



MD880 Series

High-Performance 690 VAC

AC Drive (Single Drive System) Hardware Guide



Preface

Thank you for purchasing the Inovance MD880 series high performance 690 VAC AC drive (single drive system).

Highlights:

- Rated voltage up to 690 VAC
- Rated power range from 560 kW to 1300 kW
- Applicable to the control of asynchronous AC induction motors and permanent magnet motors
- Fast dynamic response, high control accuracy, and high power density
- Modular design for flexible cabinet assembly
- High power density, easy to install and maintain, simple cabinet integration, and smart fan speed regulation for cooling

Wide range of applications:

- Metallurgy
High-power fans, water pumps, etc.
- Petroleum
Mud pumps, electric drilling rigs, top drive drilling systems, rotary drilling rigs, etc
- Construction material
Rotary kilns, fans, etc
- Vessels
Marine electric propulsion system, wind turbine installation vessels, etc
- Others
Internal mixers, slurry pumps, belt conveyors, etc

This guide describes the hardware of the MD880 series high performance 690 VAC AC drive (single drive system), covering safety precautions, product information, mechanical and electrical installation, and maintenance. New users must read through this guide carefully. If you have any questions about product functionality and performance, consult Inovance technical support for help.

Precautions	
◆	To display more details, the drawings in the guide sometimes show the product without covers or protective guards. When using this product, be sure to reinstall them and operate in accordance with the guide.
◆	Drawings in the guide are for the whole series and may vary with the specific product you have purchased. Therefore, drawings are only for reference.
◆	The intellectual property rights in the guide belong to Inovance. The guide is subject to change without notice due to continuous product improvements.

Revision History

Date	Version	Change Description
November 2021	A00	First release

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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 manual 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



DANGER

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



WARNING

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



CAUTION

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 is 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 stand or stay below the equipment when the equipment is lifted by hoisting equipment.

Installation

 WARNING

- ◆ 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.



DANGER

- ◆ Equipment installation, wiring, maintenance, inspection, or parts replacement must be performed only by professionals.
- ◆ Installation, wiring, maintenance, inspection, or parts replacement must be performed only by 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



DANGER

- ◆ Equipment installation, wiring, maintenance, inspection, or parts replacement must be performed only by 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.



WARNING

- ◆ 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 cross sectional area 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



DANGER

- ◆ 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



DANGER

- ◆ 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 enclosure, fan, or resistor for temperature detection. Failure to comply will result in heat injuries.
- ◆ Signal detection must be performed only by professionals during operation. Failure to comply will result in personal injuries or equipment damage.



WARNING

- ◆ 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



DANGER

- ◆ Equipment installation, wiring, maintenance, inspection, or parts replacement must be performed only by 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.



WARNING

- ◆ Perform daily and periodic inspection and maintenance for the equipment according to maintenance requirements and keep a maintenance record.

Repair	
 DANGER	◆ Equipment installation, wiring, maintenance, inspection, or parts replacement must be performed only by 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.
 WARNING	◆ Require for 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	
 WARNING	◆ Dispose of retired equipment by following local regulations or standards. Failure to comply may result in property damage, personal injuries, or even death. ◆ Recycle retired equipment by following industry waste disposal standards to avoid environmental pollution.

Safety Signs

To ensure safe operation and maintenance of the equipment, be sure to observe the safety signs on the equipment, and do not damage or peel them off. Their descriptions are in the table below:

Safety Sign	Description
-------------	-------------

1 Product Information

The MD880 series AC drive is a high-end low-voltage drive for controlling asynchronous AC induction motors and permanent magnet motors. It features high power density, compact structure, and high reliability. The control methods it supports are V/f control, sensorless vector control (SVC), and feedback vector control (FVC).

The rated power of the drive ranges from 560 kW to 1300 kW. The maximum rated power of one AC drive module is 710 kW and that of the cabinet is 1300 kW. The drive applies to industries including metallurgy, petroleum, construction materials, and vessels.

1.1 Nameplate and Model Number

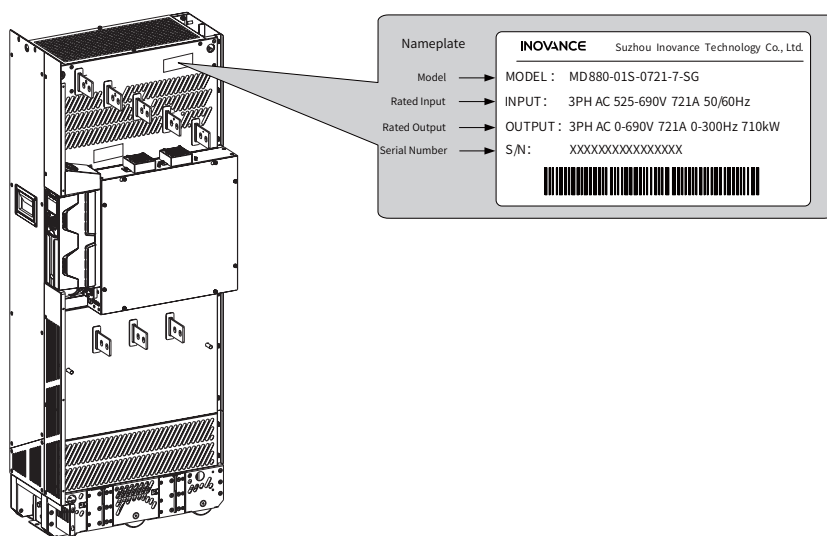


Figure 1-1 Nameplate for the S12 AC drive module

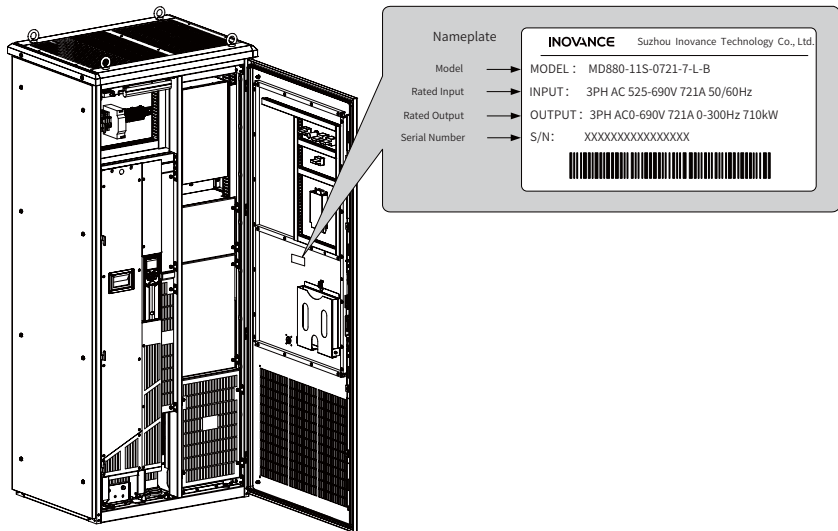


Figure 1-2 Nameplate for the cabinet with one S12 AC drive module

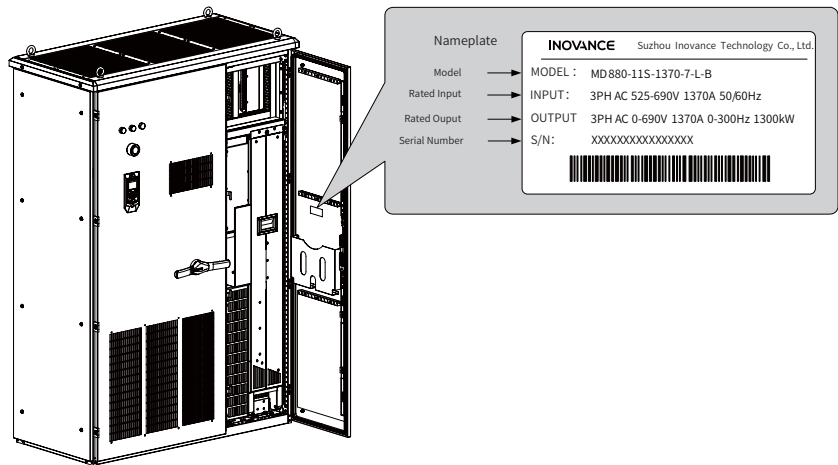


Figure 1-3 Nameplate for cabinet with two S12 AC drive modules

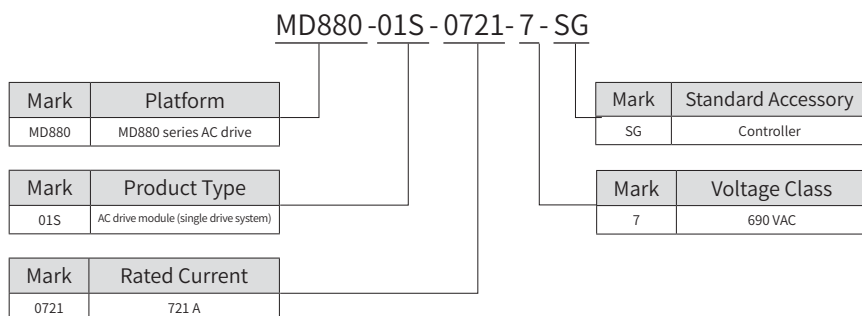


Figure 1-4 Model for MD880 series AC drive module

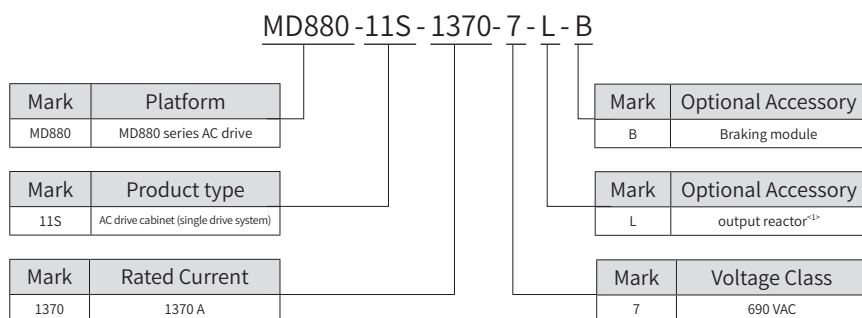


Figure 1-5 Model for MD880 series AC drive cabinet



- ◆ <1>: For the cabinet with one S12 AC drive module, the output reactor is an optional part. For the cabinet with two S12 AC drive modules, the output reactor is a standard part.

1.2 Product Specifications

Table 1-1 Specifications for MD880 AC drive module

Model	Structure	No Overload		Light Overload		Heavy Overload		Weight (kg)	Power Loss (kW)	Air Volume (CFM)	Dimensions (W x H x D) (mm)
		Current (A)	Power (kW)	Current (A)	Power (kW)	Current (A)	Power (kW)				
UN: three-phase 690 VAC (range: 525–690 VAC)											

1 Product Information

Model	Structure	No Overload		Light Overload		Heavy Overload		Weight (kg)	Power Loss (kW)	Air Volume (CFM)	Dimensions (W x H x D) (mm)
		Current (A)	Power (kW)	Current (A)	Power (kW)	Current (A)	Power (kW)				
MD880-01S-0600-7-SG	S12	600	560	576	560	450	400	180	9.52	900	315 x 1502 x 588
MD880-01S-0650-7-SG		650	630	624	630	488	450		10.71		
MD880-01S-0721-7-SG		721	710	692	710	541	500		12.07		

Table 1-2 Specifications for MD880 AC drive cabinet

Model	Structure	No Overload		Light Overload		Heavy Overload		Weight (kg)	Power Loss (kW)	Air Volume (CFM)	Dimensions (W x H x D) (mm)
		Current (A)	Power (kW)	Current (A)	Power (kW)	Current (A)	Power (kW)				
UN: three-phase 690 VAC (range: 525–690 VAC)											
MD880–11S–0600–7	S12	600	560	576	560	450	400	530	11.39	1,190	853 x 2058 x 729
MD880–11S–0650–7		650	630	624	630	488	450		12.62		
MD880–11S–0721–7		721	710	692	710	541	500		14.06		
MD880–11S–1140–7	2 x S12	1,140	1,100	1,094	1,050	855	800	920	21.99	2,350	1353 x 2058 x 718
MD880–11S–1235–7		1,235	1,200	1,186	1,150	926	900		24.47		
MD880–11S–1370–7		1,370	1,300	1,315	1,300	1,027	1,000		27.29		

1.3 Technical Data

Table 1-3 Technical data for MD880 AC drive

Item		Technical data
Basics	Rated input voltage and frequency	525–690 VAC, 50/60 Hz
	Allowable voltage variation	±10% (-15%, < 1 min)
	Output voltage	0–690 VAC
	Output frequency	0–300 Hz
	Overload capacity	Light overload: 110% overload for 1 minute every 5 minutes Heavy overload: 150% overload for 1 minute every 5 minutes
	Efficiency	More than 98%
Control features	Motor control modes	V/f SVC FVC
	Carrier frequency	Default carrier frequency of 1.5 kHz for 690 V system
	Speed regulation range	1:50 (V/f)
		1:200 (SVC)
		1:1000 (FVC)
	Speed control accuracy	±10% Fsl (SVC)
		±0.01% (FVC)
	Torque response	≤ 5 ms (SVC)
		≤ 5 ms (FVC)
	Starting torque	0.5 Hz/150% (SVC)
		0 Hz/200% (FVC)
Mechanical data	Vibration	Conforms to GB/T4798.3-Mechanical conditions. Frequency: 2-9 Hz; displacement: 3 mm Frequency: 9-200 Hz; acceleration rate: 9.8 m/s ² (1 g) Shock: 10 g, 11 ms
	Safety	Conforms to EN 61800–5–1.
	Cooling	Forced air cooling (AF) in accordance with EN 60146

Item		Technical data
Protective features	Phase loss protection	Input phase loss protection and output phase loss protection
	Overtemperature protection	Protection is triggered when the drive overheats.
	Overload protection	The drive stops if running at 150% rated current under heavy overload for 60s. The drive stops if running at 110% rated current under light overload for 60s.
	Overcurrent protection	The drive stops if the current exceeds 2.5 times the rated current under heavy overload.
	Brake protection	The external braking module is recommended.
	Short circuit protection	Output interphase short circuit protection and protection against output short-circuit to ground
Environment requirements	Operating location	Indoor and free from direct sunlight, dust, corrosive or flammable gas, oil mist, water vapor, drips, salt, etc.
	Altitude	Check that the altitude of the actual application site is equal to or lower than 1000 m. If the altitude exceeds 1000 m, derate by 1% for every additional 100 m. The maximum operating altitude is 4000 m.
	Operating temperature	-10° C to +40° C. If the temperature is above 40° C, derate by 1% for every additional 1° C. The maximum operating temperature is 50° C.
	Storage temperature	-40° C to +70° C
	Humidity	Less than 95% RH (no condensation)
	Pollution degree	PD2
	Power system	IT TT/TN (VDR and EMC screws required)
	Overvoltage category	OVCIII
	IP rating	IP00 for the S12 AC drive module IP20 for the cabinet with one and two S12 AC drive modules

1.4 Hardware Description

1.4.1 Main Circuit Topology and Electrical Diagram

The wiring diagram of the MD880 series AC drive for a typical task is shown below.

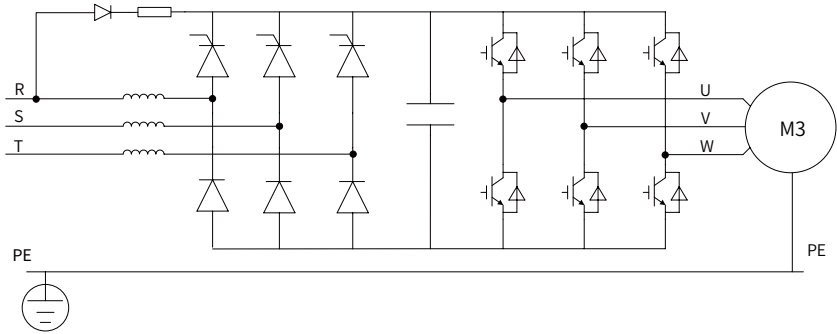


Figure 1-6 Main circuit topology for the MD880 series AC drive

The following figure depicts two typical drive systems for the cabinet with one and two AC drive modules.

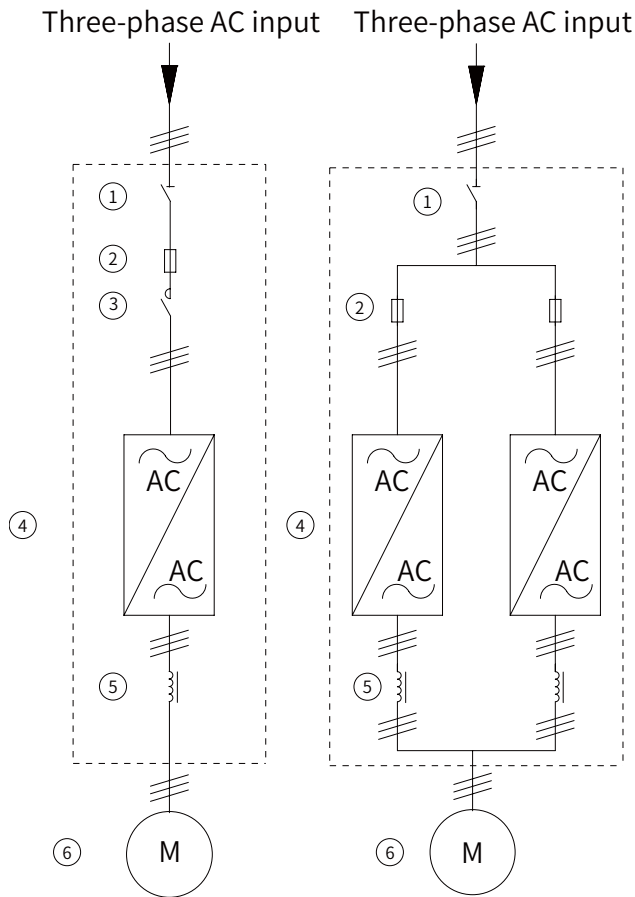


Figure 1-7 Electrical diagram

No.	Notes
1	Disconnector
2	Three-phase input fuse
3	Contactor (optional)
4	AC drive module
5	Output reactor (optional for the cabinet with one S12 AC drive module and standard for that with two S12 AC drive modules)
6	Motor



NOTE

- ◆ The products within the dotted line are provided by Inovance.
- ◆ Customers can replace the disconnecter or other components shown above with a circuit breaker as needed.

1.4.2 Structure for the S12 AC Drive Module

1 Overview

Handles are arranged at the front and back of the module, so that the module can be conveniently pushed into the cabinet. Terminals and the control room are located at the right side of the module. The AC input and positive and negative bus terminals are located above the control room. Output terminals are below and the HCU is at the front of the control room. The control system includes I/O terminals and optional function modules. For the description of I/O terminals on the HCU as standard, see "[5 HCU Control Module](#)". Other optional function modules are mainly installed on the HCU control module.

2 External power supply

The external 24 VDC/2 A power supply can power the drive control system for commissioning. After the main power supply works, the drive relies on the internal auxiliary power supply, and the 24 V power is redundant.

3 Structure

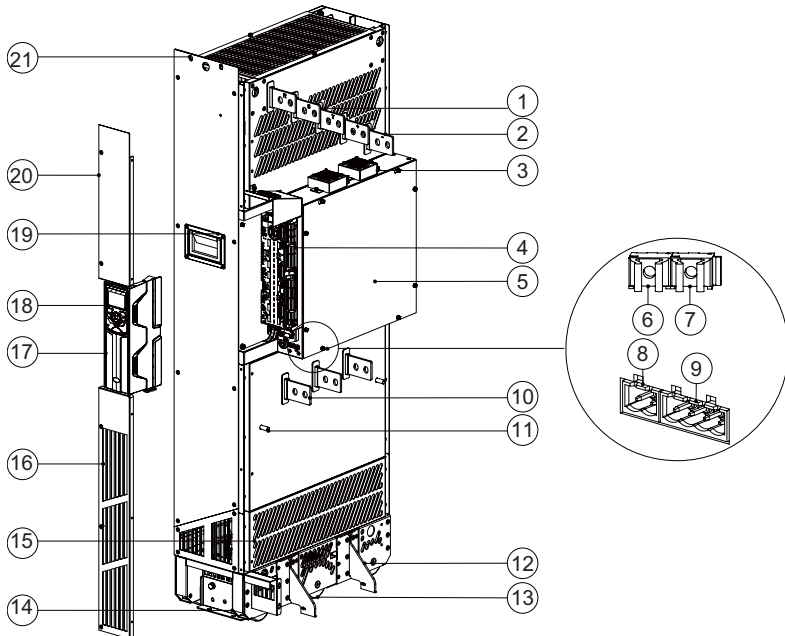


Figure 1-8 Structure for the S12 AC drive module

No.	Notes
1	AC input terminal
2	DC bus terminal
3	Control room fan
4	HCU control module
5	Control room
6	VR optical fiber receiving terminal
7	VT optical fiber transmitting terminal
8	External 24 VDC power supply input terminal
9	STO terminal
10	AC output terminal
11	PE terminal
12	Anti-tipping support
13	Roller
14	Bottom mounting bracket
15	Air inlet with total area of 1000 cm ²
16	Lower baffle plate
17	Cover
18	SOP-20-880 smart operating panel
19	Handle
20	Upper baffle plate
21	Top mounting bracket

1.4.3 Structure for the Cabinet with One S12 AC Drive Module

1 Overview

The cabinet has two chambers, and the AC drive module is installed in the left chamber. Such components as the copper busbar, disconnecter, contactor, braking module, and output reactors are integrated in the middle chamber. An SOP-20-880 smart operating panel is on the front door. The cabinet features a high degree of integration and slim profile, enabling the cabinet space to be better utilized.

2 External power supply

220 VAC/2 A is required for the cabinet.

3 Structure

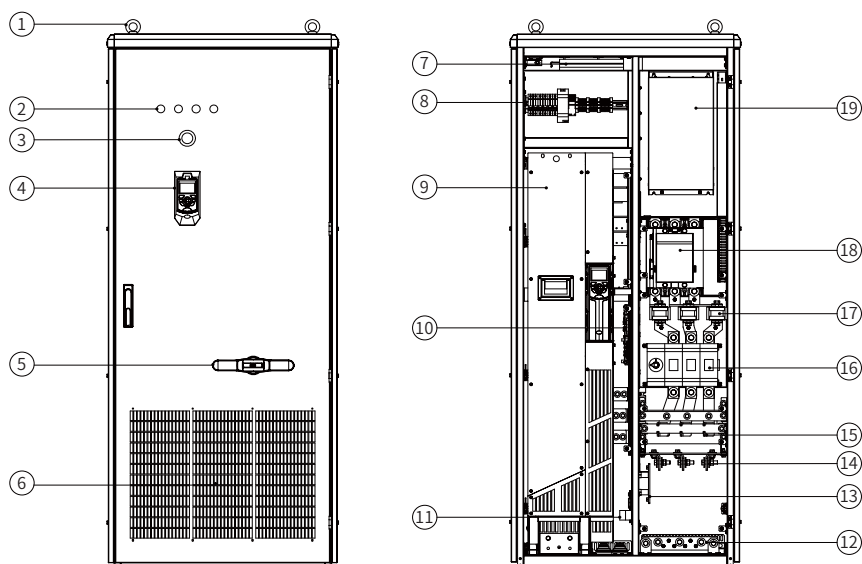


Figure 1-9 Structure for the cabinet with one S12 AC drive module

No.	Notes
1	Eye bolt
2	Switch-on,switch-off, fault, and reset
3	Emergency stop button
4	SOP-20-880 smart operating panel
5	Outside handle for disconnector control
6	Air inlet with total area of 2200 cm ²
7	Light
8	Air switch
9	MD880-01S-XXXX-7-SG single drive AC drive module
10	Power supply for the internal fan
11	User terminal
12	Grounding copper busbar
13	Braking resistor copper bar (optional)
14	AC output copper busbar
15	AC input copper busbar
16	Disconnector
17	Three-phase input fuse
18	Contactor (optional)
19	MD880-61M-0400-7 Single-phase braking unit (optional)

1.4.4 Structure for the Cabinet with Two S12 AC Drive Modules

1 Overview

The cabinet has three chambers, and the two AC drive modules are installed in the left and right chambers, respectively. Such components as the copper busbar, disconnecter, braking module, and output reactors are integrated in the middle chamber. An SOP-20-880 smart operating panel is on the front door. The cabinet features a high degree of integration and slim profile, enabling the cabinet space to be better utilized.

2 External power supply

220 VAC/2 A is required for the cabinet.

3 Structure

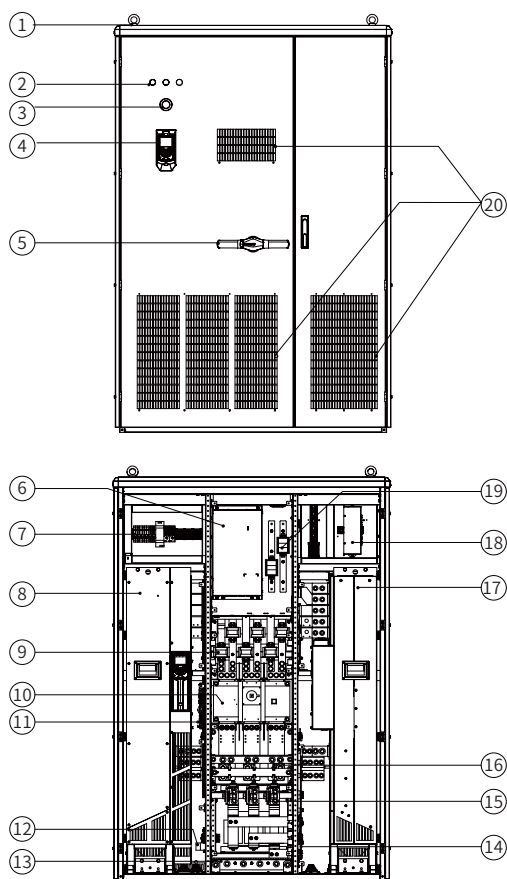


Figure 1-10 Structure for the cabinet with two S12 AC drive modules

No.	Notes
1	Eye bolt
2	Motor start button, stop button, fault indicator
3	Emergency stop button
4	SOP-20-880 smart operating panel
5	Outside handle for disconnect control
6	MD880-61M-0400-7 single-phase braking unit (optional)
7	Internal terminal block
8	MD880-01S-XXXX-7-SG single drive AC drive module
9	Three-phase input fuse
10	Disconnect
11	Power supply for the internal fan
12	User terminal
13	Grounding copper busbar
14	Braking resistor copper bar (optional)
15	AC output copper busbar
16	AC input copper busbar
17	MD880-01S-XXXX-7-SG single drive AC drive module (reverse mounting)
18	MD880-HPCU-40 parallel-connected control unit
19	Braking unit DC fuse (optional)
20	Air inlet with total area of 4000 cm ²

1.5 Outline Dimensions

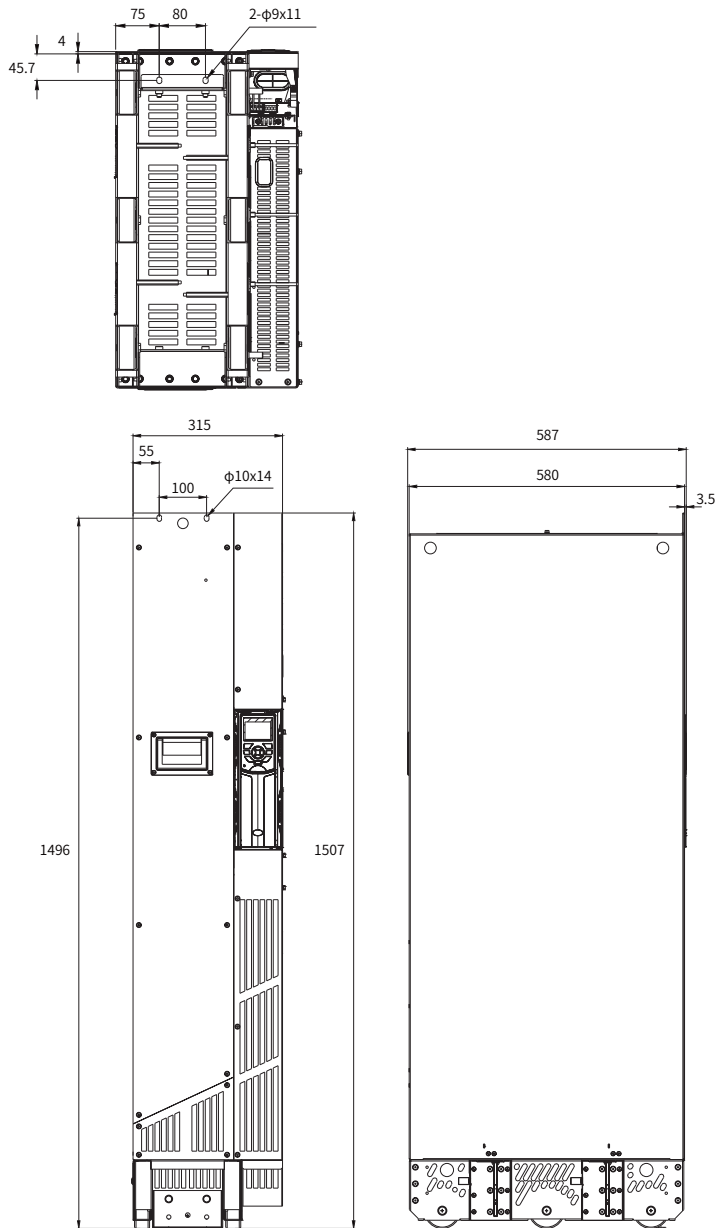


Figure 1-11 Dimensions for the S12 AC drive module (mm)

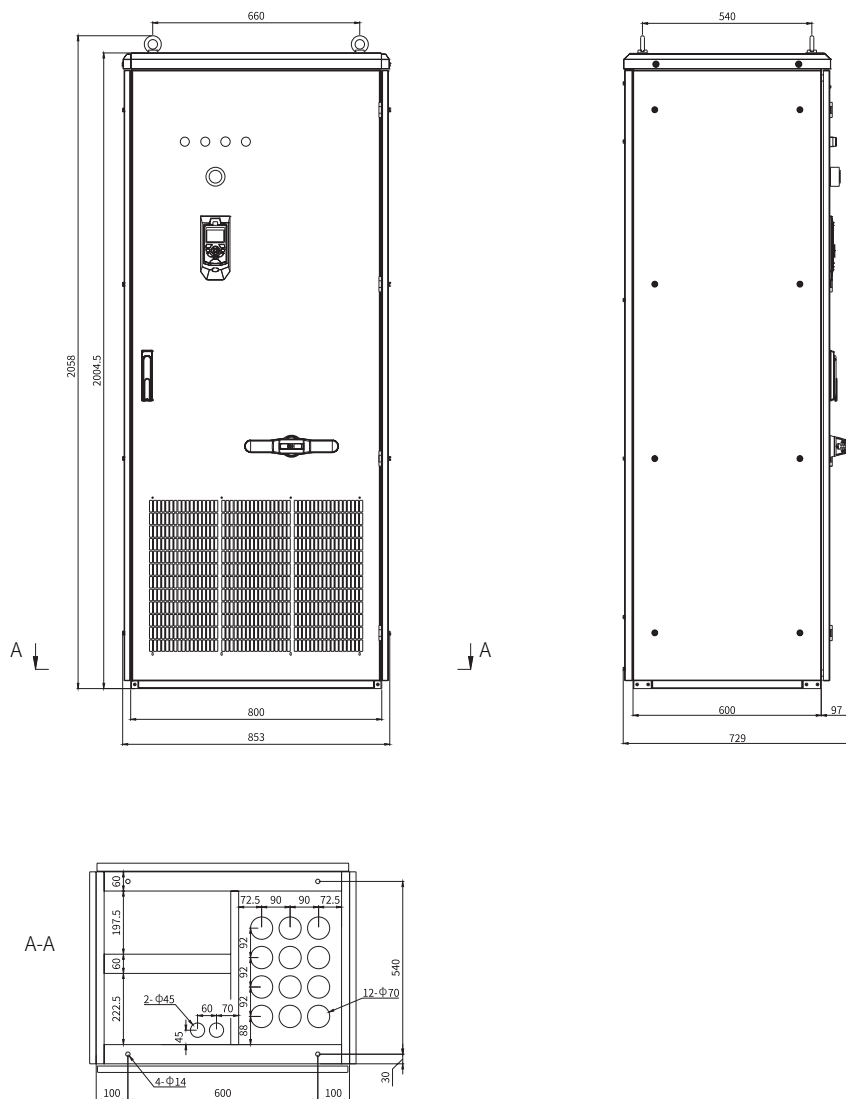


Figure 1-12 Dimensions for the cabinet with one S12 AC drive module (mm)

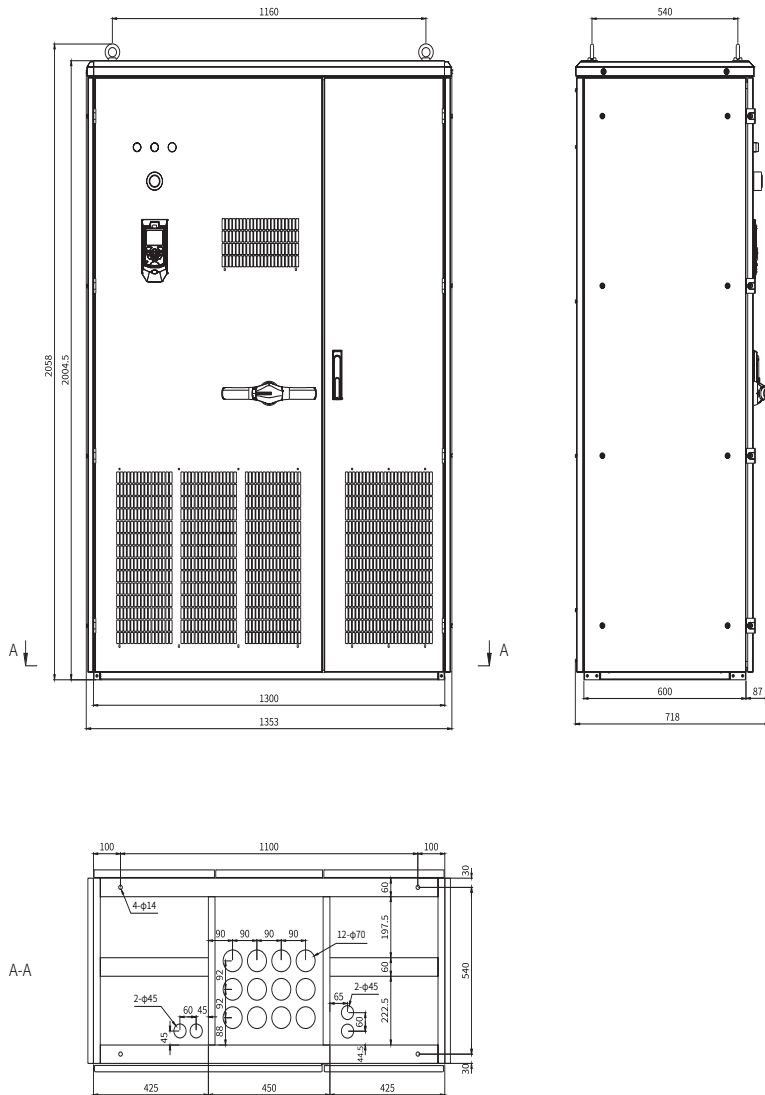


Figure 1-13 Dimensions for the cabinet with two S12 AC drive modules (mm)

1.6 Derating

1 Temperature-based derating

When the temperature ranges from 40° C to 50° C, the rated output current must be derated by 1% for every additional 1° C. The output current can be calculated by multiplying the current value given in the rating table by the derating factor (k):

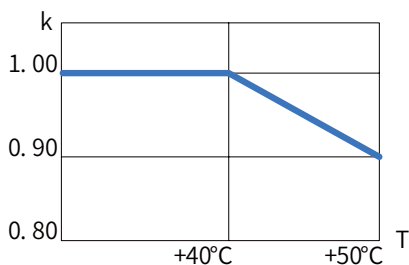


Figure 1-14 Temperature-based derating

2 Altitude-based derating

When the altitude is above 1,000 m and below 4,000 m above sea level, the output current must be derated by 1% for every additional 100 m.

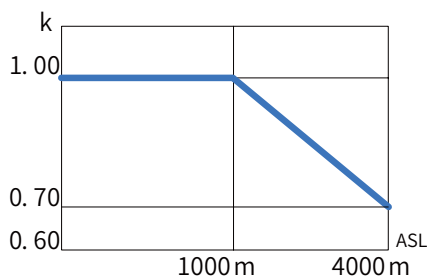


Figure 1-15 Altitude-based derating

3 Carrier frequency-based derating

Table 1-4 Carrier frequency-based derating list for the AC drive module

Model	Rated Power	Carrier Frequency (kHz)									
	P (kW)	1.2	1.5	2	2.5	3.2	4	5	6	7	8
MD880-01S-0600-7-SG	560	100%	100%	87%	76%	63%	52%	42%	34%	28%	23%

Model	Rated Power	Carrier Frequency (kHz)									
	P (kW)	1.2	1.5	2	2.5	3.2	4	5	6	7	8
MD880-01S-0650-7-SG	630	100%	100%	85%	74%	61%	51%	38%	32%	26%	23%
MD880-01S-0721-7-SG	710	100%	100%	85%	72%	60%	47%	38%	29%	24%	19%

Table 1-5 Carrier frequency-based derating list for the cabinet

Model	Rated Power	Carrier Frequency (kHz)									
	P (kW)	1.2	1.5	2	2.5	3.2	4	5	6	7	8
MD880-11S-0600-7	560	100%	100%	87%	76%	63%	52%	42%	34%	28%	23%
MD880-11S-0650-7	630	100%	100%	85%	74%	61%	51%	38%	32%	26%	23%
MD880-11S-0721-7	710	100%	100%	85%	72%	60%	47%	38%	29%	24%	19%
MD880-11S-1140-7	1,100	100%	100%	87%	76%	63%	52%	42%	34%	28%	23%
MD880-11S-1235-7	1,200	100%	100%	85%	74%	61%	51%	38%	32%	26%	23%
MD880-11S-1370-7	1,300	100%	100%	85%	72%	60%	47%	38%	29%	24%	19%

**NOTE**

◆ Carrier frequencies have linear derating factors correlation.

1.7 Overload Capacity

For some drive systems where overload may occur, a proper base load current is necessary for the MD880 series AC drive. The criterion for overload is that the drive is operated with its base load current before and after the overload occurs (lasting for

300s).

1 Curve in light overload duty

Light overload duty (IL) is based on 110% base load current for 60s.

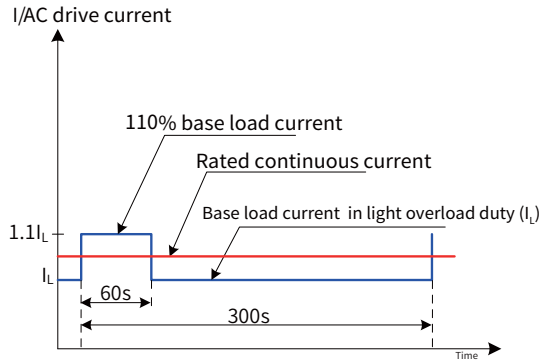


Figure 1-16 Curve in light overload duty

2 Curve in heavy overload duty

Heavy overload duty (IH) is based on 150% base load current for 60s.

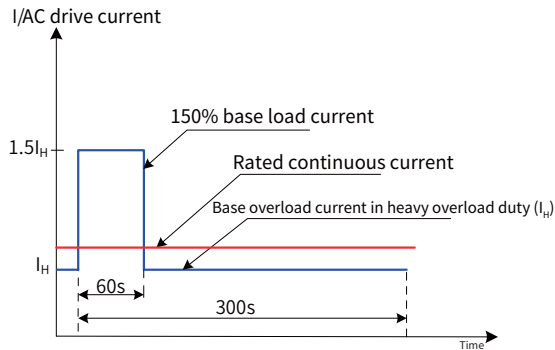


Figure 1-17 Curve in heavy overload duty

1.8 Tightening Torque of Screws/Bolts

Table 1-6 Electrical connection

Screw/Bolt	Property Class	Max. Torque (N·m)
M3	4.8	0.5
M4	4.8	1.2

Screw/Bolt	Property Class	Max. Torque (N · m)
M5	4.8	2.8
M6	4.8	4.8
M8	8.8	20
M10	8.8	40
M12	8.8	70
M16	8.8	180

Table 1-7 Mechanical connection

Screw/Bolt	Property Class	Max. Torque (N · m)
M5	4.8	2.8
M6	4.8	4.8
M8	8.8	20

Table 1-8 Insulator connection

Screw/Bolt	Property Class	Max. Torque (N · m)
M6	4.8	4.8
M8	8.8	9
M10	8.8	18
M12	8.8	31

Table 1-9 Cable connectors

Screw/Bolt	Property Class	Max. Torque (N · m)
M8	8.8	15
M10	8.8	32
M12	8.8	50

1.9 Consumption of Auxiliary Power Supply

Table 1-10 Consumption of auxiliary power supply

Structure	Power Input	Notes
S12 AC drive module	24 VDC/2 A	The external power supply can be used for commissioning and the internal power supply for operation.
Cabinet with one S12 AC drive module	220 VAC/2 A	The external 220 VAC power supply is required for the cabinet.

Structure	Power Input	Notes
Cabinet with two S12 AC drive modules	220 VAC/2 A	The external 220 VAC power supply is required for the cabinet.

2 Mechanical Installation for the AC Drive Module

2.1 Installation Flowchart

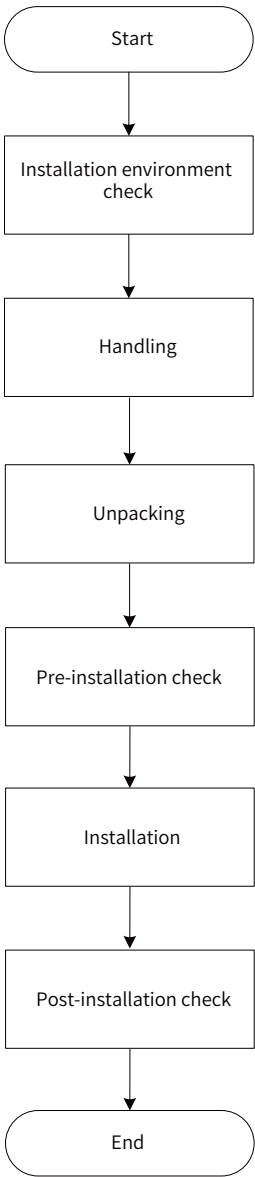


Figure 2-1 Installation flowchart

2.2 Installation Requirements

2.2.1 Environment Requirements

Item	Requirement
Heat dissipation and ventilation	Install the drive on flame retardant objects. Reserve enough ventilation space to dissipate heat as the drive generates a lot of heat during operation. Vertically install the drive on the mounting support with screws.
Installation location	Ensure the following requirements are met: Avoid direct sunlight. Avoid places with humidity above 95% and where condensation forms. Avoid places with corrosive, flammable, or explosive gases. Avoid places with greasy dirt and dust.
Vibration	Install the drive in a place not prone to vibration. For vibration isolation performance, see " 1.3 Technical Data ".
Ambient temperature	Install the drive under all the specified environmental conditions. Derating is required for ambient temperatures above 40° C and altitudes above 1,000 m. For the derating factors, see " 1.6 Derating ".
Enclosure	This product is intended to be installed inside a cabinet for use in a final system. The final system must provide enclosures for fireproof, electrical and mechanical protection in line with local laws and regulations and relevant IEC standards.

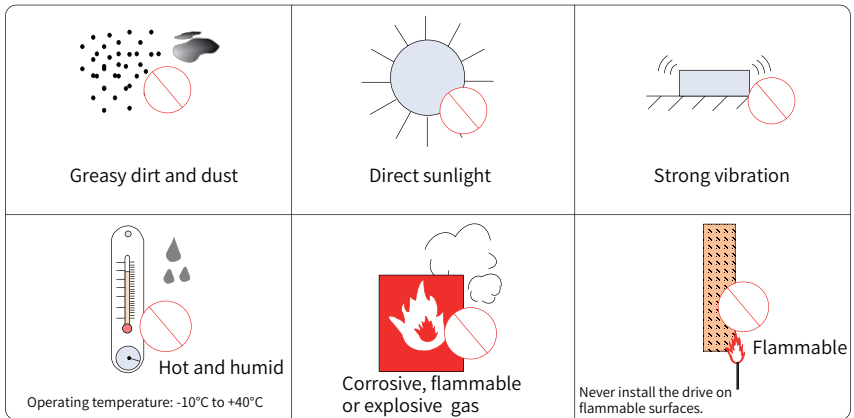


Figure 2-2 Environment requirements

2.2.2 Clearance Requirements

The dedicated clearance must be reserved for the installation of the AC drive module, as shown below.

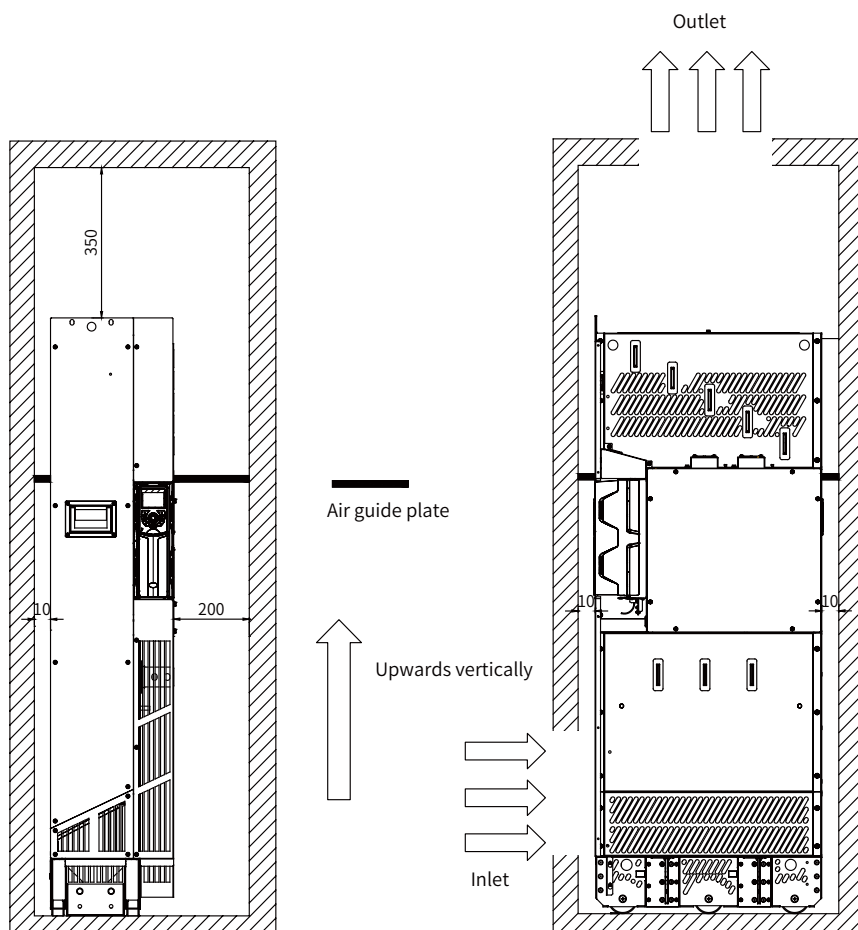


Figure 2-3 Clearance for the installation of the AC drive module



NOTE

- ◆ The dimensions above represents the minimum space requirements (unit: mm).

2.3 Unpacking and Handling

2.3.1 Storage

Store the product in a clean and dry place with a temperature ranging from -40°C to $+70^{\circ}\text{C}$ and variation less than $1^{\circ}\text{C}/\text{min}$. For long-term storage, appropriate measures (cover the product, for example) must be taken to ensure that the drive is free from contamination and environmental factors.

For both temporary and long-term storage, follow the two rules below:

- Store the product in the original packing carton.
- Never place the product in a damp area with high temperature and excessive sunlight exposure.

2.3.2 Handling before Unpacking

- The packaged drive is to be transported on the pallet by qualified operators using a forklift and crane. The product must be carried on a wooden pallet when transported with a forklift and crane.
- All handling equipment must have a load capacity that is greater than the combined weight of the drive.

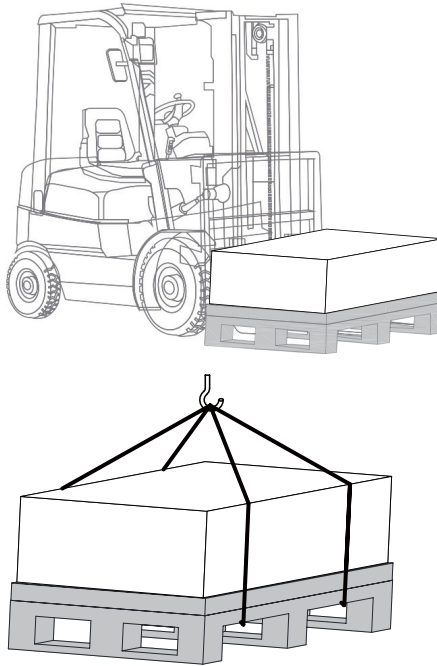


Figure 2-4 Handling before unpacking

- Ensure that the ground where the drive is installed is flat and strong enough to bear the drive.
- With its heavy weight and a high center of gravity, the drive cannot be placed on the inclined plane with a tilt of over 5 degrees.
- The product must be transported in the direction as specified on the package, and cannot be transported in an upside down direction or a side direction.

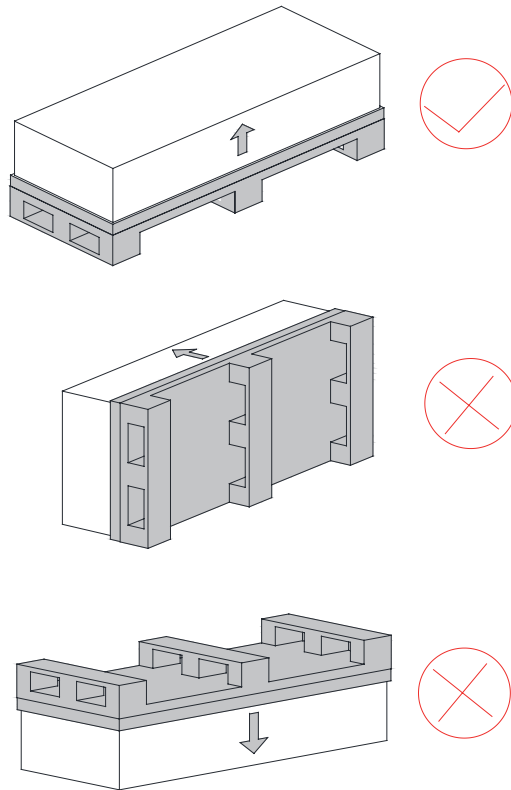


Figure 2-5 Transportation

2.3.3 Acceptance

Upon receipt of the product, a thorough inspection must be done.

Check the received items against the packing list to ensure all the ordered items arrive intact. Be sure to advise the courier of any shortages or damage at the time of delivery. If necessary, you can seek support from an Inovance office or a regional representative.

⚠ Danger	
	◆ If product damage occurs during transportation, the electrical safety performance may be degraded. Do not connect the equipment before the high voltage test is performed. ◆ Failure to comply with this warning may result in severe personal injury or death and/or property damage.

Unpacking steps:

- 1) Remove all straps and uncover the lid.

- 2) Remove all protective filler materials inside the box.
- 3) Take out the drive and its accessories.
- 4) Cut off the stretch films.
- 5) Check and make sure there is no damage.

Dispose of or recycle packaging materials according to local regulations.

2.3.4 Handling After Unpacking

- Lifting equipment needs to be strong, stable, and suitable for the MD880 series product.
- The crane must have a load capacity that is greater than the weight of the drive.
- Use eyelets on the top of the drive for lifting and handling, with the lift height not higher than 0.3 m.
- As the product is laid flat, it is necessary to make it upright for lifting and handling.

2.4 Pre-installation Checklist

 Danger	
	◆ To ensure the equipment is reliable and safe to use, it must be properly installed and operated by qualified personnel in accordance with all the warning notices and safety instructions. ◆ Failure to comply with this warning may result in severe personal injury or death and/or property damage.

If any items in the checklist below are within the scope of supply, tick the corresponding columns on the right. After the installation is completed, tick each work step for confirmation.

Table 2-1 Drive installation checklist

No.	Item	Compliance
1	Check and ensure the packaging holding the device is not damaged or wet.	☐
2	After unpacking, check that the drive enclosure is free from abnormalities, such as deformation, flaking paint, cracks, and signs of damp.	☐
3	Check for complete accessories and items inside, such as manual and options.	☐
4	The space around the drive must meet the minimum requirements for ventilation at both the inlet and outlet.	☐
5	Before commissioning, ensure that appropriate measures are taken to protect the drive.	☐

2.5 Installation Guide

2.5.1 Installation Notices

 Attention	
	◆ The cabinet frame must be sturdy enough to carry the drive components, control circuit, and other equipment installed in it. ◆ The cabinet must protect the AC drive module against contact and meet the requirements for dust and humidity. ◆ For easy installation and maintenance, a spacious layout for cooling air flow, cables, and cable support is recommended. The control boards must not be installed near main circuits or hot parts. ◆ Make sure all components that connect to both the high voltage side and the low voltage side or shelves on which components are mounted are properly grounded and the connecting surfaces left unpainted. ◆ Ensure that the AC drive module is grounded via its fastening screws on the mounting base. ◆ Nickel-plated copper is recommended, but aluminum can also be used. ◆ Before joining aluminum busbars, remove the oxide layer and apply a suitable anti-oxidant joint compound. ◆ If there is a risk of condensation in the cabinet, use a cabinet heater. Although the primary function of the heater is to keep the air dry, it may also be used for heating at low temperatures. When placing the heater, follow the instructions provided by its manufacturer.

1 Cabinet air inlet and outlet sizes

Minimum ventilation space must be observed at the lower and upper parts of the AC drive module to guide cooling air flow effectively. In particular, this rule must be followed when cable ducts are used. No wiring work or installation of any components is allowed in the designated ventilation space.

With high power density and heat dissipation needs of the AC drive module, the inlet and outlet must be set based on the following requirements:

The air inlet area must be: $S_{\text{inlet}} = (1.5 \text{ to } 2.0) \times S_{\text{Drive module}}$.

S_{inlet} : air inlet area of the system

$S_{\text{Drive module}}$: air inlet area of the AC drive module

The air outlet area must be: $S_{\text{Outlet}} = (1.2 \text{ to } 1.5) \times S_{\text{inlet}}$.

We recommend that the air outlet be at the top of the cabinet. If the air outlet is located on the cabinet door, use an extra exhaust fan.

Air volume of the cabinet exhaust fan at the operating point: $Q_{\text{System}} \geq 1.2 \times Q_{\text{Drive module}}$

Q_{System} : air volume of the system

$Q_{\text{Drive module}}$: air volume of the AC drive module

Ventilation parameters of the AC drive module are listed in the following table.

Table 2-2 Ventilation parameters

Structure	Air Inlet Area S_{Module} (cm ²)	Air Volume $Q_{\text{Drive module}}$ (CFM)
S12	1,000	900



NOTE

◆ Violations of the installation rules can shorten the service life of the AC drive or may cause AC drive fault or failure.

2 Preventing the recirculation of hot air

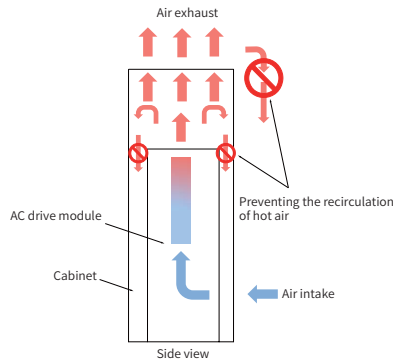


Figure 2-6 Air flow exhaust

1) Outside the cabinet

Prevent circulation of the hot air outside the cabinet by guiding the discharged hot air away from the air inlet area. Possible solutions include the following:

- Install the grids to guide air flow at the air inlet and outlet.
- Locate the air inlet and outlet at different sides of the cabinet.
- Locate the cooling air inlet in the lower part of the front door, and install more exhaust fans on the top of the cabinet.

2) Inside the cabinet

Use leak-proof air baffles at the right positions to prevent hot air circulation inside the cabinet. Use neoprene gaskets or equivalents to seal the baffles to the inner wall.

3 EMC requirements

- The fewer and smaller the holes in the cabinet, the better the interference attenuation. The maximum diameter of a hole on the galvanic metal contact in the

cabinet is 100 mm. Pay special attention to the cooling air inlet and outlet grids.

- The best galvanic connection between the steel panels is achieved by welding them together as no holes are necessary. If welding is not possible, the seams between the panels are recommended to be left unpainted and equipped with special conductive EMC strips to provide adequate galvanic connection. Usually, reliable strips are made of flexible silicon mass covered by a metal mesh. The non-tightened contact between the metal surfaces cannot meet requirements, so conductive gaskets between the surfaces are required. The maximum distance between assembly screws is 100 mm.
- Sufficient high-frequency grounding networks must be constructed in the cabinet to avoid voltage differences and forming of high-impedance radiator structures. A good high-frequency grounding can be realized by short flat copper braids with low inductance. Single-point high-frequency grounding cannot be used due to the large space inside the cabinet.
- Conductive EMC shielding gasket tapes cannot realize protective grounding. A sturdy low-frequency grounding structure is required for electrical safety of the parts. When designing protective grounding, follow local regulations.

2.5.2 Installation of the AC Drive Module

Follow these steps:

- 1) Install the insertion ramp.

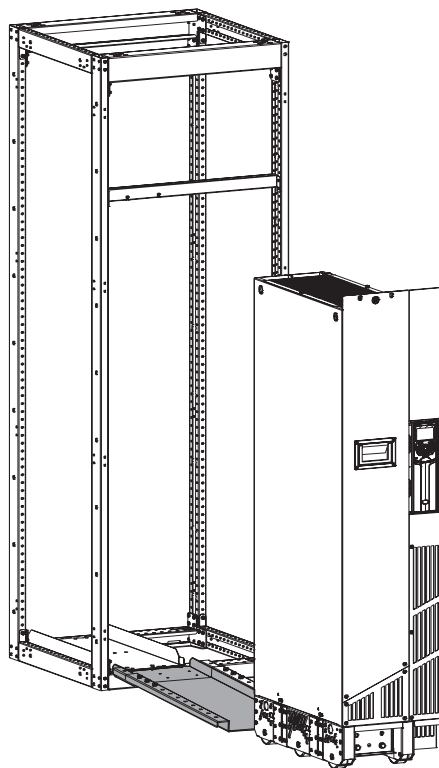


Figure 2-7 Installation of the insertion ramp

- 2) Push the AC drive module carefully into the cabinet along the guide rail.



Figure 2-8 Pushing the AC drive module

- 3) Adjust the bottom mounting bracket, and install the AC drive module into the cabinet by fastening the bolts at the top and bottom of the module.

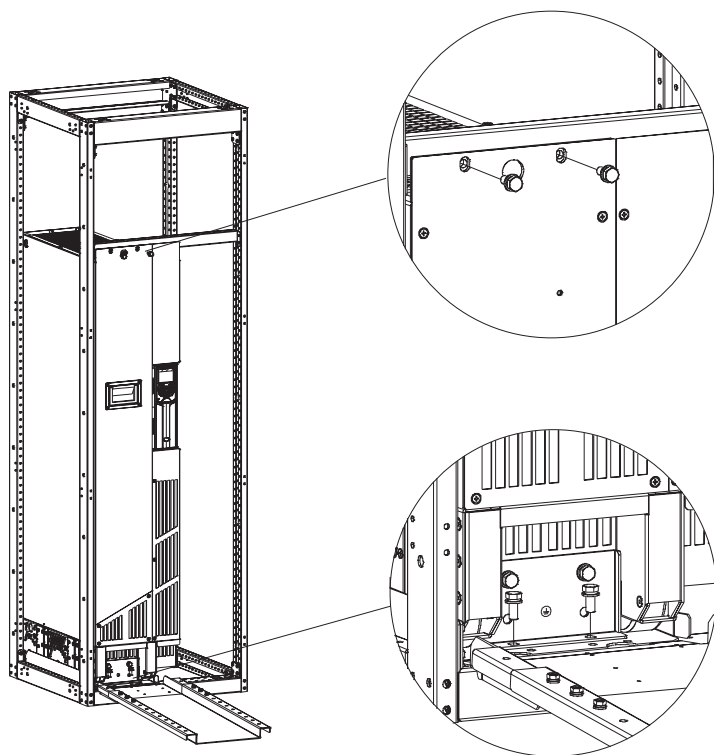


Figure 2-9 Fastening the AC drive module

**NOTE**

- ◆ Prevent the AC drive module from toppling during pushing.

3 Mechanical Installation for the AC Drive Cabinet

3.1 Installation Flowchart

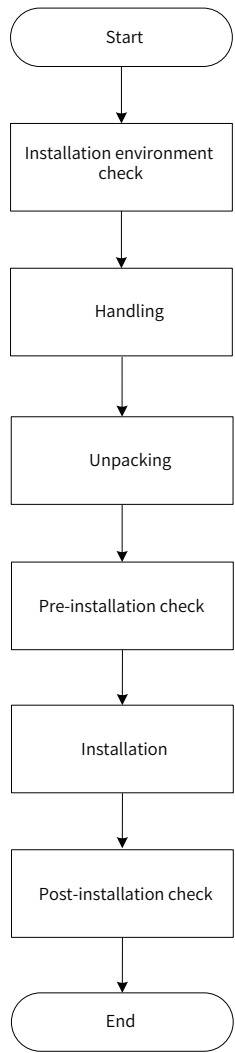


Figure 3-1 Installation flowchart

3.2 Installation Requirements

3.2.1 Environment Requirements

Item	Requirement
Heat dissipation and ventilation	Install the AC drive on flame retardant materials with enough space around it to dissipate heat as the drive generates a lot of heat during operation. Vertically install the drive on the mounting support with screws.
Installation location	Install the drive in a place that meets the following requirement: Free from direct sunlight Free from water drops (RH > 95%) Free from corrosive, flammable, or explosive gases. Free from greasy dirt and dust.
Vibration	Install the drive in a place not prone to vibration. For vibration isolation performance, see " 1.3 Technical Data ".
Ambient temperature	Install the drive under all the specified environmental conditions. Derating is required for ambient temperatures above 40° C and altitudes above 1,000 m. For the derating factors, see " 1.6 Derating ".

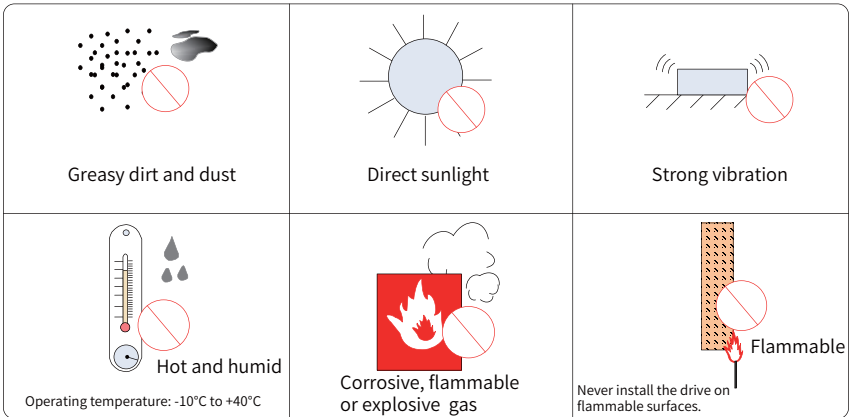


Figure 3-2 Environment requirements

Install the cabinet on the floor made of non-flammable material, and ensure that the floor is strong enough to bear the weight of the cabinet and is as flat as possible. Use a level to check the flatness of the ground. The maximum allowable deviation of the ground level is 5 mm per 3 m. If necessary, level the installation site because the cabinet is not equipped with adjustable feet.

Use the door lock properly when opening and closing the cabinet door.



NOTE

- ◆ For convenient maintenance, do not install the cabinet at a position higher than the ground. If the cabinet is installed at a higher position, you cannot use the ramp that is delivered by default to replace the power module.

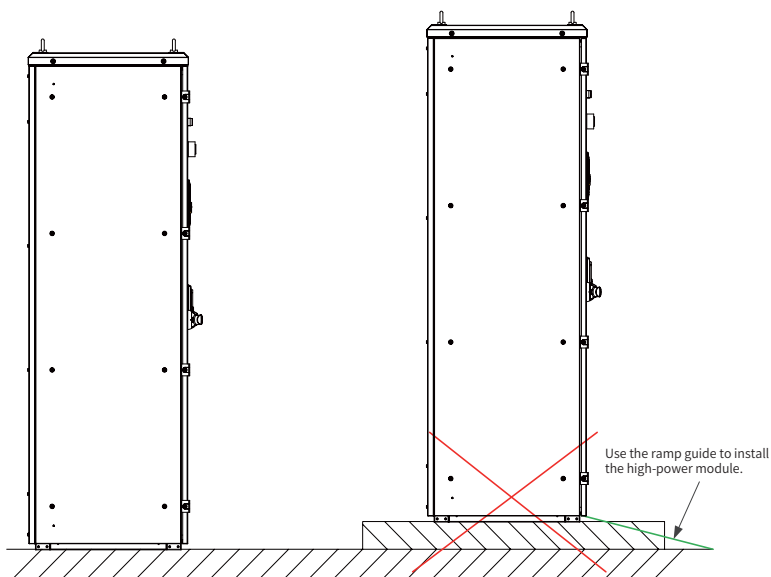


Figure 3-3 Installation site

3.2.2 Clearance Requirements

1 Clearance on the top of the cabinet

Do not install the cabinet in an environment without any cover. Install the cabinet according to the drawings, with sufficient clearance around to allow proper air flow, maintenance, and door open/close at the maximum angle. Reserve the passageway for entering the installation site and the space for transmitting the auxiliary device of the AC drive module.

The installation site must be dry and free of dust. The air supplied must not contain any electrically conductive gas, vapor, or dust, which could impair the device. If necessary, filter the air supplied to the installation site. If the air contains dust, install the filter mat in front of the ventilation vent on the cabinet door and the ventilation hood at the top of the cabinet. The basic version of the cabinet complies with IP20.

 Caution	
	◆ Install the cabinet under all the specified environmental conditions. Power derating is required for ambient temperatures above 40° C and altitudes above 1,000 m. For details, see "1.6 Derating".

Install the cabinet in accordance with the dimension drawings supplied. The following figure shows the distance required between the cabinet top and the ceiling.

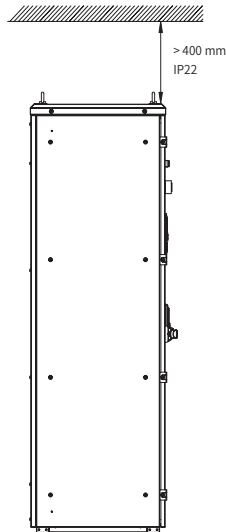


Figure 3-4 Distance between the cabinet top and the ceiling

2 Clearance in front of the cabinet

The cooling air for the power unit is drawn in from the front through the ventilation holes under the cabinet door. The warmed air is discharged through the perforated top hood.

You can place the cabinet against the wall. The distance between the front of the cabinet and the wall must be equal to or greater than 1200 mm. Reserve enough installation space on both sides of the cabinet.

Reserve sufficient space to ensure that the front door open/close angle is larger than 120° (maximum door open/close angle is about 120° without obstacles) to facilitate maintenance and repair.

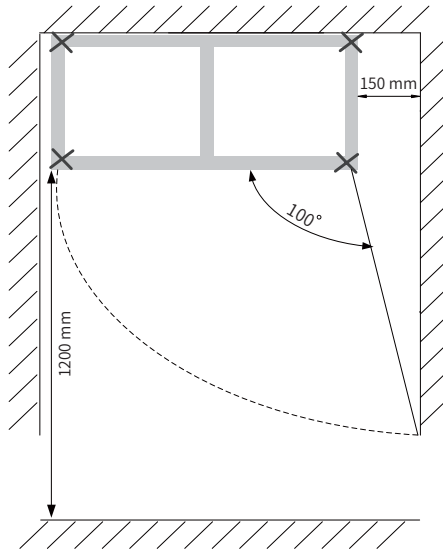


Figure 3-5 Space reserved for door open/close for the cabinet with one S12 AC drive module (unit: mm)

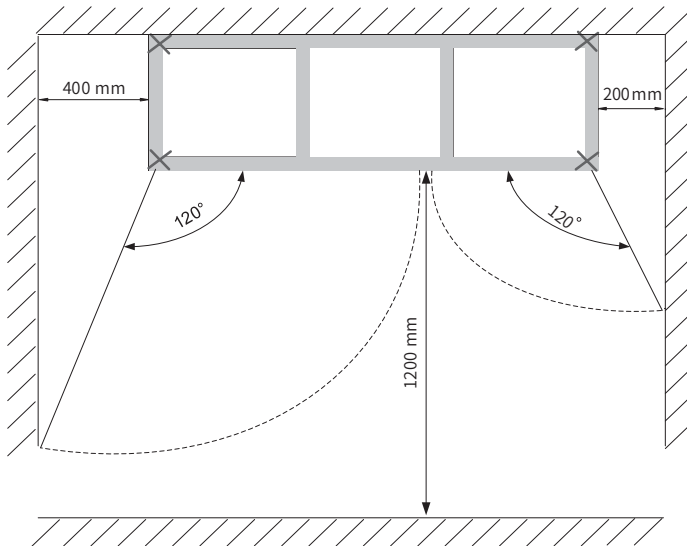


Figure 3-6 Space reserved for door open/close for the cabinet with two S12 AC drive modules (unit: mm)

3.3 Unpacking and Handling

3.3.1 Storage

Store the product in a clean and dry place with a temperature ranging from -40°C to $+70^{\circ}\text{C}$ and variation less than $1^{\circ}\text{C}/\text{min}$. For long-term storage, appropriate measures (cover the product, for example) must be taken to ensure that the drive is free from contamination and environmental factors.

For both temporary and long-term storage, follow the two rules below:

- Store the product in the original packing carton.
- Never place the product in a damp area with high temperature and excessive sunlight exposure.

 Caution	
	Do not place mechanical load on the ventilation hood at the top of the cabinet. Otherwise, it may be damaged. The ventilation hood is packed separately and assembled on site.

3.3.2 Handling Before Unpacking

1 Transportation

- The cabinet is heavy. The center of gravity, which is high, is labeled on the cabinet.

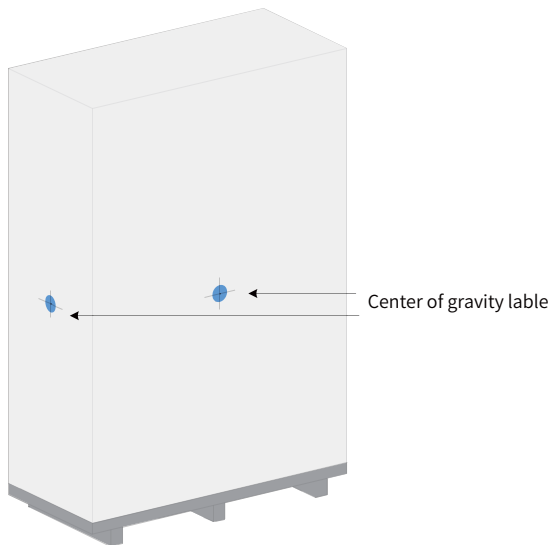


Figure 3-7 Label for the center of gravity

- Ensure that the ground where the cabinet is installed is flat and strong enough to

bear the cabinet.

- Due to the heavy weight, the cabinet must be hoisted by trained personnel with suitable hoisting gear.
- Transport the cabinet in the upright direction indicated on the package. Never transport the cabinet in an upside down or in a horizontal direction.

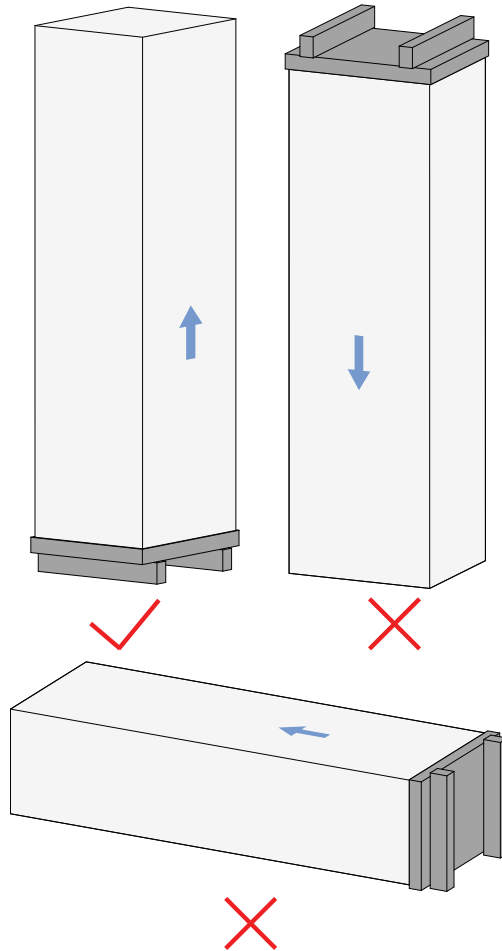


Figure 3-8 Transportation

- Due to the weight and height, you can transport the cabinet only with the auxiliary eye bolts at the top of the cabinet and the wooden pallet under it.
- Before transporting the cabinet with the forklift, fix the cabinet to the wooden pallet.

You can detach the cabinet from the wooden pallet only after the cabinet is at the installation location.

- Before transporting the cabinet with a crane, install the auxiliary hoisting eye bolt on the cabinet.

2 Transport the packed product by using the pallet.

- The cabinet can be transported with a forklift and crane. The load capacity of the transportation equipment must be greater than the weight of the cabinet.
- Adjust the distance between forklift feet to a value larger than one half of the cabinet length.
- The lifting rope of the crane must pass through the pallet under the cabinet, with the height not higher than 0.3 m.
- Do not use the hydraulic vehicle for carrying for a long distance or on the slop road.
- Two persons need to hold the cabinet at the left and right sides when it is moved.

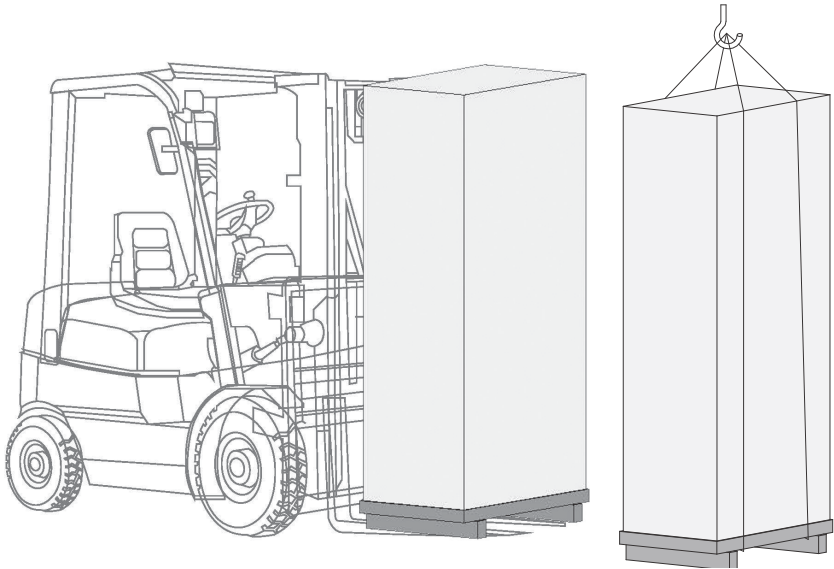


Figure 3-9 Handling before unpacking

3.3.3 Acceptance

After receiving the product, check that you have received all the items specified on the delivery note. Notify the shipping company immediately of any missing components or damage. If you have any problem, contact Inovance or the local agent for technical support.



 **Danger**

- ◆ If the device is damaged during transportation, electrical safety of the device may be impaired. In this case, perform a professional high-voltage test before connecting the device.
- ◆ Failure to comply with this warning may result in severe personal injury or death and/or property damage.

1 Unpacking the package

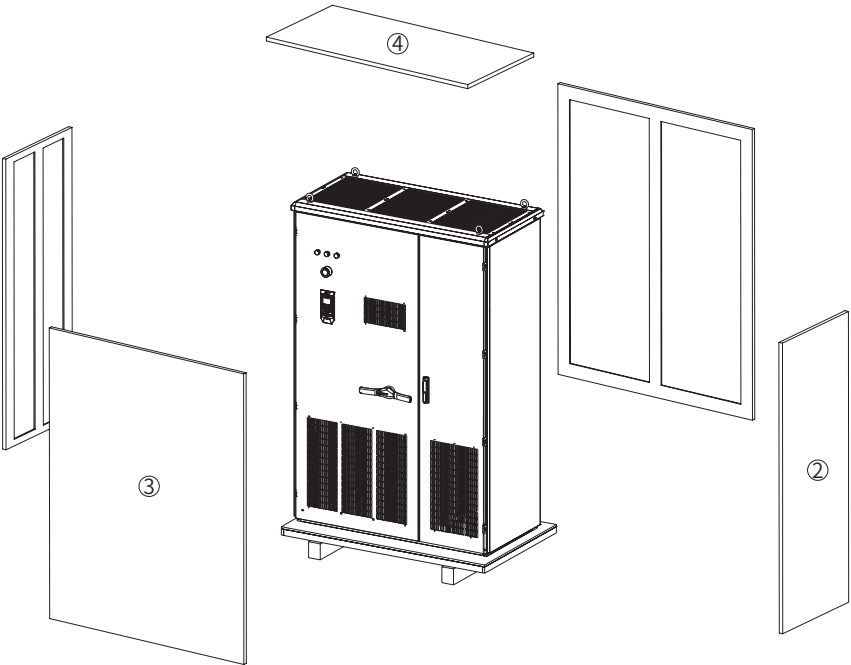


Figure 3-10 Unpacking the product

No.	Name
1	Pallet
2	End plate
3	Side plate
4	Cover

 Caution	
	◆ During unpacking, put the crowbar into the crate as short as possible so as to prevent damaging the equipment. Take care to avoid injury caused by nails. ◆ When removing the inner packing materials such as plastic film, do not use the sharp tool to avoid scratching the equipment.

Place the packed product on the empty and flat ground of the production hall, and use a crowbar or similar to pry off the crate along the gap of the plate edge. Then remove the cover plate, side plate, and end plate.

2 Removing the pallet

Before installing the cabinet, loosen the screws for fastening the transportation pallet and cabinet units, and remove the pallet.

The fastening screws are in the four corners of the cabinet.

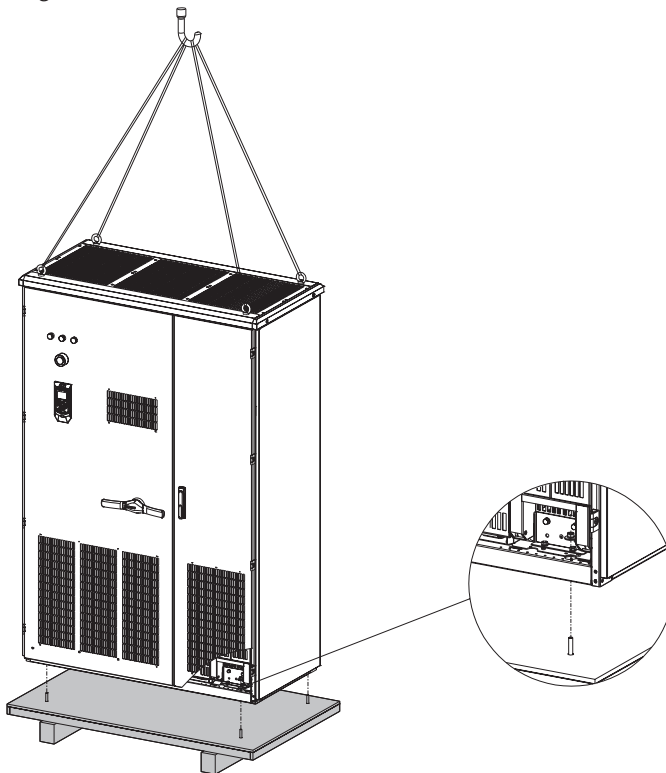


Figure 3-11 Removing the cabinet from the pallet



NOTE

◆ If using the forklift to transport the cabinet, do not remove the pallet.

3.3.4 Handling After Unpacking

- 1) Using the crane

Fix the lifting ropes to the eye bolts on the top of the cabinet.

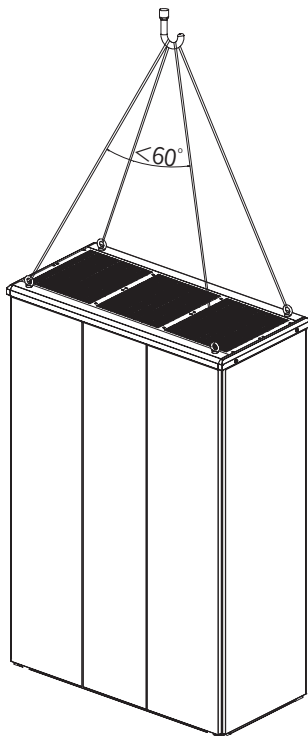


Figure 3-12 Lifting the cabinet with the crane

- 2) Using the forklift or pallet truck

Before using the pallet truck, check its load capacity.

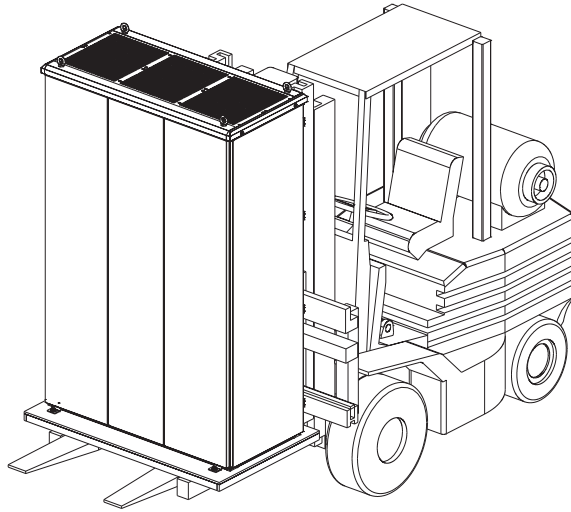


Figure 3-13 Using the forklift or pallet truck

3) Using the rollers

Remove the pallet from the cabinet.

Place the cabinet on the rollers and move the cabinet carefully until it is close to the final installation position. Lift the cabinet with a crane, forklift, pallet truck, or jack, and remove the rollers.

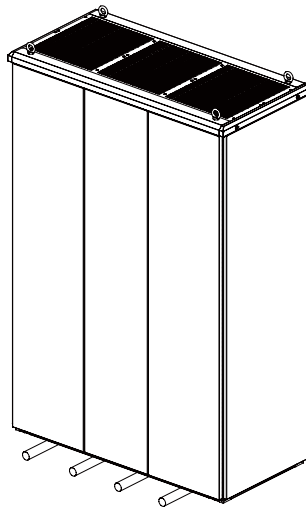


Figure 3-14 Using the rollers

4) Removing the eye bolt

When the cabinet is shipped, eye bolts for lifting and transportation are installed. After removing the eye bolts, re-tighten the M12 bolts into the original holes to make the cabinet meet the requirements of the specified IP rating.

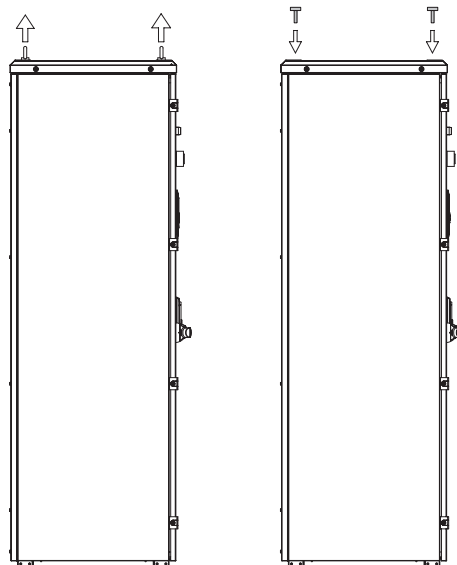


Figure 3-15 Removing the eye bolts

3.4 Pre-installation Checklist

 Danger		
	◆	For the safe operation of the cabinet, professional personnel must correctly install and use the equipment by complying with all warnings.
	◆	In particular, the professional personnel must observe the general and national installation and safety guidelines for high-voltage operations as well as the guidelines relating to the proper use of tools and personal protective equipment.
	◆	Failure to comply with this warning may result in severe personal injury or death and/or property damage.

After the installation is completed, tick each work step for confirmation.

Table 3-3 Mechanical installation checklist

No.	Item	Completed or Not
1	The center of gravity is labeled.	☐

No.	Item	Completed or Not
2	The packing box is intact and dry. free of loss, damage, and dampness.	☐
3	The load-bearing capacity and properties of the ground fulfill the requirements for installation of the cabinet. For details, see "3.2.1 Environment Requirements" .	☐
4	The minimum ceiling height required (for unhindered air discharge) is observed. The air inlet and outlet are not obstructed and have sufficient space. Sufficient space is reserved for safety passageway after cabinet doors are open. For details, see "3.2.2 Clearance Requirements" .	☐
5	The cabinet housing is intact without distortion, peeling, or crack, and there is no water stain in the cabinet.	☐
6	The accessories (user manual, optional parts) inside the cabinet are complete.	☐
7	The wooden pallets are removed before the cabinet is placed in the final installation site. For details, see "3.3.3 Acceptance" .	☐
8	The auxiliary eye bolts are removed after the cabinet devices are unloaded in the final installation site. For details, see "3.3.4 Handling After Unpacking" .	☐
9	The cabinet must be firmly attached to the fixing points provided.	☐
10	Before commissioning, all contact protection devices (protection plates) inside and outside the cabinet are installed.	☐

3.5 Installation Guidance

3.5.1 Installation Notices

 Caution	
	◆ Lay high voltage cables and low voltage cables in different brackets. If they can only be routed in one bracket due to restricted conditions, lay low voltage cables in completely enclosed metal pipes. ◆ The cable trench must be smooth and made of incombustible materials to form a structure that prevents moisture, dust, and intrusion of animals. ◆ Failure to comply with this warning may result in severe personal injury or death and/or property damage.

During foundation design, take the following factors into consideration:

- Inspection space in front of the cabinet
- Routing of power supply cables, motor driving cables, and system control cables

Design the cable trench or cable channel under the cabinet. The power cables and signal cables must be separated. The following figure shows the wiring example.

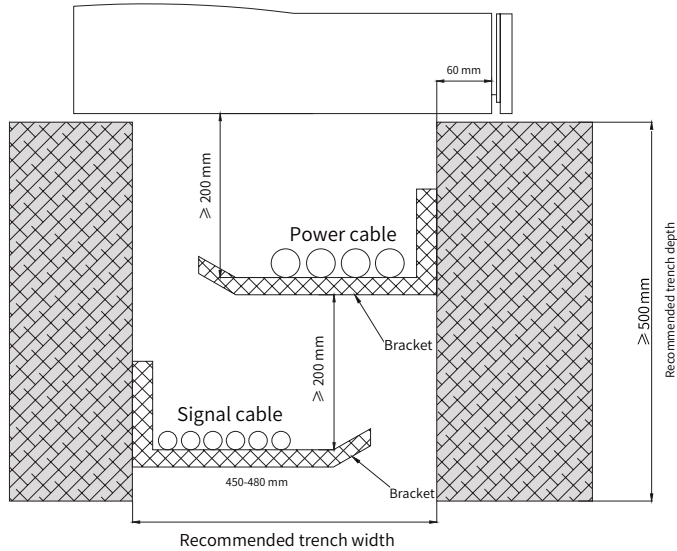


Figure 3-16 Foundation layout

3.5.2 Installation of the Cabinet

1 Installing the expansion screws

To install the cabinet on the concrete ground, install the expansion screws at the positions corresponding to the fixing holes of the cabinet under the ground.

Installing the expansion screws

- 1) The dimensions in ["1.5 Outline Dimensions"](#) show the drilling hole for the expansion screw. The drilling hole must meet the following requirements:
 - Diameter of the drilling hole < Maximum outer diameter of the expansion screw
 - Depth of the drilling hole > Length of the expansion screw
 - Perpendicular to the ground
- 2) Knock the expansion screw into the hole completely by using the hammer, as shown in Step 2. The expansion screw consists of two movable parts: bolt spring shell and stem.
- 3) After placing the cabinet at the required position, fasten it with M12 bolts. The expansion screw stem will be pulled up, making the spring shell deform to fasten the cabinet unit, as shown in Step 3.

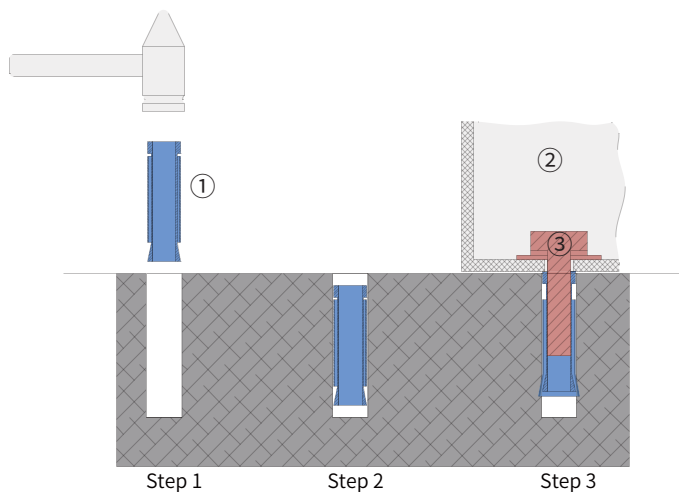
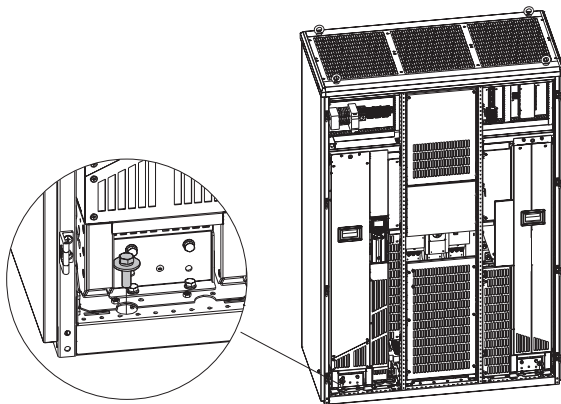


Figure 3-17 Installing the expansion screws

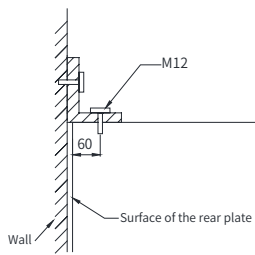
No.	Notes
1	Expansion screw
2	Cabinet
3	M10 bolt

2 Installing the cabinet

- 1) Fix the cabinet to the ground and the wall, or to the ground and the ceiling vertically. Use the M10 bolts to fix the bottom of the cabinet to the ground.



- 2) If the fixing holes at the rear cannot be reached, you can use the L-shaped frame (excluded in the delivery) to fix the top of the cabinet to the wall using the hanging beam fixing holes.



4 Electrical Installation

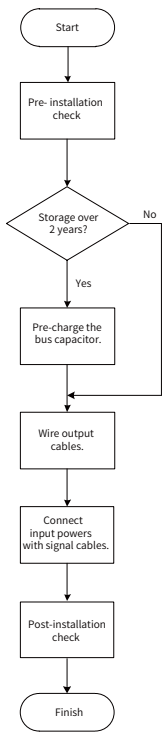


Figure 4-1 Electrical installation flowchart

4.1 Safety Precautions

4.1.1 Safety precautions before installation

 Danger	
	◆ As the drive is often used in high-voltage applications and contains live and rotary parts, unauthorized removal of covers and improper use, operation or maintenance of the drive may lead to severe personal injury or property damage. ◆ Only professional technicians are allowed to perform operations and they must read and comply with the safety information provided in this guide. ◆ When carrying out electrical work, the professional technicians must observe the following five safety rules: 1) The device has been powered off. 2) The power supply will not be reconnected. 3) No voltage is generated from the device 4) The voltage is properly grounded. 5) Adjacent live parts are covered or isolated properly.

4.1.2 Inspection

 Danger	
	◆ The equipment is operated with high voltages. All connection work must be carried out in a no-voltage condition. ◆ All work on the equipment must be carried out only by qualified personnel. ◆ Work on a disconnected device must be carried out with extreme caution because external power supply voltages may be present. The power and control terminals may be live even when the equipment is not running. ◆ Due to the DC bus capacitor installed in the device, the device may still be live after 15 minutes of power failure. Therefore, make sure that the voltage is lower than 36 VDC before opening the device. ◆ The user is responsible for ensuring that the motor, cabinet, and other components are installed and connected in accordance with the recognized technical rules in the country of installation and with applicable regional guidelines. Special attention must be paid to cable dimensioning, protective devices, grounding, shutdown, separation, and overcurrent protection. ◆ If a protective device trips in a branch circuit, a fault current may have been interrupted. To reduce the risk of fire or electric shock, the conductive parts and other components must be inspected and damaged parts replaced. When a protective device trips, the cause of the trip must be identified and the problem rectified.

4.1.3 General

■ Electrostatic

 Danger	
	◆ The printed circuit boards contain components sensitive to electrostatic discharge. Wear a properly grounded wrist strap when handling the boards. Do not touch the boards unless necessary.

■ Optical fiber cables

 Attention	
	◆ Handle the optical fiber cable with care. When unplugging the optical fiber cable, always grab the connector, not the cable itself. Do not touch the ends of the fibers with bare hands as the fiber is extremely sensitive to dirt.

4.1.4 Checking the Insulation

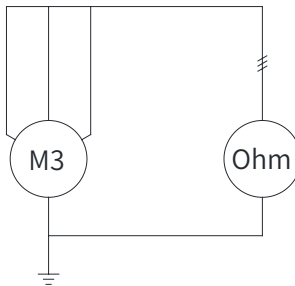
Every MD880 series AC drive module has been tested for insulation between the main circuit and the enclosure at the factory. Therefore, do not perform any voltage tolerance or insulation resistance tests on the drive. Check the insulation of the motor and the

motor cable as follows.

⚠ Danger	
	◆ Before checking the insulation, ensure that the drive is disconnected from the main circuit (input power). ◆ Check that the motor cable is connected to the motor, but disconnected from the drive output terminals U, V and W. ◆ Measure the insulation resistance between each phase cable and the PE cable by using a measuring voltage of 500 VDC. For the insulation resistance of the motor, see the manufacturer's documentation.



- ◆ Moisture decreases the insulation resistance of the motor. If the insulation resistance does not meet the requirements, reduce the humidity of the environment where the motor is located and measure insulation resistance again.



4.2 EMC-Compliant Cabling

⚠ Danger	
	◆ Before the drive is put into operation, reinstall protective covers that were removed during cabling. ◆ Fix the power cable shield to the shield plate and connect the PE cable to the PE busbar.

4.2.1 Requirements

1 Routing signal cables and power cables separately

When analog signals are used to remotely control the drive, route signal cables and high voltage circuit cables (power input, IGBT module output, and braking resistor connection cables) through different routes and keep them at least 40 cm away from each other. This can reduce interference generated by the drive and other equipment to the analog signal. This requirement must also be met inside the control cabinet.

2 Requirements on the analog signal cable

Use shielded twisted pair cables for analog signal cables. Keep the stripped part of the cable as short as possible (5–7 mm) and cover the bare shield with the insulating tape to prevent the shielded cable from coming into contact with other devices and causing interference.

3 Requirements on the motor cables

Use shielded motor cables. Keep the distance between the drive and the motor as short as possible. Route the motor cable and other cables through different routes. Avoid long parallel routing of motor cables with other cables to decrease electromagnetic interference caused by the rapid change of the drive output voltage.

4 Requirements on the power cables

Use shielded power cables, or shield cables from the drive to the motor in conduits.

5 Requirements on the control cables and power cables

Where control cables must cross power cables, make sure they are cross-connected at an angle as close to 90° as possible.

4.2.2 Routing Suggestions

- 1) Route different types of signal cables through different routes and keep a distance of at least 40 cm (recommended) between disturbing cables and disturbed cables. If cross-connection is needed for disturbing and disturbed cables, make them be cross-connected at 90° to avoid interference.

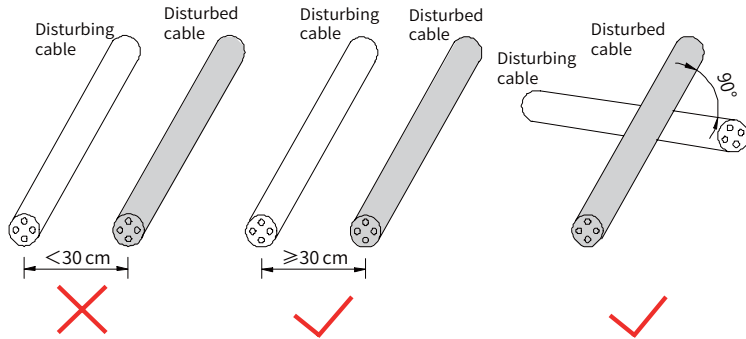


Figure 4-2 Routing of disturbing cables and disturbed cables

- 2) Route different signal cables through different routes and isolate different types of signals with the equipotential signal. When routing cables of the same signal type, lay the equipotential signal cables at the outer layer, and lay the equipotential signal cables as many as possible in the middle, as shown below.

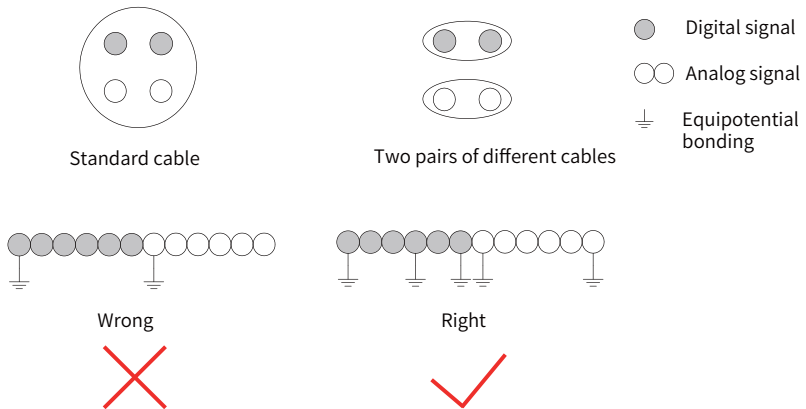


Figure 4-3 Routing of different signal cables

- 3) For the multi-core cable, it is recommended that the cable transmits only one type of signals. If different types of signals are to be transmitted, use the cable with the conductor shielded, as shown in the following figure.

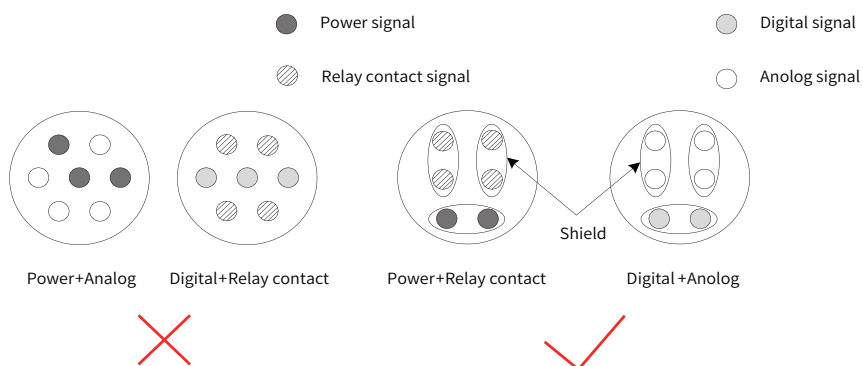


Figure 4-4 Routing of a multi-core cable

- 4) For unused conductors in a multi-core cable, connect them to the equipotential bonding point.

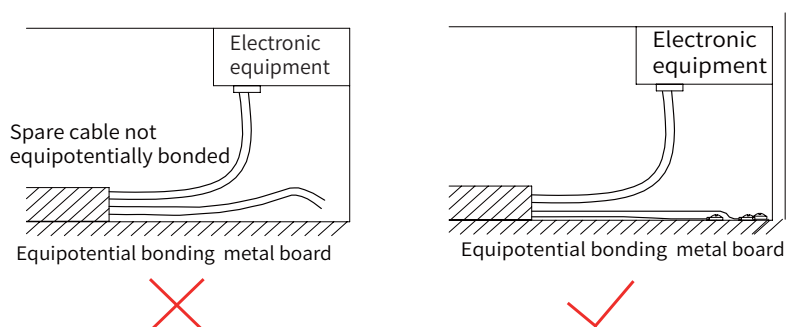


Figure 4-5 Handling of unused conductors in a multi-core cable

- 5) For the cables transmitting low-level sensor signals and relay signals, lay the two cable types close to each other to avoid a large loop area. Use twisted pair cables for the analog signals. Route the digital signal cables close to each other.

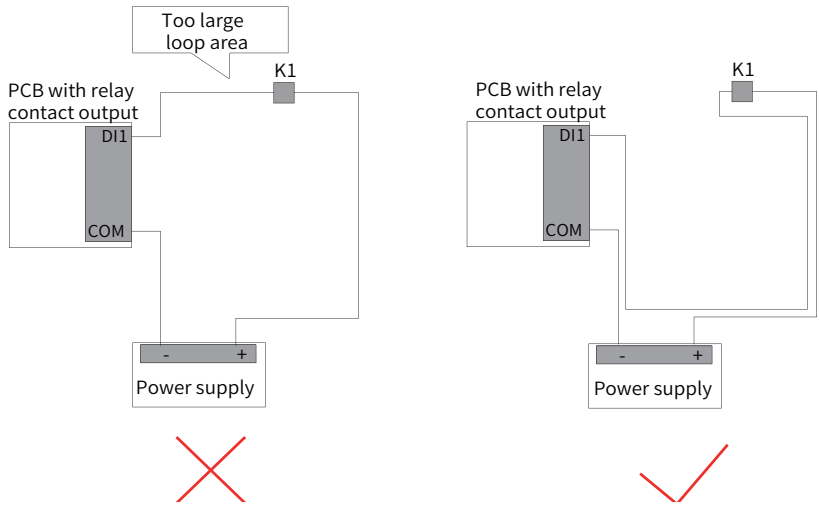


Figure 4-6 Routing for avoiding large loop area

- 6) For cables of different types, route them along the equipotential metal plate. Separating different types of cables or cables in the same metal (zinc-iron or stainless steel) duct with metal separators can enhance the internal EMC performance.

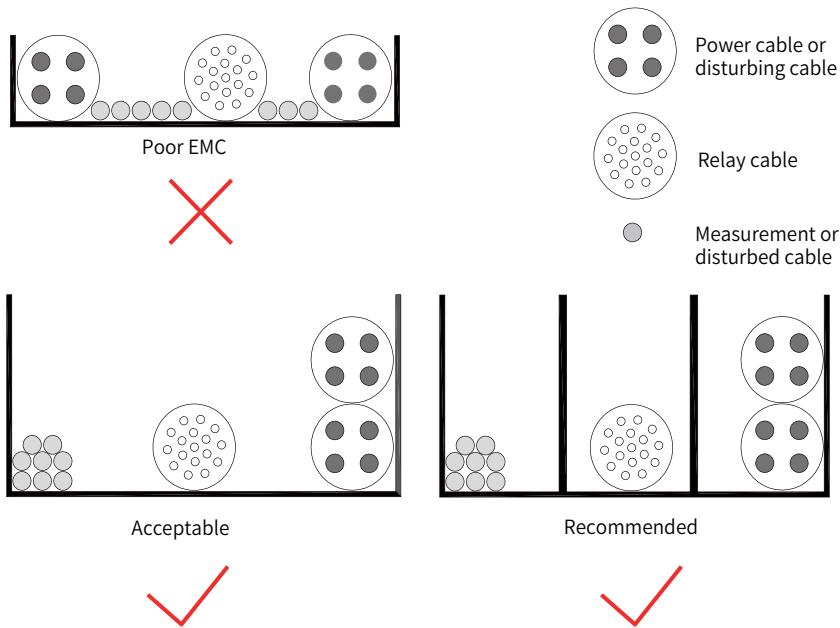


Figure 4-7 Routing of multiple types of cables

- 7) Keep the length of the unshielded cable part as short as possible, and connect the shield to the nearest PE terminal. Too long a stripped part will make the cable susceptible to interference, especially for encoder signals.

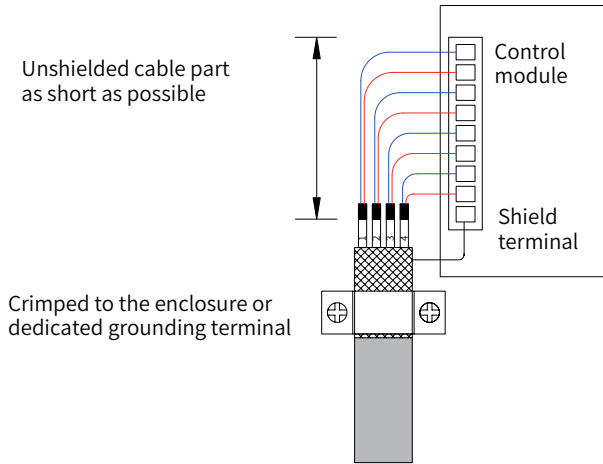


Figure 4-8 Requirements on the cable shield

4.2.3 Connection of Shielded Power Cables

For the shielded power cables for input and output inside the drive, the shield must have a large contact area with the shielding plate in the cabinet for excellent EMC performance. See the following figure for the installation and fixing method.

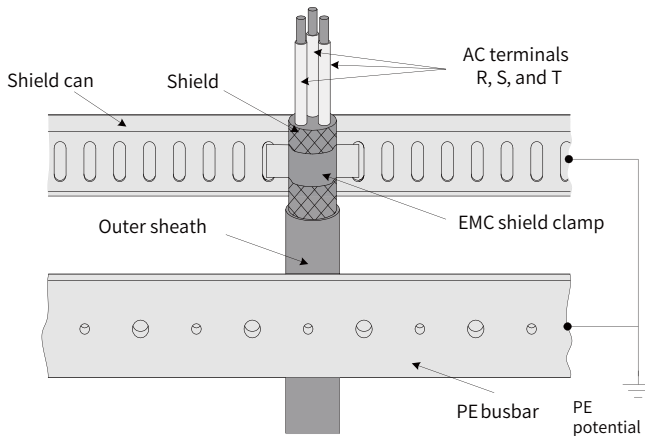


Figure 4-9 Connection of shielded power cables

4.3 Pre-charging the Bus Capacitor

A drive includes multiple electrolytic capacitors. Their service life depends on working time, load, and ambient temperature, and can be extended by lowering the ambient temperature.

Capacitor failures are often accompanied by device damage, input fuse failure, or fault-caused trip. Contact Inovance if the capacitor may be faulty. Obtain spare parts from Inovance rather than from an unauthorized dealer.

 Danger	
	◆ The drive unit cannot be stored for more than two years in theory. If it is kept in storage for over two years, re-charge the DC bus capacitor before commissioning. The storage period is calculated from the date of production rather than the date of delivery.

See the following for how to charge the bus capacitor:

Charging requirements:

Apply the rated voltage to the bus capacitor without load for at least 30 minutes. During this period, do not operate the charging module.

Recommended components of the charging circuit:

- 1) One 3-phase 10 A/690 V fuse switch;
- 2) Six 100 W/230 V incandescent lamps for the 690 VAC drive module. Connect two incandescent lamps in serial or one 1 K/100 W resistor for each of the 3 phases.
- 3) Various small components, such as lamp holder and 1.5 mm² cable

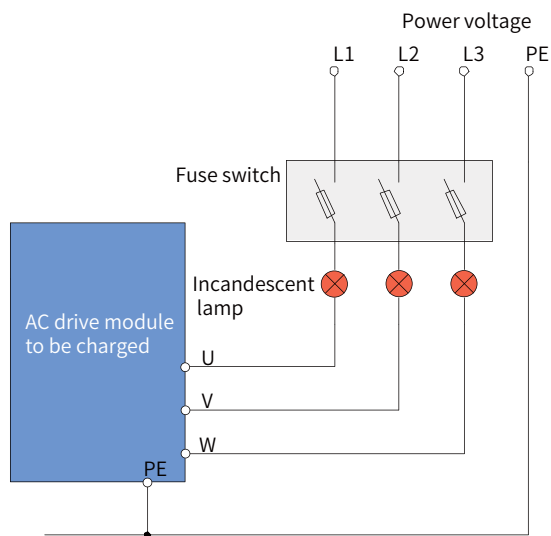


Figure 4-10 Charging connection

4.4 Wiring

 Danger	
	◆ During wiring, tighten the screws with the specified torque. For details, see "1.8 Tightening Torque of Screws/Bolts" . Otherwise, the screw joints can be overheated during operation.

4.4.1 Wiring for the S12 AC Drive Module

1 Terminals

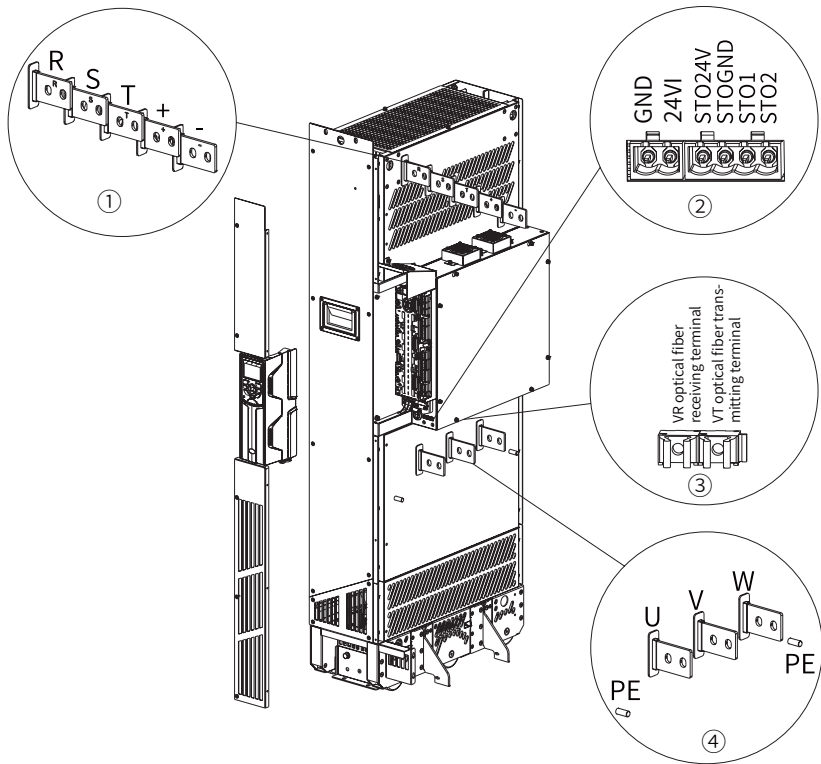


Figure 4-11 Terminals of the S12 AC drive module

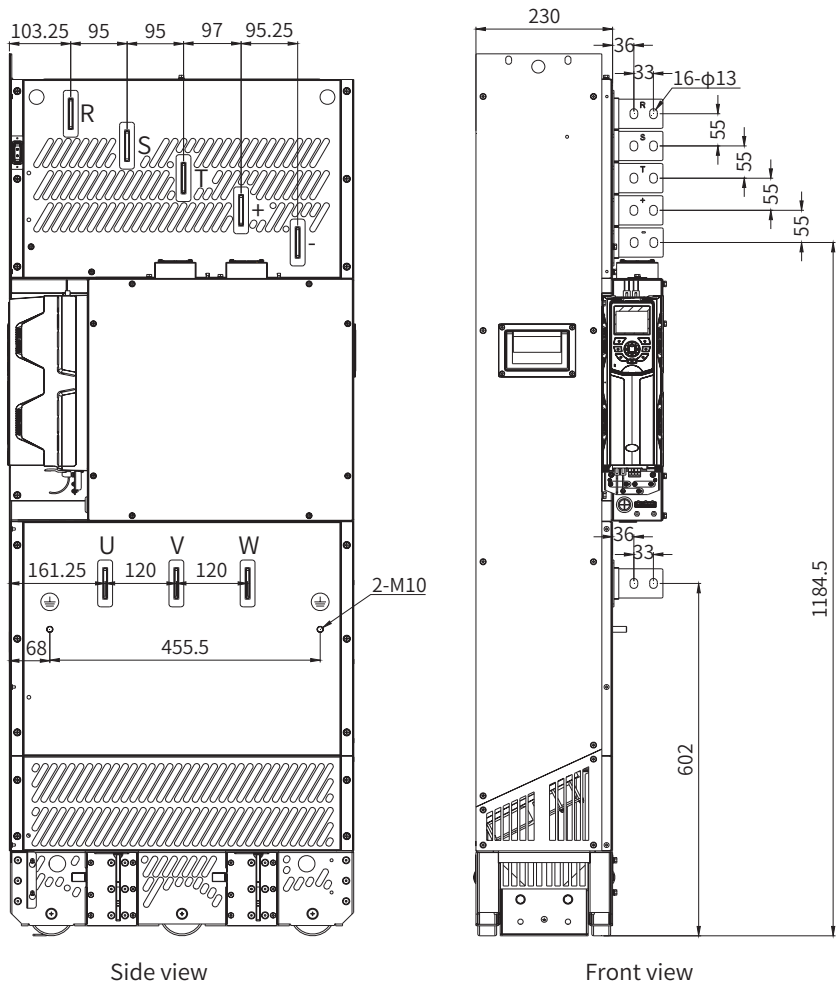


Figure 4-12 Terminal dimensions of the S12 AC drive module

Table 4-1 Terminal connection of the S12 AC drive module

No.	Terminal	Description
1	a: AC input terminals R, S, and T b: Bus terminals + and -	For the copper busbar of the AC input and the positive and negative bus, select the appropriate cable and tightening torque according to "4.4.5 Recommended Cable Models and Specifications" .

No.	Terminal	Description
2	a: 2-pin power supply terminals b: 4-pin STO terminals	a: External 24 V input power terminal, 2-core twisted pair, single-core cable, cross-sectional area of 0.5–2.5 mm ² b: STO terminal, 4-core cable shield, cross-sectional area of 0.5–2.5 mm ²
3	VR optical fiber receiving terminal/VT optical fiber transmitting terminal	Used to connect to the HCU/HPCU
4	a: AC output terminals U, V, and W b: PE terminals	For the AC input copper busbar and the PE copper busbar, select the appropriate cable and tightening torque according to " 4.4.5 Recommended Cable Models and Specifications ".

2 Wiring steps

- 1) Make sure that the inputs and outputs are connected properly.
- 2) Fix power cables on the cable mounting bracket to prevent stress to the terminals.
- 3) When shielded power cables are used, the shields must be secured to the shielding plate according to the EMC requirements.

4.4.2 Wiring for the Cabinet with One S12 AC Drive Module

1 Terminals

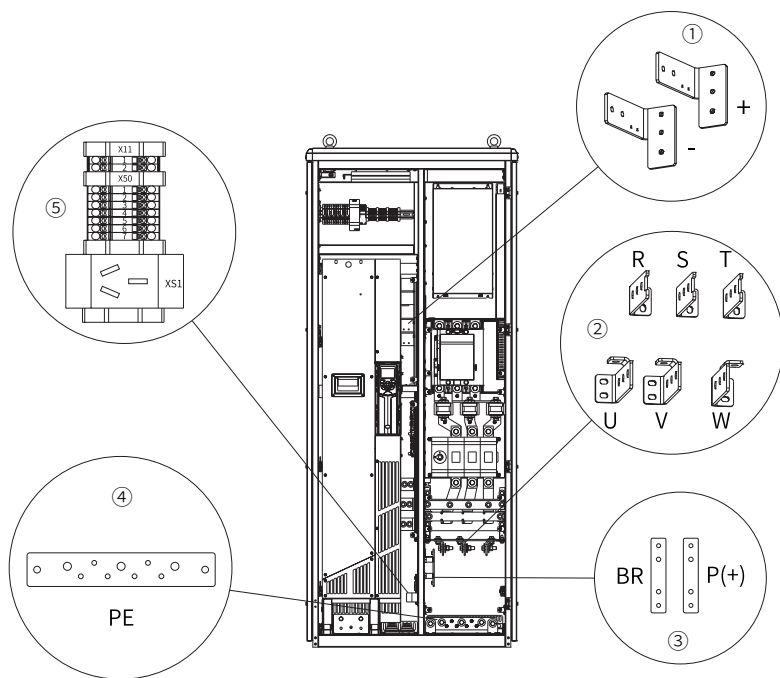


Figure 4-13 Terminals of the cabinet with one S12 AC drive module

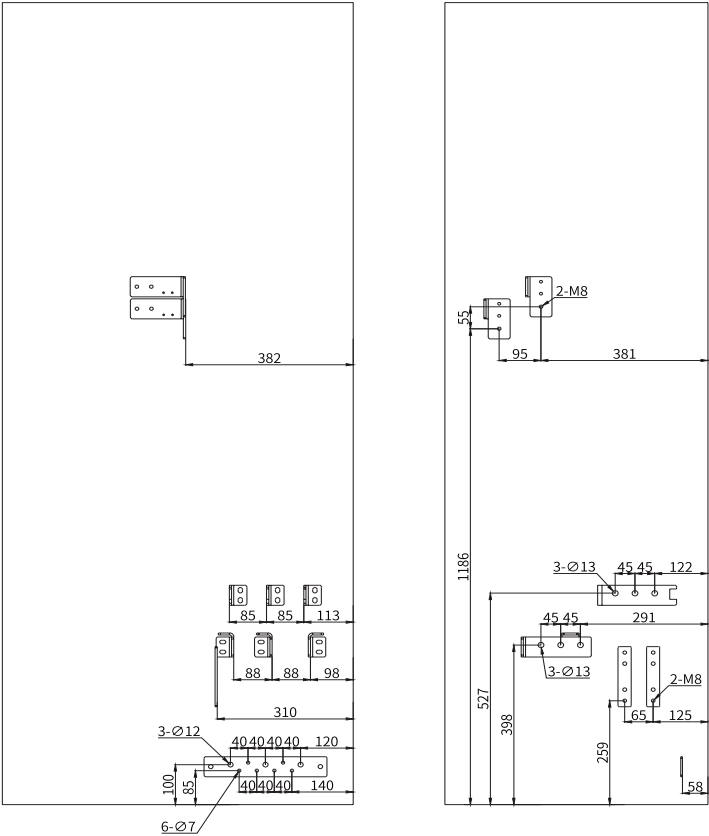


Figure 4-14 Terminal dimensions of the cabinet with one S12 AC drive module (mm)

Table 4-2 Terminal connection of the cabinet with one S12 AC drive module

No.	Terminal	Description
1	Bus terminals + and -	For the positive and negative copper busbar, select the appropriate cable and tightening torque according to " 4.4.5 Recommended Cable Models and Specifications ".
2	a: AC input terminals R, S, and T b: AC output terminals U, V, and W	For the AC input and output copper busbar, select the appropriate cable and tightening torque according to " 4.4.5 Recommended Cable Models and Specifications ".
3	Braking resistor copper busbar	Recommended cable: single cable 70 mm ² , cable lug type OT/70-10

No.	Terminal	Description
4	PE terminals	For the PE copper busbar, select the appropriate cable and tightening torque according to " 4.4.5 Recommended Cable Models and Specifications ".
5	X11: Control power input X50: Emergency stop input terminals	Control power terminals: 2-core, cross-sectional area of 2.5–4 mm ² Emergency stop input terminals: 2-core, cross-sectional area of 2.5–4 mm ²

2 Wiring steps

- 1) Make sure that the inputs and outputs are connected properly.
- 2) Fix power cables on the cable mounting bracket to prevent stress to the terminals.
- 3) When shielded power cables are used, the shields must be secured to the shielding plate according to EMC requirements.

4.4.3 Wiring for the Cabinet with Two S12 AC Drive Modules

1 Terminals

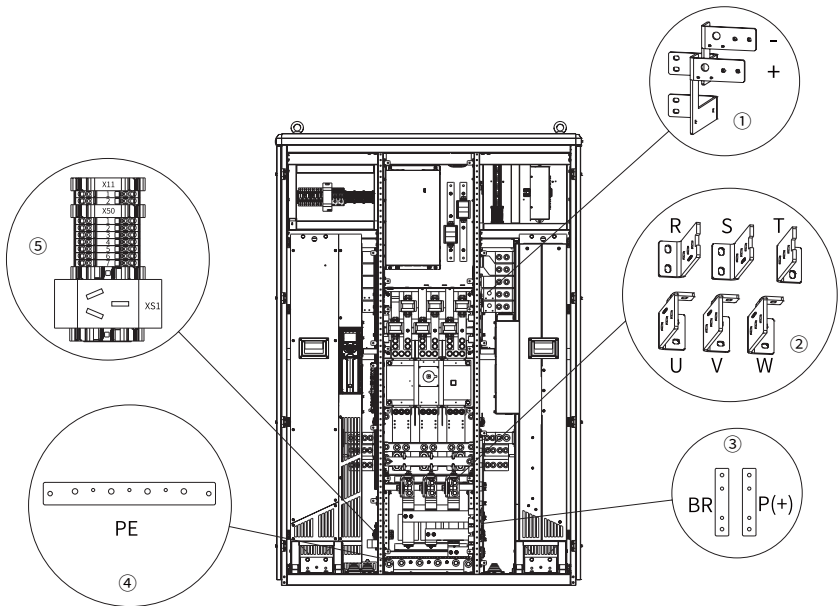


Figure 4-15 Terminals of the cabinet with two S12 AC drive modules

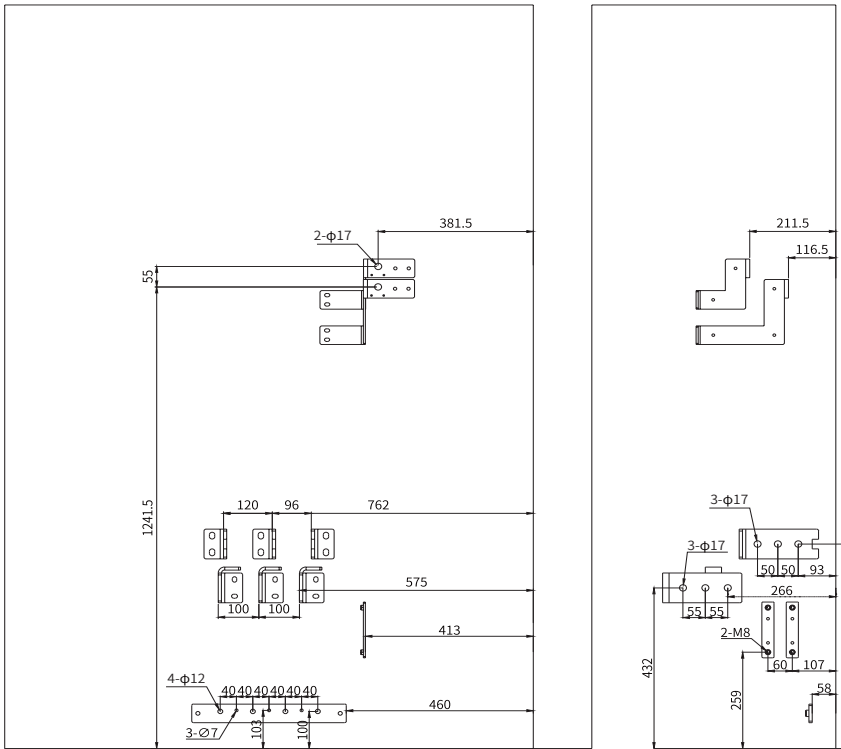


Figure 4-16 Terminal dimensions of the cabinet with two S12 AC drive modules (mm)

Table 4-3 Terminal connection of the cabinet with two S12 AC drive modules

No.	Terminal	Description
1	Bus terminals + and -	For the positive and negative copper busbar, select the appropriate cable and tightening torque according to "4.4.5 Recommended Cable Models and Specifications" .
2	a: AC input terminals R, S, and T b: AC output terminals U, V, and W	For the AC input and output copper busbar, select the appropriate cable and tightening torque according to "4.4.5 Recommended Cable Models and Specifications" .
3	Braking resistor copper busbar	Recommended cable: single cable 70 mm ² , cable lug type OT/70-10
4	PE terminals	For the PE copper busbar, select the appropriate cable and tightening torque according to "4.4.5 Recommended Cable Models and Specifications" .

5	X11: Control power input X50: Emergency stop input terminals	Control power terminals: 2-core, cross-sectional area of 2.5–4 mm ² Emergency stop input terminals: 2-core, cross-sectional area of 2.5–4 mm ²
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2 Wiring steps

- 1) Make sure that the inputs and outputs are connected properly.
- 2) Fix power cables on the cable mounting bracket to prevent stress to the terminals.
- 3) When shielded power cables are used, the shields must be secured to the shielding plate in an EMC-compliant manner.

4.4.4 Operation of the Drive in Two Earthing Systems (TT and TN)

It is strongly recommended to install two grounding screws on the varistor board when operating the drive in the TT and TN grid systems, as shown in the following figure.

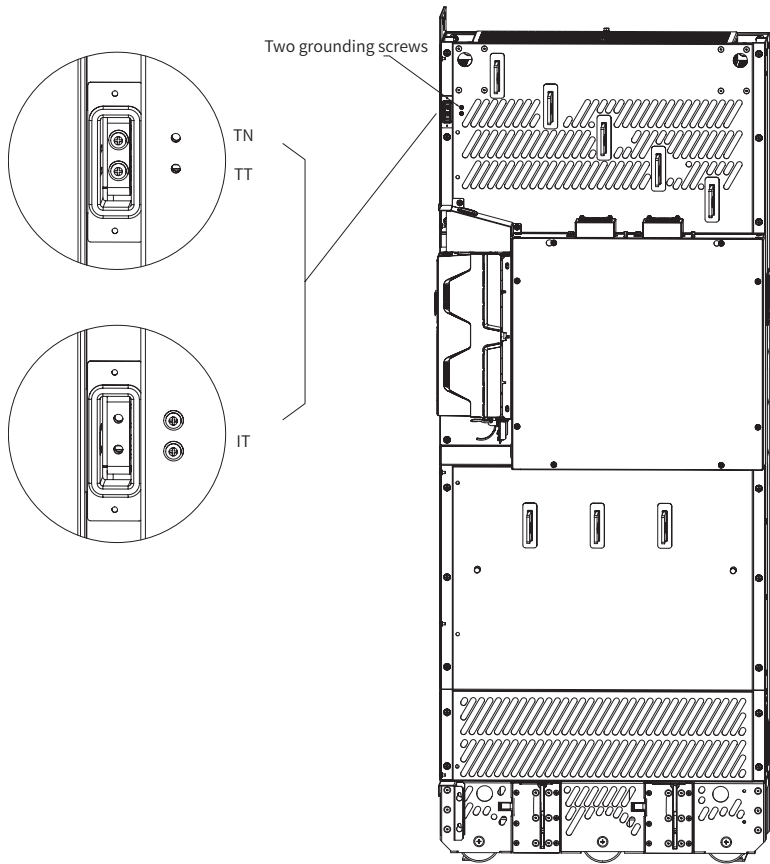


Figure 4-17 Installation of two M3 screws on the varistor board



NOTE

- ◆ When operating the AC drive in the IT grid system, do not reinstall the two grounding screws which have been removed by default.

4.4.5 Recommended Cable Models and Specifications

Table 4-4 Recommended main circuit cables

Model	Rated Current (A)	Input/ Output Power Cables (mm ²)	Power Cable Lug Model (mm ²)	Grounding Cable (mm ²)	Tightening Torque (N·m)
MD880-01S-0600-7-SG	600	3 x 120	OT/120-12	2 x 120	50
MD880-01S-0650-7-SG	650	3 x 120	OT/120-12	2 x 120	50

Model	Rated Current (A)	Input/ Output Power Cables (mm ²)	Power Cable Lug Model (mm ²)	Grounding Cable (mm ²)	Tightening Torque (N·m)
MD880-01S-0721-7-SG	721	4 x 120	OT/120-12	2 x 120	50
MD880-11S-0600-7	600	3 x 120	OT/120-12	2 x 120	50
MD880-11S-0650-7	650	3 x 120	OT/120-12	2 x 120	50
MD880-11S-0721-7	721	4 x 120	OT/120-12	2 x 120	50
MD880-11S-1140-7	1,140	6 x 120	OT/120-16	3 x 120	120
MD880-11S-1235-7	1,235	6 x 150	OT/120-16	3 x 120	120
MD880-11S-1370-7	1,370	6 x 150	OT/150-16	3 x 150	120

- To prevent accidents caused by short circuit and protect the system from further damage, AC fuses and other protective devices can be installed at the input side for the drive. The recommended models are as follows:

Table 4-5 Selection of fuses, contactors, and circuit breakers

Device	Recommend UL-Certified Bussmann Fuse		Recommend UL-Certified Sinofuse Fuse		Recommend Contactor	Recommend Circuit Breaker
Model	Rated Current (A)	Model	Rated Current (A)	Model	Rated Current (A)	Rated Current (A)
MD880-01S-0600-7-SG	1,000	170M6414	1,000	RS306-3-S1P-1000A690V	750	800
MD880-01S-0650-7-SG	1,100	170M6415	1,100	RS306-3-S1P-1100A690V	750	800
MD880-01S-0721-7-SG	1,250	170M6416	1,250	RS306-3-S1P-1250A690V	750	800

Table 4-6 Disconnecter selection

Model	Size	Rated Current (A)	Disconnecter
			BRAND: SOCOMEC
MD880-01S-0600-7-SG	S12	800	26003081
MD880-01S-0650-7-SG	S12	800	26003081
MD880-01S-0721-7-SG	S12	800	26003081

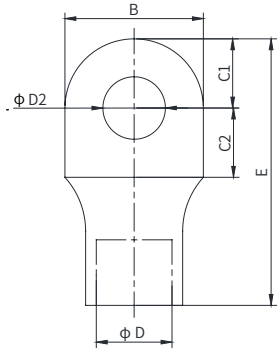


Figure 4-18 Terminal appearance

Table 4-7 Maximum terminal size

Screw/Bolt	Cross-sectional Area (mm ²)	D2 (mm)	B (mm)	E (mm)	C1 (mm)	C2 (mm)
M5	6	5.3	10	23.8	5.5	6.0
M6	10	6.4	12.4	27.5	7.0	8.0
M6	16	6.4	12.4	31.0	7.0	8.0
M6	25	6.4	14.0	32.0	7.0	8.0
M10	35	10.5	17.5	40.5	10.0	10.5
M10	50	10.5	18.0	43.5	10.5	11.0
M10	70	10.5	21.8	50.0	13.0	13.0
M10	95	10.5	25.0	55.0	13.0	13.0
M12	70	13.0	21.8	50.0	13.0	13.0
M12	95	13.0	25	55	13.0	13.0
M12	120	13.0	28.4	60	14.0	14.0
M16	120	17	28.4	64	16	16
M16	150	17	30	69	16	16



NOTE

- ◆ The cables recommended in the table are all symmetrical shielded cables comprised of three conductors, with each conductor connected to each of the three phases of the AC output copper busbar. PE cables must be separately wired. The cross-sectional area of the PE cable is specified below:

When the cross-sectional area of the phase (S) is smaller than or equal to 16 mm^2 ($S \leq 16 \text{ mm}^2$), the cross-sectional area of the PE cable is the same as that of the phase (S).

When S is larger than 16 mm^2 and smaller than or equal to 35 mm^2 ($16 \text{ mm}^2 < S \leq 35 \text{ mm}^2$), the cross-sectional area of the PE cable is equal to 16 mm^2 .

When S is larger than 35 mm^2 ($S > 35 \text{ mm}^2$), the cross-sectional area of the PE cable is equal to half of S ($S/2$).

- ◆ Explanation on the recommended cable: $3 \times 120 \text{ mm}^2$ means three single-core power cables with a cross-sectional area of 120 mm^2 for each cable.
- ◆ Explanation on the terminal: OT/120-16 means a crimping OT terminal with a cable cross-sectional area of 120 mm^2 and a hole size for M16 screws.
- ◆ Note the maximum size of the cable terminals listed in the following table. Use cable terminals within these limits. Otherwise, the mechanical stability and electrical clearance cannot be ensured.
- ◆ Derating is required when multiple cables of the same specification are connected in parallel.

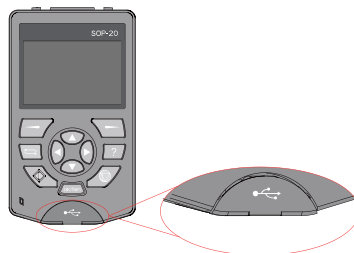
4.4.6 HCU Control Module Wiring

For details about how to install the HCU control module and connect the control cable, see ["5 HCU Control Module"](#).

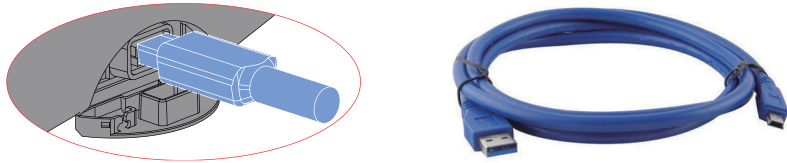
4.4.7 Connection Between the SOP-20-880 and the PC

Connect the mini USB type-B connector of the SOP-20-880 to the PC with a cable no longer than three meters. The communication protocol USB 2.0 is used between the SOP-20-880 and the PC.

- 1) Open the USB connector cover.



- 2) Plug the shielded USB cable. The cable with ferrite core is recommended, as shown in the following figure.



- 3) Connect the cable to the PC.

You are prompted to choose between the USB repeater mode and mass storage mode.

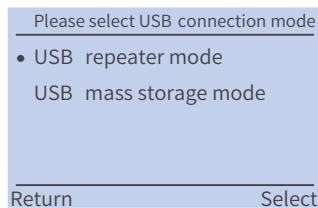


Figure 4-19 USB mode

When the USB repeater mode is selected, the SOP-20-880 is used for interaction between the PC and the drive. When the mass storage mode is selected, the SOP-20-880 serves as a memory.

4.4.8 Connection Between the SOP-20-880 and the Drive

Use a cable compliant with EIA/TIA 568A or EIA/TIA 568B standard to connect SOP-20-880 to the drive control board (such as the HCU) through the RJ45 port at the rear side. Select a termination resistor through the jumper on the control board at the end of the communication line. Shielded twisted pair cables with a maximum length of 100 m are recommended for the SOP-20-880 bus cable.

Table 4-8 Transmission distance, rate, and number of nodes for the SOP-20-880 bus

Distance (m)	Baud Rate (kbit/s)	Number of Nodes	Cross-Sectional Area	Notes
100	1,000	32	$\geq 0.5 \text{ mm}^2$	When there are repeaters, the maximum number of nodes is 128. When there is no repeater, a maximum of 32 nodes are allowed. When there is polar offset, the maximum number of nodes is reduced by 4 based on whether there are repeaters.
50	2,000	32	$\geq 0.5 \text{ mm}^2$	
25	4,000	32	$\geq 0.5 \text{ mm}^2$	

4.5 Installation Checklist

After the completion of electrical installation, check the key items listed in the following table. Read all the safety precautions in "[Safety Instructions](#)" before operating the device.

No.	Item	Compliance √
1	The input power and motor cables are connected and the correct voltage is supplied.	☐
2	The auxiliary power provides the correct voltage.	☐
3	To reduce stress, input and output power cables are fixed on the cable mounting brackets.	☐
4	The cables are properly connected to the terminals provided with the required torque.	☐
5	For EMC shielded cables, threaded sleeve connectors must be used on the motor terminal box. The connectors have a large contact area with the shield and are properly grounded. The cable shield is secured to the shielding plate in the AC drive to ensure EMC compliance.	☐
6	Several AC drives are correctly connected to the motor in parallel.	☐
7	The manufacturing date can be found on the nameplate of the AC drive. If it is shorter than 2 years from the initial commissioning or the downtime of power components is shorter than 2 years, then there is no need to pre-charge the DC bus capacitors.	☐
8	The control cables must be shielded and connected properly according to the port layout and shield. To prevent interference, the control cables and the power cables must be routed through different routes. Cabling and connections must always comply with the relevant EMC directives.	☐

5 HCU Control Module

This chapter introduces the control module HCU-50S used by 690 VAC single drive AC drive.

5.1 Components of the HCU Control Module

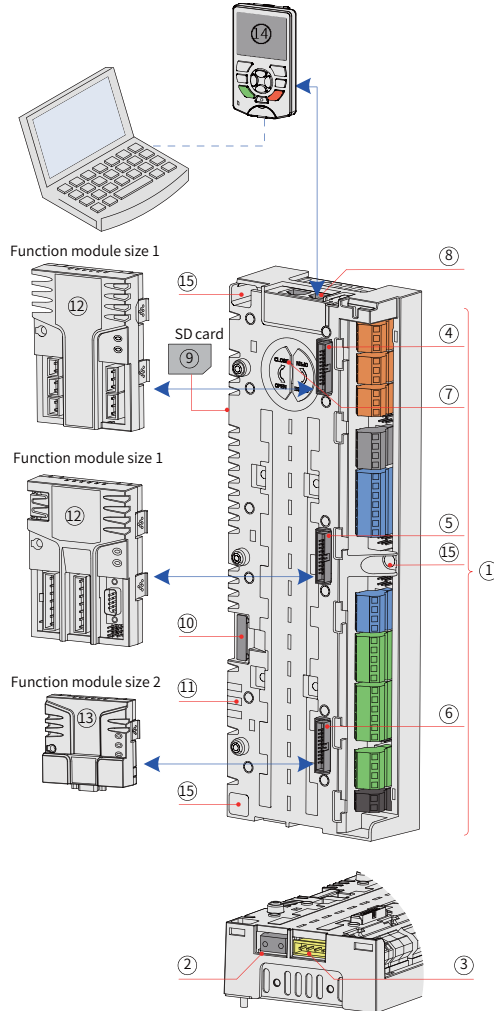


Figure 5-1 HCU control module

Table 5-1 Functions

No.	Component Name	Function
1	User terminal	Standard user input and output terminals for connection between the HCU and the drive
2	Optical fiber communication port	Optical fiber communication interface for communication between the HCU-50S and the drive
3	XSTO	Safety torque interruption input (model dependent)
4	SLOT1	Function module interfaces: SLOT1_1, SLOT1_2, and SLOT1_3
5	SLOT2	Function module interfaces: SLOT2_1, SLOT2_2, and SLOT2_3
6	SLOT3	Function module interface: SLOT3_1
7	Battery cover	Spare RTC battery cover. The RTC battery is non-rechargeable lithium battery which must be replaced regularly.
8	Smart operation panel (SOP) terminal	For the connection between the HCU and the SOP-20-880. The two RJ45 ports are identical and easy to cascade.
9	SD card	Standard 8 GB microSD memory card which can be flexibly inserted and removed
10	Function safety slot	Slot for connecting the function safety module
11	Indicator	Power, run, and fault indicators
12	Function module SIZE1	Function module, 105 mm x 73 mm x 24 mm
13	Function module SIZE2	Function module, 75 mm x 73 mm x 24 mm
14	SOP-20-880	Human-machine interaction (HMI)
15	Fixing hole	Holes for fixing the HCU; 3 in total

**NOTE**

- ◆ Function modules are directly installed in SLOT1, SLOT2, and SLOT3. The addresses are SLOT1_1, SLOT2_1, and SLOT3_1.
- ◆ SLOT1 and SLOT2 can be used with HOFM-30 and HESD-10 to achieve slot expansion.
- ◆ SLOT3 does not support slot expansion.
- ◆ A computer cannot directly connect to the RJ45 port on the HCU; otherwise, the computer might be damaged.

5.2 LED Indicator

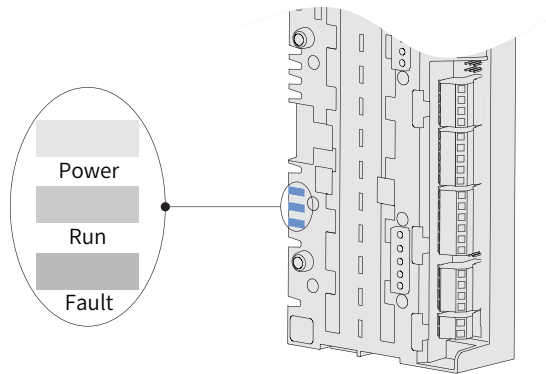


Figure 5-2 Position and definition of LED indicators

Table 5-2 Description

No.	Name	Status	Description
1	Power	Steady ON	The HCU power supply is normal.
		Off	The HCU is not energized or the power supply is faulty.
2	Run	Steady ON	The power module is running.
		Off	The power module is in the stop state.
3	Fault	Red light steady on	The system stops due to a fault.
		Yellow light steady on	An alarm occurs, but the system keeps running.
		Off	The system is normal.
		Flashing	The auxiliary power supply of the HCU is faulty. Check 24 VDC power supplies for short circuit or overload.
4	Fault, Run	Flashing at the same time	The HCU is connected with a PC or an SOP-20-880. The indicators will be off after flashing for 10s.

5.3 SD Memory Card

The HCU is equipped with an SD card for storing real-time data from all stages of the control module, therefore, facilitating monitoring and analysis of the power module. The data is stored on an SD card and analyzed by a qualified service technician.

5.4 Dimensions and Installation Instructions

5.4.1 Precautions

- Before installation, ensure that the cabinet has been in the power-off state for over

15 minutes and the external power supply is disconnected.

- Protect the HCU module from falling or impact to avoid damage to the module.
- Do not disassemble the HCU module; otherwise, the module may be damaged.
- Tighten the terminals with proper tightening torque.

 Danger	
	◆ Before installing or removing the HCU, ensure that the cabinet has been in the power-off state for more than 15 minutes and the HCU input power supply is disconnected to avoid damage to the HCU. ◆ Before installing or removing a function module on the HCU, ensure that the HCU input power supply is disconnected to avoid damage to the HCU or the function module.

1 Tools

1# Phillips screwdriver

2 Tightening torque of screws

The following tightening torque applies to the screws used for HCU installation.

Screw	Tightening Torque
M4	1.2 N·m

5.4.2 Dimensions

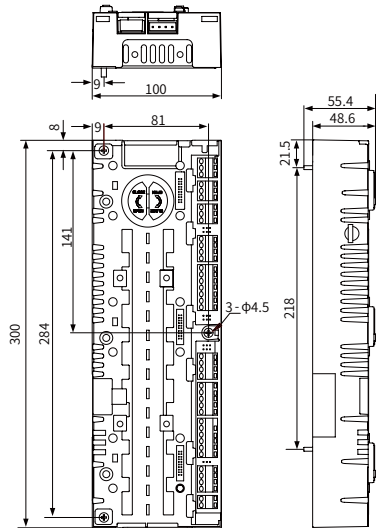


Figure 5-3 HCU dimensions (mm)

5.4.3 Clearance

To install the HCU, reserve certain clearance around the HCU. Install the HCU on a conductive metal surface and ensure that the entire conductive bottom of the HCU is in good contact with the surface.

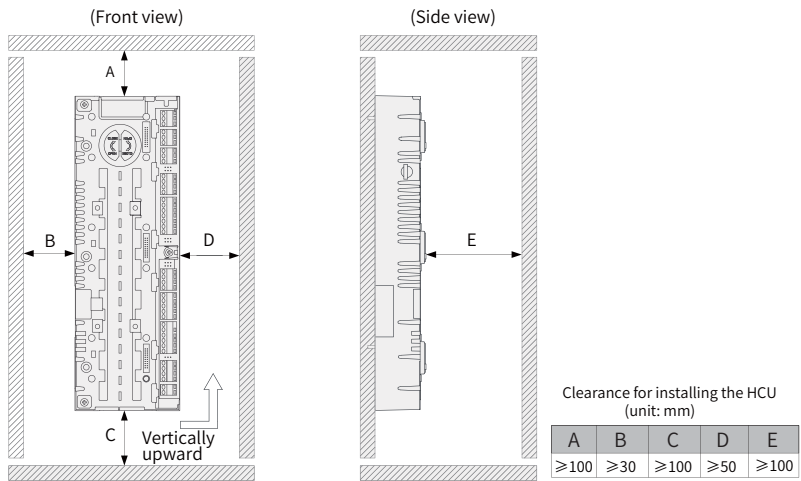


Figure 5-4 Installation clearance (mm)

5.4.4 Installation Procedure

- 1) Align the HCU vertically with the two positioning holes on the metal mounting plate.
- 2) Tighten the three HCU mounting M4 screws with the 1# Phillips screwdriver (already fixed in the HCU) as shown below.

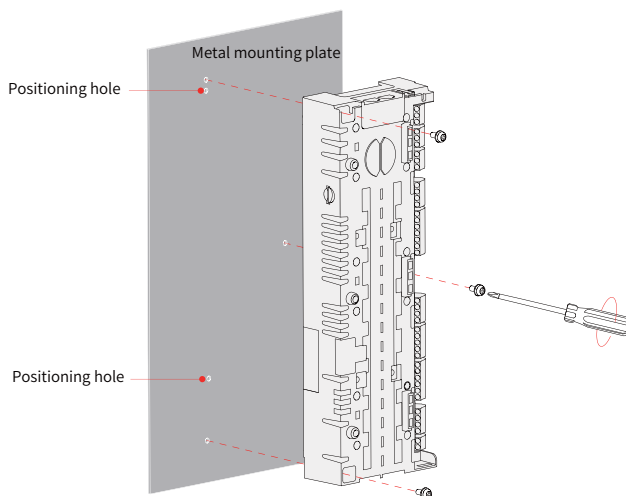


Figure 5-5 Installing the HCU

■ Grounding in the cabinet

The mounting plate of the HCU must be a bare metal plate and reliably grounded.

The HCU enclosure will be grounded to the cabinet enclosure through the screws on the mounting surface.

5.4.5 HCU Cover

The drive is equipped with the HCU cover by default. If the HCU terminals will be used for connection, remove the cover as shown in the following figure.



Figure 5-6 Removing the HCU cover

5.5 HCU Terminals

For all terminal circuits of the HCU, see ["Appendix Overview of All Terminals of the HCU"](#).

5.5.1 Standard Terminal

Table 5-3 HCU standard terminals

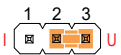
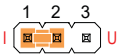
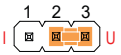
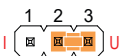
Name	Mark	Description
Input power supply	XPWR: 24 V input	Power supply input terminal of the HCU
Digital power supply output	XDPWR: 24 V digital output	Digital output power supply isolated from XPWR
Digital input	XDI: DI1–DI6, DIL	Input type: relay contact, NPN, or PNP
High-speed digital input	XHDIO: HDI1, HDI2	Input type: NPN or PNP
High-speed digital output	XHDIO: HDO1, HDO2	Output type: open collector
Analog output	XAO: AO1, AO2	Output type: current or voltage, selected by jumper
Analog input	XAI: AI1, AI2	Input type: current or voltage, selected by jumper
Relay output	XRO1, XRO2, XRO3	Relay output: NO, NC, and COM
InoLink communication	XCOMM	High speed RS485. The bus resistor is selected by jumper.
RJ45 terminal	X11, X12	For communication with the SOP-20-880. Because the two terminals are identical, they can be used for multiple HCU cascade. The connection cable is shorter than 3 m.

5.5.2 Terminal Detailed Description

Table 5-4 Detailed description of HCU control module terminals

Terminal No.	Terminal Name	Function	Cable Specification
XPWR: input power supply terminal			
1	GND	24 VDC $\pm$ 10%, 2.0 A	Two-core twisted pair cables are recommended. Cross-sectional area: 0.5–2.5 mm ²
2	24VI		
XDPWR: 24 V power supply output, DIL connection terminal			

Terminal No.	Terminal Name	Function	Cable Specification
1	24VD	It is used to provide power supply for DI, HDI, and HDO. 24 VDC $\pm$ 10%, 0.2A	Twisted pair, single core Cross-sectional area: 0.5–2.5 mm ² Note: The load of the 24VD terminal cannot exceed 0.2 A.
2	DGND	24 VDC grounding	
3	DICOM	DI common output. It can be connected to DGND through jumper J16.	
4	DIL	Digital interlock or common DI. Technical parameters are the same as the common DI.	
Jumper J16: Power Supply Selection			
 If terminals 1 and 2 are shorted, DI is powered by 24 VDC internal power supply.			
 If terminals 2 and 3 are shorted, DI is powered by external power supply.			
XDI: DI			
1	DI1	24 V logic level: "0" < 5 V; "1" > 15 V; Rin: 2.0 k Ω Input type: NPN/PNP, relay contact Hardware filter: 0.04 ms I _{max} : 15 mA	Single core cable Cross-sectional area: 0.5–2.5 mm ²
2	DI2		
3	DI3		
4	DI4		
5	DI5		
6	DI6		
XHDIO: HDIO input terminal			
1	OP	HDI common terminal	Cross-sectional area: 0.5–2.5 mm ² The shielded twisted pair cables are recommended. HDO and DGND twisted pair HDI and OP twisted pair
2	HDI1	Input type: NPN, PNP 24 V logic level: "0" < 5 V; "1" > 15 V; Rin: 2.0 k Ω	
3	HDI2	Input voltage range: 0–30 VDC Input frequency range: 0–100 kHz HDI maximum load: 15 mA (maximum load current)	
4	HDO1	Output type: OC Output frequency range: 0–100 kHz HDO maximum load: 20 mA (maximum load current)	
5	HDO2	Output voltage range: 0–26.4 VDC	
XAO: AO			

Terminal No.	Terminal Name	Function	Cable Specification
1	AO1	AO1 output range: 0–20 mA; Rload ≤ 500 Ω 0–10 V; Rload ≥ 10 kΩ AO2 output range: 0–20 mA; Rload ≤ 500 Ω 0–10 V; Rload ≥ 10 kΩ Resolution: 11 bit + sign bit Accuracy: 2% full scale range	Cross-sectional area: 0.5–2.5 mm ² The shielded twisted pair cables are recommended. AO1 and AO1_AGND twisted pair AO2 and AO2_AGND twisted pair
2	AO1_AGND		
3	AO2		
4	AO2_AGND		
Jumper J19: AI1 Current or Voltage Signal Selection			
 AO1 current signal output by shorting terminals 1 and 2			
 AO1 voltage signal output by shorting terminals 2 and 3			
Jumper J18: AO2 Current or Voltage Signal Selection			
 AO2 current signal output by shorting terminal 1 and 2			
 AO2 voltage signal output by shorting terminals 2 and 3			
XAI: AI			
1	AI1-	Current input: -20 mA to +20mA; Rin: 500 Ω Voltage input: -10 V to +10 V; Rin: 200 kΩ	Cross-sectional area: 0.5–2.5 mm ² Use two two-core twisted-pair shielded cables when using two AIs. Use one four-core twisted pair shielded cable for one AI when reference voltage is provided.
2	AI1+		
3	AI2-		
4	AI2+	Differential input range: - 30 V to +30 V Sample interval per channel: 0.25 ms Hardware filter: 0.25 ms Resolution: 11 bit + sign bit Accuracy: 1% full scale range	
5	+10V	+10 V: +10 V ± 1%	
6	-10V	-10 V: -10V ± 1%	
7	AGND	Rload 1–10 kΩ	
Jumper J14: AI1 Current or Voltage Signal Input Selection			
 AI1 current signal input by shorting terminals 1 and 2			
 AI1 voltage signal input by shorting terminals 2 and 3			
Jumper J15: AO2 Current or Voltage Signal Selection			
 AI2 current signal input by shorting terminals 1 and 2			

Terminal No.	Terminal Name	Function	Cable Specification
1 2 3 AI2 voltage signal input by shorting terminals 2 and 3			
XCOMM: InoLink RS485 Terminal			
1	SHIELD	RS485 bus, 5 V standard level Bus resistor: 124 Ω Maximum communication speed: 5 Mbit/s Maximum number of nodes: 32 (without repeater) Maximum transmission distance: 40 m	Four-core shielded twisted pair cable Cross-sectional area: 0.5–2.5 mm ² When used for InoLink, the maximum number of nodes is 16, the maximum speed is 4 Mbit/s, and the maximum cable length is 40 m.
2	C485+		
3	C485-		
4	CGND		
Jumpers J10 and J12: RS485 Bus Termination Resistor Selection (J10 and J12 Must Be in the Same Status.)			
1 2 3 If terminals 1 and 2 are shorted, the termination resistor is connected.			
1 2 3 If terminals 2 and 3 are shorted, the termination resistor is disconnected.			
XRO1: output terminal of relay 1			
1	RO1_NO	Output type: passive NO and NC contacts Contact parameters: 250 VAC/30 VDC, 2 A	Single core cable Cross-sectional area: 0.5–2.5 mm ²
2	RO1_COM		
3	RO1_NC		
XRO2: output terminal of relay 2			
1	RO2_NO	Output type: passive NO and NC contacts Contact parameters: 250 VAC/30 VDC, 2 A	Single core cable Cross-sectional area: 0.5–2.5 mm ²
2	RO2_COM		
3	RO2_NC		
XRO3: output terminal of relay 3			
1	RO3_NO	Output type: passive NO and NC contacts Contact parameters: 250 VAC/30 VDC, 2 A	Single core cable Cross-sectional area: 0.5–2.5 mm ²
2	RO3_COM		
3	RO3_NC		
X11, X12: RS485 terminal for communication with the SOP-20-880			
1, 2, 7	NC	RS485 bus, 5 V standard level Bus resistor: 124 Ω Maximum communication speed: 4 Mbit/s Maximum number of nodes: 32 (without repeater) Maximum transmission distance: 100 m	Standard network cable
3, 8	GND3		
4	A		
5	B		
6	15V3	15V3: 15 V ± 15%	

Terminal No.	Terminal Name	Function	Cable Specification
Jumpers J12 and J15: Bus Resistor Selection (J12 and J15 Must Be in the Same Status.)			
1 2 3  If terminals 1 and 2 are shorted, connect the resistor.			
1 2 3  If terminals 2 and 3 are shorted, disconnect the resistor.			
VR, VT: transceiver			
1	VR	VR optical fiber receiving terminal	Optical fiber type: plastic optical fiber (POF)
2	VT	VT optical fiber transmitting terminal	
XSTO: safety torque interruption terminal (reserved)			
1	STO24V	STO1 and STO2 for safety torque interruption input of the drive: 24 V ± 10%	Four-core shielded cable Cross-sectional area: 0.5–2.5 mm ²
2	STOGND		
3	STO1		
4	STO2		

5.6 HCU Applications

5.6.1 Function Modules

The HCU can be used with other function modules to expand its functions, as described in the following table.

Table 5-5 Function modules used with the HCU

No.	Name	Model	Function Description	Connection Method	Dimensions
1	Encoder detection module	HPG-10	HTL incremental encoder signal detection	SLOT	105 x 73 x 24
		HPG-40	Resolver encoder signal detection	SLOT	105 x 73 x 24
		HPG-50	TTL incremental encoder signal detection	SLOT	105 x 73 x 24
2	I/O module	HIO-10	Two AIs Two AOs Two DIos One relay output	SLOT	105 x 73 x 24
3	PROFIBUS DP module	HDP-10	PROFIBUS-DP bus adaptation	SLOT	75 x 73 x 24
4	CANbus module	HCAN-10	CANopen bus adaptation	SLOT	75 x 73 x 24
5	MODBUS RTU module	HMBA-10	MODBUS RTU bus adaptation	SLOT	75 x 73 x 24

No.	Name	Model	Function Description	Connection Method	Dimensions
6	EtherNet module	HETN-10	EtherNet commissioning module	SLOT	75 x 73 x 24
7	PROFINET I/O module	HPFN-10	PROFINET I/O industrial Ethernet	SLOT	75 x 73 x 24
8	MODBUS TCP module	HMBT-10	MODBUS TCP industrial Ethernet	SLOT	75 x 73 x 24
9	Optical fiber expansion module	HOFM-10	One pair of 50 MB optical fiber cables	SLOT	75 x 73 x 24
		HOFM-30	Three-pair of 50 MB optical fiber cables	SLOT	75 x 73 x 24
10	Parallel control module	HPCU-40	Supports two to four parallel modules.	Optical fiber	232 x 86 x 40
11	Expansion module	HESD-10	One SLOT expansion slot	Optical fiber	105 x 75 x 70
12	Synchronization voltage detection module	HSVM-10	AC voltage detection	Optical fiber	170 x 122 x 35
		HSVM-20	DC voltage detection	Optical fiber	170 x 122 x 35
13	SOP	SOP-20-880	HMI	Network cable	73 x 125 x 25
14	Optical fiber routing control module	HOFR-50	Supports data exchange among five HCU control modules.	Optical fiber	232 x 86 x 40
15	Pulse-by-pulse current limit module	HCBC-A0	Pulse-by-pulse current limit control for parallel power modules	Optical fiber	232 x 86 x 40

**NOTE**

- ◆ The HOFM-30 can only be installed in SLOT1 or SLOT2.
- ◆ It is recommended that the HDP-10 be installed in SLOT3.

5.6.2 SLOT Expansion

- Different function modules are available and can be installed directly in the SLOTS of the HCU.
- The HCU has only three SLOTS. When more than three function modules are needed, install HOFM and HESD expansion modules. Each HESD can connect to one function module.

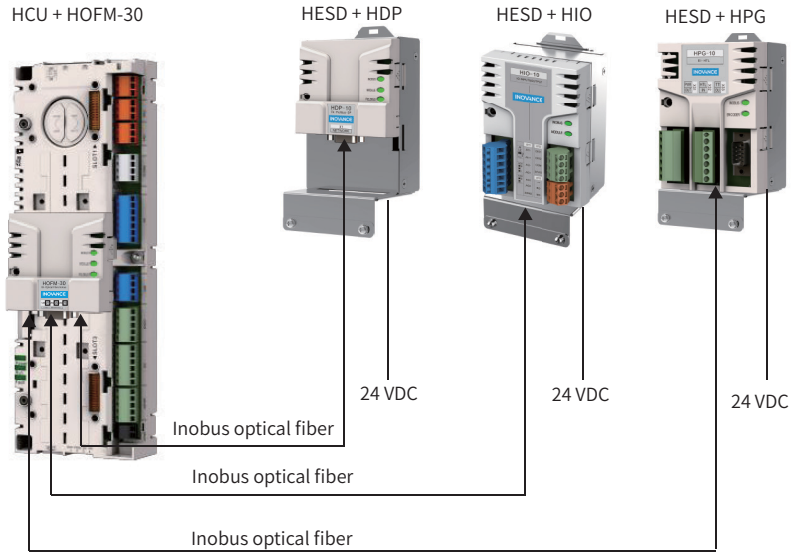


Figure 5-7 HESD wiring example



NOTE

- ◆ Function modules can be directly installed in SLOT1, SLOT2 and SLOT3. The addresses are A1, B1, and C1, respectively.
- ◆ The HOFM-30 module can be installed in SLOT1 and SLOT2 to expand two slots to six slots. The addresses are SLOT1_1, SLOT1_2, SLOT1_3, SLOT2_1, SLOT2_2, and SLOT2_3, respectively;
- ◆ SLOT3 does not support slot expansion.
- ◆ After connected to the HCU, the HESD module cannot be connected to the HOFM optical fiber expansion module.

5.6.3 Temperature Measurement with AI and AO

AI and AO can be used together to detect the signal of the PT100 temperature sensor, which is generally for detecting motor temperature. One PT100 or one to three PT100s in series are supported. Constant current output is selected for AO and voltage signal input is selected for AI.

Do not ground both ends of the cable shield. Ground one end and suspend the other end, or ground one end and ground the other end after passing through a capacitor in series connection.

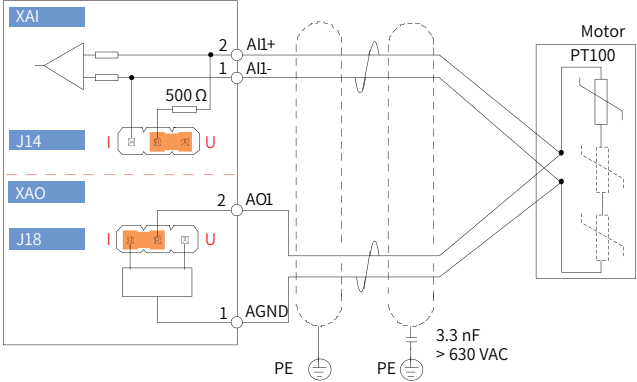


Figure 5-8 Temperature measurement with AI and AC

5.6.4 InoLink Communication Bus

When several drives in the system need to exchange information with each other, use an InoLink bus.

The specifications of the InoLink bus are as follows:

Baud rate: 5 Mbit/s

Maximum number of nodes: 16

Use shielded twisted pair cables for wiring. To achieve the best communication quality and prevent electromagnetic interference, it is recommended to use high quality cables, such as PROFIBUS cables. Keep the cable as short as possible with the link length no longer than 40 m. Do not entangle the cables and keep the cable away from power cables.

If an HCU is at the end of the InoLink link, install a termination resistor, and turn the J10 and J12 jumpers to the ON position.

The RS485 link topology of the InoLink bus is as follows.

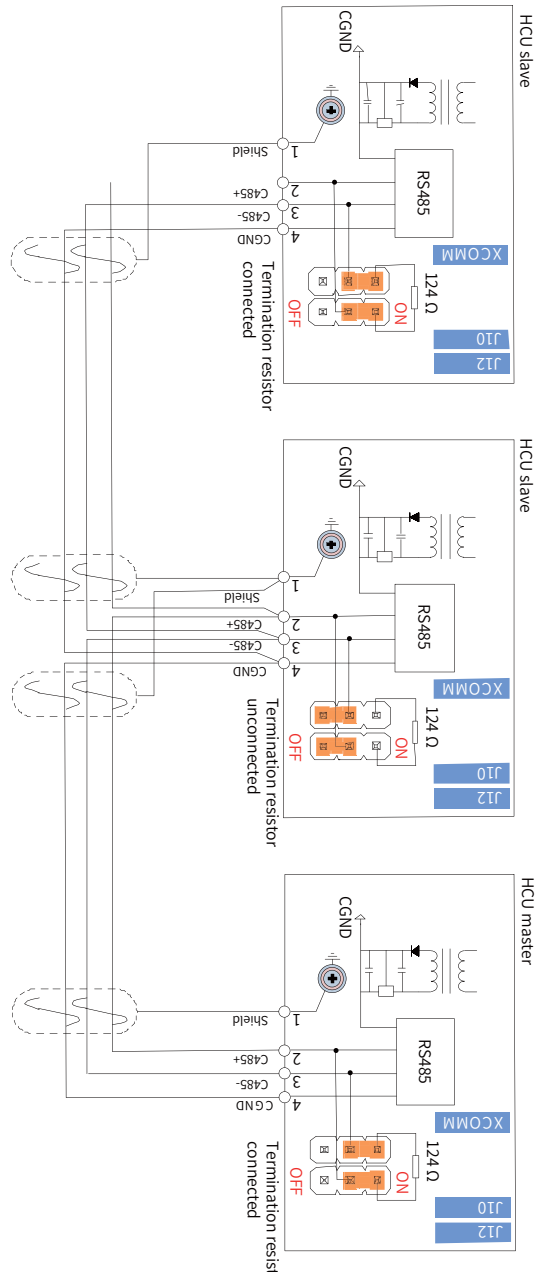


Figure 5-9 Application example

5.7 HPCU Parallel Control Module

The HPCU is the parallel control module. After receiving driving and control signals from the HCU, the HPCU transmits them to each drive. In addition, after the HPCU collects the current, voltage, status, and other information reported by each drive, it forwards them to the HCU. The HPCU also controls synchronization, current sharing, reset, start, and stop of all paralleled drives.

5.7.1 HPCU Standard Terminals

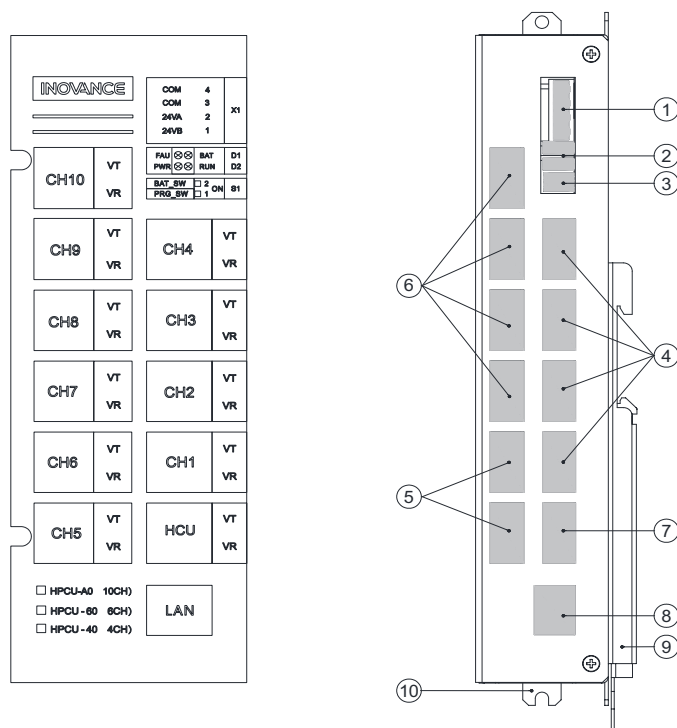


Figure 5-10 HPCU-40/60/A0 (unit: mm)

Table 5-6 HPCU functions

No.	Item	Terminal Name	Terminal Description	Function Description
①	Power supply X1	COM 4	24 V GND	External power supply of the HPCU X1 terminal: 5.08 mm pitch, 4-pin black pluggable terminal Cross-sectional area of twisted pair cables: 0.5–2.5 mm ²
		COM 3	24 V GND	
		24 VA 2	24 V+	
		24 VB 1	24 V+	

No.	Item	Terminal Name	Terminal Description	Function Description
②	LED indicator	PWR	Green light steady on	The HPCU power supply is normal.
			Off	The HPCU is not energized or the power supply has failed.
		RUN	Green light steady on	The power module is running.
			Off	The power module is in the stop state.
		FAU	Red light steady on	A system fault occurs.
			Off	The system is normal.
		BAT	Reserved	-
			Reserved	-
③	DIP switch S1	BAT_SW	Reserved	-
		PRG_SW	Reserved	-
④	Optical fiber transceiver	CH1 to CH4	Channel 1 to channel 4 of the parallel module	VT: 50 MB, used to transmit optical fiber communication signals. VR: 50 MB, used to receive optical fiber communication signals. Optical fiber type: POF The HPCU-40 contains channels CH1 to CH4. The HPCU-60 contains channels CH1 to CH6. The HPCU-A0 contains channels CH1 to CH10.
⑤		CH5 to CH6	Channel 5 to channel 6 of the parallel module	
⑥		CH7 to CH10	Channel 7 to channel 10 of the parallel module	
⑦		HCU	Communication between the HPCU and the HCU	
⑧	-	LAN	Commissioning terminal	Connection with the PC
⑨	Guide rail groove	-	For guide rail installation	-
⑩	Mounting hole	-	Four holes for installation	-

5.7.2 LED Indicators

Table 5-7 Description

No.	Name	Status	Function
1	PWR	Green light steady on	The HPCU power supply is normal.
		Off	The HPCU is not energized or the power supply has failed.
2	RUN	Green light steady on	The drive is running.
		Off	The drive is in the stop state.
3	FAU	Flashing in red	A system fault occurs.
		Off	The system is normal.
4	BAT	Red light steady on	A battery undervoltage fault occurs.
		Off	The battery is normal.

5.7.3 Electrical Connection of the HPCU

The MD880 series AC drive supports the parallel mode with two cabinets. In the parallel mode, an HPCU module is required. The following figure describes electrical connection of the cabinets and the HPCU.

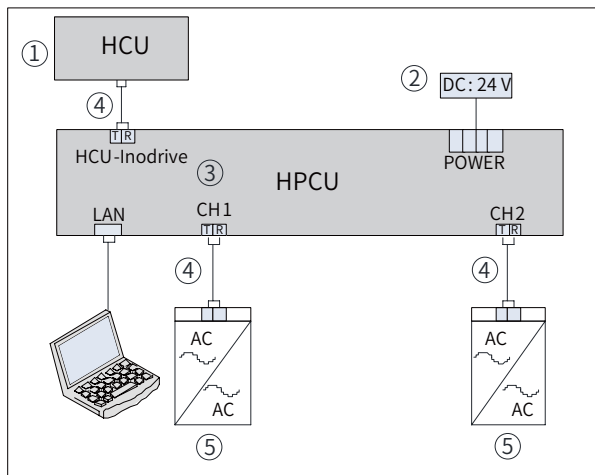


Figure 5-11 Electrical connection

Table 5-8 Components for the HPCU electrical connection

No.	Name
1	HCU control module
2	24 VDC external power supply

3	HPCU parallel control module
4	Optical fiber communication port
5	Drive

6 Maintenance

6.1 Routine Maintenance

Because the drive is basically composed of electrical components, you must maintain or repair the electrical components that have been worn out. To keep the drive in the specified state, clean the drive periodically to remove the dust and pollutants.

Observe the following points when cleaning.

1 Dust

- The dust inside the drive must be cleaned regularly and thoroughly by qualified professionals in compliance with relevant safety regulations.
- Clean the dust at least once a year or at a shorter interval according to different usage environments.
- A brush and vacuum cleaner must be used to clean the dust. For the positions that cannot be easily reached, use dry compressed air (maximum 1 bar) for cleaning.

2 Ventilation

- Keep the air vent of the cabinet unobstructed and ensure that the fan runs properly.

6.2 Periodic Maintenance

Before Maintenance and Inspection	
 DANGER	◆ Before maintenance, power off the drive, wait for at least 15 minutes, and ensure that the bus voltage of the drive is lower than 36 VDC. Otherwise, the residual electric charge on the capacitor will cause personal injury. ◆ When the external power supply is connected, hazardous voltage is still present in the drive and the cabinet even if the main breaker is disconnected. ◆ Be aware of the possibly inertia rotation of the fan.

During Maintenance and Inspection



DANGER

- ◆ Strictly obey correct operating instructions.
- ◆ Before maintaining and inspecting the drive, ensure that the drive has been powered off and became cool.
- ◆ Mount and wire the device by complying with the national standards, industry standards, and local safety codes.
- ◆ Residual voltage is still present in the cabinet when you turn off the input breaker switch. Before maintenance and inspection, check and ensure that no voltage exists.
- ◆ The tools you use must satisfy the withstanding voltage requirement and the enclosure must be well grounded.
- ◆ Be careful when measuring components inside the cabinet. Prevent meter leads from shorting together or from touching other terminals.
- ◆ Only qualified personnel can install, inspect, and maintain the drive.

1 Required tools

The following tools are required during repair and replacement:

- Wrench or socket wrench with width across flats 6
- Wrench or socket wrench with width across flats 8
- Wrench or socket wrench with width across flats 10
- Wrench or socket wrench with width across flats 12
- Torque wrench
- Phillips screwdriver with the size 1/2
- A socket wrench kit with two extension rods is recommended.

2 Service life of components

To ensure normal use of the drive for long time, regularly maintain and inspect the electronic components of the drive according to their service life. The service life of the electronic components depends on the operating environment. The following tables lists the replacement interval of these components, which is for your reference.

Table 6-1 Service life of components

Name	Standard Service Life
Master fan	8 years
Electrolytic capacitor	10 years
Fan in the control room	10 years

3 Cable terminals and fasteners

Regularly check the cable terminals and screw terminals. If they are loose, tighten them. Check for wiring faults, and immediately replace damaged parts.



NOTE

- ◆ The actual maintenance period depends on the installation environment and operating conditions of the device.

6.3 Component Replacement

This section describes the components that need to be replaced at maintenance and inspection. The other components are not subject to wear normally and thus are not described.

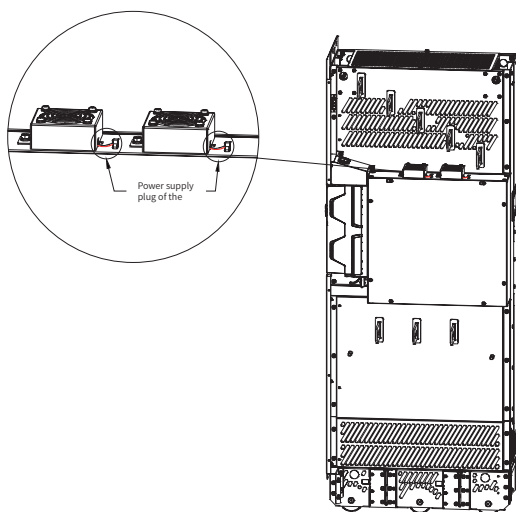
Observe the following safety precautions before maintenance and inspection.

 Danger	
	◆ Be aware that the drive is operated with high voltage. ◆ Before all device connections, ensure that the device is powered off. ◆ Before maintenance, power off the drive, wait for at least 15 minutes, and ensure that the drive voltage is lower than 36 VDC. Otherwise, the residual charge on the capacitor will cause personal injury. ◆ Only trained and qualified personnel can perform maintenance and inspection. Failure to comply may result in severe personal injury or death or severe property loss. ◆ Because voltage of the external power supply may exist, be careful when maintaining and inspecting the open device. Even when the motor does not rotate, the power supply and terminals may be energized. ◆ Some devices are heavy or the upper parts of some devices are heavy. Therefore, the devices must be handled with care by trained and qualified personnel. If they are hoisted or transported improperly, severe personal injury or even death or severe property loss may result.

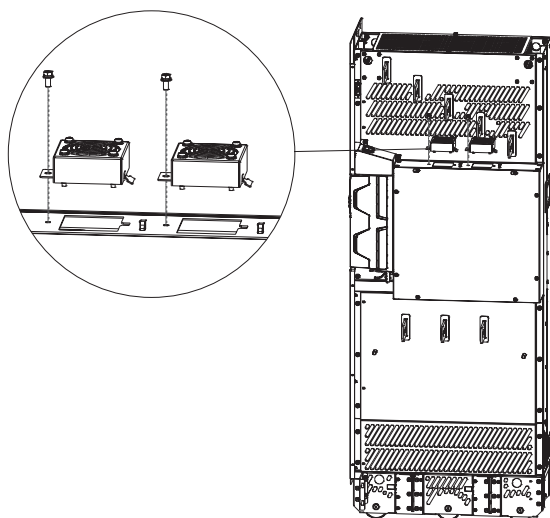
6.3.1 Replacing the Fan in the Module Control Room

1 Replace the fan in the module control room.

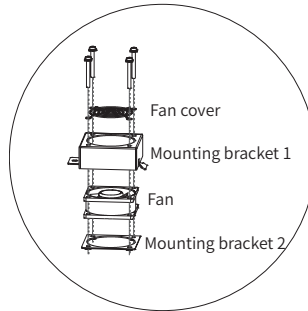
- 1) Remove the power supply plug of the cool fan.



- 2) Use the screwdriver to remove the two M5 screws, and then take out the fan.



- 3) Use the screwdriver to remove the eight M4 screws on the fan to detach it.



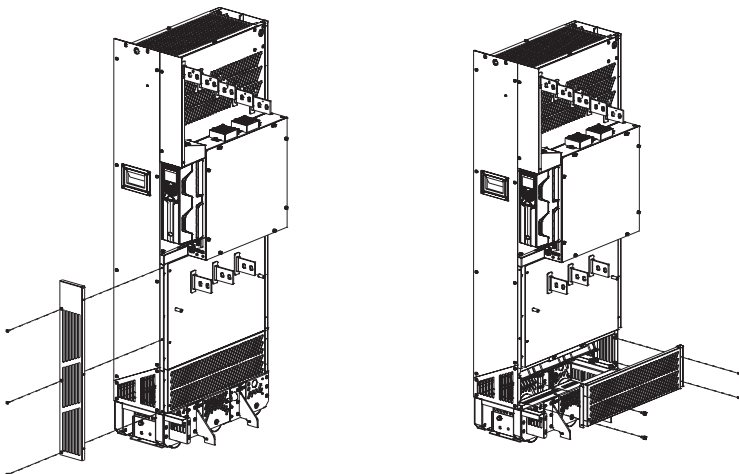
- 4) Install a new fan of the same specification in the reverse order.

6.3.2 Replacing the Master Fan

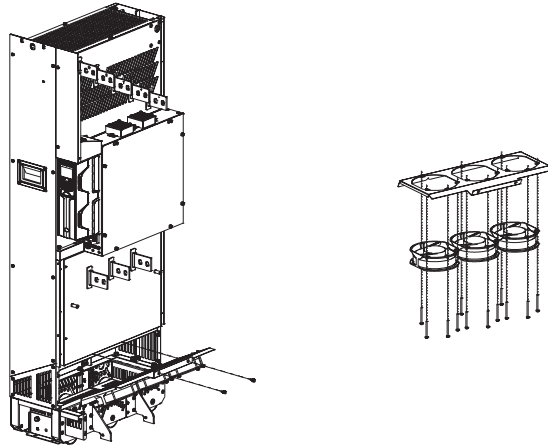
1 Replace the master fan.

Steps:

- 1) Use the screwdriver to remove the three M4 screws, and then take out the lower baffle plate.
- 2) Use the screwdriver to remove the four M6 screws, and then take out the side baffle plate.



- 3) Use the screwdriver to remove the two M5 screws, remove the power supply plug of the fan, and then take out the fan.
- 4) Use the screwdriver to remove the 12 M4 screws on the fan to detach it.



- 5) Install a new fan of the same specification in the reverse order.



- ◆ The direction of the airflow is from bottom to top. Install the fan with the upward wind direction.
- ◆ When installing the fan, ensure that the power supply cable of the fan will not be squeezed by the fan.

6.3.3 Replacing the Braking Module

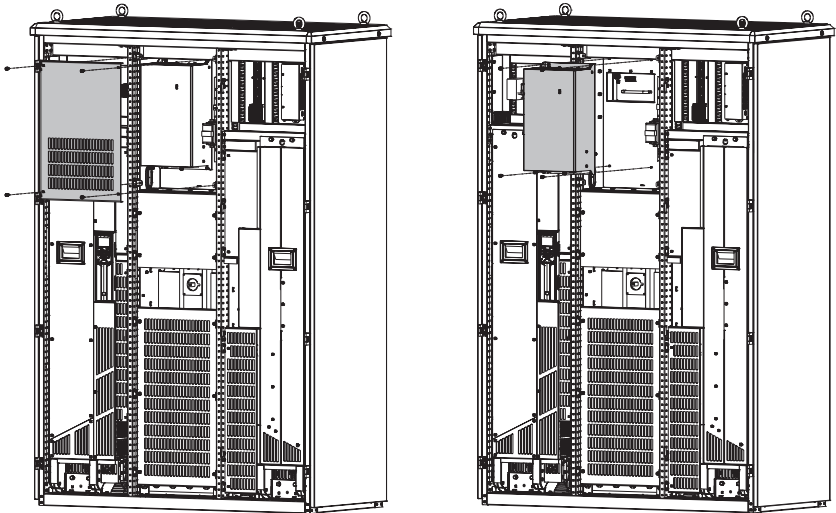


Figure 6-12 Braking module maintenance

- 1) Disconnect the AC power supply of the drive cabinet and ensure that the equipment is voltage-free.

- 2) Open the cabinet door.
- 3) Use the screwdriver to remove the four M6 screws, and then take out the polycarbonate sheet.
- 4) Unplug the top terminal of the braking module, and then remove the cable at the bottom of the braking module.
- 5) Use the screwdriver to remove the four M6 screws, and then take out the braking module.
- 6) Install a new braking module of the same specification in the reverse order.

6.3.4 Replacing the Cabinet Fan

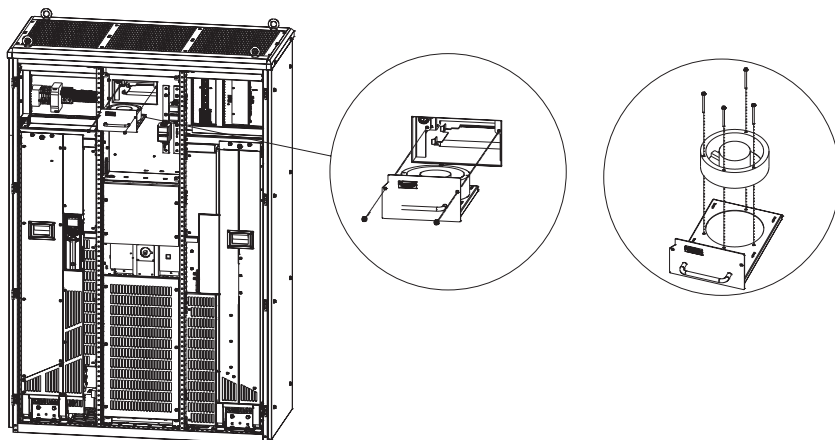


Figure 6-13 Maintenance of the cabinet fan

Steps:

- 1) Remove the braking module.
- 2) Remove the power supply terminal of the fan.
- 3) Use the screwdriver to remove the two M6 screws, and then take out the fan.
- 4) Use the screwdriver to remove the four M4 screws on the fan to detach it.
- 5) Install a new fan of the same specification in the reverse order.
- 6) Reinstall the braking module.

6.3.5 Replacing the Fuse

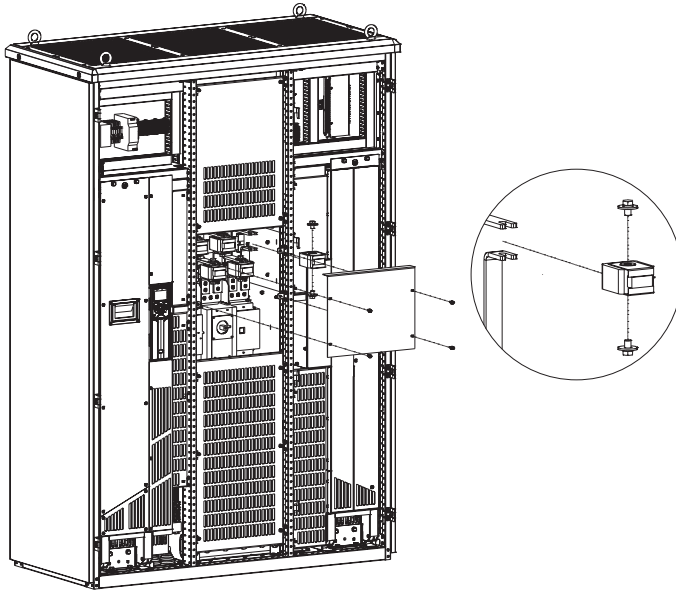


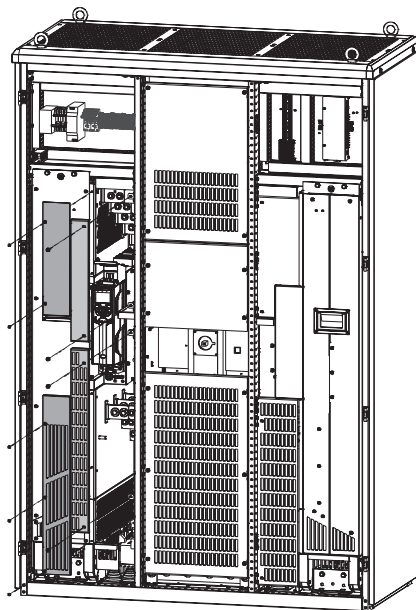
Table 6-2 Fuse maintenance

- 1) Disconnect the AC power supply of the drive cabinet and ensure that the equipment is voltage-free.
- 2) Open the cabinet door.
- 3) Use the screwdriver to remove the four M6 screws, and then take out the polycarbonate sheet.
- 4) Loosen the fuse screw and pull out the fuse together with the screw.
Note: do not loosen the screw completely to prevent the screw from falling into the cabinet.
- 5) Remove the screw and check the condition of the fuse. If the fuse burns out, replace all fuses and tighten the nut. The maximum tightening torque of the nut is $35 \text{ N} \cdot \text{m}$.
- 6) Install the polycarbonate sheet in the reverse order and close the cabinet door.

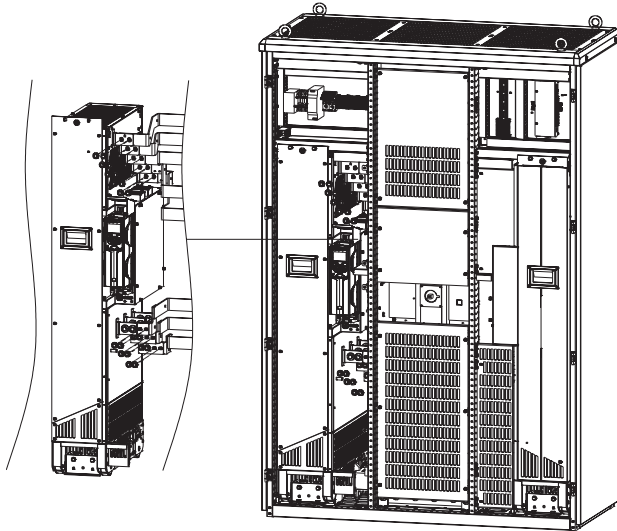
6.3.6 Replacing the AC Drive Module

- 1) Disconnect the AC power supply of the drive cabinet and ensure that the equipment is voltage-free.
- 2) Open the cabinet door.
- 3) Use the screwdriver to remove the five M4 screws, and then take out the upper cover and lower cover of the module.

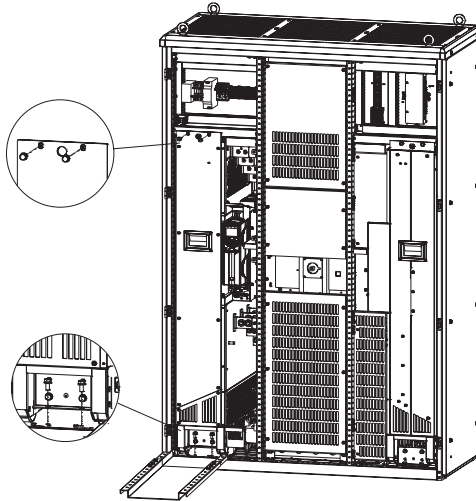
- 4) Use the screwdriver to remove the four M6 screws, and then take out the polycarbonate sheet.



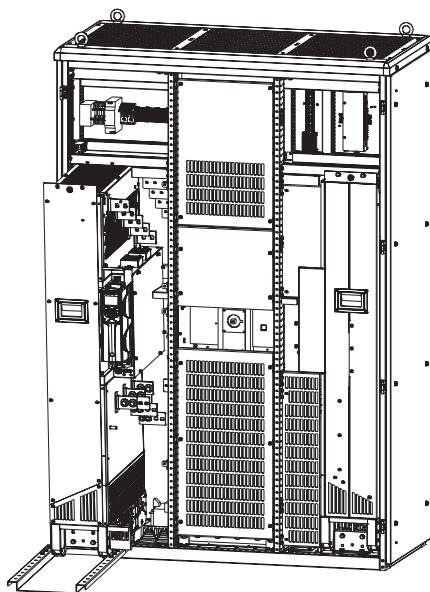
- 5) Use the screwdriver to remove the 16 M8 screws, and then disconnect the copper busbar of the module from that of the cabinet.
- 6) Unplug the optical fiber cables in front of the module.



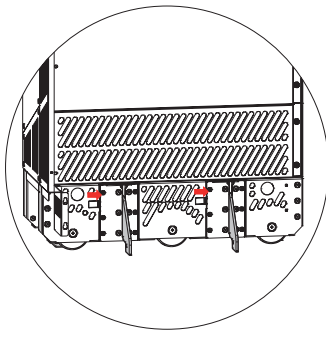
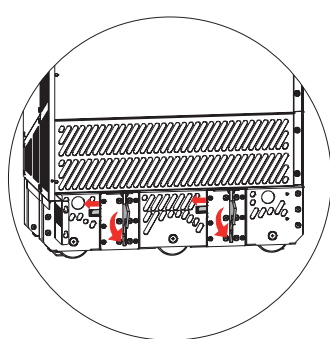
- 7) Remove the two M8 screws that secure the bottom of the module to the base of the cabinet, and move the module bracket upward.



- 8) Pull the rail from the cabinet base to attach the base hook to the rail hole.
- 9) Remove the two M8 screws that secure the top of the module to the cabinet frame.
- 10) Carefully pull the module out of the cabinet along the rail.

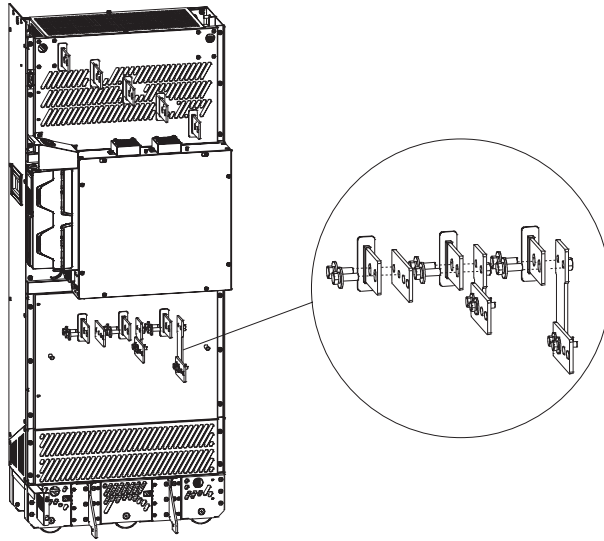


11) Release the anti-tipping supports.



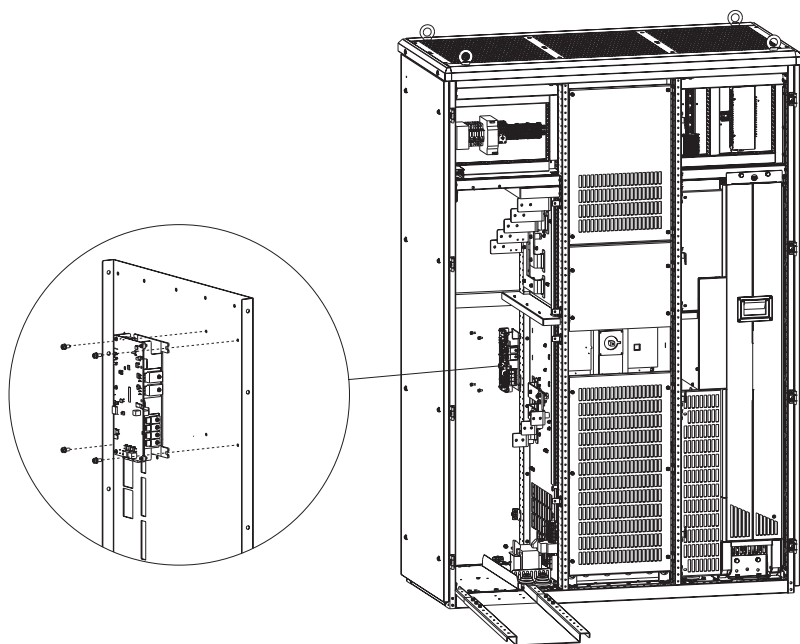
- Switch the buckles of the supports to the left.
- Make the supports flip 90° to touch the ground.
- Loosen the buckles and insert them into the support limit holes to the right.

12) Remove the six M10 screws, and then take out the copper busbar of the module.



- 13) Install a new module in the reverse order with care to your fingers. Use one foot to apply constant pressure to the base of the module to prevent the module from falling backwards.
- 14) Reconnect the optical fiber cable and tighten the cover.
- 15) Remove the mounting rail and close the cabinet door.

6.3.7 Replacing the Power Supply Board of the Fan



- 1) Remove the module at the left side of the cabinet.
- 2) Pull out the terminal of the fan power supply.
- 3) Use the screwdriver to remove the four M5 screws on the power supply, and then take out the power supply.
- 4) Install a new power supply in the reverse order.
- 5) Re-connect the power supply terminal.
- 6) Reinstall the module and close the cabinet door.

**NOTE**

◆ Be careful not to drop the screws inside the cabinet.

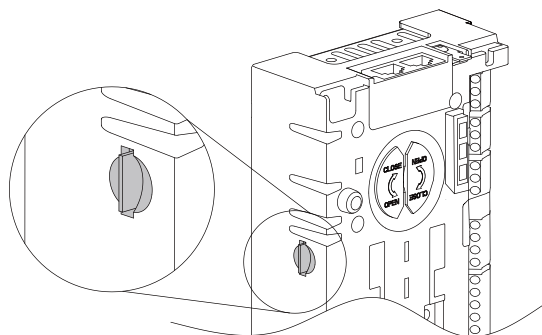
6.3.8 Maintaining the HCU Control Module

1 Replace the memory card.

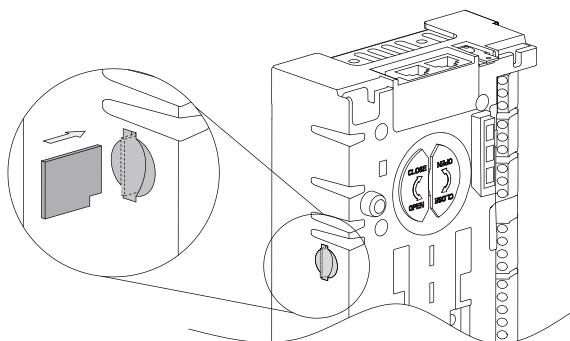
After replacing the HCU control module, you can transfer the memory card from the faulty module to the new module to retain the existing parameter settings.

Steps:

- 1) Press the SD memory card to eject it and pull it straight out of the faulty module.



- 2) Push the SD memory card in the direction as shown below into the card holder of a new module.

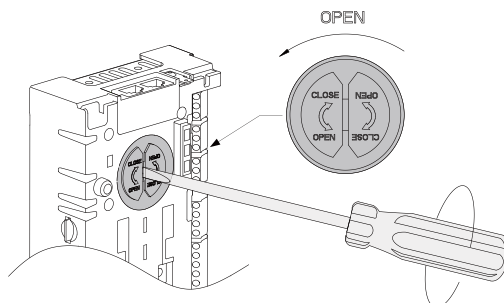


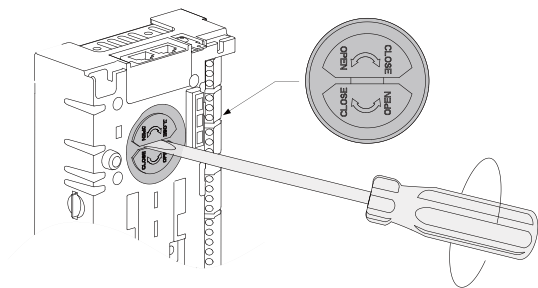
- 3) Ensure that the the SD memory card is pushed into position. Otherwise, an abnormality will occur due to poor contact.

2 Replacing the Battery

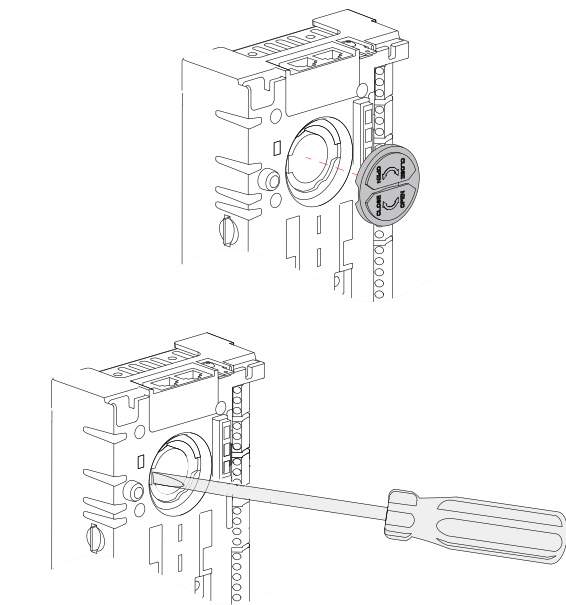
Steps:

- 1) Use a 2# slotted screwdriver to turn the battery cover 90° counterclockwise to open the cover.

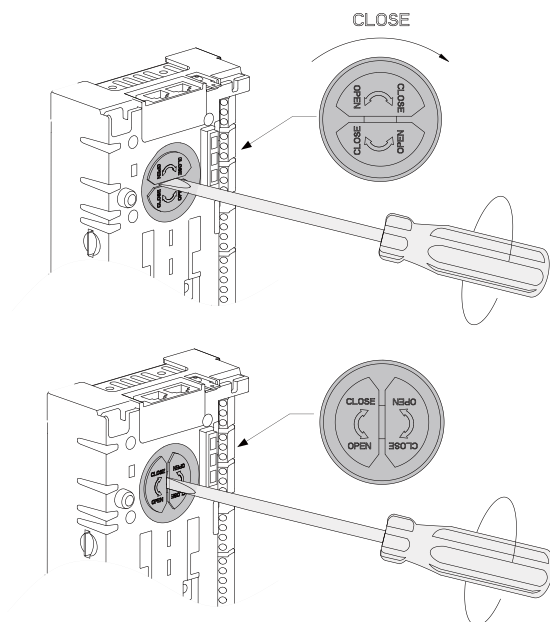




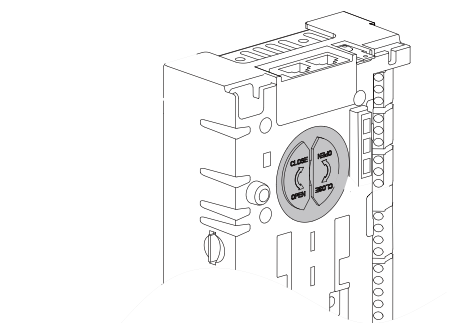
- 2) Remove the cover. Press one side of the battery with the screwdriver, remove the battery, and then install a new battery.



- 3) Close the cover and turn it 90° clockwise to secure it.



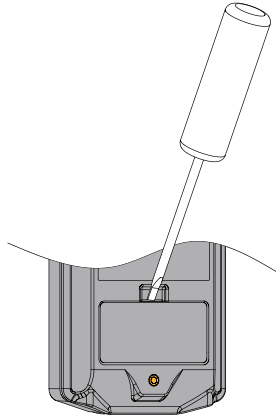
- 4) Dispose of the used battery in accordance with local disposal rules or applicable laws.



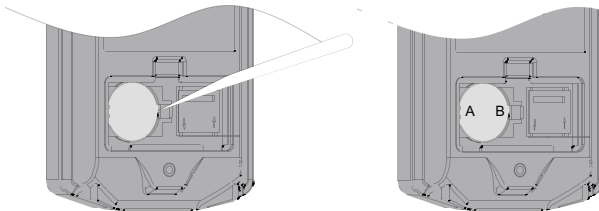
6.3.9 Replacing the Battery of the SOP-20-880

Steps:

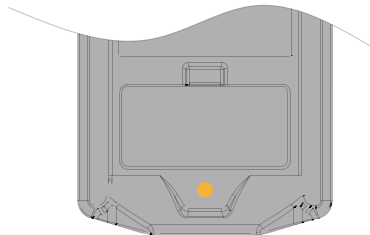
- 1) Use a tool or finger to remove the battery cover.



- 2) Use the tweezers or a slotted screwdriver to take out the battery.



- 3) Place the battery into the clip (A side) first and then press the other end (B side) of the battery.
- 4) Use a tool or finger to put the battery cover back.



7 Optional Parts

7.1 Function Expansion Module

For details about the function expansion modules, see "[5.6.1 Function Modules](#)". For details about how to use the modules, see their user guides.

7.2 Selection of Braking Units

For MD880 series high-performance 690 VAC AC drives (single drive system), braking modules are recommended to recover the energy generated during braking. For selections and operations, see *MD880-61 Series Single-Phase Braking Unit User Guide* (19011170).

7.3 Outline and Mounting Dimensions of Braking Units

■ Outline dimensions of MD880-61M series braking units (unit: mm)

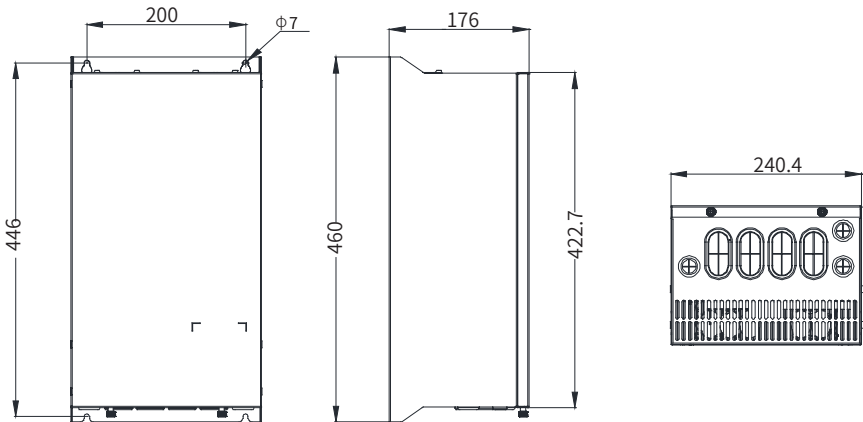


Figure 7-14 Outline dimensions of MD880-61M series braking units (unit: mm)

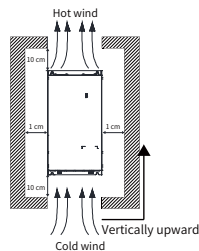


Figure 7-15 Mounting dimensions of the MD880-61M series braking units (unit: mm)

**NOTE**

- ◆ For details on how to install and use the MD880-61M series braking units, see *MD880-61M Series Braking Unit User Guide*.

7.4 Guide Rail for the AC Drive Module

During installation, replacement, or maintenance, to push the S12 AC drive module into or pull out the drive from the cabinet conveniently, you can use the guide rail. For details, see ["6.3.6 Replacing the AC Drive Module"](#).

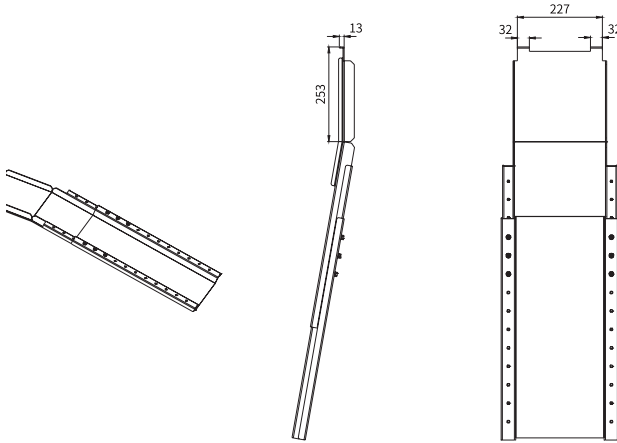


Figure 7-16 Dimensions of the guide rail

Table 7-3 Model of the guide rail

Model	Applicable Drive
mounting-rail-2	S12 AC drive module

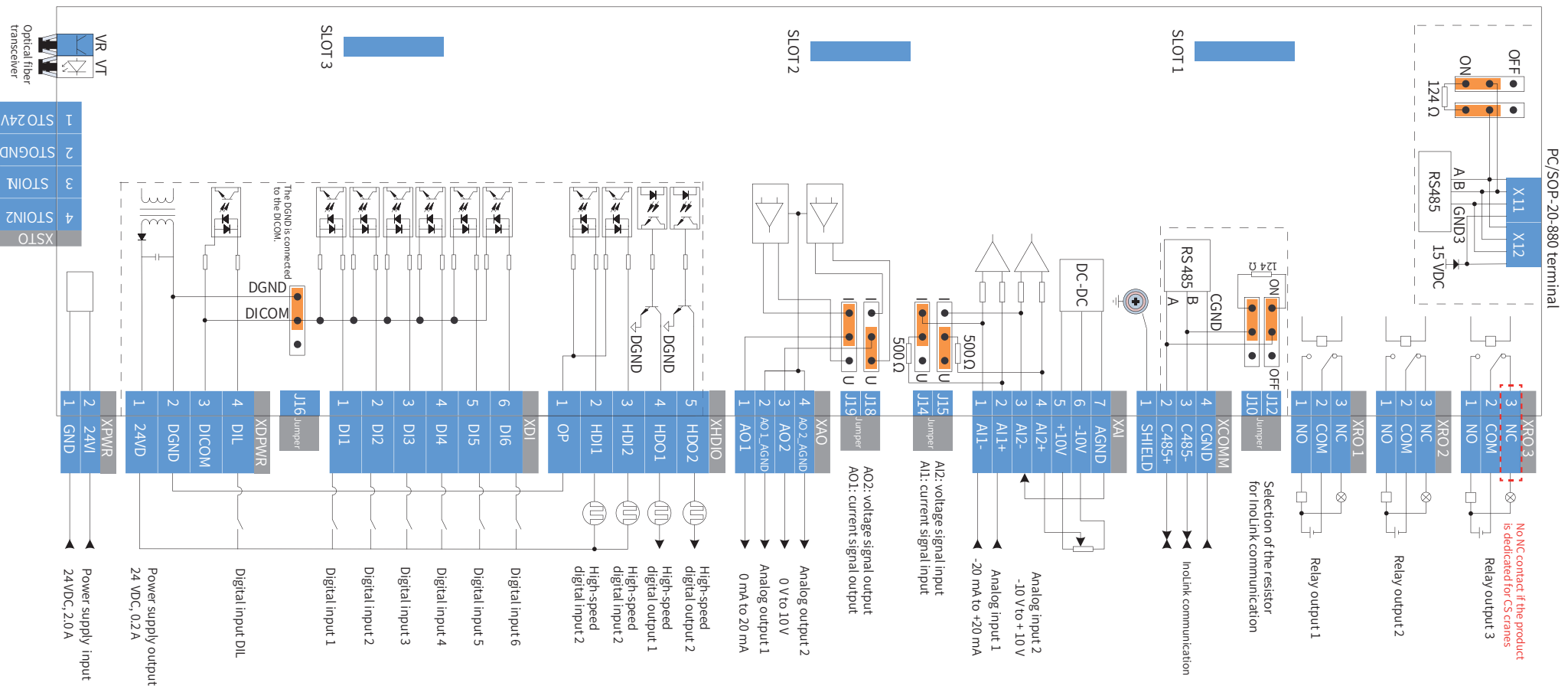
8 Ordering Instructions

This chapter lists the models and order numbers of MD880 series AC drives.

Figure 8-1 Ordering instructions for MD880 series AC drives

Model	Size	Order Number	Remarks
MD880-01S-0600-7-SG	S12	MD880-01S-0600-7-SG	AC drive module
MD880-01S-0650-7-SG	S12	MD880-01S-0650-7-SG	AC drive module
MD880-01S-0721-7-SG	S12	MD880-01S-0721-7-SG	AC drive module
MD880-11S-0600-7	S12	MD880-11S-1140-7	Optional components: cabinet, output reactor, input contactor, and braking module
MD880-11S-0650-7	S12	MD880-11S-1140-7	Optional components: cabinet, output reactor, input contactor, and braking module
MD880-11S-0721-7	S12	MD880-11S-1235-7	Optional components: cabinet, output reactor, input contactor, and braking module
MD880-11S-1140-7	2 x S12	MD880-11S-1235-7	Optional components: cabinet and braking module
MD880-11S-1235-7	2 x S12	MD880-11S-1370-7	Optional components: cabinet and braking module
MD880-11S-1370-7	2 x S12	MD880-11S-1370-7	Optional components: cabinet and braking module

Appendix Overview of All Terminals of the HCU



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