



User Guide

810 Series Power Supply Unit



Preface

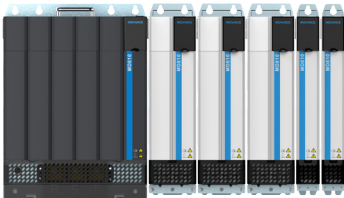
Thank you for purchasing the 810 series power supply unit developed and manufactured by Inovance.

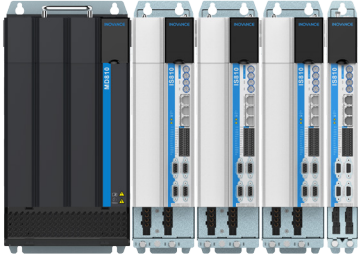

The MD810, a new generation low voltage multidrive system, is a common DC bus drive system consisting of a power supply unit and multiple drive units. It is applicable to applications such as a single mechanical device with multiple drive points or continuous production line system.

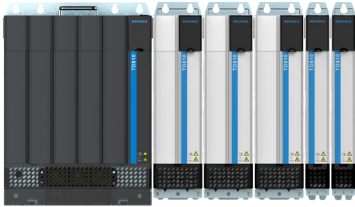
The 810 series power supply unit covers a power range of 22 kW, 45 kW, 110 kW, 160 kW, and 355 kW and has a total of five outline structures. It is divided into the booksize unit and the vertical tower unit. The 22 kW to 160 kW power supply unit is a booksize unit with equal height and depth and a total of four width designs (50 mm, 100 mm, 200 mm and 300 mm). The 355 kW power supply unit is a vertical tower unit with a width of 180 mm.

The 810 series power supply unit is divided into the MD810, ES810, and TD810 series power supply unit. The MD810 series power supply unit applies to the MD810 and IS810 series drive units. The ES810 series power supply unit applies to the ES810 series drive unit. The TD810 series power supply unit applies to the TD810 series drive unit.

The following table lists the combined system schemes and applications based on the 810 series power supply unit:

Combined Scheme	Schematic Diagram of Combination Effects	Application
MD810 series power supply unit + MD810 series drive unit		Metal products, printing and packaging, textile printing and dyeing, chemical fiber and plastics, EU small-sized papermaking, hoisting, and other industries

Combined Scheme	Schematic Diagram of Combination Effects	Application
<p>MD810 series power supply unit + IS810 series drive unit</p>		<p>This scheme is able to implement stable running and accurate positioning control along with the small and medium inertia ISMH series high response servo motor, and is applicable for such automation equipment as gravure presses, flexo presses, corrugated paper printing equipment, semiconductor manufacturing equipment, chip mounters, PCB punching machines, transport machinery, food processing machinery, machine tools and conveying machinery.</p>
<p>ES810 series power supply unit + ES810 series drive unit</p>		<p>This scheme is able to implement quick and accurate position, speed and torque control along with the small and medium inertia ESMQ, ESMG and ESMH series high response servo motors, and is applicable for such automation equipment as plastic molding, semiconductor manufacturing equipment, chip mounters, PCB punching machines, transport machinery, food processing machinery, machine tools and conveying machinery.</p>

Combined Scheme	Schematic Diagram of Combination Effects	Application
TD810 series power supply unit + TD810 series drive unit		Textile industries including dyeing and printing, chemical fiber, cotton spinning, doubling and twisting,

Note: Specific appearance and structure of combined effects shown in the table are subject to real objects.

First-time Use

For users who use this product for the first time, read the manual carefully. If you have any problem concerning the functions or performance, contact the technical support personnel of Inovance to ensure correct use.

For More Documents

The 810 series power supply unit applies to the MD810, IS810, ES810, and TD810 series drive units. This manual describes only data such as the product information, installation, communication, troubleshooting and function parameters of the power supply unit. For data about the drive units, refer to their manuals.

Optional drive unit manual:

19010518 MD810 Series Drive (Multidrive System) User Guide

19010647 IS810N-INT Series Standard Servo Drive (Multidrive System) User Guide

19010648 ES810 Series Servo Drive (Multidrive System) User Guide

Please visit Inovance technical official website at <http://www.inovance.com> to download PDF documents.

Approvals

The following table lists the certificates and standards that the product may comply with. For details about the acquired certificates, see the certification marks on the product nameplate.

Certification	Directives		Standard
CE	EMC directives	2014/30/EU	EN 61800-3
	LVD directives	2014/35/EU	EN 61800-5-1
	RoHS directives	2011/65/EU	EN 50581
TUV	-		EN 61800-5-1



NOTE

- ◆ The above EMC directives are complied with only when the EMC electric installation requirements are strictly observed.
- ◆ Certification marks on the product nameplate indicate compliance with the corresponding certificates and standards.
- ◆ Machines and devices used in combination with this drive must also be CE certified and marked. The integrator who integrates the drive with the CE mark into other devices has the responsibility of ensuring compliance with CE standards and verifying that conditions meet European standards.
- ◆ For more information on certification, consult our distributor or sales representative.

Revision History

Date	Version	Change Description
March 2018	A00	First release
March 2019	A01	Added information about TD810 series. Added information about the PROFINET-to-CANopen network bridge.

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Safety Instructions

Safety Precautions

- 1) Before installing, using, and maintaining this equipment, read the safety information and precautions thoroughly, and comply with them during operations.
- 2) To ensure the safety of humans and equipment, follow the signs on the equipment and all the safety instructions in this user guide.
- 3) "CAUTION", "WARNING", and "DANGER" items in the user guide do not indicate all safety precautions that need to be followed; instead, they just supplement the safety precautions.
- 4) Use this equipment according to the designated environment requirements. Damage caused by improper usage is not covered by warranty.
- 5) Inovance shall take no responsibility for any personal injuries or property damage caused by improper usage.

Safety Levels and Definitions



indicates that failure to comply with the notice will result in severe personal injuries or even death.



indicates that failure to comply with the notice may result in severe personal injuries or even death.



indicates that failure to comply with the notice may result in minor personal injuries or damage to the equipment.

Safety Instructions

Unpacking

 CAUTION

- ◆ Check whether the packing is intact and whether there is damage, water seepage, damp, and deformation.
- ◆ Unpack the package by following the package sequence. Do not hit the package with force.
- ◆ Check whether there are damage, rust, or injuries on the surface of the equipment or equipment accessories.
- ◆ Check whether the number of packing materials is consistent with the packing list.

 WARNING

- ◆ Do not install the equipment if you find damage, rust, or indications of use on the equipment or accessories.
- ◆ Do not install the equipment if you find water seepage, component missing or damage upon unpacking.
- ◆ Do not install the equipment if you find the packing list does not conform to the equipment you received.

Storage and Transportation

 CAUTION

- ◆ Store and transport this equipment based on the storage and transportation requirements for humidity and temperature.
- ◆ Avoid transporting the equipment in environments such as water splashing, rain, direct sunlight, strong electric field, strong magnetic field, and strong vibration.
- ◆ Avoid storing this equipment for more than three months. Long-term storage requires stricter protection and necessary inspections.
- ◆ Pack the equipment strictly before transportation. Use a sealed box for long-distance transportation.
- ◆ Never transport this equipment with other equipment or materials that may harm or have negative impacts on this equipment.

 WARNING

- ◆ Use professional loading and unloading equipment to carry large-scale or heavy equipment.
- ◆ When carrying this equipment with bare hands, hold the equipment casing firmly with care to prevent parts falling. Failure to comply may result in personal injuries.
- ◆ Handle the equipment with care during transportation and mind your step to prevent personal injuries or equipment damage.
- ◆ Never stay below the equipment when the equipment is lifted by hoisting equipment.

Installation



- ◆ Thoroughly read the safety instructions and user guide before installation.
- ◆ Do not modify this equipment.
- ◆ Do not rotate the equipment components or loosen fixed bolts (especially those marked in red) on equipment components.
- ◆ Do not install this equipment in places with strong electric or magnetic fields.
- ◆ When this equipment is installed in a cabinet or final equipment, protection measures such as a fireproof enclosure, electrical enclosure, or mechanical enclosure must be provided. The IP rating must meet IEC standards and local laws and regulations.



- ◆ Equipment installation, wiring, maintenance, inspection, or parts replacement must be performed by only professionals.
- ◆ Installation, wiring, maintenance, inspection, or parts replacement must be performed by only experienced personnel who have been trained with necessary electrical information.
- ◆ Installation personnel must be familiar with equipment installation requirements and relevant technical materials.
- ◆ Before installing equipment with strong electromagnetic interference, such as a transformer, install an electromagnetic shielding device for this equipment to prevent malfunctions.

Wiring



- ◆ Equipment installation, wiring, maintenance, inspection, or parts replacement must be performed by only professionals.
- ◆ Never perform wiring at power-on. Failure to comply will result in an electric shock.
- ◆ Before wiring, cut off all equipment power supplies. Wait at least 10 minutes before further operations because residual voltage exists after power-off.
- ◆ Make sure that the equipment is well grounded. Failure to comply will result in an electric shock.
- ◆ During wiring, follow the proper electrostatic discharge (ESD) procedures, and wear an antistatic wrist strap. Failure to comply will result in damage to internal equipment circuits.



- ◆ Never connect the power cable to output terminals of the equipment. Failure to comply may cause equipment damage or even a fire.
- ◆ When connecting a drive with the motor, make sure that the phase sequences of the drive and motor terminals are consistent to prevent reverse motor rotation.
- ◆ Wiring cables must meet diameter and shielding requirements. The shielding layer of the shielded cable must be reliably grounded at one end.
- ◆ After wiring, make sure that no screws are fallen and cables are exposed in the equipment.

Power-on



- ◆ Before power-on, make sure that the equipment is installed properly with reliable wiring and the motor can be restarted.
- ◆ Before power-on, make sure that the power supply meets equipment requirements to prevent equipment damage or even a fire.
- ◆ At power-on, unexpected operations may be triggered on the equipment. Therefore, stay away from the equipment.
- ◆ After power-on, do not open the cabinet door and protective cover of the equipment. Failure to comply will result in an electric shock.
- ◆ Do not touch any wiring terminals at power-on. Failure to comply will result in an electric shock.
- ◆ Do not remove any part of the equipment at power-on. Failure to comply will result in an electric shock.






Operation



- ◆ Do not touch any wiring terminals during operation. Failure to comply will result in an electric shock.
- ◆ Do not remove any part of the equipment during operation. Failure to comply will result in an electric shock.
- ◆ Do not touch the equipment shell, fan, or resistor for temperature detection. Failure to comply will result in heat injuries.
- ◆ Signal detection must be performed by only professionals during operation. Failure to comply will result in personal injuries or equipment damage.



- ◆ Prevent metal or other objects from falling into the device during operation. Failure to comply may result in equipment damage.
- ◆ Do not start or stop the equipment using the contactor. Failure to comply may result in equipment damage.

Maintenance
<div style="border: 1px solid black; padding: 2px; display: inline-block;"> DANGER</div> <ul style="list-style-type: none"> ◆ Equipment installation, wiring, maintenance, inspection, or parts replacement must be performed by only professionals. ◆ Do not maintain the equipment at power-on. Failure to comply will result in an electric shock. ◆ Before maintenance, cut off all equipment power supplies and wait at least 10 minutes.
<div style="border: 1px solid black; padding: 2px; display: inline-block;"> WARNING</div> <ul style="list-style-type: none"> ◆ Perform daily and periodic inspection and maintenance for the equipment according to maintenance requirements and keep a maintenance record.
Repair
<div style="border: 1px solid black; padding: 2px; display: inline-block;"> DANGER</div> <ul style="list-style-type: none"> ◆ Equipment installation, wiring, maintenance, inspection, or parts replacement must be performed by only professionals. ◆ Do not repair the equipment at power-on. Failure to comply will result in an electric shock. ◆ Before inspection and repair, cut off all equipment power supplies and wait at least 10 minutes.
<div style="border: 1px solid black; padding: 2px; display: inline-block;"> WARNING</div> <ul style="list-style-type: none"> ◆ Require repair services according to the product warranty agreement. ◆ When the equipment is faulty or damaged, require professionals to perform troubleshooting and repair by following repair instructions and keep a repair record. ◆ Replace quick-wear parts of the equipment according to the replacement guide. ◆ Do not operate damaged equipment. Failure to comply may result in worse damage. ◆ After the equipment is replaced, perform wiring inspection and parameter settings again.
Disposal
<div style="border: 1px solid black; padding: 2px; display: inline-block;"> WARNING</div> <ul style="list-style-type: none"> ◆ Retire equipment by following local regulations or standards. Failure to comply may result in property damage, personal injuries, or even death. ◆ Dispose of or recycle retired equipment by following industry waste disposal standards to avoid environmental pollution.

Safety Signs

- Description of safety signs in the user guide



Read the user guide before installation and operation.



Reliably ground the system and equipment.



Danger!



High temperature!



Prevent personal injuries caused by machines.



High voltage!



Wait xx minutes before further operations.

- Description of safety signs on the equipment

For safe equipment operation and maintenance, comply with safety signs on the equipment, and do not damage or remove the safety labels. The following table describes the safety signs.

Safety Sign	Description
	<ul style="list-style-type: none"> ◆ Read the user guide before installation and operation. Failure to comply will result in an electric shock. ◆ Do not remove the cover at power-on or within 10 minutes after power-off. ◆ Before maintenance, inspection, and wiring, cut off input and output power, and wait at least 10 minutes until the power indicator is off.

1 Product Information

The 810 series power supply unit applies to the MD810, IS810, ES810, and TD810 series drive units. This chapter describes only the product information about the power supply unit. For product information about the drive units, refer to their manuals.

Safety Instructions

Danger

- ◆ Never perform wiring at power-on. Failure to comply may result in electric shock. Keep the breaker in OFF state.

Warning

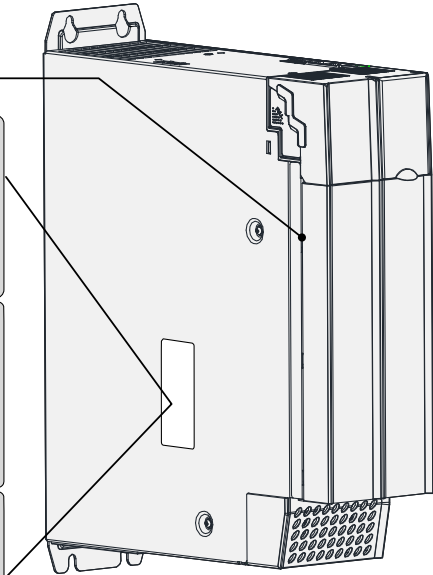
- ◆ When installing the power supply unit in an enclosed cabinet or shell box, cool it fully with a cooling fan or air conditioner to keep the air inlet temperature of the power supply unit below 50°C. Failure to comply may result in overheat or fire.

Caution

- ◆ Cover the top of the power supply unit with a cloth or paper during installation to prevent metal filing, oil, and water from entering the power supply unit during drilling.
- ◆ If foreign objects enter the power supply unit, it may result in the failure of the power supply unit.
- ◆ After the installation work is completed, remove the paper or cloth. If the cloth or paper continues to cover the top, the ventilation may become bad, resulting in abnormal heating of the power supply unit.
- ◆ When operating the power supply unit, follow the procedure specified the ESD to avoid static damage to any internal circuit of the power supply unit.
- ◆ When the motor runs at a low speed, the cooling effect will drop. With the temperature increasing, it may result in motor failure due to overheating. Improvement on motor cooling conditions may be made into consideration.
- ◆ The motor speed control range varies with lubrication methods and manufacturers.
- ◆ When running the motor beyond the speed control range, consult the motor manufacturer.
- ◆ The torque characteristics with the power supply unit used for the drive are different from those with the commercial power supply used for the drive. Please check the load torque characteristics of the machinery to be connected.
- ◆ Pay attention to this when selecting a power supply unit capacity. In addition, when the wiring distance between the motor and the drive unit is long, the motor torque will be reduced due to voltage drop. Please use a cable with enough thickness to perform wiring.
- ◆ Do not lift the power supply unit with the outer cover removed. Failure to comply may result in damage to the circuit board or terminal block of the power supply unit.

1.1 Nameplate and Model Number

You can see the machine barcode by opening the lower cover.



Nameplate of MD810 series power supply unit

Product model	MODEL: MD810-20M4T45G100	Certificates
Rated input	INPUT: 3PH AC 380-480V 112.0A 50/60Hz	
Rated output	OUTPUT: DC 537V-679V 110.0A 45kW	
Serial No.	S/N: XXXXXXXXXX000000	

Suzhou Inovance Technology Co., Ltd.

Nameplate of ES810 series power supply unit

Product model	MODEL: ES810-20M4T240-00	Certificates
Rated input	INPUT: 3PH AC 380-480V 119.6A 50/60Hz	
Rated output	OUTPUT: DC 537V-679V 110.0A 110kW	
Serial No.	S/N: XXXXXXXXXX000000	

Suzhou Inovance Technology Co., Ltd.

Nameplate of TD810 series power supply unit

Product model	MODEL: TD810-20M4T45G100	Certificates
Rated input	INPUT: 3PH AC 380-480V 112.0A 50/60Hz	
Rated output	OUTPUT: DC 537V-679V 110.0A 45kW	
Serial No.	S/N: XXXXXXXXXX000000	

Suzhou Inovance Technology Co., Ltd.

MD810 - 50M 4T D 45 G 000 W

Mark	Product Category
MD 810	AC drive series
TD 810	AC drive specialised for textile

Mark	Unit Type
20 M	Power supply unit
50 M	Drive unit

Mark	Voltage Class
4T	380-480 V

Mark	Axis Type
Drive unit	None
	D

Mark	Power Range (kW)
Power supply unit	22 22
	45 45
	110 110
	160 160
	355 355
Drive unit	1.5 1.5

	355 355

Mark	Model
G	General purpose

Mark	Description
None	1.5-160 kW (booksize unit)
H	90-355 kW (vertical tower unit)
W	Water cooling

Mark	Optional Extension Part
0	None
1	Built-in STO

Mark	Optional Communication Part	
Power supply unit	0	Built-in RS-485 and CAN
	1	Built-in Profibus-DP network bridge and CAN
	2	Built-in PROFINET network bridge and CAN (unavailable for the 355 kW model)
Drive unit	0	Built-in RS-485 and CAN
	1	Built-in Profibus-DP and CAN

Mark	Optional Functional Part	
Power supply unit	0	No optional built-in braking unit
	1	Built-in braking unit (only available for the 22 kW and 45 kW models)
Drive unit	2	Built-in differential PG card
	3	Built-in 23-bit PG card
		Built-in resolver and frequency division card
	4	

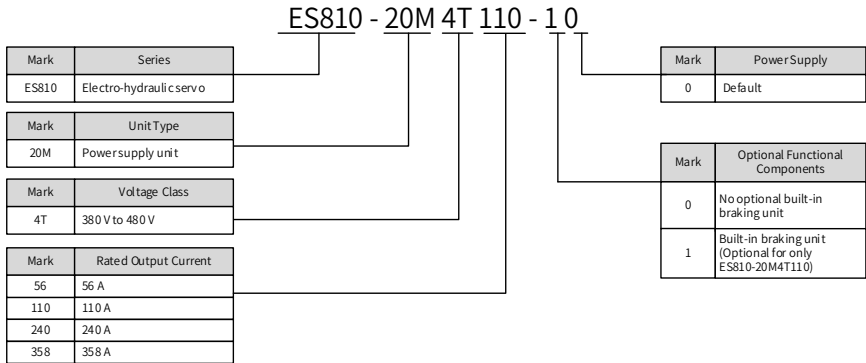


Figure 1-1 Designation rules and nameplate of the power supply unit



- ◆ The PROFINET network bridge is unavailable for 355 kW power supply units.
- ◆ The water cooling models are 160 kW power supply units and 11 to 37 kW single-axis drive units.
- ◆ Only 22 kW and 45 kW power supply units are equipped with built-in braking units.

1.2 Components

The 810 series power supply unit is divided into the MD810, ES810, and TD810 series power supply unit. The following figure shows the description of components:

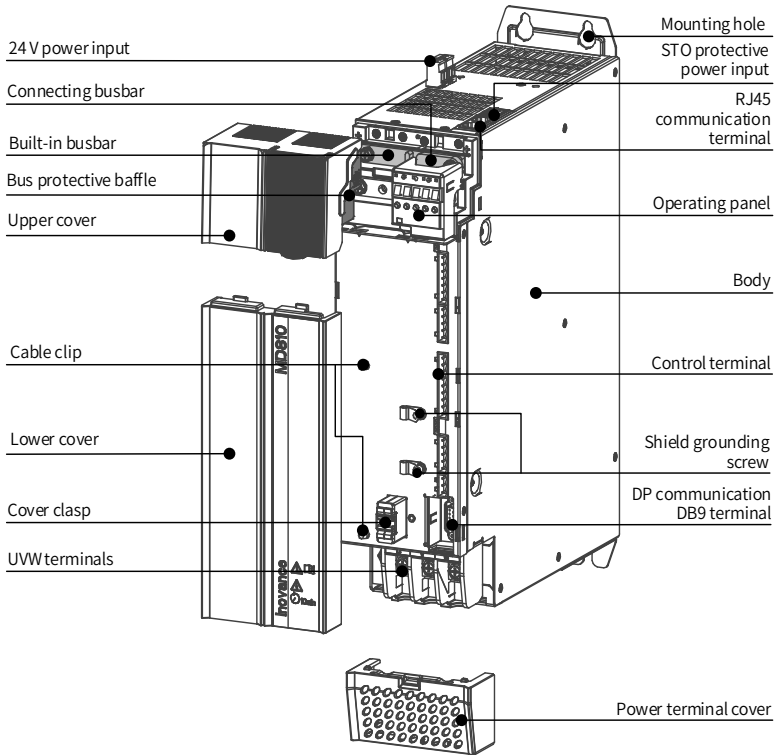


Figure 1-2 Description of components of the power supply unit

2 Mechanical Installation

The 810 series power supply unit applies to the MD810, IS810, ES810, and TD810 series drive units. This chapter describes only the mechanical installation of the power supply unit. For the mechanical installation of the drive units, refer to their manuals.

2.1 Precautions

2.1.1 Transportation Precautions

■ Transportation loss precautions

- 1) When receiving goods from a transportation company, check the 810 series power supply unit carefully.
- 2) Check received goods according to the supply list.
- 3) If any goods loss or damage is found, notify the transportation company immediately.
- 4) If you find any invisible loss or damage, please notify the transportation company immediately and ask it to perform equipment qualification.
- 5) If you do not notify the transportation company immediately, you may lose the right of compensation for goods loss or damage.
- 6) If necessary, contact your local Inovance technical office for support.

■ Transportation precautions

- 1) Pack the equipment according to the requirements and climatic conditions in transit and the destination before the equipment leaves the factory.
- 2) Follow precautions for transportation, storage, and correct operation indicated on the package.
- 3) The equipment must be placed on a wooden chassis (pallet) when being transported with a forklift.
- 4) Do not disassemble the equipment as long as it is still placed on this wooden chassis and continues to be transported.
- 5) Allowable ambient temperature during transportation:
-25°C to +70°C, level 2K3 according to IEC 60721-3-2, maximum 24 hours at as low as -40°C .
- 6) For precautions on auxiliary installation for cabinet transportation, see ["2.5 Auxiliary Installation for Cabinet Transportation"](#) to avoid damage to the power supply unit during transportation.



- ◆ Transportation loss indicates that the AC drive is under improper stress so that the electrical safety performance of the AC drive cannot continue to be ensured. Do not connect the equipment before a professional test is performed.
- ◆ Failure to comply may result in death, serious injuries, or great property loss.
- ◆ The storage period cannot exceed one year. If the storage period exceeds one year, the DC bus capacitor in the power component must be recharged during commissioning.

2.1.2 Storage Precautions

- 1) The AC drive must be placed in a clear and dry space. The temperature must maintain in the range of -25°C to $+70^{\circ}\text{C}$ (level 1K4 according to IEC 60721-3-1). Temperature fluctuation cannot exceed $20^{\circ}\text{C}/\text{h}$.
- 2) Covering or corresponding measures must be taken during long-term storage to ensure that the AC drive is not polluted and environmentally affected. Otherwise, the right of compensation for damage will lose effectiveness.

2.1.3 Installation Environment Precautions

- 1) Ambient temperature: Ambient temperature has a great effect on the power supply unit life. The operating ambient temperature of the power supply unit must not exceed an allowable temperature range (-10°C to 50°C).
- 2) Altitude: When the installation altitude exceeds 1000 m, the 810 series power supply unit must be derated according to any recommended capacitance value.
- 3) Installation surface requirements: The installation surface of the 810 series power supply unit must be flame retardant. Its structural strength must meet the strength requirements for device transportation, storage, and running under normal conditions to avoid damage to the AC drive device due to vibration or excessive deformation of the installation surface. The installation surface must remain vertical to the horizontal ground and be secured to the cabinet properly. The installation surface must be able to withstand no less than four times the total weight of the installed device.
- 4) Cooling requirements: A large amount of heat may be generated during the operation of the AC drive. There must be plenty of cooling space in the installation area. It must be ensured that the cooling holes of the AC drive cabinet are not blocked.
- 5) Vibration requirements: Install the drive in a place with no vibration. Vibration must not be greater than 0.6 g. Keep away from devices such as punch presses.
- 6) Other requirements: Install the drive in an environment free from a) direct sunlight, moisture, and water drops; b) corrosive, inflammable, or explosive gases; and c) grease dirt and dust.


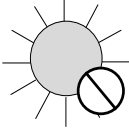
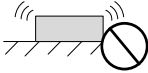
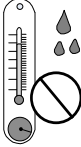

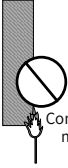
 <p>Dust, oil</p>	 <p>Sunlight</p>	 <p>Strong vibration Vibration less than 0.6 g</p>
 <p>High temperature and humidity</p> <p>Ambient -10°C to 50°C</p>	 <p>Corrosive, explosive and combustible gas</p>	 <p>Combustible material</p> <p>Install on the surface of an incombustible object</p>

Figure 2-1 Installation environment

- 7) The drive units must be installed in a fireproof cabinet with doors that provide effective electrical and mechanical protection. The installation must conform to local and regional laws and regulations, and to relevant IEC requirements.

2.2 System Selection

2.2.1 System Selection Flowchart

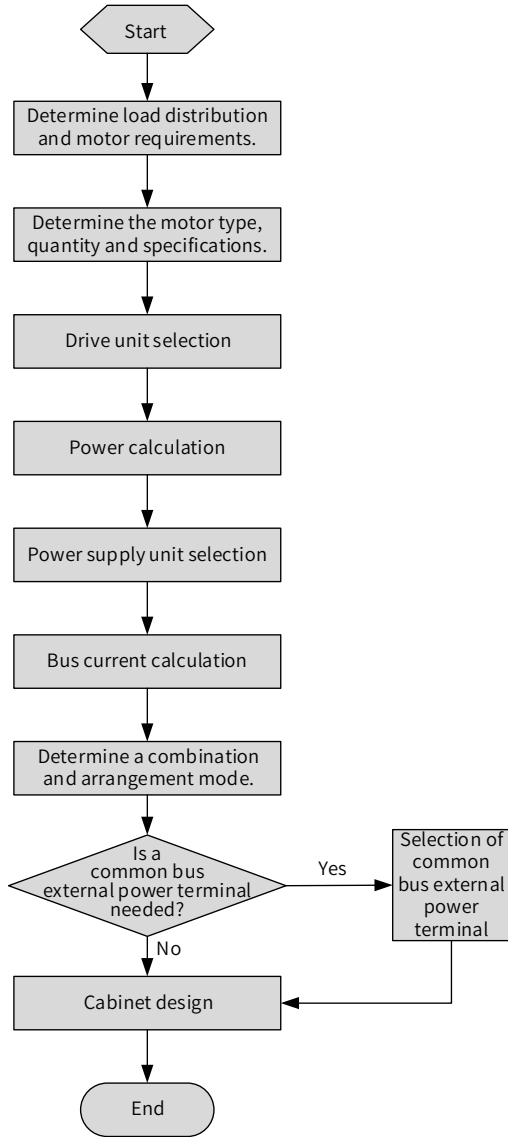


Figure 2-2 Selection flowchart

2.2.2 Selection of the Load and Motor

- 1) Determine a motor type and quantity according to the load and operating mode of the mechanical equipment.
- 2) Determine the requirements of the mechanical equipment for the power, torque, speed, startup, speed regulation, braking, overload, heating, and temperature rise of the motor.
- 3) Select the rated power, rated voltage, and rated speed in the motor product catalog.
- 4) Economically and correctly select a motor capacity provided that the load of the mechanical equipment is fully satisfied.

$$P_n = \sqrt{3} \times U_n \times I_n \times \cos \theta \times \eta$$

P_n – Rated power; U_n – Rated voltage; I_n – Rated current; $\cos \theta$ – Power factor;
 η – Efficiency

2.2.3 Selection of the Drive Unit

- 1) Determine the drive unit quantity according to the power supply unit quantity. One motor needs one drive unit.
- 2) Select the power and model of the drive unit according to the rated power of the motor.
- 3) For the selection models and powers of the MD810, IS810, ES810, and TD810 series drive units, see their user manuals.

2.2.4 Selection of the Power Supply Unit

- 1) Calculate the sum of rated powers of all selected drive units.
- 2) The power of the power supply unit must be greater than or equal to 80% of the sum of rated powers of all drive units.

$$P \geq 80\% (P_1 + P_2 + P_3 + P_4 + P_5 + \dots)$$

where p is the power of the power supply unit and P_1, P_2, P_3, P_4, P_5 , etc. are the rated powers of drive units.

- 3) Select a power supply unit model from the following table. When one power supply unit cannot meet the power requirements, parallel connection of multiple power supply units may be used.

Table 2-1 Parameter specifications of the power supply unit

Power Supply Unit Model	Rated Power (kW)	Power Capacity (kVA)	AC Input Current (A)	DC Output Current (A)	Braking Unit	Current Carrying Capacity (A)
Input voltage 380 VAC to 480 VAC (Operating range: 323 VAC to 528 VAC) Output voltage 537 VDC to 679 VDC						
MD810-20M4T22GXXX	22	54	59	56	Optional built-in	100
MD810-20M4T45GXXX	45	81	112	110	Optional built-in	200
MD810-20M4T110GXXX	110	179	196	240	Optional external MDBUN series	200
MD810-20M4T160GXXX(W)	160	263	292	358	Optional external MDBUN series	200
MD810-20M4T355GXXX	355	565	619	759	Optional external MDBUN series	200
TD810-20M4T22GXXX	22	54	59	56	Optional built-in	100
TD810-20M4T45GXXX	45	81	112	110	Optional built-in	200
TD810-20M4T110GXXX	110	179	196	240	Optional external MDBUN series	200
TD810-20M4T160GXXX(W)	160	263	292	358	Optional external MDBUN series	200
TD810-20M4T355GXXX	355	565	619	759	Optional external MDBUN series	200
ES810-20M4T056-10	22	54	59	56	Optional built-in	100
ES810-20M4T110-10	45	81	112	110	Optional built-in	200
ES810-20M4T240-00	110	179	196	240	Optional external MDBUN series	200
ES810-20M4T358-00	160	263	292	358	Optional external MDBUN series	200

 **Caution**

- ◆ The configuration coefficient of the power supply and drive units is generally 80%. When the requirements for the overload capacity of the mechanical equipment load are high, the configuration coefficient needs to be adjusted to 100% to 150%. When the requirements for the overload capacity of the mechanical equipment load are low, the configuration coefficient can be adjusted to 60% to 80%.
- ◆ Only power supply units with the same power size can be paralleled. The maximum number of parallel power supply units is four. If more than four power supply units are adopted, power supply units with a greater power level must be selected before parallel connection.

2.2.5 System Combination and Arrangement

The 810 series power supply unit uses the booksize design. The combination and arrangement modes are very flexible. Single or dual rack installation is allowed. A power supply unit may be located between or on the left side of the drive units. The 810 series power supply unit applies to the MD810, IS810, ES810, and TD810 series drive units. For specific installation of the power supply unit and the drive units, refer to their manuals.

■ Single rack installation

It is recommended to use a single rack paralleled arrangement with a power supply unit placed on the left or in the middle provided that physical space in the cabinet allows doing so. The following table shows typical single rack combination and arrangement modes:

Arrangement Mode	Schematic Diagram of Combination and Arrangement	Bus Current Calculation
Power supply unit placed on the left	<p>Current-carrying capacity 200 A Current-carrying capacity 100 A</p>	$I_{\text{power supply unit}} \geq 80\% (I_1 + I_2 + I_3 + I_4 + I_5 + I_6 + \dots)$ $I_1 + I_2 + I_3 + I_4 + I_5 + I_6 + \dots \leq 200 \text{ A}$ $I_4 + I_5 + I_6 + \dots \leq 100 \text{ A}$
Power supply unit placed on the left Common bus external terminal	<p>Common bus external power terminal (optional, current-carrying capacity 200 A)</p> <p>Current-carrying capacity 200 A Current-carrying capacity 100 A</p>	$I_{\text{power supply unit}} \geq 80\% (I_1 + I_2 + I_3 + I_4 + I_5 + I_6 + \dots)$ $I_1 + I_2 \leq 200 \text{ A}$ $I_3 + I_4 + I_5 + I_6 + \dots \leq 200 \text{ A}$ $I_4 + I_5 + I_6 + \dots \leq 100 \text{ A}$
Power supply unit placed in the middle	<p>Current-carrying capacity 200 A Current-carrying capacity 100 A</p>	$I_{\text{power supply unit}} \geq 80\% (I_1 + I_2 + I_3 + I_4 + I_5 + I_6 + \dots)$ $I_1 + I_2 + I_3 + \dots \leq 200 \text{ A}$ $I_4 + I_5 + I_6 + \dots \leq 200 \text{ A}$ $I_1 + I_2 + \dots \leq 100 \text{ A}$ $I_6 + \dots \leq 100 \text{ A}$

■ Dual rack installation

If space in the cabinet is limited, dual rack installation can be performed. A power supply unit is generally placed on the left during dual rack installation. If there are two power supply units, it is recommended to provide one power supply unit in each rack. If there are more power supply units, it is recommended to separately install them in multiple cabinets.

The following table shows typical dual rack combination and arrangement modes:

Arrangement Mode	Schematic Diagram of Combination and Arrangement	Bus Current Calculation
Rectifier unit	<p>Common bus external power terminal (optional, current-carrying capacity 200 A)</p> <p>Power supply unit</p> <p>Power supply unit</p> <p>Drive unit</p> <p>Drive unit</p> <p>...</p> <p>Common bus external power terminal (optional, current-carrying capacity 200 A)</p> <p>Drive unit</p> <p>Drive unit</p> <p>Drive unit</p> <p>...</p> <p>Current-carrying capacity 200 A</p> <p>Current-carrying capacity 100 A</p>	$I_{\text{power supply unit}} \geq 80\% (I_1 + I_2 + I_3 + I_4 + I_5 + I_6 + \dots)$ $I_1 + I_2 + \dots \leq 200\text{A}$ $I_3 + I_4 + I_5 + I_6 + \dots \leq 200\text{A}$ $I_4 + I_5 + I_6 + \dots \leq 100\text{A}$
Rectifier unit	<p>Common bus external power terminal (optional, current-carrying capacity 200 A)</p> <p>Power supply unit 1</p> <p>Power supply unit</p> <p>Drive unit</p> <p>Drive unit</p> <p>Drive unit</p> <p>Drive unit</p> <p>...</p> <p>Common bus external power terminal (optional, current-carrying capacity 200 A)</p> <p>Power supply unit 2</p> <p>Power supply unit</p> <p>Drive unit</p> <p>Drive unit</p> <p>...</p> <p>Current-carrying capacity 200 A</p> <p>Current-carrying capacity 100 A</p>	$I_{\text{power supply unit 1}} + I_{\text{power supply unit 2}} \geq 80\% (I_1 + I_2 + I_3 + I_4 + I_5 + I_6 + \dots)$ $I_1 + I_2 + I_3 + I_4 + \dots \leq 200\text{A}$ $I_2 + I_3 + I_4 + \dots \leq 100\text{A}$ $I_5 + I_6 + \dots \leq 200\text{A}$ $I_{\text{power supply unit 1}} / I_{\text{power supply unit 2}} \approx (I_1 + I_2 + I_3 + I_4 + \dots) / (I_5 + I_6 + \dots)$

2.2.6 System Selection Precautions

Caution

- ◆ When the bus current is excessive and the DC busbar current-carrying capacity cannot meet the requirements, common bus external power terminals must be selected.
- ◆ Common bus external power terminals must be selected during dual rack combination and arrangement.
- ◆ For ordering information about common bus external power terminals, see "[9.3 Options](#)".
- ◆ The DC busbar current-carrying capacity of the 50 mm wide model and other models is 100 A and 200 A respectively. For details of specifications, see "[9.1 Technical Data](#)".
- ◆ For the installation and selection of the MD810, ES810, IS810, and TD810 series drive units, refer to their user manuals.
- ◆ Only power supply units with the same power size can be paralleled. It is advisable that they must not exceed four sets. If they exceed four sets, power supply units with a greater power level must be selected before parallel connection.

2.3 Cabinet Design

2.3.1 Space Requirements

The 810 series power supply unit is divided into the booksize unit (50 mm, 100 mm, 200 mm and 300 mm wide) and the vertical tower unit (180 mm wide). The recommended installation methods are single rack installation and dual rack installation. The following figure table and figures show the minimum clearance between two racks during dual rack installation. An insulation deflector must be installed in the lower rack of units.

Table 2-2 Minimum clearance during the installation of the power supply unit

Item	50 mm Wide Unit	100 mm Wide Unit	200 mm Wide Unit	300 mm Wide Unit	180 mm Wide Unit
	Booksize Unit				Vertical Tower Unit
S1	≥ 300mm	≥ 300 mm	≥ 300 mm	≥ 300 mm	≥ 300 mm
S2	≥ 300mm	≥ 300 mm	≥ 300 mm	≥ 300 mm	≥ 500 mm
S3	≥ 300mm	≥ 300 mm	≥ 300 mm	≥ 300 mm	-

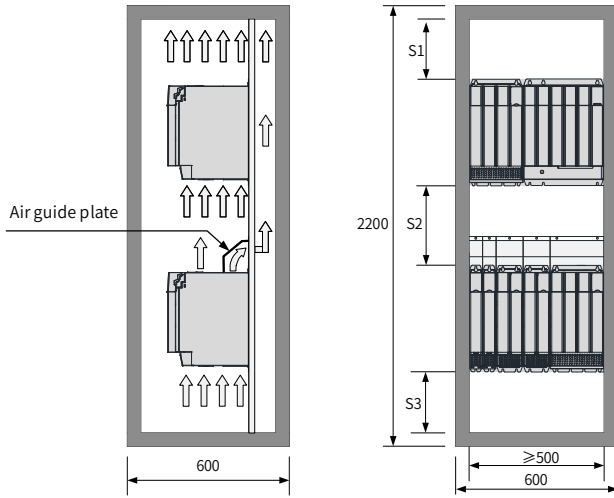


Figure 2-3 Heat dissipation clearances for dual rack installation of the booksize unit

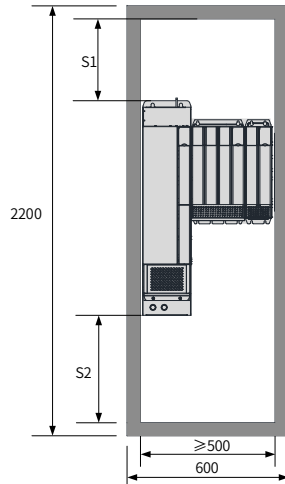


Figure 2-4 Heat dissipation clearances for the vertical tower unit



NOTE

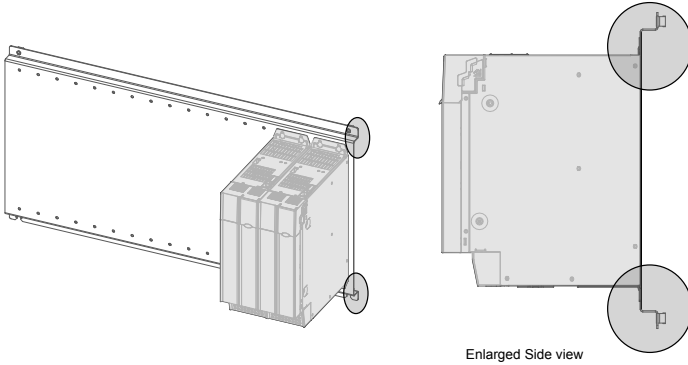
- ◆ The vertical tower units are designed to be installed vertically to enable correct heat dissipation. Do not install horizontally.

2.3.2 Mounting Backplate Design Requirements

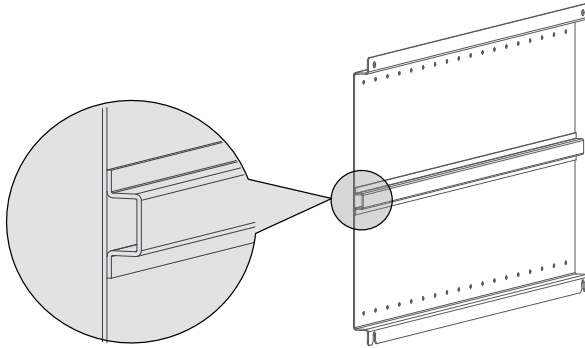
1 Thickness and stiffness reinforcing principles of the mounting backplate

To avoid damage to the power supply unit during transportation and ensure its normal operation, the mounting backplate of the power supply unit must have enough stiffness and strength and a thickness of not less than 2 mm. Backplate reinforcement must be performed at the top and bottom mounting feet. The recommended reinforcement scheme is as follows:

- Scheme 1: The lateral bending of the backplate is reinforced;



- Scheme 2: A lateral reinforced beam is welded on the back of the backplate.



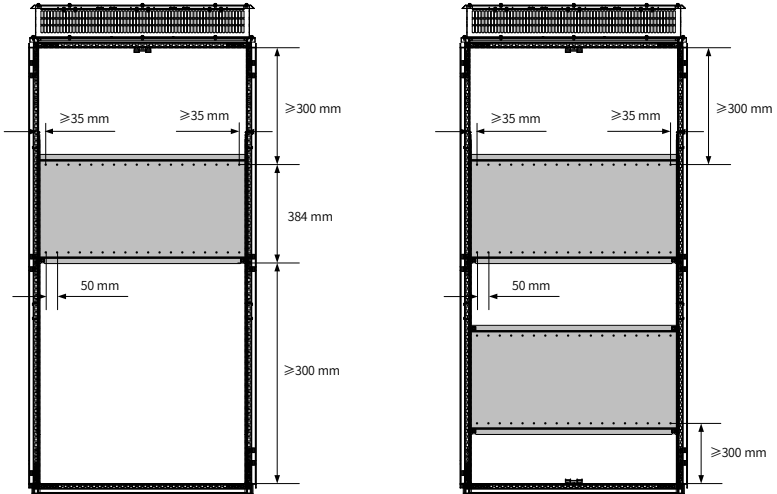
2 Mounting hole fabricating principles:

- The booksize unit is characterized by equal height and mounting hole 50 mm equal interval. Mounting holes must be prefabricated during backplate processing so that combined installation can be configured flexibly.
- To avoid damage to the power supply unit during the transportation, the mounting screws of the power supply unit must be not only fixed on the mounting backplate by tapping, but also riveted with nuts or added with independent nuts on the back of the backplate to engage the screw threads and strength as much as possible.



◆ The relative position of the mounting holes of the power supply unit must be accurate to ensure that the built-in DC busbar of the power supply unit is reliably connected. It is strongly recommended to process mounting holes during backplate processing. It is not recommended to drill mounting holes on site.

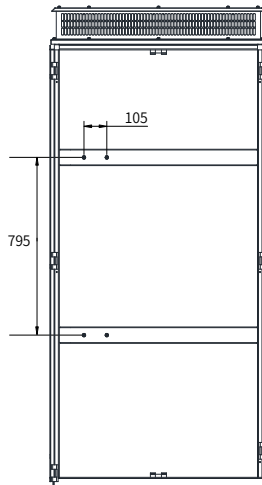
■ Dimensions of mounting holes of the booksize unit



Single rack installation

Dual rack installation

■ Dimensions of mounting holes of vertical tower unit (355 kW power supply unit)



2.3.3 Cabinet Cooling Design

1 Cabinet door sheet cooling design

The power supply unit is forcedly air cooled with a built-in fan. A large enough air inlet must be provided on the cabinet door sheet to ensure that enough cooling air enters the cabinet.

The cabinet air inlet must be designed to be over 50 mm lower than the air inlet of the 810 series power supply according to the characteristic that cold air flows from bottom up after thermal expansion, as shown in the following figure.

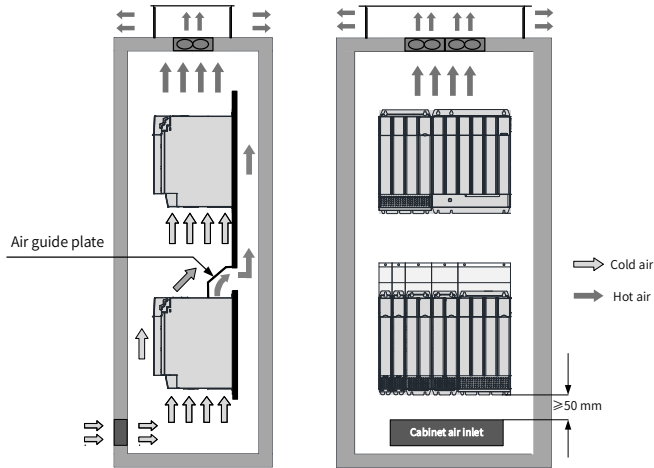


Figure 2-5 Position of the cabinet air inlet



NOTE

- ◆ Where multiple power supply units are installed in one cabinet, if air is blown into the air inlet with a fan from outside to inside, it may result in chaos of air distribution of power supply units in the cabinet, affecting the overall cooling effect. Therefore, no fan must be installed at the cabinet air inlet to blow air into the cabinet.

After a power supply unit enters the cabinet, the following table shows the minimum effective area of the air inlet.

Table 2-3 Minimum effective area of the cabinet air inlet of the 810 series power supply unit

Module Power	Minimum Effective Ventilation Area of the Cabinet Air Inlet (cm ²)
22kW	15
45 kW	50
110 kW	90
160 kW	150
355 kW	150

- This table applies to only a single unit. When there are multiple units in the cabinet, the sum of the above-mentioned air inlet areas is the total requirement for air inlet area. For example, if there are eight 7.5 kW drive units, two 22 kW drive units, and one 160 kW power supply unit in the cabinet, the minimum effective area of the cabinet air inlet must be $8 \times 15 + 2 \times 70 + 1 \times 150 = 410 \text{ cm}^2$.
- If a strainer is installed at the air inlet, the air inlet resistance will rise significantly and the air inlet area must be increased to 1.2 to 1.5 times the value indicated in the table.
- The effective area indicated in the table is an actual through-hole area in the hole zone. Effective area = Area of the hole zone \times Hole ratio.

2 Exhaust air design at the top

Hot air in the cabinet must be able to be smoothly discharged to outside the cabinet to ensure full cooling of the the 810 series power supply unit. Passive or active air discharge

■ Passive air discharge (Direct air discharge)

Passive air discharge is to guide exhaust air from the power supply unit to be discharged to outside the cabinet from the air outlet at the top of the cabinet.

Passive air discharge may cause accumulated hot air at the top of the cabinet so that air in this zone rises. The air pressure at the cabinet air inlet is low due to the suction effect of the fan of the power supply unit at the air inlet. Therefore, there is an air pressure difference between the inside, air outlet and air inlet of the cabinet to form an air flow. This air flow forces hot air at the air outlet to flow towards the air inlet so that it is absorbed into the power supply unit again, causing a great temperature rise of the power supply unit and an adverse effect on the performance of the power supply unit.

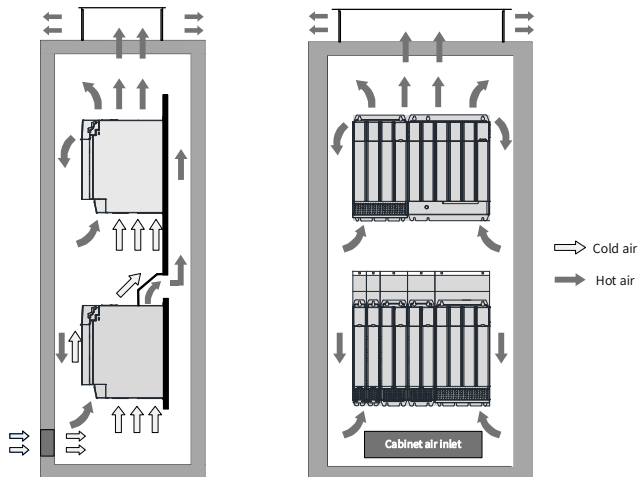


Figure 2-6 Backflow of hot air in the passive air discharge cabinet (without any isolating device)

Therefore, an isolating device must be used in the passive air discharge cabinet to prevent backflow of hot air. An isolating device may be a plate or exhaust duct.

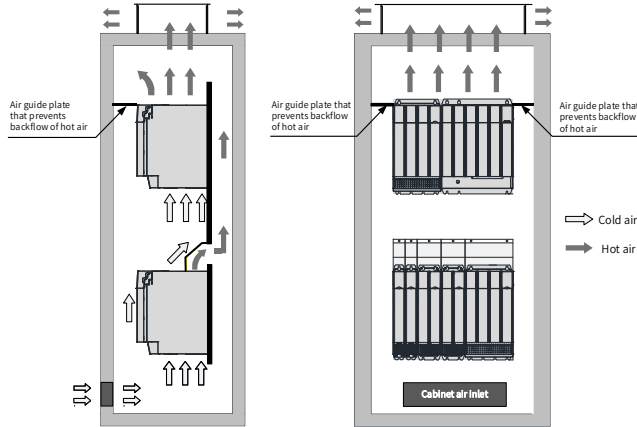


Figure 2-7 Backflow of hot air in the passive air discharge cabinet (with an isolating device)

The temperature at the air outlet of the power supply unit is high and the density is lower than that at the air inlet. When passive air discharge is used, the following table shows minimum effective areas of the cabinet air outlet to ensure that hot air in the cabinet is smoothly discharged to outside the cabinet.

Table 2-4 Minimum effective area of the cabinet air inlet of the power supply unit during passive air discharge

Unit Power	Minimum Effective Ventilation Area of the Cabinet Air Outlet (m ²)
22 kW	24
45 kW	80
110 kW	145
160 kW	240
355 kW	240

The above-mentioned table is described as follows:

- This table applies to only a single unit. When there are multiple units in the cabinet, the sum of the above-mentioned areas is the total requirement for air outlet area.
- If a strainer is installed at the air outlet, the air outlet resistance will rise significantly and the air outlet area must be increased to 1.2 to 1.5 times the value indicated in the table.
- The effective area indicated in the table is an actual through-hole area in the hole zone. Effective area = Area of the hole zone x Hole ratio.
- Active air discharge

Active air discharge is to discharge hot air in the cabinet to outside the cabinet by installing a fan at the top of the cabinet. Active air discharge is a commonly used air discharge mode.

The total air flow must not be smaller than the sum of air flows of all power supply units in the cabinet to ensure that hot air in the cabinet can be smoothly discharged to outside the cabinet. The cooling air flow required for the 810 series power supply unit is as follows:

Table 2-5 Cooling air flow of the power supply unit

Unit Power	Cooling Air Flow (CFM)
22 kW	15
45 kW	40
110 kW	100
160 kW	285
355 kW	310



NOTE

◆ 1 CFM = 0.02832 m³/min.

3 Cabinet fan selection

Cabinet fan selection procedure:

- Calculate the sum of cooling air flows required for all units according to "[Table 2-5 Cooling air flow of the power supply unit](#)".
- Determine the maximum air flow value (Q_{max}) of the cabinet fan.
- Determine the fan specifications and quantity according to the maximum air flow value (Q_{max}). Where, Maximum air flow of the cabinet = (1.3 to 1.5 times) the sum of cooling air flows
Maximum air flow of the cabinet = (1.6 to 2.2 times) the sum of cooling air flows (when components such as dry nets and shutters are installed at the cabinet air outlet).

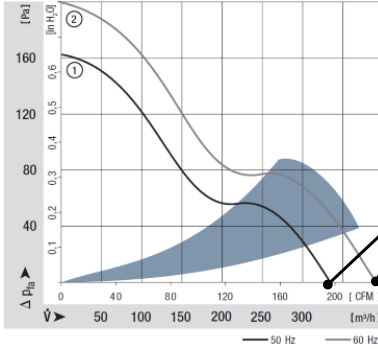


NOTE

- ◆ The selected fan air flow must not be smaller than the maximum air flow Q_{max}. When a single fan cannot meet this requirement, multiple fans can be paralleled.
- ◆ The following figure shows typical fan air flow specifications.

Air flow	Air flow	Nominal voltage	Frequency	Sound pressure level	Sound power level	Sinter sleeve bearings Ball bearings	Power input	Nominal speed	Temperature range	Service life L10 at 40 °C	at T max	Curve
m ³ /h	CFM	V	Hz	dB(A)	Bel(A)	■ / ■	Watts	RPM	°C	Hours	Hours	Curve
320	188,3	230	50	51	6,4	■	27,0	2 800	-25...+55	60 000 / 32 000		1
380	223,6	115	60	56	6,8	■	28,0	3 350	-25...+65	55 000 / 18 000		2

This column in the fan specifications is the maximum air flow Q_{max} of this fan



Fan maximum air flow Q_{max}

Figure 2-8 Q_{max} of a system fan

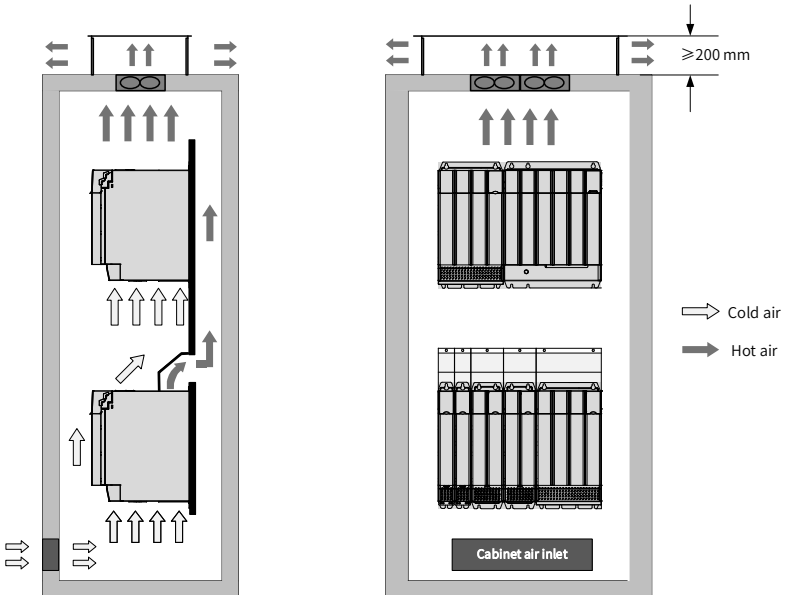


Figure 2-9 Cabinet exhaust air system of the power supply unit



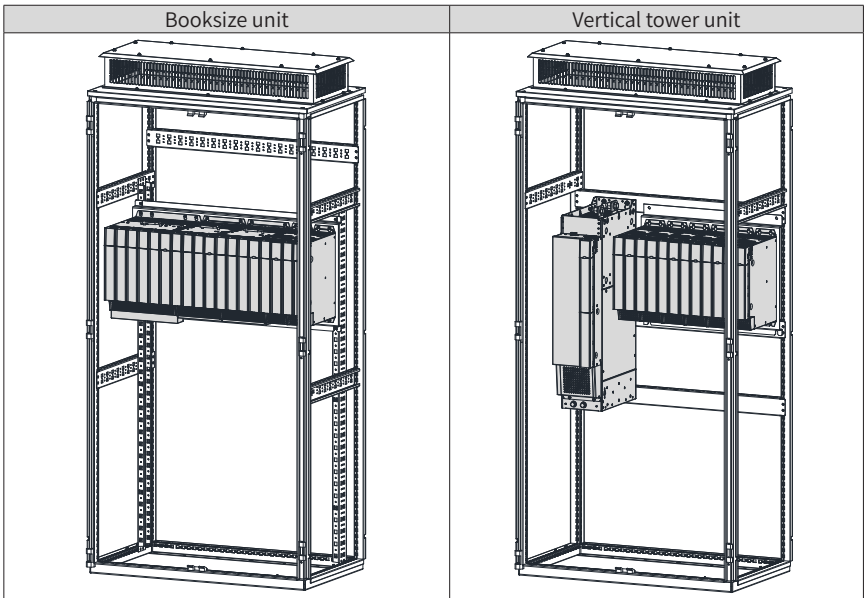
- ◆ Pay attention to the air draft direction during fan installation to ensure air draft from inside to outside of the cabinet and avoid overheat or damage to the power supply unit due to discharge failure of hot air.
- ◆ The distance between the exhaust air top cover and the fan outlet must be at least 200 mm to avoid any serious effect on the fan cooling performance.

2.4 Combined Installation

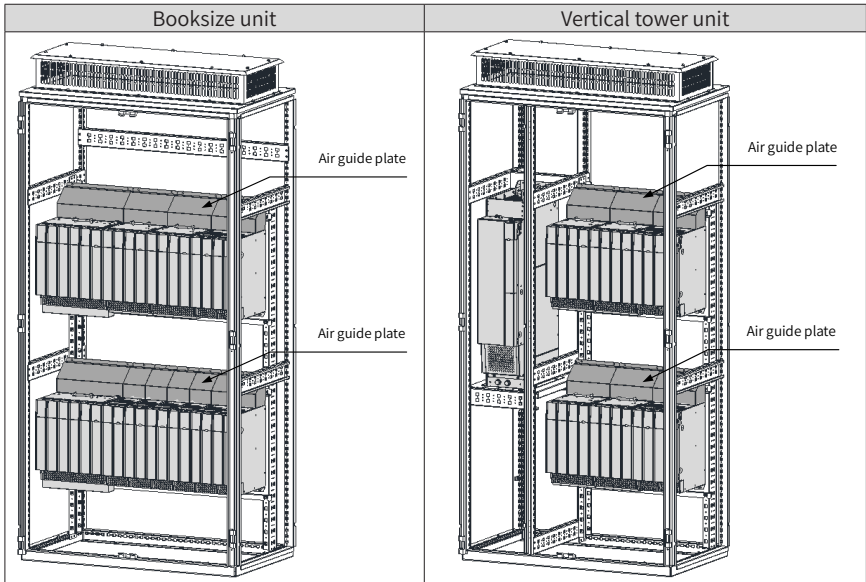
2.4.1 Installation Method

The installation method of this product in a cabinet supports single rack installation and dual rack installation. The booksize unit must be installed in close arrangement to avoid damage to the power supply unit in transit. Do not install two or fewer power supply units and even separately install them. The through-hole mounting method supports only single rack installation.

- Single rack installation



■ Dual rack installation

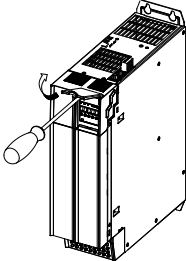
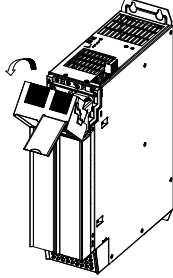
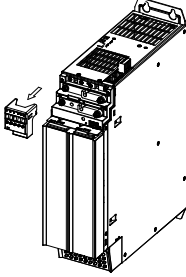
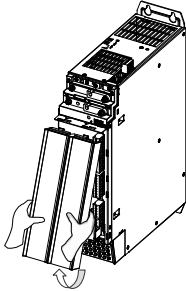
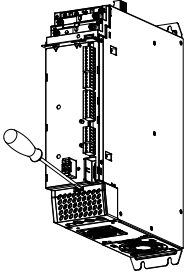
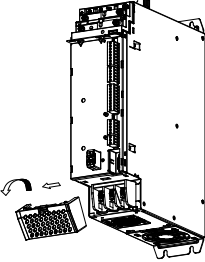


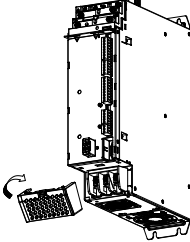
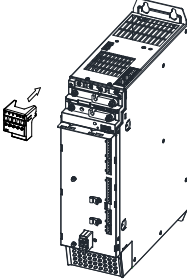
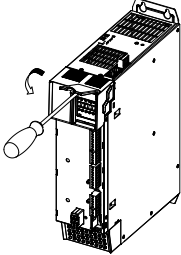
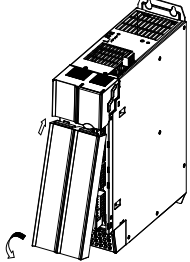
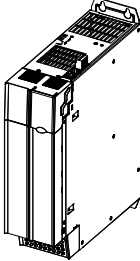
- ◆ An insulation deflector may be selectively installed in the upper rack of units during dual rack installation.
- ◆ Do not separately install two or fewer sets.
- ◆ The through-hole mounting method supports only single rack installation.

2.4.2 Installation of the Power Supply Unit

This section describes only the installation of the power supply unit. For details of the installation of the drive units, refer to their manuals.

1 Cover removal and installation

Cover Removal		
<p>1) Lift the translucent operating panel cover. Loosen the screws in the upper cover with a screwdriver.</p> 	<p>2) Remove the upper cover by turning it frontward.</p> 	<p>3) Pull the whole operating panel box frontward.</p> 
<p>4) Hold the bottom of the lower cover with your hands. Remove the lower cover by turning it forward.</p> 	<p>5) Insert the tool (screwdriver) into the clasp of the power terminal cover. Pry the clasp.</p> 	<p>6) Remove the power terminal cover.</p> 

Cover Installation		
<p>1) Align the power terminal cover with the position of the clasp of the bus seat. Press the power terminal cover to clasp and fix it.</p>	<p>2) Insert the operating panel.</p>	<p>3) Align the upper cover with the position of the clasp. Press the upper cover to clasp and fix it. Tighten the screw with a screwdriver.</p>
		
<p>4) Insert the top end of the lower cover below the upper cover. Turn the bottom end of the lower cover to clasp it.</p>	<p>5) The installation is completed.</p>	
		

2 Backplate mounting

- Backplate mounting of 22 kW power supply unit

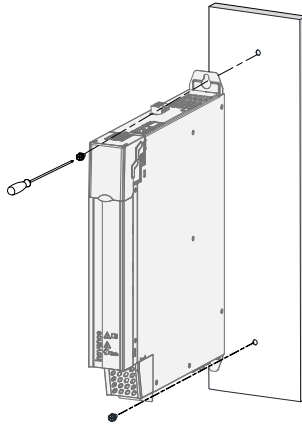


Figure 2-10 Backplate mounting of 22 kW power supply unit (50 mm wide)

- Backplate mounting of 45 kW power supply unit

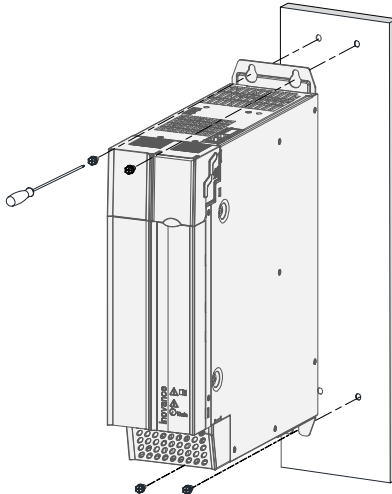


Figure 2-11 Backplate mounting of 45 kW power supply unit (100 mm wide)

■ Backplate mounting of 110 kW power supply unit

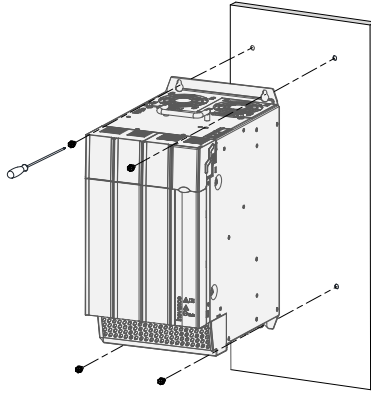


Figure 2-12 Backplate mounting of 110kW power supply unit (200mm wide)

■ Backplate mounting of 160 kW power supply unit

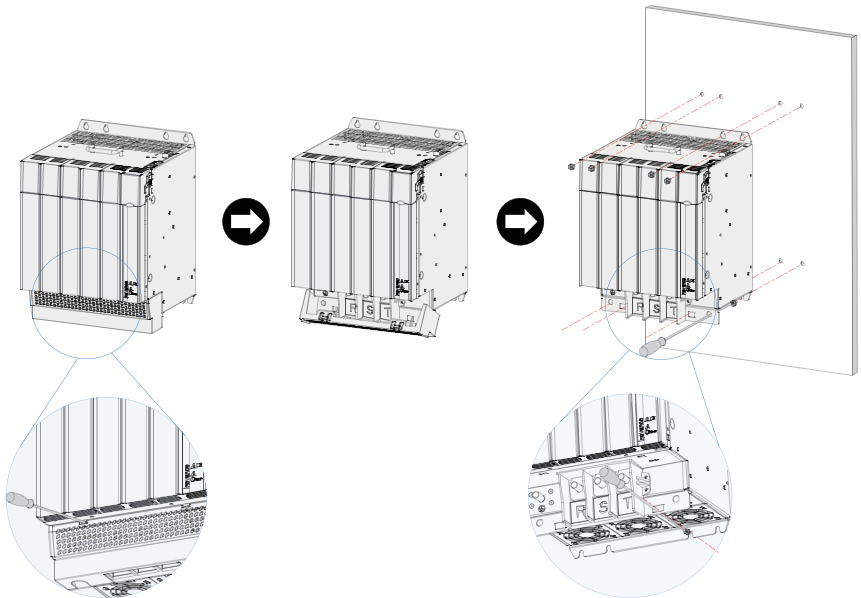


Figure 2-13 Backplate mounting of 160 kW power supply unit (300mm wide)

The installation procedure is as follows:

- 1) Insert a screwdriver in the left and right clasps of the power terminal cover and push them up lightly to loosen the clasps.
- 2) Turn downwards the terminal cover loosen from the clasps and remove it from the shell.
- 3) Fabricate mounting holes shown in the figure on the mounting backplate. The M6 mounting nuts are used.
- 4) Attach the unit to the mounting backplate with M6 x 15 screws and fix screws.
- 5) Align the power terminal cover with the limit holes on the shell and press it lightly. If a click is heard, the installation is proper.



NOTE

- ◆ When fixing two screws in the bottom middle, the screwdriver must be placed into the limit holes of the power terminal clasp to tighten screws. The recommended Phillips screwdriver model for installation is slot No. 3 with a rod length ≥ 190 mm.

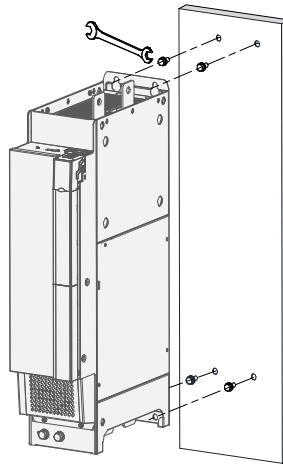


Figure 2-14 Backplate mounting of 355 kW power supply unit (180mm wide)



NOTE

- ◆ M10 x 20 screws are used on the mounting backplate. Tighten screws with an appropriate screw spanner or socket spanner.

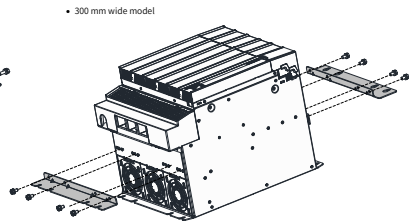
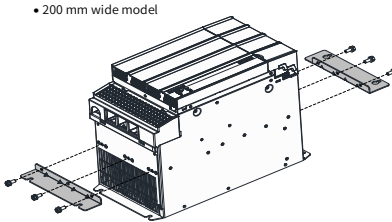
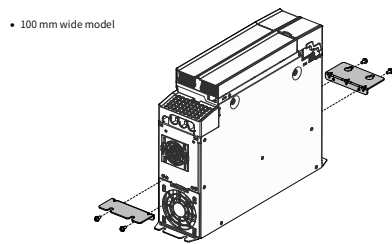
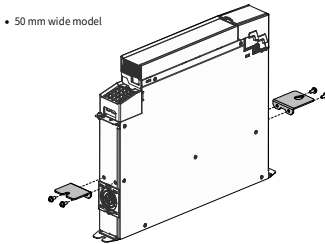
3 Through-hole mounting

■ Through-hole mounting brackets

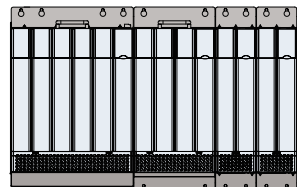
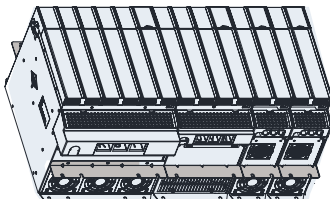


- ❶ Upper and lower through-hole mounting brackets of 50 mm wide unit
- ❷ Upper and lower through-hole mounting brackets of 100mm wide unit
- ❸ Upper and lower through-hole mounting brackets of 200mm wide unit
- ❹ Upper and lower through-hole mounting brackets of 300mm wide unit

■ Installation of upper and lower through-hole mounting brackets on the unit



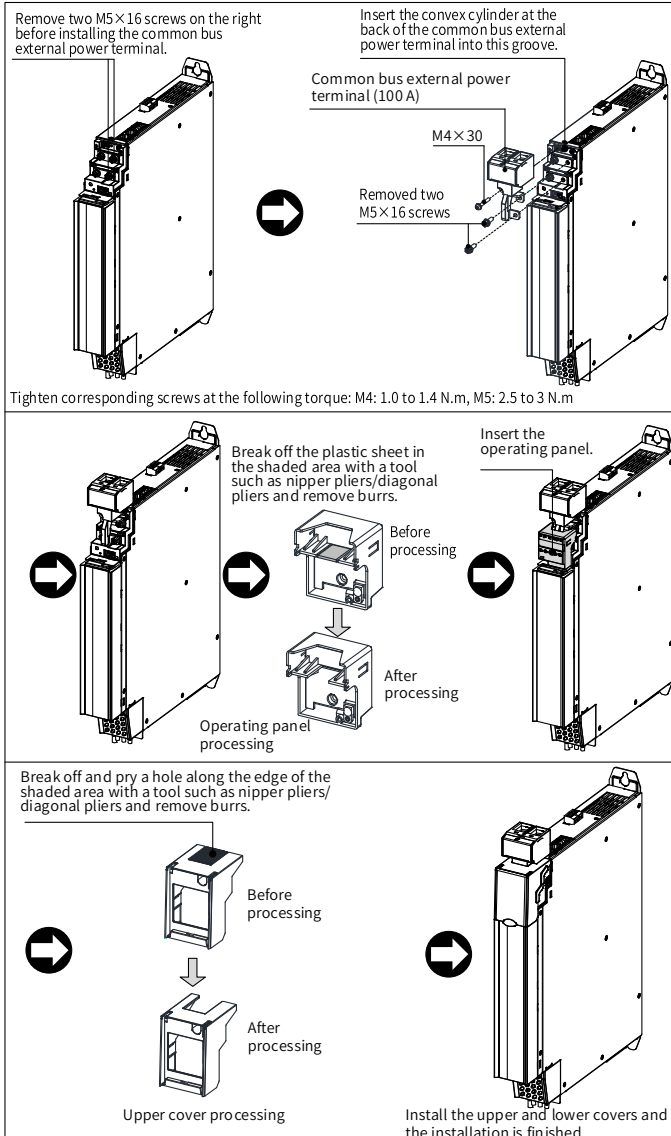
■ Installation completion



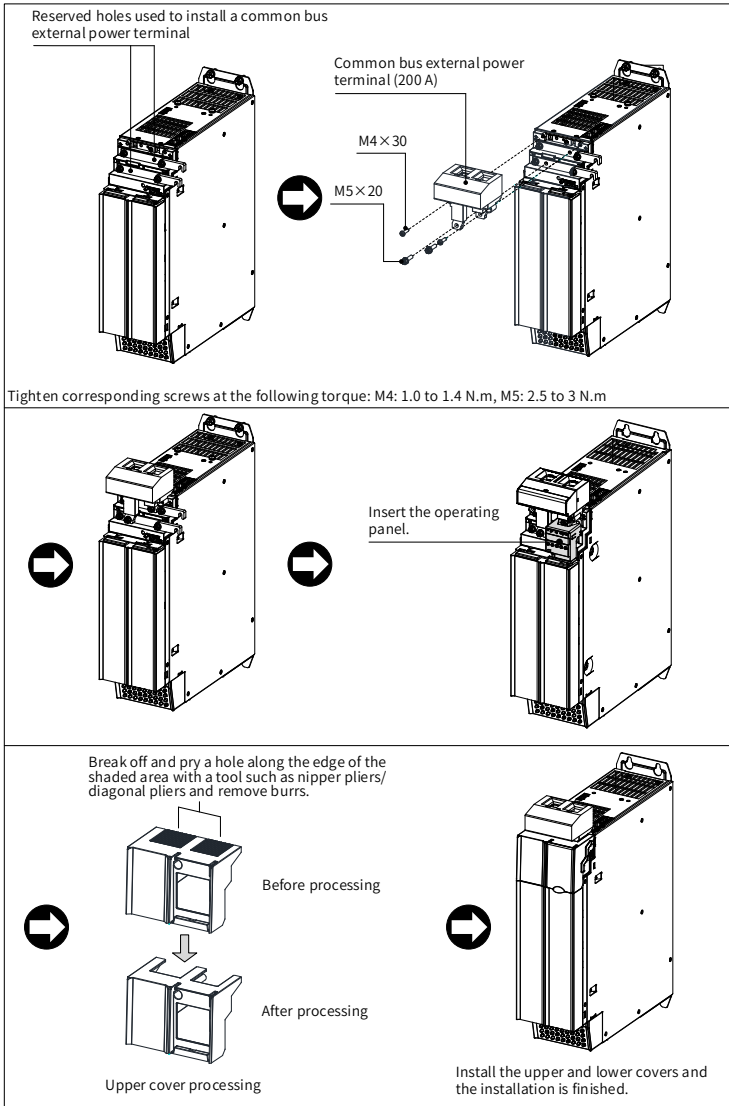
4 Installation of common bus external power terminal

The common bus external power terminal used for the 810 series power supply unit is not installed in the factory. If necessary, assemble it by yourself.

- Installation example of 100 A common bus external power terminal (22 kW power supply unit)

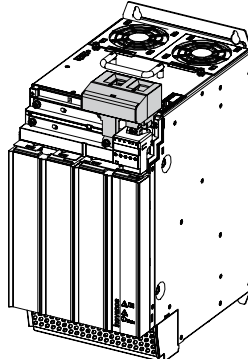


- Installation example of 200 A common bus external power terminal (45 kW power supply unit)

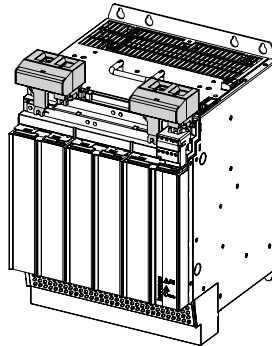


- Installation example of 200 A common bus external power terminal (110 kW and 160 kW power supply units)

The installation procedure of the 110 kW and 160 kW power supply units is the same as the 45 kW power supply unit. The following figures show the position examples after the installation is completed:



Installation position example of 110 kW power supply



Installation position example of 160 kW power supply

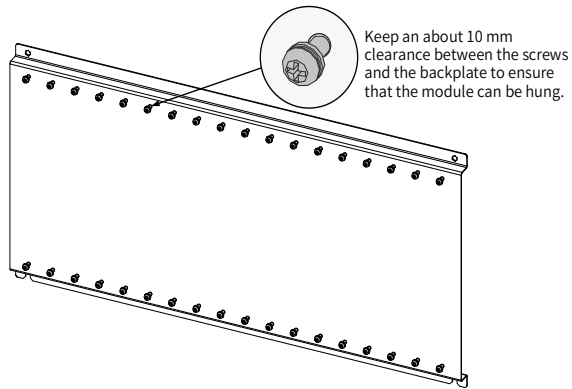


NOTE

- ◆ The 110 kW and 160 kW common bus external power terminals of the ES810 series power supply unit have been installed in the factory to facilitate site and external braking unit MDBUN connection.

2.4.3 Cabinet Installation

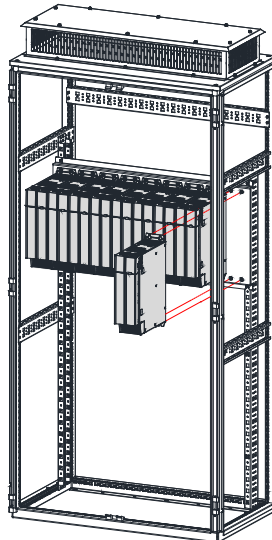
Step 1: Pre-install screws on the mounting backplate.



Step 2: Remove the cover of the unit.

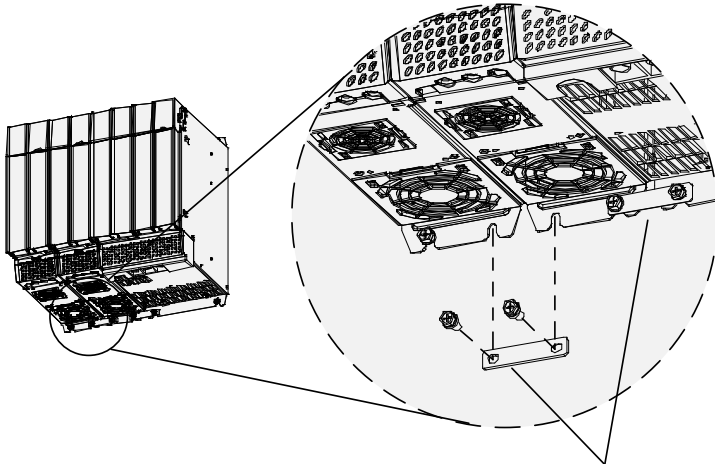
See "[2.4.2 Installation of the Power Supply Unit](#)".

Step 3: Attach the power supply unit to the pre-installed screws one by one.



Step 4: Install the EMC grounding aluminum bar.

To achieve correct grounding in the overall system and form an entirety (equipotential body), when the power supply unit and multiple drive units are installed on the installation face, grounding aluminum bars must be added on the mounting holes between units and fixed on the installation face to ensure that units are connected together using the grounding aluminum bars. (A grounding aluminum bar must be connected between two modules.)



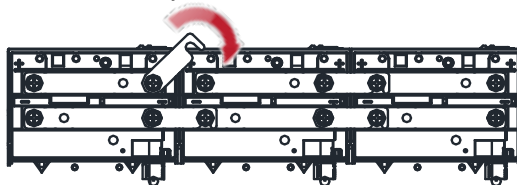
EMC grounding aluminum bars (machine accessories, standard delivery)

Cascade every machine with EMC grounding aluminum bars.

Step 5: Tighten the mounting screws.

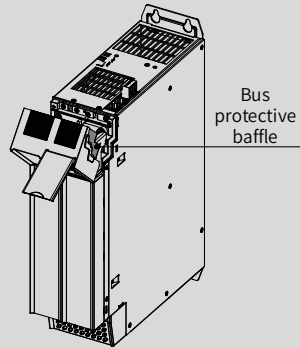
Step 6: Connecting the built-in busbar: Unscrew the built-in busbar, turn the connecting busbar, and tighten the busbar screws.

Rotary connection



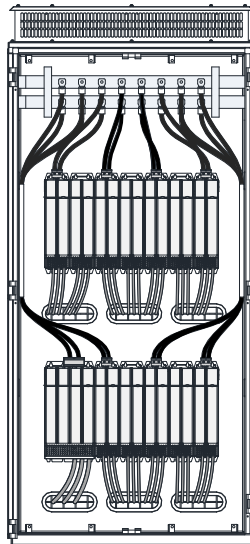
**NOTE**

- ◆ Before connecting the built-in busbar, remove the left and right bus protective baffles in the top cover with tools such as nipper pliers/diagonal pliers. The following figure shows the position of the bus protective baffle.



- ◆ When a row of units are installed, the left bus protective baffle of the leftmost unit and the right bus protective baffle of the rightmost unit must be reserved to prevent electric shock.

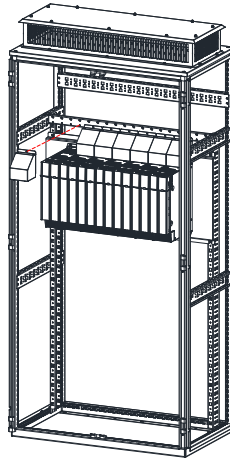
Step 7: Connect the cabinet busbar, common bus external power terminals, and power cable.



Step 8: Connect the control cable and PE grounding cable by referring to "[3 Electrical Installation](#)".

Step 9: Install the cover by referring to "[2.4.2 Installation of the Power Supply Unit](#)".

Step 10: Install the wind scooper option.

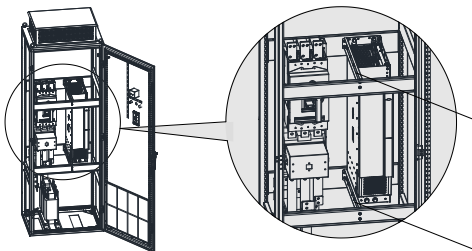


Step 11: Finish the installation.

2.5 Auxiliary Installation for Cabinet Transportation

The following principles must be followed before cabinet transportation to avoid damage to the power supply unit during cabinet transportation:

- The booksize unit must be installed in close arrangement. Do not install two or fewer sets and even separately install them.
- A cross beam must be added on the side for auxiliary fixing during the installation of the vertical tower unit, as shown in the following figure.
- The mounting screws of the power supply unit must be not only fixed on the mounting backplate by tapping, but also riveted with nuts or added with independent nuts on the back of the backplate to engage the screw threads and strength as much as possible.
- The mounting backplate of the power supply unit must have enough stiffness and strength and a thickness of not less than 2 mm. Backplate reinforcement must be performed at the top and bottom mounting feet. For details of the recommended reinforcement scheme, see "[2.3.2 Mounting Backplate Design Requirements](#)".



Upper and lower cross beams (self-made according to an actual cabinet), fixed with six M6 screws for auxiliary fixing during cabinet transportation. They can be removed for recycling after arrival at the terminal site.

3 Electrical Installation

The 810 series power supply unit applies to the MD810, IS810, ES810, and TD810 series drive units. This chapter describes only the electrical installation of the power supply unit. For the electrical installation of the drive units, refer to their manuals.

Safety Instructions

Danger

- ◆ Never perform wiring at power-on. Failure to comply may result in electric shock. Keep the breaker in OFF state.

Warning

- ◆ When installing the power supply unit in an enclosed cabinet or shell box, cool it fully with a cooling fan or air conditioning to keep the air inlet temperature of the power supply below 50°C . Failure to comply may result in overheat or fire.

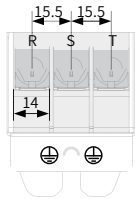
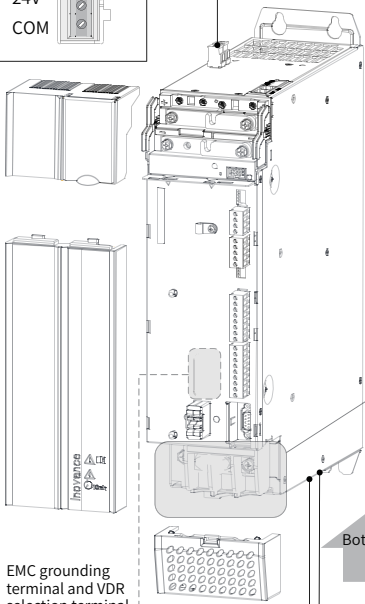
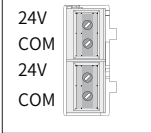
Caution

- ◆ Cover the top of the power supply unit with a cloth or paper during installation to prevent metal filing, oil, and water from entering the power supply unit during drilling.
- ◆ If foreign objects enter the power supply unit, it may result in the failure of the power supply unit.
- ◆ After the installation work is completed, remove the paper or cloth. If the cloth or paper continues to cover the top, the ventilation may become bad, resulting in abnormal heating of the power supply unit.
- ◆ When operating the power supply unit, follow the procedure specified the ESD to avoid static damage to any internal circuit of the power supply unit.
- ◆ When the motor runs at a low speed, the cooling effect will drop. With the temperature increasing, it may result in motor failure due to overheating. Improvement on motor cooling conditions may be taken into consideration.
- ◆ The motor speed control range varies with lubrication methods and manufacturers.
- ◆ When running the motor beyond the speed control range, consult the motor manufacturer.
- ◆ The torque characteristics with the power supply unit used for the drive are different from those with the commercial power supply used for the drive. Please check the load torque characteristics of the machinery to be connected.
- ◆ Pay attention to this when selecting a power supply unit capacity. In addition, when the wiring distance between the motor and the drive unit is long, the motor torque will be reduced due to voltage drop. Please use a cable with enough thickness to perform wiring.

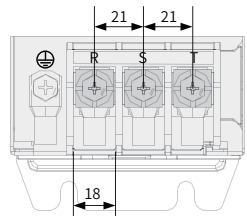
3.1 Main Circuit Wiring

3.1.1 Assignment of Terminals in the Power Supply Unit

24 V power input

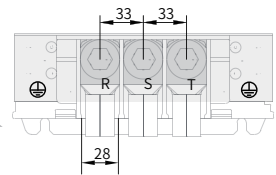


MD810-20M4T22GXXX
TD810-20M4T22GXXX
ES 810-20M4T56-10



MD810-20M4T45GXXX
TD810-20M4T45GXXX
ES 810-20M4T110-10

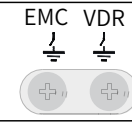
Main circuit terminals



MD810-20M4T110GXXX
TD810-20M4T110GXXX
ES 810-20M4T240-00

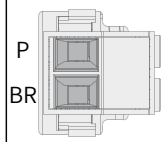


EMC grounding terminal and VDR selection terminal

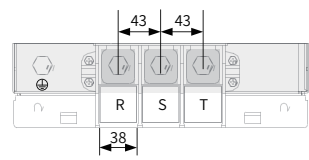


For 22 kW and 45 kW models, the terminals are located at the bottom of the machine. For 110 kW to 160 kW models, open the lower cover to see the terminals, as shown in the dashed box in the figure.

Braking resistor terminal



(Only 22 kW and 45 kW models have these terminals.)



MD810-20M4T160GXXX
TD810-20M4T160GXXX
ES 810-20M4T358-00

Figure 3-1 Assignment and dimensions of terminals in power supply unit (booksize, unit: mm)

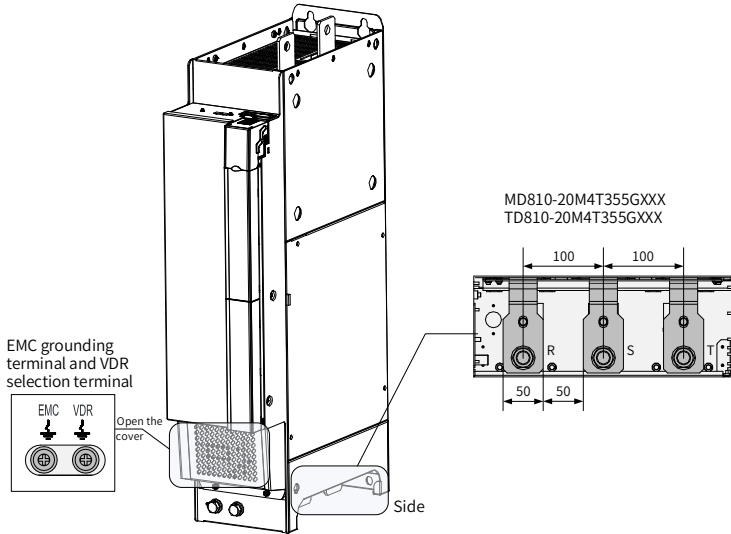


Figure 3-2 Assignment and dimensions of terminals in power supply unit (vertical tower, unit: mm)

Table 3-1 Power cable selection of 810 series power supply unit

Power Supply Unit Model	PHd	AC INPUT	Recommended Input IEC Cable Specifications
	kW	A	mm ²
MD810-20M4T22GXXX	22	59	10
MD810-20M4T45GXXX	45	112	25
MD810-20M4T110GXXX	110	196	95
MD810-20M4T160GXXX(W)	160	292	150
MD810-20M4T355GXXX	355	619	2 × 185
TD810-20M4T22GXXX	22	59	10
TD810-20M4T45GXXX	45	112	25
TD810-20M4T110GXXX	110	196	95
TD810-20M4T160GXXX(W)	160	292	150
TD810-20M4T355GXXX	355	619	2 × 185
ES810-20M4T56-10	22	59	10
ES810-20M4T110-10	45	112	25
ES810-20M4T240-00	110	196	95

Power Supply Unit Model	PHd	AC INPUT	Recommended Input IEC Cable Specifications
	kW	A	mm ²
ES810-20M4T358-00	160	292	150

3.1.2 Description of Terminals in the Power Supply Unit

1) Input power supply R, S, T

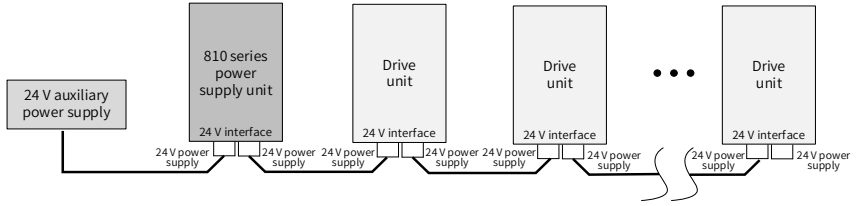
- Input wiring of the power supply unit, having no phase sequence requirements.
- The specifications and installation method of external power cables must comply with local regulations and related IEC requirements.
- Use copper conductors of a proper size as power cable wirings according to the recommended values of power cable selection in ["Table 3-1 Power cable selection of 810 series power supply unit"](#).
- The filter must be installed near the input terminals of the power supply unit and the connecting cable must be smaller than 30 cm. The grounding terminals of the filter and power supply unit must be connected together. Ensure that the filter and power supply unit are installed on the same conductive installation surface. This conductive installation surface must be connected to the main grounding of the cabinet.

2) DC bus (+, -)


- Note that there is a residual voltage at the DC bus (+, -) terminals just after power-off. You can perform wiring at least 10 minutes after power-off when the CHARGE indicator is off. Failure to comply may result in electric shock.
- When selecting an external braking component for the 45 kW power supply unit, note that the polarity must not be inversely connected. Failure to comply may result in damage to the power supply unit and braking component and even fire.
- The wiring length of the braking unit must not exceed 100 m. Use the twisted pair wire or tight pair wires for parallel connection.
- Do not connect the braking resistor directly to the DC bus. Failure to comply may result in damage to the power supply unit and even fire.

3) External 24 V power system

This system consists of an external 24 V power supply connected using a 24 V terminal at the top of the machine and different cascaded units. After this system is connected, the control part of the entire system can normally operate without adding any strong current and you can set parameters and inquire about fault information, improving security greatly.

**NOTE**

- ◆ Selection of external 24 V power supply: It must be selected according to 1 A current per set.
- ◆ Normal use is not affected without connecting the 24 V external power supply system.

- 4) Braking resistor connecting terminals BR and P (Built-in braking unit of 45 kW power supply unit)
 - For the selection of braking resistors, refer to a recommended value and the wiring distance must be smaller than 5 m. Failure to comply may result in damage to the power supply unit.
 - Note that no combustibles must exist around the braking resistor. Avoid igniting the surrounding components due to overheating of the braking resistor.
 - After connecting the braking resistor, set the braking unit actuation start voltage parameter F9-08 according to actual load.
- 5) Grounding terminal ()
 - The terminal must be reliably grounded. Failure to comply may result in operation abnormality and even damage to the equipment.
 - Do not connect the grounding terminal to the N terminal of the power supply.
 - The size of protective grounding conductors must be selected according to "[Table 3-1 Power cable selection of 810 series power supply unit](#)".
 - Use proper grounding cable with yellow/green insulation for protective grounding conductor.
 - It is recommended that the power supply unit be installed on a conductive metal mounting surface to ensure that the entire conductive bottom of the power supply unit is properly overlapped with the installation surface.
 - The filter and electric reactor must be installed on the same installation surface as the power supply unit to ensure the performance of the filter and electric reactor.

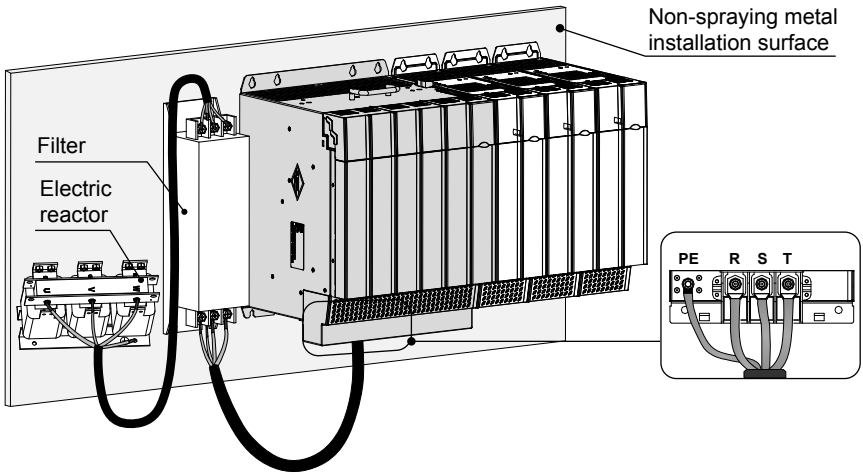


Figure 3-3 Protective grounding connection of main circuit terminals

6) VDR and safety capacitor (EMC) jumpers to ground

Where a leakage circuit breaker is configured, if leakage protector is tripped during startup, the screw of the safety capacitor (EMC) jumper to ground may be removed. For specific positions of the VDR and safety capacitor (EMC) jumpers to ground, see "[Figure 3-1 Assignment and dimensions of terminals in power supply unit \(booksize, unit: mm\)](#)" and "[Figure 3-2 Assignment and dimensions of terminals in power supply unit \(vertical tower, unit: mm\)](#)".

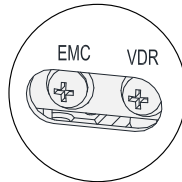


Figure 3-4 Positions of the VDR and safety capacitor (EMC) jumpers to ground

3.1.3 Cable Selection

1) Main circuit cable selection

It is recommended that a symmetrical shielded cable be used as the input main circuit cable. Compared with a four-core cable, a symmetrical shielded cable can reduce electromagnetic radiation of the entire conducting system.

- Recommended power cable type – symmetrical shielded cable:

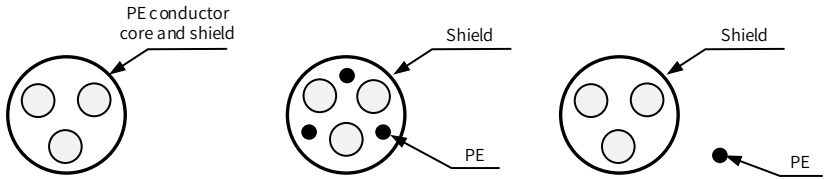


Figure 3-5 Recommended power cable type

- Non-recommended power cable type:

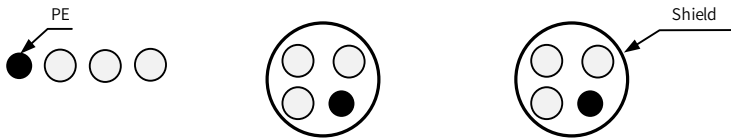


Figure 3-6 Non-recommended power cable type

2) Recommended lug selection

Reference data for recommended lugs (Suzhou Yuanli Metal Enterprise Co., Ltd)



GTNR series



TNR series



TNS series



NOTE

- ◆ For details of lug selection, see "[9.5.2 Lugs](#)" of this guide.

3.1.4 System Grounding

Securely ground every device in the system. Connect the power supply unit, drive units, and components such as the input electric reactor and filter to the PE copper bar in the cabinet by star connection, as shown in the following figure:

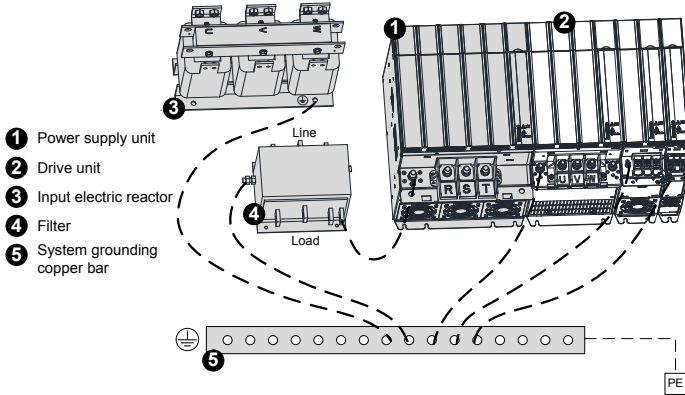


Figure 3-7 System protective grounding connection

3.2 Control Circuit Wiring

3.2.1 Assignment of Terminals in the Power Supply Unit

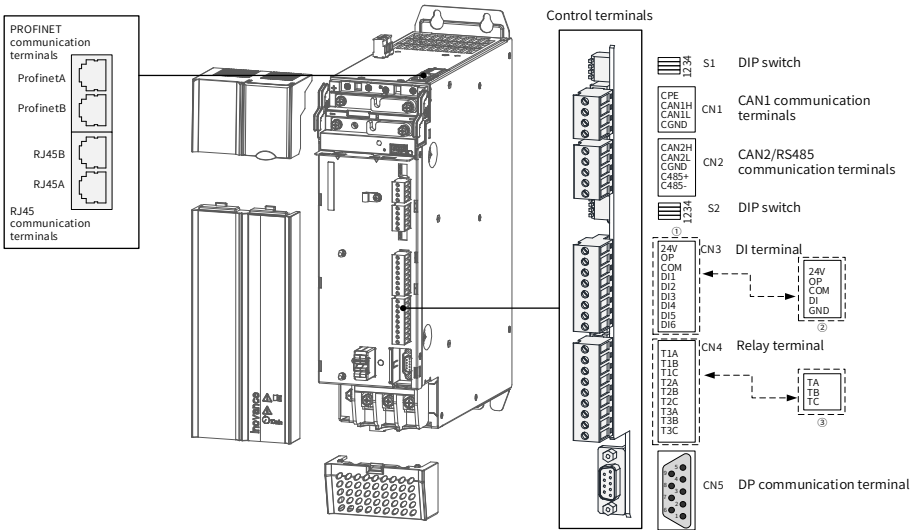
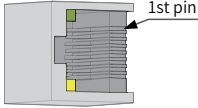
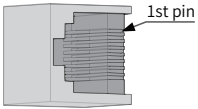


Figure 3-8 Assignment of control circuit terminals in the power supply unit



- ◆ The new version control terminals CN3 and CN4 change from ① to ②, and other terminals remain unchanged, as shown in the preceding figure.

Table 3-2 Definitions of control circuit terminals

Port Type	Interface Name		Function	Performance Indicator	
PROFINET communication interfaces (ProfinetA/ProfinetB)	1	TX+	Data sending+	The yellow indicator indicates that the link connection is normal. The green indicator indicates that the signal is normal.	
	2	TX-	Data sending-		
	3	RX+	Data receiving+		
	6	RX-	Data receiving-		
RJ45 communication interfaces (RJ45A/RJ45B)	1	CAN1H	CAN_H of CAN communication signal	CANopen/CANlink communication protocol supported.	
	2	CAN1L	CAN_L of CAN communication signal		
	3	CGND	Ground of CAN communication signal		
	4	RS485+	Positive of RS485 communication signal	Used for RS485 internal bus, external operating panel, and PC commissioning	
	5	RS485-	Negative of RS485 communication signal		
	6	CGND	Ground of RS485 communication signal		
	7	C7V	Power supply to an external LCD operating panel	Connect an external LCD operating panel.	
CANopen/CANlink (CN1)	CAN1H		CAN_H of CAN communication signal	CANopen/CANlink communication protocol supported; CAN1 external terminal of RJ45	
	CAN1L		CAN_L of CAN communication signal		
	CGND		Common ground of communication		
	CPE		Network cable shield		

Port Type	Interface Name	Function	Performance Indicator
Synchronous CAN and RS485 communication (CN2)	C485+	Positive of external RS485 communication signal	Modbus communication protocol supported
	C485-	Negative of external RS485 communication signal	
	CAN2H	CAN_H of CAN communication signal	Dedicated CAN for synchronous control
	CAN2L	CAN_L of CAN communication signal	
	CGND	Common ground of communication	
DI interfaces (CN3)	DI1~DI5 / DI	Ordinary multi-functional input terminal	Programmable terminal for isolated sink/source input Operating voltage range of 9 V to 30 V; ineffective voltage range below 5 V; input impedance of 3 kΩ; conformance of response time to the requirements for 100 Hz frequency input Note: The new version control board is equipped with one DI terminal (DI), and the older version control board is equipped with five DI terminals (DI1 to DI5).
	OP	Common terminal for multi-functional input terminal	Internally isolated from COM and 24 V. Shorted to 24 V with a U jumper by default.
	24 V	Internal 24 V	24 V ± 10%, no-load voltage of not more than 30 V, maximum output current of 200 mA, internally isolated from OP/CGND/GND.
	COM	Internal 24 V ground	Internally isolated from CGND and GND.
	GND	Reference ground of power supply	Note: Only the new version control board rectifier unit is equipped with the terminal.
Relay output interfaces (CN4)	T1A/T1B/T1C T2A/T2B/T2C T3A/T3B/T3C	T1A-T1B, T2A-T2B, T3A-T3B, TA-TB: NC; T1A-T1C, T2A-T2C, T3A-T3C, TA-TC: NO	Contact capacity: 250 VAC/3 A (COSφ = 0.4). Note: The new version control board rectifier unit is equipped with one relay interface (TA/TB/TC).

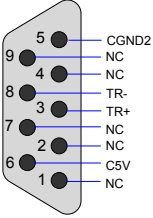
Port Type	Interface Name	Function	Performance Indicator
Profibus-DP communication terminals (CN5)	Unconnected	/	
	Unconnected	/	
	TR+	Profibus-DP bus plus	
	Unconnected	/	
	CGND2	Ground of Profibus-DP bus power supply	
	C5V	Profibus-DP bus power supply	
	Unconnected	/	
	TR-	Profibus-DP bus minus	
	Unconnected	/	

Table 3-3 Definition of DIP switches of the power supply unit

Terminal ID	Terminal Name	Function Description	Toggle Position
S1	Selection of RS485 termination resistor	Connect the termination resistor when switches 1 and 2 are turned on.	
		Connect no termination resistor when switches 1 and 2 are turned off.	
	Selection of CAN1 termination resistor	Connect the termination resistor when switches 3 and 4 are turned on.	
		Connect no termination resistor when switches 3 and 4 are turned off.	
S2	Selection of C485 termination resistor	Connect the termination resistor when switches 1 and 2 are turned on.	
		Connect no termination resistor when switches 1 and 2 are turned off.	
	Selection of CAN2 termination resistor	Connect the termination resistor when switches 3 and 4 are turned on.	
		Connect no termination resistor when switches 3 and 4 are turned off.	



NOTE

- ◆ Figure 3-8 shows the 45 kW power supply unit only. For the screw positions of EMC and VDR of other power supply units, see "[Figure 3-1 Assignment and dimensions of terminals in power supply unit \(booksize, unit: mm\)](#)" and "[Figure 3-2 Assignment and dimensions of terminals in power supply unit \(vertical tower, unit: mm\)](#)".
- ◆ Except the 22kW and 45 kW power supply unit, other power supply units are not provided with a built-in braking unit.

3.2.2 Control Circuit Wiring Requirements

- 1) Control circuit cable selection
 - All control cables must be shielded cables.
 - It is recommended to use shielded twisted pairs (STPs) as digital signal cables.

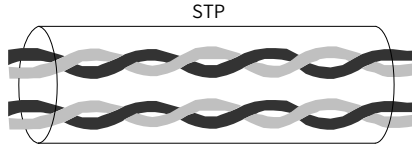


Figure 3-9 STP

- 2) Control circuit wiring requirements
 - The motor cable must be laid far from all control cables.
 - It is recommended that the motor cable, input power cable, and control circuit cables be located in different cable troughs. Avoid long-distant parallel routing of the motor cable and control circuit and electromagnetic interference resulting from coupling.
 - When the control circuit and the drive cable must be intersected, the intersection angle must be 90 degrees.

Recommended cabling diagram:

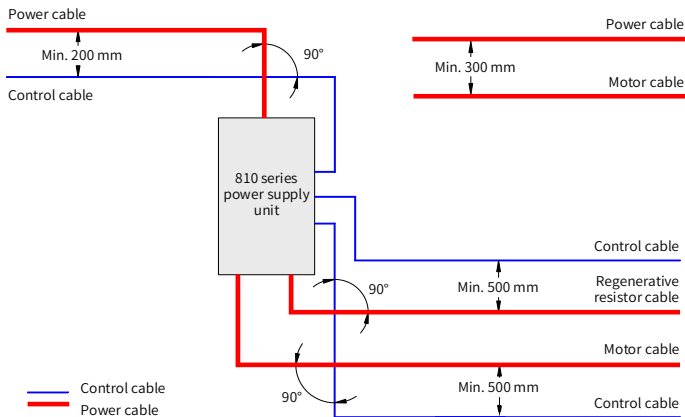


Figure 3-10 Cabling diagram

3.2.3 Description of Control Circuit Wiring

1) DI terminals

DI terminals are compatible with sink (NPN) and source (PNP) wiring methods.

■ Sink wiring method

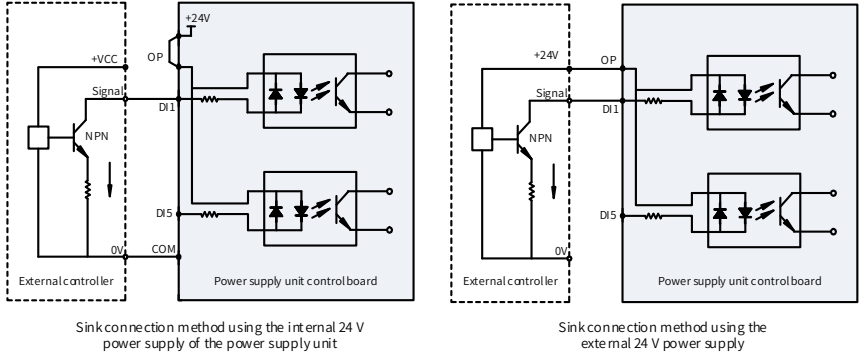


Figure 3-11 Sink wiring method

Using the internal 24 V power supply of the power supply unit is the most commonly used wiring method in which the OP of the power supply unit is shorted to the 24 V terminal and the COM terminal of the power supply unit is connected to the 0 V of the external controller.

If an external 24 V power supply is used, the jumper between the +24 V and the OP must be removed, the 24 V positive electrode of the external power supply must be connected to the OP terminal, and the 0 V of the external power supply is connected to a corresponding DI terminal using the controller contact.

■ Source wiring method

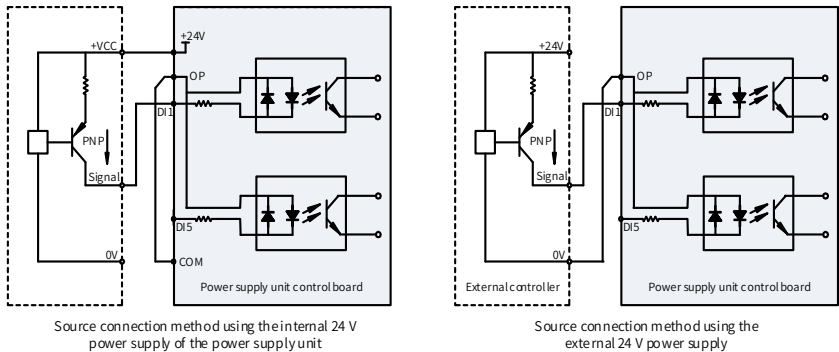


Figure 3-12 Source wiring method

If the internal 24 V power supply of the power supply unit is used, the jumper between the +24 V and the OP must be removed, the OP and COM must be connected together, and the +24 V and the common terminal of the external controller must be connected together.

If an external power supply is used, the jumper between the +24 V and the OP must be removed, the OP and the 0 V of the external power supply must be connected together, and the positive electrode of the 24 V of the external power supply must be connected to a corresponding DI terminal using the control contact of the external controller.

2) Relay output terminals

The inductive load (relay, contactor, and motor) causes voltage spike after the current is removed. A VDR must be used for protection at the relay contact and absorption circuits such as VDRs, RC absorption circuits and diodes must be installed on inductive loads to ensure minimum interference during cutoff.

When a contactor and an intermediate relay are connected to 220 V AC, a VDR must be paralleled at both ends of the drive coil of the contactor and intermediate relay and have a withstand voltage of more than 275 V AC. When a contactor and an intermediate relay are connected to 24 V DC, a freewheel diode must be inversely paralleled at both ends of the drive coil of the contactor and intermediate relay, i.e. the cathode and anode of the freewheel diode are connected to the 24 V side and non-24 V side of the drive coil respectively.

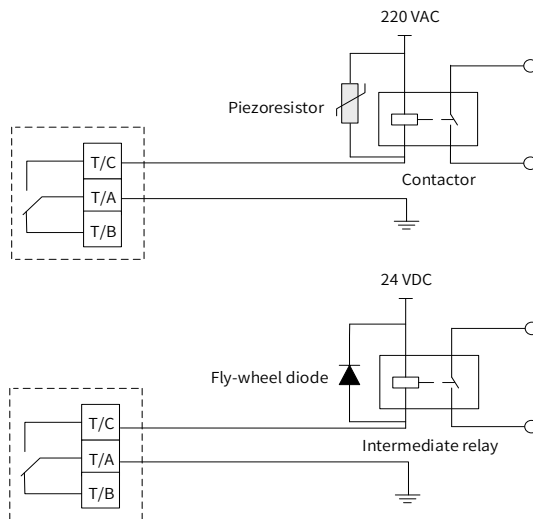


Figure 3-13 Anti-interference processing of relay output terminals



Warning

- ◆ If relay output terminals are connected to 220 V dangerous voltage, pay attention to distinguishing them from the surrounding safety extra-low voltage circuit terminals to ensure no misconnection. It must be taken into consideration that wiring must meet the requirements for reinforced insulation.
- ◆ The external 220 V power supply connected to the relay must be used in an environment with overvoltage class II (OVC II).

3) DI/DO terminals

DIO1 and DIO2 can be used as DI or DO terminals. The current specific function depends on the setting of F4-41 (DIO terminal type). DIO1 and DIO2 are DI terminals by default. Note that DIO1 and DIO2 cannot be used as DI and DO terminals at the same time.

When they are used as DI terminals, the wiring method is consistent with the preceding DI1- DI2. When DIO is used as DO, DO common terminal is COM and only the sink wiring method is supported, as shown in the following figure. At this moment, it is recommended to connect the DI common terminal OP of DIO to the 24 V to avoid the following case: When the OP is connected to the COM, customer's equipment will receive input signals before DIO performs output.

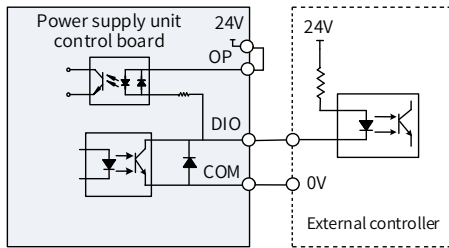


Figure 3-14 DO terminal wiring

4 Panel Operations

The 810 series power supply unit applies to the MD810, IS810, ES810, and TD810 series drive units. This chapter describes only the panel operations of the power supply unit. For the panel operations of the drive units, refer to their manuals.

The commissioning tools of the 810 series power supply unit mainly include the LED operating panel, the external LCD operating panel, and the commissioning software.

4.1 LED Operating Panel

You can perform operations such as parameter setting/modification, operating status monitoring, and motor parameter auto-tuning on the power supply unit using this LED operating panel. The following figure shows the appearance and operation key names of the LED operating panel.

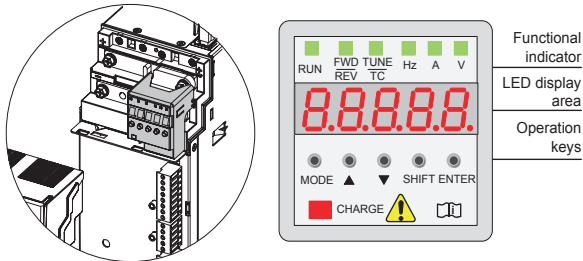


Figure 4-1 LED operating panel

4.1.1 Function Indicators

🟢 in the following table indicates ON; ■ indicates OFF; 🟡 indicates flash.

Table 4-1 Description of indicators on the LED operating panel

Indicator State		State Description
RUN indicator	■ RUN	Off: Stop
	🟢 RUN	On: Running
FWD/REV indicator	■ FWD/REV	Off: Forward running
	🟡 FWD/REV	On: Reverse running

Indicator State			State Description
ERR/TC/TUNE Fault/Torque control/ Auto-tuning indicator		ERR/TC/TUNE	Off: Speed mode
		ERR/TC/TUNE	ON (green): Torque control mode
		ERR/TC/TUNE	Slow flash (green): Auto-tuning state (1 time/s)
		ERR/TC/TUNE	Quick flash (red): fault state (4 times/s)
			Speed/Frequency unit: RPM/Hz
			Current unit: A
			Voltage unit: V
			Parameter unit: %

4.1.2 LED Display Area

There are 5-digit LEDs on the LED operating panel to display the set frequency, output frequency, various monitoring data, and alarm codes.




Table 4-2 LED display and actual data

LED Display	Actual Data	LED Display	Actual Data	LED Display	Actual Data	LED Display	Actual Data
0	0	7	7	d	D	o	o
1	1	8	8	E	E	P	P
2	2	9	9, g	F	F	r	R
3	3	A	A	H	H	f	T
4	4	b	B	J	J	U	U
5	5, S	C	C	L	L	u	u
6	6	c	c	N	N		

4.1.3 Key Functions



Table 4-3 Key function description

Key	Key Name	Function Description
	Programming	Enter or exit a menu, and perform parameter query mode switchover.
	Up	Data or parameter increment

Key	Key Name	Function Description
	Down	Data or parameter decrement
 SHIFT	Shift	<ul style="list-style-type: none"> ◆ Select the displayed parameter in the STOP or RUNNING status. ◆ Select the digit to be modified when modifying a parameter value.
 ENTER	ENTER	<ul style="list-style-type: none"> ◆ Enter each level of menu interface. ◆ Confirm displayed parameter setting.

4.1.4 Parameter Viewing and Modification Methods

The LED operating panel of the 810 series power supply uses a three-level menu structure to perform operations such as parameter settings. After entering a menu at

every level, press  and  to perform modification when a display bit flashes. The following figure shows the operation flow.

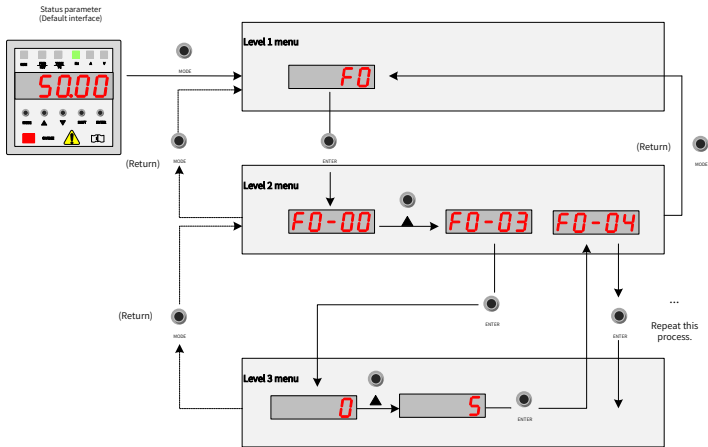


Figure 4-2 Operation flowchart for the 3-level menu structure

Example of changing F3-02 (Cut-off frequency of torque boost) from 10.00 Hz to 15.00 Hz:

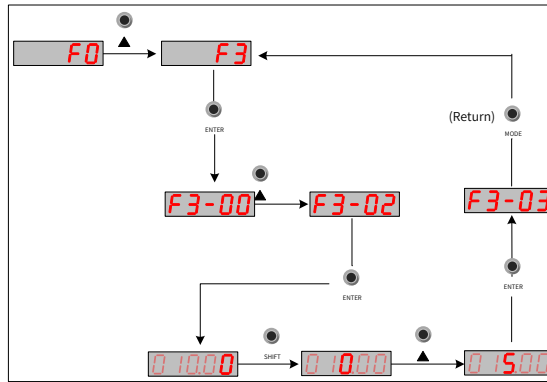


Figure 4-3 Parameter modification

- You can press or to return to a level-2 menu when performing level-3 menu operations. The difference between both keys is as follows:

Pressing is to save a set parameter and then return to a level-2 menu and automatically transfer to the next parameter. Pressing is to give up the current parameter modification and directly back to a level-2 menu with the current parameter

No.

- If a parameter does not include a flashing digit in level-3 menu state, the parameter cannot be modified. Two possible reasons are:
 - 1) The parameter is an unmodifiable parameter such as the power supply unit type, actual detection parameter, and running record parameter.
 - 2) The parameter cannot be modified while the AC drive is in RUNNING status. You can modify these types of parameters only when the AC drive is in the STOP status.

4.1.5 Parameter Viewing

The 810 series power supply units have many parameters and three parameter viewing methods are provided. The default is the basic viewing method (to view all parameter groups). By setting of FP-03 (Setting of monitoring parameter display 1), two quick parameter viewing methods are also provided.

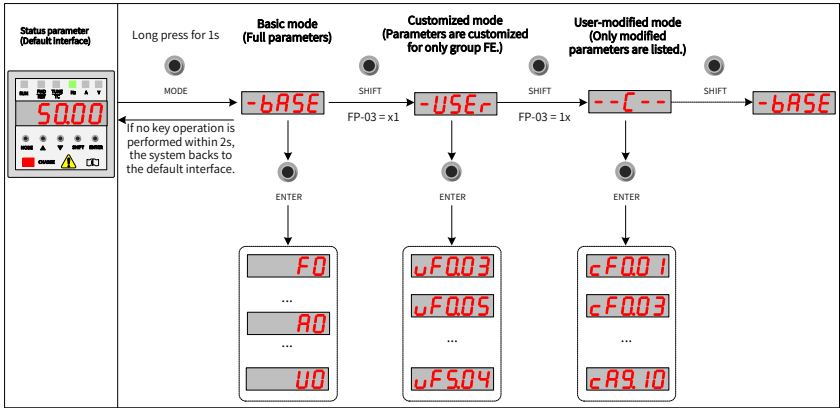


Figure 4-4 Parameter viewing methods

As shown in the preceding figure, the parameter display form such as uF3.02 in the customized mode menu indicates the function parameter F3-02. The operation method of modifying parameters in the customized menu is the same as that of modifying corresponding parameters in ordinary programming state. The operating panel provides three viewing modes, as listed in the following table.

Parameter Display Method	Display	Description
User-defined parameter display	-USEr	View user-defined parameters.
User-modified parameter display	--C--	View parameters different from defaults.
Function parameter display	-bA5E	View all parameters.



1 Basic viewing method

The basic parameter group, i.e. all parameters of the power supply unit, can be queried or modified by the operation method described in "[4.1.4 Parameter Viewing and Modification Methods](#)". Three parameter display modes can be switched over by pressing


MODE on the panel. After entering group parameters, the viewing or modification methods are the same as operation methods described in "[4.2 External LCD Operating Panel](#)".


2 Quick viewing methods

If you want to display user-defined groups and user-modified parameter groups, set FP-03 (Setting of monitoring parameter display 1) to 11 (DI function status 2).

Parameter	Function	Default	Setting Range	Parameter Description
FP-03	Selection of function parameter group display	11	Ones: Selection of  0: Disabled; 1: Enabled	Determine whether to display user-defined groups and user-modified parameter groups.
			Tens: Selection of  0: Disabled; 1: Enabled	

■ Viewing user-defined parameter groups

Long press  on the panel to enter the "user-defined parameter" mode

 and view user-defined parameters.

Method of defining parameters by users: You can define up to 32 commonly used parameters in group FE (FE-00 to FE-31). There are 16 user-defined parameters (FE-00 to FE-15) in group FE by default. You can modify these default parameters as required. If a parameter in group FE is set to F0.00, it indicates that no user-defined parameter is defined.





If  is displayed when you long press  to enter a menu, it indicates that the customized menu is empty. The following table shows the default parameters in a customized menu:

Table 4-4 Commonly used parameters in a customized menu

Parameter	User-defined Parameter	Name	Parameter	User-defined Parameter	Name
FE-00	F0-01	Control mode	FE-01	F0-02	RUN command selection
FE-02	F0-03	Main frequency reference input selection	FE-03	F0-07	Frequency source superposition selection
FE-04	F0-08	Preset frequency	FE-05	F0-17	Acceleration time
FE-06	F0-18	Deceleration time	FE-07	F3-00	V/F curve setting
FE-08	F3-01	Torque boost	FE-09	F4-00	D1 terminal function selection
FE-10	F4-01	D12 terminal function selection	FE-11	F4-02	D13 terminal function selection
FE-12	F5-04	DO1 output selection	FE-13	F5-07	AO output selection
FE-14	F6-00	Start mode	FE-15	F6-10	Stop mode


■ Viewing user-modified parameters

Long press  on the panel to enter the "user-modified parameter" mode

 and view parameters different from defaults.

This mode facilitates your access to modified parameters. User-modified parameters are listed in user-modified parameter groups, i.e. the current setting values are different from defaults. These parameters are in a list that is automatically generated by the power supply unit.



3 State parameter query

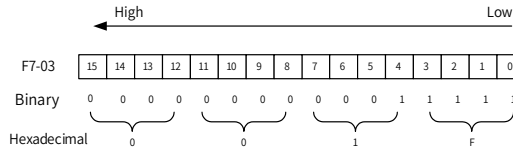
In stop or running state, multiple state parameters can be displayed by pressing  on the operating panel to switch over every byte of F7-03 (Running display parameter 1), F7-04 (Running display parameter 2), and F7-05 (Stop display parameter).

Thirty-two running state parameters are available in running state. Select whether to display a parameter corresponding to every bit according to binary bits of F7-03 (Running display parameter 1) and F7-04 (Running display parameter 2). Thirteen stop state parameters are available in stop state. Select whether to display a parameter corresponding to every bit according to binary bits of F7-05 (Stop display parameter).

Example:

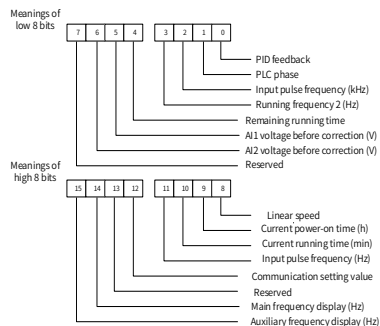
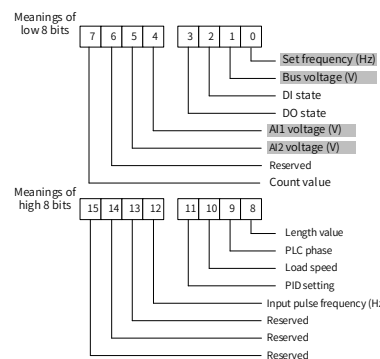
Viewing parameters in running state using the panel: (Running frequency, bus voltage, output voltage, output current, output power, and PID settings)

- 1) Set a corresponding bit to 1 according to the corresponding relation between every byte in F7-03 (Running display parameter 1) and the preceding parameters.
- 2) After converting this binary number to a hexadecimal number, set it in F7-03 (Running display parameter 1). Use the operating panel to set the value that is displayed as  .
- 3) View values of related parameters by pressing  on the operating panel to switch over every byte of F7-03 (Running display parameter 1). The following figure shows the setting:



The method of viewing other state parameters is the same as F7-03 (Running display parameter 1). The corresponding relation between the state parameters and every byte of F7-03 (Running display parameter 1), F7-04 (Running display parameter 2), and F7-05 (Stop display parameter) is as follows:

Parameter	Function	Default	Setting Range	Parameter Description
F7-03	Running display parameter 1	1F	0000 to FFFF	<p>If the following parameters need to be displayed in running, set their corresponding positions to 1. After converting this binary number to a hexadecimal number, set it in F7-03.</p> <p>Meanings of low 8 bits</p> <ul style="list-style-type: none"> Running frequency (Hz) Set frequency (Hz) Bus voltage (V) Output voltage (V) Output current (A) Output power (kW) DI state <p>Meanings of high 8 bits</p> <ul style="list-style-type: none"> DO state AI1 voltage (V) AI2 voltage (V) Speed Count value Length value Load speed display PID setting <p>Note: The part with shading is default display.</p>

Parameter	Function	Default	Setting Range	Parameter Description
F7-04	Running display parameter 2	0	0000 to FFFF	<p>If the following parameters need to be displayed in running, set their corresponding positions to 1. After converting this binary number to a hexadecimal number, set it in F7-04.</p> 
F7-05	Stop display parameter	0	0000 to FFFF	<p>If the following parameters need to be displayed upon stop, set their corresponding positions to 1. After converting this binary number to a hexadecimal number, set it in F7-05.</p>  <p>Note: The part with shading is default display.</p>



NOTE

- ◆ If the power supply unit is repowered on, the displayed parameter is the parameter selected before power-off by default.

4.2 External LCD Operating Panel





The external LCD operating panel (model SOP-20) is Inovance's new-generation commissioning aid of frequency control system and supports products such as MD810, IS810, ES810, and TD810 series. The external LCD operating panel has a wide power supply range and LCD display, supports multibus and applies to the single-drive/multidrive system. The operating panel provides the functions such as parameter setting, state monitoring, simple oscilloscope, parameter copy, fault analysis and locating, program download, and USB relay. The following section describes the display interface of the MD810 drive unit. For details of the operating panel interface display of other drive units, refer to their user manuals.

4.2.1 Appearance and Page



Figure 4-5 Appearance of external LCD operating panel

Name	Legend	Function Description
Left soft key		Used to execute the display function at the bottom left of the screen.
Right soft key		Used to execute the display function at the bottom right of the screen.
Toggle key		Used to quickly enter the equipment list page. In some pages where operations cannot be interrupted by this key, the quick model toggle function is disabled and this key is invalid.
Arrow keys		The up and down arrow keys are used to select options in a display menu and list, scroll up and down a text page and adjust a value (e.g. setting time, entering a password or changing a parameter value). The left and right arrow keys are used to move the cursor left and right.

Name	Legend	Function Description
Help key		Used to open a help page. A help page depends on the context, i.e. the contents of this page are related to a corresponding menu or view. For more information about a help page, refer to "Help".
RUN key		Used to start up the drive in local control mode.
Stop key		Used to stop the drive in local control mode. When the equipment is faulty, the stop key is used to reset the equipment.
Loc/Rem toggle key		Used to switch control between the control panel (local) and the remote connection (remote).

Main interface display:

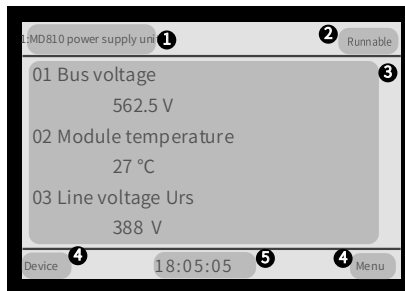
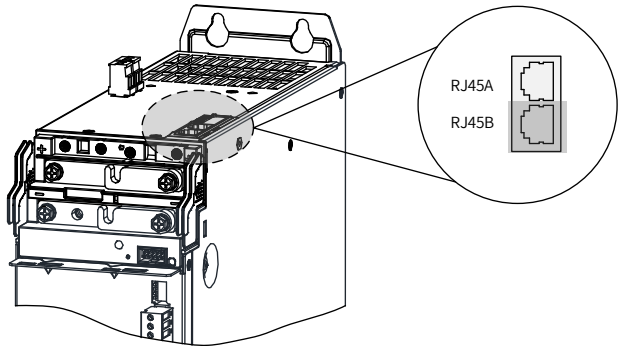


Figure 4-6 Main interface of the external LCD operating panel



- ① Current equipment information: The value in the front is station No. The value in the rear is a specific equipment name.
- ② Equipment status and fault information: Displays the running status information of the current equipment. When the equipment fails, fault information is displayed by flashing and the running status is not displayed.
- ③ Content area: Displays actual contents of a view in this area. Contents of every view are different. The preceding example view is a homepage.
- ④ Soft key selection: Displays the soft key function in the given context.
- ⑤ Clock: Displays the current time.

4.2.2 Wiring

The commissioning operation can be performed by connecting the RJ45 interface at the back of the external LCD operating panel to the RJ45B interface at the top of the 810 series power supply unit using a standard network cable. The following figure shows the interface of the 810 series power supply unit.



4.2.3 Status Viewing

After the external LCD operating panel wiring is started, the main interface is the status information interface of the power supply unit with the current default station No., as shown in the following figure. Press  and  to view more status information.

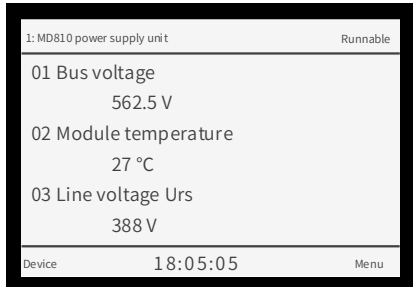






Figure 4-7 Status page

Press  to enter the equipment list page. Press  and  to move the cursor. After selecting a machine to be viewed, press  to enter the status information page of this machine.

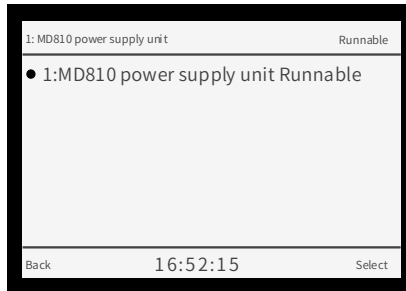



Figure 4-8 Equipment list page

4.2.4 Parameter Setting

Press  on the main page to enter the parameter setting interface. The following figure shows the setting procedure.

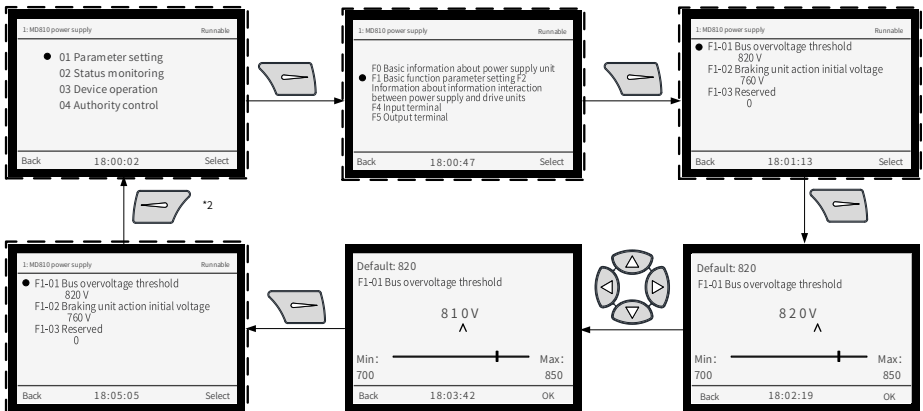




Figure 4-9 Parameter setting



- ◆ Press  in the page with a box  to enter the equipment list page and select the parameter setting of other machines.

4.2.5 Parameter Copy

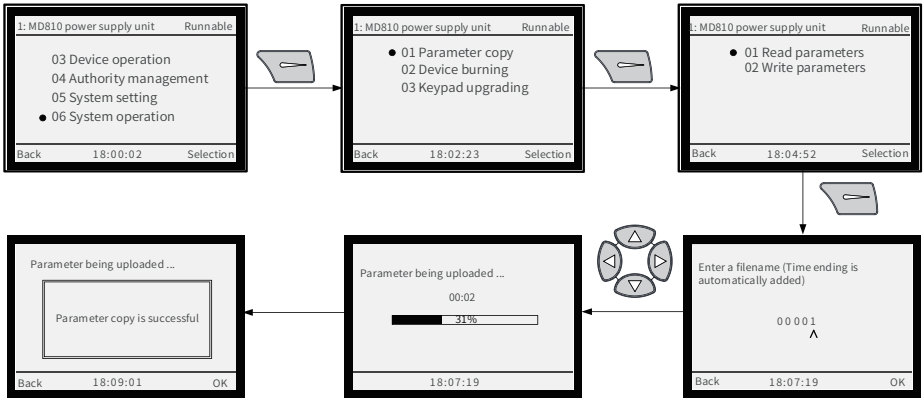


Figure 4-10 Parameter uploading

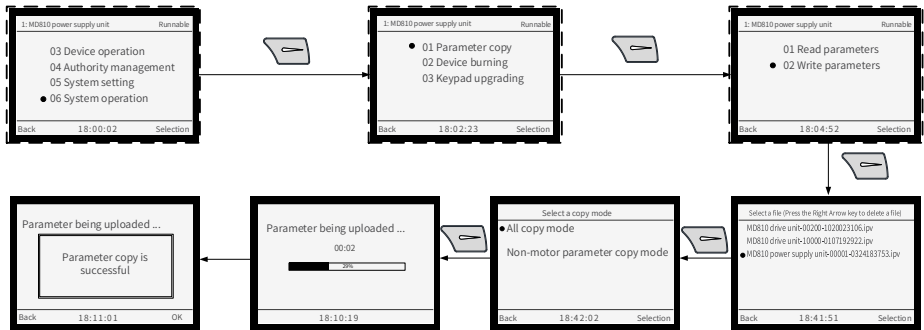




Figure 4-11 Parameter downloading



◆ Press  in the page with a box  to enter the equipment list page and select the parameter copy and equipment burning functions of other machines in the station.

4.2.6 Fault Query

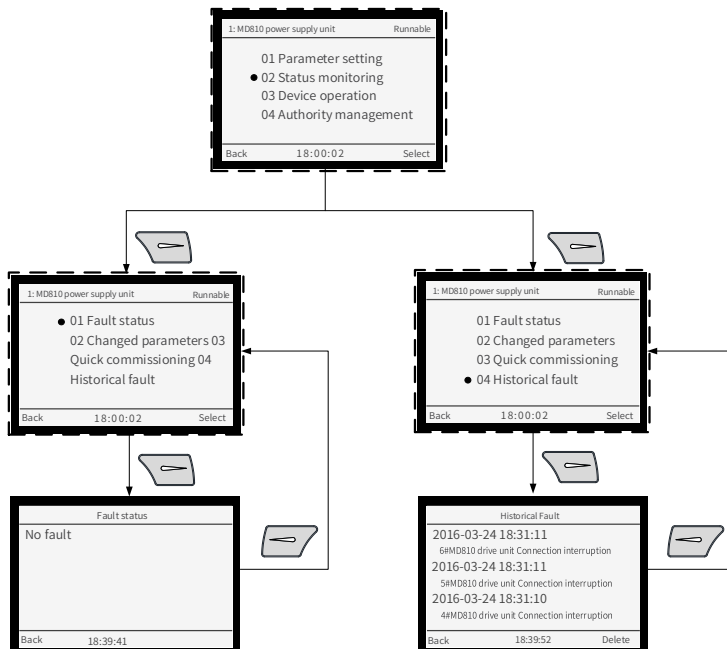




Figure 4-12 Fault query

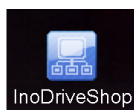


NOTE

- ◆ The current fault information list is displayed in Fault State. The historical fault information list is displayed in Historical Fault.
- ◆ Press  in the page with a box  to enter the equipment list page and select the fault state query of other machines in the station.

4.3 InoDriveShop

InoDriveShop is a piece of commissioning software developed for the 810 series power supply unit. The following figure shows the software icon.



The functions such as real-time monitoring, parameter configuration, oscilloscope, Profibus-DP bus configuration, and emergency stop are implemented on the PC using the InoDriveShop commissioning software.

For details of the introduction and operating instructions of the InoDriveShop software, refer to the user manuals of the drive units.

5 Parameter Description

The 810 series power supply unit applies to the MD810, IS810, ES810, and TD810 series drive units. This chapter describes only the parameter description of the power supply unit. For the parameter description of the drive units, refer to their manuals.

5.1 Basic Information

Basic information about the 810 series power supply unit includes the product model, software version and other information. Information has been determined during product delivery. Parameters in this group can be displayed, but cannot be modified.

Parameter	Function	Default	Setting Range	Parameter Description
F0-01	Product model	810	810	MD810
F0-02	Software version	uxx.xx	uxx.xx	Software version
F0-03	Temporary software version	Lxx.xx	Lxx.xx	Temporary software version
F0-04	Customized No.	Fxx.xx	Fxx.xx	Customized software version

xx.xx in the software version indicates specific version figures when leaving the factory.

5.2 Parameter Settings of Basic Functions

Parameter	Function	Default	Setting Range	Parameter Description
F1-00	Bus undervoltage threshold	350 V	300 V to 500 V	Undervoltage threshold of bus voltage

When the bus voltage is lower than the F1-00 setting value, the system judges it as undervoltage state. When the system is in undervoltage state, it will go against with-load running of the drive unit. This parameter must be set according to the actual application.

Parameter	Function	Default	Setting Range	Parameter Description
F1-01	Bus overvoltage threshold	820 V	700 V to 850 V	Overvoltage threshold of bus voltage

When the bus voltage is higher than F1-01 setting value, the system judges it as overvoltage state. When the system is in overvoltage state, the operating panel of the power supply unit flashes. If the motor runs in generation state, it may result in continuous rise of the bus voltage. When the bus voltage is too high, there is a risk of damage to the system. This parameter must be correctly set according to the actual application.

Parameter	Function	Default	Setting Range	Parameter Description
F1-02	Start voltage of braking unit actuation	760 V	700 V to 800 V	When the bus voltage is higher than the setting value, the braking unit is actuated.

When the bus voltage is higher than the F1-02 setting value, the braking unit is actuated, playing a role in reducing the bus voltage. When the braking pipe is connected, large energy consumption is generated on the braking resistor instantaneously. A braking resistor must be correctly configured according to actual application to ensure good cooling of the braking resistor.

Parameter	Function	Default	Setting Range	Parameter Description
F1-09	Fan control mode	1	0: The fan runs automatically.	When the temperature is higher than 45°C, the fan runs. When the temperature is lower than 40°C, the fan stops.
			1: The fan always runs.	The fan always runs after the system is powered on.

If F1-09 is set to 0, when the heat sink or braking pipe temperature is higher than 45°C, the fan starts to run. When the temperature is lower than 40°C, the fan stops.

Parameter	Function	Default	Setting Range	Parameter Description
F1-10	Selection of braking unit fault protection	111	0: Disabled	The system forcedly enables braking unit fault protection.
			1: Enabled	

This parameter is unmodifiable. When overcurrent, overload or short circuit occurs in the braking unit, the system forcedly performs protection to avoid damage to the braking unit.

Parameter	Function	Default	Setting Range	Parameter Description
F1-11	Selection of three-phase input abnormality protection	111	0: Disabled	When three-phase input is abnormal, select whether to perform protection.
			1: Enabled	

Three-phase input abnormalities include phase loss, three-phase imbalance and high power grid voltage. When the unit's digit is set to 0, power grid phase loss is not protected. When the unit's digit is set to 1, power grid phase loss is protected. When the ten's digit is set to 0, power grid voltage is not protected. When the ten's digit is set to 1, high power grid voltage is protected. When the hundred's digit is set to 0, three-phase

imbalance is not protected. When the hundred's digit is set to 1, three-phase imbalance is protected.

When F1-11 is set to 0, the power supply unit does not detect any fault. When the system continues to run, the risk of damage to the system will increase.

Parameter	Function	Default	Setting Range	Parameter Description
F1-13	Selection of communication abnormality protection	1	0: Disabled	The system forcedly performs protection in case of communication abnormality.
			1: Enabled	
F1-14	Selection of module overheat protection	1	0: Disabled	The system forcedly performs protection in case of module overheat.
			1: Enabled	
F1-15	Selection of EEPROM abnormality protection	1	0: Disabled	The system forcedly performs protection in case of EEPROM abnormality.
			1: Enabled	

The preceding three parameters are unmodifiable. When communication abnormality, module overheating or EEPROM abnormality occurs, the system forcedly performs protection to ensure system reliability.

Parameter	Function	Default	Setting Range	Parameter Description
F1-17	Selection of protection against communication abnormality between the power supply and drive units	1	0: Disabled	Select whether to perform protection in case of communication abnormality between the power supply and drive units.
			1: Enabled	

When communication of the power supply unit with the drive unit is abnormal, set F1-17 to 1 and the power supply unit gives an A16.13 alarm; set F1-17 to 0 and the power supply unit does not give an alarm.

Parameter	Function	Default	Setting Range	Parameter Description
F1-18	Waiting time for timeout of communication between the power supply and drive units	5.00s	1.00s to 20.00s	When the time for the power supply failing to communicate with the drive unit exceeds this setting value, the power supply gives an alarm.

5.3 Information Exchange Setting Between the Power Supply and Drive Units

When the power supply unit is faulty, it transfers a message to the drive unit that then performs corresponding actions according to message contents.

Parameter	Function	Default	Setting Range	Parameter Description
F2-00	Drive unit protection action against high power grid voltage	2	1: Run	When the power supply unit detects any high power grid voltage fault, it transfers "coast to stop" command to the drive unit.
			2: Coast to stop	
			3: Stop by a setting method	
F2-01	Drive unit protection action against low power grid voltage	1	1: Run	When the power supply unit detects any low power grid voltage fault, it transfers the "run" command to the drive unit.
			2: Coast to stop	
			3: Stop by a setting method	
F2-02	Drive unit protection action against three-phase imbalance	3	1: Run	When the power supply unit detects any three-phase imbalance, it transfers the "stop by a setting method" command to the drive unit.
			2: Coast to stop	
			3: Stop by a setting method	
F2-03	Drive unit protection action against input phase loss	3	1: Run	When the power supply unit detects any input phase loss, it transfers the "stop by a setting method" command to the drive unit.
			2: Coast to stop	
			3: Stop by a setting method	
F2-04	Drive unit protection action against braking unit short circuit	2	1: Run	When the power supply unit detects any braking unit short circuit, it transfers the "coast to stop" command to the drive unit.
			2: Coast to stop	
			3: Stop by a setting method	
F2-05	Drive unit protection action against braking unit overcurrent	1	1: Run	When the power supply unit detects any braking unit overcurrent, it transfers the "run" command to the drive unit.
			2: Coast to stop	
			3: Stop by a setting method	
F2-06	Drive unit protection action against braking unit overload	1	1: Run	When the power supply unit detects any braking unit overload, it transfers the "run" command to the drive unit.
			2: Coast to stop	
			3: Stop by a setting method	
F2-09	Drive unit protection action against communication fault	1	1: Run	When any communication fault occurs in the power supply unit, it transfers the "run" command to the drive unit.
			2: Coast to stop	
			3: Stop by a setting method	

Parameter	Function	Default	Setting Range	Parameter Description
F2-11	Drive unit protection action against EEPROM fault	3	1: Run	When any EEPROM fault occurs in the power supply unit, it transfers the "stop by a setting method" command to the drive unit.
			2: Coast to stop	
			3: Stop by a setting method	
F2-12	Drive unit protection action against module overheat	2	1: Run	When the power supply unit detects any module overheat, it transfers the "coast to stop" command to the drive unit.
			2: Coast to stop	
			3: Stop by a setting method	

All preceding parameters are unmodifiable. When the power supply unit is faulty, the drive unit performs related actions via the preceding parameters. The table shows specific meanings of parameters.

Parameter	Function	Default	Setting Range	Parameter Description
F2-13	Drive unit protection action against module overheat warning	3	1: Run	When the power supply unit detects that the module temperature reaches the warning temperature, it transfers "stop by a setting method" command to the drive unit.
			2: Coast to stop	
			3: Stop by a setting method	

When the power supply unit temperature reaches the warning temperature, the power supply unit transfers "stop by a setting method" command to the drive unit. You can change F2-13 setting values according to the actual application. When the power supply unit temperature is higher than the warning temperature, the power supply unit transfers a command corresponding to a parameter.

Parameter	Function	Default	Setting Range	Parameter Description
F2-14	Power supply unit protection action against high power grid voltage	1	0: Run	When the power grid voltage exceeds an input range, the power supply unit stops by default.
			1: The power supply unit stops	

When the power grid voltage exceeds an input range, the power supply unit detects any high power grid voltage fault, the power supply stops and the bus voltage is lowered. You can change F2-14 setting values according to the actual application. High power grid voltage will result in rise in bus voltage, causing braking unit actuation or triggering drive unit overvoltage suppression. Excessive bus voltage may result in a risk of damage to the system.

5.4 Input Terminal Functions

The 810 series power supply unit is provided with 5 multi-functional DI terminals as standard configuration. You can set different functions for input terminals according to the actual application respectively.

Parameter	Function	Default	Setting Range	Parameter Description
F4-00	DI1 terminal function selection	5	0 to 9	For details, refer to the following table.
F4-01	DI2 terminal function selection	0		
F4-02	DI3 terminal function selection	0		
F4-03	DI4 terminal function selection	0		
F4-04	DI5 terminal function selection	0		

These parameters are used to set the functions of multi-functional DI terminals. The following table shows optional functions:

Setting Value	Function	Detailed Description
0	No function	Set 0 for reserved terminals to avoid malfunction.
1	The drive unit can run	The power supply unit sends the "run" command to the drive unit.
2	Incoming line breaker feedback	The power supply unit sends the "run" command to the drive unit according to feedback signals.
3	Auxiliary breaker feedback	The power supply unit sends the "run" command to the drive unit according to feedback signals.
4	Leakage protection switch feedback	The power supply unit sends the "run" command to the drive unit according to feedback signals.
5	Fault reset	The terminal is used for fault reset function, the same as the function of RESET key on the operating panel. Remote fault reset is implemented by this function.
6	Drive unit running disabled	The power supply unit sends the "running disabled" command to the drive unit.
7	Drive unit coast to stop	The power supply unit sends the "coast to stop" command to the drive unit.
8	3: Drive unit stop by a setting method	The power supply unit sends the "stop by a setting method" command to the drive unit.
9	Power supply unit running enabled	Establish and keep the bus voltage constant.

If a maloperation is caused due to interference to an input terminal, the parameters shown in the following table can be increased to enhance anti-interference performance, However, the increase of DI filter time will reduce the response of DI terminals.

Parameter	Function	Default	Setting Range	Parameter Description
F4-05	DI1 filter time	0.010s	0.010s to 5.000s	It is used to set the software filter time of DI terminal status.
F4-06	DI2 filter time	0.010s	0.010s to 5.000s	
F4-07	DI3 filter time	0.010s	0.010s to 5.000s	
F4-08	DI4 filter time	0.010s	0.010s to 5.000s	
F4-09	DI5 filter time	0.010s	0.010s to 5.000s	
F4-10	DI1 effective delay time	0.00s	0.00s to 600.00s	It is used to set the delay time of a DI terminal status change.
F4-11	DI2 effective delay time	0.00s	0.00s to 600.00s	
F4-12	DI3 effective delay time	0.00s	0.00s to 600.00s	
F4-13	DI4 effective delay time	0.00s	0.00s to 600.00s	
F4-14	DI5 effective delay time	0.00s	0.00s to 600.00s	
F4-15	DI1 ineffective delay time	0.00s	0.00s to 600.00s	
F4-16	DI2 ineffective delay time	0.00s	0.00s to 600.00s	
F4-17	DI3 ineffective delay time	0.00s	0.00s to 600.00s	
F4-18	DI4 ineffective delay time	0.00s	0.00s to 600.00s	
F4-19	DI5 ineffective delay time	0.00s	0.00s to 600.00s	

They are used to set the delay time of a DI terminal status change.

Parameter	Function	Default	Setting Range	Parameter Description
F4-20	DI active mode selection	0	0: Active at low level	Unit's digit: DI1 Ten's digit: DI2 Hundred's digit: DI3 Thousand's digit: DI4 Ten thousand's digit: DI5
			1: Active at high level	

It is used to set an active status mode of a DI terminal.

When it is set to active at low level, a corresponding DI terminal is active at low level between the DI terminal and COM.

When it is set to active at high level, a corresponding DI terminal is active at high level between the DI terminal and COM.

5.5 Relay Output Terminal Functions

The 810 series power supply unit is provided with 3 groups of multi-functional relay output terminals.

Parameter	Function	Default	Setting Range	Parameter Description
F5-00	T1A, T1B and T1C output function selection	0	0 to 15	For details, refer to the following table.
F5-01	T2A, T2B and T2C output function selection	0		
F5-02	T3A, T3B and T3C output function selection	0		
F5-09	Relay DO active status selection	000	0: Active at high level 1: Active at low level	Unit's digit: T1A, T1B and T1C Ten's digit: T2A, T2B and T2C Hundred's digit: T3A, T3B and T3C

Define output logic of output terminals T1A, T1B and T1C/T2A, T2B and T2C/T3A, T3B and T3C

0: Active at high level. The connection of a DO terminal to a corresponding common terminal is high level.

0: Active at low level. The connection of a DO terminal to a corresponding common terminal is low level.

Description of output terminal function selection:

Setting Value	Function	Description
0	No output	Output terminals have no function.
1	Run	The power supply unit is normal and outputs ON signals when it sends the "run" command to the drive unit.
2	Fault output	When the power supply unit fails, it outputs ON signals.
3	Warning output	When the power supply unit gives an alarm, it outputs ON signals.
4	Breaker actuation output	When three-phase input is too high or the braking pipe is short-circuited, ON signals are output to actuate the breaker.
5	Undervoltage output of bus voltage	When the power supply unit detects that the bus is in undervoltage state, ON signals are output.

Setting Value	Function	Description
6	Overvoltage output of bus voltage	When the power supply unit detects that the bus is in overvoltage state, ON signals are output.
7	Normal output of bus voltage	When the power supply unit detects that the bus voltage is normal, ON signals are output.
8	Bus voltage abnormal	When the power supply unit detects that the bus voltage is abnormal, ON signals are output.
9	Three-phase input abnormal	When the power supply unit detects that three-phase input is abnormal, ON signals are output.
10	Three-phase input normal	When the power supply unit detects that three-phase input is normal, ON signals are output.
11	Module overtemperature fault output	When the module overtemperature fault occurs in the power supply unit, it outputs ON signals.
12	Module overtemperature warning output	When the power supply unit detects that the module temperature exceeds the module warning temperature, it outputs ON signals.

5.6 Fault Record Group

The last five faults of the power supply unit are recorded. For possible causes and solutions of every fault code, see "[7 Troubleshooting](#)".

FA-00	Fault code upon the fifth fault	Fault code upon the last fault
FA-01	Fault subcode upon the fifth fault	Fault subcode upon the last fault
FA-02	Bus voltage upon the fifth fault	Bus voltage upon the last fault
FA-03	Module temperature upon the fifth fault	Module temperature upon the last fault
FA-04	Braking piping temperature upon the fifth fault	Braking piping temperature upon the last fault
FA-05	Braking circuit current upon the fifth fault	Braking circuit current upon the last fault
FA-06	Power grid voltage U _{sr} upon the fifth fault	Power grid voltage U _{sr} upon the last fault
FA-07	Power grid voltage U _{st} upon the fifth fault	Power grid voltage U _{st} upon the last fault
FA-08	Power grid voltage U _{tr} upon the fifth fault	Power grid voltage U _{tr} upon the last fault
FA-09	Degree of three-phase imbalance upon the fifth fault	Degree of three-phase imbalance upon the last fault
FA-10	DI status upon the fifth fault	DI status upon the last fault
FA-11	RO status upon the fifth fault	RO status upon the last fault

FA-12	Stop command sent from the power supply unit upon the fifth fault	Stop command sent from the power supply unit upon the last fault
FA-13	Total power-on time upon the fifth fault (h)	Total power-on time upon the last fault (h)
FA-14	Total power-on time upon the fifth fault (min)	Total power-on time upon the last fault (min)
FA-15	Total power-on time upon the fifth fault (s)	Total power-on time upon the last fault (s)
FA-20	Fault code upon the fourth fault	The same as FA-00 to FA-15
FA-21	Fault subcode upon the fourth fault	
FA-22	Bus voltage upon the fourth fault	
FA-23	Module temperature upon the fourth fault	
FA-24	Braking piping temperature upon the fourth fault	
FA-25	Braking circuit current upon the fourth fault	
FA-26	Power grid voltage U _{sr} upon the fourth fault	
FA-27	Power grid voltage U _{st} upon the fourth fault	
FA-28	Power grid voltage U _{tr} upon the fourth fault	
FA-29	Degree of three-phase imbalance upon the fourth fault	
FA-30	DI status upon the fourth fault	
FA-31	RO status upon the fourth fault	
FA-32	Stop command sent from the power supply unit upon the fourth fault	
FA-33	Total power-on time upon the fourth fault (h)	
FA-34	Total power-on time upon the fourth fault (min)	
FA-35	Total power-on time upon the fourth fault (s)	
FA-40	Fault code upon the third fault	

5 Parameter Description

FA-41	Fault subcode upon the third fault	The same as FA-00 to FA-15
FA-42	Bus voltage upon the third fault	
FA-43	Module temperature upon the third fault	
FA-44	Braking piping temperature upon the third fault	
FA-45	Braking circuit current upon the third fault	
FA-46	Power grid voltage U _{sr} upon the third fault	
FA-47	Power grid voltage U _{st} upon the third fault	
FA-48	Power grid voltage U _{tr} upon the third fault	
FA-49	Degree of three-phase imbalance upon the third fault	
FA-50	DI status upon the third fault	
FA-51	RO status upon the third fault	
FA-52	Stop command sent from the power supply unit upon the third fault	
FA-53	Total power-on time upon the third fault (h)	
FA-54	Total power-on time upon the third fault (min)	
FA-55	Total power-on time upon the third fault (s)	
FA-60	Fault code upon the second fault	
FA-61	Fault subcode upon the second fault	
FA-62	Bus voltage upon the second fault	
FA-63	Module temperature upon the second fault	
FA-64	Braking piping temperature upon the second fault	
FA-65	Braking circuit current upon the second fault	
FA-66	Power grid voltage U _{sr} upon the second fault	
FA-67	Power grid voltage U _{st} upon the second fault	
FA-68	Power grid voltage U _{tr} upon the second fault	
FA-69	Degree of three-phase imbalance upon the second fault	
FA-70	DI status upon the second fault	
FA-71	RO status upon the second fault	
FA-72	Stop command sent from the power supply unit upon the second fault	
FA-73	Total power-on time upon the second fault (h)	
FA-74	Total power-on time upon the second fault (min)	
FA-75	Total power-on time upon the second fault (s)	
FA-80	Fault code upon the first fault	
FA-81	Fault subcode upon the first fault	
FA-82	Bus voltage upon the first fault	
FA-83	Module temperature upon the first fault	
FA-84	Braking piping temperature upon the first fault	
FA-85	Braking circuit current upon the first fault	
FA-86	Power grid voltage U _{sr} upon the first fault	

FA-87	Power grid voltage Ust upon the first fault	The same as FA-00 to FA-15
FA-88	Power grid voltage Utr upon the first fault	
FA-89	Degree of three-phase imbalance upon the first fault	
FA-90	DI status upon the first fault	
FA-91	RO status upon the first fault	
FA-92	Stop command sent from the power supply unit upon the first fault	
FA-93	Total power-on time upon the first fault (h)	
FA-94	Total power-on time upon the first fault (min)	
FA-95	Total power-on time upon the first fault (s)	

5.7 Parameter Management

Parameter	Function	Default	Setting Range	Parameter Description
FP-00	User password	0	0 to 65535	Users set a machine password.

Set FP-00 to any nonzero value, and the password protection function takes effect. When entering the menu, you must enter a correct password, otherwise you cannot view and modify function parameters. Please remember the set user password.

If FP-00 is set to 00000, the previously set user password is cleared, and the password protection function is disabled.

Parameter	Function	Default	Setting Range	Parameter Description
FP-01	Parameter initialization	0	0: No operation 1: Restore default parameters (not including groups FA and FP) 2: Clear record information 4: Back up your current parameters 501: Restore your backup parameters	Perform operations such as parameter restoration and backup.

- 1: Restore default parameters (not including parameters in groups FA and FP)
- 2: Clear record information. Clear fault record information and accumulated running time of the power supply unit
- 4: Back up your current parameters

Back up the current parameters set by you. The current parameter setting is backed up, helping you to restore the setting after performing incorrect parameter setting.

501: Restore your previously backed-up parameters, i.e. restore parameters that are backed up by setting FP-01 to 4.

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Parameter	Function	Default	Setting Range	Parameter Description
FP-02	Parameter modification selection	0	0: Disabled 1: Enabled	After it is set to 1, any modification to all function parameters is disabled.

Set FP-02 to 1 to prevent any modification after you set function parameters.

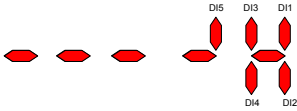
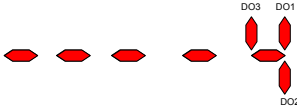
Parameter	Function	Default	Setting Range	Parameter Description
FP-03	Parameter display attribute	0	0: Not displayed 1: Displayed	When it is set to 0, a corresponding monitoring parameter is not displayed in level 0 menu through the switchover of the shift key.

The following table shows the meaning of the display parameter of every setting value bit of FP-03.

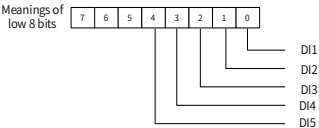
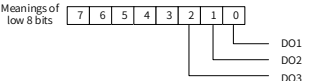
FP-03	Meaning	Description
DATA0	Bus voltage	0: Not displayed 1: Displayed
DATA1	Heatsink temperature	
DATA2	Braking piping temperature	
DATA3	Braking circuit current	
DATA4	Input voltage U _{sr}	
DATA5	Input voltage U _{st}	
DATA6	Input voltage U _{tr}	
DATA7	Degree of three-phase imbalance	
DATA8	DI status	
DATA9	RO status	
DATA10	0	
DATA11	0	
DATA12	Fault code	
DATA13	Fault subcode	

5.8 Monitoring Parameters

Parameters in group U0 are used to monitor running status information of the power supply unit. You can view them via the panel to facilitate site commissioning or read parameter group values via communication to perform host controller monitoring. The communication address is 0x7000~0x7021.

Parameter	Function	Minimum Unit	Monitoring Range	Parameter Description
U0-00	Bus voltage (V)	0.1 V	0.0 V to 2000.0 V	Display the bus voltage value of the power supply unit.
U0-01	Heatsink temperature (°C)	1°C	-20°C to 124°C	Display the heatsink temperature of the power supply unit.
U0-02	Braking piping temperature (°C)	1°C	-20°C to 124°C	Display the braking piping temperature of the power supply unit.
U0-03	Braking circuit current (A)	0.01 A		Display the braking circuit current of the power supply unit.
U0-04	Input voltage U _{sr}	1 V	0 V to 1000 V	Display the effective value of input voltage U _{sr} .
U0-05	Input voltage U _{st}	1 V	0V to 1000 V	Display the effective value of input voltage U _{st} .
U0-06	Input voltage U _{tr}	1 V	0V to 1000 V	Display the effective value of input voltage U _{tr} .
U0-07	Degree of three-phase imbalance		0.00% to 100.00%	Display the degree of three-phase voltage imbalance.
U0-08	DI status	---	---	<p>DI status display: ON indicates high level; OFF indicates low level.</p> 
U0-09	DO status	---	---	<p>DO status display: ON indicates high level; OFF indicates low level.</p> 

Parameter	Function	Minimum Unit	Monitoring Range	Parameter Description																																
U0-08	DI status	1	0x0000 to 0x7FFF	<p>Display the current DI status value. After it is converted into binary data, every bit corresponds to one DI signal. The value 1 indicates that the input is high level. The value 0 indicates that the input is low level. The relation between every bit and input terminals is as follows:</p> <p>Meanings of low 8 bits</p> <table border="1"> <tr> <td>7</td><td>6</td><td>5</td><td>4</td><td>3</td><td>2</td><td>1</td><td>0</td> </tr> <tr> <td>DI1</td><td>DI2</td><td>DI3</td><td>DI4</td><td>DI5</td><td>DI6</td><td>DI7</td><td>DI8</td> </tr> </table> <p>Meanings of high 8 bits</p> <table border="1"> <tr> <td>15</td><td>14</td><td>13</td><td>12</td><td>11</td><td>10</td><td>9</td><td>8</td> </tr> <tr> <td>DI9</td><td>DI10</td><td>VDI1</td><td>VDI2</td><td>VDI3</td><td>VDI4</td><td>VDI5</td><td>---</td> </tr> </table>	7	6	5	4	3	2	1	0	DI1	DI2	DI3	DI4	DI5	DI6	DI7	DI8	15	14	13	12	11	10	9	8	DI9	DI10	VDI1	VDI2	VDI3	VDI4	VDI5	---
7	6	5	4	3	2	1	0																													
DI1	DI2	DI3	DI4	DI5	DI6	DI7	DI8																													
15	14	13	12	11	10	9	8																													
DI9	DI10	VDI1	VDI2	VDI3	VDI4	VDI5	---																													
U0-09	DO status	1	0x0000 to 0x03FF	<p>Display the current DO status value. After it is converted into binary data, every bit corresponds to one DO signal. The value 1 indicates that the output is high level. The value 0 indicates that the output is low level. The relation between every bit and output terminals is as follows:</p> <p>Meanings of low 8 bits</p> <table border="1"> <tr> <td>7</td><td>6</td><td>5</td><td>4</td><td>3</td><td>2</td><td>1</td><td>0</td> </tr> <tr> <td>DO3</td><td>Relay 1</td><td>Relay 2</td><td>DO1</td><td>DO2</td><td>VDO1</td><td>VDO2</td><td>VDO3</td> </tr> </table> <p>Meanings of high 8 bits</p> <table border="1"> <tr> <td>15</td><td>14</td><td>13</td><td>12</td><td>11</td><td>10</td><td>9</td><td>8</td> </tr> <tr> <td>VDO4</td><td>VDO5</td><td>---</td><td>---</td><td>---</td><td>---</td><td>---</td><td>---</td> </tr> </table>	7	6	5	4	3	2	1	0	DO3	Relay 1	Relay 2	DO1	DO2	VDO1	VDO2	VDO3	15	14	13	12	11	10	9	8	VDO4	VDO5	---	---	---	---	---	---
7	6	5	4	3	2	1	0																													
DO3	Relay 1	Relay 2	DO1	DO2	VDO1	VDO2	VDO3																													
15	14	13	12	11	10	9	8																													
VDO4	VDO5	---	---	---	---	---	---																													
U0-12	Current fault code	1	1 to 65535	<p>Display the current fault code of the power supply unit.</p>																																

Parameter	Function	Minimum Unit	Monitoring Range	Parameter Description								
U0-13	Current fault subcode	1	1 to 65535	Display the fault subcode corresponding to the current fault code of the power supply unit.								
U0-14	DI status after delay processing	1	0 to 31	<p>Display the current DI status value. After it is converted into binary data, every bit corresponds to one DI signal. The value 1 indicates that the input is high level. The value 0 indicates that the input is low level. The relation between every bit and input terminals is as follows:</p>  <p>Meanings of low 8 bits</p> <table border="1" style="display: inline-table; vertical-align: middle;"> <tr> <td>7</td><td>6</td><td>5</td><td>4</td><td>3</td><td>2</td><td>1</td><td>0</td> </tr> </table> <p style="margin-left: 150px;">DI1 DI2 DI3 DI4 DI5</p>	7	6	5	4	3	2	1	0
7	6	5	4	3	2	1	0					
U0-15	DI status after positive and negative logic processing	1	0 to 31	Display the input status value after positive and negative logic judgment on the DI value in U0-14.								
U0-17	RO status after delay processing	1	0 to 7	<p>Display the current DO status value. After it is converted into binary data, every bit corresponds to one DO signal. The value 1 indicates that the input is high level. The value 0 indicates that the input is low level. The relation between every bit and input terminals is as follows:</p>  <p>Meanings of low 8 bits</p> <table border="1" style="display: inline-table; vertical-align: middle;"> <tr> <td>7</td><td>6</td><td>5</td><td>4</td><td>3</td><td>2</td><td>1</td><td>0</td> </tr> </table> <p style="margin-left: 150px;">DO1 DO2 DO3</p>	7	6	5	4	3	2	1	0
7	6	5	4	3	2	1	0					
U0-18	RO status after positive and negative logic processing	1	0 to 7	Display the input status value after positive and negative logic judgment on the DO value in U0-17.								
U0-20	Power-on time for this time (h)	1 h	0 to 65535	Display the running hours of the power supply unit from power-on to now for this time.								
U0-21	Power-on time for this time (min)	1 min	0 to 59	Display the running minutes of the power supply unit from power-on to now for this time.								
U0-22	Power-on time for this time (s)	1	0 to 59	Display the running seconds of the power supply unit from power-on to now for this time.								

5 Parameter Description

Parameter	Function	Minimum Unit	Monitoring Range	Parameter Description
U0-23	Power-on time for this time (ms)	1	0 to 999	Display the running milliseconds of the power supply unit from power-on to now for this time.
U0-24	Command word for fan control	1	0 to 1	0: The fan stops running
				1: The fan always runs
U0-25	Command word for braking unit control	1	0 to 1	0: The braking pipe is turned off
				1: The braking pipe is turned on
U0-27	Command word for interaction between the power supply and drive units	1	1 to 3	1: Run
				2: Coast to stop
				3: Stop by a setting method
U0-30	Total power-on time (h)	1	0 to 65535	Display the running hours of the power supply unit from the first power-on to now.
U0-31	Total power-on time (min)	1	0 to 59	Display the running minutes of the power supply unit from the first power-on to now.
U0-32	Total power-on time (s)	1	0 to 59	Display the running seconds of the power supply unit from the first power-on to now.
U0-33	Total power-on time (ms)	1	0 to 999	Display the running milliseconds of the power supply unit from the first power-on to now.

6 Communication

The 810 series power supply unit applies to the MD810, IS810, ES810, and TD810 series drive units. This chapter describes only the communication of the power supply unit. For the communication of the drive units, refer to their manuals.

6.1 Parameter Communication Address

Parameter communication addresses must be used to perform read-write and other operations on parameters of the 810 series power supply unit. This chapter mainly describes the method of obtaining communication addresses according to parameters as well as special parameter communication addresses for Modbus communication. Parameter communication addresses are often written as parameter addresses or function addresses in this chapter.

6.1.1 Parameter Introduction

The parameters of the 810 series power supply unit are divided into basic function parameters and monitoring function parameters. They are stored in corresponding parameter groups.

Basic function parameters are stored in groups F and A, as shown in the following table:

810 Series Power Supply Unit Parameter Data	Group F (Read-write)	F0, F1, F2, F3, F4, F5, F6, F7, F8, F9, FA, FB, FC, Fd, FE, FF
	Group A (Read-write)	A0, A1, A2, A3, A4, A5, A6, A7, A8, A9, AA, AB, AC, AD, AE, AF
	Group B (Read-write)	B0, B1, B2

The following table shows the addresses used for the monitoring function parameters including the RUN command, running status, running parameters, and alarm information.

810 Series Power Supply Unit Monitoring Function Parameter	Status Data (Read-only)	U0, 8000H
	Control Parameter (Write-only)	U3, 1000H

6.1.2 Description of Parameter Communication Addresses

Each of groups F0 to FF, A0 to AF, and B0 to B2 include multiple function parameters. For example, F0-16 indicates number 16 in group F0. High 16 bits of communication addresses of function parameters are function group numbers. Low 16 bits are the hexadecimal format of serial numbers in function groups.

That is, the communication address of F0-16 is 0xF010.

In addition, writing basic function parameters and performing power-off save cause frequent operations on EEPROM, reducing the service life of EEPROM. Therefore, some basic function parameters are modified by changing the values in RAM through communication without being stored.

See the following table.

For parameters in group F, corresponding RAM addresses are obtained as long as the high bit F of the parameter addresses becomes 0.

For parameters in group A, corresponding RAM addresses are obtained as long as the high bit A of the parameter addresses becomes 4.

That is, the F3-12 communication RAM address is 0x030C; the A0-05 communication RAM address is 0x4005.

Parameter Group No.	Communication Access Address	Modified RAM Parameter Address through Communication
Groups F0 to FE	0xF000 to 0xFEFF	0x0000 to 0x0EFF
Groups A0 to AF	0xA000 to 0xACFF	0x4000 to 0x4CFF
Groups B0 to BF	0xB000 to 0xBFFF	0x5000 to 0x5FFF
Group U0	0x7000 to 0x70FF	



NOTE

- ◆ Group FF: Parameters cannot be read and changed.
- ◆ Group U0: Parameters can be read, but cannot be changed.
- ◆ 1000H and 8000H are Modbus-specific communication addresses. Some functions are the same as group U.
- ◆ Only the write operation can be performed on communication RAM addresses. They are invalid addresses during the read operation.
- ◆ Some parameters cannot be changed when the power supply unit is in running state.
- ◆ Some parameters cannot be changed regardless of states of the power supply unit.
- ◆ When changing a parameter, pay attention to the range, unit, and related description of the parameter.

6.1.3 Modbus-Specific Parameter Communication Addresses

Parameter Address	Parameter Description
Communication Monitoring Parameters	
1000H	*Communication setting value (decimal) -10000 to 10000 Communication setting values are percentage of relative values. 10000 and -10000 correspond to 100.00% and -100.00%, respectively. For frequency dimension data, this percentage is a percentage of relative maximum frequency (F0-10). For torque dimension data, this percentage is F2-10 (Digital setting of torque upper limit).
Control commands are input to the power supply unit: (Write-only)	
7311H	0000: Stop by a stop method set in F6-10 0001: Forward running 0002: Reverse running 0003: Forward jogging 0004: Reverse jogging 0005: Coast to stop 0006: Decelerate to stop 0007: Fault reset
Reading the power supply unit status	
703DH	0001: Forward running 0002: Reverse running 0003: Stop 0004: Auto-tuning 0005: Fault
Parameter locking password check	
1F00H	Parameter locking password check: If an actual password value is returned, the password check passes. (If no password is available, i.e. the password is 0, 0000H is returned.)
DO control	
7312H	BIT0: DO1 output control BIT1: DO2 output control BIT2: RELAY1 output control BIT3: Reserved BIT4: FMR output control BIT5 to BIT9: Reserved
Pulse output control	
7315H	0 to 7FFF indicate 0% to 100%.

Parameter Address	Parameter Description
Description of power supply unit faults	
8000H	0000: No fault 0001: Hardware fault 0002: Overcurrent during acceleration 0003: Overcurrent during deceleration 0004: Overcurrent at constant speed 0005: Overvoltage during acceleration 0006: Overvoltage during deceleration 0007: Overvoltage at constant speed 0009: Undervoltage fault 000A: Drive overload 000B: Motor overload 000C: Input phase loss 000D: Output phase loss 000E: IGBT overheat 000F: External fault 0010: Communication fault 0013: Motor auto-tuning fault 0014: Encoder/PG card fault 0015: Parameter read-write abnormality 0016: Motor auto-tuning result abnormality 0017: Motor short circuit to ground 0018: Inter-phase short circuit 0019: Power supply unit fault
8000H	001A: Running time reached 001B: User-defined fault 1 001C: User-defined fault 2 001D: Power-on time reached 001E: Load lost 001F: PID feedback lost during running 002A: Excessive speed deviation 002B: Motor overspeed 002D: Motor overtemperature 0050: Fan fault

6.2 Modbus Communication

6.2.1 Networking

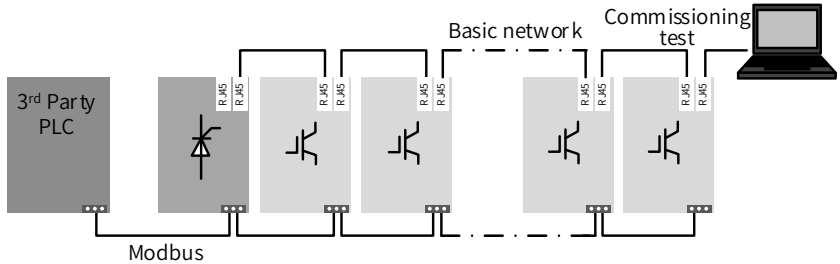


Figure 6-1 Modbus communication networking

6.2.2 Interface Description

The terminal names of 3-pin connection terminals are C485+, C485-, and CGND from left to right, as shown in the following figure:

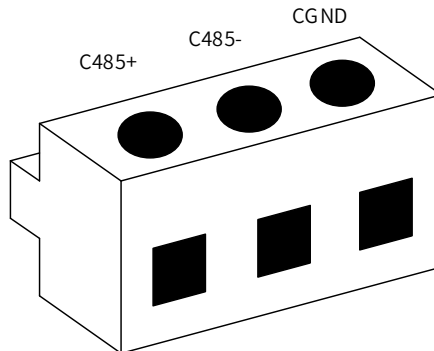


Figure 6-2 3-pin connection terminals

6.2.3 Communication Performance

- 1) Up to 128 nodes are borne with a maximum baud rate of 115.2 Kbps. In this case, the maximum communication distance is 100 m.
- 2) The maximum transmission distance corresponding to the baud rate of 9.6 Kbps is 1 km.

6.2.4 Related Parameters

Parameter	Name	Default	Setting Range		Parameter Description
Fd-00	Modbus baud rate	5	0: 300 bps 1: 600 bps 2: 1200 bps 3: 2400 bps 4: 4800 bps	5: 9600 bps 6: 19200 bps 7: 38400 bps 8: 57600 bps 9: 115200 bps	This parameter is used to set a data transmission rate between the host controller and the power supply unit. The larger the baud rate is, the faster the communication speed is. Note that the set frequency of the host controller must be consistent with that of the power supply unit. Otherwise, communication cannot be performed.
Fd-01	Modbus data format	0	0: No check (8-N-2) 1: Even parity check (8-E-1) 2: Odd parity check (8-O-1) 3: 8-N-1		The set data format of the host controller must be consistent with that of the power supply unit. Otherwise, communication cannot be performed.
Fd-02	Modbus local address	1	1 to 247. The value 0 is a broadcast address.		When the local address is set to 0 (broadcast address), the broadcasting function of the host controller is implemented. The local address is unique (except the broadcast address) and is the basis to implement point-to-point communication between the host controller and the power supply unit.
Fd-03	Modbus response delay	2	0 ms to 20 ms		Interval time from the end of data receiving by the power supply unit data to data sending to the host controller. If the response delay is less than the system processing time, the former is subject to the latter. If the response delay is greater than the system processing time, the system sends data to the host control only after the response delay time reaches after data processing is complete.

Parameter	Name	Default	Setting Range	Parameter Description
Fd-04	Modbus communication timeout	0.0	0.0 (invalid), 0.1s to 60.0s	When it is set to 0.0s, the communication timeout is invalid. It is generally set to 0.0s. This parameter is used to monitor communication status in a system with continuous communication. When it is set to an effective value, if communication interval time between this communication and the next communication exceeds Fd-04 (communication timeout), the system will report a communication fault error (Err16).

6.2.5 Modbus Communication Protocol

The 810 series power supply unit provides RS485 communication interfaces and supports the Modbus-RTU slave communication protocol. You can implement centralized control with a computer or PLC. You can set the power supply unit RUN command, modify or read parameters, and read the operating state and fault information of the power supply unit using this communication protocol.

This protocol defines the content and format of transmitted messages during serial communication, including the master polling (or broadcasting) format and master coding method (function code for the action, transmission data, and error check). The slave response uses the same structure including action confirmation, data return, and error check. If an error occurs when the slave receives information, or if the slave cannot finish an action required by the master, a fault message will be responded to the master.

1) Application mode

The power supply unit is connected to the "single-master multi-slave" PC/PLC control network with an RS485 bus as a communication slave.

2) Bus structure

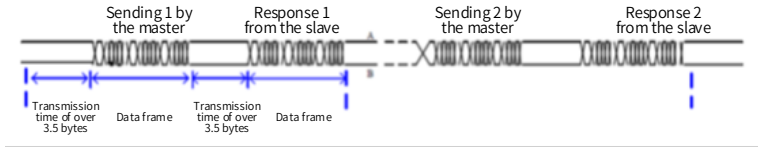
■ Topological structure

The system consists of a single master and multiple slaves. Every communication device in the network has a unique slave address. One device, functioning as a communication host (generally a PC host controller, PLC, HMI, etc.), actively initiates communication to perform the parameter read or write operation on slaves. Other devices functioning as communication slaves respond to the host's inquiry or communication operations on them. Only one device is allowed to transmit data at the same moment and other devices receive data.

The setting range of the slave address is 1 to 247. The value 0 is a broadcast communication address. A slave must have a unique address in the network.

■ Communication transmission mode

The asynchronous serial and half-duplex transmission mode is used. One data frame is sent at a time in the form of packet in the serial asynchronous communication process. It is agreed in the Modbus-RTU protocol that when the idle time on the communication data line is greater than the 3.5 byte transmission time, it indicates the start of one new communication frame.

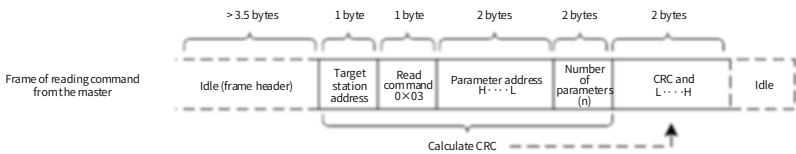


The built-in communication protocol of the 810 series power supply unit is the Modbus-RTU slave communication protocol. It enables the power supply unit to respond to an "inquiry/command" of the host or perform corresponding action and communication data response according to an "inquiry/command" of the host.

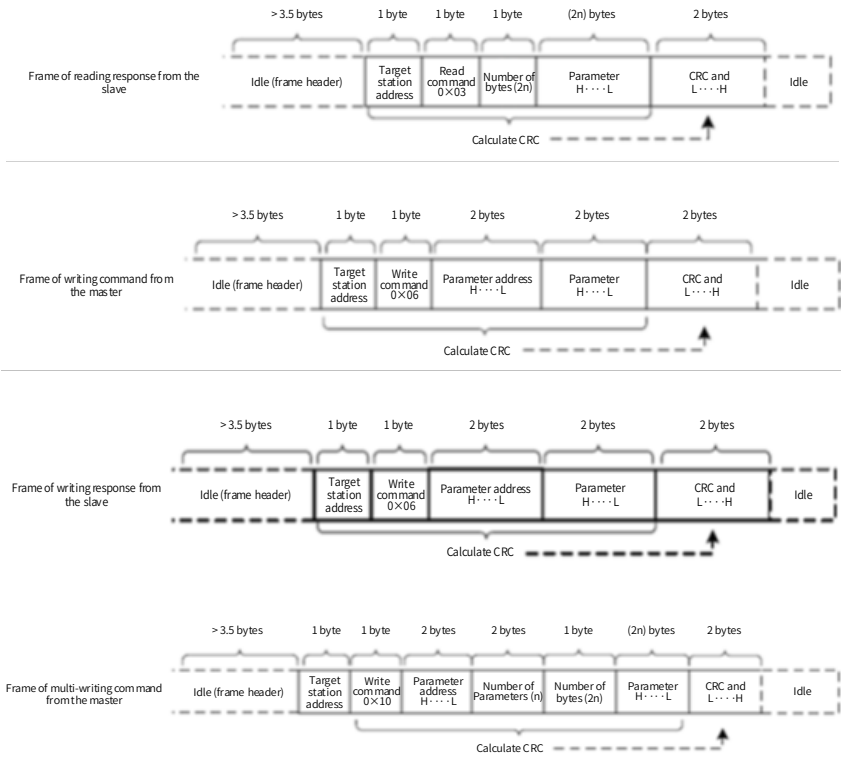
A host is a PC, an industrial control device or a PLC, etc. A host can separately communicate with a slave or issue broadcast information to all slaves. For a separate "inquiry/command" from a host, a corresponding slave must return one response frame. For broadcast information sent from a host, a slave does not need to feed back a response to the host.

6.2.6 Communication Data Frame Structure

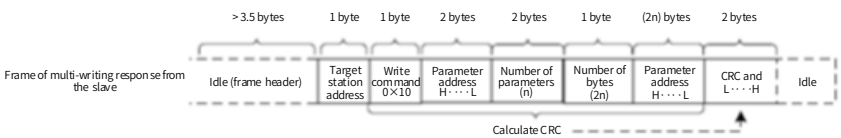
The communication data format of the Modbus-RTU protocol of the 810 series power supply unit is as follows. The power supply unit supports only the read or write operation of Word type parameters. The corresponding communication read operation command is 0x03. The write operation command is 0x06. The multi-write operation command is 0x10. The read or write operation of bytes or bits are not supported.



The host controller can theoretically read multiple continuous parameters at a time (i.e. N is up to 12). Do not stride the last parameter in this parameter group, otherwise the response error will occur.



Multi-write is the same as multi-read and up to 12 parameters can be continuously operated.



If the slave detects a communication frame error or reading/writing fails due to other causes, it returns an error frame.

Note: No response will be given for CRC check error.

The slave read response error command is 0x83. The write response error command is 0x86. The multi-write response error command is 0x90.

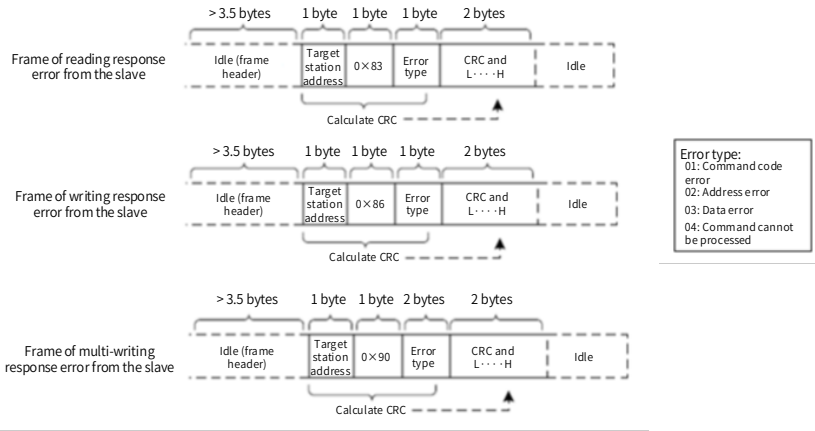


Table 6-1 Description of data frame field

START	Idle time greater than the transmission time of 3.5 characters
ADR	Communication address range: 1 to 247; 0=Broadcast
CMD	03: Read slave parameters; 06: Write slave parameters; 10: Multi-write slave parameters
Parameter address H	Internal hexadecimal parameter address of the power supply unit; parameters are divided into parameter type and non-parameter type (e.g. running status parameter and RUN command) parameters. See the definition of address.
Parameter address L	
Parameter count H	Number of parameters read in this frame. If it is 1, it indicates reading one parameter. Low order bytes follow high order bytes during transmission.
Parameter count L	
Data bytes	The data length is twice the number of parameters.
Data H	Response data or data to be written. Low order bytes follow high order bytes during transmission.
Data L	
CRC low bit	Detection value: CRC16 check value. High order bytes follow low order bytes during transmission. For details of the calculation method, refer to the description of CRC check in this section.
CRC high bit	
END	At 3.5 characters

CRC check mode:

CRC (Cyclical Redundancy Check) uses the RTU frame format. A Modbus message includes an error detection domain based on the CRC method. The CRC field checks the content of the entire message. The CRC field is two bytes, containing a 16-bit binary value. The CRC field is calculated by the transmitting device, and then added to the message. The receiving device recalculates CRC of received messages that is compared

with the value in the received CRC domain. If both CRC values are unequal, it indicates that a transmission error occurs.

The CRC is first stored to 0xFFFF. Then a procedure is invoked to process the successive 8-bit byte in the message and the value in the register. Only the eight bits in each character are used for the CRC. The start bit, stop bit and the parity bit does not apply to the CRC.

During generation of the CRC, each eight-bit character is in exclusive-OR (XOR) with the content in the register. Then the result is shifted in the direction of the least significant bit (LSB), with a zero filled into the most significant bit (MSB) position. The LSB is extracted and examined. If the LSB was 1, the register then performs XOR with a preset value. If the LSB was 0, no XOR is performed. This process is repeated until eight shifts have been performed. After the last (eighth) shift, the next eight-bit byte is in XOR with the register's current value, and the process repeats for eight more shifts as described above. The final value of the register, after all the bytes of the message have been applied, is the CRC value.

When CRC is added in a message, high order bytes follow low order bytes. The CRC simple function is as follows:

```
unsigned int crc_chk_value (unsigned char *data_value,unsigned char length)
{
    unsigned int crc_value=0xFFFF;
    int i;
    while (length--)
    {
        crc_value^=*data_value++;
        for (i=0;i<8;i++)
        {
            if (crc_value&0x0001)
            {
                crc_value=(crc_value>>1) ^0xa001;
            }
            else
            {
                crc_value=crc_value>>1;
            }
        }
    }
    return (crc_value);
}
```


6.3 CANopen/CANlink Communication

The CANopen communication protocol is an international general standard protocol. The CANlink communication protocol is a special protocol based on CAN bus applications and independently developed by Inovance. This protocol can communicate with only Inovance's PLCs such as H2U and H3U.

6.3.1 Networking

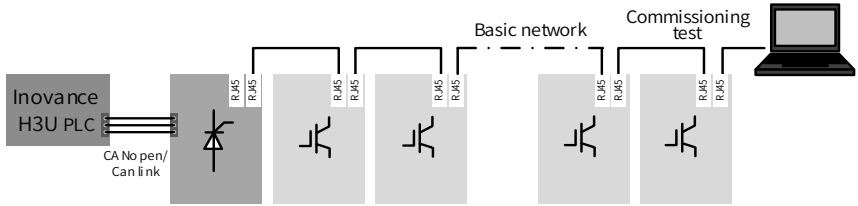


Figure 6-3 CANopen/CANlink communication networking



NOTE

- ◆ Ensure that terminal resistors are located at both ends of the CAN bus.
- ◆ A computer or commissioning tool can be connected at the tail end of the CAN network.

6.3.2 Interface Description

The dual RJ45 terminals of the 810 series power supply unit are CANopen/CANlink protocol communication interfaces. The following figure shows the terminal interfaces.

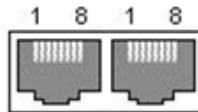


Figure 6-4 CANopen/CANlink communication terminals of the 810 series power supply unit. Pins of both interfaces are internally connected together. The following table shows the definition of the interfaces.

Table 6-2 Definition of RJ45 interfaces

Pin No.	Signal	Description
1	CANH	CAN bus high level
2	CANL	CAN bus low level
3	CGND	Common ground of communication
4	Reserved by the manufacturer	
5	Reserved by the manufacturer	
6	Unconnected	Reserved
7	Unconnected	Reserved
8	CGND	Common ground of communication

6.3.3 CAN Bus Topology

The following figure shows the CAN bus connection topology. It is recommended that the CAN bus be connected using STP. Two 120 Ω termination resistors must be connected at both ends of the bus respectively to avoid signal reflection. Reliable single-point grounding is often used for shielded layers.

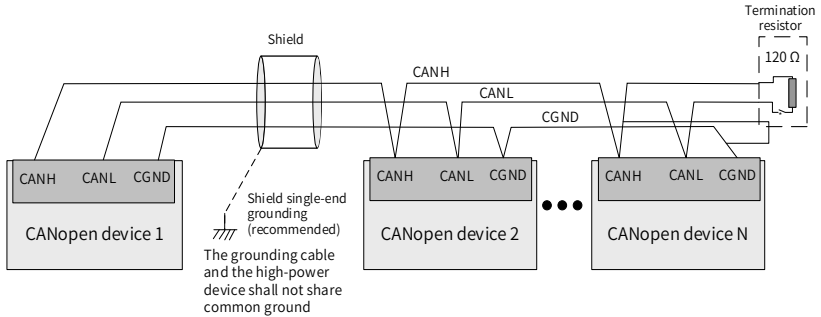


Figure 6-5 CAN bus connection topology

6.3.4 CAN Transmission Distance

The transmission distance of the CANopen/CANlink bus has a direct relationship with the baud rate and communication cable. The following table shows the relationship between the maximum bus line length and the baud rate.

Table 6-3 Baud rate and bus length

Baud Rate (Bps)	1 M	500 K	250 K	125 K	100 K	50 K	20 K
Length (m)	25	100	250	500	500	1000	1000

6.3.5 Related Parameters

To use CANopen/CANlink, set the power supply unit parameters as shown in the following table.

Table 6-4 Related equipment parameters

Parameter	Function	Default	Setting Range	Parameter Description
Fd-09	Communication status	0	Units digit (CANopen) 1: Initialization 2: Pre-running 8: Running 9: Stop Tens digit (CANlink) 1: Initialization 2: Pre-running 8: Running 9: Stop Hundreds digit(Profibus-PROFIBUS-DP) 1: Initialization 2: Pre-running 8: Running 9: Stop	The hundred's digit is used for PROFIBUS-DP communication. This read-only parameter is used to monitor communication status.
Fd-10	Communication protocol selection	1	0: No protocol 1: CANopen 2: CANlink 3: Switching the PROFIBUS-DP to the CANopen Network Bridge	CAN communication protocol selection: If it is set to 1, it indicates CANopen communication. If it is set to 2, it indicates CANlink communication.
Fd-11	CANopen402 mode selection	1	0: Disabled 1: Enabled	CANopen mode selection. When it is set to 0, it indicates ordinary mode. When it is set to 1, it indicates CIA402 mode.
Fd-12	CAN baud rate	5	0: 20 Kbps 1: 50 Kbps 2: 100 Kbps 3: 125 Kbps 4: 250 Kbps 5: 500 Kbps 6: 1 MKbps	CAN communication baud rate, including CANlink and CANopen. In the same network, baud rates of all stations must be inconsistent, otherwise communication is abnormal.
Fd-13	CAN station No.	1	1 to 247	CAN station No., including CANlink and CANopen. In the same network, station Nos. of all stations must be inconsistent, otherwise communication is abnormal.

Parameter	Function	Default	Setting Range	Parameter Description
Fd-14	Number of CAN frames received within unit time	0	0 to 65535	It is used to monitor the bus load. This parameter indicates the number of CAN frames received by this station each second.
Fd-15	Max. value of node reception error counter	0	0 to 65535	It is used to monitor bus errors. This parameter indicates the maximum value of CAN reception error counter in this node.
Fd-16	Max. value of node sending error counter	0	0 to 65535	It is used to monitor bus errors. This parameter indicates the maximum value of CAN sending error counter in this node.
Fd-17	Accumulative trip count of the CAN bus	0	0 to 65535	It is used to monitor bus errors. This parameter indicates the CAN bus trip count in this node.
Fd-18	Power supply unit No.	1	1 to 99	Common bus network group No. It is used for networking of multiple groups of common buses. The same number must be set for the network with the same group of common buses. Numbers cannot be the same for networks with different common buses.
Fd-34	CANopen mode selection	0	0: Ordinary mode 1: Expert mode	The ordinary mode is a standard CANopen mode. In the expert mode, a PDO can be sent and received in this node according to the mapping configured in function code group AF.
Fd-35	CANopen disabled time	0	0: Disabled 1 to 65535: TPDO disabled time (Unit: 100 us)	When 0 is selected, this function code is invalid. When a value is greater than 1, if a TPDO is not configured with disabled time by the master, this value is sent.

Parameter	Function	Default	Setting Range	Parameter Description
Fd-36	CANopen event time	0	0: Disabled 1 to 65535: TPDO event time (Unit: ms)	When 0 is selected, this function code is invalid. When a value is greater than 1, if a TPDO is not configured with event time by the master, this value is sent.

6.3.6 Description of CANopen Communication Protocol Application

1 Software feature

The MD810-CANopen supports six protocols as follows:

- Supports the Node Guard protocol. The master uses this function to query the equipment status.
- Supports the Heartbeat protocol. The slave regularly reports the current status to the master.
- SDO supports only the acceleration transmission mechanism. One parameter or one object dictionary is transmitted every time.
- Supports four TPDOs and four RPDOs.
- Supports emergency objects.
- Supports synchronous mode.

2 Communication object COB-ID

CANopen provides multiple communication objects. Every communication object has different features (For details, see "[6.3.7 CANopen Communication Protocol](#)"). You can cherry-pick a communication object according to different applications. This expansion card uses predefined COB-ID. Specific rules are as follows:

- NMT object: 0x000
- SYNC object: 0x080
- SDO object:
 - SDO sending — 0x600+Node-Id
 - SDO receiving — 0x580+Node-Id
- PDO object:
 - RPDO1 — 0x200+Node-Id
 - RPDO2 — 0x300+Node-Id
 - RPDO3 — 0x400+Node-Id
 - RPDO4 — 0x500+Node-Id
 - TPDO1 — 0x180+Node-Id
 - TPDO2 — 0x280+Node-Id

TPDO3 — 0x380+Node-Id

TPDO4 — 0x480+Node-Id

- EMCY object: 0x80+Node-Id

Node-Id: Equipment ID (station address) set by Fd-13 (CAN station number)

3 Parameter operations of the power supply unit

A correspondence method between the various power supply unit parameters and the object dictionary is specified. You can simply and directly determine the relationship between the parameters and the object dictionary by this method. This facilitates parameter operations.

- Relationship between the parameters and CANopen object dictionary indexes of the power supply unit

1) Correspondence method

The parameter groups of the power supply unit correspond to the indexes 0x2000 to 0x20FF of the CANopen object dictionary. The correspondence method is as follows: An object dictionary index is high 16 bits of a parameter address plus 0x2000; an object dictionary sub-index is low 16 bits plus 1. For example, for power supply unit parameter F0-03 and communication address 0xF003, the corresponding object dictionary index and sub-index are 0x20F0 and 0x04, respectively.

2) Relation list

The parameter groups of the 810 series power supply unit are divided into groups F0 to FF, A0 to AF, and U0 to UF.

According to the preceding correspondence method, during parameter read/write operation, the relationship between the parameter group numbers and the object dictionary indexes is as follows:

Parameter Group	CANopen Object Dictionary Index
F0-FF	0x20F0-0x20FF
A0-XX	0x20A0-0x20AF
U0-UF	0x2070-0x207F

A sub-index is low 16 bits of a parameter address plus 1, so the relationship between the parameter group numbers and the object dictionary indexes is as follows:

Parameter Index	CANopen Object Dictionary Index
0x0–0xFE	0x1–0xFF

Take F0-17 as an example. When the F0-17 parameter value is read, the parameter address is 0xF011. Therefore, its object dictionary index number and sub-index number are 0x20F0 and 0x12, respectively.

■ Example of operations on the power supply unit (SDO)

The power supply unit uses a CANopen data service object (SDO) to perform the read operation. The following table shows the data format sent from the master.

Take F0-02 as an example. According to the relation described in the preceding section, the index and sub-index are 0x20F0 and 0x03, respectively.

Table 6-5 SDO object sent during the read operation

CAN Frame		CANopen Data	Description
COB-ID	11-bit ID	0x600+Node-ID	DIP switch setting of Node-ID equipment address
RTR	RTR	0	Remote frame flag "0"
8-byte frame data	DATA0	Command code (0x40)	0x40 read command
	DATA1	Low byte of index	Parameter group (group F0 "0xF0")
	DATA2	High byte of index	0x20
	DATA3	Sub-index	Parameter No. + 1 ("0x03")
	DATA4	Data 1	Reserved "0"
	DATA5	Data 2	Reserved "0"
	DATA6	Data 3	Reserved "0"
DATA7	Data 4	Reserved "0"	

The preceding table shows the SDO slave response data during the read operation on the power supply unit.

If the operation is successful, the command code return value is "0x4B"; the index remains unchanged; the read data is returned to DATA4 and DATA5; "0" is returned to DATA6 and DATA7.

If the operation fails, the command code return value is "0x80"; the index remains unchanged; SDO failure error codes are returned to DATA4, DATA5, DATA6, and DATA7. (For error codes, see ["7.3 Fault Codes and Solutions"](#).)

Table 6-6 SDO object returned during the read operation

CAN Frame		CANopen Data	Description
COB-ID	11-bit ID	0x580+Node-ID	DIP switch setting of Node-ID equipment address
RTR	RTR	0	Remote frame flag "0"
8-byte frame data	DATA0	Command code return	Success: "0x4B" Failure: "0x80"
	DATA1	Low byte of index	Parameter group (group F0 "0xF0")
	DATA2	High byte of index	0x20
	DATA3	Sub-index	Parameter No. + 1 ("0x03")
	DATA4	Data 1	Low byte of data
	DATA5	Data 2	High byte of data
	DATA6	Data 3	Success: "0" Failure: SDO operation failure error code (Refer to the CANopen protocol.)
DATA7	Data 4		

■ SDO write operation on the power supply unit

The power supply unit uses a CANopen data service object (SDO) to perform the write operation. The following table shows the data format sent from the master.

Table 6-7 SDO object sent during the write operation

CAN Frame		CANopen Data	Description
COB-ID	11-bit ID	0x600+Node-ID	DIP switch setting of Node-ID equipment address
RTR	RTR	0	Remote frame flag "0"
8-byte frame data	DATA0	Command code	0x2B
	DATA1	Low byte of index	Parameter group (group F0 "0xF0")
	DATA2	High byte of index	0x20
	DATA3	Sub-index	Parameter No. + 1 ("0x03")
	DATA4	Data 1	Low byte of data
	DATA5	Data 2	High byte of data
	DATA6	Data 3	Reserved "0"
	DATA7	Data 4	Reserved "0"

The preceding table shows the SDO slave response data during the write operation on the power supply unit.

If the operation is successful, the command code return value is "0x60"; the index remains unchanged; "0" is returned to DATA4, DATA5, DATA6, and DATA7.

If the operation fails, the command code return value is "0x80"; the index remains unchanged; SDO failure error codes are returned to DATA4, DATA5, DATA6, and DATA7. (For error codes, see ["7.3 Faults and Diagnostics"](#)).

Table 6-8 SDO object returned during the write operation

CAN Frame		CANopen Data	Description
COB-ID	11-bit ID	0x580+Node-ID	DIP switch setting of Node-ID equipment address
RTR	RTR	0	Remote frame flag "0"
8-byte frame data	DATA0	Command code return	Success: "0x60" Failure: "0x80"
	DATA1	Low byte of index	Parameter group (group F0 "0xF0")
	DATA2	High byte of index	0x20
	DATA3	Sub-index	Parameter No. + 1 ("0x03")
	DATA4	Data 1	Success: 0 Failure: SDO operation failure error code (See "6.3.7 CANopen Communication Protocol") Reserved "0"
	DATA5	Data 2	
	DATA6	Data 3	
	DATA7	Data 4	

■ Examples of read and write operations on the power supply unit

This section takes the F0-02 read and write operations as an example. The CANopen address of the power supply unit is set to "0x06".

■ Read the power supply unit command source (F0-02)

Read the power supply unit parameter F0-02 (Command source selection). The following table shows a CANopen packet sent from the master.

Table 6-9 Packet sent from the master to read F0-02

Packet ID (Hex)	RTR	Data (Hex)
0x606	0	40 F0 20 03 00 00 00 00

The following table shows a CANopen response packet of the power supply unit. The current value of F0-02 is "0x0002", indicating that the current command source of the power supply unit is a communication command channel.

Table 6-10 Response packet of the power supply unit to read F0-02

Packet ID (Hex)	RTR	Data (Hex)
0x586	0	4B F0 20 03 02 00 00 00

■ Set the command source (F0-02) to the operating panel

To set the command source to the operating panel, write F0-02 as "0" to enable the master to send a CANopen packet shown in the following table.

Table 6-11 Packet sent from the master to write F0-02

Packet ID (Hex)	RTR	Data (Hex)
0x606	0	2B F0 20 03 00 00 00 00

The following table shows the CANopen response packet of the power supply unit. F0-02 is rewritten as "0", i.e. the current command source is set to the operating panel.

Table 6-12 Response packet of the power supply unit to write F0-02

Packet ID (Hex)	RTR	Data (Hex)
0x586	0	60 F0 20 03 00 00 00 00

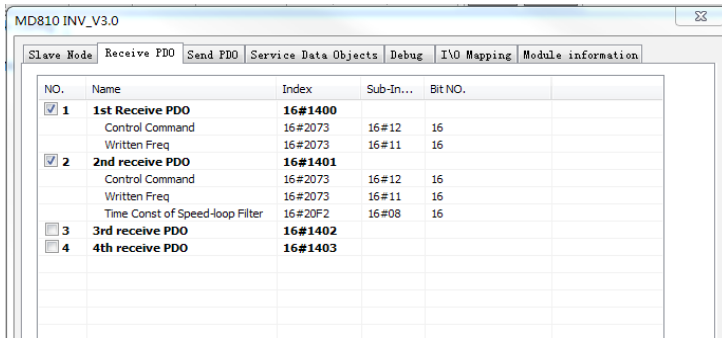
■ PDO Configuration

The 810 series power supply unit supports four RPDOs (RPDO1, RPDO2, RPDO3, and RPDO4) and four TPDOs (TPDO1, TPDO2, TPDO3, and TPDO4). You can configure them as required.

You can set a slave PDO mapping on the master operation background or directly configure a slave PDO mapping. It is generally recommended to use the CANopen master to configure a mapping.

■ Configure a slave PDO on the master

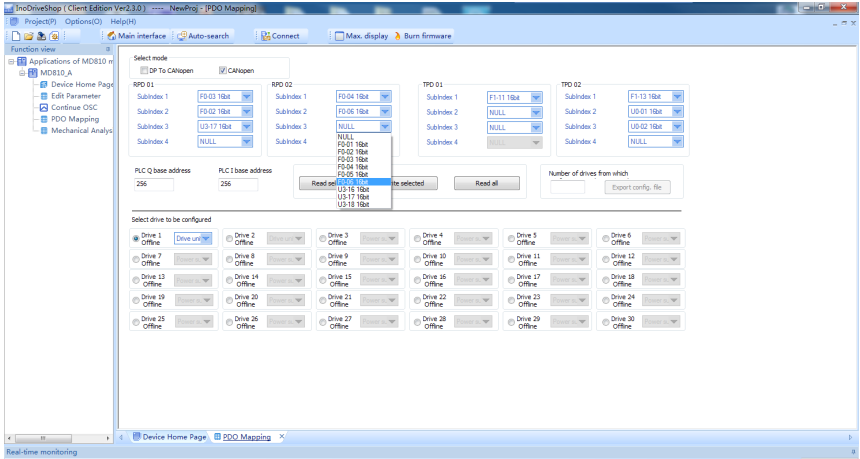
Directly select an object to be configured on the master operation background and the master uses an SDO to write a PDO mapping to the nodes, as shown in the following figure.



■ Directly configure a slave PDO

i. Configure a PDO using the commissioning software

When using a master that cannot configure a slave PDO mapping, you can directly configure the slave using the CANopen configuration interface of the commissioning software InoDriveShop of the 810 series power supply unit, as shown in the following figure:



◆ Any modification operation through the background must be finished before a CANopen remote node is started up.

ii. Manually configure a PDO using the operating panel

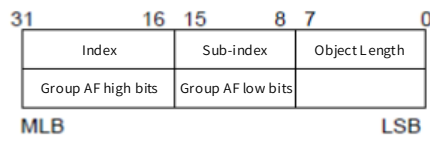
The 810 series power supply unit also supports any manual modification to parameters in group AF to configure a PDO mapping. The following table shows the mapping relation of every PDO.

Table 6-13 PDO mapping table

RPDO	Group AF Address		TPDO	Group AF Address	
RPDO1	Sub-index 1	AF-00	TPDO1	Sub-index 1	AF-32
		AF-01			AF-33
	Sub-index 2	AF-02		Sub-index 2	AF-34
		AF-03			AF-35
	Sub-index 3	AF-04		Sub-index 3	AF-36
		AF-05			AF-37
	Sub-index 4	AF-06		Sub-index 4	AF-38
		AF-07			AF-39

RPDO	Group AF Address		TPDO	Group AF Address		
RPDO2	Sub-index 1	AF-08	TPDO2	Sub-index 1	AF-40	
		AF-09			AF-41	
	Sub-index 2	AF-10		AF-42	Sub-index 2	AF-43
		AF-11		AF-44		
	Sub-index 3	AF-12		AF-45	Sub-index 3	AF-46
		AF-13		AF-47		
	Sub-index 4	AF-14		AF-48	Sub-index 4	AF-49
		AF-15		AF-50		
RPDO3	Sub-index 1	AF-16	TPDO3	Sub-index 1	AF-51	
		AF-17			AF-52	
	Sub-index 2	AF-18		AF-53	Sub-index 2	AF-54
		AF-19		AF-55		
	Sub-index 3	AF-20		AF-56	Sub-index 3	AF-57
		AF-21		AF-58		
	Sub-index 4	AF-22		AF-59	Sub-index 4	AF-60
		AF-23		AF-61		
RPDO4	Sub-index 1	AF-24	TPDO4	Sub-index 1	AF-62	
		AF-25			AF-63	
	Sub-index 2	AF-26		AF-64	Sub-index 2	AF-65
		AF-27		AF-66		
	Sub-index 3	AF-28		AF-67	Sub-index 3	AF-68
		AF-29		AF-69		
	Sub-index 4	AF-30		AF-70	Sub-index 4	AF-71
		AF-31		AF-72		

One PDO can be configured with four mappings. Configuring one mapping requires operating two parameters in group AF to achieve 32-bit data whose high 16 bits are an object dictionary index and low 16 bits (large parameter No.) are an object dictionary sub-index and object length. The object length is calculated in bits. Mapping object format is required as follows:



According to the preceding relation between the parameters and the object dictionary, when a parameter needs to be mapped to a PDO, you need only to write into group AF an object dictionary index and sub-index and data length corresponding to a parameter according to the preceding rules.

For example, you want to configure two mappings in RPDO1, one directs at F0-01 and the other is an object dictionary object 0x6060-00. The operation is as follows:

Figure 6-6 Example of group AF mapping

Assumed Address	Group AF Address	Contents	Remarks
F0-01	AF-00	0x20F0	Parameter address index Equal to group No. F0 + 0x2000
	AF-01	0x0210	High bit 02: Parameter group No. offset + 1; Low bit 10: 16-bit parameter length.
0x6060-00.	AF-02	0x6060	Object dictionary index
	AF-03	0x0008	High bit 00: Object dictionary sub-index; Low bit 08: 8-bit object length.



NOTE

- ◆ Any write operation through the background or operating panel must be finished before a CANopen remote node is started up.

1) Expert mode

You can select a CANopen expert mode using Fd-34. In expert mode, a PDO mapping is subject to configurations in group AF and its configurations performed by the CANopen master are omitted.

Note: If the CANopen master has configured it, the configured mapping is not written, but the number of PDOs and the length must be consistent with those set in group AF. Failure to comply may result in an error in the configuration phase.

In expert mode, you can manually set a PDO by the method described in the preceding section "Manually configure a PDO using the operating panel" in the case that the master does not perform configuration. After receiving a start command, the 810 series power supply unit performs communication according to any configured mapping in group AF.

2) Manually configure disabled time/event time

You can manually configure disabled time/event time using Fd-35 and Fd-36. Take disabled time as an example to describe the work mode of this function code.

When Fd-35 is set to 0, this function code is invalid and has no effect on disabled time;

When Fd-35 is set to a value greater than 1, if the master has configured the disabled time of a TPDO (e.g. TPDO1), then this TPDO communicates according to the disabled time configured by the master. If the master does not configure a TPDO with disabled time, this TPDO communicates according to the value set in Fd-35.

The work mode of Fd-36 is the same as Fd-35.

Note: The unit of Fd-35 (disabled time) is 100 us; the unit of Fd-36 (event time) is ms.

6.3.7 CANopen Communication Protocol

1) Overview of CANopen Communication Protocol

CANopen is an application layer protocol of the network transmission system based on the CAN serial bus. The CAN bus follows an ISO/OSI standard model. This protocol defines the data link layer and some physical layers in the OSI model. It can adopt multi-master mode, in which any node in the network can send a message to other nodes. Network nodes are classified with different priorities based on the system real-time requirements, reducing the bus arbitration time in case of a transmission collision. The CAN network cancels the traditional address coding that is replaced with communication data block coding. With data block coding, the number of nodes in the network is not limited theoretically, and different nodes can receive the same data. This coding mode also features short transmission byte, fast speed, good fault tolerance, and reliable data transmission, making it suitable for industrial control and distributed real-time control. The following figure shows a CANopen equipment model.

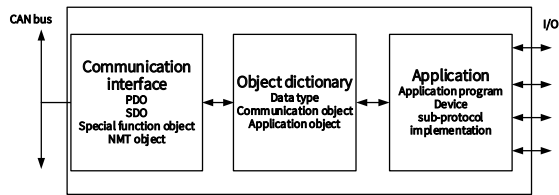


Figure 6-7 CANopen equipment model

2) Object dictionary

Object dictionary is the most important part in the device profile. It is an ordered set of parameters and variables, and includes all parameters of the device profile and device network state. A set of objects can be accessed by using the ordered pre-defined method.

The CANopen protocol uses an object dictionary with a 16-bit index and 8-bit sub-index. The following table shows the structure of the object dictionary. One master node or configuration tool can access all values in a slave node object dictionary.

Index	Object
000	Unused
0001—001F	Static data type (Standard data type such as Boolean and Integer16)
0020—003F	Complex data type (Predefine a structure into which simple types are combined, such as PDOCommPar and SDOParameter)
0040—005F	Complex data type specified by the manufacturer
0060—007F	Static data type specified by the device sub-protocol
0080—009F	Complex data type specified by the device sub-protocol
00A0—0FFF	Reserved
1000—1FFF	Communication sub-protocol area (e.g. device type, error register and supported PDO quantity)
2000—5FFF	Manufacturer-specific sub-protocol area
6000—9FFF	Standard device sub-protocol area (e.g. "DSP-401 I/O module device sub-protocol": Read State 8 Input Lines)
A000—FFFF	Reserved

Figure 6-8 Structure of object dictionary

3) Commonly-used communication object

■ NMT

An NMT includes Boot-up messages, Heartbeat protocol, and NMT messages. Based on master-slave mode, an NMT is used to manage and monitor nodes in the network and mainly implements three functions: node status control, error control, and node activation.

■ SDO

An SDO enables you to access items in the equipment object dictionary using an index and sub-index.

An SDO is achieved through a CMS object of the multi-element domain in CAL and allows transmitting data in any length. (When exceeding four bytes, data are broken into several packets.)

The SDO protocol produces a response for every request. SDO request and response packets always contain eight bytes.

■ PDO

A PDO is used to transmit real-time data from one node to one or multiple nodes. The data length ranges from one to eight bytes.

Every CANopen device contains eight default PDO channels, four PDO sending channels, and four PDO receiving channels.

A PDO contains synchronous and asynchronous transmission modes that depend on the corresponding communication parameter of this PDO.

The contents of a PDO message are pre-defined and depend on the corresponding mapping parameter of this PDO.

■ SYNC object

A SYNC object is a packet that is broadcast to the CAN bus periodically by the CANopen master. It is used to achieve basic network clock signals. Every device determines whether to perform synchronous communication with other network devices using this event according to its own configurations.

4) Description of CANopen packet format

■ NMT module control packet

Only an NMT-Master node can send an NMT Module ControlNMT packet. ["Table 6-15 NMT packet"](#) shows the packet format. COB-ID is fixed to "0x000". Data0 is a command word occupying one byte, as shown in ["Table 6-16 NMT packet command"](#). Data1 is a CANopen network device address occupying one byte. When it is "0", it indicates a broadcast message that is valid for all slave devices in the network.

For example, set a device with device address "6" to operable state. The command is "0x000 0x01 0x06".

Table 6-14 NMT packet

COB-ID	RTR	Data0	Data1
0x000	0	Command word	Node ID

Table 6-15 NMT packet command

Command	Description
0x01	Start Remote Node
0x02	Stop Remote Node
0x80	Enter Pre-operational State
0x81	Reset Node
0x82	Reset Communication

■ NodeGuarding packet

The current state of every node can be checked using the node protection service MNT master node. Especially, this service is significant when these nodes have no data to be transmitted.

The standard protocol object 0x100C sets Guard Time and 0x100D sets a product factor of Guard Time. Both jointly determine the node protection time period.

The following table shows a remote frame sent from the NMT master node.

Table 6-16 NodeGuarding packet sent from the master node

COB-ID	RTR
0x700+Node-ID	1

Table 6-18 shows a response packet returned from an NMT slave node. A status word has one byte. Table 6-19 shows the format.

Table 6-17 NodeGuarding response packet returned from a slave

COB-ID	RTR	Data0
0x700+Node-ID	0	Status word

Table 6-18 NodeGuarding return status

Data Bit	Description
bit7	"0" or "1" must be alternatively set every time.
bit6 to bit0	State: 4: Stopped 5: Operational 127: Pre-operational

■ Heartbeat packet

A Heartbeat packet is that a node is configured to generate periodicity. The status word bit7 is "0" and bit6 to bit0 are consistent with those of NodeGuarding, as shown in the following table. Heartbeat time is set in the standard protocol object 0x1017. One node cannot support both NodeGuarding and Heartbeat protocols.

Table 6-19 Heartbeat packet

COB-ID	RTR	Data0
0x700+Node-ID	0	Status word

6.4 PROFIBUS-DP Communication

6.4.1 Networking

If more than 32 nodes are deployed, relays are required. With two relays, a maximum of 32 nodes (including the relays) can be connected.

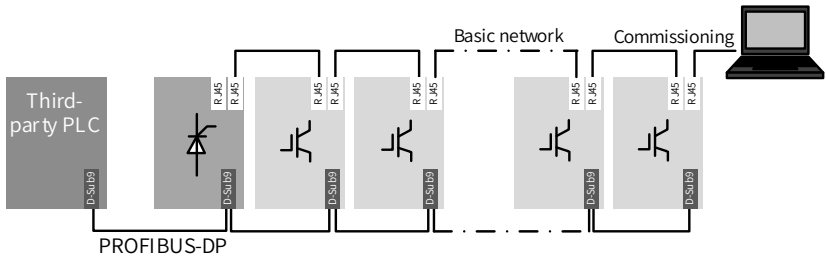


Figure 6-9 PROFIBUS-DP communication networking

6.4.2 Interface Description

Description of PROFIBUS-DP 9PIN standard interfaces

MD810DP is connected to the PROFIBUS master station using the standard DB9 socket. The pin signal definition and pin arrangement of the standard DB9 socket are similar to those of Siemens' DB9 socket, as shown in the following figure.

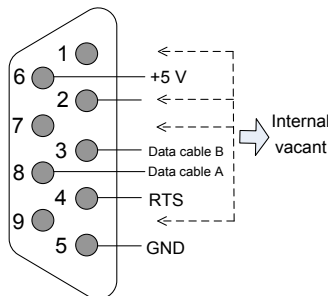


Figure 6-10 DB9 interface pins

Table 6-20 DB9 control terminal functions

Category	Terminal ID	Terminal Name	Function Description
PROFIBUS-DP communication terminal	1, 2, 7, and 9	NC	Internal vacant
	3	Data cable B	Positive of data cable
	4	RTS	Request for transmitting signal
	5	GND	Isolated 5 V power ground
	6	+5 V	Isolated 5 V power supply
	8	Data cable A	Negative of data cable

6.4.3 Baud Rate and Communication Distance

Baud Rate (bps)	12 M	6 M	3 M	1.5 M	500 K	187.5 K	19.2 K	9.6 K
Length (m)	100	100	100	100	200	600	1200	1200

6.4.4 Relevant Parameters

Parameter	Function	Default Value	Value Range	Parameter Description
Fd-20	DP communication address	1	0: DP function disabled 1–125: DP communication address	Indicates the slave station number for DP communication. When this parameter is set to 0, the DP communication function is disabled. On the same network, all station numbers must be different. Otherwise, communication fails.
Fd-97	DP software version	0.00	0.00–655.35	Indicates the version number of DP communication software.

6.4.5 PROFIBUS-DP Communication Protocol Description

1 Data transmission format

In the PROFIdrive protocol, parameter/process data object (PPO) is used as the data transmission format, including PPO1, PPO2, PPO3, PPO4, and PPO5. MD810 supports all data formats.

Table 6-21 Functions of PPO data formats

Data Format	Supported Function	Data Format	Supported Function
PPO1	Single function parameter operation Drive command and frequency settings Drive state and running frequency reading	PPO4	Drive command and frequency settings Drive state and running frequency reading Periodic writing of four function parameters Periodic reading of four function parameters
PPO2	Single function parameter operation Drive command and frequency settings Drive state and running frequency reading Periodic writing of four function parameters Periodic reading of four function parameters	PPO5	Single function parameter operation Drive command and frequency settings Drive state and running frequency reading Periodic writing of 10 function parameters Periodic reading of 10 function parameters
PPO3	Drive command and frequency settings Drive state and running frequency reading		

Data blocks of the PPO data formats are divided into two zones, including the PKW zone (parameter zone) and PZD zone (process data zone). Figure 6-10 shows the PPO data formats supported by MD810, and Table 6-23 lists the data length in different data zones.

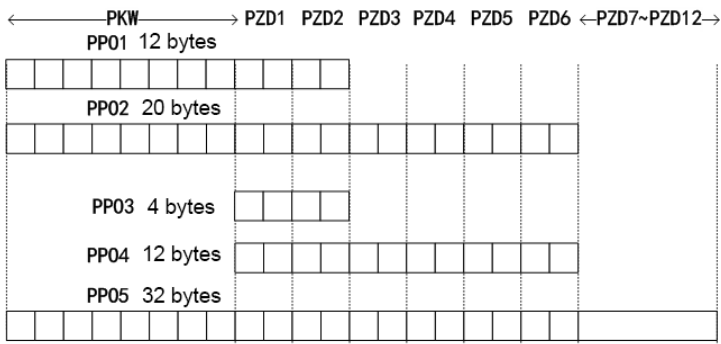


Figure 6-11 PPO data formats

Table 6-22 PPO data length

PPO Data Format	Length in the PKW Zone (Byte)	Length in the PZD Zone (Byte)	Total PPO Data Length (Byte)
PPO1	8	4	12
PPO2	8	12	20
PPO3	0	4	4
PPO4	0	12	12
PPO5	8	24	32

2 PKW data description

PKW data is used by the master station to read/write a single parameter of the drive. Communication addresses of the drive parameters are directly determined by communication data. PKW data functions as follows:

- Reading AC drive function parameters
- Modifying AC drive function parameters

Data format

The PKW data includes three groups of arrays, including PKE, IND, and PWE. The PKE, IND, and PWE data length are two bytes, two bytes, and four bytes, respectively. The following table describes the data formats.

PKW Data Sent by the Master Station							
Operation Command	Parameter Address		Reserved			Writing: parameter value Reading: null	
PKE	PKE	IND	IND	PWE	PWE	PWE	PWE
Drive PKW response data							
Operation Command	Parameter Address		Reserved			Successful: returned value Failed: error information	
PKE	PKE	IND	IND	PWE	PWE	PWE	PWE

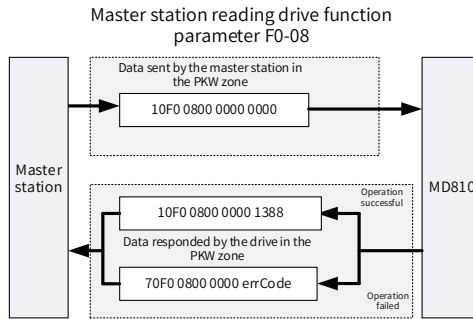
Data description

PKW Data Sent by the Master Station		Drive PKW Response Data	
PKE	Four higher bits: command code 0 : no request 1 : reading parameter data 2 : modifying parameter data (The preceding command code is in decimal format.) Four lower bits: reserved Eight lower bits: high-order bits of the parameter address	PKE	Four higher bits: response code 0 : no request 1 : correct parameter operation 7 : execution failed Eight lower bits: high-order bits of the parameter address

PKW Data Sent by the Master Station		Drive PKW Response Data	
IND	Eight higher bits: low-order bits of the parameter address Eight lower bits: reserved	IND	Eight higher bits: low-order bits of the parameter address Eight lower bits: reserved
PWE	16 higher bits: reserved 16 lower bits: unused in the read request, and indicating the parameter value in the write request	PWE	Request successful: parameter value Request failed: error code (consistent with standard Modbus) 1: invalid command 2: invalid address 3: invalid data 4: other error

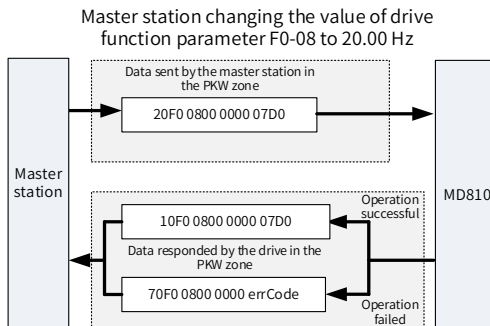
Example:

The following figure shows the PKW data sent by the master station and PKW response data sent by the drive when the master station reads the drive function parameter F0-08.



1) Example PKW data sent by the master station when reading a drive parameter

The following figure shows the PKW data sent by the master station and PKW response data sent by the drive when the master station modifies the drive function parameter F0-08.



2) Example PKW data sent by the master station when modifying a drive parameter

PKW data exchange with the drive is performed circularly. If the write command (PKE=0x20xx) is continuously used on EEPROM, the service life of the drive's main control chip will be shortened. Therefore, it is recommended that non-periodic write operations or RAM addresses in PKW be used to modify drive parameters. The following table lists RAM addresses of parameters.

Parameter Group	Address
F0–FF	0x00–0x0F
A0–AF	0x40–0x4F
B0–BF	0x50–0x5F
C0–CF	0x60–0x6F

The hexadecimal value converted from the digits in the parameter group are the eight lower bits of the RAM address. For example, the RAM address of F0-10 is 0x000A.

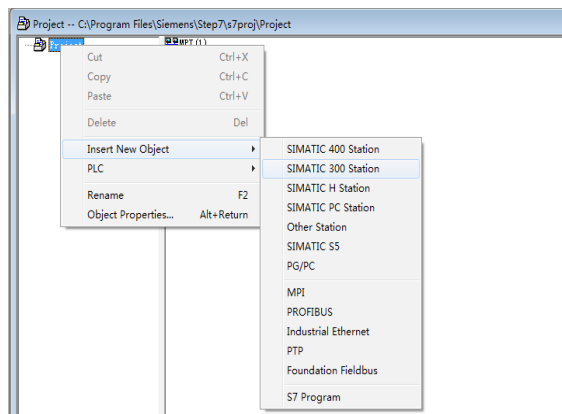
3 PZD data description

The PZD data is used for the master station to modify and read drive data in real time and perform periodic data exchange. Data communication addresses are directly configured by DP network parameters. Specific data definition of PZD1 to PZD12 is determined by PZD configuration. For details about PZD configuration, see step 5 in the next chapter.

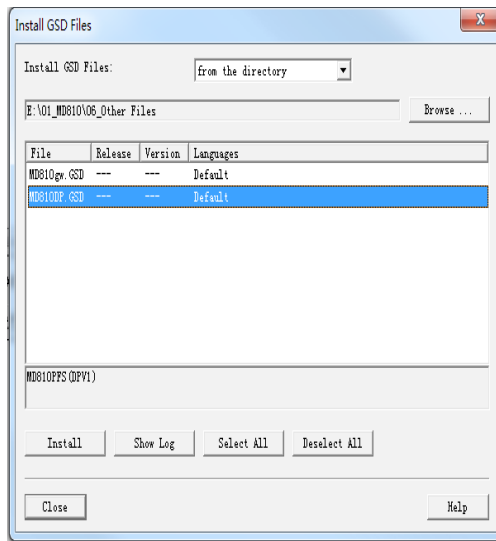
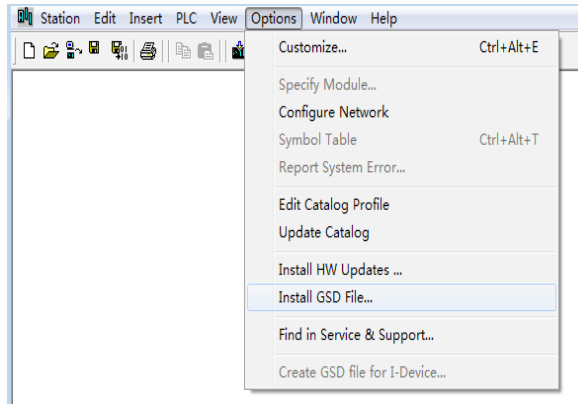
4 Configuring a slave station on the S7-300 master station

When using the PROFIBUS-DP master station, configure the GSD file (obtained from Inovance's agency or manufacturer) of the slave station first to add the slave device to the master station system. If a slave device exists, skip step 2. To configure a slave station, perform the following steps:

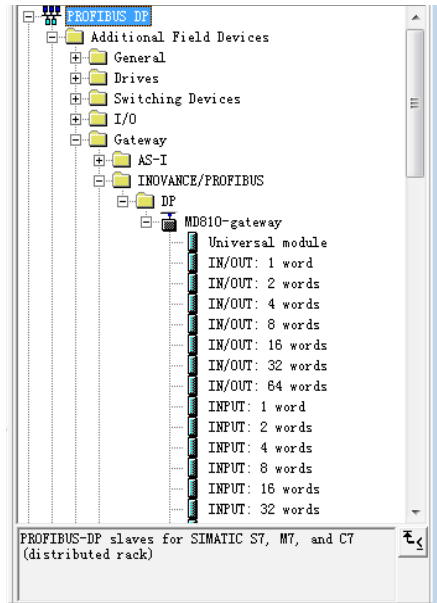
Step 1: Open STEP 7, create a project, and add the S7-300 master station to the project, as shown in the following figure.



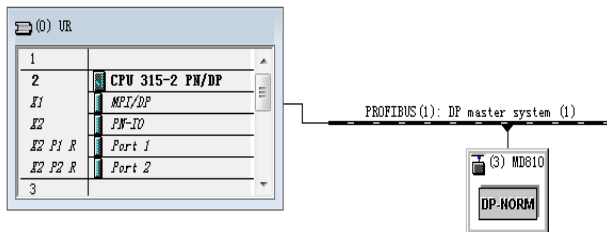
Step 2: Double-click Hardware to access the HW Config window. In the HW Config window, add the MD810DP.GSD file, as shown in the following figure.



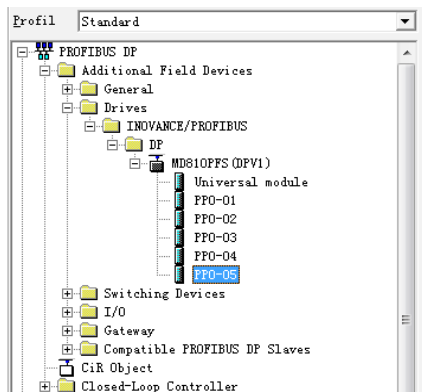
Click Install. After installation is complete, the PROFIBUS-DP module of MD810DP is displayed, as shown in the following figure.



Step 3: Configure the actual hardware system, as shown in the following figure.

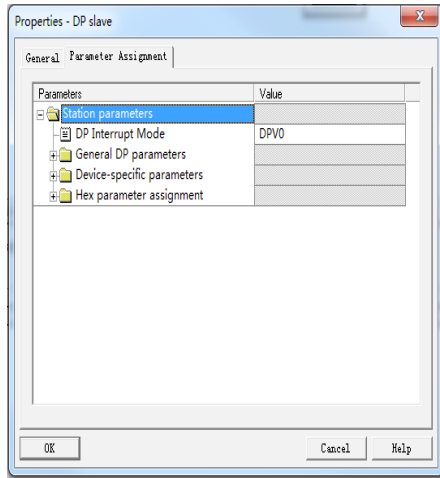


Step 4: Configure data features of the slave station.

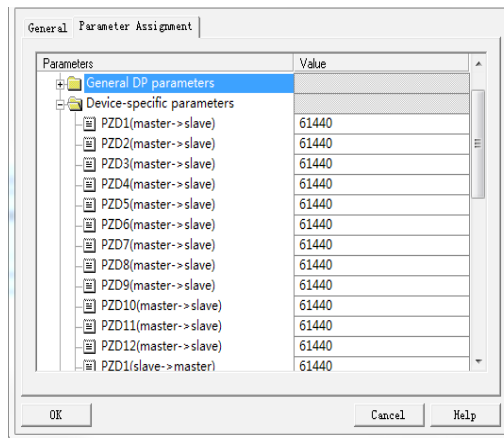


Step 5: Configure the PZD.

Two DP interruption modes are provided, including DPV0 and DPV1. For all Inovance DP, only DPV0 can be selected. By default, DPV0 is selected in STEP 7, and DPV1 is selected in Portal. Therefore, you need to change DPV1 to DPV0 if Portal is used.



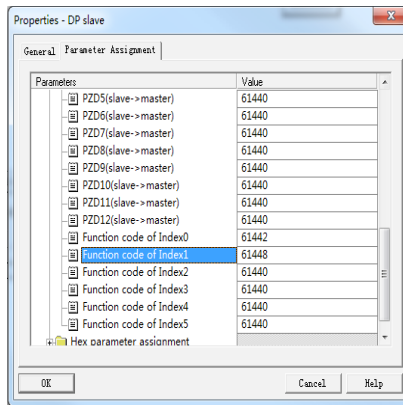
Parameters PZD1 to PZD12 are for customized periodic data exchange. They can be configured in hardware configuration. Double-click the MD810DP sign in HW Config, click "Device-specific parameters", and configure corresponding parameter addresses as required.



PZDx(master->slave) indicates the address used by the master station to write the slave station, and PZDx(slave->master) indicates the address used by the master station to read the slave station. PZD1 to PZD12 displayed in decimal are available. To set PZD3(master->slave) to F0-12, enter 61452.

By default, all PZDs of MD810 is set to F0-00 (61440 in decimal). For unused PZDs, modification is not required and default values can be retained. PZD mapping relationships must be set independently for each slave station as required (if mapping relationships of various slave stations are the same, you can select one configured slave station, press Ctrl+C, select the PROFIBUS-DP bus in the configuration, press Ctrl+V, and modify the station number).

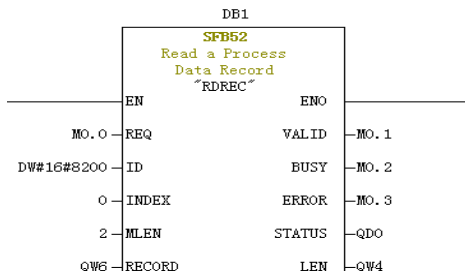
To enable the non-periodic read and write parameter function of DPV1, set corresponding parameters in customized indexes at the end of "Device-specific parameters". MD810 provides six customized indexes numbered from 0 to 5, as shown in the following figure. For example, indexes 0 and 1 are set to F0-02 and F0-08, respectively.



After all the preceding operations are complete, the PROFIBUS slave station is configured. Now, you can compile programs in S7-300 to control the drive.

5 Non-periodic reading and writing on the slave DP station of the drive

To perform non-periodic reading and writing on the slave DP station of the drive, Siemens's system function modules SFB52 (for reading) and SFB53 (for writing) are required. Create an organization block in the program, and add relevant function blocks and programs in the organization block.



After M0.0 is set, the function block reads F0-02 (Index 0 has been set to F0-02 before) of the drive No. 3 and saves it in QW6. Field definitions are as follows:

REQ: Command enablement. When this field is set to 1, the function block is enabled.

ID: Logic address. To specify this field, convert any bit in the Q address of the corresponding drive slave station to a decimal value, and set bit 15 of the value to 1. For example, after Q512 is converted to the decimal value H200, and bit 15 is set to 1, H8200 is obtained.

S...	DP ID	Order Number / Designation	I Add...	Q Address	Comment
1	4AX	PP0-05	256...263	256...263	
2	12AF	--> PP0-05	264...287	264...287	

INDEX: Index ranging from 0 to 5. This field can be customized to an index mapping address of a slave station as required.

MLEN: Maximum length of the data to be obtained. For MD38DP2, this field must be set to 2.

RECORD: Target region of an obtained data record. This field is used to store read data when the read operation is performed and sent data when the write operation is performed.

VALID: New data record received and valid.

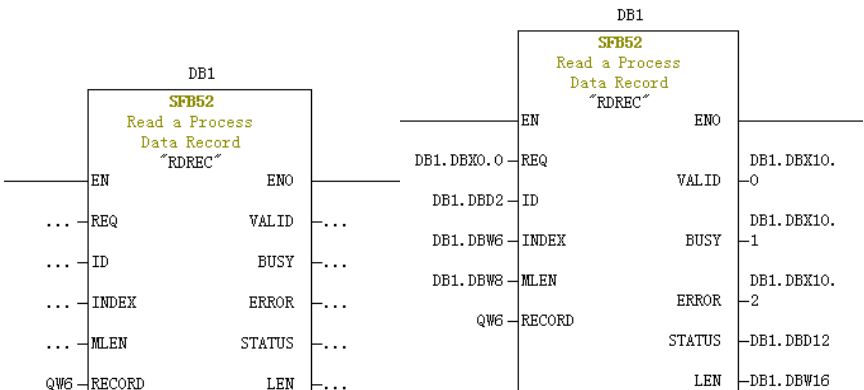
BUSY: When the field value is ON, operations are not complete.

ERROR: When the field value is ON, an error occurs.

STATUS: Block status or error information.

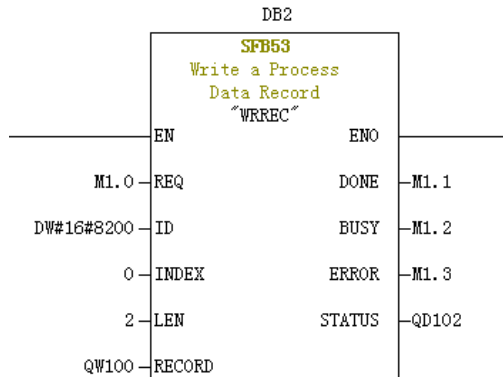
LEN: Obtained data record length.

During invocation, you can customize parameters or use partial or all default parameters, as shown in the following figure.



In the preceding figure, default parameters are used on the left, that is, parameters are set according to the information shown on the right. You can customize parameters or use default parameters for corresponding blocks as required. However, if multiple invocations are involved, you need to customize parameters to avoid invocation errors caused by default parameters (note: RECORD must be customized).

Non-periodic write operations are similar to non-periodic read operations. The RECORD field stores data to be written, as shown in the following figure.



Note that before running an organization block, you need to download data blocks (above the function block with DB1 and DB2 used as examples) to the PLC. Otherwise, the DB block unloading error will be generated.

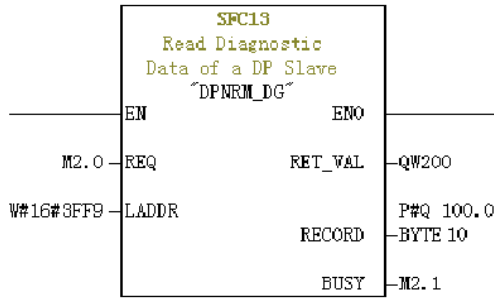
SFB53 is used to perform operations on the EEPROM. Therefore, the program is required to invoke relevant operations when required and disable relevant operations in time. After the write operation is complete (M1.1 is set to 1), the program is invoked to reset M1.0, as shown in the following figure.



Execution of SFB52 and SFB53 requires invoking relevant blocks for multiple times each time. Therefore, do not invoke them when single execution is required.

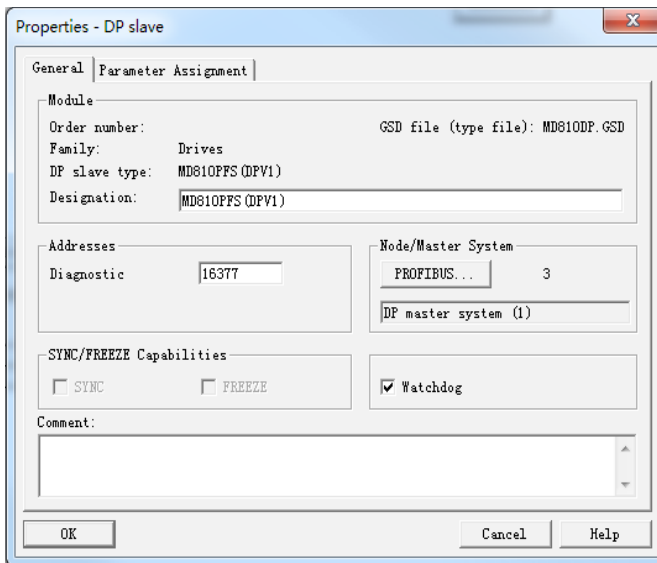
6 Diagnosis

Use SFC13 in the program to obtain specific diagnosis information of each slave station, as shown in the following figure.



REQ: Command enablement. When this field is set to ON, diagnosis information reading is initiated.

LADDR: Configured diagnosis address of the slave DP station. The actual value is shown in the following figure. For SFC13, the address must be specified in hexadecimal.



RET_VAL: Error code (negative) displayed when invocation errors occur and actual transmitted data length (positive) displayed when no error occurs.

RECORD: Target region of the read diagnosis data. The value must be in byte data type with 10 bytes. Otherwise, an error will be generated during invocation. Byte definitions are as follows:

Byte	Definition
Byte 0-2	Station status
Byte 3	Master station number

Byte	Definition
Byte 4	Supplier ID (high byte)
Byte 5	Supplier ID (low byte)
Byte 6–9	Dedicated device diagnosis information

BUSY: When this field is 1, reading is not complete.

Dedicated device diagnosis provides relevant drive fault information, which is consistent with the value of U0-45.

6.5 Switching the PROFIBUS-DP to the CANopen Network Bridge

6.5.1 Networking

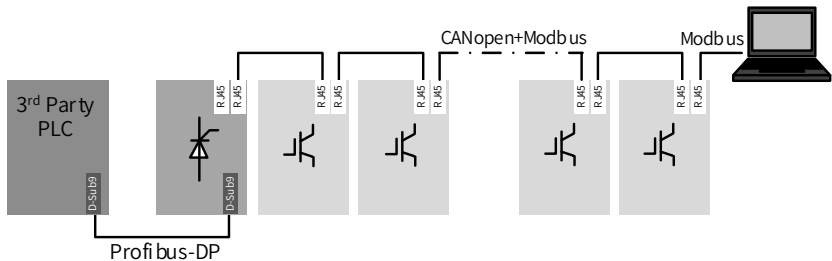


Figure 6-12 Communication networking of switching the PROFIBUS-DP to the CANopen network bridge

6.5.2 Interface Description

The PROFIBUS-DP terminal interface is the same as the standard PROFIBUS-DP definition. For details, refer to the PROFIBUS-DP communication interface chapter.

The CANopen terminal interface is the same as the standard CANopen definition. For details, refer to the CANopen communication interface chapter.

6.5.3 Communication Performance

One network bridge unit (PROFIBUS-DP slave) is provided with 30 CANopen slaves.
Note: The network bridge itself is also a CANopen slave.

Data sent/received during the interaction of one network bridge unit (PROFIBUS-DP slave) with a PLC contain up to 122 parameters.

Data sent/received by every CANopen slave contains up to eight parameters.

The communication distance is the same as the standard PROFIBUS-DP and CANopen networks. For details, refer to the PROFIBUS-DP and CANopen chapters.

6.5.4 Related Parameters

Parameter	Name	Default	Setting Range	Remarks
Fd-09	Communication status	0	Units digit (CANopen) 1: Initialization 2: Pre-running 8: Running 9: Stop Tens digit (CANlink) 1: Initialization 2: Pre-running 8: Running 9: Stop Hundreds digit (PROFIBUS-DP) 1: Initialization 2: Pre-running 8: Running 9: Stop	The tens digit is used for CANlink. Read-only, used to monitor communication status.
Fd-10	Communication protocol selection	1	0: No protocol 1: CANopen 2: CANlink 3: Switching the PROFIBUS-DP to the CANopen Network Bridge	The power supply unit uses the PROFIBUS-DP network bridge function if "3" is set.
Fd-12	CAN baud rate	5	0: 20 Kbps 1: 50 Kbps 2: 100 Kbps 3: 125 Kbps 4: 250 Kbps 5: 500 Kbps 6: 1 MKbps	CAN communication baud rate of the power supply unit Note: After the network runs, modify the baud rate of the power supply and drive units and it will take effect immediately. In addition, the network will detect an error and the error must be manually cleared. Use the default if there is no special application.
Fd-13	CANopen address	1	0 to 127	Configure a CANopen slave address.
Fd-20	PROFIBUS-DP communication address	1	0: PROFIBUS-DP function disabled 1 to 125: PROFIBUS-DP communication address	Set enabling the PROFIBUS-DP function of the AC drive. Configure a PROFIBUS-DP node address.

Parameter	Name	Default	Setting Range	Remarks
Fd-22	Network bridge mode	0	0: Uncommunicable 1: Communicable	Specially designed for the power supply unit. It is used to select whether to normally establish communication when the number of slaves configured in the PLC does not match with that in the actual network.
Fd-23	Number of online slaves	0	0 to 29	Specially designed for the power supply unit. It indicates the number of online slaves after communication is established. It is used to check whether the number of online slaves is consistent with that in the actual network when Fd-22 is set to 1.
Fd-24	Network bridge power-on delay	8	5 to 20	Specially designed for the power supply unit. It indicates the network bridge power-on delay. When there are many common bus drive slaves, the power-on time becomes long and the network bridge communicates first, but slaves are not ready, causing errors. In this case, set this parameter to a large value.
Fd-25	Online status of slaves 1-15	0	0 to 65535	Specially designed for the power supply unit. Bit 1: Network bridge itself. Bit 2: Slave 2. The rest can be done in the same manner. The values 0 and 1 indicate offline and online, respectively.
Fd-26	Online status of slaves 16-30	0	0 to 65535	Specially designed for the power supply unit. Bit 0: Slave 16; Bit 1: Slave 17. The rest can be done in the same manner. The values 0 and 1 indicate offline and online, respectively.
Fd-33	Network bridge communication period	-	-	-
AF-00 to AF-31	Process data mapping received by the power supply unit			Process data mapping from the PLC to the power supply unit. For the specific configuration method, refer to the CANopen slave configuration chapter.

Parameter	Name	Default	Setting Range	Remarks
AF-32 to AF-63	Process data mapping sent from the power supply unit			Process data mapping from the power supply unit to the PLC. For the specific configuration method, refer to the CANopen slave configuration chapter.
AF-66	Number of data mappings received by the power supply unit			Effective number of mappings in this station and corresponds to OUT of the PLC.
AF-67	Number of data mappings sent from the power supply unit			Effective number of mappings in this station and corresponds to IN of the PLC.

6.5.5 Fault Description

The fault codes of the power supply unit are as follows:

Error Code	Description	Troubleshooting
E16.31	PROFIBUS-DP slave communication timeout	Check the connection of the PROFIBUS-DP cable.
E16.34	CAN slave offline in the configuration process of switching the PROFIBUS-DP to the CANopen network bridge	Check whether the value of "The number of devices" in the special device parameter of the PLC is consistent with the actual number of stations or whether the setting of the slave station No. is correct.
E16.35	Incorrect configuration parameter of the drive part for switching the PROFIBUS-DP to the CANopen network bridge	According to the diagnosis packet of the PLC, check whether the IN/OUT values of "NO. n" in the special device parameter of the PLC is consistent with AF-66/67 of the slave.
E16.42	Incorrect configuration parameter of the power supply unit for switching the PROFIBUS-DP to the CANopen network bridge	According to the diagnosis packet of the PLC, check whether the IN/OUT values of "NO. 1" in the special device parameter of the PLC is consistent with AF-66/67 of the network bridge unit.



NOTE

- ◆ In case of configuration errors, the PROFIBUS-DP is reconfigured only after the error of the network bridge unit is reset.

The fault codes of the drive unit are as follows:

Error Code	Description	Troubleshooting
E16.11	CANopen slave communication timeout	Check the connection of the cable.

Error Code	Description	Troubleshooting
E16.12	CANopen configuration mappings inconsistent with actual transmission mappings	Check mappings in group AF.
E16.13	Communication failure between the power supply and drive units	1: Check whether the cable is correctly connected. 2: Check whether the terminal resistor of the grid is correct. The head end of the network must be connected to the tail end. 3: Check whether Fd-12 (CAN baud rate) is consistent.

6.5.6 Description of Application

1) Configuring parameters of the power supply unit

Step 1: Set the power supply unit as a network bridge.

- Set Fd-10 to 3 (network bridge mode).
- In Fd-20, set a PROFIBUS-DP slave No., which is consistent with the station No. in the PLC slave system.
- Configure interaction data between the network bridge unit and the PLC by setting AF-00 to AF-63. The default is empty. The default parameter can be directly used. The network bridge unit generally does not need to perform data interaction with the PLC. For the specific setting, refer to the CANopen slave configuration description chapter.

Step 2: Set other slave units of the network bridge that can be drive or power supply units.

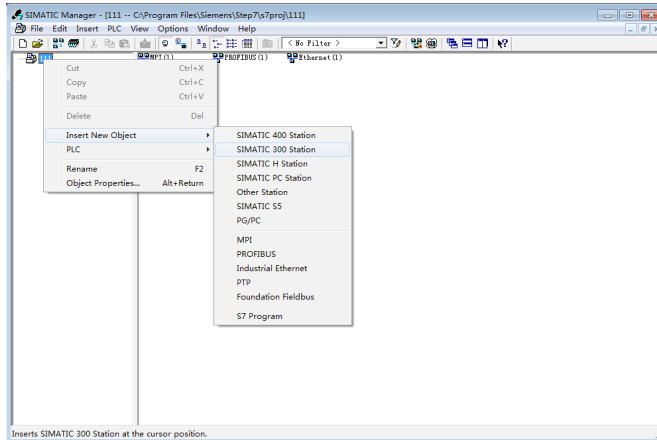
- Set the station No. of every slave unit in Fd-13. The station No. must start with 2 and be sequentially set without being repeated. If there are any needless power supply or drive unit in the network and networking control is not required, this parameter does not need to be set, i.e. the default value 1 is used.
- Configure interaction data between the network bridge unit and the PLC by setting AF-00 to AF-63. The drive unit may directly use default parameters. For specific setting, see "[6.3.6 Description of CANopen Communication Protocol Application](#)".

2) Master configuration on S7-300

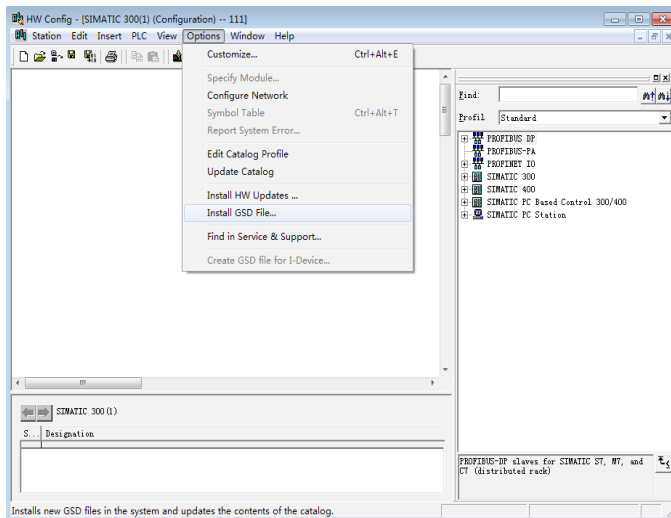
When using in the Profibus master, a slave GSD file must be configured first so that corresponding slave devices can be added in the master system. If the file exists, skip Step 2. The GSD file is available from an Inovance agent or manufacturer. Specific operations are as follows:

Step 1: Establish a project in STEP7. Add an S7 -300 master in the project, as shown in

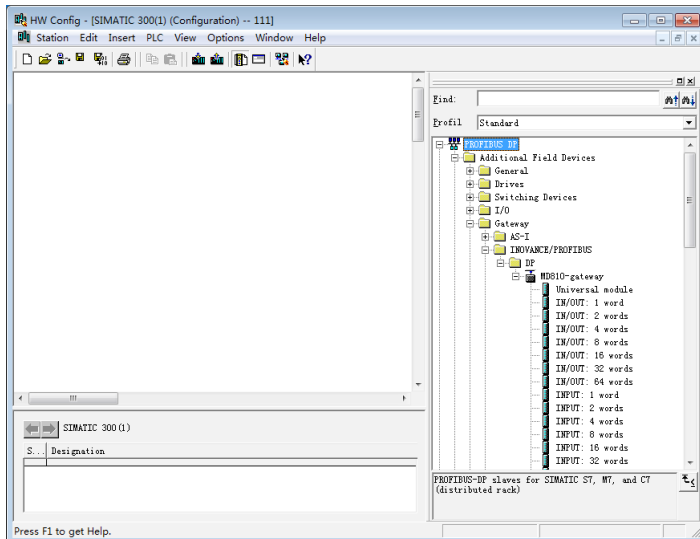
the following figure:



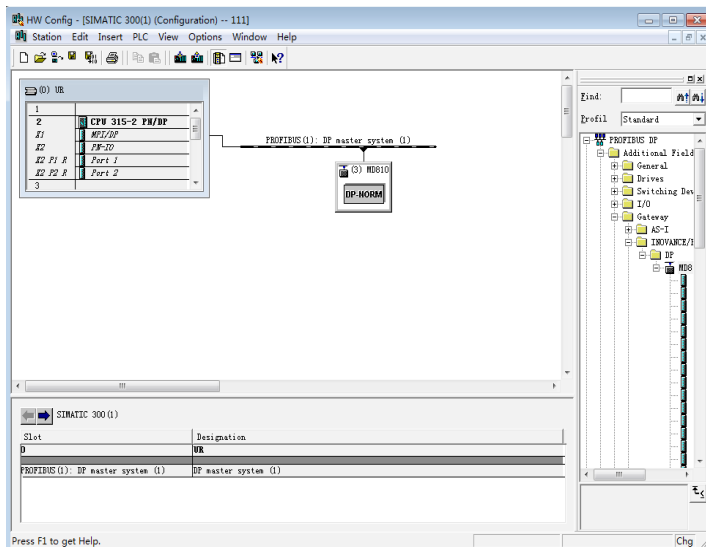
Step 2: Double-click the hardware icon to enter the HW config configuration interface where the MD810DP.GSD file is added. The operations are as follows:



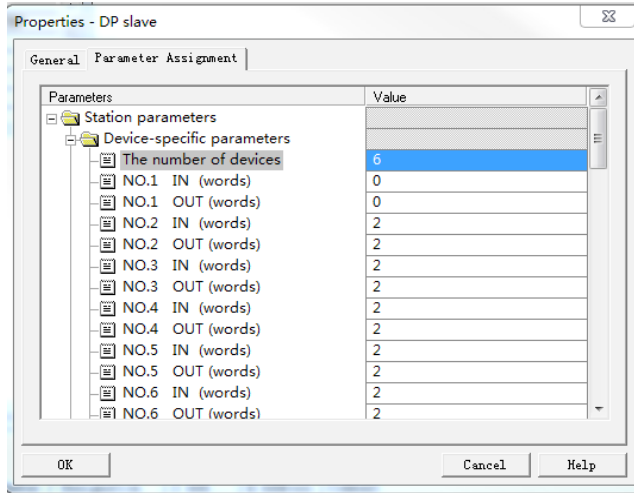
Click Install. After the installation is finished, the MD810-gateway module will emerge under Gateway, as shown in the following figure:



Step 3: Establish a slave system, as shown in the following figure. The establishment of the master is not described here.



Step 4: Configure PROFIBUS-DP slave parameters. Double-click the MD810 slave, as shown in the following figure:

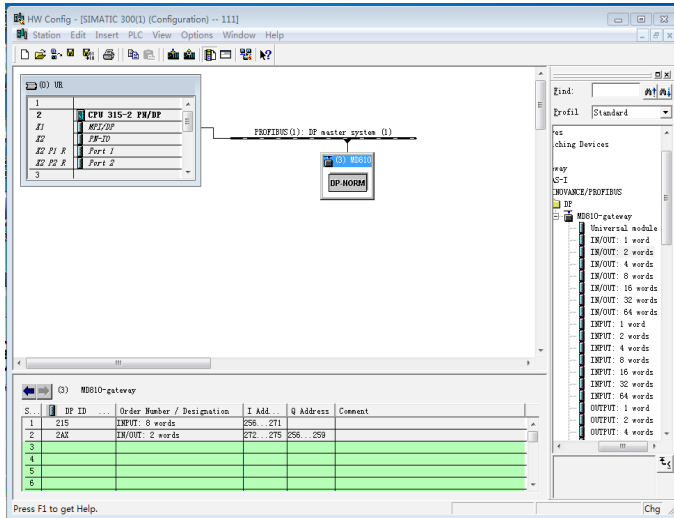


- "The number of devices": Number of stations in the network, up to 30, including the network bridge itself. Assume that one power supply unit (network bridge) plus five drive units use this function. This value is equal to 6.
- "NO.1, NO.2, NO.3...": NO.1 is the network bridge. NO.2 is a slave with No. 2 address when Fd-13 is set to 2. NO.3 is a slave with No. 3 address when Fd-13 is set to 3. NO.n can be done in the same manner.
- "IN, OUT": The value in "IN, OUT" indicates the number of communication data between the power supply unit and the PLC in words. IN: Data from the power supply unit to the PLC, OUT: Data from the PLC to the power supply unit. Communication data between the power supply unit and the PLC is configured in function code group AF. Therefore, this value corresponds to the number of INs and OUTs configured in group AF. For details, see section 7.4.7. Take NO.2 shown in the figure as an example. If INs are 2, it indicates that two data is sent from the power supply unit with CAN address being 2 to the PLC (IN) in words. Set the function codes of both data to AF-32 to AF-35. (The function codes of both groups AF are mapped to one data.) When OUTs are 2, the meaning is similar.



- ◆ For specific IN and OUT values, view the parameters of every station. OUT and IN correspond to AF-66 and AF-67, respectively.
- ◆ AF-66 and AF-67 values are equal to the sum of bits. For example, if AF-66 is 0012, OUT is 3 (1 + 2 = 3).

Step 5: Configure INPUT and OUTPUT data length.



You can see various units with "IN/OUT", "INPUT" and "OUTPUT" on the right. They indicate IN and OUT data containing several words in these units.

- "IN/OUT 1 word, IN/OUT 2 words...": It indicates the combination of INs and OUTs. 1 word indicates one IN and one OUT. 2 words indicate two INs and two OUTs. n words can be done in the same manner.
- "INPUT 1 word, INPUT 2 words...": It indicates independent INs. 1 word indicates one IN. 2 words indicate two INs. n words can be done in the same manner.
- "OUTPUT 1 word, OUTPUT 2 words...": The same as above.

The slot IN and OUT quantity is equal to the sum of INs and OUTs of valid stations in the special device parameter in step 4. If "The number of devices" is 6, the sum of INs equals to NO.1 IN + NO.2 IN + ... NO.6 IN and the sum of OUTs equals to NO.1 OUT + NO.2 OUT + ... NO.6 OUT. The value shown in the preceding figure is for reference, i.e. the sum of INs = 10 and the sum of OUTs = 10.

Insert ten INs and Ten OUTs in the slot by selecting an optional unit on the right. The unit selection method is similar to block building. It can be a combined method or an independent method or an independent and combined method as long as the sum of INs is equal to the sum of INs of valid stations configured in step 4 and so are OUTs. There are multiple combined methods in the following figure, but the result of every combined method is that INs have a total of ten words and OUTs have a total of ten words.

Press F1 to get Help.

S...	DP ID	Order Number / Designation	I Add...	Q Address	Comment
1	8AX	IN/OUT: 8 words	256... 271	256... 271	
2	2AX	IN/OUT: 2 words	272... 275	272... 275	
3					
4					
5					
6					
7					
8					
9					

S...	DP ID	Order Number / Designation	I Add...	Q Address	Comment
1	215	INPUT: 8 words	256... 271		
2	209	INPUT: 2 words	272... 275		
3	231	OUTPUT: 8 words		256... 271	
4	225	OUTPUT: 2 words		272... 275	
5					
6					
7					
8					
9					

S...	DP ID	Order Number / Designation	I Add...	Q Address	Comment
1	8AX	IN/OUT: 8 words	256... 271	256... 271	
2	209	IN/OUT: 2 words	272... 275		
3	225	OUTPUT: 2 words		272... 275	
4					
5					
6					
7					
8					
9					

Press F1 to get Help.



◆ Any inserted I and Q addresses must be continuous. In addition, insertion must sequentially start with slot 1. There is no limitation on the number of slots. In addition, the total of INs and OUTs in the slot must be the same as the calculated total of INs and OUTs in the special device parameter, otherwise communication cannot be established.

Step 6: For obtaining the process data relation between the PLC I/Q address and the power supply unit process data, refer to the CANopen slave configuration description chapter.

6.5.7 CANopen Slave Configuration Description

1) Process data mapping

Every CANopen slave supports sending and receiving up to 16-byte process data, i.e. sending and receiving eight parameters, respectively. Any mapping is allowed. Both the sum of sent process data and received process data cannot exceed 244 bytes.

OUT: PLC -> Power supply unit; IN: Power supply unit -> PLC

■ Manual modification using the operating panel

You can select received/sent parameters by modifying parameters in group AF of the power supply unit. Take the following table as an example. The method of configuring F0-01 in OUT1 is as follows:

- a. Enter the parameter group No. of received/sent parameters plus 0x2000 in the first parameter in group AF of corresponding INPUT or OUTPUT. For example, F0 corresponds to 0x20F0. Enter it in AF-00.
- b. After the group No. of received/sent parameters plus 1 is finished, convert the result into a hexadecimal number and enter the high bits of the second parameter in group AF of corresponding INPUT or OUTPUT; convert the parameter data length into a hexadecimal number and enter the low bits of the second parameter in group AF of corresponding INPUT or OUTPUT.

For example, if the parameter data length of F0-01 is 16 bits, enter 0x0210.

Target Parameter No.	Group AF Address	Setting Value	Remarks
F0-01	AF-00	0x20F0	Parameter address index Equal to group No. F0 + 0x2000
	AF-01	0x0210	High bit 02: Parameter group No. offset + 1; Low bit 10: 16-bit parameter length. For example, this value is 20 for a 32-bit parameter. Note: An offset value must be converted into a hexadecimal number.

You can also map the CANopen object dictionary to group AF. Except that an object dictionary sub-index does not need to be added by 1, other steps are similar, as shown in the following table:

Target Object Dictionary	Group AF Address	Setting Value	Remarks
0x2073-12.	AF-00	0x2073	Object dictionary index
	AF-01	0x1210	High bit 12: Object dictionary sub-index; Low bit 10: 16-bit object length.

The following table shows the relation between the parameters in group AF and INPUT/OUTPUT.

		Group AF Address	Default Drive Parameters				Group AF Address	Drive Default	
OUT	OUT 1	AF-00	0x2073	0x7311 (Control word)	IN	IN 1	AF-32	0x2070	0x7044 (Status word)
		AF-01	0x1210				AF-33	0x4510	
	OUT 2	AF-02	0x2073	0x7310 (Frequency setting)		IN 2	AF-34	0x2070	0x7045 (Running frequency)
		AF-03	0x1110				AF-35	0x4610	
	OUT 3	AF-04				IN 3	AF-36		
		AF-05					AF-37		
	OUT 4	AF-06				IN 4	AF-38		
		AF-07					AF-39		
	OUT 5	AF-08				IN 5	AF-40		
		AF-09					AF-41		
	OUT 6	AF-10				IN 6	AF-42		
		AF-11					AF-43		
	OUT 7	AF-12				IN 7	AF-44		
		AF-13					AF-45		
	OUT 8	AF-14				IN 8	AF-46		
AF-15				AF-47					



- ◆ The power supply unit has no default.
- ◆ If received or sent data needs to be reserved, the power supply unit and drive units use Fd-93. If the first received data reserved by the power supply unit corresponds to AF-00 and AF-01, set AF-00 to 0x20Fd and AF-01 to 0x5E10.
 $AF-00 = 0x2000 + Fd = 0x20Fd;$
 $AF-01 \text{ high 8 bits} = 93+1 = 0x5E;$
 $AF-01 \text{ low 8 bits} = 0x10;$

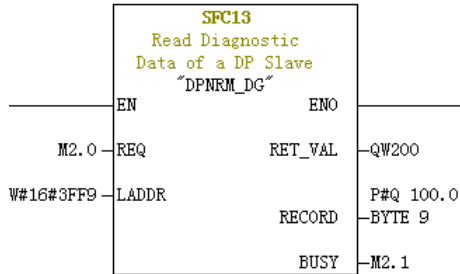
■ Modification using the commissioning software

You can also configure slave process data using the commissioning software of the 810 series power supply unit, as shown in the following figure.

6.5.8 PLC Fault Diagnosis

PROFIBUS-DP master diagnosis information

Specific diagnosis information of slaves can be read using SFC13 in the program, as shown in the following figure:

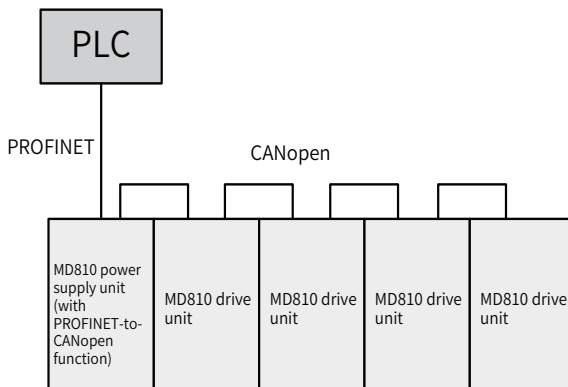


REQ: Command enabled. Diagnosis information reading is enabled when it is set to ON.
 LADDR: Diagnosis address of configured PROFIBUS-DP slaves. The hexadecimal format of this address, i.e. hexadecimal 3FF9 of 16337, must be filled in SFC13.

6.6 PROFINET-to-CANopen Network Bridge

6.6.1 PROFINET Overview

The PROFINET-to-CANopen network bridge function is implemented in the MD810 power supply unit to convert PROFINET to the CANopen protocol. The following figure shows the basic structure of the network bridge.



The network bridge function implements data exchange for a total of 30 nodes (including the power supply unit). Detailed data is as follows.

- 1) For the power supply unit: The network bridge function supports three RPDOs and three TPDOs each with a maximum of 24 bytes.

- 2) For the MD810 or IS810 drive unit: The network bridge function supports a maximum of 29 nodes, each of which can be configured with up to four RPDOs and four TPDOs each with a maximum of 32 bytes. The total number of RPDOs and that of TPDOs configured for the 29 nodes cannot exceed 63. The maximum input or output data length exported by the 29 nodes is 504 bytes, which is obtained by multiplying 63 with 8.

This section describes PROFINET-to-CANopen conversion with the CANopen node of the MD810 drive unit, Siemens' S300 PLC, and Siemens' STEP 7 are used as examples.

6.6.2 Configuration Preparation

Complete the following configuration before using the PROFINET-to-CANopen network bridge function:

- 1) Power supply unit: Set Fd-10 (Communication protocol selection) to 5 and Fd-12 (CAN baud rate) to the desired CANopen baud rate to support PROFINET-to-CANopen conversion.
- 2) Drive unit: Set Fd-10 (Communication protocol selection) to 1 (CANopen), set Fd-12 (CAN baud rate) to the desired baud rate, and set Fd-13 (CAN station number) to the CAN station number (the value 1 is not allowed). Ensure that the CAN station numbers increase gradually. You can set Fd-13 (CAN station number) to CAN site 1 if the node with process data does not exist.



NOTE

- ◆ The power supply unit that supports PROFINET-to-CANopen conversion provides four Ethernet ports, which are divided into two groups. Ensure that PROFINET and CANopen are wired properly.

6.6.3 Process Data Configuration on the AC Drive

This section describes process data configuration, which is the same for the power supply unit and drive unit. The process data required for communication of the local device is configured using the parameters in group AF.

Every CANopen slave supports sending and receiving up to 32-byte process data. Each PDO supports up to eight bytes. Parameters can be selected as required.

Set the received/sent parameters as follows: In the configuration, define IN as AC drive -> PLC and OUT as PLC -> AC drive in a unified manner.

You can select received/sent parameters by modifying parameters in group AF of the power supply unit. Take the following table as an example. The method of configuring F0-01 (Product SN) in OUT1 is as follows:

- 1) Enter the parameter group No. of received/sent parameters plus 0x2000 in the first parameter in group AF of corresponding INPUT or OUTPUT. For example, F0 corresponds to 0x20F0. Enter it in AF-00.
- 2) After the group No. of received/sent parameters plus 1 is finished, convert the

result into a hexadecimal number and enter the high bits of the second parameter in group AF of corresponding INPUT or OUTPUT; convert the parameter data length into a hexadecimal number and enter the low bits of the second parameter in group AF of corresponding INPUT or OUTPUT. For example, if the parameter data length of F0-01 is 16 bits, enter 0x0210.

Target Parameter No.	Group AF Address	Setting Value	Remarks
F0-01	AF-00	0x20F0	Group No. F0 + 0x2000
	AF-01	0x0210	High bit 02: Parameter No. in the group + 1; Low bit 10: Parameter length. For example, this value is 10, 20, and 08 for a 16-bit, 32-bit, and 8-bit parameters, respectively. Note: The parameter No. must be converted into a hexadecimal number.

You can also map the CANopen object dictionary to group AF. Except that an object dictionary sub-index does not need to be added by 1, other steps are similar, as shown in the following table:

Target Object Dictionary	Group AF Address	Setting Value	Remarks
0x2073-12.	AF-00	0x2073	Object dictionary index
	AF-01	0x1210	High bit 12: Object dictionary sub-index; Low bit 10: 16-bit object length.

1 MD810 mapping configuration

The MD810 drive unit is used as an example. The following table shows the relation between the parameters in group AF and INPUT/OUTPUT.

		Group AF Address		AF Param. Value	Process Data Address			Group AF Address		AF Param. Value	Process Data Address
OUT	RPDO1	OUT1	AF-00	0x2073	0x7311	INPUT	TPDO1	INPUT1	AF-32	0x2070	0x7044
			AF-01	0x1210					AF-33	0x4510	
		OUT2	AF-02	0x2073	0x7310			INPUT2	AF-34	0x2070	0x7045
			AF-03	0x1110					AF-35	0x4610	
		OUT3	AF-04					INPUT3	AF-36		
			AF-05						AF-37		
		OUT4	AF-06					INPUT4	AF-38		
			AF-07						AF-39		
	RPDO2	OUT5	AF-08				TPDO2	INPUT5	AF-40		
			AF-09						AF-41		
		OUT6	AF-10					INPUT6	AF-42		
			AF-11						AF-43		
		OUT7	AF-12					INPUT7	AF-44		
			AF-13						AF-45		
		OUT8	AF-14					INPUT8	AF-46		
			AF-15						AF-47		
	RPDO3	OUT9	AF-16				TPDO3	INPUT9	AF-48		
			AF-17						AF-49		
		OUT10	AF-18					INPUT10	AF-50		
			AF-19						AF-51		
		OUT11	AF-20					INPUT11	AF-52		
			AF-21						AF-53		
		OUT12	AF-22					INPUT12	AF-54		
			AF-23						AF-55		
RPDO4	OUT13	AF-24			TPDO4	INPUT13	AF-56				
		AF-25					AF-57				
	OUT14	AF-26				INPUT14	AF-58				
		AF-27					AF-59				
	OUT15	AF-28				INPUT15	AF-60				
		AF-29					AF-61				
	OUT16	AF-30				INPUT16	AF-62				
		AF-31					AF-63				



NOTE

- ◆ For 32-bit data, ensure that each configured PDO contains not more than 8 bytes.
- ◆ The power supply unit supports input and output of up to 24 bytes, respectively. Power on the power supply unit again after modifying its process data.
- ◆ If received or sent data needs to be reserved, the power supply unit and drive units use Fd-93. If the first received data reserved by the power supply unit corresponds to AF-00 and AF-01, set AF-00 to 0x20Fd and AF-01 to 0x5E10.
- ◆ $AF-00 = 0x2000 + FD = 0x20FD$;
- ◆ 8 high-order bits of AF-01 = $93+1 = 0x5E$;
- ◆ 8 lower-order bits of AF-01 = 0x10.

2 IS810 mapping configuration method

IS810 is updated from IS620P. For its application details, see the IS620P user guide.

Configure the IS810 PROFINET network bridge as follows: Set the CANopen slave number to 0C-00 and select 0C-45 = 1 network bridge mode for the CANopen mode.

Different from the PROFIBUS-DP-to-CANopen network bridge, the PROFINET-to-CANopen network bridge supports four RPDOs/TPDOs for IS810 and the 8-, 16-, and 32-bit data structures. The corresponding parameters are as follows.

		Group 2D Address		2D Param. Value	Process Data Address			Group 2E Address		2E Param. Value	Process Data Address		
OUT	RPDO1	Number of mapping objects	2D-32			TPDO1	Number of mapping objects	2E-20					
			OUT1	2D-33					INPUT1	2E-21			
			2D-34					2E-22					
		OUT2	2D-35				INPUT2	2E-23					
			2D-36					2E-24	0x4610				
		OUT3	2D-37				INPUT3	2E-25					
			2D-38					2E-26					
		OUT4	2D-39				INPUT4	2E-27					
			2D-40					2E-28					
		RPDO2	Number of mapping objects	2D-49				TPDO2	Number of mapping objects	2E-37			
				OUT5	2D-50						INPUT5	2E-38	
				2D-51						2E-39			
	OUT6		2D-52			INPUT6	2E-40						
			2D-53				2E-41						
	OUT7		2D-54			INPUT7	2E-42						
			2D-55				2E-43						
	OUT8		2D-56			INPUT8	2E-44						
			2D-57				2E-45						
	RPDO3		Number of mapping objects	2D-66			TPDO3		Number of mapping objects	2E-54			
				OUT9	2D-67						INPUT9	2E-55	
				2D-68						2E-56			
		OUT10	2D-69			INPUT10		2E-57					
			2D-70					2E-58					
		OUT11	2D-71			INPUT11		2E-59					
2D-72					2E-60								
OUT12		2D-73			INPUT12	2E-61							
	2D-74			2E-62									

		Group 2D Address		2D	Process			Group 2E Address		2E	Process
		Number of mapping objects	2D-83	Param. Value	Data Address			Param. Value	Data Address	Number of mapping objects	2E-71
OUT	RPDO4	OUT13	2D-84			INPUT	TPDO4	INPUT13	2E-72		
			2D-85						2E-73		
		OUT14	2D-86					INPUT14	2E-74		
			2D-87						2E-75		
		OUT15	AF-88					INPUT15	2E-76		
			AF-89						2E-77		
		OUT16	AF-90					INPUT16	2E-78		
			AF-91						2E-79		

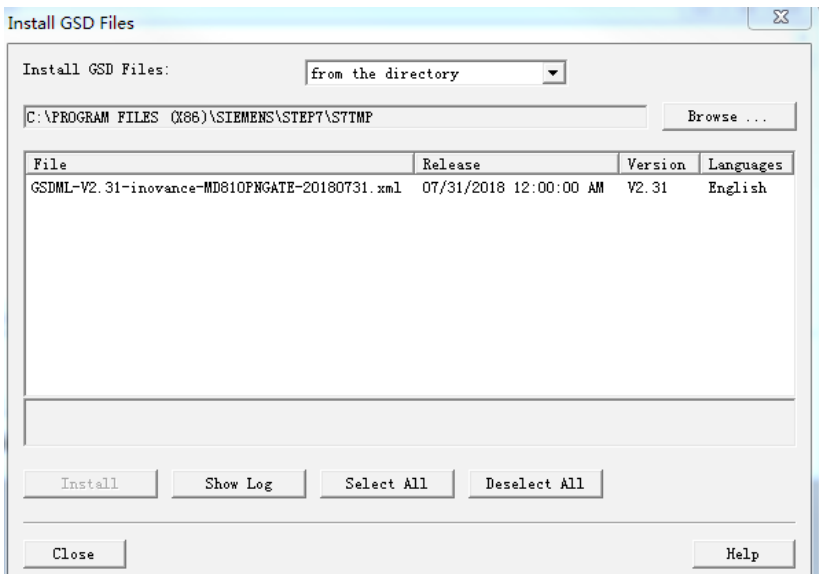


- ◆ Pay attention to the configured mapping length. Ensure that each configured PDO contains not more than eight bytes.
- ◆ If PDO for communication is not required, clear the parameter value; otherwise, the configuration may fail.
- ◆ The configured number of mapping objects must comply with the actual value.

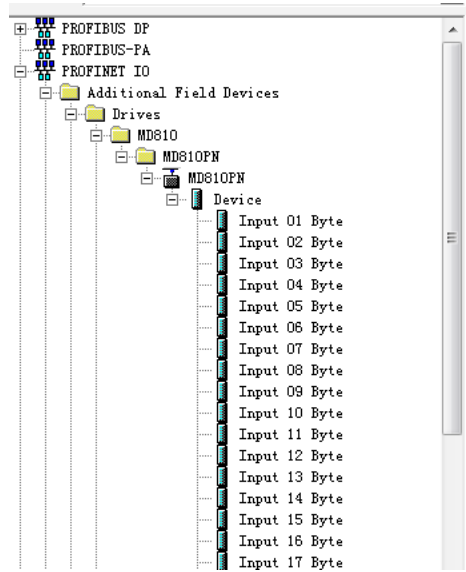
6.6.4 Configuration on STEP 7

1 Import the GSDML file.

Import the GSDML file to STEP 7, as shown in the following figure.

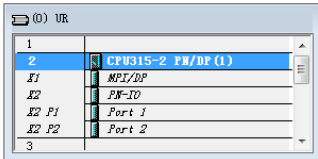


If the import is successful, the device is displayed, as shown in the following figure.



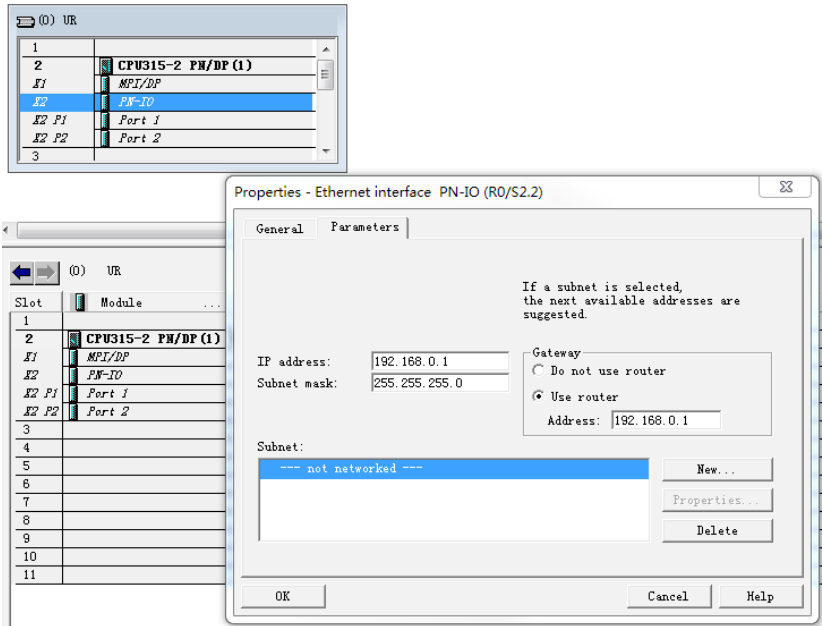
2 Build a PROFINET network.

Assume that a PLC exists in configuration, as shown in the following figure. Add a PROFINET network.

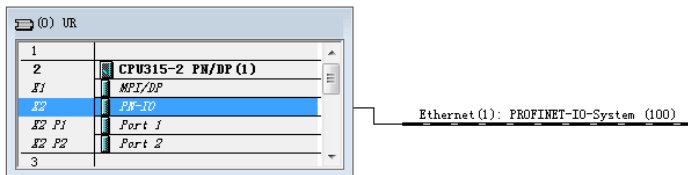


Slot	Module	Order number	Firmware	MPI address	I add...	Q address	Comment
1							
2	CPU315-2 PN/DP (1)	6ES7 315-2EH14-0AB0	V3.1	2			
X1	MPI/DP			2	2047*		
X2	PN-IO				2046*		
X2 P1	Port 1				2045*		
X2 P2	Port 2				2044*		
3							

Right-click **PN-IO** and choose **Insert PROFINET IO System** from the shortcut menu. In the displayed window, select **Properties**, as shown in the following figure.

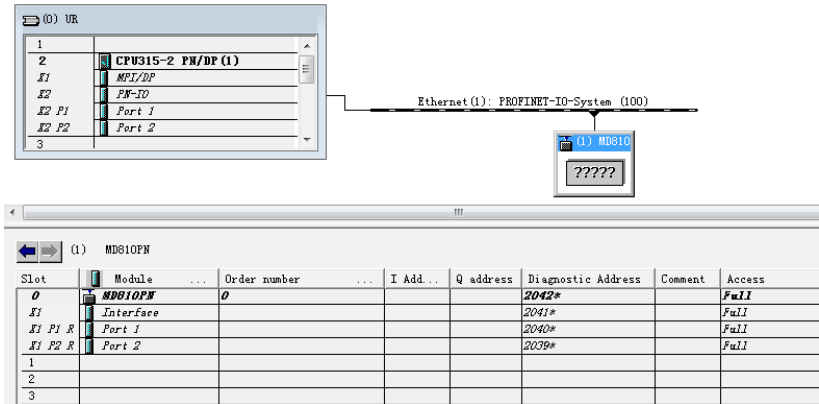


Click **New**. Keep the default settings unless otherwise specified. Then, click **OK**. The following figure shows the new PROFINET network.



Slot	Module	Order number	Firmware	MPI address	I address	Q address	Comment
1							
2	CPU315-2 PN/DP (1)	6ES7 315-2EH14-0AB0	V3.1	2			
E1	MPI/DP			2	2047*		
E2	PN-IO				2048*		
E2 P1	Port 1				2045*		
E2 P2	Port 2				2044*		
3							

Drag the previously added MD810PN device and drop it onto the bus, as shown in the following figure.

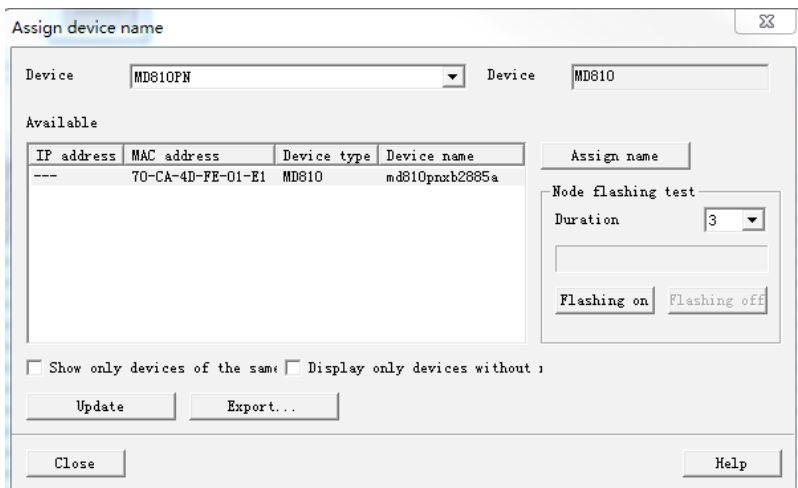


3 Allocate device names.

PROFINET communication requires each device to be allocated with a name. You can name each device as needed and allocate the name to the device. The device name can be kept in normal cases. You need to allocate a name to the PROFINET-to-CANopen unit.

Double-click the module dragged to the configuration and modify the device name as needed. You can also keep the default name.

Then, allocate the name to the PROFINET-to-CANopen device. In the preceding menu, select **Internet** for **PLC** and select **Assign device names**. The following window is displayed.



Select the site to be allocated with a name and click Assign name. Then, close the window.

4 Configure process data.

Before configuring process data, ensure that the AC drive parameters have been set and the process data described above has been configured.

The configuration rules of the PROFINET-to-CANopen network bridge function are as follows.

- 1) Add a site by double-clicking or dragging and dropping it to Device in the list.
- 2) The power supply unit network bridge is named Device 1, which must be added regardless of whether process data of the power supply unit exists.
- 3) Device 2 corresponds to CANopen site 2, and so on.
- 4) Each device contains two sub-slots. The first one only receives input data, and the second one only receives output data.
- 5) The length of data in each sub-slot must be the same as the total input or output length of the corresponding AC drive. The length is measured in bytes.
- 6) If a site does not have input or output data, insert "Input No Data" or "Output No Data" into the corresponding sub-slot.
- 7) Power on the power supply unit again after you modify the process data configuration during PROFINET-to-CANopen communication.

See the following example:

Slot	Module	Order number	I Add...	Q address	Diagnostic Address	Comment	Access
0	MDS10PW	0			2042*		Full
F1	Interface				2041*		Full
F1 P1 R	Port 1				2040*		Full
F1 P2 R	Port 2				2039*		Full
1	Device				256*		
1.1	Input 02 Byte		256...257				Full
1.2	Output No Data				2037*		Full
2	Device				258*		
2.1	Input 12 Byte		258...269				Full
2.2	Output 12 Byte			256...267			Full
3	Device				2038*		
3.1	Input No Data				2038*		Full
3.2	Output No Data				2036*		Full
4	Device				270*		
4.1	Input 04 Byte		270...273				Full
4.2	Output 04 Byte			268...271			Full
5	Device				274*		
5.1	Input 04 Byte		274...277				Full
5.2	Output 04 Byte			272...275			Full
6	Device				278*		
6.1	Input 04 Byte		278...281				Full
6.2	Output 04 Byte			276...279			Full
7	Device				282*		
7.1	Input 32 Byte		282...313				Full
7.2	Output 32 Byte			280...311			Full
8	Device				314*		
8.1	Input 04 Byte		314...317				Full
8.2	Output 04 Byte			312...315			Full
9							
10							

As shown in the preceding figure, Device 1 is the power supply unit and has only one input data record of two bytes in group AF. Therefore, insert "Input 02 Byte" into the first slot, and insert "Output No Data" because no output data exists.

Device 2 corresponds to CANopen site 2 and has six input data records and six output data records, each of which is two bytes in length. Therefore, there are a total of 12 bytes of input data and 12 bytes of output data.

Device 3 corresponds to CANopen site 3 and has no process data. In principle, this site can be set to site 1 (which is not involved in the network bridge function), but the configuration in the preceding figure also ensures normal operation.

The configuration for the following sites is similar.

Process data address mapping:

Device 5 is used as an example. The input data is four bytes in length. Assume that the two process data records 0x7044 and 0x7045 are configured in the corresponding AF group. In the PLC, I addresses 270 to 273 correspond to the two data records. I270 to 271 correspond to 0x7044. I270 is the higher-order place of 0x7044, and I271 is the lower-order place. Other mappings are similar.



NOTE

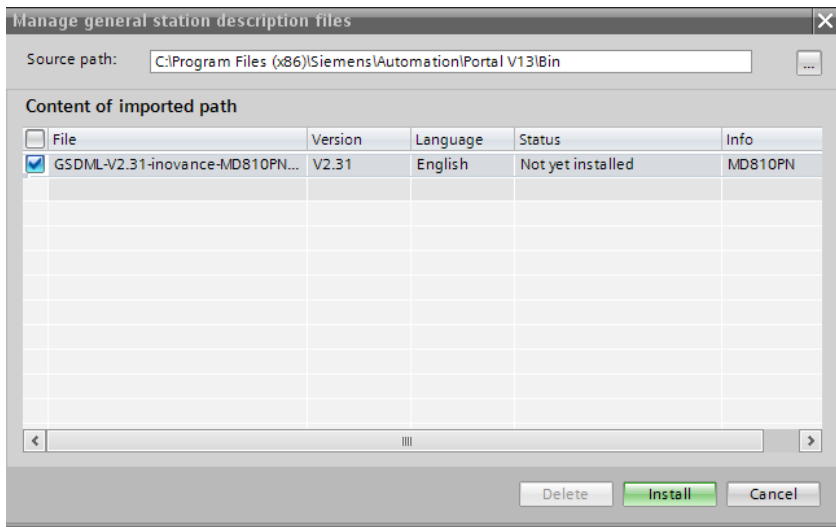
- ◆ Ensure that the AC drive configuration has a one-to-one correspondence with each device configured on STEP 7; otherwise, an error may be reported.

Then, download the configuration to the PLC and start communication.

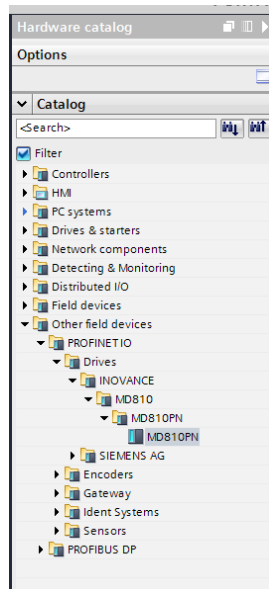
6.6.5 Configuration on TIA Portal

- Import the GSDML file.

Open **Manage general station description files** under **Options**, as shown in the following figure.

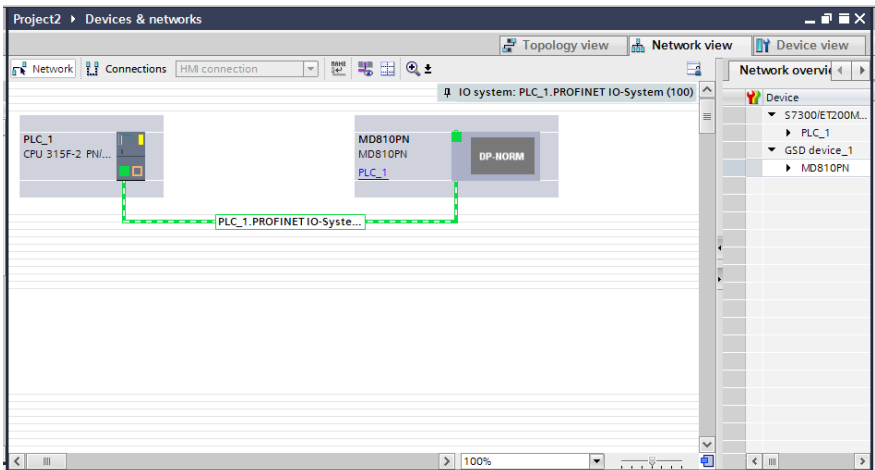


If the import is successful, the device is displayed, as shown in the following figure.



- Build a PROFINET network.

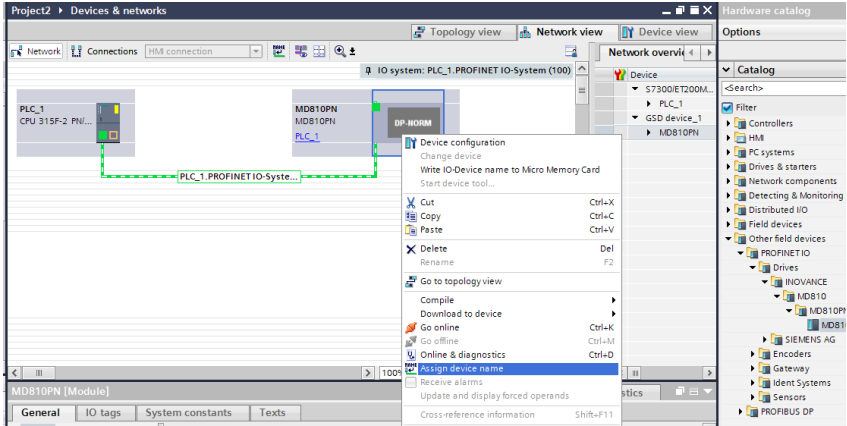
After a PLC is added, drag and drop the MD810PN device onto the page, and connect it to the PLC, as shown in the following figure.



- Allocate device names.

Right-click the device and choose **Assign device name** from the shortcut menu, as shown in the following figure.

The method of allocating device names is the same as that for STEP 7. For details, see the "Allocate device names" description in ["6.6.4 Configuration on STEP 7"](#).



■ Configure process data.

The method of configuring process data is the same as that for STEP 7. For details, see the "Configure process data" description in ["6.6.4 Configuration on STEP 7"](#). The following figure shows the page with complete configuration.

Module	Rack	Slot	I address	Q address	Type	Article number	Firmware	Comment
MD810PN	0	0	2042*		MD810PN	0		
Interface	0	0 X1	2041*		MD810PN			
Device_1	0	1			Device			
Input 24 Byte	0	1 1	256...279		Input 24 Byte			
Output 24 Byte	0	1 2		256...279	Output 24 Byte			
Device_2	0	2			Device			
Input 04 Byte	0	2 1	280...283		Input 04 Byte			
Output 04 Byte	0	2 2		280...283	Output 04 Byte			
Device_3	0	3			Device			
Input 04 Byte	0	3 1	284...287		Input 04 Byte			
Output 04 Byte	0	3 2		284...287	Output 04 Byte			
Device_4	0	4			Device			
Input 26 Byte	0	4 1	288...313		Input 26 Byte			
Output 26 Byte	0	4 2		288...313	Output 26 Byte			
	0	5						
	0	6						
	0	7						
	0	8						
	0	9						
	0	10						

Then, download the configuration to the PLC and start communication.

6.6.6 Auxiliary Functions

■ Startup with a missing site

This function is applicable in the scenario where you want to start the network without modifying the PLC configuration and program when a CANopen slave fails to go online. In this case, set Fd-50 to 1. The setting takes effect after power-on again.



NOTE

- ◆ It is an auxiliary function not intended to solve problems similar to error 16.74. Be sure to enable this function after commissioning is complete, and do not perform network commissioning when this function is enabled.
- ◆ Use this function only when a node fails to go online, rather than it is slow to go online.

■ PROFINET timeout period setting

You can set the maximum timeout period of PROFINET through Fd-55 (unit: ms; default: 350) based on the onsite situation. After the setting is successful, the CANopen network stops running when the timeout period has elapsed. The setting takes effect after power-on again.

6.6.7 Error Reporting and Diagnosis

When the network bridge function is incorrectly configured, the PLC and power supply unit report errors. The power supply unit may report the following errors:

Error Code	Error Message
16.71	PROFINET is disconnected.
16.72	A CANopen slave is disconnected. Identify the disconnected slave and check the wiring.
None	A slave generates an application alarm. Identify the slave. (This error is only reported by the PLC.)
16.74	The configured CANopen slave is missing. Check whether the CANopen station number is correct.
16.75	The process data configuration of some CANopen slaves is inconsistent with the PLC configuration.
16.76	The process data of the power supply unit is inconsistent with the PLC configuration.
16.77	The PROFINET function of the power supply unit is faulty. Set Fd-10 to 5 and power on the power supply unit again. (The PLC generates an alarm when PROFINET is disconnected.)
16.78	The PROFINET function of the power supply unit is faulty. Set Fd-10 to 5 and power on the power supply unit again. (The PLC generates an alarm when PROFINET is disconnected.)

You can query the error description using the diagnosis function in the PLC commissioning software. For example, when a slave is disconnected, the power supply panel reports error 16.72, and the same error is reported by the slot of the corresponding node of the PLC.

6.6.8 Monitoring

The power supply unit provides parameters used to monitor the online status and other information about slaves, as shown in the following table.

Parameter	Description
Fd-51	CANopen slave communication disabled time
Fd-52	Number of online CANopen slaves
Fd-53	Online status of sites 1 to 15. Bit 1 indicates site 1, and so on.
Fd-54	Online status of sites 16 to 31. Bit 0 indicates site 16, and so on.
Fd-59	PROFINET software version
Fd-61	Two high-order bytes of a MAC address
Fd-62	Two middle bytes of a MAC address
Fd-63	Two low-order bytes of a MAC address

6.6.9 Configuration of PROFINET Network Bridge Used with Siemens PLC S1500

The hardware configuration described in this section is based on the following models:

Inovance's MD810 power supply unit with the network bridge, model: MD81020M4T22G120

Inovance's IS810P-CO CANopen bus servo, model: IS810P50M4T005CO

Inovance's standard servo motor, model: ISMH2-15C30CD-U231Y

Siemens' PROFINET bus PLC, model: S7-1500

1 Servo configuration

■ Preparations

- 1) Check whether the MD810 power supply unit is equipped with the PROFINET network bridge (PROFINET interface), and ensure that the drive unit in use supports the CANopen bus.
- 2) Ensure that the main circuit is correctly connected, including three-phase input, inter-unit bridging, and output motor connection.



NOTE

- ◆ MD810 must be connected to a three-phase 380 VAC power supply. Do not connect it to a single-phase power supply.
- ◆ If the drive unit provides the STO function, connect each terminal (four pairs in total, 0 V to 24 V) to 24 V, and set parameters (MD810: F8-54 = 0; IS810N: H01-21 = 1) on the drive unit to disable the STO function; otherwise, the servo is always in the NR state.






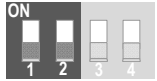


- 3) Connect the network cable correctly.

Connect the PROFINET interface of the MD810 power supply unit to the PLC communication interface through a network cable.

Connect the RJ45 network interface of the MD810 power supply unit to the RJ45 network interface of the drive unit.

Adjust the DIP switch for the MD810 power supply unit. Turn on switches 3 and 4 for CAN1. (The following table lists the definitions of the DIP switch.)

Connect the last drive unit to a termination resistor; otherwise, CANopen communication may be abnormal and alarm A16.13 may be generated.

Terminal ID	Terminal Name	Function	Toggle Position
S1	Selection of RS485 termination resistor	The termination resistor is connected when switches 1 and 2 are turned on.	
		The termination resistor is disconnected when switches 1 and 2 are turned off.	
	Selection of CAN1 termination resistor	The termination resistor is connected when switches 3 and 4 are turned on.	
		The termination resistor is disconnected when switches 3 and 4 are turned off.	
S2	Selection of C485 termination resistor	The termination resistor is connected when switches 1 and 2 are turned on.	
		The termination resistor is disconnected when switches 1 and 2 are turned off.	
	Selection of CAN2 termination resistor	The termination resistor is connected when switches 3 and 4 are turned on.	
		The termination resistor is disconnected when switches 3 and 4 are turned off.	

■ Communication parameter setting

1) Power supply unit (master):

Set Fd-10 (Communication protocol selection) to 5, indicating the PROFINET-to-CANopen network bridge mode.

Set Fd-12 (CAN baud rate) to 5. (In this example, Fd-12 is set to 5, and the baud rate is 500 Kbit/s.)

Set Fd-13 (CAN station number) to 1 to set site 1 as the master.

2) Drive unit (slave):

MD810 drive unit:

Set Fd-10 (Communication protocol selection) to 1, indicating the CANopen mode.

Set Fd-12 (CAN baud rate) to 5. (In this example, Fd-12 is set to 5, and the baud rate is 500 Kbit/s. The setting must be consistent between the slave and master.)

Set Fd-13 (CAN station number) to any other value than 1.

3) IS810 drive unit:

Set H0C-45 (Communication protocol selection) to 1, indicating the CANopen mode.

Set H0C-00 (CAN station number) to any value other than 1.

Set H0C-02 (CAN baud rate) to 5. (In this example, H0C-02 is set to 5, and the baud rate is 500 Kbit/s. The setting must be consistent between the slave and master.)

■ Process data transmission configuration

The CANopen transmission parameters related to the IS810 servo or drive unit belong to groups 2D and 2E. The following table lists the mappings.

		Group 2D Address		2D Param. Value	Process Data Address			Group 2E Address		2E Param. Value	Process Data Address
OUT	RPDO1	Number of mapping objects	2D-32			INPUT	TPDO1	Number of mapping objects	2E-20		
			OUT1	2D-33						INPUT1	2E-21
			2D-34						2E-22		
		OUT2	2D-35					INPUT2	2E-23		
			2D-36						2E-24		
		OUT3	2D-37					INPUT3	2E-25		
			2D-38						2E-26		
		OUT4	2D-39					INPUT4	2E-27		
		2D-40					2E-28				
	RPDO2	Number of mapping objects	2D-49				TPDO2	Number of mapping objects	2E-37		
			OUT5	2D-50						INPUT5	2E-38
			2D-51						2E-39		
		OUT6	2D-52					INPUT6	2E-40		
			2D-53						2E-41		
		OUT7	2D-54					INPUT7	2E-42		
			2D-55						2E-43		
OUT8		2D-56			INPUT8	2E-44					
	2D-57				2E-45						

		Group 2D Address		2D	Process			Group 2E		2E	Process
				Param.	Data			Address	Param.	Data	Value
OUT	RPDO3	Number of mapping objects	2D-66			INPUT	TPDO3	Number of mapping objects	2E-54		
			OUT9	2D-67						INPUT9	2E-55
		OUT10	2D-68					2E-56			
			2D-69					2E-57			
		OUT11	2D-70					2E-58			
			2D-71					2E-59			
	OUT12	2D-72			2E-60						
		2D-73			2E-61						
	RPDO4	Number of mapping objects	2D-83				TPDO4	Number of mapping objects	2E-71		
			OUT13	2D-84						INPUT13	2E-72
		2D-85						2E-73			
		OUT14	2D-86					2E-74			
			2D-87			2E-75					
		OUT15	AF-88			2E-76					
			AF-89			2E-77					
		OUT16	AF-90			2E-78					
AF-91					2E-79						

- 1) You can configure up to 32-byte RPDO and 32-byte TPDO process data. Each PDO can be configured with process data not exceeding 8 bytes in length.
- 2) PDOs can be configured with servo parameters and CANopen object dictionaries. The following table lists the mappings.

Parameters (the servo parameters are used as an example, and the same principle applies to the AC drive):

Assume that you want to assign values to servo parameters H11-12 and H11-14 through the PLC. The value of H11-12 consists of 32 bits, and that of H11-14 also consists of 16 bits.

You can plan a configuration method based on the actual number of PDOs to be configured and the data type. Two configuration methods are described as follows.

Configuration method 1:

Method 1	2D Address			Value	Remarks
RPDO1	Mapping quantity	2D32		2	
	OUT1	2D33	H1112	2011	First-segment displacement
		2D34		0D20	32 bits
	OUT2	2D35	H1114	2011	First-segment speed
		2D36		0F10	16 bits
	OUT3	2D37			
		2D38			
	OUT4	2D39			
		2D40			

Configuration method 2:

	2D Address			Value	Remarks
RPDO1	Mapping quantity	2D32		1	
	OUT1	2D33	H1112	2011	First-segment displacement
		2D34		0D20	32 bits
	OUT2	2D35			
		2D36			
	OUT3	2D37			
		2D38			
	OUT4	2D39			
		2D40			
	RPDO2	Mapping quantity	2D49		1
OUT5		2D50	H1114	2011	First-segment speed
		2D51		0F10	16 bits
OUT6		2D52			
		2D53			
OUT7		2D54			
		2D55			
OUT8		2D56			
		2D57			

Configuration principle:

H11-12 is set to 20110D20.

(a) 20110D20: H11 value + 0x2000 = 0x2011. Enter 2011 in the high-order place of OUT1.

(b) 20110D20: The 12 part of the parameter is in the decimal format, which is 0C in the hexadecimal format. One-bit displacement to 0D is required.

(c) 20110D20: 32-bit parameters correspond to 20, 16-bit parameters correspond to 10, and 8-bit parameters correspond to 08. For details about the parameter length, see the IS620P Series Servo Drive Application Manual – CANopen Communication (document code: 19010699).

Object dictionary:

You can configure the CANopen object dictionary to the servo.

Assume that you want to read 0x6077-12 from the servo through the PLC. The data type is 16-bit. An offset is not required by object dictionaries. The following table lists the formats.

		2E Address			
TPDO1	Mapping quantity	2E 20	1		
	IPUT1	2E 21	6077		
		2E 22	1210		16 bits
	IPUT2	2E 23			
		2E 24			
	IPUT3	2E 25			
		2E 26			
	IPUT4	2E 27			
		2E 28			

- 3) You can set no more than four parameters (total length not exceeding 32 bytes) for RPDO1/TPDO1 (RPDO/TPDO2, 3, 4, and so on) as needed. The mapping quantity must be consistent.

The CANopen transmission parameters related to the MD810 servo or drive unit belong to group AF.

Parameters AF-00 to AF-31 belong to RPDO and are transferred from the host controller to the drive.

Parameters AF-32 to AF-63 belong to TPDO and are transferred from the drive to the host controller.

		Group AF Address		AF Param. Value	Process Data Address			Group AF Address		AF Param. Value	Process Data Address
OUT	RPDO1	OUT1	AF-00		INPUT	TPDO1	INPUT1	AF-32			
			AF-01					AF-33			
		OUT2	AF-02				INPUT2	AF-34			
			AF-03					AF-35			
		OUT3	AF-04				INPUT3	AF-36			
			AF-05					AF-37			
		OUT4	AF-06				INPUT4	AF-38			
			AF-07					AF-39			
	RPDO2	OUT5	AF-08			TPDO2	INPUT5	AF-40			
			AF-09					AF-41			
		OUT6	AF-10				INPUT6	AF-42			
			AF-11					AF-43			
		OUT7	AF-12				INPUT7	AF-44			
			AF-13					AF-45			
		OUT8	AF-14				INPUT8	AF-46			
			AF-15					AF-47			
	RPDO3	OUT9	AF-16			TPDO3	INPUT9	AF-48			
			AF-17					AF-49			
		OUT10	AF-18				INPUT10	AF-50			
			AF-19					AF-51			
		OUT11	AF-20				INPUT11	AF-52			
			AF-21					AF-53			
		OUT12	AF-22				INPUT12	AF-54			
			AF-23					AF-55			
RPDO4	OUT13	AF-24		TPDO4	INPUT13	AF-56					
		AF-25				AF-57					
	OUT14	AF-26			INPUT14	AF-58					
		AF-27				AF-59					
	OUT15	AF-28			INPUT15	AF-60					
		AF-29				AF-61					
	OUT16	AF-30			INPUT16	AF-62					
		AF-31				AF-63					

- 4) You can configure up to 32-byte RPDO and 32-byte TPDO process data. Each PDO can be configured with process data not exceeding 8 bytes in length.
- 5) PDOs can be configured with AC drive parameters and CANopen object dictionaries. The following table lists the mappings.

Parameters (AC drive parameters are used as an example):

Assume that you want to assign values to AC drive parameters F0-01 and F0-10 through the PLC. The value of F0-01 consists of 16 bits, and that of F0-10 also consists of 16 bits.

You can plan a configuration method based on the actual number of PDOs to be configured and the data type. The configuration method is described as follows.

Method 1	Group AF Address			Value	
RPDO1	OUT1	AF-00	F0-01	20F0	First-segment displacement
		AF-01		0210	16 bits
	OUT2	AF-02	F0-10	20F0	First-segment speed
		AF-03		0B10	16 bits
	OUT3	AF-04			
		AF-05			
	OUT4	AF-06			
		AF-07			

Configuration principle (F0-10 is used as an example):

F0-10 is set to 20F00B10.

(a) 20F00B10: F0 value + 0x2000 = 0x20F0. Enter 20F0 in the high-order place of OUT1 for AF-00.

(b) 20F00B10: The 10 part of the parameter is in the decimal format, which is 0A in the hexadecimal format. One-bit displacement to 0B is required.

(c) 20F00B10: 32-bit parameters correspond to 20, 16-bit parameters correspond to 10, and 8-bit parameters correspond to 08. The AC drive parameter values are 16 bits in length, corresponding to 10.

Object dictionary:

You can configure the CANopen object dictionary to the AC drive.

Assume that you want to write 0x2073-12 to the AC drive through the PLC. The data type is 16-bit. An offset is not required by object dictionaries. The following table lists the formats.

	Group AF Address		Value	Data Length
RPDO1	OUT1	AF-00	2073	
		AF-01	1210	16 bits
	OUT2	AF-02		
		AF-03		
	OUT3	AF-04		
		AF-05		
	OUT4	AF-06		
		AF-07		

6) You can set no more than four parameters (total length not exceeding 32 bytes) for RPDO1/TPDO1 (RPDO/TPDO2, 3, 4, and so on) as needed. The mapping quantity must be consistent.

- 7) After servo configuration is complete, perform PLC configuration by following ["2 PLC configuration"](#). The servo configuration and PLC configuration must be consistent; otherwise, the drive may generate the E16.75 alarm.

The following table lists common alarms.

Fault Code	Fault Description and Solution
E16.71	PROFINET is disconnected. Reconnect the network.
E16.72	A CANopen slave is disconnected. Identify the disconnected slave, check the wiring, and reconnect to the network.
E16.74	The configured CANopen slave is missing. Check whether the CANopen site number is matched and whether the device configuration of the PLC is correct.
E16.75	The process data configuration of some CANopen slaves is inconsistent with that of the PLC. Check the configuration of the PLC and that of the servo or AC drive and ensure that the data length is consistent between the PLC and the servo or AC drive.
E16.76	The process data configuration of the power supply unit is inconsistent with that of the PLC. Check the configuration of the PLC and that of the servo or AC drive and ensure that the data length is consistent between the PLC and the servo or AC drive.
E16.77	The PROFINET function of the power supply unit is faulty. Set Fd-10 to 5 and power on the power supply unit again.
E16.78	The PROFINET function of the power supply unit is faulty. Set Fd-10 to 5 and power on the power supply unit again.
A16.13	The master-slave communication is abnormal. Check whether the wiring is correct, whether the DIP switch of the MD810 power supply unit is set correctly, and whether the end drive unit is connected to a termination resistor. (You can rectify the fault temporarily by reducing the baud rate, but you still need to add a termination resistor.)

2 PLC configuration

On the PLC, install the GSD file and complete project configuration, network configuration, hardware configuration, and monitoring configuration.

■ Basic configuration

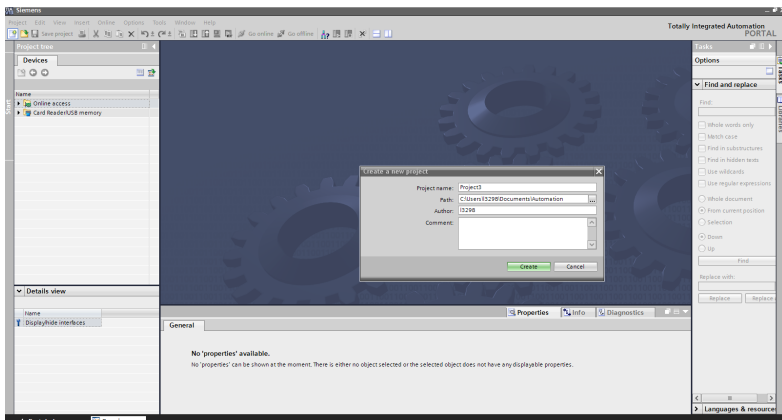
- 1) Hardware configuration: Inovance's MD810 power supply unit with the network bridge (MD81020M4T22G120), Inovance's IS810P-CO (IS810P50M4T005CO), and Siemens' PROFINET bus PLC
- 2) Software: Siemens TIA Portal V14 and Inovance's servo commissioning software (manual input is supported)

■ GSD file configuration

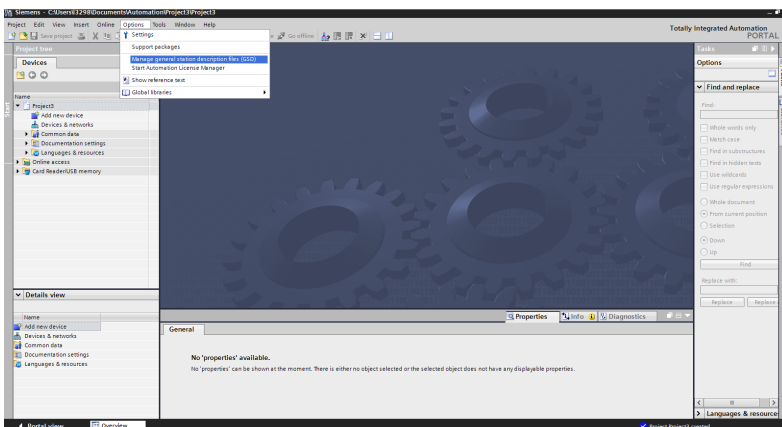
- 1) Start TIA Portal. TIA Portal V14 is used as an example. You can select a version as needed.



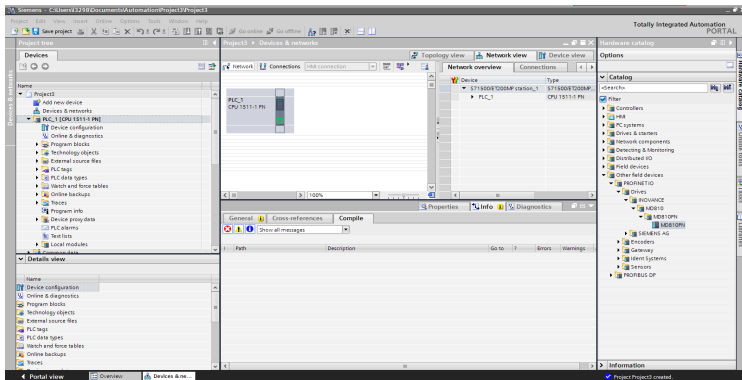
- 2) Create a project.



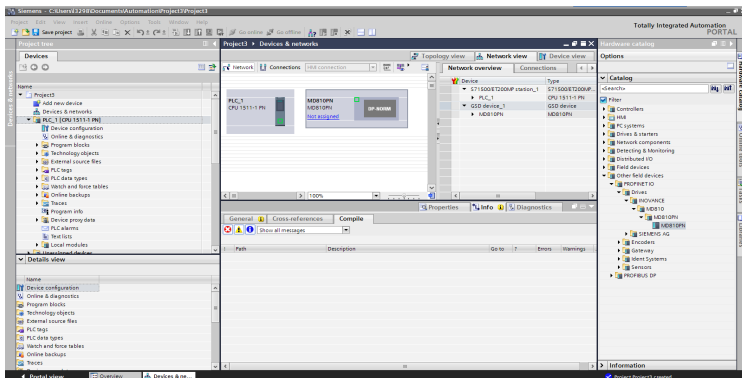
- 3) Install the GSD file.



- 2) Configure a slave. The following figure shows the master after a slave is added. Add the slave MD810PN on the right.

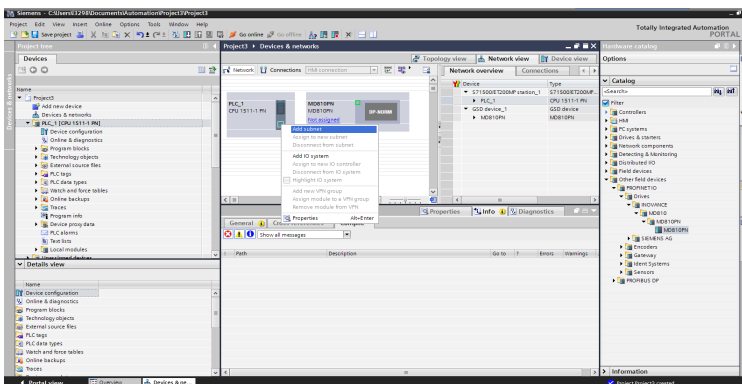


- 3) Configure the slave, as shown in the following figure.

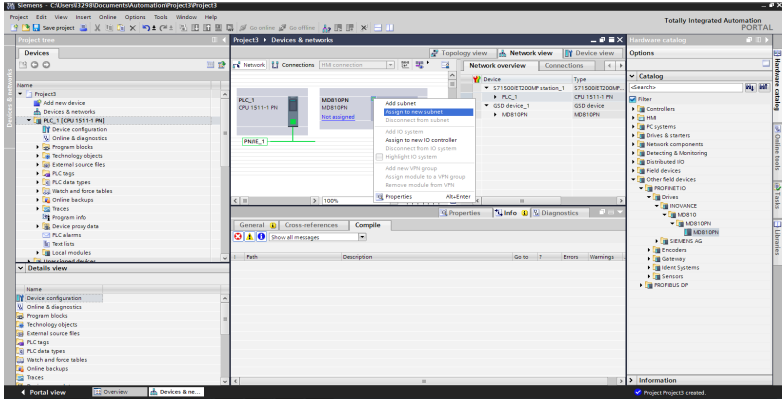


■ Network configuration

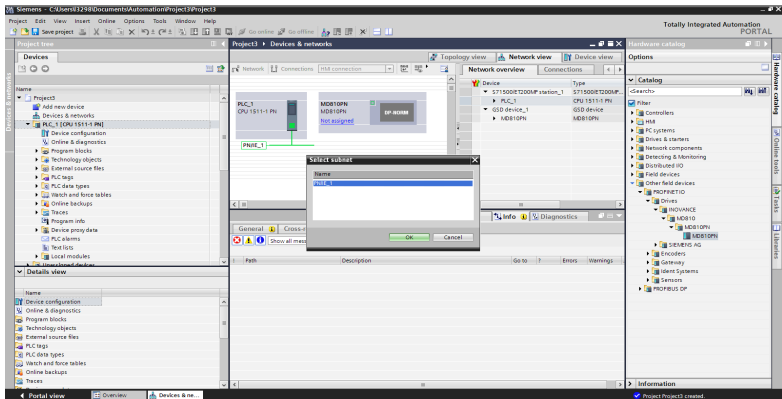
- 1) Add a subnet to the master.



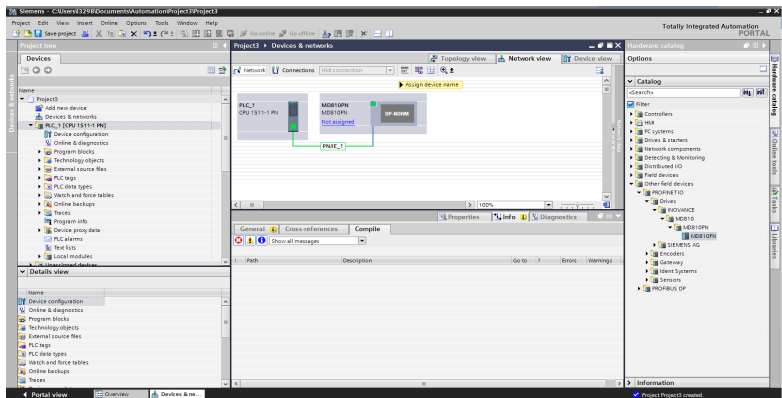
2) Allocate the slave to the subnet.



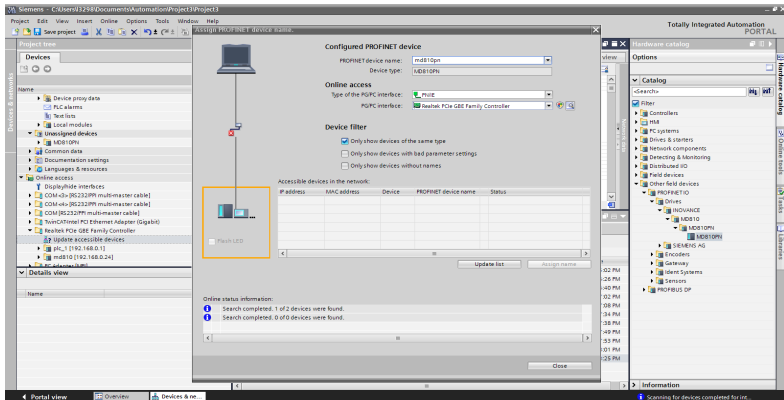
3) Select the subnet.



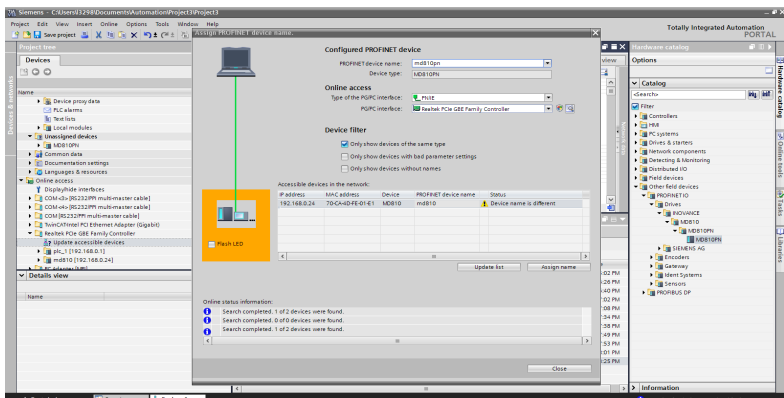
4) The following figure shows the added network. Click PN/IE_1, select Assign device name, and allocate a name to the slave.



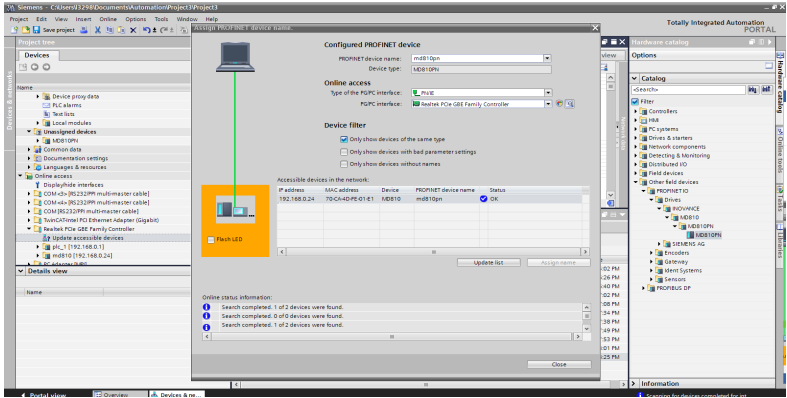
5) Connect the device correctly, allocate a device interface, and click Update list.



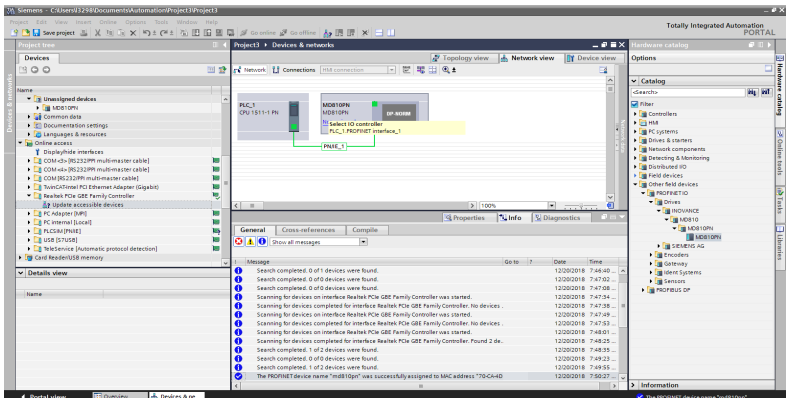
6) Allocate a name to the slave.



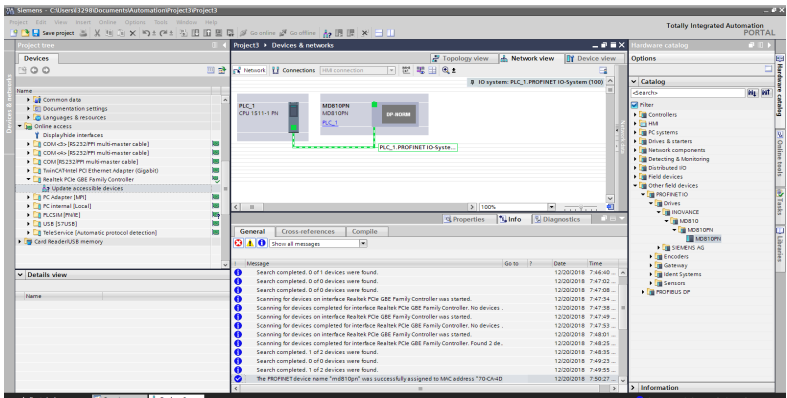
7) See the following figure.



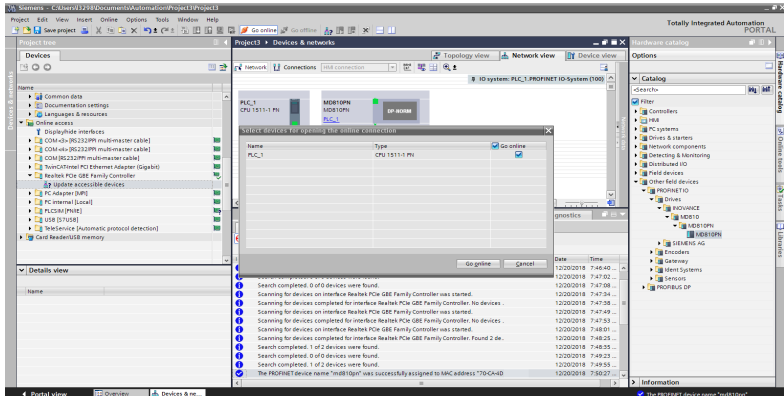
8) Select an interface.



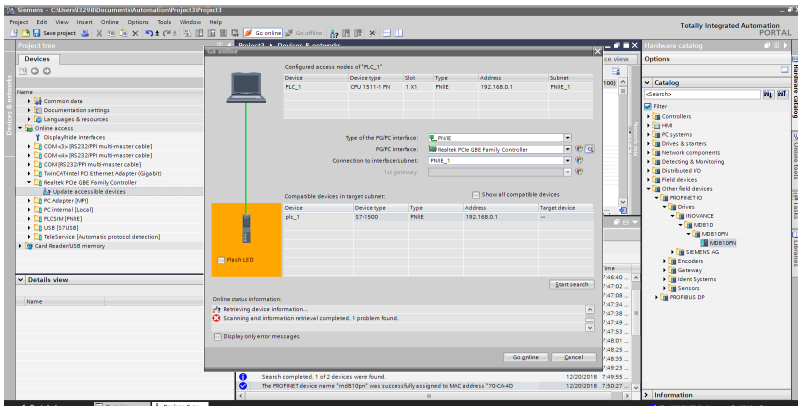
9) The following figure shows the correct connection.



10) Switch to online mode.

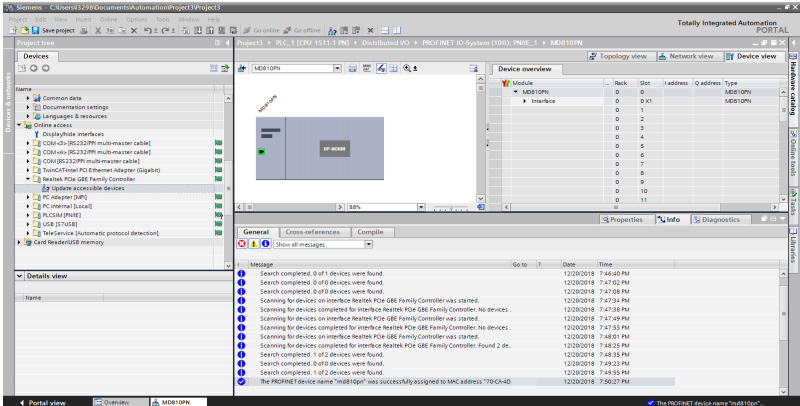


11) Select the device during initial connection.



■ Hardware configuration

- 1) Double-click the added MD810 device configuration to perform hardware configuration on the MD810 power supply unit and the attached drive unit. Edit the configuration in the Device overview pane.

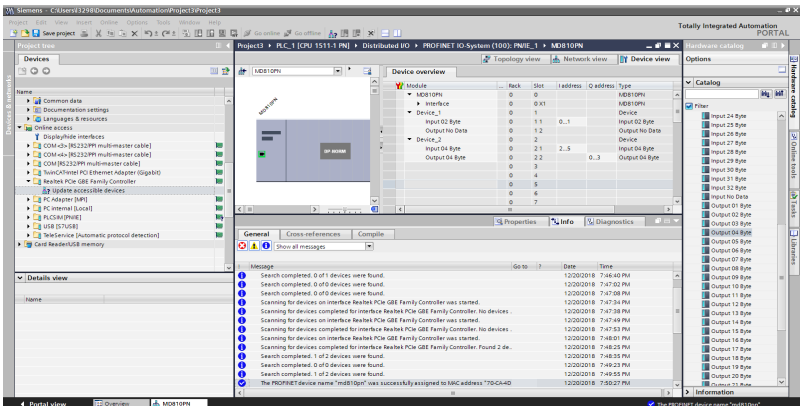


- 2) Perform configuration based on the PDO settings of the MD810 power supply unit and the attached drive unit. You can only set the number of bytes on the PLC and ensure that the set number is consistent with the number of bytes occupied by the PDOs of the drive; otherwise, an alarm indicating hardware mismatch is generated and the drive generates the E16.75 alarm. For example, if the drive TPDO is configured with a 32-bit PDO and a 16-bit PDO, add 6-byte input to the PLC and add output of the same number of bytes to RPDO.

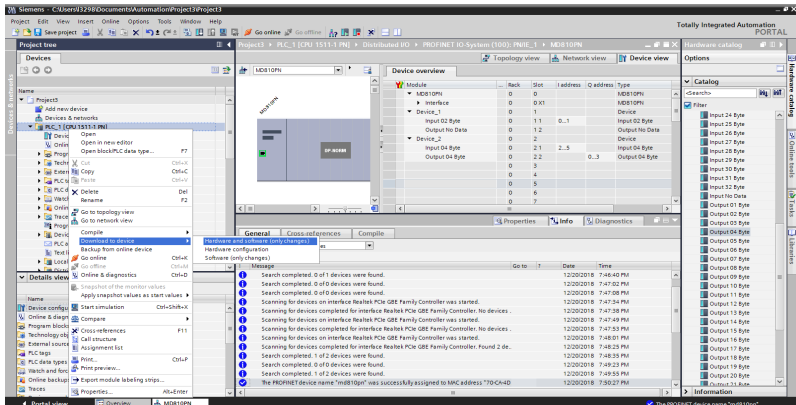
Brief description:

In the following figure, Device_1 is the power supply unit configured with a 2-byte input signal.

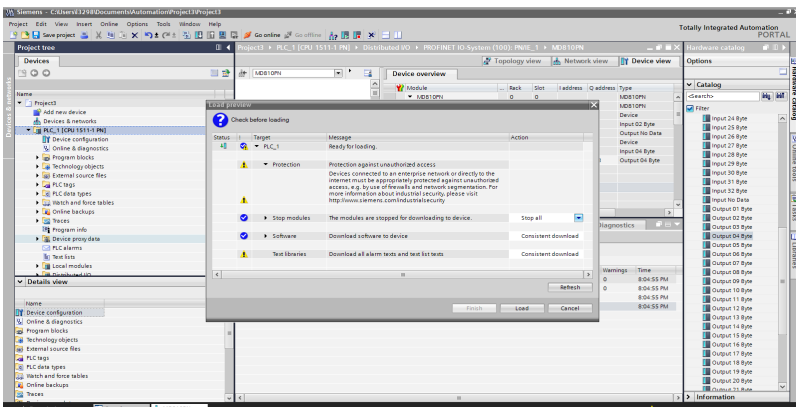
Device_2 is the drive unit configured with a 12-byte input signal and an 18-byte output signal.



- Download the configuration to the PLC. After the hardware configuration in step 2 is modified, download the configuration to the PLC again. If only the hardware configuration is modified, you can download only the hardware configuration.

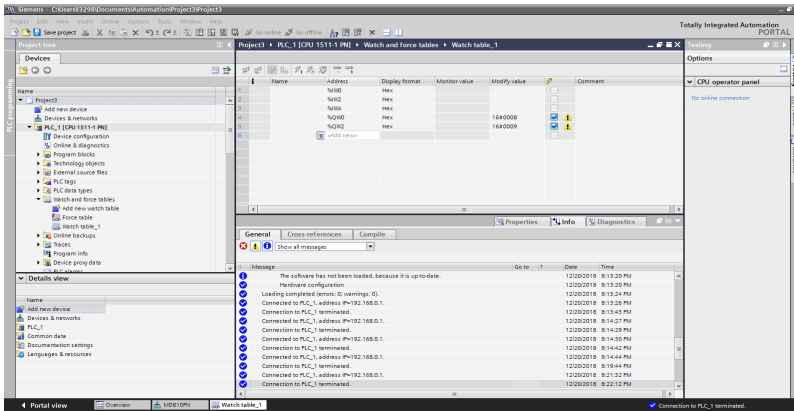


- Download step 1: Click Load to download the configuration to the PLC. Then, the PLC stops running.
- Download step 2: Click Finish after the download is complete. The PLC restarts.

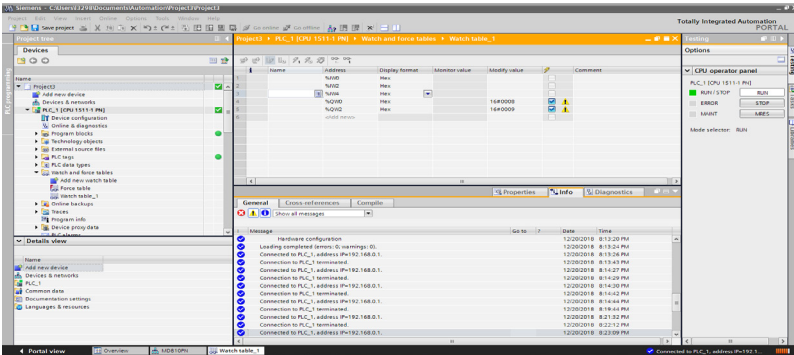


■ Adding the online monitoring list

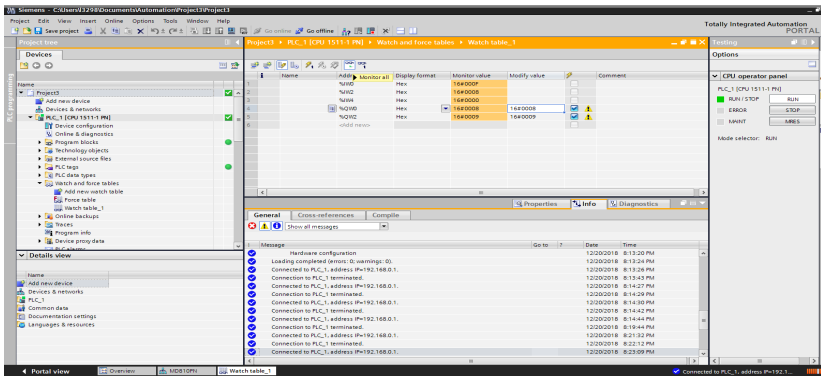
- 1) Add the monitoring list and add motoring items based on the variables to be monitored.



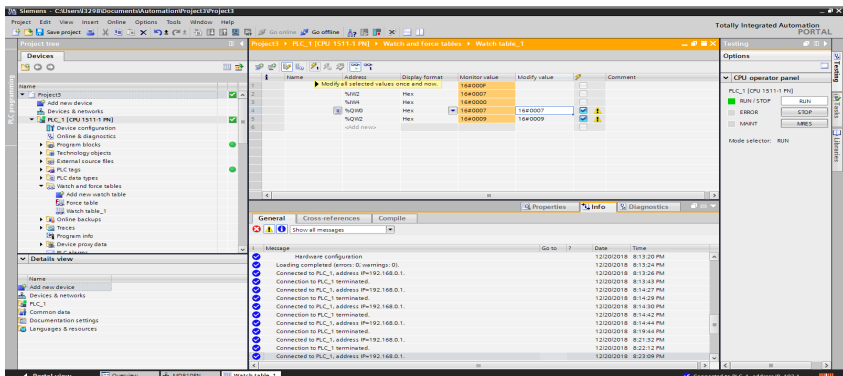
- 2) Switch to online mode.



3) Click Monitor all.



4) Modify values.



The configuration of the drive must be consistent with that of the PLC; otherwise, an alarm will be generated.

The following table lists common alarms.




Fault Code	Fault Description and Solution
E16.71	PROFINET is disconnected. Reconnect the network.
E16.72	A CANopen slave is disconnected. Identify the disconnected slave, check the wiring, and reconnect to the network.
E16.74	The configured CANopen slave is missing. Check whether the CANopen site number is matched and whether the device configuration of the PLC is correct.
E16.75	The process data configuration of some CANopen slaves is inconsistent with that of the PLC. Check the configuration of the PLC and that of the servo or AC drive and ensure that the data length is consistent between the PLC and the servo or AC drive.

Fault Code	Fault Description and Solution
E16.76	The process data configuration of the power supply unit is inconsistent with that of the PLC. Check the configuration of the PLC and that of the servo or AC drive and ensure that the data length is consistent between the PLC and the servo or AC drive.
E16.77	The PROFINET function of the power supply unit is faulty. Set Fd-10 to 5 and power on the power supply unit again.
E16.78	The PROFINET function of the power supply unit is faulty. Set Fd-10 to 5 and power on the power supply unit again.
A16.13	The master-slave communication is abnormal. Check whether the wiring is correct, whether the DIP switch of the MD810 power supply unit is set correctly, and whether the end drive unit is connected to a termination resistor. (You can rectify the fault temporarily by reducing the baud rate, but you still need to add a termination resistor.)

7 Troubleshooting

The 810 series power supply units are used with the MD810, IS810, ES810, and TD810 series drive units. This chapter describes the troubleshooting methods for power supply units. For details about the troubleshooting methods for drive units, see the corresponding user guides.


7.1 Safety Information

Safety Information	
 Danger	<ul style="list-style-type: none"> ◆ Do not connect the power supply unit while power is on, and keep all breakers in OFF state. Failure to comply may result in electric shock.
 Warning	<ul style="list-style-type: none"> ◆ Make sure to ground the power supply unit according to local laws and regulations. Failure to comply may result in electric shock or a fire. ◆ Do not remove the front cover or touch internal circuits while the power is on. Failure to comply may result in electric shock. ◆ Do not allow unqualified personnel to perform any maintenance, inspection or part replacement work. Failure to comply may result in electric shock or a fire. ◆ When installing the power supply unit inside an enclosed cabinet, use a cooling fan or air conditioner to keep the temperature below 50°C. Failure to comply may result in overheating or even a fire. ◆ Tighten all screws based on specified tightening torque. Failure to comply may result in electric shock or a fire. ◆ Always confirm the input voltage is within nameplate rating. Failure to comply may result in electric shock or a fire. ◆ Keep flammable and combustible materials away from the power supply unit.
 Caution	<ul style="list-style-type: none"> ◆ Cover the top of the power supply unit with a temporary cloth or paper during installation so as to prevent foreign matter such as metal shavings, oil, and water from falling into the unit. ◆ After installation is completed, remove the temporary cloth or paper. Failure to comply will reduce ventilation and result in overheating. ◆ Follow proper electrostatic discharge (ESD) procedures when operating the power supply unit. Failure to comply will damage the unit because of static electricity.


7.2 Fault Display and Solutions

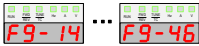
The power supply unit is designed with the fault level and alarm level for problem locating purposes. Fault takes precedence over alarm during troubleshooting.

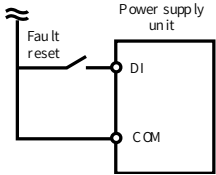
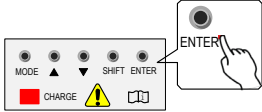
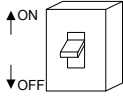

1) Example of fault display: 

2) Example of alarm display: 

When a fault occurs during running, the power supply unit stops output immediately,

the fault indicator  flashes in red, and the contact of the fault relay acts. The following table lists the fault types and solutions for specific fault codes. The following information is for your reference only. Do not repair or modify the power supply unit by yourself. If the fault cannot be eliminated, contact the agent or Inovance.

Stage	Solution	Remarks
After the fault occurs	Check the operating panel for detailed information of recent three faults, such as fault type and frequency, current, bus voltage, DI/DO state, accumulative power-on time, accumulative running time, IGBT temperature, and fault subcode at the occurrence of the faults.	View the information using F9-14 (1st fault type) to F9-46 (1st fault subcode). 
Before the fault is reset	Find and remove the fault cause. Then follow the steps below to reset the fault.	Troubleshoot the fault according to "7.3 Fault Codes and Solutions" .

Stage	Solution	Remarks
Fault resetting method	1) Allocate a DI terminal with function 9 "Fault reset (RESET)" by setting any of F4-00 (DI1 function selection) to F4-04 (DI5 function selection) to 9.	
	2) Press the ENTER key on the operating panel.	
	3) Automatic resetting Disconnect the main circuit power supply. Wait until the fault code disappears, and connect the power supply again.	
	4) Fault resetting using the host controller Confirm that F0-02 (RUN command selection) is set to 2 (Communication control) and write "7" (fault reset) to communication address 2000H. ^[1]	

[1] For details, see "[6 Communication](#)".

7.3 Fault Codes and Solutions

Troubleshoot the fault according to the following table.


Fault Name	Operating Panel Display	Cause	Possible Solution
Input voltage abnormal	E12.01	R phase loss occurs on input voltage.	Check the three-phase power. Check whether the input power cable is broken.
	E12.02	S phase loss occurs on input voltage.	Check that the input terminal is correctly connected.
	E12.03	T phase loss occurs on input voltage.	Check the hardware voltage detection circuit.
	E12.04	The input three-phase voltage is too high.	Adjust three-phase voltage to normal range.
	E12.05	Three-phase input voltage unbalance occurs.	Check the three-phase power. Check the hardware voltage detection circuit.



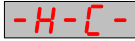

Fault Name	Operating Panel Display	Cause	Possible Solution
SCR overheat	E14.00	The ambient temperature is too high.	Lower the ambient temperature.
		The ventilation is clogged.	Clean the ventilation.
		The fan is damaged.	Replace the cooling fan.
		The thermally sensitive resistor of SCR is damaged.	Contact the agent or Inovance.
		The SCR is damaged.	
Communication fault	E16.01	Modbus communication times out.	Check that the RS-485 communication cable is correctly connected. Check that the setting of Fd-04 (Modbus communication timeout time) and PLC communication cycle are proper.
	E16.11	CANopen communication times out.	Check that the CAN communication cable is correctly connected. Check the setting of Fd-15 [Maximum value of node reception error count (real-time)] to Fd-17 (Bus disconnection times per unit of time) and confirm interference.
	E16.12	The PDO mapping configured for CANopen is not consistent with the actual mapping.	Check the PDO mapping of parameters in group AF.
	E16.13	Data exchange times out when the drive units receive data from the power supply unit.	Check that the power supply unit is running. Check whether the network cables of the power supply unit and drive units are connected. Check that the terminal build-out resistor is correctly connected. Check Fd-12 (CAN baud rate) and confirm that the CAN baud rate setting is consistent.

Fault Name	Operating Panel Display	Cause	Possible Solution
Communication fault (continued)	E16.14	Data exchange is abnormal when the drive units receive data from the power supply unit.	Rectify the fault of the power supply unit.
	E16.21	The CANlink heartbeat times out.	Check that the CAN communication cable is correctly connected. Check the setting of Fd-15 [Maximum value of node reception error count (real-time)] to Fd-17 (Bus disconnection times per unit of time) and confirm interference.
	E16.22	CANlink station numbers conflict.	Change the value of Fd-13 (CAN station number) to make CANlink station numbers different.
	E16.31	Profius-DP communication times out (which is specific to Profius-DP-to-CANopen bridge mode).	Check that the Profius-DP communication cable is correctly connected.
	E16.34	A CAN slave is offline during Profius-DP-to-CANopen bridge configuration.	Check whether the value of the "The number of devices" parameter of PLC is consistent with the actual number of stations. Check that the slave station number is correctly set.
	E16.35	Parameters of Profius-DP-to-CANopen bridge configuration are incorrectly set.	Check that the value of the "NO. n" parameter of PLC is consistent with the setting of AF-66 (Number of valid RPDOs) and AF-67 (Number of valid TPDOs) according to the PLC diagnosis report.
	E16.41	Profius-DP communication times out.	Check that the Profius-DP communication cable is correctly connected.
	E16.42	Parameters of Profius-DP-to-CANopen bridge configuration are incorrectly set.	Check that the value of the "NO. 1" parameter of PLC is consistent with the setting of AF-66 (Number of valid RPDOs) and AF-67 (Number of valid TPDOs) of the bridge unit.
	E16.71	PROFINET communication times out.	Check the Ethernet wiring. Increase the PROFINET timeout interval.
	E16.72	The CANopen slave communication times out.	Check the wiring. Check whether the termination resistor is configured correctly.
E16.74	The configured CANopen slave is missing.	Modify the AC drive site number or modify the PLC configuration to ensure consistent configuration.	
E16.75	CANopen mapping data does not match.	Check the process data mapping of parameter configuration. Ensure that the data length of the PLC configuration is consistent with the process data length of the corresponding slave.	

Fault Name	Operating Panel Display	Cause	Possible Solution
Communication fault (continued)	E16.76	The process data of the power supply unit does not match the configuration.	Check the process data mapping of parameter configuration. Ensure that the data length of the PLC configuration is consistent with the process data length of the power supply unit.
	E16.77	An internal serial communication fault occurs.	Check that Fd-10 (Communication protocol selection) is set to 5. Then, re-power on the power supply unit, and contact the agent or Inovance.
	E16.78	An internal SPI communication fault occurs.	Check that Fd-10 (Communication protocol selection) is set to 5. Then, re-power on the power supply unit, and contact the agent or Inovance.
Braking unit fault	E61.01	The braking unit is directly connected.	Check whether the braking resistor is short circuited. Check whether the brake transistor is directly connected.
	E61.02	Overcurrent occurs on the braking unit.	Check whether the resistance and power of the braking resistor are too low. Check for interference. Check whether an error occurs during hardware circuit detection.
	E61.03	Overload occurs on the braking unit.	Check whether the resistance and power of the braking resistor are too small.
	E61.04	An overheat warning is detected on the braking unit.	Lower the ambient temperature. Check whether the cooling fan runs properly.
	E61.05	The braking unit overheats.	Clean the ventilation. Check whether the temperature sensor is damaged.

7.4 Symptoms and Solutions

No.	Operating Panel Display	Cause	Possible Solution
1	There is no display while power-on. 	The mains voltage is not input or too low.	Check the power supply.
		The switching power supply on the drive board of the power supply unit is faulty.	Check the bus voltage.
		The control board or operating panel is faulty.	Contact the agent or Inovance.
		The rectifier bridge is damaged.	

No.	Operating Panel Display	Cause	Possible Solution
2	"HC" is displayed while power-on. 	Related components on the control board are damaged.	Contact the agent or Inovance.
		The motor or motor cable is short circuited to the ground.	
		The hall is damaged.	
		The mains voltage is too low.	
3	"E23.00" is displayed at power-on. 	The motor or motor cable is short circuited to the ground.	Use a megger to measure the insulation resistance of the motor and motor cable.
		The power supply unit is damaged.	Contact the agent or Inovance.
4	The display is normal while power-on. But after running, "HC" is displayed and the power supply unit stops immediately. 	The cooling fan is damaged or locked-rotor occurs.	Replace the damaged fan.
		Short circuit exists in wiring of control terminals.	Eliminate short circuit fault in control circuit wiring.
5	E14.00 (SCR overheat) is detected frequently. 	The setting of carrier frequency is too high.	Reduce F0-15 (Carrier frequency).
		The cooling fan is damaged, or ventilation is clogged.	Replace the fan or clean the ventilation.
		Components inside the power supply unit are damaged (thermistor or others).	Contact the agent or Inovance.
6	DI terminals are disabled.	Related parameters are incorrectly set.	Check and set parameters in group F4 again.
		External signals are incorrect.	Re-connect external signal cables.
		Jumper across OP and +24 V becomes loose.	Re-confirm the jumper bar across OP and +24 V.
		The control board is faulty.	Contact the agent or Inovance.
7	The power supply unit detects overcurrent and overvoltage frequently.	Motor parameters are incorrectly set.	Set motor parameters or perform motor auto-tuning again.
		The acceleration/deceleration time is improper.	Set proper acceleration/ deceleration time.
		Load fluctuates.	Contact the agent or Inovance.
8	The braking torque of the motor is insufficient when the motor is decelerating or in the decelerate to stop state.	The encoder is disconnected, or overvoltage stall protection is enabled.	Check encoder connection in FVC mode (F0-01 = 1). If the braking resistor is configured, set F3-23 (Voltage limit selection) to 0 (Disabled).

8 Maintenance

The 810 series power supply units are used with the MD810, IS810, ES810, and TD810 series drive units. This chapter describes the maintenance and inspection of power supply units. For details about the maintenance and inspection of drive units, see the corresponding user guides.

Safety Information



Danger

- ◆ Do not connect or disconnect wires while the power is on.
- ◆ Disconnect all power and wait for at least 10 minutes. Do not touch any terminals before the capacitors have fully discharged.
- ◆ Do not modify or disconnect wires, remove optional extension card, or replace the cooling fan while the power is on.
- ◆ Make sure to connect the motor-side grounding terminal. Failure to comply may result in electric shock due to touching motor housing.
- ◆ Do not allow unqualified personnel to do the repair and maintenance work.
- ◆ Installation, wiring, commissioning, repair and maintenance, and component replacement must be performed only by qualified technicians.



Warning

- ◆ Do not run the power supply unit with the front cover removed.
- ◆ Drawings in the user guide are sometimes shown without covers or protective guards. Remember to install the covers or protective guards as specified first, and then perform operations in accordance with instructions.
- ◆ Tighten all terminal screws based on the specified tightening torque.
- ◆ Ensure that the input voltage is within the permissible range. Incorrect input voltage of the main circuit may result in abnormal running.
- ◆ Keep combustible materials far away from the power supply unit or mount the power supply unit on incombustible surfaces.



Caution

- ◆ Replace the cooling fan in correct ways as specified in this chapter. Ensure correct air outlet direction of the fan. Incorrect air direction will diminish the cooling effects.
- ◆ Do not connect or disconnect the motor while the power supply unit is running. Failure to comply may result in electric shock and damage to the power supply unit.
- ◆ Use shielded cables for control circuit wiring.
- ◆ Meanwhile, ground the shield to the grounding terminal reliably.
- ◆ Do not modify the power supply unit circuitry. Failure to comply will damage the power supply unit.
- ◆ Make sure to connect the output terminals of the power supply unit and the input terminals of the drive units correctly.
- ◆ Do not operate the power supply unit that has been damaged. This is to prevent further damage to external equipment.

8.1 Daily Inspection

Influence of ambient temperature, humidity, dust, and vibration will cause aging of components in the power supply unit, which may cause potential faults or reduce the product life. Therefore, routine and periodic maintenance is necessary. More frequent inspection will be required if the power supply unit is used in harsh environments, such as:

- High ambient temperature
- Frequent starting and stopping
- Fluctuations in the AC power supply or load
- Excessive vibrations or shock loading
- Dust, metal dust, salt, sulfuric acid, chlorine atmospheres


Check the following items daily to avoid deterioration in performance or product. Copy this checklist and sign the "Checked" column after each inspection.

Inspection Item	Inspection Points	Solutions	Checked
Fan	Inspect whether the cooling fan of the power supply unit works abnormally.	<ul style="list-style-type: none"> ◆ Check running of the cooling fan of the power supply unit. ◆ Check whether the ventilation is clogged. ◆ Check whether the ambient temperature is within the permissible range. 	
Installation environment	Inspect whether the cabinet and cable duct are abnormal.	<ul style="list-style-type: none"> ◆ Check for input and output cables with insulation damaged. ◆ Check for vibration of hanging bracket. ◆ Check whether ground bars and terminals become loose or get corroded. 	
Input voltage	Inspect whether the power voltage of the main and control circuits is within the allowed range.	<ul style="list-style-type: none"> ◆ Check that the input voltage is within the allowed range. ◆ Check whether start of heavy load exists. 	

8.2 Periodic Inspection

8.2.1 Periodic Inspection Items

Always keep the power supply unit clean. Clear away dust, especially metal powder, on the surface of the power supply unit, to prevent dust from entering the unit. Clear oil dirt from the cooling fan of the power supply unit.



Danger

- ◆ Do not perform inspection while the power is on.
- ◆ Disconnect all power and wait for at least 10 minutes. Do not touch any terminal before the capacitors have fully discharged.

Inspection Item	Inspection Points	Solutions	Checked
General	Inspect for wastes, dirt, and dust on the surface of the power supply unit, and capacitor leakage.	<ul style="list-style-type: none"> ◆ Check whether the cabinet of the power supply unit is powered off. ◆ Use a vacuum cleaner to suck up wastes and dust to prevent direct touching. ◆ Wipe surface dirt gently with a soft cloth immersed in neutral detergent. ◆ Contact Inovance for electrolytic capacitor replacement in case of capacitor leakage. 	
Cables	Inspect power cables and connections for discoloration. Inspect wiring insulation for aging or wear.	<ul style="list-style-type: none"> ◆ Replace cracked cables. ◆ Replace damaged terminals. 	
Peripheral devices such as relay and contactor	Inspect contactors and relays for excessive noise during operation. Inspect coils for signs of overheating such as melted or cracked insulation.	<ul style="list-style-type: none"> ◆ Replace abnormal peripheral devices. 	
Ventilation	Inspect whether ventilation and heatsink are clogged. Check whether the fan is damaged.	<ul style="list-style-type: none"> ◆ Clean ventilation. ◆ Replace the fan. 	
Control circuit	Inspect for control components in poor contact. Inspect for loose terminal screws. Inspect for control cables with cracked insulation.	<ul style="list-style-type: none"> ◆ Clear away foreign matter on the surface of control cables and terminals. ◆ Replace damaged or corroded control cables. 	

8.2.2 Insulation Test on the Main Circuit

Note: Before measuring insulation resistance with megameter (500 VDC megameter recommended), disconnect the main circuit from the power supply unit. Do not conduct the dielectric strength test. A high voltage (> 500 V) test is not required because it has been completed before delivery.

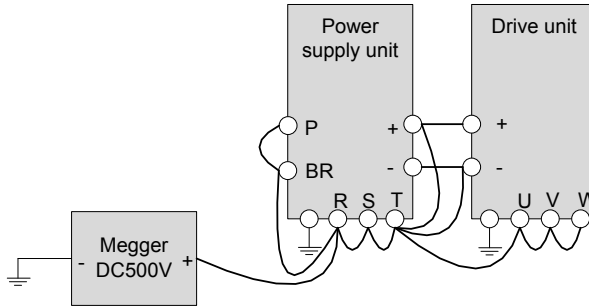


Figure 8-1 Test insulation on the main circuit

The measured insulation resistance must be greater than 5 MΩ.

Before the test, remove the VDR screw, as shown in the following position.

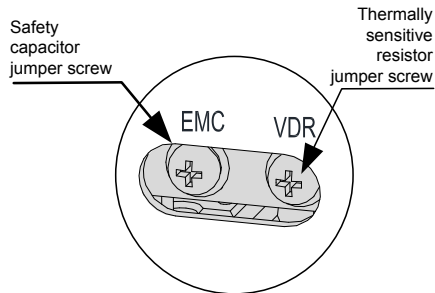


Figure 8-2 Positions of ground jumpers of the VDR screw and EMC screw

For details, see "[Figure 3-1 Assignment and dimensions of terminals in power supply unit \(booksize, unit: mm\)](#)" and "[Figure 3-2 Assignment and dimensions of terminals in power supply unit \(vertical tower, unit: mm\)](#)".

8.3 Replacing Cooling Fans

Cooling fans are wear parts and have a service life not less than 5 years^[1].

[1] The standard service time indicates the service time when the power supply unit is used in the following conditions. You can determine when to replace these parts according to the actual operating time.

- Ambient temperature: about 40°C on average yearly
 - Load rate: below 80%
 - Operating rate: below 24 hours per day
- 1) Possible damage causes: Bearing worn and blade aging
 - 2) Judging criteria: Whether there is crack on the blade; whether there is abnormal vibration noise upon startup; whether the blade runs abnormally
 - 3) Removal and installation:
 - Depress the fan cover hook and pull the fan outward.
 - After the replacement is completed, check that the air flow direction is upright.

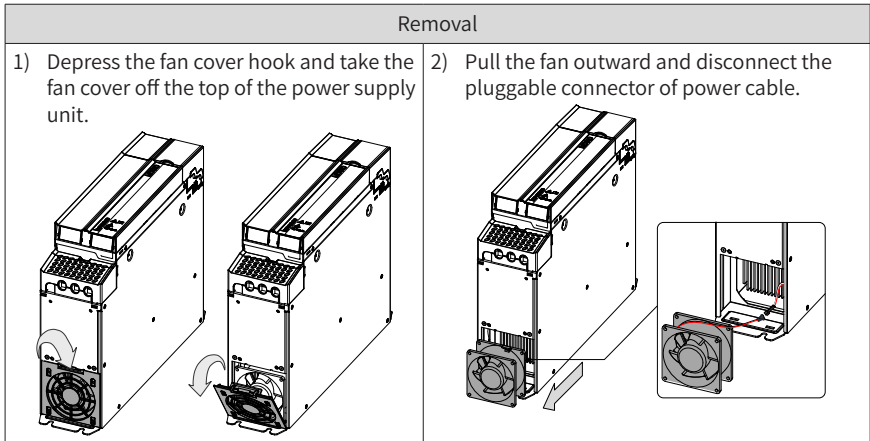
8.3.1 Number of Cooling Fans on the Power Supply Unit

Table 8-13 Size and number of fans on the power supply unit

Model	Number of Fans			
	40x40x28 mm	80x80x25 mm	80x80x3 mm	80x80x3 mm
MD810-20M4T22GXXX	1	-	-	-
MD810-20M4T45GXXX	-	1	-	-
MD810-20M4T110GXXX	-	-	2	-
MD810-20M4T160GXXX(W)	-	-	-	3
MD810-20M4T355GXXX	-	-	-	3
ES810-20M4T56-10	1	-	-	-
TD810-20M4T22GXXX	1	-	-	-
TD810-20M4T45GXXX	-	1	-	-
TD810-20M4T110GXXX	-	-	2	-
TD810-20M4T160GXXX(W)	-	-	-	3
TD810-20M4T355GXXX	-	-	-	3
ES810-20M4T110-10	-	1	-	-
ES810-20M4T240-00	-	-	2	-
ES810-20M4T358-00	-	-	-	3

8.3.2 Removing and Installing Fans

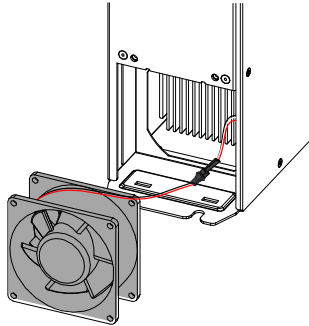
- Removing the fan (80 mm x 80 mm) of a unit with equal height



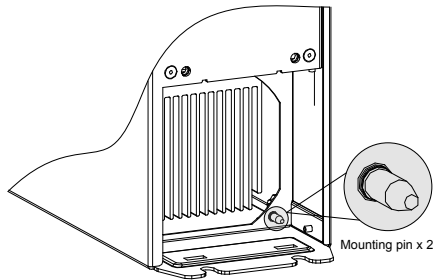
■ Installing the fan (80 mm x 80 mm) of a unit with equal height

Installing

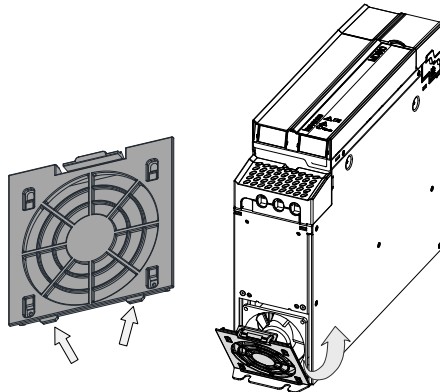
- 1) Install the fan in reverse order of removal. Pay attention to the fan direction.
 - ◆ Plug in the fan power cable to the fan power socket.



- ◆ Install the fan into the power supply unit and ensure that the mounting pins are aligned.

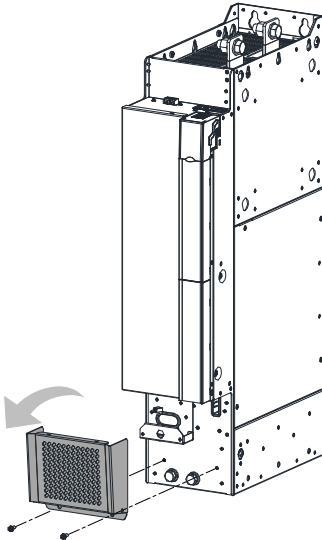
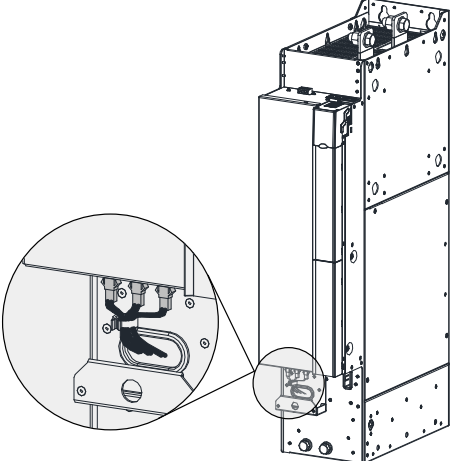
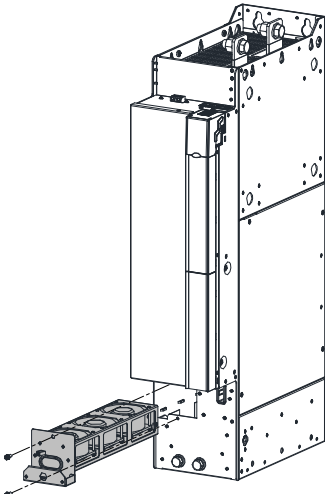
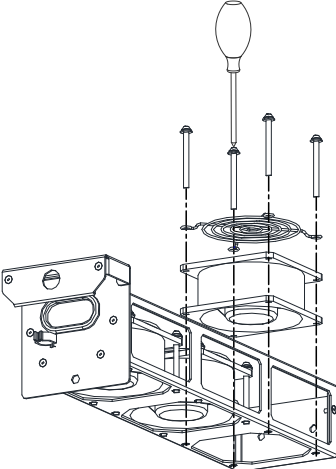


- 2) Insert the two guide pins into the square holes and then press in the hook.



- 3) After the replacement is complete, check that the air flow direction is upright.

■ Removing the fan of a vertical tower unit

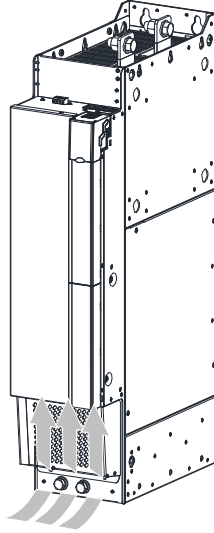
Removal	
<p>1) Disconnect the six screws and remove the front cover.</p> 	<p>2) Disconnect the fan power cable connector from the power supply unit. Each fan has a power cable connector.</p> 
<p>3) Remove two screws from the fan box and draw the fan box out in the direction of the arrow.</p> 	<p>4) Loosen four screws from each fan cover and remove the fan.</p> 

■ Installing the fan of a vertical tower unit

Installing

Install the fan in reverse order of removal. Pay attention to the fan direction.

- ◆ Align the fan box to the rail and push it into the power supply unit.
- ◆ Connect the fan power cable connectors and fix the two screws. After the replacement is complete, check that the air flow direction is upright.



9 Technical Data and Options

The 810 series power supply units are used with the MD810, IS810, ES810, and TD810 series drive units. This chapter describes the technical specifications and options of power supply units. For details about the technical specifications and options of drive units, see the corresponding user guides.

9.1 Technical Data

Table 9-1 Parameter specifications of the power supply unit

Power Supply Unit Model	Rated Power (kW)	Power Capacity (kVA)	Input AC Current (A)	Output DC Current (A)	Braking Unit	Current Carrying Capacity (A)	Thermal Power (W)
380 VAC to 480 VAC (operating range: 323 VAC to 528 VAC); output voltage: 537 VDC to 679 VDC							
MD810-20M4T22GXXX	22	54	59	56	(Optional) Built-in	100	176
MD810-20M4T45GXXX	45	81	112	110	(Optional) Built-in	200	290
MD810-20M4T110GXXX	110	179	196	240	(Optional) External MDBUN	200	590
MD810-20M4T160GXXX (W)	160	263	292	358	(Optional) External MDBUN	200	880
MD810-20M4T355GXXX	355	565	619	759	(Optional) External MDBUN	200	1525
ES810-20M4T56-10	22	54	59	56	(Optional) Built-in	100	176
TD810-20M4T22GXXX	22	81	59	56	(Optional) Built-in	200	290
TD810-20M4T45GXXX	45	179	112	110	(Optional) Built-in	200	590
TD810-20M4T110GXXX	110	263	196	240	(Optional) External MDBUN	200	880
TD810-20M4T160GXXX(W)	160	565	292	358	(Optional) External MDBUN	200	1525
TD810-20M4T355GXXX	355	54	619	759	(Optional) External MDBUN	100	176
ES810-20M4T110-10	45	81	112	110	(Optional) Built-in	200	290
ES810-20M4T240-00	110	179	196	240	(Optional) External MDBUN	200	590

Power Supply Unit Model	Rated Power (kW)	Power Capacity (kVA)	Input AC Current (A)	Output DC Current (A)	Braking Unit	Current Carrying Capacity (A)	Thermal Power (W)
ES810-20M4T358-00	160	263	292	358	(Optional) External MDBUN	200	880

Table 9-2 Technical specifications of the power supply unit

Item	Specifications
Basic parameter	Input voltage Three-phase 380 V AC to 480 V AC (operating range: 323 V AC to 528 V AC)
Personalized function	Communication/Fieldbus Support for Modbus-RTU: max. baud rate 115,200, 128 nodes, max. distance 1000 m Support for PROFIBUS-DP (depending on different models): 12 Mbps, 32 nodes, max. distance 100 m Support for CANopen: 1 Mbps, 64 nodes, max. distance 40 m
HMI	DI/DO Five general multifunctional input terminals; isolation of drain source input programmable terminals; operating voltage 9 V to 30 V; inactive voltage less than 5 V; input impedance 3 kΩ; compliant with 100 Hz frequency input; three relay outputs; programmable normally open (NO) and normally closed (NC) contacts.
	Operating panel display Standard configuration: 5-bit LED display and five keys
Protection	Overtemperature protection, power phase loss protection, detection of three-phase input voltage unbalance, overvoltage protection, braking circuit overcurrent protection, braking resistor short circuit protection, and detection of braking transistor direct connection

General technical specifications

Mains voltage	Three-phase 380 V AC to 480 V AC: 323 V AC to 528 V AC (-15% to +10%)
Power	MD810 series power supply unit: 22 kW, 45 kW, 110 kW, 160 kW, and 355 kW TD810 series power supply unit: 22 kW, 45 kW, 110 kW, 160 kW, and 355 kW ES810 series power supply unit: 22 kW, 45 kW, 110 kW, and 160 kW
Mains type	TN, TT, and IT star topologies
Input frequency	0 to 500 Hz
Braking	Additional braking module and resistor
IP rating	IP20
Cooling	Forced air cooling
Ambient temperature	Operating temperature: -10°C to +50°C ; ambient temperature variation < 0.5°C /min; derating above 40°C ; derating of rated current by 1.5% with every 1°C temperature rise; max. operating temperature: 50°C Storage temperature: -25°C to +70°C Transportation temperature: -25°C to +70°C

Relative humidity	Relative humidity variation: 5% to 95%. Standard models are not suitable for use in environments with corrosive gases. Select models with corrosion-resistant coated housing. Relative humidity for storage: 5% to 95% Relative humidity for transportation: less than 95% at 40°C
Altitude	1000 m; derating of 1% with every increase of 100 m above 1000 m until 3000 m

9.2 Installation Dimensions

The 810 series power supply units are classified into the MD810, ES810, and TD810 series that come in four outline structures and two unit types: booksize and vertical tower units. The booksize unit with equal height and depth provides three design width options: 100 mm, 200 mm, and 300 mm. The 355 kW power supply unit is a vertical tower unit measuring 180 mm wide.

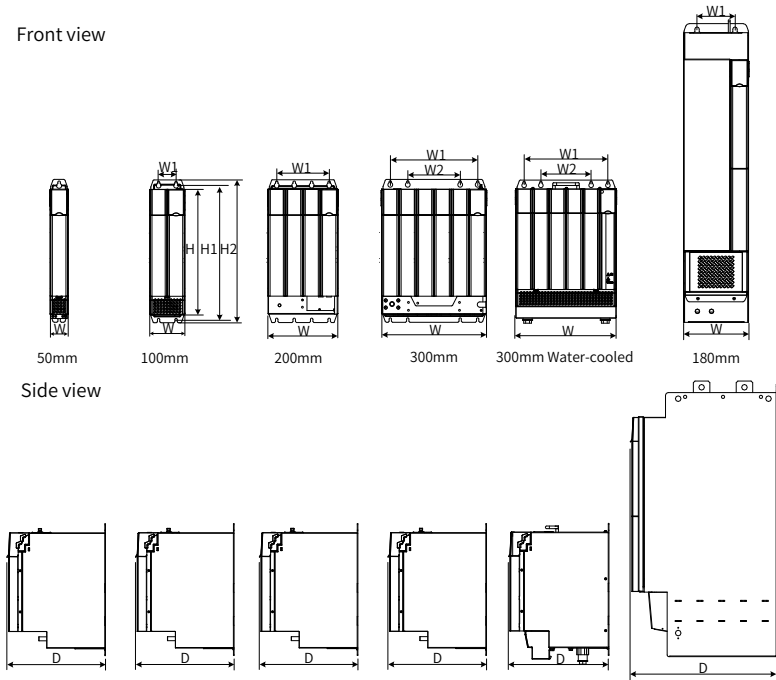


Figure 9-1 Overall dimensions of the power supply unit

Table 9-3 Overall dimensions of the power supply unit

Power Supply Unit Model	Dimensions (mm)				Mounting Hole Location (mm)			Mounting Hole Size (mm)	Weight (kg)
	H2	H	W	D	W1	W2	H1		
MD810-20M4T22GXXX	400	350	50	305	-	-	384	Φ7	3.8
MD810-20M4T45GXXX	400	350	100	305	50	-	384	Φ7	8
MD810-20M4T110GXXX	400	350	200	305	150	-	384	Φ7	23
MD810-20M4T160GXXX	400	350	300	305	250	150	384	Φ7	38
MD810-20M4T160GXXXW	426.5	350	300	305	250	150	384	Φ7	38
MD810-20M4T355GXXX	832	800	180	445	105	-	795	Φ12	65
ES810-20M4T56-10	400	350	50	305	-	-	384	Φ7	3.8
TD810-20M4T22GXXX	400	350	50	305	-	-	384	Φ7	3.8
TD810-20M4T45GXXX	400	350	100	305	50	-	384	Φ7	8
TD810-20M4T110GXXX	400	350	200	305	150	-	384	Φ7	23
TD810-20M4T160GXXX	400	350	300	305	250	150	384	Φ7	38
TD810-20M4T160GXXXW	426.5	350	300	305	250	150	384	Φ7	38
TD810-20M4T355GXXX	832	800	180	445	105	-	795	Φ12	65
ES810-20M4T110-10	400	350	100	305	50	-	384	Φ7	8
ES810-20M4T240-00	400	350	200	305	150	-	384	Φ7	23
ES810-20M4T358-00	400	350	300	305	250	150	384	Φ7	38

9.3 Options

Name		Applicable Power Supply Unit Model	Model	Code
Co-bus external power terminal	Co-bus external power terminal of 100 A	22 kW	MD810-CON1	01040014
	Co-bus external power terminal of 200 A	45 kW, 110 kW, and 160 kW	MD810-CON2	01040015
Embedded mounting bracket	50 mm wide embedded mounting bracket	22 kW	MD810-AZJ50M-W1	01040039
	100 mm wide embedded mounting bracket	45 kW	MD810-AZJ50M-W2	01040040
	200 mm wide embedded mounting bracket	110 kW	MD810-AZJ20M-W3	01040042
	300 mm wide embedded mounting bracket	160 kW	MD810-AZJ20M-W4	01040043

Name		Applicable Power Supply Unit Model	Model	Code
Heat insulation baffle	50 mm wide heat insulation baffle	22 kW	MD810-DLB-W1	01040044
	100 mm wide heat insulation baffle	45 kW	MD810-DLB-W2	01040045
	200 mm wide heat insulation baffle	110 kW	MD810-DLB-W3	01040046
	300 mm wide heat insulation baffle	160 kW	MD810-DLB-W4	01040047
Shielding bracket	50 mm wide shielding bracket	22 kW	MD810-PBJ50M-W1	01040048
	100 mm wide shielding bracket	45 kW	MD810-PBJ50M-W2	01040049
	200 mm wide shielding bracket	110 kW	MD810-PBJ50M-W3	01040050
External LCD operating panel	SOP-20-external LCD operating panel	Whole series	SOP-20-MD	01040028
External operating panel network cable	3 m network cable	Whole series	C45590-GNCN-C25003	01040020
Network cable	240 mm network cable	50 mm wide model	C45590-GNCN-C2500024	01040038
	250 mm network cable	100 mm wide model	C45590-GNCN-C2500025	01040018
	350 mm network cable	200 mm wide model	C45590-GNCN-C2500035	01040019
	430 mm network cable	300 mm wide model	C45590-GNCN-C2500043	01040021
	800mm network cable	180 mm wide model	C45590-GNCN-C2500080	01040016

9.3.1 Co-bus External Power Terminal

- The co-bus external power terminal of 100 A is applicable to 22 kW power supply units (which correspond to 50 mm width).
- The co-bus external power terminal of 200 A is applicable to 45 kW, 110 kW, and 160 kW power supply units (which correspond to 100 mm, 200 mm, and 300 mm width).

Co-bus external power terminal of 100 A Co-bus external power terminal of 200 A

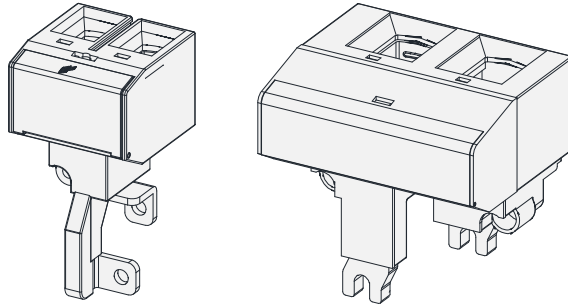


Figure 9-2 Physical appearance of the co-bus external power terminal

Table 9-4 Recommended cable diameter for the co-bus external power terminal

Terminal Model	Cable Diameter
Co-bus external power terminal of 100 A	10 AWG to 1 AWG
Co-bus external power terminal of 200 A	6 AWG to 250 kcmil

9.3.2 Embedded Mounting Bracket and Backplate Tapping Dimensions

The embedded mounting bracket is only applicable to single rack installation. When installing a booksize power supply unit, select an embedded mounting bracket based on the unit's width. The embedded mounting bracket is not required for installing vertical tower units.

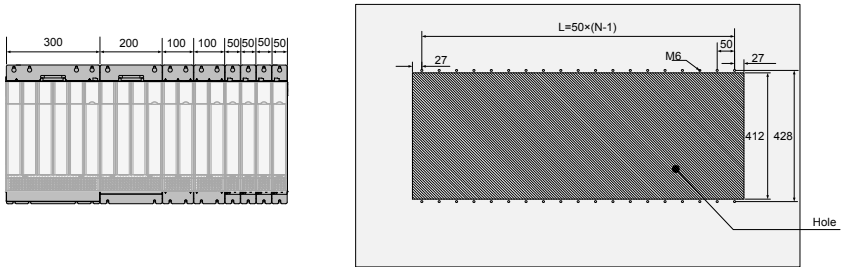


Figure 9-3 Physical appearance of the embedded mounting bracket and backplate tapping dimensions (unit: mm)

9.3.3 Heat Insulation Baffle

The heat insulation baffle is applicable to dual rack installation. When installing a booksize power supply unit, select a heat insulation baffle based on the unit's width. The heat insulation baffle is not required for installing vertical tower units.

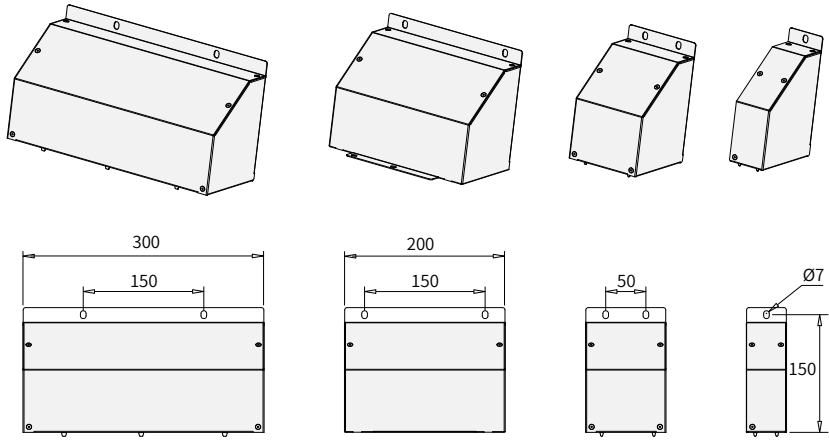


Figure 9-4 Overall dimensions of the heat insulation baffle (unit: mm)

9.3.4 Shielded Bracket

It is recommended that a shielding layer fixed by a shielding bracket be used for input cables of a booksize power supply unit.

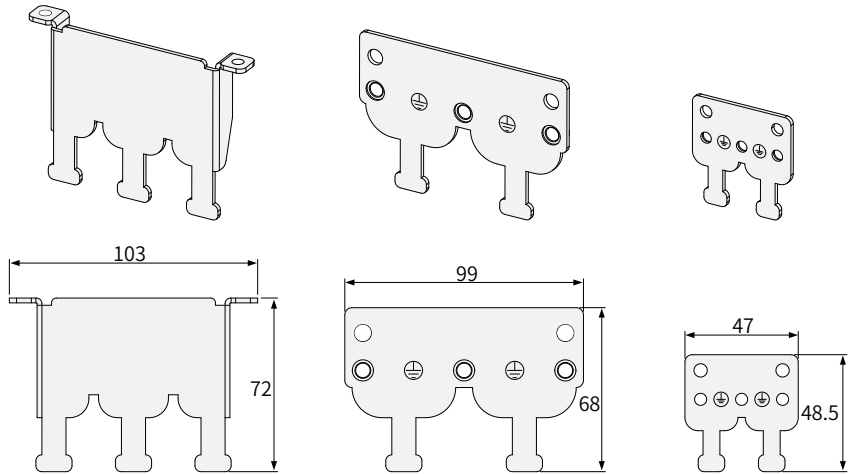


Figure 9-5 Overall dimensions of the shielded bracket (unit: mm)

9.3.5 External LCD Operating Panel

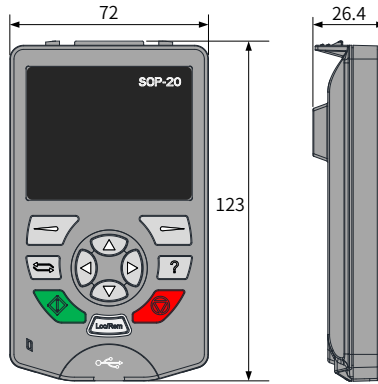


Figure 9-6 Overall dimensions of the external LCD operating panel

9.4 Selection of Braking Components

9.4.1 Selection of Resistance of the Braking Resistor

During braking, almost all regenerative energy of the motor is consumed by the braking resistor. The resistance of the braking resistor is calculated by the following formula:

$$U \times U/R = P_b$$

U indicates the braking voltage at system stable braking. U varies depending on different systems. For the 810 series power supply units, usually select the 760 V braking voltage, which can be adjusted by setting F1-02 (Braking unit applied voltage).

P_b indicates the braking power.

9.4.2 Selection of Power of the Braking Resistor

In theory, power of the braking resistor is the same as the braking power. However, in consideration of derating K, power of braking resistor is calculated using the following formula:

$$K \times P_r = P_b \times D$$

K is set to 50% or an approximate value.

P_r indicates the power of the braking resistor.

D indicates the braking frequency (percentage of regenerative process to whole deceleration).

The following two formulas can be obtained:

$$K \times P_r = P_b \times D = U \times U/R \times D$$

$$P_r = (U \times U \times D)/(R \times K)$$

The braking resistor power is calculated accordingly.

K is the derating coefficient of braking resistor. Low K value ensures that the braking resistor does not get overheated. The K value can be increased appropriately on the condition of good dissipation and must not exceed 50%. Failure to comply may result in a fire due to overheating of braking resistor.

Braking frequency (D) is determined by application. Typical values of braking frequency in different applications are listed in Table 9-6.

Table 9-5 Typical values of braking frequency in different applications

Application	Elevator	Winding and unwinding	Centrifuge	Occasional braking load	General application
Braking Frequency	20% to 30%	20% to 30%	50% to 60%	5%	10%

9.4.3 Selection Guidance

Power Supply Unit Model	Applicable Motor (kW)	Braking Unit		125% Braking Torque (10% ED; Max. 10s)		Remarks	Min. Braking Resistance (Ω)
		Model	Quantity	Braking Resistor Specifications	Number of Braking Resistors		
MD810-20M4T22GXXX	22	Built-in	-	4 kW, 32 Ω	1		24
MD810-20M4T45GXXX	45	Built-in	-	9 kW, 13 Ω	1		12.8
MD810-20M4T110GXXX	110	MDBUN-60-T	2	11 kW, 9.4 Ω	2	Input voltage ≤ 440 V AC	9.3 × 2
	110	MDBUN-60-5T	2	11 kW, 10.5 Ω	2	Input voltage > 440 V AC	10.5 × 2
MD810-20M4T160GXXX (W)	160	MDBUN-90-T	2	16 kW, 6.3 Ω	2	Input voltage ≤ 440 V AC	6.2 × 2
	160	MDBUN-90-5T	2	16 kW, 7.2 Ω	2	Input voltage > 440 V AC	7.0 × 2
MD810-20M4T355GXXX	355	MDBU-200-B	3	23 kW, 3.8 Ω	3	Input voltage ≤ 440 V AC	2.5 × 3
	355	MDBU-200-C	3	23 kW, 4.9 Ω	3	Input voltage > 440 V AC	3.0 × 3
TD810-20M4T22GXXX	22	Built-in	-	4 kW, 32 Ω	1		24
TD810-20M4T45GXXX	45	Built-in	-	9 kW, 13 Ω	1		12.8
TD810-20M4T110GXXX	110	MDBUN-60-T	2	11 kW, 9.4 Ω	2	Input voltage ≤ 440 V AC	9.3×2
	110	MDBUN-60-5T	2	11 kW, 10.5 Ω	2	Input voltage > 440 V AC	10.5×2
TD810-20M4T160GXXX(W)	160	MDBUN-90-T	2	16 kW, 6.3 Ω	2	Input voltage ≤ 440 V AC	6.2×2
	160	MDBUN-90-5T	2	16 kW, 7.2 Ω	2	Input voltage > 440 V AC	7.0×2

Power Supply Unit Model	Applicable Motor (kW)	Braking Unit		125% Braking Torque (10% ED; Max. 10s)		Remarks	Min. Braking Resistance (Ω)
		Model	Quantity	Braking Resistor Specifications	Number of Braking Resistors		
TD810-20M4T355GXXX	355	MDBU-200-B	3	23 kW, 3.8 Ω	3	Input voltage \leq 440 V AC	2.5 \times 3
	355	MDBU-200-C	3	23 kW, 4.9 Ω	3	Input voltage > 440 V AC	3.0 \times 3
ES810-20M4T56-10	22	Built-in	-	4 kW, 32 Ω	1		24
ES810-20M4T110-10	45	Built-in	-	9 kW, 13 Ω	1		12.8
ES810-20M4T240-00	110	MDBUN-60-T	2	11 kW, 9.4 Ω	2	Input voltage \leq 440 V AC	9.3 \times 2
	110	MDBUN-60-5T	2	11 kW, 10.5 Ω	2	Input voltage > 440 V AC	10.5 \times 2
ES810-20M4T358-00	160	MDBUN-90-T	2	16 kW, 6.3 Ω	2	Input voltage \leq 440 V AC	6.2 \times 2
	160	MDBUN-90-5T	2	16 kW, 7.2 Ω	2	Input voltage > 440 V AC	7.0 \times 2

9.4.4 Overall Dimensions and Installation Dimensions of Braking Unit

Figures 9-7 and 9-8 show the overall dimensions and installation dimensions of the MDBUN series braking unit (unit: mm).

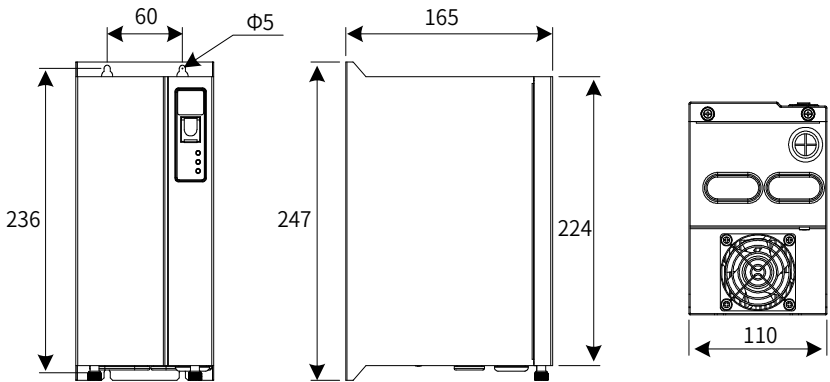


Figure 9-7 Overall dimensions of the MDBUN series braking unit

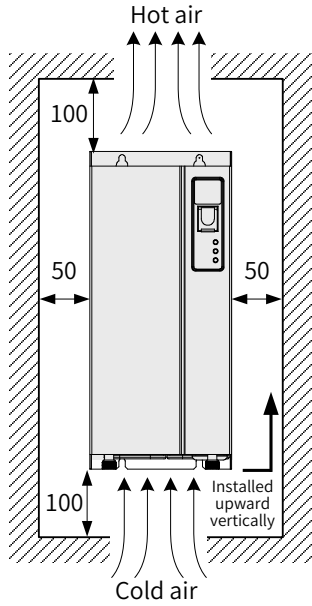


Figure 9-8 Installation dimensions of the MDBUN series braking unit

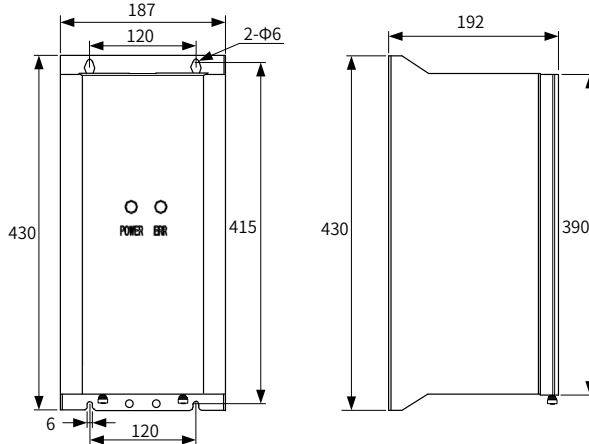


Figure 9-9 Overall dimensions of the MDBU series braking unit (unit: mm)



NOTE

- ◆ For details about how to install and use MDBUN, see the 19010533 MDBUN Series Braking Unit User Guide.

9.4.5 Overall Dimensions of Energy Feedback Unit

The active front end (AFE) is an optional unit used to feed the energy generated by the motor during braking back to the mains, which removes the use of the braking unit and braking resistor and reduces heat emission. Inovance AFE features energy efficiency, low noise, low harmonic, and high power factor.

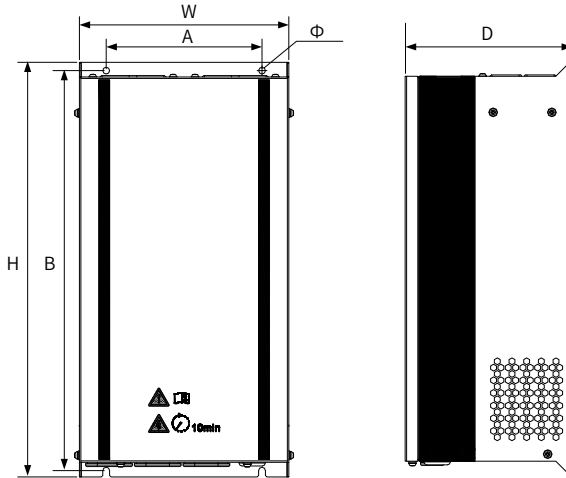


Figure 9-10 Overall dimensions of the MD051 series AFE (unit: mm)

Table 9-6 Overall dimensions of the MD051 series AFE

Model	Dimensions (mm)			Mounting Hole Location (mm)		Mounting Hole Size (mm)	Weight (kg)
	H	W	D	A	B		
MD051T5.5G	305	190	163	130	290	7.0	7.2
MD051T7.5G	305	190	163	130	290	7.0	7.2
MD051T11G	305	190	163	130	290	7.0	7.2
MD051T15G	425	215	174	160	410	7.0	13.2
MD051T18.5G	425	215	174	160	410	7.0	13.2
MD051T22G	490	260	200	160	475	7.0	19.6
MD051T30G	490	260	200	160	475	7.0	21.3

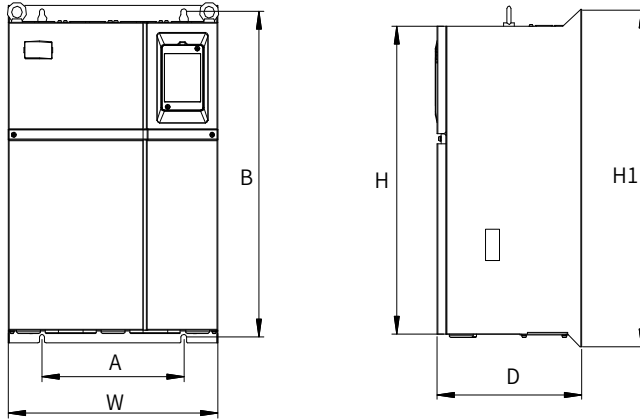


Figure 9-11 Overall dimensions of the MD050 series AFE (unit: mm)

Table 9-7 Overall dimensions of the MD050 series AFE

Model	Dimensions (mm)				Mounting Hole Location (mm)		Mounting Hole Size (mm)	Weight (kg)
	H	H1	W	D	A	B		
MD050-T37G	549	600	385	265	260	580	10	32
MD050-T45G								
MD050-T55G								
MD050-T75G	660	700	473	307	343	678	10	47
MD050-T90G								
MD050-T110G								
MD050-T132G	880	930	579	380	449	903	10	90
MD050-T160G								
MD050-T200G								
MD050-T220G	983	1060	650	377	420	1030	12	130
MD050-T250G								
MD050-T280G								
MD050-T315G	1203	1358	800	400	520	1300	14	200
MD050-T355G								
MD050-T400G								
MD050-T450G								
MD050-T450G								

**NOTE**

- ◆ MD050 and MD051 cannot be used with the power supply unit.

9.5 Selection of Electrical Peripherals

9.5.1 MCCB and Contactor

Power Supply Unit Model	IEC Cable Specifications (mm ²)		Power Supply Unit Terminal Width (mm)	Screw	Fuse Bussmann (Pass UL Certification)		Contactor	MCCB
	Input	Ground			Rated Current (A)	Model		
Three-phase 380 to 480 V, 50/60 Hz								
MD810-20M4T22GXXX	3 x 10	10	14	M6	100	FWH-100B	65	80
MD810-20M4T45GXXX	3 x 25	16	18	M6	150	FWH-150B	95	160
MD810-20M4T110GXXX	3 x 95	70	28	M10	325	FWH-325A	205	400
MD810-20M4T160GXXX (W)	3 x 185	95	38	M12	500	FWH-500A	300	400
MD810-20M4T355GXXX	2 x (3 x 185)	185	/	M16	1000	FWH-1000A	620	800
TD810-20M4T22GXXX	3 x 10	10	14	M6	100	FWH-100B	65	80
TD810-20M4T45GXXX	3 x 25	16	18	M6	150	FWH-150B	95	160
TD810-20M4T110GXXX	3 x 95	70	28	M10	325	FWH-325A	205	400
TD810-20M4T160GXXX(W)	3 x 185	95	38	M12	500	FWH-500A	300	400
TD810-20M4T355GXXX	2 x (3 x 185)	185	/	M16	1000	FWH-1000A	620	800
ES810-20M4T56-10	3 x 10	10	14	M6	100	FWH-100B	65	80
ES810-20M4T110-10	3 x 25	16	18	M6	150	FWH-150B	95	160
ES810-20M4T240-00	3 x 95	70	28	M10	325	FWH-325A	205	400
ES810-20M4T358-00	3 x 185	95	38	M12	500	FWH-500A	300	400

9.5.2 Lugs



GTNR series



TNR series



TNS series

Figure 9-12 Lugs manufactured by Suzhou Yuanli Metal Enterprise Co., Ltd.

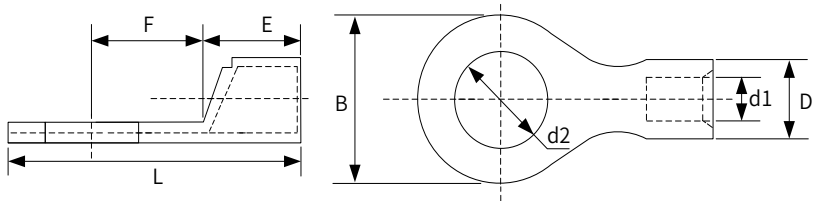


Figure 9-13 Dimensions of TNR series lug

Table 9-8 Models and dimensions of TNR series lug

Model	Cable Range		D	d1	E	F	B	d2	L	Current (A)	Crimping Tool
	AWG/MCM	mm ²									
TNR0.75-4	22-16	0.25-1.0	2.8	1.3	4.5	6.6	8.0	4.3	15.0	10	RYO-8 AK-1M
TNR1.25-4	22-16	0.25-1.65	3.4	1.7	4.5	7.3	8	5.3	15.8	19	

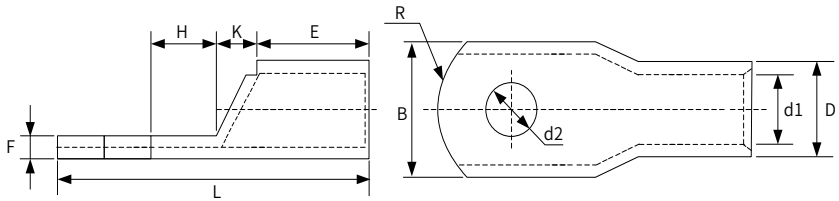


Figure 9-14 Dimensions of GTNR series lug

Table 9-9 Models and dimensions of GTNR series lug (unit: mm)

Model	D	d1	E	H	K	B	d2	F	L	R	Crimping Tool
GTNR1.5-5	4.0	2.2	5.0	5.0	2.0	8.0	5.3	1.0	16.0	5	RYO-8 YYT-8 RYO-14
GTNR2.5-4	4.5	2.9	7.0	5.0	2.0	8.0	4.3	1.0	18.0		
GTNR2.5-5				6.0			5.3		20.0		
GTNR2.5-6				10.2			6.4				
GTNR4-5	5.2	3.6	7.0	6.0	2.0	10.0	5.3	1.0	20.0		
GTNR4-6				6.4							
GTNR6-5	6.0	4.2	9.0	6.0	3.0	10.0	5.3	1.2	23.0		
GTNR6-6				7.5			6.4		26.0		
GTNR6-8				12.0			8.4			1.0	
GTNR10-6	7.0	5.0	9.0	8.0	3.5	12.4	6.4	1.3	26.5		
GTNR10-8							8.4		27.5		
GTNR16-6	7.8	5.8	12.0	8.0	4.0	12.4	6.4	1.3	31.0		
GTNR16-8							8.4				
GTNR25-6	9.5	7.5	12.0	8.0	4.5	14.0	6.4	2.0	32.0		
GTNR25-8				9.0			15.5		8.4	1.6	34.0
GTNR25-10				10.5			17.5		10.5	1.4	37.0
GTNR35-6	11.4	8.6	15.0	9.0	5.0	15.5	6.4	2.8	38.0		
GTNR35-8				10.5			8.4				
GTNR35-10				17.5			10.5			2.5	40.5
GTNR50-8	12.6	9.6	16.0	11.0	6.0	18.0	8.4	2.8	43.5		
GTNR50-10							10.5				
GTNR70-8	15.0	12.0	18.0	13.0	7.0	21.0	8.4	2.8	50.0		
GTNR70-10							10.5				
GTNR70-12							13.0				
GTNR95-10	17.4	13.5	20.0	13.0	9.0	25.0	10.5	3.9	55.0		
GTNR95-12							13.0				
GTNR120-12	19.8	15.0	22.0	14.0	10.0	28.0	13.0	4.7	60.0		
GTNR120-16				16.0			17.0		64.0		
GTNR150-12	21.2	16.5	26.0	16.0	11.0	30.0	13.0	4.7	69.0		
GTNR150-16							17.0				
GTNR185-16	23.5	18.5	32.0	17.0	12.0	34.0	17.0	5.0	78.0		
GTNR240-16	26.5	21.5	38.0	20.0	14.0	38.0	17.0	5.5	92.0		
GTNR240-20							21.0				

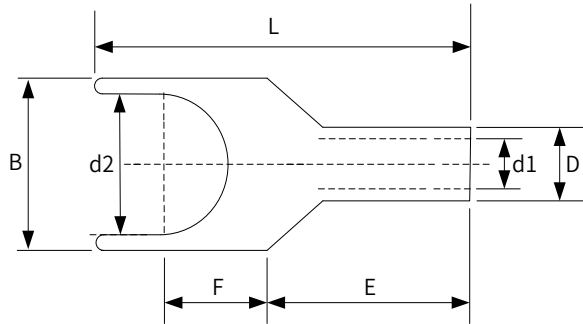


Figure 9-15 Dimensions of TNS series lug

Table 9-10 Models and dimensions of TNS series lug (unit: mm)

Model	D	d1	E	H	K	B	d2	F	L	R	Crimping Tool
TNS1.5-5.	4.0	2.2	5.0	5.0	2.0	8.0	5.3	1.0	16.0	5	RYO-8 YYT-8 RYO-14
TNS2.5-4	4.5	2.9	7.0	5.0	2.0	8.0	4.3	1.0	18.0		
TNS2.5-5				6.0			5.3		20.0		
TNS2.5-6				10.2			6.4				
TNS4-5	5.2	3.6	7.0	6.0	2.0	10.0	5.3	1.0	20.0		
TNS4-6				6.4							
TNS6-5	6.0	4.2	9.0	6.0	3.0	10.0	5.3	1.2	23.0		
TNS6-6				7.5			6.4				
TNS6-8				12.0			8.4		1.0	26.0	
TNS10-6	7.0	5.0	9.0	8.0	3.5	12.4	6.4	1.3	26.5		
TNS10-8							8.4		27.5		
TNS16-6	7.8	5.8	12.0	8.0	4.0	12.4	6.4	1.3	31.0		
TNS16-8							8.4				
TNS25-6	9.5	7.5	12.0	8.0	4.5	14.0	6.4	2.0	32.0		
TNS25-8				9.0		15.5	8.4	1.6	34.0		
TNS25-10				10.5		17.5	10.5	1.4	37.0		
TNS35-6	11.4	8.6	15.0	9.0	5.0	15.5	6.4	2.8	38.0		
TNS35-8				10.5			8.4				
TNS35-10				17.5			10.5			2.5	40.5
TNS50-8	12.6	9.6	16.0	11.0	6.0	18.0	8.4	2.8	43.5		
TNS50-10							10.5				
TNS70-8	15.0	12.0	18.0	13.0	7.0	21.0	8.4	2.8	50.0		
TNS70-10							10.5				
TNS70-12							13.0				
TNS95-10	17.4	13.5	20.0	13.0	9.0	25.0	10.5	3.9	55.0		
TNS95-12							13.0				
TNS120-12	19.8	15.0	22.0	14.0	10.0	28.0	13.0	4.7	60.0		
TNS120-16				16.0			17.0		64.0		
TNS150-12	21.2	16.5	26.0	16.0	11.0	30.0	13.0	4.7	69.0		
TNS150-16							17.0				
TNS185-16	23.5	18.5	32.0	17.0	12.0	34.0	17.0	5.0	78.0		
TNS240-16	26.5	21.5	38.0	20.0	14.0	38.0	17.0	5.5	92.0		
TNS240-20							21.0				

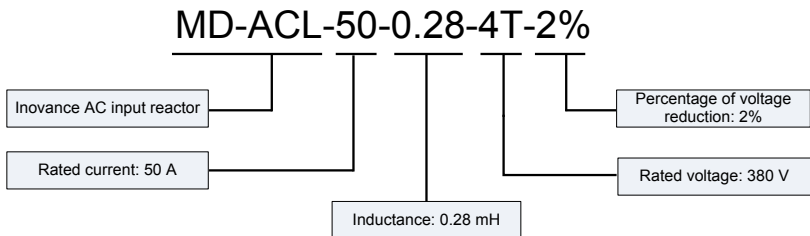
9.5.3 AC Input Reactor

An AC input reactor is connected to suppress harmonic current on the input side. Install an AC reactor when the application has higher requirements on harmonic suppression. For models above 200G, ensure that the cabinet has sufficient space for installing the reactor. Table 9-12 lists the recommended AC reactor manufacturers and models.

Table 9-11 Recommended AC reactor manufacturers and models

Power Supply Unit Model	AC Input Reactor Model (Inovance)
MD810-20M4T22GXXX	MD-ACL-60-0.24-4T-2%
MD810-20M4T45GXXX	MD-ACL-120-0.12-4T-2%
MD810-20M4T110GXXX	MD-ACL-250-0.056-4T-2%
MD810-20M4T160GXXX (W)	MD-ACL-330-0.042-4T-2%
MD810-20M4T355GXXX	MD-ACL-800-0.017-4T-2%
TD810-20M4T22GXXX	MD-ACL-60-0.24-4T-2%
TD810-20M4T45GXXX	MD-ACL-120-0.12-4T-2%
TD810-20M4T110GXXX	MD-ACL-250-0.056-4T-2%
TD810-20M4T160GXXX(W)	MD-ACL-330-0.042-4T-2%
TD810-20M4T355GXXX	MD-ACL-800-0.017-4T-2%
ES810-20M4T56-10	MD-ACL-60-0.24-4T-2%
ES810-20M4T110-10	MD-ACL-120-0.12-4T-2%
ES810-20M4T240-00	MD-ACL-250-0.056-4T-2%
ES810-20M4T358-00	MD-ACL-330-0.042-4T-2%

■ Model description:



- Overall dimensions of the AC input reactor:
- Dimensions of the AC input reactor of 60 A

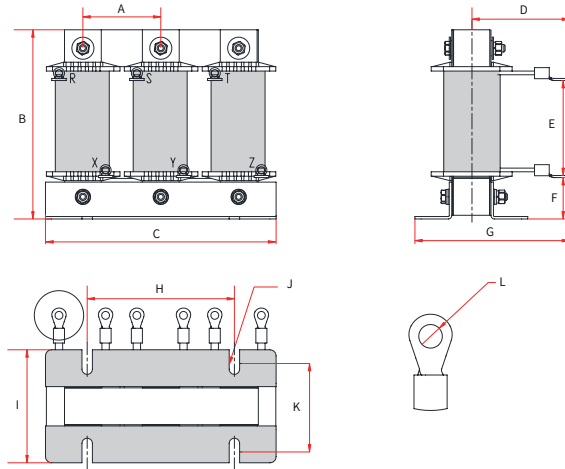


Figure 9-16 Dimensions of the AC input reactor of 60 A

Table 9-12 Dimensions of the AC input reactor of 60 A (unit: mm)

Rated Current (A)	A	B	C	D	E	F	G	H	I	J	K	L
60	64	160	195	80±10	75±5	35±5	135	120±1	92±2	Φ8.5*20	72±2	Φ6.4

- Dimensions of the AC input reactor of 120 A

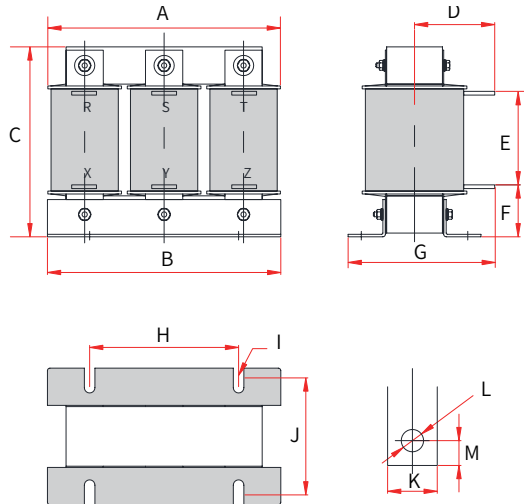


Figure 9-17 Dimensions of the AC input reactor of 120 A

Table 9-13 Dimensions of the AC input reactor of 120 A (unit: mm)

Rated Current (A)	A	B	C	D	E	F	G	H	I	J	K	L	M
120	195	188±1	160	78±10	79±5	40±5	135	120±1	Φ8.5*20	92±2	20	Φ9	10

■ Dimensions of the AC input reactor of 250A/330A

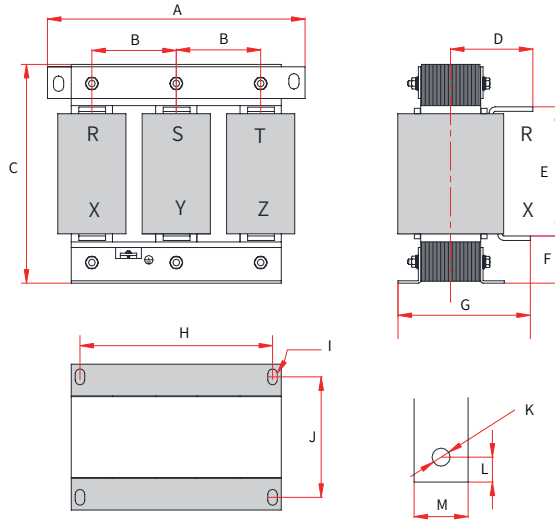


Figure 9-18 Dimensions of the AC input reactor of 250A/330A

Table 9-14 Dimensions of the AC input reactor of 250A/330A (unit: mm)

Rated Current (A)	A	B	C	D	E	F	G	H	I	J	K	L	M
250	250	81±5	260	102±10	160±5	50±5	175	182±1	Φ11*18	96±2	Φ11	13	25
330	290	95±5	275	107±10	160±5	60±5	180	214±1	Φ11*18	100±2	Φ12	15	30

■ Dimensions of the AC input reactor of 800A

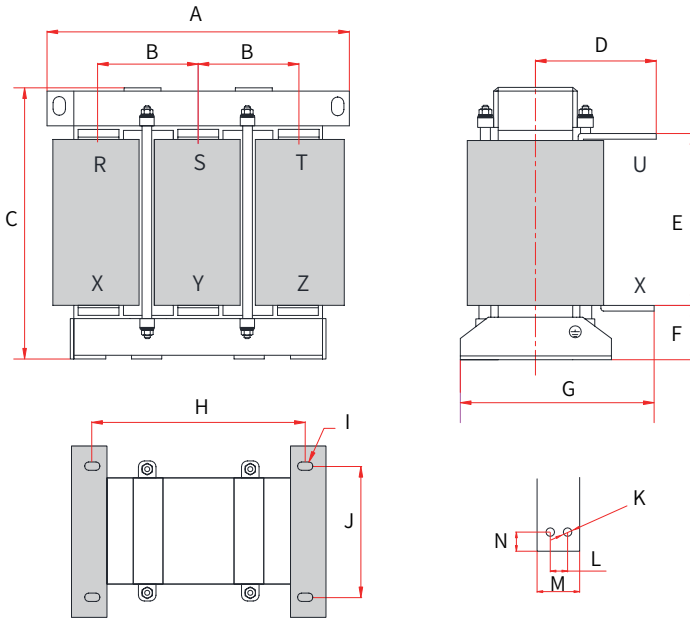


Figure 9-19 Dimensions of the AC input reactor of 800A

Table 9-15 Dimensions of the AC input reactor of 800A (unit: mm)

Rated Current (A)	A	B	C	D	E	F	G	H	I	J	K	L	M	N
800	385	123±5	390	142±10	238±5	70±5	250	260±2	Φ12*20	175±1	Φ12	22	50	23

9.5.4 External EMC Filter

■ Standard EMC filter

The standard EMC filter meets the EN 61800-3 C2 emission requirement of CE certification. Connect the filter to ground reliably and ensure that the length of the cable connecting the power supply unit and filter is less than 30 cm.



NOTE

- ◆ The length of the cable connecting the power supply unit and filter must be less than 30 cm. The filter and power supply unit must be connected to the same ground reference plane, and the filter must be reliably connected to the ground. Failure to comply will diminish the filter effect.
- ◆ The power supply unit with built-in standard filter satisfies the European EMC directive 2014/30/EU and the standard EN 61800-3 Category C3. The power supply unit is applied to the second environment.

■ Physical Appearance



Schaffner FN3258 series filter



Schaffner FN3359 series filter



Changzhou Jianli series filter

Figure 9-20 Physical appearance of standard EMC filter

■ Selection Guidance

Schaffner and Jianli filters are recommended. See Table 9-17.

Table 9-16 Recommended EMC filter manufacturers and models

Power Supply Unit Model	Input AC Filter Model (Schaffner)	Input AC Filter Model (Changzhou Jianli)
MD810-20M4T22GXXX	FN 3258-75-34	DL-65EBK5
MD810-20M4T45GXXX	FN 3258-100-35	DL-100EBK5
MD810-20M4T110GXXX	FN 3359-250-28	DL-250EBK5
MD810-20M4T160GXXX (W)	FN 3270H-320-99	DL-400EBK3
MD810-20M4T355GXXX	FN 3270H-800-99	DL-700EBK3
TD810-20M4T22GXXX	FN 3258-75-34	DL-65EBK5
TD810-20M4T45GXXX	FN 3258-100-35	DL-100EBK5
TD810-20M4T110GXXX	FN 3359-250-28	DL-250EBK5
TD810-20M4T160GXXX(W)	FN 3270H-320-99	DL-400EBK3

Power Supply Unit Model	Input AC Filter Model (Schaffner)	Input AC Filter Model (Changzhou Jianli)
TD810-20M4T355GXXX	FN 3270H-800-99	DL-700EBK3
ES810-20M4T56-10	FN 3258-75-34	DL-65EBK5
ES810-20M4T110-10	FN 3258-100-35	DL-100EBK5
ES810-20M4T240-00	FN 3359-250-28	DL-250EBK5
ES810-20M4T358-00	FN 3270H-320-99	DL-400EBK3

■ Mounting Dimensions

Dimensions of Schaffner FN 3258 series filter of 50 to 180 A

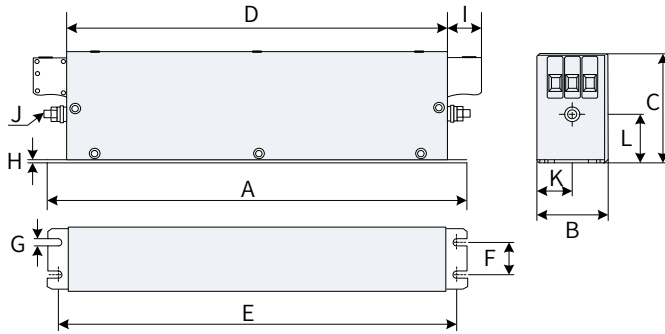


Figure 9-21 Dimensions of Schaffner FN 3258 series filter of 50 to 180 A (unit: mm)

Table 9-17 Dimensions of Schaffner FN 3258 series filter of 50 to 180 A (unit: mm)

Rated Current (A)	A	B	C	D	E	F	G	H	I	J	K	L
7	190	40	70	160	180	20	4.5	1	22	M5	20	29.5
16	250	45	70	220	235	25	5.4	1	22	M5	22.5	29.5
30	270	50	85	240	255	30	5.4	1	25	M5	25	39.5
42	310	50	85	280	295	30	5.4	1	25	M6	25	37.5
55	250	85	90	220	235	60	5.4	1	39	M6	42.5	26.5
75	270	80	135	240	255	60	6.5	1.5	39	M6	40	70.5
100	270	90	150	240	255	65	6.5	1.5	45	M10	45	64
130	270	90	150	240	255	65	6.5	1.5	45	M10	45	64
180	380	120	170	350	365	102	6.5	1.5	51	M10	60	47

■ Dimensions of Schaffner FN 3359 series filter of 150 to 2500 A

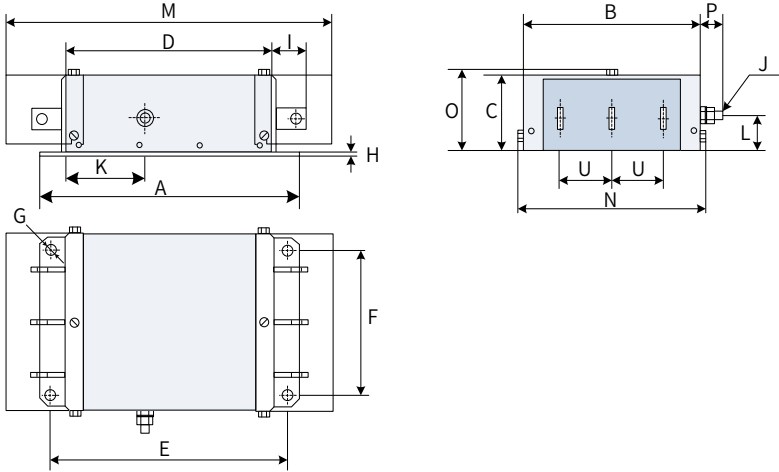


Figure 9-22 Dimensions of Schaffner FN 3359 series filter of 150 to 2500 A (unit: mm)

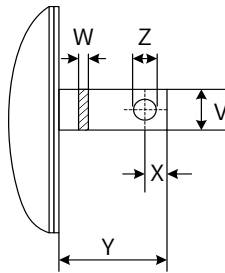


Figure 9-23 Dimensions of the copper bar(unit: mm)

Table 9-18 Dimensions of Schaffner FN 3359 series filter of 150 to 2500 A (unit: mm)

Mark	150A	180A	250A	320A	400A	600A	800A	1000A	1600A	2500A
A	300	300	300	300	300	300	350	350	400	600
B	210	210	230	260	260	260	280	280	300	370
C	120	120	125	115	115	135	170	170	160	200
D	160	160	180	210	210	210	230	230	250	300
E	120	120	120	120	120	120	145	145	170	250
F	185	185	205	235	235	235	255	255	275	330
G	φ12	φ12	φ12	φ12	φ12	φ12	φ12	φ12	φ12	φ14
H	2	2	2	2	2	2	3	3	3	3
I	33	33	33	43	43	43	53	53	93	98
J	M10	M10	M10	M12	M12	M12	M12	M12	M12	M16

Mark	150A	180A	250A	320A	400A	600A	800A	1000A	1600A	2500A
K	55	55	62.5	20	20	20	25	25	25	25
L	30	30	35	20	20	20	25	25	25	25
M	420	420	420	440	440	440	510	510	-	-
N	171	171	191	221	221	221	241	241	-	-
O	127	127	132	122	122	142	177	177	-	-
S	-	-	-	-	-	-	-	-	26	35
T	-	-	-	-	-	-	-	-	26	35
U	50	50	55	60	60	60	60	60	60	100
V	-	-	-	25	25	25	40	40	60	70
W	-	-	-	6	6	8	8	8	10	15
X	-	-	-	15	15	15	20	20	17	20
Y	-	-	-	40	40	40	50	50	90	95
Z	-	-	-	φ10.5	φ10.5	φ10.5	φ14	φ14	φ14	φ14

■ Dimensions of Jianli series filter of 50 to 200 A

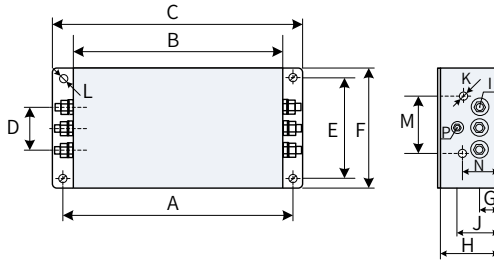


Figure 9-24 Dimensions of Jianli series filter of 50 to 200 A (unit: mm)

Table 9-19 Dimensions of Jianli series filter of 50 to 200 A (unit: mm)

Model	A	B	C	D	E	F	G	H	I	J	K	M	N	P	L
DL-25EBK5	243	224	265	58	70	102	25	92	M6	58	M4	74	49	M6	6.4 × 9.4
DL-35EBK5															
DL-50EBK5															
DL-65EBK5															
DL-80EBK5	354	323	388	66	155	188	30	92	M8	62	M4	86	56	M8	6.4 × 9.4
DL-100EBK5															
DL-130EBK5															
DL-160EBK5															
DL-200EBK5															

■ Dimensions of Jianli series filter of 250 to 800 A

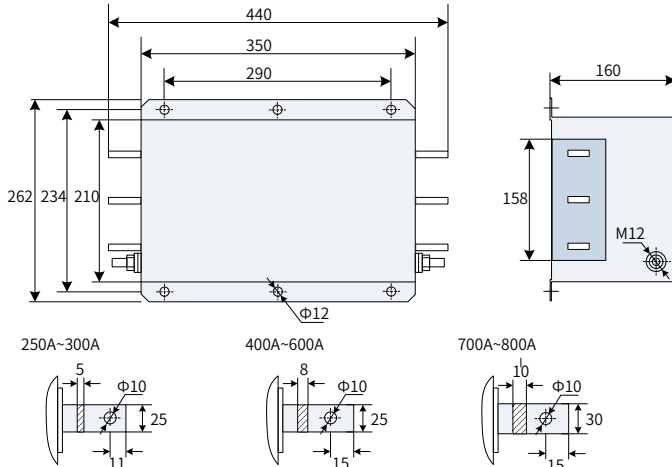


Figure 9-25 Dimensions of Jianli series filter of 250 to 800 A (unit: mm)

■ Dimensions of Jianli series filter of 1000 A

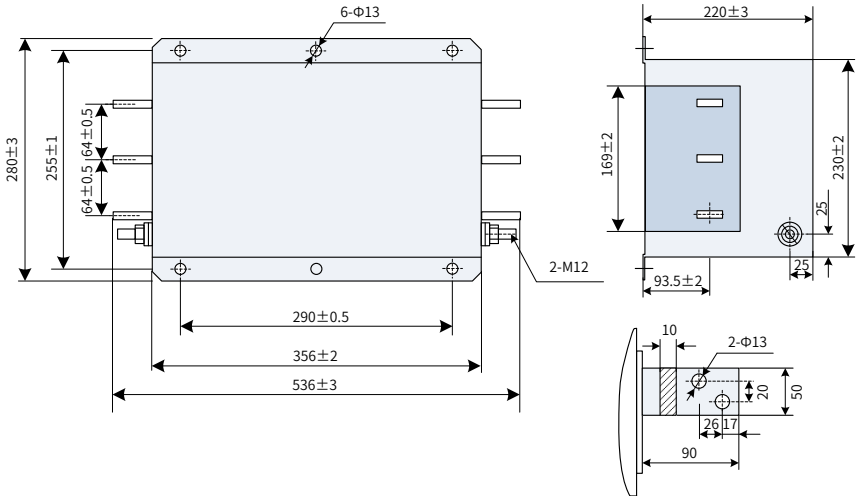


Figure 9-26 Dimensions of Jianli series filter of 1000 A (unit: mm)

■ Simple EMC input filter

A simple EMC input filter is installed to prevent the surrounding interference and prevent the interference from the power supply unit during running.

Connect the simple EMC filter to ground reliably and ensure that the length of the cable connecting the power supply unit and the filter is less than 30 cm.

Table 9-20 Recommended models of simple EMC input filters

Power Supply Unit Model	Simple EMC AC Input Filter Model
MD810-20M4T22GXXX	DL65EB1/10
MD810-20M4T45GXXX	DL-120EB1/10
MD810-20M4T110GXXX	/
MD810-20M4T160GXXX (W)	/
MD810-20M4T355GXXX	/
TD810-20M4T22GXXX	DL65EB1/10
TD810-20M4T45GXXX	DL-120EB1/10
TD810-20M4T110GXXX	/
TD810-20M4T160GXXX(W)	/
TD810-20M4T355GXXX	/
ES810-20M4T56-10	DL65EB1/10
ES810-20M4T110-10	DL-120EB1/10
ES810-20M4T240-00	/
ES810-20M4T358-00	/

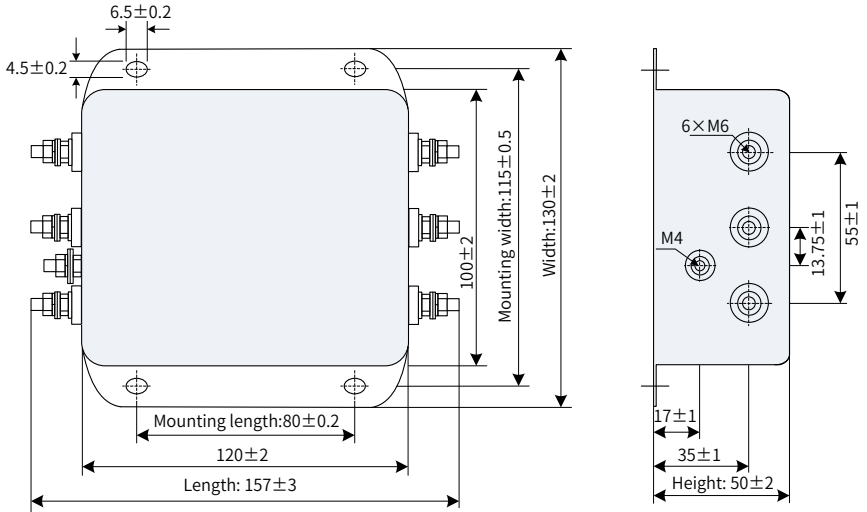


Figure 9-27 Mounting dimensions of the simple EMC filter (unit: mm)

Table 9-21 Overall dimensions and mounting dimensions of the simple EMC filter

Filter Model	Overall Dimensions (Length x Width x Height, in mm)	Mounting Dimensions (Mounting Length x Mounting Width, in mm)
DL-15EB1/10	157 × 130 × 50	80 × 115
DL-35EB1/10	218 × 140 × 80	184 × 112
DL-65EB1/10	218 × 140 × 80	184 × 112
DL-120EB1/10	334 × 185 × 90	304 × 155
DL-180EB1/10	388 × 220 × 100	354 × 190

Appendix A Standards Compliance

A.1 CE Certification



Figure A-28 CE Mark

- 1) CE mark indicates compliance with European safety and environmental regulations. It is required for engaging in business and commerce in Europe. European standards include the Machinery Directive for machine manufacturers, the Low Voltage Directive for electronics manufacturers, and EMC guidelines for controlling noise.
- 2) This power supply unit is marked with CE mark based on the following EMC guidelines and the Low Voltage Directive.
 - 2014/35/EU: Low Voltage Directive
 - 2014/30/EU: Electromagnetic compatibility
- 3) Machines and devices used in combination with this power supply unit must also be CE certified and marked.
- 4) The integrator who integrates the power supply unit with the CE mark into other devices has the responsibility of ensuring compliance with CE standards and verifying that conditions meet European standards.

A.1.1 CE Low Voltage Directive Compliance

This power supply unit has been tested according to IEC 61800-5-1: 2007, and it complies with the Low Voltage Directive completely.

To enable machines and devices integrating this power supply unit to comply with the Low Voltage Directive, be sure to meet the following conditions:

- Mounting Location

Mount the power supply unit in places with pollution not higher than severity 2 and overvoltage category 3 in accordance with IEC60664.

- Installing Fuse on the Input Side

To prevent accidents caused by short circuit, install a fuse on the input side. The fuse must comply with the UL standard. Select the fuse according to Table A-1.

For details about the input and output current of the power supply unit, see ["9 Technical Data and Options"](#)

Table A-22 Options of the external fuse for the power supply unit

Power Supply Unit Model	FWH Series Fuse in Compliance with UL Certification Manufacturer: Bussmann		
	Rated Current (A)	Model	Quantity
Three-phase 380 to 480 V, 50/60 Hz			
MD810-20M4T22GXXX	100	FWH-100B	1
MD810-20M4T45GXXX	150	FWH-150B	1
MD810-20M4T110GXXX	325	FWH-325A	1
MD810-20M4T160GXXX (W)	500	FWH-500A	1
MD810-20M4T355GXXX	1000	FWH-1000A	1
TD810-20M4T22GXXX	100	FWH-100B	1
TD810-20M4T45GXXX	150	FWH-150B	1
TD810-20M4T110GXXX	325	FWH-325A	1
TD810-20M4T160GXXX(W)	500	FWH-500A	1
TD810-20M4T355GXXX	1000	FWH-1000A	1
ES810-20M4T56-10	100	FWH-100B	1
ES810-20M4T110-10	150	FWH-150B	1
ES810-20M4T240-00	325	FWH-325A	1
ES810-20M4T358-00	500	FWH-500A	1

**NOTE**

- ◆ When the fuse burns or the wiring breaker trips, do not connect to power immediately or operate the machine. Check wiring and peripherals to identify the cause. If the cause cannot be identified, contact the agent or Inovance. Do not connect to power or operate the machine by yourself.
- ◆ Each input cable of the power supply unit must be connected to a fuse. When a fuse burns, replace all other fuses.

■ Preventing Entry of Foreign Objects

The 810 series power supply units must be installed in a fireproof cabinet with doors that provide effective electrical and mechanical protection. The installation must conform to local and regional laws and regulations, and to relevant IEC requirements.

■ Grounding

If using a power supply unit of the 400 V class, connect the neutral point of the power supply unit to ground.

A.1.2 EMC Guidelines Compliance

Electromagnetic compatibility (EMC) describes the ability of electronic and electrical devices or systems to work properly in the electromagnetic environment and not to generate electromagnetic interference that influences other local devices or systems. In other words, EMC includes two aspects: The electromagnetic interference generated by

a device or system must be restricted within a certain limit; the device or system must have sufficient immunity to the electromagnetic interference in the environment.

The power supply unit with a built-in standard filter satisfies the European EMC directive 2014/30/EU and the standard EN 61800-3 Category C3. The power supply unit is applied to the second environment.

The power supply unit with an external filter satisfies the European EMC directive 2014/30/EU and the standard EN 61800-3 Category C2. The power supply unit is applied to both the first environment and the second environment.



- ◆ When applied in the first environment, the power supply unit may generate radio interference. Besides the CE compliance described in this chapter, take measures to avoid the radio interference if required.

To satisfy the EMC directive and standard, install the EMC filter on the input side of the power supply unit, connect a shielded cable on the output side, connect the filter to ground reliably, and connect the shield layer of output cable fully to ground. For details about EMC filter selection, see "[9 Technical Data and Options](#)". For details about how to select and install drive cables on the output side, see "Chapter 3 Electrical Installation".

The integrator of the system installed with the power supply unit is responsible for compliance of the system with the European EMC directive and standard EN 61800-3 Category C2, C3, or C4 according to the system application environment.

A.1.3 Definition of Terms

First environment: Environment that includes domestic premises. It also includes establishments directly connected without intermediate transformers to a low-voltage power supply network which supplies buildings used for domestic purposes.

Second environment: Environment that includes all establishments other than those directly connected to a low-voltage power supply network which supplies buildings used for domestic purposes

Category C1 power supply unit: power drive system (PDS) of rated voltage less than 1000 V, intended for use in the first environment

Category C2 power supply unit: PDS of rated voltage less than 1000 V, which is neither a plug-in device nor a movable device and, when used in the first environment, is intended to be installed and commissioned only by a professional.

Category C3 power supply unit: PDS of rated voltage less than 1000 V, intended for use in the second environment and not intended for use in the first environment

Category C4 power supply unit: PDS of rated voltage equal to or above 1000 V, or rated current equal to or above 400 A, or intended for use in complex systems in the second environment

A.1.4 Cabling Requirements

- 1) The shielded cable must be used to satisfy EMC requirements of CE marking. Shielded cables are classified into three-conductor cables and four-conductor cables. If conductivity of the cable shield is not sufficient, add an independent PE cable, or use a four-conductor cable, of which one phase conductor is a PE cable. To suppress emission and conduction of radio frequency interference effectively, the shield of the cable is copper braid. Braided density of the copper braid must be greater than 90% to enhance shielding efficiency and conductivity. For details about selection and grounding of shielded cables, see "[3.1.3 Cable Selection](#)" and "[3.1.4 System Grounding](#)".
- 2) The motor cable and PE shielded conducting wire (twisted shielded) should be as short as possible to reduce electromagnetic radiation and external stray current and capacitive current of the cable. If the motor cable is longer than 100 meters, an output filter or dv/dt reactor is required.
- 3) It is recommended that all control cables be shielded.
- 4) Motor cables must be routed away from other cables. Motor cables of multiple drive units can be routed in parallel.
- 5) It is recommended that motor cables, power input cables, and control cables be laid in different ducts. To avoid electromagnetic interference caused by rapid change of output voltage of the drive unit, do not lay motor cables and other cables side by side for a long distance.
- 6) If the control cable must run across the power cable, make sure they are arranged at an angle of close to 90°. Other cables are not allowed to run across the power supply unit.
- 7) Power input and output cables of the power supply unit and weak-current signal cables (such as control cable) must be laid vertically (if possible) rather than in parallel.
- 8) Cable ducts must be in good connection and well grounded. Aluminum ducts can be used to improve electric potential.
- 9) The filter and power supply unit must be connected to the system (machinery or appliance) properly, with spraying protection at installation part and conductive metal in full contact.
- 10) For detailed cabling requirements, see "[3 Electrical Installation](#)".

A.1.5 Solutions to Current Leakage

The power supply unit outputs high-speed pulse voltage, producing high-frequency leakage current during running of the unit. Each power supply unit produces more than 100 mA leakage current. Therefore, it is necessary to select a residual current circuit breaker with a rated operating current of 100 mA or above. The power supply unit

generates DC leakage current in a protective conductor. In this case, a time-delay B-type breaker must be used.

If multiple power supply units are required, each power supply unit must be installed with a circuit breaker.

- Factors that influence the leakage current are as follows:
 - Power supply unit capacity
 - Carrier frequency
 - Type and length of the motor cable
 - EMI filter
- When leakage current causes the circuit breaker to act, you must:
 - Increase sensitivity current of the circuit breaker.
 - Replace the circuit breaker with a new one with high-frequency suppression function.
 - Reduce carrier frequency.
 - Shorten length of the output cable.
 - Install a current leakage suppression device.

Recommended residual current circuit breaker manufacturers are Chint Electric and Schneider.

A.1.6 Solutions to Common EMC Interference Problems

The power supply unit generates very strong interference. Although EMC measures are taken, interference may still exist due to improper cabling or grounding during use. When the power supply unit interferes with other devices, adopt the following solutions.

Table A-23 Solutions to common EMC interference problems

Interference Type	Solution
Leakage protection switch tripping	<ul style="list-style-type: none"> ◆ Reduce carrier frequency. ◆ Shorten length of the drive cable. ◆ Wind ferrite core around the drive input cable except the PE cable. ◆ For tripping at the moment of power-on, cut off the large capacitance to ground on the power input side by disconnecting the grounding terminal of the external or built-in filter and disconnecting the grounding terminal of Y capacitance to ground of input terminals. ◆ For tripping when the power supply unit is running or enabled, take leakage current suppression measures (install a leakage current filter, safety capacitor + wind ferrite core, or wind ferrite core).

Interference Type	Solution
Drive interference during running	<ul style="list-style-type: none"> ◆ Connect the motor housing to the PE of the drive. ◆ Connect the PE of the AC drive to the PE of the mains. ◆ Wind the power input cable with a ferrite core. ◆ Add a safety capacitor or ferrite core to the interfered signal terminal. ◆ Add an extra common ground.
Communication interference	<ul style="list-style-type: none"> ◆ Connect the motor housing to the PE of the drive. ◆ Connect the PE of the AC drive to the PE of the mains. ◆ Wind the power input cable with a ferrite core. ◆ Add a matching resistor between the communication cable source and load. ◆ Add a common grounding cable besides the communication cable. ◆ Use a shielded cable as the communication cable and connect the cable shield to the common grounding point. ◆ Adopt the daisy chain mode for multi-node communication and reserve branch length of less than 30 cm.
I/O interference	<ul style="list-style-type: none"> ◆ Enlarge capacitance at low-speed DI. A maximum of 0.1 uF capacitance is suggested. ◆ Enlarge capacitance at AI. A maximum of 0.22 uF is suggested.

Appendix B Parameter Table

The 810 series power supply units are used with the MD810, IS810, ES810, and TD810 series drive units. This chapter describes the parameters of power supply units. For details about the parameters of drive units, see the corresponding user guides.

If FP-00 (User password) is set to a non-zero value (which enables password protection), the parameter menu is accessible in base mode and user-modified mode only after the correct password is entered. To disable password protection, set FP-00 (User password) to 0.

The password is only used for locking the operating panel. After the password is set, you need to enter the password each time you access the operating panel for parameter reading and writing. However, reading and writing of parameters (except parameters in groups FP and FF) is not password-protected during communication.

Password protection is not available for the parameter menu in user-defined mode.

Groups F and A include standard function parameters. Group U includes monitoring function parameters. The symbols in the parameter table are described as follows:

☆ : It is possible to modify the parameter with the power supply unit in the stop or in the Run status.

★ : It is not possible to modify the parameter with the power supply unit in the Run status.

● : The parameter is the actual measured value and cannot be modified.

*: The parameter is a factory parameter and can be set only by the manufacturer.

B.1 Standard Parameters

Param. No.	Param. Name	Setting Range	Default	Property
Group F0: Basic Parameters				
F0-00	Module type	2: Power supply unit	2	●
F0-01	Product SN	810	810	●
F0-02	Software version	General version: uxx.xx Interim version: Lxx.xx; customized version: Fxx.xx	-	●
F0-03	Software version upgrade process	xxx.xx	-	●
F0-04	Customized SN	0-9999	-	●
Group F1: Standard Parameters				
F1-00	Undervoltage threshold	300 to 500 V	350 V	☆
F1-01	Bus overvoltage threshold	700 to 850 V	820 V	☆
F1-02	Braking unit applied voltage	700 to 800 V	760 V	☆
F1-03	Reserved	-	-	●
F1-04	Reserved	-	-	●

Param. No.	Param. Name	Setting Range	Default	Property
F1-05	Reserved	-	-	●
F1-06	Usr correction coefficient	80.0% to 140.0%	100.0%	☆
F1-07	Ust correction coefficient	80.0% to 140.0%	100.0%	☆
F1-08	Utr correction coefficient	80.0% to 140.0%	100.0%	☆
F1-09	Fan control mode	0: Automatic running The fan starts when temperature is above 45°C . The fan stops when temperature is below 40°C . 1: Always running	1	☆
F1-10	Protection of braking transistor direct connection	0: Disabled 1: Enabled Ones: Braking transistor direct connection protection (enabled forcibly) Tens: Braking transistor overcurrent protection (enabled forcibly) Hundreds: Braking transistor overload protection (enabled forcibly)	111	●
F1-11	Protection of abnormal three-phase input	0: Disabled 1: Enabled Ones: Input phase loss Tens: High three-phase input voltage Hundreds: Three-phase input voltage unbalance	111	☆
F1-12	Reserved	-	-	●
F1-13	Protection of abnormal communication	0: Disabled 1: Enabled	1	●
F1-14	IGBT overheat protection	0: Disabled 1: Enabled Ones: Module overheat fault (enabled forcibly) Tens: Module overheat warning (enabled forcibly)	11	●
F1-15	EEPROM fault protection	0: Disabled 1: Enabled	1	●
F1-16	Reserved	-	-	●
F1-17	Protection of abnormal communication between power supply unit and drive unit	0: Disabled 1: Enabled	1	☆
F1-18	Timeout time of communication between power supply unit and drive unit	1.00s to 20.00s	5.00s	☆

Appendix B Parameter Table

Param. No.	Param. Name	Setting Range	Default	Property
Group F2: Information Exchange Between Power Supply Unit and Drive Unit				
F2-00	Drive unit protection upon high mains voltage	1: Able to run 2: Coast to stop 3: Stop in configured mode	2	●
F2-01	Drive unit protection upon low mains voltage		1	●
F2-02	Drive unit protection upon three-phase input voltage imbalance		3	●
F2-03	Drive unit protection upon input phase loss		3	●
F2-04	Drive unit protection upon braking transistor direct connection		2	●
F2-05	Drive unit protection upon braking transistor overcurrent		1	●
F2-06	Drive unit protection upon braking transistor overload		1	●
F2-07	Reserved		0	●
F2-08	Reserved		0	●
F2-09	Drive unit protection upon abnormal communication		1	●
F2-10	Reserved		0	●
F2-11	Drive unit protection upon EEPROM fault		3	●
F2-12	Drive unit protection upon IGBT overheat		2	●
F2-13	Drive unit protection upon IGBT overheat warning		3	☆
F2-14	Power supply unit protection upon high mains voltage	0: Able to run 1: Coast to stop	1	☆
Group F4: DI terminals				
F4-00	DI1 function selection	0: No function 1: RUN enabled	5	☆
F4-01	DI2 function selection	2: Incoming circuit breaker feedback 3: Auxiliary circuit breaker feedback	0	☆
F4-02	DI3 function selection	4: Residual current device feedback	0	☆
F4-03	DI4 function selection	5: Fault reset 6: RUN disabled for drive unit	0	☆
F4-04	DI5 function selection	7: Drive unit coast to stop 8: Drive unit stop in configured mode	0	☆

Param. No.	Param. Name	Setting Range	Default	Property
F4-05	DI1 filter time	0.000s to 5.000s	0.010s	☆
F4-06	DI2 filter time			☆
F4-07	DI3 filter time			☆
F4-08	DI4 filter time			☆
F4-09	DI5 filter time			☆
F4-10	DI1 active delay	0.00s to 600.00s	0.00s	☆
F4-11	DI2 active delay			☆
F4-12	DI3 active delay			☆
F4-13	DI4 active delay			☆
F4-14	DI5 active delay			☆
F4-15	DI1 inactive delay	0.00s to 600.00s	0.00s	☆
F4-16	DI2 inactive delay			☆
F4-17	DI3 inactive delay			☆
F4-18	DI4 inactive delay			☆
F4-19	DI5 inactive delay			☆
F4-20	DI active mode selection	0: Low level active 1: High level active Ones: DI1 active mode Tens: DI2 active mode Hundreds: DI3 active mode Thousands: DI4 active mode Ten thousands: DI5 active mode	00000	☆
Group F5: DO terminals				
F5-00	RO1 function selection	0: No function 1: Able to run 2: Fault 3: Alarm	0	☆
F5-01	RO2 function selection	4: Circuit breaker act 5: Bus undervoltage 6: Bus overvoltage 7: Normal bus voltage 11: Abnormal bus voltage 12: Abnormal three-phase input	0	☆
F5-02	RO3 function selection	13: Normal three-phase input 14: Output upon heatsink overheat 15: Output upon SCR overheat warning	0	☆
F5-03	RO1 active delay	0.00s to 600.00s	0.00s	☆
F5-04	RO2 active delay		0.00s	☆
F5-05	RO3 active delay		0.00s	☆

Appendix B Parameter Table

Param. No.	Param. Name	Setting Range	Default	Property
F5-06	RO1 inactive delay	0.00s to 600.00s	0.00s	☆
F5-07	RO2 inactive delay		0.00s	☆
F5-08	RO3 inactive delay		0.00s	☆
F5-09	RO active state selection	0: High level active 1: Low level active Ones: RO1 active mode Tens: RO2 active mode Hundreds: RO3 active mode	000	☆
Group FA: Fault Record				
FA-00	Fault code upon 5th fault (the most recent fault)	-	-	●
FA-01	Fault subcode upon 5th fault	-	-	●
FA-02	Bus voltage upon 5th fault	Min. unit: 0.1 V	-	●
FA-03	Heatsink temperature upon 5th fault	Min. unit: 1°C	-	●
FA-04	Ambient temperature upon 5th fault	Min. unit: 1°C	-	●
FA-05	Braking circuit current upon 5th fault	Min. unit: 0.01 A	-	●
FA-06	Mains voltage U _{sr} upon 5th fault	Min. unit: 1 V	-	●
FA-07	Mains voltage U _{st} upon 5th fault	Min. unit: 1 V	-	●
FA-08	Mains voltage U _{tr} upon 5th fault	Min. unit: 1 V	-	●
FA-09	Degree of three-phase input voltage unbalance upon 5th fault	Min. unit: 0.01%	-	●
FA-10	DI status upon 5th fault	-	-	●
FA-11	RO status upon 5th fault	-	-	●
FA-12	Stop command sending by power supply unit upon 5th fault	1: Able to run 2: Coast to stop 3: Stop in configured mode	-	●
FA-13	Total power-on time (in hours) upon 5th fault	Min. unit: 1 hour	-	●
FA-14	Total power-on time (in minutes) upon 5th fault	Min. unit: 1 minute	-	●
FA-15	Total power-on time (in seconds) upon 5th fault	Min. unit: 1s	-	●
FA-20	Fault code upon 4th fault (the second most recent fault)	-	-	●
FA-21	Fault subcode upon 4th fault	-	-	●
FA-22	Bus voltage upon 4th fault	Min. unit: 0.1 V	-	●
FA-23	Heatsink temperature upon 4th fault	Min. unit: 1°C	-	●

Param. No.	Param. Name	Setting Range	Default	Property
FA-24	Ambient temperature upon 4th fault	Min. unit: 1°C	-	●
FA-25	Braking circuit current upon 4th fault	Min. unit: 0.01 A	-	●
FA-26	Mains voltage U _{sr} upon 4th fault	Min. unit: 1 V	-	●
FA-27	Mains voltage U _{st} upon 4th fault	Min. unit: 1 V	-	●
FA-28	Mains voltage U _{tr} upon 4th fault	Min. unit: 1 V	-	●
FA-29	Degree of three-phase input voltage unbalance upon 4th fault	Min. unit: 0.01%	-	●
FA-30	DI status upon 4th fault	-	-	●
FA-31	RO status upon 4th fault	-	-	●
FA-32	Stop command sending by power supply unit upon 4th fault	1: Able to run 2: Coast to stop 3: Stop in configured mode	-	●
FA-33	Total power-on time (in hours) upon 4th fault	Min. unit: 1 hour	-	●
FA-34	Total power-on time (in minutes) upon 4th fault	Min. unit: 1 minute	-	●
FA-35	Total power-on time (in seconds) upon 4th fault	Min. unit: 1s	-	●
FA-40	Fault code upon 3rd fault (the third most recent fault)	-	-	●
FA-41	Fault subcode upon 3rd fault	-	-	●
FA-42	Bus voltage upon 3rd fault	Min. unit: 0.1 V	-	●
FA-43	Heatsink temperature upon 3rd fault	Min. unit: 1°C	-	●
FA-44	Ambient temperature upon 3rd fault	Min. unit: 1°C	-	●
FA-45	Braking circuit current upon 3rd fault	Min. unit: 0.01 A	-	●
FA-46	Mains voltage U _{sr} upon 3rd fault	Min. unit: 1 V	-	●
FA-47	Mains voltage U _{st} upon 3rd fault	Min. unit: 1 V	-	●
FA-48	Mains voltage U _{tr} upon 3rd fault	Min. unit: 1 V	-	●
FA-49	Degree of three-phase input voltage unbalance upon 3rd fault	Min. unit: 0.01%	-	●
FA-50	DI status upon 3rd fault	-	-	●
FA-51	RO status upon 3rd fault	-	-	●
FA-52	Stop command sending by power supply unit upon 3rd fault	1: Able to run 2: Coast to stop 3: Stop in configured mode	-	●

Appendix B Parameter Table

Param. No.	Param. Name	Setting Range	Default	Property
FA-53	Total power-on time (in hours) upon 3rd fault	Min. unit: 1 hour	-	●
FA-54	Total power-on time (in minutes) upon 3rd fault	Min. unit: 1 minute	-	●
FA-55	Total power-on time (in seconds) upon 3rd fault	Min. unit: 1s	-	●
FA-60	Fault code upon 2nd fault (the fourth most recent fault)	-	-	●
FA-61	Fault subcode upon 2nd fault	-	-	●
FA-62	Bus voltage upon 2nd fault	Min. unit: 0.1 V	-	●
FA-63	Heatsink temperature upon 2nd fault	Min. unit: 1°C	-	●
FA-64	Ambient temperature upon 2nd fault	Min. unit: 1°C	-	●
FA-65	Braking circuit current upon 2nd fault	Min. unit: 0.01 A	-	●
FA-66	Mains voltage U _{sr} upon 2nd fault	Min. unit: 1 V	-	●
FA-67	Mains voltage U _{st} upon 2nd fault	Min. unit: 1 V	-	●
FA-68	Mains voltage U _{tr} upon 2nd fault	Min. unit: 1 V	-	●
FA-69	Degree of three-phase input voltage unbalance upon 2nd fault	Min. unit: 0.01%	-	●
FA-70	DI status upon 2nd fault	-	-	●
FA-71	RO status upon 2nd fault	-	-	●
FA-72	Stop command sending by power supply unit upon 2nd fault	1: Able to run 2: Coast to stop 3: Stop in configured mode	-	●
FA-73	Total power-on time (in hours) upon 2nd fault	Min. unit: 1 hour	-	●
FA-74	Total power-on time (in minutes) upon 2nd fault	Min. unit: 1 minute	-	●
FA-75	Total power-on time (in seconds) upon 2nd fault	Min. unit: 1s	-	●
FA-80	Fault code upon 1st fault (the fifth most recent fault)	-	-	●
FA-81	Fault subcode upon 1st fault	-	-	●
FA-82	Bus voltage upon 1st fault	Min. unit: 0.1 V	-	●
FA-83	Heatsink temperature upon 1st fault	Min. unit: 1°C	-	●
FA-84	Ambient temperature upon 1st fault	Min. unit: 1°C	-	●

Param. No.	Param. Name	Setting Range	Default	Property
FA-85	Braking circuit current upon 1st fault	Min. unit: 0.01 A	-	●
FA-86	Mains voltage U _{sr} upon 1st fault	Min. unit: 1 V	-	●
FA-87	Mains voltage U _{st} upon 1st fault	Min. unit: 1 V	-	●
FA-88	Mains voltage U _{tr} upon 1st fault	Min. unit: 1 V	-	●
FA-89	Degree of three-phase input voltage unbalance upon 1st fault	Min. unit: 0.01%	-	●
FA-90	DI status upon 1st fault	-	-	●
FA-91	RO status upon 1st fault	-	-	●
FA-92	Stop command sending by power supply unit upon 1st fault	1: Able to run 2: Coast to stop 3: Stop in configured mode	-	●
FA-93	Total power-on time (in hours) upon 1st fault	Min. unit: 1 hour	-	●
FA-94	Total power-on time (in minutes) upon 1st fault	Min. unit: 1 minute	-	●
FA-95	Total power-on time (in seconds) upon 1st fault	Min. unit: 1s	-	●
Group Fd: Communication Parameters				
Fd-00	Modbus baud rate	0: 300 bps 1: 600 bps 2: 1200 bps 3: 2400 bps 4: 4800 bps 5: 9600 bps 6: 19200 bps 7: 38400 bps 8: 57600 bps 9: 115200 bps	5	☆
Fd-01	Modbus data format	0: No check <8,N,2> 1: Even parity check <8,E,1> 2: Odd parity check <8,O,1> 3: 8-N-1	0	☆
Fd-02	Modbus local host address	1 to 247 0: Broadcast address	1	☆
Fd-03	Modbus response delay	0 to 20 ms	2 ms	☆
Fd-04	Modbus communication timeout time	0.1s to 60.0s 0.0: Disabled	0.0	☆

Appendix B Parameter Table

Param. No.	Param. Name	Setting Range	Default	Property
Fd-09	Communication status	Ones (CANopen) 1: Initialization 2: Pre-running 8: Running 9: Stop Tens (CANlink) 1: Initialization 2: Pre-running 8: Running 9: Stop Hundreds (PROFIBUS-DP) 1: Initialization 2: Pre-running 8: Running 9: Stop	0	●
Fd-10	Communication protocol selection	0: No protocol 1: CANopen 2: CANlink 3: Switching the PROFIBUS-DP to the CANopen Network Bridge	1	☆
Fd-11	CANopen 402	0: Disabled 1: Enabled	21	☆
Fd-12	CAN baud rate	0: 20 Kbps 1: 50 Kbps 2: 100 Kbps 3: 125 Kbps 4: 250 Kbps 5: 500 Kbps 6: 1 Mkbps	5	☆
Fd-13	CAN station number	1 to 127	1	☆
Fd-14	Number of received real-time CAN frames per unit of time	-	-	●
Fd-15	Maximum value of node reception error count (real-time)	-	-	●
Fd-16	Maximum value of node sending error count (real-time)	-	-	●
Fd-17	Bus disconnection times per unit of time	-	-	●
Fd-18	Power supply unit number	1 to 99	-	☆
Fd-20	Profius-DP communication address	0 to 125	-	☆
Fd-22	Network bridge mode	0: Uncommunicable 1: Communicable	0	★
Fd-23	Number of online slaves	0 to 29	0	●
Fd-24	Network bridge power-on delay	5 to 20	8	★

Param. No.	Param. Name	Setting Range	Default	Property
Fd-25	Online status of slaves 1-15	0 to 65535	0	●
Fd-26	Online status of slaves 16-30	0 to 65535	0	★
Fd-30	Number of RPDO1 and RPDO2 mapped bytes	-	-	●
Fd-31	Number of TPDO1 and TPDO2 mapped bytes	-	-	●
Fd-32	Group AF mapping mode change	0: Communication not saved 1: Communication saved	-	☆
Fd-33	CANopen communication cycle	-	-	●
Fd-34	CANopen mode selection	0: Ordinary mode 1: Expert mode	0	★
Fd-35	CANopen disabled time	0 to 65535 (Unit: 100 us)	0	★
Fd-36	CANopen event time 0	0 to 65535 (Unit: ms)	0	★
Group FP: Parameter Management				
FP-00	User password	0 to 65535	0	☆
FP-01	Parameter initialization	0: No operation 1: Restore factory parameters 2: Clear records 4: Back up current user parameters 501: Restore user backup parameters	0	☆
FP-02	Selection of parameter modification	0: Parameter modification enabled 1: Parameter modification disabled	0	☆
FP-03	Setting of monitoring parameter display 1	0000 to FFFF Bit 00: Bus voltage Bit 01: Heatsink temperature Bit 02: Ambient temperature Bit 03: Braking circuit current Bit 04: Usr cable voltage Bit 05: Ust cable voltage Bit 06: Utr cable voltage Bit 07: Degree of three-phase input voltage unbalance Bit 08: DI status Bit 09: RO status Bit 10: DI function status 1 Bit 11: DI function status 2 Bit 12: Current fault code Bit 13: Current fault subcode Bit 14: Reserved Bit 15: Reserved	0x00FB	☆
FP-04	Setting of monitoring parameter display 2	Bit 00: Any memory address value Bit 01 to Bit 15: Reserved	0x0000	☆
Group AF: Process Data Address Mapping				
For details, see group AF parameter setting for drive units.				

B.2 Power Supply Unit Monitoring Parameters

Param. No.	Param. Name	Setting Range	Default	Property
Group U0: Monitoring Parameters				
U0-00	Bus voltage (V)	Min. unit: 0.1 V	-	●
U0-01	Heatsink temperature (°C)	Min. unit: 1°C	-	●
U0-02	Braking transistor temperature (°C)	Min. unit: 1°C	-	●
U0-03	Braking circuit current (A)	Min. unit: 0.01 A	-	●
U0-04	Input voltage U _{sr} (V)	Min. unit: 1 V	-	●
U0-05	Input voltage U _{st} (V)	Min. unit: 1 V	-	●
U0-06	Input voltage U _{tr} (V)	Min. unit: 1 V	-	●
U0-07	Degree of three-phase input voltage unbalance (%)	Min. unit: 0.01%	-	●
U0-08	DI status	-	-	●
U0-09	RO status	-	-	●
U0-10	DI function status 1	-	-	●
U0-11	DI function status 2	-	-	●
U0-12	Current fault code	-	-	●
U0-13	Current fault subcode	-	-	●
U0-14	DI status after delay	-	-	●
U0-15	DI status after positive and negative logic processing	-	-	●
U0-17	RO status after delay	-	-	●
U0-18	RO status after positive and negative logic processing	-	-	●
U0-19	Reserved	-	-	●
U0-20	Current running time (in hours)	Min. unit: 1 hour	-	●
U0-21	Current running time (in minutes)	Min. unit: 1 minute	-	●
U0-22	Current running time (in seconds)	Min. unit: 1s	-	●
U0-23	Current running time (in milliseconds)	Min. unit: 1 millisecond	-	●
U0-24	Fan control command word	0: Disable fan 1: Enable fan	-	●
U0-25	Braking unit control command word	0: Disable braking transistor 1: Enable braking transistor	-	●
U0-26	Reserved	-	-	●
U0-27	Command word for interaction of power supply unit and drive unit	1: Able to run 2: Coast to stop 3: Stop in configured mode	-	●

Param. No.	Param. Name	Setting Range	Default	Property
U0-28	-	-	-	●
U0-29	-	-	-	●
U0-30	Total power-on time (in hours)	-	-	●
U0-31	Total power-on time (in minutes)	-	-	●
U0-32	Total power-on time (in seconds)	-	-	●
U0-33	Total power-on time (in milliseconds)	-	-	●

INOVANCE Warranty Agreement

- 1) Inovance provides an 18-month free warranty to the equipment itself from the date of manufacturing for the failure or damage under normal use conditions.
- 2) Within the warranty period, maintenance will be charged for the damage caused by the following reasons:
 - a. Improper use or repair/modification without prior permission
 - b. Fire, flood, abnormal voltage, natural disasters and secondary disasters
 - c. Hardware damage caused by dropping or transportation after procurement
 - d. Operations not following the user instructions
 - e. Damage out of the equipment (for example, external device factors)
- 3) The maintenance fee is charged according to the latest Maintenance Price List of Inovance.
- 4) If there is any problem during the service, contact Inovance's agent or Inovance directly.
- 5) Inovance reserves the rights for explanation of this agreement.

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