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MD880 Series
690 VAC High-Performance AC Drive (Single-Drive System)

Hardware Guide

Industrial Automation | Intelligent Elevator | New Energy Vehicle | Industrial Robot | Rail Transit

Data code 19011542B03

Preface

Introduction

This is an MD880 series 690 VAC high-performance single-drive unit, with the rated power ranging from 560 kW to 1300 kW. It is characterized by fast dynamic response, high control accuracy, high power density, flexible modular design, easy cabinet assembly, simple installation and maintenance, and intelligent cooling fan speed control, and is well-suited for cabinet-based system integration. It can be used to control asynchronous AC induction motors and permanent magnet motors. The product is widely applicable across industries, including metallurgy, oil, building material, shipbuilding, internal mixer, slurry pump, and belt conveyor industries.

This guide presents technical specifications, components, dimensions, mechanical installation, electrical installation, routine maintenance, and component replacement of the product.

More information

Document	Code	Description
MD880 Series 690 VAC High-performance AC Drive (Single-Drive System) Hardware Guide (the present guide)	19011542	Presents technical specifications, components, dimensions, mechanical installation, electrical installation, routine maintenance, and component replacement of the product.
MD880 Series High-performance AC Drive (Single-Drive System) Hardware Guide	19011400	Presents technical specifications, components, dimensions, mechanical installation, electrical installation, routine maintenance, and component replacement of the product.
SOP-20-880 Smart Operating Panel User Guide	19010611	Presents technical specifications, components, dimensions, mechanical installation, electrical installation, routine maintenance, and component replacement of the product.
SOP-20-880 Base Kit Installation Guide	19012483	Presents installation and dimensions of the product.
HPCU Parallel Control Module User Guide	19012536	Presents technical specifications, components, dimensions, mechanical installation, electrical connection, and parameter configuration of the product.
HPG-10 HTL Incremental Encoder Signal Detection Module User Guide	19012517	Presents technical specifications, components, dimensions, mechanical installation, electrical connection, and parameter configuration of the product.

Document	Code	Description
HPG-40 Resolver Signal Detection Module User Guide	19012600	Presents technical specifications, components, dimensions, mechanical installation, electrical connection, and parameter configuration of the product.
HPG-50 TTL Incremental Encoder Signal Detection Module User Guide	19012516	Presents technical specifications, components, dimensions, mechanical installation, electrical connection, and parameter configuration of the product.
HDP-10 PROFIBUS DP Fieldbus Adapter Module User Guide	19012510	Presents technical specifications, components, dimensions, mechanical installation, bus connection, and parameter configuration of the product.
HSVM-10 Synchronous Voltage Detection Module User Guide	19012535	Presents technical specifications, components, dimensions, mechanical installation, bus connection, and parameter configuration of the product.
HOFM-10/30 Optical Fiber Expansion Module User Guide	19012514	Presents technical specifications, components, dimensions, mechanical installation, and optical fiber connection of the product.
HMBA-10 Modbus-RTU Fieldbus Adapter Module User Guide	19012603	Presents technical specifications, components, dimensions, mechanical installation, electrical connection, and parameter configuration of the product.
HCAN-10 Fieldbus Adapter Module User Guide	19012602	Presents technical specifications, components, dimensions, mechanical installation, electrical connection, and parameter configuration of the product.
HPFN-10 PROFINET I/O Industrial Ethernet Adapter Module User Guide	19012533	Presents technical specifications, components, dimensions, mechanical installation, electrical connection, and parameter configuration of the product.
HSVM-20 Synchronous Voltage Detection Module User Guide	19012599	Presents technical specifications, components, dimensions, mechanical installation, electrical connection, and parameter configuration of the product.
HIO-10 I/O Function Module User Guide	19012609	Presents technical specifications, components, dimensions, mechanical installation, electrical connection, and parameter configuration of the product.
HMBT-10 Modbus TCP Adapter Module User Guide	19012534	Presents technical specifications, components, dimensions, mechanical installation, electrical connection, and parameter configuration of the product.

Document	Code	Description
HETN-10 Ethernet Commissioning Module User Guide	19012607	Presents technical specifications, components, dimensions, mechanical installation, electrical connection, and parameter configuration of the product.
MD880-61 Series Single-Phase Braking Unit User Guide	19012239	Presents technical specifications, components, dimensions, mechanical installation, electrical installation, routine maintenance, and component replacement of the product.
HEIP-10 EtherNet/IP Adapter Module User Guide	19012606	Presents technical specifications, components, dimensions, mechanical installation, electrical connection, and parameter configuration of the product.
HEIP-10 EtherNet/IP Adapter Module Communication Guide	PS00010301	Presents technical specifications, components, dimensions, mechanical installation, electrical connection, communication overview, specifications, networking, and communication configuration of the product.

Revision history

Revision time	Version	Description of change(s)
2024-08	B03	◆ Updated the front cover. ◆ Added the information for models MD880-01S-0410-7-SG, MD880-01S-0340-7-SG, and MD880-01S-0530-7-SG. ◆ Updated "Braking Components" section to add the description of braking resistor protection.
2023-12	B02	◆ Updated the preface to add EIP card to the list of related guides. ◆ Updated "1.3 Technical Data" to update the output frequency and add the torque control accuracy. ◆ Updated "1.4.1 Main Circuit Topology and Electrical Connection Diagram". ◆ Updated "4.4.1 Cable Connection for S12 AC Drive Module". ◆ Added "7.2 Recommended Models of I/O Reactors". ◆ Updated "8 Ordering Instructions". ◆ Corrected minor errors.

2022-01	B01	◆ Modified the product appearance. ◆ Corrected minor errors.
2021-01	B00	Product upgrade
2020-11	A01	Corrected minor errors.
2020-08	A00	Initial release

Access to the guide

This guide is not delivered with the product. You can obtain the PDF version in the following ways:

- Do keyword searching under Service and Support at www.inovance.com.
- Scan the QR code on the product with your mobile phone.
- Scan the QR code below to install My Inovance app, where you can search for and download the guide.

Warranty

Inovance provides warranty service to the product within the warranty period (as specified in the order) for failure or damage that occurs under normal use.

When the warranty expires, reasonable maintenance fee will be charged.

Even within the warranty period, maintenance will be charged for the following product damage:

- Damage caused by operations not following the instructions in the guide
- Damage caused by fire, flood, and unusual voltage
- Damage caused by using the product for unintended functions
- Damage caused by using the product outside the specified scope
- Secondary damage caused by force majeure (natural disaster, earthquake, and lightning strike)

When applicable, relevant maintenance fee will be charged according to the latest Price List of Inovance. If otherwise agreed upon, the agreed terms and conditions shall prevail.

For details, see the Warranty Card.

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Fundamental Safety Instructions

Safety statements

- This chapter provides essential safety instructions for proper use of the product. Before using this product, read through the guide to fully understand these safety instructions. Failure to observe the safety instructions may result in severe personal injury or death or product damage.
- "DANGER", "WARNING", and "CAUTION" signs in this guide are only supplements to the safety instructions, and do not reflect all safety instructions to be followed.
- Use this product in the environment specified in this guide. Using this product in the environment not satisfying all the specifications can cause malfunction or damage to parts not covered by the warranty.
- Inovance shall not be held responsible for any personal injury or loss of property caused by improper use.

Levels of precautions



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



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



indicates that minor personal injury or product damage can result if proper precautions are not taken.

Safety precautions

- Drawings in the guide are sometimes shown without covers or protective guards. Remember to install the covers or protective guards as specified, and then operate the product as specified in the guide.
- The drawings in this guide are shown for illustration only and may be different from the product you purchased.
- Operators must take mechanical protection measures to protect their safety. For example, they must wear safety shoes, safety clothing, safety glasses, protective gloves and sleeves, or other protective equipment.

Unpacking
WARNING ◆ Do not install the product in the case of any damage, rust, or signs of use on the product or accessories upon unpacking. ◆ Do not install the product in the case of water seepage into the product or missing or damaged components upon unpacking. ◆ Check the delivery against the packing list carefully. Do not install the product in the case of any discrepancy between the product you received and the product name on the packing list.
CAUTION ◆ Check for secondary packaging integrity, damage, water seepage, dampness, and deformation before unpacking. ◆ Unpack the product in order. Never hit the package with force. ◆ Check for damage, rust, or signs of bumping on the surfaces of the product and accessories upon unpacking. ◆ Check the number of the product, accessories, and paper materials against the packing list carefully upon unpacking.
Storage and transportation
WARNING ◆ Large or heavy equipment must be handled by skilled personnel using specialized hoisting equipment; otherwise, it may result in personal injury or product damage. ◆ Before hoisting the product, ensure that components such as the front cover and terminal blocks are secured firmly with screws. Loosely connected components may fall off and result in personal injury or product damage. ◆ Never stand or stay below the product which is being hoisted. ◆ Hoist the product at a constant speed with a steel rope to prevent any vibration or shock to the product. Never turn the product over or keep the product suspended for a long time. Dosing so may result in personal injury or product damage.

CAUTION

- Handle the product with care and mind your steps during transportation to prevent personal injury or product damage.
- When handling the product by hand, hold the product enclosure to prevent parts from falling, or there is a risk of personal injury.
- Store and transport the product based on the storage and transportation requirements, or there is a risk of product damage.
- Do not store or transport the product in locations where the product may be exposed to splashing water or rain, direct sunlight, strong electric field, strong magnetic field, or strong vibration.
- Store the product for up to three months. Take stricter protective measures and carry out the necessary inspections for a longer storage time.
- Ensure the product is securely and properly packaged before transportation. Use a fully enclosed container for long-distance transportation.
- Never transport the product with other devices or items that could impact or cause harm to the product.

Installation

DANGER

- Installation must be performed by skilled personnel who have received the trainings on electrical devices and have sufficient electrical knowledge. Installation by unskilled personnel is prohibited.

WARNING

- Read the guide and safety instructions carefully before installation.
- Never install the product in locations where there is strong electric or magnetic field.
- Before installation, check that the mechanical strength of the installation site can bear the product weight, or it may result in a mechanical hazard.
- Do not wear loose clothes or accessories during installation, or it may result in an electric shock.
- Before installing the product in an enclosed environment (for example, a cabinet or case), use a cooling device (for example, a fan or air conditioner) to cool the environment to the required temperature. Failure to do so may result in product over-temperature or a fire.
- Never retrofit the product.
- Do not fiddle with the bolts for fixing product components or the bolts marked in red.
- When the product is installed in a cabinet or terminal device, appropriate guard devices (guards for fire, electrical, and mechanical protection) meeting applicable IEC standards and local laws and regulations must be provided.
- When a device with strong electromagnetic interference (for example, a transformer) is required, install a shielding device for the product to prevent malfunction.
- Install the product on metal or other non-flammable objects, and prevent flammable materials from contacting or attaching to the product. Failure to do so may result in a fire.

CAUTION

- During installation, cover the top of the product with a piece of cloth or paper, to prevent foreign matters such as metal chips, oil, and water from falling into the product and causing the product failure. After installation, remove the covering to prevent it from blocking the vent, which may affect the heat dissipation and cause the product to overheat.
- Resonance may occur when a constant-speed machine executes variable speed operations. In this case, install the anti-vibration rubber under the motor frame or activate the vibration suppression function to reduce resonance.

Wiring

DANGER

- Installation, wiring, maintenance, repair, inspection, or part replacement must be performed by skilled personnel.
- Before wiring, disconnect all the power supplies of the product. Before wiring or other operations, wait for at least the time specified on the warning label because residual voltage still exists after power-off. Measure the DC voltage of the main circuit to ensure that the voltage is below the safety voltage, or it may result in an electric shock.
- Never perform wiring, remove the product cover, or touch the circuit board with power-on. Dosing so may result in an electric shock.
- Be sure that the product is grounded properly, or it may result in an electric shock.



- Never connect the input power supply to an output terminal of the product. Dosing so may result in product damage or even a fire.
- When a drive is connected to the motor, be sure that the phase sequences of the product and motor terminals are consistent to prevent reverse motor rotation.
- Cables must meet size and shield requirements. The shield must be reliably grounded at one end.
- Fix the terminal screws with the tightening torque specified in the guide. Improper tightening torque may cause the connecting part over-temperature or damage, resulting in a fire.
- After wiring, be sure that all cables are connected properly with no screws, gaskets, or exposed cables inside the product, or it may result in an electric shock or product damage.



- During wiring or other operations, follow the proper electrostatic discharge (ESD) procedures, and wear an anti-static wrist strap. Failure to do so may result in damage to internal circuits of the product.
- Use the shielded twisted pair cable to wire the control circuit, and connect the shield to the grounding terminal of the product. Failure to do so may result in product malfunction.

Power-on



- Before power-on, check that the product is installed properly with secure wiring and the motor can be restarted.
- Before power-on, be sure that the power supply meets the product requirements, or it may result in product damage or a fire.
- Never open the cabinet door or protective cover of the product, touch any terminal of the product, or remove any part of the product with power-on. Doing so may result in an electric shock.



- Perform a trial run after wiring and parameter setting to ensure safe operation of the product. Failure to do so may result in personal injury or product damage.
- Before power-on, be sure that the rated voltage of the product is consistent with the supply voltage, or it may result in a fire.
- Before power-on, be sure that no one is near the product, the motor, and other devices, or it may result in personal injury or death.

Operation
 DANGER ◆ The product must be operated by skilled personnel, or it may result in personal injury or death. ◆ During operation, do not touch any connecting terminals or disassemble any component of the equipment. Failure to comply can result in electric shock.
 WARNING ◆ Never touch the product enclosure, fan, or resistor with a bare hand. Doing so may cause burns. ◆ Prevent metal or other objects from falling into the product during operation, or it may result in a fire or product damage.
Maintenance
 DANGER ◆ Installation, wiring, maintenance, repair, inspection, or part replacement must be performed by skilled personnel. ◆ Never maintain the product with power-on, or it may result in an electric shock. ◆ Before maintenance, disconnect all the power supplies of the product and wait for at least the time specified on the warning label. ◆ When a permanent magnet motor is used, do not touch the motor terminals immediately after the product is powered off because the terminals will generate induced voltage during the motor rotation. Failure to do so may result in an electric shock.
 WARNING ◆ Perform routine and periodic product inspection and maintenance based on the maintenance requirements, with the maintenance records kept properly.
Repair
 DANGER ◆ Installation, wiring, maintenance, repair, inspection, or part replacement must be performed by skilled personnel. ◆ Never repair the product with power-on, or it may result in an electric shock. ◆ Before inspection or repair, disconnect all the power supplies of the product and wait for at least the time specified on the warning label.



- Submit a request for repair based on the warranty agreement.
- When the fuse is blown or the circuit breaker or earth leakage current breaker (ELCB) trips, wait for at least the time specified on the warning label before power-on or other operations. Failure to do so may result in personal injury or death and product damage.
- Troubleshooting and repair of a faulty or damaged product must be performed by skilled personnel based on the repair instructions, with the repair records kept properly.
- Replace quick-wear parts of the product in according with the replacement instructions.
- Never operate the damaged product. Doing so may cause personal injury or death or greater damage.
- Recheck the wiring and reset the parameters after product replacement.

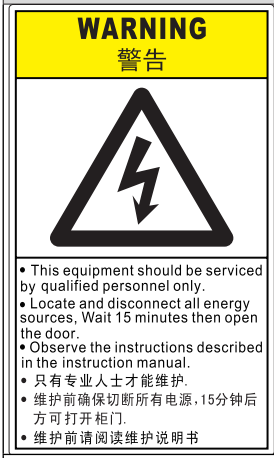
Disposal



- Dispose of the retired product in accordance with applicable national regulations and standards. Failure to do so may result in loss of property or personal injury or death.
- Recycle the retired product in accordance with industrial waste disposal standards to prevent environmental pollution.

Safety labels

To guarantee safe operations and maintenance, follow the safety labels on the product. Do not damage or remove the safety labels. The description of the safety labels is as follows.

Safety label	Description
	◆ This product must be maintained by skilled personnel only. ◆ Disconnect all power supplies and wait for at least 15 min before maintenance. ◆ Read through the maintenance instructions before maintenance.
	◆ When the DC bus voltage indicator is ON, it indicates hazardous voltage is present, which may result in an electric shock.

1 Product Information

The MD880 series 690 VAC high-performance AC drive is a low-voltage, high-end product launched by Inovance. It can be used to control asynchronous AC induction motors and permanent magnet motors. With high power density, compact structure, and high reliability, it enables the V/f control, sensorless vector control (SVC), and flux vector control (FVC) of motors.

The drive has a rated power ranging from 560 kW to 1300 kW, with the maximum rated power of 710 kW for a single module and 1300 kW for a cabinet, suitable for use in metallurgy, oil, building material, and shipbuilding industries.

1.1 Nameplate and Model Descriptions

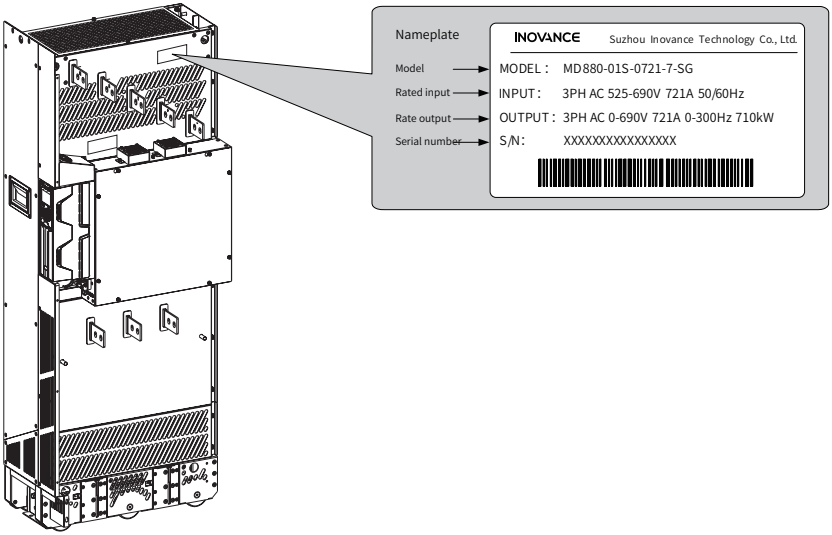


Figure 1-1 Nameplate description of the S12 AC drive module

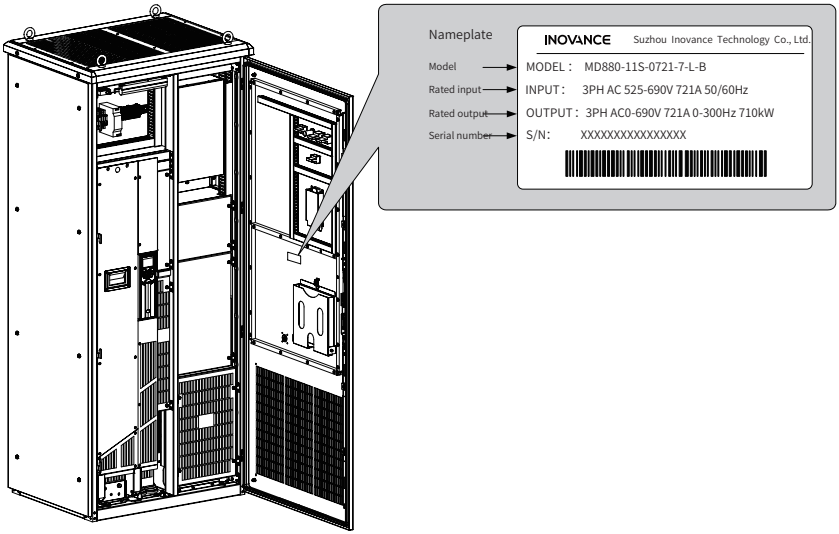


Figure 1-2 Nameplate description of the S12 AC drive cabinet

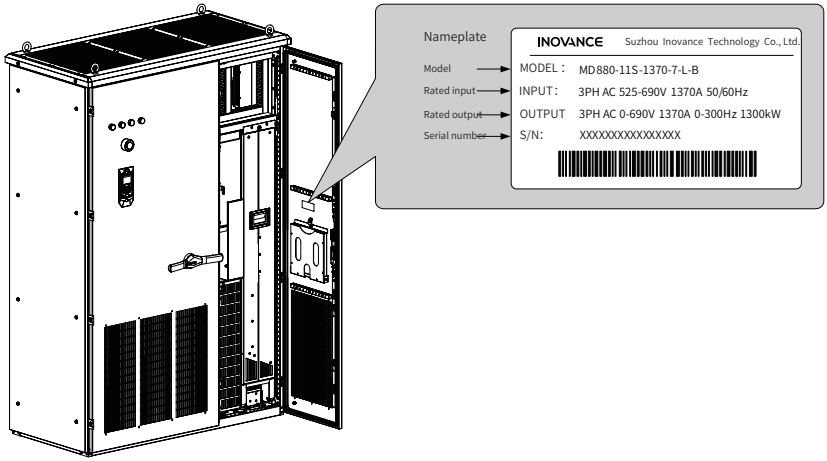


Figure 1-3 Nameplate description of the 2 × S12 AC drive cabinet

MD880 -01S - 0721- 7 - SG

Code	Product series
MD880	MD880 series AC drive

Code	Product type
01S	Drive module (single-drive system)

Code	Rated current
0721	721 A

Code	Standard accessory
SG	Controller

Code	Voltage class
7	690 VAC

Figure 1-4 Model description of the drive module

MD880 -11S - 1370- 7 - L - B

Code	Product series
MD880	MD880 series AC drive

Code	Product type
11S	Drive module (single-drive system)

Code	Rated current
1370	1370 A

Code	Options
B	Braking module

Code	Options
L	Output reactor<1>

Code	Voltage class
7	690 VAC

Figure 1-5 Model description of the drive cabinet

NOTE

◆ <1>: The output reactor is optional for the S12 AC drive cabinet, and standard for the 2 × S12 AC drive cabinet.

1.2 Product Specifications

Table 1-1 Specifications of the drive module

Model	Layout	Nominal use		Low-overload use		High-overload use		Weight (kg)	Loss (kW)	Air flow (CFM)	Dimension (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 V to 690 V)											
MD880-01S-0340-7-SG	S12	340	315	326	315	255	250	180	5.35	900	315 × 1502 × 588
MD880-01S-0410-7-SG		410	400	394	355	308	315		6.8		
MD880-01S-0530-7-SG		530	500	509	450	398	355		8.5		
MD880-01S-0600-7-SG		600	560	576	560	450	400		9.52		
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 of the drive cabinet

Model	Layout	Nominal use		Low-overload use		High-overload use		Weight (kg)	Loss (kW)	Air flow (CFM)	Dimension (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 V to 690 V)											
MD880-11S-0600-7	S12	600	560	576	560	450	400	530	11.39	1190	853 × 2058 × 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 × S12	1140	1100	1094	1050	855	800	920	21.99	2350	1353 × 2058 × 718
MD880-11S-1235-7		1235	1200	1186	1150	926	900		24.47		
MD880-11S-1370-7		1370	1300	1315	1300	1027	1000		27.29		

1.3 Technical Data

Table 1-3 Technical data of the AC drive

Item		Technical data
Basic performance	Rated input voltage and frequency	525 VAC to 690 VAC, 50/60 Hz
	Allowable voltage range	± 10% (-15%, < 1 min)
	Output voltage	0-690 VAC
	Output frequency	0-500 Hz
	Overload capacity	Low overload: The drive can operate at 110% of the base load current in this mode for 1 min per every 5 min. High overload: The drive can operate at 150% of the base load current in this mode for 1 min per every 5 min
	Operating efficiency	> 98%
Control characteristics	Motor control method	V/f control Sensorless vector control (SVC) Flux vector control (FVC)
	Carrier frequency	690 V system: 1.5 kHz by default
	Speed range	V/f control: 1:50
		SVC: 1:200
		FVC: 1:1000
	Speed control accuracy	SVC: ± 10% Fsl
		FVC: ± 0.01%
	Torque response	SVC: ≤ 5 ms
		FVC: ≤ 5 ms
	Torque control accuracy	SVC: ± 5% for those above 5 Hz
		FVC: ± 3%
	Starting torque	SVC: 0.5 Hz/150%
		FVC: 0 Hz/200%
Mechanical data	Vibration resistance	Compliant with GB/T4798.3 - Mechanical conditions Frequency: 2 Hz to 9 Hz; Displacement: 3 mm Frequency: 9 Hz to 200 Hz; Acceleration rate: 9.8 m/s^2 (1g) Shock: 10 g, 11 ms
	Safety performance	Compliant with EN 61800-5-1
	Cooling method	Forced air cooling (AF), compliant with EN 60146

Item		Technical data
Protection functions	Phase loss protection	Input/output phase loss protection
	Overtemperature protection	Triggered when the AC drive is overheated.
	Overload protection	High overload: The drive shuts down when it operates at 150% of the rated current in this mode for more than 60s. Low overload: The drive shuts down when it operates at 110% of the rated current in this mode for more than 60s.
	Overcurrent protection	The drive shuts down when it operates at 250% of the rated current in high overload mode.
	Braking protection	It is recommended to use the external braking module.
	Short-circuit protection	Output phase-to-phase and output phase-to-ground short-circuit protection
Environment requirements	Operating environment	Indoors without direct sunlight, dusts, corrosive gas, combustible gas, oil mist, water vapor, drips, or salty elements
	Altitude	≤ 1000 m. Derate 1% per every additional 100 m. The allowable maximum altitude is 4000 m.
	Operating temperature	-10° C to +40° C For temperatures above 40° C, derate 1% for every additional 1° C. The allowable maximum operating temperature is 50° C.
	Storage temperature	-40° C to +70° C
	Humidity	Less than 95%RH (non-condensing)
	Pollution degree	PD2
	Power grid system	IT TT/TN (VDR and EMC screws required)
	Overvoltage class	OVCIII
	IP rating	S12 AC drive module: IP00 S12 AC drive cabinet and 2 × S12 AC drive cabinet: IP20

1.4 Hardware Description

1.4.1 Main Circuit Topology and Electrical Connection Diagram

The connection diagram is as follows when the drive is used for performing typical tasks:

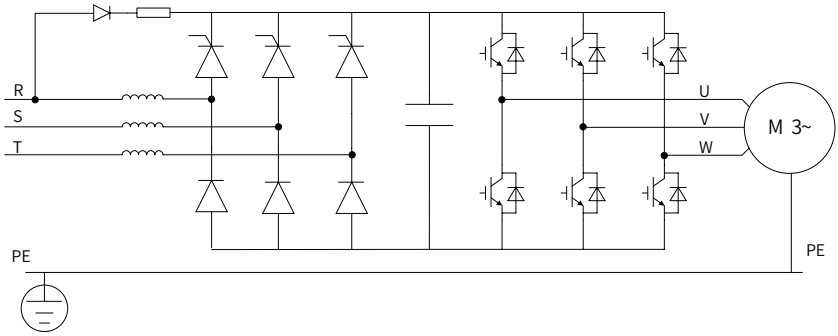


Figure 1-6 Main circuit topology of the drive

The following figure illustrates typical drive systems for the S12 AC drive cabinet and 2 × S12 AC drive cabinet.

NOTE

A maximum of two drives can be connected in parallel. For applications requiring more parallel drives, it is recommended to select multi-drive products of the same series. For details, see the MD880-20 Series Basic Rectifier Hardware Guide (19010983).

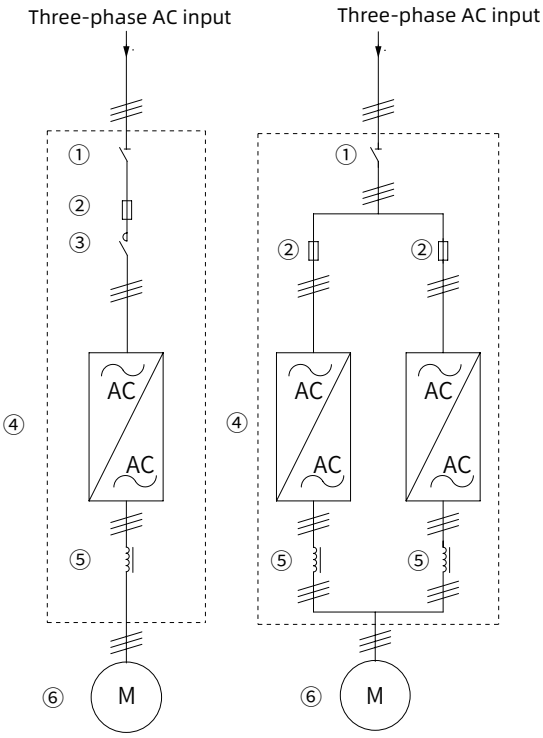


Figure 1-7 Electrical connection

No.	Remark
①	Disconnector
②	Three-phase input fuse
③	Contactor (optional)
④	Drive module (single-drive system)
⑤	Output reactor (optional for the S12 AC drive cabinet and standard for the 2 × S12 AC drive cabinet)
⑥	Motor

NOTE

- Products in the dashed boxes are provided by Inovance.
- You may reconfigure the disconnector assembly in the proceeding figure as a circuit breaker as needed.

1.4.2 Layout of S12 AC Drive Module

1 Overview

The module has handles at both the front and rear, allowing it to be pushed into the cabinet from either side. The terminals and the control chamber are on the right side of the module. The AC input and positive/negative bus terminals are at the upper part of the control chamber; the output terminals are at the lower part; the HCU is at the front. The control system includes I/O and optional function modules. For details on standard I/O terminals of the HCU control module, see "5 HCU Control Module". Other optional function modules are primarily installed on the HCU control module.

2 External power supply

The external 24 VDC/2 A power supply can be used for the AC drive control system for commissioning. After the main power supply is established, the AC drive operates relying on its internal auxiliary power supply, with the external 24 V power supply being redundant.

3 Layout

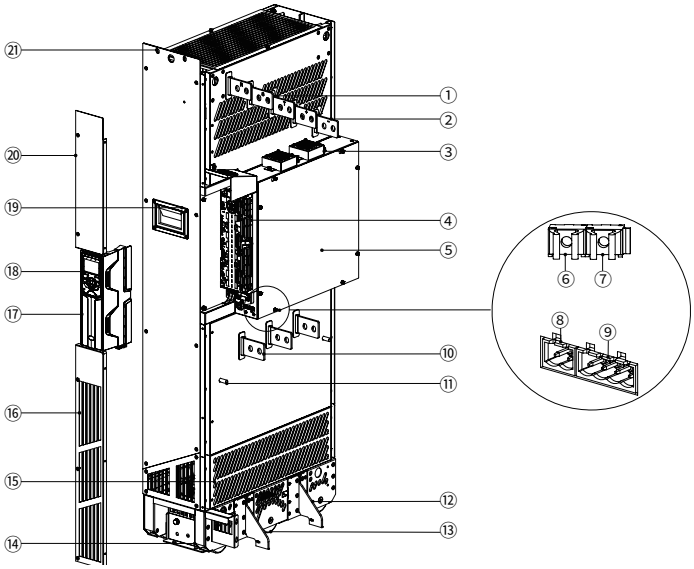


Figure 1-8 Layout of the S12 AC drive module

No.	Remark
1	AC input copper busbar
2	DC bus copper busbar
3	Cooling fan of the control chamber
4	HCU control module
5	Control chamber
6	VR optical fiber reception terminal

No.	Remark
7	VT optical fiber transmission terminal
8	Input terminal for 24 VDC external power supply
9	STO terminal
10	AC output copper busbar
11	PE grounding stud
12	Anti-tipping bracket
13	Roller
14	Bottom mounting bracket
15	Air inlet with a total area of 1000 cm^2
16	Lower baffle
17	Mask
18	SOP-20-880 smart operating panel components
19	Handle
20	Upper baffle
21	Top mounting bracket

1.4.3 Layout of S12 AC Drive Cabinet

1 Overview

The cabinet consists of two chambers. In the left chamber, there is one AC drive module; in the right chamber, there are copper busbars, disconnectors, contactors, a braking module, and an output reactor. The front door is equipped with an SOP-20-880 smart operating panel. With the highly integrated design and compact width, the cabinet makes the most of available space.

2 External power supply

The cabinet requires an external 220 VAC/2A power supply for operation.

3 Layout

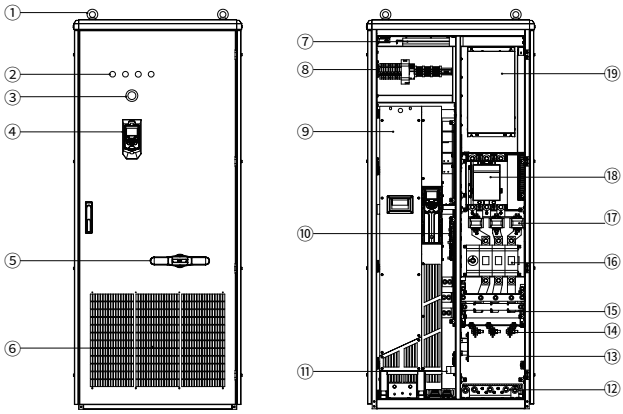


Figure 1-9 Layout of the S12 AC drive cabinet

No.	Remark
1	Eye bolt
2	Switch-on button/indicator, switch-off button/indicator, fault indicator, reset button
3	Emergency stop button
4	SOP-20-880 smart operating panel components
5	External interlock operating handle for the disconnector switchgear
6	Air inlet with a total area of 2200 cm^2
7	Lighting lamp
8	Control circuit breaker
9	MD880-01S-XXXX-7-SG AC drive module
10	Cooling fan power supply in the cabinet
11	User terminal
12	Grounding copper busbar
13	Braking resistor copper busbar (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 Layout of 2 × S12 AC Drive Cabinet

1 Overview

The cabinet consist of three chambers. In each of the left and right chambers, there is one AC drive module. In the central chamber, there are copper busbars, disconnectors, a braking module, and an output reactor. The front door is equipped with an SOP-20-880 smart operating panel. With the highly integrated design and compact width, the cabinet makes the most of available space.

2 External power supply

The cabinet requires an external 220 VAC/2A power supply for operation.

3 Layout

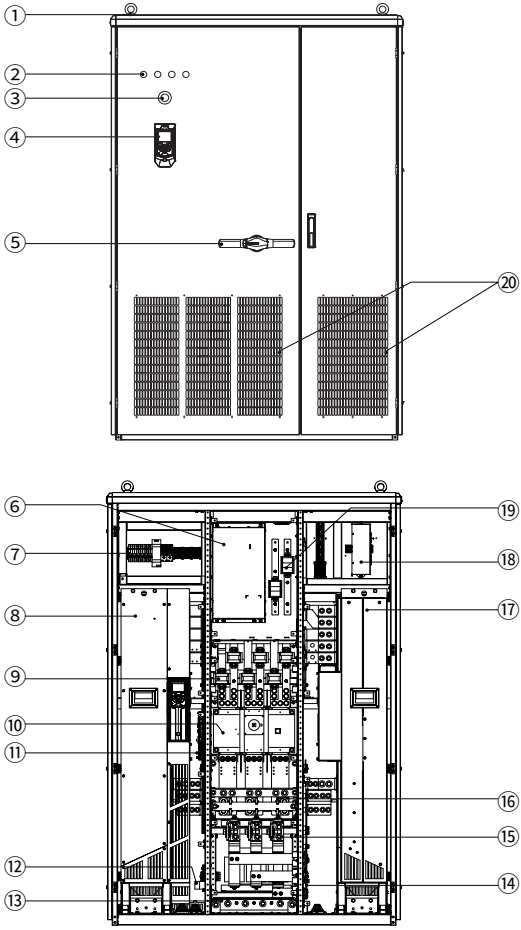


Figure 1-10 Layout of the 2 × S12 AC drive cabinet

No.	Remark
1	Eye bolt
2	Switch-on button/indicator, switch-off button/indicator, fault indicator, reset button
3	Emergency stop button
4	SOP-20-880 smart operating panel components
5	External interlock operating handle for the disconnector switchgear
6	MD880-61M-0400-7 single-phase braking unit (optional)
7	Internal terminal block
8	MD880-01S-XXXX-7-SG AC drive module
9	Three-phase input fuse
10	Disconnector
11	Cooling fan power supply in the cabinet
12	User terminal
13	Grounding copper busbar
14	Braking resistor copper busbar (optional)
15	AC output copper busbar
16	AC input copper busbar
17	MD880-01S-XXXX-7-SG AC drive module (installed in reverse direction)
18	MD880-HPCU-40 parallel control module
19	DC fuse of the braking unit (optional)
20	Air inlet with a total area of 3680 cm^2

1.5 Overall Dimensions

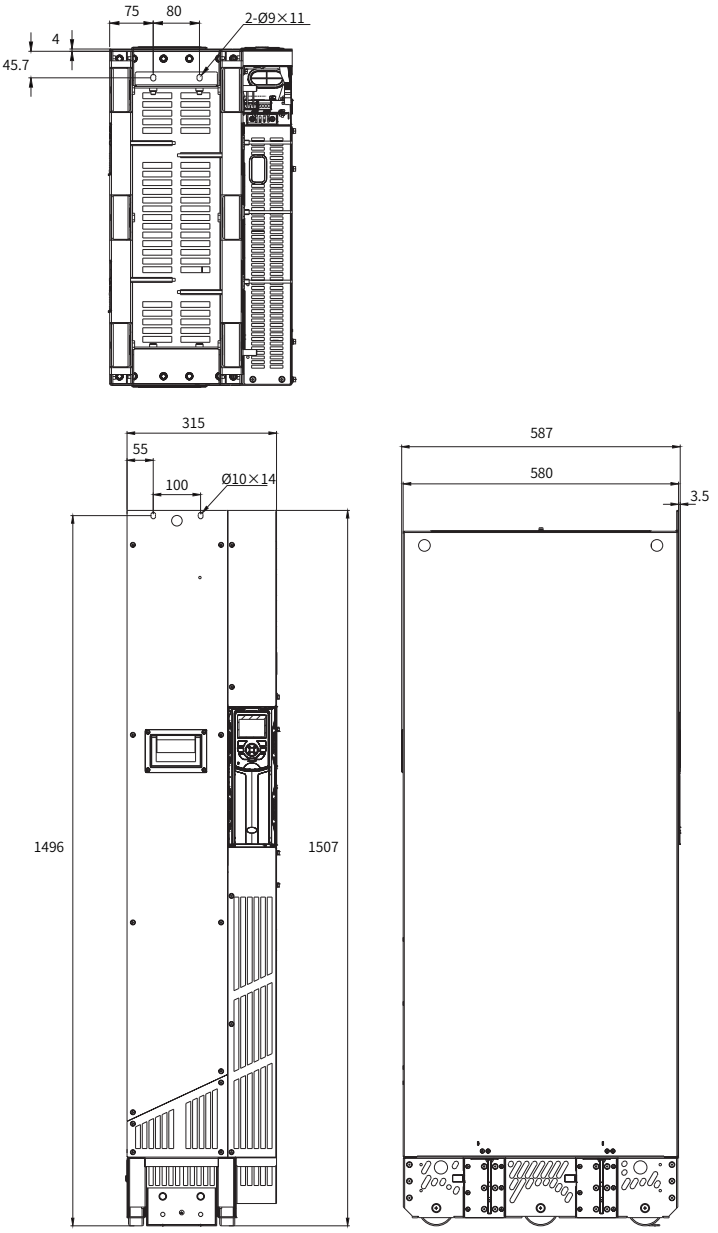


Figure 1-11 Overall dimensions (mm) of the S12 AC drive module

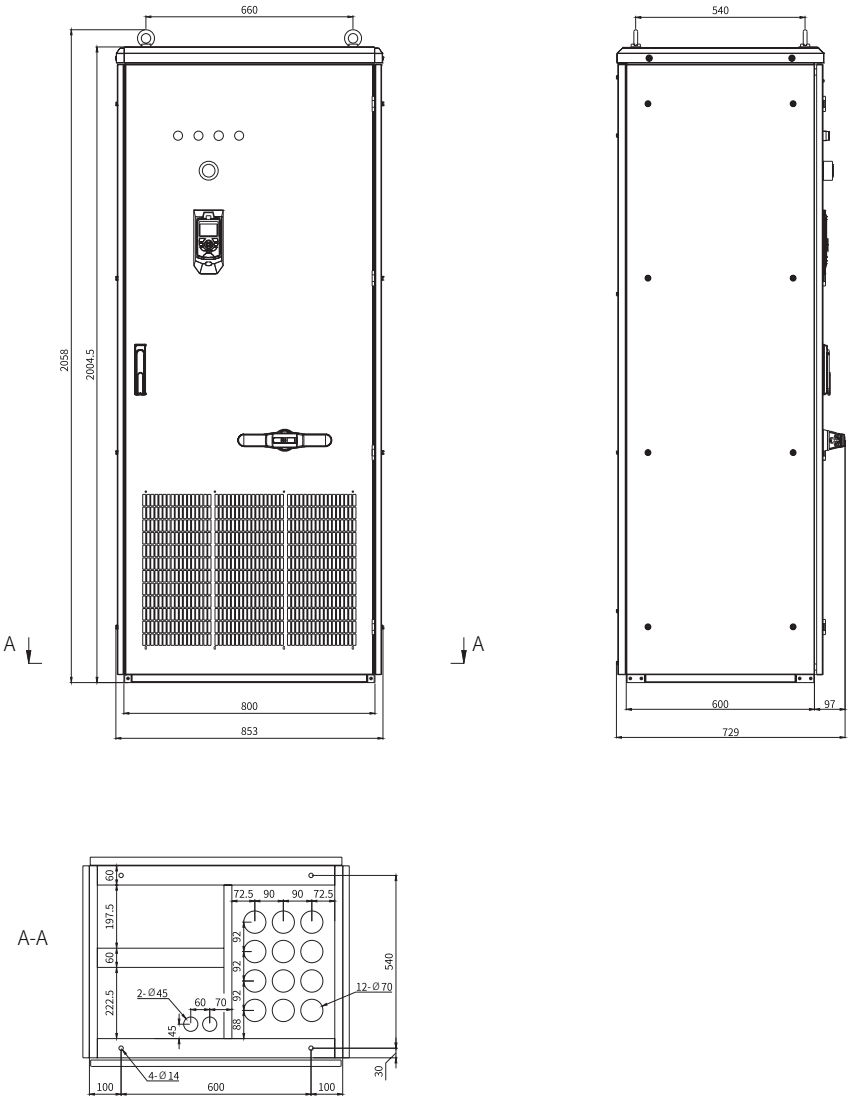


Figure 1-12 Overall dimensions (mm) of the S12 AC drive cabinet

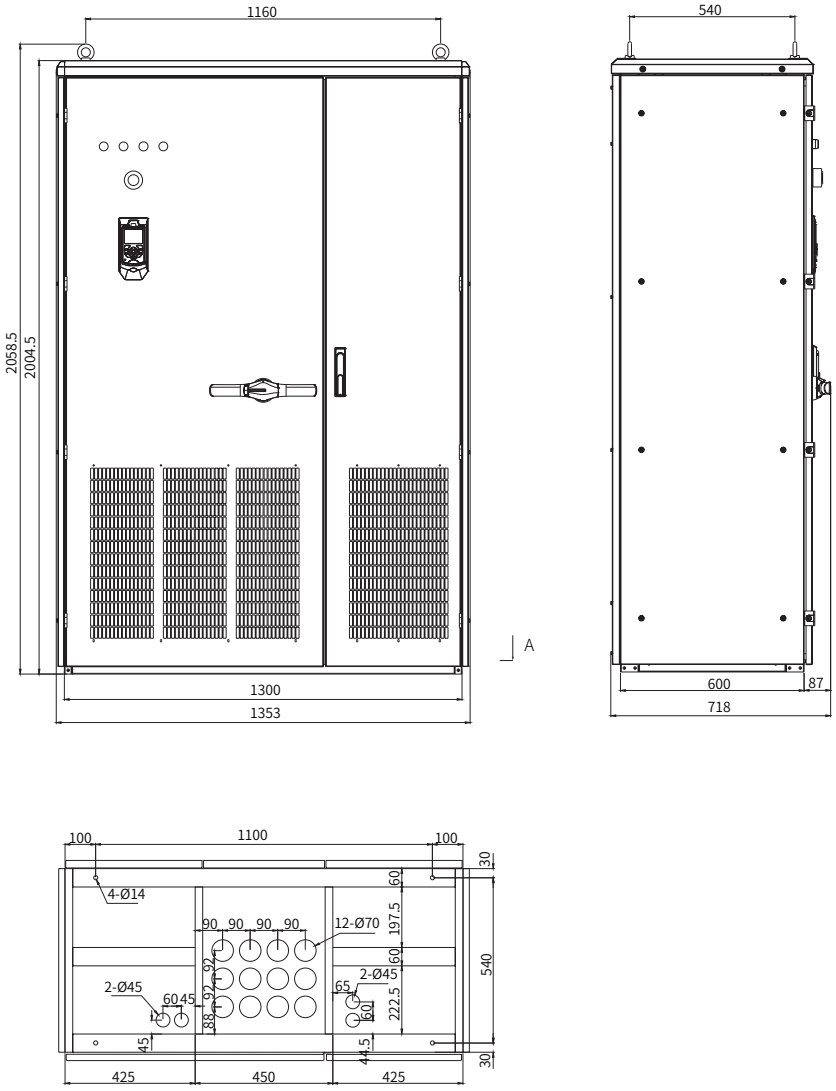


Figure 1-13 Overall dimensions (mm) of the 2 × S12 AC drive cabinet

1.6 Derating

1 Ambient temperature-based derating

Within the temperature range of 40–50° C, the rated output current must be derated by 1% for every 1° C increase from 40° C. Output current = Rated current x Derating coefficient (k).

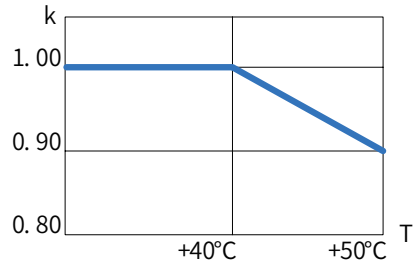


Figure 1-14 Ambient temperature-based derating

2 Altitude-based derating

Within the altitude range of 1000–4000 m, the output current of the drive must be derated by 1% for every 100 m increase from 1000 m. Output current = Rated current x Derating coefficient (k).

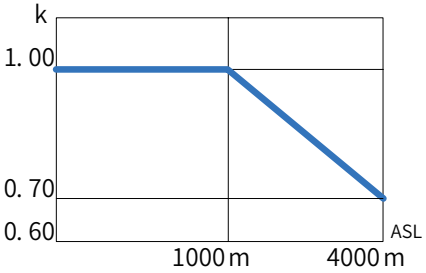


Figure 1-15 Altitude-based derating

3 Carrier frequency-based derating

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

Model	Rated power	Carrier frequency (kHz)									
	(kW)	1.2	1.5	2	2.5	3.2	4	5	6	7	8
MD880-01S-0340-7-SG	315	100%	100%	87%	76%	63%	52%	42%	34%	28%	23%
MD880-01S-0410-7-SG	400	100%	100%	87%	76%	63%	52%	42%	34%	28%	23%
MD880-01S-0530-7-SG	500	100%	100%	87%	76%	63%	52%	42%	34%	28%	23%

Model	Rated power	Carrier frequency (kHz)									
	(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%
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 of the AC drive cabinet

Model	Rated power	Carrier frequency (kHz)									
	(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	1100	100%	100%	87%	76%	63%	52%	42%	34%	28%	23%
MD880-11S-1235-7	1200	100%	100%	85%	74%	61%	51%	38%	32%	26%	23%
MD880-11S-1370-7	1300	100%	100%	85%	72%	60%	47%	38%	29%	24%	19%

NOTE

- A linear interpolation may be applied to determine the derating coefficient between the two carrier frequencies.

1.7 Overload Capacity

A proper base load current must be used for the AC drive in the drive systems with overload requirements. When the drive system operates at the base load current, overload is allowed only once in a cycle of 300s to prevent system shutdown.

1 Curve in the low overload mode

In the low overload mode, the system can operate at 110% of the base load current in this mode (I_{LD}) for up to 60s in a cycle.

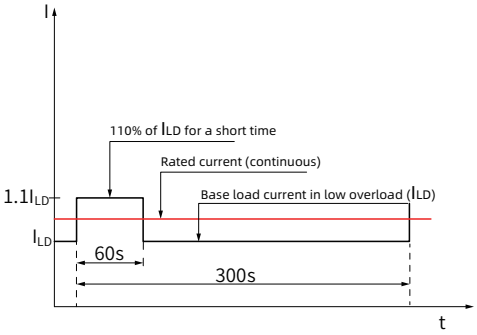


Figure 1-16 Curve in the low overload mode

2 Curve in the high overload mode

In the high overload mode, the system can operate at 150% of the base load current in this mode (I_{HD}) for up to 60s in a cycle.

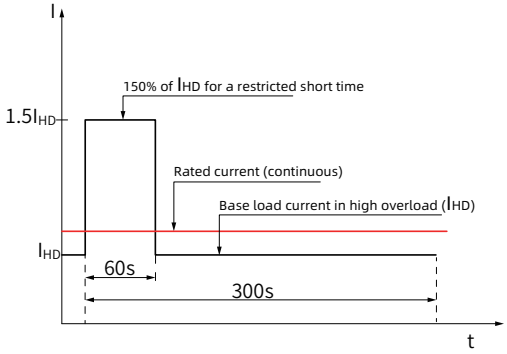


Figure 1-17 Curve in the high overload mode

1.8 Common Tightening Torques of Screws and Bolts

Table 1-6 Electrical connection

Screw/Bolt	Strength grade	Maximum torque (N·m)
M3	4.8	0.55
M4	4.8	1.2
M5	4.8	2.8
M6	4.8	4.8
M8	4.8	13
M10	4.8	20
M12	4.8	35
M16	4.8	85

Table 1-7 Mechanical connection

Screw/Bolt	Strength grade	Maximum torque (N·m)
M5	4.8	2.8
M6	4.8	4.8
M8	4.8	13

Table 1-8 Insulating spacer connection

Screw/Bolt	Strength grade	Maximum torque (N·m)
M6	4.8	4.8
M8	4.8	13
M10	4.8	20
M12	4.8	35

Table 1-9 Cable lug connection

Screw/Bolt	Strength grade	Maximum torque (N·m)
M8	4.8	13
M10	4.8	20
M12	4.8	35

1.9 Power Consumption of Auxiliary Power Supply

Table 1-10 Power consumption of auxiliary power supply

Layout	Power supply	Remarks
S12 module	24 VDC/2 A	The external power supply may be used for commissioning, and the internal power supply is used during operation.
S12 cabinet	220 VAC/2 A	The external 220 VAC power supply is required.
2 × S12 cabinet	220 VAC/2 A	The external 220 VAC power supply is required.

1.10 Selecting the Fuse, Contactor, and Circuit Breaker

■ Install AC fuse or similar devices at the drive input side to prevent short circuits and system damage. The recommended models are as follows:

Table 4-1 Recommended models of the fuse, contactor, and circuit breaker

Device type	Fuse (Bussmann, UL-certified)		Fuse (SINOFUSE, UL-certified)		Contactor	Circuit breaker
Model	Rated current (A)	Model	Rated current (A)	Model	Rated current (A)	Rated current (A)
MD880-01S-0340-7-SG	550	170M3122	550	RS306-1-W1Z-550A690V	400	630
MD880-01S-0410-7-SG	630	170M3123	630	RS306-1-W1Z-630A690V	580	630
MD880-01S-0530-7-SG	900	170M6547	900	RS306-3-S5P-900A1250V-D	750	1000
MD880-01S-0600-7-SG	1000	170M6414	1000	RS306-3-S1P-1000A690V	750	800
MD880-01S-0650-7-SG	1100	170M6415	1100	RS306-3-S1P-1100A690V	750	800
MD880-01S-0721-7-SG	1250	170M6416	1250	RS306-3-S1P-1250A690V	750	800

1.11 Selecting the Disconnector

Table 4-2 Models of the disconnector

Product model	Layout	Rated current of the disconnector (A)	Disconnector model (ABB)
MD880-01S-0340-7-SG	S12	400	OT400E03
MD880-01S-0410-7-SG	S12	630	OT630E03
MD880-01S-0530-7-SG	S12	630	OT630E03
MD880-01S-0600-7-SG	S12	800	OT800E03
MD880-01S-0650-7-SG	S12	800	OT800E03
MD880-01S-0721-7-SG	S12	800	OT800E03

2 Mechanical Installation of AC Drive Module

2.1 Installation Flowchart

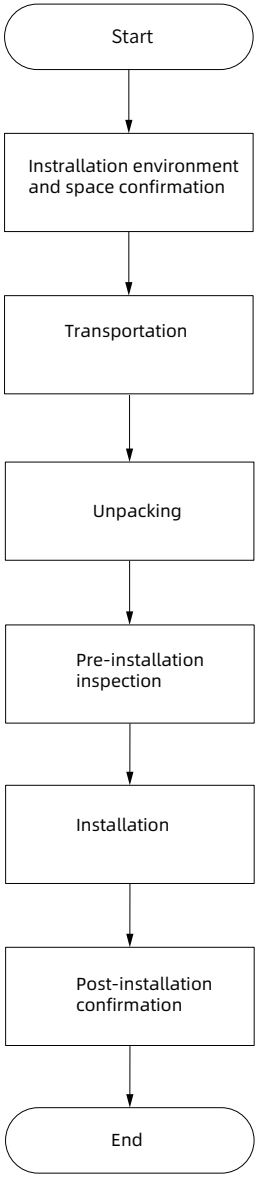


Figure 2-1 Mechanical installation flowchart

2.2 Installation Requirements

2.2.1 Environment

Item	Requirements
Heat dissipation and ventilation	Put the drive onto the incombustible surface and mount the drive vertically to the mounting bracket with screws. Reserve sufficient space around the drive for heat dissipation, because the drive generates a large amount of heat during operation.
Installation site	The installation site must meet the following requirements: Free from direct sunlight. Humidity ≤ 95% RH with no condensation. Free from corrosive, flammable, and explosive gases. Free from greasy dirt or dust.
Vibration	Install the drive in a place with minimum risk of vibration. For the vibration resistance performance, see “1.3 Technical Data".
Ambient temperature	The allowable climatic conditions must be complied with: Derate the power when the driver is installed at an ambient temperature of > 40° C or at an altitude of > 1000 m. For the derating coefficient, see “1.6 Derating".
Protective enclosure	The product is designed for installation in a cabinet and must be used within a final system, which must be equipped with an enclosure providing fire, electrical, and mechanical protection and meeting local laws and regulations and applicable IEC standards.

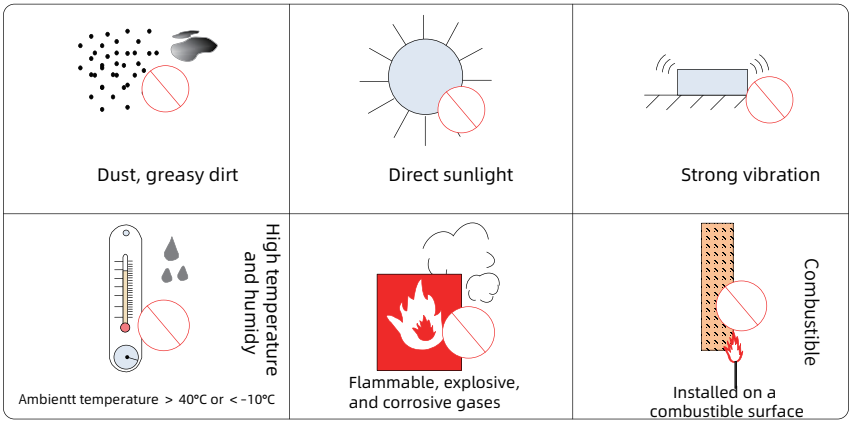


Figure 2-2 Environment requirements

2.2.2 Space

Reserve sufficient space around the drive module, as shown below.

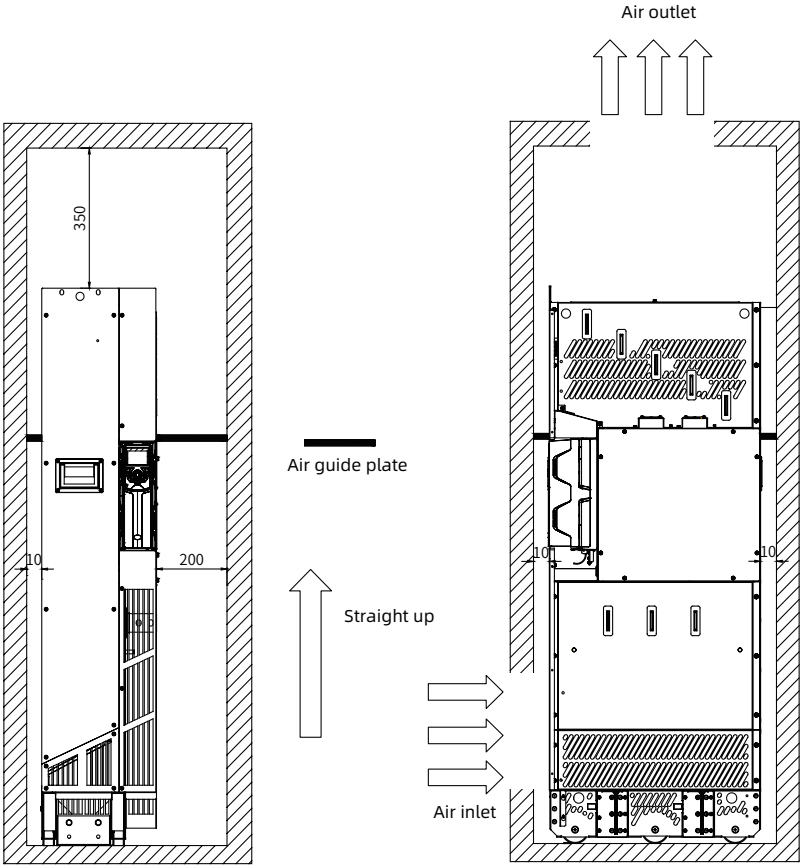


Figure 2-3 Space requirements for installing the drive module

NOTE

◆ The dimensions in the preceding figure are the minimum dimensions in mm.

2.3 Unpacking and Transportation

2.3.1 Storage

Store the drive in a clean and dry room with temperatures between -40° C and +70° C and temperature variation smaller than 1° C/min. For long-term storage, cover the drive or take other appropriate measures to protect it against contamination and environmental influences.

To store the drive properly, observe the following:

- Store the product with the original package if possible.
- Do not store the drive in humid, high-temperature, or outdoor areas exposed to direct sunlight for an extended period.

2.3.2 Pre-Unpacking Transportation

- Use a forklift or crane to transport the well-packed drive through the wooden pallet below the package. The operator must be well trained. When transporting the drive with a forklift, mount the drive onto a wooden pallet. When transporting the drive with a crane, mount the drive onto a wooden pallet to hoist them together.
- The load-carrying capacity of the handling device must be greater than the weight of the drive.

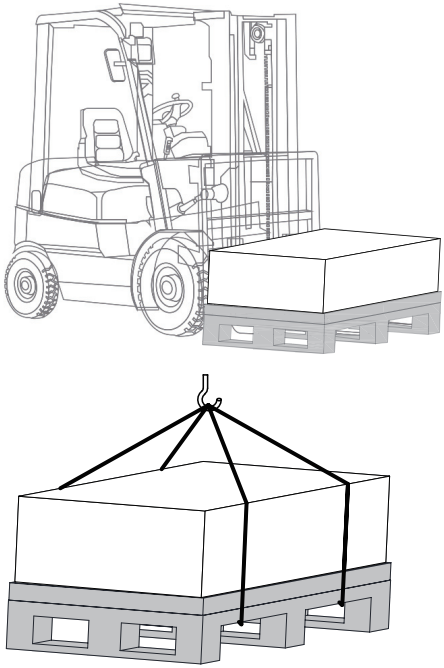


Figure 2-4 Pre-unpacking transportation

- Place the drive on a flat and solid ground that can bear its weight.
- The drive is heavy with a high center of gravity. Therefore, do not place the drive on an inclined surface with an inclination angle greater than 5 degrees.
- Transport the drive only in the flat position as indicated on the package.

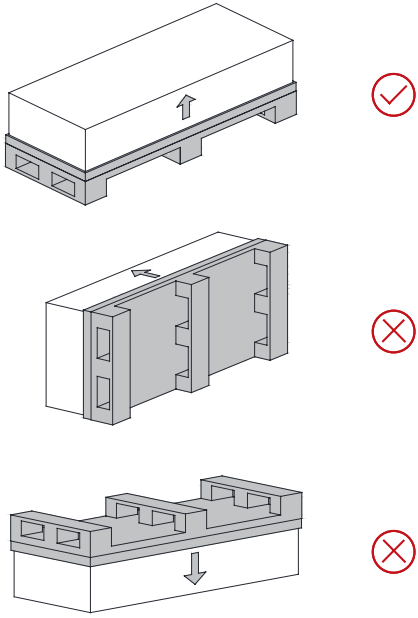


Figure 2-5 Modes of transportation

2.3.3 Acceptance

Be sure to inspect the drive carefully upon receipt from the shipping company.

Check each received item against the delivery note. Notify the shipping company immediately of any missing components or damage. Contact Inovance or Inovance's local agent for technical support when necessary.

DANGER	
	◆ If the product is damaged during transportation, its electrical safety performance may no longer be guaranteed. Connect the product only after performing a professional medium-voltage test. Failure to comply may result in personal injury, death, or major property loss.

Unpack the product in the following steps:

1) Remove all the straps and open the cover of the box.
2) Remove all filler materials.
3) Take out the drive and accessories.
4) Cut the stretch film around the drive.
5) Check the drive for any damage.

Dispose of or recycle the packaging materials according to local regulations.

2.3.4 Post-Unpacking Transportation

- Use a proper hoisting tool for MD880 series models.
- When transporting the drive with a crane, ensure that the load-carrying capacity of the crane is greater than the weight of the drive.
- Use eyelets on the top of the drive for hoisting and transportation, with the hoisting height not higher than 0.3 m.
- Stand the drive upright before hoisting and transportation.

2.4 Pre-Installation Checklist

DANGER	
	◆ To ensure the safe operation, the drive must be properly installed and put in to use by qualified personnel in accordance with all the warnings and notices. ◆ Failure to comply may result in personal injury or death or major loss of property.

After the installation is done, check appropriate check boxes in the "Confirmed" column to confirm task completion.

Table 2-3 Installation checklist

No.	Item	Confirmed
1	The package is intact and free of damage and dampness.	☐
2	The drive enclosure is free of deformation, paint peeling, cracks, and other defects, without water stains inside the enclosure.	☐
3	The accessories (options) in the package are checked against the packing list to be complete.	☐
4	The space around the drive meets the minimum requirements for unhindered ventilation. Sufficient space is reserved for air inlet and outlet without obstruction.	☐
5	The drive has been properly protected before commissioning.	☐

2.5 Installation Instructions

2.5.1 Installation Precautions

CAUTION	
	◆ The cabinet frame must be sturdy enough to carry the weight of the components, control circuits, and other devices installed in the cabinet. ◆ The cabinet for the drive module must be designed to provide protection against contact and meet the requirements for dust and humidity. ◆ To facilitate installation and maintenance, it is recommended to leave enough space around the product to ensure adequate cooling air flow, necessary clearances, and room for cables and cable supports. Do not install the control board near the main circuit or high-temperature parts. ◆ Make sure any bridging components or frames on which components are mounted are properly grounded and the connecting surfaces are unpainted. ◆ Ensure that the drive module is grounded properly through the mounting points on its mounting base. ◆ It is recommended to use nickel-plated copper; however, aluminum is also acceptable. ◆ Before connecting the aluminum busbar, remove the oxide layer and apply proper anti-oxidation filler compound. ◆ If there is a risk of condensation in the cabinet, use a cabinet heater. Although the heater is mainly used to keep the air dry, it can also be used for heating at low temperatures. When placing the heater, follow the instructions provided by the manufacturer.

1 Air inlet and outlet area of the cabinet

Reserve the minimum space for ventilation above and below the drive module to ensure heat dissipation. Especially when using cable ducts, observe this requirement. Do not route cables or install any components in the aforementioned areas.

Because the drive module has a high power density and strict cooling requirements, the air inlet and outlet must be arranged according to the following requirements.

Air inlet area: $S_{inlet} = (1.5–2.0) \times S_{module}$

S_{inlet}: Air inlet area of the system

S_{module}: Air inlet area of the module

Air outlet area: $S_{outlet} = (1.2–1.5) \times S_{inlet}$

It is recommended to arrange the air outlet on the top of the cabinet. If the air outlet is arranged at the cabinet door, use an additional exhaust fan.

Operating point airflow of the configured cabinet exhaust fan: $Q_{system} \geq 1.2 \times Q_{module}$

Q_{system}: Airflow of the system

Q_{module}: Airflow of the module

The ventilation parameters of the drive module are listed as follows:

Table 2-4 Ventilation parameters

Structure	S_{module} (cm^2)	Q_{module} (CFM)
S12	1000	900

NOTE

◆ Failure to comply with the installation requirements may significantly shorten the service life of the drive and cause the drive to malfunction.

2 Preventing recirculation of heated air

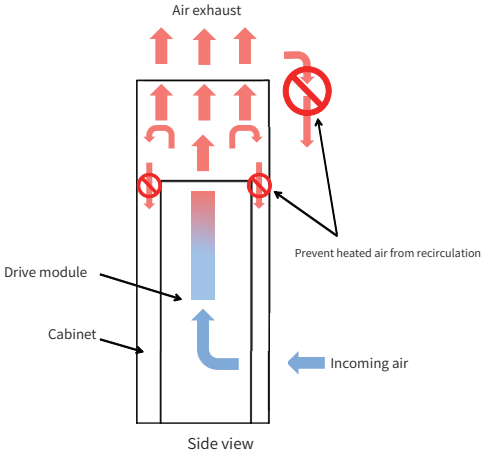


Figure 2-6 Air exhaust

1) Exterior of the cabinet

Prevent the heated air outside the cabinet from entering air flow circulation by guiding the outgoing heated air out of the air inlet area. Possible solutions include:

- Set grids for airflow guidance at the air inlet and outlet.
- Position the air inlet and outlet on different sides of the cabinet.
- Position the cooling air inlet at the lower part of the front door and install another exhaust fan on the top of the cabinet.

2) Interior of the cabinet

Install air-tight baffles at appropriate locations inside the cabinet to prevent the heated air from recirculating in the cabinet. Seal the baffles to the inner wall using neoprene gaskets or equivalent.

3 EMC Requirements

- Minimize the holes on the cabinet for better anti-interference and anti-attenuation performance. In the covered cabinet structure, the diameters of the holes on the metal contact surface for galvanic connection are up to 100 mm. Pay special attention to the hole size of the grids at the cooling air inlet and outlet.
- Weld the steel panels together without holes to achieve the optimal electrical connection. If welding cannot be performed, leave the gaps between the panels unpainted and install special conductive EMC strips to provide adequate galvanic connection. Generally, reliable conductive strips are made of flexible silicon substrates and coated with a layer of metal mesh on the surface. Additional conductive gaskets are needed between metal surfaces to enhance the contact. The distances between assembly screws are up to 100 mm.
- Establish a multi-point high-frequency grounding network in the cabinet to prevent voltage differences that could turn parts of the structure into high-impedance radiating elements. Use short and flat low-inductance braided copper straps to ensure good high-frequency grounding. High-frequency single-point grounding cannot be used due to the long distance in the cabinet.
- Relying solely on conductive EMC gaskets/straps is not sufficient to achieve protective grounding. Therefore, a sturdy low-frequency grounding structure is required for electrical safety of the components. Follow local regulations to design protective grounding.

2.5.2 Installing the Drive Module

Observe the following steps.

1) Install the ramp plate.

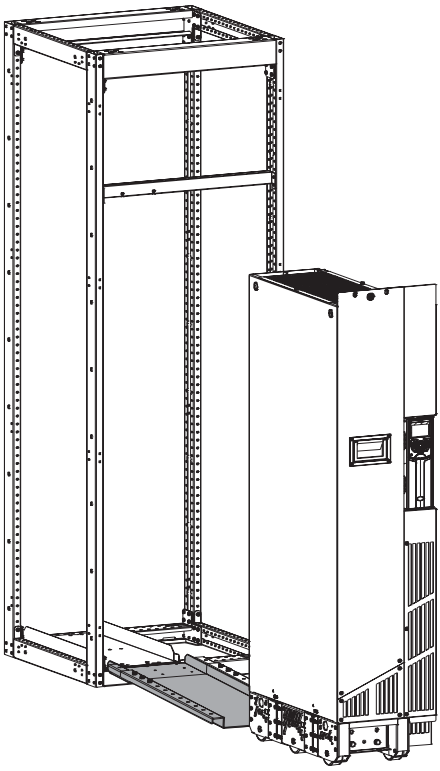


Figure 2-7 Installing the ramp plate

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



Figure 2-8 Pushing the drive module into the cabinet

3) Move down the bottom mounting bracket of the module and tighten the anchor bolts at the top and bottom to mount the module into the cabinet.

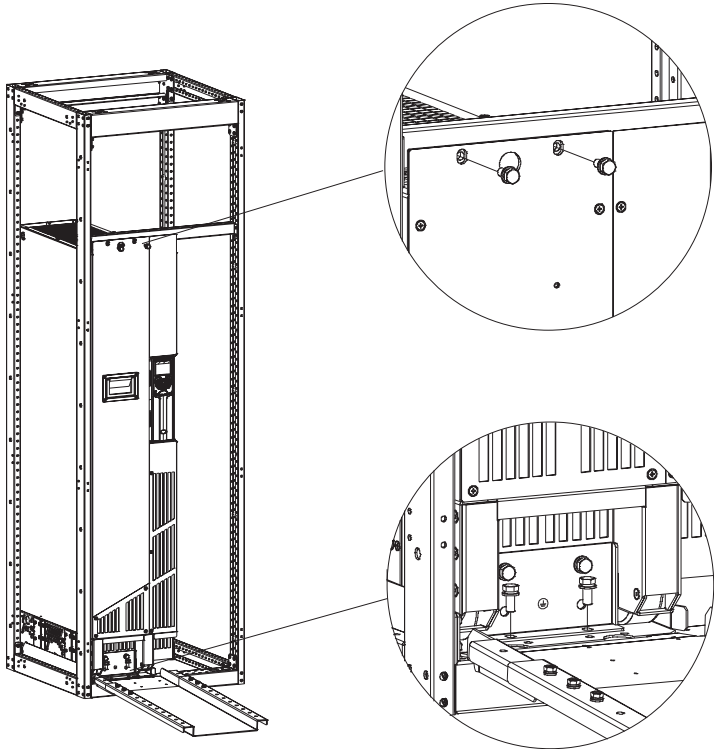


Figure 2-9 Mounting the module

NOTE

- Due to the module weight, prevent any toppling during the push-in process.

3 Mechanical Installation of AC Drive Cabinet

3.1 Installation Flowchart

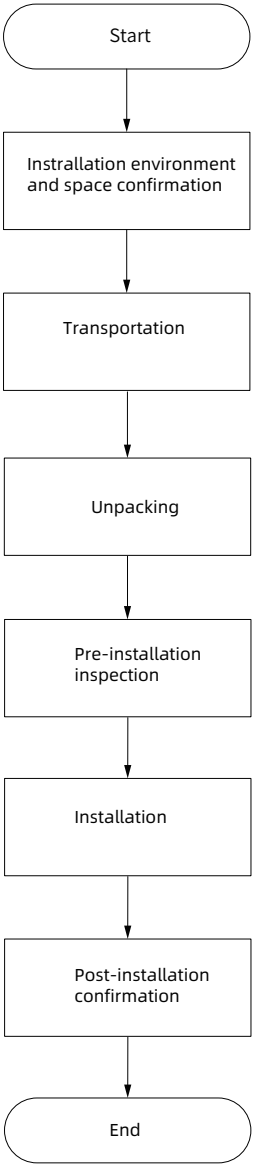


Figure 3-1 Mechanical installation flowchart

3.2 Installation Requirements

3.2.1 Environment

Item	Requirements
Heat dissipation and ventilation	Put the drive onto the incombustible surface and mount the drive vertically to the mounting bracket with screws. Reserve sufficient space around the drive for heat dissipation, because the drive generates a large amount of heat during operation.
Installation site	The installation site must meet the following requirements: Free from direct sunlight. Humidity ≤ 95% RH with no condensation. Free from corrosive, flammable, and explosive gases. Free from greasy dirt or dust.
Vibration	Install the drive in a place with minimum risk of vibration. For the vibration resistance performance, see "1.3 Technical Data".
Ambient temperature	The allowable climatic conditions must be complied with: Derate the power when the driver is installed at an ambient temperature of > 40° C or at an altitude of > 1000 m. For the derating coefficient, see "1.6 Derating".

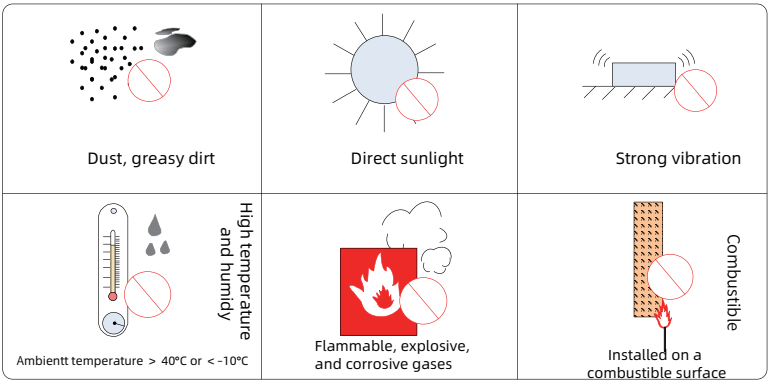


Figure 3-2 Environment requirements

Install the drive cabinet on a flat floor that is made of non-combustible materials and solid enough to support the weight of the cabinet. Check the floor flatness with a spirit level. The maximum allowable deviation from the surface level is 5 mm in every 3 m. Level the installation site, if necessary, as the cabinet is not equipped with adjustable feet.

Ensure that the door lock works properly during door opening and closing.

NOTE

- Mount the cabinet at a lower height for easier maintenance. If the cabinet is mounted at an elevated height, you cannot use the ramp rail of the power module in the cabinet when replacing the module.

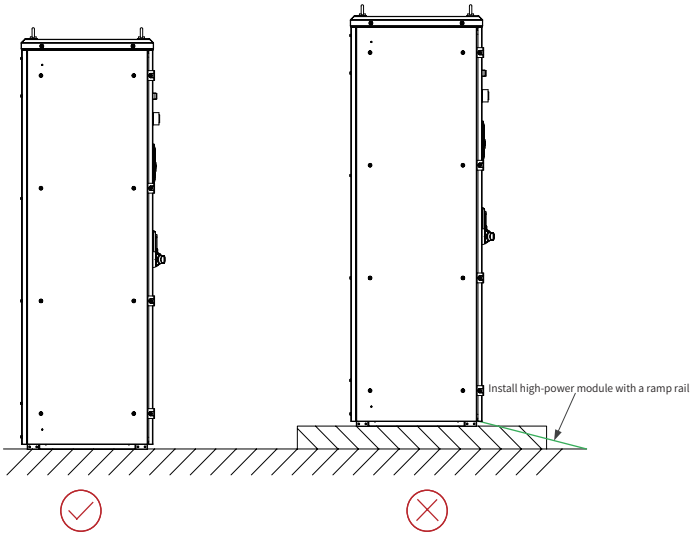


Figure 3-3 Requirements on the installation site

3.2.2 Space

1 Space on the top of the cabinet

Do not install the drive cabinet in a completely unprotected environment. Install all cabinets according to the drawings, with sufficient space around the cabinets for air flow, full range of door opening/closing, and maintenance. Reserve a passage for entering the installation foundation and the space for the auxiliary devices for transporting the cabinets.

The installation site must be dry and clean. The supplied air cannot contain any conductive gas, vapor, or dust, which is harmful to the product. If necessary, deploy filters to clean the air of the installation site. If there is dust present in the air, install filter mats in front of the vent of the cabinet door and the ventilation hood on the top of the cabinet. The IP ratings of basic cabinets are IP20.

CAUTION	
	◆ The allowable climatic conditions must be complied with: Derate the power when the cabinet is installed at an ambient temperature of > 40℃ or at an altitude of > 1000 m. For details, see "1.6 Derating".

Install the cabinet with reference to the attached dimension drawing. The following figure shows the distance between the cabinet top and the ceiling.

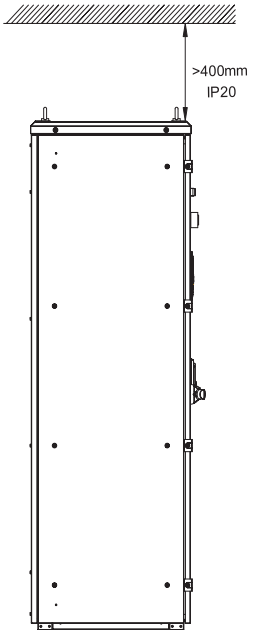


Figure 3-4 Distance between the cabinet top and the ceiling

2 Space in front of the cabinet

The cooling air is drawn into the power unit from the front through the vent at the lower part of the cabinet door. The heated air is discharged through the perforated canopy.

It is acceptable to place the cabinet against the wall, provided that the distance between the front of the cabinet and the wall is not less than 1200 mm and sufficient space is reserved for two sides of the cabinet.

Take the front door handle into consideration. Reserve sufficient space for maintenance and inspection to ensure that the front door can open to an angle of > 120° (with a maximum door opening angle of about 120° if unobstructed).

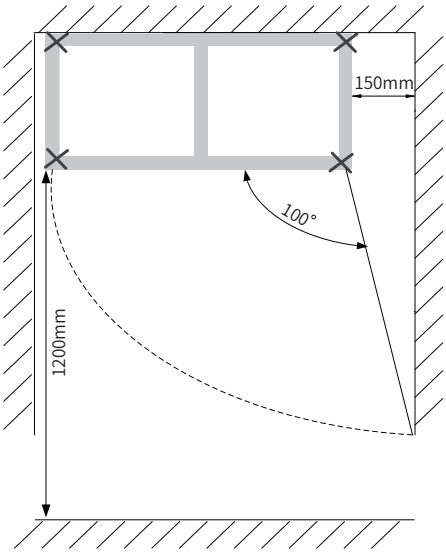


Figure 3-5 Space reserved for door opening/closing of the S12 AC drive cabinet (mm)

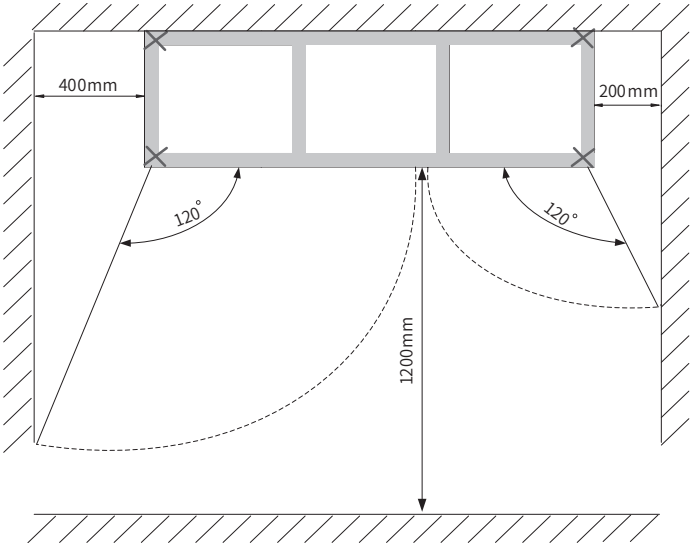


Figure 3-6 Space reserved for door opening/closing of the 2 × S12 AC drive cabinet (mm)

3.3 Unpacking and Transportation

3.3.1 Storage

Store the drive in a clean and dry room with temperatures between -40° C and +70° C and temperature variation smaller than 1° C/min. For long-term storage, cover the drive or take other appropriate measures to protect it against contamination and environmental influences.

To store the drive properly, observe the following:

- Store the product with the original package if possible.
- Do not store the drive in humid, high-temperature, or outdoor areas exposed to direct sunlight for an extended period.

CAUTION	
	◆ Do not place any mechanical load on the ventilation hood at the top of the cabinet. Doing so may result in hood damage. ◆ The ventilation cover is packaged separately and installed on site.

3.3.2 Pre-Unpacking Transportation

1 Precautions during transportation

- The product is heavy with a high center of gravity, which has been marked on the product.

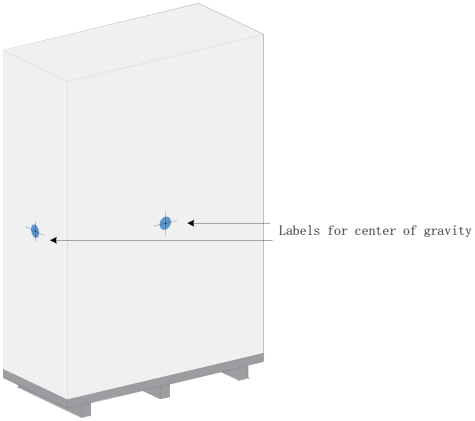


Figure 3-7 Labels for the center of gravity

- Place the drive on a flat and solid ground that can bear its weight.
- Transportation must be performed by well-trained personnel with suitable hoisting tools.
- Transport the product only in the upright position as indicated on the package. Never transport the cabinet in an inverted or flat position.

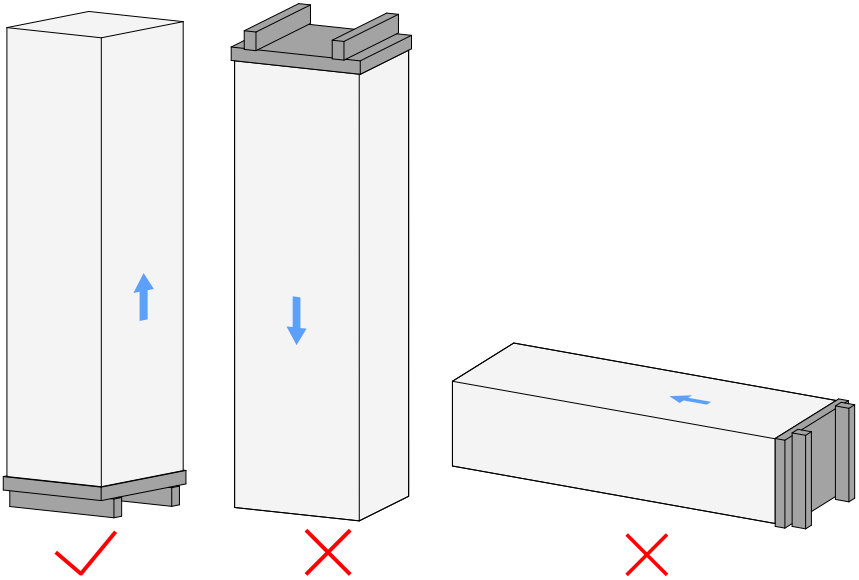


Figure 3-8 Modes of transportation

- Due to the weight and length, transport the cabinet by using auxiliary eye bolts on the top of the cabinet and the wooden pallet under the cabinet.
- When transporting the cabinet with a forklift, mount the cabinet onto a wooden pallet. If the cabinet needs to be transported to another place, do not remove the cabinet from the pallet.
- When transporting the cabinet with a crane, install auxiliary eye bolts on the cabinet.

2 Transporting the packaged product by using the pallet under the package

- Transport the cabinet with a forklift or crane with the load-carrying capacity greater than the cabinet weight.
- Adjust the distance between forklift feet to be larger than one half of the length of the cabinet.

- The hoisting rope of the crane must pass through the pallet under the cabinet, with the hoisting height not higher than 0.3 m.
- Do not use a hydraulic vehicle for long-distance transportation or on slopes.
- Hold the cabinet on both sides during handling.

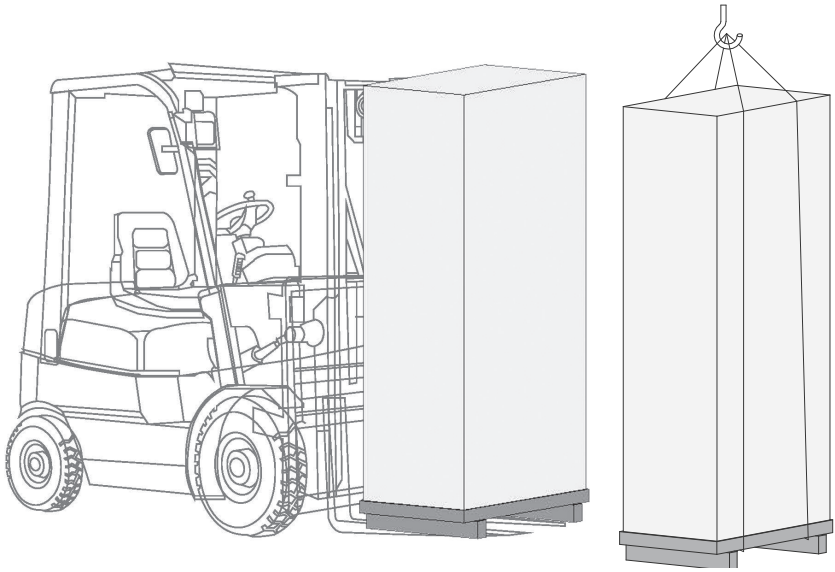


Figure 3-9 Pre-unpacking transportation

3.3.3 Acceptance

Be sure to inspect the product carefully upon receipt from the shipping company.

Check each received item against the delivery note. Notify the shipping company immediately of any missing components or damage. Contact Inovance or Inovance's local agent for technical support when necessary.

DANGER	
	◆ If the product is damaged during transportation, its electrical safety performance may no longer be guaranteed. Connect the product only after performing a professional medium-voltage test. ◆ Failure to comply may result in personal injury, death, or major property loss.

1 Unpacking

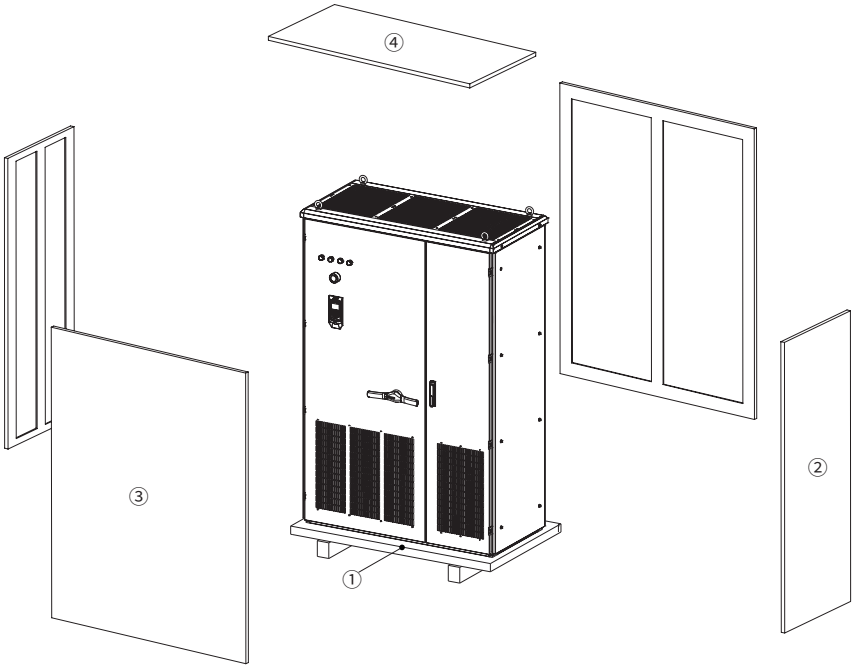


Figure 3-10 Unpacking the cabinet

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

CAUTION

- During unpacking, put the crowbar into the crate as short as possible to prevent cabinet damage. Exercise caution to prevent injury by nails.
- Do not use sharp tools to remove packaging materials such as plastic films. Doing so may scratch the cabinet.

Place the packaged product on the empty and flat ground of a factory building. Use appropriate tools, such as a crowbar, to pry off the wooden crate along the gap at the plate edge. Then, remove the cover plate, side plate, and end plate.

2 Removing the pallet

Before installing the cabinet, remove the screws for fastening the pallet and the cabinet from four corners of the cabinet, and then remove the pallet.

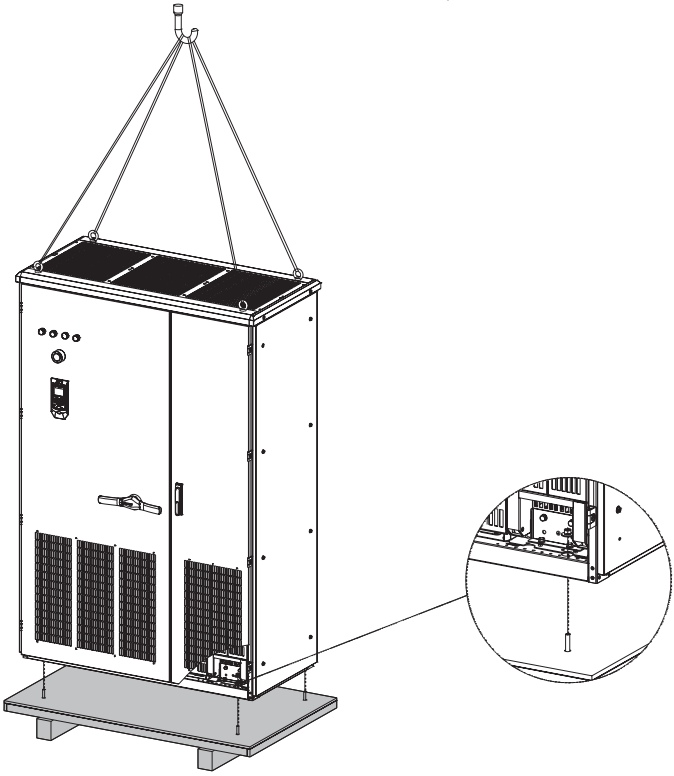


Figure 3-11 Removing the cabinet from the pallet

NOTE

◆ For transportation with a forklift, do not remove the pallet.

3.3.4 Post-Unpacking Transportation

1) Using a crane

Secure the hoisting ropes or slings to hoisting holes at the beams on top of the cabinet.

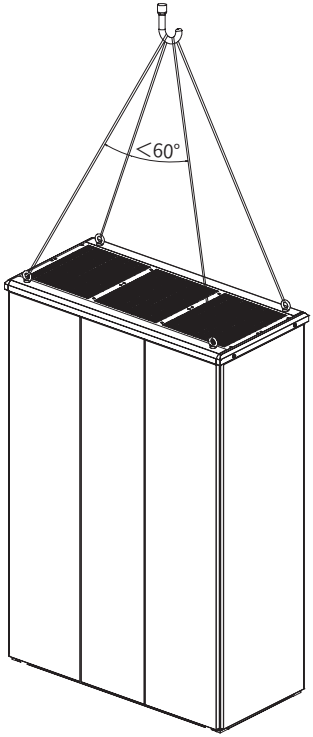


Figure 3-12 Hoisting the cabinet

2) Using a forklift or pallet truck

When using a pallet truck, check the load-carrying capacity of the truck before moving the cabinet.

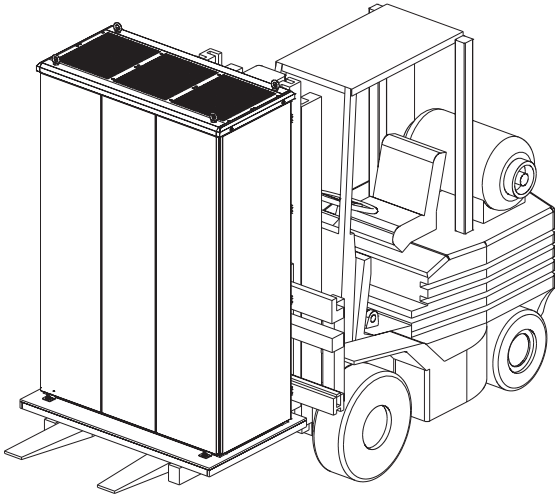


Figure 3-13 Using a forklift or pallet truck

3) Using rollers

Remove the wooden pallet used for transportation.

Lay the cabinet on the rollers and move it carefully until it is close to the final installation site. Remove the rollers by hoisting the cabinet with a crane, forklift, pallet truck or jack.

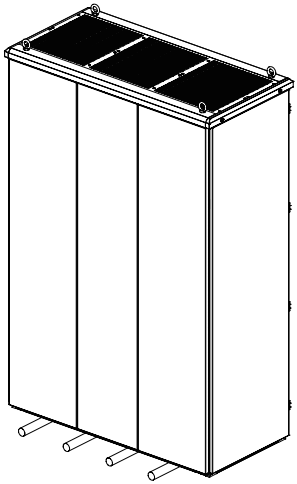


Figure 3-14 Using rollers

4) Removing the eye bolts

The auxiliary eye bolts are installed on the drive at the time of shipment. After removing the eye bolts, fasten the M12 bolts to the original holes; otherwise, the required IP rating cannot be achieved.

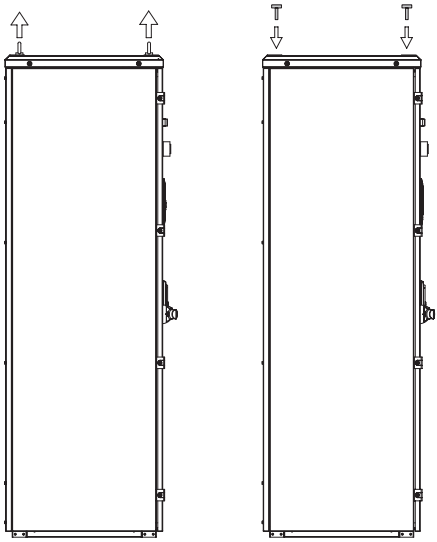


Figure 3-15 Removing the auxiliary eye bolts

3.4 Pre-Installation Checklist

DANGER	
	◆ To ensure the safe operation, the drive cabinet must be properly installed and put in to use by qualified personnel in accordance with all the warnings and notices. ◆ In particular, the general and national installation and safety guidelines for high-voltage installations (for example, GB-Chinese national mandatory standard) as well as the guidelines relating to the proper use of tools and personal protective equipment must be observed. ◆ Failure to comply may result in personal injury or death or major loss of property.

After the installation is done, check appropriate check boxes in the "Confirmed" column to confirm task completion.

Table 3-5 Checklist for mechanical installation

No.	Description	Confirmed
1	The center of gravity is labeled.	☐
2	The package is intact and free of damage and dampness.	☐
3	The load-bearing capacity of the floor and the environment meet the installation requirements. For details, see "3.2.1 Environment".	☐
4	The ceiling height meets the minimum requirements for unhindered ventilation. There is sufficient space for air inlet and outlet without obstruction. Sufficient space is reserved for a safe passing when the cabinet door is opened. For details, see "3.2.2 Space".	☐
5	The cabinet enclosure is free of deformation, paint peeling, cracks, and other defects, without water stains inside the cabinet.	☐
6	The accessories (options) inside the cabinet are complete.	☐
7	The wooden pallet is removed when the cabinet is transported to the final installation site. For details, see "3.3.3 Acceptance".	☐
8	The auxiliary eye bolts are removed before the cabinet is finally installed. For details, see "3.3.4 Post-Unpacking Transportation".	☐
9	The cabinet is installed at the pre-designed anchor point as required.	☐
10	All contact protection devices (guard plates) inside and outside the cabinet are installed before commissioning.	☐

3.5 Installation Instructions

3.5.1 Installation Precautions

⚠ CAUTION	
	◆ Separate high-voltage cables from low-voltage cables by using different brackets. If they cannot be separated, lay low-voltage cables in fully-enclosed metal ducts. ◆ The cable trench must be: a) made of incombustible materials; b) smooth, moisture-proof, and dust-proof; and c) able to prevent intrusion of animals. ◆ Failure to comply may result in personal injury or death or major loss of property.

During foundation design, take the following factors into consideration: a) inspection space in front of the drive; b) routing of power cables, motor cables, and system control cables. Design a cable trench or duct below the drive. Route power cables separately from signal cables. The routing diagram and requirements are as follows.

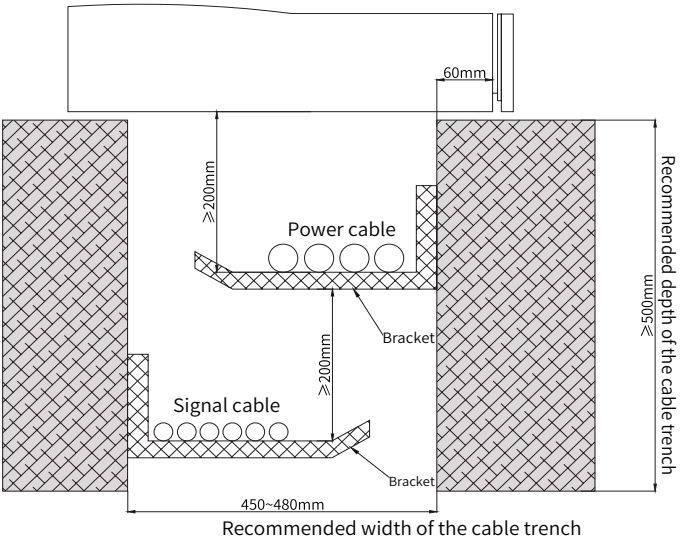


Figure 3-16 Foundation layout

3.5.2 Installing the Drive Cabinet

1 Installing expansion screws

Before installing the cabinet on a concrete floor, install the expansion screws in the floor at the positions corresponding to the holes for fixing the cabinet.

The procedure for installing the expansion screw is as follows:

1) The overall dimension diagrams of the cabinets show the dimensions of drilling holes for expansion screws. All drilling holes must have a diameter slightly smaller than the maximum outer diameter of the expansion screws and a depth greater than the length of the expansion screws, and must be perpendicular to the ground.
2) The expansion screw consists of two movable parts: a spring-type expansion tube and a screw. Knock the expansion screw into the hole (below the surface) with a hammer, as shown in Step 2.
3) After placing the cabinet on the required position, fasten it with M10 bolts. The screw will be pulled up, making the spring-type expansion tube deform to fasten the cabinet, as shown in Step 3.

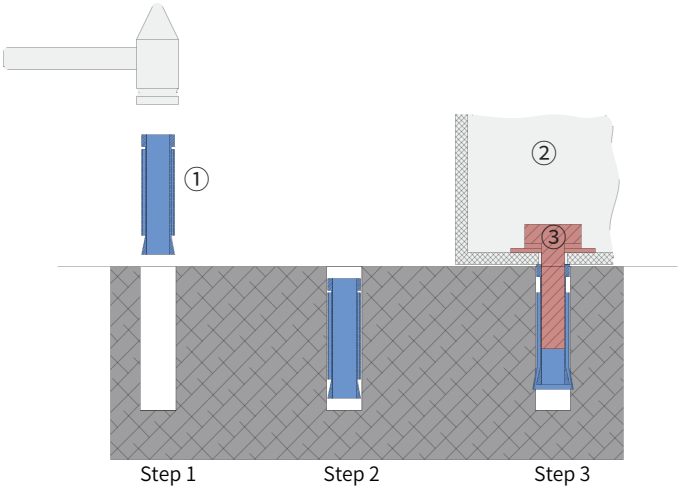
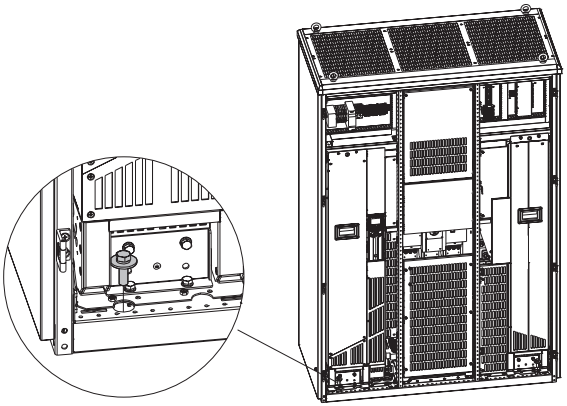


Figure 3-17 Procedure for installing expansion screws

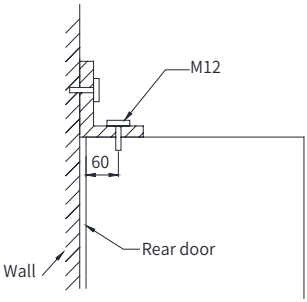
No.	Remark
①	Expansion screw
②	Cabinet
③	M10 bolt

2 Installing the cabinet

1) Fix the drive cabinet in an upright position to the floor and the wall or ceiling. The cabinet can be bolted to the floor through inner holes. Secure the cabinet to the floor with M10 bolts through the mounting holes in the bottom of the cabinet.



2) If floor mounting at the back is not possible, attach the top of the cabinet to the wall with L-brackets (not included in the delivery) bolted to the lifting eye.



4 Electrical Installation

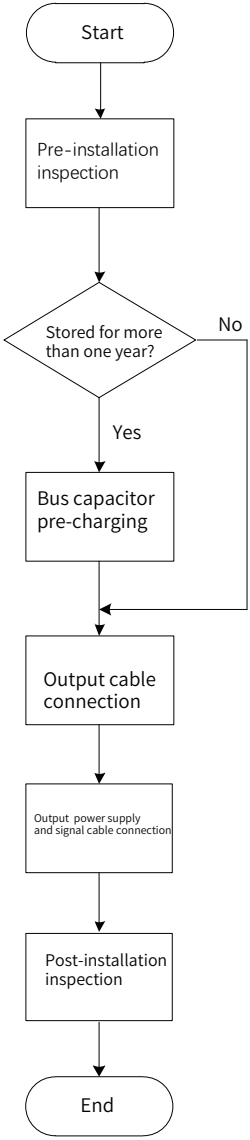


Figure 4-1 Electrical installation flowchart

4.1 Safety Information

4.1.1 Pre-Installation Safety Precautions

DANGER	
	◆ The product is typically used in industrial applications involving high voltage. Given the product contains live and rotating components during operation, improper removal of the cover, improper use/operation, and insufficient maintenance may result in severe personal injury, death, or loss of property. ◆ Read and observe the safety precautions in this guide prior to operations. Only professional technicians are allowed to perform operations. ◆ When carrying out any kind of work on electrical devices, always observe the following "five safety rules": 1) Power off the device. 2) Make sure that the device will not be energized again. 3) Make sure that there is no residual voltage. 4) Make sure that the device is reliably grounded. 5) Cover or isolate the adjacent components that are still live.

4.1.2 Electrical Inspection

DANGER	
	◆ The product operates at medium voltage. Any connections must be performed after no residual voltage is present. ◆ Only qualified personnel can operate the product. ◆ Exercise caution in operating the de-energized product, because there may be external supply voltage. The power terminals and control terminals may still be live even when the product stops. ◆ Open the product after verifying that the voltage is lower than 36 VDC, because the product may be live after 15 min of power-off due to the internal DC link capacitor. ◆ Install and connect the motor, cabinet and other components in compliance with national technical specifications and other applicable regional regulations, especially regulations concerning cable dimensions, fuses, grounding, disconnection, isolation, and overcurrent protection. ◆ If a fuse on a branch circuit trips, the fault current may have been disconnected. To minimize the risk of a fire or an electric shock, check the conductive parts and other components of the product and replace any damaged ones. If any fuse trips, figure out the cause and rectify the fault.

4.1.3 General Precautions

■ Static electricity

DANGER	
	◆ The circuit board contains components that are sensitive to static electricity. When operating the circuit board, wear a grounded wrist strap. Do not touch the circuit board unless necessary.

■ Optical components

CAUTION	
	◆ Handle optical fibers with care. When unplugging the optical fiber, hold the connector instead of the fiber itself. Since optical fiber is extremely sensitive to dirt, do not touch the end with a bare hand.

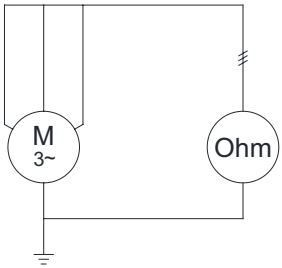
4.1.4 Insulation Test

The MD880 series AC drive has been tested for insulation between the main circuit and the enclosure at the factory. Therefore, do not perform any voltage and insulation resistance tests on the drive. Perform the insulation test of the motor and motor cables according to the following steps:

DANGER	
	◆ When perform the insulation test before connecting the system to the main power supply, ensure that the drive system and main power supply (input power supply) are disconnected. ◆ Check that the motor cables are connected to the motor and disconnected from the drive output terminals (U, V, W). ◆ Measure the insulation resistance between each phase cable and PE cable with 500 VDC applied. For details about the insulation resistance of the motor, see the motor manufacturer's user guide.


NOTE

◆ High ambient humidity can reduce the insulation resistance of the motor. If the insulation resistance does not meet requirements, reduce the ambient humidity and then measure the insulation resistance again.



4.2 EMC-Compliant Cable Routing

DANGER	
	◆ All covers removed during the cable routing must be re-installed before the drive is commissioned. ◆ Secure 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 separately from power cables:

When analog signals are used to remotely control the drive, the signal cables and strong-current circuit cables (power supply input, inverter output, and braking resistor connecting cable) of the controlled drive must be routed separately with a distance larger than 30 cm, to reduce interference on the analog generated by the drive and other devices. The preceding requirement must be met for routing inside the control cabinet.

2 Analog control signal cables:

Use shielded twisted pair cables as the analog control signal cables. When stripping the cable sheath, keep the stripped part as short as possible (5 mm to 7 mm), and wrap the exposed shield with the insulating tape to prevent the interference from the shielded cable in contact with other devices.

3 Motor cables:

Use the shielded cables as the motor cables. Keep the distance between the drive and the motor as short as possible. Route the motor cables separately from other cables, and avoid laying the motor cables and other cables in parallel for a long distance, which reduce the electromagnetic interference caused by rapid change of the drive output voltage.

4 Power cables:

Use the shielded cables as the motor cables, or protect all cables between the drive and the motor with ducts.

5 Control cables and power supply cables:

If the power supply cables and control cables must be intersected, make the intersection angle 90 degrees.

4.2.2 Routing Suggestions

1) Route the cables for transmitting different signals separately. Separate disturbing cables from sensitive cables with a minimum clearance of 30 cm wherever possible. When these two types of cables must be intersected, make the intersection angle 90 degrees to avoid interference.

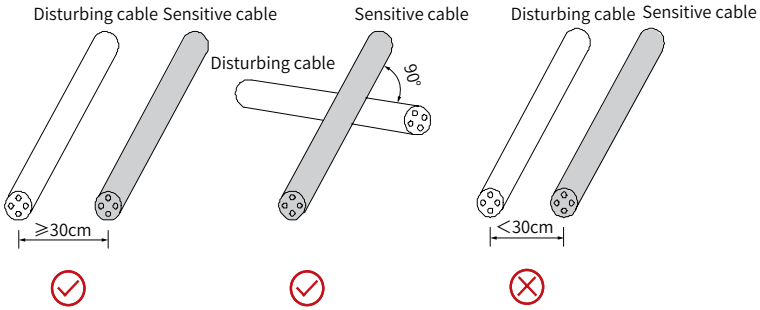


Figure 4-2 Routing of disturbing cables and sensitive cables

2) Route different signal cables separately and keep different signals apart with the equipotential signal cables. When routing signal cables of the same type, place the equipotential signal cables on the outer layer and include as many equipotential signal cables as possible in the middle. The following figure shows an example.

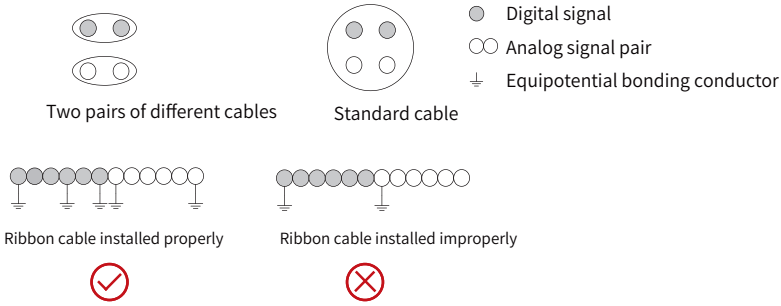


Figure 4-3 Routing of different signal cables

3) For multi-conductor cables, use one cable to transmit one type of signals. If one cable is used to transmit different types of signals, use the cable with shielded conductors, as shown in the following figure.

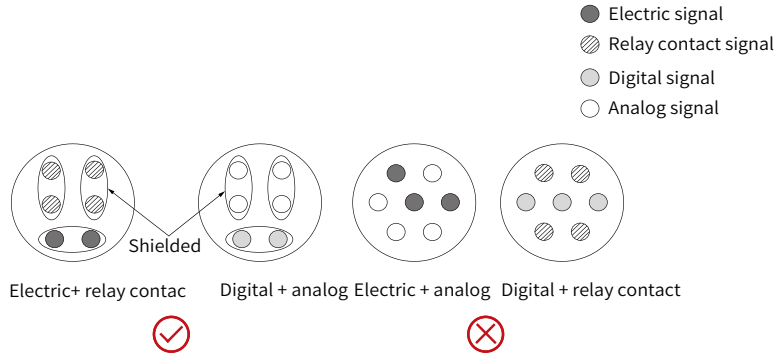


Figure 4-4 Routing of multi-conductor cables

4) For unused conductors in a multi-conductor cable, connect the unused (or reserved) conductors to the equipotential connection point.

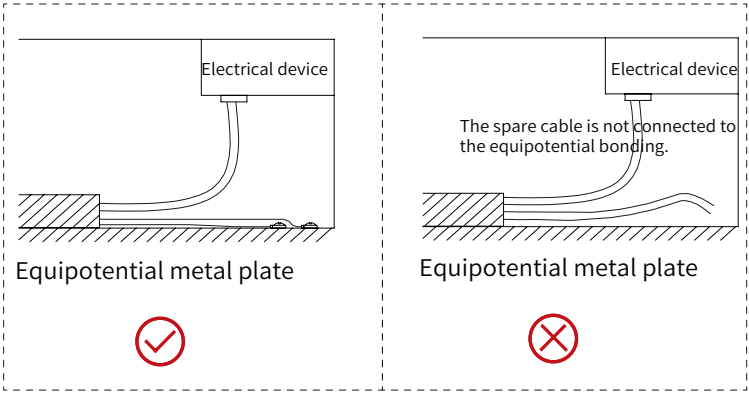


Figure 4-5 Handling unused conductors in a multi-core cable

5) For low-level sensor signals and relay signals sharing a common line, route the two cables as close as possible to prevent a large loop area. For analog signals, use the twisted pair cables. For digital signals, ensure that the signal cables are routed close to each other.

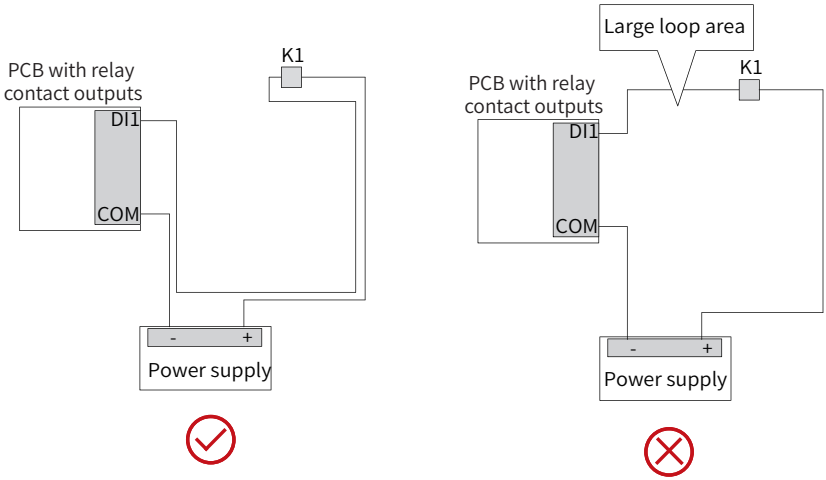


Figure 4-6 Preventing a large loop area

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

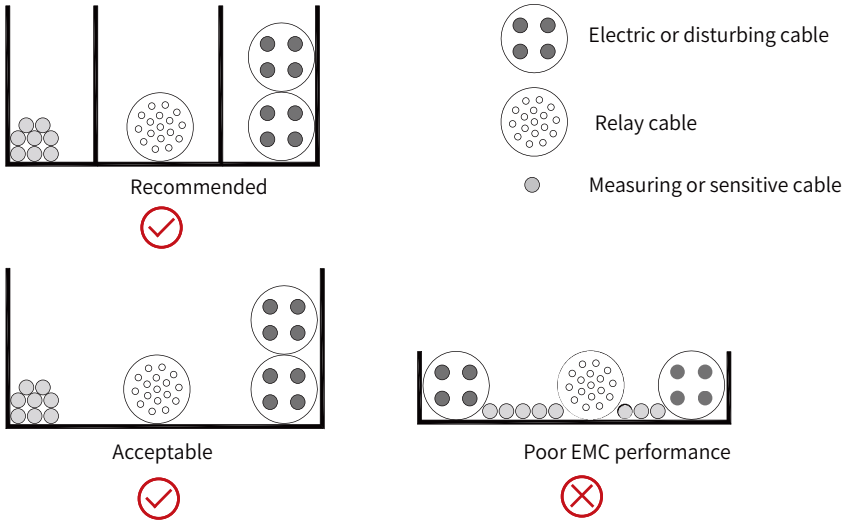


Figure 4-7 Routing of different types of cables

7) Keep the unshielded part of the shielded cable as short as possible. Connect the shield to the nearest PE terminal. Note that if the stripped sheath is too long, the conductor may be prone to signal interference, especially the encoder signals.

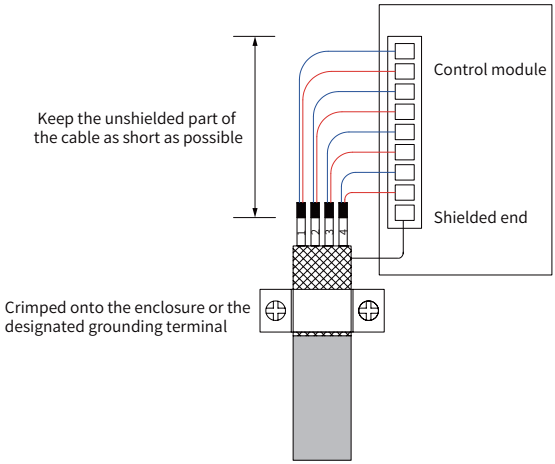


Figure 4-8 Handing the shielded cable

4.2.3 Connecting Shielded Power Cables

The shield of the shielded power input/output cables inside the drive must be in large-area contact with the shield plate in the cabinet to achieve good EMC effect. See the following figure for the connection method.

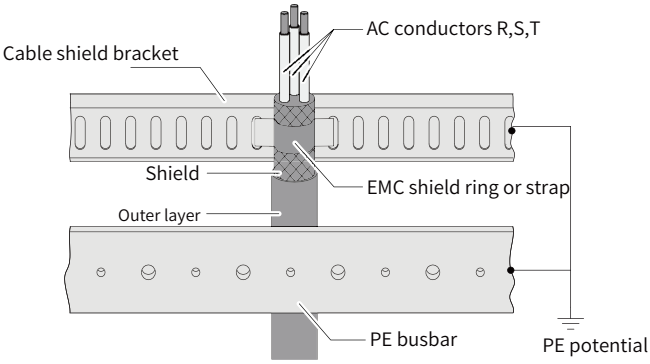


Figure 4-9 Connecting shielded power cables

4.3 Pre-Charging the Bus Capacitor

The drive contains multiple electrolytic capacitors, the service lives of which depend on the operating time, load, and ambient temperature. Therefore, their service lives can be extended by lowering the ambient temperature.

Capacitor fault is often associated with product damage, input fuse fault, or fault trip. Contact Inovance if you suspect a capacitor fault. You can obtain spare parts from Inovance. Do not use spare parts other than those specified by Inovance.

DANGER	
	◆ Store the product for up to two years. If it is stored for more than one year, recharge the internal DC link capacitors before commissioning. The storage period is calculated from the date of manufacture, rather than the date of delivery.

For the charging procedure, see the following:

Charging requirements:

Apply the rated voltage to the bus capacitor without load for at least 30 min. During this period, no charging module is allowed to be enabled.

Recommended components for the charging circuit:

1) One three-phase fuse switch (10 A/690 V)

2) Six incandescent lamps (100 W/230 V), used for the drive module of the 690 V system. Connect two incandescent lamps in series in each power supply phase or use three 1 kΩ/100 W resistors in the incandescent lamp position.

3) Small components, such as lamp holder and 1.5 mm^2 cables.

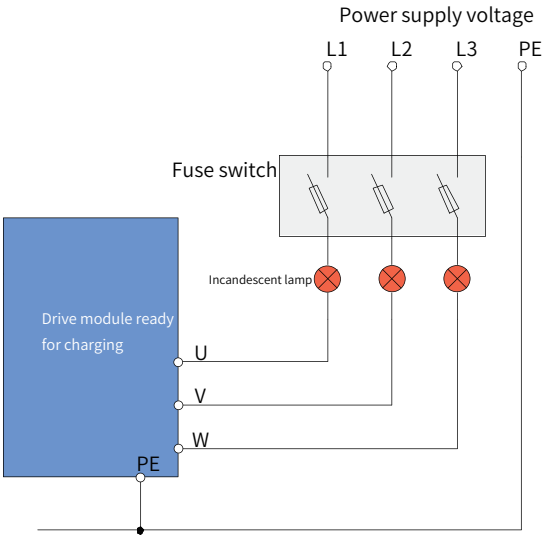


Figure 4-10 Charging connection

4.4 Wiring

DANGER	
	◆ When wiring the drive, tighten the screws with the specified tightening torques as shown in "1.8 Common Tightening Torques of Screws and Bolts". Failure to do so may result in connector overtemperature during the drive operation.

4.4.1 Cable Connection for S12 AC Drive Module

1 Terminal layout

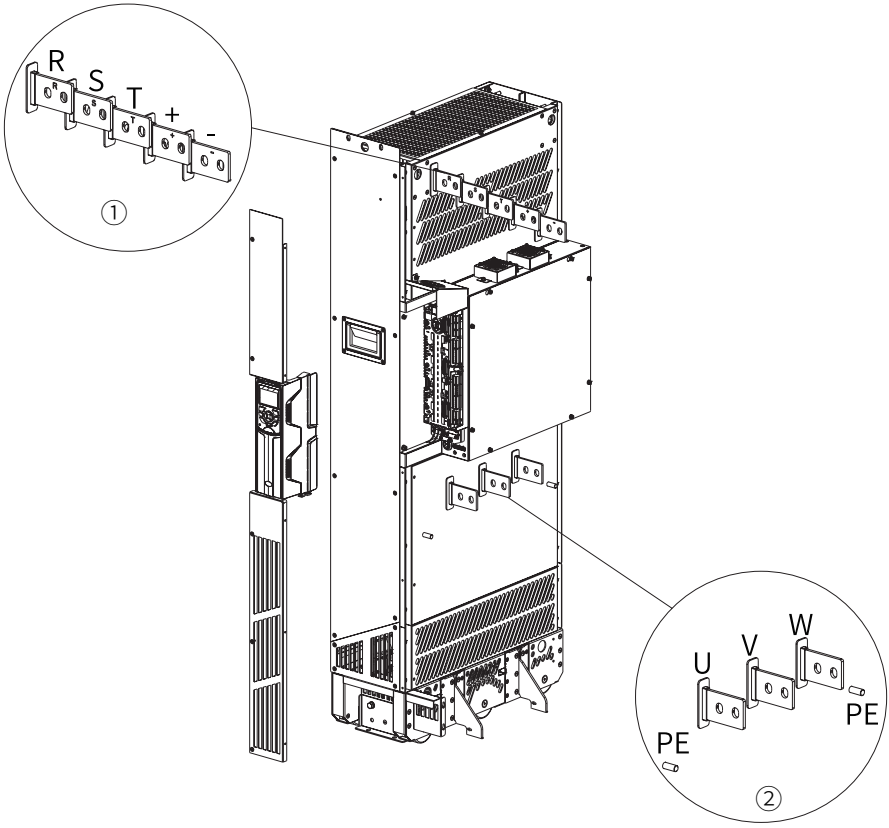


Figure 4-11 Power terminal layout of the S12 AC drive module

Table 4-1 Power terminal description for S12 AC drive module

No.	Terminal assignment	Description
①	a: AC input copper busbar (R, S, T) b: Copper busbar (+, -)	Connected to the AC input copper busbar and the positive and negative copper busbars. Select appropriate cables and tightening torques according to the recommended cables for the main circuit in the following section.
②	a: AC output busbar (U, V, and W) b: PE grounding stud	Connected to the AC output copper busbar and PE copper busbar. Select appropriate cables and tightening torques according to the recommended cables for the main circuit in the following section.

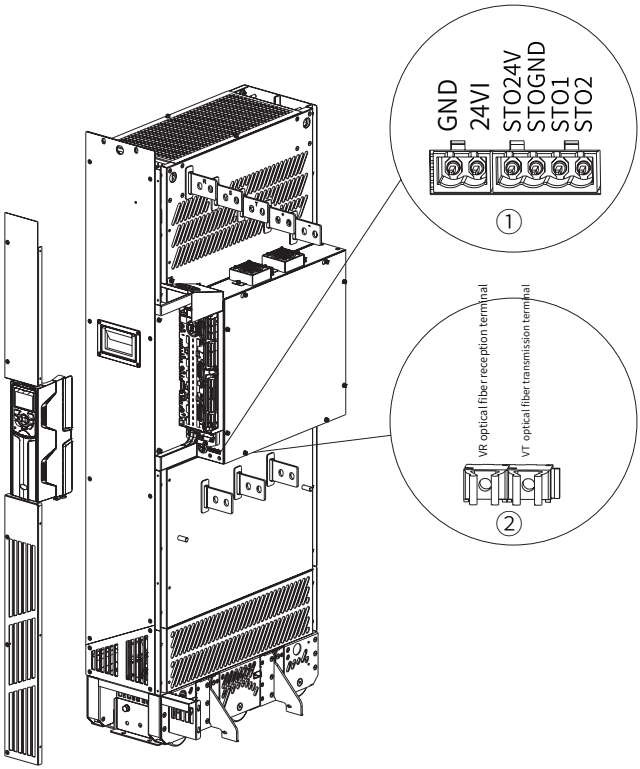


Figure 4-12 Control circuit terminal layout of the S12 AC drive module

Table 4-2 Control circuit terminal description for the S12 AC drive module

No.	Terminal assignment	Description
①	a: 2-pin power supply terminal b: 4-pin STO terminal	a: Input terminal for external 24 V power supply, dual-conductor twisted pair, single-conductor cable, cross-sectional area: 0.5–2.5 mm^2 b: STO terminal, four-conductor shielded cable, cross-sectional area: 0.5–2.5 mm^2
②	VR optical fiber reception terminal/VT optical fiber transmission terminal	Terminals for connecting the optical fiber, connected to the HCU or HPCU through optical fiber.

NOTE

- The terminal for external 24 V redundant power supply enables the input of the 24 V redundant power supply.

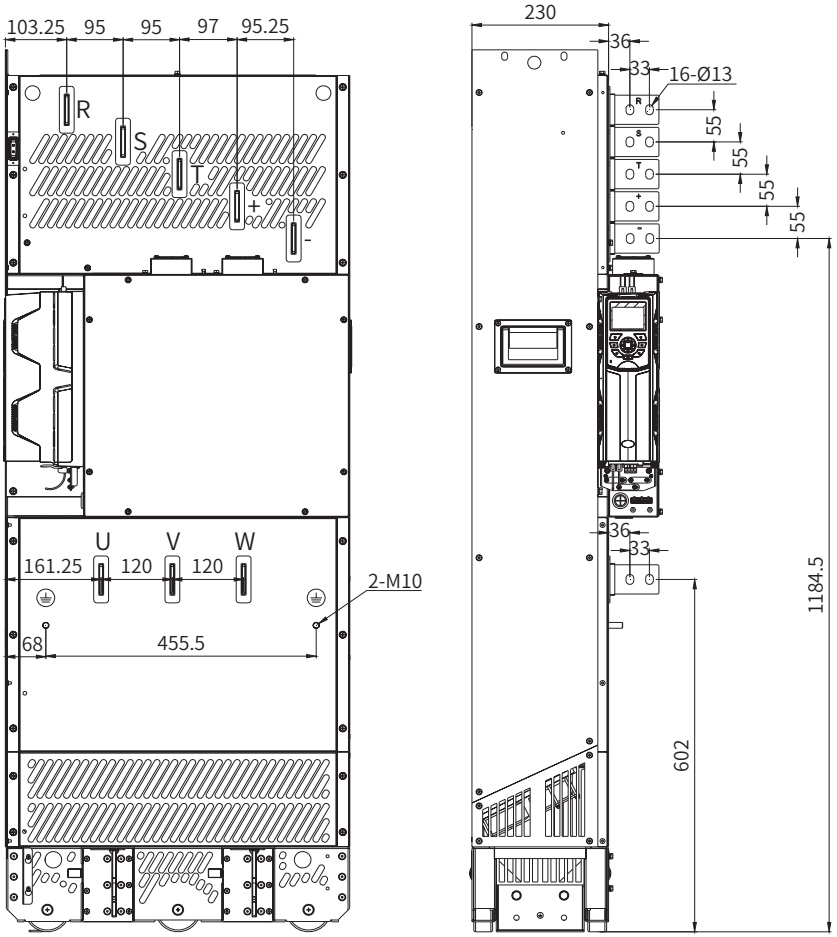


Figure 4-13 Terminal dimensions of the S12 AC drive module

2 Wiring procedure

1) Be sure that all the I/O terminals are connected properly.
2) Secure the power cable to the cable rack to prevent tension applied on terminals.
3) When the shielded power cable is used, fix the shield to the shield plate based on EMC requirements.

4.4.2 Cable Connection for S12 AC Drive Cabinet

1 Terminal layout

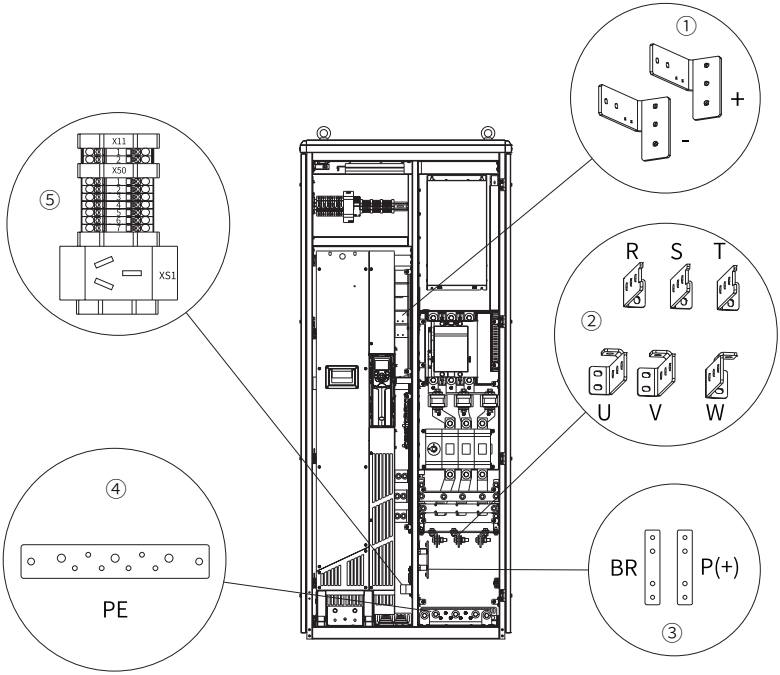
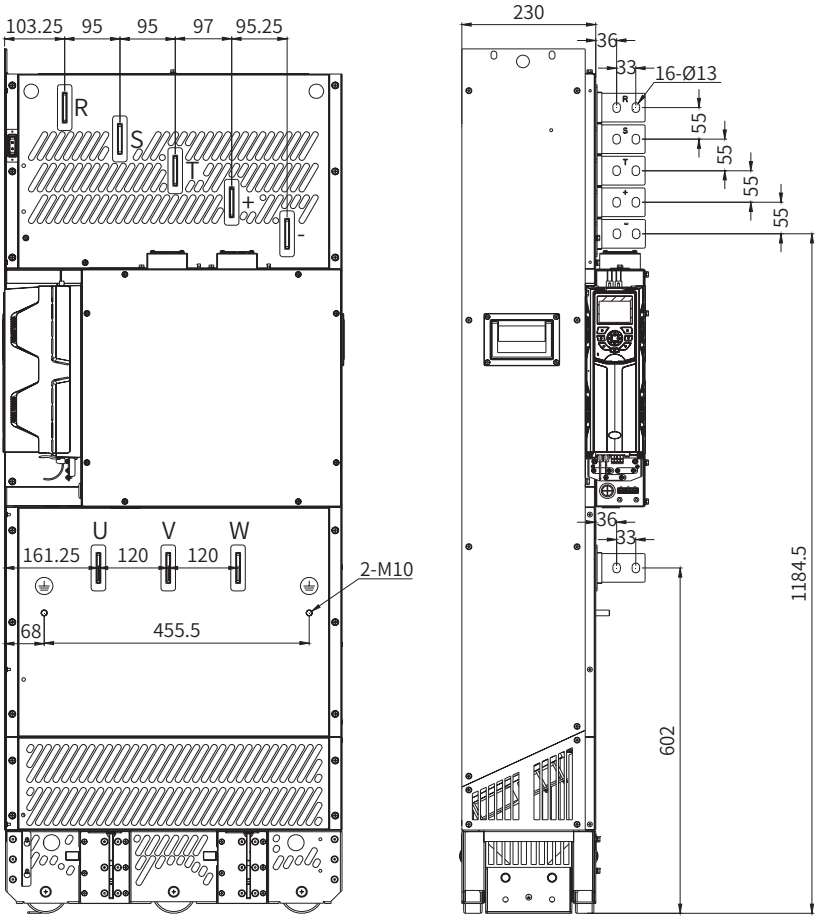


Figure 4-14 Terminal layout of the S12 AC drive cabinet



Side view

Front view

Figure 4-15 Terminal dimensions of the S12 AC drive cabinet (mm)

Table 4-3 Terminal description for the S12 drive cabinet

No.	Terminal assignment	Description
①	Copper busbar (+, -)	Connected to the positive and negative copper busbars. Select appropriate cables and tightening torques according to the recommended cables for the main circuit in the following section.
②	a: AC input copper busbar (R, S, T) b: AC output copper busbar (U, V, W)	Connected to the AC input/output copper busbar. Select appropriate cables and tightening torques according to the recommended cables for the main circuit in the following section.

No.	Terminal assignment	Description
③	Braking resistor copper busbar	Recommended cable: single 70 mm^2 cable, lug model: OT/70-10
④	PE grounding terminal	Connected to the PE copper busbar. Select appropriate cables and tightening torques according to the recommended cables for the main circuit in the following section.
⑤	X11: Control power input X50: Emergency stop input terminal	Control power terminal: two-conductor cable, cross-sectional area: 2.5-4 mm^2 Emergency stop input terminal: two-conductor cable, cross-sectional area: 2.5-4 mm^2

2 Wiring procedure

1) Be sure that all the I/O terminals are connected properly.
2) Secure the power cable to the cable rack to prevent tension applied on terminals.
3) When the shielded power cable is used, fix the shield to the shield plate based on EMC requirements.

4.4.3 Cable Connection for 2 × S12 AC Drive Cabinet

1 Terminal layout

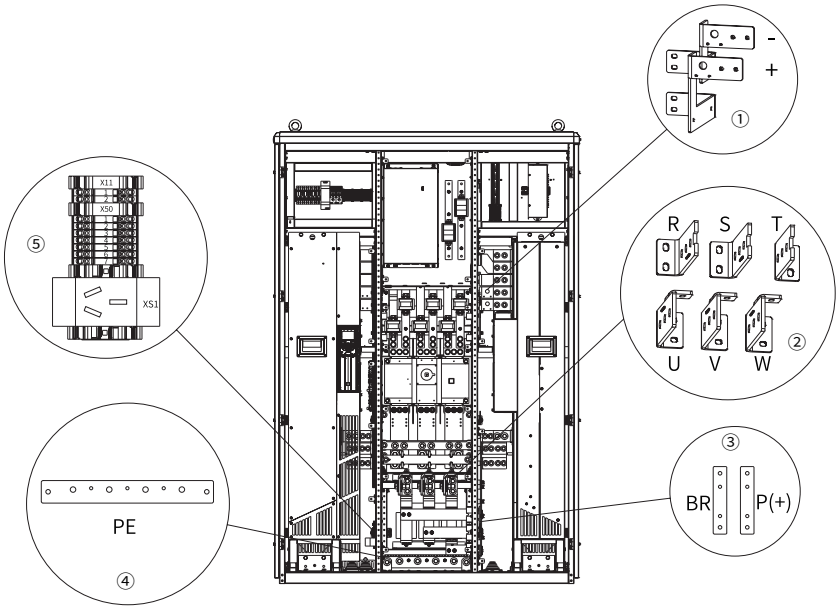


Figure 4-16 Terminal layout for the 2 × S12 AC drive cabinet

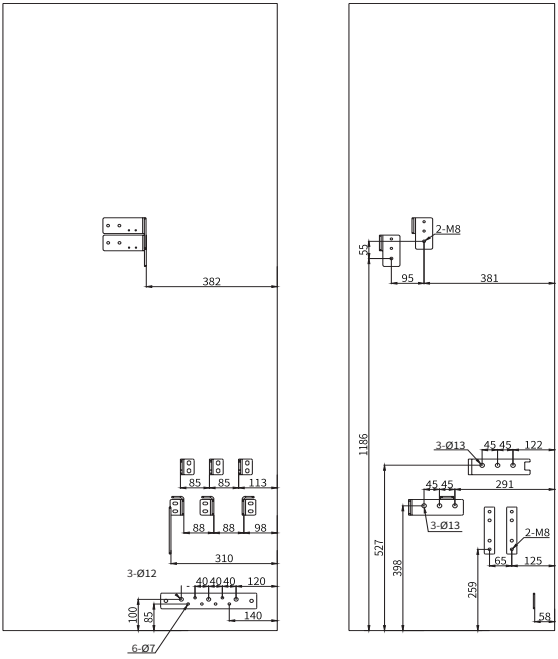


Figure 4-17 Terminal dimensions for the 2 × S12 AC drive cabinet (mm)

Table 4-4 Terminal description for the 2 × S12 AC drive cabinet

No.	Terminal assignment	Description
①	Bus terminals (+, -)	Connected to the positive and negative copper busbars. Select appropriate cables and tightening torques according to the recommended cables for the main circuit in the following section.
②	a: AC input copper busbar (R, S, T) b: AC output copper busbar (U, V, W)	Connected to the AC input/output copper busbar. Select appropriate cables and tightening torques according to the recommended cables for the main circuit in the following section.
③	Braking resistor copper busbar	Recommended cable: single 70 mm^2 cable, lug model: OT/70-10
④	PE grounding copper busbar	Connected to the PE copper busbar. Select appropriate cables and tightening torques according to the recommended cables for the main circuit in the following section.
5	X11: Control power input X50: Emergency stop input terminal	Control power terminal: two-conductor cable, cross-sectional area: 2.5-4 mm^2 Emergency stop input terminal: two-conductor cable, cross-sectional area: 2.5-4 mm^2

2 Wiring procedure

1) Be sure that all the I/O terminals are connected properly.
2) Secure the power cable to the cable rack to prevent tension applied on terminals.
3) When the shielded power cable is used, fix the shield to the shield plate based on EMC requirements.

4.4.4 Operating the Drive in TT/TN System

It is strongly recommended to install two grounding screws on the voltage dependent resistor plate as shown below when operating the drive in the TT/TN system.

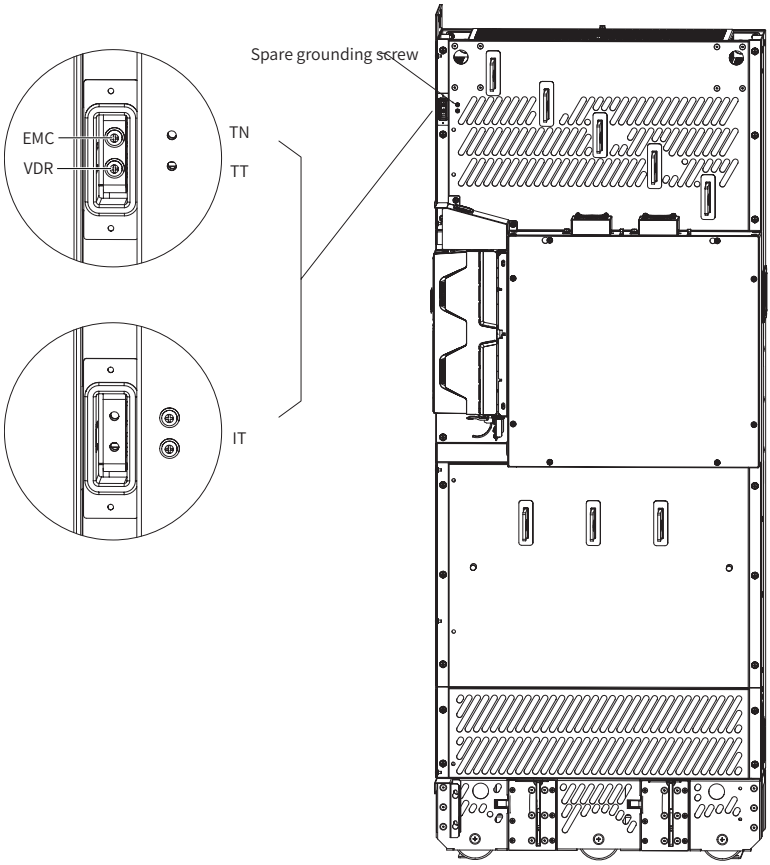


Figure 4-18 Installing two M3 screws on the voltage dependent resistor plate

NOTE

◆ Do not install the two grounding screws when operating the drive in the IT system. The two grounding screws have been removed by default.

4.4.5 Cable Specifications and Recommendation

Table 4-5 Recommended cables for the main circuit

Model	Rated current (A)	I/O power cable (mm^2)	Lug model (mm^2)	Grounding cable (mm^2)	Tightening torque (N·m)
MD880-01S-0340-7-SG	340	3 x 50	OT/50-10	1 x 50	20
MD880-01S-0410-7-SG	410	3 x 70	OT/70-10	1 x 70	20
MD880-01S-0530-7-SG	530	3 x 95	OT/95-12	1 x 95	35
MD880-01S-0600-7-SG	600	3 x 120	OT/120-12	2 x 120	35
MD880-01S-0650-7-SG	650	3 x 120	OT/120-12	2 x 120	35
MD880-01S-0721-7-SG	721	4 x 120	OT/120-12	2 x 120	35
MD880-11S-0600-7	600	3 x 120	OT/120-12	2 x 120	35
MD880-11S-0650-7	650	3 x 120	OT/120-12	2 x 120	35
MD880-11S-0721-7	721	4 x 120	OT/120-12	2 x 120	35
MD880-11S-1140-7	1140	6 x 120	OT/120-16	3 x 120	85
MD880-11S-1235-7	1235	6 x 150	OT/120-16	3 x 120	85
MD880-11S-1370-7	1370	6 x 150	OT/150-16	3 x 150	85

NOTE

- Cables recommended in the proceeding table must be symmetric three-conductor shielded cables, with each conductor connected to each phase of the AC input copper busbar. The PE cable must be connected separately. The cross-sectional area of the PE cable must meet the following requirements:

  When the cross-sectional area of the phase conductor (S) is ≤ 16 mm^2, the cross-sectional area of the PE cable equals S.

  When the cross-sectional area of the phase conductor (S) is greater than 16 mm^2 but less than or equal to 35 mm^2, the cross-sectional area of the PE cable equals 16 mm^2.

  When the cross-sectional area of the phase conductor (S) is greater than 35 mm^2, the cross sectional area of the PE cable equals S/2.
- Recommended cables: 3 x 120 mm^2, which indicates the single-conductor power cable with a cross-sectional area of 120 mm^2.
- Recommended terminals: OT/120-16 indicates that the cable is crimped to a OT-type terminal; the cross-sectional area is 120 mm^2m; and the size of the wiring screw hole is M16.
- Observe the maximum size of the terminals listed in the following table. The size of the terminals cannot exceed the maximum size. Otherwise, the mechanical stability and specified electrical clearance cannot be ensured.
- Derating is required when multiple cables of the same specification are connected in parallel.

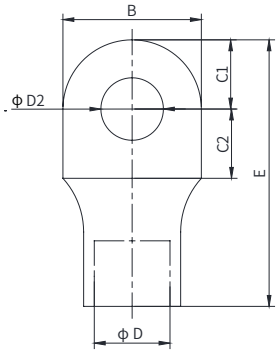


Figure 4-19 Terminal appearance

Table 4-6 Maximum dimensions of the terminals

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

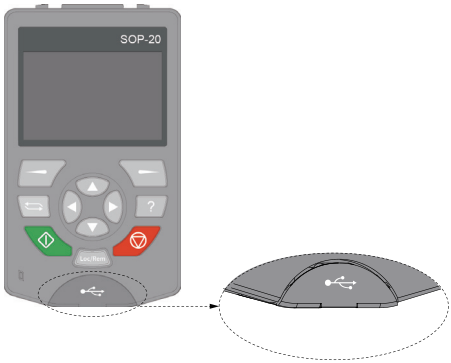
4.4.6 Cable Connection for HCU Control Module

For details on how to install the HCU control module and connect the control cable, see the “5 HCU Control Module".

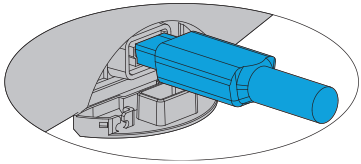
4.4.7 Connecting the SOP-20-880 and PC

Connect the type-B mini USB connector of the SOP-20-880 to the PC with a cable of up to 3 m. The communication protocol is USB2.0 between the SOP-20-880 and the PC.

1) Open the cover of the USB connector.



2) Insert the USB shielded cable. It is recommended to use the cable with a ferrite core, as shown below.





3) Connect the cable to the PC.

USB relay mode and USB mass storage mode are available when the USB cable is connected to the PC.

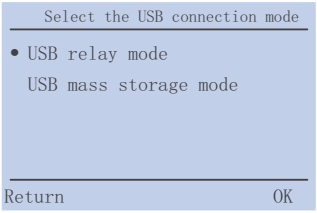


Figure 4-20 Selecting the USB connection mode

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

4.4.8 Connecting the SOP-20-880 and Drive

The SOP-20-880 and the drive control board (such as the HCU) can be connected by a network cable that meets the EIA/TIA/568A or 568B standards. The network cable is connected to the RJ45 port on the back of the SOP-20-880. For details, see the HCU Control Module Hardware Guide (19010339). Select the termination resistor on the control board with the jumper. It is recommended to use the shielded twisted pair cable of up to 100 m as the SOP-20-880 bus.

Table 4-7 Transmission distance, number of nodes, and baud rate of the SOP-20-880 bus

Distance (m)	baud rate (kbps)	Number of nodes	Cross-sectional area	Remarks
100	1000	32	≥ 0.5 mm^2	With repeaters, the maximum number of nodes is 128. Without repeaters, the maximum number of nodes is 32. With polarity offset, the maximum number of nodes is reduced by 4.
50	2000	32	≥ 0.5 mm^2	
25	4000	32	≥ 0.5 mm^2	

4.5 Post-Installation Checklist

After electrical installation is done, check the following items. Read through the safety instructions in "Fundamental Safety Instructions" before operating the product.

No.	Item	Confirmed
1	The input power supply is connected to the motor cable properly, with proper voltage supplied.	☐
2	The auxiliary power supply is used to provide proper voltage.	☐
3	The input and output power cables are secured to the cable rack for tension relief.	☐
4	The cables are connected to proper terminals with the required tightening torques.	☐
5	The EMC-compliant shielded cables, if any, are connected to the motor terminal box through grounded threaded sleeve joints in contact with the shield in a large area. The cable shield is fixed to the shield plate to meet the EMC requirement.	☐
6	Parallel outputs of the AC drive are correctly connected to the motor.	☐
7	When the period from the date of manufacture shown on the drive nameplate to initial commissioning or the downtime of the power components is shorter than one year, precharging the DC link capacitor is not required.	☐
8	The control cables are connected based on corresponding terminal layout and routed by the shield. The control cables are routed separately from the power supply cables to prevent interference. Applicable EMC directives are followed.	☐

5 HCU Control Module

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

5.1 Components of HCU Control Module

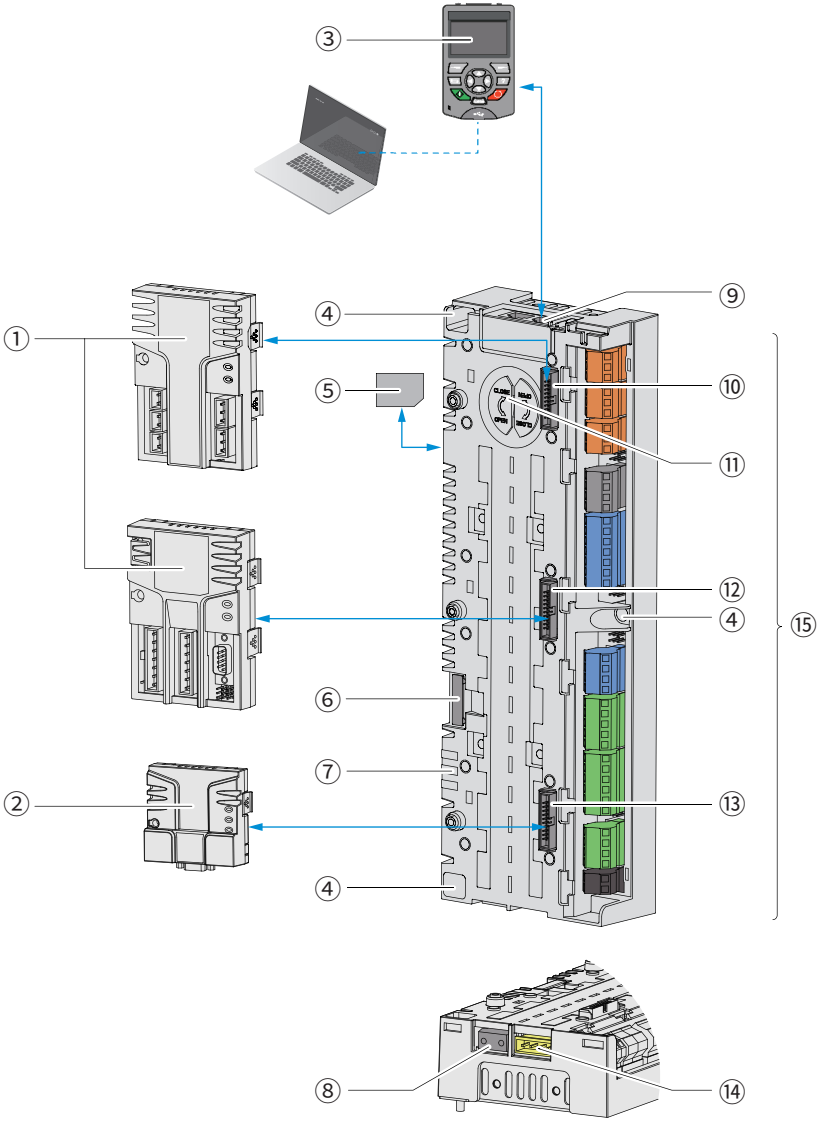


Figure 5-1 Components of the HCU control unit

Table 5-1 Components of the HCU control unit

No.	Name	Description
1	Function module SIZE1	105 mm x 73 mm x 24 mm
2	Function module SIZE2	75 mm x 73 mm x 24 mm
3	Smart operating panel	SOP-20-880
4	Fixing hole	Three holes for fixing the HCU
5	SD card	Standard pluggable micro memory card for the HCU with a capacity of 8 GB
6	Functional safety slot	For connecting the functional safety module
7	Indicator	Power, run, and fault indicators
8	Optical fiber for communication	Optical fiber communication interface between the HCU and power unit
9	Smart operating panel interface	For connecting the HCU and SOP-20-880. The two interfaces are RJ45 ports, which are identical and easy to be cascaded.
10	SLOT1	Function module interface: SLOT1_1, SLOT1_2, and SLOT1_3
11	Spare battery cover	Spare RTC battery cover. The RTC battery is non-rechargeable lithium battery which must be replaced regularly.
12	SLOT2	Function module interface: SLOT2_1, SLOT2_2, and SLOT2_3
13	SLOT3	Function module interface: SLOT3_1
14	STO terminal	STO input terminal (determined based on the actual model)
15	User terminal	Standard user I/O terminal of the HCU



NOTE

- Install function modules in SLOT1, SLOT2, and SLOT3. The addresses are SLOT1_1, SLOT2_1, and SLOT3_1.
- SLOT1 and SLOT2 can be used with the HOFM-30 and HESD-10 to achieve slot expansion.
- SLOT3 does not support slot expansion.
- The RJ45 port of the HCU controller cannot be connected directly to the PC. Otherwise, the PC may be damaged.

5.2 LED Indicators

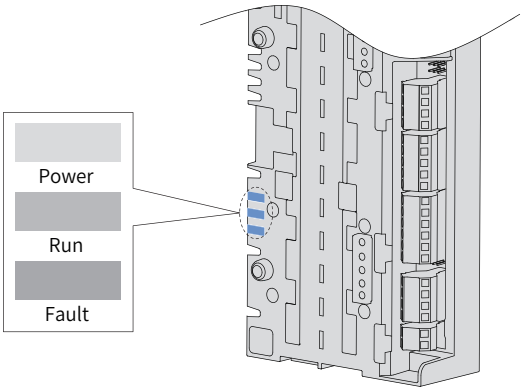


Figure 5-2 Locations and definitions of LED indicators

Table 5-2 Description of the LED indicators

No.	Name	State	Description
1	Power	Steady ON	The HCU power supply is in normal condition.
		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 not running.
3	Fault	Red indicator steady ON	The system malfunctions.
		Yellow indicator steady ON	The system gives an alarm.
		OFF	The system is functioning normally.
		Flashing of red indicator	The auxiliary power supply of the HCU is faulty. Check whether 24 V power supply is short-circuited or overloaded.
4	Fault, Run	Simultaneously flashing of yellow (Fault) and green (Run) indicators	This HCU is selected by the PC or SOP-20-880, which ends after 10s.
		Alternately flashing of red (Fault) and green (Run) indicators	The FPGA of the HCU or external expansion RAM is abnormal.

5.3 SD Memory Card

The SD card in the HCU is used for storing backup data of the black box data and parameters, which facilitates monitoring and analysis of the power module. The data is saved on the microSD memory card to be analyzed by qualified service personnel.

5.4 HCU Dimensions and Installation Instructions

5.4.1 Installation Precautions

- Before installation, switch off the power supply of the cabinet (including external power supply) and wait for at least 15 min.
- Protect the HCU module from falling or shock.
- Do not disassemble the HCU module; otherwise, the module may be damaged.
- Do not fasten the module with excessive torque to prevent damage to the terminals.

DANGER	
	◆ Before installing or removing the HCU, power off the cabinet for at least 15 min. Disconnect the input power supply of the HCU to prevent damage to the HCU control module caused by live installation or removal. ◆ Before installing or removing a function module on the HCU, disconnect the input power supply of the HCU to prevent damage to the HCU or function module caused by live installation or removal.

1 Tools

The following tools may be required for installation:

- Phillips screwdriver, #1 or #2
- Straight screwdriver, #1 or #2

2 Tightening torque

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

Screw	Tightening torque
M4	1.2 N·m

5.4.2 HCU Dimensions

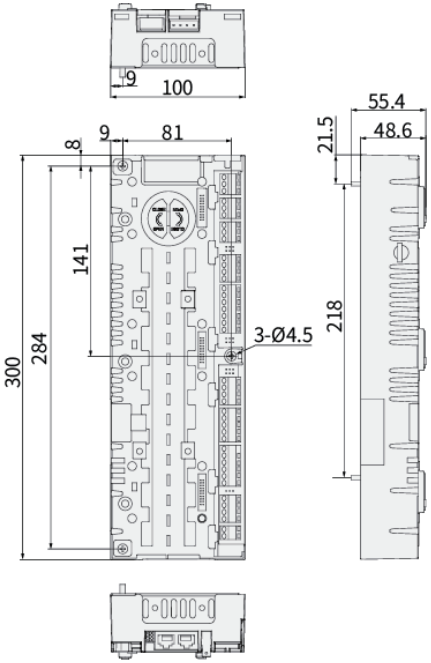
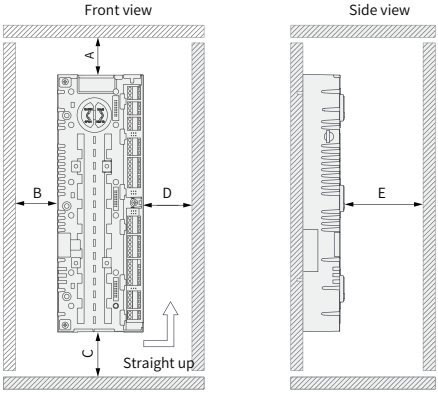


Figure 5-3 Dimensions of the HCU (mm)

5.4.3 Installation Clearances

Reserve certain clearances as shown below to install the HCU properly. Mount the HCU on a conductive metal surface to ensure full and reliable contact between its conductive base and the mounting surface.



Dimensions of HCU installation space (mm)

A	B	C	D	E
⩾100	⩾30	⩾100	⩾50	⩾100

Figure 5-4 Installation clearances of the HCU (mm)

5.4.4 Installation Procedure

1) Step 1: Align the HCU vertically with two positioning holes on the metal mounting plate.
2) Step 2: Tighten the HCU mounting screws (three M4 screws) with a #2 Phillips screwdriver as shown below.

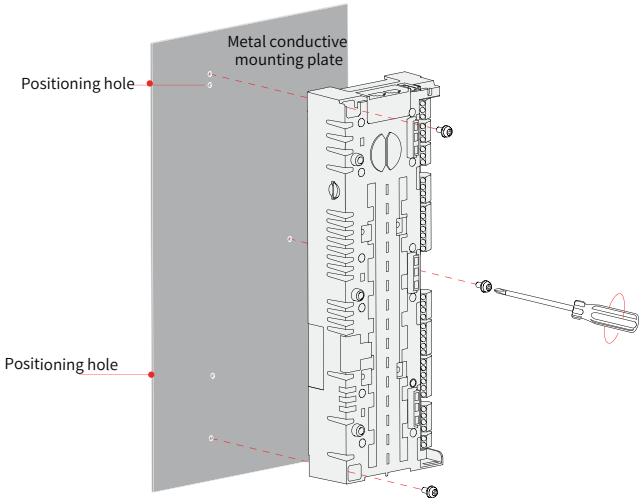


Figure 5-5 Installing the HCU

■ Grounding inside the cabinet

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

The HCU enclosure is grounded by fastening it to the cabinet enclosure through the screws on the mounting surface.

5.4.5 Handling the HCU Cover

In actual applications, the drive is typically equipped with an HCU cover as standard. In this case, if an external HCU interface is required, remove the cover portion for wiring, as shown below.

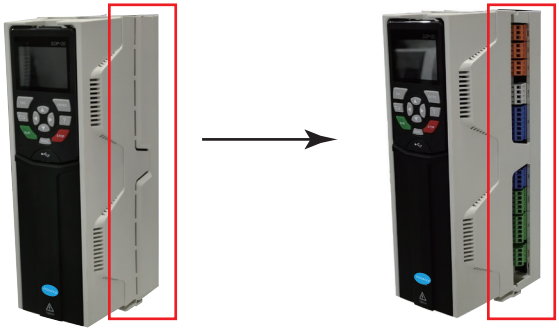


Figure 5-6 Handling the HCU cover

5.5 Overview of HCU Control Module Terminals

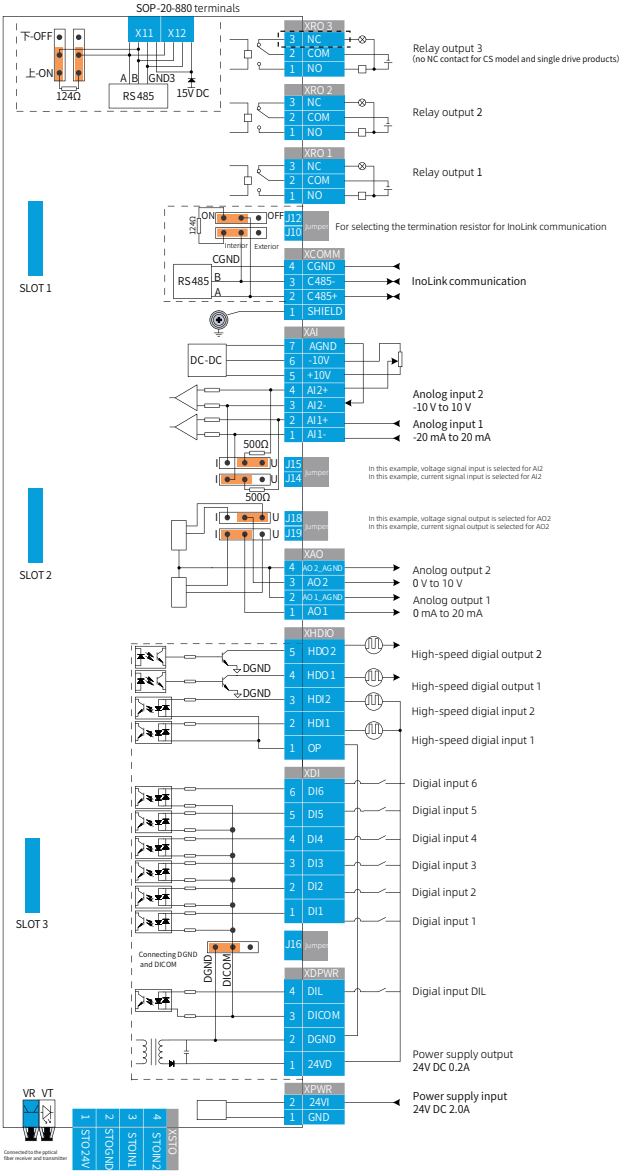


Figure 5-7 Overview of HCU control module terminals

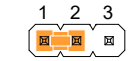
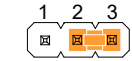
5.5.1 Standard Terminals

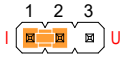
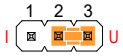
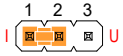
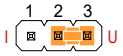
Table 5-3 Description of standard terminals of the HCU

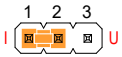
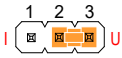
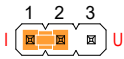
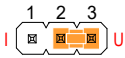
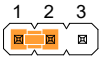
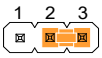
Name	Assignment	Description
Input power supply	XPWR: 24VI	HCU power supply
Digital output power supply	XDPWR: 24VD	Digital output power supply, isolated from XPWR
Digital input	XDI: DI1-DI6, DIL	Input type: relay contact, NPN, or PNP
High-speed digital input	XHDIO: HDI1, HDI2	Input type: NPN or PNP
High-speed 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 contacts No NC contact for CS model or single-drive XRO3
InoLink communication	XCOMM	High-speed RS485, with termination resistor selected by jumper
RJ45 port	X11, X12	Two identical ports, used for cascading multiple HCU modules. Connecting cable < 3 m
Safe torque off (STO)	XSTO	Provides 24 V power supply for the functional safety contact, with two functional safety contact inputs Products that support STO: (multi-drive: CS model; single-drive: 690 V air-cooled; water-cooled inverter products)
Inodrive communication	Optical fiber or DB15	Optical interface: Optical fiber; electrical interface: DB15
SD card	SD	Self-eject card holder, SD card capacity: 8 G
RTC battery	BAT	Non-rechargeable lithium battery that must be replaced regularly.

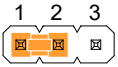
5.5.2 Detailed Description of Terminals

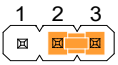
Table 5-4 Detailed description of the HCU control module terminals

Terminal	Name	Description	Cable specifications
XPWR: Input power supply terminals			
1	GND	24 VDC ± 10%, 2.0 A	The dual-conductor twisted pair cable is recommended. Cross-sectional area: 0.5 mm^2 to 2.5 mm^2
2	24VI		
XDPWR: 24V power supply output and DIL terminals			
1	24VD	Provides power supply for DI, HDI, and HDO 24 VDC ± 10%, 0.2 A	Twisted pair cable, single-conductor cable Cross-sectional area: 0.5 mm^2 to 2.5 mm^2 Note: The load of 24VD cannot exceed 0.2 A.
2	DGND	24VD ground	
3	DICOM	DI common output; connected to DGND through jumper J16	
4	DIL	Digital interlock or common DI; the same technical parameters as common DI	
Jumper J16: power supply selection			
 Provides 24 VD internal power supply for DIs by shorting DGND to DICOM.			
 Provides an external power supply for DIs by disconnecting DGND from DICOM.			
XDI: DI terminals			
1	DI1	24 V logic level: 0: < 5 V; 1: > 15 V; Rin: 2.0 kΩ Input type: NPN/PNP, relay contact Hardware filter: 0.04 ms Imax: 15 mA	Single-conductor cable Cross-sectional area: 0.5 mm^2 to 2.5 mm^2
2	DI2		
3	DI3		
4	DI4		
5	DI5		
6	DI6		

Terminal	Name	Description	Cable specifications
XHDIO: HDIO input terminal			
1	OP	HDI common terminal	Cross-sectional area: 0.5 mm^2 to 2.5 mm^2 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 kΩ Input voltage range: 0–30 VDC Input frequency range: 0–100 kHz HDI maximum load: Imax: 15 mA	
3	HDI2		
4	HDO1	Output type: OC Output frequency range: 0–100 kHz HDO maximum load: Imax: 20 mA Output voltage range: 0–26.4 VDC	
5	HDO2		
XAO: AO terminal			
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% of the full range	Cross-sectional area: 0.5 mm^2 to 2.5 mm^2 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: Current or voltage signal selection for AO1			
 Current signal output of AO1 by shorting 1 to 2			
 Voltage signal output of AO1 by shorting 2 to 3			
Jumper J18: Current or voltage signal selection for AO2			
 Current signal output of AO2 by shorting 1 to 2			
 Voltage signal output of AO2 by shorting 2 to 3			
XAI: AI terminals			
1	AI1-	Current input: -20 mA to +20 mA, Rin: 500 Ω Voltage input: -10 V to +10 V; Rin: 200 kΩ Differential input, input range: ± 30 V Sampling interval per channel: 0.25 ms Hardware filter: 0.25 ms Resolution: 11 bit + sign bit Error: 1% of full range	Cross-sectional area: 0.5 mm^2 to 2.5 mm^2 Use two dual-conductor shielded twisted pair cables when using two AIs. Use one quad-conductor shielded twisted pair cable for one AI under the base voltage.
2	AI1+		
3	AI2-		
4	AI2+		
5	+10V	+10V: +10 V ± 1% -10V: -10 V ± 1% Rload: 1 kΩ to 10 kΩ	
6	-10V		
7	AGND		

Terminal	Name	Description	Cable specifications
Jumper J14: Current or voltage signal input selection for AI1			
		Current signal input of AI1 by shorting 1 to 2	
		Voltage signal input of AI1 by shorting 2 to 3	
Jumper J15: Current or voltage signal selection for AI2			
		Current signal input of AI2 by shorting 1 to 2	
		Voltage signal input of AI2 by shorting 2 to 3	
XCOMM: InoLink RS485 terminals			
1	SHIELD	RS485 bus, 5 V standard level Termination resistor of the bus: 124 Ω Maximum communication rate: 5 Mbps Maximum number of nodes: 16 (without repeater) Maximum transmission distance: 40 m	Quad-conductor shielded twisted pair cable Cross-sectional area: 0.5 mm^2 to 2.5 mm^2
2	C485+		
3	C485-		
4	CGND		
Jumpers J10 and J12: RS485 termination resistor selection. To connect the termination resistor, J10 and J12 must be in the same status.			
		Connect the termination resistor by shorting 1 to 2	
		Disconnect the termination resistor by shorting 2 to 3	
XRO1: Relay 1 output terminal			
1	RO1_NO	Output type: passive NO and NC contacts Contact specifications: 250 VAC/30 VDC, 2 A	Single-conductor cable Cross-sectional area: 0.5 mm^2 to 2.5 mm^2
2	RO1_ COM		
3	RO1_NC		
XRO2: Relay 2 output terminal			
1	RO2_NO	Output type: passive NO and NC contacts Contact specifications: 250 VAC/30 VDC, 2 A	Single-conductor cable Cross-sectional area: 0.5 mm^2 to 2.5 mm^2
2	RO2_ COM		
3	RO2_NC		
XRO3: Relay 3 output terminal			
1	RO3_NO	Output type: passive NO and NC contacts Contact specifications: 250 VAC/30 VDC, 2 A	Single-conductor cable Cross-sectional area: 0.5 mm^2 to 2.5 mm^2
2	RO3_ COM		
3	RO3_NC		

<table>
<tr><th>Terminal</th><th>Name</th><th>Description</th><th>Cable specifications</th></tr>
<tr><td colspan="4">X11, X12: RS485 terminals for communication with the SOP-20-880</td></tr>
<tr><td>1, 2, 7</td><td>NC</td><td rowspan="4">RS485 bus, 5 V standard level
Termination resistor of the bus: 124 Ω
Max. communication rate: 4 Mbps
Maximum number of nodes: 32 (without repeater)
Maximum transmission distance: 100 m</td><td rowspan="4">Standard network cable</td></tr>
<tr><td>3, 8</td><td>GND3</td></tr>
<tr><td>4</td><td>A</td></tr>
<tr><td>5</td><td>B</td></tr>
<tr><td>6</td><td>15V3</td><td>15V3: 15 V ± 15%</td><td></td></tr>
<tr><td colspan="4">Jumpers J12 and J15: termination resistor selection. To connect the termination resistor, J12 and J15 must be in the same status.</td></tr>
<tr><td colspan="4">

Connect the termination resistor by shorting 1 to 2</td></tr>
<tr><td colspan="4">

Disconnect the termination resistor by shorting 2 to 3.</td></tr>
<tr><td colspan="4">VR, VT: Optical fiber receiver and transmitter</td></tr>
<tr><td>1</td><td>VR</td><td>VR optical fiber reception terminal</td><td rowspan="2">Optical fiber type: Plastic optical fiber (POF)</td></tr>
<tr><td>2</td><td>VT</td><td>VT optical fiber transmission terminal</td></tr>
<tr><td colspan="4">XSTO: STO terminal (reserved)</td></tr>
<tr><td>1</td><td>STO24V</td><td rowspan="4">Drive STO1, STO2: 24 V ± 10%</td><td rowspan="4">Quad-conductor shielded twisted pair cable
Cross-sectional area: 0.5 mm^2 to 2.5 mm^2</td></tr>
<tr><td>2</td><td>STOGND</td></tr>
<tr><td>3</td><td>STO1</td></tr>
<tr><td>4</td><td>STO2</td></tr>
</table>

5.6 Applications of the HCU

5.6.1 Function Modules

The HCU can be used with other function modules to expand its functions. See the following for details.

Table 5-5 Function modules used with the HCU

No.	Name	Module model	Description	Connection method with the HCU	Dimension (mm)
1	Encoder detection module	HPG-10	HTL incremental differential, single-ended, OC or OE encoder detection, frequency-division output	SLOT	105 x 73 x 24
		HPG-40	Resolver encoder signal detection module	SLOT	105 x 73 x 24
		HPG-50	TTL incremental OC or differential encoder detection, frequency-division output	SLOT	105 x 73 x 24
2	I/O module	HIO-10	2 AIs 2 AOs 2 DIOs One relay output	SLOT	105 x 73 x 24
3	PROFIBUS DP module	HDP-10	PROFIBUS DP fieldbus adapter	SLOT	75 x 73 x 24
4	CAN bus module	HCAN-10	CANopen fieldbus adapter	SLOT	75 x 73 x 24
		HCAN-30	CAN2.0 fieldbus adapter	SLOT	75 x 73 x 24
5	Optical fiber expansion module	HOFM-10	One pair of 50 M optical fibers	SLOT	75 x 73 x 24
		HOFM-30	Three pairs of 50 M optical fibers	SLOT	75 x 73 x 24
6	Modbus-RTU module	HMBA-10	Modbus-RTU fieldbus adapter	SLOT	75 x 73 x 24
7	EtherCAT module	HETC-10	EtherCAT fieldbus adapter	SLOT	75 x 73 x 24
8	EtherNet module	HETN-10	EtherNet commissioning module	SLOT	75 x 73 x 24
9	PROFINET IO module	HPFN-10	PROFINET IO industrial Ethernet adapter	SLOT	75 x 73 x 24
		HPFN-20	PROFINET IRT industrial Ethernet adapter	SLOT	75 x 73 x 24

No.	Name	Module model	Description	Connection method with the HCU	Dimension (mm)
10	Modbus TCP module	HMBT-10	Modbus TCP industrial Ethernet adapter	SLOT	75 x 73 x 24
11	Parallel control module	HPCU-40	Supports 2 to 4 parallel modules.	Optical fiber	232 x 86 x 40
		HPCU-60	Supports 2 to 6 parallel modules.	Optical fiber	232 x 86 x 40
		HPCU-A0	Supports 2 to 10 parallel modules.	Optical fiber	232 x 86 x 40
12	Function expansion module	HESD-10	Enables the expansion of one slot.	Optical fiber	105 x 75 x 70
13	Synchronous voltage detection module	HSVM-10	Three-phase AC input voltage detection	Optical fiber	150 x 100 x 30
		HSVM-20	DC voltage detection module (supports one voltage channel and two current channels)	Optical fiber	150 x 100 x 30
14	Digital gateway commissioning monitoring module	HGW-10	Supports centralized commissioning and operation data collection.	Network cable	180 x 100 x 50
15	Smart operating panel	SOP-20-880	HMI operating panel	Network cable	73 x 125 x 25
16	Optical fiber router control module	HOFR-50	Supports data exchange among two to five HCU control modules.	Optical fiber	232 x 86 x 40

NOTE

- The HOFM-30 can be installed only in SLOT1 or SLOT2.
- The HDP-10 is recommended to be installed in SLOT3.

5.6.2 SLOT Expansion

There are three slots on the HCU. To use more function modules, install the HESD-10 function module expansion unit. Each slot (excluding SLOT 3) can be used with the HOFM module to expand three function modules.

SLOT 1 and SLOT 2 of the HCU can be used with the optical fiber expansion module HOFM to expand up to six pairs of optical fibers. An individual HCU can be used with the HOFM and HESD to expand up to six function modules. The expansion principle is shown in the following figure.

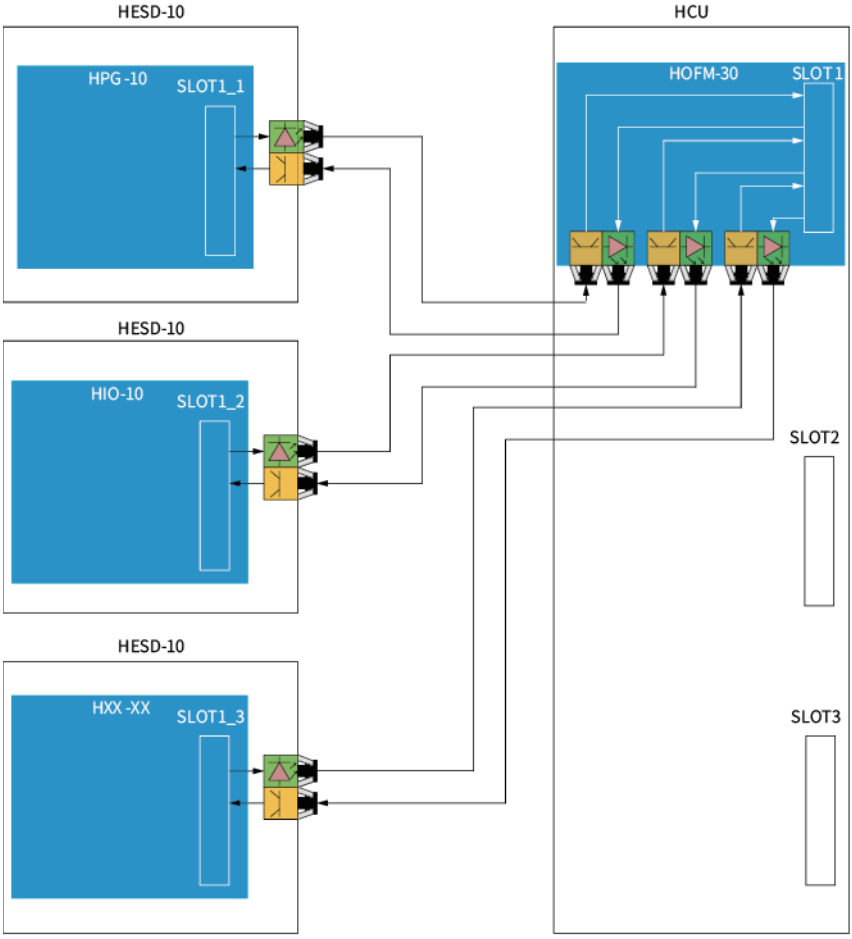


Figure 5-1 HESD wiring example

When installing function modules to the three slots, observe the following principles.

- Functional modules can be directly installed in SLOT1, SLOT2 and SLOT3, with addresses being SLOT1_1, SLOT2_ 1, and SLOT3_1.
- Each of SLOT 1 and SLOT 2 can be used with the HOFM-30 module to achieve expansion of up to three slots, with addresses being SLOT1_1, SLOT1_2, SLOT1_3, SLOT2_1, SLOT2_2, and SLOT2_3.
- SLOT3 does not support slot expansion.
- No additional HOFM optical fiber expansion module can be installed on the HESD module.

5.6.3 Temperature Measurement with AI and AO

AI and AO can be used together to detect temperature sensor signals. This configuration is generally used for motor temperature detection. The system can detect signals from a single sensor or from a series connection of one to three sensors.

In this case, select constant current output for the AO and voltage signal input for the AI. The supported temperature sensor types are PT100, PT1000, and KTY84.

Do not directly ground both ends of the cable shield. Ground one end and keep the other end unconnected, or ground one end directly and ground the other end through a capacitor in series.

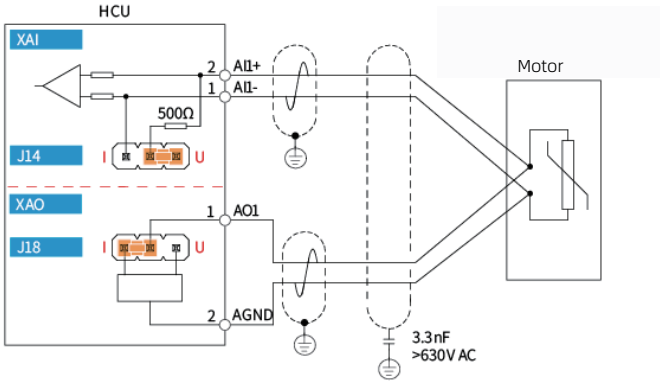


Figure 5-8 Wiring for temperature detection with the AI and AO

5.6.4 Applications of InoLink Communication Bus

When information exchange is required between several inverter modules in the system, use the InoLink bus.

The parameters of the InoLink bus are as follows:

Communication baud rate: 5 Mbps

Maximum number of nodes: 16

Shielded twisted pair cables must be used for wiring. To achieve optimal communication quality and prevent electromagnetic interference, use the high-quality cables,

such as PROFIBUS cable; keep the cables as short as possible, with a link length not exceeding 40m; prevent cable entanglement and keep the cables away from power cables.

If an HCU is at the end of the InoLink link, it must be equipped with a termination resistor, and the jumpers J10 and J12 must be set to the ON position.

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

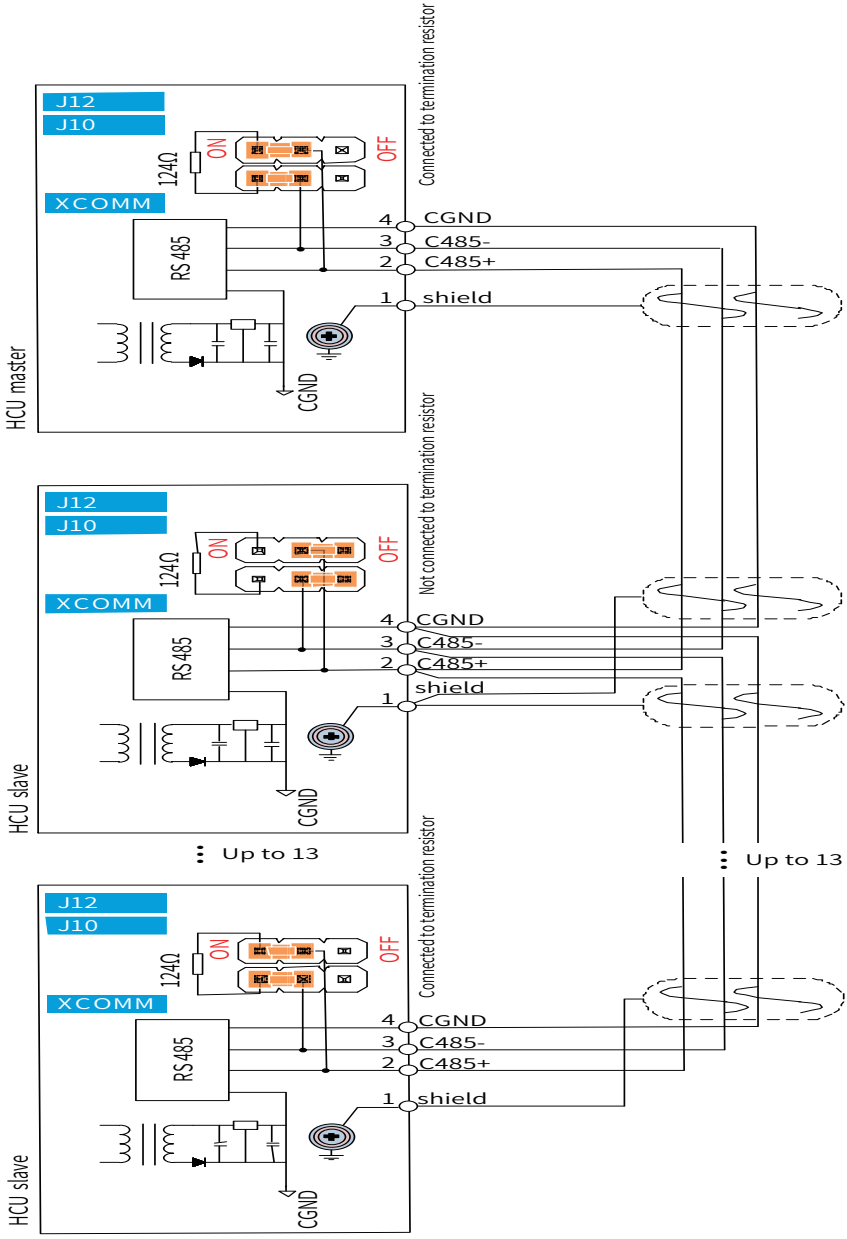


Figure 5-9 Example of connection application

5.7 HPCU Parallel Control Module

The HPCU parallel control module serves to receive drive and control signals from the HCU through communication and transmits such signals to each drive synchronously, acting as an intermediary in the system. Meanwhile, it uploads the current, voltage, and status data from each drive to the HCU and controls synchronization, current sharing, reset, and start/stop operations of parallel drives.

5.7.1 HPCU Standard Terminals

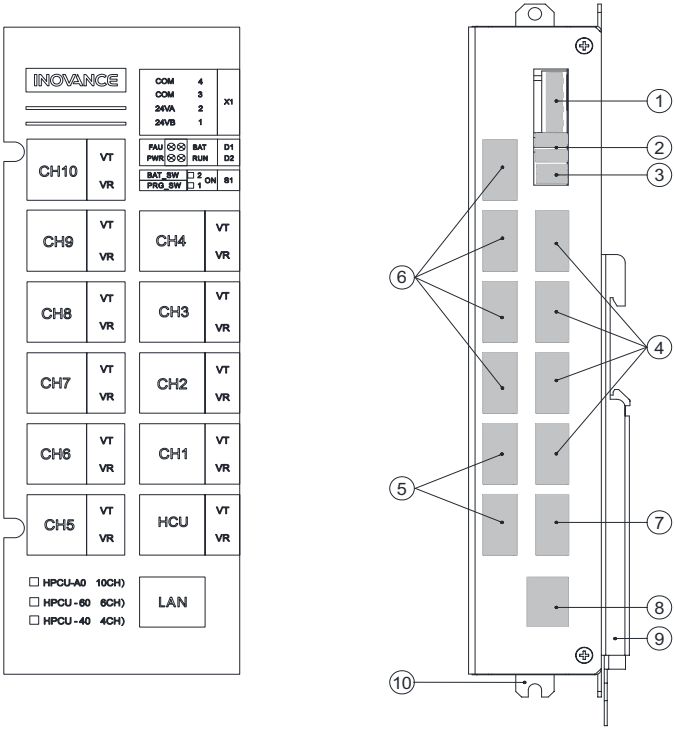


Figure 5-10 HPCU-40/60/A0 diagram (mm)

Table 5-6 Description of HPCU terminals

No.	Name	Terminal	Description	Remarks
1	Power supply X1	COM 4	24 V ground	External power supply of the HPCU X1 terminal: 5.08 mm clearance, 4-pin black pluggable terminal Twisted pair cable with a cross-sectional area of 0.5 mm^2 to 2.5 mm^2
		COM 3	24 V ground	
		24 VA 2	24 V +	
		24 VB 1	24 V +	
2	LED indicator	PWR	Green indicator steady ON	The HPCU power supply is in normal condition.
			OFF	The HPCU is not energized or the power supply is faulty.
		RUN	Green indicator steady ON	The power module is running.
			OFF	The power module is not running.
		FAU	Red indicator steady ON	The system malfunctions.
			OFF	The system is functioning normally.
		BAT	Reserved	-
			Reserved	-
3	DIP switch S1	BAT_SW	Reserved	-
		PRG_SW	Reserved	-
4	Optical fiber transceiver	CH1 to CH4	Parallel module channel 1-channel 4	VT: 50 M, transmission terminal for optical fiber communication VR: 50 M, reception terminal for optical fiber communication Optical fiber type: Plastic optical fiber (POF) Channels available in HPCU-40: CH1-CH4 Channels available in HPCU-60: CH1-CH6 Channels available in HPCU-A0: CH1-CH10
5		CH5 to CH6	Parallel module channel 5-channel 6	
6		CH7 to CH10	Parallel module channel 7-channel 10	
7		HCU	Communication between the HPCU and HCU	
8	-	LAN	Commissioning terminal	Connection with the PC
9	Guide rail groove	-	Used to install the guide rail.	-
10	Mounting hole	-	Four holes, for securing installation.	-

5.7.2 LED Indicators

Table 5-7 Description of the LED indicators

No.	Name	State	Description
1	PWR	Green indicator steady ON	The HPCU power supply is in normal condition.
		OFF	The HPCU is not energized or the power supply is faulty.
2	RUN	Green indicator steady ON	The drive is running.
		OFF	The drive is not running.
3	FAU	Red indicator flashing	The system malfunctions.
		OFF	The system is functioning normally.
4	BAT	Red indicator steady ON	Battery undervoltage
		OFF	The battery is in normal condition.

5.7.3 Electrical Connection of HPCU

The MD880 series 690 VAC high-performance AC drive can operate in a dual-drive parallel mode by using a HPCU module. The electrical connection block diagram is as follows.

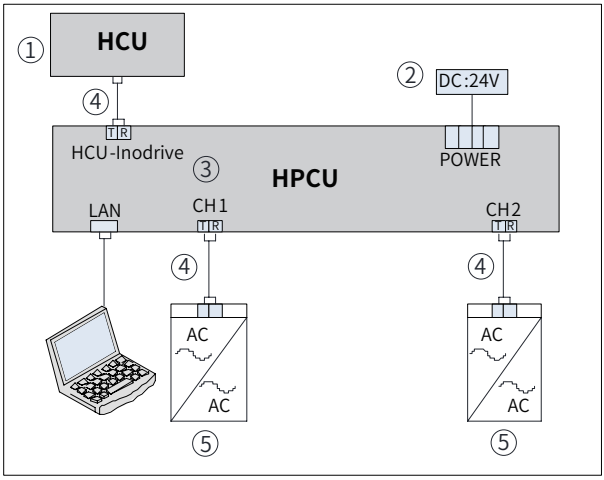


Figure 5-11 Electrical connection of the HPCU

Table 5-8 Description of electrical connection of the HPCU

No.	Name
①	HCU control module
②	External 24 VDC power supply
③	HPCU parallel control module
④	Optical fiber for communication
⑤	AC drive

6 Maintenance

6.1 Routine Maintenance

The drive is mostly composed of electrical components. Therefore, it is necessary to inspect or maintain worn electrical components. Clear the dust and pollutants regularly to keep the product in a proper state.

Note the following points:

1 Dust

- The dust inside the drive must be cleared thoroughly on a regular basis by qualified personnel according to relevant safety regulations.
- Clear the dust at least once a year or higher frequency according to the operating environment.
- Use the brush and dust collector. Clean areas that cannot be reached using dry compressed air (max. 1 bar).

2 Ventilation

- Always keep the air vents and cooling air circuit of the drive cabinet unobstructed and ensure that the fan functions properly.

6.2 Periodic Maintenance

Before maintenance and inspection
 DANGER ◆ Before maintenance, power off and wait for at least 15 min until the bus voltage of the drive is verified to be lower than 36 VDC. Otherwise, the residual charge on the capacitor may result in personal injury. ◆ When an external power supply is connected, hazardous voltage are still present in the drive and the cabinet even if the main circuit breaker is disconnected. ◆ Be aware of the possible rotation of the fan by inertia.

During maintenance and inspection

DANGER

- Observe correct operating procedures during maintenance or inspection.
- Maintain and inspect the drive only after verifying that it has been powered off and cooled.
- Install and wire the product in line with the national standards, industry standards and local safety codes.
- Proceed with operations only after verifying no residual voltage, because there is still voltage present in the cabinet for a period of time even if the input circuit breaker is disconnected.
- Use instruments that comply with the voltage withstanding requirements and keep their housings well-grounded.
- Be careful not to let the probes touch each other or come into contact with other terminals when measuring components in the cabinet.
- Only qualified personnel can install, inspect, and maintain the drive.

1 Required tools

The following tools may be required for inspection and component replacement.

- Nut wrench or socket wrench, 6 mm
- Nut wrench or socket wrench, 8 mm
- Nut wrench or socket wrench, 10 mm
- Nut wrench or socket wrench, 12 mm
- Torque wrench
- Phillips screwdriver, PH1 or PH2
- Socket wrench set including two extension rods (recommended)

2 Service lives of components

To ensure normal use of the drive for a long time, regularly maintenance the electronic components inside the drive according to their service lives, which are affected by the operating environment and conditions. The following table lists the service lives of the components for your reference.

Table 6-1 Service lives of the components

Component	Standard service life
Main cooling fan	8 years
Electrolytic capacitor	10 years
Fan of the control chamber	10 years

3 Cable terminals and fasteners

Regularly inspect whether the cable terminals and screw terminals are secured properly. If not, retighten the loose ones. Check the routing for faults and replace damaged components promptly.



NOTE

- The actual maintenance cycle depends on the product installation environment and operating conditions.

6.3 Part Replacement

This section describes the components to be replaced during maintenance and inspection.

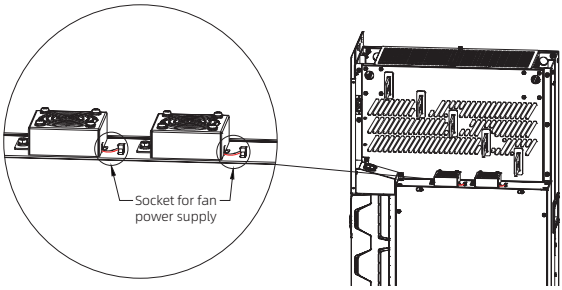
Take necessary safety measures before maintenance and inspection.

DANGER	
	- Note that the drive operates at medium voltage. - Any connections must be performed when the drive is powered off. - Before maintenance, power off and wait for at least 15 min until the voltage of the drive is verified to be lower than 36 VDC. Otherwise, the residual charge on the capacitor may cause personal injury. - Only well-trained personnel can maintain and inspect the drive. Otherwise, it may result in severe personal injury, death, or major loss of property. - Be careful when maintaining or inspecting an opened device, because there may be voltage from the external power supply or live power supply or terminals even if the motor does not operate. - Handle heavy devices or devices with high center of gravity with care. Improper hoisting or transportation may result in severe personal injury, death, or major loss of property.

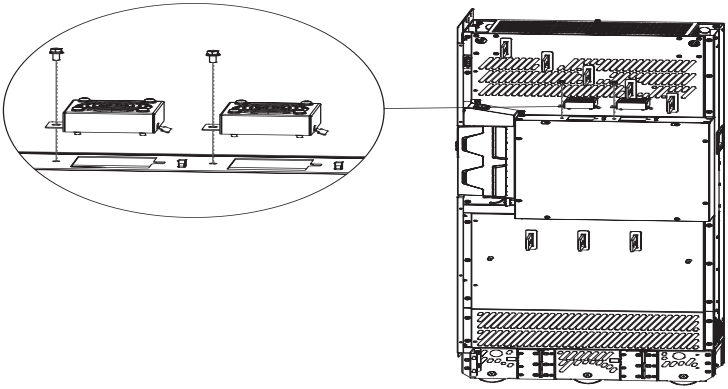
6.3.1 Replacing Cooling Fans of the Module Control Chamber

1 Replacing fans of the drive module control chamber

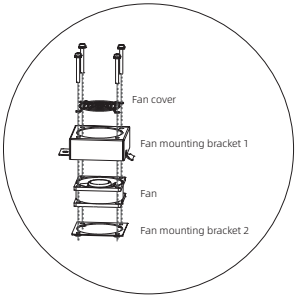
1) Unplug the power supply connectors of the fans.



2) Remove two M5 screws with a screwdriver to disassemble the fan components.



3) Remove eight M4 screws from the fan components with a screwdriver.



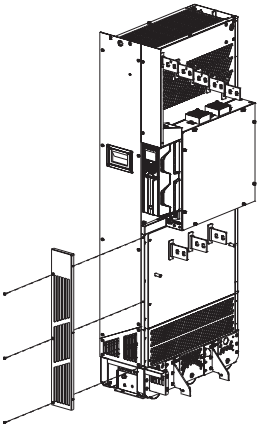
4) Replace with new fans of the same specifications in the reverse order of the above procedure.

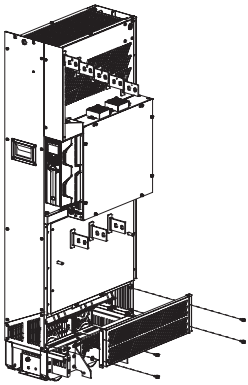
6.3.2 Replacing Main Cooling Fans of the Module

1 Replacing main cooling fans of the drive module

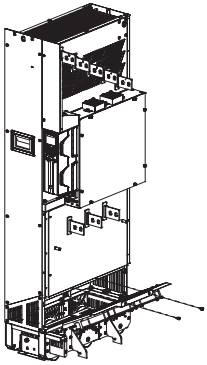
Procedure:

1) Remove three M4 screws with a screwdriver to take off the lower baffle.
2) Remove four M6 screws with a screwdriver to take off the side panel.





3) Remove two M5 screws with a screwdriver to unplug the power supply connector of the fan and pull out the fan components.
4) Remove twelve M4 screws from the fan components with a screwdriver.





5) Replace with new fans of the same specifications in the reverse order of the above procedure.

NOTE

- The air flows from bottom to top. When installing the fan, make sure that the fan blows air upwards.
- When installing the fan, ensure that the fan power supply cable is not pinched by the fan.

6.3.3 Replacing the Braking Module

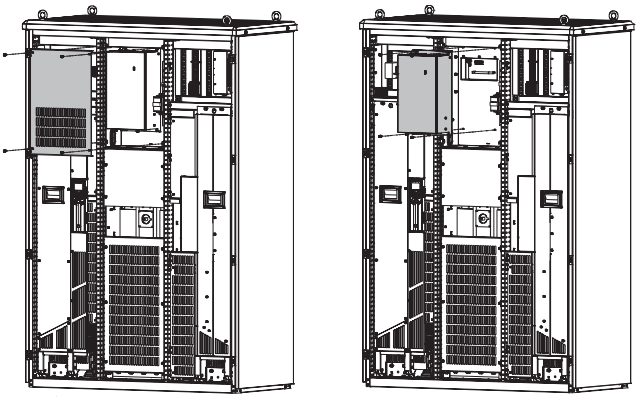


Figure 6-12 Maintaining the braking module

1) Disconnect the DC power supply from the drive cabinet and ensure that the cabinet carries no residual voltage.
2) Open the cabinet door.
3) Remove four M6 screws with a screwdriver to take off the protective PC board.
4) Unplug the terminals at the top of the braking module and remove the cables at the bottom of the braking module.
5) Remove four M6 screws with a screwdriver to disassemble the braking module.
6) Install a new braking module of the same specifications in the reverse order of the above procedure.

6.3.4 Replacing Cooling Fans of the Cabinet

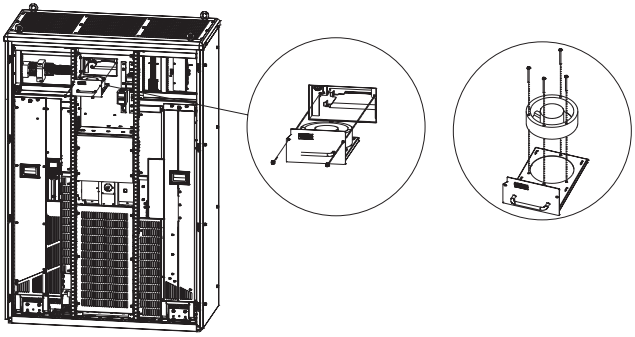


Figure 6-13 Maintaining the cabinet fans

Procedure:

1) Remove the braking module following the preceding steps.
2) Unplug the fan power supply terminal.

3) Remove two M6 screws with a screwdriver to take off the fan components.
4) Remove four M4 screws with a screwdriver to unplug the fan power supply terminal.
5) Replace with new fans of the same specifications in the reverse order of the above procedure.
6) Reinstall the braking module previously removed.

6.3.5 Replacing the Fuse

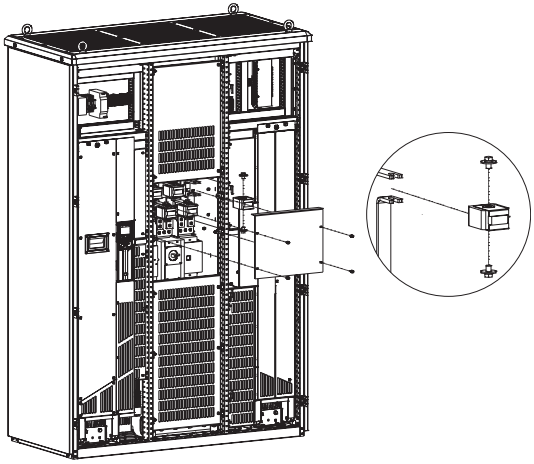
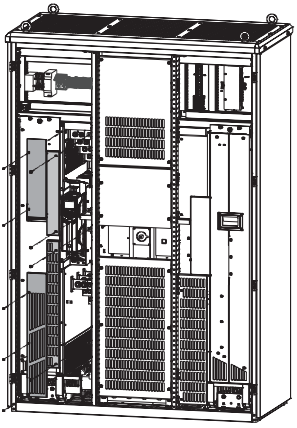


Table 6-2 Maintaining the fuse of the drive cabinet

1) Disconnect the DC power supply from the drive cabinet and ensure that the cabinet carries no residual voltage.
2) Open the cabinet door.
3) Remove four M6 screws with a screwdriver to take off the protective PC board.
4) Loosen the fuse screw and pull out the fuse together with the screw. Do not loosen the screw completely to prevent it from falling into the cabinet.
5) Remove the screw and check the condition of the fuse. In case of a blown fuse, replace the fuse and then tighten the nut with a tightening torque of up to 35 N•m.
6) Install the PC board in the reverse order of the above procedure and close the cabinet door.

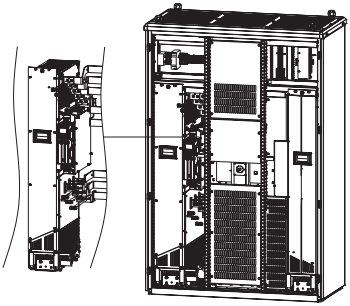
6.3.6 Replacing the Drive Module

1) Disconnect the DC power supply from the drive cabinet and ensure that the cabinet carries no residual voltage.
2) Open the cabinet door.
3) Remove five M4 screws with a screwdriver to take off the upper and lower baffles on the module.
4) Remove four M6 screws with a screwdriver to take off the protective PC board.

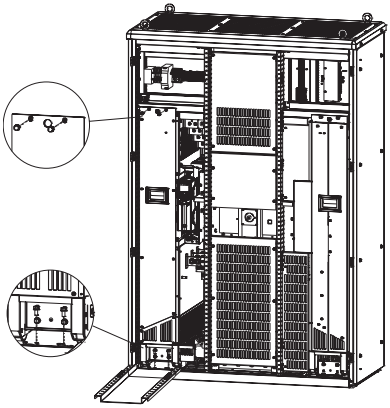


5) Remove sixteen M8 screws with a screwdriver to disconnect the module copper busbar from the cabinet copper busbar.

6) Pull out the optical fiber cable in the front of the module.



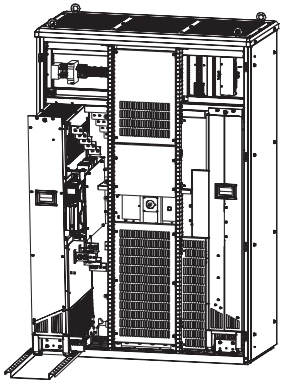
7) Remove two M8 screws that fix the module's bottom to the cabinet base, and move the bottom mounting bracket upward.



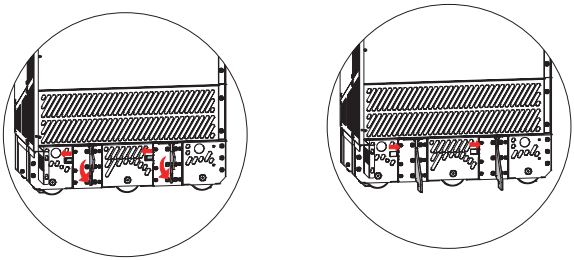
8) Fixing the mounting rail of the module: Pull up the mounting rail from the cabinet base so that the base hook engages with the mounting rail hole.

9) Remove two M8 screws that fix the module's top to the cabinet frame.

10) Carefully pull the module out from the cabinet along the rail.

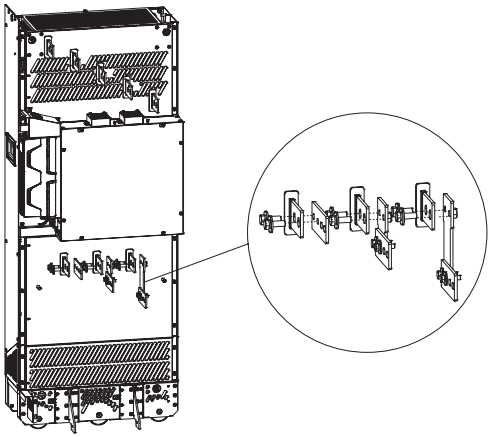


11) Unlock the anti-tipping bracket:



- Push the bracket latch to the left to release the bracket.
- Rotate the bracket outward by 90° until it touches the floor.
- Release the bracket latch and allow it to engage the bracket locating hole on the right.

12) Remove six M10 screws to take off the bonding copper busbar from the module.

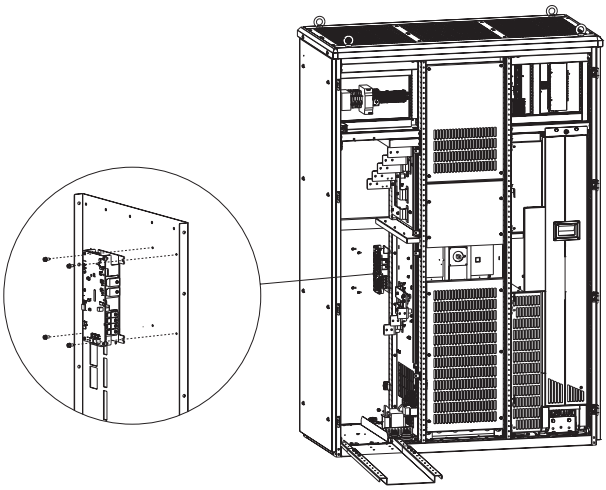


13) Replace with a new module in the reverse order of the above procedure. Mind your fingers. Step on the module base with one foot to prevent the module from falling backwards.

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 Fan Power Supply Board



1) Remove the left module of the cabinet according to the preceding procedure.

2) Unplug the terminal for connecting the fan power supply.

3) Remove two M5 screws that fix the power supply with a screwdriver to take off the power supply board.

4) Replace with a new power supply board in the reverse order of the above procedure.
5) Reconnect the power supply terminal.
6) Reinstall the previously removed module and close the cabinet door.

NOTE

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

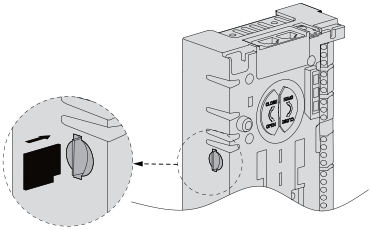
6.3.8 Maintaining the HCU Control Module

1 Replacing the memory card

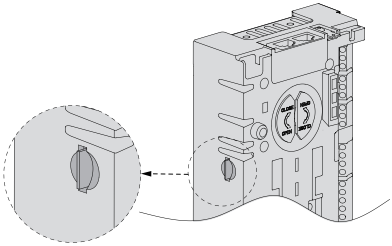
After replacing the HCU control module, you can keep present parameter settings by inserting the original SD memory card from the faulty module to the new module.

The replacement procedure is as follows:

1) Press the SD memory card once to release it, and then take it straight out of the faulty module.
2) Insert the card in the direction as shown below into the holder of the new module.



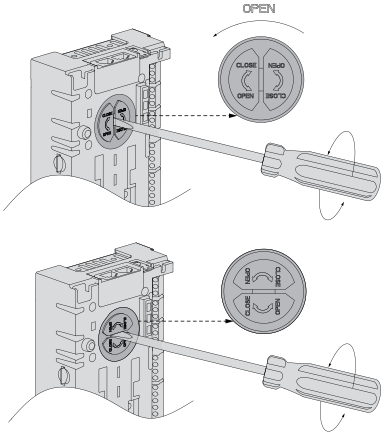
3) When inserting the card into the holder, make sure that it is fully seated. After the insertion is done, check whether it is flush with the surface. If not, an error will occur due to improper contact.



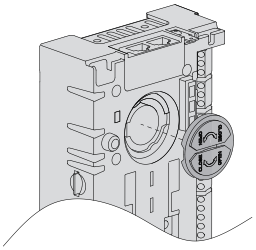
2 Replacing the battery

The replacement procedure is as follows:

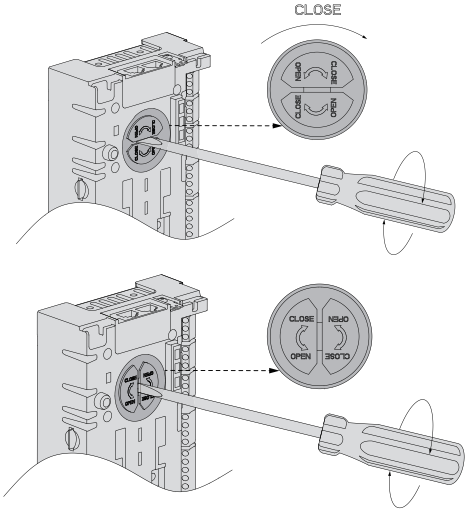
1) Turn the battery cover 90° counterclockwise with a #2 straight screwdriver until the cover is released.

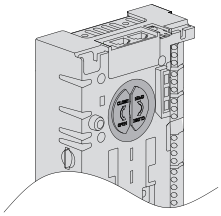


2) Remove the cover. Press one side of the battery with the screwdriver to remove the battery. Then, install a new battery.



3) Put back the cover and turn it 90° clockwise to secure it.



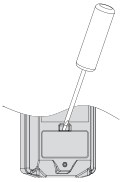


4) Dispose of the used battery in accordance with local rules or applicable laws.

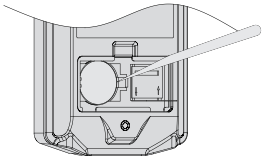
6.3.9 Replacing the Battery of SOP-20-880

Procedure:

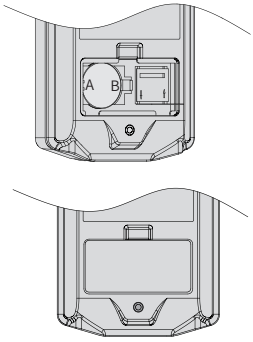
1) Release the battery cover with a straight screwdriver or your fingers, as shown below.



2) Take out the battery with a tweezer or straight screwdriver, as shown below.



3) When installing the battery, insert the battery into the latch on side A of the holder, and then press down firmly on side B to put the battery in place.



4) Put back the battery cover with a tool or your fingers.

7 Options

7.1 Function Expansion Modules

For specific function expansion modules, see “5.6.1 Function Modules". For their use, see corresponding module user guides.

7.2 Selection of Input/Output Reactor

This product comes with an input reactor; there is no need to install an AC input reactor on the input side of the drive.

Whether to install an AC output reactor on the output side of the drive depends on actual situation. The cables connecting the drive and motor cannot be too long. Longer cables have higher distributed capacitance, which can easily lead to high harmonic current. When the output cable is excessively long, install an output reactor. When the cable length is equal to or longer than 150 m, install an AC output reactor near the drive.

Table 7-1 Models of the output reactor

MD880-01S	Rated current (A)	Equivalent voltage drop	Inductance (μH)	Insulation class	Output reactor model	D x H x W (mm)	D1 x W1 (mm)	a x b (mm)	Mounting hole diameter ϕ (mm)	A x e (mm)	Material	Weight (kg)	Loss (W)
0340-7	340	1%	32	F	OCL-0400-EISA-E32U	320 × 280 × 235	243 ± 1× 144 ± 2	12 × 20	12	40 x 8	AL	45	210
0410-7	410	1%	25		OCL-0500-EISA-E25U	320 × 280 × 250	243 ± 1× 149 ± 2	12 × 20	12	40 x 8	AL	46	245
0530-7	530	1%	23		OCL-0600-EISH-E23UA	287 × 325 × 234	214 × 135	11 × 18	11	40 x 8	AL	48	380
0600-7	600	1%	23		OCL-0600-EISH-E23UA	287 × 325 × 234	214 × 135	11 × 18	11	40 x 8	AL	48	380
0650-7	650	1%	21		OCL-0660-EISH-E21UA	317 × 340 × 244	243 × 137	12 × 20	12	40 x 8	AL	58	335
0721-7	721	1%	17		OCL-0800-EISH-E17UA	317 × 360 × 247	243 × 137	12 × 20	12	60 x 8	AL	68	385

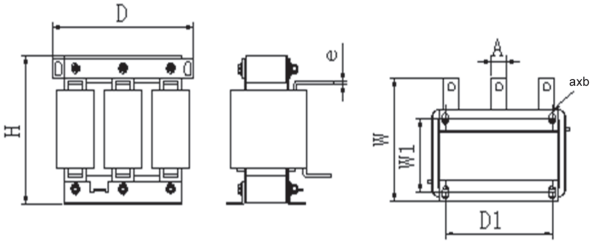
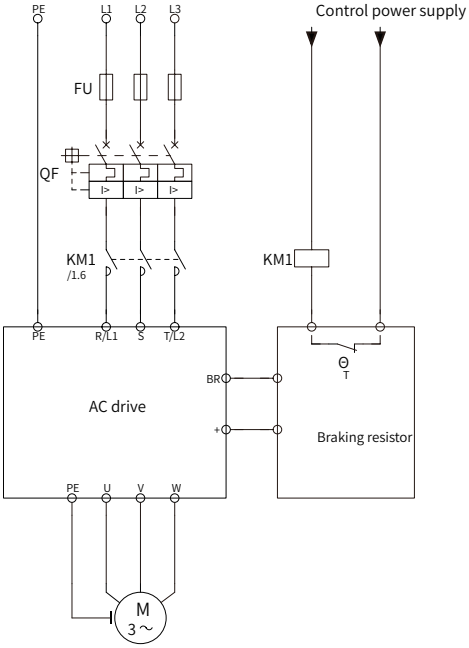


Figure 7-1 Dimensions of the output reactor

7.3 Selection of Braking Components

Braking resistor protection

In applications where a braking resistor is installed, it is recommended to use a resistor with a temperature switch to ensure safety and prevent the resistor from overheating and burning out under abnormal conditions. Connect the temperature switch output to the electromagnetic contactor control circuit (as shown in the following figure) in the front of the drive to provide the interlock protection. When the resistor overheats, it triggers a fault trip to prevent damage to the resistor.



For the MD880 series 690 VAC high-performance AC drive, it is recommended to use a braking module to recover the energy generated during braking. For details on how to select and use the braking module, see the MD880-61 Series Single-Phase Braking Unit User Guide (19011170).

7.4 Overall and Mounting Dimensions of Braking Unit

■ Overall dimensions of the MD880-61M series braking unit (mm)

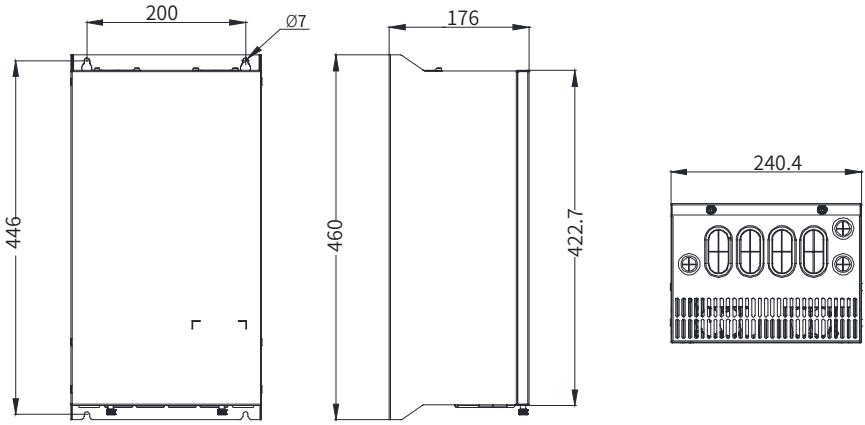


Figure 7-2 Overall dimensions of the MD880-61M series braking unit (mm)

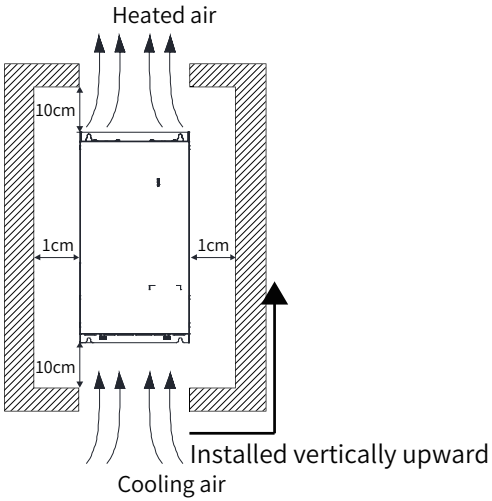


Figure 7-3 Mounting dimensions of the MD880-61M series braking unit (mm)

NOTE

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

7.5 Mounting Rail of AC Drive Module

When installing the S12 AC drive into the cabinet or performing replacement/ maintenance, use the mounting rail to facilitate sliding the drive into or out of the cabinet. For details, see "6.3.6 Replacing the Drive Module".

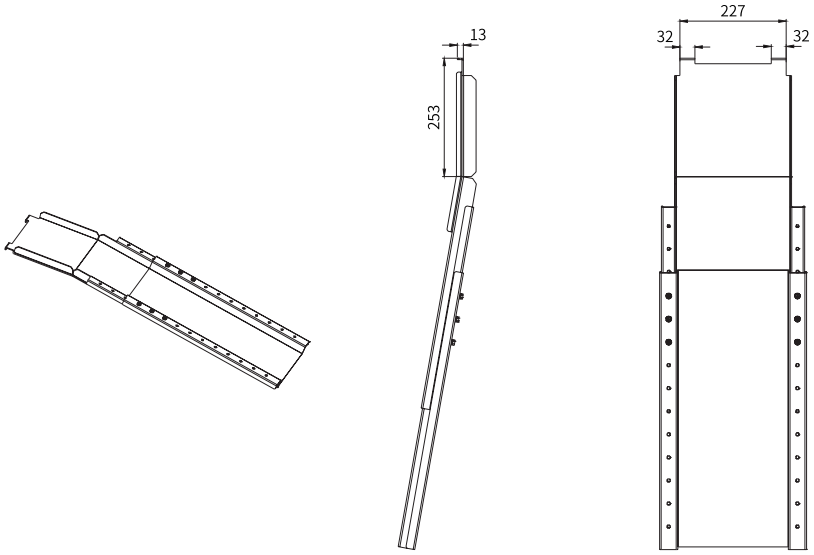


Figure 7-4 Dimensions of the mounting rail

Table 7-2 Model of the mounting rail

Model	Applicable device types
mounting-rail-2	All models with a structural dimension of S12

8 Ordering Instructions

This section lists the models and ordering numbers of the MD880 series 690 VAC high-performance AC drive.

Table 8-1 Ordering information of the MD880 series AC drive

Model	Layout	Order No.	Remarks
MD880-01S-0340-7-SG	S12	MD880-01S-0340-7-SG	Drive module (single-drive system)
MD880-01S-0410-7-SG	S12	MD880-01S-0410-7-SG	Drive module (single-drive system)
MD880-01S-0530-7-SG	S12	MD880-01S-0530-7-SG	Drive module (single-drive system)
MD880-01S-0600-7 -SG	S12	MD880-01S-0600-7 -SG	Drive module (single-drive system)
MD880-01S-0650-7-SG	S12	MD880-01S-0650-7-SG	Drive module (single-drive system)
MD880-01S-0721-7-SG	S12	MD880-01S-0721-7-SG	Drive module (single-drive system)
MD880-11S-0600-7	S12	MD880-11S-0600-7	Cabinet, with optional output reactor, input contactor, and braking module
MD880-11S-0650-7	S12	MD880-11S-0650-7	Cabinet, with optional output reactor, input contactor, and braking module
MD880-11S-0721-7	S12	MD880-11S-0721-7	Cabinet, with optional output reactor, input contactor, and braking module
MD880-11S-1140-7	2 x S12	MD880-11S-1140-7	Cabinet, with optional braking module
MD880-11S-1235-7	2 x S12	MD880-11S-1235-7	Cabinet, with optional braking module
MD880-11S-1370-7	2 x S12	MD880-11S-1370-7	Cabinet, with optional braking module

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