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MD880 Series

690 VAC High-Performance Water-Cooled AC Drive (Single-Drive System)

Hardware Guide

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

Data code 19011622A03

Preface

Introduction

The MD880 series high performance low-voltage water-cooled AC drive is mainly used to control AC asynchronous induction motors and permanent magnet synchronous motors. It features high power density, compact structure, and high reliability to achieve V/f control, SVC (sensorless vector control) control, and FVC (feedback vector control) on motors. It can be used in cutterhead drives, slurry pumps, offshore drilling platforms, marine electric propulsion system equipment, wind turbine installation vessels and so on.

This guide presents the safety instructions, product information, mechanical and electrical installation, and routine maintenance and inspection.

Note

- The drawings in the user guide are shown for illustration only and may be different from the product. Actual products may vary.
- The user guide is subject to change due to product upgrade, specification modification as well as efforts to improve the accuracy and convenience of the guide.

More information

Data name	Data Code	Description
MD880 Series 690 VAC High-Performance Water-Cooled AC Drive (Single-drive System) Hardware Guide	19011622	Presents safety instructions, product information, mechanical and electrical installation, and routine maintenance and inspection.
MD880 Series AC Drive Software Guide (HCU-50S, HCU-51S, HCU-50S-SG, and HCU-51S-SG)	19012098	Presents commissioning tool, quick commissioning guide, function module description, parameter description, connector resource, data flow diagram, and troubleshooting.
MD880 Series High-performance AC Drive (Single-drive System) Hardware Guide	19010529	Presents the product information, mechanical installation, electrical installation, and routine maintenance.
SOP-20-880 Series Smart Operating Panel User Guide	19010611	Presents safety instructions, product information, installation and wiring, function and application-level maintenance and inspection.
SOP-20-880 Base Kit Installation Guide	19012483	Presents IP20-compliant installation, Ip54-compliant installation, and dimension drawing of the base.

Data name	Data Code	Description
HPG-10-HTL Incremental Encoder Signal Detection Module User Guide	19012517	Presents the production information, installation, bus connection, and parameter setting.
HPG-40 Resolver Signal Detection Module User Guide	19012600	Presents the production information, installation, electrical connection, and parameter setting.
HPG-50-TTL Incremental Encoder Signal Detection Module User Guide	19012516	Presents production information, installation, and cable connection.
HDP-10 PROFIBUS-DP Fieldbus Adapter Module User Guide	19012510	Presents the production information, installation, bus connection, and software setting.
HOFM-10/30 Optical Fiber Expansion Module User Guide	19012601	Presents production information, installation, and optical fiber connection.
HMBA-10 Modbus-RTU Fieldbus Adapter Module User Guide	19012603	Presents production information, installation, and cable connection.
HCAN-10 Fieldbus Adapter Module User Guide	19012602	Presents production information, installation, cable connection, and parameter setting.
HPFN-10 PROFINET I/O Industrial Ethernet Adapter Module User Guide	19012119	Presents the production information, installation, electrical connection, and parameter setting.
HIO-10 I/O Function Module User Guide	19012609	Presents the production information, installation, electrical connection, and parameter setting.
HMBT-10 Modbus TCP Adapter Module User Guide	19012534	Presents the production information, installation, electrical connection, and parameter setting.
HETN-10 Ethernet Commissioning Module User Guide	19012607	Presents the production information, installation, electrical connection, and parameter setting.
HEIP-10 PROFINET IP Ethernet Adapter Module User Guide	19012606	Presents the production information, installation, electrical connection, and parameter setting.

Revision History

Revision date	Version	Revision
December 2024	A03	Updated section "Model and nameplate" (*"1.1 Model and Nameplate" on page 16*).
October 2023	A02	**Revision:** • Updated section "Model and nameplate" (*"1.1 Model and Nameplate" on page 16*). • Updated the product specifications in *"1.2 Specifications" on page 16*. • Modified section "Technical Data" (*"1.3 Technical Data" on page 17*). • Modified section "Technical Data" (*"1.3 Technical Data" on page 17*). • Updated section "Derating" (*"1.5 Derating" on page 23*). • Updated section "Common Screws/Bolts and Tightening Torque" (*"3.5.3 Tightening Torque of Common Screws and Bolts" on page 50*). • Updated section "Recommended Fuse, Disconnector, Contactor, and Circuit Breaker Models" (*"6.2 Recommended Fuse, Disconnector, Contactor, and Circuit Breaker Models" on page 88*). • Updated section "Recommended Input Reactor Model" (*"6.3 Selection of Input Reactor" on page 88*). • Updated section "Recommended Output Reactor Model" (*"6.4 Recommended Output Reactor Model" on page 89*).
January 2022	A01	Made minor corrections.
December 2020	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 search under Service and Support at *www.inovance.com*.
- Scan the QR code on the product with your smart phone.
- Scan the QR code below to install My Inovance app, where you can search for and download user guides.

Warranty Disclaimer

Inovance provides warranty service within the warranty period (as specified in your order) for any fault or damage that is not caused by improper operation of the user. Maintenance will be charged after the warranty expires.

Within the warranty period, maintenance will be charged for the following damage:

- Damage caused by operations not following the instructions in the user guide
- Damage caused by fire, flood, or unusual voltage
- Damage caused by unintended use of the product
- Damage caused by use beyond the specified scope of application of the product
- Damage or secondary damage caused by force majeure (natural disaster, earthquake, and lightning strike)

The maintenance is charged according to the latest Price List of Inovance. If otherwise agreed upon, the terms and conditions in the agreement shall prevail.

For details, see Product Warranty Card.

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Fundamental Safety Instructions

Safety Precautions

- This chapter provides essential safety instructions for proper use of the equipment. Before operating the equipment, read through the guide and comprehend all the safety instructions. Failure to observe the safety precautions may result in serious injury or death of personnel or device damage.
- "DANGER", "WARNING", and "CAUTION" in this guide only indicate some of the precautions that need to be followed; they just supplement the safety precautions.
- Use this product according to the designated environment requirements. Damage caused by improper use is not covered by warranty.
- Inovance shall take no responsibility for any personal injury or property damage caused by improper usage.

Safety Levels and Definitions



Indicates that failure to comply with the notice can result in death or severe personal injury.



Indicates that failure to comply with the notice may result in death or severe personal injury.



Indicates that failure to comply with the notice may result in minor or moderate personal injury or equipment damage.

Safety Precautions

- Drawings in the guide are sometimes shown without covers or protective guards. Remember to install the covers or protective guards as specified first, and then perform operations in accordance with the instructions.
- The drawings in the guide are shown for illustration only and may be different from the product you purchased.
- Operators must take mechanical precautions to protect personal safety and wear protective equipment, such as anti-smashing shoes, safety clothing, safety glasses, protective gloves, and protective sleeves.

Unpacking
 • Do not install the equipment if you find damage, rust, or signs of use on the equipment or accessories upon unpacking. • Do not install the equipment if you find water seepage or missing or damaged components upon unpacking. • Do not install the equipment if you find the packing list does not conform to the equipment you received.
 • Check whether the packing is intact and whether there is damage, water seepage, dampness, and deformation before unpacking. • Unpack the package in sequence. Do not hit the package violently. • Check whether there is damage, rust, or signs of bumping on the surface of the equipment and equipment accessories before unpacking. • Check whether the package contents are consistent with the packing list before unpacking.

Storage and transportation



- Large-scale or heavy equipment must be handled by qualified professionals using specialized hoisting equipment. Failure to comply may result in personal injury or equipment damage.
- Before hoisting the equipment, 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 equipment damage.
- Do not stand or stay below the equipment when it is being hoisted.
- When hoisting the equipment with a steel rope, ensure the equipment is hoisted at a constant speed without suffering from vibration or shock. Do not turn the equipment over or let the equipment stay hanging in the air. Failure to comply may result in personal injury or equipment damage.



- Handle the equipment with care during transportation and mind your steps to prevent personal injury or equipment damage.
- When carrying the equipment with bare hands, hold the equipment casing firmly with care to prevent parts from falling. Failure to comply may result in personal injury.
- Store and transport the equipment strictly based on the requirements. Failure to comply may result in equipment damage.
- Do not store or transport the equipment in environments with water splash, rain, direct sunlight, strong electric field, strong magnetic field, and strong vibration.
- Avoid storing the equipment for more than 3 months. When the equipment needs to be stored for an extended period, take strict protection measures and necessary inspection.
- Pack the equipment strictly before transportation. Use a sealed box for long-distance transportation.
- Do not transport the equipment with other devices or materials that may harm or have negative impacts on the equipment.

Installation



- Installation must be carried out by skilled personnel who have undergone specialized electrical training and possess comprehensive electrical expertise. Non-professionals are not allowed to install the equipment.



- Read through the user guide and safety precautions before installation.
- Do not install the equipment in places with strong electric or magnetic fields.
- Before installation, check that the mechanical strength of the installation site can bear the weight of the equipment. Failure to comply can result in mechanical hazards.
- Do not wear loose clothes or accessories during installation. Failure to comply may result in electric shock.
- When installing the equipment in a closed environment (such as a cabinet or casing), use a cooling device (such as a fan or air conditioner) to cool the environment down to the required temperature. Failure to comply may result in equipment over-temperature or a fire.
- Do not retrofit the equipment.
- Do not fiddle with the bolts used to fix equipment components or the bolts marked in red.
- When the equipment is installed in a cabinet or final assembly, a fireproof enclosure providing both electrical and mechanical protections must be provided. The IP rating must meet IEC standards and local laws and regulations.
- Before installing equipments with strong electromagnetic interference, such as a transformer, install a shielding equipment for the equipment to prevent malfunction.
- Install the equipment on an incombustible object such as metal and do not touch or attach the equipment to combustibles. Failure to comply can result in fire.



- Cover the top of the equipment with a piece of cloth or paper during installation. This is to prevent unwanted objects such as metal chippings, oil, and water from falling into the equipment and causing faults. After installation, remove the cloth or paper to prevent over-temperature caused by poor ventilation due to blocked ventilation holes.
- Resonance may occur when the equipment operating at a constant speed switches to variable speed operations. In this case, install the vibration-proof rubber under the motor frame or use the vibration suppression function to reduce resonance.

Wiring



- Equipment installation, wiring, maintenance, inspection, or component replacement must be performed only by professionals.
- Before wiring, disconnect all the power supplies of the equipment. Wait for at least the time designated on the equipment warning label before further operations because residual voltage still exists after power-off. Measure the DC voltage of the main circuit and make sure that it is below the safety voltage. Failure to comply can result in electric shock.
- Do not perform wiring, remove the equipment cover, or touch the circuit board with power on. Failure to comply can result in electric shock.
- Ensure the equipment is grounded properly. Failure to comply can result in electric shock.



- Do not connect the input power supply to the output end of the equipment. Failure to comply can result in equipment damage or even a fire.
- When connecting a drive to the motor, check that the phase sequences of the drive and motor terminals are consistent to prevent reverse motor rotation.
- Cables used for wiring must meet cross sectional area and shielding requirements. The shield of the cable must be reliably grounded at one end.
- Tighten the terminal screws with the tightening torque specified in the user guide. Improper tightening torque may result in overheat, damage to the connecting parts, or a fire.
- After wiring, check that all cables are connected properly and no screws, washers or exposed cables are left inside the equipment. Failure to comply may result in electric shock or equipment damage.



- During wiring, follow proper electrostatic discharge (ESD) proceduresand wear an anti-static wrist strap. Failure to comply can result in damage to the equipment or internal product circuits.
- Use shielded twisted pairs for the control circuit. Connect the shield to the grounding terminal of the equipment for grounding. Failure to comply can result in equipment malfunction.

Power-on



- Before power-on, check that the equipment is installed properly with reliable wiring and the motor can be restarted.
- Check that the power supply meets equipment requirements before powering on to prevent equipment damage or a fire.
- When the equipment is powered on, do not open the cabinet door or protective cover, touch any wiring terminal, or disassemble any component of the equipment. Failure to comply can result in electric shock.



- After wiring and parameter setting, perform a trial run to ensure the equipment operates safely. Failure to comply may result in personal injury or equipment damage.
- Before power-on, check that the rated voltage of the equipment is consistent with that of the power supply. Failure to comply may result in fire.
- Before powering on, check that no one is near the equipment, motor, or machine. Failure to comply may result in death or personal injury.

Operation



- The equipment must be operated only by professionals. Failure to comply can result in death or personal injury.
- During operation, do not touch any connecting terminals or disassemble any component of the equipment. Failure to comply can result in electric shock.



- Do not touch the equipment enclosure, fan, or resistor with bare hands. Failure to comply may result in burns.
- During operation, prevent metal or other objects from falling into the equipment. Failure to comply may result in fire or equipment damage.

Maintenance



- Equipment installation, wiring, maintenance, inspection, or component replacement must be performed only by professionals.
- Do not maintain the equipment with power ON. Failure to comply can result in electric shock.
- Before maintenance, disconnect all the power supplies of the equipment and wait for at least the time designated on the equipment warning label.
- When a permanent magnet motor is used, do not touch the motor terminals immediately after power-off because the motor terminals can generate induced voltage during rotation even after the equipment is powered off. Failure to comply can result in electric shock.



- Perform routine and regular inspection and maintenance on the equipment in accordance with maintenance requirements, with maintenance records kept properly.

Repair



- Equipment installation, wiring, maintenance, inspection, or component replacement must be performed only by professionals.
- Do not perform maintenance on the equipment with power on. Failure to comply can result in electric shock.
- Before inspection and maintenance, disconnect all the power supplies of the equipment and wait for at least the time designated on the equipment warning label.



- Submit a request for repair services in accordance with the product warranty agreement.
- When the fuse is blown or the circuit breaker or earth leakage current breaker (ELCB) trips, wait for at least the time designated on the equipment warning label before power-on or further operations. Failure to comply may result in death, personal injury, or equipment damage.
- Troubleshooting and maintenance must be performed by professionals according to the repair instructions, with maintenance records kept properly.
- Replace quick-wear parts of the equipment in accordance with the replacement instructions.
- Do not operate on damaged equipment. Failure to comply may result in death, personal injury, or equipment damage.
- After the equipment is replaced, check the wiring and set parameters again.

Disposal
WARNING • Dispose of retired equipment in accordance with local regulations and standards. Failure to comply may result in death, personal injury, or property damage. • Recycle retired equipment by observing industry waste disposal standards to avoid environmental pollution.

Safety label

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

To ensure safe operation, comply with equipment-related safety labels. See the following table for description of the safety labels.

Safety Label	Description
	• Read through the safety instructions before operating the equipment. Failure to comply may result equipment damage, personal injury, or even death. • Do not touch the terminals or remove the cover with power ON or within 10 min after power-off. Failure to comply can result in an electric shock.

1 Product Information

1.1 Model and Nameplate

MD880LC - 01S - 0530 - 7
① ② ③ ④

① **Product series** MD880LC: MD880LC water-cooled AC drive series	③ **Voltage class** 7: 690 VAC
② **Product type** 01S: AC drive (single-drive system) module	④ **Rated current** 0530: 530 A

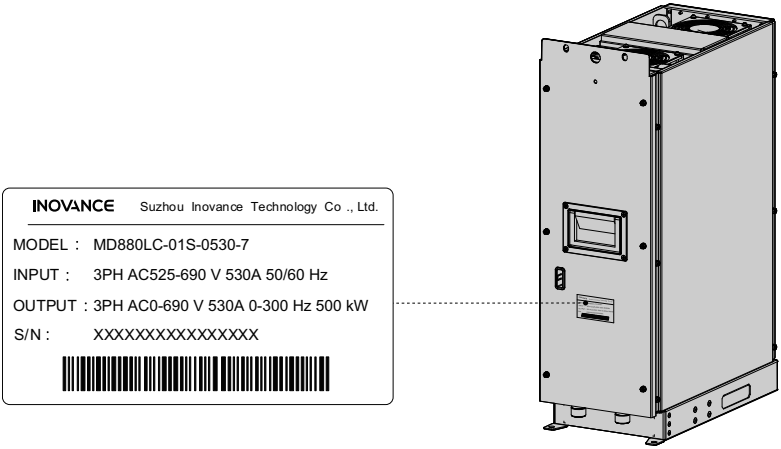


Figure 1-1 Nameplate of the drive module

1.2 Specifications

Table 1–1 Technical data

Drive model	Structure	Applications without overload		Applications with low overload		Applications with high overload		Power loss c/a/T<1> (kW)	Air volume (CFM)	Net weight (kg)	Outline dimensions (W x H x D) (mm)
		Current (A)	Power (kW)	Current (A)	Power (kW)	Current (A)	Power (kW)				
UN: Three-phase 690 V (range: 525 V to 690 V)											
MD880LC-01S-0530-7	H7w	530	500	509	500	424	400	9.0/0.5/9.5	360	55	230 x 720 x 456

Note

<1>: "c" indicates the power loss dissipated in the coolant. "a" indicates the power loss dissipated in air. "T" indicates the total power loss excluding the power loss of the input reactor.

1.3 Technical Data

Item	Technical data	
Basic performance	Rated input voltage and frequency	525 VAC to 690 VAC, 50/60 Hz
	Allowable voltage fluctuation range	±10% (-15%, < 1 min)
	Output voltage	0 VAC to 690 VAC
	Output frequency	0 Hz to 500 Hz
	Overload capacity	Low overload: 110%I_{LD}, continuous operation for 1 min allowed per every 5 min High overload: 150%I_{HD}, continuous operation for 1 min allowed per every 5 min
	Operating efficiency	> 98%
Control features	Motor control method	Voltage/frequency (V/f) control Sensorless vector control (SVC) Feedback vector control (FVC)
	Carrier frequency	2.5 kHz carrier frequency by default
	Speed regulation range	V/f control: 1:50 SVC control: 1:200 FVC control: 1:1000
	Speed control accuracy	SVC control: ±10% Fsl FVC control: ±0.01%
	Torque response	SVC control: ⩽ 5 ms FVC control: ⩽ 5 ms
	Torque control accuracy	FVC: +3% SVC: ±5% at frequencies higher than 5 Hz
	Starting torque	SVC control: 0.5 Hz/150% FVC control: 0 Hz/200%

Item	Technical data	
Mechanical data	Anti-vibration performance	Compliant with GB/T4798.3 - Mechanical condition Frequency: 2 Hz to 9 Hz; vibration amplitude: 3 mm Frequency: 9 Hz to 200 Hz; acceleration rate: 9.8 m/s^2 (1 g) Shock: 10 g, 11 ms
	Safety performance	Compliant with EN 61800-5-1
Protective functions	Phase loss protection	Input/Output phase loss protection
	Overtemperature protection	Triggered when the AC drive is overheated.
	Overload protection	The drive stops after operating at 150% of rated load for 60s. The drive stops after operating at 110% of rated load for 60s.
	Overcurrent protection	When the current exceeds 2.5 x rated current, the AC drive stops.
	Short circuit protection	Providing protections against output phase-to-phase short circuit and output phase-to-ground short circuit.
Water-cooled system	Coolant	Pure water or mixture of pure water and ethylene glycol + preservative. For use in ambient temperatures below 5°C, antifreeze coolant must be added.
	Maximum pressure	6 bar
	Flow requirements	• 100% water: ⩾ 16 L/min • 80% water and 20% ethylene glycol: ⩾ 18 L/min • 60% water and 40% ethylene glycol: ⩾ 21 L/min

Item	Technical data	
Environment requirements	Cooling method	Water-cooled
	Operating location	Indoors without direct sunlight, dust, corrosive gas, combustible gas, oil mist, water vapor, drip, or salty element
	Altitude	Below 1000 m (For altitudes above 1000 m, derate 1% per every additional 100 m. The maximum altitude is 4000 m.) For altitudes above 2000 m, install an isolation transformer.
	Ambient temperature	0°C to 60°C (For temperatures above 50°C, derate 1% for every additional 1°C. The maximum ambient temperature is 60°C.)
	Cooling water temperature	0°C to 40°C (For temperatures above 40°C, derate 2% for every additional 1°C. The maximum cooling water temperature is 50°C.)
	Storage temperature	-40°C to +70°C (It is recommended to empty the cooling water before storage.)
	Relative humidity	Less than 95% RH (without condensation)
	Pollution degree	PD2
	Power grid system	IT
	Overvoltage category	OVCIII
	IP rating	IP00
Water quality requirements	Water	Pure water (or deionized water) + preservative + antifreeze coolant
	PH value	6 to 8
	Hardness	< 10 dH
	Conductivity	＜ 300 μs/cm
	Chloride	< 50 mg/L
	Fluoride	< 50 mg/L
	Sulfate	< 100 mg/L
	TDS (Total Dissolved Solids)	⩽ 200 mg/L
	Preservative	0.5% Cortec VCI-649 (replacement needed every two years)

Note

Water quality is critical for normal operation of equipment.

1.4 Hardware Description

1.4.1 Typical Single-Line Circuit Diagram of the Drive

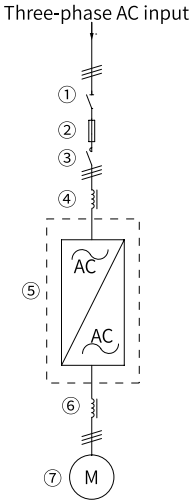


Figure 1-2 Electrical wiring diagram

No.	Description
①	Disconnector (Depending on the different power levels, you can choose to configure a switch fuse, disconnector, and an independent fuse, or a molded case circuit breaker and independent fuse.)
②	Three-phase input fuse
③	Contactor
④	Input reactor
⑤	Drive module (single-drive system)
⑥	Output reactor
⑦	Motor

Note

- Products in the dotted line frame are provided by Inovance.
- Customers can choose different configurations based on local specifications as needed.

1.4.2 Overview of the Power Module Structure

Install a handle to the front panel of the module so that you can push in or pull out the cabinet from the front. The control chamber locates inside the closure plate on the right side of the module. The AC input copper busbar terminals and output copper busbar terminals locate at the bottom of the module. The positive and negative copper busbar terminals locate at the upper part of the module.

Auxiliary 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 is established, the drive module relies on the internal auxiliary power supply, which makes the external 24 V power supply redundant.

Structural Layout

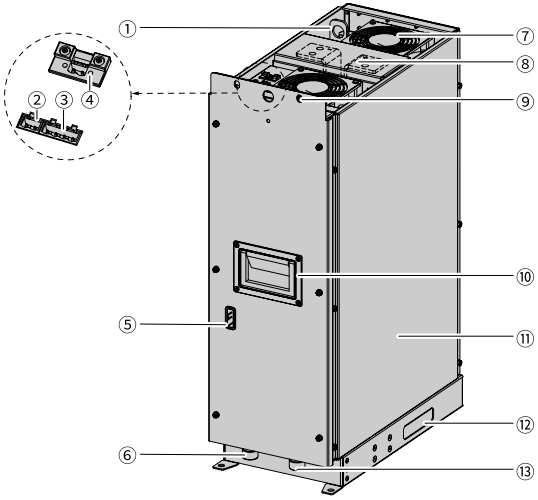


Figure 1-3 Diagram 1 of MD880 series 690 VAC water-cooled AC drive (single-drive system) components

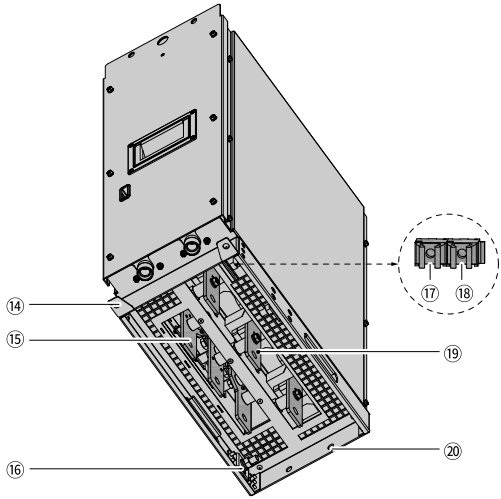


Figure 1-4 Diagram 2 of MD880 series 690 VAC water-cooled AC drive (single-drive system) components

No.	Name
①	Eyebolt
②	Input terminal for 24 VDC external power supply
③	STO terminal
④	HCU redundant power supply (24 VDC output)
⑤	Grounding terminal of lightning protection board
⑥	Water inlet fitting, M26x1.5 metric external thread, 24-degree internal taper
⑦	Auxiliary cooling fan
⑧	Copper busbar terminals (+) and (-)
⑨	Upper fixing hole
⑩	Front handle
⑪	Side plate (control chamber inside)
⑫	Bottom handle
⑬	Water outlet fitting, M26x1.5 metric external thread, 24-degree internal taper
⑭	Lower fixing hole
⑮	AC input copper busbar terminals (R/S/T)
⑯	PE (grounding) terminal
⑰	VR optical fiber reception terminal
⑱	VT optical fiber transmission terminal
⑲	AC output copper busbar terminals (U/V/W)
⑳	Rear fixing hole (optional)

1.5 Derating

Temperature-based derating

When the coolant temperature is within 50°C to 60°C, the rated output current must be derated by 1% for every additional 1°C. Output current = Rated current x Derating coefficient (k).

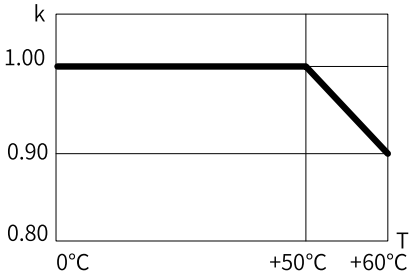


Figure 1-5 Ambient temperature-based derating

Coolant temperature-based derating

When the coolant temperature is within 40°C to 50°C, the rated output current must be derated by 2% for every additional 1°C. Output current = Rated current x Derating coefficient (k).

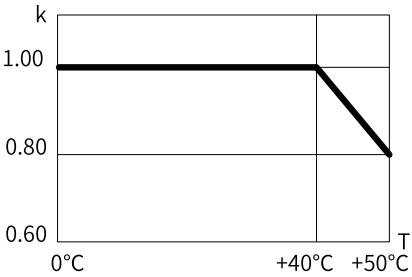


Figure 1-6 Coolant-based derating

Altitude-based derating

For altitudes between 1000 m and 4000 m, the output current of the drive is derated by 1% for every additional 100 m.

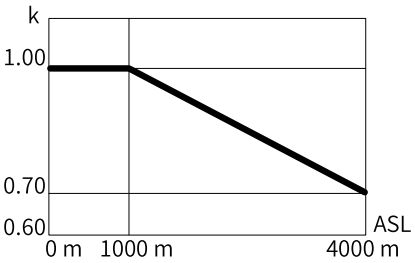


Figure 1-7 Altitude-based derating

Carrier frequency-based derating

Table 1–2 Carrier frequency-based derating

Drive model	Rated power	Carrier frequency (kHz)						
	P (kW)	2.5	3.2	4	5	6	7	8
MD880LC-01S-0530-7	500	1	0.87	0.75	0.62	0.53	0.46	0.4

Note

The derating coefficient between two carrier frequencies can be linearly interpolated.

1.6 Overload Characteristics

When the drive is used in a system where overload may occur, a proper reference load current must be set. The criterion for determining overload is that the drive system operates at the reference load current before and after an overload event, with a load duration of 300 seconds as basis.

Curve for low overload mode

I_{LD} indicates the reference load current for low overload mode. In this mode, the system operates at 110% of the reference load current for 60 consecutive seconds.

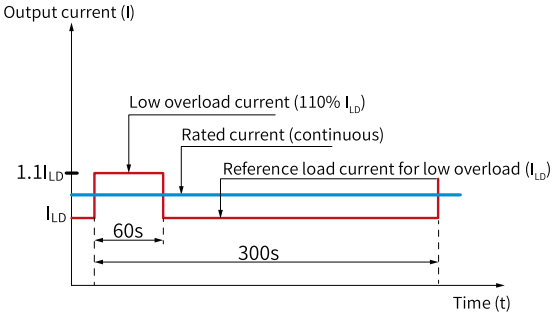


Figure 1-8 Curve for low overload mode

Curve of high overload mode

I_{HD} indicates the reference load current for high overload mode. In this mode, the system operates at 150% of the reference load current for 60 consecutive seconds.

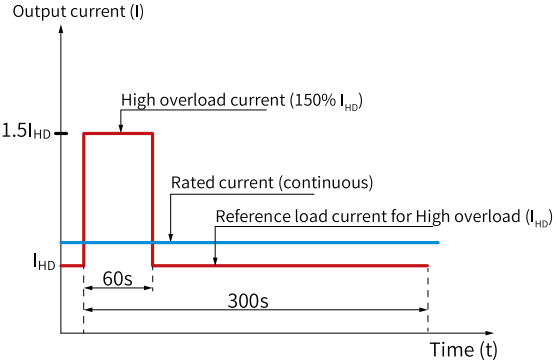


Figure 1-9 Curve of high overload mode

1.7 Power Consumption of Auxiliary Power Supply

Table 1–3 Consumption of auxiliary power supply

Structure	Power supply input	Remark
H7w	24 VDC/2 A	Redundant power supply is implemented through external power supply and internal bus power supply.

2 Mechanical Installation

2.1 Installation Flowchart

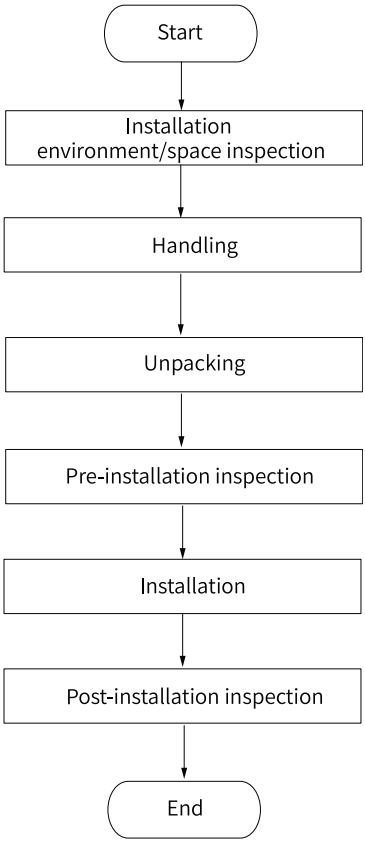


Figure 2-1 Mechanical installation flowchart

2.2 Installation Preparation

2.2.1 Installation Environment

Item	Requirement
Heat dissipation and ventilation	Put the drive onto a flame-retardant surface and mount the drive vertically to the mounting bracket with screws. The drive generates a large amount of heat during operation, therefore reserve sufficient space around the drive for heat dissipation.
Installation location	Install the drive in a place that meets the following requirements: • No direct sunlight • Free from water drops, with RH ⩽ 95% • Free from corrosive, flammable, and explosive gases • Free from greasy dirt and dust
Vibration	Install the battery simulator in a place with minimum risk of vibration. See section *"1.3 Technical Data" on page 17* for vibration-resistance performance.
Ambient temperature	Derating is required for ambient temperatures greater than 50°C and altitudes above 1000 m. For the derating factor, see section *"1.5 Derating" on page 23*.
Protective enclosure	The drive must be installed in a cabinet that used in a final system. The final system must be equipped with a fireproof enclosure providing both electrical and mechanical protection. The installation must conform to local and regional laws and regulations, and relevant IEC standards.

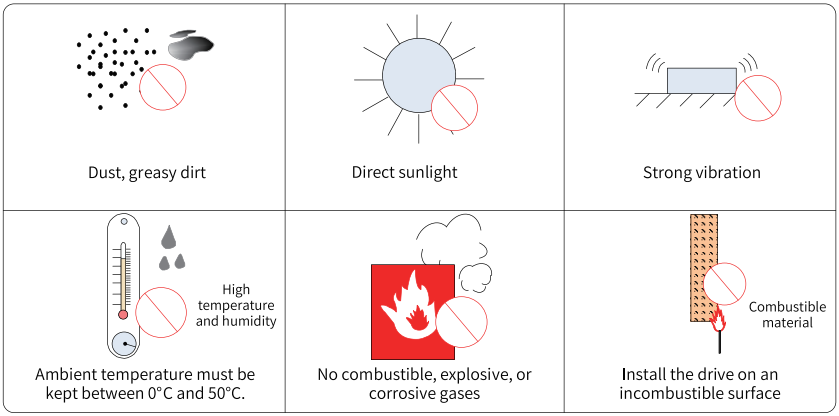


Figure 2-2 Environment requirements

2.2.2 Installation Space

Reserve proper installation space and clearance around the MD880LC-01S-0530-7 drive, as shown below.

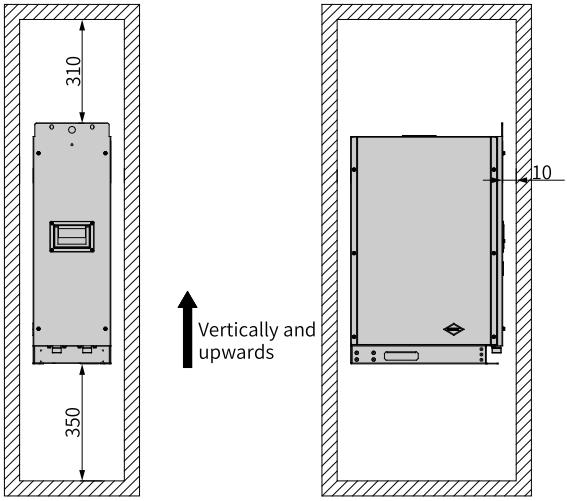


Figure 2-3 Clearance of the drive (mm)

Note

The dimensions above represent the minimum space requirements (mm).

2.2.3 Preparing Installation Tools

Prepare the following tools for moving, fixing, and fastening the module:

- Crane, forklift, pallet truck, and roller, which are used to move the power module
- Wrench or socket wrench with opening size 13, which is used to fix the power module
- Wrench or socket wrench with opening size 16/18, which is used to connect the cable or copper busbar
- Straight screwdriver that used to connect the signal cable
- 32 mm open-end torque wrench, which is used to connect the water pipes.

Tightening torque of common screws and bolts

Table 2–1 Electrical connection

Screw/Bolt	Property class	Max. torque (N·m)
M3	4.8	0.55
M4	4.8	1.2

Screw/Bolt	Property class	Max. torque (N·m)
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 2–2 Cable connector

Screw/Bolt	Property class	Max. torque (N·m)
M8	4.8	13
M10	4.8	20
M12	4.8	35

2.3 Unpacking and Handling

2.3.1 Storage

Keep the equipment in a clean and dry room, with temperatures between -40°C and +70°C and temperature variation lower than 1°C/min. If the equipment is stored for a long term, cover it or take other appropriate measures to keep it from being affected by contamination and environmental pollutants.

Store the drive based on the following requirements.

- Pack the drive into the original packing box before storage.
- Do not expose the drive to environments with moisture, high temperature, or direct sunlight for a long time.
- If the storage temperature is lower than 0°C, empty the coolant inside the drive.

2.3.2 Handling Before Unpacking

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

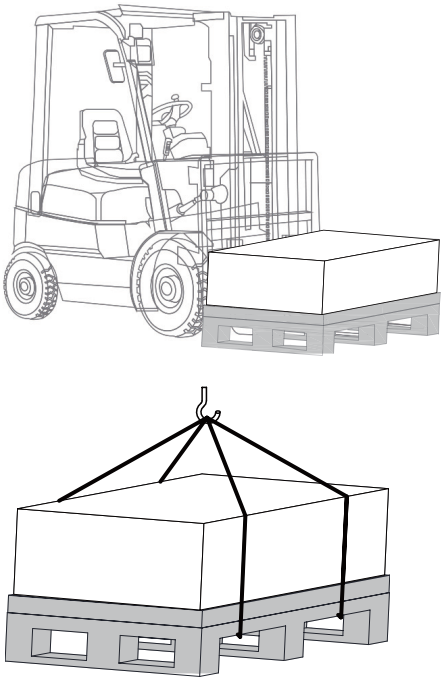


Figure 2-4 Handling before unpacking

- The drive must be placed on a flat and firm ground that can bear the weight of the drive.
- 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.
- The device must always be transported vertically, as indicated on the packing box.

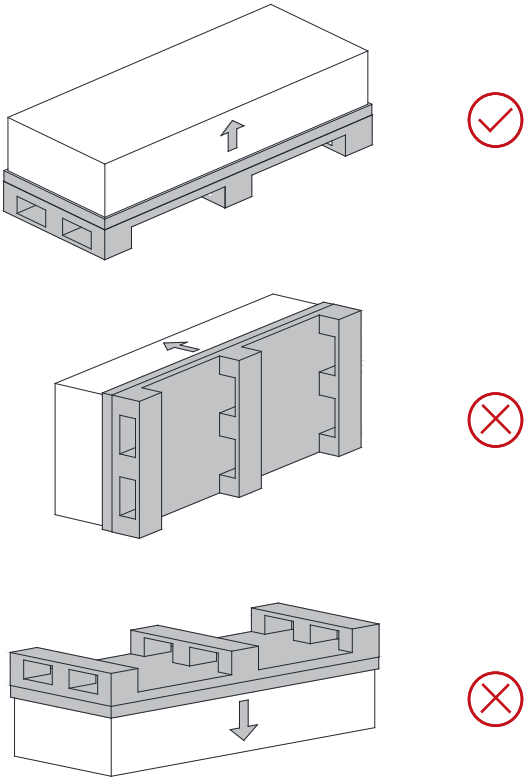


Figure 2-5 Handling method

2.3.3 Unpacking Inspection

After receiving the drive, perform necessary inspection on the drive. Check that you have received all the items specified on the delivery note. Notify the shipping company immediately of any missing components or damage. If necessary, contact Inovance office or the local agent for technical support.

Danger

- If the equipment is damaged during transportation, the electrical safety of the equipment can be affected. Connect the equipment only after performing professional high-voltage test.
- Failure to comply may result in property damage, physical injury, or even death.

Unpack the drive based on the following procedure.

1. Remove all the straps and ties and open the cover of the box.
2. Remove all filler materials.
3. Take out the drive module and accessories.
4. Cut the plastic film and wrapping tape.
5. Check that the drive is not damaged.
6. Dispose of or recycle the packing material according to local regulations.

2.3.4 Handling After Unpacking

- Use a proper hoisting tool for MD880 series models.
- Ensure that the load-carrying capacity of the handling equipment is higher than the weight of the equipment to be hoisted.
- Use the auxiliary eyebolt on top of the equipment for hoisting and handling, with the relief height not higher than 0.3 m.
- Make the equipment in the vertical position before hoisting and handling.

2.4 Pre-installation Inspection



- To ensure safe and reliable operation, the equipment must be properly installed and commissioned by professionals, taking into account all the warning notices provided.
- In particular, the general and national installation and safety guidelines for power equipment installation 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 property damage, physical injury, or even death.

Check the following items before installation.

Table 2–3 Pre-installation checklist

No.	Item	Compliance
1	Check the label of the center of gravity.	☐
2	Check that the packing box is intact and dry.	☐
3	Check that the load-bearing capacity of the floor and the environment meet the installation requirements.	☐
4	The minimum ceiling height requirement for unblocked air passage is fulfilled. The cooling air supply and exhaust must not be obstructed and must have sufficient space. Reserve sufficient space for a safe passage when the cabinet door opens.	☐

No.	Item	Compliance
5	The cabinet enclosure is free of deformation, paint peeling, cracks, and other defects. The interior of the cabinet is free of water stains and other defects.	☐
6	Check that the accessories (options) in the cabinet are complete.	☐
7	Before the cabinet units are finally installed, the wooden pallets supplied with the transport unit must be removed properly.	☐
8	Install the cabinet to the pre-designed anchor point as required.	☐
9	Install all contact protective devices (protective plates) inside and outside the cabinet before commissioning.	☐

2.5 Installation Instructions

2.5.1 Installation Precautions



- The cabinet frame must be sturdy enough to carry the weight of the components, control circuit and other devices installed in the cabinet.
- The cabinet must protect the power module against contact and meet the requirements for dust and humidity.
- To facilitate installation and maintenance, it is recommended to leave enough space around the equipment to allow sufficient cooling air flow, necessary clearance, and space required for holding cables and cable supports. Do not install the control board near the main circuit or high-temperature parts. Make sure that all cross members or shelves on which components are mounted are properly grounded and the connecting surfaces are not painted.
- Ensure that the module is grounded properly through the fixing points on the mounting baseplate.
- It is recommended to use nickel plated copper or aluminum materials. Before connecting the aluminum busbar, remove the oxide coating and apply proper antioxidant joint compound.
- If there is a risk of condensation in the cabinet, use a cabinet heater. When placing the heater, follow the instructions provided by the manufacturer.
- Take care when installing coolant pipes. Ensure the pipe machineries are installed correctly without leakage.

Cooling inside the cabinet

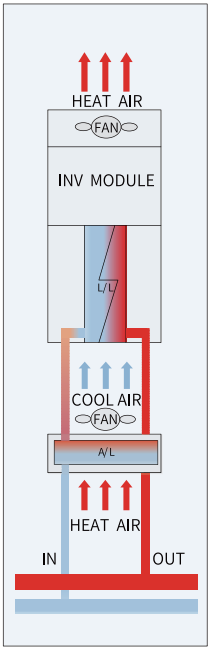


Figure 2-6 Cooling circuit inside the cabinet

Model	Inlet air tempera ture of the drive (°C)	Air flow of the drive (CFM)	Flow rate of the drive (L/min)			Inlet water tempera ture of the drive (°C)	Inlet water pressure of the drive (bar)
			100% water	Water/ Ethylene glycol ratio: 80:20	Water/ Ethylene glycol ratio: 60:40		
MD880LC-01S-530-7	< 50	360	16	18	21	< 40	2

Note

- Failure to comply with the installation regulations can significantly shorten the service life of the drive, which may result in faults.
- The maximum water inlet pressure of the drive cannot exceed 6 bar, which should be 1 bar to 2 bar generally.
- See the water quality requirements in *"1.3 Technical Data" on page 17*.

EMC requirements

- The fewer and smaller the holes in the cabinet, the better the anti-interference and anti-attenuation performance can be. The maximum diameter of a hole on the galvanic

metal contact surface in the cabinet is 100 mm. Pay special attention to the size of the grid holes at the cooling air inlet and outlet.

- Weld the steel panels together without holes to achieve the optimal electrical connection. If welding is not possible, do not paint the gap between panels. In this case, install special conductive EMC bars to realize galvanic connection. Generally, reliable conductive bars are made of flexible silicon with the surface covered by a metal mesh. Additional conductive gaskets are needed between metal surfaces to enhance the contact between them. The maximum distance between assembly screws is 100 mm.
- Make sure that a high-frequency grounding system has been established in the cabinet. This is to prevent voltage difference and form structures that can shield against radiation. Use short and flat low-inductance copper braids to improve the performance of high-frequency grounding system. High-frequency single-point grounding cannot be used due to the long distance in the cabinet.
- The use of only conductive EMC shield gaskets is not enough to achieve protective grounding. To ensure electrical safety of the parts, a low-frequency grounding system is required. Follow local regulations when designing protective grounding.

2.5.2 Installing the Power Module

1. Push the drive module into the cabinet along the metal rail. See *"Figure 2–8 Dimensions of mounting baseplate (unit: mm)" on page 36* for dimensions of the mounting backplate.

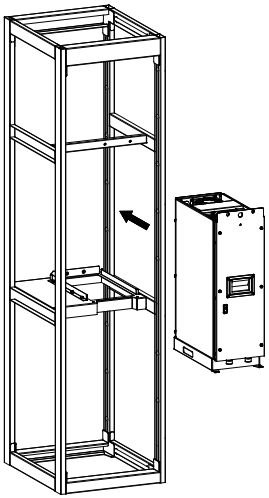


Figure 2-7 Pushing the module into the cabinet

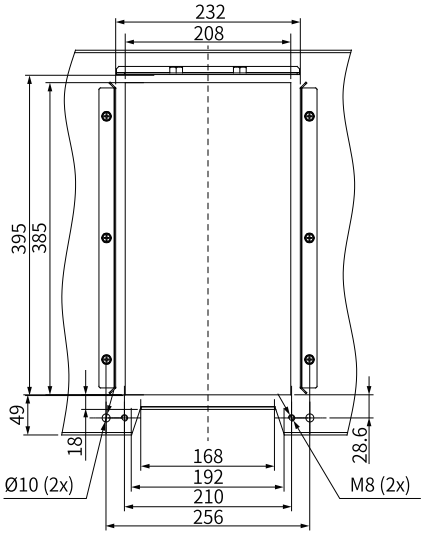


Figure 2-8 Dimensions of mounting baseplate (unit: mm)

2. After pushing the drive module in place, fasten the four anchor bolts (M8x20) at the top and bottom of the module.

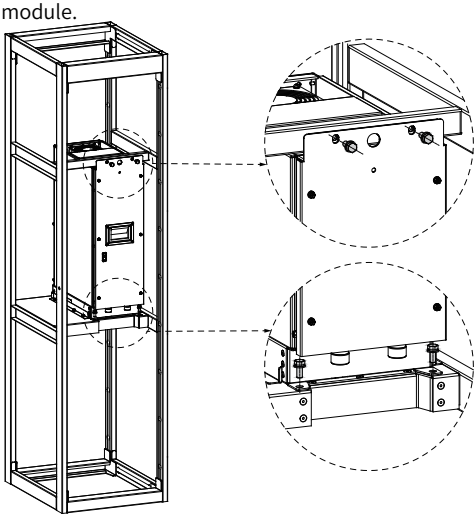


Figure 2-9 Fixing the drive module

2.5.3 Installing the HCU Control Module

For details on installing the HCU control module, see *"4.4.4 Installation Procedure" on page 60*.

2.6 Post-installation Inspection

After installation is done, perform the following inspection to avoid equipment damage and property loss.

Table 2–4 Post-installation checklist

No.	Item	Compliance
1	The cabinet is fixed to the ground. In the case of vibration, fix the cabinet top to the wall or roof.	☐
2	There is no drilling debris, tools, or unwanted objects left inside the cabinet.	☐
3	The cabinet cover has been installed properly with the door closed.	☐

3 Electrical Installation

3.1 Installation Flowchart

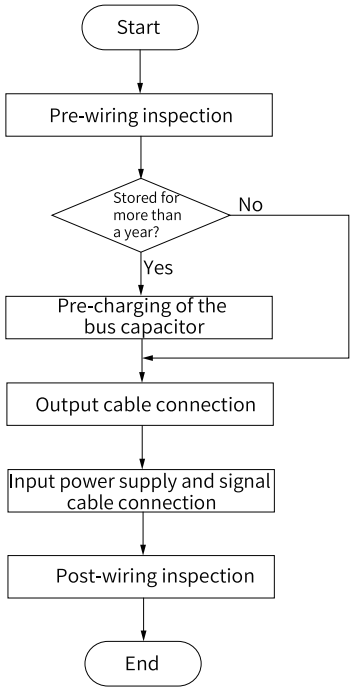


Figure 3-1 Electrical installation flowchart

3.2 Safety Alerts

3.2.1 Protective Measures Before Installation



- The drive contains live parts and rotary components and is typically used in industrial applications involving high voltage. Therefore major personal injury or property loss may occur when necessary covers are removed illegally or the drive is being operated/maintained improperly.
- The drive can only be operated by professional technicians who have read and comply with the safety instructions in this guide.
- The following five safety rules must always be observed during any kind of work on electrical equipment:
  - Power off the equipment.
  - Make sure that the equipment cannot be energized again.
  - Make sure that the equipment is free of residual voltage.
  - Make sure that the equipment is grounded properly.
  - Cover or isolate adjacent live parts.

3.2.2 Inspection on Electrical Installation



- The equipment runs with high voltage. The wiring work must be carried out only after the cabinet is powered off without any residual voltage left.
- Only qualified professionals are allowed to work on the equipment.
- Take caution when working on the equipment even after it is disconnected from power supply because residual voltage may still existin the external power supply. The power and control terminals may be live even when the equipment is in the stop state.
- The equipment may still be live even 15 minutes after power-off due to the DC bus capacitors inside. Therefore, ensure that the voltage is below 36 VDC before opening the equipment.
- The user is responsible for ensuring that the motor, cabinet units, and other components are installed and connected in accordance with the recognized technical rules in the country of installation and with other applicable regional regulations. Pay special attention to regulations on cable dimensions, safety devices, grounding, disconnection, isolation, and over-current protection.
- Tripping of a safety device on a branch circuit may cut off the fault current. To reduce the risk of fire or electric shock, check the conductive parts and other components and replace the damaged parts. After a safety device trips, identify and rectify the cause of the tripping.

3.2.3 General Statements

Static electricity



The circuit board contains components that are sensitive to static electricity. Wear a grounded wrist strap when working on the circuit board. Do not touch the circuit board unless necessary.

Optical components

Handle the optical fiber carefully. When removing the optical fiber, hold and pull the connector rather than the fiber itself. As the optical fiber is extremely susceptible to dirt, do not touch the ends of the fiber with bare hands.

3.2.4 Inspection on Component Insulation

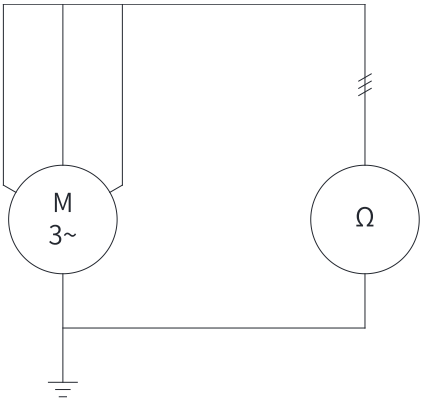
The insulation test has been performed between the main circuit and enclosure of the drive before delivery. Therefore, do not perform any withstand voltage or insulation resistance tests on the drive again. Check insulation of the motor and motor cables according to the following steps.

Danger

- When checking insulation before connecting the system to the main power supply, make sure that the drive system is disconnected from the main power supply (input power).
- Check that the motor cables have been connected to the motor and disconnected from the drive output terminals (U, V, W).
- Measure the insulation resistance between the conductor of each phase and PE conductor with 500 VDC applied. For details about the insulation resistance of the motor, see the related user guide.

Note

The insulation resistance may decrease due to ambient humidity. If the insulation resistance does not meet requirements, reduce the ambient humidity and then measure the insulation resistance again.



3.3 EMC-Compliant Installation and Routing

3.3.1 Routing Requirements

Routing signal cables and power cables separately

When analog signals are used to remotely control the active rectifier module, route the signal cables and high-voltage circuit cables (power supply input, AC-DC output, and braking resistor connection cables) through different routes with a distance larger than 30 cm. This is to reduce interference generated by the active rectifier and other devices on the analog signal. This requirement must be met even inside the control cabinet.

Requirements on analog control signal cables

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

Power cable requirements

Use shielded cables as the power cables, or shield all the cables with cable ducts.

Requirements on control cables and power supply cables

If the power supply cables and control cables must be cross-connected, make them be cross-connected at 90 degrees.

3.3.2 Routing Suggestions

Disturbing cables

Route cables that transmit different types of signals through different routes. Separate disturbing cables from sensitive cables with a minimum clearance of 30 cm wherever possible. When the two types of cables must be cross-connected, make sure they are cross-connected at 90 degrees to avoid interference.

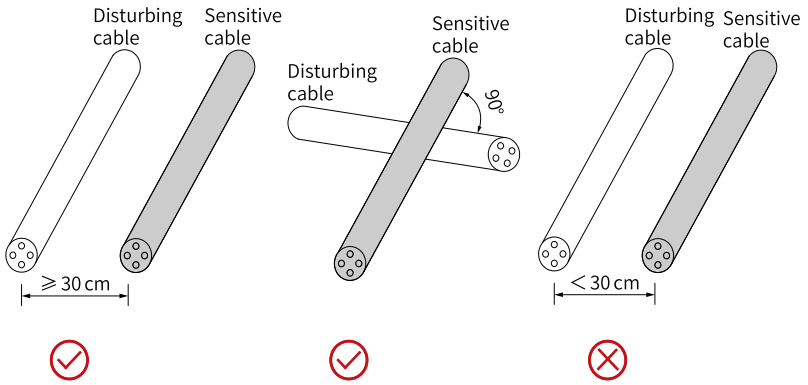


Figure 3-2 Routing disturbing cables and sensitive cables

Signal cables

Route cables that transmit different types of signals separately and isolate them with potential equalization cables. When routing cables that transmit the same type of signals, lay potential equalization cables to the outer layers and lay potential equalization bonding points as many as possible in the middle, as shown below.

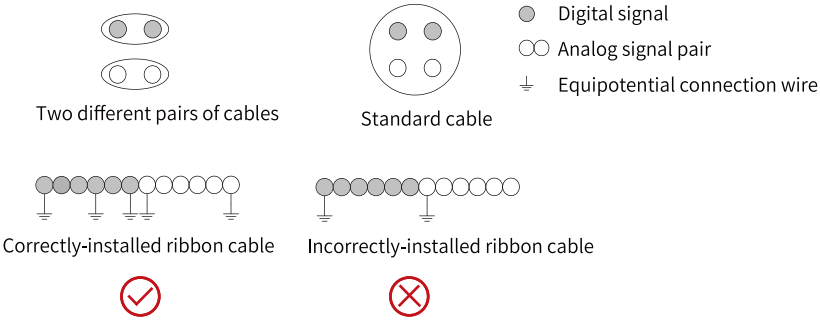


Figure 3-3 Routing cables that transmit different types of signals

Multi-conductor cables

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

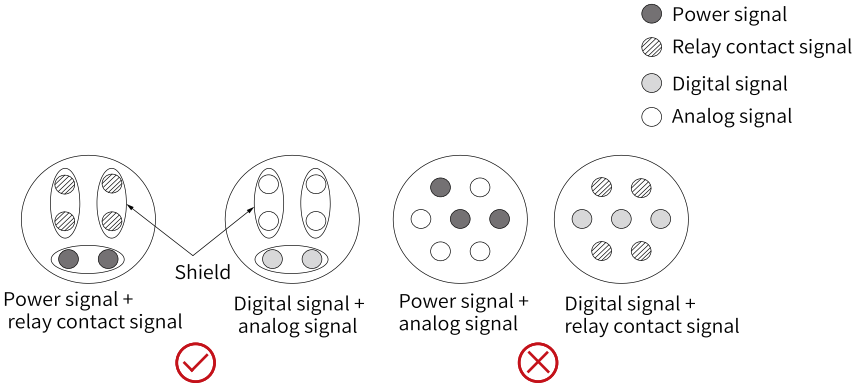


Figure 3-4 Routing multi-conductor cables

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

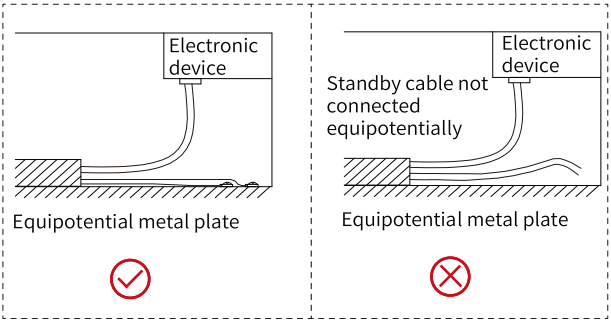


Figure 3-5 Handling reserved or unused conductors in a multi-conductor cable

Routing loop

For cables that transmit low-level sensor signals and shared cables that transmit relay signals, lay them close to each other to avoid an excessively large loop area. Use twisted pair cables for analog signals. Lay digital signal cables close to each other.

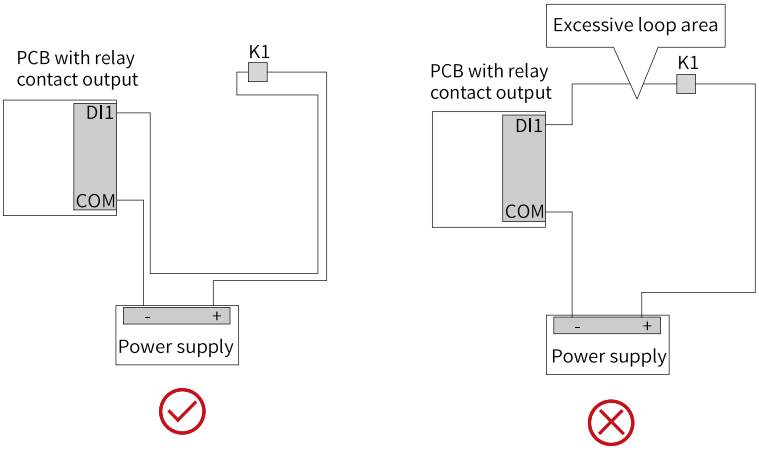


Figure 3-6 Small loop area

Multiple types of cables

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

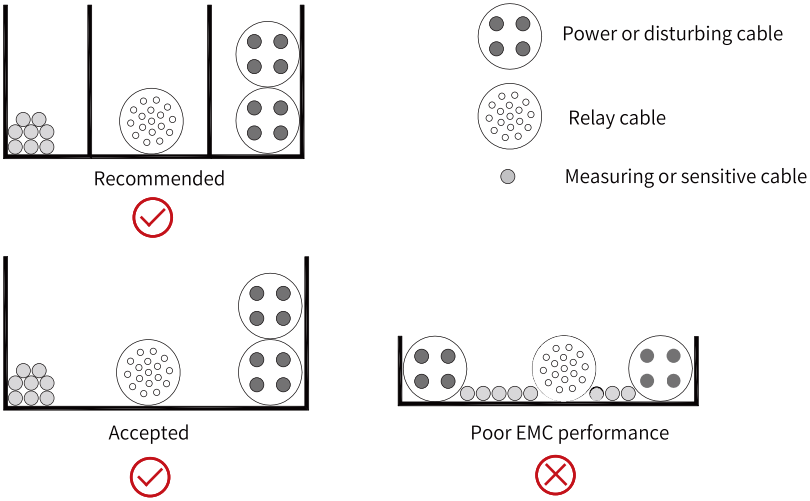


Figure 3-7 Routing multiple types of cables

Handling shielded cables

Minimize the unshielded part of the shielded cable, and connect the shield to the nearest PE terminal. If the unshielded part is excessively long, the conductor may be prone to signal interference, especially the encoder signals.

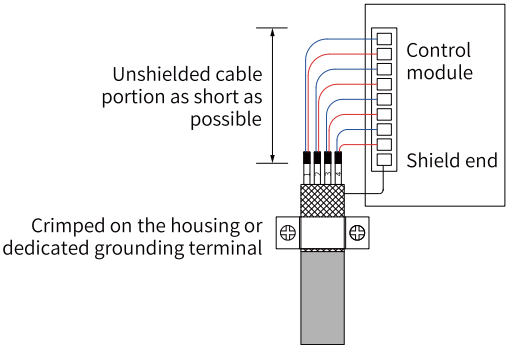


Figure 3-8 Requirements on handing shielded cables

Connecting shielded power cables

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

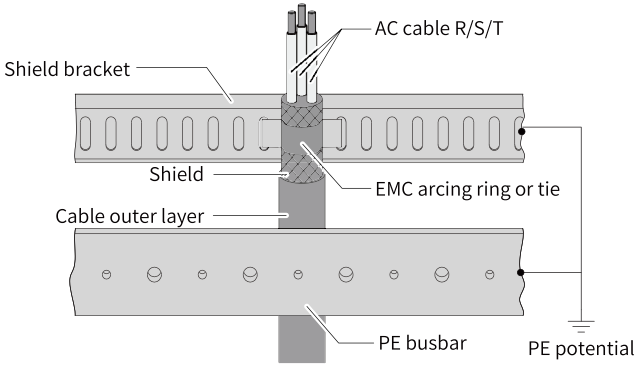
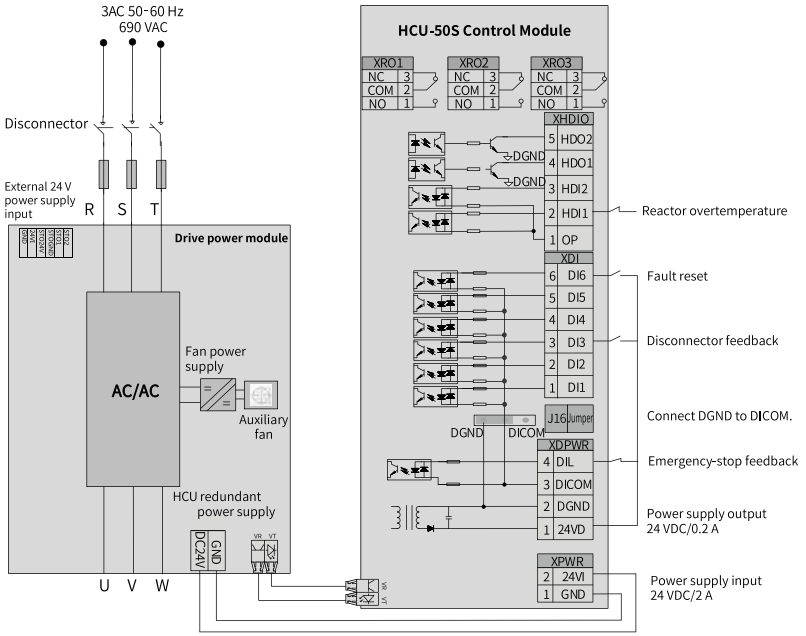


Figure 3-9 Requirements on connecting shielded power cables

3.4 Electrical Diagram for Connecting the Drive



3.5 Wiring

Danger

When connecting the drive, use specified tightening torque to tighten the screws, as shown by *"3.5.3 Tightening Torque of Common Screws and Bolts" on page 50*. Failure to comply may result in connector over-temperature.

3.5.1 Cable Connection

Terminal layout

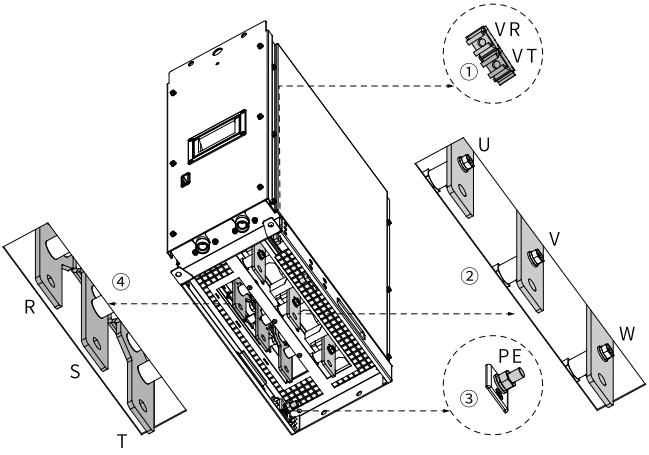


Figure 3-10 Layout of bottom terminals of the drive

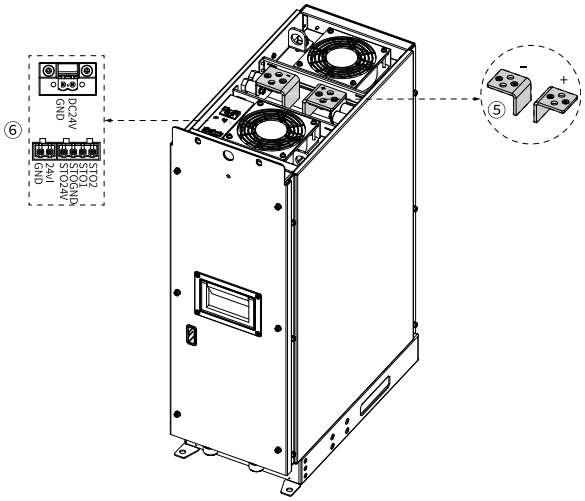


Figure 3-11 Layout of top terminals of the drive

Table 3–1 Terminal connection parameters

No.	Name	Description
①	VR optical fiber reception terminal/VT optical fiber transmission terminal	Connected to HCU or HPCU through optical fiber.
②	AC output copper busbar terminals U, V, and W	AC output copper busbar terminals
③	PE (grounding) terminal	PE wiring terminal
④	AC input copper busbar terminals R, S, and T	AC input copper busbar terminals
⑤	Copper busbar terminals (+) and (-)	Grounding copper busbar of the bus terminals (+) and (-)
⑥	a: 2-pin power supply terminal b: 2-pin power supply terminal c: 4-pin STO terminal	a: HCU redundant power supply output terminal b: Input terminal for 24 VDC external power supply, dual-conductor twisted pair, single-conductor cable, cross-sectional area: 0.5–2.5 mm^2 c: STO terminal, four-conductor shielded cable, cross–sectional area: 0.5–2.5 mm^2

Wiring procedure

1. Make sure that all inputs and outputs are correctly connected.
2. Secure power cables to the cable bracket to prevent terminals from being subject to tension.
3. When shielded power cables are used, fix the shield to the shield plate as instructed by EMC requirements.

3.5.2 Operating the Drive in TT/TN Systems

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

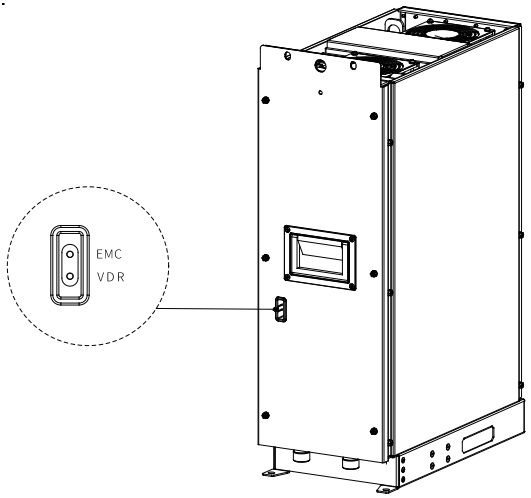


Figure 3-12 Installing two M3 screws on the voltage dependent resistor plate

Note

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

3.5.3 Tightening Torque of Common Screws and Bolts

Table 3–2 Electrical connection

Screw/Bolt	Property class	Max. 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 3–3 Mechanical connection

Screw/Bolt	Property class	Max. torque (N·m)
M5	4.8	2.8
M6	4.8	4.8
M8	4.8	13

Table 3–4 Insulating spacer connection

Screw/Bolt	Property class	Max. torque (N·m)
M6	4.8	4.8
M8	4.8	13
M10	4.8	20
M12	4.8	35

Table 3–5 Cable connector

Screw/Bolt	Property class	Max. torque (N·m)
M8	4.8	13
M10	4.8	20
M12	4.8	35

Table 3–6 Recommended cable model

MD880LC-01S-	Rated current (A)	I/O power cable (mm^2)	Power cable lug model (mm^2)	Grounding cable (mm^2)	Tightening torque (N·m)
0340-7	340	2 x 120	OT/120-12	1 x 120	70
0530-7	530	2 x 150	OT/150-12	1 x 150	70

Note

- Cables recommended in the table are all symmetric 3-conductor shielded cables, which are connected to the three phases of the AC output busbar respectively. The cross sectional area of the PE cable must fulfill the following requirements.
  - When the cross-sectional area S ⩽ 16 mm ^{2} , the cross-sectional area of the PE wire = S.
  - When 16 mm^2 < cross-sectional area S ⩽ 35 mm^2 , the cross-sectional area of the PE wire = 16 mm^2.
  - When the cross-sectional area S > 35 mm^2, the cross sectional area of the PE wire = S/2.
- OT/120-12 indicates the cable is crimped to OT-type terminals, the cross-sectional area that matches the terminal is 120 mm^2, and the size of the wiring screw hole is M12.
- The maximum size of the wiring terminal listed in the following table cannot be exceeded. Use terminals within the maximum size. Otherwise, the mechanical stability and specified electrical clearance can be affected.
- Derating is required when multiple cables of the same specifications are connected in parallel.

3.5.4 Wiring the HCU Control Module

For the control cable connection of the HCU control module, see Wiring in *HCU Control Unit Hardware Guide*.

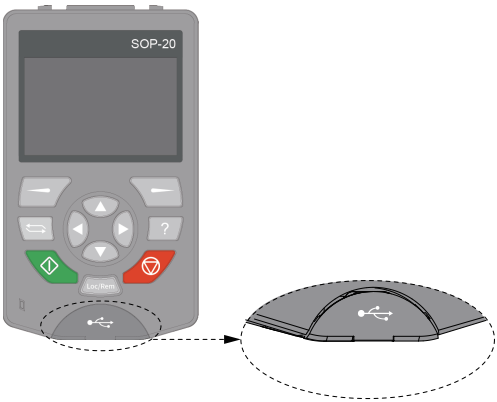
For the control cable connection of the HPCU parallel control module, see Electrical Connection in *HPCU Parallel Control Module User Guide*.

3.5.5 Connecting SOP-20-880 To the PC

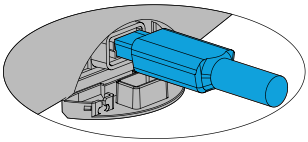
The USB mini-B terminal on SOP-20-880 is used to connect to the PC. The USB cable length cannot exceed 3 m.

The USB2.0 communication protocol is used between the SOP-20-880 and the PC.

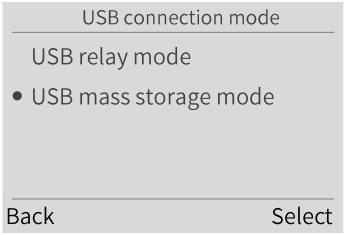
1. Open the cover of the USB port.



2. Plug in the USB shielded cable. It is recommended to use a 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.



- In the USB relay mode, the SOP-20-880 is used for interaction between the PC tool and the drive.
- In the USB mass storage mode, the SOP-20-880 can be used as a memory.

3.5.6 Connecting SOP-20-880 To the Control Module

The RJ45 terminal is on the back of the SOP-20-880, which is connected to the HCU control board through a network cable that complies with EIA/TIA/568A or 568B standards. For details, see *HCU Control Unit Hardware Guide*. On the control board at the end of a communication network, set the jumper to connect the termination resistor. It is recommended to use the shielded twisted pair cable as the SOP-20-880 bus. The total maximum length is 100 m.

Table 3–7 SOP-20-880 bus transmission distance, number of nodes, and baud rate

Distance (m)	Baud rate (kbps)	Number of nodes	Cable specification	Remarks
100	1000	32	⩾ 0.5 mm^2	The maximum number of nodes is 128 when the repeater is used. The maximum number of nodes is 32 in the absence of the repeater. When there is 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	

3.6 Post-Wiring Inspection

After electrical installation is done, check the following items. Read through the safety precautions before operating the equipment.

No.	Item	Compliance
1	The input power supply is connected to the motor cable properly, with correct voltage supplied.	☐
2	The auxiliary source provides the correct voltage.	☐
3	Input/Output power cables are secured to the cable bracket for strain relief.	☐
4	Cables are properly connected with the required tightening torque to the terminals provided.	☐
5	For EMC shielded cables, threaded sleeve joints are provided on the motor terminal box and the joints are grounded and in contact with a large area of the shield. In the drive module, the cable shield is fixed to the shielding plate to meet the EMC requirement.	☐
6	Parallel outputs of the drive are correctly connected to the motor.	☐
7	The production date can be found on the nameplate of the drive. If the period from the production date to the initial commissioning date or the downtime of the power components is shorter than one year, the DC bus capacitors do not need to be pre-charged. If the downtime is longer than one year, pre-charge the capacitors first.	☐
8	The control cables are connected in accordance with the terminal layout and shield. The control cables are routed separately from the power supply cables to prevent interference. Cable routing complies with the relevant EMC directives.	☐

4 HCU Control Module

4.1 HCU Control Module Structure

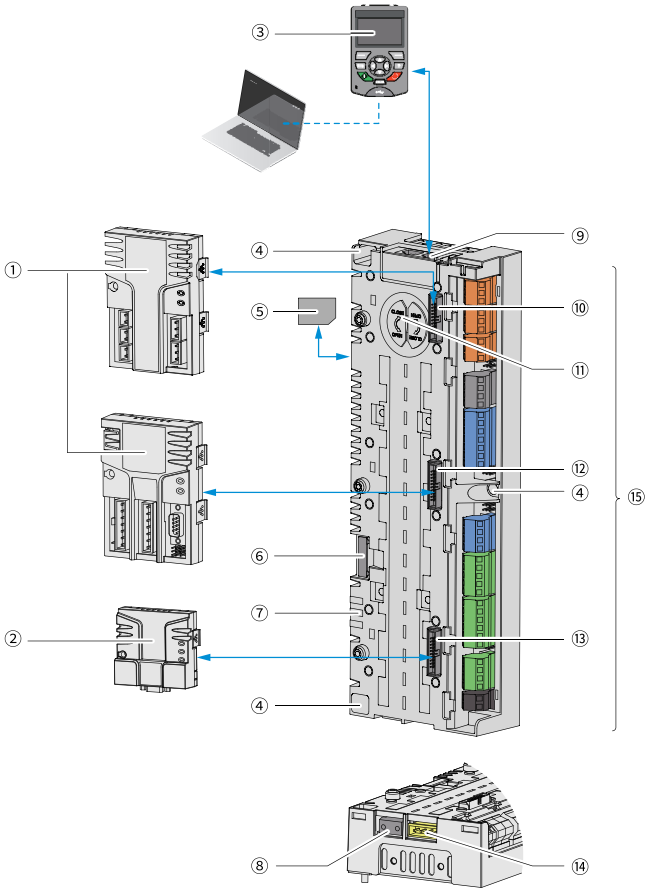


Figure 4-1 HCU control module structure

Table 4–1 HCU control module structure

No.	Name	Function
①	Function module in size 1	105 mm x 73 mm x 24 mm
②	Function module in size 2	75 mm x 73 mm x 24 mm
③	Smart operating panel	SOP-20-880

No.	Name	Function
④	Fixing hole	Three holes for fixing the HCU
⑤	SD card	Standard pluggable micro SD memory card for the HCU with the capacity of 8 GB
⑥	Functional safety slot	For connection of functional safety modules
⑦	Indicators	Power supply, operation, and fault indicators
⑧	Optical fiber terminal	Connected between the HCU and the power unit.
⑨	Smart operating panel terminal	Used to connect HCU to SOP-20-880. The two terminals are both RJ45 with identical assignment for easy cascade.
⑩	SLOT1	Function module interface: SLOT1_1, SLOT1_2 and SLOT1_3
⑪	Battery replacement 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, SLOT2_3
⑬	SLOT3	Function module interface: SLOT3_1
⑭	STO terminal	Reserved
⑮	User terminal	Standard user I/O terminals

Note

The RJ45 terminal of the HCU controller cannot be connected directly to the computer; otherwise, the computer may be damaged.

4.2 LED Indicators

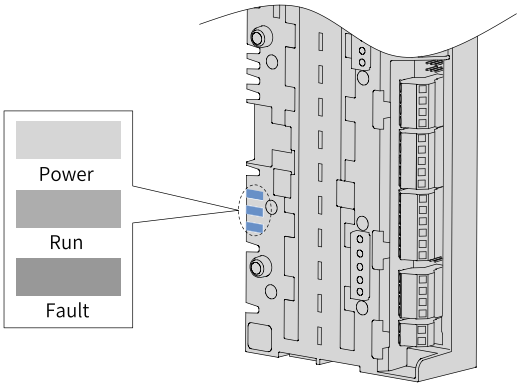


Figure 4-2 Location and assignment of the LED indicator

Table 4–2 Description of the LED indicator

No.	Name	Status	Description
1	Power	Solid ON	The HCU power supply is normal.
		OFF	The HCU is not energized or the power supply is faulty.
2	Run	Solid ON	The power module is in the operation state.
		OFF	The power module is in the stop state.
3	Fault	Solid ON in red	System fault
		Steady yellow	System alarm
		OFF	System OK
		Flashing in red	HCU auxiliary power supply fault (Check whether 24 V power supply is short-circuited or overloaded.)
4	Fault, Run	Flashing in yellow (FAULT) and green (RUN) simultaneously	This HCU is selected by the PC or SOP-20-880. The indicator stops flashing after 10s.
		Flashing alternately in red (FAULT) and green (RUN)	The FPGA of the HCU is abnormal or the external expansion RAM is abnormal.

4.3 SD Memory Card

The HCU is equipped with a SD card for saving the black box data and parameters, which helps facilitate monitoring and analysis on power modules. The data is saved on a micro SD memory card to be analyzed by a qualified service technician.

4.4 HCU Dimensions and Installation

4.4.1 Installation Preparation



- Before installing or removing the HCU, make sure that the cabinet has been powered off for more than 15 minutes and the HCU input power supply is disconnected. Failure to comply can damage the HCU control module.
- When installing or removing a function module on the HCU, make sure that the HCU input power supply is disconnected. Failure to comply can damage the HCU or function module.
- Do not drop or subject the HCU module to shock to avoid damage.
- Do not disassemble the HCU module. Failure to comply may damage the module.
- Do not tighten terminals with excessive tightening torque to avoid damage.

Installation tools

The following tools are required for installation.

- PH1 or PH2 Phillips screwdriver
- PH1 or PH2 straight screwdriver

Tightening torque for screws and fasteners

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

Screw	Tightening torque
M3	0.55 N·m
M4	1.2 N·m

4.4.2 Outline Dimensions

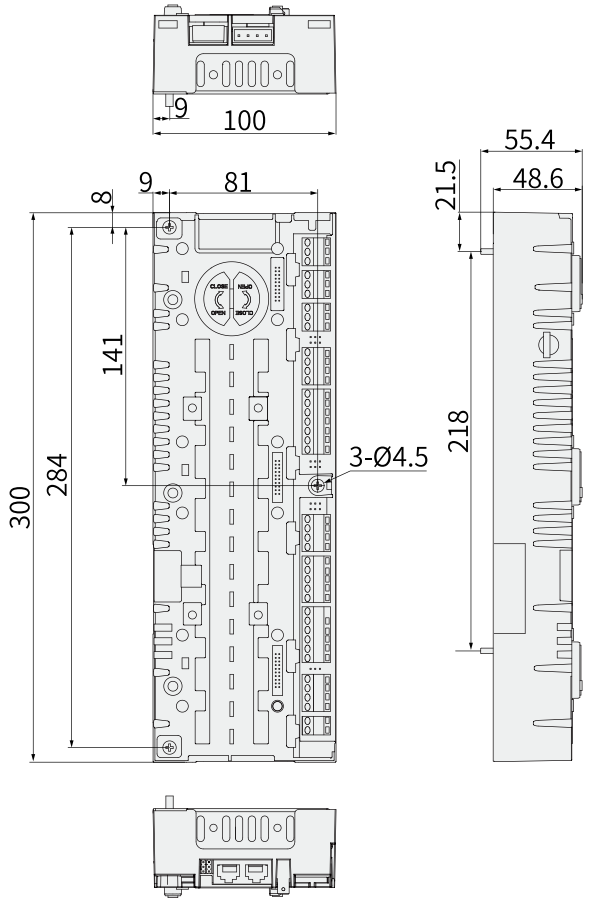


Figure 4-3 Outline dimensions of the HCU control module (mm)

4.4.3 Installation Clearance

To install the HCU, reserve proper clearance as shown below. The HCU must be mounted on a conductive metal surface and ensure that the entire conductive bottom of the HCU is in good contact with the mounting surface.

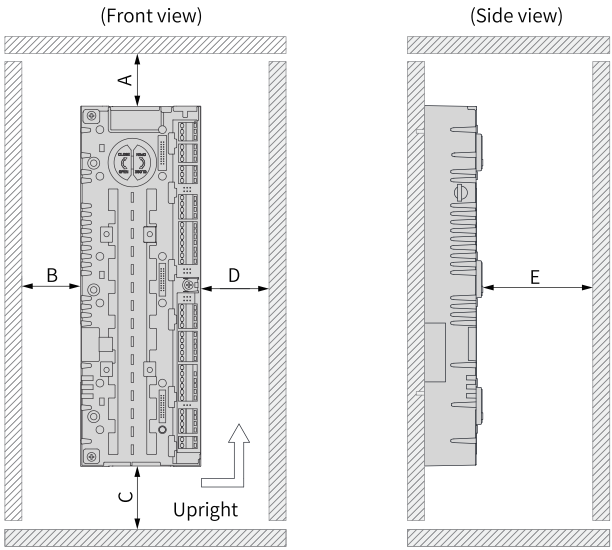


Figure 4-4 Installation clearance

Table 4–3 Installation clearance (mm)

A	B	C	D	E
⩾ 100	⩾ 30	⩾ 100	⩾ 50	⩾ 100

4.4.4 Installation Procedure

1. Align the HCU vertically with the two positioning holes on the metal mounting plate.
2. Tighten the HCU mounting screws (three M4 screws) with a PH2 Phillips screwdriver as shown below.

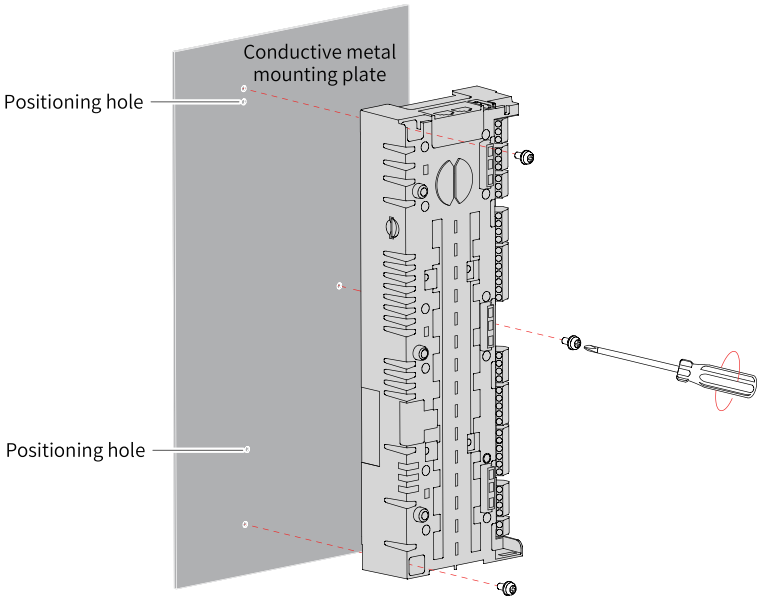


Figure 4-5 Installing the HCU

3. Connect the HCU and optical fiber of the drive module.

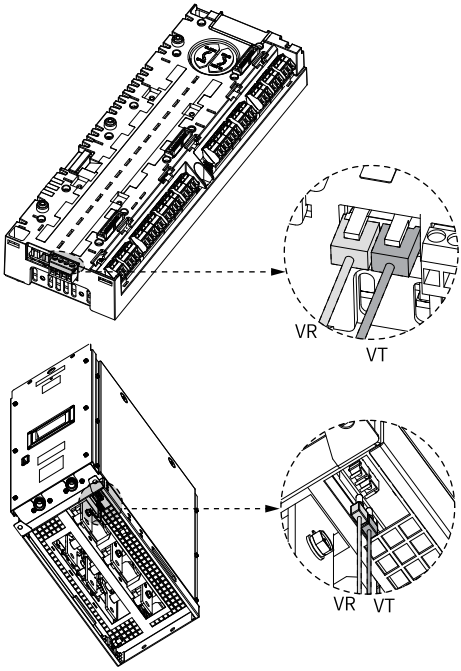


Figure 4-6 Connecting the HCU and optical fiber of the drive module

Grounding inside the cabinet

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

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

4.4.5 Handling the HCU Cover

In actual application, the drive is equipped with a HCU cover as standard. In this case, if the HCU interface is configured externally, the wiring parts of the cover needs to be removed, as shown below.

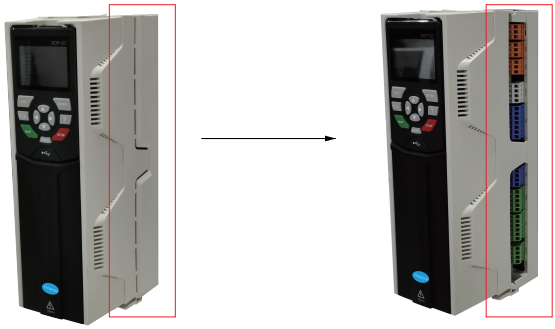


Figure 4-7 Handling the HCU cover

4.5 Overview of HCU Control Module Interfaces

4.5.1 Overview of HCU Interface Circuit

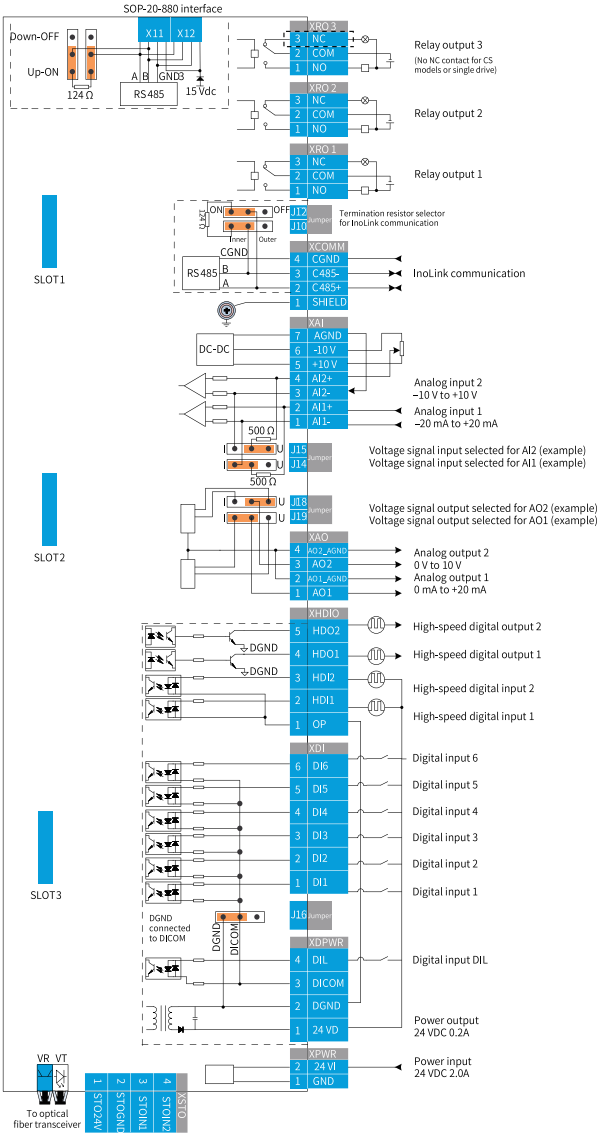


Figure 4-8 Overview of HCU interface circuit

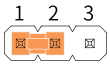
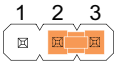
4.5.2 Standard Interface

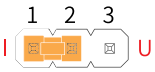
Table 4–4 Description of standard HCU interfaces

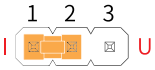
Name	Terminal	Description
Input power supply	XPWR: 24VI	HCU power supply
Digital power supply output	XDPWR: 24 VDC	Digital output power supply that isolated from XPWR
Digital input	XDI: DI1–DI6, DIL	Input type: relay contact, NPN or PNP
High-speed digital input	XHDIO: HDI1, HDI2	Input type: NPN or PNP
High-speed digital output	XHDIO: HDO1, HDO2	Output type: open collector
Analog output	XAO: AO1, AO2	Output type: current or voltage, as defined by jumper
Analog input	XAI: AI1, AI2	Input type: current or voltage, as defined by jumper
Relay output	XRO1, XRO2, XRO3	Relay output: NO, NC, and COM No NC contact for CS model or single-drive XRO3
InoLink communication	XCOMM	High-speed RS485, with termination resistor selected by jumper
RJ45 terminal	X11, X12	For communication with the SOP-20-880 (These two terminals have the same assignment for easy cascading of multiple HCUs with cables shorter than 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	Replace the non-rechargeable lithium-ion battery regularly.

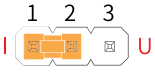
4.5.3 Description of HCU Control Module Interfaces

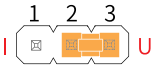
Table 4–5 Description of HCU control module interfaces

<table>
<tr><th>No.</th><th>Name</th><th>Function</th><th>Cable specification</th></tr>
<tr><td colspan="4">XPWR: Input power supply</td></tr>
<tr><td>1</td><td>GND</td><td rowspan="2">24.0 VDC±10%, 2.0 A</td><td rowspan="2">Recommended cable: 2-conductor shielded twisted pair cable, cross-sectional area: 0.5 mm^2 to 2.5 mm^2</td></tr>
<tr><td>2</td><td>24VI</td></tr>
<tr><td colspan="4">XDPWR: DIL</td></tr>
<tr><td>1</td><td>24VD</td><td>Power supply for DI, HDI and HDO
24.0 VDC±10%, 0.2 A</td><td rowspan="4">Twisted pair cable, single-conductor cable
Cross-sectional area: 0.5 mm^2 to 2.5 mm^2
Note: The load of the 24VD terminal cannot exceed 0.2 A.</td></tr>
<tr><td>2</td><td>DGND</td><td>24VD ground</td></tr>
<tr><td>3</td><td>DICOM</td><td>DI common output, which can be connected to DGND through jumper J16</td></tr>
<tr><td>4</td><td>DIL</td><td>Digital interlock or common DI with identical technical data as common DIs</td></tr>
<tr><td colspan="4">Jumper J16: Power supply selection</td></tr>
<tr><td colspan="4">
1 2 3
DGND DICOM
When DGND and DICOM are shorted, DIs are powered up by 24 VDC internal power supply.</td></tr>
<tr><td colspan="4">
1 2 3
DGND DICOM
When DGND is disconnected from DICOM, DIs are powered up by an external power supply.</td></tr>
<tr><td colspan="4">XDI: DI</td></tr>
<tr><td>1</td><td>DI1</td><td rowspan="6">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</td><td rowspan="6">Single-conductor cable
Cross-sectional area: 0.5 mm^2 to 2.5 mm^2</td></tr>
<tr><td>2</td><td>DI2</td></tr>
<tr><td>3</td><td>DI3</td></tr>
<tr><td>4</td><td>DI4</td></tr>
<tr><td>5</td><td>DI5</td></tr>
<tr><td>6</td><td>DI6</td></tr>
<tr><td colspan="4">XHDIO: HDIO input</td></tr>
</table>

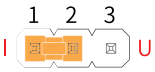
<table>
<tr><th>No.</th><th>Name</th><th>Function</th><th>Cable specification</th></tr>
<tr><td>1</td><td>OP</td><td>HDI common terminal</td><td rowspan="5">Cross-sectional area: 0.5 mm^2 to 2.5 mm^2
Shielded twisted pair cables are recommended.
HDO and DGND twisted pair
HDI and OP twisted pair</td></tr>
<tr><td>2</td><td>HDI1</td><td rowspan="2">Input type: NPN, PNP
24 V logic level: "0" < 5 V; "1" > 15 V
Rin: 2.0 kΩ
Input voltage range: 0 VDC to 30 VDC
Input frequency range: 0 kHz to 100 kHz
Max. load of HDI: Imax: 15 mA</td></tr>
<tr><td>3</td><td>HDI2</td></tr>
<tr><td>4</td><td>HDO1</td><td rowspan="2">Output type: OC
Output frequency range: 0 kHz to 100 kHz
Max. load of HDO: Imax: 20 mA
Output voltage range: 0 VDC to 26.4 VDC</td></tr>
<tr><td>5</td><td>HDO2</td></tr>
<tr><td colspan="4">XAO: AO</td></tr>
<tr><td>1</td><td>AO1</td><td rowspan="4">AO1 output range:
0 mA to 20 mA, Rload ⩽ 500 Ω
0 V to 10 V, Rload ⩾ 10 kΩ
AO2 output range:
0 mA to 20 mA; Rload: ⩽ 500 Ω
0 V to 10 V; Rload: ⩾ 10 kΩ
Resolution: 11 bits + sign bit
Accuracy: 2% of the full range</td><td rowspan="4">Cross-sectional area: 0.5 mm^2 to 2.5 mm^2
Shielded twisted pair cables are recommended.
AO1 twisted with AO1_AGND
AO2 twisted with AO2_AGND</td></tr>
<tr><td>2</td><td>AO1_AGND</td></tr>
<tr><td>3</td><td>AO2</td></tr>
<tr><td>4</td><td>AO2_AGND</td></tr>
<tr><td colspan="4">Jumper J19: Current or voltage signal selection for AO1</td></tr>
<tr><td colspan="4">

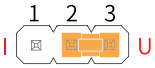
Current signal output is used for AO1 when pins 1 and 2 are shorted.</td></tr>
<tr><td colspan="4">

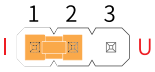
Voltage signal output is used for AO1 when pins 2 and 3 are shorted.</td></tr>
<tr><td colspan="4">Jumper J18: Current and voltage signal selection for AO2</td></tr>
<tr><td colspan="4">

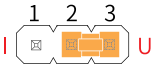
Current signal output is used for AO2 when pins 1 and 2 are shorted.</td></tr>
<tr><td colspan="4">

Voltage signal output is used for AO2 when pins 2 and 3 are shorted.</td></tr>
<tr><td colspan="4">XAI: AI</td></tr>
</table>

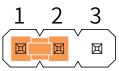
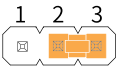
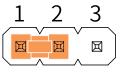
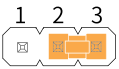
<table>
<tr><th>No.</th><th>Name</th><th>Function</th><th>Cable specification</th></tr>
<tr><td>1</td><td>AI1-</td><td rowspan="4">Current input: -20 mA to +20 mA; Rin: 500 Ω
Voltage input: -10 V to +10 V; Rin: 200 kΩ
Differential input, input range: ±30 V
Sampling interval per channel: 0.25 ms
Hardware filter: 0.25 ms
Resolution: 11 bits + sign bit
Error: 1% of full range</td><td rowspan="7">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 four-conductor shielded twisted pair cable for one AI when reference voltage is provided.</td></tr>
<tr><td>2</td><td>AI1+</td></tr>
<tr><td>3</td><td>AI2-</td></tr>
<tr><td>4</td><td>AI2+</td></tr>
<tr><td>5</td><td>+10V</td><td rowspan="3">+10 V: +10 V±1%
-10 V: -10 V±1%
Rload: 1 kΩ to 10 kΩ</td></tr>
<tr><td>6</td><td>-10V</td></tr>
<tr><td>7</td><td>AGND</td></tr>
<tr><td colspan="4">Jumper J14: Current or voltage signal input selection for AI1</td></tr>
<tr><td colspan="4">

Current signal input is used for AI1 when pins 1 and 2 are shorted.</td></tr>
<tr><td colspan="4">

Voltage signal input is used for AI1 when pins 2 and 3 are shorted.</td></tr>
<tr><td colspan="4">Jumper J15: Current and voltage signal selection for AI2</td></tr>
<tr><td colspan="4">

Current signal input is used for AI2 when pins 1 and 2 are shorted.</td></tr>
<tr><td colspan="4">

Voltage signal input is used for AI2 when pins 2 and 3 are shorted.</td></tr>
<tr><td colspan="4">XCOMM: InoLink RS485</td></tr>
<tr><td>1</td><td>SHIELD</td><td rowspan="4">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</td><td rowspan="4">Four-conductor shielded twisted pair cable
Cross-sectional area: 0.5 mm^2 to 2.5 mm^2</td></tr>
<tr><td>2</td><td>C485+</td></tr>
<tr><td>3</td><td>C485-</td></tr>
<tr><td>4</td><td>CGND</td></tr>
<tr><td colspan="4">Jumpers J10 and J12: RS485 termination resistor selection. To connect the termination resistor, J10 and J12 must be in the same status.</td></tr>
</table>

No.	Name	Function	Cable specification
 If pins 1 and 2 are shorted, the termination resistor is connected.			
 If pins 2 and 3 are shorted, the termination resistor is disconnected.			
XRO1: Relay 1 output			
1	RO1_NO	Output type: passive NO and NC contacts Contact parameters: 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			
1	RO2_NO	Output type: passive NO and NC contacts Contact parameters: 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			
1	RO3_NO	Output type: passive NO and NC contacts Contact parameters: 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		
X11, X12: RS485 communication with SOP-20-880			
1, 2, 7	NC	RS485 bus, 5 V standard level Termination resistor of the bus: 124 Ω Maximum communication rate: 4 Mbps Maximum number of nodes: 32 (without repeater) Maximum transmission distance: 100 m	Standard network cable
3, 8	GND3		
4	A		
5	B		
6	15V3	15V3: 15 V±15%	
Jumpers J12 and J15: Bus termination resistor selection. To connect the termination resistor, J12 and J15 must be in the same status.			
 If pins 1 and 2 are shorted, the termination resistor is connected.			
 If pins 2 and 3 are shorted, the termination resistor is disconnected.			
VR, VT: Optical fiber transceiver			

No.	Name	Function	Cable specification
1	VR	Receives optical fiber communication signals.	Optical fiber type: plastic optical fiber (POF)
2	VT	Transmits optical fiber communication signals.	

4.6 HCU Function Application

4.6.1 Function Module

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

Table 4–6 Function modules used together with the HCU

No.	Name	Model	Function	Connection method with HCU	Dimensions (W x D x H) (mm)
1	I/O module	HIO-10	Two AIs Two AOs Two DIOs One relay output	Slot	105 x 73 x 24
2	PROFIBUS-DP module	HDP-10	PROFIBUS-DP bus adaption	Slot	75 x 73 x 24
3	CAN bus module	HCAN-10	CANopen bus adaptation	Slot	75 x 73 x 24
		HCAN-30	CAN2.0 fieldbus adaption	Slot	75 x 73 x 24
4	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
5	Modbus-RTU module	HMBA-10	Modbus-RTU bus adaption	Slot	75 x 73 x 24
6	EtherCAT module	HETC-10	EtherCAT bus adaption	Slot	75 x 73 x 24
7	Ethernet module	HETN-10	Ethernet commissioning module	Slot	75 x 73 x 24
8	PROFINET I/O module	HPFN-10	Adapt to PROFINET I/O industrial Ethernet	Slot	75 x 73 x 24
		HPFN-20	Adapt to PROFINET IRT industrial Ethernet	Slot	75 x 73 x 24
9	Modbus TCP module	HMBT-10	Adapt to Modbus TCP industrial Ethernet	Slot	75 x 73 x 24
10	Parallel control module	HPCU-40	2 to 4 paralleled modules supported	Optical fiber	232 x 86 x 40
		HPCU-60	2 to 6 paralleled modules supported	Optical fiber	232 x 86 x 40
		HPCU-A0	2 to 10 paralleled modules supported	Optical fiber	232 x 86 x 40

No.	Name	Model	Function	Connection method with HCU	Dimensions (W x D x H) (mm)
11	Function expansion module	HESD-10	One expansion slot	Optical fiber	105 x 75 x 70
12	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
13	Digital gateway commissioning monitoring module	HGW-10	Centralized commissioning and operation data collection supported	Network cable	180 x 100 x 50
14	Smart operating panel	SOP-20-880	HMI operating panel	RS485	150 x 100 x 30
15	Optical fiber router module	HOFR-50	Data exchange of 2 to 5 HCU controllers (master-slave communication through optical fiber)	Optical fiber	232 x 86 x 40
16	Pulse-by-pulse current limit module	HCBC-A0	Pulse-by-pulse current limit control for parallel power modules	Optical fiber	232 x 86 x 40

Note

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

4.6.2 Slot Expansion Application

- Different function modules are available in the HCU application. The function modules are installed directly in the slots of the HCU.
- The HCU only has three slots. When more modules are needed, install HOFM and HESD expansion modules. Each HESD can be extended with one function module.

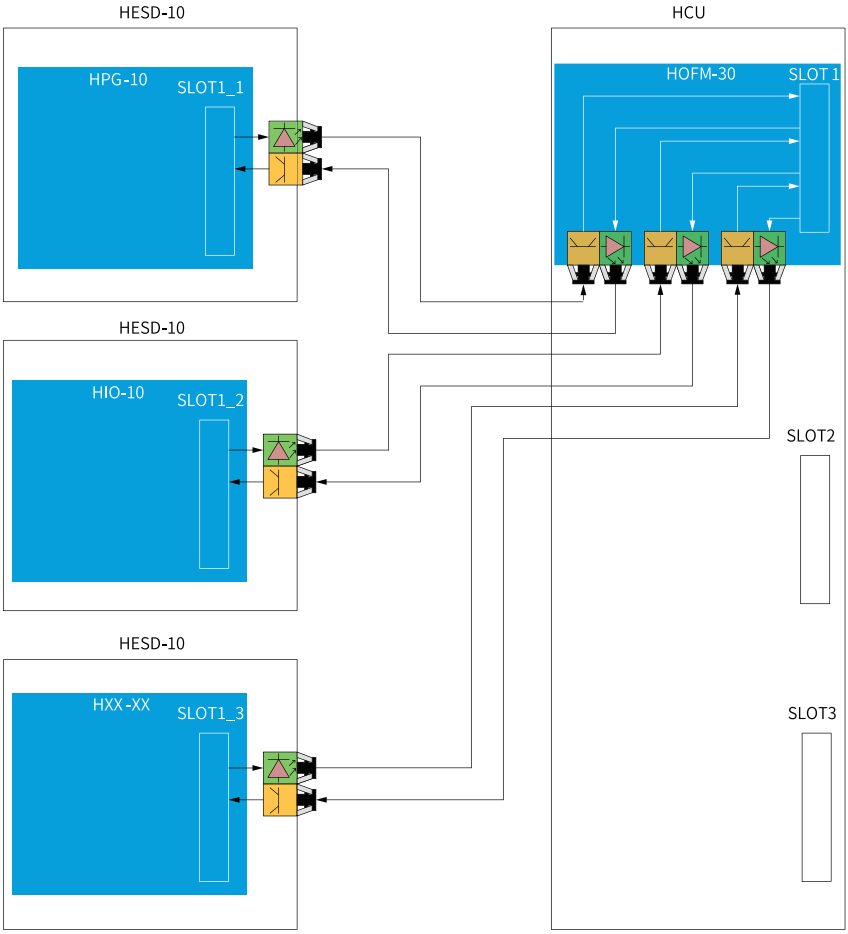


Figure 4-9 Example of HESD wiring

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

- Function modules are directly installed in SLOT1, SLOT2, and SLOT3 (addresses SLOT1_1, SLOT2_, and SLOT3_1).
- The SLOT1 or SLOT2 can be used together with the HOFM-30 module to expand to three slots. The addresses are SLOT1_1, SLOT1_2, SLOT1_3 or SLOT2_1, SLOT2_2, and SLOT2_3.
- SLOT3 does not support slot expansion.
- In this case, the HESD module is not allowed to install another HOFM optical fiber expansion module.

4.6.3 Temperature Detection with AI and AO

AI and AO can be used together to detect the temperature sensor signal. They are generally used for motor temperature detection from either one sensor or two and three sensors connected in series.

In this case, select constant current output for the AO and voltage signal input for the AI. Temperature sensors PT100, PT1000, and KTY84 are supported.

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

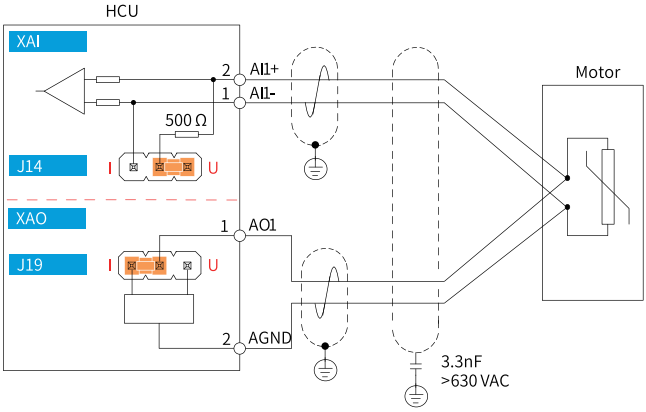


Figure 4-10 Temperature detection with the AI and AO

4.6.4 Application of InoLink Communication Bus Function

When data exchange is required between several drives in the system, use an InoLink bus.

The parameters of the InoLink bus are as follows:

- Communication baud rate: 5 Mbps
- Maximum number of nodes: 16

Use shielded twisted pair cables for wiring. To achieve the best communication quality and prevent electromagnetic interference, use high-quality cables, such as PROFIBUS-DP cables. Keep cables as short as possible with the link length equal to or shorter than 40 m to avoid entanglement or proximity to power cables.

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

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

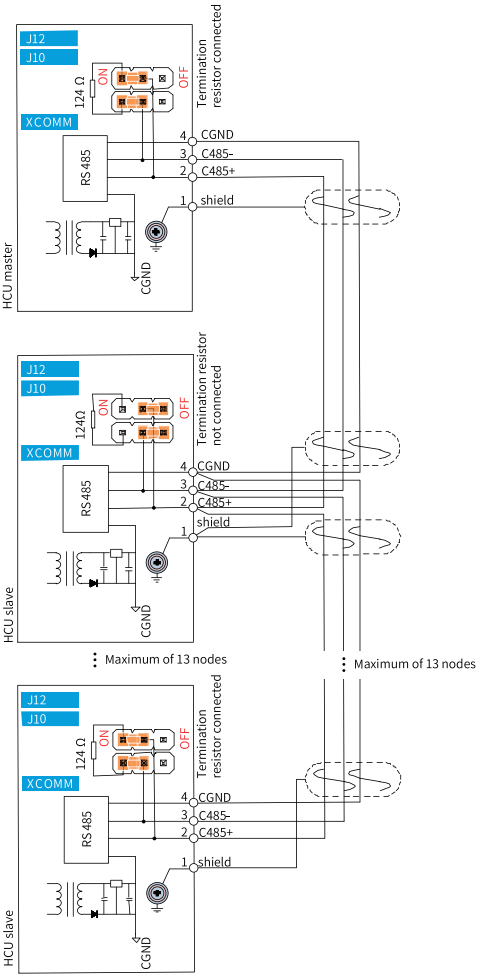


Figure 4-11 Example of connection application

5 Routine Maintenance

5.1 Routine Maintenance

The drive is comprised of electrical components, it is necessary to perform maintenance or inspection on the worn electrical components. Check the water quality regularly based on the requirements described in *"1.3 Technical Data" on page 17*. Clean the dust and pollutant regularly to keep the module in a proper state. Observe the following items for cleaning:

Dust accumulation

- The dust inside the drive must be cleaned regularly by professionals according to safety regulations.
- Clean the drive at least once per year (or shorter interval based on the operating environment).
- A brush and vacuum cleaner must be used to clean the dust. For positions that cannot be easily reached, use dry compressed air (max. 1 bar) for cleaning.

Ventilation

Always keep the ventilation openings and cooling circuit of the cabinet unobstructed and ensure that the cooling fan functions properly.

5.2 Regular Checklist

Before maintenance and inspection



- Before maintenance, power off and wait for at least 15 minutes until the voltage of drive is lower than 36 VDC. Failure to comply may result in personal injury caused by the residual voltage in the capacitor.
- When external power supply is connected, hazardous voltage are still present in the drive and the cabinet even if the main breaker is open.
- Be aware of the possibly residual rotation of the cooling fan.

During maintenance and inspection



- Strictly obey correct operating instructions before maintenance or inspection.
- Perform maintenance and inspection on the drive only after verifying that it has been powered off and cooled down.
- Install and wire the equipment according to national standards, industry standards, and local safety codes.
- Proceed with operations only after verifying that no residual voltage is left inside the cabinet after the input circuit breaker is switched off.
- Use only instruments that comply with the voltage withstanding requirements and keep the enclosure of the instrument well grounded.
- Be careful when measuring components in the cabinets. Prevent meter leads from coming into contact with each other or with other terminals.
- Only qualified personnel are allowed to perform installation, inspection, and maintenance on the drive.

Required tools

- Wrench or socket wrench with opening size 6
- Wrench or socket wrench with opening size 8
- Wrench or socket wrench with opening size 10
- Wrench or socket wrench with opening size 13
- Torque wrench
- PH1 and PH2 Phillips screwdriver
- A socket wrench equipped with two extension rods is recommended.

Service life of components

To ensure normal use of AC drives for long time, regular maintenance and inspection must be performed on the electronic components inside the drive according to their service life. The service life of the electronic components of the drive is affected by the operating environment. The following table lists the replacement interval of these components for your reference.

Table 5–1 Service life of components

Name	Standard service life
Electrolytic capacitor	10 years
Cooling fan of the control chamber	10 years

Cable terminals and fasteners

Regularly check whether the cable terminals and screw terminals are secured properly. If not, re-tighten them. Check the cabling fault. If any component is damaged, replace it immediately.

Note

The actual maintenance interval is determined based on the installation environment and operating conditions of the equipment.

5.3 Components Replacement

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

Take necessary protective measures before maintenance and inspection.



- Note that the drive operates with high voltage.
- All the wiring work can be done only after power-off.
- Before maintenance, power off and wait for at least 15 minutes until the voltage of drive is lower than 36 VDC. Failure to comply may result in personal injury caused by the residual voltage in the capacitor.
- Only trained professionals are allowed to perform inspection and maintenance on the drive. Failure to comply may result in severe personal injury, death, or major property loss.
- As voltage generated by an external power supply may be present, take cautious when operating on a device with power on. Even if the device is not operating, residual voltage may be present in the power supply and terminals.
- Handle heavy equipment or equipment with high center of gravity with care. Improper lifting or handling may result in death, serious personal injury, or major property loss.

5.3.1 Replacing the DC Fan

1. Unplug the power supply connector of the fan.

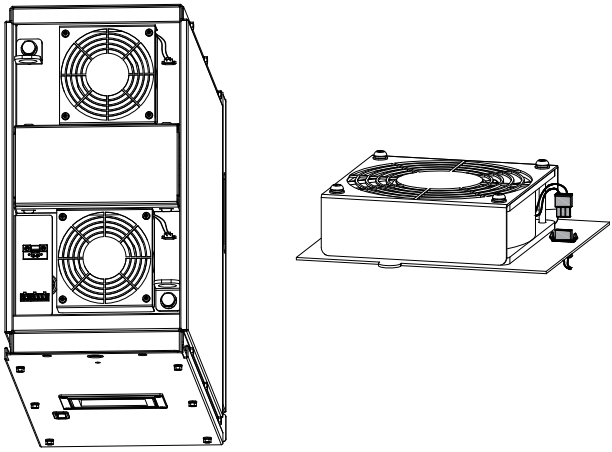


Figure 5-1 Unplugging the power supply connector of the fan

2. Remove the four M4 screws with a screwdriver to disassemble the fan components.

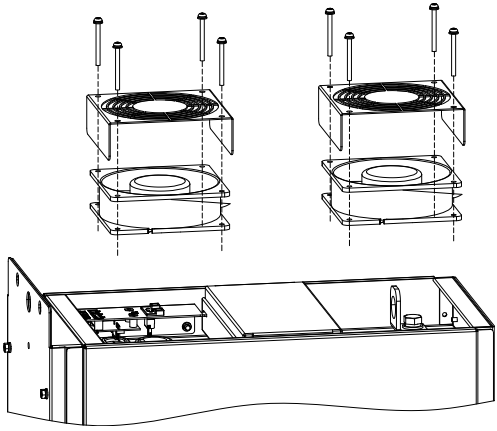


Figure 5-2 Removing the fan components

3. Install a new fan of the same specification based on the same procedure, but in the reverse order.

Note

- The air flows from bottom to top. When installing the fan, make sure that the fan blows air upwards.
- Do not pinch the power cable of the fan during installation.

5.3.2 Replacing the Power Module

1. Open the cabinet door.
2. Remove the secondary wiring on top of the drive module, as shown below.

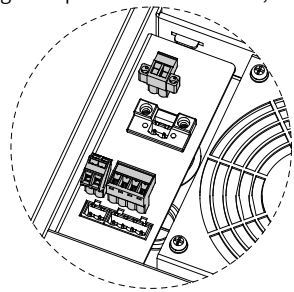


Figure 5-3 Removing the secondary wiring on the top

3. Pull out the optical fiber at the bottom of the drive module and put the optical fiber to a proper position to prevent it from being damaged during disassembly.

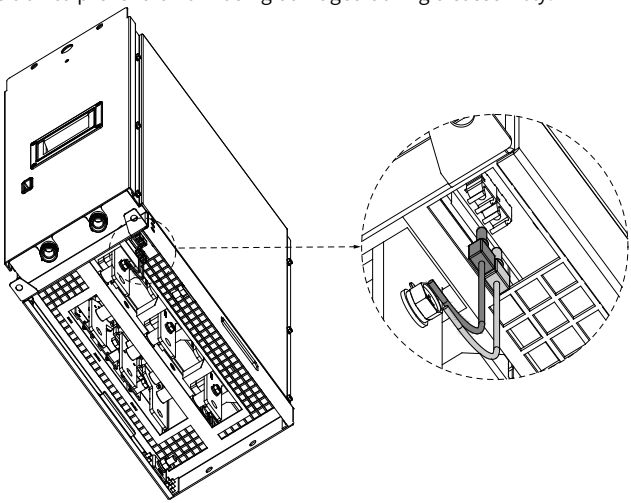


Figure 5-4 Pulling out the optical fiber

4. Empty all the coolant inside the drive module. Disassemble the coolant circuit, as shown below.

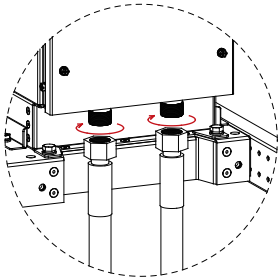
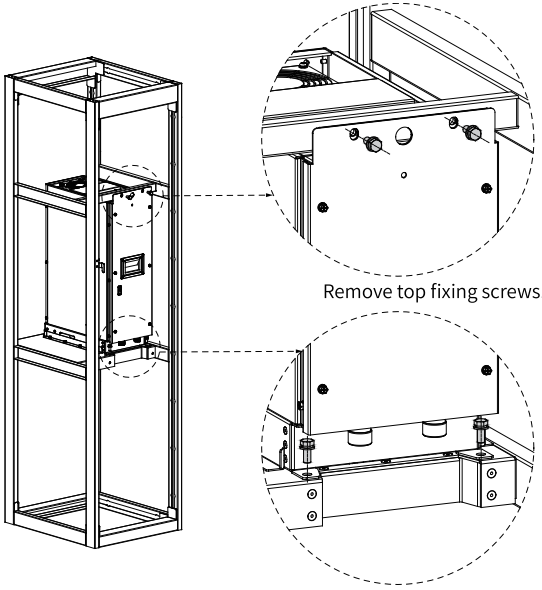


Figure 5-5 Removing the water inlet/outlet pipe

Note

Disassemble the coolant pipe. Use a container to hold the water, preventing the water from being splashed to the interior of the module.

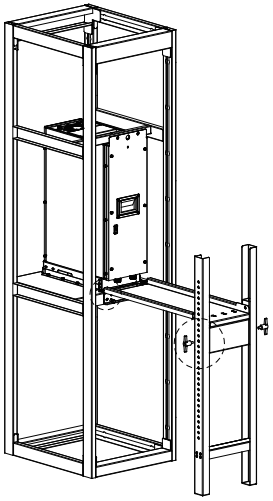
5. Remove the main circuit inlet/outlet cable (or copper busbar).
6. Remove the fixing screws on top and bottom of the module.



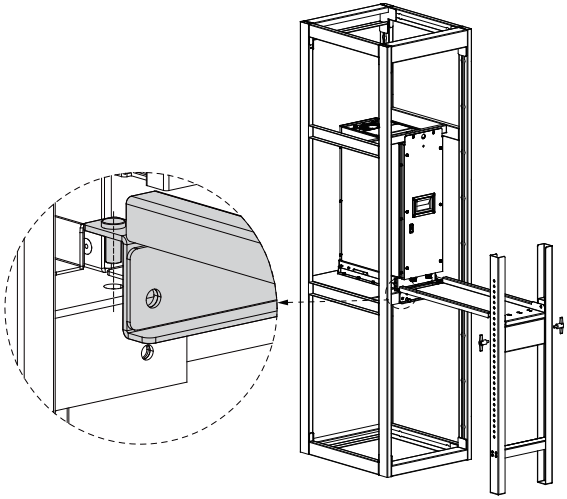
Remove top fixing screws.

Remove bottom fixing screws.

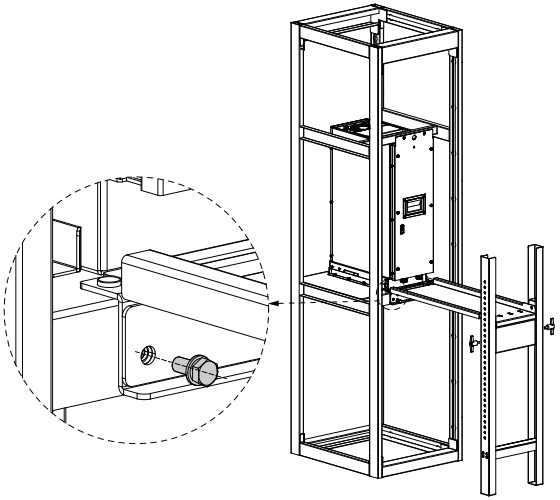
7. Install the maintenance bracket for the module.



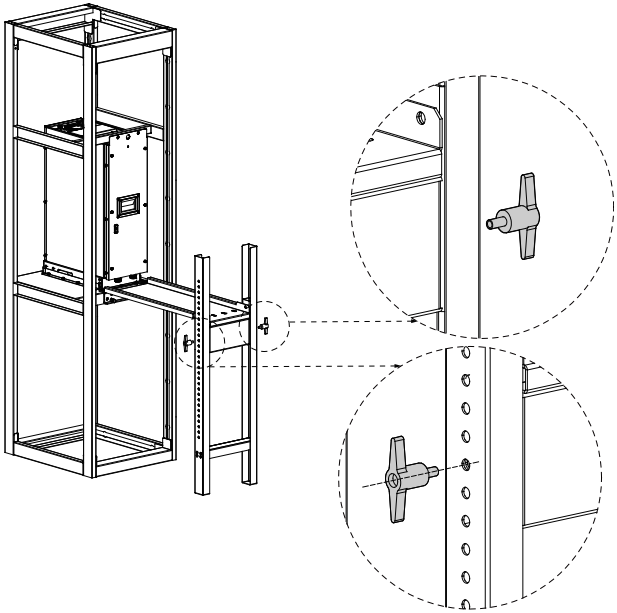
a. Insert the maintenance bracket limit pins into the positioning hole.



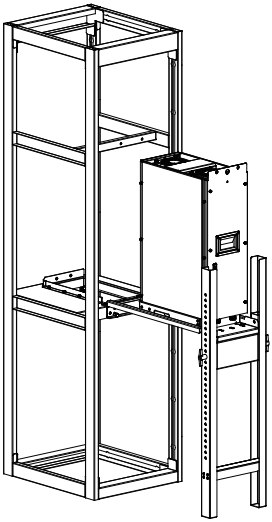
b. Fix the bracket with two M8 screws.



c. Adjust the foot height and fix it to the proper hole with thumb screws.



8. Pull out the drive module and put it onto the maintenance stand.



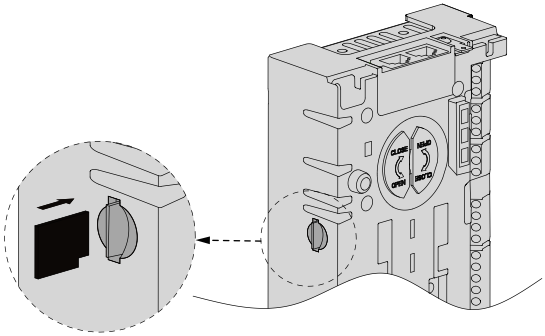
9. Lift up the module and move it to the wooden pallet. Use a forklift truck to transport the drive module to the designated maintenance site.
10. Install the module in steps same as above, but in the reverse order.

5.3.3 Replacing the SD Card and Battery of the HCU Control Module

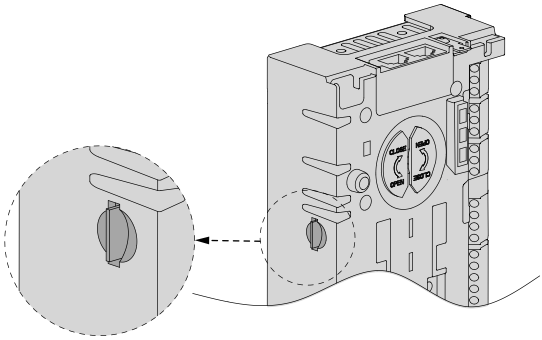
Replacing the memory card

After replacing the HCU control module, you can keep present parameter setting by inserting the original SD card from the faulty module to the new module. To install and remove the SD card, do as follows.

1. Press the SD card to take it out straightly from the faulty module.
2. Push the SD card into the SD card base of the HCU control module, as shown below.



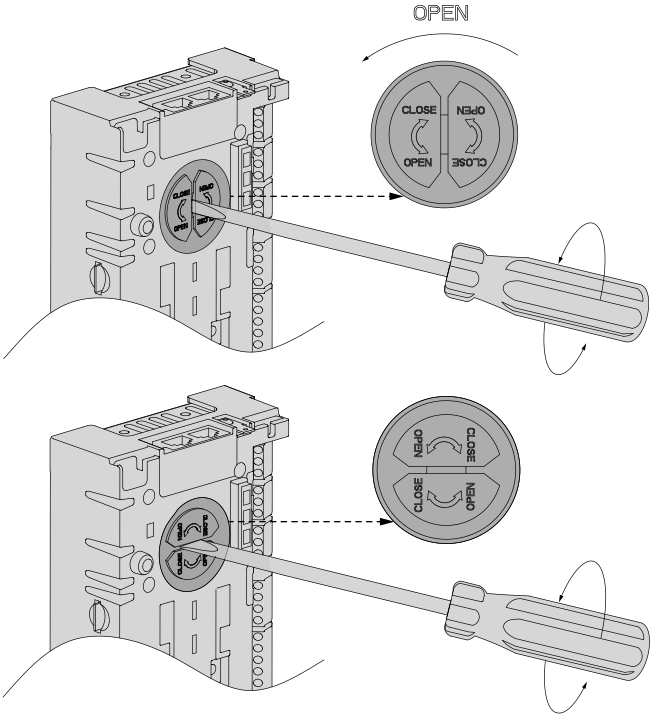
3. Ensure the SD card is inserted in place, and then check whether the SD card floats. Otherwise, an exception can occur due to poor contact.



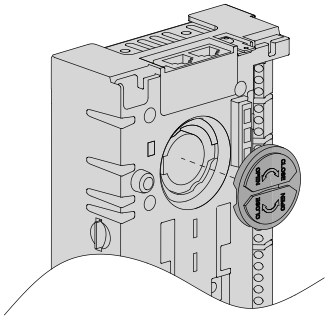
Replacing the battery

Steps:

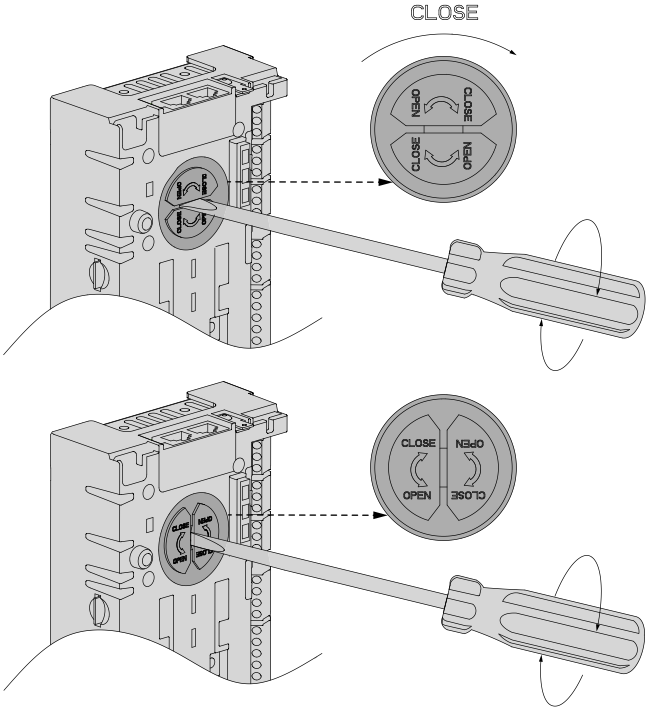
1. Turn the battery cover 90° counterclockwise with a #2 straight screwdriver until the cover is released.

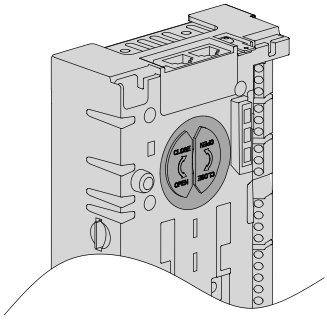


2. Remove the cover, press one side of the battery with the screwdriver, take the battery out and replace it with a new one.



3. Close the cover and rotate the cover 90° clockwise to fasten the cover.

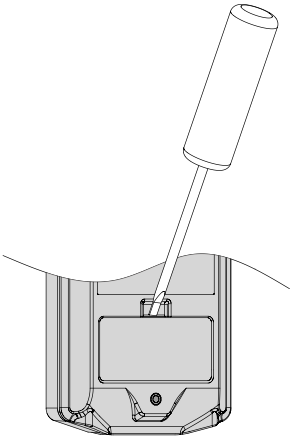




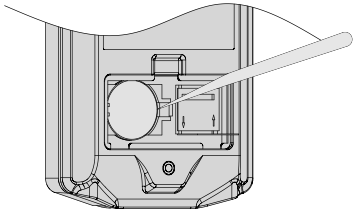
4. Dispose of the retired battery in accordance with local rules or applicable laws.

5.3.4 Replacing the SOP-20-880 Battery

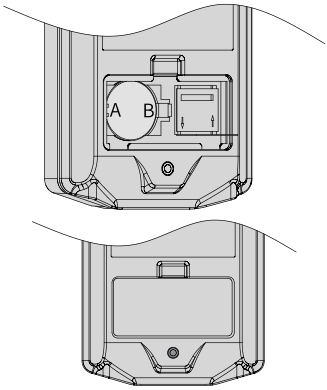
1. Remove the battery cover with a straight screwdriver or finger.



2. Pry the battery out with tweezers or a straight screwdriver, as shown below.



3. Insert the battery into the snap-fit joint on end A first, and then press down the battery on end B to install the battery in place.



4. Install the battery cover with a tool or your finger.

6 Recommended System Configuration

6.1 Function Expansion Module

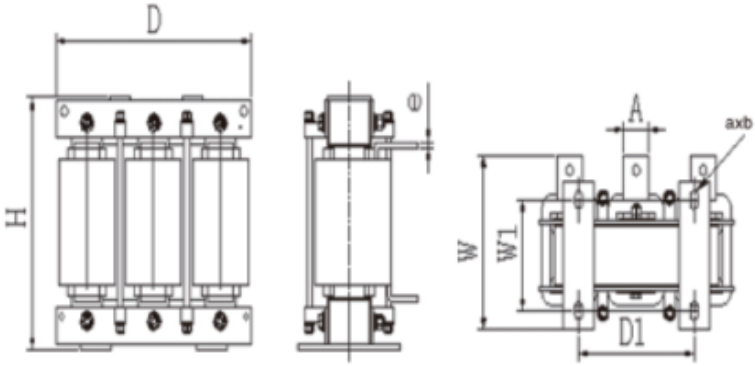
See *"4.6.1 Function Module" on page 70* for the specific description of the function expansion module. See the related user guides for the function expansion modules for details.

6.2 Recommended Fuse, Disconnector, Contactor, and Circuit Breaker Models

MD880LC-01S-	Fuse (SINOFUSE)	Fuse (BUSSMAN)	Disconnector	Contactor	Circuit breaker
0530-7	RS306-3-S1P-900A690V	170M6413	630 A	580 A	630 A

6.3 Selection of Input Reactor

The input reactor is not included in the MD880 water-cooled single-drive unit. An external AC input reactor is required when the system is installed in a cabinet. It is recommended to use an AC reactor with an equivalent voltage drop of 2% and forced air cooling.



ACL-0530-EISH-E53U

Figure 6-1 Dimensions of the input reactor model

Table 6–1 Input reactor model selection

MD880LC-01S-	Rated current (A)	Equivalent voltage drop	Inductance (uH)	Insulation class	Input reactor model	D x H x W (mm)	D1 x W1 (mm)	a x b (mm)	Mounting hole diameter Ø (mm)	A x e (mm)	Material	Weight (kg)	Loss (W)
0530-7	530	2%	47	F	ACL-0600-EISH-E47UA	370 x 355 x 265	272 x 160	12 x 20	12	50 x 8	Al	80	450

6.4 Recommended Output Reactor Model

Whether to install an AC output reactor on the output side of the drive depends on actual applications. The cables connecting the drive and motor cannot be excessively long. Excessively long cables can incur large distributed capacitance, which may result in high harmonic current. When the output cable is excessively long, install an output reactor. When the cable is equal to or longer than 150 m, install an AC output reactor near the drive.

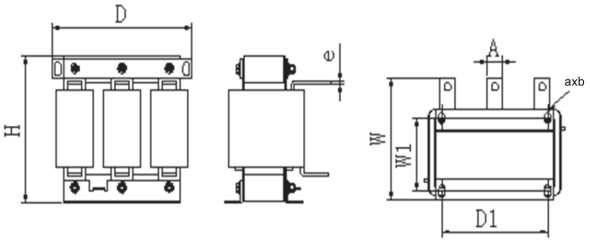


Figure 6-2 Dimensions of the output reactor

Table 6–2 Output reactor model selection

MD880LC-01S-	Rated current (A)	Equivalent voltage drop	Inductance (uH)	Insulation class	Output reactor model	D x H x W (mm)	D1 x W1 (mm)	a x b (mm)	Mounting hole diameter Ø (mm)	A x e (mm)	Material	Weight (kg)	Loss (W)
0530-7	530	1%	23	F	OCL-0600-EISH-E23UA	287 x 325 x 234	214 x 135	11 x 18	11	40 x 8	AL	48	380

7 Ordering Instructions

7.1 Ordering Instructions

This section lists the models and ordering numbers of the drive.

Note

The other essential components include SOP, HCU, 0.5 m network cable, and 3 m optical fiber. These accessories need to be purchased separately.

Table 7–1 Ordering instructions

Drive model	Outline dimensions	Ordering No.	Remarks
MD880LC-01S-0530-7	H7w	MD880LC-01S-0530-7	Water-cooled AC drive module (single-drive system)

8 Appendix: Structural Dimensions

8.1 Dimension Drawings

Outline dimensions of the drive module

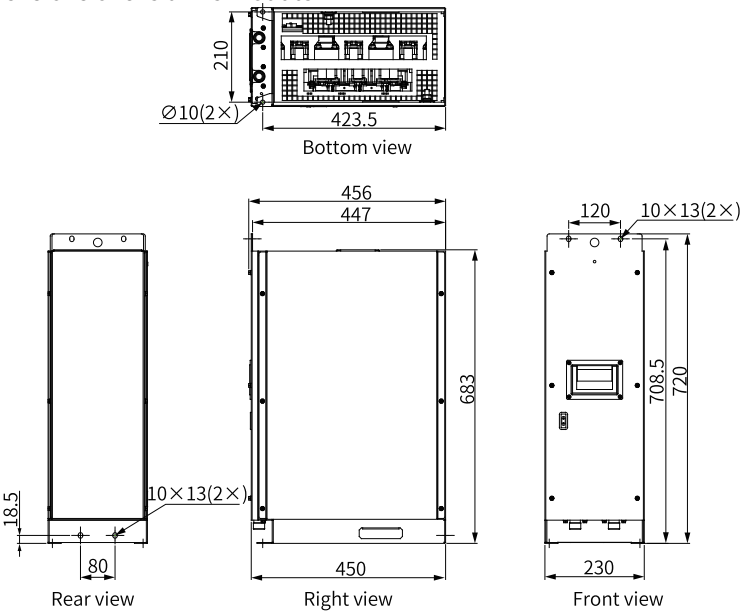


Figure 8-1 Outline dimensions of the drive module (mm)

AC interface dimensions of the drive module

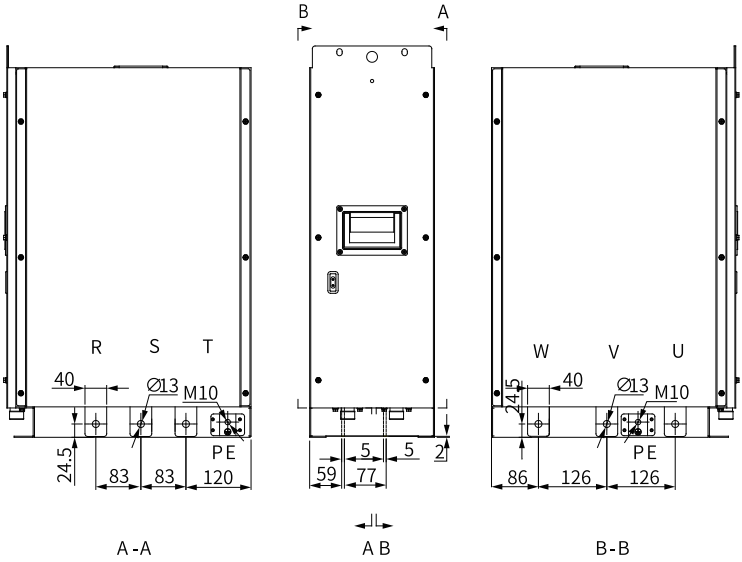


Figure 8-2 AC interface dimensions of the drive module (mm)

Dimensions of DC copper busbar terminals of the drive module

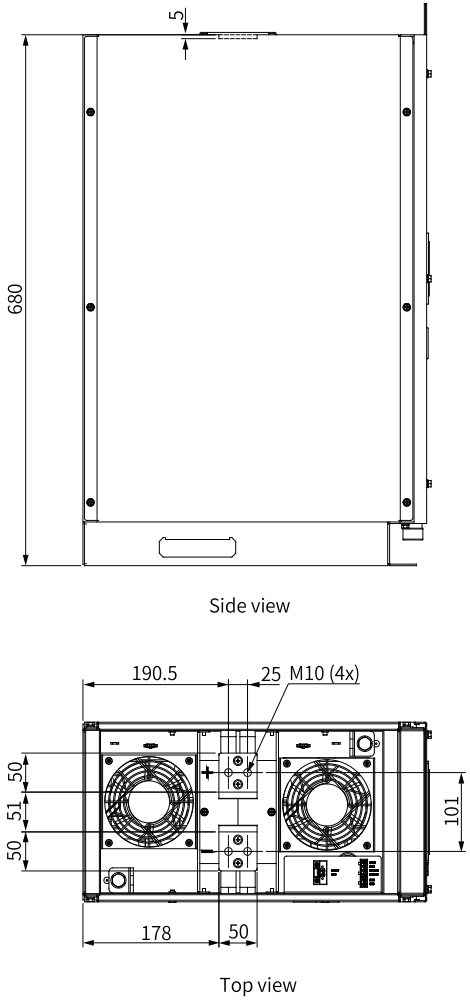


Figure 8-3 Dimensions of DC copper busbar terminals of the drive module (mm)

Mounting hole for the maintenance bracket of the drive module

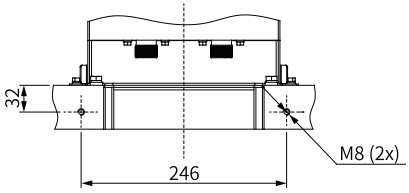
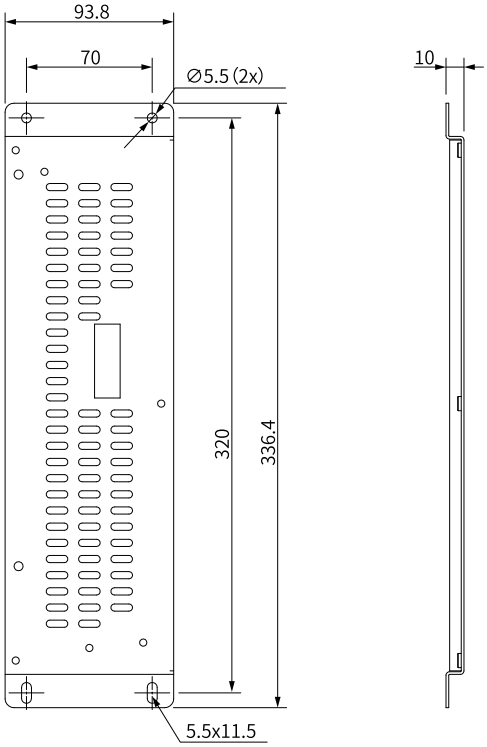


Figure 8-4 Mounting hole for the maintenance bracket of the drive module

Dimensions of HCU mounting baseplate



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