

Altivar Solar ATV320

Variable Speed Drives for pumps with photovoltaic arrays

User Manual

PKR47019.03
11/2024



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Safety Information

Safety Information

Important Information

Read these instructions carefully, and look at the equipment to become familiar with the device before trying to install, operate, service, or maintain it. The following special messages may appear throughout this documentation or on the equipment to warn of potential hazards or to call attention to information that clarifies or simplifies a procedure.



The addition of this symbol to a “Danger” or “Warning” safety label indicates that an electrical hazard exists which will result in personal injury if the instructions are not followed.



This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.

⚠ DANGER
DANGER indicates a hazardous situation which, if not avoided, will result in death or serious injury.

⚠ WARNING
WARNING indicates a hazardous situation which, if not avoided, could result in death or serious injury.

⚠ CAUTION
CAUTION indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.

NOTICE
NOTICE is used to address practices not related to physical injury.

Please Note

Electrical equipment should be installed, operated, serviced, and maintained only by qualified personnel. No responsibility is assumed by Schneider Electric for any consequences arising out of the use of this material.

A qualified person is one who has skills and knowledge related to the construction and operation of electrical equipment and its installation, and has received safety training to recognize and avoid the hazards involved.

Qualification of Personnel

Only appropriately trained persons who are familiar with and understand the contents of this manual and all other pertinent product documentation are authorized to work on and with this product. In addition, these persons must have received safety training to recognize and avoid hazards involved. These persons must have sufficient technical training, knowledge and experience and be able to foresee and detect potential hazards that may be caused by using the product, by changing the settings and by the mechanical, electrical and electronic equipment of the entire system in which the product is used. All persons working on and with the product must be fully familiar with all applicable standards, directives, and accident prevention regulations when performing such work.

Intended Use

This product is intended for industrial use according to this manual.

The product may only be used in compliance with all applicable safety standard and local regulations and directives, the specified requirements and the technical data. The product must be installed outside the hazardous ATEX zone. Prior to using the product, you must perform a risk assessment in view of the planned application. Based on the results, the appropriate safety measures must be implemented. Since the product is used as a component in an entire system, you must ensure the safety of persons by means of the design of this entire system (for example, machine design). Any use other than the use explicitly permitted is prohibited and can result in hazards.

Product Related Information

Read and understand these instructions before performing any procedure with this drive.

DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION OR ARC FLASH

- Only appropriately trained persons who are familiar with and fully understand the contents of the present manual and all other pertinent product documentation and who have received all necessary training to recognize and avoid hazards involved are authorized to work on and with this drive system.
- Installation, adjustment, repair and maintenance must be performed by qualified personnel.
- Verify compliance with all local and national electrical code requirements as well as all other applicable regulations with respect to grounding of all equipment.
- Only use properly rated, electrically insulated tools and measuring equipment.
- Do not touch unshielded components or terminals with voltage present.
- Prior to performing any type of work on the drive system, block the motor shaft to prevent rotation.
- Insulate both ends of unused conductors of the motor cable.
- Do not short across the DC bus terminals or the DC bus capacitors or the braking resistor terminals.

Failure to follow these instructions will result in death or serious injury.

DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

Before performing work on the drive system:

- Disconnect all power, including external control power that may be present. Take into account that the circuit breaker or main switch does not de-energize all circuits.
- Place a "Do Not Turn On" label on all power switches related to the drive system.
- Lock all power switches in the open position.
- Wait 15 minutes to allow the DC bus capacitors to discharge.
- Verify the absence of voltage. (1)

Before applying voltage to the drive system:

- Verify that the work has been completed and that the entire installation cannot cause hazards.
- If the mains input terminals and the motor output terminals have been grounded and short-circuited, remove the ground and the short circuits on the mains input terminals and the motor output terminals.
- Verify proper grounding of all equipment.
- Verify that all protective equipment such as covers, doors, grids is installed and/or closed.

Failure to follow these instructions will result in death or serious injury.

(1) Refer to the Verify the Absence of Voltage section, page 17.

Damaged products or accessories may cause electric shock or unanticipated equipment operation.

 **DANGER**

ELECTRIC SHOCK OR UNANTICIPATED EQUIPMENT OPERATION

Do not use damaged products or accessories.

Failure to follow these instructions will result in death or serious injury.

Contact your local Schneider Electric sales office if you detect any damage whatsoever.

This equipment has been designed to operate outside of any hazardous location. Only install this equipment in zones known to be free of a hazardous atmosphere.

 **DANGER**

POTENTIAL FOR EXPLOSION

Install and use this equipment in non-hazardous locations only.

Failure to follow these instructions will result in death or serious injury.

Your application consists of a whole range of different interrelated mechanical, electrical, and electronic components, the drive being just one part of the application. The drive by itself is neither intended to nor capable of providing the entire functionality to meet all safety-related requirements that apply to your application. Depending on the application and the corresponding risk assessment to be conducted by you, a whole variety of additional equipment is required such as, but not limited to, external encoders, external brakes, external monitoring devices, guards, etc. As a designer/manufacturer of machines, you must be familiar with and observe all standards that apply to your machine. You must conduct a risk assessment and determine the appropriate Performance Level (PL) and/or Safety Integrity Level (SIL) and design and build your machine in compliance with all applicable standards. In doing so, you must consider the interrelation of all components of the machine. In addition, you must provide instructions for use that enable the user of your machine to perform any type of work on and with the machine such as operation and maintenance in a safe manner. The present document assumes that you are fully aware of all normative standards and requirements that apply to your application. Since the drive cannot provide all safety-related functionality for your entire application, you must ensure that the required Performance Level and/or Safety Integrity Level is reached by installing all necessary additional equipment.

▲ WARNING
<p>INSUFFICIENT PERFORMANCE LEVEL/SAFETY INTEGRITY LEVEL AND/OR UNINTENDED EQUIPMENT OPERATION</p> <ul style="list-style-type: none"> • Conduct a risk assessment according to EN ISO 12100 and all other standards that apply to your application. • Use redundant components and/or control paths for all critical control functions identified in your risk assessment. • Verify that the service life of all individual components used in your application is sufficient for the intended service life of your overall application. • Perform extensive commissioning tests for all potential error situations to verify the effectiveness of the safety-related functions and monitoring functions implemented, for example, but not limited to, speed monitoring by means of encoders, short circuit monitoring for all connected equipment, correct operation of brakes and guards. • Perform extensive commissioning tests for all potential error situations to verify that the load can be brought to a safe stop under all conditions. <p>Failure to follow these instructions can result in death, serious injury, or equipment damage.</p>

Product may perform unexpected movements because of incorrect wiring, incorrect settings, incorrect data or other errors.

▲ WARNING
<p>UNANTICIPATED EQUIPMENT OPERATION</p> <ul style="list-style-type: none"> • Carefully install the wiring in accordance with the EMC requirements. • Do not operate the product with unknown or unsuitable settings or data. • Perform a comprehensive commissioning test. <p>Failure to follow these instructions can result in death, serious injury, or equipment damage.</p>

⚠ WARNING**LOSS OF CONTROL**

- The designer of any control scheme must consider the potential failure modes of control paths and, for critical control functions, provide a means to achieve a safe state during and after a path failure. Examples of critical control functions are emergency stop, overtravel stop, power outage and restart.
- Separate or redundant control paths must be provided for critical control functions.
- System control paths may include communication links. Consideration must be given to the implications of unanticipated transmission delays or failures of the link.
- Observe all accident prevention regulations and local safety guidelines (1).
- Each implementation of the product must be individually and thoroughly tested for proper operation before being placed into service.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

(1) For USA: Additional information, refer to NEMA ICS 1.1 (latest edition), Safety Guidelines for the Application, Installation, and Maintenance of Solid State Control and to NEMA ICS 7.1 (latest edition), Safety Standards for Construction and Guide for Selection, Installation and Operation of Adjustable-Speed Drive Systems.

The temperature of the products described in this manual may exceed 80 °C (176 °F) during operation.

⚠ WARNING**HOT SURFACES**

- Ensure that any contact with hot surfaces is avoided.
- Do not allow flammable or heat-sensitive parts in the immediate vicinity of hot surfaces.
- Verify that the product has sufficiently cooled down before handling it.
- Verify that the heat dissipation is sufficient by performing a test run under maximum load conditions.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

NOTICE**DESTRUCTION DUE TO INCORRECT MAINS VOLTAGE**

Before switching on and configuring the product, verify that it is approved for the mains voltage.

Failure to follow these instructions can result in equipment damage.

About the Book

Document Scope

The purpose of this document is to provide the commissioning information for the ATV320 Solar product.

This will show you basic actions:

1. How to install and wire the drive.
2. How to start the drive.

For more detailed technical information, you need to download the ATV320 Installation manual and ATV320 programming manual.

To prepare the installation and purchase order, you can use the ATV solar sizer software, available on www.se.com.

Validity Note

Original instructions and information given in the present document have been written in English (before optional translation).

This documentation is valid for the Altivar Solar ATV320 drives.

The characteristics of the products described in this document are intended to match the characteristics that are available on www.se.com. As part of our corporate strategy for constant improvement, we may revise the content over time to enhance clarity and accuracy. If you see a difference between the characteristics in this document and the characteristics on www.se.com, consider www.se.com to contain the latest information.

Step	Action
1	Go to the Schneider Electric home page www.se.com .
2	In the Search box type the reference of the product or the name of a product range. <ul style="list-style-type: none"> • Do not include blank spaces in the reference or product range. • To get information on grouping similar modules, use asterisks (*).
3	If you entered a reference, go to the Product Datasheets search results and click on the reference that interests you. If you entered the name of a product range, go to the Product Ranges search results and click on the product range that interests you.
4	If more than one reference appears in the Products search results, click on the reference that interests you.
5	Depending on the size of your screen, you may need to scroll down to see the data sheet.
6	To save or print a data sheet as a .pdf file, click Download XXX product datasheet .

Information on Non-Inclusive or Insensitive Terminology

As a responsible, inclusive company, Schneider Electric is constantly updating its communications and products that contain non-inclusive or insensitive

terminology. However, despite these efforts, our content may still contain terms that are deemed inappropriate by some customers.

Related Documents

Use your tablet or your PC to quickly access detailed and comprehensive information on all our products on www.se.com.

The internet site provides the information you need for products and solutions:

- The whole catalog for detailed characteristics and selection guides,
- The CAD files to help design your installation, available in over 20 different file formats,
- All software and firmware to maintain your installation up to date,
- A large quantity of White Papers, Environment documents, Application solutions, Specifications... to gain a better understanding of our electrical systems and equipment or automation,
- And finally all the User Guides related to your drive, listed below:

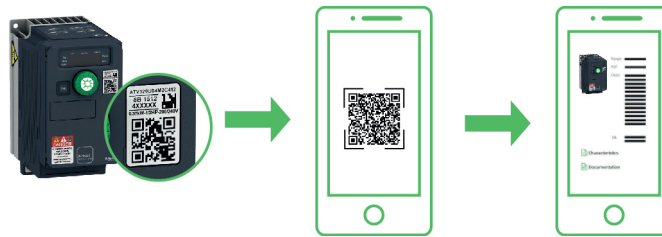
Title of Documentation	Reference Number
ATV320 Solar Catalog	DIA2ED2231101EN (English), DIA2ED2231101FR (French)
ATV320 Solar Getting Started	PKR42507 (English and French)
ATV320 Solar Getting Started Annex (SCCR)	PKR39141 (English)
Video: ATV320 Solar Getting Started	FAQ000257728 (English)
ATV320 Solar User Manual	PKR47019 (English), PKR47020 (French)
ATV320 Installation manual	NVE41289 (English), NVE41290 (French), NVE41291 (German), NVE41292 (Spanish), NVE41293 (Italian), NVE41294 (Chinese), NVE41289PT (Portuguese), NVE41289TR (Turkish)
ATV320 Programming manual	NVE41295 (English), NVE41296 (French), NVE41297 (German), NVE41298 (Spanish), NVE41299 (Italian), NVE41300 (Chinese)
ATV320 Modbus Serial Link manual (embedded)	NVE41308 (English)
ATV320 Modbus TCP - Ethernet IP manual (VW3A3616)	NVE41313 (English)
ATV320 Communication Parameters	BQT67538 (English)
ATV312 to ATV320 Migration Manual	QGH39563 (English)
ATV320 Safety Functions manual	NVE50467 (English), NVE50468 (French), NVE50469 (German), NVE50470 (Spanish), NVE50472 (Italian), NVE50473 (Chinese)
BMP Synchronous Motor manual	0198441113981-EN (English), 0198441113982-FR (French), 0198441113980-DE (German), 0198441113984-ES (Spanish), 0198441113983-IT (Italian), 0198441113985-ZH (Chinese)
ATV320 ATV Logic manual	NVE71954 (English), NVE71955 (French), NVE71957 (German), NVE71959 (Spanish), NVE71958 (Italian), NVE71960 (Chinese)
ATV320 ATEX manual	NVE41307 (English)
SoMove: FDT	SoMove_FDT (English, French, German, Spanish, Italian, Chinese)
ATV320: DTM	ATV320_DTM_Library (English, French, German, Spanish, Italian, Chinese)
Recommended Cybersecurity Best Practices	CS-Best-Practices-2019-340 (English)

(Other option manuals and Instruction sheets are available on www.se.com)

You can download these technical publications and other technical information from our website at www.se.com/en/download.

Electronic product data sheet

Scan the QR code in front of the drive to get the product data sheet.



Terminology

The technical terms, terminology, and the corresponding descriptions in this manual normally use the terms or definitions in the relevant standards.

In the area of drive systems this includes, but is not limited to, terms such as **error**, **error message**, **failure**, **fault**, **fault reset**, **protection**, **safe state**, **safety function**, **warning**, **warning message**, and so on.

Among others, these standards include:

- IEC 61800 series: Adjustable speed electrical power drive systems
- IEC 61508 Ed.2 series: Functional safety of electrical/electronic/programmable electronic safety-related
- EN 954-1 Safety of machinery - safety-related parts of control systems
- ISO 13849-1 & 2 Safety of machinery - safety related parts of control systems
- IEC 61158 series: Industrial communication networks - Fieldbus specifications
- IEC 61784 series: Industrial communication networks - Profiles
- IEC 60204-1: Safety of machinery - Electrical equipment of machines – Part 1: General requirements
- IEC 62443: Security for industrial automation and control systems

In addition, the term **zone of operation** is used in conjunction with the description of specific hazards, and is defined as it is for a **hazard zone** or **danger zone** in the EC Machinery Directive (2006/42/EC) and in ISO 12100-1.

Contact us

Select your country on www.se.com/contact.

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Altivar Solar Sizer Tool

The free dedicated software Altivar Solar Sizer will help you:

- size the solar array.
- check the compatibility with the pump and the drive.
- choose the appropriate Altivar Solar reference.
- define the drive's parameters.

Refer to the **Altivar Solar Sizer** on se.com for more information.

☀️
Altivar Solar Selection tool V1.0
English ▾

Grid setting

Compatibility with grid
230 V Grid voltage

Solar panel setting

420 Wc Maximum power
52 Vdc Open circuit voltage (Voc)
41 Vdc Maximum power voltage (Vmpp)
10 A Maximum power current (Impp)
10,5 A Short circuit current (Isc)

Operating margining
10% Margining (PV-Vmot+%)

Irradiance
1000 W/m² Irradiance nominal
400 W/m² Irradiance min

Temperature
20 °C Nominal operating Cell temp.
40 °C Max operating temperature
-0,33 %/°C Temperature coef. of Voc
0,05 %/°C Temperature coef. of Isc
-0,41 %/°C Temperature coef. of Pmax

Sizing as ATV312 (advised)
 Centered inside ATV320 voltage range
 Minimized quantity of panel

Grid ✓

Solar Panels ✓
7 Panel(s) by string
1 string(s)
7 x

VSD ✓
Variable Speed Drive
ATV320U15M3C412
8 A Courant max permanent
1,5 kW Puissance max permanent

Tank

Pump

Moteur ✓

VSD setting

[DRIVE] - Drive menu
[CONF] - Configuration menu
[FULL] - Full menu
[SUN] - Sun menu
Low voltage assign
LDCA= No
[DRC] - Motor Control menu
Motor nameplate
NPR= 1,5 kW
UN5= 230 V
NCR= 7,8 A
NSP= 2830 rpm
FRS= 50 Hz

Pump selection

2800 rpm Rated speed
27 m H@0m³/h
180 m³/h Q@0m
20 m H (rated head)
100 m³/h

Motor setting

1,5 kW Rated power
230 V Rated voltage
7,8 A Rated current
0,72 Cos Phi
50 Hz Rated Frequency
2830 tr/min Rated speed

For more information...

All informations about use of sizer are available on Solar Sizer guide available on Schneider-Electric.com
If you need more help about sizing, please contact your local SE support

Be sure to use latest version of Solar Sizer official release on SE.com

Inspect the drive

Remove ATV320 drive from the packaging and check that it has not been damaged.

Damaged products or accessories may cause electric shock or unanticipated equipment operation.

DANGER

ELECTRIC SHOCK OR UNANTICIPATED EQUIPMENT OPERATION

Do not use damaged products or accessories.

Failure to follow these instructions will result in death or serious injury.

Contact your local Schneider Electric sales office if you detect any damage whatsoever.

Verifying the Absence of Voltage

Instructions

The DC bus voltage level is determined by measuring the voltage between the DC bus terminals PA/+ and PC/-.

The location of the DC bus terminals depends on the drive model.

Identify your drive model by referring to the nameplate of the drive.


Read and understand these instructions before performing any procedure with this drive.

DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION OR ARC FLASH

- Only appropriately trained persons who are familiar with and fully understand the contents of the present manual and all other pertinent product documentation and who have received all necessary training to recognize and avoid hazards involved are authorized to work on and with this drive system.
- Installation, adjustment, repair and maintenance must be performed by qualified personnel.
- Verify compliance with all local and national electrical code requirements as well as all other applicable regulations with respect to grounding of all equipment.
- Only use properly rated, electrically insulated tools and measuring equipment.
- Do not touch unshielded components or terminals with voltage present.
- Prior to performing any type of work on the drive system, block the motor shaft to prevent rotation.
- Insulate both ends of unused conductors of the motor cable.
- Do not short across the DC bus terminals or the DC bus capacitors or the braking resistor terminals.

Failure to follow these instructions will result in death or serious injury.

 **DANGER**

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

Before performing work on the drive system:

- Disconnect all power, including external control power that may be present. Take into account that the circuit breaker or main switch does not de-energize all circuits.
- Place a “Do Not Turn On” label on all power switches related to the drive system.
- Lock all power switches in the open position.
- Wait 15 minutes to allow the DC bus capacitors to discharge.
- Verify the absence of voltage. (1)

Before applying voltage to the drive system:

- Verify that the work has been completed and that the entire installation cannot cause hazards.
- If the mains input terminals and the motor output terminals have been grounded and short-circuited, remove the ground and the short circuits on the mains input terminals and the motor output terminals.
- Verify proper grounding of all equipment.
- Verify that all protective equipment such as covers, doors, grids is installed and/or closed.

Failure to follow these instructions will result in death or serious injury.

(1) Refer to the procedure in the present document., page 18.

Procedure

Perform the following actions to verify the absence of voltage

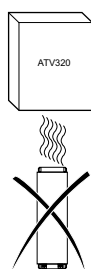
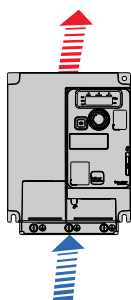
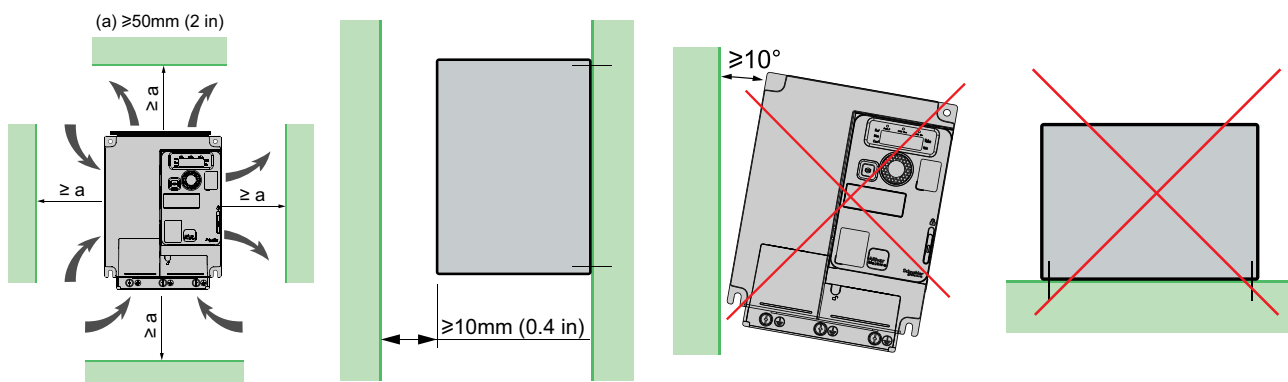
Step	Action
1	Measure the voltage on the DC bus between the DC bus terminals (PA/+ and PC/-) using a properly rated voltmeter to verify that the voltage is less than 42 Vdc
2	If the DC bus capacitors do not discharge properly, contact your local Schneider Electric representative. Do not repair or operate the product.
3	Verify that no other voltage is present in the drive system.

Getting started your Altivar Solar ATV320

Follow this getting started only with solar applications.

1. Mounting the drive

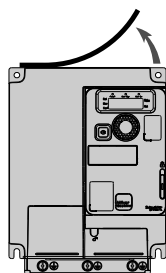
The drive is designed to be used in a controlled indoor environment for a surrounding air temperature up to 50°C (122°F).



Respect the minimum clearances so that the cooling air can circulate from the bottom to the top of the drive.

Do not install the drive above heating elements.

When IP20 protection is adequate, we recommend that the vent cover on the top of the drive be removed, as shown below:



See ATV320 installation manual for other thermal conditions.

For other topics about mounting the drive, refer to the chapter Mounting the drive, page 64.

2. Wiring the drive

To wire the drive, see the general wiring diagram, refer to the chapter General Wiring Diagram, page 71.

For other topics about wiring, refer to the part Drive wiring, page 70.

3. Set pump parameters

Refer to the motor/pump Nameplate to set the following parameters in **[Simply start] S i n** menu.

Example of a motor/pump nameplate:

Nameplate with **Nominal motor power n P r**

Type:	T max 35°C	
Model:		
Serial no.:		
Q(m3/min) 4.5	Qmin -	Qmax 6.5
H(m) 11.8	Hmin -	Hmax 22.5
230V (u n S)	2.6A (n c r)	2860 tr/min (n S P)
0.37kW (n P r)	50Hz (F r S)	IP-68 10.9 kg

Nameplate with **Motor 1 Cosinus Phi C o S**

Type:	T max 35°C	
Model:		
Serial no.:		
Q(m3/min) 4.5	Qmin -	Qmax 6.5
H(m) 11.8	Hmin -	Hmax 22.5
230V (u n S)	2.6A (n c r)	2860 tr/min (n S P)
cos φ 0.64 (c o S)	50Hz (F r S)	IP-68 10.9 kg

Step	Action
1	Check that the [Macro Config] C F G is set to [Solar Application] S u n .
2	Configure the standard frequency of the motor/pump [Motor Standard] b F r .
3	Configure the nominal power of the motor/pump [Nominal Motor Power] n P r . If the [Nominal Motor Power] n P r is not provided on the nameplate, follow this procedure: 1. Set [Motor param choice] n P C to [Motor 1 Cosinus Phi] C o S . 2. Configure the cos φ of the motor/pump [Motor 1 Cosinus Phi] C o S .
4	Configure the nominal motor voltage of the motor/pump [Nom Motor Voltage] u n S .
5	Configure the nominal current of the motor/pump [Nom Motor Current] n C r .
6	Configure the nominal frequency of the motor/pump [Nominal Motor Freq] F r S .
7	Configure the nominal speed of the motor/pump [Nominal Motor Speed] n S P .
8	<p>This step must be performed with the grid or at maximum sunlight.</p> <p>Once all these parameters are set, you will have to perform an autotuning procedure allowing the drive to refine the motor characteristics using the [Autotuning] t u n parameter.</p> <p>This will generate a small noise in the motor which is totally normal.</p> <div style="border: 1px solid black; padding: 5px; text-align: center;"> <p>⚠ WARNING</p> <p>UNEXPECTED MOVEMENT</p> <p>Autotuning moves the motor in order to tune the control loops.</p> <ul style="list-style-type: none"> Only start the system if there are no persons or obstructions in the zone of operation. <p>Failure to follow these instructions can result in death, serious injury, or equipment damage.</p> </div> <p>During autotuning, noise development and oscillations of the system are normal.</p> <div style="border: 1px solid black; padding: 5px; text-align: center;"> <p>⚠ WARNING</p> <p>LOSS OF CONTROL</p> <ul style="list-style-type: none"> If you modify the value of one or more motor parameters after having performed autotuning, the value of [Tune selection] S t u n is reset to [Default] t A b and you must re-perform autotuning. <p>Failure to follow these instructions can result in death, serious injury, or equipment damage.</p> </div>
9	Configure the thermal monitoring current (A) of the motor/pump [Motor Th Current] i t H .
10	Configure the acceleration of the motor/pump [Acceleration] A C C .
11	Configure the deceleration of the motor/pump [Deceleration] d E C .

4. [Low Voltage Assign] L_{dCR} Activation

NOTICE

DESTRUCTION OF DRIVE INPUT BRIDGE

If the product is used with both panel and grid supplies, the parameter **[Low Voltage Assign] L_{dCR}** must be assigned to a digital input to disable the extended voltage range when the supply is switched to grid.

Failure to follow these instructions can result in equipment damage.

In **[Sun] S_{un}** menu, access to the **[Low Voltage Assign] L_{dCR}** parameter and set it to **[Yes] $Y E 5$** .

For more information about **[Low Voltage Assign] L_{dCR}** , refer to Other **[SUN]** parameters, page 121.

5. Define the minimum pump speed and check the pump running way (reverse or forward)

NOTE: The instructions given in the following table only apply in optimum sunlight conditions, allowing the pump to operate at its nominal speed.

Step	Action
1	Increase [Low Speed] L_{SP} step by step until the water appears.
2	Switch off S1 and the DC switch disconnecter.
3	Follow the procedure <i>Verifying the Absence of Voltage</i> , page 17.
4	Invert pump wiring U and V.
5	Switch on the DC switch disconnecter then S1 to start the pump.
6	Set [Low Speed] L_{SP} to 0. Increase [Low Speed] L_{SP} to step by step until the water appears.
7	If the value of [Low Speed] L_{SP} in the step 6 is: <ul style="list-style-type: none"> lower than the value of [Low Speed] L_{SP} in the step 1, keep this wiring in the step 6. higher than the value of [Low Speed] L_{SP} in the step 1, keep this wiring in the step 1.

6. Process Underload Condition

A process underload condition occurs when the pump impeller is not totally submerged. Working in process underload during a long time can cause premature wear of the pump impeller.

For more information, refer to **[Process underload] u_{Ld-}** , page 118.

Technical Data

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Environment Data

Environment Conditions

NOTE: The drive is designed to be used in a controlled indoor environment.

Degree of protection	IEC 60529	IP20	
Pollution degree	IEC 61800-5-1	Level 2	
Chemical class	IEC 60721-3-2	Transport	class 2C3
	IEC 60721-3-1	Storage	Class 1C3
	IEC 60721-3-3	Operation	Class 3C3
Mechanical class	IEC 60721-3-2	Transport	class 2S1
	IEC 60721-3-1	Storage	Class 1S2
	IEC 60721-3-3	Operation	Class 3S2
Vibration resistance	IEC 60068-2-6	Maximum deflection under vibratory	1.5 mm peak to peak at 2 to 13 Hz
		Maximum acceleration under vibratory load	10 m/s ² (1g) at 13 to 200 Hz
Shock resistance	IEC 60068-2-27	Maximum acceleration under shock load	150 m/s ² (15 g) at 11 ms
Maximum relative humidity	IEC 60068-2-3	5...95% without condensation or dripping water	
Ambient temperature around the unit at transport/storage	-	-25...70 °C (-13...158 °F)	-
Ambient temperature around the unit in operation	-	-10...50 °C (14...122 °F)	No derating
		up to 60 °C (up to 140 °F)	Derate current by 2% each °C (1.8 °F)
Maximum operating altitude	IEC60947-1	0...1000m (0...3300ft)	No derating
		1000...3000m (3300...9840ft)	Derate current by 1% each additional 100m (330ft)
Operating position	-	Vertical at ± 10°	

Mains Supply in Function of the System Earthing Arrangement According to the Altitude

Mains voltage	System earthing arrangement	Supply source overvoltage category required according to altitude	
		Up to 2000 m (6600 ft)	From 2000 m to 3000 m (6600 ft to 9840 ft)
208...480 Vac	TT or TN	OVC III	OVC III
	IT or Corner-Grounded	OVC III	OVC II
480...600 Vac	TT or TN	OVC III	OVC II
	IT or Corner-Grounded	OVC III	OVC II
600...690 Vac	TT or TN	OVC III	OVC II
	IT or Corner-Grounded	OVC II	-

The supply source overvoltage category could be reduced by using an appropriate system such as an insulation transformer.

Green Premium™

Description

Information on the environmental impact of products, their resource efficiency, and end-of-life instructions.

Easy access to information: "Check Your Product"

Certificates and relevant product information available at the address:

www.se.com/green-premium

You can download RoHS and REACH compliance declarations, Product Environmental Profiles (PEP) and End-of-Life instructions (EoLi).

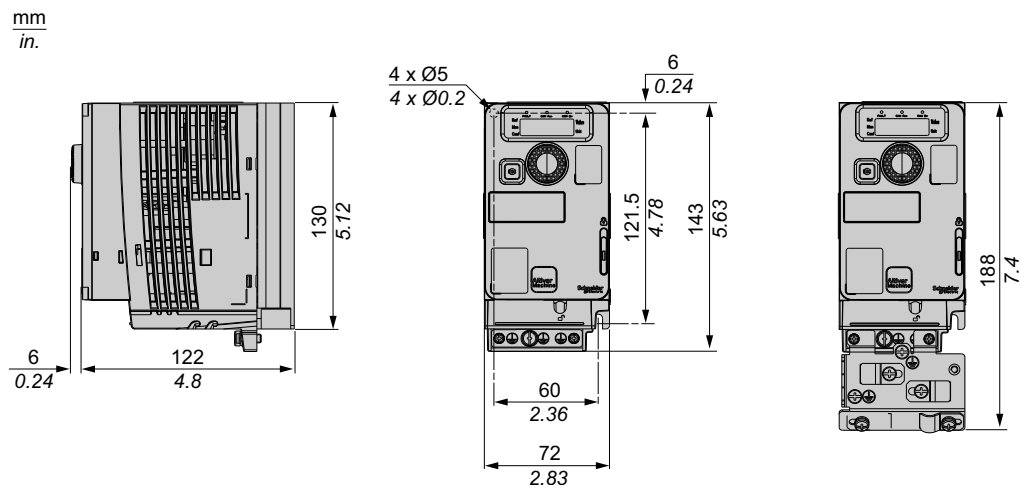
Dimensions and Weights

About the drawings

All drawings CAD files can be downloaded from www.se.com

NOTE: When designing your installation, please take into account that all depth values should be increased by 40 mm (1.58 in) when using the additional slot option. This option module takes place between the Graphic display Terminal and the drive, causing the depth value to be increased. It makes it possible to connect an option module.

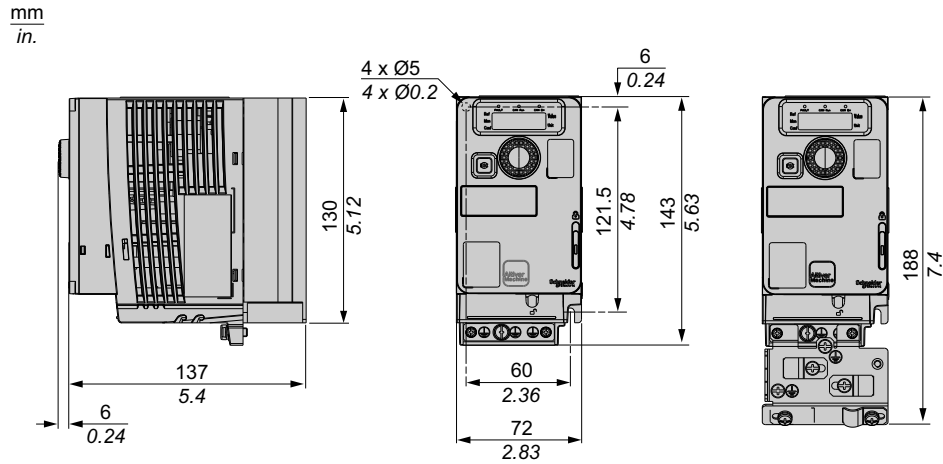
ATV320U04M2C412



Weights

Catalog Number	Weight in kg (lb)
ATV320U04M2C412	1.0 (2.2)

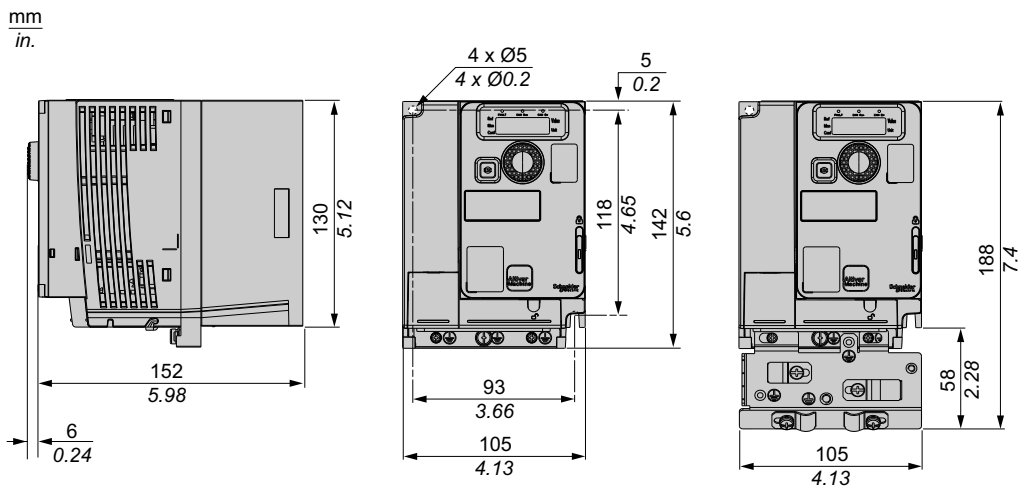
ATV320U06M2C412, ATV320U07M2C412



Weights

Catalog Number	Weight in kg (lb)
ATV320U06M2C412, ATV320U07M2C412	1.10 (2.42)

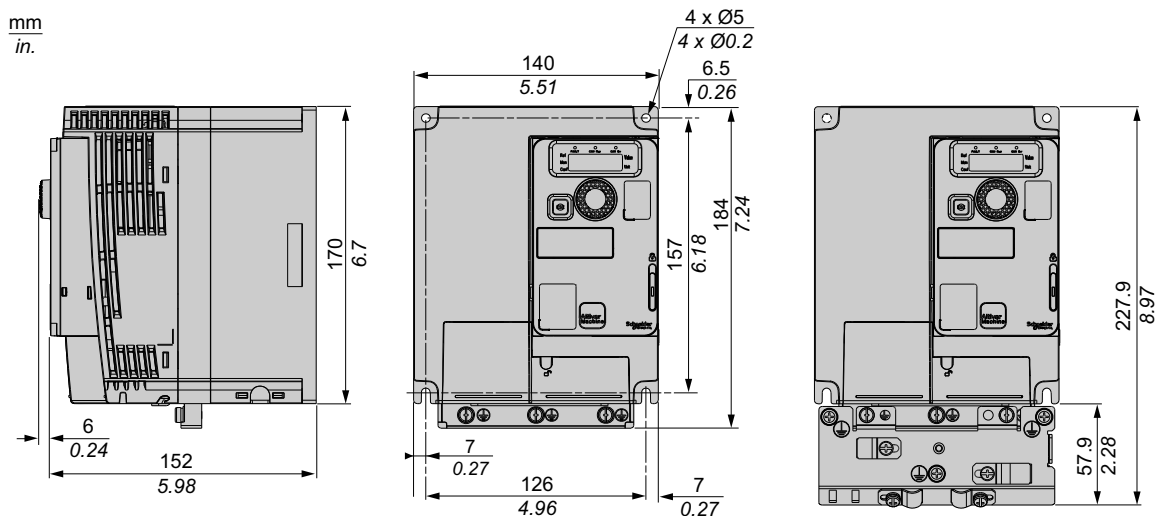
ATV320U11M2C412...ATV320U22M2C412, ATV320U04N4C412...ATV320U15N4C412



Weights

Catalog Number	Weight in kg (lb)
ATV320U04N4C412...U07N4C412	1.2 (2.6)
ATV320U11N4C412, U15N4C412	1.3 (2.9)
ATV320U11M2C412...U22M2C412	1.6 (3.5)

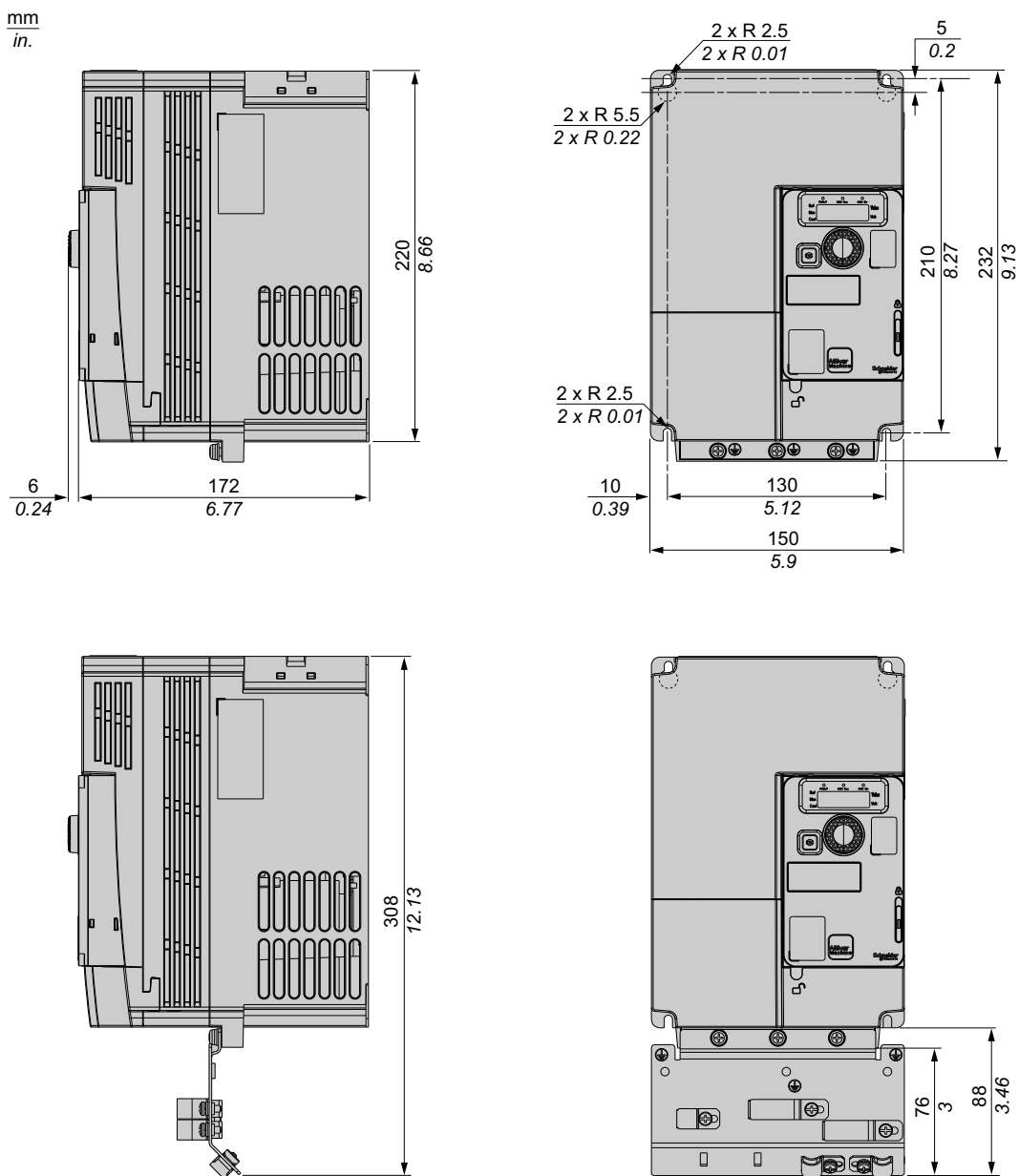
ATV320U30M3C and ATV320U40M3C, ATV320U22N4C... ATV320U40N4C



Weights

Catalog Number	Weight in kg (lb)
ATV320U22N4C412, ATV320U30N4C412	2.1 (4.6)
ATV320U30M3C412, ATV320U40M3C412, ATV320U40N4C412	2.2 (4.8)

ATV320U55M3C412, ATV320U75M3C412, ATV320U55N4C412, ATV320U75N4C412

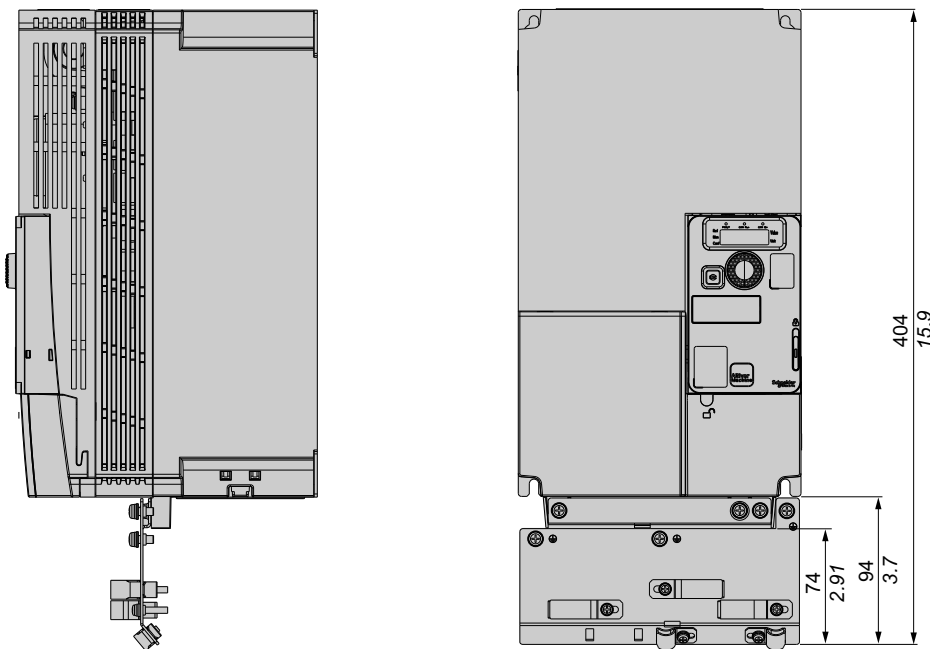
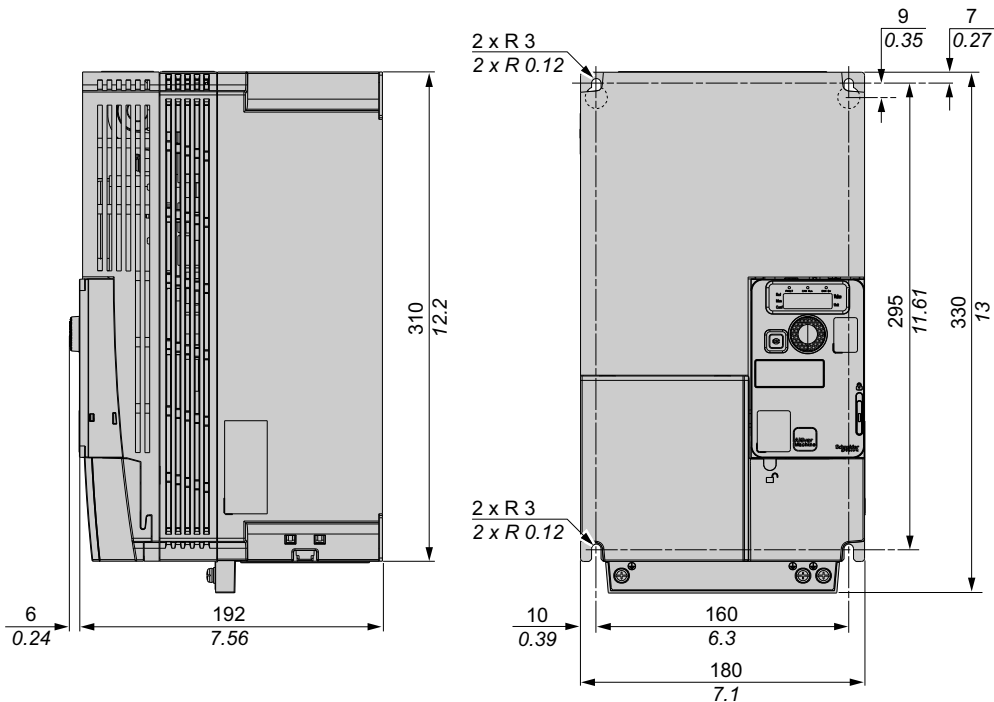


Weights

Catalog Number	Weight in kg (lb)
ATV320U55•C412	3.5 (7.7)
ATV320U75•C412	3.6 (7.9)

ATV320D11M3C412, ATV320D15M3C412, ATV320D11N4C412, ATV320D15N4C412

mm
in.



Weights

Catalog Number	Weight in kg (lb)
ATV320D11•C412	6.8 (15.0)
ATV320D15•C412	6.9 (15.2)

Electrical Data - Drive Ratings

ATV320•M•C412

Power and Current Ratings

- **M2C:** Single phase supply voltage: 200 (-15%)...240 (+10%)V 50/60 Hz
- **M3C:** 3-phase supply voltage: 200 (-15%)...240 (+10%)V 50/60 Hz

Catalog Number	Nominal Power (1)		Power Part Supply				Drive (output)	
			Max. Input Current		Apparent Power	Max. Inrush Current (2)	Nominal Current (1)	Max. Transient current (1) (3)
			At 200 Vac	At 240 Vac				
	kW	HP	A	A	kVA	A	A	A
ATV320U04M2C412	0.37	0.5	6.0	5.0	1.2	9.6	3.3	5.0
ATV320U06M2C412	0.55	0.75	7.8	6.6	1.6	9.6	3.7	5.6
ATV320U07M2C412	0.75	1.0	10.1	8.5	2.0	9.6	4.8	7.2
ATV320U11M2C412	1.1	1.5	13.6	11.5	2.8	19.1	6.9	10.4
ATV320U15M2C412	1.5	2.0	17.6	14.8	3.6	19.1	8.0	12.0
ATV320U22M2C412	2.2	3.0	23.9	20.1	4.8	19.1	11.0	16.5
ATV320U30M3C412	3.0	4.1	18.7	15.7	6.5	28.7	13.7	20.6
ATV320U40M3C412	4.0	5.0	23.8	19.9	8.3	28.7	17.5	23.6
ATV320U55M3C412	5.5	7.5	35.4	29.8	12.4	35.2	27.5	41.3
ATV320U75M3C412	7.5	10.0	45.3	38.2	15.9	35.2	33.0	49.5
ATV320D11M3C412	11.0	15.0	60.9	51.4	21.4	66.7	54.0	81.0
ATV320D15M3C412	15.0	20.0	79.7	67.1	27.9	66.7	66.0	99.0

- (1) The switching frequency is adjustable from 2...16 kHz, rated value: 4 kHz.
 For operation at switching frequencies higher than the rated value, derating must be applied to the drive (output) current, page 33. In this case, switching frequency can be reduced if an excessive temperature rise occurs.
- (2) Peak current when power is switched On, for the maximum supply mains voltage.
- (3) The drive is designed to run up to 60s at 150% of nominal current.

ATV320•N4C412

Power and Current Ratings

3-phase supply voltage: 380 (-15%)...500 (+10%) Vac 50/60 Hz

Catalog Number	Nominal Power (1)		Power Part Supply				Drive (output)	
			Max. Input Current		Apparent Power	Max. Inrush Current (2)	Nominal Current (1)	Max. Transient current (1) (3)
			At 380 Vac	At 500 Vac				
	kW	HP	A	A	kVA	A	A	A
ATV320U04N4C412	0.37	0.5	2.1	1.6	1.4	10.0	1.5	2.3
ATV320U06N4C412	0.55	0.75	2.8	2.2	1.9	10.0	1.9	2.9
ATV320U07N4C412	0.75	1.0	3.6	2.7	2.3	10.0	2.3	3.5
ATV320U11N4C412	1.1	1.5	5.0	3.8	3.3	10.0	3.0	4.5
ATV320U15N4C412	1.5	2.0	6.5	4.9	4.2	10.0	4.1	6.2
ATV320U22N4C412	2.2	3.0	8.7	6.6	5.7	10.0	5.5	8.3
ATV320U30N4C412	3.0	4.1	11.1	8.4	7.3	10.0	7.1	10.7
ATV320U40N4C412	4.0	5.0	13.7	10.5	9.1	10.0	9.5	14.3
ATV320U55N4C412	5.5	7.5	20.7	14.5	12.6	27.6	14.3	21.5
ATV320U75N4C412	7.5	10.0	26.5	18.7	16.2	27.6	17.0	25.5
ATV320D11N4C412	11.0	15.0	36.6	25.6	22.2	36.7	27.7	41.6
ATV320D15N4C412	15.0	20.0	47.3	33.3	28.8	36.7	33.0	49.5

(1) The switching frequency is adjustable from 2...16 kHz, rated value: 4 kHz:
For operation at switching frequencies higher than the rated value, derating must be applied to the drive (output) current, page 33. In this case, switching frequency can be reduced if an excessive temperature rise occurs.

(2) Peak current when power is switched On, for the maximum supply mains voltage.

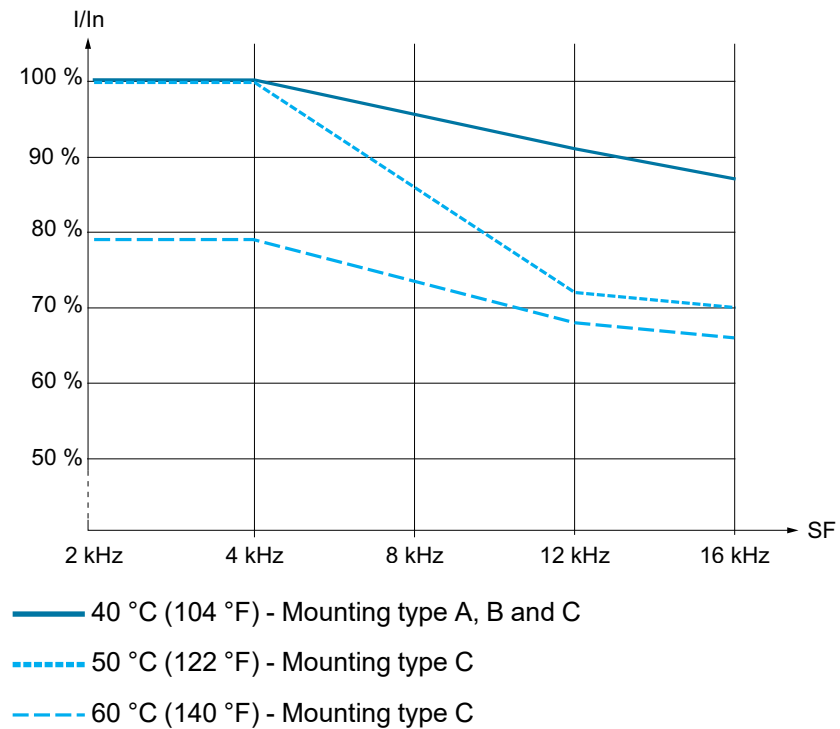
(3) The drive is designed to run up to 60s at 150% of nominal current.

Derating Curves

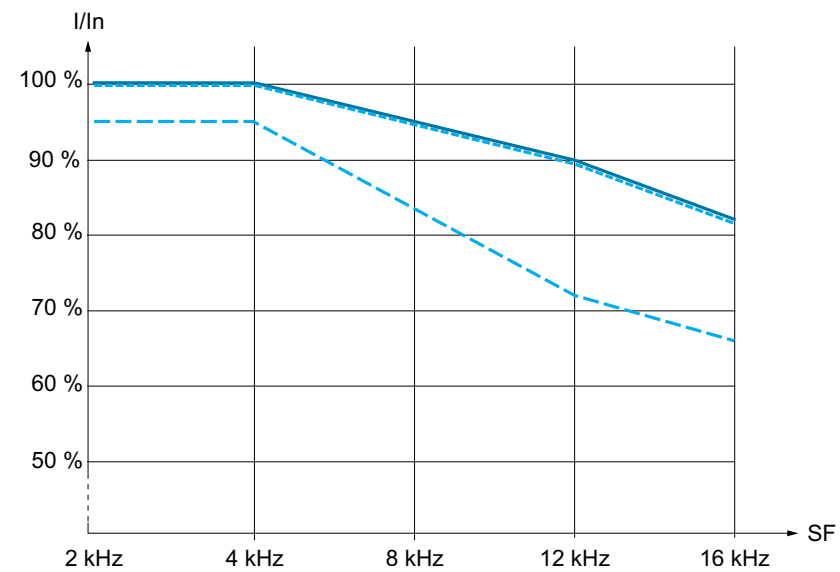
Description

Derating curves for the nominal drive current (I_n) as a function of temperature and switching frequency.

ATV320U04M2C412...ATV320U7M2C412

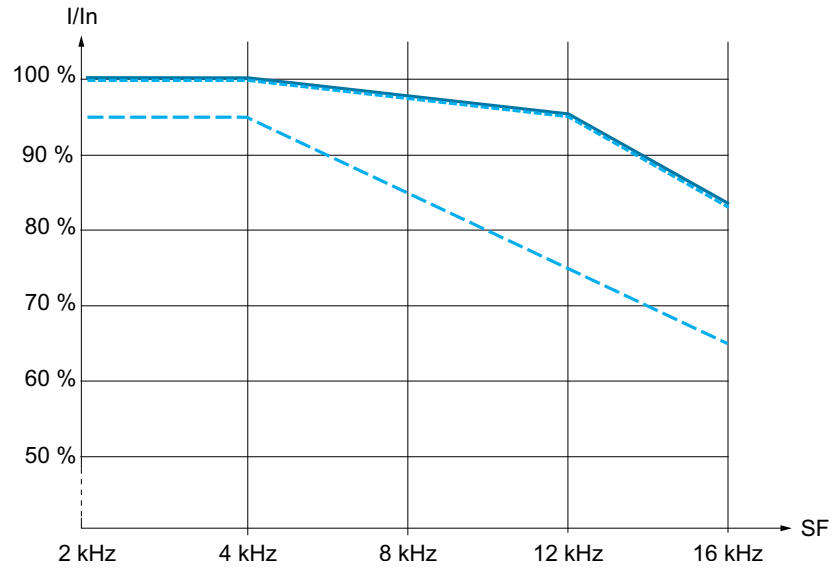


ATV320U11M241C412...ATV320U22M2C412



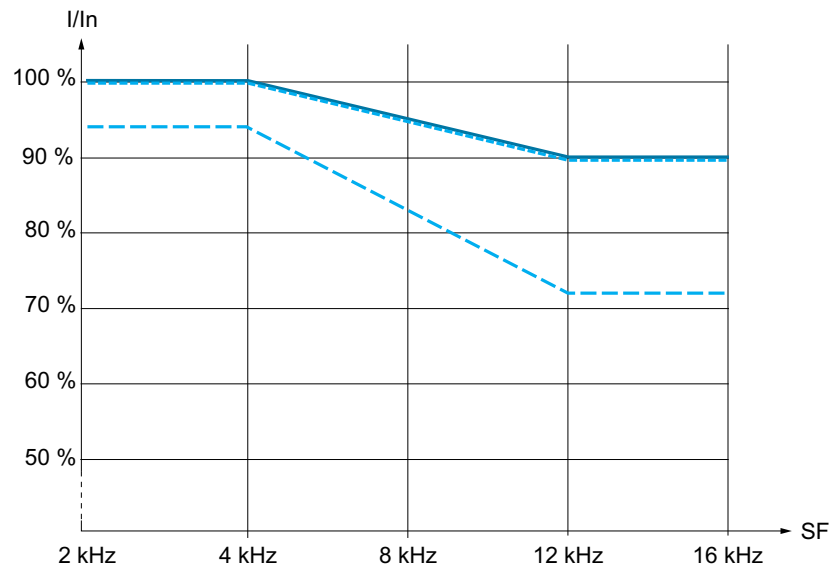
- 40 °C (104 °F) - Mounting type A, B and C
- - - 50 °C (122 °F) - Mounting type C
- - - 60 °C (140 °F) - Mounting type C

ATV320U30M3C412...ATV320U40M3C412



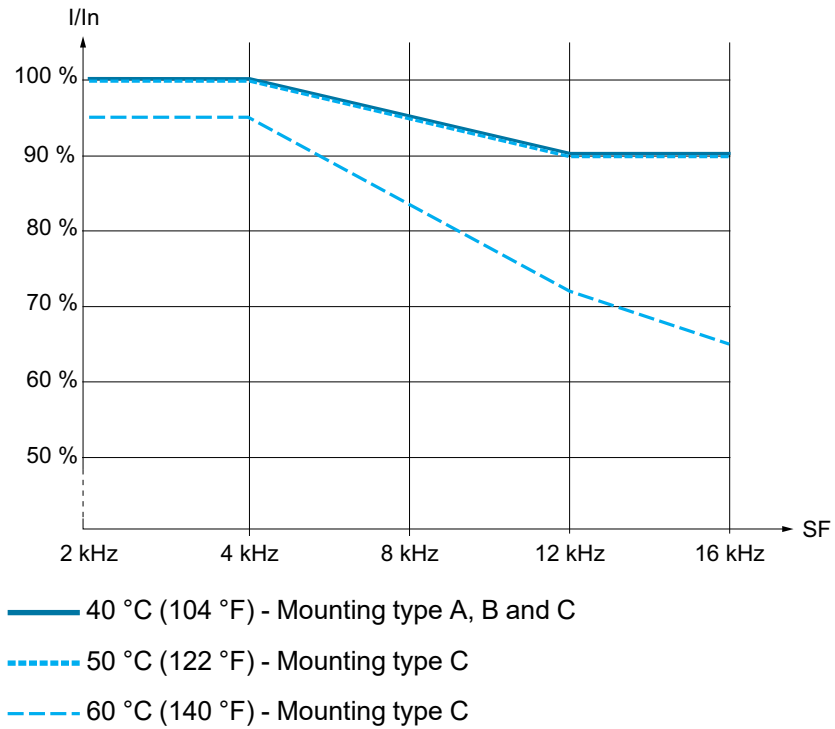
- 40 °C (104 °F) - Mounting type A, B and C
- - - 50 °C (122 °F) - Mounting type C
- - - 60 °C (140 °F) - Mounting type C

ATV320U55M3C412 and ATV320U75M3C412

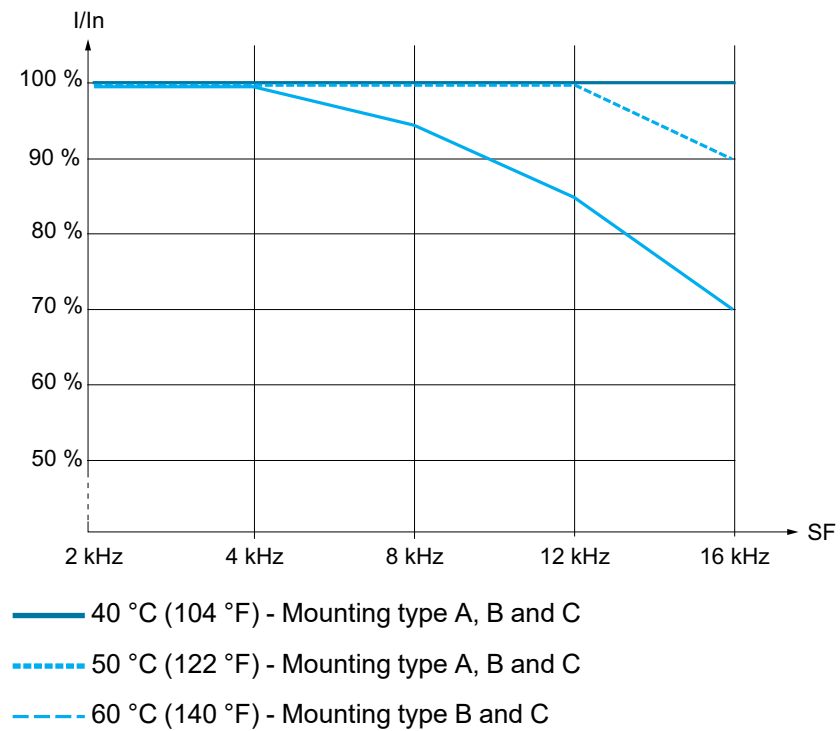


- 40 °C (104 °F) - Mounting type A, B and C
- - - 50 °C (122 °F) - Mounting type C
- - - 60 °C (140 °F) - Mounting type C

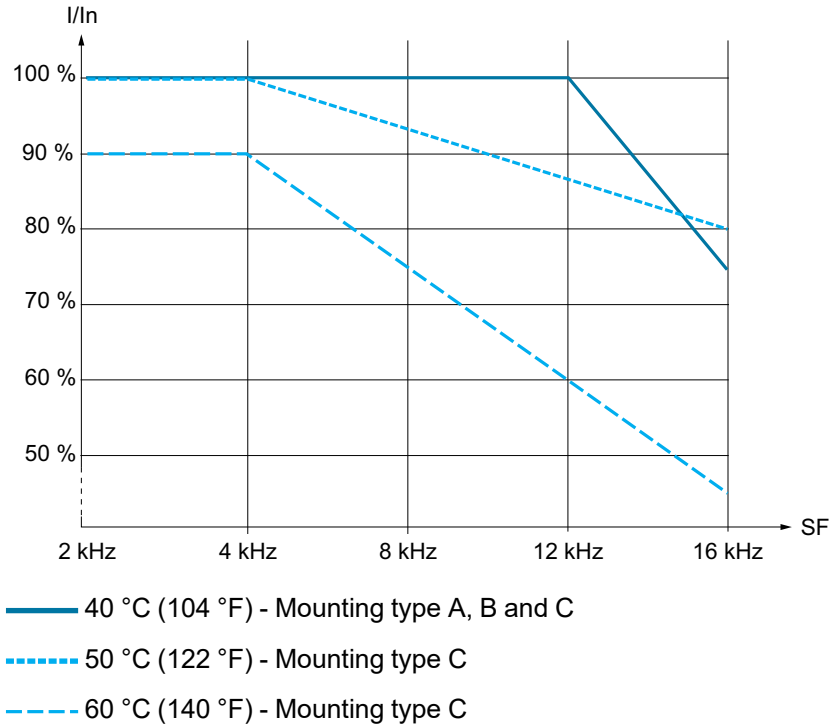
ATV320D11M3C412 and ATV320D15M3C412



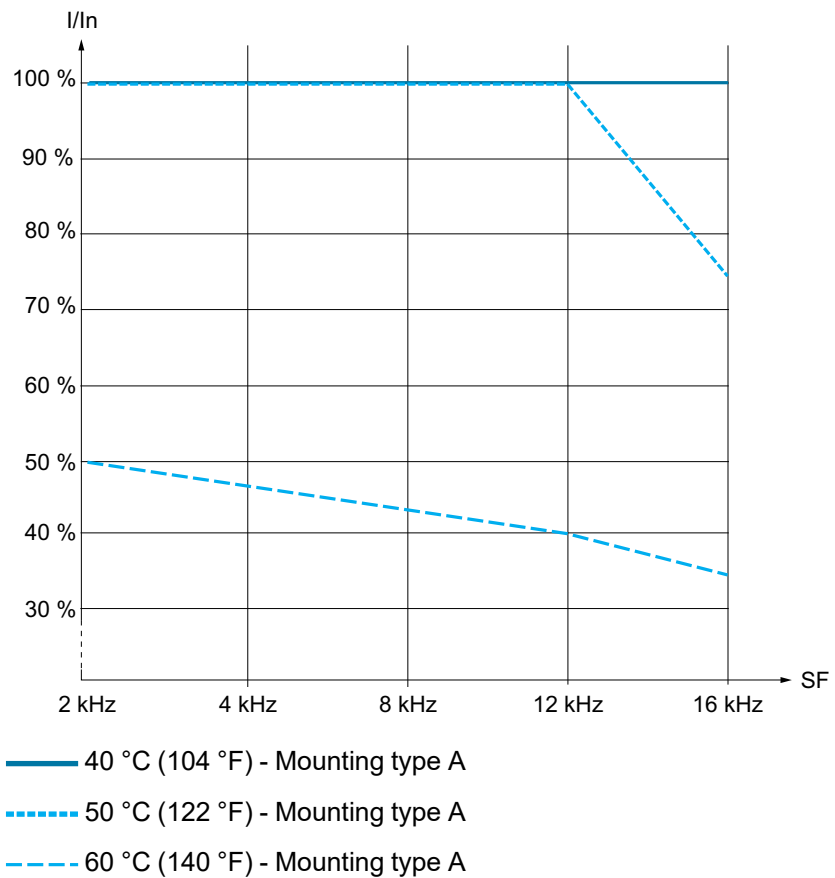
ATV320U04N4C412...ATV320U15N4C412

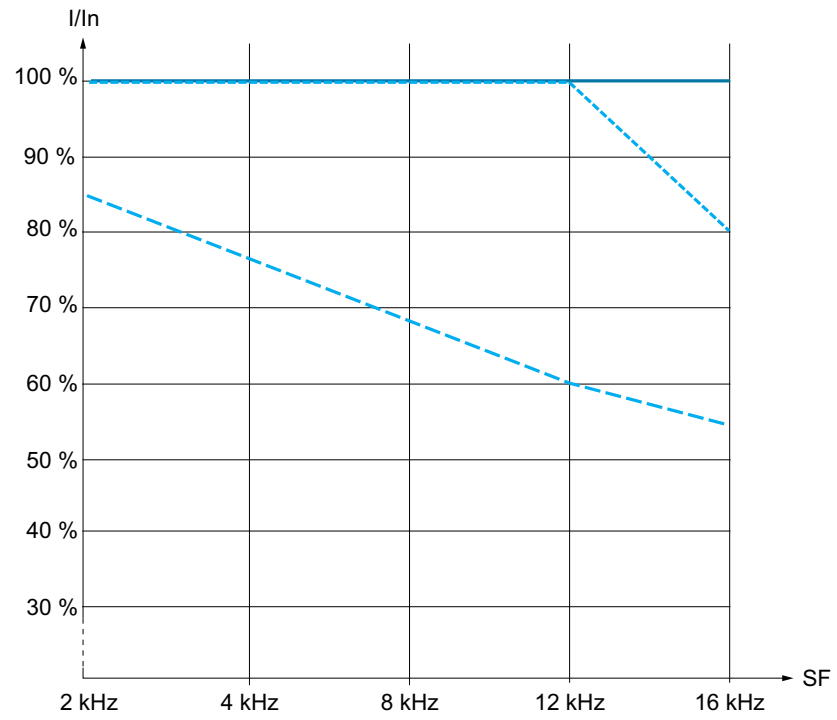


ATV320U22N4C412...ATV320U40N4C412

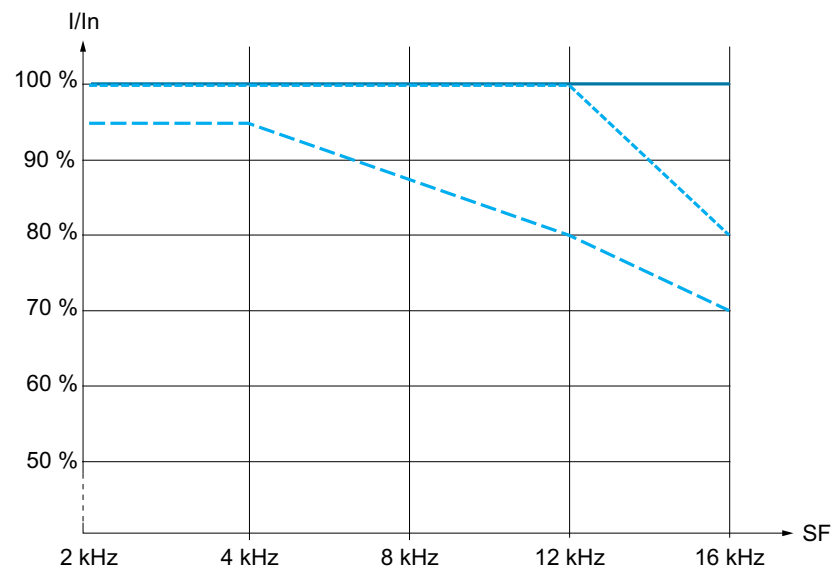


ATV320U55N4C412...ATV320U75N4C412



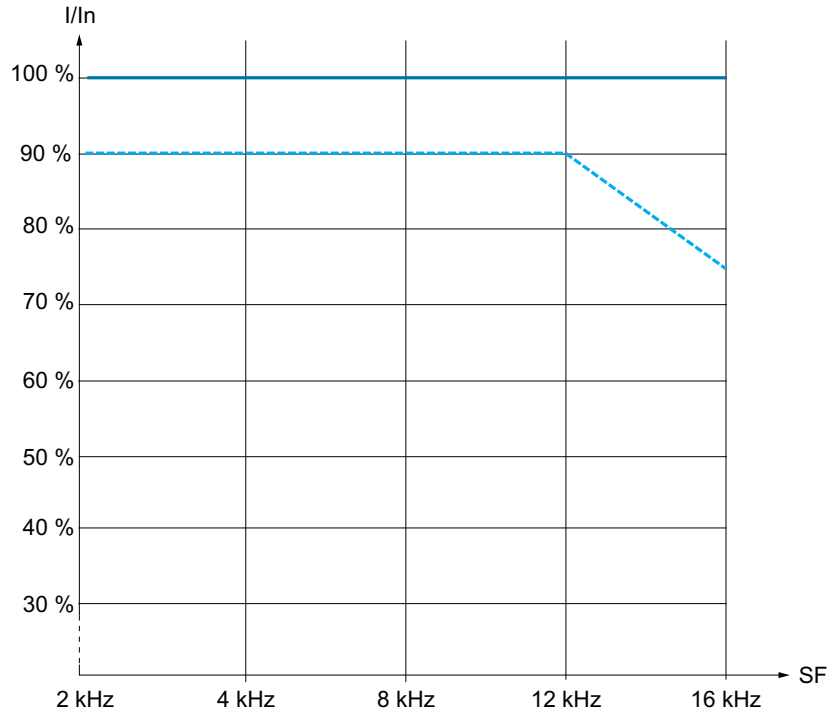


- 40 °C (104 °F) - Mounting type B
- ⋯ 50 °C (122 °F) - Mounting type B
- - - 60 °C (140 °F) - Mounting type B



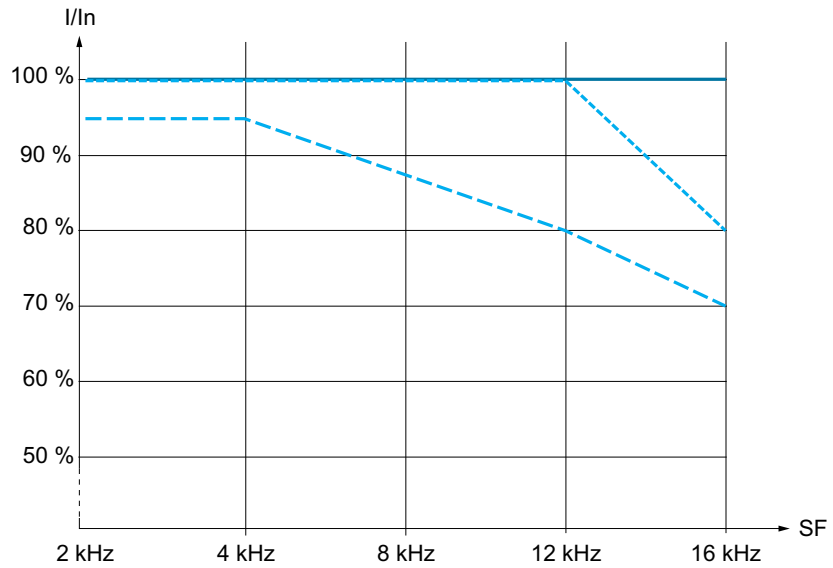
- 40 °C (104 °F) - Mounting type C
- ⋯ 50 °C (122 °F) - Mounting type C
- - - 60 °C (140 °F) - Mounting type C

ATV320D11N4C412...ATV320D15N4C412



— 40 °C (104 °F) - Mounting type A and B

- - - 50 °C (122 °F) - Mounting type A and B



— 40 °C (104 °F) - Mounting type C

- - - 50 °C (122 °F) - Mounting type C

- . - 60 °C (140 °F) - Mounting type C

Electrical Data - Upstream Protective Device

What's in This Chapter

Upstream Protective Device – Introduction	40
Prospective Short-Circuit Current	42
Short-Circuit Current Ratings (SCCR) and Branch Circuit Protection	45

Upstream Protective Device – Introduction

Overview

DANGER

INSUFFICIENT PROTECTION AGAINST OVERCURRENTS CAN CAUSE FIRE OR EXPLOSION

- Use properly rated overcurrent protection devices.
- Use the fuses/circuit breakers specified.
- Do not connect the product to a supply mains whose prospective short circuit current rating (current that flows during a short circuit) exceeds the specified maximum permissible value.
- When rating the upstream mains fuses and the cross sections as well as the lengths of the mains cables, take into account the minimum required prospective short-circuit current (Isc). Refer to the Upstream Protection Device section.
- If the minimum required prospective short-circuit current (Isc) is not available, increase the power of the transformer or decrease the length of the cables.

Failure to follow these instructions will result in death or serious injury.

The values and products for IEC compliance are specified in the present manual.

NOTE: About connection to the grid, the values and products for IEC/ UL compliance are specified in the *ATV320* installation manual.

General

- The Short Circuit Protective Device (SCPD) rated to the drive will help protect the upstream installation in case of a short-circuit internal to the drive and mitigate the damage to the drive and its surrounding area.
- The SCPD rated to the drive is mandatory to help ensuring the safety of the Power Drive System.
It comes in addition to the upstream branch circuit protection which is in compliance with the local regulation for electrical installation.
- The SCPD shall mitigate the damage in case of detected error condition such as an internal short-circuit of the drive.
- The SCPD must take into account both following characteristics...
 - a maximum prospective short-circuit current
 - a minimum required prospective short-circuit current (Isc).

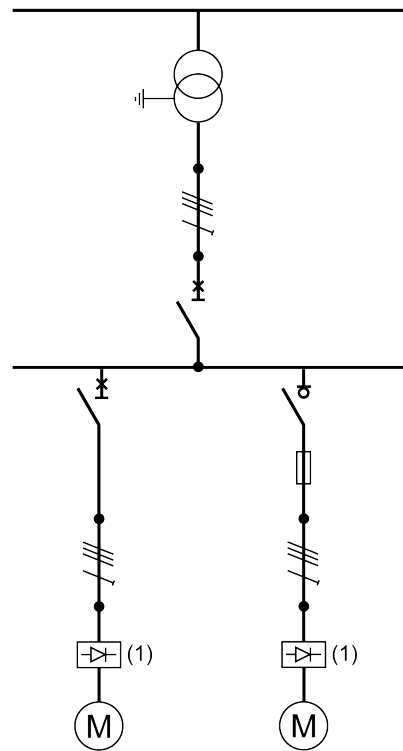
If the minimum required prospective short-circuit current (Isc) is not available, increase the power of the transformer or decrease the length of the cables

In other cases, contact your Schneider Electric Customer Care Center (CCC) www.se.com/CCC for specific selection of Short Circuit Protective Device (SCPD).

Note: The electronic power output short-circuit protection circuitry meets the requirements of IEC 60364-4-41:2005/AMD1 — Clause 411.

Wiring Diagram

This diagram shows an example of installation with both SCPD types, Circuit-breaker and Fuse link rated to the drive.



(1) Drive

Prospective Short-Circuit Current

Calculation

The prospective short-circuit current shall be computed at the drive connection points.

We recommend using the Schneider Electric tool Ecodial Advance Calculation



available on www.se.com/en/product-range-presentation/61013-ecodial-advance-calculation/

The following equations allow to estimate the value of the symmetrical three-phase prospective short-circuit current (I_{sc}) at the drive connection points.

$$X_t = \frac{U^2}{S_n} \cdot usc$$

$$Z_{cc} = \sqrt{\left(\rho \cdot \frac{l}{S} + R_f\right)^2 + (X_t + X_c \cdot l + X_f)^2}$$

$$I_{sc} = \frac{U}{\sqrt{3}} \cdot \frac{1}{Z_{cc}}$$

I_{sc}	Symmetrical three-phase prospective short-circuit current (kA)
X_t	Transformer reactance
U	No-load phase to phase voltage of the transformer (V)
S_n	Apparent transformer power (kVA)
usc	Short-circuit voltage, according to the transformer data sheet (%)
Z_{cc}	Total short-circuit impedance (mΩ)
ρ	Conductor resistivity e.g. Cu: 0.01851 mΩ·mm
l	Conductor length (mm)
S	Conductor cross section (mm ²)
X_c	Conductor lineic reactance (0.0001 mΩ/mm)
R_f, X_f	Resistance and reactance of the line filter (mΩ) , page 44

Example of Calculation with Copper Cable (without line filter)

Transformer 50 Hz	U 400 Vac Usc	Cable Cross Section	Isc depending on cable length in m(ft)							
			10 (33)	20 (66)	40 (131)	80 (262)	100 (328)	160 (525)	200 (656)	320 (1,050)
kVA	%	mm ² (AWG)	kA	kA	kA	kA	kA	kA	kA	kA
100	4	2.5 (14)	2.3	1.4	0.8	0.4	0.3	0.2	0.2	0.1
		4 (12)	2.9	2.0	1.2	0.6	0.5	0.3	0.2	0.2
		6 (10)	3.2	2.6	1.6	0.9	0.7	0.5	0.4	0.2
		10 (8)	3.4	3.1	2.3	1.4	1.2	0.8	0.6	0.4
		25 (4)	3.5	3.4	3.1	2.5	2.2	1.6	1.4	0.9
		50 (0)	3.5	3.5	3.3	3.0	2.8	2.3	2.1	1.5
		70 (00)	3.5	3.5	3.4	3.1	2.9	2.6	2.3	1.8
		120 (250 MCM)	3.6	3.5	3.4	3.2	3.1	2.8	2.6	2.1
250	4	6 (10)	5.7	3.4	1.8	0.9	0.7	0.5	0.4	0.2
		10 (8)	7.1	5.0	2.9	1.5	1.2	0.8	0.6	0.4
		25 (4)	8.4	7.4	5.5	3.4	2.8	1.8	1.5	0.9
		50 (0)	8.6	8.1	7.0	5.2	4.5	3.2	2.7	1.8
		70 (00)	8.6	8.2	7.3	5.8	5.2	3.9	3.3	2.3
		120 (250 MCM)	8.7	8.3	7.6	6.5	6.0	4.8	4.2	3.0
400	4	6 (10)	6.6	3.6	1.8	0.9	0.7	0.5	0.4	0.2
		10 (8)	9.2	5.6	3.0	1.5	1.2	0.8	0.6	0.4
		25 (4)	12	9.9	6.5	3.6	2.9	1.9	1.5	1.0
		50 (0)	13	12	9.3	6.1	5.1	3.4	2.8	1.8
		70 (00)	13	12	10	7.2	6.2	4.4	3.6	2.4
		120 (250 MCM)	13	13	11	8.6	7.6	5.7	4.9	3.4
800	6	6 (10)	6.9	3.7	1.9	0.9	0.7	0.5	0.4	0.2
		10 (8)	10	5.8	3.0	1.5	1.2	0.8	0.6	0.4
		25 (4)	15	11	6.9	3.7	3.0	1.9	1.5	1.0
		50 (0)	17	15	11	6.5	5.4	3.5	2.9	1.8
		70 (00)	17	15	12	7.9	6.7	4.6	3.7	2.4
		120 (250 MCM)	17	16	13	9.8	8.6	6.2	5.2	3.5
1,000	6	6 (10)	7.1	3.7	1.9	0.9	0.7	0.5	0.4	0.2
		10 (8)	11	6.0	3.1	1.5	1.2	0.8	0.6	0.4
		25 (4)	18	12	7.1	3.7	3.0	1.9	1.5	1.0
		50 (0)	21	17	12	6.7	5.5	3.6	2.9	1.8
		70 (00)	21	18	13	8.4	7.0	4.7	3.8	2.4
		120 (250 MCM)	22	19	16	11	9.3	6.5	5.4	3.6

Additional Line Filter Option

If a line input filter option is required for the installation such as a line reactor or a passive harmonic filter, the minimum prospective short-circuit current capability of the source is reduced at the drive connection point and shall be estimated (see Calculation, page 42) with the impedance values given in the table below.

Then, the SCPD type shall be selected according to the drive. If no selection is available, Schneider Electric Customer Care Center (CCC) www.se.com/CCC should be contacted.

EMC filter series have no significant effect on the minimum prospective short-circuit current capability of the main source.

Through the line option, the I_{sc} will be limited to a maximum value independent of the transformer and cable. **Therefore the below equations can be used to estimate the minimum prospective short-circuit current capability.**

$$10 \text{ m}\Omega \leq Xf \leq 400 \text{ m}\Omega \Rightarrow I_{sc_{\max i}} (\text{kA}) = 4.7 - 0.7 \cdot \text{Log} (Xf)$$

$$400 \text{ m}\Omega \leq Xf \leq 2000 \text{ m}\Omega \Rightarrow I_{sc_{\max i}} (\text{kA}) = 2.05 - 0.26 \cdot \text{Log} (Xf)$$

Log: Natural logarithm

Line Choke Filters Impedance Values

Line Choke Filter	Xf in mΩ
VZ1L004M010, VW3A4551	700
VZ1L007UM50, VW3A4552	300
VZ1L018UM20, VW3A4553	100
VW3A4554	70
VW3A4555	30
VW3A4556	20

Short-Circuit Current Ratings (SCCR) and Branch Circuit Protection

DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR FIRE

The opening of the branch-circuit protective device is able to be an indication that a fault current has been interrupted.

- Current-carrying parts and other components of the controller should be examined and replaced if damaged.
- If burnout of the current element of an overload relay occurs, the complete overload relay must be replaced.

Failure to follow these instructions will result in death or serious injury.

The maximum open circuit voltage and short circuit current rating of DC Bus connection which is intended for use with a PV source is provided in the IEC DC Fuses table and UL DC Fuses table.

Short Circuit Current Ratings: Selection Table

Note:

- Integral solid state short circuit protection in the drive does not provide branch circuit protection. Branch circuit protection must be provided in accordance with any local codes.
- The drive has a 100 kA interrupt rating on the output of the drive. In addition to providing a rating based on shorting the output of the drive, these short circuit current ratings have been obtained by shorting components internal to the drive. These ratings allow proper coordination of short circuit protection.

Note: Verify that the minimum required prospective short-circuit current (I_{sc}) value from the table above is lower than the value estimated in the Calculation section, page 42.

IEC DC Fuses

Suitable for use on a circuit capable of delivering not more than **X** rms symmetrical kiloAmperes, **Y** Volts maximum, when protected by **Z1** with a maximum rating of **Z2**.

DC Input Voltage (Y)	Catalog Number ⁽¹⁾	500/1000V ⁽²⁾ (Z1 mandatory (Z2 optional)	PV SCCR (X)
		(A)	
150-378 Vdc	ATV320U04M2C412	10	4,6
	ATV320U06M2C412	10	4,6
	ATV320U07M2C412	15	4,6
	ATV320U11M2C412	175	4,6
	ATV320U15M2C412	20	4,6
	ATV320U22M2C412	25	4,6
	ATV320U30M3C412	30	4,6
	ATV320U40M3C412	40	4,6
	ATV320U55M3C412	60	4,6
	ATV320U75M3C412	80	4,6
	ATV320D11M3C412	125	4,6
	ATV320D15M3C412	150	4,6
280-778 Vdc	ATV320U04N4C412	4	4,6
	ATV320U06N4C412	5	4,6
	ATV320U07N4C412	6	4,6
	ATV320U11N4C412	8	4,6
	ATV320U15N4C412	10	4,6
	ATV320U22N4C412	15	4,6
	ATV320U30N4C412	20	4,6
	ATV320U40N4C412	25	4,6
	ATV320U55N4C412	40	4,6
	ATV320U75N4C412	40	4,6
	ATV320D11N4C412	63	4,6
	ATV320D15N4C412	100	4,6

(1) Order optional UL Type 1 conformity kits separately.

(2) Use Protistor Class gR (FRxx) or gS (NH00) fast acting full range protection fuse. Refer to fuse selection file.

UL DC Fuses

Suitable for use on a circuit capable of delivering not more than **X** rms symmetrical kiloAmperes, **Y** Volts maximum, when protected by **Z1** with a maximum rating of **Z2**.

DC Input Voltage (Y)	Catalog Number ⁽¹⁾	Mersen - SF Catalog Number E2137 (500Vdc) E76491 (1200Vdc)	500/1000V (Z1 mandatory (Z2 optional)	PV SCCR (X)
			(A)	
150-378 Vdc	ATV320U04M2C412	HSJ10	10	4.6
	ATV320U06M2C412	HSJ10	10	4.6
	ATV320U07M2C412	HSJ15	15	4.6
	ATV320U11M2C412	HSJ15	175	4.6
	ATV320U15M2C412	HSJ20	20	4.6
	ATV320U22M2C412	HSJ25	25	4.6
	ATV320U30M3C412	HSJ30	30	4.6
	ATV320U40M3C412	HSJ40	40	4.6
	ATV320U55M3C412	HSJ60	60	4.6
	ATV320U75M3C412	HSJ80	80	4.6
	ATV320D11M3C412	HSJ125	125	4.6
	ATV320D15M3C412	HSJ150	150	4.6
280-778 Vdc	ATV320U04N4C412	D70SF120V20QF	4	4.6
	ATV320U06N4C412	D70SF120V20QF	5	4.6
	ATV320U07N4C412	D70SF120V20QF	6	4.6
	ATV320U11N4C412	D70SF120V20QF	8	4.6
	ATV320U15N4C412	D70SF120V20QF	10	4.6
	ATV320U22N4C412	D70SF120V20QF	15	4.6
	ATV320U30N4C412	D70SF120V20QF	20	4.6
	ATV320U40N4C412	D70SF120V25QF	25	4.6
	ATV320U55N4C412	D70SF120V40QF	40	4.6
	ATV320U75N4C412	D70SF120V40QF	40	4.6
	ATV320D11N4C412	D70SF120V63QF	63	4.6
	ATV320D15N4C412	D70SF120V100QF	100	4.6

(1) Order optional UL Type 1 conformity kits separately.

DC switch-disconnector

DC Input Voltage	Drive Catalog Number	DC switch-disconnector Catalog Number
150-378 Vdc	ATV320U04M2C412	A9N61690
	ATV320U06M2C412	
	ATV320U07M2C412	
	ATV320U11M2C412	
	ATV320U15M2C412	
	ATV320U22M2C412	
	ATV320U30M3C412	
	ATV320U40M3C412	
	ATV320U55M3C412	
	ATV320U75M3C412	
	ATV320D11M3C412	A9N61701
	ATV320D15M3C412	
280-778 Vdc	ATV320U04N4C412	A9N61690
	ATV320U06N4C412	
	ATV320U07N4C412	
	ATV320U11N4C412	
	ATV320U15N4C412	
	ATV320U22N4C412	
	ATV320U30N4C412	
	ATV320U40N4C412	
	ATV320U55N4C412	
	ATV320U75N4C412	
	ATV320D11N4C412	A9N61701
	ATV320D15N4C412	

Grid - AC without Line Reactor

240 Vac Single-phase

Suitable for use on a circuit capable of delivering not more than X rms symmetrical kiloAmperes, **240** Volts maximum, when protected by Z1 with a maximum rating of Z2 .

Catalog Number	Minimum Enclosure Volume		SCCR (X) (kA)	PowerPact ⁽²⁾ Catalog Number (Z1, Z2)	GV•P (Z1, Z2)			Fuses (Z1, Z2)
	(L)	(in ³)			Type E ⁽³⁾	Voltage Rating (V)	Power ⁽⁴⁾ (HP)	600 V Class J ⁽⁵⁾ (A)
ATV320U04M2C412	53	3223	5 ⁽¹⁾	H•L36015	GV2P10	240	1/2	15
ATV320U06M2C412				H•L36015	GV2P14		1 1/2	25
ATV320U07M2C412				H•L36015	GV2P16		2	25
ATV320U11M2C412				H•L36020	GV2P16		2	25
ATV320U15M2C412				H•L36030	GV2P20		3	40
ATV320U22M2C412				H•L36035	GV2P32		5	45

(1) Despite a 5kA SCCR, the thermal design is for 1kA as indicated in the catalog. For an operating at 5kA, do not exceed 45 °C (113 °F) ambient temperature at nominal load, or reduce slightly the load not to operate over the input current given in the catalog.

(2) Use • = D for 25 kA, G for 65 kA, J for 65 kA, L for 65 kA, R for 65 kA.

(3) For GV2P/3P use, 480 V and 600 V ratings are for Wye connected electrical distribution systems. GV2P•• self protected manual combination starter must be used with GV2GH7 insulating barrier to meet UL 508 Type E rating. GV3P•• self protected manual combination starter must be used with GV3G66 + GVAM11 insulating barrier and auxiliary contact to meet UL 508 Type E rating. The GVAM11 provides a visual indication if the GV3P has tripped.

(4) UL61800-5-1 Par. 6.3.7DV.2.1.1 require publishing the standard Type E combination motor controller power rating since this is a basic identification marking of type E devices. However, when applied as an input overcurrent protective device for a drive, the rated current of the Type E combination motor controller, not the rated power, is the key parameter for dimensioning (reference UL61800-5-1Par. 5.2.3.6.2DV.4.1.11 & 5.2.3.6.2DV.4.1.12).

Schneider Electric GV•P Type E combination motor controllers are adjustable, their current range is shown on the adjustment dial and their selection is based on the input current and not the power rating of the drive.

(5) Use Protistor Class gR (FRxx) or gS (NH00) fast acting full range protection fuse. Refer to fuse selection file.

240 Vac Three-phase

Suitable for use on a circuit capable of delivering not more than **X** rms symmetrical kiloAmperes, **240** Volts maximum, when protected by **Z1** with a maximum rating of **Z2**.

Catalog Number	Minimum Enclosure Volume		SCCR (X) (kA)	PowerPact ⁽¹⁾ Catalog Number (Z1, Z2)	GV•P (Z1, Z2)			Fuses (Z1, Z2)
	(L)	(in ³)			Type E ⁽²⁾	Voltage Rating (V)	Power ⁽³⁾ (HP)	600 V Class J ⁽⁴⁾ (A)
ATV320U30M3C412	53	3223	5	H•L36020	GV2P20	240	5	45
ATV320U40M3C412				H•L36030	GV2P21		7,5	45
ATV320U55M3C412			22	H•L36040	GV3P40		10	60
ATV320U75M3C412				H•L36050	GV3P50		15	70
ATV320D11M3C412				H•L36070	GV3P65		20	100
ATV320D15M3C412				H•L36090	GV4PB80S		20	100

(1) Use • = D for 18 kA, G for 35 kA, J for 65 kA, L for 65 kA, R for 65 kA.

(2) For GV2P/3P use, 480 V and 600 V ratings are for Wye connected electrical distribution systems. GV2P•• self protected manual combination starter must be used with GV2GH7 insulating barrier to meet UL 508 Type E rating. GV3P•• self protected manual combination starter must be used with GV3G66 + GVAM11 insulating barrier and auxiliary contact to meet UL 508 Type E rating. The GVAM11 provides a visual indication if the GV3P has tripped.

(3) UL61800-5-1 Par. 6.3.7DV.2.1.1 require publishing the standard Type E combination motor controller power rating since this is a basic identification marking of type E devices. However, when applied as an input overcurrent protective device for a drive, the rated current of the Type E combination motor controller, not the rated power, is the key parameter for dimensioning (reference UL61800-5-1Par. 5.2.3.6.2DV.4.1.11 & 5.2.3.6.2DV.4.1.12).

Schneider Electric GV•P Type E combination motor controllers are adjustable, their current range is shown on the adjustment dial and their selection is based on the input current and not the power rating of the drive.

(4) Use Protistor Class gR (FRxx) or gS (NH00) fast acting full range protection fuse. Refer to fuse selection file.

480 Vac Three-phase

Suitable for use on a circuit capable of delivering not more than X rms symmetrical kiloAmperes, **480** Volts maximum, when protected by Z1 with a maximum rating of Z2 .

Catalog Number	Minimum Enclosure Volume		SCCR (X) (kA)	PowerPact ⁽¹⁾ Catalog Number (Z1, Z2)	GV•P (Z1, Z2)			Fuses (Z1, Z2)
	(L)	(in ³)			Type E ⁽²⁾	Voltage Rating (V)	Power ⁽⁴⁾ (HP)	600 V Class J ⁽⁵⁾ (A)
ATV320U04N4C412	53	3223	5	H•L36015	GV2P07	480Y/277	1	6
ATV320U06N4C412				H•L36015	GV2P07		1	6
ATV320U07N4C412				H•L36015	GV2P08		2	6
ATV320U11N4C412				H•L36015	GV2P08		2	12
ATV320U15N4C412				H•L36015	GV2P10		3	12
ATV320U22N4C412				H•L36015	GV2P14		5	15
ATV320U30N4C412				H•L36015	GV2P14		5	17,5
ATV320U40N4C412				H•L36015	GV3P13 ⁽³⁾		7,5	25
ATV320U55N4C412			22	H•L36020	GV3P18 ⁽³⁾		10	40
ATV320U75N4C412				H•L36030	GV3P25 ⁽³⁾		15	40
ATV320D11N4C412				H•L36040	GV3P32		20	60
ATV320D15N4C412				H•L36050	GV3P40		25	60

(1) Use • = D for 14 kA, G for 18 kA, J for 22 kA, L for 22 kA, R for 22 kA.

(2) For GV2P/3P use, 480 V and 600 V ratings are for Wye connected electrical distribution systems. GV2P•• self protected manual combination starter must be used with GV2GH7 insulating barrier to meet UL 508 Type E rating. GV3P•• self protected manual combination starter must be used with GV3G66 + GVAM11 insulating barrier and auxiliary contact to meet UL 508 Type E rating. The GVAM11 provides a visual indication if the GV3P has tripped.

(3) GV2P products detailed below can be used in place of the GV3P products for obtaining the ratings listed in the SCCR column for ratings listed lower than 10kA, or ratings limited to 10kA for ratings listed higher than 10kA. GV2P16 for GV3P13, GV2P20 for GV3P18, GV2P22 for GV3P25.

(4) UL61800-5-1 Par. 6.3.7DV.2.1.1 require publishing the standard Type E combination motor controller power rating since this is a basic identification marking of type E devices. However, when applied as an input overcurrent protective device for a drive, the rated current of the Type E combination motor controller, not the rated power, is the key parameter for dimensioning (reference UL61800-5-1Par. 5.2.3.6.2DV.4.1.11 & 5.2.3.6.2DV.4.1.12).

Schneider Electric GV•P Type E combination motor controllers are adjustable, their current range is shown on the adjustment dial and their selection is based on the input current and not the power rating of the drive.

(5) Use Protistor Class gR (FRxx) or gS (NH00) fast acting full range protection fuse. Refer to fuse selection file.

Grid - AC with Line Reactor

240 Vac Single-phase

Suitable for use on a circuit capable of delivering not more than X rms symmetrical kiloAmperes, **240** Volts maximum, when protected by Z1 with a maximum rating of Z2 .

Catalog Number	Minimum Enclosure Volume		SCCR (X) (kA)	PowerPact ⁽¹⁾ Catalog Number (Z1, Z2)	GV•P (Z1, Z2)			Fuses (Z1, Z2)		Line Reactor Minimum Value ⁽⁵⁾	
	(L)	(in ³)			Type E ⁽²⁾	Voltage Rating (V)	Power ⁽³⁾ (HP)	600 V Class J ⁽⁴⁾ (A)	(m-H)	(A)	
ATV320U04M2C412	53	3223	65	H•L36015	GV2P10	240	1/2	15	2,5	5	
ATV320U06M2C412				H•L36015	GV2P14		1 1/2	25	2,5	5	
ATV320U07M2C412				H•L36015	GV2P16		2	25	2,5	7	
ATV320U11M2C412				H•L36020	GV2P16		2	25	1	10	
ATV320U15M2C412				H•L36030	GV2P20		3	40	1	13	
ATV320U22M2C412				H•L36035	GV2P32		5	45	1	18	

(1) Use • = D for 25 kA, G for 65 kA, J for 65 kA, L for 65 kA, R for 65 kA.

(2) For GV2P/3P use, 480 V and 600 V ratings are for Wye connected electrical distribution systems. GV2P•• self protected manual combination starter must be used with GV2GH7 insulating barrier to meet UL 508 Type E rating. GV3P•• self protected manual combination starter must be used with GV3G66 + GVAM11 insulating barrier and auxiliary contact to meet UL 508 Type E rating. The GVAM11 provides a visual indication if the GV3P has tripped.

(3) UL61800-5-1 Par. 6.3.7DV.2.1.1 require publishing the standard Type E combination motor controller power rating since this is a basic identification marking of type E devices. However, when applied as an input overcurrent protective device for a drive, the rated current of the Type E combination motor controller, not the rated power, is the key parameter for dimensioning (reference UL61800-5-1Par. 5.2.3.6.2DV.4.1.11 & 5.2.3.6.2DV.4.1.12).

Schneider Electric GV•P Type E combination motor controllers are adjustable, their current range is shown on the adjustment dial and their selection is based on the input current and not the power rating of the drive.

(4) Use Protistor Class gR (FRxx) or gS (NH00) fast acting full range protection fuse. Refer to fuse selection file.

(5) Reactor from Altivar ATV320 catalog or MTE series: RLW, do not substitute.

240 Vac Three-phase

Suitable for use on a circuit capable of delivering not more than **X** rms symmetrical kiloAmperes, **240** Volts maximum, when protected by **Z1** with a maximum rating of **Z2**.

Catalog Number	Minimum Enclosure Volume		SCCR (X) (kA)	PowerPact ⁽¹⁾ Catalog Number (Z1, Z2)	GV•P (Z1, Z2)			Fuses (Z1, Z2)		Line Reactor Minimum Value ⁽⁵⁾	
	(L)	(in ³)			Type E ⁽²⁾	Voltage Rating (V)	Power ⁽³⁾ (HP)	600 V Class J ⁽⁴⁾ (A)	(mH)	(A)	
ATV320U30M3C412	53	3223	65	H•L36020	GV2P20	240	5	45	0,8	12	
ATV320U40M3C412				H•L36030	GV2P21		7,5	45	0,8	15	
ATV320U55M3C412				H•L36040	GV3P40		10	60	0,5	21	
ATV320U75M3C412				H•L36050	GV3P50		15	70	0,4	28	
ATV320D11M3C412				H•L36070	GV3P65		20	100	0,3	41	
ATV320D15M3C412				H•L36090	GV4P-B80S		20	100	0,2	55	

(1) Use ● = D for 18 kA, G for 35 kA, J for 65 kA, L for 65 kA, R for 65 kA.

(2) For GV2P/3P use, 480 V and 600 V ratings are for Wye connected electrical distribution systems. GV2P●● self protected manual combination starter must be used with GV2GH7 insulating barrier to meet UL 508 Type E rating. GV3P●● self protected manual combination starter must be used with GV3G66 + GVAM11 insulating barrier and auxiliary contact to meet UL 508 Type E rating. The GVAM11 provides a visual indication if the GV3P has tripped.

(3) UL61800-5-1 Par. 6.3.7DV.2.1.1 require publishing the standard Type E combination motor controller power rating since this is a basic identification marking of type E devices. However, when applied as an input overcurrent protective device for a drive, the rated current of the Type E combination motor controller, not the rated power, is the key parameter for dimensioning (reference UL61800-5-1Par. 5.2.3.6.2DV.4.1.11 & 5.2.3.6.2DV.4.1.12).

Schneider Electric GV•P Type E combination motor controllers are adjustable, their current range is shown on the adjustment dial and their selection is based on the input current and not the power rating of the drive.

(4) Use Protistor Class gR (FRxx) or gS (NH00) fast acting full range protection fuse. Refer to fuse selection file.

(5) Reactor from Altivar ATV320 catalog or MTE series: RLW, do not substitute.

480 Vac Three-phase

Suitable for use on a circuit capable of delivering not more than **X** rms symmetrical kiloAmperes, **480** Volts maximum, when protected by **Z1** with a maximum rating of **Z2**.

Catalog Number	Minimum Enclosure Volume		SCCR (X) (kA)	PowerPact ⁽¹⁾ Catalog Number (Z1, Z2)	GV•P (Z1, Z2)			Fuses (Z1, Z2)		Line Reactor Minimum Value ⁽⁶⁾	
	(L)	(in ³)			Type E ⁽²⁾	Voltage Rating (V)	Power ⁽⁴⁾ (HP)	600 V Class J ⁽⁵⁾ (A)	(mH)	(A)	
ATV320U04N4C412	53	3223	65	H•L36015	GV2P07	480Y/277	1	6	12	1	
ATV320U06N4C412				H•L36015	GV2P07		1	6	12	1,3	
ATV320U07N4C412				H•L36015	GV2P08		2	6	12	1,7	
ATV320U11N4C412				H•L36015	GV2P08		2	12	6,8	2,4	
ATV320U15N4C412				H•L36015	GV2P10		3	12	6,8	3,2	
ATV320U22N4C412				H•L36015	GV2P14		5	15	5	4,7	
ATV320U30N4C412				H•L36015	GV2P14		5	17,5	3	6,2	
ATV320U40N4C412				H•L36015	GV3P13 ⁽³⁾		7,5	25	3	8	
ATV320U55N4C412				H•L36020	GV3P18 ⁽³⁾		10	40	2,5	11	
ATV320U75N4C412				H•L36030	GV3P25 ⁽³⁾		15	40	1,5	15	
ATV320D11N4C412				H•L36040	GV3P32		20	60	1,2	22	
ATV320D15N4C412				H•L36050	GV3P40		25	60	0,8	29	

(1) Use • = D for 14 kA, G for 18 kA, J for 22 kA, L for 22 kA, R for 22 kA.

(2) For GV2P/3P use, 480 V and 600 V ratings are for Wye connected electrical distribution systems. GV2P•• self protected manual combination starter must be used with GV2GH7 insulating barrier to meet UL 508 Type E rating. GV3P•• self protected manual combination starter must be used with GV3G66 + GVAM11 insulating barrier and auxiliary contact to meet UL 508 Type E rating. The GVAM11 provides a visual indication if the GV3P has tripped.

(3) GV2P products detailed below can be used in place of the GV3P products for obtaining the ratings listed in the SCCR column for ratings listed lower than 10kA, or ratings limited to 10kA for ratings listed higher than 10kA. GV2P16 for GV3P13, GV2P20 for GV3P18, GV2P22 for GV3P25.

(4) UL61800-5-1 Par. 6.3.7DV.2.1.1 require publishing the standard Type E combination motor controller power rating since this is a basic identification marking of type E devices. However, when applied as an input overcurrent protective device for a drive, the rated current of the Type E combination motor controller, not the rated power, is the key parameter for dimensioning (reference UL61800-5-1Par. 5.2.3.6.2DV.4.1.11 & 5.2.3.6.2DV.4.1.12).

Schneider Electric GV•P Type E combination motor controllers are adjustable, their current range is shown on the adjustment dial and their selection is based on the input current and not the power rating of the drive.

(5) Use Protistor Class gR (FRxx) or gS (NH00) fast acting full range protection fuse. Refer to fuse selection file.

(6) Reactor from Altivar ATV320 catalog or MTE series: RLW, do not substitute.

Power Dissipated For Enclosed Drives and Required Air Flow

ATV320•M•C412

Catalog Number	Cooling Type	Power Dissipated (1)	Minimum Air Flow Rate Required	
		(W)	(m ³ /h)	(ft ³ /min)
ATV320U04M2C412	Fanless	30	–	–
ATV320U06M2C412	Fanless	33	–	–
ATV320U07M2C412	Fanless	45	–	–
ATV320U11M2C412	Forced cooling	61	16	9.4
ATV320U15M2C412	Forced cooling	76	16	9.4
ATV320U22M2C412	Forced cooling	99	16	9.4
ATV320U30M3C412	Forced cooling	105	16.4	9.7
ATV320U40M3C412	Forced cooling	140	16.4	9.7
ATV320U55M3C412	Forced cooling	242	60	35.3
ATV320U75M3C412	Forced cooling	293	60	35.3
ATV320D11M3C412	Forced cooling	468	156	91.8
ATV320D15M3C412	Forced cooling	551	156	91.8

(1) Power dissipated at nominal current

ATV320•N4C412

Catalog Number	Cooling Type	Power Dissipated (1)	Minimum Air Flow Rate Required	
		(W)	(m ³ /h)	(ft ³ /min)
ATV320U04N4C412	Forced cooling	23	18	10.6
ATV320U06N4C412	Forced cooling	27	18	10.6
ATV320U07N4C412	Forced cooling	32	18	10.6
ATV320U11N4C412	Forced cooling	40	18	10.6
ATV320U15N4C412	Forced cooling	56	18	10.6
ATV320U22N4C412	Forced cooling	74	37.7	22.2
ATV320U30N4C412	Forced cooling	93	37.7	22.2
ATV320U40N4C412	Forced cooling	111	37.7	22.2
ATV320U55N4C412	Forced cooling	195	60	35.3
ATV320U75N4C412	Forced cooling	229	60	35.3
ATV320D11N4C412	Forced cooling	370	156	91.8
ATV320D15N4C412	Forced cooling	452	156	91.8

(1) Power dissipated at nominal current

Characteristics of the Power Part Terminals


DANGER

HAZARD OF FIRE OR ELECTRIC SHOCK

- Wire cross sections and tightening torques must comply with the specifications provided in this document.
- If you use flexible multi-wire cables for a connection with a voltage higher than 25 Vac, you must use ring type cable lugs or wire ferrules, depending on the wire gauge and the specified stripping length of the cable.

Failure to follow these instructions will result in death or serious injury.

Description of the Power Terminals

Terminal	Function
PE or 	Ground connection terminal
R/L1 S/L2 T/L3	AC supply mains
PA/+	DC bus + polarity (Solar panel)
PB (if any)	Output to braking resistor
PC/-	DC bus - polarity (Solar panel)
U/T1 V/T2 W/T3	Outputs to the motor

Additional PE Ground Connection Cables

Ground cable cross sections of input and output ground cables are the same as those given for the input and output cables. These cross sections and related tightening torques are given in the tables below. Due to high leakage currents an additional PE connection must be wired.

Cross Section: Electrical and Mechanical characteristics

DANGER

HAZARD OF FIRE OR ELECTRIC SHOCK

If the product is used below its rated power and you choose to reduce the wire cross section compared to the specified minimum wire cross section given at rated condition, ensure that the selected wire cross section is compliant with the duty cycle and current load of the application.

Failure to follow these instructions will result in death or serious injury.

NOTE: Only use cables with solid wires or rigid stranded wires.

ATV320•N4C412

Solar: DC Bus Terminals (PA/+ and PC/-) (Wire cross section in case of solar panel voltage supply)

Catalog reference	Wire Cross Section		Tightening Torque
	Minimum	Maximum	Rated
	mm ² (AWG)	mm ² (AWG)	N·m (lbf·in)
U04N4C, U06N4C, U07N4C, U11N4C, U15N4C	2.5 (14)	6 (10)	1.4 (12.4)
U22N4C, U30N4C	2.5 (14)	6 (10)	1.4 (12.4)
U40N4C	2.5 (14)	6 (10)	1.4 (12.4)
U55N4C	6 (10)	16 (6)	2.4 (21.2)
U75N4C	10 (8)	16 (6)	2.4 (21.2)
D11N4C	10 (8)	16 (6)	2.4 (21.2)
D15N4C	16 (6)	16 (6)	2.4 (21.2)

Motor: Output Terminals (U, V, W)

Catalog reference	Wire Cross Section		Tightening Torque
	Minimum	Maximum	Rated
	mm ² (AWG)	mm ² (AWG)	N·m (lbf·in)
U04N4C, U06N4C, U07N4C, U11N4C, U15N4C	2.5 (14)	6 (10)	1.4 (12.4)
U22N4C, U30N4C	2.5 (14)	6 (10)	1.4 (12.4)
U40N4C	2.5 (14)	6 (10)	1.4 (12.4)
U55N4C	10 (8)	16 (6)	2.4 (21.2)
U75N4C	16 (6)	16 (6)	2.4 (21.2)
D11N4C	16*2 (6*2)	16*2 (6*2)	4.5 (40)
D15N4C	16*2 (6*2)	16*2 (6*2)	4.5 (40)

Grid: Supply Terminals (L1, L2, L3)

Catalog reference	Wire Cross Section		Tightening Torque
	Minimum	Maximum	Rated
	mm ² (AWG)	mm ² (AWG)	N·m (lbf·in)
U04N4C, U06N4C, U07N4C, U11N4C, U15N4C	2.5 (14)	6 (10)	1.4 (12.4)
U22N4C, U30N4C	2.5 (14)	6 (10)	1.4 (12.4)
U40N4C	4 (12)	6 (10)	1.4 (12.4)
U55N4C	10 (8)	16 (6)	2.4 (21.2)
U75N4C	16 (6)	16 (6)	2.4 (21.2)
D11N4C	10 (8)	16 (6)	2.4 (21.2)
D15N4C	16 (6)	16 (6)	2.4 (21.2)

ATV320•M•C412

Solar: DC Bus Terminals (PA/+ and PC/-) (Wire cross section in case of solar panel voltage supply)

Catalog reference	Wire Cross Section		Tightening Torque
	Minimum	Maximum	Rated
	mm ² (AWG)	mm ² (AWG)	N·m (lbf·in)
U02M2C, U04M2C, U06M2C, U07M2C, U02M3C, U04M3C, U06M3C, U07M3C	2.5 (14)	4 (12)	1.0 (8.9)
U11M3C, U15M3C, U11M2C, U15M2C, U22M3C	2.5 (14)	6 (10)	1.4 (12.4)
U30M3C	4 (12)	6 (10)	1.4 (12.4)
U22M2C, U40M3C	6 (10)	6 (10)	1.4 (12.4)
U55M3C	10 (8)	16 (6)	2.4 (21.2)
U75M3C	16 (6)	16 (6)	2.4 (21.2)
D11M3C, D15M3C	16*2 (6*2)	16*2 (6*2)	4.5 (40)

Motor: Output Terminals (U, V, W)

Catalog reference	Wire Cross Section		Tightening Torque
	Minimum	Maximum	Rated
	mm ² (AWG)	mm ² (AWG)	N·m (lbf·in)
U02M2C, U04M2C, U06M2C, U07M2C, U02M3C, U04M3C, U06M3C, U07M3C	2.5 (14)	4 (12)	1 (8.9)
U11M3C, U15M3C, U22M3C	2.5 (14)	6 (10)	1.4 (12.4)
U11M2C, U15M2C, U30M3C	4 (12)	6 (10)	1.4 (12.4)
U22M2C, U40M3C	6 (10)	6 (10)	1.4 (12.4)
U55M3C	10 (8)	16 (6)	2.4 (21.2)
U75M3C	16 (6)	16 (6)	2.4 (21.2)
D11M3C, D15M3C	16*2 (6*2)	16*2 (6*2)	4.5 (40)

Grid: Supply Terminals (L1, L2, L3)

Catalog reference	Wire Cross Section		Tightening Torque
	Minimum	Maximum	Rated
	mm ² (AWG)	mm ² (AWG)	N·m (lbf·in)
U02M2C, U04M2C, U06M2C, U07M2C, U02M3C, U04M3C, U06M3C, U07M3C	2.5 (14)	4 (12)	1 (8.9)
U11M3C, U15M3C	2.5 (14)	6 (10)	1.4 (12.4)
U11M2C, U15M2C, U22M3C	4 (12)	6 (10)	1.4 (12.4)
U22M2C, U30M3C, U40M3C	6 (10)	6 (10)	1.4 (12.4)
U55M3C	10 (8)	16 (6)	2.4 (21.2)
U75M3C	16 (6)	16 (6)	2.4 (21.2)
D11M3C, D15M3C	16*2 (6*2)	16*2 (6*2)	4.5 (40)

Control Terminals Electrical Data

Characteristics of Terminals

NOTE:

- For a description of the terminal arrangement, refer to Arrangement and Characteristics of Control Terminals and Communication And I/O Ports.
- For factory setting I/O assignment, refer to the Programming Manual.

Terminal	Description	I/O Type	Electrical characteristics
R1A	NO contact of relay R1	O	Output Relay 1 <ul style="list-style-type: none"> • Minimum switching capacity: 5 mA for 24 Vdc • Maximum switching current on resistive load: 3 A for 250 Vac (OVC II) and 30 Vdc • Maximum switching current on inductive load: 2 A for 250 Vac (OVC II) and 30 Vdc. Inductive load must be equipped with a voltage surge suppression device according to ac or dc operation with total energy dissipation greater than the inductive energy stored in the load. Refer to the installation Manual chapters "Output Relay with Inductive AC Loads" and "Output Relay with Inductive DC Loads". • Refresh time: 2 ms • Service life: 100,000 operations at maximum switching current
R1B	NC contact of relay R1	O	
R1C	Common point contact of relay R1	O	
COM	Analog I/O common	I/O	0 V
AQ1	Analog output	O	AQ: Analog output software-configurable for voltage or current <ul style="list-style-type: none"> • Voltage analog output 0...10 Vdc. Minimum load impedance 470 Ω, • Current analog output X-Y mA by programming X and Y from 0...20 mA, maximum load impedance 800 Ω • Sampling time: 2 ms • Resolution 10 bits • Accuracy: <ul style="list-style-type: none"> ◦ $\pm 1\%$ at 25 °C ± 10 °C (77 °F ± 18 °F) ◦ $\pm 2\%$ for a temperature variation of 60 °C (108 °F) • Linearity $\pm 0.3\%$
COM	Analog I/O common	I/O	0 V
AI3	Current analog input	I	Analog input 0-20 mA (or 4-20 mA, X-20 mA, 20-Y mA). X and Y can be programmed from 0 to 20 mA <ul style="list-style-type: none"> • Impedance: 250 Ω • Resolution: 10 bits • Accuracy: <ul style="list-style-type: none"> ◦ $\pm 0.5\%$ at 25 °C (77 °F) ◦ $\pm 0.7\%$ for a temperature variation of 60 °C (108 °F) • Linearity $\pm 0.2\%$ (maximum $\pm 0.5\%$) of full scale • Sampling time: 2 ms
AI2	Voltage analog input	I	Bipolar analog input 0 \pm 10 Vdc (maximum voltage ± 30 Vdc) <p>The + or – polarity of the voltage on AI2 affects the direction of the setpoint and therefore the direction of operation.</p> <ul style="list-style-type: none"> • Impedance: 30 kΩ • Resolution: 10 bits • Accuracy: <ul style="list-style-type: none"> ◦ $\pm 0.5\%$ at 25 °C (77 °F) ◦ $\pm 0.7\%$ for a temperature variation of 60 °C (108 °F) • Linearity $\pm 0.2\%$ (maximum $\pm 0.5\%$) of full scale • Sampling time: 2 ms

Terminal	Description	I/O Type	Electrical characteristics
10V	Power supply for reference potentiometer	O	Internal supply for the analog inputs <ul style="list-style-type: none"> + 10 Vdc Tolerance: 0...10 % Current: maximum 10 mA
AI1	Voltage analog input	I	Analog input 0 + 10 Vdc <ul style="list-style-type: none"> Impedance: 30 kΩ Resolution: 10 bit converter Accuracy: <ul style="list-style-type: none"> ± 0.5 % at 25 °C (77 °F) ± 0.7 % for a temperature variation of 60 °C (108 °F) Linearity ± 0.2 % (maximum ± 0.5 %) of full scale Sampling time: 2 ms
COM	Analog I/O common	I/O	0 V
+24	Digital input power supply	I/O	<ul style="list-style-type: none"> +24 Vdc input supply Tolerance: -15...+20 % Current: 100 mA Terminal protected against overload and short-circuit.
R2A R2C	NO contact of programmable relay R2	O	Output Relay 2 <ul style="list-style-type: none"> Minimum switching capacity: 5 mA for 24 Vdc Maximum switching current on resistive load: 5 A for 250 Vac (OVC II) and 30 Vdc. Maximum switching current on inductive load: 2 A for 250 Vac (OVC II) and 30 Vdc. Inductive load must be equipped with a voltage surge suppression device according to ac or dc operation with total energy dissipation greater than the inductive energy stored in the load. Refer to the installation Manual chapters "Output Relay with Inductive AC Loads" and "Output Relay with Inductive DC Loads". Refresh time: 2 ms Service life: <ul style="list-style-type: none"> 100,000 operations at maximum switching power 1,000,000 operations at 1 A
STO	STO (Safe Torque Off) input	I	<ul style="list-style-type: none"> Input: +24 Vdc Impedance: 1.5 kΩ Refer to the Wiring Diagrams section and the ATV320 Safety Functions Manual (NVE50467) available on www.se.com
P24	Input for an external 24 Vdc supply / Output power supply for digital inputs and STO	I/O	<ul style="list-style-type: none"> +24 Vdc Tolerance: -15...+20 % Current: maximum 1.1 A
DQ+ DQ-	Digital output	O	Open collector output configurable as sink or source using SW1 switch <ul style="list-style-type: none"> Refresh time: 2 ms Maximum voltage: 30 Vdc Maximum current: 100 mA
DI6 DI5	Digital inputs	I	If programmed as digital inputs, same characteristics as DI1 to DI4 <ul style="list-style-type: none"> DI5 can be programmed as pulse input 20 kpps (pulse per second). DI6 can be used as PTC (Positive Temperature Coefficient) using SW2 switch Arrangement and Characteristics of Control Block Terminals and Communication and I/O Ports, page 62. Trip threshold: 3 kΩ, reset threshold: 1.8 kΩ Short-circuit detection threshold < 50 Ω

Terminal	Description	I/O Type	Electrical characteristics
D14 D13 D12 D11	Digital inputs	I	<p>4 programmable digital inputs configurable as sink or source using SW1 switch Arrangement and Characteristics of Control Block Terminals and Communication and I/O Ports, page 62.</p> <ul style="list-style-type: none"> + 24 Vdc power supply (maximum 30 Vdc) State 0 if < 5 Vdc, state 1 if > 11 Vdc (in source mode) State 0 if > 16 Vdc, state 1 if < 10 Vdc (in sink mode) Response time 8 ms at Stop D11: RUN command. D13: If nothing is connected (by default), then standard voltage range is applied.
PE	Protective earth	–	ATV320•••••C protective earth for fast communication. Wiring is detailed in the Control Block Wiring section Control Block Wiring, page 83.

Arrangement and Characteristics of Control Block Terminals and Communication and I/O Ports

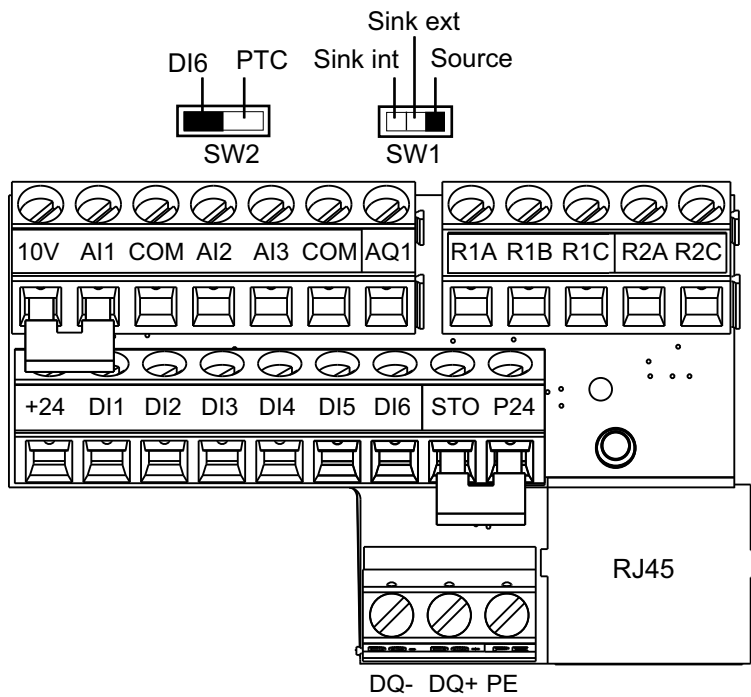
Wiring Characteristics

⚡ ⚠ DANGER

HAZARD OF FIRE OR ELECTRIC SHOCK

- Wire cross sections and tightening torques must comply with the specifications provided in this document.
- If you use flexible multi-wire cables for a connection with a voltage higher than 25 Vac, you must use ring type cable lugs or wire ferrules, depending on the wire gauge and the specified stripping length of the cable.

Failure to follow these instructions will result in death or serious injury.



Wire cross sections and tightening torques

Control Terminals	Relay Output Wire Cross Section		Other Wire Cross Section		Tightening Torque
	Minimum (1)	Maximum	Minimum (1)	Maximum	
	mm ² (AWG)	mm ² (AWG)	mm ² (AWG)	mm ² (AWG)	
All terminals	0.75 (18)	1.5 (16)	0.5 (20)	1.5 (16)	0.5 (4.4)

(1) The value corresponds to the minimum permissible cross section of the terminal.

NOTE: Control Terminal Electrical data., page 59

RJ45 Communication port

It is used to connect a:

- PC using SoMove software
- Remote graphic display terminal, using a Modbus serial line
- Modbus or CANopen network
- Configuration loader tool...

NOTE: Check that the RJ45 cable is not damaged prior to connect it to the product otherwise the power supply of the control could be lost.

Mounting the drive

What's in This Part

Mounting Procedure	65
Mounting Conditions.....	66

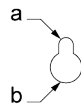
Mounting Procedure

Mounting Holes and Screws

Fixation by screws is required for all drives ratings:

- Number of holes: Use the 4 mounting holes.
- Use of only 2 holes is possible (left top and right bottom) on •U04•...•U40• references.

Top hole



Frame Size	Top Holes a mm (in.)	Top Holes b (if any) mm (in.)	Bottom holes mm (in.)	Recommended Screws
ATV320U04•C412... ATV320U40•C412	5 (0.2)	–	5 (0.2)	M4
ATV320U55•C412, ATV320U75•C412	5 (0.2)	11 (0.43)	5 (0.2)	M4
ATV320D11•C412, ATV320D15•C412	6 (0.24)	14 (0.55)	6 (0.24)	M5

NOTE: Screws are not delivered with the product.

Mounting Conditions

Before You Begin

DANGER

HAZARD OF FIRE OR ELECTRIC SHOCK

The open type product does not provide comprehensive mitigation for fire hazards and protection against direct contact to hazardous live parts.

- Install the product inside a supplementary enclosure which provides appropriate protection against spread of fire and electric shock.

Failure to follow these instructions will result in death or serious injury.

DANGER

RISK OF FIRE

The device is suitable for mounting on concrete or other non-combustible surfaces only.

Failure to follow these instructions will result in death or serious injury.

Conductive foreign objects may cause parasitic voltage.

DANGER

ELECTRIC SHOCK AND/OR UNANTICIPATED EQUIPMENT OPERATION

- Keep foreign objects such as chips, screws or wire clippings from getting into the product.
- Verify correct seat of seals and cable entries in order to avoid deposits and humidity.

Failure to follow these instructions will result in death or serious injury.

The temperature of the products described in this manual may exceed 80 °C (176 °F) during operation.

WARNING

HOT SURFACES

- Ensure that any contact with hot surfaces is avoided.
- Do not allow flammable or heat-sensitive parts in the immediate vicinity of hot surfaces.
- Verify that the product has sufficiently cooled down before handling it.
- Verify that the heat dissipation is sufficient by performing a test run under maximum load conditions.


Failure to follow these instructions can result in death, serious injury, or equipment damage.

Power Drive Systems (PDS) can generate strong local electrical and magnetic fields. This can cause interference in electromagnetically sensitive devices.

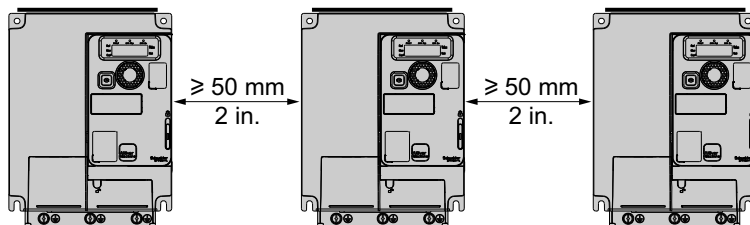
⚠ WARNING
<p>ELECTROMAGNETIC FIELDS</p> <ul style="list-style-type: none"> • Keep persons with electronic medical implants, such as pacemakers, away from the equipment. • Do not place electromagnetically sensitive devices in the vicinity of the equipment. <p>Failure to follow these instructions can result in death, serious injury, or equipment damage.</p>

Attaching A Label With Safety Instructions

A label kit is provided with the drive.

Step	Action
1	Observe the safety regulations in the targeted country
2	Select the label suitable for the targeted country
3	<p>Attach the label to the front of the device so that it is clearly visible. Below is the English version</p> <div style="border: 1px solid black; padding: 5px; margin: 10px 0;">  <p>DANGER ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH.</p> <p>To service, remove all power. - Wait 15 minutes - Verify no voltage is present.</p> <p>Failure to comply will result in death or serious injury</p> </div> <p>NOTE: Products used in Canada according to CSA C22.2 no.274 must comply with the requirement defined by the Canadian Advisory council of Electrical Safety (CACES).</p> <p>It defines that dual language (French and English) safety labeling is required on all products for use in Canada</p> <p>To fulfill this requirement, add the French language safety label on the front panel of the product.</p>

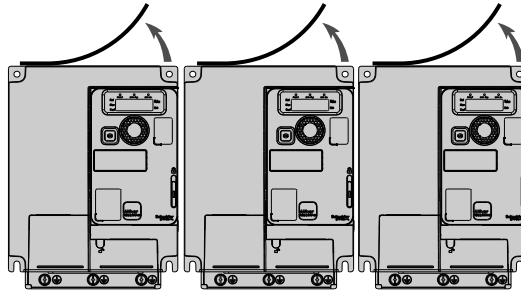
Mounting Type A for ATV320...C Drives



Free space ≥ 50 mm (2 in.) on each side, with vent cover fitted.

Mounting type A is suitable for drive operation at a specific surrounding air temperature. For more information, refer to [Derating Curves](#).

Mounting Type B for ATV320...C Drives

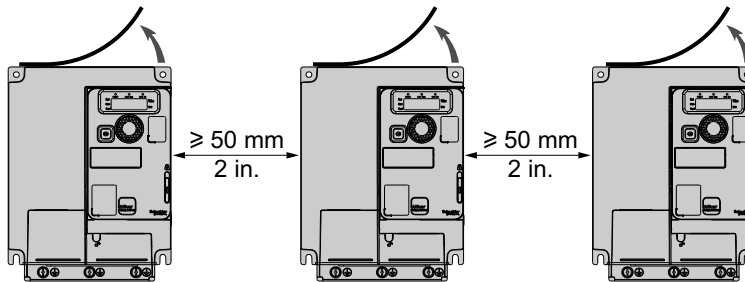


Drives mounted side-by-side, vent cover should be removed. The degree of protection becomes IP20.

Mounting type B is suitable for drive operation at a specific surrounding air temperature. For more information, refer to Derating Curves.

NOTE: Use a tool to peel off the top label.

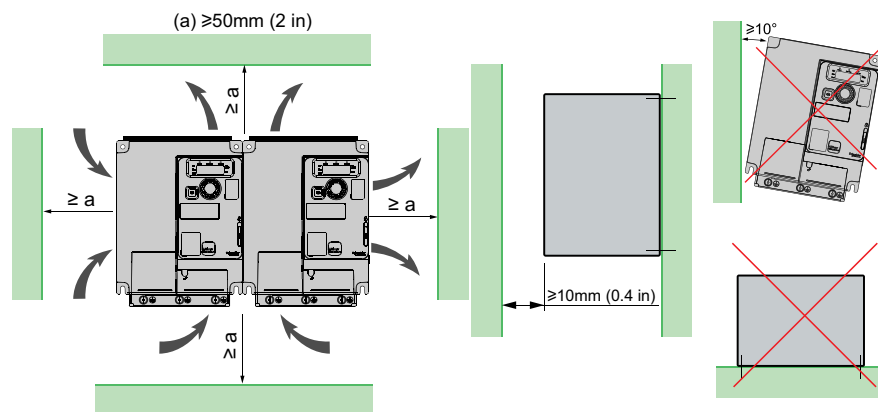
Mounting Type C for ATV320...C Drives



The degree of protection becomes IP20. Free space ≥ 50 mm (2 in.) on each side. Vent cover should be removed for operation at a specific surrounding air temperature. For more information, refer to Derating Curves.

NOTE: Use a tool to peel off the top label.

Clearances and Mounting Position



a: Minimum value corresponding to thermal constraint (50 mm (2 in.)).

General Mounting Instructions

- Mount the device in a vertical position at $\pm 10^\circ$. This is required for cooling the device.
- Attach it on the mounting surface in compliance with standards, using screws according to the table given in the [Mounting Procedure](#) section, page 65.
- The use of washers is required with all mounting screws.
- Tighten the fixation screws.
- Do not mount the device outdoors.
- Do not mount the device close to heat sources.
- Avoid environmental effects like high temperatures and high humidity as well as dust, dirt and conductive gases.
- Adhere to the minimum installation distances for required cooling.
- Do not mount the device on flammable materials.
- Install the drive on a solid, vibration-free support.
- Frame size 1B and 2B can be installed horizontally without derating, except side by side mounting, and provided that:
 - the upper side is the one with the air inlets,
 - clearances around the drive are the same than for vertical mounting.

Drive wiring

What's in This Part

General Wiring Diagram using Solar Panel supply only	71
Wiring Instructions	72
Wiring the Power Part	75
Wiring The Control Part	81

General Wiring Diagram using Solar Panel supply only

NOTICE

WRONG GROUND CONNECTION

Never connect the ground to the terminal PC- of the product.

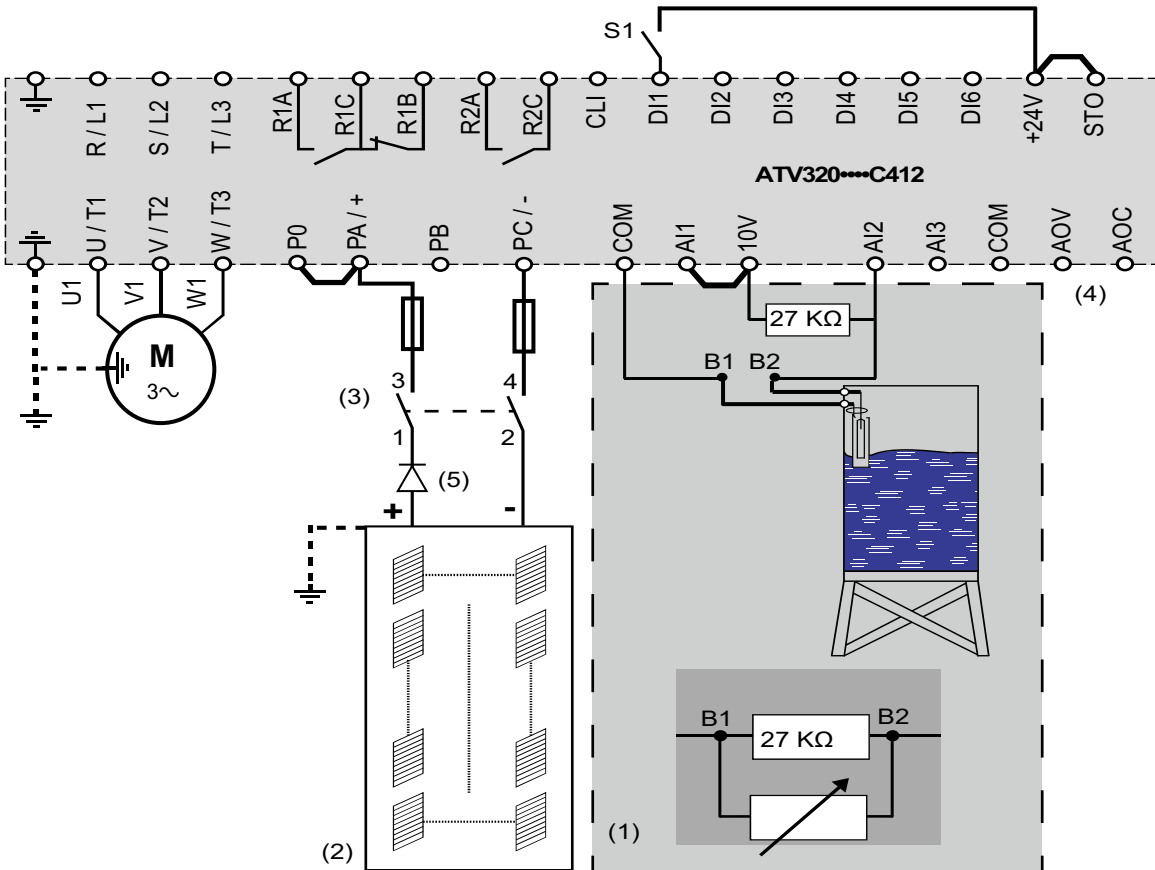
Failure to follow these instructions can result in equipment damage.

NOTICE

INCORRECT POLARITY

Prior to connect the photovoltaic arrays to the system, respect the polarity PA/+ and PC/-.

Failure to follow these instructions can result in equipment damage.



(1) Tank water / liquid probe is optional. For more information, refer to the chapter [Tank Liquid Probe] *L P Π -*, page 104

(2) The photovoltaic modules used shall comply with UL 1703. The solar panels and the drive input shall be in compliance with NEC article 690. For the photovoltaic installation ground connection, safety instructions and orientation, refer to the photovoltaic panel user manual.

(3) Protection according to the concerned voltage, current and according to the photovoltaic arrays manual.

Fuse between PC/- and the - of the solar panel is optional.

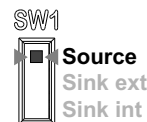
For fuse selection and DC switch-disconnector, refer to the Short-Circuit Current Ratings (SCCR) and Branch Circuit Protection, page 45.

For connections, refer to the ATV320 Solar sizer software on www.se.com.

(4) For AOC or AOV diagnostic values on ATV320 Solar drive, refer to the chapter Diagnostic on AOV or AOC, page 158.

(5) On some applications, a blocking diode is mandatory. For more information, refer to the chapter Blocking diode, page 135

NOTE: Check that the Logic Input switch is on Source position:



Wiring Instructions

General Instructions

The entire installation procedure must be performed without voltage present.

DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION OR ARC FLASH

Read and understand the instructions in **Safety Information** chapter before performing any procedure in this chapter.

Failure to follow these instructions will result in death or serious injury.

DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

Before applying voltage to and configuring the product, verify that it is properly wired.

Failure to follow these instructions will result in death or serious injury.

The product has a leakage current greater than 3.5 mA. If the protective ground connection is interrupted, a hazardous touch current may flow if the product is touched.

DANGER

ELECTRIC SHOCK CAUSED BY HIGH LEAKAGE CURRENT

Verify compliance with all local and national electrical code requirements as well as all other applicable regulations with respect to grounding of the entire drive system installation.

Failure to follow these instructions will result in death or serious injury.

Drive systems may perform unexpected movements because of incorrect wiring, incorrect settings, incorrect data or other errors.

WARNING

UNANTICIPATED EQUIPMENT OPERATION

- Carefully install the wiring in accordance with the EMC requirements.
- Do not operate the product with unknown or unsuitable settings or data.
- Perform a comprehensive commissioning test.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

Cable Characteristics

If you are using cables longer than 50 m (164 ft) between the drive and the motor, add output filters (for more details refer to the catalog).

Use a shielded cable to meet the requirements of Category C2 or C3 according to the standard IEC 61800-3.

To limit the currents in common mode, use common mode output filters (ferrite) in order to reduce the circulating currents in the motor windings.

Standard linear capacity cables can be used with Altivar Machine. Use of cables with lower linear capacity could increase cable length performances.

The overvoltage limitation function **[Motor surge limit.]** $S \propto L$ enables you to increase the cable length while decreasing the torque performances (refer to Programming manual, page 12).

Residual Current Device

Direct current can be introduced in the protective ground conductor of this drive. If a residual current device (RCD / GFCI) or a residual current monitor (RCM) is used for additional protection against direct or indirect contact, the following specific types must be used:

⚠ WARNING

DIRECT CURRENT CAN BE INTRODUCED INTO THE PROTECTIVE GROUND CONDUCTOR

- Use a Type A or Type F Residual Current Device (RCD / GFCI) or a Residual Current Monitor (RCM) for single-phase drives connected to a phase and to the neutral conductor.
- Use a Type B Residual Current Device (RCD / GFCI) or a Residual Current Monitor (RCM) that has approval for use with frequency inverters and is sensitive to all types of current for three-phase devices and for single-phase devices not connected to a phase and the neutral conductor.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

Further conditions for use of a residual current device:

- The drive has an increased leakage current at the moment power is applied. Use a residual current device (RCD / GFCI) or a residual current monitor (RCM) with a response delay.
- High-frequency currents must be filtered.

Choose a suitable model integrating:

- High frequency current filtering,
- A time delay that helps to prevent a triggering of the upstream device caused by the load from stray capacitance on power-on. The time delay is not available for 30 mA device; in this case, choose devices with immunity against nuisance triggering.

Due to high leakage current in standard operation, we recommend choosing at least a 300 mA device.

If the installation requires a residual current device less than 300 mA, it can be possible to use a device lower than 300 mA by removing the screws according to the instructions given in the **Operation on an IT or Corner Grounded System** section in the Installation manual, page 12.

If the installation includes several drives, provide one residual current device per drive.

Equipment Grounding

⚡⚠ DANGER

ELECTRIC SHOCK CAUSED BY INSUFFICIENT GROUNDING

- Verify compliance with all local and national electrical code requirements as well as all other applicable regulations with respect to grounding of the entire device.
- Ground the device before applying voltage.
- The cross section of the protective ground conductor must comply with the applicable standards.
- Do not use conduits as protective ground conductors; use a protective ground conductor inside the conduit.
- Do not consider cable shields to be protective ground conductors.

Failure to follow these instructions will result in death or serious injury.

Tighten the grounding screws according to the instructions given in the Ground Cables section in Characteristics of the Power Part Terminals, page 56.

Connection Instructions

The product has a leakage current greater than 3.5 mA. If the protective ground connection is interrupted, a hazardous touch current may flow if the product is touched.

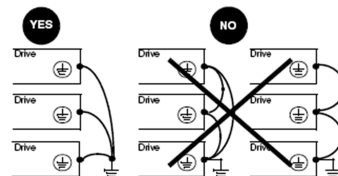
⚡⚠ DANGER

ELECTRIC SHOCK CAUSED BY HIGH LEAKAGE CURRENT

Verify compliance with all local and national electrical code requirements as well as all other applicable regulations with respect to grounding of the entire drive system installation.

Failure to follow these instructions will result in death or serious injury.

- Ensure that the resistance to Ground is 1 Ohm or less.
- When grounding several drives, you must connect each one directly, as shown in the above figure.
- Do not loop Ground cables or connect them in series.



Wiring the Power Part

DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION OR ARC FLASH

Verify that the cables are properly installed as specified in the Characteristics of the Power Part Terminals section.

Failure to follow these instructions will result in death or serious injury.

DANGER

HAZARD OF FIRE OR ELECTRIC SHOCK

- Wire cross sections and tightening torques must comply with the specifications provided in this document.
- If you use flexible multi-wire cables for a connection with a voltage higher than 25 Vac, you must use ring type cable lugs or wire ferrules, depending on the wire gauge and the specified stripping length of the cable.

Failure to follow these instructions will result in death or serious injury.

DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION OR ARC FLASH

Read and understand the instructions in **Safety Information** chapter before performing any procedure in this chapter.

Failure to follow these instructions will result in death or serious injury.

DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

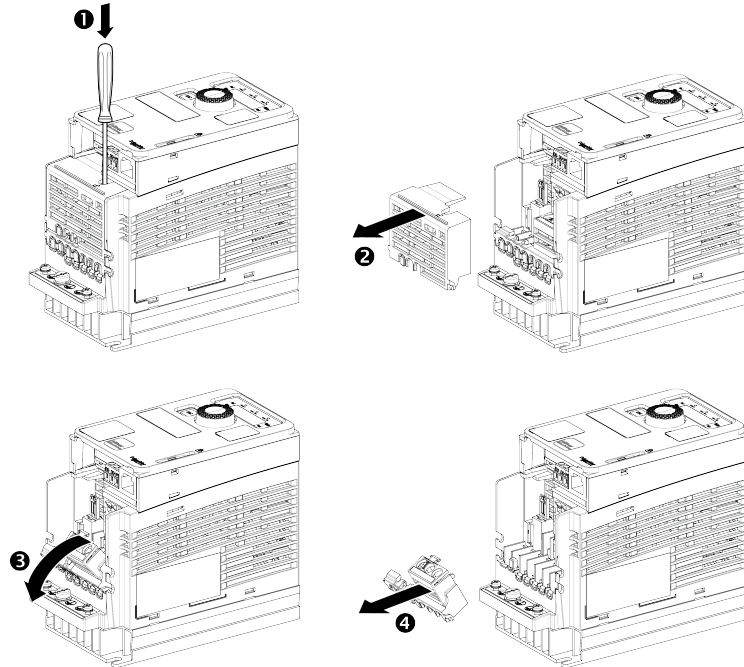
After wiring the power terminals, refit properly the terminal cover and the wiring cover to meet the required degree of protection.

Failure to follow these instructions will result in death or serious injury.

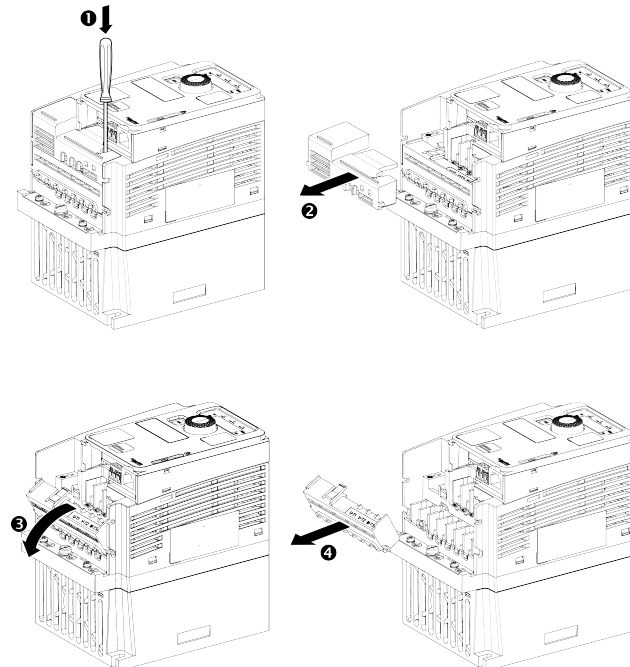
Access To The Terminals For ATV320U04•C412... ATV320U40•C412

Power supply terminals, motor terminals and braking resistor terminals are located on the bottom of the drive.

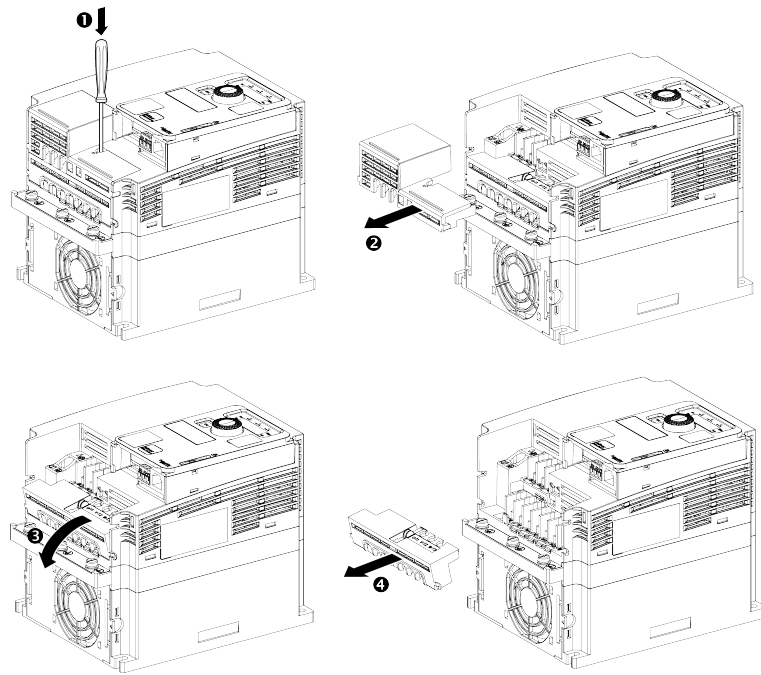
ATV320U04•C412...ATV320U07•C412



ATV320U11•C412...ATV320U22•C412



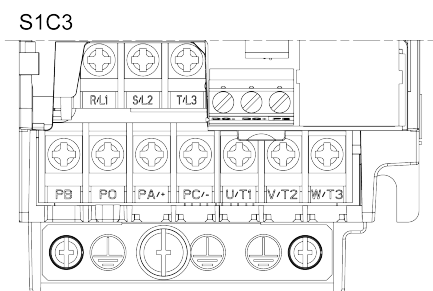
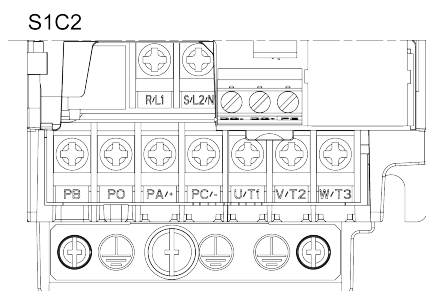
ATV320U30•C412, ATV320U40•C412



Apply the following instructions to access the power terminals on drives:

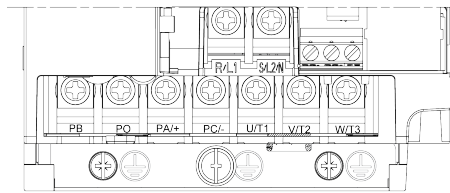
Step	Action
1	Push the locking tab using a screwdriver.
2	Remove the wiring cover.
3	Tilt the terminal cover
4	Remove the terminal cover

Power Terminals Arrangement For ATV320U04•C412... ATV320U07•C412

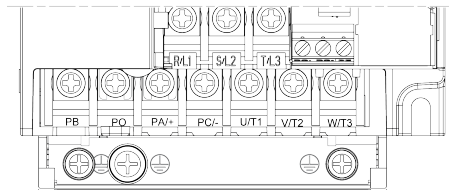


Power Terminals Arrangement For ATV320U11•C412... ATV320U22•C412

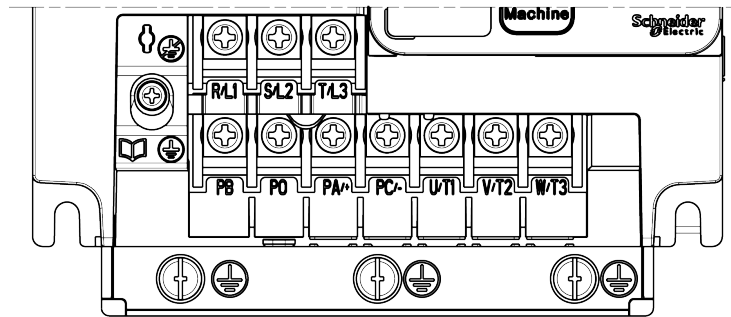
Single-phase



3-phase

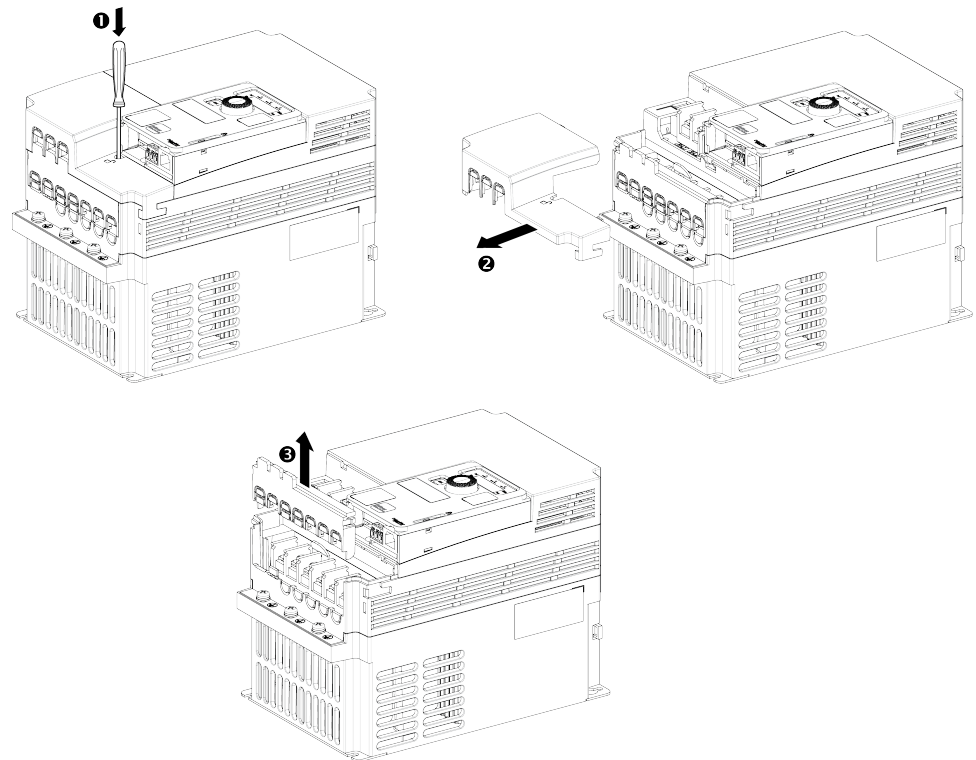


Power Terminals Arrangement For ATV320U30•C412, ATV320U40•C412



Access To The Terminals For ATV320U55•C412... ATV320D15•C412

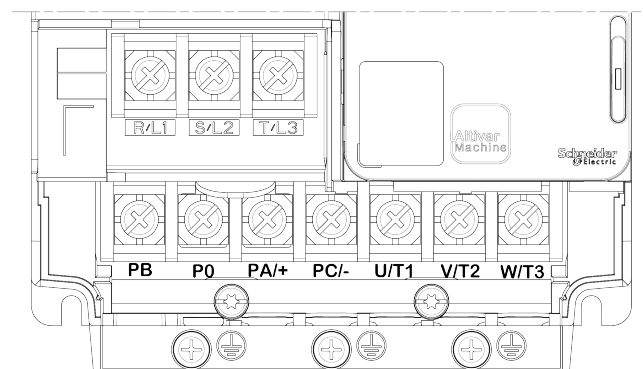
Power supply terminals, motor terminals and braking resistor terminals are located on the bottom of the drive.



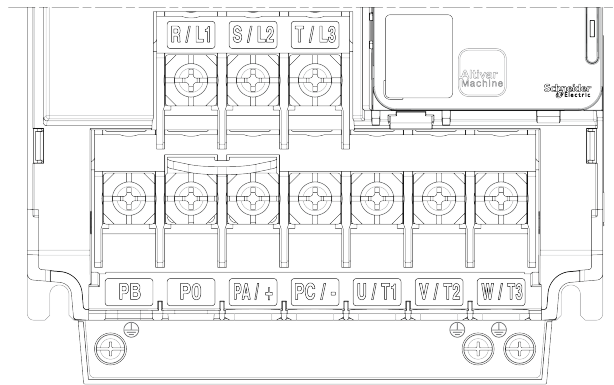
Apply the following instructions to access the power terminals on drives:

Step	Action
1	Push the locking tab using a screwdriver.
2	Remove the wiring cover.
3	Remove the terminal cover

Power Terminals Arrangement For ATV320U55•C412, ATV320U75•C412



Power Terminals Arrangement For ATV320D11•C412, ATV320D15•C412



Wiring The Control Part

PELV Requirements of Connected Devices

⚡⚠ DANGER
HAZARD OF ELECTRIC SHOCK, EXPLOSION OR ARC FLASH
<ul style="list-style-type: none"> • Verify that the temperature sensors in the motor meet the PELV requirements. • Verify that the motor encoder meets the PELV requirements. • Verify that any other equipment connected via signal cables meets the PELV requirements.
Failure to follow these instructions will result in death or serious injury.

⚠ WARNING
UNANTICIPATED EQUIPMENT OPERATION
<ul style="list-style-type: none"> • Use shielded cables for all digital and analog I/O signals and communication signals. • Ground cable shields at a single point. • Route communication cables and I/O cables separately from power cables
Failure to follow these instructions can result in death, serious injury, or equipment damage.

⚠ WARNING
UNANTICIPATED EQUIPMENT OPERATION
Verify that the digital and analog inputs and outputs are wired with the shielded, twisted-pair cables specified in the present manual.
Failure to follow these instructions can result in death, serious injury, or equipment damage.

- Keep the control circuits away from the power cables. For digital and analog inputs/outputs, use shielded twisted cables with a pitch of 25...50 mm (1 in. and 2 in.)
- It is advisable to use cable ends, available on www.se.com.

NOTICE
INCORRECT VOLTAGE
Supply the digital inputs with 24 Vdc only.
Failure to follow these instructions can result in equipment damage.

Optional Module Installation and Wiring

NOTE:

- For approved fieldbus module list, refer to the catalog.
- For fieldbus modules information, refer to the instruction sheet S1A45591 available on www.se.com.

Access to the Terminals

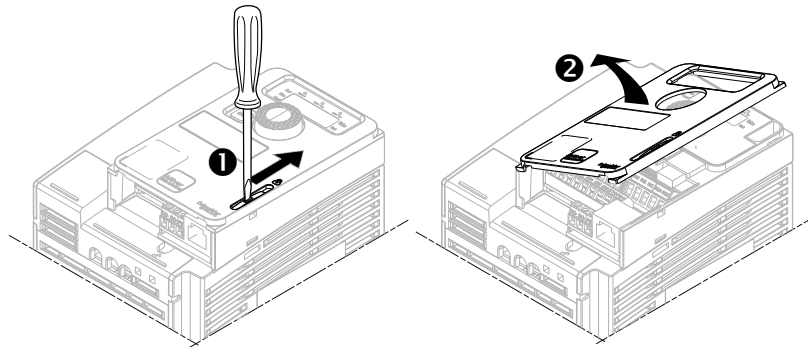
DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION OR ARC FLASH

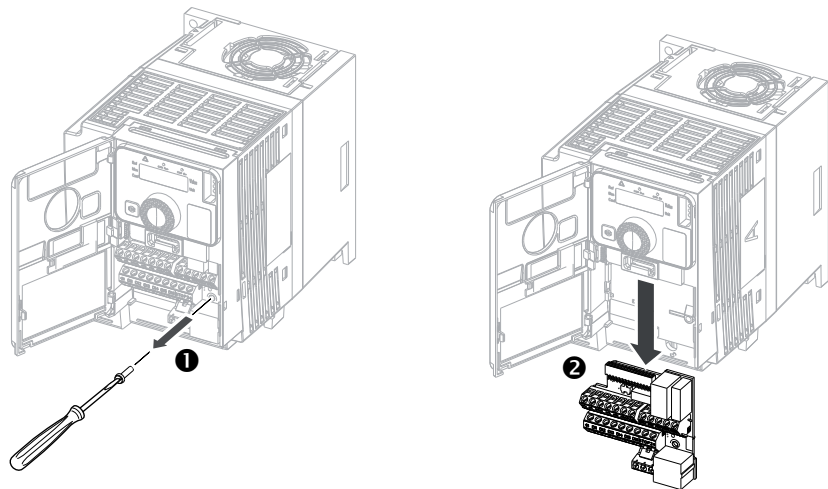
Read and understand the instructions in **Safety Information** chapter before performing any procedure in this chapter.

Failure to follow these instructions will result in death or serious injury.

Open the cover as shown in the examples below to access the terminals. All screws are M3 slotted type, 3.8 mm (0.15 in.) diameter.



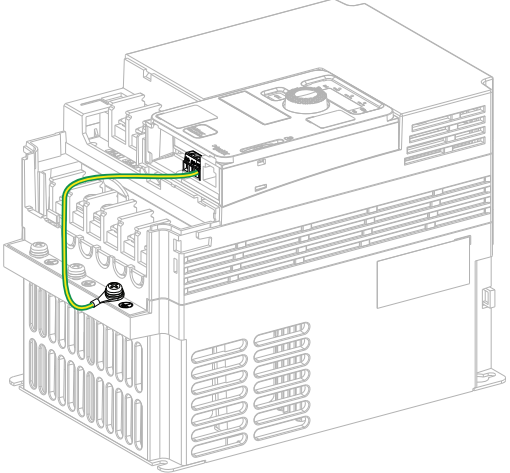
Control block can be removed to facilitate the wiring.



Control Block Wiring

Apply the following instructions to wire the control block terminals:


Step	Action
1	Wire the P24, the STO, the digital inputs (DI1...DI6), the +24, DQ-, DQ+ and PE terminals
2	Wire the 10V, the analog inputs (AI1...AI3), the COM, The digital input AQ1 and the COM terminals
3	Wire the Relay outputs
4	Wire the PE terminal as shown below - example of frame size 3




Checking Installation

Before Switching On


The safety function STO (Safe Torque Off) does not remove power from the DC bus. The safety function STO only removes power to the motor. The DC bus voltage and the mains voltage to the drive are still present.

 DANGER
HAZARD OF ELECTRIC SHOCK <ul style="list-style-type: none">• Do not use the safety function STO for any other purposes than its intended function.• Use an appropriate switch, that is not part of the circuit of the safety function STO, to disconnect the product from the mains power. Failure to follow these instructions will result in death or serious injury.

Unsuitable settings or unsuitable data or unsuitable wiring may trigger unintended movements, trigger signals, damage parts and disable monitoring functions.

 WARNING
UNANTICIPATED EQUIPMENT OPERATION <ul style="list-style-type: none">• Only start the system if there are no persons or obstructions in the zone of operation.• Verify that a functioning emergency stop push-button is within reach of all persons involved in the operation.• Do not operate the product with unknown settings or data.• Verify that the wiring is appropriate for the settings.• Never modify a parameter unless you fully understand the parameter and all effects of the modification.• When commissioning, carefully run tests for all operating states, operating conditions and potential error situations.• Anticipate movements in unintended directions or oscillation of the motor. Failure to follow these instructions can result in death, serious injury, or equipment damage.

If the power stage is disabled unintentionally, for example as a result of power outage, errors or functions, there is a possibility that the motor is no longer decelerated in a controlled way.

 WARNING
UNANTICIPATED EQUIPMENT OPERATION <p>Verify that movements without braking effect does not result in unsafe conditions.</p> Failure to follow these instructions can result in death, serious injury, or equipment damage.

Mechanical Installation

Verify the mechanical installation of the entire drive system:

Step	Action	✓
1	Does the installation meet the specified distance requirements?	
2	Did you tighten all fastening screws with the specified tightening torque?	

Electrical installation

Verify the electrical connections and the wiring:

Step	Action	✓
1	Did you connect all protective ground conductors?	
2	Do all fuses and circuit breaker have the correct rating; are the fuses of the specified type?	
3	Did you connect or insulate all wires at the cable ends?	
4	Did you properly connect and install all cables and connectors?	
5	Did you properly connect the signal wires?	
6	Are the required shield connections EMC-compliant?	
7	Did you take all measures for EMC compliance?	

Covers And Seals

Verify that all devices, doors and covers of cabinet are properly installed to meet the required degree of protection.

Programming

What's in This Part

Overview	87
[Simply start] (S i n-)	97
[Sun] (S u n-)	103
[Inputs / Outputs] (i - o-)	124

Unsuitable settings or unsuitable data or unsuitable wiring may trigger unintended movements, trigger signals, damage parts and disable monitoring functions.

⚠ WARNING
UNANTICIPATED EQUIPMENT OPERATION <ul style="list-style-type: none">• Only start the system if there are no persons or obstructions in the zone of operation.• Verify that a functioning emergency stop push-button is within reach of all persons involved in the operation.• Do not operate the product with unknown settings or data.• Verify that the wiring is appropriate for the settings.• Never modify a parameter unless you fully understand the parameter and all effects of the modification.• When commissioning, carefully run tests for all operating states, operating conditions and potential error situations.• Anticipate movements in unintended directions or oscillation of the motor. Failure to follow these instructions can result in death, serious injury, or equipment damage.


Overview

What's in This Chapter

Structure of the Parameter Table	88
Finding a Parameter in this Document.....	89
Description of the HMI	89
Structure of the Menus.....	91
Cyber Security	92
Difference between ATV320 standard and solar product.....	96

Structure of the Parameter Table

General Legend

Pictogram	Description
★	These parameters only appear if the corresponding function has been selected in another menu. When the parameters can also be accessed and adjusted from within the configuration menu for the corresponding function, their description is detailed in these menus, on the pages indicated, to aid programming.
()	Setting of this parameter can be done during operation or when stopped.
 2 s	To change the assignment of this parameter, press the ENT key for 2 s.

Menu Presentation

This document shows the **[Short Label]** labels and **Long Label** of the most recent Remote Graphic Display Terminal, the VW3A1111.

Below an example of a menu presentation:

[Short Label] `C o d E`

Long Label (is written in italic and accessible with the "i" button on the graphic display terminal VW3A1111, or visible on the DTM interface).

Access path: `M E n u c o d E` → `S u b - M E n u c o d E`

About this menu

Description of the menu.

Parameter Presentation

Below an example of a parameter presentation:

HMI label	Setting or Display	Factory setting
[Short Label] <code>C o d E</code> (pictogram)	XXX...XXX [unit] [additional informations]	Factory setting: [Short Label] <code>C o d E</code>
<p>[Long label]</p> <p>Reference exclusivity and required optional modules. Example: Fieldbus Module VW3A3607 is required.</p> <p>Description of the parameter.</p> <p>Parameter incompatibilities and / or required configuration. Example: This parameter can be accessed it [Short Label] <code>C o d E</code> is set to [Short Label] <code>C o d E</code>. This parameter is not compatible with [Short Label] <code>C o d E</code>.</p> <p>Impact on other parameters. Example: If this parameter is modified, the parameter [Short Label] <code>C o d E</code> is set to factory settings.</p>		

Finding a Parameter in this Document

The following assistance with finding explanations on a parameter is provided:

- With the integrated display terminal and the remote display terminal: direct use of the parameter code index, to find the page giving details of the displayed parameter.
- Select the required parameter and press F1 F1 : **[Code]**. The parameter code is displayed instead of its name while the key is held down.

Example: ACC

RDY	Term	+0.0 Hz	0.0 A
SETTINGS			
Ramp increment		0.1	
Acceleration		9.51 s	
Deceleration		9.67 s	
Low speed		0.0 Hz	
High speed		50.0H-Z	
Code	<<	>>	Quick

Code

→

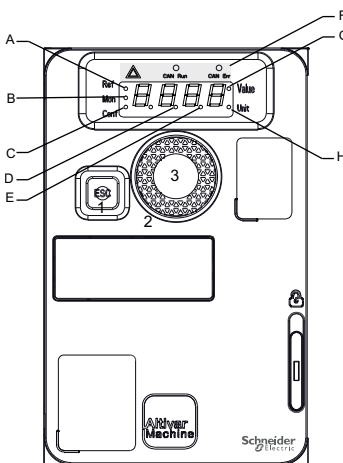
RDY	Term	+0.0 Hz	0.0 A
SETTINGS			
Ramp increment		0.1	
ACC		9.51 s	
Deceleration		9.67 s	
Low speed		0.0 Hz	
High speed		50.0H-Z	
Code	<<	>>	Quick

- Use the parameter code index , to find the page giving details of the displayed parameter.

Description of the HMI

Display and Keys Functionalities

- 1 The **ESC** key is used for menu navigation (backward) and parameters adjustment (cancel)
- 2 The **Jog dial** is used for menu navigation (up or down) and parameters adjustment (increase/decrease value or element choice). It can be used as Virtual analog input 1 for drive frequency reference value.
- 3 The **ENT** key (push on the Jog dial) is used for menu navigation (forward) and parameters adjustment (validation).



Item	Description
A	Reference mode selected <i>r E F -</i>
B	Monitoring mode selected <i>fl o n -</i>
C	Configuration mode selected <i>C o n F</i>
D	Dot used to display parameter value (1/100 unit)
E	Dot used to display parameter value (1/10 unit)
F	From the left to the right: • Indicates that the drive has detected an error • CANopen RUN Led Status (refer to the CANopen Manual). • CANopen Error Led Status (refer to the CANopen Manual).
G	Current display is parameter value
H	Current display is parameter unit

About other HMI display

Refer to the ATV320 programming manual.

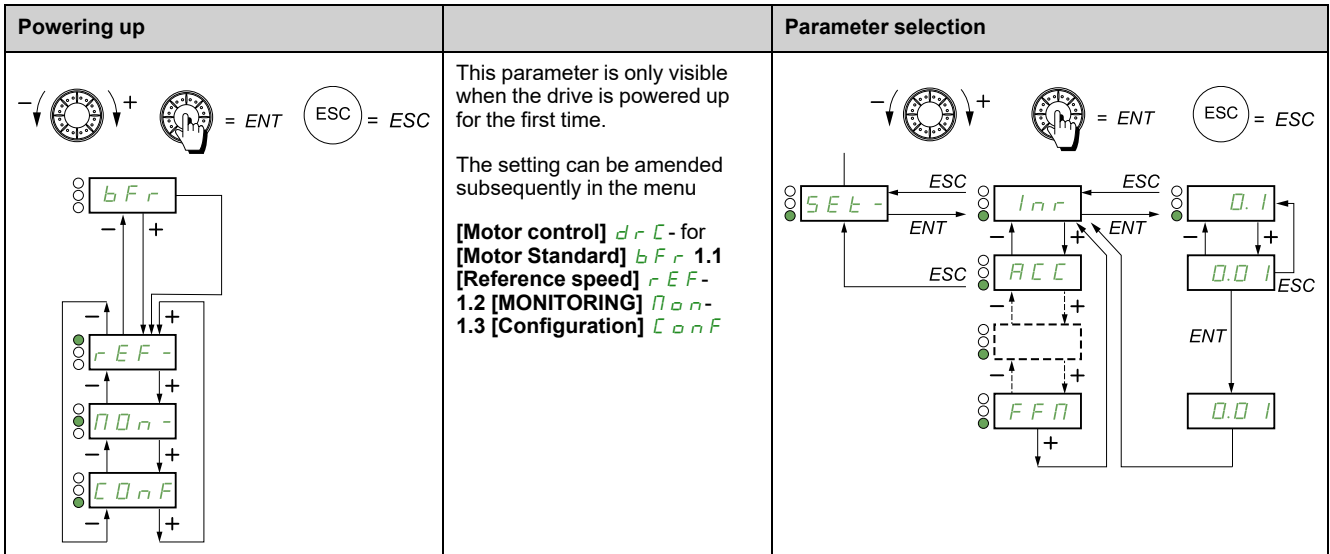
Normal display, with no detected error code displayed and no startup:

Displays the parameter selected in the 1.2 [MONITORING] (M o n-) menu (default: [Pre-Ramp Ref Freq] (F r H)).

- *i n i t*: **Initialization** (only on remote display terminal)
- *t u n*: **Autotuning**
- *d c b*: **DC injection**
- *r d y*: **Drive ready**
- *n s t*: **Freewheel stop**
- *c l i*: **Current limitation**
- *f s t*: **Fast stop**
- *f l u*: **Motor fluxing**
- *n l p*: **No mains voltage**
- *c t l*: **Control stopping**
- *a b r*: **Drive deceleration ramp adaptation**
- *s o c*: **Output cut**
- *u s r*: **Undervoltage warning**
- *s s 1*: **SS1 active**
- *s l s*: **SLS active**
- *s t o*: **STO active**
- *s n s*: **SMS active**
- *g d l*: **GDL active**
- *p s d i*: **Power switch disable**
- *l l*: **Low light**
- *t f*: **Tank full**
- *g p p t*: **Global MPPT**

NOTE: In the event of a detected error, the display blinks to notify the user accordingly. If a Graphic Display Terminal is connected, the name of the detected error is displayed.

Structure of the Menus



On the 7-segment display, a dash after menu and submenu codes is used to differentiate them from parameter codes.

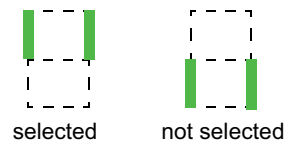
Example: [Application function] *F u n* - menu, [Acceleration] *A C C* parameter

Selection of Multiple Assignments for One Parameter

Example: List of group 1 warning in [Inputs / Outputs] *i _ o* - menu

A number of warnings can be chosen by selecting them as follows.

The digit on the right indicates:



The same principle is used for all multiple selections.

Cyber Security

Introduction

Cyber Security is a branch of network administration that addresses attacks on or by computer systems and through computer networks that can result in accidental or intentional disruptions.

The objective of Cyber Security is to help provide increased levels of protection for information and physical assets from theft, corruption, misuse, or accidents while maintaining access for their intended users.

No single Cyber Security approach is adequate. Schneider Electric recommends a defense-in-depth approach. Conceived by the **National Security Agency (NSA)**, this approach layers the network with security features, appliances, and processes.

The basic components of this approach are:

- Risk assessment
- A security plan built on the results of the risk assessment
- A multi-phase training campaign
- Physical separation of the industrial networks from enterprise networks using a demilitarized zone (DMZ) and the use of firewalls and routing to establish other security zones
- System access control
- Device hardening
- Network monitoring and maintenance

This chapter defines the elements that help you configure a system that is less susceptible to cyber attacks.

For detailed information on the defense-in-depth approach, refer to the TVDA: **How Can I Reduce Vulnerability to Cyber Attacks in the Control Room (STN V2)** on the Schneider Electric website.

To submit a Cyber Security question, report security issues, or get the latest news from Schneider Electric, visit the Schneider Electric website.

Potential Risks and Compensating Controls

Address potential risks using these compensating controls:

Area	Issue	Risk	Compensating controls
User accounts.	Default account settings are often the source of unauthorized access by malicious users.	If you do not change default password or disable the user access control, unauthorized access can occur.	Ensure User access control is enabled on all the communication ports and change the default passwords to help reduce unauthorized access to your device.
Secure protocols.	The device does not have the capability to transmit data encrypted using these protocols: <ul style="list-style-type: none"> • Modbus serial • Modbus TCP • EtherNet/IP • SNMP 	If a malicious user gained access to your network, they could intercept communication.	For transmitting data over internal network, physically or logically segment your network. For transmitting data over external network, encrypt protocol transmissions over all external connections using an encrypted tunnel, TLS wrapper or a similar solution.

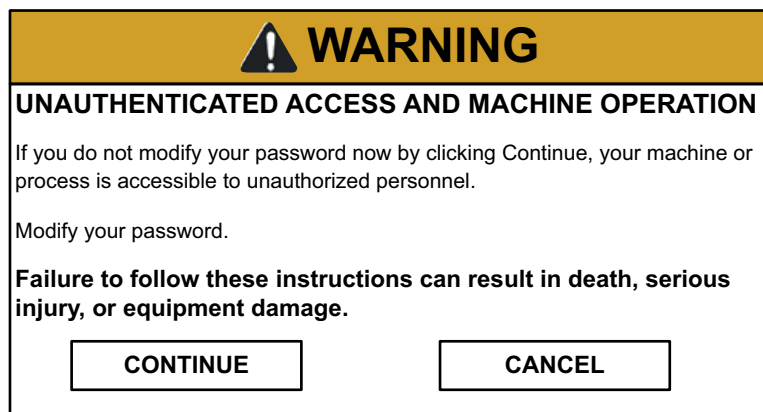
Password Management

With Ethernet and Profinet option module, Ethernet channels and Profinet channels, allowing the access to the configuration of the drive, are secured by a password. The password is required in case of access via PC software tools provided by Schneider Electric (such as SoMove FDT / DTM).

The ethernet password must contain:

- A total of eight characters
- At least one upper-case letter
- At least one lower-case letter
- At least one special character (for example, @, #, \$)
- No blank character

The figure below displays the first connection a dialog box requiring the modification of the default password. This dialog box continues to be displayed until a password is defined.



Additionally:

- The system can be secured with a drive password to access the drive configuration and parameter visibility.
- The device topology can be secured with a password. These passwords must contain four digits.

NOTE: After five unsuccessful login attempts, the access must be reactivated by the administrator.

Schneider Electric recommends to:

- Modify the password every 90 days
- Use a dedicated password (not related to your personal password)

NOTE: No responsibility is assumed by Schneider Electric for any consequences if anyone hacks your product password and if you use the same password for personal usage.

Backing-up and Restoring the Software Configuration

To protect your data, Schneider Electric recommends backing-up the device configuration and keeping your backup file in a secure place. The backup is available in the device DTM, using **load from device** and **store to device** functions.

Remote Access to the Drive

When remote access is used between a device and the drive, ensure your network is secure (VPN, Firewall...).

Machines, controllers, and related equipment are usually integrated into networks. Unauthorized persons and malware may gain access to the machine as well as to other devices on the network/fieldbus of the machine and connected networks via insufficiently secure access to software and networks.

⚠ WARNING

UNAUTHORIZED ACCESS TO THE MACHINE VIA SOFTWARE AND NETWORKS

- In your hazard and risk analysis, consider all hazards that result from access to and operation on the network/fieldbus and develop an appropriate cyber security concept.
- Verify that the hardware infrastructure and the software infrastructure into which the machine is integrated as well as all organizational measures and rules covering access to this infrastructure consider the results of the hazard and risk analysis and are implemented according to best practices and standards covering IT security and cyber security (such as: ISO/IEC 27000 series, Common Criteria for Information Technology Security Evaluation, ISO/IEC 15408, IEC 62351, ISA/IEC 62443, NIST Cybersecurity Framework, Information Security Forum - Standard of Good Practice for Information Security, SE recommended Cybersecurity Best Practices*).
- Verify the effectiveness of your IT security and cyber security systems using appropriate, proven methods.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

(*) : SE Recommended Cybersecurity Best Practices can be downloaded on SE.com.

Data Flow Restriction

To secure the access to the drive and limit the data flow, the use of a firewall device is required.

ConneXium Tofino Firewall Product

The ConneXium TCSEFEA Tofino Firewall is a security appliance that provides levels of protection against cyber threats for industrial networks, automation systems, SCADA systems, and process control systems.

This Firewall is designed to permit or deny communications between devices connected to the external network connection of the Firewall and the protected devices connected to the internal network connection.

The Firewall can restrict network traffic based on user defined rules that would permit only authorized devices, communication types and services.

The Firewall includes built-in security modules and an off-line configuration tool for creating secure zones within an industrial automation environment.

Control Command Restriction

To prevent unauthorized use of the command of the drive, it is possible to grant access to a limited number of IP address using the IP master parameter.

The parameter IP Master defines which device can command with the device. This parameter is available in the device DTM.

Deactivation of Unused Functions

To avoid unauthorized access, it is advisable to deactivate unused functions.

Example: Fast Device Replacement if Ethernet option module is used.

Difference between ATV320 standard and solar product

The following list shows the menus and parameters not available with solar product compared to a standard product:

- **[+/- speed around ref]** *S r E*
- **[Brake logic control]** *b L C*
- **[External weight meas.]** *E L n*
- **[High speed hoisting]** *H S H*
- **[Torque limitation]** *t o L*
- **[Mains contactor command]** *L L C*
- **[Output contactor cmd]** *o C C*
- **[Positioning by sensors]** *L P o*
- **[Traverse control]** *t r D*
- **[UnderV. prevention]** *S E P*

The following table shows the factory settings differences of the existing parameters between standard and solar product:

Parameter	Standard Product	Solar Product
[InPhaseLoss Assign] <i>i P L</i>	According to drive rating	[No] <i>n o</i>
[Acceleration] <i>A C C</i>	30	100
[Deceleration] <i>d E C</i>	30	100
[2-wire type] <i>t C t</i>	[Transition] <i>t r n</i>	[Level] <i>L E L</i>
[Reverse Assign] <i>r r S</i>	[DI2] <i>L i 2</i>	[No] <i>n o</i>
[AI2 Type] <i>A i 2 t</i>	[Voltage +/-] <i>n I O u</i>	[Voltage] <i>I O u</i>
[AQ1 assignment] <i>A o 1</i>	[No] <i>n o</i>	[Drive State] <i>d S t</i>
[AQ1 Type] <i>A o 1 t</i>	[Current] <i>D R</i>	[Voltage] <i>I O u</i>
[Reverse Disable] <i>r i n</i>	[No] <i>n o</i>	[Yes] <i>Y E S</i>
[Motor control type] <i>C t t</i>	[U/F VC Standard] <i>S t d</i>	[Energy Sav.] <i>n L d</i>
[DI1 Delay] <i>L i d</i>	0 ms	100 ms
[Catch On Fly] <i>F L r</i>	[No] <i>n o</i>	[Yes] <i>Y E S</i>
[Command Switching] <i>C C S</i>	[Cmd Channel 1] <i>C d 1</i>	[DI4] <i>L i 4</i>
[Profile] <i>C H C F</i>	[Not separ.] <i>S i n</i>	[Separate] <i>S E P</i>
[Freq Switch Assign] <i>r F C</i>	[Ref Freq Channel 1] <i>F r 1</i>	[DI4] <i>L i 4</i>
[Ref Freq 2 Config] <i>F r 2</i>	[Not Configured] <i>n o</i>	[Ref. Freq-Modbus] <i>n d b</i>

For detailed technical information, download the [ATV320 Programming manual](#).

For more details on Integrated Safety Functions, please refer to the dedicated [ATV320 Safety manual](#) or [ATV320 Programming manual](#).

[Simply start] (5, 17-)

Access

Parameters described below can be accessed by: *dr* → *CONF* → *FULL* → *5, 17*

HMI label	Settings	Factory setting
[Simply start] 5, 17 —		

⚠ WARNING

LOSS OF CONTROL

- Fully read and understand the manual of the connected motor.
- Verify that all motor parameters are correctly set by referring to the nameplate and the manual of the connected motor.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

[2/3-Wire Control] <i>EEC</i> 2s	—	[2-Wire Control] (<i>2C</i>)
----------------------------------	---	--------------------------------

2/3-wire control

⚠ WARNING

UNANTICIPATED EQUIPMENT OPERATION

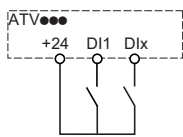
If this parameter is changed, the parameters **[Auto Fault Reset] *ATR*** and **[2-wire type] *TCT*** and the assignments of the digital and virtual inputs are partially reset to the factory setting.

- Verify that this change is compatible with the type of wiring used.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

- [2-Wire Control] (*2C*) : 2-wire control (level commands):** This is the input state (0 or 1) or edge (0 to 1 or 1 to 0), which controls running or stopping.

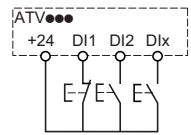
Example of "source" wiring:



D11: forward
D1x: reverse

- [3-Wire Control] (*3C*) : 3-wire control (pulse commands):** A "forward" or "reverse" pulse is sufficient to command starting, a "stop" pulse is sufficient to command stopping.

Example of "source" wiring:



D11: stop
D12: forward
D1x: reverse

HMI label	Settings	Factory setting
[Macro-configuration] C F G ★ ⏱ 2s	—	[Solar Application] (S u n)
Macro configuration		
⚠ WARNING		
UNANTICIPATED EQUIPMENT OPERATION		
Verify that the selected macro configuration is compatible with the type of wiring used.		
Failure to follow these instructions can result in death, serious injury, or equipment damage.		
<ul style="list-style-type: none"> • [Start/Stop] (S E S): Standard Start/Stop • [Solar Application] (S u n): Solar application 		
[Customized macro] C C F G ★	—	—
Customized macro		
Read-only parameter, only visible if at least one macro configuration parameter has been modified.		
<ul style="list-style-type: none"> • [No] (n o): No • [Yes] (Y E S): Yes 		
[Motor Standard] b F r	—	[50 Hz] [IEC] (5 0)
Motor Standard		
This parameter modifies the presets of the following parameters: [Nom Motor Voltage] (u n S) below, [High Speed] (H S P), [Motor Freq Thd] (F t d), [Nominal Motor Freq] (F r S) and [Max Frequency] (t F r).		
NOTE: Modifying this parameter resets the motor tune parameters and, [Tune selection] (S t u n) is reset to [Default] (t R b). Autotuning is needed to be performed again.		
<ul style="list-style-type: none"> • [50 Hz] (5 0): 50Hz motor frequency • [60 Hz] (6 0): 60Hz motor frequency 		

HMI label	Settings	Factory setting
[InPhaseLoss Assign] <i>iPL</i> ★	—	Yes or No, according to drive rating
<div style="background-color: black; color: white; padding: 5px; font-weight: bold; font-size: 1.2em;">⚡⚠ DANGER</div> <p>HAZARD OF ELECTRIC SHOCK, EXPLOSION OR ARC FLASH</p> <p>If input phase monitoring is disabled, phase loss and, by implication, accidental disconnection of cables, are not detected.</p> <ul style="list-style-type: none"> Verify that the setting of this parameter does not result in unsafe conditions. <p>Failure to follow these instructions will result in death or serious injury.</p>		
<p>Input Phase Loss assignment</p> <p>This parameter is only accessible in this menu on 3-phase drives.</p> <p>If one phase disappears, the drive switches to detected error mode [Input Phase Loss] (<i>PHF</i>), but if 2 or 3 phases disappear, the drive continues to operate until it trips on an undervoltage detected error (the drive trips in [Input Phase Loss] (<i>PHF</i>) if there is an input phase loss and if this leads to performance decrease).</p> <p>If [PV Supply Assign] <i>PVSR</i> is active, [Input Phase Loss] <i>PHF</i> detection is deactivated whatever the setting of the [InPhaseLoss Assign] <i>iPL</i> parameter.</p> <p>See [Input phase loss] (<i>iPL</i>) on the ATV320 Programming manual.</p> <ul style="list-style-type: none"> [Ignore] (<i>no</i>): <i>Ignore</i>, detected error ignored, to be used when the drive is supplied via a single-phase supply or by the DC bus [Freewheel Stop] (<i>YES</i>): <i>Freewheel stop</i> 		
[Motor param choice] <i>NPC</i> ★	—	[Nominal Motor Power] (<i>nPr</i>)
<p>Motor parameter choice</p> <p>NOTE: Modifying this parameter resets the motor tune parameters and, [Tune selection] (<i>Stun</i>) is reset to [Default] (<i>FRb</i>). Autotuning is needed to be performed again.</p> <ul style="list-style-type: none"> [Nominal Motor Power] (<i>nPr</i>) [Motor 1 Cosinus Phi] (<i>CoS</i>) 		
[Nominal Motor Power] <i>nPr</i> ★	—	According to drive rating
<p>Nominal motor power</p> <p>Rated motor power given on the nameplate, in kW if [Motor Standard] (<i>bFr</i>) is set to [50 Hz] (<i>SD</i>), in HP if [Motor Standard] (<i>bFr</i>) is set to [60 Hz] (<i>BD</i>).</p> <p>See [Nominal Motor Power] (<i>nPr</i>) on the ATV320 Programming manual.</p> <p>NOTE: Modifying this parameter resets the motor tune parameters and, [Tune selection] (<i>Stun</i>) is reset to [Default] (<i>FRb</i>). Autotuning is needed to be performed again.</p>		
[Motor 1 Cosinus Phi] <i>CoS</i> ★	0.5 to 1	According to drive rating
<p>Motor 1 Cosinus Phi</p> <p>Nominal motor cos phi.</p> <p>This parameter can be accessed if [Motor param choice] <i>NPC</i> is set to [Motor 1 Cosinus Phi] <i>CoS</i>.</p> <p>NOTE: Modifying this parameter resets the motor tune parameters and, [Tune selection] (<i>Stun</i>) is reset to [Default] (<i>FRb</i>). Autotuning is needed to be performed again.</p>		

HMI label	Settings	Factory setting
[Nom Motor Voltage] u_{n5} ★	100 to 480 V	According to drive rating
<p>Nominal motor voltage</p> <p>ATV320●●●M2●: 100 to 240 V – ATV320●●●N4●: 200 to 480 V.</p> <p>See [Nom Motor Voltage] (u_{n5}) on the ATV320 Programming manual.</p> <p>NOTE: Modifying this parameter resets the motor tune parameters and, [Tune selection] ($Stun$) is reset to [Default] (AB). Autotuning is needed to be performed again.</p>		
[Nom Motor Current] nCr ★	0.25 to 1.5 In (1)	According to drive rating and [Motor Standard] (bFr)
<p>Nominal motor current</p> <p>See [Nom Motor Current] (nCr) on the ATV320 Programming manual.</p> <p>NOTE: Modifying this parameter resets the motor tune parameters and, [Tune selection] ($Stun$) is reset to [Default] (AB). Autotuning is needed to be performed again.</p>		
[Nominal Motor Freq] Frs ★	10 to 800 Hz	50 Hz
<p>Nominal motor frequency</p> <p>The factory setting is 50 Hz, or preset to 60 Hz if [Motor Standard] (bFr) is set to 60 Hz.</p> <p>This parameter is not visible if [Motor control type] (CtE) is set to [Synchronous motor] (SYn).</p> <p>See [Nominal Motor Freq] (Frs) on the ATV320 Programming manual.</p> <p>NOTE: Modifying this parameter resets the motor tune parameters and, [Tune selection] ($Stun$) is reset to [Default] (AB). Autotuning is needed to be performed again.</p>		
[Nominal Motor Speed] nSP ★	0 to 65,535 rpm	According to drive rating
<p>Nominal motor speed</p> <p>This parameter is not visible if [Motor control type] (CtE) is set to [Synchronous motor] (SYn).</p> <p>See [Nominal Motor Speed] (nSP) on the ATV320 Programming manual.</p> <p>0 to 9,999 rpm then 10.00 to 60.00 krpm on the integrated display terminal.</p> <p>If, rather than the rated speed, the nameplate indicates the synchronous speed and the slip in Hz or as a %, calculate the rated speed as follows:</p> $\text{Nominal speed} = \text{Synchronous speed} \times \frac{100 - \text{slip as a \%}}{100}$ <p>or</p> $\text{Nominal speed} = \text{Synchronous speed} \times \frac{50 - \text{slip in Hz}}{50} \quad (50 \text{ Hz motors}).$ <p>or</p> $\text{Nominal speed} = \text{Synchronous speed} \times \frac{60 - \text{slip in Hz}}{60} \quad (60 \text{ Hz motors})$ <p>NOTE: Modifying this parameter resets the motor tune parameters and, [Tune selection] ($Stun$) is reset to [Default] (AB). Autotuning is needed to be performed again.</p>		

HMI label	Settings	Factory setting
[Max Frequency] (E F r)	10 to 599 Hz	60 Hz
<p>Max frequency</p> <p>The factory setting is 60 Hz, or preset to 72 Hz if [Motor Standard] (b F r) is set to 60 Hz.</p> <p>The maximum value is limited by the following conditions: It must not exceed 10 times the value of [Nominal Motor Freq] (F r 5).</p> <p>To help prevent detected [Motor Overspeed] (S o F) error, it is recommended to have [Max Frequency] (E F r) equal to or higher than 110% of [High Speed] (H S P).</p> <p>See [Max Frequency] (E F r) on the ATV320 Programming manual.</p>		
[Autotuning] (E u n)	—	[No Action] (n o)
<p>Autotuning</p> <p>For technical detailed information, download the ATV320 Programming manual.</p>		
[Autotuning Status] (E u S)	—	[Not Done] (E R b)
<p>Autotuning status</p> <p>This parameter is not saved at drive power off. It shows the Autotuning status since last power on.</p> <ul style="list-style-type: none"> [Not Done] (E R b): Not done, autotune is not done [Pending] (P E n d): Test is pending, autotune has been requested but not yet performed [In Progress] (P r o G): Test in progress, autotune is in progress [Error] (F R i L): Error detected, autotune has detected an error [Autotuning Done] (d o n E): Autotuning Done, the stator resistance measured by the auto-tuning function is used to control the motor 		
[Tune selection] (S E u n)	—	[Default] (E R b)
<p>Tune selection</p> <ul style="list-style-type: none"> [Default] (E R b): Default, the default stator resistance value is used to control the motor [Measure] (M E A S): Measure, the stator resistance measured by the auto-tuning function is used to control the motor [Custom] (C u S): Custom, the stator resistance set manually is used to control the motor 		
[Motor Th Current] (I E H)	0.2 to 1.5 I _n (1)	[Nom Motor Current] (n C r)
<p>Motor Thermal current</p> <p>See [Motor Th Current] (I E H) on the ATV320 Programming manual.</p>		

HMI label	Settings	Factory setting
[Acceleration] <i>ACC</i> (⌚)	0.00 to 6,000 s (2)	10.0 s
<p>Acceleration ramp time</p> <p>Time to accelerate from 0 to the [Nominal Motor Freq] (<i>FR5</i>). To have repeatability in ramps, the value of this parameter must be set according to the capabilities of the application.</p> <p>See [Acceleration] (<i>ACC</i>) on the ATV320 Programming manual.</p>		
[Deceleration] <i>DEC</i> (⌚)	0.00 to 6,000 s (2)	10.0 s
<p>Deceleration ramp time</p> <p>Time to decelerate from the [Nominal Motor Freq] (<i>FR5</i>) to 0. To have repeatability in ramps, the value of this parameter must be set according to the capabilities of the application.</p> <p>See [Deceleration] (<i>DEC</i>) on the ATV320 Programming manual.</p>		
[Low Speed] <i>LSP</i> (⌚)	0 to 599 Hz	0
<p>Low speed</p> <p>Motor frequency at minimum reference, can be set between 0 and [High Speed] (<i>HSP</i>).</p> <p>See [Low Speed] (<i>LSP</i>) on the ATV320 Programming manual.</p>		
[High Speed] <i>HSP</i> (⌚)	0 to 599 Hz	50 Hz
<p>High speed</p> <p>Motor frequency at maximum reference, can be set between [Low Speed] (<i>LSP</i>) and [Max Frequency] (<i>EFR</i>). The factory setting changes to 60 Hz if [Motor Standard] (<i>BFr</i>) is set to [60 Hz] (<i>BD</i>). To help prevent detected [Motor Overspeed] (<i>SOF</i>) error, it is recommended to have [Max Frequency] (<i>EFR</i>) equal to or higher than 110% of [High Speed] (<i>HSP</i>).</p> <p>See [High Speed] (<i>HSP</i>) on the ATV320 Programming manual.</p>		

(1) In corresponds to the rated drive current indicated in the Installation manual and on the drive nameplate.

(2) Range 0.01 to 99.99 s or 0.1 to 999.9 s or 1 to 6,000 s according to **[Ramp increment]** (*IRr*). For detailed technical information, download the ATV320 Programming manual.

★ : These parameters only appear if the corresponding function has been selected in another menu. When the parameters can also be accessed and adjusted from within the configuration menu for the corresponding function, their description is detailed in these menus, on the pages indicated, to aid programming.

⌚ : Setting of this parameter can be done during operation or when stopped.



2 s: To change the assignment of this parameter, press the ENT key for 2 s.

[Sun] (Sun-)

What's in This Chapter

[Tank Liquid Probe] L P n	104
[Anti-Jam] A J n	108
[Flow estimation] F E n	111
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Other [SUN] parameters	121

About this chapter

This chapter explains the parameters from the [Sun] Sun- menu.

For more information about the parameters available on the ATV320 solar drive, refer to the ATV320 programming manual.

★ : These parameters only appear if the corresponding function has been selected in another menu. When the parameters can also be accessed and adjusted from within the configuration menu for the corresponding function, their description is detailed in these menus, on the pages indicated, to aid programming.

⌚ : Setting of this parameter can be done during operation or when stopped.

⌚ 2 s: To change the assignment of this parameter, press the ENT key for 2 s.

[Tank Liquid Probe] L P Π

Access

[Drive menu] *dr i* → [Configuration] *CONF* → [Full] *FULL* → [Sun] *Sun* → [Tank Liquid Probe] *L P Π*

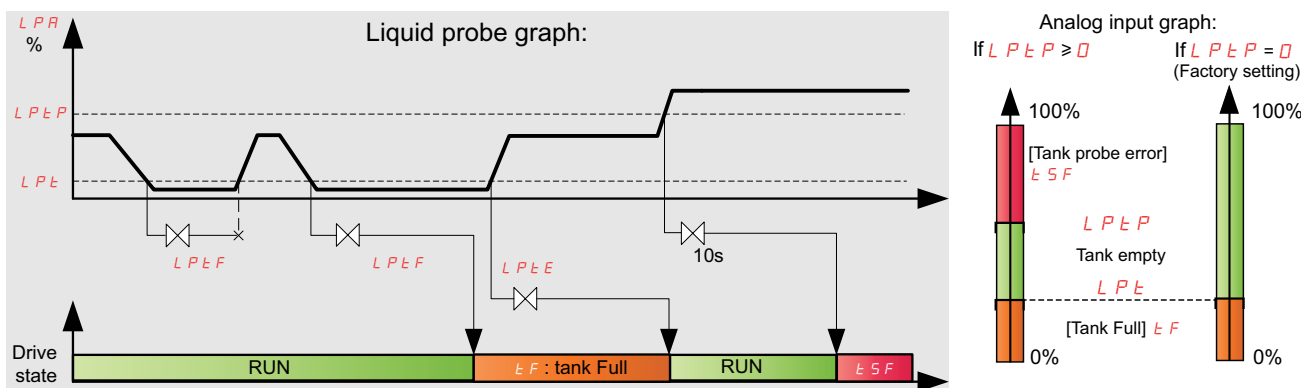
Commissioning

By default, [Liquid Probe Assign] *L P A* is set to [Not Configured] *no*.

To wire the Tank water probe the analog input is assigned by [Liquid Probe Assign] *L P A*.

The Liquid probe signal follows the rule:

- Above [Probe Threshold] *L P E P* triggers an error [Tank Probe Error] *ESF*.
- Between [Liquid Threshold] *L P E* to [Probe Threshold] *L P E P* the tank is empty, the pump is active.
- [Liquid Threshold] *L P E* to 0 triggers a warning [Tank Full] *EF*.

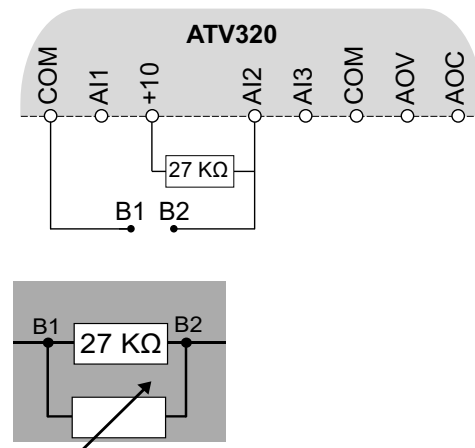


HMI label	Setting	Factory setting
[Liquid Probe Assign] <i>L P A</i>	-	[Not Configured] <i>no</i>
Liquid probe assignment		
<ul style="list-style-type: none"> • [Not Configured] <i>no</i> : Not assigned. Without tank water or without liquid probe (factory setting). • [AI1] <i>A I 1</i> : Analog input AI1. • [AI2] <i>A I 2</i> : Analog input AI2. • [AI3] <i>A I 3</i> : Analog input AI3. 		
[Liquid Threshold] <i>L P E</i>	0 to 100 %	25
Liquid detection threshold		
Detection level for the liquid probe.		
[Tank Full Delay] <i>L P E F</i>	0 to 60 min.	1
Tank full delay		
To avoid water wave detection in the tank, a minimum timeout is set to validate that the tank is full.		
[Tank Empty Delay] <i>L P E E</i>	0 to 60 min.	10
Tank empty delay		
To avoid water wave detection in the tank, a minimum timeout is set to validate that the tank is empty.		

HMI label	Setting	Factory setting
[Probe Threshold] <i>L P E P</i>	0 to 100 %	0
Tank probe presence threshold		
Note: When <i>L P E P</i> is set to 0, there is no detection of probe.		
NOTICE		
WATER OVERFLOW		
<ul style="list-style-type: none"> In factory setting [Probe Threshold] <i>L P E P</i> is set to 0. In this case, the loss of [Liquid Probe Assign] <i>L P A</i> signal is not detected. Check that the tank can allow any water overflow due to the loss of <i>L P A</i> signal. 		
Failure to follow these instructions can result in equipment damage.		

Tank water with a resistive probe

Note: The R2 resistor needs to be wired as close as possible to the probe. The error detection is only able to detect short circuit and open circuit at wire level (between R1 and R2). If R2 (27kΩ) is not used, the probe error detection is not possible and the liquid level error threshold parameter [Probe Threshold] *L P E P* must be set to 0.



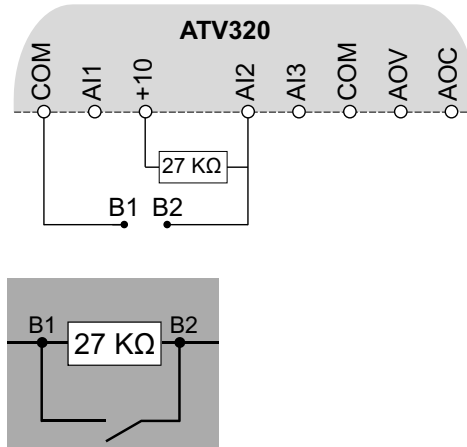
Assign [Liquid Probe Assign] *L P A* to [AI1] *R , 1*, [AI2] *R , 2* or [AI3] *R , 3*.

HMI label	Setting
[Liquid Threshold] <i>L P E</i>	0 to 100 %
Set the [Liquid Threshold] <i>L P E</i> to 25 %	
[Probe Threshold] <i>L P E P</i>	0 to 100 %
Set the [Probe Threshold] <i>L P E P</i> to 0 %	

Tank water with switch probe

Note: The R2 resistor need to be wired as close as possible to the probe. The error detection is only able to detect short circuit and open circuit at wire level (between R1 and R2). If R2 (27kΩ) is not used, the probe error detection is not possible and the liquid level error threshold parameter **[Probe Threshold] $LPEP$** must be set to 0.

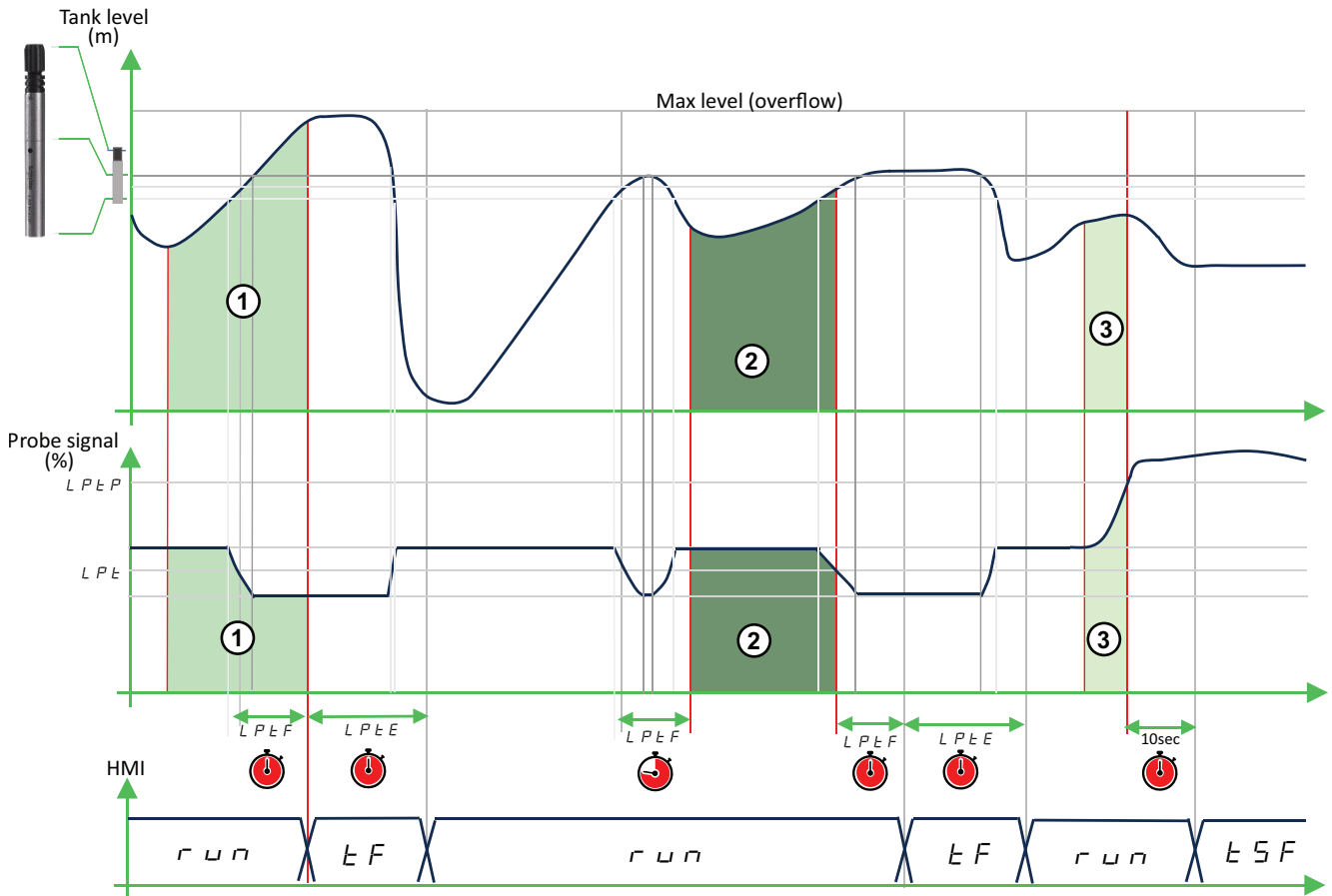
Do this step only if you don't have tank water resistive probe.



Assign **[Liquid Probe Assign] LPA** to **[AI1] $R, 1$** , **[AI2] $R, 2$** or **[AI3] $R, 3$** .

HMI label	Setting
[Liquid Threshold] LPE	0 to 100 %
Set the [Liquid Threshold] LPE to 25 %	
[Probe Threshold] $LPEP$	0 to 100 %
Set the [Probe Threshold] $LPEP$ to 50 %	

Example



Example:

- 1. High-irradiance filling.
- 2. Low-irradiance filling.
- 3. Probe disconnected or signal problem.

[Anti-Jam] *A J Π*

Access

[Drive menu] *dr i* → [Configuration] *ConF* → [Full] *FuLL* → [Sun] *Sun* → [Anti-Jam] *A J Π*

About This Menu

In waste water applications, clogging substances reduce the efficiency of the system and may decrease the pump service life.

It may also help to clear a blocked impeller, pipe, or valve at downstream location.

The anti-Jam function allows manually to execute forward and reverse pump rotation cycles.

The frequency reference, acceleration and deceleration, in forward and in reverse direction can be adjusted via dedicated parameters. It allows you to set up the function in accordance with the application specifications. Refer to the pump datasheet while setting up the function.

The Anti-jam function uses forward and reverse operation of the motor.

NOTICE

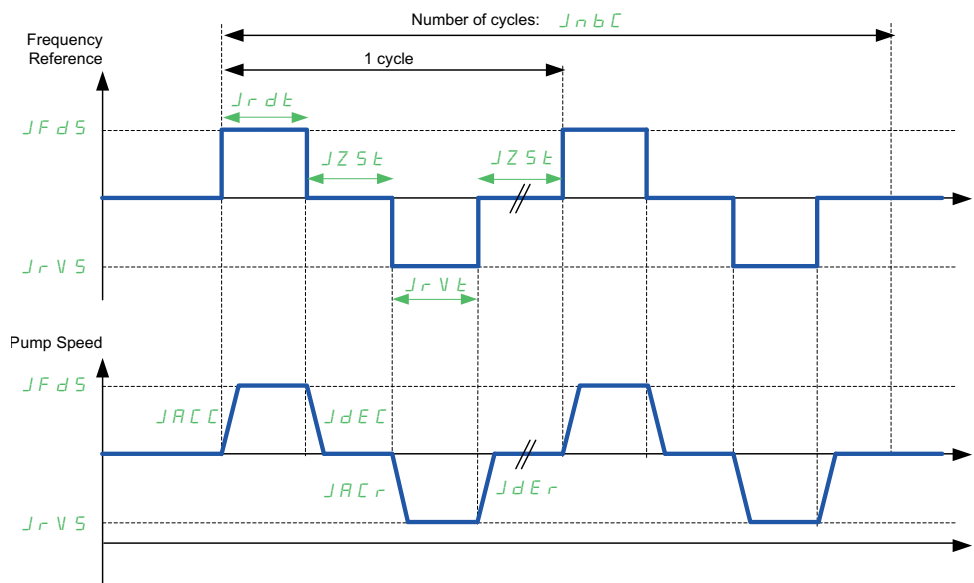
INOPERATIVE MOTOR, PUMP, AND OTHER EQUIPMENT

Verify that the motor, the pump and all other equipment are suitable for reverse operation before using this function.

Failure to follow these instructions can result in equipment damage.

Anti-Jam Cycle

The anti-Jam function can be triggered by an external trigger that can be assigned to a digital input (or word bit in IO profile).



An Anti-Jam cycle is composed of:

- 1 forward action according to [Anti-Jam Fwd Acc] *JACC*, [Anti-Jam Fwd Time] *JFdt*, [Anti-Jam Fwd Speed] *JFds*, [Anti-Jam Fwd Dec] *JdEc*,
- 1 stop action during [Anti-Jam Stop Time] *JZSt*,
- 1 reverse action according to [Anti-Jam Rv Acc] *JACr*, [Anti-Jam Rv Time] *Jrvt*, [Anti-Jam Rv Speed] *Jrvs*, 3[Anti-Jam Rv Dec] *JdEr*,
- 1 stop action during [Anti-Jam Stop Time] *JZSt*,

An Anti-Jam sequence corresponds to a number of consecutive anti-Jam cycles: [Anti-Jam Cycle Nb] *JnbC*

NOTE: In case of an external trigger, if the command is removed before the end of the anti-Jam sequence, the anti-Jam sequence continues up to the end. In addition to the trigger, a run command is necessary during the whole anti-Jam sequence.

Parameters description

HMI label	Setting	Factory setting
[Ext Anti-Jam Trigger] <i>JEtC</i>	–	[Not Assigned] <i>no</i>
External Anti-Jam trigger External Anti Jam trigger condition		
<ul style="list-style-type: none"> • [Not Assigned] <i>no</i>: Not assigned Factory setting • [DI1] <i>L1</i>...[DI6] <i>L6</i>: Anti-Jam sequence will start on Digital input DI1...DI6 activation. • [CD00] <i>Cd00</i>...[CD10] <i>Cd10</i>: Anti-Jam sequence will start on Virtual digital input CMD.0...CMD.10 activation. 		
[Anti-Jam Fwd Acc] <i>JACC</i> ★	0...300 (s)	3 s
Dedicated acceleration time, for all Forward pump movements into AntiJam sequence's cycles.		
[Anti-Jam Fwd Dec] <i>JdEc</i> ★	0...300 (s)	3 s
Deceleration time, for all Forward pump movements into AntiJam sequence's cycles.		
[Anti-Jam Rv Acc] <i>JACr</i> ★	0...300 (s)	3 s
Dedicated acceleration time, for all Reverse pump movements into AntiJam sequence's cycles.		
[Anti-Jam Rv Dec] <i>JdEr</i> ★	0...300 (s)	3 s
Deceleration time, for all Reverse pump movements into AntiJam sequence's cycles.		
[Anti-Jam Rv Time] <i>Jrvt</i>	0...300 (s)	10 s
Time to set the duration of each Reverse cycle's phase into AntiJam sequence.		
[Anti-Jam Fwd Time] <i>JFdt</i> ★	0...300 (s)	10 s
Time to set the duration of each Forward cycle's phase into AntiJam sequence.		
[Anti-Jam Rv Speed] <i>Jrvs</i> ★	0...599 Hz	0 Hz
Speed of each Reverse cycle's phase into AntiJam sequence.		
[Anti-Jam Rv Speed] <i>Jrvs</i> must be superior to [Low Speed] <i>LSP</i>.		
[Anti-Jam Fwd Speed] <i>JFds</i> ★	0...599 Hz	0 Hz
Speed of each Forward cycle's phase into AntiJam sequence.		
[Anti-Jam Fwd Speed] <i>JFds</i> must be superior to [Low Speed] <i>LSP</i>.		

HMI label	Setting	Factory setting
[Anti-Jam Stop Time] <i>JZSt</i> ★	0...300 (s)	0 s
Time between forward step and reverse step into AntiJam sequence.		
[Anti-Jam Cycle Nb] <i>JnbC</i> ★	1...100	10
Number of "Forward+Reverse" cycles, for complete 1 AntiJam sequence.		
[Anti-Jam Status] <i>JAMS</i> ()	-	NONE
Anti-Jam function status: <ul style="list-style-type: none"> • [Not Configured] <i>none</i>: Function is not configured. • [Inactive] <i>inact</i>: Function is configured but not active. • [Pending] <i>pend</i>: Anti-Jam trigger condition is fulfilled, but waiting for run order, wake-up or motor stop to start sequence ([JAM_PENDING] = 1). • [Running] <i>run</i>: Sequence is in progress ([JAM_RUNNING] = 1). 		

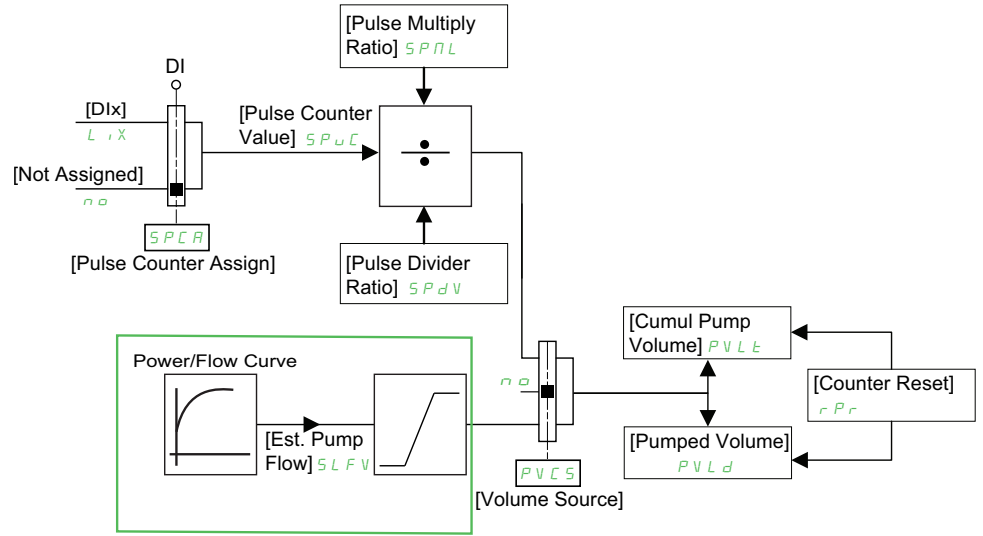
[Flow estimation] F E Π

Access

[Drive menu] *dr i* → [Configuration] *ConF* → [Full] *FuLL* → [Sun] *Sun* → [Flow estimation] *F E Π*

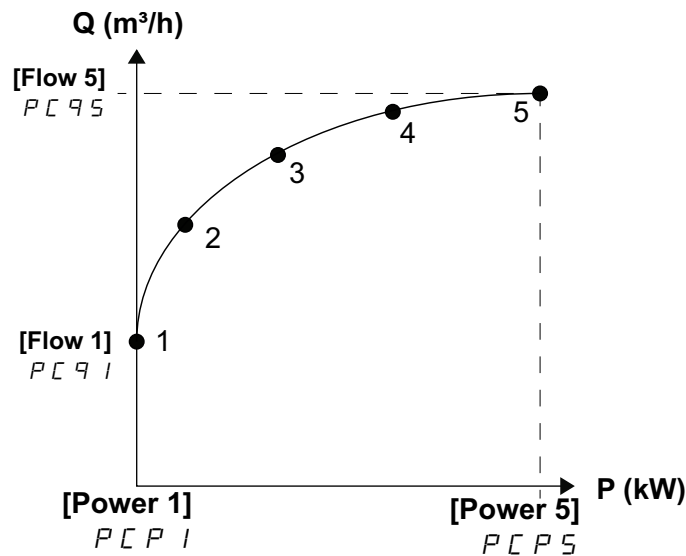
Description of the function

The Daily and Total volume counters are designed to count the volume pumped based on the estimated instant flow or based on the pulse input.



The [Flow estimation] function provides an estimation of the flow without the installation of a separate flow meter. The function defines the flow estimate using the pump performance curve and drive actual load. The PQ (power/flow) performance curve enables calculating the flow output from the pump. The performance curve is provided by the pump manufacturer. The user saves five operating points (P, Q) of the performance curve to drive parameters.

PQ curve:



Note: Ensure that flow points are in incremental order with non-zero values.

Calibration – Example

For the following procedure, make sure you are :

- Either on the grid ([PV Supply Assign] PVSA = [No] No)
- Or on the panels ([PV Supply Assign] PVSA = [Yes] Yes) in optimum sunlight conditions.

Set values for [Low Speed] LSP and [High Speed] HSP. Take the result of subtracting HSP from LSP and divide by 5 to obtain 5 reference points.

Example:

- LSP = 10 Hz, HSP = 30 Hz

These 5 points should be measured at 10, 15, 20, 25 and 30Hz.

These 5 points should be measured :

- With a portable flowmeter for values from [Flow 1] PCQ1 to [Flow 5] PCQ5.
- With the drive for [Power 1] PCP1 to [Power 5] PCP5.

How to calculate PCP1 to PCP5:

$$PCPX = \frac{OPR}{100} \times NPR$$

With OPR : [Mot Mech Power in %] Output power monitoring (100% = nominal motor power, estimated value based on current measure).

With NPR : [Nominal Motor Power] Rated motor power given on the nameplate, in kW.

Example: For 1.5kW motor @3% of load :

$$PCPX = \frac{35}{100} \times 1,5 = 0,525 \rightarrow 0,53kW$$

NOTE: the result should be rounded off to 0.1kW, as the drive configuration range is 0.1kW.

Calibration – How to video

To see a practical example, a video is available here: [FAQ000266768](#)

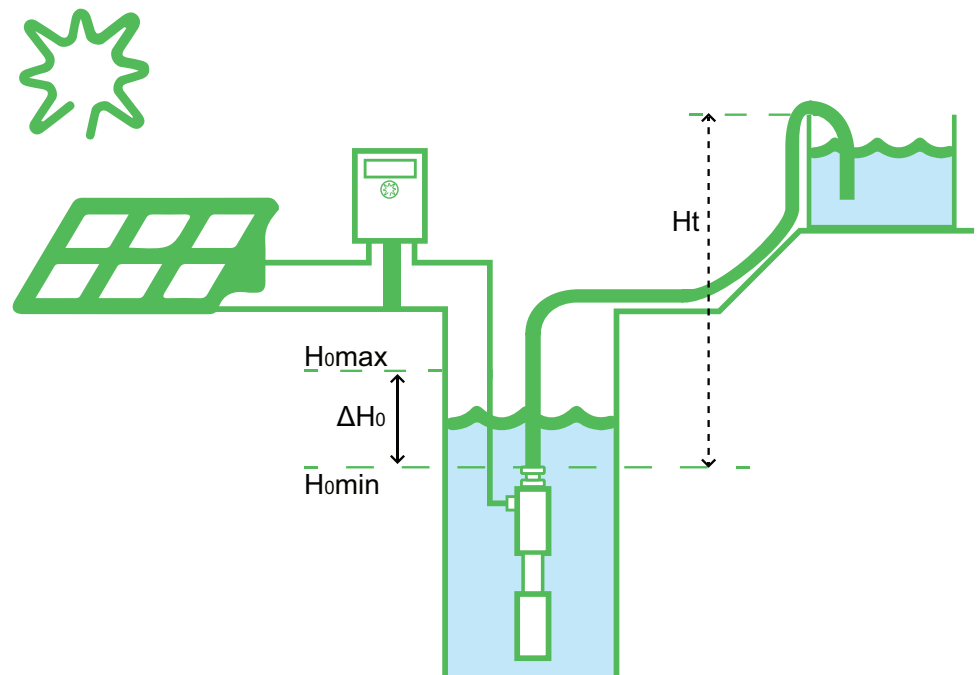
Precision of the flow estimation function

The sensorless flow estimation function is dedicated to installations where the water level is stable in comparison of the total height of the system.

Even with optimal calibration and low geometrical height, the sensorless estimated flow function still has an accuracy of around +/- 20% with a stable water level in the well/tank.

NOTE: The flow calculation function cannot be used for invoicing purposes.

If ΔH_0 ($= H_{max} - H_{min}$) is greater than 5% of the total height of the system H_t ($\Delta H_0 > 5\% H_t$), a sensor must be considered for accurate measurement.



Legend

- **Ht**: distance between the maximum height of the installation and **Homin**.
- **Homax**: maximum value +5% of the water level in the well/tank. Above, saturated at max flow (PC95).
- **Homin**: minimum value of the water level in the well/tank. Below, saturated at 0.

Parameters description

HMI label	Setting	Factory setting
[Flow 1] PC91 to [Flow 5] PC95	Range: 0...3276.7 Unit: m³/h	0
Flow rate entered at point x (for HQ and PQ curves)		
[Power 1] PCP1 to [Power 5] PCP5	Range: 0...327.67 Unit: kW	0
Mechanical power entered at point y		
[Est. Pump Flow] SLFV	Range: 0...3276.7 Unit: m³/h	0
Estimated pump flow value		

[Pulse Counter] P u L C

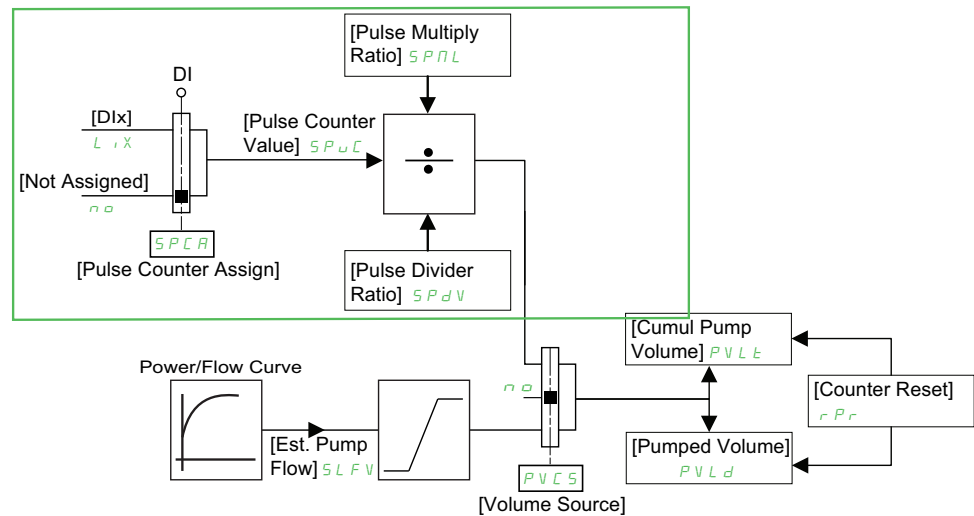
Access

[Drive menu] *dr* → [Configuration] *CONF* → [Full] *FULL* → [Sun] *Sun* → [Pulse Counter] *PuLC*

Description of the function

The Daily and Total volume counters are designed to count the volume pumped based on the estimated instant flow or based on the pulse input.

The pulse input information is converted in volume with a resolution of 0.1 L using the 2 ratios parameters (Volume Multiplier/Volume Divider).



Example

For a pulse counter meter at 100L/pulse, the drive unit is 0.1L/pulse:

- [Pulse Multiply Ratio] *SPmL* at 1000.
- [Pulse Divider Ratio] *SPdV* at 1.

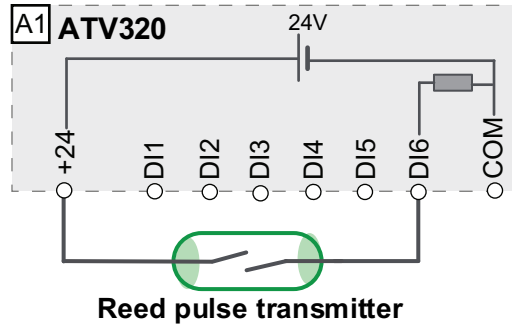
Control Terminals Electrical Data for the pulse counter

On digital input DI1 to DI6:

- Pulse counter duration must be $\geq 10\text{ms}$.
- Pulse signal period must be $\geq 20\text{ms}$.
- Digital inputs impedance: $3\text{k}\Omega$

NOTE: check that the reed relay supports the voltage supply and the current (current consumption in the digital input), according to its datasheet.

Example of a reed relay connect to DI6:



How to video

To see a practical example, a video is available here: [FAQ000266767](#)

Parameters description

HMI label	Setting	Factory setting
[Pulse Counter Assign] <i>SPCR</i>	–	[Not Assigned] <i>no</i>
Slow pulse counter assignment Select the source of the pulse counter. <ul style="list-style-type: none"> • [Not Assigned] <i>no</i> : Function is not activated. • [DIx] <i>LIX</i> : Any Digital Input. 		
[Pulse Counter Value] <i>SPUC</i>	0...65535	0
Slow pulse counter value Slow pulse counter current value.		
[Pulse Multiply Ratio] <i>SPNL</i>	1...65535	1
Pulse multiplier ratio Slow pulse counter to Volume Multiplier.		
[Pulse Divider Ratio] <i>SPDV</i>	1...65535	1
Pulse divider ratio Slow pulse counter to Volume Divider.		

[Volume Counters] VOLC

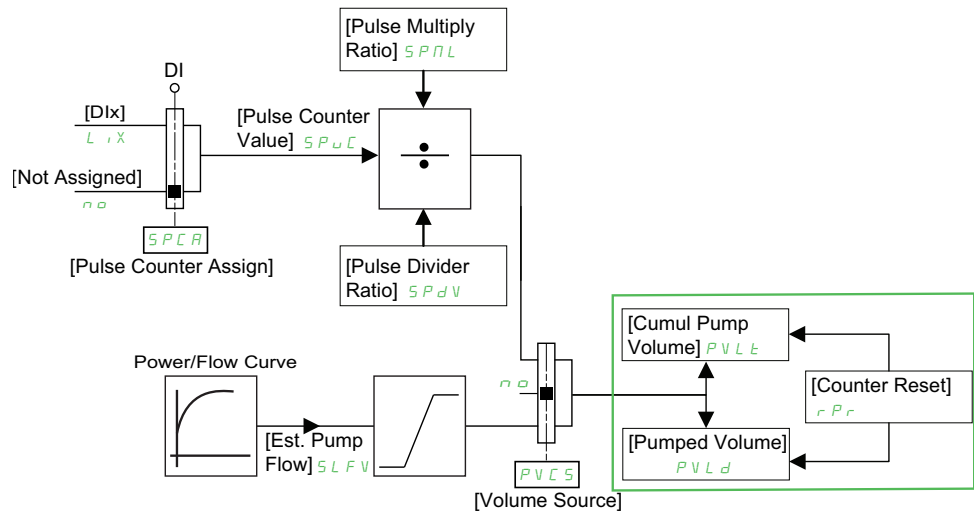
Access

[Drive menu] *dr* → [Configuration] *CONF* → [Full] *FULL* → [Sun] *Sun* → [Volume Counters] *VOLC*

Description of the function

The Daily Counter is providing in 0.1 m³ the total volume pumped since the last power up (or the last counter reset request).

The Total Counter is providing in 0.1 dam³ the total volume pumped since the last counter reset request.



Parameters description

HMI label	Setting	Factory setting
[Volume Source] <i>PVCS</i>	–	[None] <i>no</i>
Volume source assignment Select the source of the volume counter. <ul style="list-style-type: none"> • [None] <i>no</i>: Function is not activated • [Flow Estimation] <i>SLFV</i>: Sensor less flow value • [Slow Pulse Counter] <i>SPUC</i>: Slow pulse counter value 		
[Pumped Volume] <i>PVLD</i>	Range: 0..6553.5 Unit: m ³	–
Pumped volume Volume pumped since last power up or [Counter Reset] <i>rPr</i> .		
[Cumul Pump Volume] <i>PVLE</i>	Range: 0..6553.5 Unit: dam ³	–
Cumulated pumped volume Volume pumped since last [Counter Reset] <i>rPr</i> .		
[Counter Reset] <i>rPr</i>		
Counter reset		

[Process underload] u L d

Access

[Drive menu] *dr i* → [Configuration] *C o n F* → [Full] *F u L L* → [Sun] *S u n* → [Process underload] *u L d*

Process Underload Condition

A process underload condition occurs when the submersible head for submersible pumps or the pressure at the pump's surface inlet is insufficient. Working in process underload during a long time can cause premature wear of the pump impeller.

Process underload occurs when there is excessive air in the suction pipe:

- Because the pump is not primed, or
- Due to excessive air leak in the suction line.

This may significantly reduce the bearings and seal service life due to high temperature raise and poor lubrication.

Process Underload Detected Error

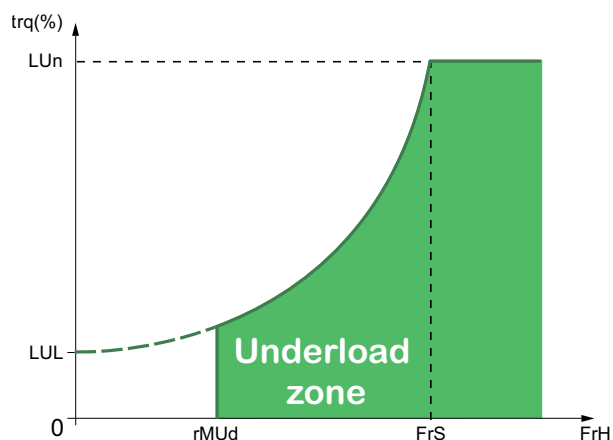
This function prevents the pump from operating in process underload. During the function setup, it is necessary to perform measurements at no-flow but with water in the system.

A process underload is detected when the next event occurs and remains pending for a minimum time [Unld Detect Delay] *u L t*, which is configurable:

- The motor is in steady state and the torque is below the set underload limit ([Unld.Thr.0.Speed] *L u L*, [Unld.Thr.Nom.Speed] *L u n*, [Unld. FreqThr. Det.] *r n u d* parameters).
- The motor is in steady state when the offset between the frequency reference and motor frequency falls below the configurable threshold [Hysteresis Freq] *S r b*.

Between zero frequency and the rated frequency, the curve reflects the following equation: torque = $L u L + (L u n - L u L) \times (\text{frequency})^2 / (\text{rated frequency})^2$

The underload function is not active for frequencies below *r n u d*.



A relay or a digital output can be assigned to the signaling of this detected error in the [Input/Output] *i o* -, [I/O assignment] *i o A S* - menus (see in the ATV320 Programming manual).

NOTICE

DAMAGE TO THE PUMP

- The no-flow torque curve characterization shall be done after setting the motor control type.
- Perform a comprehensive commissioning test to verify the effectiveness of the settings in order to detect properly and in all circumstances that the pump is working in dry running condition (1).

Failure to follow these instructions can result in equipment damage.

(1) The no-flow torque curve characterization remains an estimation.

To improve the detection of no flow conditions, it is advisable to add a water level switch.

This water level switch can be managed through ATV Logic or using a digital input of the drive set to **[Ext Error assign] EEF** to trigger an error when the condition of low level is reached.

Parameters description

HMI label	Setting	Factory setting
[Unld Detect Delay] u L t	0...100 s	0 s
<p>Underload detection delay Underload detection time delay.</p> <p>It is reset to zero if the torque rises above the value of [Unld.Thr.0.Speed] L u L + 10% (hysteresis). A value of 0 deactivates the function and makes the other parameters inaccessible.</p>		
[Unld.Thr.Nom.Speed] L u n ★	20...100%	50%
<p>Unld.Thr. at Nom. speed Underload threshold at nominal motor speed [Nominal Motor Freq] F r 5, as a % of the rated motor torque. This parameter can be accessed if [Unld Detect Delay] u L t is not set to 0.</p>		
[Unld.Thr.0.Speed] L u L ★	0... [Unld.Thr.Nom.Speed] L u n	0%
<p>Unld.Thr. at 0 speed Underload threshold at zero frequency as a % of the rated motor torque. This parameter can be accessed if [Unld Detect Delay] u L t is not set to 0.</p>		
[Unld. FreqThr. Det.] r n u d ★	0.0...500.0 Hz	0.0 Hz
<p>[Unld. FreqThr. Det.] Minimum frequency underload detection threshold. This parameter can be accessed if [Unld Detect Delay] u L t is not set to 0.</p>		
[Hysteresis Freq] s r b ★	0.3...500.0 Hz	0.3 Hz
<p>Hysteresis frequency Maximum deviation between the frequency reference and the motor frequency, which defines a steady state operation. This parameter can be accessed if [Unld Detect Delay] u L t or [Ovld Detection Delay] t o L is not set to 0.</p>		
[Underload ErrorResp] u d L ★	-	Freewheel stop
<p>Response to underload error Behavior on switching to underload detection. This parameter can be accessed if [Unld Detect Delay] u L t is not set to 0.</p>		

HMI label	Setting	Factory setting
<ul style="list-style-type: none"> • [Ignore] <i>no</i> : Detected error ignored • [Freewheel Stop] <i>YES</i> : Freewheel stop (Factory setting) • [Ramp stop] <i>rPP</i> : Stop on ramp • [Fast stop] <i>FSE</i> : Fast stop 		
[Underload T.B.Rest.] <i>Ftu</i> ★	0...6 min	0 min
<p>Und time Before Restart Minimum time permitted between an underload being detected and any automatic restart.</p> <p>To allow an automatic restart, the value of [Fault Reset Time] <i>Err</i> must exceed this parameter by at least 1 minute.</p> <p>This parameter can be accessed if [Underload ErrorResp] <i>udL</i> is not set to [Ignore] <i>no</i>.</p>		

Other [SUN] parameters

Access

[Drive menu] *dr* → [Configuration] *CONF* → [Full] *FULL*
 → [Sun] *Sun*

Parameters description

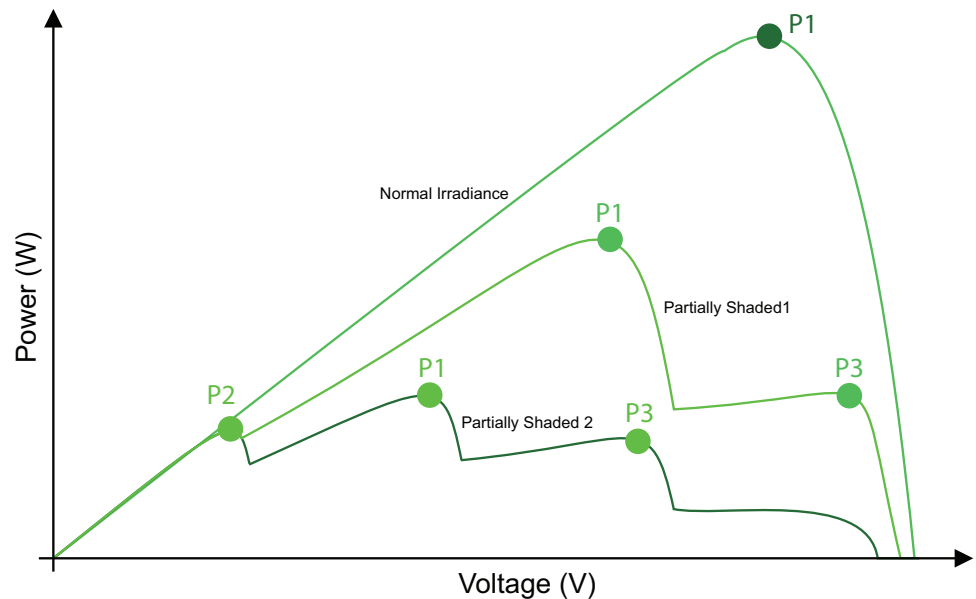
HMI label	Setting	Factory setting
[Low Voltage Assign] <i>LdCA</i>	-	[No] <i>no</i>
<p>Low voltage assignment The parameter [Low Voltage Assign] <i>LdCA</i> can be set to [Yes] <i>YES</i> if the power supply is provided only by the solar panels. If the power supply can be switched between solar panels and grid, [Low Voltage Assign] <i>LdCA</i> must be changed to [Dix] <i>LIX</i>.</p>		
<h3>NOTICE</h3>		
<p>DESTRUCTION OF DRIVE INPUT BRIDGE</p> <p>If the product is used with both panel and grid supplies, the parameter [Low Voltage Assign] <i>LdCA</i> must be assigned to a digital input to disable the extended voltage range when the supply is switched to grid.</p> <p>Failure to follow these instructions can result in equipment damage.</p>		
<p>[Low Voltage Assign] <i>LdCA</i> can be set to:</p> <ul style="list-style-type: none"> • [No] <i>no</i>: Standard Voltage Range activated. Standard Voltage Range: *M3 = 199 to 374 VDC and for *N4 products 390 to 778 VDC • [Yes] <i>YES</i>: Extended Voltage Range activated. Extended Voltage Range: *M3 = 150 to 374 VDC and for *N4 products 280 to 778 VDC • [Dix] <i>LIX</i>: assigned to a digital input. If this digital input selected: <ul style="list-style-type: none"> ◦ is supplied, [Low Voltage Assign] <i>LdCA</i> is set to [Yes] <i>YES</i>. ◦ is not supplied, [Low Voltage Assign] <i>LdCA</i> is set to [No] <i>no</i>. <p>NOTE: For more information, refer to General Wiring Diagram using alternatively Solar Panel or Grid, page 139.</p>		
[PV Supply Assign] <i>PVSA</i>	-	[Yes] <i>YES</i>
<p>PV supply assignment Purpose of the MPPT (Maximum Power Point Tracking) is to manage the application to the maximum power operating point of the solar panel to improve the efficiency of solar energy systems. [PV Supply Assign] <i>PVSA</i> can be set to:</p> <ul style="list-style-type: none"> • [Yes] <i>YES</i>: Function MPPT is activated. • [No] <i>no</i>: Function is not activated. • [Dix] <i>LIX</i>: assigned to a digital input. If this digital input selected: <ul style="list-style-type: none"> ◦ is supplied, [PV Supply Assign] <i>PVSA</i> is set to [Yes] <i>YES</i>. ◦ is not supplied, [PV Supply Assign] <i>PVSA</i> is set to [No] <i>no</i>. <p>NOTE: If [PV Supply Assign] <i>PVSA</i> is active, [Input Phase Loss] <i>PHF</i> detection is deactivated whatever the setting of the [InPhaseLoss Assign] <i>IPL</i> parameter. NOTE: If the product is used with both panel and grid supplies, the parameter [PV Supply Assign] <i>PVSA</i> must be assigned to a digital input to disable the Maximum Power Point Tracking when the supply is switched to grid. For more information, refer to General Wiring Diagram using alternatively Solar Panel or Grid, page 139.</p>		

HMI label	Setting	Factory setting
[Low Light Duration] LLT	0...3600 s	30 s
<p>Low light duration This parameter avoids frequent pump start and stop during the sunrise and the sunset. During cloudy day, it can happened that the energy provided by the solar panel is not sufficient to maintain the DC bus voltage above the lower limit threshold [Supply Mains UnderV] USF. In this case, the product will trigger a [Supply Mains UnderV] USF error which will be automatically reset when the DC bus voltage will again exceed this lower limit threshold and then, run again the motor (if the [Running] RUN command is still active) who can lead to frequent starts and stops of the pump. To limit these frequent starts and stops, the drive will switch in [Low Light] LL state instead of [Running] RUN state for a given period set by the parameter [Low Light Duration] LLT. As long as the period is not achieved, the drive will stay in [Low Light] LL state without applying the [Running] RUN command that could be already present.</p>		

About the function Global maximum Power Point (GMPPT)

The solar pump inverter uses the maximum power point tracking (MPPT) control program to improve the efficiency of solar energy systems. The Global Maximum Power Point (GMPPT) helps to ensure that maximum power is absorbed by the photovoltaic system when irradiation is uneven (solar panels are partially shaded by a tree, for example).

NOTE: The algorithm is active when the status GPP (Global MPPT) is displayed on the right top corner of the display terminal.



When GMPPT function is active, the drive will regularly scan the range to highest power point curves.

The drive will find the P1 area instead of staying on P2 or P3 areas.

NOTE: During each scan, the user will observe a variation in speed between the current speed and the [Low Speed] LSP, even in the absence of partial shading. For this reason, it is advisable to activate the function only if partial shading is expected during the day or season.

About the parameters

HMI label	Setting	Factory setting
[Global MPPT] <i>G P P T</i>	-	[Disabled] <i>n o</i>
<p>The mode can be selected between:</p> <ul style="list-style-type: none"> • [Disabled] <i>n o</i>: Function is not activated. • [Timer] <i>t i m e r</i>: Function is activated by a timer. 		
[GMPPT Timer] <i>G P P T T</i>	1...1000 min	10 min
<p>Define the detection delay in [GMPPT Timer] <i>G P P T T</i> mode.</p>		

[Inputs / Outputs] (I - O -)

What's in This Chapter

[R1 Configuration] <i>r 1</i> —	125
[R2 Configuration] <i>r 2</i> —	128
Reference channel for [Not separ.] (<i>S i N</i>), [Separate] (<i>S E P</i>) and [I/O profile] (<i>I O</i>) configurations, PID not configured	130
Command channel	131

Access

Parameters described below can be accessed by: *d r i* → *C o n F* → *F u L L*
→ *I - O*

★ : These parameters only appear if the corresponding function has been selected in another menu. When the parameters can also be accessed and adjusted from within the configuration menu for the corresponding function, their description is detailed in these menus, on the pages indicated, to aid programming.

[R1 Configuration] r / —

HMI label	Settings	Factory setting
[R1 Assignment] r / —	—	[No drive flt] I I
<p>R1 assignment</p> <p>[No] (n o): Not assigned. In this case, the output can be controlled via the internal parameter OL1R (refer to the communication parameter addresses file). By default, if an error (such as a communication interruption is detected), the output remains unchanged. Use the parameter [Enable R1 fallback] (r I F) to disable the output in case of error detection.</p> <ul style="list-style-type: none"> • [No drive flt] I I : Drive fault detection status (relay normally energized, and de-energized in the event of an error) • [Drive Running] (r u n): Drive running • [Mot Freq High Thd] (F t R): Motor frequency high threshold reached • [High Speed Reached] (F L R): High speed reached • [Current Thd Reached] (C t R): Current threshold reached ([High Current Thd] (C t d)) • [Current Thd Reached] (C t R): Current threshold reached • [Motor Therm Thd reached] (t S R): Motor thermal threshold reached • [PID error Warning] (P E E): PID error warning • [PID Feedback Warn] (P F R): PID feedback warning • [Mot Freq High Thd 2] (F 2 R): Motor frequency high threshold 2 reached ([Freq. threshold 2] (F 2 d)) • [Dev Thermal reached] (t R d): Device thermal threshold reached • [Process Undld Warn] (u L R): Process underload warning • [Process Overload Warning] (o L R): Process overload warning • [Slack Rope Warning] (r S d R): Slack rope warning (see [Rope slack config.] (r S d) parameter) • [High Torque Warning] (t t H R): High torque warning [High torque thd.] (t t H) • [Low Torque Warning] (t t L R): Low torque warning [Low torque thd.] (t t L) • [Run Forward] (r F r d): Run forward • [Run Reverse] (r r S): Run reverse • [Mot2 Therm Thd reached] (t S 2): Motor 2 thermal threshold reached • [Mot3 Therm Thd reached] (t S 3): Motor 3 thermal threshold reached • [Neg Torque] (R t S): Negative torque (braking) • [Cnfg.0 act.] (C n F 0): Configuration 0 active • [Cnfg.1 act.] (C n F 1): Configuration 1 active • [Cnfg.2 act.] (C n F 2): Configuration 2 active • [set 1 active] (C F P 1): Parameter set 1 active • [set 2 active] (C F P 2): Parameter set 2 active • [set 3 active] (C F P 3): Parameter set 3 active • [DC charged] (d b L): DC bus charged • [In braking] (b r S): In braking sequence • [Power Removal State] (P r n): Power Removal state, drive locked by "Safe Torque Off" input • [Power Switch Disable] (P S d i): Power switch disable • [Pulse Warn Thd Reached] (F 9 L R): Pulse warning threshold reached [Pulse warning thd.] (F 9 L) • [I present] (n C P): I present, motor current present • [Limit Switch Reached] (L S R): Limit switch reached • [Dynamic Load Warning] (d L d R): Dynamic load warning Load variation detection • [Warning Grp 1] (R G 1): Warning group 1 • [Warning Grp 2] (R G 2): Warning group 2 		

HMI label	Settings	Factory setting
<ul style="list-style-type: none"> • [Warning Grp 3] (<i>AG3</i>): Warning group 3 • [DI6=PTC Warning] (<i>PLA</i>): DI6=PTC warning • [External Error Warning] (<i>EFA</i>): External error warning • [Undervoltage Warning] (<i>USA</i>): Undervoltage warning • [Preventive UnderV Active] (<i>UPA</i>): Preventive undervoltage active • [Device Therm Warn] (<i>LHA</i>): Device thermal state warning • [Lim T/I Reached] (<i>SSA</i>): Limit torque / I reached • [Therm Junction Warn] (<i>LJA</i>): Thermal junction warning • [AI3 4-20 Warning] (<i>APA</i>): AI3 4-20 Loss warning • [Ready] (<i>rdY</i>): Ready • [OL01] (<i>OL01</i>): OL01, function blocks: Logical Output 01 <p>...</p> <ul style="list-style-type: none"> • [OL10] (<i>OL10</i>): OL10, function blocks: Logical Output 10 		
[R1 Delay time] <i>rd</i> (1)	0 to 60,000 ms	0 ms
<p>R1 delay time</p> <p>The change in state only takes effect once the configured time has elapsed, when the information becomes true.</p> <p>The delay cannot be set for the [No drive fit] // assignment, and remains at 0.</p>		
[R1 Active at] <i>rs</i>	—	[1] (POS)
<p>R1 active level</p> <p>Configuration of the operating logic:</p> <ul style="list-style-type: none"> • [High Level] <i>POS</i>: High level, state 1 when the information is true • [Low Level] <i>NEG</i>: Low level, state 0 when the information is true <p>Configuration [High Level] <i>POS</i> cannot be modified for the [No drive fit] // assignment.</p>		
[R1 Holding time] <i>rh</i>	0 to 9,999 ms	0 ms
<p>R1 holding time</p> <p>The change in state only takes effect once the configured time has elapsed, when the information becomes false.</p> <p>The holding time cannot be set for the [No drive fit] // assignment, and remains at 0.</p>		

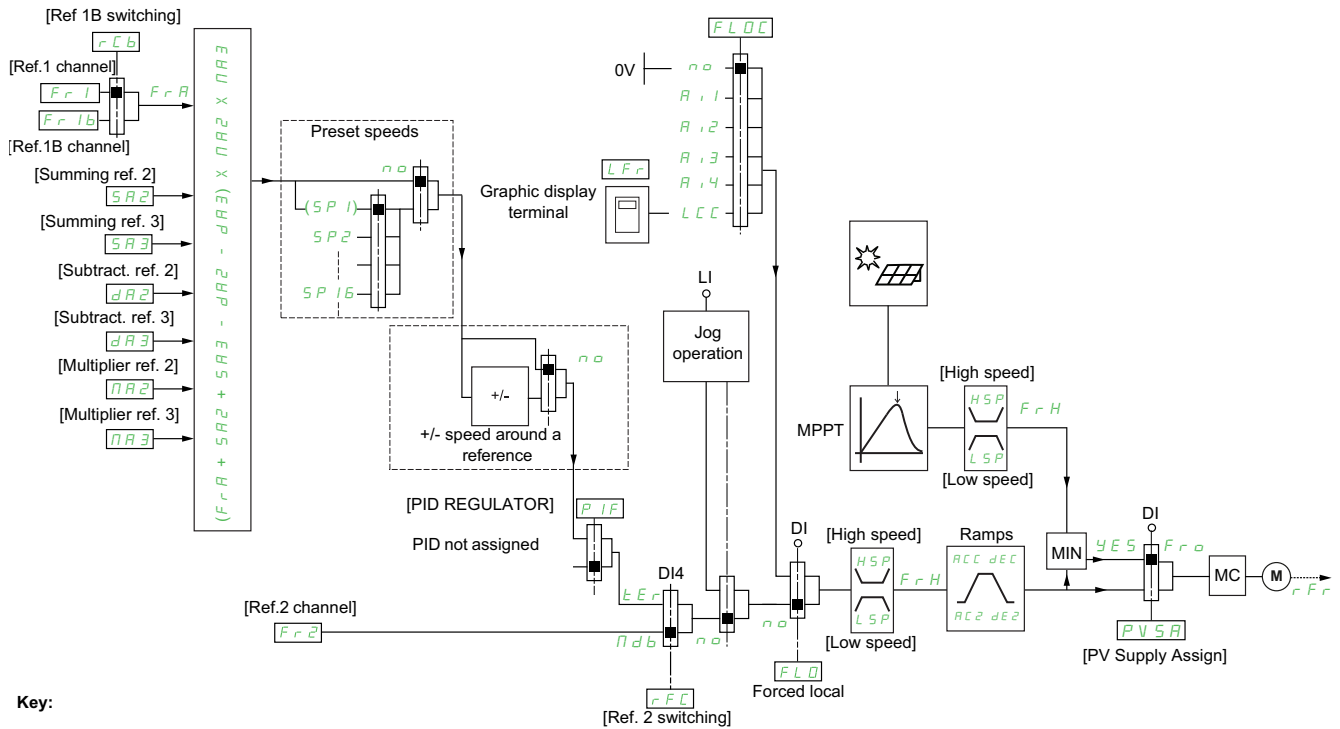
HMI label	Settings	Factory setting
[Enable R1 fallback] <i>r 1 F</i>	—	[No] (n o)
<p>Enable relay 1 fallback If the output is controlled by fieldbus and has been enabled, transition to operating state Fault such as, but not limited to, communication interruption, will not disable the output if this parameter is set to [No] NO .</p>		
<p>⚠ WARNING</p>		
<p>LOSS OF CONTROL</p> <ul style="list-style-type: none"> • Verify that using this default setting does not result in unsafe conditions including communication interruption. • Set this parameter to [Yes] YES to disable the output if an error is triggered. <p>Failure to follow these instructions can result in death, serious injury, or equipment damage.</p>		
<p>This parameter is forced to [No] (n o) if [R1 Assignment] (r 1) is set to a value different from [No] (n o).</p>		
<p>[Yes] (Y E S): Fallback feature enabled: The state of the relay can be controlled via a bit of OL1R (refer to the communication parameter addresses file). If an error is detected, the output is disabled.</p> <p>NOTE: If an error is detected, the process applied on the output (e.g. delays, active level) remains applied.</p>		
<p>[No] (n o): Fallback feature disabled: When the output is assigned, the state of the output is defined according to its assignment. When the corresponding output is not assigned, the state of the output can be controlled via a bit of OL1R (refer to the communication parameter addresses file). If a error is detected, the output remains unchanged.</p>		

[R2 Configuration] *r 2* —

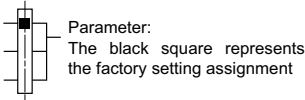
HMI label	Settings	Factory setting
[R2 Assignment] <i>r 2</i>	—	[Drive Running] (<i>r u n</i>)
<p>R2 assignment</p> <p>Identical to [R1 Assignment] (<i>r 1</i>) with the addition of:</p> <ul style="list-style-type: none"> • [Brake Sequence] (<i>b L C</i>): Brake sequence • [Mains Contactor] (<i>L L C</i>): Mains contactor control • [Output cont] (<i>o C C</i>): Output contactor control • [Spool end] (<i>E b o</i>): Spool end, end of reel (traverse control function) • [Sync wobble] (<i>t S Y</i>): Sync wobble, "Counter wobble" synchronization 		
[R2 Delay time] <i>r 2 d</i> ⁽¹⁾	0 to 60,000 ms	0 ms
<p>R2 delay time</p> <p>The delay cannot be set for the [No drive fit] <i>I I</i>, [Brake Sequence] (<i>b L C</i>), [Output cont] (<i>o C C</i>) and [Mains Contactor] (<i>L L C</i>) assignments, and remains at 0.</p> <p>The change in state only takes effect once the configured time has elapsed, when the information becomes true.</p>		
[R2 Active at] <i>r 2 S</i>	—	[1] (POS)
<p>R2 active level</p> <p>Configuration of the operating logic:</p> <ul style="list-style-type: none"> • [High Level] <i>P o S</i>: High level, state 1 when the information is true • [Low Level] <i>n E C</i>: Low level, state 0 when the information is true <p>The configuration [High Level] <i>P o S</i> cannot be modified for the [No drive fit] <i>I I</i>, [Brake Sequence] (<i>b L C</i>), [DC charging] (<i>d C o</i>), and [Mains Contactor] (<i>L L C</i>) assignments.</p>		
[R2 Holding time] <i>r 2 H</i>	0 to 9,999 ms	0 ms
<p>R2 holding time</p> <p>The holding time cannot be set for the [No drive fit] <i>I I</i>, [Brake Sequence] (<i>b L C</i>) and [Mains Contactor] (<i>L L C</i>) assignments, and remains at 0.</p> <p>The change in state only takes effect once the configured time has elapsed, when the information becomes false.</p>		

HMI label	Settings	Factory setting
[Enable R2 fallback] <i>r 2 F</i>	—	[No] (n o)
<p>Enable relay 2 fallback If the output is controlled by fieldbus and has been enabled, transition to operating state Fault such as, but not limited to, communication interruption, will not disable the output if this parameter is set to [No] NO .</p>		
<p>⚠ WARNING</p>		
<p>LOSS OF CONTROL</p> <ul style="list-style-type: none"> • Verify that using this default setting does not result in unsafe conditions including communication interruption. • Set this parameter to [Yes] YES to disable the output if an error is triggered. <p>Failure to follow these instructions can result in death, serious injury, or equipment damage.</p>		
<p>This parameter is forced to [No] (n o) if [R2 Assignment] (r 2) is set to a value different from [No] (n o).</p>		
<p>[Yes] (Y E S): Fallback feature enabled: The state of the relay can be controlled via a bit of OL1R (refer to the communication parameter addresses file). If an error is detected, the output is disabled.</p> <p>NOTE: If an error is detected, the process applied on the output (e.g. delays, active level) remains applied.</p>		
<p>[No] (n o): Fallback feature disabled: When the output is assigned, the state of the output is defined according to its assignment. When the corresponding output is not assigned, the state of the output can be controlled via a bit of OL1R (refer to the communication parameter addresses file). If an error is detected, the output remains unchanged.</p>		

Reference channel for [Not separ.] (S , Π), [Separate] (S E P) and [I/O profile] (I O) configurations, PID not configured



Key:



Note: Forced local is not active in [I/O profile].

Note: rFr follows FrO

[Ref Freq 1 Config] (Fr1), [Summing Input 2] (SA2), [Summing Input 3] (SA3), [Subtract Ref Freq 2] (DA2), [Subtract Ref Freq 3] (DA3), [Ref Freq 2 Multiply] (NA2), [Ref Freq 3 Multiply] (NA3):

- Terminals, graphic display terminal, integrated Modbus, integrated CANopen®, communication module

[Ref.1B channel] (Fr1b), for [Separate] (SEP) and [I/O profile] (IO):

- Terminals, graphic display terminal, integrated Modbus, integrated CANopen®, communication module

[Ref.1B channel] (Fr1b), for [Not separ.] (S, Π):

- Terminals, only accessible if [Ref Freq 1 Config] (Fr1) = terminals

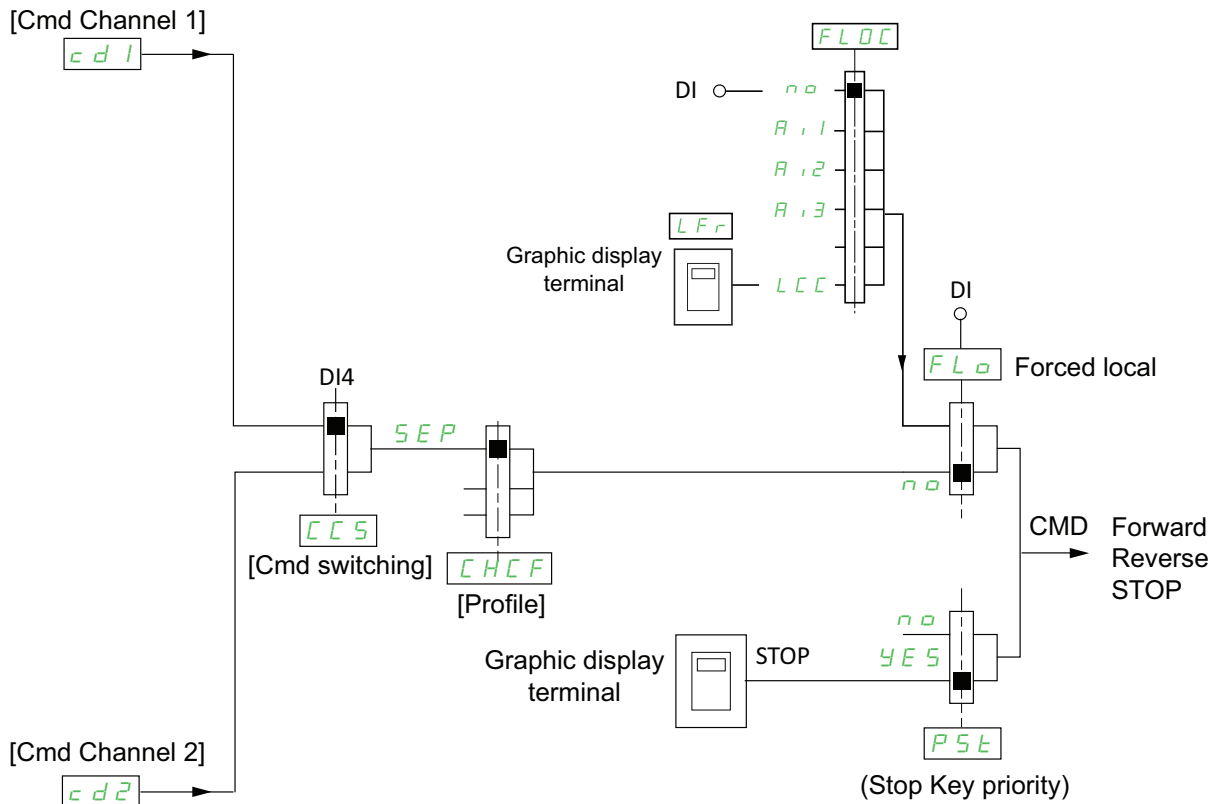
[Ref Freq 2 Config] (Fr2):

- Terminals, graphic display terminal, integrated Modbus, integrated CANopen®, communication module, and +/- speed

NOTE: [Ref.1B channel] (Fr1b) and [Ref 1B switching] (rCb) must be configured in the [Application function] (Fun) menu.

Command channel

Separate reference and command, as in **[Separate] (SEP)** configuration
 The command channels **[Cmd channel 1] (Cd1)** and **[Cmd channel 2] (Cd2)** are independent of the reference channels **[Ref Freq 1 Config] (Fr1)**, **[Ref.1B channel] (Fr1b)** and **[Ref Freq 2 Config] (Fr2)**.



Key:

Parameter:
 The black square represents the factory setting assignment, except for [Profile].

[Cmd channel 1] (Cd1) [Cmd channel 2] (Cd2):

- Terminals, graphic display terminal, integrated Modbus, integrated CANopen®, communication module

A command or an action can be assigned:

- To a fixed channel by selecting an **[Digital Input NST Freewheel] (Li)** input or a Cxxx bit:
 - By selecting, for example, **[DI3] (Li3)**, this action is triggered by **[DI3] (Li3)** regardless of which command channel is switched.
 - By selecting, for example, **[C214] (C214)**, this action is triggered by integrated CANopen® with bit 14 regardless of which command channel is switched.
- To a switchable channel by selecting a CDxx bit:
 - By selecting, for example, **[CD11] (Cd11)**, this action is triggered by:
 - [DI12] (Li12)** if the terminals channel is active
 - [C111] (C111)** if the integrated Modbus channel is active
 - [C211] (C211)** if the integrated CANopen® channel is active
 - [C311] (C311)** if the communication module channel is active

If the active channel is the graphic display terminal, the functions and commands assigned to CDxx switchable internal bits are inactive.

NOTE: [CD06] (C d 0 6) to [CD13] (C d 1 3) can only be used for switching between 2 networks. They do not have equivalent logic inputs.

Terminals	Integrated Modbus	Integrated CANopen®	Communication module	Internal bit, can be switched
				CD00
DI2 ⁽¹⁾	C101 ⁽¹⁾	C201 ⁽¹⁾	C301 ⁽¹⁾	CD01
DI3	C102	C202	C302	CD02
DI4	C103	C203	C303	CD03
DI5	C104	C204	C304	CD04
DI6	C105	C205	C305	CD05
-	C106	C206	C306	CD06
-	C107	C207	C307	CD07
-	C108	C208	C308	CD08
-	C109	C209	C309	CD09
-	C110	C210	C310	CD10
-	C111	C211	C311	CD11
-	C112	C212	C312	CD12
LAI1	C113	C213	C313	CD13
LAI2	C114	C214	C314	CD14
-	C115	C215	C315	CD15
OL01 to OL10				

(1) If [2/3-Wire Control] (E C C) is set to [3-Wire Control] (3 C), [DI2] (L i 2), [C101] (C 1 0 1), [C201] (C 2 0 1) and [C301] (C 3 0 1) cannot be accessed.

Common Additional Features

What's in This Part

Braking Resistors — Incompatibility when [Macro Config] <code>CFG</code> is set to [Solar Application] <code>Sun</code>	134
Blocking Diode	135
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Manage Grid and solar panel supply with ATV320 Solar	139
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Braking Resistors — Incompatibility when **[Macro Config]** *CFG* is set to **[Solar Application]** *SUN*

Solar panels and braking resistors are incompatible.

When **[Macro Config]** *CFG* is set to **[Solar Application]** *SUN*, the **[Dec.Ramp Adapt]** (*brR*) parameter cannot be set on **[No]** (*no*).

Blocking Diode

NOTICE

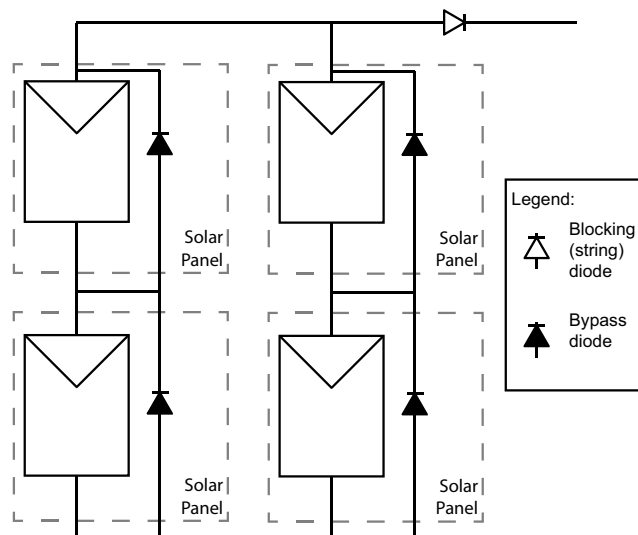
OVERVOLTAGE TO THE SOLAR PANEL

- Always use blocking diode when the supply is provided by Solar panel only and if the drive needs to be in Regeneration mode (braking and/or inertia present at the deceleration).
- Always use blocking diode when the supply is provided by both Solar panel and Grid alternatively whatever the conditions.

Failure to follow these instructions can result in equipment damage.

Protect the solar panels

Protect the solar panels by adding blocking diode:



Recommended Blocking Diode

DC Input Voltage	Catalog Number	Voltage rating	Current rating
150-378 Vdc	ATV320U04M2C412	600	12
	ATV320U06M2C412	600	12
	ATV320U07M2C412	600	25
	ATV320U11M2C412	600	25
	ATV320U15M2C412	600	40
	ATV320U22M2C412	600	40
	ATV320U30M3C412	600	50
	ATV320U40M3C412	600	70
	ATV320U55M3C412	600	85
	ATV320U75M3C412	600	120
	ATV320D11M3C412	600	120
	ATV320D15M3C412	600	150

DC Input Voltage	Catalog Number	Voltage rating	Current rating
280-778 Vdc	ATV320U04N4C412	1200	6
	ATV320U06N4C412	1200	6
	ATV320U07N4C412	1200	12
	ATV320U11N4C412	1200	12
	ATV320U15N4C412	1200	12
	ATV320U22N4C412	1200	16
	ATV320U30N4C412	1200	25
	ATV320U40N4C412	1200	40
	ATV320U55N4C412	1200	40
	ATV320U75N4C412	1200	70
	ATV320D11N4C412	1200	70
	ATV320D15N4C412	1200	150

DC Bus sharing

Generic recommendations

The DC bus connections between two drives must be designed to be as short as possible and the distance between +DC and -DC cables as reduced as possible in order to reduce the leakage inductance of the wiring, which creates overvoltage during switching.

When the DC bus wiring is made with standard cables, the following solutions can be used to meet the DC-bus cable requirements:

- Independent cables with cable clamps,
- Two or three-wires sheathed cable,
- Or 2-wires shielded cable where the shield is grounded.

To protect the drives in case of a short-circuit on the DC bus link, semi-conductor protection class fuses must be used in the DC+ and DC- wires of each drive, or in the mains input lines when the daisy chain feature is used which does not allow to put them in the DC lines. For more information, refer to Short-Circuit Current Ratings (SCCR) and Branch Circuit Protection, page 45.

NOTE: the selected drives must be in the same power range.

Standard wires DC terminals

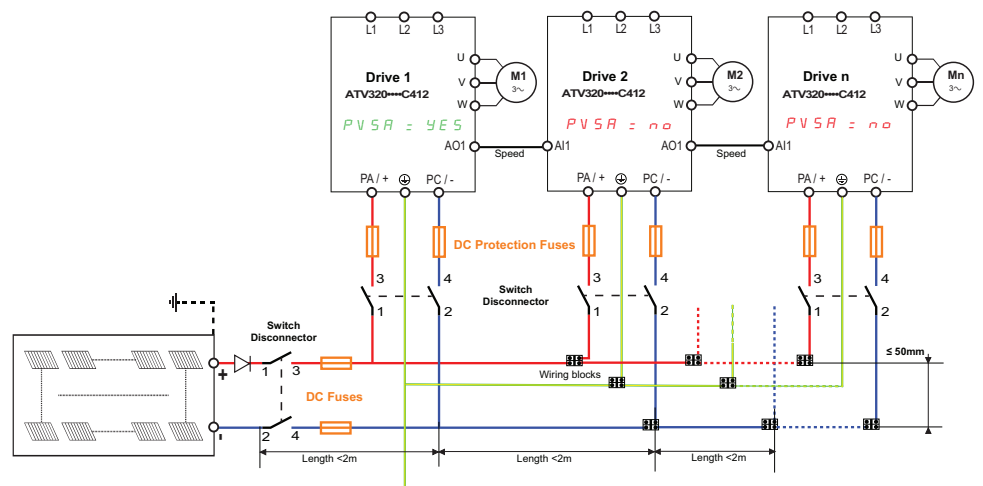
The DC terminals are similar to the input lines and motor outputs terminals. Same cables as those used for mains input lines can be used for DC bus connections.

The drive DC terminals cannot withstand the total DC-bus current and therefore cannot be used for chaining. **Wiring blocks have to be used to build the DC bus link** and to wire each drive with only one wire for the PA/+ connection and one wire for the PC/- connection.

In addition, the following cabling rules must be respected:

- The total **cable length between PA/+ and PC/-** connections of one drive to PA/+ and PC/- connections of another drive **must be less than 2 m**.
- The ground wire included in the DC bus is optional. It is not a protective ground conductor (PE); it just helps to reduce the conducted and radiated emissions.
- The **distance between +DC and -DC wires must not exceed 5 cm** except close to the junctions' terminals, the switch-disconnector, the fuses holders or the drives PA/+ and PC/- to allow cabling.

The generic wiring diagram in this case is shown on the drawing below:



NOTE: Drive 1 sets the reference speed for the other **Drives n**.

NOTE:

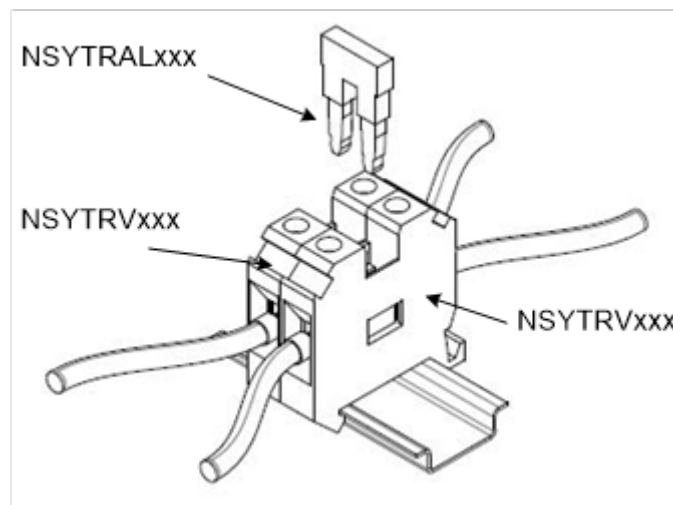
- on the Drive 1: **[PV Supply Assign] P V S A** can be set on **[Yes] Y E S**.
- on the Drive n: **[PV Supply Assign] P V S A** must be set on **[No] n o**.

NOTE: The following parameters must be set if the pumps are the same and the scale for both speed references for analog inputs and outputs are the same.

- Set **[AQ1 assignment] A o 1** to **[Motor Frequency] o F r**.
- Set **[AI1 assignment] A , I A** to **[Ref Freq 1 Config] F r 1**.

Wiring blocks

Type	Ref.	Ref.	Ref.
Pass-through 1-pole 1x1 terminal block	NSYTRV102	NSYTRV162	NSYTRV352
Jumper to connect 2 blocks	NSYTRAL102	NSYTRAL162	NSYTRAL352
Rated current at 690 V	54 A	73 A	126 A
Maximum current at 1000 V	76 A	101 A	125 A
Cable cross section capability	0.5 – 16 mm ²	1.5 – 25 mm ²	1.5 – 50 mm ²



Manage Grid and solar panel supply with ATV320 Solar

What's in This Chapter

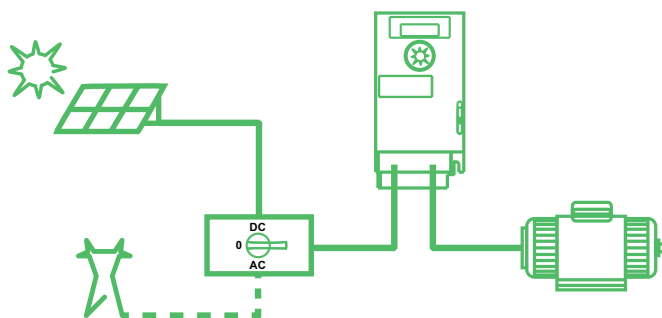
General Wiring Diagram using alternatively Solar Panel or Grid 139
 Configuration to manage Grid and solar panel supplies 141
 How to use and to switch from a source to another..... 144

⚠ ⚠ DANGER
<p>INSUFFICIENT PROTECTION AGAINST OVERCURRENTS CAN CAUSE FIRE OR EXPLOSION</p> <ul style="list-style-type: none"> • Use properly rated overcurrent protection devices for both solar panel and grid supplies. • Use the fuses/circuit breakers specified in the annex provided with the product. <p>Failure to follow these instructions will result in death or serious injury.</p>

The values and products for UL compliance and for IEC compliance are specified in the annex provided with the product.

NOTICE
<p>RISK OF DAMAGE TO THE DRIVE AND TO THE SOLAR PANELS</p> <p>Do not supply the product with the grid and the solar connection at the same time.</p> <p>Failure to follow these instructions can result in equipment damage.</p>

The switch panel / network is possible by using a contactor 4 poles or more. The selection and choice of this contactor is to be made by the customer. The Customer Care Center can provide support in this matter if necessary.



NOTE: If the ATV320...C412 is used as a standard product, standard application diagrams must be applied.

General Wiring Diagram using alternatively Solar Panel or Grid

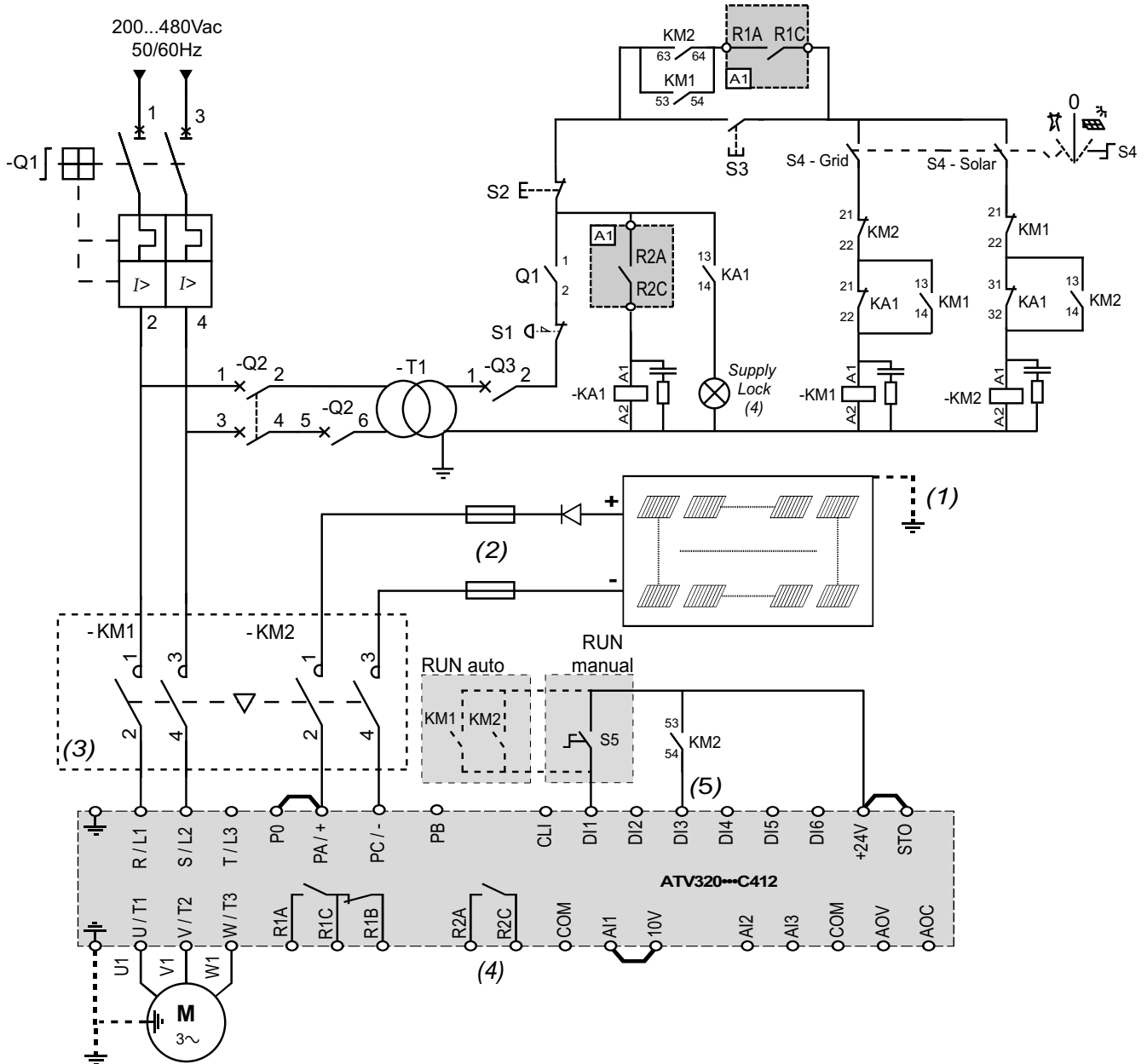
NOTICE
<p>WRONG GROUND CONNECTION</p> <p>Never connect the ground to the terminal PC- of the product.</p> <p>Failure to follow these instructions can result in equipment damage.</p>

NOTICE

INCORRECT POLARITY

Prior to connect the photovoltaic arrays to the system, respect the polarity PA/+ and PC/-.

Failure to follow these instructions can result in equipment damage.



(1) The photovoltaic modules used shall comply with UL 1703. The solar panels and the drive input shall be in compliance with NEC article 690.

For the photovoltaic installation ground connection, safety instructions and orientation, refer to the photovoltaic panel user manual.

(2) Protection according to the concerned voltage, current and according to the photovoltaic arrays manual.

Fuse between PC/- and the - of the solar panel is optional.

For fuse selection and DC switch-disconnector, refer to the Short-Circuit Current Ratings (SCCR) and Branch Circuit Protection, page 45.

(3) The system of two contactors can be replaced by a unique switch who support AC/DC switch. The selection and choice of this switch have to be made by the customer.

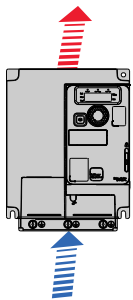
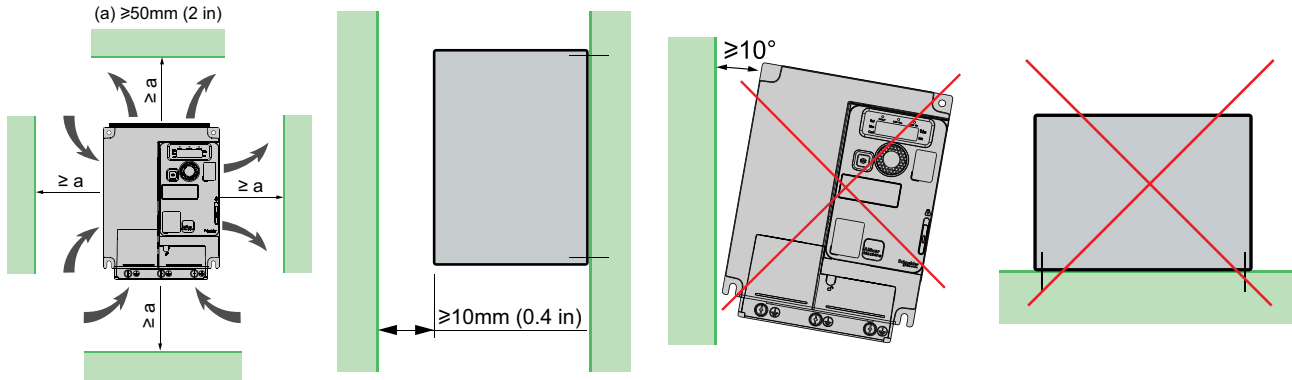
(4) LED Supply Lock to warn the customer if it's possible to switch to the another supply. The LED is active as long as the DC bus voltage has not reach an acceptable value to switch between the supplies. Set [R2 Assignment] r 2 to [Power Switch Disable] (P 5 d i) to manage switching between two power sources.

(5) Set [PV Supply Assign] P V 5 R to [Dix] L , X (in our example, DI3).

Configuration to manage Grid and solar panel supplies

1. Mounting the drive

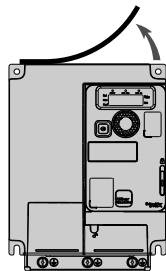
The drive is designed to be used in a controlled indoor environment for a surrounding air temperature up to 50°C (122°F).



Respect the minimum clearances so that the cooling air can circulate from the bottom to the top of the drive.

Do not install the drive above heating elements.

When IP20 protection is adequate, we recommend that the vent cover on the top of the drive be removed, as shown below:



See ATV320 installation manual for other thermal conditions.

For other topics about mounting the drive, refer to the chapter Mounting the drive, page 64.

2. Wire the drive

Follow this recommended wiring diagram, page 139 and make sure to wire the part *Run Manual*.

Otherwise, if the product has been wired in *Run Auto*, the product will be immediately in running state. After pressing S3, it will be impossible to configure the product without stopping the motor by pressing the **STOP** key on the HMI.

3. Configuration of the drive to manage two supplies

Step	Actions
1	Closed Q1 then Q2 then Q3.
2	Select Solar supply source with the S4 switch.
3	Power on the installation by pressing the S3 button.
4	Check that the [Macro Config] C F G is set to [Solar Application] S u n .
5	<p>Access Path: [Drive menu] d r i → [Configuration] C o n F → [Full] F u L L → [Sun] S u n</p> <p>Set [Low Voltage Assign] L d C A to [Dix] L , X (in our example, DI3).</p> <div style="border: 1px solid black; padding: 10px; text-align: center;"> <p>NOTICE</p> <p>DESTRUCTION OF DRIVE INPUT BRIDGE</p> <p>If the product is used with both panel and grid supplies, the parameter [Low Voltage Assign] L d C A must be assigned to a digital input to disable the extended voltage range when the supply is switched to grid.</p> <p>Failure to follow these instructions can result in equipment damage.</p> </div>
6	<p>Access Path: [Drive menu] d r i → [Configuration] C o n F → [Full] F u L L → [Sun] S u n</p> <p>Set [PV Supply Assign] P V S A to [Dix] L , X (in our example, DI3).</p> <p>NOTE: If [PV Supply Assign] P V S A is active, [Input Phase Loss] P H F detection is deactivated whatever the setting of the [InPhaseLoss Assign] , P L parameter.</p>
7	<p>Access Path: [Drive menu] d r i → [Configuration] C o n F → [Full] F u L L → [Inputs / Outputs] i , o → [R2 Configuration] r 2</p> <p>Set [R2 Assignment] r 2 to [Power Switch Disable] P S d i.</p> <p>NOTE: The [Power Switch Disable] P S d i status will match the voltage levels of the drive and the power sources. Otherwise, switching from one source to another will be locked.</p>

4. Set pump parameters

Refer to the motor/pump Nameplate to set the following parameters in **[Simply start] 5, 11** menu.

Example of a motor/pump nameplate:

Nameplate with **Nominal motor power** nPr

Nameplate with **Motor 1 Cosinus Phi** $c\phi S$

Type:	T max 35°C		
Model:			
Serial no.:			
Q(m3/min) 4.5	Qmin -	Qmax 6.5	
H(m) 11.8	Hmin -	Hmax 22.5	
230V ($u n S$)	2.6A ($n c r$)	2860 tr/min ($n S P$)	
0.37kW ($n P r$)	50Hz ($F r S$)	IP-68	10.9 kg

Type:	T max 35°C		
Model:			
Serial no.:			
Q(m3/min) 4.5	Qmin -	Qmax 6.5	
H(m) 11.8	Hmin -	Hmax 22.5	
230V ($u n S$)	2.6A ($n c r$)	2860 tr/min ($n S P$)	
$\cos \phi$ 0.64 ($c \phi S$)	50Hz ($F r S$)	IP-68	10.9 kg

Step	Action
1	Configure the standard frequency of the motor/pump [Motor Standard] b F r .
2	Configure the nominal power of the motor/pump [Nominal Motor Power] n P r . If the [Nominal Motor Power] n P r is not provided on the nameplate, follow this procedure: 1. Set [Motor param choice] n P c to [Motor 1 Cosinus Phi] c \phi S . 2. Configure the $\cos \phi$ of the motor/pump [Motor 1 Cosinus Phi] c \phi S .
3	Configure the nominal motor voltage of the motor/pump [Nom Motor Voltage] u n S .
4	Configure the nominal current of the motor/pump [Nom Motor Current] n c r .
5	Configure the nominal frequency of the motor/pump [Nominal Motor Freq] F r S .
6	Configure the nominal speed of the motor/pump [Nominal Motor Speed] n S P .
7	<p>This step must be performed with the grid or at maximum sunlight.</p> <p>Once all these parameters are set, you will have to perform an autotuning procedure allowing the drive to refine the motor characteristics using the [Autotuning] t u n parameter.</p> <p>This will generate a small noise in the motor which is totally normal.</p> <div style="border: 1px solid black; padding: 5px; text-align: center;"> <p>⚠ WARNING</p> <p>UNEXPECTED MOVEMENT</p> <p>Autotuning moves the motor in order to tune the control loops.</p> <ul style="list-style-type: none"> Only start the system if there are no persons or obstructions in the zone of operation. <p>Failure to follow these instructions can result in death, serious injury, or equipment damage.</p> </div> <p>During autotuning, noise development and oscillations of the system are normal.</p> <div style="border: 1px solid black; padding: 5px; text-align: center;"> <p>⚠ WARNING</p> <p>LOSS OF CONTROL</p> <ul style="list-style-type: none"> If you modify the value of one or more motor parameters after having performed autotuning, the value of [Tune selection] S t u n is reset to [Default] t A b and you must re-perform autotuning. <p>Failure to follow these instructions can result in death, serious injury, or equipment damage.</p> </div>
8	Configure the thermal monitoring current (A) of the motor/pump [Motor Th Current] i t H .
9	Configure the acceleration of the motor/pump [Acceleration] A c c .
10	Configure the deceleration of the motor/pump [Deceleration] d e c .

5. Define the minimum pump speed and check the pump running way (reverse or forward)

NOTE: The instructions given in the following table only apply in optimum sunlight conditions, allowing the pump to operate at its nominal speed.

Step	Action
1	Increase [Low Speed] LSP step by step until the water appears.
2	Switch off Q3, Q2 and Q1.
3	Follow the procedure <i>Verifying the Absence of Voltage</i> , page 17.
4	Invert pump wiring U and V.
5	Switch on Q1, Q2 and Q3 then press S5 to start the motor.
6	Set [Low Speed] LSP to 0. Increase [Low Speed] LSP to step by step until the water appears.
7	If the value of [Low Speed] LSP in the step 6 is: <ul style="list-style-type: none"> • lower than the value of [Low Speed] LSP in the step 1, keep this wiring in the step 6. • higher than the value of [Low Speed] LSP in the step 1, keep this wiring in the step 1.

How to use and to switch from a source to another

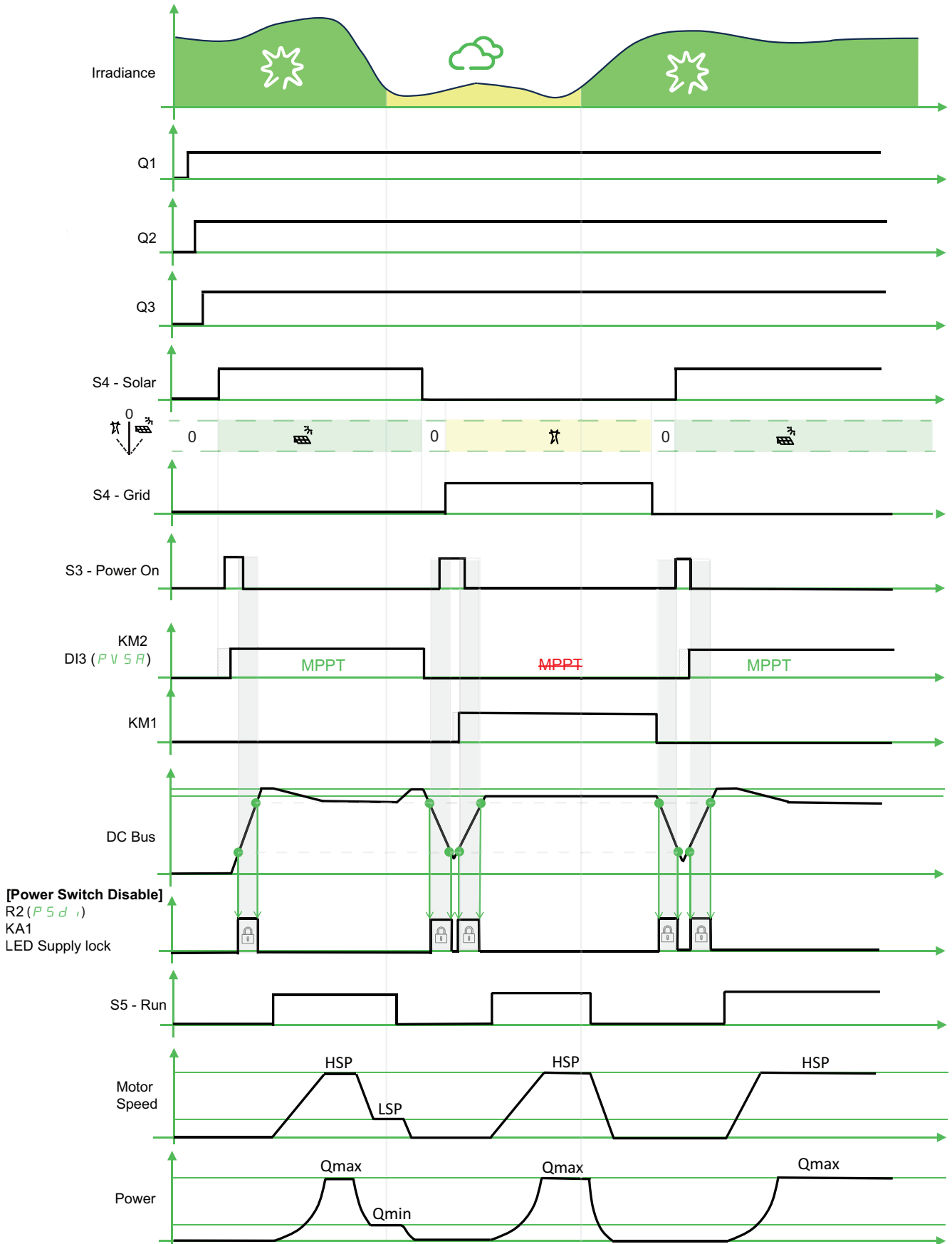
How to use

Step	Actions
1	Make sure that the <i>Configuration to manage Grid and solar panel supplies</i> procedure has been followed before continue.
2	Closed Q1 then Q2 then Q3.
3	Select a supply source (Grid or Solar) with the S4 switch.
4	To start the installation, press the S3 button.
5	<ul style="list-style-type: none"> • In <i>Run Manual</i>, press on S5 to start the motor. • In <i>Run Automatic</i>, the motor will start. To stop the installation, press the S2 button.

How to switch from a source to another

Step	Actions
1	Stop the installation by pressing the S2 button.
2	Wait for the LED <i>Supply Lock</i> is off to switch from a source to another. NOTE: As long the LED <i>Supply Lock</i> is supplied, commands on the S3 button are not taken into account.
3	Select a supply source (Grid or Solar) with the S4 switch.
4	To start the installation, press the S3 button.
5	<ul style="list-style-type: none">• In <i>Run Manual</i>, press on S5 to start the motor.• In <i>Run Automatic</i>, the motor will start.
6	To stop the installation, press the S2 button.

Chronogram



ATV Logic Programming

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ATV Logic provides graphic programming based on predefined function blocks.

This chapter provides a summary of information about ATV Logic Programming and a specific example for a solar application. For more information, refer to ATV320 ATV Logic manual, page 12.

Creating an FBD Application Using Function Blocks

Insertion of Function Blocks

To add a function block, left-click and drag the selected block to the desired location on the diagram.

Creation of a Virtual Port

To add a function block, drag the function block you wish to add to the diagram.



① : Virtual input pins

② : Virtual output pins

Configuration of Virtual Ports

The type of input/output pins can be configured by double-clicking on them.

- Logic input 1 assignment (IL01) to Logic input 10 assignment (IL10): Logic inputs
- Analog input 1 assignment (IA01) to Analog input 10 assignment (IA10): Analog inputs
- Logic output 1 assignment (OL01) to Logic output 10 assignment (OL10): Logic outputs

- Analog output 1 assignment (OA01) to Analog output 10 assignment (OA10): Analog outputs

OAXX must be in the range [0 - 8192] if used on OA1. Other values generate the OA1 max. value.

When you double-click on an input/output, only this port can be changed; the others are grayed-out.

Links Between Blocks

The following process describes how to link function blocks together:

Step	Action	Comment
1	Left -click on an output of a function block output.	Result: The mouse cursor is displayed as a cross.
2	Hold down the left button.	
3	With the button held down, move the cursor over a block output.	
4	Release the mouse button.	Result: The line is shown between the two linked blocks
5	Repeat steps 1 and 2 to link all the blocks.	

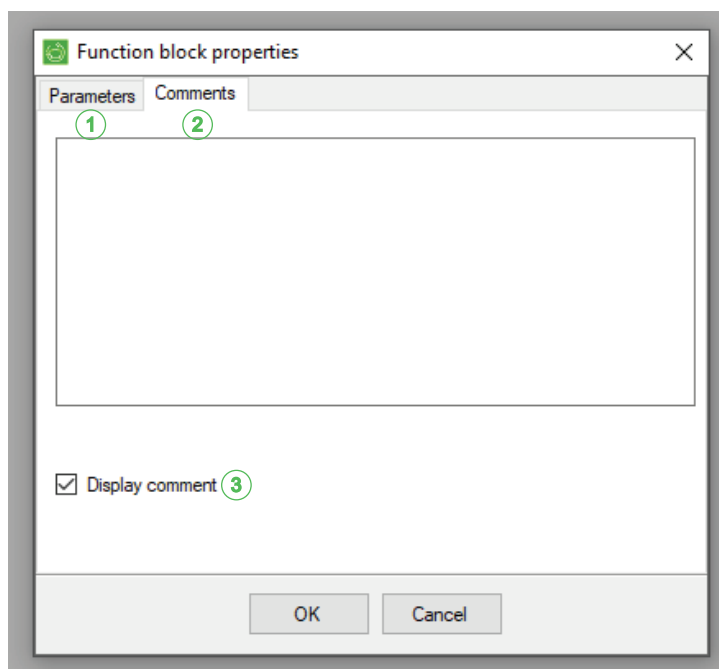
Function Block Configuration

The Configuration Window

Each function block has a configuration window. This window consists of 2 tabs:

- Comments for all function blocks
- Parameters that depend on the function block type

When you double-click on a block, a configuration window appears.



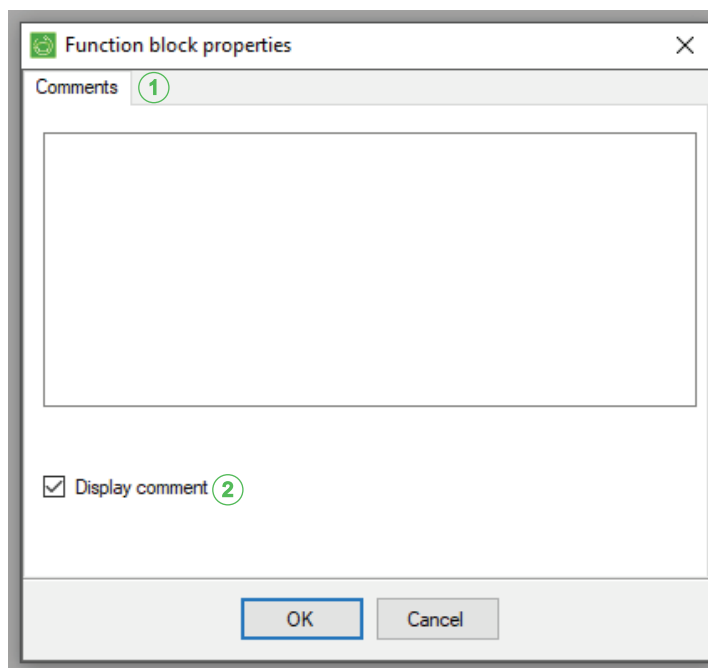
Legend:

- ① : **Parameters** tab: Most function blocks have a **Parameters** tab. In this tab, you need to set the function block's specific parameters. These parameters are described in detail for each of the blocks.
- ② : **Comments** tab: All the blocks can have an associated comment. These comments are displayed under the block in the diagram.
- ③ : **Display** comment: When a comment has been added to a function block, the comment is displayed if the **Display** comment box is checked. This option is activated by default.

Configuration: Virtual Input or Output

Each diagram input or output has a configuration window.

By double-clicking on the start point or end point, a configuration window appears.



Legend:

- ① : **Comments** tab: These comments are displayed under the block in the diagram.
- ② : **Display** comment: When a comment has been added to a function block, the comment is displayed if the **Display** comment box is checked. This option is activated by default.

Type of Link

Table with three columns

Link	Description	Possible value
	For a Boolean link, it is a Black line.	1 or 0
	For an analog link, it is a Green line.	- 32768 to 32767
	For a register link, it is a Blue line.	0 to 65535

Check the Application

Description

With the **Device > ATVLogic > Edition > Check the compilation** command, you launch the compilation (check) of the program.

The result of compilation is displayed in the compilation report window.

In this window, the following information appears:

- The result of the program check
- Used and available resources

NOTE: This check must be performed before the program can be downloaded.

Results Window Elements

The compiler calculates the volumes of resources used in the drive.

If the values calculated are greater than the available values, they appear in the compilation report window.

The compilation report window displays the various possible errors revealed during compilation.

List of errors that can occur during compilation

Unknown Error

Aux task duration too long

The virtual port ID of the block {0} in the {1} task is not allowed

Binary file not created. Error during the file creation

Error during the generation of the {0} task

Error during the Header generation

Error during the Signals generation

The Catalog isn't compatible with the Compiler version

Binary too large

Memory overflow

Virtual Input present in the {0} task, but no one were connected

Virtual Output present in the {0} task, but no one were connected

Error Pre and Post tasks are too long

Two or more Function Blocks have the same Execution Order in the {0} task

Internal error : {0}

Internal error : {0}, block {1}

List of warnings that can occur during compilation

Unknown Warning

The Function Block {0} in the {1} task has no Input port connected

A parameter of the Function Block {0} in the {1} task has no value

At least one of the output ports of the block {0} from the {1} task is not connected

The Virtual Input {0} is used in different tasks. The value could be modified during the other tasks execution

The Virtual Output {0} is used in different tasks. The value could be overridden during the other tasks execution

ADL Containers

Description

ADL Containers are linked to 6 function blocks

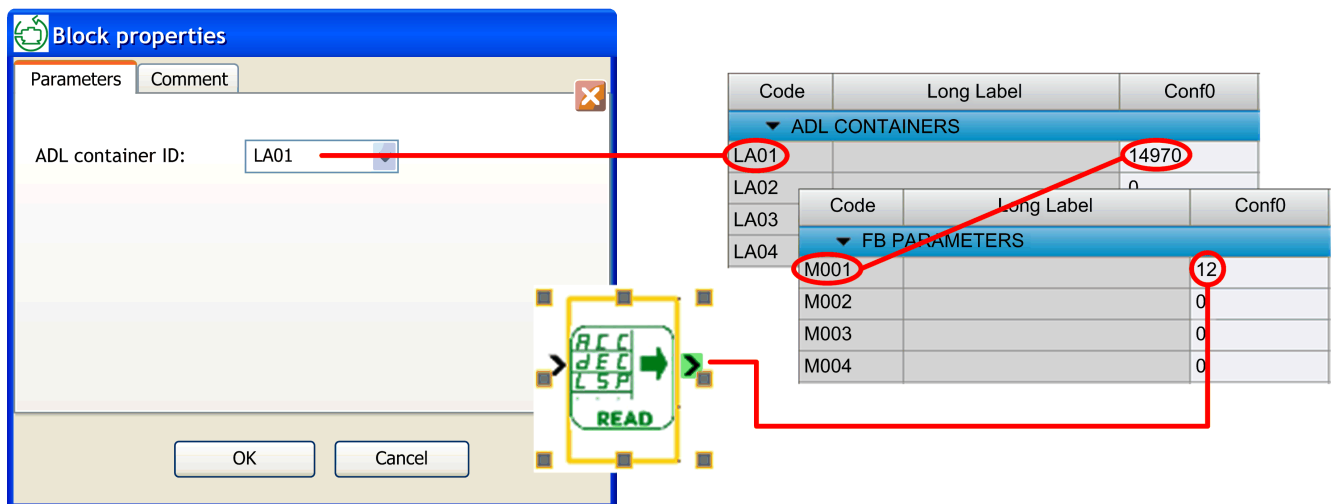
- Read Ana Param
- Read Reg Param
- Write Ana Param
- Write Reg Param
- ReadBitParam
- WriteBitParam

The drive has 8 ADL containers (LA01 to LA08).

These LA0x contain the address of the target parameters.

This configuration is used during graphic editing of the program in Function Blocks.

There are 8 ADL containers used to connect %MW, %SW, or other drive parameters (see programming manual in Help menu).



Depending on which task in the Read/Write Ana/Reg Param logic block is implemented, it will allow connection to Fast or Slow parameters.

The rule is:

- In PRE/POST tasks: Connection to Fast access parameters only
- In the AUX task: Connection to Slow and Fast access parameters

PRE and POST tabs have priority over AUX tabs.

ATV Logic – Solar Application Example

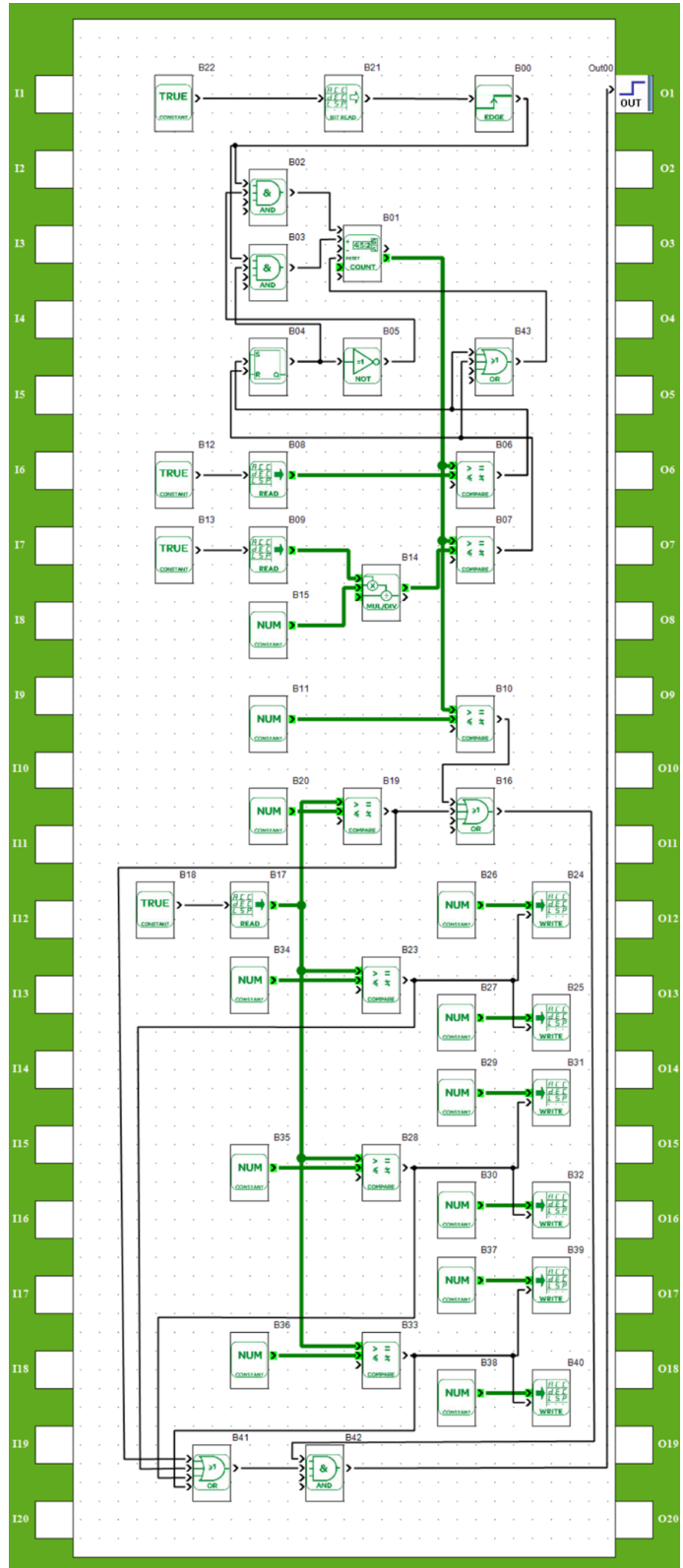
Specifications

Download this program: Altivar_Solar_Logic_one_light

NOTE: Other programs will be available in the future.

This program is done to provide drive status through one light.

Status is provided through light connected to DO1.



Drive setting

- Drive setting
 - Low speed = 0Hz → Write *L S P* = 0Hz
 - High speed = 50Hz → Write *H S P* = 50Hz
- Check Drive status → Read *H M I S* (through scope)
- Check Fault status → Read *L F L* (through scope)
- Check speed setpoint and estimated speed , and torque → Read *F r a* and *r F r* (through scope)

ATVLogic setting in the drive :

Drive :
DO1=OL01
ATVLogic :
FBCD = Run
FBRM = Yes
FBDf = Ignored
FB : ADL Container XX:
LA01 = 14980 → S001 (FB status register 1)
LA02 = 14970 → M001 (FB : M0XX parameter)
LA03 = 14971 → M002 (FB : M0XX parameter)
LA04 = 3240 → H M I S (Product status)
FB : M0XX parameter :
M001 = x (On cycle time , manage by program)
M002 = x (Off cycle time , manage by program)

Virtual Input Pin Creation

Double-click on the inputs/outputs, then assign a data type using the **Virtual Port Configuration** window.

The detailed procedure is explained in the [Creating an FBD Application Using Function Blocks](#), page 147 section.

Program Creation

Drag and drop function blocks from the Function Block Set window. Set the required links between inputs, function blocks and outputs.

The detailed procedure is explained in the [Creating an FBD Application Using Function Blocks](#), page 147 and [Function Block Configuration](#), page 148 sections.

To optimize the cycle time you can adjust the program order of execution.

Check the Application

The detailed procedure is explained in the [Check the Application](#), page 150 section.

Inputs, Outputs and ADL Container Configuration

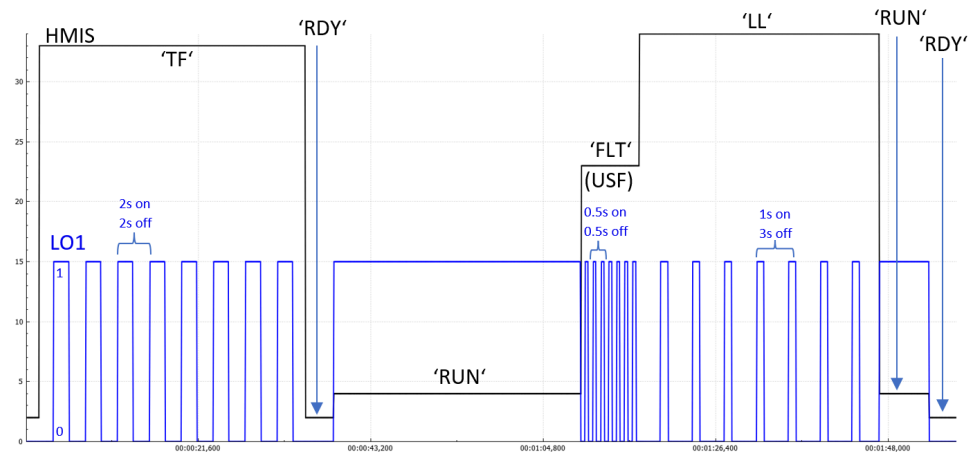
The detailed procedure is explained in the ADL Containers, page 151 section.

Once the program and parameter assignment is complete the configuration can be downloaded.

After downloading, to execute the program, you should set the **[FB Command]** *F b C d* parameter to *5 k r k* for testing.

But for independent applications use the **[FB start mode]** *F b r n* parameter (see the Programming Manual in the Help menu).

Scope of the system



ATV312 Solar Substitution by an ATV320 Solar

NOTE: Some functions available on both products can have minor differences and cannot be converted. For technical detailed information, download the [ATV312 to ATV320 Migration Manual](#), page 12.

The table provides the factory settings difference between an ATV312 Solar and an ATV320 Solar:

Function	ATV312 Solar	ATV320 Solar
Automatic restart The factory setting value of [Auto Fault Reset] <i>AlEr</i> is set to:	[Yes] <i>YES</i>	[No] <i>NO</i>

The table provides the summary of the functions available in ATV312 Solar and ATV320 Solar:

Function	ATV312 Solar	ATV320 Solar	Compatibility
Catch on the fly	✓	✓	Yes
Reverse			
I/O multi-assignment			
2/3 wires control			
Freewheel stop			
Fast stop			
Ramp types			
Ramp switching			
Ramp auto-adaptation			
DC injection braking			
Reference operation			
Jog			
Preset Speeds			
+/- Speed			
2nd Current limitation	✓	✓	No
Jump frequency			
Reverse Inhibition			
Speed Loop Parameters			
Macro-configurations			
Reference switching			
Separate mode (command & reference)			
Brake control sequence			
PID regulator			
Internal PID reference			
Preset PID reference			
Sleep / WakeUp			
Limit switches			
Multi-Motors, Multi-Configurations			

Function	ATV312 Solar	ATV320 Solar	Conversion
High-speed hoisting			
Rope slack			
External weight measurement			
Positioning			
Supply Mains contactor control			
Output contactor control			
Traverse control			
Parameter sets switching			
PID predictive speed			
Torque limitation			
+/- Speed around reference	-	✓	-
Safety functions			
ATV Logic			
MPPT (Maximum Power Point Tracking)			
Pump Overload			
Pump Cleaning			
Changeover to Grid and vice versa			
Monitoring Counters & Data			
Flow Estimation			
Flow meter (Pulse)			

Diagnostics and troubleshooting

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Diagnostic on AOV or AOC

A diagnostic is present on the Analog Outputs:

- **Either** voltage between COM and AOV (Analog Output Voltage) in factory setting.
- **or** current between COM and AOC (Analog output Current).

AOV (1)	AOC (2)	Diagnostic	Possible codes/Names
0 Vdc	0 mA	Drive stopped	<ul style="list-style-type: none"> • [Ready] <i>r d y</i>: Drive ready • [Freewheel] <i>n s t</i>: Freewheel stop • [Fast stop] <i>f s t</i>: Fast stop
1 Vdc	2 mA	Tank Full	[Tank Full] <i>t f</i>
2 Vdc	4 mA	Drive running	<ul style="list-style-type: none"> • Displays the parameter selected in the [MONITORING] <i>s u p</i>-menu (default selection [Motor Frequency] <i>r f r</i>). • [In DC inject.] <i>d c b</i>: DC injection braking in progress • [Autotuning] <i>t u n</i>: Auto-tuning in progress
3 Vdc	6 mA	Low light	[Low Light] <i>l l</i>
10 Vdc	20 mA	Trip	A detected fault appears.

(1) Factory setting

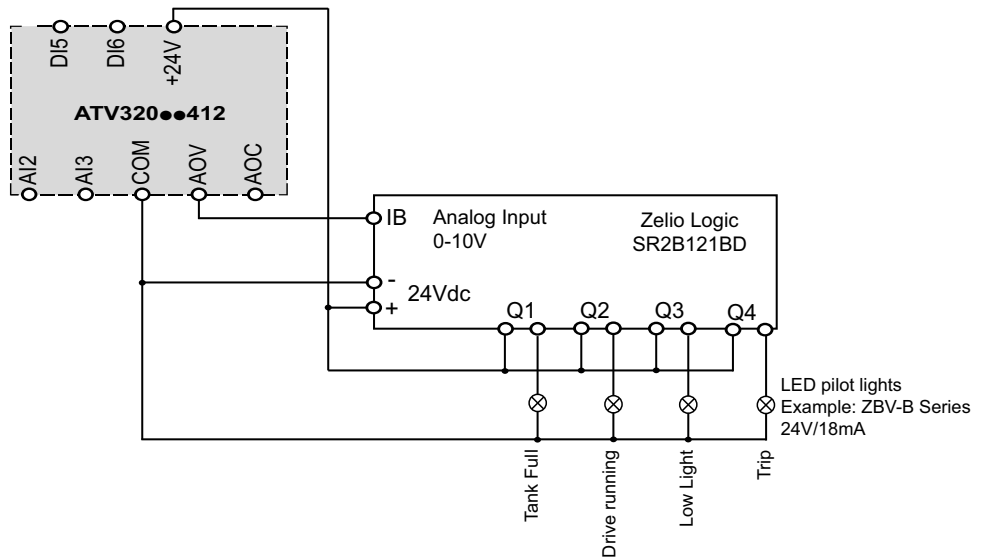
(2) See on the ATV320 Programming manual, the parameter **[AQ1 Type]** *A o I t* to set the value **[Current]** *C r*.

Example:

Diagnostics on LEDs, with a compact smart relay ZELIO Logic.

You can use AOV status to display the drive status on LEDs.

The Zelio Logic program is available on www.se.com.



Clearing the Detected error

Follow these steps in the event of a non resettable detected error:

Step	Action
1	Disconnect all power, including external control power that may be present.
2	Lock all power disconnects in the open position.
3	Wait 15 minutes to allow the DC bus capacitors to discharge (the drive LEDs are not indicators of the absence of DC bus voltage).
4	Measure the voltage of the DC bus between the PA/+ and PC/- terminals to ensure that the voltage is less than 42 Vdc.
5	If the DC bus capacitors do not discharge completely, contact your local Schneider Electric representative. Do not repair or operate the drive.
6	Find and correct the cause of the detected error.
7	Restore power to the drive to confirm that the detected error has been rectified.

In the event of a resettable detected error, the drive can be reset after the cause is cleared:

- By switching off the drive until the display disappears completely, then switching on again.
- Automatically in the scenarios described for the **[Auto Fault Reset]** *r E r* - function.
- By means of a logic input or control bit assigned to the **[Fault reset]** *r S E* - function.
- By pressing the **STOP/RESET** key on the graphic display terminal if the active channel command is the HMI (see **[Cmd Channel 1]** *C d I*).

How To Clear the Error Codes?

The following table summarizes the possibilities to clear a detected error:

How to clear the error code	List of the cleared detected errors
<p>Error detection codes which require a power reset after the detected error is cleared</p> <p>The cause of the detected error must be removed before resetting by turning off and then back on.</p> <p><i>RSF, brF, Sof, SPF</i> and <i>tnF</i> detected errors can also be cleared remotely by means of a logic input or control bit ([Fault Reset Assign] <i>rSF</i> parameter).</p>	<p><i>AnF, RSF, bLF, brF, CrF 1, EEF 1, EEF 2, FCF 1, HdF, iLF, inF 1, inF 2, inF 3, inF 4, inF 6, inF 9, inFA, inFb, inFE, SFFF, Sof, SPF</i></p>
<p>Error detection codes that can be cleared with the automatic restart function after the cause has disappeared</p> <p>These detected errors can also be cleared by turning on and off or by means of a logic input or control bit ([Fault Reset Assign] <i>rSF</i> parameter).</p>	<p><i>CnF, CoF, EPF 1, EPF 2, FbES, FCF 2, LCF, LFF 3, obF, oHF, oLF, oLC, oPF 1, oPF 2, oSF, otFL, PtFL, SCF 4, SCF 5, SLF 1, SLF 2, SLF 3, SSF, tJF, tnF, uLF, tSF</i></p>
<p>Error detection codes that are cleared as soon as their cause disappears</p>	<p><i>CFE, CF 1, CF 2, CSF, dLF, FbE, HCF, PHF, uSF</i></p>
<p>If [Extended Fault Reset] <i>HRFC</i> is set to YES:</p> <ul style="list-style-type: none"> Use the digital input or the control bit assigned to [Fault Reset Assign] <i>RSE</i>. 	<p><i>oCF, SCF 1, SCF 3</i></p>




Warning messages and error codes

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[Process Underload] <i>u L F</i>	179
[Supply Mains UnderV] <i>u S F</i>	179




[Load slipping] *R n F*

Load slipping error

 Probable Cause	The difference between the output frequency and the speed feedback is not correct.
 Remedy	<ul style="list-style-type: none"> • Check the motor, gain and stability parameters. • Add a braking resistor. • Check the size of the motor/drive/load. • Check the encoder's mechanical coupling and its wiring. • Check the setting of parameters.
 Clearing the Error Code	This detected error requires a power reset of the device after its cause has been removed.




[Angle Error] *R 5 F*

Angle error

 Probable Cause	It occurs during the phase-shift angle measurement, if the motor phase is disconnected or if the motor inductance is too high.
 Remedy	Check the motor phases and the maximum current allowed by the drive.
 Clearing the Error Code	This detected error can be cleared with the [Auto Fault Reset] <i>r E r</i> or manually with the [Fault Reset Assign] <i>r 5 F</i> parameter after its cause has been removed.




[Brake Control] *b L F*

Brake control error

 Probable Cause	<ul style="list-style-type: none"> • Brake release current not reached. • Brake engage frequency threshold [Brake engage freq] <i>b E n</i> only regulated when brake logic control is assigned.
 Remedy	<ul style="list-style-type: none"> • Check the drive/motor connection. • Check the motor windings. • Check the [Brk Release Current] <i>i b r</i> and [Brake release I Rev] <i>i r d</i> settings. • Apply the recommended settings for [Brake engage freq] <i>b E n</i>.
 Clearing the Error Code	This detected error requires a power reset of the device after its cause has been removed.




[Brake Feedback] *b r F*

Brake feedback error

 Probable Cause	<ul style="list-style-type: none"> The brake feedback contact does not match the brake logic control. The brake does not stop the motor quickly enough (detected by measuring the speed on the Pulse input input).
 Remedy	<ul style="list-style-type: none"> Check the feedback circuit and the brake logic control circuit. Check the mechanical state of the brake. Check the brake linings.
 Clearing the Error Code	This detected error can be cleared with the [Auto Fault Reset] <i>r b r</i> or manually with the [Fault Reset Assign] <i>r 5 F</i> parameter after its cause has been removed.




[Incorrect Config] *C F F*

Incorrect configuration error

 Probable Cause	<ul style="list-style-type: none"> Option module changed or removed. Control block replaced by a control block configured on a drive with a different rating. The current configuration is inconsistent.
 Remedy	<ul style="list-style-type: none"> Check that there are no detected module errors. In the event of the option module being changed/removed deliberately, see the remarks below. Return to factory settings or retrieve the backup configuration, if it is valid.
 Clearing the Error Code	This detected error is cleared as soon as its cause has been removed.




[Invalid Configuration] *C F ,*

Invalid configuration error

 Probable Cause	Invalid configuration. The configuration loaded in the drive via the bus or communication network is inconsistent.
 Remedy	<ul style="list-style-type: none"> Check the configuration loaded previously. Load a compatible configuration.
 Clearing the Error Code	This detected error is cleared as soon as its cause has been removed.




[Conf Transfer Error] $\llcorner F 12$

Configuration transfer error

 Probable Cause	Invalid configuration. The configuration loaded in the drive via the bus or communication network is inconsistent.
 Remedy	<ul style="list-style-type: none"> • Check the configuration loaded previously. • Load a compatible configuration.
 Clearing the Error Code	This detected error is cleared as soon as its cause has been removed.




[Fieldbus Com Interrupt] $\llcorner n F$

Fieldbus module communication interruption error

 Probable Cause	Communication interruption on communication module.
 Remedy	<ul style="list-style-type: none"> • Check the environment (electromagnetic compatibility). • Check the wiring. • Check the time-out. • Replace the option module. • Contact Schneider Electric Product Support.
 Clearing the Error Code	This detected error can be cleared with the [Auto Fault Reset] A E r or manually with the [Fault Reset Assign] r 5 F parameter after its cause has been removed.




[CANopen Com Interrupt] $\llcorner o F$

CANopen communication interruption error

 Probable Cause	Communication interruption on the CANopen® bus.
 Remedy	<ul style="list-style-type: none"> • Check the communication bus. • Check the time-out. • Refer to the CANopen® User manual.
 Clearing the Error Code	This detected error can be cleared with the [Auto Fault Reset] A E r or manually with the [Fault Reset Assign] r 5 F parameter after its cause has been removed.




[Precharge Capacitor] $C r F I$

Precharge capacitor error

 Probable Cause	Charging relay control detected error or charging resistor damaged.
 Remedy	<ul style="list-style-type: none"> • Turn the drive off and then turn on again. • Check the internal connections. • Contact Schneider Electric Product Support.
 Clearing the Error Code	This detected error requires a power reset of the device after its cause has been removed.




[Ch Switch Error] $C S F$

Channel switching detected error

 Probable Cause	Switch to not valid channels.
 Remedy	Check the function parameters.
 Clearing the Error Code	This detected error is cleared as soon as its cause has been removed.




[Dynamic Load Error] $D L F$

Dynamic load detected error

 Probable Cause	Abnormal load variation.
 Remedy	<ul style="list-style-type: none"> • Check that the load is not blocked by an obstacle. • Removal of a run command causes a reset.
 Clearing the Error Code	This detected error is cleared as soon as its cause has been removed.




[EEprom Control] $E E F I$

EEprom control error

 Probable Cause	Internal memory detected error, control block.
 Remedy	<ul style="list-style-type: none"> • Check the environment (electromagnetic compatibility). • Turn off, reset, return to factory settings • Contact Schneider Electric Product Support.
 Clearing the Error Code	This detected error requires a power reset of the device after its cause has been removed.




[EEprom Power] *E E F 2*

EEprom power error

 Probable Cause	Internal memory detected error, power board.
 Remedy	<ul style="list-style-type: none"> • Check the environment (electromagnetic compatibility). • Turn off, reset, return to factory settings • Contact Schneider Electric Product Support.
 Clearing the Error Code	This detected error requires a power reset of the device after its cause has been removed.




[External Error] *E P F 1*

External error

 Probable Cause	Event triggered by an external device, depending on user.
 Remedy	Check the device which caused the triggering and reset.
 Clearing the Error Code	This detected error can be cleared with the [Auto Fault Reset] <i>A E r</i> or manually with the [Fault Reset Assign] <i>r S F</i> parameter after its cause has been removed.




[Fieldbus External Error] *E P F 2*

Fieldbus external detected error

 Probable Cause	Event triggered by a communication network.
 Remedy	Check for the cause of the triggering and reset.
 Clearing the Error Code	This detected error can be cleared with the [Auto Fault Reset] <i>A E r</i> or manually with the [Fault Reset Assign] <i>r S F</i> parameter after its cause has been removed.




[Fct Block Error] *F b E*

Function block error

 Probable Cause	Function block detected error.
 Remedy	See [FB Error] <i>F b F E</i> for more details.
 Clearing the Error Code	This detected error is cleared as soon as its cause has been removed.




[Fct Block StopError] F 6 E 5

Function block stop error

 Probable Cause	Function blocks have been stopped while motor was running.
 Remedy	Check [FB Motor Stop Type] F 6 S 0 configuration.
 Clearing the Error Code	This detected error can be cleared with the [Auto Fault Reset] R 6 r or manually with the [Fault Reset Assign] r 5 F parameter after its cause has been removed.




[Out Contact Closed] F 7 F 1

Output contactor closed error

 Probable Cause	The output contactor remains closed although the opening conditions have been met.
 Remedy	<ul style="list-style-type: none"> • Check the contactor and its wiring. • Check the feedback circuit.
 Clearing the Error Code	This detected error requires a power reset of the device after its cause has been removed.




[Out Contact Opened] F 7 F 2

Output contactor opened error

 Probable Cause	The output contactor remains open although the closing conditions have been met.
 Remedy	<ul style="list-style-type: none"> • Check the contactor and its wiring. • Check the feedback circuit.
 Clearing the Error Code	This detected error can be cleared with the [Auto Fault Reset] R 7 r or manually with the [Fault Reset Assign] r 5 F parameter after its cause has been removed.




[Boards Compatibility] H 7 F

Boards compatibility error

 Probable Cause	The [Boards pairing] P P - function has been configured and a drive card has been changed.
 Remedy	<ul style="list-style-type: none"> • In the event of a card error, reinsert the original card. • Confirm the configuration by entering the [Pairing password] P P , if the card was changed deliberately.
 Clearing the Error Code	This detected error is cleared as soon as its cause has been removed.




[IGBT Desaturation] H d F

IGBT desaturation error

 Probable Cause	Short-circuit or grounding at the drive.
 Remedy	Check the cables connecting the drive to the motor, and the motor insulation.
 Clearing the Error Code	This detected error requires a power reset of the device after its cause has been removed.




[Internal Link Error] i L F

Internal link error

 Probable Cause	Communication interruption between option module and drive.
 Remedy	<ul style="list-style-type: none"> • Check the environment (electromagnetic compatibility). • Check the connections. • Replace the option module. • Contact Schneider Electric Product Support.
 Clearing the Error Code	This detected error requires a power reset of the device after its cause has been removed.




[Internal Error 1] i n F 1

Internal error 1 (Rating)

 Probable Cause	The power board is different from the board stored.
 Remedy	Check the reference of the power board.
 Clearing the Error Code	This detected error requires a power reset of the device after its cause has been removed.




[Internal Error 2] i n F 2

Internal error 2 (Soft)

 Probable Cause	The power board is incompatible with the control block.
 Remedy	Check the reference of the power board and its compatibility.
 Clearing the Error Code	This detected error requires a power reset of the device after its cause has been removed.




[Internal Error 3] I n F 3

Internal error 3 (Intern Comm)

 Probable Cause	Communication interruption between the internal cards.
 Remedy	<ul style="list-style-type: none"> • Check the internal connections. • Contact Schneider Electric Product Support.
 Clearing the Error Code	This detected error requires a power reset of the device after its cause has been removed.




[Internal Error 4] I n F 4

Internal error 4 (Manufacturing)

 Probable Cause	Internal data inconsistent.
 Remedy	Re-calibrate the drive (performed by Schneider Electric Product Support).
 Clearing the Error Code	This detected error requires a power reset of the device after its cause has been removed.




[Internal Error 6] I n F 6

Internal error 6 (Option)

 Probable Cause	The option installed in the drive is not recognized.
 Remedy	<ul style="list-style-type: none"> • Check the reference and compatibility of the option. • Check that the option is well inserted into the ATV320.
 Clearing the Error Code	This detected error requires a power reset of the device after its cause has been removed.




[Internal Error 9] I n F 9

Internal error 9 (Measure)

 Probable Cause	The current measurements are incorrect.
 Remedy	<ul style="list-style-type: none"> • Replace the current sensors or the power board. • Contact Schneider Electric Product Support.
 Clearing the Error Code	This detected error requires a power reset of the device after its cause has been removed.




[Internal Error 10] *I n F R*

Internal error 10 (Mains)

 Probable Cause	The input stage is not operating correctly.
 Remedy	Contact Schneider Electric Product Support.
 Clearing the Error Code	This detected error requires a power reset of the device after its cause has been removed.




[Internal Error 11] *I n F b*

Internal error 11 (Temperature)

 Probable Cause	The drive temperature sensor is not operating correctly.
 Remedy	<ul style="list-style-type: none"> • Replace the drive temperature sensor. • Contact Schneider Electric Product Support.
 Clearing the Error Code	This detected error requires a power reset of the device after its cause has been removed.




[Internal Error 14] *I n F E*

Internal error 14 (CPU) error

 Probable Cause	Internal microprocessor detected error.
 Remedy	<ul style="list-style-type: none"> • Turn off and reset. • Contact Schneider Electric Product Support.
 Clearing the Error Code	This detected error requires a power reset of the device after its cause has been removed.




[Input Contactor] *L C F*

Input contactor error

 Probable Cause	The drive is not turned on even though [Mains V. time out] <i>L C E</i> has elapsed.
 Remedy	<ul style="list-style-type: none"> • Check the contactor and its wiring. • Check the time-out. • Check the supply mains /contactor /drive connection.
 Clearing the Error Code	This detected error can be cleared with the [Auto Fault Reset] <i>R E r</i> or manually with the [Fault Reset Assign] <i>r S F</i> parameter after its cause has been removed.




[AI3 4-20mA loss] L F F 3

AI3 4-20mA loss error

 Probable Cause	Loss of the 4-20 mA reference on analog input AI3.
 Remedy	Check the connection on the analog inputs.
 Clearing the Error Code	This detected error can be cleared with the [Auto Fault Reset] A L R or manually with the [Fault Reset Assign] r 5 F parameter after its cause has been removed.




[DC Bus Overvoltage] o b F

DC bus overvoltage error

 Probable Cause	<ul style="list-style-type: none"> Braking too sudden or driving load. Supply voltage too high.
 Remedy	<ul style="list-style-type: none"> Increase the deceleration time. Install a braking resistor if necessary. Activate the [Dec.Ramp Adapt] b r A function, if it is compatible with the application. Check the supply voltage.
 Clearing the Error Code	This detected error can be cleared with the [Auto Fault Reset] A L R or manually with the [Fault Reset Assign] r 5 F parameter after its cause has been removed.




[Overcurrent] o C F

Overcurrent error

 Probable Cause	<ul style="list-style-type: none"> Parameters in the [Settings] S E L- and [Motor control] d r C- menus are not correct. Inertia or load too high. Mechanical locking.
 Remedy	<ul style="list-style-type: none"> Check the parameters. Check the size of the motor/drive/load. Check the state of the mechanism. Decrease [Current Limitation] C L L. Increase the switching frequency.
 Clearing the Error Code	<ul style="list-style-type: none"> If the parameter [Extended Fault Reset] H r F C is set to [No] n o : This detected error requires a power reset. If the parameter [Extended Fault Reset] H r F C is set to [Yes] y e s : This detected error can be cleared manually with the [Fault Reset Assign] r 5 F parameter after its cause has been removed.




[Drive Overheating] □ H F

Drive overheating error

 Probable Cause	Drive temperature too high.
 Remedy	Check the motor load, the drive ventilation and the ambient temperature. Wait for the drive to cool down before restarting.
 Clearing the Error Code	This detected error can be cleared with the [Auto Fault Reset] AEr or manually with the [Fault Reset Assign] rSF parameter after its cause has been removed.




[Process Overload] □ L L

Process overload error

 Probable Cause	Process overload.
 Remedy	<ul style="list-style-type: none"> • Check and remove the cause of the overload. • Check the parameters of the [Process overload] oLd-function.
 Clearing the Error Code	This detected error can be cleared with the [Auto Fault Reset] AEr or manually with the [Fault Reset Assign] rSF parameter after its cause has been removed.




[Motor Overload] □ L F

Motor overload error

 Probable Cause	Triggered by excessive motor current.
 Remedy	Check the setting of the motor thermal protection, check the motor load. Wait for the motor to cool down before restarting.
 Clearing the Error Code	This detected error can be cleared with the [Auto Fault Reset] AEr or manually with the [Fault Reset Assign] rSF parameter after its cause has been removed.




[Single Output Phase Loss] □ P F I

Single output phase loss error

 Probable Cause	Loss of one phase at drive output.
 Remedy	Check the connections from the drive to the motor.
 Clearing the Error Code	This detected error can be cleared with the [Auto Fault Reset] AEr or manually with the [Fault Reset Assign] rSF parameter after its cause has been removed.




[Output Phase Loss] $\square P F \varnothing$

Output phase loss error

 Probable Cause	<ul style="list-style-type: none"> • Motor not connected or motor power too low. • Output contactor open. • Instantaneous instability in the motor current.
 Remedy	<ul style="list-style-type: none"> • Check the connections from the drive to the motor. • If an output contactor is being used, set [Output phase loss] $\square P L$ to [No Error Triggered] $\square R C$. • • Test on a low power motor or without a motor: In factory settings mode, motor phase loss detection is active [Output phase loss] $\square P L = [Yes] Y E S$. To check the drive in a test or maintenance environment, without having to use a motor with the same rating as the drive (in particular for high power drives), deactivate motor phase loss detection [Output phase loss] $\square P L = [No] n o$. • Check and optimize the following parameters: [IR compensation] $\square F r$, [Nom Motor Voltage] $\square n S$ and [Nom Motor Current] $\square C r$ and perform [Autotuning] $\square u n$.
 Clearing the Error Code	<p>This detected error can be cleared with the [Auto Fault Reset] $\square R e r$ or manually with the [Fault Reset Assign] $\square r S F$ parameter after its cause has been removed.</p>




[Supply Mains Overvoltage] $\square S F$

Supply mains overvoltage error

 Probable Cause	<ul style="list-style-type: none"> • Supply voltage too high. • Disturbed mains supply.
 Remedy	<p>Check the supply voltage.</p>
 Clearing the Error Code	<p>This detected error can be cleared with the [Auto Fault Reset] $\square R e r$ or manually with the [Fault Reset Assign] $\square r S F$ parameter after its cause has been removed.</p>




[DI6=PTC Overheat] $\square t F L$

DI6=PTC overheat error

 Probable Cause	<p>Overheating of PTC probes detected on input DI6.</p>
 Remedy	<ul style="list-style-type: none"> • Check the motor load and motor size. • Check the motor ventilation. • Wait for the motor to cool before restarting. • Check the type and state of the PTC probes.
 Clearing the Error Code	<p>This detected error can be cleared with the [Auto Fault Reset] $\square R e r$ or manually with the [Fault Reset Assign] $\square r S F$ parameter after its cause has been removed.</p>




[Input Phase Loss] P H F

Input phase loss error

 Probable Cause	<ul style="list-style-type: none"> • Drive incorrectly supplied or a fuse blown. • One phase missing. • 3-phase ATV320 used on a single-phase supply mains. • Unbalanced load. <p>This protection only operates with the drive on load.</p>
 Remedy	<p>Check the power connection and the fuses.</p> <p>Use a 3-phase supply mains.</p> <p>Disable the detected error by [InPhaseLoss Assign] $rPL = [No]$.</p>
 Clearing the Error Code	<p>This detected error is cleared as soon as its cause has been removed.</p>




[DI6=PTC Probe Error] P E F L

DI6=PTC probe error

 Probable Cause	<p>PTC probe on input DI6 open or short-circuited.</p>
 Remedy	<p>Check the PTC probe and the wiring between it and the motor/drive.</p>
 Clearing the Error Code	<p>This detected error can be cleared with the [Auto Fault Reset] rEr or manually with the [Fault Reset Assign] rSF parameter after its cause has been removed.</p>




[Safety fct error] S A F F

Safety function detected error

 Probable Cause	<ul style="list-style-type: none"> • Debounce time exceeded. • SS1 threshold exceeded. • Incorrect configuration. • SLS type overspeed detected.
 Remedy	<ul style="list-style-type: none"> • Check the safety functions configuration. • Check the ATV320 Integrated safety Functions manual • Contact Schneider Electric Product Support.
 Clearing the Error Code	<p>This detected error requires a power reset of the device after its cause has been removed.</p>




[Motor short circuit] 5 [F] 1

Motor short circuit error

 Probable Cause	Short-circuit or grounding at the drive output.
 Remedy	<ul style="list-style-type: none"> • Check the cables connecting the drive to the motor, and the motor insulation. • Reduce the switching frequency. • Connect chokes in series with the motor. • Check the adjustment of speed loop and brake. • Increase the [Time to restart] ttr. • Increase the switching frequency.
 Clearing the Error Code	<ul style="list-style-type: none"> • If the parameter [Extended Fault Reset] H r F C is set to [No] no: This detected error requires a power reset. • If the parameter [Extended Fault Reset] H r F C is set to [Yes] YES: This detected error can be cleared manually with the [Fault Reset Assign] r 5 F parameter after its cause has been removed.




[Ground Short Circuit] 5 [F] 3

Ground short circuit error

 Probable Cause	Significant earth leakage current at the drive output if several motors are connected in parallel.
 Remedy	<ul style="list-style-type: none"> • Check the cables connecting the drive to the motor, and the motor insulation. • Reduce the switching frequency. • Connect chokes in series with the motor. • Check the adjustment of speed loop and brake. • Increase the [Time to restart] ttr. • Reduce the switching frequency.
 Clearing the Error Code	<ul style="list-style-type: none"> • If the parameter [Extended Fault Reset] H r F C is set to [No] no: This detected error requires a power reset. • If the parameter [Extended Fault Reset] H r F C is set to [Yes] YES: This detected error can be cleared manually with the [Fault Reset Assign] r 5 F parameter after its cause has been removed.




[IGBT Short Circuit] 5 [F] 4

IGBT short circuit error

 Probable Cause	Power component detected error.
 Remedy	Contact Schneider Electric Product Support.
 Clearing the Error Code	This detected error can be cleared with the [Auto Fault Reset] Rtr or manually with the [Fault Reset Assign] r 5 F parameter after its cause has been removed.




[Motor Short Circuit] 5 L F 5

Motor short circuit error

 Probable Cause	Short-circuit at drive output.
 Remedy	<ul style="list-style-type: none"> • Check the cables connecting the drive to the motor, and the motor insulation. • Contact Schneider Electric Product Support.
 Clearing the Error Code	This detected error can be cleared with the [Auto Fault Reset] ALr or manually with the [Fault Reset Assign] rSF parameter after its cause has been removed.




[Modbus Com Interrupt] 5 L F 1

Modbus communication interruption error

 Probable Cause	Communication interruption on the Modbus bus.
 Remedy	<ul style="list-style-type: none"> • Check the communication bus. • Check the time-out. • Refer to the Modbus User manual.
 Clearing the Error Code	This detected error can be cleared with the [Auto Fault Reset] ALr or manually with the [Fault Reset Assign] rSF parameter after its cause has been removed.




[PC com Interruption] 5 L F 2

PC communication interruption error

 Probable Cause	Communication interruption with PC Software.
 Remedy	<ul style="list-style-type: none"> • Check the PC Software connecting cable. • Check the time-out.
 Clearing the Error Code	This detected error can be cleared with the [Auto Fault Reset] ALr or manually with the [Fault Reset Assign] rSF parameter after its cause has been removed.




[HMI com Interruption] 5 L F 3

HMI communication interruption error

 Probable Cause	Communication interruption with the graphic display terminal or remote display terminal.
 Remedy	<ul style="list-style-type: none"> • Check the terminal connection. • Check the time-out.
 Clearing the Error Code	This detected error can be cleared with the [Auto Fault Reset] ALr or manually with the [Fault Reset Assign] rSF parameter after its cause has been removed.




[Motor Overspeed] 5 0 F

Motor overspeed error

	Probable Cause	<ul style="list-style-type: none"> • Instability or driving load too high. • If a downstream contactor is used, the contacts between the motor and the drive have not been closed before applying a Run command. • The overspeed threshold (corresponding to 110 % of [Max Frequency] $E F r$) has been reached.
	Remedy	<ul style="list-style-type: none"> • Check the motor, gain and stability parameters. • Add a braking resistor. • Check the size of the motor/drive/load. • Check the parameters settings for the [Frequency meter] $F 9 F$ - function, if it is configured. • Verify and close the contacts between the motor and the drive before applying a Run command. • Verify the consistency between [Max Frequency] $E F r$ and [High Speed] $H S P$. It is recommended to have at least [Max Frequency] <math>E F r \geq 110\% * [High Speed] $H S P$</math>.
	Clearing the Error Code	<p>This detected error can be cleared with the [Auto Fault Reset] $A E r$ or manually with the [Fault Reset Assign] $r 5 F$ parameter after its cause has been removed.</p>




[Encoder Feedback Loss] 5 P F

Encoder feedback loss error

	Probable Cause	<ul style="list-style-type: none"> • Signal on Pulse input missing, if the input is used for speed measurement. • Encoder feedback signal missing.
	Remedy	<ul style="list-style-type: none"> • Check the wiring of the input cable and the detector used. • Check the configuration parameters of the encoder. • Check the wiring between the encoder and the drive. • Check the encoder.
	Clearing the Error Code	<p>This detected error can be cleared with the [Auto Fault Reset] $A E r$ or manually with the [Fault Reset Assign] $r 5 F$ parameter after its cause has been removed.</p>




[Torque Limitation Error] 5 5 F

Torque limitation error

	Probable Cause	<p>Switch to torque or current limitation.</p>
	Remedy	<ul style="list-style-type: none"> • Check if there are any mechanical problems. • Check the parameters of [Torque limitation] $E 0 L$ - and the parameters of the [Torque or I limit detect] $E i d-$.
	Clearing the Error Code	<p>This detected error can be cleared with the [Auto Fault Reset] $A E r$ or manually with the [Fault Reset Assign] $r 5 F$ parameter after its cause has been removed.</p>




[IGBT Overheating] E J F

IGBT overheating




 Probable Cause	Drive overheated.
 Remedy	<ul style="list-style-type: none"> • Check the size of the load/motor/drive. • Reduce the switching frequency. • Wait for the motor to cool before restarting.
 Clearing the Error Code	This detected error can be cleared with the [Auto Fault Reset] A E r or manually with the [Fault Reset Assign] r 5 F parameter after its cause has been removed.

[Autotuning Error] E n F

Autotuning detected error




 Probable Cause	<ul style="list-style-type: none"> • Special motor or motor whose power is not suitable for the drive. • Motor not connected to the drive. • Motor not stopped
 Remedy	<ul style="list-style-type: none"> • Check that the motor/drive are compatible. • Check that the motor is present during auto-tuning. • If an output contactor is being used, close it during auto-tuning. • Check that the motor is stopped during tune operation.
 Clearing the Error Code	This detected error can be cleared with the [Auto Fault Reset] A E r or manually with the [Fault Reset Assign] r 5 F parameter after its cause has been removed.

[Tank Probe Error] E 5 F

 Probable Cause	Tank water probe disconnected <ul style="list-style-type: none"> • Tank water probe broken • Alarm threshold too low ([Probe Threshold] L P E P)
 Remedy	<ul style="list-style-type: none"> • Check the liquid probe connexion. • Check [Liquid Threshold] L P E and [Probe Threshold] L P E P parameters refer to [Tank Liquid Probe] L P n, page 104.
 Clearing the Error Code	This detected error can be cleared with the [Auto Fault Reset] A E r or manually with the [Fault Reset Assign] r 5 F parameter after its cause has been removed.




[Process Underload] $\cup L F$

Process underload error

	Probable Cause	Process underload.
	Remedy	Check and remove the cause of the underload. Check the parameters of the [Process underload] $\cup L d$ - function.
	Clearing the Error Code	This detected error can be cleared with the [Auto Fault Reset] AEr or manually with the [Fault Reset Assign] rSF parameter after its cause has been removed.

[Supply Mains UnderV] $\cup S F$

Supply mains undervoltage error

	Probable Cause	<ul style="list-style-type: none"> • Supply mains too low. • Transient voltage dip.
	Remedy	Check the voltage and the parameters of [Undervoltage handling] $\cup Sb$.
	Clearing the Error Code	This detected error is cleared as soon as its cause has been removed.

Maintenance

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Scheduled Servicing

Servicing

DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION OR ARC FLASH

Read and understand the instructions in **Safety Information** chapter before performing any procedure in this chapter.

Failure to follow these instructions will result in death or serious injury.

The temperature of the products described in this manual may exceed 80 °C (176 °F) during operation.

WARNING

HOT SURFACES

- Ensure that any contact with hot surfaces is avoided.
- Do not allow flammable or heat-sensitive parts in the immediate vicinity of hot surfaces.
- Verify that the product has sufficiently cooled down before handling it.
- Verify that the heat dissipation is sufficient by performing a test run under maximum load conditions.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

WARNING

INSUFFICIENT MAINTENANCE

Verify that the maintenance activities described below are performed at the specified intervals.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

Adherence to the environmental conditions must be ensured during operation of the device. In addition, during maintenance, verify and, if appropriate, correct all factors that may have an impact on the environmental conditions.

Maintenance Activities

	Part concerned	Activity	Interval (1)
Overall condition	All parts such as housing, HMI, control block, connections, etc.	Perform a visual inspection	At least every year
Corrosion	Terminals, connectors, screws, EMC plate	Inspect and clean if required	
Dust	Terminals, fans, cabinet air inlets and air outlets, air filters of cabinet	Inspect and clean if required	
Cooling	Fan	Verify the fan operation	
Fastening	All screws for electrical and mechanical connections	Verify tightening torques	
(1)	Maximum maintenance intervals from the date of commissioning. Reduce the intervals between maintenance to adapt maintenance to the environmental conditions, the operating conditions of the drive, and to any other factor that may influence the operation and/ or maintenance requirements of the drive.		

NOTE: The fan operation depends on the drive thermal state. The drive may be running and the fan not.

Fans may continue to run for a certain period of time even after power to the product has been disconnected.

⚠ CAUTION
RUNNING FANS
Verify that fans have come to a complete standstill before handling them.
Failure to follow these instructions can result in injury or equipment damage.

Spares and repairs

Serviceable products:

Please refer to your Customer Care Center on www.se.com/CCC.

Long-term Storage

Capacitor Reforming

If the drive was not connected to mains for an extended period of time, the capacitors must be restored to their full performance before the motor is started.

NOTICE

REDUCED CAPACITOR PERFORMANCE

- Apply mains voltage to the drive for one hour before starting the motor if the drive has not been connected to mains for the specified periods of time.(1)
- Verify that no Run command can be applied before the period of one hour has elapsed.
- Verify the date of manufacture if the drive is commissioned for the first time and run the specified procedure if the date of manufacture is more than 12 months in the past.

Failure to follow these instructions can result in equipment damage.

(1) Period of time:

- 12 months at a maximum storage temperature of +50°C (+122°F)
- 24 months at a maximum storage temperature of +45°C (+113°F)
- 36 months at a maximum storage temperature of +40°C (+104°F)

If the specified procedure cannot be performed without a Run command because of internal mains contactor control, perform this procedure with the power stage enabled, but the motor being at a standstill so that there is no appreciable mains current in the capacitors.

Decommissioning

Uninstall the Product

Observe the following procedure when uninstalling the product.

- Switch off all supply voltage. Verify that no voltages are present - refer to the Safety Information chapter.
- Remove all connection cables.
- Uninstall the product.

End of Life

The components of the product consist of different materials which can be recycled and which must be disposed of separately.

- Dispose of the packaging in compliance with all applicable regulations.
- Dispose of the product in compliance with all applicable regulations.

Refer to the Green Premium section , page 25 for information and documents on environmental protection such as EoLI (End of Life instruction).

Additional Support

Customer Care Center

For additional support, you can contact our Customer Care Center on:

www.se.com/CCC.

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As standards, specifications, and design change from time to time,
please ask for confirmation of the information given in this publication.

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