	Month of manufacture
M	2020	1 to 9	January to September
N	2021	O	October
P	2022	N	November
R	2023	D	December
S	2024		
T	2025		
U	2026		
V	2027		
W	2028		

The serial number is found on the nameplate.

Forming circuit

When DC link capacitors are formed, a defined voltage is connected to them and a defined current flows so that the appropriate capacitor characteristics are restored for them to be re-used as DC link capacitors.

The forming circuit can be configured using resistors.

Forming circuit for converters with 1 AC line connection

Components required for forming outside the drive line-up:

- 1 fuse switch 2-pole 230 V / 10 A
- Cable 1.5 mm^2 (AWG 16)
- 2 resistors 1 kΩ each / 100 W (e.g. GWK150J1001KLX000, Vishay company)

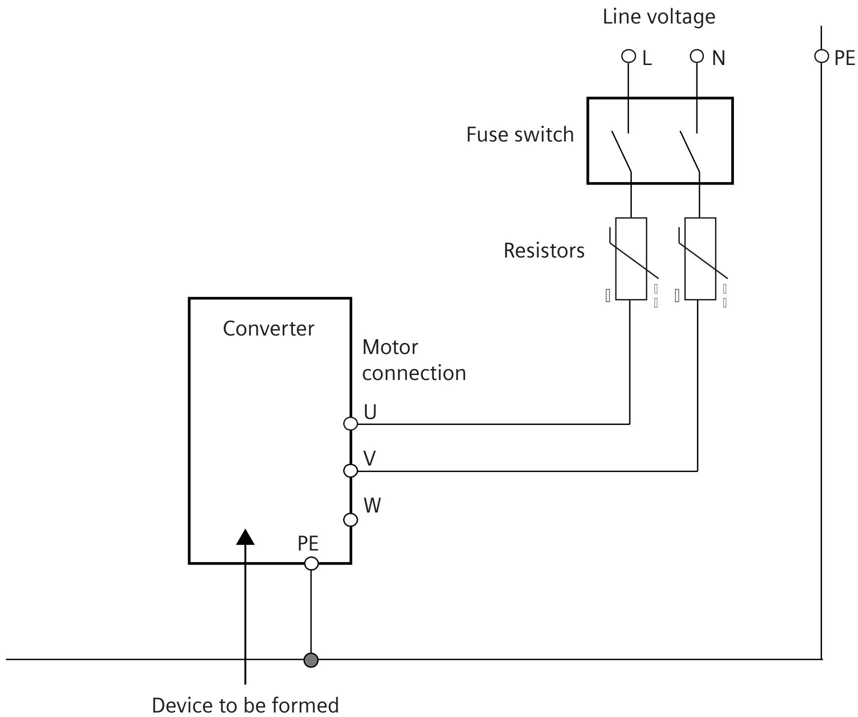


Figure 11-10 Forming circuit for converters with 1 AC line connection

Forming circuit for converters with 3 AC line connection

Components required for forming outside the drive line-up:

- 1 fuse switch 3-pole 400 V
- Cable 1.5 mm² (AWG 16)
- 3 resistors 1 kΩ each / 100 W (e.g. GWK150J1001KLX000, Vishay company)

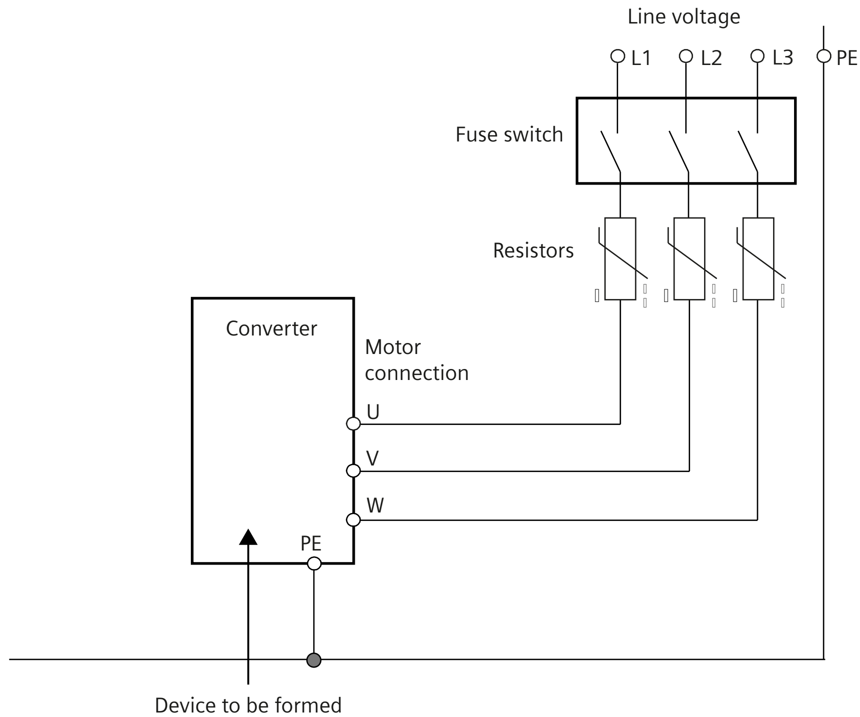


Figure 11-11 Forming circuit for converters with 3 AC line connection

Procedure

Proceed as follows to reform DC link capacitors:

1. Ensure that the device does **not** receive a power-on command (e.g. from the keyboard or terminal block).
2. Connect the forming circuit.
3. For forming using resistors, the converter must remain in the circuit for approx. 1 h. The resistors will become very hot if there is a fault in the unit (surface temperature > 80 °C).

CAUTION

Burns resulting from high resistor surface temperatures

The resistors can reach a high temperature if there is a fault in the converter (surface temperature > 80 °C). You can get seriously burnt when touching the surface.

- Mount the resistors so that contact is not possible. If this is not possible, attach clearly visible and understandable warning notices at hazardous positions.

11.3.8 Replacing the converter in a spare part scenario

11.3.8.1 Overview

Requirement

When replacing, the following applies to the new converter:

- Same converter type as the converter to be replaced
- Same power as the converter to be replaced for the scenario where the memory card of the converter to be replaced is used.

Operation with memory card

If the converter being replaced was operated with a memory card, you have the following options in a spare part scenario:

- If the memory card contains the configuration data and the firmware of the converter, proceed as described in Chapter "Replacing a converter using a memory card with firmware (Page 513)".
- If the memory card only contains the configuration data, proceed as described in Chapter "Replacing a converter using a memory card without firmware (Page 514)".

Operation without memory card

If the converter being replaced was operated without a memory card, you have the following options in a spare part scenario:

- If you have a backup file, proceed as described in Chapter "Replacing a converter using a backup file (no memory card) (Page 516)".
- If there is no backup file, proceed as described in Chapter "Replacing a converter without data backup (no memory card, no backup file) (Page 519)".

Operation with Safety Integrated Functions

If the converter being replaced was operated with Safety Integrated Functions, an acceptance test must be carried out after the replacement. You can find more information in Chapter "Acceptance after a component has been replaced (Page 430)".

11.3.8.2 Replacing a converter using a memory card with firmware

Overview

If you retentively saved the configuration of the converter being replaced after commissioning, all configuration data are stored in the "USER" folder on the memory card.

Requirement

- The converter being replaced was operated with a memory card.
- The memory card contains the firmware files and the configuration data of the converter being replaced.
- The rated power of the replacement device is the same as the rated power of the converter being replaced.
- The replacement device is unused or has been reset to the factory setting.

Procedure

1. Switch off the converter supply voltage.
2. Remove the memory card from the converter.
3. Check that all parts of the device are in a no-voltage condition.
4. Release all of the connections at the converter, replace the converter and re-establish the connections.
5. Insert the memory card into the new converter.
6. Switch on the converter supply voltage.
   If the firmware version in the replacement device differs from the firmware version in the converter being replaced, the converter performs a firmware update. In this case, after the update, switch the supply voltage for the converter off and on again.

More information

There is more information about installation in the following chapters:

- "Installing the converter (Page 113)"
- "Connecting the converter (Page 126)"

11.3.8.3 Replacing a converter using a memory card without firmware

Overview

If you retentively saved the configuration of the converter being replaced after commissioning, all configuration data are stored in the "USER" folder on the memory card.

The procedure is described below using the web server as an example. If you use Startdrive, note that the procedure in Startdrive differs.

Requirement

- The converter being replaced was operated with a memory card.
- The memory card contains the configuration data of the converter being replaced.

- The rated power of the replacement device is the same as the rated power of the converter being replaced.
- The replacement device is unused or has been reset to the factory setting.

Procedure

1. Switch off the converter supply voltage.
2. Remove the memory card from the converter.
3. Check that all parts of the device are in a no-voltage condition.
4. Release all of the connections at the converter, replace the converter and re-establish the connections.
5. Switch on the converter supply voltage.
6. Connect your operating unit to the converter via the service interface X127.
7. Enter the IP address of the converter, e.g. https://169.254.11.22, in the browser.
   When the web server is called for the first time, the function view appears with the basic settings.
8. Make the following basic settings:
   – Preferred language of the user interface
   – Converter date and time; either manually or via NTP
9. Click on the "Next" button.
   You are taken to the Security Wizard.
10. Select the option "Exit the Security Wizard and continue with low security settings".
    User management and access control (UMAC) is not activated.
    You can configure the security settings at a later time, see Chapter "Protection & Security (Page 198)".
11. Check the installed firmware version on the home page of the web server.
    – If the firmware in the replacement device < the firmware in the replaced converter, proceed as described in the next step.

    Note

    Loss of configuration data

    If you skip the next step, the converter will be reset to factory settings at the next ramp-up. The configuration data will be lost.

    – If the firmware in the replacement device ≥ the firmware in the replaced converter, continue with step 13.
12. Perform a firmware update to a firmware ≥ the firmware in the replaced converter.
    You can find more information on updating the firmware using the web server in Chapter "Firmware update (Page 201)".
13. Switch off the converter supply voltage.
14. Insert the memory card into the converter.

15. Switch on the converter supply voltage.
    – The converter imports the settings from the memory card during ramp-up.
    – Following ramp-up, commissioning is completed.
16. Log in to the web server via the IP address of the converter, e.g. https://169.254.11.22.
17. Save the settings retentively using the Save button .

More information

- There is more information about installation in the following chapters:
  – "Installing the converter (Page 113)"
  – "Connecting the converter (Page 126)"
- You can find information about all options in the firmware update in Chapter "Converter firmware update (Page 505)".
- Information about available firmware versions can be found on this website (https://support.industry.siemens.com/cs/ww/en/view/109812303).

11.3.8.4 Replacing a converter using a backup file (no memory card)

Overview

If you retentively saved the configuration of the converter being replaced after commissioning, and created a backup file, all configuration data are stored in the backup file.

The procedure is described below using the web server as an example. If you use Startdrive, note that the procedure in Startdrive differs.

Requirement

- The backup file was created in the web server with the function "Save drive data to backup file".
- The backup file is in the file directory of your operating unit.
- The rated power of the replacement device is the same as the rated power of the converter being replaced.
- The replacement device is unused or has been reset to the factory setting.

Procedure

1. Switch off the converter supply voltage.
2. Check that all parts of the device are in a no-voltage condition.
3. Release all of the connections at the converter, replace the converter and re-establish the connections.
4. Switch on the converter supply voltage.

5. Connect your operating unit to the converter via the service interface X127.
6. Enter the IP address of the converter, e.g. https://169.254.11.22, in the browser.
   When the web server is called for the first time, the function view appears with the basic settings.
7. Make the following basic settings:
   – Preferred language of the user interface
   – Converter date and time; either manually or via NTP
8. Click on the "Next" button.
   You are taken to the Security Wizard.
9. Select the option "Exit the Security Wizard and continue with low security settings".
   User management and access control (UMAC) is not activated.
   You can configure the security settings at a later time, see Chapter "Protection & Security (Page 198)".
10. Check the installed firmware version on the home page of the web server.
    – If the firmware in the replacement device < the firmware in the replaced converter, proceed as described in the next step.

    Note

    Loss of configuration data

    If you skip the next step, the converter will be reset to factory settings at the next ramp-up. The configuration data will be lost.

    – If the firmware in the replacement device ≥ the firmware in the replaced converter, continue with step 12.
11. Perform a firmware update to a firmware ≥ the firmware in the replaced converter.
    You can find more information on updating the firmware using the web server in Chapter "Firmware update (Page 201)".
12. Call the function view "Backup and restore".
13. In the area "Restore drive data from backup file", click on the "Click to select file, or drag and drop file here" button.
    A dialog window opens.
14. In your file directory, select the backup file.
15. Click "Restore".
    – The backup file is checked and loading begins.
    – To load the settings to the converter, a ramp-up (reset) is initiated.
      When the process has been completed successfully, a corresponding message is displayed.
    – The current settings are displayed after the ramp-up (reset).
16. If the UMAC settings are changed through loading of the backup file, you may be logged out of the web server. Now log back in to the web server.
17. Save the settings retentively using the Save button.

More information

- Information about installation can be found in the following chapters:
  - "Installing the converter (Page 113)"
  - "Connecting the converter (Page 126)"
- You can find information about all options in the firmware update in Chapter "Converter firmware update (Page 505)".
- Information about available firmware versions can be found on this website (https://support.industry.siemens.com/cs/ww/en/view/109812303).

11.3.8.5 Replacing a converter without data backup (no memory card, no backup file)

Requirement

The replacement device is unused or has been reset to the factory setting.

Procedure

1. Switch off the supply voltage to the converter.
2. Check that all parts of the device are in a no-voltage condition.
3. Release all of the connections at the converter, replace the converter and re-establish the connections.
4. Switch on the supply voltage to the converter.
5. Carry out a complete commissioning procedure with a commissioning tool.

More information

- Information about installation can be found in the following chapters:
  - "Installing the converter (Page 113)"
  - "Connecting the converter (Page 126)"
- Information about performing commissioning can be found in the following chapters:
  - "Commissioning (web server) (Page 155)"
  - "Commissioning (Startdrive) (Page 207)"

Technical specifications 12

12.1 Line connection conditions for the S210 converter system with the motors 1FK2/1FT2

Description

The drive system is designed for connection to grounded TN/TT and non-grounded IT line systems.

Depending on the motor/converter combination and the planned installation altitude, the following constraints must be taken into account regarding the line connection.

Table 12-1 For devices with Article No. 6SL5310-1BB10-.CF0 and 6SL5310-1BE1.-.DF0

Motor	Converter	Converter input voltage	Permissible line system configurations for installation altitude 0 ... 2000 m	Permissible line system configurations for installation altitude 2001 ... 4000 m
All 1F☐2 motors	1 AC	1 AC 200 ... 240 V ±10%	• TN and TT line systems with grounding at any potential • IT line systems [1]	Install an upstream isolation transformer and ground the secondary side at any location.
	3 AC	3 AC 200 ... 240 V ±10%	• TN and TT line systems with grounded neutral point or line conductor • IT line systems Install an upstream isolation transformer and ground the secondary side at the neutral point	• TN and TT line systems with grounded neutral point • IT line systems Install an upstream isolation transformer and ground the secondary side at the neutral point
All 1F☐2 motors with the exception of 1F☐2☐☐☐-☐☐**G**...	3 AC	3 AC 380 ... 480 V ±10%	• TN and TT line systems with grounded neutral point • IT line systems Install an upstream isolation transformer and ground the secondary side at the neutral point	Install an upstream isolation transformer and ground the secondary side at the neutral point

[1] With grounding screw removed

More information on the grounding screw is provided in Chapter "Converters with 1 AC line connection (Page 67)".

Table 12-2 For devices with Article No. 6SL5310-1BE1.-.DF1

Motor	Converter	Converter input voltage	Permissible line system configurations for installation altitude 0 ... 2000 m	Permissible line system configurations for installation altitude 2001 ... 4000 m
All 1F☐2 motors	3 AC	3 AC 200 ... 240 V ±10%	• TN and TT line systems with grounded neutral point or line conductor • IT line systems [1]	Install an upstream isolation transformer and ground the secondary side at the neutral point
All 1F☐2 motors with the exception of 1F☐2☐☐☐-☐☐**G**...	3 AC	3 AC 380 ... 480 V ±10%	• TN and TT line systems with grounded neutral point • IT line systems [1]	Install an upstream isolation transformer and ground the secondary side at the neutral point

[1] With grounding screw removed

More information on the grounding screw is provided in Chapter "Converter with 3 AC line connection, 6SL5310-1BE1.-.DF1 (Page 68)".

NOTICE

Damage to motor insulation due to excessive voltages

In the event of a ground fault in the IT supply system, the motor insulation can be damaged by the higher voltage to ground.

- Use a ground fault monitor.
- Eliminate the ground fault as quickly as possible.

12.2 Technical data and properties of the motor

12.2.1 Technical features

Property	Version
Type of motor	Permanent-magnet synchronous motor
Rotor inertia	1F☐21 - High Dynamic - motor with low rotor inertia 1F☐22 - Compact - motor with medium rotor inertia
Cooling	Natural cooling, optionally forced ventilation

Property	Version
Stator winding insulation according to EN 60034-1 (IEC 60034-1)	1F☐2☐02, 1F☐2☐03: Temperature class 130 (B) for a winding temperature of ΔT = 80 K at an ambient temperature of +40 °C 1F☐2☐04, 1F☐2☐05, 1F☐2☐06, 1F☐2☐08, 1F☐2☐10: Temperature class 155 (F) for a winding overtemperature of ΔT = 100 K at an ambient temperature of +40 °C
Impulse voltage-insulation class according to EN 60034-18-41(IEC 60034-18-41)	IVIC: C
Operating range	-15 to +40 °C, derating at higher temperatures
Installation altitude (acc. to EN 60034-1 and IEC 60034-1)	≤ 1000 m above sea level, otherwise power derating
Type of construction acc. to EN 60034-7 (IEC 60034-7)	IM B5 (IM V1, IM V3)
Degree of protection according to EN 60034-5 (IEC 60034-5)	IP64, optionally IP65 or IP67 (IP67 only for 1FT2), optional fan IP66
Temperature monitoring	Thermal motor model
Paint finish	Anthracite (RAL 7016)
Shaft extension according to DIN 748-3 (IEC 60072-1)	Plain shaft, optionally with feather key and half-key balancing,
Radial eccentricity, concentricity and axial eccentricity acc. to DIN 42955 (IEC 60072-1) [1)]	Tolerance N (normal)
Vibration severity grade according to EN 60034-14 (IEC 60034-14)	Grade A is maintained up to rated speed
Sound pressure level L_{pA} (1 m) according to DIN EN ISO 1680, max. tolerance + 3 dB(A)	1F☐2102, 1F☐2☐03, 1F☐2☐04: 55 dB(A) 1F☐2☐05, 1F☐2☐06: 65dB(A) 1F☐2☐08, 1F☐2210: 70dB(A) 1F☐2☐08, force-ventilated: 73dB(A)
Encoder systems, built-in with DRIVE-CLiQ interface	• AS22DQC, absolute encoder single-turn, 22 bit (identification letter: S) • AM22DQC, absolute encoder, 22 bit + 12 bit multiturn (identification letter: M) • AS26DQC, absolute encoder single-turn 26 bit (identification letter: B) (only for 1FT2) • AM26DQC, absolute encoder 26 bit + 12 bit multiturn (identification letter: C) (only for 1FT2)
Connection	One cable system (OCC), rotatable
Holding brake	Optional integrated holding brake

1) Shaft extension run-out, concentricity of centering edge, and perpendicularity of the mounting flange to the axis of the shaft extension.

12.2.2 Permissible environmental conditions for the motor

Environmental conditions for transport in the transport packaging according to Class 2K3 to DIN EN IEC 60721-3-2, except for the "air temperature" and "condensation" environmental factors	
Climatic environmental conditions	-15 °C ... +70 °C
Highest relative humidity	< 95% at 40 °C, condensation not permissible
Mechanical environmental conditions	Shock and vibration permissible according to 3M8 to EN 60721-3-3:1995-09 (historical): Single shocks (6 ms) max. 250 m/s^2
Protection against chemical substances	Protected according to Class 2C2
Biological environmental conditions	Suitable according to Class 2B2

Environmental conditions for long-term storage in the product packaging according to Class 1K3 to DIN EN IEC 60721-3-1, except for environmental variables "air temperature", "highest relative humidity" and "condensation"	
Climatic environmental conditions	-15 °C ... +55 °C
Highest relative humidity	< 60%, condensation not permissible
Mechanical environmental conditions	Vibration-free storage space, v_{rms} < 0.2 mm/s
Protection against chemical substances	Protected according to Class 1C2
Biological environmental conditions	Suitable according to Class 1B2
Duration	• Six months for the above-mentioned conditions. • Special preservation measures are required for storage periods of 6 months up to a maximum of two years. For more information, please contact your local sales partner.

Environmental conditions during operation according to 3K4 to DIN EN 60721-3-3:1995-09 (historical), except for environmental variables "low air temperature", "condensation" and "low air pressure"	
Installation altitude	Up to 1000 m above sea level without limitations You can find more information in Chapter "Derating factors (Page 529)".
Climatic environmental conditions[1)]	• Temperature range: -15 °C[1)] ... +40 °C • Recommended relative humidity: 5 ... 95%, condensation not permitted • Permissible relative humidity from 0.25% at 20 °C, dew point: - 50 °C • Absolute air humidity: 1 ... 29 g/m^3 • Rate of temperature change[2)]: 0.5°/min • Atmospheric pressure: 89[1), 3)] ... 106 kPa[4)] • Solar radiation: 700 W/m^2 [2)] • Movement of the air: 1.0 m/s • Water (other than rain): See protection class
Mechanical environmental conditions	• Vibration levels permissible according to Class 3M8 to EN 60721-3-3: 1995-09 (historical): Max. 50 m/s^2

Environmental conditions during operation according to 3K4 to DIN EN 60721-3-3:1995-09 (historical), except for environmental variables "low air temperature", "condensation" and "low air pressure"	
Protection against chemical substances	protected according to 3C2 to DIN EN 60721-3-3: 1995-09 (historical)
Biological environmental conditions	suitable according to 3B2 to DIN EN 60721-3-3:1995-09 (historical)
Pollution	Suitable for environments with degree of pollution 2 acc. to IEC 61800-5-1
Cooling air	Clean and dry air
The motors are not suitable for operation: • In a vacuum[5)] • In salt-laden or aggressive atmospheres • Outdoors	

1) Increased ruggedness with regard to low air temperature and low atmospheric pressure better than 3K3 according to DIN EN 60721-3-3 1995-09 (historical)

2) Averaged over a period of 5 min

3) The limit value of 89 kPa covers applications at altitudes up to 1000 m.

4) Conditions in mines are not considered.

5) Operation in a vacuum is not permissible because of the low dielectric strength and poor heat dissipation.

12.2.3 Protection against electromagnetic fields (motor)

Active implant malfunctions due to electromagnetic fields

WARNING

Malfunction of active implants due to magnetic and electrical fields

Electric motors pose a danger to people with active medical implants, e.g. heart pacemakers, who come close to these motors.

- If you are affected, stay a minimum distance of 30 cm away from the motors (tripping threshold for static magnetic fields of 0.5 mT according to Directive 2013/35/EU).

12.2.4 Cooling

Overview

The motors are available in naturally cooled and force-ventilated versions.

Naturally cooled motors	Force-ventilated motors
Frame sizes 20 ... 100	Frame size 80
The motors are designed for operation without external ventilation and the heat is dissipated through the motor surface.	The motors are cooled using a mounted 24 V DC fan. The air flows from NDE to DE

Naturally cooled motors

On naturally cooled motors, the thermal losses are dissipated by thermal conduction, radiation, and natural convection.

Some of the thermal losses are dissipated through the mounting surface of the motor. On large motors, heat is dissipated via the base frame (steel plate).

Note the specifications on thermally non-insulated mounting and on thermally insulated mounting.

Note

To ensure enough heat is dissipated, a minimum clearance to adjacent components of 100 mm must be kept free on three side surfaces.

- Maintain the minimum clearances, independent of the thermal mounting variants.

The motor ratings apply in an ambient temperature of 40 °C (104 °F). If the ambient temperature exceeds 40 °C (104 °F), you must adjust the torque and power of the motor accordingly.

- Adjust the torque or the power of the motor at the converter based on the table in Chapter "Derating factors (Page 529)."
  Follow the Operating Instructions of the converter.

Motors with forced ventilation

The motor is cooled by a separately driven fan mounted on motor.

This fan has IP66 degree of protection.

WARNING

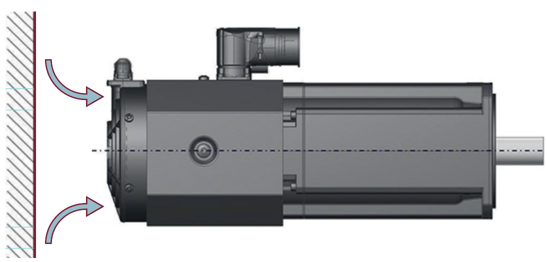
Danger of explosion when operated in hazardous zones

Operating the fan in an environment with inflammable, chemically corrosive, electrically conductive, or potentially explosive dust or gases can cause explosions and result in death or serious injury.

- Operate the motor with forced ventilation only in an environment that is free of inflammable, chemically corrosive, electrically conductive, or potentially explosive dust or gases.

Operate the fan only with normal ambient air.

Direction of the fan air flow



(NDE → DE output)

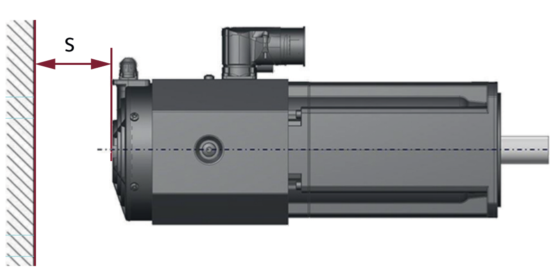
Notes for operating the motor with forced ventilation

Note

Ensure that the motor is only operated when the separately driven fan is running.

- Position the motor so that the cooling air can freely flow in and out.
- Make sure that no heated discharged air is drawn in.
- Maintain the minimum clearance between the air intake and discharge openings and adjacent components (see the "Minimum clearance" figure).

Minimum clearance to adjacent components or surfaces



s The minimum clearance is 30 mm

Non-thermally insulated mounting

Some of the motor power loss is dissipated through the flange when the motor is connected to the mounting surface.

- Observe the following mounting conditions for the specified motor data:

Shaft height	Steel plate, width x height x thickness (in mm)
1F□2□02	200 x 200 x 6
1F□2□03	250 x 250 x 6
1F□2□04	
1F□2□05	300 x 300 x 12
1F□2□06	450 x 370 x 30
1F□2□08	
1F□2□10	

The data in the table refers to an ambient temperature of 40 °C and an installation altitude up to 1000 m above sea level.

If the environmental conditions are different, derating may be required. You can find information on this in the chapter "Derating factors (Page 529)".

For larger mounting surfaces, the heat dissipation conditions improve.

Thermally insulated mounting without additional mounted components

The following description applies only to motors with frame sizes 1F□2□02 ... 1F□2□04.

For naturally cooled motors, you must reduce the S1/characteristic as follows:

- Reduce the motor static torque by 20 % to 30 %.
- Reduce the torque at 3000 r/min by 40 % to 50 %.

Thermal motor protection

The converter monitors the motor temperature based on a thermal motor model and issues the alarm "Motor overtemperature" before the maximum temperature is reached. If the motor exceeds the maximum temperature, the converter switches off the motor with the fault message "Motor overtemperature".

If the ambient temperature exceeds 40 °C, you need to set the ambient temperature at the converter so that the motor is reliably protected.

- To do this, select parameter p0613 at the converter.
- Set the maximum ambient temperature that occurs.

Parameter r0034 indicates the thermal load of the motor as a percentage. The reading is influenced by the ambient temperature selected in parameter p0613.

You can find additional information in the parameter lists "Parameters (Page 821)".

12.2.5 Derating factors

Description

Due to the decreasing air pressure in higher installation altitudes, the cooling of the motor deteriorates. Therefore, reduce the power of the motor as the installation altitude increases.

Multiply the permissible torques or powers by the factors from the following table.

Reduce the torques and powers according to the values determined.

Factors for power derating depending on the installation altitude and the ambient temperature

Table 12-3 Factors for power derating depending on the installation altitude and the ambient temperature

Installation altitude above sea level in m	Ambient temperature in °C				
	30	40	45	50	55
1000	1.05	1	0.95	0.89	0.84
2000	1	0.95	0.86	0.8	0.73
3000	0.95	0.89	0.76	0.69	0.62
4000	0.89	0.84	0.65	0.57	0.47

Calculate the derating factor for ambient temperatures that are not shown here and installation altitudes below the maximum values by interpolating. For example: 40 °C at 1500 m above sea level = derating factor 0.965.

Calculating the reduced characteristic curve

$M_{S1\ red}\ (n) = x_d \bullet M_{S1}\ (n\ /\ x_d)$

$M_{S1\ red}$	Reduced motor torque for S1 operation at the required installation altitude and ambient temperature
M_{S1}	Motor torque for S1 operation at an ambient temperature of 40 °C and 1000 m above sea level (see Chapter "Technical specifications and characteristics")
n	Motor speed
x_d	Derating factor from the table "Factors for reducing the power..." above

Graphic representation of the derating factors

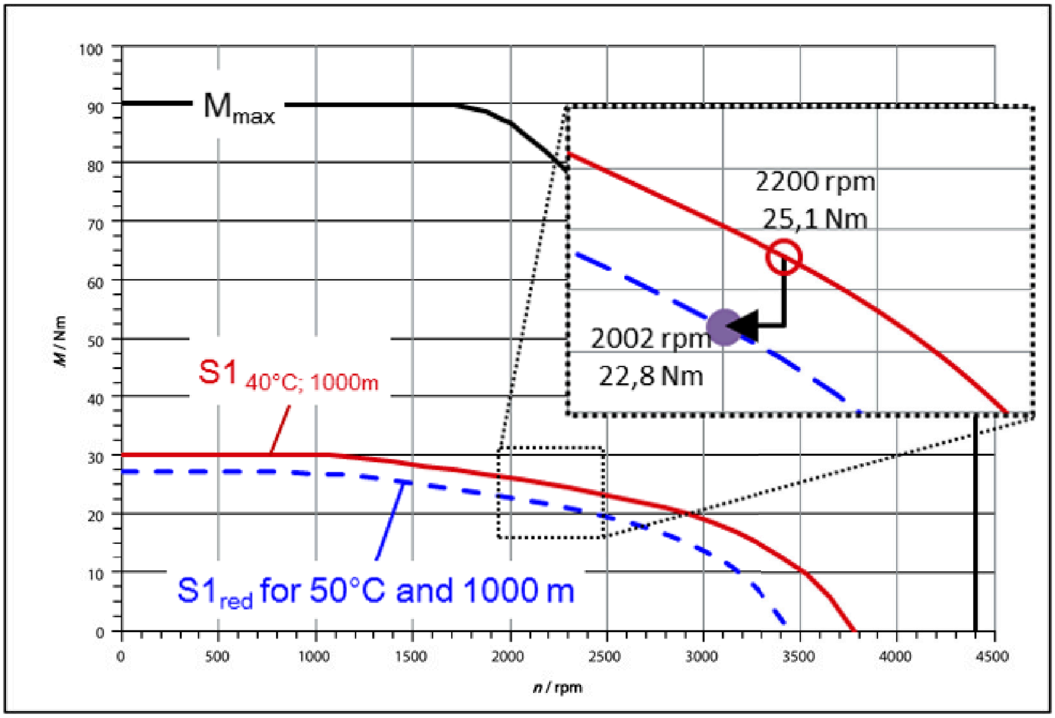


Figure 12-1 Example of a derating factor

Factors for reducing the DC link voltage depending on the installation altitude

The voltage strength of the motor insulation is reduced for installation altitudes exceeding 2000 m above sea level. Check whether it is necessary to limit the DC link voltage.

Reduce the permissible DC link voltage with increasing installation altitude due to the decreasing air pressure.

Table 12-4 Limit values for the DC link voltage for motors of the 1FK2/1FS2/1FT2 series at installation altitudes below 2000 m mean sea level

Motors with the following rated speed in the article number (part number) 1F□2□□□-□□X□□..., X =	Max. permissible converter DC link voltage in V
G	375
B, C, E, F, H, K	720

Table 12-5 Typical DC link voltage of the SINAMICS converters

Network	Infeed	DC link voltage in V
1 AC 230 V	Non-regulated	248
3 AC 240 V	Non-regulated	307

Network	Infeed	DC link voltage in V
3 AC 400 V	Non-regulated	528
3 AC 480 V	Non-regulated	634

As the DC link voltage is reduced, the converter output voltage also decreases. This reduces the operating range in the M-n diagram.

The M-n diagrams are provided in the following chapters:

- "Technical data and characteristics of the 1FK2 connected to 230 V 1AC, 240 V 3AC, naturally cooled (Page 558)"
- "Technical data and characteristics of the 1FK2 connected to 3 AC 400 V, 3 AC 480 V, naturally cooled (Page 592)"
- "Technical data and characteristics of the 1FT2 connected to 1 AC 230 V, 3 AC 240 V, naturally cooled (Page 620)"
- "Technical data and characteristics of the 1FT2 connected to 400 V 3AC, 480 V 3AC, naturally cooled (Page 684)"

12.2.6 Degree of protection

Description

The degree of protection of a motor is marked, for example, using "IP64".

The motor degree of protection is classified according to EN 60034-5 (IEC 60034-5).

The combination of "IP" + 2 numbers means the following:

IP = International Protection
1st Number = Protection against the ingress of foreign bodies
2. Number = Protection against the ingress of water

DIN 60034-5 is valid for water as potentially occurring medium, not for oil or other creeping fluids.

Configure the motor in the required degree of protection.

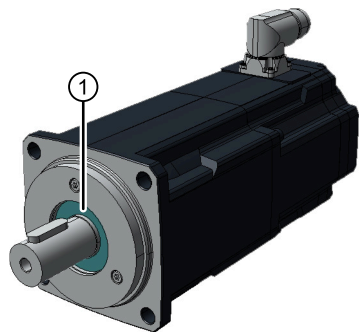
Degrees of protection available for the 1FK2 and the 1FT2

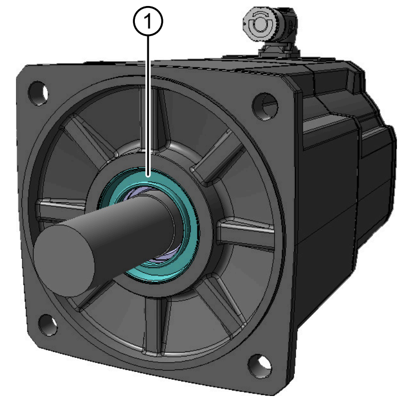
Degree of protection	1FK2	1FT2
IP64	x	x
IP65	x	x
IP67		x *)

*) Not applicable for 1F☐2☐02 and fans for force-ventilated motors

The degree of protection is specified on the rating plate.

Motors with degree of protection IP65 and IP67 have a radial shaft sealing ring.





1F☐2☐02 ... 1F☐2☐04 1F☐2☐05 ... 1F☐2☐10

① radial shaft seal ring

For 1F☐2☐02, 1F☐2☐03 and 1F☐2☐04, the radial shaft sealing ring shortens the length of shaft end that can be used.

Note

It is permissible that the radial shaft sealing ring runs dry.

With degrees of protection IP65 and IP67, it is not permissible for liquid to collect on the flange.

The service life of the radial shaft sealing ring is approximately 25000 operating hours.

You can find more information in Chapter "Shaft extension (Page 534)".

12.2.7 Balancing

Description

The motor rotor is balanced according to EN 60034-14.

Motors with featherkey in the shaft are half-key balanced.

- A mass equalization for the protruding half key must be taken into account for the output elements.

12.2.8 Vibration response

Vibration severity grade

Motors with keyway are balanced by the manufacturer using a half-key.

The vibration response of the system at the location of use is influenced by output elements, any built-on parts, the alignment, the installation, and external vibrations. This can change the vibration values of the motor.

The motors conform to vibration severity grade A according to EN 60034-14 (IEC 60034-14).

The specified values refer only to the motor. The installation-dependent system vibration behavior can increase these values at the motor.

The vibration severity grade is maintained up to the rated speed (n_N)

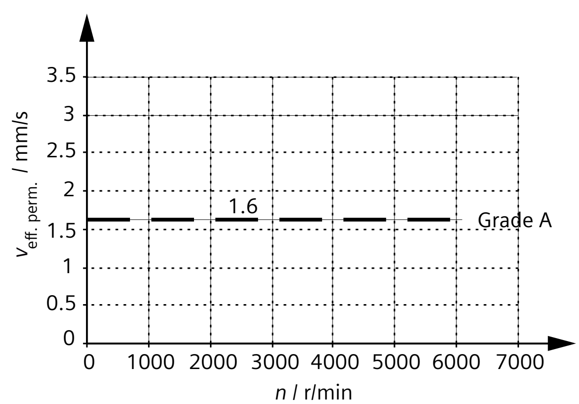


Figure 12-2 Vibration severity levels

Permissible vibration in operation

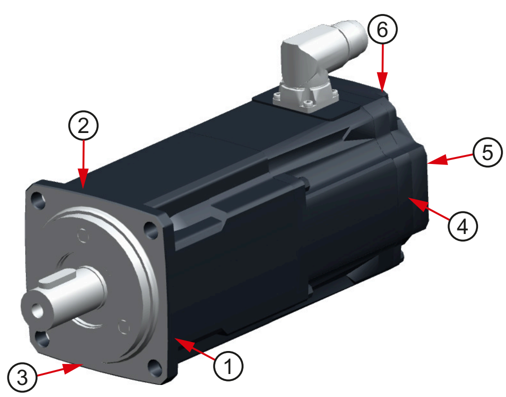
In order to guarantee the proper function of the motor and not to impair the lifetime of the bearing, the following vibration values must be observed during operation.

• Vibration velocity V_{rms} after	Max. 4.5 mm/s
• ISO 10816-1:1997-08 (historical)	
• Vibration acceleration a_{peak} axial	50 m/s² for naturally cooled motors
	25 m/s² for force-ventilated motors
• Vibration acceleration a_{peak} radial	50 m/s² for naturally cooled motors
	25 m/s² for force-ventilated motors

To evaluate the vibration velocity, the measuring equipment must comply with the requirements of ISO 2954.

The vibration acceleration is evaluated in the frequency range of 10 Hz ... 2000 Hz.
The maximum peak in the measurement time range is considered.

Select the measuring points according to ISO 10816-1:1997-08 (historical), Section 3.2. The vibration values must not exceed the specified limits at any measuring point.



① End shield DE radial
② End shield DE radial
③ End shield DE axial
④ End shield NDE radial
⑤ End shield NDE axial
⑥ End shield NDE radial

Measuring points for vibration values

12.2.9 Shaft extension

The motors are supplied with cylindrical shaft extensions. The shaft end usually has a centering thread according to DIN 332, form DR.

Optionally, a shaft extension with keyway and fitted key is available.

With motors 1F☐2☐02 ... 1F☐2☐04, the usable shaft end is reduced by the radial shaft sealing ring with IP65 degree of protection.

Dimensions of shaft ends

Motor	Shaft extension with IP64 Diameter x length in mm	Shaft end with IP65 or IP67 Diameter x length in mm	Feather key Width x height x length in mm	Centering thread
1F☐2☐02	8 (h6) × 25	8 (h6) × 18	2 × 2 × 10	M3
1F☐2☐03	14 (h6) × 30	14 (h6) × 21.5	5 × 5 × 16	M5
	11 (k6) × 23 [1)]	-	-	M4
1F☐2☐04	19 (k6) × 40	19 (k6) × 32	6 × 6 × 22	M6
	14 (k6) x 30	14 (k6) x 30	5 × 5 × 16	M5
1F☐2☐05	19 (k6) × 40		6 × 6 × 32	M6
1F☐2☐06	24 (k6) × 50		8 × 7 × 40	M8
1F☐2☐08	32 (k6) × 58		10 × 8 × 45	M12
	24 (k6) × 50		8 × 7 × 40	M8
1F☐2☐10	38 (k6) × 80		10 × 8 × 70	M12
	32 (k6) × 58		10 × 8 × 7	M12

1) The optional 11 mm x 23 mm shaft extension is only available without a keyway and without a shaft sealing ring (IP65).

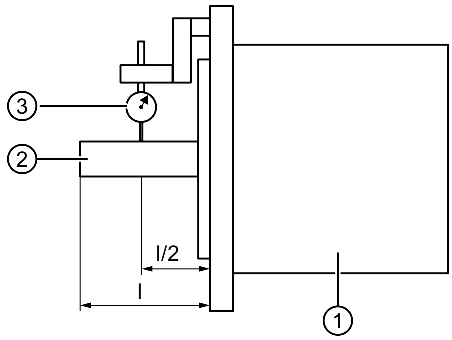
12.2.10 Radial eccentricity, concentricity and axial eccentricity

Description

The shaft and flange accuracies for 1F☐2 motors are implemented according to DIN 42955 (IEC 60072-1) as standard (Normal class).

Radial eccentricity tolerance of the shaft to the frame axis (referred to cylindrical shaft ends)

Motor	Standard (Normal class)
1F☐2☐02	0.03 mm
1F☐2☐03	0.035 mm
1F☐2☐04 1F☐2☐05 1F☐2☐06	0.04 mm
1F☐2☐08 1F☐2☐10	0.05 mm

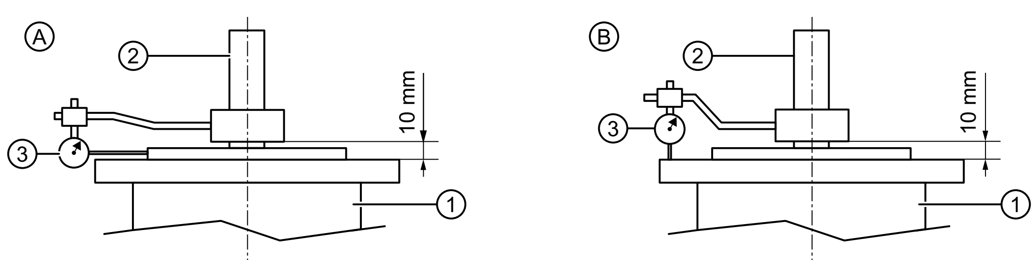


① Motor
② Motor shaft
③ Dial gauge

Figure 12-3 Checking the radial eccentricity (diagram with example)

Concentricity and axial eccentricity tolerance of the flange surface to the shaft axis (referred to the centering diameter of the mounting flange)

Motor	Standard (Normal class)
1F□2□02 1F□2□03 1F□2□04 1F□2□05	0.08 mm
1F□2□06 1F□2□08 1F□2□10	0.1 mm



A Check for concentricity
B Check for axial eccentricity

① Motor
② Motor shaft
③ Dial gauge

Figure 12-4 Checking the concentricity and axial eccentricity (diagram with example)

12.2.11 Axial and radial forces

Permissible axial forces

Type	Axial force, static [1] $F_{A\ stat}$ / N
1F☐2☐02	30
1F☐2☐03	75
1F☐2☐04	100
1F☐2105	120
1F☐2106	200
1F☐2205	120
1F☐2206	200
1F☐2208	300
1F☐2210	450

[1] The specified axial forces are determined by the spring loading and therefore also apply for motors with holding brake.

Note

Applications with an angular toothed pinion directly on the motor shaft are not permitted if the permissible axial forces are exceeded.

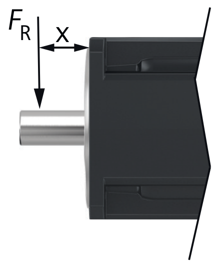
Description

As a result of the bearing arrangement, the 1F☐2 is designed for aligned forces. Forces such as these occur for belt drives, for example.

All radial forces refer to aligned forces.

NOTICE
Motor damage caused by rotating forces
Circulating forces can cause bearing motion, and therefore damage the motor. • Avoid rotating forces.

Point of application of radial forces F_R at the shaft extension



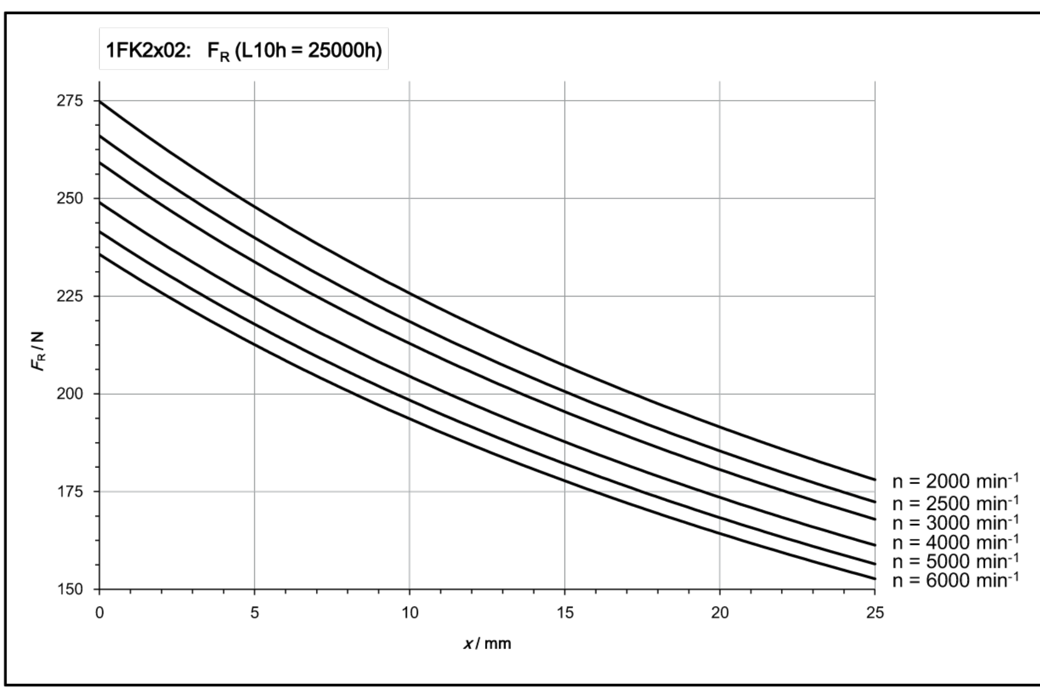
F_R	Point of application of the radial force
x	Distance between where the radial force is applied and the shaft shoulder in mm

The following diagrams indicate the maximum permissible radial force for the corresponding motor frame size. It depends on the force application point and the average speed for a nominal bearing service life (L10h) of 25000 h.

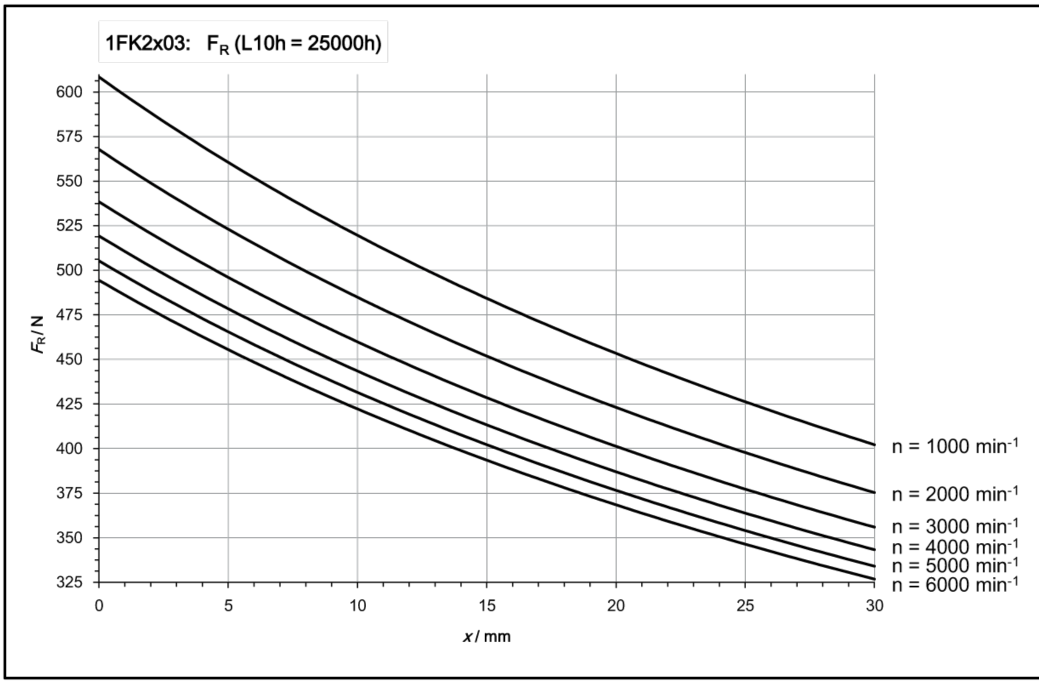
Note

The radial force diagrams of the 1FK2 motors also apply to 1FT2 motors.

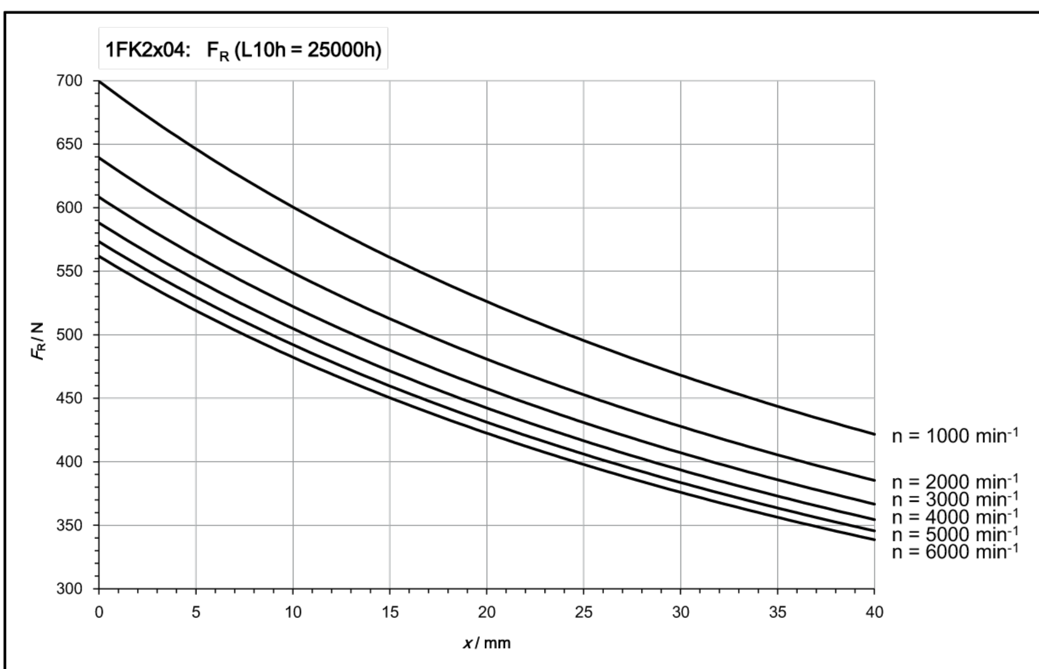
Radial force diagram 1F☐2☐02



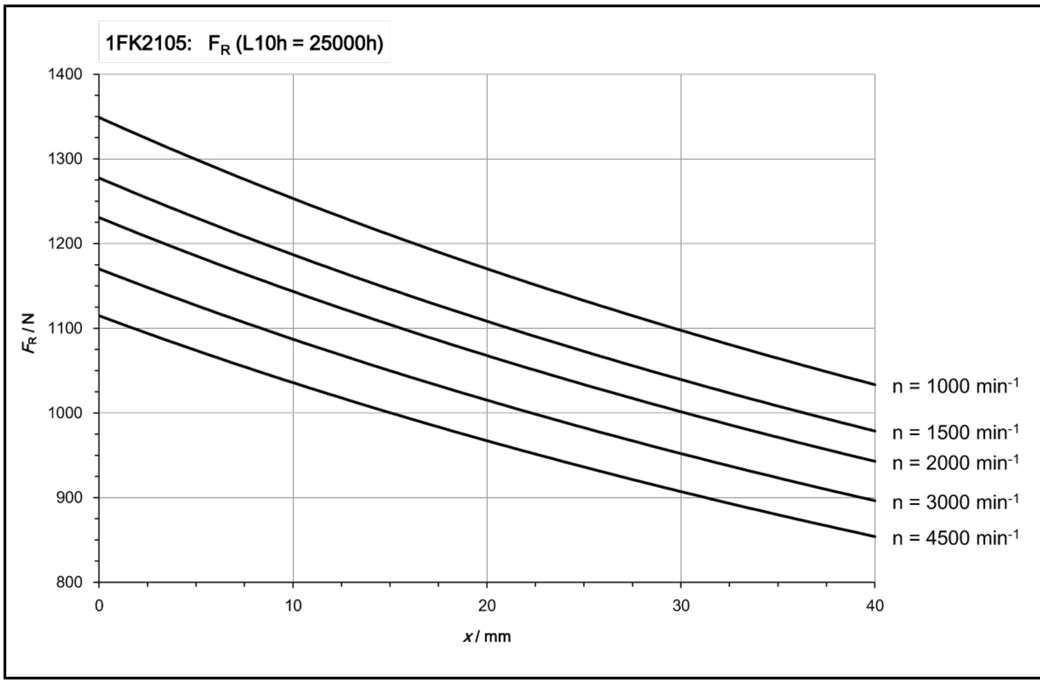
Radial force diagram 1F☐2☐03



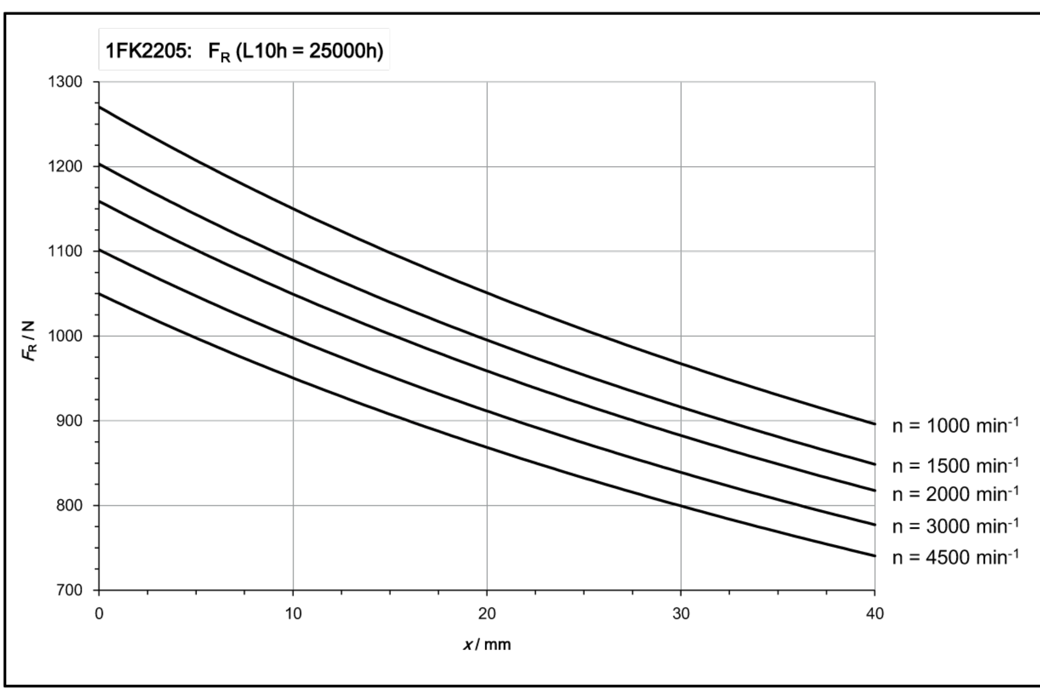
Radial force diagram 1F☐2☐04



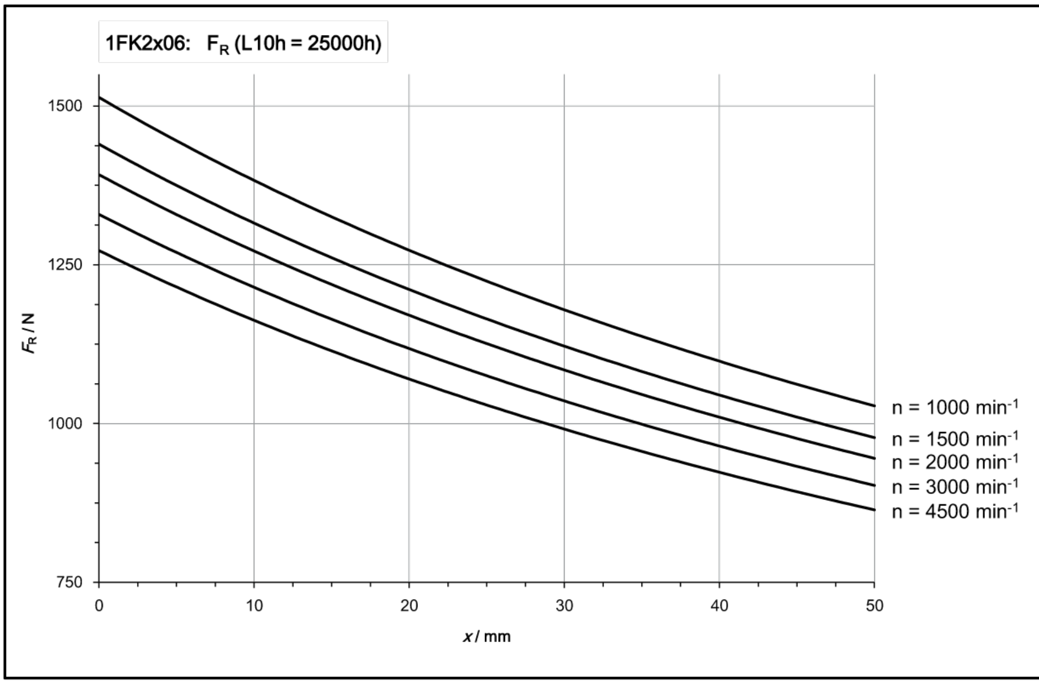
Radial force diagram 1F☐2105



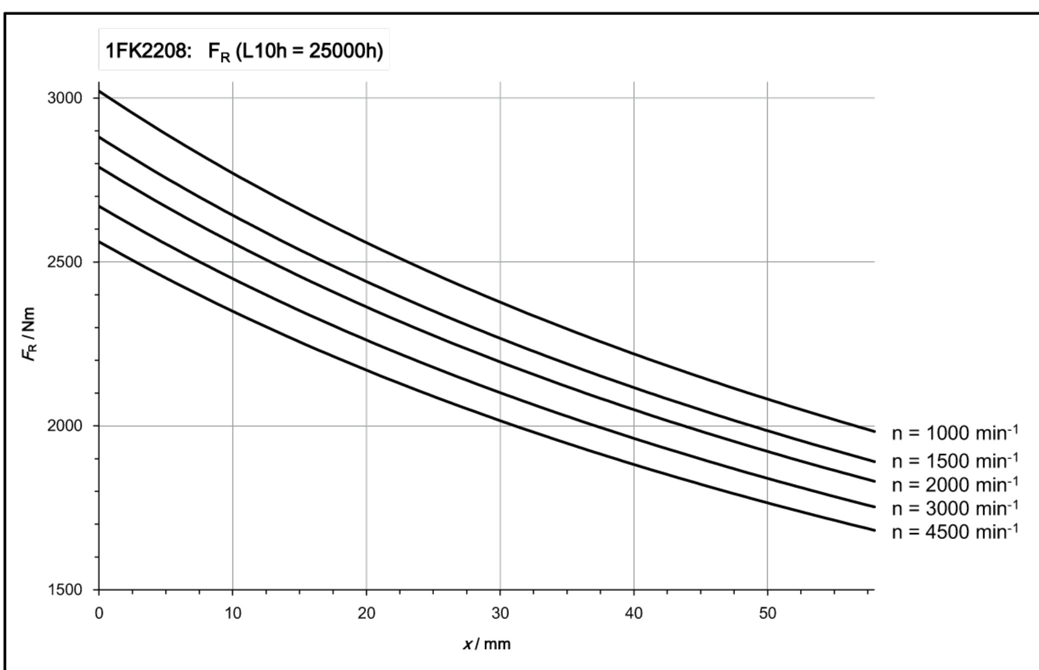
Radial force diagram 1F☐2205



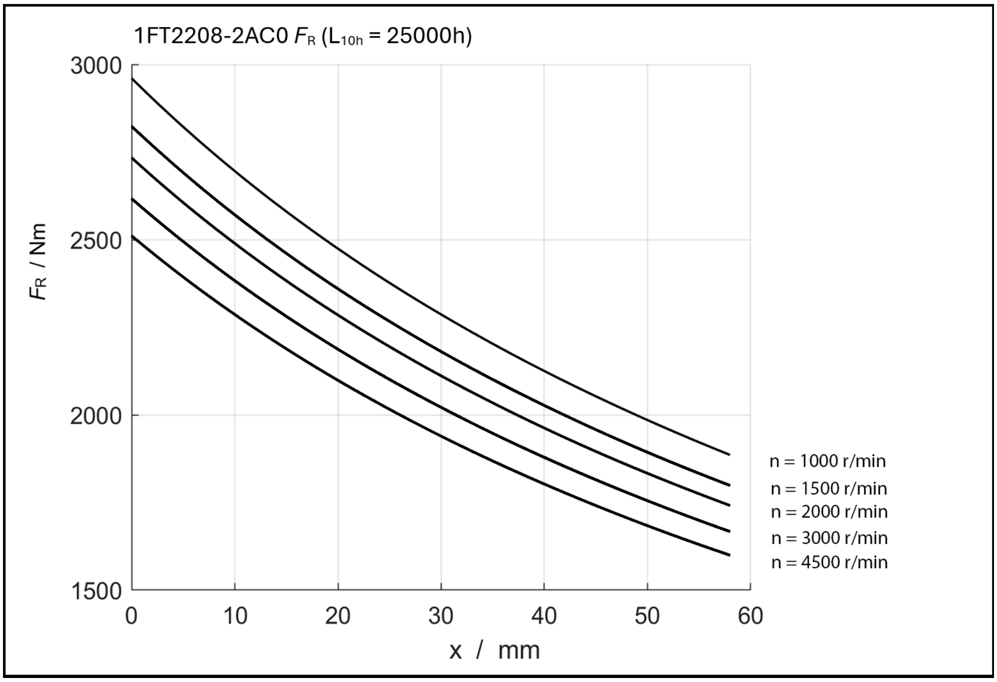
Radial force diagram 1F☐2☐06



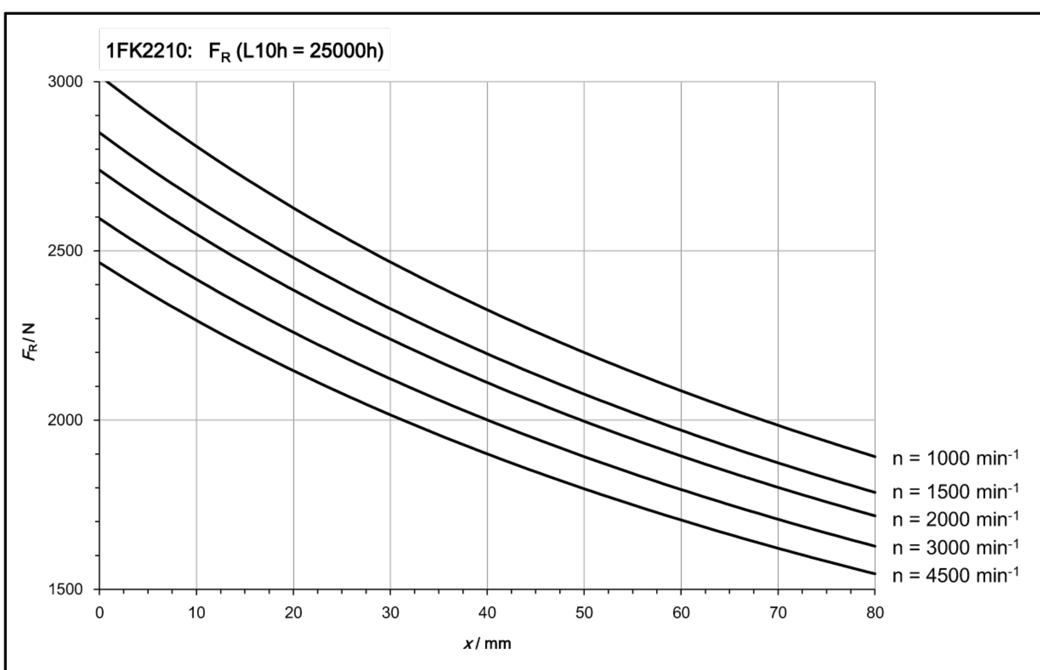
Radial force diagram 1F☐2208



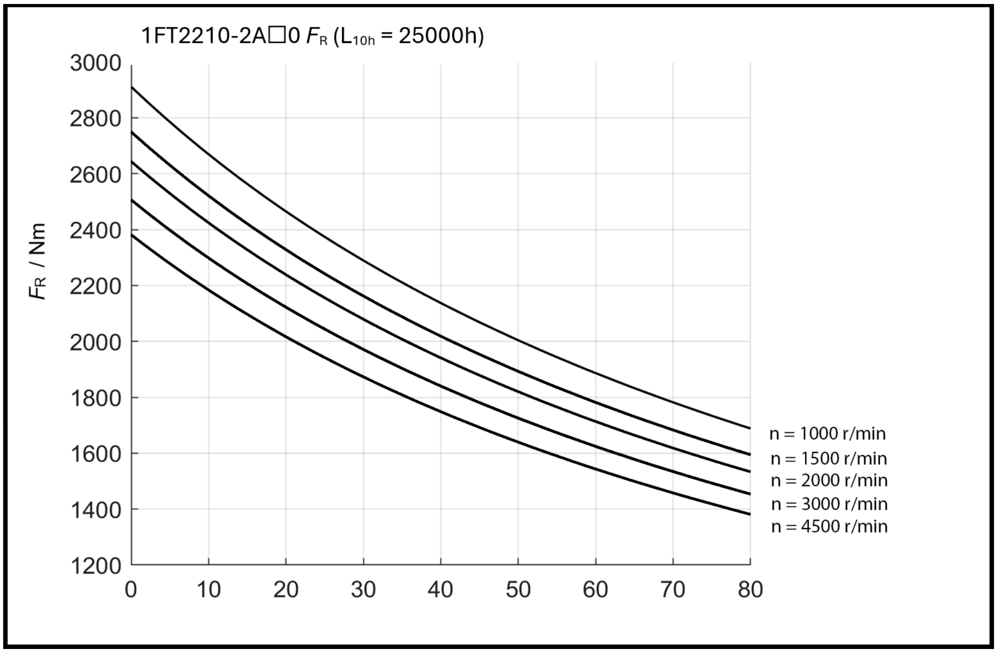
Radial force diagram 1FT2208-2AC0



Radial force diagram 1F☐2210



Radial force diagram 1FT2210-2A☐0



12.2.12 Available encoders

Encoders that can be ordered for the 1FK2

	Absolute encoder single-turn, 22 bit	Absolute encoder, 22 bit +12 bit multiturn
Encoder designation	**AS22DQC**	**AM22DQC**
Identification in the article number	S	M
Resolution	4,194,304 = 22 bit	4,194,304 = 22 bit
Absolute position	Yes, one revolution	Yes, 4096 revolutions (12 bit)
Angle error	± 100"	± 100"

Encoders that can be ordered for the 1FT2

	Absolute encoder, single-turn		Absolute encoder, multiturn	
	22 bit	26 bit	22 bit +12 bit	26 bit +12 bit
Encoder designation	**AS22DQC**	**AS26DQC**	**AM22DQC**	**AM26DQC**
Identification in the article number	S	B	M	C
Resolution	4,194,304 = 22 bit	67,108,864 = 26 bit	4,194,304 = 22 bit	67,108,864 = 26 bit

	Absolute encoder, single-turn		Absolute encoder, multiturn	
	22 bit	**26 bit**	**22 bit +12 bit**	**26 bit +12 bit**
Absolute position	Yes, one revolution		Yes, 4096 revolutions (12 bit)	
Angle error	± 100"	± 40"	± 100"	± 40"

12.2.13 Holding brake data

The holding brake is used to clamp the motor shaft when the motor is at a standstill. The holding brake is not a working brake for braking the rotating motor. When the motor is at a standstill, the holding brake is designed for at least 5 million switching cycles.

Limited EMERGENCY STOP operation is permissible. Take into account the maximum permissible single operating energy as well as service life, total operating energy of the brake.

> **WARNING**
>
> **Unintentional movements through inadequate braking effect**
>
> If you use the holding brake incorrectly, e.g. as an operating brake or you ignore the permissible operating energy of the brake, then the brake will be subject to excessive and impermissible wear. As a consequence, there may be no brake effect. Unintentional movements of the machine or system can result in death or serious injury.
>
> - Observe the permissible number of operating cycles and EMERGENCY STOP properties.
> - Operate the motor only in conjunction with an intact brake.
> - Avoid repeated brief acceleration of the motor against a holding brake that is still closed.

The holding brakes of the 1F☐2 have a torsional backlash of less than 1.5°.

Description

The following table lists technical data regarding the holding brakes for operation with a SINAMICS S210 converter.

<table>
<tr><th rowspan="2">Motor type</th><th>①</th><th>②</th><th>③</th><th>④</th><th>⑤</th><th>⑥ 1)</th><th>⑦</th><th>⑧</th><th colspan="2">⑨</th></tr>
<tr><th>M_4 / Nm</th><th>M_{1m} / Nm</th><th>M_{1max} / Nm</th><th>t_{open_f} / ms</th><th>t_{close_f} / ms</th><th>W_{max} / J</th><th>W_{Tot} / kJ</th><th>I_h / A</th><th>I_{o_n} / A</th><th>t_{oex} / ms</th></tr>
<tr><td colspan="11">For spring-loaded brake</td></tr>
<tr><td>1F☐2☐02</td><td>0.32</td><td>0.32</td><td>1</td><td>25</td><td>20</td><td>7.4</td><td>1.75</td><td>0.1</td><td>0.6</td><td>50</td></tr>
<tr><td>1F☐2☐03</td><td>1.3</td><td>1.3</td><td>3.9</td><td>40</td><td>30</td><td>62</td><td>17.5</td><td>0.15</td><td>0.8</td><td>60</td></tr>
<tr><td>1F☐2☐04</td><td>3.3</td><td>3.3</td><td>9</td><td>50</td><td>40</td><td>270</td><td>120</td><td>0.2</td><td>1.2</td><td>80</td></tr>
<tr><td colspan="11">For permanent-magnet brake</td></tr>
<tr><td>1F☐2☐05</td><td>8</td><td>5</td><td>18</td><td>35</td><td>20</td><td>568</td><td>284</td><td>0.3</td><td rowspan="3">1.1</td><td rowspan="4">120</td></tr>
<tr><td>1F☐2206</td><td>13</td><td>6.5</td><td rowspan="2">35</td><td rowspan="3">70</td><td rowspan="3">35</td><td>1548</td><td rowspan="2">774</td><td rowspan="2">0.35</td></tr>
<tr><td>1F☐2106</td><td>16</td><td>9</td><td>1065</td></tr>
<tr><td>1F☐2☐08-2
1F☐2☐08-3</td><td>19</td><td>12</td><td>37</td><td>2000</td><td>1800</td><td>0.4</td><td>1.2</td></tr>
<tr><td>1FT2108</td><td>36</td><td>15</td><td rowspan="2">70</td><td rowspan="2">120</td><td rowspan="2">40</td><td>1300</td><td rowspan="2">2400</td><td rowspan="2">0.5</td><td rowspan="2">1.4</td><td rowspan="2">180</td></tr>
<tr><td>1F☐2☐08-4
1F☐2☐08-5</td><td>32</td><td>17</td><td>4800</td></tr>
</table>

Motor type	①	②	③	④	⑤	⑥ [1]	⑦	⑧	⑨	
	M_4 / Nm	M_{1m} / Nm	M_{1max} / Nm	t_{open_f} / ms	t_{close_f} / ms	W_{max} / J	W_{Tot} / kJ	I_h / A	I_{o_n} / A	t_{oex} / ms
1F□2□10-2 1F□2□10-3	32	17	70	120	40	6658	2400	0.5	1.4	180
1F□2□10-4 1F□2□10-5	55	26	100	130	65	8700	3800	0.5	1.5	200
Higher performance brake for 1FT22□□-□□□2□-□□□□										
1FT2108 1FT2208-2 1FT2208-3	32	17	70	120	40	4800	2400	0.5	1.4	180
1FT2210-2 1FT2210-3	55	26	100	130	65	8700	3800	0.5	1.5	200

[1] Maximum of three consecutive EMERGENCY STOP procedures. Maximum 25% of all EMERGENCY STOP procedures as high-energy stops with W_{max}.

① Holding torque M_4

The holding torque M_4 is the highest permissible torque for the closed brake in steady-state operation without slip (holding function when motor is at standstill). The data applies for the state at operating temperature (120 °C).

② Dynamic braking torque M_{1m}

The dynamic braking torque M_{1m} is the smallest mean dynamic braking torque that can occur for an EMERGENCY STOP.

③ Maximum dynamic braking torque M_{1max}

The maximum dynamic braking torque M_{1max} is the greatest dynamic braking torque that can occur for an EMERGENCY STOP.

Based on M_{1max}, you can assess whether mounted mechanical elements, e.g. a gearbox, can withstand the maximum possible peak torques occurring on EMERGENCY STOP.

④ Opening time t_0 and ⑤ closing time t_{c1}

The delay times that occur when switching the brake t_o and t_{c1} are saved in the motor and are automatically taken into consideration.
After activation of the holding brake (opening), the speed/velocity setpoint remains at "Zero" during the opening time t_o. The speed/velocity setpoint is only enabled after the opening time t_0 has elapsed.

After OFF1 or OFF3 and activation of the holding brake (closing), the drive still remains in closed-loop control with speed/velocity setpoint "Zero" during closing time t_{c1}. The pulses are only canceled after this.

⑥ Maximum permissible single operating energy W_{max}

The maximum permissible single operating energy of an individual EMERGENCY STOP operation.

After an EMERGENCY STOP with the maximum single operating energy, allow a cooling time of at least 3 minutes before you operate the motor again.

⑦ Total operating energy (service life) W_{total}

The total operating energy is the sum of the single operating energy (operating energy for each EMERGENCY STOP procedure). If you exceed the total operating energy, problem-free functioning of the brake can no longer be guaranteed.

- Refurbish the motor.

⑧ Holding current I_h

The holding current I_h keeps the holding brake open. The holding current I_h continues to load the 24-V power supply of the converter after time t_{oex} until the brake is released.

⑨ Typical opening current I_o for overexcitation time t_{oex}

After activation of the holding brake (opening), the break-induced current I_0 places a load on the 24 V power supply of the converter for the specified overexcitation time t_{oex}. This break-induced current applies to a brake temperature of approx. 20 °C.
At a brake temperature of -15 °C, the break-induced current can increase by up to 30%.

Formula to calculate the operating energy per braking operation

$W_{BR} = (J_{Mot\ Br} + J_{load}) \bullet n_{mot}^2 / 182.4$

W_{Br} / J	Operating energy per braking operation
n_{Mot} / r/min	Speed at which the brake is engaged
$J_{Mot\ Br}$ / kgm²	Rotor moment of inertia of the motor with brake You can find this information in these chapters: • "Technical data and characteristics of the 1FK2 connected to 230 V 1AC, 240 V 3AC, naturally cooled (Page 558)" • "Technical data and characteristics of the 1FK2 connected to 3 AC 400 V, 3 AC 480 V, naturally cooled (Page 592)" • "Technical data and characteristics of the 1FT2 connected to 1 AC 230 V, 3 AC 240 V, naturally cooled (Page 620)" • "Technical data and characteristics of the 1FT2 connected to 400 V 3AC, 480 V 3AC, naturally cooled (Page 684)"
J_{load} / kgm²	Load moment of inertia of the mounting part on the motor with brake (kgm²)
182.4	Constant for calculating the circular frequency and SI units

12.2.14 Options

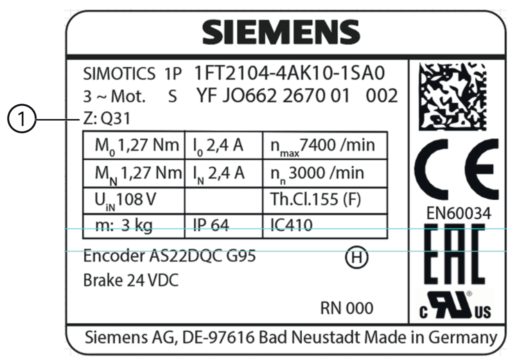
Overview

The following options are available for the 1F☐2.

- Planetary gearbox (order code A☐☐, B☐☐, C☐☐, J☐☐ or H☐☐)
- Paint finish (order code X0☐)

- increased resistance to chemicals (order code N16)
- Pressure equalization (order code Q20)
- Use down to -30 °C (order code Q30)
- Metal rating plate (order code Q31)
- Suitable for dry room conditions and certification for clean rooms (order code Q40)
- Customer data on the rating plate (order code Y84)

The selected options are stamped on the rating plate as order codes.



① Order codes for the selected options

Figure 12-5 1F☐2 rating plate with order codes for the options (example diagram)

12.2.14.1 Option, planetary gearbox (order code Axx, Bxx, Cxx, Hxx or Jxx)

Overview of planetary gearboxes for S-1FK2 and S-1FT2 servomotors

You can optionally order SIMOTICS S-1FK2 or S-1FT2, servomotors, called "1F☐2" in the following, as coaxial or angled planetary geared motors. The geared motors are specified as unit; interaction between the motor and gearbox thermal situations have been taken into account.

Coaxial planetary gearboxes NRB, NRK and NLC, precision gearboxes SP+ and TP+ and right angle planetary gearboxes NRBW, NRKW and NLCW are available.

Right angle planetary gearboxes are planetary gearboxes with an output shaft arranged at an angle with a bevel gear stage.

NRB, NRK, NLC coaxial planetary gearboxes are available for 1FK2 and 1FT2.

SP+ and TP+ precision gearboxes are only available for 1FT2.

The right angle planetary gearboxes are only available for the 1FT2 and are identified with an extra "W".

The following table shows the possible combinations of planetary gearboxes with servomotors.

for 1FK2 and FT2	only for 1FT2	
Coaxial planetary gearbox	Angled planetary gearbox	Precision gearbox

NRB	NRBW	SP+
NRK	NRKW	TP+
NLC	NLCW	

1F☐2 geared motors are specified and delivered as complete units. All outstanding performance data are matched to the motor-gearbox combination.

The illustrations show the planetary gearboxes mounted on the S-1FT2 servomotor:

Table 12-6 Coaxial planetary gearbox series

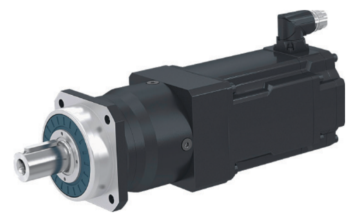
	NRB	NRK	NLC
			
Coaxial precision gear-box only for 1FT2	**SP+**		**TP+**
			

Table 12-7 Right angle planetary gearbox series

NRBW	NRKW	NLCW
		

Motor versions

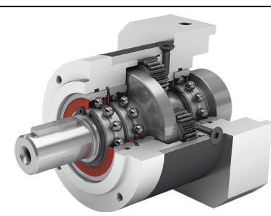
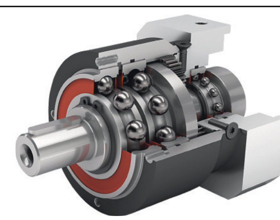
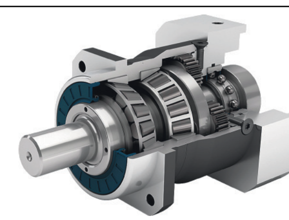
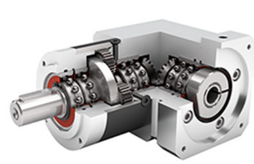
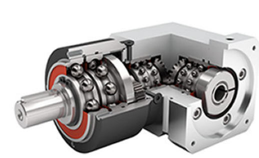
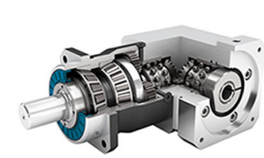
Two motor versions are available for 1F□2 geared motors.

	High-Dynamic motors	Compact motors
Series	**1FK21□□-□** **1FT21□□-□**	**1FK22□□-□** **1FT22□□-□**
Dimensioning	• Low intrinsic moment of inertia • For applications in which small masses are moved with maximum dynamics and precision	• Average intrinsic moment of inertia • For applications in which large loads are moved with dynamics and precision • In connection with planetary gearboxes with higher transmission ratios for applications with inertia ratios which are difficult to regulate via control technology

Planetary gearboxes

NRB, RBW, NRK, NRKW, NLC and NLCW planetary gearboxes are maintenance-free due to their lifetime lubrication and can be mounted in any mounting position without any restrictions.

Table 12-8 Design and technical features of planetary gearboxes

ECO gearbox	**NRB, NRBW**	**NRK, NRKW**	**NLC, NLCW**
Order code on the rating plate of the motor	A□□	B□□	C□□
Diagrams showing NRB, NRK and NLC coaxial planetary gearboxes			
Illustrations of right angle planetary gearboxes NRBW, NRKW and NLCW			
Special features	• Low friction for the highest speeds • Lightweight gearbox	• For higher radial and axial forces exerted on the output shaft by large ball bearings	For high radial and axial forces exerted by preloaded tapered roller bearings
Transmission ratio *i*	3 ... 512	3 ... 100	3 ... 100
Gearbox stages *z*	1-, 2- and 3-stage	1- and 2-stage	1- and 2-stage
Torsional backlash φ_2 of the planetary gearbox in arcmin	6 ... 22 for NRB 11 .. 28 for NRBW	6 ... 19 for NRK 11 ... 25 for NRKW	7 ... 12 for NLC 11 ... 18 for NLCW
Gearbox type	IM B14 / IM V18 / IM V19	IM B14 / IM V18 / IM V19	IM B5 / IM V1 / IM V3
Degree of protection	IP64	IP64	IP65

ECO gearbox	NRB, NRBW	NRK, NRKW	NLC, NLCW
Power density	++	+	+
Bearing loading capacity	+	++	++++
Torsional stiffness	++	++	++
Suitable for high speeds	++	++	+
Degree of protection	+	+	++
Applications	Pharmaceutical and medical technology	Automation and assembly technology	
	Food industry	-	• Food industry • Pressure
	Packaging, auxiliary axes in machine tools		
Options	• Plain shaft or solid shaft with feather key • Standard lubrication or food-safe lubricant		

Table 12-9 Design and technical features of precision gearboxes

Precision gearbox	SP+	TP+
Order code on the rating plate of the motor	J☐☐	H☐☐
Diagrams of coaxial planetary gearboxes SP+ and TP+		
Special features	• Low running noise due to the helical teeth • For high radial and axial forces exerted by preloaded tapered roller bearings • Low torsional backlash	• Low running noise due to the helical teeth • For high radial and axial forces exerted by preloaded tapered roller bearings • Low torsional backlash • Output flange
Transmission ratio *i*	3 ... 100	4 ... 100
Gearbox stages *z*	1-, 2-stage	1- and 2-stage
Torsional backlash φ_2 of the planetary gearbox in arcmin	4 ... 6	3 ... 4
Reduced torsional backlash φ2 of the planetary gearbox in arcmin	2 ... 4	1 ... 2
Gearbox type	IMB5 / IMV1 / IMV3	IMB5 / IMV1 / IMV3
Degree of protection	IP65	IP65
Power density	+++	++
Bearing loading capacity	+++	+++
Torsional stiffness	++	+++
Suitable for high speeds	++	++

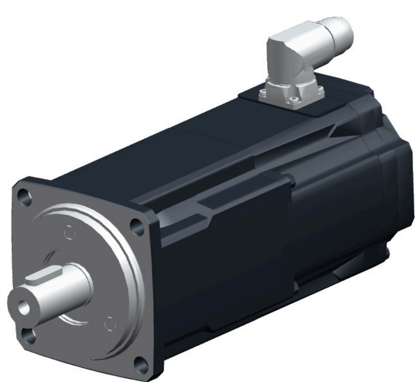
Precision gearbox	SP+	TP+
Degree of protection	++	++
Applications	Demanding drive technology (machinery construction, machine tools and production machines and systems with high positioning precision, dynamic response and power density)	
Options	• Plain shaft, shaft with feather key or splined shaft • Standard lubrication or food-safe lubricant • Reduced torsional backlash	• Standard lubrication or food-safe lubricant • Reduced torsional backlash

More information can be found in the associated Configuration Manual for planetary gearboxes (https://support.industry.siemens.com/cs/de/de/view/109802596/en) and in Catalog D21.4.

12.2.14.2 Option paint finish (order code X0x)

Description

If specific color and paint/coating data are not specified when ordering, 1F☐2 motors are painted in the standard anthracite color (RAL 7016).



1FT2 is available in various colors.

The standard paint finishes meet the requirements for ambient conditions of climate class 3K4 according to IEC 60721-3-3 with the exception of the environmental factors "low air temperature", "condensation" and "low air pressure".

The standard paint finish complies with corrosivity category C1 according to DIN EN ISO 12944-2

For higher corrosion protection categories, you require option " Option, motors with increased resistance to chemicals (order code N16) (Page 553)".

Note

You will find more information in Chapter "Permissible environmental conditions for the motor (Page 524)".

The standard colors are available within the regular delivery times.

Special colors (option X..)

Designation	Order code	Color pattern
Unpainted*	X00	
RAL 9005, jet black, matte	X01	
RAL 9001, cream white	X02	
RAL 6011, reseda green	X03	
RAL 7032, pebble gray	X04	
RAL 5015, sky blue	X05	
RAL 1015, light ivory	X06	
RAL 9006, white aluminum	X08	
Special paint finish corresponding to the ambient conditions for the standard paint finish and for condensation on the outer motor surfaces, primer and paint finish in RAL 7016, anthracite grey	K23	
Special paint finish as for K23; however, special color according to color table	K23 + X□□	

* Cannot be combined with mounted gearbox

12.2.14.3 Option, motors with increased resistance to chemicals (order code N16)

Description

You can order 1F□2 motors with increased chemical resistance.

The motor is classified according to corrosivity category according to DIN EN ISO 12944-2.

With this option, the motor has corrosion protection according to Class C4(M).

This option is available for 1FT2 for all frame sizes from 1FT2□03.

Additional characteristics of the motor with option "Increased chemical resistance"

- 4-layer paint finish (PS Premium paint system), has the properties of a paint finish with additional primer K23
- Nickel-plated plug connectors
- Resistant to greases, mineral oils, aliphatic solvents (10%), caustic soda (10%)

Permissible environmental conditions when using the motor

- Indoor and outdoor installations,
  when installing motors outdoor, we recommend that the motors are protected using a suitable weather protection cover. Especially prevent solar radiation from excessively increasing the motor temperature.
- Chemical plants, swimming pools, wastewater treatment plants
- Electroplating facilities and boathouses above seawater
- Industrial areas and coastal areas with moderate salt levels

Motor applications

Plants and systems in the food industry or machine tools are typical applications for these types of device versions.

The paint system for these motors is resistant to a wide range of common cleaning and disinfecting agents.

Note

The ECOLAB Deutschland GmbH company verified the resistance to cleaning and disinfecting agents based on a material resistance test. The certificate is provided in the product information for Option N16 (https://support.industry.siemens.com/cs/ww/en/view/58657336).

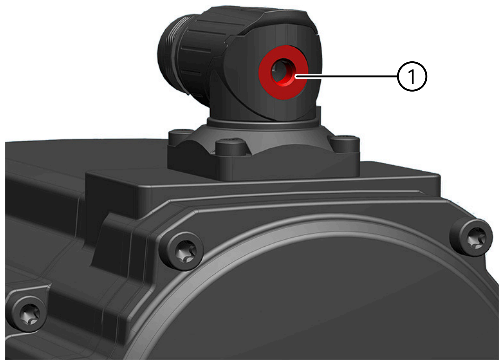
- Check the resistance of your complete system comprising motor, connections and cables before use.

12.2.14.4 Option, pressure equalization (order code Q20)

Description

With this option, 1FT2 motors are equipped with a pressure compensation connection.

Pressure compensation is available for 1FT2 in all frame sizes with the exception of 1FT2102-□□□□□.



① Pressure compensation connection (closed with a plug if not used)

Figure 12-6 Connector with pressure equalization on the 1FT2 (example diagram) applicable for single and dual cable technology.

The pressure compensation connector has an M5 female thread and is located in the power connector.

Purpose of the pressure compensation

When the motor cools down after operation, underpressure can build up in the motor. This may result in moisture ingress.

You can prevent such moisture ingress with an air supply provided by a connected pressure compensation tube.

NOTICE
Motor damage due to continuous overpressure The motor must not be subjected to continuous overpressure resulting from the pressure compensation connection. Continuous overpressure leads to motor leaks and may cause motor damage. • Use the pressure compensation connection only for pressure compensation.

Air quality requirements for pressure compensation

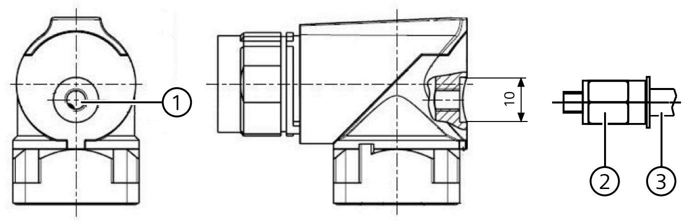
Note

The connected pressure compensation tube must supply dry and dust-free air.

Use a suitable filter if necessary.

Maximum residual water content in g/m³	0.12
Maximum residual oil content in g/m³	0.01
Maximum residual dust in mg/m³	0.1
Particle size for optical encoder in µm	< 3

Technical specifications of the pressure compensation connection



① M5 pressure compensation connector
② Connector nipple, e.g. Festo QSM-B-M5-4-20
③ Tube, outside diameter 4 mm, inside diameter 2.5 mm.

The connection tightening torque is 3.5 .... 5 Nm.

When supplied, the M5 thread is sealed with a treated hexagon socket head cap screw with flat head. The screw was sealed with TEROSON® VR 410, known as Fluid-D. The Fluid-D remains pasty and does not harden.

Note

If necessary, remove Fluid-D using a lint-free cloth and a some ethanol.

If there is no other way for you to seal the pressure equalization connection, e.g. using a flat seal, then use Fluid-D for sealing, for example.

12.2.14.5 Option, temperature extended down to -30 °C (order code Q30)

Description

With option "Extended temperature range down to -30 °C", the motors are suitable for operation in temperatures down to -30 °C, for example for applications in refrigerated warehouses.

Exceptions

The extended operating temperature range is not possible for the following 1FT2 variants:

- IP67 degree of protection
- Motors with gearbox
- Motors with forced ventilation

12.2.14.6 Option, metal motor rating plate (order code Q31)

Description

The motor rating plate is usually an adhesive label made of plastic.

You can use the order code Q31 to order a metal rating plate made of aluminum instead. The laser engraving stays legible even in difficult ambient conditions.

12.2.14.7 Option, clean room (order code Q40)

Description

1FT2 motors with order code Q40 are clean room compatible and classified and certified according to ISO 14644-1.

These motors are suitable for operation in extremely dry environments down to a relative atmospheric humidity of 0.3% (dew point -50°C).

The following clean room classes are achieved according to ISO 156441-14, and have been appropriately certified by the TÜV (German Technical Inspectorate):

Table 12-10 Certification of the motors according to clean room classes

Clean room class 7 or better	Clean room class 6 or better
All 1FT2 motors with degree of protection IP64	1FT2 motors, degree of protection IP65, without planetary gearbox
All 1FT2 motors with planetary gearbox have degree of protection IP64	

Exceptions

Order option "Motors for clean room requirements according to ISO 14644 Part 14" with order code Q40 is only available for naturally ventilated motors.

Certificates

The certificates can be downloaded at the following link.

Clean room certification according to ISO 14644-1 (https://support.industry.siemens.com/cs/de/de/view/109815586/en)

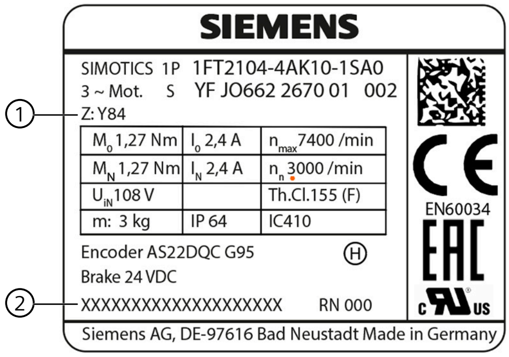
12.2.14.8 Option, customer data on the motor rating plate (order code Y84)

Option Y84 permits customer data on the rating plate of the motor. If you are ordering electronically, you can enter the text for the rating plate when you select option Y84.

Note

The text can be up to 20 characters long. Excess characters will be cut off. Option Y84 does not have any effect on the delivery time.

The customer data are printed on the rating plate and on the type labels for the product packaging.



① Identification of the order code

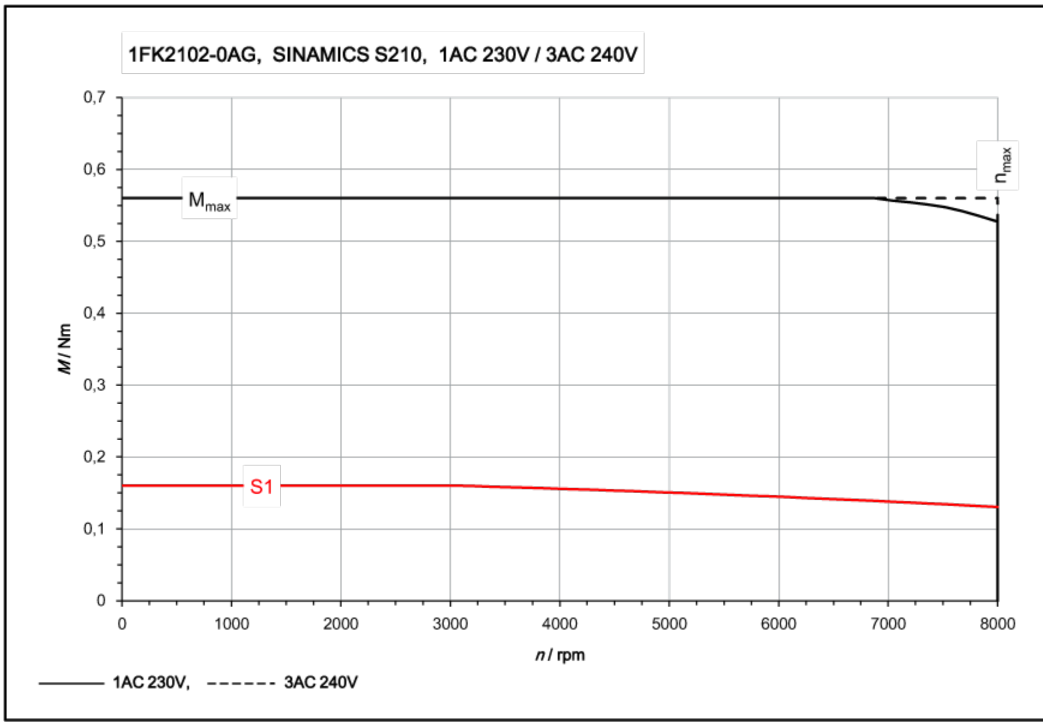
② Field for customer data (max. 20 characters, any distribution)

Figure 12-7 Example of a rating plate with option "Customer data on the rating plate", Y84

12.2.15 Technical data and characteristics of the 1FK2 connected to 230 V 1AC, 240 V 3AC, naturally cooled

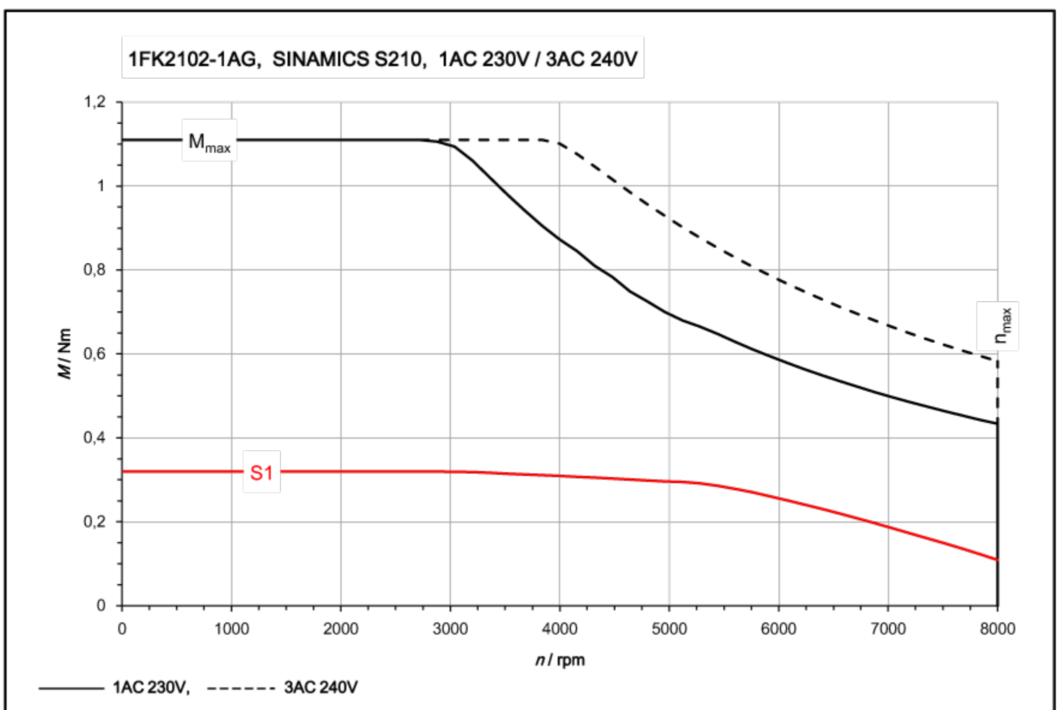
12.2.15.1 1FK2102-0AG connected to 1 AC 230 V / 3 AC 240 V

1FK2102-0AG	For 1 AC 230 V, 3 AC 240 V		
Technical specifications in the SINAMICS S210 system	**Symbol**	**Unit**	**Value**
Static torque	M_0	Nm	0.16
Stall current	I_0	A	0.75
Maximum permissible speed	n_{max}	r/min	8000
Maximum torque	M_{max}	Nm	0.56
Maximum current	I_{max}	A	3.1
Thermal time constant	T_{th}	min	14
Moment of inertia	J_{mot}	$kgcm^2$	0.0245
Moment of inertia (with brake)	$J_{mot\ br}$	$kgcm^2$	0.0285
Weight	m_{mot}	kg	0.47
Weight (with brake)	$m_{mot\ br}$	kg	0.73
Rated data for S210 connected to 1 AC 230 V, 3 AC 240 V			
Rated speed	n_{rated}	r/min	3000
Rated torque	M_{rated}	Nm	0.16
Rated current	I_{rated}	A	0.75
Rated power	P_{rated}	kW	0.05


1FK2102-0AG, SINAMICS S210, 1AC 230V / 3AC 240V
M / Nm
0,7
0,6
0,5
0,4
0,3
0,2
0,1
0
M_{max}
n_{max}
S1
0
1000
2000
3000
4000
5000
6000
7000
8000
n / rpm
1AC 230V,
3AC 240V

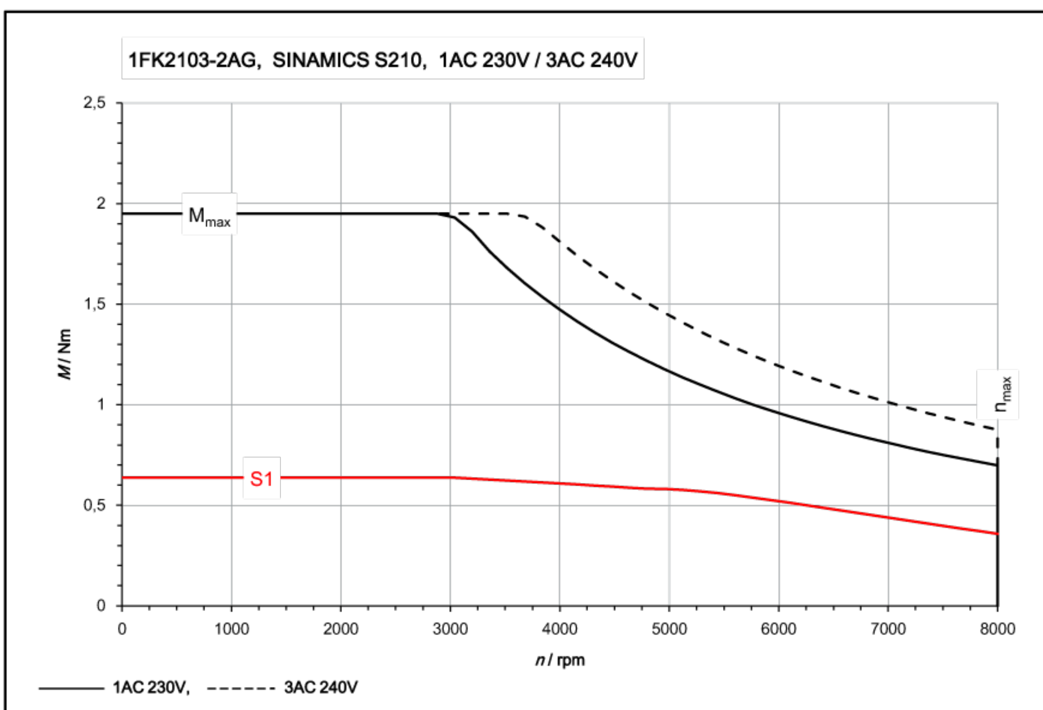
12.2.15.2 1FK2102-1AG connected to 1 AC 230 V / 3 AC 240 V

1FK2102-1AG	For 1 AC 230 V, 3 AC 240 V		
Technical specifications in the SINAMICS S210 system	**Symbol**	**Unit**	**Value**
Static torque	M_0	Nm	0.32
Stall current	I_0	A	0.76
Maximum permissible speed	n_{max}	r/min	8000
Maximum torque	M_{max}	Nm	1.11
Maximum current	I_{max}	A	2.95
Thermal time constant	T_{th}	min	16
Moment of inertia	J_{mot}	$kgcm^2$	0.036
Moment of inertia (with brake)	$J_{mot\ br}$	$kgcm^2$	0.04
Weight	m_{mot}	kg	0.6
Weight (with brake)	$m_{mot\ br}$	kg	0.86
Rated data for S210 connected to 1 AC 230 V, 3 AC 240 V			
Rated speed	n_{rated}	r/min	3000
Rated torque	M_{rated}	Nm	0.32
Rated current	I_{rated}	A	0.76
Rated power	P_{rated}	kW	0.1



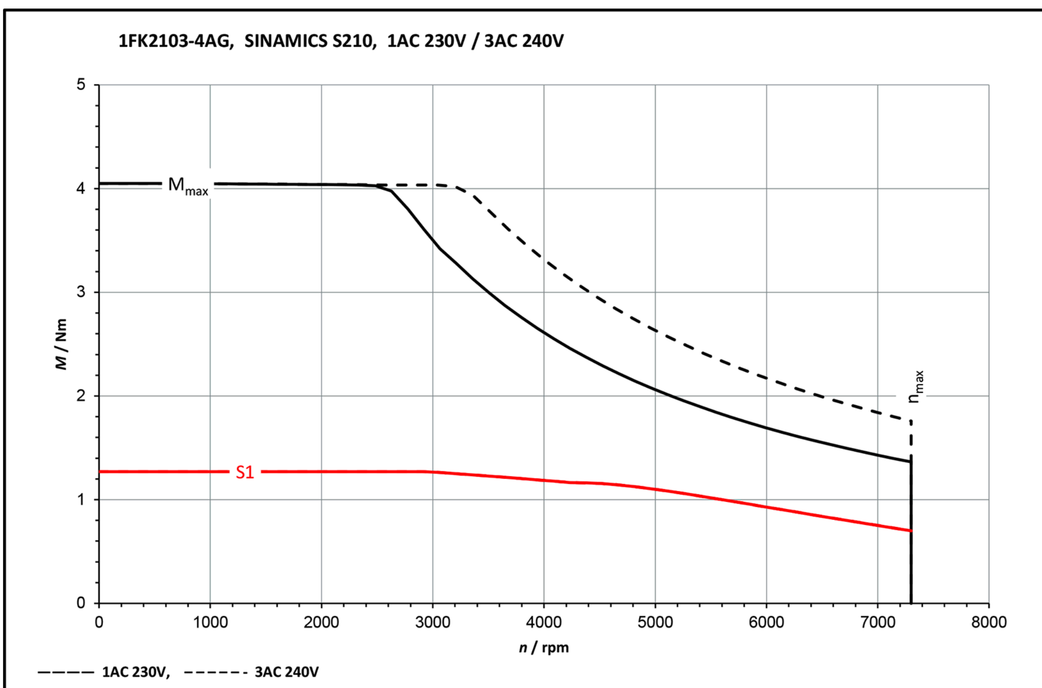
12.2.15.3 1FK2103-2AG connected to 1 AC 230 V / 3 AC 240 V

1FK2103-2AG	For 1 AC 230 V, 3 AC 240 V		
Technical specifications in the SINAMICS S210 system	**Symbol**	**Unit**	**Value**
Static torque	M_0	Nm	0.64
Stall current	I_0	A	1.36
Maximum permissible speed	n_{max}	r/min	8000
Maximum torque	M_{max}	Nm	1.95
Maximum current	I_{max}	A	4.8
Thermal time constant	T_{th}	min	17
Moment of inertia	J_{mot}	$kgcm^2$	0.093
Moment of inertia (with brake)	$J_{mot\ br}$	$kgcm^2$	0.112
Weight	m_{mot}	kg	1.17
Weight (with brake)	$m_{mot\ br}$	kg	1.54
Rated data for S210 connected to 1 AC 230 V, 3 AC 240 V			
Rated speed	n_{rated}	r/min	3000
Rated torque	M_{rated}	Nm	0.64
Rated current	I_{rated}	A	1.36
Rated power	P_{rated}	kW	0.2



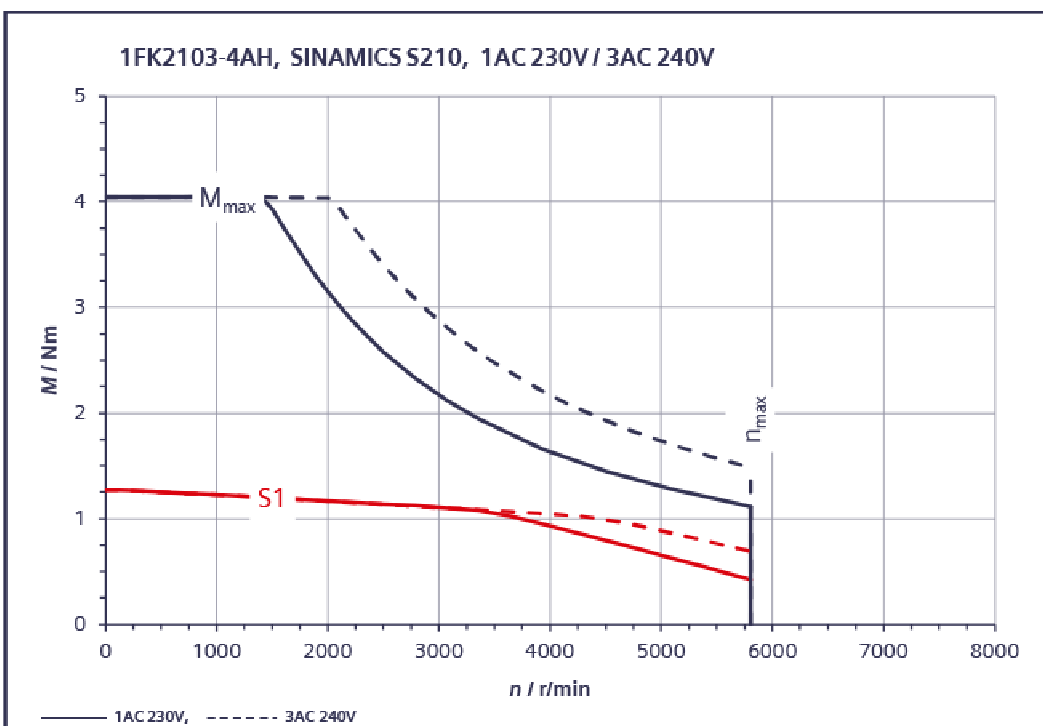
12.2.15.4 1FK2103-4AG connected to 1 AC 230 V / 3 AC 240 V

1FK2103-4AG	For 1 AC 230 V, 3 AC 240 V		
Technical specifications in the SINAMICS S210 system	**Symbol**	**Unit**	**Value**
Static torque	M_0	Nm	1.27
Stall current	I_0	A	2.4
Maximum permissible speed	n_{max}	r/min	7300
Maximum torque	M_{max}	Nm	4.05
Maximum current	I_{max}	A	8.7
Thermal time constant	T_{th}	min	21
Moment of inertia	J_{mot}	kgcm^2	0.139
Moment of inertia (with brake)	$J_{mot\ br}$	kgcm^2	0.158
Weight	m_{mot}	kg	1.64
Weight (with brake)	$m_{mot\ br}$	kg	1.98
Rated data for S210 connected to 1 AC 230 V, 3 AC 240 V			
Rated speed	n_{rated}	r/min	3000
Rated torque	M_{rated}	Nm	1.27
Rated current	I_{rated}	A	2.4
Rated power	P_{rated}	kW	0.4



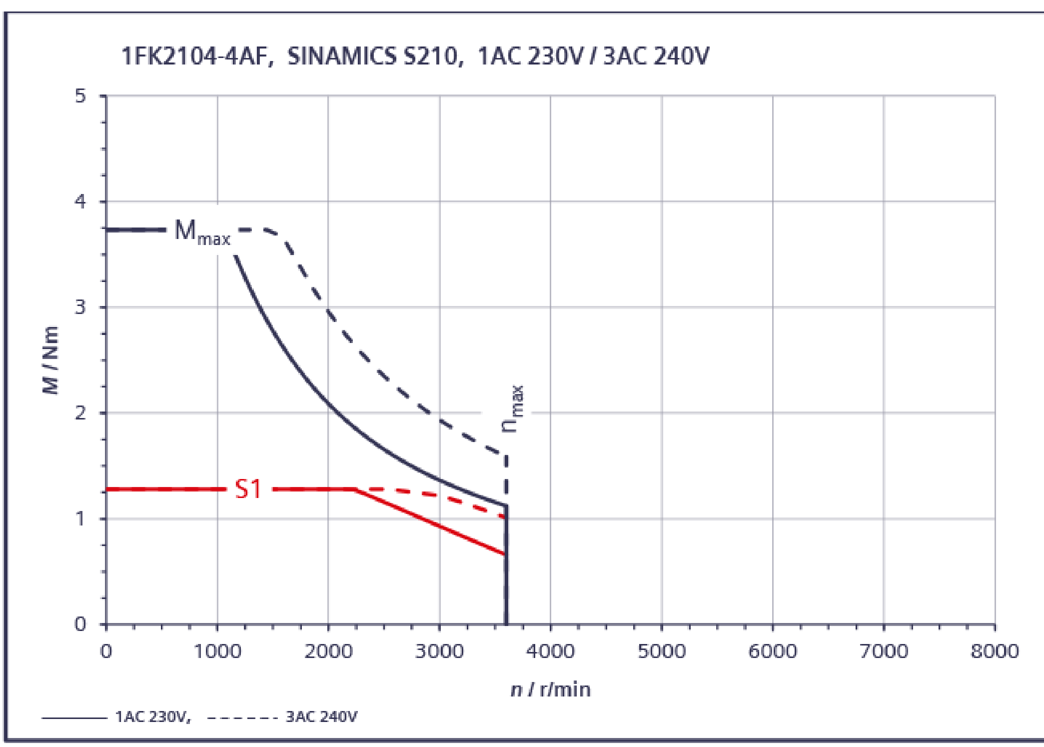
12.2.15.5 1FK2103-4AH connected to 1 AC 230 V / 3 AC 240 V

1FK2103-4AH	For 1 AC 230 V, 3 AC 240 V		
Technical specifications in the SINAMICS S210 system	**Symbol**	**Unit**	**Value**
Static torque	M_0	Nm	1.27
Stall current	I_0	A	1.87
Maximum permissible speed	n_{max}	r/min	8000
Maximum torque	M_{max}	Nm	4.05
Maximum current	I_{max}	A	7.1
Thermal time constant	T_{th}	min	21
Rotor moment of inertia	J_{mot}	$kgcm^2$	0.139
Rotor moment of inertia (with brake)	$J_{mot\ br}$	$kgcm^2$	0.158
Weight	m_{mot}	kg	1.65
Weight (with brake)	$m_{mot\ br}$	kg	1.99
Rated data for S210 connected to 1 AC 230 V, 3 AC 240 V			
Rated speed	n_{rated}	r/min	2500
Rated torque	M_{rated}	Nm	1.14
Rated current	I_{rated}	A	1.72
Rated power	P_{rated}	kW	0.3



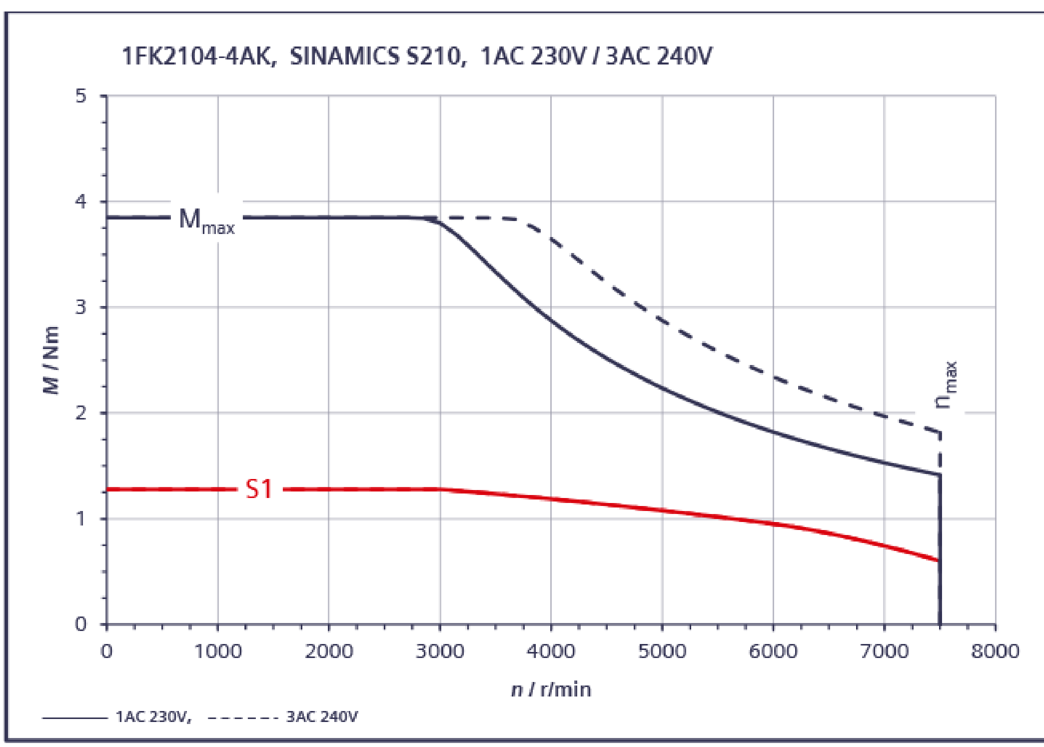
12.2.15.6 1FK2104-4AF connected to 1 AC 230 V / 3 AC 240 V

1FK2104-4AF	For 1 AC 230 V, 3 AC 240 V		
Technical specifications in the SINAMICS S210 system	**Symbol**	**Unit**	**Value**
Static torque	M_0	Nm	1.27
Stall current	I_0	A	1.19
Maximum permissible speed	n_{max}	r/min	3600
Maximum torque	M_{max}	Nm	3.75
Maximum current	I_{max}	A	4.2
Thermal time constant	T_{th}	min	33
Rotor moment of inertia	J_{mot}	$kgcm^2$	0.35
Rotor moment of inertia (with brake)	$J_{mot\ br}$	$kgcm^2$	0.43
Weight	m_{mot}	kg	2.05
Weight (with brake)	$m_{mot\ br}$	kg	2.9
Rated data for S210 connected to 1 AC 230 V, 3 AC 240 V			
Rated speed	n_{rated}	r/min	1500
Rated torque	M_{rated}	Nm	1.27
Rated current	I_{rated}	A	1.19
Rated power	P_{rated}	kW	0.2



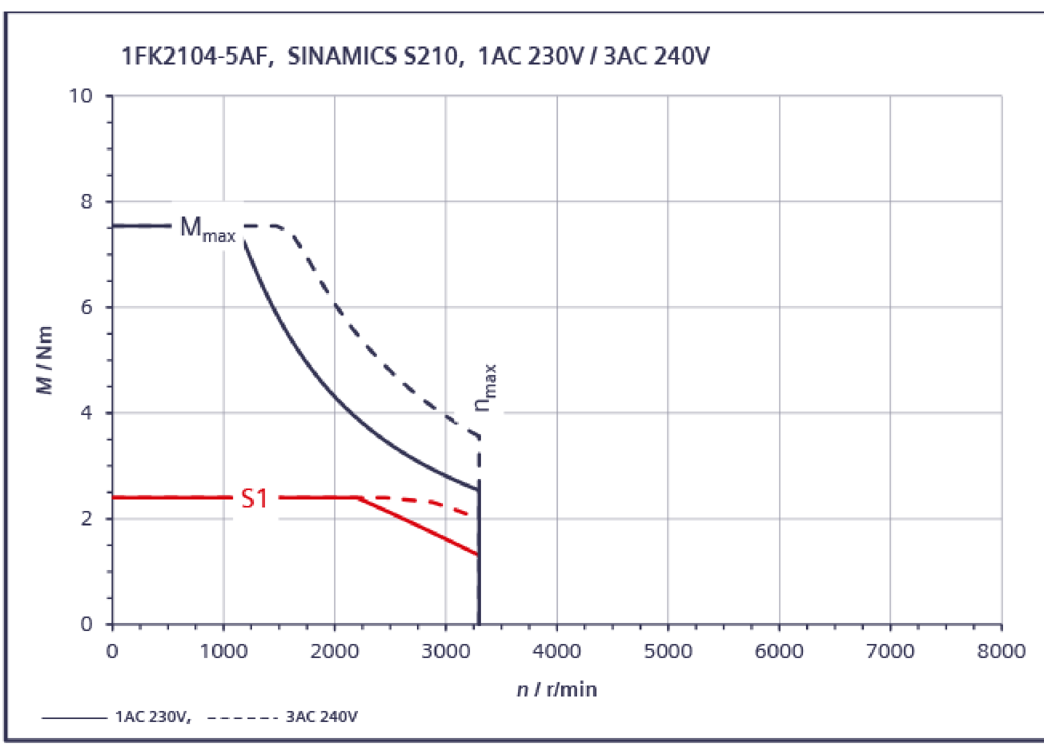
12.2.15.7 1FK2104-4AK connected to 230 V 1 AC / 240 V 3 AC

1FK2104-4AK	For 1 AC 230 V, 3 AC 240 V		
Technical specifications in the SINAMICS S210 system	**Symbol**	**Unit**	**Value**
Static torque	M_0	Nm	1.27
Stall current	I_0	A	2.4
Maximum permissible speed	n_{max}	r/min	7500
Maximum torque	M_{max}	Nm	3.85
Maximum current	I_{max}	A	8.7
Thermal time constant	T_{th}	min	33
Rotor moment of inertia	J_{mot}	$kgcm^2$	0.35
Rotor moment of inertia (with brake)	$J_{mot\ br}$	$kgcm^2$	0.43
Weight	m_{mot}	kg	2.05
Weight (with brake)	$m_{mot\ br}$	kg	2.9
Rated data for S210 connected to 1 AC 230 V, 3 AC 240 V			
Rated speed	n_{rated}	r/min	3000
Rated torque	M_{rated}	Nm	1.27
Rated current	I_{rated}	A	2.4
Rated power	P_{rated}	kW	0.4



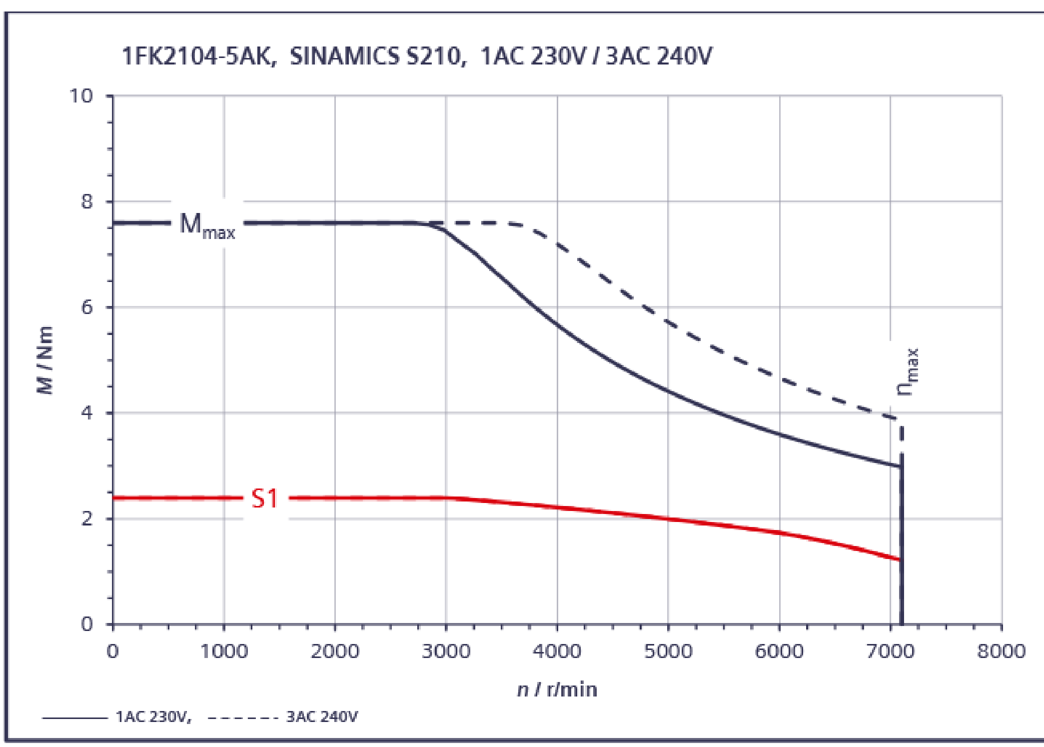
12.2.15.8 1FK2104-5AF connected to 1 AC 230 V / 3 AC 240 V

1FK2104-5AF	For 1 AC 230 V, 3 AC 240 V		
Technical specifications in the SINAMICS S210 system	**Symbol**	**Unit**	**Value**
Static torque	M_0	Nm	2.4
Stall current	I_0	A	2.1
Maximum permissible speed	n_{max}	r/min	3300
Maximum torque	M_{max}	Nm	7.5
Maximum current	I_{max}	A	7.6
Thermal time constant	T_{th}	min	35
Rotor moment of inertia	J_{mot}	$kgcm^2$	0.56
Rotor moment of inertia (with brake)	$J_{mot\ br}$	$kgcm^2$	0.65
Weight	m_{mot}	kg	2.85
Weight (with brake)	$m_{mot\ br}$	kg	3.7
Rated data for S210 connected to 1 AC 230 V, 3 AC 240 V			
Rated speed	n_{rated}	r/min	1500
Rated torque	M_{rated}	Nm	2.4
Rated current	I_{rated}	A	2.1
Rated power	P_{rated}	kW	0.375



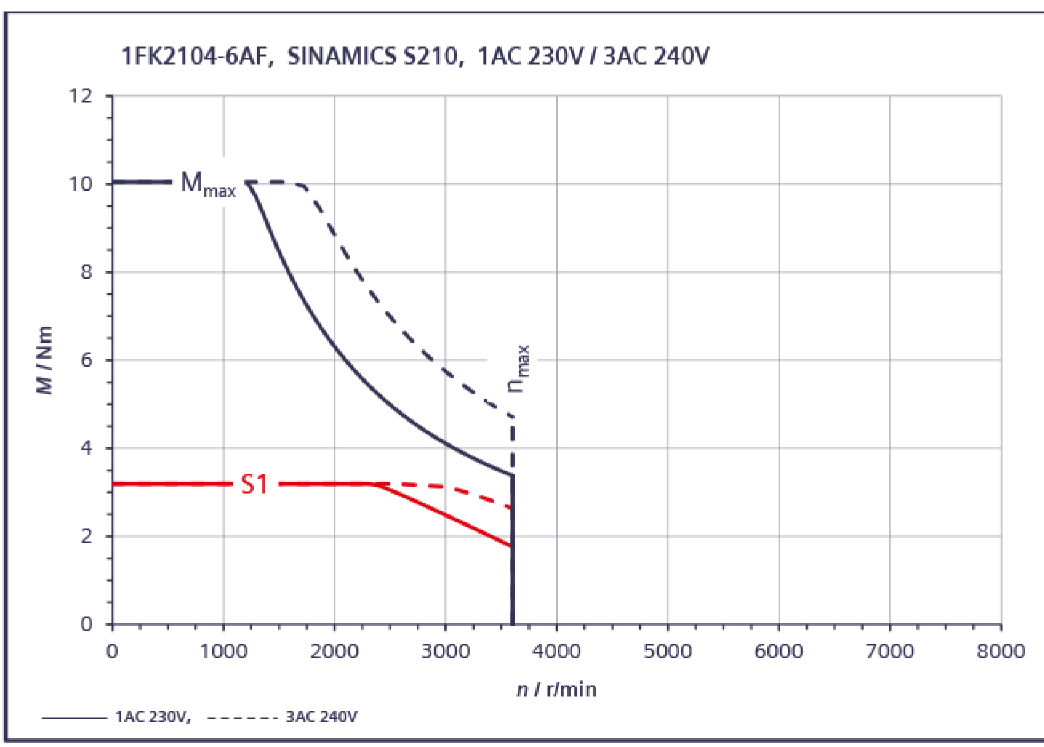
12.2.15.9 1FK2104-5AK connected to 1 AC 230 V / 3 AC 240 V

1FK2104-5AK	For 1 AC 230 V, 3 AC 240 V		
Technical specifications in the SINAMICS S210 system	**Symbol**	**Unit**	**Value**
Static torque	M_0	Nm	2.4
Stall current	I_0	A	4.4
Maximum permissible speed	n_{max}	r/min	7100
Maximum torque	M_{max}	Nm	7.6
Maximum current	I_{max}	A	16
Thermal time constant	T_{th}	min	35
Rotor moment of inertia	J_{mot}	$kgcm^2$	0.56
Rotor moment of inertia (with brake)	$J_{mot\ br}$	$kgcm^2$	0.65
Weight	m_{mot}	kg	2.85
Weight (with brake)	$m_{mot\ br}$	kg	3.7
Rated data for S210 connected to 1 AC 230 V, 3 AC 240 V			
Rated speed	n_{rated}	r/min	3000
Rated torque	M_{rated}	Nm	2.4
Rated current	I_{rated}	A	4.4
Rated power	P_{rated}	kW	0.75



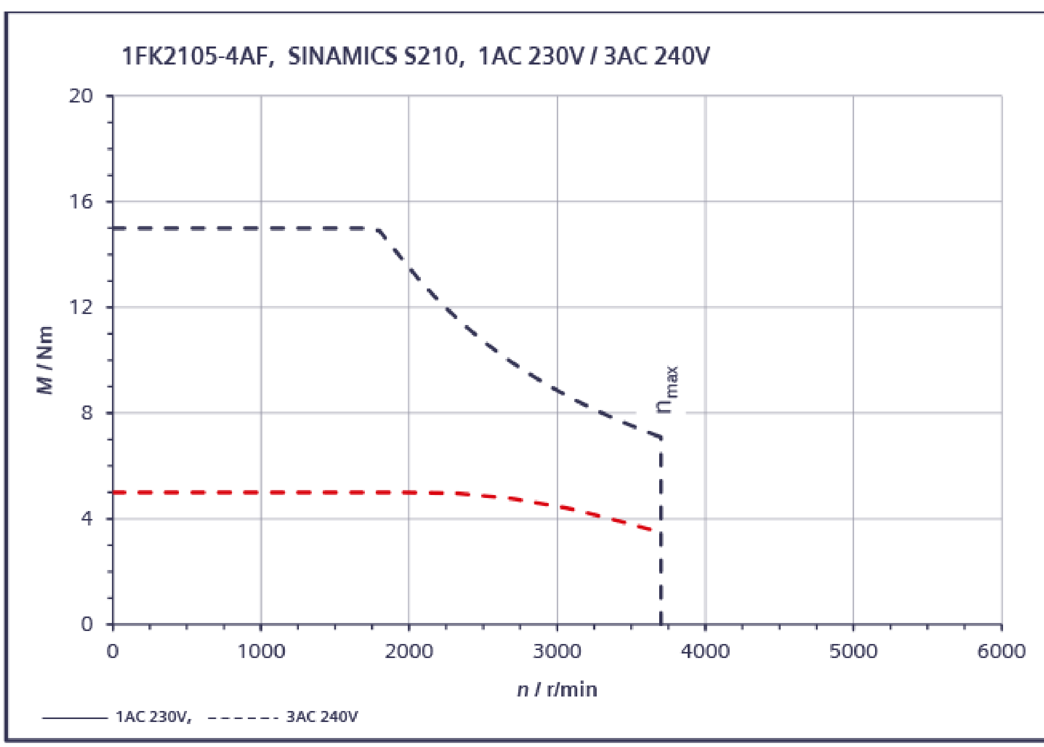
12.2.15.10 1FK2104-6AF connected to 1 AC 230 V / 3 AC 240 V

1FK2104-6AF	For 1 AC 230 V, 3 AC 240 V		
Technical specifications in the SINAMICS S210 system	**Symbol**	**Unit**	**Value**
Static torque	M_0	Nm	3.2
Stall current	I_0	A	3
Maximum permissible speed	n_{max}	r/min	3600
Maximum torque	M_{max}	Nm	10
Maximum current	I_{max}	A	10.9
Thermal time constant	T_{th}	min	38
Rotor moment of inertia	J_{mot}	$kgcm^2$	0.76
Rotor moment of inertia (with brake)	$J_{mot\ br}$	$kgcm^2$	0.84
Weight	m_{mot}	kg	3.4
Weight (with brake)	$m_{mot\ br}$	kg	4.25
Rated data for S210 connected to 1 AC 230 V, 3 AC 240 V			
Rated speed	n_{rated}	r/min	1500
Rated torque	M_{rated}	Nm	3.2
Rated current	I_{rated}	A	3
Rated power	P_{rated}	kW	0.5



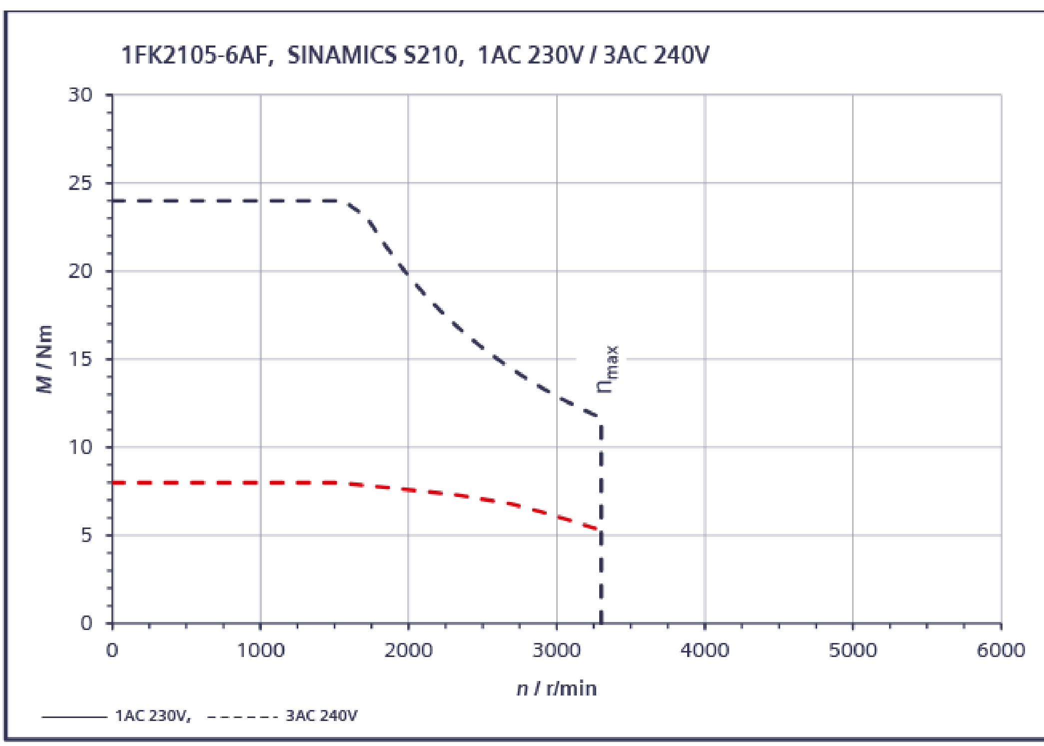
12.2.15.11 1FK2105-4AF connected to 3 AC 240 V

1FK2105-4AF	For 3 AC 240 V		
Technical specifications in the SINAMICS S210 system	**Symbol**	**Unit**	**Value**
Static torque	M_0	Nm	5
Stall current	I_0	A	4.65
Maximum permissible speed	n_{max}	r/min	3700
Maximum torque	M_{max}	Nm	15
Maximum current	I_{max}	A	18
Thermal time constant	T_{th}	min	37
Rotor moment of inertia	J_{mot}	$kgcm^2$	1.71
Rotor moment of inertia (with brake)	$J_{mot\ br}$	$kgcm^2$	2.55
Weight	m_{mot}	kg	5.6
Weight (with brake)	$m_{mot\ br}$	kg	6.6
Rated data for S210 connected to 3 AC 240 V			
Rated speed	n_{rated}	r/min	1500
Rated torque	M_{rated}	Nm	5
Rated current	I_{rated}	A	4.65
Rated power	P_{rated}	kW	0.79



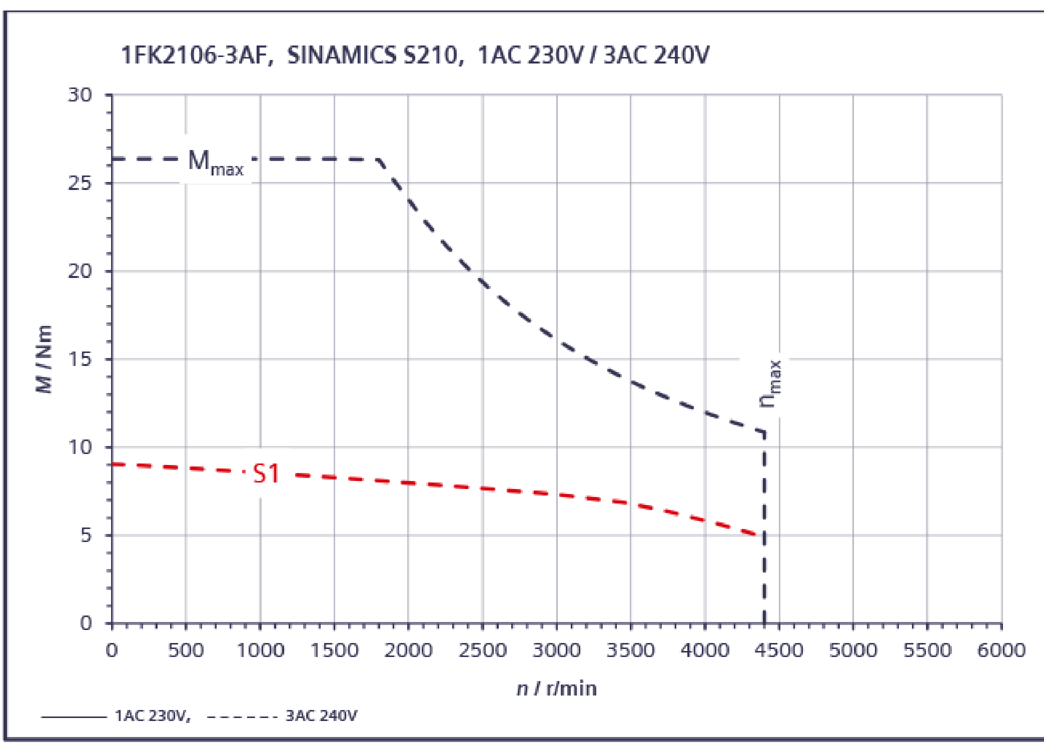
12.2.15.12 1FK2105-6AF connected to 3 AC 240 V

1FK2105-6AF	For 3 AC 240 V		
Technical specifications in the SINAMICS S210 system	**Symbol**	**Unit**	**Value**
Static torque	M_0	Nm	8
Stall current	I_0	A	6.7
Maximum permissible speed	n_{max}	r/min	3300
Maximum torque	M_{max}	Nm	24
Maximum current	I_{max}	A	24
Thermal time constant	T_{th}	min	40
Rotor moment of inertia	J_{mot}	$kgcm^2$	2.65
Rotor moment of inertia (with brake)	$J_{mot\ br}$	$kgcm^2$	3.5
Weight	m_{mot}	kg	7.7
Weight (with brake)	$m_{mot\ br}$	kg	8.7
Rated data for S210 connected to 3 AC 240 V			
Rated speed	n_{rated}	r/min	1500
Rated torque	M_{rated}	Nm	8
Rated current	I_{rated}	A	6.7
Rated power	P_{rated}	kW	1.26



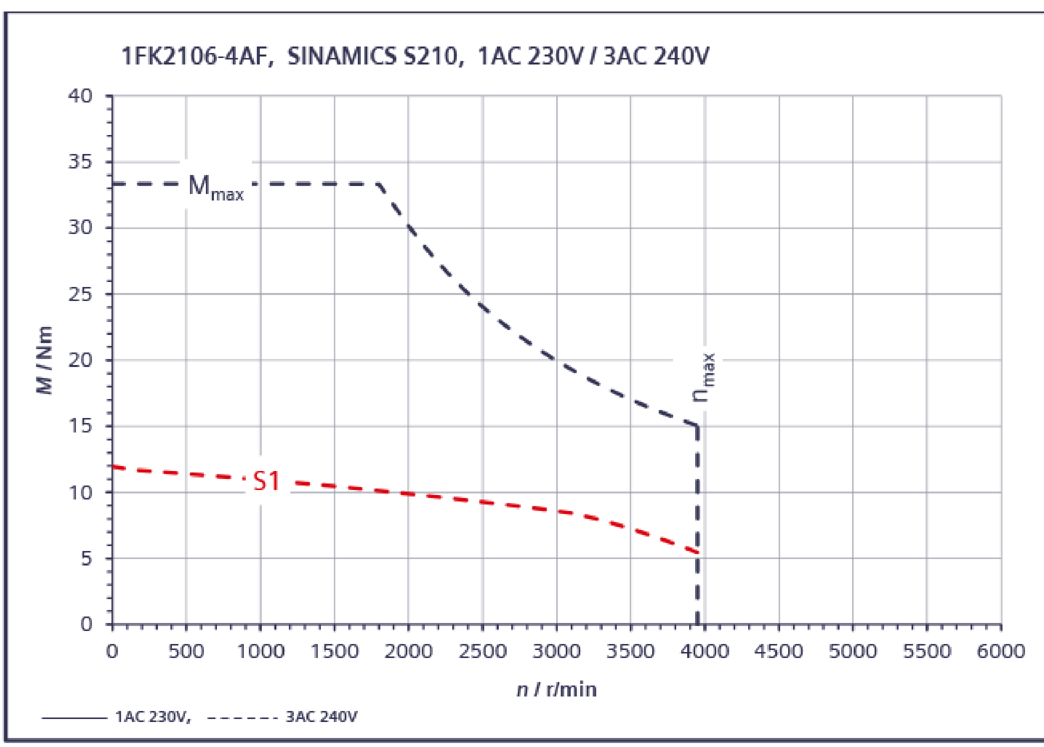
12.2.15.13 1FK2106-3AF connected to 240 V 3 AC

1FK2106-3AF	For 3 AC 240 V		
Technical specifications in the SINAMICS S210 system	**Symbol**	**Unit**	**Value**
Static torque	M_0	Nm	9
Stall current	I_0	A	9.2
Maximum permissible speed	n_{max}	r/min	6000
Maximum torque	M_{max}	Nm	26
Maximum current	I_{max}	A	43
Thermal time constant	T_{th}	min	30
Rotor moment of inertia	J_{mot}	$kgcm^2$	4.6
Rotor moment of inertia (with brake)	$J_{mot\ br}$	$kgcm^2$	6.3
Weight	m_{mot}	kg	7.4
Weight (with brake)	$m_{mot\ br}$	kg	9
Rated data for S210 connected to 3 AC 240 V			
Rated speed	n_{rated}	r/min	1500
Rated torque	M_{rated}	Nm	8.3
Rated current	I_{rated}	A	8.7
Rated power	P_{rated}	kW	1.3



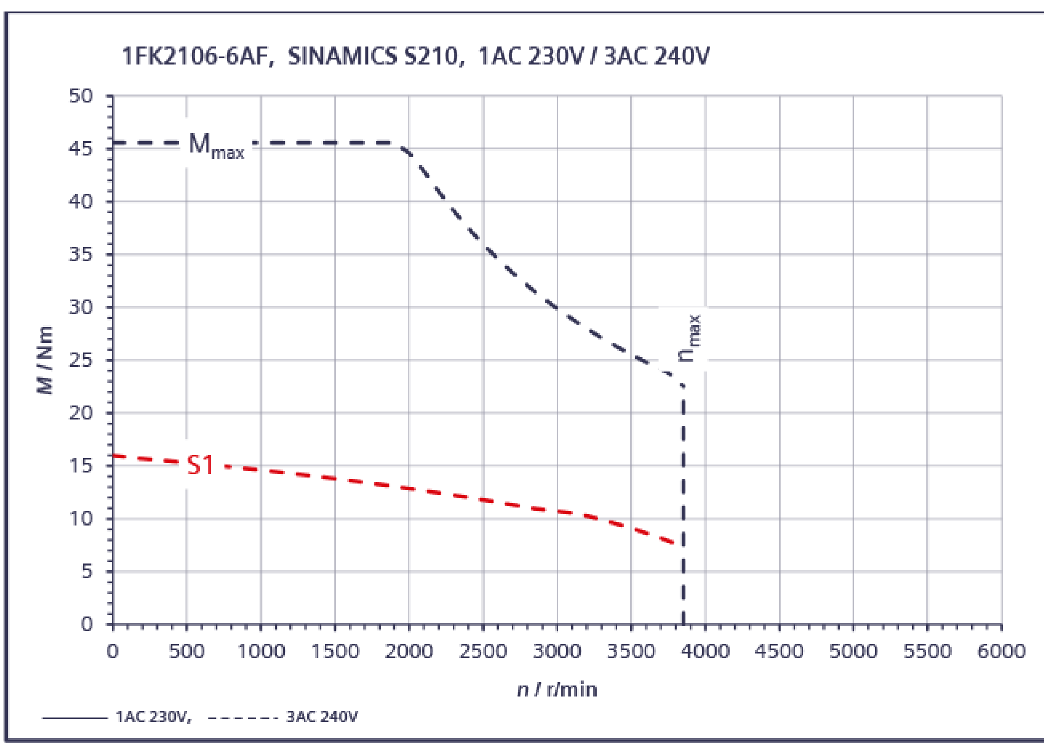
12.2.15.14 1FK2106-4AF connected to 240 V 3 AC

1FK2106-4AF	**For 3 AC 240 V**		
Technical specifications in the SINAMICS S210 system	**Symbol**	**Unit**	**Value**
Static torque	M_0	Nm	12
Stall current	I_0	A	10.7
Maximum permissible speed	n_{max}	r/min	3950
Maximum torque	M_{max}	Nm	33
Maximum current	I_{max}	A	42
Thermal time constant	T_{th}	min	34
Rotor moment of inertia	J_{mot}	$kgcm^2$	6
Rotor moment of inertia (with brake)	$J_{mot\ br}$	$kgcm^2$	7.6
Weight	m_{mot}	kg	9
Weight (with brake)	$m_{mot\ br}$	kg	10.6
Rated data for S210 connected to 3 AC 240 V			
Rated speed	n_{rated}	r/min	1500
Rated torque	M_{rated}	Nm	10.5
Rated current	I_{rated}	A	9.6
Rated power	P_{rated}	kW	1.64



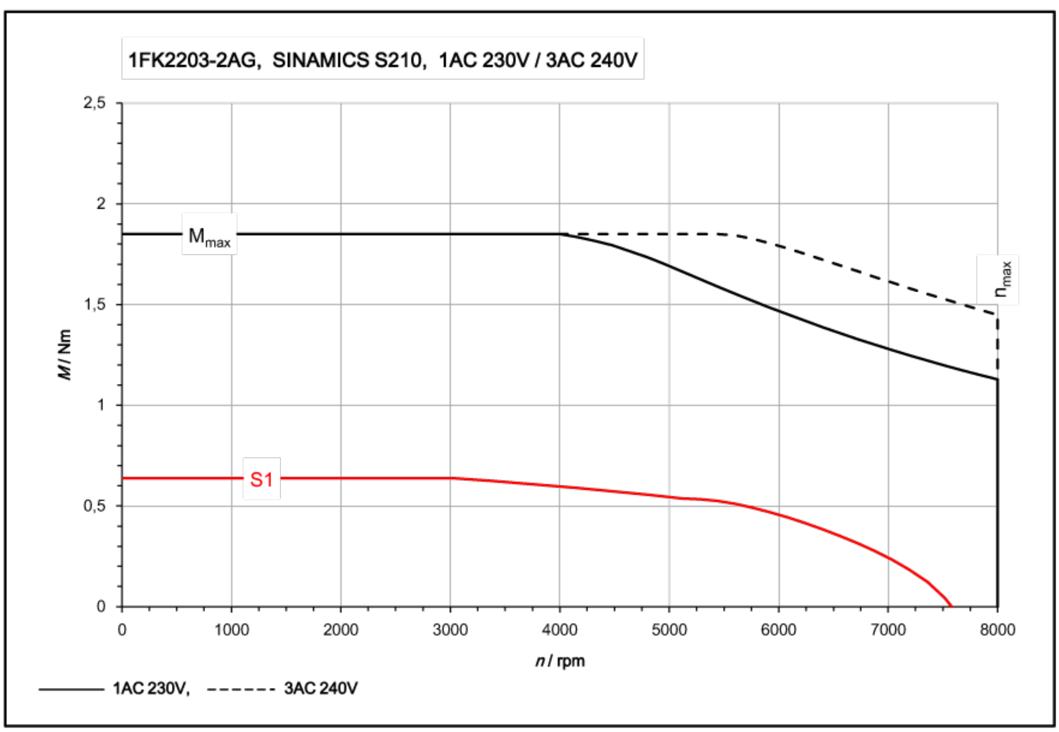
12.2.15.15 1FK2106-6AF connected to 240 V 3 AC

1FK2106-6AF	For 3 AC 240 V		
Technical specifications in the SINAMICS S210 system	**Symbol**	**Unit**	**Value**
Static torque	M_0	Nm	16
Stall current	I_0	A	14.3
Maximum permissible speed	n_{max}	r/min	3850
Maximum torque	M_{max}	Nm	45.5
Maximum current	I_{max}	A	49
Thermal time constant	T_{th}	min	50
Rotor moment of inertia	J_{mot}	$kgcm^2$	8.7
Rotor moment of inertia (with brake)	$J_{mot\ br}$	$kgcm^2$	10.4
Weight	m_{mot}	kg	11.8
Weight (with brake)	$m_{mot\ br}$	kg	13.4
Rated data for S210 connected to 3 AC 240 V			
Rated speed	n_{rated}	r/min	1500
Rated torque	M_{rated}	Nm	13.8
Rated current	I_{rated}	A	12.5
Rated power	P_{rated}	kW	2.15



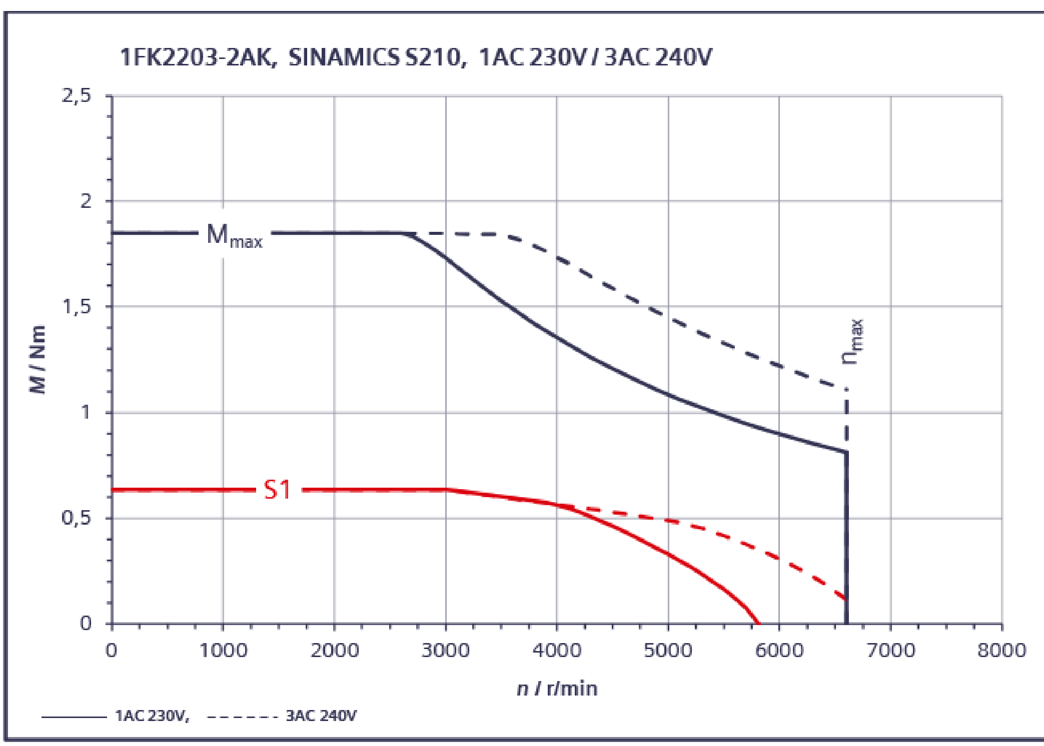
12.2.15.16 1FK2203-2AG connected to 1 AC 230 V / 3 AC 240 V

1FK2203-2AG	For 1 AC 230 V, 3 AC 240 V		
Technical specifications in the SINAMICS S210 system	**Symbol**	**Unit**	**Value**
Static torque	M_0	Nm	0.64
Stall current	I_0	A	1.38
Maximum permissible speed	n_{max}	r/min	8000
Maximum torque	M_{max}	Nm	1.85
Maximum current	I_{max}	A	4.2
Thermal time constant	T_{th}	min	21
Rotor moment of inertia	J_{mot}	$kgcm^2$	0.2
Rotor moment of inertia (with brake)	$J_{mot\ br}$	$kgcm^2$	0.22
Weight	m_{mot}	kg	1.15
Weight (with brake)	$m_{mot\ br}$	kg	1.52
Rated data for S210 connected to 1 AC 230 V, 3 AC 240 V			
Rated speed	n_{rated}	r/min	3000
Rated torque	M_{rated}	Nm	0.64
Rated current	I_{rated}	A	1.38
Rated power	P_{rated}	kW	0.2



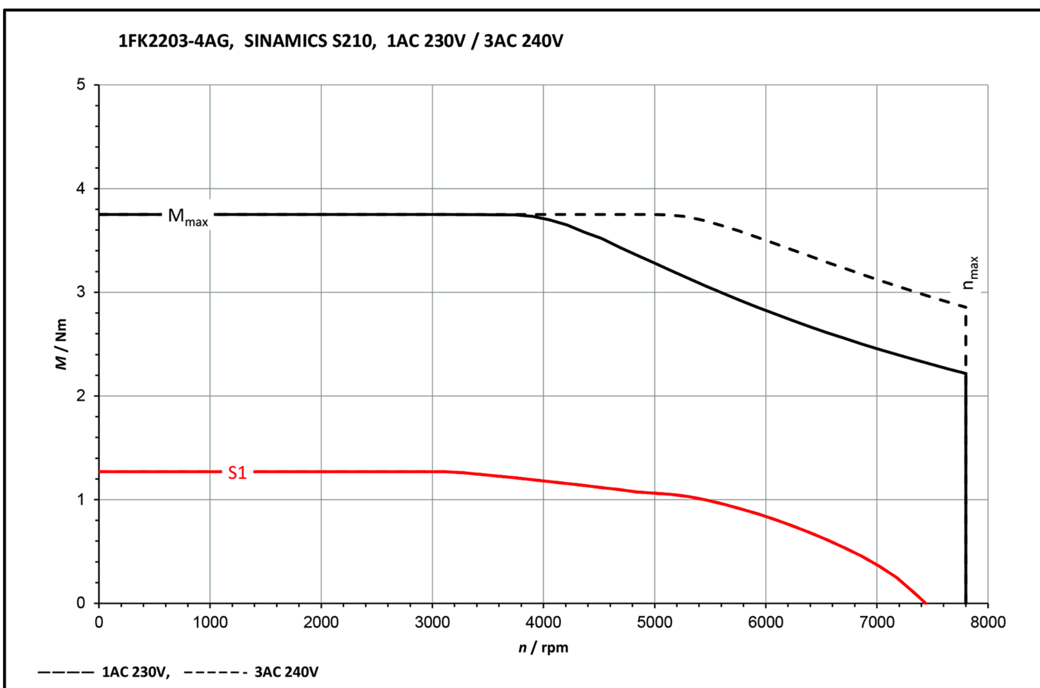
12.2.15.17 1FK2203-2AK connected to 1 AC 230 V / 3 AC 240 V

1FK2203-2AK	For 1 AC 230 V, 3 AC 240 V		
Technical specifications in the SINAMICS S210 system	**Symbol**	**Unit**	**Value**
Static torque	M_0	Nm	0.64
Stall current	I_0	A	1.05
Maximum permissible speed	n_{max}	r/min	8000
Maximum torque	M_{max}	Nm	1.85
Maximum current	I_{max}	A	3.4
Thermal time constant	T_{th}	r/min	21
Rotor moment of inertia	J_{mot}	$kgcm^2$	0.2
Rotor moment of inertia (with brake)	$J_{mot\ br}$	$kgcm^2$	0.22
Weight	m_{mot}	kg	1.16
Weight (with brake)	$m_{mot\ br}$	kg	1.53
Rated data for S210 connected to 1 AC 230 V, 3 AC 240 V			
Rated speed	n_{rated}	r/min	3000
Rated torque	M_{rated}	Nm	0.64
Rated current	I_{rated}	A	1.12
Rated power	P_{rated}	kW	0.2



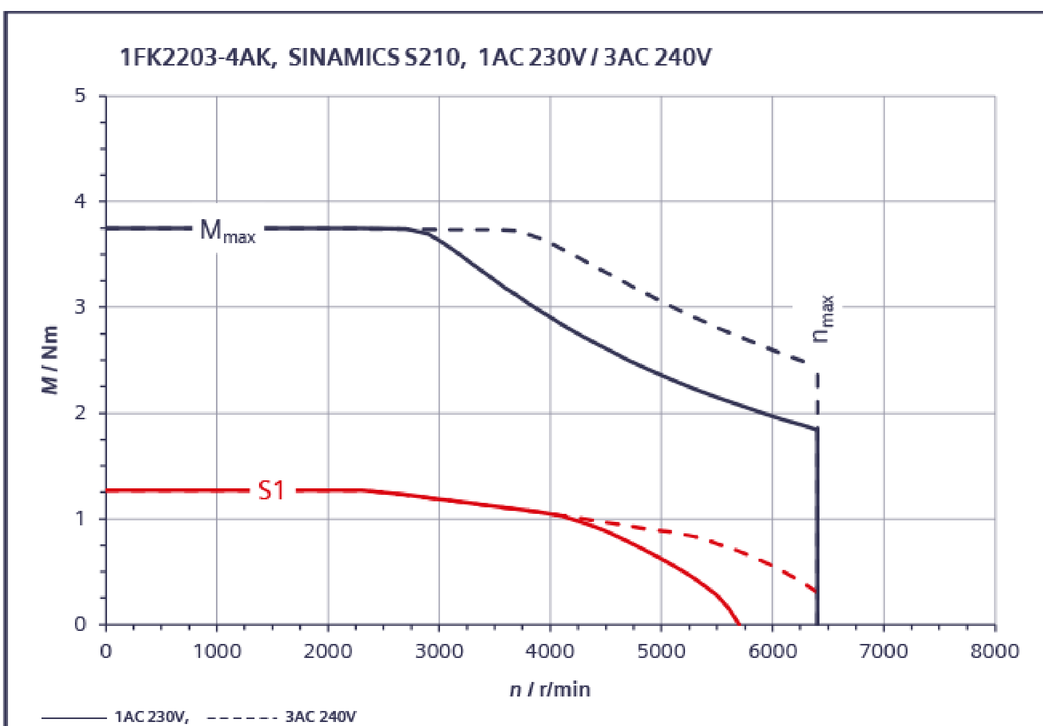
12.2.15.18 1FK2203-4AG connected to 1 AC 230 V / 3 AC 240 V

1FK2203-4AG	**For 1 AC 230 V, 3 AC 240 V**		
Technical specifications in the SINAMICS S210 system	**Symbol**	**Unit**	**Value**
Static torque	M_0	Nm	1.27
Stall current	I_0	A	2.52
Maximum permissible speed	n_{max}	r/min	7800
Maximum torque	M_{max}	Nm	3.75
Maximum current	I_{max}	A	7.8
Thermal time constant	T_{th}	min	28
Rotor moment of inertia	J_{mot}	$kgcm^2$	0.35
Rotor moment of inertia (with brake)	$J_{mot\ br}$	$kgcm^2$	0.37
Weight	m_{mot}	kg	1.48
Weight (with brake)	$m_{mot\ br}$	kg	1.96
Rated data for S210 connected to 1 AC 230 V, 3 AC 240 V			
Rated speed	n_{rated}	r/min	3000
Rated torque	M_{rated}	Nm	1.27
Rated current	I_{rated}	A	2.52
Rated power	P_{rated}	kW	0.4



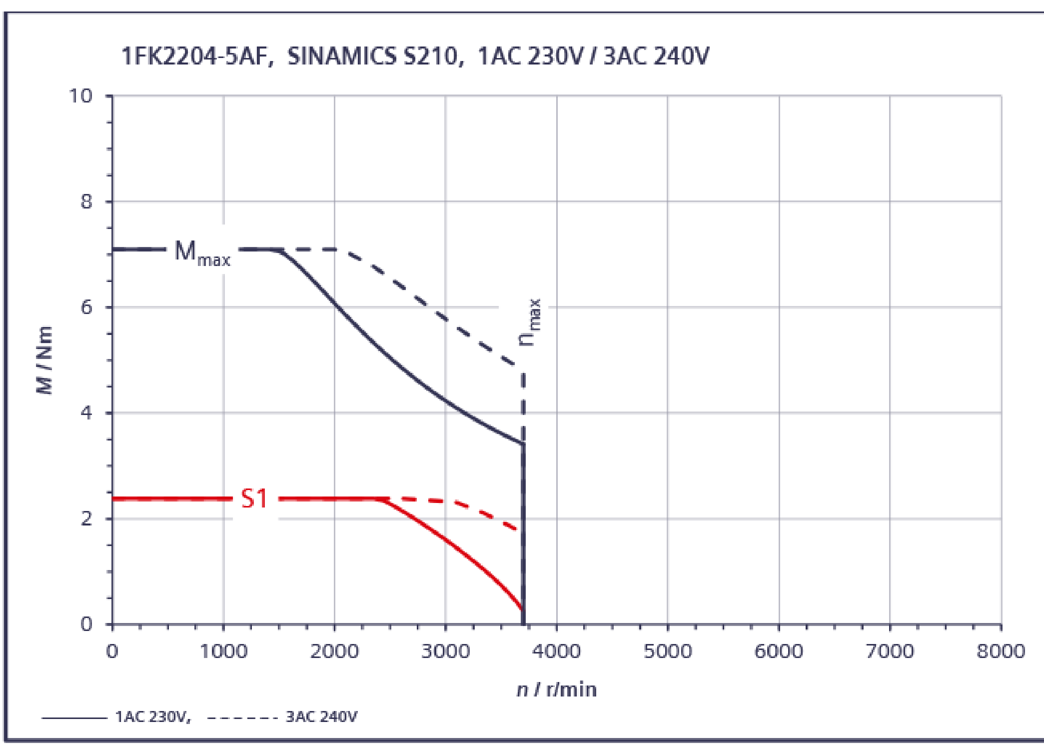
12.2.15.19 1FK2203-4AK connected to 1 AC 230 V / 3 AC 240 V

1FK2203-4AK	For 1 AC 230 V, 3 AC 240 V		
Technical specifications in the SINAMICS S210 system	**Symbol**	**Unit**	**Value**
Static torque	M_0	Nm	1.27
Stall current	I_0	A	2.05
Maximum permissible speed	n_{max}	r/min	8000
Maximum torque	M_{max}	Nm	3.75
Maximum current	I_{max}	A	6.7
Thermal time constant	T_{th}	min	28
Rotor moment of inertia	J_{mot}	$kgcm^2$	0.35
Rotor moment of inertia (with brake)	$J_{mot\ br}$	$kgcm^2$	0.37
Weight	m_{mot}	kg	1.49
Weight (with brake)	$m_{mot\ br}$	kg	1.97
Rated data for S210 connected to 1 AC 230 V, 3 AC 240 V			
Rated speed	n_{rated}	r/min	3000
Rated torque	M_{rated}	Nm	1.19
Rated current	I_{rated}	A	2
Rated power	P_{rated}	kW	0.375



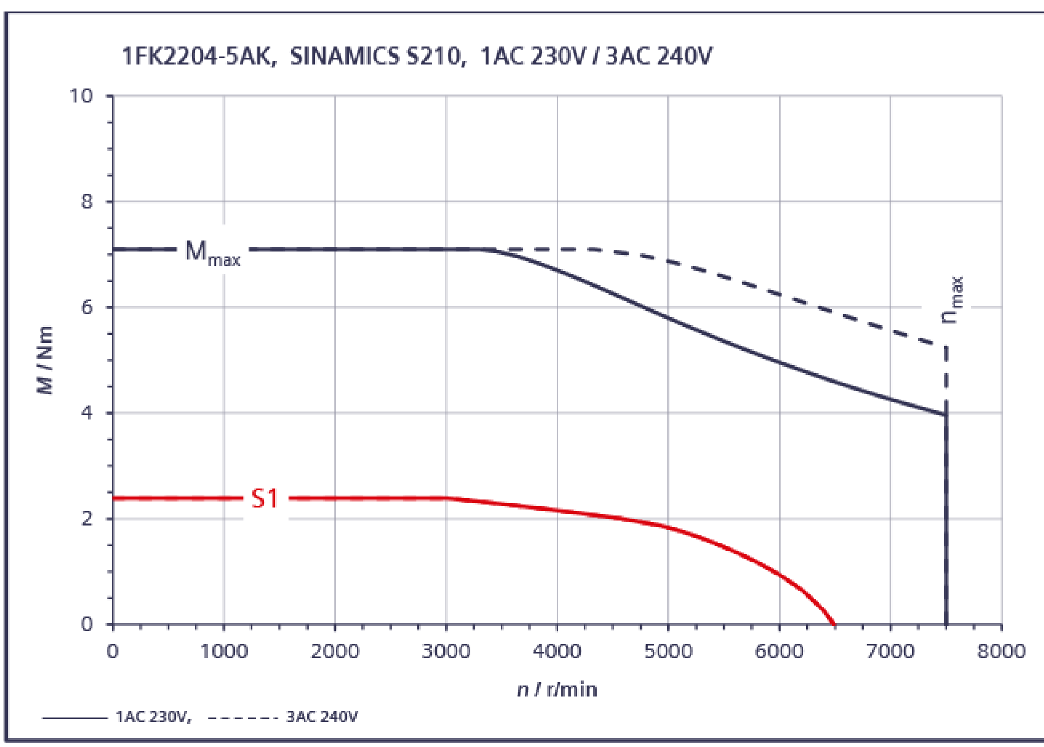
12.2.15.20 1FK2204-5AF connected to 1 AC 230 V / 3 AC 240 V

1FK2204-5AF	For 1 AC 230 V, 3 AC 240 V		
Technical specifications in the SINAMICS S210 system	**Symbol**	**Unit**	**Value**
Static torque	M_0	Nm	2.4
Stall current	I_0	A	2.25
Maximum permissible speed	n_{max}	r/min	3700
Maximum torque	M_{max}	Nm	7.1
Maximum current	I_{max}	A	7.1
Thermal time constant	T_{th}	min	29
Rotor moment of inertia	J_{mot}	$kgcm^2$	1.23
Rotor moment of inertia (with brake)	$J_{mot\ br}$	$kgcm^2$	1.31
Weight	m_{mot}	kg	2.9
Weight (with brake)	$m_{mot\ br}$	kg	3.75
Rated data for S210 connected to 1 AC 230 V, 3 AC 240 V			
Rated speed	n_{rated}	r/min	1500
Rated torque	M_{rated}	Nm	2.4
Rated current	I_{rated}	A	2.25
Rated power	P_{rated}	kW	0.375



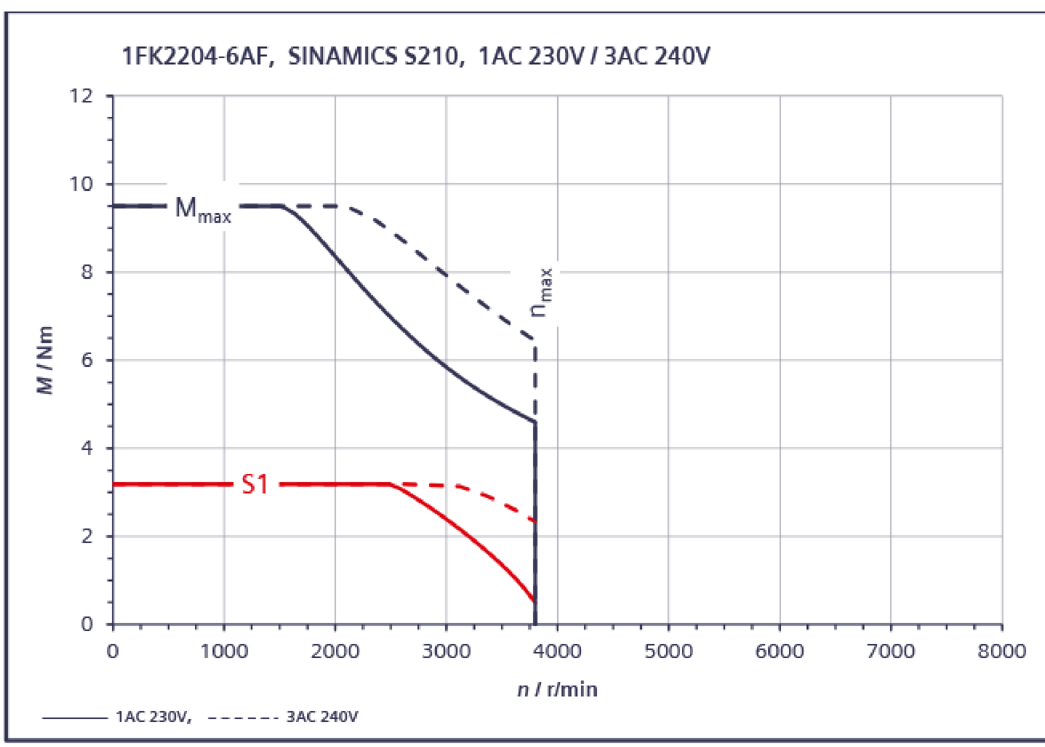
12.2.15.21 1FK2204-5AK connected to 1 AC 230 V / 3 AC 240 V

1FK2204-5AK	**For 1 AC 230 V, 3 AC 240 V**		
Technical specifications in the SINAMICS S210 system	**Symbol**	**Unit**	**Value**
Static torque	M_0	Nm	2.4
Stall current	I_0	A	4.4
Maximum permissible speed	n_{max}	r/min	7500
Maximum torque	M_{max}	Nm	7.1
Maximum current	I_{max}	A	14.2
Thermal time constant	T_{th}	min	29
Rotor moment of inertia	J_{mot}	$kgcm^2$	1.23
Rotor moment of inertia (with brake)	$J_{mot\ br}$	$kgcm^2$	1.31
Weight	m_{mot}	kg	2.9
Weight (with brake)	$m_{mot\ br}$	kg	3.75
Rated data for S210 connected to 1 AC 230 V, 3 AC 240 V			
Rated speed	n_{rated}	r/min	3000
Rated torque	M_{rated}	Nm	2.4
Rated current	I_{rated}	A	4.4
Rated power	P_{rated}	kW	0.75



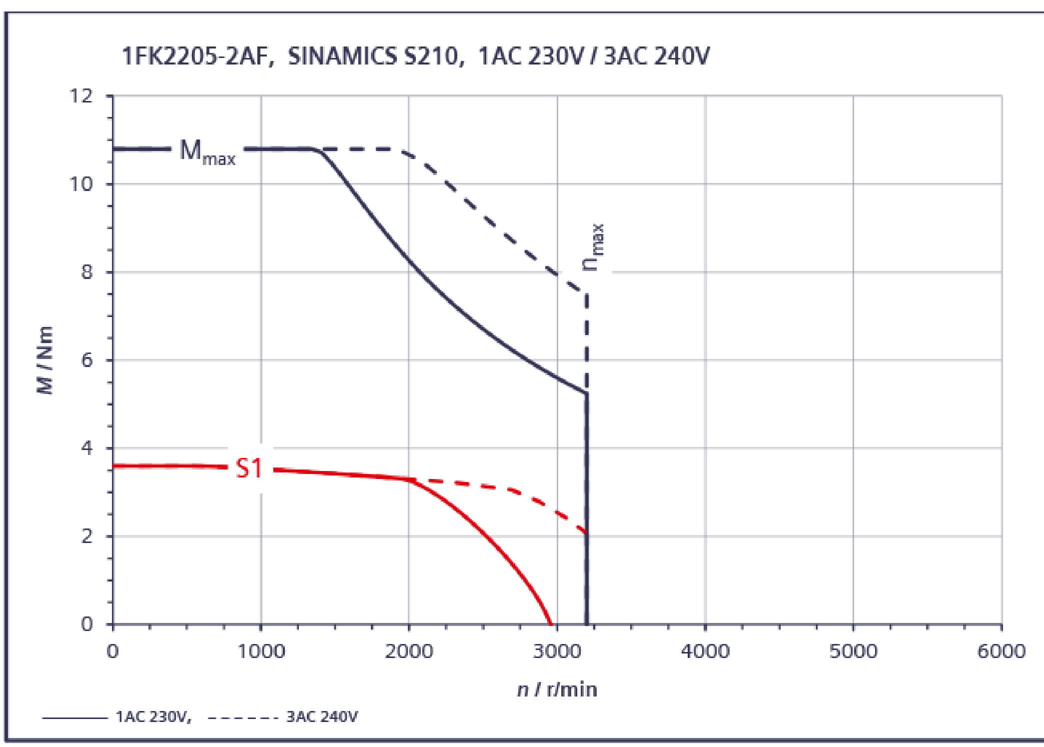
12.2.15.22 1FK2204-6AF connected to 1 AC 230 V / 3 AC 240 V

1FK2204-6AF	**For 1 AC 230 V, 3 AC 240 V**		
Technical specifications in the SINAMICS S210 system	**Symbol**	**Unit**	**Value**
Static torque	M_0	Nm	3.2
Stall current	I_0	A	3
Maximum permissible speed	n_{max}	r/min	3700
Maximum torque	M_{max}	Nm	9.5
Maximum current	I_{max}	A	9.9
Thermal time constant	T_{th}	min	35
Rotor moment of inertia	J_{mot}	$kgcm^2$	1.61
Rotor moment of inertia (with brake)	$J_{mot\ br}$	$kgcm^2$	1.69
Weight	m_{mot}	kg	3.5
Weight (with brake)	$m_{mot\ br}$	kg	4.35
Rated data for S210 connected to 1 AC 230 V, 3 AC 240 V			
Rated speed	n_{rated}	r/min	1500
Rated torque	M_{rated}	Nm	3.2
Rated current	I_{rated}	A	3
Rated power	P_{rated}	kW	0.5



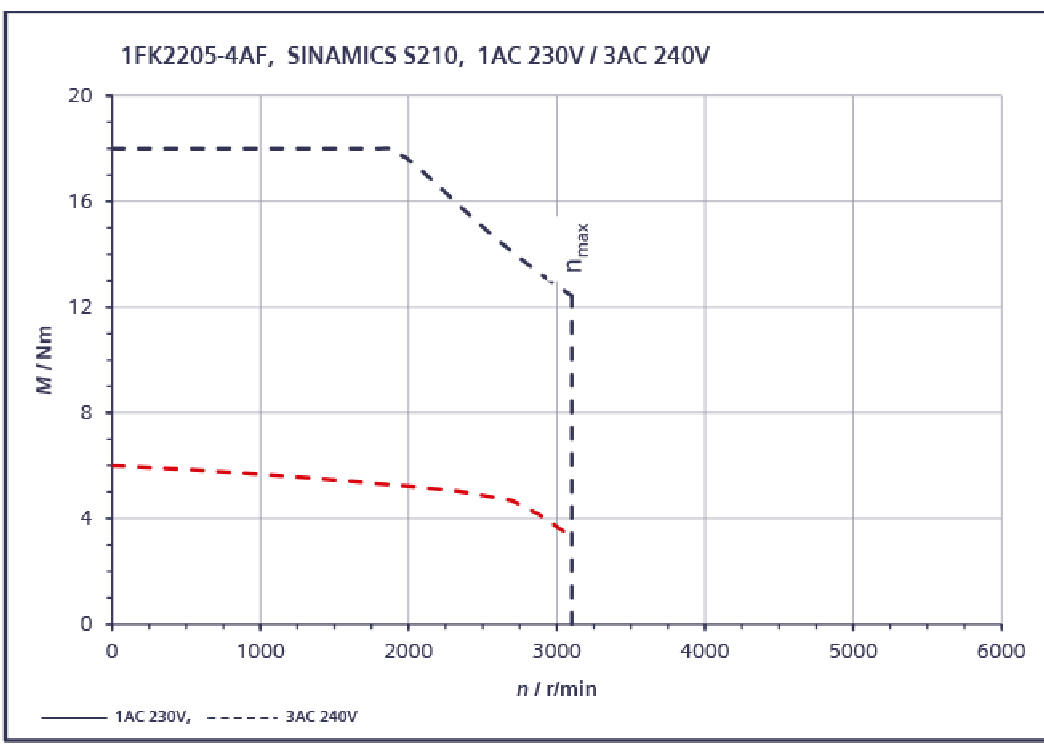
12.2.15.23 1FK2205-2AF connected to 1 AC 230 V / 3 AC 240 V

1FK2205-2AF	For 1 AC 230 V, 3 AC 240 V		
Technical specifications in the SINAMICS S210 system	**Symbol**	**Unit**	**Value**
Static torque	M_0	Nm	3.6
Stall current	I_0	A	2.9
Maximum permissible speed	n_{max}	r/min	3200
Maximum torque	M_{max}	Nm	10.8
Maximum current	I_{max}	A	9.5
Thermal time constant	T_{th}	min	29
Rotor moment of inertia	J_{mot}	$kgcm^2$	3.15
Rotor moment of inertia (with brake)	$J_{mot\ br}$	$kgcm^2$	4.05
Weight	m_{mot}	kg	3.75
Weight (with brake)	$m_{mot\ br}$	kg	4.75
Rated data for S210 connected to 1 AC 230 V, 3 AC 240 V			
Rated speed	n_{rated}	r/min	1500
Rated torque	M_{rated}	Nm	3.4
Rated current	I_{rated}	A	2.8
Rated power	P_{rated}	kW	0.53



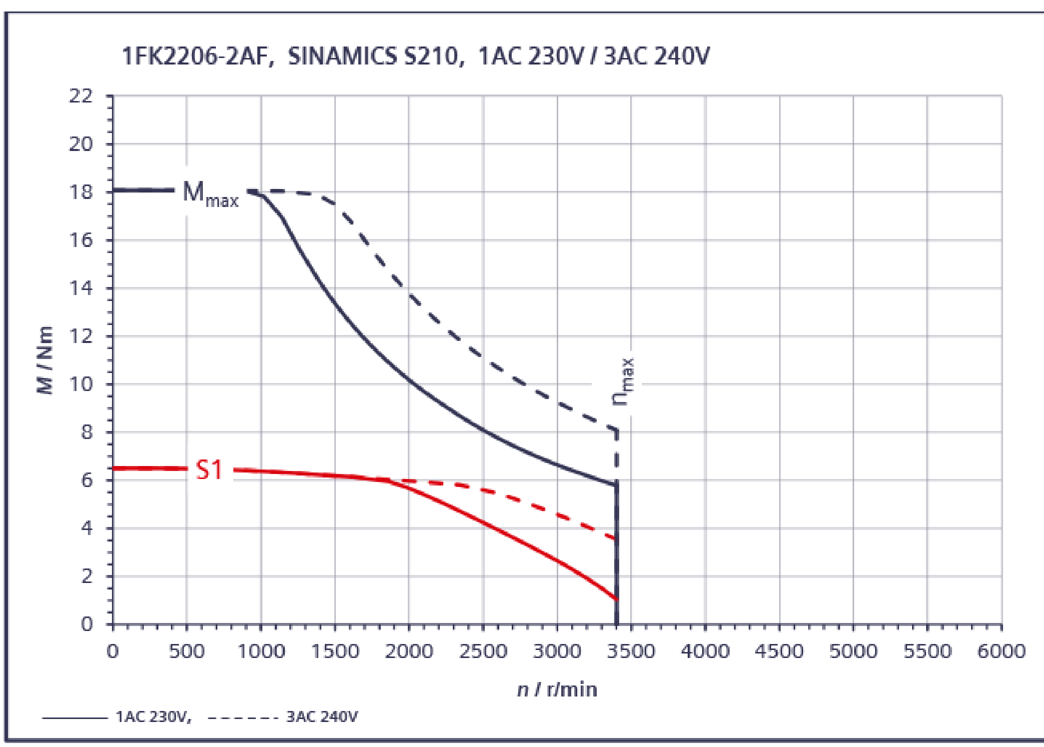
12.2.15.24 1FK2205-4AF connected to 3 AC 240 V

1FK2205-4AF	For 3 AC 240 V		
Technical specifications in the SINAMICS S210 system	**Symbol**	**Unit**	**Value**
Static torque	M_0	Nm	6
Stall current	I_0	A	4.7
Maximum permissible speed	n_{max}	r/min	3100
Maximum torque	M_{max}	Nm	18
Maximum current	I_{max}	A	15.1
Thermal time constant	T_{th}	min	31
Rotor moment of inertia	J_{mot}	$kgcm^2$	5.1
Rotor moment of inertia (with brake)	$J_{mot\ br}$	$kgcm^2$	6
Weight	m_{mot}	kg	5.2
Weight (with brake)	$m_{mot\ br}$	kg	6.2
Rated data for S210 connected to 3 AC 240 V			
Rated speed	n_{rated}	r/min	1500
Rated torque	M_{rated}	Nm	5.5
Rated current	I_{rated}	A	4.35
Rated power	P_{rated}	kW	0.86



12.2.15.25 1FK2206-2AF connected to 1 AC 230 V / 3 AC 240 V

1FK2206-2AF	For 3 AC 240 V		
Technical specifications in the SINAMICS S210 system	**Symbol**	**Unit**	**Value**
Static torque	M_0	Nm	6.5
Stall current	I_0	A	5
Maximum permissible speed	n_{max}	r/min	3400
Maximum torque	M_{max}	Nm	18
Maximum current	I_{max}	A	17.8
Thermal time constant	T_{th}	min	21
Rotor moment of inertia	J_{mot}	$kgcm^2$	7.8
Rotor moment of inertia (with brake)	$J_{mot\ br}$	$kgcm^2$	9.4
Weight	m_{mot}	kg	6.3
Weight (with brake)	$m_{mot\ br}$	kg	7.9
Rated data for S210 connected to 3 AC 240 V			
Rated speed	n_{rated}	r/min	1500
Rated torque	M_{rated}	Nm	6.1
Rated current	I_{rated}	A	4.8
Rated power	P_{rated}	kW	0.97



12.2.15.26 1FK2206-4AF connected to 240 V 3 AC

1FK2206-4AF	**For 3 AC 240 V**		
Technical specifications in the SINAMICS S210 system	**Symbol**	**Unit**	**Value**
Static torque	M_0	Nm	12
Stall current	I_0	A	7.9
Maximum permissible speed	n_{max}	r/min	2900
Maximum torque	M_{max}	Nm	36
Maximum current	I_{max}	A	29.5
Thermal time constant	T_{th}	min	24
Rotor moment of inertia	J_{mot}	$kgcm^2$	15.1
Rotor moment of inertia (with brake)	$J_{mot\ br}$	$kgcm^2$	16.8
Weight	m_{mot}	kg	8.9
Weight (with brake)	$m_{mot\ br}$	kg	10.6
Rated data for S210 connected to 3 AC 240 V			
Rated speed	n_{rated}	r/min	1500
Rated torque	M_{rated}	Nm	10.9
Rated current	I_{rated}	A	7.3
Rated power	P_{rated}	kW	1.72

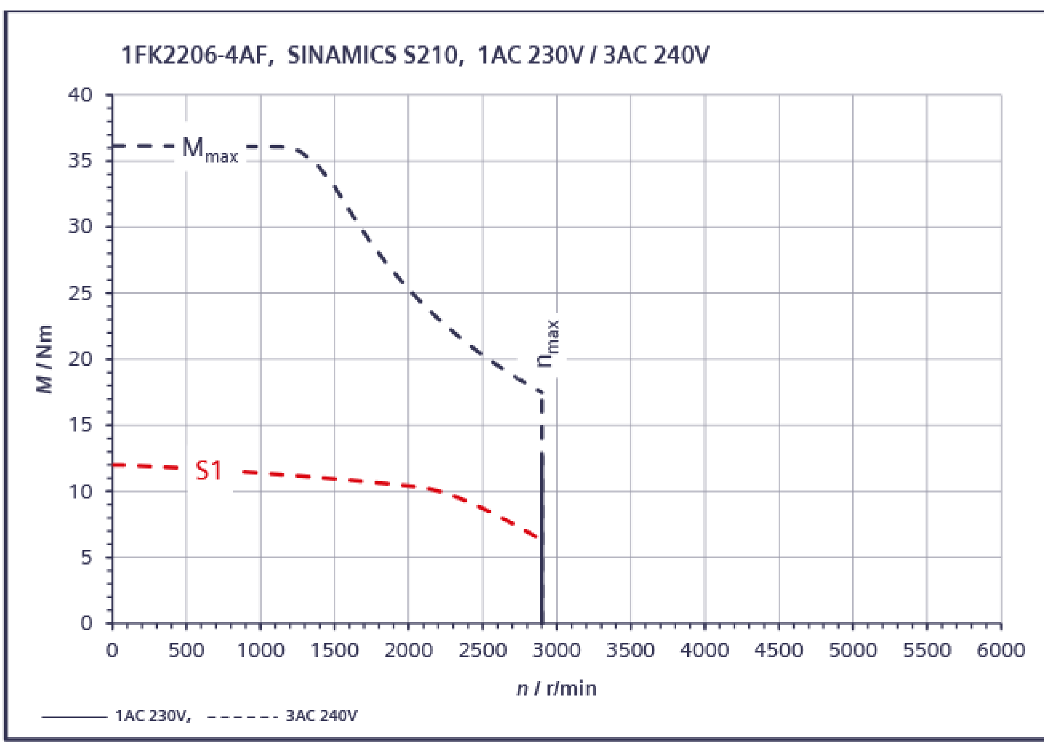
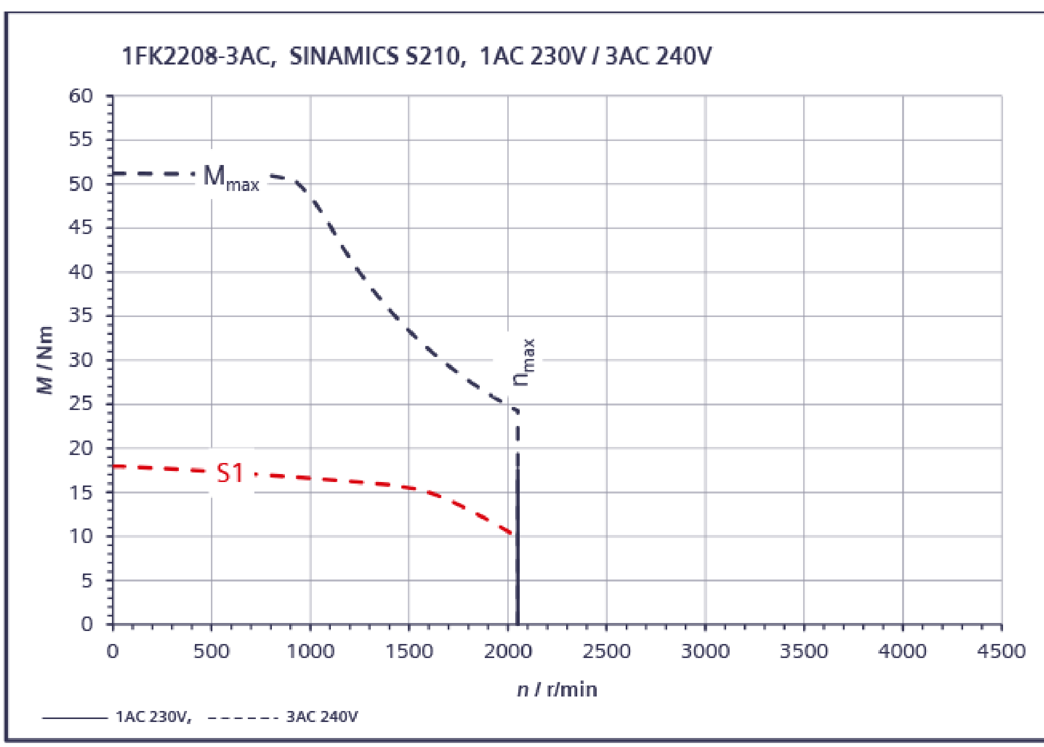


Figure 12-8 1FK2206-4AF_230V

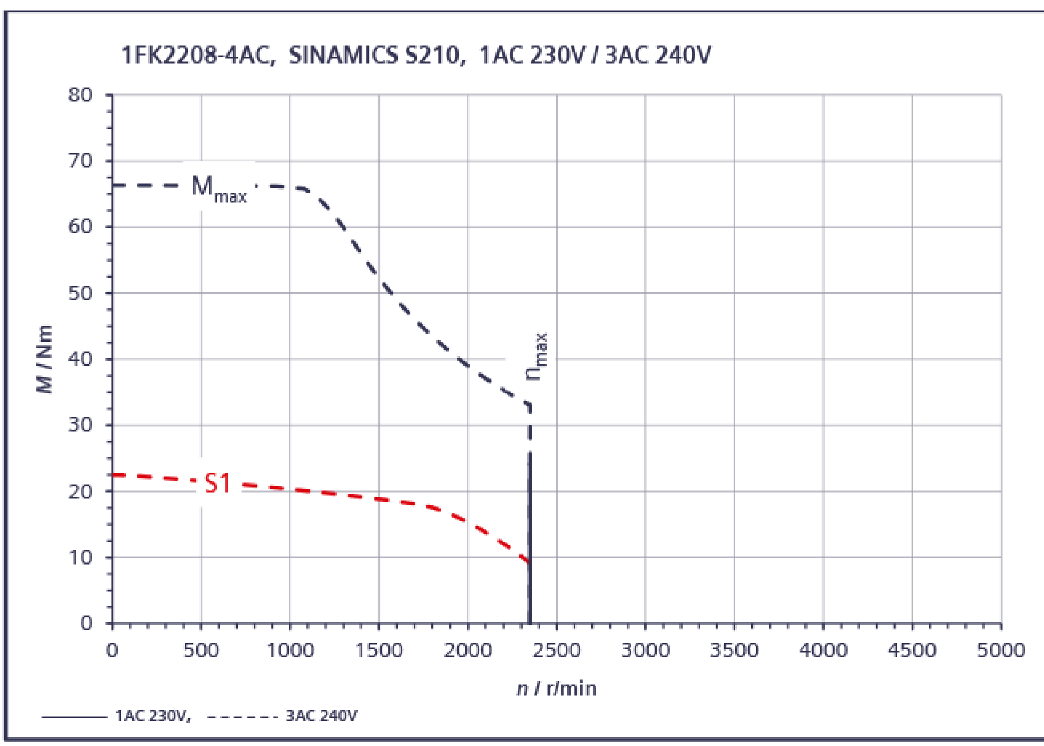
12.2.15.27 1FK2208-3AC connected to 3 AC 240 V

1FK2208-3AC	For 3 AC 240 V		
Technical specifications in the SINAMICS S210 system	**Symbol**	**Unit**	**Value**
Static torque	M_0	Nm	18
Stall current	I_0	A	8.4
Maximum permissible speed	n_{max}	r/min	2050
Maximum torque	M_{max}	Nm	51
Maximum current	I_{max}	A	29.5
Thermal time constant	T_{th}	min	26
Rotor moment of inertia	J_{mot}	$kgcm^2$	29.6
Rotor moment of inertia (with brake)	$J_{mot\ br}$	$kgcm^2$	32.6
Weight	m_{mot}	kg	12.6
Weight (with brake)	$m_{mot\ br}$	kg	14.6
Rated data for S210 connected to 3 AC 240 V			
Rated speed	n_{rated}	r/min	1000
Rated torque	M_{rated}	Nm	16.6
Rated current	I_{rated}	A	7.9
Rated power	P_{rated}	kW	1.74



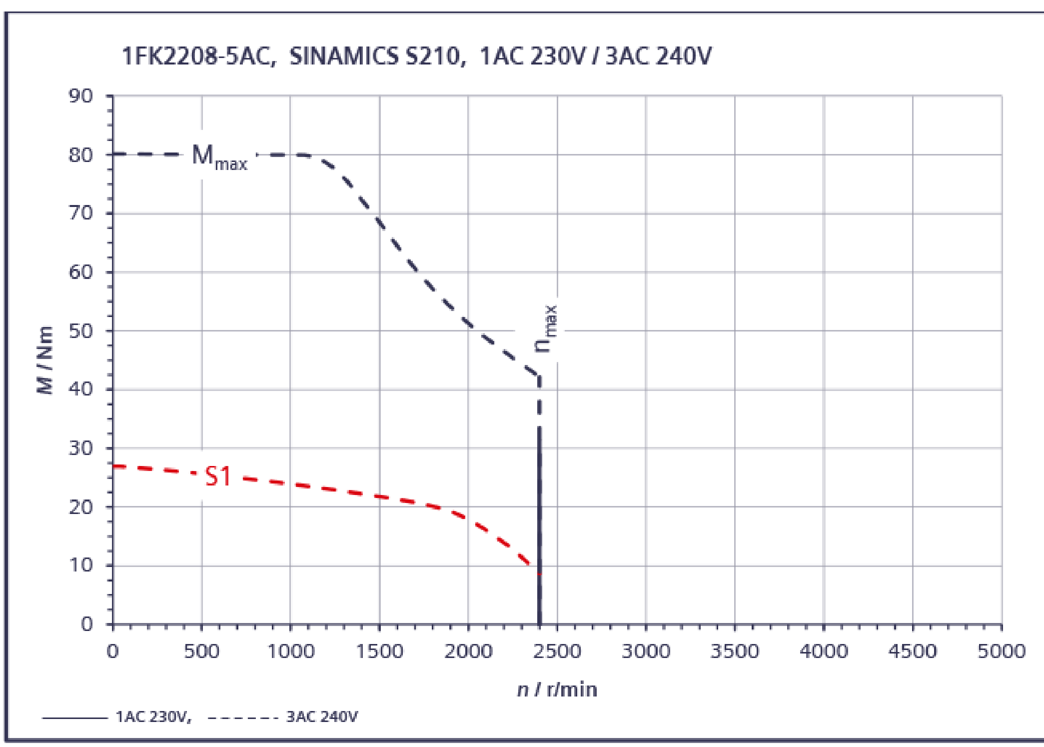
12.2.15.28 1FK2208-4AC connected to 3 AC 240 V

1FK2208-4AC	For 3 AC 240 V		
Technical specifications in the SINAMICS S210 system	**Symbol**	**Unit**	**Value**
Static torque	M_0	Nm	22
Stall current	I_0	A	11.7
Maximum permissible speed	n_{max}	r/min	2300
Maximum torque	M_{max}	Nm	66
Maximum current	I_{max}	A	43.5
Thermal time constant	T_{th}	min	28
Rotor moment of inertia	J_{mot}	$kgcm^2$	38.8
Rotor moment of inertia (with brake)	$J_{mot\ br}$	$kgcm^2$	44.4
Weight	m_{mot}	kg	14.6
Weight (with brake)	$m_{mot\ br}$	kg	17.3
Rated data for S210 connected to 3 AC 240 V			
Rated speed	n_{rated}	r/min	1000
Rated torque	M_{rated}	Nm	20
Rated current	I_{rated}	A	10.9
Rated power	P_{rated}	kW	2.15



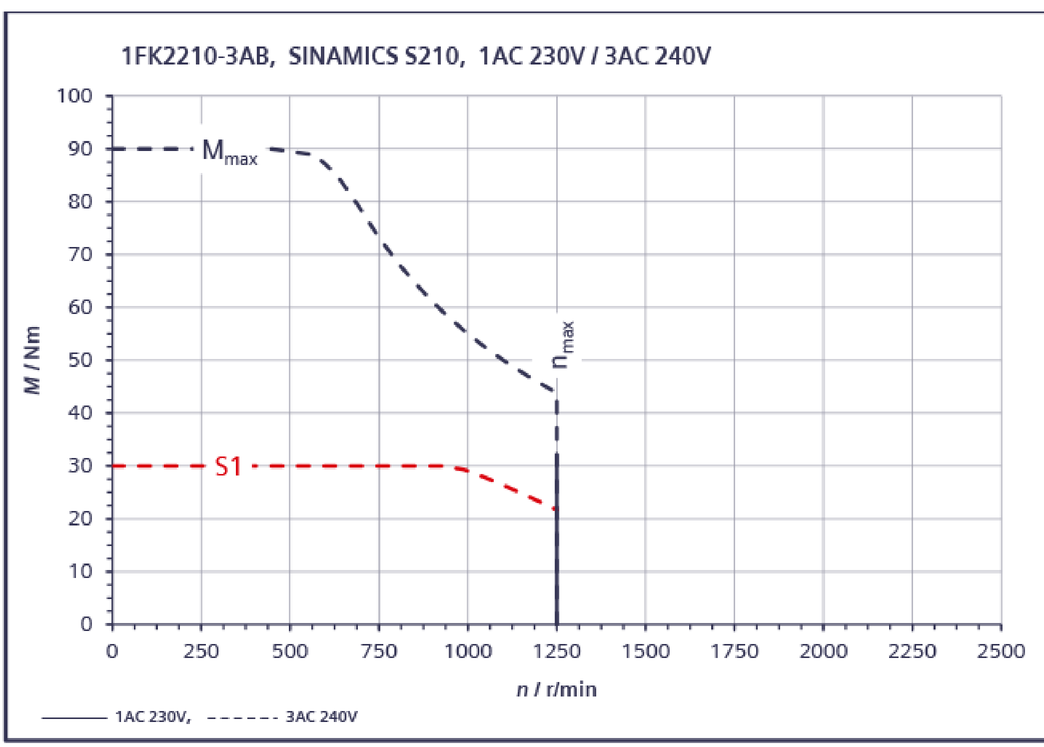
12.2.15.29 1FK2208-5AC connected to 3 AC 240 V

1FK2208-5AC	For 3 AC 240 V		
Technical specifications in the SINAMICS S210 system	**Symbol**	**Unit**	**Value**
Static torque	M_0	Nm	27
Stall current	I_0	A	14.6
Maximum permissible speed	n_{max}	r/min	2350
Maximum torque	M_{max}	Nm	80
Maximum current	I_{max}	A	51.5
Thermal time constant	T_{th}	min	30
Rotor moment of inertia	J_{mot}	$kgcm^2$	48.1
Rotor moment of inertia (with brake)	$J_{mot\ br}$	$kgcm^2$	53.6
Weight	m_{mot}	kg	16.6
Weight (with brake)	$m_{mot\ br}$	kg	19.3
Rated data for S210 connected to 3 AC 240 V			
Rated speed	n_{rated}	r/min	1000
Rated torque	M_{rated}	Nm	23.5
Rated current	I_{rated}	A	13.2
Rated power	P_{rated}	kW	2.5



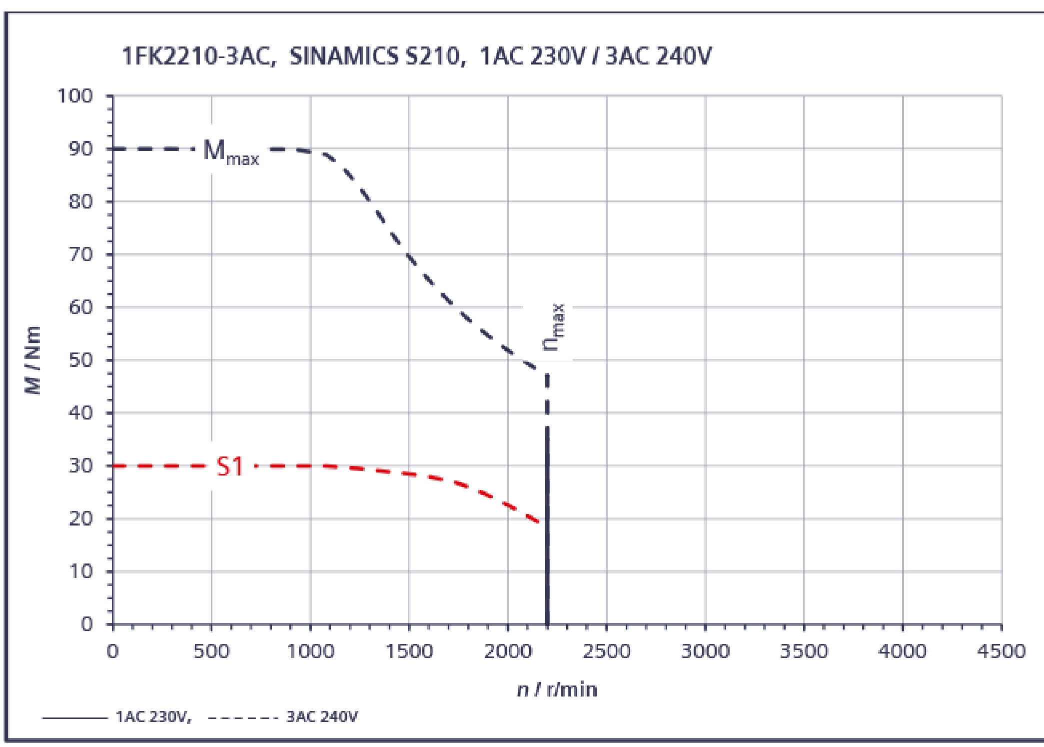
12.2.15.30 1FK2210-3AB connected to 240 V 3 AC

1FK2210-3AB	For 3 AC 240 V		
Technical specifications in the SINAMICS S210 system	**Symbol**	**Unit**	**Value**
Static torque	M_0	Nm	30
Stall current	I_0	A	8.5
Maximum permissible speed	n_{max}	r/min	1250
Maximum torque	M_{max}	Nm	90
Maximum current	I_{max}	A	31.5
Thermal time constant	T_{th}	min	33
Rotor moment of inertia	J_{mot}	$kgcm^2$	88.8
Rotor moment of inertia (with brake)	$J_{mot\ br}$	$kgcm^2$	94.8
Weight	m_{mot}	kg	22
Weight (with brake)	$m_{mot\ br}$	kg	25
Rated data for S210 connected to 3 AC 240 V			
Rated speed	n_{rated}	r/min	750
Rated torque	M_{rated}	Nm	30
Rated current	I_{rated}	A	8.6
Rated power	P_{rated}	kW	2.5



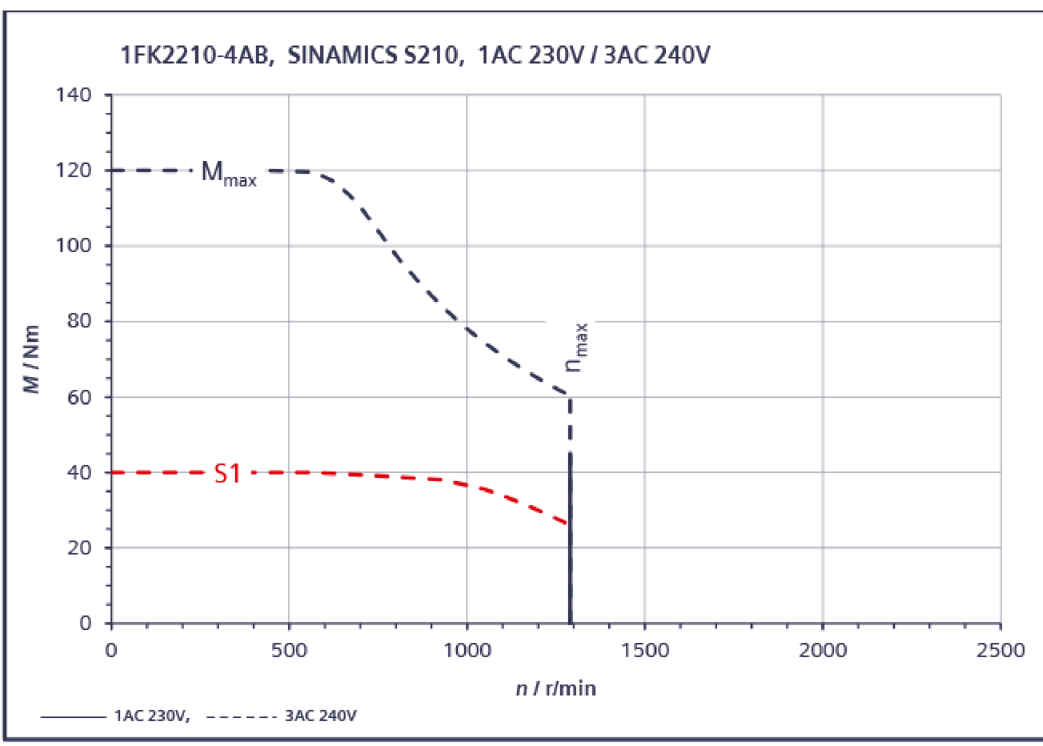
12.2.15.31 1FK2210-3AC connected to 240 V 3 AC

1FK2210-3AC	For 3 AC 240 V		
Technical specifications in the SINAMICS S210 system	**Symbol**	**Unit**	**Value**
Static torque	M_0	Nm	30
Stall current	I_0	A	15
Maximum permissible speed	n_{max}	r/min	2200
Maximum torque	M_{max}	Nm	90
Maximum current	I_{max}	A	55
Thermal time constant	T_{th}	min	33
Rotor moment of inertia	J_{mot}	$kgcm^2$	88.8
Rotor moment of inertia (with brake)	$J_{mot\ br}$	$kgcm^2$	94.8
Weight	m_{mot}	kg	22
Weight (with brake)	$m_{mot\ br}$	kg	25
Rated data for S210 connected to 3 AC 240 V			
Rated speed	n_{rated}	r/min	1000
Rated torque	M_{rated}	Nm	30
Rated current	I_{rated}	A	15.5
Rated power	P_{rated}	kW	3.2



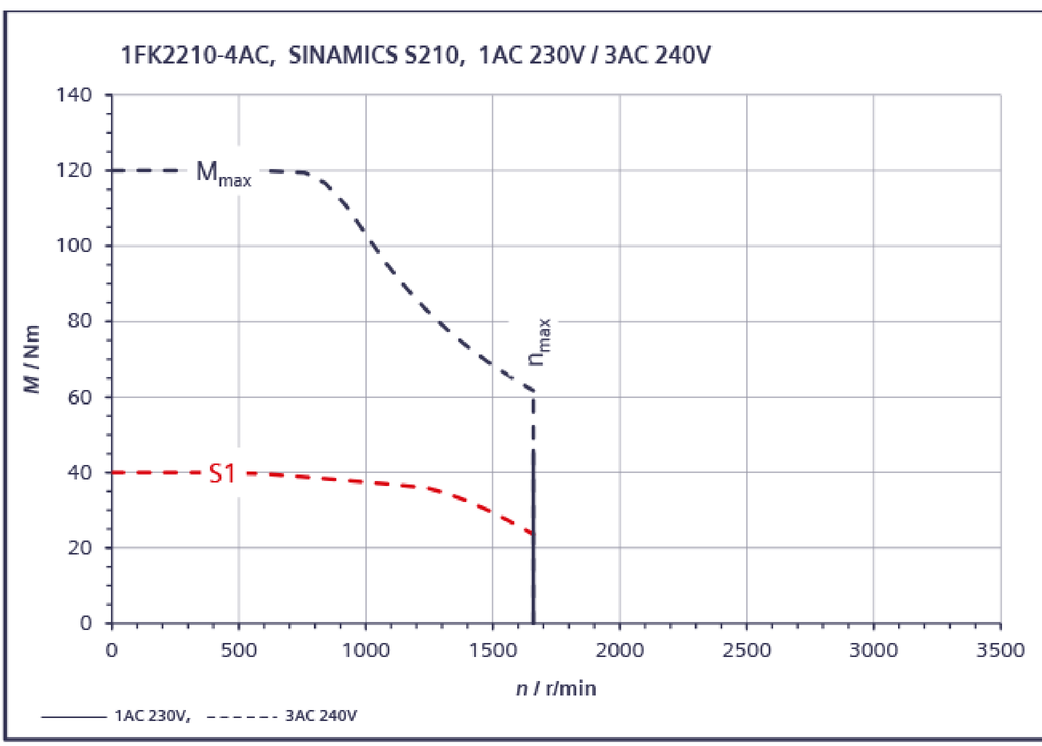
12.2.15.32 1FK2210-4AB connected to 240 V 3 AC

1FK2210-4AB	**For 3 AC 240 V**		
Technical specifications in the SINAMICS S210 system	**Symbol**	**Unit**	**Value**
Static torque	M_0	Nm	40
Stall current	I_0	A	11.8
Maximum permissible speed	n_{max}	r/min	1250
Maximum torque	M_{max}	Nm	120
Maximum current	I_{max}	A	43.5
Thermal time constant	T_{th}	min	35
Rotor moment of inertia	J_{mot}	$kgcm^2$	117
Rotor moment of inertia (with brake)	$J_{mot\ br}$	$kgcm^2$	133
Weight	m_{mot}	kg	27
Weight (with brake)	$m_{mot\ br}$	kg	31
Rated data for S210 connected to 3 AC 240 V			
Rated speed	n_{rated}	r/min	750
Rated torque	M_{rated}	Nm	39
Rated current	I_{rated}	A	11.6
Rated power	P_{rated}	kW	3.05



12.2.15.33 1FK2210-4AC connected to 240 V 3 AC

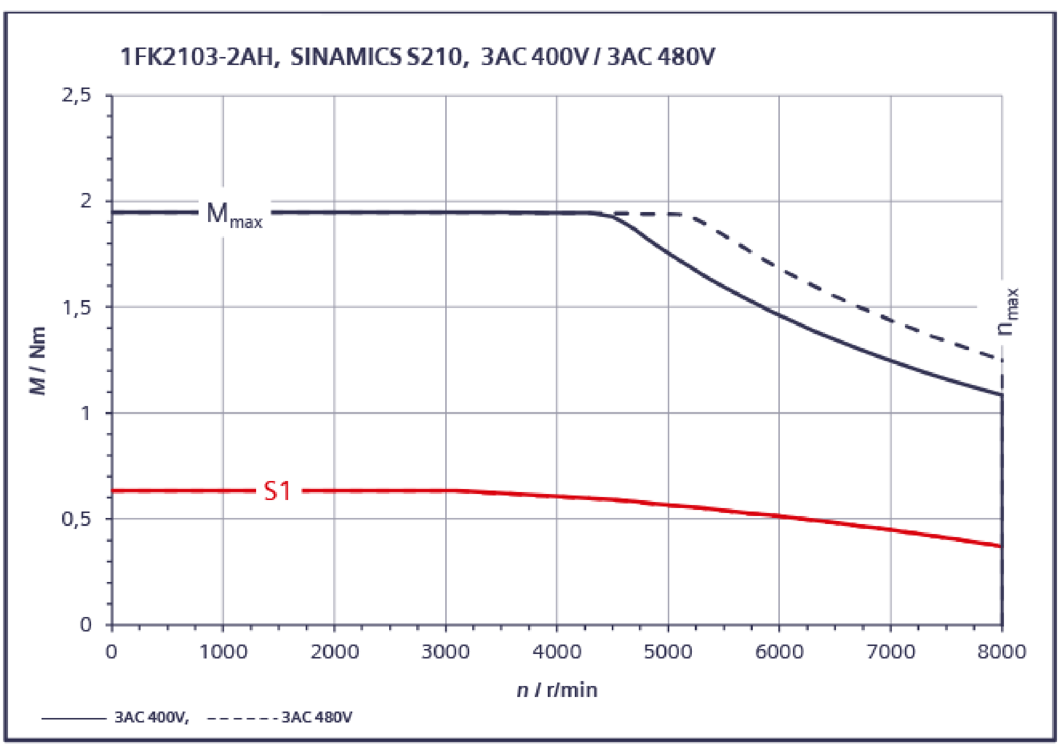
1FK2210-4AC	**For 3 AC 240 V**		
Technical specifications in the SINAMICS S210 system	**Symbol**	**Unit**	**Value**
Static torque	M_0	Nm	40
Stall current	I_0	A	15
Maximum permissible speed	n_{max}	r/min	1650
Maximum torque	M_{max}	Nm	120
Maximum current	I_{max}	A	55
Thermal time constant	T_{th}	min	35
Rotor moment of inertia	J_{mot}	$kgcm^2$	117
Rotor moment of inertia (with brake)	$J_{mot\ br}$	$kgcm^2$	133
Weight	m_{mot}	kg	27
Weight (with brake)	$m_{mot\ br}$	kg	31
Rated data for S210 connected to 3 AC 240 V			
Rated speed	n_{rated}	r/min	1000
Rated torque	M_{rated}	Nm	37
Rated current	I_{rated}	A	14.3
Rated power	P_{rated}	kW	3.9



12.2.16 Technical data and characteristics of the 1FK2 connected to 3 AC 400 V, 3 AC 480 V, naturally cooled

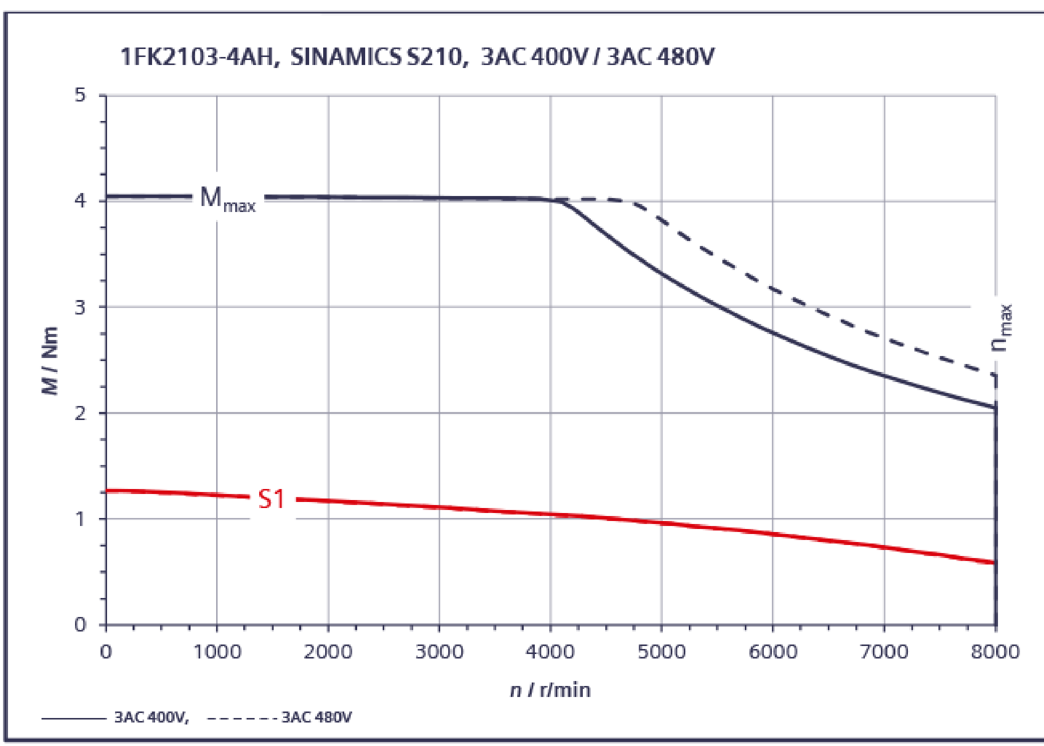
12.2.16.1 1FK2103-2AH connected to 3 AC 400 V / 3 AC 480 V

1FK2103-2AH	For 3 AC 400 V, 3 AC 480 V		
Technical specifications in the SINAMICS S210 system	**Symbol**	**Unit**	**Value**
Static torque	M_0	Nm	0.64
Stall current	I_0	A	1.06
Maximum permissible speed	n_{max}	r/min	8000
Maximum torque	M_{max}	Nm	1.95
Maximum current	I_{max}	A	3.95
Thermal time constant	T_{th}	min	17
Rotor moment of inertia	J_{mot}	$kgcm^2$	0.093
Rotor moment of inertia (with brake)	$J_{mot\ br}$	$kgcm^2$	0.112
Weight	m_{mot}	kg	1.18
Weight (with brake)	$m_{mot\ br}$	kg	1.55
Rated data for S210 connected to 3 AC 400 V, 3 AC 480 V			
Rated speed	n_{rated}	r/min	4500
Rated torque	M_{rated}	Nm	0.59
Rated current	I_{rated}	A	1.05
Rated power	P_{rated}	kW	0.28



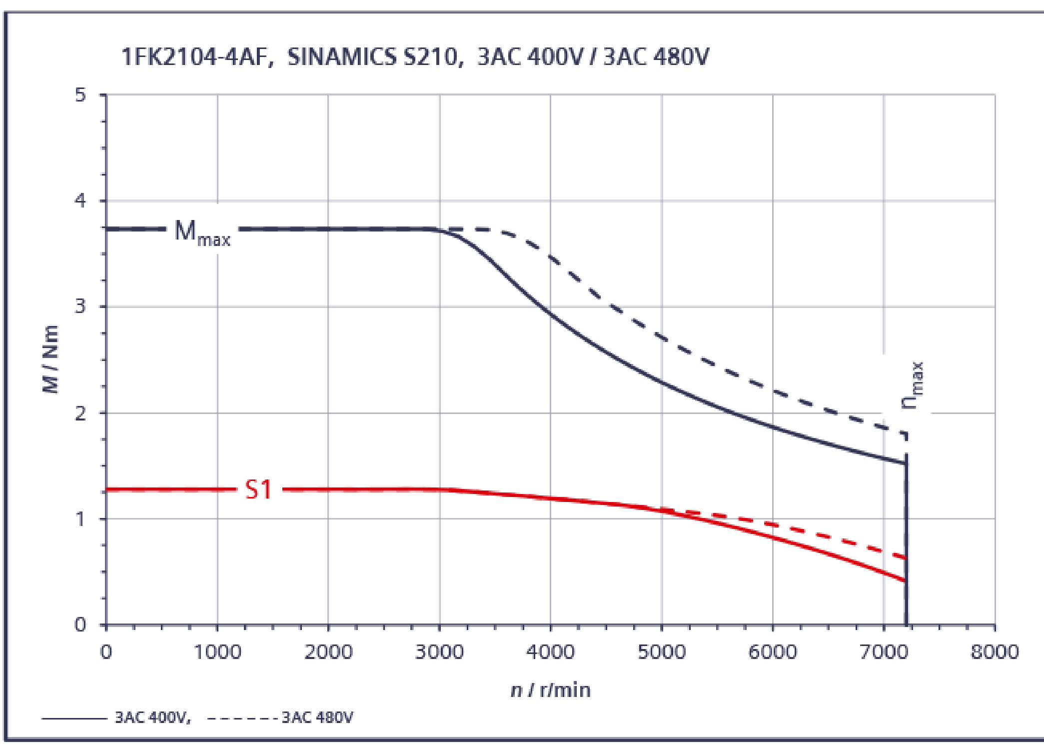
12.2.16.2 1FK2103-4AH connected to 3 AC 400V / 3 AC 480 V

1FK2103-4AH	For 3 AC 400 V, 3 AC 480 V		
Technical specifications in the SINAMICS S210 system	**Symbol**	**Unit**	**Value**
Static torque	M_0	Nm	1.27
Stall current	I_0	A	1.87
Maximum permissible speed	n_{max}	r/min	8000
Maximum torque	M_{max}	Nm	4.05
Maximum current	I_{max}	A	7.1
Thermal time constant	T_{th}	min	21
Rotor moment of inertia	J_{mot}	$kgcm^2$	0.139
Rotor moment of inertia (with brake)	$J_{mot\ br}$	$kgcm^2$	0.158
Weight	m_{mot}	kg	1.65
Weight (with brake)	$m_{mot\ br}$	kg	1.99
Rated data for S210 connected to 3 AC 230 V, 3 AC 480 V			
Rated speed	n_{rated}	r/min	4500
Rated torque	M_{rated}	Nm	1.01
Rated current	I_{rated}	A	1.56
Rated power	P_{rated}	kW	0.48



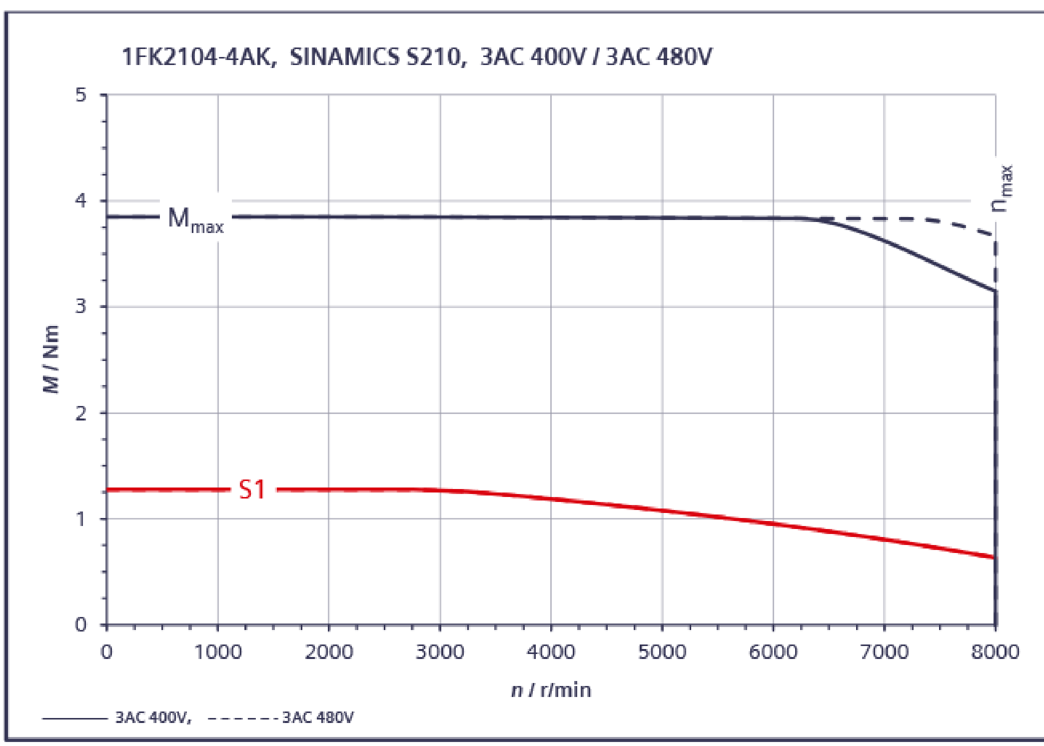
12.2.16.3 1FK2104-4AF connected to 3 AC 400 V / 3 AC 480 V

1FK2104-4AF	For 3 AC 400 V, 3 AC 480 V		
Technical specifications in the SINAMICS S210 system	**Symbol**	**Unit**	**Value**
Static torque	M_0	Nm	1.27
Stall current	I_0	A	1.19
Maximum permissible speed	n_{max}	r/min	7200
Maximum torque	M_{max}	Nm	3.75
Maximum current	I_{max}	A	4.2
Thermal time constant	T_{th}	min	33
Rotor moment of inertia	J_{mot}	$kgcm^2$	0.35
Rotor moment of inertia (with brake)	$J_{mot\ br}$	$kgcm^2$	0.43
Weight	m_{mot}	kg	2.05
Weight (with brake)	$m_{mot\ br}$	kg	2.9
Rated data for S210 connected to 3 AC 400 V, 3 AC 480 V			
Rated speed	n_{rated}	r/min	3000
Rated torque	M_{rated}	Nm	1.27
Rated current	I_{rated}	A	1.19
Rated power	P_{rated}	kW	0.4



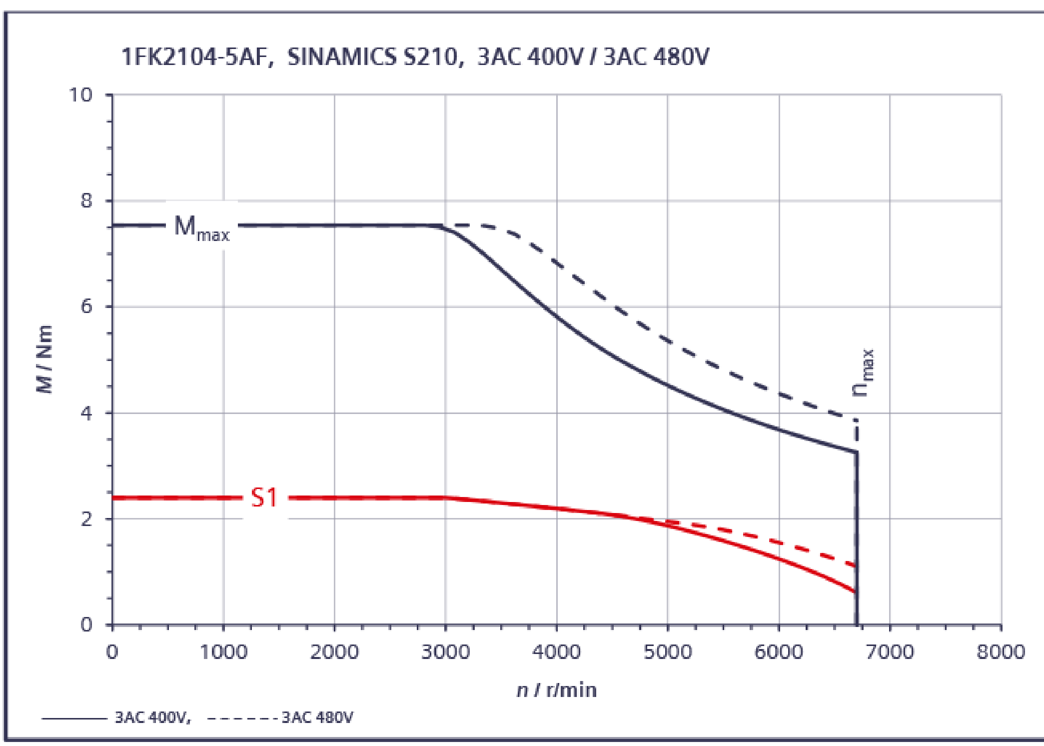
12.2.16.4 1FK2104-4AK connected to 3 AC 400 V / 3 AC 480 V

1FK2104-4AK	For 3 AC 400 V, 3 AC 480 V		
Technical specifications in the SINAMICS S210 system	**Symbol**	**Unit**	**Value**
Static torque	M_0	Nm	1.27
Stall current	I_0	A	2.4
Maximum permissible speed	n_{max}	r/min	8000
Maximum torque	M_{max}	Nm	3.85
Maximum current	I_{max}	A	8.7
Thermal time constant	T_{th}	min	33
Rotor moment of inertia	J_{mot}	$kgcm^2$	0.35
Rotor moment of inertia (with brake)	$J_{mot\ br}$	$kgcm^2$	0.43
Weight	m_{mot}	kg	2.05
Weight (with brake)	$m_{mot\ br}$	kg	2.9
Rated data for S210 connected to 3 AC 400 V, 3 AC 480 V			
Rated speed	n_{rated}	r/min	6000
Rated torque	M_{rated}	Nm	0.95
Rated current	I_{rated}	A	1.88
Rated power	P_{rated}	kW	0.6



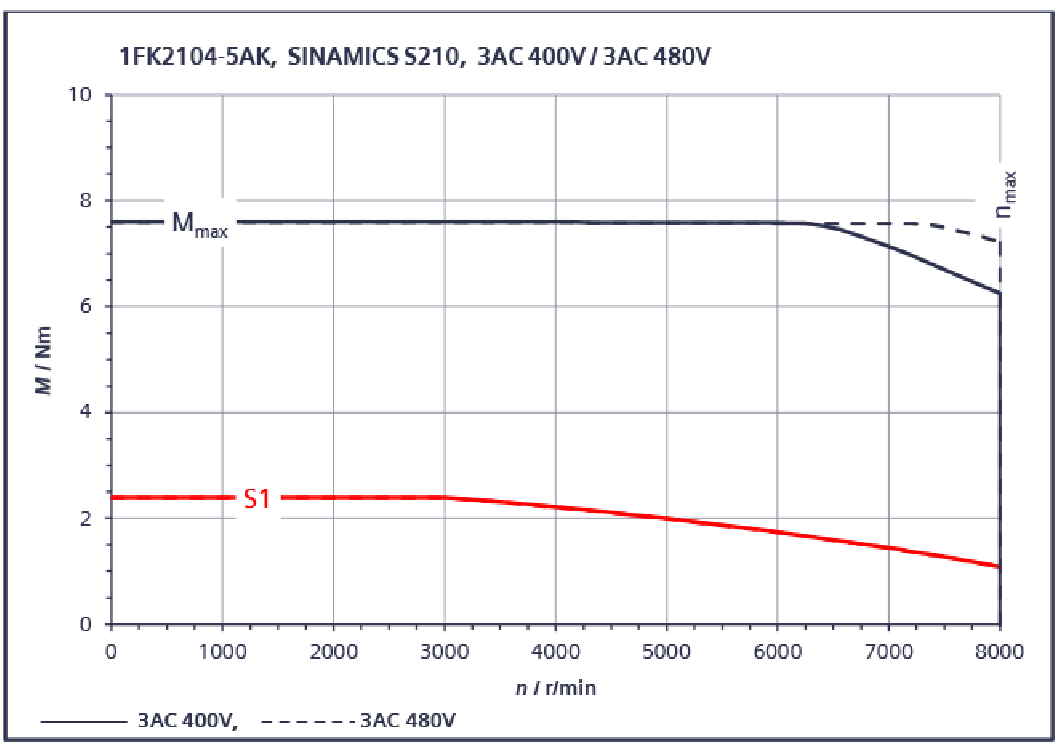
12.2.16.5 1FK2104-5AF connected to 3 AC 400 V / 3 AC 480 V

1FK2104-5AF	For 3 AC 400 V, 3 AC 480 V		
Technical specifications in the SINAMICS S210 system	**Symbol**	**Unit**	**Value**
Static torque	M_0	Nm	2.4
Stall current	I_0	A	2.1
Maximum permissible speed	n_{max}	r/min	6700
Maximum torque	M_{max}	Nm	7.5
Maximum current	I_{max}	A	7.6
Thermal time constant	T_{th}	min	35
Rotor moment of inertia	J_{mot}	$kgcm^2$	0.56
Rotor moment of inertia (with brake)	$J_{mot\ br}$	$kgcm^2$	0.65
Weight	m_{mot}	kg	2.85
Weight (with brake)	$m_{mot\ br}$	kg	3.7
Rated data for S210 connected to 3 AC 400 V, 3 AC 480 V			
Rated speed	n_{rated}	r/min	3000
Rated torque	M_{rated}	Nm	2.4
Rated current	I_{rated}	A	2.1
Rated power	P_{rated}	kW	0.75



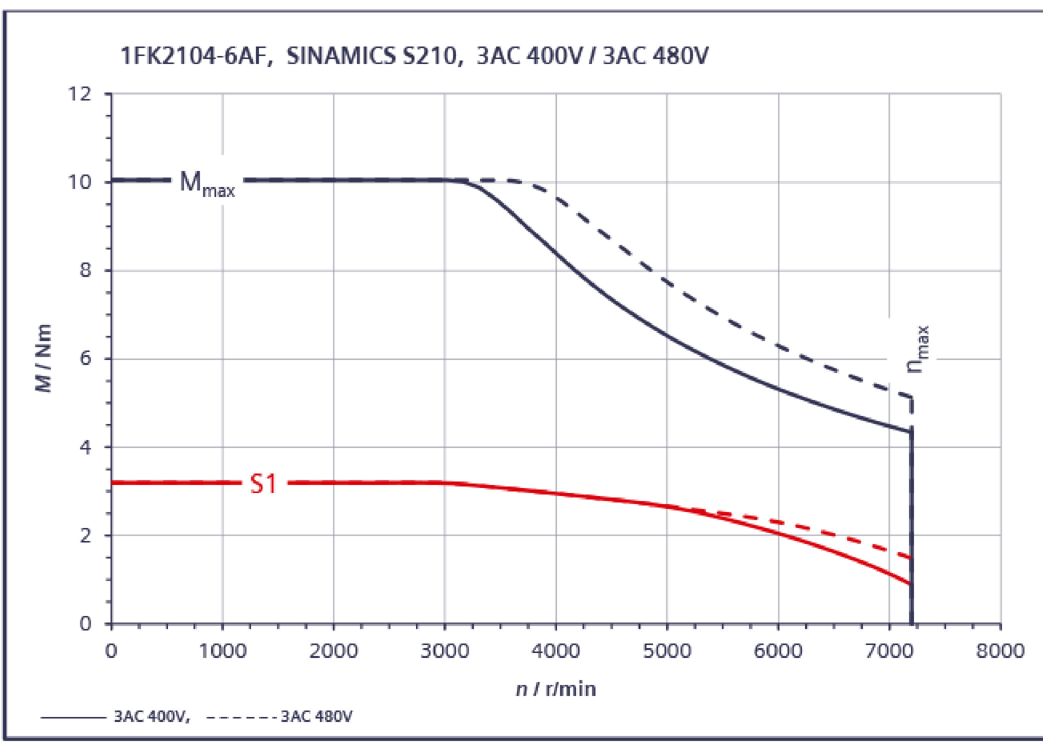
12.2.16.6 1FK2104-5AK connected to 3 AC 400 V / 3 AC 480 V

1FK2104-5AK	For 3 AC 400 V, 3 AC 480 V		
Technical specifications in the SINAMICS S210 system	**Symbol**	**Unit**	**Value**
Static torque	M_0	Nm	2.4
Stall current	I_0	A	4.4
Maximum permissible speed	n_{max}	r/min	8000
Maximum torque	M_{max}	Nm	7.6
Maximum current	I_{max}	A	16
Thermal time constant	T_{th}	min	35
Rotor moment of inertia	J_{mot}	$kgcm^2$	0.56
Rotor moment of inertia (with brake)	$J_{mot\ br}$	$kgcm^2$	0.65
Weight	m_{mot}	kg	2.85
Weight (with brake)	$m_{mot\ br}$	kg	3.7
Rated data for S210 connected to 3 AC 400 V, 3 AC 480 V			
Rated speed	n_{rated}	r/min	6000
Rated torque	M_{rated}	Nm	1.7
Rated current	I_{rated}	A	3.2
Rated power	P_{rated}	kW	1.07



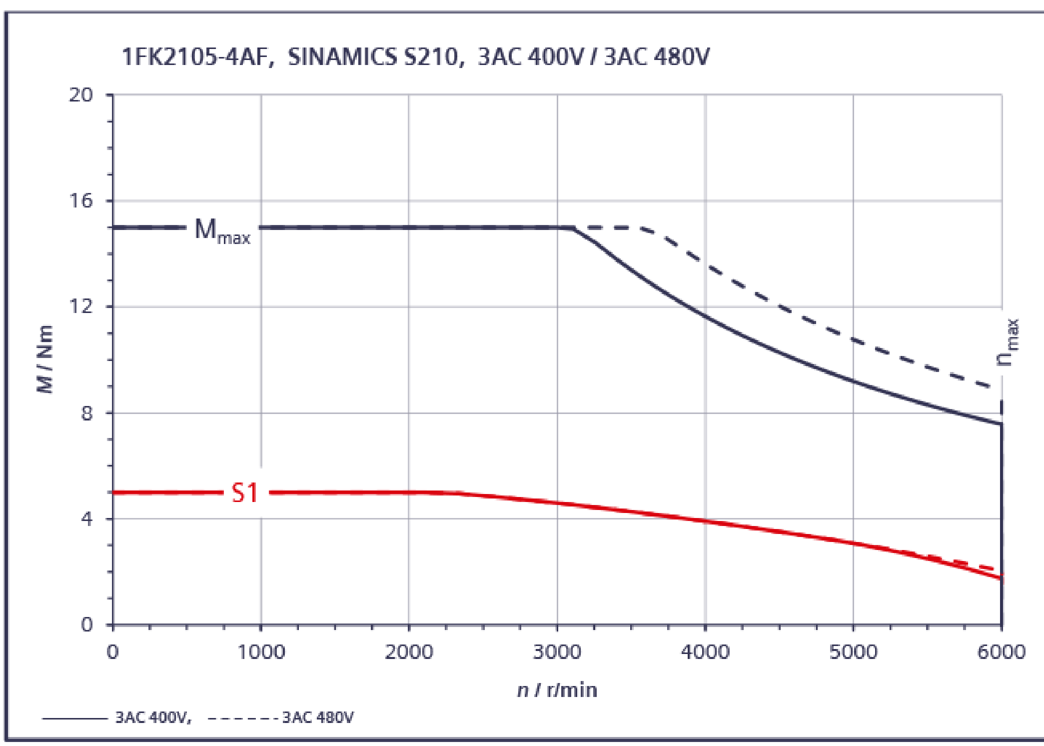
12.2.16.7 1FK2104-6AF connected to 3 AC 400 V / 3 AC 480 V

1FK2104-6AF	For 3 AC 400 V, 3 AC 480 V		
Technical specifications in the SINAMICS S210 system	**Symbol**	**Unit**	**Value**
Static torque	M_0	Nm	3.2
Stall current	I_0	A	3
Maximum permissible speed	n_{max}	r/min	7200
Maximum torque	M_{max}	Nm	10
Maximum current	I_{max}	A	10.9
Thermal time constant	T_{th}	min	38
Rotor moment of inertia	J_{mot}	$kgcm^2$	0.76
Rotor moment of inertia (with brake)	$J_{mot\ br}$	$kgcm^2$	0.84
Weight	m_{mot}	kg	3.4
Weight (with brake)	$m_{mot\ br}$	kg	4.25
Rated data for S210 connected to 3 AC 400 V, 3 AC 480 V			
Rated speed	n_{rated}	r/min	3000
Rated torque	M_{rated}	Nm	3.2
Rated current	I_{rated}	A	3
Rated power	P_{rated}	kW	1



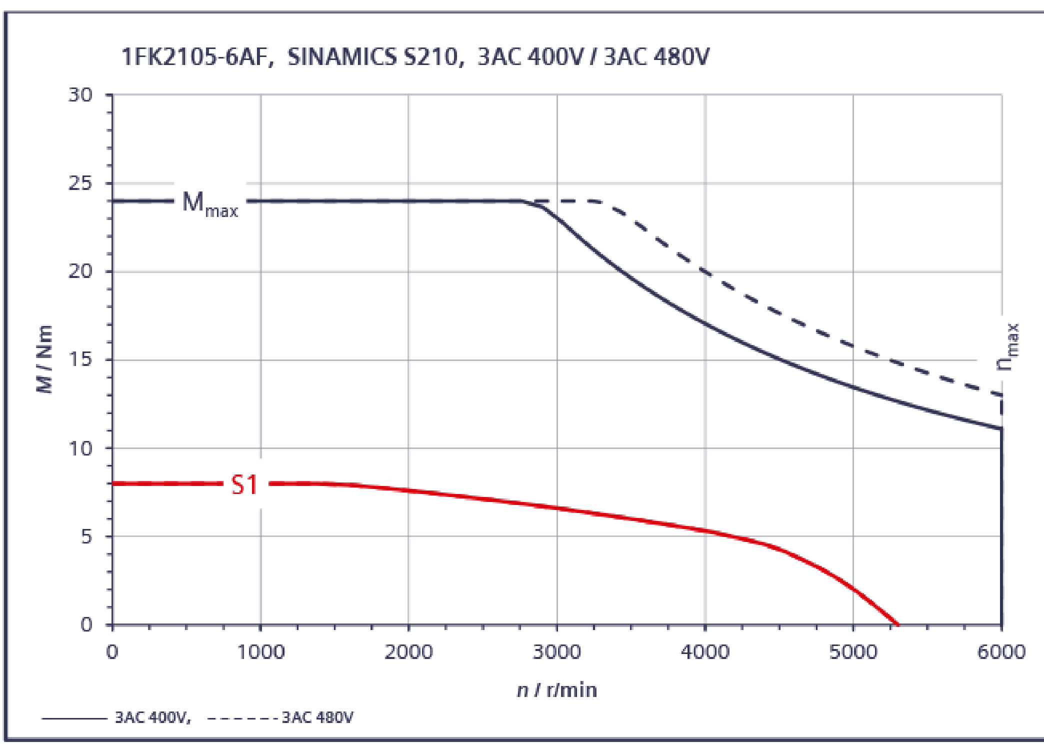
12.2.16.8 1FK2105-4AF connected to 3 AC 400 V / 3 AC 480 V

1FK2105-4AF	For 3 AC 400 V, 3 AC 480 V		
Technical specifications in the SINAMICS S210 system	**Symbol**	**Unit**	**Value**
Static torque	M_0	Nm	5
Stall current	I_0	A	4.65
Maximum permissible speed	n_{max}	r/min	6000
Maximum torque	M_{max}	Nm	15
Maximum current	I_{max}	A	18
Thermal time constant	T_{th}	min	37
Rotor moment of inertia	J_{mot}	$kgcm^2$	1.71
Rotor moment of inertia (with brake)	$J_{mot\ br}$	$kgcm^2$	2.55
Weight	m_{mot}	kg	5.6
Weight (with brake)	$m_{mot\ br}$	kg	6.6
Rated data for S210 connected to 3 AC 400 V, 3 AC 480 V			
Rated speed	n_{rated}	r/min	3000
Rated torque	M_{rated}	Nm	4.6
Rated current	I_{rated}	A	4.35
Rated power	P_{rated}	kW	1.45



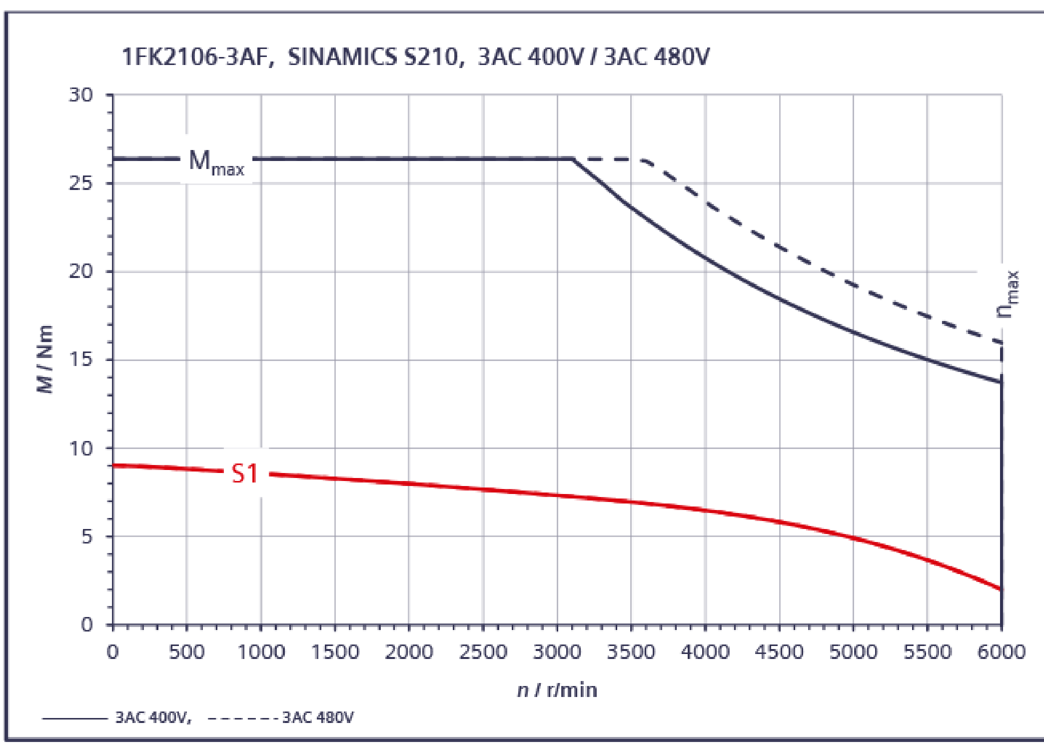
12.2.16.9 1FK2105-6AF connected to 3 AC 400 V / 3 AC 480 V

1FK2105-6AF	For 3 AC 400 V, 3 AC 480 V		
Technical specifications in the SINAMICS S210 system	**Symbol**	**Unit**	**Value**
Static torque	M_0	Nm	8
Stall current	I_0	A	6.7
Maximum permissible speed	n_{max}	r/min	6000
Maximum torque	M_{max}	Nm	24
Maximum current	I_{max}	A	24
Thermal time constant	T_{th}	min	40
Rotor moment of inertia	J_{mot}	$kgcm^2$	2.65
Rotor moment of inertia (with brake)	$J_{mot\ br}$	$kgcm^2$	3.5
Weight	m_{mot}	kg	7.7
Weight (with brake)	$m_{mot\ br}$	kg	8.7
Rated data for S210 connected to 3 AC 400 V, 3 AC 480 V			
Rated speed	n_{rated}	r/min	3000
Rated torque	M_{rated}	Nm	6.6
Rated current	I_{rated}	A	5.6
Rated power	P_{rated}	kW	2.1



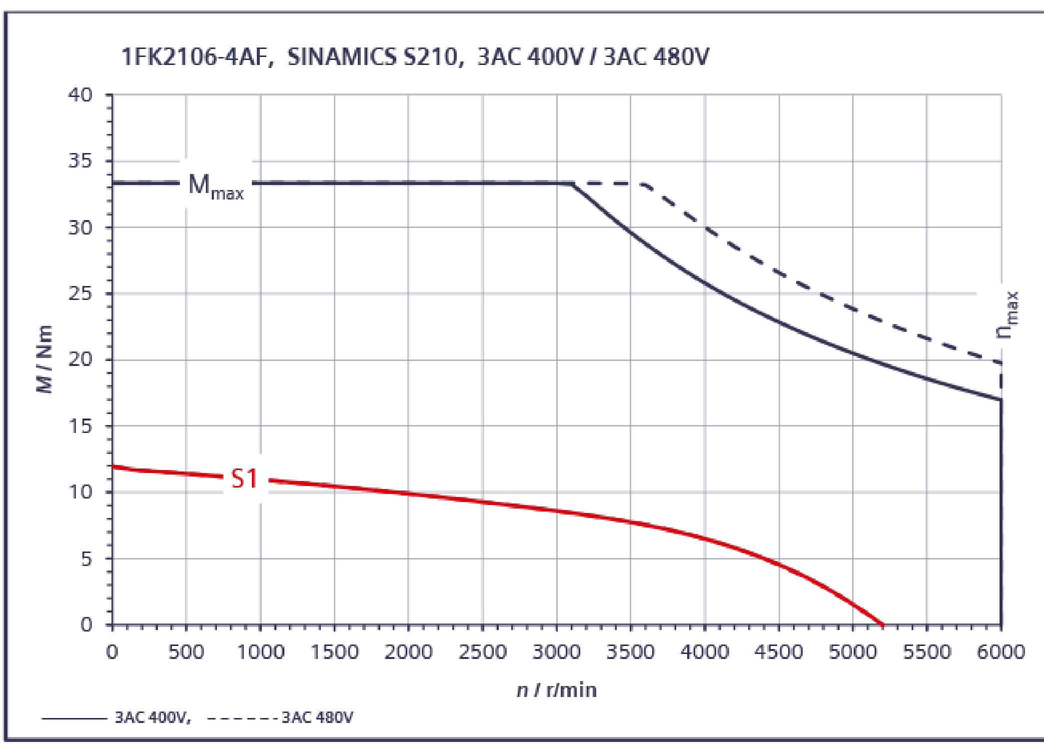
12.2.16.10 1FK2106-3AF connected to 400 V 3 AC / 480 V 3 AC

1FK2106-3AF	For 3 AC 400 V, 3 AC 480 V		
Technical specifications in the SINAMICS S210 system	**Symbol**	**Unit**	**Value**
Static torque	M_0	Nm	9
Stall current	I_0	A	9.2
Maximum permissible speed	n_{max}	r/min	6000
Maximum torque	M_{max}	Nm	26
Maximum current	I_{max}	A	43
Thermal time constant	T_{th}	min	30
Rotor moment of inertia	J_{mot}	$kgcm^2$	4.6
Rotor moment of inertia (with brake)	$J_{mot\ br}$	$kgcm^2$	6.3
Weight	m_{mot}	kg	7.4
Weight (with brake)	$m_{mot\ br}$	kg	9
Rated data for S210 connected to 3 AC 400 V, 3 AC 480 V			
Rated speed	n_{rated}	r/min	3000
Rated torque	M_{rated}	Nm	7.3
Rated current	I_{rated}	A	7.9
Rated power	P_{rated}	kW	2.3



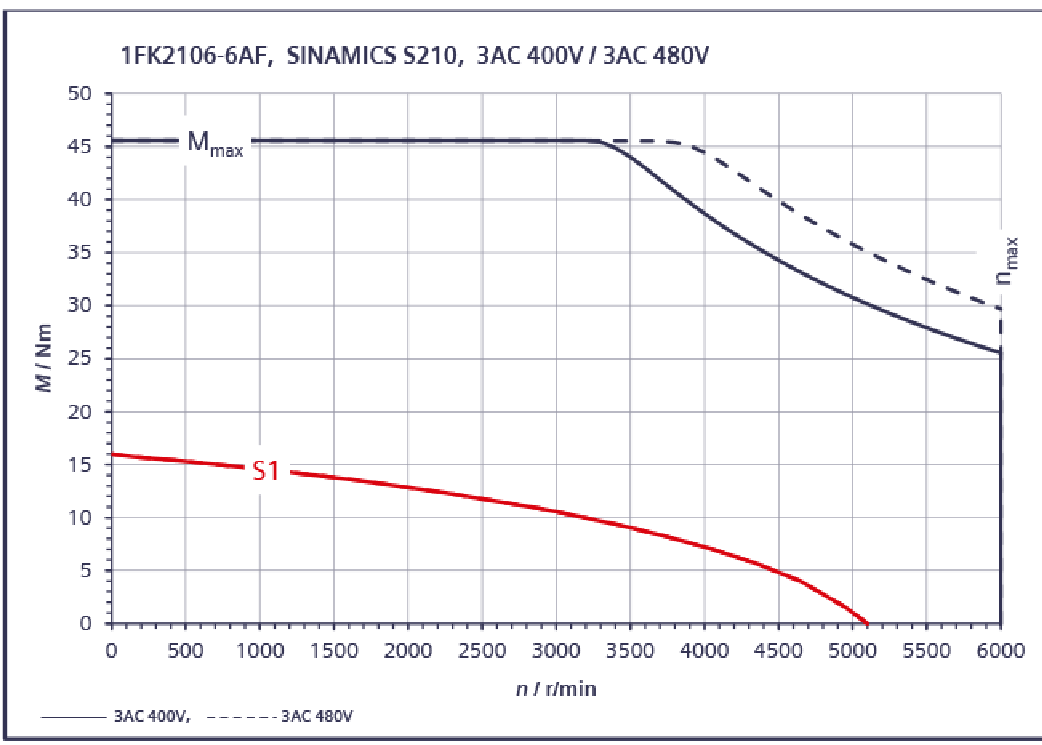
12.2.16.11 1FK2106-4AF connected to 400 V 3 AC / 480 V 3 AC

1FK2106-4AF	For 3 AC 400 V, 3 AC 480 V		
Technical specifications in the SINAMICS S210 system	**Symbol**	**Unit**	**Value**
Static torque	M_0	Nm	12
Stall current	I_0	A	10.7
Maximum permissible speed	n_{max}	r/min	6000
Maximum torque	M_{max}	Nm	33
Maximum current	I_{max}	A	42
Thermal time constant	T_{th}	min	34
Rotor moment of inertia	J_{mot}	$kgcm^2$	6
Rotor moment of inertia (with brake)	$J_{mot\ br}$	$kgcm^2$	7.6
Weight	m_{mot}	kg	9
Weight (with brake)	$m_{mot\ br}$	kg	10.6
Rated data for S210 connected to 3 AC 400 V, 3 AC 480 V			
Rated speed	n_{rated}	r/min	3000
Rated torque	M_{rated}	Nm	8.6
Rated current	I_{rated}	A	8.1
Rated power	P_{rated}	kW	2.7



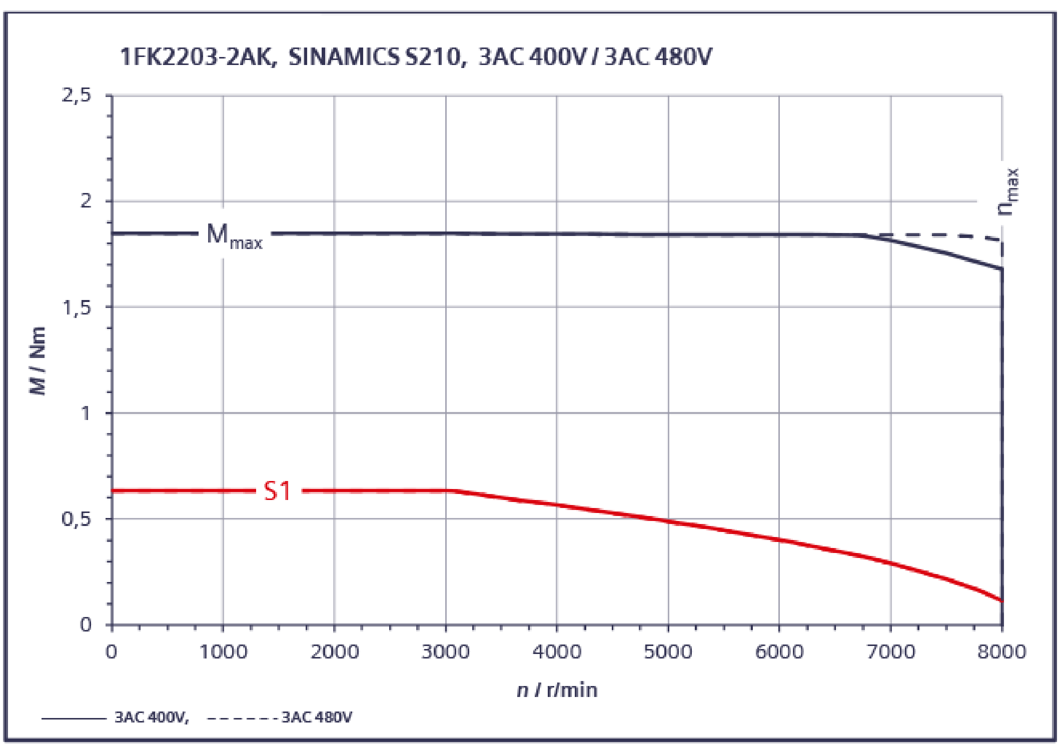
12.2.16.12 1FK2106-6AF connected 400 V 3 AC / 480 V 3 AC

1FK2106-6AF	For 3 AC 400 V, 3 AC 480 V		
Technical specifications in the SINAMICS S210 system	**Symbol**	**Unit**	**Value**
Static torque	M_0	Nm	16
Stall current	I_0	A	14.3
Maximum permissible speed	n_{max}	r/min	6000
Maximum torque	M_{max}	Nm	45.5
Maximum current	I_{max}	A	49
Thermal time constant	T_{th}	min	50
Rotor moment of inertia	J_{mot}	kgcm^2	8.7
Rotor moment of inertia (with brake)	$J_{mot\ br}$	kgcm^2	10.4
Weight	m_{mot}	kg	11.8
Weight (with brake)	$m_{mot\ br}$	kg	13.4
Rated data for S210 connected to 3 AC 400 V, 3 AC 480 V			
Rated speed	n_{rated}	r/min	3000
Rated torque	M_{rated}	Nm	10.6
Rated current	I_{rated}	A	9.7
Rated power	P_{rated}	kW	3.3



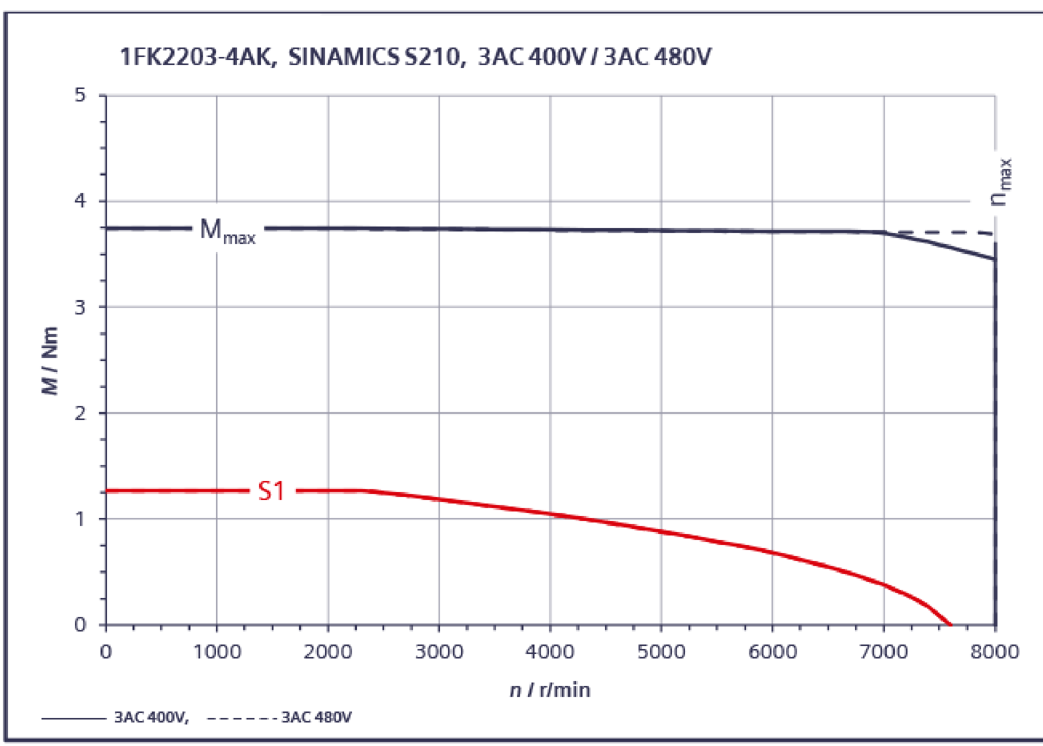
12.2.16.13 1FK2203-2AK connected to 3 AC 400 V / 3 AC 480 V

1FK2203-2AK	For 3 AC 400 V, 3 AC 480 V		
Technical specifications in the SINAMICS S210 system	**Symbol**	**Unit**	**Value**
Static torque	M_0	Nm	0.64
Stall current	I_0	A	1.05
Maximum permissible speed	n_{max}	r/min	8000
Maximum torque	M_{max}	Nm	1.85
Maximum current	I_{max}	A	3.4
Thermal time constant	T_{th}	min	21
Rotor moment of inertia	J_{mot}	$kgcm^2$	0.2
Rotor moment of inertia (with brake)	$J_{mot\ br}$	$kgcm^2$	0.22
Weight	m_{mot}	kg	1.16
Weight (with brake)	$m_{mot\ br}$	kg	1.53
Rated data for S210 connected to 3 AC 400 V, 3 AC 480 V			
Rated speed	n_{rated}	r/min	6000
Rated torque	M_{rated}	Nm	0.405
Rated current	I_{rated}	A	0.75
Rated power	P_{rated}	kW	0.255



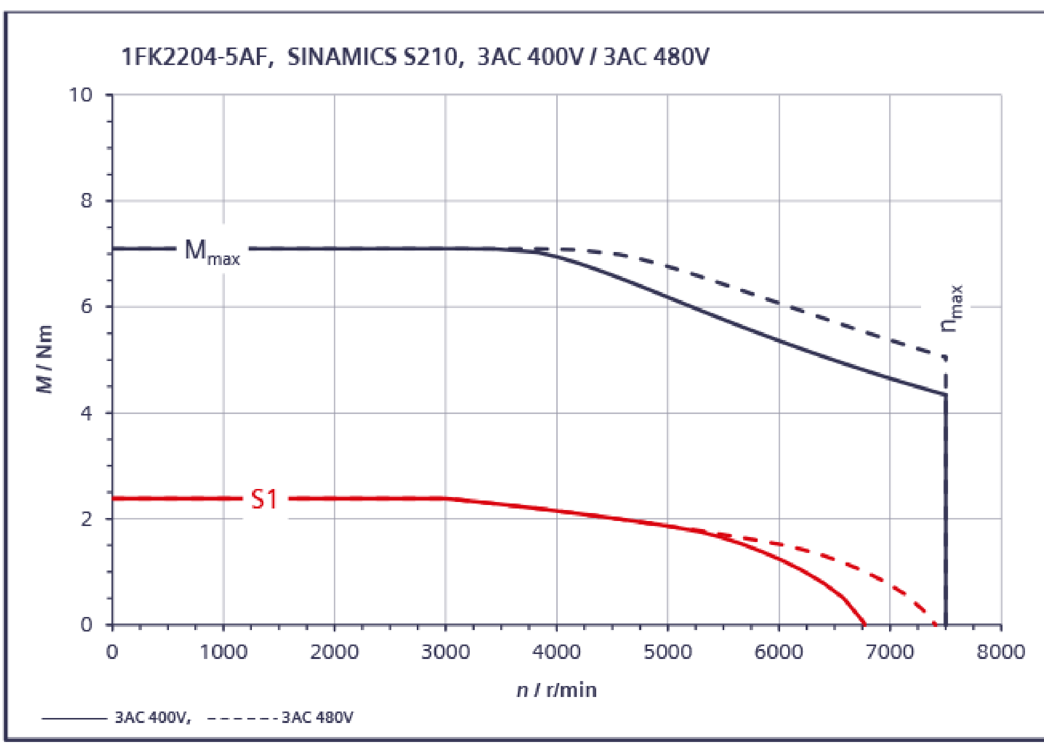
12.2.16.14 1FK2203-4AK connected to 3 AC 400 V / 3 AC 480 V

1FK2203-4AK	**For 3 AC 400 V, 3 AC 480 V**		
Technical specifications in the SINAMICS S210 system	**Symbol**	**Unit**	**Value**
Static torque	M_0	Nm	1.27
Stall current	I_0	A	2.05
Maximum permissible speed	n_{max}	r/min	8000
Maximum torque	M_{max}	Nm	3.75
Maximum current	I_{max}	A	6.7
Thermal time constant	T_{th}	min	28
Rotor moment of inertia	J_{mot}	$kgcm^2$	0.35
Rotor moment of inertia (with brake)	$J_{mot\ br}$	$kgcm^2$	0.37
Weight	m_{mot}	kg	1.49
Weight (with brake)	$m_{mot\ br}$	kg	1.97
Rated data for S210 connected to 3 AC 400 V, 3 AC 480 V			
Rated speed	n_{rated}	r/min	6000
Rated torque	M_{rated}	Nm	0.68
Rated current	I_{rated}	A	1.24
Rated power	P_{rated}	kW	0.43



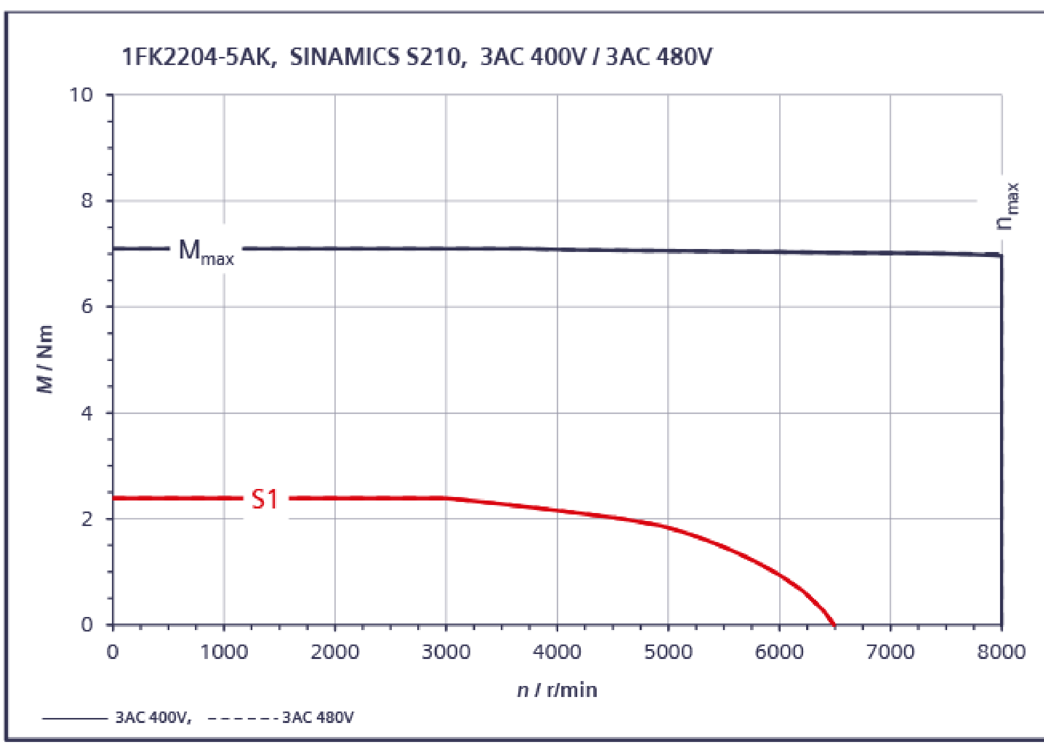
12.2.16.15 1FK2204-5AF connected to 3 AC 400 V / 3 AC 480 V

1FK2204-5AF	For 3 AC 400 V, 3 AC 480 V		
Technical specifications in the SINAMICS S210 system	**Symbol**	**Unit**	**Value**
Static torque	M_0	Nm	2.4
Stall current	I_0	A	2.25
Maximum permissible speed	n_{max}	r/min	7500
Maximum torque	M_{max}	Nm	7.1
Maximum current	I_{max}	A	7.1
Thermal time constant	T_{th}	min	29
Rotor moment of inertia	J_{mot}	$kgcm^2$	1.23
Rotor moment of inertia (with brake)	$J_{mot\ br}$	$kgcm^2$	1.31
Weight	m_{mot}	kg	2.9
Weight (with brake)	$m_{mot\ br}$	kg	3.75
Rated data for S210 connected to 3 AC 400 V, 3 AC 480 V			
Rated speed	n_{rated}	r/min	3000
Rated torque	M_{rated}	Nm	2.4
Rated current	I_{rated}	A	2.25
Rated power	P_{rated}	kW	0.75



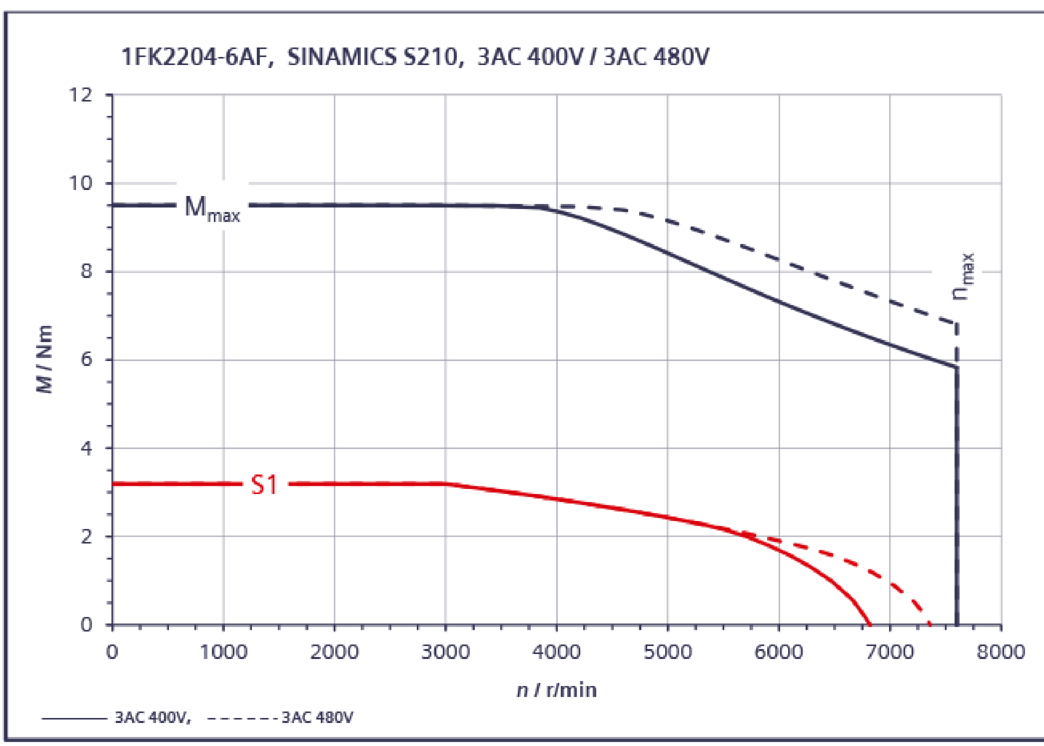
12.2.16.16 1FK2204-5AK connected to 3 AC 400 V / 3 AC 480 V

1FK2204-5AK	For 1 AC 400 V, 3 AC 480 V		
Technical specifications in the SINAMICS S210 system	**Symbol**	**Unit**	**Value**
Static torque	M_0	Nm	2.4
Stall current	I_0	A	4.4
Maximum permissible speed	n_{max}	r/min	8000
Maximum torque	M_{max}	Nm	7.1
Maximum current	I_{max}	A	14.2
Thermal time constant	T_{th}	min	29
Rotor moment of inertia	J_{mot}	$kgcm^2$	1.23
Rotor moment of inertia (with brake)	$J_{mot\ br}$	$kgcm^2$	1.31
Weight	m_{mot}	kg	2.9
Weight (with brake)	$m_{mot\ br}$	kg	3.75
Rated data for S210 connected to 1 AC 400 V, 3 AC 480 V			
Rated speed	n_{rated}	r/min	6000
Rated torque	M_{rated}	Nm	0.9
Rated current	I_{rated}	A	1.95
Rated power	P_{rated}	kW	0.57



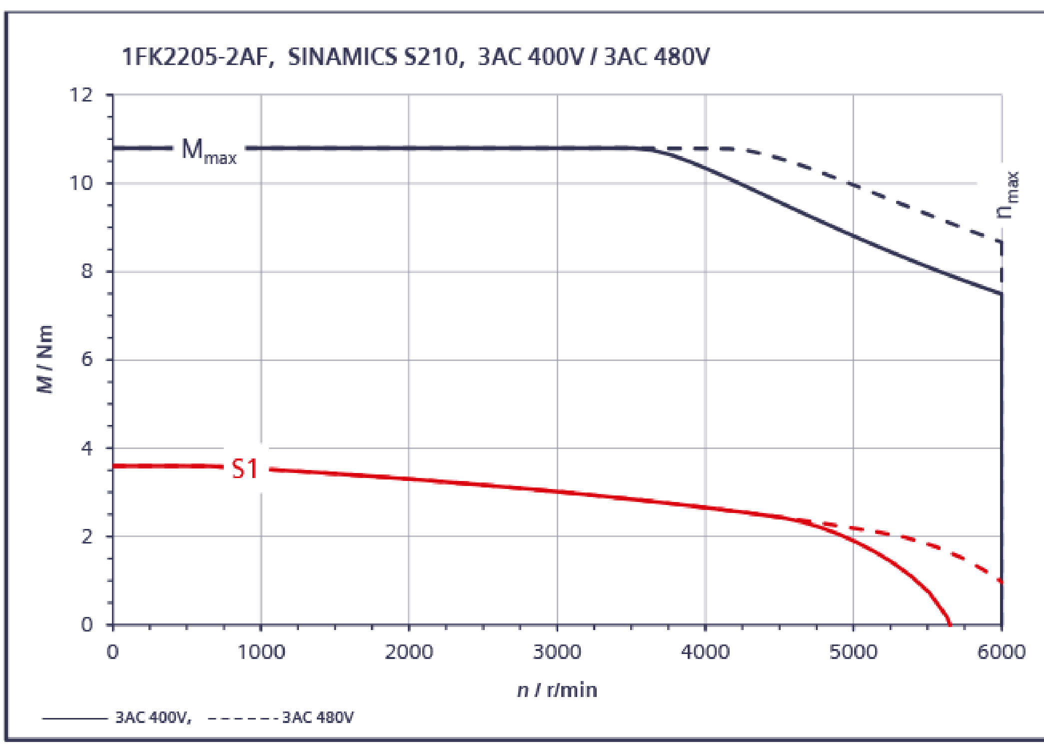
12.2.16.17 1FK2204-6AF connected to 3 AC 400 V / 3 AC 480 V

1FK2204-6AF	**For 3 AC 400 V, 3 AC 480 V**		
Technical specifications in the SINAMICS S210 system	**Symbol**	**Unit**	**Value**
Static torque	M_0	Nm	3.2
Stall current	I_0	A	3
Maximum permissible speed	n_{max}	r/min	7600
Maximum torque	M_{max}	Nm	9.5
Maximum current	I_{max}	A	9.9
Thermal time constant	T_{th}	min	35
Rotor moment of inertia	J_{mot}	$kgcm^2$	1.61
Rotor moment of inertia (with brake)	$J_{mot\ br}$	$kgcm^2$	1.69
Weight	m_{mot}	kg	3.5
Weight (with brake)	$m_{mot\ br}$	kg	4.35
Rated data for S210 connected to 3 AC 400 V, 3 AC 480 V			
Rated speed	n_{rated}	r/min	3000
Rated torque	M_{rated}	Nm	3.2
Rated current	I_{rated}	A	3
Rated power	P_{rated}	kW	1



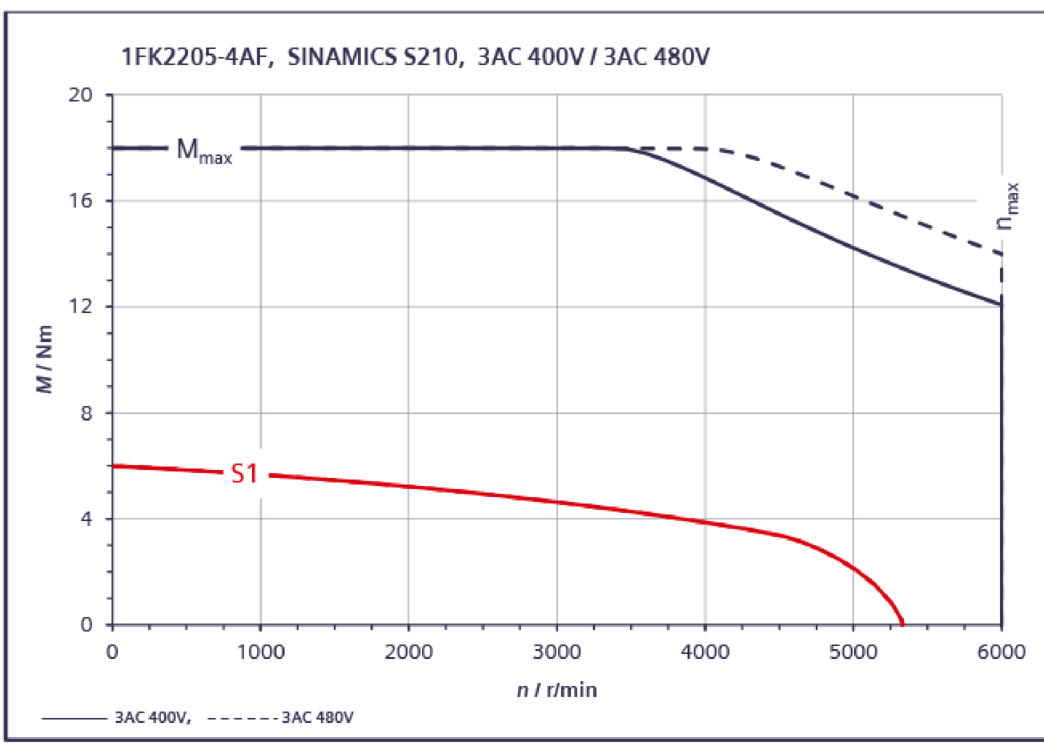
12.2.16.18 1FK2205-2AF connected to 3 AC 400 V / 3 AC 480 V

1FK2205-2AF	For 3 AC 400 V, 3 AC 480 V		
Technical specifications in the SINAMICS S210 system	**Symbol**	**Unit**	**Value**
Static torque	M_0	Nm	3.6
Stall current	I_0	A	2.9
Maximum permissible speed	n_{max}	r/min	6000
Maximum torque	M_{max}	Nm	10.8
Maximum current	I_{max}	A	9.5
Thermal time constant	T_{th}	min	29
Rotor moment of inertia	J_{mot}	$kgcm^2$	3.15
Rotor moment of inertia (with brake)	$J_{mot\ br}$	$kgcm^2$	4.05
Weight	m_{mot}	kg	3.75
Weight (with brake)	$m_{mot\ br}$	kg	4.75
Rated data for S210 connected to 3 AC 400 V, 3 AC 480 V			
Rated speed	n_{rated}	r/min	3000
Rated torque	M_{rated}	Nm	3
Rated current	I_{rated}	A	2.5
Rated power	P_{rated}	kW	0.94



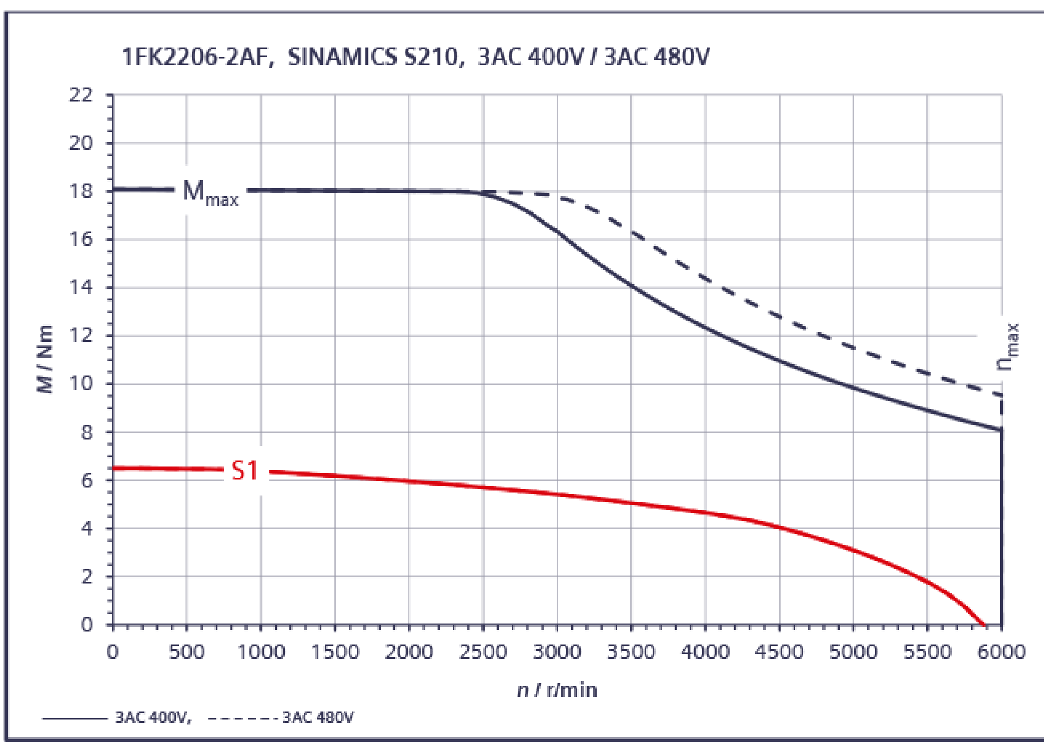
12.2.16.19 1FK2205-4AF connected to 3 AC 400 V / 3 AC 480 V

1FK2205-4AF	For 3 AC 400 V, 3 AC 480 V		
Technical specifications in the SINAMICS S210 system	**Symbol**	**Unit**	**Value**
Static torque	M_0	Nm	6
Stall current	I_0	A	4.7
Maximum permissible speed	n_{max}	r/min	6000
Maximum torque	M_{max}	Nm	18
Maximum current	I_{max}	A	15.1
Thermal time constant	T_{th}	min	31
Rotor moment of inertia	J_{mot}	$kgcm^2$	5.1
Rotor moment of inertia (with brake)	$J_{mot\ br}$	$kgcm^2$	6
Weight	m_{mot}	kg	5.2
Weight (with brake)	$m_{mot\ br}$	kg	6.2
Rated data for S210 connected to 3 AC 400 V, 3 AC 480 V			
Rated speed	n_{rated}	r/min	3000
Rated torque	M_{rated}	Nm	4.6
Rated current	I_{rated}	A	3.75
Rated power	P_{rated}	kW	1.45



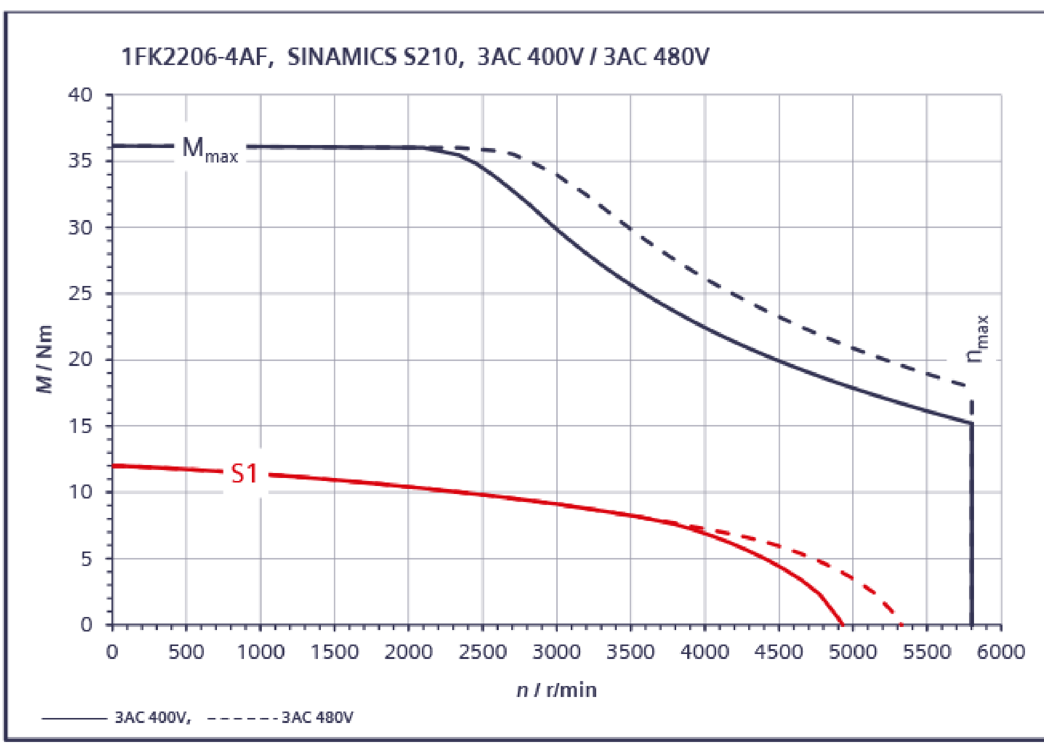
12.2.16.20 1FK2206-2AF connected to 3 AC 400 V / 3 AC 480 V

1FK2206-2AF	For 3 AC 400 V, 3 AC 480 V		
Technical specifications in the SINAMICS S210 system	**Symbol**	**Unit**	**Value**
Static torque	M_0	Nm	6.5
Stall current	I_0	A	5
Maximum permissible speed	n_{max}	r/min	6000
Maximum torque	M_{max}	Nm	18
Maximum current	I_{max}	A	17.8
Thermal time constant	T_{th}	min	21
Rotor moment of inertia	J_{mot}	$kgcm^2$	7.8
Rotor moment of inertia (with brake)	$J_{mot\ br}$	$kgcm^2$	9.4
Weight	m_{mot}	kg	6.3
Weight (with brake)	$m_{mot\ br}$	kg	7.9
Rated data for S210 connected to 3 AC 400 V, 3 AC 480 V			
Rated speed	n_{rated}	r/min	3000
Rated torque	M_{rated}	Nm	5.4
Rated current	I_{rated}	A	4.35
Rated power	P_{rated}	kW	1.71



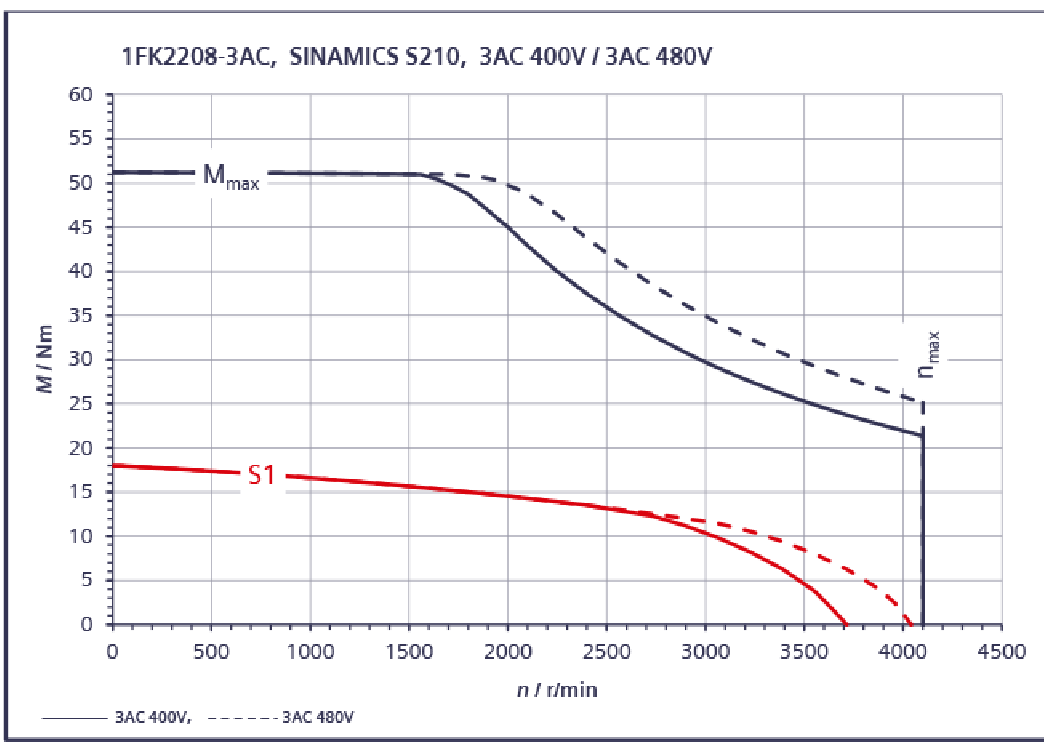
12.2.16.21 1FK2206-4AF connected to 3 AC 400 V / 3 AC 480 V

1FK2206-4AF	For 3 AC 400 V, 3 AC 480 V		
Technical specifications in the SINAMICS S210 system	**Symbol**	**Unit**	**Value**
Static torque	M_0	Nm	12
Stall current	I_0	A	7.9
Maximum permissible speed	n_{max}	r/min	5800
Maximum torque	M_{max}	Nm	36
Maximum current	I_{max}	A	29.5
Thermal time constant	T_{th}	min	24
Rotor moment of inertia	J_{mot}	$kgcm^2$	15.1
Rotor moment of inertia (with brake)	$J_{mot\ br}$	$kgcm^2$	16.8
Weight	m_{mot}	kg	8.9
Weight (with brake)	$m_{mot\ br}$	kg	10.6
Rated data for S210 connected to 3 AC 400 V, 3 AC 480 V			
Rated speed	n_{rated}	r/min	3000
Rated torque	M_{rated}	Nm	9.1
Rated current	I_{rated}	A	6.2
Rated power	P_{rated}	kW	2.85



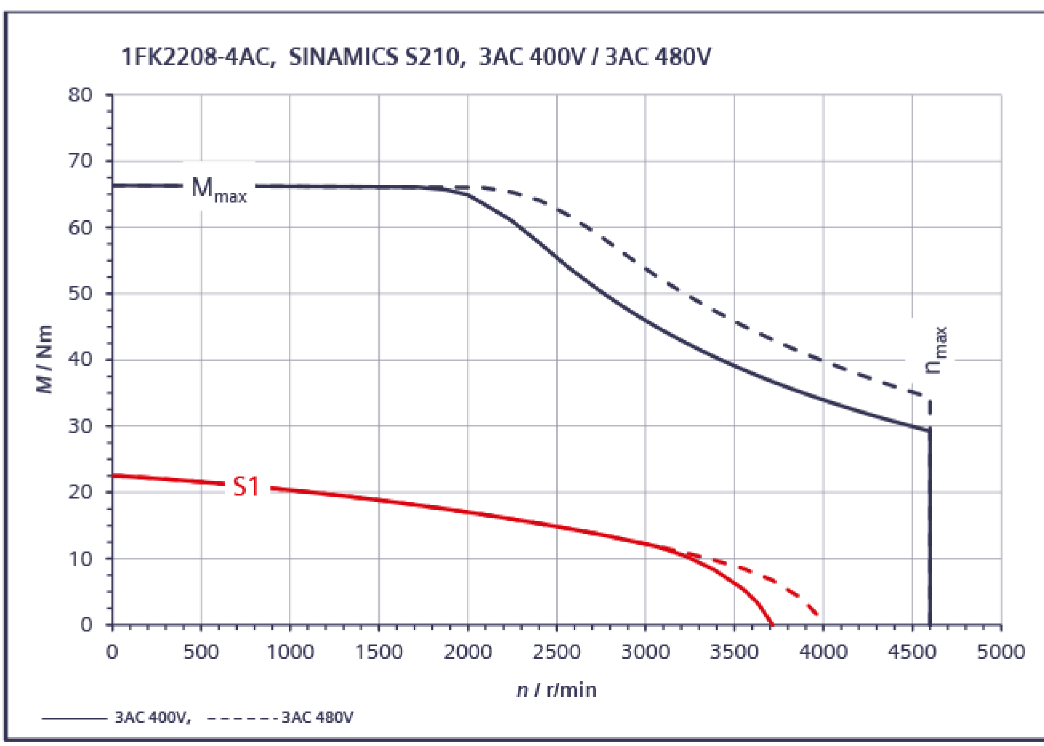
12.2.16.22 1FK2208-3AC connected to 3 AC 400 V / 3 AC 480 V

1FK2208-3AC	For 3 AC 400 V, 3 AC 480 V		
Technical specifications in the SINAMICS S210 system	**Symbol**	**Unit**	**Value**
Static torque	M_0	Nm	18
Stall current	I_0	A	8.4
Maximum permissible speed	n_{max}	r/min	4100
Maximum torque	M_{max}	Nm	51
Maximum current	I_{max}	A	29.5
Thermal time constant	T_{th}	min	26
Rotor moment of inertia	J_{mot}	$kgcm^2$	29.6
Rotor moment of inertia (with brake)	$J_{mot\ br}$	$kgcm^2$	32.6
Weight	m_{mot}	kg	12.6
Weight (with brake)	$m_{mot\ br}$	kg	14.6
Rated data for S210 connected to 3 AC 400 V, 3 AC 480 V			
Rated speed	n_{rated}	r/min	2000
Rated torque	M_{rated}	Nm	14.5
Rated current	I_{rated}	A	7
Rated power	P_{rated}	kW	3.05



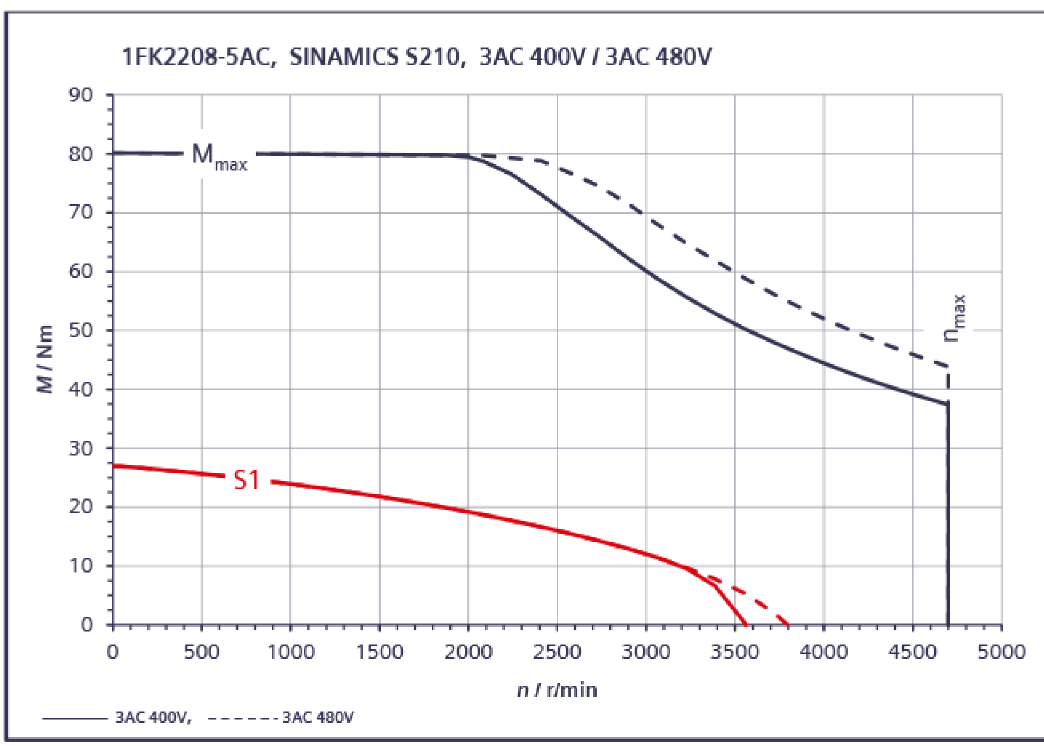
12.2.16.23 1FK2208-4AC connected to 3 AC 400 V / 3 AC 480 V

1FK2208-4AC	For 3 AC 400 V, 3 AC 480 V		
Technical specifications in the SINAMICS S210 system	**Symbol**	**Unit**	**Value**
Static torque	M_0	Nm	22
Stall current	I_0	A	11.7
Maximum permissible speed	n_{max}	r/min	4600
Maximum torque	M_{max}	Nm	66
Maximum current	I_{max}	A	43.5
Thermal time constant	T_{th}	min	28
Rotor moment of inertia	J_{mot}	$kgcm^2$	38.8
Rotor moment of inertia (with brake)	$J_{mot\ br}$	$kgcm^2$	44.4
Weight	m_{mot}	kg	14.6
Weight (with brake)	$m_{mot\ br}$	kg	17.3
Rated data for S210 connected to 3 AC 400 V, 3 AC 480 V			
Rated speed	n_{rated}	r/min	2000
Rated torque	M_{rated}	Nm	17
Rated current	I_{rated}	A	9.3
Rated power	P_{rated}	kW	3.55



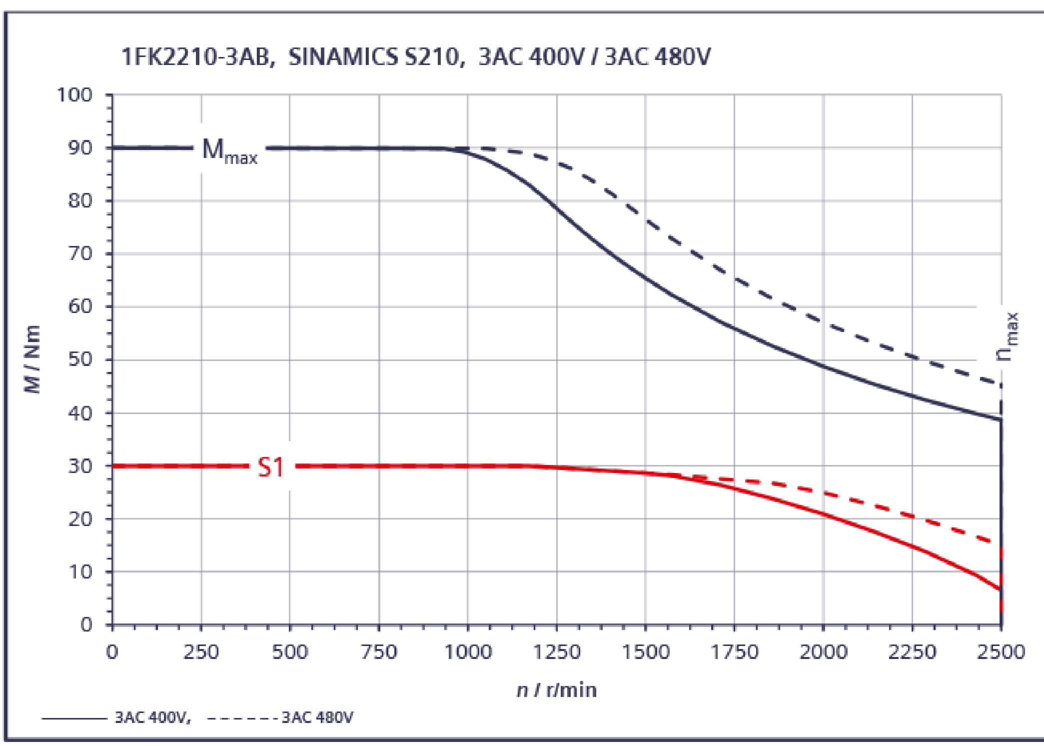
12.2.16.24 1FK2208-5AC connected to 3 AC 400 V / 3 AC 480 V

1FK2208-5AC	For 3 AC 400 V, 3 AC 480 V		
Technical specifications in the SINAMICS S210 system	**Symbol**	**Unit**	**Value**
Static torque	M_0	Nm	27
Stall current	I_0	A	14.6
Maximum permissible speed	n_{max}	r/min	4700
Maximum torque	M_{max}	Nm	80
Maximum current	I_{max}	A	51.5
Thermal time constant	T_{th}	min	30
Rotor moment of inertia	J_{mot}	$kgcm^2$	48.1
Rotor moment of inertia (with brake)	$J_{mot\ br}$	$kgcm^2$	53.6
Weight	m_{mot}	kg	16.6
Weight (with brake)	$m_{mot\ br}$	kg	19.3
Rated data for S210 connected to 3 AC 400 V, 3 AC 480 V			
Rated speed	n_{rated}	r/min	2000
Rated torque	M_{rated}	Nm	19.1
Rated current	I_{rated}	A	10.8
Rated power	P_{rated}	kW	4



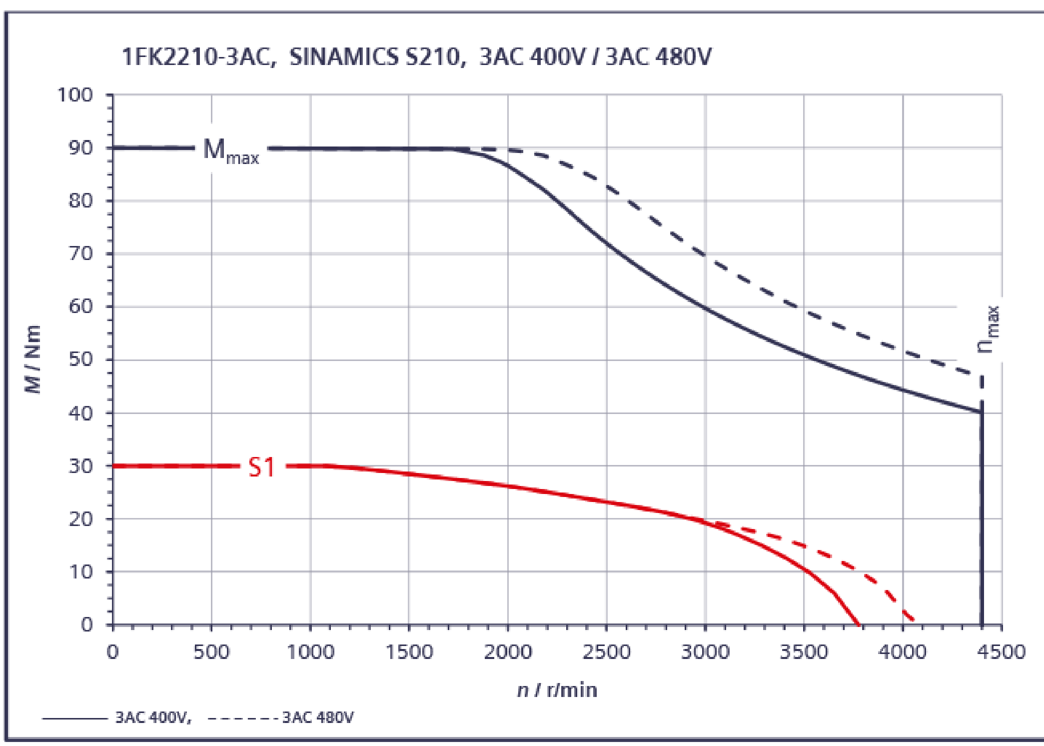
12.2.16.25 1FK2210-3AB connected to 400 V 3 AC / 480 V 3 AC

1FK2210-3AB	For 3 AC 400 V, 3 AC 480 V		
Technical specifications in the SINAMICS S210 system	**Symbol**	**Unit**	**Value**
Static torque	M_0	Nm	30
Stall current	I_0	A	8.5
Maximum permissible speed	n_{max}	r/min	2500
Maximum torque	M_{max}	Nm	90
Maximum current	I_{max}	A	31.5
Thermal time constant	T_{th}	min	33
Rotor moment of inertia	J_{mot}	kgcm^2	88.8
Rotor moment of inertia (with brake)	$J_{mot\ br}$	kgcm^2	94.8
Weight	m_{mot}	kg	22
Weight (with brake)	$m_{mot\ br}$	kg	25
Rated data for S210 connected to 3 AC 400 V, 3 AC 480 V			
Rated speed	n_{rated}	r/min	1500
Rated torque	M_{rated}	Nm	28.5
Rated current	I_{rated}	A	8.3
Rated power	P_{rated}	kW	4.5



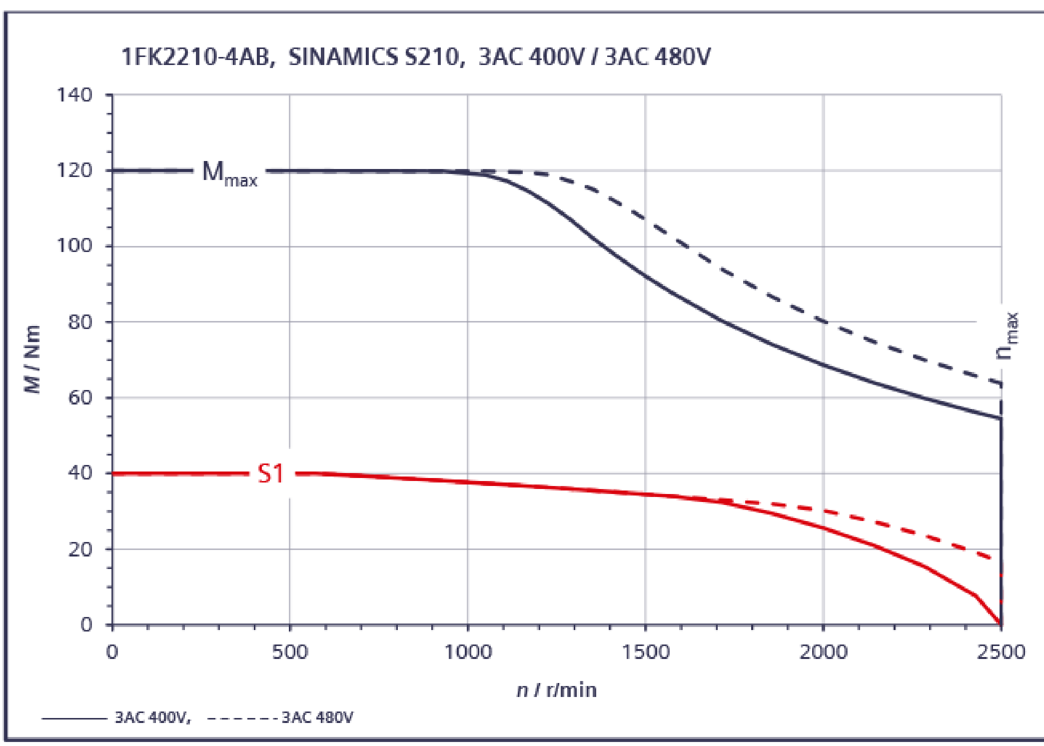
12.2.16.26 1FK2210-3AC connected to 3 AC 400 V / 3 AC 480 V

1FK2210-3AC	For 3 AC 400 V, 3 AC 480 V		
Technical specifications in the SINAMICS S210 system	**Symbol**	**Unit**	**Value**
Static torque	M_0	Nm	30
Stall current	I_0	A	15
Maximum permissible speed	n_{max}	r/min	4400
Maximum torque	M_{max}	Nm	90
Maximum current	I_{max}	A	55
Thermal time constant	T_{th}	min	33
Rotor moment of inertia	J_{mot}	$kgcm^2$	88.8
Rotor moment of inertia (with brake)	$J_{mot\ br}$	$kgcm^2$	94.8
Weight	m_{mot}	kg	22
Weight (with brake)	$m_{mot\ br}$	kg	25
Rated data for S210 connected to 3 AC 400 V, 3 AC 480 V			
Rated speed	n_{rated}	r/min	2000
Rated torque	M_{rated}	Nm	26
Rated current	I_{rated}	A	13.5
Rated power	P_{rated}	kW	5.5



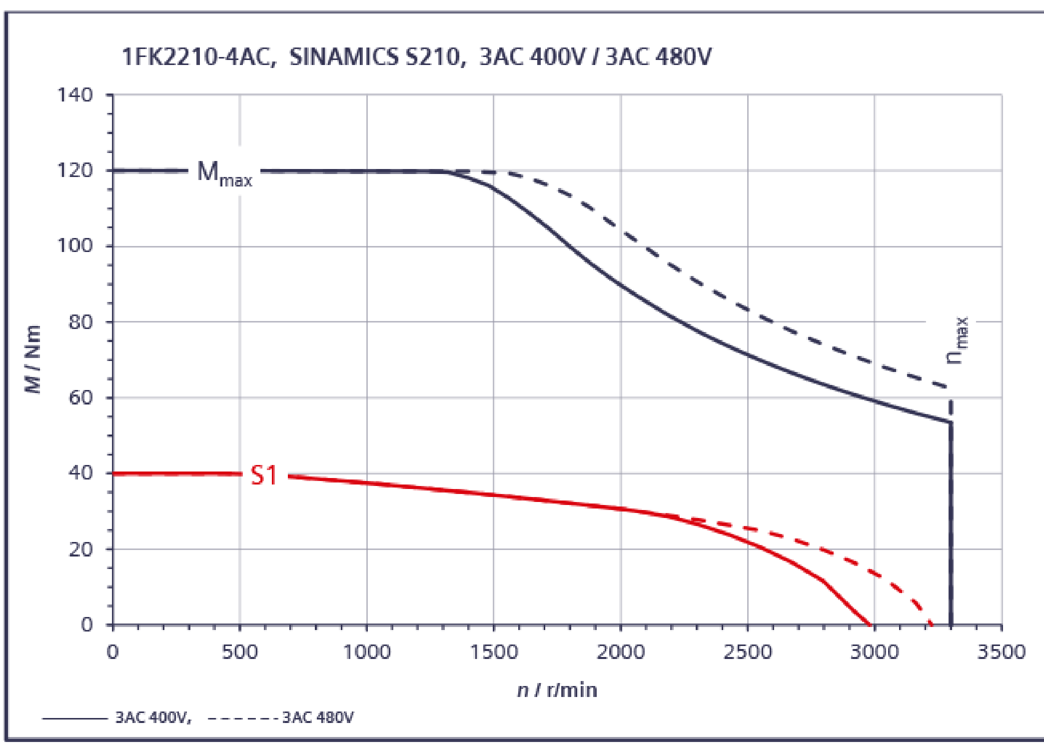
12.2.16.27 1FK2210-4AB connected to 400 V 3 AC / 480 V 3 AC

1FK2210-4AB	**For 3 AC 400 V, 3 AC 480 V**		
Technical specifications in the SINAMICS S210 system	**Symbol**	**Unit**	**Value**
Static torque	M_0	Nm	40
Stall current	I_0	A	11.8
Maximum permissible speed	n_{max}	r/min	2500
Maximum torque	M_{max}	Nm	120
Maximum current	I_{max}	A	43.5
Thermal time constant	T_{th}	min	35
Rotor moment of inertia	J_{mot}	$kgcm^2$	117
Rotor moment of inertia (with brake)	$J_{mot\ br}$	$kgcm^2$	133
Weight	m_{mot}	kg	27
Weight (with brake)	$m_{mot\ br}$	kg	31
Rated data for S210 connected to 3 AC 400 V, 3 AC 480 V			
Rated speed	n_{rated}	r/min	1500
Rated torque	M_{rated}	Nm	34.5
Rated current	I_{rated}	A	10.4
Rated power	P_{rated}	kW	5.4



12.2.16.28 1FK2210-4AC connected to 3 AC 400 V / 3 AC 480 V

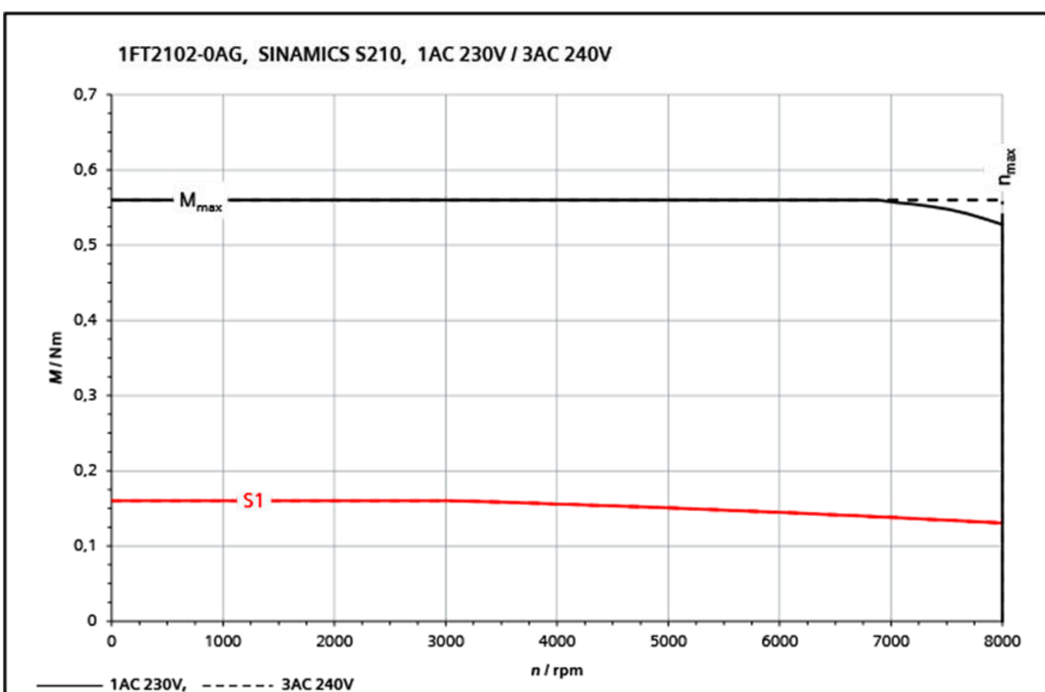
1FK2210-4AC	**For 3 AC 400 V, 3 AC 480 V**		
Technical specifications in the SINAMICS S210 system	**Symbol**	**Unit**	**Value**
Static torque	M_0	Nm	40
Stall current	I_0	A	15
Maximum permissible speed	n_{max}	r/min	3300
Maximum torque	M_{max}	Nm	120
Maximum current	I_{max}	A	55
Thermal time constant	T_{th}	min	35
Rotor moment of inertia	J_{mot}	$kgcm^2$	117
Rotor moment of inertia (with brake)	$J_{mot\ br}$	$kgcm^2$	133
Weight	m_{mot}	kg	27
Weight (with brake)	$m_{mot\ br}$	kg	31
Rated data for S210 connected to 3 AC 400 V, 3 AC 480 V			
Rated speed	n_{rated}	r/min	2000
Rated torque	M_{rated}	Nm	30.5
Rated current	I_{rated}	A	11.8
Rated power	P_{rated}	kW	6.4



12.2.17 Technical data and characteristics of the 1FT2 connected to 1 AC 230 V, 3 AC 240 V, naturally cooled

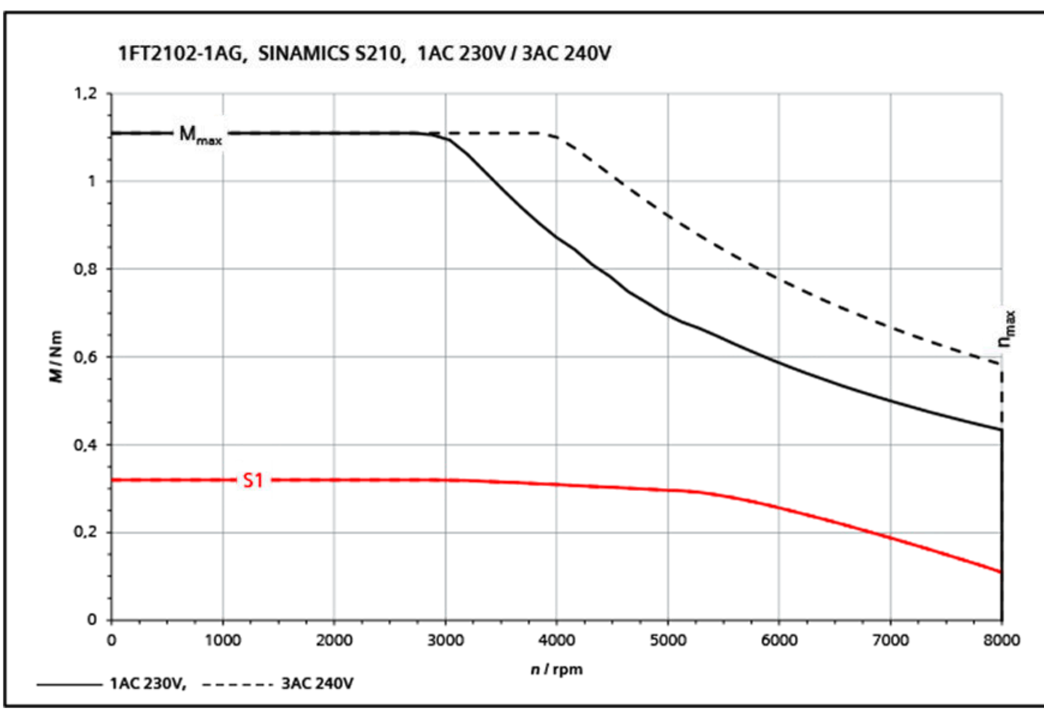
12.2.17.1 1FT2102-0AG connected to 230 V 1 AC / 240 V 3 AC

1FT2102-0AG	For 1 AC 230 V, 3 AC 240 V		
Technical specifications in the SINAMICS S210 system	**Symbol**	**Unit**	**Value**
Static torque	M_0	Nm	0.16
Stall current	I_0	A	0.75
Maximum permissible speed	n_{max}	r/min	8000
Maximum torque	M_{max}	Nm	0.56
Maximum current	I_{max}	A	3.1
Thermal time constant	T_{th}	min	14
Moment of inertia	J_{mot}	kgcm²	0.0245
Moment of inertia (with brake)	$J_{mot\ br}$	kgcm²	0.0285
Weight	m_{mot}	kg	0.47
Weight (with brake)	$m_{mot\ br}$	kg	0.73
Rated data for S210 connected to 1 AC 230 V, 3 AC 240 V			
Rated speed	n_{rated}	r/min	3000
Rated torque	M_{rated}	Nm	0.16
Rated current	I_{rated}	A	0.75
Rated power	P_{rated}	kW	0.05



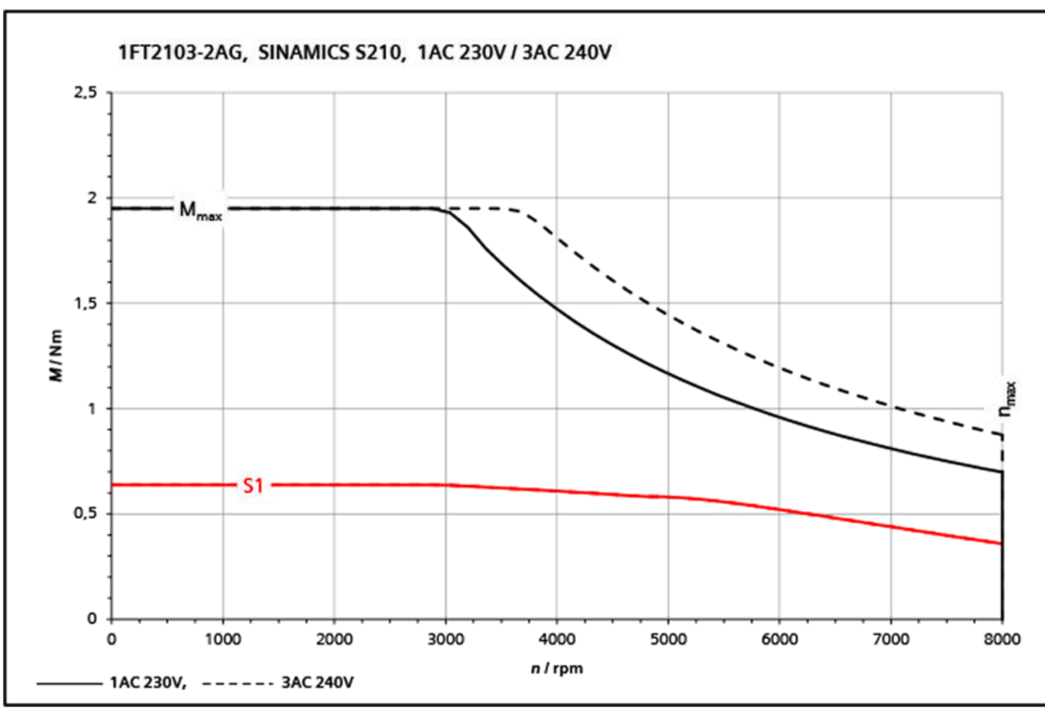
12.2.17.2 1FT2102-1AG connected to 230 V 1 AC / 240 V 3 AC

1FT2102-1AG	For 1 AC 230 V, 3 AC 240 V		
Technical specifications in the SINAMICS S210 system	**Symbol**	**Unit**	**Value**
Static torque	M_0	Nm	0.32
Stall current	I_0	A	0.76
Maximum permissible speed	n_{max}	r/min	8000
Maximum torque	M_{max}	Nm	1.11
Maximum current	I_{max}	A	2.95
Thermal time constant	T_{th}	min	16
Moment of inertia	J_{mot}	$kgcm^2$	0.036
Moment of inertia (with brake)	$J_{mot\ br}$	$kgcm^2$	0.04
Weight	m_{mot}	kg	0.6
Weight (with brake)	$m_{mot\ br}$	kg	0.86
Rated data for S210 connected to 1 AC 230 V, 3 AC 240 V			
Rated speed	n_{rated}	r/min	3000
Rated torque	M_{rated}	Nm	0.32
Rated current	I_{rated}	A	0.76
Rated power	P_{rated}	kW	0.1



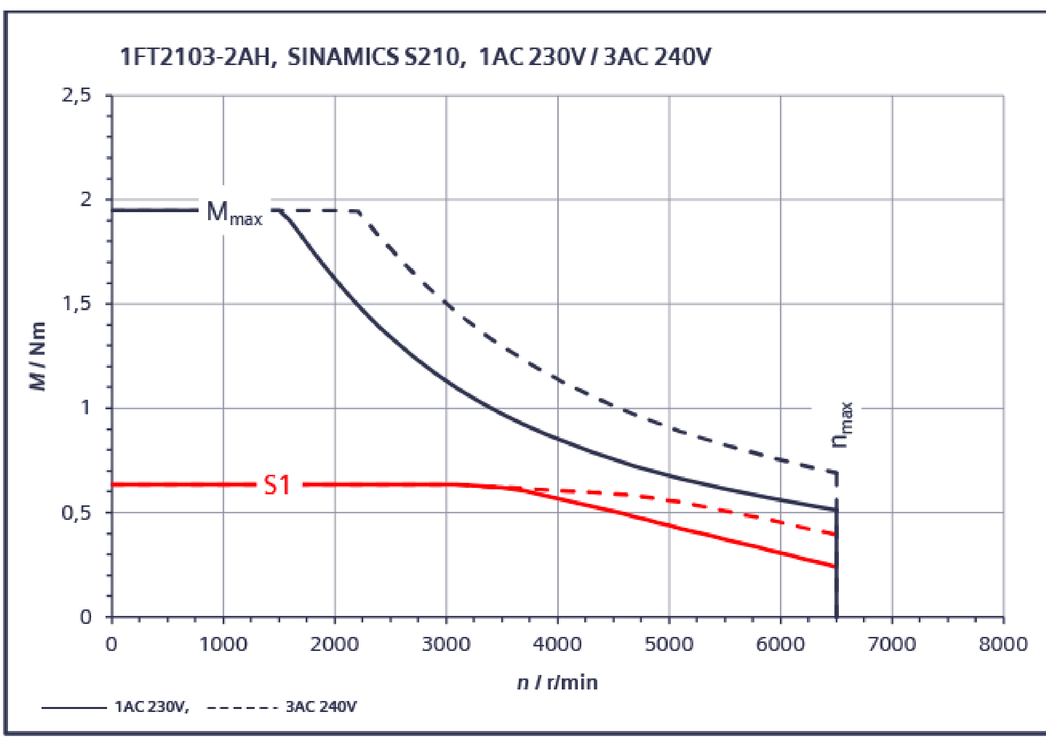
12.2.17.3 1FT2103-2AG connected to 230 V 1 AC / 240 V 3 AC

1FT2103-2AG	For 1 AC 230 V, 3 AC 240 V		
Technical specifications in the SINAMICS S210 system	**Symbol**	**Unit**	**Value**
Static torque	M_0	Nm	0.64
Stall current	I_0	A	1.36
Maximum permissible speed	n_{max}	r/min	8000
Maximum torque	M_{max}	Nm	1.95
Maximum current	I_{max}	A	4.8
Thermal time constant	T_{th}	min	17
Moment of inertia	J_{mot}	$kgcm^2$	0.093
Moment of inertia (with brake)	$J_{mot\ br}$	$kgcm^2$	0.112
Weight	m_{mot}	kg	1.17
Weight (with brake)	$m_{mot\ br}$	kg	1.54
Rated data for S210 connected to 1 AC 230 V, 3 AC 240 V			
Rated speed	n_{rated}	r/min	3000
Rated torque	M_{rated}	Nm	0.64
Rated current	I_{rated}	A	1.36
Rated power	P_{rated}	kW	0.2



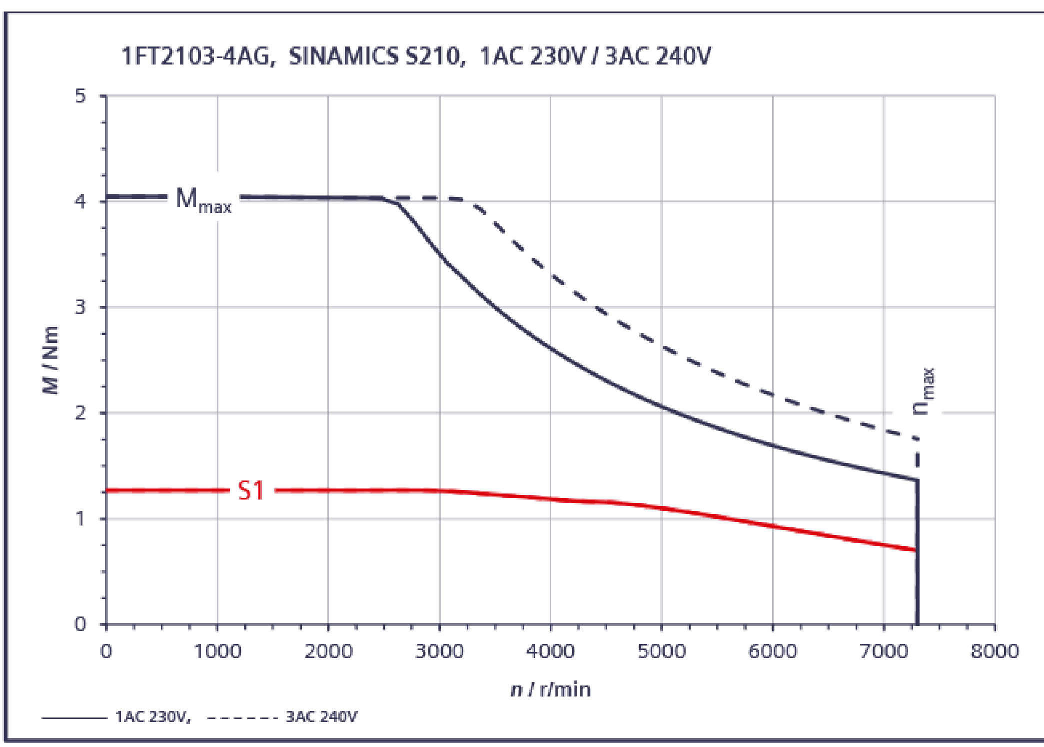
12.2.17.4 1FT2103-2AH connected to 1 AC 230 V / 3 AC 240 V

1FT2103-2AH	For 1 AC 230 V, 3 AC 240 V		
Technical specifications in the SINAMICS S210 system	**Symbol**	**Unit**	**Value**
Static torque	M_0	Nm	0.64
Stall current	I_0	A	1.36
Maximum permissible speed	n_{max}	r/min	8000
Maximum torque	M_{max}	Nm	1.95
Maximum current	I_{max}	A	4.8
Thermal time constant	T_{th}	min	17
Moment of inertia	J_{mot}	$kgcm^2$	0.093
Moment of inertia (with brake)	$J_{mot\ br}$	$kgcm^2$	0.112
Weight	m_{mot}	kg	1.17
Weight (with brake)	$m_{mot\ br}$	kg	1.54
Rated data for S210 connected to 1 AC 230 V, 3 AC 240 V			
Rated speed	n_{rated}	r/min	2500
Rated torque	M_{rated}	Nm	0.64
Rated current	I_{rated}	A	1.1
Rated power	P_{rated}	kW	0.167



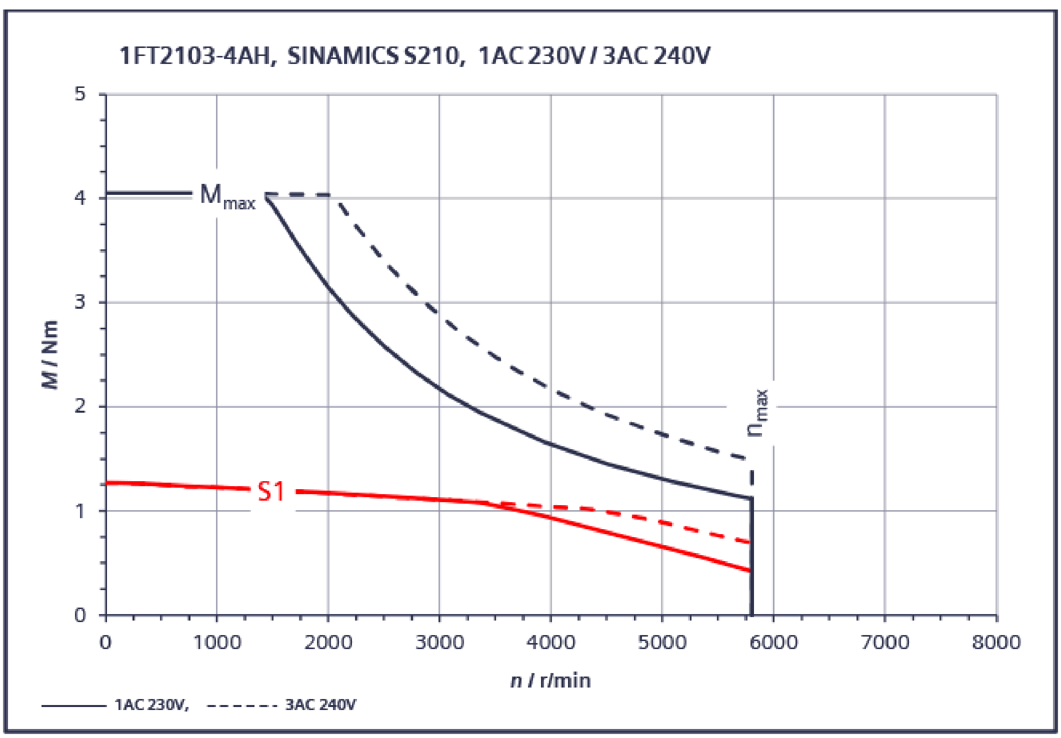
12.2.17.5 1FT2103-4AG connected to 230 V 1 AC / 240 V 3 AC

1FT2103-4AG	For 1 AC 230 V, 3 AC 240 V		
Technical specifications in the SINAMICS S210 system	**Symbol**	**Unit**	**Value**
Static torque	M_0	Nm	1.27
Stall current	I_0	A	2.4
Maximum permissible speed	n_{max}	r/min	7300
Maximum torque	M_{max}	Nm	4.05
Maximum current	I_{max}	A	8.7
Thermal time constant	T_{th}	min	21
Moment of inertia	J_{mot}	$kgcm^2$	0.139
Moment of inertia (with brake)	$J_{mot\ br}$	$kgcm^2$	0.158
Weight	m_{mot}	kg	1.64
Weight (with brake)	$m_{mot\ br}$	kg	1.98
Rated data for S210 connected to 1 AC 230 V, 3 AC 240 V			
Rated speed	n_{rated}	r/min	3000
Rated torque	M_{rated}	Nm	1.27
Rated current	I_{rated}	A	2.4
Rated power	P_{rated}	kW	0.4



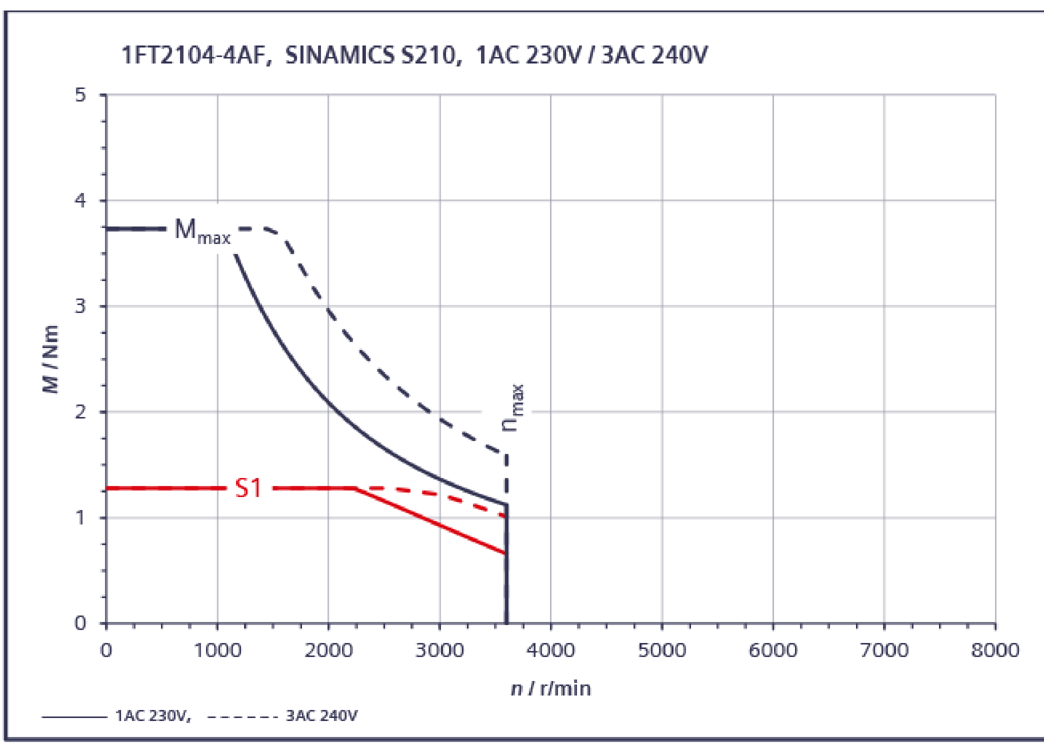
12.2.17.6 1FT2103-4AH connected to 1 AC 230 V / 3 AC 240 V

1FT2103-4AH	For 1 AC 230 V, 3 AC 240 V		
Technical specifications in the SINAMICS S210 system	**Symbol**	**Unit**	**Value**
Static torque	M_0	Nm	1.27
Stall current	I_0	A	1.87
Maximum permissible speed	n_{max}	r/min	8000
Maximum torque	M_{max}	Nm	4.05
Maximum current	I_{max}	A	7.1
Thermal time constant	T_{th}	min	21
Moment of inertia	J_{mot}	$kgcm^2$	0.139
Moment of inertia (with brake)	$J_{mot\ br}$	$kgcm^2$	0.158
Weight	m_{mot}	kg	1.65
Weight (with brake)	$m_{mot\ br}$	kg	1.99
Rated data for S210 connected to 1 AC 230 V, 3 AC 240 V			
Rated speed	n_{rated}	r/min	2500
Rated torque	M_{rated}	Nm	1.14
Rated current	I_{rated}	A	1.72
Rated power	P_{rated}	kW	0.3



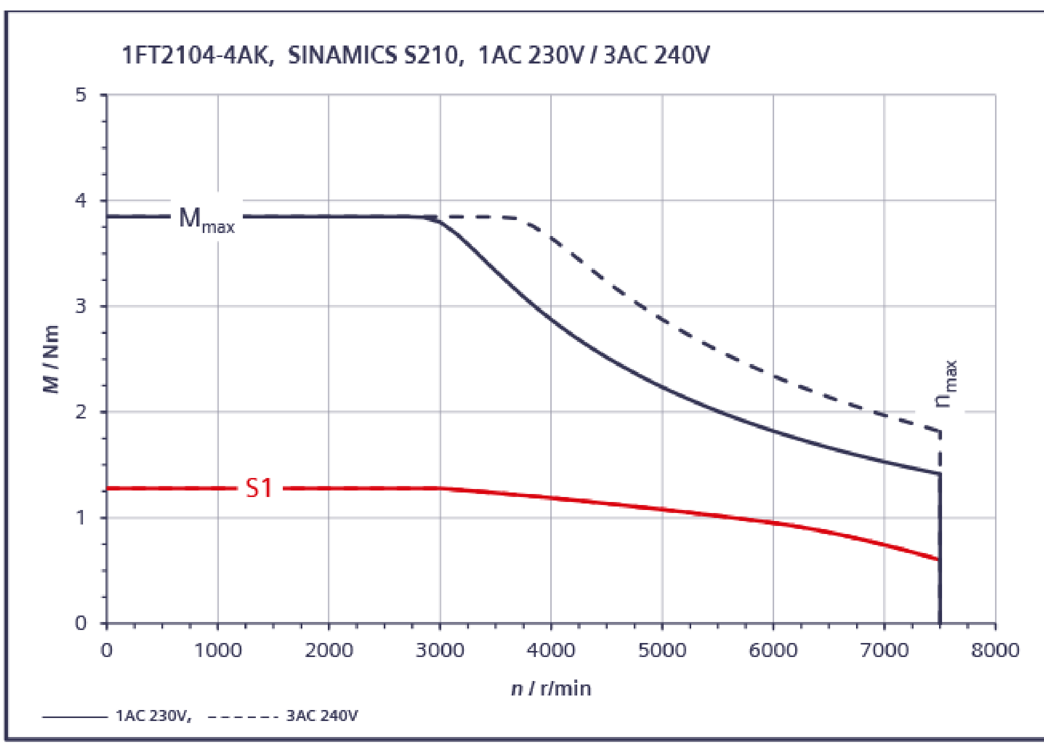
12.2.17.7 1FT2104-4AF connected to 230 V 1 AC / 240 V 3 AC

1FT2104-4AF	For 1 AC 230 V, 3 AC 240 V		
Technical specifications in the SINAMICS S210 system	**Symbol**	**Unit**	**Value**
Static torque	M_0	Nm	1.27
Stall current	I_0	A	1.19
Maximum permissible speed	n_{max}	r/min	3600
Maximum torque	M_{max}	Nm	3.75
Maximum current	I_{max}	A	4.2
Thermal time constant	T_{th}	min	33
Rotor moment of inertia	J_{mot}	$kgcm^2$	0.35
Rotor moment of inertia (with brake)	$J_{mot\ br}$	$kgcm^2$	0.43
Weight	m_{mot}	kg	2.05
Weight (with brake)	$m_{mot\ br}$	kg	2.9
Rated data for S210 connected to 1 AC 230 V, 3 AC 240 V			
Rated speed	n_{rated}	r/min	1500
Rated torque	M_{rated}	Nm	1.27
Rated current	I_{rated}	A	1.19
Rated power	P_{rated}	kW	0.2



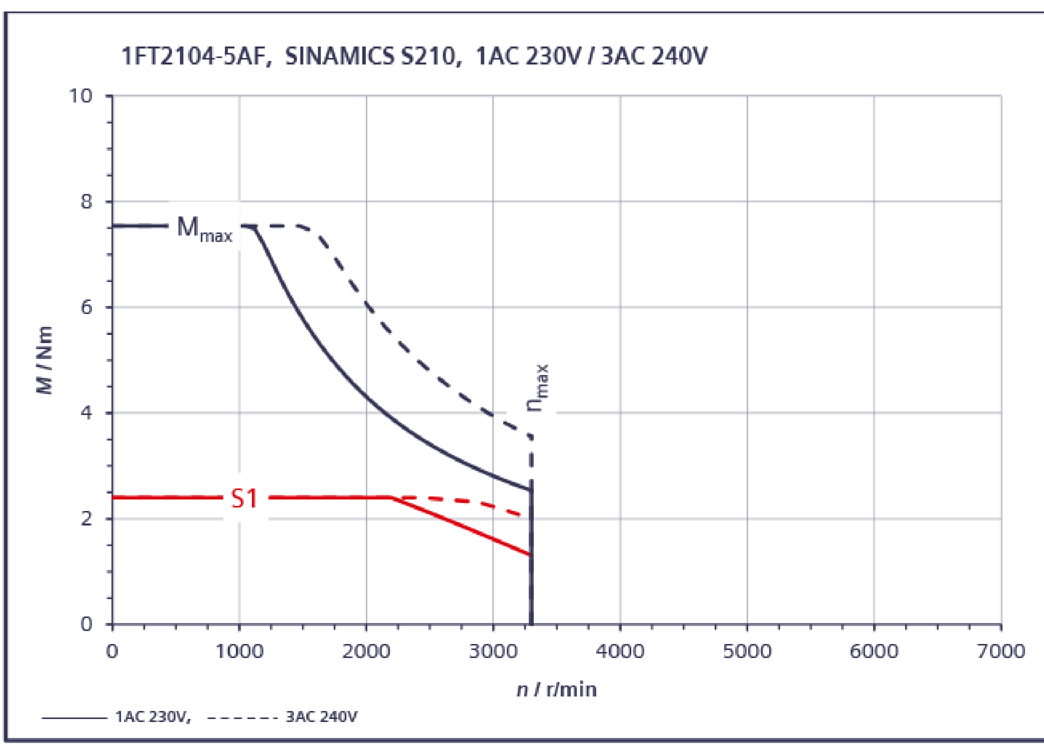
12.2.17.8 1FT2104-4AK connected to 230 V 1 AC / 240 V 3 AC

1FT2104-4AK	**For 1 AC 230 V, 3 AC 240 V**		
Technical specifications in the SINAMICS S210 system	**Symbol**	**Unit**	**Value**
Static torque	M_0	Nm	1.27
Stall current	I_0	A	2.4
Maximum permissible speed	n_{max}	r/min	7500
Maximum torque	M_{max}	Nm	3.85
Maximum current	I_{max}	A	8.7
Thermal time constant	T_{th}	min	33
Rotor moment of inertia	J_{mot}	kgcm²	0.35
Rotor moment of inertia (with brake)	$J_{mot\ br}$	kgcm²	0.43
Weight	m_{mot}	kg	2.05
Weight (with brake)	$m_{mot\ br}$	kg	2.9
Rated data for S210 connected to 1 AC 230 V, 3 AC 240 V			
Rated speed	n_{rated}	r/min	3000
Rated torque	M_{rated}	Nm	1.27
Rated current	I_{rated}	A	2.4
Rated power	P_{rated}	kW	0.4



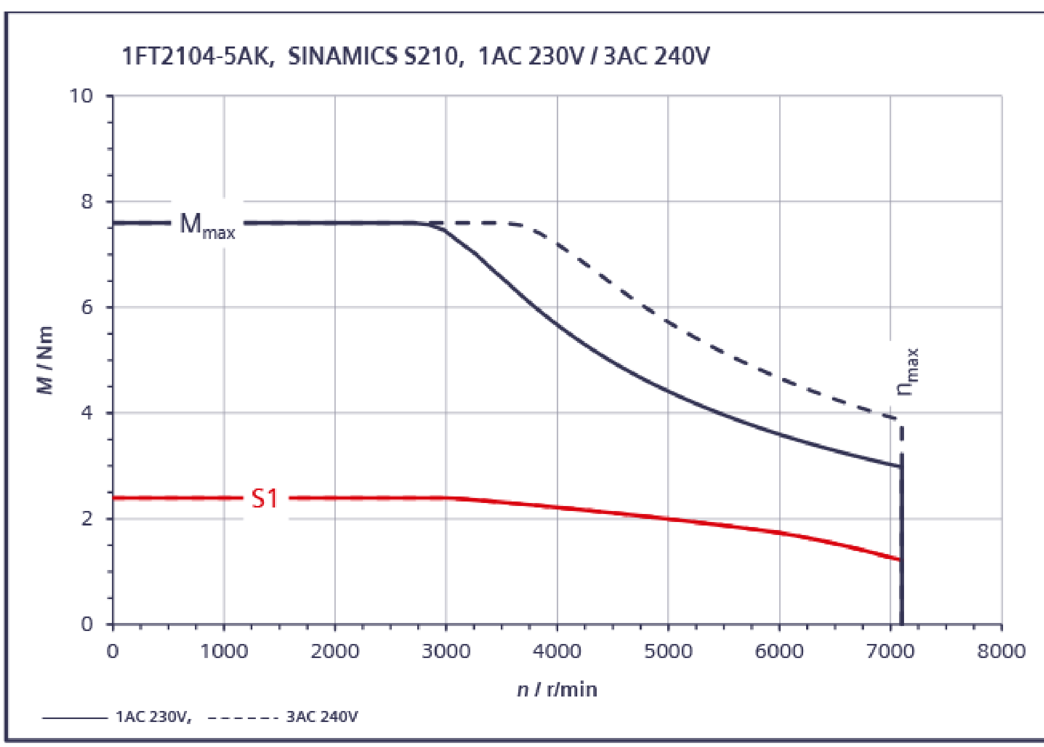
12.2.17.9 1FT2104-5AF connected to 230 V 1 AC / 240 V 3 AC

1FT2104-5AF	For 1 AC 230 V, 3 AC 240 V		
Technical specifications in the SINAMICS S210 system	**Symbol**	**Unit**	**Value**
Static torque	M_0	Nm	2.4
Stall current	I_0	A	2.1
Maximum permissible speed	n_{max}	r/min	3300
Maximum torque	M_{max}	Nm	7.5
Maximum current	I_{max}	A	7.6
Thermal time constant	T_{th}	min	35
Rotor moment of inertia	J_{mot}	$kgcm^2$	0.56
Rotor moment of inertia (with brake)	$J_{mot\ br}$	$kgcm^2$	0.65
Weight	m_{mot}	kg	2.85
Weight (with brake)	$m_{mot\ br}$	kg	3.7
Rated data for S210 connected to 1 AC 230 V, 3 AC 240 V			
Rated speed	n_{rated}	r/min	1500
Rated torque	M_{rated}	Nm	2.4
Rated current	I_{rated}	A	2.1
Rated power	P_{rated}	kW	0.375



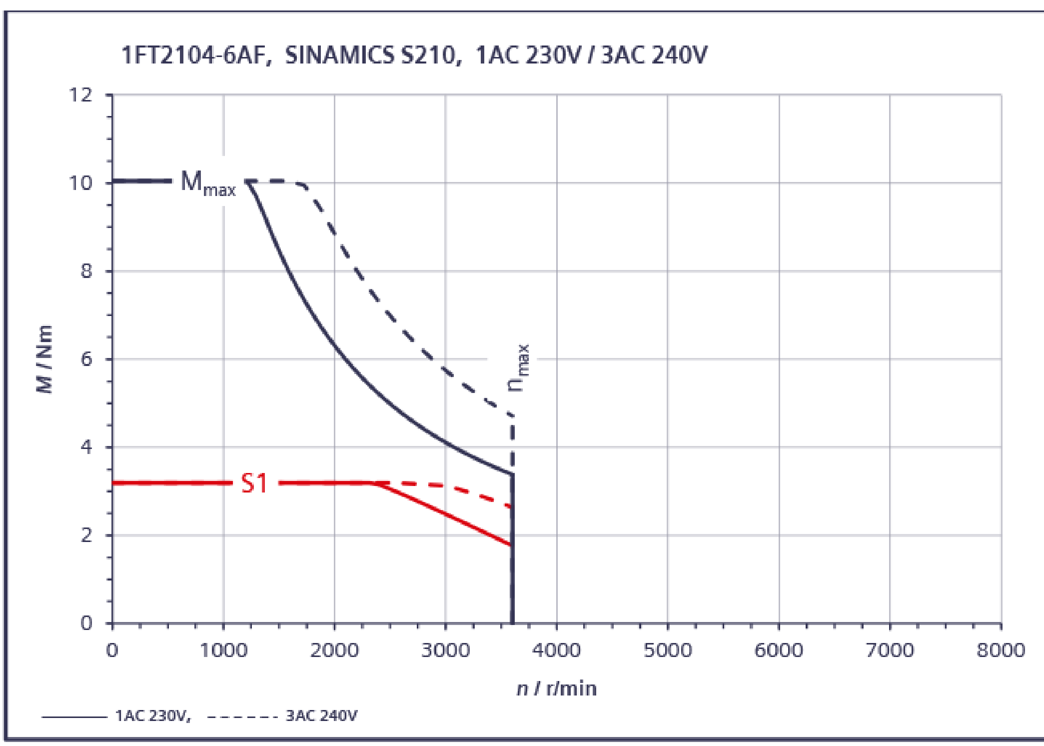
12.2.17.10 1FT2104-5AK connected to 230 V 1 AC / 240 V 3 AC

1FT2104-5AK	For 1 AC 230 V, 3 AC 240 V		
Technical specifications in the SINAMICS S210 system	**Symbol**	**Unit**	**Value**
Static torque	M_0	Nm	2.4
Stall current	I_0	A	4.4
Maximum permissible speed	n_{max}	r/min	7100
Maximum torque	M_{max}	Nm	7.6
Maximum current	I_{max}	A	16
Thermal time constant	T_{th}	min	35
Rotor moment of inertia	J_{mot}	$kgcm^2$	0.56
Rotor moment of inertia (with brake)	$J_{mot\ br}$	$kgcm^2$	0.65
Weight	m_{mot}	kg	2.85
Weight (with brake)	$m_{mot\ br}$	kg	3.7
Rated data for S210 connected to 1 AC 230 V, 3 AC 240 V			
Rated speed	n_{rated}	r/min	3000
Rated torque	M_{rated}	Nm	2.4
Rated current	I_{rated}	A	4.4
Rated power	P_{rated}	kW	0.75



12.2.17.11 1FT2104-6AF connected to 230 V 1 AC / 240 V 3 AC

1FT2104-6AF	For 1 AC 230 V, 3 AC 240 V		
Technical specifications in the SINAMICS S210 system	**Symbol**	**Unit**	**Value**
Static torque	M_0	Nm	3.2
Stall current	I_0	A	3
Maximum permissible speed	n_{max}	r/min	3600
Maximum torque	M_{max}	Nm	10
Maximum current	I_{max}	A	10.9
Thermal time constant	T_{th}	min	38
Rotor moment of inertia	J_{mot}	$kgcm^2$	0.76
Rotor moment of inertia (with brake)	$J_{mot\ br}$	$kgcm^2$	0.84
Weight	m_{mot}	kg	3.4
Weight (with brake)	$m_{mot\ br}$	kg	4.25
Rated data for S210 connected to 1 AC 230 V, 3 AC 240 V			
Rated speed	n_{rated}	r/min	1500
Rated torque	M_{rated}	Nm	3.2
Rated current	I_{rated}	A	3
Rated power	P_{rated}	kW	0.5



12.2.17.12 1FT2104-6AH connected to 1 AC 230 V / 3 AC 240 V

1FT2104-6AH	For 1 AC 230 V, 3 AC 240 V		
Technical specifications in the SINAMICS S210 system	**Symbol**	**Unit**	**Value**
Static torque	M_0	Nm	3.6
Stall current	I_0	A	4.95
Maximum permissible speed	n_{max}	r/min	9000
Maximum torque	M_{max}	Nm	10
Maximum current	I_{max}	A	16.3
Thermal time constant	T_{th}	min	38
Rotor moment of inertia	J_{mot}	$kgcm^2$	0.76
Rotor moment of inertia (with brake)	$J_{mot\ br}$	$kgcm^2$	0.84
Weight	m_{mot}	kg	3.4
Weight (with brake)	$m_{mot\ br}$	kg	4.25
Rated data for S210 connected to 1 AC 230 V, 3 AC 240 V			
Rated speed	n_{rated}	r/min	2500
Rated torque	M_{rated}	Nm	3.25
Rated current	I_{rated}	A	4.6
Rated power	P_{rated}	kW	0.86

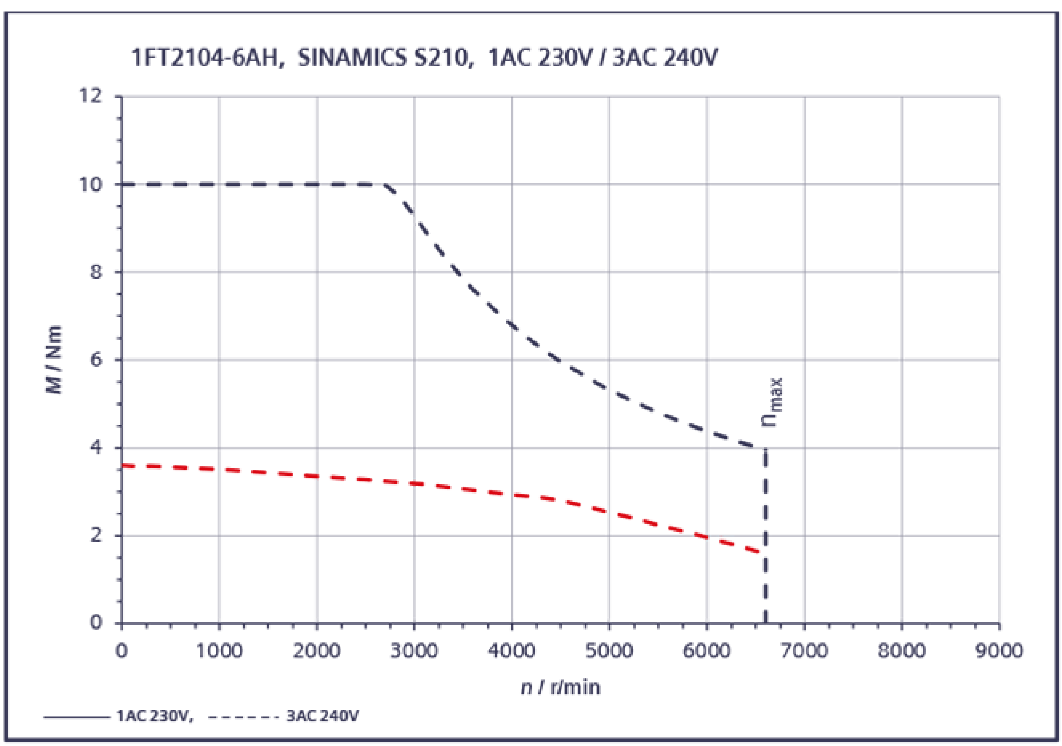
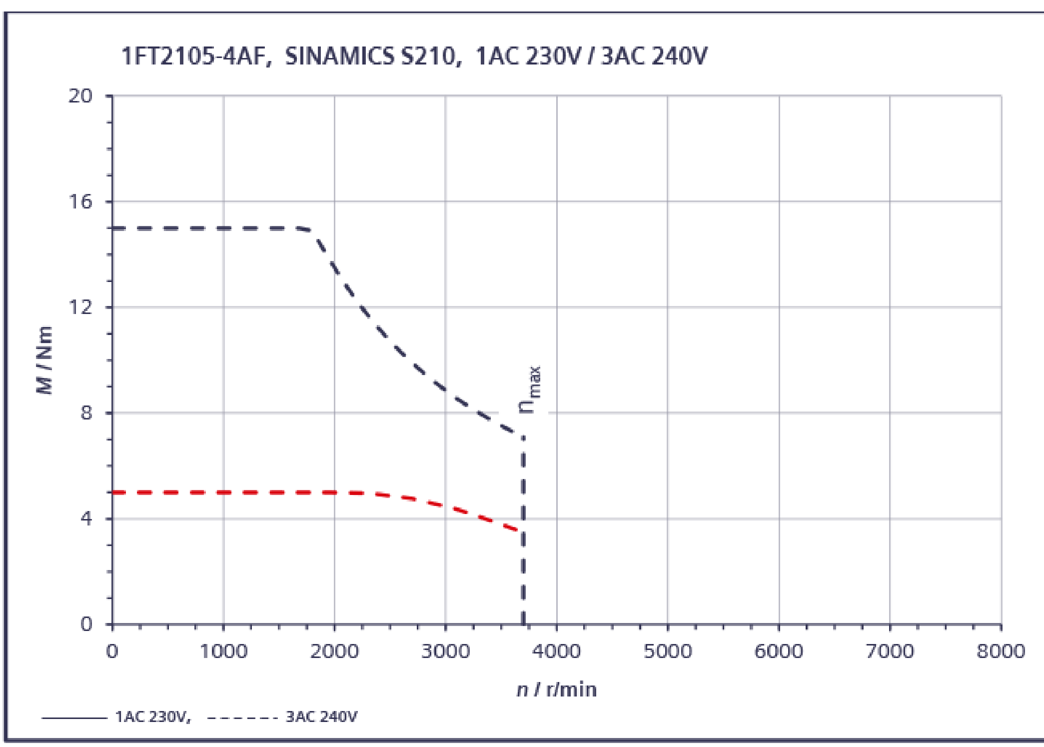


Figure 12-9 1FT2104_6AH_230 V

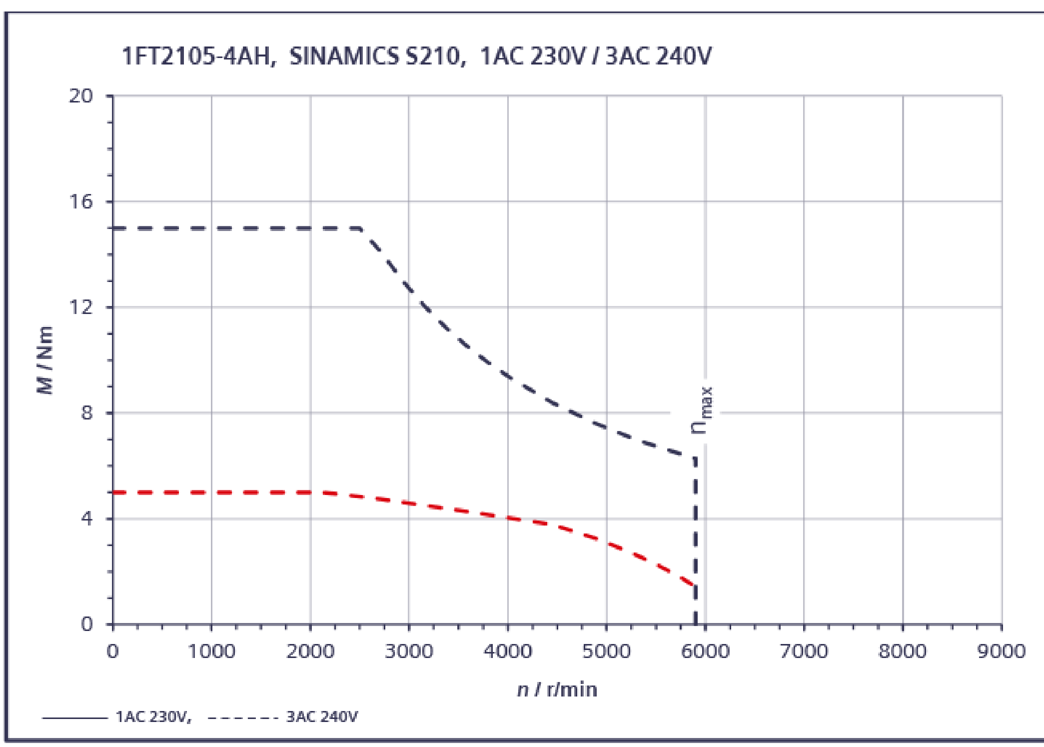
12.2.17.13 1FT2105-4AF connected to 3 AC 240 V

1FT2105-4AF	For 3 AC 240 V		
Technical specifications in the SINAMICS S210 system	**Symbol**	**Unit**	**Value**
Static torque	M_0	Nm	5
Stall current	I_0	A	4.65
Maximum permissible speed	n_{max}	r/min	3700
Maximum torque	M_{max}	Nm	15
Maximum current	I_{max}	A	18
Thermal time constant	T_{th}	min	37
Rotor moment of inertia	J_{mot}	$kgcm^2$	1.71
Rotor moment of inertia (with brake)	$J_{mot\ br}$	$kgcm^2$	2.55
Weight	m_{mot}	kg	5.6
Weight (with brake)	$m_{mot\ br}$	kg	6.6
Rated data for S210 connected to 3 AC 240 V			
Rated speed	n_{rated}	r/min	1500
Rated torque	M_{rated}	Nm	5
Rated current	I_{rated}	A	4.65
Rated power	P_{rated}	kW	0.79



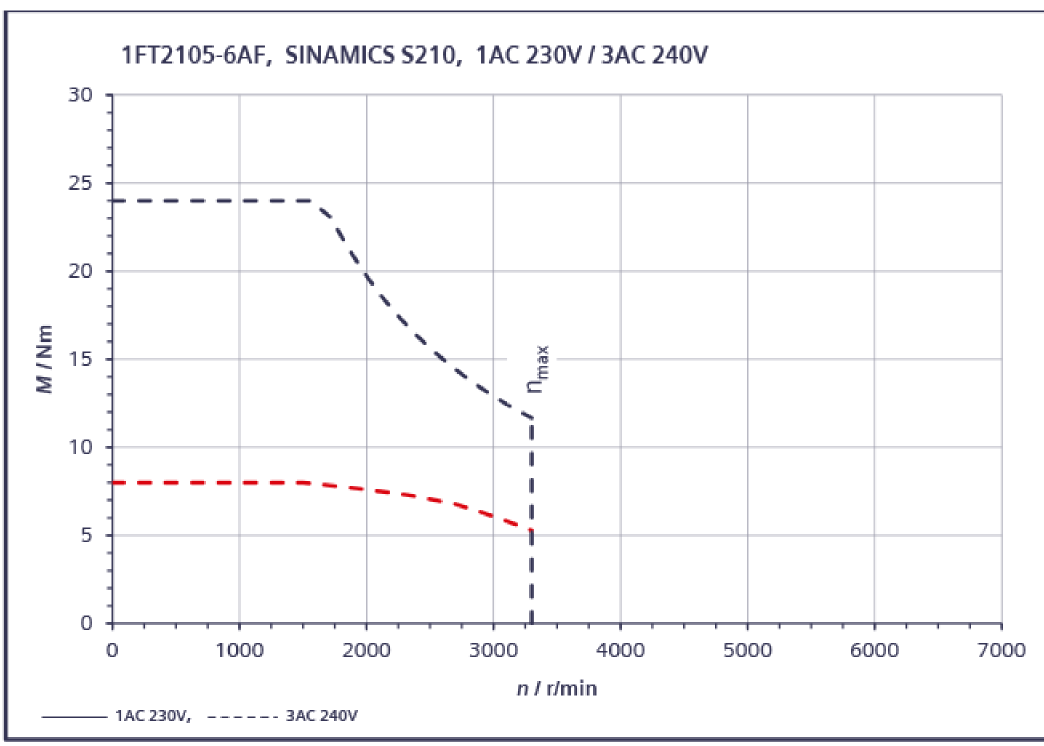
12.2.17.14 1FT2105-4AH connected to 3 AC 240 V

1FT2105-4AH	For 3 AC 240 V		
Technical specifications in the SINAMICS S210 system	**Symbol**	**Unit**	**Value**
Static torque	M_0	Nm	5
Stall current	I_0	A	6.9
Maximum permissible speed	n_{max}	r/min	5900
Maximum torque	M_{max}	Nm	15
Maximum current	I_{max}	A	27
Thermal time constant	T_{th}	min	37
Rotor moment of inertia	J_{mot}	$kgcm^2$	1.71
Rotor moment of inertia (with brake)	$J_{mot\ br}$	$kgcm^2$	2.55
Weight	m_{mot}	kg	5.6
Weight (with brake)	$m_{mot\ br}$	kg	6.6
Rated data for S210 connected to 3 AC 240 V			
Rated speed	n_{rated}	r/min	2500
Rated torque	M_{rated}	Nm	4.85
Rated current	I_{rated}	A	6.9
Rated power	P_{rated}	kW	1.27



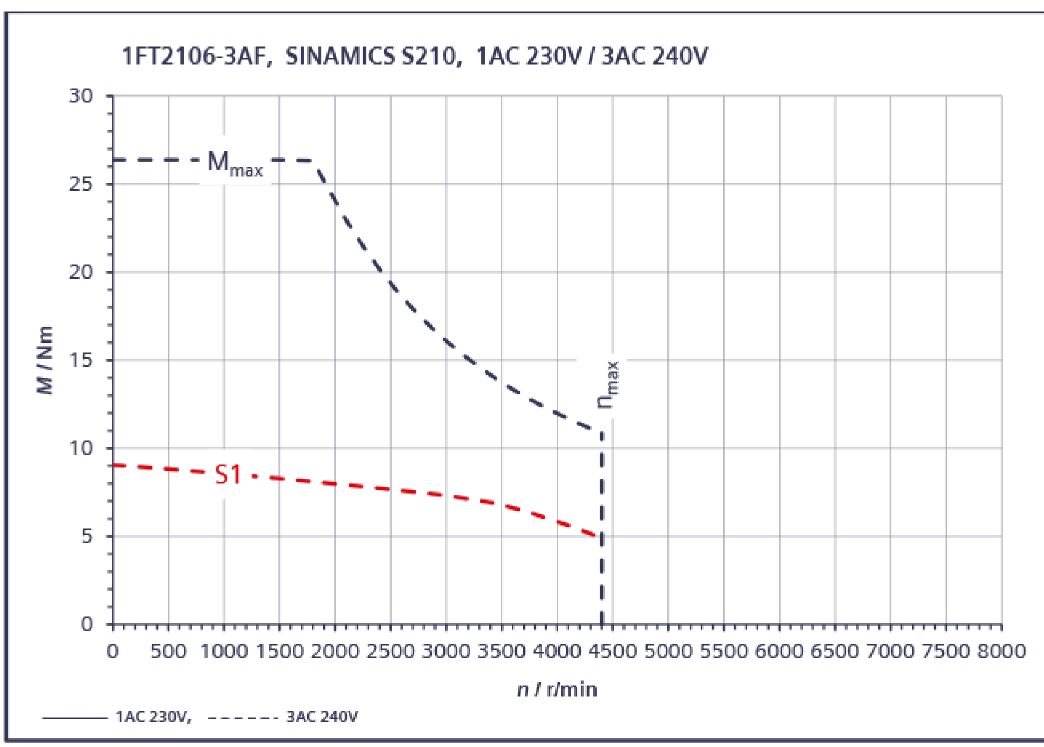
12.2.17.15 1FT2105-6AF connected to 3 AC 240 V

1FT2105-6AF	For 3 AC 240 V		
Technical specifications in the SINAMICS S210 system	**Symbol**	**Unit**	**Value**
Static torque	M_0	Nm	8
Stall current	I_0	A	6.7
Maximum permissible speed	n_{max}	r/min	3300
Maximum torque	M_{max}	Nm	24
Maximum current	I_{max}	A	24
Thermal time constant	T_{th}	min	40
Rotor moment of inertia	J_{mot}	$kgcm^2$	2.65
Rotor moment of inertia (with brake)	$J_{mot\ br}$	$kgcm^2$	3.5
Weight	m_{mot}	kg	7.7
Weight (with brake)	$m_{mot\ br}$	kg	8.7
Rated data for S210 connected to 3 AC 240 V			
Rated speed	n_{rated}	r/min	1500
Rated torque	M_{rated}	Nm	8
Rated current	I_{rated}	A	6.7
Rated power	P_{rated}	kW	1.26



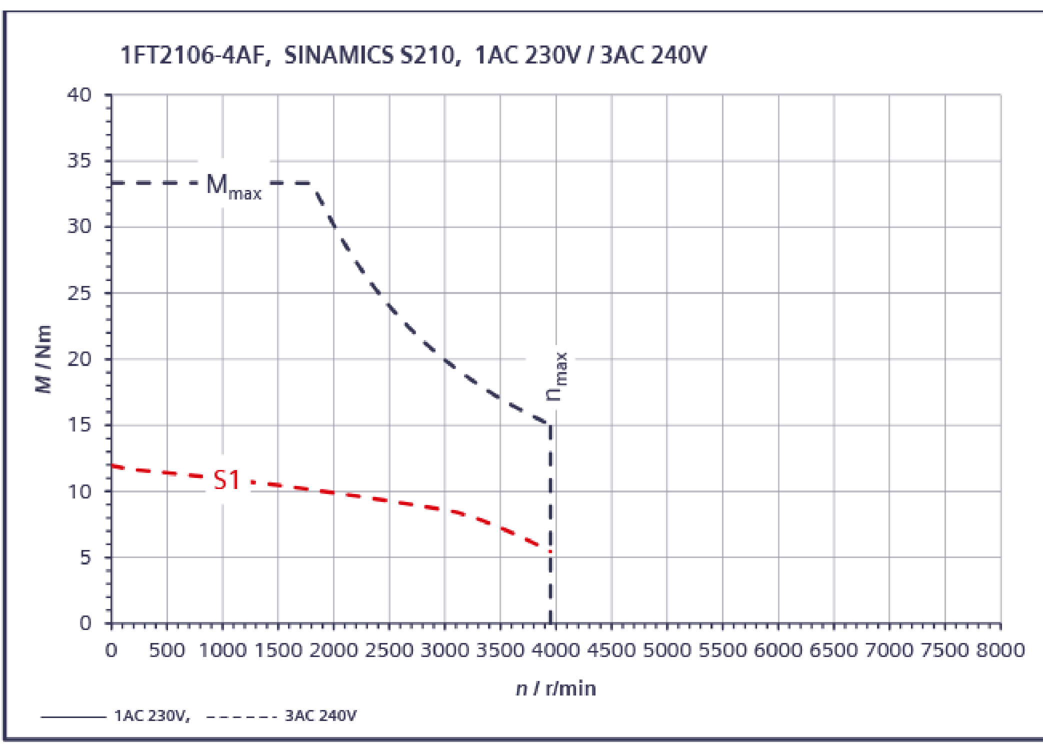
12.2.17.16 1FT2106-3AF connected to 3 AC 240 V

1FT2106-3AF	For 3 AC 240 V		
Technical specifications in the SINAMICS S210 system	**Symbol**	**Unit**	**Value**
Static torque	M_0	Nm	9
Stall current	I_0	A	9.2
Maximum permissible speed	n_{max}	r/min	4400
Maximum torque	M_{max}	Nm	26
Maximum current	I_{max}	A	43
Thermal time constant	T_{th}	min	30
Rotor moment of inertia	J_{mot}	$kgcm^2$	4.6
Rotor moment of inertia (with brake)	$J_{mot\ br}$	$kgcm^2$	6.3
Weight	m_{mot}	kg	7.4
Weight (with brake)	$m_{mot\ br}$	kg	9
Rated data for S210 connected to 3 AC 240 V			
Rated speed	n_{rated}	r/min	1500
Rated torque	M_{rated}	Nm	8.3
Rated current	I_{rated}	A	8.7
Rated power	P_{rated}	kW	1.3



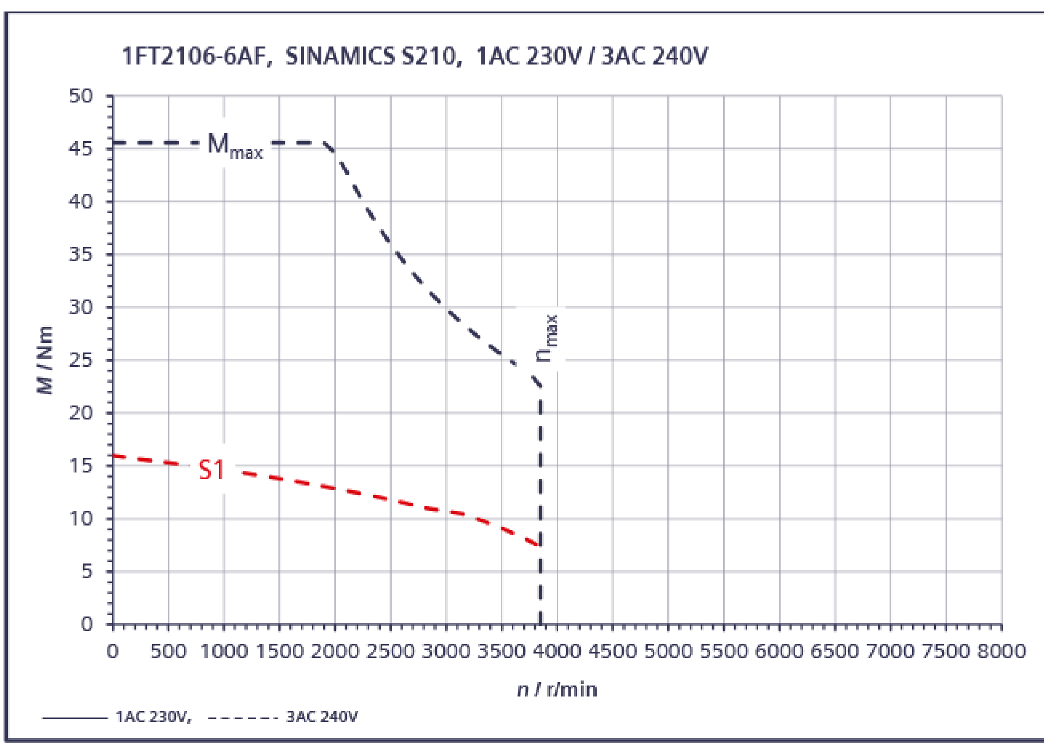
12.2.17.17 1FT2106-4AF connected to 3 AC 240 V

1FT2106-4AF	For 3 AC 240 V		
Technical specifications in the SINAMICS S210 system	**Symbol**	**Unit**	**Value**
Static torque	M_0	Nm	12
Stall current	I_0	A	10.7
Maximum permissible speed	n_{max}	r/min	3950
Maximum torque	M_{max}	Nm	33
Maximum current	I_{max}	A	42
Thermal time constant	T_{th}	min	34
Rotor moment of inertia	J_{mot}	$kgcm^2$	6
Rotor moment of inertia (with brake)	$J_{mot\ br}$	$kgcm^2$	7.6
Weight	m_{mot}	kg	9
Weight (with brake)	$m_{mot\ br}$	kg	10.6
Rated data for S210 connected to 3 AC 240 V			
Rated speed	n_{rated}	r/min	1500
Rated torque	M_{rated}	Nm	10.5
Rated current	I_{rated}	A	9.6
Rated power	P_{rated}	kW	1.64



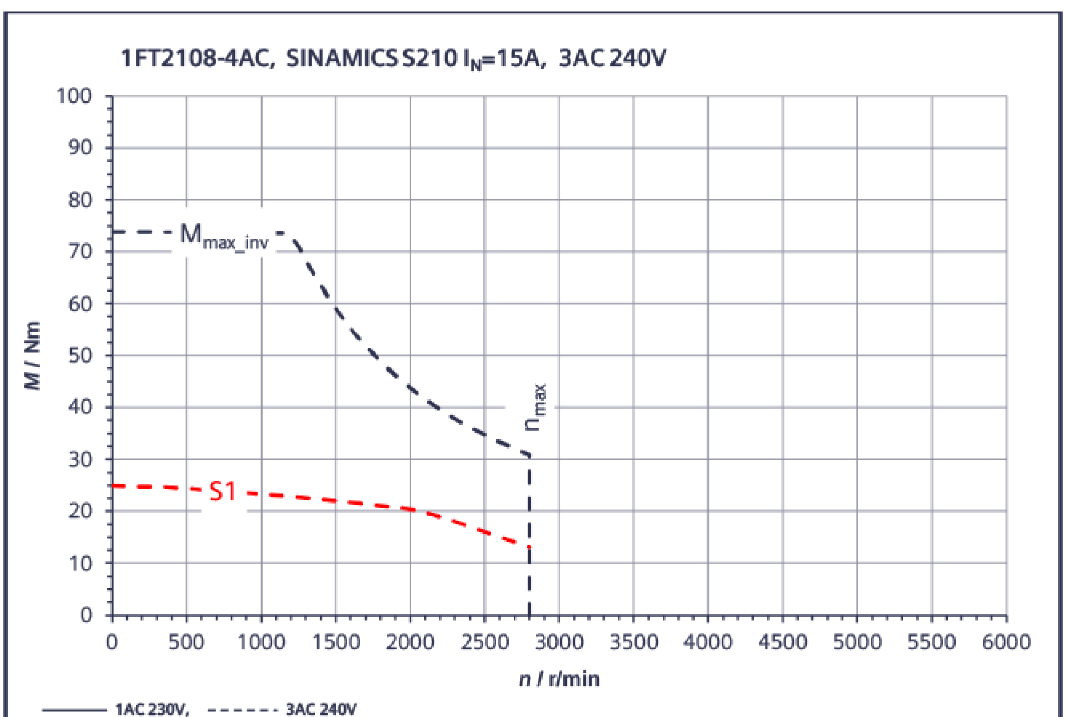
12.2.17.18 1FT2106-6AF connected to 3 AC 240 V

1FT2106-6AF	For 3 AC 240 V		
Technical specifications in the SINAMICS S210 system	**Symbol**	**Unit**	**Value**
Static torque	M_0	Nm	16
Stall current	I_0	A	14.3
Maximum permissible speed	n_{max}	r/min	3850
Maximum torque	M_{max}	Nm	45.5
Maximum current	I_{max}	A	49
Thermal time constant	T_{th}	min	50
Rotor moment of inertia	J_{mot}	kgcm²	8.7
Rotor moment of inertia (with brake)	$J_{mot\ br}$	kgcm²	10.4
Weight	m_{mot}	kg	11.8
Weight (with brake)	$m_{mot\ br}$	kg	13.4
Rated data for S210 connected to 3 AC 240 V			
Rated speed	n_{rated}	r/min	1500
Rated torque	M_{rated}	Nm	13.8
Rated current	I_{rated}	A	12.5
Rated power	P_{rated}	kW	2.15



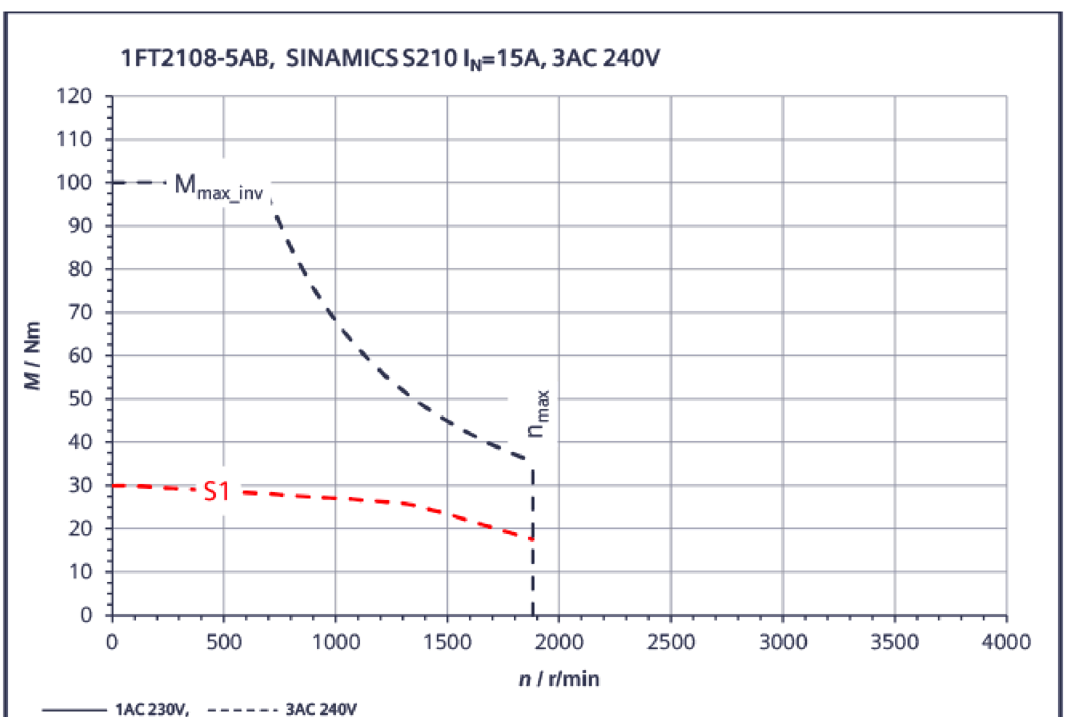
12.2.17.19 1FT2108-4AC connected to 3 AC 240 V

1FT2108-4AC	**For 3 AC 240 V**		
Technical specifications in the SINAMICS S210 system	**Symbol**	**Unit**	**Value**
Static torque	M_0	Nm	25
Stall current	I_0	A	14.8
Maximum permissible speed	n_{max}	r/min	5600
Maximum torque	$M_{max\ inv}$	Nm	74
Maximum current	I_{max}	A	77
Thermal time constant	T_{th}	min	49
Rotor moment of inertia	J_{mot}	$kgcm^2$	18.3
Rotor moment of inertia (with brake 1)	$J_{mot\ br}$	$kgcm^2$	22.3
Rotor moment of inertia (with brake 2)	$J_{mot\ br}$	$kgcm^2$	23.9
Weight	m_{mot}	kg	17
Weight (with brake 1)	$m_{mot\ br}$	kg	19.7
Weight (with brake 2)	$m_{mot\ br}$	kg	19.9
Rated data for S210 connected to 3 AC 240 V			
Rated speed	n_{rated}	r/min	1000
Rated torque	M_{rated}	Nm	23.5
Rated current	I_{rated}	A	14.2
Rated power	P_{rated}	kW	2.45



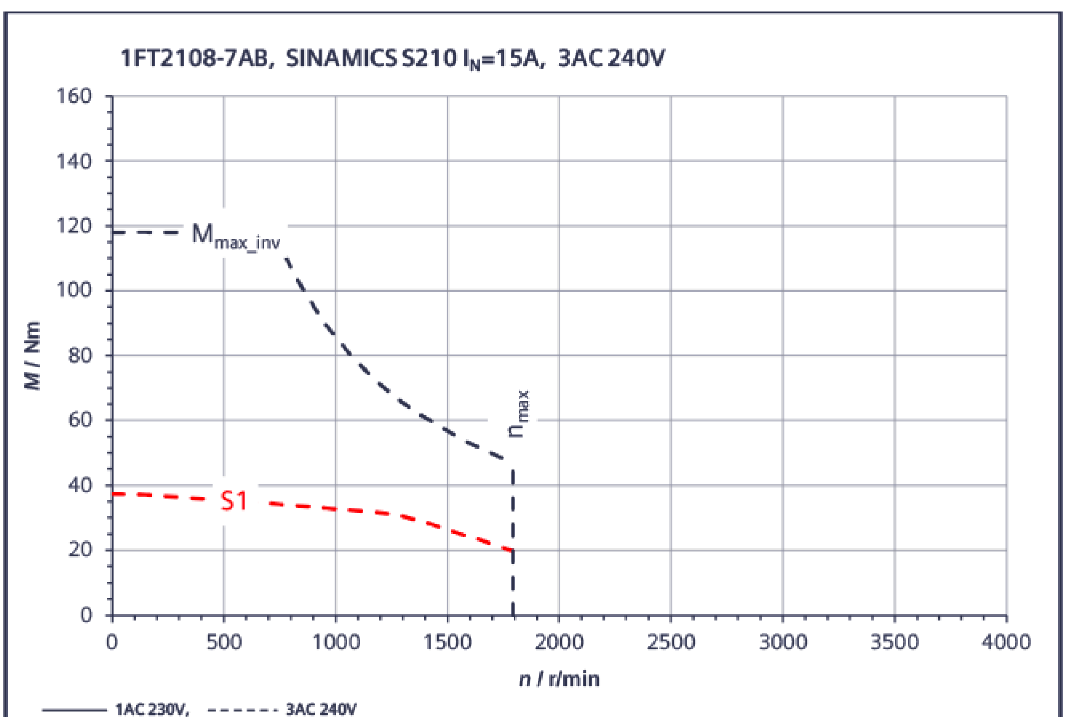
12.2.17.20 1FT2108-5AB connected to 3 AC 240 V

1FT2108-5AB	For 3 AC 240 V		
Technical specifications in the SINAMICS S210 system	**Symbol**	**Unit**	**Value**
Static torque	M_0	Nm	30
Stall current	I_0	A	11.8
Maximum permissible speed	n_{max}	r/min	3750
Maximum torque	$M_{max\ inv}$	Nm	100
Maximum current	I_{max}	A	61
Thermal time constant	T_{th}	min	50
Rotor moment of inertia	J_{mot}	$kgcm^2$	21.6
Rotor moment of inertia (with brake 1)	$J_{mot\ br}$	$kgcm^2$	25.6
Rotor moment of inertia (with brake 2)	$J_{mot\ br}$	$kgcm^2$	27.2
Weight	m_{mot}	kg	19.7
Weight (with brake 1)	$m_{mot\ br}$	kg	22.4
Weight (with brake 2)	$m_{mot\ br}$	kg	22.5
Rated data for S210 connected to 3 AC 240 V			
Rated speed	n_{rated}	r/min	750
Rated torque	M_{rated}	Nm	28
Rated current	I_{rated}	A	11.1
Rated power	P_{rated}	kW	2.2



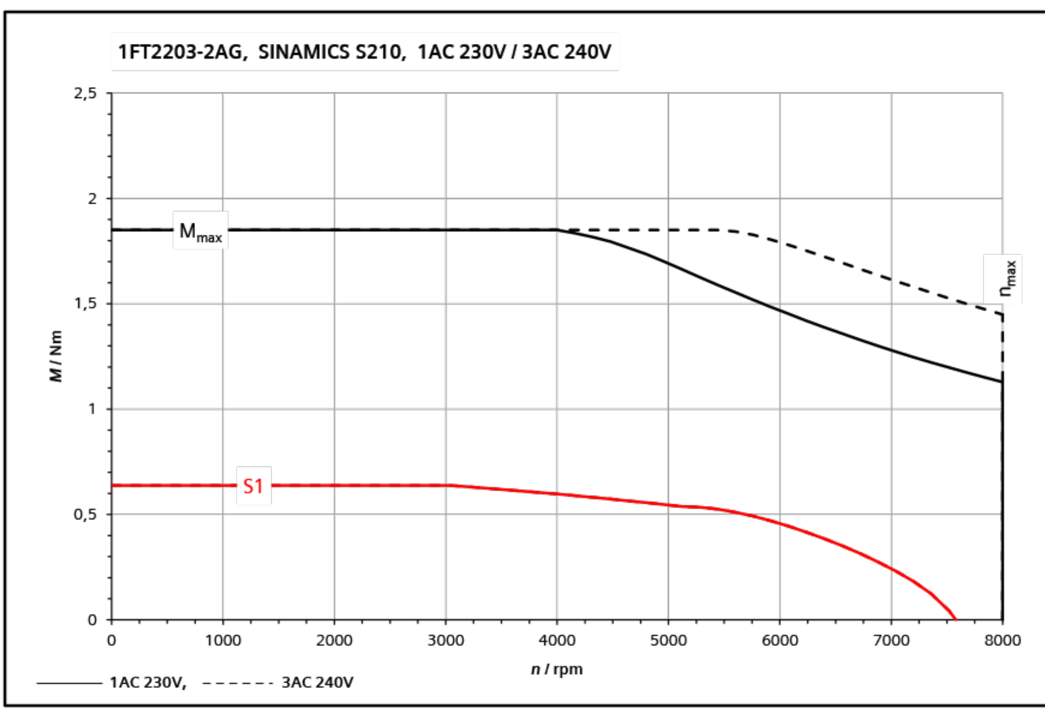
12.2.17.21 1FT2108-7AB connected to 3 AC 240 V

1FT2108-7AB	**For 3 AC 240 V**		
Technical specifications in the SINAMICS S210 system	**Symbol**	**Unit**	**Value**
Static torque	M_0	Nm	37.5
Stall current	I_0	A	14
Maximum permissible speed	n_{max}	r/min	3550
Maximum torque	$M_{max\ inv}$	Nm	118
Maximum current	I_{max}	A	78
Thermal time constant	T_{th}	min	60
Rotor moment of inertia	J_{mot}	$kgcm^2$	28.2
Rotor moment of inertia (with brake 1)	$J_{mot\ br}$	$kgcm^2$	32.2
Rotor moment of inertia (with brake 2)	$J_{mot\ br}$	$kgcm^2$	33.8
Weight	m_{mot}	kg	24.5
Weight (with brake 1)	$m_{mot\ br}$	kg	27.2
Weight (with brake 2)	$m_{mot\ br}$	kg	27.4
Rated data for S210 connected to 3 AC 240 V			
Rated speed	n_{rated}	r/min	750
Rated torque	M_{rated}	Nm	33
Rated current	I_{rated}	A	13
Rated power	P_{rated}	kW	2.6



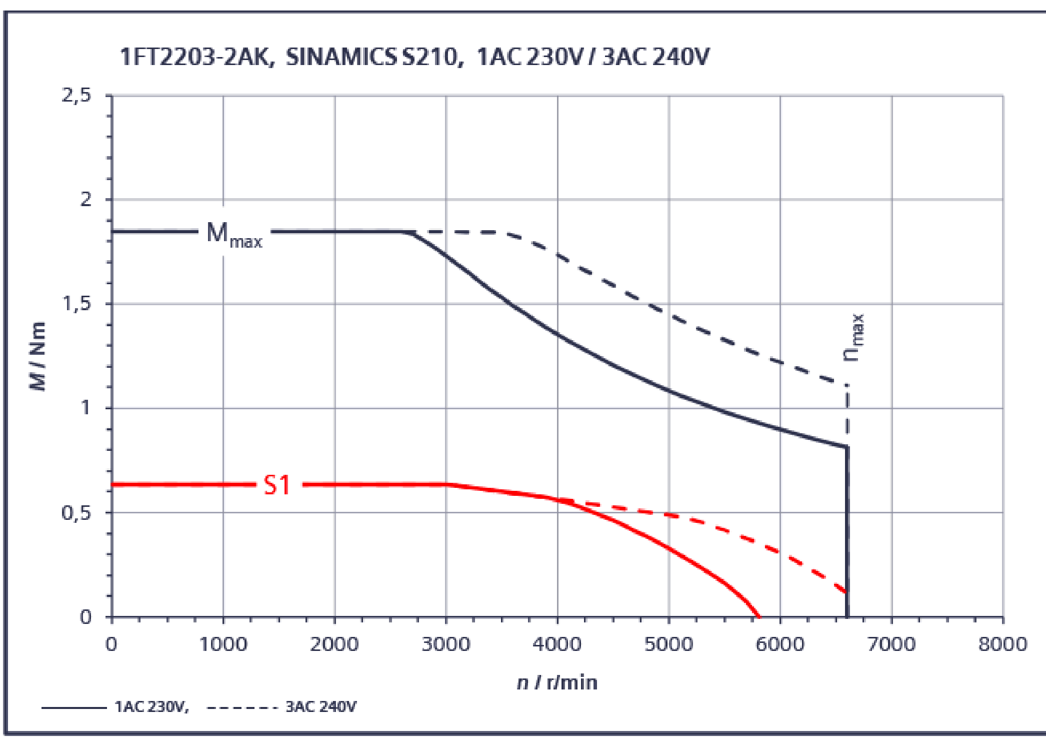
12.2.17.22 1FT2203-2AG connected to 230 V 1 AC / 240 V 3 AC

1FT2203-2AG	**For 1 AC 230 V, 3 AC 240 V**		
Technical specifications in the SINAMICS S210 system	**Symbol**	**Unit**	**Value**
Static torque	M_0	Nm	0.64
Stall current	I_0	A	1.38
Maximum permissible speed	n_{max}	r/min	8000
Maximum torque	M_{max}	Nm	1.85
Maximum current	I_{max}	A	4.2
Thermal time constant	T_{th}	min	21
Rotor moment of inertia	J_{mot}	$kgcm^2$	0.2
Rotor moment of inertia (with brake)	$J_{mot\ br}$	$kgcm^2$	0.22
Weight	m_{mot}	kg	1.15
Weight (with brake)	$m_{mot\ br}$	kg	1.52
Rated data for S210 connected to 1 AC 230 V, 3 AC 240 V			
Rated speed	n_{rated}	r/min	3000
Rated torque	M_{rated}	Nm	0.64
Rated current	I_{rated}	A	1.38
Rated power	P_{rated}	kW	0.2



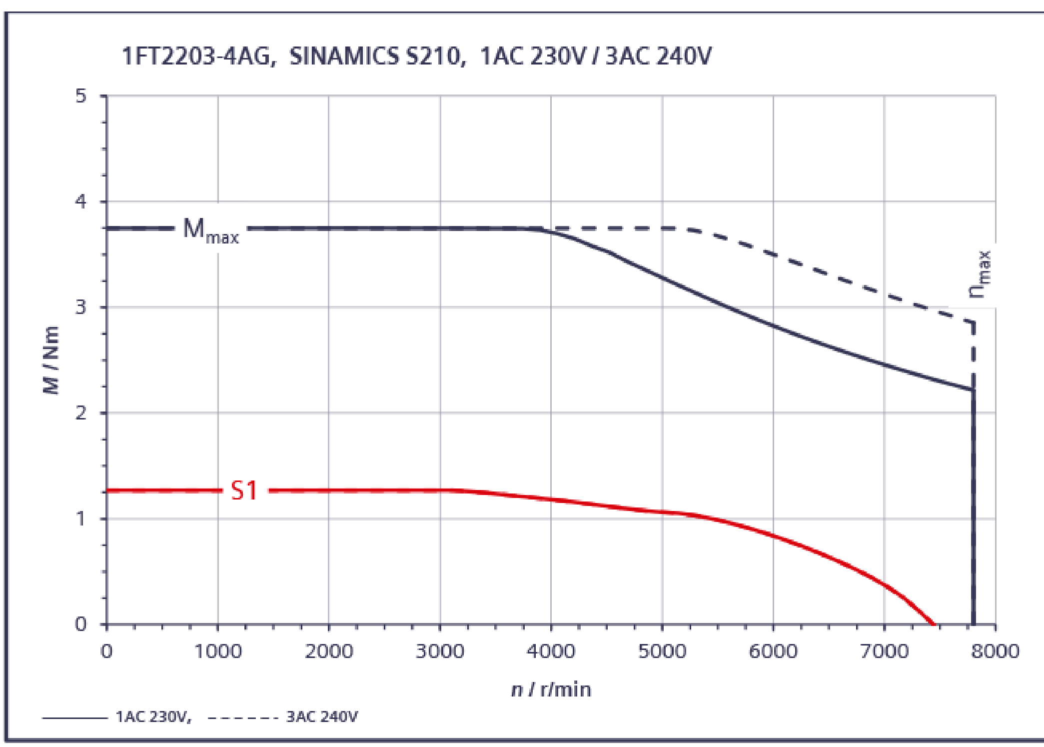
12.2.17.23 1FT2203-2AK connected to 1 AC 230 V / 3 AC 240 V

1FT2203-2AK	**For 3 AC 400 V, 3 AC 480 V**		
Technical specifications in the SINAMICS S210 system	**Symbol**	**Unit**	**Value**
Static torque	M_0	Nm	0.64
Stall current	I_0	A	1.05
Maximum permissible speed	n_{max}	r/min	8000
Maximum torque	M_{max}	Nm	1.85
Maximum current	I_{max}	A	3.4
Thermal time constant	T_{th}	min	21
Rotor moment of inertia	J_{mot}	$kgcm^2$	0.2
Rotor moment of inertia (with brake)	$J_{mot\ br}$	$kgcm^2$	0.22
Weight	m_{mot}	kg	1.16
Weight (with brake)	$m_{mot\ br}$	kg	1.53
Rated data for S210 connected to 1 AC 230 V, 3 AC 240 V			
Rated speed	n_{rated}	r/min	3000
Rated torque	M_{rated}	Nm	0.64
Rated current	I_{rated}	A	1.12
Rated power	P_{rated}	kW	0.2



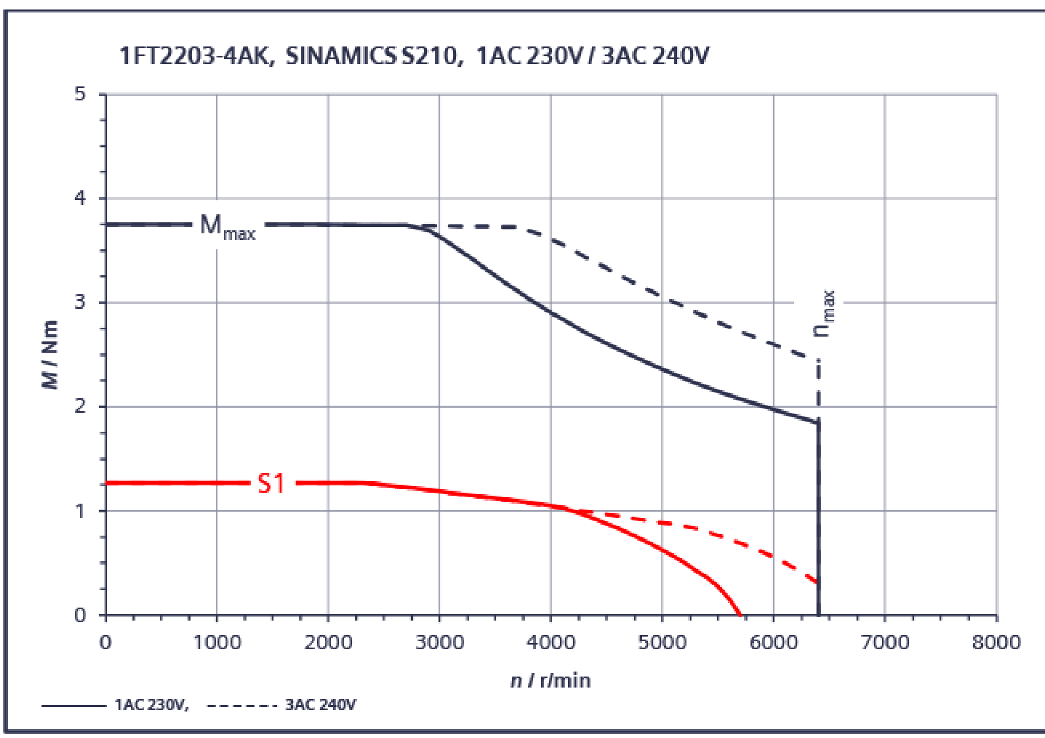
12.2.17.24 1FT2203-4AG connected to 230 V 1 AC / 240 V 3 AC

1FT2203-4AG	For 1 AC 230 V, 3 AC 240 V		
Technical specifications in the SINAMICS S210 system	**Symbol**	**Unit**	**Value**
Static torque	M_0	Nm	1.27
Stall current	I_0	A	2.52
Maximum permissible speed	n_{max}	r/min	7800
Maximum torque	M_{max}	Nm	3.75
Maximum current	I_{max}	A	7.8
Thermal time constant	T_{th}	min	28
Rotor moment of inertia	J_{mot}	$kgcm^2$	0.35
Rotor moment of inertia (with brake)	$J_{mot\ br}$	$kgcm^2$	0.37
Weight	m_{mot}	kg	1.48
Weight (with brake)	$m_{mot\ br}$	kg	1.96
Rated data for S210 connected to 1 AC 230 V, 3 AC 240 V			
Rated speed	n_{rated}	r/min	3000
Rated torque	M_{rated}	Nm	1.27
Rated current	I_{rated}	A	2.52
Rated power	P_{rated}	kW	0.4



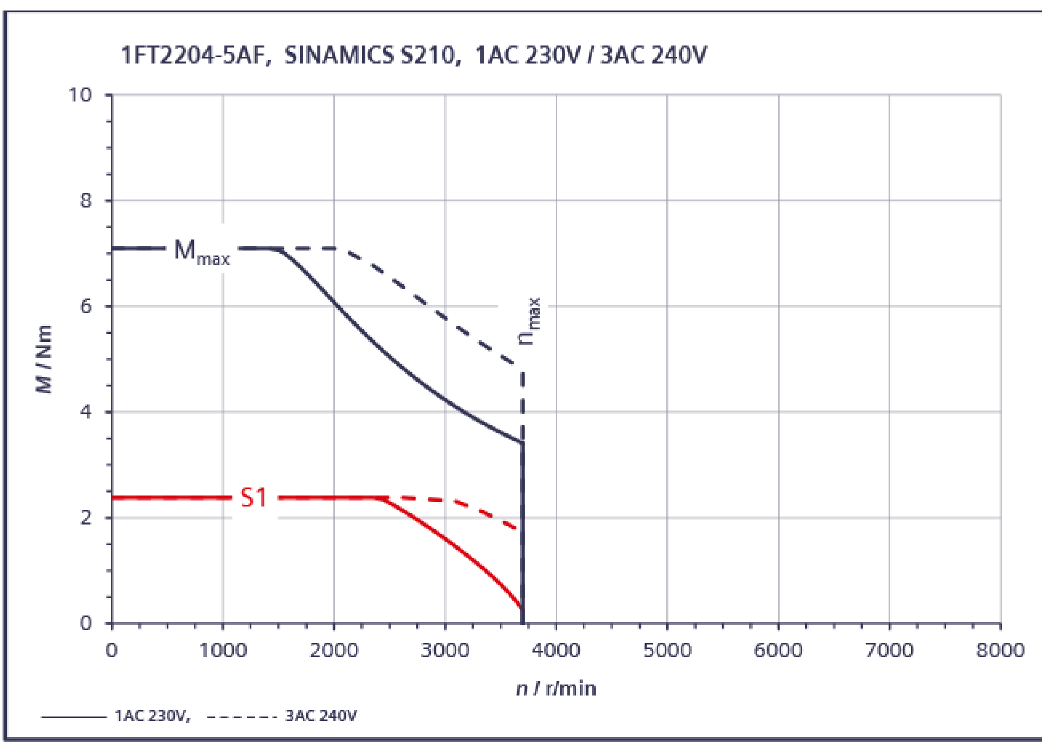
12.2.17.25 1FT2203-4AK connected to 1 AC 230 V / 3 AC 240 V

1FT2203-4AK	For 3 AC 400 V, 3 AC 480 V		
Technical specifications in the SINAMICS S210 system	**Symbol**	**Unit**	**Value**
Static torque	M_0	Nm	1.27
Stall current	I_0	A	2.05
Maximum permissible speed	n_{max}	r/min	8000
Maximum torque	M_{max}	Nm	3.75
Maximum current	I_{max}	A	6.7
Thermal time constant	T_{th}	min	28
Rotor moment of inertia	J_{mot}	$kgcm^2$	0.35
Rotor moment of inertia (with brake)	$J_{mot\ br}$	$kgcm^2$	0.37
Weight	m_{mot}	kg	1.49
Weight (with brake)	$m_{mot\ br}$	kg	1.97
Rated data for S210 connected to 3 AC 400 V, 3 AC 480 V			
Rated speed	n_{rated}	r/min	3000
Rated torque	M_{rated}	Nm	1.19
Rated current	I_{rated}	A	2
Rated power	P_{rated}	kW	0.375



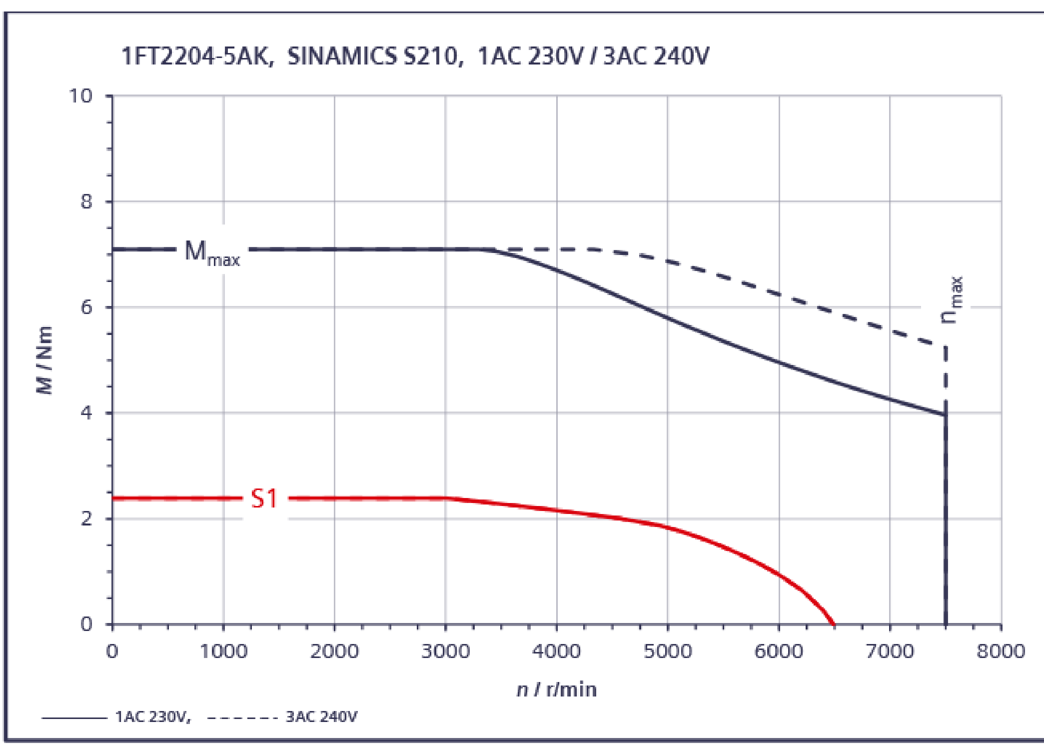
12.2.17.26 1FT2204-5AF connected to 230 V 1 AC / 240 V 3 AC

1FT2204-5AF	For 1 AC 230 V, 3 AC 240 V		
Technical specifications in the SINAMICS S210 system	**Symbol**	**Unit**	**Value**
Static torque	M_0	Nm	2.4
Stall current	I_0	A	2.25
Maximum permissible speed	n_{max}	r/min	3700
Maximum torque	M_{max}	Nm	7.1
Maximum current	I_{max}	A	7.1
Thermal time constant	T_{th}	min	29
Rotor moment of inertia	J_{mot}	$kgcm^2$	1.23
Rotor moment of inertia (with brake)	$J_{mot\ br}$	$kgcm^2$	1.31
Weight	m_{mot}	kg	2.9
Weight (with brake)	$m_{mot\ br}$	kg	3.75
Rated data for S210 connected to 1 AC 230 V, 3 AC 240 V			
Rated speed	n_{rated}	r/min	1500
Rated torque	M_{rated}	Nm	2.4
Rated current	I_{rated}	A	2.25
Rated power	P_{rated}	kW	0.375



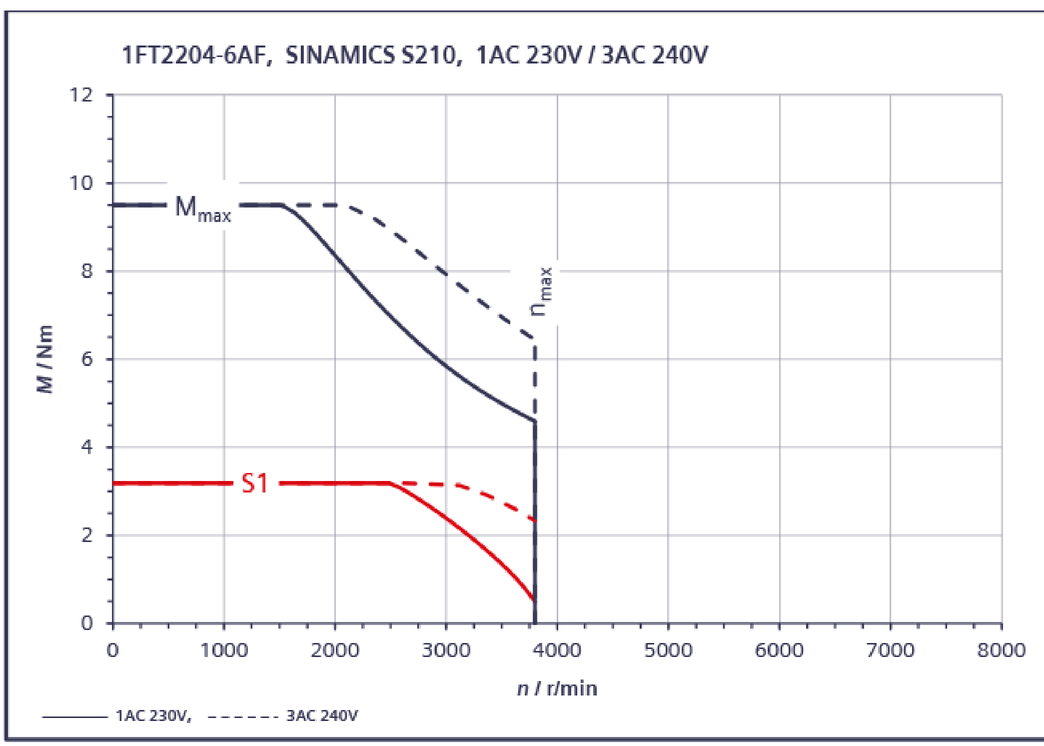
12.2.17.27 1FT2204-5AK connected to 230 V 1 AC / 240 V 3 AC

1FT2204-5AK	For 1 AC 230 V, 3 AC 240 V		
Technical specifications in the SINAMICS S210 system	**Symbol**	**Unit**	**Value**
Static torque	M_0	Nm	2.4
Stall current	I_0	A	4.4
Maximum permissible speed	n_{max}	r/min	7500
Maximum torque	M_{max}	Nm	7.1
Maximum current	I_{max}	A	14.2
Thermal time constant	T_{th}	min	29
Rotor moment of inertia	J_{mot}	kgcm²	1.23
Rotor moment of inertia (with brake)	$J_{mot\ br}$	kgcm²	1.31
Weight	m_{mot}	kg	2.9
Weight (with brake)	$m_{mot\ br}$	kg	3.75
Rated data for S210 connected to 1 AC 230 V, 3 AC 240 V			
Rated speed	n_{rated}	r/min	3000
Rated torque	M_{rated}	Nm	2.4
Rated current	I_{rated}	A	4.4
Rated power	P_{rated}	kW	0.75



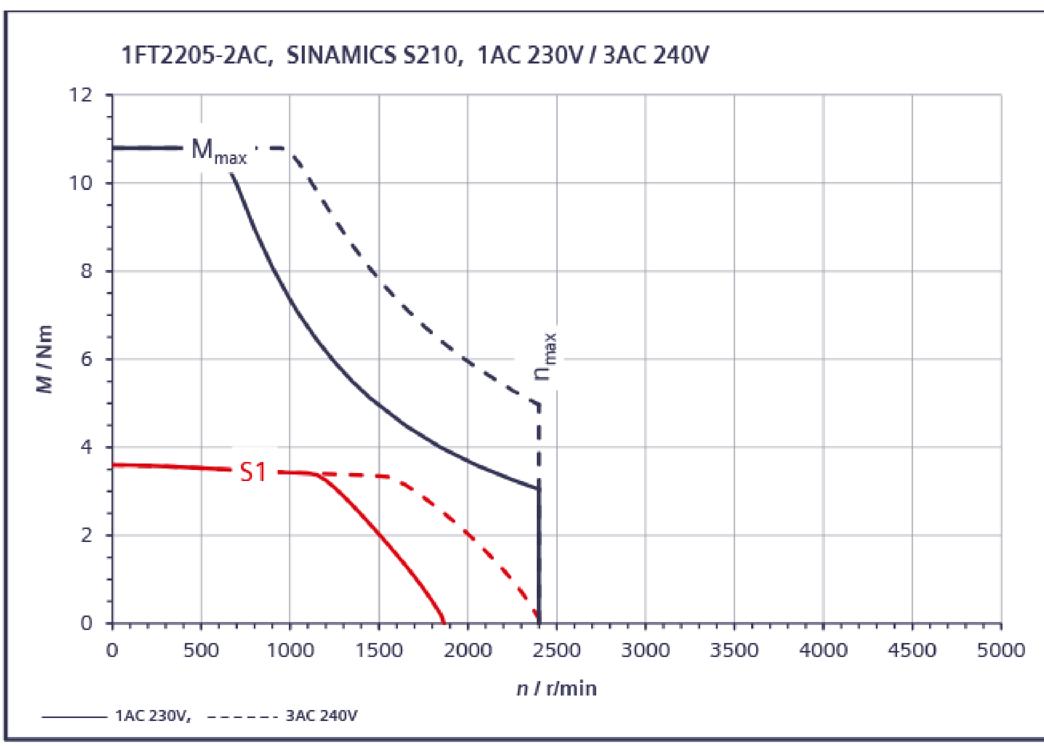
12.2.17.28 1FT2204-6AF connected to 230 V 1 AC / 240 V 3 AC

1FT2204-6AF	**For 1 AC 230 V, 3 AC 240 V**		
Technical specifications in the SINAMICS S210 system	**Symbol**	**Unit**	**Value**
Static torque	M_0	Nm	3.2
Stall current	I_0	A	3
Maximum permissible speed	n_{max}	r/min	3700
Maximum torque	M_{max}	Nm	9.5
Maximum current	I_{max}	A	9.9
Thermal time constant	T_{th}	min	35
Rotor moment of inertia	J_{mot}	$kgcm^2$	1.61
Rotor moment of inertia (with brake)	$J_{mot\ br}$	$kgcm^2$	1.69
Weight	m_{mot}	kg	3.5
Weight (with brake)	$m_{mot\ br}$	kg	4.35
Rated data for S210 connected to 1 AC 230 V, 3 AC 240 V			
Rated speed	n_{rated}	r/min	1500
Rated torque	M_{rated}	Nm	3.2
Rated current	I_{rated}	A	3
Rated power	P_{rated}	kW	0.5



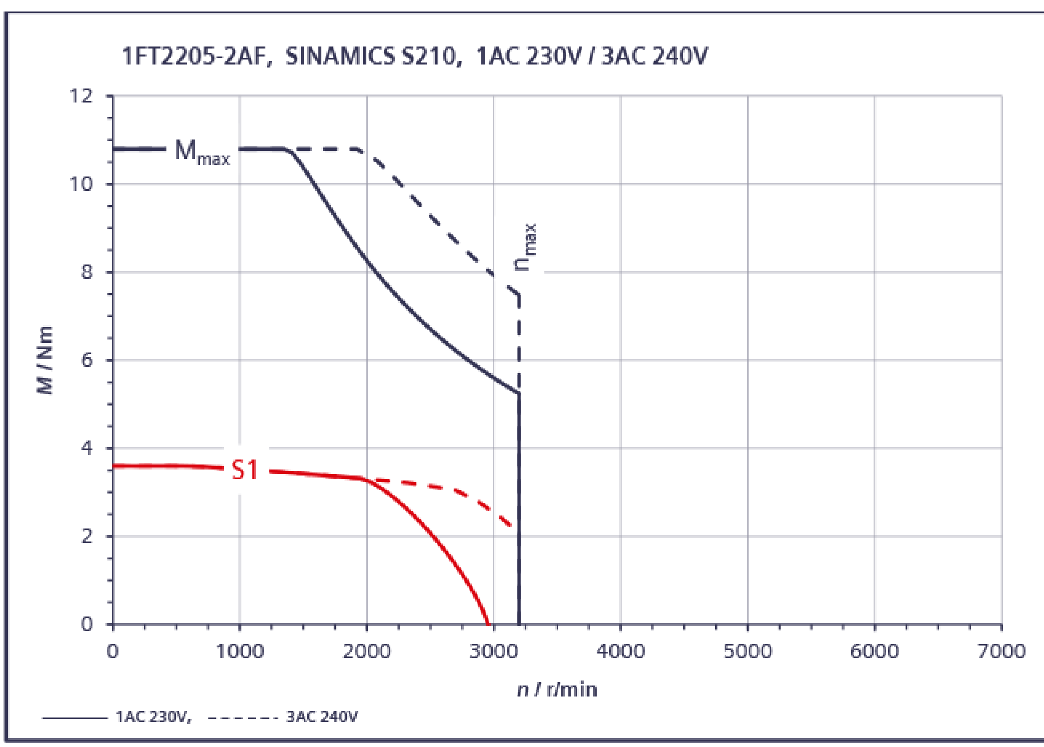
12.2.17.29 1FT2205-2AC connected to 1 AC 230 V / 3 AC 240 V

1FT2205-2AC	For 1 AC 230 V, 3 AC 240 V		
Technical specifications in the SINAMICS S210 system	**Symbol**	**Unit**	**Value**
Static torque	M_0	Nm	3.6
Stall current	I_0	A	1.84
Maximum permissible speed	n_{max}	r/min	2400
Maximum torque	M_{max}	Nm	10.8
Maximum current	I_{max}	A	6
Thermal time constant	T_{th}	min	29
Rotor moment of inertia	J_{mot}	$kgcm^2$	3.15
Rotor moment of inertia (with brake)	$J_{mot\ br}$	$kgcm^2$	4.05
Weight	m_{mot}	kg	3.75
Weight (with brake)	$m_{mot\ br}$	kg	4.75
Rated data for S210 connected to 1 AC 230 V, 3 AC 240 V			
Rated speed	n_{rated}	r/min	1000
Rated torque	M_{rated}	Nm	3.45
Rated current	I_{rated}	A	1.79
Rated power	P_{rated}	kW	0.36



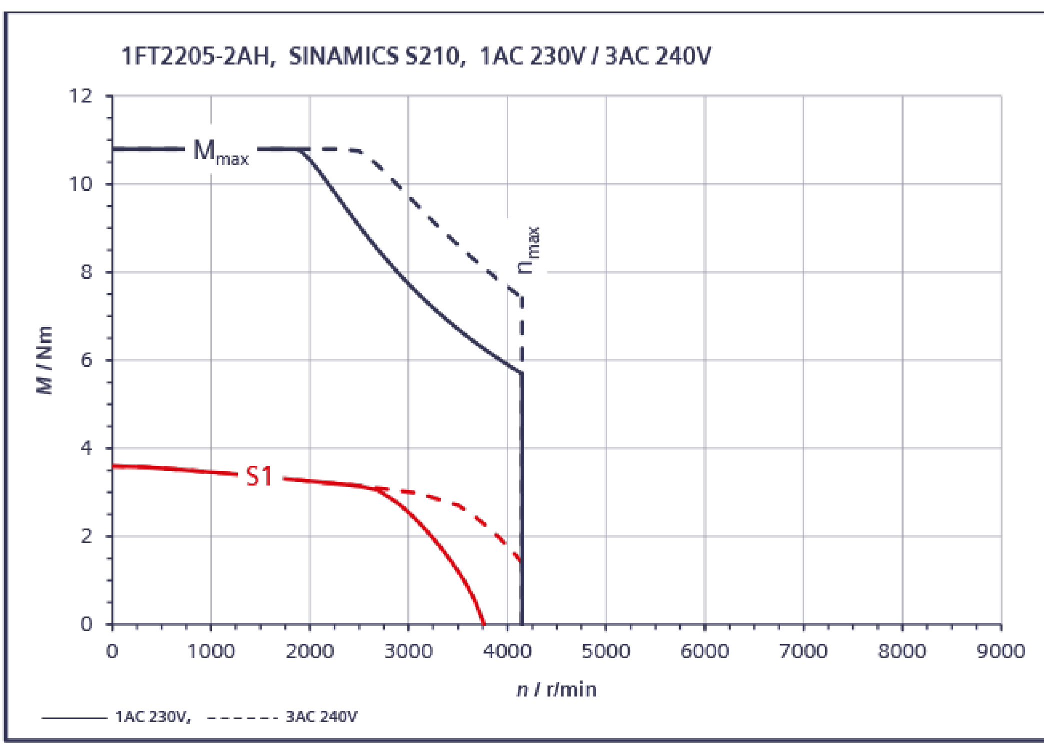
12.2.17.30 1FT2205-2AF connected to 230 V 1 AC / 240 V 3 AC

1FT2205-2AF	For 1 AC 230 V, 3 AC 240 V		
Technical specifications in the SINAMICS S210 system	**Symbol**	**Unit**	**Value**
Static torque	M_0	Nm	3.6
Stall current	I_0	A	2.9
Maximum permissible speed	n_{max}	r/min	3200
Maximum torque	M_{max}	Nm	10.8
Maximum current	I_{max}	A	9.5
Thermal time constant	T_{th}	min	29
Rotor moment of inertia	J_{mot}	$kgcm^2$	3.15
Rotor moment of inertia (with brake)	$J_{mot\ br}$	$kgcm^2$	4.05
Weight	m_{mot}	kg	3.75
Weight (with brake)	$m_{mot\ br}$	kg	4.75
Rated data for S210 connected to 1 AC 230 V, 3 AC 240 V			
Rated speed	n_{rated}	r/min	1500
Rated torque	M_{rated}	Nm	3.4
Rated current	I_{rated}	A	2.8
Rated power	P_{rated}	kW	0.53



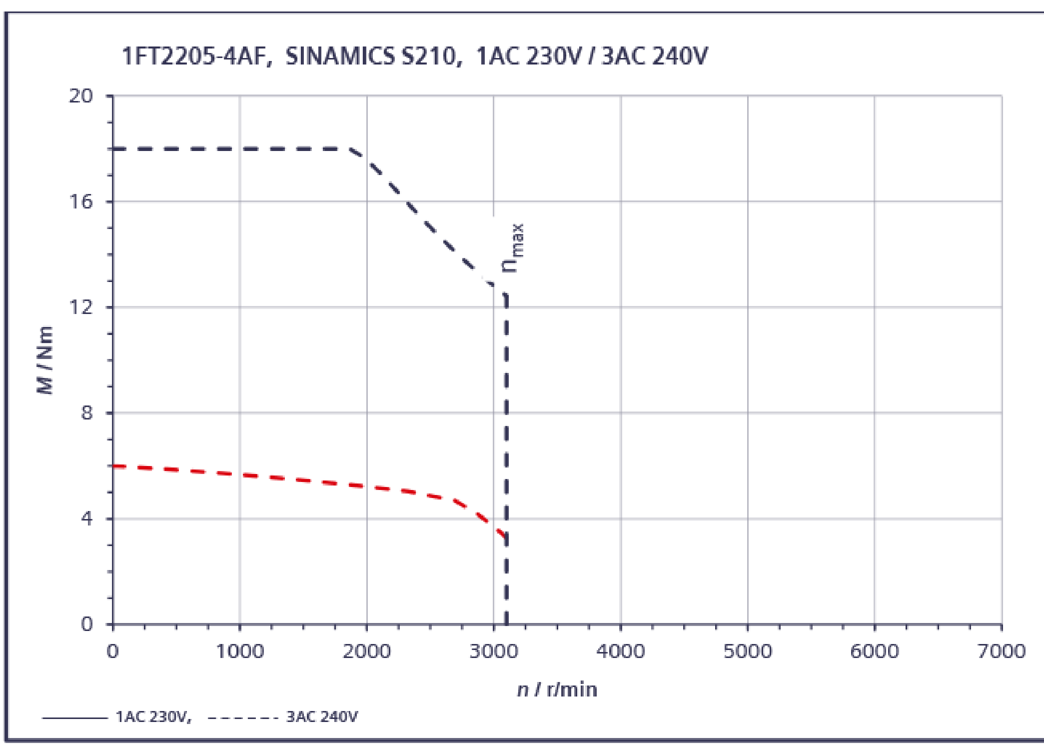
12.2.17.31 1FT2205-2AH connected to 230 V 1 AC / 240 V 3 AC

1FT2205-2AH	For 1 AC 230 V, 3 AC 240 V		
Technical specifications in the SINAMICS S210 system	**Symbol**	**Unit**	**Value**
Static torque	M_0	Nm	3.6
Stall current	I_0	A	3.8
Maximum permissible speed	n_{max}	r/min	4250
Maximum torque	M_{max}	Nm	10.8
Maximum current	I_{max}	A	12.1
Thermal time constant	T_{th}	min	29
Rotor moment of inertia	J_{mot}	$kgcm^2$	3.15
Rotor moment of inertia (with brake)	$J_{mot\ br}$	$kgcm^2$	4.05
Weight	m_{mot}	kg	3.75
Weight (with brake)	$m_{mot\ br}$	kg	4.75
Rated data for S210 connected to 1 AC 230 V, 3 AC 240 V			
Rated speed	n_{rated}	r/min	2500
Rated torque	M_{rated}	Nm	3.15
Rated current	I_{rated}	A	3.45
Rated power	P_{rated}	kW	0.82



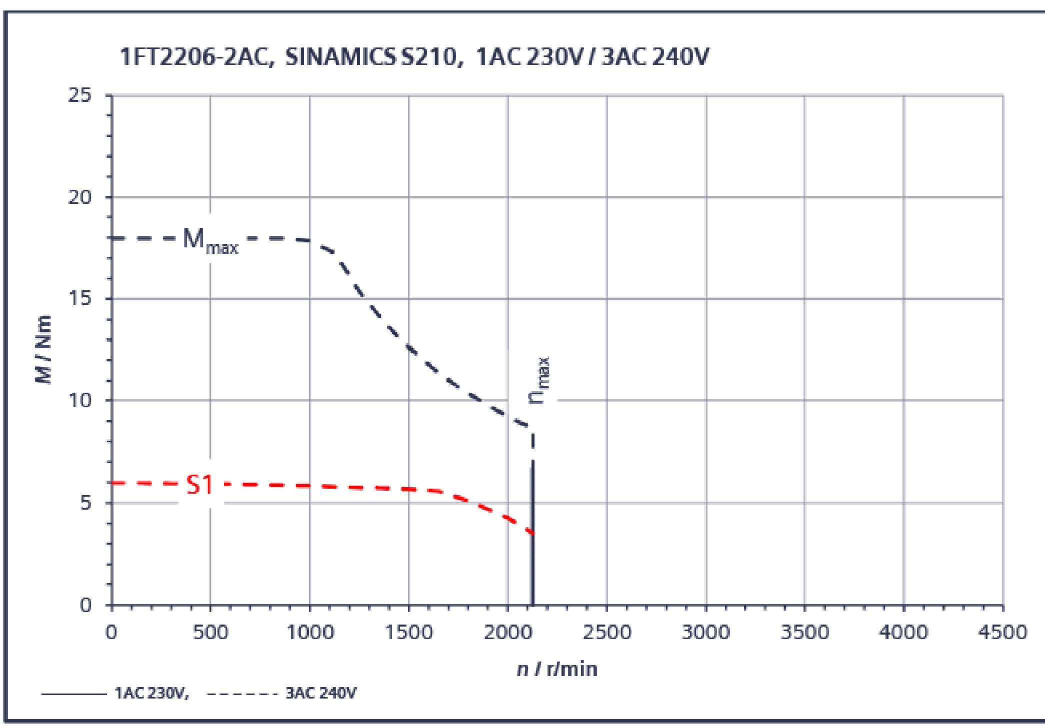
12.2.17.32 1FT2205-4AF connected to 3 AC 240 V

1FT2205-4AF	**For 3 AC 240 V**		
Technical specifications in the SINAMICS S210 system	**Symbol**	**Unit**	**Value**
Static torque	M_0	Nm	6
Stall current	I_0	A	4.7
Maximum permissible speed	n_{max}	r/min	3100
Maximum torque	M_{max}	Nm	18
Maximum current	I_{max}	A	15.1
Thermal time constant	T_{th}	min	31
Rotor moment of inertia	J_{mot}	$kgcm^2$	5.1
Rotor moment of inertia (with brake)	$J_{mot\ br}$	$kgcm^2$	6
Weight	m_{mot}	kg	5.2
Weight (with brake)	$m_{mot\ br}$	kg	6.2
Rated data for S210 connected to 3 AC 240 V			
Rated speed	n_{rated}	r/min	1500
Rated torque	M_{rated}	Nm	5.5
Rated current	I_{rated}	A	4.35
Rated power	P_{rated}	kW	0.86



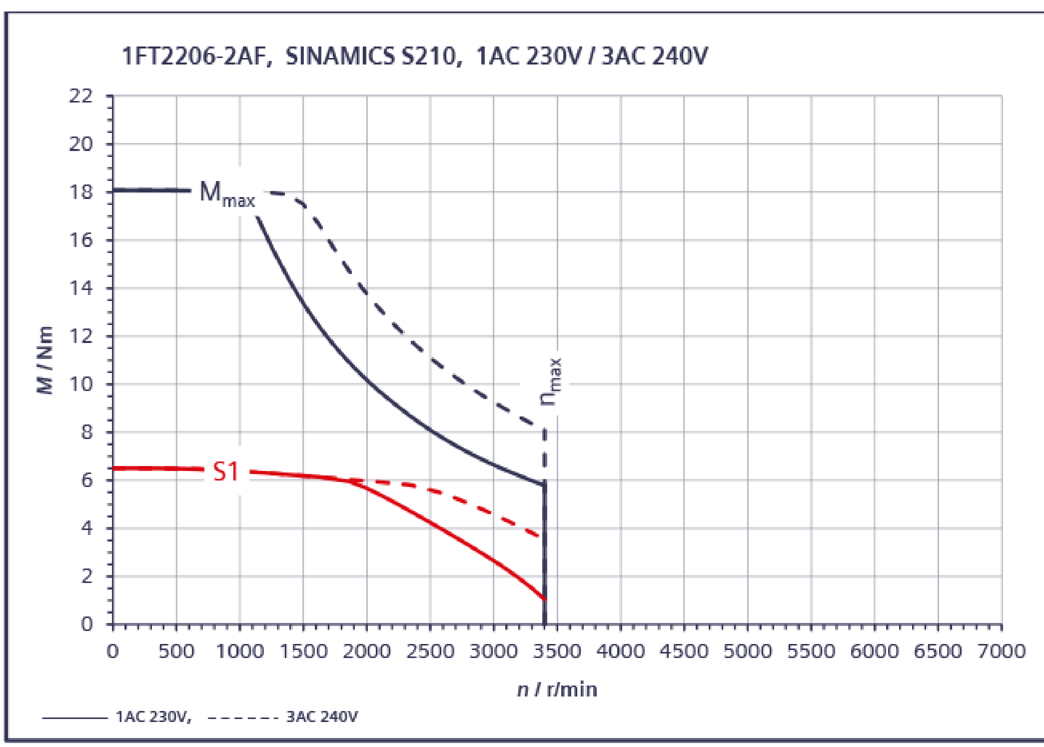
12.2.17.33 1FT2206-2AC connected to 3 AC 240 V

1FT2206-2AC	For 3 AC 400 V, 3 AC 480 V		
Technical specifications in the S210 system	**Abbreviation**	**Unit**	**Value**
Static torque	M_0	Nm	6
Stall current	I_0	A	2.8
Max. permissible speed	$n_{max\ inv}$	r/min	4300
Maximum torque	M_{max}	Nm	18
Maximum current	I_{max}	A	10.3
Thermal time constant	T_{th}	min	24
Moment of inertia	J_{mot}	kg cm²	7.8
Moment of inertia (with brake)	$J_{Mot\ with\ Br}$	kg cm²	9.4
Weight	m_{Mot}	kg	6.3
Weight (with brake)	$m_{Mot\ with\ Br}$	kg	7.9
Rated data 3 AC 240			
Rated speed	n_{rated}	r/min	1000
Rated torque	M_{rated}	Nm	5.85
Rated current	I_{rated}	A	2.8
Rated power	P_{rated}	kW	0.61



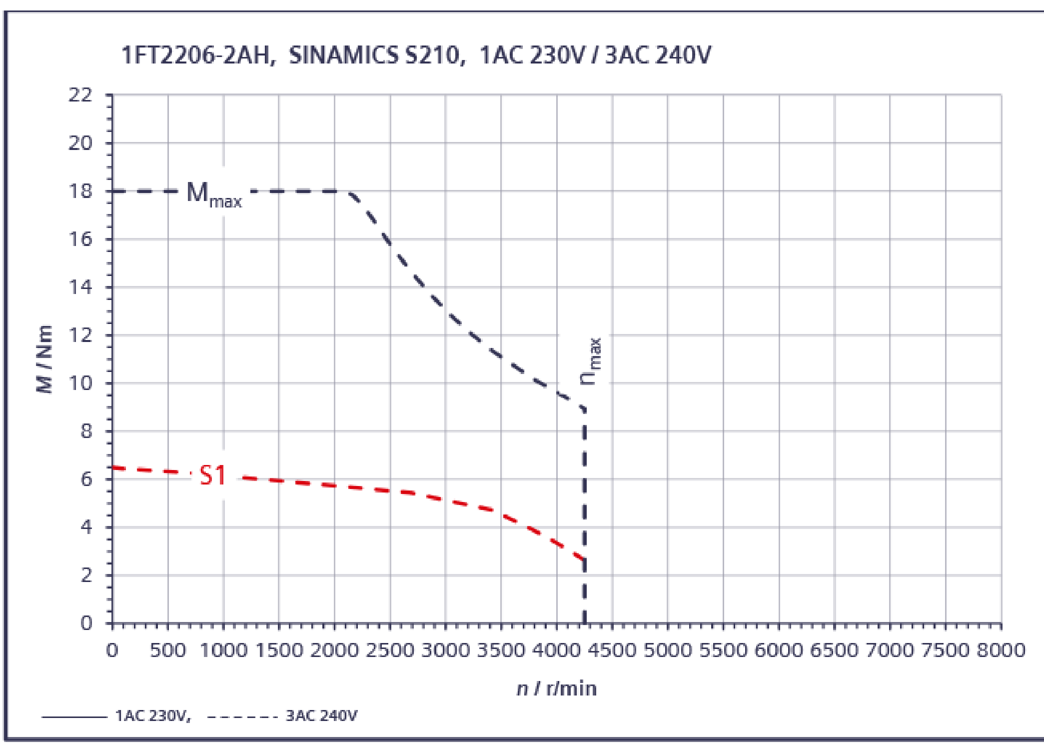
12.2.17.34 1FT2206-2AF connected to 230 V 1 AC / 240 V 3 AC

1FT2206-2AF	For 3 AC 240 V		
Technical specifications in the SINAMICS S210 system	**Symbol**	**Unit**	**Value**
Static torque	M_0	Nm	6.5
Stall current	I_0	A	5
Maximum permissible speed	n_{max}	r/min	3400
Maximum torque	M_{max}	Nm	18
Maximum current	I_{max}	A	17.8
Thermal time constant	T_{th}	min	21
Rotor moment of inertia	J_{mot}	$kgcm^2$	7.8
Rotor moment of inertia (with brake)	$J_{mot\ br}$	$kgcm^2$	9.4
Weight	m_{mot}	kg	6.3
Weight (with brake)	$m_{mot\ br}$	kg	7.9
Rated data for S210 connected to 3 AC 240 V			
Rated speed	n_{rated}	r/min	1500
Rated torque	M_{rated}	Nm	6.1
Rated current	I_{rated}	A	4.8
Rated power	P_{rated}	kW	0.97



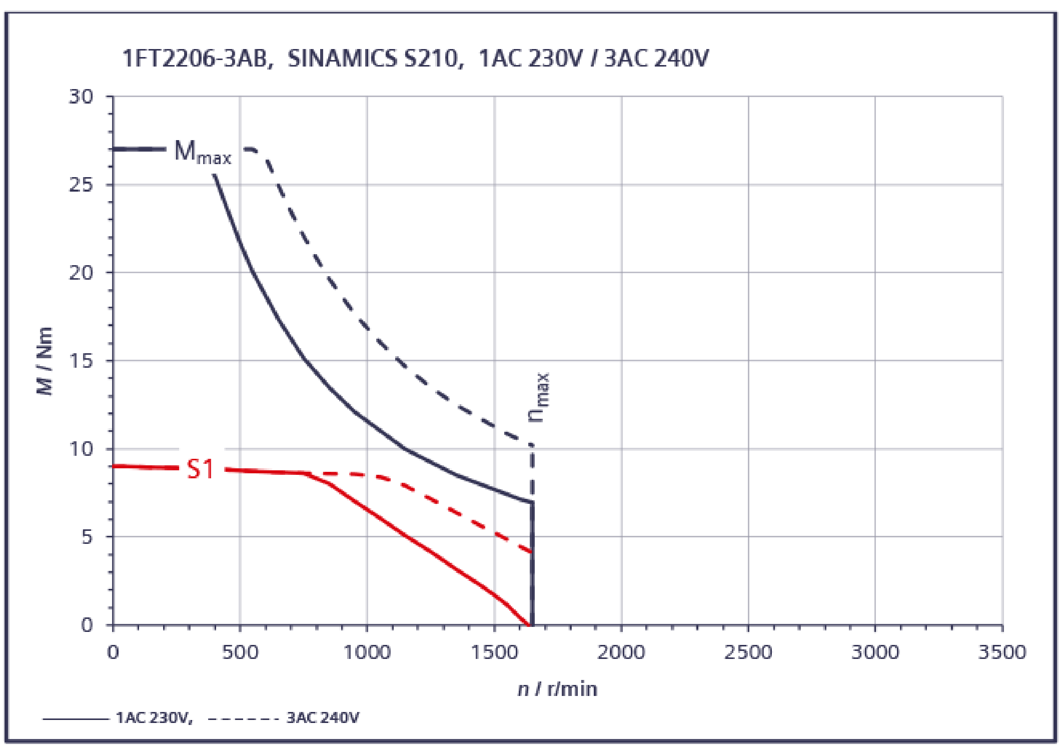
12.2.17.35 1FT2206-2AH connected to 3 AC 240 V

1FT2206-2AH	**For 3 AC 240 V**		
Technical specifications in the SINAMICS S210 system	**Symbol**	**Unit**	**Value**
Static torque	M_0	Nm	6.5
Stall current	I_0	A	6.5
Maximum permissible speed	n_{max}	r/min	4250
Maximum torque	M_{max}	Nm	18
Maximum current	I_{max}	A	22.5
Thermal time constant	T_{th}	min	21
Rotor moment of inertia	J_{mot}	$kgcm^2$	7.8
Rotor moment of inertia (with brake)	$J_{mot\ br}$	$kgcm^2$	9.4
Weight	m_{mot}	kg	6.3
Weight (with brake)	$m_{mot\ br}$	kg	7.9
Rated data for S210 connected to 3 AC 240 V			
Rated speed	n_{rated}	r/min	2500
Rated torque	M_{rated}	Nm	5.5
Rated current	I_{rated}	A	5.7
Rated power	P_{rated}	kW	1.45



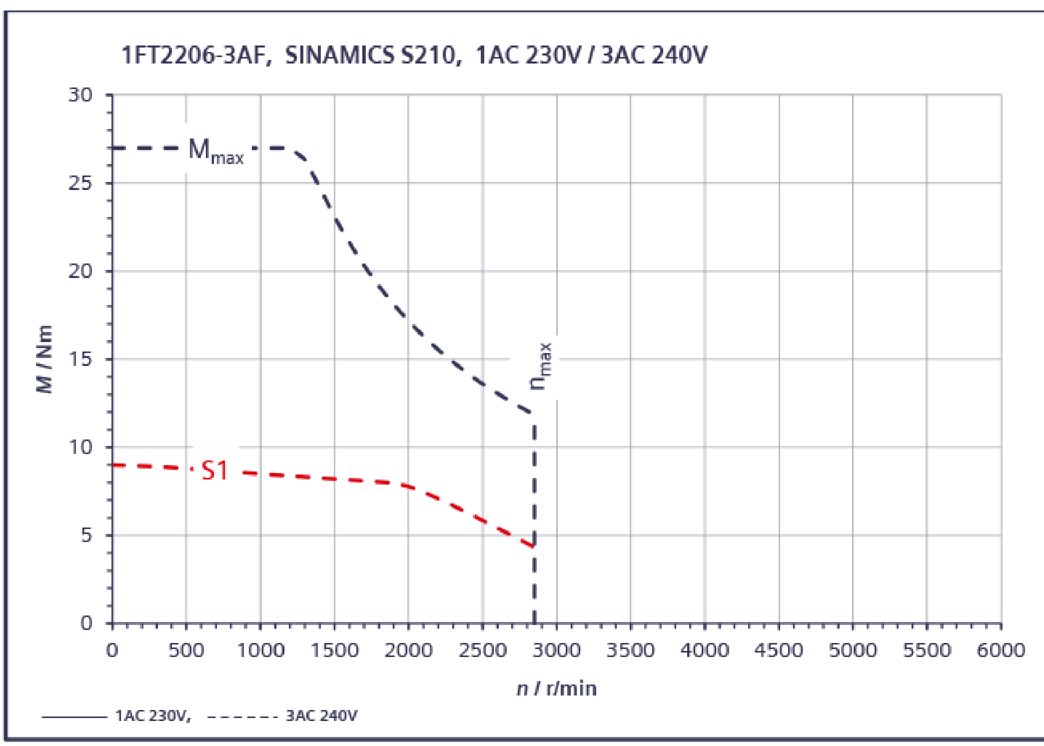
12.2.17.36 1FT2206-3AB connected to 1 AC 230 V / 3 AC 240 V

1FT2206-3AB	For 1 AC 230 V, 3 AC 240 V		
Technical specifications in the SINAMICS S210 system	**Symbol**	**Unit**	**Value**
Static torque	M_0	Nm	9
Stall current	I_0	A	3.15
Maximum permissible speed	n_{max}	r/min	1620
Maximum torque	M_{max}	Nm	27
Maximum current	I_{max}	A	11.4
Thermal time constant	T_{th}	min	33
Rotor moment of inertia	J_{mot}	kgcm²	11.5
Rotor moment of inertia (with brake)	$J_{mot\ br}$	kgcm²	13.1
Weight	m_{mot}	kg	7.4
Weight (with brake)	$m_{mot\ br}$	kg	9
Rated data for S210 connected to 1 AC 230 V, 3 AC 240 V			
Rated speed	n_{rated}	r/min	2500
Rated torque	M_{rated}	Nm	3.15
Rated current	I_{rated}	A	3.45
Rated power	P_{rated}	kW	0.82



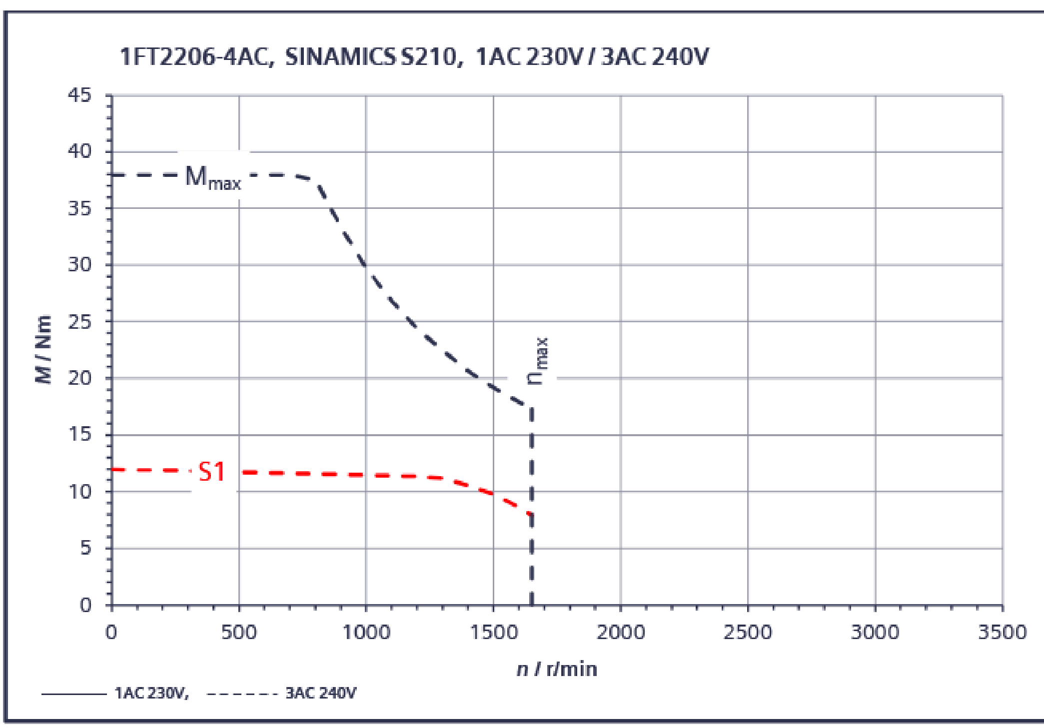
12.2.17.37 1FT2206-3AF connected to 3 AC 240 V

1FT2206-3AF	For 3 AC 240 V		
Technical specifications in the SINAMICS S210 system	**Symbol**	**Unit**	**Value**
Static torque	M_0	Nm	9
Stall current	I_0	A	5.4
Maximum permissible speed	n_{max}	r/min	2850
Maximum torque	M_{max}	Nm	27
Maximum current	I_{max}	A	19.7
Thermal time constant	T_{th}	min	330
Rotor moment of inertia	J_{mot}	$kgcm^2$	11.5
Rotor moment of inertia (with brake)	$J_{mot\ br}$	$kgcm^2$	13.1
Weight	m_{mot}	kg	7.4
Weight (with brake)	$m_{mot\ br}$	kg	9
Rated data for S210 connected to 3 AC 240 V			
Rated speed	n_{rated}	r/min	1500
Rated torque	M_{rated}	Nm	8.2
Rated current	I_{rated}	A	5
Rated power	P_{rated}	kW	1.29



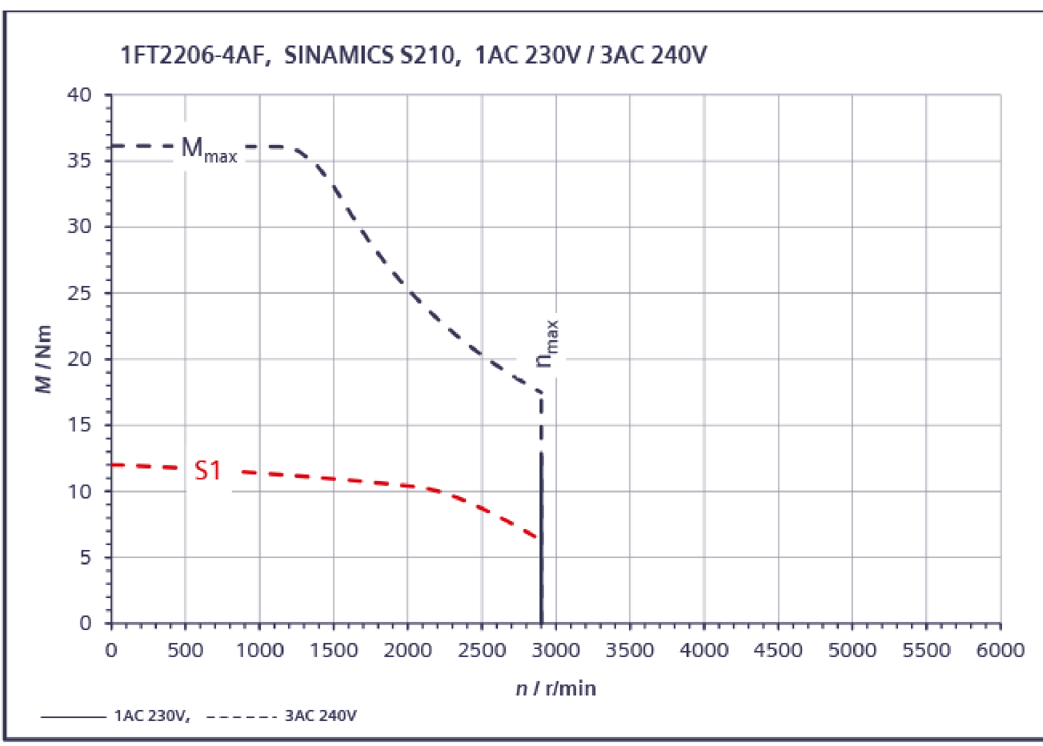
12.2.17.38 1FT2206-4AC connected to 3 AC 240 V

1FT2206-4AC	For 3 AC 400 V, 3 AC 480 V		
Technical specifications in the S210 system	**Abbreviation**	**Unit**	**Value**
Static torque	M_0	Nm	12
Stall current	I_0	A	4.5
Max. permissible speed	$n_{max\ inv}$	r/min	3300
Maximum torque	M_{max}	Nm	38
Maximum current	I_{max}	A	17
Thermal time constant	T_{th}	min	32
Moment of inertia	J_{mot}	kg cm²	15.1
Moment of inertia (with brake)	$J_{Mot\ with\ Br}$	kg cm²	16.8
Weight	m_{Mot}	kg	8.9
Weight (with brake)	$m_{Mot\ with\ Br}$	kg	10.6
Rated data 3 AC 240			
Rated speed	n_{rated}	r/min	1000
Rated torque	M_{rated}	Nm	11.5
Rated current	I_{rated}	A	4.37
Rated power	P_{rated}	kW	1.2



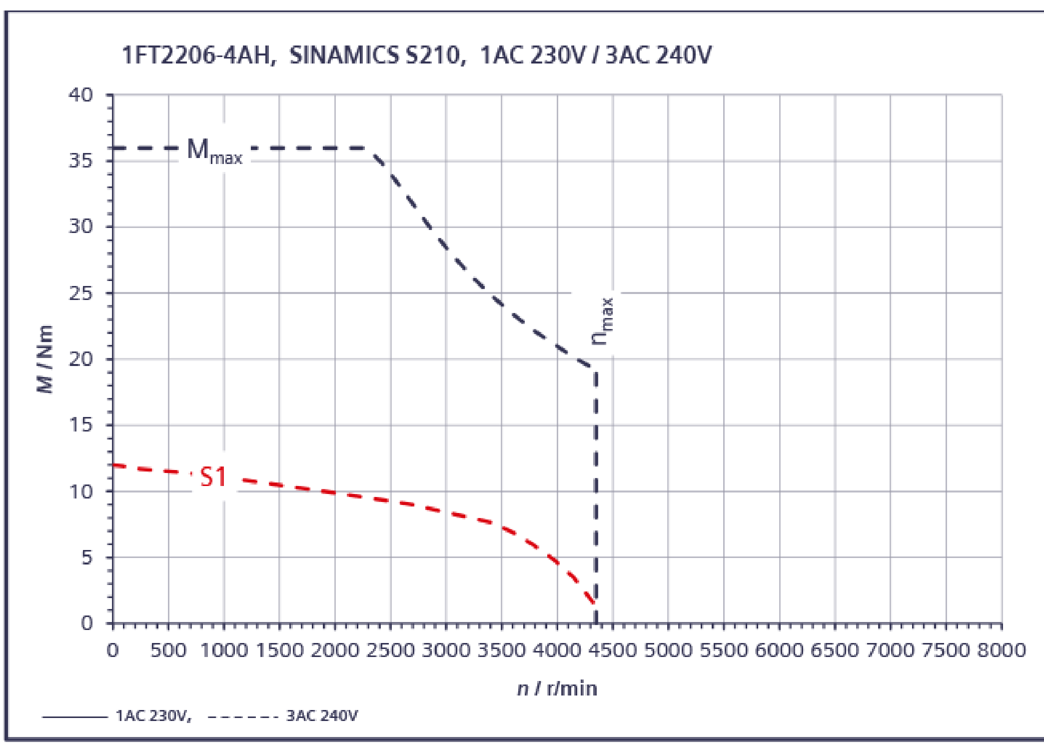
12.2.17.39 1FT2206-4AF connected to 3 AC 240 V

1FT2206-4AF	For 3 AC 240 V		
Technical specifications in the SINAMICS S210 system	**Symbol**	**Unit**	**Value**
Static torque	M_0	Nm	12
Stall current	I_0	A	7.9
Maximum permissible speed	n_{max}	r/min	2900
Maximum torque	M_{max}	Nm	36
Maximum current	I_{max}	A	29.5
Thermal time constant	T_{th}	min	24
Rotor moment of inertia	J_{mot}	$kgcm^2$	15.1
Rotor moment of inertia (with brake)	$J_{mot\ br}$	$kgcm^2$	16.8
Weight	m_{mot}	kg	8.9
Weight (with brake)	$m_{mot\ br}$	kg	10.6
Rated data for S210 connected to 3 AC 240 V			
Rated speed	n_{rated}	r/min	1500
Rated torque	M_{rated}	Nm	10.9
Rated current	I_{rated}	A	7.3
Rated power	P_{rated}	kW	1.72



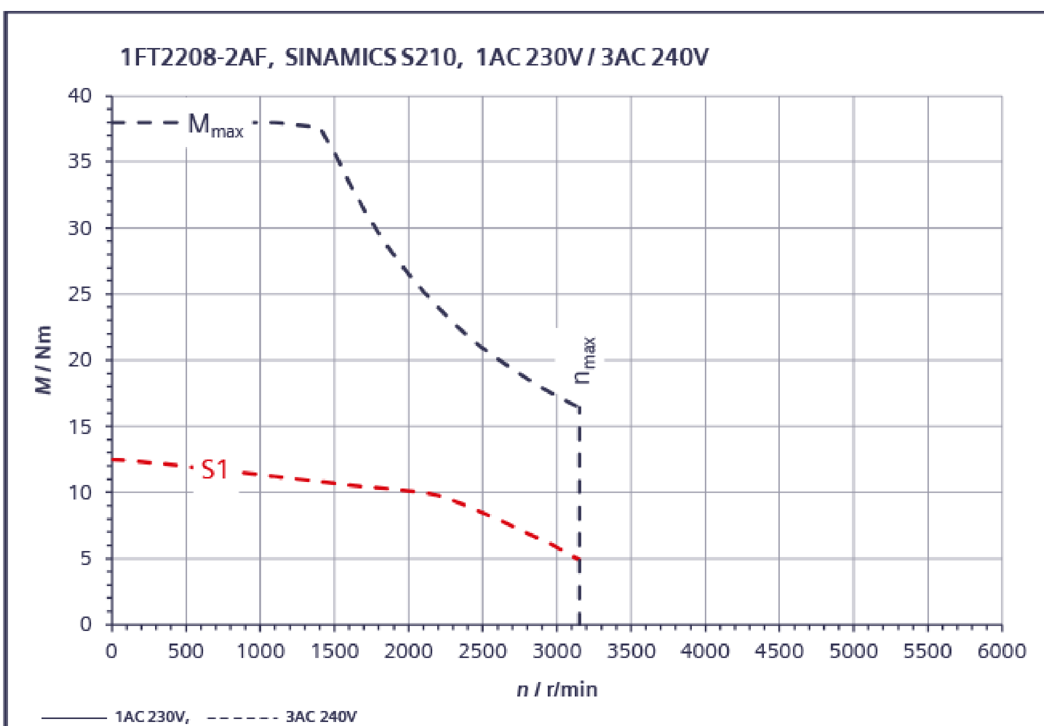
12.2.17.40 1FT2206-4AH connected to 3 AC 240 V

1FT2206-4AH	For 3 AC 240 V		
Technical specifications in the SINAMICS S210 system	**Symbol**	**Unit**	**Value**
Static torque	M_0	Nm	12
Stall current	I_0	A	12
Maximum permissible speed	n_{max}	r/min	4350
Maximum torque	M_{max}	Nm	36
Maximum current	I_{max}	A	44
Thermal time constant	T_{th}	min	24
Rotor moment of inertia	J_{mot}	$kgcm^2$	15.1
Rotor moment of inertia (with brake)	$J_{mot\ br}$	$kgcm^2$	16.8
Weight	m_{mot}	kg	8.9
Weight (with brake)	$m_{mot\ br}$	kg	10.6
Rated data for S210 connected to 3 AC 240 V			
Rated speed	n_{rated}	r/min	2500
Rated torque	M_{rated}	Nm	9.3
Rated current	I_{rated}	A	9.8
Rated power	P_{rated}	kW	2.4



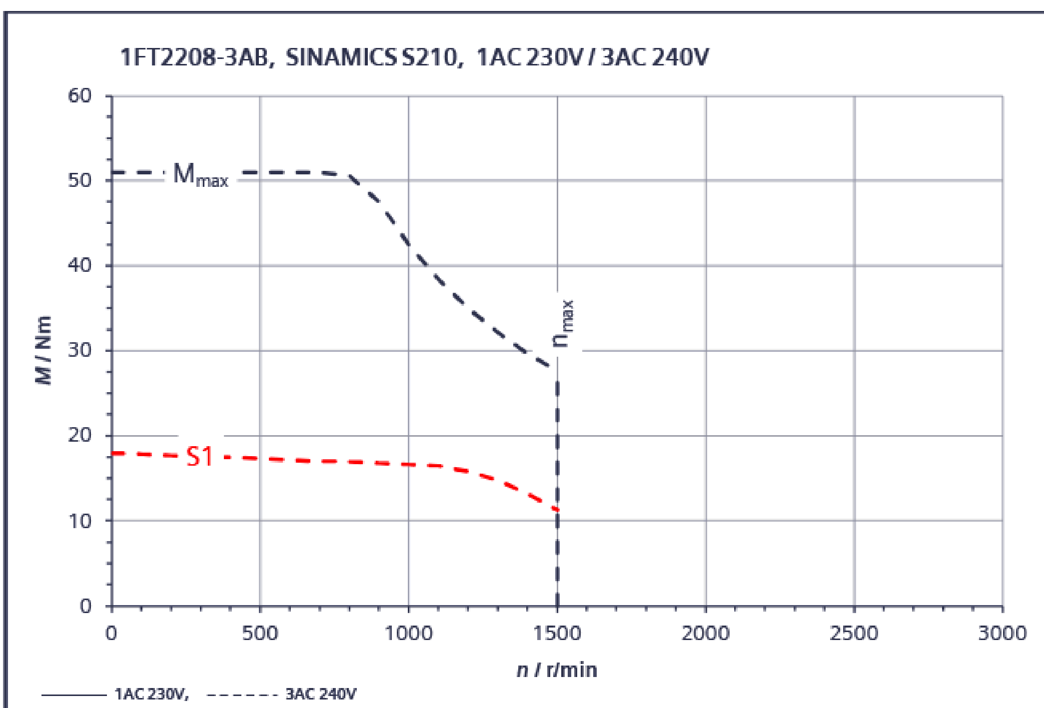
12.2.17.41 1FT2208-2AF connected to 3 AC 240 V

1FT2208-2AF	For 3 AC 240 V		
Technical specifications in the SINAMICS S210 system	**Symbol**	**Unit**	**Value**
Static torque	M_0	Nm	12.5
Stall current	I_0	A	8.3
Maximum permissible speed	n_{max}	r/min	6000
Maximum torque	M_{max}	Nm	38
Maximum current	I_{max}	A	31
Thermal time constant	T_{th}	min	30
Rotor moment of inertia	J_{mot}	$kgcm^2$	22.5
Rotor moment of inertia (with brake 1)	$J_{mot\ br}$	$kgcm^2$	25.5
Rotor moment of inertia (with brake 2)	$J_{mot\ br}$	$kgcm^2$	28
Weight	m_{mot}	kg	10.4
Weight (with brake 1)	$m_{mot\ br}$	kg	12.6
Weight (with brake 2)	$m_{mot\ br}$	kg	13.2
Rated data for S210 connected to 3 AC 240 V			
Rated speed	n_{rated}	r/min	1500
Rated torque	M_{rated}	Nm	10.7
Rated current	I_{rated}	A	7.5
Rated power	P_{rated}	kW	1.68



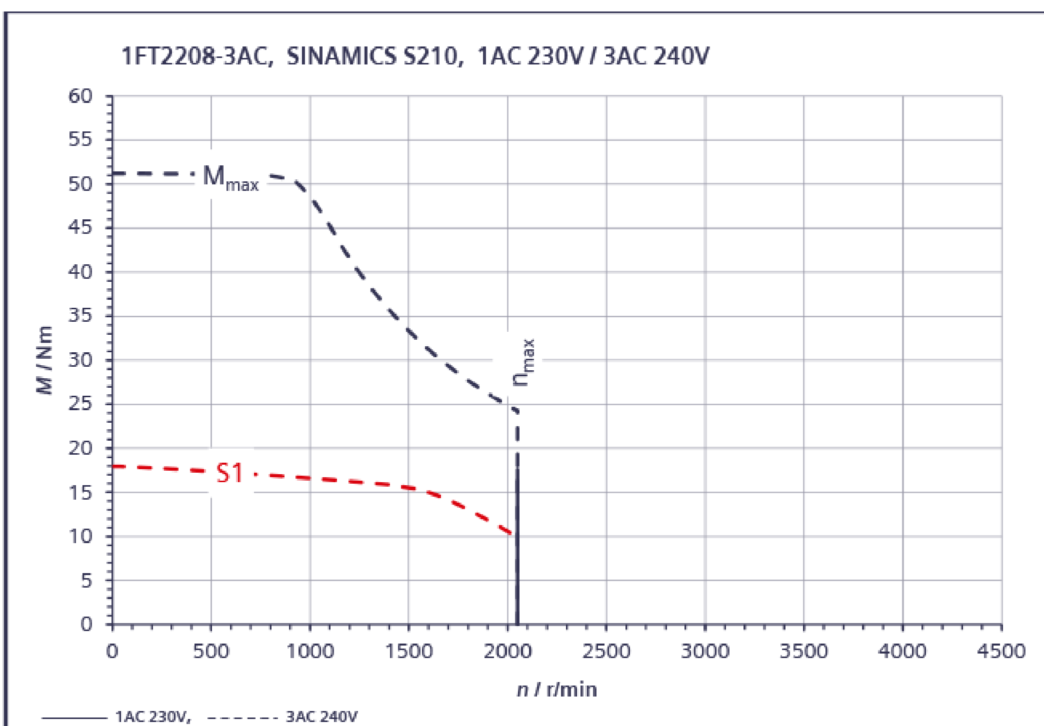
12.2.17.42 1FT2208-3AB connected to 3 AC 240 V

1FT2208-3AB	For 3 AC 400 V, 3 AC 480 V		
Technical specifications in the S210 system	**Abbreviation**	**Unit**	**Value**
Static torque	M_0	Nm	18
Stall current	I_0	A	6.2
Max. permissible speed	$n_{max\ inv}$	r/min	3000
Maximum torque	M_{max}	Nm	51
Maximum current	I_{max}	A	20.5
Thermal time constant	T_{th}	min	36
Moment of inertia	J_{mot}	kg cm²	29.6
Moment of inertia (with brake 1)	$J_{mot\ br\ 1}$	kg cm²	32.6
Moment of inertia (with brake 2)	$J_{mot\ br\ 2}$	kg cm²	35.1
Weight	m_{mot}	kg	12.6
Weight (with brake 1)	$m_{mot\ br\ 1}$	kg	14.6
Weight (with brake 2)	$m_{mot\ br\ 2}$	kg	15.2
Rated data 1AC 230 V, 3AC 240 V			
Rated speed	n_{rated}	r/min	750
Rated torque	M_{rated}	Nm	17
Rated current	I_{rated}	A	5.95
Rated power	P_{rated}	kW	1.34



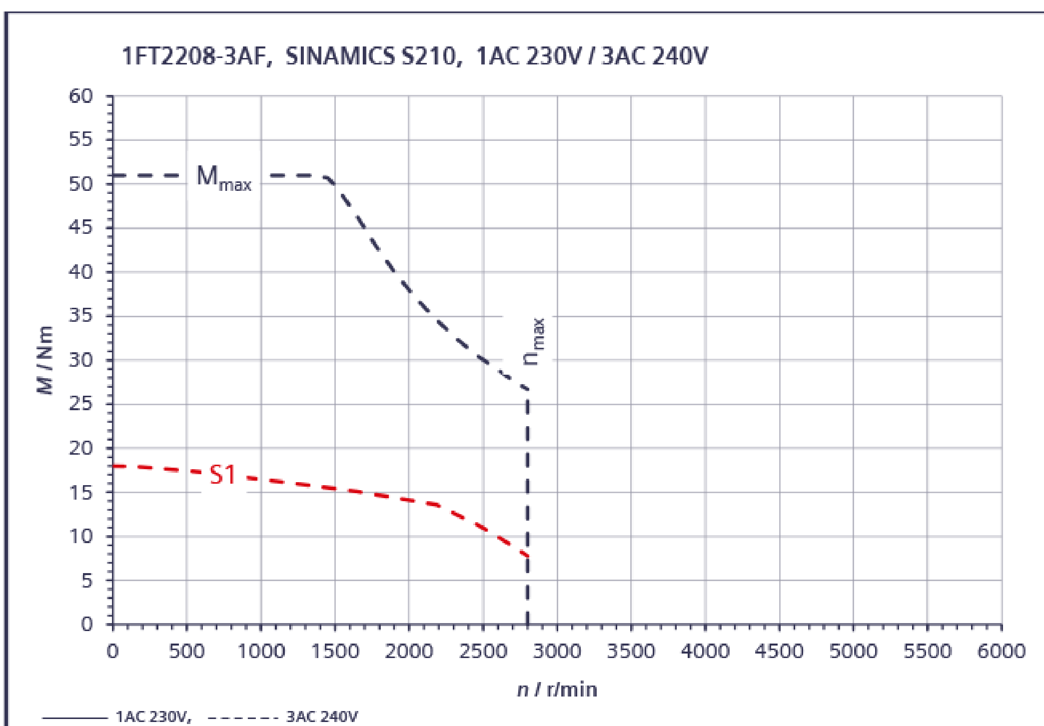
12.2.17.43 1FT2208-3AC connected to 3 AC 240 V

1FT2208-3AC	For 3 AC 240 V		
Technical specifications in the SINAMICS S210 system	**Symbol**	**Unit**	**Value**
Static torque	M_0	Nm	18
Stall current	I_0	A	8.4
Maximum permissible speed	n_{max}	r/min	6000
Maximum torque	M_{max}	Nm	51
Maximum current	I_{max}	A	29.5
Thermal time constant	T_{th}	min	26
Rotor moment of inertia	J_{mot}	$kgcm^2$	29.6
Rotor moment of inertia (with brake 1)	$J_{mot\ br\ 1}$	$kgcm^2$	32.6
Rotor moment of inertia (with brake 2)	$J_{mot\ br\ 2}$	$kgcm^2$	35.1
Weight	m_{mot}	kg	12.6
Weight (with brake 1)	$m_{mot\ br\ 1}$	kg	14.6
Weight (with brake 2)	$m_{mot\ br\ 2}$	kg	15.2
Rated data for S210 connected to 3 AC 240 V			
Rated speed	n_{rated}	r/min	1000
Rated torque	M_{rated}	Nm	16.6
Rated current	I_{rated}	A	7.9
Rated power	P_{rated}	kW	1.74



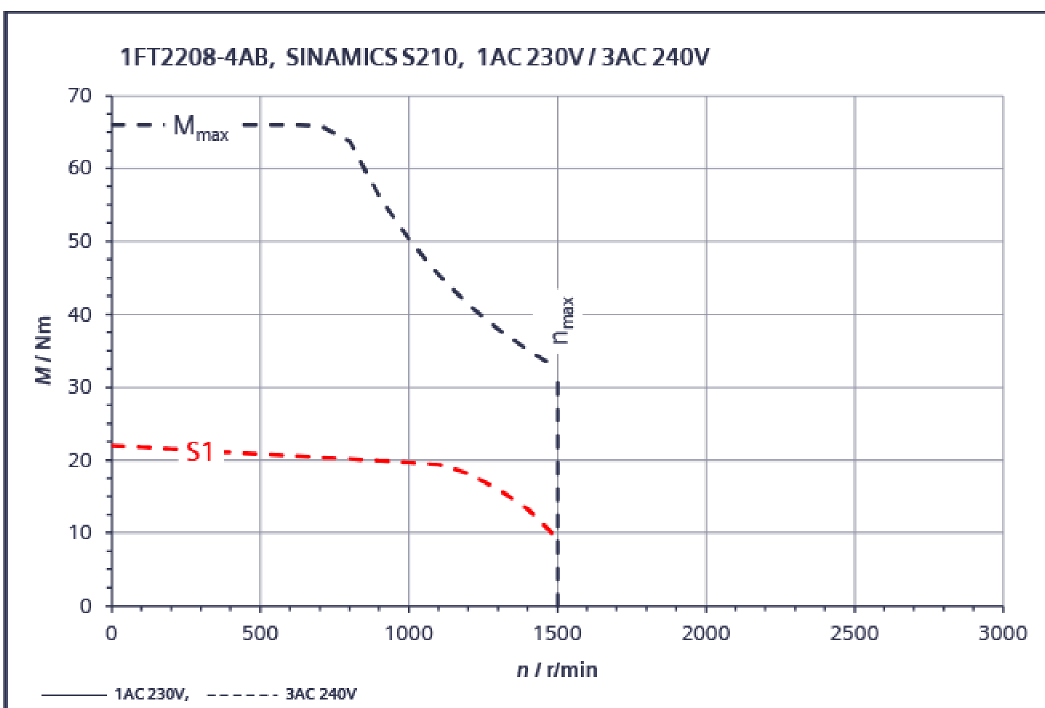
12.2.17.44 1FT2208-3AF connected to 3 AC 240 V

1FT2208-3AF	For 3 AC 240 V		
Technical specifications in the SINAMICS S210 system	**Symbol**	**Unit**	**Value**
Static torque	M_0	Nm	18
Stall current	I_0	A	11.9
Maximum permissible speed	n_{max}	r/min	6000
Maximum torque	M_{max}	Nm	51
Maximum current	I_{max}	A	40
Thermal time constant	T_{th}	min	26
Rotor moment of inertia	J_{mot}	kgcm²	29.5
Rotor moment of inertia (with brake 1)	$J_{mot\ br\ 1}$	kgcm²	32.5
Rotor moment of inertia (with brake 2)	$J_{mot\ br\ 2}$	kgcm2	35.1
Weight	m_{mot}	kg	12.6
Weight (with brake 1)	$m_{mot\ br\ 1}$	kg	14.6
Weight (with brake 2)	$m_{mot\ br\ 2}$	kg	15.2
Rated data for S210 connected to 3 AC 240 V			
Rated speed	n_{rated}	r/min	1500
Rated torque	M_{rated}	Nm	15.4
Rated current	I_{rated}	A	10.4
Rated power	P_{rated}	kW	2.4



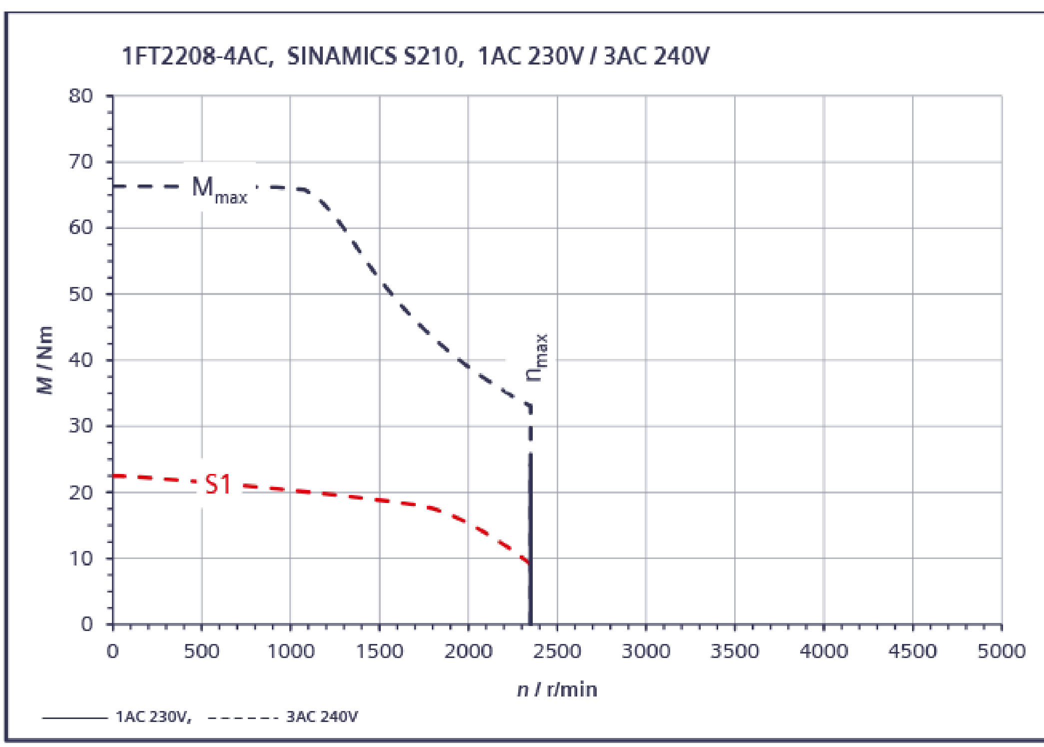
12.2.17.45 1FT2208-4AB connected to 3 AC 240 V

1FT2208-4AB	For 3 AC 400 V, 3 AC 480 V		
Technical specifications in the S210 system	**Abbreviation**	**Unit**	**Value**
Static torque	M_0	Nm	22
Stall current	I_0	A	7.1
Max. permissible speed	$n_{max\ inv}$	r/min	3000
Maximum torque	M_{max}	Nm	66
Maximum current	I_{max}	A	25
Thermal time constant	T_{th}	min	42
Moment of inertia	J_{mot}	kg cm²	38.8
Rotor moment of inertia (with brake 1)	$J_{mot\ br\ 1}$	kgcm²	44.4
Rotor moment of inertia (with brake 2)	$J_{mot\ br\ 2}$	kgcm2	-
Weight	m_{mot}	kg	14.6
Weight (with brake 1)	$m_{mot\ br\ 1}$	kg	17.3
Weight (with brake 2)	$m_{mot\ br\ 2}$	kg	-
Rated data 3 AC 240			
Rated speed	n_{rated}	r/min	750
Rated torque	M_{rated}	Nm	20.3
Rated current	I_{rated}	A	6.75
Rated power	P_{rated}	kW	1.59



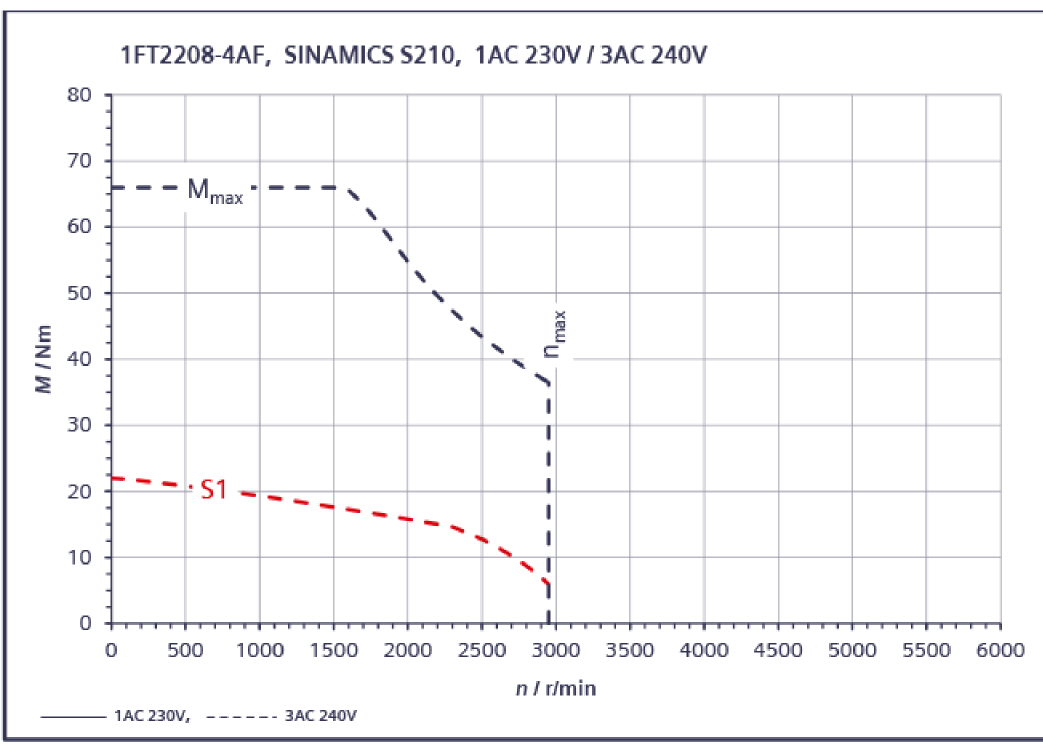
12.2.17.46 1FT2208-4AC connected to 3 AC 240 V

1FT2208-4AC	For 3 AC 240 V		
Technical specifications in the SINAMICS S210 system	**Symbol**	**Unit**	**Value**
Static torque	M_0	Nm	22
Stall current	I_0	A	11.7
Maximum permissible speed	n_{max}	r/min	2300
Maximum torque	M_{max}	Nm	66
Maximum current	I_{max}	A	43.5
Thermal time constant	T_{th}	min	28
Rotor moment of inertia	J_{mot}	$kgcm^2$	38.8
Rotor moment of inertia (with brake)	$J_{mot\ br}$	$kgcm^2$	44.4
Weight	m_{mot}	kg	14.6
Weight (with brake)	$m_{mot\ br}$	kg	17.3
Rated data for S210 connected to 3 AC 240 V			
Rated speed	n_{rated}	r/min	1000
Rated torque	M_{rated}	Nm	20
Rated current	I_{rated}	A	10.9
Rated power	P_{rated}	kW	2.15



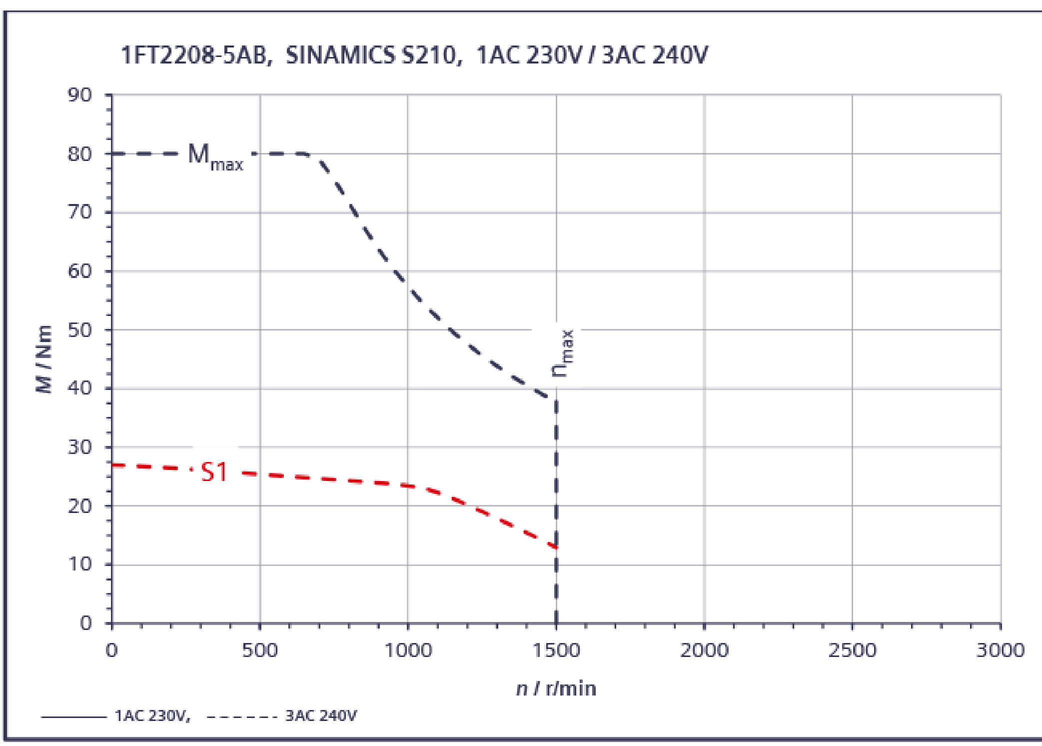
12.2.17.47 1FT2208-4AF connected to 3 AC 240 V

1FT2208-4AF	For 3 AC 240 V		
Technical specifications in the SINAMICS S210 system	**Symbol**	**Unit**	**Value**
Static torque	M_0	Nm	22
Stall current	I_0	A	15
Maximum permissible speed	n_{max}	r/min	2950
Maximum torque	M_{max}	Nm	66
Maximum current	I_{max}	A	55
Thermal time constant	T_{th}	min	28
Rotor moment of inertia	J_{mot}	$kgcm^2$	38.8
Rotor moment of inertia (with brake)	$J_{mot\ br}$	$kgcm^2$	44.4
Weight	m_{mot}	kg	14.6
Weight (with brake)	$m_{mot\ br}$	kg	17.3
Rated data for S210 connected to 3 AC 240 V			
Rated speed	n_{rated}	r/min	1500
Rated torque	M_{rated}	Nm	17.6
Rated current	I_{rated}	A	12.4
Rated power	P_{rated}	kW	2.75



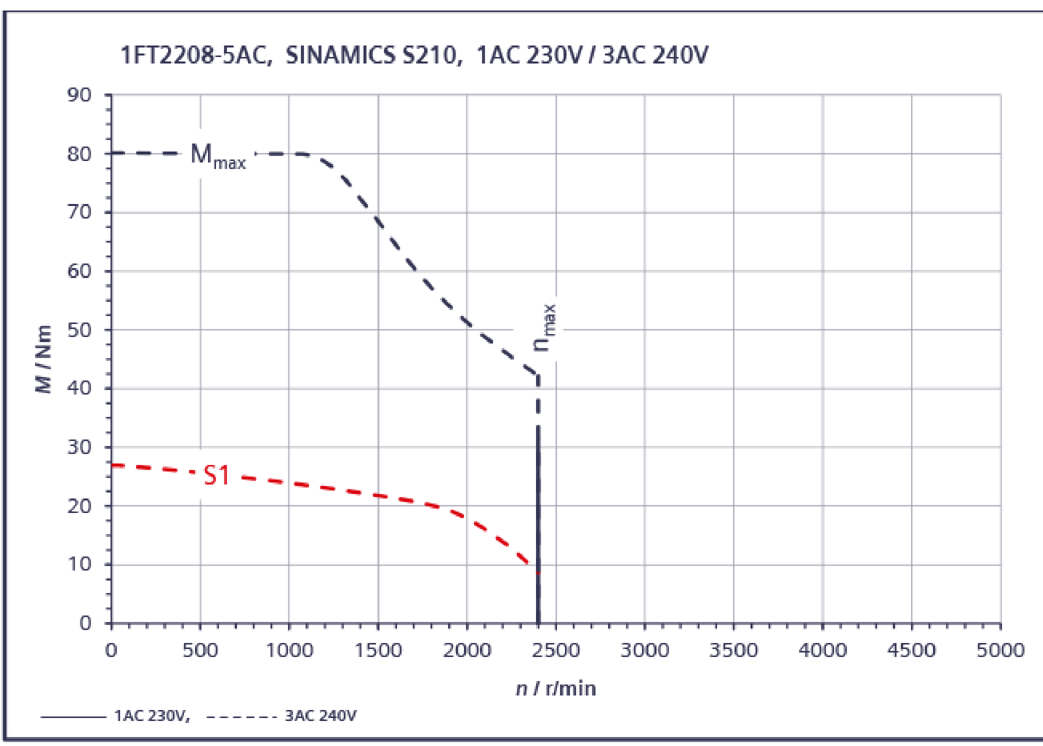
12.2.17.48 1FT2208-5AB connected to 3 AC 240 V

1FT2208-5AB	**For 1 AC 230 V, 3 AC 240 V**		
Technical specifications in the SINAMICS S210 system	**Symbol**	**Unit**	**Value**
Static torque	M_0	Nm	27
Stall current	I_0	A	8.6
Maximum permissible speed	n_{max}	r/min	1490
Maximum torque	M_{max}	Nm	80
Maximum current	I_{max}	A	29.5
Thermal time constant	T_{th}	min	30
Rotor moment of inertia	J_{mot}	$kgcm^2$	48.1
Rotor moment of inertia (with brake)	$J_{mot\ br}$	$kgcm^2$	53.6
Weight	m_{mot}	kg	16.6
Weight (with brake)	$m_{mot\ br}$	kg	19.3
Rated data for S210 connected to 1 AC 230 V, 3 AC 240 V			
Rated speed	n_{rated}	r/min	750
Rated torque	M_{rated}	Nm	24.5
Rated current	I_{rated}	A	7.9
Rated power	P_{rated}	kW	1.92



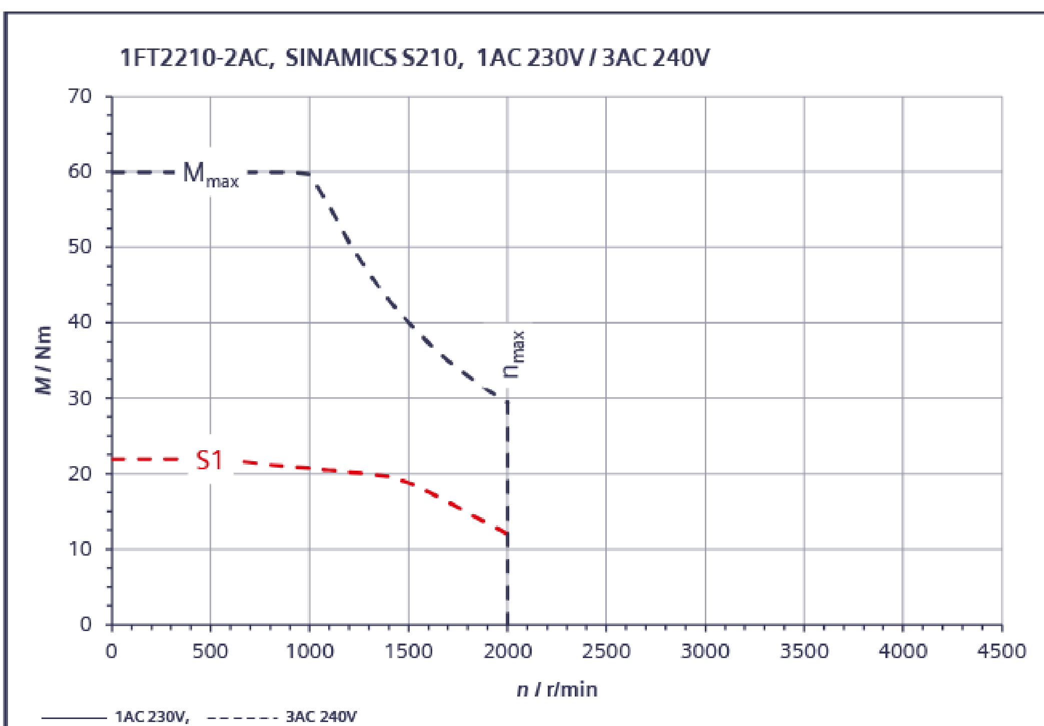
12.2.17.49 1FT2208-5AC connected to 3 AC 240 V

1FT2208-5AC	For 3 AC 240 V		
Technical specifications in the SINAMICS S210 system	**Symbol**	**Unit**	**Value**
Static torque	M_0	Nm	27
Stall current	I_0	A	14.6
Maximum permissible speed	n_{max}	r/min	2350
Maximum torque	M_{max}	Nm	80
Maximum current	I_{max}	A	51.5
Thermal time constant	T_{th}	min	30
Rotor moment of inertia	J_{mot}	$kgcm^2$	48.1
Rotor moment of inertia (with brake)	$J_{mot\ br}$	$kgcm^2$	53.6
Weight	m_{mot}	kg	16.6
Weight (with brake)	$m_{mot\ br}$	kg	19.3
Rated data for S210 connected to 3 AC 240 V			
Rated speed	n_{rated}	r/min	1000
Rated torque	M_{rated}	Nm	23.5
Rated current	I_{rated}	A	13.2
Rated power	P_{rated}	kW	2.5



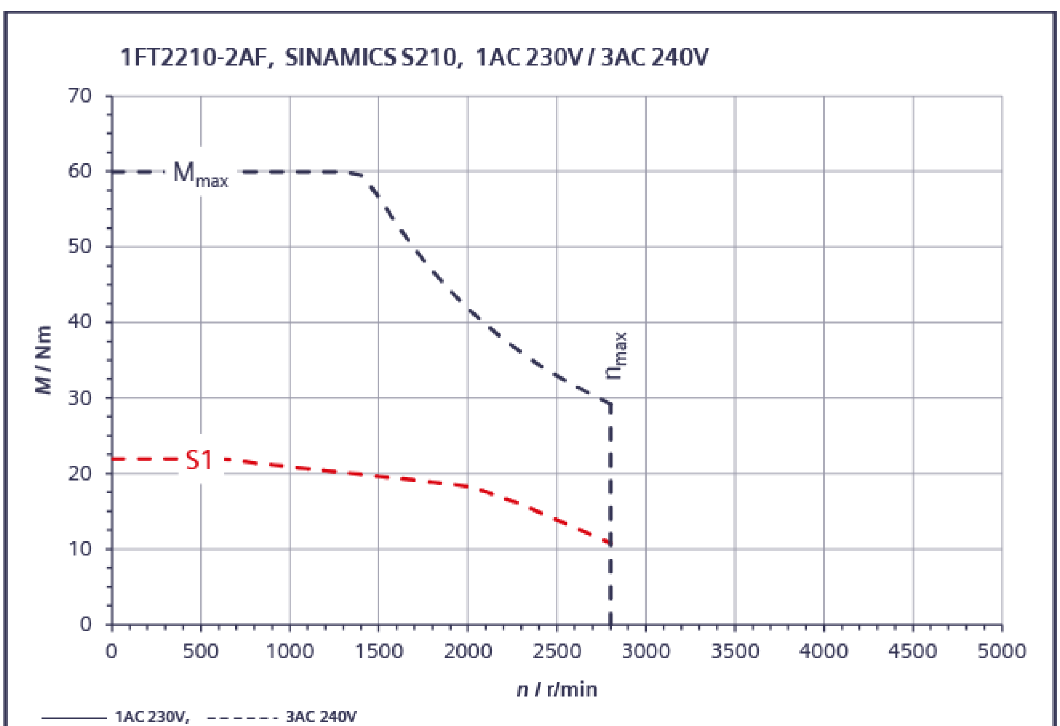
12.2.17.50 1FT2210-2AC connected to 3 AC 240 V

1FT2210-2AC	For 3 AC 240 V		
Technical specifications in the SINAMICS S210 system	**Symbol**	**Unit**	**Value**
Static torque	M_0	Nm	22
Stall current	I_0	A	9.3
Maximum permissible speed	n_{max}	r/min	4050
Maximum torque	M_{max}	Nm	60
Maximum current	I_{max}	A	32
Thermal time constant	T_{th}	min	39
Rotor moment of inertia	J_{mot}	$kgcm^2$	61.7
Rotor moment of inertia (with brake 1)	$J_{mot\ br\ 1}$	$kgcm^2$	67.7
Rotor moment of inertia (with brake 2)	$J_{mot\ br\ 2}$	$kgcm^2$	77.3
Weight	m_{mot}	kg	16.7
Weight (with brake 1)	$m_{mot\ br\ 1}$	kg	20.1
Weight (with brake 2)	$m_{mot\ br\ 2}$	kg	21.4
Rated data for S210 connected to 3 AC 240 V			
Rated speed	n_{rated}	r/min	1000
Rated torque	M_{rated}	Nm	20.5
Rated current	I_{rated}	A	9
Rated power	P_{rated}	kW	2.15



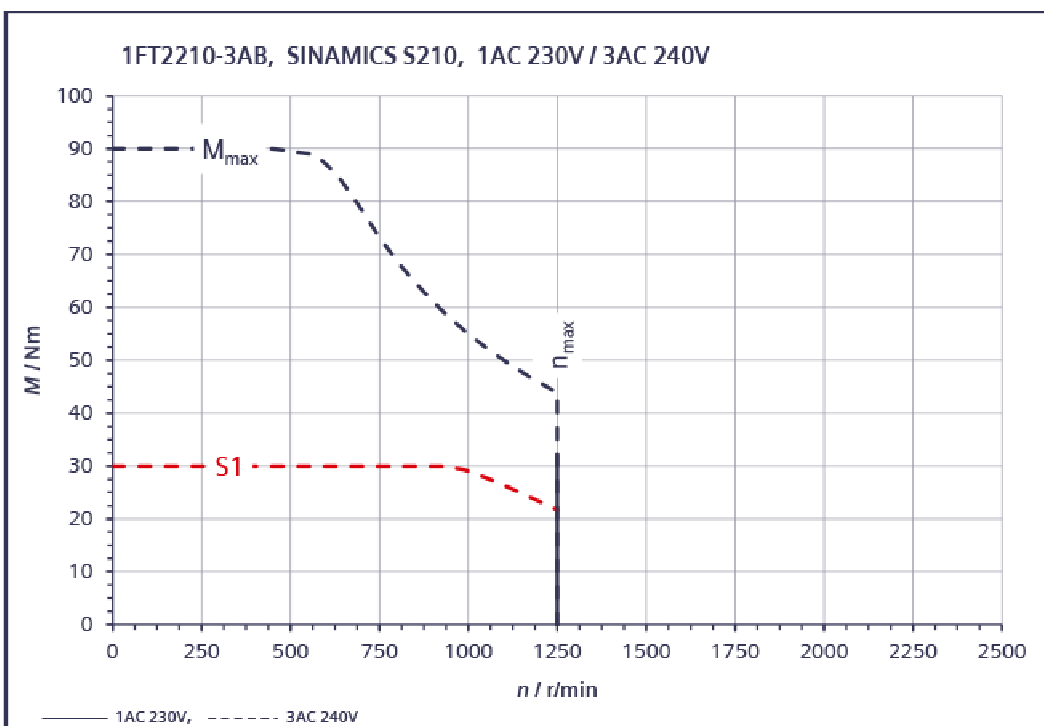
12.2.17.51 1FT2210-2AF connected to 3 AC 240 V

1FT2210-2AF	For 3 AC 240 V		
Technical specifications in the SINAMICS S210 system	**Symbol**	**Unit**	**Value**
Static torque	M_0	Nm	22
Stall current	I_0	A	12.9
Maximum permissible speed	n_{max}	r/min	5000
Maximum torque	M_{max}	Nm	60
Maximum current	I_{max}	A	44.5
Thermal time constant	T_{th}	min	39
Rotor moment of inertia	J_{mot}	$kgcm^2$	61.7
Rotor moment of inertia (with brake 1)	$J_{mot\ br}$	$kgcm^2$	67.7
Rotor moment of inertia (with brake 2)	$J_{mot\ br}$	$kgcm^2$	77.3
Weight	m_{mot}	kg	16.7
Weight (with brake 1)	$m_{mot\ br}$	kg	20.1
Weight (with brake 2)	$m_{mot\ br}$	kg	21.4
Rated data for S210 connected to 3 AC 240 V			
Rated speed	n_{rated}	r/min	1500
Rated torque	M_{rated}	Nm	19.6
Rated current	I_{rated}	A	11.9
Rated power	P_{rated}	kW	3.1



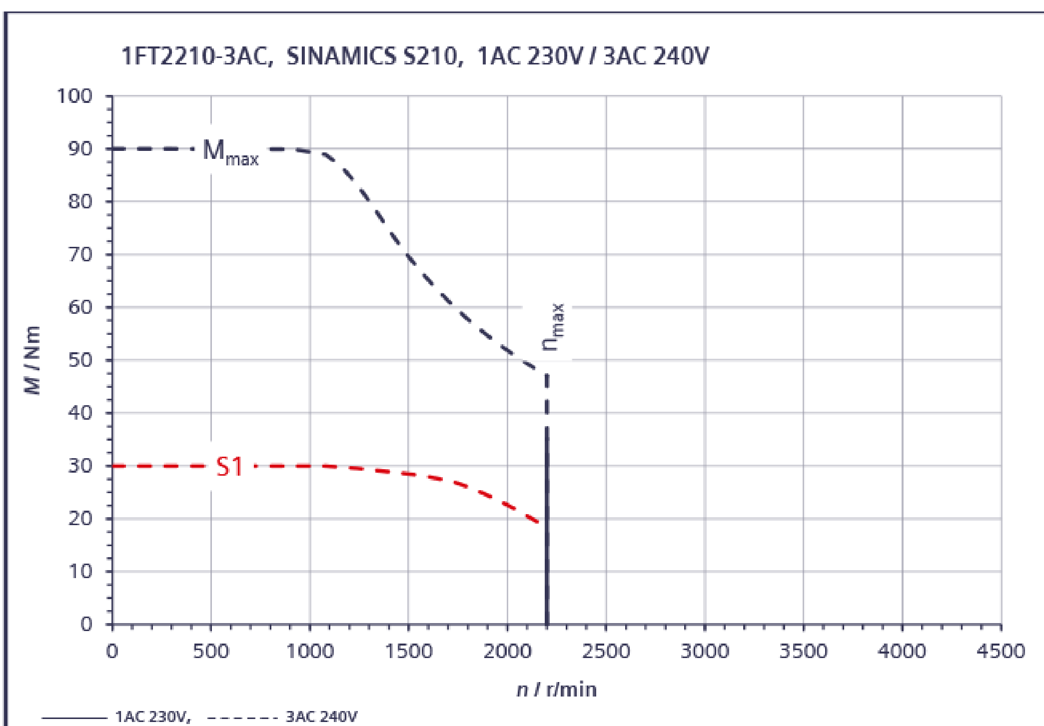
12.2.17.52 1FT2210-3AB connected to 3 AC 240 V

1FT2210-3AB	**For 3 AC 240 V**		
Technical specifications in the SINAMICS S210 system	**Symbol**	**Unit**	**Value**
Static torque	M_0	Nm	30
Stall current	I_0	A	8.5
Maximum permissible speed	n_{max}	r/min	5000
Maximum torque	M_{max}	Nm	90
Maximum current	I_{max}	A	31.5
Thermal time constant	T_{th}	min	33
Rotor moment of inertia	J_{mot}	$kgcm^2$	88.8
Rotor moment of inertia (with brake 1)	$J_{mot\ br\ 1}$	$kgcm^2$	94.8
Rotor moment of inertia (with brake 2)	$J_{mot\ br\ 2}$	kgcm2	104
Weight	m_{mot}	kg	22
Weight (with brake 1)	$m_{mot\ br\ 1}$	kg	25
Weight (with brake 2)	$m_{mot\ br\ 2}$	kg	26.3
Rated data for S210 connected to 3 AC 240 V			
Rated speed	n_{rated}	r/min	750
Rated torque	M_{rated}	Nm	30
Rated current	I_{rated}	A	8.6
Rated power	P_{rated}	kW	2.5



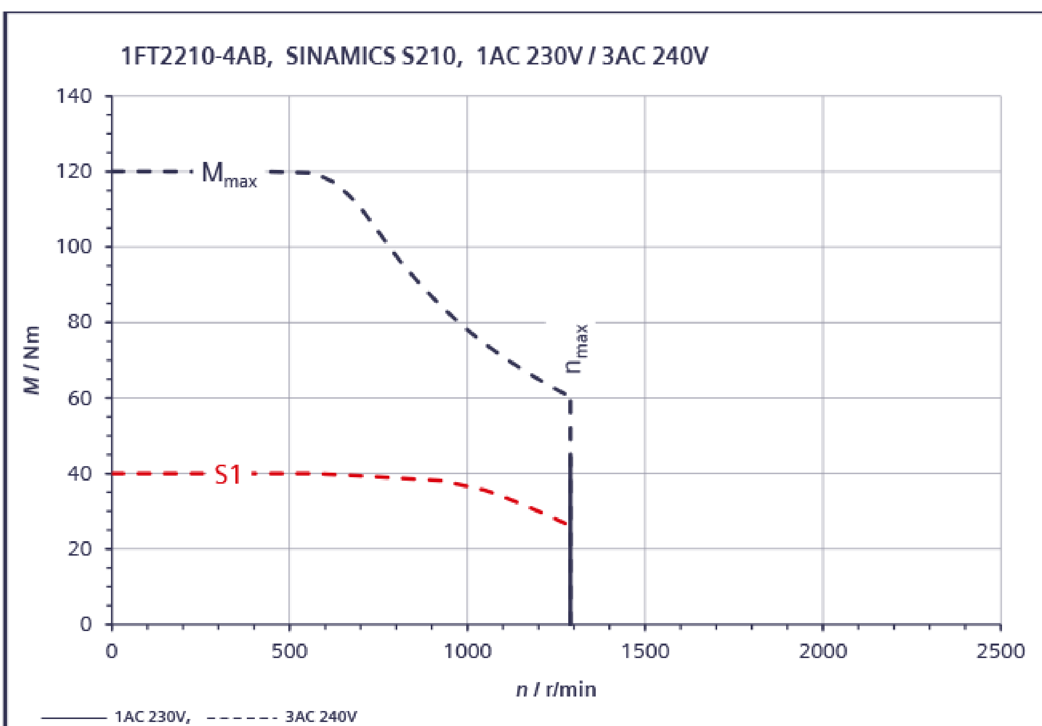
12.2.17.53 1FT2210-3AC connected to 3 AC 240 V

1FT2210-3AC	For 3 AC 240 V		
Technical specifications in the SINAMICS S210 system	**Symbol**	**Unit**	**Value**
Static torque	M_0	Nm	30
Stall current	I_0	A	15
Maximum permissible speed	n_{max}	r/min	5000
Maximum torque	M_{max}	Nm	90
Maximum current	I_{max}	A	55
Thermal time constant	T_{th}	min	33
Rotor moment of inertia	J_{mot}	$kgcm^2$	88.8
Rotor moment of inertia (with brake 1)	$J_{mot\ br\ 1}$	$kgcm^2$	94.8
Rotor moment of inertia (with brake 2)	$J_{mot\ br\ 2}$	kgcm2	104
Weight	m_{mot}	kg	22
Weight (with brake 1)	$m_{mot\ br\ 1}$	kg	25
Weight (with brake 2)	$m_{mot\ br\ 2}$	kg	26.3
Rated data for S210 connected to 3 AC 240 V			
Rated speed	n_{rated}	r/min	1000
Rated torque	M_{rated}	Nm	30
Rated current	I_{rated}	A	15.5
Rated power	P_{rated}	kW	3.2



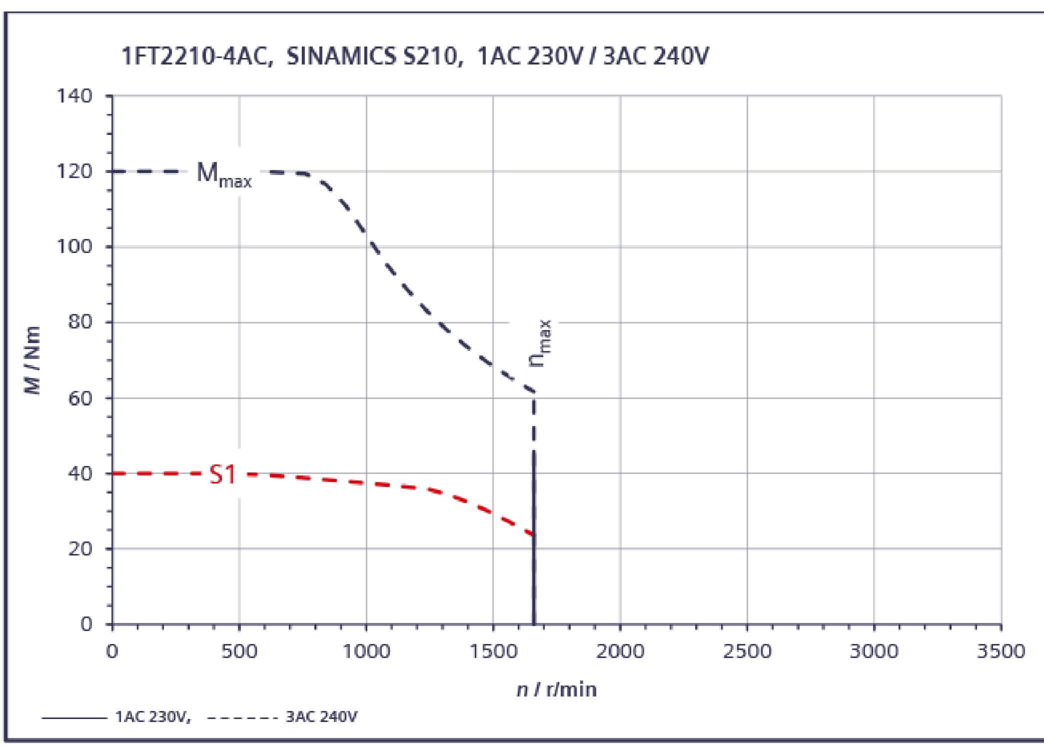
12.2.17.54 1FT2210-4AB connected to 3 AC 240 V

1FT2210-4AB	For 1 AC 230 V, 3 AC 240 V		
Technical specifications in the SINAMICS S210 system	**Symbol**	**Unit**	**Value**
Static torque	M_0	Nm	40
Stall current	I_0	A	11.8
Maximum permissible speed	n_{max}	r/min	1250
Maximum torque	M_{max}	Nm	120
Maximum current	I_{max}	A	43.5
Thermal time constant	T_{th}	min	35
Rotor moment of inertia	J_{mot}	$kgcm^2$	117
Rotor moment of inertia (with brake 1)	$J_{mot\ br\ 1}$	$kgcm^2$	133
Rotor moment of inertia (with brake 2)	$J_{mot\ br\ 2}$	kgcm2	-
Weight	m_{mot}	kg	27
Weight (with brake 1)	$m_{mot\ br\ 1}$	kg	31
Weight (with brake 2)	$m_{mot\ br\ 2}$	kg	-
Rated data for S210 connected to 1 AC 230 V, 3 AC 240 V			
Rated speed	n_{rated}	r/min	750
Rated torque	M_{rated}	Nm	39
Rated current	I_{rated}	A	11.6
Rated power	P_{rated}	kW	3.05



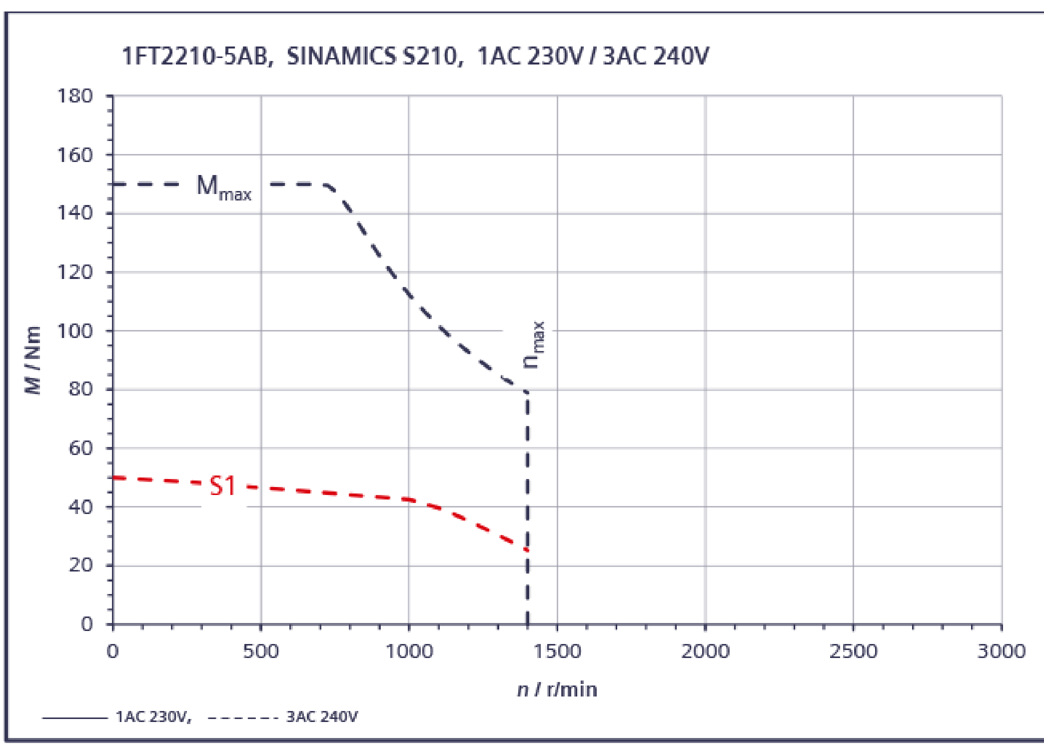
12.2.17.55 1FT2210-4AC connected to 3 AC 240 V

1FT2210-4AC	For 3 AC 240 V		
Technical specifications in the SINAMICS S210 system	**Symbol**	**Unit**	**Value**
Static torque	M_0	Nm	40
Stall current	I_0	A	15
Maximum permissible speed	n_{max}	r/min	1650
Maximum torque	M_{max}	Nm	120
Maximum current	I_{max}	A	55
Thermal time constant	T_{th}	min	35
Rotor moment of inertia	J_{mot}	$kgcm^2$	117
Rotor moment of inertia (with brake)	$J_{mot\ br}$	$kgcm^2$	133
Weight	m_{mot}	kg	27
Weight (with brake)	$m_{mot\ br}$	kg	31
Rated data for S210 connected to 3 AC 240 V			
Rated speed	n_{rated}	r/min	1000
Rated torque	M_{rated}	Nm	37
Rated current	I_{rated}	A	14.3
Rated power	P_{rated}	kW	3.9



12.2.17.56 1FT2210-5AB connected to 3 AC 240 V

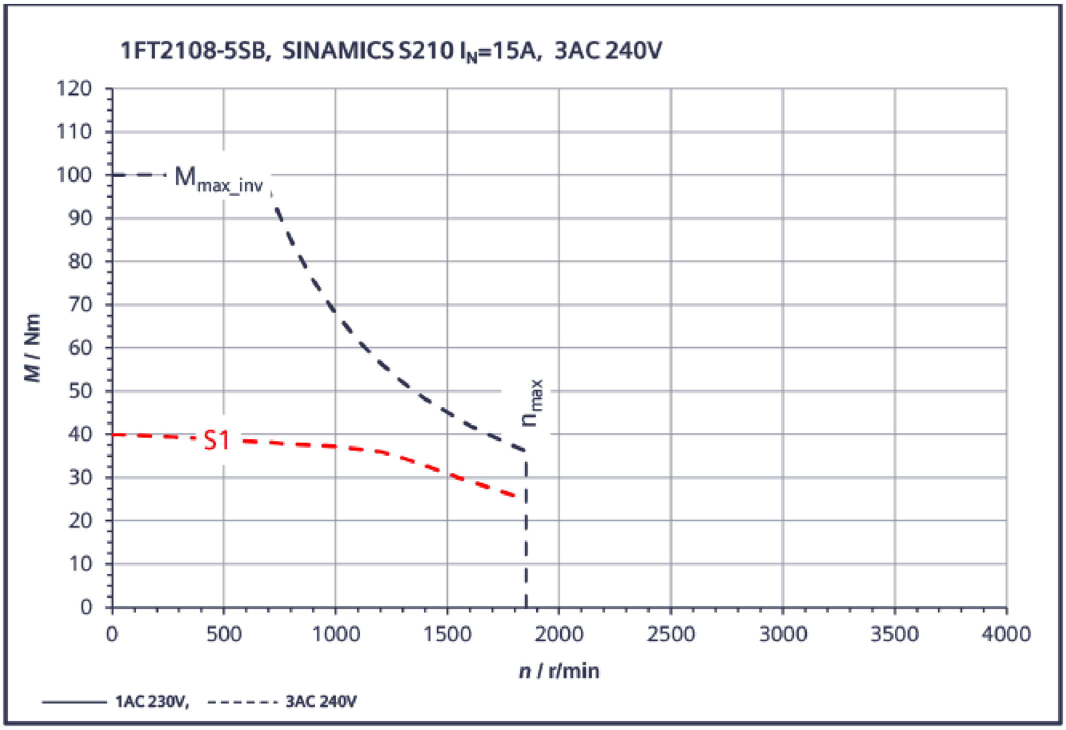
1FK2210-5AB	For 3 AC 240 V		
Technical specifications in the SINAMICS S210 system	**Symbol**	**Unit**	**Value**
Static torque	M_0	Nm	50
Stall current	I_0	A	15
Maximum permissible speed	n_{max}	r/min	1430
Maximum torque	M_{max}	Nm	150
Maximum current	I_{max}	A	55
Thermal time constant	T_{th}	min	37
Rotor moment of inertia	J_{mot}	$kgcm^2$	145
Rotor moment of inertia (with brake)	$J_{mot\ br}$	$kgcm^2$	161
Weight	m_{mot}	kg	32
Weight (with brake)	$m_{mot\ br}$	kg	36
Rated data for S210 connected to 3 AC 240 V			
Rated speed	n_{rated}	r/min	750
Rated torque	M_{rated}	Nm	44.5
Rated current	I_{rated}	A	13.6
Rated power	P_{rated}	kW	3.5



12.2.18 Technical data and characteristics of the 1FT2 connected to 1 AC 230 V, 3 AC 240 V, force-ventilated

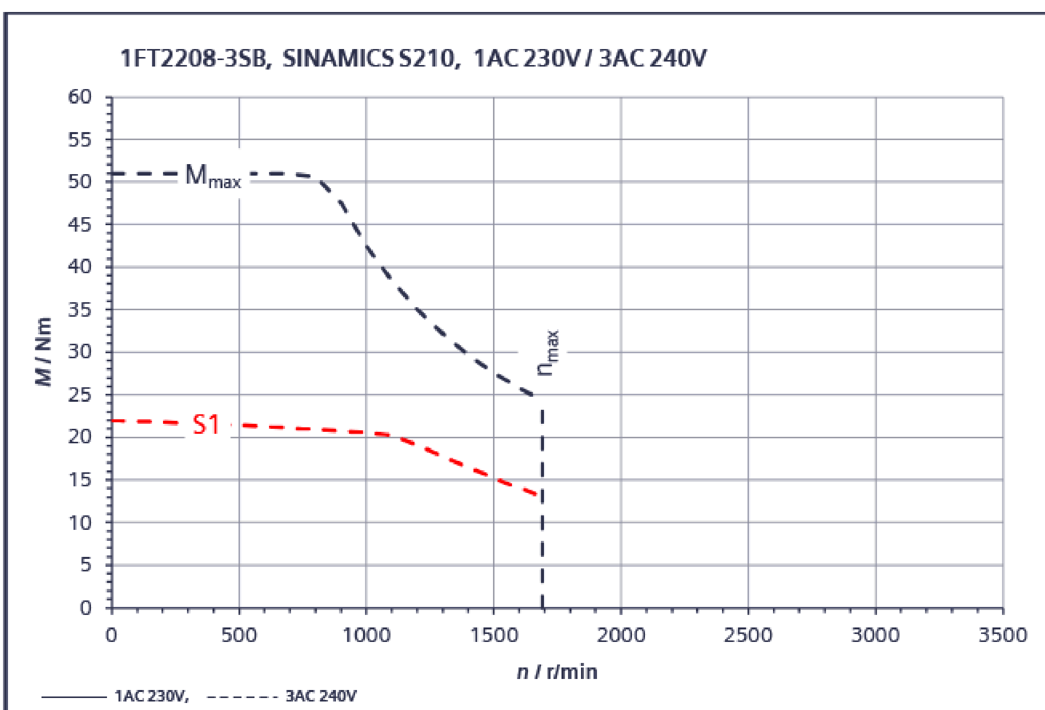
12.2.18.1 1FT2108-5SB connected to 3 AC 240 V

1FT2108-5SB	**For 3 AC 240 V**		
Technical specifications in the SINAMICS S210 system	**Symbol**	**Unit**	**Value**
Static torque	M_0	Nm	40
Stall current	I_0	A	15.5
Maximum permissible speed	n_{max}	r/min	3700
Maximum torque	$M_{max\ inv}$	Nm	100
Maximum current	I_{max}	A	61
Thermal time constant	T_{th}	min	16
Rotor moment of inertia	J_{mot}	$kgcm^2$	21.6
Rotor moment of inertia (with brake 1)	$J_{mot\ br}$	$kgcm^2$	25.6
Rotor moment of inertia (with brake 2)	$J_{mot\ br}$	$kgcm^2$	27.2
Weight	m_{mot}	kg	22.1
Weight (with brake 1)	$m_{mot\ br}$	kg	24.8
Weight (with brake 2)	$m_{mot\ br}$	kg	24.9
Rated data for S210 connected to 3 AC 240 V			
Rated speed	n_{rated}	r/min	750
Rated torque	M_{rated}	Nm	38
Rated current	I_{rated}	A	14.6
Rated power	P_{rated}	kW	3


1FT2108-5SB, SINAMICS S210 I_N=15A, 3AC 240V
M / Nm
n / r/min
M_max_inv
S1
n_max
0
10
20
30
40
50
60
70
80
90
100
110
120
0
500
1000
1500
2000
2500
3000
3500
4000
1AC 230V,
3AC 240V

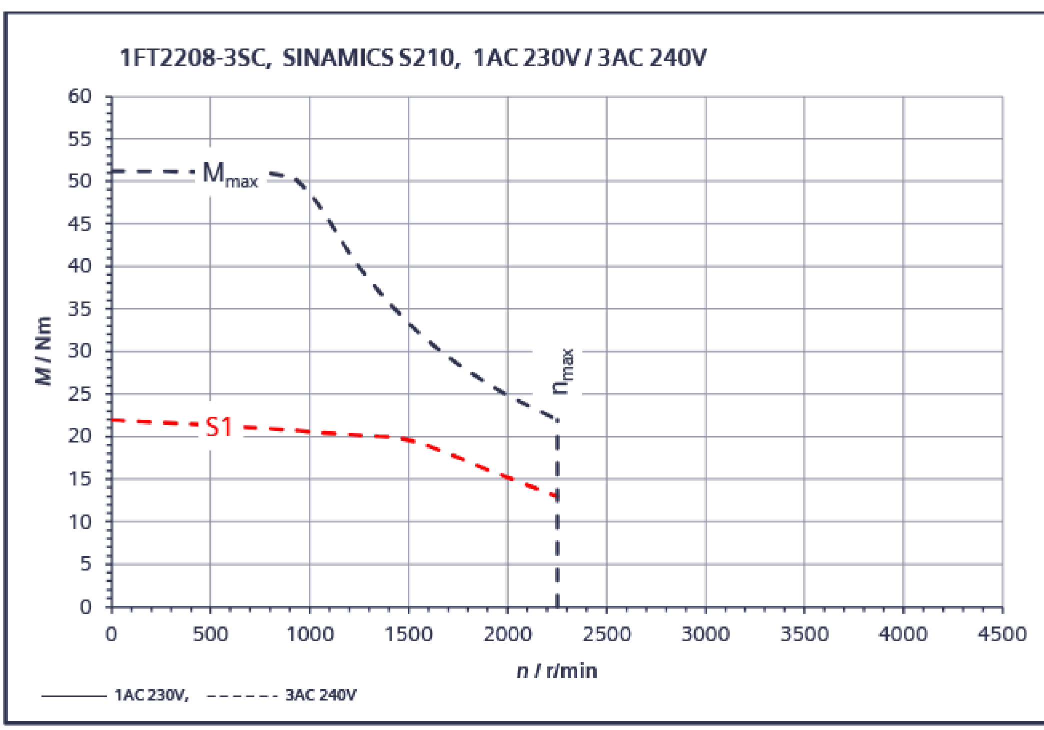
12.2.18.2 1FT2208-3SB connected to 3 AC 240 V

1FT2208-3SB	For 3 AC 400 V, 3 AC 480 V		
Technical specifications in the S210 system	**Abbreviation**	**Unit**	**Value**
Static torque	M_0	Nm	22
Stall current	I_0	A	7.8
Max. permissible speed	$n_{max\ inv}$	r/min	3350
Maximum torque	M_{max}	Nm	51
Maximum current	I_{max}	A	20.5
Thermal time constant	T_{th}	min	12
Moment of inertia	J_{mot}	kg cm²	29.6
Moment of inertia (with brake 1)	$J_{mot\ br\ 1}$	kg cm²	32.6
Moment of inertia (with brake 2)	$J_{mot\ br\ 2}$	kg cm²	35.1
Weight	m_{mot}	kg	14.9
Weight (with brake 1)	$m_{mot\ br\ 1}$	kg	17.1
Weight (with brake 2)	$m_{mot\ br\ 2}$	kg	17.7
Rated data 1AC 230 V, 3AC 240 V			
Rated speed	n_{rated}	r/min	750
Rated torque	M_{rated}	Nm	20.5
Rated current	I_{rated}	A	7.6
Rated power	P_{rated}	kW	1.62



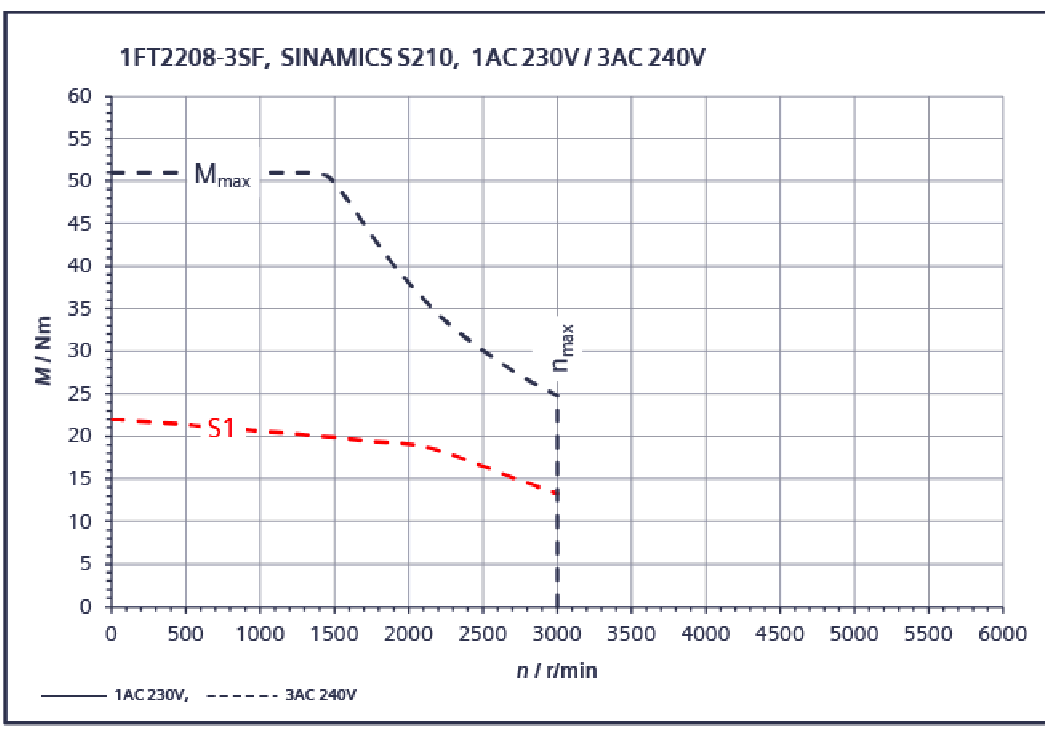
12.2.18.3 1FT2208-3SC connected to 3 AC 240 V

1FT2208-3SC	For 3 AC 240 V		
Technical specifications in the SINAMICS S210 system	**Symbol**	**Unit**	**Value**
Static torque	M_0	Nm	22
Stall current	I_0	A	10.4
Maximum permissible speed	n_{max}	r/min	4500
Maximum torque	M_{max}	Nm	51
Maximum current	I_{max}	A	29.5
Thermal time constant	T_{th}	min	12
Rotor moment of inertia	J_{mot}	$kgcm^2$	29.6
Rotor moment of inertia (with brake 1)	$J_{mot\ br\ 1}$	$kgcm^2$	32.6
Rotor moment of inertia (with brake 2)	$J_{mot\ br\ 2}$	$kgcm^2$	35.1
Weight	m_{mot}	kg	14.9
Weight (with brake 1)	$m_{mot\ br\ 1}$	kg	17.1
Weight (with brake 2)	$m_{mot\ br\ 2}$	kg	17.7
Rated data for S210 connected to 3 AC 240 V			
Rated speed	n_{rated}	r/min	1000
Rated torque	M_{rated}	Nm	20.5
Rated current	I_{rated}	A	9.9
Rated power	P_{rated}	kW	2.15



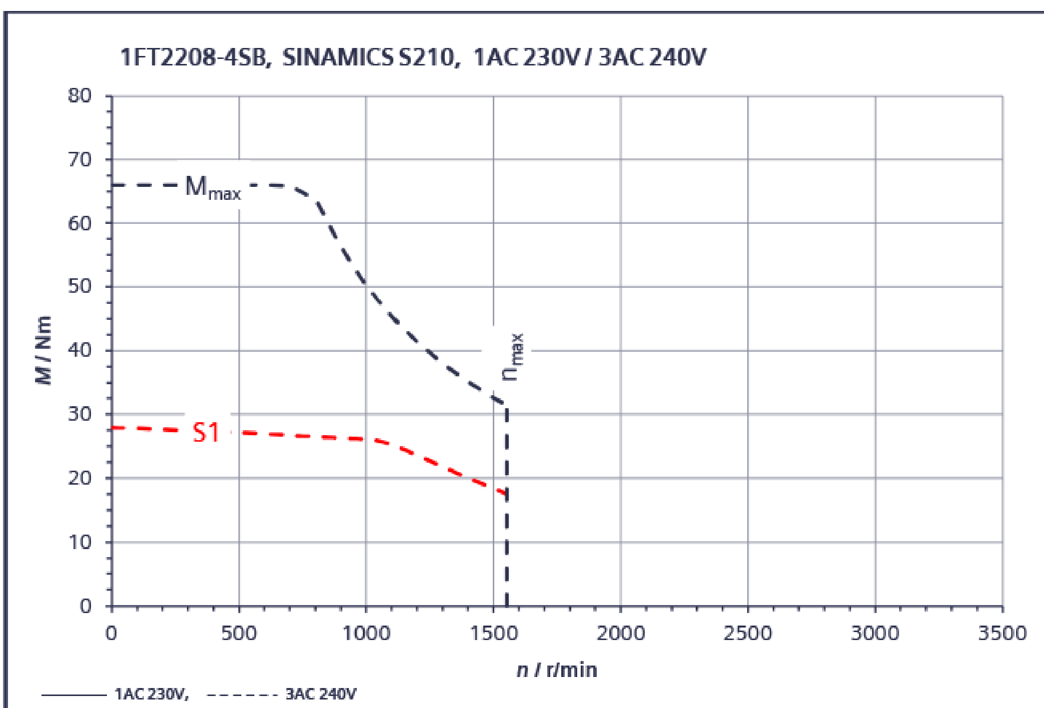
12.2.18.4 1FT2208-3SF connected to 3 AC 240 V

1FT2208-3SF	**For 3 AC 240 V**		
Technical specifications in the SINAMICS S210 system	**Symbol**	**Unit**	**Value**
Static torque	M_0	Nm	22
Stall current	I_0	A	14.1
Maximum permissible speed	n_{max}	r/min	6000
Maximum torque	M_{max}	Nm	51
Maximum current	I_{max}	A	40
Thermal time constant	T_{th}	min	12
Rotor moment of inertia	J_{mot}	$kgcm^2$	29.6
Rotor moment of inertia (with brake 1)	$J_{mot\ br\ 1}$	$kgcm^2$	32.6
Rotor moment of inertia (with brake 2)	$J_{mot\ br\ 2}$	kgcm2	35.1
Weight	m_{mot}	kg	14.9
Weight (with brake 1)	$m_{mot\ br\ 1}$	kg	17.1
Weight (with brake 2)	$m_{mot\ br\ 2}$	kg	17.7
Rated data for S210 connected to 3 AC 240 V			
Rated speed	n_{rated}	r/min	1500
Rated torque	M_{rated}	Nm	19.9
Rated current	I_{rated}	A	13.2
Rated power	P_{rated}	kW	3.1



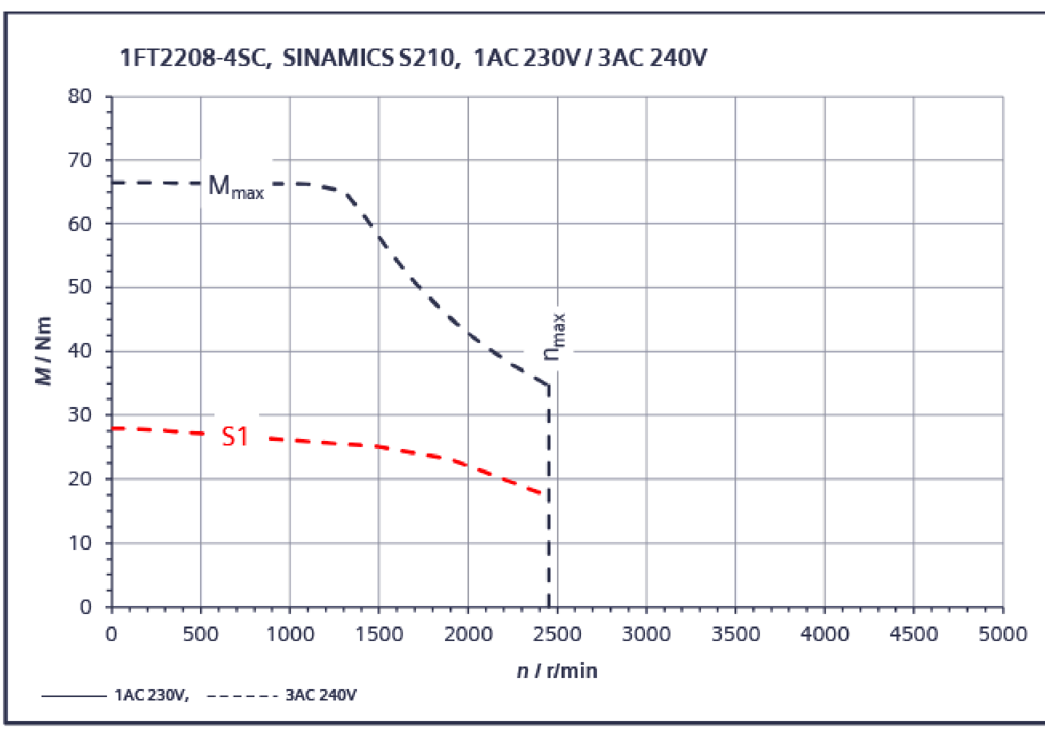
12.2.18.5 1FT2208-4SB connected to 3 AC 240 V

1FT2208-4SB	For 3 AC 400 V, 3 AC 480 V		
Technical specifications in the S210 system	**Abbreviation**	**Unit**	**Value**
Static torque	M_0	Nm	28
Stall current	I_0	A	9.3
Max. permissible speed	$n_{max\ inv}$	r/min	3150
Maximum torque	M_{max}	Nm	66
Maximum current	I_{max}	A	25
Thermal time constant	T_{th}	min	13
Moment of inertia	J_{mot}	kg cm²	38.8
Rotor moment of inertia (with brake 1)	$J_{mot\ br\ 1}$	kgcm²	44.4
Rotor moment of inertia (with brake 2)	$J_{mot\ br\ 2}$	kgcm2	-
Weight	m_{mot}	kg	17.5
Weight (with brake 1)	$m_{mot\ br\ 1}$	kg	20.3
Weight (with brake 2)	$m_{mot\ br\ 2}$	kg	-
Rated data 3 AC 240			
Rated speed	n_{rated}	r/min	750
Rated torque	M_{rated}	Nm	26.5
Rated current	I_{rated}	A	9
Rated power	P_{rated}	kW	2.1



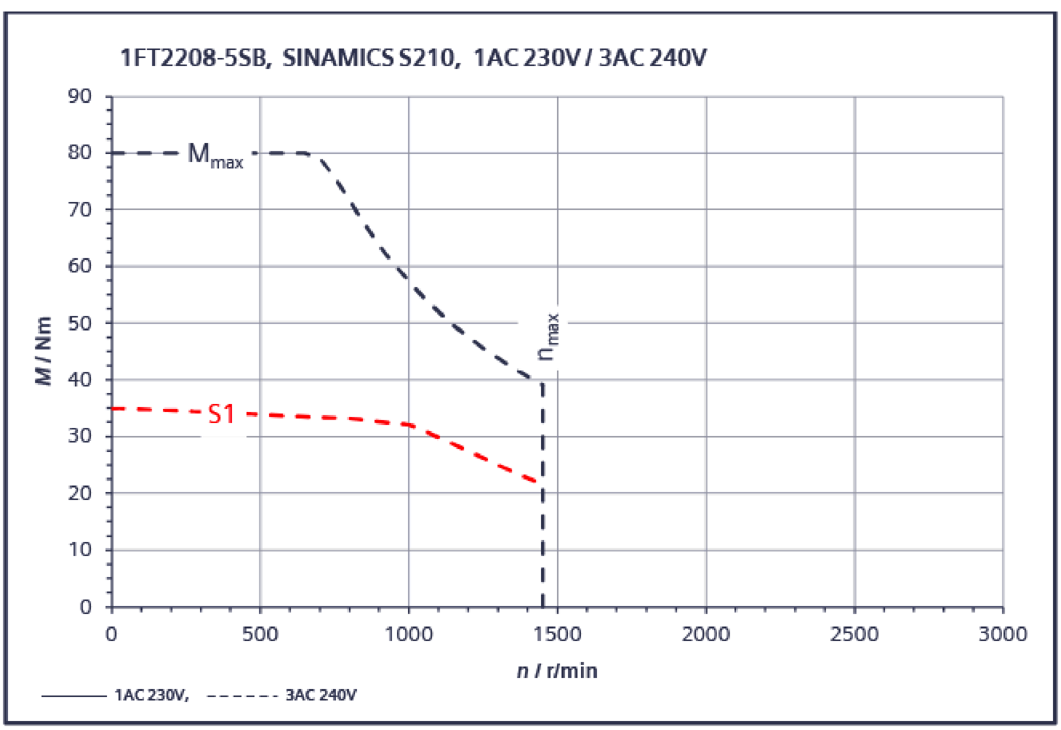
12.2.18.6 1FT2208-4SC connected to 3 AC 240 V

1FT2208-4SC	**For 3 AC 240 V**		
Technical specifications in the SINAMICS S210 system	**Symbol**	**Unit**	**Value**
Static torque	M_0	Nm	28
Stall current	I_0	A	14.6
Maximum permissible speed	n_{max}	r/min	4950
Maximum torque	M_{max}	Nm	66
Maximum current	I_{max}	A	43.5
Thermal time constant	T_{th}	min	13
Rotor moment of inertia	J_{mot}	$kgcm^2$	38.8
Rotor moment of inertia (with brake 1)	$J_{mot\ br\ 1}$	$kgcm^2$	44.4
Rotor moment of inertia (with brake 2)	$J_{mot\ br\ 2}$	kgcm2	-
Weight	m_{mot}	kg	17.5
Weight (with brake 1)	$m_{mot\ br\ 1}$	kg	20.3
Weight (with brake 2)	$m_{mot\ br\ 2}$	kg	-
Rated data for S210 connected to 3 AC 240 V			
Rated speed	n_{rated}	r/min	1000
Rated torque	M_{rated}	Nm	26
Rated current	I_{rated}	A	14
Rated power	P_{rated}	kW	2.75



12.2.18.7 1FT2208-5SB connected to 3 AC 240 V

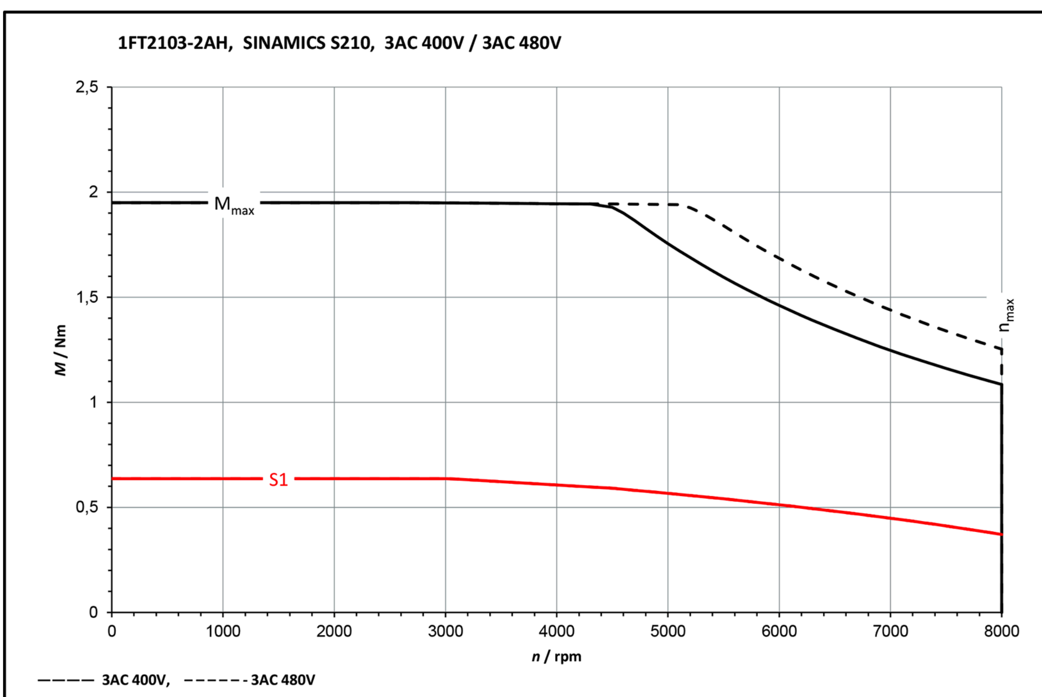
1FT2208-5SB	For 1 AC 230 V, 3 AC 240 V		
Technical specifications in the SINAMICS S210 system	**Symbol**	**Unit**	**Value**
Static torque	M_0	Nm	35
Stall current	I_0	A	10.7
Maximum permissible speed	n_{max}	r/min	2900
Maximum torque	M_{max}	Nm	80
Maximum current	I_{max}	A	29.5
Thermal time constant	T_{th}	min	13
Rotor moment of inertia	J_{mot}	$kgcm^2$	48.1
Rotor moment of inertia (with brake 1)	$J_{mot\ br\ 1}$	$kgcm^2$	53.6
Rotor moment of inertia (with brake 2)	$J_{mot\ br\ 2}$	kgcm2	-
Weight	m_{mot}	kg	20
Weight (with brake 1)	$m_{mot\ br\ 1}$	kg	22.8
Weight (with brake 2)	$m_{mot\ br\ 2}$	kg	-
Rated data for S210 connected to 1 AC 230 V, 3 AC 240 V			
Rated speed	n_{rated}	r/min	750
Rated torque	M_{rated}	Nm	33.5
Rated current	I_{rated}	A	10.5
Rated power	P_{rated}	kW	2.6



12.2.19 Technical data and characteristics of the 1FT2 connected to 400 V 3AC, 480 V 3AC, naturally cooled

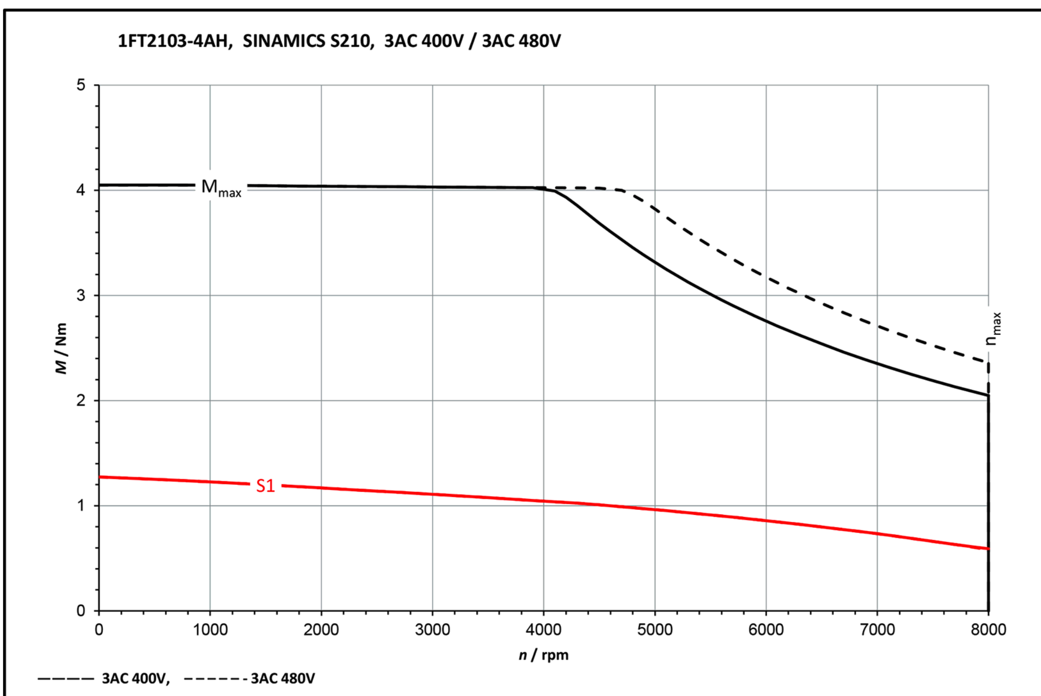
12.2.19.1 1FT2103-2AH connected to 3 AC 400 V / 3 AC 480 V

1FT2103-2AH	**For 3 AC 400 V, 3 AC 480 V**		
Technical specifications in the SINAMICS S210 system	**Symbol**	**Unit**	**Value**
Static torque	M_0	Nm	0.64
Stall current	I_0	A	1.06
Maximum permissible speed	n_{max}	r/min	8000
Maximum torque	M_{max}	Nm	1.95
Maximum current	I_{max}	A	3.95
Thermal time constant	T_{th}	r/min	17
Rotor moment of inertia	J_{mot}	$kgcm^2$	0.093
Rotor moment of inertia (with brake)	$J_{mot\ br}$	$kgcm^2$	0.112
Weight	m_{mot}	kg	1.18
Weight (with brake)	$m_{mot\ br}$	kg	1.55
Rated data for S210 connected to 3 AC 400 V, 3 AC 480 V			
Rated speed	n_{rated}	r/min	4500
Rated torque	M_{rated}	Nm	0.59
Rated current	I_{rated}	A	1.05
Rated power	P_{rated}	kW	0.28



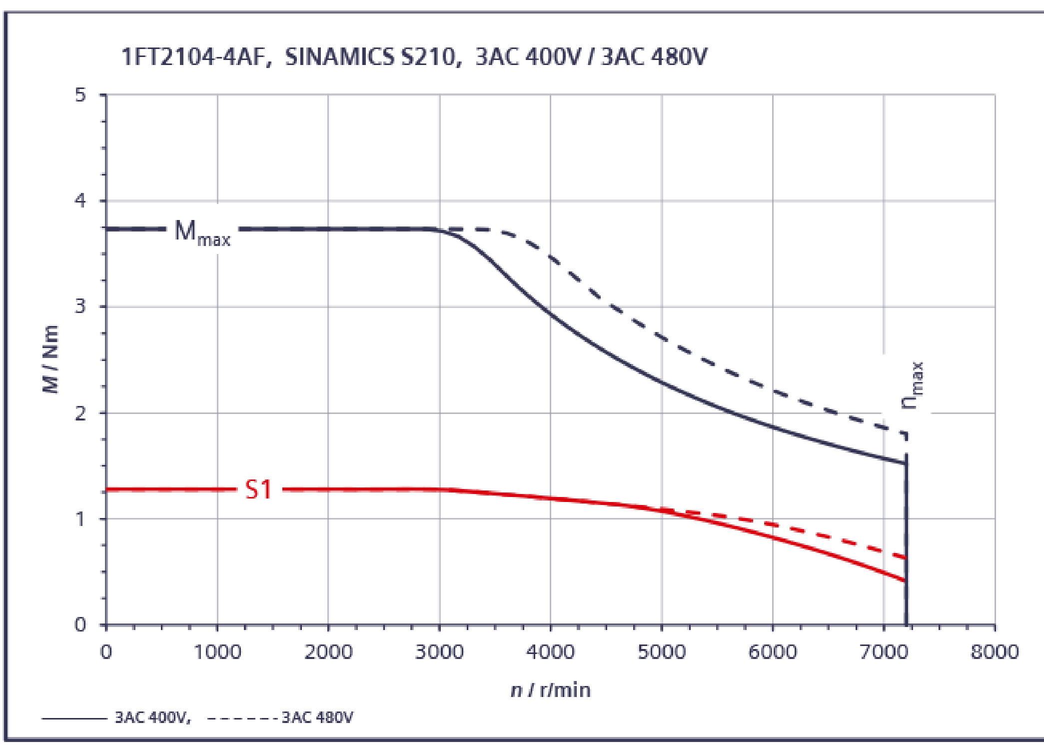
12.2.19.2 1FT2103-4AH connected to 3 AC 400 V / 3 AC 480 V

1FT2103-4AH	For 3 AC 400 V, 3 AC 480 V		
Technical specifications in the SINAMICS S210 system	**Symbol**	**Unit**	**Value**
Static torque	M_0	Nm	1.27
Stall current	I_0	A	1.87
Maximum permissible speed	n_{max}	r/min	8000
Maximum torque	M_{max}	Nm	4.05
Maximum current	I_{max}	A	7.1
Thermal time constant	T_{th}	min	21
Rotor moment of inertia	J_{mot}	$kgcm^2$	0.139
Rotor moment of inertia (with brake)	$J_{mot\ br}$	$kgcm^2$	0.158
Weight	m_{mot}	kg	1.65
Weight (with brake)	$m_{mot\ br}$	kg	1.99
Rated data for S210 connected to 3 AC 400 V, 3 AC 480 V			
Rated speed	n_{rated}	r/min	4500
Rated torque	M_{rated}	Nm	1.01
Rated current	I_{rated}	A	1.56
Rated power	P_{rated}	kW	0.48



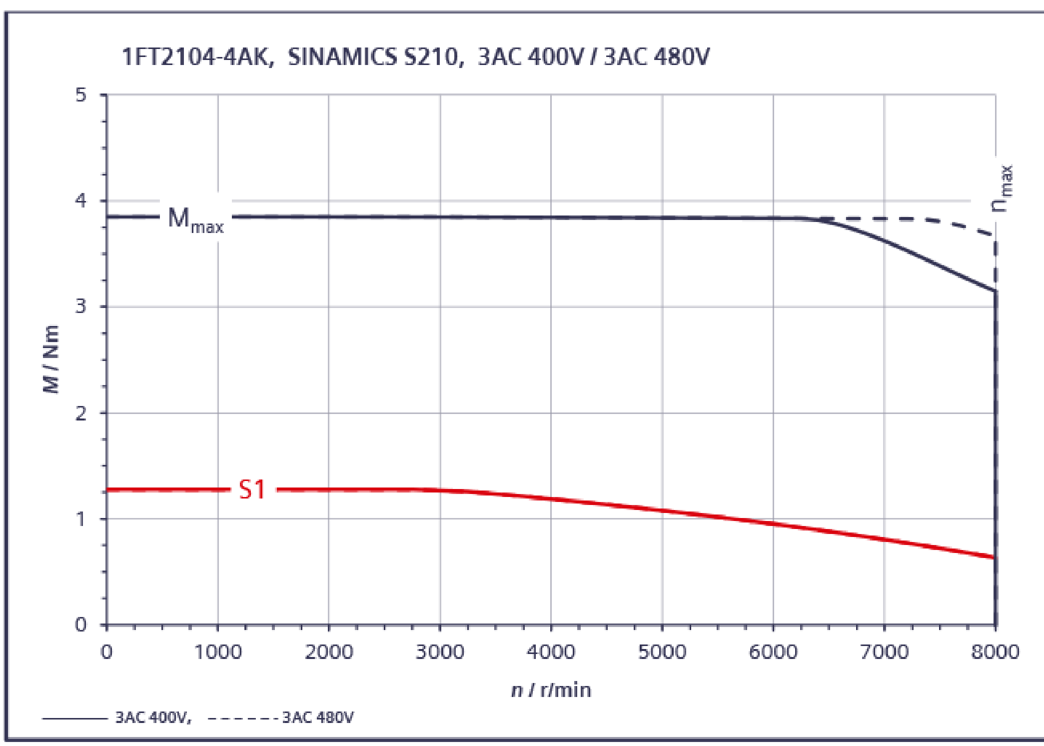
12.2.19.3 1FT2104-4AF connected to 400 V 3 AC / 480 V 3 AC

1FT2104-4AF	For 3 AC 400 V, 3 AC 480 V		
Technical specifications in the SINAMICS S210 system	**Symbol**	**Unit**	**Value**
Static torque	M_0	Nm	1.27
Stall current	I_0	A	1.19
Maximum permissible speed	n_{max}	r/min	7200
Maximum torque	M_{max}	Nm	3.75
Maximum current	I_{max}	A	4.2
Thermal time constant	T_{th}	min	33
Rotor moment of inertia	J_{mot}	$kgcm^2$	0.35
Rotor moment of inertia (with brake)	$J_{mot\ br}$	$kgcm^2$	0.43
Weight	m_{mot}	kg	2.05
Weight (with brake)	$m_{mot\ br}$	kg	2.9
Rated data for S210 connected to 3 AC 400 V, 3 AC 480 V			
Rated speed	n_{rated}	r/min	3000
Rated torque	M_{rated}	Nm	1.27
Rated current	I_{rated}	A	1.19
Rated power	P_{rated}	kW	0.4



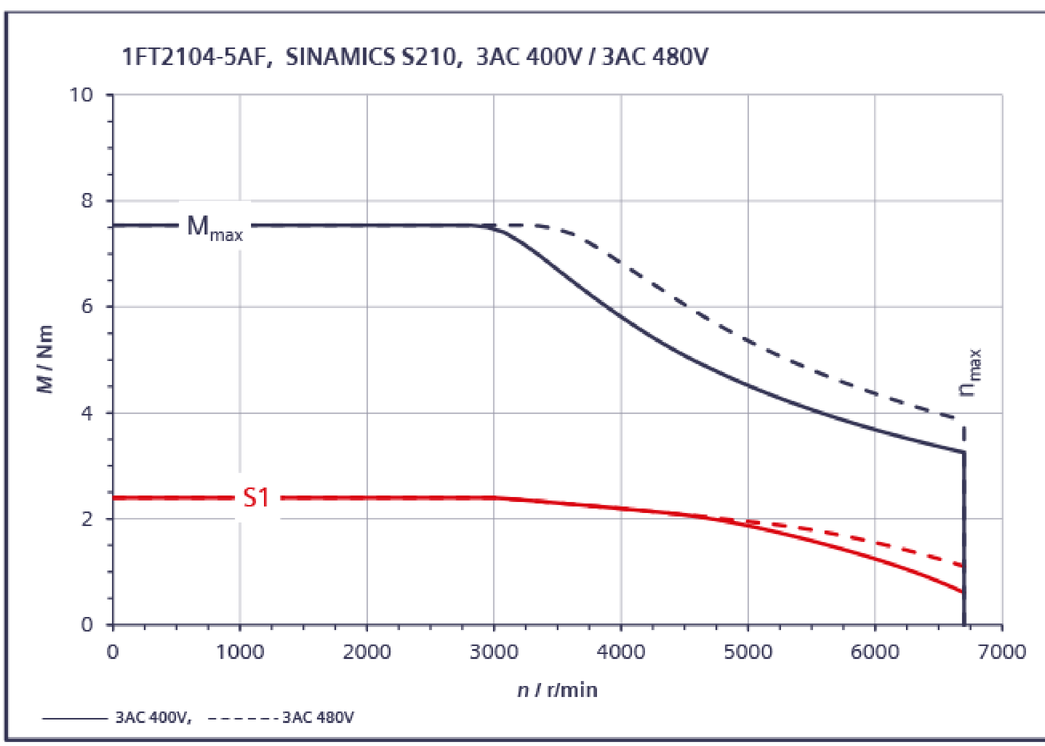
12.2.19.4 1FT2104-4AK connected to 3 AC 400 V / 3 AC 480 V

1FT2104-4AK	For 3 AC 400 V, 3 AC 480 V		
Technical specifications in the SINAMICS S210 system	**Symbol**	**Unit**	**Value**
Static torque	M_0	Nm	1.27
Stall current	I_0	A	2.4
Maximum permissible speed	n_{max}	r/min	8000
Maximum torque	M_{max}	Nm	3.85
Maximum current	I_{max}	A	8.7
Thermal time constant	T_{th}	r/min	33
Rotor moment of inertia	J_{mot}	$kgcm^2$	0.35
Rotor moment of inertia (with brake)	$J_{mot\ br}$	$kgcm^2$	0.43
Weight	m_{mot}	kg	2.05
Weight (with brake)	$m_{mot\ br}$	kg	2.9
Rated data for S210 connected to 3 AC 400 V, 3 AC 480 V			
Rated speed	n_{rated}	r/min	6000
Rated torque	M_{rated}	Nm	0.95
Rated current	I_{rated}	A	1.88
Rated power	P_{rated}	kW	0.6



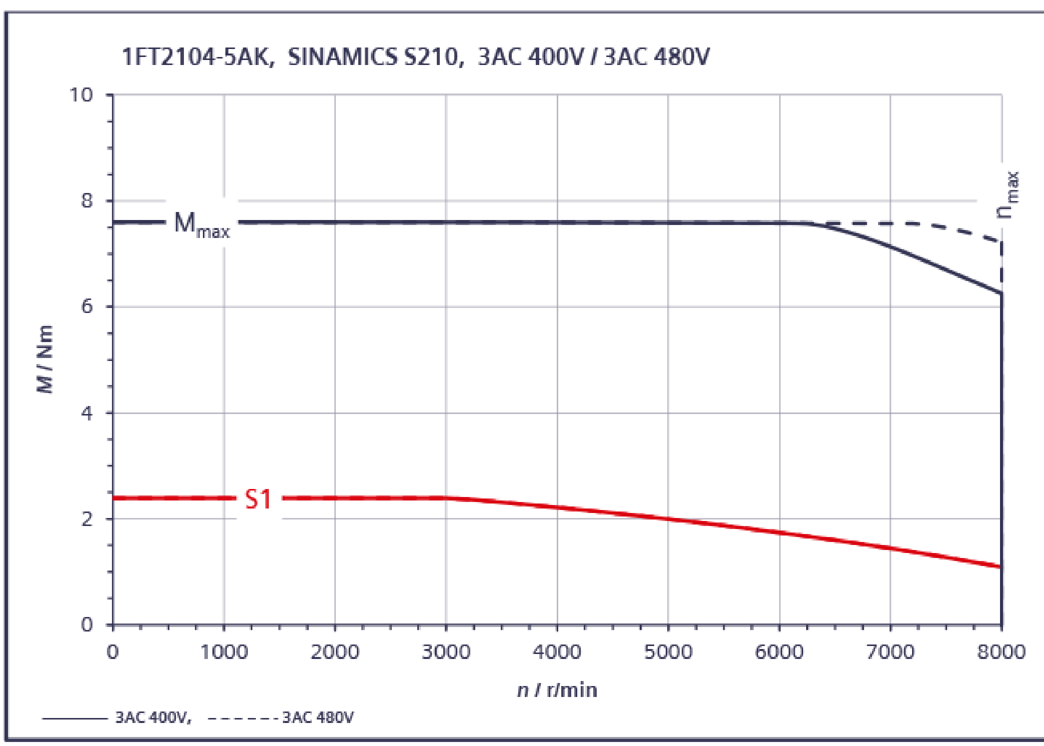
12.2.19.5 1FT2104-5AF connected to 400 V 3 AC / 480 V 3 AC

1FT2104-5AF	For 3 AC 400 V, 3 AC 480 V		
Technical specifications in the SINAMICS S210 system	**Symbol**	**Unit**	**Value**
Static torque	M_0	Nm	2.4
Stall current	I_0	A	2.1
Maximum permissible speed	n_{max}	r/min	6700
Maximum torque	M_{max}	Nm	7.5
Maximum current	I_{max}	A	7.6
Thermal time constant	T_{th}	min	35
Rotor moment of inertia	J_{mot}	$kgcm^2$	0.56
Rotor moment of inertia (with brake)	$J_{mot\ br}$	$kgcm^2$	0.65
Weight	m_{mot}	kg	2.85
Weight (with brake)	$m_{mot\ br}$	kg	3.7
Rated data for S210 connected to 3 AC 400 V, 3 AC 480 V			
Rated speed	n_{rated}	r/min	3000
Rated torque	M_{rated}	Nm	2.4
Rated current	I_{rated}	A	2.1
Rated power	P_{rated}	kW	0.75



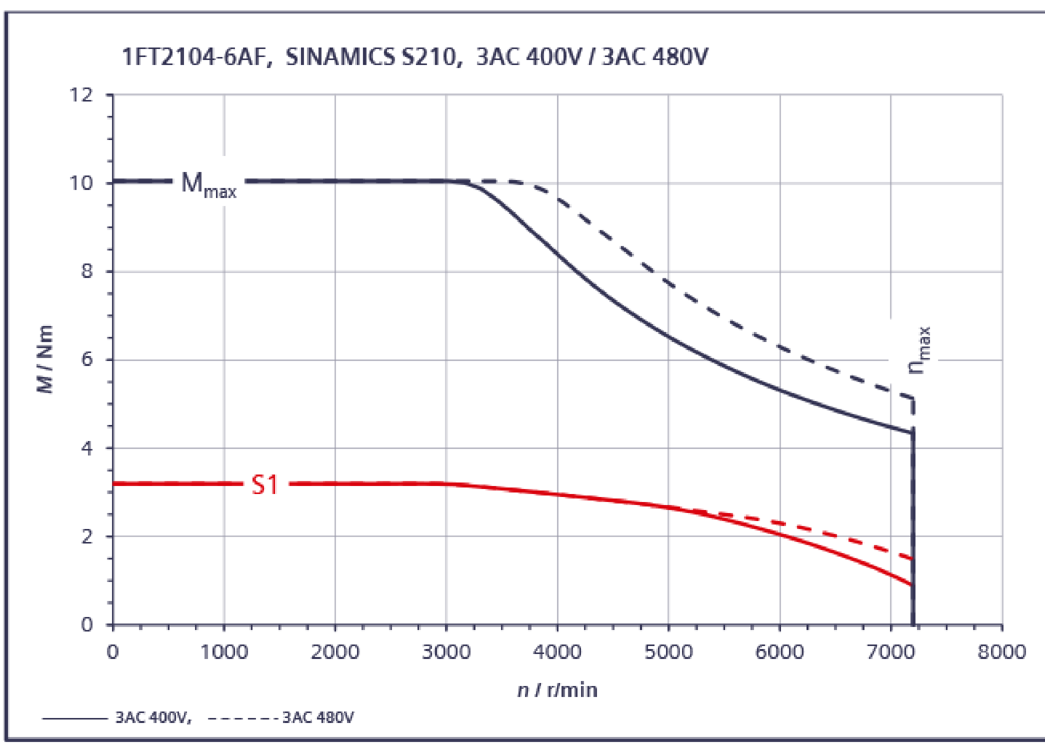
12.2.19.6 1FT2104-5AK connected to 3 AC 400 V / 3 AC 480 V

1FT2104-5AK	For 1 AC 400 V, 3 AC 480 V		
Technical specifications in the SINAMICS S210 system	**Symbol**	**Unit**	**Value**
Static torque	M_0	Nm	2.4
Stall current	I_0	A	4.4
Maximum permissible speed	n_{max}	r/min	8000
Maximum torque	M_{max}	Nm	7.6
Maximum current	I_{max}	A	16
Thermal time constant	T_{th}	min	35
Rotor moment of inertia	J_{mot}	$kgcm^2$	0.56
Rotor moment of inertia (with brake)	$J_{mot\ br}$	$kgcm^2$	0.65
Weight	m_{mot}	kg	2.85
Weight (with brake)	$m_{mot\ br}$	kg	3.7
Rated data for S210 connected to 1 AC 400 V, 3 AC 480 V			
Rated speed	n_{rated}	r/min	6000
Rated torque	M_{rated}	Nm	1.7
Rated current	I_{rated}	A	3.2
Rated power	P_{rated}	kW	1.07



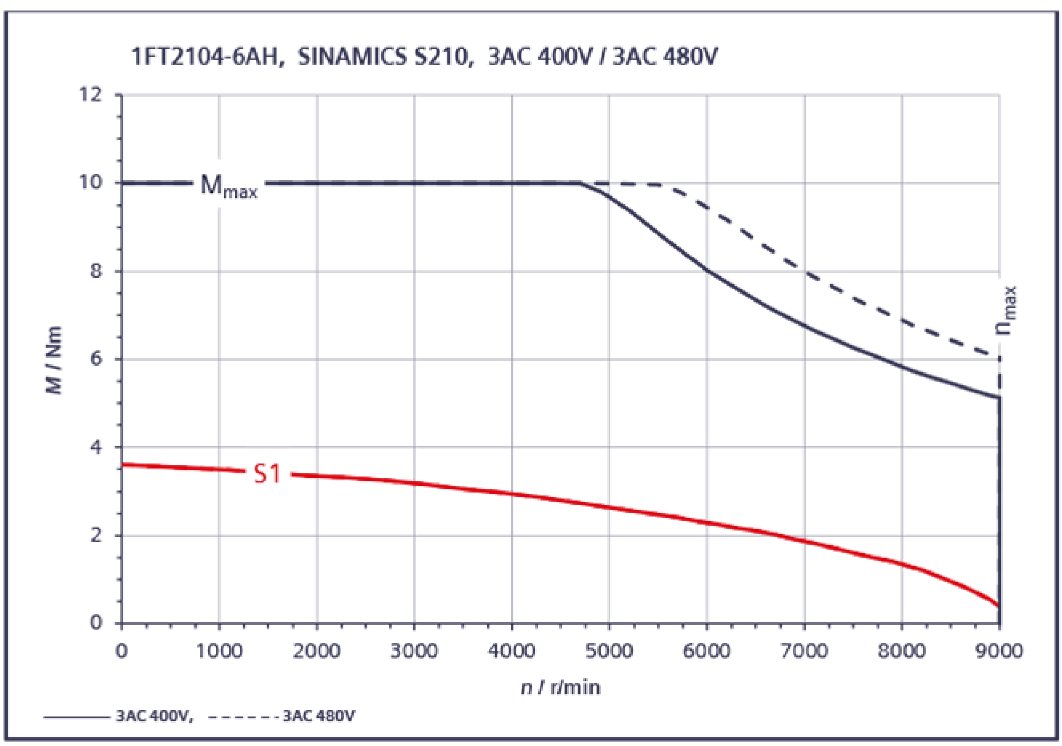
12.2.19.7 1FT2104-6AF connected to 3 AC 400 V / 3 AC 480 V

1FT2104-6AF	For 3 AC 400 V, 3 AC 480 V		
Technical specifications in the SINAMICS S210 system	**Symbol**	**Unit**	**Value**
Static torque	M_0	Nm	3.2
Stall current	I_0	A	3
Maximum permissible speed	n_{max}	r/min	7200
Maximum torque	M_{max}	Nm	10
Maximum current	I_{max}	A	10.9
Thermal time constant	T_{th}	min	38
Rotor moment of inertia	J_{mot}	$kgcm^2$	0.76
Rotor moment of inertia (with brake)	$J_{mot\ br}$	$kgcm^2$	0.84
Weight	m_{mot}	kg	3.4
Weight (with brake)	$m_{mot\ br}$	kg	4.25
Rated data for S210 connected to 3 AC 400 V, 3 AC 480 V			
Rated speed	n_{rated}	r/min	3000
Rated torque	M_{rated}	Nm	3.2
Rated current	I_{rated}	A	3
Rated power	P_{rated}	kW	1



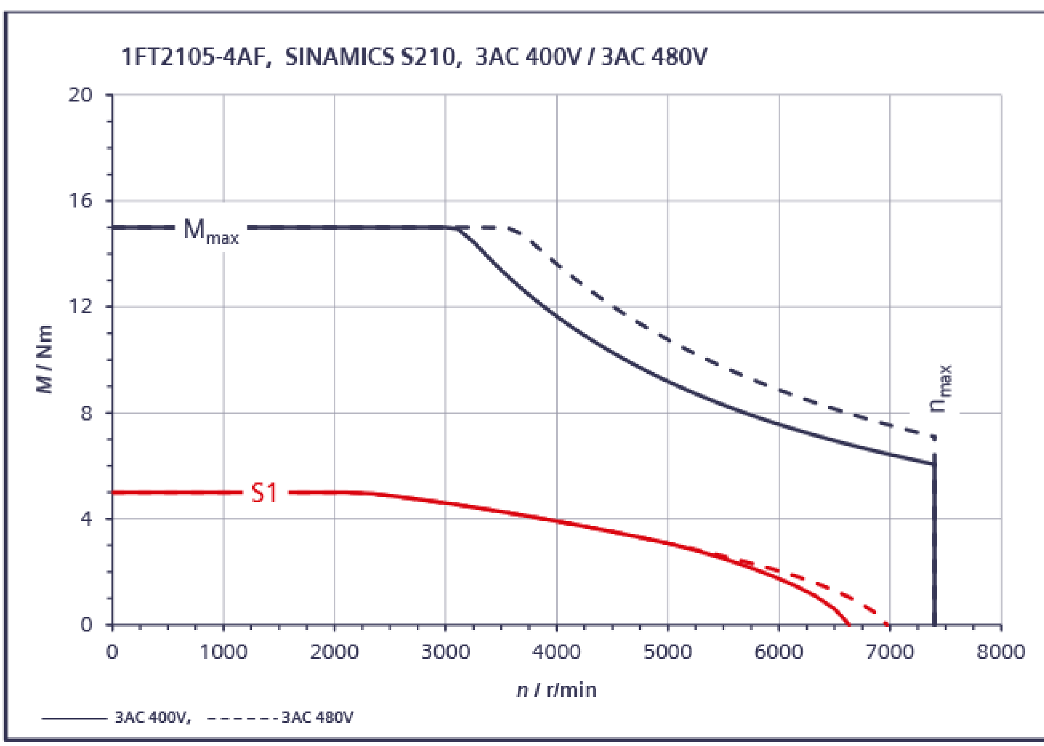
12.2.19.8 1FT2104-6AH connected to 3 AC 400 V / 3 AC 480 V

1FT2104-6AH	**For 3 AC 400 V, 3 AC 480 V**		
Technical specifications in the SINAMICS S210 system	**Symbol**	**Unit**	**Value**
Static torque	M_0	Nm	3.6
Stall current	I_0	A	4.95
Maximum permissible speed	n_{max}	r/min	9000
Maximum torque	M_{max}	Nm	10
Maximum current	I_{max}	A	16.3
Thermal time constant	T_{th}	min	38
Rotor moment of inertia	J_{mot}	$kgcm^2$	0.76
Rotor moment of inertia (with brake)	$J_{mot\ br}$	$kgcm^2$	0.84
Weight	m_{mot}	kg	3.4
Weight (with brake)	$m_{mot\ br}$	kg	4.25
Rated data for S210 connected to 3 AC 400 V, 3 AC 480 V			
Rated speed	n_{rated}	r/min	4500
Rated torque	M_{rated}	Nm	2.8
Rated current	I_{rated}	A	4
Rated power	P_{rated}	kW	1.32



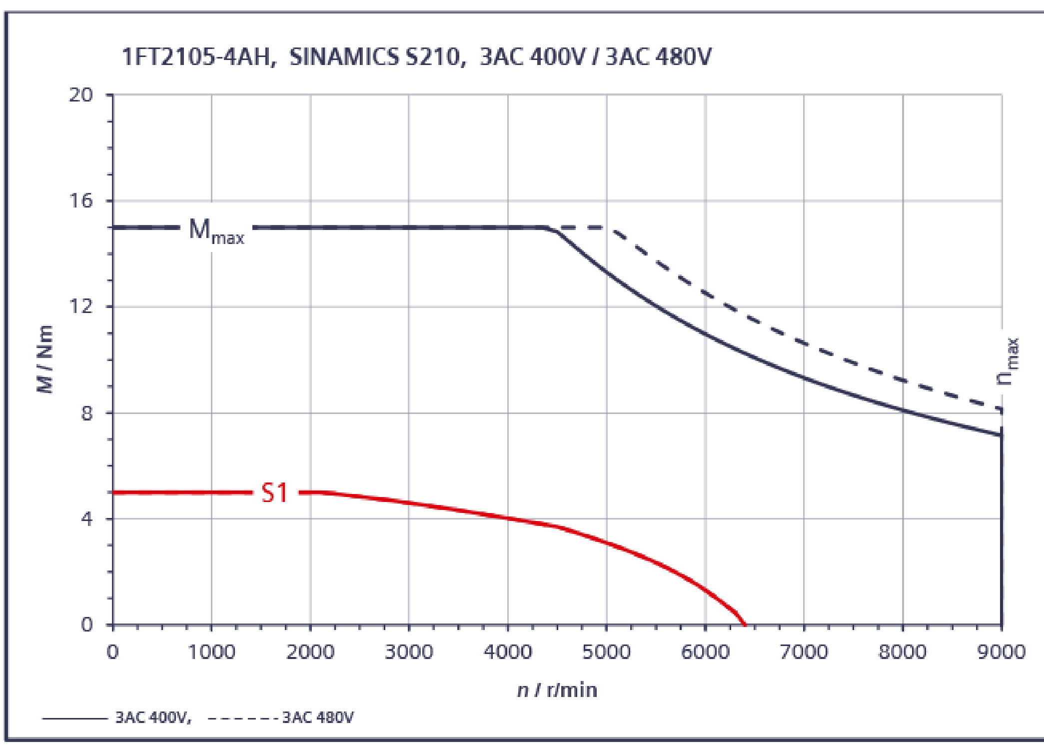
12.2.19.9 1FT2105-4AF connected to 400 V 3 AC / 480 V 3 AC

1FT2105-4AF	For 3 AC 400 V, 3 AC 480 V		
Technical specifications in the SINAMICS S210 system	**Symbol**	**Unit**	**Value**
Static torque	M_0	Nm	5
Stall current	I_0	A	4.65
Maximum permissible speed	n_{max}	r/min	7400
Maximum torque	M_{max}	Nm	15
Maximum current	I_{max}	A	18
Thermal time constant	T_{th}	min	37
Rotor moment of inertia	J_{mot}	kgcm²	1.71
Rotor moment of inertia (with brake)	$J_{mot\ br}$	kgcm²	2.55
Weight	m_{mot}	kg	5.6
Weight (with brake)	$m_{mot\ br}$	kg	6.6
Rated data for S210 connected to 3 AC 400 V, 3 AC 480 V			
Rated speed	n_{rated}	r/min	3000
Rated torque	M_{rated}	Nm	4.6
Rated current	I_{rated}	A	4.35
Rated power	P_{rated}	kW	1.45



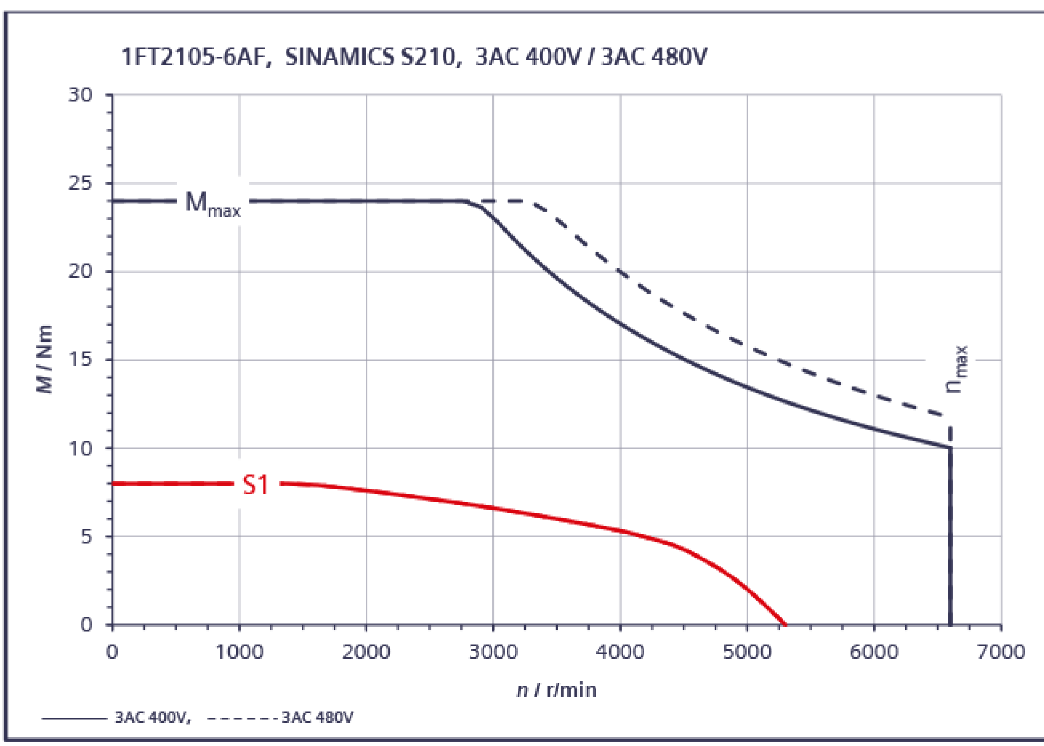
12.2.19.10 1FT2105-4AH connected to 400 V 3 AC / 480 V 3 AC

1FT2105-4AH	For 3 AC 400 V, 3 AC 480 V		
Technical specifications in the SINAMICS S210 system	**Symbol**	**Unit**	**Value**
Static torque	M_0	Nm	5
Stall current	I_0	A	6.9
Maximum permissible speed	n_{max}	r/min	9000
Maximum torque	M_{max}	Nm	15
Maximum current	I_{max}	A	27
Thermal time constant	T_{th}	min	37
Rotor moment of inertia	J_{mot}	$kgcm^2$	1.71
Rotor moment of inertia (with brake)	$J_{mot\ br}$	$kgcm^2$	2.55
Weight	m_{mot}	kg	5.6
Weight (with brake)	$m_{mot\ br}$	kg	6.6
Rated data for S210 connected to 3 AC 400 V, 3 AC 480 V			
Rated speed	n_{rated}	r/min	4500
Rated torque	M_{rated}	Nm	3.7
Rated current	I_{rated}	A	5.4
Rated power	P_{rated}	kW	1.74



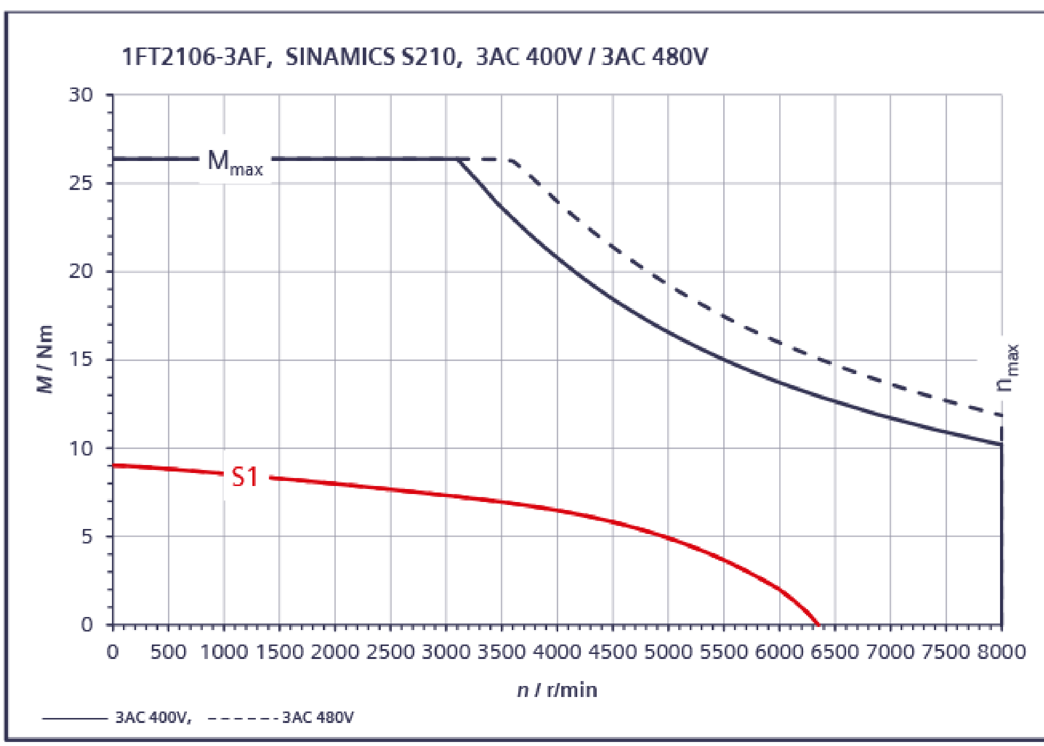
12.2.19.11 1FT2105-6AF connected to 400 V 3 AC / 480 V 3 AC

1FT2105-6AF	For 3 AC 400 V, 3 AC 480 V		
Technical specifications in the SINAMICS S210 system	**Symbol**	**Unit**	**Value**
Static torque	M_0	Nm	8
Stall current	I_0	A	6.7
Maximum permissible speed	n_{max}	r/min	6600
Maximum torque	M_{max}	Nm	24
Maximum current	I_{max}	A	24
Thermal time constant	T_{th}	min	40
Rotor moment of inertia	J_{mot}	$kgcm^2$	2.65
Rotor moment of inertia (with brake)	$J_{mot\ br}$	$kgcm^2$	3.5
Weight	m_{mot}	kg	7.7
Weight (with brake)	$m_{mot\ br}$	kg	8.7
Rated data for S210 connected to 3 AC 400 V, 3 AC 480 V			
Rated speed	n_{rated}	r/min	3000
Rated torque	M_{rated}	Nm	6.6
Rated current	I_{rated}	A	5.6
Rated power	P_{rated}	kW	2.1



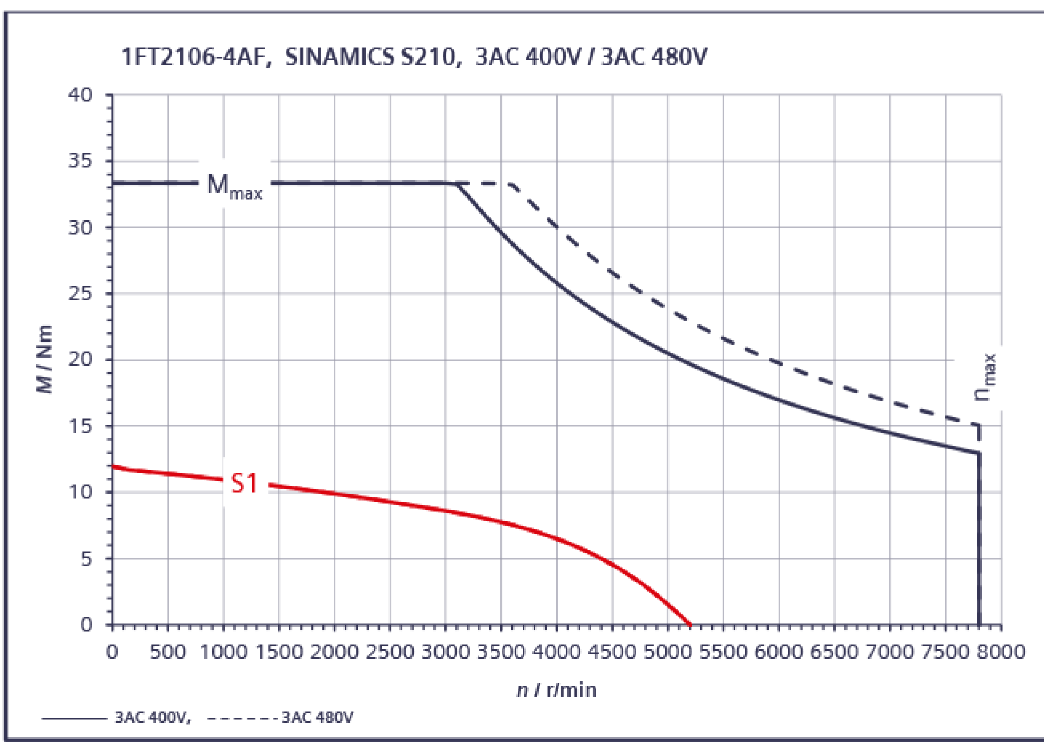
12.2.19.12 1FT2106-3AF connected to 400 V 3 AC / 480 V 3 AC

1FT2106-3AF	For 3 AC 400 V, 3 AC 480 V		
Technical specifications in the SINAMICS S210 system	**Symbol**	**Unit**	**Value**
Static torque	M_0	Nm	9
Stall current	I_0	A	9.2
Maximum permissible speed	n_{max}	r/min	8000
Maximum torque	M_{max}	Nm	26
Maximum current	I_{max}	A	43
Thermal time constant	T_{th}	min	30
Rotor moment of inertia	J_{mot}	$kgcm^2$	4.6
Rotor moment of inertia (with brake)	$J_{mot\ br}$	$kgcm^2$	6.3
Weight	m_{mot}	kg	7.4
Weight (with brake)	$m_{mot\ br}$	kg	9
Rated data for S210 connected to 3 AC 400 V, 3 AC 480 V			
Rated speed	n_{rated}	r/min	3000
Rated torque	M_{rated}	Nm	7.3
Rated current	I_{rated}	A	7.9
Rated power	P_{rated}	kW	2.3



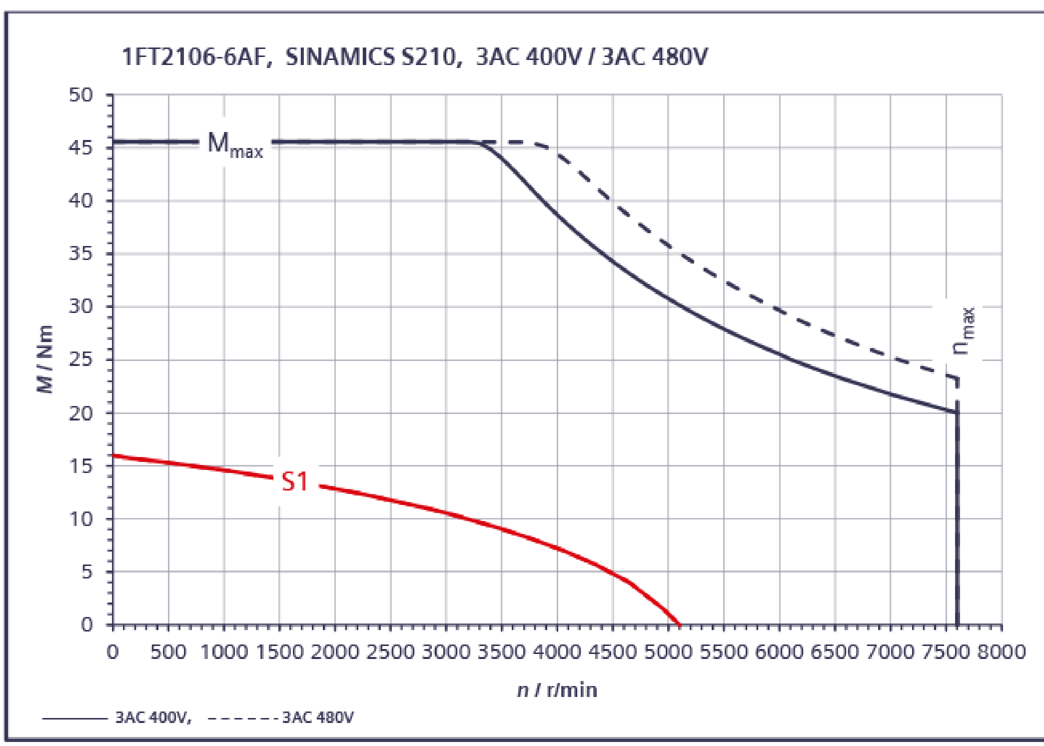
12.2.19.13 1FT2106-4AF connected to 400 V 3 AC / 480 V 3 AC

1FT2106-4AF	For 3 AC 400 V, 3 AC 480 V		
Technical specifications in the SINAMICS S210 system	**Symbol**	**Unit**	**Value**
Static torque	M_0	Nm	12
Stall current	I_0	A	10.7
Maximum permissible speed	n_{max}	r/min	7800
Maximum torque	M_{max}	Nm	33
Maximum current	I_{max}	A	42
Thermal time constant	T_{th}	min	34
Rotor moment of inertia	J_{mot}	$kgcm^2$	6
Rotor moment of inertia (with brake)	$J_{mot\ br}$	$kgcm^2$	7.6
Weight	m_{mot}	kg	9
Weight (with brake)	$m_{mot\ br}$	kg	10.6
Rated data for S210 connected to 3 AC 400 V, 3 AC 480 V			
Rated speed	n_{rated}	r/min	3000
Rated torque	M_{rated}	Nm	8.6
Rated current	I_{rated}	A	8.1
Rated power	P_{rated}	kW	2.7



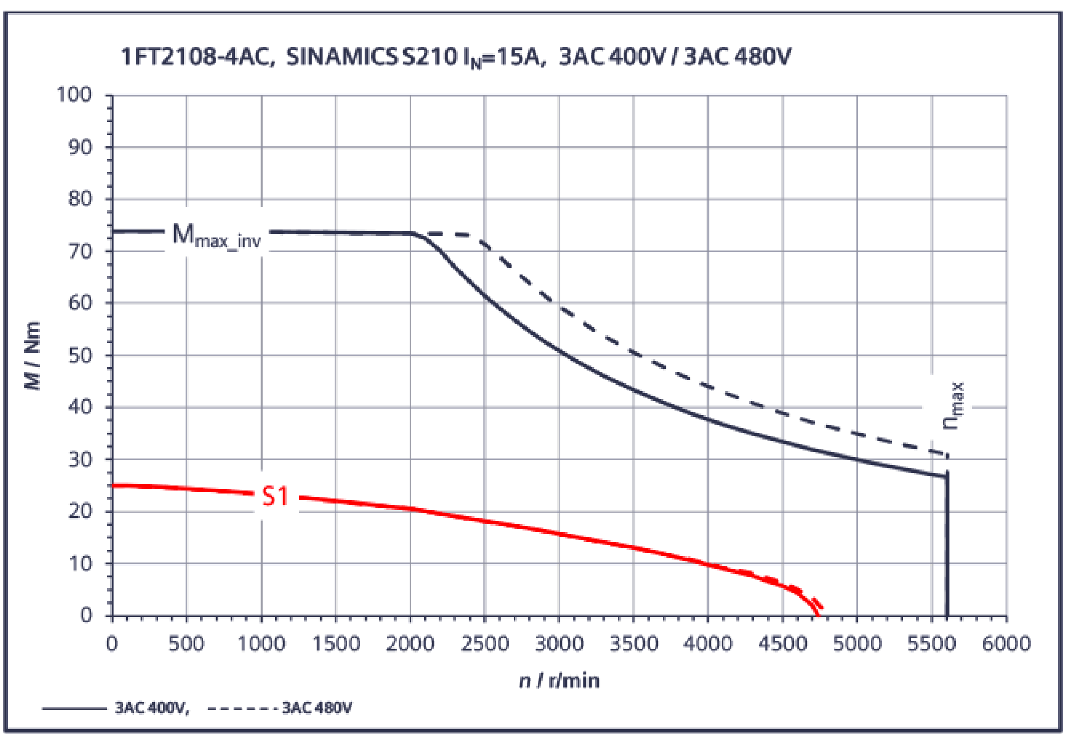
12.2.19.14 1FT2106-6AF connected to 400 V 3 AC / 480 V 3 AC

1FT2106-6AF	For 3 AC 400 V, 3 AC 480 V		
Technical specifications in the SINAMICS S210 system	**Symbol**	**Unit**	**Value**
Static torque	M_0	Nm	16
Stall current	I_0	A	14.3
Maximum permissible speed	n_{max}	r/min	7600
Maximum torque	M_{max}	Nm	45.5
Maximum current	I_{max}	A	49
Thermal time constant	T_{th}	min	50
Rotor moment of inertia	J_{mot}	$kgcm^2$	8.7
Rotor moment of inertia (with brake)	$J_{mot\ br}$	$kgcm^2$	10.4
Weight	m_{mot}	kg	11.8
Weight (with brake)	$m_{mot\ br}$	kg	13.4
Rated data for S210 connected to 3 AC 400 V, 3 AC 480 V			
Rated speed	n_{rated}	r/min	3000
Rated torque	M_{rated}	Nm	10.6
Rated current	I_{rated}	A	9.7
Rated power	P_{rated}	kW	3.3



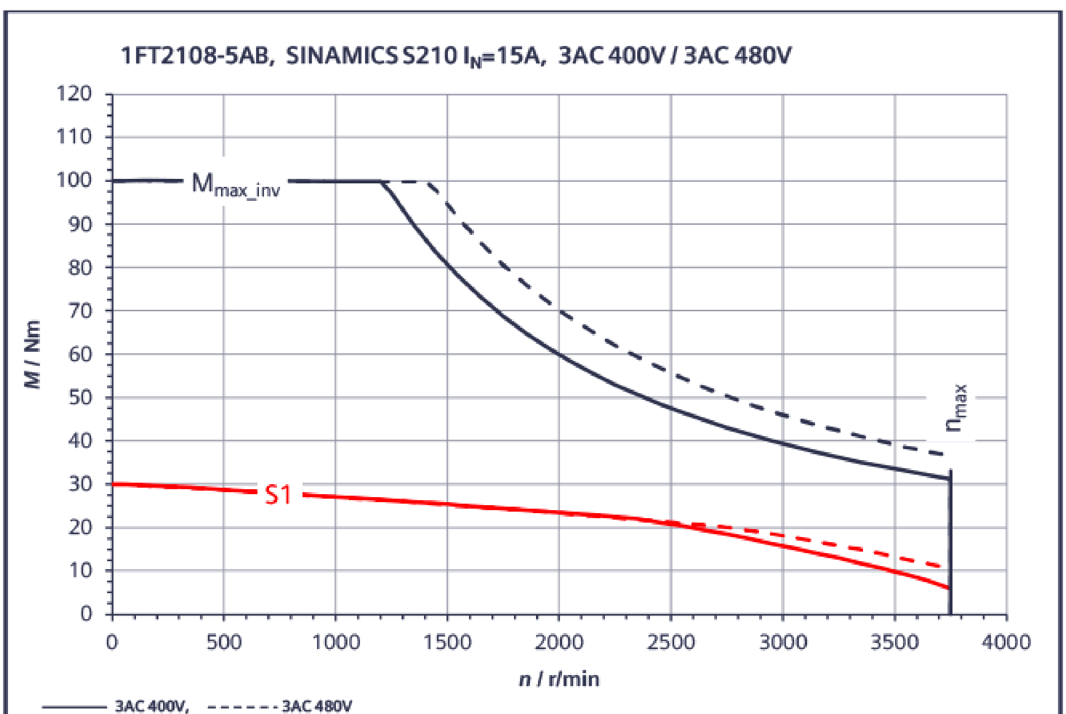
12.2.19.15 1FT2108-4AC connected to 3 AC 400 V / 3 AC 480 V

1FT2108-4AC	For 3 AC 400 V, 3 AC 480 V		
Technical specifications in the SINAMICS S210 system	**Symbol**	**Unit**	**Value**
Static torque	M_0	Nm	25
Stall current	I_0	A	14.8
Maximum permissible speed	n_{max}	r/min	5600
Maximum torque	$M_{max\ inv}$	Nm	74
Maximum current	I_{max}	A	77
Thermal time constant	T_{th}	min	49
Rotor moment of inertia	J_{mot}	$kgcm^2$	18.3
Rotor moment of inertia (with brake 1)	$J_{mot\ br}$	$kgcm^2$	22.3
Rotor moment of inertia (with brake 2)	$J_{mot\ br}$	$kgcm^2$	23.9
Weight	m_{mot}	kg	17
Weight (with brake 1)	$m_{mot\ br}$	kg	19.7
Weight (with brake 2)	$m_{mot\ br}$	kg	19.9
Rated data for S210 connected to 3 AC 400 V, 3 AC 480 V			
Rated speed	n_{rated}	r/min	2000
Rated torque	M_{rated}	Nm	20.5
Rated current	I_{rated}	A	12.8
Rated power	P_{rated}	kW	4.3



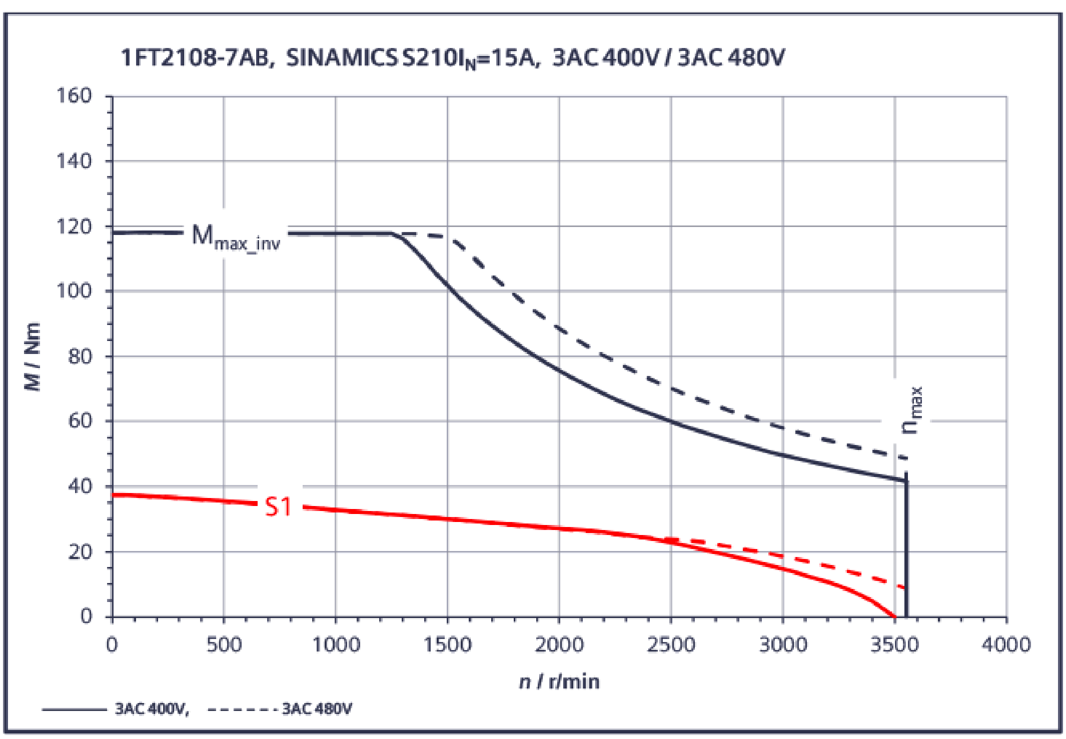
12.2.19.16 1FT2108-5AB connected to 3 AC 400 V / 3 AC 480 V

1FT2108-4AC	For 3 AC 400 V, 3 AC 480 V		
Technical specifications in the SINAMICS S210 system	**Symbol**	**Unit**	**Value**
Static torque	M_0	Nm	30
Stall current	I_0	A	11.8
Maximum permissible speed	n_{max}	r/min	3750
Maximum torque	$M_{max\ inv}$	Nm	100
Maximum current	I_{max}	A	61
Thermal time constant	T_{th}	min	50
Rotor moment of inertia	J_{mot}	$kgcm^2$	21.6
Rotor moment of inertia (with brake 1)	$J_{mot\ br}$	$kgcm^2$	25.6
Rotor moment of inertia (with brake 2)	$J_{mot\ br}$	$kgcm^2$	27.2
Weight	m_{mot}	kg	19.7
Weight (with brake 1)	$m_{mot\ br}$	kg	22.4
Weight (with brake 2)	$m_{mot\ br}$	kg	22.5
Rated data for S210 connected to 3 AC 400 V, 3 AC 480 V			
Rated speed	n_{rated}	r/min	1500
Rated torque	M_{rated}	Nm	25.5
Rated current	I_{rated}	A	10.3
Rated power	P_{rated}	kW	4



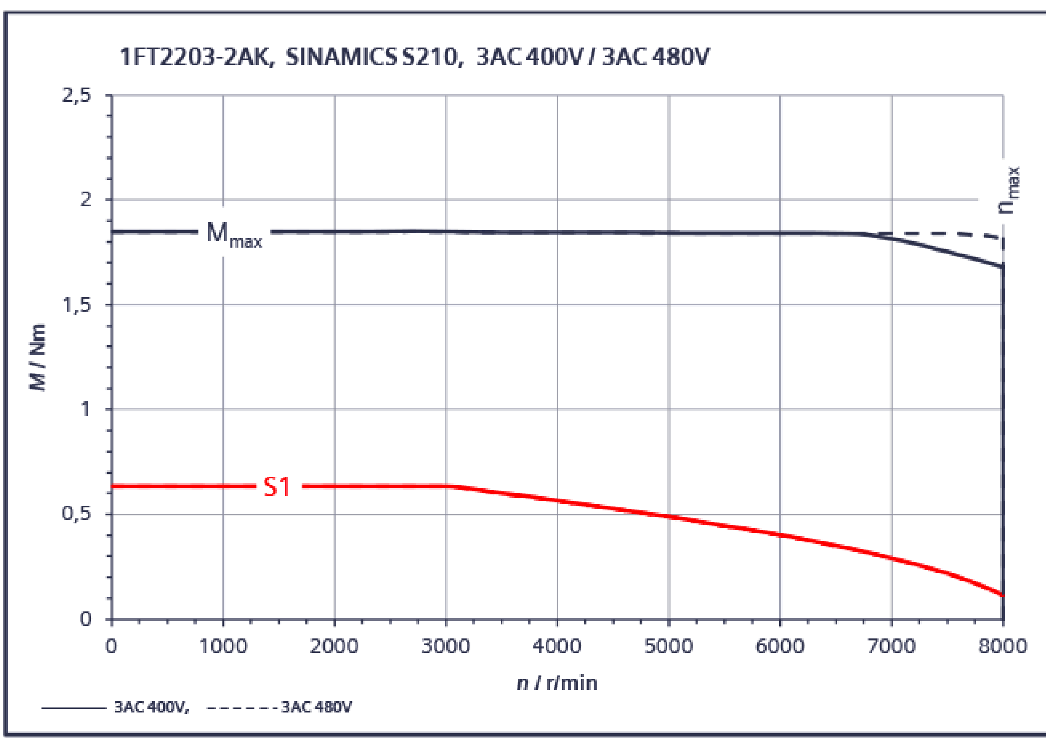
12.2.19.17 1FT2108-7AB connected to 3 AC 400 V / 3 AC 480 V

1FT2108-7AB	For 3 AC 400 V, 3 AC 480 V		
Technical specifications in the SINAMICS S210 system	**Symbol**	**Unit**	**Value**
Static torque	M_0	Nm	37.5
Stall current	I_0	A	14
Maximum permissible speed	n_{max}	r/min	3550
Maximum torque	$M_{max\ inv}$	Nm	118
Maximum current	I_{max}	A	78
Thermal time constant	T_{th}	min	60
Rotor moment of inertia	J_{mot}	$kgcm^2$	28.2
Rotor moment of inertia (with brake 1)	$J_{mot\ br}$	$kgcm^2$	32.2
Rotor moment of inertia (with brake 2)	$J_{mot\ br}$	$kgcm^2$	33.8
Weight	m_{mot}	kg	24.5
Weight (with brake 1)	$m_{mot\ br}$	kg	27.2
Weight (with brake 2)	$m_{mot\ br}$	kg	27.4
Rated data for S210 connected to 3 AC 400 V, 3 AC 480 V			
Rated speed	n_{rated}	r/min	1500
Rated torque	M_{rated}	Nm	30
Rated current	I_{rated}	A	11.5
Rated power	P_{rated}	kW	4.7



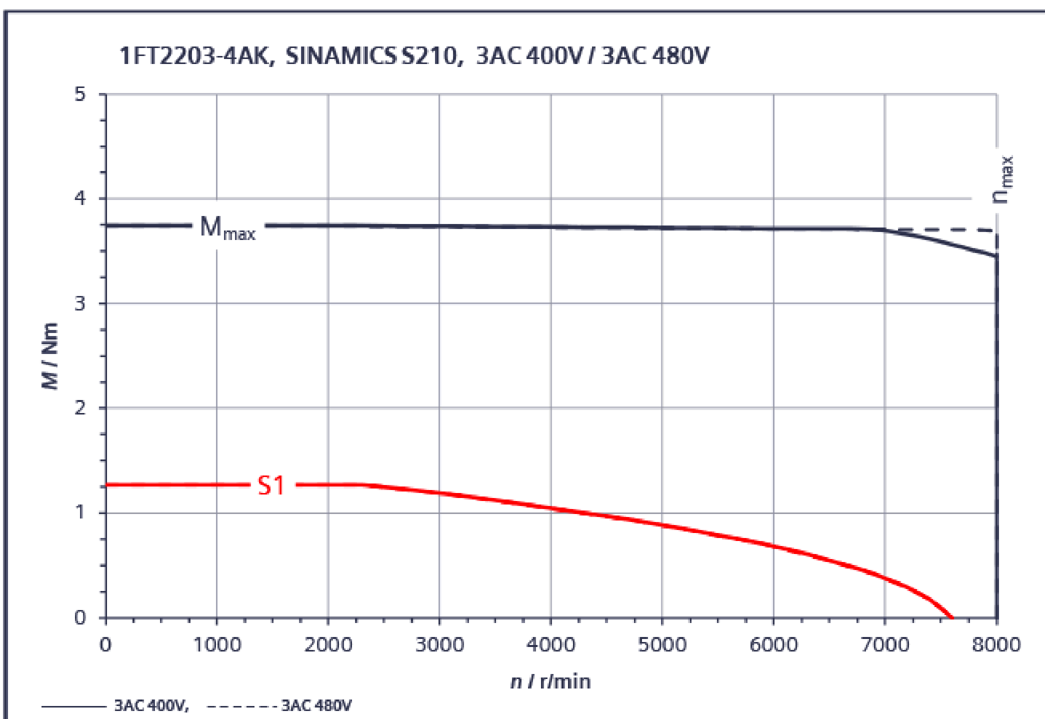
12.2.19.18 1FT2203-2AK connected to 3 AC 400 V / 3 AC 480 V

1FT2203-2AK	For 3 AC 400 V, 3 AC 480 V		
Technical specifications in the SINAMICS S210 system	**Symbol**	**Unit**	**Value**
Static torque	M_0	Nm	0.64
Stall current	I_0	A	1.05
Maximum permissible speed	n_{max}	r/min	8000
Maximum torque	M_{max}	Nm	1.85
Maximum current	I_{max}	A	3.4
Thermal time constant	T_{th}	min	21
Rotor moment of inertia	J_{mot}	$kgcm^2$	0.2
Rotor moment of inertia (with brake)	$J_{mot\ br}$	$kgcm^2$	0.22
Weight	m_{mot}	kg	1.16
Weight (with brake)	$m_{mot\ br}$	kg	1.53
Rated data for S210 connected to 3 AC 400 V, 3 AC 480 V			
Rated speed	n_{rated}	r/min	6000
Rated torque	M_{rated}	Nm	0.405
Rated current	I_{rated}	A	0.75
Rated power	P_{rated}	kW	0.255



12.2.19.19 1FT2203-4AK connected to 3 AC 400 V / 3 AC 480 V

1FT2203-4AK	For 3 AC 400 V, 3 AC 480 V		
Technical specifications in the SINAMICS S210 system	**Symbol**	**Unit**	**Value**
Static torque	M_0	Nm	1.27
Stall current	I_0	A	2.05
Maximum permissible speed	n_{max}	r/min	8000
Maximum torque	M_{max}	Nm	3.75
Maximum current	I_{max}	A	6.7
Thermal time constant	T_{th}	min	28
Rotor moment of inertia	J_{mot}	$kgcm^2$	0.35
Rotor moment of inertia (with brake)	$J_{mot\ br}$	$kgcm^2$	0.37
Weight	m_{mot}	kg	1.49
Weight (with brake)	$m_{mot\ br}$	kg	1.97
Rated data for S210 connected to 3 AC 400 V, 3 AC 480 V			
Rated speed	n_{rated}	r/min	6000
Rated torque	M_{rated}	Nm	0.68
Rated current	I_{rated}	A	1.24
Rated power	P_{rated}	kW	0.43



12.2.19.20 1FT2204-5AF connected to 400 V 3 AC / 480 V 3 AC

1FT2204-5AF	**For 3 AC 400 V, 3 AC 480 V**		
Technical specifications in the SINAMICS S210 system	**Symbol**	**Unit**	**Value**
Static torque	M_0	Nm	2.4
Stall current	I_0	A	2.25
Maximum permissible speed	n_{max}	r/min	7500
Maximum torque	M_{max}	Nm	7.1
Maximum current	I_{max}	A	7.1
Thermal time constant	T_{th}	min	29
Rotor moment of inertia	J_{mot}	$kgcm^2$	1.23
Rotor moment of inertia (with brake)	$J_{mot\ br}$	$kgcm^2$	1.31
Weight	m_{mot}	kg	2.9
Weight (with brake)	$m_{mot\ br}$	kg	3.75
Rated data for S210 connected to 3 AC 400 V, 3 AC 480 V			
Rated speed	n_{rated}	r/min	3000
Rated torque	M_{rated}	Nm	2.4
Rated current	I_{rated}	A	2.25
Rated power	P_{rated}	kW	0.75

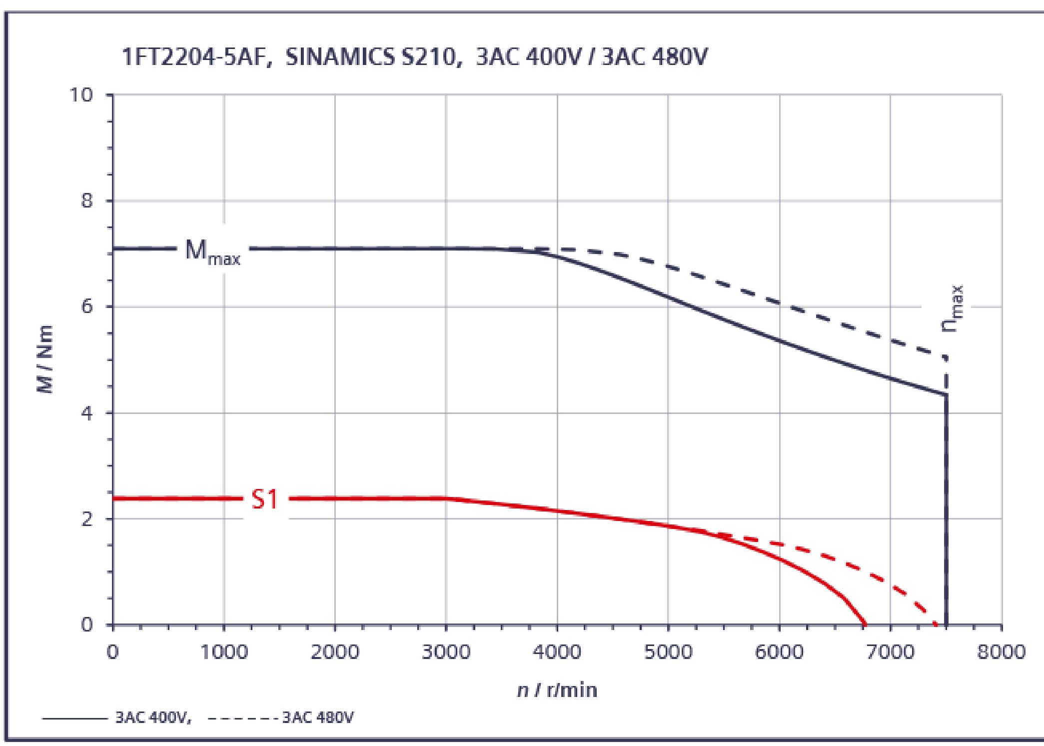
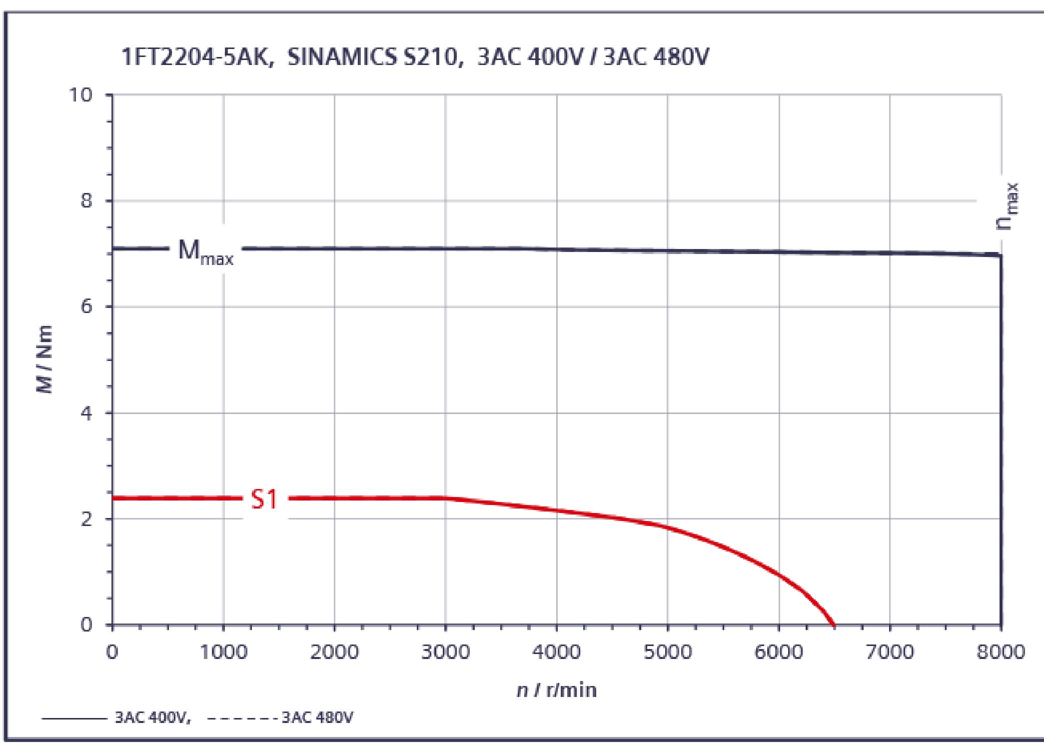


Figure 12-10 1FT2204-5AF_400V

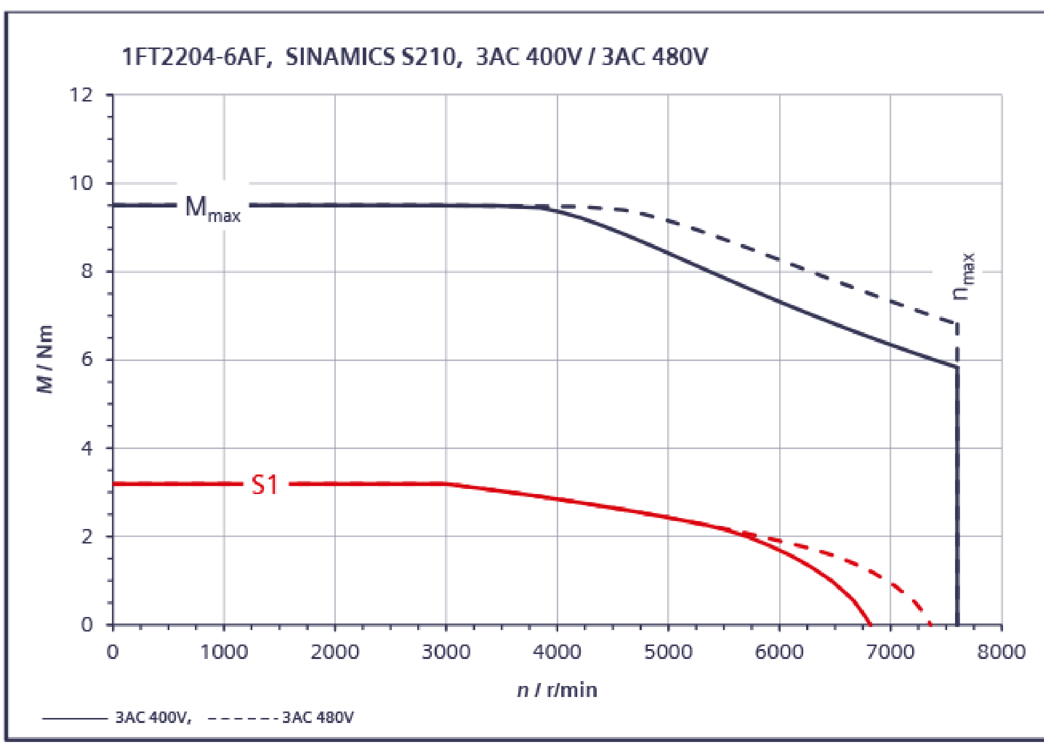
12.2.19.21 1FT2204-5AK connected to 400 V 3 AC / 480 V 3 AC

1FT2204-5AK	**For 1 AC 400 V, 3 AC 480 V**		
Technical specifications in the SINAMICS S210 system	**Symbol**	**Unit**	**Value**
Static torque	M_0	Nm	2.4
Stall current	I_0	A	4.4
Maximum permissible speed	n_{max}	r/min	8000
Maximum torque	M_{max}	Nm	7.1
Maximum current	I_{max}	A	14.2
Thermal time constant	T_{th}	min	29
Rotor moment of inertia	J_{mot}	$kgcm^2$	1.23
Rotor moment of inertia (with brake)	$J_{mot\ br}$	$kgcm^2$	1.31
Weight	m_{mot}	kg	2.9
Weight (with brake)	$m_{mot\ br}$	kg	3.75
Rated data for S210 connected to 1 AC 400 V, 3 AC 480 V			
Rated speed	n_{rated}	r/min	6000
Rated torque	M_{rated}	Nm	0.9
Rated current	I_{rated}	A	1.95
Rated power	P_{rated}	kW	0.57



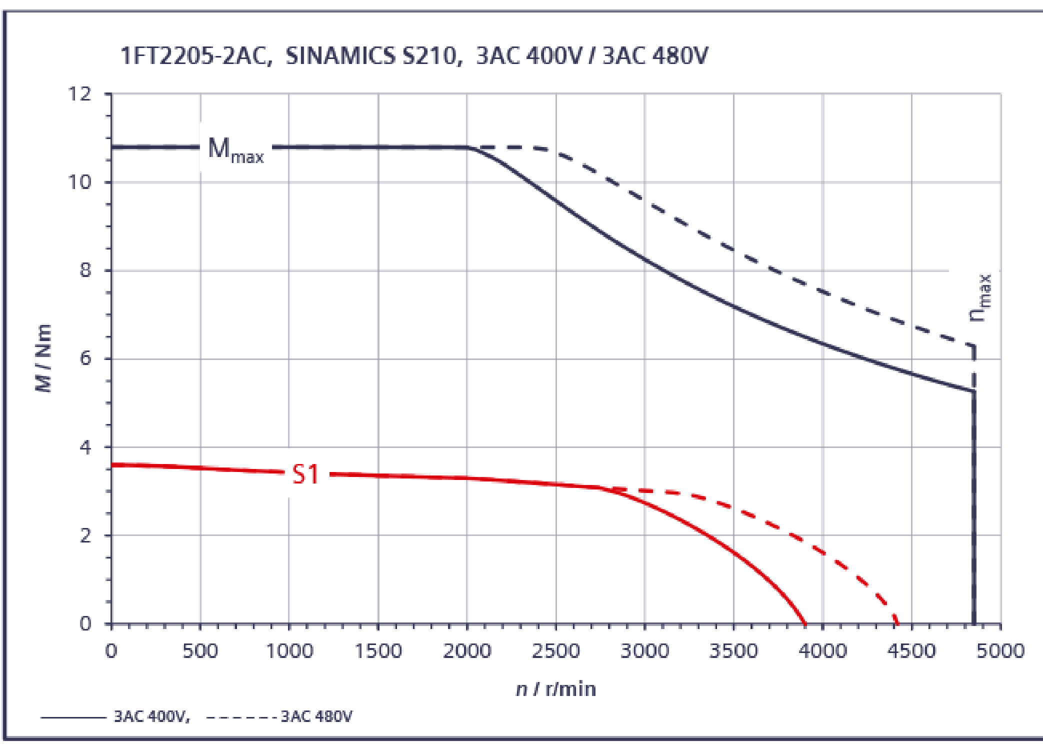
12.2.19.22 1FT2204-6AF connected to 400 V 3 AC / 480 V 3 AC

1FT2204-6AF	**For 3 AC 400 V, 3 AC 480 V**		
Technical specifications in the SINAMICS S210 system	**Symbol**	**Unit**	**Value**
Static torque	M_0	Nm	3.2
Stall current	I_0	A	3
Maximum permissible speed	n_{max}	r/min	7600
Maximum torque	M_{max}	Nm	9.5
Maximum current	I_{max}	A	9.9
Thermal time constant	T_{th}	min	35
Rotor moment of inertia	J_{mot}	$kgcm^2$	1.61
Rotor moment of inertia (with brake)	$J_{mot\ br}$	$kgcm^2$	1.69
Weight	m_{mot}	kg	3.5
Weight (with brake)	$m_{mot\ br}$	kg	4.35
Rated data for S210 connected to 3 AC 400 V, 3 AC 480 V			
Rated speed	n_{rated}	r/min	3000
Rated torque	M_{rated}	Nm	3.2
Rated current	I_{rated}	A	3
Rated power	P_{rated}	kW	1



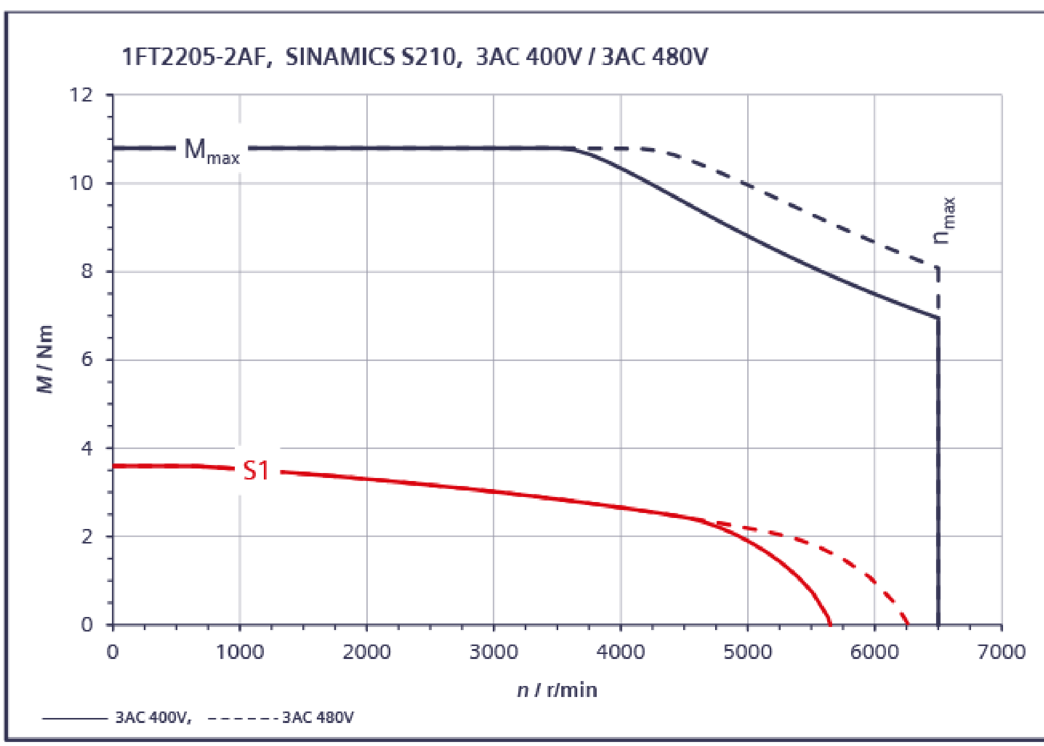
12.2.19.23 1FT2205-2AC connected to 3 AC 400 V / 3 AC 480 V

1FT2205-2AC	For 3 AC 400 V, 3 AC 480 V		
Technical specifications in the SINAMICS S210 system	**Symbol**	**Unit**	**Value**
Static torque	M_0	Nm	3.6
Stall current	I_0	A	1.84
Maximum permissible speed	n_{max}	r/min	4850
Maximum torque	M_{max}	Nm	10.8
Maximum current	I_{max}	A	6
Thermal time constant	T_{th}	min	29
Rotor moment of inertia	J_{mot}	$kgcm^2$	3.15
Rotor moment of inertia (with brake)	$J_{mot\ br}$	$kgcm^2$	4.05
Weight	m_{mot}	kg	3.75
Weight (with brake)	$m_{mot\ br}$	kg	4.75
Rated data for S210 connected to 3 AC 400 V, 3 AC 480 V			
Rated speed	n_{rated}	r/min	2000
Rated torque	M_{rated}	Nm	3.3
Rated current	I_{rated}	A	1.74
Rated power	P_{rated}	kW	0.69



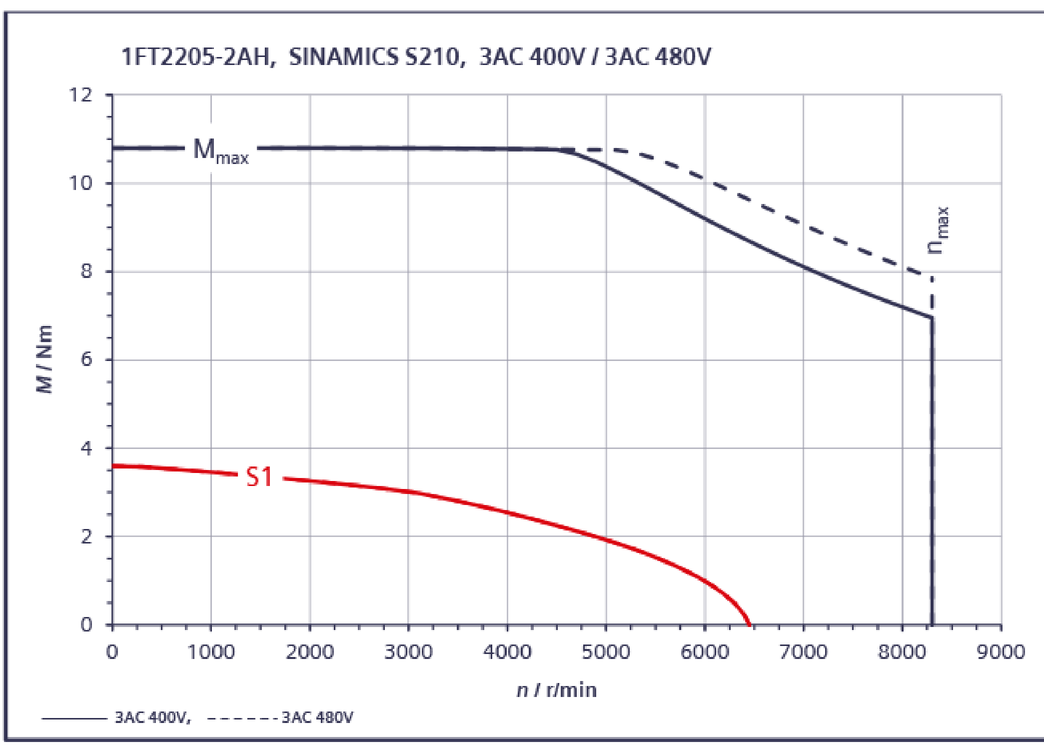
12.2.19.24 1FT2205-2AF connected to 400 V 3 AC / 480 V 3 AC

1FT2205-2AF	For 1 AC 400 V, 3 AC 480 V		
Technical specifications in the SINAMICS S210 system	**Symbol**	**Unit**	**Value**
Static torque	M_0	Nm	3.6
Stall current	I_0	A	2.9
Maximum permissible speed	n_{max}	r/min	6500
Maximum torque	M_{max}	Nm	10.8
Maximum current	I_{max}	A	9.5
Thermal time constant	T_{th}	min	29
Rotor moment of inertia	J_{mot}	$kgcm^2$	3.15
Rotor moment of inertia (with brake)	$J_{mot\ br}$	$kgcm^2$	4.05
Weight	m_{mot}	kg	3.75
Weight (with brake)	$m_{mot\ br}$	kg	4.75
Rated data for S210 connected to 3 AC 400 V, 3 AC 480 V			
Rated speed	n_{rated}	r/min	3000
Rated torque	M_{rated}	Nm	3
Rated current	I_{rated}	A	2.5
Rated power	P_{rated}	kW	0.94



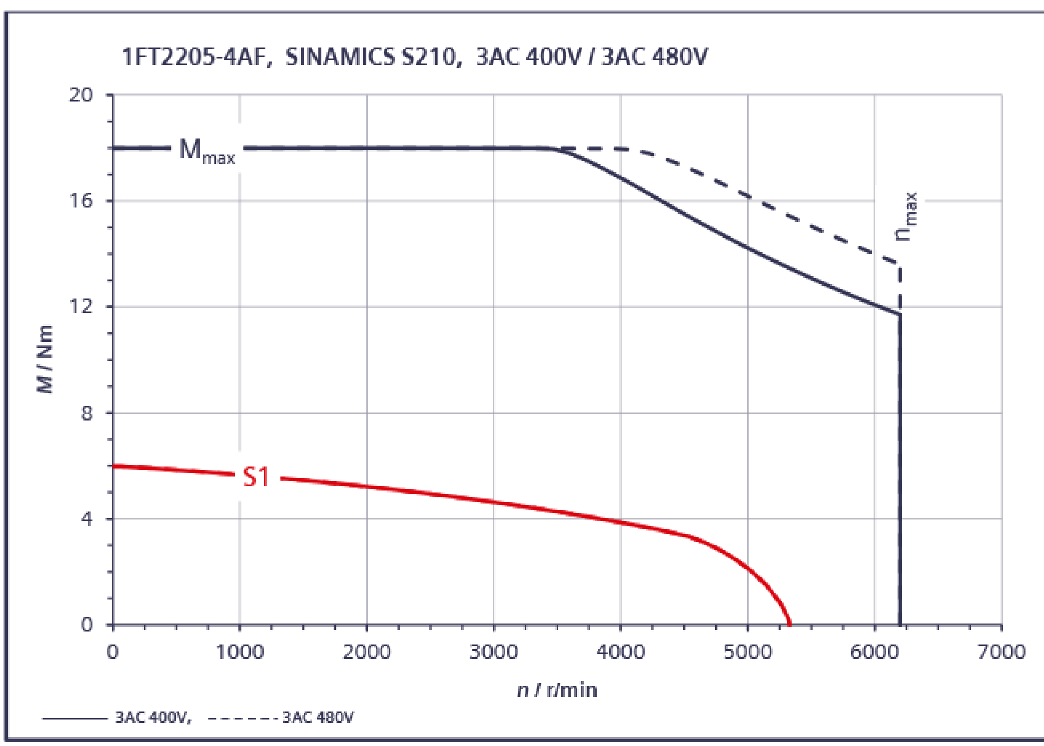
12.2.19.25 1FT2205-2AH connected to 400 V 3 AC / 480 V 3 AC

1FT2205-2AH	For 1 AC 400 V, 3 AC 480 V		
Technical specifications in the SINAMICS S210 system	**Symbol**	**Unit**	**Value**
Static torque	M_0	Nm	3.6
Stall current	I_0	A	3.8
Maximum permissible speed	n_{max}	r/min	8 300
Maximum torque	M_{max}	Nm	10.8
Maximum current	I_{max}	A	12.1
Thermal time constant	T_{th}	min	29
Rotor moment of inertia	J_{mot}	kgcm²	3.15
Rotor moment of inertia (with brake)	$J_{mot\ br}$	kgcm²	4.05
Weight	m_{mot}	kg	3.75
Weight (with brake)	$m_{mot\ br}$	kg	4.75
Rated data for S210 connected to 3 AC 400 V, 3 AC 480 V			
Rated speed	n_{rated}	r/min	4500
Rated torque	M_{rated}	Nm	2.25
Rated current	I_{rated}	A	2.55
Rated power	P_{rated}	kW	1.06



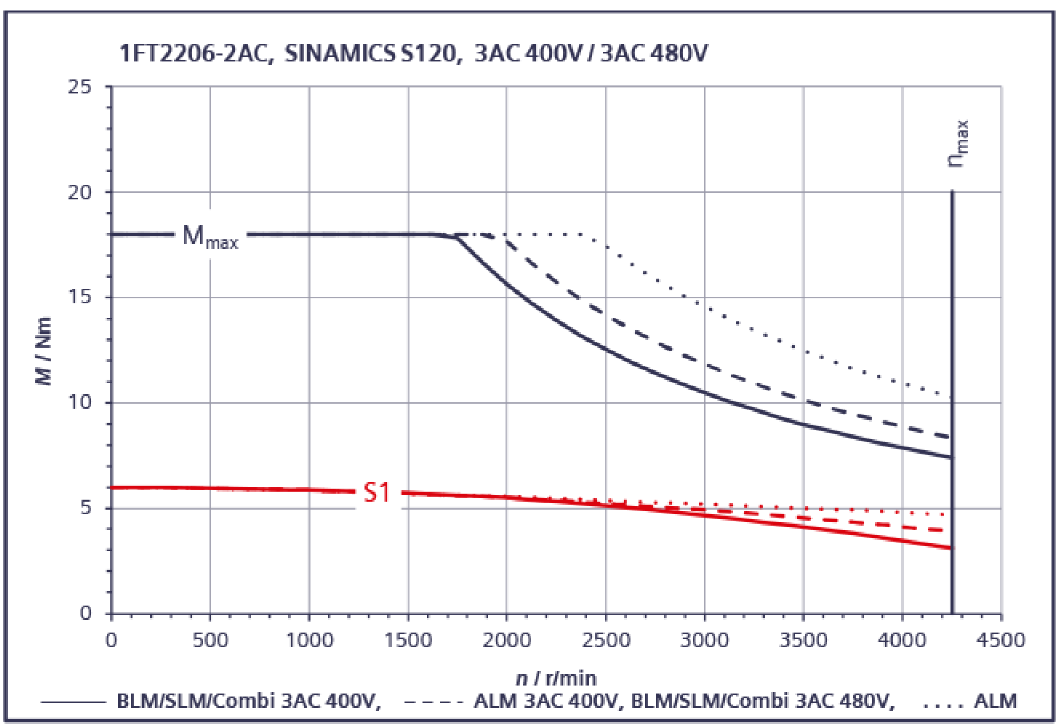
12.2.19.26 1FT2205-4AF connected to 400 V 3 AC / 480 V 3 AC

1FT2205-4AF	**For 3 AC 400 V, 3 AC 480 V**		
Technical specifications in the SINAMICS S210 system	**Symbol**	**Unit**	**Value**
Static torque	M_0	Nm	6
Stall current	I_0	A	4.7
Maximum permissible speed	n_{max}	r/min	6200
Maximum torque	M_{max}	Nm	18
Maximum current	I_{max}	A	15.1
Thermal time constant	T_{th}	min	31
Rotor moment of inertia	J_{mot}	$kgcm^2$	5.1
Rotor moment of inertia (with brake)	$J_{mot\ br}$	$kgcm^2$	6
Weight	m_{mot}	kg	5.2
Weight (with brake)	$m_{mot\ br}$	kg	6.2
Rated data for S210 connected to 3 AC 400 V, 3 AC 480 V			
Rated speed	n_{rated}	r/min	3000
Rated torque	M_{rated}	Nm	4.6
Rated current	I_{rated}	A	3.75
Rated power	P_{rated}	kW	1.45



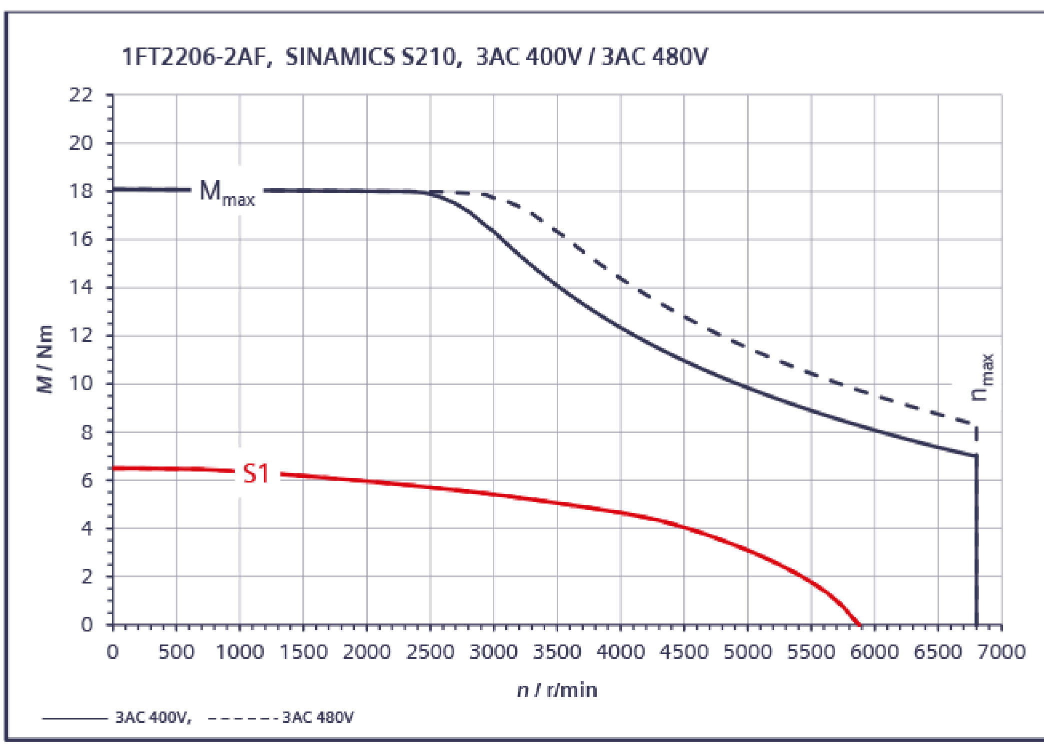
12.2.19.27 1FT2206-2AC connected to 3 AC 400 V / 3 AC 480 V

1FT2206-2AC	For 3 AC 400 V, 3 AC 480 V		
Technical specifications in the S210 system	**Abbreviation**	**Unit**	**Value**
Static torque	M_0	Nm	6
Stall current	I_0	A	2.8
Max. permissible speed	$n_{max\ inv}$	r/min	4300
Maximum torque	M_{max}	Nm	18
Maximum current	I_{max}	A	10.3
Thermal time constant	T_{th}	min	24
Moment of inertia	J_{mot}	kg cm²	7.8
Moment of inertia (with brake)	$J_{Mot\ with\ Br}$	kg cm²	9.4
Weight	m_{Mot}	kg	6.3
Weight (with brake)	$m_{Mot\ with\ Br}$	kg	7.9
Rated data 3 AC 380 ... 480 V			
Rated speed	n_{rated}	r/min	2000
Rated torque	M_{rated}	Nm	5.5
Rated current	I_{rated}	A	2.8
Rated power	P_{rated}	kW	1.15



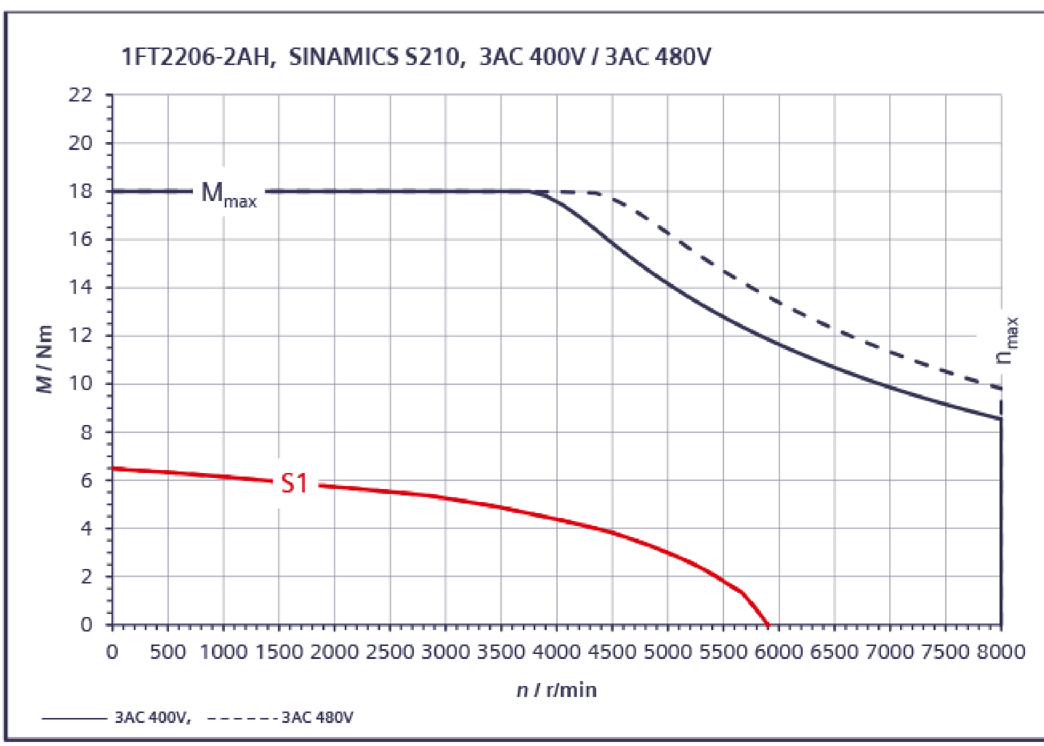
12.2.19.28 1FT2206-2AF connected to 400 V 3 AC / 480 V 3 AC

1FT2206-2AF	For 1 AC 400 V, 3 AC 480 V		
Technical specifications in the SINAMICS S210 system	**Symbol**	**Unit**	**Value**
Static torque	M_0	Nm	6.5
Stall current	I_0	A	5
Maximum permissible speed	n_{max}	r/min	6800
Maximum torque	M_{max}	Nm	18
Maximum current	I_{max}	A	17.8
Thermal time constant	T_{th}	min	21
Rotor moment of inertia	J_{mot}	$kgcm^2$	7.8
Rotor moment of inertia (with brake)	$J_{mot\ br}$	$kgcm^2$	9.4
Weight	m_{mot}	kg	6.3
Weight (with brake)	$m_{mot\ br}$	kg	7.9
Rated data for S210 connected to 1 AC 400 V, 3 AC 480 V			
Rated speed	n_{rated}	r/min	3000
Rated torque	M_{rated}	Nm	5.4
Rated current	I_{rated}	A	4.35
Rated power	P_{rated}	kW	1.71



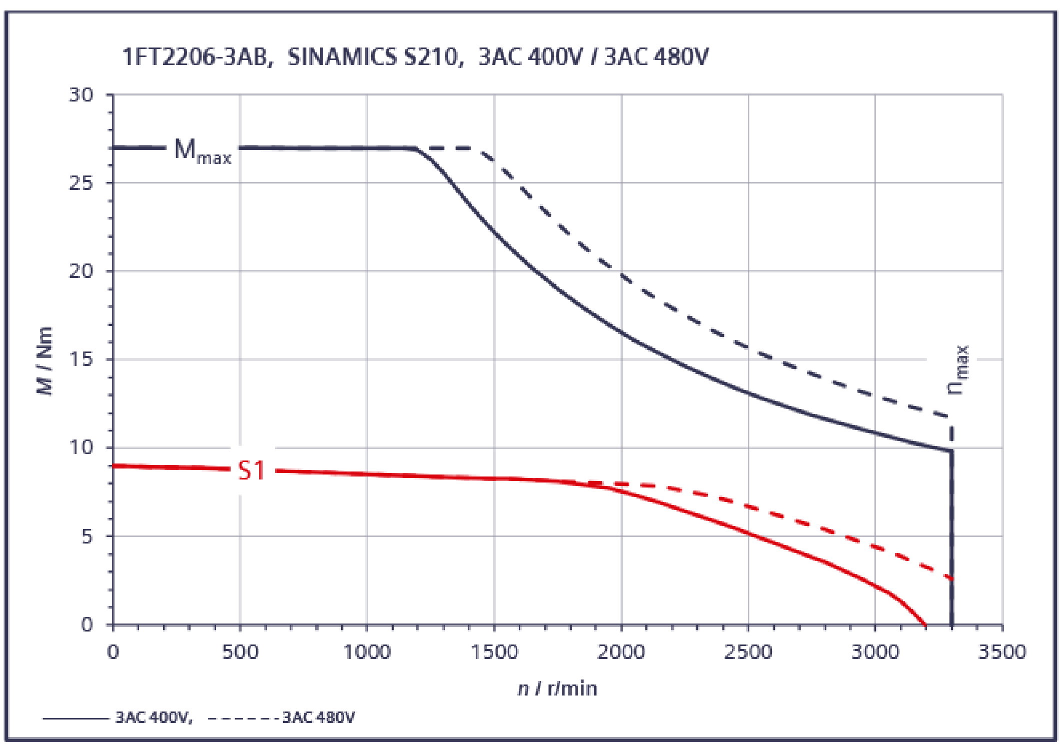
12.2.19.29 1FT2206-2AH connected to 400 V 3 AC / 480 V 3 AC

1FT2206-2AH	**For 1 AC 400 V, 3 AC 480 V**		
Technical specifications in the SINAMICS S210 system	**Symbol**	**Unit**	**Value**
Static torque	M_0	Nm	6.5
Stall current	I_0	A	6.5
Maximum permissible speed	n_{max}	r/min	8000
Maximum torque	M_{max}	Nm	18
Maximum current	I_{max}	A	22.5
Thermal time constant	T_{th}	min	21
Rotor moment of inertia	J_{mot}	kgcm²	7.8
Rotor moment of inertia (with brake)	$J_{mot\ br}$	kgcm²	9.4
Weight	m_{mot}	kg	6.3
Weight (with brake)	$m_{mot\ br}$	kg	7.9
Rated data for S210 connected to 1 AC 400 V, 3 AC 480 V			
Rated speed	n_{rated}	r/min	4500
Rated torque	M_{rated}	Nm	3.85
Rated current	I_{rated}	A	4.1
Rated power	P_{rated}	kW	1.8



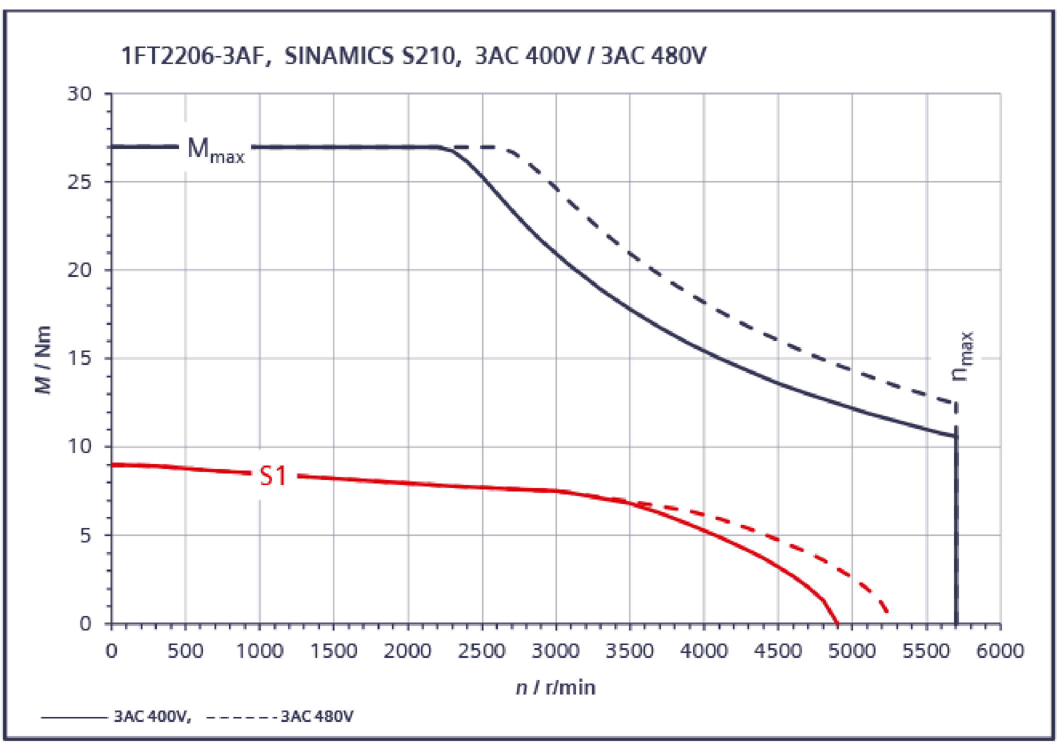
12.2.19.30 1FT2206-3AB connected to 3 AC 400 V / 3 AC 480 V

1FT2206-3AB	**For 3 AC 400 V, 3 AC 480 V**		
Technical specifications in the SINAMICS S210 system	**Symbol**	**Unit**	**Value**
Static torque	M_0	Nm	9
Stall current	I_0	A	3.15
Maximum permissible speed	n_{max}	r/min	3300
Maximum torque	M_{max}	Nm	27
Maximum current	I_{max}	A	11.4
Thermal time constant	T_{th}	min	33
Rotor moment of inertia	J_{mot}	$kgcm^2$	11.5
Rotor moment of inertia (with brake)	$J_{mot\ br}$	$kgcm^2$	13.1
Weight	m_{mot}	kg	7.4
Weight (with brake)	$m_{mot\ br}$	kg	9
Rated data for S210 connected to 3 AC 400 V, 3 AC 480 V			
Rated speed	n_{rated}	r/min	1500
Rated torque	M_{rated}	Nm	8.3
Rated current	I_{rated}	A	2.9
Rated power	P_{rated}	kW	1.3



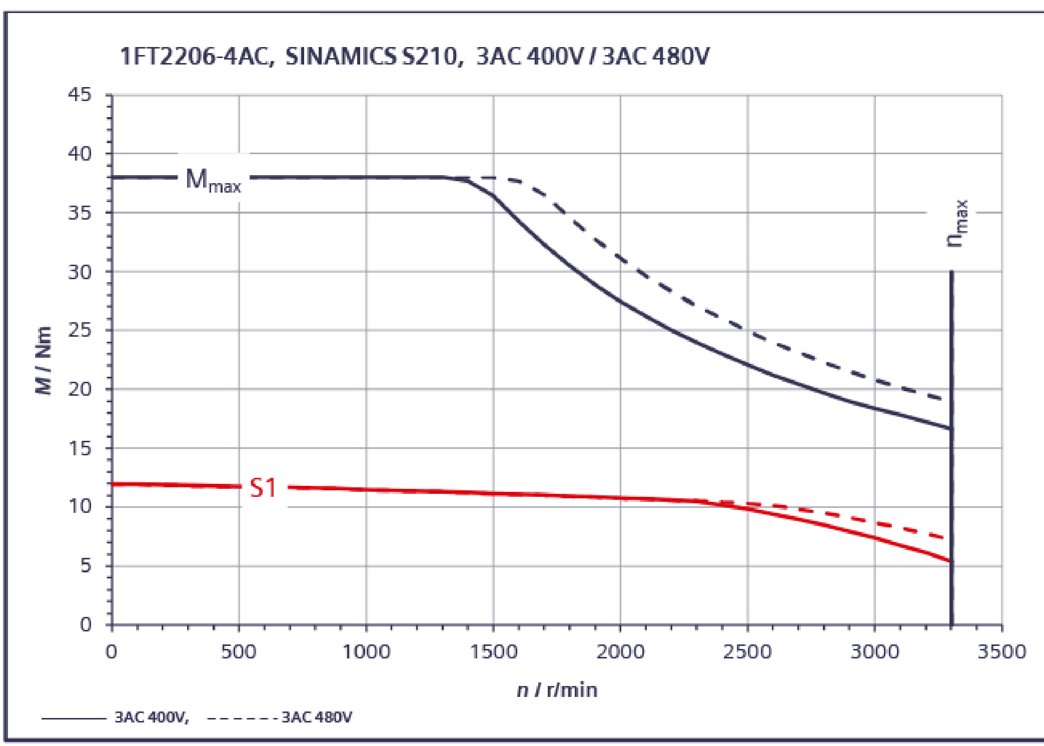
12.2.19.31 1FT2206-3AF connected to 1 AC 400 V / 3 AC 480 V

1FT2206-3AF	For 3 AC 400 V, 3 AC 480 V		
Technical specifications in the SINAMICS S210 system	**Symbol**	**Unit**	**Value**
Static torque	M_0	Nm	9
Stall current	I_0	A	5.4
Maximum permissible speed	n_{max}	r/min	5700
Maximum torque	M_{max}	Nm	27
Maximum current	I_{max}	A	19.7
Thermal time constant	T_{th}	min	330
Rotor moment of inertia	J_{mot}	$kgcm^2$	11.5
Rotor moment of inertia (with brake)	$J_{mot\ br}$	$kgcm^2$	13.1
Weight	m_{mot}	kg	7.4
Weight (with brake)	$m_{mot\ br}$	kg	9
Rated data for S210 connected to 3 AC 400 V, 3 AC 480 V			
Rated speed	n_{rated}	r/min	3000
Rated torque	M_{rated}	Nm	7.5
Rated current	I_{rated}	A	4.65
Rated power	P_{rated}	kW	2.35



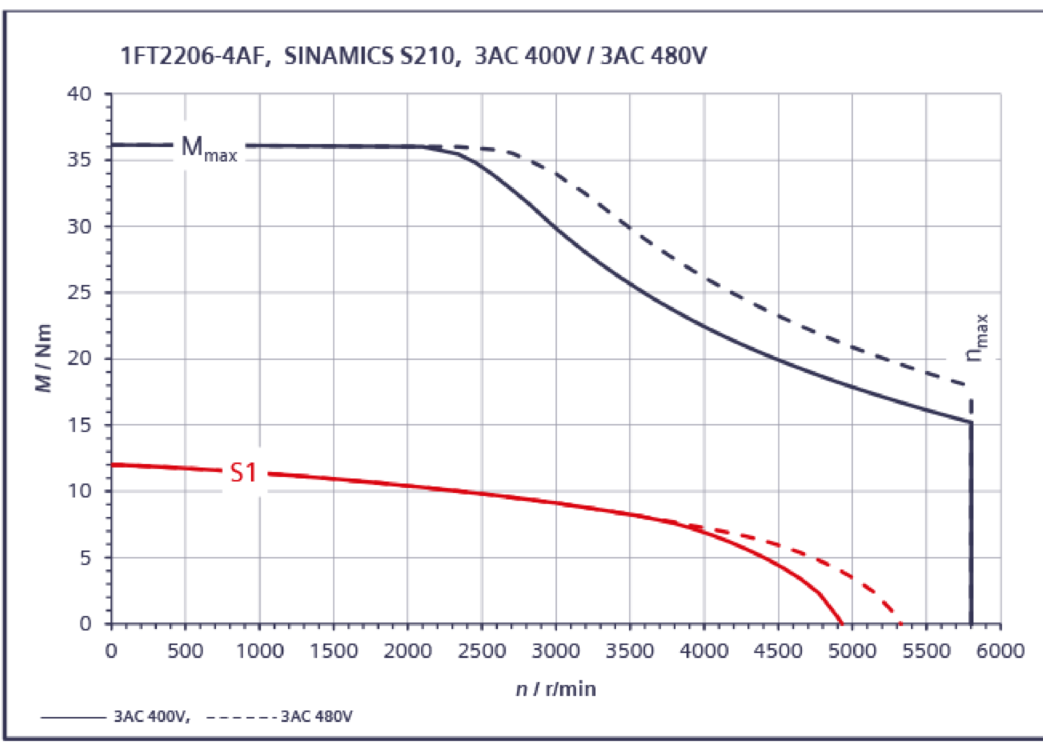
12.2.19.32 1FT2206-4AC connected to 3 AC 400 V / 3 AC 480 V

1FT2206-4AC	For 3 AC 400 V, 3 AC 480 V		
Technical specifications in the S210 system	**Abbreviation**	**Unit**	**Value**
Static torque	M_0	Nm	12
Stall current	I_0	A	4.5
Max. permissible speed	$n_{max\ inv}$	r/min	3300
Maximum torque	M_{max}	Nm	38
Maximum current	I_{max}	A	17
Thermal time constant	T_{th}	min	32
Moment of inertia	J_{mot}	kg cm²	15.1
Moment of inertia (with brake)	$J_{Mot\ with\ Br}$	kg cm²	16.8
Weight	m_{Mot}	kg	8.9
Weight (with brake)	$m_{Mot\ with\ Br}$	kg	10.6
Rated data 3 AC 380 ... 480 V			
Rated speed	n_{rated}	r/min	2000
Rated torque	M_{rated}	Nm	10.5
Rated current	I_{rated}	A	4.1
Rated power	P_{rated}	kW	2.2



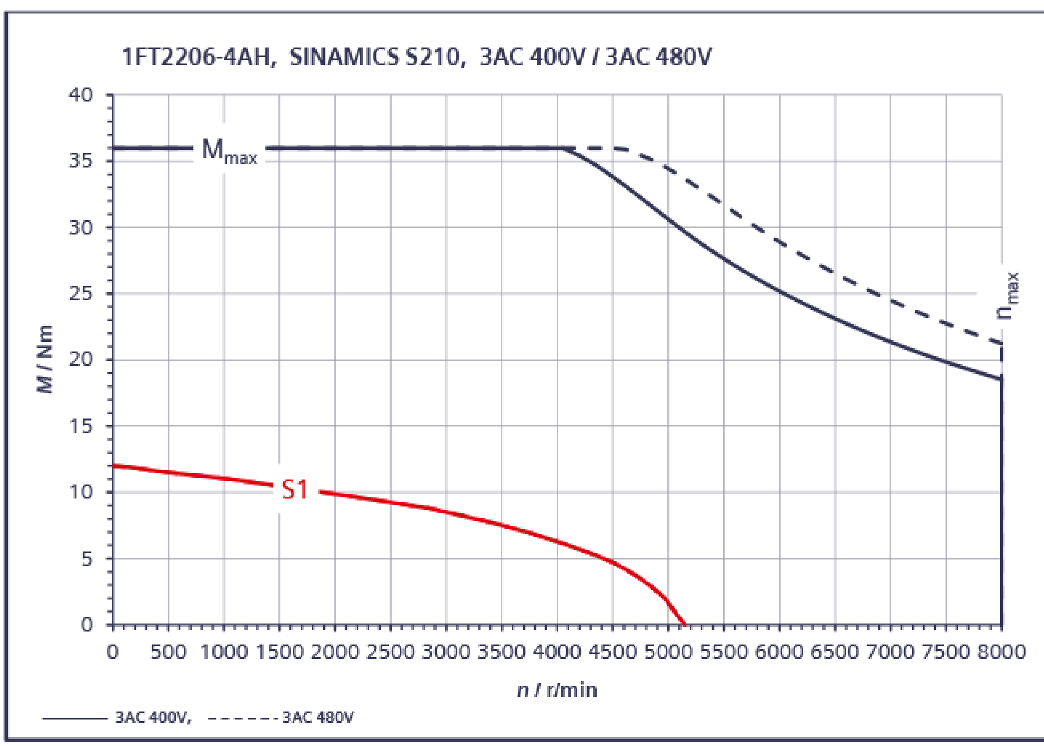
12.2.19.33 1FT2206-4AF connected to 400 V 3 AC / 480 V 3 AC

1FT2206-4AF	For 3 AC 400 V, 3 AC 480 V		
Technical specifications in the SINAMICS S210 system	**Symbol**	**Unit**	**Value**
Static torque	M_0	Nm	12
Stall current	I_0	A	7.9
Maximum permissible speed	n_{max}	r/min	5800
Maximum torque	M_{max}	Nm	36
Maximum current	I_{max}	A	29.5
Thermal time constant	T_{th}	min	24
Rotor moment of inertia	J_{mot}	$kgcm^2$	15.1
Rotor moment of inertia (with brake)	$J_{mot\ br}$	$kgcm^2$	16.8
Weight	m_{mot}	kg	8.9
Weight (with brake)	$m_{mot\ br}$	kg	10.6
Rated data for S210 connected to 3 AC 400 V, 3 AC 480 V			
Rated speed	n_{rated}	r/min	3000
Rated torque	M_{rated}	Nm	9.1
Rated current	I_{rated}	A	6.2
Rated power	P_{rated}	kW	2.85



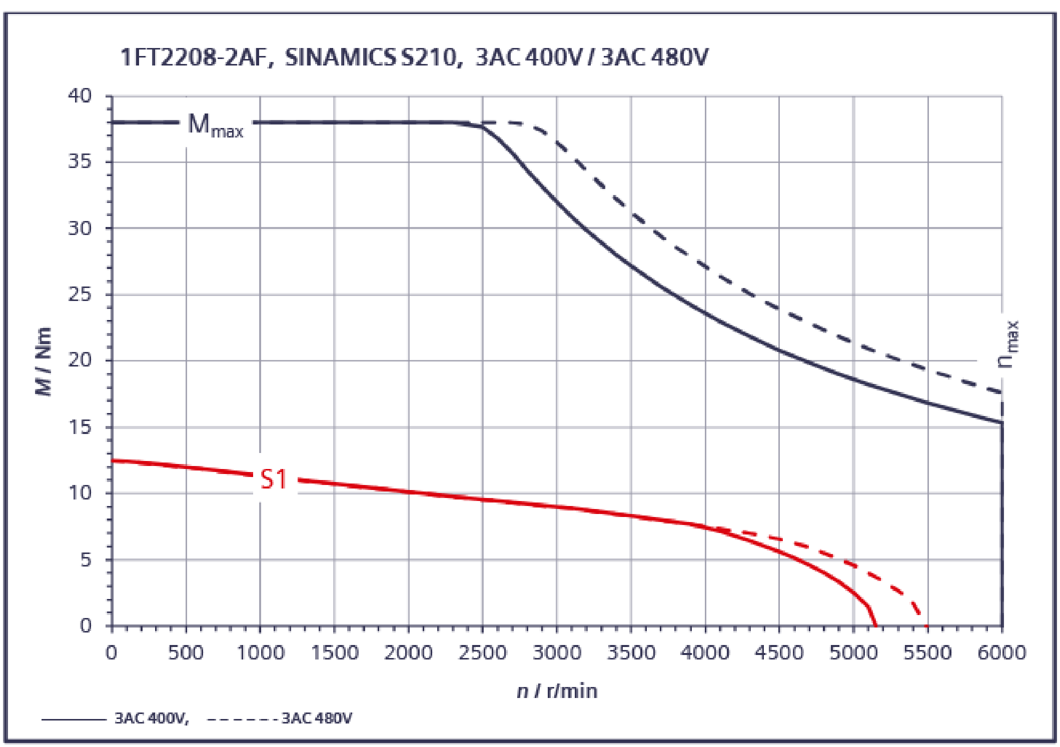
12.2.19.34 1FT2206-4AH connected to 400 V 3 AC / 480 V 3 AC

1FT2206-4AH	For 1 AC 400 V, 3 AC 480 V		
Technical specifications in the SINAMICS S210 system	**Symbol**	**Unit**	**Value**
Static torque	M_0	Nm	12
Stall current	I_0	A	12
Maximum permissible speed	n_{max}	r/min	8000
Maximum torque	M_{max}	Nm	36
Maximum current	I_{max}	A	44
Thermal time constant	T_{th}	min	24
Rotor moment of inertia	J_{mot}	$kgcm^2$	15.1
Rotor moment of inertia (with brake)	$J_{mot\ br}$	$kgcm^2$	16.8
Weight	m_{mot}	kg	8.9
Weight (with brake)	$m_{mot\ br}$	kg	10.6
Rated data for S210 connected to 1 AC 400 V, 3 AC 480 V			
Rated speed	n_{rated}	r/min	4500
Rated torque	M_{rated}	Nm	4.7
Rated current	I_{rated}	A	5.2
Rated power	P_{rated}	kW	2.2



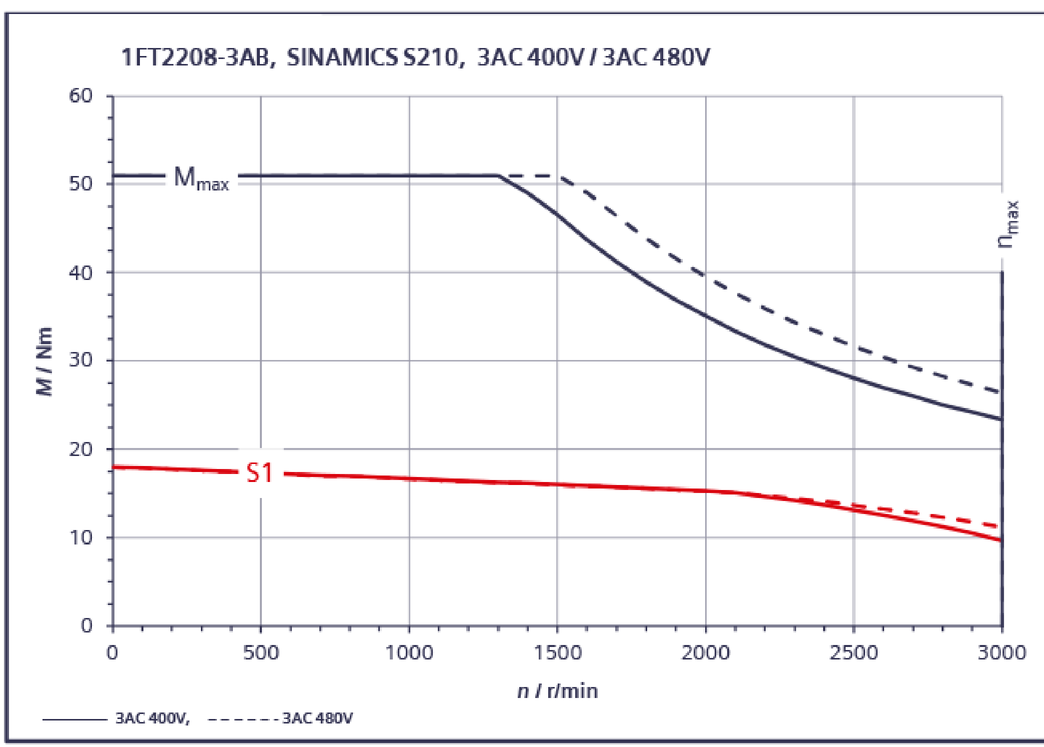
12.2.19.35 1FT2208-2AF connected to 3 AC 400 V / 3 AC 480 V

1FT2208-2AF	For 3 AC 400 V, 3 AC 480 V		
Technical specifications in the SINAMICS S210 system	**Symbol**	**Unit**	**Value**
Static torque	M_0	Nm	12.5
Stall current	I_0	A	8.3
Maximum permissible speed	n_{max}	r/min	6000
Maximum torque	M_{max}	Nm	38
Maximum current	I_{max}	A	31
Thermal time constant	T_{th}	min	30
Rotor moment of inertia	J_{mot}	$kgcm^2$	22.5
Rotor moment of inertia (with brake 1)	$J_{mot\ br}$	$kgcm^2$	25.5
Rotor moment of inertia (with brake 2)	$J_{mot\ br}$	$kgcm^2$	28
Weight	m_{mot}	kg	10.4
Weight (with brake 1)	$m_{mot\ br}$	kg	12.6
Weight (with brake 2)	$m_{mot\ br}$	kg	13.2
Rated data for S210 connected to 3 AC 400 V, 3 AC 480 V			
Rated speed	n_{rated}	r/min	3000
Rated torque	M_{rated}	Nm	9
Rated current	I_{rated}	A	6.5
Rated power	P_{rated}	kW	2.85



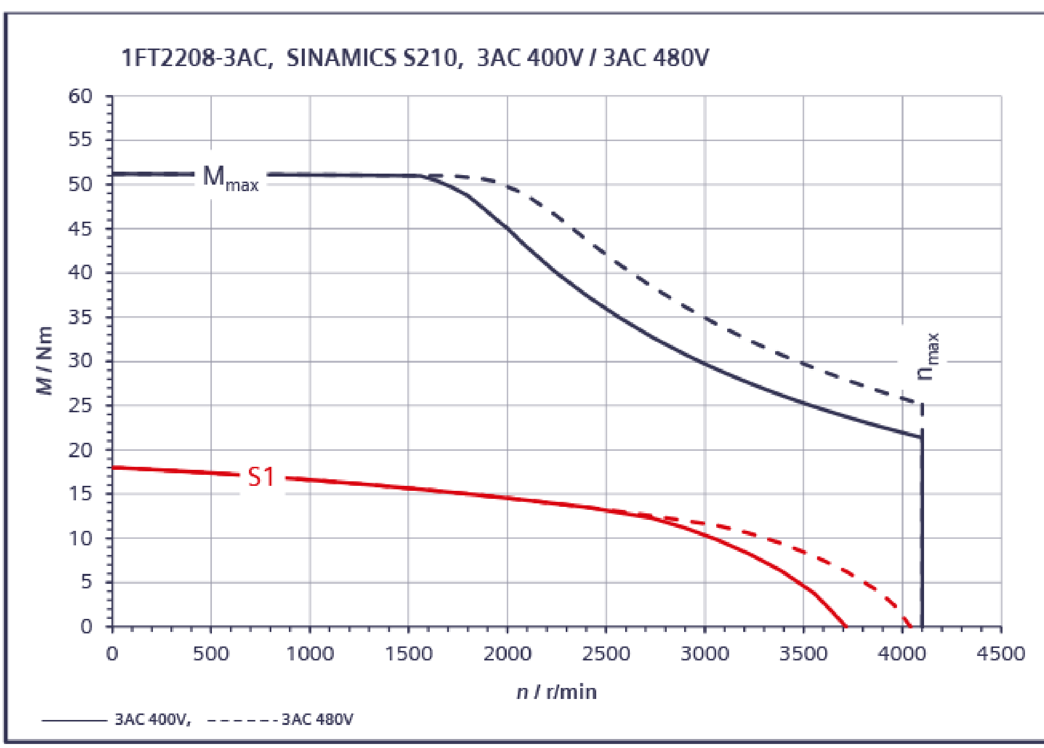
12.2.19.36 1FT2208-3AB connected to 3 AC 400 V / 3 AC 480 V

1FT2208-3AB	For 3 AC 400 V, 3 AC 480 V		
Technical specifications in the S210 system	**Abbreviation**	**Unit**	**Value**
Static torque	M_0	Nm	18
Stall current	I_0	A	6.2
Max. permissible speed	$n_{max\ inv}$	r/min	3000
Maximum torque	M_{max}	Nm	51
Maximum current	I_{max}	A	20.5
Thermal time constant	T_{th}	min	36
Moment of inertia	J_{mot}	kg cm^2	29.6
Moment of inertia (with brake 1)	$J_{mot\ br\ 1}$	kg cm2	32.6
Moment of inertia (with brake 2)	$J_{mot\ br\ 2}$	kg cm2	35.1
Weight (without brake)	m_{mot}	kg	12.6
Weight (with brake 1)	$m_{mot\ br\ 1}$	kg	14.6
Weight (with brake 2)	$m_{mot\ br\ 2}$	kg	15.2
Rated data 3 AC 380 ... 480 V			
Rated speed	n_{rated}	r/min	1500
Rated torque	M_{rated}	Nm	16
Rated current	I_{rated}	A	5.7
Rated power	P_{rated}	kW	2.5



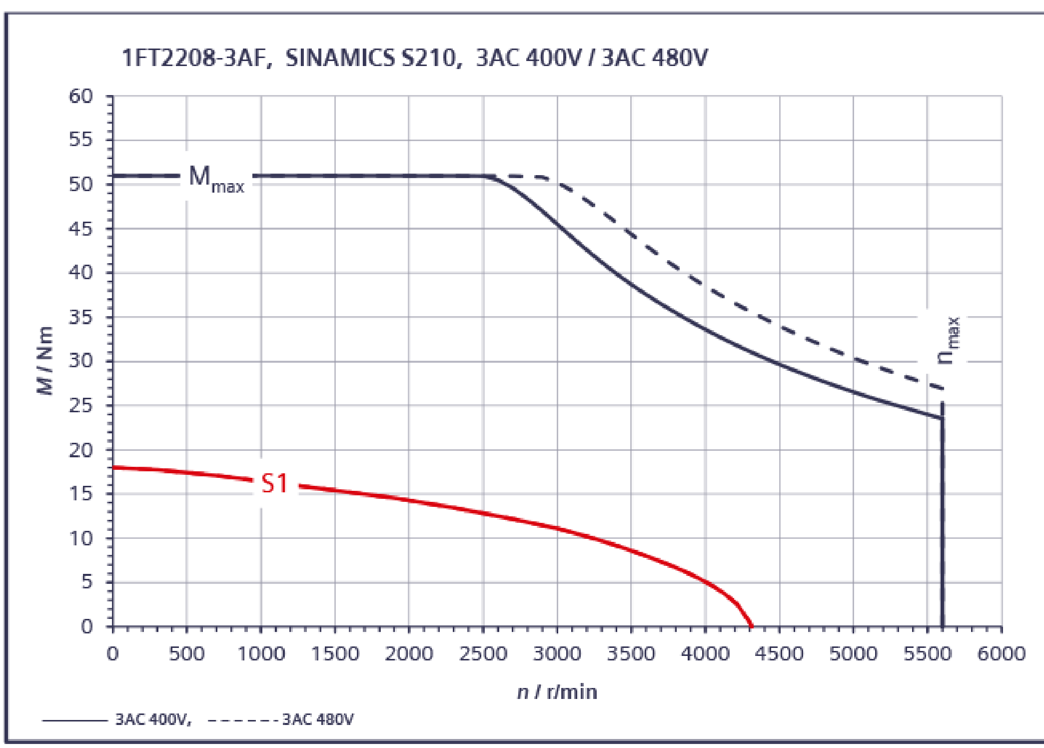
12.2.19.37 1FT2208-3AC connected to 400 V 3 AC / 480 V 3 AC

1FT2208-3AC	**For 3 AC 400 V, 3 AC 480 V**		
Technical specifications in the SINAMICS S210 system	**Symbol**	**Unit**	**Value**
Static torque	M_0	Nm	18
Stall current	I_0	A	8.4
Maximum permissible speed	n_{max}	r/min	6000
Maximum torque	M_{max}	Nm	51
Maximum current	I_{max}	A	29.5
Thermal time constant	T_{th}	min	26
Rotor moment of inertia	J_{mot}	$kgcm^2$	29.6
Rotor moment of inertia (with brake 1)	$J_{mot\ br\ 1}$	$kgcm^2$	32.6
Rotor moment of inertia (with brake 2)	$J_{mot\ br\ 2}$	$kgcm^2$	35.1
Weight	m_{mot}	kg	12.6
Weight (with brake 1)	$m_{mot\ br\ 1}$	kg	14.6
Weight (with brake 2)	$m_{mot\ br\ 2}$	kg	15.2
Rated data for S210 connected to 3 AC 400 V, 3 AC 480 V			
Rated speed	n_{rated}	r/min	2000
Rated torque	M_{rated}	Nm	14.5
Rated current	I_{rated}	A	7
Rated power	P_{rated}	kW	3.05



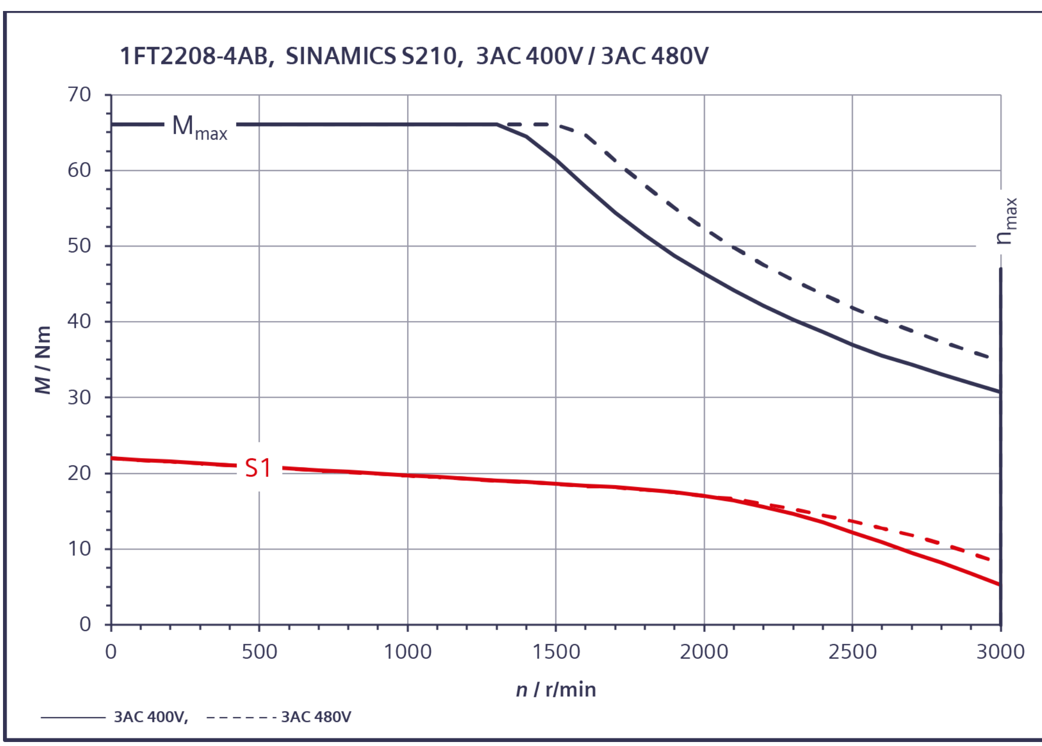
12.2.19.38 1FT2208-3AF connected to 400 V 3 AC / 480 V 3 AC

1FT2208-3AF	**For 1 AC 400 V, 3 AC 480 V**		
Technical specifications in the SINAMICS S210 system	**Symbol**	**Unit**	**Value**
Static torque	M_0	Nm	18
Stall current	I_0	A	11.9
Maximum permissible speed	n_{max}	r/min	6000
Maximum torque	M_{max}	Nm	51
Maximum current	I_{max}	A	40
Thermal time constant	T_{th}	min	26
Rotor moment of inertia	J_{mot}	kgcm^2	29.5
Rotor moment of inertia (with brake 1)	$J_{mot\ br\ 1}$	kgcm^2	32.5
Rotor moment of inertia (with brake 2)	$J_{mot\ br\ 2}$	kgcm2	35.1
Weight	m_{mot}	kg	12.6
Weight (with brake 1)	$m_{mot\ br\ 1}$	kg	14.6
Weight (with brake 2)	$m_{mot\ br\ 2}$	kg	15.2
Rated data for S210 connected to 1 AC 400 V, 3 AC 480 V			
Rated speed	n_{rated}	r/min	3000
Rated torque	M_{rated}	Nm	11.1
Rated current	I_{rated}	A	7.7
Rated power	P_{rated}	kW	3.5



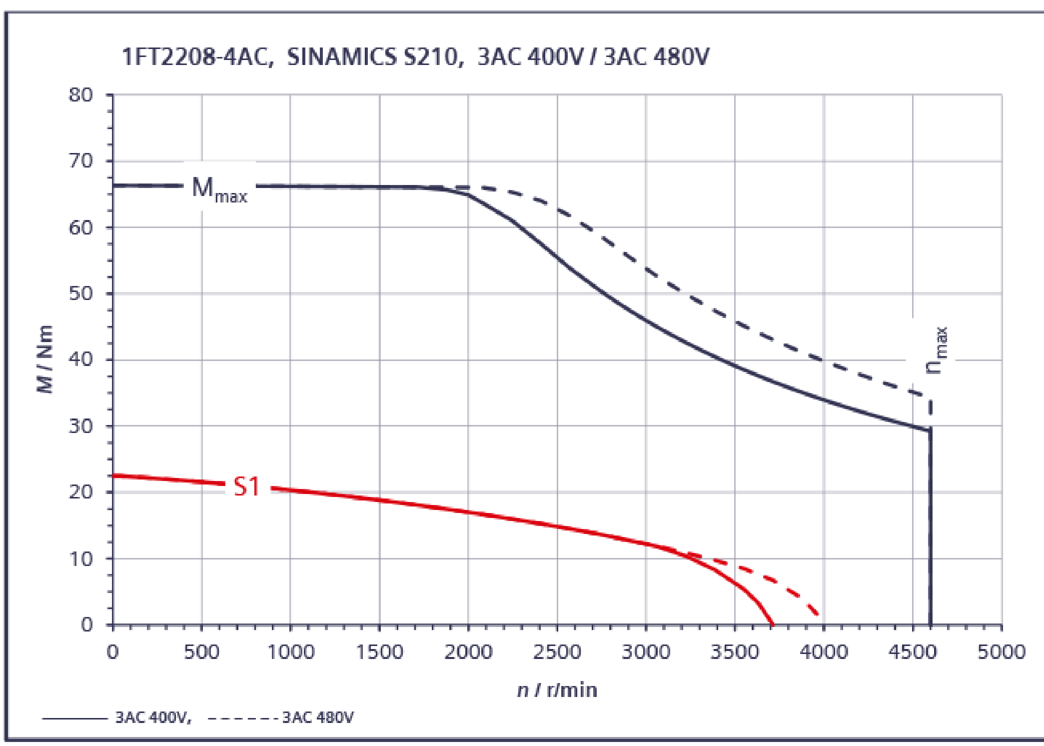
12.2.19.39 1FT2208-4AB connected to 3 AC 400 V / 3 AC 480 V

1FT2208-4AB	For 3 AC 400 V, 3 AC 480 V		
Technical specifications in the S210 system	**Abbreviation**	**Unit**	**Value**
Static torque	M_0	Nm	22
Stall current	I_0	A	7.1
Max. permissible speed	$n_{max\ inv}$	r/min	3000
Maximum torque	M_{max}	Nm	66
Maximum current	I_{max}	A	25
Thermal time constant	T_{th}	min	42
Moment of inertia	J_{mot}	kg cm^2	38.8
Rotor moment of inertia (with brake 1)	$J_{mot\ br\ 1}$	kgcm^2	44.4
Rotor moment of inertia (with brake 2)	$J_{mot\ br\ 2}$	kgcm2	-
Weight	m_{mot}	kg	14.6
Weight (with brake 1)	$m_{mot\ br\ 1}$	kg	17.3
Weight (with brake 2)	$m_{mot\ br\ 2}$	kg	-
Rated data 3 AC 380 ... 480 V			
Rated speed	n_{rated}	r/min	1500
Rated torque	M_{rated}	Nm	18.6
Rated current	I_{rated}	A	6.4
Rated power	P_{rated}	kW	2.9



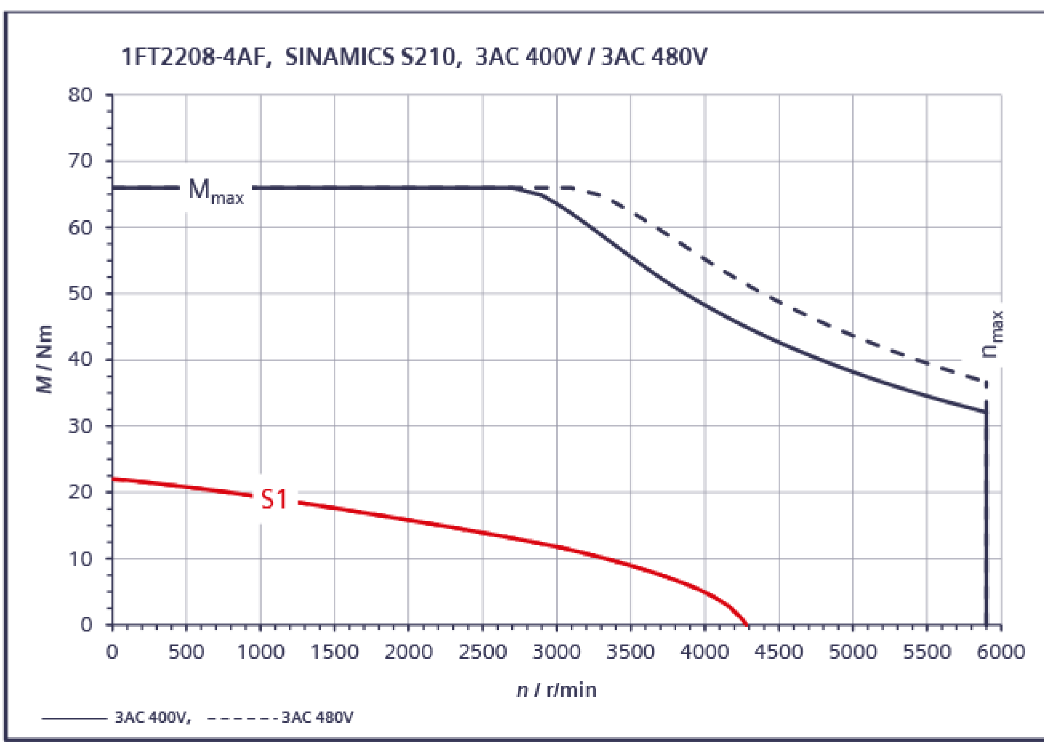
12.2.19.40 1FT2208-4AC connected to 400 V 3 AC / 480 V 3 AC

1FT2208-4AC	For 3 AC 400 V, 3 AC 480 V		
Technical specifications in the SINAMICS S210 system	**Symbol**	**Unit**	**Value**
Static torque	M_0	Nm	22
Stall current	I_0	A	11.7
Maximum permissible speed	n_{max}	r/min	4600
Maximum torque	M_{max}	Nm	66
Maximum current	I_{max}	A	43.5
Thermal time constant	T_{th}	min	28
Rotor moment of inertia	J_{mot}	$kgcm^2$	38.8
Rotor moment of inertia (with brake)	$J_{mot\ br}$	$kgcm^2$	44.4
Weight	m_{mot}	kg	14.6
Weight (with brake)	$m_{mot\ br}$	kg	17.3
Rated data for S210 connected to 3 AC 400 V, 3 AC 480 V			
Rated speed	n_{rated}	r/min	2000
Rated torque	M_{rated}	Nm	17
Rated current	I_{rated}	A	9.3
Rated power	P_{rated}	kW	3.55



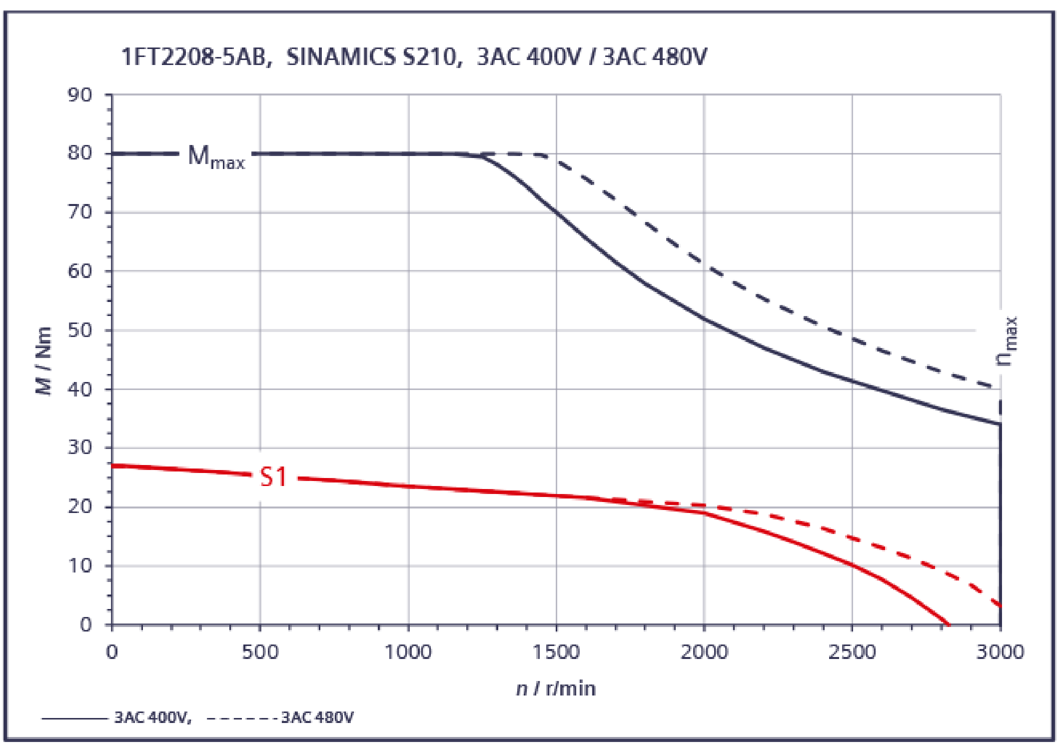
12.2.19.41 1FT2208-4AF connected to 400 V 3 AC / 480 V 3 AC

1FT2208-4AF	For 1 AC 400 V, 3 AC 480 V		
Technical specifications in the SINAMICS S210 system	**Symbol**	**Unit**	**Value**
Static torque	M_0	Nm	22
Stall current	I_0	A	15
Maximum permissible speed	n_{max}	r/min	5900
Maximum torque	M_{max}	Nm	66
Maximum current	I_{max}	A	55
Thermal time constant	T_{th}	min	28
Rotor moment of inertia	J_{mot}	$kgcm^2$	38.8
Rotor moment of inertia (with brake)	$J_{mot\ br}$	$kgcm^2$	44.4
Weight	m_{mot}	kg	14.6
Weight (with brake)	$m_{mot\ br}$	kg	17.3
Rated data for S210 connected to 1 AC 400 V, 3 AC 480 V			
Rated speed	n_{rated}	r/min	3000
Rated torque	M_{rated}	Nm	11.8
Rated current	I_{rated}	A	8.5
Rated power	P_{rated}	kW	3.7



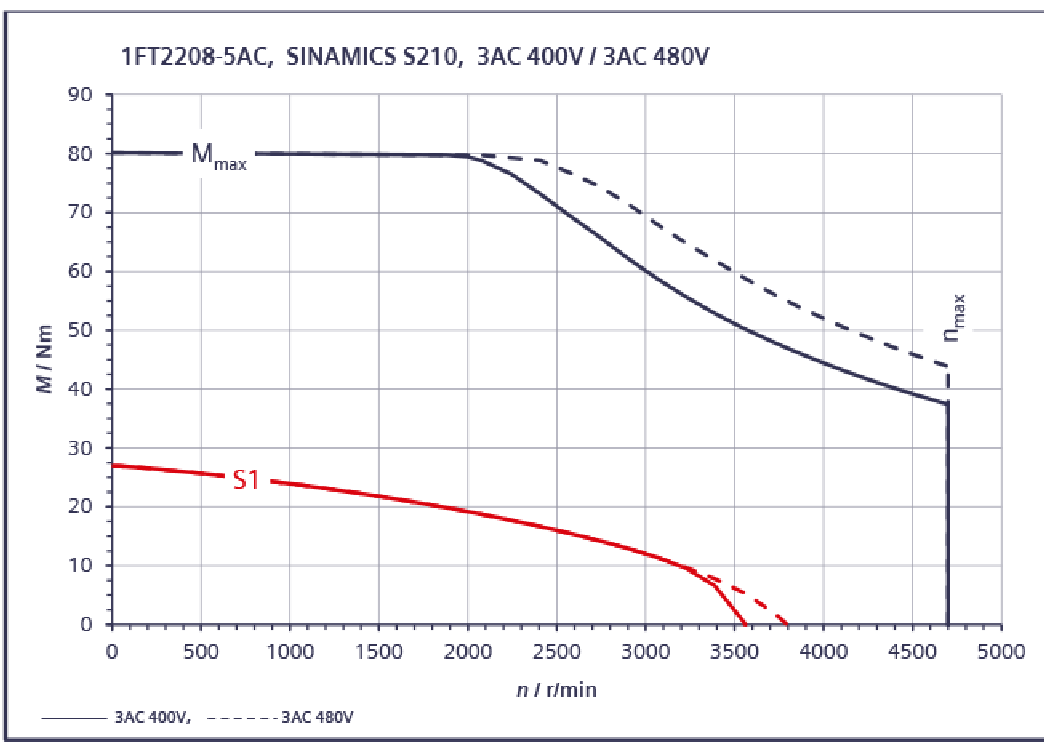
12.2.19.42 1FT2208-5AB connected to 3 AC 400 V / 3 AC 480 V

1FT2208-5AB	For 3 AC 400 V, 3 AC 480 V		
Technical specifications in the SINAMICS S210 system	**Symbol**	**Unit**	**Value**
Static torque	M_0	Nm	27
Stall current	I_0	A	8.6
Maximum permissible speed	n_{max}	r/min	3000
Maximum torque	M_{max}	Nm	80
Maximum current	I_{max}	A	29.5
Thermal time constant	T_{th}	min	30
Rotor moment of inertia	J_{mot}	$kgcm^2$	48.1
Rotor moment of inertia (with brake)	$J_{mot\ br}$	$kgcm^2$	53.6
Weight	m_{mot}	kg	16.6
Weight (with brake)	$m_{mot\ br}$	kg	19.3
Rated data for S210 connected to 3 AC 400 V, 3 AC 480 V			
Rated speed	n_{rated}	r/min	1500
Rated torque	M_{rated}	Nm	22
Rated current	I_{rated}	A	7.2
Rated power	P_{rated}	kW	3.45



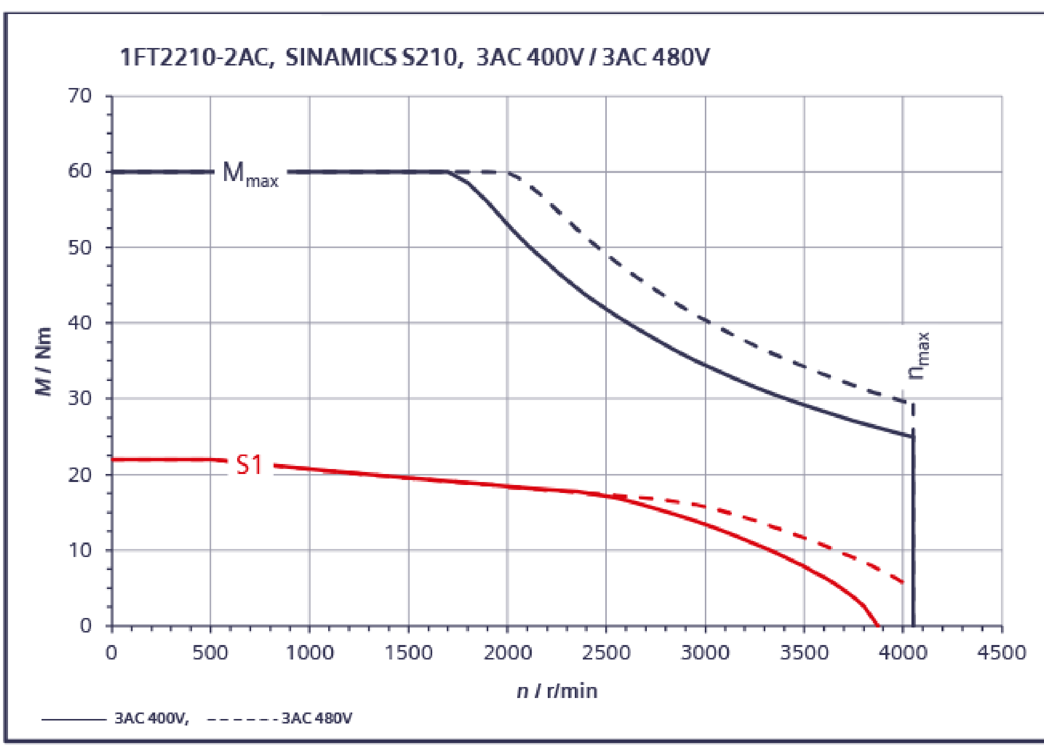
12.2.19.43 1FT2208-5AC connected to 400 V 3 AC / 480 V 3 AC

1FT2208-5AC	**For 3 AC 400 V, 3 AC 480 V**		
Technical specifications in the SINAMICS S210 system	**Symbol**	**Unit**	**Value**
Static torque	M_0	Nm	27
Stall current	I_0	A	14.6
Maximum permissible speed	n_{max}	r/min	4700
Maximum torque	M_{max}	Nm	80
Maximum current	I_{max}	A	51.5
Thermal time constant	T_{th}	min	30
Rotor moment of inertia	J_{mot}	$kgcm^2$	48.1
Rotor moment of inertia (with brake)	$J_{mot\ br}$	$kgcm^2$	53.6
Weight	m_{mot}	kg	16.6
Weight (with brake)	$m_{mot\ br}$	kg	19.3
Rated data for S210 connected to 3 AC 400 V, 3 AC 480 V			
Rated speed	n_{rated}	r/min	2000
Rated torque	M_{rated}	Nm	19.1
Rated current	I_{rated}	A	10.8
Rated power	P_{rated}	kW	4



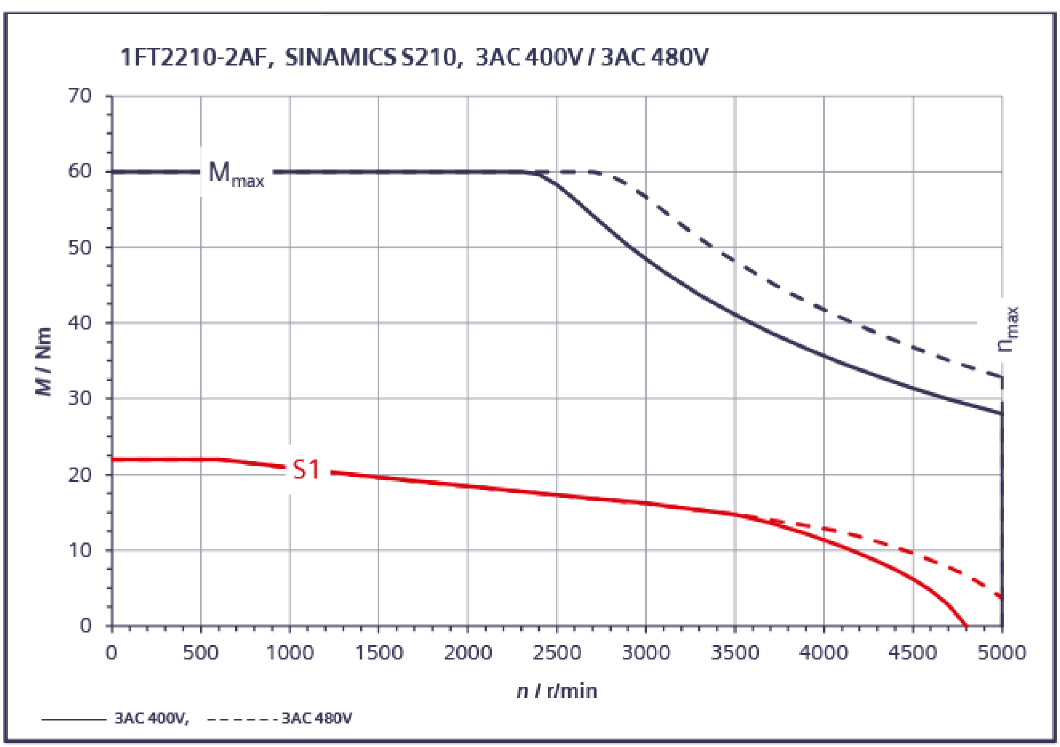
12.2.19.44 1FT2210-2AC connected to 3 AC 400 V / 3 AC 480 V

1FT2210-2AC	For 3 AC 400 V, 3 AC 480 V		
Technical specifications in the SINAMICS S210 system	**Symbol**	**Unit**	**Value**
Static torque	M_0	Nm	22
Stall current	I_0	A	9.3
Maximum permissible speed	n_{max}	r/min	4050
Maximum torque	M_{max}	Nm	60
Maximum current	I_{max}	A	32
Thermal time constant	T_{th}	min	39
Rotor moment of inertia	J_{mot}	$kgcm^2$	61.7
Rotor moment of inertia (with brake 1)	$J_{mot\ br\ 1}$	$kgcm^2$	67.7
Rotor moment of inertia (with brake 2)	$J_{mot\ br\ 2}$	$kgcm^2$	77.3
Weight	m_{mot}	kg	16.7
Weight (with brake 1)	$m_{mot\ br\ 1}$	kg	20.1
Weight (with brake 2)	$m_{mot\ br\ 2}$	kg	21.4
Rated data for S210 connected to 3 AC 400 V, 3 AC 480 V			
Rated speed	n_{rated}	r/min	2000
Rated torque	M_{rated}	Nm	18.4
Rated current	I_{rated}	A	8.1
Rated power	P_{rated}	kW	3.85



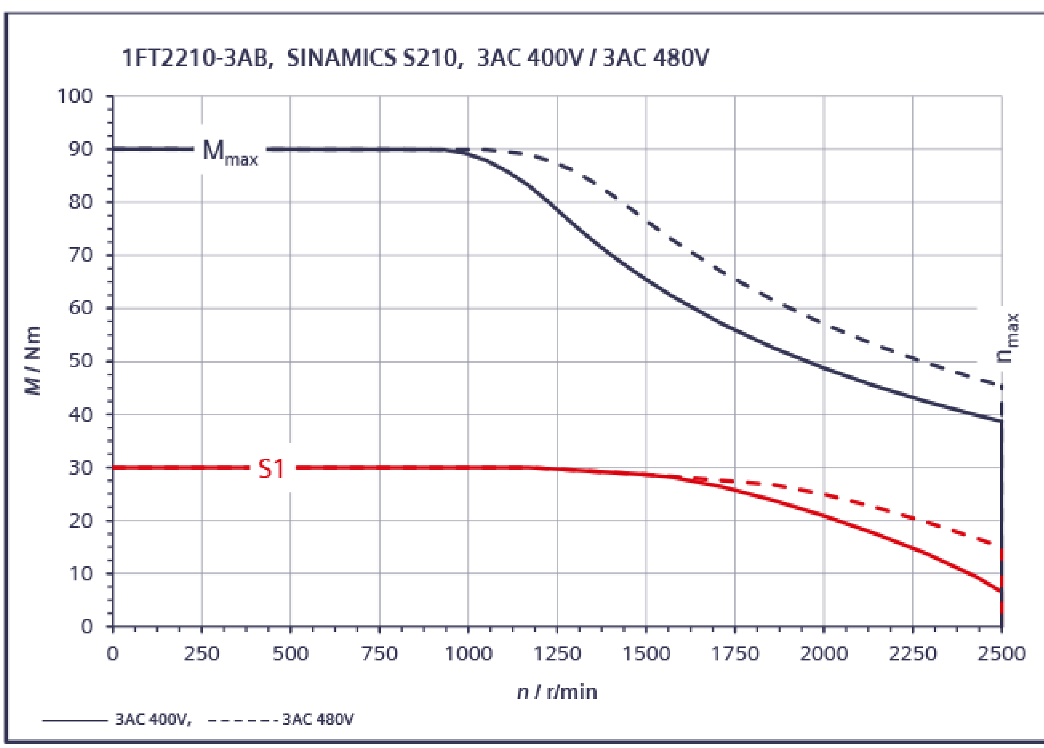
12.2.19.45 1FT2210-2AFan 3 AC 400 V / 3 AC 480 V

1FT2210-2AF	For 3 AC 400 V, 3 AC 480 V		
Technical specifications in the SINAMICS S210 system	**Symbol**	**Unit**	**Value**
Static torque	M_0	Nm	22
Stall current	I_0	A	12.9
Maximum permissible speed	n_{max}	r/min	5000
Maximum torque	M_{max}	Nm	60
Maximum current	I_{max}	A	44.5
Thermal time constant	T_{th}	min	39
Rotor moment of inertia	J_{mot}	$kgcm^2$	61.7
Rotor moment of inertia (with brake 1)	$J_{mot\ br\ 1}$	$kgcm^2$	67.7
Rotor moment of inertia (with brake 2)	$J_{mot\ br\ 2}$	$kgcm^2$	77.3
Weight	m_{Mot}	kg	16.7
Weight (with brake 1)	$m_{mot\ br\ 1}$	kg	20.1
Weight (with brake 2)	$m_{mot\ br\ 2}$	kg	21.4
Rated data for S210 connected to 3 AC 400 V, 3 AC 480 V			
Rated speed	n_{rated}	r/min	3000
Rated torque	M_{rated}	Nm	16.2
Rated current	I_{rated}	A	10.1
Rated power	P_{rated}	kW	5.1



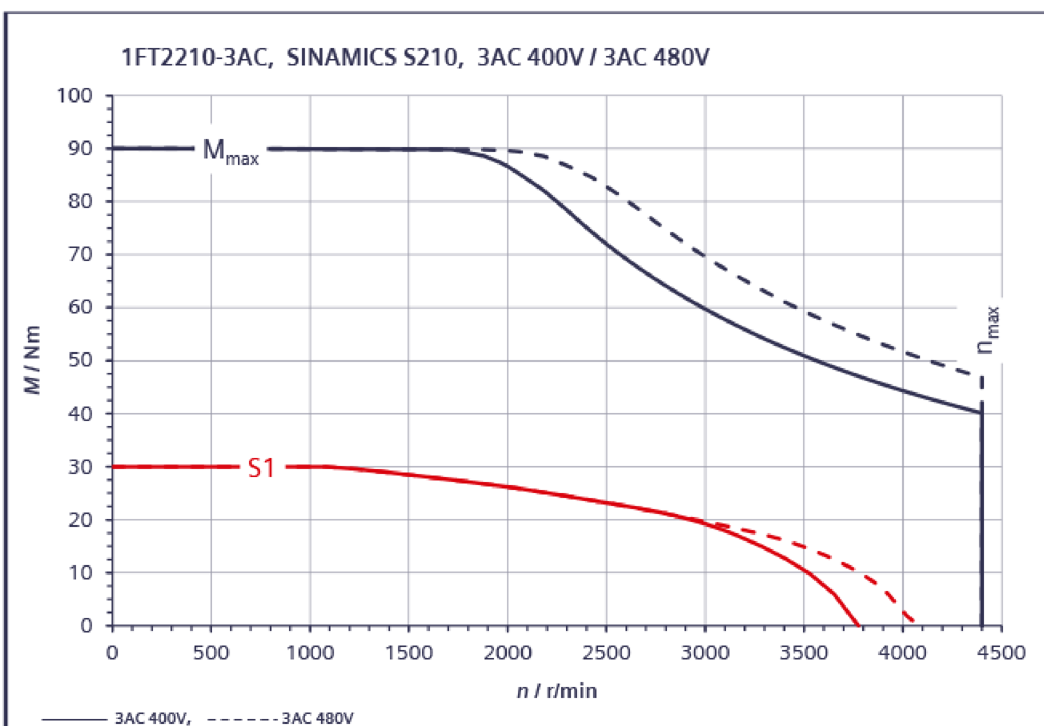
12.2.19.46 1FT2210-3AB connected to 3 AC 400 V / 3 AC 480 V

1FT2210-3AB	For 3 AC 400 V, 3 AC 480 V		
Technical specifications in the SINAMICS S210 system	**Symbol**	**Unit**	**Value**
Static torque	M_0	Nm	30
Stall current	I_0	A	8.5
Maximum permissible speed	n_{max}	r/min	2500
Maximum torque	M_{max}	Nm	90
Maximum current	I_{max}	A	31.5
Thermal time constant	T_{th}	min	33
Rotor moment of inertia	J_{mot}	$kgcm^2$	88.8
Rotor moment of inertia (with brake 1)	$J_{mot\ br\ 1}$	$kgcm^2$	94.8
Rotor moment of inertia (with brake 2)	$J_{mot\ br\ 2}$	kgcm2	104
Weight	m_{mot}	kg	22
Weight (with brake 1)	$m_{mot\ br\ 1}$	kg	25
Weight (with brake 2)	$m_{mot\ br\ 2}$	kg	26.3
Rated data for S210 connected to 3 AC 400 V, 3 AC 480 V			
Rated speed	n_{rated}	r/min	1500
Rated torque	M_{rated}	Nm	28.5
Rated current	I_{rated}	A	8.3
Rated power	P_{rated}	kW	4.5



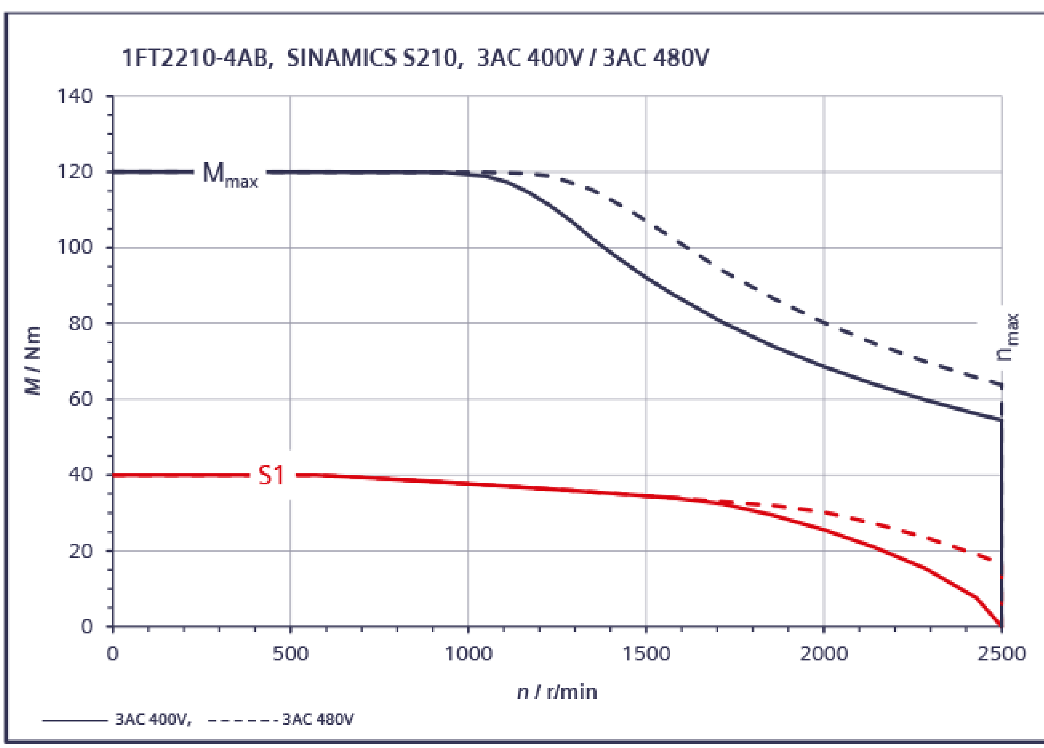
12.2.19.47 1FT2210-3AC connected to 3 AC 400 V / 3 AC 480 V

1FT2210-3AC	For 3 AC 400 V, 3 AC 480 V		
Technical specifications in the SINAMICS S210 system	**Symbol**	**Unit**	**Value**
Static torque	M_0	Nm	30
Stall current	I_0	A	15
Maximum permissible speed	n_{max}	r/min	4400
Maximum torque	M_{max}	Nm	90
Maximum current	I_{max}	A	55
Thermal time constant	T_{th}	min	33
Rotor moment of inertia	J_{mot}	$kgcm^2$	88.8
Rotor moment of inertia (with brake 1)	$J_{mot\ br\ 1}$	$kgcm^2$	94.8
Rotor moment of inertia (with brake 2)	$J_{mot\ br\ 2}$	kgcm2	104
Weight	m_{mot}	kg	22
Weight (with brake 1)	$m_{mot\ br\ 1}$	kg	25
Weight (with brake 2)	$m_{mot\ br\ 2}$	kg	26.3
Rated data for S210 connected to 3 AC 400 V, 3 AC 480 V			
Rated speed	n_{rated}	r/min	2000
Rated torque	M_{rated}	Nm	26
Rated current	I_{rated}	A	13.5
Rated power	P_{rated}	kW	5.5



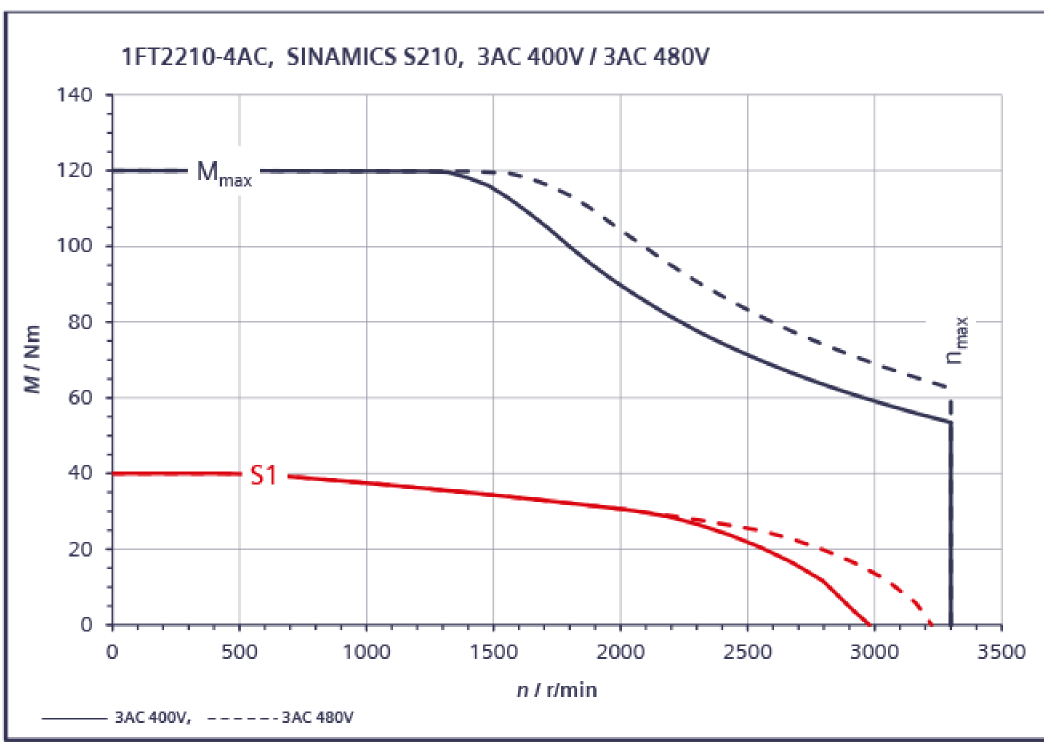
12.2.19.48 1FT2210-4AB connected to 400 V 3 AC / 480 V 3 AC

1FT2210-4AB	**For 3 AC 400 V, 3 AC 480 V**		
Technical specifications in the SINAMICS S210 system	**Symbol**	**Unit**	**Value**
Static torque	M_0	Nm	40
Stall current	I_0	A	11.8
Maximum permissible speed	n_{max}	r/min	2500
Maximum torque	M_{max}	Nm	120
Maximum current	I_{max}	A	43.5
Thermal time constant	T_{th}	min	35
Rotor moment of inertia	J_{mot}	$kgcm^2$	117
Rotor moment of inertia (with brake 1)	$J_{mot\ br\ 1}$	$kgcm^2$	133
Rotor moment of inertia (with brake 2)	$J_{mot\ br\ 2}$	kgcm2	-
Weight	m_{mot}	kg	27
Weight (with brake 1)	$m_{mot\ br\ 1}$	kg	31
Weight (with brake 2)	$m_{mot\ br\ 2}$	kg	-
Rated data for S210 connected to 3 AC 400 V, 3 AC 480 V			
Rated speed	n_{rated}	r/min	1500
Rated torque	M_{rated}	Nm	34.5
Rated current	I_{rated}	A	10.4
Rated power	P_{rated}	kW	5.4



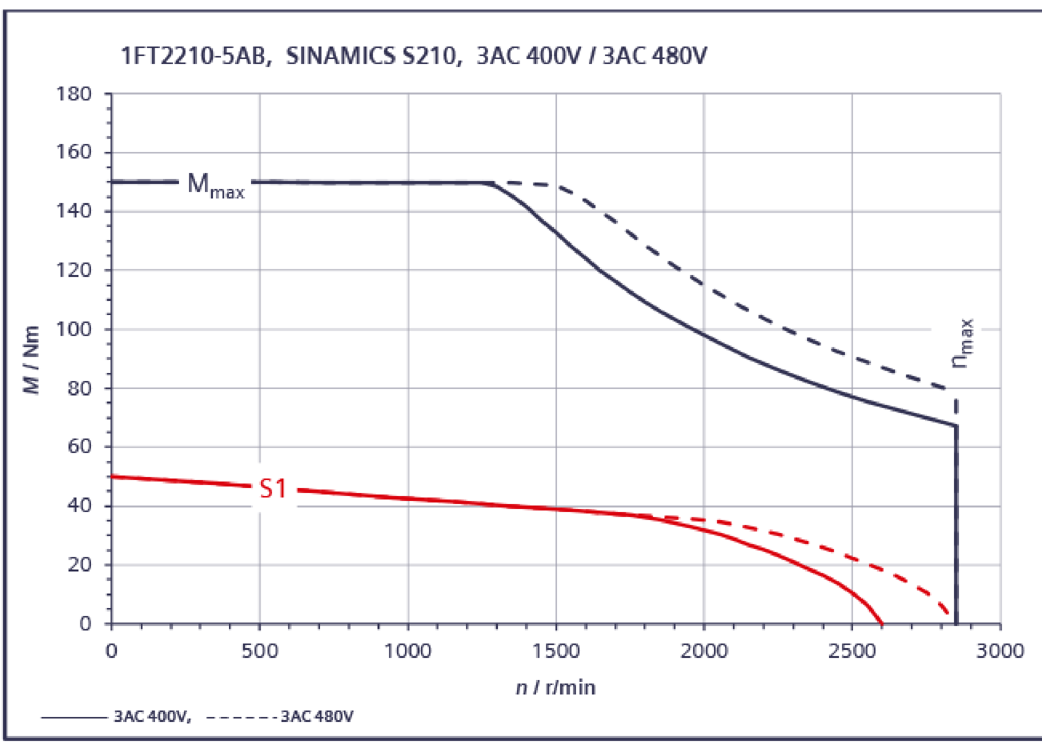
12.2.19.49 1FT2210-4AC connected to 3 AC 400 V / 3 AC 480 V

1FT2210-4AC	For 3 AC 400 V, 3 AC 480 V		
Technical specifications in the SINAMICS S210 system	**Symbol**	**Unit**	**Value**
Static torque	M_0	Nm	40
Stall current	I_0	A	15
Maximum permissible speed	n_{max}	r/min	3300
Maximum torque	M_{max}	Nm	120
Maximum current	I_{max}	A	55
Thermal time constant	T_{th}	min	35
Rotor moment of inertia	J_{mot}	$kgcm^2$	117
Rotor moment of inertia (with brake)	$J_{mot\ br}$	$kgcm^2$	133
Weight	m_{mot}	kg	27
Weight (with brake)	$m_{mot\ br}$	kg	31
Rated data for S210 connected to 3 AC 400 V, 3 AC 480 V			
Rated speed	n_{rated}	r/min	2000
Rated torque	M_{rated}	Nm	30.5
Rated current	I_{rated}	A	11.8
Rated power	P_{rated}	kW	6.4



12.2.19.50 1FT2210-5AB connected to 3 AC 400 V / 3 AC 480 V

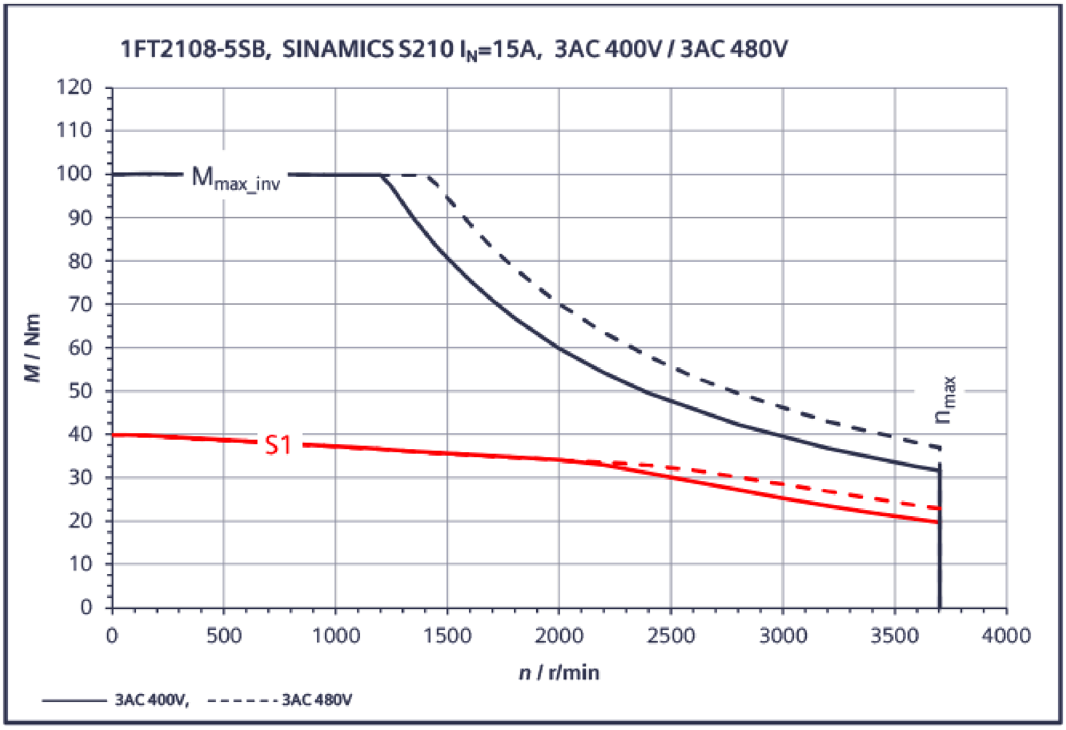
1FK2210-5AB	For 3 AC 400 V, 3 AC 480 V		
Technical specifications in the SINAMICS S210 system	**Symbol**	**Unit**	**Value**
Static torque	M_0	Nm	50
Stall current	I_0	A	15
Maximum permissible speed	n_{max}	r/min	2850
Maximum torque	M_{max}	Nm	150
Maximum current	I_{max}	A	55
Thermal time constant	T_{th}	min	37
Rotor moment of inertia	J_{mot}	$kgcm^2$	14.5
Rotor moment of inertia (with brake)	$J_{mot\ br}$	$kgcm^2$	16.1
Weight	m_{mot}	kg	32
Weight (with brake)	$m_{mot\ br}$	kg	36
Rated data for S210 connected to 3 AC 400 V, 3 AC 480 V			
Rated speed	n_{rated}	r/min	1500
Rated torque	M_{rated}	Nm	39
Rated current	I_{rated}	A	12.1
Rated power	P_{rated}	kW	6.1



12.2.20 Technical data and characteristics of the 1FT2 connected to 3 AC 400 V, 3 AC 480 V, force-ventilated

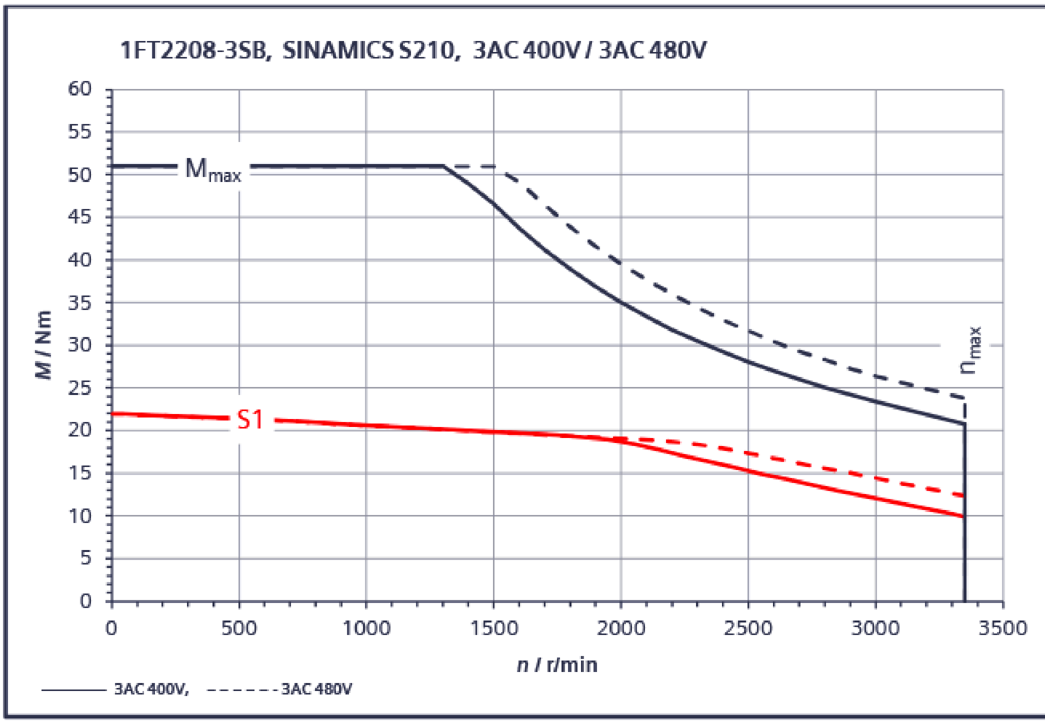
12.2.20.1 1FT2108-5SB connected to 3 AC 400 V / 3 AC 480 V

1FT2108-5SB	For 3 AC 400 V, 3 AC 480 V		
Technical specifications in the SINAMICS S210 system	**Symbol**	**Unit**	**Value**
Static torque	M_0	Nm	40
Stall current	I_0	A	15.5
Maximum permissible speed	n_{max}	r/min	3700
Maximum torque	$M_{max\ inv}$	Nm	100
Maximum current	I_{max}	A	61
Thermal time constant	T_{th}	min	16
Rotor moment of inertia	J_{mot}	$kgcm^2$	21.6
Rotor moment of inertia (with brake 1)	$J_{mot\ br}$	$kgcm^2$	25.6
Rotor moment of inertia (with brake 2)	$J_{mot\ br}$	$kgcm^2$	27.2
Weight	m_{mot}	kg	22.1
Weight (with brake 1)	$m_{mot\ br}$	kg	24.8
Weight (with brake 2)	$m_{mot\ br}$	kg	24.9
Rated data for S210 connected to 3 AC 400 V, 3 AC 480 V			
Rated speed	n_{rated}	r/min	1500
Rated torque	M_{rated}	Nm	35.5
Rated current	I_{rated}	A	14.9
Rated power	P_{rated}	kW	5.6



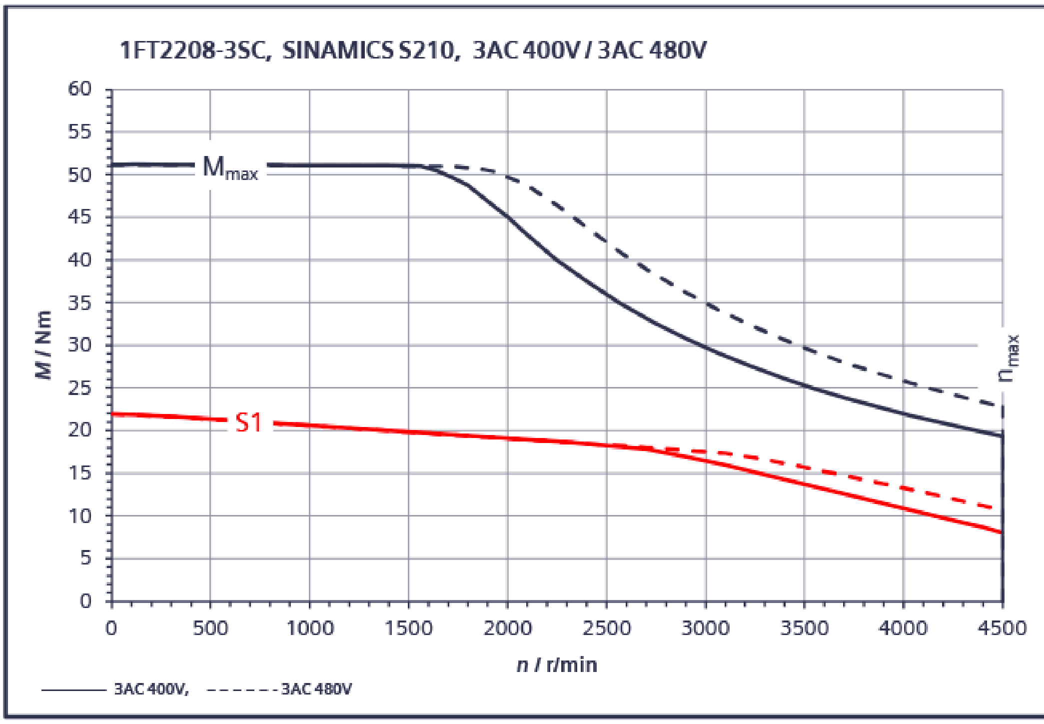
12.2.20.2 1FT2208-3SB connected to 3 AC 400 V / 3 AC 480 V

1FT2208-3SB	For 3 AC 400 V, 3 AC 480 V		
Technical specifications in the S210 system	**Abbreviation**	**Unit**	**Value**
Static torque	M_0	Nm	22
Stall current	I_0	A	7.8
Max. permissible speed	$n_{max\ inv}$	r/min	3350
Maximum torque	M_{max}	Nm	51
Maximum current	I_{max}	A	20.5
Thermal time constant	T_{th}	min	12
Moment of inertia	J_{mot}	kg cm^2	29.6
Moment of inertia (with brake 1)	$J_{mot\ br\ 1}$	kg cm2	32.6
Moment of inertia (with brake 2)	$J_{mot\ br\ 2}$	kg cm2	35.1
Weight (without brake)	m_{mot}	kg	14.9
Weight (with brake 1)	$m_{mot\ br\ 1}$	kg	17.1
Weight (with brake 2)	$m_{mot\ br\ 2}$	kg	17.7
Rated data 3 AC 380 ... 480 V			
Rated speed	n_{rated}	r/min	1500
Rated torque	M_{rated}	Nm	19.9
Rated current	I_{rated}	A	7.3
Rated power	P_{rated}	kW	3.1



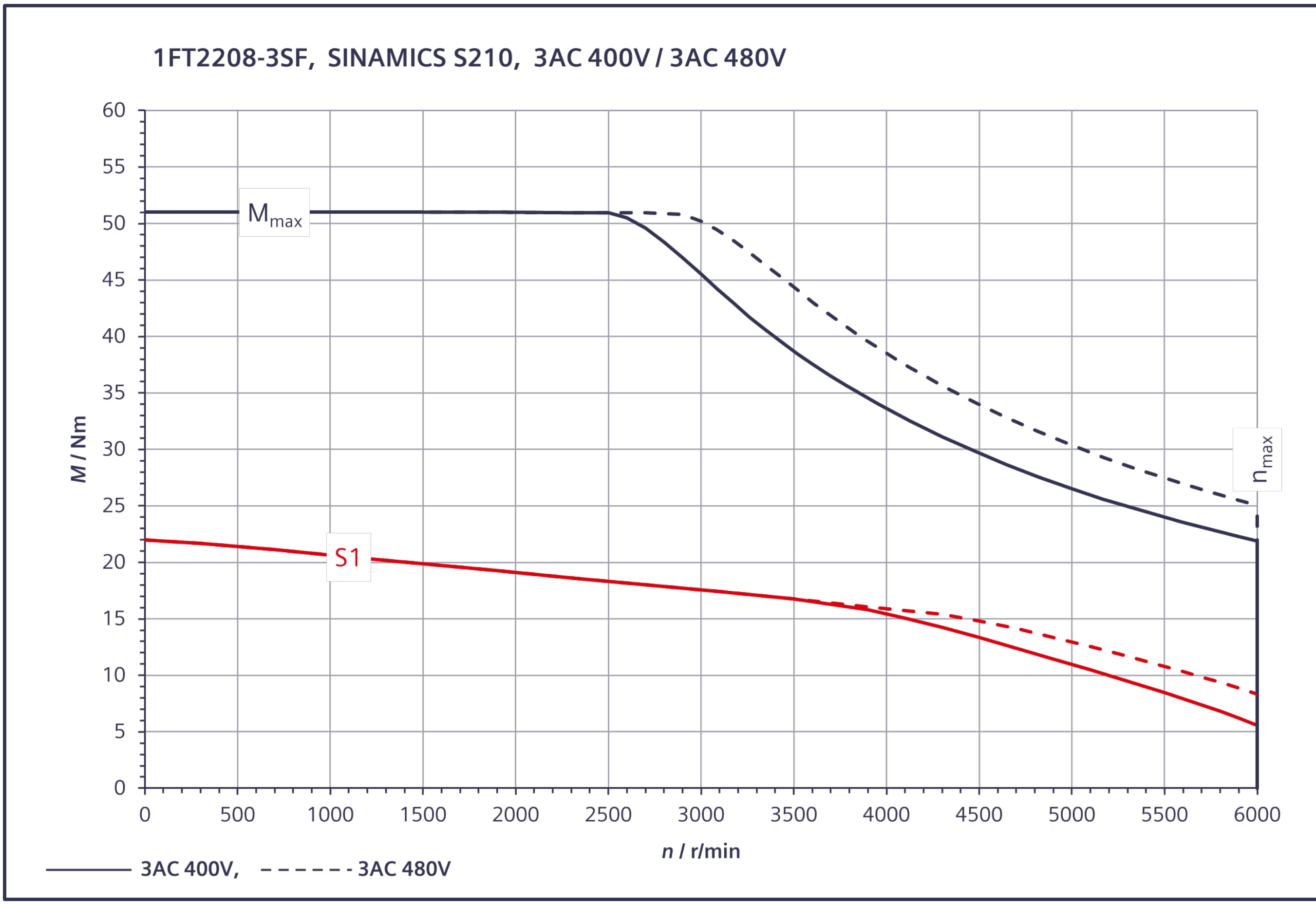
12.2.20.3 1FT2208-3SC connected to 3 AC 400 V / 3 AC 480 V

1FT2208-3SC	For 3 AC 400 V, 3 AC 480 V		
Technical specifications in the SINAMICS S210 system	**Symbol**	**Unit**	**Value**
Static torque	M_0	Nm	22
Stall current	I_0	A	10.4
Maximum permissible speed	n_{max}	r/min	4500
Maximum torque	M_{max}	Nm	51
Maximum current	I_{max}	A	29.5
Thermal time constant	T_{th}	min	12
Rotor moment of inertia	J_{mot}	$kgcm^2$	29.6
Rotor moment of inertia (with brake 1)	$J_{mot\ br\ 1}$	$kgcm^2$	32.6
Rotor moment of inertia (with brake 2)	$J_{mot\ br\ 2}$	$kgcm^2$	35.1
Weight	m_{mot}	kg	14.9
Weight (with brake 1)	$m_{mot\ br\ 1}$	kg	17.1
Weight (with brake 2)	$m_{mot\ br\ 2}$	kg	17.7
Rated data for S210 connected to 3 AC 400 V, 3 AC 480 V			
Rated speed	n_{rated}	r/min	2000
Rated torque	M_{rated}	Nm	19.1
Rated current	I_{rated}	A	9.5
Rated power	P_{rated}	kW	4



12.2.20.4 1FT2208-3SF connected to 3 AC 400 V / 3 AC 480 V

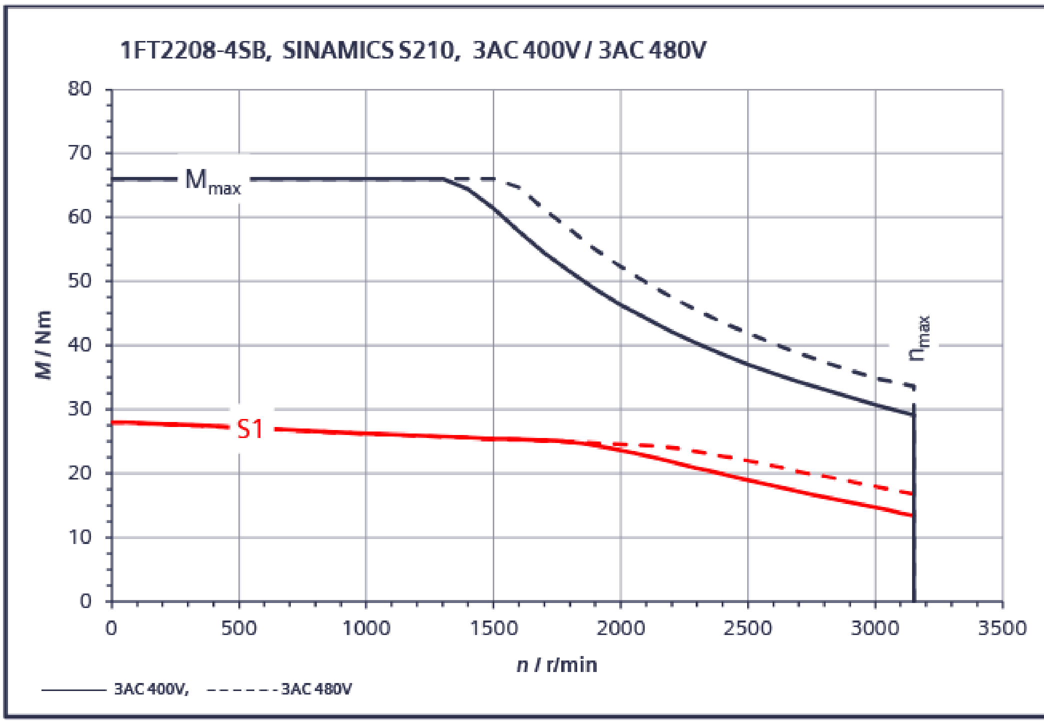
1FT2208-3SF	For 3 AC 400 V, 3 AC 480 V		
Technical specifications in the SINAMICS S210 system	**Symbol**	**Unit**	**Value**
Static torque	M_0	Nm	22
Stall current	I_0	A	14.1
Maximum permissible speed	n_{max}	r/min	6000
Maximum torque	M_{max}	Nm	51
Maximum current	I_{max}	A	40
Thermal time constant	T_{th}	min	12
Rotor moment of inertia	J_{mot}	$kgcm^2$	29.6
Rotor moment of inertia (with brake 1)	$J_{mot\ br\ 1}$	$kgcm^2$	32.6
Rotor moment of inertia (with brake 2)	$J_{mot\ br\ 2}$	$kgcm^2$	35.1
Weight	m_{mot}	kg	14.9
Weight (with brake 1)	$m_{mot\ br\ 1}$	kg	17.1
Weight (with brake 2)	$m_{mot\ br\ 2}$	kg	17.7
Rated data for S210 connected to 3 AC 400 V, 3 AC 480 V			
Rated speed	nN	r/min	3000
Rated torque	MN	Nm	17.6
Rated current	IN	A	12.2
Rated power	PN	kW	5.5



12.2.20.5 1FT2208-4SB connected to 3 AC 400 V / 3 AC 480 V

1FT2208-4SB	For 3 AC 400 V, 3 AC 480 V		
Technical specifications in the S210 system	**Abbreviation**	**Unit**	**Value**
Static torque	M_0	Nm	28
Stall current	I_0	A	9.3
Max. permissible speed	$n_{max\ inv}$	r/min	3150
Maximum torque	M_{max}	Nm	66
Maximum current	I_{max}	A	25
Thermal time constant	T_{th}	min	13
Moment of inertia	J_{mot}	kg cm²	38.8
Rotor moment of inertia (with brake 1)	$J_{mot\ br\ 1}$	kgcm²	44.4
Rotor moment of inertia (with brake 2)	$J_{mot\ br\ 2}$	kgcm2	-
Weight	m_{mot}	kg	17.5
Weight (with brake 1)	$m_{mot\ br\ 1}$	kg	20.3
Weight (with brake 2)	$m_{mot\ br\ 2}$	kg	-
Rated data 3 AC 380 ... 480 V			

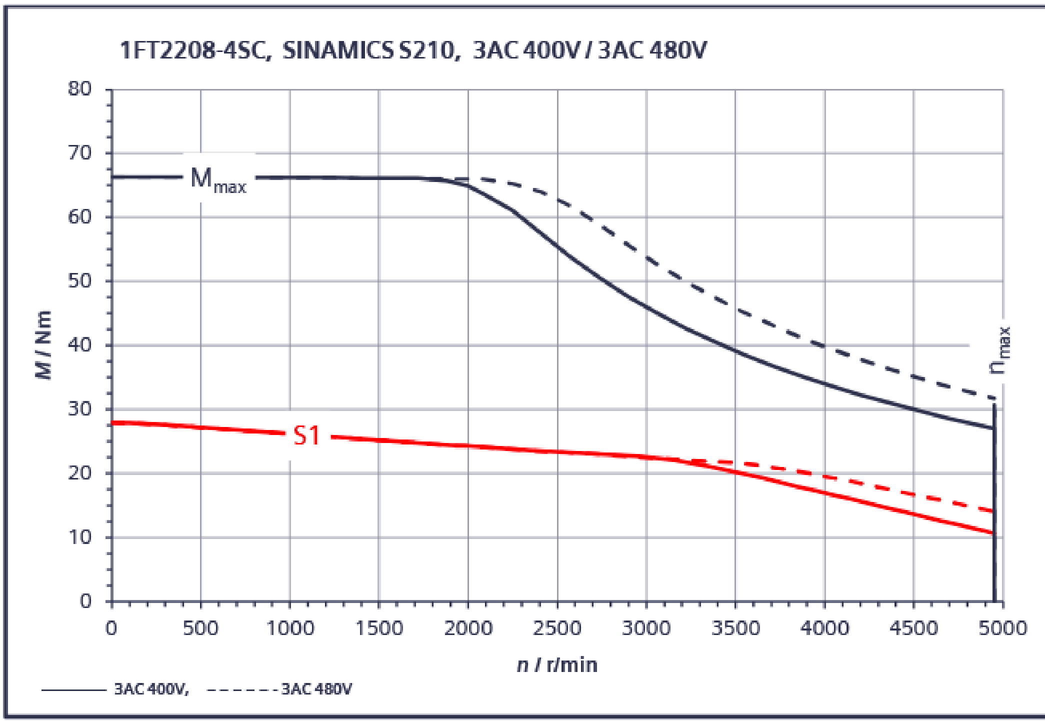
Rated speed	n_{rated}	r/min	1500
Rated torque	M_{rated}	Nm	25.5
Rated current	I_{rated}	A	8.8
Rated power	P_{rated}	kW	4



12.2.20.6 1FT2208-4SC connected to 3 AC 400 V / 3 AC 480 V

1FT2208-4SC	For 3 AC 400 V, 3 AC 480 V		
Technical specifications in the SINAMICS S210 system	**Symbol**	**Unit**	**Value**
Static torque	M_0	Nm	28
Stall current	I_0	A	14.6
Maximum permissible speed	n_{max}	r/min	4950
Maximum torque	M_{max}	Nm	66
Maximum current	I_{max}	A	43.5
Thermal time constant	T_{th}	min	13
Rotor moment of inertia	J_{mot}	kgcm^2	38.8
Rotor moment of inertia (with brake 1)	$J_{mot\ br\ 1}$	kgcm^2	44.4
Rotor moment of inertia (with brake 2)	$J_{mot\ br\ 2}$	kgcm2	-
Weight	m_{mot}	kg	17.5
Weight (with brake 1)	$m_{mot\ br\ 1}$	kg	20.3
Weight (with brake 2)	$m_{mot\ br\ 2}$	kg	-
Rated data for S210 connected to 3 AC 400 V, 3 AC 480 V			

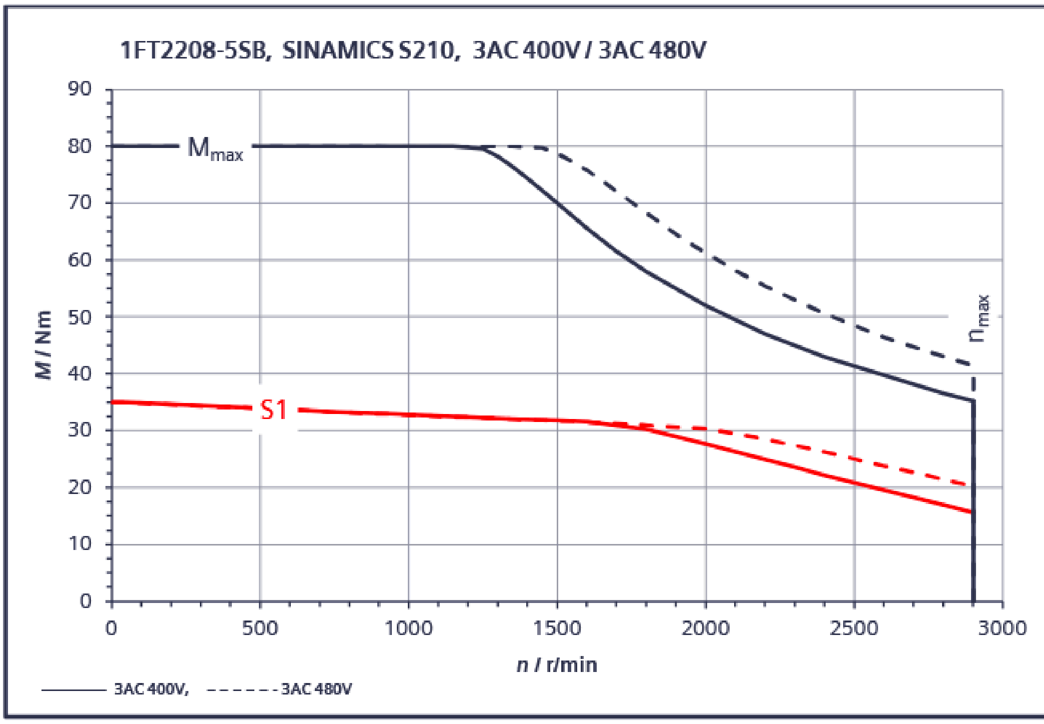
1FT2208-4SC	For 3 AC 400 V, 3 AC 480 V		
Rated speed	n_{rated}	r/min	2000
Rated torque	M_{rated}	Nm	24
Rated current	I_{rated}	A	13.3
Rated power	P_{rated}	kW	5.1



12.2.20.7 1FT2208-5SB connected to 3 AC 400 V / 3 AC 480 V

1FT2208-5SB	For 3 AC 400 V, 3 AC 480 V		
Technical specifications in the SINAMICS S210 system	**Symbol**	**Unit**	**Value**
Static torque	M_0	Nm	35
Stall current	I_0	A	10.7
Maximum permissible speed	n_{max}	r/min	2900
Maximum torque	M_{max}	Nm	80
Maximum current	I_{max}	A	29.5
Thermal time constant	T_{th}	min	13
Rotor moment of inertia	J_{mot}	$kgcm^2$	48.1
Rotor moment of inertia (with brake 1)	$J_{mot\ br\ 1}$	$kgcm^2$	53.6
Rotor moment of inertia (with brake 2)	$J_{mot\ br\ 2}$	kgcm2	-
Weight	m_{mot}	kg	20
Weight (with brake 1)	$m_{mot\ br\ 1}$	kg	22.8
Weight (with brake 2)	$m_{mot\ br\ 2}$	kg	-

1FT2208-5SB	For 3 AC 400 V, 3 AC 480 V		
Rated data for S210 connected to 3 AC 400 V, 3 AC 480 V			
Rated speed	n_{rated}	r/min	1500
Rated torque	M_{rated}	Nm	32
Rated current	I_{rated}	A	10.2
Rated power	P_{rated}	kW	5



12.3 Technical specifications of the converter

12.3.1 Overload capability

Overload capability and shutdown behavior of the converter

The converter has integrated overload protection for the connected motor.

When delivered, the tripping threshold is 115% of the parameterized motor current. Brief overloads of up to 300% of the motor current are possible.

When the load exceeds the rated motor current, the thermal protection in the converter starts and switches off the motor in accordance with the overload characteristics shown below.

The following diagrams show the general characteristic for the converter. The maximum current of each converter is given in the technical data. It must not be exceeded irrespective of the overload characteristics.

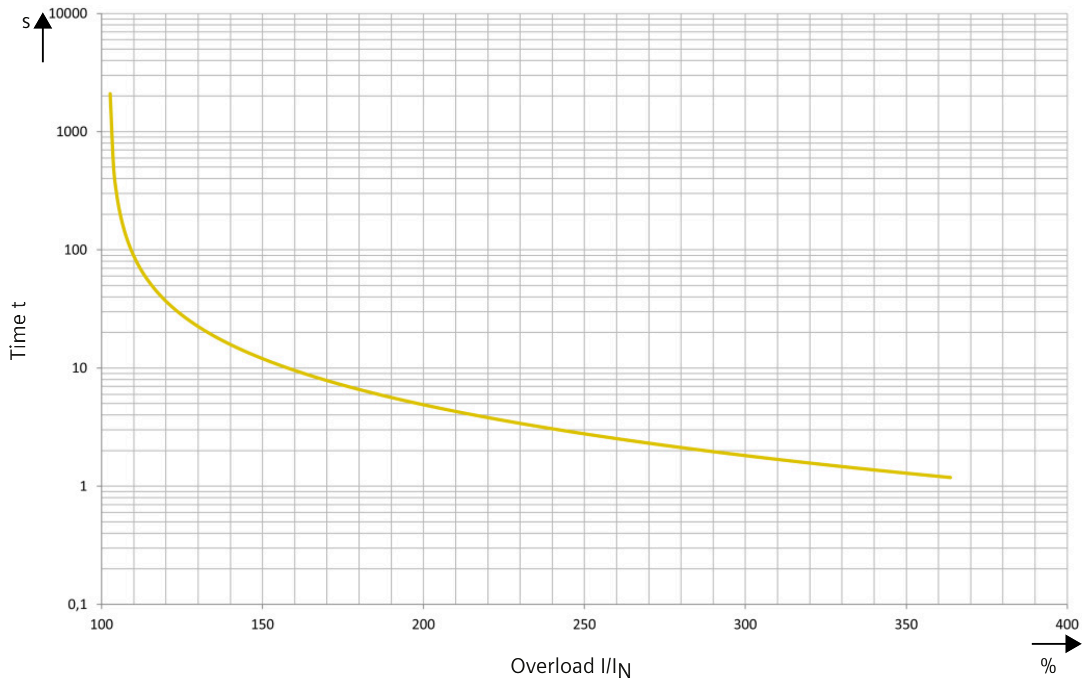


Figure 12-11 Overload characteristic for shutting down the converter with 1 AC line connection

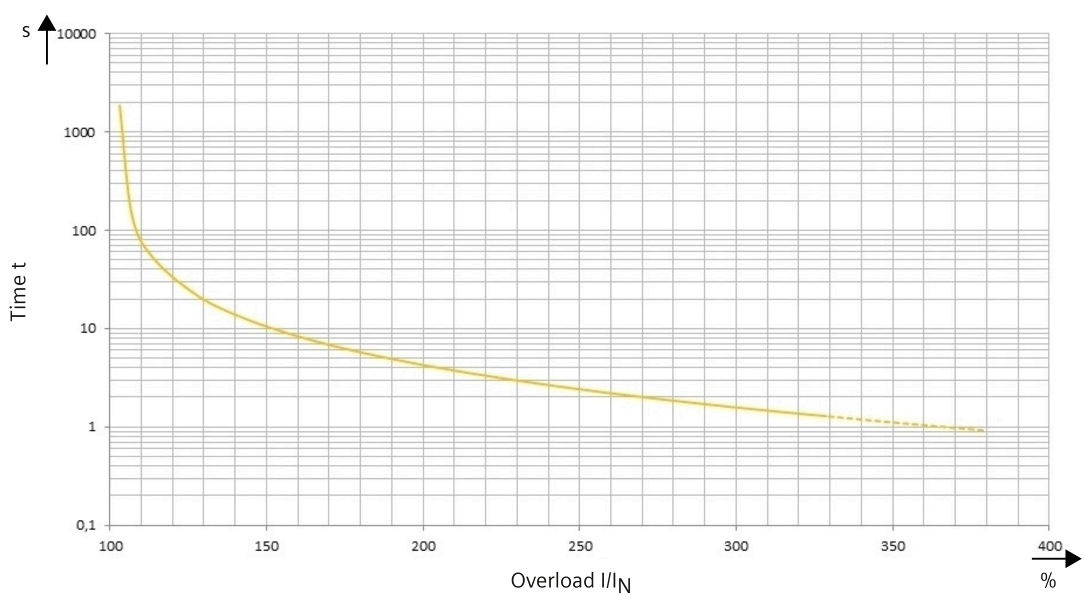


Figure 12-12 Overload characteristic for shutting down the converter with 3 AC line connection

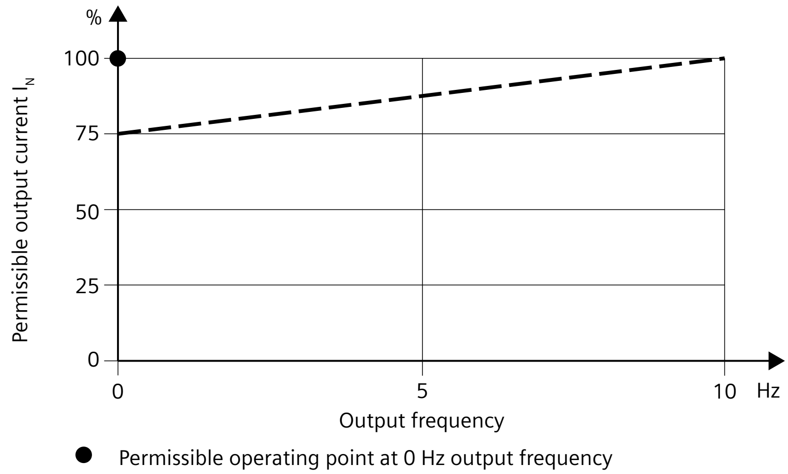


Figure 12-13 Permitted output current at low frequencies

Note

Using the TIA Selection Tool (TST)

As a result of the combination possibilities (smaller motor connected to a larger converter and vice verse), the response cannot be covered solely by the diagram. The TIA Selection Tool is required for this purpose.

TIA selection tool (TST)

Use the TIA Selection Tool (TST) to configure a converter-motor combination, adapted to your specific machine. This allows the load profile to be more precisely checked for a selected drive configuration - even with more complex profiles.

- "TIA selection tool (https://www.siemens.com/tst)"

12.3.2 Electromagnetic compatibility according to IEC 61800-3

The intended and proper use of the converter is specified in the introduction to these operating instructions.

The converters described there are intended for operation in the second environment. In this environment, they meet all requirements relating to interference immunity.

For an EMC-compliant installation, observe the information provided in the Configuration Manual: EMC installation guideline (https://support.industry.siemens.com/cs/ww/en/view/60612658).

Maximum permissible cable lengths for the respective EMC categories

Table 12-11 Converters with 1 AC line connection

	Converters with internal line filter	Converters with additional external line filter
EMC category C2	10 m	25 m
EMC category C3	25 m	50 m

Table 12-12 Converters with 3 AC line connection

	Converters with internal line filter	Converters with additional external line filter
	without line/DC link coupling	
EMC category C2	---	25 m
EMC category C3	25 m	50 m
	with line or DC link coupling ≤ 6 converters[1)]	
EMC category C2	---	100 m
EMC category C3	100 m	250 m

1) The data is applicable for the complete cable length of the motors whose converters are coupled with one another through an AC coupling or a DC link coupling.
The maximum cable length per motor is 25 m when using the internal line filter to achieve EMC Category C3 or an external line filter to achieve EMC Category C2.
When using an external line filter to achieve EMC category C3, the maximum cable length per motor is 50 m.

Note

To be observed for devices used in Category C2

In a residential environment this product may cause radio-frequency interference, which may make interference suppression measures necessary.

- Have qualified personnel carry out the installation and commissioning with suitable interference suppression measures.
- Use a suitable external line filter.

More information about external line filters is provided in Chapter "External line filters (Page 788)".

Note

To be observed for devices used in Category C3

In a residential environment this product may cause radio-frequency interference.

- Do not use this device in the first environment (residential area).

Note

Behavior regarding flicker

The flicker behavior can only be evaluated in a combination of the drive with an application (see IEC 61800-3, Section 6.2.4.2). The drive behaves passively in this regard, i.e. load fluctuations of the application will be visible without changes on the line side.

12.3.3 Protection from electromagnetic fields

Overview

Protection of workers from electromagnetic fields is specified in the European EMF Directive 2013/35/EU. This directive is implemented in national law in the European Economic Area (EEA). Employers are obligated to design workplaces in such a way that workers are protected from impermissibly strong electromagnetic fields.

To this end, assessments and/or measurements must be performed for workplaces.

General conditions

The following general conditions apply for the evaluations and measurements:

1. The laws for protection from electromagnetic fields in force in individual EU member states can go beyond the minimum requirements of the EMF Directive 2013/35/EU and always take precedence.
2. The ICNIRP 2010 limits for the workplace are the basis for the assessment.
3. The 26th BImSchV (German Federal Emission Protection Regulation) defines 100 µT (RMS) for the assessment of active implants.
   According to Directive 2013/35/EU, 500 µT (RMS) at 50 Hz is applicable here.
4. The routing of power cables has a significant impact on the electromagnetic fields that occur. Install and operate the components inside metallic cabinets in compliance with the documentation and use shielded motor cables (see "EMC Installation Guideline (https://support.industry.siemens.com/cs/ww/en/view/60612658)").

Evaluation of the converter

The converters are normally used in machines. The assessment and testing is based on DIN EN 12198-1 and IEC 62311.

Compliance with the limit values was assessed for the following frequencies:

- Line frequency 47 ... 63 Hz
- 8 kHz pulse frequency

The indicated minimum distances apply to the head and complete torso of the human body. Shorter distances are possible for extremities.

Table 12-13 Minimum distances to the converter

Individuals without active implants		Individuals with active implants	
Control cabinet closed	**Control cabinet open**	**Control cabinet closed**	**Control cabinet open**
0 cm	Forearm length (approx. 35 cm)	Must be separately assessed depending on the active implant.	

12.3.4 Permissible environmental conditions for the converter

Property	Version
Ambient conditions for transport in the transport packaging	
Climatic ambient conditions	-40 °C ... +70 °C, according to Class 2K4 to IEC 60721-3-2:1997 maximum humidity 95% at 40 °C
Mechanical ambient conditions	Shocks and vibrations permissible according to 3M2 to IEC 60721-3-2:1997
Protection against chemical substances	Protected according to Class 2C2 to IEC 60721-3-2:1997
Biological environmental conditions	Suitable according to Class 2B2 to IEC 60721-3-2:1997
Ambient conditions for long-term storage in the product packaging	
Climatic ambient conditions	-25 °C ... +55 °C, according to Class 1K4 to IEC 60721-3-1:1997
Protection against chemical substances	Protected according to Class 1C2 to IEC 60721-3-1:1997
Biological environmental conditions	Suitable according to Class 1B2 to IEC 60721-3-1:1997
Ambient conditions in operation	
Installation altitude	• up to 1000 m above sea level without derating • up to 4000 m, derating, see the following table
Climatic ambient conditions	• Temperature range -10 °C ... +50 °C • Relative humidity: 5 ... 95%, condensation not permitted • Oil mist, salt mist, ice formation, condensation, dripping water, spraying water, splashing water and water jets are not permitted Increased ruggedness regarding temperature range and relative humidity; therefore better than 3K3 according to IEC 60721-3-3:2002
Mechanical ambient conditions	• Vibration levels permissible according to Class 3M2 to IEC 60721-3-3:2002 Vibration test in operation according to IEC 60068-2-6 Test Fc (sinusoidal) – 2 Hz ... 9 Hz: 1.5 mm deflection amplitude – 9 Hz ... 200 Hz: 0.5 g acceleration amplitude – 10 frequency cycles per axis • Shocks permissible according to Class 3M2 to IEC 60721-3-3:2002 Shock test in operation according to IEC 60068-2-27 Test Ea (semi sinusoidal) – 5 g peak acceleration – 30 ms duration – 3 shocks in all three axes in both directions
Protection against chemical substances	• Protected according to Class 3C2 to IEC 60721-3-3:2002 • Protected according to Class 3C3 for H_2S and SO_2 to IEC 60721-3-3:2002 • Protected according to Class G3 to ANSI/ISA 71.04:2013
Biological environmental conditions	Suitable according to Class 3B2 to IEC 60721-3-3:2002
Pollution	Suitable for environments with degree of pollution 2 acc. to IEC 61800-5-1

Table 12-14 Maximum permissible output current depending on the installation altitude and ambient temperature

Installation altitude	Ambient temperature in °C		
	50	**45**	**40**
	Output current as a %		
Up to 1000 m	100		
Up to 2000 m	90	100	
Up to 3000 m	80	90	100
Up to 4000 m	70	80	90

A maximum of 2000 m is permissible for CSA compliance.

12.3.5 General data

Property	Version
Line voltage	200 V 1 AC ... 240 V 1 AC, ±10% Line system configuration: Grounded TN/TT line systems and non-grounded IT line systems
	3 AC 200 V ... 240 V, ±10% 380 V ... 480 V 3 AC, ±10% Line system configuration: • Devices 6SL5310-1BE1.-.DF0: Grounded TN/TT line systems, non-grounded IT line systems only with isolation transformer • Devices 6SL5310-1BE1.-.DF1: Grounded TN/TT line systems and non-grounded IT line systems You can find more information in Chapter "Line connection conditions for the S210 converter system with the motors 1FK2/1FT2 (Page 521)".
Insulation resistance	The insulation resistance on the 24 V side is < 500 kOhm
Power failure-buffering concept	The converter is dimensioned so that there is no functional restriction at rated power (3 ms power dip or interruption according to IEC 61800-3 (2017)[1)]). The specified times can be several times longer depending on the drive constellation and the operating conditions. In particular in 3 AC devices in groups with DC link coupling in which some converters operate in the motor mode while others operate in generator mode, the time can be substantially longer. Based on these influencing factors, no generally valid statements can be made about the S210 system, however, so that each drive constellation must be assessed individually.
Output voltage	3 AC 0 V ... 0.95 x input voltage
Input frequency	50 Hz / 60 Hz, ±10 Hz
Output frequency	0 ... 550 Hz
Overvoltage category according to IEC/ EN 61800-5-1	The converter insulation is designed for surge voltages of overvoltage category III.
Pulse frequency	8 kHz
Short-circuit current rating (SCCR) and branch protection	≤ 65 kA rms Branch protection and short-circuit strength according to UL and IEC Protective Devices for SINAMICS S210 (https://support.industry.siemens.com/cs/ww/en/view/109815356)
Minimum prospective short-circuit current	To prevent fire in the event of a fault, a minimum value must be ensured for the prospective short-circuit current so that the upstream protective device trips quickly enough. A typical value when dimensioning is 20 to 25 x[2)] the rated current of the protection device used.
Braking resistor	Integrated in the device[3)], when required, a larger resistor can be externally connected.
Service life of fan (3 AC only)	40000 h
Degree of protection according to IEC 60529	IP20 Must be installed in a control cabinet

Property	Version			
Electronics power supply	24 V DC, -15% ... +20%, (PELV or SELV) For PELV systems, grounding must be carried out via the external power supply.			
	Current requirements from electronic power supply at 24 V DC (motor without brake)			
		Frame size	Current requirements [A]	
	1 AC devices	FSA - FSC	0.8	
	3 AC devices	FSA FSB FSC	0.9 1.0 1.2	
	Additional current requirements for 1F☐2 servomotor with brake (at 24 V DC)			
	Motor type	Current when opening, typical[4] (to open the brake)	Duration of the current when opening After expiration of t_{oex}, the holding current takes effect	Holding current (with open brake)
		I_o / A	t_{oex} / ms	I_h / A
	1F☐2102	0.6	50	0.1
	1F☐2☐03	0.8	60	0.15
	1F☐2☐04	1.2	80	0.2
	1F☐2☐05	1.1	120	0.3
	1F☐2☐06	1.1	120	0.35
	1FT2108			
	1FT2208-2 1F☐2210-3	1.2	120	0.4
	1F☐2208-4 1F☐2208-5 1FT2210-2 1F☐2210-3	1.4	180	0.5
	1F☐2210-4 1F☐2210-5	1.5	200	0.5
	Higher performance brake			
	1FT2108			
	1FT2208-2 1FT2208-3	1.4	180	0.5
	1FT2210-2 1FT2210-3	1.5	200	0.5
	The brake output voltage is controlled internally. Therefore, with a deviating input voltage at terminal X124, the brake currents must be converted accordingly (constant power). It is not necessary to adjust the input voltage to the cable length. For more information on the motor brake, refer to the technical specifications in Chapter "Holding brake data (Page 545)".			
Control mode	Servo control			

Property	Version
Switch-on frequency minimum precharging cycle	120 s[5)]
Protection functions	Ground fault protection, output short-circuit protection, overvoltage/undervoltage protection, I^2t detection, IGBT overtemperature protection

1) When operating 3 AC devices on a voltage of 3 AC 200 V ... 240 V, the 3 ms may possibly not be reached depending on the operating conditions.

2) To comply with permissible line harmonics, depending on the line connection conditions, different values may be required.

3) The 1 AC 200 ... 240 V 100 W device does not have an internal braking resistor. An internal braking resistor is not required for normal operation as a result of the available DC link capacitance.

4) Typical value for 20 °C ambient temperature. At -15 °C, the break-induced currents can increase by up to 30%.

5) Shorter precharging cycles may result in a shorter service life.

Table 12-15 Technical data of the digital inputs

Type	High-speed digital inputs for probe or homing marks	Failsafe Digital Input (F-DI)	Digital input for monitoring the temperature of an external braking resistor
Number	**2 (DI 0, DI 1)**	**1 (DI 2 and DI 3)**	**1 (DI 4)**
• Low level	-30 V ... +5 V and ≤ 2 mA	-30 V ... +5 V and ≤ 2 mA	-30 V ... +5 V and ≤ 2 mA
• High level	15 V ... 30 V	15 V ... 30 V	15 V ... 30 V
• Current consumption	6 mA	5 mA	6 mA
• Delay time, typ. L → H	5 μs	50 μs	5 μs
• Delay time, typ. H → L	50 μs	100 μs	50 μs
• Electrical isolation	No	Yes	No
Conductor cross section, max.	1.5 mm²	1.5 mm²	1.5 mm²

The inputs correspond to Type 1 according to EN 61131-2.

12.3.6 Specific data of the converter with 1 AC line connection

Table 12-16 Frame size FSA, 1 AC

Article number	**6SL5310-1BB10-1CF0**	**6SL5310-1BB10-2CF0**
Rated output current	0.8 A	1.4 A
Maximum output current	3.1 A	4.8 A
Rated power	100 W	200 W
Rated input current	1.4 A	2.7 A
Inrush current[1)]	7.5 A	2.6 A
Maximum braking current at connector X1	2 A	2 A
Power loss	15.7 W	23.2 W
Fuse according to IEC Fuse according to UL, Class J	3NA3 801 (6 A) 6 A	3NA3 801 (6 A) 6 A
Cooling	Convection cooling without fan	Convection cooling without fan
Weight	1.1 kg	1.1 kg

Table 12-17 Frame size FSB 1 AC

Article number	**6SL5310-1BB10-4CF0**
Rated output current	2.4 A
Maximum output current	8.7 A
Rated power	400 W
Rated input current	5 A
Inrush current[1)]	3.9 A
Maximum braking current at connector X1	4 A
Power loss	38.5 W
Fuse according to IEC Fuse according to UL, Class J	3NA3 803 (10 A) 10 A
Cooling	Convection cooling without fan
Weight	1.2 kg

Table 12-18 Frame size FSC 1 AC

Article number	**6SL5310-1BB10-8CF0**
Rated output current	4.4 A
Maximum output current	16 A
Rated power	750 W
Rated input current	9.3 A
Inrush current[1)]	7.9 A
Maximum braking current at connector X1	6 A
Power loss	71.1 W

Article number	6SL5310-1BB10-8CF0
Fuse according to IEC Fuse according to UL, Class J	3NA3 805 (16 A) 20 A
Cooling	Convection cooling without fan
Weight	1.9 kg

[1)] The inrush currents may differ significantly if external braking resistors are used: Inrush current = (connection voltage × √2)/R_{ext}

12.3.7 Specific data of the converter with 3 AC line connection

Table 12-19 Frame size FSA, 3 AC

Article number	**6SL5310-1BE10-4DF.**	**6SL5310-1BE10-8DF.**
Rated output current	1.2 A	2.3 A
Maximum output current	4.2 A	7.6 A
Rated power	0.4 kW	0.75 kW
Rated input current	1.6 A	2.8 A
Inrush current[1)]	4.3 A	4.3 A
Maximum braking current at connector X4	5 A	5 A
Power loss	69 W	81 W
Fuse according to IEC Fuse according to UL, Class J	3NA3 805 (16 A) 15 A	3NA3 805 (16 A) 15 A
Cooling	Integrated fan	Integrated fan
Weight	2.1 kg	2.1 kg

Table 12-20 Frame size FSA, 3 AC

Article number	**6SL5310-1BE11-0DF.**	
Rated output current	3 A	
Maximum output current	10.9 A	
Rated power	1 kW	
Rated input current	3.8 A	
Inrush current[1)]	4.3 A	
Maximum braking current at connector X4	5 A	
Power loss	94 W	
Fuse according to IEC Fuse according to UL, Class J	3NA3 805 (16 A) 15 A	
Cooling	Integrated fan	
Weight	2.1 kg	

Table 12-21 Frame size FSB 3 AC

Article number	**6SL5310-1BE11-5DF.**	**6SL5310-1BE12-0DF.**
Rated output current	5 A	7 A
Maximum output current	19 A	24 A
Rated power	1.5 kW	2 kW
Rated input current	6.0 A	7.5 A
Inrush current[1)]	8.6 A	8.6 A
Maximum braking current at connector X4	10 A	10 A
Power loss	114 W	131 W

Article number	6SL5310-1BE11-5DF.	6SL5310-1BE12-0DF.
Fuse according to IEC Fuse according to UL, Class J	3NA3 812 (32 A) 30 A	3NA3 812 (32 A) 30 A
Cooling	Integrated fan	Integrated fan
Weight	3.3 kg	3.3 kg

Table 12-22 Frame size FSC 3 AC

Article number	6SL5310-1BE13-5DF.	6SL5310-1BE15-0DF.
Rated output current	9 A	12 A
Maximum output current	33 A	44 A
Rated power	3.5 kW	5 kW
Rated input current	12.5 A	15.0 A
Inrush current[1)]	27.7 A	27.7 A
Maximum braking current at connector X4	32 A	32 A
Power loss	167 W	191 W
Fuse according to IEC Fuse according to UL, Class J	3NA3 822 (63 A) 70 A	3NA3 822 (63 A) 70 A
Cooling	Integrated fan	Integrated fan
Weight	5 kg	5 kg

Table 12-23 Frame size FSC 3 AC

Article number	6SL5310-1BE17-0DF.
Rated output current	15 A
Maximum output current	55 A
Rated power	7 kW
Rated input current	17.9 A
Inrush current[1)]	27.7 A
Maximum braking current at connector X4	32 A
Power loss	204 W
Fuse according to IEC Fuse according to UL, Class J	3NA3 822 (63 A) 70 A
Cooling	Integrated fan
Weight	5 kg

[1)] The inrush currents may differ significantly if external braking resistors are used: Inrush current = (connection voltage × $\sqrt{2}$)/R_{ext}

12.4 Technical data and properties of the connection system

MOTION-CONNECT connection cables between the motor and the converter

The following technical data applies to the MOTION-CONNECT OCC cables.

Table 12-24 MOTION-CONNECT OCC cable with SPEED-CONNECT connector

Designation and use	For connection to motor	Connector size	Outer diameter	Minimum bending radius, static	Conductor cross-section	Article number[1]
			D_{max} / mm	*R* / mm	in mm²	
Motor connection cable MC500 OCC for predominantly fixed routing	1F□2□02 1F□2□03[2]	M12	9.7	23.5	0.38	6FX5002-8QN04-□□□□[4]
	1F□2□03[3] 1F□2□04 1F□2□05	M17	10.5	25.5	0.75	6FX5002-8QN08-□□□□
	1F□2□06 1F□2□08 1F□2□10	M23	12.7	30.7	1.5	6FX5002-8QN11-□□□□
			13.7	33.3	2.5	6FX5002-8QN21-□□□□ [6]
Motor connection cable MC800 OCC for use in a cable carrier	1F□2□02 1F□2□03[2]	M12	9.7	28.2	0.38	6FX8002-8QN04-□□□□[4]
			9.9	28.8	0.84	6FX8002-8QN06-□□□□[5]
	1F□2□03[3] 1F□2□04 1F□2□05	M17	10.5	30.6	0.75	6FX8002-8QN08-□□□□
	1F□2□06 1F□2□08 1F□2□10	M23	12.7	36.9	1.5	6FX8002-8QN11-□□□□
			13.7	39.9	2.5	6FX8002-8QN21-□□□□ [6]
Extension cable MC500 OCC for predominantly fixed routing	1F□2□02 1F□2□03[2]	M12	9.9	23.5	0.38	6FX5002-8QE04-□□□□[4]
	1F□2□03[3] 1F□2□04 1F□2□05	M17	10.5	25.5	0.75	6FX5002-8QE08-□□□□
	1F□2□06 1F□2□08 1F□2□10	M23	12.7	30.7	1.5	6FX5002-8QE11-□□□□
			13.7	33.3	2.5	6FX5002-8QE21-□□□□ [6]

Designation and use	For connection to motor	Connector size	Outer diameter	Minimum bending radius, static	Conductor cross-section	Article number[1]
			D_{max} / mm	*R* / mm	in mm²	
Extension cable MC800 OCC for use in a cable carrier	1F□2□02 1F□2□03[2]	M12	9.7	28.2	0.38	6FX8002-8QE04-□□□□[4]
			9.9	28.8	0.84	6FX8002-8QE06-□□□□[5]
	1F□2□03[3] 1F□2□04 1F□2□05	M17	10.5	30.6	0.75	6FX8002-8QE08-□□□□
	1F□2□06 1F□2□08 1F□2□10	M23	12.7	36.9	1.5	6FX8002-8QE11-□□□□
			13.7	39.9	2.5	6FX8002-8QE21-□□□□ [6]

1) The last 4 positions (□□□□) define the cable length corresponding to the length code.
2) Applicable for 1F□2□03-□□**G** with M12 connector
3) Applicable for 1F□2□03-□□**H** and 1F□2□03-□□**K** with M17 connector
4) For IEC applications
5) For UL applications (minimum conductor cross-section is independent of the current load)
6) Optionally available with 2.5 mm² due to derating in a warm environment

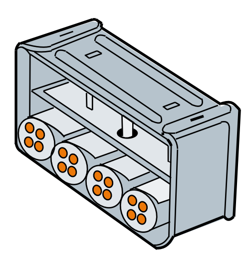
The length code can be found in Chapter "Determining the article number of a prefabricated OCC MOTION-CONNECT cable (Page 819)".

Technical data and notes for cable carrier use with MC800 PLUS

Note

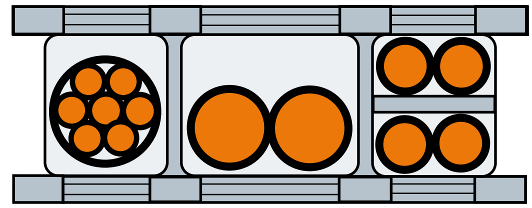
You require an MC800 PLUS cable to connect the motor using a cable carrier.

- When inserting prefabricated cables in the cable carrier, do not pull the connector, as this may damage the strain relief or cable clamping.



Strain relief in a cable carrier

- Lay the cables loosely in the carrier. They must be free to move. The cables must be free to move in particular in the bending radii of the carrier. Observe the specified minimal bending radii.



Cable routed in a cable carrier

- The cable fixings must be attached at both ends at an appropriate distance away from the end points of the moving parts in a dead zone.

When laying cables, comply with the instructions given by the cable carrier manufacturer.

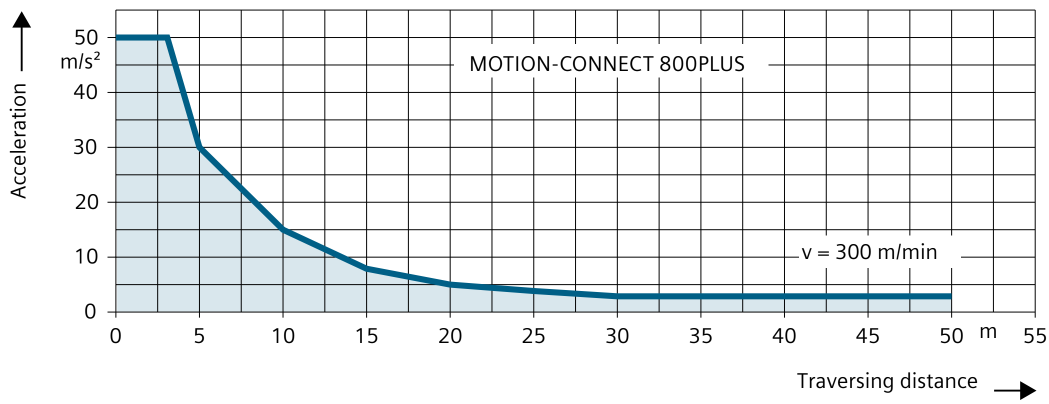


Figure 12-14 Permissible acceleration levels for MOTION-CONNECT 800 PLUS cables

---

Note

Additional fixing of the cable

If between the cable strain relief on the cable carrier and the terminal at the motor, part of the cable is hanging loose or is not routed, we recommend that the cable is additionally fixed for vibration load and with horizontal or vertical cable entries.

- Also fix the cable where the motor is fixed so that machine vibrations are not transferred to the connector.

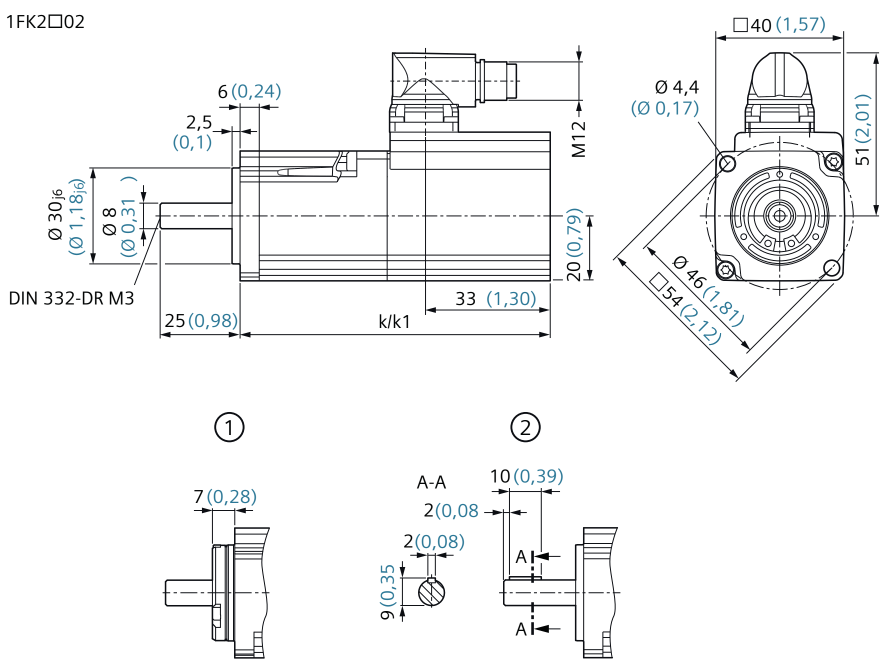
Dimension drawings

13

13.1 Dimension drawings of 1FK2 motors

13.1.1 Dimension drawings of 1FK2, frame size 20

All dimensions in mm (inches).



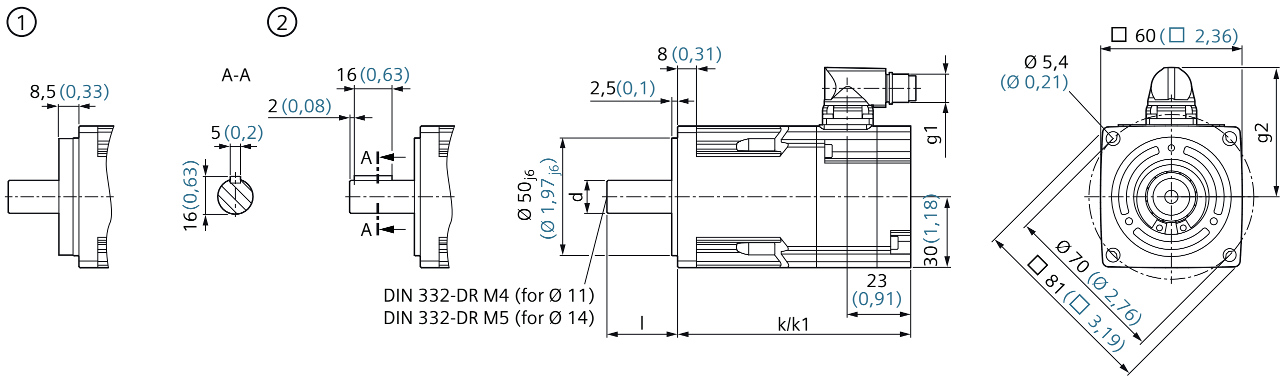
1 With shaft sealing ring (IP65) 2 With feather key

Figure 13-1 Dimension drawing 1FK2102

SIMOTICS S-1FK2 Frame size 20		Dimensions	
		Without brake	With brake
	DIN	k	k1
	IEC	LB	LB1
1FK2102-0A□		90 (3.54)	121 (4.76)
1FK2102-1A□		106 (4.17)	137 (5.39)

13.1.2 Dimension drawings of 1FK2, frame size 30

All dimensions in mm (inches).



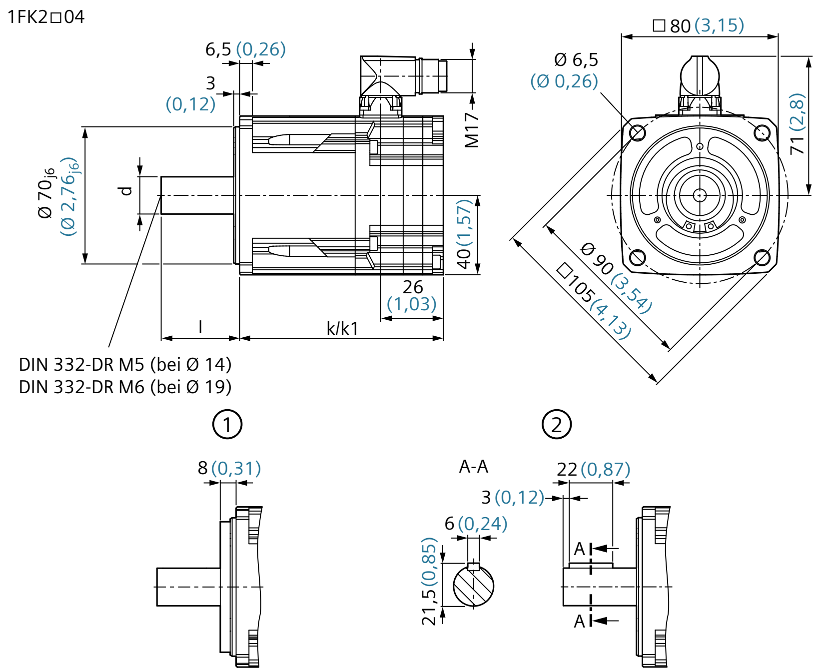
① With shaft sealing ring (IP65) ② With feather key

Figure 13-2 Dimension drawing 1FK2☐03

SIMOTICS S-1FK2 Frame size 30		Dimensions							
				Without brake	With brake	Shaft 14 x 30 mm		Shaft 11 x 23 mm	
	DIN	g1	g2	k	k1	d	l	d	l
	IEC			LB	LB1	D	L	D	L
1FK2☐03-2AG		M12	55 (2.17)	99 (3.9)	131 (5.16)	14_{h6} (0.55$_{h6}$)	30 (1.18)	11_{k6} (0.43$_{k6}$)	23 (0.91)
1FK2☐03-4AG				123 (4.84)	155 (6.10)	14_{h6} (0.55$_{h6}$)	30 (1.18)	11_{k6} (0.43$_{k6}$)	23 (0.91)
1FK2☐03-2AH 1FK2☐03-2AK		M17	60 (2.36)	99 (3.9)	131 (5.16)	14_{h6} (0.55$_{h6}$)	30 (1.18)	11_{k6} (0.43$_{k6}$)	23 (0.91)
1FK2☐03-4AH 1FK2☐03-4AK				123 (4.84)	155 (6.10)	14_{h6} (0.55$_{h6}$)	30 (1.18)	11_{k6} (0.43$_{k6}$)	23 (0.91)

13.1.3 Dimension drawings of 1FK2, frame size 40

All dimensions in mm (inches)



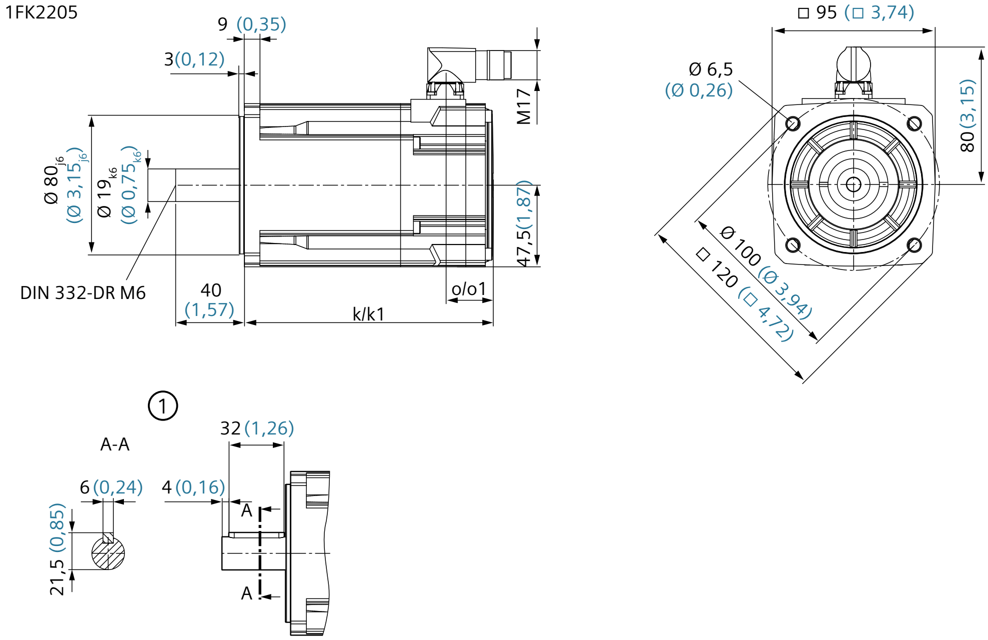
① With shaft sealing ring (IP65) ② With feather key

Figure 13-3 Dimension drawing 1FK2104

SIMOTICS S-1FK2 Frame size 40		Dimensions					
		Without brake	With brake	Shaft diam. 19 x 40		Shaft diam. 14 x 30	
	DIN	k	k1	d	l	d	l
	IEC	LB	LB1	D	L	D	L
1FK2□04-4A□		98 (3.86)	142 (5.59)	Diam. 19 k6 (diam. 0.75 k6)	40 (1.57)	Diam. 14 k6 (diam. 0.55 k6)	30 (1.18)
1FK2□04-5A□		126 (4.96)	170 (6.69)				
1FK2□04-6A□		144 (5.57)	188 (7.40)				

13.1.4 Dimension drawings of 1FK2, frame size 48

All dimensions in mm (inches).



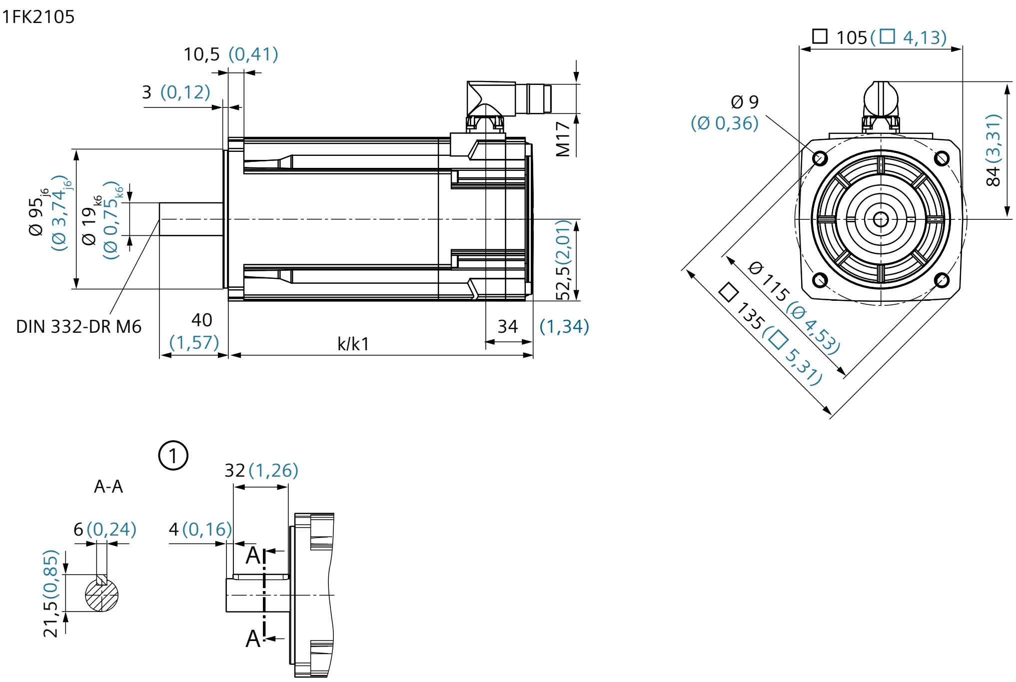
① With feather key

Figure 13-4 Dimension drawing, 1FK2205

SIMOTICS S-1FK2 Frame size 48		Dimensions			
		Without brake		With brake	
	DIN	k	o	k1	o1
	IEC	LB	-	LB1	-
1FK2205-2A☐		145 (5.71)	28 (1.1)	188 (7.4)	34 (1.34)
1FK2205-4A☐		177 (6.97)		220 (8.66)	

13.1.5 Dimension drawings of 1FK2, frame size 52

All dimensions in mm (inches).



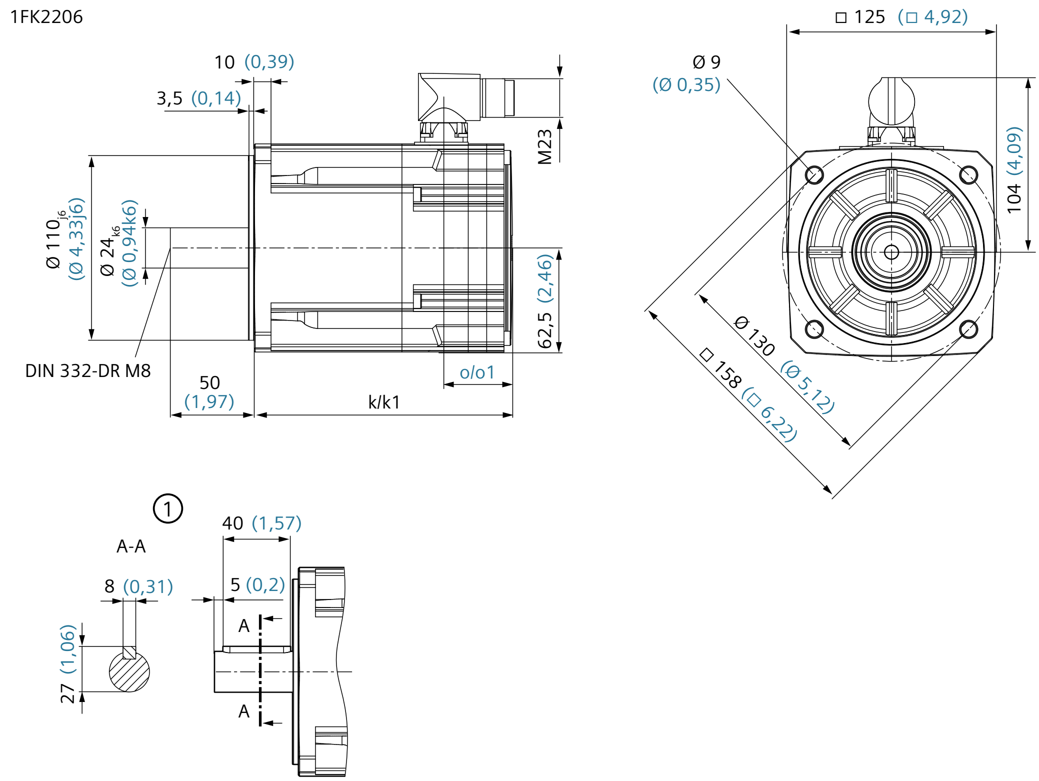
① With feather key

Figure 13-5 Dimension drawing, 1FK2105

SIMOTICS S-1FK2 Frame size 52		Dimensions	
		Without brake	With brake
	DIN	k	k1
	IEC	LB	LB1
1FK2105-4A☐		173 (6.81)	200 (7.87)
1FK2105-6A☐		215 (8.46)	242 (9.53)

13.1.6 Dimension drawings 1FK2, frame size 63

All dimensions in mm (inches).



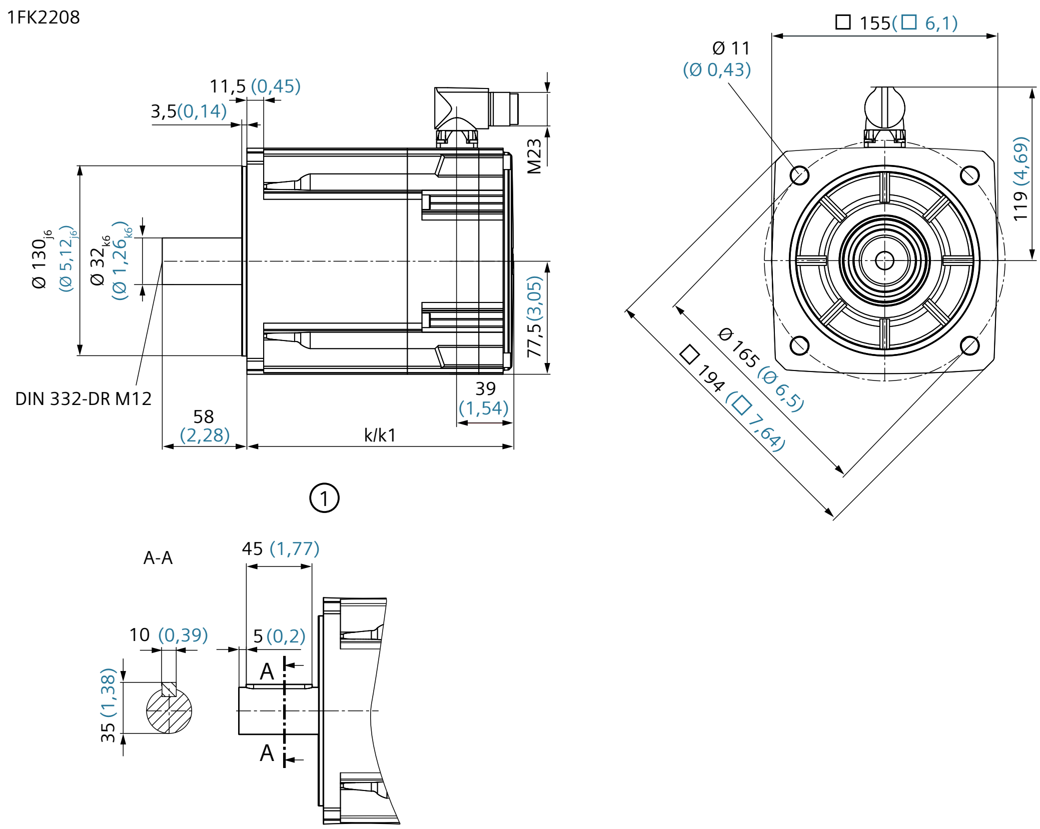
① With feather key

Figure 13-6 Dimension drawing, 1FK2☐06

SIMOTICS S-1FK2 Frame size 63		Dimensions			
		Without brake		With brake	
	DIN	k	o	k1	o1
	IEC	LB	-	LB1	-
1FK2206-2A☐		154 (6.06)	41 (1.61)	205 (8.07)	53 (2.09)
1FK2106-3A☐		174 (6.85)		225 (8.86)	
1FK2☐06-4A☐		193 (7.60)		244 (9.61)	
1FK2106-6A☐		232 (9.13)		283 (11.14)	

13.1.7 Dimension drawings of 1FK2, frame size 80

All dimensions in mm (inches).



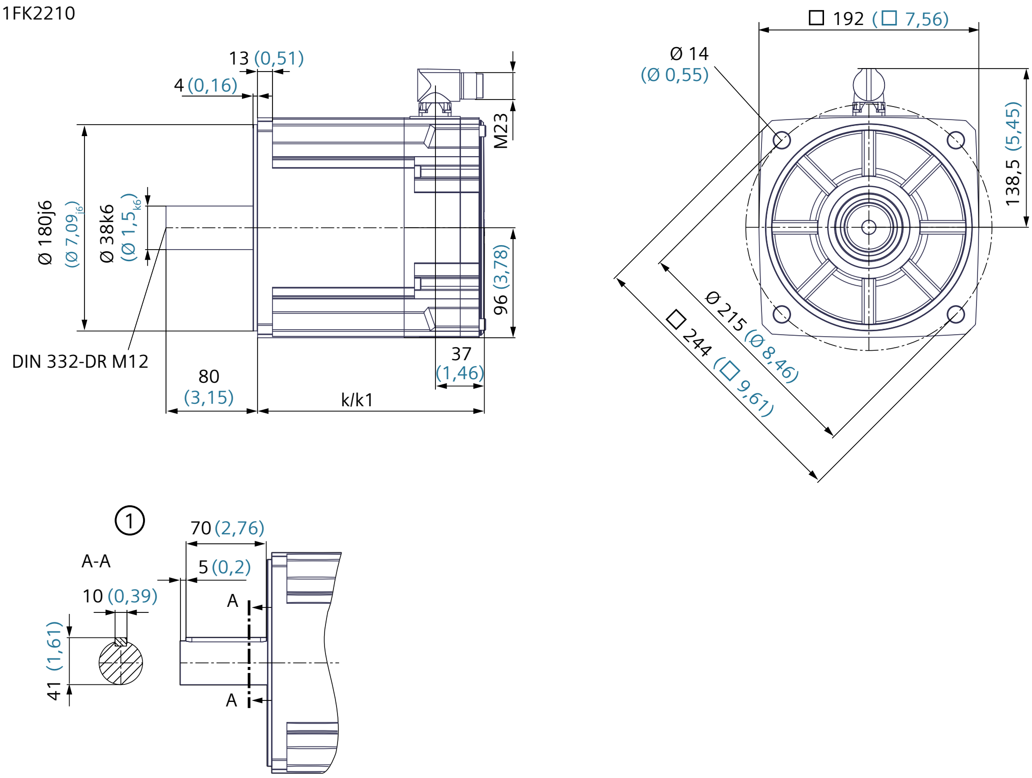
① With feather key

Figure 13-7 Dimension drawing, 1FK2208

SIMOTICS S-1FK2 Frame size 80		Dimensions	
		Without brake	**With brake**
	DIN	**k**	**k1**
	IEC	**LB**	**LB1**
1FK2208-3A□		183 (7.20)	236 (9.29)
1FK2208-4A□		203 (7.99)	256 (10.08)
1FK2208-5A□		223 (8.78)	276 (10.87)

13.1.8 Dimension drawings of 1FK2, frame size 100

All dimensions in mm (inches).



① With feather key

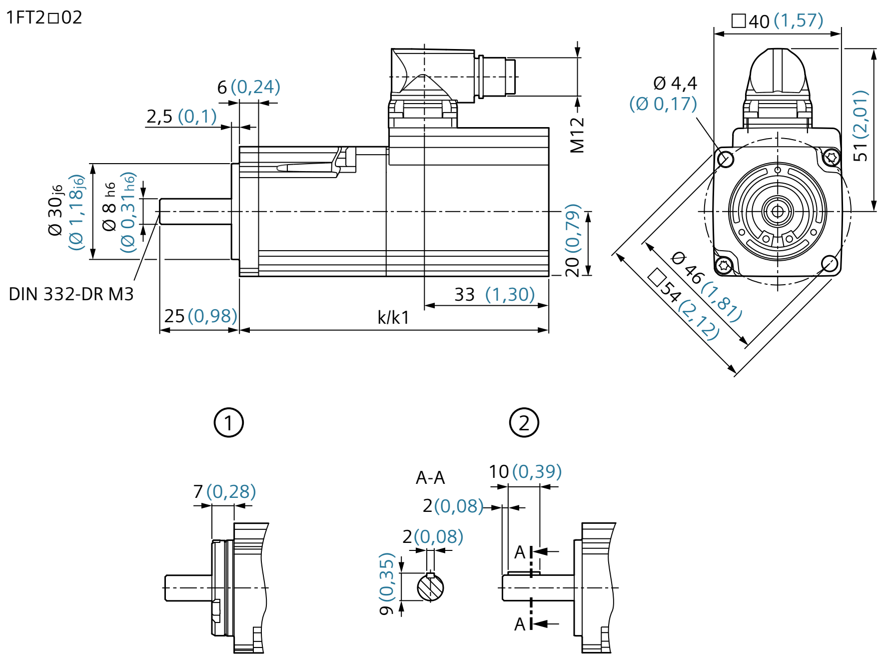
Figure 13-8 Dimension drawing, 1FK2210

SIMOTICS S-1FK2 Frame size 100		Dimensions	
		Without brake	With brake
	DIN	k	k1
	IEC	LB	LB1
1FK2210-3A☐		198 (7.80)	257 (10.12)
1FK2210-4A☐		223 (8.78)	282 (11.10)

13.2 Dimension drawings of 1FT2 motors

13.2.1 Dimension drawings of 1FT2, frame size 20

All dimensions in mm (inches).



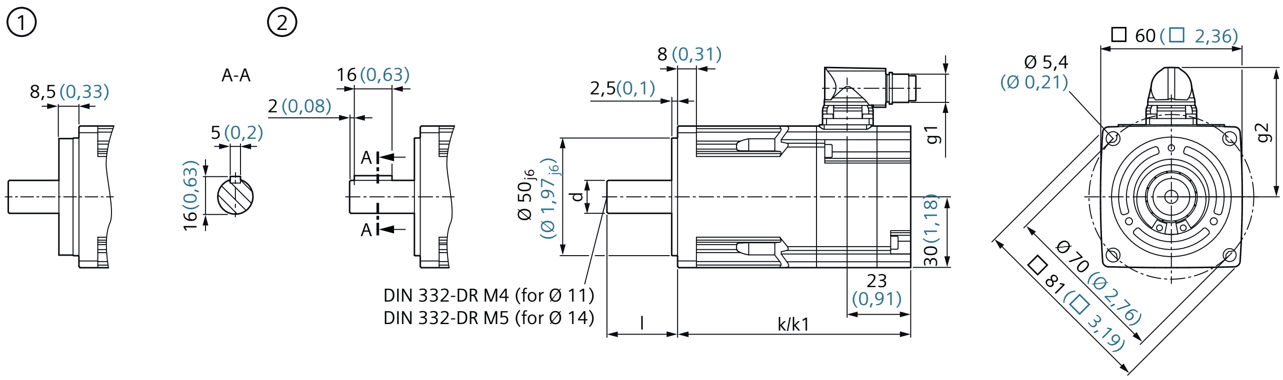
① With shaft sealing ring (IP65) ② With feather key

Figure 13-9 Dimension drawing 1FT2102

SIMOTICS S-1FT2 Frame size 20		Dimensions	
		Without brake	With brake
	DIN	k	k1
	IEC	LB	LB1
1FT2102-0A□		90 (3.54)	121 (4.76)
1FT2102-1A□		106 (4.17)	137 (5.39)

13.2.2 Dimension drawings of 1FT2, frame size 30

All dimensions in mm (inches).



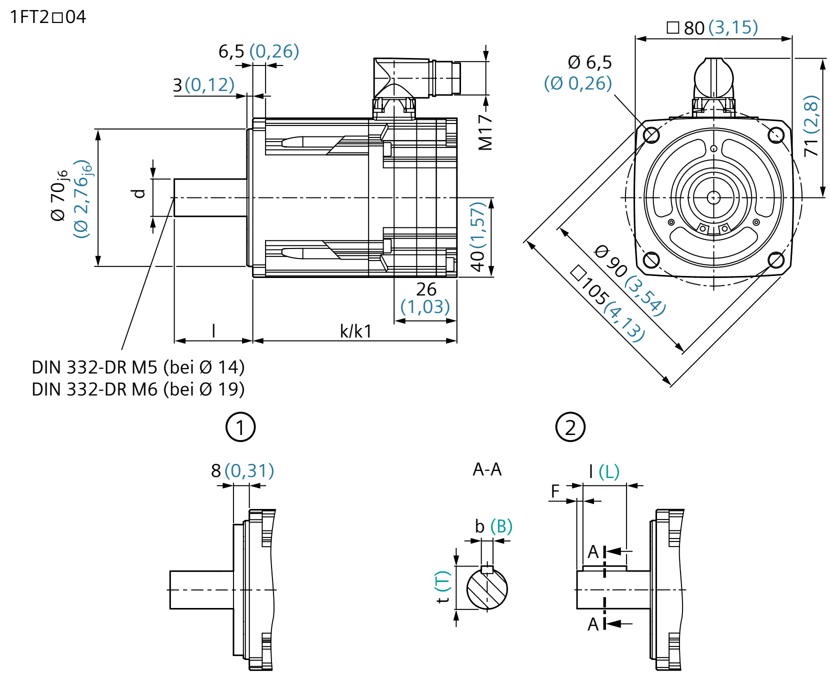
① With shaft sealing ring (IP65 and IP67)
② With feather key

Figure 13-10 Dimension drawing 1FT2103

SIMOTICS S-1FT2 Frame size 30		Dimensions							
				Without brake	With brake	Shaft 14 x 30 mm		Shaft 11 x 23 mm	
	DIN	g1	g2	k	k1	d	l	d	l
	IEC			LB	LB1	D	L	D	L
1FT2□03-2AG		M12	55 (2.17)	99 (3.9)	131 (5.16)	14_{h6} (0.55_{h6})	30 (1.18)	11_{k6} (0.43_{k6})	23 (0.91)
1FT2□03-4AG				123 (4.84)	155 (6.10)	14_{h6} (0.55_{h6})	30 (1.18)	11_{k6} (0.43_{k6})	23 (0.91)
1FT2□03-2AH 1FT2□03-2AK		M17	60 (2.36)	99 (3.9)	131 (5.16)	14_{h6} (0.55_{h6})	30 (1.18)	11_{k6} (0.43_{k6})	23 (0.91)
1FT2□03-4AH 1FT2□03-4AK				123 (4.84)	155 (6.10)	14_{h6} (0.55_{h6})	30 (1.18)	11_{k6} (0.43_{k6})	23 (0.91)

13.2.3 Dimension drawings of 1FT2, frame size 40

All dimensions in mm (inches)



① With shaft sealing ring (IP65 and IP67) ② With feather key

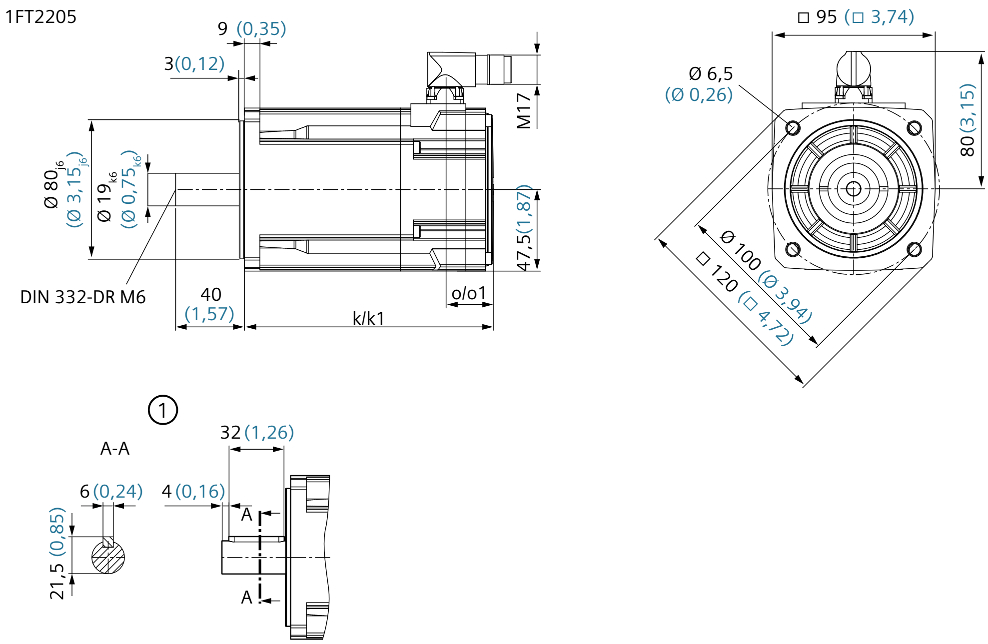
Figure 13-11 1FT2104 dimension drawing

SIMOTICS S-1FT2 Frame size 40		Dimensions					
		Without brake	With brake	Shaft diam. 19 x 40		Shaft diam. 14 x 30	
	DI	k	k1	d	l	d	l
	IEC	LB	LB1	D	L	D	L
1FT2□04-4A□		98 (3.86)	142 (5.59)	Diam. 19 $_{k6}$ (diam. 0.75 $_{k6}$)	40 (1.57)	Diam. 14 $_{k6}$ (diam. 0.55 $_{k6}$)	30 (1.18)
1FT2□04-5A□		126 (4.96)	170 (6.69)				
1FT2□04-6A□		144 (5.57)	188 (7.40)				

Motor frame size		Feather key dimensions							
		Shaft geometry "1"				Shaft geometry "3"			
	DIN	l	b	F	t	l	b	F	t
	IEC	L	B	F	T	L	B	F	T
1F□2□04		22 (0.87)	6 (0.24)	3 (0.12)	21.5 (0.85)	16 (0.63)	5 (0.2)	2 (0.08)	16 (0.63)

13.2.4 Dimension drawings of 1FT2, frame size 48

All dimensions in mm (inches).



① With feather key

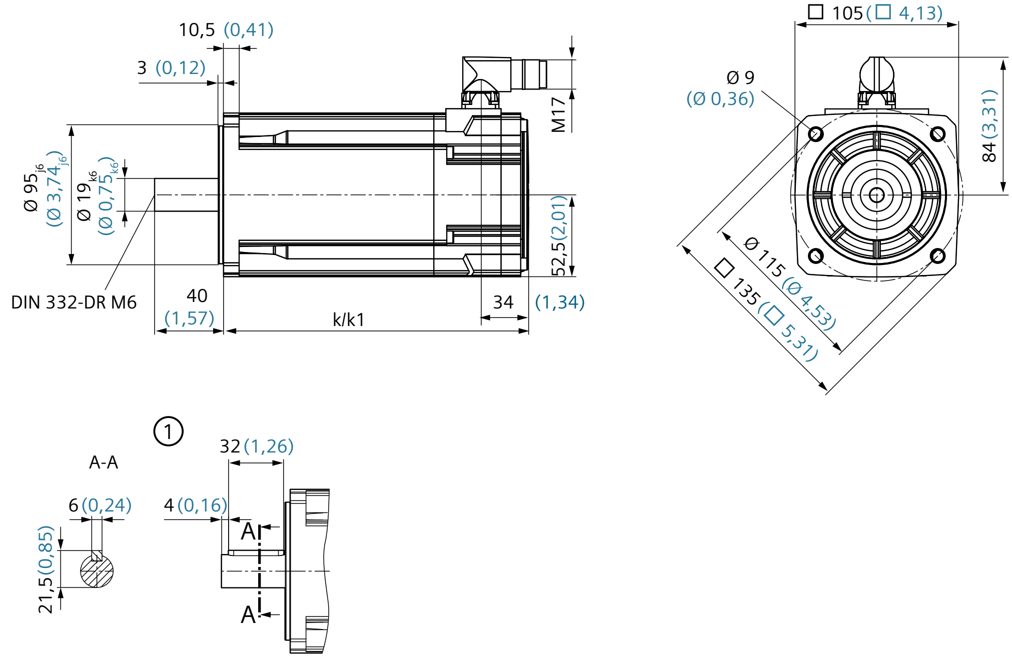
Figure 13-12 Dimension drawing of 1FT2205

SIMOTICS S-1FT2 Frame size 48		Dimensions			
		Without brake		With brake	
	DIN	k	o	k1	o1
	IEC	LB	-	LB1	-
1FT2205-2A☐		145 (5.71)	28(1.10)	188 (7.4)	34 (1.34)
1FT2205-4A☐		177 (6.97)		220 (8.66)	

13.2.5 Dimension drawings of 1FT2, frame size 52

All dimensions in mm (inches).

1FT2105



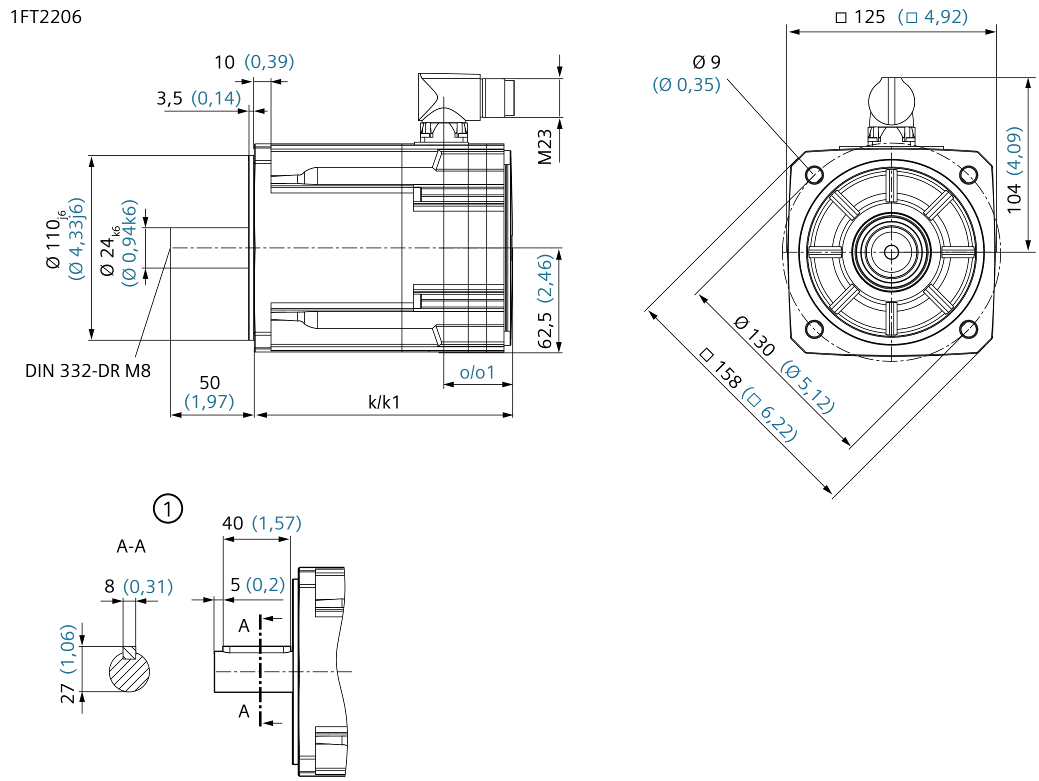
1 With feather key

Figure 13-13 Dimension drawing of 1FT2105

SIMOTICS S-1FT2 Frame size 52		Dimensions	
		Without brake	With brake
	DIN	k	k1
	IEC	LB	LB1
1FT2105-4A☐		173 (6.81)	200 (7.87)
1FT2105-6A☐		215 (8.46)	242 (9.53)

13.2.6 Dimension drawings 1FT2, frame size 63

All dimensions in mm (inches).



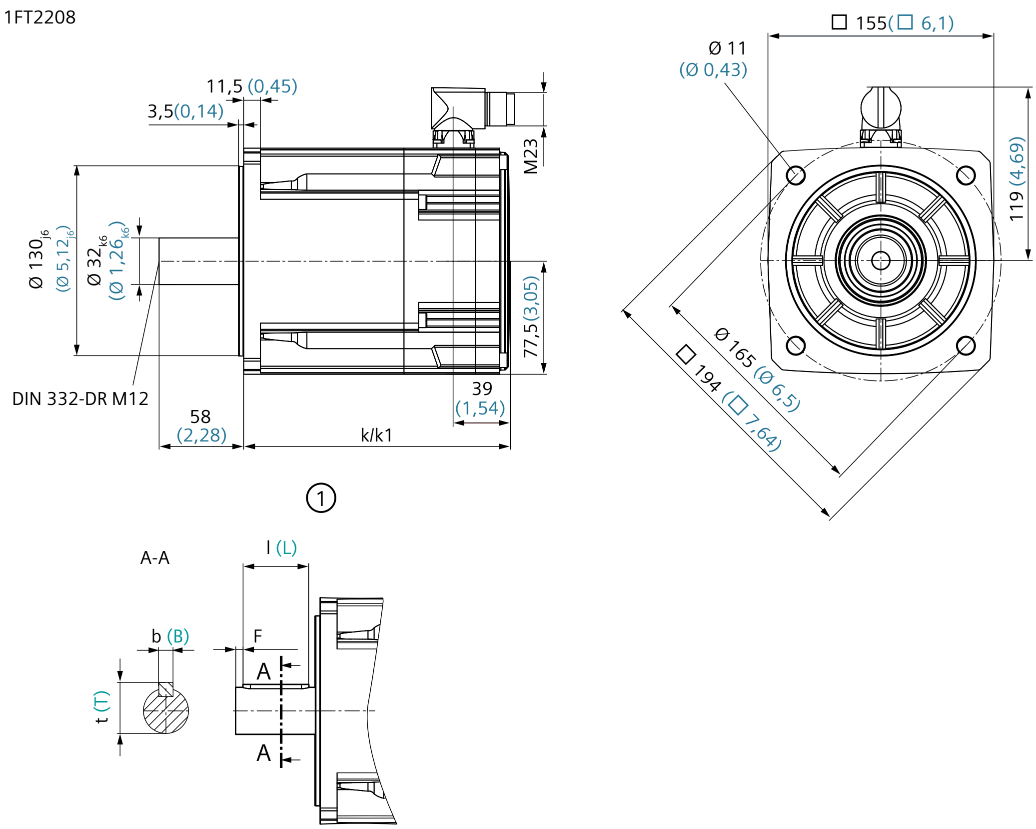
① With feather key

Figure 13-14 1FT2206 dimension drawing

SIMOTICS S-1FT2 Frame size 63		Dimensions			
		Without brake		With brake	
	DIN	k	o	k1	o1
	IEC	LB	-	LB1	-
1FT2206-2A☐		154 (6.06)	41 (1.61)	205 (8.07)	53 (2.09)
1FT2☐06-3A☐		174 (6.85)		225 (8.86)	
1FT2☐06-4A☐		193 (7.60)		244 (9.61)	
1FT2106-6A☐		232 (9.13)		283 (11.14)	

13.2.7 Dimension drawings of 1FT2, frame size 80

All dimensions in mm (inches).



① With feather key

Figure 13-15 1FT2208 dimension drawing

SIMOTICS S-1FT2 Frame size 80		Dimensions	
		Without brake	With brake
	DIN	k	k1
	IEC	LB	LB1
1FT2108-4A□		227 (8.94)	280 (11.0)
1FT2108-5A□		247 (9.72)	300 (11.8)
1FT2108-7A□		287 (11.3)	340 (13.4)
1FT2208-2A□		168 (6.61)	221 (8.7)
1FT2208-3A□		183 (7.20)	236 (9.29)
1FT2208-4A□		203 (7.99)	256 (10.08)
1FT2208-5A□		223 (8.78)	276 (10.87)

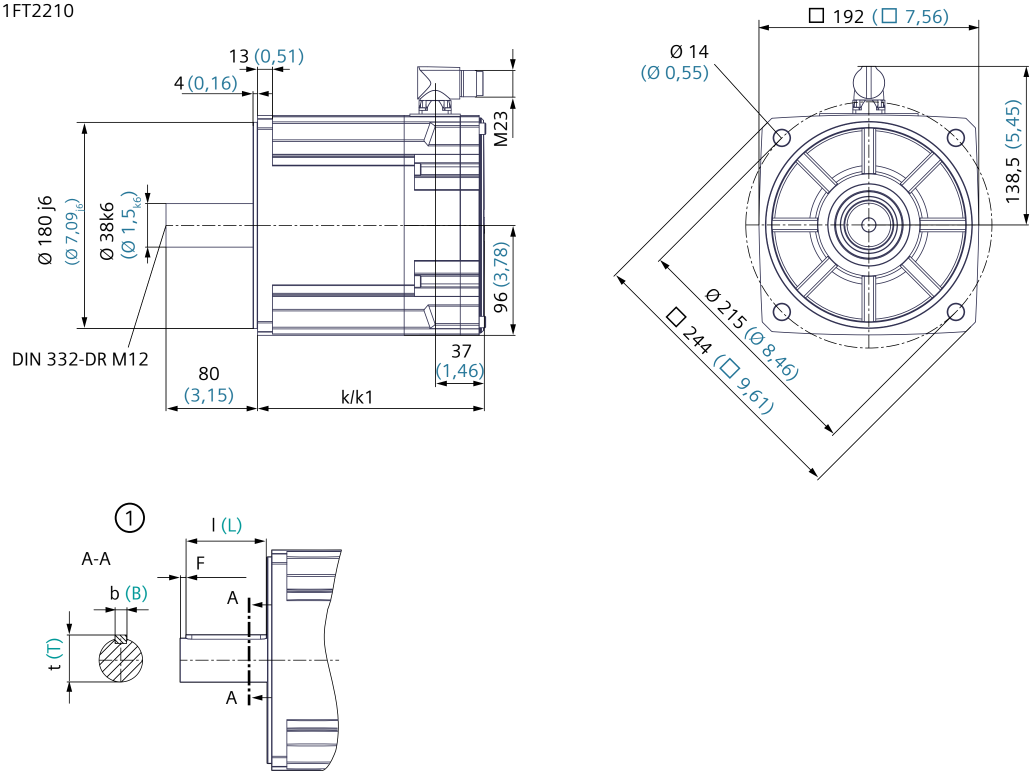
Motor frame size		Dimensions for the shaft geometry (13th position in the Article No.)			
		Shaft geometry "0" or "1"		Shaft geometry "2" or "3"	
	DIN	d	l	d	l
	IEC	D	L	D	L
1F☐2☐08		32 (k6) 1.26 (k6)	58 2.28	24 (k6) 0.94 (k6)	50 1.97

Motor frame size		Feather key dimensions							
		Shaft geometry "1"				Shaft geometry "1"			
	DIN	l	b	F	t	l	b	F	t
	IEC	L	B	F	T	L	B	F	T
1F☐2☐08		45 (1.77)	10 (0.39)	5 (0.2)	35 (1.38)	40 (1.57)	8 (0.31)	5 (0.2)	27 (1.06)

13.2.8 Dimension drawings of 1FT2, frame size 100

All dimensions in mm (inches).

1FT2210



① With feather key

Figure 13-16 Dimension drawing of 1FT2210

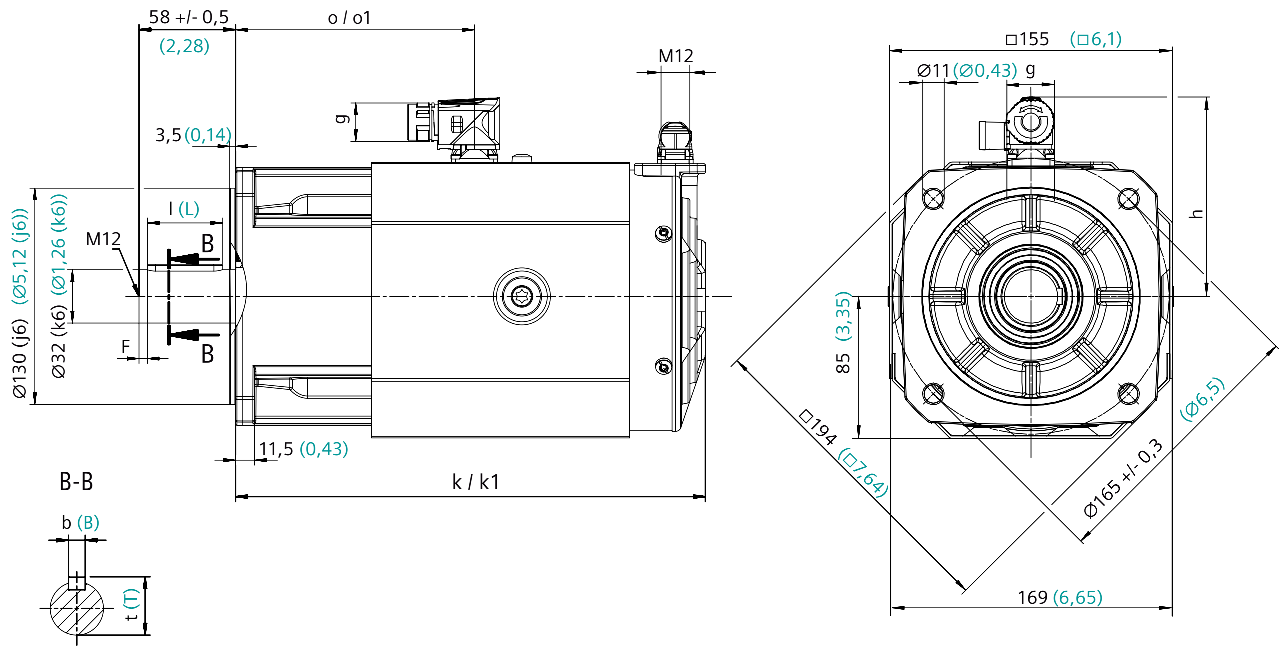
SIMOTICS S-1FT2 Frame size 100		Dimensions	
		Without brake	With brake
	DIN	k	k1
	IEC	LB	LB1
1FT2210-2A☐		174 (6.85)	233 (9.17)
1FT2210-3A☐		198 (7.80)	257 (10.12)
1FT2210-4A☐		223 (8.78)	282 (11.10)
1FT2210-5A☐		248 (9.76)	307 (12.09)

Motor frame size		Dimensions for the shaft geometry (13th position in the Article No.)			
		Shaft geometry "0" or "1"		Shaft geometry "2" or "3"	
	DIN	d	l	d	l
	IEC	D	L	D	L
1F☐2210		38 (k6) 1.49 (k6)	80 3.15	32 (k6) 1.26 (k6)	58 2.28

Motor frame size		Feather key dimensions							
		Shaft geometry "1"				Shaft geometry "3"			
	DIN	l	b	F	t	l	b	F	t
	IEC	L	B	F	T	L	B	F	T
1F☐2210		70 (2.76)	10 (0.39)	5 (0.19)	41 (1.61)	45 (1.77)	10 (0.39)	5 (0.19)	35 (1.38)

13.2.9 1FT2 dimension drawings, frame size 80, force-ventilated

The motor has the following dimensions:



Motor frame size	Power connector		Motor length			
	Connector size	Connector height	Without brake		With brake	
	g / mm	h / mm	k / mm	o / mm	k1 / mm	o1 / mm
1FT2108-5SB	M23	119	347	208	400	261
1FT2208-3S	M23	119	283	144	336	197
1FT2208-4SB 1FT2208-4SC	M23	119	303	164	356	217
1FT2208-5SB	M23	119	323	184	376	237

Motor frame size		Dimensions for the shaft geometry (13th position in the Article No.)			
		Shaft geometry "0" or "1"		Shaft geometry "2" or "3"	
	DIN	d	l	d	l
	IEC	D	L	D	L
1F☐2☐08		32 (k6) 1.26 (k6)	58 2.28	24 (k6) 0.94 (k6)	50 1.97

Motor frame size		Feather key dimensions for shaft geometry "1" or "3"							
	DIN	l	b	F	t	l	b	F	t
	IEC	L	B	F	T	L	B	F	T
1F☐2☐08		45 (1.77)	10 (0.39)	5 (0.19)	35 (1.38)	40 (1.57)	8 (0.31)	5 (0.2)	27 (1.06)

13.3 Dimension drawings, converter

13.3.1 FSA with 1 AC line connection

FSA with 1 AC line connection

6SL5310-1BB10-1CF0 (100 W)

6SL5310-1BB10-2CF0 (200 W)

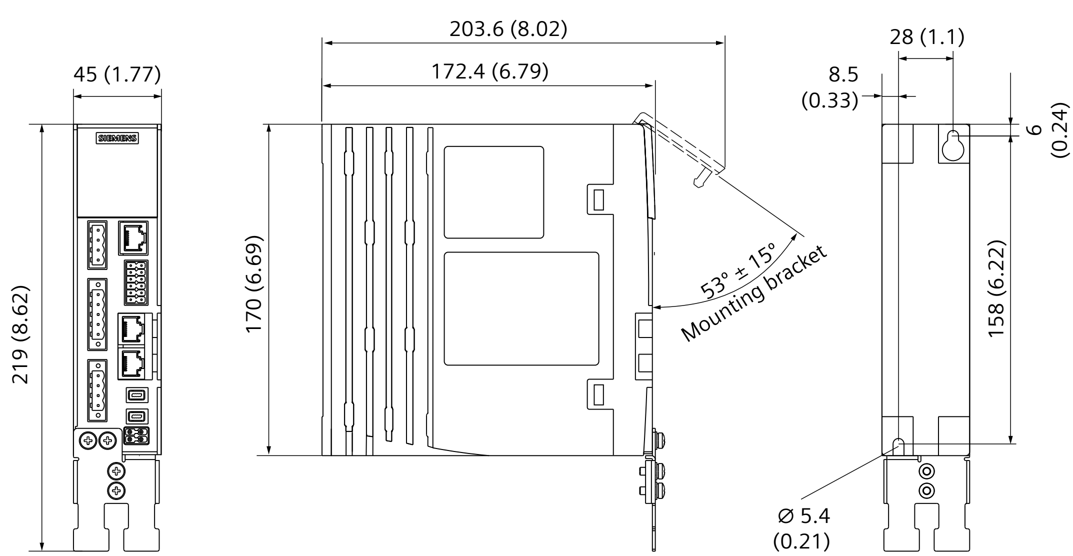


Figure 13-17 Dimension drawing SINAMICS S210 FSA, 1 AC, dimensions in mm (inch)

13.3.2 FSB with 1 AC line connection

FSB with 1 AC line connection

6SL5310-1BB10-4CF0 (400 W)

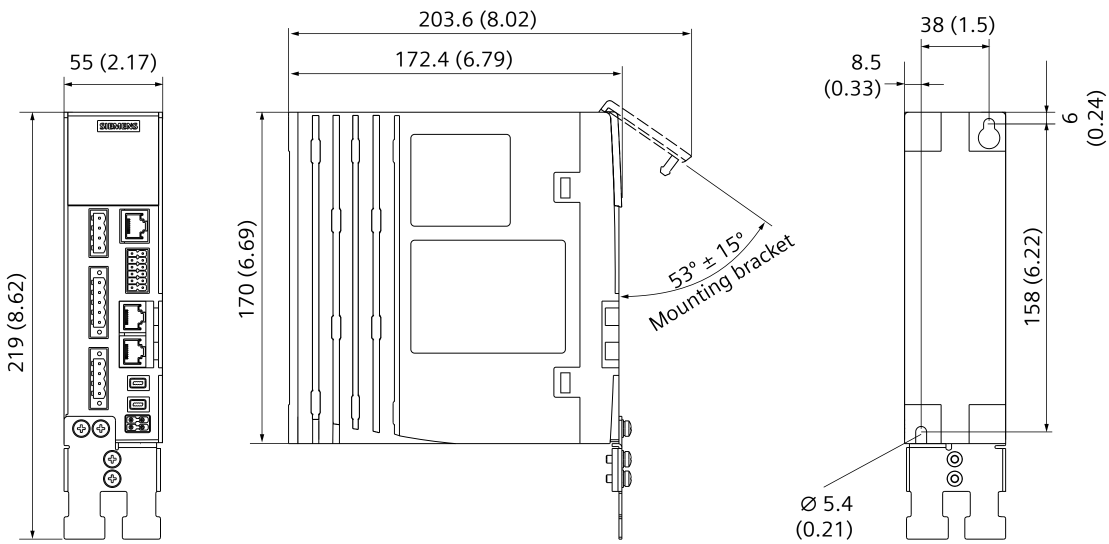


Figure 13-18 Dimension drawing SINAMICS S210 FSB, 1 AC, dimensions in mm (inch)

13.3.3 FSC with 1 AC line connection

FSC with 1 AC line connection

6SL5310-1BB10-8CF0 (750 W)

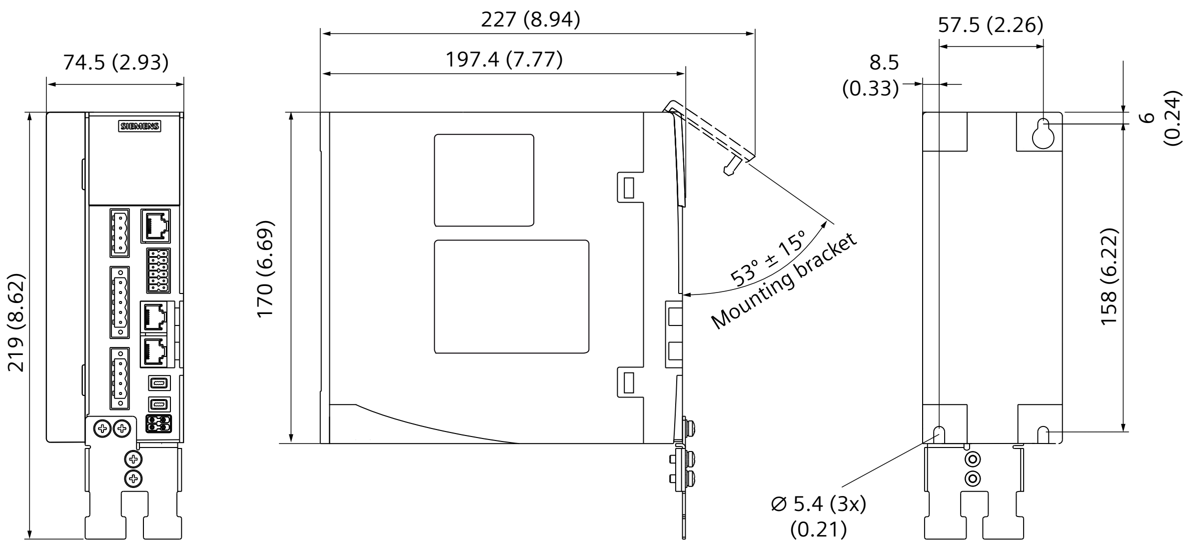


Figure 13-19 Dimension drawing SINAMICS S210 FSC, 1 AC, dimensions in mm (inch)

13.3.4 FSA with 3 AC line connection

FSA with 3 AC line connection

6SL5310-1BE10-4DF. (0.4 kW)

6SL5310-1BE10-8DF. (0.75 kW)

6SL5310-1BE11-0DF. (1 kW)

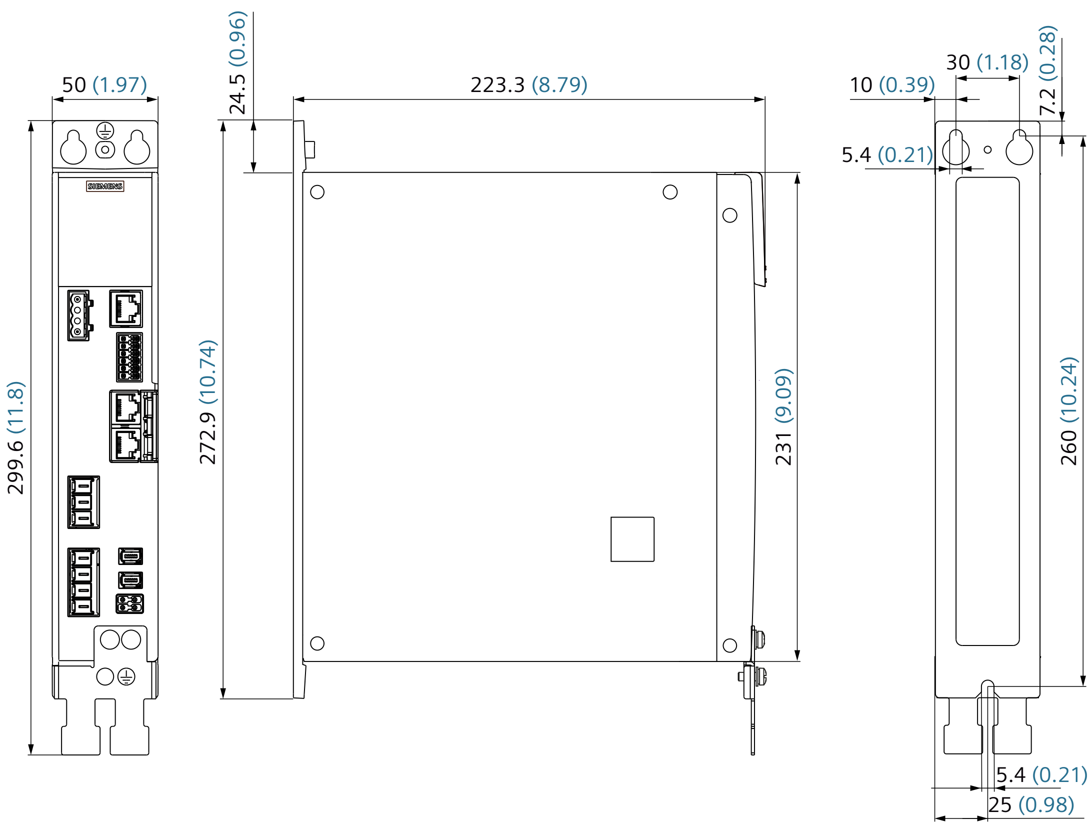


Figure 13-20 Dimension drawing SINAMICS S210 FSA, 3 AC, dimensions in mm (inch)

13.3.5 FSB with 3 AC line connection

FSB with 3 AC line connection

6SL5310-1BE11-5DF. (1.5 kW)

6SL5310-1BE12-0DF. (2 kW)

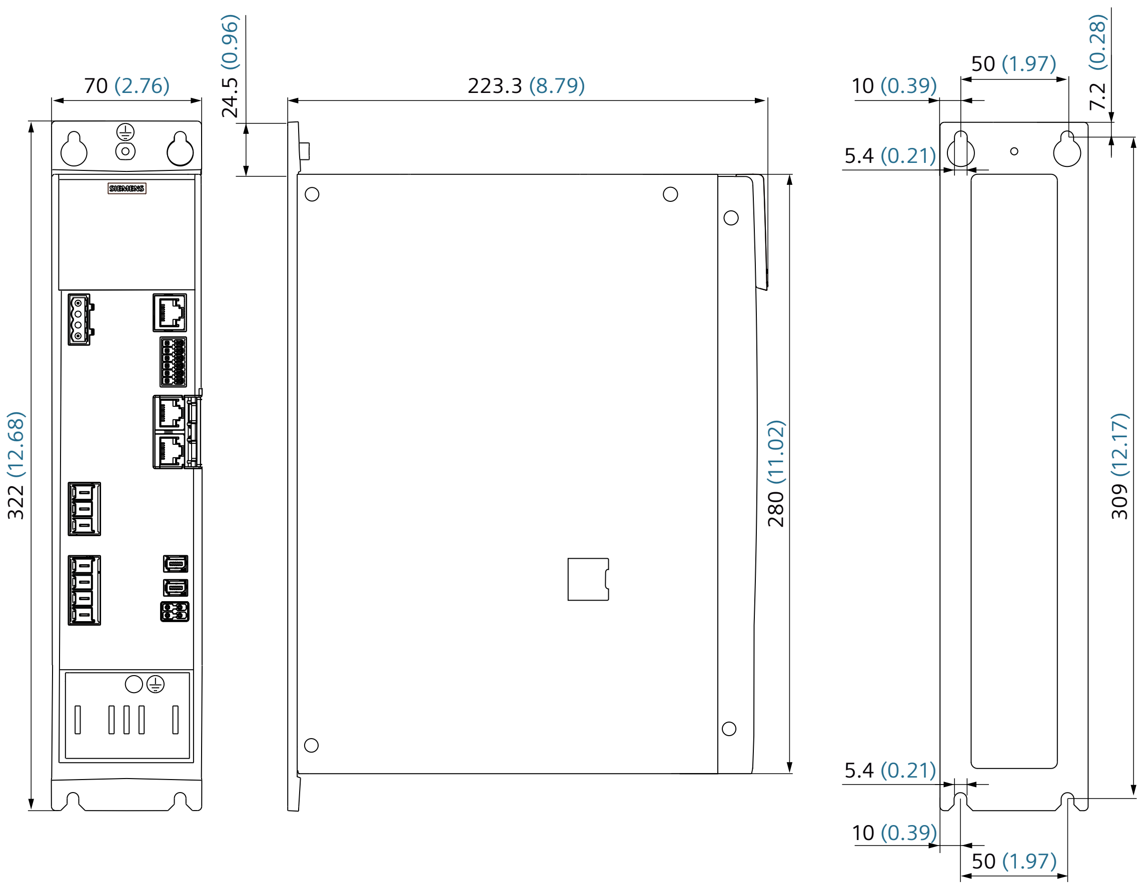


Figure 13-21 Dimension drawing SINAMICS S210 FSB, 3 AC, dimensions in mm (inch)

13.3.6 FSC with 3 AC line connection

FSC with 3 AC line connection

6SL5310-1BE13-5DF. (3.5 kW)

6SL5310-1BE15-0DF. (5 kW)

6SL5310-1BE17-0DF. (7 kW)

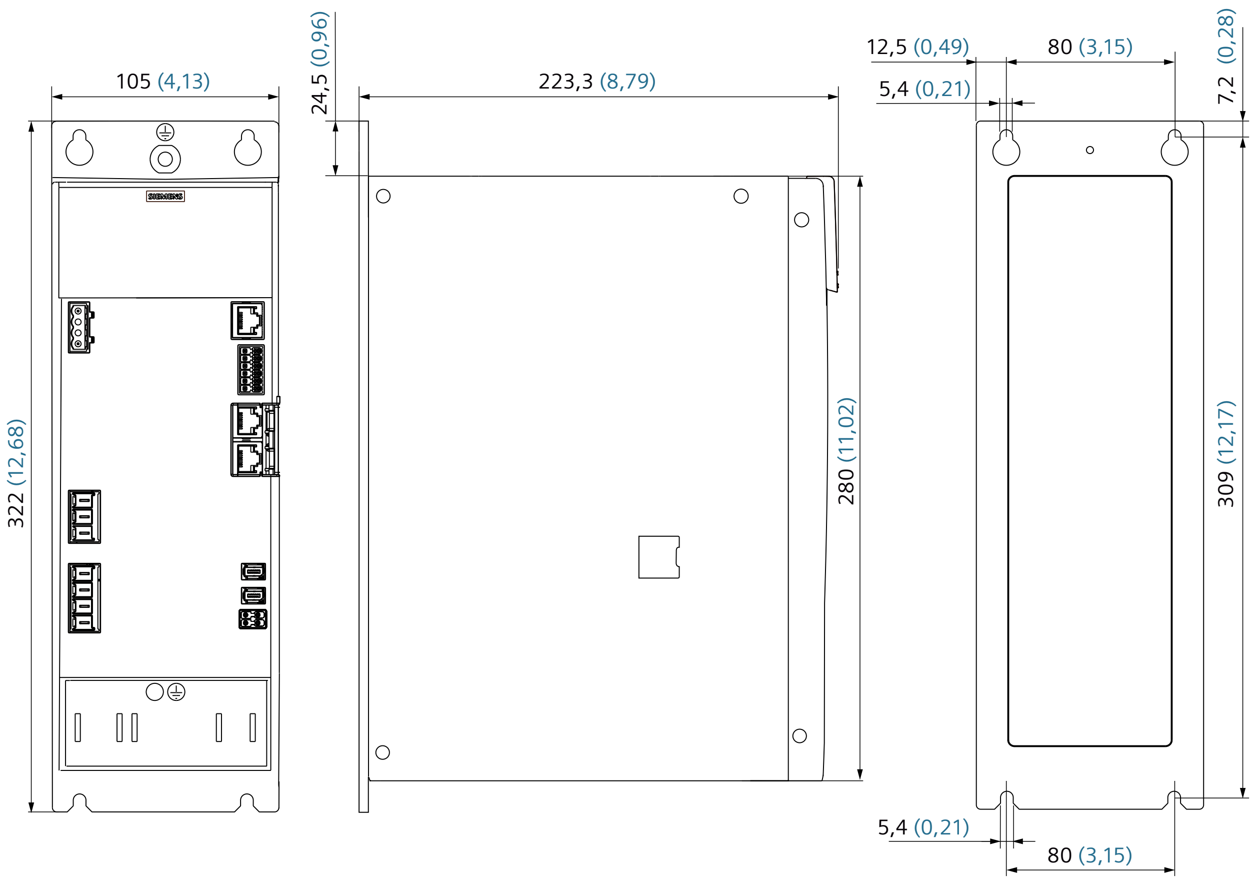


Figure 13-22 Dimension drawing SINAMICS S210 FSC, 3 AC, dimensions in mm (inch)

Decommissioning and disposal

14

WARNING

Risk of injury through falling motors or machine components

Motors and machine components can fall when being dismantled from the machine. They can cause serious injury or property damage.

- Secure the machine components being dismantled to prevent them falling.

NOTICE

Damage caused by data misuse

If the memory card or converter is disposed of in a non-secure manner, misuse of data may occur resulting in damage or malfunctions in the systems.

- Therefore, delete the configuration of the converter: see Chapter "Full reset of all device settings (Page 503)".
- Make sure you securely remove all custom certificates.

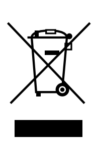
More information is provided in Configuration Manual "SINAMICS Industrial Cybersecurity (https://support.industry.siemens.com/cs/ww/en/view/109810578)".

Removing the device from the machine

1. Check that all parts of the device are in a no voltage condition.
2. Let the device cool down enough so that you are not burnt.
3. Disconnect all electrical connections.
4. Remove the fixing elements.
5. Transport the device to a suitable location for disposal.

14.1 Device disposal

Description



For environmentally-friendly recycling and disposal of your old device, contact a company certified for the disposal of waste electrical and electronic equipment, and dispose of the old device as prescribed in the respective country of use.

Accessories and spare parts 15

15.1 Accessories

15.1.1 Memory cards

The memory card is only required for data backup, series commissioning and for functions that require a license. The converter can also be operated without a memory card.

Memory card for data backup and series commissioning

Use the following memory cards to back up data, for licensing and series commissioning.

If you are using functions that require a license, a memory card is absolutely necessary for converter operation. The memory card must then be permanently inserted.

The license key can only be assigned to a SINAMICS memory card.

The integrated card reader does not support the exFAT format. Large memory cards must therefore be formatted with FAT32.

Memory cards with up to 32 GB are supported.

Card type	Article number
Empty SD card	6SL5970-0AA00-0AA0
SD card with firmware V6.4	6SL5370-0GE00-0AA0
SD card with firmware V6.4 and license for Extended Safety Functions	6SL5370-0GE00-0AA0-Z F01
License for Extended Safety Functions "Certificate of License" without SD card, to subsequently license an existing SD card	6SL5977-0AA00-2HA0

15.1.2 SINAMICS Smart Adapter

15.1.2.1 Function of the SINAMICS Smart Adapter

Description

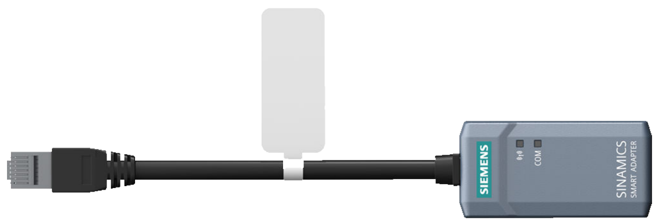


Figure 15-1 SINAMICS Smart Adapter

The SINAMICS Smart Adapter establishes a WLAN connection between the converter's X127 service interface and an operating unit, for example a tablet, smartphone, panel or PC.

Once plugged into the converter, the SINAMICS Smart Adapter is ready to use. No battery is required.

The SINAMICS Smart Adapter may only be installed temporarily for commissioning and service activities. It may not be used permanently with the converter.

The SINAMICS Smart Adapter supports WPA3 WLAN encryption.

15.1.2.2 SINAMICS Smart Adapter ordering data

SINAMICS Smart Adapter	
Designation	**Article number**
SINAMICS Smart Adapter	6SL4950-0AJ00-0AA0

15.1.3 Connectors and cables for the AC coupling and DC link coupling

The following packages are available for the connectors:

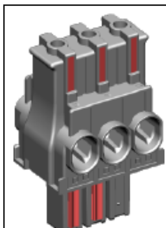
Article number	Spare part
6SL3260-2DC00-0AA0	Connector package for AC coupling and DC link coupling
6SL3260-2DC10-0AA0	Connector kit for the AC coupling

Content	6SL3260-2DC00-0AA0	6SL3260-2DC10-0AA0
Connectors for the AC coupling	1	1
Connector for the DC link coupling	1	-
End cap	2	1
Description/data sheet	1	1

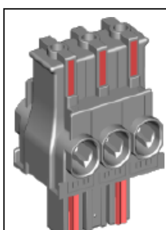
The connectors are designed so that they cannot be accidentally interchanged.

The cables required for the AC coupling and DC link coupling are standard cables, and therefore not included in the scope of delivery. Permissible connecting cables are listed in section "Establishing the AC coupling and the DC link coupling (Page 141)".

X1: Connectors for the AC coupling

	Pin	Pin assignment	Explanation
	L1	Phase L1 line system	The terminals are Torx screw terminals. Permissible conductor cross-sections: • 16 mm² • AWG: 6 Tightening torque: 3 Nm
	L2	Phase L2 line system	
	L3	Phase L3 line system	

X3: Connector for the DC link coupling

	Pin	Pin assignment	Explanation
	DCP	DC link, positive	The terminals are Torx screw terminals. Permissible conductor cross-sections: • 16 mm² • AWG: 6 Tightening torque: 3 Nm
	--	not assigned	
	DCN	DC link, negative	

End cap for AC coupling and DC link coupling

15.1.4 PROFINET patch cable

Use the following patch cable to network converters located adjacent one another via PROFINET:

Cable type	Length	Article number
Industrial Ethernet TP cord, CAT 6A, TP cable 4 x 2 insulated conductors, prefabricated with 2 RJ45 connectors	0.3 m	6XV1870-3QE30
	0.5 m	6XV1870-3QE50

15.1.5 External line filters

Line filters limit the electromagnetic interference emissions from converters to permissible limit values according to IEC 61800-3 or the requirements of Class A laid down in CISPR11.

The SINAMICS S210 line filters are passive components used to expand the EMC properties of the S210 system. These allow EMC categories C2 or C3 with longer cable lengths to be achieved (see Chapter "Electromagnetic compatibility according to IEC 61800-3 (Page 744)").

The following line filter is used depending on the converter:

- Converter with 1 AC line connection: 1 AC line filter
- Individual converters, frame size FSA with 3 AC line connection: 3 AC line filter, 35 A
- Drive line-ups (with and without DC link coupling) as well as individual converters, frame sizes FSB and FSC with 3 AC line connection: 3 AC line filter, 65A

Figure 15-2 3 AC line filter and converter

In a 3 AC drive line-up, the associated line filter must always be mounted to the left of the converters. The 3 AC line filters are connected to the converter via the AC coupling.

The sum of the rated currents of the converters connected to a common AC coupling must not exceed the rated line filter current.

15.1.5.1 Safety instructions

NOTICE
Destruction or damage of components by incorrectly connecting the line filter
When incorrectly connecting the line filter, components can be destroyed or damaged. • Connect the line filter in accordance with the instructions in the technical documentation. • Do not connect any additional loads downstream of the line filter.

NOTICE
Line filter damage due to interchanged connections
The line filter might be damaged if the input and output connections are interchanged. • Connect the incoming line supply cable to "Line" or X5. • Connect the outgoing cable to "Load" or X6.

NOTICE
Damage to the system caused by a line filter that is not permissible
A line filter that is not permissible can damage the system. • Only use the line filter with the components that are compatible with it.

NOTICE
Damage caused by using third party filters
According to product standard IEC 61800-3, radio interference suppression commensurate with the relevant rated conditions must be provided and is a legal requirement in the EU (EMC Directive). Line filters and line reactors are required in order to comply with this standard. The use of filters of other filter types can lead to limit value violations, resonance effects, overvoltages, and irreparable damage to motors and other equipment. • The machine manufacturer must provide verification that the machine equipped with the drive products and the installed suppression elements, e.g. line filters, is EMC-compliant before the machines are placed in the market.

NOTICE
Destruction of the line filter when used with an unsuitable protective element
Use of an incorrectly dimensioned protective element can result in thermal overload or destruction of the line filter. • Use the protective elements provided, (see Product Information "Protective devices for SINAMICS S210 (https://support.industry.siemens.com/cs/ww/en/view/109815356)").

Note

Disconnect the line filter for a high-voltage test

If a high-voltage test is conducted with alternating voltage in the system, the existing line filters must be disconnected in order to obtain accurate measurements.

Safety instructions for 1 AC line filter

WARNING

Electric shock caused by PEN conductor overload

In TN-C supply networks, the protective function of the PEN conductor can be adversely affected by exposure to harmonic currents.

- Consider the harmonic currents when dimensioning the PEN conductor.

WARNING

Fire caused by neutral conductor (N) overload

The neutral conductor can heat up due to the load from harmonic currents and cause a fire.

- Consider the harmonic currents when dimensioning the neutral conductor.

Safety instructions for 3 AC line filter

NOTICE

Line filter damage by connecting to impermissible line supply

The line filters are only suitable for direct connection to line supplies with grounded neutral point. Connecting the line filter to another line supply will damage the line filter.

- Only connect the line filter to a line supply with grounded neutral point.

15.1.5.2 Interfaces

Line filter for converters with 1 AC line connection

Figure 15-3 Interfaces of the line filter for converters with 1 AC line connection

Terminals for line filters for converters with 1 AC line connection:

- Line: Line connection
- Load: Load connection

Line filter for converters with 3 AC line connection

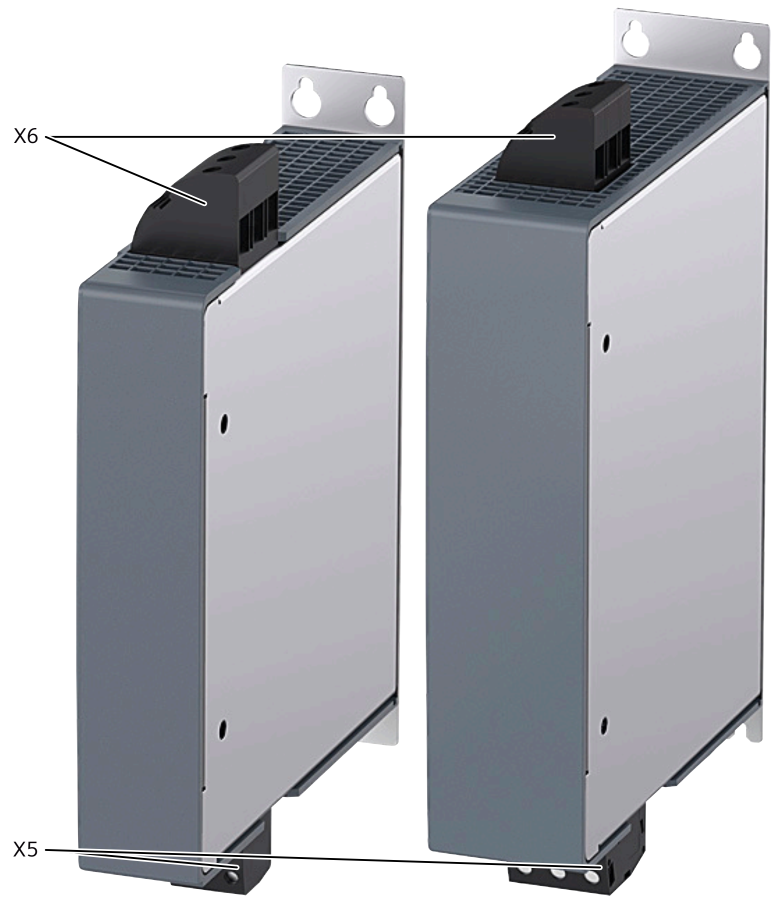
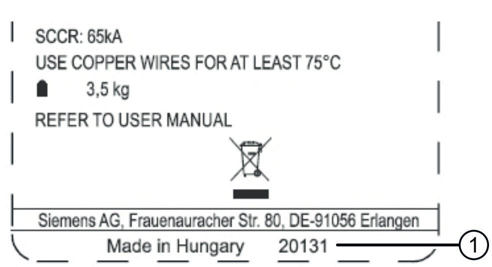


Figure 15-4 Interfaces of the line filter for converters with 3 AC line connection, 35 A and 65 A

Terminals for line filters for converters with 3 AC line connection:

- X5: Line connection
- X6: Load connection

Date of manufacture



The date of manufacturer of the filter ① is stated on the nameplate in the following form:

- CY: Calendar year (two digit)
- CW: Calendar week (01 ... 53)
- D: Day (Mon ... Sun)

In the example provided here, "20131" means: 2020, KW 13, Monday = March 23, 2020

15.1.5.3 Dimension drawings

Line filter for converters with 1 AC line connection

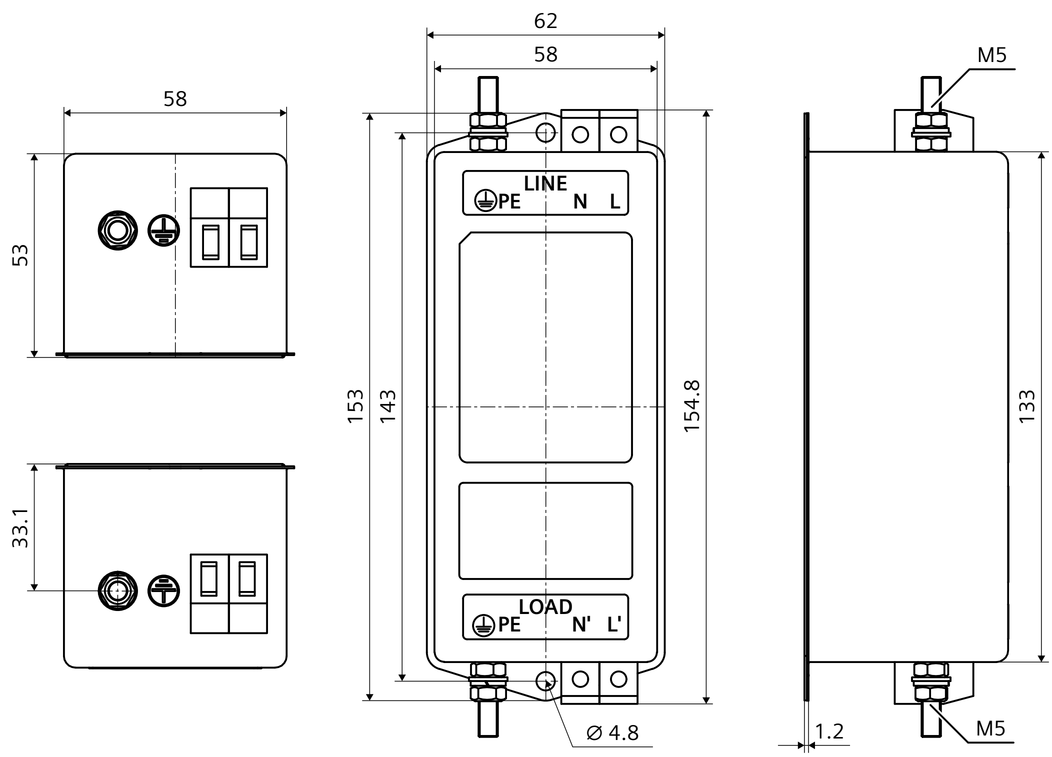
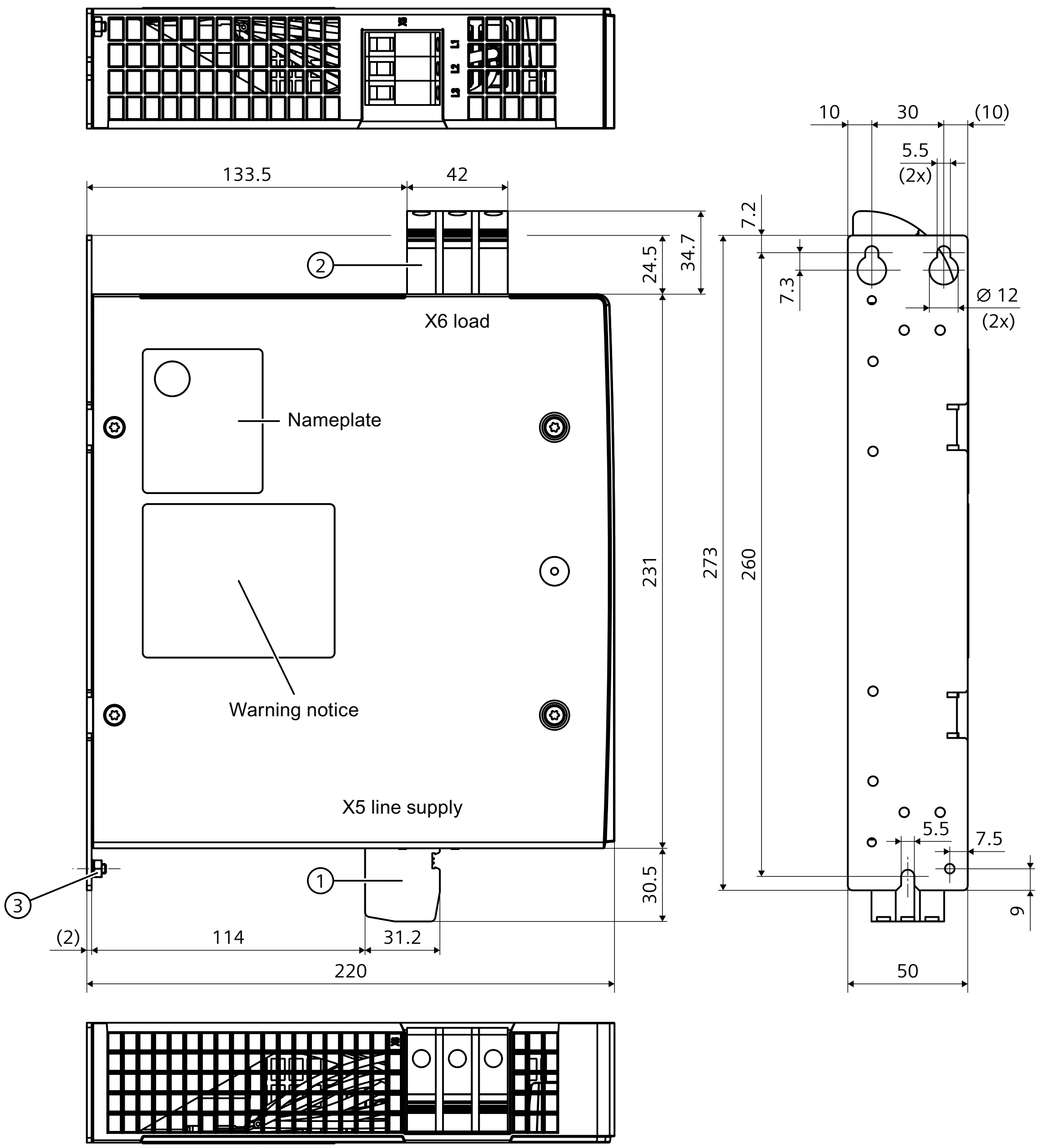


Figure 15-5 Dimension drawing for the line filter for converters with 1 AC line connection

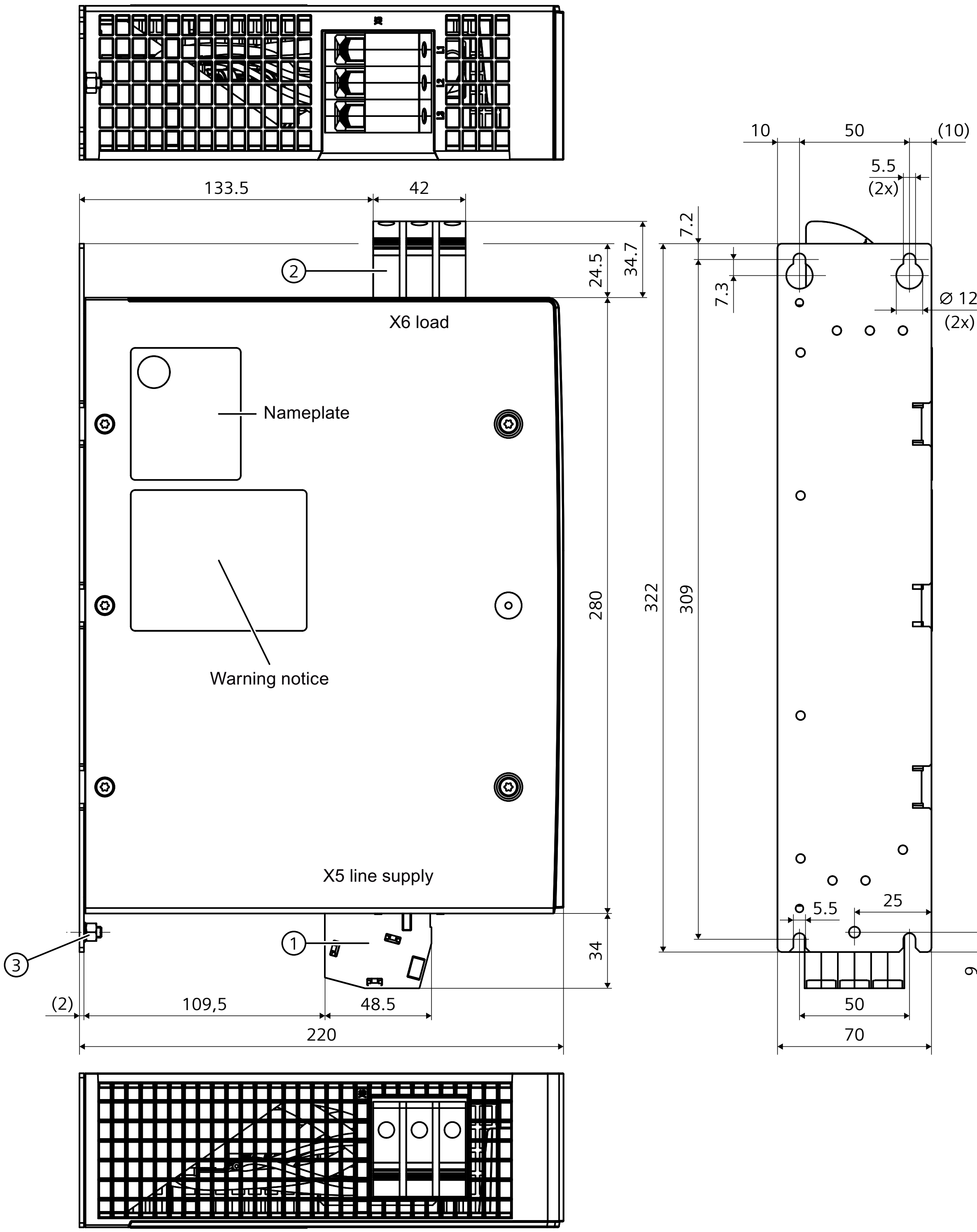
- Tightening torque for fixing screws (M4): 1.2 ... 1.8 Nm
- Tightening torque for the protective conductor fixing bolt (M5): 2.0 ... 2.2 Nm
- Tightening torque of the line-side and load-side screw connection: 0.7 ... 0.8 Nm

Line filter for converters with 3 AC line connection



① Connecting terminal 10 mm², tightening torque 1.5 ... 1.8 Nm
② Connecting terminal 16 mm², tightening torque 2.5 ... 3 Nm
③ Protective conductor M4x6, tightening torque 1.8 Nm

Figure 15-6 Dimension drawing for the line filter for converters with 3 AC line connection, 35 A



① Connecting terminal 25 mm², tightening torque 4 ... 4.5 Nm

② Connecting terminal 16 mm², tightening torque 2.5 ... 3 Nm

③ Protective conductor M5x8, tightening torque 3 Nm

Figure 15-7 Dimension drawing for the line filter for converters with 3 AC line connection, 65 A

15.1.5.4 Mounting

Note

When you mount external line filters, consider the specifications for routing cables in the electrical cabinet according to the EMC Directive.

Line filter for converters with 1 AC line connection

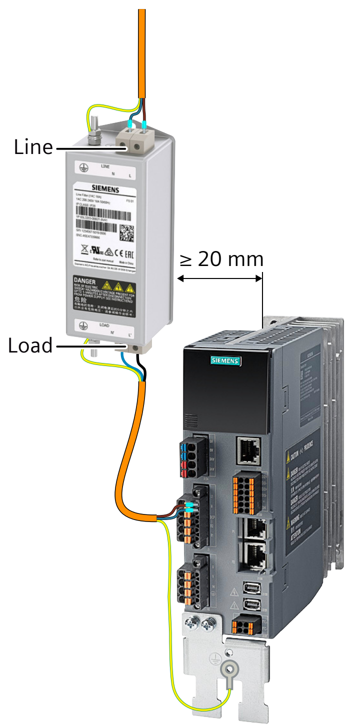


Figure 15-8 Mounting the line filter for converters with 1 AC line connection

Note

When installing a line filter, maintain a minimum lateral clearance of 20 mm (0.79 inches) to the converter.

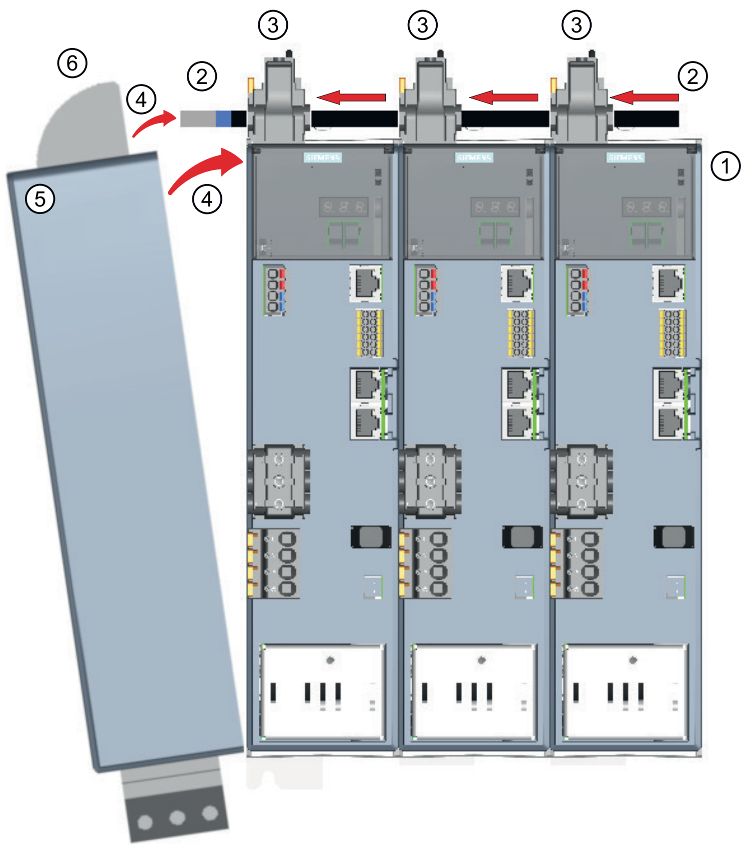
Line filter for converters with 3 AC line connection

There are basically 2 ways of mounting and connecting 3 AC line filters:

Variant 1: The converter group is mounted and wired

The converter group is already mounted and the AC coupling is wired and prepared for the line filter, i.e. insulation stripped and end sleeves attached.

The line filter then only has to be "threaded on " from the left and screwed tight. This simpler variant requires sufficient mounting space to the left of the converters.



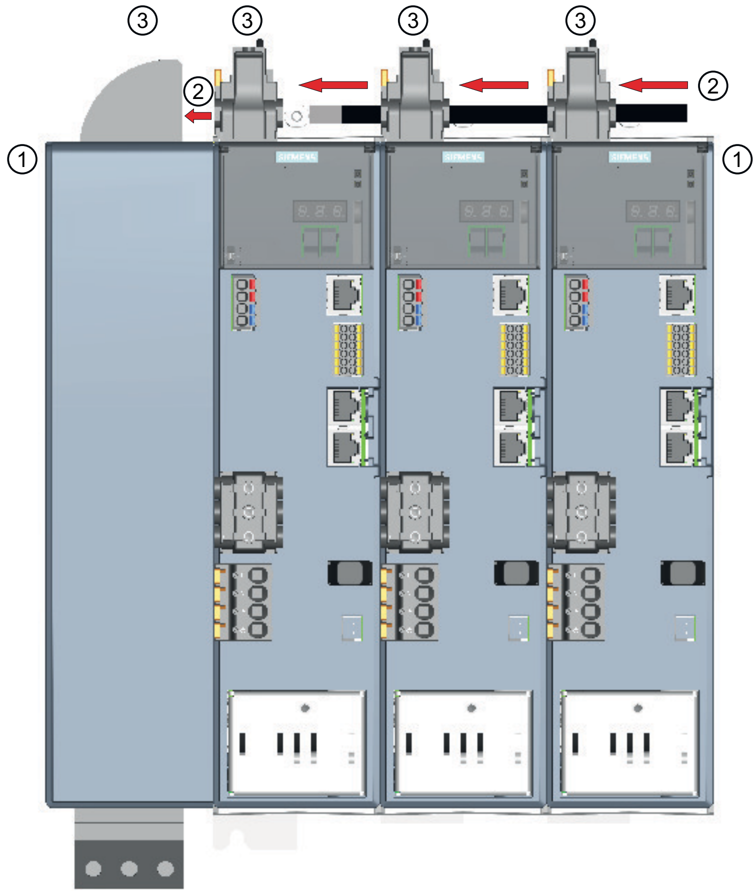
① Screw the converters tight in the cabinet.
② Push the cable for the AC coupling through the AC connector and provide it with end sleeves (with or without protective collar).
③ Screw the cable into the AC connectors.
④ Swing the line filter with load connection X6 from the side over the cable/end sleeves.
⑤ Screw the line filter tight in the cabinet.
⑥ Screw the cable into load connection X6 of the line filter.

Figure 15-9 Mounting the line filter for converters with 3 AC line connection - variant 1

Variant 2: The converter group and 3 AC line filter are mounted, but not wired

For wiring, each conductor must be individually pulled through the connector for the AC coupling up to load connection X6 of the line filter and screwed into the control cabinet.

You can only insert end sleeves without a protective collar, as otherwise the conductor no longer fits through the connector for the AC coupling.



① Screw the devices tight on the cabinet wall or on the mounting plate.

② Attach end sleeves without protective collars to the cables for the AC coupling, and push them through the AC connectors into load connection X6 of the line filter.

③ Screw the cables into the AC connectors and into load connection X6 of the line filter.

Figure 15-10 Mounting the line filter for converters with 3 AC line connection - variant 2

15.1.5.5 Technical data

Line filter for converters with 1 AC line connection

Table 15-1 Technical data

Article number		**6SL3203-0BB21-8VA1**
Line voltage		200 ... 240 V 1 AC
Rated current	A	18
Power loss	W	< 1.2
Type of connection		Screw terminals
Conductor cross-section - for single-conductor connection - for flexible cables	 mm^2 mm^2	 0.25 ... 6 (AWG 24 ... 10) 0.25 ... 4 (AWG 24 ... 12)
Insulation stripping length	mm	8 ... 9
Protective conductor connection		M5 studs
Degree of protection		IP20
Dimensions (W x H x D)	mm	62 x 155 x 53
Weight	kg	0.7

Line filter for converters with 3 AC line connection

Table 15-2 Technical data

Article number		**6SL3203-0BE23-5HA0**	**6SL3203-0BE26-5HA0**
Line voltage		200 ... 480 V 3 AC	
Rated current	A	35	65
Power loss	W	12	18
Type of connection		Screw terminals	
Conductor cross-section - Line-side connection - Load-side connection	 mm^2 mm^2	 0.5 ... 10 (AWG 24 ... 6) 16 (AWG 6)	 4 ... 25 (AWG 10 ... 3) 16 (AWG 6)
Stripped length - Line side - Load side	 mm mm	 10 16	 18 16
Protective conductor connection		M4 studs	M5 studs
Degree of protection		IP20	
Dimensions (W x H x D)	mm	50 x 296 x 220	70 x 349 x 220
Weight	kg	2.3	3.5

15.1.6 External braking resistors for 1/3 AC 200 ... 240 V

The following Michael Koch GmbH braking resistors can be purchased directly through Siemens with the article numbers below.

The correct product (with 1/3 AC 200 ... 240 V) can be found in the table "Examples of suitable braking resistors from a third-party supplier (Page 93)".

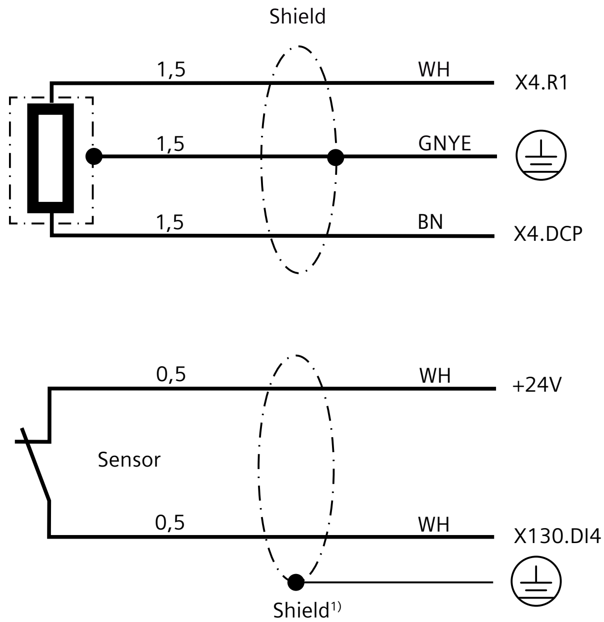
- GXK:BWG250047TS-190: 100 W, 47 Ohm
- GXK:BWG600014TS-190: 240 W, 14 Ohm
  For UL, the resistor has only a 240 W braking power. According to CE, 400 W braking power is also possible.

Figure 15-11 External braking resistor (example)

The resistors have approvals for the North American market (cURus and CSA).

The temperature sensor of the resistor can by connected at digital input DI4 on the converter for temperature monitoring. This switches the converter off when the braking resistor is overloaded.

We recommend that sensor cables are also shielded.

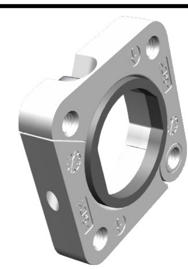


1) Not included in the scope of delivery of the braking resistor

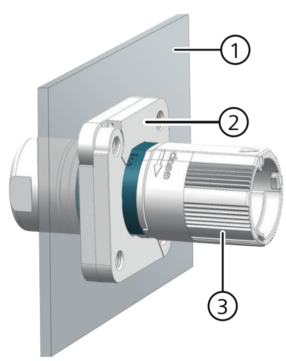
Figure 15-12 Braking resistor connection

15.1.7 Cabinet bushing via mounting flange

Mounting accessories for connection system

Accessories	Diagram	For connector size	For motor	Article number
Mounting flange as cabinet bushing (with installation instructions) Packing unit: 1 item		M12	1F☐2☐02 1F☐2☐03	6FX2003-7JX00
		M17	1F☐2☐04 1F☐2☐05	6FX2003-7HX00
		M23	1F☐2☐06 1F☐2☐08 1F☐2☐10	6FX2003-7BX00

The mounting flange is installed on the external wall of the control cabinet. It ensures the degree of protection of the control cabinet.



① Wall of the control cabinet
② Mounting flange
③ Connectors

Install the mounting flange as specified in the enclosed installation instructions.

15.1.8 Degree of protection kit IP65 for the motor

Shaft sealing ring - IP65 degree of protection kit for the motor

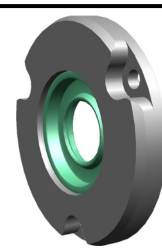
The shaft sealing ring can be used as spare part or for retrofitting.

Note

You can order a motor with shaft sealing ring (degree of protection IP65) directly.

More information about ordering degree of protection IP65 can be found in Chapter "Ordering data of the motor (Page 813)".

The motor satisfies degree of protection IP65 when the shaft sealing ring is installed.

Motor article number	Figure of the shaft sealing ring	Article number of the degree of protection kit
1F☐2☐02		1FY2902-0GC00
1F☐2☐03		1FY2903-0GC00
1F☐2☐04		1FY2904-0GC00

15.1.9 Connecting cables and extension cables between the motor and converter

You can order OCC MOTION-CONNECT cables as preassembled cables or as kits that you can assemble yourself.

Note

A maximum of three separating points are allowed without reducing the total permitted length.

OCC MOTION-CONNECT cable with SPEED-CONNECT connector

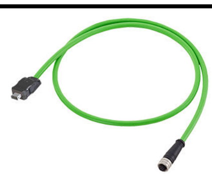
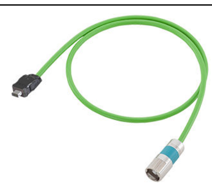
Information and data to select the optimum connecting cable and extension cable between the motor and converter is provided in Chapter "Ordering data of the connection system (Page 816)".

15.1.10 Encoder cable for a direct measuring system (2nd encoder connection)

Description

In addition to the motor encoder, a direct measuring system can be connected to the moving part of the machine. This can be realized if the motor encoder is not suitable for position sensing and closed-loop control, e.g. due to excessive elasticity and backlash in the drive train.

Drive-CLiQ (DQ) rotary encoders can be connected, which have an M12 or M17 connection plug. The connection to the 2nd encoder interface X101 is established using the following cable:

	Designation and use	Connector size	Article number
	MC 500 encoder cable for connecting DQ rotary encoders for predominantly fixed routing	M12	6FX5002-2DX30
	MC 800PLUS encoder cable for connecting DQ rotary encoders for routing in cable carriers	M12	6FX8002-2DX30
	MC 500 encoder cable for connecting M17 SPEED-CONNECT for predominantly fixed routing	M17	6FX5002-2DX40
	MC 800PLUS encoder cable for connecting M17 SPEED-CONNECT for routing in cable carriers	M17	6FX8002-2DX40

The following encoder types can be selected in the Startdrive engineering tool:

- Drive-CLiQ encoder AS20, singleturn
- Drive-CLiQ encoder AM20, multiturn 4096
- Drive-CLiQ encoder AS24, singleturn
- Drive-CLiQ encoder AM24, multiturn 4096
- Drive-CLiQ encoder AS22, singleturn
- Drive-CLiQ encoder AM22, multiturn 4096
- Drive-CLiQ encoder AS26, singleturn
- Drive-CLiQ encoder AM26, multiturn
- Drive-CLiQ encoder (identification required): The identified Drive-CLiQ encoder must correspond to one of the types listed above. You can find more information in the description of parameter p0400 in Chapter List of parameters (Page 825).

If you use a third-party encoder, then you must carefully ensure that the encoder meets the same technical specifications as a Siemens encoder.

15.2 Spare parts

Spare parts for the converter

The following components are available as spare parts for the converter:

- Connector set for converters with 1 AC line connection 6SL3260-2DB00-0AA0
- Connector set for converters with 3 AC line connection 6SL3260-2DB10-0AA0
- Siemens IX connector for the encoder connection for converters with 1 AC / 3 AC line connection 6FX2003-0DE01
- Fan for converters with 3 AC line connection, FSA 6SL3260-0AA00-0AA0
- Fan for converters with 3 AC line connection, FSB 6SL3260-0AB00-0AA0
- Fan for converters with 3 AC line connection, FSC 6SL3260-0AC00-0AA0

15.2.1 Connector set for converters with 1 AC line connection - 6SL3260-2DB00-0AA0

Under this article number, you will receive a spare parts package for the frame sizes FSA, FSB and FSC with the following content:

- Connectors
  - X1: Connector for the line connection and the external braking resistor (jumper for using the internal braking resistor is provided)
  - X2: Connector for the motor connection
  - X107: Connector for the motor holding brake
  - X124: Connector for the external 24 V DC power supply
  - X130: Connector for the digital inputs
- Shield plate for FSA, FSB and FSC

X1: Connector for the line connection and the external braking resistor

<table>
<tr><th></th><th>Pin</th><th>Pin assignment</th><th>Explanation</th></tr>
<tr><td rowspan="5"></td><td>L1</td><td>Phase L1 line system</td><td></td></tr>
<tr><td>N</td><td>Neutral conductor</td><td></td></tr>
<tr><td>DCP</td><td>Braking resistor, external
Braking resistor, internal</td><td rowspan="3">• If you are using the internal braking resistor, DCP and R2 must be jumpered.
• If you are using an external braking resistor, then do not insert the jumper between DCP and R2. Connect the external braking resistor via the DCP and R1 terminals.</td></tr>
<tr><td>R2</td><td>Internal braking resistor</td></tr>
<tr><td>R1</td><td>External braking resistor</td></tr>
<tr><td colspan="4">Weidmüller: BLF 5.08HC/05/180F SN BK BX, article number 1012670000
As daisy chain: BLDF 5.08/05/180F SN BK BX, article number 1000970000</td></tr>
</table>

The terminals are spring-loaded terminals.

Permissible conductor cross-sections for single-conductor connection or for connecting flexible cables with end sleeves:

- 0.2 mm² ... 2.5 mm²
- AWG: 26 ... 12
- Insulation stripping length: 10 mm

X2: Connector for the motor connection

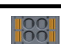
	Pin	Pin assignment	Color coding for Siemens OCC cables
	U	Motor phase U	Brown
	V	Motor phase V	Black
	W	Motor phase W	Gray
	PE	Protective ground	Green-yellow
Weidmüller: BLF 5.08HC/04/180F SN BK BX, article number 1012660000			

The terminals are spring-loaded terminals.

Permissible conductor cross-sections for single-conductor connection or for connecting flexible cables with end sleeves:

- 0.2 mm² ... 2.5 mm²
- AWG: 26 ... 12
- Insulation stripping length: 10 mm

X107: Connector for the motor holding brake (PTC has no function, for use in the future)

	Pin	Pin assignment		Pin assignment	Pin
	BR+	B+: Voltage for motor holding brake, 24 V (black-turquoise)		Reserved, do not use	PTC+
	BR-	B-: Voltage for motor holding brake, 0 V (white-turquoise)		Reserved, do not use	PTC-
Phoenix DFMC 1.5/ 2-ST-3.81 BK, Article number 1864707					

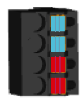
The terminals are spring-loaded terminals.

Permissible conductor cross-sections:

- For single-core cables or for flexible cable with end sleeves without protective collars or long end sleeves with protective collars:
  - 0.25 mm² ... 1.5 mm²
  - AWG: 24 ... 16
- For flexible cables with end sleeves with protective collars:
  - 0.25 mm² ... 0.75 mm²
  - AWG: 24 ... 19
- Insulation stripping length: 10 mm

Also connect the insulated conductors for the motor holding brake to the connector at X107, even when you are using a motor without holding brake.

X124: Connector for the external 24 V DC control voltage

	Pin	Pin assignment	Explanation
	0V	0 V	Power supply for the converter electronics Maximum current for looping through via the internal jumper (blue-blue, red-red): 24 A
	0V	0 V	
	24 V	+24 V	
	24 V	+24 V	
Dinkle article number 2ESS-6621-04P			

The terminals are spring-loaded terminals.

Permissible conductor cross-sections for single-conductor connection or for connecting flexible cables with or without end sleeves:

- 0.2 mm^2 ... 2.5 mm^2
- AWG: 24 ... 12
- Insulation stripping length: 10 mm

X130: Connector for the digital inputs

	Pin	Pin assignment		Pin assignment	Pin
	+	+24 V output		Failsafe digital input	DI2+
	DI0	High-speed DI, measuring probe			DI2-
	M	Ground			DI3+
	+	+24 V output			DI3-
	DI1	High-speed DI, measuring probe		+24 V output	VS+
	M	Ground		Digital input	DI4
Phoenix DFMC 1.5/ 6-ST-3.5, Article No. 1790140					

The terminals are spring-loaded terminals.

The three terminals marked with "+" and "VS+" are provided as power supply for external sensors. They are short-circuit-proof and provide a max. of 50 mA per sensor. A sensor short-circuit interrupts the power supply for all three sensors.

For more information about the digital inputs, see Chapter "Connecting digital inputs and the external 24 V supply (Page 144)".

Permissible conductor cross-sections:

- For single-conductor connection:
  - 0.2 mm² ... 1.5 mm²
  - AWG: 24 ... 16
- For flexible cables with end sleeves:
  - 0.25 mm² ... 1.5 mm²
  - AWG: 24 ... 16
- For flexible cables with end sleeves with protective collars:
  - 0.25 mm² ... 0.75 mm²
  - AWG: 24 ... 19
- Insulation stripping length: 10 mm

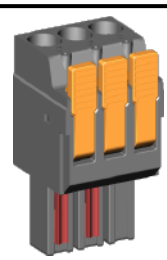
15.2.2 Connector set for converters with 3 AC line connection - 6SL3260-2DB10-0AA0

Under this article number, you will receive a spare parts package for the frame sizes FSA, FSB and FSC with the following content:

- Connectors
  - X1: Standard connector for the line connection
  - X2: Connector for the motor connection
  - X4: Connector for the external braking resistor
    (jumper for using the internal braking resistor is provided)
  - X107: Connector for the motor holding brake
  - X124: Connector for the external 24 V DC power supply
  - X130: Connector for the digital inputs
- Shield plate with two fixing screws M4 x 10 for FSA

X1: Connector for the line connection

Standard connector

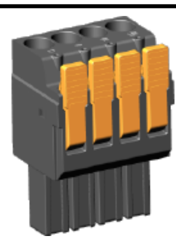
	Pin	Pin assignment	Explanation
	L1	Phase L1 line system	
	L2	Phase L2 line system	
	L3	Phase L3 line system	
Phoenix, article number 1060224			

The terminals are spring-loaded terminals.

Permissible conductor cross-sections for single-conductor connection or for connecting flexible cables with or without end sleeves:

- 0.75 mm^2 ... 6 mm^2
- AWG: 18 ... 8
- Insulation stripping length: 18 mm

X2: Connector for the motor connection

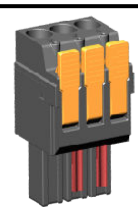
	Pin	Pin assignment	Color coding for Siemens OCC cables
	U	Motor phase U	Brown
	V	Motor phase V	Black
	W	Motor phase W	Gray
	PE	Protective ground	Green-yellow
Phoenix, article number 1060242			

The terminals are spring-loaded terminals.

Permissible conductor cross-sections for single-conductor connection or for connecting flexible cables with or without end sleeves:

- 0.75 mm² ... 6 mm²
- AWG: 18 ... 8
- Insulation stripping length: 18 mm

X4: Connector for the external braking resistor

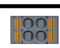
	Pin	Pin assignment	Explanation
	DCP	External braking resistor Internal braking resistor	• If you are using the internal braking resistor, DCP and R2 must be jumpered. • If you are using an external braking resistor, then do not insert the jumper between DCP and R2. Connect the external braking resistor via the DCP and R1 terminals.
	R1	Internal braking resistor	
	R2	External braking resistor	
Phoenix, article number 1060241			

The terminals are spring-loaded terminals.

Permissible conductor cross-sections for single-conductor connection or for connecting flexible cables with or without end sleeves:

- 0.75 mm² ... 6 mm²
- AWG: 18 ... 8
- Insulation stripping length: 18 mm

X107: Connector for the motor holding brake (PTC has no function, for use in the future)

	Pin	Pin assignment		Pin assignment	Pin
	BR+	B+: Voltage for motor holding brake, 24 V (black-turquoise)		Reserved, do not use	PTC+
	BR-	B-: Voltage for motor holding brake, 0 V (white-turquoise)		Reserved, do not use	PTC-
Phoenix DFMC 1.5/ 2-ST-3.81 BK, Article number 1864707					

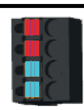
The terminals are spring-loaded terminals.

Permissible conductor cross-sections:

- For single-core cables or for flexible cable with end sleeves without protective collars or long end sleeves with protective collars:
  - 0.25 mm^2 ... 1.5 mm^2
  - AWG: 24 ... 16
- For flexible cables with end sleeves with protective collars:
  - 0.25 mm^2 ... 0.75 mm^2
  - AWG: 24 ... 19
- Insulation stripping length: 10 mm

Also connect the insulated conductors for the motor holding brake to the connector at X107, even when you are using a motor without holding brake.

X124: Connector for the external 24 V DC control voltage

	Pin	Pin assignment	Explanation
	24 V	+24 V	Power supply for the converter electronics Maximum current for looping through via the internal jumper (blue-blue, red-red): 24 A
	24 V	+24 V	
	0V	0 V	
	0V	0 V	
Dinkle article number 2ESS-6621-04P			

The terminals are spring-loaded terminals.

Permissible conductor cross-sections for single-conductor connection or for connecting flexible cables with or without end sleeves:

- 0.2 mm^2 ... 2.5 mm^2
- AWG: 24 ... 12
- Insulation stripping length: 10 mm

X130: Connector for the digital inputs

	Pin	Pin assignment		Pin assignment	Pin
	+	+24 V output		Failsafe digital input	DI2+
	DI0	High-speed DI, measuring probe			DI2-
	M	Ground			DI3+
	+	+24 V output			DI3-
	DI1	High-speed DI, measuring probe		+24 V output	VS+
	M	Ground		Digital input	DI4
Phoenix DFMC 1.5/ 6-ST-3.5, Article No. 1790140					

The terminals are spring-loaded terminals.

The three terminals marked with "+" and "VS+" are provided as power supply for external sensors. They are short-circuit-proof and provide a max. of 50 mA per sensor. A sensor short-circuit interrupts the power supply for all three sensors.

For more information about the digital inputs, see Chapter "Connecting digital inputs and the external 24 V supply (Page 144)".

Permissible conductor cross-sections:

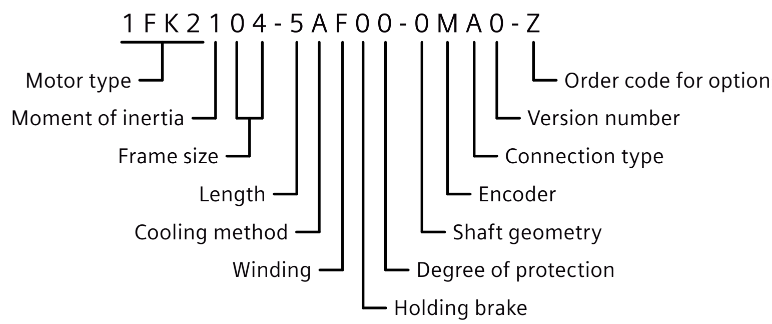
- For single-conductor connection:
  - 0.2 mm² ... 1.5 mm²
  - AWG: 24 ... 16
- For flexible cables with end sleeves:
  - 0.25 mm² ... 1.5 mm²
  - AWG: 24 ... 16
- For flexible cables with end sleeves with protective collars:
  - 0.25 mm² ... 0.75 mm²
  - AWG: 24 ... 19
- Insulation stripping length: 10 mm

Ordering data

16

16.1 Ordering data of the motor

The article number comprises a combination of digits and letters. It is divided into three hyphenated blocks.



Note that not every theoretical combination is possible in practice.

Permissible combinations can be found in Chapter "Motor-converter combinations for 1FK2 (Page 52)", Motor-converter combinations for 1FT2 (Page 55), in the catalog "D 32 SINAMICS S210 and SIMOTICS S-1F☐2" or SIEMENS Product Configurator (www.siemens.com/SPC).

Description of the structure of the article number

Description			Position of the article number																	
			1	2	3	4	5	6	7	-	8	9	10	11	12	-	13	14	15	16
SIMOTICS S-1F☐2 synchronous servomotors			**1**	**F**	☐	2														
Moment of inertia	High Dynamic						1													
	Compact						2													
	High Inertia						3													
Frame size	20							0	2											
	30							0	3											
	40							0	4											
	48 (Compact) 52 (High Dynamic)							0	5											
	63							0	6											
	80							0	8											
	100							1	0											
Total length	0 ... 8										0									
Cooling method	Natural cooling											A								
	Forced ventilation											S								
Winding, rated speed	**max. 1 AC 240 V**																			
	3000 r/min @ 230 V												G							
	max. 3 AC 480 V																			
	1500 r/min @ 400 V	750 r/min @ 230 V											B							
	2000 r/min @ 400 V	1000 r/min @ 230 V											C							
	3000 r/min @ 400 V	1500 r/min @ 230 V											F							
	4500 r/min @ 400 V /	2500 r/min @ 230 V											H							
	6000 r/min @ 400 V	3000 r/min @ 230 V											K							
Holding brake	Without													0						
	With													1						
	Higher performance brake													2						
Degree of protection	IP64														0					
	IP65 with radial shaft sealing ring														1					
	IP67 with radial shaft sealing ring														2					
Shaft geometry	Plain shaft																0			
	Shaft with feather key																1			
	Plain shaft, alternative shaft geometry																2			
	Shaft with feather key, alternative shaft geometry																3			
Encoder	Absolute encoder single-turn, 22 bit (encoder AS22DQC)																	S		
	Absolute encoder single-turn, 26 bit (encoder AS26DQC)																	B		
	Absolute encoder multiturn, 22 bit + 12 bit (encoder AM22DQC)																	M		
	Absolute encoder multiturn, 26 bit + 12 bit (encoder AM26DQC)																	C		
Connection type	OCC (one cable connection) for S210																		A	
Version number	Start																			0

Description of order codes for options

Options for motor 1FT2		Order codes on the rating plate (-Z)
Planetary gearbox / planetary gearbox (precision gearbox)		A☐☐, B☐☐, C☐☐ / J☐☐, H☐☐
Paint finish	Unpainted	X00
	RAL 9005, jet black, matte	X01
	RAL 9001, cream white	X02
	RAL 6011, reseda green	X03
	RAL 7032, pebble gray	X04
	RAL 5015, sky blue	X05
	RAL 1015, light ivory	X06
	RAL 9006, white aluminum	X08
	Special paint finish corresponding to the environmental conditions for the standard paint finish and for condensation on the outer motor surfaces, primer and paint finish in RAL 7016, anthracite grey	K23
	Special paint finish as for K23, but standard color according to color table	K23 + X☐☐
	K23 in combination with option N16: Primer and paint finish in RAL 7016, anthracite gray or optional Primer K23, paint finish with standard color according to color table	K23 + X☐☐
Motor with increased chemical resistance		N16
Pressure compensation connector		Q20
Use down to -30 °C		Q30
Metal rating plate		Q31
Suitable for dry room environments and certification for clean rooms		Q40
Customer data on the rating plate		Y84

You can find more information in Chapter "Options (Page 547)".

For motors with planetary gearbox, the options are separately listed in the associated Operating Instructions as well as in the Configuration Manual.

16.2 Ordering data of the converter

16.2.1 Order data for converters with 1 AC line connection

Converters with 1 AC line connection		
Article number	**Frame size**	**Rated power**
6SL5310-1BB10-1CF0	FSA	100 W
6SL5310-1BB10-2CF0	FSA	200 W
6SL5310-1BB10-4CF0	FSB	400 W
6SL5310-1BB10-8CF0	FSC	750 W

16.2.2 Order data for converters with 3 AC line connection

Converters with 3 AC line connection		
Article number	**Frame size**	**Rated power**
6SL5310-1BE10-4DF0 6SL5310-1BE10-4DF1	FSA	0.4 kW
6SL5310-1BE10-8DF0 6SL5310-1BE10-8DF1	FSA	0.75 kW
6SL5310-1BE11-0DF0 6SL5310-1BE11-0DF1	FSA	1 kW
6SL5310-1BE11-5DF0 6SL5310-1BE11-5DF1	FSB	1.5 kW
6SL5310-1BE12-0DF0 6SL5310-1BE12-0DF1	FSB	2 kW
6SL5310-1BE13-5DF0 6SL5310-1BE13-5DF1	FSC	3.5 kW
6SL5310-1BE15-0DF0 6SL5310-1BE15-0DF1	FSC	5 kW
6SL5310-1BE17-0DF0 6SL5310-1BE17-0DF1	FSC	7 kW

16.3 Ordering data of the connection system

16.3.1 Order data for OCC MOTION-CONNECT cables

You can only order OCC MOTION-CONNECT cables as prefabricated cables.

A maximum of 3 disconnection points are allowed between the cables without reducing the total permitted length.

Table 16-1 MOTION-CONNECT OCC cable with SPEED-CONNECT connector

Designation and use	For connection to motor	Connector size	Outer diameter	Minimum bending radius, static	Conductor cross-section	Article number[1)]
			D_{max} / mm	*R* / mm	in mm²	
Motor connection cable MC500 OCC for predominantly fixed routing	1F□2□02 1F□2□03[2)]	M12	9.9	23.5	0.38	6FX5002-8QN04-□□□□[4)]
	1F□2□03[3)] 1F□2□04 1F□2□05	M17	10.5	25.5	0.75	6FX5002-8QN08-□□□□
	1F□2□06 1F□2□08 1F□2□10	M23	12.7	30.7	1.5	6FX5002-8QN11-□□□□
			13.7	33.3	2.5	6FX5002-8QN21-□□□□ [6)]
Motor connection cable MC800 OCC for use in a cable carrier	1F□2□02 1F□2□03[2)]	M12	9.7	28.2	0.38	6FX8002-8QN04-□□□□[4)]
			9.9	28.8	0.84	6FX8002-8QN06-□□□□[5)]
	1F□2□03[3)] 1F□2□04 1F□2□05	M17	10.5	30.6	0.75	6FX8002-8QN08-□□□□
	1F□2□06 1F□2□08 1F□2□10	M23	12.7	36.9	1.5	6FX8002-8QN11-□□□□
			13.7	39.9	2.5	6FX8002-8QN21-□□□□ [6)]
Extension cable MC500 OCC for predominantly fixed routing	1F□2□02 1F□2□03[2)]	M12	9.9	23.5	0.38	6FX5002-8QE04-□□□□[4)]
	1F□2□03[3)] 1F□2□04 1F□2□05	M17	10.5	25.5	0.75	6FX5002-8QE08-□□□□
	1F□2□06 1F□2□08 1F□2□10	M23	12.7	30.7	1.5	6FX5002-8QE11-□□□□
			13.7	33.3	2.5	6FX5002-8QE21-□□□□ [6)]

Designation and use	For connection to motor	Connector size	Outer diameter	Minimum bending radius, static	Conductor cross-section	Article number[1]
			D_{max} / mm	*R* / mm	in mm²	
Extension cable MC800 OCC for use in a cable carrier	1F☐2☐02 1F☐2☐03[2]	M12	9.9	27.2	0.38	6FX8002-8QE04-☐☐☐☐[4]
			9.9	28.8	0.84	6FX8002-8QE06-☐☐☐☐[5]
	1F☐2☐03[3] 1F☐2☐04 1F☐2☐05	M17	10.5	30.6	0.75	6FX8002-8QE08-☐☐☐☐
	1F☐2☐06 1F☐2☐08 1F☐2☐10	M23	12.7	36.9	1.5	6FX8002-8QE11-☐☐☐☐
			13.7	39.9	2.5	6FX8002-8QE21-☐☐☐☐ [6]

1) The last 4 positions (☐☐☐☐) define the cable length corresponding to the length code.

2) Applicable for 1F☐2☐03-☐☐**G** with M12 connector

3) Applicable for 1F☐2☐03-☐☐**H** and 1F☐2☐03-☐☐**K** with M17 connector

4) For IEC applications

5) For UL applications (minimum conductor cross-section is independent of the current load)

6) Optionally available with 2.5 mm² due to derating in a warm environment

16.3.2 Determining the article number of a prefabricated OCC MOTION-CONNECT cable

Overview

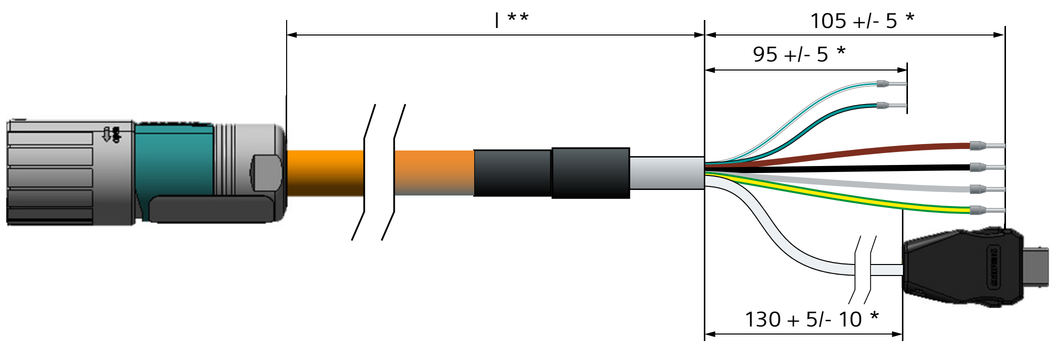


Figure 16-1 Lengths of an OCC MOTION-CONNECT cable

Procedure

1. Determine the required cable length l **. Consider having cable in reserve for strain-free routing.
2. Determine the length code for the required length l ** corresponding to the following overview. The stretched lengths (*) are added automatically for the prefabricated cables.

3. Also select the cable type, the desired cable version, and the required connectors for the article number.

6 F X □ 0 0 2 - 8 Q □ □ □ - □ □ □ □

OCC MOTION-CONNECT

Cable type	Code
MC 500	5
MC 800PLUS	8

Cable version	Code
Motor connection cables	N
Extension cable	E

Connector size	Code
M12 (0.38 mm²)	04 1)
M12 (0.82 mm²)	06 2)
M17 (0.75 mm²)	08
M23 (1.5 mm²)	11
M23 (2.5 mm²)	21

Example of a length code

1.0 m	1AB0
2.3 m	1AC3
36.0 m	1DG0
max. 50.0 m	1FA0

Length	Code
0 m	1

Length	Code
0 m	A
10 m	B
20 m	C
30 m	D
40 m	E
50 m	F

Length	Code
0 m	A
1 m	B
2 m	C
3 m	D
4 m	E
5 m	F
6 m	G
7 m	H
8 m	J
9 m	K

Length	Code
0 m	0
0.1 m	1
0.2 m	2
0.3 m	3
0.4 m	4
0.5 m	5
0.6 m	6
0.7 m	7
0.8 m	8

1) For IEC applications
2) For UL applications

Figure 16-2 Structure of the article number with length code for an OCC MOTION-CONNECT cable

4. Order the required cable with the article number thus determined.

Parameters 17

17.1 Explanation of the list of parameters

Description

The parameters are displayed according to the following pattern.

---

rxxxx **Parameter name / short parameter name**

Variant

Data type: Integer16 **Visible in:** Standard display
Read rights: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in operating state Ready for operation
Parameter group: Name of the group(s)
Unit: -

Min:	**Max:**	**Factory setting:**
-	-	-

Description: Text

Value:
0: Name of value 0
10: Name of value 10

Recommendation: Text

Index:
[0] = Name and meaning of index 0
[1] = Name and meaning of index 1

Bit array:

Bit	**Signal name**	**1 signal**	**0 signal**
00	Name of bit 0	Yes	No
01	Name of bit 1	Yes	No

Dependency: Text
See also: pxxx, rxxx
See also: Fxxxxx, Axxxxx, Cxxxxx

Danger / Caution / Warning / Notice: Safety-related note corresponding to the warning note concept

Note: Text

The representation of a parameter includes as a maximum the information listed below. Depending on the specific parameter, some of the listed information is not applicable.

- **Parameter number (rxxxx)**
  The parameter number is made up of a "p", "r" or "c", followed by several numbers and optionally an index and bit array.
  The parameter number has the following syntax: pxxxx[0...n], rxxxx[0...n], cxxxx[0...n], pxxxx.0...15 or rxxxx.0...15, cxxxx.0...15, pxxxx[0...n].0...15 or rxxxx[0...n].0...15, cxxxx[0...n].0...15.
  Examples of representation in the parameter list:

• p...	Setting parameters (read and write)
• r...	Display parameters (read-only)
• c...	Display parameters (read-only)
• p0972	Setting parameter 972
• p0489[0...2]	Setting parameter 489 index 0 to 2
• r0945	Display parameter 945
• r0196[0...255].4...15	Display parameter with index 0 to 255 and bit array, bit 4 to bit 15
• r5613.0...1	Display parameter 5613 with bit array from bit 0 to bit 1
• c8997[0...2]	Display parameter 8997 index 0 to 2
Other examples of the notation in the documentation:	
• p9563[1]	Setting parameter 9563, index 1
• r0196[1].5	Display parameter 196, index 1, bit 5
• r0964[2]	Display parameter 964, index 2
• p5611.1	Setting parameter 5611, bit 1

- **Parameter name / short parameter name**
  Shows the parameter name in the long form and separated by a slash in the short form.
- **Variant**
  Specifies the product variant for which the parameter is valid. This information is not applicable if a parameter is the same for all product variants used in the parameter list.
- **Data type**
  Each parameter is assigned one of the following data types:

• Integer8	I8	8-bit integer
• Integer16	I16	16-bit integer
• Integer32	I32	32-bit integer
• Unsigned8	U8	8-bit without sign
• Unsigned16	U16	16-bit without sign
• Unsigned32	U32	32-bit without sign
• FloatingPoint32	Float	32-bit floating-point number

- **Visible in**
  You change the number of parameters displayed in the commissioning tool via:
  - Standard display
    Only the basic parameters are displayed.
  - Extended display
    The full scope of parameters is displayed.
- **Rights**
  The user and rights management (UMAC) controls access to the parameters.
  You require runtime function rights to read and set parameters.
  The following read rights are available:
  - Read drive data or acknowledge messages

  The following write permissions are available:
  - Control drive in manual mode
  - Perform drive diagnostics
  - Perform firmware update
  - Create backup or load drive data to Startdrive
  - Edit device settings or drive application
  - Edit Safety Integrated application
  - Edit web server settings
  - Manage users and roles

  Runtime function rights depend on user roles, which are assigned in the commissioning tool being used (Startdrive, web server). As a consequence, setting parameters can be write-protected.
  The commissioning tool provides additional support.
- **Can be changed in operating state**
  A parameter can only be changed in this operating state. The change only becomes active after exiting the state.
  The following states exist:
  - Operation
    The pulses have been enabled.
  - Ready for operation
    The pulses are not enabled and state "Commissioning" is not active.
  - Commissioning
    Commissioning takes place.
    The pulses cannot be enabled.
- **Parameter group**
  A parameter group contains parameters that are functionally associated with one another.
- **Unit**
  Shows the default unit of the parameter. For setting parameters, the unit is additionally specified according to the values (Min, Max, Factory setting) in square brackets.

- **Min, Max, Factory setting**
  The parameter value "when shipped" is specified under "Factory setting" with the relevant unit in square parentheses.
  The value can be adjusted within the range defined by "Min" and "Max".
  This information is not applicable for display parameters.

Min	Minimum value of the parameter [unit]
Max	Maximum value of the parameter [unit]
Factory setting	Value when delivered [unit]

- **Description**
  Explanation of the function of a parameter.
- **Values**
  List of the possible values of a parameter.
- **Recommendation**
  Information about recommended settings.
- **Index**
  Indexed parameters represent the name and its significance for each individual index.
  The following applies to the values (Min, Max, Factory setting) of indexed setting parameters:
  - Min, Max:
    The adjustment range and the unit apply to all indices.
  - Factory setting:
    When all indices have the same factory setting, index 0 is specified with the unit to represent all indices.
    When the indices have different factory settings, they are all listed individually with the unit.
- **Bit array**
  For parameters with bit arrays, the following information is provided for each bit:
  - Bit number and signal name
  - Meaning for signal states 0 and 1
  - Function diagram (optional)
    The signal is shown in this function diagram.
- **Dependency**
  Specification of interactions that this parameter can potentially have:
  - Effect on other parameters
  - Dependent on other parameter settings (dependent on the selected functions)
  - List of other parameters to be considered
  - List of faults and alarms to be considered

- **Danger / Caution / Warning / Notice**
  The safety-relevant notes correspond to the warning notice concept and contain the following information:
  – Important information that must be observed to avoid the risk of physical injury or material damage.
  – Information that must be observed to avoid any problems.
  – Information that the user may find useful.
- **Note**
  Additional explanations about parameters

17.2 List of parameters

Parameters

The following list contains parameters of the S210 product.

Product: SINAMICS S210, Version: 604030000, Language: eng
Objects: S210

r0002 **Operating display / Op_display**

Data type: Integer16	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Parameter group:	Status parameters, Diagnostics general, Drive enable signals	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -

Description: Operating display for the drive.

Value:

0:	Operation - Everything enabled
10:	Operation - Set "enable setpoint" = "1"
11:	Operation - Set "Enable speed controller" = "1"
12:	Operation - RFG frozen, set "RFG start" = "1"
13:	Operation - Set "enable RFG" = "1"
14:	Operation - Speed setpoint not enabled
15:	Operation - Open brake (p1215)
16:	Operation - Withdraw braking with OFF1 using "ON/OFF1" = "1"
17:	Operation - Braking with OFF3 can only be interrupted with OFF2
18:	Operation - Brake on fault, remove fault, acknowledge
21:	Ready for operation - Set "Enable operation" = "1"
31:	Ready for switching on - Set "ON/OFF1" = "0/1"
35:	Switching on inhibited - Commissioning not possible, check motor
41:	Switching on inhibited - Set "ON/OFF1" = "0"
42:	Switching on inhibited - Set "Operating condition/OFF2" = "1"
43:	Switching on inhibited - Set "Operating condition/OFF3" = "1"
44:	Switching on inhibited - Supply STO terminal w/ 24 V (hardware)
45:	Switching on inhibited - Rectify fault, acknowledge fault, STO
46:	Switching on inhibited - Exit commissioning mode

60:	Drive deactivated/not operational
70:	Initialization
200:	Wait for run-up/partial run-up
250:	Device signals a topology error

Dependency: See also: r0046

NOTICE

For a display not equal to 0, the drive is either powering up or an enable signal is missing. The control sends these enable signals.
For several missing enable signals, the corresponding value with the highest number is displayed.

Note

The drive only controls the motor speed in the "Operation" state (r0002 = 0).
OC: Operating condition
EP: Enable Pulses (pulse enable)
RFG: Ramp-function generator
COMM: Commissioning
MotID: Motor data identification
SS2: Safe Stop 2
STO: Safe Torque Off

r0020 Speed setpoint smoothed / Speed setpoint

Data type: FloatingPoint32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Parameter group: Mode signals / displays
Not relevant for motor type: -
Dyn. index [0...n]: - **Calculated:** -
Unit: rpm **Unit group:** - **Unit selection:** -

Description: Displays the smoothed speed setpoint at the speed controller input.

Dependency: See also: r1438

r0021 Speed actual value smoothed / Speed actual value

Data type: FloatingPoint32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Parameter group: Diagnostics, Mode signals / displays
Not relevant for motor type: -
Dyn. index [0...n]: - **Calculated:** -
Unit: rpm **Unit group:** - **Unit selection:** -
Type of signal interconnection: Source numeric **Scaling:** p2000

Description: Display for the smoothed actual value of the motor speed.

Dependency: See also: r0063

Note

Smoothing time constant = 100 ms
The speed actual value is available smoothed (r0021) and unsmoothed (r0063).

r0026 DC link voltage smoothed / DC link voltage

Data type: FloatingPoint32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Parameter group: Brake control, Mode signals / displays
Not relevant for motor type: -
Dyn. index [0...n]: - **Calculated:** -

	Unit: V	**Unit group:** -	**Unit selection:** -
	Type of signal interconnection:	Source numeric	**Scaling:** p2001
Description:	Displays the smoothed actual value of the DC link voltage.		
Dependency:	See also: r0070		

r0027 Absolute actual current smoothed / I_act AbsV smth

	Data type: FloatingPoint32	**Visible in:** Standard display	
	Read permission:	Read drive data or acknowledge messages	
	Parameter group:	Mode signals / displays	
	Not relevant for motor type:	-	
	Dyn. index [0...n]:	-	**Calculated:** -
	Unit: Arms	**Unit group:** -	**Unit selection:** -
	Type of signal interconnection:	Source numeric	**Scaling:** p2002
Description:	Displays the smoothed absolute current actual value.		
Dependency:	See also: r0068		

r0031 Actual torque smoothed / Torque actual val

	Data type: FloatingPoint32	**Visible in:** Standard display	
	Read permission:	Read drive data or acknowledge messages	
	Parameter group:	Brake control, Mode signals / displays	
	Not relevant for motor type:	-	
	Dyn. index [0...n]:	-	**Calculated:** -
	Unit: Nm	**Unit group:** -	**Unit selection:** -
Description:	Displays the smoothed torque actual value.		
Dependency:	See also: r0080		

r0032 Active power actual value smoothed / Active power ActV

	Data type: FloatingPoint32	**Visible in:** Standard display	
	Read permission:	Read drive data or acknowledge messages	
	Parameter group:	Mode signals / displays	
	Not relevant for motor type:	-	
	Dyn. index [0...n]:	-	**Calculated:** -
	Unit: kW	**Unit group:** -	**Unit selection:** -
	Type of signal interconnection:	Source numeric	**Scaling:** r2004
Description:	Display for the smoothed actual value of the active power.		
Dependency:	See also: r0082		

Note

The active power is available smoothed (r0032 with 100 ms, r0082[1] with 1 ms) and unsmoothed (r0082[0]).

r0034 Motor utilization thermal / Mot_util therm

	Data type: FloatingPoint32	**Visible in:** Standard display	
	Read permission:	Read drive data or acknowledge messages	
	Parameter group:	Motor temperature, Mode signals / displays	
	Not relevant for motor type:	Induction motor, Separately excited synchronous motor, Synchronous or reluctance motor with starting cage	
	Dyn. index [0...n]:	-	**Calculated:** -
	Unit: %	**Unit group:** -	**Unit selection:** -
	Type of signal interconnection:	Source numeric	**Scaling:** PERCENT

Description: Displays the thermal motor utilization taking into account the ambient temperature set in p0613.

Dependency: See also: p0613
See also: F07011, A07012

NOTICE
After the drive is switched on, the system starts to determine the motor temperature with an assumed model value. This means that the value for the motor utilization is only valid after a stabilization time.

r0037[0...10] Drive temperatures / Drv temp

Data type: FloatingPoint32	**Visible in:** Extended display	
Read permission:	Read drive data or acknowledge messages	
Parameter group:	Mode signals / displays	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: °C	**Unit group:** -	**Unit selection:** -
Type of signal interconnection:	Source numeric	**Scaling:** p2006

Description: Displays the temperatures of the drive components.

Index:
[0] = Inverter maximum value
[1] = Depletion layer maximum value
[2] = Rectifier maximum value
[3] = Air intake
[4] = Interior of power unit
[5] = Cooling unit liquid intake
[6] = Capacitor air discharge
[7] = Depletion layer maximum value 1
[8] = Depletion layer maximum value 2
[9] = Depletion layer maximum value 3
[10] = Depletion layer maximum value 4

Note
The value of -200 indicates that there is no measuring signal.
r0037[0]: Maximum value of the inverter temperatures.
r0037[1]: Maximum value of the depletion layer temperatures.
In the case of a fault, the particular shutdown threshold depends on the power unit, and cannot be read out.

r0039[0...2] Energy display / Energy display

Data type: FloatingPoint32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Parameter group:	Mode signals / displays, Power loss optimization	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: kWh	**Unit group:** -	**Unit selection:** -
Type of signal interconnection:	Source numeric	**Scaling:** -

Description: Display for the energy values at the drive output terminals.

Index:
[0] = Energy balance (sum)
[1] = Energy drawn
[2] = Energy fed back

Note
For index [0]:
Difference between the energy drawn and energy that is fed back.

r0044 Thermal converter utilization / Conv_util therm

Data type: FloatingPoint32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Parameter group:	Mode signals / displays, Power unit	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: %	**Unit group:** -	**Unit selection:** -
Type of signal interconnection:	Source numeric	**Scaling:** PERCENT

Description: Displays the thermal converter utilization as a percentage.
With this value, various thermal monitoring functions are taken into account.

Dependency: See also: r0034

Note
The thermal motor utilization is displayed in parameter r0034.

r0046.0...30 Missing enable signals / Missing enable sig

Data type: Unsigned32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Parameter group:	Control/status words, Drive enable signals	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -
Type of signal interconnection:	Source binary/numeric	**Scaling:** -

Description: Displays the missing enable signals.
All enable signals are required to operate the drive. The enable signals are set by the control.

Bit array:

Bit	Signal name	1 signal	0 signal
00	OFF1 enable missing	Yes	No
01	OFF2 enable missing	Yes	No
02	OFF3 enable missing	Yes	No
03	Operation enable missing	Yes	No
08	Safety enable missing	Yes	No
10	Ramp-function generator enable missing	Yes	No
12	Speed setpoint enable missing	Yes	No
16	OFF1 enable internal missing	Yes	No
17	OFF2 enable internal missing	Yes	No
18	OFF3 enable internal missing	Yes	No
19	Pulse enable internal missing	Yes	No
21	STOP2 enable internal missing	Yes	No
24	License missing	Yes	No
26	Drive inactive or not operational	Yes	No
28	Brake open missing	Yes	No
30	Speed controller enable missing	Yes	No

Dependency: See also: r0002

Note

The value r0046 = 0 indicates that all enable signals for this drive are present.
Bit 00 = 1 (enable signal missing), if:
- OFF1 from the PROFINET interface missing.
- Switching on inhibited is active.

Bit 01 = 1 (enable signal missing), if:
- OFF2 from the PROFINET interface missing.

Bit 02 = 1 (enable signal missing), if:
- OFF3 from the PROFINET interface missing.

Bit 03 = 1 (enable signal missing), if:
- "Enable operation" from the PROFINET interface missing.

Bit 08 = 1 (enable signal missing), if:
- Safety functions have been enabled and STO is active.
- A safety-relevant message with STO as response is active.
STO enabled via terminals:
- Pulse enable via the STO terminals has a 0 signal.
STO enabled via PROFIsafe:
- STO is selected via PROFIsafe.
- Additional details relating to the reason that STO was selected, see parameter r10352.

Bit 10 = 1 (enable signal missing), if:
- "Enable ramp-function generator" from the PROFINET interface missing.

Bit 12 = 1 (enable signal missing), if:
- "Enable setpoint" from the PROFINET interface missing.

Bit 16 = 1 (enable signal missing), if:
- There is an OFF1 fault response. The system is only enabled if the fault is removed and was acknowledged and the "switching on inhibited" withdrawn with OFF1 = 0.

Bit 17 = 1 (enable signal missing), if:
- The commissioning mode is selected.
- There is an OFF2 fault response.
- The drive is inactive or not capable of operation.

Bit 18 = 1 (enable signal missing), if:
- OFF3 has still not been completed or an OFF3 fault response is present.

Bit 19 = 1 (internal pulse enable missing), if:
- Synchronization still not completed.

Bit 21 = 1 (enable signal missing), if:
The pulses have been enabled and the speed setpoint has still not been enabled, because:
- The holding brake opening time (r1216) has still not elapsed.
- The encoder has not been calibrated (synchronous motor).

Bit 26 = 1 (enable signal missing), if:
- The drive is inactive or not capable of operation.
- The drive is in the "PROFIenergy energy-saving mode" (r5600, CU-specific).

Bit 28 = 1 (enable signal missing), if:
- The holding brake is closed or has still not been opened.

Bit 30 = 1 (speed controller inhibited), if one of the following reasons is present:
- Pulse enable missing
- The function generator with current setpoint is active.
- The measuring function "current controller reference frequency characteristic" is active.
- The pole position identification is active.
- Motor data identification is active (only certain steps).

r0060 Speed setpoint before the setpoint filter / n_set before filt

Data type: FloatingPoint32 | **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Parameter group: Mode signals / displays, Speed setpoint filter
Not relevant for motor type: -
Dyn. index [0...n]: - | **Calculated:** -
Unit: rpm | **Unit group:** - | **Unit selection:** -
Type of signal interconnection: Source numeric | **Scaling:** p2000

Description: Displays the currently unsmoothed speed setpoint at the input of the speed controller or U/f characteristic (after the interpolator).

r0061[0...1] Actual speed unsmoothed / n_act unsmoothed

Data type: FloatingPoint32 | **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Parameter group: Encoder evaluation, Mode signals / displays
Not relevant for motor type: -
Dyn. index [0...n]: - | **Calculated:** -
Unit: rpm | **Unit group:** - | **Unit selection:** -
Type of signal interconnection: Source numeric | **Scaling:** p2000

Description: Displays the unsmoothed actual speed values sensed by the encoders.

Index: [0] = Motor encoder
[1] = Encoder 2

r0062 Speed setpoint after the filter / n_set after filter

Data type: FloatingPoint32 | **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Parameter group: Mode signals / displays
Not relevant for motor type: -
Dyn. index [0...n]: - | **Calculated:** -
Unit: rpm | **Unit group:** - | **Unit selection:** -
Type of signal interconnection: Source numeric | **Scaling:** p2000

Description: Displays the speed setpoint after the setpoint filters.

r0063 Speed actual value smoothed / Speed actual value

Data type: FloatingPoint32 | **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Parameter group: U/f control, Speed controller, Speed actual value filter, Mode signals / displays
Not relevant for motor type: -
Dyn. index [0...n]: - | **Calculated:** -
Unit: rpm | **Unit group:** - | **Unit selection:** -
Type of signal interconnection: Source numeric | **Scaling:** p2000

Description: Display for the smoothed speed actual value.

Dependency: See also: r0021, r0061, p1441

Note
The smoothing time is set in p1441.
The speed actual value is available strongly smoothed (r0021) and unsmoothed (r0061).

r0068 Absolute current actual value / I_act AbsV

Data type: FloatingPoint32	**Visible in:** Extended display	
Read permission:	Read drive data or acknowledge messages	
Parameter group:	Mode signals / displays	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: Arms	**Unit group:** -	**Unit selection:** -
Type of signal interconnection:	Source numeric	**Scaling:** p2002

Description: Displays actual absolute current.

Dependency: See also: r0027

NOTICE
The value is updated with a sampling time of 1 ms.

Note
Absolute current value = sqrt(Iq^2 + Id^2)
The absolute current actual value is available smoothed (r0027) and unsmoothed (r0068).

r0070 Actual DC link voltage / Vdc act val

Data type: FloatingPoint32	**Visible in:** Extended display	
Read permission:	Read drive data or acknowledge messages	
Parameter group:	Mode signals / displays	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: V	**Unit group:** -	**Unit selection:** -
Type of signal interconnection:	Source numeric	**Scaling:** p2001

Description: Display for the measured actual value of the DC link voltage.

Dependency: See also: r0026

Note
The DC link voltage is available smoothed (r0026) and unsmoothed (r0070).

r0072 Output voltage / U_output

Data type: FloatingPoint32	**Visible in:** Extended display	
Read permission:	Read drive data or acknowledge messages	
Parameter group:	U/f control, Current controller, Mode signals / displays, Power unit	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: Vrms	**Unit group:** -	**Unit selection:** -
Type of signal interconnection:	Source numeric	**Scaling:** p2001

Description: Display for the actual output voltage of the power unit.

r0076 Current actual value field-generating / Id_act

Data type: FloatingPoint32	**Visible in:** Extended display
Read permission:	Read drive data or acknowledge messages
Parameter group:	U/f control, Current controller

	Not relevant for motor type:	-	
	Dyn. index [0...n]:	-	**Calculated:** -
	Unit: Arms	**Unit group:** -	**Unit selection:** -
	Type of signal interconnection:	Source numeric	**Scaling:** p2002
Description:	Display for the field-generating current actual value.		

r0077[0...1] Current setpoint torque-generating / Iq_set

	Data type: FloatingPoint32	**Visible in:** Extended display	
	Read permission:	Read drive data or acknowledge messages	
	Parameter group:	Current controller, Mode signals / displays	
	Not relevant for motor type:	Synchronous or reluctance motor with starting cage	
	Dyn. index [0...n]:	-	**Calculated:** -
	Unit: Arms	**Unit group:** -	**Unit selection:** -
	Type of signal interconnection:	Source numeric	**Scaling:** p2002
Description:	Displays the torque/force-generating current setpoint.		
Index:	[0] = Current setpoint [1] = Current setpoint model		

r0078[0...1] Current actual value torque-generating / Iq_act

	Data type: FloatingPoint32	**Visible in:** Extended display	
	Read permission:	Read drive data or acknowledge messages	
	Parameter group:	Mode signals / displays	
	Not relevant for motor type:	-	
	Dyn. index [0...n]:	-	**Calculated:** -
	Unit: Arms	**Unit group:** -	**Unit selection:** -
	Type of signal interconnection:	Source numeric	**Scaling:** p2002
Description:	Display for the actual value of the torque-generating current Iq.		
Index:	[0] = Unsmoothed [1] = Smoothed with 1 ms		

r0079[0...1] Torque setpoint total / M_set total

	Data type: FloatingPoint32	**Visible in:** Extended display	
	Read permission:	Read drive data or acknowledge messages	
	Parameter group:	Torque limiting, Mode signals / displays	
	Not relevant for motor type:	Synchronous or reluctance motor with starting cage	
	Dyn. index [0...n]:	-	**Calculated:** -
	Unit: Nm	**Unit group:** -	**Unit selection:** -
	Type of signal interconnection:	Source numeric	**Scaling:** p2003
Description:	Displays the torque setpoint at the output of the speed controller.		
Index:	[0] = Unsmoothed [1] = Smoothed with 1 ms		

r0080 Torque actual value / Torque actual val

	Data type: FloatingPoint32	**Visible in:** Extended display	
	Read permission:	Read drive data or acknowledge messages	
	Parameter group:	Mode signals / displays	
	Not relevant for motor type:	-	
	Dyn. index [0...n]:	-	**Calculated:** -

Unit: Nm | **Unit group:** - | **Unit selection:** -
Type of signal interconnection: Source numeric | **Scaling:** p2003

Description: Display for the actual torque.

Dependency: See also: r0031

Note

The value is available smoothed (r0031) and unsmoothed (r0080).

r0081 Torque utilization / M_utilization

Data type: FloatingPoint32 | **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Parameter group: Torque limiting, Mode signals / displays
Not relevant for motor type: -
Dyn. index [0...n]: - | **Calculated:** -
Unit: % | **Unit group:** - | **Unit selection:** -
Type of signal interconnection: Source numeric | **Scaling:** PERCENT

Description: Displays the torque utilization as a percentage.
The torque utilization is obtained from the required smoothed torque referred to the torque limit.

Note

The torque utilization is obtained from the required torque referred to the torque limit as follows:
- Positive torque: r0081 = ((r0079 + p1532) / (r1538 - p1532)) * 100 %
- Negative torque: r0081 = ((-r0079 + p1532) / (-r1539 + p1532)) * 100 %
The torque utilization calculation is smoothed with 1 ms.

r0082[0...3] Active power actual value / P_act

Data type: FloatingPoint32 | **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Parameter group: Mode signals / displays
Not relevant for motor type: -
Dyn. index [0...n]: - | **Calculated:** -
Unit: kW | **Unit group:** - | **Unit selection:** -
Type of signal interconnection: Source numeric | **Scaling:** r2004

Description: Displays the actual active power.

Index:
[0] = Unsmoothed
[1] = Smoothed with 1 ms
[2] = Power drawn
[3] = Power drawn smoothed

Dependency: See also: r0032

Note

The mechanical active power is available smoothed (r0032 with 100 ms, r0082[1] with 1 ms) and unsmoothed (r0082[0]).
For index [3]:
Smoothing time constant = 0.25 ms

p0140 Number of Encoder Data Sets (EDS) / EDS count

Data type: Unsigned8 | **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Commissioning

Parameter group:	Data sets	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
1	2	1

Description: Sets the number of Encoder Data Sets (EDS).

Note
When parameterizing the drive with "no encoder" there must be at least one encoder data set (p0140 >= 1).

p0187[0] Motor encoder encoder data set number / Mot enc EDS number

Data type: Unsigned8	**Visible in:** Extended display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Commissioning	
Parameter group:	Data sets	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
0	99	99

Description: Assigns a drive data set (= index) the associated encoder data set (EDS) for the motor encoder.

The value corresponds to the number of the assigned encoder data set.

Example:

Motor encoder in drive data set 2 should be assigned encoder data set 0.

--> p0187[2] = 0

Note
A value of 99 means that no encoder has been assigned to this drive data set (not configured).

p0188[0] Encoder 2 encoder data set number / Enc 2 EDS number

Data type: Unsigned8	**Visible in:** Extended display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Commissioning	
Parameter group:	Data sets	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
0	99	99

Description: Assign a drive data set (= index) the corresponding encoder data set (EDS) for encoder 2.

The value corresponds to the number of the assigned encoder data set.

Example:

Encoder 2 in drive data set 2 should be assigned to encoder data set 1.

--> p0188[2] = 1

Note
A value of 99 means that no encoder has been assigned to this drive data set (not configured).

r0196[0...255].4...15 Topology component status / Top comp stat

Data type: Unsigned32 | **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Parameter group: Diagnostics general
Not relevant for motor type: -
Dyn. index [0...n]: - | **Calculated:** -
Unit: - | **Unit group:** - | **Unit selection:** -

Description: Displays the status of the components.
r0196[0]: Group status of all components
r0196[1]: Status of component with component number 1
...
r0196[255]: Status of component with component number 255

Bit array:

Bit	Signal name	1 signal	0 signal
04	Component state	Active	Inactive/parking
06	Topology problem active	Yes	No
07	Part of the target topology	Yes	No only act topo
08	Alarm present	Yes	No
10	Fault present	Yes	No
13	Maintenance required	Yes	No
14	Maintenance urgently required	Yes	No
15	Fault gone/can be acknowledged	Yes	No

Note
For bits 12 ... 11:
These status bits are used for the classification of internal alarm classes and are intended for diagnostic purposes only on certain automation systems with integrated SINAMICS functionality.

p0201[0] Power unit code number / PU code no

Data type: Unsigned16 | **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Commissioning
Parameter group: Power unit
Not relevant for motor type: -
Dyn. index [0...n]: - | **Calculated:** -
Unit: - | **Unit group:** - | **Unit selection:** -

Min:	Max:	Factory setting:
0	65535	0

Description: Sets the actual code number of the power unit being used.

r0208 Rated power unit line voltage / PU U_rated

Data type: FloatingPoint32 | **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Parameter group: System identification, Power unit
Not relevant for motor type: -
Dyn. index [0...n]: - | **Calculated:** -
Unit: Vrms | **Unit group:** - | **Unit selection:** -

Description: Displays the rated line voltage of the power unit.
r0208 = 230: 200 - 240 V (line voltage tolerance: +/-10 %)
r0208 = 400: 380 - 480 V (line voltage tolerance: +/-10 %)

p0210 Device supply voltage / U_supply

Data type: Unsigned16	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Ready for operation	
Parameter group:	Power unit, Quick commissioning, Line data/operating mode	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: V	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
1 [V]	63000 [V]	400 [V]

Description: Sets the device supply voltage.
The voltage between two phases should be entered as the device supply voltage.
This setting is important for operating with voltages that are less than the voltage range for which the drive is designed.

Note
Setting ranges for p0210 as a function of the rated power unit voltage:
U_rated = 230 V:
- p0210 = 200 ... 240 V
U_rated = 400 V:
- p0210 = 380 ... 480 V (wide voltage range, in addition to 200 ... 240 V)

p0215 Braking resistor selection / Brk resistor sel

Data type: Integer16	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Commissioning	
Parameter group:	Dynamic braking, Quick commissioning	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
3	10	10

Description: Sets the external braking resistor.

Value:
3: Third-party braking resistor (with software monitoring)
10: No monitoring (external braking resistor)

Dependency: See also: p0216, p0218, p0219

Note
p0215 = 3:
An externally connected braking resistor is controlled and also thermally monitored per software.
Parameters p0216, p0218 and p0219[0] and p0219[1] must be set in order that the monitoring functions. Chopper operation is not possible if the values are not set.
p0215 = 10:
The externally connected braking resistor is not monitored.
If the power unit has an internal braking resistor, then this is monitored.

p0216 Braking resistance value / Resistance value

Data type: FloatingPoint32	**Visible in:** Extended display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Commissioning	
Parameter group:	Dynamic braking, Quick commissioning	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: ohm	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
0.0 [ohm]	1000.0 [ohm]	0.0 [ohm]

Description: Sets the resistance value of a connected external braking resistor.

Dependency: The parameter is only relevant for p0215 = 2, 3.

p0218 Braking resistor duration at maximum power / Brk res dT Pmax

Data type: FloatingPoint32	**Visible in:** Extended display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Commissioning	
Parameter group:	Dynamic braking, Quick commissioning	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: s	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
0.00 [s]	2000.00 [s]	0.00 [s]

Description: Sets the maximum duration when operating the braking resistor at its maximum power level.

Dependency: The parameter is only relevant for p0215 = 2, 3.

p0219[0...1] Braking resistor braking power / R_brake P_brake

Data type: FloatingPoint32	**Visible in:** Extended display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Commissioning	
Parameter group:	Dynamic braking, Quick commissioning	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: kW	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
0.00 [kW]	20000.00 [kW]	0.00 [kW]

Description: Sets the braking power of the connected braking resistor.

Index:
[0] = Maximum power
[1] = Rated power

p0251[0] Power unit heat sink fan operating hours counter / PU fan t_op

Data type: Unsigned32	**Visible in:** Standard display
Read permission:	Read drive data or acknowledge messages

Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Ready for operation	
Parameter group:	System identification, Power unit	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: h	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
0 [h]	4294967295 [h]	0 [h]

Description: Displays the operating hours of the heat sink fan in the power unit.

The number of hours operated can only be reset to 0 in this parameter (e.g. after a fan has been replaced).

Dependency: See also: r0277

See also: A30042

Note

This parameter is only available/included in the customer interface for compatibility reasons.

In the future, use parameter r0277 (power unit heat sink-fan wear counter).

r0277[0...2] Power unit fan wear counter / PU fan wear_count

Data type: FloatingPoint32	**Visible in:** Extended display	
Read permission:	Read drive data or acknowledge messages	
Parameter group:	Power unit	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: %	**Unit group:** -	**Unit selection:** -

Description: Displays the wear counter of the fan in the power unit.

After a fan has been replaced, using an appropriate button, the value can be reset in the commissioning tool to 0.

Index: [0] = Heat sink fan

[1] = Auxiliary fan 1

[2] = Auxiliary fan 2

Dependency: See also: A30042

p0300[0] Motor type selection / Mot type sel

Data type: Integer16	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Commissioning	
Parameter group:	Motor data, Quick commissioning	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
0	10000	0

Description: Selects the motor type or start to read in the motor parameters for a motor with DRIVE-CLiQ (p0300 = 10000).

For p0300 < 10000 the following applies:

The first digit of the parameter value always defines the general motor type and corresponds to the third-party motor belonging to a motor list:

2 = rotating synchronous motor

Value:

0:	No motor
2:	Synchronous motor

203: 1FT2 synchronous motor
237: 1FK7 synchronous motor
272: 1FK2 synchronous motor
295: 1FS2 synchronous motor
2024: 1FK7 synchronous motor
2030: 1FT2 synchronous motor
2031: 1FK2 synchronous motor
2032: 1FS2 synchronous motor
10000: Motor with DRIVE-CLiQ

Dependency: See also: p0301

p0301[0] Motor code number selection / Mot code no sel

Data type: Unsigned32 | **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Commissioning
Parameter group: Motor data, Quick commissioning
Not relevant for motor type: Separately excited synchronous motor
Dyn. index [0...n]: - | **Calculated:** -
Unit: - | **Unit group:** - | **Unit selection:** -

Min:	Max:	Factory setting:
0	99999999	0

Description: Code number of the connected motor, whose data was accepted when commissioning.

Dependency: Code numbers are only possible for motor types that correspond to the motor type selected in p0300.
See also: p0300

Note
For a motor with self-identifying data, p0301 cannot be changed. p0301 is automatically written to the code number of the motor parameter read in (r0302) if p0300 is set to 10000. For other values, the commissioning routine cannot be exited.

r0302[0] Motor code (identified) / Motor code ident

Data type: Unsigned32 | **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Parameter group: Motor data, Quick commissioning
Not relevant for motor type: Separately excited synchronous motor, Synchronous or reluctance motor with starting cage
Dyn. index [0...n]: - | **Calculated:** -
Unit: - | **Unit group:** - | **Unit selection:** -

Description: Displays the identified motor code number.
When the drive powers up, the motor code is read out the motor. For r0302 = 0, the motor data were not identified.

r0304[0] Rated motor voltage / Mot U_rated

Data type: FloatingPoint32 | **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Parameter group: Motor data, Quick commissioning
Not relevant for motor type: -
Dyn. index [0...n]: - | **Calculated:** -
Unit: Vrms | **Unit group:** - | **Unit selection:** -

Description: Displays the rated motor voltage.

r0305[0] Rated motor current / Mot I_rated

Data type: FloatingPoint32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Parameter group: Motor data, Quick commissioning
Not relevant for motor type: -
Dyn. index [0...n]: - **Calculated:** -
Unit: Arms **Unit group:** - **Unit selection:** -

Description: Displays the rated motor current.

r0307[0] Rated motor power / Mot P_rated

Data type: FloatingPoint32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Parameter group: Motor data, Quick commissioning
Not relevant for motor type: -
Dyn. index [0...n]: - **Calculated:** -
Unit: kW **Unit group:** - **Unit selection:** -

Description: Displays the rated motor power.

r0311[0] Rated motor speed / Mot n_rated

Data type: FloatingPoint32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Parameter group: Motor data, Quick commissioning
Not relevant for motor type: -
Dyn. index [0...n]: - **Calculated:** -
Unit: rpm **Unit group:** - **Unit selection:** -

Description: Displays the rated motor speed.

r0312[0] Rated motor torque / Mot M_rated

Data type: FloatingPoint32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Parameter group: Motor data
Not relevant for motor type: Induction motor, Separately excited synchronous motor, Synchronous or reluctance motor with starting cage, Synchronous reluctance motor
Dyn. index [0...n]: - **Calculated:** -
Unit: Nm **Unit group:** - **Unit selection:** -

Description: Displays the rated motor torque.

r0316[0] Motor torque constant / Mot kT

Data type: FloatingPoint32 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Parameter group: Motor data, Quick commissioning
Not relevant for motor type: Induction motor, Separately excited synchronous motor, Synchronous or reluctance motor with starting cage, Synchronous reluctance motor
Dyn. index [0...n]: - **Calculated:** -
Unit: Nm/A **Unit group:** - **Unit selection:** -

Description: Sets the torque constant of the synchronous motor.
r0316 = 0:
The torque constant is calculated from r0312 or r0307.
r0316 > 0:
The set value is used as torque constant.

r0318[0] Motor stall current / Mot I_standstill

Data type: FloatingPoint32 | **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Parameter group: Motor data
Not relevant for motor type: Induction motor, Separately excited synchronous motor, Synchronous or reluctance motor with starting cage, Synchronous reluctance motor
Dyn. index [0...n]: - | **Calculated:** -
Unit: Arms | **Unit group:** - | **Unit selection:** -

Description: Displays the rated motor stall current.

r0319[0] Motor static torque / Mot M_standstill

Data type: FloatingPoint32 | **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Parameter group: Motor data
Not relevant for motor type: Induction motor, Separately excited synchronous motor, Synchronous or reluctance motor with starting cage, Synchronous reluctance motor
Dyn. index [0...n]: - | **Calculated:** -
Unit: Nm | **Unit group:** - | **Unit selection:** -

Description: Displays the motor standstill/static torque.

r0322[0] Maximum motor speed / Mot n_max

Data type: FloatingPoint32 | **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Parameter group: Motor data, Quick commissioning
Not relevant for motor type: -
Dyn. index [0...n]: - | **Calculated:** -
Unit: rpm | **Unit group:** - | **Unit selection:** -

Description: Displays the maximum motor speed.
Dependency: See also: p1082

r0323[0] Maximum motor current / Mot I_max

Data type: FloatingPoint32 | **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Parameter group: Motor data, Quick commissioning
Not relevant for motor type: Induction motor, Separately excited synchronous motor, Synchronous reluctance motor
Dyn. index [0...n]: - | **Calculated:** -
Unit: Arms | **Unit group:** - | **Unit selection:** -

Description: Displays the maximum permissible motor current.

r0341[0] Motor moment of inertia / Mot m_inert

Data type: FloatingPoint32 | **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages

Parameter group:	Motor data, Speed controller	
Not relevant for motor type:	Synchronous or reluctance motor with starting cage	
Dyn. index [0...n]:	-	**Calculated:** automatic
Unit: kgm²	**Unit group:** -	**Unit selection:** -

Description: Displays the motor moment of inertia (without load).

p0400[0...n] Encoder type selection / Enc_type sel

Data type: Integer16	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Commissioning	
Parameter group:	Encoder evaluation, Quick commissioning	
Not relevant for motor type:	-	
Dyn. index [0...n]:	EDS n defined by: p0140	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
0	10100	0

Description: Selects the encoder from the list of encoder types supported.

Value:

0:	No encoder
202:	DRIVE-CLiQ encoder AS20, singleturn
204:	DRIVE-CLiQ encoder AM20, multiturn 4096
222:	DRIVE-CLiQ encoder AS22, singleturn
224:	DRIVE-CLiQ encoder AM22, multiturn 4096
242:	DRIVE-CLiQ encoder AS24, singleturn
244:	DRIVE-CLiQ encoder AM24, multiturn 4096
262:	DRIVE-CLiQ encoder AS26, singleturn
264:	DRIVE-CLiQ encoder AM26, multiturn 4096
10100:	Identify encoder (waiting)

NOTICE

An encoder type with p0400 < 9999 defines an encoder for which there is an encoder parameter list.
When selecting a catalog encoder (p0400 < 9999) the parameters from the encoder parameter list cannot be changed (write protection).

Note

The connected encoder can be identified using p0400 = 10100. This means that the encoder must support this, and is possible in the following cases:
- Motor with DRIVE-CLiQ
- Encoder with EnDat interface
- DRIVE-CLiQ encoder

For p0400 = 10100 the following applies:
The connected encoder is identified. If identification is not possible, then p0400 remains set = 10100, and the system waits until identification is possible.

p0404[0...n].1...10 Encoder configuration effective / Enc_config eff

Data type: Unsigned32	**Visible in:** Standard display
Read permission:	Read drive data or acknowledge messages
Write permission:	Edit device configuration or drive applications
Can be changed in the operating state:	Commissioning

Parameter group:	Encoder evaluation	
Not relevant for motor type:	-	
Dyn. index [0...n]:	EDS n defined by: p0140	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
-	-	0000 0000 0000 0000 bin

Description: Settings for the basic encoder properties.

Bit array:

Bit	Signal name	1 signal	0 signal
01	Absolute encoder	Yes	No
02	Multiturn encoder	Yes	No
10	DRIVE-CLiQ encoder	Yes	No

NOTICE

This parameter is automatically preassigned for encoders from the encoder list and for identify encoder (p0400).
When selecting a catalog encoder, this parameter cannot be changed (write protection).

Note

For bit 01, 02 (absolute encoder, multiturn encoder):
These bits can only be selected for a DRIVE-CLiQ encoder.
For bit 10 (DRIVE-CLiQ encoder):
This bit is only used for the large-scale integrated DRIVE-CLiQ encoders that provide their encoder data directly in DRIVE-CLiQ format without converting this data. Therefore, this bit is not set for first generation DRIVE-CLiQ encoders.

p0408[0...n] Rotary encoder pulse number / Rot enc pulse no

Data type: Unsigned32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Commissioning	
Parameter group:	Encoder evaluation	
Not relevant for motor type:	-	
Dyn. index [0...n]:	EDS n defined by: p0140	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
0	16777215	2048

Description: Sets the number of pulses for a rotary encoder.

In conjunction with the fine resolution, the pulse number defines the transfer format for position actual values Gn_XIST1 (r0479).

NOTICE

This parameter is automatically preassigned for encoders from the encoder list and for identify encoder (p0400).
When selecting a catalog encoder, this parameter cannot be changed (write protection).

Note

The smallest permissible value is 1 pulse.
This value does not always correspond to the pulse number of the measuring device. For a DRIVE-CLiQ encoder, a value is entered here that facilitates optimum transfer of the resolution (p0423).

p0410[0...n].0...1 Encoder invert actual value / Enc inv actual val

Data type: Unsigned16	**Visible in:** Standard display
Read permission:	Read drive data or acknowledge messages
Write permission:	Edit device configuration or drive applications
Can be changed in the operating state:	Commissioning

Parameter group:	Encoder evaluation	
Not relevant for motor type:	-	
Dyn. index [0...n]:	EDS n defined by: p0140	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
-	-	0000 bin

Description: Setting to invert actual values.

Bit array:

Bit	Signal name	1 signal	0 signal
00	Invert speed actual value	Yes	No
01	Invert position actual value	Yes	No

Note

The inversion influences the following parameters:
Bit 00: r0061, r0063 (exception: encoderless closed-loop control)
Bit 01: r0479

p0411[0...n].0...3 Measuring gearbox configuration / Meas gear config

Data type: Unsigned32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Commissioning	
Parameter group:	Encoder evaluation	
Not relevant for motor type:	-	
Dyn. index [0...n]:	EDS n defined by: p0140	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
-	-	0000 bin

Description: Sets the configuration for position tracking of a measuring gearbox.

Bit array:

Bit	Signal name	1 signal	0 signal
00	Measuring gearbox activate position tracking	Yes	No
01	Axis type	Linear axis	Rotary axis
02	Measuring gearbox reset position	Yes	No
03	Meas. gearbox, activate pos. tracking for incremental encoders	Yes	No

NOTICE

For p0411.3 = 1 the following applies:
If position tracking is activated for incremental encoders, only the position actual value is stored. Axis or encoder motion is not detected when deactivated! Any tolerance window entered in p0413 has no effect.

Note

For the following events, the non-volatile, saved position values are automatically reset:
- When an encoder replacement has been identified.
- When changing the configuration of the Encoder Data Set (EDS).

p0412[0...n] Measuring gearbox absolute encoder rotary revolutions virtual / Abs rot rev

Data type: Unsigned32	**Visible in:** Standard display
Read permission:	Read drive data or acknowledge messages
Write permission:	Edit device configuration or drive applications
Can be changed in the operating state:	Commissioning
Parameter group:	Encoder evaluation

Not relevant for motor type:	-	
Dyn. index [0...n]:	EDS n defined by: p0140	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
0	4194303	0

Description: Sets the number of rotations that can be resolved for a rotary encoder with activated position tracking of the measuring gearbox.

Dependency: This parameter is only of significance for an absolute encoder (p0404.1 = 1) with activated position tracking (p0411.0 = 1) and for an incremental encoder with activated position tracking (p0411.3 = 1).

Note

The resolution that is set must be able to be represented using Gx_XIST2.

For rotary axes/modulo axes, the following applies:
p0411.0 = 1:
This parameter is preset with p0421 and can be changed.
p0411.3 = 1:
The parameter value is preset to the highest possible value.

For linear axes, the following applies:
p0411.0 = 1:
This parameter is pre-assigned with p0421, expanded by 6 bits for multiturn information (maximum number of overflows) and cannot be changed.
p0411.3 = 1:
The parameter value is preset to the highest possible value.

p0413[0...n] Measuring gearbox position tracking tolerance window / Pos track window

Data type: FloatingPoint32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Commissioning	
Parameter group:	Encoder evaluation	
Not relevant for motor type:	-	
Dyn. index [0...n]:	EDS n defined by: p0140	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
0.00	4.2949673e+09	0.00

Description: Sets a tolerance window for position tracking.

After the system is switched on, the difference between the saved position and the actual position is determined, and depending on this, the following is initiated:

Difference within the tolerance window --> The position is reproduced as a result of the encoder actual value.

Difference outside the tolerance window --> An appropriate message is output.

⚠ CAUTION
Rotation, for example through a complete encoder range is not detected.

Note

The value is entered in complete encoder pulses.
For p0411.0 = 1, the value is automatically pre-assigned quarter of the encoder range.
Example:
Quarter of the encoder range = (p0408 * p0421) / 4
It is possible that the tolerance window may not be able to be precisely set due to the data type (floating point number with 23 bit mantissa).

p0421[0...n] Absolute encoder rotary multiturn resolution / Enc abs multiturn

Data type: Unsigned32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Commissioning	
Parameter group:	Encoder evaluation	
Not relevant for motor type:	-	
Dyn. index [0...n]:	EDS n defined by: p0140	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
0	4294967295	4096

Description: Maximum number of revolutions that can be resolved for a rotary absolute encoder to determine the position.

The value of p0421 is read out when the drive powers up and cannot be changed.

p0423[0...n] Absolute encoder rotary singleturn resolution / Enc abs singleturn

Data type: Unsigned32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Commissioning	
Parameter group:	Encoder evaluation	
Not relevant for motor type:	-	
Dyn. index [0...n]:	EDS n defined by: p0140	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
0	1073741823	8192

Description: Sets the number of measuring steps per revolution for a rotary absolute encoder.

The resolution refers to the absolute position.

NOTICE
This parameter is automatically preset for encoders from the encoder list and for "Encoder type selection" (p0400). When selecting a catalog encoder, this parameter cannot be changed (write protection).

p0432[0...n] Gearbox factor encoder revolutions / Grbx_fact enc_rev

Data type: Integer32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Commissioning	
Parameter group:	Encoder evaluation	
Not relevant for motor type:	-	
Dyn. index [0...n]:	EDS n defined by: p0140	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
1	1048576	1

Description: Sets the encoder revolutions for the gearbox factor of the encoder evaluation.

The gearbox factor specifies the ratio between the encoder shaft and motor shaft (for motor encoders) or between the encoder shaft and the load.

Dependency: See also: p0410, p0433

Note

Negative gearbox ratios should be implemented with p0410.

For synchronous motors, the quotient of the pole pair number divided by the ratio of the measuring gearbox must be an integer number: (motor pole pair number * p0433) / p0432

p0433[0...n] Gearbox factor motor/load revolutions / Grbx_fact mot/load

Data type: Integer32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Commissioning	
Parameter group:	Encoder evaluation	
Not relevant for motor type:	-	
Dyn. index [0...n]:	EDS n defined by: p0140	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
1	1048576	1

Description: Sets the motor and load revolutions for the gearbox factor of the encoder evaluation.

The gearbox factor specifies the ratio between the encoder shaft and motor shaft (for motor encoders) or between the encoder shaft and the load.

Dependency: See also: p0410, p0432

Note

Negative gearbox ratios should be implemented with p0410.

For synchronous motors, the quotient of the pole pair number divided by the ratio of the measuring gearbox must be an integer number:

(motor pole pair number * p0433) / p0432

r0479[0...2] Diagnostics encoder position actual value Gn_XIST1 / Diag Gn_XIST1

Data type: Integer32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Parameter group:	Encoder evaluation	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -
Type of signal interconnection:	Source numeric	**Scaling:** -

Description: Display for the encoder position actual value Gn_XIST1 according to PROFIdrive for diagnostics.

The value is displayed with sign.

Index:
[0] = Motor encoder
[1] = Encoder 2
[2] = Reserved

p0488[0...2] Activate measuring probe 1 / Act meas probe 1

Data type: Integer16	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Operation	
Parameter group:	Measuring probe	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -

Unit: -	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
0	210	210

Description: Setting to activate/deactivate measuring probe 1.
The inversion of probe 1 is set in p0490.0.

Value:
0: No measuring probe
210: DI 0 (X130 / 1.2)

Index:
[0] = Motor encoder
[1] = Encoder 2
[2] = Reserved

Dependency: See also: p0489, p0490

CAUTION
In order to prevent incorrect measurement values, these parameters may not be written during an active measurement.

Note
DI: Digital Input
Refer to the encoder interface for PROFIdrive.

p0489[0...2] Activate measuring probe 2 / Act meas probe 2

Data type: Integer16	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Operation	
Parameter group:	Measuring probe	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
0	211	211

Description: Setting to activate/deactivate measuring probe 2.
The inversion of probe 2 is set in p0490.1.

Value:
0: No measuring probe
211: DI 1 (X130 / 1.5)

Index:
[0] = Motor encoder
[1] = Reserved
[2] = Reserved

Dependency: See also: p0488, p0490

CAUTION
In order to prevent incorrect measurement values, these parameters may not be written during an active measurement.

Note
DI: Digital Input
Refer to the encoder interface for PROFIdrive.

p0489[0...2] Activate measuring probe 2 / Act meas probe 2

Variant:	S210 (Basic positioner)
Data type: Integer16	**Visible in:** Standard display
Read permission:	Read drive data or acknowledge messages
Write permission:	Edit device configuration or drive applications

Can be changed in the operating state:	Operation	
Parameter group:	Measuring probe	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
0	211	0

Description: Setting to activate/deactivate measuring probe 2.
The inversion of probe 2 is set in p0490.1.

Value:
0: No measuring probe
211: DI 1 (X130 / 1.5)

Index:
[0] = Motor encoder
[1] = Reserved
[2] = Reserved

Dependency: See also: p0488, p0490

CAUTION
In order to prevent incorrect measurement values, these parameters may not be written during an active measurement.

Note
DI: Digital Input
Refer to the encoder interface for PROFIdrive.

p0490.0...1 Invert measuring probe / Probe inv

Data type: Unsigned32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Operation	
Parameter group:	Measuring probe	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
-	-	0000 bin

Description: Setting to invert digital input 0 or 1 (probe 1, 2).

Bit array:

Bit	Signal name	1 signal	0 signal
00	DI 0 (X130 / 1.2)	Inverted	Not inverted
01	DI 1 (X130 / 1.5)	Inverted	Not inverted

Dependency: See also: p0488, p0489

Note
The inversion has No effect on the status display of the digital inputs (r0722).
DI: Digital Input

p0494[0...n] Equivalent zero mark input terminal / ZM_equiv inp_term

Data type: Integer16	**Visible in:** Standard display
Read permission:	Read drive data or acknowledge messages
Write permission:	Edit device configuration or drive applications
Can be changed in the operating state:	Operation

Parameter group:	Encoder evaluation	
Not relevant for motor type:	-	
Dyn. index [0...n]:	EDS n defined by: p0140	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
0	211	0

Description: Selects the input terminal for connecting an equivalent zero mark (external encoder zero mark).

Value:
0: No equivalent zero mark (evaluation of the encoder zero mark)
210: DI 0 (X130 / 1.2)
211: DI 1 (X130 / 1.5)

Dependency: See also: p0490

⚠ CAUTION
In order to prevent incorrect measurement values, these parameters may not be written during an active measurement.

Note
Refer to the encoder interface for PROFIdrive.

r0550[0] Brake status / Brake status

Data type: Integer16	**Visible in:** Extended display	
Read permission:	Read drive data or acknowledge messages	
Parameter group:	Motor holding brake, Quick commissioning	
Not relevant for motor type:	Separately excited synchronous motor, Synchronous or reluctance motor with starting cage	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -

Description: Displays the status of the brake.
This value is read when the drive runs up.

Value:
0: No data
1: Holding brake
2: High performance holding brake

Dependency: See also: p1215, r1216, r1217

Note
For value = 1:
The default value for opening time/closing time applies.
For value = 2:
A shorter opening time/closing time is realized if the drive satisfies the preconditions.

p0551[0] Brake code number / Brake code no

Data type: Unsigned32	**Visible in:** Extended display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Commissioning	
Parameter group:	Motor holding brake, Quick commissioning	
Not relevant for motor type:	Separately excited synchronous motor, Synchronous or reluctance motor with starting cage	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
0	4294967295	1

Description: Display and setting the code number for the brake.
0 = No data
1 = Manual entry
> 1 = valid code number
For value = 0:
- Parameters listed under Dependent are set to a value of zero and are write protected.
- Parameters r1216, r1217 are set to a value of zero.
For value = 1:
- Write protection for the parameters listed under Dependent is withdrawn.
For value > 1:
- Parameters listed under Dependent are automatically pre-assigned and are write protected.
- Parameters r1216, r1217 are automatically preassigned the appropriate values.

Dependency: See also: r0550

Note
Only code numbers can be set that are permitted for the selected motor code (p0301).

p0613[0] Motor temperature model ambient temperature / Temp_mod amb_temp

Data type: FloatingPoint32	**Visible in:** Extended display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Operation	
Parameter group:	Motor temperature	
Not relevant for motor type:	Induction motor, Separately excited synchronous motor, Synchronous or reluctance motor with starting cage	
Dyn. index [0...n]:	-	**Calculated:** automatic
Unit: °C	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
-40 [°C]	100 [°C]	40 [°C]

Description: Sets the motor ambient temperature.
Based on this value, the motor temperature model calculates the thermal motor utilization (r0034).

Dependency: See also: r0034
See also: F07011, A07012

Note
If the thermal motor model is activated for permanent-magnet synchronous motors, then the parameter is incorporated in the model calculation if a temperature sensor is not being used.
For thermal motor model 1, the factory setting is based on an ambient temperature of 40 °C.

r0722.0...4 Digital inputs status / DI status

Data type: Unsigned32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Parameter group:	Digital inputs, Programmable digital inputs/outputs	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -
Type of signal interconnection:	Source binary/numeric	**Scaling:** -

Description: Displays for the status of the digital inputs.

Bit array:

Bit	Signal name	1 signal	0 signal
00	DI 0 (X130 / 1.2)	High	Low
01	DI 1 (X130 / 1.5)	High	Low

02	DI 2 (X130 / 2.1-2)	High	Low
03	DI 3 (X130 / 2.3-4)	High	Low
04	DI 4 (X130 / 2.6)	High	Low

Dependency: See also: p0488, p0489

Note
For bit 00, 01:
DI 0 and DI 1 are fast digital inputs and can be used to connect a measuring probe (p0488, p0489).
For bits 02, 03:
DI 2 and DI 3 form a failsafe digital input.
For bit 04:
DI 4 is intended to monitor the temperature of the external brake resistor.
DI: Digital Input

r0898.0...14 Control word sequence control / STW seq_ctrl

Data type: Unsigned16 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Parameter group: Control/status words
Not relevant for motor type: -
Dyn. index [0...n]: - **Calculated:** -
Unit: - **Unit group:** - **Unit selection:** -
Type of signal interconnection: Source binary/numeric **Scaling:** -

Description: Displays the control word of the sequence control.
The higher-level control cyclically sends the control word to the drive.

Bit array:

Bit	Signal name	1 signal	0 signal
00	ON/OFF1	ON	OFF
01	No coast-down / coast-down (OFF2)	No OFF2	OFF2
02	No Quick Stop / Quick Stop (OFF3)	No OFF3	OFF3
03	Enable operation	Yes	No
04	Enable ramp-function generator	Yes	No
05	Continue ramp-function generator	Yes	No
06	Enable speed setpoint	Yes	No
07	Command open brake	Yes	No
08	Jog 1 ON/jog 1 OFF	ON	OFF
09	Jog 2 ON/jog 2 OFF	ON	OFF
10	Control by PLC	Yes	No
12	Enable speed controller	Yes	No
14	Command close brake	Yes	No

Note
For bit 10:
This bit is only relevant for telegram types that cyclically send the associated bit in the control word. Otherwise, r0898.10 is always "Yes".

r0899.0...13 Status word sequence control / ZSW seq_ctrl

Data type: Unsigned16 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Parameter group: Control/status words
Not relevant for motor type: -
Dyn. index [0...n]: - **Calculated:** -
Unit: - **Unit group:** - **Unit selection:** -

Type of signal interconnection:	Source binary/numeric	**Scaling:** -

Description: Display for the status word of the sequence control.

The status word is cyclically sent from the drive to the higher-level control.

Bit array:

Bit	Signal name	1 signal	0 signal
00	Ready for switching on	Yes	No
01	Ready	Yes	No
02	Operation enabled	Yes	No
03	Jog active	Yes	No
04	No coasting active	OFF2 inactive	OFF2 active
05	No Quick Stop active	OFF3 inactive	OFF3 active
06	Switching on inhibited active	Yes	No
07	Drive ready	Yes	No
08	Controller enable	Yes	No
09	Control requested	Yes	No
11	Pulses enabled	Yes	No
12	Open holding brake	Yes	No
13	Command close holding brake	Yes	No

Note

For bits 00, 01, 02, 04, 05, 06, 09:

For PROFIdrive, these signals are used for status word 1.

For bit 13:

When function "SBC (Safe Brake Control)" is activated and selected, the brake is no longer controlled using this signal.

r0922 PROFIdrive PZD telegram selection / PZD telegr

Data type: Unsigned16	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Parameter group:	Quick commissioning, Configuration	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -

Description: Displays the PROFIdrive telegram.

Value:

3:	Standard telegram 3, PZD-5/9
4:	Standard telegram 4, PZD-6/14
5:	Standard telegram 5, PZD-9/9
6:	Standard telegram 6, PZD-10/14
102:	SIEMENS telegram 102, PZD-6/10
103:	SIEMENS telegram 103, PZD-7/15
105:	SIEMENS telegram 105, PZD-10/10
106:	SIEMENS telegram 106, PZD-11/15

Note

The telegram is set in the commissioning tool or by the control.

r0922 PROFIdrive PZD telegram selection / PZD telegr

Variant:	S210 (Basic positioner)	
Data type: Unsigned16	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Parameter group:	Quick commissioning, Configuration	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -

Unit: -	**Unit group:** -	**Unit selection:** -

Description: Displays the PROFIdrive telegram.

Value:
- 7: Standard telegram 7, PZD-2/2
- 9: Standard telegram 9, PZD-10/5
- 111: SIEMENS telegram 111, PZD-12/12
- 112: SIEMENS telegram 112, PZD-17/12
- 113: SIEMENS telegram 113, PZD-21/14
- 999: Free telegram configuration via signal interconnection

Note
The telegram is set in the commissioning tool or by the control.

r0924[0...1] ZSW bit pulses enabled / ZSW pulse enab

Data type: Unsigned16	**Visible in:** Extended display	
Read permission:	Read drive data or acknowledge messages	
Parameter group:	Configuration	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -

Description: Displays the position of the "Pulses enabled" status signal in the PROFIdrive telegram.

Index:
[0] = Signal number
[1] = Bit position

p0925 PROFIdrive clock synchronous sign-of-life tolerance / PD SoL_tol

Data type: Unsigned16	**Visible in:** Extended display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Operation	
Parameter group:	Configuration	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
0	65535	1

Description: Sets the number of tolerated consecutive sign-of-life errors of the isochronous controller.
The sign-of-life signal is normally received in PZD4 (control word 2) from the controller.

Dependency: See also: F01912

Note
The sign-of-life monitoring is disabled for p0925 = 65535.

r0930 PROFIdrive operating mode / PD operating mode

Data type: Unsigned16	**Visible in:** Extended display	
Read permission:	Read drive data or acknowledge messages	
Parameter group:	Configuration	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -

Description: Displays the operating mode.
3: Closed-loop speed controlled operation without ramp-function generator

r0944 Counter for fault buffer changes / Fault buff change

Data type: Unsigned16 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Parameter group: Faults / alarms
Not relevant for motor type: -
Dyn. index [0...n]: - **Calculated:** -
Unit: - **Unit group:** - **Unit selection:** -
Type of signal interconnection: Source numeric **Scaling:** -

Description: Display the counter for fault buffer changes.
Recommendation: Used to check whether the fault buffer has been read out consistently.
Dependency: See also: r0945, r0947, r0948, r0949, r2109

r0945[0...63] Fault code / Fault code

Data type: Unsigned16 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Parameter group: Faults / alarms
Not relevant for motor type: -
Dyn. index [0...n]: - **Calculated:** -
Unit: - **Unit group:** - **Unit selection:** -

Description: Displays the codes of faults that have occurred.
Dependency: See also: r0947, r0948, r0949, r2109, r2130, r2133, r2136, r3122

NOTICE
The properties of the fault buffer should be taken from the corresponding product documentation.

Note
The buffer parameters are cyclically updated (states are indicated in r2139).
Fault buffer structure (general principle):
r0945[0], r0949[0] or r2133[0], r2130[0], r0948[0], r2136[0], r2109[0]
--> Fault 1 (oldest active fault) of the active incident
. . .
r0945[7], r0949[7] or r2133[7], r2130[7], r0948[7], r2136[7], r2109[7]
--> fault 8 (oldest active fault) of the active incident

For more than 8 active faults, only the entries are overwritten at the eighth position (index 7).

History of acknowledged faults:
If a fault incident is acknowledged, then all alarms of the 1st fault incident are transferred into the 2nd fault incident, this becomes the 1st acknowledged fault incident.
The 2nd incident is transferred into the 3rd, the 3rd into the 4th etc. The last incident is rejected.

r0945[8], r0949[8] or r2133[8], r2130[0], r0948[8], r2136[8], r2109[8]
--> fault 1 of the 1st acknowledged incident
. . .
r0945[16], r0949[16] or r2133[16], r2130[16], r0948[16], r2136[16], r2109[16]
--> fault 1 of the 2nd acknowledged incident
. . .
r0945[56], r0949[56] or r2133[56], r2130[56], r0948[56], r2136[56], r2109[56]
--> fault 1 of the 7th acknowledged incident
. . .
r0945[63], r0949[63] or r2133[63], r2130[63], r0948[63], r2136[63], r2109[63]
--> fault 8 (oldest fault that has gone) of the 7th acknowledged incident

r0947[0...63] Fault number / Fault number

Data type: Unsigned16	**Visible in:** Extended display	
Read permission:	Read drive data or acknowledge messages	
Parameter group:	Faults / alarms	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -

Description: Displays the numbers of faults that have occurred.

Dependency: See also: r0945

NOTICE
The properties of the fault buffer should be taken from the corresponding product documentation.

Note

The buffer parameters are cyclically updated (states are indicated in r2139).
Fault buffer structure (general principle):
r0945[0], r0949[0] or r2133[0], r2130[0], r0948[0], r2136[0], r2109[0] --> fault 1 (oldest active fault) of the active incident
. . .
r0945[7], r0949[7] or r2133[7], r2130[7], r0948[7], r2136[7], r2109[7] --> fault 8 (latest active fault) of the active incident
For more than 8 active faults, only the entries are overwritten at the eighth position (index 7).

History of acknowledged faults:
If a fault incident is acknowledged, then all alarms of the 1st fault incident are transferred into the 2nd fault incident, this becomes the 1st acknowledged fault incident.
The 2nd incident is transferred into the 3rd, the 3rd into the 4th etc. The last incident is rejected.

r0945[8], r0949[8] or r2133[8], r2130[0], r0948[8], r2136[8], r2109[8] --> fault 1 of the 1st acknowledged incident
. . .
r0945[16], r0949[16] or r2133[16], r2130[16], r0948[16], r2136[16], r2109[16] --> fault 1 of the 2nd acknowledged incident
. . .
r0945[56], r0949[56] or r2133[56], r2130[56], r0948[56], r2136[56], r2109[56] --> fault 1 of the 7th acknowledged incident
. . .
r0945[63], r0949[63] or r2133[63], r2130[63], r0948[63], r2136[63], r2109[63] --> fault 8 (oldest fault that has gone) of the 7th acknowledged incident

r0948[0...63] Fault received in milliseconds / Fault received ms

Data type: Unsigned32	**Visible in:** Extended display	
Read permission:	Read drive data or acknowledge messages	
Parameter group:	Faults / alarms	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: ms	**Unit group:** -	**Unit selection:** -

Description: Displays the system runtime in milliseconds referred to the day that the fault occurred.

Dependency: See also: r0945, r0947, r0949, r2109, r2114, r2130, r2133, r2136, r3122

NOTICE
The time comprises r2130 (complete days) and r0948 (milliseconds, incomplete day).

r0949[0...63] Fault value / Fault value

Data type: Integer32	**Visible in:** Extended display

Read permission:	Read drive data or acknowledge messages	
Parameter group:	Faults / alarms	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -

Description: Displays additional information about the fault that occurred (as integer number).
The fault causes can be found under the fault values of the particular fault number.

Dependency: See also: r0945, r0947, r0948, r2109, r2130, r2133, r2136, r3122

Note
The buffer parameters are cyclically updated in the background.
The structure of the fault buffer and the assignment of the indices is shown in r0945.

p0952 Fault cases counter / Fault cases qty

Data type: Unsigned16	**Visible in:** Extended display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Operation	
Parameter group:	Faults / alarms	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
0	65535	0

Description: Number of fault situations since the last reset.

Dependency: The counter is reset with p0952 = 0.
See also: r0945, r0947, r0948, r0949, r2109, r2130, r2133, r2136

r0964[0...6] Device identification / Device ID

Data type: Unsigned16	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Parameter group:	System identification	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -

Description: Displays the device identification.

Index:
[0] = Company (Siemens = 42)
[1] = Device type
[2] = Firmware version
[3] = Firmware date (year)
[4] = Firmware date (day/month)
[5] = Reserved
[6] = Firmware patch/hot fix

Note
Example:
r0964[0] = 42 --> SIEMENS
r0964[1] = device type, see below
r0964[2] = 602 --> first part firmware version V06.02 (second part, refer to index 6)
r0964[3] = 2023 --> year 2023
r0964[4] = 1706 --> June 17
r0964[5] = 1 --> 1 (fixed value)
r0964[6] = 0 --> second part firmware version (complete version: V06.02.00.00)
Device type:
r0964[1] = 5410 --> SINAMICS S210

r0965 PROFIdrive profile number profile version / PD profile nr vers

Data type: Unsigned16	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Parameter group:	Configuration	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -

Description: Displays the PROFIdrive profile number and profile version.
Constant value = 032A hex.
Byte 1: Profile number = 03 hex = PROFIdrive profile
Byte 2: profile version = 2A hex = 42 dec = version 4.2

Note
When the parameter is read via PROFIdrive, the Octet String 2 data type applies.

p0972 Drive reset / Drive reset

Data type: Unsigned16	**Visible in:** Extended display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Ready for operation	
Parameter group:	Save & reset	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
0	3	0

Description: Sets the required procedure to execute a hardware reset for the drive.

Value:
0: Inactive
1: Hardware-Reset immediate
2: Hardware reset preparation
3: Hardware reset after cyclic communication has failed

DANGER
It must be absolutely ensured that the system is in a safe condition.
The memory card/device memory of the converter must not be accessed.

Note
For value = 1:
Reset is immediately executed and communications interrupted.
After communications have been established, check the reset operation (refer below).
This value cannot be set in operation.
For value = 2:
Help to check the reset operation.
Firstly, set p0972 = 2 and then read back. Secondly, set p0972 = 1 (it is possible that this request is possibly no longer acknowledged). The communication is then interrupted.
After communications have been established, check the reset operation (refer below).
For value = 3:
The reset is executed after interrupting cyclic communication. This setting is used to implement a synchronized reset by a control for several drives.
If cyclic communication is not active, then the reset is immediately executed.
After communications have been established, check the reset operation (refer below).
To check the reset operation:
After the drive has been restarted and communications have been established, read p0972 and check the following:
p0972 = 0 --> the reset was successfully executed.
p0972 > 0 --> the reset was not executed.

r0975[0...10] Converter identification / Converter ident

Data type: Unsigned16	**Visible in:** Extended display	
Read permission:	Read drive data or acknowledge messages	
Parameter group:	System identification	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -

Description: Displays the identification of the converter. The drive internally comprises components, device and converter. Both components require their own identification parameters according to PROFIdrive.

Index:
[0] = Company (Siemens = 42)
[1] = Converter type
[2] = Firmware version
[3] = Firmware date (year)
[4] = Firmware date (day/month)
[5] = PROFIdrive converter type class
[6] = PROFIdrive converter subtype class
[7] = Reserved
[8] = Reserved
[9] = Reserved
[10] = Firmware patch/hot fix

Dependency: See also: r0964

Note
Example:
r0975[0] = 42 --> SIEMENS
r0975[1] = 311 --> SERVO converter type
r0975[2] = 602 --> first part firmware version V06.02 (second part refer to index 10)
r0975[3] = 2023 --> year 2023
r0975[4] = 1706 --> 17th of June
r0975[5] = 1 --> PROFIdrive type class = 1 (axis)
r0975[6] = 8 --> PROFIdrive subtype class = 4 (application class)
r0975[7] = 1 --> 1 (fixed value)
r0975[8] = 0 (reserved)
r0975[9] = 0 (reserved)
r0975[10] = 0 --> second part firmware version (complete version: V06.02.00.00)

p0976 Reset all parameters / Reset all par

Data type: Unsigned16	**Visible in:** Extended display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Ready for operation	
Parameter group:	Save & reset	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
0	1	0

Description: Resets all drive system parameters to the factory settings.

Value:
0: Inactive
1: Start to reset all parameters

NOTICE
Writing to parameters is inhibited during the reset operation.

p0977 Save all parameters / Save all par

Data type: Unsigned16	**Visible in:** Extended display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Operation	
Parameter group:	Save & reset	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
0	1	0

Description: Retentively saves all parameters of the drive system to the non-volatile memory.
When saving, only the adjustable parameters intended to be saved are taken into account.

Value:
0: Inactive
1: Save in non-volatile memory - Loaded at POWER ON

Dependency: See also: p0976

NOTICE
The drive power supply may only be switched off after data has been saved (i.e. after data save has been started, wait until the parameter again has the value 0). Writing to parameters is inhibited while saving.

r0979[0...30] PROFIdrive encoder format / PD encoder format

Data type: Unsigned32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Parameter group: System identification, Configuration
Not relevant for motor type: -
Dyn. index [0...n]: - **Calculated:** -
Unit: - **Unit group:** - **Unit selection:** -

Description: Displays the actual position encoder used according to PROFIdrive.

Index:
[0] = Header
[1] = Motor encoder type
[2] = Motor encoder resolution
[3] = Shift factor G1_XIST1
[4] = Shift factor G1_XIST2
[5] = Distinguishable revolutions motor encoder
[6...10] = Reserved
[11] = Type encoder 2
[12] = Resolution encoder 2
[13] = Shift factor G2_XIST1
[14] = Shift factor G2_XIST2
[15] = Distinguishable revolutions encoder 2
[16...30] = Reserved

Note
Information about the individual indices can be taken from the following literature:
PROFIdrive Profile Drive Technology

r0980[0...299] List of existing parameters 1 / List avail par 1

Data type: Unsigned16 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Parameter group: System identification
Not relevant for motor type: -
Dyn. index [0...n]: - **Calculated:** -
Unit: - **Unit group:** - **Unit selection:** -

Description: Displays the parameters that exist for this drive.

Note
Modified parameters are displayed in indices 0 to 298. If an index contains the value 0, then the list ends here. In a long list, index 299 contains the parameter number at which position the list continues.
This list consists solely of the following parameters:
r0980[0...299], r0981[0...299] ... r0989[0...299]
The parameters in this list are not displayed in the parameter lists of the commissioning tool. However, they can be read from a higher-level control system.

p1082[0] Maximum speed / n_max

Data type: FloatingPoint32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications

Can be changed in the operating state:	Ready for operation	
Parameter group:	Motorized potentiometer, Speed limiting, U/f control, Speed controller, Limits	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** automatic
Unit: rpm	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
0.000 [rpm]	210000.000 [rpm]	1500.000 [rpm]

Description: Sets the maximum speed of the motor to a value less than or equal to the maximum motor speed (r0322).

The set value is valid for both directions of rotation.

Dependency: See also: r0322

p1083[0] Positive speed limit / n_limit pos

Data type: FloatingPoint32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Operation	
Parameter group:	Speed controller	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: rpm	**Unit group:** -	**Unit selection:** -
Type of signal interconnection:	Source numeric	**Scaling:** p2000
Min:	**Max:**	**Factory setting:**
0.000 [rpm]	210000.000 [rpm]	210000.000 [rpm]

Description: Sets the maximum speed for the positive direction.

The set value must be less than or equal to the maximum speed (p1082).

p1086[0] Negative speed limit / n_limit neg

Data type: FloatingPoint32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Operation	
Parameter group:	Speed controller	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: rpm	**Unit group:** -	**Unit selection:** -
Type of signal interconnection:	Source numeric	**Scaling:** p2000
Min:	**Max:**	**Factory setting:**
-210000.000 [rpm]	0.000 [rpm]	-210000.000 [rpm]

Description: Sets the maximum speed for the negative direction.

The set value must be less than or equal to the maximum speed (p1082).

p1121[0] OFF1 ramp-down time / OFF1 t_ramp down

Data type: FloatingPoint32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Operation	

Parameter group:	Quick commissioning	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: s	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
0.000 [s]	999999.000 [s]	1.000 [s]

Description: Sets the ramp-down time after an OFF1 command.
The value is referred to the maximum speed (p1082).
After an OFF1 command, within this time, the speed setpoint is ramped down from the maximum speed (p1082) to standstill.

Dependency: See also: p1082

p1135[0] OFF3 ramp-down time / OFF3 t_RD

Data type: FloatingPoint32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Operation	
Parameter group:	Enable logic, Quick commissioning	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: s	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
0.000 [s]	600.000 [s]	0.000 [s]

Description: Sets the ramp-down time for Quick Stop.
In this time, after an OFF3, the speed setpoint is reduced from the maximum speed (p1082) down to standstill.

Note
This time can be exceeded if the DC link voltage reaches its maximum value.

r1196 DSC position setpoint / DSC x_set

Data type: Integer32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Parameter group:		
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -
Type of signal interconnection:	Source numeric	**Scaling:** -

Description: Displays the position setpoint of Dynamic Servo Control in fine pulses.

Note
DSC: Dynamic Servo Control

p1215[0] Motor holding brake configuration / Brake config

Data type: Integer16	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Ready for operation	
Parameter group:	Motor holding brake, Basic functions	
Not relevant for motor type:	-	

Dyn. index [0...n]:	-	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
0	2	0

Description: Sets the holding brake configuration.

Value:
0: No motor holding brake available
1: Motor holding brake acc. to sequence control
2: Motor holding brake always open

Dependency: See also: r1216, r1217, p1226, p1227, p1228, p1278

CAUTION

For the setting p1215 = 0, if a brake is used, it remains closed. If the motor moves, this will destroy the brake.
If the brake must hold a load, then it is not permissible that p1215 is set = 2, as otherwise damage can occur as a result of the falling load.

NOTICE

If p1215 was set to 1, then when the pulses are cancelled, the brake is closed even if the motor is still rotating. Pulses can be canceled as a result of withdrawing OFF2, or withdrawing enable operation or by faults with an OFF2 response.

Note

If p1215 is set = 0 (no holding brake available) when running up, then the motor holding brake is automatically identified. If a motor holding brake is detected, then p1215 is set = 2 (motor holding brake as for sequence control).
For value 2:
This setting allows the motor shaft to be rotated for installation purposes.

r1216[0] Motor holding brake opening time / Brake t_open

Data type: FloatingPoint32	**Visible in:** Extended display	
Read permission:	Read drive data or acknowledge messages	
Parameter group:	Motor holding brake	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: ms	**Unit group:** -	**Unit selection:** -

Description: Displays the opening time for the motor holding brake.
The speed setpoint is kept at 0 for this time. The speed setpoint is then enabled.

Dependency: See also: p1215, r1217

r1217[0] Motor holding brake closing time / Brake t_close

Data type: FloatingPoint32	**Visible in:** Extended display	
Read permission:	Read drive data or acknowledge messages	
Parameter group:	Motor holding brake	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: ms	**Unit group:** -	**Unit selection:** -

Description: Displays the time to close the motor holding brake.
If the drive signals that the motor is at a standstill, if the holding brake is activated, after the closing time has expired, the pulses are canceled. This prevents the load from sagging, for example.

Dependency: See also: p1215, r1216

p1226[0] Threshold for zero speed detection / n_standst n_thr

Data type: FloatingPoint32	**Visible in:** Extended display
Read permission:	Read drive data or acknowledge messages
Write permission:	Edit device configuration or drive applications

Can be changed in the operating state:	Operation	
Parameter group:	Motor holding brake, Enable logic	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: rpm	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
0.00 [rpm]	210000.00 [rpm]	20.00 [rpm]

Description: Sets the speed threshold for the standstill identification.

Acts on the actual value and setpoint monitoring.

When braking with OFF1 or OFF3, when the threshold is undershot, standstill is identified.

The following applies when the brake control is activated:

When the threshold is fallen below, the brake control is started and the system waits for the brake closing time in r1217. The pulses are then canceled.

if the brake control is not activated, the following applies:

When the threshold is undershot, the pulses are canceled and the drive coasts down.

Dependency: See also: p1215, r1216, r1217, p1227

Note

Standstill is identified in the following cases:

- The speed actual value falls below the speed threshold in p1226 and the time started after this in p1228 has expired.
- The speed setpoint falls below the speed threshold in p1226 and the time started after this in p1227 has expired.

The actual value sensing is subject to measuring noise. For this reason, standstill cannot be detected if the speed threshold is too low.

p1227[0] Zero speed detection monitoring time / n_standst t_mon

Data type: FloatingPoint32	**Visible in:** Extended display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Operation	
Parameter group:	Motor holding brake, Enable logic	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: s	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
0.000 [s]	300.000 [s]	4.000 [s]

Description: Sets the monitoring time for the standstill identification.

When braking with OFF1 or OFF3, standstill is detected after the monitoring time has expired, after the setpoint speed has fallen below p1226.

After this, the brake control is started, the system waits for the closing time in r1217 and then the pulses are canceled.

Dependency: See also: p1215, r1216, r1217, p1226

Note

Standstill is detected if at least one of the following conditions is satisfied:

- The speed actual value falls below the speed threshold in p1226 and the time started after this in p1228 has expired.
- The speed setpoint falls below the speed threshold in p1226 and the time started after this in p1227 has expired.

For p1227 = 300.000 s the following applies:

Monitoring is deactivated.

For p1227 = 0.000 s, the following applies:

With OFF1 or OFF3 and a ramp-down time = 0, the pulses are immediately canceled and the motor "coasts" down.

p1228[0]	**Pulse cancellation delay time / Pulse cancel t_del**		
	Data type: FloatingPoint32	**Visible in:** Extended display	
	Read permission:	Read drive data or acknowledge messages	
	Write permission:	Edit device configuration or drive applications	
	Can be changed in the operating state:	Operation	
	Parameter group:	Motor holding brake, Enable logic	
	Not relevant for motor type:	-	
	Dyn. index [0...n]:	-	**Calculated:** -
	Unit: s	**Unit group:** -	**Unit selection:** -
	Min:	**Max:**	**Factory setting:**
	0.000 [s]	299.000 [s]	0.000 [s]

Description: Sets the delay time for pulse cancellation.

After OFF1 or OFF3, the pulses are canceled, if at least one of the following conditions is fulfilled:

- The speed actual value falls below the threshold in p1226 and the time started after this in p1228 has expired.
- The speed setpoint falls below the threshold in p1226 and the time started after this in p1227 has expired.

Dependency: See also: p1226, p1227

p1278[0]	**Brake control diagnostics evaluation / Brake diagnostics**		
	Data type: Integer16	**Visible in:** Standard display	
	Read permission:	Read drive data or acknowledge messages	
	Write permission:	Edit device configuration or drive applications	
	Can be changed in the operating state:	Operation	
	Parameter group:	Motor holding brake, Basic functions	
	Not relevant for motor type:	-	
	Dyn. index [0...n]:	-	**Calculated:** -
	Unit: -	**Unit group:** -	**Unit selection:** -
	Min:	**Max:**	**Factory setting:**
	0	1	0

Description: Sets the brake control type (with or without diagnostics evaluation).

Value:

0: Brake control with diagnostics evaluation

1: Brake control without diagnostics evaluation

Note

If the configuration of the motor holding brake (p1215 = 0) is set to "No holding brake present" when running up, then an automatic identification of the motor holding brake will be carried out.

If a brake control is detected without diagnostics evaluation, then the parameter is set to "Brake control without diagnostics evaluation".

It is not permissible to parameterize "Brake control without diagnostics evaluation" and enable "SBC (Safe Brake Control)" (p1278 = 1, p9603 > 0, p9604.1 = 1).

r1407.0...28	**Status word speed controller / ZSW n_ctrl**		
	Data type: Unsigned32	**Visible in:** Extended display	
	Read permission:	Read drive data or acknowledge messages	
	Parameter group:	Torque setpoints, U/f control, Torque limiting, Speed actual value filter, Control/status words, Acceleration model, Setpoint addition, Speed precontrol, Speed setpoint filter	
	Not relevant for motor type:	Synchronous or reluctance motor with starting cage	
	Dyn. index [0...n]:	-	**Calculated:** -
	Unit: -	**Unit group:** -	**Unit selection:** -

Type of signal interconnection:	Source binary/numeric	**Scaling:** -	

Description: Displays the status word of the speed controller.

Bit array:

Bit	Signal name	1 signal	0 signal
00	Reserved	Yes	No
01	Reserved	Yes	No
02	Torque control active	Yes	No
04	Speed setpoint from DSC	Yes	No
05	Speed controller I component frozen	Yes	No
06	Speed controller I component set	Yes	No
07	Torque limit reached	Yes	No
08	Upper torque limit active	Yes	No
09	Lower torque limit active	Yes	No
11	Speed setpoint limited	Yes	No
13	Encoderless operation due to a fault	Yes	No
19	Reserved	Yes	No
20	Reserved	Yes	No
21	Reserved	Yes	No
22	Reserved	Yes	No
23	Torque-speed precontrol with encoder on	Yes	No
24	Moment of inertia estimator active	Yes	No
25	Load estimate active	Yes	No
26	Moment of inertia estimator stabilized	Yes	No
28	Speed precontrol	For symmetrizing	For setp_filter 2

Note

For bit 04:
For bit 04 = 1 signal, the following conditions must be fulfilled:
- A telegram type that supports DSC must be selected (r0922 = 5 or 105)
- OFF1, OFF3 or STOP2 must not be active.
- Master control must not be active.

The following conditions can mean that the DSC function is not active in spite of the fact that the bit is set:
- DSC is not switched in on the control side; this means that KPC = 0 is transferred.

p1414[0].0...1 Speed setpoint filter activation / n_set_filt act

Data type: Unsigned16	**Visible in:** Extended display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Operation	
Parameter group:	Speed setpoint filter	
Not relevant for motor type:	Synchronous or reluctance motor with starting cage	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
-	-	0001 bin

Description: Setting for activating/deactivating the speed setpoint filter.

Recommendation: If only one filter is required, filter 1 should be activated and filter 2 deactivated, to avoid excessive processing time.

Bit array:

Bit	Signal name	1 signal	0 signal
00	Activate filter 1	Yes	No
01	Activate filter 2	Yes	No

Dependency: The individual speed setpoint filters are parameterized from p1415.

p1415[0] Speed setpoint filter 1 type / n_set_filt 1 type

Data type: Integer16	**Visible in:** Extended display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Operation	
Parameter group:	Speed setpoint filter	
Not relevant for motor type:	Synchronous or reluctance motor with starting cage	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
0	2	0

Description: Sets the type for speed setpoint filter 1.

Value:
0: Low pass: PT1
1: Low pass: PT2
2: General 2nd order filter

Dependency: PT1 low pass: p1416
PT2 low pass: p1417, p1418
General filter: p1417 ... p1420

p1416[0] Speed setpoint filter 1 time constant / n_set_filt 1 Tc

Data type: FloatingPoint32	**Visible in:** Extended display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Operation	
Parameter group:	Speed setpoint filter	
Not relevant for motor type:	Synchronous or reluctance motor with starting cage	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: ms	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
0.00 [ms]	5000.00 [ms]	0.00 [ms]

Description: Sets the time constant for the speed setpoint filter (PT1).

Dependency: See also: p1414, p1415

Note
The speed setpoint filter is activated with a time constant greater than zero.

p1417[0] Speed setpoint filter 1 denominator natural frequency / n_set_filt1 fn_den

Data type: FloatingPoint32	**Visible in:** Extended display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Operation	
Parameter group:	Speed setpoint filter	
Not relevant for motor type:	Synchronous or reluctance motor with starting cage	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: Hz	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
0.5 [Hz]	16000.0 [Hz]	2000.0 [Hz]

Description: Sets the denominator natural frequency for speed setpoint filter 1 (PT2, general filter).

Dependency: See also: p1414, p1415

Note

This parameter is only effective if the speed filter is parameterized as a PT2 low pass or as general filter.
The filter is only effective if the natural frequency is less than half of the sampling frequency.

p1418[0] Speed setpoint filter 1 denominator damping / n_set_filt 1 D_den

Data type: FloatingPoint32	**Visible in:** Extended display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Operation	
Parameter group:	Speed setpoint filter	
Not relevant for motor type:	Synchronous or reluctance motor with starting cage	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
0.001	10.000	0.700

Description: Sets the denominator damping for speed setpoint filter 1 (PT2, general filter).

Dependency: See also: p1414, p1415

Note

This parameter is only effective if the speed filter is parameterized as a PT2 low pass or as general filter.

p1419[0] Speed setpoint filter 1 numerator natural frequency / n_set_filt1 fn_num

Data type: FloatingPoint32	**Visible in:** Extended display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Operation	
Parameter group:	Speed setpoint filter	
Not relevant for motor type:	Synchronous or reluctance motor with starting cage	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: Hz	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
0.5 [Hz]	16000.0 [Hz]	2000.0 [Hz]

Description: Sets the numerator natural frequency for speed setpoint filter 1 (general filter).

Dependency: See also: p1414, p1415

Note

This parameter is only effective if the speed filter is set as a general filter.
The filter is only effective if the natural frequency is less than half of the sampling frequency.

p1420[0] Speed setpoint filter 1 numerator damping / n_set_filt 1 D_num

Data type: FloatingPoint32	**Visible in:** Extended display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Operation	
Parameter group:	Speed setpoint filter	
Not relevant for motor type:	Synchronous or reluctance motor with starting cage	

Dyn. index [0...n]:	-	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
0.000	10.000	0.700

Description: Sets the numerator damping for speed setpoint filter 1 (general filter).

Dependency: See also: p1414, p1415

Note

This parameter is only effective if the speed filter is set as a general filter.

p1421[0] Speed setpoint filter 2 type / n_set_filt 2 type

Data type: Integer16 **Visible in:** Extended display

Read permission: Read drive data or acknowledge messages

Write permission: Edit device configuration or drive applications

Can be changed in the operating state: Operation

Parameter group: Speed setpoint filter

Not relevant for motor type: Synchronous or reluctance motor with starting cage

Dyn. index [0...n]:	-	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
0	2	0

Description: Sets the type for speed setpoint filter 2.

Value:

0: Low pass: PT1

1: Low pass: PT2

2: General 2nd order filter

Dependency: PT1 low pass: p1422

PT2 low pass: p1423, p1424

General filter: p1423 ... p1426

p1422[0] Speed setpoint filter 2 time constant / n_set_filt 2 Tc

Data type: FloatingPoint32 **Visible in:** Extended display

Read permission: Read drive data or acknowledge messages

Write permission: Edit device configuration or drive applications

Can be changed in the operating state: Operation

Parameter group: Speed setpoint filter

Not relevant for motor type: Synchronous or reluctance motor with starting cage

Dyn. index [0...n]:	-	**Calculated:** -
Unit: ms	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
0.00 [ms]	5000.00 [ms]	0.00 [ms]

Description: Sets the time constant for the speed setpoint filter 2 (PT1).

Dependency: See also: p1414, p1421

Note

This parameter is only effective if the speed filter is set as a PT1 low pass.

p1423[0] Speed setpoint filter 2 denominator natural frequency / n_set_filt2 fn_den

Data type: FloatingPoint32 **Visible in:** Extended display

Read permission: Read drive data or acknowledge messages

Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Operation
Parameter group: Speed setpoint filter
Not relevant for motor type: Synchronous or reluctance motor with starting cage

Dyn. index [0...n]:	-	**Calculated:** -
Unit: Hz	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
0.5 [Hz]	16000.0 [Hz]	2000.0 [Hz]

Description: Sets the denominator natural frequency for speed setpoint filter 2 (PT2, general filter).

Dependency: See also: p1414, p1421

Note
This parameter is only effective if the speed filter is parameterized as a PT2 low pass or as general filter.
The filter is only effective if the natural frequency is less than half of the sampling frequency.

p1424[0] Speed setpoint filter 2 denominator damping / n_set_filt 2 D_den

Data type: FloatingPoint32 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Operation
Parameter group: Speed setpoint filter
Not relevant for motor type: Synchronous or reluctance motor with starting cage

Dyn. index [0...n]:	-	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
0.001	10.000	0.700

Description: Sets the denominator damping for speed setpoint filter 2 (PT2, general filter).

Dependency: See also: p1414, p1421

Note
This parameter is only effective if the speed filter is parameterized as a PT2 low pass or as general filter.

p1425[0] Speed setpoint filter 2 numerator natural frequency / n_set_filt2 fn_num

Data type: FloatingPoint32 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Operation
Parameter group: Speed setpoint filter
Not relevant for motor type: Synchronous or reluctance motor with starting cage

Dyn. index [0...n]:	-	**Calculated:** -
Unit: Hz	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
0.5 [Hz]	16000.0 [Hz]	2000.0 [Hz]

Description: Sets the numerator natural frequency for speed setpoint filter 2 (general filter).

Dependency: See also: p1414, p1421

Note
This parameter is only effective if the speed filter is set as a general filter.
The filter is only effective if the natural frequency is less than half of the sampling frequency.

p1426[0] Speed setpoint filter 2 numerator damping / n_set_filt 2 D_num

Data type: FloatingPoint32	**Visible in:** Extended display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Operation	
Parameter group:	Speed setpoint filter	
Not relevant for motor type:	Synchronous or reluctance motor with starting cage	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
0.000	10.000	0.700

Description: Sets the numerator damping for speed setpoint filter 2 (general filter).

Dependency: See also: p1414, p1421

Note

This parameter is only effective if the speed filter is set as a general filter.

p1433[0] Speed controller reference model natural frequency / n_ctrl RefMod fn

Data type: FloatingPoint32	**Visible in:** Extended display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Operation	
Parameter group:	Speed controller	
Not relevant for motor type:	Synchronous or reluctance motor with starting cage	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: Hz	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
0.00 [Hz]	8000.00 [Hz]	0.00 [Hz]

Description: Sets the natural frequency of a PT2 element for the reference model of the speed controller.

Recommendation: The reference model is finely set using p1433.

r1438 Speed controller speed setpoint / n_ctrl n_set

Data type: FloatingPoint32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Parameter group:	U/f control, Speed controller	
Not relevant for motor type:	Synchronous or reluctance motor with starting cage	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: rpm	**Unit group:** -	**Unit selection:** -
Type of signal interconnection:	Source numeric	**Scaling:** p2000

Description: Displays the speed setpoint after setpoint limiting for the P component of the speed controller.

p1441[0] Actual speed smoothing time / n_act t_smth

Data type: FloatingPoint32	**Visible in:** Extended display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Operation	
Parameter group:	Speed controller	

Not relevant for motor type:	Synchronous or reluctance motor with starting cage	
Dyn. index [0...n]:	-	**Calculated:** automatic
Unit: ms	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
0.00 [ms]	50.00 [ms]	0.00 [ms]

Description: Sets the smoothing time constant (PT1) for the speed actual value.

Dependency: See also: r0063

p1460[0] Speed controller P gain / n_ctrl Kp n lower

Data type: FloatingPoint32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Operation	
Parameter group:	Speed controller	
Not relevant for motor type:	Synchronous or reluctance motor with starting cage	
Dyn. index [0...n]:	-	**Calculated:** automatic
Unit: Nms/rad	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
0.00000 [Nms/rad]	5e+08 [Nms/rad]	0.30000 [Nms/rad]

Description: Sets the P gain of the speed controller.

The drive determines the P gain for One Button Tuning and writes the value to p1460.

The value can be changed.

Dependency: See also: p1462

Note

The higher the set P gain, the faster and more unstable the control.

p1462[0] Speed controller integral time / n_ctrl Tn n lower

Data type: FloatingPoint32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Operation	
Parameter group:	Speed controller	
Not relevant for motor type:	Synchronous or reluctance motor with starting cage	
Dyn. index [0...n]:	-	**Calculated:** automatic
Unit: ms	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
0.00 [ms]	100000.00 [ms]	10.00 [ms]

Description: Sets the integral time for the speed controller

The drive determines the integral time for One Button Tuning - and writes the value to p1462.

Dependency: See also: p1460

Note

The shorter the integral time, the faster and more unstable the control.

p1498[0] Load moment of inertia / Load m_inert

Data type: FloatingPoint32	**Visible in:** Extended display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	

Can be changed in the operating state:	Operation	
Parameter group:	Speed controller	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: kgm^2	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
0.000000 [kgm^2]	100000.000000 [kgm^2]	0.000000 [kgm^2]

Description: Sets the load moment of inertia.

The setting is made during commissioning while the One Button Tuning is being performed.

p1520[0] Torque limit upper / M_limit upper

Data type: FloatingPoint32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Operation	
Parameter group:	Torque limiting, Limits	
Not relevant for motor type:	Synchronous or reluctance motor with starting cage	
Dyn. index [0...n]:	-	**Calculated:** automatic
Unit: Nm	**Unit group:** -	**Unit selection:** -
Type of signal interconnection:	Source numeric	**Scaling:** p2003
Min:	**Max:**	**Factory setting:**
-1000000.00 [Nm]	2e+07 [Nm]	0.00 [Nm]

Description: Setting the upper torque limit.

This setting is made as part of the basic commissioning.

Dependency: See also: p1521, p1532, r1538, r1539

p1521[0] Torque limit lower / M_limit lower

Data type: FloatingPoint32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Operation	
Parameter group:	Torque limiting, Limits	
Not relevant for motor type:	Synchronous or reluctance motor with starting cage	
Dyn. index [0...n]:	-	**Calculated:** automatic
Unit: Nm	**Unit group:** -	**Unit selection:** -
Type of signal interconnection:	Source numeric	**Scaling:** p2003
Min:	**Max:**	**Factory setting:**
-2e+07 [Nm]	1000000.00 [Nm]	0.00 [Nm]

Description: Sets the lower torque limit

This setting is made as part of the basic commissioning.

Dependency: See also: p1520, p1532, r1538, r1539

p1532[0] Torque limit offset / M_max offset

Data type: FloatingPoint32	**Visible in:** Extended display
Read permission:	Read drive data or acknowledge messages
Write permission:	Edit device configuration or drive applications

Can be changed in the operating state:	Operation	
Parameter group:	Torque limiting	
Not relevant for motor type:	Synchronous or reluctance motor with starting cage	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: Nm	**Unit group:** -	**Unit selection:** -
Type of signal interconnection:	Source numeric	**Scaling:** p2003
Min:	**Max:**	**Factory setting:**
-100000.00 [Nm]	100000.00 [Nm]	0.00 [Nm]

Description: Sets the offset for the torque limit.

The setting allows electronic weight equalization to be used for vertical axes.

Parameters p1520 and p1521 are offset by the set value in the same direction.

Dependency: See also: p1520, p1521

DANGER

If the offset is set higher/lower than the lower/upper torque limit, then the unloaded drive can accelerate up to the maximum speed.

r1538 Upper effective torque limit / M_max upper eff

Data type: FloatingPoint32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Parameter group:	Torque limiting	
Not relevant for motor type:	Synchronous or reluctance motor with starting cage	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: Nm	**Unit group:** -	**Unit selection:** -
Type of signal interconnection:	Source numeric	**Scaling:** p2003

Description: Displays the currently effective upper torque limit.

Note

The value in r1538 may not exceed the value in p1520.

r1539 Lower effective torque limit / M_max lower eff

Data type: FloatingPoint32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Parameter group:	Torque limiting	
Not relevant for motor type:	Synchronous or reluctance motor with starting cage	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: Nm	**Unit group:** -	**Unit selection:** -
Type of signal interconnection:	Source numeric	**Scaling:** p2003

Description: Displays the currently effective lower torque limit.

Note

The value in r1539 may not exceed the value in p1521.

p1558 Measure/precontrol hanging/suspended axis force due to weight / Meas/prectr weight

Data type: Integer16	**Visible in:** Standard display
Read permission:	Read drive data or acknowledge messages
Write permission:	Edit device configuration or drive applications
Can be changed in the operating state:	Operation
Parameter group:	Motor data identification routine
Not relevant for motor type:	-

Dyn. index [0...n]:	-	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
-1	1	0

Description: Setting to start/reset the measurement of the force due to weight for a hanging axis.

The measurement can be started when the pulses are inhibited or the pulses are enabled (p1558 = 1). If it was started when the pulses were inhibited, then it is only executed after the pulses have been enabled.

For the measurement, the torque to hold the axis is determined and entered into p1532.

Further, this value is used internally for the precontrol.

Value:

- -1: Reset values
- 0: Inactive
- 1: Start measurement and activate precontrol

Dependency: The pulse enable is withdrawn at the end of the measurement.

See also: p1532

Note

For master control with speed setpoint input from the commissioning tool, the torque precontrol channels are deactivated, so that the weight equalization entered here is not active.

r1651 Torque setpoint function generator / M_set FG

Data type: FloatingPoint32	**Visible in:** Extended display	
Read permission:	Read drive data or acknowledge messages	
Parameter group:	Current setpoint filter	
Not relevant for motor type:	Synchronous or reluctance motor with starting cage	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: Nm	**Unit group:** -	**Unit selection:** -
Type of signal interconnection:	Source numeric	**Scaling:** p2003

Description: Displays the torque setpoint of the function generator.

p1656[0].0...3 Activates current setpoint filter / I_set_filt act

Data type: Unsigned16	**Visible in:** Extended display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Operation	
Parameter group:	Current setpoint filter, Supplementary closed-loop control	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** automatic
Unit: -	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
-	-	0001 bin

Description: Setting for activating/deactivating the current setpoint filter.

Bit array:

Bit	Signal name	1 signal	0 signal
00	Filter 1	Active	Inactive
01	Filter 2	Active	Inactive
02	Filter 3	Active	Inactive
03	Filter 4	Active	Inactive

Dependency: The individual current setpoint filters are parameterized as of p1657.

Note

If not all of the filters are required, then the filters should be used consecutively starting from filter 1.

p1657[0] Current setpoint filter 1 type / I_set_filt 1 type

Data type: Integer16	**Visible in:** Extended display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Operation	
Parameter group:	Current setpoint filter	
Not relevant for motor type:	Synchronous or reluctance motor with starting cage	
Dyn. index [0...n]:	-	**Calculated:** automatic
Unit: -	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
1	2	1

Description: Sets the current setpoint filter 1 as low pass (PT2) or general 2nd-order filter.

Value:
1: PT2 low pass
2: General 2nd order filter

Dependency: The current setpoint filter 1 is activated via p1656.0 and parameterized via p1657 ... p1661.

Note
For a general 2nd order filter, by inserting the same natural frequency in both the numerator and in the denominator, i.e. bandstop frequency, then a bandstop filter is implemented. If the numerator damping of zero is selected, the bandstop frequency is completely suppressed.
The denominator damping can be determined from the equation for the 3 dB bandwidth:
f_3dB bandwidth = 2 * D_denominator * f_bandstop frequency

p1658[0] Current setpoint filter 1 denominator natural frequency / I_set_filt1 fn_den

Data type: FloatingPoint32	**Visible in:** Extended display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Operation	
Parameter group:	Current setpoint filter	
Not relevant for motor type:	Synchronous or reluctance motor with starting cage	
Dyn. index [0...n]:	-	**Calculated:** automatic
Unit: Hz	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
0.5 [Hz]	16000.0 [Hz]	1999.0 [Hz]

Description: Sets the denominator natural frequency for current setpoint filter 1 (PT2, general filter).

Dependency: The current setpoint filter 1 is activated via p1656.0 and parameterized via p1657 ... p1661.

p1659[0] Current setpoint filter 1 denominator damping / I_set_filt 1 D_den

Data type: FloatingPoint32	**Visible in:** Extended display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Operation	
Parameter group:	Current setpoint filter	
Not relevant for motor type:	Synchronous or reluctance motor with starting cage	
Dyn. index [0...n]:	-	**Calculated:** automatic
Unit: -	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
0.001	10.000	0.700

Description: Sets the denominator damping for current setpoint filter 1.
Dependency: The current setpoint filter 1 is activated via p1656.0 and parameterized via p1657 ... p1661.

p1660[0] Current setpoint filter 1 numerator natural frequency / I_set_filt1 fn_num

Data type: FloatingPoint32	**Visible in:** Extended display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Operation	
Parameter group:	Current setpoint filter	
Not relevant for motor type:	Synchronous or reluctance motor with starting cage	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: Hz	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
0.5 [Hz]	16000.0 [Hz]	1999.0 [Hz]

Description: Sets the numerator natural frequency for current setpoint filter 1 (general filter).
Dependency: The current setpoint filter 1 is activated via p1656.0 and parameterized via p1657 ... p1661.

p1661[0] Current setpoint filter 1 numerator damping / I_set_filt 1 D_num

Data type: FloatingPoint32	**Visible in:** Extended display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Operation	
Parameter group:	Current setpoint filter	
Not relevant for motor type:	Synchronous or reluctance motor with starting cage	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
0.000	10.000	0.700

Description: Sets the numerator damping for current setpoint filter 1.
Dependency: The current setpoint filter 1 is activated via p1656.0 and parameterized via p1657 ... p1661.

p1662[0] Current setpoint filter 2 type / I_set_filt 2 type

Data type: Integer16	**Visible in:** Extended display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Operation	
Parameter group:	Current setpoint filter	
Not relevant for motor type:	Synchronous or reluctance motor with starting cage	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
1	2	1

Description: Sets current setpoint filter 2 as lowpass filter (PT2) or general 2nd order filter.
Value:
1: PT2 low pass
2: General 2nd order filter
Dependency: Current setpoint filter 2 is activated via p1656.1 and parameterized via p1662 ... p1666.

Note

For a general 2nd order filter, by inserting the same natural frequency in both the numerator and in the denominator, i.e. bandstop frequency, then a bandstop filter is implemented. If the numerator damping of zero is selected, the bandstop frequency is completely suppressed.

The denominator damping can be determined from the equation for the 3 dB bandwidth:

f_3dB bandwidth = 2 * D_denominator * f_bandstop frequency

p1663[0] Current setpoint filter 2 denominator natural frequency / I_set_filt2 fn_den

Data type: FloatingPoint32	**Visible in:** Extended display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Operation	
Parameter group:	Current setpoint filter	
Not relevant for motor type:	Synchronous or reluctance motor with starting cage	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: Hz	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
0.5 [Hz]	16000.0 [Hz]	1999.0 [Hz]

Description: Sets the denominator natural frequency for current setpoint filter 2 (PT2, general filter).

Dependency: Current setpoint filter 2 is activated via p1656.1 and parameterized via p1662 ... p1666.

p1664[0] Current setpoint filter 2 denominator damping / I_set_filt 2 D_den

Data type: FloatingPoint32	**Visible in:** Extended display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Operation	
Parameter group:	Current setpoint filter	
Not relevant for motor type:	Synchronous or reluctance motor with starting cage	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
0.001	10.000	0.700

Description: Sets the denominator damping for current setpoint filter 2.

Dependency: Current setpoint filter 2 is activated via p1656.1 and parameterized via p1662 ... p1666.

p1665[0] Current setpoint filter 2 numerator natural frequency / I_set_filt2 fn_num

Data type: FloatingPoint32	**Visible in:** Extended display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Operation	
Parameter group:	Current setpoint filter	
Not relevant for motor type:	Synchronous or reluctance motor with starting cage	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: Hz	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
0.5 [Hz]	16000.0 [Hz]	1999.0 [Hz]

Description: Sets the numerator natural frequency for current setpoint filter 2 (general filter).

Dependency: Current setpoint filter 2 is activated via p1656.1 and parameterized via p1662 ... p1666.

p1666[0] Current setpoint filter 2 numerator damping / I_set_filt 2 D_num

Data type: FloatingPoint32	**Visible in:** Extended display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Operation	
Parameter group:	Current setpoint filter	
Not relevant for motor type:	Synchronous or reluctance motor with starting cage	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
0.000	10.000	0.700

Description: Sets the numerator damping for current setpoint filter 2.

Dependency: Current setpoint filter 2 is activated via p1656.1 and parameterized via p1662 ... p1666.

p1667[0] Current setpoint filter 3 type / I_set_filt 3 type

Data type: Integer16	**Visible in:** Extended display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Operation	
Parameter group:	Current setpoint filter	
Not relevant for motor type:	Synchronous or reluctance motor with starting cage	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
1	2	1

Description: Sets current setpoint filter 3 as lowpass filter (PT2) or general 2nd order filter.

Value:

1:	PT2 low pass
2:	General 2nd order filter

Dependency: Current setpoint filter 3 is activated via p1656.2 and parameterized via p1667 ... p1671.

p1668[0] Current setpoint filter 3 denominator natural frequency / I_set_filt3 fn_den

Data type: FloatingPoint32	**Visible in:** Extended display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Operation	
Parameter group:	Current setpoint filter	
Not relevant for motor type:	Synchronous or reluctance motor with starting cage	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: Hz	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
0.5 [Hz]	16000.0 [Hz]	1999.0 [Hz]

Description: Sets the denominator natural frequency for current setpoint filter 3 (PT2, general filter).

Dependency: Current setpoint filter 3 is activated via p1656.2 and parameterized via p1667 ... p1671.

p1669[0] Current setpoint filter 3 denominator damping / I_set_filt 3 D_den

Data type: FloatingPoint32 | **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Operation
Parameter group: Current setpoint filter
Not relevant for motor type: Synchronous or reluctance motor with starting cage

Dyn. index [0...n]:	-	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
0.001	10.000	0.700

Description: Sets the denominator damping for current setpoint filter 3.
Dependency: Current setpoint filter 3 is activated via p1656.2 and parameterized via p1667 ... p1671.

p1670[0] Current setpoint filter 3 numerator natural frequency / I_set_filt3 fn_num

Data type: FloatingPoint32 | **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Operation
Parameter group: Current setpoint filter
Not relevant for motor type: Synchronous or reluctance motor with starting cage

Dyn. index [0...n]:	-	**Calculated:** -
Unit: Hz	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
0.5 [Hz]	16000.0 [Hz]	1999.0 [Hz]

Description: Sets the numerator natural frequency for current setpoint filter 3 (general filter).
Dependency: Current setpoint filter 3 is activated via p1656.2 and parameterized via p1667 ... p1671.

p1671[0] Current setpoint filter 3 numerator damping / I_set_filt 3 D_num

Data type: FloatingPoint32 | **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Operation
Parameter group: Current setpoint filter
Not relevant for motor type: Synchronous or reluctance motor with starting cage

Dyn. index [0...n]:	-	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
0.000	10.000	0.700

Description: Sets the numerator damping for current setpoint filter 3.
Dependency: Current setpoint filter 3 is activated via p1656.2 and parameterized via p1667 ... p1671.

p1672[0] Current setpoint filter 4 type / I_set_filt 4 type

Data type: Integer16 | **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications

Can be changed in the operating state:	Operation	
Parameter group:	Current setpoint filter	
Not relevant for motor type:	Synchronous or reluctance motor with starting cage	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
1	2	1

Description: Sets current setpoint filter 4 as lowpass filter (PT2) or general 2nd order filter.

Value:
1: PT2 low pass
2: General 2nd order filter

Dependency: Current setpoint filter 4 is activated via p1656.3 and parameterized via p1672 ... p1676.

p1673[0] Current setpoint filter 4 denominator natural frequency / I_set_filt4 fn_den

Data type: FloatingPoint32	**Visible in:** Extended display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Operation	
Parameter group:	Current setpoint filter	
Not relevant for motor type:	Synchronous or reluctance motor with starting cage	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: Hz	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
0.5 [Hz]	16000.0 [Hz]	1999.0 [Hz]

Description: Sets the denominator natural frequency for current setpoint filter 4 (PT2, general filter).

Dependency: Current setpoint filter 4 is activated via p1656.3 and parameterized via p1672 ... p1676.

p1674[0] Current setpoint filter 4 denominator damping / I_set_filt 4 D_den

Data type: FloatingPoint32	**Visible in:** Extended display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Operation	
Parameter group:	Current setpoint filter	
Not relevant for motor type:	Synchronous or reluctance motor with starting cage	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
0.001	10.000	0.700

Description: Sets the denominator damping for current setpoint filter 4.

Dependency: Current setpoint filter 4 is activated via p1656.3 and parameterized via p1672 ... p1676.

p1675[0] Current setpoint filter 4 numerator natural frequency / I_set_filt4 fn_den

Data type: FloatingPoint32	**Visible in:** Extended display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Operation	
Parameter group:	Current setpoint filter	

Not relevant for motor type:	Synchronous or reluctance motor with starting cage	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: Hz	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
0.5 [Hz]	16000.0 [Hz]	1999.0 [Hz]

Description: Sets the numerator natural frequency for current setpoint filter 4 (general filter).

Dependency: Current setpoint filter 4 is activated via p1656.3 and parameterized via p1672 ... p1676.

p1676[0] Current setpoint filter 4 numerator damping / I_set_filt 4 D_num

Data type: FloatingPoint32	**Visible in:** Extended display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Operation	
Parameter group:	Current setpoint filter	
Not relevant for motor type:	Synchronous or reluctance motor with starting cage	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
0.000	10.000	0.700

Description: Sets the numerator damping for current setpoint filter 4.

Dependency: Current setpoint filter 4 is activated via p1656.3 and parameterized via p1672 ... p1676.

p1703[0] Isq current controller precontrol scaling / Isq_ctr_prectrScal

Data type: FloatingPoint32	**Visible in:** Extended display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Operation	
Parameter group:	Current controller	
Not relevant for motor type:	Synchronous or reluctance motor with starting cage	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: %	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
0.0 [%]	200.0 [%]	0.0 [%]

Description: Sets the scaling of the dynamic current controller precontrol for the torque-generating current component Isq.

p1821[0] Direction of rotation / Dir of rotation

Data type: Integer16	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Commissioning	
Parameter group:	Motor data	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
0	1	0

Description: Setting to change the direction of rotation.

If the parameter is changed, it reverses the direction of rotation of the motor and the encoder actual value without changing the setpoint.

Value:
0: Clockwise
1: Counterclockwise

Dependency: See also: F07434

NOTICE
After changing parameter p1821, the direction of rotation is not automatically adapted in the safety area.

p2000 Reference speed / n_ref

Data type: FloatingPoint32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Ready for operation	
Parameter group:	Reference variables	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** automatic
Unit: rpm	**Unit group:** -	**Unit selection:** -
Type of signal interconnection:	Source numeric	**Scaling:** -
Min:	**Max:**	**Factory setting:**
6.00 [rpm]	210000.00 [rpm]	3000.00 [rpm]

Description: Sets the reference quantity for the speed values.

All speeds specified as relative values refer to this reference quantity.

The reference quantity corresponds to 100% or 4000 hex (word) or 4000 0000 hex (double word).

Dependency: See also: p2003

p2002 Reference current / I_ref

Data type: FloatingPoint32	**Visible in:** Extended display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Ready for operation	
Parameter group:	Reference variables	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** automatic
Unit: Arms	**Unit group:** -	**Unit selection:** -
Type of signal interconnection:	Source numeric	**Scaling:** -
Min:	**Max:**	**Factory setting:**
0.10 [Arms]	100000.00 [Arms]	100.00 [Arms]

Description: Sets the reference quantity for currents.

All currents specified as relative value are referred to this reference quantity.

The reference quantity corresponds to 100% or 4000 hex (word) or 4000 0000 hex (double word).

Note

Default value is 2 * r0305 or the motor current limit.

p2003 Reference torque / M_ref

Data type: FloatingPoint32	**Visible in:** Standard display
Read permission:	Read drive data or acknowledge messages

Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Ready for operation	
Parameter group:	Reference variables	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** automatic
Unit: Nm	**Unit group:** -	**Unit selection:** -
Type of signal interconnection:	Source numeric	**Scaling:** -
Min:	**Max:**	**Factory setting:**
0.01 [Nm]	2e+07 [Nm]	1.00 [Nm]

Description: Sets the reference quantity for the torque values.
All torques specified as relative value are referred to this reference quantity.
The reference quantity corresponds to 100% or 4000 hex (word) or 4000 0000 hex (double word).

r2043.0...2 PROFIdrive PZD state / PD PZD state

Data type: Unsigned8	**Visible in:** Extended display	
Read permission:	Read drive data or acknowledge messages	
Parameter group:	Configuration	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -
Type of signal interconnection:	Source binary	**Scaling:** -

Description: Displays the PROFIdrive PZD state.

Bit array:

Bit	Signal name	1 signal	0 signal
00	Setpoint failure	Yes	No
01	Isochronous operation active	Yes	No
02	Fieldbus running	Yes	No

Note
When using the "setpoint failure" signal, the bus can be monitored and an application-specific response triggered when the setpoint fails.

r2050[0...31].0...15 PROFIdrive PZD receive word / PZD receive word

Data type: Unsigned16	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Parameter group:	Receive direction	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -
Type of signal interconnection:	Source binary/numeric	**Scaling:** 4000H

Description: Displays the PZD (setpoints) in the word format received from the fieldbus controller.

Index:
[0] = PZD 1
[1] = PZD 2
[2] = PZD 3
[3] = PZD 4
[4] = PZD 5
[5] = PZD 6
[6] = PZD 7
[7] = PZD 8
[8] = PZD 9
[9] = PZD 10
[10] = PZD 11
[11] = PZD 12
[12] = PZD 13
[13] = PZD 14
[14] = PZD 15
[15] = PZD 16
[16] = PZD 17
[17] = PZD 18
[18] = PZD 19
[19] = PZD 20
[20] = PZD 21
[21] = PZD 22
[22] = PZD 23
[23] = PZD 24
[24] = PZD 25
[25] = PZD 26
[26] = PZD 27
[27] = PZD 28
[28] = PZD 29
[29] = PZD 30
[30] = PZD 31
[31] = PZD 32

Bit array:

Bit	Signal name	1 signal	0 signal
00	Bit 0	On	Off
01	Bit 1	On	Off
02	Bit 2	On	Off
03	Bit 3	On	Off
04	Bit 4	On	Off
05	Bit 5	On	Off
06	Bit 6	On	Off
07	Bit 7	On	Off
08	Bit 8	On	Off
09	Bit 9	On	Off
10	Bit 10	On	Off
11	Bit 11	On	Off
12	Bit 12	On	Off
13	Bit 13	On	Off
14	Bit 14	On	Off
15	Bit 15	On	Off

Dependency: See also: r2060

c2053[0...31] PROFIdrive PZD send word / PZD send word

Data type: Unsigned16 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Parameter group: Send direction
Not relevant for motor type: -
Dyn. index [0...n]: - **Calculated:** -
Unit: - **Unit group:** - **Unit selection:** -
Type of signal interconnection: Sink numeric **Scaling:** 4000H
Factory interconnection: Fixed value: 0

Description: Displays the PZD (actual values) in the word format that are sent to the fieldbus controller.

Index:
[0] = PZD 1
[1] = PZD 2
[2] = PZD 3
[3] = PZD 4
[4] = PZD 5
[5] = PZD 6
[6] = PZD 7
[7] = PZD 8
[8] = PZD 9
[9] = PZD 10
[10] = PZD 11
[11] = PZD 12
[12] = PZD 13
[13] = PZD 14
[14] = PZD 15
[15] = PZD 16
[16] = PZD 17
[17] = PZD 18
[18] = PZD 19
[19] = PZD 20
[20] = PZD 21
[21] = PZD 22
[22] = PZD 23
[23] = PZD 24
[24] = PZD 25
[25] = PZD 26
[26] = PZD 27
[27] = PZD 28
[28] = PZD 29
[29] = PZD 30
[30] = PZD 31
[31] = PZD 32

Dependency: See also: c2063

r2060[0...30] PROFIdrive PZD receive double word / PZD recv DW

Data type: Integer32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Parameter group: Receive direction
Not relevant for motor type: -
Dyn. index [0...n]: - **Calculated:** -

	Unit: -	**Unit group:** -	**Unit selection:** -
	Type of signal interconnection:	Source numeric	**Scaling:** 4000H

Description: Displays the PZD (setpoints) in the double word format received from the fieldbus controller.

Index:
[0] = PZD 1 + 2
[1] = PZD 2 + 3
[2] = PZD 3 + 4
[3] = PZD 4 + 5
[4] = PZD 5 + 6
[5] = PZD 6 + 7
[6] = PZD 7 + 8
[7] = PZD 8 + 9
[8] = PZD 9 + 10
[9] = PZD 10 + 11
[10] = PZD 11 + 12
[11] = PZD 12 + 13
[12] = PZD 13 + 14
[13] = PZD 14 + 15
[14] = PZD 15 + 16
[15] = PZD 16 + 17
[16] = PZD 17 + 18
[17] = PZD 18 + 19
[18] = PZD 19 + 20
[19] = PZD 20 + 21
[20] = PZD 21 + 22
[21] = PZD 22 + 23
[22] = PZD 23 + 24
[23] = PZD 24 + 25
[24] = PZD 25 + 26
[25] = PZD 26 + 27
[26] = PZD 27 + 28
[27] = PZD 28 + 29
[28] = PZD 29 + 30
[29] = PZD 30 + 31
[30] = PZD 31 + 32

Dependency: See also: r2050

c2063[0...30] PROFIdrive PZD send double word / PZD send DW

Data type: Unsigned32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Parameter group:	Send direction	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -
Type of signal interconnection:	Sink numeric	**Scaling:** 4000H
Factory interconnection:	Fixed value: 0	

Description: Displays the PZD (actual values) in the double word format that are sent to the fieldbus controller.

Index: [0] = PZD 1 + 2
[1] = PZD 2 + 3
[2] = PZD 3 + 4
[3] = PZD 4 + 5
[4] = PZD 5 + 6
[5] = PZD 6 + 7
[6] = PZD 7 + 8
[7] = PZD 8 + 9
[8] = PZD 9 + 10
[9] = PZD 10 + 11
[10] = PZD 11 + 12
[11] = PZD 12 + 13
[12] = PZD 13 + 14
[13] = PZD 14 + 15
[14] = PZD 15 + 16
[15] = PZD 16 + 17
[16] = PZD 17 + 18
[17] = PZD 18 + 19
[18] = PZD 19 + 20
[19] = PZD 20 + 21
[20] = PZD 21 + 22
[21] = PZD 22 + 23
[22] = PZD 23 + 24
[23] = PZD 24 + 25
[24] = PZD 25 + 26
[25] = PZD 26 + 27
[26] = PZD 27 + 28
[27] = PZD 28 + 29
[28] = PZD 29 + 30
[29] = PZD 30 + 31
[30] = PZD 31 + 32

Dependency: See also: c2053

NOTICE
A maximum of 4 indices of the "trace" function can be used.

r2109[0...63] Fault removed in milliseconds / F removed ms

Data type: Unsigned32 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Parameter group: Faults / alarms
Not relevant for motor type: -
Dyn. index [0...n]: - **Calculated:** -
Unit: ms **Unit group:** - **Unit selection:** -

Description: Displays the time in milliseconds referred to the day that the fault was removed.

Dependency: See also: r0945, r0947, r0948, r0949, r2114, r2130, r2133, r2136, r3122

NOTICE
The time comprises r2136 (days) and r2109 (milliseconds).

Note
The buffer parameters are cyclically updated in the background.
The structure of the fault buffer and the assignment of the indices is shown in r0945.

r2111 Alarm counter / Alarm counter

Data type: Unsigned16 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Parameter group: Faults / alarms
Not relevant for motor type: -
Dyn. index [0...n]: - **Calculated:** -
Unit: - **Unit group:** - **Unit selection:** -

Description: Number of alarms that have occurred.

Dependency: See also: r2122, r2123, r2124, r2125

Note
The parameter is reset to 0 at POWER ON.

r2114[0...1] System runtime total / Sys runtime tot

Data type: Unsigned32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Parameter group: Diagnostics general
Not relevant for motor type: -
Dyn. index [0...n]: - **Calculated:** -
Unit: - **Unit group:** - **Unit selection:** -

Description: Displays the total system runtime of the converter.
The time comprises r2114[0] (milliseconds) and r2114[1] (days).
After r2114[0] has reached a value of 86.400.000 ms (24 hours) this value is reset and r2114[1] is incremented.

Index: [0] = Milliseconds
[1] = Days

Note
The counter values are saved when the power supply is switched off.
After the converter is switched on, the counter continues to run with the last value that was saved.

r2121 Counter alarm buffer changes / A buff changed

Data type: Unsigned16 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Parameter group: Faults / alarms
Not relevant for motor type: -
Dyn. index [0...n]: - **Calculated:** -
Unit: - **Unit group:** - **Unit selection:** -
Type of signal interconnection: Source numeric **Scaling:** -

Description: This counter is incremented every time the alarm buffer changes.

Dependency: See also: r2122, r2123, r2124, r2125

r2122[0...63] Alarm number / Alarm number

Data type: Unsigned16 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Parameter group: Faults / alarms
Not relevant for motor type: -
Dyn. index [0...n]: - **Calculated:** -
Unit: - **Unit group:** - **Unit selection:** -

Description: Displays the numbers of the last 64 alarms.

Dependency: See also: r2123, r2124, r2125, r2134, r2145, r2146, r3123

NOTICE
The properties of the alarm buffer should be taken from the corresponding product documentation.

Note
The buffer parameters are cyclically updated in the background.
Alarm buffer structure (general principle):
Currently active alarms (not gone):
r2122[0], r2124[0], r2123[0], r2125[0] --> alarm 1 (the oldest)
. . .
r2122[7], r2124[7], r2123[7], r2125[7] --> Alarm 8 (the latest)

History of alarms that have gone:
r2122[8], r2124[8], r2123[8], r2125[8] --> Alarm 1 (the latest)
. . .
r2122[63], r2124[63], r2123[63], r2125[63] --> alarm 56 (the oldest)

r2123[0...63] Alarm received in milliseconds / Alarm received ms

Data type: Unsigned32 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Parameter group: Faults / alarms
Not relevant for motor type: -
Dyn. index [0...n]: - **Calculated:** -
Unit: ms **Unit group:** - **Unit selection:** -

Description: Displays the time in milliseconds referred to the day that the alarm occurred.
Dependency: See also: r2114, r2122, r2124, r2125, r2134, r2145, r2146, r3123

NOTICE
The time comprises r2145 (days) and r2123 (milliseconds).

Note
The buffer parameters are cyclically updated in the background.
The structure of the alarm buffer and the assignment of the indices is shown in r2122.

r2124[0...63] Alarm value / Alarm value

Data type: Integer32 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Parameter group: Faults / alarms
Not relevant for motor type: -
Dyn. index [0...n]: - **Calculated:** -
Unit: - **Unit group:** - **Unit selection:** -

Description: Displays additional information about the active alarm (as integer number).
Dependency: See also: r2122, r2123, r2125, r2134, r2145, r2146, r3123

Note
The buffer parameters are cyclically updated in the background.
The structure of the alarm buffer and the assignment of the indices are shown in r2122.

r2125[0...63] Alarm removed in milliseconds / Alarm removed ms

Data type: Unsigned32 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Parameter group: Faults / alarms
Not relevant for motor type: -
Dyn. index [0...n]: - **Calculated:** -

Unit: ms | **Unit group:** - | **Unit selection:** -

Description: Displays the time in milliseconds referred to the day that the alarm was removed.

Dependency: See also: r2114, r2122, r2123, r2124, r2134, r2145, r2146, r3123

NOTICE
The time comprises r2146 (days) and r2125 (milliseconds).

Note

The buffer parameters are cyclically updated in the background.

The structure of the alarm buffer and the assignment of the indices is shown in r2122.

r2130[0...63] Fault received in days / Fault recv days

Data type: Unsigned16 | **Visible in:** Extended display

Read permission: Read drive data or acknowledge messages

Parameter group: Faults / alarms

Not relevant for motor type: -

Dyn. index [0...n]: - | **Calculated:** -

Unit: - | **Unit group:** - | **Unit selection:** -

Description: Displays the time in days referred to the day that the fault occurred.

Dependency: See also: r0945, r0947, r0948, r0949, r2109, r2114, r2133, r2136, r3122

NOTICE
The time comprises r2130 (days) and r0948 (milliseconds).

Note

The buffer parameters are cyclically updated in the background.

r2131 Actual fault number / Actual fault no

Data type: Unsigned16 | **Visible in:** Extended display

Read permission: Read drive data or acknowledge messages

Parameter group: Faults / alarms

Not relevant for motor type: -

Dyn. index [0...n]: - | **Calculated:** -

Unit: - | **Unit group:** - | **Unit selection:** -

Type of signal interconnection: Source numeric | **Scaling:** -

Description: Displays the number of the active fault that last occurred.

Note

0: No fault present.

r2132 Actual alarm number / Alarm number act

Data type: Unsigned16 | **Visible in:** Extended display

Read permission: Read drive data or acknowledge messages

Parameter group: Faults / alarms

Not relevant for motor type: -

Dyn. index [0...n]: - | **Calculated:** -

Unit: - | **Unit group:** - | **Unit selection:** -

Type of signal interconnection: Source numeric | **Scaling:** -

Description: Displays the number of the alarm that last occurred.

Note

0: No alarm present.

r2133[0...63] Fault value for float values / Fault val float

Data type: FloatingPoint32 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Parameter group: Faults / alarms
Not relevant for motor type: -
Dyn. index [0...n]: - **Calculated:** -
Unit: - **Unit group:** - **Unit selection:** -

Description: Displays the additional information about the fault that occurred for float values.
Refer to the fault for the interpretation of the fault value.

Dependency: See also: r0945, r0947, r0948, r0949, r2109, r2130, r2136

Note
The buffer parameters are cyclically updated in the background.

r2134[0...63] Alarm value for float values / Alarm value float

Data type: FloatingPoint32 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Parameter group: Faults / alarms
Not relevant for motor type: -
Dyn. index [0...n]: - **Calculated:** -
Unit: - **Unit group:** - **Unit selection:** -

Description: Displays the additional information about the alarm that occurred for float values.
Refer to the alarm for an interpretation of the alarm value.

Dependency: See also: r2122, r2123, r2124, r2125, r2145, r2146, r3123

Note
The buffer parameters are cyclically updated in the background.

r2136[0...63] Fault removed in days / Flt removed days

Data type: Unsigned16 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Parameter group: Faults / alarms
Not relevant for motor type: -
Dyn. index [0...n]: - **Calculated:** -
Unit: - **Unit group:** - **Unit selection:** -

Description: Displays the time in days referred to the day when the fault was removed.

Dependency: See also: r0945, r0947, r0948, r0949, r2109, r2114, r2130, r2133, r3122

NOTICE
The time comprises r2136 (days) and r2109 (milliseconds).

Note
The buffer parameters are cyclically updated in the background.

r2139.0...15 Status word faults/alarms / ZSW fault/alarm

Data type: Unsigned16 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Parameter group: Faults / alarms
Not relevant for motor type: -
Dyn. index [0...n]: - **Calculated:** -
Unit: - **Unit group:** - **Unit selection:** -

Type of signal interconnection:	Source binary/numeric	**Scaling:** -	

Description: Displays status word 1 of faults and alarms.

Bit array:

Bit	Signal name	1 signal	0 signal
00	Being acknowledged	Yes	No
01	Acknowledgment required	Yes	No
03	Fault present	Yes	No
05	Safety message present	Yes	No
07	Alarm present	Yes	No
11	Alarm class bit 0	High	Low
12	Alarm class bit 1	High	Low
13	Maintenance required	Yes	No
14	Maintenance urgently required	Yes	No
15	Fault gone/can be acknowledged	Yes	No

Note

For bit 03, 05, 07:

These bits are set if at least one fault/alarm or safety message occurs. The entry in the fault/alarm buffer or safety message buffer is delayed. This is the reason that the fault/alarm buffer or safety message buffer should only be read if, after "Fault active", "Alarm active" or "Safety message active" occurs, a change is also identified in the buffer (r0944, r2121, r60044).

For bits 11, 12:

These status bits are used for the classification of internal alarm classes and are intended for diagnostic purposes only on certain automation systems with integrated SINAMICS functionality.

r2145[0...63] Alarm received in days / Alarm recv days

Data type: Unsigned16	**Visible in:** Extended display	
Read permission:	Read drive data or acknowledge messages	
Parameter group:	Faults / alarms	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -

Description: Displays the time in days referred to the day that the alarm occurred.

Dependency: See also: r2114, r2122, r2123, r2124, r2125, r2134, r2146, r3123

NOTICE
The time comprises r2145 (days) and r2123 (milliseconds).

Note

The buffer parameters are cyclically updated in the background.

r2146[0...63] Alarm cleared in days / Alarm cleared days

Data type: Unsigned16	**Visible in:** Extended display	
Read permission:	Read drive data or acknowledge messages	
Parameter group:	Faults / alarms	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -

Description: Displays the time in days referred to the day when the alarm was cleared.

Dependency: See also: r2114, r2122, r2123, r2124, r2125, r2134, r2145, r3123

NOTICE
The time comprises r2146 (days) and r2125 (milliseconds).

Note
The buffer parameters are cyclically updated in the background.

p2175[0] Motor blocked speed threshold / Mot blk n_thr

Data type: FloatingPoint32 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Operation
Parameter group: Speed messages
Not relevant for motor type: -
Dyn. index [0...n]: - **Calculated:** automatic
Unit: rpm **Unit group:** - **Unit selection:** -

Min:	Max:	Factory setting:
0.00 [rpm]	210000.00 [rpm]	120.00 [rpm]

Description: Sets the speed threshold for message "Motor blocked".
Monitoring is deactivated with p2175 = 0.

Dependency: See also: F07900

Note
If the motor speed is less than the threshold value set in p2175 - and the motor is operated for longer than 200 ms at the torque limit - then the motor is shut down and a fault is output.

r2199.0...11 Status word monitoring 3 / ZSW monitor 3

Data type: Unsigned16 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Parameter group: Speed messages, Control/status words
Not relevant for motor type: -
Dyn. index [0...n]: - **Calculated:** -
Unit: - **Unit group:** - **Unit selection:** -
Type of signal interconnection: Source binary/numeric **Scaling:** -

Description: Displays the third status word of the monitoring functions.

Bit array:

Bit	Signal name	1 signal	0 signal
00	|n_act| < speed threshold 3	Yes	No
01	f or n comparison value reached or exceeded	Yes	No
04	Speed setpoint - actual value deviation in tolerance t_on	Yes	No
05	Ramp-up/ramp-down completed	Yes	No
11	Torque utilization < torque threshold value 2	Yes	No

Note
For bit 00:
Speed threshold 3 is 5 rpm
For bit 01:
The comparison value is 5 rpm
The hysteresis for canceling the bits is set to 2 rpm.
For bit 11:
Torque threshold value 2 is 90 %.

p2496 LR dimension system physical length units / Dim sys unit phy

Data type: Integer16 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages

Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Commissioning	
Parameter group:	Position control, Basic parameters / mechanical system	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
0	8	3

Description: Sets the physical length units.

Value:
0: LU (user-defined)
1: km
2: m
3: mm
4: µm
5: nm
6: in
7: ft
8: mi

Dependency: Available with activated function: Position control

Note
This parameter is only of significance for visualization (e.g. using the commissioning tool).
Internally in the drive, the neutral length unit (LU) without dimensions is used for calculations.

p2496 LR dimension system physical length units / Dim sys unit phy

Variant:	S210 (Basic positioner for rotary motion)	
Data type: Integer16	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Commissioning	
Parameter group:	Position control, Basic parameters / mechanical system	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
0	10	10

Description: Sets the physical length units.

Value:
0: LU (user-defined)
10: °

Dependency: Available with activated function: Position control

Note
This parameter is only of significance for visualization (e.g. using the commissioning tool).
Internally in the drive, the neutral length unit (LU) without dimensions is used for calculations.

p2497 LR dimension system physical velocity / Dim sys v phy

Data type: Integer16	**Visible in:** Standard display
Read permission:	Read drive data or acknowledge messages
Write permission:	Edit device configuration or drive applications

Can be changed in the operating state:	Commissioning	
Parameter group:	Position control, Basic parameters / mechanical system	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
0	15	8

Description: Sets the physical unit for the velocities.

Value:
0: 1000LU/min (user-defined)
1: km/h
2: km/min
3: m/h
4: m/min
5: m/s
6: mm/h
7: mm/min
8: mm/s
11: in/min
12: in/s
13: ft/min
14: ft/s
15: mi/h

Dependency: Available with activated function: Position control

p2497 LR dimension system physical velocity / Dim sys v phy

Variant:	S210 (Basic positioner for rotary motion)	
Data type: Integer16	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Commissioning	
Parameter group:	Position control, Basic parameters / mechanical system	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
0	18	18

Description: Sets the physical unit for the velocities.

Value:
0: 1000LU/min (user-defined)
18: °/s

Dependency: Available with activated function: Position control

p2498 LR dimension system physical acceleration / Dim sys a phy

Data type: Integer16	**Visible in:** Standard display
Read permission:	Read drive data or acknowledge messages
Write permission:	Edit device configuration or drive applications
Can be changed in the operating state:	Commissioning

Parameter group:	Position control, Basic parameters / mechanical system	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
0	11	7

Description: Sets the physical unit for the accelerations.

Value:
0: 1000LU/s² (user-defined)
6: m/s²
7: mm/s²
10: in/s²
11: ft/s²

Dependency: Available with activated function: Position control

p2498 LR dimension system physical acceleration / Dim sys a phy

Variant:	S210 (Basic positioner for rotary motion)	
Data type: Integer16	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Commissioning	
Parameter group:	Position control, Basic parameters / mechanical system	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
0	18	18

Description: Sets the physical unit for the accelerations.

Value:
0: 1000LU/s² (user-defined)
18: °/s²

Dependency: Available with activated function: Position control

p2499 LR dimension system physical jerk / Dim sys phy jerk

Data type: Integer16	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Commissioning	
Parameter group:	Position control, Basic parameters / mechanical system	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
0	11	7

Description: Sets the physical unit für jerk.

Value:
0: 1000LU/s³ (user-defined)
7: mm/s³
10: in/s³
11: ft/s³

Dependency: Available with activated function: Position control

p2499 LR dimension system physical jerk / Dim sys phy jerk

Variant:	S210 (Basic positioner for rotary motion)	
Data type: Integer16	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Commissioning	
Parameter group:	Position control, Basic parameters / mechanical system	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
0	18	18

Description: Sets the physical unit für jerk.

Value:
0: 1000LU/s³ (user-defined)
18: °/s³

Dependency: Available with activated function: Position control

p2502[0] LR encoder assignment / Encoder assignment

Data type: Integer16	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Commissioning	
Parameter group:	Basic parameters / mechanical system, Actual position value preprocessing	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
0	2	1

Description: Setting to assign the encoder.
The actual value preprocessing and the closed-loop position control are carried out using the assigned encoder.

Value:
0: No encoder
1: Motor encoder
2: Encoder 2

Dependency: Available with activated function: Position control
See also: p0187, p0188

NOTICE
For the setting p2502 = 0 (no encoder), closed-loop position control is not possible. This setting is only practical as supportive measure to implement encoderless closed-loop speed control (e.g. if the motor encoder is defective).

Note
An encoder data set must be assigned to the assigned encoder (p2502 = 1, 2, 3).

p2503[0] LR length unit MU per 10 mm / MU per 10 mm

Data type: FloatingPoint32	**Visible in:** Extended display
Read permission:	Read drive data or acknowledge messages
Write permission:	Edit device configuration or drive applications

Can be changed in the operating state:	Commissioning	
Parameter group:	Position control	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: mm	**Unit group:** 10_3	**Unit selection:** p2496
Min:	**Max:**	**Factory setting:**
0.000001 [mm]	2.1474837e+09 [mm]	10.000000 [mm]

Description: Sets the length unit MU per 10 mm set by the user.

For a linear scale, this establishes a reference between the physical arrangement and the neutral length units LU used in the drive.

Example, linear scale:

p2503 = 10000 means: 10 mm should be resolved to µm (this means that 1 LU = 1 µm).

Dependency: Available with activated function: Position control

Note

When selecting a physical length unit, the drive automatically preassigns the parameter and it cannot be changed.

The assignment to the grid spacing can be achieved using this for a rotary axis with linear encoder.

MU: measurement unit

p2503[0] LR length unit MU per 10 mm / MU per 10 mm

Variant:	S210 (Basic positioner for rotary motion)	
Data type: FloatingPoint32	**Visible in:** Extended display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Commissioning	
Parameter group:	Position control	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: °	**Unit group:** 10_4	**Unit selection:** p2496
Min:	**Max:**	**Factory setting:**
0.000001 [°]	2.1474837e+09 [°]	10.000000 [°]

Description: Sets the length unit MU per 10 mm set by the user.

For a linear scale, this establishes a reference between the physical arrangement and the neutral length units LU used in the drive.

Example, linear scale:

p2503 = 10000 means: 10 mm should be resolved to µm (this means that 1 LU = 1 µm).

Dependency: Available with activated function: Position control

Note

When selecting a physical length unit, the drive automatically preassigns the parameter and it cannot be changed.

The assignment to the grid spacing can be achieved using this for a rotary axis with linear encoder.

MU: measurement unit

p2504[0] LR motor/load motor revolutions / Mot/load mot rev

Data type: Unsigned32	**Visible in:** Standard display
Read permission:	Read drive data or acknowledge messages
Write permission:	Edit device configuration or drive applications
Can be changed in the operating state:	Commissioning
Parameter group:	Position control, Basic parameters / mechanical system

Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
1	1048576	1

Description: Sets the motor revolutions for the gearbox factor between the motor shaft and load shaft.
Gearbox factor = motor revolutions (p2504) / load revolutions (p2505)

Dependency: Available with activated function: Position control
See also: p0432, p0433, p2505

p2505[0] LR motor/load load revolutions / Mot/load load rev

Data type: Integer32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Commissioning	
Parameter group:	Position control, Basic parameters / mechanical system	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
-1048576	1048576	1

Description: Sets the load revolutions for the gearbox factor between the motor shaft and load shaft.
Gearbox factor = motor revolutions (p2504) / load revolutions (p2505)

Dependency: Available with activated function: Position control
See also: p0432, p0433, p2504

p2506[0] LR length unit MU per load distance / MU per load dist

Data type: FloatingPoint32	**Visible in:** Extended display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Commissioning	
Parameter group:	Position control, Basic parameters / mechanical system	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: mm	**Unit group:** 10_3	**Unit selection:** p2496
Min:	**Max:**	**Factory setting:**
0.000001 [mm]	2.1474837e+09 [mm]	10.000000 [mm]

Description: Sets the length unit MU per load distance set by the user.

For a rotary encoder, this establishes a reference between the actual physical situation and the user-specific length unit MU.

Example:

Rotary encoder, ballscrew with 10 mm/revolution, 10 mm should be broken down to units of µm.

Length unit LU (p2496 = 0)

--> One load distance corresponds to 10000 LU (i.e. 1 LU = 1 µm)

--> p2506 = 10000

Physical unit µm (2496) = 4

--> One load distance corresponds to 10000 µm

--> p2506 = 10000

Dependency: Available with activated function: Position control

See also: p2496

p2506[0] LR length unit MU per load revolution / MU per load rev

Variant:	S210 (Basic positioner for rotary motion)	
Data type: FloatingPoint32	**Visible in:** Extended display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Commissioning	
Parameter group:	Position control, Basic parameters / mechanical system	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: °	**Unit group:** 10_4	**Unit selection:** p2496
Min:	**Max:**	**Factory setting:**
0.000001 [°]	2.1474837e+09 [°]	360.000000 [°]

Description: Sets the rotary unit MU per load revolution set by the user. For a rotary encoder, this establishes a reference between the physical arrangement and the user-specific rotating unit MU.

Example:

Rotating unit LU (p2496 = 0)

Rotary encoder, 1 revolution should be broken down into mdegrees, (i.e. 1 LU = 1 mdegrees).

--> One load revolution corresponds to 360000 LU

--> p2506 = 360000

Dependency: Available with activated function: Position control

See also: p2496

Note

When selecting a physical length unit, the drive automatically preassigns the parameter and it cannot be changed.

p2507[0...n] LR absolute encoder adjustment status / Abs_enc_adj stat

Data type: Integer16	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Operation	
Parameter group:	Position control	
Not relevant for motor type:	-	
Dyn. index [0...n]:	EDS n defined by: p0140	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -

Min:	Max:	Factory setting:
0	3	1

Description: Activates the adjustment and display of the status of the adjustment for absolute encoders.
For p2507 = 2:
This initiates encoder adjustment. The status is displayed using the other values.

Value:
0: Error occurred while adjusting
1: Absolute encoder not adjusted
2: Absolute encoder not adjusted and encoder adjustment initiated
3: Absolute encoder adjusted

Dependency: Available with activated function: Position control
See also: c2598, p2599, c11500

CAUTION

For rotating absolute encoders, when adjusting, a range is set up symmetrically around zero with half of the encoder range, within which the position must be re-established after switch-off/switch-on. In this range, it is only permissible that the encoder overflows.
After the adjustment has been completed, it must be guaranteed that the range is not exited. The reason for this is that outside the range, there is no clear reference any longer between the encoder actual value and mechanical system.
If the home position (c2598) lies in this range, then the position actual value is set when adjusting to the home position. Otherwise, adjustment is canceled with F07443.
There is no overflow for linear absolute encoders. This means that after the adjustment, the position can be re-established in the complete traversing range after switch-off/switch-on. When adjusting, the position actual value is set to the home position.

Note
To permanently accept the determined position offset, it must be retentively saved (p0977).
This adjustment can only be initiated for an absolute encoder.

c2510[0...3] LR selecting measuring probe evaluation / MT_eval select

Data type: Unsigned8 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Parameter group: Homing, Traversing blocks, Position control
Not relevant for motor type: -
Dyn. index [0...n]: - **Calculated:** -
Unit: - **Unit group:** - **Unit selection:** -
Type of signal interconnection: Sink binary
Factory interconnection: Fixed value: 0

Description: Signal to select the measuring probe.
0 signal, measuring probe 1 is used.
1 signal, measuring probe 2 is used.

Index:
[0] = Position control
[1] = Motor encoder
[2] = Encoder 2
[3] = Reserved

Dependency: Available with activated function: Position control
See also: p2502, c2511

Note
When function "Basic positioner" is activated, the measuring probe is selected at the 0/1 edge at r2684.1 (passive homing active).

c2511[0...3] LR measuring probe evaluation edge / MT_eval edge

Data type: Unsigned8 **Visible in:** Standard display

Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Parameter group:	Homing, Traversing blocks, Position control	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -
Type of signal interconnection:	Sink binary	
Factory interconnection:	Fixed value: 0	

Description: Signal to evaluate the measuring probe edge.
1 signal:
The falling edge of the measuring probe (c2510) is used.
0 signal:
The rising edge of the measuring probe (c2510) is used.

Index:
[0] = Position control
[1] = Motor encoder
[2] = Encoder 2
[3] = Reserved

Dependency: Available with activated function: Position control
See also: p2502, c2510

r2521[0...3] LR position actual value / s_act

Data type: FloatingPoint64	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Parameter group:	Jog, Homing, Traversing blocks, Direct setpoint input (MDI), Actual position value preprocessing	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: mm	**Unit group:** 10_3	**Unit selection:** p2496
Type of signal interconnection:	Source numeric	**Scaling:** -

Description: Display for the position actual value determined by the position actual value processing.

Index:
[0] = Position control
[1] = Motor encoder
[2] = Encoder 2
[3] = Reserved

Dependency: Available with activated function: Position control
See also: p2502, r2526

Note
r2526.0 = 1 --> The position actual value in r2521[0] for the position control is valid.
r2527.0 = 1 --> The position actual value in r2521[1] for encoder 1 is valid.
r2528.0 = 1 --> The position actual value in r2521[2] for encoder 2 is valid.

r2521[0...3] LR position actual value / s_act

Variant:	S210 (Basic positioner for rotary motion)	
Data type: FloatingPoint64	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Parameter group:	Jog, Homing, Traversing blocks, Direct setpoint input (MDI), Actual position value preprocessing	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: °	**Unit group:** 10_4	**Unit selection:** p2496

Type of signal interconnection: Source numeric **Scaling:** -

Description: Display for the position actual value determined by the position actual value processing.

Index:
[0] = Position control
[1] = Motor encoder
[2] = Encoder 2
[3] = Reserved

Dependency: Available with activated function: Position control
See also: p2502, r2526

Note
r2526.0 = 1 --> The position actual value in r2521[0] for the position control is valid.
r2527.0 = 1 --> The position actual value in r2521[1] for encoder 1 is valid.
r2528.0 = 1 --> The position actual value in r2521[2] for encoder 2 is valid.

r2522[0...3] LR velocity actual value / v_act

Data type: FloatingPoint32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Parameter group: Jog, Homing, Traversing blocks, Direct setpoint input (MDI), Actual position value preprocessing
Not relevant for motor type: -
Dyn. index [0...n]: - **Calculated:** -
Unit: mm/s **Unit group:** 11_3 **Unit selection:** p2497
Type of signal interconnection: Source numeric **Scaling:** -

Description: Display for the velocity actual value determined by the position actual value processing.

Index:
[0] = Position control
[1] = Motor encoder
[2] = Encoder 2
[3] = Reserved

Dependency: Available with activated function: Position control
See also: p2502, r2526

Note
r2526.0 = 1 --> The velocity actual value in r2522[0] for the position control is valid.
r2527.0 = 1 --> The velocity actual value in r2522[1] for encoder 1 is valid.
r2528.0 = 1 --> The velocity actual value in r2522[2] for encoder 2 is valid.

r2522[0...3] LR velocity actual value / v_act

Variant: S210 (Basic positioner for rotary motion)
Data type: FloatingPoint32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Parameter group: Jog, Homing, Traversing blocks, Direct setpoint input (MDI), Actual position value preprocessing
Not relevant for motor type: -
Dyn. index [0...n]: - **Calculated:** -
Unit: °/s **Unit group:** 11_4 **Unit selection:** p2497
Type of signal interconnection: Source numeric **Scaling:** -

Description: Display for the velocity actual value determined by the position actual value processing.

Index:
[0] = Position control
[1] = Motor encoder
[2] = Encoder 2
[3] = Reserved

Dependency: Available with activated function: Position control
See also: p2502, r2526

Note
r2526.0 = 1 --> The velocity actual value in r2522[0] for the position control is valid.
r2527.0 = 1 --> The velocity actual value in r2522[1] for encoder 1 is valid.
r2528.0 = 1 --> The velocity actual value in r2522[2] for encoder 2 is valid.

r2523[0...3] LR measured value / Measured value

Data type: FloatingPoint64 | **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Parameter group: Position control
Not relevant for motor type: -
Dyn. index [0...n]: - | **Calculated:** -
Unit: mm | **Unit group:** 10_3 | **Unit selection:** p2496
Type of signal interconnection: Source numeric | **Scaling:** -

Description: Displays the measured values that were determined using functions "Homing mark search" and "Measuring probe evaluation".

Index:
[0] = Position control
[1] = Motor encoder
[2] = Encoder 2
[3] = Reserved

Dependency: Available with activated function: Position control
See also: p2502, r2526

Note
r2526.2 = 1 --> The measured value in r2523[0] for the closed-loop position control is valid.
r2527.2 = 1 --> The measured value in r2523[1] for encoder 1 is valid.
r2528.2 = 1 --> The measured value in r2523[2] for encoder 2 is valid.

r2523[0...3] LR measured value / Measured value

Variant: S210 (Basic positioner for rotary motion)
Data type: FloatingPoint64 | **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Parameter group: Position control
Not relevant for motor type: -
Dyn. index [0...n]: - | **Calculated:** -
Unit: ° | **Unit group:** 10_4 | **Unit selection:** p2496
Type of signal interconnection: Source numeric | **Scaling:** -

Description: Displays the measured values that were determined using functions "Homing mark search" and "Measuring probe evaluation".

Index:
[0] = Position control
[1] = Motor encoder
[2] = Encoder 2
[3] = Reserved

Dependency: Available with activated function: Position control
See also: p2502, r2526

Note
r2526.2 = 1 --> The measured value in r2523[0] for the closed-loop position control is valid.
r2527.2 = 1 --> The measured value in r2523[1] for encoder 1 is valid.
r2528.2 = 1 --> The measured value in r2523[2] for encoder 2 is valid.

r2526.0...12 LR status word / ZSW

Data type: Unsigned16 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Parameter group: Actual position value preprocessing
Not relevant for motor type: -
Dyn. index [0...n]: - **Calculated:** -
Unit: - **Unit group:** - **Unit selection:** -
Type of signal interconnection: Source binary/numeric **Scaling:** -

Description: Displays the status word of the position controller.

Bit array:

Bit	Signal name	1 signal	0 signal
00	Position actual value valid	Yes	No
01	Homing active	Yes	No
02	Measured value valid	Yes	No
03	Position control active	Yes	No
04	Fixed stop reached	Yes	No
05	Fixed stop outside window	Yes	No
06	Position controller output limited	Yes	No
07	Request tracking mode	Yes	No
08	Clamping active when traveling to fixed stop	Yes	No
09	Setting value for adjustment valid	Yes	No
10	Absolute encoder adjusted	Yes	No
11	Absolute encoder adjustment unsuccessful	Yes	No
12	Absolute encoder being adjusted	Yes	No

Dependency: Available with activated function: Position control
See also: r2521, r2522, r2523

Note
For bit 04:
The signal is influenced via p2634.
For bit 05:
The signal is influenced via p2635.

r2527.0...12 LR actual value sensing status word motor encoder / ActV_sens ZSW Menc

Data type: Unsigned16 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Parameter group: Position control
Not relevant for motor type: -
Dyn. index [0...n]: - **Calculated:** -
Unit: - **Unit group:** - **Unit selection:** -
Type of signal interconnection: Source binary/numeric **Scaling:** -

Description: Display and signal source for the status word of the actual position sensing for encoder 1.

Bit array:

Bit	Signal name	1 signal	0 signal
00	Position actual value valid	Yes	No
01	Homing active	Yes	No
02	Measured value valid	Yes	No
10	Absolute encoder adjusted	Yes	No
11	Absolute encoder adjustment unsuccessful	Yes	No
12	Absolute encoder being adjusted	Yes	No

Dependency: Available with activated function: Position control

r2528.0...12 LR actual value sensing status word encoder 2 / ActV Sens ZSW enc2

Data type: Unsigned16 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Parameter group: Position control
Not relevant for motor type: -
Dyn. index [0...n]: - **Calculated:** -
Unit: - **Unit group:** - **Unit selection:** -
Type of signal interconnection: Source binary/numeric **Scaling:** -

Description: Display and signal source for the status word of the actual position sensing for encoder 2

Bit array:

Bit	Signal name	1 signal	0 signal
00	Position actual value valid	Yes	No
01	Homing active	Yes	No
02	Measured value valid	Yes	No
10	Absolute encoder adjusted	Yes	No
11	Absolute encoder adjustment unsuccessful	Yes	No
12	Absolute encoder being adjusted	Yes	No

Dependency: Available with activated function: Position control

c2530 LR position setpoint / s_set

Data type: FloatingPoint64 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Parameter group: Position controller
Not relevant for motor type: -
Dyn. index [0...n]: - **Calculated:** -
Unit: mm **Unit group:** 10_3 **Unit selection:** p2496
Type of signal interconnection: Sink numeric **Scaling:** -
Factory interconnection: Parameter: 2665

Description: Signal for the position setpoint of the position controller.

Dependency: Available with activated function: Position control
See also: r2665

c2530 LR position setpoint / s_set

Variant: S210 (Basic positioner for rotary motion)
Data type: FloatingPoint64 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Parameter group: Position controller
Not relevant for motor type: -
Dyn. index [0...n]: - **Calculated:** -
Unit: ° **Unit group:** 10_4 **Unit selection:** p2496
Type of signal interconnection: Sink numeric **Scaling:** -
Factory interconnection: Parameter: 2665

Description: Signal for the position setpoint of the position controller.

Dependency: Available with activated function: Position control
See also: r2665

c2531 LR velocity setpoint / v_set

Data type: FloatingPoint32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Parameter group:	Position controller	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: mm/s	**Unit group:** 11_3	**Unit selection:** p2497
Type of signal interconnection:	Sink numeric	**Scaling:** -
Factory interconnection:	Parameter: 2666	

Description: Signal for the velocity setpoint of the position controller.

Dependency: Available with activated function: Position control

See also: r2666

c2531 LR velocity setpoint / v_set

Variant:	S210 (Basic positioner for rotary motion)	
Data type: FloatingPoint32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Parameter group:	Position controller	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: °/s	**Unit group:** 11_4	**Unit selection:** p2497
Type of signal interconnection:	Sink numeric	**Scaling:** -
Factory interconnection:	Parameter: 2666	

Description: Signal for the velocity setpoint of the position controller.

Dependency: Available with activated function: Position control

See also: r2666

p2533[0] LR position setpoint filter time constant / s_set_filt Tc

Data type: FloatingPoint32	**Visible in:** Extended display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Operation	
Parameter group:	Position controller	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: ms	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
0.00 [ms]	1000.00 [ms]	0.00 [ms]

Description: Sets the time constant for the position setpoint filter (PT1).

Dependency: Available with activated function: Position control

Note

The effective Kv factor (position loop gain) is reduced with the filter. This allows a softer control behavior with improved tolerance with respect to noise/disturbances.

Applications:

- Reduces the precontrol dynamic response.
- Jerk limiting.

p2534[0] LR speed precontrol factor / n_prectrl fact

Data type: FloatingPoint32 | **Visible in:** Standard display

Read permission: Read drive data or acknowledge messages

Write permission: Edit device configuration or drive applications

Can be changed in the operating state: Operation

Parameter group: Position controller

Not relevant for motor type: -

Dyn. index [0...n]:	-	**Calculated:** -
Unit: %	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
0.00 [%]	200.00 [%]	0.00 [%]

Description: Setting for activation and weighting of the speed precontrol value.

Value = 0 % --> The precontrol is deactivated.

Dependency: Available with activated function: Position control

See also: p2535, p2536, r2563

Note

When the axis control loop is optimally set as well as a precisely determined equivalent time constant of the speed control loop, the precontrol factor is 100%.

p2535[0] LR speed precontrol symmetrizing filter dead time / n_prectrFil t_dead

Data type: FloatingPoint32 | **Visible in:** Extended display

Read permission: Read drive data or acknowledge messages

Write permission: Edit device configuration or drive applications

Can be changed in the operating state: Operation

Parameter group: Position controller

Not relevant for motor type: -

Dyn. index [0...n]:	-	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
0.00	2.00	0.00

Description: Sets the "fractional" dead time to emulate the timing behavior of the speed control loop.

The selected multiplier refers to the position controller sampling time (dead time= p2535 * position controller clock cycle).

Dependency: Available with activated function: Position control

See also: p2536

NOTICE

When speed precontrol is active (p2534 > 0 %), the following applies:
In addition to the set dead time (p2535), internally two position controller sampling times are effective.
When speed precontrol is inactive (p2534 = 0 %), the following applies:
No dead time is effective (p2535 and internal).

Note

Together with p2536, the time response of the closed speed control loop can be emulated.

p2536[0] LR speed precontrol symmetrizing filter PT1 / n_prectrl filt PT1

Data type: FloatingPoint32 | **Visible in:** Extended display

Read permission: Read drive data or acknowledge messages

Write permission: Edit device configuration or drive applications

Can be changed in the operating state:	Operation	
Parameter group:	Position controller	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: ms	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
0.00 [ms]	100.00 [ms]	0.00 [ms]

Description: Sets a PT1 filter to emulate the time response of the closed speed control loop.

Dependency: Available with activated function: Position control

See also: p2535

NOTICE
When speed precontrol is inactive (p2534 = 0 %), the following applies: If a PT1 filter has been set, it is not effective.

Note

Together with p2535, the time response of the closed speed control loop can be emulated.

p2538[0] LR proportional gain / Kp

Data type: FloatingPoint32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Operation	
Parameter group:	Position controller	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: 1000 rpm	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
0.000 [1000 rpm]	300.000 [1000 rpm]	1.000 [1000 rpm]

Description: Sets the proportional gain (P gain, position loop gain, Kv factor) of the position controller.

Dependency: Available with activated function: Position control

See also: p2539, r2557, r2558

Note

The proportional gain is used define at which traversing velocity which following error is obtained (without precontrol)
Low proportional gain:
Slow response to a setpoint - actual value difference, the following error becomes large.
High proportional gain:
Fast response to the setpoint - actual value difference, the following error becomes small.

p2539[0] LR integral time / Tn

Data type: FloatingPoint32	**Visible in:** Extended display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Operation	
Parameter group:	Position controller	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: ms	**Unit group:** -	**Unit selection:** -

Min:	Max:	Factory setting:
0.00 [ms]	100000.00 [ms]	0.00 [ms]

Description: Setting to activate the integral time of the position controller.
Value = 0 ms --> The I component of the position controller is deactivated.

Dependency: Available with activated function: Position control
See also: p2538, r2559

p2540 LR position controller output speed limit / LR_outp n_lim

Data type: FloatingPoint32	**Visible in:** Extended display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Operation	
Parameter group:	Position controller	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: rpm	**Unit group:** 3_1	**Unit selection:** p0505
Type of signal interconnection:	Source numeric	**Scaling:** p2000
Min:	**Max:**	**Factory setting:**
0.000 [rpm]	210000.000 [rpm]	210000.000 [rpm]

Description: Sets the speed limit of the position controller output.

Dependency: Available with activated function: Position control
See also: c2541

c2541 LR position controller output speed limit signal / LR_outp n_lim sig

Data type: FloatingPoint32	**Visible in:** Extended display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Parameter group:	Position controller	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: rpm	**Unit group:** -	**Unit selection:** -
Type of signal interconnection:	Sink numeric	**Scaling:** p2000
Factory interconnection:	Parameter: 2540	

Description: Signal for limiting the position controller output.

Dependency: Available with activated function: Position control
See also: p2540

p2542 LR standstill window / Standstill window

Data type: FloatingPoint32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Operation	
Parameter group:	Position monitoring	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: mm	**Unit group:** 10_3	**Unit selection:** p2496

Min:	**Max:**	**Factory setting:**
0.000000 [mm]	2.1474839e+09 [mm]	0.250000 [mm]

Description: Sets the standstill window for the standstill monitoring function.

After the standstill monitoring time expires, it is cyclically checked whether the difference between the setpoint and actual position is located within the standstill window and, if required, an appropriate fault is output.

Value = 0 --> The standstill monitoring is deactivated.

Dependency: Available with activated function: Position control

See also: p2543, p2544

Note

The following applies for the setting of the standstill window and positioning window:
Standstill window (p2542) >= positioning window (p2544)

p2542 LR standstill window / Standstill window

Variant:	S210 (Basic positioner for rotary motion)	
Data type: FloatingPoint32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Operation	
Parameter group:	Position monitoring	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: °	**Unit group:** 10_4	**Unit selection:** p2496
Min:	**Max:**	**Factory setting:**
0.000000 [°]	2.1474839e+09 [°]	10.000000 [°]

Description: Sets the standstill window for the standstill monitoring function.

After the standstill monitoring time expires, it is cyclically checked whether the difference between the setpoint and actual position is located within the standstill window and, if required, an appropriate fault is output.

Value = 0 --> The standstill monitoring is deactivated.

Dependency: Available with activated function: Position control

See also: p2543, p2544

Note

The following applies for the setting of the standstill window and positioning window:
Standstill window (p2542) >= positioning window (p2544)

p2543 LR standstill monitoring time / t_standstill mon

Data type: FloatingPoint32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Operation	
Parameter group:	Position monitoring	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: ms	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
0.00 [ms]	100000.00 [ms]	200.00 [ms]

Description: Sets the standstill monitoring time for the standstill monitoring function.

After the standstill monitoring time expires, it is cyclically checked whether the difference between the setpoint and actual position is located within the standstill window and, if required, an appropriate fault is output.

Dependency: Available with activated function: Position control
See also: p2542, p2545

Note
The following applies for the setting of the standstill and positioning monitoring time:
Standstill monitoring time (p2543) <= positioning monitoring time (p2545)

p2544 LR positioning window / Pos_window

Data type: FloatingPoint32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Operation	
Parameter group:	Position monitoring	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: mm	**Unit group:** 10_3	**Unit selection:** p2496
Min:	**Max:**	**Factory setting:**
0.000000 [mm]	2.1474839e+09 [mm]	0.050000 [mm]

Description: Sets the positioning window for the positioning monitoring function.
After the positioning monitoring time expires, it is checked once as to whether the difference between the setpoint and actual position lies within the positioning window and if required an appropriate fault is output.
Value = 0 --> The positioning monitoring function is deactivated.

Dependency: Available with activated function: Position control
See also: p2542, p2545, r2684

Note
The following applies for the setting of the standstill and positioning window:
Standstill window (p2542) >= positioning window (p2544)

p2544 LR positioning window / Pos_window

Variant:	S210 (Basic positioner for rotary motion)	
Data type: FloatingPoint32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Operation	
Parameter group:	Position monitoring	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: °	**Unit group:** 10_4	**Unit selection:** p2496
Min:	**Max:**	**Factory setting:**
0.000000 [°]	2.1474839e+09 [°]	2.000000 [°]

Description: Sets the positioning window for the positioning monitoring function.
After the positioning monitoring time expires, it is checked once as to whether the difference between the setpoint and actual position lies within the positioning window and if required an appropriate fault is output.
Value = 0 --> The positioning monitoring function is deactivated.

Dependency: Available with activated function: Position control
See also: p2542, p2545, r2684

Note
The following applies for the setting of the standstill and positioning window:
Standstill window (p2542) >= positioning window (p2544)

p2545 LR positioning monitoring time / t_pos_mon

Data type: FloatingPoint32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Operation	
Parameter group:	Position monitoring	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: ms	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
0.00 [ms]	100000.00 [ms]	1000.00 [ms]

Description: Sets the positioning monitoring time for the positioning monitoring.

After the positioning monitoring time expires, it is checked once as to whether the difference between the setpoint and actual position lies within the positioning window and if required an appropriate fault is output.

Dependency: Available with activated function: Position control

See also: p2543, p2544, r2684

Note

The following applies for the setting of the standstill and positioning monitoring time:
Standstill monitoring time (p2543) <= positioning monitoring time (p2545)

p2546[0] LR dynamic following error monitoring tolerance / s_delta_mon tol

Data type: FloatingPoint32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Operation	
Parameter group:	Position monitoring	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: mm	**Unit group:** 10_3	**Unit selection:** p2496
Min:	**Max:**	**Factory setting:**
0.000000 [mm]	2.1474839e+09 [mm]	1.000000 [mm]

Description: Sets the tolerance for the dynamic following error monitoring.

If the dynamic following error (r2563) exceeds the selected tolerance, then an appropriate fault is output.

Value = 0 --> The dynamic following error monitoring is deactivated.

Dependency: Available with activated function: Position control

See also: r2563, r2684

Note

The tolerance bandwidth is intended to prevent the dynamic following error monitoring incorrectly responding due to operational control sequences (e.g. during load surges).

p2546[0] LR dynamic following error monitoring tolerance / s_delta_mon tol

Variant:	S210 (Basic positioner for rotary motion)
Data type: FloatingPoint32	**Visible in:** Standard display
Read permission:	Read drive data or acknowledge messages
Write permission:	Edit device configuration or drive applications
Can be changed in the operating state:	Operation
Parameter group:	Position monitoring

Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: °	**Unit group:** 10_4	**Unit selection:** p2496
Min:	**Max:**	**Factory setting:**
0.000000 [°]	2.1474839e+09 [°]	36.000000 [°]

Description: Sets the tolerance for the dynamic following error monitoring.

If the dynamic following error (r2563) exceeds the selected tolerance, then an appropriate fault is output.

Value = 0 --> The dynamic following error monitoring is deactivated.

Dependency: Available with activated function: Position control

See also: r2563, r2684

Note

The tolerance bandwidth is intended to prevent the dynamic following error monitoring incorrectly responding due to operational control sequences (e.g. during load surges).

r2556 LR position setpoint after setpoint smoothing / s_set after interp

Data type: FloatingPoint64	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Parameter group:	Position controller	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: mm	**Unit group:** 10_3	**Unit selection:** p2496
Type of signal interconnection:	Source numeric	**Scaling:** -

Description: Displays the position setpoint after the setpoint smoothing.

Dependency: Available with activated function: Position control

r2556 LR position setpoint after setpoint smoothing / s_set after interp

Variant:	S210 (Basic positioner for rotary motion)	
Data type: FloatingPoint64	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Parameter group:	Position controller	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: °	**Unit group:** 10_4	**Unit selection:** p2496
Type of signal interconnection:	Source numeric	**Scaling:** -

Description: Displays the position setpoint after the setpoint smoothing.

Dependency: Available with activated function: Position control

r2557 LR position controller input system deviation / LR_inp SysDev

Data type: FloatingPoint32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Parameter group:	Position controller	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: mm	**Unit group:** 10_3	**Unit selection:** p2496
Type of signal interconnection:	Source numeric	**Scaling:** -

Description: Displays the difference between the position setpoint and the position actual value at the position controller input.

Dependency: Available with activated function: Position control

r2557 LR position controller input system deviation / LR_inp SysDev

Variant: S210 (Basic positioner for rotary motion)
Data type: FloatingPoint32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Parameter group: Position controller
Not relevant for motor type: -
Dyn. index [0...n]: - **Calculated:** -
Unit: ° **Unit group:** 10_4 **Unit selection:** p2496
Type of signal interconnection: Source numeric **Scaling:** -

Description: Displays the difference between the position setpoint and the position actual value at the position controller input.
Dependency: Available with activated function: Position control

r2558 LR position controller output P component / LR_outp P comp

Data type: FloatingPoint32 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Parameter group: Position controller
Not relevant for motor type: -
Dyn. index [0...n]: - **Calculated:** -
Unit: rpm **Unit group:** 3_1 **Unit selection:** p0505
Type of signal interconnection: Source numeric **Scaling:** p2000

Description: Displays the P component at the output of the position controller (speed setpoint).
Dependency: Available with activated function: Position control

r2559 LR position controller output I component / LR_outp I comp

Data type: FloatingPoint32 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Parameter group: Position controller
Not relevant for motor type: -
Dyn. index [0...n]: - **Calculated:** -
Unit: rpm **Unit group:** 3_1 **Unit selection:** p0505
Type of signal interconnection: Source numeric **Scaling:** p2000

Description: Displays the I component at the output of the position controller (speed setpoint).
Dependency: Available with activated function: Position control

r2560 LR speed setpoint / n_set

Data type: FloatingPoint32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Parameter group: Position controller
Not relevant for motor type: -
Dyn. index [0...n]: - **Calculated:** -
Unit: rpm **Unit group:** 3_1 **Unit selection:** p0505
Type of signal interconnection: Source numeric **Scaling:** p2000

Description: Displays the speed setpoint after limiting (c2541).
Dependency: Available with activated function: Position control

r2561 LR speed precontrol value / n_prectrl value

Data type: FloatingPoint32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages

	Parameter group:	Position controller	
	Not relevant for motor type:	-	
	Dyn. index [0...n]:	-	**Calculated:** -
	Unit: rpm	**Unit group:** 3_1	**Unit selection:** p0505
	Type of signal interconnection:	Source numeric	**Scaling:** p2000

Description: Displays the speed setpoint due to the precontrol.

Dependency: Available with activated function: Position control

r2562 LR total speed setpoint / n_set total

Data type: FloatingPoint32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Parameter group:	Position controller	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: rpm	**Unit group:** 3_1	**Unit selection:** p0505
Type of signal interconnection:	Source numeric	**Scaling:** p2000

Description: Displays the total speed setpoint

This value is obtained from the sum of the speed precontrol and position controller output.

Dependency: Available with activated function: Position control

See also: r2560, r2561

r2563 LR following error dynamic model / Follow error dyn

Data type: FloatingPoint32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Parameter group:	Jog, Homing, Traversing blocks, Direct setpoint input (MDI), Position monitoring	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: mm	**Unit group:** 10_3	**Unit selection:** p2496
Type of signal interconnection:	Source numeric	**Scaling:** -

Description: Displays the dynamic following error.

This value is the deviation, corrected by the velocity-dependent component, between the position setpoint and the position actual value.

Dependency: Available with activated function: Position control

Note

For p2534 >= 100 % (precontrol activated) the following applies:

The dynamic following error (r2563) corresponds to the system deviation (r2557) at the position controller input.

For 0 % < p2534 < 100 % (precontrol activated) or p2534 = 0 % (precontrol deactivated) the following applies:

The dynamic following error (r2563) is the deviation between the measured position actual value and a value that is calculated from the position setpoint via a PT1 model. This compensates the system-related velocity-dependent system deviation for a P controller.

r2563 LR following error dynamic model / Follow error dyn

Variant:	S210 (Basic positioner for rotary motion)	
Data type: FloatingPoint32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Parameter group:	Jog, Homing, Traversing blocks, Direct setpoint input (MDI), Position monitoring	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: °	**Unit group:** 10_4	**Unit selection:** p2496
Type of signal interconnection:	Source numeric	**Scaling:** -

Description: Displays the dynamic following error.

This value is the deviation, corrected by the velocity-dependent component, between the position setpoint and the position actual value.

Dependency: Available with activated function: Position control

Note

For p2534 >= 100 % (precontrol activated) the following applies:

The dynamic following error (r2563) corresponds to the system deviation (r2557) at the position controller input.

For 0 % < p2534 < 100 % (precontrol activated) or p2534 = 0 % (precontrol deactivated) the following applies:

The dynamic following error (r2563) is the deviation between the measured position actual value and a value that is calculated from the position setpoint via a PT1 model. This compensates the system-related velocity-dependent system deviation for a P controller.

r2564 LR torque precontrol value / M_prectrl val

Data type: FloatingPoint32 **Visible in:** Standard display

Read permission: Read drive data or acknowledge messages

Parameter group: Position controller

Not relevant for motor type: -

Dyn. index [0...n]: - **Calculated:** -

Unit: Nm **Unit group:** 7_1 **Unit selection:** p0505

Type of signal interconnection: Source numeric **Scaling:** p2003

Description: Displays the torque precontrol value.

Dependency: Available with activated function: Position control

Note

The torque precontrol value is the derivation over time of the speed precontrol value and is referred to a moment of inertia of 1 kgm^2/2 PI. When using the precontrol, then this should be evaluated corresponding to the actual moment of inertia.

r2565 LR following error actual / Following err act

Data type: FloatingPoint32 **Visible in:** Standard display

Read permission: Read drive data or acknowledge messages

Parameter group: Position controller

Not relevant for motor type: -

Dyn. index [0...n]: - **Calculated:** -

Unit: mm **Unit group:** 10_3 **Unit selection:** p2496

Type of signal interconnection: Source numeric **Scaling:** -

Description: Displays the actual following error.

This value is the deviation between the position setpoint - after fine interpolation - and the position actual value.

Dependency: Available with activated function: Position control

NOTICE

When speed precontrol is active (p2534 > 0 %), the following applies:

To calculate this value, the position setpoint is delayed by two position controller sampling times.

When speed precontrol is inactive (p2534 = 0 %), the following applies:

To calculate this value, the position setpoint is delayed by two position controller clock cycles.

r2565 LR following error actual / Following err act

Variant: S210 (Basic positioner for rotary motion)

Data type: FloatingPoint32 **Visible in:** Standard display

Read permission: Read drive data or acknowledge messages

Parameter group: Position controller

Not relevant for motor type: -

Dyn. index [0...n]:	-	**Calculated:** -
Unit: °	**Unit group:** 10_4	**Unit selection:** p2496
Type of signal interconnection:	Source numeric	**Scaling:** -

Description: Displays the actual following error.

This value is the deviation between the position setpoint - after fine interpolation - and the position actual value.

Dependency: Available with activated function: Position control

NOTICE

When speed precontrol is active (p2534 > 0 %), the following applies:
To calculate this value, the position setpoint is delayed by two position controller sampling times.
When speed precontrol is inactive (p2534 = 0 %), the following applies:
To calculate this value, the position setpoint is delayed by two position controller clock cycles.

p2567[0] LR torque precontrol moment of inertia / M_prectrl M_inert

Data type: FloatingPoint32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Operation	
Parameter group:	Position controller	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: kgm²	**Unit group:** 25_1	**Unit selection:** p0100
Min:	**Max:**	**Factory setting:**
0.000000 [kgm²]	100000.000000 [kgm²]	0.000000 [kgm²]

Description: Sets the moment of inertia for the torque precontrol.

Dependency: Available with activated function: Position control

See also: p2534, r2564

Note

When calculating the torque precontrol value (c2654), the time derivation of the speed precontrol value is multiplied by 2 PI * p2567.

For reasons associated with the compatibility to earlier firmware versions, the factory setting for p2567 = 1 kgm^2/2 PI. This means that r2564 remains as standard the derivation over time of the speed precontrol value and is referred, as before, to a moment of inertia of 1 kgm^2/2 PI. For torque precontrol, the moment of inertia can now be directly entered into p2567 (instead of subsequently evaluating the precontrol value).

c2568 EPOS hardware limit switch activation / HW lim switch act

Data type: Unsigned8	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Parameter group:	Position limits	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -
Type of signal interconnection:	Sink binary	
Factory interconnection:	Fixed value: 0	

Description: Signal to activate the hardware limit switch.

For c2568 = 1 signal:

Negative hardware limit switch (c2569) and positive hardware limit switch (c2570) are activated.

For c2568 = 0 signal:

Negative hardware limit switch (c2569) and positive hardware limit switch (c2570) are not evaluated.

Dependency: Available with activated function: Basic positioner

See also: c2569, c2570

Note

The traversing range can also be limited using software limit switches.

c2569 EPOS negative hardware limit switch / Neg HW lim switch

Data type: Unsigned8 **Visible in:** Standard display

Read permission: Read drive data or acknowledge messages

Write permission: Edit device configuration or drive applications

Parameter group: Position limits

Not relevant for motor type: -

Dyn. index [0...n]: - **Calculated:** -

Unit: - **Unit group:** - **Unit selection:** -

Type of signal interconnection: Sink binary

Factory interconnection: Parameter: 1:722.1

Description: Signal for the hardware limit switch in the negative direction of travel.

Recommendation: Set the OFF3 ramp-down time (p1135) so that after the axis reaches the hardware limit switch at maximum velocity, the braking distance traveled by the axis is not longer than the distance that is available.

Sets message 07491 as alarm (A07491):

Set the maximum deceleration (p2573) so that after the axis reaches the hardware limit switch at maximum velocity, the braking distance traveled by the axis is not longer than the distance that is available.

Dependency: Available with activated function: Basic positioner

See also: p1135, c2568, c2570, p2573, r2684

⚠ CAUTION

The hardware limit switch is low active.

Sets message 07491 as fault (F07491):

For a 0 signal, the drive stops with the OFF3 ramp-down time (p1135), status signal r2684.13 = 1 is set, saved and the corresponding fault is output. After the fault has been acknowledged, only motion moving away from the hardware limit switch is permitted.

For a 0/1 signal and valid travel direction, when the hardware limit switch is exited, this is detected and status signal r2684.13 is set to 0.

Sets message 07491 as alarm (A07491):

For a 0 signal, the axis is stopped with the maximum deceleration (p2573), status signal r2684.13 is set to 1, saved and the appropriate alarm is output. Only motion away from the hardware limit switch is permitted.

For a 0/1 signal and valid travel direction, when the hardware limit switch is exited, this is detected and status signal r2684.13 is set to 0 and the alarm is cleared.

c2570 EPOS positive hardware limit switch / Pos HW lim switch

Data type: Unsigned8 **Visible in:** Standard display

Read permission: Read drive data or acknowledge messages

Write permission: Edit device configuration or drive applications

Parameter group: Position limits

Not relevant for motor type: -

Dyn. index [0...n]: - **Calculated:** -

Unit: - **Unit group:** - **Unit selection:** -

Type of signal interconnection: Sink binary

Factory interconnection: Parameter: 1:722.4

Description: Signal for the hardware limit switch in the positive direction of travel.

Recommendation: Set the OFF3 ramp-down time (p1135) so that after the axis reaches the hardware limit switch at maximum velocity, the braking distance traveled by the axis is not longer than the distance that is available.

Dependency: Available with activated function: Basic positioner

See also: p1135, c2568, c2569, p2573, r2684

CAUTION

The hardware limit switch is low active.

For a 0 signal

the drive stops with the OFF3 ramp-down time (p1135), status signal r2684.14 = 1 is set, saved and the corresponding fault is output. After the fault has been acknowledged, only motion moving away from the hardware limit switch is permitted.

For a 0/1 signal

and valid travel direction, when the hardware limit switch is exited, this is detected and status signal r2684.14 is set to 0.

p2571 EPOS maximum velocity / v_max

Data type: FloatingPoint32 — **Visible in:** Standard display

Read permission: Read drive data or acknowledge messages

Write permission: Edit device configuration or drive applications

Can be changed in the operating state: Operation

Parameter group: Dynamic response limits

Not relevant for motor type: -

Dyn. index [0...n]: - — **Calculated:** -

Unit: mm/s — **Unit group:** 11_3 — **Unit selection:** p2497

Min:	Max:	Factory setting:
0.010 [mm/s]	4e+07 [mm/s]	500.000 [mm/s]

Description: Sets the maximum velocity for the "basic positioner" function (EPOS).

Dependency: Available with activated function: Basic positioner

See also: p2503, p2504, p2505, p2506

Note

The maximum velocity is active in all of the operating modes of the basic positioner.

The maximum velocity for the basic positioner should be aligned with the maximum speed/velocity of the speed/velocity controller:

Rotary encoders:

p2571[1000 LU/min] = min(p1082, p1083, |p1086|)[rpm] x p2505/p2504 x p2506/1000

Linear encoders:

p2571[1000 LU/min] = min(p1082, p1083, |p1086|)[m/min] x p2503/10[m]

p2571 EPOS maximum velocity / v_max

Variant: S210 (Basic positioner for rotary motion)

Data type: FloatingPoint32 — **Visible in:** Standard display

Read permission: Read drive data or acknowledge messages

Write permission: Edit device configuration or drive applications

Can be changed in the operating state: Operation

Parameter group: Dynamic response limits

Not relevant for motor type: -

Dyn. index [0...n]: - — **Calculated:** -

Unit: °/s — **Unit group:** 11_4 — **Unit selection:** p2497

Min:	Max:	Factory setting:
0.010 [°/s]	4e+07 [°/s]	18000.000 [°/s]

Description: Sets the maximum velocity for the "basic positioner" function (EPOS).

Dependency: Available with activated function: Basic positioner

See also: p2503, p2504, p2505, p2506

Note

The maximum velocity is active in all of the operating modes of the basic positioner.

The maximum velocity for the basic positioner should be aligned with the maximum speed/velocity of the speed/velocity controller:

Rotary encoders:

p2571[1000 LU/min] = min(p1082, p1083, |p1086|)[rpm] x p2505/p2504 x p2506/1000

Linear encoders:

p2571[1000 LU/min] = min(p1082, p1083, |p1086|)[m/min] x p2503/10[m]

p2572 EPOS maximum acceleration / a_max

Data type: FloatingPoint32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Ready for operation	
Parameter group:	Dynamic response limits, Jog	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: mm/s²	**Unit group:** 12_3	**Unit selection:** p2498
Type of signal interconnection:	Source numeric	**Scaling:** -
Min:	**Max:**	**Factory setting:**
0.001 [mm/s²]	2e+06 [mm/s²]	10000.000 [mm/s²]

Description: Sets the maximum acceleration for the "basic positioner" function (EPOS).

Dependency: Available with activated function: Basic positioner

See also: p2619, c2644

Note

The maximum acceleration appears to exhibit jumps (without jerk).

"Traversing blocks" operating mode:

The programmed acceleration override (p2619) acts on the maximum acceleration.

"Direct setpoint input/MDI" operating mode:

The acceleration override is effective (c2644, 4000 hex = 100 %).

"Jog" and "Active homing" operating modes:

No acceleration override is active. The axis starts with the maximum acceleration.

p2572 EPOS maximum acceleration / a_max

Variant:	S210 (Basic positioner for rotary motion)	
Data type: FloatingPoint32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Ready for operation	
Parameter group:	Dynamic response limits, Jog	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: °/s²	**Unit group:** 12_4	**Unit selection:** p2498
Type of signal interconnection:	Source numeric	**Scaling:** -
Min:	**Max:**	**Factory setting:**
0.001 [°/s²]	2e+06 [°/s²]	360000.000 [°/s²]

Description: Sets the maximum acceleration for the "basic positioner" function (EPOS).

Dependency: Available with activated function: Basic positioner
See also: p2619, c2644

Note
The maximum acceleration appears to exhibit jumps (without jerk).
"Traversing blocks" operating mode:
The programmed acceleration override (p2619) acts on the maximum acceleration.
"Direct setpoint input/MDI" operating mode:
The acceleration override is effective (c2644, 4000 hex = 100 %).
"Jog" and "Active homing" operating modes:
No acceleration override is active. The axis starts with the maximum acceleration.

p2573 EPOS maximum deceleration / -a_max

Data type: FloatingPoint32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Ready for operation	
Parameter group:	Dynamic response limits, Jog	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: mm/s²	**Unit group:** 12_3	**Unit selection:** p2498
Type of signal interconnection:	Source numeric	**Scaling:** -
Min:	**Max:**	**Factory setting:**
0.001 [mm/s²]	2e+06 [mm/s²]	10000.000 [mm/s²]

Description: Sets the maximum deceleration for the "basic positioner" function (EPOS).

Dependency: Available with activated function: Basic positioner
See also: p2620, c2645

Note
The maximum deceleration appears to exhibit jumps (without jerk).
"Traversing blocks" operating mode:
The programmed deceleration override (p2620) acts on the maximum deceleration.
"Direct setpoint input/MDI" operating mode:
The deceleration override is effective (c2645, 4000 hex = 100 %).
"Jog" and "Active homing" operating modes:
No deceleration override is effective. The axis breaks with the maximum deceleration.

p2573 EPOS maximum deceleration / -a_max

Variant:	S210 (Basic positioner for rotary motion)	
Data type: FloatingPoint32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Ready for operation	
Parameter group:	Dynamic response limits, Jog	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: °/s²	**Unit group:** 12_4	**Unit selection:** p2498
Type of signal interconnection:	Source numeric	**Scaling:** -
Min:	**Max:**	**Factory setting:**
0.001 [°/s²]	2e+06 [°/s²]	360000.000 [°/s²]

Description: Sets the maximum deceleration for the "basic positioner" function (EPOS).

Dependency: Available with activated function: Basic positioner
See also: p2620, c2645

Note
The maximum deceleration appears to exhibit jumps (without jerk).
"Traversing blocks" operating mode:
The programmed deceleration override (p2620) acts on the maximum deceleration.
"Direct setpoint input/MDI" operating mode:
The deceleration override is effective (c2645, 4000 hex = 100 %).
"Jog" and "Active homing" operating modes:
No deceleration override is effective. The axis breaks with the maximum deceleration.

p2574 EPOS jerk limiting / Jerk lim

Data type: FloatingPoint32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Operation	
Parameter group:	Dynamic response limits	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: mm/s³	**Unit group:** 13_3	**Unit selection:** p2499
Min:	**Max:**	**Factory setting:**
0.001 [mm/s³]	1e+08 [mm/s³]	200000.000 [mm/s³]

Description: Sets the jerk limiting

Dependency: Available with activated function: Basic positioner
See also: p2572, p2573, c2575

Note
The jerk limiting is internally converted into a jerk time as follows:
Jerk time Tr = max(p2572, p2573) / p2574
The jerk time is internally limited to 1000 ms, and is rounded off to an integer multiple of the sampling time of the basic positioner cycle.
The jerk time is valid for the acceleration and deceleration phases also for unequal maximum acceleration (p2572) and maximum deceleration (p2573).
For unequal maximum acceleration and maximum deceleration, the motion is not optimal from a time perspective as the jerk limit cannot be used for the lower of the two values.
If, in the traversing profile, the acceleration time without jerk limiting is shorter than jerk time Tr, then motion with jerk limiting is not time-optimized.
For traversing motion with a direct transition between acceleration and deceleration (i.e. jerk time is greater than the constant velocity phase), jerk can increase up to twice the parameterized jerk.
CONTINUE_FLYING with direction reversal acts internally just like a CONTINUE_WITH_STOP without the "position reached" being set. Without jerk limiting, this behavior can hardly be noticed as, when reversing, the position setpoint is only kept at zero for one interpolator clock cycle.
For block change enable CONTINUE_WITH_STOP, jerk limiting results in a longer delay time.

p2574 EPOS jerk limiting / Jerk lim

Variant:	S210 (Basic positioner for rotary motion)
Data type: FloatingPoint32	**Visible in:** Standard display
Read permission:	Read drive data or acknowledge messages
Write permission:	Edit device configuration or drive applications
Can be changed in the operating state:	Operation
Parameter group:	Dynamic response limits

Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: °/s³	**Unit group:** 13_4	**Unit selection:** p2499
Min:	**Max:**	**Factory setting:**
0.001 [°/s³]	1e+08 [°/s³]	7.2e+06 [°/s³]

Description: Sets the jerk limiting

Dependency: Available with activated function: Basic positioner

See also: p2572, p2573, c2575

Note

The jerk limiting is internally converted into a jerk time as follows:

Jerk time Tr = max(p2572, p2573) / p2574

The jerk time is internally limited to 1000 ms, and is rounded off to an integer multiple of the sampling time of the basic positioner cycle.

The jerk time is valid for the acceleration and deceleration phases also for unequal maximum acceleration (p2572) and maximum deceleration (p2573).

For unequal maximum acceleration and maximum deceleration, the motion is not optimal from a time perspective as the jerk limit cannot be used for the lower of the two values.

If, in the traversing profile, the acceleration time without jerk limiting is shorter than jerk time Tr, then motion with jerk limiting is not time-optimized.

For traversing motion with a direct transition between acceleration and deceleration (i.e. jerk time is greater than the constant velocity phase), jerk can increase up to twice the parameterized jerk.

CONTINUE_FLYING with direction reversal acts internally just like a CONTINUE_WITH_STOP without the "position reached" being set. Without jerk limiting, this behavior can hardly be noticed as, when reversing, the position setpoint is only kept at zero for one interpolator clock cycle.

For block change enable CONTINUE_WITH_STOP, jerk limiting results in a longer delay time.

c2575 EPOS jerk limiting activation / Jerk limit act

Data type: Unsigned8	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Parameter group:	Dynamic response limits, Jog, Homing, Traversing blocks, Direct setpoint input (MDI)	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -
Type of signal interconnection:	Sink binary	
Factory interconnection:	Fixed value: 0	

Description: Signal to activate jerk limiting.

Activating/deactivating:

- Using c2575 = 1 signal or 0 signal.
- Using the JERK command in the traversing block (only for c2575 = 0 signal).

Dependency: Available with activated function: Basic positioner

See also: p2574

Note

A change to the signal state is only accepted at zero speed.

p2576 EPOS modulo correction modulo range / Modulo corr range

Data type: FloatingPoint64	**Visible in:** Standard display
Read permission:	Read drive data or acknowledge messages
Write permission:	Edit device configuration or drive applications
Can be changed in the operating state:	Ready for operation

Parameter group:	Basic parameters / mechanical system, Actual position value preprocessing	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: mm	**Unit group:** 10_3	**Unit selection:** p2496
Min:	**Max:**	**Factory setting:**
0.000100 [mm]	2.1474828e+09 [mm]	360.000000 [mm]

Description: Sets the modulo range for axes with modulo correction.

Dependency: Available with activated function: Basic positioner

See also: c2577

p2576 EPOS modulo correction modulo range / Modulo corr range

Variant:	S210 (Basic positioner for rotary motion)	
Data type: FloatingPoint64	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Ready for operation	
Parameter group:	Basic parameters / mechanical system, Actual position value preprocessing	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: °	**Unit group:** 10_4	**Unit selection:** p2496
Min:	**Max:**	**Factory setting:**
0.000100 [°]	2.1474828e+09 [°]	360.000000 [°]

Description: Sets the modulo range for axes with modulo correction.

Dependency: Available with activated function: Basic positioner

See also: c2577

c2577 EPOS modulo correction activation / Modulo corr act

Data type: Unsigned8	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Parameter group:	Basic parameters / mechanical system, Actual position value preprocessing	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -
Type of signal interconnection:	Sink binary	
Factory interconnection:	Fixed value: 0	

Description: Signal to activate modulo correction.

Dependency: Available with activated function: Basic positioner

See also: p2576

Note

When the signal state changes, this only becomes effective in the "ready for switching on" state.

Selecting modulo correction:

The actual position setpoint in the modulo range is corrected. The position actual value differs from the position setpoint by the following error and can also leave the modulo range.

Deselecting modulo correction:

It is based on the actual position actual value.

c2578 EPOS negative software limit switch / Neg SW lim switch

Data type: FloatingPoint64	**Visible in:** Standard display

Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Parameter group:	Position limits	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: mm	**Unit group:** 10_3	**Unit selection:** p2496
Type of signal interconnection:	Sink numeric	**Scaling:** -
Factory interconnection:	Parameter: 2580	

Description: Signal for the negative software limit switch.

Dependency: Available with activated function: Basic positioner

See also: c2579, p2580, p2581, c2582

NOTICE

A change to the software limit switch immediately becomes effective.
If the software limit switch is changed, then this results in the positions in the traversing blocks being checked.

Note

The following applies for the setting of the software limit switch:
Negative software limit switch < positive software limit switch

c2578 EPOS negative software limit switch / Neg SW lim switch

Variant:	S210 (Basic positioner for rotary motion)	
Data type: FloatingPoint64	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Parameter group:	Position limits	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: °	**Unit group:** 10_4	**Unit selection:** p2496
Type of signal interconnection:	Sink numeric	**Scaling:** -
Factory interconnection:	Parameter: 2580	

Description: Signal for the negative software limit switch.

Dependency: Available with activated function: Basic positioner

See also: c2579, p2580, p2581, c2582

NOTICE

A change to the software limit switch immediately becomes effective.
If the software limit switch is changed, then this results in the positions in the traversing blocks being checked.

Note

The following applies for the setting of the software limit switch:
Negative software limit switch < positive software limit switch

c2579 EPOS positive software limit switch / Pos SW lim switch

Data type: FloatingPoint64	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Parameter group:	Dynamic response limits	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: mm	**Unit group:** 10_3	**Unit selection:** p2496

Type of signal interconnection: Sink numeric **Scaling:** -
Factory interconnection: Parameter: 2581

Description: Signal for the positive setpoint limit switch.

Dependency: Available with activated function: Basic positioner

See also: c2578, p2580, p2581, c2582

NOTICE
A change to the software limit switch immediately becomes effective. If the software limit switch is changed, then this results in the positions in the traversing blocks being checked.

Note

The following applies for the setting of the software limit switch:

Negative software limit switch < positive software limit switch

c2579 EPOS positive software limit switch / Pos SW lim switch

Variant: S210 (Basic positioner for rotary motion)

Data type: FloatingPoint64 **Visible in:** Standard display

Read permission: Read drive data or acknowledge messages

Write permission: Edit device configuration or drive applications

Parameter group: Dynamic response limits

Not relevant for motor type: -

Dyn. index [0...n]: - **Calculated:** -

Unit: ° **Unit group:** 10_4 **Unit selection:** p2496

Type of signal interconnection: Sink numeric **Scaling:** -

Factory interconnection: Parameter: 2581

Description: Signal for the positive setpoint limit switch.

Dependency: Available with activated function: Basic positioner

See also: c2578, p2580, p2581, c2582

NOTICE
A change to the software limit switch immediately becomes effective. If the software limit switch is changed, then this results in the positions in the traversing blocks being checked.

Note

The following applies for the setting of the software limit switch:

Negative software limit switch < positive software limit switch

p2580 EPOS negative software limit switch / Neg SW lim switch

Data type: FloatingPoint64 **Visible in:** Standard display

Read permission: Read drive data or acknowledge messages

Write permission: Edit device configuration or drive applications

Can be changed in the operating state: Operation

Parameter group: Position limits

Not relevant for motor type: -

Dyn. index [0...n]: - **Calculated:** -

Unit: mm **Unit group:** 10_3 **Unit selection:** p2496

Type of signal interconnection: Source numeric **Scaling:** -

Min:	Max:	Factory setting:
-2.1474828e+09 [mm]	2.1474828e+09 [mm]	-2.1474828e+09 [mm]

Description: Sets the software limit switch, in the negative direction of travel.

Dependency:	Available with activated function: Basic positioner See also: c2578, c2579, p2581, c2582

p2580 EPOS negative software limit switch / Neg SW lim switch

Variant:	S210 (Basic positioner for rotary motion)	
Data type: FloatingPoint64	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Operation	
Parameter group:	Position limits	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: °	**Unit group:** 10_4	**Unit selection:** p2496
Type of signal interconnection:	Source numeric	**Scaling:** -
Min:	**Max:**	**Factory setting:**
-2.1474828e+09 [°]	2.1474828e+09 [°]	-2.1474828e+09 [°]

Description:	Sets the software limit switch, in the negative direction of travel.
Dependency:	Available with activated function: Basic positioner See also: c2578, c2579, p2581, c2582

p2581 EPOS positive software limit switch / Pos SW lim switch

Data type: FloatingPoint64	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Operation	
Parameter group:	Dynamic response limits	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: mm	**Unit group:** 10_3	**Unit selection:** p2496
Type of signal interconnection:	Source numeric	**Scaling:** -
Min:	**Max:**	**Factory setting:**
-2.1474828e+09 [mm]	2.1474828e+09 [mm]	2.1474828e+09 [mm]

Description:	Sets the software limit switch, in the positive direction of travel.
Dependency:	Available with activated function: Basic positioner See also: c2578, c2579, p2580, c2582

p2581 EPOS positive software limit switch / Pos SW lim switch

Variant:	S210 (Basic positioner for rotary motion)	
Data type: FloatingPoint64	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Operation	
Parameter group:	Dynamic response limits	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: °	**Unit group:** 10_4	**Unit selection:** p2496

Type of signal interconnection:	Source numeric	**Scaling:** -
Min:	**Max:**	**Factory setting:**
-2.1474828e+09 [°]	2.1474828e+09 [°]	2.1474828e+09 [°]

Description: Sets the software limit switch, in the positive direction of travel.

Dependency: Available with activated function: Basic positioner

See also: c2578, c2579, p2580, c2582

c2582 EPOS software limit switch activation / SW lim switch act

Data type: Unsigned8	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Parameter group:	Position limits	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -
Type of signal interconnection:	Sink binary	
Factory interconnection:	Fixed value: 0	

Description: Signal to activate the software limit switch.

Dependency: Available with activated function: Basic positioner

See also: c2578, c2579, p2580, p2581

CAUTION

Software limit switch is effective for:
- Axis is homed (r2684.11 = 1) and
- c2582 = 1 signal.

Software limit switch is ineffective for:
- Modulo correction active (c2577 = 1 signal) or
- "Active homing" is executed.

NOTICE

Target position for relative positioning outside software limit switch:
The traversing block is started and the axis comes to a standstill at the software limit switch. An appropriate alarm is output and the traversing block is interrupted. Traversing blocks with valid position can be activated.

Target position for absolute positioning outside software limit switch:
In the "traversing blocks" mode, the traversing block is not started and an appropriate fault is output.

Axis outside the valid traversing range:
If the axis is already outside the valid traversing range, then an appropriate fault is output. The fault can be acknowledged at standstill. Traversing blocks with valid position can be activated.

Note

The traversing range can also be limited using hardware limit switches.

p2583 EPOS backlash compensation / Backlash comp

Data type: FloatingPoint32	**Visible in:** Extended display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Operation	
Parameter group:	Basic positioner	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -

Unit: mm	**Unit group:** 10_3	**Unit selection:** p2496
Min:	**Max:**	**Factory setting:**
-200000.000000 [mm]	200000.000000 [mm]	0.000000 [mm]

Description: Sets the amount of play (backlash) for positive or negative play.

0: backlash compensation is deactivated.

> 0: Positive backlash (normal case)

When the direction is reversed, the encoder actual value leads the actual value.

< 0: Negative backlash

When the direction is reversed, the actual value leads the encoder actual value.

Dependency: If a stationary axis is referenced by "setting the home position", or an adjusted with absolute encoder is switched on, then the setting of c2604 is relevant for entering the compensation value.

c2604 = 1:

Traveling in the positive direction -> A compensation value is immediately entered.

Traveling in the negative direction -> A compensation value is not entered

c2604 = 0:

Traveling in the positive direction -> A compensation value is not entered

Traveling in the negative direction -> A compensation value is immediately entered.

When again setting the home position (a homed axis) or for "passive homing", c2604 is not relevant but instead the history of the axis.

Available with activated function: Basic positioner

See also: c2604

p2583 EPOS backlash compensation / Backlash comp

Variant:	S210 (Basic positioner for rotary motion)	
Data type: FloatingPoint32	**Visible in:** Extended display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Operation	
Parameter group:	Basic positioner	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: °	**Unit group:** 10_4	**Unit selection:** p2496
Min:	**Max:**	**Factory setting:**
-200000.000000 [°]	200000.000000 [°]	0.000000 [°]

Description: Sets the amount of play (backlash) for positive or negative play.

0: backlash compensation is deactivated.

> 0: Positive backlash (normal case)

When the direction is reversed, the encoder actual value leads the actual value.

< 0: Negative backlash

When the direction is reversed, the actual value leads the encoder actual value.

Dependency: If a stationary axis is referenced by "setting the home position", or an adjusted with absolute encoder is switched on, then the setting of c2604 is relevant for entering the compensation value.

c2604 = 1:

Traveling in the positive direction -> A compensation value is immediately entered.

Traveling in the negative direction -> A compensation value is not entered

c2604 = 0:

Traveling in the positive direction -> A compensation value is not entered

Traveling in the negative direction -> A compensation value is immediately entered.

When again setting the home position (a homed axis) or for "passive homing", c2604 is not relevant but instead the history of the axis.

Available with activated function: Basic positioner

See also: c2604

p2584.0...3 EPOS functions configuration / EPOS fct config

Data type: Unsigned32	**Visible in:** Extended display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Ready for operation	
Parameter group:	Basic positioner	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
-	-	0100 bin

Description: Sets the configuration for additional functions for the basic positioner (EPOS).

Bit array:

Bit	Signal name	1 signal	0 signal
00	Activate position feedback signal	Yes	No
01	Hardware limit switch evaluation	Level evaluation	Edge evaluation
02	Travel to fixed stop - torque calculation based on the offset	Yes	No
03	Active homing with absolute encoder adjustment	Yes	No

Dependency: Available with activated function: Basic positioner

Note

For bit 00:

When the bit is set, for traversing blocks with absolute target positions (p2617[x]) when the tolerance window (p2688) is reached, the traversing block number (p2616[x]) is output bit-coded (r2689).

For bit 01:

When the bit is set, the hardware limit switch is evaluated, level-triggered.

This setting is recommended for a poor position actual value resolution, as in this case the direction does not have to be evaluated.

For bit 02:

When the bit is set, for "Travel to fixed stop", the torque setpoints are calculated based on the offset for the torque limit (p1532).

For bit 03:

After successful active homing, an absolute encoder is adjusted (p2507).

p2585 EPOS jog 1 setpoint velocity / Jog 1 v_set

Data type: FloatingPoint32	**Visible in:** Standard display
Read permission:	Read drive data or acknowledge messages
Write permission:	Edit device configuration or drive applications
Can be changed in the operating state:	Operation

Parameter group:	Jog	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: mm/s	**Unit group:** 11_3	**Unit selection:** p2497
Min:	**Max:**	**Factory setting:**
-4e+07 [mm/s]	4e+07 [mm/s]	-5.000 [mm/s]

Description: Sets the setpoint velocity for jog 1.

Dependency: Available with activated function: Basic positioner

See also: p2587, c2589, c2591

p2585 EPOS jog 1 setpoint velocity / Jog 1 v_set

Variant:	S210 (Basic positioner for rotary motion)	
Data type: FloatingPoint32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Operation	
Parameter group:	Jog	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: °/s	**Unit group:** 11_4	**Unit selection:** p2497
Min:	**Max:**	**Factory setting:**
-4e+07 [°/s]	4e+07 [°/s]	-180.000 [°/s]

Description: Sets the setpoint velocity for jog 1.

Dependency: Available with activated function: Basic positioner

See also: p2587, c2589, c2591

p2586 EPOS jog 2 setpoint velocity / Jog 2 v_set

Data type: FloatingPoint32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Operation	
Parameter group:	Jog	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: mm/s	**Unit group:** 11_3	**Unit selection:** p2497
Min:	**Max:**	**Factory setting:**
-4e+07 [mm/s]	4e+07 [mm/s]	5.000 [mm/s]

Description: Sets the setpoint velocity for jog 2.

Dependency: Available with activated function: Basic positioner

See also: p2588, c2590, c2591

p2586 EPOS jog 2 setpoint velocity / Jog 2 v_set

Variant:	S210 (Basic positioner for rotary motion)
Data type: FloatingPoint32	**Visible in:** Standard display
Read permission:	Read drive data or acknowledge messages
Write permission:	Edit device configuration or drive applications

Can be changed in the operating state: Operation
Parameter group: Jog
Not relevant for motor type: -
Dyn. index [0...n]: - **Calculated:** -
Unit: °/s **Unit group:** 11_4 **Unit selection:** p2497

Min:	Max:	Factory setting:
-4e+07 [°/s]	4e+07 [°/s]	180.000 [°/s]

Description: Sets the setpoint velocity for jog 2.

Dependency: Available with activated function: Basic positioner
See also: p2588, c2590, c2591

p2587 EPOS jog 1 traversing distance / Jog 1 distance

Data type: FloatingPoint32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Operation
Parameter group: Jog
Not relevant for motor type: -
Dyn. index [0...n]: - **Calculated:** -
Unit: mm **Unit group:** 10_3 **Unit selection:** p2496

Min:	Max:	Factory setting:
0.000000 [mm]	2.1474828e+09 [mm]	1.000000 [mm]

Description: Sets the traversing distance for incremental jog 1.

Dependency: Available with activated function: Basic positioner
See also: p2585, c2589, c2591

Note
Incremental jog 1 is started with c2591 = 1 signal and c2589 = 0/1 signal.
With c2589 = 0 signal, incremental jogging is interrupted.

p2587 EPOS jog 1 traversing distance / Jog 1 distance

Variant: S210 (Basic positioner for rotary motion)
Data type: FloatingPoint32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Operation
Parameter group: Jog
Not relevant for motor type: -
Dyn. index [0...n]: - **Calculated:** -
Unit: ° **Unit group:** 10_4 **Unit selection:** p2496

Min:	Max:	Factory setting:
0.000000 [°]	2.1474828e+09 [°]	36.000000 [°]

Description: Sets the traversing distance for incremental jog 1.

Dependency: Available with activated function: Basic positioner
See also: p2585, c2589, c2591

Note
Incremental jog 1 is started with c2591 = 1 signal and c2589 = 0/1 signal.
With c2589 = 0 signal, incremental jogging is interrupted.

p2588 EPOS jog 2 traversing distance / Jog 2 distance

Data type: FloatingPoint32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Operation	
Parameter group:	Jog	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: mm	**Unit group:** 10_3	**Unit selection:** p2496
Min:	**Max:**	**Factory setting:**
0.000000 [mm]	2.1474828e+09 [mm]	1.000000 [mm]

Description: Sets the traversing distance for incremental jog 2.

Dependency: Available with activated function: Basic positioner

See also: p2586, c2590, c2591

Note

Incremental jog 2 is started with c2591 = 1 signal and c2590 = 0/1 signal.

Incremental jogging is interrupted with c2590 = 0 signal.

p2588 EPOS jog 2 traversing distance / Jog 2 distance

Variant:	S210 (Basic positioner for rotary motion)	
Data type: FloatingPoint32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Operation	
Parameter group:	Jog	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: °	**Unit group:** 10_4	**Unit selection:** p2496
Min:	**Max:**	**Factory setting:**
0.000000 [°]	2.1474828e+09 [°]	36.000000 [°]

Description: Sets the traversing distance for incremental jog 2.

Dependency: Available with activated function: Basic positioner

See also: p2586, c2590, c2591

Note

Incremental jog 2 is started with c2591 = 1 signal and c2590 = 0/1 signal.

Incremental jogging is interrupted with c2590 = 0 signal.

c2589 EPOS jog 1 / Jog 1

Data type: Unsigned8	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Parameter group:	Jog	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -
Type of signal interconnection:	Sink binary	
Factory interconnection:	Fixed value: 0	

Description: Signal for jog 1.

Dependency: When jogging, the axis is accelerated or braked with the maximum acceleration/deceleration (p2572/p2573).
c2591 = 0 signal
The axis endlessly moves with the setpoint velocity, jog 1 (p2585).
c2591 = 1 signal
The axis traverses through a parameterized distance (p2585) with the setpoint velocity, jog 1 (p2587).
Available with activated function: Basic positioner
See also: p2572, p2573, p2585, p2587, c2591

NOTICE
The parameter may be protected as a result of r0922 and cannot be changed.

c2590 EPOS jog 2 / Jog 2

Data type: Unsigned8	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Parameter group:	Jog	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -
Type of signal interconnection:	Sink binary	
Factory interconnection:	Fixed value: 0	

Description: Signal for jog 2.

Dependency: When jogging, the axis is accelerated or braked with the maximum acceleration/deceleration (p2572/p2573).
c2591 = 0 signal
The axis endlessly moves with the setpoint velocity, jog 2 (p2586).
c2591 = 1 signal
The axis traverses through a parameterized distance (p2586) with the setpoint velocity, jog 2 (p2588).
Available with activated function: Basic positioner
See also: p2572, p2573, p2586, p2588, c2591

NOTICE
The parameter may be protected as a result of r0922 and cannot be changed.

c2591 EPOS jogging incremental / Jog incr

Data type: Unsigned8	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Parameter group:	Jog	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -
Type of signal interconnection:	Sink binary	
Factory interconnection:	Fixed value: 0	

Description: Signal for incremental jogging.

Dependency: Available with activated function: Basic positioner
See also: p2585, p2586, p2587, p2588, c2589, c2590

c2595 EPOS homing start / Hom start

Data type: Unsigned8	**Visible in:** Standard display
Read permission:	Read drive data or acknowledge messages

Write permission:	Edit device configuration or drive applications	
Parameter group:	Homing	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -
Type of signal interconnection:	Sink binary	
Factory interconnection:	Fixed value: 0	

Description: Signal to start "Active homing" or "Passive homing".
0/1 signal edge: Homing is started.
1/0 signal edge: Homing is interrupted.

Dependency: Available with activated function: Basic positioner
See also: c2597, c2598, p2599, r2684

NOTICE
The parameter may be protected as a result of r0922 and cannot be changed.

Note
Active homing (c2597 = 0 signal):
Active homing can only be activated (0/1 edge) after traversing motion that is being processed has been completed.
With the start, where relevant, the state signal "home position set" (r2684.11) is reset.
Passive homing (c2597 = 1 signal):
With the start, the state signal "home position set" (r2684.11) is not reset.

c2596 EPOS set home position / Set hom_pos

Data type: Unsigned8	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Parameter group:	Homing	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -
Type of signal interconnection:	Sink binary	
Factory interconnection:	Fixed value: 0	

Description: Signal for "Set home position".

Dependency: Available with activated function: Basic positioner
See also: c2598, p2599, r2684

NOTICE
The parameter may be protected as a result of r0922 and cannot be changed.

Note
Home position setting is effective in the following operating states:
- In the basic state.
- For FIXED STOP with progress condition END (corresponds to the initial state).
- For traversing block interrupted via c2640 = 0 signal (intermediate stop).
- For EPOS not enabled and position actual value valid

c2597 EPOS homing type selection / Hom_type selection

Data type: Unsigned8	**Visible in:** Standard display
Read permission:	Read drive data or acknowledge messages
Write permission:	Edit device configuration or drive applications
Parameter group:	Homing
Not relevant for motor type:	-

Dyn. index [0...n]:	-	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -
Type of signal interconnection:	Sink binary	
Factory interconnection:	Fixed value: 0	

Description: Signal to select homing type.
1 signal: Passive homing
0 signal: Active homing

Dependency: Available with activated function: Basic positioner
See also: c2595

Note
Homing is activated as follows:
- Select homing type (c2597)
- Start homing (c2595 = 0/1 signal edge)

c2598[0...3] EPOS home position signal / Hom_pos signal

Data type: FloatingPoint64	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Parameter group:	Homing	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: mm	**Unit group:** 10_3	**Unit selection:** p2496
Type of signal interconnection:	Sink numeric	**Scaling:** -
Factory interconnection:	Parameter: 2599	

Description: Signal for the home position.
This value is used as reference for the following homing operations:
- Active homing
- Set home position
- Passive homing
- Absolute value adjustment

Index: [0] = Position control
[1] = Motor encoder
[2] = Encoder 2
[3] = Reserved

Dependency: Available with activated function: Basic positioner
See also: p2502, p2507, c2595, c2596, c2597, p2599

Note
When function "Basic positioner" is activated, the following applies:
Incremental measuring system:
After the home position is reached, the drive accepts the actual axis position from the position value received via c2598[0].
Absolute encoder:
When adjusting the encoder, the position received is set as the actual axis position.

c2598[0...3] EPOS home position signal / Hom_pos signal

Variant:	S210 (Basic positioner for rotary motion)	
Data type: FloatingPoint64	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Parameter group:	Homing	

Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: °	**Unit group:** 10_4	**Unit selection:** p2496
Type of signal interconnection:	Sink numeric	**Scaling:** -
Factory interconnection:	Parameter: 2599	

Description: Signal for the home position.

This value is used as reference for the following homing operations:

- Active homing
- Set home position
- Passive homing
- Absolute value adjustment

Index: [0] = Position control

[1] = Motor encoder

[2] = Encoder 2

[3] = Reserved

Dependency: Available with activated function: Basic positioner

See also: p2502, p2507, c2595, c2596, c2597, p2599

Note

When function "Basic positioner" is activated, the following applies:

Incremental measuring system:

After the home position is reached, the drive accepts the actual axis position from the position value received via c2598[0].

Absolute encoder:

When adjusting the encoder, the position received is set as the actual axis position.

p2599 EPOS home position value / Home_pos_value

Data type: FloatingPoint64	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Operation	
Parameter group:	Homing	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: mm	**Unit group:** 10_3	**Unit selection:** p2496
Type of signal interconnection:	Source numeric	**Scaling:** -
Min:	**Max:**	**Factory setting:**
-2.1474828e+09 [mm]	2.1474828e+09 [mm]	0.000000 [mm]

Description: Sets the position value for the home position.

This value is set as the actual axis position after homing or adjustment.

Dependency: Available with activated function: Basic positioner

See also: p2507, c2595, c2596, c2597, c2598

p2599 EPOS home position value / Home_pos_value

Variant:	S210 (Basic positioner for rotary motion)	
Data type: FloatingPoint64	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Operation	

Parameter group:	Homing	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: °	**Unit group:** 10_4	**Unit selection:** p2496
Type of signal interconnection:	Source numeric	**Scaling:** -
Min:	**Max:**	**Factory setting:**
-2.1474828e+09 [°]	2.1474828e+09 [°]	0.000000 [°]

Description: Sets the position value for the home position.
This value is set as the actual axis position after homing or adjustment.

Dependency: Available with activated function: Basic positioner
See also: p2507, c2595, c2596, c2597, c2598

p2600 EPOS active homing home position offset / Home pos offset

Data type: FloatingPoint64	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Operation	
Parameter group:	Homing	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: mm	**Unit group:** 10_3	**Unit selection:** p2496
Min:	**Max:**	**Factory setting:**
-2.1474828e+09 [mm]	2.1474828e+09 [mm]	0.000000 [mm]

Description: Sets the home position shift for active homing.

Dependency: Available with activated function: Basic positioner
See also: c2598

p2600 EPOS active homing home position offset / Home pos offset

Variant:	S210 (Basic positioner for rotary motion)	
Data type: FloatingPoint64	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Operation	
Parameter group:	Homing	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: °	**Unit group:** 10_4	**Unit selection:** p2496
Min:	**Max:**	**Factory setting:**
-2.1474828e+09 [°]	2.1474828e+09 [°]	0.000000 [°]

Description: Sets the home position shift for active homing.

Dependency: Available with activated function: Basic positioner
See also: c2598

c2604 EPOS active homing start direction / Act homing direct

Data type: Unsigned8	**Visible in:** Standard display
Read permission:	Read drive data or acknowledge messages
Write permission:	Edit device configuration or drive applications

Parameter group:	Homing	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -
Type of signal interconnection:	Sink binary	
Factory interconnection:	Fixed value: 0	

Description: Signal for the start direction for active homing.
1 signal: Start in the negative direction.
0 signal: Start in the positive direction.

Dependency: Available with activated function: Basic positioner
See also: p2583, c2595, c2597

p2605 EPOS active homing approach velocity reference cam / v_appr ref_cam

Data type: FloatingPoint32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Operation	
Parameter group:	Homing	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: mm/s	**Unit group:** 11_3	**Unit selection:** p2497
Min:	**Max:**	**Factory setting:**
0.0001 [mm/s]	4e+07 [mm/s]	100.0000 [mm/s]

Description: Sets the approach velocity to the reference cam for active homing.

Dependency: Active homing only starts with the approach velocity to the reference cam when there is a reference cam (p2607 = 1).
Available with activated function: Basic positioner
See also: c2595, c2597, c2604, p2606, p2607

Note
When traversing to the reference cam, the velocity override is effective.
If, at the start of active homing, the axis is already at the reference cam, then the axis immediately starts to traverse to the zero mark.

p2605 EPOS active homing approach velocity reference cam / v_appr ref_cam

Variant:	S210 (Basic positioner for rotary motion)	
Data type: FloatingPoint32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Operation	
Parameter group:	Homing	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: °/s	**Unit group:** 11_4	**Unit selection:** p2497
Min:	**Max:**	**Factory setting:**
0.0001 [°/s]	4e+07 [°/s]	3600.0000 [°/s]

Description: Sets the approach velocity to the reference cam for active homing.

Dependency: Active homing only starts with the approach velocity to the reference cam when there is a reference cam (p2607 = 1).
Available with activated function: Basic positioner
See also: c2595, c2597, c2604, p2606, p2607

Note
When traversing to the reference cam, the velocity override is effective.
If, at the start of active homing, the axis is already at the reference cam, then the axis immediately starts to traverse to the zero mark.

p2606 EPOS active homing reference cam maximum distance / Ref_cam max s

Data type: FloatingPoint64 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Operation
Parameter group: Homing
Not relevant for motor type: -
Dyn. index [0...n]: - **Calculated:** -
Unit: mm **Unit group:** 10_3 **Unit selection:** p2496

Min:	Max:	Factory setting:
0.000000 [mm]	2.1474828e+09 [mm]	2.1474828e+09 [mm]

Description: Sets the maximum distance after starting active homing when traversing to the reference cam.
Dependency: Available with activated function: Basic positioner
See also: c2595, c2597, c2604, p2605, p2607

Note
When using a reversing cam, the maximum distance must be set appropriately long.

p2606 EPOS active homing reference cam maximum distance / Ref_cam max s

Variant: S210 (Basic positioner for rotary motion)
Data type: FloatingPoint64 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Operation
Parameter group: Homing
Not relevant for motor type: -
Dyn. index [0...n]: - **Calculated:** -
Unit: ° **Unit group:** 10_4 **Unit selection:** p2496

Min:	Max:	Factory setting:
0.000000 [°]	2.1474828e+09 [°]	2.1474828e+09 [°]

Description: Sets the maximum distance after starting active homing when traversing to the reference cam.
Dependency: Available with activated function: Basic positioner
See also: c2595, c2597, c2604, p2605, p2607

Note
When using a reversing cam, the maximum distance must be set appropriately long.

p2607 EPOS active homing reference cam available / Ref_cam pres

Data type: Unsigned8 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Operation
Parameter group: Homing

Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
0	1	1

Description: Sets whether or not a reference cam is available for active homing.
Value = 1: Reference cam present.
Value = 0: No reference cam present.

Dependency: Available with activated function: Basic positioner
See also: c2595, c2597, c2604, p2605, p2606

p2608 EPOS active homing approach velocity zero mark / v_appr hom_ZM

Data type: FloatingPoint32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Operation	
Parameter group:	Homing	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: mm/s	**Unit group:** 11_3	**Unit selection:** p2497
Min:	**Max:**	**Factory setting:**
0.0001 [mm/s]	4e+07 [mm/s]	25.0000 [mm/s]

Description: Sets the approach velocity after detecting the reference cam to search for the zero mark for active homing.

Dependency: If there is no reference cam (p2607 = 0), active homing starts immediately with the axis traversing to the zero mark.
Available with activated function: Basic positioner
See also: c2595, c2597, c2604, p2607, p2609, p2610

> **CAUTION**
>
> If the reference cam is not adjusted so that for each active homing the same zero mark for synchronization is detected, then an "incorrect" axis reference point is obtained.
> After the reference cam has been left, the search for the zero mark is activated with a time delay due to internal factors. This is the reason that the reference cam should be adjusted in this center between two zero marks and the approach velocity should be adapted to the distance between two zero marks.

Note
The velocity override is not effective when traversing to the zero mark.

p2608 EPOS active homing approach velocity zero mark / v_appr hom_ZM

Variant:	S210 (Basic positioner for rotary motion)	
Data type: FloatingPoint32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Operation	
Parameter group:	Homing	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: °/s	**Unit group:** 11_4	**Unit selection:** p2497
Min:	**Max:**	**Factory setting:**
0.0001 [°/s]	4e+07 [°/s]	900.0000 [°/s]

Description: Sets the approach velocity after detecting the reference cam to search for the zero mark for active homing.

Dependency: If there is no reference cam (p2607 = 0), active homing starts immediately with the axis traversing to the zero mark.

Available with activated function: Basic positioner

See also: c2595, c2597, c2604, p2607, p2609, p2610

CAUTION

If the reference cam is not adjusted so that for each active homing the same zero mark for synchronization is detected, then an "incorrect" axis reference point is obtained.
After the reference cam has been left, the search for the zero mark is activated with a time delay due to internal factors. This is the reason that the reference cam should be adjusted in this center between two zero marks and the approach velocity should be adapted to the distance between two zero marks.

Note

The velocity override is not effective when traversing to the zero mark.

p2609 EPOS active homing max distance reference cam and zero mark / Max s ref_cam ZM

Data type: FloatingPoint32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Operation	
Parameter group:	Homing	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: mm	**Unit group:** 10_3	**Unit selection:** p2496
Min:	**Max:**	**Factory setting:**
0.000000 [mm]	2.1474828e+09 [mm]	20.000000 [mm]

Description: Sets the maximum distance after leaving the reference cam when traversing to the zero mark.

Dependency: Available with activated function: Basic positioner

See also: c2595, c2597, c2604, p2607, p2608, p2610

p2609 EPOS active homing max distance reference cam and zero mark / Max s ref_cam ZM

Variant:	S210 (Basic positioner for rotary motion)	
Data type: FloatingPoint32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Operation	
Parameter group:	Homing	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: °	**Unit group:** 10_4	**Unit selection:** p2496
Min:	**Max:**	**Factory setting:**
0.000000 [°]	2.1474828e+09 [°]	720.000000 [°]

Description: Sets the maximum distance after leaving the reference cam when traversing to the zero mark.

Dependency: Available with activated function: Basic positioner

See also: c2595, c2597, c2604, p2607, p2608, p2610

p2610 EPOS active homing tolerance band for distance to zero mark / Tol_band to ZM

Data type: FloatingPoint32	**Visible in:** Extended display
Read permission:	Read drive data or acknowledge messages
Write permission:	Edit device configuration or drive applications

Can be changed in the operating state:	Operation	
Parameter group:	Homing	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: mm	**Unit group:** 10_3	**Unit selection:** p2496
Min:	**Max:**	**Factory setting:**
0.000000 [mm]	2.1474828e+09 [mm]	2.1474828e+09 [mm]

Description: Sets the tolerance bandwidth for the distance to the zero mark

The zero mark is evaluated within the maximum distance between the reference cam and zero mark (p2609) minus the tolerance bandwidth for the distance to the zero mark (p2610).

Dependency: Available with activated function: Basic positioner

See also: p2609

p2610 EPOS active homing tolerance band for distance to zero mark / Tol_band to ZM

Variant:	S210 (Basic positioner for rotary motion)	
Data type: FloatingPoint32	**Visible in:** Extended display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Operation	
Parameter group:	Homing	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: °	**Unit group:** 10_4	**Unit selection:** p2496
Min:	**Max:**	**Factory setting:**
0.000000 [°]	2.1474828e+09 [°]	2.1474828e+09 [°]

Description: Sets the tolerance bandwidth for the distance to the zero mark

The zero mark is evaluated within the maximum distance between the reference cam and zero mark (p2609) minus the tolerance bandwidth for the distance to the zero mark (p2610).

Dependency: Available with activated function: Basic positioner

See also: p2609

p2611 EPOS active homing approach velocity home position / v_appr hom_pos

Data type: FloatingPoint32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Operation	
Parameter group:	Homing	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: mm/s	**Unit group:** 11_3	**Unit selection:** p2497
Min:	**Max:**	**Factory setting:**
0.0001 [mm/s]	4e+07 [mm/s]	25.0000 [mm/s]

Description: Sets the approach velocity after detecting the zero mark to approach the home position.

Dependency: Available with activated function: Basic positioner

See also: c2595, c2597, c2604, p2607, p2609, p2610

Note

When traversing to the home position, the velocity override is not effective.

p2611 EPOS active homing approach velocity home position / v_appr hom_pos

Variant: S210 (Basic positioner for rotary motion)
Data type: FloatingPoint32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Operation
Parameter group: Homing
Not relevant for motor type: -
Dyn. index [0...n]: - **Calculated:** -
Unit: °/s **Unit group:** 11_4 **Unit selection:** p2497

Min:	**Max:**	**Factory setting:**
0.0001 [°/s]	4e+07 [°/s]	900.0000 [°/s]

Description: Sets the approach velocity after detecting the zero mark to approach the home position.

Dependency: Available with activated function: Basic positioner
See also: c2595, c2597, c2604, p2607, p2609, p2610

Note
When traversing to the home position, the velocity override is not effective.

c2612[0...1] EPOS active homing reference cam / Ref_cam

Data type: Unsigned8 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Parameter group: Homing
Not relevant for motor type: -
Dyn. index [0...n]: - **Calculated:** -
Unit: - **Unit group:** - **Unit selection:** -
Type of signal interconnection: Sink binary
Factory interconnection: Fixed value: 0

Description: Signal for the reference cam.

Index: [0] = Reference cam selection 1
[1] = Reference cam selection 2

Dependency: Available with activated function: Basic positioner
See also: r0922, p2607

NOTICE
Parameter c2612[0] may be protected as a result of r0922 and cannot be changed.

Note
The selection of reference cam 1 or 2 can be configured using p11550.

c2613 EPOS active homing negative reversing cam / Neg reversing cam

Data type: Unsigned8 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Parameter group: Homing
Not relevant for motor type: -
Dyn. index [0...n]: - **Calculated:** -
Unit: - **Unit group:** - **Unit selection:** -

Type of signal interconnection:	Sink binary	
Factory interconnection:	Fixed value: 1	

Description: Signal for the reversing cam in the negative direction of travel.

1 signal: Reversing cam not reached.

0 signal: Reversing cam reached.

Dependency: Available with activated function: Basic positioner

See also: c2614

Note

If, during active homing of the positive and negative reversing cam, a 0 signal is detected, then the axis remains at a standstill.

c2614 EPOS active homing positive reversing cam / Pos reversing cam

Data type: Unsigned8	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Parameter group:	Homing	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -
Type of signal interconnection:	Sink binary	
Factory interconnection:	Fixed value: 1	

Description: Signal for the reversing cam in the positive direction of travel.

1 signal: Reversing cam not reached.

0 signal: Reversing cam reached.

Dependency: Available with activated function: Basic positioner

See also: c2613

Note

If, during active homing of the positive and negative reversing cam, a 0 signal is detected, then the axis remains at a standstill.

p2615 EPOS maximum number of traversing blocks / Trav_block qty max

Data type: Unsigned8	**Visible in:** Extended display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Commissioning	
Parameter group:	Traversing blocks	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
1	64	64

Description: Sets the maximum number of traversing blocks that are available.

Dependency: Available with activated function: Basic positioner

See also: p2616, p2617, p2618, p2619, p2620, p2621, p2622, p2623

p2616[0...n] EPOS traversing block block number / Trav_blk, blk no

Data type: Integer16	**Visible in:** Standard display
Read permission:	Read drive data or acknowledge messages

Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Operation	
Parameter group:	Traversing blocks	
Not relevant for motor type:	-	
Dyn. index [0...n]:	n defined by: p2615	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
-1	63	-1

Description: Sets a block number.
-1: Invalid block number. These blocks are not taken into account.
0 ... 63: valid block number.

Dependency: The number of indices depends on p2615.
Available with activated function: Basic positioner
See also: p2615, p2617, p2618, p2619, p2620, p2621, p2622, p2623

p2617[0...n] EPOS traversing block position / Trav_block pos

Data type: FloatingPoint64	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Operation	
Parameter group:	Traversing blocks	
Not relevant for motor type:	-	
Dyn. index [0...n]:	n defined by: p2615	**Calculated:** -
Unit: mm	**Unit group:** 10_3	**Unit selection:** p2496
Min:	**Max:**	**Factory setting:**
-2.1474828e+09 [mm]	2.1474828e+09 [mm]	0.000000 [mm]

Description: Sets the target position for the traversing block.

Dependency: The number of indices depends on p2615.
Available with activated function: Basic positioner
See also: p2615, p2616, p2618, p2619, p2620, p2621, p2622, p2623

Note
The target position is approached in either relative or absolute terms depending on p2623.

p2617[0...n] EPOS traversing block position / Trav_block pos

Variant:	S210 (Basic positioner for rotary motion)	
Data type: FloatingPoint64	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Operation	
Parameter group:	Traversing blocks	
Not relevant for motor type:	-	
Dyn. index [0...n]:	n defined by: p2615	**Calculated:** -
Unit: °	**Unit group:** 10_4	**Unit selection:** p2496
Min:	**Max:**	**Factory setting:**
-2.1474828e+09 [°]	2.1474828e+09 [°]	0.000000 [°]

Description: Sets the target position for the traversing block.

Dependency: The number of indices depends on p2615.
Available with activated function: Basic positioner
See also: p2615, p2616, p2618, p2619, p2620, p2621, p2622, p2623

Note
The target position is approached in either relative or absolute terms depending on p2623.

p2618[0...n] EPOS traversing block velocity / Trav_block v

Data type: FloatingPoint32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Operation	
Parameter group:	Traversing blocks	
Not relevant for motor type:	-	
Dyn. index [0...n]:	n defined by: p2615	**Calculated:** -
Unit: mm/s	**Unit group:** 11_3	**Unit selection:** p2497
Min:	**Max:**	**Factory setting:**
0.0001 [mm/s]	4e+07 [mm/s]	100.0000 [mm/s]

Description: Sets the velocity for the traversing block.

Dependency: The number of indices depends on p2615.
Available with activated function: Basic positioner
See also: p2615, p2616, p2617, p2619, p2620, p2621, p2622, p2623, c2646

Note
The velocity can be influenced using the velocity override (c2646).

p2618[0...n] EPOS traversing block velocity / Trav_block v

Variant:	S210 (Basic positioner for rotary motion)	
Data type: FloatingPoint32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Operation	
Parameter group:	Traversing blocks	
Not relevant for motor type:	-	
Dyn. index [0...n]:	n defined by: p2615	**Calculated:** -
Unit: °/s	**Unit group:** 11_4	**Unit selection:** p2497
Min:	**Max:**	**Factory setting:**
0.0001 [°/s]	4e+07 [°/s]	3600.0000 [°/s]

Description: Sets the velocity for the traversing block.

Dependency: The number of indices depends on p2615.
Available with activated function: Basic positioner
See also: p2615, p2616, p2617, p2619, p2620, p2621, p2622, p2623, c2646

Note
The velocity can be influenced using the velocity override (c2646).

p2619[0...n] EPOS traversing block acceleration override / Trav_block a_over

Data type: FloatingPoint32	**Visible in:** Standard display
Read permission:	Read drive data or acknowledge messages
Write permission:	Edit device configuration or drive applications

Can be changed in the operating state:	Operation	
Parameter group:	Traversing blocks	
Not relevant for motor type:	-	
Dyn. index [0...n]:	n defined by: p2615	**Calculated:** -
Unit: %	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
1.0 [%]	100.0 [%]	100.0 [%]

Description: Sets the acceleration override for the traversing block.
The override refers to the maximum acceleration (p2572).

Dependency: The number of indices depends on p2615.
Available with activated function: Basic positioner
See also: p2572, p2615, p2616, p2617, p2618, p2620, p2621, p2622, p2623

p2620[0...n] EPOS traversing deceleration override / Trav_block -a_over

Data type: FloatingPoint32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Operation	
Parameter group:	Traversing blocks	
Not relevant for motor type:	-	
Dyn. index [0...n]:	n defined by: p2615	**Calculated:** -
Unit: %	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
1.0 [%]	100.0 [%]	100.0 [%]

Description: Sets the deceleration override for the traversing block.
The override refers to the maximum deceleration (p2573).

Dependency: The number of indices depends on p2615.
Available with activated function: Basic positioner
See also: p2573, p2615, p2616, p2617, p2618, p2619, p2621, p2622, p2623

NOTICE
If, when calculating the traversing profile, it is identified that the target position of the next block with the programmed deceleration override will not be reached without direction reversal (flying block change), then the old (actual) deceleration override remains effective.

p2621[0...n] EPOS traversing block task / Trav_block task

Data type: Integer16	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Operation	
Parameter group:	Traversing blocks	
Not relevant for motor type:	-	
Dyn. index [0...n]:	n defined by: p2615	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
1	9	1

Description: Sets the required task for the traversing block.

Value: 1: POSITIONING

2:	FIXED STOP
3:	ENDLESS_POS
4:	ENDLESS_NEG
5:	WAITING
6:	GOTO
7:	SET_O
8:	RESET_O
9:	JERK

Dependency: The number of indices depends on p2615.
Available with activated function: Basic positioner
See also: p2615, p2616, p2617, p2618, p2619, p2620, p2622, p2623

p2622[0...n] EPOS traversing block task parameter / Trav_blck task_par

Data type: Integer32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Operation	
Parameter group:	Traversing blocks	
Not relevant for motor type:	-	
Dyn. index [0...n]:	n defined by: p2615	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
-2147483648	2147483647	0

Description: Sets additional information/data of the appropriate task for the traversing block.

Dependency: The number of indices depends on p2615.
Available with activated function: Basic positioner
See also: p2615, p2616, p2617, p2618, p2619, p2620, p2621, p2623

Note
The following should be set depending on the task:
FIXED STOP: Clamping torque and clamping force (rotary 0...65536 [0.01 Nm], linear 0...65536 [N])
WAIT: Wait time [ms]
GOTO: Block number
SET_O: 1, 2 or 3 - set direct output 1, 2 or 3 (both)
RESET_O: 1, 2 or 3 - reset direct output 1, 2 or 3 (both)
JERK: 0 - deactivate, 1 - activate

p2623[0...n] EPOS traversing block task mode / Trav_block mode

Data type: Unsigned16	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Operation	
Parameter group:	Traversing blocks	
Not relevant for motor type:	-	
Dyn. index [0...n]:	n defined by: p2615	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
0	65535	0

Description: Sets the influence of the task for the traversing block.
Value = 0000 cccc bbbb aaaa
cccc: Positioning mode
cccc = 0000 --> ABSOLUTE
cccc = 0001 --> RELATIVE
cccc = 0010 --> ABS_POS (only for a rotary axis with modulo correction)
cccc = 0011 --> ABS_NEG (only for a rotary axis with modulo correction)
bbbb: Progression condition
bbbb = 0000 --> END
bbbb = 0001 --> CONTINUE_WITH_STOP
bbbb = 0010 --> CONTINUE_FLYING
bbbb = 0011 --> CONTINUE_EXTERNAL
bbbb = 0100 --> CONTINUE_EXTERNAL_WAIT
bbbb = 0101 --> CONTINUE_EXTERNAL_ALARM
aaaa: IDs
aaaa = 000x --> show/hide block (x = 0: show, x = 1: hide)

Dependency: The number of indices depends on p2615.
Available with activated function: Basic positioner
See also: p2615, p2616, p2617, p2618, p2619, p2620, p2621, p2622

c2625 EPOS traversing block selection bit 0 / Trav_blk sel bit 0

Data type: Unsigned8 | **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Parameter group: Traversing blocks
Not relevant for motor type: -
Dyn. index [0...n]: - | **Calculated:** -
Unit: - | **Unit group:** - | **Unit selection:** -
Type of signal interconnection: Sink binary
Factory interconnection: Fixed value: 0

Description: Signal to select the traversing block, bit 0.

Dependency: Parameters c2625, c2626, c2627, c2628 and c2629 are used to select one of the maximum 64 traversing blocks.
Available with activated function: Basic positioner
See also: c2626, c2627, c2628, c2629

c2626 EPOS traversing block selection bit 1 / Trav_blk sel bit 1

Data type: Unsigned8 | **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Parameter group: Traversing blocks
Not relevant for motor type: -
Dyn. index [0...n]: - | **Calculated:** -
Unit: - | **Unit group:** - | **Unit selection:** -
Type of signal interconnection: Sink binary
Factory interconnection: Fixed value: 0

Description: Signal to select the traversing block, bit 1.

Dependency: Parameters c2625, c2626, c2627, c2628 and c2629 are used to select one of the maximum 64 traversing blocks.
Available with activated function: Basic positioner
See also: c2625, c2627, c2628, c2629

c2627 EPOS traversing block selection bit 2 / Trav_blk sel bit 2

Data type: Unsigned8 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Parameter group: Traversing blocks
Not relevant for motor type: -
Dyn. index [0...n]: - **Calculated:** -
Unit: - **Unit group:** - **Unit selection:** -
Type of signal interconnection: Sink binary
Factory interconnection: Fixed value: 0

Description: Signal to select the traversing block, bit 2.

Dependency: Parameters c2625, c2626, c2627, c2628 and c2629 are used to select one of the maximum 64 traversing blocks.
Available with activated function: Basic positioner
See also: c2625, c2626, c2628, c2629

c2628 EPOS traversing block selection bit 3 / Trav_blk sel bit 3

Data type: Unsigned8 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Parameter group: Traversing blocks
Not relevant for motor type: -
Dyn. index [0...n]: - **Calculated:** -
Unit: - **Unit group:** - **Unit selection:** -
Type of signal interconnection: Sink binary
Factory interconnection: Fixed value: 0

Description: Signal to select the traversing block, bit 3.

Dependency: Parameters c2625, c2626, c2627, c2628 and c2629 are used to select one of the maximum 64 traversing blocks.
Available with activated function: Basic positioner
See also: c2625, c2626, c2627, c2629

c2629 EPOS traversing block selection bit 4 / Trav_blk sel bit 4

Data type: Unsigned8 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Parameter group: Traversing blocks
Not relevant for motor type: -
Dyn. index [0...n]: - **Calculated:** -
Unit: - **Unit group:** - **Unit selection:** -
Type of signal interconnection: Sink binary
Factory interconnection: Fixed value: 0

Description: Signal to select the traversing block, bit 4.

Dependency: Parameters c2625, c2626, c2627, c2628 and c2629 are used to select one of the maximum 64 traversing blocks.
Available with activated function: Basic positioner
See also: c2625, c2626, c2627, c2628

c2631 EPOS activate traversing task (0 -> 1) / Trav_task act

Data type: Unsigned8 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications

Parameter group:	Traversing blocks	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -
Type of signal interconnection:	Sink binary	
Factory interconnection:	Fixed value: 0	

Description: Signal for "Activate traversing task".
c2631 = 0/1 signal
The traversing task, selected using c2625 ... c2629, is started.

Dependency: Available with activated function: Basic positioner
See also: c2625, c2626, c2627, c2628, c2629, c2640, c2641

NOTICE
The parameter may be protected as a result of r0922 and cannot be changed.

Note
To start a traversing block, the axis must be homed (r2684.11 = 1).
The status signal r2684.12 = 0/1 signal is used for acknowledgment.
A traversing task can be influenced using the following signals:
- Intermediate stop via c2640.
- Reject traversing task via c2641.

p2632 EPOS external block change evaluation / Ext block chg eval

Data type: Integer16	**Visible in:** Extended display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Ready for operation	
Parameter group:	Traversing blocks	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
0	1	0

Description: Sets the mode to evaluate "external block change".

Value:
0: External block change via a measuring probe
1: External block change via c2633

Dependency: Available with activated function: Basic positioner
See also: p2623, c2633, r2677, r2678

Note
In the mode "external block change via measuring probe" (p2632 = 0), the following applies:
When starting a traversing block with the block change enable CONTINUE_EXTERNAL, CONTINUE_EXTERNAL_WAIT and CONTINUE_EXTERNAL_ALARM, an activated "passive homing" is interrupted.
After ending the block, "Passive homing" must be reactivated using a 0/1 edge in c2595.

c2633 EPOS external block change (0 -> 1) / Ext blk chg (0->1)

Data type: Unsigned8	**Visible in:** Extended display
Read permission:	Read drive data or acknowledge messages
Write permission:	Edit device configuration or drive applications
Parameter group:	Traversing blocks
Not relevant for motor type:	-

Dyn. index [0...n]: -		**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -
Type of signal interconnection:	Sink binary	
Factory interconnection:	Fixed value: 0	

Description: Signal for the "External block change" for a positive signal edge.

Dependency: The evaluation of the signal is only active p2632 = 1.
Available with activated function: Basic positioner
See also: p2623, p2632, c2640, c2641, r2677, r2678

NOTICE
The parameter may be protected as a result of r0922 and cannot be changed.

Note
A positive signal edge initiates a flying block change in the subsequent traversing block.
When the external block change is identified, the actual position is saved in r2678.
A traversing task can be influenced using the following signals:
- Intermediate stop via c2640.
- Reject traversing task via c2641.

p2634[0] EPOS fixed stop maximum following error / Following err max

Data type: FloatingPoint32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Operation	
Parameter group:	Traversing blocks	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: mm	**Unit group:** 10_3	**Unit selection:** p2496
Min:	**Max:**	**Factory setting:**
0.000000 [mm]	2.1474828e+09 [mm]	1.000000 [mm]

Description: Sets the following error to detect the "fixed stop reached" state (r2526.4).

Dependency: Available with activated function: Basic positioner
See also: r2526, p2621, r2675

Note
The state "fixed stop reached" is detected if the following error exceeds the theoretically calculated following error value by p2634.

p2634[0] EPOS fixed stop maximum following error / Following err max

Variant:	S210 (Basic positioner for rotary motion)	
Data type: FloatingPoint32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Operation	
Parameter group:	Traversing blocks	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: °	**Unit group:** 10_4	**Unit selection:** p2496
Min:	**Max:**	**Factory setting:**
0.000000 [°]	2.1474828e+09 [°]	36.000000 [°]

Description: Sets the following error to detect the "fixed stop reached" state (r2526.4).

Dependency: Available with activated function: Basic positioner

See also: r2526, p2621, r2675

Note

The state "fixed stop reached" is detected if the following error exceeds the theoretically calculated following error value by p2634.

p2635 EPOS fixed stop monitoring window / Fixed stop mon

Data type: FloatingPoint32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Operation	
Parameter group:	Traversing blocks	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: mm	**Unit group:** 10_3	**Unit selection:** p2496
Min:	**Max:**	**Factory setting:**
0.000000 [mm]	2.1474828e+09 [mm]	0.125000 [mm]

Description: Sets the monitoring window of the actual position after the fixed stop is reached.

Dependency: Available with activated function: Basic positioner

See also: r2526, r2683

Note

If, after the fixed stop is reached, the end stop shifts in either the positive or negative direction by more than the value set here, then r2526.5 is set to 1 and an appropriate message is output.

p2635 EPOS fixed stop monitoring window / Fixed stop mon

Variant:	S210 (Basic positioner for rotary motion)	
Data type: FloatingPoint32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Operation	
Parameter group:	Traversing blocks	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: °	**Unit group:** 10_4	**Unit selection:** p2496
Min:	**Max:**	**Factory setting:**
0.000000 [°]	2.1474828e+09 [°]	3.600000 [°]

Description: Sets the monitoring window of the actual position after the fixed stop is reached.

Dependency: Available with activated function: Basic positioner

See also: r2526, r2683

Note

If, after the fixed stop is reached, the end stop shifts in either the positive or negative direction by more than the value set here, then r2526.5 is set to 1 and an appropriate message is output.

c2640 EPOS intermediate stop (0 signal) / Intermediate stop

Data type: Unsigned8	**Visible in:** Standard display
Read permission:	Read drive data or acknowledge messages

Write permission:	Edit device configuration or drive applications	
Parameter group:	Traversing blocks, Direct setpoint input (MDI)	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -
Type of signal interconnection:	Sink binary	
Factory interconnection:	Fixed value: 0	

Description: Signal for "No intermediate stop/intermediate stop".
1 signal: No intermediate stop
0 signal: Intermediate stop.

Dependency: Available with activated function: Basic positioner
See also: c2631, c2641, c2647, c2649

> ⚠ **CAUTION**
> For c2649 = 1 signal, the following applies:
> Motion starts without any explicit control signal.

> **NOTICE**
> The parameter may be protected as a result of r0922 and cannot be changed.

Note
This signal is only effective in the modes "traversing blocks" and "direct setpoint input/MDI".
When the intermediate stop is activated, then the axis brakes with the parameterized deceleration (p2620 or c2645).

c2641 EPOS reject traversing task (0 signal) / Trav_task reject

Data type: Unsigned8	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Parameter group:	Traversing blocks, Direct setpoint input (MDI)	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -
Type of signal interconnection:	Sink binary	
Factory interconnection:	Fixed value: 0	

Description: Signal for "Do not reject traversing task/reject traversing task".
1 signal: Do not reject traversing task.
0 signal: Reject traversing task

Dependency: Available with activated function: Basic positioner
See also: c2631, c2640, c2647, c2649

> ⚠ **CAUTION**
> For c2649 = 1 signal, the following applies:
> Motion starts without any explicit control signal.

> **NOTICE**
> The parameter may be protected as a result of r0922 and cannot be changed.

Note
This signal is only effective in the modes "traversing blocks" and "direct setpoint input/MDI".
When activating reject traversing tasks, then the axis brakes with the maximum deceleration (p2573).

c2642 EPOS direct setpoint input/MDI position setpoint / MDI s_set

Data type: FloatingPoint64	**Visible in:** Standard display
Read permission:	Read drive data or acknowledge messages

Write permission: Edit device configuration or drive applications
Parameter group: Direct setpoint input (MDI)
Not relevant for motor type: -
Dyn. index [0...n]: - **Calculated:** -
Unit: mm **Unit group:** 10_3 **Unit selection:** p2496
Type of signal interconnection: Sink numeric **Scaling:** -
Factory interconnection: Fixed value: 0.00 [mm]

Description: Signal for the position setpoint in the mode "direct setpoint input/MDI".

Dependency: Available with activated function: Basic positioner
See also: c2648, c2649, c2650

NOTICE
The parameter may be protected as a result of r0922 and cannot be changed.

Note
Depending on c2649, the position setpoint is either transferred continuously or edge-triggered.
The position setpoint input is interpreted as length unit [LU].

c2642 EPOS direct setpoint input/MDI position setpoint / MDI s_set

Variant: S210 (Basic positioner for rotary motion)
Data type: FloatingPoint64 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Parameter group: Direct setpoint input (MDI)
Not relevant for motor type: -
Dyn. index [0...n]: - **Calculated:** -
Unit: ° **Unit group:** 10_4 **Unit selection:** p2496
Type of signal interconnection: Sink numeric **Scaling:** -
Factory interconnection: Fixed value: 0.00 [°]

Description: Signal for the position setpoint in the mode "direct setpoint input/MDI".

Dependency: Available with activated function: Basic positioner
See also: c2648, c2649, c2650

NOTICE
The parameter may be protected as a result of r0922 and cannot be changed.

Note
Depending on c2649, the position setpoint is either transferred continuously or edge-triggered.
The position setpoint input is interpreted as length unit [LU].

c2643 EPOS direct setpoint input/MDI velocity setpoint / MDI v_set

Data type: FloatingPoint32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Parameter group: Direct setpoint input (MDI)
Not relevant for motor type: -
Dyn. index [0...n]: - **Calculated:** -
Unit: mm/s **Unit group:** 11_3 **Unit selection:** p2497
Type of signal interconnection: Sink numeric **Scaling:** -
Factory interconnection: Fixed value: 100.00 [mm/s]

Description: Signal for the velocity setpoint in the mode "Direct setpoint input/MDI".

Dependency: Available with activated function: Basic positioner
See also: c2649, c2650

NOTICE
The parameter may be protected as a result of r0922 and cannot be changed.

Note
Depending on c2649, the velocity setpoint is either transferred continuously or edge-triggered.
The velocity setpoint input is interpreted as [1000 LU/min].

c2643 EPOS direct setpoint input/MDI velocity setpoint / MDI v_set

Variant: S210 (Basic positioner for rotary motion)
Data type: FloatingPoint32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Parameter group: Direct setpoint input (MDI)
Not relevant for motor type: -
Dyn. index [0...n]: - **Calculated:** -
Unit: °/s **Unit group:** 11_4 **Unit selection:** p2497
Type of signal interconnection: Sink numeric **Scaling:** -
Factory interconnection: Fixed value: 3600.00 [°/s]

Description: Signal for the velocity setpoint in the mode "Direct setpoint input/MDI".

Dependency: Available with activated function: Basic positioner
See also: c2649, c2650

NOTICE
The parameter may be protected as a result of r0922 and cannot be changed.

Note
Depending on c2649, the velocity setpoint is either transferred continuously or edge-triggered.
The velocity setpoint input is interpreted as [1000 LU/min].

c2644 EPOS direct setpoint input/MDI acceleration override / MDI a_over

Data type: FloatingPoint32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Parameter group: Direct setpoint input (MDI)
Not relevant for motor type: -
Dyn. index [0...n]: - **Calculated:** -
Unit: % **Unit group:** - **Unit selection:** -
Type of signal interconnection: Sink numeric **Scaling:** PERCENT
Factory interconnection: Fixed value: 100.00 [%]

Description: Signal for acceleration override in the operating mode "direct setpoint input/MDI".

Dependency: Available with activated function: Basic positioner
See also: c2649, c2650, c11560

NOTICE
The parameter may be protected as a result of r0922 and cannot be changed.

Note
Depending on c2649, the acceleration override is either transferred continuously or edge-triggered.
The signal value 4000 hex (16384 dec) corresponds to 100 %.

c2645 EPOS direct setpoint input/MDI deceleration override / MDI -a_over

Data type: FloatingPoint32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Parameter group: Traversing blocks
Not relevant for motor type: -
Dyn. index [0...n]: - **Calculated:** -
Unit: % **Unit group:** - **Unit selection:** -
Type of signal interconnection: Sink numeric **Scaling:** PERCENT
Factory interconnection: Fixed value: 100.00 [%]

Description: Signal for the deceleration override in the operating mode "Direct setpoint input/MDI".

Dependency: Available with activated function: Basic positioner
See also: c2649, c2650, c11561

NOTICE
If, when calculating the traversing profile, it is identified that the target position with the programmed deceleration override cannot be reached without reversing the direction, then when accepting the dynamic values, the larger deceleration override is accepted and becomes effective.
The parameter may be protected as a result of r0922 and cannot be changed.

Note
Depending on c2649, the deceleration override is either transferred continuously or edge-triggered.
The signal value 4000 hex (16384 dec) corresponds to 100 %.

c2646 EPOS velocity override / v_over

Data type: FloatingPoint32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Parameter group: Jog, Homing, Traversing blocks, Direct setpoint input (MDI)
Not relevant for motor type: -
Dyn. index [0...n]: - **Calculated:** -
Unit: % **Unit group:** - **Unit selection:** -
Type of signal interconnection: Sink numeric **Scaling:** PERCENT
Factory interconnection: Fixed value: 100.00 [%]

Description: Signal for the velocity override.
This velocity override is effective in the following operating modes "Direct setpoint input/MDI", "Traversing blocks", "Jogging" and "Active homing" (when approaching the reference cam).

Dependency: Available with activated function: Basic positioner
See also: p2571, p2585, p2586, p2605, p2618, c2643, r2681

NOTICE
The parameter may be protected as a result of r0922 and cannot be changed.

Note
The effective override (r2681) can differ from the specified override due to limits (e.g. maximum velocity).

c2647 EPOS direct setpoint input/MDI selection / MDI selection

Data type: Unsigned8 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Parameter group: Direct setpoint input (MDI)
Not relevant for motor type: -

Dyn. index [0...n]:	-	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -
Type of signal interconnection:	Sink binary	
Factory interconnection:	Fixed value: 0	

Description: Signal to select operating mode "Direct setpoint input/MDI".

Dependency: Available with activated function: Basic positioner

See also: c2640, c2641, c2642, c2643, c2644, c2645, c2646, c2648, c2649, c2650, c2651, c2652, c2653

Note

In this mode, using c2653, a flying changeover can be made between setting-up and positioning.

In this mode, even if the axis is not referenced (r2684.11 = 0) relative positioning is possible.

c2648 EPOS direct setpoint input/MDI positioning type / MDI pos_type

Data type: Unsigned8	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Parameter group:	Direct setpoint input (MDI)	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -
Type of signal interconnection:	Sink binary	
Factory interconnection:	Fixed value: 0	

Description: Signal for the positioning type in mode "Direct setpoint input/MDI".

1 signal: Absolute positioning is selected.

0 signal: Relative positioning is selected.

Dependency: Available with activated function: Basic positioner

See also: c2649, c2650, c2654

NOTICE
Absolute positioning: To traverse, the home position must be set (r2684.11 = 1). Relative positioning: To traverse, "Home position set" is not required.

Note

Depending on c2649, the positioning type is either transferred continuously or edge-triggered.

This parameter is only evaluated for c2654 = 0.

This parameter is possibly not evaluated as a result of the selected telegram.

c2649 EPOS direct setpoint input/MDI transfer type selection / MDI trans_type sel

Data type: Unsigned8	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Parameter group:	Direct setpoint input (MDI)	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -
Type of signal interconnection:	Sink binary	
Factory interconnection:	Fixed value: 0	

Description: Signal to define how values are transferred in operating mode "Direct setpoint input/MDI".

1 signal: Values are continually transferred (refer to parameter under dependency).

0 signal: The values are transferred for c2650 = 0/1 signal.

Dependency: Available with activated function: Basic positioner

See also: c2642, c2643, c2644, c2645, c2648, c2650, c2651, c2652

⚠ CAUTION
For a 1 signal, the following applies: Motion starts without any explicit control signal.

Note

Parameter c2649 can only be changed when r0922 = 999.

c2650 EPOS direct setpoint input/MDI setpoint acceptance edge / MDI set_accept

Data type: Unsigned8 **Visible in:** Standard display

Read permission: Read drive data or acknowledge messages

Write permission: Edit device configuration or drive applications

Parameter group: Direct setpoint input (MDI)

Not relevant for motor type: -

Dyn. index [0...n]: - **Calculated:** -

Unit: - **Unit group:** - **Unit selection:** -

Type of signal interconnection: Sink binary

Factory interconnection: Fixed value: 0

Description: Signal to accept the values for edge-triggered selection (c2649 = 0 signal) in the operating mode "Direct setpoint input/MDI".

c2650 = 0/1 signal and c2649 = 0 signal

Values are accepted, edge-triggered (refer to parameter under dependency).

Dependency: Available with activated function: Basic positioner

See also: c2640, c2641, c2642, c2643, c2644, c2645, c2648, c2649, c2651, c2652, r2684

NOTICE
The parameter may be protected as a result of r0922 and cannot be changed.

Note

The status signal r2684.12 = 0/1 signal is used for acknowledgment.

The operating mode "direct setpoint input/MDI" can be influenced via the following signals:

- Intermediate stop via c2640.
- Reject traversing task via c2641.

c2651 EPOS direct setpoint input/MDI direction selection, positive / MDI dir_sel pos

Data type: Unsigned8 **Visible in:** Standard display

Read permission: Read drive data or acknowledge messages

Write permission: Edit device configuration or drive applications

Parameter group: Direct setpoint input (MDI)

Not relevant for motor type: -

Dyn. index [0...n]: - **Calculated:** -

Unit: - **Unit group:** - **Unit selection:** -

Type of signal interconnection: Sink binary

Factory interconnection: Fixed value: 0

Description: Signal for the positive direction selection in operating mode "Direct setpoint input/MDI".

Dependency: Available with activated function: Basic positioner

See also: p2576, c2648, c2649, c2650, c2652, c2653, c2654

Note
The following applies for "setting-up":
- The traversing direction can be specified using this parameter.
- If both directions (c2651, c2652) are selected, then the axis remains stationary (zero speed).
- If both directions (c2651, c2652) are deselected, then the axis remains stationary (zero speed).
The following applies for "positioning":
Using parameters c2651 and c2652, when the modulo correction (c2577 = 1 signal) is activated and absolute positioning (c2648 = 1 signal), the travel direction is specified as follows:
c2651 / c2652
0 signal / 0 signal: Absolute positioning through the shortest distance.
1 signal / 0 signal: Absolute positioning in the positive direction.
0 signal / 1 signal: Absolute positioning in the negative direction.
1 signal / 1 signal: Absolute positioning through the shortest distance.

c2652 EPOS direct setpoint input/MDI direction selection negative / MDI dir_sel neg

Data type: Unsigned8 | **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Parameter group: Direct setpoint input (MDI)
Not relevant for motor type: -
Dyn. index [0...n]: - | **Calculated:** -
Unit: - | **Unit group:** - | **Unit selection:** -
Type of signal interconnection: Sink binary
Factory interconnection: Fixed value: 0

Description: The signal for the negative direction selection in the operating mode "Direct setpoint input/MDI".

Dependency: Available with activated function: Basic positioner
See also: p2576, c2648, c2649, c2650, c2651, c2653, c2654

Note
The following applies for "setting-up":
- The travel direction is specified using this signal.
- If both directions (c2651, c2652) are selected, then the axis remains stationary (zero speed).
- If both directions (c2651, c2652) are deselected, then the axis remains stationary (zero speed).
The following applies for "positioning":
Using c2651 and c2652, when the modulo correction (c2577 = 1 signal) is activated and absolute positioning (c2648 = 1 signal), the travel direction can be specified as follows:
c2651 / c2652
0 signal / 0 signal: Absolute positioning through the shortest distance.
1 signal / 0 signal: Absolute positioning in the positive direction.
0 signal / 1 signal: Absolute positioning in the negative direction.
1 signal / 1 signal: Absolute positioning through the shortest distance.

c2653 EPOS direct setpoint input/MDI setting-up selection / MDI setting-up sel

Data type: Unsigned8 | **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Parameter group: Direct setpoint input (MDI)
Not relevant for motor type: -
Dyn. index [0...n]: - | **Calculated:** -
Unit: - | **Unit group:** - | **Unit selection:** -
Type of signal interconnection: Sink binary
Factory interconnection: Fixed value: 0

Description: Signal for setting-up in operating mode "Direct setpoint input/MDI".
1 signal: Setting-up selected.
0 signal: Positioning selected.

Dependency: Available with activated function: Basic positioner
See also: c2651, c2652

Note
In the operating mode "direct setpoint input/MDI", it is possible to make a flying changeover between setting-up and positioning.
For "setting up" (c2653 = 1 signal), the following applies:
A traversing direction must be selected using parameters c2651 and c2652.

c2654 EPOS direct setpoint input/MDI mode adaptation / MDI mode adapt

Data type: Unsigned16	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Parameter group:	Direct setpoint input (MDI)	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -
Type of signal interconnection:	Sink numeric	**Scaling:** -
Factory interconnection:	Fixed value: 0	

Description: Signal of the MDI mode via PROFIdrive telegram 110 in operating mode "direct setpoint input/MDI".
c2654 = 0: Signals are evaluated.
c2654 > 0: Signals are not evaluated.
The evaluation involves the following signals:
- c2648 (positioning type)
- c2651 (positive direction selection)
- c2652 (negative direction selection)
In this case, the following definitions apply:
Signal via c2654 = xx0x hex -> absolute
Signal via c2654 = xx1x hex -> relative
Signal via c2654 = xx2x hex -> abs_pos (only for modulo correction)
Signal via c2654 = xx3x hex -> abs_neg (only for modulo correction)

Dependency: Available with activated function: Basic positioner
See also: c2648, c2651, c2652

c2655[0...1] EPOS select tracking mode / Sel tracking mode

Data type: Unsigned8	**Visible in:** Extended display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Parameter group:	Basic positioner	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -
Type of signal interconnection:	Sink binary	
Factory interconnection:	[0] Fixed value: 1 [1] Parameter: 2526.7	

Description: Signal to select tracking operation.
c2655[0] or c2655[1] = 1 signal
Tracking mode after withdrawing the enable signal.
c2655[0] and c2655[1] = 0 signal
No tracking mode after withdrawing the enable signal.

Dependency: Available with activated function: Basic positioner

NOTICE
The parameter may be protected as a result of r0922 and cannot be changed.

Note
For the following events, independent of the signal that is present, the tracking mode is selected:
- After running up.
- After r2526.0 = 0/1 edge.
- While a fault is active.

r2665 EPOS position setpoint / s_set

Data type: FloatingPoint64	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Parameter group:	Jog, Homing, Traversing blocks, Direct setpoint input (MDI)	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: mm	**Unit group:** 10_3	**Unit selection:** p2496
Type of signal interconnection:	Source numeric	**Scaling:** -

Description: Displays the actual absolute position setpoint.

Dependency: Available with activated function: Basic positioner
See also: c2530

Note
As default, c2530 is interconnected with r2665.

r2665 EPOS position setpoint / s_set

Variant:	S210 (Basic positioner for rotary motion)	
Data type: FloatingPoint64	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Parameter group:	Jog, Homing, Traversing blocks, Direct setpoint input (MDI)	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: °	**Unit group:** 10_4	**Unit selection:** p2496
Type of signal interconnection:	Source numeric	**Scaling:** -

Description: Displays the actual absolute position setpoint.

Dependency: Available with activated function: Basic positioner
See also: c2530

Note
As default, c2530 is interconnected with r2665.

r2666 EPOS velocity setpoint / v_set

Data type: FloatingPoint32	**Visible in:** Standard display
Read permission:	Read drive data or acknowledge messages
Parameter group:	Jog, Homing, Traversing blocks, Direct setpoint input (MDI)
Not relevant for motor type:	-

Dyn. index [0...n]:	-	**Calculated:** -	
Unit: mm/s	**Unit group:** 11_3	**Unit selection:** p2497	
Type of signal interconnection:	Source numeric	**Scaling:** -	

Description: Displays the actual velocity setpoint.

Dependency: Available with activated function: Basic positioner

See also: c2531

Note

As default, c2531 is interconnected with r2666.

r2666 EPOS velocity setpoint / v_set

Variant:	S210 (Basic positioner for rotary motion)	
Data type: FloatingPoint32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Parameter group:	Jog, Homing, Traversing blocks, Direct setpoint input (MDI)	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: °/s	**Unit group:** 11_4	**Unit selection:** p2497
Type of signal interconnection:	Source numeric	**Scaling:** -

Description: Displays the actual velocity setpoint.

Dependency: Available with activated function: Basic positioner

See also: c2531

Note

As default, c2531 is interconnected with r2666.

r2669.0...5 EPOS actual operating mode / Op mode act

Data type: Unsigned32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Parameter group:	Jog, Homing, Traversing blocks, Direct setpoint input (MDI)	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -
Type of signal interconnection:	Source binary/numeric	**Scaling:** -

Description: Displays the actual active operating mode.

Bit array:

Bit	Signal name	1 signal	0 signal
00	Jog operating mode	Active	Not active
01	Operating mode active homing	Active	Not active
02	Operating mode traversing blocks	Active	Not active
03	Operating mode positioning for direct setpoint input / MDI	Active	Not active
04	Operating mode setting up for direct setpoint input / MDI	Active	Not active
05	Option passive homing	Active	Not active

Dependency: Available with activated function: Basic positioner

See also: c2589, c2590, c2595, c2631, c2647, c2653

r2670.0...15 EPOS status word active traversing block / ZSW act trav_blk

Data type: Unsigned32	**Visible in:** Standard display
Read permission:	Read drive data or acknowledge messages
Parameter group:	Traversing blocks
Not relevant for motor type:	-

Dyn. index [0...n]: -		**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -
Type of signal interconnection:	Source binary/numeric	**Scaling:** -

Description: Displays the status word for the active traversing block.

r2670.0: Active traversing block, bit 0

...

r2670.5: Active traversing block, bit 5

r2670.15: MDI active

Bit array:

Bit	Signal name	1 signal	0 signal
00	Active traversing block bit 0	Active	Not active
01	Active traversing block bit 1	Active	Not active
02	Active traversing block bit 2	Active	Not active
03	Active traversing block bit 3	Active	Not active
04	Active traversing block bit 4	Active	Not active
05	Active traversing block bit 5	Active	Not active
15	MDI active	Active	Not active

Dependency: Available with activated function: Basic positioner

See also: c2631, c2647

Note

For bit 00 ... 05:

Displays the active traversing block in the traversing blocks operating mode.

For bit 15:

For a 1 signal, the operating mode - direct setpoint input/MDI - is active

r2671 EPOS actual position setpoint / s_set act

Data type: FloatingPoint64	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Parameter group:	Jog, Traversing blocks, Direct setpoint input (MDI)	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: mm	**Unit group:** 10_3	**Unit selection:** p2496
Type of signal interconnection:	Source numeric	**Scaling:** -

Description: Displays the position setpoint presently being processed.

Dependency: Available with activated function: Basic positioner

Note

A position of 0 is displayed for non position-related tasks (e.g. ENDLESS_POS, ENDLESS_NEG).

r2671 EPOS actual position setpoint / s_set act

Variant:	S210 (Basic positioner for rotary motion)	
Data type: FloatingPoint64	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Parameter group:	Jog, Traversing blocks, Direct setpoint input (MDI)	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: °	**Unit group:** 10_4	**Unit selection:** p2496
Type of signal interconnection:	Source numeric	**Scaling:** -

Description: Displays the position setpoint presently being processed.

Dependency: Available with activated function: Basic positioner

Note
A position of 0 is displayed for non position-related tasks (e.g. ENDLESS_POS, ENDLESS_NEG).

r2672 EPOS actual velocity setpoint / v_set act

Data type: FloatingPoint32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Parameter group: Jog, Homing, Traversing blocks, Direct setpoint input (MDI)
Not relevant for motor type: -
Dyn. index [0...n]: - **Calculated:** -
Unit: mm/s **Unit group:** 11_3 **Unit selection:** p2497
Type of signal interconnection: Source numeric **Scaling:** -

Description: Displays the velocity setpoint presently being processed.
Dependency: Available with activated function: Basic positioner

r2672 EPOS actual velocity setpoint / v_set act

Variant: S210 (Basic positioner for rotary motion)
Data type: FloatingPoint32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Parameter group: Jog, Homing, Traversing blocks, Direct setpoint input (MDI)
Not relevant for motor type: -
Dyn. index [0...n]: - **Calculated:** -
Unit: °/s **Unit group:** 11_4 **Unit selection:** p2497
Type of signal interconnection: Source numeric **Scaling:** -

Description: Displays the velocity setpoint presently being processed.
Dependency: Available with activated function: Basic positioner

r2673 EPOS actual acceleration override / a_over act

Data type: FloatingPoint32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Parameter group: Jog, Traversing blocks, Direct setpoint input (MDI)
Not relevant for motor type: -
Dyn. index [0...n]: - **Calculated:** -
Unit: % **Unit group:** - **Unit selection:** -
Type of signal interconnection: Source numeric **Scaling:** -

Description: Displays the acceleration override presently being processed.
Dependency: Available with activated function: Basic positioner

Note
An override of 100% is effective in the "Jogging" and "Active homing" operating modes.

r2674 EPOS actual deceleration override / -a_over act

Data type: FloatingPoint32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Parameter group: Jog, Traversing blocks, Direct setpoint input (MDI)
Not relevant for motor type: -
Dyn. index [0...n]: - **Calculated:** -
Unit: % **Unit group:** - **Unit selection:** -
Type of signal interconnection: Source numeric **Scaling:** -

Description: Displays the deceleration override presently being processed.

Dependency: Available with activated function: Basic positioner

Note
An override of 100% is effective in the "Jogging" and "Active homing" operating modes.

r2675 EPOS actual task / Task act

Data type: Integer16	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Parameter group:	Traversing blocks	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -
Type of signal interconnection:	Source numeric	**Scaling:** -

Description: Display for the task presently being processed.

Value:
0: Inactive
1: POSITIONING
2: FIXED STOP
3: ENDLESS_POS
4: ENDLESS_NEG
5: WAITING
6: GOTO
7: SET_O
8: RESET_O
9: JERK

Dependency: Available with activated function: Basic positioner
See also: p2621

r2676 EPOS actual task parameter / Task par act

Data type: Integer32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Parameter group:	Traversing blocks	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -
Type of signal interconnection:	Source numeric	**Scaling:** -

Description: Displays the task parameter presently being processed in the "traversing blocks" operating mode.

Dependency: Available with activated function: Basic positioner
See also: p2622

Note
The following is displayed depending on the task:
FIXED STOP: Clamping torque (0 ... 65536 [0.01 Nm]) or clamping force (0 ... 65536 [N])
WAIT: Wait time [ms]
GOTO: Block number
SET_O: 1, 2, 3 --> direct output 1, 2 or 3 (both) is set
RESET_O: 1, 2, 3 --> direct output 1, 2 or 3 (both) is reset
JERK: 0 --> deactivate, 1 --> activate

r2677 EPOS actual task mode / Task mode act

Data type: Unsigned16	**Visible in:** Standard display
Read permission:	Read drive data or acknowledge messages

Parameter group:	Traversing blocks	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -
Type of signal interconnection:	Source numeric	**Scaling:** -

Description: Displays the task mode presently being processed.

Dependency: Available with activated function: Basic positioner

See also: p2623

r2678 EPOS external block change actual position / Ext blk chg s_act

Data type: FloatingPoint64	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Parameter group:	Traversing blocks, Direct setpoint input (MDI)	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: mm	**Unit group:** 10_3	**Unit selection:** p2496
Type of signal interconnection:	Source numeric	**Scaling:** -

Description: Displays the actual position for the following events:
- External block change via measuring probe (p2632 = 0).
- External block change via c2633 (p2632 = 1, c2633 = 0/1 signal).
- Activate traversing task (c2631 = 0/1 signal).

Dependency: Available with activated function: Basic positioner

See also: c2631, p2632, c2633

r2678 EPOS external block change actual position / Ext blk chg s_act

Variant:	S210 (Basic positioner for rotary motion)	
Data type: FloatingPoint64	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Parameter group:	Traversing blocks, Direct setpoint input (MDI)	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: °	**Unit group:** 10_4	**Unit selection:** p2496
Type of signal interconnection:	Source numeric	**Scaling:** -

Description: Displays the actual position for the following events:
- External block change via measuring probe (p2632 = 0).
- External block change via c2633 (p2632 = 1, c2633 = 0/1 signal).
- Activate traversing task (c2631 = 0/1 signal).

Dependency: Available with activated function: Basic positioner

See also: c2631, p2632, c2633

r2680 EPOS clearance reference cam and zero mark / Clear ref_cams/ZM

Data type: FloatingPoint32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Parameter group:	Homing	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: mm	**Unit group:** 10_3	**Unit selection:** p2496
Type of signal interconnection:	Source numeric	**Scaling:** -

Description: Display for the distance (clearance) between the reference cam and zero mark.
The value is determined for active homing.

Dependency: Available with activated function: Basic positioner

r2680 EPOS clearance reference cam and zero mark / Clear ref_cams/ZM

Variant:	S210 (Basic positioner for rotary motion)	
Data type: FloatingPoint32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Parameter group:	Homing	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: °	**Unit group:** 10_4	**Unit selection:** p2496
Type of signal interconnection:	Source numeric	**Scaling:** -

Description: Display for the distance (clearance) between the reference cam and zero mark.
The value is determined for active homing.

Dependency: Available with activated function: Basic positioner

r2681 EPOS velocity override effective / v_over effective

Data type: FloatingPoint32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Parameter group:	Jog, Homing, Traversing blocks, Direct setpoint input (MDI)	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: %	**Unit group:** -	**Unit selection:** -
Type of signal interconnection:	Source numeric	**Scaling:** -

Description: Displays the actual effective velocity override.

Dependency: Available with activated function: Basic positioner
See also: p2571, c2646

Note
The effective override can differ from the specified override due to limits (e.g. p2571, maximum velocity).

r2682 EPOS residual distance to go / Residual distance

Data type: FloatingPoint64	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Parameter group:	Jog, Traversing blocks, Direct setpoint input (MDI)	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: mm	**Unit group:** 10_3	**Unit selection:** p2496
Type of signal interconnection:	Source numeric	**Scaling:** -

Description: Displays the current residual distance.
The remaining distance is the distance to still to be moved through up to the end of the actual positioning task.

Dependency: Available with activated function: Basic positioner
See also: r2665, r2671, r2678

r2682 EPOS residual distance to go / Residual distance

Variant:	S210 (Basic positioner for rotary motion)	
Data type: FloatingPoint64	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	

Parameter group:	Jog, Traversing blocks, Direct setpoint input (MDI)	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: °	**Unit group:** 10_4	**Unit selection:** p2496
Type of signal interconnection:	Source numeric	**Scaling:** -

Description: Displays the current residual distance.

The remaining distance is the distance to still to be moved through up to the end of the actual positioning task.

Dependency: Available with activated function: Basic positioner

See also: r2665, r2671, r2678

r2683.0...14 EPOS status word 1 / POS_ZSW1

Data type: Unsigned16	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Parameter group:	Control/status words, Jog, Homing, Traversing blocks, Direct setpoint input (MDI), Position monitoring	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -
Type of signal interconnection:	Source binary/numeric	**Scaling:** -

Description: Display for status word 1 of the basic positioner (EPOS).

Bit array:

Bit	Signal name	1 signal	0 signal
00	Tracking mode active	Yes	No
01	Velocity limiting active	Yes	No
02	Setpoint fixed	Yes	No
03	Set position reached	Yes	No
04	Axis moves forward	Yes	No
05	Axis moves backward	Yes	No
06	Negative software limit switch reached	Yes	No
07	Positive software limit switch reached	Yes	No
08	Position actual value <= cam switching position 1	Yes	No
09	Position actual value <= cam switching position 2	Yes	No
10	Direct output 1 via traversing block	Yes	No
11	Direct output 2 via traversing block	Yes	No
12	Fixed stop reached	Yes	No
13	Fixed stop clamping torque reached	Yes	No
14	Travel to fixed stop active	Yes	No

Dependency: Available with activated function: Position control

See also: r2684

Note

For bit 02, 04, 05, 06, 07:

This signals designate the state after jerk limiting.

For bits 08, 09:

These signals are generated in function "Closed-loop position control".

r2684.0...15 EPOS status word 2 / POS_ZSW2

Data type: Unsigned16	**Visible in:** Standard display
Read permission:	Read drive data or acknowledge messages
Parameter group:	Position limits, Dynamic response limits, Control/status words, Jog, Homing, Traversing blocks, Direct setpoint input (MDI), Basic parameters / mechanical system, Position monitoring

Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -
Type of signal interconnection:	Source binary/numeric	**Scaling:** -

Description: Display for status word 2 of the basic positioner (EPOS).

Bit array:

Bit	Signal name	1 signal	0 signal
00	Active homing active	Active	Not active
01	Passive homing active	Active	Not active
02	Homing active	Active	Not active
03	Printing mark outside outer window	Yes	No
04	Axis accelerating	Yes	No
05	Axis decelerating	Yes	No
06	Jerk limiting active	Yes	No
07	Activate correction	Yes	No
08	Following error in tolerance	Yes	No
09	Modulo correction active	Yes	No
10	Target position reached	Yes	No
11	Home position set	Yes	No
12	Acknowledgment traversing block activated	Yes	No
13	Negative hardware limit switch reached	Yes	No
14	Positive hardware limit switch reached	Yes	No
15	Traversing command active	Yes	No

Dependency: Available with activated function: Position control

Note
For bit 02:
The "homing active" signal is an OR logic operation of "active homing active" and "passive homing active"
For bit 00 ... 07 and 11 ... 14:
For bit 08:
The signal is generated in function "Closed-loop position control".

r2685 EPOS corrective value / Correction value

Data type: FloatingPoint64	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Parameter group:	Basic positioner	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: mm	**Unit group:** 10_3	**Unit selection:** p2496
Type of signal interconnection:	Source numeric	**Scaling:** -

Description: Display for the correction value of the position actual value.

Dependency: Available with activated function: Basic positioner
See also: r2684

Note
Using this value, for example, modulo corrections are carried out.

r2685 EPOS corrective value / Correction value

Variant:	S210 (Basic positioner for rotary motion)
Data type: FloatingPoint64	**Visible in:** Standard display
Read permission:	Read drive data or acknowledge messages
Parameter group:	Basic positioner

Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: °	**Unit group:** 10_4	**Unit selection:** p2496
Type of signal interconnection:	Source numeric	**Scaling:** -

Description: Display for the correction value of the position actual value.

Dependency: Available with activated function: Basic positioner

See also: r2684

Note

Using this value, for example, modulo corrections are carried out.

r2686[0...1] EPOS torque limiting effective / M_limit eff

Data type: FloatingPoint32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Parameter group:	Basic positioner	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: %	**Unit group:** -	**Unit selection:** -
Type of signal interconnection:	Source numeric	**Scaling:** -

Description: Displays the active torque limit.

r2686[0]:

Displays the active upper torque limiting when traveling to fixed stop.

r2686[1]:

Displays the active lower torque limiting when traveling to fixed stop.

Index: [0] = Upper

[1] = Lower

Dependency: Available with activated function: Basic positioner

See also: p1520, p1521, r2676

r2687 EPOS torque setpoint / M_set

Data type: FloatingPoint32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Parameter group:	Traversing blocks	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: Nm	**Unit group:** -	**Unit selection:** -
Type of signal interconnection:	Source numeric	**Scaling:** -

Description: Displays the active torque setpoint when reaching the fixed stop.

Dependency: Available with activated function: Basic positioner

See also: p1520, p1521, r2676

p2688 EPOS position feedback signal tolerance window / Pos_FS tol

Data type: FloatingPoint32	**Visible in:** Extended display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Operation	
Parameter group:	Basic positioner	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -

Unit: mm	**Unit group:** 10_3	**Unit selection:** p2496
Min:	**Max:**	**Factory setting:**
0.000000 [mm]	2.1474828e+09 [mm]	0.050000 [mm]

Description: Sets the tolerance window for the position feedback signal.

If, for a positioning operation, the actual position (r2521) lies within this tolerance window of the target position, then the traversing block number is displayed in r2689.

Dependency: This parameter is only active when the "Position feedback signal" function is activated (p2584.0 = 1).

Available with activated function: Basic positioner

See also: p2584, r2689

p2688 EPOS position feedback signal tolerance window / Pos_FS tol

Variant:	S210 (Basic positioner for rotary motion)	
Data type: FloatingPoint32	**Visible in:** Extended display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Operation	
Parameter group:	Basic positioner	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: °	**Unit group:** 10_4	**Unit selection:** p2496
Min:	**Max:**	**Factory setting:**
0.000000 [°]	2.1474828e+09 [°]	1.500000 [°]

Description: Sets the tolerance window for the position feedback signal.

If, for a positioning operation, the actual position (r2521) lies within this tolerance window of the target position, then the traversing block number is displayed in r2689.

Dependency: This parameter is only active when the "Position feedback signal" function is activated (p2584.0 = 1).

Available with activated function: Basic positioner

See also: p2584, r2689

r2689[0...1] EPOS position feedback signal display / Pos_FS display

Data type: Unsigned32	**Visible in:** Extended display	
Read permission:	Read drive data or acknowledge messages	
Parameter group:	Basic positioner	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -
Type of signal interconnection:	Source numeric	**Scaling:** -

Description: Displays the traversing block numbers for position feedback signal.

Here, the block numbers of the traversing blocks are displayed bit-coded whose absolute target positions lie within the tolerance window around the actual position.

Index: [0] = Position feedback signal low

[1] = Position feedback signal high

Dependency: This parameter is only active when the "Position feedback signal" function is activated (p2584.0 = 1).

Available with activated function: Basic positioner

See also: p2584, p2688

Note
r2689[0]:
Bit-coded display of traversing block numbers 0 to 31
r2689[1]:
Bit-coded display of traversing block numbers 32 to 63

p2720[0].0...2 Load gear configuration / Load gear config

Data type: Unsigned32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Commissioning	
Parameter group:	Encoder evaluation, Basic parameters / mechanical system	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
-	-	0000 bin

Description: Sets the configuration for position tracking for a load gear.

Bit array:

Bit	Signal name	1 signal	0 signal
00	Load gear activate position tracking	Yes	No
02	Load gear reset position	Yes	No

Dependency: Available with activated function: Position control

Note
For the following events, the non-volatile, saved position values are automatically reset:
- When an encoder replacement has been identified.
- When changing the configuration of the Encoder Data Set (EDS).
- When adjusting the absolute encoder again.

p2721[0] Load gear rotary absolute encoder revolutions virtual / Abs rot rev

Data type: Unsigned32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Commissioning	
Parameter group:	Encoder evaluation, Basic parameters / mechanical system	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
0	4194303	0

Description: Sets the number of rotations that can be resolved for a rotary absolute encoder with activated position tracking of the load gear.

Dependency: This parameter is only of significance for an absolute encoder (p0404.1 = 1) with activated position tracking of the load gear (p2720.0 = 1).
Available with activated function: Position control

Note
The resolution that is set must be able to be represented using r2723.
For rotary axes/modulo axes, the following applies:
This parameter is preset with p0421 when activating position tracking and can be changed.
For linear axes, the following applies:
This parameter is pre-assigned with p0421 when activating position tracking, expanded by 6 bits for multiturn information (maximum number of overflows) and cannot be changed.

p2722[0] Load gear position tracking tolerance window / Pos track tol

Data type: FloatingPoint32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Commissioning
Parameter group: Encoder evaluation, Basic parameters / mechanical system
Not relevant for motor type: -

Dyn. index [0...n]:	-	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
0.00	4.2949673e+09	0.00

Description: Sets a tolerance window for position tracking.
After the system is switched on, the difference between the saved position and the actual position is determined.
The following response is initiated:
- Difference within the tolerance window: The position is reproduced based on the encoder actual value.
- Difference outside the tolerance window: An appropriate message is output.

Dependency: Available with activated function: Position control

CAUTION
Rotation, for example through a complete encoder range is not detected.

Note
The value is entered in complete encoder pulses.
For p2720.0 = 1, the value is automatically pre-assigned one quarter of the encoder range.
Example:
Quarter of the encoder range = (p0408 * p0421) / 4
It is possible that the tolerance window may not be able to be precisely set due to the data type (floating point number with 23 bit mantissa).

r2723[0] Load gear absolute value / Load gear AbsV

Data type: Unsigned32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Parameter group: Encoder evaluation, Basic parameters / mechanical system
Not relevant for motor type: -

Dyn. index [0...n]:	-	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -
Type of signal interconnection:	Source numeric	**Scaling:** -

Description: Displays the absolute value after the load gear.

Dependency: Available with activated function: Position control

NOTICE
The encoder position actual value must be requested using the encoder control word Gn_STW.13.

Note
The increments are displayed in the format the same as Gx_IST2.

r2724[0] Load gear position difference / Load gear pos diff

Data type: Integer32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Parameter group:	Encoder evaluation, Basic parameters / mechanical system	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -
Type of signal interconnection:	Source numeric	**Scaling:** -

Description: Displays the position difference before the load gear between switching off and switching on.

Dependency: Available with activated function: Position control

Note
The increments are displayed in the format the same as Gx_IST2/r2723.
If the measuring gearbox of the motor encoder is not activated, the position difference should be read in encoder increments.
If the measuring gear of the motor encoder is activated, the position difference is converted using the measuring gear ratio.

r2741 LR acceleration precontrol value / Accel_prectrl_val

Data type: FloatingPoint32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Parameter group:	Position controller	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: rev/s²	**Unit group:** 39_1	**Unit selection:** p0505
Type of signal interconnection:	Source numeric	**Scaling:** p2007

Description: Displays the acceleration precontrol value.

Dependency: Available with activated function: Position control

Note
The acceleration precontrol value is a derivation of the speed precontrol value with respect to time.

p3117 Change safety message type / Chg SI msg type

Data type: Unsigned32	**Visible in:** Extended display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Commissioning (Safety Integrated)	
Parameter group:	Safety Integrated, Faults / alarms	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
0	1	0

Description: Sets the re-parameterization of all safety messages for faults and alarms.
The relevant message type during changeover is selected by the firmware.
0: Safety messages are not reparameterized (safety message buffer)
1: Safety messages are reparameterized (no safety message buffer)

Note
When online safety commissioning has been completed, a change results in an automatic restart.

r3122[0...63].0...20 Diagnostic attribute fault / Diag_attr fault

Data type: Unsigned32 | **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Parameter group: Faults / alarms
Not relevant for motor type: -
Dyn. index [0...n]: - | **Calculated:** -
Unit: - | **Unit group:** - | **Unit selection:** -

Description: Displays the diagnostic attribute of the fault which has occurred.

Bit array:

Bit	Signal name	1 signal	0 signal
00	Hardware replacement recommended	Yes	No
15	Message has gone	Yes	No
16	PROFIdrive fault class bit 0	High	Low
17	PROFIdrive fault class bit 1	High	Low
18	PROFIdrive fault class bit 2	High	Low
19	PROFIdrive fault class bit 3	High	Low
20	PROFIdrive fault class bit 4	High	Low

Dependency: See also: r0945, r0947, r0948, r0949, r2109, r2130, r2133, r2136

Note
The buffer parameters are cyclically updated in the background (refer to status signal in r2139).
The structure of the fault buffer and the assignment of the indices is shown in r0945.
Bit 20, 19, 18, 17, 16 =
0, 0, 0, 0, 0 --> PROFIdrive message class 0: Not assigned
0, 0, 0, 0, 1 --> PROFIdrive message class 1: Hardware/software fault
0, 0, 0, 1, 0 --> PROFIdrive message class 2: Line fault
0, 0, 0, 1, 1 --> PROFIdrive message class 3: Supply voltage fault
0, 0, 1, 0, 0 --> PROFIdrive message class 4: DC link fault
0, 0, 1, 0, 1 --> PROFIdrive message class 5: Power electronics fault
0, 0, 1, 1, 0 --> PROFIdrive message class 6: Overtemperature, electronics component
0, 0, 1, 1, 1 --> PROFIdrive message class 7: Ground fault/interphase fault detected
0, 1, 0, 0, 0 --> PROFIdrive message class 8: Motor overload
0, 1, 0, 0, 1 --> PROFIdrive message class 9: Communications error to higher-level control
0, 1, 0, 1, 0 --> PROFIdrive message class 10: Safe monitoring channel has identified an error
0, 1, 0, 1, 1 --> PROFIdrive message class 11: Incorrect position actual value/speed actual value or not available
0, 1, 1, 0, 0 --> PROFIdrive message class 12: Internal communications error
0, 1, 1, 0, 1 --> PROFIdrive message class 13: Infeed faulted
0, 1, 1, 1, 0 --> PROFIdrive message class 14: Braking controller / Braking Module faulted
0, 1, 1, 1, 1 --> PROFIdrive message class 15: Line filter faulted
1, 0, 0, 0, 0 --> PROFIdrive message class 16: External measured value/signal state outside the permissible range
1, 0, 0, 0, 1 --> PROFIdrive message class 17: Application/technological function fault
1, 0, 0, 1, 0 --> PROFIdrive message class 18: Error in the parameterization/configuration/commissioning sequence
1, 0, 0, 1, 1 --> PROFIdrive message class 19: General drive fault
1, 0, 1, 0, 0 --> PROFIdrive message class 20: Auxiliary unit faulted

r3123[0...63].0...20 Diagnostic attribute alarm / Diag_attr alarm

Data type: Unsigned32 | **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Parameter group: Faults / alarms
Not relevant for motor type: -

Dyn. index [0...n]: -		**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -

Description: Displays the diagnostic attribute of the alarm which has occurred.

Bit array:

Bit	Signal name	1 signal	0 signal
00	Hardware replacement recommended	Yes	No
11	Alarm class bit 0	High	Low
12	Alarm class bit 1	High	Low
13	Maintenance required	Yes	No
14	Maintenance urgently required	Yes	No
15	Message has gone	Yes	No
16	PROFIdrive fault class bit 0	High	Low
17	PROFIdrive fault class bit 1	High	Low
18	PROFIdrive fault class bit 2	High	Low
19	PROFIdrive fault class bit 3	High	Low
20	PROFIdrive fault class bit 4	High	Low

Dependency: See also: r2122, r2123, r2124, r2125, r2134, r2145, r2146

Note

The buffer parameters are cyclically updated in the background (refer to status signal in r2139).
The structure of the alarm buffer and the assignment of the indices is shown in r2122.
For bit 12, 11:
These status bits are used for the classification of internal alarm classes and are intended for diagnostic purposes only on certain automation systems with integrated SINAMICS functionality.
Bit 20, 19, 18, 17, 16 =
0, 0, 0, 0, 0 --> PROFIdrive message class 0: Not assigned
0, 0, 0, 0, 1 --> PROFIdrive message class 1: Hardware/software fault
0, 0, 0, 1, 0 --> PROFIdrive message class 2: Line fault
0, 0, 0, 1, 1 --> PROFIdrive message class 3: Supply voltage fault
0, 0, 1, 0, 0 --> PROFIdrive message class 4: DC link fault
0, 0, 1, 0, 1 --> PROFIdrive message class 5: Power electronics fault
0, 0, 1, 1, 0 --> PROFIdrive message class 6: Overtemperature, electronics component
0, 0, 1, 1, 1 --> PROFIdrive message class 7: Ground fault/interphase fault detected
0, 1, 0, 0, 0 --> PROFIdrive message class 8: Motor overload
0, 1, 0, 0, 1 --> PROFIdrive message class 9: Communications error to higher-level control
0, 1, 0, 1, 0 --> PROFIdrive message class 10: Safe monitoring channel has identified an error
0, 1, 0, 1, 1 --> PROFIdrive message class 11: Incorrect position actual value/speed actual value or not available
0, 1, 1, 0, 0 --> PROFIdrive message class 12: Internal communications error
0, 1, 1, 0, 1 --> PROFIdrive message class 13: Infeed faulted
0, 1, 1, 1, 0 --> PROFIdrive message class 14: Braking controller / Braking Module faulted
0, 1, 1, 1, 1 --> PROFIdrive message class 15: Line filter faulted
1, 0, 0, 0, 0 --> PROFIdrive message class 16: External measured value/signal state outside the permissible range
1, 0, 0, 0, 1 --> PROFIdrive message class 17: Application/technological function fault
1, 0, 0, 1, 0 --> PROFIdrive message class 18: Error in the parameterization/configuration/commissioning sequence
1, 0, 0, 1, 1 --> PROFIdrive message class 19: General drive fault
1, 0, 1, 0, 0 --> PROFIdrive message class 20: Auxiliary unit faulted

p3941[0] Motor code number 2 / Motor code No. 2

Data type: Unsigned32	**Visible in:** Standard display
Read permission:	Read drive data or acknowledge messages
Write permission:	Edit device configuration or drive applications
Can be changed in the operating state:	Commissioning
Parameter group:	Motor data, Quick commissioning

Not relevant for motor type:	Separately excited synchronous motor, Synchronous or reluctance motor with starting cage	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
0	99999999	0

Description: Sets the second motor code number.

Dependency: See also: p0301

r3988 Final boot state / Boot_state

Data type: Integer16	**Visible in:** Extended display	
Read permission:	Read drive data or acknowledge messages	
Parameter group:	System identification	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -

Description: Displays the final boot states.

001 - Software error

200 - Carry out first commissioning

250 - Topology error (check the connected hardware)

800 - Ready

The following options are available to reach the "Ready" state:

- Check the project and load again.
- Restore factory setting.
- Check the hardware.
- Carry out a POWER ON (switch-off/switch-on).

p5271[0].0...7 One Button Tuning configuration 1 / OBT config 1

Data type: Unsigned16	**Visible in:** Extended display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Ready for operation	
Parameter group:		
Not relevant for motor type:	Synchronous or reluctance motor with starting cage	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
-	-	0001 1100 bin

Description: Sets the configuration for One Button Tuning.

Bit array:

Bit	Signal name	1 signal	0 signal
00	PD controller for large load moments of inertia	Yes	No
01	Reduce gain at low speeds	Yes	No
02	Load adaptation Kp	Yes	No
03	Setting the speed precontrol	Yes	No
04	Setting the torque precontrol	Yes	No
05	Setting the maximum acceleration for the basic positioner	Yes	No
06	Do not change Kp	Yes	No
07	Setting the voltage precontrol	Yes	No

Dependency: See also: r5274, p5275

Note
For bit 00:
For significant differences between the motor moment of inertia and load moment of inertia - or for a low controller dynamic response - the P controller in the position control loop is transformed into a PD controller. As a consequence, the dynamic performance of the position controller is increased.
This function should only be set when the speed precontrol (bit 3 = 1) or the torque precontrol (bit 4 = 1) is active.
For bit 01:
At low speeds, the controller gain factors are automatically reduced in order to avoid noise and oscillation at standstill.
For bit 02:
The estimated load moment of inertia is taken into account for the speed controller gain.
For bit 03:
Activates the speed precontrol for the basic positioner (EPOS).
For bit 04:
Activation of the torque precontrol for the basic positioner (EPOS); if this is not active, then the internal drive speed/torque precontrol is parameterized.
For bit 05:
The maximum acceleration (p2572) and maximum deceleration (p2573) for the basic positioner (EPOS) are determined using the estimated moment of inertia. This is only realized once by setting the bit.
Prerequisite:
The drive pulses are inhibited and the moment of inertia was previously determined.
For bit 06:
The speed controller gain set in p1460 is not changed when calculating the controller data.
For bit 07:
Activation of the voltage precontrol.

r5274 One Button Tuning dynamic response estimated / OBT dyn estimate

Data type: FloatingPoint32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Parameter group:		
Not relevant for motor type:	Synchronous or reluctance motor with starting cage	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: ms	**Unit group:** -	**Unit selection:** -
Type of signal interconnection:	Source numeric	**Scaling:** -

Description: Displays the estimated dynamic response of the speed control loop as PT1 time constant for One Button Tuning.
The lower the time constant, the higher the dynamic performance.

Dependency: See also: p5271, p5275

p5275[0] Real Time / One Button Tuning dynamic response time constant / RTT dyn T

Data type: FloatingPoint32	**Visible in:** Extended display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Operation	
Parameter group:		
Not relevant for motor type:	Synchronous or reluctance motor with starting cage	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: ms	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
0.0 [ms]	60.0 [ms]	7.5 [ms]

Description: Sets the time constant for the precontrol symmetrization for Real Time Tuning / One Button Tuning.

As a consequence, the drive is allocated a defined, dynamic response via its precontrol.

Examples:

0 ms = travel without following error (Kv factor is infinity)

5 ms = settling behavior as for PT1 with 5 ms (Kv factor = 12 [1000/min])

Dependency: See also: p5271, r5274

Note

This time constant is only effective if p5302.7 is set = 1.

Otherwise, the precontrol symmetrization is adapted to the estimated dynamic response, therefore setting positioning without any overshoot.

For axes, which must interpolate with one another, the same value must be entered.

r5276[0] One Button Tuning Kv factor estimated / OBT Kv estimated

Data type: FloatingPoint32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Parameter group:		
Not relevant for motor type:	Synchronous or reluctance motor with starting cage	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: 1000 rpm	**Unit group:** -	**Unit selection:** -

Description: Displays the estimated position controller gain (Kv factor) for One Button Tuning.

Dependency: See also: p5271, p5275

Note

The value for the closed-loop position control is required by a higher-level control system.

r5277[0] One Button Tuning precontrol symmetrizing time estimated / OBT prectrl est

Data type: FloatingPoint32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Parameter group:		
Not relevant for motor type:	Synchronous or reluctance motor with starting cage	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: ms	**Unit group:** -	**Unit selection:** -

Description: Displays the estimated precontrol symmetrizing time for One Button Tuning.

This is required to symmetrize the position controller if the closed-loop position control is in an external control system.

Dependency: See also: p5271, p5275

p5291.0...16 FFT tuning configuration / FFT tun config

Data type: Unsigned32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Operation	
Parameter group:		
Not relevant for motor type:	Synchronous or reluctance motor with starting cage	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
-	-	0000 0000 0000 0000 0000 0000 0011 1001 bin

Description: Sets the configuration for the "FFT tuning" function.
This function is used for One Button Tuning (p5300 = 1).

Bit array:

Bit	Signal name	1 signal	0 signal
00	Noise excitation after pulse enable	Yes	No
01	Set current setpoint filter (HF)	Yes	No
02	Set speed controller gain (HF)	Yes	No
03	Length of FFT window bit 0 (LF, HF)	Yes	No
04	Length of FFT window bit 1 (LF, HF)	Yes	No
05	Windowing the time signals using a Hamming window (LF, HF)	Yes	No
06	Measure current controller	Yes	No
07	Bandwidth bit 0 (LF)	Yes	No
08	Bandwidth bit 1 (LF)	Yes	No
09	Bandwidth bit 2 (LF)	Yes	No
10	Measuring periods bit 0	Yes	No
11	Measuring periods bit 1	Yes	No
12	Inject noise onto speed setpoint	Yes	No
13	Do not reduce Kp for measurement	Yes	No
14	Set the current setpoint filter with loop compensation	Yes	No
16	Torque in front of the current setpoint filter	Yes	No

Dependency: See also: r5293, r5294, r5295, p5296

Note
HF: high frequency
LF: low frequency
For bit 00:
A PRBS signal (pseudo random binary signal) is superimposed on the current setpoint to be able to better identify the mechanical controlled system.
For bit 01:
The identified mechanical resonance points are suppressed using current setpoint filters.
For bit 02:
The maximum speed controller gain is determined from the identified mechanical controlled system.
For bits 03, 04:
The measured value buffer length is set using these bits:
Bit 04 = 0 and bit 03 = 0 -> buffer length = 256
Bit 04 = 0 and bit 03 = 1 -> buffer length = 512
Bit 04 = 1 and bit 03 = 0 -> buffer length = 1024
Bit 04 = 1 and bit 03 = 1 -> buffer length = 2048
For bit 05:
A Hamming window is used to filter the measured time signals.
For bit 06:
The measurement checks the current controller frequency response and this is taken into account in the speed controller loop.
For bits 07, 08, 09:
The measurement bandwidth is set using these bits:
Bit 09 = 0, bit 08 = 0, bit 07 = 0 -> bandwidth = 50 Hz
Bit 09 = 0, bit 08 = 0, bit 07 = 1 -> bandwidth = 100 Hz
Bit 09 = 0, bit 08 = 1, bit 07 = 0 -> bandwidth = 200 Hz
Bit 09 = 0, bit 08 = 1, bit 07 = 1 -> bandwidth = 400 Hz
Bit 09 = 1, bit 08 = 0, bit 07 = 0 -> bandwidth = 800 Hz
Bit 09 = 1, bit 08 = 0, bit 07 = 1 -> bandwidth = 1600 Hz
For bits 10, 11:
Number of measuring periods.
Bit 11 = 0 and bit 10 = 0 -> number of measurements = 1
Bit 11 = 0 and bit 10 = 1 -> number of measurements = 2
Bit 11 = 1 and bit 10 = 0 -> number of measurements = 4
Bit 11 = 1 and bit 10 = 1 -> number of measurements = 8
For bit 12:
The PRBS signal is switched to the speed setpoint (in front of the filter).
For bit 13:
The input signal for the torque actual value is taken from in front of the current setpoints filters.
For bit 14:
When the bit is set, a current setpoint filter is used to partially compensate the mechanical system.
This is recommended for the following machine attributes:
- The load moment of inertia is significantly higher than the motor moment of inertia (e.g. > 6x).
- The coupling between the machine elements has almost no backlash (no play).
- The stiffness of the mechanical transmission elements does not change significantly in the traversing range.

p5292 Controller optimization dynamic factor / Ctr_opt dyn_factor

Data type: FloatingPoint32 | **Visible in:** Standard display

Read permission: Read drive data or acknowledge messages

Write permission: Edit device configuration or drive applications

Can be changed in the operating state: Operation

Parameter group:

Not relevant for motor type: Synchronous or reluctance motor with starting cage

Dyn. index [0...n]: - **Calculated:** -

Unit: % **Unit group:** - **Unit selection:** -
Min: 25.0 [%] **Max:** 125.0 [%] **Factory setting:** 80.0 [%]

Description: Sets the dynamic factor for optimizing the speed controller when One Button Tuning is activated (p5300 = 1).

Dependency: The higher the value in p5292, the lower the value in r5274.
See also: p5291

Note
The higher the dynamic factor, the faster and more unstable the control.

r5293 FFT tuning speed controller P gain identified / FFT tun Kp ident

Data type: FloatingPoint32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Parameter group:
Not relevant for motor type: -
Dyn. index [0...n]: - **Calculated:** -
Unit: Nms/rad **Unit group:** - **Unit selection:** -

Description: Displays the determined proportional gain Kp of the speed controller before FFT tuning.
This function is used for One Button Tuning (p5300 = 1).

Dependency: See also: p5291

r5294[0...5] FFT tuning zero position identified / FFT tun zero ident

Data type: FloatingPoint32 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Parameter group:
Not relevant for motor type: -
Dyn. index [0...n]: - **Calculated:** -
Unit: Hz **Unit group:** - **Unit selection:** -

Description: Displays the identified mechanical zero points.
One Button Tuning must be carried out beforehand (p5300 = 1).

Dependency: See also: p5291

Note
For r5294[0...2]:
Displays the zero positions for the "Load oscillation detection" function (p5301.4 = 1) or "Suppress detected load oscillation" (p5301.5 = 1).
For r5294[3...5]:
Displays the zero positions for the "Set proportional gain Kp" function (p5301.0 = 1) or "Set current setpoint filter" (p5301.1 = 1).

r5295[0...5] FFT tuning pole position identified / FFT tun pole ident

Data type: FloatingPoint32 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Parameter group:
Not relevant for motor type: -
Dyn. index [0...n]: - **Calculated:** -
Unit: Hz **Unit group:** - **Unit selection:** -

Description: Displays the identified mechanical pole positions.
One Button Tuning must be carried out beforehand (p5300 = 1).

Dependency: See also: p5291

Note
For r5295[0...2]:
Displays the pole positions for the "Load oscillation detection" function (p5301.4 = 1) or "Suppress detected load oscillation" (p5301.5 = 1).
For r5295[3...5]:
Displays the pole positions for the "Set proportional gain Kp" function (p5301.0 = 1) or "Set current setpoint filter" (p5301.1 = 1).

p5296[0...2] Controller optimization noise amplitude / Ctrl_opt ampl

Data type: FloatingPoint32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Operation	
Parameter group:		
Not relevant for motor type:	Synchronous or reluctance motor with starting cage	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: %	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
1.0 [%]	300.0 [%]	[0] 10.0 [%] [1] 30.0 [%] [2] 5.0 [%]

Description: The drive determines the noise amplitude for One Button Tuning and writes the value to p5296.

Dependency: See also: p5291

p5300[0] One Button Tuning selection / OBT sel

Data type: Integer16	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Ready for operation	
Parameter group:		
Not relevant for motor type:	Synchronous or reluctance motor with starting cage	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
-1	1	0

Description: Activating/deactivating function "One Button Tuning".
For p5300 = 1:
Function "One Button Tuning" is configured using p5271 and p5301.

Value:
-1: Reset controller parameters
0: Inactive
1: One Button Tuning

Dependency: The motor must have already been commissioned so that One Button Tuning functions perfectly.
The "One Button Tuning" function is configured using p5271 and p5301.
The required dynamic performance of the control loop is set in p5292.
The traversing path for the test signal is parameterized in p5308.
See also: p5271, r5274, p5275, p5292, r5293, r5294, r5295, p5296, p5301, p5302, p5308, p5309

Note
For p5300 = -1:
One Button Tuning is deactivated and p5300 is automatically set = 0. Further, the presetting values for the speed controller are restored.
For p5300 = 0:
To permanently save the values for the speed controller that have been determined, the parameters must be saved in a non-volatile memory.
For p5300 = 1:
One Button Tuning is active.
The moment of inertia is determined once using a test signal. The controller parameters and current setpoint filters are additionally determined once using a noise signal as excitation source. The steps to be executed can be configured using p5301.

p5301[0].0...8 One Button Tuning configuration 2 / OBT config 2

Data type: Unsigned32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Operation
Parameter group:
Not relevant for motor type: Synchronous or reluctance motor with starting cage
Dyn. index [0...n]: - **Calculated:** -
Unit: - **Unit group:** - **Unit selection:** -
Min: - **Max:** - **Factory setting:** 0000 0000 0000 0111 bin

Description: Setting the functions for One Button Tuning (p5300 = 1).
A test signal is required for some functions. To do this, observe parameters p5308 and p5309.

Bit array:

Bit	Signal name	1 signal	0 signal
00	Setting the proportional gain Kp	Yes	No
01	Setting current setpoint filter	Yes	No
02	Estimate moment of inertia	Yes	No
07	Activating synchronized axes	Yes	No
08	Moment of inertia determination from frequency response	Yes	No

Dependency: It is only possible to change the configuration if One Button Tuning is not active (p5300 = 0).
See also: p5292, r5293, r5294, r5295, p5296, p5300, p5308, p5309

Note
For bit 00:
The speed controller gain is determined and set using a noise signal.
For bit 01:
Possibly required current setpoint filters are determined and set using a noise signal.
As a consequence, a higher dynamic performance can be achieved in the speed control loop.
For bit 02:
Using this bit, the moment of inertia is determined using a test signal. If this bit is not set, then the load moment of inertia must be manually set using parameter p1498. The test signal must have been previously set using parameters p5308 and p5309.
For bit 08:
Using this bit, the moment of inertia is determined from the frequency characteristic using a test signal, and is transferred to p1498. The traversing path must first be set using parameter p5308.

p5302[0].2...8 Real Time Tuning configuration / RTT config

Data type: Unsigned32 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages

Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Operation	
Parameter group:		
Not relevant for motor type:	Synchronous or reluctance motor with starting cage	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
-	-	0000 0000 0000 1100 bin

Description: Setting the functions for Real Time Tuning (p5300 = 2).

Bit array:

Bit	Signal name	1 signal	0 signal
02	Estimate moment of inertia	Yes	No
03	Configuring the moment of inertia estimator	Cyclic	Once
06	Activating the current setpoint filter adaptation	Yes	No
07	Activating synchronized axes	Yes	No
08	Moment of inertia determination from frequency response	Yes	No

Dependency: It is only possible to change the configuration if autotuning is not active (p5300 = 0).

See also: p5271, r5274, p5275, p5300

Note

For bit 00:

The speed controller gain is determined and set using a noise signal.

For bit 01:

Possibly required current setpoint filters are determined and set using a noise signal.

As a consequence, a higher dynamic performance can be achieved in the speed control loop.

For bit 02:

Using this bit, the moment of inertia is determined using a test signal. If this bit is not set, then the
load moment of inertia must be manually set using parameter p1498. The test signal must be previously set via parameters p5308
and p5309.

For bit 08:

Using this bit, the moment of inertia is determined from the frequency characteristic using a test signal, and is transferred to p1498.

The traversing path must first be set using parameter p5308.

r5306[0].0...14 One Button Tuning status / OBT stat

Data type: Unsigned16	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Parameter group:		
Not relevant for motor type:	Synchronous or reluctance motor with starting cage	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -

Description: Displays the status of the functions performed using "One Button Tuning".

Bit array:

Bit	Signal name	1 signal	0 signal
00	Proportional gain Kp set	Yes	No
01	Current setpoint filter set	Yes	No
02	Moment of inertia estimation carried out	Yes	No
07	EPOS set	Yes	No
13	One Button Tuning successfully completed	Yes	No
14	Controller parameters reset due to fault	Yes	No

Dependency: See also: p5300, p5301, p5302

Note
For bit 00 = 1: The speed controller gain was set using One Button Tuning.
For bit 01 = 1: The current setpoint filter was set using One Button Tuning
For bit 02 = 1: The moment of inertia was determined.

p5308[0] One Button Tuning distance limiting / OBT distance lim

Data type: Integer32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Ready for operation	
Parameter group:		
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: °	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
-30000 [°]	30000 [°]	0 [°]

Description: Setting the distance limiting (permissible traversing range of the motor).
The traversing range is limited in the positive and negative directions.

Note
A value of 360 degrees corresponds to one motor revolution.
The position before the pulse enable is used as zero point.

p5309[0] One Button Tuning duration / OBT duration

Data type: Unsigned32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Ready for operation	
Parameter group:		
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: ms	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
0 [ms]	5000 [ms]	2000 [ms]

Description: Sets the duration for One Button Tuning (several acceleration operations)
This function is used for One Button Tuning (p5300 = 1) to identify the total moment of inertia of the drive train.

Dependency: See also: F07093

Note
If, within this time, no setting values can be determined, then the drive is shut down with the corresponding fault.

p5375[0].0...1 Additional motor overload protection configuration / AddMotOvProtConf

Data type: Unsigned16	**Visible in:** Extended display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Operation	
Parameter group:	Motor temperature	
Not relevant for motor type:	-	

Dyn. index [0...n]:	-	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
-	-	0000 bin

Description: Sets the configuration for additional motor overload protection.

Bit array:

Bit	Signal name	1 signal	0 signal
00	Activate monitoring	Yes	No
01	Activation of speed dependency	Yes	No

Note

To comply with standard UL 61800-5-1 Ed. 2, bit 0 and bit 1 must be set.

These bits activate electronic motor overload protection according to IEC 61800-5-1 Ed. 3 / UL 61800-5-1 Ed. 2, with the emulation of an electronic overload relay, Class 20 and the speed sensitivity.

For bit 00:

This bit activates electronic motor overload protection with emulation of an electronic overload relay, Class 20.

For bit 01:

This bit activates the speed dependency of the electronic motor overload protection. Not active, if bit 00 is also set.

r5600 PROFIenergy energy-saving mode ID / Pe mode ID

Data type: Integer16	**Visible in:** Extended display	
Read permission:	Read drive data or acknowledge messages	
Parameter group:		
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -

Description: Displays the PROFIenergy mode ID of the effective energy-saving mode.

Value:

0:	POWER OFF
2:	Energy-saving mode 2
240:	Operation
255:	Ready

p5611.0...2 PROFIenergy energy-saving properties general / Pe properties gen

Data type: Unsigned32	**Visible in:** Extended display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Ready for operation	
Parameter group:		
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
-	-	0000 bin

Description: Sets the general properties for energy-saving.

Bit array:

Bit	Signal name	1 signal	0 signal
00	Inhibit PROFIenergy control commands	Yes	No
01	Drive initiates OFF1 when transitioning to energy-saving mode	Yes	No
02	Trans to energy-saving mode from PROFIdrive state S3/4 poss	Yes	No

Note
PROFIenergy is a profile for energy management in production systems.
PROFIdrive state S3: ready
PROFIdrive state S4: operation

r5613.0...1 PROFIenergy energy saving active/inactive / Pe save act/inact

Data type: Unsigned8	**Visible in:** Extended display	
Read permission:	Read drive data or acknowledge messages	
Parameter group:		
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -
Type of signal interconnection:	Source binary/numeric	**Scaling:** -

Description: Status display, PROFIenergy energy saving active or inactive.

Bit array:

Bit	Signal name	1 signal	0 signal
00	PROFIenergy active	Yes	No
01	PROFIenergy inactive	Yes	No

Note
Bit 00 and bit 01 are inverse with respect to one another.

r7700[0...63] Hash value for the integrity of UMAC data / Integrity UMAC

Data type: Unsigned8	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Parameter group:		
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -

Description: Display of the hash value for the integrity of UMAC data in the ASCII format (Base64 Encoding)

Note
The index contains the value at the corresponding position in the string

r7727[0] Power unit heat sink fan wear counter / PU fan wear_count

Data type: FloatingPoint32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Parameter group:	Power unit	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: %	**Unit group:** -	**Unit selection:** -

Description: Displays the wear counter of the heat sink fan in the power unit.

Dependency: See also: A30042

r8400[0...2] Date / Date

Data type: Unsigned16	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Parameter group:	Diagnostics general	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -

Description: Displays the actual date in year, month and day.

Index: [0] = Year (YYYY)
[1] = Month (1 ... 12)
[2] = Day (1 ... 31)

Note
The time in r8400 and r8401 is used to display the fault and alarm times.
Possible date/time setting:
- Web server (manually)
- NTP (Network Time Protocol)
When the converter is switched off, date/time are not updated.
After the converter has restarted, the date and time that the converter was in a no-current condition applies.

r8401[0...2] Time / Time

Data type: Unsigned16	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Parameter group:	Diagnostics general	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -

Description: Displays the current time in hours, minutes and seconds.

Index: [0] = Hour (0 ... 23)
[1] = Minute (0 ... 59)
[2] = Second (0 ... 59)

Note
The time in r8400 and r8401 is used to display the fault and alarm times.
The time is displayed in the 24-hour format.
Possible date/time setting:
- Web server (manually)
- NTP (Network Time Protocol)
When the converter is switched off, date/time are not updated. After POWER ON the instant of the previous power off is valid.

r8600[0...30] PROFIdrive PZD receive Float32 / PZD recv F32

Data type: FloatingPoint32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Parameter group:	Receive direction	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -
Type of signal interconnection:	Source numeric	**Scaling:** -

Description: Display and numerical signal source to interconnect PZD (setpoints) with Float32 format received from the fieldbus controller.

Index:
[0] = PZD 1 + 2
[1] = PZD 2 + 3
[2] = PZD 3 + 4
[3] = PZD 4 + 5
[4] = PZD 5 + 6
[5] = PZD 6 + 7
[6] = PZD 7 + 8
[7] = PZD 8 + 9
[8] = PZD 9 + 10
[9] = PZD 10 + 11
[10] = PZD 11 + 12
[11] = PZD 12 + 13
[12] = PZD 13 + 14
[13] = PZD 14 + 15
[14] = PZD 15 + 16
[15] = PZD 16 + 17
[16] = PZD 17 + 18
[17] = PZD 18 + 19
[18] = PZD 19 + 20
[19] = PZD 20 + 21
[20] = PZD 21 + 22
[21] = PZD 22 + 23
[22] = PZD 23 + 24
[23] = PZD 24 + 25
[24] = PZD 25 + 26
[25] = PZD 26 + 27
[26] = PZD 27 + 28
[27] = PZD 28 + 29
[28] = PZD 29 + 30
[29] = PZD 30 + 31
[30] = PZD 31 + 32

NOTICE
A signal interconnection of a single PZD can only take place either on r2050, r2060 or r8600. A maximum of 4 indices of the "trace" function can be used.

c8601[0...30] PROFIdrive PZD send Float32 / PZD send F32

Data type: FloatingPoint32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Parameter group:	Send direction	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -
Type of signal interconnection:	Sink numeric	**Scaling:** -
Factory interconnection:	Fixed value: 0.00	

Description: Displays the PZD (actual values) in the Float32 format that are sent to the fieldbus controller.

Index:
[0] = PZD 1 + 2
[1] = PZD 2 + 3
[2] = PZD 3 + 4
[3] = PZD 4 + 5
[4] = PZD 5 + 6
[5] = PZD 6 + 7
[6] = PZD 7 + 8
[7] = PZD 8 + 9
[8] = PZD 9 + 10
[9] = PZD 10 + 11
[10] = PZD 11 + 12
[11] = PZD 12 + 13
[12] = PZD 13 + 14
[13] = PZD 14 + 15
[14] = PZD 15 + 16
[15] = PZD 16 + 17
[16] = PZD 17 + 18
[17] = PZD 18 + 19
[18] = PZD 19 + 20
[19] = PZD 20 + 21
[20] = PZD 21 + 22
[21] = PZD 22 + 23
[22] = PZD 23 + 24
[23] = PZD 24 + 25
[24] = PZD 25 + 26
[25] = PZD 26 + 27
[26] = PZD 27 + 28
[27] = PZD 28 + 29
[28] = PZD 29 + 30
[29] = PZD 30 + 31
[30] = PZD 31 + 32

NOTICE
A signal interconnection of an individual PZD is only possible either with c2053, c2063 or c8601. It is possible that the interconnection is locked as a result of a set PROFIdrive telegram. A maximum of 4 indices of the "trace" function can be used.

r8602[0...28] PROFIdrive PZD receive Float64 / PZD recv F64

Data type: FloatingPoint64	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Parameter group:	Receive direction	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -
Type of signal interconnection:	Source numeric	**Scaling:** -

Description: Display and numerical signal source to interconnect PZD (setpoints) with Float64 format received from the fieldbus controller.

Index:

[0] = PZD 1...4
[1] = PZD 2...5
[2] = PZD 3...6
[3] = PZD 4...7
[4] = PZD 5...8
[5] = PZD 6...9
[6] = PZD 7...10
[7] = PZD 8...11
[8] = PZD 9...12
[9] = PZD 10...13
[10] = PZD 11...14
[11] = PZD 12...15
[12] = PZD 13...16
[13] = PZD 14...17
[14] = PZD 15...18
[15] = PZD 16...19
[16] = PZD 17...20
[17] = PZD 18...21
[18] = PZD 19...22
[19] = PZD 20...23
[20] = PZD 21...24
[21] = PZD 22...25
[22] = PZD 23...26
[23] = PZD 24...27
[24] = PZD 25...28
[25] = PZD 26...29
[26] = PZD 27...30
[27] = PZD 28...31
[28] = PZD 29...32

NOTICE
A signal interconnection of a single PZD can only take place either on r2050, r2060, r8600 or r8602. A maximum of 4 indices of the "trace" function can be used.

c8603[0...28] PROFIdrive PZD send Float64 / PZD send F64

Data type: FloatingPoint64	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Parameter group:	Send direction	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -
Type of signal interconnection:	Sink numeric	**Scaling:** -
Factory interconnection:	Fixed value: 0.00	

Description: Displays the PZD (actual values) in the Float32 format that are sent to the fieldbus controller.

Index: [0] = PZD 1...4
[1] = PZD 2...5
[2] = PZD 3...6
[3] = PZD 4...7
[4] = PZD 5...8
[5] = PZD 6...9
[6] = PZD 7...10
[7] = PZD 8...11
[8] = PZD 9...12
[9] = PZD 10...13
[10] = PZD 11...14
[11] = PZD 12...15
[12] = PZD 13...16
[13] = PZD 14...17
[14] = PZD 15...18
[15] = PZD 16...19
[16] = PZD 17...20
[17] = PZD 18...21
[18] = PZD 19...22
[19] = PZD 20...23
[20] = PZD 21...24
[21] = PZD 22...25
[22] = PZD 23...26
[23] = PZD 24...27
[24] = PZD 25...28
[25] = PZD 26...29
[26] = PZD 27...30
[27] = PZD 28...31
[28] = PZD 29...32

NOTICE
A signal interconnection of an individual PZD is only possible with either c2053, c2063, c8601 or c8603. It is possible that the interconnection is locked as a result of a set PROFIdrive telegram. A maximum of 4 indices of the "trace" function can be used.

r8936[0...1] PN cyclic connection state / PN cyc conn state

Data type: Integer16 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Parameter group:
Not relevant for motor type: -
Dyn. index [0...n]: - **Calculated:** -
Unit: - **Unit group:** - **Unit selection:** -

Description: Displays the status of the cyclic PROFINET connection.

Value:
0: Canceled
1: Not connected
2: Connection starts to be established
3: Module information expected
4: Module information received
5: Module address expected
6: Module address received
7: Parameterization data expected

8:	Parameterization data received
9:	Evaluate parameterization data
10:	Connection being established completion expected
11:	Reserved
12:	Configured controller STOP
13:	Configured controller RUN

Index: [0] = Controller 1
[1] = Controller 2

Dependency: See also: r8961

Note
The parameter is active when the "PROFINET Device" protocol is selected.
For two connections (shared device) the display in the index depends on the sequence in which the connections are established.
For value = 10:
If the connection remains in this state, then when using PROFINET IRT the following can apply:
- Topology error (incorrect port assignment).
- Synchronization missing.

r8937[0...5] PN cyclic connection diagnostics / PN cycl conn diag

Data type: Unsigned32	**Visible in:** Extended display	
Read permission:	Read drive data or acknowledge messages	
Parameter group:		
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -

Description: Display to diagnose the cyclic PROFINET connection.

Index: [0] = Number of cyclic connections
[1] = Number of send subslots of all connections
[2] = Number of send net data (bytes) of all connections
[3] = Number of receive subslots of all connections
[4] = Number of receive net data (bytes) of all connections
[5] = Connection type (RT, IRT)

Note
For PROFINET, the following applies:
For index [5]:
Bit 0 = 1: there is at least one RT connection.
Bit 1 = 1: there is an IRT connection.
For EtherNet/IP, the following applies:
For index [1, 3, 5]:
These indices are not relevant.

r8961[0...3] PN controller IP address / PN Ctrl IP Addr

Data type: Unsigned8	**Visible in:** Extended display	
Read permission:	Read drive data or acknowledge messages	
Parameter group:	Configuration	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -

Description: Displays the IP address of the PROFINET controller.

Note
For a shared device, the IP address of the automation controller is displayed.

c8995[0...3] Ethernet X127 enable / Eth X127 enable

Data type: Unsigned8 | **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Write permission: -
Parameter group: Configuration
Not relevant for motor type: -
Dyn. index [0...n]: - | **Calculated:** -
Unit: - | **Unit group:** - | **Unit selection:** -
Type of signal interconnection: Sink binary
Factory interconnection:
[0] Fixed value: 1
[1] Fixed value: 1
[2] Fixed value: 0
[3] Fixed value: 0

Description: Signal to enable the Ethernet interface X127 for applications.

Index:
[0] = Secure S7 Protocol Startdrive
[1] = Web server HTTPS
[2] = S7 protocol PCS7
[3] = Web server HTTP

Note
The parameter influences the access from applications.
1 signal:
Ethernet interface X127 is enabled for access.
0 signal:
Ethernet interface X127 is blocked and cannot be accessed.
The signal is not influenced by restoring the factory settings.

c8997[0...3] PROFINET X150 enable / PN X150 enable

Data type: Unsigned8 | **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Write permission: -
Parameter group: Configuration
Not relevant for motor type: -
Dyn. index [0...n]: - | **Calculated:** -
Unit: - | **Unit group:** - | **Unit selection:** -
Type of signal interconnection: Sink binary
Factory interconnection:
[0] Fixed value: 1
[1] Fixed value: 1
[2] Fixed value: 0
[3] Fixed value: 0

Description: Signal to enable PROFINET interface X150 for applications.

Index:
[0] = Secure S7 Protocol Startdrive
[1] = Web server HTTPS
[2] = S7 protocol PCS7
[3] = Data set protocol for commands and configuration

Note
The parameter influences the access from applications.
1 signal:
PROFINET interface X150 is enabled for access.
0 signal:
PROFINET interface X150 is inhibited for access.
The signal is not influenced by restoring the factory settings.

p9500 SI monitoring clock cycle / SI cycle

Data type: FloatingPoint32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit Safety Integrated application	
Can be changed in the operating state:	Commissioning (Safety Integrated)	
Parameter group:	Safety Integrated	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: ms	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
4.00000 [ms]	4.00000 [ms]	4.00000 [ms]

Description: Sets the monitoring clock cycle for safe motion monitoring.

Dependency: See also: p9511
See also: C01652

Note
When online safety commissioning has been completed, a change results in an automatic restart.
The monitoring cycle must be a multiple of the actual value sensing clock cycle (p9511).

r9502 SI axis type / SI axis type

Data type: Integer16	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Parameter group:	Safety Integrated	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -

Description: Displays the axis type (linear axis or rotary axis/spindle).

Value:
0: Linear axis
1: Rotary axis/spindle

Note
The axis type is set in the commissioning tool.
Safety parameters whose units are dependent on the axis type change after switching over the axis type.

p9507.8...9 SI function configuration / SI Config

Data type: Unsigned32	**Visible in:** Standard display
Read permission:	Read drive data or acknowledge messages
Write permission:	Edit Safety Integrated application
Can be changed in the operating state:	Commissioning (Safety Integrated)
Parameter group:	Extended functions
Not relevant for motor type:	-

Dyn. index [0...n]:	-	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
-	-	0000 0000 0000 0000 bin

Description: Sets the function configuration for the safe motion monitoring functions.

Bit array:

Bit	Signal name	1 signal	0 signal
08	No STO after encoder fault for 1-encoder safety	Yes	No
09	Status bit 'SSM below the limit' initial value when running up	SSM status=0	SSM status=1

Dependency: See also: C01711

Note

For bit 08:

When the function is activated, after an encoder fault for 1-encoder safety and when a safety function is selected, an STO (Safe Torque Off) is not triggered.

For bit 09:

When the function is activated, the status signal for SSM (Safety Speed Monitoring) is initialized with "0" when running up.

When the function is deactivated, the status signal for SSM is initialized with "1" when running up.

p9511 SI actual value sensing cycle / SI act cycle

Data type: FloatingPoint32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit Safety Integrated application	
Can be changed in the operating state:	Commissioning (Safety Integrated)	
Parameter group:	Safety Integrated	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: ms	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
1.00000 [ms]	1.00000 [ms]	1.00000 [ms]

Description: Sets the clock cycle time of the actual value sensing for safe motion monitoring.

Setting criteria if the motion monitoring functions are executed with an encoder.

- A slower cycle time reduces the maximum permissible speed; however, it ensures a lower system utilization level.

- The maximum permissible velocity, which, when exceeded, can mean that errors occur in the safe actual value sensing, is displayed in r9730.

Dependency: See also: C01652

Note

The monitoring clock cycle from p9500 must be an integer multiple of this parameter.

For motion monitoring functions with encoder, the cycle time of the actual value sensing must be an integer multiple of the current controller cycle.

When online safety commissioning has been completed, a change results in an automatic restart.

p9516.1 SI encoder configuration, safety functions / SI enc_config

Data type: Unsigned16	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit Safety Integrated application	
Can be changed in the operating state:	Commissioning (Safety Integrated)	
Parameter group:	Extended functions	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -

Unit: -	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
-	-	0000 bin

Description: Sets the configuration for the position actual value.

The encoder that is used for the safe motion monitoring function must be parameterized in this parameter.

Bit array:

Bit	Signal name	1 signal	0 signal
01	Position actual value sign change	Yes	No

Dependency: See also: p0404, p0410

See also: C01671

p9520 SI leadscrew pitch / SI leadscrew_pitch

Data type: FloatingPoint32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit Safety Integrated application	
Can be changed in the operating state:	Commissioning (Safety Integrated)	
Parameter group:	Extended functions	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: mm	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
0.1000 [mm]	8388.0000 [mm]	10.0000 [mm]

Description: Sets the gear ratio between SI encoder 1 and load in mm/revolution for a linear axis with rotary encoder.

NOTICE
The fourth decimal point can be rounded-off depending on the size of the entered number (from 3 places before the decimal point).

p9521[0...7] SI gearbox encoder (motor)/load denominator / SI grbx denom

Data type: Unsigned32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit Safety Integrated application	
Can be changed in the operating state:	Commissioning (Safety Integrated)	
Parameter group:	Extended functions	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
1	2147000000	1

Description: Sets the denominator for the selected gearbox between SI encoder 1 and the load.

Index: [0] = Gearbox 1

[1...7] = Reserved

Dependency: See also: p9522

Note

The gearbox ratio is obtained from p9522 / p9521.

p9522[0...7] SI gearbox encoder (motor)/load numerator / SI grbx numerator

Data type: Unsigned32	**Visible in:** Standard display
Read permission:	Read drive data or acknowledge messages

Write permission:	Edit Safety Integrated application	
Can be changed in the operating state:	Commissioning (Safety Integrated)	
Parameter group:	Extended functions	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
1	2147000000	1

Description: Sets the numerator for the selected gearbox between SI encoder 1 and the load.

Index: [0] = Gearbox 1
[1...7] = Reserved

Dependency: See also: p9521

Note
The gearbox ratio is obtained from p9522 / p9521.

p9530 SI SOS standstill tolerance / SI standst_tol

Data type: FloatingPoint32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit Safety Integrated application	
Can be changed in the operating state:	Commissioning (Safety Integrated)	
Parameter group:	Extended functions	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: mm	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
0.000 [mm]	100.000 [mm]	1.000 [mm]

Description: Sets the tolerance for function SOS (Safe Operating Stop).

Dependency: See also: C01707

p9530 SI SOS standstill tolerance / SI standst_tol

Variant:	S210 (Safety rotary axis)	
Data type: FloatingPoint32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit Safety Integrated application	
Can be changed in the operating state:	Commissioning (Safety Integrated)	
Parameter group:	Extended functions	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: °	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
0.000 [°]	100.000 [°]	1.000 [°]

Description: Sets the tolerance for function SOS (Safe Operating Stop).

Dependency: See also: C01707

p9531[0...3] SI SLS limit values / SI SLS limit

Data type: FloatingPoint32	**Visible in:** Standard display

Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit Safety Integrated application	
Can be changed in the operating state:	Commissioning (Safety Integrated)	
Parameter group:	Extended functions	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: mm/min	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
0.00 [mm/min]	1000000.00 [mm/min]	2000.00 [mm/min]

Description: Sets the limit values for function SLS (Safely-Limited Speed).

Index:
[0] = Limit value SLS1
[1] = Limit value SLS2
[2] = Limit value SLS3
[3] = Limit value SLS4

Dependency: See also: p9563
See also: C01714

p9531[0...3] SI SLS limit values / SI SLS limit

Variant:	S210 (Safety rotary axis)	
Data type: FloatingPoint32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit Safety Integrated application	
Can be changed in the operating state:	Commissioning (Safety Integrated)	
Parameter group:	Extended functions	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: rpm	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
0.00 [rpm]	1000000.00 [rpm]	2000.00 [rpm]

Description: Sets the limit values for function SLS (Safely-Limited Speed).

Index:
[0] = Limit value SLS1
[1] = Limit value SLS2
[2] = Limit value SLS3
[3] = Limit value SLS4

Dependency: See also: p9563
See also: C01714

p9533 SI SLS setpoint speed limiting / SI SLS set_lim

Data type: FloatingPoint32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Operation	
Parameter group:	Extended functions	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: %	**Unit group:** -	**Unit selection:** -

Min:	**Max:**	**Factory setting:**
0.000 [%]	100.000 [%]	80.000 [%]

Description: Sets the evaluation factor to define the setpoint limit from the selected actual velocity limit.

The active SLS (Safely-Limited Speed) limit value is evaluated with this factor and is made available as setpoint limit in r9733.

For a value = 0, the setpoint velocity limiting is inactive.

Dependency: r9733[0] = p9531[x] x p9533 (converted from the load side to the encoder side)

r9733[1] = p9531[x] x p9533 (converted from the load side to the encoder side)

[x] = selected SLS limit value

Conversion factor from the encoder side to the load side:

- Motor type = rotary and axis type = linear: p9522 / (p9521 x p9520)
- Otherwise: p9522 / p9521

See also: p9531

Note

The active actual velocity limit is selected via safety-relevant inputs (SGE).

When selecting a safety function, where standstill is reached or required (e.g. STO, SS1), then setpoint 0 is specified in r9733.

p9539[0...7] SI gearbox rotation reversal / SI grbx reversal

Data type: Integer16	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit Safety Integrated application	
Can be changed in the operating state:	Commissioning (Safety Integrated)	
Parameter group:	Extended functions	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
0	1	0

Description: Sets the direction of rotation reversal for the gearbox.

Value:

0:	No direction of rotation reversal
1:	Direction of rotation reversal

Index: [0] = Gearbox 1

[1...7] = Reserved

Dependency: See also: p9521

p9545 SI SSM filter time / SI SSM filt

Data type: FloatingPoint32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit Safety Integrated application	
Can be changed in the operating state:	Commissioning (Safety Integrated)	
Parameter group:	Extended functions	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: ms	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
0.00 [ms]	500.00 [ms]	0.00 [ms]

Description: Sets the filter time for the feedback signal SSM (Safe Speed Monitor) to detect standstill.

Note
The filter time is only active if the function is enabled (p9604.12 = 1).

p9546 SI SSM velocity limit / SI SSM v_lim

Data type: FloatingPoint32 | **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit Safety Integrated application
Can be changed in the operating state: Commissioning (Safety Integrated)
Parameter group: Extended functions
Not relevant for motor type: -
Dyn. index [0...n]: - | **Calculated:** -
Unit: mm/min | **Unit group:** - | **Unit selection:** -

Min:	Max:	Factory setting:
0.002 [mm/min]	1000000.000 [mm/min]	60.000 [mm/min]

Description: Sets the velocity limit for the feedback signal SSM (Safe Speed Monitor) to detect standstill.
When this limit value is undershot (take into account the parameterized hysteresis), signal "SSM feedback signal active" is set.

p9546 SI SSM velocity limit / SI SSM v_lim

Variant: S210 (Safety rotary axis)
Data type: FloatingPoint32 | **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit Safety Integrated application
Can be changed in the operating state: Commissioning (Safety Integrated)
Parameter group: Extended functions
Not relevant for motor type: -
Dyn. index [0...n]: - | **Calculated:** -
Unit: rpm | **Unit group:** - | **Unit selection:** -

Min:	Max:	Factory setting:
0.002 [rpm]	1000000.000 [rpm]	60.000 [rpm]

Description: Sets the velocity limit for the feedback signal SSM (Safe Speed Monitor) to detect standstill.
When this limit value is undershot (take into account the parameterized hysteresis), signal "SSM feedback signal active" is set.

p9547 SI SSM velocity hysteresis / SI SSM hyst

Data type: FloatingPoint32 | **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit Safety Integrated application
Can be changed in the operating state: Commissioning (Safety Integrated)
Parameter group: Extended functions
Not relevant for motor type: -
Dyn. index [0...n]: - | **Calculated:** -
Unit: mm/min | **Unit group:** - | **Unit selection:** -

Min:	Max:	Factory setting:
0.0010 [mm/min]	500.0000 [mm/min]	30.0000 [mm/min]

Description: Sets the speed hysteresis for the feedback signal SSM (Safe Speed Monitor) to detect standstill (n < nx).
Dependency: See also: C01711

Note
The following applies when parameterizing the hysteresis:
- Set parameters p9546 and p9547 according to the following rule: p9546 * 0.75 >= p9547

p9547 SI SSM velocity hysteresis / SI SSM hyst

Variant:	S210 (Safety rotary axis)	
Data type: FloatingPoint32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit Safety Integrated application	
Can be changed in the operating state:	Commissioning (Safety Integrated)	
Parameter group:	Extended functions	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: rpm	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
0.0010 [rpm]	500.0000 [rpm]	30.0000 [rpm]

Description: Sets the speed hysteresis for the feedback signal SSM (Safe Speed Monitor) to detect standstill (n < nx).

Dependency: See also: C01711

Note
The following applies when parameterizing the hysteresis:
- Set parameters p9546 and p9547 according to the following rule: p9546 * 0.75 >= p9547

p9548 SI SAM velocity tolerance / SI SAM vel tol

Data type: FloatingPoint32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit Safety Integrated application	
Can be changed in the operating state:	Commissioning (Safety Integrated)	
Parameter group:	Extended functions	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: mm/min	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
0.00 [mm/min]	120000.00 [mm/min]	300.00 [mm/min]

Description: Sets the velocity tolerance for function SAM (Safe Acceleration Monitor).

If the drive velocity increases during the down ramp by more than this tolerance, then SAM identifies this and STO (Safe Torque Off) is initiated.

Dependency: See also: C01706

p9548 SI SAM velocity tolerance / SI SAM vel tol

Variant:	S210 (Safety rotary axis)
Data type: FloatingPoint32	**Visible in:** Standard display
Read permission:	Read drive data or acknowledge messages
Write permission:	Edit Safety Integrated application
Can be changed in the operating state:	Commissioning (Safety Integrated)
Parameter group:	Extended functions
Not relevant for motor type:	-

Dyn. index [0...n]:	-	**Calculated:** -
Unit: rpm	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
0.00 [rpm]	120000.00 [rpm]	300.00 [rpm]

Description: Sets the velocity tolerance for function SAM (Safe Acceleration Monitor).

If the drive velocity increases during the down ramp by more than this tolerance, then SAM identifies this and STO (Safe Torque Off) is initiated.

Dependency: See also: C01706

p9551 SI SLS delay time for limit value change / SI SLS t_del

Data type: FloatingPoint32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit Safety Integrated application	
Can be changed in the operating state:	Commissioning (Safety Integrated)	
Parameter group:	Extended functions	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: ms	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
0.00 [ms]	600000.00 [ms]	100.00 [ms]

Description: Sets the delay time for the limit value change for function SLS (Safely-Limited Speed).

When transitioning from a higher to a lower safely-limited velocity/speed stage, within this delay time, the "old" velocity stage remains active.

Even if SLS is activated from the state "SLS inactive", then this delay time is still applied.

Note

The set time is rounded internally to an integer multiple of the monitoring clock cycle.

p9552 SI transition time SS2 to SOS / SI t SS2->SOS

Data type: FloatingPoint32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit Safety Integrated application	
Can be changed in the operating state:	Commissioning (Safety Integrated)	
Parameter group:	Extended functions	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: ms	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
0.00 [ms]	600000.00 [ms]	100.00 [ms]

Description: Sets the transition time from SS2 (Safe Stop 2) to SOS (Safe Operating Stop).

Note

The set time is rounded internally to an integer multiple of the monitoring clock cycle.

p9553 SI transition time SS2E to SOS / SI t SS2E->SOS

Data type: FloatingPoint32	**Visible in:** Standard display
Read permission:	Read drive data or acknowledge messages
Write permission:	Edit Safety Integrated application
Can be changed in the operating state:	Commissioning (Safety Integrated)

Parameter group:	Extended functions	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: ms	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
0.00 [ms]	600000.00 [ms]	100.00 [ms]

Description: Sets the transition time from SS2E (Safe Stop 2 External) to SOS (Safe Operating Stop).

Note
The set time is rounded internally to an integer multiple of the monitoring clock cycle.

p9555 SI transition time SCF to SS1/SS1E / SI t SCF->SS1/SS1E

Data type: FloatingPoint32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit Safety Integrated application	
Can be changed in the operating state:	Commissioning (Safety Integrated)	
Parameter group:	Basic functions	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: ms	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
0.00 [ms]	600000.00 [ms]	0.00 [ms]

Description: Sets the transition time from SCF (Safety Channel Failure) to SS1 (Safe Stop 1) / SS1E (Safe Stop 1 with external Stop).

Dependency: See also: p9561
See also: C01701, C01702, C01711

Note
The set time is rounded internally to an integer multiple of the monitoring clock cycle.

p9556 SI transition time SS1 to STO / SI t SS1->STO

Data type: FloatingPoint32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit Safety Integrated application	
Can be changed in the operating state:	Commissioning (Safety Integrated)	
Parameter group:	Basic functions	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: ms	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
0.00 [ms]	3.6e+06 [ms]	100.00 [ms]

Description: Sets the transition time from SS1 (Safe Stop 1) to STO (Safe Torque Off).
The parameter has no effect for motion monitoring functions with safe brake ramp monitoring (p9606 = 2).

Dependency: See also: p9560
See also: C01701

Note
The set time is rounded internally to an integer multiple of the monitoring clock cycle.

p9560 SI STO shutdown velocity / SI STO v_shutdown

Data type: FloatingPoint32	**Visible in:** Standard display

Read permission: Read drive data or acknowledge messages
Write permission: Edit Safety Integrated application
Can be changed in the operating state: Commissioning (Safety Integrated)
Parameter group: Basic functions
Not relevant for motor type: -

Dyn. index [0...n]:	-	**Calculated:** -
Unit: mm/min	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
0.00 [mm/min]	6000.00 [mm/min]	0.00 [mm/min]

Description: Sets the shutdown velocity for activating STO (Safe Torque Off).

Below this velocity, "standstill" is assumed, and for SS1/SS1E (Safe Stop 1/Safe Stop 1 External), STO is initiated.

For motion monitoring functions with safe brake ramp monitoring (p9606 = 2) the parameter must be > 0, as it is the only cancel criterion for the safe brake ramp monitoring.

Dependency: See also: p9556

Note
The shutdown velocity has no effect for a value = 0.

p9560 SI STO shutdown velocity / SI STO v_shutdown

Variant: S210 (Safety rotary axis)
Data type: FloatingPoint32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit Safety Integrated application
Can be changed in the operating state: Commissioning (Safety Integrated)
Parameter group: Basic functions
Not relevant for motor type: -

Dyn. index [0...n]:	-	**Calculated:** -
Unit: rpm	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
0.00 [rpm]	6000.00 [rpm]	0.00 [rpm]

Description: Sets the shutdown velocity for activating STO (Safe Torque Off).

Below this velocity, "standstill" is assumed, and for SS1/SS1E (Safe Stop 1/Safe Stop 1 External), STO is initiated.

For motion monitoring functions with safe brake ramp monitoring (p9606 = 2) the parameter must be > 0, as it is the only cancel criterion for the safe brake ramp monitoring.

Dependency: See also: p9556

Note
The shutdown velocity has no effect for a value = 0.

p9561 SI SCF stop response / SI SCF stop

Data type: Integer16 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Commissioning (Safety Integrated)
Parameter group: Extended functions
Not relevant for motor type: -

Dyn. index [0...n]:	-	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -

	Min:	Max:	Factory setting:
	1	2	1

Description: Sets the stop response after SCF (Safety Channel Failure).

Value:
1: SS1 (Safe Stop 1)
2: SS1E (Safe Stop 1 External)

Dependency: See also: p9555
See also: C01701, C01702, C01711

Note
SI: Safety Integrated
SS1: Safe Stop 1
SS1E: Safe Stop 1 External (Safe Stop 1 with external stop)

p9563[0...3] SI SLS stop response / SI SLS stop

Data type: Integer16	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit Safety Integrated application	
Can be changed in the operating state:	Commissioning (Safety Integrated)	
Parameter group:	Extended functions	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
0	4	1

Description: Sets the specific stop response for the SLS function.
These settings apply to the individual limit values for SLS.

Value:
0: STO (Safe Torque Off)
1: SS1 (Safe Stop 1)
2: SS1E (Safe Stop 1 External)
3: SS2 (Safe Stop 2)
4: SS2E (Safe Stop 2 External)

Index:
[0] = Limit value SLS1
[1] = Limit value SLS2
[2] = Limit value SLS3
[3] = Limit value SLS4

Dependency: See also: p9531, p9561

Note
SI: Safety Integrated
SLS: Safely-Limited Speed
SS1: Safe Stop 1
SS1E: Safe Stop 1 External (Safe Stop 1 with external Stop)
SS2: Safe Stop 2
SS2E: Safe Stop 2 External
STO: Safe Torque Off

p9564 SI SDI tolerance / SI SDI tol

Data type: FloatingPoint32	**Visible in:** Standard display
Read permission:	Read drive data or acknowledge messages
Write permission:	Edit Safety Integrated application

Can be changed in the operating state:	Commissioning (Safety Integrated)	
Parameter group:	Extended functions	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: mm	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
0.001 [mm]	360.000 [mm]	12.000 [mm]

Description: Sets the tolerance for function SDI (Safe Direction).

This motion in the monitored direction is still permissible without a stop response occurring and safety message C01716 being output.

Dependency: See also: p9565, p9566

See also: C01716

p9564 SI SDI tolerance / SI SDI tol

Variant:	S210 (Safety rotary axis)	
Data type: FloatingPoint32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit Safety Integrated application	
Can be changed in the operating state:	Commissioning (Safety Integrated)	
Parameter group:	Extended functions	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: °	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
0.001 [°]	360.000 [°]	12.000 [°]

Description: Sets the tolerance for function SDI (Safe Direction).

This motion in the monitored direction is still permissible without a stop response occurring and safety message C01716 being output.

Dependency: See also: p9565, p9566

See also: C01716

p9565 SI SDI delay time / SI SDI t

Data type: FloatingPoint32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit Safety Integrated application	
Can be changed in the operating state:	Commissioning (Safety Integrated)	
Parameter group:	Extended functions	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: ms	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
0.00 [ms]	600000.00 [ms]	100.00 [ms]

Description: Sets the delay time for function SDI (Safe Direction).

After selecting the SDI function, motion in the monitored direction is permissible for a maximum of this time. This time can therefore be used for braking any motion.

Dependency: See also: p9564, p9566

See also: C01716

Note
The set time is rounded internally to an integer multiple of the monitoring clock cycle.

p9566 SI SDI stop response / SI SDI stop

Data type: Integer16	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit Safety Integrated application	
Can be changed in the operating state:	Commissioning (Safety Integrated)	
Parameter group:	Extended functions	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
0	4	1

Description: Sets the stop response for the SDI function (Safe Direction).
This setting applies to both directions of motion.

Value:
0: STO (Safe Torque Off)
1: SS1 (Safe Stop 1)
2: SS1E (Safe Stop 1 External)
3: SS2 (Safe Stop 2)
4: SS2E (Safe Stop 2 External)

Dependency: See also: p9564, p9565
See also: C01716

p9568 SI SAM velocity limit / SI SAM v_lim

Data type: FloatingPoint32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit Safety Integrated application	
Can be changed in the operating state:	Commissioning (Safety Integrated)	
Parameter group:	Extended functions	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: mm/min	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
0.00 [mm/min]	1000.00 [mm/min]	0.00 [mm/min]

Description: Sets the velocity limit for function SAM (Safe Acceleration Monitor).
The SAM limit value is limited downward to this value.

p9568 SI SAM velocity limit / SI SAM v_lim

Variant:	S210 (Safety rotary axis)
Data type: FloatingPoint32	**Visible in:** Standard display
Read permission:	Read drive data or acknowledge messages
Write permission:	Edit Safety Integrated application
Can be changed in the operating state:	Commissioning (Safety Integrated)
Parameter group:	Extended functions
Not relevant for motor type:	-

Dyn. index [0...n]:	-	**Calculated:** -
Unit: rpm	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
0.00 [rpm]	1000.00 [rpm]	0.00 [rpm]

Description: Sets the velocity limit for function SAM (Safe Acceleration Monitor).
The SAM limit value is limited downward to this value.

p9576 SI SLA filter time / SI SLA filt

Data type: FloatingPoint32 | **Visible in:** Standard display

Read permission: Read drive data or acknowledge messages

Write permission: Edit Safety Integrated application

Can be changed in the operating state: Commissioning (Safety Integrated)

Parameter group: Extended functions

Not relevant for motor type: -

Dyn. index [0...n]:	-	**Calculated:** -
Unit: ms	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
0.00 [ms]	500.00 [ms]	0.00 [ms]

Description: Sets the filter time for the acceleration monitoring with a fine resolution of the acceleration.

Note

The filter time is only active after the function has been enabled (p9604.13 = 1).
SLA: Safely-Limited Acceleration

p9578 SI SLA acceleration limit / SI SLA limit

Data type: FloatingPoint32 | **Visible in:** Standard display

Read permission: Read drive data or acknowledge messages

Write permission: Edit Safety Integrated application

Can be changed in the operating state: Commissioning (Safety Integrated)

Parameter group: Extended functions

Not relevant for motor type: -

Dyn. index [0...n]:	-	**Calculated:** -
Unit: m/s²	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
0.00 [m/s²]	1000.00 [m/s²]	1.00 [m/s²]

Description: Sets the acceleration limit for function SLA (Safely-Limited Acceleration).

Dependency: See also: p9579
See also: C01717

p9578 SI SLA acceleration limit / SI SLA limit

Variant: S210 (Safety rotary axis)

Data type: FloatingPoint32 | **Visible in:** Standard display

Read permission: Read drive data or acknowledge messages

Write permission: Edit Safety Integrated application

Can be changed in the operating state: Commissioning (Safety Integrated)

Parameter group: Extended functions

Not relevant for motor type: -

Dyn. index [0...n]:	-	**Calculated:** -
Unit: rev/s²	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
0.00 [rev/s²]	1000.00 [rev/s²]	1.00 [rev/s²]

Description: Sets the acceleration limit for function SLA (Safely-Limited Acceleration).

Dependency: See also: p9579
See also: C01717

p9579 SI SLA stop response / SI SLA stop

Data type: Integer16	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit Safety Integrated application	
Can be changed in the operating state:	Commissioning (Safety Integrated)	
Parameter group:	Extended functions	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
0	4	1

Description: Sets the stop response for function SLA.

Value:
0: STO (Safe Torque Off)
1: SS1 (Safe Stop 1)
2: SS1E (Safe Stop 1 External)
3: SS2 (Safe Stop 2)
4: SS2E (Safe Stop 2 External)

Dependency: See also: p9578
See also: C01717

Note
SI: Safety Integrated
SLA: Safely-Limited Acceleration
SS1: Safe Stop 1
SS1E: Safe Stop 1 External (Safe Stop 1 with external stop)
SS2: Safe Stop 2
SS2E: Safe Stop 2 External (Safe Stop 2 with external stop)
STO: Safe Torque Off

p9581 SI SBR reference velocity for SS1 and SS2 / SI SBR vRef

Data type: FloatingPoint32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit Safety Integrated application	
Can be changed in the operating state:	Commissioning (Safety Integrated)	
Parameter group:	Extended functions	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: mm/min	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
600.0000 [mm/min]	1000000.0000 [mm/min]	1500.0000 [mm/min]

Description: Sets the reference velocity for monitoring SBR (Safe Brake Ramp) for SS1 (Safe Stop 1) and SS2 (Safe Stop 2).

Dependency: The SBR brake ramp gradient depends on p9581 (reference velocity) and p9583 (reference time).
See also: p9582, p9583

p9581 SI SBR reference velocity for SS1 and SS2 / SI SBR vRef

Variant: S210 (Safety rotary axis)
Data type: FloatingPoint32 | **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit Safety Integrated application
Can be changed in the operating state: Commissioning (Safety Integrated)
Parameter group: Extended functions
Not relevant for motor type: -

Dyn. index [0...n]: -		**Calculated:** -
Unit: rpm	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
600.0000 [rpm]	1000000.0000 [rpm]	1500.0000 [rpm]

Description: Sets the reference velocity for monitoring SBR (Safe Brake Ramp) for SS1 (Safe Stop 1) and SS2 (Safe Stop 2).

Dependency: The SBR brake ramp gradient depends on p9581 (reference velocity) and p9583 (reference time).
See also: p9582, p9583

p9582 SI SAM/SBR delay time for SS1 and SS2 / SI SAM_SBR t_del

Data type: FloatingPoint32 | **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit Safety Integrated application
Can be changed in the operating state: Commissioning (Safety Integrated)
Parameter group: Extended functions
Not relevant for motor type: -

Dyn. index [0...n]: -		**Calculated:** -
Unit: ms	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
10.00 [ms]	99000.00 [ms]	50.00 [ms]

Description: Sets the delay time for monitoring SAM (Safe Acceleration Monitor) / SBR (Safe Brake Ramp) for SS1 (Safe Stop 1) and SS2 (Safe Stop 2).
The SAM/SBR monitoring is started once the delay time has expired.

Dependency: See also: p9581, p9583

Note
The set time is rounded internally to an integer multiple of the monitoring clock cycle.
Internally, the set time is limited downwards (lower limit) to two safety monitoring clock cycles (2 * p9500).

p9583 SI SBR reference time for SS1 and SS2 / SI SBR tRef

Data type: FloatingPoint32 | **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit Safety Integrated application
Can be changed in the operating state: Commissioning (Safety Integrated)
Parameter group: Extended functions
Not relevant for motor type: -

Dyn. index [0...n]: -		**Calculated:** -
Unit: s	**Unit group:** -	**Unit selection:** -

Min:	**Max:**	**Factory setting:**
0.50 [s]	3600.00 [s]	10.00 [s]

Description: Sets the reference time for monitoring SBR (Safe Brake Ramp) for SS1 (Safe Stop 1) and SS2 (Safe Stop 2).

Dependency: The SBR brake ramp gradient depends on p9581 (reference velocity) and p9583 (reference time).

See also: p9581, p9582

Note

The set time is rounded internally to an integer multiple of the monitoring clock cycle.

p9584 SI SBR velocity limit / SI SBR v_lim

Data type: FloatingPoint32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit Safety Integrated application	
Can be changed in the operating state:	Commissioning (Safety Integrated)	
Parameter group:	Extended functions	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: mm/min	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
0.00 [mm/min]	1000.00 [mm/min]	0.00 [mm/min]

Description: Sets the velocity limit for monitoring SBR (Safe Brake Ramp).

The SBR lower limit value is limited to this value.

Dependency: See also: p9568

p9584 SI SBR velocity limit / SI SBR v_lim

Variant:	S210 (Safety rotary axis)	
Data type: FloatingPoint32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit Safety Integrated application	
Can be changed in the operating state:	Commissioning (Safety Integrated)	
Parameter group:	Extended functions	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: rpm	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
0.00 [rpm]	1000.00 [rpm]	0.00 [rpm]

Description: Sets the velocity limit for monitoring SBR (Safe Brake Ramp).

The SBR lower limit value is limited to this value.

Dependency: See also: p9568

p9591 SI SBR reference velocity for SS1E and SS2E / SI SBR vRef E

Data type: FloatingPoint32	**Visible in:** Standard display
Read permission:	Read drive data or acknowledge messages
Write permission:	Edit Safety Integrated application
Can be changed in the operating state:	Commissioning (Safety Integrated)
Parameter group:	Extended functions
Not relevant for motor type:	-

Dyn. index [0...n]:	-	**Calculated:** -
Unit: mm/min	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
600.0000 [mm/min]	1000000.0000 [mm/min]	1500.0000 [mm/min]

Description: Sets the reference velocity for monitoring SBR (Safe Brake Ramp) for SS1E (Safe Stop 1 External) and SS2E (Safe Stop 2 External).

Dependency: The gradient of the SBR braking ramp depends on p9591 (reference velocity) and p9593 (reference time).

See also: p9592, p9593

p9591 SI SBR reference velocity for SS1E and SS2E / SI SBR vRef E

Variant:	S210 (Safety rotary axis)	
Data type: FloatingPoint32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit Safety Integrated application	
Can be changed in the operating state:	Commissioning (Safety Integrated)	
Parameter group:	Extended functions	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: rpm	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
600.0000 [rpm]	1000000.0000 [rpm]	1500.0000 [rpm]

Description: Sets the reference velocity for monitoring SBR (Safe Brake Ramp) for SS1E (Safe Stop 1 External) and SS2E (Safe Stop 2 External).

Dependency: The gradient of the SBR braking ramp depends on p9591 (reference velocity) and p9593 (reference time).

See also: p9592, p9593

p9592 SI SAM/SBR delay time for SS1E and SS2E / SI SAM_SBR t_del E

Data type: FloatingPoint32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit Safety Integrated application	
Can be changed in the operating state:	Commissioning (Safety Integrated)	
Parameter group:	Extended functions	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: ms	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
10.00 [ms]	99000.00 [ms]	50.00 [ms]

Description: Sets the delay time for monitoring SAM (Safe Acceleration Monitor) / SBR (Safe Brake Ramp) for SS1E (Safe Stop 1 External) and SS2E (Safe Stop 2 External).

The SAM/SBR monitoring is started once the delay time has expired.

Dependency: See also: p9591, p9593

Note

The set time is rounded internally to an integer multiple of the monitoring clock cycle.

Internally, the set time is limited downwards (lower limit) to two safety monitoring clock cycles (2 * p9500).

p9593 SI SBR reference time for SS1E and SS2E / SI SBR tRef E

Data type: FloatingPoint32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	

Write permission:	Edit Safety Integrated application	
Can be changed in the operating state:	Commissioning (Safety Integrated)	
Parameter group:	Extended functions	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: s	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
0.50 [s]	3600.00 [s]	10.00 [s]

Description: Sets the reference time for monitoring SBR (Safe Brake Ramp) for SS1E (Safe Stop 1 External) and SS2E (Safe Stop 2 External).

Dependency: The gradient of the SBR braking ramp depends on p9591 (reference velocity) and p9593 (reference time).

See also: p9591, p9592

Note

The set time is rounded internally to an integer multiple of the monitoring clock cycle.

p9594 SI transition time SS1E to STO / SI t SS1E->STO

Data type: FloatingPoint32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit Safety Integrated application	
Can be changed in the operating state:	Commissioning (Safety Integrated)	
Parameter group:	Extended functions	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: ms	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
0.00 [ms]	3.6e+06 [ms]	100.00 [ms]

Description: Sets the transition time from SS1E (Safe Stop 1 External) to STO (Safe Torque Off).

The parameter has no effect for motion monitoring functions with safe brake ramp monitoring (p9607 = 2).

Dependency: See also: p9560

See also: C01702

Note

The set time is rounded internally to an integer multiple of the monitoring clock cycle.

p9595 SI SLA delay time / SI SLA t_delay

Data type: FloatingPoint32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit Safety Integrated application	
Can be changed in the operating state:	Commissioning (Safety Integrated)	
Parameter group:	Extended functions	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: ms	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
0.00 [ms]	600000.00 [ms]	100.00 [ms]

Description: Sets the delay time for function SLA (Safely-Limited Acceleration).

SLA is activated from state "SLA inactive" with this delay time.

Note
The set time is rounded internally to an integer multiple of the monitoring clock cycle.

p9596 SI SOS delay time / SI SOS t_del

Data type: FloatingPoint32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit Safety Integrated application	
Can be changed in the operating state:	Commissioning (Safety Integrated)	
Parameter group:	Extended functions	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: ms	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
0.00 [ms]	600000.00 [ms]	100.00 [ms]

Description: Sets the delay time for the SOS function (Safe Operating Stop).
Activating SOS from state "SOS inactive" is always realized with this delay time.

Dependency: See also: p9530

Note
The set time is rounded internally to an integer multiple of the monitoring clock cycle.

p9603.0...1 SI control / SI control

Data type: Unsigned32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit Safety Integrated application	
Can be changed in the operating state:	Commissioning (Safety Integrated)	
Parameter group:	Safety Integrated	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
-	-	0000 bin

Description: Sets the type of control for the safety functions integrated in the drive.

Bit array:

Bit	Signal name	1 signal	0 signal
00	Control via F-DI	Enable	Inhibit
01	Control via PROFIsafe	Enable	Inhibit

Note
When online safety commissioning has been completed, a change results in an automatic restart.
If no bit is set, then Safety Integrated is inhibited for this drive.
When controlled via terminal (bit 00 = 1 signal), only STO / SS1 / SS1E may be interconnected.

p9604.0...30 SI enable / SI enable

Data type: Unsigned32	**Visible in:** Standard display
Read permission:	Read drive data or acknowledge messages
Write permission:	Edit Safety Integrated application
Can be changed in the operating state:	Commissioning (Safety Integrated)
Parameter group:	Safety Integrated

Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
-	-	0000 0000 0000 0000 0000 0000 0000 0000 bin

Description: Sets the enable signal for the safety functions integrated in the drive.

Bit array:

Bit	Signal name	1 signal	0 signal
00	Enable STO	Enable	Inhibit
01	Enable SBC	Enable	Inhibit
02	Enable SS1	Enable	Inhibit
03	Enable SS1E	Enable	Inhibit
04	Enable SS2	Enable	Inhibit
05	Enable SS2E	Enable	Inhibit
07	Enable SOS	Enable	Inhibit
08	Enable SLS	Enable	Inhibit
09	Enable SLS dynamic	Enable	Inhibit
11	Enable SDI	Enable	Inhibit
12	Enable SSM	Enable	Inhibit
13	Enable SLA	Enable	Inhibit
23	Enable SBT	Enable	Inhibit
30	Enable F-DI in PROFIsafe telegram	Enable	Inhibit

p9606 SI SS1 function specification / SI SS1 fct spec

Data type: Integer16	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit Safety Integrated application	
Can be changed in the operating state:	Commissioning (Safety Integrated)	
Parameter group:	Basic functions	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
0	2	0

Description: Sets the function specification of the SS1 (Safe Stop 1) safety function integrated in the drive.

Value:

0:	none
1:	with SAM
2:	with SBR

p9607 SI SS1E function specification / SI SS1E fct spec

Data type: Integer16	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit Safety Integrated application	
Can be changed in the operating state:	Commissioning (Safety Integrated)	
Parameter group:	Basic functions	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -

Unit: -	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
0	2	0

Description: Sets the function specification of the SS1E (Safe Stop 1 External) safety function integrated in the drive.

Value:
0: none
1: with SAM
2: with SBR

p9608 SI SS2 function specification / SI SS2 fct spec

Data type: Integer16	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit Safety Integrated application	
Can be changed in the operating state:	Commissioning (Safety Integrated)	
Parameter group:	Extended functions	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
0	2	0

Description: Sets the function specification of the SS2 (Safe Stop 2) safety function integrated in the drive.

Value:
0: none
1: with SAM
2: with SBR

p9609 SI SS2E function specification / SI SS2E fct spec

Data type: Integer16	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit Safety Integrated application	
Can be changed in the operating state:	Commissioning (Safety Integrated)	
Parameter group:	Extended functions	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
0	2	0

Description: Sets the function specification of the SS2E (Safe Stop 2 External) safety function integrated in the drive.

Value:
0: none
1: with SAM
2: with SBR

p9610 SI PROFIsafe destination address / SI PROFIsafe dest

Data type: Unsigned16	**Visible in:** Standard display
Read permission:	Read drive data or acknowledge messages
Write permission:	Edit Safety Integrated application
Can be changed in the operating state:	Commissioning (Safety Integrated)
Parameter group:	Safety Integrated

Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
0	65534	0

Description: Sets the PROFIsafe destination address (F_Dest_Add).

Note
When online safety commissioning has been completed, a change results in an automatic restart.

p9611 SI PROFIsafe telegram selection / SI PS tel

Data type: Unsigned16	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit Safety Integrated application	
Can be changed in the operating state:	Commissioning (Safety Integrated)	
Parameter group:	Safety Integrated	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
0	902	0

Description: Sets the PROFIsafe telegram number.

Value:
- 0: No PROFIsafe telegram selected
- 30: PROFIsafe standard telegram 30, PZD-1/1
- 901: PROFIsafe SIEMENS telegram 901, PZD-3/5
- 902: PROFIsafe SIEMENS telegram 902, PZD-3/6

Dependency: See also: r60022

p9612 SI stop response for failure or control fault / SI ctrl failure

Data type: Integer16	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit Safety Integrated application	
Can be changed in the operating state:	Commissioning (Safety Integrated)	
Parameter group:	Safety Integrated	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
0	1	0

Description: Sets the stop response for failure or control fault (e.g. PROFIsafe communication).

Value:
- 0: STO
- 1: SS1

Note
For p9612 = 0 (STO):
The drive safely switches off the motor, the motor coasts down.
For p9612 = 1 (SS1):
The drive brakes the motor with OFF3 ramp-down time until standstill is detected. A switchover is then made to STO.

p9613 SI PROFIsafe source address / SI PROFIsafe src

Data type: Unsigned16	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit Safety Integrated application	
Can be changed in the operating state:	Commissioning (Safety Integrated)	
Parameter group:	Safety Integrated	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
0	65534	0

Description: Sets the PROFIsafe source address (F_Source_Add).

Note
When online safety commissioning has been completed, a change results in an automatic restart.

p9614 SI PROFIsafe F_watchdog time / SI PROFIsafe WD

Data type: Unsigned16	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit Safety Integrated application	
Can be changed in the operating state:	Commissioning (Safety Integrated)	
Parameter group:	Safety Integrated	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: ms	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
0 [ms]	65535 [ms]	0 [ms]

Description: Sets the PROFIsafe monitoring time (F_WD_Time).

p9619 SI PROFIsafe compatibility mode SS1 / SS1E / CompMode SS1/SS1E

Data type: Integer16	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit Safety Integrated application	
Can be changed in the operating state:	Commissioning (Safety Integrated)	
Parameter group:	Basic functions	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
0	1	0

Description: Sets the project conversion for the correct response of function SS1 (Safe Stop 1) or SS1E (Safe Stop 1 External).
When importing projects with V5.2 and configuring SS1/SS1E, this parameter is automatically set to the correct value.

Value:
0: No compatibility mode
1: Compatibility mode SS1/SS1E for project imports with V5.2

Note
For value = 0:
All safety settings and displays correspond to the standard response of the firmware used.

For value = 1:
A project with FW version V5.2 and SS1E was detected and converted.
The significance of the following parameter was changed:
- SI PROFIsafe control word (channels A and B) r10075/r10175
Bit 01: Selection and deselection of SS1E
Bit 18: is not evaluated.
- SI Safety Information Channel status word S_ZSW1B (r9734.0...15)
Bit 01: Display of SS1E active or SS1 as stop response
- SI Safety Information Channel status word S_ZSW2B (r9743.3...9)
Bit 03: A 0 signal is always displayed.

p9630 SI safe maximum speed encoder (rotary) / SI n_max enc rot

Data type: FloatingPoint32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit Safety Integrated application	
Can be changed in the operating state:	Commissioning (Safety Integrated)	
Parameter group:	Extended functions	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: rpm	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
0 [rpm]	300000000 [rpm]	0 [rpm]

Description: Sets the safe maximum speed for the rotary encoder (encoder side).

p9631 SI safe position accuracy encoder (rotary) / SI pos gen enc rot

Data type: FloatingPoint32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit Safety Integrated application	
Can be changed in the operating state:	Commissioning (Safety Integrated)	
Parameter group:	Extended functions	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: °	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
0.000 [°]	360.000 [°]	0.000 [°]

Description: Sets the safe position accuracy for the rotary encoder (encoder side).

r9634 SI safe maximum speed encoder detected (rotary) / SI n_Max EncRotAct

Data type: FloatingPoint32	**Visible in:** Extended display	
Read permission:	Read drive data or acknowledge messages	
Parameter group:	Extended functions	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: rpm	**Unit group:** -	**Unit selection:** -

Description: Displays the safe maximum speed for the rotary encoder (encoder side) that was detected.

r9635 SI safe position accuracy encoder detected (rotary) / SI PosAccEncRotAct

Data type: FloatingPoint32	**Visible in:** Extended display	
Read permission:	Read drive data or acknowledge messages	
Parameter group:	Extended functions	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: °	**Unit group:** -	**Unit selection:** -

Description: Displays the safe position accuracy for the rotary encoder (encoder side) that was detected.

p9659 SI brake output test timer / SI brk test timer

Data type: FloatingPoint32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit Safety Integrated application	
Can be changed in the operating state:	Commissioning (Safety Integrated)	
Parameter group:	Basic functions	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: h	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
0.00 [h]	9000.00 [h]	2160.00 [h]

Description: Sets the time interval for carrying out the forced checking procedure and testing the safety brake control.

Within the parameterized time, when function SBC (Safe Brake Control) is enabled, then the brake must have been closed or opened at least once. The monitoring time is reset each time the brake is opened or closed.

r9660 SI brake output test remaining time / SI brk test t_rem

Data type: FloatingPoint32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Parameter group:	Basic functions	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: h	**Unit group:** -	**Unit selection:** -

Description: Displays the time remaining before the brake output is tested.

p9670 SI module identification drive / Module ID drv

Data type: Unsigned32	**Visible in:** Extended display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit Safety Integrated application	
Can be changed in the operating state:	Ready for operation	
Parameter group:	Safety Integrated	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
0	4294967295	0

Description: Safety Integrated module identifier for the drive.

Replacement of the drive is identified when the safety functions are activated.

Dependency: See also: A01641

Note
After replacement, when the drive runs up, an alarm is output

p9674 SI module identifier Sensor Module / Module ID SM

Data type: Unsigned32	**Visible in:** Extended display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit Safety Integrated application	
Can be changed in the operating state:	Ready for operation	
Parameter group:	Safety Integrated	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
0	4294967295	0

Description: Module identifier of the Sensor Module.

p9675 SI module identifier encoder / Module ID encoder

Data type: Unsigned32	**Visible in:** Extended display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit Safety Integrated application	
Can be changed in the operating state:	Ready for operation	
Parameter group:	Safety Integrated	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
0	4294967295	0

Description: Module identifier of the encoder.

Note
The value = 0 when using an encoder without its own serial number.

p9676 SI identifier encoder properties / No encoder

Data type: Unsigned32	**Visible in:** Extended display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit Safety Integrated application	
Can be changed in the operating state:	Ready for operation	
Parameter group:	Safety Integrated	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
0	4294967295	0

Description: Identifier for the encoder properties.

p9677 SI offset POS1 POS2 encoder / SI offs POS1/2

Data type: Integer32	**Visible in:** Extended display

Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit Safety Integrated application	
Can be changed in the operating state:	Ready for operation	
Parameter group:	Extended functions	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
-2147483648	2147483647	0

Description: Sets the offset between encoder positions POS1 and POS2.
This value is used only once to perform a check after running up.

p9699 SI configuration alarm filtering / SI conf alarm filt

Data type: Integer16	**Visible in:** Extended display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Ready for operation	
Parameter group:	Safety Integrated	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
0	1	1

Description: Sets the enable for the "Alarm filtering" function.

Value:
0: Deactivate alarm filtering
1: Activate alarm filtering

Note
The parameter is active after a POWER ON
Only for internal Siemens use.

r9708 SI diagnostics safe position / SI safe pos

Data type: FloatingPoint32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Parameter group:	Extended functions	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: mm	**Unit group:** -	**Unit selection:** -
Type of signal interconnection:	Source numeric	**Scaling:** -

Description: Displays the actual load-side actual value.

Note
The display of the load-side position actual value is updated in the monitoring clock cycle.

r9708 SI diagnostics safe position / SI safe pos

Variant:	S210 (Safety rotary axis)
Data type: FloatingPoint32	**Visible in:** Standard display
Read permission:	Read drive data or acknowledge messages
Parameter group:	Extended functions

Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: °	**Unit group:** -	**Unit selection:** -
Type of signal interconnection:	Source numeric	**Scaling:** -

Description: Displays the actual load-side actual value.

Note

The display of the load-side position actual value is updated in the monitoring clock cycle.

r9714[0...7] SI diagnostics velocity / SI diag v

Data type: FloatingPoint32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Parameter group:	Extended functions	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: mm/min	**Unit group:** -	**Unit selection:** -
Type of signal interconnection:	Source numeric	**Scaling:** -

Description: Displays the velocity actual values for motion monitoring functions.

Index:
[0] = Load side velocity actual value
[1] = SS1: Actual SAM/SBR velocity limit
[2] = Actual SLS velocity limit
[3] = Actual SLA velocity limit
[4] = Load side filtered velocity actual value
[5] = SS2: Actual SAM/SBR velocity limit
[6] = SS1E: Actual SAM/SBR velocity limit
[7] = SS2E: Actual SAM/SBR velocity limit

Dependency: See also: r9732

NOTICE
For index [2]: This SLS velocity limit can, as a result of conversion into the internal monitoring format, deviate from the specified SLS velocity limit (see r9732).

Note

The display is updated in the SI monitoring clock cycle.

r9714[0...7] SI diagnostics velocity / SI diag v

Variant:	S210 (Safety rotary axis)	
Data type: FloatingPoint32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Parameter group:	Extended functions	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: rpm	**Unit group:** -	**Unit selection:** -
Type of signal interconnection:	Source numeric	**Scaling:** -

Description: Displays the velocity actual values for motion monitoring functions.

Index: [0] = Load side velocity actual value
[1] = SS1: Actual SAM/SBR velocity limit
[2] = Actual SLS velocity limit
[3] = Actual SLA velocity limit
[4] = Load side filtered velocity actual value
[5] = SS2: Actual SAM/SBR velocity limit
[6] = SS1E: Actual SAM/SBR velocity limit
[7] = SS2E: Actual SAM/SBR velocity limit

Dependency: See also: r9732

NOTICE
For index [2]: This SLS velocity limit can, as a result of conversion into the internal monitoring format, deviate from the specified SLS velocity limit (see r9732).

Note
The display is updated in the SI monitoring clock cycle.

r9720.0...28 SI control word / SI STW

Data type: Unsigned32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Parameter group: Safety Integrated
Not relevant for motor type: -
Dyn. index [0...n]: - **Calculated:** -
Unit: - **Unit group:** - **Unit selection:** -
Type of signal interconnection: Source binary/numeric **Scaling:** -

Description: Control signals for safety functions integrated in the drive.

Bit array:

Bit	Signal name	1 signal	0 signal
00	Deselect STO	Yes	No
01	Deselect SS1	Yes	No
02	Deselect SS2	Yes	No
03	Deselect SOS	Yes	No
04	Deselect SLS	Yes	No
07	Acknowledgment	Signal edge active	No
08	Deselect SLA	Yes	No
09	Select SLS bit 0	Set	Not set
10	Select SLS bit 1	Set	Not set
12	Deselect SDI positive	Yes	No
13	Deselect SDI negative	Yes	No
15	Deselect SSM	Yes	No
18	Deselect SS1E	Yes	No
28	Deselect SS2E	Yes	No

Note
Note: only the control signals of the available and enabled functions (see p9604) are updated. All others are 1 across the board.

r9722.0...28 SI status signals / SI status signals

Data type: Unsigned32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Parameter group: Safety Integrated
Not relevant for motor type: -

Dyn. index [0...n]: -		**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -
Type of signal interconnection: Source binary/numeric		**Scaling:** -

Description: Displays the status signals of the safety functions (synchronized signal).

Bit array:

Bit	Signal name	1 signal	0 signal
00	STO or safe pulse cancellation active	Yes	No
01	SS1 active	Yes	No
02	SS2 active	Yes	No
03	SOS active	Yes	No
04	SLS active	Yes	No
07	Internal event	No	Yes
08	SLA active	Yes	No
09	Active SLS limit value bit 0	Set	Not set
10	Active SLS limit value bit 1	Set	Not set
11	SOS selected	Yes	No
12	SDI positive active	Yes	No
13	SDI negative active	Yes	No
15	SSM (speed below limit value)	Yes	No
18	SS1E active	Yes	No
28	SS2E active	Yes	No

NOTICE

For bit 07:
An internal event is displayed if a stop function is active.
The signal state behaves in an opposite way to the PROFIsafe Standard.

Note

Only the status signals of the enabled functions (see p9604) are updated, all others are 0 across the board.
Bit 09 and bit 10 together determine the selected SLS limit value.

r9725[0...2] SI diagnostics data cross-check / SI diag KDV

Data type: Unsigned32	**Visible in:** Extended display	
Read permission:	Read drive data or acknowledge messages	
Parameter group:	Safety Integrated	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -

Description: Displays the diagnostics of the data cross-check.

For index [0]

Number of the data, which, for the data cross-check between the two monitoring channels, led to the SCF (Safety Channel Failure) on the drive.

For index [1]:

Displays the value from channel A for a KDV error.

For index [2]:

Displays the value from channel B for a KDV error.

Index: [0] = Message value for KDV
[1] = KDV actual value channel A
[2] = KDV actual value channel B

Dependency: See also: C01769

Note

KDV: Data cross-check

r9728 SI actual checksum configuration of the safety functions / SI act CRC FctConf

Data type: Unsigned32	**Visible in:** Extended display	
Read permission:	Read drive data or acknowledge messages	
Parameter group:	Safety Integrated	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -

Description: Displays the checksum over the checked parameters used to configure safety functions (actual checksum).

Dependency: See also: p9729

p9729 SI reference checksum configuration of the safety functions / SI set CRC FctConf

Data type: Unsigned32	**Visible in:** Extended display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit Safety Integrated application	
Can be changed in the operating state:	Commissioning (Safety Integrated)	
Parameter group:	Safety Integrated	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
0000 hex	FFFF FFFF hex	A1A1 A1A1 hex

Description: Sets the checksum over the checked parameters used to configure safety functions (reference checksum).

Dependency: See also: r9728

r9730 SI Safe maximum velocity / SI safe v_max

Data type: FloatingPoint32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Parameter group:	Extended functions	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: mm/min	**Unit group:** -	**Unit selection:** -

Description: Displays the safe maximum velocity (on the load side) that is permissible for the safe motion monitoring functions as a result of the actual value sensing.

This parameter indicates up to which load velocity the safe encoder actual values (redundant encoder coarse position) can still be correctly detected as a result of the particular encoder parameterization.

This parameter is only of significance for enabled Safety Integrated applications with encoder (otherwise "0").

r9730 SI Safe maximum velocity / SI safe v_max

Variant:	S210 (Safety rotary axis)	
Data type: FloatingPoint32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Parameter group:	Extended functions	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: rpm	**Unit group:** -	**Unit selection:** -

Description: Displays the safe maximum velocity (on the load side) that is permissible for the safe motion monitoring functions as a result of the actual value sensing.

This parameter indicates up to which load velocity the safe encoder actual values (redundant encoder coarse position) can still be correctly detected as a result of the particular encoder parameterization.

This parameter is only of significance for enabled Safety Integrated applications with encoder (otherwise "0").

r9731 SI safe position accuracy / SI pos_accuracy

Data type: FloatingPoint32 **Visible in:** Standard display

Read permission: Read drive data or acknowledge messages

Parameter group: Extended functions

Not relevant for motor type: -

Dyn. index [0...n]: - **Calculated:** -

Unit: mm **Unit group:** - **Unit selection:** -

Description: Displays the safe position accuracy (load side).

As a result of the actual value sensing for safe motion monitoring functions, this accuracy can be achieved as the maximum.

The parameter is only of significance for enabled Safety Integrated applications with encoder (otherwise "0").

r9731 SI safe position accuracy / SI pos_accuracy

Variant: S210 (Safety rotary axis)

Data type: FloatingPoint32 **Visible in:** Standard display

Read permission: Read drive data or acknowledge messages

Parameter group: Extended functions

Not relevant for motor type: -

Dyn. index [0...n]: - **Calculated:** -

Unit: ° **Unit group:** - **Unit selection:** -

Description: Displays the safe position accuracy (load side).

As a result of the actual value sensing for safe motion monitoring functions, this accuracy can be achieved as the maximum.

The parameter is only of significance for enabled Safety Integrated applications with encoder (otherwise "0").

r9732[0...1] SI velocity resolution / SI v_res

Data type: FloatingPoint32 **Visible in:** Standard display

Read permission: Read drive data or acknowledge messages

Parameter group: Extended functions

Not relevant for motor type: -

Dyn. index [0...n]: - **Calculated:** -

Unit: mm/min **Unit group:** - **Unit selection:** -

Description: Displays the velocity resolution for safety-relevant motion monitoring functions.

For index [0]:

Displays the safe velocity resolution (load side). Setpoints for velocity limits or parameter changes for velocities below this threshold have no effect.

For index [1]:

Displays the safe velocity resolution based on the safe encoder accuracy.

Index: [0] = Actual velocity resolution

[1] = Minimum velocity resolution

Note
For index [0]:
This parameter does not provide any information about the actual accuracy of the velocity sensing. This depends on the type of actual value sensing, the gear factors as well as the quality of the encoder being used.
Conversion of:
(internal fixed value / Tsi) to mm/min (linear) or rpm (rotary) with Tsi = p9500 (SI monitoring cycle).
Example:
For Tsi = 4 ms, r9732[0] = 15 mm/min (linear) or 1/24 rpm (rotary) is obtained.

For index [1]:
- Only takes into account the coarse encoder resolution and is an internal calculation, which also incorporates the factor for the motor-load side conversion, the gear ratio and the SI monitoring clock cycle.

r9732[0...1] SI velocity resolution / SI v_res

Variant: S210 (Safety rotary axis)
Data type: FloatingPoint32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Parameter group: Extended functions
Not relevant for motor type: -
Dyn. index [0...n]: - **Calculated:** -
Unit: rpm **Unit group:** - **Unit selection:** -

Description: Displays the velocity resolution for safety-relevant motion monitoring functions.
For index [0]:
Displays the safe velocity resolution (load side). Setpoints for velocity limits or parameter changes for velocities below this threshold have no effect.
For index [1]:
Displays the safe velocity resolution based on the safe encoder accuracy.

Index: [0] = Actual velocity resolution
[1] = Minimum velocity resolution

Note
For index [0]:
This parameter does not provide any information about the actual accuracy of the velocity sensing. This depends on the type of actual value sensing, the gear factors as well as the quality of the encoder being used.
Conversion of:
(internal fixed value / Tsi) to mm/min (linear) or rpm (rotary) with Tsi = p9500 (SI monitoring cycle).
Example:
For Tsi = 4 ms, r9732[0] = 15 mm/min (linear) or 1/24 rpm (rotary) is obtained.

For index [1]:
- Only takes into account the coarse encoder resolution and is an internal calculation, which also incorporates the factor for the motor-load side conversion, the gear ratio and the SI monitoring clock cycle.

r9733[0...2] SI effective setpoint velocity limiting / SI setp_limit

Data type: FloatingPoint32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Parameter group: Extended functions
Not relevant for motor type: -
Dyn. index [0...n]: - **Calculated:** -
Unit: rpm **Unit group:** - **Unit selection:** -
Type of signal interconnection: Source numeric **Scaling:** p2000

Description: Displays the necessary setpoint velocity limit as a result of the selected motion monitoring functions.

Contrary to the parameterization of the Safety Integrated limit values, this parameter specifies the motor-side limit value and not the load-side limit value.

Index: [0] = Setpoint limiting positive
[1] = Setpoint limiting negative
[2] = Setpoint limit absolute

Dependency: For SLS: r9733[0] = p9531[x] x p9533 (converted from the load side to the motor side)
For SDI negative: r9733[0] = 0
For SLS: r9733[1] = - p9531[x] x p9533 (converted from the load side to the motor side)
For SDI positive: r9733[1] = 0
[x] = selected SLS limit value
Conversion factor from the load side to the motor side:
- Motor type = rotary and axis type = linear: p9522 / (p9521 x p9520)
- Otherwise: p9522 / p9521
See also: p9531, p9533

NOTICE
If only the absolute value of the setpoint velocity limiting is required, then r9733[2] must be selected.

Note

The unit changeover between linear and rotary axis is not implemented via the safety changeover (r9502) but by the linear motor changeover.
If the "SLS" or "SDI" function is not selected, r9733[0] shows p1082 and r9733[1] shows -p1082.
The display in r9733 can be delayed by up to one SI monitoring clock cycle as compared to the display in r9720 and r9722.
When selecting a safety function, where standstill is reached or required (e.g. STO, SS1), then setpoint 0 is specified in r9733.

r9734.0...15 SI Safety Information Channel status word S_ZSW1B / SIC S_ZSW1B

Data type: Unsigned16	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Parameter group:	Safety Integrated	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -
Type of signal interconnection:	Source binary/numeric	**Scaling:** -

Description: Displays status word S_ZSW1B for the SIC (Safety Information Channel).

Bit array:

Bit	Signal name	1 signal	0 signal
00	STO selected or active	Yes	No
01	SS1 active	Yes	No
02	SS2 active	Yes	No
03	SOS active	Yes	No
04	SLS active	Yes	No
05	SOS selected	Yes	No
06	SLS selected	Yes	No
07	Internal event	Yes	No
08	SLA selected	Yes	No
09	Select SLS bit0	Yes	No
10	Select SLS bit1	Yes	No
12	SDI positive selected	Yes	No
13	SDI negative selected	Yes	No
14	ESR retract requested	Yes	No
15	Safety message present	Yes	No

Note
For bit 07:
An internal event is displayed if a stop function is active.

r9743.3...9 SI Safety Information Channel status word S_ZSW2B / SIC S_ZSW2B

Data type: Unsigned16 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Parameter group: Safety Integrated
Not relevant for motor type: -
Dyn. index [0...n]: - **Calculated:** -
Unit: - **Unit group:** - **Unit selection:** -
Type of signal interconnection: Source binary/numeric **Scaling:** -

Description: Displays status word S_ZSW2B for the SIC (Safety Information Channel).

Bit array:

Bit	Signal name	1 signal	0 signal
03	SS1E active	Yes	No
08	SDI positive selected	Yes	No
09	SDI negative selected	Yes	No

r9750[0...63].0...20 SI diagnostic attributes / SI diag_attr

Data type: Unsigned32 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Parameter group: Safety Integrated
Not relevant for motor type: -
Dyn. index [0...n]: - **Calculated:** -
Unit: - **Unit group:** - **Unit selection:** -

Description: Displays the diagnostic attributes of the safety messages that have occurred.

Bit array:

Bit	Signal name	1 signal	0 signal
00	Hardware replacement recommended	Yes	No
15	Message has gone	Yes	No
16	PROFIdrive fault class bit 0	High	Low
17	PROFIdrive fault class bit 1	High	Low
18	PROFIdrive fault class bit 2	High	Low
19	PROFIdrive fault class bit 3	High	Low
20	PROFIdrive fault class bit 4	High	Low

Note
The buffer parameters are cyclically updated in the background (refer to status signal in r2139).
The structure of the safety message buffer and the assignment of the indices is shown in r60045.
Bit 20, 19, 18, 17, 16 =
0, 0, 0, 0, 0 --> PROFIdrive message class 0: Not assigned
0, 0, 0, 0, 1 --> PROFIdrive message class 1: Hardware/software fault
0, 0, 0, 1, 0 --> PROFIdrive message class 2: Line fault
0, 0, 0, 1, 1 --> PROFIdrive message class 3: Supply voltage fault
0, 0, 1, 0, 0 --> PROFIdrive message class 4: DC link fault
0, 0, 1, 0, 1 --> PROFIdrive message class 5: Power electronics fault
0, 0, 1, 1, 0 --> PROFIdrive message class 6: Overtemperature, electronics component
0, 0, 1, 1, 1 --> PROFIdrive message class 7: Ground fault/interphase fault detected
0, 1, 0, 0, 0 --> PROFIdrive message class 8: Motor overload
0, 1, 0, 0, 1 --> PROFIdrive message class 9: Communications error to higher-level control
0, 1, 0, 1, 0 --> PROFIdrive message class 10: Safe monitoring channel has identified an error
0, 1, 0, 1, 1 --> PROFIdrive message class 11: Incorrect position actual value/speed actual value or not available
0, 1, 1, 0, 0 --> PROFIdrive message class 12: Internal communications error
0, 1, 1, 0, 1 --> PROFIdrive message class 13: Infeed faulted
0, 1, 1, 1, 0 --> PROFIdrive message class 14: Braking controller / Braking Module faulted
0, 1, 1, 1, 1 --> PROFIdrive message class 15: Line filter faulted
1, 0, 0, 0, 0 --> PROFIdrive message class 16: External measured value/signal state outside the permissible range
1, 0, 0, 0, 1 --> PROFIdrive message class 17: Application/technological function fault
1, 0, 0, 1, 0 --> PROFIdrive message class 18: Error in the parameterization/configuration/commissioning sequence
1, 0, 0, 1, 1 --> PROFIdrive message class 19: General drive fault
1, 0, 1, 0, 0 --> PROFIdrive message class 20: Auxiliary unit faulted

r9753[0...63] SI message value for float values / SI msg_val float

Data type: FloatingPoint32 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Parameter group: Safety Integrated
Not relevant for motor type: -
Dyn. index [0...n]: - **Calculated:** -
Unit: - **Unit group:** - **Unit selection:** -

Description: Displays additional information about the safety message that has occurred for float values.
Dependency: See also: r9754, r9755, r9756, r60044, r60045, r60048, r60049, p60052

r9754[0...63] SI message time received in days / SI t_msg recv days

Data type: Unsigned16 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Parameter group: Safety Integrated
Not relevant for motor type: -
Dyn. index [0...n]: - **Calculated:** -
Unit: - **Unit group:** - **Unit selection:** -

Description: Displays the relative system runtime in days when the safety message occurred.
Dependency: See also: r9753, r9755, r9756, r60044, r60045, r60048, r60049, p60052

r9755[0...63] SI message time removed in milliseconds / SI t_msg rem ms

Data type: Unsigned32 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Parameter group: Safety Integrated
Not relevant for motor type: -
Dyn. index [0...n]: - **Calculated:** -

	Unit: ms	**Unit group:** -	**Unit selection:** -

Description: Displays the relative system runtime in milliseconds when the safety message was removed.

Dependency: See also: r9753, r9754, r9756, r60044, r60045, r60048, r60049, p60052

r9756[0...63] SI message time removed in days / SI t_msg rem days

Data type: Unsigned16 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Parameter group: Safety Integrated
Not relevant for motor type: -
Dyn. index [0...n]: - **Calculated:** -
Unit: - **Unit group:** - **Unit selection:** -

Description: Displays the relative system runtime in days when the safety message was removed.

Dependency: See also: r9753, r9754, r9755, r60044, r60045, r60048, r60049, p60052

r9768[0...8] Receive SI PROFIsafe control words / SI PS PZD recv

Data type: Unsigned16 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Parameter group: Safety Integrated
Not relevant for motor type: -
Dyn. index [0...n]: - **Calculated:** -
Unit: - **Unit group:** - **Unit selection:** -

Description: Displays the received PROFIsafe telegram.

Index:
[0] = PZD 1
[1] = PZD 2
[2] = PZD 3
[3] = PZD 4
[4] = PZD 5
[5] = PZD 6
[6] = PZD 7
[7] = PZD 8
[8] = PZD 9

Dependency: See also: r9769

Note
The PROFIsafe trailer at the end of the telegram is displayed (5 bytes).

r9769[0...8] Send SI PROFIsafe status words / SI PS PZD send

Data type: Unsigned16 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Parameter group: Safety Integrated
Not relevant for motor type: -
Dyn. index [0...n]: - **Calculated:** -
Unit: - **Unit group:** - **Unit selection:** -

Description: Displays the PROFIsafe telegram to be sent.

Index: [0] = PZD 1
[1] = PZD 2
[2] = PZD 3
[3] = PZD 4
[4] = PZD 5
[5] = PZD 6
[6] = PZD 7
[7] = PZD 8
[8] = PZD 9

Dependency: See also: r9768

Note
The PROFIsafe trailer at the end of the telegram is displayed (5 bytes).

r9770[0...7] SI PROFIsafe configuration of the F-PLC / SI Config F-PLC

Data type: Unsigned16	**Visible in:** Extended display	
Read permission:	Read drive data or acknowledge messages	
Parameter group:	Safety Integrated	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -

Description: Displays the configuration data received from the F-PLC (when control via PROFIsafe is enabled).

Index: [0] = Telegram number
[1] = Control telegram length from the F-PLC in bytes
[2] = Status telegram length to the F-PLC in bytes
[3] = F_PRM_FLAG1, F_PRM_FLAG2
[4] = F_Source_Add
[5] = F_Dest_Add
[6] = F_WD_Time
[7] = F_Par_CRC

r9771[0...43] SI PROFIsafe diagnostics information CRC error / SI PS diag CRC err

Data type: Unsigned8	**Visible in:** Extended display	
Read permission:	Read drive data or acknowledge messages	
Parameter group:	Safety Integrated	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -

Description: Diagnostics data for CRC error in the cyclic PROFIsafe communication. The information regarding the last signaled CRC error is always displayed.

Structure of the diagnostic information:
Bytes 0 to 1: diagnostic data structure version
Bytes 2 to 9: IncNo_1: used in the V2.6.1 mode
Bytes 10 to 17: IncNo_2: used in the V2.6.1 mode
Bytes 18 to 21: received telegram CRC
Bytes 22 to 25: expected telegram CRC
Bytes 26 to 29: VirtualConsecutiveNo: used in the V2.4 mode
Bytes 30 to 33: Code name: used in the V2.6.1 mode
Bytes 34 to 37: Modifier: used in the V2.6.1 mode
Bytes 38 to 41: CRC of the iParameters (not used)
Bytes 42 to 43: CRC of the F-parameters

r9776.0...4 SI diagnostics / SI diag

Data type: Unsigned32 | **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Parameter group: Safety Integrated
Not relevant for motor type: -
Dyn. index [0...n]: - | **Calculated:** -
Unit: - | **Unit group:** - | **Unit selection:** -
Type of signal interconnection: Source binary | **Scaling:** -

Description: Displays the operating state, referred to the safety functions. The parameter is used for diagnostics.

Bit array:

Bit	Signal name	1 signal	0 signal
00	Safety parameter changed	Yes	No
01	Safety functions enabled	Yes	No
02	Safety component replaced and data save required	Yes	No
03	Safety component replaced and acknowledge/save required	Yes	No
04	Safety commissioning mode active	Yes	No

Note
For bit 00 = 1:
At least one safety parameter was changed. The change only becomes effective after a restart, which is automatically performed after exiting safety commissioning.
For bit 01 = 1:
Safety functions have been enabled and are active.
For bit 02 = 1:
A safety-relevant component was replaced. Saving required (p0977 = 1 or retentively save).
For bit 03 = 1:
A safety-relevant component was replaced. Acknowledgment using the commissioning tool (with CCI command SF_ACKNOWLEDGE_DATA) and saving (p0977 = 1 or retentively save) required.
For bit 04 = 1:
The safety commissioning mode is selected.

r9780[0...1] SI checksum to check changes / SI chg chksm

Data type: Unsigned32 | **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Parameter group: Safety Integrated
Not relevant for motor type: -
Dyn. index [0...n]: - | **Calculated:** -
Unit: - | **Unit group:** - | **Unit selection:** -

Description: Displays the checksum to track changes for Safety Integrated.

These are additional checksums that are created to track changes to relevant safety parameters (fingerprint for the "safety logbook" functionality).

Index: [0] = SI checksum to track functional changes

[1] = SI checksum to track hardware-specific changes

Dependency: See also: p9729, p9797

r9781[0...1] SI change control time stamp days / SI chg chksm days

Data type: Unsigned16 **Visible in:** Standard display

Read permission: Read drive data or acknowledge messages

Parameter group: Safety Integrated

Not relevant for motor type: -

Dyn. index [0...n]: - **Calculated:** -

Unit: - **Unit group:** - **Unit selection:** -

Description: Displays the day component of the time stamp for the checksums for tracking changes for Safety Integrated.

The time stamps are generated for the checksums (r9780[0...1]) (fingerprint for the "safety logbook" functionality)

Index: [0] = SI time stamp for checksum to track functional changes

[1] = SI time stamp for checksum to track hardware-specific changes

Dependency: See also: p9729, p9797, p9799

See also: C01690

Note

The time comprises r9781 (days) and r9782 (milliseconds).

r9782[0...1] SI change control time stamp milliseconds / SI chg t ms

Data type: Unsigned32 **Visible in:** Standard display

Read permission: Read drive data or acknowledge messages

Parameter group: Safety Integrated

Not relevant for motor type: -

Dyn. index [0...n]: - **Calculated:** -

Unit: ms **Unit group:** - **Unit selection:** -

Description: Displays the millisecond component of the time stamp for the checksums for tracking changes for Safety Integrated.

The time stamps are generated for the checksums (r9780[0...1]) (fingerprint for the "safety logbook" functionality)

Index: [0] = SI time stamp for checksum to track functional changes

[1] = SI time stamp for checksum to track hardware-specific changes

Dependency: See also: p9729, p9797, p9799

See also: C01690

Note

The time comprises r9781 (days) and r9782 (milliseconds).

r9789[0...2] SI SLA acceleration diagnostics / SI SLA a diag

Data type: FloatingPoint32 **Visible in:** Standard display

Read permission: Read drive data or acknowledge messages

Parameter group: Extended functions

Not relevant for motor type: -

Dyn. index [0...n]: - **Calculated:** -

Unit: m/s² **Unit group:** - **Unit selection:** -

Type of signal interconnection: Source numeric **Scaling:** -

Description: Display for the actual acceleration values and limit values for SLA (Safely-Limited Acceleration).

Index:
[0] = Acceleration actual value on the load side
[1] = Lower acceleration limit
[2] = Upper acceleration limit

Note
The display is updated in the safety monitoring clock cycle.
Unit for linear axis: meters / (second * second)
Unit for rotary axis: revolution / (second * second)

r9789[0...2] SI SLA acceleration diagnostics / SI SLA a diag

Variant: S210 (Safety rotary axis)
Data type: FloatingPoint32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Parameter group: Extended functions
Not relevant for motor type: -
Dyn. index [0...n]: - **Calculated:** -
Unit: rev/s² **Unit group:** - **Unit selection:** -
Type of signal interconnection: Source numeric **Scaling:** -

Description: Display for the actual acceleration values and limit values for SLA (Safely-Limited Acceleration).

Index:
[0] = Acceleration actual value on the load side
[1] = Lower acceleration limit
[2] = Upper acceleration limit

Note
The display is updated in the safety monitoring clock cycle.
Unit for linear axis: meters / (second * second)
Unit for rotary axis: revolution / (second * second)

r9790[0...1] SI SLA acceleration resolution / SI SLA a_res

Data type: FloatingPoint32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Parameter group: Extended functions
Not relevant for motor type: -
Dyn. index [0...n]: - **Calculated:** -
Unit: m/s² **Unit group:** - **Unit selection:** -

Description: Displays the acceleration resolution (load side) for function SLA (Safely-Limited Acceleration).
Setpoints for acceleration limits or parameter changes for acceleration levels below this threshold have no effect.

Index:
[0] = Coarse resolution
[1] = Fine resolution

Note
This parameter does not provide any information about the actual accuracy of the acceleration sensing. This depends on the type of actual value sensing, the gear factors as well as the quality of the encoder being used.
Conversion of:
(internal fixed value/ Tsi²) to m/s² (linear) or 1/s² (rotary) with Tsi = p9500 (SI monitoring clock cycle)
Example:
Coarse resolution: for Tsi = 4 ms, r9790[0] = 0.0625 m/s² (linear) or 0.173611 1/s² (rotary) is obtained.
Fine resolution: for Tsi = 4 ms, r9790[1] = 0.0000625 m/s² (linear) or 0.000173611 1/s² (rotary) is obtained.

r9790[0...1] SI SLA acceleration resolution / SI SLA a_res

Variant: S210 (Safety rotary axis)
Data type: FloatingPoint32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages

Parameter group:	Extended functions	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: rev/s²	**Unit group:** -	**Unit selection:** -

Description: Displays the acceleration resolution (load side) for function SLA (Safely-Limited Acceleration).
Setpoints for acceleration limits or parameter changes for acceleration levels below this threshold have no effect.

Index: [0] = Coarse resolution
[1] = Fine resolution

Note
This parameter does not provide any information about the actual accuracy of the acceleration sensing. This depends on the type of actual value sensing, the gear factors as well as the quality of the encoder being used.
Conversion of:
(internal fixed value/ Tsi²) to m/s² (linear) or 1/s² (rotary) with Tsi = p9500 (SI monitoring clock cycle)
Example:
Coarse resolution: for Tsi = 4 ms, r9790[0] = 0.0625 m/s² (linear) or 0.173611 1/s² (rotary) is obtained.
Fine resolution: for Tsi = 4 ms, r9790[1] = 0.0000625 m/s² (linear) or 0.000173611 1/s² (rotary) is obtained.

r9794 SI actual checksum safety enable / SI act CRC ENA

Data type: Unsigned32	**Visible in:** Extended display	
Read permission:	Read drive data or acknowledge messages	
Parameter group:	Safety Integrated	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -

Description: Displays the checksum over the parameters to enable the safety functions (actual checksum).

Dependency: See also: p9795

p9795 SI reference checksum safety enable / SI set CRC ENA

Data type: Unsigned32	**Visible in:** Extended display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit Safety Integrated application	
Can be changed in the operating state:	Commissioning (Safety Integrated)	
Parameter group:	Safety Integrated	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
0000 hex	FFFF FFFF hex	A1A1 A1A1 hex

Description: Sets the checksum over the parameters for enabling the safety functions (reference checksum).

Dependency: See also: r9794

r9796 SI actual checksum PROFIsafe addresses / SI act CRC PA

Data type: Unsigned32	**Visible in:** Extended display	
Read permission:	Read drive data or acknowledge messages	
Parameter group:	Safety Integrated	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -

Description: Displays the checksum over the parameters for the PROFIsafe addresses (actual checksum).

Dependency: See also: p9797

p9797 SI reference checksum PROFIsafe addresses / SI set CRC PA

Data type: Unsigned32 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Write permission: Edit Safety Integrated application
Can be changed in the operating state: Commissioning (Safety Integrated)
Parameter group: Safety Integrated
Not relevant for motor type: -
Dyn. index [0...n]: - **Calculated:** -
Unit: - **Unit group:** - **Unit selection:** -

Min:	Max:	Factory setting:
0000 hex	FFFF FFFF hex	A1A1 A1A1 hex

Description: Sets the checksum over the parameters for the PROFIsafe addresses (reference checksum).
Dependency: See also: r9796

r9798 SI actual checksum over the drive configuration / SI act CRC DOconf

Data type: Unsigned32 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Parameter group: Safety Integrated
Not relevant for motor type: -
Dyn. index [0...n]: - **Calculated:** -
Unit: - **Unit group:** - **Unit selection:** -

Description: Displays the checksum over the checksum-checked parameters to configure the drive (actual checksum).
Dependency: See also: p9799

p9799 SI reference checksum over the configuration of the drive / SI ref CRC DOconf

Data type: Unsigned32 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Write permission: Edit Safety Integrated application
Can be changed in the operating state: Commissioning (Safety Integrated)
Parameter group: Safety Integrated
Not relevant for motor type: -
Dyn. index [0...n]: - **Calculated:** -
Unit: - **Unit group:** - **Unit selection:** -

Min:	Max:	Factory setting:
0000 hex	FFFF FFFF hex	A1A1 A1A1 hex

Description: Sets the checksum over the checksum-checked parameters to configure the drive (reference checksum).
Dependency: See also: r9798

r9828 SI actual checksum configuration of safety functions channel B / SI act CRCfctConfB

Data type: Unsigned32 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Parameter group: Safety Integrated
Not relevant for motor type: -
Dyn. index [0...n]: - **Calculated:** -
Unit: - **Unit group:** - **Unit selection:** -

Description: Displays the checksum over the checksum-checked parameters to configure safety functions (actual checksum) channel B.

Dependency: See also: p9829

p9829 SI reference checksum configuration of safety functions chan. B / SI set CRCfctConfB

Data type: Unsigned32 | **Visible in:** Extended display

Read permission: Read drive data or acknowledge messages

Write permission: Edit Safety Integrated application

Can be changed in the operating state: Commissioning (Safety Integrated)

Parameter group: Safety Integrated

Not relevant for motor type: -

Dyn. index [0...n]:	-	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
0000 hex	FFFF FFFF hex	B2B2 B2B2 hex

Description: Sets the checksum over the checked parameters used to configure safety functions (reference checksum).

Dependency: See also: r9828

r9894 SI actual checksum safety enable channel B / SI act CRC ENA B

Data type: Unsigned32 | **Visible in:** Extended display

Read permission: Read drive data or acknowledge messages

Parameter group: Safety Integrated

Not relevant for motor type: -

Dyn. index [0...n]:	-	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -

Description: Displays the checksum over the parameters to enable the safety functions (actual checksum) channel B.

Dependency: See also: p9895

p9895 SI reference checksum safety enable channel B / SI ref CRC ENA B

Data type: Unsigned32 | **Visible in:** Extended display

Read permission: Read drive data or acknowledge messages

Write permission: Edit Safety Integrated application

Can be changed in the operating state: Commissioning (Safety Integrated)

Parameter group: Safety Integrated

Not relevant for motor type: -

Dyn. index [0...n]:	-	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
0000 hex	FFFF FFFF hex	B2B2 B2B2 hex

Description: Sets the checksum over the parameters for enabling the safety functions (reference checksum) channel B.

Dependency: See also: r9894

r9896 SI actual checksum PROFIsafe addresses channel B / SI act CRC PA B

Data type: Unsigned32 | **Visible in:** Extended display

Read permission: Read drive data or acknowledge messages

Parameter group: Safety Integrated

Not relevant for motor type: -

	Dyn. index [0...n]:	-	**Calculated:** -
	Unit: -	**Unit group:** -	**Unit selection:** -
Description:	Displays the checksum over the parameters for the PROFIsafe addresses (act checksum) chan B.		
Dependency:	See also: p9897		

p9897 SI reference checksum PROFIsafe addresses channel B / SI set CRC PA B

	Data type: Unsigned32	**Visible in:** Extended display	
	Read permission:	Read drive data or acknowledge messages	
	Write permission:	Edit Safety Integrated application	
	Can be changed in the operating state:	Commissioning (Safety Integrated)	
	Parameter group:	Safety Integrated	
	Not relevant for motor type:	-	
	Dyn. index [0...n]:	-	**Calculated:** -
	Unit: -	**Unit group:** -	**Unit selection:** -
	Min:	**Max:**	**Factory setting:**
	0000 hex	FFFF FFFF hex	B2B2 B2B2 hex
Description:	Sets the checksum over the parameters for the PROFIsafe addresses (reference checksum) channel B		
Dependency:	See also: r9896		

r9898 SI actual checksum configuration of the drive, channel B / SI act CRC DOconfB

	Data type: Unsigned32	**Visible in:** Extended display	
	Read permission:	Read drive data or acknowledge messages	
	Parameter group:	Safety Integrated	
	Not relevant for motor type:	-	
	Dyn. index [0...n]:	-	**Calculated:** -
	Unit: -	**Unit group:** -	**Unit selection:** -
Description:	Displays the checksum over the checksum-checked parameters to configure the drive (actual checksum) channel B.		
Dependency:	See also: p9899		

p9899 SI reference checksum over the drive configuration, channel B / SI ref CRC DOconfB

	Data type: Unsigned32	**Visible in:** Extended display	
	Read permission:	Read drive data or acknowledge messages	
	Write permission:	Edit Safety Integrated application	
	Can be changed in the operating state:	Commissioning (Safety Integrated)	
	Parameter group:	Safety Integrated	
	Not relevant for motor type:	-	
	Dyn. index [0...n]:	-	**Calculated:** -
	Unit: -	**Unit group:** -	**Unit selection:** -
	Min:	**Max:**	**Factory setting:**
	0000 hex	FFFF FFFF hex	B2B2 B2B2 hex
Description:	Sets the checksum over the checksum-checked parameters to configure the drive (reference checksum) channel B.		
Dependency:	See also: r9898		

p10000.0 SI F-DI enable / SI F-DI enable

	Data type: Unsigned8	**Visible in:** Standard display	
	Read permission:	Read drive data or acknowledge messages	
	Write permission:	Edit Safety Integrated application	

Can be changed in the operating state:	Commissioning (Safety Integrated)	
Parameter group:	Safety Integrated	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
-	-	0000 bin

Description: Sets the enable signal for the failsafe digital inputs.

Bit array:

Bit	Signal name	1 signal	0 signal
00	F-DI 0 (X130/2.1, X130/2.3)	Enabled	Not enabled

Note

- Digital inputs of F-DI that have not been enabled can be used for non-safety-related functions.
- Only F-DI that have been enabled are monitored in a safety-relevant way. It is not permissible that the associated DI are used as non-safety-related functions, as they can be subject to test pulses.

p10002 SI F-DI changeover discrepancy time / SI F-DI chg t

Data type: FloatingPoint32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit Safety Integrated application	
Can be changed in the operating state:	Commissioning (Safety Integrated)	
Parameter group:	Safety Integrated	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: ms	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
1.00 [ms]	2000.00 [ms]	500.00 [ms]

Description: Sets the discrepancy time for digital inputs.

The signal states at the two associated digital inputs (F-DI) must assume the same state within this discrepancy time.

Note

The time must be set longer than the SI monitoring clock cycle.

p10017[0...2] SI digital inputs input filter / SI F-DI t_filt

Data type: FloatingPoint32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit Safety Integrated application	
Can be changed in the operating state:	Commissioning (Safety Integrated)	
Parameter group:	Safety Integrated	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: ms	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
1.00 [ms]	100.00 [ms]	4.00 [ms]

Description: Setting the input filter for the digital inputs.
The input filter is rounded off to whole milliseconds and accepted.
The input filter acts on the following digital inputs:
- Failsafe digital inputs (F-DI).

Example:
Input filter = 1 ms: Fault pulses of 1 ms are filtered; only pulses longer than 2 ms are processed.
Input filter = 3 ms: Fault pulses of 3 ms are filtered; only pulses longer than 4 ms are processed.
The input filtering result can be read in r10051 and r10151.
The set input filter impacts the response time of the safety function.

Index: [0] = F-DI 0
[1] = Reserved
[2] = Reserved

NOTICE
The maximum length of cables that are connected to a fail-safe digital input is 30 m.

Note
If the self test is enabled using externally specified dark pulses (p10041 = 3) for at least one F-DI, then p10017 must be set longer than the maximum duration of the dark pulses + 2 ms. If the test pulses are specified using the switchable power supply (p10041 = 1), then this means p10017 > p10018 + 2 ms.

p10018 SI F-DI self test length dark pulses VS+ / SI F-DI pulsLength

Data type: FloatingPoint32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit Safety Integrated application	
Can be changed in the operating state:	Commissioning (Safety Integrated)	
Parameter group:	Safety Integrated	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: ms	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
0 [ms]	50 [ms]	0 [ms]

Description: Sets the dark pulse length of the switchable power supply for the self test using specified dark pulses (p10041) of the F-DI.
Value = 0: switchable power supply, permanently switched on.
Value > 0: dark pulse length for the switchable power supply. The test cycle is fixed at 5 s.

Note
The dark pulses of the switchable power supply are only enabled for the self test using specified dark pulses (p10041 = 1).
The switchable power supply is continuously switched on if another self test was set

p10019 SI F-DI self test external dark pulses wait time / SI F-DI ext puls_t

Data type: FloatingPoint32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit Safety Integrated application	
Can be changed in the operating state:	Commissioning (Safety Integrated)	
Parameter group:	Safety Integrated	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -

Unit: s	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
10 [s]	3600 [s]	1020 [s]

Description: Sets the maximum wait time for the dark pulses for the F-DI self test using an externally specified test pulses.

Note
This parameter is only active for F-DIs that are tested using external test pulses (p10041[x] = 3).

c10022 SI STO input terminal / SI STO F-DI

Data type: Unsigned8
Visible in: Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit Safety Integrated application
Parameter group: Safety Integrated
Not relevant for motor type: -
Dyn. index [0...n]: -
Calculated: -
Unit: -
Unit group: -
Unit selection: -
Type of signal interconnection: Sink binary
Factory interconnection: Fixed value: 1

Description: Signal for the axis-specific selection of function "STO (Safe Torque Off)" (control via F-DI).

Note
F-DI: Failsafe Digital Input

c10023 SI SS1 input terminal / SI SS1 F-DI

Data type: Unsigned8
Visible in: Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit Safety Integrated application
Parameter group: Safety Integrated
Not relevant for motor type: -
Dyn. index [0...n]: -
Calculated: -
Unit: -
Unit group: -
Unit selection: -
Type of signal interconnection: Sink binary
Factory interconnection: Fixed value: 1

Description: Signal for selecting function "SS1 (Safe Stop 1)".

Note
F-DI: Failsafe Digital Input

p10040.0 SI F-DI input mode / SI F-DI InpModeChA

Data type: Unsigned8
Visible in: Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit Safety Integrated application
Can be changed in the operating state: Commissioning (Safety Integrated)
Parameter group: Safety Integrated
Not relevant for motor type: -
Dyn. index [0...n]: -
Calculated: -

Unit: -	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
-	-	0000 bin

Description: Sets the input mode for the safety digital inputs (F-DI).

Bit array:

Bit	Signal name	1 signal	0 signal
00	F-DI 0, DI 3+ (X130/2.3)	NO contact	NC contact

Note
Only an NC contact can be connected for the safety digital inputs not listed.

p10041[0...2] SI F-DI self test mode selection / SI F-DI test mode

Data type: Integer16 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit Safety Integrated application
Can be changed in the operating state: Commissioning (Safety Integrated)
Parameter group: Safety Integrated
Not relevant for motor type: -
Dyn. index [0...n]: - **Calculated:** -
Unit: - **Unit group:** - **Unit selection:** -

Min:	Max:	Factory setting:
0	3	0

Description: Enable for the F-DI self test.

Value:
0: Self test using internal test signals
1: Self test using specified dark pulses (VS+)
3: Self test using externally specified dark pulses

Index:
[0] = F-DI 0
[1] = Reserved
[2] = Reserved

Note
Mode 1:
A check is made whether p10017 is > p10018 + 2 ms and whether p10018 is set > 0.

c10050[0...2] SI status F-DI via PROFIsafe / SI F-DI above PS

Data type: Unsigned8 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit Safety Integrated application
Parameter group: Safety Integrated
Not relevant for motor type: -
Dyn. index [0...n]: - **Calculated:** -
Unit: - **Unit group:** - **Unit selection:** -
Type of signal interconnection: Sink binary
Factory interconnection: Fixed value: 0

Description: The state of the selected failsafe digital inputs F-DIs is transferred to the F-control via PROFIsafe.

Index:
[0] = F-DI via Profisafe status 1
[1] = Reserved
[2] = Reserved

Note
F-DI: Failsafe Digital Input

r10051.0 SI digital inputs status channel A / SI DI status chA

Data type: Unsigned8 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Parameter group: Safety Integrated

Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -
Type of signal interconnection:	Source binary/numeric	**Scaling:** -

Description: Display for the single-channel, logical and debounced status of the failsafe digital inputs of channel A.

Bit array:

Bit	Signal name	1 signal	0 signal
00	Status of DI 2+ (X130/2.1)	Logical 1	Logical 0

Dependency: See also: p10017

Note

The relationship between the logic level and the external voltage level at the input is intended for the use of a safety function:
Normally closed contacts have for
- 0 V at the input, a logical signal level of "0".
- 24 V at the input, a logical signal level of "1".
As a consequence, for an NC/NC contact parameterization for
- 0 V at both inputs of the F-DI results in a status of the F-DI equal to "0" (safety function selected),
- 24 V at both inputs of the F-DI results in a status of the F-DI equal to "1" (safety function selected),

F-DI: Failsafe Digital Input

c10060 SI SS1E input terminal / SI SS1E F-DI

Data type: Unsigned8	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit Safety Integrated application	
Parameter group:	Safety Integrated	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -
Type of signal interconnection:	Sink binary	
Factory interconnection:	Fixed value: 1	

Description: Signal for selecting function "SS1E (Safe Stop 1 External)".

Note

F-DI: Failsafe Digital Input

r10071.0 SI F-DI status / SI F-DI status

Data type: Unsigned8	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Parameter group:	Safety Integrated	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -
Type of signal interconnection:	Source binary/numeric	**Scaling:** -

Description: Display for the status of the failsafe digital inputs.

Bit array:

Bit	Signal name	1 signal	0 signal
00	Status of the F-DI 0	Logical 1	Logical 0

Note
The following applies:
- Logical "0": Safety function is selected
- Logical "1": safety function is deselected

F-DI: Failsafe Digital Input

r10075.0...28 SI PROFIsafe control word / SI S_STW2

Data type: Unsigned32 | **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Parameter group: Safety Integrated
Not relevant for motor type: -
Dyn. index [0...n]: - | **Calculated:** -
Unit: - | **Unit group:** - | **Unit selection:** -
Type of signal interconnection: Source binary/numeric | **Scaling:** -

Description: Displays the control signals for safety functions integrated in the drive only via PROFIsafe.

Bit array:

Bit	Signal name	1 signal	0 signal
00	Deselect STO	Yes	No
01	Deselect SS1	Yes	No
02	Deselect SS2	Yes	No
03	Deselect SOS	Yes	No
04	Deselect SLS	Yes	No
07	Acknowledgment	Signal edge active	No
08	Deselect SLA	Yes	No
09	Select SLS bit 0	Set	Not set
10	Select SLS bit 1	Set	Not set
12	Deselect SDI positive	Yes	No
13	Deselect SDI negative	Yes	No
15	Deselect SSM	Yes	No
18	Deselect SS1E	Yes	No
28	Deselect SS2E	Yes	No

r10076 SI PROFIsafe SLS-LIMIT / SI S_SLS_LIM_A

Data type: Integer16 | **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Parameter group: Safety Integrated
Not relevant for motor type: -
Dyn. index [0...n]: - | **Calculated:** -
Unit: - | **Unit group:** - | **Unit selection:** -
Type of signal interconnection: Source numeric | **Scaling:** -

Description: Scaling for limit value SLS1 via PROFIsafe telegram 901.
The value range 1 ... 32767 corresponds to 0.01 % ... 100 % of limit value SLS1.
An invalid value results in the stop response parameterized in p9563[0].

Also for scaled limit value SLS1, the SLS2, SLS3 and SLS4 limit values can be selected using r9720.9 and r9720.10.

r10080.0...28 SI status signals channel A / SI status chA

Data type: Unsigned32 | **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages

Parameter group:	Safety Integrated		
Not relevant for motor type:	-		
Dyn. index [0...n]:	-	**Calculated:** -	
Unit: -	**Unit group:** -	**Unit selection:** -	
Type of signal interconnection:	Source binary/numeric	**Scaling:** -	

Description: Status signals (channel A) for safety-relevant motion monitoring functions integrated in the drive.

Bit array:

Bit	Signal name	1 signal	0 signal
00	STO or safe pulse cancellation active	Yes	No
01	SS1 active	Yes	No
02	SS2 active	Yes	No
03	SOS active	Yes	No
04	SLS active	Yes	No
07	Internal event	No	Yes
08	SLA active	Yes	No
09	Active SLS limit value bit 0	Set	Not set
10	Active SLS limit value bit 1	Set	Not set
11	SOS selected	Yes	No
12	SDI positive active	Yes	No
13	SDI negative active	Yes	No
15	SSM (speed below limit value)	Yes	No
18	SS1E active	Yes	No
28	SS2E active	Yes	No

NOTICE

For bit 07:
An internal event is displayed if a stop function is active.
The signal state behaves in an opposite way to the PROFIsafe Standard.

Note

Only the status signals of the available and enabled functions (see p9604) are updated. All others are 0 across the board.

r10098 SI actual checksum across device-specific parameters / SI act CRC DO conf

Data type: Unsigned32	**Visible in:** Extended display	
Read permission:	Read drive data or acknowledge messages	
Parameter group:	Safety Integrated	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -

Description: Displays the checksum over the checksum-checked parameters for the device-specific parameters of the drive system (actual checksum).

Dependency: See also: p10099

p10099 SI reference checksum across device-specific parameters / SI set CRC DO conf

Data type: Unsigned32	**Visible in:** Extended display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit Safety Integrated application	
Can be changed in the operating state:	Commissioning (Safety Integrated)	
Parameter group:	Safety Integrated	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -

Unit: -	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
0000 hex	FFFF FFFF hex	A1A1 A1A1 hex

Description: Displays the checksum over the checksum-checked parameters for the device-specific parameters of the drive system (reference checksum).

Dependency: See also: r10098

r10151.0 SI digital inputs status channel B / SI DI status chB

Data type: Unsigned8	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Parameter group:	Safety Integrated	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -
Type of signal interconnection:	Source binary/numeric	**Scaling:** -

Description: Display for the single-channel, logical and debounced status of the failsafe digital inputs of channel B.

Bit array:

Bit	Signal name	1 signal	0 signal
00	Status of the DI 3+ (X130/2.3)	Logical 1	Logical 0

Dependency: See also: p10017, p10040

Note

The relationship between the logic level and the external voltage level at the input depends on the parameterization (see p10040) of the input as NC contact or NO contact, and is aligned to the use of a safety function:

With 24 V at the input, NC contacts have a logical "1" level, for 0 V at the input, a logical "0" level.

This means that an NC/NC contact parameterization of 0 V at both inputs of the F-DI leads to a status of the F-DI equal to "0" (safety function selected), for 24 V at both inputs of the F-DI, to a status of the F-DI equal to "1" (safety function deselected).

With 24 V at the input, NO contacts have a logical "0" level, for 0 V at the input, a logical "1" level. This means that for an NC/NO contact parameterization, the level 0 V/24 V leads to a status of the F-DI equal to "0" (safety function selected), the level 24 V/0 V leads to status of the F-DI equal to "1" (safety function deselected).

F-DI: Failsafe Digital Input

r10171.0 SI F-DI status channel B / SI F-DI status B

Data type: Unsigned8	**Visible in:** Extended display	
Read permission:	Read drive data or acknowledge messages	
Parameter group:	Safety Integrated	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -

Description: Display for the status of the failsafe digital inputs.

Bit array:

Bit	Signal name	1 signal	0 signal
00	Status of the F-DI 0	Logical 1	Logical 0

Note

If a safety function (e.g. via c10022) is controlled via an F-DI, then the following applies:

- Logical "0": Safety function is selected
- Logical "1": safety function is deselected

F-DI: Failsafe Digital Input

r10175.0...28 SI PROFIsafe control word channel B / SI S_STW2 B

Data type: Unsigned32	**Visible in:** Extended display
Read permission:	Read drive data or acknowledge messages

Parameter group:	Safety Integrated		
Not relevant for motor type:	-		
Dyn. index [0...n]:	-	**Calculated:** -	
Unit: -	**Unit group:** -	**Unit selection:** -	

Description: Displays the control signals for safety-related motion monitoring functions integrated in the drive via PROFIsafe.

Bit array:

Bit	Signal name	1 signal	0 signal
00	Deselect STO	Yes	No
01	Deselect SS1	Yes	No
02	Deselect SS2	Yes	No
03	Deselect SOS	Yes	No
04	Deselect SLS	Yes	No
07	Acknowledgment	Signal edge active	No
08	Deselect SLA	Yes	No
09	Select SLS bit 0	Set	Not set
10	Select SLS bit 1	Set	Not set
12	Deselect SDI positive	Yes	No
13	Deselect SDI negative	Yes	No
15	Deselect SSM	Yes	No
18	Deselect SS1E	Yes	No
28	Deselect SS2E	Yes	No

r10176 SI PROFIsafe S_SLS_LIMIT_A channel B / SI S_SLS_LIM B

Data type: Integer16	**Visible in:** Extended display		
Read permission:	Read drive data or acknowledge messages		
Parameter group:	Safety Integrated		
Not relevant for motor type:	-		
Dyn. index [0...n]:	-	**Calculated:** -	
Unit: -	**Unit group:** -	**Unit selection:** -	

Description: Dynamic limit value input for SLS (Safely-Limited Speed) via PROFIsafe.

r10180.0...28 SI status signals channel B / SI status chB

Data type: Unsigned32	**Visible in:** Extended display		
Read permission:	Read drive data or acknowledge messages		
Parameter group:	Safety Integrated		
Not relevant for motor type:	-		
Dyn. index [0...n]:	-	**Calculated:** -	
Unit: -	**Unit group:** -	**Unit selection:** -	
Type of signal interconnection:	Source binary/numeric	**Scaling:** -	

Description: Status signals (channel B) for safety-relevant motion monitoring functions integrated in the drive.

Bit array:

Bit	Signal name	1 signal	0 signal
00	STO or safe pulse cancellation active	Yes	No
01	SS1 active	Yes	No
02	SS2 active	Yes	No
03	SOS active	Yes	No
04	SLS active	Yes	No
07	Internal event	No	Yes
08	SLA active	Yes	No
09	Active SLS limit value bit 0	Set	Not set
10	Active SLS limit value bit 1	Set	Not set

11	SOS selected	Yes	No
12	SDI positive active	Yes	No
13	SDI negative active	Yes	No
15	SSM (speed below limit value)	Yes	No
18	SS1E active	Yes	No
28	SS2E active	Yes	No

NOTICE

For bit 07:
An internal event is displayed if a stop function is active.
The signal state behaves in an opposite way to the PROFIsafe Standard.

Note

Only the function status signals of the available and enabled functions (see p9604) are updated. All others are 0 across the board.

r10198 SI actual checksum across device-specific parameters channel B / SI act CRC DOconfB

Data type: Unsigned32 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Parameter group: Safety Integrated
Not relevant for motor type: -
Dyn. index [0...n]: - **Calculated:** -
Unit: - **Unit group:** - **Unit selection:** -

Description: Displays the checksum over the checksum-checked parameters for the device-specific parameters of the drive system (actual checksum) channel B.

Dependency: See also: p10199

p10199 SI reference checksum across device-specific parameters chan B / SI ref CRC DOconfB

Data type: Unsigned32 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Write permission: Edit Safety Integrated application
Can be changed in the operating state: Commissioning (Safety Integrated)
Parameter group: Safety Integrated
Not relevant for motor type: -
Dyn. index [0...n]: - **Calculated:** -
Unit: - **Unit group:** - **Unit selection:** -

Min:	Max:	Factory setting:
0000 hex	FFFF FFFF hex	B2B2 B2B2 hex

Description: Displays the checksum over the checksum-checked parameters for the device-specific parameters of the drive system (reference checksum) channel B.

Dependency: See also: r10198

p10202[0...1] SI SBT brake selection / SBT brake sel

Data type: Integer16 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit Safety Integrated application
Can be changed in the operating state: Commissioning (Safety Integrated)
Parameter group: Extended functions
Not relevant for motor type: -

Dyn. index [0...n]:	-	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
0	1	0

Description: Selects the brakes to be tested.
p10202[0] must be set to 1 to test the brake.

Value: 0: Inhibit
1: Test motor holding brake

Index: [0] = Brake 1
[1] = Reserved

Dependency: See also: C01785

p10208[0...1] SI SBT test torque ramp time / SBT M_test t_ramp

Data type: FloatingPoint32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit Safety Integrated application	
Can be changed in the operating state:	Commissioning (Safety Integrated)	
Parameter group:	Extended functions	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: ms	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
20 [ms]	10000 [ms]	1000 [ms]

Description: Sets the time, during which the test torque is ramped up against the closed brake.
The test torque is then ramped down after the safe brake test.

Index: [0] = Brake 1
[1] = Reserved

Note

The set time is rounded internally to an integer multiple of the monitoring clock cycle.

p10209[0...1] SI SBT brake holding torque / SBT brake M_stop

Data type: FloatingPoint32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit Safety Integrated application	
Can be changed in the operating state:	Commissioning (Safety Integrated)	
Parameter group:	Extended functions	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: Nm	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
1.00 [Nm]	60000.00 [Nm]	10.00 [Nm]

Description: Sets the effective holding torque on the motor side of the brake to be tested.

Index: [0] = Brake 1
[1] = Reserved

Dependency: See also: p10210, p10220

Note

The test torque effective for the brake test can be set for each sequence using a factor (p10210, p10220).

p10210[0...1] SI SBT test torque factor sequence 1 / SBT M_test fact 1

Data type: FloatingPoint32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit Safety Integrated application
Can be changed in the operating state: Commissioning (Safety Integrated)
Parameter group: Extended functions
Not relevant for motor type: -

Dyn. index [0...n]: -		**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
0.30	1.00	1.00

Description: Sets the factor for the test torque of sequence 1 for the safe brake test.
The factor is referred to the holding torque of the brake (p10209).

Index: [0] = Brake 1
[1] = Reserved

Dependency: See also: p10209, c10235

Note
The test sequence is selected using c10235.4.

p10211[0...1] SI SBT test duration sequence 1 / SBT t_test seq 1

Data type: FloatingPoint32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit Safety Integrated application
Can be changed in the operating state: Commissioning (Safety Integrated)
Parameter group: Extended functions
Not relevant for motor type: -

Dyn. index [0...n]: -		**Calculated:** -
Unit: ms	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
20 [ms]	10000 [ms]	1000 [ms]

Description: Sets the test duration for sequence 1 for the safe brake test.
The test torque is available for this time at the closed brake.

Index: [0] = Brake 1
[1] = Reserved

Dependency: See also: c10235

Note
The test sequence is selected using c10235.4.
The set time is rounded internally to an integer multiple of the monitoring clock cycle.

p10212[0...1] SI SBT position tolerance sequence 1 / SBT pos_tol seq 1

Data type: FloatingPoint32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit Safety Integrated application
Can be changed in the operating state: Commissioning (Safety Integrated)
Parameter group: Extended functions
Not relevant for motor type: -

Dyn. index [0...n]:	-	**Calculated:** -
Unit: mm	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
0.001 [mm]	360.000 [mm]	1.000 [mm]

Description: Sets the tolerated position deviation for sequence 1 for the safe brake test.

Index: [0] = Brake 1
[1] = Reserved

Note
The test sequence is selected using c10235.4.

p10212[0...1] SI SBT position tolerance sequence 1 / SBT pos_tol seq 1

Variant:	S210 (Safety rotary axis)	
Data type: FloatingPoint32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit Safety Integrated application	
Can be changed in the operating state:	Commissioning (Safety Integrated)	
Parameter group:	Extended functions	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: °	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
0.001 [°]	360.000 [°]	1.000 [°]

Description: Sets the tolerated position deviation for sequence 1 for the safe brake test.

Index: [0] = Brake 1
[1] = Reserved

Note
The test sequence is selected using c10235.4.

p10220[0...1] SI SBT test torque factor sequence 2 / SBT M_test fact 2

Data type: FloatingPoint32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit Safety Integrated application	
Can be changed in the operating state:	Commissioning (Safety Integrated)	
Parameter group:	Extended functions	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
0.30	1.00	1.00

Description: Sets the factor for the test torque of sequence 2 for the safe brake test.
The factor is referred to the holding torque of the brake (p10209).

Index: [0] = Brake 1
[1] = Reserved

Dependency: See also: p10209, c10235

Note
The test sequence is selected using c10235.4.

p10221[0...1] SI SBT test duration sequence 2 / SBT t_test seq 2

Data type: FloatingPoint32 | **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit Safety Integrated application
Can be changed in the operating state: Commissioning (Safety Integrated)
Parameter group: Extended functions
Not relevant for motor type: -
Dyn. index [0...n]: - | **Calculated:** -
Unit: ms | **Unit group:** - | **Unit selection:** -

Min:	Max:	Factory setting:
20 [ms]	10000 [ms]	1000 [ms]

Description: Sets the test duration for sequence 2 for the safe brake test.
The test torque is available for this time at the closed brake.

Index: [0] = Brake 1
[1] = Reserved

Dependency: See also: c10235

Note
The test sequence is selected using c10235.4.
The set time is rounded internally to an integer multiple of the monitoring clock cycle.

p10222[0...1] SI SBT position tolerance sequence 2 / SBT pos_tol seq 2

Data type: FloatingPoint32 | **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit Safety Integrated application
Can be changed in the operating state: Commissioning (Safety Integrated)
Parameter group: Extended functions
Not relevant for motor type: -
Dyn. index [0...n]: - | **Calculated:** -
Unit: mm | **Unit group:** - | **Unit selection:** -

Min:	Max:	Factory setting:
0.001 [mm]	360.000 [mm]	1.000 [mm]

Description: Sets the tolerated position deviation for sequence 2 for the safe brake test.

Index: [0] = Brake 1
[1] = Reserved

Dependency: See also: c10235

Note
The test sequence is selected using c10235.4.

p10222[0...1] SI SBT position tolerance sequence 2 / SBT pos_tol seq 2

Variant: S210 (Safety rotary axis)
Data type: FloatingPoint32 | **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit Safety Integrated application
Can be changed in the operating state: Commissioning (Safety Integrated)
Parameter group: Extended functions
Not relevant for motor type: -

Dyn. index [0...n]: -		**Calculated:** -
Unit: °	**Unit group:** -	**Unit selection:** -
Min: 0.001 [°]	**Max:** 360.000 [°]	**Factory setting:** 1.000 [°]

Description: Sets the tolerated position deviation for sequence 2 for the safe brake test.

Index: [0] = Brake 1
[1] = Reserved

Dependency: See also: c10235

Note

The test sequence is selected using c10235.4.

r10231.0...4 SI SBT control word diagnostics / SBT STW diag

Data type: Unsigned32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Parameter group: Extended functions
Not relevant for motor type: -
Dyn. index [0...n]: - **Calculated:** -
Unit: - **Unit group:** - **Unit selection:** -

Description: Displays the diagnostic bits for the control word of the safe brake test

Bit array:

Bit	Signal name	1 signal	0 signal
00	Select brake test	Yes	No
01	Start brake test	Yes	No
03	Select test torque sign	Negative	Positive
04	Select test sequence	Test sequence 2	Test sequence 1

r10234.0...15 SI Safety Information Channel status word S_ZSW3B / SIC S_ZSW3B

Data type: Unsigned32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Parameter group: Safety Integrated
Not relevant for motor type: -
Dyn. index [0...n]: - **Calculated:** -
Unit: - **Unit group:** - **Unit selection:** -
Type of signal interconnection: Source binary/numeric **Scaling:** -

Description: Displays status word S_ZSW3B for the SIC (Safety Information Channel).

Bit array:

Bit	Signal name	1 signal	0 signal
00	Brake test selected	Yes	No
01	Setpoint input drive/external	Drive	External
02	Active brake	Brake 2	Brake 1
03	Brake test active	Yes	No
04	Brake test result	Successful	Erroneous/not
05	Brake test completed	Yes	No
07	Actual load sign	Negative	Positive
11	SS2E active	Yes	No
15	Acceptance test mode selected	Yes	No

Note
For bits 05, 04:
A combination of bit 04 and bit 05 indicates whether a brake test returned an error or has still not been performed.
Bit 05/04 = 0/0: The brake test has still not been performed since the last restart.
Bit 05/04 = 1/0: The last brake test that was executed failed (error)
For bit 07:
Sign for the static hanging/suspended load at the motor axis; the bit can fluctuate if the axis has no connected load.

SS2E: Safe Stop 2 External (Safe Stop 2 with external stop)

c10235 SI Safety Control Channel control word S_STW3B / SCC S_STW3B

Data type: Unsigned16 | **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Parameter group: Safety Integrated
Not relevant for motor type: -
Dyn. index [0...n]: - | **Calculated:** -
Unit: - | **Unit group:** - | **Unit selection:** -
Type of signal interconnection: Sink numeric | **Scaling:** -
Factory interconnection: Fixed value: 0

Description: Signal for control word S_STW3B of the SCC (Safety Control Channel).
Dependency: This parameter is used as control word for SBT (Safe Brake Test).

r10240 SI SBT test torque diagnostics / SBT test diag

Data type: FloatingPoint32 | **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Parameter group: Extended functions
Not relevant for motor type: -
Dyn. index [0...n]: - | **Calculated:** -
Unit: Nm | **Unit group:** - | **Unit selection:** -

Description: Displays the active maximum test torque on the motor side for SBT (Safe Brake Test).
Dependency: See also: p10210, p10220

Note
The value remains displayed until the start of the next test sequence.

r10241 SI SBT load torque diagnostics / SBT load diag

Data type: FloatingPoint32 | **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Parameter group: Extended functions
Not relevant for motor type: -
Dyn. index [0...n]: - | **Calculated:** -
Unit: Nm | **Unit group:** - | **Unit selection:** -

Description: Displays the load torque for SBT (Safe Brake Test).
When initializing the brake test, this load torque is available at the drive.

Note
The value remains displayed until the brake test is deselected.

r10242 SI SBT status diagnostics / SBT status diag

Data type: Integer16 | **Visible in:** Extended display

Read permission:	Read drive data or acknowledge messages	
Parameter group:	Extended functions	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -

Description: Displays the actual status of the SBT (Safe Brake Test).

Value:

0:	Brake test inactive, wait for SBT selection
1:	Setpoint input drive
2:	Determining the load
3:	Brake test is initialized, wait for start of test sequence
4:	Start test sequence
5:	Closing the brake, establishing the test torque
6:	Brake test active, wait for test duration sequence
7:	Reduce test torque
8:	Wait for the brake to open
9:	Brake test successfully completed, wait for start deselection
10:	Change to brake test initialized - fault acknowledgment
11:	Brake test canceled, torque is reduced
12:	Brake test canceled, wait for brake to open
13:	Brake test ended with error, wait for acknowledgment
14:	Brake opening timer elapsed
15:	Error when initializing the brake test, wait for acknowledgment
16:	Change to brake test inactive, acknowledgment active

c10250 SI Safety Control Channel control word S_STW1B / SCC S_STW1B

Data type: Unsigned16	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Parameter group:	Safety Integrated	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -
Type of signal interconnection:	Sink numeric	**Scaling:** -
Factory interconnection:	Fixed value: 0	

Description: Signal for control word S_STW1B of the SCC (Safety Control Channel).

Dependency: See also: r10251

r10251.13 SI Safety Control Channel control word S_STW1B diagnostics / SCC S_STW1B diag

Data type: Unsigned32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Parameter group:	Safety Integrated	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -
Type of signal interconnection:	Source binary/numeric	**Scaling:** -

Description: Display for the diagnostics of control word S_STW1B of the SCC (Safety Control Channel).

Bit array:

Bit	Signal name	1 signal	0 signal
13	Close brake from control	Selected	Not selected

Dependency: See also: c10250

r10352.0...17 SI STO select cause / SI STO sel cause

Data type: Unsigned32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Parameter group:	Safety Integrated	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -
Type of signal interconnection:	Source binary/numeric	**Scaling:** -

Description: Reason that STO (Safe Torque Off) function was selected.

Bit array:

Bit	Signal name	1 signal	0 signal
00	Selection via F-DI	High	Low
01	Selection via PROFIsafe	High	Low
04	Safety commissioning mode active	High	Low
05	Axis parking active / missing actual value	High	Low
07	Response to SS1	High	Low
08	Response to SS1E	High	Low
09	Response to SS2	High	Low
10	Response to SS2E	High	Low
12	Stop response	High	Low
14	Response to parameterization/configuration errors	High	Low
15	Response to internal software error	High	Low
17	No communication via PROFIsafe	High	Low

r10353.0...17 SI SS1 select cause / SI SS1 sel cause

Data type: Unsigned32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Parameter group:	Safety Integrated	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -
Type of signal interconnection:	Source binary/numeric	**Scaling:** -

Description: Reason for the selection of function SS1 (Safe Stop 1).

Bit array:

Bit	Signal name	1 signal	0 signal
00	Selection via F-DI	High	Low
01	Selection via PROFIsafe	High	Low
12	Stop response	High	Low
13	Selection when transitioning to following function	High	Low
17	No communication via PROFIsafe	High	Low

r10354.0...13 SI SS2 selection cause / SI SS2 sel cause

Data type: Unsigned32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Parameter group:	Safety Integrated	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -
Type of signal interconnection:	Source binary/numeric	**Scaling:** -

Description: Reason for the selection of function SS2 (Safe Stop 2).

Bit array:	Bit	Signal name	1 signal	0 signal
	00	Selection via F-DI	High	Low
	01	Selection via PROFIsafe	High	Low
	12	Stop response	High	Low
	13	Selection when transitioning to following function	High	Low

r10355.0...10 SI SOS selection cause / SI SOS sel cause

Data type: Unsigned32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Parameter group: Safety Integrated
Not relevant for motor type: -
Dyn. index [0...n]: - **Calculated:** -
Unit: - **Unit group:** - **Unit selection:** -
Type of signal interconnection: Source binary/numeric **Scaling:** -

Description: Reason for the selection of function SOS (Safe Operating Stop).

Bit array:	Bit	Signal name	1 signal	0 signal
	00	Selection via F-DI	High	Low
	01	Selection via PROFIsafe	High	Low
	09	Response to SS2	High	Low
	10	Response to SS2E	High	Low

r10356.0...1 SI SLS select cause / SI SLS sel cause

Data type: Unsigned32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Parameter group: Safety Integrated
Not relevant for motor type: -
Dyn. index [0...n]: - **Calculated:** -
Unit: - **Unit group:** - **Unit selection:** -
Type of signal interconnection: Source binary/numeric **Scaling:** -

Description: Reason for the selection of function SLS (Safely-Limited Speed).

Bit array:	Bit	Signal name	1 signal	0 signal
	00	Selection via F-DI	High	Low
	01	Selection via PROFIsafe	High	Low

r10360.0...1 SI SDI positive select cause / SI SDIpos SelCause

Data type: Unsigned32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Parameter group: Safety Integrated
Not relevant for motor type: -
Dyn. index [0...n]: - **Calculated:** -
Unit: - **Unit group:** - **Unit selection:** -
Type of signal interconnection: Source binary/numeric **Scaling:** -

Description: Reason for the selection of SDI (Safe Direction) positive.

Bit array:	Bit	Signal name	1 signal	0 signal
	00	Selection via F-DI	High	Low
	01	Selection via PROFIsafe	High	Low

r10361.0...1 SI SDI negative select cause / SI SDIneg SelCause

Data type: Unsigned32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Parameter group: Safety Integrated
Not relevant for motor type: -
Dyn. index [0...n]: - **Calculated:** -
Unit: - **Unit group:** - **Unit selection:** -
Type of signal interconnection: Source binary/numeric **Scaling:** -

Description: Reason for the selection of SDI (Safe Direction) negative.

Bit array:

Bit	Signal name	1 signal	0 signal
00	Selection via F-DI	High	Low
01	Selection via PROFIsafe	High	Low

r10365.0...1 SI SSM select cause / SI SSM sel cause

Data type: Unsigned32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Parameter group: Safety Integrated
Not relevant for motor type: -
Dyn. index [0...n]: - **Calculated:** -
Unit: - **Unit group:** - **Unit selection:** -
Type of signal interconnection: Source binary/numeric **Scaling:** -

Description: Reason for the selection of function SSM (Safe Speed Monitor).

Bit array:

Bit	Signal name	1 signal	0 signal
00	Selection via F-DI	High	Low
01	Selection via PROFIsafe	High	Low

r10366.0...1 SI SLA selection cause / SI SLA sel cause

Data type: Unsigned32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Parameter group: Safety Integrated
Not relevant for motor type: -
Dyn. index [0...n]: - **Calculated:** -
Unit: - **Unit group:** - **Unit selection:** -
Type of signal interconnection: Source binary/numeric **Scaling:** -

Description: Displays the reason for the selection of function SLA (Safely-Limited Acceleration).

Bit array:

Bit	Signal name	1 signal	0 signal
00	Selection via F-DI	High	Low
01	Selection via PROFIsafe	High	Low

r10369.6 SI SBC selection cause / SI SBC sel cause

Data type: Unsigned32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Parameter group: Safety Integrated
Not relevant for motor type: -
Dyn. index [0...n]: - **Calculated:** -
Unit: - **Unit group:** - **Unit selection:** -
Type of signal interconnection: Source binary/numeric **Scaling:** -

Description: Reason for the selection of function SBC (Safe Brake Control)

Bit array:	Bit	Signal name	1 signal	0 signal
	06	Response to STO	High	Low

r10370.0...13 SI SS1E selection cause / SI SS1E sel cause

Data type: Unsigned32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Parameter group: Safety Integrated
Not relevant for motor type: -
Dyn. index [0...n]: - **Calculated:** -
Unit: - **Unit group:** - **Unit selection:** -
Type of signal interconnection: Source binary/numeric **Scaling:** -

Description: Reason for the selection of function SS1E (Safe Stop 1 External).

Bit array:

Bit	Signal name	1 signal	0 signal
00	Selection via F-DI	High	Low
01	Selection via PROFIsafe	High	Low
12	Stop response	High	Low
13	Selection when transitioning to following function	High	Low

r10372.0...13 SI SS2E select cause / SI SS2E sel cause

Data type: Unsigned32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Parameter group: Safety Integrated
Not relevant for motor type: -
Dyn. index [0...n]: - **Calculated:** -
Unit: - **Unit group:** - **Unit selection:** -
Type of signal interconnection: Source binary/numeric **Scaling:** -

Description: Reason for the selection of function SS2E (Safe Stop 2 External).

Bit array:

Bit	Signal name	1 signal	0 signal
00	Selection via F-DI	High	Low
01	Selection via PROFIsafe	High	Low
12	Stop response	High	Low
13	Selection when transitioning to following function	High	Low

r10452.0...17 SI STO select cause channel B / SI STO sel cause B

Data type: Unsigned32 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Parameter group: Safety Integrated
Not relevant for motor type: -
Dyn. index [0...n]: - **Calculated:** -
Unit: - **Unit group:** - **Unit selection:** -

Description: Reason for the selection of function STO (Safe Torque Off) on channel B.

Bit array:

Bit	Signal name	1 signal	0 signal
00	Selection via F-DI	High	Low
01	Selection via PROFIsafe	High	Low
04	Safety commissioning mode active	High	Low
05	Axis parking active / missing actual value	High	Low
07	Response to SS1	High	Low
08	Response to SS1E	High	Low

Bit	Signal name	1 signal	0 signal
09	Response to SS2	High	Low
10	Response to SS2E	High	Low
12	Stop response	High	Low
14	Response to parameterization/configuration errors	High	Low
15	Response to internal software error	High	Low
17	No communication via PROFIsafe	High	Low

r10453.0...17 SI SS1 select cause channel B / SI SS1 sel cause B

Data type: Unsigned32 **Visible in:** Extended display

Read permission: Read drive data or acknowledge messages

Parameter group: Safety Integrated

Not relevant for motor type: -

Dyn. index [0...n]: - **Calculated:** -

Unit: - **Unit group:** - **Unit selection:** -

Description: Reason for the selection of function SS1 (Safe Stop 1) on channel B.

Bit array:

Bit	Signal name	1 signal	0 signal
00	Selection via F-DI	High	Low
01	Selection via PROFIsafe	High	Low
12	Stop response	High	Low
13	Selection when transitioning to following function	High	Low
17	No communication via PROFIsafe	High	Low

r10454.0...13 SI SS2 selection cause channel B / SI SS2 sel cause B

Data type: Unsigned32 **Visible in:** Extended display

Read permission: Read drive data or acknowledge messages

Parameter group: Safety Integrated

Not relevant for motor type: -

Dyn. index [0...n]: - **Calculated:** -

Unit: - **Unit group:** - **Unit selection:** -

Description: Reason for the selection of function SS2 (Safe Stop 2) on channel B.

Bit array:

Bit	Signal name	1 signal	0 signal
00	Selection via F-DI	High	Low
01	Selection via PROFIsafe	High	Low
12	Stop response	High	Low
13	Selection when transitioning to following function	High	Low

r10455.0...10 SI SOS select cause channel B / SI SOS sel cause B

Data type: Unsigned32 **Visible in:** Extended display

Read permission: Read drive data or acknowledge messages

Parameter group: Safety Integrated

Not relevant for motor type: -

Dyn. index [0...n]: - **Calculated:** -

Unit: - **Unit group:** - **Unit selection:** -

Description: Reason for the selection of function SOS (Safe Operating Stop) on channel B.

Bit array:

Bit	Signal name	1 signal	0 signal
00	Selection via F-DI	High	Low
01	Selection via PROFIsafe	High	Low
09	Response to SS2	High	Low

10	Response to SS2E	High	Low

r10456.0...1 SI SLS select cause channel B / SI SLS sel cause B

Data type: Unsigned32 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Parameter group: Safety Integrated
Not relevant for motor type: -
Dyn. index [0...n]: - **Calculated:** -
Unit: - **Unit group:** - **Unit selection:** -

Description: Reason for the selection of function SLS (Safely-Limited Speed) on channel B.

Bit array:

Bit	Signal name	1 signal	0 signal
00	Selection via F-DI	High	Low
01	Selection via PROFIsafe	High	Low

r10460.0...1 SI SDI positive select cause channel B / SI SDIposSelCauseB

Data type: Unsigned32 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Parameter group: Safety Integrated
Not relevant for motor type: -
Dyn. index [0...n]: - **Calculated:** -
Unit: - **Unit group:** - **Unit selection:** -

Description: Reason for the selection of SDI (Safe Direction) positive on channel B.

Bit array:

Bit	Signal name	1 signal	0 signal
00	Selection via F-DI	High	Low
01	Selection via PROFIsafe	High	Low

r10461.0...1 SI SDI negative select cause channel B / SI SDInegSelCauseB

Data type: Unsigned32 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Parameter group: Safety Integrated
Not relevant for motor type: -
Dyn. index [0...n]: - **Calculated:** -
Unit: - **Unit group:** - **Unit selection:** -

Description: Reason for the selection of SDI (Safe Direction) negative on channel B.

Bit array:

Bit	Signal name	1 signal	0 signal
00	Selection via F-DI	High	Low
01	Selection via PROFIsafe	High	Low

r10465.0...1 SI SSM select cause channel B / SI SSM sel cause B

Data type: Unsigned32 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Parameter group: Safety Integrated
Not relevant for motor type: -
Dyn. index [0...n]: - **Calculated:** -
Unit: - **Unit group:** - **Unit selection:** -

Description: Reason for the selection of function SSM (Safe Speed Monitor) on channel B.

Bit array:

Bit	Signal name	1 signal	0 signal
00	Selection via F-DI	High	Low

01	Selection via PROFIsafe	High	Low

r10466.0...1 SI SLA select cause channel B / SI SLA sel cause B

Data type: Unsigned32 | **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Parameter group: Safety Integrated
Not relevant for motor type: -
Dyn. index [0...n]: - | **Calculated:** -
Unit: - | **Unit group:** - | **Unit selection:** -

Description: Reason for the selection of function SLA (Safely-Limited Acceleration) on channel B.

Bit array:

Bit	Signal name	1 signal	0 signal
00	Selection via F-DI	High	Low
01	Selection via PROFIsafe	High	Low

r10469.6 SI SBC selection cause channel B / SI SBC sel cause B

Data type: Unsigned32 | **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Parameter group: Safety Integrated
Not relevant for motor type: -
Dyn. index [0...n]: - | **Calculated:** -
Unit: - | **Unit group:** - | **Unit selection:** -

Description: Reason for the selection of function SBC (Safe Brake Control) on Channel B.

Bit array:

Bit	Signal name	1 signal	0 signal
06	Response to STO	High	Low

r10470.0...13 SI SS1E select cause channel B / SI SS1E SelCauseB

Data type: Unsigned32 | **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Parameter group: Safety Integrated
Not relevant for motor type: -
Dyn. index [0...n]: - | **Calculated:** -
Unit: - | **Unit group:** - | **Unit selection:** -

Description: Reason for the selection of function SS1E (Safe Stop 1 External) on channel B.

Bit array:

Bit	Signal name	1 signal	0 signal
00	Selection via F-DI	High	Low
01	Selection via PROFIsafe	High	Low
12	Stop response	High	Low
13	Selection when transitioning to following function	High	Low

r10472.0...13 SI SS2E select cause channel B / SI SS2E SelCauseB

Data type: Unsigned32 | **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Parameter group: Safety Integrated
Not relevant for motor type: -
Dyn. index [0...n]: - | **Calculated:** -
Unit: - | **Unit group:** - | **Unit selection:** -

Description: Reason for the selection of function SS2E (Safe Stop 2 External) on channel B.

Bit array:

Bit	Signal name	1 signal	0 signal

00	Selection via F-DI	High	Low
01	Selection via PROFIsafe	High	Low
12	Stop response	High	Low
13	Selection when transitioning to following function	High	Low

c11500[0...3] LR initiate absolute encoder adjustment / Abs_enc_adj_start

Data type: Unsigned8 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Parameter group: Position control
Not relevant for motor type: -
Dyn. index [0...n]: - **Calculated:** -
Unit: - **Unit group:** - **Unit selection:** -
Type of signal interconnection: Sink binary
Factory interconnection: Fixed value: 0

Description: Initiate adjustment for absolute encoder
A 0/1 signal starts the absolute encoder adjustment.

Index: [0] = Position control
[1] = Motor encoder
[2] = Encoder 2
[3] = Encoder 3

Dependency: Available with activated function: Position control
See also: p2507, r2526, c2598, p2599

CAUTION

For rotating absolute encoders, when adjusting, a range is set up symmetrically around zero with half of the encoder range, within which the position must be re-established after switch-off/switch-on. In this range, it is only permissible that the encoder overflows.
After the adjustment has been completed, it must be guaranteed that the range is not exited. The reason for this is that outside the range, there is no clear reference any longer between the encoder actual value and mechanical system.
If the home position (c2598) lies in this range, then the position actual value is set when adjusting to the home position. Otherwise, adjustment is canceled with F07443.
There is no overflow for linear absolute encoders. This means that after the adjustment, the position can be re-established in the complete traversing range after switch-off/switch-on. When adjusting, the position actual value is set to the home position.

Note

The status of the absolute encoder adjustment is indicated via p2507 and in status word r2526.
To permanently accept the determined position offset, it must be retentively saved (p0977).
This adjustment can only be initiated for an absolute encoder.

p11550 EPOS active homing reference cam selection / Ref_cam selection

Data type: Integer16 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Ready for operation
Parameter group: Homing
Not relevant for motor type: -
Dyn. index [0...n]: - **Calculated:** -
Unit: - **Unit group:** - **Unit selection:** -

Min:	**Max:**	**Factory setting:**
0	1	0

Description: Signal to evaluate "Active homing reference cam".

Value:
0: Reference cam selection 1
1: Reference cam selection 2

Dependency: Available with activated function: Basic positioner
See also: p2607, c2612

c11560 EPOS direct setpoint input/MDI acceleration setpoint / MDI a_set

Data type: FloatingPoint32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Parameter group: Direct setpoint input (MDI)
Not relevant for motor type: -
Dyn. index [0...n]: - **Calculated:** -
Unit: mm/s² **Unit group:** 12_3 **Unit selection:** p2498
Type of signal interconnection: Sink numeric **Scaling:** -
Factory interconnection: Parameter: 2572

Description: Signal for the acceleration setpoint in mode "direct setpoint input/MDI".

Dependency: Available with activated function: Basic positioner
See also: c2649, c2650

NOTICE
The parameter may be protected as a result of r0922 and cannot be changed.

Note
Depending on c2649, the acceleration setpoint is either transferred continuously or edge-triggered.

c11560 EPOS direct setpoint input/MDI acceleration setpoint / MDI a_set

Variant: S210 (Basic positioner for rotary motion)
Data type: FloatingPoint32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Parameter group: Direct setpoint input (MDI)
Not relevant for motor type: -
Dyn. index [0...n]: - **Calculated:** -
Unit: °/s² **Unit group:** 12_4 **Unit selection:** p2498
Type of signal interconnection: Sink numeric **Scaling:** -
Factory interconnection: Parameter: 2572

Description: Signal for the acceleration setpoint in mode "direct setpoint input/MDI".

Dependency: Available with activated function: Basic positioner
See also: c2649, c2650

NOTICE
The parameter may be protected as a result of r0922 and cannot be changed.

Note
Depending on c2649, the acceleration setpoint is either transferred continuously or edge-triggered.

c11561 EPOS direct setpoint input/MDI deceleration setpoint / MDI -a_set

Data type: FloatingPoint32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications

Parameter group:	Traversing blocks	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: mm/s²	**Unit group:** 12_3	**Unit selection:** p2498
Type of signal interconnection:	Sink numeric	**Scaling:** -
Factory interconnection:	Parameter: 2573	

Description: Signal for the deceleration setpoint in mode "direct setpoint input/MDI".

Dependency: Available with activated function: Basic positioner

See also: c2649, c2650

NOTICE

If, when calculating the traversing profile, it is identified that the target position with the programmed deceleration setpoint cannot be reached without reversing the direction, then when accepting the dynamic response values, the higher deceleration setpoint is accepted and becomes effective.

The parameter may be protected as a result of r0922 and cannot be changed.

Note

Depending on c2649, the deceleration setpoint is either transferred continuously or edge-triggered.

c11561 EPOS direct setpoint input/MDI deceleration setpoint / MDI -a_set

Variant:	S210 (Basic positioner for rotary motion)	
Data type: FloatingPoint32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Parameter group:	Traversing blocks	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: °/s²	**Unit group:** 12_4	**Unit selection:** p2498
Type of signal interconnection:	Sink numeric	**Scaling:** -
Factory interconnection:	Parameter: 2573	

Description: Signal for the deceleration setpoint in mode "direct setpoint input/MDI".

Dependency: Available with activated function: Basic positioner

See also: c2649, c2650

NOTICE

If, when calculating the traversing profile, it is identified that the target position with the programmed deceleration setpoint cannot be reached without reversing the direction, then when accepting the dynamic response values, the higher deceleration setpoint is accepted and becomes effective.

The parameter may be protected as a result of r0922 and cannot be changed.

Note

Depending on c2649, the deceleration setpoint is either transferred continuously or edge-triggered.

r11570 EPOS actual acceleration / a act

Data type: FloatingPoint32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Parameter group:	Jog, Traversing blocks, Direct setpoint input (MDI)	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: mm/s²	**Unit group:** 12_3	**Unit selection:** p2498
Type of signal interconnection:	Source numeric	**Scaling:** -

Description: Displays the acceleration value currently being processed.

Dependency: Available with activated function: Basic positioner
See also: p2572

Note
The maximum acceleration from p2572 is effective in operating mode "Jog" and "Active homing".

r11570 EPOS actual acceleration / a act

Variant: S210 (Basic positioner for rotary motion)
Data type: FloatingPoint32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Parameter group: Jog, Traversing blocks, Direct setpoint input (MDI)
Not relevant for motor type: -
Dyn. index [0...n]: - **Calculated:** -
Unit: °/s² **Unit group:** 12_4 **Unit selection:** p2498
Type of signal interconnection: Source numeric **Scaling:** -

Description: Displays the acceleration value currently being processed.

Dependency: Available with activated function: Basic positioner
See also: p2572

Note
The maximum acceleration from p2572 is effective in operating mode "Jog" and "Active homing".

r11571 EPOS actual deceleration / -a act

Data type: FloatingPoint32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Parameter group: Jog, Traversing blocks, Direct setpoint input (MDI)
Not relevant for motor type: -
Dyn. index [0...n]: - **Calculated:** -
Unit: mm/s² **Unit group:** 12_3 **Unit selection:** p2498
Type of signal interconnection: Source numeric **Scaling:** -

Description: Displays the deceleration value currently being processed.

Dependency: Available with activated function: Basic positioner
See also: p2573

Note
The maximum deceleration from p2573 is effective in operating mode "Jog" and "Active homing".

r11571 EPOS actual deceleration / -a act

Variant: S210 (Basic positioner for rotary motion)
Data type: FloatingPoint32 **Visible in:** Standard display
Read permission: Read drive data or acknowledge messages
Parameter group: Jog, Traversing blocks, Direct setpoint input (MDI)
Not relevant for motor type: -
Dyn. index [0...n]: - **Calculated:** -
Unit: °/s² **Unit group:** 12_4 **Unit selection:** p2498
Type of signal interconnection: Source numeric **Scaling:** -

Description: Displays the deceleration value currently being processed.

Dependency: Available with activated function: Basic positioner
See also: p2573

Note
The maximum deceleration from p2573 is effective in operating mode "Jog" and "Active homing".

p31585 VIBSUP frequency fd / Frequency fd

Data type: FloatingPoint32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Write permission:	Edit device configuration or drive applications	
Can be changed in the operating state:	Ready for operation	
Parameter group:	Technology functions	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: Hz	**Unit group:** -	**Unit selection:** -
Min:	**Max:**	**Factory setting:**
10.000 [Hz]	10000.000 [Hz]	10.000 [Hz]

Description: Sets the frequency of the damped natural vibration of the mechanical system.
This frequency can be determined by making the appropriate measurements.

Dependency: See also: r31613
See also: F53432

r31600.2...15 VIBSUP status word / ZSW

Data type: Unsigned16	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Parameter group:	Technology functions	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: -	**Unit group:** -	**Unit selection:** -
Type of signal interconnection:	Source binary/numeric	**Scaling:** -

Description: Displays the status word of VIBSUP.

Bit array:

Bit	Signal name	1 signal	0 signal
02	"Filter ready" state	Yes	No
03	"Filter being activated" state	Yes	No
04	"Filter active" state	Yes	No
05	"Filter being deactivated" state	Yes	No
06	Axis moves forward	Yes	No
07	Axis moves backward	Yes	No
08	Setpoint fixed	Yes	No
12	Immediate coupling-in possible	Yes	No
13	Tracking active	Yes	No
14	Axis accelerating	Yes	No
15	Axis decelerating	Yes	No

Note
For bit 02:
The setpoint filter is ready and can be coupled in.
For bit 03:
The filter is being coupled into the setpoint channel.
For bit 04:
The setpoint filter is activated.
For bit 05:
The filter is being coupled out of the setpoint channel.
For bit 06:
The axis moves forward.
The filtered speed setpoint is used to determine the direction of travel.
For bit 07:
The axis moves backward.
The filtered speed setpoint is used to determine the direction of travel.
For bit 12:
The filter can be immediately coupled-in.
For bit 13:
Filter tracking mode is activated.
For bit 14:
The axis accelerates.
The filtered speed setpoint is used for the calculation.
For bit 15:
The axis brakes.
The filtered speed setpoint is used for the calculation.

r31613 VIBSUP frequency fd active / fd active

Data type: FloatingPoint32	**Visible in:** Standard display	
Read permission:	Read drive data or acknowledge messages	
Parameter group:	Technology functions	
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** -
Unit: Hz	**Unit group:** -	**Unit selection:** -
Type of signal interconnection:	Source numeric	**Scaling:** -

Description: Display and numerical signal source for the active frequency fd.

Dependency: See also: p31585

r60000 PROFIdrive reference speed / PD n_ref

Data type: FloatingPoint32	**Visible in:** Extended display	
Read permission:	Read drive data or acknowledge messages	
Parameter group:		
Not relevant for motor type:	-	
Dyn. index [0...n]:	-	**Calculated:** automatic
Unit: rpm	**Unit group:** -	**Unit selection:** -

Description: Sets the reference quantity for the speed values.
All speeds specified as relative values refer to this reference quantity.
The reference quantity corresponds to 100% or 4000 hex (word) or 4000 0000 hex (double word).

Dependency: See also: p2000

Note
Parameter r60000 is an image of parameter p2000 in conformance with PROFIdrive.

r60022 PROFIsafe telegram / Ps telegr

Data type: Unsigned16 | **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Parameter group: Safety Integrated, Configuration
Not relevant for motor type: -
Dyn. index [0...n]: - | **Calculated:** -
Unit: - | **Unit group:** - | **Unit selection:** -

Description: Displays the PROFIsafe telegram.

Value:
0: No PROFIsafe telegram selected
30: PROFIsafe standard telegram 30, PZD-1/1
901: PROFIsafe SIEMENS telegram 901, PZD-3/5
902: PROFIsafe SIEMENS telegram 902, PZD-3/6

Dependency: See also: p9611

Note
When reading the parameter via PROFIdrive, value 65534 is applicable for "No PROFIsafe telegram".

r60044 SI message buffer counter changes / SI msg_buffer chg

Data type: Unsigned16 | **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Parameter group: Safety Integrated
Not relevant for motor type: -
Dyn. index [0...n]: - | **Calculated:** -
Unit: - | **Unit group:** - | **Unit selection:** -

Description: Displays the changes of the safety message buffer.
This counter is incremented every time that the safety message buffer changes.

Recommendation: This is used to check whether the safety message buffer has been read out consistently.

Dependency: See also: r9753, r9754, r9755, r9756, r60045, r60048, r60049, p60052

r60045[0...63] SI message code / SI msg_code

Data type: Unsigned16 | **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Parameter group: Safety Integrated
Not relevant for motor type: -
Dyn. index [0...n]: - | **Calculated:** -
Unit: - | **Unit group:** - | **Unit selection:** -

Description: Displays the numbers of safety messages that have occurred.

Dependency: See also: r9753, r9754, r9755, r9756, r60044, r60048, r60049, p60052

Note
The messages type "safety message" (Cxxxxx) are entered in the message fault buffer.
Message buffer structure (principle):
r60045[0], r60048[0], r60049[0], r9753[0], r9754[0], r9755[0], r9756[0] --> safety message 1 (oldest active message) of the actual message case.
...
r60045[7], r60048[7], r60049[7], r9753[7], r9754[7], r9755[7], r9756[7] --> safety message 8 (latest active message) of the actual message case,

Safety messages that have gone are automatically acknowledged.
History of acknowledged messages:
r60045[8], r60048[8], r60049[8], r9753[8], r9754[8], r9755[8], r9756[8] --> safety message 1 of the 1st acknowledged message case,
...
r60045[16], r60048[16], r60049[16], r9753[16], r9754[16], r9755[16], r9756[16] --> safety message 1 of the 2nd acknowledged message case,
...
r60045[56], r60048[56], r60049[56], r9753[56], r9754[56], r9755[56], r9756[56] --> safety message 1 of the 7th acknowledged message case,
...
r60045[63], r60048[63], r60049[63], r9753[63], r9754[63], r9755[63], r9756[63] --> safety message 8 (oldest gone message) of the 7th acknowledged message case,

r60047[0...63] SI message number / SI mess_no

Data type: Unsigned16 **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Parameter group: Safety Integrated
Not relevant for motor type: -
Dyn. index [0...n]: - **Calculated:** -
Unit: - **Unit group:** - **Unit selection:** -

Description: Displays the numbers of safety messages that have occurred.

Dependency: See also: r9753, r9754, r9755, r9756, r60044, r60048, r60049, p60052

Note
The messages type "safety message" (Cxxxxx) are entered in the message fault buffer.
Message buffer structure (principle):
r60045[0], r60048[0], r60049[0], r9753[0], r9754[0], r9755[0], r9756[0] --> safety message 1 (oldest active message) of the actual message case.
...
r60045[7], r60048[7], r60049[7], r9753[7], r9754[7], r9755[7], r9756[7] --> safety message 8 (latest active message) of the actual message case,

Safety messages that have gone are automatically acknowledged.
History of acknowledged messages:
r60045[8], r60048[8], r60049[8], r9753[8], r9754[8], r9755[8], r9756[8] --> safety message 1 of the 1st acknowledged message case,
...
r60045[16], r60048[16], r60049[16], r9753[16], r9754[16], r9755[16], r9756[16] --> safety message 1 of the 2nd acknowledged message case,
...
r60045[56], r60048[56], r60049[56], r9753[56], r9754[56], r9755[56], r9756[56] --> safety message 1 of the 7th acknowledged message case,
...
r60045[63], r60048[63], r60049[63], r9753[63], r9754[63], r9755[63], r9756[63] --> safety message 8 (oldest gone message) of the 7th acknowledged message case,

r60048[0...63] SI message time received in milliseconds / SI t_msg recv ms

Data type: Unsigned32 | **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Parameter group: Safety Integrated
Not relevant for motor type: -
Dyn. index [0...n]: - | **Calculated:** -
Unit: ms | **Unit group:** - | **Unit selection:** -

Description: Displays the relative system runtime in milliseconds when the safety message occurred.

Dependency: See also: r9753, r9754, r9755, r9756, r60044, r60045, r60049, p60052

r60049[0...63] SI message value / SI msg_value

Data type: Integer32 | **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Parameter group: Safety Integrated
Not relevant for motor type: -
Dyn. index [0...n]: - | **Calculated:** -
Unit: - | **Unit group:** - | **Unit selection:** -

Description: Displays the additional information about the safety message that occurred (as integer number).

Dependency: See also: r9753, r9754, r9755, r9756, r60044, r60045, r60048, p60052

p60052 SI message cases counter / SI msg_cases count

Data type: Unsigned16 | **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Write permission: Edit device configuration or drive applications
Can be changed in the operating state: Operation
Parameter group: Safety Integrated
Not relevant for motor type: -
Dyn. index [0...n]: - | **Calculated:** -
Unit: - | **Unit group:** - | **Unit selection:** -

Min:	**Max:**	**Factory setting:**
0	65535	0

Description: Number of safety message cases that have occurred since the last reset.

Dependency: The safety message buffer is cleared by resetting the parameter to 0.
See also: r9753, r9754, r9755, r9756, r60044, r60045, r60048, r60049

r60100[0...4] PROFIdrive telegram display total / Pd telegr tot

Data type: Unsigned16 | **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Parameter group: Configuration
Not relevant for motor type: -
Dyn. index [0...n]: - | **Calculated:** -
Unit: - | **Unit group:** - | **Unit selection:** -

Description: Displays the send and receive telegrams.

Index:
[0] = Subslot 1: MAP
[1] = Subslot 2: PROFIsafe
[2] = Subslot 3: standard/SIEMENS
[3] = Subslot 4: supplementary telegram
[4] = Subslot 5: supplementary telegram

Dependency: See also: r0922, r60022, r60122

Note
Value = 65534: No telegram
Value = 65535: MAP "Module Access Point"

r60122 PROFIdrive SIC/SCC telegram / SIC/SCC tel

Data type: Unsigned16 | **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Parameter group: Safety Integrated, Configuration
Not relevant for motor type: -
Dyn. index [0...n]: - | **Calculated:** -
Unit: - | **Unit group:** - | **Unit selection:** -

Description: Displays the telegram for the Safety Information Channel (SIC) / Safety Control Channel (SCC).

Value:
700: Supplementary telegram 700, PZD-0/3
701: Supplementary telegram 701, PZD-2/5
32766: No telegram

Note
When reading the parameter via PROFIdrive, value 65534 is applicable for "No telegram".

r61000[0...239] PROFINET NameOfStation / PN NameOfStation

Data type: Unsigned8 | **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Parameter group: Configuration
Not relevant for motor type: -
Dyn. index [0...n]: - | **Calculated:** -
Unit: - | **Unit group:** - | **Unit selection:** -

Description: Displays "PROFINET NameOfStation". This is the device name of the PROFINET interface.

r61001[0...3] PROFINET IP of Station / PN IP of station

Data type: Unsigned8 | **Visible in:** Extended display
Read permission: Read drive data or acknowledge messages
Parameter group: Configuration
Not relevant for motor type: -
Dyn. index [0...n]: - | **Calculated:** -
Unit: - | **Unit group:** - | **Unit selection:** -

Description: Displays "PROFINET IP of Station". This is the IP address of the PROFINET interface.

Faults and alarms 18

18.1 Overview of faults and alarms

18.1.1 Display of faults/alarms (messages)

Description

In the case of a fault, the converter signals the corresponding fault(s) and/or alarm(s).

The texts about faults and alarms are displayed via the following interfaces:

- Output of messages via the fault and alarm buffer with a fieldbus connection to the higher-level controller.
- Output of messages via the commissioning interface.

18.1.2 Differences between faults and alarms

Overview

An alarm reports an operating state which is non-critical at present. A fault means that it is normally no longer possible to run the motor. The converter therefore responds to alarms and faults differently.

Function description

The differences between faults and alarms are as follows:

Message type	Response to a message and removal of the message
Fault	How does a converter respond when a fault occurs? • Initiate the appropriate fault response • Set the status signal ZSW1.3 • Enter the fault into the fault buffer How are faults eliminated? • Remove the cause of the fault • Acknowledge fault What happens when the converter is switched off and switched on? • Faults are saved retentively.
Alarm	How does a converter respond when an alarm occurs? • Set the status signal ZSW1.7 • Enter the alarm into the alarm buffer How are alarms eliminated? • Alarms are self-acknowledging. If the cause of the alarm is no longer present, the converter resets the alarm. What happens when the converter is switched off and switched on? • The alarm buffer is lost when the supply voltage is switched off.

Note:

Messages from encoders whose signal is not used for control purposes are output by the converter as a warning.

18.1.3 Explanation of the list of faults and alarms

Description

The messages are displayed according to the following pattern.

Fxxxxx	**Fault location (optional): Name**
Message class:	Text of the message class (number according to PROFIdrive)
Message value:	Component number: %1, fault cause: %2
Variant:	Product variant
Component:	Hardware component
Response:	NONE
Acknowledgment:	POWER ON
Explanation of the message value:	For %2

Value	Cause	Remedy
11	Fault cause for value = 11	Remedy for value = 11
15	Fault cause for value = 15	Remedy for value = 15

Cause	Description of possible causes. Fault value (r0949, interpret <format>): or alarm value (r2124, interpret <format>): (optional) Information about fault and alarm values (optional).
Remedy	Description of possible remedies.

The representation of a message includes as a maximum the information listed below. Depending on the message, some information can be omitted.

- **Fxxxxx**
  A message comprises a letter followed by the relevant number.
  The meaning of the letters is as follows:
  - A means "Alarm"
  - F means "Fault"
  - N means "No message" ("No Report")
  - C means "Safety message" (dedicated message buffer)
- **Fault location (optional): Name**
  The fault location (optional), the name of the fault or alarm and the message number are all used to identify the message (e.g. with the commissioning software).

- **Message class**
  Every message is assigned a message class using the following structure:
  Text of the message class (number according to PROFIdrive)
  The message classes are transferred at different interfaces to the higher-level controller and their associated display and operating units.
  The message classes that are available are listed in the following table. In addition to the text of the message class and its number according to PROFIdrive – as well as a brief help text regarding the cause and remedy – they also include information about the various diagnostic interfaces:
  – PN (hex)
    Specifies the "Channel error type" of the PROFINET channel diagnostics.
    When activating the channel diagnostics, using the GSDML file, the texts listed in the table can be displayed.
  – DS1 (dec)
    Specifies the bit number in data set DS1 of the diagnostic alarm for SIMATIC S7.
    When the diagnostic alarms are activated, the texts listed in the table can be displayed.

Text of the message class	Number according to PROFIdrive	Diagnostics interface	
Cause and remedy		**PN (hex)**	**DS1 (dec)**
Hardware fault/software error A hardware or software malfunction has been identified. • Carry out a POWER ON for the relevant component. • If it occurs again, contact the hotline. • Replace device.	1	9000	0
Line fault A line supply fault has occurred (phase failure, voltage level, etc.). • Check the line supply/fuses. • Check the supply voltage. • Check the wiring.	2	9001	1
Supply voltage fault An electronics supply voltage fault (48 V, 24 V, 5 V...) was detected. • Check the wiring. • Check the voltage level.	3	9002	2
DC link overvoltage The DC link voltage has assumed an inadmissibly high value. • Check the dimensioning of the system (line supply, reactor, voltages). • Check the infeed settings.	4	9003	3

Text of the message class	Number according to PROFIdrive	Diagnostics interface	
Cause and remedy		**PN (hex)**	**DS1 (dec)**
Power electronics fault An inadmissible operating state of the power electronics has been identified (overcurrent, overtemperature, IGBT failure, ...). • Check that the permissible duty cycles are complied with. • Check the ambient temperatures (fan).	5	9004	4
Electronic component overload The temperature in the component has exceeded the highest permissible limit. • Check the ambient temperature /control cabinet cooling.	6	9005	5
Ground fault / inter-phase short-circuit detected A ground fault/interphase short-circuit was detected in the power cables or in the motor windings. • Check the power cables (connection). • Check the motor.	7	9006	6
Motor overload The motor was operated outside the permissible limits (temperature, current, torque, ...). • Check the duty cycles and set limits. • Check the ambient temperature / motor cooling.	8	9007	7
Communication error to the higher-level controller The communication to the higher-level controller (internal coupling, PROFIBUS, PROFINET, ...) is faulted or interrupted. • Check the state of the higher-level controller. • Check the communication connection/wiring. • Check the bus configuration/clock cycles.	9	9008	8
Safety monitoring channel has identified an error A safe operation monitoring function (Safety) has identified an error.	10	9009	9
Actual position value / actual speed value incorrect or not available An illegal signal state was detected while evaluating the encoder signals (track signals, zero marks, absolute values, ...). • Check the encoder / status of the encoder signals. • Observe the maximum permissible frequencies.	11	900A	10
Internal (DRIVE-CLiQ) communication error The internal communication between the SINAMICS components is faulted or interrupted. • Check the DRIVE-CLiQ wiring. • Ensure an EMC-compliant design. • Observe the maximum quantity structure/cycles.	12	900B	11

Text of the message class	Number according to PROFIdrive	Diagnostics interface	
Cause and remedy		**PN (hex)**	**DS1 (dec)**
Infeed fault The infeed is faulted or has failed. • Check the infeed and its environment (line supply, filters, reactors, fuses...). • Check the infeed control.	13	900C	12
Braking controller / Braking Module faulted The internal or external Braking Module is faulted or overloaded (temperature). • Check the connection/state of the Braking Module. • Comply with the permissible number of braking operations and their duration.	14	900D	13
Line filter faulted The line filter monitoring has identified an excessively high temperature or other inadmissible state. • Check the temperature / temperature monitoring. • Check the configuration to ensure that it is permissible (filter type, infeed, thresholds).	15	900E	14
External measured value / signal state outside of the permissible range A measured value / signal state read in via the input area (digital/analog/temperature) has assumed an inadmissible value/state. • Determine and check the relevant signal. • Check the set thresholds.	16	900F	15
Application / technology function faulted The application / technological function has exceeded a (set) limit (position, speed, torque, ...). • Determine and check the relevant limit. • Check the setpoint specified by the higher-level controller.	17	9010	16
Error in the parameterization/configuration/commissioning sequence An error has been identified in the parameterization or in a commissioning procedure, or the parameterization does not match the existing device configuration. • Determine the precise cause of the fault using the commissioning tool. • Adapt the parameterization or device configuration.	18	9011	17
General drive fault Group fault. • Determine the precise cause of the fault using the commissioning tool.	19	9012	18

- **Message value**
  Provides information about the composition of the fault/alarm value.
  Example:
  Message value: Component number: %1, fault cause: %2
  In this example, the message value contains information about the component number and cause of the fault. Entries %1 and %2 are placeholders. If the commissioning software is connected to the converter, then these placeholders are populated with the appropriate values.
- **Variant**
  Specifies the product variant in which the message exists. This information is not applicable if an alarm is the same for all product variants.
- **Component**
  Type of hardware component that has triggered the fault or alarm. For "None", it is not possible to assign the message to a hardware component.
- **Explanation of the message value**
  Explains the possible values of the variables (%n) in the message value. In this case, detailed information can be specified regarding the cause and remedy for specific values.
- **Response**
  Specifies the response in the event of a fault.
  The following table lists all fault responses and their meanings used for the entire SINAMICS drive family.

List	PROFI-drive	Response	Description
NONE	–	None	No response when a fault occurs.
OFF1	ON/OFF	Brake along the ramp-function generator deceleration ramp followed by pulse inhibit	• The motor is braked by immediately specifying n_set = 0 at the ramp-function generator deceleration ramp (p1121). • The pulses are suppressed when standstill has been identified. • "Switching on inhibited" is activated.
OFF2	COAST-STOP	Internal/external pulse inhibit	• Immediate pulse cancellation, the motor "coasts down " to a standstill. • "Switching on inhibited" is activated.
OFF3	QUICK-STOP	Braking along the OFF3 deceleration ramp followed by pulse inhibit	• The motor is braked along the OFF3 deceleration ramp (p1135) by immediately entering n_set = 0. • The pulses are suppressed when standstill has been identified. • "Switching on inhibited" is activated.
STOP2	–	STOP2	• The motor is braked along the OFF3 deceleration ramp (p1135) by immediately entering n_set = 0. • The drive remains in closed-loop speed control.
ENCODER	–	Internal/external pulse inhibit	The ENCODER fault response occurs because of a sensor error and results in OFF2.

- **Acknowledgment**
  A fault can only be acknowledged if the cause has been resolved.
  The acknowledgment specifies when the fault can be acknowledged.
  An alarm is self-acknowledging.

Acknowledg-ment	Description
IMMEDIATELY	Acknowledgment can be immediately realized after the cause has been resolved.
PULSE INHIBIT	Once the cause has been resolved, the fault can only be acknowledged when the pulses are inhibited (r0899.11 = 0).
POWER ON	The fault can only be acknowledged using POWER ON (the converter is switched-off/switched-on).
NONE	For alarms (type "A"), an acknowledgment is not required.

- **Cause**
  Describes the possible causes of the fault or alarm. Optionally, a message value, fault value or alarm value can be additionally specified.
- **Remedy**
  Generally explains possible procedures to resolve the cause of this active fault or alarm.

18.2 List of faults and alarms

Faults and alarms

The following list contains the faults and alarms of the S210 product.

Product: SINAMICS S210, Version: 604030000, Language: eng
Objects: S210

F01000 **Internal software error**

Message class: Hardware/software error (1)
Message value: Module: %1, line: %2
Component: Control Unit (CU)
Propagation: Global
Response: OFF2
Acknowledgment: POWER ON
Cause: An internal software error has occurred.
Fault value (r0949, interpret hexadecimal):
Only for internal Siemens troubleshooting.
Remedy: - Evaluate fault buffer (r0945).
- Carry out a POWER ON (switch-off/switch-on) for all components.
- If required, check the data on the non-volatile memory (e.g. memory card).
- Upgrade firmware to later version.
- Contact Technical Support.
- Replace the converter.

F01001 **FloatingPoint exception**

Message class: Hardware/software error (1)

Message value:	%1
Component:	Control Unit (CU)
Propagation:	Global
Response:	OFF2
Acknowledgment:	POWER ON
Cause:	An exception occurred for an operation with the FloatingPoint data type. The error can be caused by the basic system or a technology function. Fault value (r0949, interpret hexadecimal): Only for internal Siemens troubleshooting.
Remedy:	- Carry out a POWER ON (switch-off/switch-on). - Upgrade firmware to later version. - Contact Technical Support.

F01002 Internal software error

Message class:	Hardware/software error (1)
Message value:	%1
Component:	Control Unit (CU)
Propagation:	Global
Response:	OFF2
Acknowledgment:	IMMEDIATELY
Cause:	An internal software error has occurred. Fault value (r0949, interpret hexadecimal): Only for internal Siemens troubleshooting.
Remedy:	- Carry out a POWER ON (switch-off/switch-on) for all components. - Upgrade firmware to later version. - Contact Technical Support.

F01003 Acknowledgment delay when accessing the memory

Message class:	Hardware/software error (1)
Message value:	%1
Component:	Control Unit (CU)
Propagation:	Global
Response:	OFF2
Acknowledgment:	IMMEDIATELY
Cause:	A memory area was accessed that does not return a "READY". Fault value (r0949, interpret hexadecimal): Only for internal Siemens troubleshooting.
Remedy:	- Carry out a POWER ON (switch-off/switch-on) for all components. - Contact Technical Support.

N01004 Internal software error

Message class:	Hardware/software error (1)
Message value:	%1
Component:	Control Unit (CU)
Propagation:	Global
Response:	NONE
Acknowledgment:	NONE

Cause: An internal software error has occurred.
Fault value (r0949, hexadecimal):
Only for internal Siemens troubleshooting.

Remedy: - Contact Technical Support.

F01005 Firmware download for DRIVE-CLiQ component unsuccessful

Message class: Hardware/software error (1)

Message value: Component number: %1, fault cause: %2

Component: None

Propagation: Local

Response: NONE

Acknowledgment: IMMEDIATELY

Explanation of the message value: For %2

Value	Cause	Remedy
11	DRIVE-CLiQ component has detected a checksum error.	After POWER ON has been carried out again for the DRIVE-CLiQ component, download firmware again.
15	The selected DRIVE-CLiQ component did not accept the contents of the firmware file.	Use a suitable firmware version
18	Firmware version is too old and is not accepted by the component.	Use a suitable firmware version
19	Firmware version is not suitable for the hardware release of the component.	Use a suitable firmware version
101	After several communication attempts, no response from the DRIVE-CLiQ component.	Check the DRIVE-CLiQ wiring.
139	Initially, only one new boot loader was loaded.	After POWER ON has been carried out again for the DRIVE-CLiQ component, download firmware again.
140	Firmware file for the DRIVE-CLiQ component not available on the memory card.	Use a suitable firmware version
141	An inconsistent length of the firmware file was signaled.	Use a suitable firmware version
142	Component has not changed to the mode for firmware download.	After POWER ON has been carried out again for the DRIVE-CLiQ component, download firmware again.
156	Component with the specified component number is not available (p7828).	Check the selected component number.

Cause: It was not possible to download the firmware to a DRIVE-CLiQ component.

Fault value (r0949, interpret hexadecimal):

yyxxxx hex: yy = component number, xxxx = fault cause

Example: xxxx = 000B hex = 11 dec:

xxxx = 008D hex = 141 dec:

An inconsistent length of the firmware file was signaled.

The firmware download may have been caused by a loss of connection to the firmware file.

This can occur during a project download/reset, for example.

xxxx = 008F hex = 143 dec:

Component has not changed to the mode for firmware download. It was not possible to delete the existing firmware.

xxxx = 0090 hex = 144 dec:

When checking the firmware that was downloaded (checksum), the component detected a fault. It is possible that the file on the memory card is defective.

xxxx = 0091 hex = 145 dec:

Checking the loaded firmware (checksum) was not completed by the component in the appropriate time.

Remedy:

- Check the selected component number.
- Check the DRIVE-CLiQ wiring.
- Use a component with a suitable hardware version.
- After warm restart has been carried out again for the DRIVE-CLiQ component, download the firmware again.

A01006 Firmware update for DRIVE-CLiQ component required

Message class: General drive fault (19)

Message value: Component number: %1

Component: None

Propagation: Local

Response: NONE

Acknowledgment: NONE

Explanation of the message value: For %1

Component in target topology

Cause: The firmware of a DRIVE-CLiQ component must be updated as there is no suitable firmware or firmware version in the component for operation with the converter.

Alarm value (r2124, interpret decimal):

Component number of the DRIVE-CLiQ component.

Remedy: Repeat the firmware update by switching off the device and switching on again.

A01007 POWER ON for DRIVE-CLiQ component required

Message class: General drive fault (19)

Message value: Component number: %1

Component: None

Propagation: Local

Response: NONE

Acknowledgment: NONE

Explanation of the message value: For %1

Component in target topology

Cause: A DRIVE-CLiQ component must be switched on again (POWER ON) (e.g. due to a firmware update).
Alarm value (r2124, interpret decimal):
Component number of the DRIVE-CLiQ component.
Note:
For a component number = 1, a POWER ON of the converter is required.

Remedy: - Switch off the power supply of the specified DRIVE-CLiQ component and switch it on again.
- For SINUMERIK, auto commissioning is prevented. In this case, a POWER ON is required for all components and the auto commissioning must be restarted.

A01009 Control Unit overtemperature

Message class: Overtemperature of the electronic components (6)
Message value: %1
Component: Control Unit (CU)
Propagation: Global
Response: NONE
Acknowledgment: NONE
Cause: The temperature of the converter has exceeded the specified limit value.
Remedy: - Check the ambient temperature at the converter installation location
- Check the converter air intake.
- Check the converter fan.
Note:
The alarm is automatically withdrawn once the limit value has been fallen below.

F01011 Download interrupted

Message class: Error in the parameterization / configuration / commissioning procedure (18)
Message value: %1
Component: None
Propagation: Global
Response: NONE
Acknowledgment: IMMEDIATELY
Cause: The project download was interrupted.
Fault value (r0949, interpret decimal):
1: The user prematurely interrupted the project download.
2: The communication cable was interrupted (e.g. cable breakage, cable withdrawn).
3: The project download was prematurely exited by the commissioning tool.
100: Different versions between the firmware version and project files which were loaded by loading into the file system "Download from memory card".
Note:
The response to an interrupted download is the state "first commissioning".
Remedy: - Check the communication cable.
- Download the project again.
- Boot from previously saved files (switch-off/switch-on or p0976).
- When loading into the file system (download from memory card), use the matching version.

F01015 Internal software error

Message class: Hardware/software error (1)
Message value: %1
Component: Control Unit (CU)
Propagation: Global
Response: OFF2

Acknowledgment: POWER ON
Cause: An internal software error has occurred.
Fault value (r0949, interpret decimal):
Only for internal Siemens troubleshooting.
Remedy: - Carry out a POWER ON (switch-off/switch-on) for all components.
- Upgrade firmware to later version.
- Contact Technical Support.

A01019 Writing to the removable data medium unsuccessful

Message class: Hardware/software error (1)
Message value: -
Component: Control Unit (CU)
Propagation: Local
Response: NONE
Acknowledgment: NONE
Cause: The write access to the removable data medium was unsuccessful.
Remedy: - Check the removable data medium and if required replace.
- Repeat the data backup.

A01020 Writing to RAM disk unsuccessful

Message class: Hardware/software error (1)
Message value: -
Component: Control Unit (CU)
Propagation: Local
Response: NONE
Acknowledgment: NONE
Cause: A write access to the internal RAM disk was unsuccessful.
Remedy: Adapt the file size for the system logbook to the internal RAM disk (p9930).

F01022 Bios Update

Message class: Hardware/software error (1)
Message value: -
Component: Control Unit (CU)
Propagation: Global
Response: OFF2
Acknowledgment: POWER ON
Cause:
Remedy:

F01023 Software timeout (internal)

Message class: Hardware/software error (1)
Message value: %1
Component: Control Unit (CU)
Propagation: Global
Response: NONE
Acknowledgment: IMMEDIATELY
Cause: An internal software timeout has occurred.
Fault value (r0949, interpret decimal):
Only for internal Siemens troubleshooting.

Remedy: - Carry out a POWER ON (switch-off/switch-on) for all components.
- Upgrade firmware to later version.
- Contact Technical Support.

F01030 Sign-of-life failure for master control

Message class: Communication error to the higher-level control system (9)
Message value: -
Component: None
Propagation: Global
Response: OFF3
Acknowledgment: IMMEDIATELY
Cause: For active PC master control of the PC, no sign-of-life was received within the monitoring time.
The master control was returned to the drive.
Remedy: Set the monitoring time higher at the PC or, if required, completely disable the monitoring function.
The monitoring time is set as follows using the commissioning tool:
<Drive> -> Commissioning -> Control panel -> Button "Fetch master control" -> A window is displayed to set the monitoring time in milliseconds.
Notice:
The monitoring time should be set as short as possible. A long monitoring time means a late response when the communication fails!

A01032 All parameters must be saved

Message class: Hardware/software error (1)
Message value: %1
Component: Control Unit (CU)
Propagation: Local
Response: NONE
Acknowledgment: NONE
Cause: Data backup is incomplete
The partially saved parameters are not loaded the next time the system runs up.
For the system to successfully power up, all of the parameters must have been completely backed up.
Alarm value (r2124, interpret decimal):
Only for internal Siemens troubleshooting.
Remedy: Save all parameters.
See also: p0977 (Save all parameters)

F01033 Units changeover: Reference parameter value invalid

Message class: Error in the parameterization / configuration / commissioning procedure (18)
Message value: Parameter: %1
Component: None
Propagation: Global
Response: NONE
Acknowledgment: IMMEDIATELY
Cause: When changing over the units to the referred representation type, it is not permissible for any of the required reference parameters to be equal to 0.0
Fault value (r0949, parameter):
Reference parameter whose value is 0.0.
Remedy: Set the value of the reference parameter to a number different than 0.0.
See also: r0304 (Rated motor voltage), r0305 (Rated motor current), p2000 (Reference speed), p2002 (Reference current), p2003 (Reference torque)

F01034	**Units changeover: Calculation parameter values after reference value change unsuccessful**
Message class:	Error in the parameterization / configuration / commissioning procedure (18)
Message value:	Parameter: %1
Component:	None
Propagation:	Global
Response:	NONE
Acknowledgment:	IMMEDIATELY
Cause:	The change of a reference parameter meant that for an involved parameter the set value was not able to be re-calculated in the per unit representation. The change was rejected and the original parameter value restored. Fault value (r0949, parameter): Parameter whose value was not able to be re-calculated. See also: r0304 (Rated motor voltage), r0305 (Rated motor current), p2000 (Reference speed), p2002 (Reference current), p2003 (Reference torque)
Remedy:	- Select the value of the reference parameter such that the parameter involved can be calculated in the per unit representation.

A01035	**Parameter backup files corrupted**
Message class:	Hardware/software error (1)
Message value:	%1
Component:	Control Unit (CU)
Propagation:	Local
Response:	NONE
Acknowledgment:	NONE
Cause:	When the converter runs up, no complete data set was found from the parameter backup files. The last time that the parameterization was saved, it was not completely carried out. It is possible that the backup was interrupted by switching off or withdrawing the memory card. Alarm value (r2124, interpret hexadecimal): ddccbbaa hex: aa = 01 hex: Run-up was realized without data backup. The drive is in the factory setting. aa = 02 hex: The last available backup data record was loaded. The parameterization must be checked. It is recommended that the parameterization is downloaded again. aa = 03 hex: An external card with valid parameter backup was found and copied to the converter. Run-up is realized from this project. aa = 04 hex: An external card with incomplete or defective parameter backup was found. Run-up was realized without data backup. The drive is in the factory setting. dd, cc, bb: Only for internal Siemens troubleshooting. See also: p0977 (Save all parameters)
Remedy:	- Download the project again using the commissioning tool. - Retentively save parameters (save all parameters p0977 = 1) See also: p0977 (Save all parameters)

F01036	**Parameter backup file missing**
Message class:	Hardware/software error (1)
Message value:	%1
Component:	Control Unit (CU)
Propagation:	Local
Response:	NONE

Acknowledgment: IMMEDIATELY
Cause: When loading the device parameterization, a parameter backup file cannot be found.
Remedy: If the project data are backed up using the commissioning tool, then the project must be downloaded again.
Retentively save parameters (save all parameters, p0977 = 1), as a consequence, parameter files are completely written back to the non-volatile memory.
Note:
If the project data have not been backed up, then a new first commissioning is required.

F01038 Loading the parameter backup file unsuccessful

Message class: Hardware/software error (1)
Message value: %1
Component: Control Unit (CU)
Propagation: Local
Response: NONE
Acknowledgment: IMMEDIATELY
Cause: An error has occurred when loading parameter backup files from the non-volatile memory.
Remedy: - If you have saved the project data using the commissioning tool, then download the project again. Retentively save the data or set p0977 = 1. This means that the parameter files are again completely written to the non-volatile memory.
- Replace the memory card or the converter.

F01039 Writing to the parameter back-up file unsuccessful

Message class: Hardware/software error (1)
Message value: %1
Component: Control Unit (CU)
Propagation: Local
Response: NONE
Acknowledgment: IMMEDIATELY
Cause: Writing to at least one parameter backup file in the non-volatile memory was unsuccessful.
- A parameter backup file has the "read only" file attribute and cannot be overwritten.
- There is not sufficient free memory space available.
- The non-volatile memory is defective and cannot be written to.
Remedy: - Check the free memory space in the non-volatile memory.
- Replace the memory card or the converter.

F01040 Save parameter settings and carry out a POWER ON

Message class: Error in the parameterization / configuration / commissioning procedure (18)
Message value: -
Component: None
Propagation: Global
Response: OFF2
Acknowledgment: POWER ON
Cause: A parameter was changed, which means that it is necessary to save the parameters and reboot.
Remedy: - Save parameters (p0977).
- Carry out a POWER ON (switch-off/switch-on).
Then:
- Upload the data to the converter (commissioning tool).

F01041 Parameter save necessary

Message class: Error in the parameterization / configuration / commissioning procedure (18)

Message value:	%1
Component:	None
Propagation:	Local
Response:	NONE
Acknowledgment:	IMMEDIATELY
Cause:	Defective or missing files were detected on the memory card when booting. Fault value (r0949, interpret decimal): 1: Source file cannot be opened. 2: Source file cannot be read. 3: Target directory cannot be set up. 4. Target file cannot be set up/opened. 5. Target file cannot be written to. Additional values: Only for internal Siemens troubleshooting.
Remedy:	- Save the parameters. - Reload the project into the converter. - Update the firmware - If required, replace the converter and/or memory card.

F01042 Parameter error during project download

Message class:	Error in the parameterization / configuration / commissioning procedure (18)
Message value:	Parameter: %1, index: %2, fault cause: %3
Component:	None
Propagation:	Local
Response:	OFF2
Acknowledgment:	IMMEDIATELY

Cause: An error was detected when downloading a project using the commissioning software (e.g. incorrect parameter value). It is possible that the parameter limits are dependent on other parameters.

The detailed cause of the fault can be determined using the fault value.

Fault value (r0949, interpret hexadecimal):

ccbbaaaa hex

aaaa = Parameter

bb = Index

cc = fault cause

0: Parameter number illegal.

1: Parameter value cannot be changed.

2: Lower or upper value limit exceeded.

3: Sub-index incorrect.

4: No array, no sub-index.

5: Data type incorrect.

6: Setting not permitted (only resetting).

7: Descriptive element cannot be changed.

9: Descriptive data not available.

11: No master control.

15: No text array available.

17: Task cannot be executed due to operating state.

20: Illegal value.

21: Response too long.

22: Parameter address illegal.

23: Format illegal.

24: Number of values not consistent.

25: Drive object does not exist.

101: Presently deactivated.

104: Illegal value.

107: Write access not permitted when controller enabled.

108: Unit unknown.

109: Write access only in the commissioning status, encoder.

110: Write access only in the commissioning status, motor.

111: Write access only in the commissioning status, power unit.

112: Write access only in the quick commissioning mode.

113: Write access only in the ready mode.

114: Write access only in the commissioning status, parameter reset.

115: Write access only in the Safety Integrated commissioning status.

116: Write access only in the commissioning status, technological application/units.

117: Write access only in the commissioning status.

118: Write access only in the commissioning status, download.

119: Parameter may not be written in download.

120: Write access only in the commissioning status, drive basis configuration.

121: Write access only in the commissioning status, define drive type.

122: Write access only in the commissioning status, data set basis configuration.

123: Write access only in the commissioning status, device configuration.

124: Write access only in the commissioning status, device download.

125: Write access only in the commissioning status, device parameter reset.

126: Write access only in the commissioning status, device ready.

127: Write access only in the commissioning status, device.

129: Parameter may not be written in download.

131: Requested signal interconnection not possible as the signal source does not supply float value.

132: Free signal interconnection via PROFIdrive telegram setting inhibited.

133: Access method not defined.
200: Below the valid values.
201: Above the valid values.
202: Cannot be accessed from the Basic Operator Panel (BOP).
203: Cannot be read from the Basic Operator Panel (BOP).
204: Write access not permitted.

Remedy: - Correct the parameterization in the commissioning tool and download the project again.
- Enter the correct value in the specified parameter.
- Identify the parameter that restricts the limits of the specified parameter.

F01043 Fatal error at project download

Message class: Error in the parameterization / configuration / commissioning procedure (18)

Message value: Fault cause: %1

Component: None

Propagation: Local

Response: NONE

Acknowledgment: IMMEDIATELY

Cause: A fatal error was detected when downloading a project using the commissioning tool.
Fault value (r0949, interpret decimal):
1: Device status cannot be changed to device download (drive object ON?).
2: Drive object number incorrect.
3: A drive object that has already been deleted is deleted again.
4: A drive object that has already been registered for generation is deleted.
5: A drive object that does not exist is deleted.
6: An undeleted drive object that already existed is generated.
7: A drive object already registered for generation is generated again.
8: Maximum number of drive objects that can be generated is exceeded.
9: Error when generating the device drive object.
10: Error when generating the target topology parameter.
11: Error when generating a drive object (global component).
12: Error when generating a drive object (drive component).
13: Drive object type unknown.
14: Drive status cannot be changed to "ready for operation" (r0947 and r0949).
15: Drive status cannot be changed to drive download.
16: Device status cannot be changed to "ready for operation".
17: It is not possible to download the topology. The component wiring should be checked, taking into account the various messages/signals.
18: A new download is only possible if the factory settings are restored for the converter.
20: The configuration is inconsistent.
21: Error when accepting the download parameters.
22: Software-internal download error.
24: Download not possible during a partial run-up after inserting a component.
Additional values:
Only for internal Siemens troubleshooting.

Remedy: - Use the current version of the commissioning tool.
- Modify the offline project and carry out a new download (e.g. compare the number of drive objects, motors, encoders, power units in the offline project and at the drive).
- Change the drive state (is a drive rotating or is there a message/signal?).
- Observe additional active messages/signals and remove their cause (e.g. correct any incorrectly set parameters).
- Automatically calculate the control parameters.
- Boot from previously saved files (switch-off/switch-on or p0976).
- Before a new download, restore the factory setting.

F01044 Descriptive data error

Message class: Hardware/software error (1)
Message value: %1
Component: Control Unit (CU)
Propagation: Global
Response: OFF2
Acknowledgment: POWER ON
Cause: An error was detected when loading the descriptive data saved in the non-volatile memory.
Remedy: Replace the memory card or the converter.

F01045 Configuring data invalid

Message class: Hardware/software error (1)
Message value: %1
Component: None
Propagation: Local
Response: NONE
Acknowledgment: IMMEDIATELY
Cause: The run-up from the loaded project was unsuccessful.
Possible projects:
- Download with commissioning tool
- Run-up from data backup after retentively saving
- Run-up from data backup after cloning created from external card
- Restart
Fault value (r0949, interpret hexadecimal):
Only for internal Siemens troubleshooting.
Remedy: - Restore the factory setting (p0976 = 1) and reload the project into the converter.
Then retentively save the parameterization or set p0977 = 1. This overwrites the incorrect parameter files in the non-volatile memory – and this alarm is withdrawn.

F01046 Parameter value from the project not accepted

Message class: Hardware/software error (1)
Message value: Parameter: %1
Component: None
Propagation: Local
Response: NONE
Acknowledgment: IMMEDIATELY

Cause: When running up from the loaded project, a parameter value was not accepted.
Possible projects:
- Download with commissioning tool
- Run-up from data backup after retentively saving
- Run-up from data backup after cloning created from external card
- Run-up from an old project or upgrade the firmware
- Restart

Fault value (r0949, interpret decimal):
Parameter number whose value was not accepted.

Remedy: Check the parameter value of the parameter that was not accepted and, if required, correct.

F01047 It is not possible to restore the drive data from the backup file

Message class: Error in the parameterization / configuration / commissioning procedure (18)
Message value: %1
Component: None
Propagation: Local
Response: NONE
Acknowledgment: IMMEDIATELY
Cause: An error occurred when restoring the drive data from the backup file.
An unsuitable or incorrect backup file was detected under path BACKUPFILE_NEXT_START on the memory card.

Fault value (r0949, interpret decimal):
1: The backup file has the incorrect format. Only files are supported with extension .zip or .ZIP.
2: Several files were found in path BACKUPFILE_NEXT_START. It cannot be determined from which backup file the drive data should be restored.
3: The backup file name is too long.
4: The backup file was unsuccessfully unzipped.
5, 6, 7, 8 or 9: The content of the backup file is invalid or the backup file was generated with encryption.
10: The backup file was generated with an incompatible (older) firmware version. Restoring the drive data is not supported.
11: The backup file version is newer than the converter firmware version being used.
12: The backup file was generated for a different converter family.
Additional values: Only for internal Siemens troubleshooting.

Remedy: For fault value = 1: Use a file with .zip or .ZIP extension.
For fault value = 2: Only save the required backup file under BACKUPFILE_NEXT_START, remove other files.
For fault value = 3: Rename backup file Notice: Special characters can be longer than a visible character.
For fault value = 4, 5, 6, 7, 8 or 9: Use the backup file which was created using a SIEMENS commissioning tool (Startdrive, web server).
Before a backup file is created, encryption of the drive data must be deactivated.
For fault value = 10: Only converter backup files with firmware versions greater than or equal to V6.1 are supported. Use a suitable backup file.
For fault value = 11: Use the converter backup file that was created with a lower firmware version or the same firmware version.
For fault value = 12: Use the backup file for the matching converter family.

A01049 CU: It is not possible to write to file

Message class: Hardware/software error (1)
Message value: %1
Component: Control Unit (CU)
Propagation: Local
Response: NONE

Acknowledgment:	NONE
Cause:	It is not possible to write to a write-protected parameter backup file. The write request was interrupted. Alarm value (r2124, interpret decimal): Number drive object
Remedy:	Check whether the "write protected" attribute has been set for the files in the non-volatile memory. When required, remove write protection and repeat the save operation (e.g. set p0977 = 1).

F01050 Memory card and device incompatible

Message class:	Error in the parameterization / configuration / commissioning procedure (18)
Message value:	-
Component:	Control Unit (CU)
Propagation:	Global
Response:	OFF2
Acknowledgment:	IMMEDIATELY
Cause:	The memory card and the device type do not match (e.g. a memory card for SINAMICS S is inserted in SINAMICS G).
Remedy:	- Insert the matching memory card. - Use the matching converter or power unit.

A01069 Parameter backup and device incompatible

Message class:	Error in the parameterization / configuration / commissioning procedure (18)
Message value:	-
Component:	Control Unit (CU)
Propagation:	Global
Response:	NONE
Acknowledgment:	NONE
Cause:	The parameter backup on the memory card and in the converter do not match. The module boots with the factory settings. Example: Devices A and B. are not compatible and a memory card with the parameter backup for device A is inserted in device B.
Remedy:	- Insert a memory card with compatible parameter backup and carry out a POWER ON. - Insert a memory card without parameter backup and carry out a POWER ON. - Save the parameters (p0977 = 1).

F01070 Project/firmware is being downloaded to the memory card

Message class:	Error in the parameterization / configuration / commissioning procedure (18)
Message value:	%1
Component:	Control Unit (CU)
Propagation:	Global
Response:	OFF2
Acknowledgment:	IMMEDIATELY
Cause:	An upgrade (project/firmware download) was initiated on the memory card. While this fault is active, the corresponding update takes place with plausibility and consistency checks. After this, depending on the command option, a new boot (reset) for the Control Unit is initiated. Caution: It is not permissible to switch off the Control Unit during the upgrade and while this fault is active. If the operation is interrupted, this can destroy the file system on the memory card. The memory card will then no longer work properly and must be repaired.

Remedy:	Not necessary. The fault is automatically withdrawn after the upgrade has been completed.

A01073 POWER ON required for backup copy on memory card

Message class:	General drive fault (19)
Message value:	-
Component:	Control Unit (CU)
Propagation:	Local
Response:	NONE
Acknowledgment:	NONE
Cause:	The parameter assignment on the visible partition of the memory card has changed. In order that the backup copy on the memory card is updated on the non-visible partition, it is necessary to carry out a POWER ON or hardware reset (p0972) of the converter. Note: It is possible that a new POWER ON is requested via this alarm.
Remedy:	- Carry out a POWER ON for the converter (switch off/switch on). - Carry out a hardware reset (RESET button, p0972).

F01082 Parameter error when running up from data backup

Message class:	Error in the parameterization / configuration / commissioning procedure (18)
Message value:	Parameter: %1, index: %2, fault cause: %3
Component:	None
Propagation:	Local
Response:	OFF2
Acknowledgment:	IMMEDIATELY

Cause: Parameterizing errors have been detected (e.g. incorrect parameter value). It is possible that the parameter limits are dependent on other parameters.

The detailed cause of the fault can be determined using the fault value.

Fault value (r0949, interpret hexadecimal):

ccbbaaaa hex

aaaa = Parameter

bb = Index

cc = fault cause

0: Parameter number illegal.

1: Parameter value cannot be changed.

2: Lower or upper value limit exceeded.

3: Sub-index incorrect.

4: No array, no sub-index.

5: Data type incorrect.

6: Setting not permitted (only resetting).

7: Descriptive element cannot be changed.

9: Descriptive data not available.

11: No master control.

15: No text array available.

17: Task cannot be executed due to operating state.

20: Illegal value.

21: Response too long.

22: Parameter address illegal.

23: Format illegal.

24: Number of values not consistent.

25: Drive object does not exist.

101: Presently deactivated.

104: Illegal value.

107: Write access not permitted when controller enabled.

108: Unit unknown.

109: Write access only in the commissioning status, encoder.

110: Write access only in the commissioning status, motor.

111: Write access only in the commissioning status, power unit.

112: Write access only in the quick commissioning mode.

113: Write access only in the ready mode.

114: Write access only in the commissioning status, parameter reset.

115: Write access only in the Safety Integrated commissioning status.

116: Write access only in the commissioning status, technological application/units.

117: Write access only in the commissioning status.

118: Write access only in the commissioning status, download.

119: Parameter may not be written in download.

120: Write access only in the commissioning status, drive basis configuration.

121: Write access only in the commissioning status, define drive type.

122: Write access only in the commissioning status, data set basis configuration.

123: Write access only in the commissioning status, device configuration.

124: Write access only in the commissioning status, device download.

125: Write access only in the commissioning status, device parameter reset.

126: Write access only in the commissioning status, device ready.

127: Write access only in the commissioning status, device.

129: Parameter may not be written in download.

131: Requested signal interconnection not possible as the signal source supplies non-float value.

132: Free signal interconnection via PROFIdrive telegram setting inhibited.

133: Access method not defined.
200: Below the valid values.
201: Above the valid values.
202: Cannot be accessed from the Basic Operator Panel (BOP).
203: Cannot be read from the Basic Operator Panel (BOP).
204: Write access not permitted.

Remedy: - Based on the fault value, identify the parameter that caused the fault.
- Correct the value in the specified parameter.
- Download the project again using the commissioning tool and retentively save parameters. Or retentively save parameters and carry out a POWER ON (switch-off/switch-on).

F01122 Frequency at the measuring probe input too high

Message class: Application/technological function faulted (17)
Message value: %1
Component: None
Propagation: Interconnection
Response: OFF1
Acknowledgment: IMMEDIATELY
Cause: The frequency of the pulses at the measuring probe input is too high.
Fault value (r0949, interpret decimal):
1: DI/DO 9 (X122.8)
2: DI/DO 10 (X122.10)
4: DI/DO 11 (X122.11)
8: DI/DO 13 (X132.8)
16: DI/DO 14 (X132.10)
32: DI/DO 15 (X132.11)
64: DI/DO 8 (X122.7)
128: DI/DO 12 (X132.7)
Remedy: Reduce the frequency of the pulses at the measuring probe input.

F01200 CU: Time slice management internal software error

Message class: Hardware/software error (1)
Message value: %1
Component: Control Unit (CU)
Propagation: Global
Response: OFF2
Acknowledgment: IMMEDIATELY
Cause: A time slice management error has occurred.
It is possible that the sampling times have been inadmissibly set.
Fault value (r0949, interpret hexadecimal):
998:
Too many time slices occupied by technology functions (e.g. DCC).
999:
Too many time slices occupied by the basic system. Too many different sampling times may have been set.
Additional values:
Only for internal Siemens troubleshooting.
Remedy: - Contact Technical Support.

F01205 CU: Time slice overflow

Message class: Hardware/software error (1)

Message value: %1
Component: Control Unit (CU)
Propagation: Global
Response: OFF2
Acknowledgment: POWER ON
Cause: Insufficient processing time is available for the existing topology.
Fault value (r0949, interpret hexadecimal):
Only for internal Siemens troubleshooting.
Remedy: - Carry out a POWER ON (switch-off/switch-on) for all components.
- Upgrade firmware to later version.
- Contact Technical Support.

F01250 EEPROM incorrect read-only data

Message class: Hardware/software error (1)
Message value: %1
Component: Control Unit (CU)
Propagation: Local
Response: NONE
Acknowledgment: POWER ON
Cause: Error when reading the read-only data of the EEPROM in the converter.
Fault value (r0949, interpret decimal):
Only for internal Siemens troubleshooting.
Remedy: - Carry out a POWER ON (switch-off/switch-on).
- Replace the converter.

A01251 CU: CU-EEPROM incorrect read-write data

Message class: Hardware/software error (1)
Message value: %1
Component: Control Unit (CU)
Propagation: Global
Response: NONE
Acknowledgment: NONE
Cause: Error when reading the read-write data of the EEPROM in the converter.
Alarm value (r2124, interpret decimal):
Only for internal Siemens troubleshooting.
Remedy: For alarm value r2124 < 256, the following applies:
- Carry out a POWER ON (switch-off/switch-on).
- Replace the converter.
For alarm value r2124 >= 256, the following applies:
- For the converter with this alarm, clear the fault memory (p0952 = 0).
- Replace the converter.

A01304 Firmware version of DRIVE-CLiQ component is not up-to-date

Message class: General drive fault (19)
Message value: %1
Component: None
Propagation: Local
Response: NONE
Acknowledgment: NONE

Cause: The non-volatile memory has a more recent firmware version than the one in the connected DRIVE-CLiQ component.
Alarm value (r2124, interpret decimal):
Component number of the DRIVE-CLiQ component involved.

Remedy: Repeat the firmware update by switching off the device and switching on again.

A01306 Firmware of the DRIVE-CLiQ component being updated

Message class: General drive fault (19)
Message value: %1
Component: None
Propagation: Local
Response: NONE
Acknowledgment: NONE
Cause: Firmware update is active for at least one DRIVE-CLiQ component.
Alarm value (r2124, interpret decimal):
Component number of the DRIVE-CLiQ component.
Remedy: Not necessary.
This alarm is automatically withdrawn after the firmware update has been completed.

A01330 Topology: Commissioning not possible

Message class: Error in the parameterization / configuration / commissioning procedure (18)
Message value: -
Component: None
Propagation: Local
Response: NONE
Acknowledgment: NONE
Cause: Unable to carry out commissioning. The actual topology does not fulfill the requirements.
Remedy: - Check the OCC cable between the converter and motor/encoder.
- Carry out a POWER ON (switch-off/switch-on).
- Check that the connected hardware is supported.
Note:
OCC: One Cable Connection (one cable system)

F01357 Topology: Two converters identified on the DRIVE-CLiQ line

Message class: Error in the parameterization / configuration / commissioning procedure (18)
Message value: Component number: %1, connection number: %2
Component: None
Propagation: Local
Response: NONE
Acknowledgment: IMMEDIATELY
Cause: In the actual topology, 2 converters are connected with one another through DRIVE-CLiQ.
As standard, this is not permitted.
Fault value (r0949, interpret hexadecimal):
yyxx hex:
yy = connection number of the converter to which the second converter is connected
xx = component number of the converter to which the second converter is connected
Note:
Pulse enable is withdrawn and prevented.
Remedy: - Remove the connection to the second converter and restart.

A01422 Topology: Required data rate cannot be set

Message class: Error in the parameterization / configuration / commissioning procedure (18)

Message value: Component: %1, connection: %2, difference: %3

Component: None

Propagation: Local

Response: NONE

Acknowledgment: NONE

Explanation of the message value:

For %1

Component in target topology

For %2

Value	Cause	Remedy
0	Port 0	
1	Port 1	
2	Port 2	
3	Port 3	
4	Port 4	
5	Port 5	
6	Port 6	
7	Port 7	
8	Port 8	
9	Port 9	
10	X100	
11	X101	
12	X102	
13	X103	
14	X104	
15	X105	
20	X200	
21	X201	
22	X202	
23	X203	
24	X204	
25	X205	
40	X400	
41	X401	
42	X402	
50	X500	
51	X501	
52	X502	
53	X503	
54	X504	
55	X505	
56	X506	
57	X507	

For %3

Value	Cause	Remedy
1	Incorrect cable	Correct cable
2	Incorrect socket	Correct socket

Cause: The topology comparison identified differences in the data rate for the connection between two components.
Alarm value (r2124, interpret hexadecimal):
ccbbaaaa hex:
aaaa = Component number of the component involved.
bb = Port number of the component involved
cc = Cause
Note:
cc = 01 hex = 1 dec:
The cable is not suitable for a 1Gbit/s data rate
cc = 02 hex = 2 dec:
The component connection used is not suitable for a 1Gbit/s data rate.
Note:
The drive system is no longer booted. In this state, the drive control (closed-loop) cannot be enabled.

Remedy: Adapting topologies:
dd = 01 hex = 1 dec:
Use a cable suitable for DRIVE-CLiQ Express.
dd = 02 hex = 2 dec:
- Use a component suitable for DRIVE-CLiQ Express.
- Use a connection suitable for DRIVE-CLiQ Express.

A01482 Topology: Sensor Module not connected

Message class: Error in the parameterization / configuration / commissioning procedure (18)
Message value: Component: %1, to %2, %3, connection: %4
Component: None
Propagation: Local
Response: NONE

Acknowledgment: NONE

Explanation of the message value:

For %1, %3

Component in target topology

For %2

Value	Cause	Remedy
0	Component unknown	
1	Control Unit	
2	Motor Module	
3	Line Module	
4	Sensor Module	
5	Voltage Sensing Module	
6	Terminal Module	
7	DRIVE-CLiQ Hub Module	
8	Controller Extension	
9	Filter module	
10	Hydraulic Module	
49	DRIVE-CLiQ component	
50	Option slot	
60	Encoder	
70	DRIVE-CLiQ motor	
71	Hydraulic cylinder	
72	Hydraulic valve	
80	Motor	

For %4

Value	Cause	Remedy
0	Port 0	
1	Port 1	
2	Port 2	
3	Port 3	
4	Port 4	
5	Port 5	
6	Port 6	
7	Port 7	
8	Port 8	
9	Port 9	
10	X100	
11	X101	
12	X102	
13	X103	
14	X104	
15	X105	
20	X200	
21	X201	
22	X202	
23	X203	
24	X204	
25	X205	
40	X400	
41	X401	

42	X402
50	X500
51	X501
52	X502
53	X503
54	X504
55	X505
56	X506
57	X507

Cause: The topology comparison has detected a Sensor Module that is missing in the actual topology with respect to the target topology.

Alarm value (r2124, interpret hexadecimal):

ddccbbaa hex:

dd = connection number (%4)

cc = component number (%3)

bb = component class (%2)

aa = component number of the component that has not been inserted (%1)

Note:

The component is described in dd, cc and bb, where the component has not been inserted.

Component class and connection number are described in F01375.

Remedy: Adapting topologies:

- Insert the components involved at the right connection (correct the actual topology).
- Adapt the project/parameterizing in the commissioning tool (correct the target topology).

Check the hardware:

- Check the 24 V supply voltage.
- Check DRIVE-CLiQ cables for interruption and contact problems.
- Check that the component is working properly.

A01484 Topology: DRIVE-CLiQ Hub Module not connected

Message class: Error in the parameterization / configuration / commissioning procedure (18)

Message value: Component: %1, to %2, %3, connection: %4

Component: None

Propagation: Local

Response: NONE

Acknowledgment: NONE

Explanation of the message value:

For %1, %3

Component in target topology

For %2

Value	Cause	Remedy
0	Component unknown	
1	Control Unit	
2	Motor Module	
3	Line Module	
4	Sensor Module	
5	Voltage Sensing Module	
6	Terminal Module	
7	DRIVE-CLiQ Hub Module	
8	Controller Extension	
9	Filter module	
10	Hydraulic Module	
49	DRIVE-CLiQ component	
50	Option slot	
60	Encoder	
70	DRIVE-CLiQ motor	
71	Hydraulic cylinder	
72	Hydraulic valve	
80	Motor	

For %4

Value	Cause	Remedy
0	Port 0	
1	Port 1	
2	Port 2	
3	Port 3	
4	Port 4	
5	Port 5	
6	Port 6	
7	Port 7	
8	Port 8	
9	Port 9	
10	X100	
11	X101	
12	X102	
13	X103	
14	X104	
15	X105	
20	X200	
21	X201	
22	X202	
23	X203	
24	X204	
25	X205	
40	X400	
41	X401	

42	X402
50	X500
51	X501
52	X502
53	X503
54	X504
55	X505
56	X506
57	X507

Cause: The topology comparison has detected a DRIVE-CLiQ Hub Module missing in the actual topology with respect to the target topology.

Alarm value (r2124, interpret hexadecimal):

ddccbbaa hex:

dd = connection number (%4)

cc = component number (%3)

bb = component class (%2)

aa = component number of the component that has not been inserted (%1)

Note:

The component is described in dd, cc and bb, where the component has not been inserted.

Component class and connection number are described in F01375.

Remedy: Adapting topologies:

- Insert the components involved at the right connection (correct the actual topology).
- Adapt the project/parameterizing in the commissioning tool (correct the target topology).

Check the hardware:

- Check the 24 V supply voltage.
- Check DRIVE-CLiQ cables for interruption and contact problems.
- Check that the component is working properly.

A01489 Topology: motor with DRIVE-CLiQ not connected

Message class: Error in the parameterization / configuration / commissioning procedure (18)

Message value: Component: %1, to %2, %3, connection: %4

Component: None

Propagation: Local

Response: NONE

Acknowledgment: NONE

Explanation of the message value:

For %1, %3

Component in target topology

For %2

Value	Cause	Remedy
0	Component unknown	
1	Control Unit	
2	Motor Module	
3	Line Module	
4	Sensor Module	
5	Voltage Sensing Module	
6	Terminal Module	
7	DRIVE-CLiQ Hub Module	
8	Controller Extension	
9	Filter module	
10	Hydraulic Module	
49	DRIVE-CLiQ component	
50	Option slot	
60	Encoder	
70	DRIVE-CLiQ motor	
71	Hydraulic cylinder	
72	Hydraulic valve	
80	Motor	

For %4

Value	Cause	Remedy
0	Port 0	
1	Port 1	
2	Port 2	
3	Port 3	
4	Port 4	
5	Port 5	
6	Port 6	
7	Port 7	
8	Port 8	
9	Port 9	
10	X100	
11	X101	
12	X102	
13	X103	
14	X104	
15	X105	
20	X200	
21	X201	
22	X202	
23	X203	
24	X204	
25	X205	
40	X400	
41	X401	

42	X402
50	X500
51	X501
52	X502
53	X503
54	X504
55	X505
56	X506
57	X507

Cause: The topology comparison has detected a motor with DRIVE-CLiQ missing in the actual topology with respect to the target topology.
Alarm value (r2124, interpret hexadecimal):
ddccbbaa hex:
dd = connection number (%4)
cc = component number (%3)
bb = component class (%2)
aa = component number of the component that has not been inserted (%1)
Note:
The component is described in dd, cc and bb, where the component has not been inserted.
Component class and connection number are described in F01375.

Remedy: Adapting topologies:
- Insert the components involved at the right connection (correct the actual topology).
- Adapt the project/parameterizing in the commissioning tool (correct the target topology).
Check the hardware:
- Check the 24 V supply voltage.
- Check DRIVE-CLiQ cables for interruption and contact problems.
- Check that the component is working properly.
Note:
Under "Topology --> Topology view" the commissioning tool where relevant offers improved diagnostics capability (e.g. setpoint/actual value comparison).

A01550 Security: Drive data encryption invalid

Message class: Hardware/software error (1)
Message value: -
Component: Control Unit (CU)
Propagation: Local
Response: NONE
Acknowledgment: NONE
Cause: The password for drive data encryption (DDE) does not match the password configured in the converter or no password was configured.
The DDE password protects sensitive data on the SD card.
It is not possible to transfer the data backup from the SD card.

Remedy: To be able to restore the data backup on the SD card, the DDE password must correspond to the password that was originally configured for the data backup in the original converter:

- With the SD card inserted, enter the correct DDE password in the Security Wizard of the web server and restart the converter.

- In Startdrive, with the SD card inserted, under Online & Diagnostics, enter the correct DDE password in screen form "Specify password for encryption of the drive data" and restart the converter.

If the data backup on the SD card is not be used:

- Remove the SD card from the converter and restart the converter.

Notice: Not observing this and continuing to work at the converter can lead to the data backup on the SD card being lost.

A01590 Drive: Motor maintenance interval expired

Message class: General drive fault (19)

Message value: Fault cause: %1 bin

Component: Motor

Propagation: Global

Response: NONE

Acknowledgment: NONE

Cause: The selected service/maintenance interval for this motor was reached.

Alarm value (r2124, interpret decimal):

Motor data set number.

Remedy: carry out service/maintenance and reset the service/maintenance interval (p0651).

C01600 SI: STO self test failed

Message class: Safety monitoring channel has identified an error (10)

Message value: %1

Component: None

Propagation: Global

Response: OFF2

Acknowledgment: IMMEDIATELY

Cause: "Safety Integrated Functions" identified a fault in the self test of the switch-off signal path, and initiated an STO (Safe Torque Off).

Message value (r60049, interpret decimal):

1005: STO active, although STO not selected and there is no internal STO active.

1010: STO inactive, although STO is selected or an internal STO is active.

1015: The self test in operation was unsuccessful.

1016: Error in the communication path to the I/O processor.

Remedy: - Select STO and then de-select again.

- Carry out a POWER ON (switch-off/switch-on) for all components.

- Upgrade software to a later version.

- Contact Technical Support.

C01603 SI: Module temperature - limit value exceeded

Message class: Safety monitoring channel has identified an error (10)

Message value: -

Component: None

Propagation: Global

Response: OFF2

Acknowledgment: IMMEDIATELY

Cause:	A safe monitoring function has detected that the module temperature has exceeded a limit value. STO (Safe Torque Off) was initiated to maintain the safe state.
Remedy:	- Check the ambient air temperature. - Check the module fan. - Operate the module in the permissible range.

F01604 SI: Safety EEPROM data error

Message class:	Safety monitoring channel has identified an error (10)
Message value:	%1
Component:	Control Unit (CU)
Propagation:	Global
Response:	OFF2
Acknowledgment:	POWER ON
Cause:	Safety relevant EEPROM data are not correct. This fault results in an STO (Safe Torque Off). Fault value (r0949, interpret decimal): Only for internal Siemens fault diagnostics.
Remedy:	Replace the module.

A01605 SI: Checksum error has occurred

Message class:	Safety monitoring channel has identified an error (10)
Message value:	%1
Component:	Control Unit (CU)
Propagation:	Local
Response:	NONE
Acknowledgment:	NONE
Cause:	A checksum error (CRC error) has occurred in the converter program memory. Alarm value (r2124, interpret decimal): Only for internal Siemens troubleshooting.
Remedy:	- Carry out a POWER ON (switch-off/switch-on). - Upgrade firmware to later version. - Contact Technical Support.

F01606 SI: Safety HW version incorrect

Message class:	Safety monitoring channel has identified an error (10)
Message value:	%1
Component:	Control Unit (CU)
Propagation:	Global
Response:	OFF2
Acknowledgment:	POWER ON
Cause:	Safety relevant hardware version is not compatible with this software. This fault results in an STO (Safe Torque Off). Fault value (r0949, interpret decimal): Only for internal Siemens fault diagnostics.
Remedy:	Update the software or exchange the module for this software.

C01630 SI: Brake control error

Message class:	Safety monitoring channel has identified an error (10)
Message value:	%1

Component: None
Propagation: Global
Response: OFF2
Acknowledgment: IMMEDIATELY
Cause: The SBC (Safe Brake Control) function integrated in the drive has identified a brake control fault and has initiated an STO (Safe Torque Off).

Message value (r60049, interpret decimal):

1:

Fault in the "Open brake" state.

- Parameter p1278 incorrectly set.
- Brake not connected or interrupted cable (check whether for p1278 = 1 and p9604 bit 1 = 0 (SBC deactivated) the brake opens).
- Ground fault in brake cable.

2:

Fault in the "Close brake" state.

- Brake not connected or interrupted cable (check whether for p1278 = 1 and p9604 bit 1 = 0 (SBC deactivated) the brake opens).
- Short-circuit in brake winding.

3:

Hardware is defective or does not support the brake control.

- Communications with the brake control has failed.
- SBC is enabled on a module that does not support brake control.

4:

- Brake is not connected or interrupted cable.

Remedy:
- Check the motor holding brake connection.
- Check the function of the motor holding brake.
- Check whether the brake control is supported.
- Check whether there are disturbances in the communications from the self-identifying brake, and if required carry out a diagnostics routine for the faults involved.
- Check that the electrical cabinet design and cable routing are in compliance with EMC regulations (e.g. shield of the motor cable and brake conductors are connected with the shield connecting plate and the motor connectors are tightly screwed to the housing).
- Replace the hardware.

A01631 SI: Motor holding brake/SBC configuration not practical

Message class: Error in the parameterization / configuration / commissioning procedure (18)
Message value: -
Component: None
Propagation: Global
Response: NONE
Acknowledgment: NONE
Cause: A configuration of motor holding brake and SBC was detected that is not practical.

The following configurations can result in this message:

- "No motor holding brake available" (p1215 = 0) and "SBC" enabled (p9604 bit 1 = 1 and p9603>0).

Remedy: Check the parameterization of the motor holding brake and SBC and correct.

See also: p1215 (Motor holding brake configuration), p9603 (SI control), p9604 (SI enable)

A01637 SI: Safety configuration not protected

Message class: Error in the parameterization / configuration / commissioning procedure (18)
Message value: -
Component: None

Propagation: Local
Response: NONE
Acknowledgment: NONE
Cause: Safety configuration is not protected using UMAC (User Management and Access Control).
Remedy: Activate UMAC and assign the rights for changing the "Edit Safety Integrated application" safety configuration to a specific user that is saved with user name and password.

C01640 SI: Component exchange identified and acknowledgment/save required

Message class: General drive fault (19)
Message value: Fault cause: %1
Component: Control Unit (CU)
Propagation: Local
Response: NONE
Acknowledgment: IMMEDIATELY
Explanation of the message value: For %1

Bit	Cause	Remedy
0	It was identified that the drive was replaced	
4	It was identified that the sensor module was replaced	
5	It was identified that the sensor was replaced	

Cause: "Safety Integrated" identified that a component has been replaced.
It is No longer possible to operate the particular drive without fault.
When safety functions are active, after a component has been replaced a partial acceptance test must be performed.

Note:
This message results in an STO (Safe Torque Off).

Remedy: - Confirm component exchange using the button in the commissioning tool.
- Save all parameters (p0977 = 1 or retentively save).
- Without a POWER ON, this message can be acknowledged using a safe acknowledgment mechanism (e.g. via PROFIsafe).

Note:
In addition to the fault, diagnostics bits r9776.2 and r9776.3 are set.
See also: r9776 (SI diagnostics)

A01641 SI: Component exchange identified and save necessary

Message class: General drive fault (19)
Message value: Fault cause: %1
Component: Control Unit (CU)
Propagation: Local
Response: NONE
Acknowledgment: NONE
Explanation of the message value: For %1

Bit	Cause	Remedy
0	It was identified that the drive was replaced	
4	It was identified that the sensor module was replaced	
5	It was identified that the sensor was replaced	

Cause: "Safety Integrated" identified that a component has been replaced.

No additional stop response is initiated, and therefore the operation of the specific drive is not restricted.

When "Safety Integrated Functions" are active, after a component has been replaced a partial acceptance test must be performed.

Alarm value (r2124, interpret binary).

Remedy: - Save all parameters (p0977 = 1 or "copy RAM to ROM").

- Acknowledge fault.

See also: r9776 (SI diagnostics)

F01646 SI: Change logbook

Message class: Safety monitoring channel has identified an error (10)

Message value: %1

Component: Control Unit (CU)

Propagation: Local

Response: OFF2

Acknowledgment: IMMEDIATELY

Cause: The saved functional safety checksum (r9780[0]) or hardware-related safety checksum (r9780[1]) differs from the safety checksum calculated when running up or a previously calculated safety checksum was not found.

An acceptance test is required as changes have been made to a safety parameter or the safety hardware.

Fault value (r0949, interpret decimal):

1: The safety logbook has identified that a functional safety checksum has changed. An acceptance test is required.

2: The safety logbook has identified that a hardware-related safety checksum has changed. An acceptance test is required.

Remedy: For fault value = 1:

- Carry out an acceptance test and generate an acceptance report.

For fault value = 2:

- Carry out the function checks for the modified hardware and generate an acceptance report.

Note:

The procedure when carrying out an acceptance test as well as an example of the acceptance report are provided in the Safety Integrated product documentation.

C01647 SI: PROFIsafe PLC configuring not the same as the parameterization

Message class: Error in the parameterization / configuration / commissioning procedure (18)

Message value: %1

Component: None

Propagation: Global

Response: OFF2

Acknowledgment: IMMEDIATELY

Cause: The drive has identified a difference between the PROFIsafe configuring in the F-PLC and the parameterization in SINAMICS.

Note:

This message results in an STO (Safe Torque Off).

Message value (r60049, interpret decimal):

1: The PROFIsafe telegram number in the F-PLC configuration is not identical with the value in p9611.

2: The PROFIsafe monitoring time F_WD_Time in the F-PLC configuration is not identical with the value in p9614.

Remedy: - Change the configuring in the F-PLC and load to the drive.

- Adapt the parameterization in the drive to the configuration in the F-PLC.

C01648 SI: PROFIsafe communication error

Message class: Safety monitoring channel has identified an error (10)

Message value:	%1
Component:	None
Propagation:	Global
Response:	NONE
Acknowledgment:	IMMEDIATELY
Cause:	The drive has identified a PROFIsafe communication error.

Note:

This message results in

- STO (Safe Torque Off), if p9612 = 0,
- SS1 (Safe Stop 1), if p9612 = 1.

Message value (r0949, interpret decimal):

6000 ... 6166:

PROFIsafe message values (PROFIsafe driver for PROFINET).

For these message values, the failsafe control signals (failsafe values) are transferred to the safety functions. If "SS1 after failure of PROFIsafe communication" is parameterized (p9612), then transfer of the Failsafe Values is delayed.

6064 ... 6076:

Error when evaluating F parameters. The values of the transferred F parameters do not match the expected values.

6064: Destination address and PROFIsafe address are different (F_Dest_Add != p9610).

6065: Destination address not valid (F_Dest_Add == 0 or 0xFFFF).

6066: Source address not valid (F_Source_Add == 0 or 0xFFFF) or source address and PROFIsafe source address different (F_Source_Add != p9613).

6067: Watchdog time not valid (F_WD_Time == 0).

6068: Incorrect SIL level (F_SIL).

6069: Incorrect F-CRC length (F_CRC_Length).

6070: Incorrect F parameter version (F_Par_Version).

6071: CRC error for the F parameters (CRC1). The transferred CRC value of the F parameters does not match the value calculated in the PROFIsafe driver.

6072: F parameterization is inconsistent.

6076: Incorrect F_block_ID.

6165: A communications error was identified when receiving the PROFIsafe telegram. The error can also occur if an inconsistent or out-of-date PROFIsafe telegram was received after switching the system off and on or after inserting the PROFINET cable.

6166: A time monitoring error (timeout) was identified when receiving the PROFIsafe telegram.

>65535: A fatal PROFIsafe communication error has occurred (only for internal Siemens error diagnostics).

Remedy: For message value = 6064:
- Check the setting of the value in the F parameter F_Dest_Add at the PROFIsafe device.
- Check the setting of the PROFIsafe address (p9610).
For message value = 6065:
- Check the setting of the value in the F parameter F_Dest_Add at the PROFIsafe device. It is not permissible that the destination address is 0 or FFFF.
For message value = 6066:
- Check the setting of the value in F-parameter F_Source_Add at the PROFIsafe device. It is not permissible for the source address to be either 0 or FFFF.
- Check the setting of the PROFIsafe source address (p9613).
For message value = 6067:
- Check the setting of the value in the F parameter F_WD_Time at the PROFIsafe device. It is not permissible for the watchdog time to be 0.
For message value = 6068:
- Check the setting of the value in F parameter F_SIL at the PROFIsafe device.
For message value = 6069:
- Check the setting of the value in the F parameter F_CRC_Length at the PROFIsafe device.
For message value = 6070:
- Check the setting of the value in the F parameter F_Par_Version at the PROFIsafe device. The value for the F parameter version is 0 in the V1 mode and 1 in the V2 mode.
For message value = 6071:
- Check the setting of the values of the F parameters and the F parameter CRC (CRC1) calculated from these at the PROFIsafe device and update if necessary.
For message value = 6072:
- Check the settings of the values for the F parameters and, if required, correct.
The following combinations are permissible for F parameters F_CRC_Length and F_Par_Version:
F_CRC_Length = 3-byte CRC and F_Par_Version = 1
F_CRC_Length = 4-byte CRC and F_Par_Version = 1
For message value = 6076:
- Check the settings of the values for the F parameters and, if required, correct.
For message value = 6165:
- Acknowledge the fault if it occurs after running up or after inserting the PROFINET cable.
- Check the configuration and communication at the PROFIsafe device.
- Check the setting of the value for F parameter F_WD_Time at the PROFIsafe device and increase if necessary.
- Check whether all F parameters of the drive match the F parameters of the F host.
For message value = 6166:
- Check the configuration and communication at the PROFIsafe device.
- Check the setting of the value for F parameter F_WD_Time at the PROFIsafe device and increase if necessary.
- Evaluate diagnostic information in the F host.
- Check PROFIsafe connection.
- Check whether all F parameters of the drive match the F parameters of the F host.
For message value > 65535:
- Carry out a POWER ON (switch-off/switch-on) for all components.
- Check whether other faults are active - and when necessary, carry out diagnostics for the faults involved.
- Increase the monitoring cycle clock settings (p9500, p9511).
- Upgrade firmware to later version.
- Contact Technical Support.
- Replace hardware relevant for the communication.

C01649 SI: Internal software error

Message class: Hardware/software error (1)
Message value: Module: %1, line: %2
Component: Control Unit (CU)

Propagation:	Global
Response:	OFF2
Acknowledgment:	IMMEDIATELY
Cause:	An internal error has occurred in the Safety Integrated software. Note: This message results in an STO (Safe Torque Off) that cannot be acknowledged. Message value (r60049, interpret hexadecimal): Only for internal Siemens fault diagnostics.
Remedy:	- Carry out a POWER ON (switch-off/switch-on) for all components. - Repeat commissioning of "Safety Integrated" and carry out a POWER ON. - Upgrade firmware to later version. - Contact Technical Support. - Replace hardware component.

F01650 SI: Acceptance test required

Message class:	Safety monitoring channel has identified an error (10)
Message value:	%1
Component:	Control Unit (CU)
Propagation:	Local
Response:	OFF2
Acknowledgment:	IMMEDIATELY
Cause:	"Safety Integrated Functions" requires an acceptance test. Message value (r0949, interpret decimal): 2003: Acceptance test is required as a safety parameter has been changed.
Remedy:	For message value = 2003: - Carry out an acceptance test and generate an acceptance report. The procedure when carrying out an acceptance test as well as an example of the acceptance report are provided in the product operating instructions.

C01652 SI: Monitoring clock cycle not permissible

Message class:	Error in the parameterization / configuration / commissioning procedure (18)
Message value:	%1
Component:	None
Propagation:	Global
Response:	OFF2
Acknowledgment:	IMMEDIATELY
Cause:	One of the Safety Integrated monitoring clock cycles is not permissible. - The monitoring clock cycle for safe motion monitoring functions is not permissible (p9500). - The actual value sensing clock cycle for safe motion monitoring functions is not permissible (p9511). - The sampling time for the current controller cannot be supported. Message value (r60049, interpret decimal): When motion monitoring is enabled (p9603 > 0), the following applies: 100: No matching monitoring clock cycle (p9500) was able to be found. 107: The actual value acquisition clock cycle (p9511) is not an integer multiple of the sampling time of the current controller clock cycle. 108: The parameterized actual value sensing clock cycle (p9511) cannot be set on this component. 111: The monitoring clock cycle (p9500) is not an integer multiple of the sampling time of the current controller clock cycle.

Remedy: When motion monitoring is enabled (p9603 > 0):
- Upgrade firmware to later version.
- Correct the monitoring clock cycle (p9500) and carry out POWER ON.

For message value = 100:

Set the monitoring clock cycle in p9500 as an integer multiple of the sampling time of the current controller (p9500 / 2 = n *current controller clock cycle)

For message value = 107, 108:

Set the actual value sensing clock cycle in p9511 as an integer multiple of the current controller sampling time (p9511 = n * current controller clock cycle), and at the same time as an integer divisor of the monitoring clock cycle (p9511 = p9500 / m).

For message value = 111:

Set the monitoring clock cycle in p9500 as an integer multiple of the sampling time of the current controller.

C01653 SI: PROFINET configuration error

Message class: Error in the parameterization / configuration / commissioning procedure (18)

Message value: %1

Component: None

Propagation: Global

Response: NONE

Acknowledgment: IMMEDIATELY

Cause: There is a PROFINET configuration error for using Safety Integrated monitoring functions with a higher-level control (F-PLC).

Note:

When the Safety Integrated Functions are enabled, this message results in an STO (Safe Torque Off).

Message value (r60049, interpret decimal):

200: A safety slot for receive data from the control has not been configured.

220: The configured safety slot for the receive data from the control has an unknown format.

230: The configured safety slot for the receive data from the F-PLC has the incorrect length.

231: The configured safety slot for the receive data from the F-PLC has the incorrect length.

300: A safety slot for the send data to the control has not been configured.

320: The configured safety slot for the send data to the control has an unknown format.

330: The configured safety slot for the send data to the F-PLC has the incorrect length.

331: The configured safety slot for the send data to the F-PLC has the incorrect length.

400: The telegram number in the F-PLC does not match the parameterization in the drive.

Remedy: The following generally applies:
- Check and, if necessary, correct the PROFINET configuration of the safety slot on the controller side.
- Upgrade firmware to later version.

For message value = 231, 331:
- In the drive, parameterize the appropriate PROFIsafe telegram (p9611) to be set on the F-PLC.
- Configure the PROFIsafe telegram matching the parameterization (p9611) in the F-PLC.

A01654 SI: PROFIsafe configuration different

Message class: Error in the parameterization / configuration / commissioning procedure (18)

Message value: %1

Component: None

Propagation: Global

Response: NONE

Acknowledgment: NONE

Cause: The configuration of a PROFIsafe telegram in the higher-level control (F-PLC) does not match the parameterization in the drive.
Note:
This message does not result in a safety stop response.
Alarm value (r2124, interpret decimal):
1:
A PROFIsafe telegram is configured in the higher-level control; however, PROFIsafe is not enabled in the drive (p9603.1).
2:
PROFIsafe is parameterized in the drive; however, a PROFIsafe telegram has not been configured in the higher-level control.

Remedy: The following generally applies:
- Check and, if necessary, correct the PROFIsafe configuration in the higher-level control.
For alarm value = 1:
- Remove the PROFIsafe configuring in the higher-level F control or enable PROFIsafe in the drive.
For alarm value = 2:
- Configure the PROFIsafe telegram to match the parameterization in the higher-level F-control.

C01657 SI: PROFIsafe telegram number invalid

Message class: Error in the parameterization / configuration / commissioning procedure (18)
Message value: -
Component: None
Propagation: Global
Response: OFF2
Acknowledgment: POWER ON
Cause: The PROFIsafe telegram number set in p9611 is not valid.
When PROFIsafe is enabled (p9603.1 = 1), then a telegram number greater than zero must be entered in p9611.
Note:
This message does not result in a safety stop response.
See also: p9611 (SI PROFIsafe telegram selection), r60022 (PROFIsafe telegram)
Remedy: Check the telegram number setting (p9611).

C01658 SI: PROFIsafe telegram number not equal

Message class: Error in the parameterization / configuration / commissioning procedure (18)
Message value: -
Component: None
Propagation: Global
Response: OFF2
Acknowledgment: IMMEDIATELY
Cause: The PROFIsafe telegram number in p9611 differs from the configured PROFIsafe telegram number in the F-PLC (r60022).
Note:
This message does not result in a safety stop response.
See also: p9611 (SI PROFIsafe telegram selection)
Remedy: Align the telegram number in p9611 with the PROFIsafe telegram number in the F-PLC (r60022).

C01668 SI: Checksum error safety monitoring functions

Message class: Safety monitoring channel has identified an error (10)
Message value: %1
Component: Control Unit (CU)
Propagation: Global

Response: OFF2

Acknowledgment: IMMEDIATELY

Cause: The actual checksum calculated by the drive and entered in r10098 via the safety-relevant parameters does not match the reference checksum saved in p10099 at the last machine acceptance.

Safety-relevant parameters have been changed or a fault is present.

Note:

This message results in an STO (Safe Torque Off).

Message value (r60049, only for internal Siemens diagnostics)

Remedy: - Carry out safety commissioning.

- Carry out an acceptance test.

C01670 SI: Invalid Sensor Module configuration

Message class: Error in the parameterization / configuration / commissioning procedure (18)

Message value: %1

Component: None

Propagation: Global

Response: OFF2

Acknowledgment: IMMEDIATELY

Cause: The configuration of a Sensor Module used for Safety Integrated is not permissible.

Note:

This message results in an STO (Safe Torque Off).

Message value (r60049, interpret decimal):

1: The encoder data set selected for Safety Integrated is not valid or the encoder is not assigned to an encoder data set.

2: No encoder was parameterized for Safety Integrated or the encoder is not suitable for safety-related applications.

4: A communication error with the encoder has occurred.

5: Number of relevant bits in the encoder coarse position invalid.

6: DRIVE-CLiQ encoder configuration invalid.

7: Non-safety relevant component of the encoder coarse position for the linear DRIVE-CLiQ encoder not valid.

8: Safety comparison algorithm not supported.

9: Relationship between the grid division and measuring step for linear DRIVE-CLiQ encoder is not binary.

15: Pulses per revolution of a rotary encoder is not valid.

16: Grid division of a linear encoder is not valid.

17: Encoder is not compatible. The safe positioning accuracy of the encoder is not equal to the setpoint parameterized in p9631 - or the safe maximum speed/velocity of the encoder is not equal to the setpoint parameterized in p9630.

18: Encoder has still not been configured for Safety Integrated. The safe positioning accuracy of the encoder has still not been parameterized in p9631 - and the safe maximum velocity of the encoder has still not been parameterized in p9630 (parameter values are 0).

19: The encoder parameterization or the module identifier of the encoder/encoder module has changed or the encoder parameterization is corrupt.

20: For a DQi encoder, the offset between POS1 and POS2 has changed since the last run-up.

21: The timer for the effectivity test for a DQi encoder is not equal to 4 hours.

22: In the current firmware version, the encoder type is not permitted for Safety Integrated.

Remedy: For message value = 1:
Carefully ensure that a safety-relevant encoder is connected and commission the drive again.

For message value = 2:
Use an encoder that Safety Integrated Functions supports.

For message value = 4:
Check whether there is a DRIVE-CLiQ communication error to the Sensor Module involved and, if required, carry out a diagnostics routine for the faults identified.

For message value =8:
Use an encoder that implements an algorithm supported by Safety Integrated.
Supported encoder types are listed in the product documentation for Safety Integrated.

For message value = 5, 6, 7, 9, 15, 16, 19, 20, 21:
Replace the encoder if it is defective.

For message value = 17, 18:
Select and deselect the safety commissioning mode (during safety commissioning, the quality of the connected encoder is transferred into the encoder quality parameter p9630 and ff.).

For message value = 22:
Use an encoder type that is supported in the current firmware version.
Supported encoder types are listed in the product documentation for Safety Integrated.

For message value = 23:
Safety actual value acquisition clock cycle (p9511) is not an integer multiple of the encoder communication clock cycle.

C01671 SI: Parameterization actual value acquisition incorrect

Message class: Error in the parameterization / configuration / commissioning procedure (18)
Message value: %1
Component: None
Propagation: Global
Response: OFF2
Acknowledgment: IMMEDIATELY
Cause: The parameterization of the actual value sensing for Safety Integrated is incorrect.
Note:
This message results in an STO (Safe Torque Off).
Message value (r60049, interpret decimal):
yyyyxxxx dec: yyyy = supplementary information, xxxx = parameter
yyyy = 0:
No additional supplementary information
xxxx = 9522:
The gear stage was set too high.
Remedy: Check the parameterization of the actual value sensing for Safety Integrated and if required correct.
For message value 9522:
- Set the gearbox stage lower.

C01674 SI: Safety function not supported by PROFIsafe telegram

Message class: Error in the parameterization / configuration / commissioning procedure (18)

Message value: %1
Component: None
Propagation: Global
Response: OFF2
Acknowledgment: IMMEDIATELY
Cause: The monitoring function enabled in p9604 is not supported by the currently set PROFIsafe telegram (p9611).
Note:
Message value (r60049, interpret bitwise binary):
Bit 3 = 1:
SS1E (Safe Stop 1 External) via PROFIsafe is not supported (p9604.3).
Bit 5 = 1:
SS2E (Safe Stop 2 External) via PROFIsafe is not supported (p9604.5).
Bit 6 = 1:
SS2ESR: (Safe Stop 2 Extended Stop and Retract) via PROFIsafe is not supported (p9604.6).
Bit 9 = 1:
Transfer of SLS (Safely-Limited Speed) limit value via PROFIsafe is not supported (p9604.9).
Bit 15 = 1:
Gearbox stage switchover via PROFIsafe is not supported (p9604.15).
Bit 19 = 1:
SCA via PROFIsafe is not supported (p9604.19).
Bit 20 = 1:
Transfer of safe position (SP) via PROFIsafe is not supported (p9604.20).
Bit 30 = 1:
Transfer of F-DI via PROFIsafe is not supported (p9604.30).
Remedy: - Deselect the monitoring function involved (p9604).
- Set the matching PROFIsafe telegram (p9611).

C01676 SI: Parameterization of the failsafe inputs not permissible

Message class: Error in the parameterization / configuration / commissioning procedure (18)
Message value: %1
Component: Control Unit (CU)
Propagation: Global
Response: OFF2
Acknowledgment: IMMEDIATELY
Cause: When controlled via terminal (p9603.0 = 1).
- Only the failsafe digital input F-DI 0 (r10071.0) may be selected
- Only STO (c10022) / SS1 (c10023) / SS1E (c10060) may be interconnected

Note:
This message results in an STO (Safe Torque Off).
Message value (r60049, interpret decimal):
xxxx = parameter number
Remedy: Correct parameters:
- Interconnect with a valid signal source.
- Inhibit control via terminal (p9603.0 = 0).

C01677 SI: Incorrect onboard F-I/O parameter value

Message class: Error in the parameterization / configuration / commissioning procedure (18)
Message value: Parameter: %1, supplementary information: %2
Component: None

Propagation: Global
Response: NONE
Acknowledgment: IMMEDIATELY
Cause: The parameter cannot be parameterized with this value.
Note:
This message does not result in a safety stop response.
Message value (r60049, interpret decimal): yyyyxxxx dec:
yyyy = supplementary information
xxxx = parameter

yyyy = 0:
No additional information available.

xxxx = 10000 and
yyyy = F-DI number:
A non-existent F-DI was enabled.

xxxx = 10002:
The F-DI discrepancy time (p10002) is less than or equal to the SI monitoring clock cycle (p9500).

xxxx = 10017 and
yyyy = F-DI number:
The input filter (p10017) is less than or equal to (p10018 + 2ms) when simultaneously selecting "Self test using specified dark pulses" (p10041[y] = 1).

xxxx = 10018 and
yyyy = F-DI number:
Setting "F-DI self test length dark pulses" (p10018) is zero when simultaneously selecting "Self test using specified dark pulses" (p10041[y] = 1).

xxxx = 10041 and
yyyy = F-DI number:
An invalid value was set in "F-DI self test mode selection" (p10041[y]).

xxxx = 10071 and
yyyy = F-DI number:
An F-DI status r10071[y], which was not enabled in p10000, was set.

Remedy: Correct the parameter value.
For xxxx = 10000 and yyyy = F-DI number:
- Correct "SI F-DI enable" (p10000).
For xxxx = 10002:
- Set "SI F-DI switchover discrepancy time" (p10002) longer than "SI monitoring clock cycle" (p9500).
For xxxx = 10017 and yyyy = F-DI number:
- Set "SI digital inputs input filter" (p10017) greater than (p10018 + 2 ms)
- Change "SI F-DI self test mode selection" (p10041[y])
For xxxx = 10018 and yyyy = F-DI number:
- Set "SI F-DI self test length dark pulses" (p10018) greater than zero.
- Change p10041[y] "SI F-DI self test mode selection".
For xxxx = 10041 and yyyy = F-DI number:
- Change "SI F-DI self test mode selection" (p10041[y])
For xxxx = 10071 and yyyy = F-DI number:
- Correct "SI F-DI enable" (p10000).

C01680 SI: Checksum error safety monitoring functions

Message class: Safety monitoring channel has identified an error (10)

Message value: %1

Component: Control Unit (CU)

Propagation: Global

Response: OFF2

Acknowledgment: IMMEDIATELY

Cause: The actual checksum over the safety-relevant parameters, calculated by the drive, does not match the reference checksum last saved for the last machine acceptance test.

Safety-relevant parameters have been changed or a fault is present.

Note:

This message results in an STO (Safe Torque Off).

Message value (r60049, only for internal Siemens diagnostics)

Remedy:

- Check the safety-relevant parameters and if required, correct.
- Retentively save parameters.
- Perform a POWER ON if safety parameters requiring a POWER ON have been modified.
- Carry out an acceptance test.

C01681 SI: Incorrect parameter value

Message class: Error in the parameterization / configuration / commissioning procedure (18)

Message value: Parameter: %1, supplementary information: %2

Component: None

Propagation: Global

Response: OFF2

Acknowledgment: IMMEDIATELY

Cause: The parameter cannot be parameterized with this value.

Note:

This message results in an STO (Safe Torque Off).

Message value (r60049, interpret decimal):

yyyyxxxx dec: yyyy = supplementary information, xxxx = parameter

yyyy = 0:

No additional information available.

xxxx = 9547:

Parameter rule not complied with.

xxxx = 9560:

For SS1 ramp-monitored (p9606 = 2) or SS1E ramp-monitored (p9607 = 2), the parameter must be greater than zero.

xxxx = 9578:

The acceleration limit (p9578) or possibly the monitoring cycle (p9500) is set too low.

xxxx = 9603:

The type of control displayed under additional information is not permissible for p9603 on this device.

xxxx = 10006 or 10022 to 10036:

An inadmissible signal source for the control via F-DI was set.

xxxx = 10050:

An inadmissible signal source for the F-DI via PROFIsafe was set. yyyy contains the incorrect index of c10050[].

Remedy: Correct parameters:

For xxxx = 9547:

Set parameters p9546 and p9547 according to the following rule: p9546 * 0.75 >= p9547

For xxxx = 9560:

Set a parameter value greater than zero.

For xxxx = 9578:

Increase parameter p9578 or if required, p9500.

The following rule must be satisfied: p9578 * 10 > r9790[1] and p9578 * 3 > r9790[0].

For xxxx = 9603:

In p9603, set a type of control that is permissible for this device.

For xxxx = 10006 or 10022 to 10036:

Interconnect with a valid signal source.

For xxxx = 10050 and yyyy = 0, 1 or 2:

Interconnect c10050[yyyy] with a valid signal source or fixed value.

C01682 SI: Monitoring function not supported

Message class: Error in the parameterization / configuration / commissioning procedure (18)

Message value: %1

Component: None

Propagation: Global

Response: OFF2

Acknowledgment: IMMEDIATELY

Cause: At least one of the monitoring functions enabled in p9604 is not supported with this firmware version on this device.

Note:

The message value (r60049, interpret binary) indicates the bits of the monitoring functions, which form this firmware version on this device, are not supported. If several, non-supported monitoring functions are simultaneously enabled, then these are all displayed in the message value.

This message results in an STO (Safe Torque Off).

See also: p9604 (SI enable)

Remedy: Correct parameter p9604 so that monitoring functions only permitted for this firmware version and for this device are enabled.

See also: p9604 (SI enable)

C01690 SI: Data backup problem for the NVRAM

Message class: Hardware/software error (1)

Message value: %1

Component: Control Unit (CU)

Propagation: Local

Response: OFF2

Acknowledgment: POWER ON

Cause: When saving parameters r9780, r9781 and r9782 (Safety logbook) says, an error has occurred in conjunction with the NVRAM.

Note:

This message does not result in a safety stop response.

Message value (r60049, interpret decimal):

1: There is no physical NVRAM in the drive.

2: There is no longer any free memory space in the NVRAM.

Remedy: For message value = 1:
- Replace the hardware.
For message value = 2:
- De-select functions that are not required and that take up memory space in the NVRAM.
- Contact Technical Support.
Note:
NVRAM: Non-Volatile Random Access Memory (non-volatile read and write memory)

A01698 SI: Commissioning mode active

Message class: General drive fault (19)
Message value: -
Component: Control Unit (CU)
Propagation: Local
Response: NONE
Acknowledgment: NONE
Cause: "Safety Integrated" commissioning is selected.
This message is withdrawn after the safety functions have been commissioned.
Note:
- This message does not result in a safety stop response.
- In the safety commissioning mode, function STO (Safe Torque Off) is internally selected.
Remedy: Not necessary.

C01700 SI: STO (Safe Torque Off) initiated

Message class: Safety monitoring channel has identified an error (10)
Message value: -
Component: None
Propagation: Global
Response: OFF2
Acknowledgment: IMMEDIATELY
Cause: The drive is stopped using STO (Safe Torque Off).
Possible causes:
Subsequent response, following messages: C01706, C01714, C01715, C01716.
Remedy: Carry out diagnostics for the active messages (C01706, C01714, C01715, C01716).

C01701 SI: SS1 (Safe Stop 1) initiated

Message class: Safety monitoring channel has identified an error (10)
Message value: -
Component: None
Propagation: Global
Response: OFF3
Acknowledgment: IMMEDIATELY
Cause: The drive is stopped using SS1 (Safe Stop 1) (braked along the OFF3 down ramp).
As a result of this message, after the time parameterized in p9556 has expired, or the speed threshold parameterized in p9560 has been fallen below, STO (Safe Torque Off) is initiated.
Possible causes:
Subsequent response, following messages: C01707, C01711, C01714, C01715, C01716.
Remedy: Perform diagnostics for active messages (C01707, C01711, C01714, C01715, C01716).

C01702 SI: SS1E (Safe Stop 1 External) initiated

Message class: Safety monitoring channel has identified an error (10)
Message value: -
Component: None
Propagation: Global
Response: NONE
Acknowledgment: IMMEDIATELY
Cause: The drive is stopped via SS1E (Safe Stop 1 External) (braked from an external control system).

As a result of this message, after the time parameterized in p9594 has expired, or the speed threshold parameterized in p9560 has been fallen below, STO (Safe Torque Off) is initiated.

Possible causes:

Subsequent response, following messages: C01714, C01716

Remedy: Carry out diagnostics for the active messages (C01714, C01716).

C01706 SI: SAM/SBR limit exceeded

Message class: Safety monitoring channel has identified an error (10)
Message value: %1
Component: None
Propagation: Global
Response: OFF2
Acknowledgment: IMMEDIATELY
Cause: The safety functions with parameterized motion monitoring SAM (Safe Acceleration Monitor) / SBR (Safe Brake Ramp) have identified an error.

After initiating SS1 (Safe Stop 1), SS1E (Safe Stop 1 External), SS2 (Safe Stop 2) or SS2E (Safe Stop 2 External), the speed has exceeded the set tolerance.

The drive is shut down by message C01700 (STO (Safe Torque Off) initiated).

Message value (r60049, interpret decimal):

0: SAM for SS1/SS2 has detected a fault.

1: SBR for SS1/SS2 has detected a fault.

2: SAM for SS1E/SS2E has detected a fault.

3: SBR for SS1E/SS2E has detected a fault.

Remedy: Check the braking behavior and, if necessary, adapt the parameterization of the SAM or SBR monitoring.

Without a POWER ON, this message can be acknowledged using a safe acknowledgment mechanism (e.g. via PROFIsafe).

See also: p9548 (SI SAM velocity tolerance), p9581 (SI SBR reference velocity for SS1 and SS2), p9582 (SI SAM/SBR delay time for SS1 and SS2), p9583 (SI SBR reference time for SS1 and SS2)

C01707 SI: Tolerance for safe operating stop exceeded

Message class: Safety monitoring channel has identified an error (10)
Message value: -
Component: None
Propagation: Global
Response: NONE
Acknowledgment: IMMEDIATELY
Cause: The actual position has distanced itself further from the target position than the standstill tolerance.

The drive is shut down by message C01701 (SS1 (Safe Stop 1) initiated).

Remedy: - Check whether safety messages are active, and if required carry out the appropriate diagnostic routines for the messages involved.
- Check whether the standstill tolerance matches the accuracy and control dynamic performance of the axis.
- Carry out a POWER ON.
Without a POWER ON, this message can be acknowledged using a safe acknowledgment mechanism (e.g. via PROFIsafe).
See also: p9530 (SI SOS standstill tolerance)

C01708 SI: SS2 (Safe Stop 2) initiated

Message class: Safety monitoring channel has identified an error (10)
Message value: -
Component: None
Propagation: Global
Response: STOP2
Acknowledgment: IMMEDIATELY
Cause: The drive is stopped using SS2 (Safe Stop 2) (braked along the OFF3 down ramp).
SOS (Safe Operating Stop) is activated after the parameterized time has expired.
Possible causes:
- Stop request from the higher-level control system.
- Subsequent response messages: C01714, C01715, C01716
See also: p9552 (SI transition time SS2 to SOS)
Remedy: - Remove the cause of the message at the control system.
- Carry out diagnostics for the active messages (C01714, C01715, C01716)
Without a POWER ON, this message can be acknowledged using a safe acknowledgment mechanism (e.g. via PROFIsafe).

C01709 SI: SS2E (Safe Stop2 External) initiated

Message class: Safety monitoring channel has identified an error (10)
Message value: -
Component: None
Propagation: Global
Response: NONE
Acknowledgment: IMMEDIATELY
Cause: The drive is stopped via SS2E (Safe Stop 2 External) (braking along a path).
SOS (Safe Operating Stop) is activated after the parameterized time has expired.
Possible causes:
- Stop request from the higher-level control system.
- Subsequent response messages: C01714, C01715, C01716
See also: p9553 (SI transition time SS2E to SOS)
Remedy: - Remove the cause of the message at the control system.
- Carry out diagnostics for the active messages (C01714, C01715, C01716)
Without a POWER ON, this message can be acknowledged using a safe acknowledgment mechanism (e.g. via PROFIsafe).

C01711 SI: SCF (Safety Channel Failure) initiated

Message class: Safety monitoring channel has identified an error (10)
Message value: -
Component: None
Propagation: Global
Response: NONE

Acknowledgment: IMMEDIATELY

Cause: The drive has detected an error in a safe monitoring function and has initiated SCF (Safety Channel Failure).

Monitoring functions are no longer reliable. Safe operation not possible.

Possible causes:

Subsequent response, following messages: C01648, C01750, C01751, C01753, C01754, C01769.

Note:

This message results in an SS1 (Safe Stop 1) or SS1E (Safe Stop 1 External) depending on p9561, and as a consequence, after the time parameterized in p9556 has expired, or the speed threshold parameterized in p9560 has been fallen below, STO (Safe Torque Off) is initiated.

See also: p9555 (SI transition time SCF to SS1/SS1E), p9561 (SI SCF stop response)

Remedy: Carry out diagnostics for the active messages (C01648, C01750, C01751, C01753, C01754, C01769).

C01714 SI: Safely-Limited Speed exceeded

Message class: Safety monitoring channel has identified an error (10)

Message value: %1

Component: None

Propagation: Global

Response: NONE

Acknowledgment: IMMEDIATELY

Cause: The drive has moved faster than that specified by the velocity limit value (p9531). The drive is stopped by the configured stop response (p9563).

Message value (r60049, interpret decimal):

100: SLS1 exceeded.

200: SLS2 exceeded.

300: SLS3 exceeded.

400: SLS4 exceeded.

Remedy: - Check the traversing/motion program in the control.

- Check the limits for SLS (Safely-Limited Speed) and if required adapt accordingly (p9531).

Without a POWER ON, this message can be acknowledged using a safe acknowledgment mechanism (e.g. via PROFIsafe).

See also: p9531 (SI SLS limit values), p9563 (SI SLS stop response)

C01716 SI: Tolerance for Safe Direction exceeded

Message class: Safety monitoring channel has identified an error (10)

Message value: %1

Component: None

Propagation: Global

Response: NONE

Acknowledgment: IMMEDIATELY

Cause: The tolerance for SDI (Safe Direction) was exceeded. The drive is stopped by the configured stop response (p9566).

Message value (r60049, interpret decimal):

0: Tolerance for "SDI positive" exceeded.

1: Tolerance for "SDI negative" exceeded.

Remedy: - Check the traversing/motion program in the control.
- Check the tolerance for function SDI and if required, adapt (p9564).
Without a POWER ON, this message can be acknowledged using a safe acknowledgment mechanism (e.g. via PROFIsafe).
Prerequisite:
- Deselect function SDI function and if required select again.
See also: p9564 (SI SDI tolerance), p9565 (SI SDI delay time), p9566 (SI SDI stop response)

C01717 SI: SLA limit exceeded

Message class: Safety monitoring channel has identified an error (10)
Message value: %1
Component: None
Propagation: Global
Response: NONE
Acknowledgment: IMMEDIATELY
Cause: The acceleration limit for function SLA (Safely-Limited Acceleration) was exceeded. The drive is stopped as a result of the configured stop response (p9579).
Message value (r60049, interpret decimal):
0: The monitoring of the coarsely resolved acceleration has violated the acceleration limit.
1: The monitoring of the finely resolved acceleration and possibly filtered acceleration has violated the acceleration limit.
Remedy: - Check the traversing/motion program in the control.
- Check the acceleration limit for the SLA function and if required, adapt (p9578).
- Carry out a safe acknowledgment.
For message value = 0:
Analyze the causes using r9714[0] and r9714[3].
For message value = 1:
Analyze the causes using r9789[0], r9789[1] and r9789[2].
See also: p9578 (SI SLA acceleration limit), p9579 (SI SLA stop response)

C01730 SI: Reference block for dynamic Safely-Limited Speed invalid

Message class: Safety monitoring channel has identified an error (10)
Message value: %1
Component: None
Propagation: Global
Response: NONE
Acknowledgment: IMMEDIATELY
Cause: The reference block transferred via PROFIsafe is negative.
A reference block is used to generate a referred velocity limit value based on the reference quantity in p9531[0].
The drive is stopped by the configured stop response (p9563[0]).
Message value (r60049, interpret decimal):
Requested, invalid reference block.
Remedy: In the PROFIsafe telegram, input data S_SLS_LIMIT_IST must be corrected.
Without a POWER ON, this message can be acknowledged using a safe acknowledgment mechanism (e.g. via PROFIsafe).

C01750 SI: Hardware fault safety-related encoder

Message class: Hardware/software error (1)
Message value: %1
Component: Encoder 1
Propagation: Global

Response: NONE

Acknowledgment: IMMEDIATELY

Cause: The encoder that is used for the safety-relevant motion monitoring functions signals a hardware fault.

Note:

This message results in

- STO (Safe Torque Off) if p9507 bit 8 = 0
- SCF (Safety Channel Failure) if p9507 bit 8 = 1

Message value (r60049, interpret decimal):

Encoder status word 1, encoder status word 2 that resulted in the message.

Remedy: - Check the encoder connection.

- Replace encoder.

Without a POWER ON, this message can be acknowledged using a safe acknowledgment mechanism (e.g. via PROFIsafe).

C01751 SI: Effectivity test error safety-related encoder

Message class: Safety monitoring channel has identified an error (10)

Message value: %1

Component: Encoder 1

Propagation: Global

Response: NONE

Acknowledgment: IMMEDIATELY

Cause: The DRIVE-CLiQ encoder for safe motion monitoring signals an error for the internal encoder effectivity tests, the sequence of which are cyclically monitored.

Note:

This message results in an SCF (Safety Channel Failure).

Message value (r60049, interpret decimal):

Only for internal Siemens troubleshooting.

Remedy: - Check the encoder connection.

- Replace encoder.

Without a POWER ON, this message can be acknowledged using a safe acknowledgment mechanism (e.g. via PROFIsafe).

C01753 SI: Fault safety-relevant encoder

Message class: Error in the parameterization / configuration / commissioning procedure (18)

Message value: %1

Component: None

Propagation: Global

Response: NONE

Acknowledgment: IMMEDIATELY

Cause: The encoder that is used for the safety-relevant motion monitoring functions signals a fault.

This message results in SCF (Safety Channel Failure).

Message value (r60049, interpret decimal):

1012: Plausibility violation of the encoder actual value.

1021: Cyclic communication failure between the monitoring channel and Sensor Module.

1022: Sign-of-life error for DRIVE-CLiQ encoders.

1024: Sign-of-life error for HTL/TTL encoders.

1031: Data transfer error between the monitoring channel and the Sensor Module (CRC error).

1033: Fault when checking offset between POS1 and POS2

Remedy: - Check the encoder connection.
- Replace encoder.
Without a POWER ON, this message can be acknowledged using a safe acknowledgment mechanism (e.g. via PROFIsafe).
For message value = 1021, 1024:
- Check the communication link.
- Set the monitoring clock cycle higher (p9500, p9511).
- Carry out a POWER ON (switch off/switch on) for all components.
- Replace the hardware.
For message value = 1033:
if one of the safety encoders was replaced:
- Acknowledge hardware replacement.
- Save all parameters (p0977 = 1 or retentively save).
- Acknowledge fault.

C01754 SI: Fault safety-relevant actual value acquisition

Message class: Error in the parameterization / configuration / commissioning procedure (18)
Message value: %1
Component: None
Propagation: Global
Response: NONE
Acknowledgment: IMMEDIATELY
Cause: The actual value sensing for safe motion monitoring signals an error.
Message value (r60049, interpret decimal):
1039: Converting the position on the load side exceeds data format.
Remedy: For message value = 1039: Check the parameterization of the gearbox (p9520, p9521, p9522).

C01755 SI: Encoder limit frequency exceeded

Message class: Error in the parameterization / configuration / commissioning procedure (18)
Message value: %1
Component: None
Propagation: Global
Response: NONE
Acknowledgment: IMMEDIATELY
Cause: Message value (r60049, interpret decimal):
1: Motion monitoring functions with encoder: the actual velocity exceeds the encoder limit frequency of 500 kHz.
Note:
This fault results in an SS1 (Safe Stop 1).
Remedy: Without a POWER ON, this message can be acknowledged using a safe acknowledgment mechanism (e.g. via PROFIsafe).

C01769 SI: Error for data cross-check

Message class: Error in the parameterization / configuration / commissioning procedure (18)
Message value: %1
Component: None
Propagation: Global
Response: NONE
Acknowledgment: IMMEDIATELY

Cause: When carrying out a data cross-check between the two monitoring channels, the drive detected a difference between parameters or results and initiated an SCF (Safety Channel Failure). One of the monitoring functions no longer functions reliably, i.e. safe operation is no longer possible.

Safety message C01711 is also displayed as SCF (Safety Channel Failure) has been initiated.

Remedy:
- Carry out a POWER ON (switch-off/switch-on) for all components.
- Recommission "Safety Integrated" and carry out a POWER ON.
- Upgrade firmware to later version.
- Contact Technical Support.
- Replace the hardware.

C01770 SI: Fault of the failsafe inputs

Message class: Safety monitoring channel has identified an error (10)

Message value: Fault cause: %1, F-DI number: %2

Component: Control Unit (CU)

Propagation: Global

Response: NONE

Acknowledgment: IMMEDIATELY

Explanation of the message value: For %1

Value	Cause	Remedy
1	Discrepancy error (state between two monitoring channels different for too long)	Check the F-DI wiring
2	Too many switching operations	Reduce the switching frequency
3	Test pulse error	Check the F-DI wiring
4	Internal software error	

Cause: The failsafe digital inputs (F-DI) have a fault condition.

Message value (r60049, interpret hexadecimal):

yyyyxxxx hex

xxxx: number of the failsafe digital input (F-DI).

yyyy: fault cause

Note:

If several faults occur consecutively, then this message is only signaled for the first fault that occurs.

Remedy: - Check the wiring of the F-DI (contact problems).

- If the wiring is correct, and for example there is no wire breakage, then a check must be made as to whether the switching frequency at F-DI is too high and must therefore be reduced (switching pulses must have a longer time between them). The time interval between each signal edge at an F-DI must be at least equal to the discrepancy time before the input is switched again.

Note:

This message can be acknowledged via F-DI or PROFIsafe (safe acknowledgment).

Discrepancy errors of an F-DI can only be acknowledged if safe acknowledgment was carried out after the cause of the error was resolved (acknowledgment via PROFIsafe, extended message acknowledgment, self acknowledgment). As long as safety acknowledgment was not carried out, the corresponding F-DI stays in the safe state internally.

A self acknowledgment for an F-DI can be realized using a positive edge at the corresponding F-DI.

Sets the discrepancy time for fast switching operations at the F-DIs:

For fast switching operations at the failsafe digital inputs (F-DI), it may be necessary to adapt the discrepancy time to the switching frequency:

- The period of a cyclic switching pulse must be less than half of the discrepancy time (if necessary, round down).
- The time between two fast switching pulses should be longer than the discrepancy time (if necessary, round up).
- The discrepancy time must be at least p9500 (it must always be rounded up or down to be an integer multiple of the SI monitoring clock cycle p9500).

If an input filter has been parameterized (p10017 > 0), then the shortest possible discrepancy time is directly specified by the input filter.

- The period of a cyclic switching pulse must be less than half of the discrepancy time p10017 (if necessary, round down).
- The time between two fast switching pulses should be longer than the discrepancy time+p10017 (if necessary, round up).
- The discrepancy time must be at least p9500 The input filter must always be set less than the discrepancy time.

Self test with specified dark pulses (p10041 > 0) for long cable lengths:

- Increase the dark pulse length (p10018 or p10019).
- Increase the input filter (p10017).

Note:

F-DI: Failsafe Digital Input

C01780 SBT When selected, the brake is closed

Message class: Safety monitoring channel has identified an error (10)

Message value: Following brakes are closed: %1 bin

Component: None

Propagation: Global

Response: NONE

Acknowledgment: IMMEDIATELY

Cause: When selecting or starting SBT (Safe Brake Test) not all of the brakes were open.

Message value (r60049, interpret binary):

Bit 0 = 1:

The internal brake is closed.

Note:

The message appears with message value 0, if no brakes are configured in p10202.

See also: p10202 (SI SBT brake selection)

Remedy: Open the brake and reselect the brake test.

C01781 SBT brake opening time exceeded

Message class: Safety monitoring channel has identified an error (10)

Message value: Fault cause: %1 bin

Component: None

Propagation: Global
Response: NONE
Acknowledgment: IMMEDIATELY
Cause: The maximum time (11 s) to open the brake during the SBT (Safe Brake Test) was exceeded.
Possible causes:
- During the brake test the drive went into a fault condition, and therefore the brake was closed by the drive.
Message value (r60049, interpret binary):
Bit 0 = 1:
Internal brake was not able to be opened.
Remedy: - Carry out a safe acknowledgment.
- Restart the brake test.
See also: c10235 (SI Safety Control Channel control word S_STW3B)

C01782 SBT brake test control error

Message class: Safety monitoring channel has identified an error (10)
Message value: Fault cause: %1 bin
Component: None
Propagation: Global
Response: NONE
Acknowledgment: IMMEDIATELY
Cause: SBT (Safe Brake Test) was canceled due to incorrect control.
Message value (r60049, interpret binary):
Message value 0:
SBT was canceled as a result of a fault (brake opening time or brake closing time exceeded).
Bit 0 = 1:
SBT was canceled as the brake test selection was reset.
Bit 1 = 1:
SBT was canceled as the brake test start was reset.
Bit 2 = 1:
The brake is not configured in configured p10202.
There is a brake test configuration error.
See also: p10202 (SI SBT brake selection)
Remedy: - Check parameterization of the brake test (p10202).
- Carry out a safe acknowledgment.
- If required, restart the brake test.

C01783 SBT brake closing time exceeded

Message class: Safety monitoring channel has identified an error (10)
Message value: Fault cause: %1 bin
Component: None
Propagation: Global
Response: NONE
Acknowledgment: IMMEDIATELY
Cause: The maximum time (11 s) to close the brake during the SBT (Safe Brake Test) was exceeded.
Message value (r60049, interpret binary):
Bit 0 = 1:
Internal brake was not able to be closed.

Remedy: - When using an internal brake with external feedback signal, check whether the feedback signal is correctly interconnected with the extended brake control.
- Carry out a safe acknowledgment.
- Restart the brake test.

C01784 SBT brake test canceled with fault

Message class: Safety monitoring channel has identified an error (10)
Message value: Fault cause: %1
Component: None
Propagation: Global
Response: NONE
Acknowledgment: IMMEDIATELY
Explanation of the message value: For %1

Bit	Cause	Remedy
0	Operation when selecting the brake test not enabled (r0899.2=0).	Enable operation when selecting the brake test
1	External fault occurred (e.g. the brake test that has already started is canceled by the user)	Do not cancel the brake test
2	A brake is closed when selecting the brake test.	Keep the brake open when selecting the brake test
3	A brake is closed when the determining the load torque	Keep the brake open when determining the load torque
4	Stop response fault occurred - or pulse enable was withdrawn	Do not withdraw pulse enable
5	Axis setpoint speed too high when selecting the brake test	Check setpoint speed
6	Actual speed (r0063) of the axis too high when selecting the brake test	Check the actual speed
7	Incorrect speed controller mode (e.g. encoderless speed control or U/f operation).	Set the correct mode for SBT
8	Closed-loop control has not been enabled or function generator is active.	Enable closed-loop control or deactivate function generator
9	Cl-lp control does not switch over to brake test (e.g.: PI cl-lp speed control not parameterized)	Check closed-loop control
10	Torque limit reached (r1407.7, r1408.8).	Check torque limit
17	Error in the brake test sequence (for the cause, see bit 0 ... 10)	see detailed fault cause (bits 0 to 10)
18	Internal brake is closed; it must be open when the external brake is tested (p10202)	Keep internal brake open
19	External brake is closed; it must be open when the internal brake is tested (p10202)	Keep external brake open
20	Not all of the brakes are open (p10202)	Keep all brakes open
21	Axis position during the brake test invalid as a result of parking axis	Check axis position
22	Internal software error	
23	Permissible position range of the axis when the brake is closed was violated	Check position range (p10212/p10222)
24	Internal brake was opened during the active brake test.	Keep the internal brake closed during the active brake test.
25	External brake was opened during the active brake test.	Keep the external brake closed during the active brake test.
26	During the active brake test, the test torque has exited its tolerance bandwidth	Checking the test torque (tolerance band, test torque = 20 %)

Cause: SBT (Safe Brake Test) was canceled due to a fault.
Message value (r60049, interpret binary):

Remedy: - Remove the fault cause.
- Carry out a safe acknowledgment.
- If required, restart the brake test.

For bit 10 = 1: Check torque limit (r1407.7)
For bit 17 = 1 with bit 6 = 1 or bit 23 = 1:
The brake was closed too late at the start of the brake test. Check the brake and replace if necessary.

C01785 SBT brake test configuration error

Message class: Safety monitoring channel has identified an error (10)
Message value: %1
Component: None
Propagation: Global
Response: NONE
Acknowledgment: IMMEDIATELY
Cause: Error when parameterizing SBT (Safe Brake Test).
In this configuration, SBT cannot be started without error.
Message value (r60049, interpret decimal):
4:
No internal brakes were configured (p10202).
Remedy: Check parameterization of the brake test.

F01786 SCC signal source changed

Message class: Safety monitoring channel has identified an error (10)
Message value: -
Component: None
Propagation: Global
Response: NONE
Acknowledgment: IMMEDIATELY
Cause: The signal source for SCC (Safety Control Channel) in c10235 or c10250 was changed.
The new signal source is effective immediately.
See also: c10235 (SI Safety Control Channel control word S_STW3B), c10250 (SI Safety Control Channel control word S_STW1B)
Remedy: Acknowledge fault.

C01793 SI: Internal safety message buffer is full

Message class: Safety monitoring channel has identified an error (10)
Message value: %1
Component: None
Propagation: Global
Response: NONE
Acknowledgment: IMMEDIATELY
Cause: Too many safety messages have occurred within a short time so that some have not been able to be displayed.
Remedy: No remedy required

A01796 SI: Wait for communication

Message class: Communication error to the higher-level control system (9)

Message value: %1
Component: None
Propagation: Global
Response: NONE
Acknowledgment: NONE
Cause: The drive waits for communication to be established to execute the safety-relevant motion monitoring functions.
Note:
STO (Safe Torque Off) is active in this state.
Alarm value (r2124, interpret decimal):
3: Wait for communication to be established to PROFIsafe F-Host.
Remedy: If the message is not automatically withdrawn after a longer period of time, then carry out the following checks:
- Evaluate any other active PROFIsafe communication messages/signals.
- Check the operating state of the F-Host.
- Check the communication connection to the F Host.
- Check whether this device supports PROFIsafe communications.

C01799 SI: Acceptance test mode active

Message class: Safety monitoring channel has identified an error (10)
Message value: -
Component: Control Unit (CU)
Propagation: Global
Response: NONE
Acknowledgment: IMMEDIATELY
Cause: The acceptance test mode is active.
This means the following:
- The setpoint velocity limiting is deactivated (r9733).
Remedy: Not necessary.
The message is withdrawn when exiting the acceptance test mode.

F01800 DRIVE-CLiQ: Hardware/configuration error

Message class: Internal (DRIVE-CLiQ) communication error (12)
Message value: %1
Component: None
Propagation: Local
Response: NONE
Acknowledgment: IMMEDIATELY
Cause: A DRIVE-CLiQ connection fault has occurred.
Fault value (r0949, interpret decimal):
100 ... 107:
Communication via DRIVE-CLiQ socket X100 ... X107 has not been switched to cyclic operation. The cause may be an incorrect structure or a configuration that results in an impossible bus timing.
10:
Loss of the DRIVE-CLiQ connection. The cause may be, for example, that the DRIVE-CLiQ cable was withdrawn from the converter or as a result of a short-circuit for motors with DRIVE-CLiQ. This fault can only be acknowledged in cyclic communication.
11:
Repeated faults when detecting the connection. This fault can only be acknowledged in cyclic communication.
12:
A connection was detected but the node ID exchange mechanism does not function. The reason is probably that the component is defective. This fault can only be acknowledged in cyclic communication.

Remedy: For fault value = 100 ... 107:
- Ensure that the DRIVE-CLiQ components have the same firmware versions.
- Avoid longer topologies for short current controller sampling times.

For fault value = 10:
- Check the DRIVE-CLiQ cables at the converter.
- Remove any short-circuit for motors with DRIVE-CLiQ.
- Carry out a POWER ON.

For fault value = 11:
- Check the electrical cabinet design and cable routing for EMC compliance.

For fault value = 12:
- Replace the component involved.

A01839 DRIVE-CLiQ diagnostics: Cable fault to the component

Message class: General drive fault (19)

Message value: Component number: %1

Component: Control Unit (CU)

Propagation: Global

Response: NONE

Acknowledgment: NONE

Cause: The fault counter to monitor the DRIVE-CLiQ connections/cables has been incremented.

Alarm value (r2124, interpret decimal):

Component number.

Note:

The component number specifies the component whose feeder cable from the direction of the converter is faulted.

The alarm is automatically withdrawn after 5 seconds, assuming that no other data transfer error has occurred.

Remedy:
- Check the corresponding DRIVE-CLiQ cables.
- Check the electrical cabinet design and cable routing for EMC compliance.

A01900 PN: Configuration telegram error

Message class: Error in the parameterization / configuration / commissioning procedure (18)

Message value: %1

Component: None

Propagation: Local

Response: NONE

Acknowledgment: NONE

Cause: A controller attempts to establish a connection using an incorrect configuring telegram.

Alarm value (r2124, interpret decimal):

2:

Too many PZD data words for output or input. The number of possible PZD is specified by the number of indices in r2050/c2053.

3:

Uneven number of bytes for input or output.

4:

Setting data for synchronization not accepted. For more information, see A01902.

211:

Unknown parameterizing block.

253:

PN Shared Device: Illegal mixed configuration of PROFIsafe and PZD.

254:

PN Shared Device: Illegal double assignment of a slot/subslot.

257:

PN Shared Device: Too many PZD data words for the output or input in the overall device.

501:

PROFIsafe parameter error (e.g. F_Source_Add, F_Dest_Add).

502:

PROFIsafe telegram does not match.

Additional values:

Only for internal Siemens troubleshooting.

Remedy: Check the bus configuration on the controller and device sides.

A01902 PN: Isochronous operation parameterization not permissible

Message class: Error in the parameterization / configuration / commissioning procedure (18)

Message value: %1

Component: None

Propagation: Local

Response: NONE

Acknowledgment: NONE

Cause: Parameterization for isochronous operation is not permissible.

Alarm value (r2124, interpret decimal):

0: Bus cycle time Tdp < 0.5 ms.

1: Bus cycle time Tdp > 32 ms.

2: Bus cycle time Tdp is not an integer multiple of the current controller sampling time.

3: Instant of the actual value sensing Ti > Bus cycle time Tdp or Ti = 0.

4: Instant of the actual value sensing Ti is not an integer multiple of the current controller sampling time.

5: Instant of the setpoint acceptance To >= Bus cycle time Tdp or To = 0.

6: Instant of the setpoint acceptance To is not an integer multiple of the current controller sampling time.

7: Controller application cycle time Tmapc is not an integer multiple of the speed controller sampling time.

8: Bus reserve bus cycle time Tdp - Data exchange time Tdx less than two current controller sampling times.

10: Instant of the setpoint acceptance To <= data exchange time Tdx + current controller sampling time

11: Controller application cycle time Tmapc > 14 x Tdp or Tmapc = 0.

12: PLL tolerance window Tpll_w > Tpll_w_max.

13: Bus cycle time Tdp is not a multiple of the speed controller clock cycle.

Remedy: - Adapt the bus parameterization Tdp, Ti, To.
- Adapt the sampling time for the current controller or speed controller.
For alarm value = 10:
- Reduce Tdx by using fewer bus participants or shorter telegrams.
Note:
PN: PROFINET

A01904 PN: Controller setting of the PZD telegram rejected

Message class: Communication error to the higher-level control system (9)
Message value: %1
Component: None
Propagation: Local
Response: NONE
Acknowledgment: NONE
Cause: A controller attempts to set a PZD telegram. The setting is not applied.
Alarm value (r2124, interpret decimal):
3: Controllers have no function rights for making changes.
4: Telegram cannot be set as a result of the drive configuration.
See also: r0922 (PROFIdrive PZD telegram selection)
Remedy: Check and align the telegram settings in the drive project and in the controller.

A01905 PN: Controller setting to activate the channel diagnostics rejected

Message class: Communication error to the higher-level control system (9)
Message value: %1
Component: Control Unit (CU)
Propagation: Local
Response: NONE
Acknowledgment: NONE
Cause: A controller attempted to change the activation of the channel diagnostics. The setting is not applied as the controller does not have the function rights to make a change.
Alarm value (r2124, interpret decimal):
1: Channel diagnostics are activated. Controller attempts to deactivate them.
2: Channel diagnostics are not activated. Controller attempts to activate them.
Remedy: Activate channel diagnostics in the bus configuration and check and align function rights in the drive.

F01910 Fieldbus: Setpoint timeout

Message class: Communication error to the higher-level control system (9)
Message value: -
Component: None
Propagation: Global
Response: OFF3
Acknowledgment: IMMEDIATELY
Cause: The reception of setpoints from the fieldbus interface (PROFINET) is interrupted.
- Bus connection interrupted.
- Controller switched off.
- Controller set into the STOP state.
Remedy: Restore the bus connection and set the controller to RUN.

F01911 PN: Isochronous operation, clock cycle failure

Message class: Communication error to the higher-level control system (9)
Message value: -
Component: None
Propagation: Global
Response: OFF1
Acknowledgment: IMMEDIATELY
Cause: The telegram to synchronize the clock cycles has failed for several bus clock cycles or in several bus clock cycles has consecutively violated the specified time grid (see bus cycle time, Tdp and Tpllw).
Remedy:
- Check the physical bus configuration (cable, connector, terminating resistor, shielding, etc.).
- Check whether communication was briefly or permanently interrupted.
- Check the utilization level of the bus and controller (e.g. bus cycle time Tdp was set too short).

Note:
PN: PROFINET

F01912 PN: Isochronous operation sign-of-life missing

Message class: Communication error to the higher-level control system (9)
Message value: -
Component: None
Propagation: Local
Response: OFF1
Acknowledgment: IMMEDIATELY
Cause: The maximum permissible number of errors in the controller sign-of-life (isochronous operation) has been exceeded in cyclic operation.
Remedy:
- Check the physical bus configuration (cables, connectors, etc.).
- Check whether the controller correctly sends the sign-of-life (e.g. create a trace with STW2.12 ... STW2.15 and trigger signal ZSW1.3).
- Check the permissible telegram failure rate (p0925).
- Check the utilization level of the bus and controller (e.g. bus cycle time Tdp was set too short).

Note:
PN: PROFINET

F01916 Internal communications error

Message class: Communication error to the higher-level control system (9)
Message value: -
Component: None
Propagation: Global
Response: OFF1
Acknowledgment: IMMEDIATELY
Cause: An internal Ethernet communications error has occurred.
Remedy:
- Carry out a POWER ON (switch-off/switch-on) for all components.
- Upgrade firmware to later version.
- Contact Technical Support.

F01917 Internal communications error

Message class: Communication error to the higher-level control system (9)
Message value: -
Component: None
Propagation: Global
Response: OFF1

Acknowledgment: IMMEDIATELY
Cause: An internal PROFINET communications error has occurred.
Remedy:
- Carry out a POWER ON (switch-off/switch-on) for all components.
- Upgrade firmware to later version.
- Contact Technical Support.

A01932 PN: Isochronous mode missing for DSC

Message class: Error in the parameterization / configuration / commissioning procedure (18)
Message value: -
Component: None
Propagation: Global
Response: NONE
Acknowledgment: NONE
Cause: There is no isochronous mode or isochronous sign of life and DSC is selected.
Note:
DSC: Dynamic Servo Control
See also: r0922 (PROFIdrive PZD telegram selection)
Remedy: Set isochronous mode across the bus configuration and transfer isochronous sign-of-life.

A01940 PN: Clock cycle synchronism not reached

Message class: Communication error to the higher-level control system (9)
Message value: -
Component: None
Propagation: Local
Response: NONE
Acknowledgment: NONE
Cause: The bus is in the data exchange state and clock synchronous operation has been selected using the parameterizing telegram. Synchronization with the clock cycle specified by the controller was still not able to be performed.
- The controller does not send an isochronous global control telegram, although isochronous operation was selected when configuring the bus.
- The controller uses another isochronous DP cycle than was transferred to the device in the parameterizing telegram.
- At least one drive object has a pulse enable (also not controlled from PROFINET).

Remedy:
- Check the controller application and bus configuration.
- Check the consistency between the clock cycle input when configuring the device and clock cycle setting at the controller.
- Check that no drive object has a pulse enable. Only enable the pulses after synchronizing the PROFINET drives.

Note:
PN: PROFINET

A01941 PN: Clock cycle signal missing when the bus is being established

Message class: Communication error to the higher-level control system (9)
Message value: -
Component: None
Propagation: Local
Response: NONE
Acknowledgment: NONE
Cause: The bus is in the data exchange state and clock synchronous operation has been selected using the parameterizing telegram. The synchronization telegram is not received.

Remedy: Check the controller application and bus configuration.

Note:

PN: PROFINET

A01943 PN: Clock cycle signal error when the bus is being established

Message class: Communication error to the higher-level control system (9)

Message value: -

Component: None

Propagation: Local

Response: NONE

Acknowledgment: NONE

Cause: The bus is in the data exchange state and clock synchronous operation has been selected using the parameterizing telegram.

The synchronization telegram is irregularly received.

- The controller sends an irregular synchronization telegram.

- The controller uses another isochronous bus clock cycle than was transferred to the device in the parameterizing telegram.

Remedy: - Check the controller application and bus configuration.

- Check the consistency between the clock cycle input when configuring the device and clock cycle setting at the controller.

Note:

PN: PROFINET

A01944 PN: Sign-of-life synchronism not reached

Message class: Communication error to the higher-level control system (9)

Message value: -

Component: None

Propagation: Local

Response: NONE

Acknowledgment: NONE

Cause: The bus is in the data exchange state and clock synchronous operation has been selected using the parameterizing telegram.

Synchronization with the controller sign-of-life (STW2.12 ... STW2.15) could not be completed because the sign-of-life changes differently to how it was configured in the Tmapc time grid.

Remedy: - Ensure that the controller correctly increments the sign-of-life in the controller application clock cycle Tmapc.

Note:

PN: PROFINET

F01950 PN: Isochronous operation, synchronization unsuccessful

Message class: Communication error to the higher-level control system (9)

Message value: -

Component: None

Propagation: Local

Response: OFF1

Acknowledgment: IMMEDIATELY

Cause: Synchronization of the internal clock cycle to the controller clock cycle has failed. The internal clock cycle exhibits an unexpected shift.

Remedy: Only for internal Siemens troubleshooting.

Note:

PN: PROFINET

A01980	PN: Cyclic connection interrupted
Message class:	Communication error to the higher-level control system (9)
Message value:	%1
Component:	None
Propagation:	Local
Response:	NONE
Acknowledgment:	NONE
Cause:	The cyclic connection to the PROFINET controller is interrupted. See also: r8936 (PN cyclic connection state)
Remedy:	Establish the PROFINET connection and activate the PROFINET controller in the cyclic mode. Check parameters "Name of Station" and "IP of Station".

A01981	PN: Maximum number of controllers exceeded
Message class:	Error in the parameterization / configuration / commissioning procedure (18)
Message value:	Info 1: %1, info 2: %2
Component:	None
Propagation:	Local
Response:	NONE
Acknowledgment:	NONE
Cause:	A controller attempts to establish a connection to the drive, and as a consequence exceeds the permitted number of PROFINET connections. The alarm is automatically withdrawn after approx. 30 seconds. Alarm value (r2124, interpret hexadecimal): yyyyxxxx hex: yyyy = info. 1, xxxx = info. 2 Info 1 = 0: number of RT connections exceeded Info 1 > 0: number of IRT connections exceeded Info 2: permitted number of connections
Remedy:	Check the configuration of the PROFINET controllers.

A01989	PN: Internal cyclic data transfer error
Message class:	Communication error to the higher-level control system (9)
Message value:	%1
Component:	None
Propagation:	Local
Response:	NONE
Acknowledgment:	NONE
Cause:	The cyclic actual values and/or setpoints were not transferred within the specified times. Alarm value (r2124, interpret hexadecimal): Only for internal Siemens troubleshooting.
Remedy:	Correctly set T_io_input or T_io_output.

F03001	NVRAM checksum incorrect
Message class:	Hardware/software error (1)
Message value:	%1
Component:	Control Unit (CU)
Propagation:	Local
Response:	NONE
Acknowledgment:	IMMEDIATELY

Cause:	A checksum error occurred when evaluating the non-volatile data (NVRAM) on the converter. The NVRAM data affected was deleted.
Remedy:	Carry out a POWER ON (switch-off/switch-on) for all components.

F03590	**TM: Module not ready**
Message class:	Error in the parameterization / configuration / commissioning procedure (18)
Message value:	%1
Component:	Terminal Module (TM)
Propagation:	Global
Response:	NONE
Acknowledgment:	IMMEDIATELY
Cause:	The Terminal Module involved does not send a ready signal and no valid cyclic data. Fault value (r0949, interpret decimal): Drive object number of the Terminal Module involved.
Remedy:	- Check the 24 V power supply. - Check the DRIVE-CLiQ wiring.

F06310	**Supply voltage (p0210) incorrectly parameterized**
Message class:	Line supply fault (2)
Message value:	-
Component:	None
Propagation:	Global
Response:	NONE
Acknowledgment:	IMMEDIATELY
Cause:	For AC/AC drive units, the measured DC link voltage lies outside the tolerance range after precharging has been completed. The following applies for the tolerance range: 1.16 * p0210 < r0070 < 1.6 * p0210 Note: The fault can only be acknowledged when the drive is switched off. See also: p0210 (Device supply voltage)
Remedy:	- Check the parameterized supply voltage and if required change (p0210). - Check the line voltage. See also: p0210 (Device supply voltage)

F07011	**Drive: Motor overtemperature**
Message class:	Motor overload (8)
Message value:	%1
Component:	Motor
Propagation:	Global
Response:	OFF2
Acknowledgment:	IMMEDIATELY

Cause: The calculated motor temperature is too high.

Possible causes:

- Motor overloaded.
- Motor ambient temperature too high.
- Sensor wire breakage.

Fault value (r0949, interpret decimal):

200:

Motor temperature model 1 (I2t): temperature too high.

300:

Motor temperature model 3: after the monitoring time has expired, the temperature is still higher than the alarm threshold.

301:

Motor temperature model 3: temperature is too high, or the model has not been parameterized.

302:

Motor temperature model 3: Encoder temperature is not within the valid range.

400:

Additional motor overload protection: the load is too high.

Remedy:

- Reduce the motor load.
- Check the ambient temperature and the motor ventilation.
- Check the wiring and temperature sensor connection.
- Check monitoring limits.
- Check activation of the additional motor overload protection (5375).

A07012 Drive: Motor temperature model overtemperature

Message class: Motor overload (8)

Message value: %1

Component: Motor

Propagation: Global

Response: NONE

Acknowledgment: NONE

Cause: Motor temperature model 1/3 or the additional motor overload protection identified that the alarm threshold was exceeded.

Hysteresis:2K

Alarm value (r2124, interpret decimal):

200:

Motor temperature model 1 (I2t): temperature too high.

300:

Motor temperature model 3: temperature too high.

400:

Additional motor overload protection: the load is too high. If the load remains at this level, the drive is shut down with fault F07011.

See also: r0034 (Motor utilization thermal), p0613 (Motor temperature model ambient temperature)

Remedy:

- Check the motor load and if required, reduce.
- Check the motor ambient temperature.
- Check activation of the additional motor overload protection (p5375).

See also: r0034 (Motor utilization thermal)

F07085 Drive: Open-loop/closed-loop control parameters changed

Message class: Error in the parameterization / configuration / commissioning procedure (18)

Message value: Parameter: %1

Component: None

Propagation: Global
Response: NONE
Acknowledgment: IMMEDIATELY
Cause: Open-loop/closed-loop control parameters have had to be changed.
Possible causes:
1. As a result of other parameters, they have exceeded the dynamic limits.
2. They cannot be used due to the fact that the hardware detected not having certain features.
3. The value is estimated as the thermal time constant is missing.
4. Motor temperature model 1 is activated as thermal motor protection is missing.
See also: p1082 (Maximum speed)
Remedy: Not necessary.
It is not necessary to change the parameters as they have already been correctly limited.

F07090 Drive: Upper torque limit less than the lower torque limit

Message class: Error in the parameterization / configuration / commissioning procedure (18)
Message value: -
Component: None
Propagation: Global
Response: OFF2
Acknowledgment: IMMEDIATELY
Cause: The upper torque limit is lower than the lower torque limit.
Remedy: When setting the torque limits via telegram 750, the positive torque limit must be >= the negative torque.

A07091 Drive: Determined current controller dynamic response invalid

Message class: Error in the parameterization / configuration / commissioning procedure (18)
Message value: %1
Component: Control Unit (CU)
Propagation: Global
Response: NONE
Acknowledgment: NONE
Cause: When One Button Tuning is activated (p5300 = 1), the current controller is measured after the pulses have been enabled. Evaluation has indicated that the current control loop was not appropriately set.
Possible causes:
- Incorrectly set current controller.
- PRBS amplitude set too high (p5296).
Alarm value (r2124, interpret hexadecimal):
1: Dynamic response too low.
2: Current controller unstable.
Note:
PRBS: Pseudo Random Binary Signal (binary noise)
Remedy: - The measurement can be repeated with a smaller excitation amplitude (p5296).

A07092 Drive: Moment of inertia estimator still not ready

Message class: Error in the parameterization / configuration / commissioning procedure (18)
Message value: %1
Component: Control Unit (CU)
Propagation: Global
Response: NONE
Acknowledgment: NONE

Cause: The moment of inertia estimator has still not determined any valid values.
The acceleration cannot be calculated.
The moment of inertia estimator has stabilized, if the frictional values as well as the moment of inertia were determined and the corresponding status signal is set.

Remedy: Traverse the axis until the moment of inertia estimator has stabilized.
This alarm is automatically withdrawn after the moment of inertia estimator has stabilized.

F07093 Drive: Test signal error

Message class: Error in the parameterization / configuration / commissioning procedure (18)
Message value: %1
Component: Control Unit (CU)
Propagation: Global
Response: OFF3
Acknowledgment: IMMEDIATELY
Cause: An error was identified when executing the "Test signal" function.
The function was not executed or was canceled.
Fault value (r0949, interpret decimal):
1: No distance limit has been defined (p5308 = 0).
2: The moment of inertia estimator has not stabilized in the parameterized time (p5309).
3: The parameterized distance (p5308) was exceeded.
4: No motor encoder parameterized (closed-loop speed control without encoder).
6: Pulse enable was withdrawn while traversing.
7: speed setpoint not equal to zero.
See also: p5308 (One Button Tuning distance limiting), p5309 (One Button Tuning duration)
Remedy: For fault value = 1:
- Define distance limiting (p5308).
For fault value = 2:
- Increase the duration, distance limit or speed limit (p5309, p5308, p1082, p1083, p1086).
For fault value = 3:
- Check distance limiting (p5308).
For fault value = 4:
- Configure speed control with encoder.
For fault value = 6:
- Keep the drive switched on until the "Test signal" function has been completely exited.
For fault value = 7:
- Set the speed setpoint to zero. It is possible that the setpoint was specified from the control panel.

F07094 General parameter limit violation

Message class: Hardware/software error (1)
Message value: Parameter: %1
Component: None
Propagation: Local
Response: NONE
Acknowledgment: IMMEDIATELY
Cause: As a result of the violation of a parameter limit, the parameter value was automatically corrected.
Minimum limit violated --> parameter is set to the minimum value.
Maximum limit violated --> parameter is set to the maximum value.
Invalid Enum value --> parameter is set to the default value.
Fault value (r0949, interpret decimal):
Parameter number, whose value had to be adapted.
Remedy: Check the adapted parameter values and if required correct.

A07095	**Drive: One Button Tuning activated**
Message class:	Error in the parameterization / configuration / commissioning procedure (18)
Message value:	-
Component:	None
Propagation:	Global
Response:	NONE
Acknowledgment:	NONE
Cause:	The One Button Tuning function is active. One Button Tuning is performed at the next switch-on command. See also: p5300 (One Button Tuning selection)
Remedy:	Not necessary. The alarm is automatically withdrawn after One Button Tuning has been exited (p5300 = 0).

F07097	**Drive: Test signal error distance limiting**
Message class:	Error in the parameterization / configuration / commissioning procedure (18)
Message value:	Fault cause: %1, traversing distance: %2
Component:	Control Unit (CU)
Propagation:	Global
Response:	OFF3
Acknowledgment:	IMMEDIATELY
Cause:	An error was identified when executing function "Test signal" or One Button Tuning selection (p5300 = 1). The function was not executed or was canceled. Fault value (r0949, interpret decimal): yyyyxxxx hex: yyyy = fault cause, xxxx = traversing distance. See also: p5308 (One Button Tuning distance limiting), p5309 (One Button Tuning duration)
Remedy:	- Enter the traversing path in parameter p5308 - or deselect the function involved in p5301. - For fault cause = 1, 2, shorter traversing paths may be possible. For fault cause = 1: - Deselect bit 0 and bit 1 in parameter p5301. For fault cause = 2: - Deselect bit 2 in parameter p5301. For fault cause = 3: - Deselect bit 4 and bit 5 in parameter p5301.

A07200	**Drive: Master control ON command present**
Message class:	Error in the parameterization / configuration / commissioning procedure (18)
Message value:	-
Component:	None
Propagation:	Global
Response:	NONE
Acknowledgment:	NONE
Cause:	The ON/OFF1 command is present (no 0 signal). The command is either influenced via binary signal sink c0840 (actual CDS) or control word bit 0 via the master control.
Remedy:	Switch the signal to 0 via binary signal sink c0840 (actual CDS) or control word bit 0 via the master control.

F07220	**Drive: Control by PLC missing**
Message class:	Communication error to the higher-level control system (9)
Message value:	-

Component: None
Propagation: Global
Response: OFF1
Acknowledgment: IMMEDIATELY
Cause: The "Control by PLC" signal was missing in operation.
- The higher-level control has withdrawn the "Control by PLC" signal.
- Data transfer via the fieldbus (controller/drive) was interrupted.

Remedy: - Check the "Control by PLC" signal and, if required, switch in.
- Check data transfer via the fieldbus (controller/drive).

Note:
If the drive should continue to operate after withdrawing "Control by PLC", then the fault response must be parameterized to NONE or the message type should be parameterized as alarm.

F07410 Drive: Current controller output limited

Message class: Application/technological function faulted (17)
Message value: -
Component: None
Propagation: Global
Response: OFF2
Acknowledgment: IMMEDIATELY
Cause: The condition "I_act = 0 and Uq_set_1 longer than 16 ms at its limit" is present and can be caused by the following:
- Motor not connected or motor contactor open.
- Phase failure in the motor feeder cable.
- No DC link voltage present.
- Power unit defective.

Remedy: - Connect the motor, check the motor feeder cable or check the motor contactor.
- Check the DC link voltage (r0070).
- Check the power unit.

F07412 Drive: Commutation angle incorrect (motor model)

Message class: Position/speed actual value incorrect or not available (11)
Message value: %1
Component: None
Propagation: Global
Response: ENCODER
Acknowledgment: IMMEDIATELY
Cause: An incorrect commutation angle was detected, which can result in a positive coupling in the speed controller.
Possible causes:
- The phase sequence of the output phases for the motor is incorrect (e.g. the phases are interchanged).
- The motor encoder is incorrectly adjusted with respect to the magnet position.
- The motor encoder is damaged.
- The motor encoder speed signal is faulted.
- The control loop is instable due to incorrect parameterization.
- Phase failure in the motor feeder cable.

Remedy: - Check the phase sequence for the motor, and if required, correct.
- Check the motor feeder cable.
- If the encoder mounting was changed, re-adjust the encoder.
- Replace the defective motor and/or motor encoder.

F07420 Drive: Current setpoint filter natural frequency > Shannon frequency

Message class: Error in the parameterization / configuration / commissioning procedure (18)
Message value: %1
Component: None
Propagation: Global
Response: NONE
Acknowledgment: IMMEDIATELY
Cause: One of the filter natural frequencies is greater than the Shannon frequency.
The Shannon frequency is calculated according to the following formula: 0.5 / current controller sampling time
Fault value (r0949, interpret binary):
Bit 0: Filter 1 (p1658, p1660)
Bit 1: Filter 2 (p1663, p1665)
Bit 2: Filter 3 (p1668, p1670)
Bit 3: Filter 4 (p1673, p1675)
Remedy: - Reduce the numerator or denominator natural frequency of the current setpoint filter involved.
- Deactivate the filter involved (p1656).

F07421 Drive: Speed filter natural frequency > Shannon frequency

Message class: Error in the parameterization / configuration / commissioning procedure (18)
Message value: %1
Component: None
Propagation: Global
Response: NONE
Acknowledgment: IMMEDIATELY
Cause: One of the filter natural frequencies is greater than the Shannon frequency.
The Shannon frequency is calculated according to the following formula: 0.5 / speed controller sampling time.
Fault value (r0949, interpret binary):
Bit 0: Filter 1 (p1417, p1419)
Bit 1: Filter 2 (p1423, p1425)
Remedy: - Reduce the numerator or denominator natural frequency of the speed setpoint filter involved.
- Deactivate the filter involved (p1414).

F07422 Drive: Reference model natural frequency > Shannon frequency

Message class: Error in the parameterization / configuration / commissioning procedure (18)
Message value: -
Component: None
Propagation: Global
Response: NONE
Acknowledgment: IMMEDIATELY
Cause: The natural filter frequency of the PT2 element for the reference model (p1433) is greater than the Shannon frequency.
The Shannon frequency is calculated according to the following formula: 0.5 / speed controller sampling time.
Remedy: - Reduce the natural frequency of PT2 element for reference model (p1433).

F07432 Drive: Motor without overvoltage protection

Message class: Error in the parameterization / configuration / commissioning procedure (18)
Message value: %1
Component: None
Propagation: Global

Response: OFF2
Acknowledgment: IMMEDIATELY
Cause: In the case of a fault at maximum speed, the motor can generate an overvoltage that can destroy the converter.
Remedy: Limit the maximum speed (p1082) without any additional protection.
Note:
The maximum speed is calculated as follows:
p1082 <= 11.695 * DC link voltage overvoltage threshold/r0316
DC link voltage overvoltage threshold:
- Line connection 1 AC: 410 V
- Line connection 3 AC: 820 V
See also: r0316 (Motor torque constant), p1082 (Maximum speed)

F07434 Drive: It is not possible to change the direction of rotation with the pulses enabled

Message class: Application/technological function faulted (17)
Message value: -
Component: None
Propagation: Global
Response: OFF2
Acknowledgment: IMMEDIATELY
Cause: With the pulses enabled, a drive data set that has a different parameterized direction of rotation was selected (p1821).
It is only possible to change the motor direction of rotation using p1821 when the pulses are inhibited.
Remedy: - Change over the drive data set with the pulses inhibited.
- Ensure that the changeover to a drive data set does not result in the motor direction of rotation being changed (i.e. for these drive data sets, the same value must be in p1821).
See also: p1821 (Direction of rotation)

A07440 EPOS: Jerk time is limited

Message class: Error in the parameterization / configuration / commissioning procedure (18)
Message value: -
Component: None
Propagation: Global
Response: NONE
Acknowledgment: NONE
Cause: The calculation of the jerk time Tr = max(p2572, p2573) / p2574 resulted in an excessively high value so that the jerk time is internally limited to 1000 ms.
Note:
The alarm is also output if jerk limiting is not active.
Remedy: - Increase the jerk limiting (p2574).
- Reduce maximum acceleration or maximum deceleration (p2572, p2573).
See also: p2572 (EPOS maximum acceleration), p2573 (EPOS maximum deceleration), p2574 (EPOS jerk limiting)

A07441 LR: Save the position offset of the absolute encoder adjustment

Message class: Error in the parameterization / configuration / commissioning procedure (18)
Message value: -
Component: None
Propagation: Global
Response: NONE
Acknowledgment: NONE

Cause: The status of the absolute encoder adjustment has changed.

To permanently accept the determined position offset, it must be retentively saved (p0977).

Possible causes:

- Motor or encoder were replaced (applies to EQN and DQI).
- Position-relevant parameters were changed.
- A non-adjusted encoder was adjusted (retentively save the project).

Note:

This message is not output when switching-on the axis after having first moved it in the switched-off state, as long as the parameterizable monitoring window was not exited.

Remedy: Readjust the encoder.

See also: p2507 (LR absolute encoder adjustment status)

F07442 LR: Multiturn does not match the modulo range

Message class: Error in the parameterization / configuration / commissioning procedure (18)

Message value: -

Component: None

Propagation: Global

Response: OFF1

Acknowledgment: IMMEDIATELY

Cause: The ratio between the multiturn resolution and the modulo range (p2576) is not an integer number.

This results in the adjustment being set back, as the position actual value cannot be reproduced after switch-off/switch-on.

Remedy: Make the ratio between the multiturn resolution and the modulo range an integer number.

The ratio v is calculated as follows:

v = (p0421 * p2506 * p2505) / (p2504 * p2576)

See also: p2504 (LR motor/load motor revolutions), p2505 (LR motor/load load revolutions), p2506, p2576 (EPOS modulo correction modulo range)

F07443 LR: Home position not in the permissible range

Message class: Error in the parameterization / configuration / commissioning procedure (18)

Message value: %1

Component: None

Propagation: Global

Response: OFF1

Acknowledgment: IMMEDIATELY

Cause: The home position received when adjusting the encoder (p2599) lies outside the half of the encoder range and cannot be set as actual axis position.

Fault value (r0949, interpret decimal):

Maximum permissible value for the home position

Remedy: Set the home position to a lower value than was specified in the fault value.

See also: c2598 (EPOS home position signal), p2599 (EPOS home position value)

F07450 LR: Standstill monitoring has responded

Message class: Application/technological function faulted (17)

Message value: -

Component: None

Propagation: Global

Response: OFF1

Acknowledgment: IMMEDIATELY

Cause:	After the standstill monitoring time (p2543) expired, the drive left the standstill window (p2542). - Standstill window set too small (p2542). - Standstill monitoring time set too low (p2543). - Position loop gain too low (p2538). - Position loop gain too high (instability/oscillation, p2538). - Mechanical overload. - Connecting cable, motor/drive converter incorrect (phase missing, interchanged).
Remedy:	Check the causes and resolve.

F07451 LR: Position monitoring has responded

Message class:	Application/technological function faulted (17)
Message value:	-
Component:	None
Propagation:	Global
Response:	OFF1
Acknowledgment:	IMMEDIATELY
Cause:	When the position monitoring time (p2545) expired, the drive had still not reached the positioning window (p2544). - Positioning window parameterized too small (p2544). - Position monitoring time parameterized too short (p2545). - Position loop gain too low (p2538). - Position loop gain too high (instability/oscillation, p2538). - Drive mechanically locked.
Remedy:	Check the causes and resolve.

F07452 LR: Following error too high

Message class:	Application/technological function faulted (17)
Message value:	-
Component:	None
Propagation:	Global
Response:	OFF1
Acknowledgment:	IMMEDIATELY
Cause:	The difference between the position setpoint position actual value (following error dynamic model, r2563) is higher than the tolerance (p2546). - The drive torque or accelerating capacity exceeded. - Position measuring system fault. - Encoder cable interrupted. - Position control sense incorrect. - Mechanical system locked. - Excessively high traversing velocity or excessively high position reference value (setpoint) differences.
Remedy:	Check the causes and resolve.

F07453 LR: Position actual value preprocessing error

Message class:	Application/technological function faulted (17)
Message value:	-
Component:	None
Propagation:	Global
Response:	OFF1
Acknowledgment:	IMMEDIATELY

Cause: A position measuring system fault has occurred (F31110, F31111).
An error has occurred during the position actual value preprocessing.

Remedy: Resolve the cause of the position measuring position fault.
Check the encoder for the position actual value preprocessing.
See also: p2502 (LR encoder assignment)

A07454 LR: Position actual value preprocessing does not have a valid encoder

Message class: Error in the parameterization / configuration / commissioning procedure (18)

Message value: -

Component: None

Propagation: Global

Response: NONE

Acknowledgment: NONE

Cause: One of the following problems has occurred with the position actual value preprocessing:
- An encoder is not assigned for the position actual value preprocessing (p2502 = 0).
- An encoder is assigned, but no encoder data set (p0187 = 99 or p0188 = 99 or p0189 = 99).
- An encoder and an encoder data set have been assigned, however, the encoder data set does not contain any encoder data (p0400 = 0) or invalid data (e.g. p0408 = 0).

Remedy: Check the drive data sets, encoder data sets and encoder assignment.
See also: p0187 (Motor encoder encoder data set number), p0188 (Encoder 2 encoder data set number), p0400 (Encoder type selection), p2502 (LR encoder assignment)

A07455 EPOS: Maximum velocity limited

Message class: Error in the parameterization / configuration / commissioning procedure (18)

Message value: -

Component: None

Propagation: Global

Response: NONE

Acknowledgment: NONE

Cause: The maximum velocity (p2571) is too high to correctly calculate the modulo correction.
Within the sampling time for positioning, at the maximum velocity, a maximum of the half modulo length must be moved through. p2571 was limited to this value.

Remedy: - Reduce the maximum velocity (p2571).

A07456 EPOS: Setpoint velocity limited

Message class: Application/technological function faulted (17)

Message value: -

Component: None

Propagation: Global

Response: NONE

Acknowledgment: NONE

Cause: The actual setpoint velocity is greater than the parameterized maximum velocity (p2571) and is therefore limited.

Remedy:
- Check the specified setpoint velocity.
- Reduce the velocity override (c2646).
- Increase the maximum velocity (p2571).

A07457 EPOS: Combination of input signals illegal

Message class: Application/technological function faulted (17)

Message value: %1

Component: None
Propagation: Global
Response: NONE
Acknowledgment: NONE
Cause: An illegal combination of input signals that are simultaneously set was identified.
Alarm value (r2124, interpret decimal):
0: Jog 1 and jog 2 (c2589, c2590).
1: Jog 1 or jog 2 and direct setpoint input/MDI (c2589, c2590, c2647).
2: Jog 1 or jog 2 and start homing (c2589, c2590, c2595).
3: Jog 1 or jog 2 and activate traversing task (c2589, c2590, c2631).
4: Direct setpoint input/MDI and starting homing (c2647, c2595).
5: Direct setpoint input/MDI and activate traversing task (c2647, c2631).
6: Start homing and activate traversing task (c2595, c2631).
Remedy: Check the appropriate input signals and correct.

F07458 EPOS: Reference cam not found

Message class: Application/technological function faulted (17)
Message value: -
Component: None
Propagation: Global
Response: OFF1
Acknowledgment: IMMEDIATELY
Cause: After the active homing starts, the axis moved through the maximum permissible distance to search for the reference cam without actually finding the reference cam.
Remedy: - Check signal "Reference cam" (c2612).
- Check the maximum permissible distance to the reference cam (p2606).
- If axis does not have any reference cam, then set p2607 to 0.
See also: p2606 (EPOS active homing reference cam maximum distance), p2607 (EPOS active homing reference cam available), c2612 (EPOS active homing reference cam)

F07459 EPOS: No zero mark

Message class: Application/technological function faulted (17)
Message value: -
Component: None
Propagation: Global
Response: OFF1
Acknowledgment: IMMEDIATELY
Cause: After leaving the reference cam, the axis has traversed the maximum permissible distance between the reference cam and zero mark without finding the zero mark.
Remedy: - Check the encoder regarding the zero mark.
- Check the maximum permissible distance between the reference cam and zero mark (p2609).
- Use an external encoder zero mark (equivalent zero mark) (p0494).
See also: p2609 (EPOS active homing max distance reference cam and zero mark)

F07460 EPOS: End of reference cam not found

Message class: Application/technological function faulted (17)
Message value: -
Component: None
Propagation: Global
Response: OFF1

Acknowledgment:	IMMEDIATELY
Cause:	In the "active homing" mode, when approaching the zero mark, the axis reached the end of the traversing range without detecting an edge at binary signal "Reference cam" (c2612). Maximum traversing range: -2147483648 [LU] ... -2147483647 [LU]
Remedy:	- Check signal "reference cam" (c2612). - Repeat active homing. See also: c2612 (EPOS active homing reference cam)

A07461 EPOS: Home position not set

Message class:	Application/technological function faulted (17)
Message value:	-
Component:	None
Propagation:	Global
Response:	NONE
Acknowledgment:	NONE
Cause:	When starting a traversing block/direct setpoint input, a home position is not set (r2684.11 = 0).
Remedy:	Carry out homing (active homing, passive homing, set home position).

A07462 EPOS: Selected traversing block number does not exist

Message class:	Error in the parameterization / configuration / commissioning procedure (18)
Message value:	%1
Component:	None
Propagation:	Global
Response:	NONE
Acknowledgment:	NONE
Cause:	A traversing block selected via binector input c2625 ... c2629 was started via binary signal c2631 = 0/1 edge "Activate traversing task". - The number of the started traversing block is not contained in p2616[0...n]. - The started traversing block is suppressed. Alarm value (r2124, interpret decimal): Number of the selected traversing block that is also not available.
Remedy:	- Correct the traversing program. - Select an available traversing block number.

A07463 EPOS: External block change not requested in the traversing block

Message class:	Application/technological function faulted (17)
Message value:	%1
Component:	None
Propagation:	Global
Response:	NONE
Acknowledgment:	NONE
Cause:	For a traversing block with the block change enable CONTINUE_EXTERNAL_ALARM, the external block change was not requested. Alarm value (r2124, interpret decimal): Number of the traversing block.
Remedy:	Resolve the reason why the signal edge at the measuring probe is missing.

F07464 EPOS: Traversing block is inconsistent

Message class:	Error in the parameterization / configuration / commissioning procedure (18)
Message value:	%1

Component:	None
Propagation:	Global
Response:	OFF1
Acknowledgment:	IMMEDIATELY
Cause:	The traversing block does not contain valid information. Alarm value (r2124, interpret decimal): Number of the traversing block with invalid information.
Remedy:	Check the traversing block and where relevant, take into consideration alarms that are present.

A07465 EPOS: Traversing block does not have a subsequent block

Message class:	Error in the parameterization / configuration / commissioning procedure (18)
Message value:	%1
Component:	None
Propagation:	Global
Response:	NONE
Acknowledgment:	NONE
Cause:	There is no subsequent block in the traversing block. Alarm value (r2124, interpret decimal): Number of the traversing block with the missing subsequent block.
Remedy:	- Parameterize this traversing block with the block change enable END. - Parameterize additional traversing blocks with a higher block number and for the last block, using the block change enable END.

A07466 EPOS: Traversing block number assigned a multiple number of times

Message class:	Error in the parameterization / configuration / commissioning procedure (18)
Message value:	%1
Component:	None
Propagation:	Global
Response:	NONE
Acknowledgment:	NONE
Cause:	The same traversing block number was assigned a multiple number of times. Alarm value (r2124, interpret decimal): Number of the traversing block that was assigned a multiple number of times.
Remedy:	Correct the traversing blocks.

A07467 EPOS: Traversing block has illegal task parameters

Message class:	Error in the parameterization / configuration / commissioning procedure (18)
Message value:	%1
Component:	None
Propagation:	Global
Response:	NONE
Acknowledgment:	NONE
Cause:	The task parameter in the traversing block contains an illegal value. Alarm value (r2124, interpret decimal): Number of the traversing block with an illegal task parameter.
Remedy:	Correct the task parameter in the traversing block.

A07468 EPOS: Traversing block jump destination does not exist

Message class:	Error in the parameterization / configuration / commissioning procedure (18)

Message value: %1
Component: None
Propagation: Global
Response: NONE
Acknowledgment: NONE
Cause: In a traversing block, a jump was programmed to a non-existent block.
Alarm value (r2124, interpret decimal):
Number of the traversing block with a jump destination that does not exist.
Remedy: - Correct the traversing block.
- Add the missing traversing block.

A07469 EPOS: Traversing block target position < negative software limit switch

Message class: Error in the parameterization / configuration / commissioning procedure (18)
Message value: %1
Component: None
Propagation: Global
Response: NONE
Acknowledgment: NONE
Cause: In the traversing block the specified absolute target position lies outside the range limited by the negative software limit switch.
Alarm value (r2124, interpret decimal):
Number of the traversing block with illegal target position.
Remedy: - Correct the traversing block.
- Change the negative software limit switch (c2578, p2580).

A07470 EPOS: Traversing block target position > positive software limit switch

Message class: Error in the parameterization / configuration / commissioning procedure (18)
Message value: %1
Component: None
Propagation: Global
Response: NONE
Acknowledgment: NONE
Cause: In the traversing block the specified absolute target position lies outside the range limited by the positive software limit switch.
Alarm value (r2124, interpret decimal):
Number of the traversing block with illegal target position.
Remedy: - Correct the traversing block.
- Change the positive software limit switch (c2579, p2581).

A07471 EPOS: Traversing block target position outside the modulo range

Message class: Application/technological function faulted (17)
Message value: %1
Component: None
Propagation: Global
Response: NONE
Acknowledgment: NONE
Cause: In the traversing block the target position lies outside the modulo range.
Alarm value (r2124, interpret decimal):
Number of the traversing block with illegal target position.

Remedy: - In the traversing block, correct the target position.
- Change the modulo range (p2576).

A07472 EPOS: Traversing block ABS_POS/ABS_NEG not possible

Message class: Application/technological function faulted (17)
Message value: %1
Component: None
Propagation: Global
Response: NONE
Acknowledgment: NONE
Cause: In the traversing block the positioning mode ABS_POS or ABS_NEG were parameterized with the modulo correction not activated.
Alarm value (r2124, interpret decimal):
Number of the traversing block with the illegal positioning mode.
Remedy: Correct the traversing block.

A07473 EPOS: Beginning of traversing range reached

Message class: Application/technological function faulted (17)
Message value: -
Component: None
Propagation: Global
Response: NONE
Acknowledgment: NONE
Cause: When traversing, the axis has moved to the traversing range limit.
Remedy: Move away in the positive direction.

A07474 EPOS: End of traversing range reached

Message class: Application/technological function faulted (17)
Message value: -
Component: None
Propagation: Global
Response: NONE
Acknowledgment: NONE
Cause: When traversing, the axis has moved to the traversing range limit.
Remedy: Move away in the negative direction.

F07475 EPOS: Target position < start of traversing range

Message class: Error in the parameterization / configuration / commissioning procedure (18)
Message value: -
Component: None
Propagation: Global
Response: OFF1
Acknowledgment: IMMEDIATELY
Cause: The target position for relative traversing lies outside the traversing range.
Remedy: Correct the target position.

F07476 EPOS: Target position > end of the traversing range

Message class: Error in the parameterization / configuration / commissioning procedure (18)
Message value: -

Component:	None
Propagation:	Global
Response:	OFF1
Acknowledgment:	IMMEDIATELY
Cause:	The target position for relative traversing lies outside the traversing range.
Remedy:	Correct the target position.

A07477 EPOS: Target position < negative software limit switch

Message class:	Error in the parameterization / configuration / commissioning procedure (18)
Message value:	-
Component:	None
Propagation:	Global
Response:	NONE
Acknowledgment:	NONE
Cause:	In the actual traversing operation, the target position is less than the negative software limit switch.
Remedy:	- Correct the target position. - Change the negative software limit switch (c2578, p2580). See also: c2578 (EPOS negative software limit switch), p2580 (EPOS negative software limit switch), c2582 (EPOS software limit switch activation)

A07478 EPOS: Target position > positive software limit switch

Message class:	Error in the parameterization / configuration / commissioning procedure (18)
Message value:	-
Component:	None
Propagation:	Global
Response:	NONE
Acknowledgment:	NONE
Cause:	In the actual traversing operation, the target position is greater than the positive software limit switch.
Remedy:	- Correct the target position. - Change the positive software limit switch (c2579, p2581). See also: c2579 (EPOS positive software limit switch), p2581 (EPOS positive software limit switch), c2582 (EPOS software limit switch activation)

A07479 EPOS: Negative software limit switch reached

Message class:	Application/technological function faulted (17)
Message value:	-
Component:	None
Propagation:	Global
Response:	NONE
Acknowledgment:	NONE
Cause:	The axis is at the position of the negative software limit switch. An active traversing block was interrupted.
Remedy:	- Correct the target position. - Change the negative software limit switch (c2578, p2580). See also: c2578 (EPOS negative software limit switch), p2580 (EPOS negative software limit switch), c2582 (EPOS software limit switch activation)

A07480 EPOS: Positive software limit switch reached

Message class:	Application/technological function faulted (17)
Message value:	-

Component: None
Propagation: Global
Response: NONE
Acknowledgment: NONE
Cause: The axis is at the position of the positive software limit switch. An active traversing block was interrupted.
Remedy: - Correct the target position.
- Change the positive software limit switch (c2579, p2581).
See also: c2579 (EPOS positive software limit switch), p2581 (EPOS positive software limit switch), c2582 (EPOS software limit switch activation)

F07481 EPOS: Axis position < negative software limit switch

Message class: Application/technological function faulted (17)
Message value: -
Component: None
Propagation: Global
Response: OFF1
Acknowledgment: IMMEDIATELY
Cause: The actual position of the axis is less than the position of the negative software limit switch.
Remedy: - Correct the target position.
- Change the negative software limit switch (c2578, p2580).
See also: c2578 (EPOS negative software limit switch), p2580 (EPOS negative software limit switch), c2582 (EPOS software limit switch activation)

F07482 EPOS: Axis position > positive software limit switch

Message class: Application/technological function faulted (17)
Message value: -
Component: None
Propagation: Global
Response: OFF1
Acknowledgment: IMMEDIATELY
Cause: The actual position of the axis is greater than the position of the positive software limit switch.
Remedy: - Correct the target position.
- Change the positive software limit switch (c2579, p2581).
See also: c2579 (EPOS positive software limit switch), p2581 (EPOS positive software limit switch), c2582 (EPOS software limit switch activation)

A07483 EPOS: Travel to fixed stop clamping torque not reached

Message class: Application/technological function faulted (17)
Message value: -
Component: None
Propagation: Global
Response: NONE
Acknowledgment: NONE
Cause: The fixed stop in the traversing block was reached without the clamping torque/clamping force having been achieved.
Remedy: - Check the torque limits (p1520, p1521).

F07484 EPOS: Fixed stop outside the monitoring window

Message class: Application/technological function faulted (17)
Message value: -

Component:	None
Propagation:	Global
Response:	OFF3
Acknowledgment:	IMMEDIATELY
Cause:	In the "fixed stop reached" state, the axis has moved outside the defined monitoring window (p2635).
Remedy:	- Check the monitoring window (p2635). - Check the mechanical system.

F07485 EPOS: Fixed stop not reached

Message class:	Application/technological function faulted (17)
Message value:	-
Component:	None
Propagation:	Global
Response:	OFF1
Acknowledgment:	IMMEDIATELY
Cause:	In a traversing block with the task FIXED STOP, the end position was reached without detecting a fixed stop.
Remedy:	- Check the traversing block and locate the target position further into the workpiece. - If required, reduce the maximum following error window to detect the fixed stop (p2634).

A07486 EPOS: Intermediate stop missing

Message class:	Application/technological function faulted (17)
Message value:	-
Component:	None
Propagation:	Global
Response:	NONE
Acknowledgment:	NONE
Cause:	In operating mode "traversing blocks" or "direct setpoint input/MDI", at the start of motion, c2640 is set to an intermediate stop, i.e. to a 0 signal.
Remedy:	Set c2640 to "No intermediate stop" (1 signal) and restart motion. See also: c2640 (EPOS intermediate stop (0 signal))

A07487 EPOS: Reject traversing task missing

Message class:	Application/technological function faulted (17)
Message value:	-
Component:	None
Propagation:	Global
Response:	NONE
Acknowledgment:	NONE
Cause:	In the modes "Traversing blocks" or "Direct setpoint input/MDI" at the start of motion, the binary signal sink "Do not reject traversing task/reject traversing task" (c2641) does not have a 1 signal.
Remedy:	Connect a 1 signal to the binary signal sink "Do not reject traversing task/reject traversing task" (c2641) and restart motion. See also: c2641 (EPOS reject traversing task (0 signal))

F07488 EPOS: Relative positioning not possible

Message class:	Application/technological function faulted (17)
Message value:	-
Component:	None
Propagation:	Global

Response:	OFF1
Acknowledgment:	IMMEDIATELY
Cause:	In the mode "direct setpoint input/MDI", for continuous transfer (c2649 = 1) relative positioning was selected (c2648 = 0 signal).
Remedy:	Check the control.

A07489 EPOS: Home position correction outside the window

Message class:	Application/technological function faulted (17)
Message value:	-
Component:	None
Propagation:	Global
Response:	NONE
Acknowledgment:	NONE
Cause:	For the function "passive homing" the difference between the measured position at the measuring probe and the home position lies outside the parameterized window.
Remedy:	- Check the mechanical system.

F07490 EPOS: Enable signal withdrawn while traversing

Message class:	Application/technological function faulted (17)
Message value:	-
Component:	None
Propagation:	Global
Response:	OFF1
Acknowledgment:	IMMEDIATELY
Cause:	- For a standard assignment, another fault may have occurred as a result of withdrawing the enable signals. - The drive is in the "switching on inhibited" state (for a standard assignment).
Remedy:	- Set the enable signals or check the cause of the fault that first occurred and then result (for a standard assignment). - Check the assignment to enable the basic positioning function.

F07491 EPOS: Negative hardware limit switch reached

Message class:	Application/technological function faulted (17)
Message value:	-
Component:	None
Propagation:	Global
Response:	OFF3
Acknowledgment:	IMMEDIATELY
Cause:	A 0 signal was detected at c2569, i.e. the negative hardware limit switch was reached. For a positive traversing direction, the negative hardware limit switch was reached - i.e. the hardware limit switch wiring is incorrect. See also: c2569 (EPOS negative hardware limit switch)
Remedy:	- Leave the negative hardware limit switch in the positive traversing direction and return the axis to the valid traversing range. - Check the wiring of the hardware limit switch.

F07492 EPOS: Positive hardware limit switch reached

Message class:	Application/technological function faulted (17)
Message value:	-
Component:	None
Propagation:	Global

Response: OFF3
Acknowledgment: IMMEDIATELY
Cause: A 0 signal was detected at c2570, i.e. the positive hardware limit switch was reached.

For a negative traversing direction, the positive hardware limit switch was reached - i.e. the hardware limit switch wiring is incorrect.

See also: c2570 (EPOS positive hardware limit switch)

Remedy: - Leave the positive hardware limit switch in the negative traversing direction and return the axis to the valid traversing range.

- Check the wiring of the hardware limit switch.

F07493 LR: Overflow of the value range for position actual value

Message class: Application/technological function faulted (17)
Message value: %1
Component: None
Propagation: Global
Response: OFF1
Acknowledgment: IMMEDIATELY
Cause: The value range (-2147483648 ... 2147483647) for the position actual value representation was exceeded.

When the overflow occurs, the "homed" or "adjustment absolute measuring system" status is reset.

Fault value (r0949, interpret decimal):

1: The position actual value (r2521) has exceeded the value range.

2: The encoder position actual value Gn_XIST2 has exceeded the value range.

3: The maximum encoder value times the factor to convert the absolute position Gn_XIST2 from increments to length units (LU) has exceeded the value range for displaying the position actual value.

Remedy: If required, reduce the traversing range or position resolution (p2506).

Note for fault value = 3:

If the value for the maximum possible absolute position (LU) is greater than 4294967296, then it is not possible to make an adjustment due to an overflow.

For rotary encoders, the maximum possible absolute position (LU) is calculated as follows:

p2506 * p2505 / p2504

p2506 * p2505 * p0421 / p2504 for multiturn encoders

A07495 LR: Homing function interrupted

Message class: Application/technological function faulted (17)
Message value: -
Component: None
Propagation: Global
Response: NONE
Acknowledgment: NONE
Cause: An activated homing function (homing mark search or measuring probe evaluation) was canceled.

Possible causes:

- An encoder fault has occurred (Gn_ZSW.15 = 1).
- Position actual value was set during an activated homing function.
- Homing mark search and measuring probe evaluation simultaneously activated.
- Activated homing function (homing mark search or measuring probe evaluation) was deactivated.

Remedy:

- Check the causes and resolve.
- Reset the control and activate the required function.
- Set the input terminal for the measuring probe.

A07496 EPOS: Enable not possible

Message class: Application/technological function faulted (17)

Message value:	%1
Component:	None
Propagation:	Global
Response:	NONE
Acknowledgment:	NONE
Cause:	It is not possible to enable the basic positioner because at least one condition is missing. Alarm value (r2124, interpret decimal): 1: EPOS enable missing. 2: Position actual value, valid feedback signal missing.
Remedy:	Check the corresponding missing condition.

A07498 LR: Measuring probe evaluation not possible

Message class:	Application/technological function faulted (17)
Message value:	%1
Component:	None
Propagation:	Local
Response:	NONE
Acknowledgment:	NONE
Cause:	When evaluating the measuring probe, an error occurred. Alarm value (r2124, interpret decimal): 6: The input terminal for the measuring probe is not set. 4098: Error when initializing the measuring probe. 4100: The measuring pulse frequency is too high. > 50000: The measuring clock cycle is not a multiple integer of the position controller clock cycle.
Remedy:	Deactivate measuring probe evaluation (c2509 = 0 signal). For alarm value = 6: Set the input terminal for the measuring probe (p0488, p0489 or p2517, p2518). For alarm value = 4098: Check the Control Unit hardware. For alarm value = 4100: Reduce the frequency of the measuring pulses at the measuring probe. For alarm value > 50000: Set the clock cycle ratio of the measuring clock cycle to the position controller clock cycle to an integer multiple. To do this, the currently effective measuring clock cycle can be determined from the alarm value as follows: Tmeas [125 µs] = alarm value - 50000 With PROFIdrive, the measuring clock cycle corresponds to the bus clock cycle. Without PROFIdrive, the measuring clock cycle is an internal cycle time that cannot be influenced.

F07499 EPOS: Reversing cam approached with the incorrect traversing direction

Message class:	Application/technological function faulted (17)
Message value:	-
Component:	None
Propagation:	Global
Response:	OFF3
Acknowledgment:	IMMEDIATELY

Cause: The negative reversing cam was approached in the positive traversing direction, or the positive reversing cam was approached in the negative traversing direction.

See also: c2613 (EPOS active homing negative reversing cam), c2614 (EPOS active homing positive reversing cam)

Remedy: - Check the wiring of the reversing cam (c2613, c2614).

- Check the traversing direction to approach the reversing cam.

A07520 Drive: Motor cannot be changed over

Message class: Application/technological function faulted (17)

Message value: %1

Component: None

Propagation: Global

Response: NONE

Acknowledgment: NONE

Cause: A motor data set switchover was requested via PROFINET that the converter does not support.

Remedy: - Check the PROFINET telegram

A07530 Drive: Drive Data Set DDS not present

Message class: Error in the parameterization / configuration / commissioning procedure (18)

Message value: -

Component: None

Propagation: Global

Response: NONE

Acknowledgment: NONE

Cause: A data set switchover was requested via PROFINET that the converter does not support.

Remedy: - Check the PROFINET telegram

A07565 Drive: Encoder error in PROFIdrive encoder interface 1

Message class: Position/speed actual value incorrect or not available (11)

Message value: %1

Component: Sensor Module Encoder 1

Propagation: Global

Response: NONE

Acknowledgment: NONE

Cause: An encoder error was signaled for encoder 1 via the PROFIdrive encoder interface (G1_ZSW.15).

Alarm value (r2124, interpret decimal):

Error code from G1_XIST2.

Remedy: Acknowledge the encoder error using the encoder control word (G1_STW.15 = 1).

A07566 Drive: Encoder error in PROFIdrive encoder interface 2

Message class: Position/speed actual value incorrect or not available (11)

Message value: %1

Component: Sensor Module Encoder 2

Propagation: Global

Response: NONE

Acknowledgment: NONE

Cause: An encoder error was signaled for encoder 2 via the PROFIdrive encoder interface (G2_ZSW.15).

Alarm value (r2124, interpret decimal):

Error code from G2_XIST2.

Remedy:	Acknowledge the encoder error using the encoder control word (G2_STW.15 = 1).

A07569	**Enc identification active**
Message class:	Error in the parameterization / configuration / commissioning procedure (18)
Message value:	-
Component:	None
Propagation:	Global
Response:	NONE
Acknowledgment:	NONE
Cause:	During encoder identification (waiting) with p0400 = 10100, the encoder could still not be identified. There is possibly an incorrect encoder or no encoder available, an incorrect encoder cable inserted or no encoder cable inserted.
Remedy:	- Check the encoder cable and if necessary connect it. - Enter the corresponding encoder type in p0400.

F07575	**Drive: Motor encoder not ready**
Message class:	Position/speed actual value incorrect or not available (11)
Message value:	-
Component:	Sensor Module Encoder 1
Propagation:	Global
Response:	OFF2
Acknowledgment:	IMMEDIATELY
Cause:	The motor encoder signals that it is not ready. - Initialization of encoder 1 (motor encoder) was unsuccessful. - The function "parking encoder" is active (encoder control word G1_STW.14 = 1). - The Sensor Module is defective.
Remedy:	Evaluate other active faults via the motor encoder.

A07581	**Motor encoder: Position actual value preprocessing error**
Message class:	Position/speed actual value incorrect or not available (11)
Message value:	-
Component:	Encoder 1
Propagation:	Global
Response:	NONE
Acknowledgment:	NONE
Cause:	An error has occurred during the position actual value preprocessing.
Remedy:	Check the encoder for the position actual value preprocessing. See also: p2502 (LR encoder assignment)

A07582	**Encoder 2: Position actual value preprocessing error**
Message class:	Position/speed actual value incorrect or not available (11)
Message value:	-
Component:	Encoder 2
Propagation:	Global
Response:	NONE
Acknowledgment:	NONE
Cause:	An error has occurred during the position actual value preprocessing.
Remedy:	Check the encoder for the position actual value preprocessing. See also: p2502 (LR encoder assignment)

A07587 Motor encoder: Position actual value preprocessing has no valid encoder

Message class: Error in the parameterization / configuration / commissioning procedure (18)
Message value: -
Component: Encoder 1
Propagation: Global
Response: NONE
Acknowledgment: NONE
Cause: The following problem has occurred during the position actual value preprocessing:
- An encoder data set has been assigned, however, the encoder data set does not contain any encoder data (p0400 = 0) or invalid data (e.g. p0408 = 0).

Remedy: Check the drive data sets, encoder data sets.
See also: p0187 (Motor encoder encoder data set number), p0188 (Encoder 2 encoder data set number), p0400 (Encoder type selection), p2502 (LR encoder assignment)

A07588 Encoder 2: Position actual value preprocessing does not have a valid encoder

Message class: Error in the parameterization / configuration / commissioning procedure (18)
Message value: -
Component: Encoder 2
Propagation: Global
Response: NONE
Acknowledgment: NONE
Cause: The following problem has occurred during the position actual value preprocessing:
- An encoder data set has been assigned, however, the encoder data set does not contain any encoder data (p0400 = 0) or invalid data (e.g. p0408 = 0).

Remedy: Check the drive data sets, encoder data sets.
See also: p0187 (Motor encoder encoder data set number), p0188 (Encoder 2 encoder data set number), p0400 (Encoder type selection), p2502 (LR encoder assignment)

A07593 Motor encoder: Value range for position actual value exceeded

Message class: Application/technological function faulted (17)
Message value: %1
Component: None
Propagation: Global
Response: NONE
Acknowledgment: NONE
Cause: The value range (-2147483648 ... 2147483647) for the position actual value representation was exceeded.
When the overflow occurs, the "homed" or "absolute encoder adjusted" status is reset.
Alarm value (r2124, interpret decimal):
1: The position actual value (r2521) has exceeded the value range.
2: The encoder position actual value Gn_XIST2 has exceeded the value range.
3: The maximum encoder value multiplied by the factor to convert the absolute position Gn_XIST2 from increments to length units (LU) has exceeded the value range for displaying the position actual value.

Remedy: If required, reduce the traversing range or position resolution.
For alarm value = 3:
Reducing the position resolution and conversion factor:
- Reduce the length unit (LU) per load revolution for rotary encoders (p2506).

A07594 Encoder 2: Value range for position actual value exceeded

Message class: Application/technological function faulted (17)
Message value: %1

Component: None
Propagation: Global
Response: NONE
Acknowledgment: NONE
Cause: The value range (-2147483648 ... 2147483647) for the position actual value representation was exceeded.
When the overflow occurs, the "homed" or "absolute encoder adjusted" status is reset.
Alarm value (r2124, interpret decimal):
1: The position actual value (r2521) has exceeded the value range.
2: The encoder position actual value Gn_XIST2 (r0483) or the absolute value after the load gearbox (r2723) has exceeded the value range.
3: The maximum encoder value times the factor to convert the absolute position (r0483 and/or r2723) from increments to length units (LU) has exceeded the value range for displaying the position actual value.
Remedy: If required, reduce the traversing range or position resolution.
For alarm value = 3:
Reducing the position resolution and conversion factor:
- Reduce the length unit (LU) per load revolution for rotary encoders (p2506).
- Increase the fine resolution of absolute position actual values (p0419).

A07596 Motor encoder: Homing function interrupted

Message class: Application/technological function faulted (17)
Message value: -
Component: None
Propagation: Global
Response: NONE
Acknowledgment: NONE
Cause: An activated homing function (homing mark search or measuring probe evaluation) was canceled.
- An encoder fault has occurred (Gn_ZSW.15 = 1).
- Position actual value was set during an activated homing function.
- Homing mark search and measuring probe evaluation simultaneously activated.
- Activated homing function (homing mark search or measuring probe evaluation) was deactivated.
Remedy: - Check the causes and resolve.
- Reset the control and activate the required function.

A07597 Encoder 2: Homing function interrupted

Message class: Application/technological function faulted (17)
Message value: -
Component: None
Propagation: Global
Response: NONE
Acknowledgment: NONE
Cause: An activated homing function (homing mark search or measuring probe evaluation) was canceled.
- An encoder fault has occurred (Gn_ZSW.15 = 1).
- Position actual value was set during an activated homing function.
- Homing mark search and measuring probe evaluation simultaneously activated (c2508 and c2509 = 1 signal).
- Activated homing function (homing mark search or measuring probe evaluation) was deactivated (c2508 and c2509 = 0 signal).
Remedy: - Check the causes and resolve.
- Reset the control (c2508 and c2509 = 0 signal) and activate the required function.

F07801 Drive: Motor overcurrent

Message class: Motor overload (8)
Message value: -
Component: Motor
Propagation: Global
Response: OFF2
Acknowledgment: IMMEDIATELY
Cause: The permissible motor limit current was exceeded.
- Active current limit too low.
- Current controller not correctly set.
- Load is too high.
- Short-circuit in the motor cable or ground fault.
- Motor current does not match the drive current.

Remedy:
- Reduce the load.
- Check the motor and motor cables for short-circuit and ground fault.
- Check the drive and motor combination.

F07802 Drive: Infeed not ready

Message class: Infeed faulted (13)
Message value: -
Component: None
Propagation: Global
Response: OFF2
Acknowledgment: IMMEDIATELY
Cause: The drive does not signal a ready state after an internal switch-on command.
- DC link voltage not available or jumper not inserted at X1/X4.
- Supply voltage incorrectly set.
- Defective drive.

Remedy:
- Switch on the load supply.
- Check the line connection and supply voltage (p0210).
- Insert the jumper for the internal braking resistor.
- Connect an external braking resistor (X1/X4)
- Replace the drive.

F07815 Drive: Power unit has been changed

Message class: Error in the parameterization / configuration / commissioning procedure (18)
Message value: Parameter: %1
Component: Power Unit
Propagation: Global
Response: NONE
Acknowledgment: IMMEDIATELY
Cause: The code number of the actual power unit does not match the saved number. This occurs if a saved configuration (SD card, backup file) of a converter with another power rating is used.

Fault value only for internal Siemens diagnostics.

See also: p0201 (Power unit code number)

Remedy:
- Reset to the factory settings, which corresponds to recommissioning the converter.
- Use an SD card or backup file with the configuration correct for the drive being used and switch-off/switch-on the drive.
- In case of doubt, before using an SD card, delete the existing configuration of the USER folder.
- For a series commissioning, only use the same converter types (order number, power class).

F07860	External braking resistor signals an overtemperature
Message class:	External measured value / signal state outside the permissible range (16)
Message value:	-
Component:	None
Propagation:	Global
Response:	OFF2
Acknowledgment:	IMMEDIATELY
Cause:	The temperature monitoring of the external braking resistor, connected via digital input 4 (DI 4, X130/2.6), responded. Note: This signal is triggered for a 1/0 edge at digital input 4.
Remedy:	- Check the dimensioning of the external braking resistor for the application. - Check the external braking resistor and temperature monitoring. - Check the temperature monitoring connection (X130/2.6).

F07900	Drive: Motor blocked/speed controller at its limit
Message class:	Application/technological function faulted (17)
Message value:	-
Component:	Motor
Propagation:	Global
Response:	OFF2
Acknowledgment:	IMMEDIATELY
Cause:	The motor operates longer than 0.2 seconds at the torque limit and below the speed threshold in p2175. This signal can also be initiated if the speed actual value oscillates and the speed controller output repeatedly and briefly goes to its limit. This message can also be output for a phase failure in the motor feeder cable. See also: p2175 (Motor blocked speed threshold)
Remedy:	- Check that the motor can freely move. - Check the effective torque limit (r1538, r1539). - Check the parameter of the "Motor blocked" signal and possibly correct (p2175). - Check the motor feeder cable.

F07901	Drive: Motor overspeed
Message class:	Application/technological function faulted (17)
Message value:	-
Component:	Motor
Propagation:	Global
Response:	OFF2
Acknowledgment:	IMMEDIATELY
Cause:	The maximum permissible speed was either positively or negatively exceeded (p1082).
Remedy:	- Check the speed controller (p1460, p1462). - Check the moment of inertia (p1498). - Check the maximum speed (p1082).

F07930	Drive: Brake control error
Message class:	Application/technological function faulted (17)
Message value:	%1
Component:	Motor
Propagation:	Global

Response: OFF1
Acknowledgment: IMMEDIATELY
Cause: The converter has detected a brake control fault.
Message value (r0949, interpret decimal):
1, 2:
- Motor cable shield is not correctly connected.
- Defect in the brake control circuit of the converter.
- Ground fault in brake cable.
4:
Brake is not connected or cable is interrupted.
See also: p1278 (Brake control diagnostics evaluation)

Remedy:
- Check the motor holding brake connection.
- Check the function of the motor holding brake.
- Check whether there is a DRIVE-CLiQ communication error, and if required, carry out a diagnostics routine for the faults involved.
- Check that the electrical cabinet design and cable routing are in compliance with EMC regulations (e.g. shield of the motor cable and brake conductors are connected with the shield connecting plate and the motor connectors are tightly screwed to the housing).
- Replace the converter involved.
- Set p1278 to 1 if brake diagnostics is not required.

See also: p1215 (Motor holding brake configuration), p1278 (Brake control diagnostics evaluation)

F07933 Drive: Brake voltage incorrect

Message class: Application/technological function faulted (17)
Message value: -
Component: Motor
Propagation: Global
Response: OFF2
Acknowledgment: IMMEDIATELY
Cause: A brake voltage fault was detected.
Remedy:
- Carry out a POWER ON (switch-off/switch-on) for all components.
- Contact Technical Support.
- Replace the converter.

F07935 Drive: Incorrect motor holding brake configuration

Message class: Error in the parameterization / configuration / commissioning procedure (18)
Message value: %1
Component: None
Propagation: Global
Response: NONE
Acknowledgment: IMMEDIATELY
Cause: An incorrect motor holding brake configuration was detected.
Message value (r0949, interpret decimal):
0:
A motor holding brake was detected where the brake control has not been configured (p1215 = 0).
The brake control configuration was set to "Motor holding brake the same as sequence control" (p1215 = 1) (only when commissioning for the first time).
1:
A motor holding brake was detected where the brake control has not been configured (p1215 = 0).
The brake control configuration was left at "No motor holding brake available" (p1215 = 0).

Remedy: For message value = 0:
- No remedy required.
For message value = 1:
- If required change the motor holding brake configuration (p1215 = 1, 2).
- If this message value is unexpectedly output, then the motor connections should be checked in order to rule out that they have been interchanged.
See also: p1215 (Motor holding brake configuration)

F07955 Drive: Motor has been changed

Message class: Error in the parameterization / configuration / commissioning procedure (18)
Message value: -
Component: Motor
Propagation: Global
Response: NONE
Acknowledgment: IMMEDIATELY
Cause: The code number of the actual motor with DRIVE-CLiQ does not match the saved number.
Or, the code numbers of the bearings, gearbox and brake do not match the saved numbers.
Remedy: Connect the original motor and switch on the converter again (POWER ON) - or restore the factory settings.
Note:
The data for bearings, gearbox and brake are reloaded.

A08561 IE: Consistency error affecting adjustable parameters

Message class: Error in the parameterization / configuration / commissioning procedure (18)
Message value: %1
Component: None
Propagation: Local
Response: NONE
Acknowledgment: NONE
Cause: A consistency error was detected when activating the configuration for the Industrial Ethernet interface (X127).
Alarm value (r2124, interpret decimal):
0: General consistency error
1: Error in the IP configuration (IP address, subnet mask or standard gateway).
2: Error in the station names.
5: Standard gateway is also set at the PROFINET interface.
6: The station name is also set at the PROFINET interface.
7: The IP address is located in the same subnet as the IP address of the PROFINET interface.
Note:
For alarm value = 0, 1, 2, 5, 7 the following applies: the configuration was not changed.
For alarm value = 6 the following applies: The new configuration was however activated.
IE: Industrial Ethernet
Remedy: Reinitialize the station using the "Edit Ethernet node" screen form (e.g. with Startdrive commissioning tool).

A08563 PROFINET: Consistency error affecting adjustable parameters

Message class: Error in the parameterization / configuration / commissioning procedure (18)
Message value: %1
Component: None
Propagation: Local
Response: NONE
Acknowledgment: NONE

Cause: A consistency error was detected when activating the configuration for the PROFINET interface (X150).
Alarm value (r2124, interpret decimal):
0: General consistency error
1: Error in the IP configuration (IP address, subnet mask or standard gateway).
2: Error in the station names.
3: DHCP was not able to be activated, as a cyclic PROFINET connection already exists.
5: Standard gateway is also set at the Industrial Ethernet interface (X127).
6: Standard station name is also set at the Industrial Ethernet interface (X127).
7: IP address is located in the same subnet as the IP address of the Industrial Ethernet interface (X127).
Note:
For alarm value = 0, 1, 2, 3, 4, 5, 7, the following applies: the configuration was not changed.
For alarm value = 6 the following applies: The new configuration was however activated.
DHCP: Dynamic Host Configuration Protocol

Remedy: Reinitialize the station using the "Edit Ethernet node" screen form (e.g. with Startdrive commissioning tool).

A08566 IIoT: Syntax error in configuration file

Message class: Error in the parameterization / configuration / commissioning procedure (18)
Message value: -
Component: None
Propagation: Local
Response: NONE
Acknowledgment: NONE
Cause: A syntax error has been detected in the configuration file for the IIoT interface (X128). The saved configuration file has not been loaded.
Note:
IIoT: Industrial Internet of Things
Remedy: Reinitialize the station using the "Edit Ethernet node" screen form (e.g. with Startdrive commissioning tool).

A08567 IIoT: Consistency error for adjustable parameters

Message class: Error in the parameterization / configuration / commissioning procedure (18)
Message value: %1
Component: None
Propagation: Local
Response: NONE
Acknowledgment: NONE
Cause: A consistency error was detected when activating the configuration for the IIoT interface (X128).
Alarm value (r2124, interpret decimal):
0: General consistency error
1: Error in the IP configuration (IP address, subnet mask or standard gateway).
2: Error in the station names.
5: Standard gateway is also set at the PROFINET interface.
6: The station name is also set at the PROFINET interface.
7: The IP address is located in the same subnet as the IP address of the PROFINET interface.
Note:
For alarm value = 0, 1, 2, 5, 7 the following applies: the configuration was not changed.
For alarm value = 6 the following applies: The new configuration was however activated.
IE: Industrial Ethernet
Remedy: Reinitialize the station using the "Edit Ethernet node" screen form (e.g. with Startdrive commissioning tool).

A08800	**PROFIenergy energy-saving mode active**
Message class:	Communication error to the higher-level control system (9)
Message value:	%1
Component:	None
Propagation:	Global
Response:	NONE
Acknowledgment:	NONE
Cause:	The PROFIenergy energy-saving mode is active Alarm value (r2124, interpret decimal): Mode ID of the active PROFIenergy energy-saving mode. See also: r5600 (PROFIenergy energy-saving mode ID)
Remedy:	The alarm is automatically withdrawn when the energy-saving mode is exited. Note: The energy-saving mode is exited after the following events: - The PROFIenergy command end_pause is received from the higher-level control. - The higher-level control has changed into the STOP operating state. - The PROFINET connection to the higher-level control has been disconnected.

F13000	**License not adequate**
Message class:	Error in the parameterization / configuration / commissioning procedure (18)
Message value:	%1
Component:	Control Unit (CU)
Propagation:	Global
Response:	OFF2
Acknowledgment:	IMMEDIATELY
Cause:	- The converter uses options that require a license and the licenses are not sufficient. - An error has occurred when checking the licensing. Fault value (r0949, interpret decimal): 0: Adequate licensing was not able to be determined as there is no licensing data available on the memory card. 1: Adequate licensing was not able to be determined as the memory card with the required licensing data was withdrawn in operation or the memory card is defective. 2: Adequate licensing was not able to be determined as there is no licensing data available on the memory card. 3: Adequate licensing was not able to be determined as the licensing data does not match the serial number of the memory card being used. 4, 5, 6, 7: Adequate licensing was not able to be determined as the licensing data were manipulated and are therefore invalid. 8, 9: An internal error occurred when checking the license.

Remedy:

For fault value = 0:

Transfer a license file with the required licenses to the converter.

For fault value = 1:

Reinsert the memory card into the converter. If you have to replace a defective memory card, contact Technical Support.

For fault value = 2:

Transfer a license file with the required licenses to the converter.

For fault value = 3:

Compare the license file name (after "LK_" to ".ZIP") with the serial number of the memory card.

Transfer the appropriate license file to the converter.

For fault value = 4, 5, 6, 7, 8, 9:

- Carry out a POWER ON.
- Upgrade firmware to later version.
- Contact Technical Support.

Note:

An overview of the converter functions requiring a license can be displayed using a commissioning tool in the online mode. Depending on the commissioning tool, you can also obtain the necessary licensing (serial number, license file, Trial License Mode).

A13002 Licensing not sufficient in operation

Message class: Error in the parameterization / configuration / commissioning procedure (18)

Message value: -

Component: Control Unit (CU)

Propagation: Global

Response: NONE

Acknowledgment: NONE

Cause:

- For the converter, the options that require a license are being used but the licenses are not sufficient.
- An error occurred when checking the existing licenses.

Alarm value (r2124, interpret decimal):

0: The existing license is not sufficient.

1: An adequate license was not able to be determined as the memory card with the required licensing data was withdrawn in operation or the memory card has developed a defect.

2: An adequate license was not able to be determined as there is no licensing data available on the memory card.

3: An adequate license was not able to be determined as there is no licensing data available on the memory card.

4, 5, 6, 7: An adequate license was not able to be determined as the licensing data were manipulated and are therefore invalid.

8,9: An internal error occurred when checking the license.

Remedy: For alarm value = 0:
Additional licenses are required and must be activated.
For alarm value = 1:
Reinsert or replace the memory card that matches the system.
For alarm value = 2:
Transfer the license file to the converter.
For alarm value = 3:
Compare the license file name (after "LK_" to ".ZIP") with the serial number of the memory card.
Transfer the appropriate license file to the converter.
For alarm value = 4, 5, 6, 7, 8, 9:
- Carry out a POWER ON.
- Upgrade firmware to later version.
- Contact Technical Support.
Note:
An overview of the converter functions requiring a license can be displayed using a commissioning tool in the online mode. Depending on the commissioning tool, you can also obtain the necessary licensing (serial number, license file, Trial License Mode).

A13030 Trial License activated

Message class: Error in the parameterization / configuration / commissioning procedure (18)
Message value: -
Component: Control Unit (CU)
Propagation: Local
Response: NONE
Acknowledgment: NONE
Cause: The "Trial License" function was activated. One of the available periods is expiring.
Remedy: Not necessary.
The alarm is automatically withdrawn after the periods have expired.

A13031 Trial License period expired

Message class: Error in the parameterization / configuration / commissioning procedure (18)
Message value: -
Component: Control Unit (CU)
Propagation: Local
Response: NONE
Acknowledgment: NONE
Cause: One of the available periods of the "Trial License" function has expired.
Remedy: - If required, start an additional period.
- Deactivate functions requiring a license.
- Appropriately license the converter.
Note:
A license that is not adequate will only become evident after the next time the system runs up.

A13032 Trial License last period activated

Message class: Error in the parameterization / configuration / commissioning procedure (18)
Message value: -
Component: Control Unit (CU)
Propagation: Local
Response: NONE
Acknowledgment: NONE

Cause: The "Trial License" function was activated. The last of the available periods is expiring.

Remedy: Not necessary.
The alarm is automatically withdrawn after the last period has expired.

A13033 Trial License last period expired

Message class: Error in the parameterization / configuration / commissioning procedure (18)

Message value: -

Component: Control Unit (CU)

Propagation: Local

Response: NONE

Acknowledgment: NONE

Cause: The last period of the "Trial License" function has expired. No additional periods available.

Remedy:
- Deactivate functions requiring a license.
- Appropriately license the converter.

Note:
A license that is not adequate will only become evident after the next time the system runs up.

F30001 Drive: Overcurrent

Message class: Power electronics faulted (5)

Message value: Fault cause: %1 bin

Component: Power Unit

Propagation: Local

Response: OFF2

Acknowledgment: IMMEDIATELY

Cause: The drive has detected an overcurrent condition.
- Closed-loop control is incorrectly parameterized.
- Motor has a short-circuit or fault to ground (frame).
- The rated motor current is significantly higher than that of the drive.
- Infeed: High discharge and post-charging currents for line voltage dip.
- Infeed: High post-charging currents for overload when motoring and DC link voltage dip.
- Infeed: Short-circuit currents at switch-on as there is no line reactor.
- Power cables are not correctly connected.
- The power cables exceed the maximum permissible length.
- Defective drive.
- Line phase interrupted.

Fault value (r0949, interpret bitwise):
Bit 0: Phase U.
Bit 1: Phase V.
Bit 2: Phase W.

Remedy:
- Check the motor data, carry out commissioning if required.
- Check the assignment of the rated currents of the motor and converter.
- Infeed: Check the line quality.
- Infeed: Reduce the motor load.
- Infeed: Check that the line filter and line reactor are correctly connected.
- Check the power cable connections.
- Check the power cables for short-circuit or ground fault.
- Check the length of the power cables.
- Replace drive.
- Check the line phases.

F30002 Drive: DC link overvoltage

Message class: DC link overvoltage (4)
Message value: %1
Component: Power Unit
Propagation: Local
Response: OFF2
Acknowledgment: IMMEDIATELY
Cause: The drive has detected an overvoltage condition in the DC link.
- Motor regenerates too much energy.
- Device supply voltage too high.
- Line phase interrupted.

Fault value only for internal Siemens diagnostics.

Remedy:
- Increase the ramp-down time.
- Use a braking resistor.
- Use a drive with a higher power rating.
- Check the device supply voltage (p0210).
- Check the line phases.

See also: p0210 (Device supply voltage)

F30003 Drive: DC link undervoltage

Message class: Infeed faulted (13)
Message value: -
Component: Power Unit
Propagation: Local
Response: OFF2
Acknowledgment: IMMEDIATELY
Cause: The power unit has detected an undervoltage condition in the DC link.
- Line supply failure.
- Line voltage below the permissible value.
- Line infeed failed or interrupted.
- Line phase interrupted.

Remedy:
- Check the line voltage.
- Check the line infeed and observe the fault messages relating to it (if there are any).
- Check the line phases.
- Check the supply voltage setting (p0210).

See also: p0210 (Device supply voltage)

F30004 Power unit: Overtemperature heat sink inverter

Message class: Power electronics faulted (5)
Message value: %1
Component: Power Unit
Propagation: Local
Response: OFF2
Acknowledgment: IMMEDIATELY

Cause: The temperature of the power unit heat sink has exceeded the permissible limit value.
- Insufficient cooling, fan failure.
- Overload.
- Ambient temperature too high.
- Pulse frequency too high.

Fault value (r0949, interpret decimal):
Temperature [0.01 °C].

Remedy:
- Check whether the fan is running.
- Check the fan elements.
- Check whether the ambient temperature is in the permissible range.
- Check the motor load.
- Reduce the pulse frequency if this is higher than the rated pulse frequency.

Notice:
This fault can only be acknowledged after the alarm threshold for alarm A30250 has been fallen below.

F30005 Power unit: Overload I2t (AC)

Message class: Power electronics faulted (5)
Message value: %1
Component: Power Unit
Propagation: Local
Response: OFF2
Acknowledgment: IMMEDIATELY
Cause: The power unit was overloaded.
- The permissible rated power unit current was exceeded for an inadmissibly long time.
- The permissible duty cycle was not maintained.

Fault value (r0949, interpret decimal):
I2t [100 % = 16384].

Remedy:
- Reduce the continuous load.
- Adapt the duty cycle.
- Check the rated currents of the motor and power unit.

See also: r0307 (Rated motor power)

F30011 Power unit: Line phase failure in main circuit

Message class: Line supply fault (2)
Message value: %1
Component: Power Unit
Propagation: Local
Response: OFF2
Acknowledgment: IMMEDIATELY
Cause: At the power unit, the DC link voltage ripple has exceeded the permissible limit value.
Possible causes:
- A line phase has failed.
- The 3 line phases are inadmissibly asymmetrical.
- The capacitance of the DC link capacitor forms a resonance frequency with the line inductance and the reactor integrated in the power unit.
- The fuse of a phase of a main circuit has ruptured.
- A motor phase has failed.
- For power units operated on a single phase, the permissible active power was exceeded.

Only for internal Siemens troubleshooting.

Remedy:	- Check the main circuit fuses. - Check whether a single-phase load is distorting the line voltages. - Detune the resonant frequency with the line inductance by using an upstream line reactor. - Dampen the resonant frequency with the line inductance by switching over the DC link voltage compensation in the software or increase the smoothing. However, this can have a negative impact on the torque ripple at the motor output. - Check the motor feeder cables.

F30012 Power unit: Temperature sensor wire breakage

Message class:	Power electronics faulted (5)
Message value:	%1
Component:	Power Unit
Propagation:	Local
Response:	OFF1
Acknowledgment:	IMMEDIATELY
Cause:	The connection to a temperature sensor in the power unit is interrupted. Fault value (r0949, interpret binary): Bit 1: Air intake Bit 2: Inverter 1 Bit 3: Inverter 2 Bit 4: Inverter 3 Bit 5: Inverter 4 Bit 6: Inverter 5 Bit 7: Inverter 6 Bit 8: Rectifier Bit 10: Moisture ext. moisture sensor Bit 11: Temperature ext. moisture sensor Bit 13: Balance resistor Bit 14: Capacitor air discharge Bit 15: Liquid intake
Remedy:	Contact Technical Support.

F30013 Power unit: Temperature sensor short-circuit

Message class:	Power electronics faulted (5)
Message value:	%1
Component:	Power Unit
Propagation:	Local
Response:	OFF1
Acknowledgment:	IMMEDIATELY

Cause: A temperature sensor in the power unit is short-circuited.
Fault value (r0949, interpret binary):
Bit 1: Air intake
Bit 2: Inverter 1
Bit 3: Inverter 2
Bit 4: Inverter 3
Bit 5: Inverter 4
Bit 6: Inverter 5
Bit 7: Inverter 6
Bit 8: Rectifier
Bit 10: Moisture ext. moisture sensor
Bit 11: Temperature ext. moisture sensor
Bit 14: Capacitor air discharge
Bit 15: Liquid intake

Remedy: Contact Technical Support.

F30015 Drive: Phase failure motor cable

Message class: Application/technological function faulted (17)
Message value: -
Component: Motor
Propagation: Global
Response: OFF2
Acknowledgment: IMMEDIATELY
Cause: A phase failure in the motor feeder cable was detected.
The signal can also be output in the following case:
The motor is correctly connected, however the closed-speed control is instable and therefore an oscillating torque is generated.
Remedy: - Check the motor feeder cables.
- Check the speed controller settings.

A30016 Power unit: Load supply switched off

Message class: Line supply fault (2)
Message value: %1
Component: Power Unit
Propagation: Global
Response: NONE
Acknowledgment: NONE
Cause: The DC link voltage is too low.
Alarm value (r2124, interpret decimal):
DC link voltage at the time of the trip [V].
Remedy: - Switch on the load supply.
- Check the line supply if necessary.
- If necessary, insert the jumper for the internal braking resistor.
- Insert a jumper for an internal or external braking resistor (X1/X4).

F30017 Power unit: Hardware current limit has responded too often

Message class: Power electronics faulted (5)
Message value: Fault cause: %1 bin
Component: Power Unit
Propagation: Local

Response: OFF2
Acknowledgment: IMMEDIATELY
Cause: The hardware current limitation in the relevant phase (see A30031, A30032, A30033) has responded too often. The number of times the limit has been exceeded depends on the design and type of power unit.

- Closed-loop control is incorrectly parameterized.
- Fault in the motor or in the power cables.
- The power cables exceed the maximum permissible length.
- Motor load too high
- Power unit defective.

Fault value (r0949, interpret binary):

Bit 0: Phase U

Bit 1: Phase V

Bit 2: Phase W

Additional bits:

Only for internal Siemens troubleshooting.

Note:

Fault value = 0 means that the phase with current limiting is not recognized (e.g. for blocksize device).

Remedy:
- Check the motor data.
- Check the motor circuit configuration (star-delta).
- Check the motor load.
- Check the power cable connections.
- Check the power cables for short-circuit or ground fault.
- Check the length of the power cables.
- Replace power unit.

F30020 Power unit: Configuration not supported

Message class: Error in the parameterization / configuration / commissioning procedure (18)
Message value: Fault cause: %1, additional information: %2
Component: Power Unit
Propagation: Local
Response: OFF2
Acknowledgment: IMMEDIATELY
Cause: A configuration is requested that is not supported by the power unit.

Fault value (r0949, interpret hexadecimal):

yyyyxxxx hex: xxxx = fault cause, yyyy = additional information (internal Siemens)

xxxx = 3: Initialization was not able to be successfully completed. It is possible that the converter was switched-off before or while running up.

xxxx = 4: The combination of power unit and converters is not supported.

xxxx = 8: The version of the ASIC installed in the power unit is no longer supported.

Remedy: For fault cause = 3, 4:

Use a converter with the appropriate power unit and carry out a POWER ON for the converter.

For fault cause = 8:

Replace the power unit by one which has a newer ASIC version.

F30021 Drive: Ground fault

Message class: Ground fault / inter-phase short-circuit detected (7)
Message value: %1
Component: Power Unit
Propagation: Local
Response: OFF2
Acknowledgment: IMMEDIATELY

Cause: The drive has detected a ground fault.
Possible causes:
- Ground fault in the power cables.
- Ground fault at the motor.
- When the brake closes, this causes the hardware DC current monitoring to respond.
- Short-circuit at the braking resistor.
Fault value (r0949, interpret decimal):
0:
- The hardware DC current monitoring has responded.
- Short-circuit at the braking resistor.
> 0:
Absolute value summation current amplitude.

Remedy:
- Check the power cable connections.
- Check the motor.
- Check the cables and contacts of the brake connection (a wire is possibly broken).
- Check the braking resistor.

F30024 Power unit: Overtemperature thermal model

Message class: Power electronics faulted (5)
Message value: Power semiconductor: %1, temperature: [0.01 degrees C] %2
Component: Power Unit
Propagation: Local
Response: OFF2
Acknowledgment: IMMEDIATELY
Cause: The temperature difference between the power semiconductor involved and the heat sink has exceeded the permissible fault threshold.
- The permissible duty cycle was not maintained.
- Insufficient cooling, fan failure.
- Overload.
- Ambient temperature too high.
- Pulse frequency too high.

Fault value (r0949, interpret hexadecimal):
yyyyxxxx hex: yyyy= Power semiconductor, xxxx = Temperature in 0.01°C
See also: r0037 (Drive temperatures)

Remedy:
- Adapt the duty cycle.
- Check whether the fan is running.
- Check the fan elements.
- Check whether the ambient temperature is in the permissible range.
- Check the motor load.
- Reduce the pulse frequency if this is higher than the rated pulse frequency.

F30025 Power unit: Chip overtemperature

Message class: Power electronics faulted (5)
Message value: Power semiconductor: %1, temperature: [0.01 degrees C] %2
Component: Power Unit
Propagation: Local
Response: OFF2
Acknowledgment: IMMEDIATELY

Cause: The chip temperature of the power semiconductor involved has exceeded the permissible fault threshold.
- The permissible duty cycle was not maintained.
- Insufficient cooling, fan failure.
- Overload.
- Ambient temperature too high.
- Pulse frequency too high.

Fault value (r0949, interpret hexadecimal):
yyyyxxxx hex: yyyy= Power semiconductor, xxxx = Temperature in 0.01°C

Remedy: - Adapt the duty cycle.
- Check whether the fan is running.
- Check the fan elements.
- Check whether the ambient temperature is in the permissible range.
- Check the motor load.
- Reduce the pulse frequency if this is higher than the rated pulse frequency.
Note:
This fault can only be acknowledged after the alarm threshold for alarm A030252 has been fallen below.
See also: r0037 (Drive temperatures)

F30026 Power unit: DC link precharging asymmetry

Message class: Power electronics faulted (5)
Message value: %1
Component: Power Unit
Propagation: Global
Response: NONE
Acknowledgment: IMMEDIATELY
Cause: Asymmetry has occurred during DC link precharging.
This message can occur in the following cases:
- Asymmetrical line voltage dips, interruptions (possibly even very briefly for just a few milliseconds)
- One or several line phases failed / not connected
- Device damage
Alarm value only for internal Siemens diagnostics.

Remedy: Caution: Continuous operation with F30026 is not permissible, and can damage the converter.
- Check the line supply and connection

F30027 Power unit: Precharging DC link time monitoring

Message class: Infeed faulted (13)
Message value: Enable signals: %1, status: %2
Component: Power Unit
Propagation: Local
Response: OFF2
Acknowledgment: IMMEDIATELY

Cause:

The power unit DC link was not able to be precharged within the expected time.

Possible causes:

1) There is no line voltage connected.
2) The line contactor/line side switch has not been closed.
3) The line voltage is too low.
4) Line voltage incorrectly set (p0210).
5) The precharging resistors are overheated as there were too many precharging operations per time unit.
6) The precharging resistors are overheated as the DC link capacitance is too high.
8) The precharging resistors are overheated as the line contactor was closed during the DC link fast discharge through the Braking Module.
9) The DC link has either a ground fault or a short-circuit.
10) Connector X4 is not correctly configured.

Fault value (r0949, interpret binary):

yyyyxxxx hex:

yyyy = power unit state

0: Fault status (wait for OFF and fault acknowledgment).
1: Restart inhibit (wait for OFF).
2: Overvoltage condition detected -> change into the fault state.
3: Undervoltage condition detected -> change into the fault state.
4: Wait for bridging contactor to open -> change into the fault state.
5: Wait for bridging contactor to open -> change into restart inhibit.
6: Wait for bypass contactor to open
7: Commissioning.
8: Ready for precharging.
9: Precharging started, DC link voltage lower than the minimum switch-on voltage.
10: Precharging, DC link voltage end of precharging still not detected.
11: Wait for the end of the de-bounce time of the main contactor after precharging has been completed.
12: Precharging completed, ready for pulse enable.
13: It was detected that the STO terminal was energized at the power unit.

xxxx = Missing internal enable signals, power unit (inverted bit-coded, FFFF hex -> all internal enable signals available)

Bit 0: Power supply of the IGBT gating shut down.
Bit 1: Ground fault detected.
Bit 2: Peak current intervention.
Bit 3: I2t exceeded.
Bit 4. Thermal model overtemperature calculated.
Bit 5: (heat sink, gating module, power unit) overtemperature measured.
Bit 6: Reserved.
Bit 7: Overvoltage detected.
Bit 8: Power unit has completed precharging, ready for pulse enable.
Bit 9: STO terminal missing.
Bit 10: Overcurrent detected.
Bit 11: Armature short-circuit active.
Bit 13: Vce fault detected, transistor de-saturated due to overcurrent/short-circuit.
Bit 14: Undervoltage detected.

See also: p0210 (Device supply voltage)

Remedy: General:
- Check the line voltage at the input terminals.
- Check the line voltage setting (p0210).

For cause 5:
- Carefully observe the permissible precharging frequency (refer to the product documentation).

For cause 6:
- Check the total capacitance of the DC link and reduce in accordance with the maximum permissible DC link capacitance if necessary (refer to the product documentation).

For cause 8:
- Check the connections of the external line contactor. The line contactor must be open during DC link fast discharge.

For cause 9:
- Check the DC link for ground faults or short-circuits.

For cause 10:
- When using the internal braking resistor, terminals DCP and R2 of connector X4 must be bridged.
- When using an external braking resistor, this must be connected between DCP and R1 of connector X4.

See also: p0210 (Device supply voltage)

A30031 Power unit: Hardware current limiting in phase U

Message class: Power electronics faulted (5)

Message value: -

Component: Power Unit

Propagation: Global

Response: NONE

Acknowledgment: NONE

Cause: Hardware current limit for phase U responded. The pulsing in this phase is inhibited for one pulse period.
- Closed-loop control is incorrectly parameterized.
- Fault in the motor or in the power cables.
- The power cables exceed the maximum permissible length.
- Motor load too high
- Power unit defective.

Remedy:
- Check the motor data.
- Check the motor circuit configuration (star/delta).
- Check the motor load.
- Check the power cable connections.
- Check the power cables for short-circuit or ground fault.
- Check the length of the power cables.

A30032 Power unit: Hardware current limiting in phase V

Message class: Power electronics faulted (5)

Message value: -

Component: Power Unit

Propagation: Local

Response: NONE

Acknowledgment: NONE

Cause: Hardware current limit for phase V responded. The pulsing in this phase is inhibited for one pulse period.
- Closed-loop control is incorrectly parameterized.
- Fault in the motor or in the power cables.
- The power cables exceed the maximum permissible length.
- Motor load too high
- Power unit defective.

Remedy: - Check the motor data.
- Check the motor circuit configuration (star/delta).
- Check the motor load.
- Check the power cable connections.
- Check the power cables for short-circuit or ground fault.
- Check the length of the power cables.

A30033 Power unit: Hardware current limiting in phase W

Message class: Power electronics faulted (5)
Message value: -
Component: Power Unit
Propagation: Local
Response: NONE
Acknowledgment: NONE
Cause: Hardware current limit for phase W responded. The pulsing in this phase is inhibited for one pulse period.
- Closed-loop control is incorrectly parameterized.
- Fault in the motor or in the power cables.
- The power cables exceed the maximum permissible length.
- Motor load too high
- Power unit defective.

Remedy: - Check the motor data.
- Check the motor circuit configuration (star/delta).
- Check the motor load.
- Check the power cable connections.
- Check the power cables for short-circuit or ground fault.
- Check the length of the power cables.

A30034 Power unit: Internal overtemperature

Message class: Power electronics faulted (5)
Message value: %1
Component: Power Unit
Propagation: Local
Response: NONE
Acknowledgment: NONE
Cause: The alarm threshold for internal overtemperature has been reached.
If the temperature inside the power unit increases up to the fault threshold, then fault F30036 is triggered.
- Ambient temperature might be too high.
- Insufficient cooling, fan failure.

Remedy: - Check the ambient air temperature.
- Check the fan for the inside of the unit.

F30036 Power unit: Internal overtemperature

Message class: Power electronics faulted (5)
Message value: %1
Component: Power Unit
Propagation: Local
Response: OFF2
Acknowledgment: IMMEDIATELY

Cause: The temperature inside the converter has exceeded the permissible limit value.
- Insufficient cooling, fan failure.
- Overload.
- Ambient temperature too high.

Remedy:
- Check the internal fan.
- Check the fan elements.
- Check whether the ambient temperature is in the permissible range.

Notice:
This fault can only be acknowledged once the permissible temperature limit minus 5 K has been fallen below.

F30040 Drive: 24/48 V undervoltage

Message class: Supply voltage fault (undervoltage) (3)
Message value: Channel: %1, voltage: %2 [0.1 V]
Component: Power Unit
Propagation: Local
Response: OFF2
Acknowledgment: IMMEDIATELY
Cause: The undervoltage threshold of the 24 V power supply for the drive was fallen below for longer than 3 ms.
Fault value (r0949, interpret hexadecimal):
yyxxxx hex: yy = channel, xxxx = voltage [0.1 V]
yy = 0: 24 V power supply
yy = 1: 48 V power supply

Remedy:
- Check the drive power supply.
- Carry out a POWER ON (switch-off/switch-on).

A30041 Power unit: Undervolt 24/48 V alarm

Message class: Supply voltage fault (undervoltage) (3)
Message value: Channel: %1, voltage: %2 [0.1 V]
Component: Power Unit
Propagation: Local
Response: NONE
Acknowledgment: NONE
Cause: For the power unit power supply, the lower threshold has been violated.
Alarm value (r2124, interpret hexadecimal):
yyxxxx hex: yy = channel, xxxx = voltage [0.1 V]
yy = 0: 24 V power supply
yy = 1: 48 V power supply

Remedy:
- Check the power supply of the power unit.
- Carry out a POWER ON (switch-off/switch-on) for the component.

A30042 Power unit: Fan has reached the maximum operating hours

Message class: Power electronics faulted (5)
Message value: %1
Component: Power Unit
Propagation: Local
Response: NONE
Acknowledgment: NONE

Cause: The maximum operating time of at least one fan will soon be reached, or has already been exceeded.

Alarm value (r2124, interpret binary):

Bit 0 = 1:

The wear counter of the heat sink fan has reached 99 %. The remaining service life is 1 %. After this 1 % has elapsed, bit 0 is cleared and bit 2 is set in the alarm value.

Bit 2 = 1:

The wear counter of the heat sink fan has exceeded 100 %.

Bit 8 = 1:

The wear counter of the 1st internal fan has reached 99 %. The remaining service life is 1 %. After this 1 % has elapsed, bit 8 is cleared and bit 10 is set in the alarm value.

Bit 10 = 1:

The wear counter of the 1st internal fan has exceeded 100 %.

Bit 16 = 1:

The wear counter of the 2nd internal fan has reached 99 %. The remaining service life is 1 %. After this 1 % has elapsed, bit 16 is cleared and bit 18 is set in the alarm value.

Bit 18 = 1:

The wear counter of the 2nd internal fan has exceeded 100 %.

Remedy: For the fan involved, carry out the following:

1. Replace the fan.
2. Reset the wear counter using the appropriate button in Startdrive or the web server.

See also: r0277 (Power unit fan wear counter)

F30043 Power unit: Overvolt 24/48 V

Message class: Supply voltage fault (overvoltage) (3)

Message value: Channel: %1, voltage: %2 [0.1 V]

Component: Power Unit

Propagation: Local

Response: OFF2

Acknowledgment: POWER ON

Cause: For the power unit power supply, the upper threshold has been violated.

Fault value (r0949, interpret hexadecimal):

yyxxxx hex: yy = channel, xxxx = voltage [0.1 V]

yy = 0: 24 V power supply

yy = 1: 48 V power supply

Remedy: Check the power supply of the power unit.

A30044 Power unit: Overvolt 24/48 V alarm

Message class: Supply voltage fault (overvoltage) (3)

Message value: Channel: %1, voltage: %2 [0.1 V]

Component: Power Unit

Propagation: Local

Response: NONE

Acknowledgment: NONE

Cause: For the power unit power supply, the upper threshold has been violated.

Alarm value (r2124, interpret hexadecimal):

yyxxxx hex: yy = channel, xxxx = voltage [0.1 V]

yy = 0: 24 V power supply

yy = 1: 48 V power supply

Remedy: Check the power supply of the power unit.

A30048 Power unit: Fan defective

Message class: External measured value / signal state outside the permissible range (16)
Message value: Fault cause: %1 bin
Component: Power Unit
Propagation: Global
Response: NONE
Acknowledgment: NONE
Cause: The feedback signal of a fan signals a fault, or there is a communication error with one or several fans.
- Fan defective.
- Fan blocked.
- Feedback signal error.

Alarm value (r2124, interpret binary):
Bit 0 = 1: heat sink fan
Bit 1 = 1: fan 1 inside the device
Bit 2 = 1: fan 2 inside the device
Bit 4 = 1: Internal communication error to one or several fans
Bits 16 to 31 are only for internal Siemens diagnostics.

Remedy: - Check the fan involved.
- If required, replace the fan.
- For communication errors, update the software or replace the power unit.

Note:
If the alarm has been withdrawn, this does not necessarily mean that the cause of the fault has been resolved. It is also possible that the software switched off the fan, and therefore can no longer evaluate the feedback signal.

F30050 Power unit: 24 V supply overvoltage

Message class: Supply voltage fault (overvoltage) (3)
Message value: -
Component: Power Unit
Propagation: Local
Response: OFF2
Acknowledgment: POWER ON
Cause: The voltage monitor signals an overvoltage fault on the module.
Remedy: - Check the 24 V power supply.
- Replace the module if necessary.

F30051 Power unit: Motor holding brake short-circuit detected

Message class: External measured value / signal state outside the permissible range (16)
Message value: %1
Component: Power Unit
Propagation: Global
Response: OFF2
Acknowledgment: IMMEDIATELY
Cause: A short-circuit at the motor holding brake terminals has been detected.
Fault value (r0949, interpret decimal):
Only for internal Siemens troubleshooting.
Remedy: - Check the motor holding brake for a short-circuit.
- Check the connection and cable for the motor holding brake.

F30052	EEPROM data error
Message class:	Hardware/software error (1)
Message value:	%1
Component:	Power Unit
Propagation:	Local
Response:	OFF2
Acknowledgment:	POWER ON
Cause:	The EEPROM data of the power unit module are incorrect. Fault value (r0949, interpret hexadecimal): Only for internal Siemens troubleshooting.
Remedy:	Replace the power unit module or update the EEPROM data.

F30055	Power unit: Braking chopper overcurrent
Message class:	Braking Module faulted (14)
Message value:	-
Component:	None
Propagation:	Global
Response:	OFF2
Acknowledgment:	IMMEDIATELY
Cause:	An overcurrent condition has occurred in the braking chopper.
Remedy:	- Check whether the braking resistor has a short-circuit. - For an external braking resistor, check whether the resistor may have been dimensioned too small. Note: The braking chopper is only enabled again at pulse enable after the fault has been acknowledged.

A30057	Power unit: Line asymmetry
Message class:	Line supply fault (2)
Message value:	%1
Component:	Power Unit
Propagation:	Local
Response:	NONE
Acknowledgment:	NONE
Cause:	Frequencies have been detected on the DC link voltage that would suggest line asymmetry or failure of a line phase. It is also possible that a motor phase has failed. If these frequencies occur with the same or even higher amplitudes, then after a device-specific time elapses, fault F30011 is output Alarm value, only for internal Siemens troubleshooting.
Remedy:	- Check the line phase connection. - Check the motor feeder cable connections. If there is no phase failure of the line or motor, then line asymmetry is involved. - Reduce the power in order to avoid fault F30011.

F30062	Bypass contactor opened under current
Message class:	Infeed faulted (13)
Message value:	-
Component:	Power Unit
Propagation:	Global
Response:	OFF2

Acknowledgment: IMMEDIATELY

Cause: The bypass contactor of the precharging unit has been opened under current.

Possible causes:

- A defect at the bypass contactor

Remedy: It is urgently recommended that the components involved are replaced to prevent serious damage to the entire converter line-up.

F30068 Power unit: Undertemperature inverter heat sink

Message class: Power electronics faulted (5)

Message value: %1

Component: Power Unit

Propagation: Drive

Response: OFF2

Acknowledgment: IMMEDIATELY

Cause: The actual inverter heat sink temperature is below the permissible minimum value.

Possible causes:

- The power unit is being operated at an ambient temperature that lies below the permissible range.
- The temperature sensor evaluation is defective.

Fault value (r0949, interpret decimal):

Inverter heat sink temperature [0.1 °C].

Remedy:

- Ensure that higher ambient temperatures prevail.
- Replace the power unit.

A30076 Power unit: Thermal overload braking resistor alarm

Message class: Braking Module faulted (14)

Message value: %1

Component: Power Unit

Propagation: Local

Response: NONE

Acknowledgment: NONE

Cause: The energy absorbed by the braking resistor has exceeded the alarm threshold of 80 %. If the power unit is still operated in the generator mode, then this can reach the shutdown threshold. To avoid overheating of the braking resistor, use of the braking resistor is inhibited and alarm A30077 is output.

Alarm value (r2124, interpret decimal):

Energy absorbed by the braking resistor [Ws].

Remedy: Reduce the power when generating.

Note:

For a DC link coupling, the generating power of all of the coupled power units must be taken into consideration.

A30077 Power unit: Thermal overload braking resistor

Message class: Braking Module faulted (14)

Message value: %1

Component: Power Unit

Propagation: Local

Response: NONE

Acknowledgment: NONE

Cause: The braking resistor is thermally overloaded. This is the reason that its use was inhibited.

Alarm value (r2124, interpret decimal):

Energy absorbed by the braking resistor [Ws].

Remedy:	Reduce the power when generating. Note: - Once the braking resistor has thermally recovered, it is enabled for further use. - For a DC link coupling, the generating power of all the coupled power units must be taken into consideration.

F30078 Power unit: Line reactor overheated

Message class:	Overtemperature of the electronic components (6)
Message value:	-
Component:	Power Unit
Propagation:	Local
Response:	OFF2
Acknowledgment:	IMMEDIATELY
Cause:	The temperature monitoring of the line reactor has responded. In addition to the OFF2 response, the use of the braking resistor was inhibited. Note: - An overtemperature condition of the line reactor can occur when a DC link coupling is used – and if the power when motoring, which is fed into the DC link - Is not evenly distributed across the rectifiers of the power units.
Remedy:	- Check the converter fan and replace if necessary. - Reduce the motoring power.

A30079 Power unit: Referred to the supply voltage, the DC link voltage is too high

Message class:	Infeed faulted (13)
Message value:	%1
Component:	Power Unit
Propagation:	Local
Response:	NONE
Acknowledgment:	NONE
Cause:	The alarm is output if the following conditions are simultaneously satisfied: 1. The device supply voltage (p0210) was reduced. 2. A DC link voltage is present, which is too high when referred to the new supply voltage. DC link precharging cannot be completed as this could place some converter components at risk. Alarm value (r2124, interpret decimal): Voltage value to which the DC link voltage must, in the meantime, be reduced in order to complete precharging [V]. See also: p0210 (Device supply voltage)
Remedy:	As a minimum, reduce the DC link voltage to the voltage specified in the alarm value. Note: The alarm is automatically withdrawn if the DC link voltage drops below the voltage specified in the alarm value. Fault F07802 is output if an attempt is made to enable the pulses even though an alarm is active.

F30081 Power unit: Switching operations too frequent

Message class:	Power electronics faulted (5)
Message value:	Fault cause: %1 bin
Component:	Power Unit
Propagation:	Local
Response:	OFF2
Acknowledgment:	IMMEDIATELY

Cause: The power unit has executed too many switching operations for current limitation.
- Closed-loop control is incorrectly parameterized.
- Motor has a short-circuit or fault to ground (frame).
- U/f operation: Up ramp set too low.
- U/f operation: Rated motor current is significantly higher than that of the power section.
- Infeed: High discharge and post-charging currents for line voltage dip.
- Infeed: High post-charging currents for overload when motoring and DC link voltage dip.
- Infeed: Short-circuit currents at switch-on as there is no line reactor.
- Power cables are not correctly connected.
- Power cables exceed the maximum permissible length.
- Power unit defective.

Fault value (r0949, interpret bitwise):
Bit 0: Phase U.
Bit 1: Phase V.
Bit 2: Phase W.

Remedy:
- Check the motor data, carry out commissioning if required.
- Check the motor circuit configuration (star-delta)
- U/f operation: Increase up ramp.
- U/f operation: Check the rated currents of the motor and power unit.
- Infeed: Check the line quality.
- Infeed: Reduce the motor load.
- Infeed: Correct connection of the line reactor.
- Check the power cable connections.
- Check the power cables for short-circuit or ground fault.
- Check the length of the power cables.
- Replace power unit.

A30096 Power unit: Thermal overload symmetrizing resistor alarm

Message class: External measured value / signal state outside the permissible range (16)
Message value: Fault cause: %1 bin
Component: Power Unit
Propagation: Global
Response: NONE
Acknowledgment: NONE
Cause: The temperature of the symmetrizing resistors has exceeded the alarm threshold.
<<A description still has to be added>>
Remedy: <<A description still has to be added>>

F30097 Power unit: Thermal overload symmetrizing resistor

Message class: External measured value / signal state outside the permissible range (16)
Message value: Fault cause: %1 bin
Component: Power Unit
Propagation: Global
Response: OFF2
Acknowledgment: IMMEDIATELY
Cause: The temperature of the symmetrizing resistors has exceeded the fault threshold.
<<A description still has to be added>>
Remedy: <<A description still has to be added>>

A30250 Power unit: Overtemperature heat sink inverter

Message class: Power electronics faulted (5)
Message value: -
Component: Power Unit
Propagation: Global
Response: NONE
Acknowledgment: NONE
Cause: The alarm threshold for overtemperature at the inverter heat sink has been reached.
Fault F30004 is initiated if the temperature of the heat sink increases by 5 K.
Remedy: Check the following:
- Is the ambient temperature within the defined limit values?
- Have the load conditions and the duty cycle been appropriately dimensioned?
- Has the cooling failed?

A30252 Power unit: Chip overtemperature alarm

Message class: Power electronics faulted (5)
Message value: Power semiconductor: %1, temperature: [0.01 degrees C] %2
Component: Power Unit
Propagation: Local
Response: NONE
Acknowledgment: NONE
Cause: The chip temperature of the power semiconductor involved has exceeded the permissible alarm threshold.
Note:
- If the chip temperature of the power semiconductor involved increases by 5K, then fault F30025 is initiated.

Alarm value (r2124, interpret hexadecimal):
yyyyxxxx hex: yyyy= Power semiconductor, xxxx = Temperature in 0.01°C
Remedy: Check the following:
- Is the ambient temperature within the defined limit values?
- Have the load conditions and the duty cycle been appropriately dimensioned?
- Has the cooling failed?
- Pulse frequency too high?

A30253 Power unit: Overtemperature thermal model alarm

Message class: Power electronics faulted (5)
Message value: Power semiconductor: %1, temperature: [0.01 degrees C] %2
Component: Power Unit
Propagation: Local
Response: NONE
Acknowledgment: NONE
Cause: The temperature difference between the power semiconductor involved and the heat sink has exceeded the permissible alarm threshold.
The maximum output current is reduced as overload response.

Alarm value (r2124, interpret hexadecimal):
yyyyxxxx hex: yyyy= Power semiconductor, xxxx = Temperature in 0.01°C
Remedy: Not necessary.
The alarm is automatically withdrawn once the alarm threshold has been fallen below.
Note:
If the temperature continues to increase, this can result in fault F30024.

A30256 Power unit: Overload I2t (AC)

Message class: Power electronics faulted (5)
Message value: -
Component: Power Unit
Propagation: Global
Response: NONE
Acknowledgment: NONE
Cause: The alarm threshold for the I2t overload on the AC side of the power unit has been exceeded. Depending on the selected overload response, the output current and therefore the output frequency can be reduced. If the current reduction is not sufficient to thermally relieve the power unit, then when the fault threshold for overload is reached the drive switches off the power unit and outputs fault F30005.
Remedy:
- Reduce the continuous load.
- Adapt the duty cycle.
- Check the rated currents of the motor and power unit.

A30257 Power unit: Overload I2t (DC)

Message class: Power electronics faulted (5)
Message value: -
Component: Power Unit
Propagation: Global
Response: NONE
Acknowledgment: NONE
Cause: The alarm threshold for the I2t overload on the DC side of the power unit has been exceeded.
Depending on the selected overload response, the output current and therefore the output frequency can be reduced. If the current reduction is not sufficient to thermally relieve the power unit, then when the fault threshold for overload is reached the drive switches off the power unit and outputs fault F30258.
Remedy:
- Reduce the continuous load.
- Adapt the duty cycle.

F30258 Power unit: Overload I2t (DC)

Message class: Power electronics faulted (5)
Message value: %1
Component: Power Unit
Propagation: Global
Response: OFF2
Acknowledgment: IMMEDIATELY
Cause: The fault threshold for the I2t overload on the DC side of the power unit has been exceeded.
The permissible duty cycle or the continuous load was not maintained.
Fault value (r0949, interpret decimal):
I2t (DC) [100 % = 16384]
Remedy:
- Reduce the continuous load.
- Adapt the duty cycle.
See also: r0307 (Rated motor power)

A30259 Braking resistor value too low

Message class: Braking Module faulted (14)
Message value: %1
Component: Power Unit
Propagation: Global
Response: NONE

Acknowledgment: NONE
Cause: The braking resistor value used in p0216 is too low.
This can result in an excessively high braking current.

Alarm value (r2124, interpret decimal):
Minimum limit value of the braking resistor [0.1 Ohm]
See also: p0216 (Braking resistance value)
Remedy: - Use a braking resistor with the appropriate resistance value
- Observe the product documentation

F30260 Power unit: Fault in the driver supply for the power semiconductor

Message class: Power electronics faulted (5)
Message value: -
Component: Power Unit
Propagation: Local
Response: OFF2
Acknowledgment: IMMEDIATELY
Cause: A fault has occurred in the driver supply of the power semiconductor.
Remedy: There is a hardware defect. The device must be replaced.

F30262 Power unit: Braking chopper defective

Message class: Power electronics faulted (5)
Message value: -
Component: Power Unit
Propagation: Local
Response: OFF2
Acknowledgment: IMMEDIATELY
Cause: The braking chopper is defective.
Remedy: Replace the converter.

F30263 Power unit: Braking chopper upper defective

Message class: Power electronics faulted (5)
Message value: -
Component: Power Unit
Propagation: Local
Response: OFF2
Acknowledgment: IMMEDIATELY
Cause: The upper braking chopper is defective.
Remedy: Replace the converter.

F30264 Power unit: Braking chopper inhibited due to implausible DC link voltage

Message class: Braking Module faulted (14)
Message value: %1
Component: Power Unit
Propagation: Local
Response: OFF2
Acknowledgment: IMMEDIATELY

Cause: The braking chopper was inhibited because the unloaded DC link voltage continuously reaches or exceeds the chopper activation threshold. This prevents the braking chopper from being permanently active and possibly damaged.

Possible causes:
The value of parameter p0210 does not match the line voltage.

Fault value (r0949, interpret decimal): DC link voltage [V]

Remedy: Replace the converter.

F30265 Power unit: Line voltage failure detected

Message class: Power electronics faulted (5)
Message value: -
Component: Power Unit
Propagation: Local
Response: OFF3
Acknowledgment: IMMEDIATELY
Cause: Line voltage failure was detected
Remedy: - Switch on the line voltage.
- To increase the degree of ruggedness, the delay time can be increased.

A30266 Power unit: Required modulator setting cannot be implemented

Message class: Hardware/software error (1)
Message value: %1
Component: Power Unit
Propagation: Global
Response: NONE
Acknowledgment: NONE
Cause: The required modulator setting was not able to be implemented. This can involve some undesirable effects; for example, unexpectedly high switching losses can occur or the current controller bandwidth can be reduced.

Alarm value (r2124, interpret hexadecimal):
Only for internal Siemens troubleshooting.

Remedy: - Carry out a POWER ON (switch-off/switch-on).

A30267 Power unit: Active power overload

Message class: Power electronics faulted (5)
Message value: -
Component: Power Unit
Propagation: Global
Response: NONE
Acknowledgment: NONE
Cause: The alarm threshold for the active power overload of the power unit has been exceeded. Depending on the selected overload response, the output current and therefore the output frequency can be reduced. If the current reduction is not sufficient to thermally relieve the power unit, then when the fault threshold for overload is reached the drive switches off the power unit and outputs fault F30268.
Remedy: - Reduce the continuous load.
- Adapt the duty cycle.

F30268	Power unit: Active power overload
Message class:	Power electronics faulted (5)
Message value:	%1
Component:	Power Unit
Propagation:	Global
Response:	OFF2
Acknowledgment:	IMMEDIATELY
Cause:	The fault threshold for the active power overload of the power unit has been exceeded. The permissible duty cycle or the continuous load was not maintained. Fault value (r0949, interpret decimal): Active power [100 % = 16384]
Remedy:	- Reduce the continuous load. - Adapt the duty cycle. See also: r0307 (Rated motor power)

A30269	Power unit: Driver supply power semiconductor overloaded
Message class:	Power electronics faulted (5)
Message value:	-
Component:	Power Unit
Propagation:	Local
Response:	NONE
Acknowledgment:	NONE
Cause:	A fault has occurred in the driver supply for the power semiconductor.
Remedy:	Frequent occurrence can mean that there is a hardware defect. Observe fault message 30022.

A30502	Power unit: DC link overvoltage
Message class:	DC link overvoltage (4)
Message value:	%1
Component:	Power Unit
Propagation:	Local
Response:	NONE
Acknowledgment:	NONE
Cause:	The power unit has detected overvoltage in the DC link on a pulse inhibit. - Device supply voltage too high. - Line reactor incorrectly dimensioned. Alarm value (r2124, interpret decimal): DC link voltage [1 bit = 100 mV]. See also: r0070 (Actual DC link voltage)
Remedy:	- Check the device supply voltage (p0210). - Check the dimensioning of the line reactor. See also: p0210 (Device supply voltage)

F30524	SI: Safety EEPROM data error
Message class:	Safety monitoring channel has identified an error (10)
Message value:	%1
Component:	Power Unit
Propagation:	Global
Response:	OFF2
Acknowledgment:	POWER ON

Cause:	Safety relevant EEPROM data are not correct. This message results in an STO (Safe Torque Off). Message value (r60049, interpret decimal): Only for internal Siemens fault diagnostics.
Remedy:	Replace the module

F30526 SI: Safety HW version of the Motor Module incorrect

Message class:	Safety monitoring channel has identified an error (10)
Message value:	%1
Component:	Power Unit
Propagation:	Global
Response:	OFF2
Acknowledgment:	POWER ON
Cause:	Safety relevant hardware version is not compatible with this software. This fault results in an STO (Safe Torque Off). Fault value (r0949, interpret decimal): Only for internal Siemens fault diagnostics.
Remedy:	Update the software or exchange the module for this software.

C30603 SI: Module temperature - limit value exceeded

Message class:	Safety monitoring channel has identified an error (10)
Message value:	-
Component:	None
Propagation:	Global
Response:	OFF2
Acknowledgment:	IMMEDIATELY
Cause:	A safe monitoring function has detected that the module temperature has exceeded a limit value. STO (Safe Torque Off) was initiated to maintain the safe state.
Remedy:	- Check the ambient air temperature. - Check the module fan. - Operate the module in the permissible range.

F30604 SI: Safety EEPROM data error

Message class:	Safety monitoring channel has identified an error (10)
Message value:	%1
Component:	Power Unit
Propagation:	Global
Response:	OFF2
Acknowledgment:	POWER ON
Cause:	Safety relevant EEPROM data are not correct. This message results in an STO (Safe Torque Off). Message value (r60049, interpret decimal): Only for internal Siemens fault diagnostics.
Remedy:	Replace the module

A30605 SI: Checksum error has occurred

Message class:	Safety monitoring channel has identified an error (10)
Message value:	%1
Component:	None

Propagation: Local
Response: NONE
Acknowledgment: NONE
Cause: A checksum error (CRC error) has occurred in the converter program memory.
Remedy: - Carry out a POWER ON (switch-off/switch-on).
- Upgrade firmware to later version.
- Contact Technical Support.

F30606 SI: Safety HW version of the Motor Module incorrect

Message class: Safety monitoring channel has identified an error (10)
Message value: %1
Component: Power Unit
Propagation: Global
Response: OFF2
Acknowledgment: POWER ON
Cause: Safety relevant hardware version is not compatible with this software.
This fault results in an STO (Safe Torque Off).

Fault value (r0949, interpret decimal): Only for internal Siemens fault diagnostics.
Remedy: Update the software or exchange the module for this software.

C30649 SI: Internal software error

Message class: Hardware/software error (1)
Message value: Module: %1, line: %2
Component: Power Unit
Propagation: Local
Response: OFF2
Acknowledgment: IMMEDIATELY
Cause: An internal error has occurred in the Safety Integrated software.
Note:
This message results in an STO (Safe Torque Off) that cannot be acknowledged.
Message value (r60049, interpret hexadecimal):
Only for internal Siemens troubleshooting.
Remedy: - Carry out a POWER ON (switch-off/switch-on) for all components.
- Repeat commissioning of "Safety Integrated" and carry out a POWER ON.
- Upgrade firmware to later version.
- Contact Technical Support.
- Replace hardware component.

N30800 Power unit: Group signal

Message class: Power electronics faulted (5)
Message value: -
Component: Power Unit
Propagation: Local
Response: OFF2
Acknowledgment: NONE
Cause: The power unit has detected at least one fault.
Remedy: Evaluate the other messages that are presently available.

F30805 Power unit: EEPROM checksum error

Message class: Hardware/software error (1)
Message value: %1
Component: Power Unit
Propagation: Local
Response: OFF2
Acknowledgment: IMMEDIATELY
Cause: Internal parameter data is corrupted.
Fault value (r0949, interpret hexadecimal):
01: EEPROM access error.
02: Too many blocks in the EEPROM.
Remedy: Replace the module.

F30810 Power unit: Watchdog timer expired

Message class: Hardware/software error (1)
Message value: -
Component: Power Unit
Propagation: Local
Response: OFF2
Acknowledgment: IMMEDIATELY
Cause: The watchdog timer has expired. This can only be caused by a fatal software error.
Remedy: - Carry out a POWER ON (switch-off/switch-on) for all components.
- Upgrade firmware to later version.
- Contact Technical Support.

F30815 Power unit: Processor clock signal error

Message class: Hardware/software error (1)
Message value: -
Component: Power Unit
Propagation: Local
Response: OFF2
Acknowledgment: POWER ON
Cause: The processor clock signal monitoring has signaled an error. This can involve the signal itself or its PLL.
Remedy: - Replace the hardware.
- Contact Technical Support.

F30850 Power unit: Internal software error

Message class: Hardware/software error (1)
Message value: %1
Component: Power Unit
Propagation: Local
Response: OFF1
Acknowledgment: POWER ON
Cause: An internal software error has occurred in the power unit.
Fault value (r0949, interpret decimal):
Only for internal Siemens troubleshooting.
Remedy: - Replace power unit.
- If required, upgrade the firmware in the power unit.
- Contact Technical Support.

A30853	**Power unit: Sign-of-life error cyclic data**
Message class:	General drive fault (19)
Message value:	-
Component:	Control Unit (CU)
Propagation:	Local
Response:	NONE
Acknowledgment:	NONE
Cause:	The cyclic setpoint telegrams of the power unit were not refreshed on time.
Remedy:	- Check the power unit and if required replace.

F30860	**Power unit DRIVE-CLiQ (CU): Telegram error**
Message class:	Internal (DRIVE-CLiQ) communication error (12)
Message value:	Component number: %1, fault cause: %2
Component:	Power Unit
Propagation:	Local
Response:	OFF2
Acknowledgment:	IMMEDIATELY

Cause: There is an internal communication error in the power unit.

Error cause:

1 (= 01 hex):

Checksum error (CRC error).

2 (= 02 hex):

Telegram is shorter than specified in the length byte or in the receive list.

3 (= 03 hex):

Telegram is longer than specified in the length byte or in the receive list.

4 (= 04 hex):

The length of the received telegram does not match the receive list.

5 (= 05 hex):

The type of the received telegram does not match the receive list.

6 (= 06 hex):

The address of the power unit in the telegram and in the receive list do not match.

9 (= 09 hex):

Failure of the supply voltage.

16 (= 10 hex):

The received telegram is too early.

17 (= 11 hex):

CRC error and the received telegram is too early.

18 (= 12 hex):

The telegram is shorter than that specified in the length byte or in the receive list and the received telegram is too early.

19 (= 13 hex):

The telegram is longer than that specified in the length byte or in the receive list and the received telegram is too early.

20 (= 14 hex):

The length of the received telegram does not match the receive list and the received telegram is too early.

21 (= 15 hex):

The type of the received telegram does not match the receive list and the received telegram is too early.

22 (= 16 hex):

The address of the power unit in the telegram and in the receive list does not match and the received telegram is too early.

25 (= 19 hex):

The error bit in the received telegram is set and the received telegram is too early.

Note regarding the message value:

The individual information is coded as follows in the message value (r0949/r2124):

0000yyxx hex: yy = component number, xx = error cause

Remedy:

- Carry out a POWER ON (switch-off/switch-on).
- Check the electrical cabinet design and cable routing for EMC compliance.

F30895 Power unit DRIVE-CLiQ: Alternating cyclic data transfer error

Message class: Internal (DRIVE-CLiQ) communication error (12)

Message value: Component number: %1, fault cause: %2

Component: Power Unit

Propagation: Local

Response: OFF2

Acknowledgment: IMMEDIATELY

Cause: There is a DRIVE-CLiQ communication error from the power unit involved to the converter.
Error cause:
11 (= 0B hex):
Synchronization error during alternating cyclic data transfer.
Note regarding the message value:
The individual information is coded as follows in the message value (r0949/r2124):
0000yyxx hex:
yy = component number,
xx = fault cause

Remedy: Carry out a POWER ON (switch-off/switch-on).

F30899 Power unit: Unknown fault

Message class: Power electronics faulted (5)
Message value: New message: %1
Component: Power Unit
Propagation: Local
Response: NONE
Acknowledgment: IMMEDIATELY
Cause: A fault occurred on the power unit, which cannot be interpreted by the converter firmware.
This can occur if the firmware on this component is more recent than the converter firmware.
Fault value (r0949, interpret decimal):
Fault number.
Note:
If required, the significance of this new fault can be read about in a more recent description of the converter.
Remedy:
- Replace the firmware on the power unit by an older firmware version.
- Upgrade the converter firmware.

F30950 Power unit: Internal software error

Message class: Hardware/software error (1)
Message value: %1
Component: Power Unit
Propagation: Local
Response: OFF2
Acknowledgment: POWER ON
Cause: An internal software error has occurred.
Fault value (r0949, interpret decimal):
Information about the fault source.
Only for internal Siemens troubleshooting.
Remedy:
- If necessary, upgrade the firmware in the power unit to a later version.
- Contact Technical Support.

A30999 Power unit: Unknown alarm

Message class: Power electronics faulted (5)
Message value: New message: %1
Component: Power Unit
Propagation: Local
Response: NONE
Acknowledgment: NONE

Cause: An alarm has occurred on the power unit, which cannot be interpreted by the converter firmware.
This can occur if the firmware on this component is more recent than the firmware on the converter.
Alarm value (r2124, interpret decimal):
Alarm number.
Note:
If required, the significance of this new alarm can be read about in a more recent description of the converter.

Remedy: - Replace the firmware on the power unit by an older firmware version.
- Upgrade the converter firmware.

F31120 Motor encoder: Encoder power supply fault

Message class: Position/speed actual value incorrect or not available (11)
Message value: Fault cause: %1 bin
Component: Encoder 1
Propagation: Local
Response: ENCODER
Acknowledgment: PULSE INHIBIT
Cause: An encoder power supply fault was detected.
Fault value (r0949, interpret binary):
Bit 0: Undervoltage condition on the sense line.
Bit 1: Overcurrent condition for the encoder power supply.
Bit 2: Overcurrent condition for encoder power supply on cable resolver excitation negative.
Bit 3: Overcurrent condition for encoder power supply on cable resolver excitation positive.
Bit 4: The 24 V power supply via the inverter is overloaded.
Bit 5: Overcurrent at the EnDat connection of the converter.
Bit 6: Overvoltage at the EnDat connection of the converter.
Bit 7: Hardware fault at the EnDat connection of the converter.
Note:
If the encoder cables 6FX2002-2EQ00-.... and 6FX2002-2CH00-.... are interchanged, this can result in the encoder being destroyed because the pins of the operating voltage are reversed.

Remedy: For fault value, bit 0 = 1:
- Correct encoder cable connected?
- Check the plug connections of the encoder cable.
- SMC30: Check the parameterization (p0404.22).
For fault value, bit 1 = 1:
- Correct encoder cable connected?
- Replace the encoder or encoder cable.
For fault value, bit 2 = 1:
- Correct encoder cable connected?
- Replace the encoder or encoder cable.
For fault value, bit 3 = 1:
- Correct encoder cable connected?
- Replace the encoder or encoder cable.
For fault value, bit 5 = 1:
- Measuring unit correctly connected at the converter?
- Replace the measuring unit or the cable to the measuring unit.
For fault value, bit 6, 7 = 1:
- Replace the defective EnDat 2.2 converter.

F31135 Motor encoder: Fault when determining the position (singleturn)

Message class: Position/speed actual value incorrect or not available (11)
Message value: Fault cause: %1 bin

Component:	Encoder 1
Propagation:	Global
Response:	ENCODER
Acknowledgment:	PULSE INHIBIT

Cause:

The encoder has identified a position determination fault (singleturn) and supplies status information bit by bit in an internal status/fault word.

Some of these bits cause this fault to be triggered. Other bits are status displays. The status/fault word is displayed in the fault value.

Note regarding the bit designation:

The first designation is valid for DRIVE-CLiQ encoders, the second for EnDat 2.2 encoders.

Fault value (r0949, interpret binary):

Bit 0: F1 (safety status display).

Bit 1: F2 (safety status display).

Bit 2: Reserved (lighting).

Bit 3: Reserved (signal amplitude).

Bit 4: Reserved (position value).

Bit 5: Reserved (overvoltage).

Bit 6: Reserved (undervoltage)/hardware fault EnDat supply (--> F3x110, x = 1, 2, 3).

Bit 7: Reserved (overcurrent)/EnDat encoder withdrawn when not in the parked state (--> F3x110, x = 1, 2, 3).

Bit 8: Reserved (battery)/overcurrent EnDat supply (--> F3x110, x = 1, 2, 3).

Bit 9: Reserved/overvoltage EnDat supply (--> F3x110, x = 1, 2, 3).

Bit 11: Reserved/internal communication error (--> F3x110, x = 1, 2, 3).

Bit 12: Reserved/internal communication error (--> F3x110, x = 1, 2, 3).

Bit 13: Reserved/internal communication error (--> F3x110, x = 1, 2, 3).

Bit 14: Reserved/internal communication error (--> F3x110, x = 1, 2, 3).

Bit 15: Internal communication error (--> F3x110, x = 1, 2, 3).

Bit 16: Lighting (--> F3x135, x = 1, 2, 3).

Bit 17: Signal amplitude (--> F3x135, x = 1, 2, 3).

Bit 18: Singleturn position 1 (--> F3x135, x = 1, 2, 3).

Bit 19: Overvoltage (--> F3x135, x = 1, 2, 3).

Bit 20: Undervoltage (--> F3x135, x = 1, 2, 3).

Bit 21: Overcurrent (--> F3x135, x = 1, 2, 3).

Bit 22: Temperature exceeded (--> F3x405, x = 1, 2, 3).

Bit 23: Singleturn position 2 (safety status display).

Bit 24: Singleturn system (--> F3x135, x = 1, 2, 3).

Bit 25: Singleturn power down (--> F3x135, x = 1, 2, 3)

Bit 26: Multiturn position 1 (--> F3x136, x = 1, 2, 3).

Bit 27: Multiturn position 2 (--> F3x136, x = 1, 2, 3).

Bit 28: Multiturn system (--> F3x136, x = 1, 2, 3).

Bit 29: Multiturn power down (--> F3x136, x = 1, 2, 3).

Bit 30: Multiturn overflow/underflow (--> F3x136, x = 1, 2, 3).

Bit 31: Multiturn battery (reserved).

Remedy:

- Determine the detailed cause of the fault using the fault value.
- Replace the encoder if necessary.

Note:

An EnDat 2.2 encoder may only be removed and inserted in the "Park" state.

If an EnDat 2.2 encoder was removed when not in the "Park" state, then after inserting the encoder, a POWER ON (switch-off/switch-on) is necessary to acknowledge the fault.

F31136 Motor encoder: Fault when determining the position (multiturn)

Message class:	Position/speed actual value incorrect or not available (11)
Message value:	Fault cause: %1 bin

Component: Encoder 1
Propagation: Global
Response: ENCODER
Acknowledgment: PULSE INHIBIT
Cause: The encoder has identified a position determination fault (multiturn) and supplies status information bit by bit in an internal status/fault word.

Some of these bits cause this fault to be triggered. Other bits are status displays. The status/fault word is displayed in the fault value.

Note regarding the bit designation:

The first designation is valid for DRIVE-CLiQ encoders, the second for EnDat 2.2 encoders.

Fault value (r0949, interpret binary):

Bit 0: F1 (safety status display).

Bit 1: F2 (safety status display).

Bit 2: Reserved (lighting).

Bit 3: Reserved (signal amplitude).

Bit 4: Reserved (position value).

Bit 5: Reserved (overvoltage).

Bit 6: Reserved (undervoltage)/hardware fault EnDat supply (--> F3x110, x = 1, 2, 3).

Bit 7: Reserved (overcurrent)/EnDat encoder withdrawn when not in the parked state (--> F3x110, x = 1, 2, 3).

Bit 8: Reserved (battery)/overcurrent EnDat supply (--> F3x110, x = 1, 2, 3).

Bit 9: Reserved/overvoltage EnDat supply (--> F3x110, x = 1, 2, 3).

Bit 11: Reserved/internal communication error (--> F3x110, x = 1, 2, 3).

Bit 12: Reserved/internal communication error (--> F3x110, x = 1, 2, 3).

Bit 13: Reserved/internal communication error (--> F3x110, x = 1, 2, 3).

Bit 14: Reserved/internal communication error (--> F3x110, x = 1, 2, 3).

Bit 15: Internal communication error (--> F3x110, x = 1, 2, 3).

Bit 16: Lighting (--> F3x135, x = 1, 2, 3).

Bit 17: Signal amplitude (--> F3x135, x = 1, 2, 3).

Bit 18: Singleturn position 1 (--> F3x135, x = 1, 2, 3).

Bit 19: Overvoltage (--> F3x135, x = 1, 2, 3).

Bit 20: Undervoltage (--> F3x135, x = 1, 2, 3).

Bit 21: Overcurrent (--> F3x135, x = 1, 2, 3).

Bit 22: Temperature exceeded (--> F3x405, x = 1, 2, 3).

Bit 23: Singleturn position 2 (safety status display).

Bit 24: Singleturn system (--> F3x135, x = 1, 2, 3).

Bit 25: Singleturn power down (--> F3x135, x = 1, 2, 3)

Bit 26: Multiturn position 1 (--> F3x136, x = 1, 2, 3).

Bit 27: Multiturn position 2 (--> F3x136, x = 1, 2, 3).

Bit 28: Multiturn system (--> F3x136, x = 1, 2, 3).

Bit 29: Multiturn power down (--> F3x136, x = 1, 2, 3).

Bit 30: Multiturn overflow/underflow (--> F3x136, x = 1, 2, 3).

Bit 31: Multiturn battery (reserved).

Remedy: - Determine the detailed cause of the fault using the fault value.

- Replace the encoder if necessary.

Note:

An EnDat 2.2 encoder may only be removed and inserted in the "Park" state.

If an EnDat 2.2 encoder was removed when not in the "Park" state, then after inserting the encoder, a POWER ON (switch-off/switch-on) is necessary to acknowledge the fault.

F31137 Motor encoder: Fault when determining the position (singleturn)

Message class: Hardware/software error (1)
Message value: Fault cause: %1 bin

Component: Encoder 1
Propagation: Global
Response: ENCODER
Acknowledgment: PULSE INHIBIT

Cause: A position determination fault has occurred in the DRIVE-CLiQ encoder.

Fault value (r0949, interpret binary):

yyxxxxxx hex: yy = encoder version, xxxxxx = bit coding of the fault cause

----

For yy = 8 (0000 1000 bin), the following applies:

Bit 1: Signal monitoring (sin/cos).

Bit 8: F1 (safety status display) error position word 1.

Bit 9: F2 (safety status display) error position word 2.

Bit 16: LED monitoring.

Bit 17: Fault when determining the position (multiturn).

Bit 18: Single-step capability monitoring singleturn from the Safety channel.

Bit 19: ECRC, configuration error in the safety channel.

Bit 23: Temperature outside the limit values.

For yy = 11 (0000 1011 bin), the following applies:

Bit 0: Position word 1 difference between rotation counter and software counter (XC_ERR).

Bit 1: Position word 1 track error of the incremental signals (LIS_ERR).

Bit 2: Position word 1 error when aligning between incremental track signals and absolute value (ST_ERR).

Bit 3: Maximum permissible temperature exceeded (TEMP_ERR).

Bit 4: Power supply overvoltage (MON_OVR_VOLT).

Bit 5: Power supply overcurrent (MON_OVR_CUR).

Bit 6: Power supply undervoltage (MON_UND_VOLT).

Bit 7: Rotation error counter (MT_ERR).

Bit 8: F1 (safety status display) error position word 1.

Bit 9: F2 (safety status display) error position word 2.

Bit 11: Position word 1 status bit: singleturn position OK (ADC_ready).

Bit 12: Position word 1 status bit: rotation counter OK (MT_ready).

Bit 13: Position word 1 memory error (MEM_ERR).

Bit 14: Position word 1 absolute position error (MLS_ERR).

Bit 15: Position word 1 LED error, lighting unit error (LED_ERR).

Bit 18: Position word 2 error when aligning between incremental track signals and absolute value (ST_ERR).

Bit 21: Position word 2 memory error (MEM_ERR).

Bit 22: Position word 2 absolute position error (MLS_ERR).

Bit 23: Position word 2 LED error, lighting unit error (LED_ERR).

For yy = 12 (0000 1100 bin), the following applies:

Bit 8: encoder fault.

Bit 10: error in the internal position data transport.

For yy = 14 (0000 1110 bin), the following applies:

Bit 0: Position word 1 temperature outside limit value.

Bit 1: Position word 1 position determination error (multiturn).

Bit 2: Position word 1 FPGA error.

Bit 3: Position word 1 velocity error.

Bit 4: Position word 1 communication error between FPGAs/error in the incremental signal.

Bit 5: Position word 1 timeout absolute value/error when determining the position (singleturn).

Bit 6: Position word 1 internal hardware fault (clock/power monitor IC/power).

Bit 7: Position word 1 internal error (FPGA communication/FPGA parameterization/self test/software).

Bit 8: F1 (safety status display) error position word 1.

Bit 9: F2 (safety status display) error position word 2.

Bit 16: Position word 2 temperature outside limit value.

Bit 17: Position word 2 position determination error (multiturn).

Bit 18: Position word 2 FPGA error.
Bit 19: Position word 2 velocity error.
Bit 20: Position word 2 communication error between FPGAs.
Bit 21: Position word 2 position determination error (singleturn).
Bit 22: Position word 2 internal hardware fault (clock/power monitor IC/power).
Bit 23: Position word 2 internal error (self test/software).

Note:
For an encoder version that is not described here, please contact the encoder manufacturer for more detailed information on the bit coding.

Remedy: - Determine the detailed cause of the fault using the fault value.
- If required, replace the DRIVE-CLiQ encoder.

F31138 Motor encoder: Fault when determining the position (multiturn)

Message class: Hardware/software error (1)
Message value: Fault cause: %1 bin
Component: Encoder 1
Propagation: Global
Response: ENCODER
Acknowledgment: PULSE INHIBIT

Cause: A position determination fault has occurred in the DRIVE-CLiQ encoder.

Fault value (r0949, interpret binary):

yyxxxxxx hex: yy = encoder version, xxxxxx = bit coding of the fault cause

----

For yy = 8 (0000 1000 bin), the following applies:

Bit 1: Signal monitoring (sin/cos).

Bit 8: F1 (safety status display) error position word 1.

Bit 9: F2 (safety status display) error position word 2.

Bit 16: LED monitoring.

Bit 17: Fault when determining the position (multiturn).

Bit 19: ECRC, configuration error in the safety channel.

Bit 23: Temperature outside the limit values.

For yy = 11 (0000 1011 bin), the following applies:

Bit 0: Position word 1 difference between rotation counter and software counter (XC_ERR).

Bit 1: Position word 1 track error of the incremental signals (LIS_ERR).

Bit 2: Position word 1 error when aligning between incremental track signals and absolute value (ST_ERR).

Bit 3: Maximum permissible temperature exceeded (TEMP_ERR).

Bit 4: Power supply overvoltage (MON_OVR_VOLT).

Bit 5: Power supply overcurrent (MON_OVR_CUR).

Bit 6: Power supply undervoltage (MON_UND_VOLT).

Bit 7: Rotation error counter (MT_ERR).

Bit 8: F1 (safety status display) error position word 1.

Bit 9: F2 (safety status display) error position word 2.

Bit 11: Position word 1 status bit: singleturn position OK (ADC_ready).

Bit 12: Position word 1 status bit: rotation counter OK (MT_ready).

Bit 13: Position word 1 memory error (MEM_ERR).

Bit 14: Position word 1 absolute position error (MLS_ERR).

Bit 15: Position word 1 LED error, lighting unit error (LED_ERR).

Bit 18: Position word 2 error when aligning between incremental track signals and absolute value (ST_ERR).

Bit 21: Position word 2 memory error (MEM_ERR).

Bit 22: Position word 2 absolute position error (MLS_ERR).

Bit 23: Position word 2 LED error, lighting unit error (LED_ERR).

For yy = 14 (0000 1110 bin), the following applies:

Bit 0: Position word 1 temperature outside limit value.

Bit 1: Position word 1 position determination error (multiturn).

Bit 2: Position word 1 FPGA error.

Bit 3: Position word 1 velocity error.

Bit 4: Position word 1 communication error between FPGAs/error in the incremental signal.

Bit 5: Position word 1 timeout absolute value/error when determining the position (singleturn).

Bit 6: Position word 1 internal hardware fault (clock/power monitor IC/power).

Bit 7: Position word 1 internal error (FPGA communication/FPGA parameterization/self test/software).

Bit 8: F1 (safety status display) error position word 1.

Bit 9: F2 (safety status display) error position word 2.

Bit 16: Position word 2 temperature outside limit value.

Bit 17: Position word 2 position determination error (multiturn).

Bit 18: Position word 2 FPGA error.

Bit 19: Position word 2 velocity error.

Bit 20: Position word 2 communication error between FPGAs.

Bit 21: Position word 2 position determination error (singleturn).

Bit 22: Position word 2 internal hardware fault (clock/power monitor IC/power).

Bit 23: Position word 2 internal error (self test/software).

Note:
For an encoder version that is not described here, please contact the encoder manufacturer for more detailed information on the bit coding.

Remedy: - Determine the detailed cause of the fault using the fault value.
- If required, replace the DRIVE-CLiQ encoder.

F31405 Motor encoder: Temperature in the encoder evaluation exceeded

Message class: Overtemperature of the electronic components (6)
Message value: Temperature: [0.1 degrees C] %1, temperature sensor number: %2
Component: Sensor Module Encoder 1
Propagation: Local
Response: ENCODER
Acknowledgment: IMMEDIATELY
Cause: An inadmissibly high temperature was detected in the encoder electronics or the encoder evaluation.
Fault value (r0949, interpret hexadecimal):
yyxxxx hex: yy = temperature sensor number, xxxx = measured module temperature in 0.1 °C.
Remedy: When using a Sensor Module: Reduce the ambient temperature of the Sensor Module.
Otherwise: Reduce the encoder ambient temperature.

A31407 Motor encoder: Function limit reached

Message class: Position/speed actual value incorrect or not available (11)
Message value: %1
Component: Encoder 1
Propagation: Local
Response: NONE
Acknowledgment: NONE
Cause: The encoder has reached one of its function limits. A service is recommended.
Alarm value (r2124, interpret decimal):
1: Incremental signals
3: Absolute track
4: Code connection
Remedy: Perform service. Replace the encoder if necessary.

F31503 Motor encoder: Position tracking cannot be reset

Message class: Position/speed actual value incorrect or not available (11)
Message value: -
Component: None
Propagation: Global
Response: OFF1
Acknowledgment: IMMEDIATELY
Cause: The position tracking for the measuring gearbox cannot be reset.
Remedy: The fault should be resolved as follows:
- Select commissioning.
- Reset the position tracking as follows (p0411.2 = 1).
- Deselect commissioning.
The fault should then be acknowledged and the absolute encoder adjusted.

A31700 Motor encoder: Functional safety monitoring initiated

Message class: Safety monitoring channel has identified an error (10)
Message value: Fault cause: %1 bin
Component: Sensor Module Encoder 1
Propagation: Global
Response: NONE
Acknowledgment: NONE
Cause: Functional safety was activated. Self test of the DRIVE-CLiQ encoder has detected a fault.
Alarm value (r2124, interpret binary):
Bit x = 1: Effectivity test x unsuccessful.
Remedy: Replace encoder.

F31801 Motor encoder DRIVE-CLiQ: Sign-of-life missing

Message class: Internal (DRIVE-CLiQ) communication error (12)
Message value: Component number: %1, fault cause: %2
Component: Control Unit (CU)
Propagation: Local
Response: ENCODER
Acknowledgment: IMMEDIATELY
Cause: There is a DRIVE-CLiQ communication error between the converter and the encoder involved.

Fault value (r0949, interpret hexadecimal):
0000yyxx hex:
yy = component number,
xx = fault cause

Error cause:
10 (= 0A hex):
The sign-of-life bit in the received telegram is not set.
Remedy: - Check the electrical cabinet design and cable routing for EMC compliance.
- Replace the component involved.

F31802 Motor encoder: Time slice overflow

Message class: Hardware/software error (1)
Message value: %1
Component: Sensor Module Encoder 1
Propagation: Local
Response: ENCODER
Acknowledgment: IMMEDIATELY
Cause: A time slice overflow for the motor encoder has occurred.
Fault value (r0949, interpret hexadecimal):
yx hex: y = function involved (Siemens-internal fault diagnostics), x = time slice involved
x = 9:
Time slice overflow of the fast (current controller clock cycle) time slice.
x = A:
Time slice overflow of the average time slice.
x = C:
Time slice overflow of the slow time slice.
yx = 3E7:
Timeout when waiting for SYNO (e.g. unexpected return to non-cyclic operation).

Remedy:	Increase the current controller sampling time Note: For a current controller sampling time = 31.25 µs, use an SMx20 with Article No. 6SL3055-0AA00-5xA3.

F31804 Motor encoder: Sensor Module checksum error

Message class:	Hardware/software error (1)
Message value:	%1
Component:	Sensor Module Encoder 1
Propagation:	Local
Response:	ENCODER
Acknowledgment:	POWER ON
Cause:	A checksum error has occurred when reading-out the program memory on the Sensor Module. Fault value (r0949, interpret hexadecimal): yyyyxxxx hex yyyy: Memory area involved. xxxx: Difference between the checksum at POWER ON and the actual checksum.
Remedy:	- Carry out a POWER ON (switch-off/switch-on). - Upgrade firmware to later version. - Check whether the permissible ambient temperature for the component is being maintained.

F31805 Motor encoder: EEPROM checksum error

Message class:	Hardware/software error (1)
Message value:	%1
Component:	Sensor Module Encoder 1
Propagation:	Local
Response:	ENCODER
Acknowledgment:	IMMEDIATELY
Cause:	Data in the EEPROM corrupted . Fault value (r0949, interpret hexadecimal): 01: EEPROM access error. 02: Too many blocks in the EEPROM.
Remedy:	Replace the module.

F31813 Motor encoder: Hardware logic unit failed

Message class:	Hardware/software error (1)
Message value:	Fault cause: %1 bin
Component:	Sensor Module Encoder 1
Propagation:	Global
Response:	ENCODER
Acknowledgment:	PULSE INHIBIT
Cause:	The logic unit of the DRIVE-CLiQ encoder has failed. Fault value (r0949, interpret binary): Bit 0: ALU watchdog has responded. Bit 1: ALU has detected a sign-of-life error.
Remedy:	When the error reoccurs, replace the encoder.

F31820 Motor encoder DRIVE-CLiQ: Telegram error

Message class:	Internal (DRIVE-CLiQ) communication error (12)
Message value:	Component number: %1, fault cause: %2

Component: Sensor Module Encoder 1
Propagation: Local
Response: ENCODER
Acknowledgment: IMMEDIATELY
Cause: There is a DRIVE-CLiQ communication error between the converter and the encoder involved.

Fault value (r0949, interpret hexadecimal):
0000yyxx hex:
yy = component number,
xx = fault cause

Error cause:
1 (= 01 hex):
Checksum error (CRC error).
2 (= 02 hex):
Telegram is shorter than specified in the length byte or in the receive list.
3 (= 03 hex):
Telegram is longer than specified in the length byte or in the receive list.
4 (= 04 hex):
The length of the received telegram does not match the receive list.
5 (= 05 hex):
The type of the received telegram does not match the receive list.
6 (= 06 hex):
The address of the component in the telegram and in the receive list do not match.
7 (= 07 hex):
A SYNC telegram is expected - but the received telegram is not a SYNC telegram.
8 (= 08 hex):
No SYNC telegram is expected - but the received telegram is one.
9 (= 09 hex):
The error bit in the received telegram is set.
16 (= 10 hex):
The received telegram is too early.

Remedy:
- Carry out a POWER ON (switch-off/switch-on).
- Check the electrical cabinet design and cable routing for EMC compliance.
- Check the DRIVE-CLiQ wiring (interrupted cable, contacts, ...).

F31835 Motor encoder DRIVE-CLiQ: Cyclic data transfer error

Message class: Internal (DRIVE-CLiQ) communication error (12)
Message value: Component number: %1, fault cause: %2
Component: Sensor Module Encoder 1
Propagation: Local
Response: ENCODER
Acknowledgment: IMMEDIATELY

Cause: There is a DRIVE-CLiQ communication error between the converter and the encoder involved. The nodes do not send and receive in synchronism.

Fault value (r0949, interpret hexadecimal):
0000yyxx hex:
yy = component number,
xx = fault cause

Error cause:
33 (= 21 hex):
The cyclic telegram has not been received.
34 (= 22 hex):
Timeout in the telegram receive list.
64 (= 40 hex):
Timeout in the telegram send list.

Remedy:
- Carry out a POWER ON.
- Replace the component involved.

F31836 Motor encoder DRIVE-CLiQ: Send error for DRIVE-CLiQ data

Message class: Internal (DRIVE-CLiQ) communication error (12)
Message value: Component number: %1, fault cause: %2
Component: Sensor Module Encoder 1
Propagation: Local
Response: ENCODER
Acknowledgment: IMMEDIATELY
Cause: There is a DRIVE-CLiQ communication error between the converter and the encoder involved. Data were not able to be sent.

Fault value (r0949, interpret hexadecimal):
0000yyxx hex:
yy = component number,
xx = fault cause

Error cause:
65 (= 41 hex):
Telegram type does not match send list.

Remedy: Carry out a POWER ON.

F31837 Motor encoder DRIVE-CLiQ: Component fault

Message class: Internal (DRIVE-CLiQ) communication error (12)
Message value: Component number: %1, fault cause: %2
Component: Sensor Module Encoder 1
Propagation: Local
Response: ENCODER
Acknowledgment: IMMEDIATELY

Cause: Fault detected on the DRIVE-CLiQ component involved. Faulty hardware cannot be excluded.

Fault value (r0949, interpret hexadecimal):
0000yyxx hex:
yy = component number,
xx = fault cause

Error cause:
32 (= 20 hex):
Error in the telegram header.
35 (= 23 hex):
Receive error: The telegram buffer memory contains an error.
66 (= 42 hex):
Send error: The telegram buffer memory contains an error.
67 (= 43 hex):
Send error: The telegram buffer memory contains an error.

Remedy: - Check the DRIVE-CLiQ wiring (interrupted cable, contacts, ...).
- Check the electrical cabinet design and cable routing for EMC compliance.
- Replace the component involved.

F31845 Motor encoder DRIVE-CLiQ: Cyclic data transfer error

Message class: Internal (DRIVE-CLiQ) communication error (12)
Message value: Component number: %1, fault cause: %2
Component: Sensor Module Encoder 1
Propagation: Local
Response: ENCODER
Acknowledgment: IMMEDIATELY
Cause: There is a DRIVE-CLiQ communication error between the converter and the encoder involved.

Fault value (r0949, interpret hexadecimal):
0000yyxx hex:
yy = component number,
xx = fault cause

Error cause:
11 (= 0B hex):
Synchronization error during alternating cyclic data transfer.

Remedy: Carry out a POWER ON (switch-off/switch-on).

F31850 Motor encoder: Encoder evaluation internal software error

Message class: Hardware/software error (1)
Message value: %1
Component: Sensor Module Encoder 1
Propagation: Local
Response: ENCODER
Acknowledgment: POWER ON

Cause: An internal software error has occurred in the Sensor Module of the motor encoder.
Fault value (r0949, interpret decimal):
1: Background time slice is blocked.
2: Checksum over the code memory is not correct.
10000: OEM memory of the EnDat encoder contains data that cannot be interpreted.
11000 ... 11499: Description data from EEPROM incorrect.
11500 ... 11899: Calibration data from EEPROM incorrect.
11900 ... 11999: Configuration data from EEPROM incorrect.
12000 ... 12008: Communications error with analog/digital converter.
16000: DRIVE-CLiQ encoder initialization application error.
16001: DRIVE-CLiQ encoder initialization ALU error.
16002: DRIVE-CLiQ encoder HISI / SISI initialization error.
16003: DRIVE-CLiQ encoder safety initialization error.
16004: DRIVE-CLiQ encoder internal system error.

Remedy:
- Replace the Sensor Module.
- If required, upgrade the firmware.
- Contact Technical Support.

F31851 Encoder 1 DRIVE-CLiQ: Sign-of-life missing

Message class: Internal (DRIVE-CLiQ) communication error (12)
Message value: Component number: %1, fault cause: %2
Component: Sensor Module Encoder 1
Propagation: Local
Response: ENCODER
Acknowledgment: IMMEDIATELY
Cause: There is a DRIVE-CLiQ communication error from the Sensor Module involved (encoder 1) to the converter.
The DRIVE-CLiQ component did not set the sign-of-life to the converter.

Fault value (r0949, interpret hexadecimal):
0000yyxx hex:
yy = component number,
xx = fault cause

Error cause:
10 (= 0A hex):
The sign-of-life bit in the received telegram is not set.

Remedy:
- Upgrade the firmware of the component involved.
- Carry out a POWER ON (switch-off/switch-on) for the component involved.

F31860 Encoder 1 DRIVE-CLiQ: Telegram error

Message class: Internal (DRIVE-CLiQ) communication error (12)
Message value: Component number: %1, fault cause: %2
Component: Sensor Module Encoder 1
Propagation: Local
Response: ENCODER
Acknowledgment: IMMEDIATELY

Cause: There is a DRIVE-CLiQ communication error from the Sensor Module involved (encoder 1) to the converter.

Fault value (r0949, interpret hexadecimal):
0000yyxx hex:
yy = component number,
xx = fault cause

Error cause:
1 (= 01 hex):
Checksum error (CRC error).
2 (= 02 hex):
Telegram is shorter than specified in the length byte or in the receive list.
3 (= 03 hex):
Telegram is longer than specified in the length byte or in the receive list.
4 (= 04 hex):
The length of the received telegram does not match the receive list.
5 (= 05 hex):
The type of the received telegram does not match the receive list.
6 (= 06 hex):
The address of the power unit in the telegram and in the receive list do not match.
9 (= 09 hex):
The DRIVE-CLiQ communication from the DRIVE-CLiQ component involved to the converter signals that the supply voltage has failed.
16 (= 10 hex):
The received telegram is too early.
17 (= 11 hex):
CRC error and the received telegram is too early.
18 (= 12 hex):
The telegram is shorter than that specified in the length byte or in the receive list and the received telegram is too early.
19 (= 13 hex):
The telegram is longer than that specified in the length byte or in the receive list and the received telegram is too early.
20 (= 14 hex):
The length of the received telegram does not match the receive list and the received telegram is too early.
21 (= 15 hex):
The type of the received telegram does not match the receive list and the received telegram is too early.
22 (= 16 hex):
The address of the power unit in the telegram and in the receive list does not match and the received telegram is too early.
25 (= 19 hex):
The error bit in the received telegram is set and the received telegram is too early.

Remedy:
- Carry out a POWER ON (switch-off/switch-on).
- Check the electrical cabinet design and cable routing for EMC compliance.
- Check the DRIVE-CLiQ wiring (interrupted cable, contacts, ...).

F31875 Motor encoder: Supply voltage failed

Message class: Supply voltage fault (undervoltage) (3)
Message value: Component number: %1, fault cause: %2
Component: Sensor Module Encoder 1
Propagation: Local
Response: ENCODER

Acknowledgment: IMMEDIATELY

Cause: The component involved has signaled that the 24 V supply has failed.
Error cause:
9 (= 09 hex):
The supply voltage for the component has failed.
Note regarding the message value:
The individual information is coded as follows in the message value (r0949/r2124):
0000yyxx hex: yy = component number, xx = error cause

Remedy: - Check the supply voltage wiring (interrupted cable, contacts, ...).
- Check the dimensioning of the 24 V supply, check cable lengths.

F31885 Encoder 1 DRIVE-CLiQ: Cyclic data transfer error

Message class: Internal (DRIVE-CLiQ) communication error (12)

Message value: Component number: %1, fault cause: %2

Component: Sensor Module Encoder 1

Propagation: Local

Response: ENCODER

Acknowledgment: IMMEDIATELY

Cause: There is a DRIVE-CLiQ communication error between the converter and motor.
The nodes do not send and receive in synchronism.
Error cause:
26 (= 1A hex):
Sign-of-life bit in the received telegram not set and the received telegram is too early.
33 (= 21 hex):
The cyclic telegram has not been received.
34 (= 22 hex):
Timeout in the telegram receive list.
64 (= 40 hex):
Timeout in the telegram send list.
98 (= 62 hex):
Error at the transition to cyclic operation.
Note regarding the message value:
The individual information is coded as follows in the message value (r0949/r2124):
0000yyxx hex: yy = component number, xx = error cause

Remedy: - Check the OCC cable between the converter and motor.
- Check the supply voltage of the component involved.
- Carry out a POWER ON (switch-off/switch-on).
- Replace the component involved.
Note:
OCC: One Cable Connection (one cable system)

F31886 Motor encoder DRIVE-CLiQ (CU): Error when sending DRIVE-CLiQ data

Message class: Internal (DRIVE-CLiQ) communication error (12)

Message value: Component number: %1, fault cause: %2

Component: Sensor Module Encoder 1

Propagation: Local

Response: ENCODER

Acknowledgment: IMMEDIATELY

Cause: There is a DRIVE-CLiQ communication error from the Sensor Module involved (encoder 1) to the converter. Data were not able to be sent.

Fault value (r0949, interpret hexadecimal):
0000yyxx hex:
yy = component number,
xx = fault cause

Error cause:
65 (= 41 hex):
Telegram type does not match send list.

Remedy: - Carry out a POWER ON.

F31887 Motor encoder DRIVE-CLiQ (CU): Component fault

Message class: Internal (DRIVE-CLiQ) communication error (12)
Message value: Component number: %1, fault cause: %2
Component: Sensor Module Encoder 1
Propagation: Local
Response: ENCODER
Acknowledgment: IMMEDIATELY
Cause: A fault has been detected on the DRIVE-CLiQ component involved (Sensor Module for the motor encoder). Faulty hardware cannot be excluded.

Fault value (r0949, interpret hexadecimal):
0000yyxx hex:
yy = component number,
xx = fault cause

Error cause:
32 (= 20 hex):
Error in the telegram header.
35 (= 23 hex):
Receive error: The telegram buffer memory contains an error.
66 (= 42 hex):
Send error: The telegram buffer memory contains an error.
67 (= 43 hex):
Send error: The telegram buffer memory contains an error.
96 (= 60 hex):
Response received too late during runtime measurement.
97 (= 61 hex):
Time taken to exchange characteristic data too long.

Remedy:
- Check the DRIVE-CLiQ wiring (interrupted cable, contacts, ...).
- Check the electrical cabinet design and cable routing for EMC compliance.
- Replace the component involved.

F31895 Encoder 1 DRIVE-CLiQ: Alternating cyclic data transfer error

Message class: Internal (DRIVE-CLiQ) communication error (12)
Message value: Component number: %1, fault cause: %2
Component: Sensor Module Encoder 1
Propagation: Local
Response: ENCODER

Acknowledgment: IMMEDIATELY

Cause: There is a DRIVE-CLiQ communication error from the Sensor Module involved (encoder 1) to the converter.

Error cause:

11 (= 0B hex):

Synchronization error during alternating cyclic data transfer.

Note regarding the message value:

The individual information is coded as follows in the message value (r0949/r2124):

0000yyxx hex:

yy = component number,

xx = fault cause

Remedy: Carry out a POWER ON.

F31896 Motor encoder DRIVE-CLiQ (CU): Inconsistent component properties

Message class: Internal (DRIVE-CLiQ) communication error (12)

Message value: Component number: %1

Component: Sensor Module Encoder 1

Propagation: Local

Response: OFF2

Acknowledgment: IMMEDIATELY

Explanation of the message value: For %1

Component in target topology

Cause: The properties of the DRIVE-CLiQ component (Sensor Module for the motor encoder), specified by the fault value, have changed in an incompatible fashion with respect to the properties when running up. One cause can be, e.g. that a DRIVE-CLiQ cable or DRIVE-CLiQ component has been replaced.

Fault value (r0949, interpret decimal):

Component number.

Remedy: - Carry out a POWER ON.

- When a component is replaced, the same component type and if possible the same firmware version should be used.

- When a cable is replaced, only use cables whose length is the same as or as close as possible to the length of the original cable (ensure compliance with the maximum cable length).

F31950 Motor encoder: Internal software error

Message class: Hardware/software error (1)

Message value: %1

Component: Sensor Module Encoder 1

Propagation: Local

Response: ENCODER

Acknowledgment: POWER ON

Cause: An internal software error has occurred.

Fault value (r0949, interpret decimal):

The fault value contains information regarding the fault source.

Only for internal Siemens troubleshooting.

Remedy: - If necessary, upgrade the firmware in the Sensor Module to a later version.

- Contact Technical Support.

A31999 Motor encoder: Unknown alarm

Message class: Position/speed actual value incorrect or not available (11)

Message value: New message: %1

Component: Sensor Module Encoder 1

Propagation:	Global
Response:	NONE
Acknowledgment:	NONE
Cause:	An alarm has occurred on the Sensor Module for encoder 1, which cannot be interpreted by the converter firmware. This can occur if the firmware on this component is more recent than the converter firmware. Alarm value (r2124, interpret decimal): Alarm number. Note: If required, the significance of this new alarm can be read about in a more recent description of the converter.
Remedy:	- Replace the firmware on the Sensor Module by an older firmware version. - Upgrade the converter firmware.

F32120 Encoder 2: Encoder power supply fault

Message class:	Position/speed actual value incorrect or not available (11)
Message value:	Fault cause: %1 bin
Component:	Encoder 2
Propagation:	Local
Response:	OFF1
Acknowledgment:	PULSE INHIBIT
Cause:	An encoder power supply fault was detected. Fault value (r0949, interpret binary): Bit 0: Undervoltage condition on the sense line. Bit 1: Overcurrent condition for the encoder power supply. Bit 2: Overcurrent condition for encoder power supply on cable resolver excitation negative. Bit 3: Overcurrent condition for encoder power supply on cable resolver excitation positive. Bit 4: The 24 V power supply via the inverter is overloaded. Bit 5: Overcurrent at the EnDat connection of the converter. Bit 6: Overvoltage at the EnDat connection of the converter. Bit 7: Hardware fault at the EnDat connection of the converter. Note: If the encoder cables 6FX2002-2EQ00-.... and 6FX2002-2CH00-.... are interchanged, this can result in the encoder being destroyed because the pins of the operating voltage are reversed.
Remedy:	For fault value, bit 0 = 1: - Correct encoder cable connected? - Check the plug connections of the encoder cable. - SMC30: Check the parameterization (p0404.22). For fault value, bit 1 = 1: - Correct encoder cable connected? - Replace the encoder or encoder cable. For fault value, bit 2 = 1: - Correct encoder cable connected? - Replace the encoder or encoder cable. For fault value, bit 3 = 1: - Correct encoder cable connected? - Replace the encoder or encoder cable. For fault value, bit 5 = 1: - Measuring unit correctly connected at the converter? - Replace the measuring unit or the cable to the measuring unit. For fault value, bit 6, 7 = 1: - Replace the defective EnDat 2.2 converter.

F32135	**Encoder 2: Fault when determining the position (single turn)**
Message class:	Position/speed actual value incorrect or not available (11)
Message value:	Fault cause: %1 bin
Component:	Encoder 2
Propagation:	Global
Response:	OFF1
Acknowledgment:	PULSE INHIBIT
Cause:	The encoder has identified a position determination fault (singleturn) and supplies status information bit by bit in an internal status/fault word. Some of these bits cause this fault to be triggered. Other bits are status displays. The status/fault word is displayed in the fault value. Note regarding the bit designation: The first designation is valid for DRIVE-CLiQ encoders, the second for EnDat 2.2 encoders. Fault value (r0949, interpret binary): Bit 0: F1 (safety status display). Bit 1: F2 (safety status display). Bit 2: Reserved (lighting). Bit 3: Reserved (signal amplitude). Bit 4: Reserved (position value). Bit 5: Reserved (overvoltage). Bit 6: Reserved (undervoltage)/hardware fault EnDat supply (--> F3x110, x = 1, 2, 3). Bit 7: Reserved (overcurrent)/EnDat encoder withdrawn when not in the parked state (--> F3x110, x = 1, 2, 3). Bit 8: Reserved (battery)/overcurrent EnDat supply (--> F3x110, x = 1, 2, 3). Bit 9: Reserved/overvoltage EnDat supply (--> F3x110, x = 1, 2, 3). Bit 11: Reserved/internal communication error (--> F3x110, x = 1, 2, 3). Bit 12: Reserved/internal communication error (--> F3x110, x = 1, 2, 3). Bit 13: Reserved/internal communication error (--> F3x110, x = 1, 2, 3). Bit 14: Reserved/internal communication error (--> F3x110, x = 1, 2, 3). Bit 15: Internal communication error (--> F3x110, x = 1, 2, 3). Bit 16: Lighting (--> F3x135, x = 1, 2, 3). Bit 17: Signal amplitude (--> F3x135, x = 1, 2, 3). Bit 18: Singleturn position 1 (--> F3x135, x = 1, 2, 3). Bit 19: Overvoltage (--> F3x135, x = 1, 2, 3). Bit 20: Undervoltage (--> F3x135, x = 1, 2, 3). Bit 21: Overcurrent (--> F3x135, x = 1, 2, 3). Bit 22: Temperature exceeded (--> F3x405, x = 1, 2, 3). Bit 23: Singleturn position 2 (safety status display). Bit 24: Singleturn system (--> F3x135, x = 1, 2, 3). Bit 25: Singleturn power down (--> F3x135, x = 1, 2, 3) Bit 26: Multiturn position 1 (--> F3x136, x = 1, 2, 3). Bit 27: Multiturn position 2 (--> F3x136, x = 1, 2, 3). Bit 28: Multiturn system (--> F3x136, x = 1, 2, 3). Bit 29: Multiturn power down (--> F3x136, x = 1, 2, 3). Bit 30: Multiturn overflow/underflow (--> F3x136, x = 1, 2, 3). Bit 31: Multiturn battery (reserved).
Remedy:	- Determine the detailed cause of the fault using the fault value. - Replace the encoder if necessary. Note: An EnDat 2.2 encoder may only be removed and inserted in the "Park" state. If an EnDat 2.2 encoder was removed when not in the "Park" state, then after inserting the encoder, a POWER ON (switch-off/switch-on) is necessary to acknowledge the fault.

F32136	**Encoder 2: Fault when determining the position (multiturn)**
Message class:	Position/speed actual value incorrect or not available (11)
Message value:	Fault cause: %1 bin
Component:	Encoder 2
Propagation:	Global
Response:	OFF1
Acknowledgment:	PULSE INHIBIT
Cause:	The encoder has identified a position determination fault (multiturn) and supplies status information bit by bit in an internal status/fault word. Some of these bits cause this fault to be triggered. Other bits are status displays. The status/fault word is displayed in the fault value. Note regarding the bit designation: The first designation is valid for DRIVE-CLiQ encoders, the second for EnDat 2.2 encoders. Fault value (r0949, interpret binary): Bit 0: F1 (safety status display). Bit 1: F2 (safety status display). Bit 2: Reserved (lighting). Bit 3: Reserved (signal amplitude). Bit 4: Reserved (position value). Bit 5: Reserved (overvoltage). Bit 6: Reserved (undervoltage)/hardware fault EnDat supply (--> F3x110, x = 1, 2, 3). Bit 7: Reserved (overcurrent)/EnDat encoder withdrawn when not in the parked state (--> F3x110, x = 1, 2, 3). Bit 8: Reserved (battery)/overcurrent EnDat supply (--> F3x110, x = 1, 2, 3). Bit 9: Reserved/overvoltage EnDat supply (--> F3x110, x = 1, 2, 3). Bit 11: Reserved/internal communication error (--> F3x110, x = 1, 2, 3). Bit 12: Reserved/internal communication error (--> F3x110, x = 1, 2, 3). Bit 13: Reserved/internal communication error (--> F3x110, x = 1, 2, 3). Bit 14: Reserved/internal communication error (--> F3x110, x = 1, 2, 3). Bit 15: Internal communication error (--> F3x110, x = 1, 2, 3). Bit 16: Lighting (--> F3x135, x = 1, 2, 3). Bit 17: Signal amplitude (--> F3x135, x = 1, 2, 3). Bit 18: Singleturn position 1 (--> F3x135, x = 1, 2, 3). Bit 19: Overvoltage (--> F3x135, x = 1, 2, 3). Bit 20: Undervoltage (--> F3x135, x = 1, 2, 3). Bit 21: Overcurrent (--> F3x135, x = 1, 2, 3). Bit 22: Temperature exceeded (--> F3x405, x = 1, 2, 3). Bit 23: Singleturn position 2 (safety status display). Bit 24: Singleturn system (--> F3x135, x = 1, 2, 3). Bit 25: Singleturn power down (--> F3x135, x = 1, 2, 3) Bit 26: Multiturn position 1 (--> F3x136, x = 1, 2, 3). Bit 27: Multiturn position 2 (--> F3x136, x = 1, 2, 3). Bit 28: Multiturn system (--> F3x136, x = 1, 2, 3). Bit 29: Multiturn power down (--> F3x136, x = 1, 2, 3). Bit 30: Multiturn overflow/underflow (--> F3x136, x = 1, 2, 3). Bit 31: Multiturn battery (reserved).
Remedy:	- Determine the detailed cause of the fault using the fault value. - Replace the encoder if necessary. Note: An EnDat 2.2 encoder may only be removed and inserted in the "Park" state. If an EnDat 2.2 encoder was removed when not in the "Park" state, then after inserting the encoder, a POWER ON (switch-off/switch-on) is necessary to acknowledge the fault.

F32137 Encoder 2: Fault when determining the position (single turn)

Message class:	Hardware/software error (1)
Message value:	Fault cause: %1 bin
Component:	Encoder 2
Propagation:	Global
Response:	OFF1
Acknowledgment:	PULSE INHIBIT

Cause:

A position determination fault has occurred in the DRIVE-CLiQ encoder.
Fault value (r0949, interpret binary):
yyxxxxxx hex: yy = encoder version, xxxxxx = bit coding of the fault cause
----
For yy = 8 (0000 1000 bin), the following applies:
Bit 1: Signal monitoring (sin/cos).
Bit 8: F1 (safety status display) error position word 1.
Bit 9: F2 (safety status display) error position word 2.
Bit 16: LED monitoring.
Bit 17: Fault when determining the position (multiturn).
Bit 18: Single-step capability monitoring singleturn from the Safety channel.
Bit 19: ECRC, configuration error in the safety channel.
Bit 23: Temperature outside the limit values.

For yy = 11 (0000 1011 bin), the following applies:
Bit 0: Position word 1 difference between rotation counter and software counter (XC_ERR).
Bit 1: Position word 1 track error of the incremental signals (LIS_ERR).
Bit 2: Position word 1 error when aligning between incremental track signals and absolute value (ST_ERR).
Bit 3: Maximum permissible temperature exceeded (TEMP_ERR).
Bit 4: Power supply overvoltage (MON_OVR_VOLT).
Bit 5: Power supply overcurrent (MON_OVR_CUR).
Bit 6: Power supply undervoltage (MON_UND_VOLT).
Bit 7: Rotation error counter (MT_ERR).
Bit 8: F1 (safety status display) error position word 1.
Bit 9: F2 (safety status display) error position word 2.
Bit 11: Position word 1 status bit: singleturn position OK (ADC_ready).
Bit 12: Position word 1 status bit: rotation counter OK (MT_ready).
Bit 13: Position word 1 memory error (MEM_ERR).
Bit 14: Position word 1 absolute position error (MLS_ERR).
Bit 15: Position word 1 LED error, lighting unit error (LED_ERR).
Bit 18: Position word 2 error when aligning between incremental track signals and absolute value (ST_ERR).
Bit 21: Position word 2 memory error (MEM_ERR).
Bit 22: Position word 2 absolute position error (MLS_ERR).
Bit 23: Position word 2 LED error, lighting unit error (LED_ERR).

For yy = 12 (0000 1100 bin), the following applies:
Bit 8: encoder fault.
Bit 10: error in the internal position data transport.

For yy = 14 (0000 1110 bin), the following applies:
Bit 0: Position word 1 temperature outside limit value.
Bit 1: Position word 1 position determination error (multiturn).
Bit 2: Position word 1 FPGA error.
Bit 3: Position word 1 velocity error.
Bit 4: Position word 1 communication error between FPGAs/error in the incremental signal.
Bit 5: Position word 1 timeout absolute value/error when determining the position (singleturn).
Bit 6: Position word 1 internal hardware fault (clock/power monitor IC/power).
Bit 7: Position word 1 internal error (FPGA communication/FPGA parameterization/self test/software).
Bit 8: F1 (safety status display) error position word 1.
Bit 9: F2 (safety status display) error position word 2.
Bit 16: Position word 2 temperature outside limit value.
Bit 17: Position word 2 position determination error (multiturn).

Bit 18: Position word 2 FPGA error.
Bit 19: Position word 2 velocity error.
Bit 20: Position word 2 communication error between FPGAs.
Bit 21: Position word 2 position determination error (singleturn).
Bit 22: Position word 2 internal hardware fault (clock/power monitor IC/power).
Bit 23: Position word 2 internal error (self test/software).

Note:
For an encoder version that is not described here, please contact the encoder manufacturer for more detailed information on the bit coding.

Remedy: - Determine the detailed cause of the fault using the fault value.
- If required, replace the DRIVE-CLiQ encoder.

F32138 Encoder 2: Fault when determining the position (multiturn)

Message class: Hardware/software error (1)
Message value: Fault cause: %1 bin
Component: Encoder 2
Propagation: Global
Response: OFF1
Acknowledgment: PULSE INHIBIT

Cause: A position determination fault has occurred in the DRIVE-CLiQ encoder.

Fault value (r0949, interpret binary):

yyxxxxxx hex: yy = encoder version, xxxxxx = bit coding of the fault cause

----

For yy = 8 (0000 1000 bin), the following applies:

Bit 1: Signal monitoring (sin/cos).

Bit 8: F1 (safety status display) error position word 1.

Bit 9: F2 (safety status display) error position word 2.

Bit 16: LED monitoring.

Bit 17: Fault when determining the position (multiturn).

Bit 19: ECRC, configuration error in the safety channel.

Bit 23: Temperature outside the limit values.

For yy = 11 (0000 1011 bin), the following applies:

Bit 0: Position word 1 difference between rotation counter and software counter (XC_ERR).

Bit 1: Position word 1 track error of the incremental signals (LIS_ERR).

Bit 2: Position word 1 error when aligning between incremental track signals and absolute value (ST_ERR).

Bit 3: Maximum permissible temperature exceeded (TEMP_ERR).

Bit 4: Power supply overvoltage (MON_OVR_VOLT).

Bit 5: Power supply overcurrent (MON_OVR_CUR).

Bit 6: Power supply undervoltage (MON_UND_VOLT).

Bit 7: Rotation error counter (MT_ERR).

Bit 8: F1 (safety status display) error position word 1.

Bit 9: F2 (safety status display) error position word 2.

Bit 11: Position word 1 status bit: singleturn position OK (ADC_ready).

Bit 12: Position word 1 status bit: rotation counter OK (MT_ready).

Bit 13: Position word 1 memory error (MEM_ERR).

Bit 14: Position word 1 absolute position error (MLS_ERR).

Bit 15: Position word 1 LED error, lighting unit error (LED_ERR).

Bit 18: Position word 2 error when aligning between incremental track signals and absolute value (ST_ERR).

Bit 21: Position word 2 memory error (MEM_ERR).

Bit 22: Position word 2 absolute position error (MLS_ERR).

Bit 23: Position word 2 LED error, lighting unit error (LED_ERR).

For yy = 14 (0000 1110 bin), the following applies:

Bit 0: Position word 1 temperature outside limit value.

Bit 1: Position word 1 position determination error (multiturn).

Bit 2: Position word 1 FPGA error.

Bit 3: Position word 1 velocity error.

Bit 4: Position word 1 communication error between FPGAs/error in the incremental signal.

Bit 5: Position word 1 timeout absolute value/error when determining the position (singleturn).

Bit 6: Position word 1 internal hardware fault (clock/power monitor IC/power).

Bit 7: Position word 1 internal error (FPGA communication/FPGA parameterization/self test/software).

Bit 8: F1 (safety status display) error position word 1.

Bit 9: F2 (safety status display) error position word 2.

Bit 16: Position word 2 temperature outside limit value.

Bit 17: Position word 2 position determination error (multiturn).

Bit 18: Position word 2 FPGA error.

Bit 19: Position word 2 velocity error.

Bit 20: Position word 2 communication error between FPGAs.

Bit 21: Position word 2 position determination error (singleturn).

Bit 22: Position word 2 internal hardware fault (clock/power monitor IC/power).

Bit 23: Position word 2 internal error (self test/software).

Note:
For an encoder version that is not described here, please contact the encoder manufacturer for more detailed information on the bit coding.

Remedy: - Determine the detailed cause of the fault using the fault value.
- If required, replace the DRIVE-CLiQ encoder.

F32405 Encoder 2: Temperature in the encoder evaluation exceeded

Message class: Overtemperature of the electronic components (6)
Message value: Temperature: [0.1 degrees C] %1, temperature sensor number: %2
Component: Sensor Module Encoder 2
Propagation: Local
Response: OFF1
Acknowledgment: IMMEDIATELY
Cause: An inadmissibly high temperature was detected in the encoder electronics or the encoder evaluation.
Fault value (r0949, interpret hexadecimal):
yyxxxx hex: yy = temperature sensor number, xxxx = measured module temperature in 0.1 °C.
Remedy: When using a Sensor Module: Reduce the ambient temperature of the Sensor Module.
Otherwise: Reduce the encoder ambient temperature.

F32802 Encoder 2: Time slice overflow

Message class: Hardware/software error (1)
Message value: %1
Component: Sensor Module Encoder 2
Propagation: Local
Response: OFF1
Acknowledgment: IMMEDIATELY
Cause: A time slice overflow has occurred in encoder 2.
Fault value (r0949, interpret hexadecimal):
yx hex: y = function involved (Siemens-internal fault diagnostics), x = time slice involved
x = 9:
Time slice overflow of the fast (current controller clock cycle) time slice.
x = A:
Time slice overflow of the average time slice.
x = C:
Time slice overflow of the slow time slice.
yx = 3E7:
Timeout when waiting for SYNO (e.g. unexpected return to non-cyclic operation).
Remedy: Increase the current controller sampling time
Note:
For a current controller sampling time = 31.25 µs, use an SMx20 with Article No. 6SL3055-0AA00-5xA3.

F32804 Encoder 2: Sensor Module checksum error

Message class: Hardware/software error (1)
Message value: %1
Component: Sensor Module Encoder 2
Propagation: Local
Response: OFF1
Acknowledgment: POWER ON

Cause: A checksum error has occurred when reading-out the program memory on the Sensor Module.
Fault value (r0949, interpret hexadecimal):
yyyyxxxx hex
yyyy: Memory area involved.
xxxx: Difference between the checksum at POWER ON and the actual checksum.

Remedy: - Carry out a POWER ON (switch-off/switch-on).
- Upgrade firmware to later version (>= V2.6 HF3, >= V4.3 SP2, >= V4.4).
- Check whether the permissible ambient temperature for the component is being maintained.
- Replace the Sensor Module.

F32813 Encoder 2: Hardware logic unit failed

Message class: Hardware/software error (1)
Message value: Fault cause: %1 bin
Component: Sensor Module Encoder 2
Propagation: Global
Response: OFF1
Acknowledgment: PULSE INHIBIT
Cause: The logic unit of the DRIVE-CLiQ encoder has failed.
Fault value (r0949, interpret binary):
Bit 0: ALU watchdog has responded.
Bit 1: ALU has detected a sign-of-life error.
Remedy: When the error reoccurs, replace the encoder.

F32850 Encoder 2: Encoder evaluation internal software error

Message class: Hardware/software error (1)
Message value: %1
Component: Sensor Module Encoder 2
Propagation: Global
Response: OFF1
Acknowledgment: POWER ON
Cause: An internal software error has occurred in the Sensor Module of encoder 2.
Fault value (r0949, interpret decimal):
1: Background time slice is blocked.
2: Checksum over the code memory is not correct.
10000: OEM memory of the EnDat encoder contains data that cannot be interpreted.
11000 ... 11499: Description data from EEPROM incorrect.
11500 ... 11899: Calibration data from EEPROM incorrect.
11900 ... 11999: Configuration data from EEPROM incorrect.
12000 ... 12008: Communications error with analog/digital converter.
16000: DRIVE-CLiQ encoder initialization application error.
16001: DRIVE-CLiQ encoder initialization ALU error.
16002: DRIVE-CLiQ encoder HISI / SISI initialization error.
16003: DRIVE-CLiQ encoder safety initialization error.
16004: DRIVE-CLiQ encoder internal system error.
Remedy: - Replace the Sensor Module.
- If required, upgrade the firmware.
- Contact Technical Support.

F32899 Encoder 2: Unknown fault

Message class: Position/speed actual value incorrect or not available (11)

Message value: New message: %1
Component: Sensor Module Encoder 2
Propagation: Local
Response: OFF1
Acknowledgment: IMMEDIATELY
Cause: A fault occurred on the Sensor Module for encoder 2 that cannot be interpreted by the Control Unit firmware.
This can occur if the firmware on this component is more recent than the firmware on the Control Unit.
Fault value (r0949, interpret decimal):
Fault number.
Note:
If required, the significance of this new fault can be read about in a more recent description of the Control Unit.
Remedy: - Replace the firmware on the Sensor Module by an older firmware version (r0148).
- Upgrade the firmware on the Control Unit (r0018).

A32999 Encoder 2: Unknown alarm

Message class: Position/speed actual value incorrect or not available (11)
Message value: New message: %1
Component: Sensor Module Encoder 2
Propagation: Local
Response: NONE
Acknowledgment: NONE
Cause: An alarm has occurred on the Sensor Module for encoder 2, which cannot be interpreted by the converter firmware.
This can occur if the firmware on this component is more recent than the converter firmware.
Alarm value (r2124, interpret decimal):
Alarm number.
Note:
If required, the significance of this new alarm can be read about in a more recent description of the converter.
Remedy: - Replace the firmware on the Sensor Module by an older firmware version.
- Upgrade the converter firmware.

F36207 Hub: Overtemperature component

Message class: Overtemperature of the electronic components (6)
Message value: %1
Component: Terminal Board (TB)
Propagation: Local
Response: NONE
Acknowledgment: IMMEDIATELY
Cause: The temperature on the DRIVE-CLiQ Hub Module has exceeded the fault threshold.
Fault value (r0949, interpret decimal):
Actual temperature in 0.1 °C resolution.
Remedy: - Check ambient temperature at component installation location.
- Replace the component involved.

A36211 Hub: Overtemperature alarm component

Message class: Overtemperature of the electronic components (6)
Message value: %1
Component: Terminal Board (TB)
Propagation: Local
Response: NONE

Acknowledgment: NONE
Cause: The temperature on the DRIVE-CLiQ Hub Module has exceeded the alarm threshold.
Alarm value (r2124, interpret decimal):
Actual temperature in 0.1 °C resolution.
Remedy: - Check ambient temperature at component installation location.
- Replace the component involved.

F36214 Hub: Overvoltage fault 24 V supply

Message class: Supply voltage fault (overvoltage) (3)
Message value: %1
Component: Terminal Board (TB)
Propagation: Local
Response: NONE
Acknowledgment: IMMEDIATELY
Cause: The 24 V power supply on the DRIVE-CLiQ Hub Module has exceeded the fault threshold.
Fault value (r0949, interpret decimal):
Actual operating voltage in 0.1 °C resolution
Remedy: - Check the power supply of the component.
- Replace the component involved.

F36216 Hub: Undervoltage fault 24 V supply

Message class: Supply voltage fault (undervoltage) (3)
Message value: %1
Component: Terminal Board (TB)
Propagation: Local
Response: NONE
Acknowledgment: IMMEDIATELY
Cause: The 24 V power supply on the DRIVE-CLiQ Hub Module has undershot the fault threshold.
Fault value (r0949, interpret decimal):
Actual operating voltage in 0.1 °C resolution
Remedy: - Check the power supply of the component.
- Replace the component involved.

A36217 Hub: Undervoltage alarm 24 V supply

Message class: Supply voltage fault (undervoltage) (3)
Message value: %1
Component: Terminal Board (TB)
Propagation: Local
Response: NONE
Acknowledgment: NONE
Cause: The 24 V power supply on the DRIVE-CLiQ Hub Module has undershot the alarm threshold.
Alarm value (r2124, interpret decimal):
Actual operating voltage in 0.1 °C resolution
Remedy: - Check the power supply of the component.
- Replace the component involved.

N36800 Hub: Group signal

Message class: General drive fault (19)
Message value: -

Component:	None
Propagation:	Local
Response:	NONE
Acknowledgment:	NONE
Cause:	The DRIVE-CLiQ Hub Module has detected at least one fault.
Remedy:	Evaluation of other active messages.

A36802 Hub: Time slice overflow

Message class:	Hardware/software error (1)
Message value:	%1
Component:	Terminal Board (TB)
Propagation:	Local
Response:	NONE
Acknowledgment:	NONE
Cause:	A time slice overflow has occurred on the DRIVE-CLiQ Hub Module. Fault value (r0949, interpret decimal): xx: Time slice number xx
Remedy:	- Reduce the current controller frequency. - Carry out a POWER ON (switch-off/switch-on) for all components. - Upgrade firmware to later version. - Contact Technical Support.

F36804 Hub: Checksum error has occurred

Message class:	Hardware/software error (1)
Message value:	%1
Component:	Terminal Board (TB)
Propagation:	Local
Response:	NONE
Acknowledgment:	IMMEDIATELY
Cause:	A checksum error occurred when reading out the program memory on the DRIVE-CLiQ Hub Module. Fault value (r0949, interpret hexadecimal): Difference between the checksum at POWER ON and the actual checksum.
Remedy:	- Check whether the permissible ambient temperature for the component is being maintained. - Replace the DRIVE-CLiQ Hub Module.

F36805 Hub: EEPROM checksum incorrect

Message class:	Hardware/software error (1)
Message value:	%1
Component:	Terminal Board (TB)
Propagation:	Local
Response:	NONE
Acknowledgment:	IMMEDIATELY
Cause:	The internal parameter data on the DRIVE-CLiQ Hub Module is incorrect. Alarm value (r2124, interpret hexadecimal): 01: EEPROM access error. 02: Too many blocks in the EEPROM.
Remedy:	- Check whether the permissible ambient temperature for the component is being maintained. - Replace the DRIVE-CLiQ Hub Module.

F36837 Hub DRIVE-CLiQ: Component fault

Message class: Internal (DRIVE-CLiQ) communication error (12)
Message value: Component number: %1, fault cause: %2
Component: Terminal Board (TB)
Propagation: Local
Response: NONE
Acknowledgment: IMMEDIATELY
Cause: Fault detected on the DRIVE-CLiQ component involved. Faulty hardware cannot be excluded.
Error cause:
32 (= 20 hex):
Error in the telegram header.
35 (= 23 hex):
Receive error: The telegram buffer memory contains an error.
66 (= 42 hex):
Send error: The telegram buffer memory contains an error.
67 (= 43 hex):
Send error: The telegram buffer memory contains an error.
Note regarding the message value:
The individual information is coded as follows in the message value (r0949/r2124):
0000yyxx hex: yy = component number, xx = error cause
Remedy: - Check the DRIVE-CLiQ wiring (interrupted cable, contacts, ...).
- Check the electrical cabinet design and cable routing for EMC compliance.
- If required, use another DRIVE-CLiQ socket.
- Replace the component involved.

F36899 Hub: Unknown fault

Message class: General drive fault (19)
Message value: New message: %1
Component: Terminal Board (TB)
Propagation: Local
Response: NONE
Acknowledgment: IMMEDIATELY
Cause: A fault occurred on the DRIVE-CLiQ Hub Module, which cannot be interpreted by the firmware.
This can occur if the firmware on this component is more recent than the firmware on the converter.
Fault value (r0949, interpret decimal):
Fault number.
Note:
If required, the significance of this new fault can be read about in a more recent description of the converter.
Remedy: - Replace the firmware on the DRIVE-CLiQ Hub Module with older firmware.
- Upgrade the converter firmware.

A36999 Hub: Unknown alarm

Message class: General drive fault (19)
Message value: New message: %1
Component: Terminal Board (TB)
Propagation: Local
Response: NONE
Acknowledgment: NONE

Cause:	An alarm has occurred on the DRIVE-CLiQ Hub Module, which cannot be interpreted by the converter firmware. This can occur if the firmware on this component is more recent than the firmware on the converter. Alarm value (r2124, interpret decimal): Alarm number. Note: If required, the significance of this new alarm can be read about in a more recent description of the converter.
Remedy:	- Replace the firmware on the DRIVE-CLiQ Hub Module with older firmware. - Upgrade the converter firmware.

F48604 SI: Safety EEPROM data error

Message class:	Safety monitoring channel has identified an error (10)
Message value:	%1
Component:	Power Unit
Propagation:	Global
Response:	OFF2
Acknowledgment:	POWER ON
Cause:	Safety relevant EEPROM data are not correct. This message results in an STO (Safe Torque Off). Message value (r60049, interpret decimal): Only for internal Siemens fault diagnostics.
Remedy:	Replace the module

A48605 SI: Checksum error has occurred

Message class:	Safety monitoring channel has identified an error (10)
Message value:	%1
Component:	None
Propagation:	Local
Response:	NONE
Acknowledgment:	NONE
Cause:	A checksum error (CRC error) has occurred in the converter program memory.
Remedy:	- Carry out a POWER ON (switch-off/switch-on). - Upgrade firmware to later version. - Contact Technical Support.

F48606 SI: Safety HW version incorrect

Message class:	Safety monitoring channel has identified an error (10)
Message value:	%1
Component:	Control Unit (CU)
Propagation:	Global
Response:	OFF2
Acknowledgment:	POWER ON
Cause:	Safety relevant hardware version is not compatible with this software. This fault results in an STO (Safe Torque Off). Fault value (r0949, interpret decimal): Only for internal Siemens fault diagnostics.
Remedy:	Update the software or exchange the module for this software.

C48649 SI: Internal software error

Message class:	Hardware/software error (1)

Message value: Module: %1, line: %2
Component: Power Unit
Propagation: Local
Response: OFF2
Acknowledgment: IMMEDIATELY
Cause: An internal error has occurred in the Safety Integrated software.
Note:
This message results in an STO (Safe Torque Off) that cannot be acknowledged.
Message value (r60049, interpret hexadecimal):
Only for internal Siemens troubleshooting.
Remedy:
- Carry out a POWER ON (switch-off/switch-on) for all components.
- Repeat commissioning of "Safety Integrated" and carry out a POWER ON.
- Upgrade firmware to later version.
- Contact Technical Support.
- Replace hardware component.

F53430 VIBSUP EPOS not activated

Message class: General drive fault (19)
Message value: -
Component: None
Propagation: Global
Response: NONE
Acknowledgment: IMMEDIATELY
Cause: It was identified that the "Basic positioner, EPOS" is not activated.
Remedy: Activate function "Basic positioner, EPOS".
Note:
VIBSUP: VIBration SUPpression

F53432 VIBSUP frequency fd > Shannon frequency

Message class: General drive fault (19)
Message value: -
Component: None
Propagation: Global
Response: NONE
Acknowledgment: IMMEDIATELY
Cause: The VIBSUP filter frequency is higher than the Shannon frequency.
Remedy: Reduce the VIBSUP filter frequency (p31585).
Note:
VIBSUP: VIBration SUPpression

Appendix A

A.1 Directives and standards

A.1.1 Directives, standards and certificates for the converter

Directives and standards that are complied with

The converters comply with the following directives and standards:

European Low-Voltage Directive

The converter fulfills the requirements stipulated in the Low-Voltage Directive 2014/35/EU, if they are covered by the field of application of this directive.

European Machinery Directive

The converter fulfills the requirements stipulated in the Machinery Directive 2006/42/EC, if they are covered by the field of application of this directive.

However, the use of the converter in a typical machine application has been fully assessed for compliance with the main regulations in this directive concerning health and safety.

European EMC Directive

The compliance of the converters with the regulations of the Directive 2014/30/EU has been verified through full compliance with IEC 61800-3.

Safety Integrated

The converters comply with the requirements relating to functional safety/safety of machinery.

RoHS

The converters comply with directive 2011/65/EU regarding limiting the use of certain hazardous substances.

Underwriters Laboratories (North American market)

Converters provided with one of the test symbols on the nameplate displayed fulfill the requirements stipulated for the North American market as a component of drive applications, and are appropriately listed.

UL file number for converters with 1 AC and 3 AC line connection: E192450

Eurasian conformity

The converters fulfill the requirements of the Russia/Belarus/Kazakhstan customs union (EAC).

Australia and New Zealand (RCM formerly C-Tick)

The converters showing the test symbols on the nameplate fulfill the EMC requirements for Australia and New Zealand.

EMC requirements for South Korea

The converters with the KC marking on the nameplate satisfy the EMC requirements for South Korea.

Certificates for download

- EC Declaration of Conformity: (https://support.industry.siemens.com/cs/ww/en/view/109755363)
- Certificates for the relevant directives, prototype test certificates, manufacturer declarations and test certificates for functions relating to functional safety ("Safety Integrated"): (https://support.industry.siemens.com/cs/ww/en/ps/24672/cert)
- Certificates for UL-certified products: (https://iq.ulprospector.com)

Standards that are not relevant

China Compulsory Certification

The converter does not fall in the area of validity of the China Compulsory Certification (CCC).

A.1.2 Guidelines and standards for motors

Standards that are complied with

Note

Dates are not specified for the standards listed in this manual.

You can take the currently relevant and valid dates from the Declaration of Conformity.

SIMOTICS S, SIMOTICS M, SIMOTICS L, SIMOTICS T, SIMOTICS A motors - subsequently called the "SIMOTICS motor series" - comply with the following directives and standards:

- EN 60034-1 - Rotating electrical machines – Dimensioning and operating behavior
- EN 60204-1 - Safety of machinery – Electrical equipment of machines; general requirements

Where applicable, the SIMOTICS motor series are in conformance with the following parts of IEC / EN 60034:

Feature	Standard
Degree of protection	IEC / EN 60034-5
Cooling	IEC / EN 60034-6
Type of construction	IEC / EN 60034-7
Connection designations	IEC / EN 60034-8
Noise emission	IEC / EN 60034-9
Temperature monitoring	IEC / EN 60034-11
Vibration severity levels	IEC / EN 60034-14

Relevant directives

The following directives are relevant for SIMOTICS motors.

European Low-Voltage Directive

SIMOTICS motors comply with the Low-Voltage Directive 2014/35/EU.

SIMOTICS motors do not fall within the area of validity covered by the Machinery Directive.

However, the use of the products in a typical machine application has been fully assessed for compliance with the main regulations in this directive concerning health and safety.

Eurasian conformity

SIMOTICS motors comply with the requirements of the Russia/Belarus/Kazakhstan (EAC) customs union.

Quality systems

Siemens AG employs a quality management system that meets the requirements of ISO 9001 and ISO 14001.

Certificates for download

EC declaration of conformity: (https://support.industry.siemens.com/cs/ww/de/ps/13347/cert)

China RoHS

SIMOTICS motors comply with the China RoHS.

You will find more information at:

China RoHS for 1FK2 and 1FT2 (https://support.industry.siemens.com/cs/ww/en/view/109772626)

China Energy Label

Name of the standard	Minimum allowable values for energy efficiency and energy efficiency class of permanent-magnet synchronous motors (GB30253).
Date of entry into force	July 1, 2020
Affected motors	Permanent-magnet synchronous motors (without incorporated brake) with a rated power of 0.55 kW to 90 kW and a rated speed of 500 r/min to 3000 r/min driven by frequency converter with variable frequency on a power supply below 1000 V.
Motor requirements	As of the implementation date of the guideline, all motors involved must be have the "China Energy Label".
Affected Siemens products	The SIEMENS motors involved are subject to the requirements of Guideline GB30253: SIMOTICS S-1FK2, SIMOTICS S-1FT2, SIMOTICS S-1FS2

Examples of the "China Energy Label" and the motor rating plate:

China Energy Label

Figure A-1 ① Article number (diagram showing a typical 1FK2, is also applicable for 1FT2)

Motor rating plate

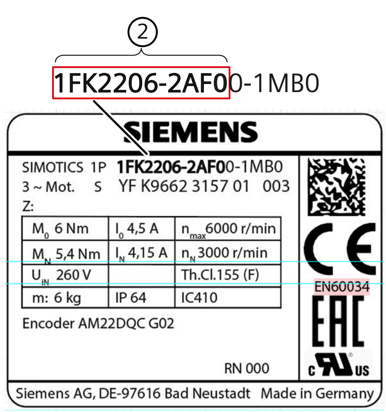


Figure A-2 ② Article number of the basic motor type (diagram showing a typical 1FK2, is also applicable for 1FT2)

Note

The article number ① stated on the China Energy Label corresponds to the article number of the basic motor type ② (boldface type) in the motor article number.

A.2 UL Markings

Converters with 1 AC line connection

Underwriters Laboratories

For US/Canadian installations (UL/cUL): The products are cULus-listed under File E192450.

- Suitable for use in a circuit that cannot provide more than 65 kA rms (symmetrical), max. 240 V.
- Protection of the branch circuit for individual drives must be guaranteed using Class J fuses in accordance with the technical data.
  Protection of the branch circuit for the group installation must be guaranteed using fuses of Class J with up to 30 amps.
  For other protection equipment and SCCRs (Short Circuit Current Rating) for individual drives and group installations, see:
  Protective Devices for SINAMICS S210 (https://support.industry.siemens.com/cs/ww/en/view/109815356)
- This device must be installed in an enclosure that provides an environment with degree of pollution 2 (controlled).
- Maximum ambient air temperature 50 °C.
- The device provides overtemperature and overload protection.
- Use copper wires with a permissible temperature of 75 °C for all power cables. You can also use cables with a higher rated temperature value. It is not permissible to reduce the conductor cross-section.

Converters with 3 AC line connection

Underwriters Laboratories

- For US/Canadian installations (UL/cUL): The products are cULus-listed under File E192450.
- Only for use in 200 ... 240 V or 380 ... 480 V line supplies with grounded neutral point (solidly grounded wye).
- Solid-state motor overload protection: 300% of the FLA motor.
- Suitable for use in a circuit that cannot provide more than 65 kA rms (symmetrical), max. 480 V.
- Protection of the branch circuit for individual drives must be guaranteed using Class J fuses in accordance with the technical data.
  Protection of the branch circuit for the group installation must be guaranteed using fuses of Class J with up to 100 amps.
  For other protection equipment and SCCRs (Short Circuit Current Rating) for individual drives and group installations, see:
  Protective Devices for SINAMICS S210 (https://support.industry.siemens.com/cs/ww/en/view/109815356)

- This device must be installed in an enclosure that provides an environment with degree of pollution 2 (controlled).
- Maximum ambient air temperature 50 °C. Maximum height 4000 m.
- The device provides overtemperature and overload protection.
- Use copper wires with a permissible temperature of 60/75 °C for all power cables. You can also use cables with a higher rated temperature value. It is not permissible to reduce the conductor cross-section.

Additional requirements relating to CSA compliance:

- Maximum height for CSA: 2000 m.

Motor overload protection according to IEC 61800-5-1 Ed.3 / UL 61800-5-1 Ed.2

The converter has a motor overload protection function according to IEC 61800-5-1 Ed.3 or UL 61800-5-1 Ed.2.

You can activate this motor overload protection function for applications involving with high motor loads.

To do this, you must make the following settings after commissioning.

Procedure

Proceed as follows, to activate motor overload protection according to IEC 61800-5-1 Ed.3 / UL 61800-5-1 Ed.2:

1. Set p5375.0 = 1
2. Set p5375.1 = 1

MOTION-CONNECT connection system (OCC cable)

The recommended assignment of motors and cables can be found in the following chapters:

- "Motor-converter combinations for 1FK2 (Page 52)"
- "Motor-converter combinations for 1FT2 (Page 55)"

Other assignments are not possible.

The technical parameters of the cables are tailored to the requirements of the motors and verified by system tests.

The following cables should be used for UL applications.

- Cables with connector size M12 (6FX8002-8QN06-☐☐☐☐, 6FX8002-8QE05-☐☐☐☐) have a cable conductor cross-section of 0.82 mm² (AWG18).
- Cables with connector size M17 have a cable conductor cross-section of 0.82 mm² (AWG18).
- Cables with connector size M23 have a cable conductor cross-section of 1.5 mm² (AWG16) or 2.5 mm² (AWG14).

A.3 EMERGENCY OFF and EMERGENCY STOP

Overview

In plants, systems and machines a distinction must be made between EMERGENCY OFF and EMERGENCY STOP.

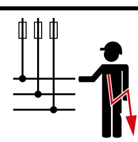
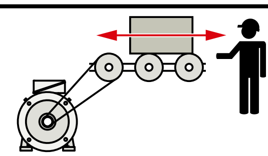
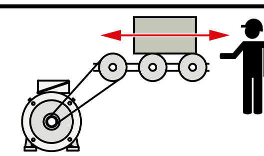
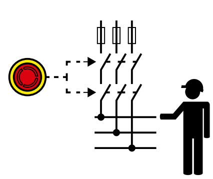
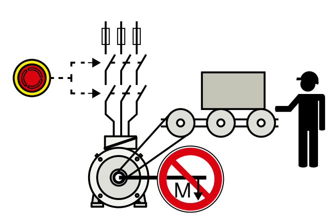
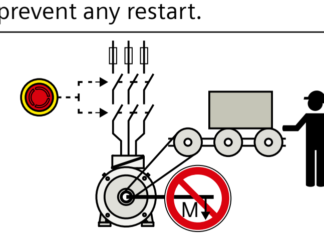
The Safe Torque Off (STO) and Safe Stop 1 (SS1) Safety Integrated Functions are suitable for implementing an EMERGENCY STOP, but are not suitable for implementing an EMERGENCY OFF.

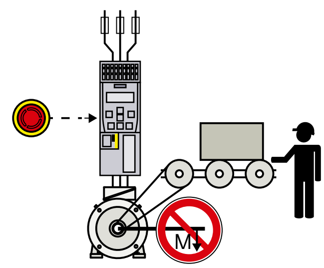
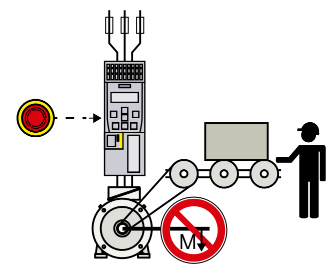
Description of function

IEC 60204-1 defines EMERGENCY OFF and EMERGENCY STOP:

- EMERGENCY OFF and EMERGENCY STOP are actions taken in an emergency.
- EMERGENCY OFF and EMERGENCY STOP reduce different risks in a system or machine:
  - EMERGENCY OFF reduces the risk of electric shock.
  - EMERGENCY STOP reduces the risk of unexpected movement.

Table A-1 The distinction between EMERGENCY OFF and EMERGENCY STOP

Action:	**EMERGENCY OFF**	**EMERGENCY STOP**	**EMERGENCY STOP**
		Stop category 0 according to IEC 60204-1	**Stop category 1 according to IEC 60204-1**
Risk:	 Electric shock	 Unexpected motion	 Motion
Measure to minimize risk:	**Switch off voltage** Switch off hazardous voltages completely or in part	**Prevent movement** Prevent any hazardous movement	**Stop movement** Stop hazardous movement and prevent any restart.
Classic solution:	Switch off the voltage: 	Switch off the power supply of the drive: 	 Brake the motor and switch off the drive power supply

Action:	**EMERGENCY OFF**	**EMERGENCY STOP**	**EMERGENCY STOP**
		Stop category 0 according to IEC 60204-1	**Stop category 1 according to IEC 60204-1**
Solution with the STO or SS1 Safety Integrated Function integrated in the drive:	STO and SS1 are not suitable for switching off an electric voltage.	Select STO: 	Select SS1: 
		If the motor is stationary, then you may also switch off the converter supply voltage. However, switching off the voltage is not required as a risk-reduction measurement.	

A.4 List of abbreviations

Note

The following list of abbreviations includes the abbreviations and meanings used.

Abbreviation	Derivation of abbreviation	Meaning
A...	Alarm	Alarm
AC	Alternating Current	Alternating current
C...	-	Safety message
eCoL	Electronic Certificate of License	Electronic certificate for the licensee of the software verifying that the licensed software can be used
COM	Communication LED	Status display of the communication
COMM	Commissioning	Commissioning
CU	Control Unit	Control Unit
DC	Direct Current	Direct current
DI	Digital Input	Digital input
DO	Drive Object	Drive Object
DP	Decentralized Peripherals	Distributed I/O
DSC	Dynamic Servo Control	Dynamic servo control
EEPROM	Electrically Erasable Programmable Read-Only Memory	Electrically Erasable Programmable Read-Only Memory
EMV	Elektromagnetische Verträglichkeit	Electromagnetic compatibility
EN	Europäische Norm	European standard
F...	Fault	Fault
F-DI	Failsafe Digital Input	Failsafe digital input

Abbreviation	Derivation of abbreviation	Meaning
FAQ	Frequently Asked Questions	Frequently asked questions
GB	Gigabyte	Gigabyte
GSD	Gerätestammdatei	Generic station description file: Describes the features of a PROFIBUS device
HW	Hardware	Hardware
IBN	Inbetriebnahme	Commissioning
ID	Identifier	Identification
IEC	International Electrotechnical Commission	International Electrotechnical Commission
IP	Internet Protocol	Internet protocol
Kp	-	Proportional gain
LED	Light Emitting Diode	Light emitting diode
M	Masse	Reference potential for all signal and operating voltages, usually defined as 0 V (also referred to as GND)
MB	Megabyte	Megabyte
MT	Messtaster	Measuring probe
N...	No Report	No message or internal message (only as part of the alarm list)
NTP	Network Time Protocol	Synchronizes the clocks in computer systems and networks
NVRAM	Non-Volatile Random Access Memory	Non-volatile read/write memory
OBT	One Button Tuning	Function for automatic optimization of drive settings
OCC	One Cable Connection	One cable technology
OEM	Original Equipment Manufacturer	Original Equipment Manufacturer
OSS	Open Source Software	Software with freely available source code
p...	-	Setting parameters
PDS	Power Drive System	Drive system
PE	Protective Earth	Protective ground
PELV	Protective Extra Low Voltage	Safety extra-low voltage
PFH	Probability of dangerous failure per hour	Probability of dangerous failure per hour
PLC	Programmable Logical Controller	Programmable logic controller
PN	PROFINET	PROFINET
PZD	Prozessdaten	Process data
r...	-	Display parameters (read-only)
RAM	Random Access Memory	Memory for reading and writing
RJ45	Registered Jack 45	Term for an 8-pin socket system for data transmission with shielded or non-shielded multi-wire copper cables
ROM	Read-Only Memory	Read-only memory
S1	-	Continuous operation
SAM	Safe Acceleration Monitor	Safe acceleration monitoring
SBC	Safe Brake Control	Safe brake control

Abbreviation	Derivation of abbreviation	Meaning
SBR	Safe Brake Ramp	Safe brake ramp monitoring
SD-Card	SecureDigital Card	Secure digital memory card
SCC	Safety Control Channel	Safety Control Channel
SDI	Safe Direction	Safe motion direction
SI	Safety Integrated	Safety Integrated
SIC	Safety Info Channel	Safety Info Channel
SIL	Safety Integrity Level	Safety integrity level
SLS	Safely-Limited Speed	Safely-limited speed
SP	Service Pack	Service pack
SPS	Speicherprogrammierbare Steuerung	Programmable logic controller
SS1	Safe Stop 1	Safe Stop 1 (time-monitored, ramp-monitored)
SSM	Safe Speed Monitor	Safe feedback from speed monitor
STO	Safe Torque Off	Safe torque off
STW	Steuerwort	Control word
TIA	Totally Integrated Automation	Totally Integrated Automation
Tn	-	Integral time
UL	Underwriters Laboratories Inc.	Underwriters Laboratories Inc.
UMAC	User Management and Access Control	User management and access control
UTC	Universal Time Coordinated	Universal time coordinated
Vdc	-	DC link voltage
VDE	Verband Deutscher Elektrotechniker	Association of German Electrical Engineers
ZSW	Zustandswort	Status word

More information

SINAMICS:
www.siemens.com/sinamics

SIMOTICS:
www.siemens.com/simotics