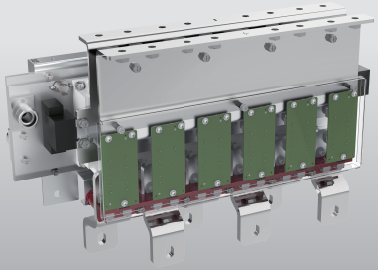
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MD880LC-20M Series
Basic Rectifier Module
Installation and Maintenance Guide

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

Data code 19011722A01

Preface

Introduction

The MD880LC-20 series general low-voltage water-cooled basic rectifier developed by Inovance features high power density, compact structure and high reliability. The MD880LC-20 series rectifier comes in two types, diode rectifier and thyristor rectifier. The most significant difference between these two types is that the thyristor rectifier supports pre-charging upon power-on, removing the need for configuring the pre-charging circuit.

The input voltage class for the water-cooled thyristor rectifier is 690 V. The rated power for an individual rectifier without overload is 1689 kW. Up to four rectifier modules can be paralleled, with the total rated output power reaching 6285 kW, capable of providing power for one or more inverter modules.

The water-cooled diode rectifier supports 6- or 12-pulse input and a voltage class of 690 V. The rated power of an individual rectifier is 2273 kW. For water-cooled diode rectifier, up to two rectifier modules can be paralleled, with the total rated output power reaching 4229 kW, capable of providing power for one or more inverter modules.

The MD880LC-20 series rectifiers are applicable to a wide range of industries, including shield machines, petroleum, and vessels.

If used together with the MD880LC-50 series water-cooled inverter, the MD880LC-20 series rectifier must be configured as a 12-pulse rectifier.

More information

Document name	Code	Description
MD880 (LC)-20 Series Basic Rectifier Function Guide	PS00017569	Presents function applications, and troubleshooting of the product.
MD880 (LC)-20 Series Basic Rectifier Commissioning Guide	PS00017546	Presents commissioning tool, commissioning flow, specific commissioning procedure, and parameters of the product.
MD880 (LC)-20 Series Basic Rectifier Parameter Guide	19012701	Presents parameters and fault codes of the product.
MD880 Series AC Drive Communication Guide	PS00013754	Presents specifications, networking, and communication configuration of the product.
MD880LC-20M Series Basic Rectifier Module Hardware Guide	PS00004005	Presents the system structure, technical specifications, components, dimensions, options (including installation accessories, cables, and electrical peripherals), certifications, and standards.

Document name	Code	Description
MD880LC-20M Series Basic Rectifier Module Installation and Maintenance Guide	PS00004025	Presents installation preparation, unpacking and transportation, mechanical installation, electrical installation, routine maintenance, and component replacement.
MD880-20 Series Basic Rectifier Hardware User Guide	19010983	Presents technical specifications, components, dimensions, mechanical installation, electrical installation, routine maintenance, and component replacement.

Revision history

Revision date	Version	Revision
October 2024	A01	**Added:** • Added section "Recommended Installation of Thyristor Rectifier Module" (*"4.5 Installing Thyristor Rectifier Module" on page 28*). • Added section "Installing Thyristor Basic Rectifier Filter Module" (*"4.6 Installing the Thyristor Basic Rectifier Filter Module" on page 32*). • Added section "Connecting Thyristor Rectifier Module Cables" (*"5.5 Connecting Thyristor Rectifier Module Cables" on page 39*). • Added section "Connecting Thyristor Basic Rectifier Filter Module Cables (*"5.6 Connecting Thyristor Basic Rectifier Filter Module Cables" on page 41*). **Modified:** • Updated section "Installation Space" (*"2.2 Installation Clearance" on page 16*). • Updated section "Unpacking" (*"3.1 Unpacking" on page 18*). • Updated section "Ordering Instructions" (*" Ordering Instructions" on page 73*).
January 2022	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 faults or damage that occur during normal operation. 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 injuries or death of personnel or device damage.
- "Danger", "Warning", and "Caution" items in this guide do not indicate all safety precautions that need to be followed; instead, 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 injuries or property damage caused by improper usage.

Safety Levels and Definitions



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



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



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

Fundamental safety instructions

- 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.
- Product illustrations in this guide are for reference only. Actual products may vary.
- 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 transported by qualified professionals using specialized hoisting equipment. Failure to comply may result in personal injuries 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.
- Never stand or stay below the equipment when the equipment is being hoisted by the hoisting equipment.
- 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 injuries or equipment damage.



- Handle the equipment with care during transportation and mind your steps to prevent personal injuries 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 injuries.
- Store and transport the equipment based on the storage and transportation requirements. Failure to comply will result in equipment damage.
- Avoid storing or transporting the equipment in environments with water splash, rain, direct sunlight, strong electric field, strong magnetic field, and strong vibration.
- Avoid storing the product for more than 3 months. When the product needs to be stored for an extended period, take more strict protection and necessary inspection.
- Pack the equipment strictly before transportation. Use a sealed box for long-distance transportation.
- Never transport the equipment with other equipment or materials that may harm or have negative impacts on this equipment.

Installation



- The equipment can be operated only by professionals with electrical knowledge. Non-professionals are not allowed to operate on the equipment.



- Read through the guide and safety instructions before installation.
- Do not install this 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 will result in mechanical hazards.
- Do not wear loose clothes or accessories during installation. Failure to comply may result in an 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 devices with strong electromagnetic interference, such as a transformer, install a shielding device for the equipment to prevent malfunction.
- Install the product on an incombustible object such as metal and do not touch or attach the product to combustibles. Failure to comply can result in fire accident.



- 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 on top of the equipment to prevent over-temperature caused by poor ventilation due to blocked ventilation holes.
- Resonance may occur when the equipment operating at a constant speed executes 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 parts 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 will result in an electric shock.
- Do not perform wiring, remove the equipment cover, or touch the circuit board with power ON. Failure to comply will result in an electric shock.
- Check that the equipment is grounded properly. Failure to comply can result in an electric shock.



- Do not connect the input power supply to the output end of the equipment. Failure to comply will 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.
- Fix the terminal screws with the tightening torque specified in the user guide. Improper tightening torque may overheat or damage the connecting part, resulting in a fire.
- After wiring is done, 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 the proper electrostatic discharge (ESD) procedures, and wear an antistatic wrist strap. Failure to comply will result in damage to internal equipment circuits.
- Use shielded twisted pairs for the control circuit. Connect the shield to the grounding terminal of the equipment for grounding purpose. 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 power-on to prevent equipment damage or a fire.
- Do not open the cabinet door or protective cover of the product, touch any wiring terminal of the product, or remove any part of the product with power on. Failure to comply can result in an electric shock.



- Perform a trial run after wiring and parameter setting to ensure the equipment operates safely. Failure to comply may result in personal injuries 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 accident.
- Before power-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.
- Do not touch any connecting terminals or disassemble any unit or component of the equipment during operation. Failure to comply can result in an electric shock.



- Do not touch the equipment casing, fan, or resistor with bare hands to feel the temperature. Failure to comply may result in personal injuries.
- Prevent metal or other objects from falling into the equipment during operation. Failure to comply may result in a fire or equipment damage.

Maintenance



- Equipment installation, wiring, maintenance, inspection, or parts 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 power supply is off. Failure to comply will result in an electric shock.



- Perform routine and periodic inspection and maintenance on the equipment in accordance with maintenance requirements and keep a maintenance record.

Repair



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

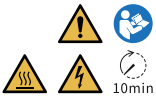


- Require for repair services in accordance with the product warranty agreement.
- When the fuse is blown or the circuit breaker or earth leakage current breaker (ELCB) trips, wait for at least the time designated on the equipment warning label before power-on or further operations. Failure to comply may result in death, personal injuries or equipment damage.
- When the equipment is faulty or damaged, require professionals to perform troubleshooting and repair by following repair instructions and keep a repair record.
- Replace quick-wear parts of the equipment in according with the replacement instructions.
- Do not operate on damaged equipment. Failure to comply may result in death, personal injury, or severe 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 property damage, personal injuries, or even death. • Recycle retired equipment by observing industry waste disposal standards to avoid environmental pollution.

Safety label

To ensure safe operations, comply with safety signs on the device, and do not damage or remove the safety labels. See the following table for descriptions of the safety labels.

Safety Label	Description
	• Beware of the risk of electric shock. Hazardous voltage still exists within 10 minutes after power-off. • Beware of the risk of burns and scalds. • Read the user guide before use.

1 Installation Flowchart

Mechanical installation

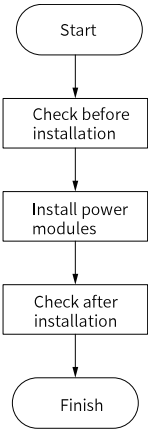


Figure 1-1 Mechanical installation flowchart

Electrical Installation

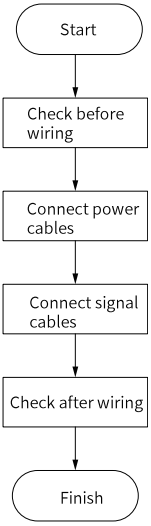


Figure 1-2 Electrical installation flowchart

2 Pre-installation Preparation

2.1 Installation Environment

Item	Requirement
Heat dissipation and ventilation	Mount the rectifier module to an incombustible surface and install it vertically to the mounting bracket with screws. As the rectifier module dissipates a large amount of heat to the surrounding during operation, reserve sufficient space for heat dissipation.
Installation location	Install the module in a place meeting the following requirements: • Free from direct sunlight • Free from water drops with ambient humidity ⩽ 95% • Free from corrosive, explosive, and combustible gases • Free from greasy dirt and dust
Vibration	Install the module in a place with minimum risk of vibration. For vibration resistance performance, see section Technical Data in MD880LC-20M Series Rectifier Module Hardware Guide.
Ambient temperature	The place where the module is installed must meet environment requirements. For derating coefficient, see section Derating in MD880LC-20M Series Basic Rectifier Module Hardware Guide.
Protective enclosure	The module 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.

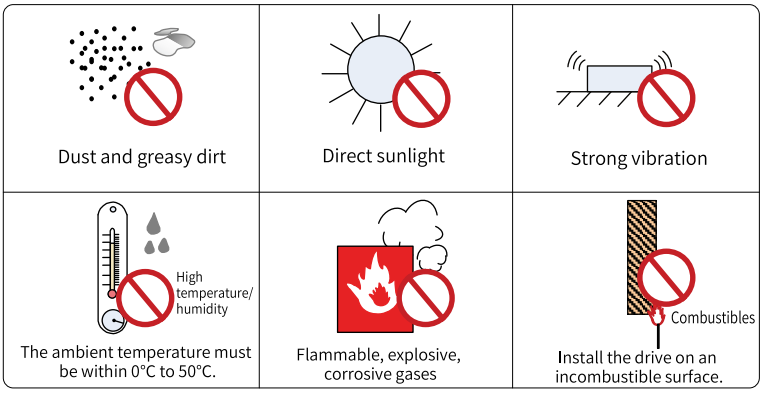


Figure 2-1 Environment requirements

2.2 Installation Clearance

Installation clearance of the diode rectifier module

The installation clearance around the rectifier module must be reserved, as shown below.

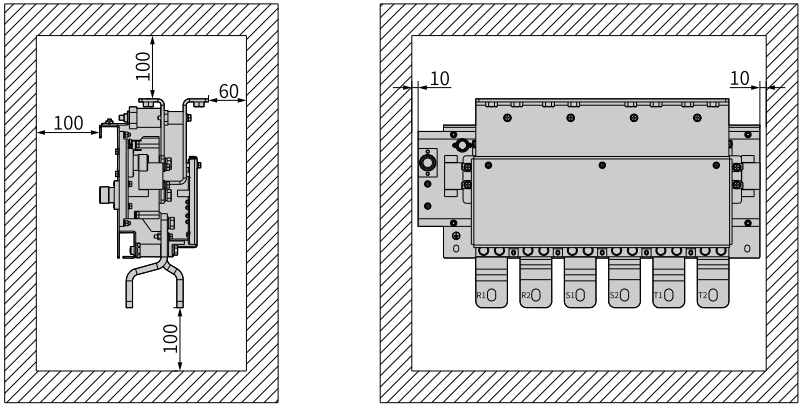


Figure 2-2 Installation clearance of the diode rectifier module

Note

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

Installation clearance of thyristor rectifier module

The installation clearance around the rectifier module must be reserved, as shown below.

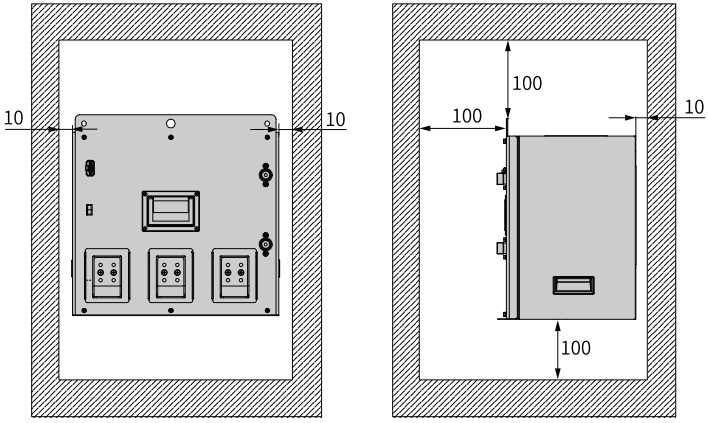


Figure 2-3 Installation clearance of thyristor rectifier module

Note

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

2.3 Installation Tools

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

- Forklift or pallet truck that used to move the rectifier module
- Wrench or socket wrench with opening size 10, which is used to fix the diode rectifier module
- Wrench or socket wrench with opening size 10/13/16, which is used to fix the thyristor rectifier 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
- M6 socket wrench with opening size 10, which is used to fix the distribution panel
- Open-end wrench with opening size 32, which is used to connect the coolant pipe

3 Unpacking and Handling

3.1 Unpacking

Precautions for Unpacking



- Check the basic rectifier module carefully upon reception.
- Check that you have received all the items specified on the delivery note. Notify the shipping company immediately of any missing components or damage. Contact Inovance technical support or local agent if necessary.



- If the equipment is damaged during transportation, the electrical safety of the equipment can be affected. In this case, do not connect to the equipment before a professional high-voltage test is performed.
- Failure to comply may result in property damage, physical injury, or even death.

Unpacking procedure for diode rectifier module

1. Cut off the plastic tape or loosen the screws of the box.
2. Remove the cover and side plate.

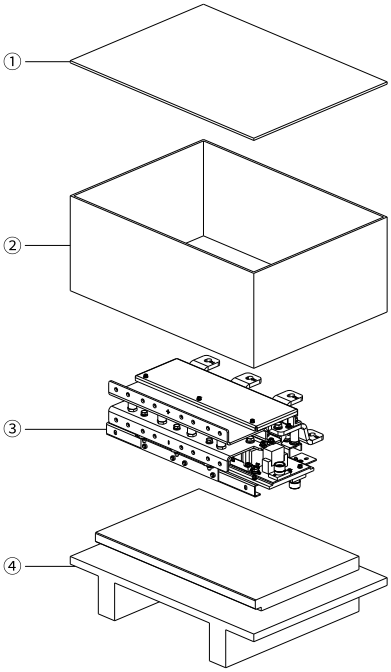


Figure 3-1 Transport packaging

No.	Note
①	Cover
②	Side plate
③	Rectifier module
④	Pallet

3. Cut off the plastic package of the module.
4. Loosen the four screws that secure the module to the plywood plate.

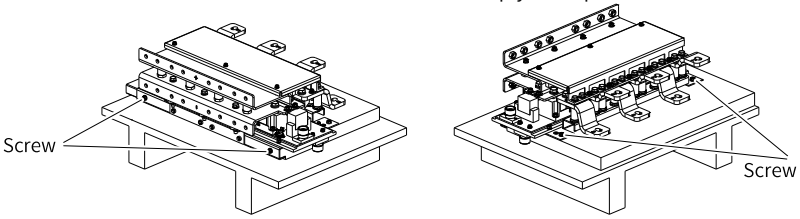


Figure 3-2 Screws that secure the module

5. Take out the module to ensure it is not damaged.

Unpacking procedure for thyristor rectifier module

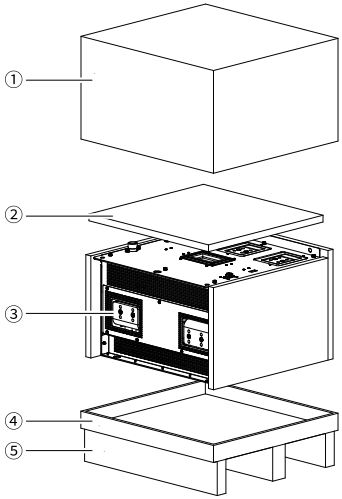


Figure 3-3 Transport packaging

No.	Name
①	Upper cover of the carton box
②	Filler plate of the carton box
③	Module
④	Bottom tray of the carton box
⑤	Pallet

Unpack the module in the following steps:

1. Remove all the straps and open the upper cover of the carton box.
2. Remove all filler materials.
3. Take out the module and accessories.
4. Cut the plastic wrap film on the module and ensure that the module is intact.
5. Dispose of or recycle the packing material according to local regulations.

Post-unpacking inspection

Check the following items after unpacking.

Table 3–1 Post-unpacking checklist

No.	Item	Checked
1	There is no sign of damage, scratching, or bumping on the surface of the product.	☐
2	All the optional parts ordered are in the packing box.	☐

No.	Item	Checked
3	The model of the product ordered is consistent with the nameplate.	☐
4	There is no sign of damage, scratch, or blur on the warning labels.	☐

Pack up the product again for storage or installation.

3.2 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. For long-term storage, cover the module or take other appropriate measures to protect it against contamination.

For storage of the module, observe the following precautions.



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

3.3 Handling

Precautions for handling



- Use a forklift to transport the well-packed module through the wooden pallets below the package. The operator must be well trained. Fix the module to the wooden pallet when handling with a forklift. Fix the module to the wooden pallet to allow the module to be lifted together with the pallet when handling with a crane.
- The load-carrying capacity of the transport device must be greater than the weight of the module.
- Use a proper hoisting tool for MD880LC series models.

Pre-unpacking handling

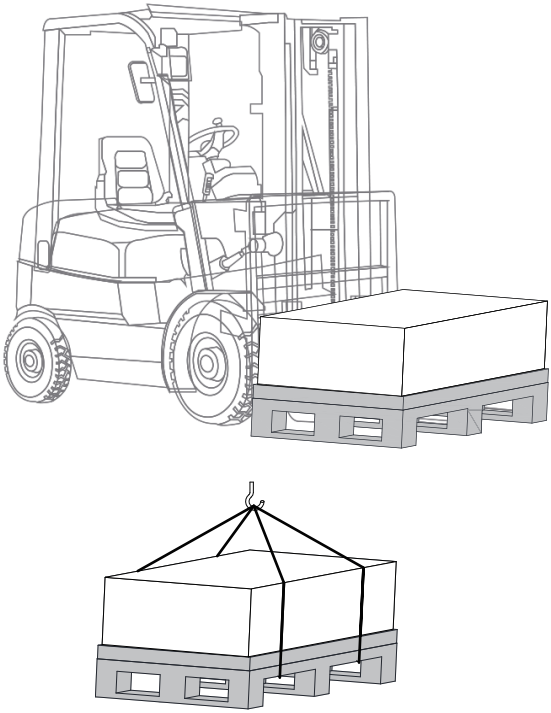


Figure 3-4 Handling before unpacking

Note

- Place the module on a flat surface that is firm enough to bear the weight of the module.
- The module is heavy with a high center of gravity. Therefore, avoid placing it on an inclined surface with an angle greater than 5 degrees.
- The module must always be transported in the method as indicated on the packing box.

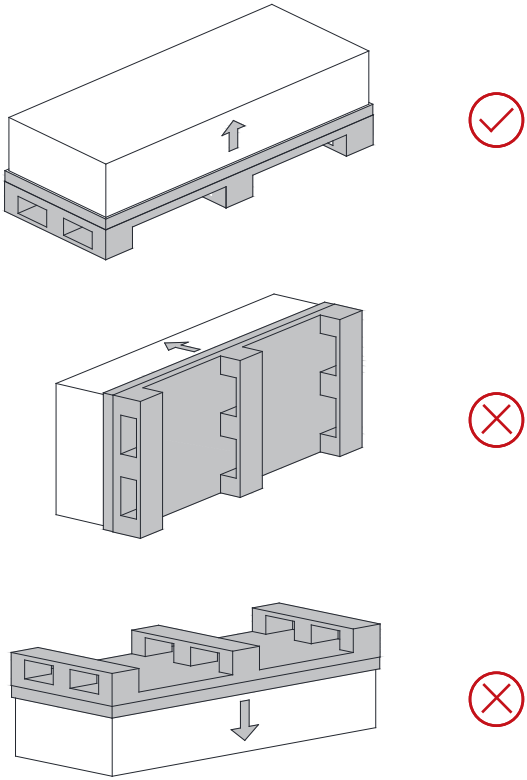


Figure 3-5 Handling method

Post-unpacking handling

- The diode rectifier module is light in weight and can be transported directly by one person after unpacking.
- The load-carrying capacity of the crane must be greater than the weight of the module.
- Lift and transport the module through the auxiliary lifting lugs on the top of the module, with the relief height no higher than 0.3 m.

4 Mechanical Installation

4.1 Safety Precautions



- The equipment must be installed and operated by qualified personnel in accordance with all the warning notices and safety instructions.
- Failure to comply may result in severe personal injury, death, and/or property damage.



- The cabinet frame must be sturdy enough to carry the weight of the drive components, control circuitry and other equipment installed in it.
- The cabinet must protect the module against contact and meet the requirements for dust and humidity.
- For easy installation, a spacious layout is recommended to reserve enough space for cooling air flow, mounting clearance, and cable supports. Do not install the control board to a place near main circuits or hot parts.
- Make sure bridging components or frames on which components are mounted are properly grounded, with the coupling surface unpainted.
- Ensure that the module is grounded to the PE busbar of the cabinet via its fastening screws.
- Nickel-plated copper is recommended.
- If there is a risk of condensation in the cabinet, use a cabinet heater. Although the primary function of the heater is to keep the air dry, it may also be used for heating at low temperatures. When placing the heater, follow the instructions provided by its manufacturer.
- Care must be taken when installing coolant pipes. Ensure coolant pipes are installed properly without the risk of leakage.

4.2 Tightening Torque of Common Screws and Bolts (Mechanical)

Table 4–1 Mechanical connection

Screw/Bolt	Property class	Max. torque (N·m)
M5	4.8	2.8
M6	4.8	4.8
M8	8.8	13
M10	8.8	20

4.3 Pre-installation Check

After installation, check the following items.

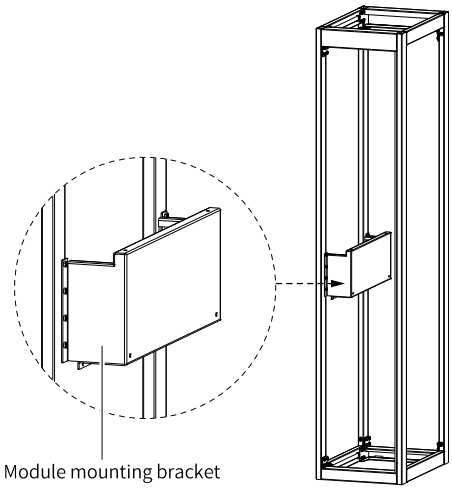
No.	Item	Compliance
1	The packing box is intact and dry.	☐
2	The enclosure of the unpacked module is free of deformation, paint loss, crack, or water stain.	☐
3	All accessories and options ordered are delivered.	☐
4	The minimum required clearance is reserved around the rectifier module to facilitate installation and air flow.	☐

4.4 Installing the Diode Rectifier Module

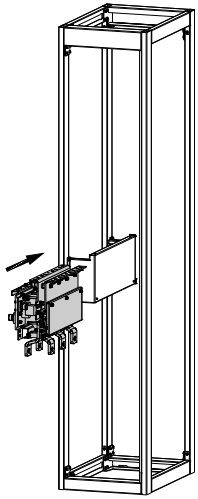
Note

The recommended tightening torque for the screws in the following procedure is shown in *"Table 4–1 Mechanical connection" on page 25*.

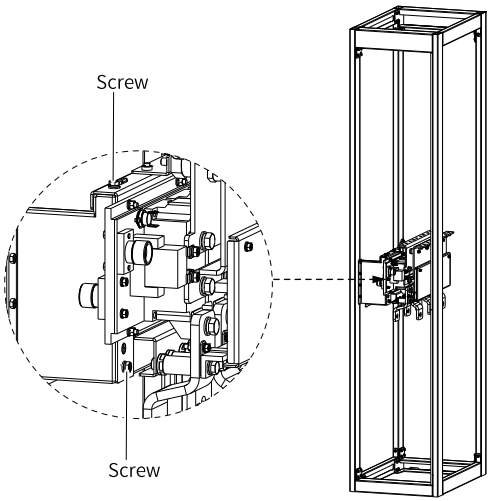
1. Design the module mounting bracket in the cabinet.



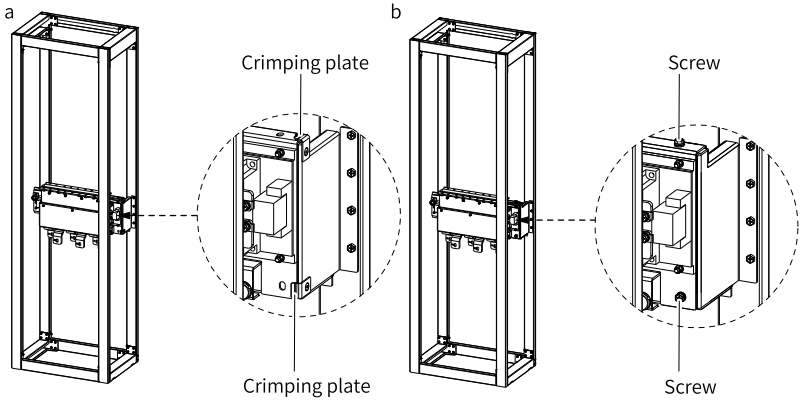
2. Push the diode rectifier module into the cabinet along the sheet metal guide rail.



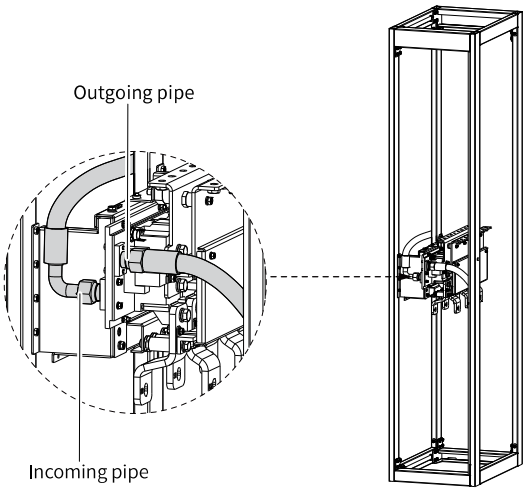
3. The front side of the module is secured with screws.



4. The rear side of the module can be fixed in the following two ways:
   a. When the operating space inside the cabinet is limited, crimp the rear side of the module by a crimping plate.
   b. When the operating space inside the cabinet is sufficient, fix the rear side of the module with screws.



5. Install the inlet and outlet pipes.

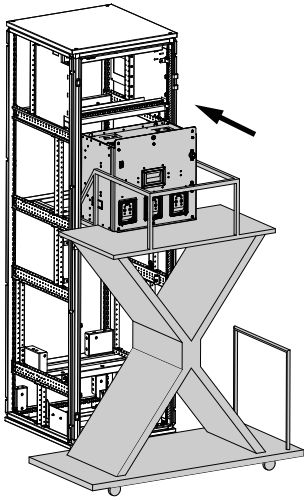


4.5 Installing Thyristor Rectifier Module

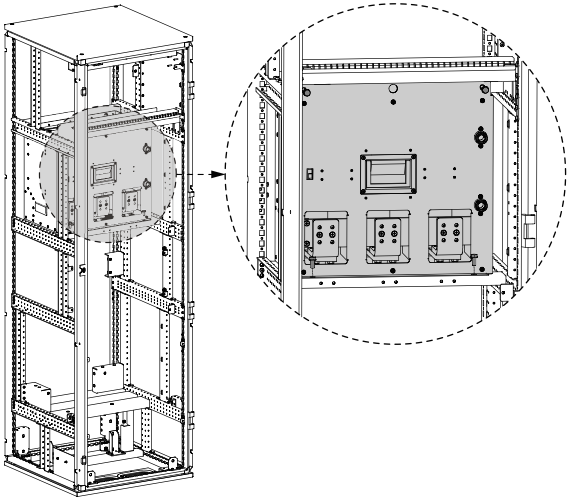
Note

The recommended tightening torque for the screws in the following procedure is shown in *"Table 4–1 Mechanical connection" on page 25*.

1. Place the unit on the bracket, raise the bracket to level with the mounting base of the unit in the cabinet, and push the module along the deep support beam onto the mounting base of the module.



2. Installing the module: Push the module inward until the front face of the unit is firmly connected to the front fixing beam. Tighten the four M8x20 screws with a socket (wrench opening size 13). The screw installation direction is shown in the figure.
   Note:
   - The socket wrench can be used together with an extension rod for easy installation.
   - The tightening direction is clockwise.

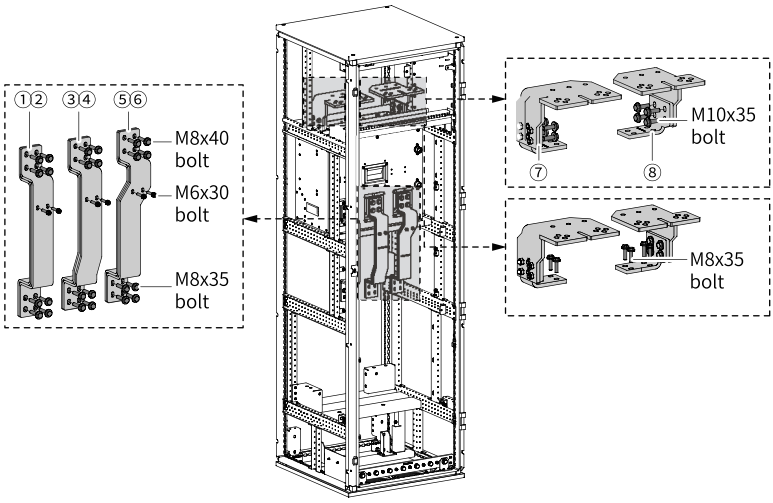


3. Installing the copper busbar:
   a. Installing copper busbars ① to ⑥: Place the copper busbars ① to ⑥. Ensure that the copper busbar is connected to the RST bus terminal of the module properly. Secure the copper busbars with 30 bolts. Fasten the twelve M8 x 40 bolts and twelve M8 x 35

bolts with a socket of wrench opening size 13. Fasten the six M6 x 30 bolts with a socket of wrench opening size 10.

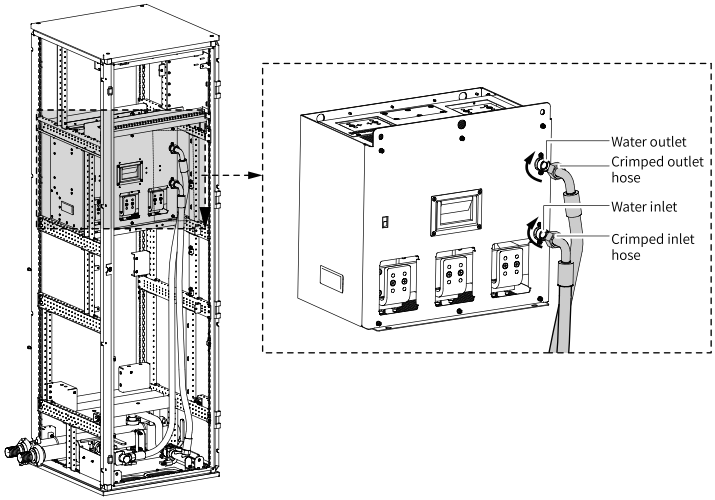
b. Install copper busbars ⑦ and ⑧. Place the copper busbars ⑦ and ⑧ in the proper position. Ensure that the copper busbar is connected to the DC bus terminal of the module properly. Secure the copper busbar with 16 bolts. Fasten the eight M10 x 35 bolts with a socket of wrench opening size 16. Fasten the eight M8 x 35 bolts with a socket of wrench opening size 13.

Note: The socket wrench can be used together with an extension rod for easy installation.



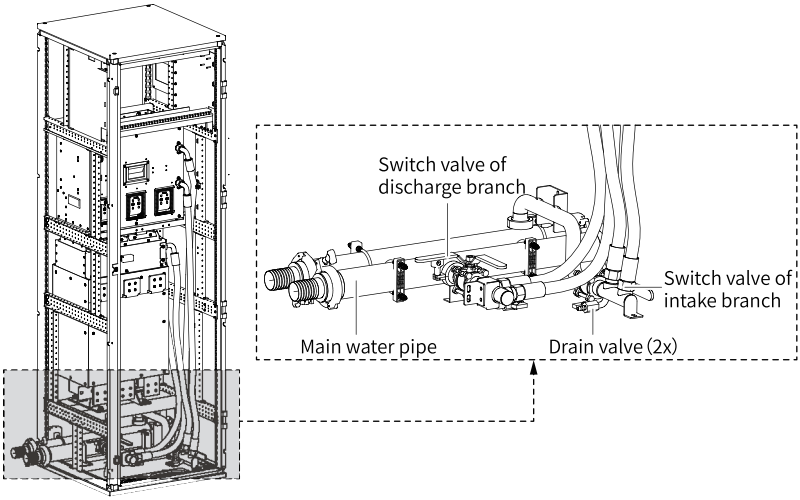
4. For main circuit terminal information, see *"Figure 5–3 Layout of main circuit terminals" on page 39*.
5. Installing the inlet and outlet pipes: Install the inlet and outlet pipes separately into the inlet nozzle and outlet nozzle of the module, as shown in the following figure. Lock the pipes with a 32 mm open-end wrench clockwise. The recommended tightening torque is 35 N·m.

   Note: The water nozzle connector is M26 x 1.5, with 24-degree internal taper.

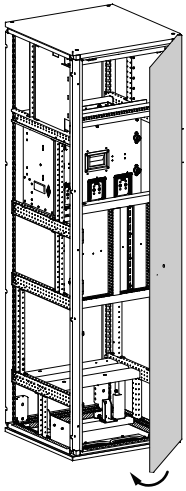


6. After installing the inlet and outlet pipes, close the two drain valves and open the inlet/outlet branch switch valve. Ensure that the water circuit inside the cabinet is connected to the main water pipe. The handle state is shown in the following figure after the valve commissioning is done.

   Note: When the handles of the switch valve and drain valve are in parallel with the water pipe, the switch valve and drain valve are opened. When the switch valve and drain valve are vertical to the water pipe, they are closed.



7. Close the cabinet door in the direction shown below.

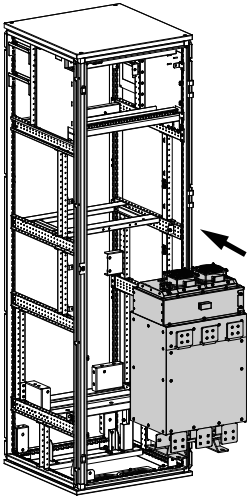


4.6 Installing the Thyristor Basic Rectifier Filter Module

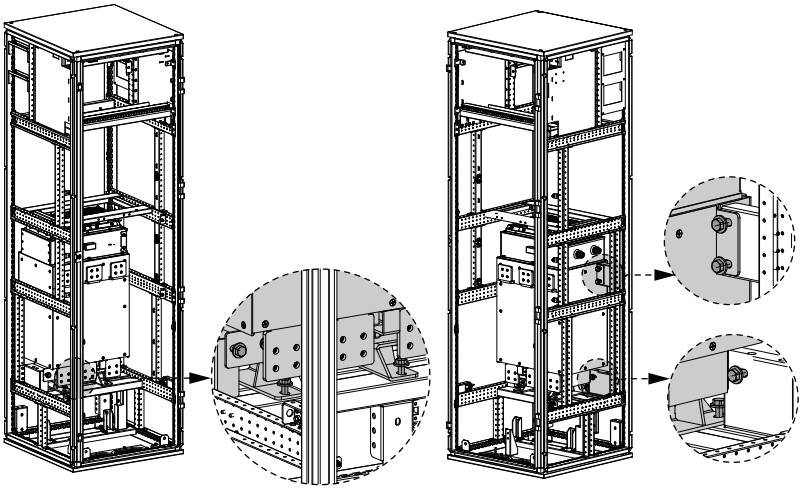
Note

The recommended tightening torque for the screws in the following procedure is shown in *"Table 4–1 Mechanical connection" on page 25*.

1. Push the reactor module inward into the cabinet, as shown in the following figure.

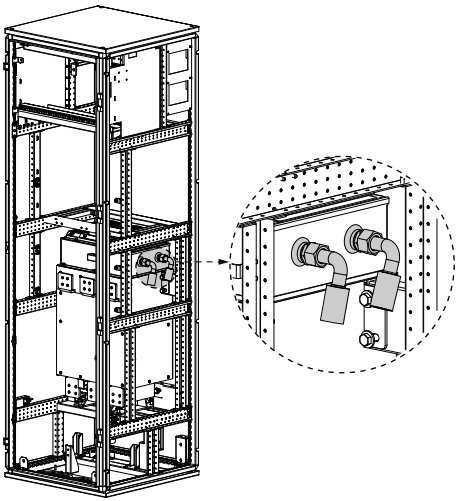


2. Fix the reactor module: After the reactor module is in place, fix the eight M10 x 25 bolts on the top and at the bottom of the reactor module.



3. Installing the inlet and outlet pipes: Install the inlet and outlet pipes separately into the inlet nozzle and outlet nozzle of the module, as shown in the following figure. Lock the pipes clockwise by using an open-end wrench with opening size 32. The recommended tightening torque is 35 N·m.

   Note: The water nozzle connector is M26 x 1.5, with 24-degree internal taper.



4.7 Post-installation Inspection

After installation is done, check the following items to avoid equipment damage and property loss.

Table 4–2 Post-installation checklist

No.	Item	Checked
1	The drive cabinet has been fixed to the floor. In case of vibration, fix the cabinet top to the wall or roof.	☐
2	The module has been fixed properly to the cabinet.	☐
3	There is no drilling debris, tools, or unwanted objects left inside the cabinet.	☐
4	The cooling circuits inside the cabinet are connected closely.	☐
5	The cabinet cover has been installed properly with the door closed.	☐

5 Electrical Installation

5.1 Safety Precautions



- The equipment is typically used in industrial applications with high voltage. Its parts become live or rotate during operation. Therefore, unauthorized removal of required covers, improper use or operation, or poor maintenance can lead to property loss, severe physical injury, or even death.
- Only professionals are allowed to operate the electrical devices and the professionals must observe the following "five safety rules" and safety precautions specified in the guide.
  - Power off the equipment
  - Ensure that the equipment cannot be energized again.
  - Make sure that the equipment is de-energized without residual voltage left.
  - Make sure that the equipment is grounded properly.
  - Cover or isolate the adjacent live components.

5.2 Tightening Torque of Common Screws and Bolts (Electrical)

Table 5–1 Electrical connection

Screw/Bolt	Property class	Max. torque (N·m)
M3	4.8	0.5
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 5–2 Cable connectors

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

5.3 Pre-wiring Inspection

Take necessary safety measures during electrical installation to ensure personal safety. Comply with the following rules during 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 operate the equipment.
- Take caution when operating the equipment that disconnected from the power supply as external supply voltage may still be present. The power terminals and control terminals may still be live even when the equipment has been shut down.
- The equipment may still be live 10 minutes after power-off due to the DC bus capacitor inside. Therefore, ensure that the voltage is about 0 V before opening the equipment.
- Ensure that the motors, cabinets, and other components are installed and connected in accordance with the national technical rules and other applicable regional regulations. Special attention must be paid to regulations concerning cable dimensions, fuses, grounding, shutdown, isolation, and overcurrent protection.
- If the fuse in a branch circuit trips, the fault current may have been disconnected. To reduce the risk of fire or electric shock, check the conductive parts and other components and replace the damaged parts. If any fuse trips, figure out the cause and rectify the fault.

5.4 Connecting Diode Rectifier Module Cables

Terminal layout

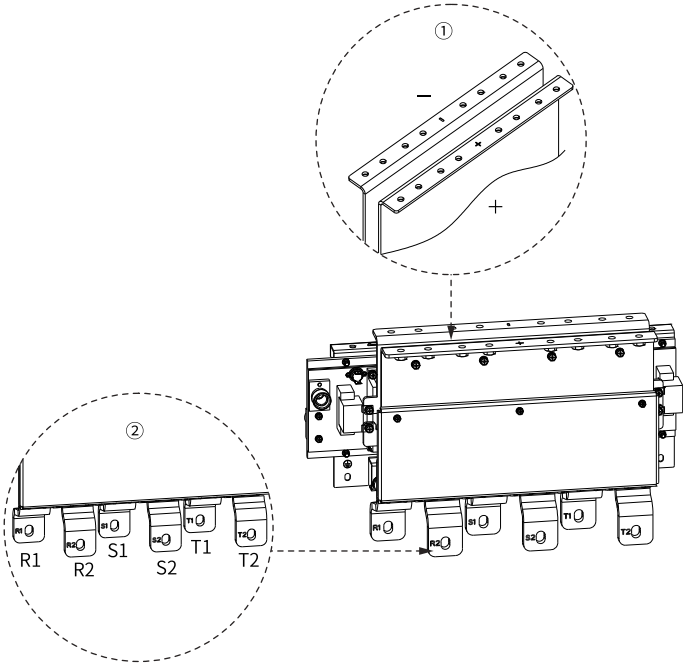


Figure 5-1 Layout of main circuit terminals

Table 5–3 Main circuit terminal of diode rectifier module

No.	Name	Description
①	DC bus terminal (+) and (-)	Select the appropriate cable and tightening torque for the positive and negative output copper busbar terminals.
②	R1, R2, S1, S2, T1, and T2 three-phase power input terminals	Select the proper cable and tightening torque.

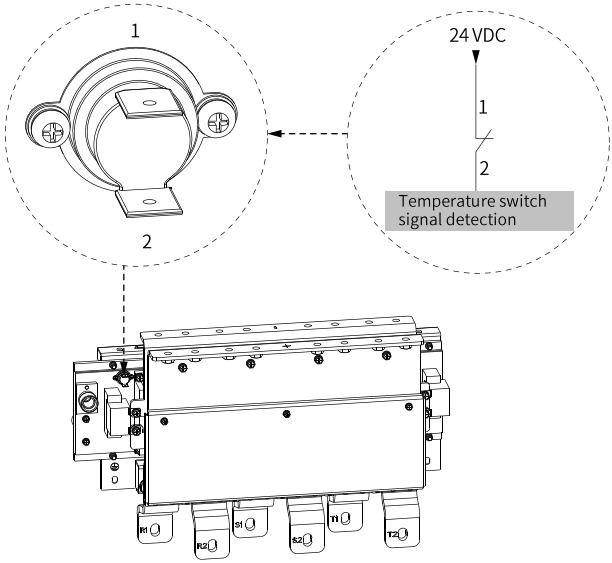


Figure 5-2 Layout of control circuit terminals

Table 5–4 Description of control circuit terminals

Terminal	Name	Description
①	NC contact switch wiring 1	Temperature detection signal point 1. Select a proper cable and tightening torque.
②	NC contact switch wiring 2	Temperature detection signal point 2. Select a proper cable and tightening torque.

Wiring procedure

1. Temperature detection terminal: Connect the crimped part of the cable to terminals 1 and 2 of the rectifier module. Connect the other end of 1 to the 24 VDC power supply and the other end of 2 to the temperature detection module.
2. Connect cables to output terminals based on the following sequence: R1, R2, S1, S2, T1, and T2.
3. Select a proper power cable based on the load size and fix the power cable to the cable rack.
4. When shielded power cables are used, fix the shield to the shield plate as instructed by EMC requirements.

Note

Each rectifier module must have the same input AC cable (same length and cross-sectional area) with a length of at least 5 m.

5.5 Connecting Thyristor Rectifier Module Cables

Description of thyristor rectifier module terminals

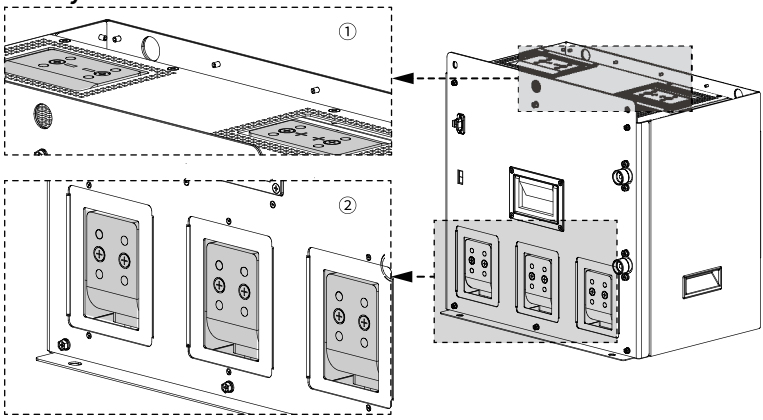


Figure 5-3 Layout of main circuit terminals

No.	Name	Description
①	Bus terminals (+) and (-)	Select the appropriate cable and tightening torque for the positive and negative output copper busbar terminals.
②	R, S, T (AC input terminals)	Select the proper cable and tightening torque.

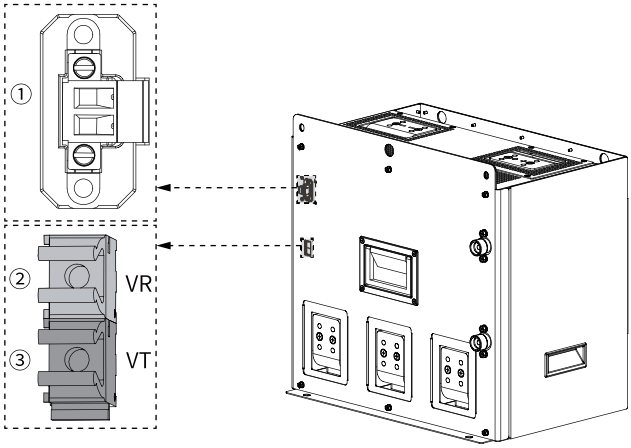


Figure 5-4 Layout of control circuit terminals

Table 5–5 Description of control circuit terminals

No.	Name	Description
①	Input terminal for 24 VDC external power supply	2-conductor twisted pair, single-conductor cable, cross-sectional area: 0.5 mm^2 to 2.5 mm^2
②	VR optical fiber reception terminal	Connected to HCU or HPCU through optical fiber.
③	VT optical fiber transmission terminal	

Wiring procedure

1. Connect the AC input terminals (R, S, T) of the rectifier module with the correct tightening torque.
2. Connect the output terminal (+ and -) cables of the rectifier module with proper tightening torque.
3. Connected to HCU or HPCU through optical fiber
4. Connect the external 24 VDC power supply to the 24 V power input terminal.

- Connect cables to output terminals based on the following sequence: R, S, and T, or (+) and (-).
- Secure the power cables to the cable bracket to prevent terminals from being subject to tension.
- When shielded power cables are used, fix the shield to the shield plate as instructed by EMC requirements.

5.6 Connecting Thyristor Basic Rectifier Filter Module Cables

Description of filter module terminals

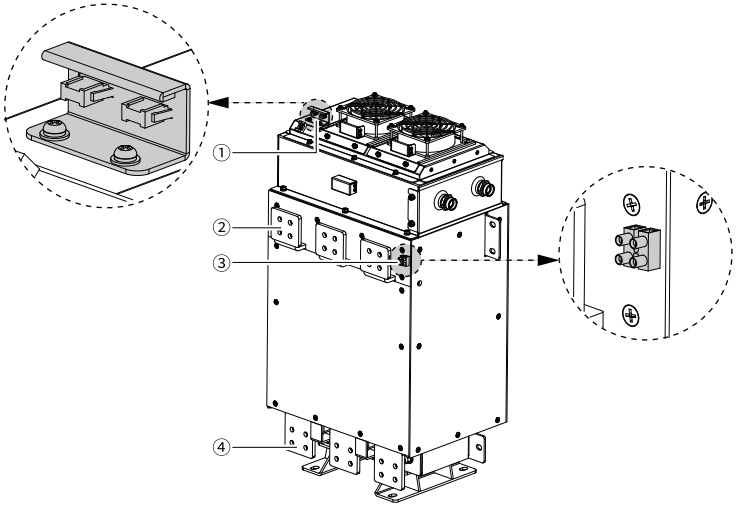


Figure 5-5 Layout of main filter module terminals

No.	Name	Description
①	Top fan terminal	24 VDC/2 A (x 2)
②	AC output terminal	Connected to the thyristor rectifier module.
③	Reactor temperature switch terminal	24 V, normally closed
④	AC input terminal	Connected to the power grid.

Wiring procedure

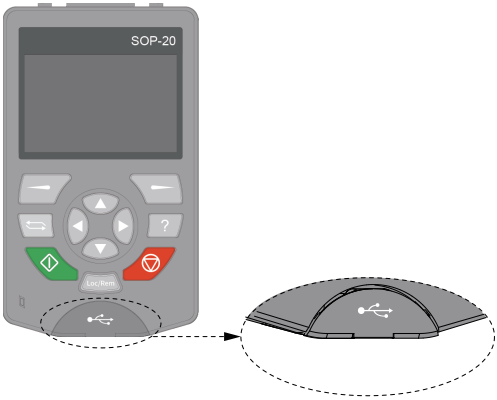
1. Connect the AC input terminals R, S, and T of the reactor to the input grid side in the correct phase sequence.
2. Connect the AC output terminals U, V, and W of the reactor to the rectifier module in the correct phase sequence.
3. Connect the top fan terminal (x 2) of the reactor to the 24 VDC power supply.
4. Connect the cables to the reactor temperature detection terminals, with one end connected to the 24 VDC power supply, and the other end connected to the HCU DI terminal or DI module

5.7 Connecting SOP-20-880 To the PC

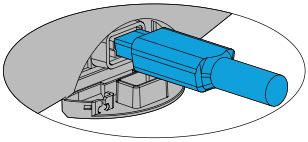
The USB mini-B terminal on SOP-20-880 is used to connect to the PC. The USB cable length cannot exceed 3 m.

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

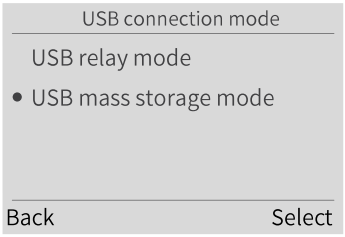
1. Open the cover of the USB port.



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.

5.8 Wiring the SOP-20-880 and 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 5–6 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	

5.9 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*.

5.10 Post-wiring Inspection

After electrical installation of the module is done, check the following items. Read *"Fundamental Safety Instructions" on page 6* and *"5.3 Pre-wiring Inspection" on page 36* before operating the equipment.

Table 5–7 Post-wiring checklist

No.	Item	Checked
1	Connect the input of the module to the power grid properly to ensure that the correct voltage is provided.	☐
2	The auxiliary power supply provides the correct voltage.	☐
3	Input/Output power cables are secured to the cable rack for strain relief.	☐
4	Cables are properly connected with the required tightening torque to the terminals provided.	☐

No.	Item	Checked
5	The cable shield is fixed to the shielding plate to meet the EMC requirement.	☐
6	The pre-charge circuit phase sequence of the basic rectifier module must be correct. Otherwise, the device can be damaged.	☐

6 Maintenance

6.1 Safety Instructions for Maintenance and Repair

Precautions for maintenance and repair



- Maintenance of the basic rectifier module can be performed only by professionals.
- Before maintenance, power off the module, wait for at least 15 minutes until the DC bus voltage is close to 0 V. Failure to comply can result in personal injury caused by the residual voltage in the capacitor.
- Be aware of the possible rotation of the cooling fan due to inertia.
- Perform maintenance on the basic rectifier module only after it has been powered off and cooled down.
- Install and wire the equipment according to national standards, industry standards, and local safety codes. Use only instruments that comply with the voltage withstanding requirements and keep the enclosure of the instruments well grounded.
- After you switch off the input circuit breaker switch, residual voltage can still exist. Check that no residual voltage is left before further operations.
- Be careful when measuring components in the cabinets. Prevent meter leads from coming into contact with each other or with other terminals.

Safety Precautions

Take necessary safety measures before maintenance and inspection.

1. Obtain operation authorization from the person in charge of electrical installation.
2. Clearly mark the work site and equipment.
3. Disconnect all voltage sources and lock and label them during maintenance and repair to prevent the power supplies from being switched on inadvertently.
   a. Disconnect the main disconnector or circuit breaker of the drive.
   b. Disconnect the disconnector of the power transformer.
   c. If the drive is connected to a permanent magnet motor, use a safety switch or similar to disconnect the motor from the drive.
   d. Disconnect the controlled circuit from the external hazardous voltage.
   e. Wait for at least 15 minutes after power-off and confirm that the DC bus voltage is close to 0 V before maintenance.
4. Avoid contact with any live parts in the workplace during maintenance.
5. Take special measures when working near bare conductors.

6. Ensure that the equipment is powered off by measuring the voltage. Remove/Dismantle the shield or cabinet during measurement according to related local laws and regulations (including but not limited to protection against electric shock and arcing).
   - Make sure that the voltage between the drive input terminals (U, V, and W) and the grounding (PE) busbar is close to 0 V.
   - Make sure that the voltage between the drive DC busbar (+ and –) and the grounding (PE) busbar is close to 0 V.
7. Perform temporary grounding as required by local codes.



- Be aware that the basic rectifier module works with high voltage.
- Perform wiring only after the basic rectifier module is powered off.
- Allow only trained personnel to perform maintenance and inspection on the basic rectifier module. Failure to comply may result in substantial property loss, severe physical injury, or even death.
- Exercise extreme caution when working on the equipment that is opened. The power supply and terminals may be live even when the motor is not running due to possible presence of external power voltage.
- The basic rectifier module must be handled by trained personnel with care. Improper hoisting or handling of such equipment may lead to substantial property loss, severe physical injury, or even death.

6.2 Routine Maintenance

6.2.1 Routine Maintenance

- The basic rectifier module is mostly composed of electrical components. Therefore, it is necessary to inspect and maintain worn electrical components.
- Clean the dusts and pollutants regularly to keep the module in a proper state.
- The water quality of the drive cabinet needs to be tested regularly. For water quality requirements, see Technical Specifications in *MD880LC-20M Series Basic Rectifier Module Hardware Guide*.

6.2.2 Routine Checklist

Check the following items during routine inspection.

Table 6–1 Routine checklist

No.	Item	Checked
1	The water inlet temperature of the module is within the range of 0°C to 40°C. The humidity is within the range of 5% RH to 95% RH without condensation.	☐
2	There is no abnormal vibration or noise.	☐
3	The power grid voltage is within the range of 525 VAC to 690 VAC.	☐
4	There is no strange smell.	☐
5	There are no fibers adhered to the air vent.	☐
6	There is no intrusion of unwanted objects on the load end.	☐

6.2.3 Routine Cleaning List

Take the following measures to clean the module.

Table 6–2 Routine cleaning list

No.	Item	Compliance
1	Clean the dust, especially the metallic dust on the surface of the equipment.	☐
2	Always keep the air vents of the cabinet that comprised of basic rectifier modules unobstructed and ensure that the cooling fan functions properly.	☐



- Ensure that the dust inside the basic rectifier module is cleared regularly and thoroughly by qualified professionals in compliance with relevant safety regulations.
- Clean the rectifier module at least once a year (or shorter according to the actual 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.

6.3 Regular Checklist

Table 6–3 Regular checklist

No.	Item	Checked
1	Check whether the cable terminals and screws are secure.	☐
2	Check that wiring is correct without fault.	☐
3	Check that there is no damaged component.	☐

6.4 Parts Replacement

6.4.1 List of Maintainable Parts

Table 6–4 Maintainable Parts

No.	Name	Module that attached to
1	AC fuse	Diode rectifier module
2	Cabinet fan	
3	DC fuse	
4	Diode rectifier module	
5	AC fuse	Thyristor rectifier module
6	DC fuse	
7	Thyristor rectifier module	
8	Filter fan	
9	SD card and battery of the HCU control module	-
10	SOP-20-880 battery	

6.4.2 Maintenance Tools

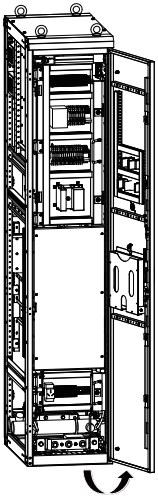
The following tools may be required during maintenance and replacement:

- 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 12
- Wrench or socket wrench with opening size 13
- Wrench or socket wrench with opening size 16
- Wrench or socket wrench with opening size 18
- M4 screwdriver
- M6 socket wrench with opening size 10

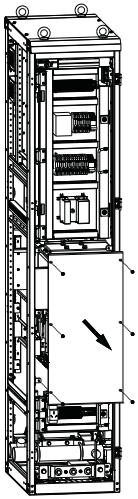
- Open-end wrench with opening size 32
- Torque wrench
- PH1 and PH2 Phillips screwdriver
- A socket wrench set with two extension rods is recommended.

6.4.3 Replacing the AC Fuse (Diode Rectifier Module)

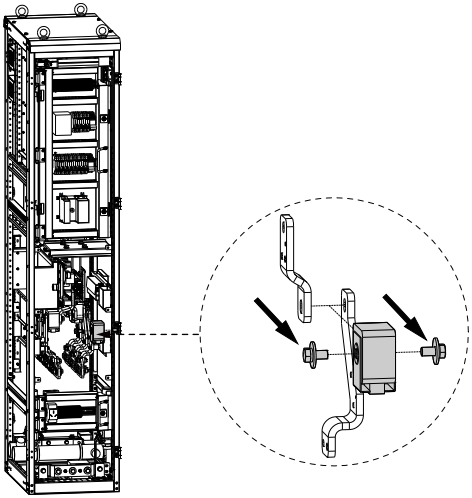
1. Take electrical safety precautions before operation according to *"6.1 Safety Instructions for Maintenance and Repair" on page 45*.
2. Open the cabinet door.



3. Remove the six M6 screws with a screwdriver and remove the protective PC board.



4. Remove the two M12 screws and pull out the AC fuse.

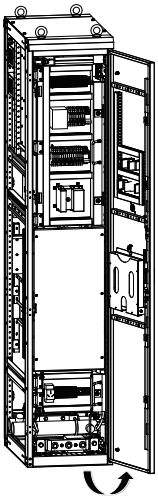


5. Check the state of the fuse. If the fuse is damaged, replace all fuses and tighten the screws with a recommended tightening torque of 40 N·m.
6. Install the PC board based on the same procedure but in the reverse order, and close the cabinet door.

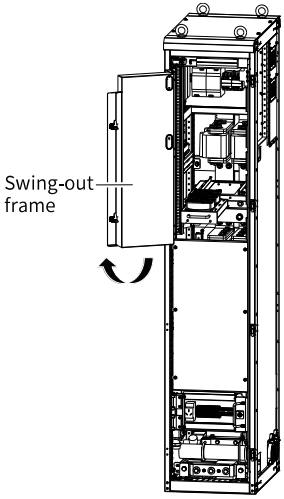
6.4.4 Replacing the Cabinet Fan (Diode Rectifier Module)

1. Take electrical safety precautions before operation according to *"6.1 Safety Instructions for Maintenance and Repair" on page 45*.

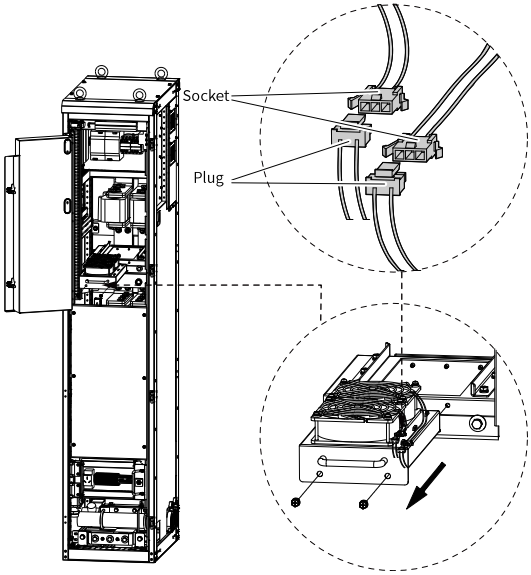
2. Open the cabinet door.



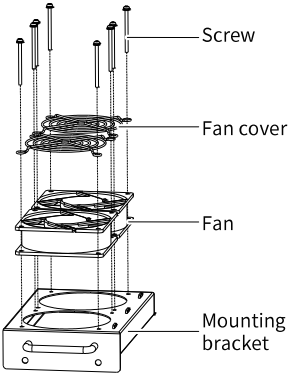
3. Open the swing door.



4. Disconnect the power supply terminal of the fan, remove the two M6 screws with a screwdriver, and pull out the fan components in the direction indicated by the arrow.



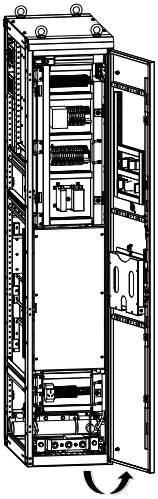
5. Remove the eight M4 screws with a screwdriver to remove the fan.



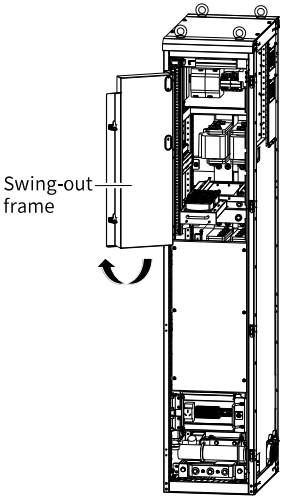
6. Install a new fan of the same specifications in the same procedure, but in the reverse order.

6.4.5 Replacing the DC Fuse (Diode Rectifier Module)

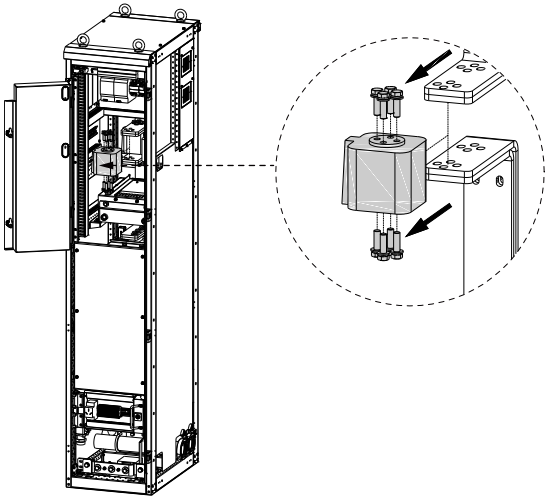
1. Take electrical safety precautions before operation according to *"6.1 Safety Instructions for Maintenance and Repair" on page 45*.
2. Open the cabinet door.



3. Open the swing door.



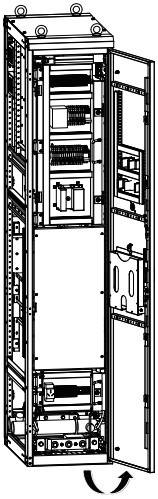
4. Pull out the fan components. See details in *"6.4.4 Replacing the Cabinet Fan (Diode Rectifier Module)" on page 50*.
5. Remove the eight M10 screws and pull out the DC fuse in the direction indicated by the arrow.



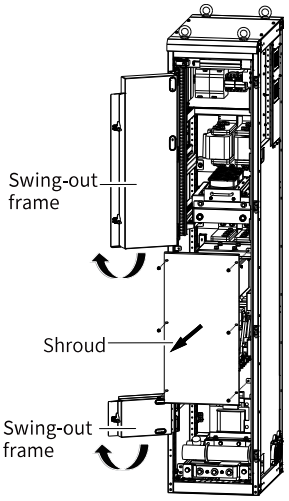
6. Check the state of the fuse. If the fuse is damaged, replace all fuses and tighten the screws with a tightening torque of 20 N · m.
7. Replace the fan components and close the swing door and cabinet door.

6.4.6 Replacing the Diode Rectifier Module

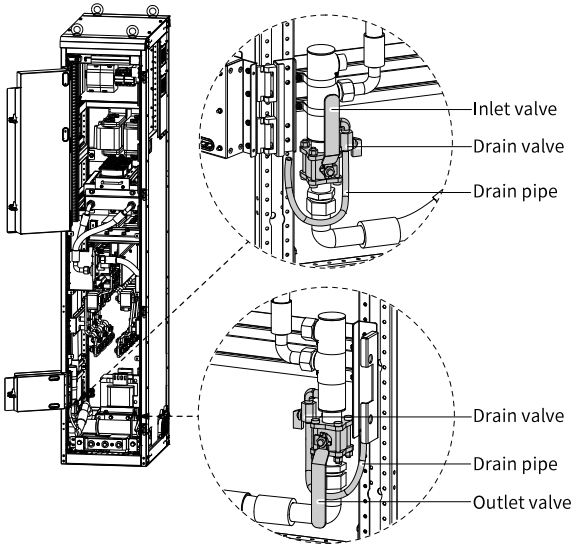
1. Take electrical safety precautions before operation according to *"6.1 Safety Instructions for Maintenance and Repair" on page 45*.
2. Open the cabinet door.



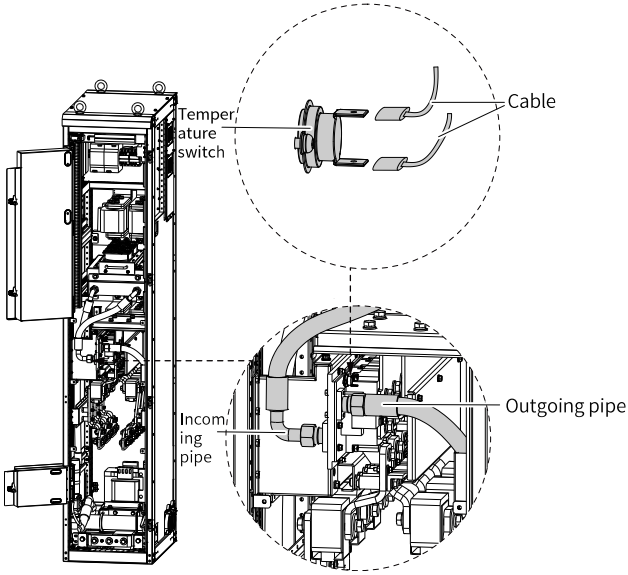
3. Open the swing door, remove the six M6 screws with a screwdriver, and remove the protective PC board.



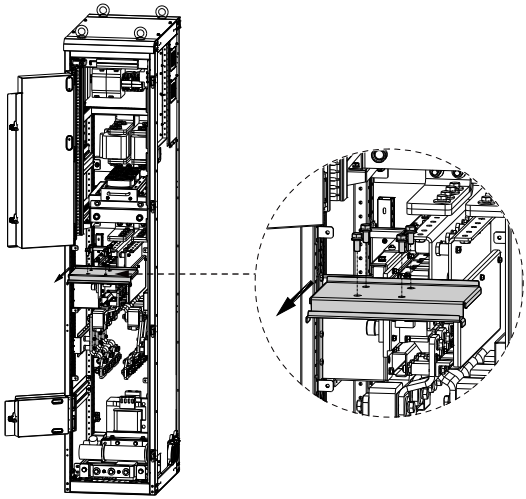
4. Close the inlet and outlet valves, connect the drain pipe to the drain valve, and guide the drain pipe into a proper container.



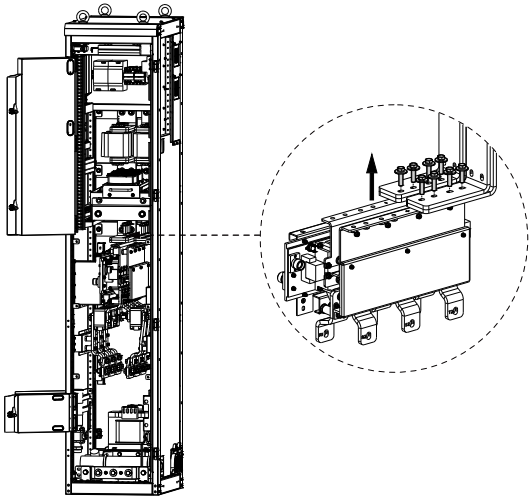
5. Open the drain valve behind the inlet and outlet valves. Make sure the ends of the drain pipe are not immersed in the coolant at any position so that the coolant in the system can be displaced. Wait until all coolant is discharged.
6. Disconnect the inlet and outlet pipes of the rectifier module and the temperature switch.



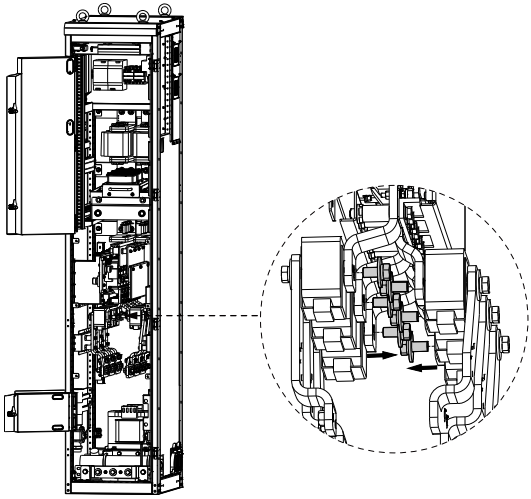
7. Remove the four M10 screws to remove the protective PC board.



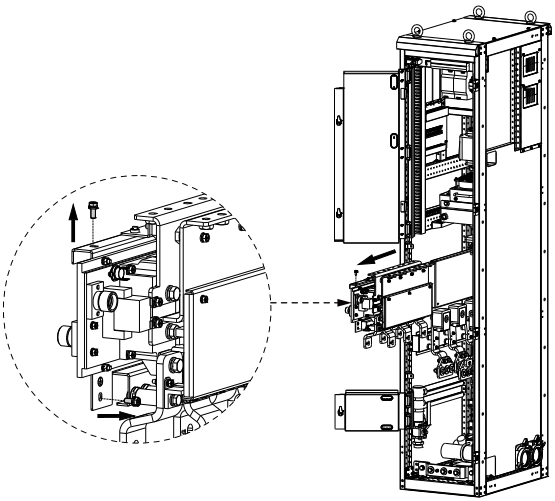
8. Remove the eight M10 screws connected to the DC copper busbar of the rectifier module.



9. Remove the six M12 screws connected to the AC copper busbar of the rectifier module.



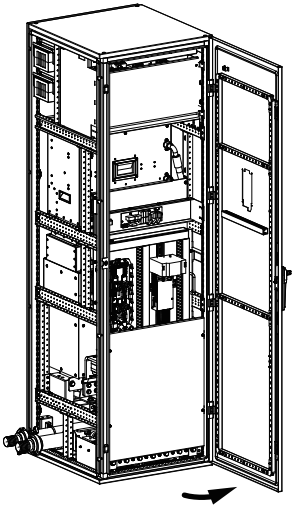
10. Remove the two M6 screws in the front of the rectifier module to pull out the rectifier module.



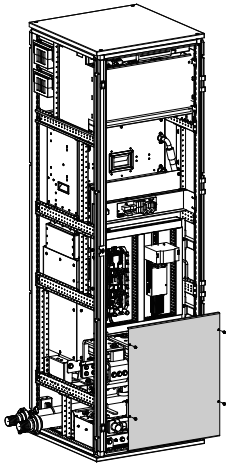
11. Install the new rectifier module in the same procedure, but in the reverse order.

6.4.7 Replacing the AC Fuse (Thyristor Rectifier Module)

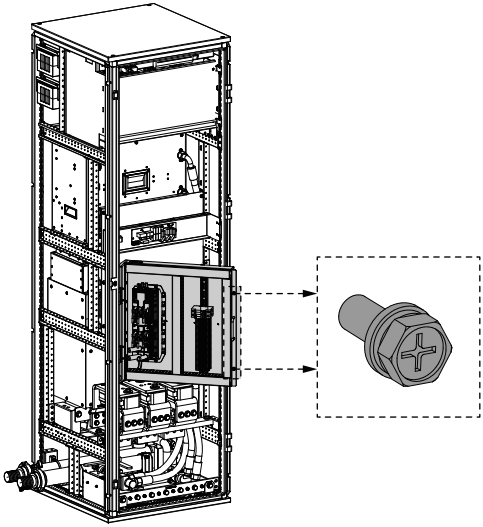
1. Take electrical safety precautions before operation according to *"6.1 Safety Instructions for Maintenance and Repair" on page 45*.
2. Open the cabinet door.



3. Removing the protective PC board: Remove the four M6 screws with an M6 socket wrench (opening size 10), and then remove the protective PC board.

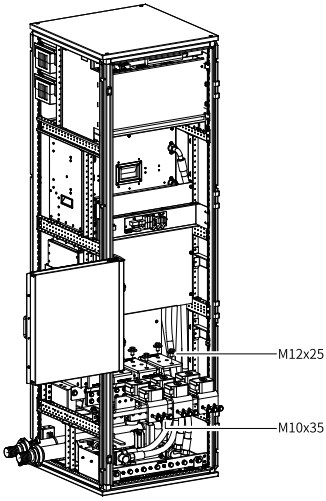


4. Opening the swing door: Remove the two M6 x 16 screws that secure the distribution panel with an M6 socket wrench (opening size 10), and then open the swing door.



5. Removing the AC fuse:

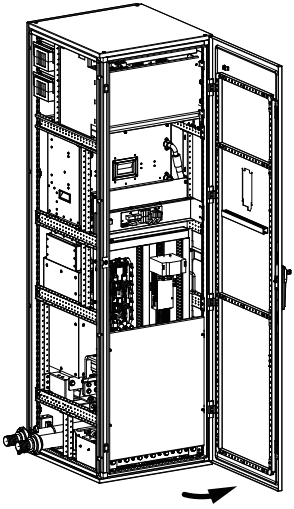
   a. Remove the six M12 x 25 screws on the top of the AC fuse and the nine M10 x 35 screws on the front, and then pull out the AC fuse and the copper bar below it together.
   b. After pulling out the fuse and the copper busbar below it, remove the six M12 x 25 screws on the bottom of the fuse and remove the AC fuse.



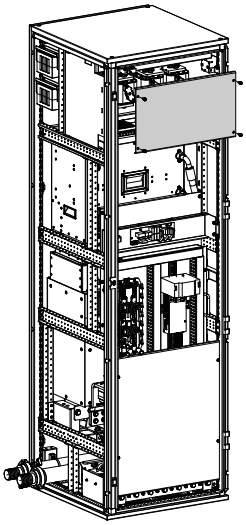
6. Check the state of the fuse. If the fuse is damaged, replace all fuses and tighten the screws with a recommended tightening torque of 40 N · m.
7. Install the AC fuse and its copper bar, swing door, PC board, and cabinet door based on the same procedure, but in the reverse order.

6.4.8 Replacing the DC Fuse (Thyristor Rectifier Module)

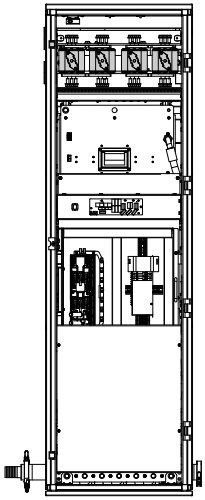
1. Take electrical safety precautions before operation according to *"6.1 Safety Instructions for Maintenance and Repair" on page 45*.
2. Open the cabinet door.



3. Removing the protective PC board: Remove the four M6 screws with an M6 socket wrench (opening size 10), and then remove the protective PC board.



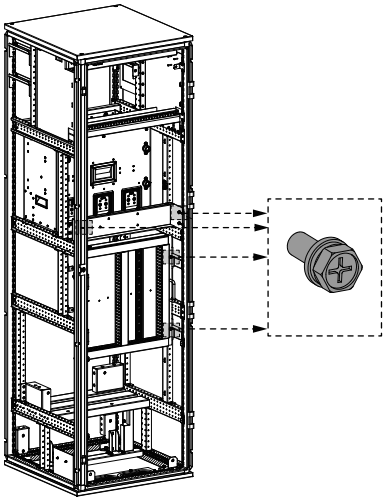
4. Removing the DC fuse: Remove 32 screws (M12 x 25) on the top and at the bottom of the four DC fuses to remove the DC fuse.



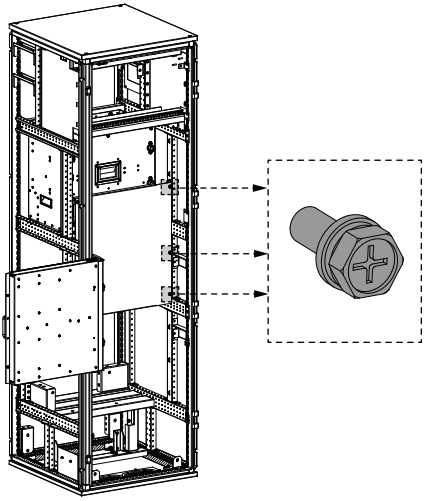
5. Check the state of the fuse. If the fuse is damaged, replace all fuses and tighten the screws with a recommended tightening torque of 40 N·m.
6. Install the DC fuse, PC board, and cabinet door based on the same procedure, but in the reverse order.

6.4.9 Replacing the Thyristor Rectifier Module

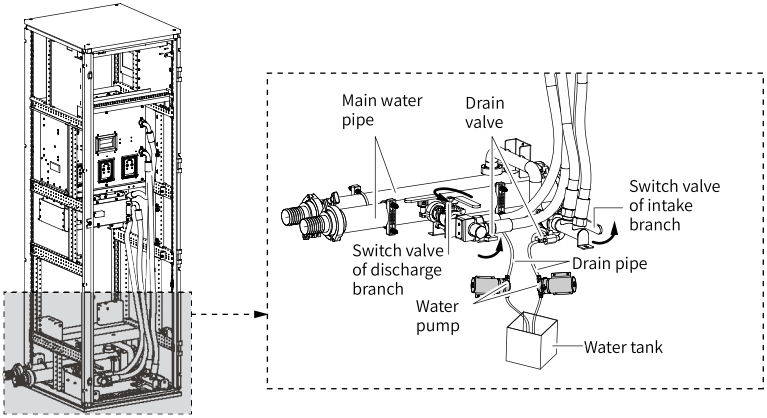
1. Take electrical safety precautions before operation according to *"6.1 Safety Instructions for Maintenance and Repair" on page 45*.
2. Opening the distribution panel:
   a. Open the cabinet door and remove the four M6 x 16 screws that secure the distribution panel and the lightning protection plate with an M6 socket wrench (opening size 10).
   b. Hold the handle on the right side of the panel and open it to the left. The opening angle of the panel can be up to 180°.



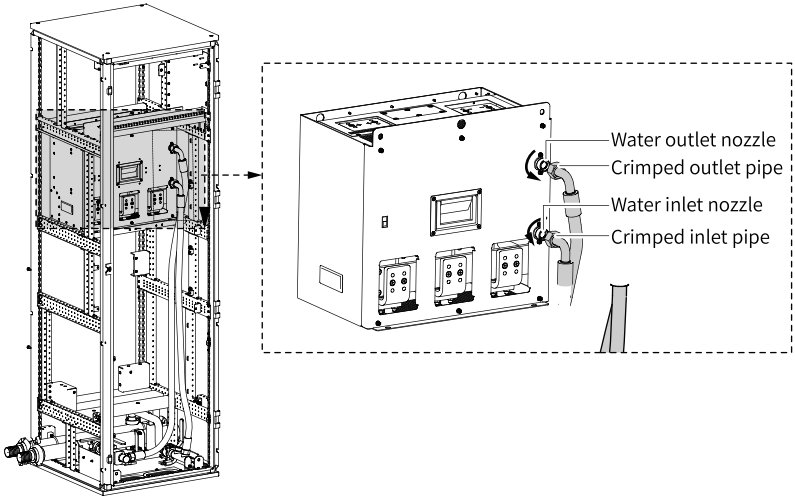
3. Removing the PC board: Use a screwdriver to remove the six M6 x 16 screws that secure the PC board. The screw locations are shown in the following figure.



4. Removing the cable: Pull out the cable from the control circuit terminal on the top of the module.
5. Water drainage:
   a. Close the inlet and outlet valves of the cabinet in the arrow direction shown in the following figure to isolate the internal water circuit of the cabinet from the water circuit of the system.
   b. Prepare a water container and install a drain pipe. Connect one end of the drain pipe to the drain valve nozzle and the other end to the air outlet of the water pump. Connect a new drain pipe to the air outlet of the water pump and the other end of the drain pipe to the container to be ready for water collection.
   c. After installing the drain pipe, open the two rows of drain valves, switch on the pump power supply, and turn on the pump for more than three minutes until no coolant drips out.

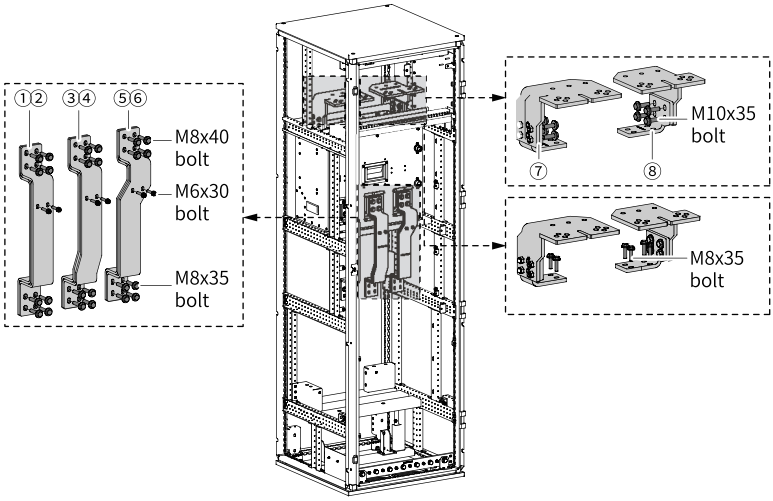


6. Removing the inlet and outlet pipes: Remove the inlet and outlet pipes in the arrow direction shown in the following figure with a wrench with opening size 32.
   Note:
   - The water nozzle connector is M26 x 1.5, with 24-degree internal taper. The recommended tightening torque is 35 N·m during installation.
   - Disassemble the coolant pipe. Use a container to hold the water, preventing the water from being splashed to live equipment inside the cabinet.

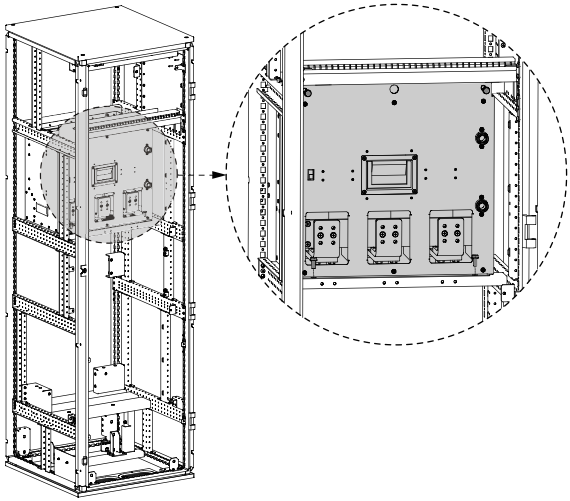


7. Removing the copper busbar:
   a. Removing copper busbars ① to ⑥: Remove the twelve M8 x 40 bolts and twelve M8 x 35 bolts with a socket wrench (opening size 13), and then remove the six M6 x 30 SEMS bolts with a socket wrench (opening size 10). Finally, remove copper busbars ① to ⑥.
   b. Installing copper busbars ⑦ and ⑧: Remove the eight M8 x 35 bolts with a socket wrench (opening size 13), and then remove the eight M10 x 35 bolts with a socket wrench (opening size 16). Finally, remove copper busbars ⑦ and ⑧.

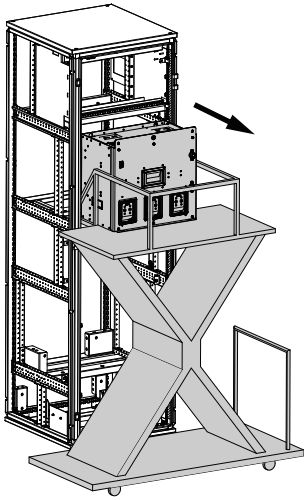
   Note: The socket wrench can be used together with an extension rod for easy installation.



8. Removing the module: Remove the module by using a socket wrench (opening size 13) to remove the four M8 x 20 bolts that secure the module.
   Note: The socket wrench can be used together with an extension rod for easy installation.



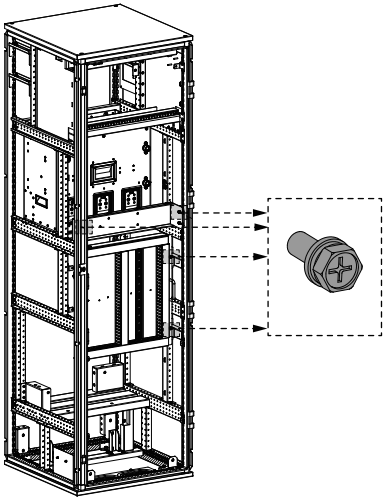
9. Adjust the platform height of the maintenance trolley and push the trolley to a position that aligned with the mounting bracket of the module.



10. Installing the module: Installing the new module of the same specification in the same procedure, but in the reverse order during replacement.

6.4.10Replacing the Filter Fan (Thyristor Rectifier Module)

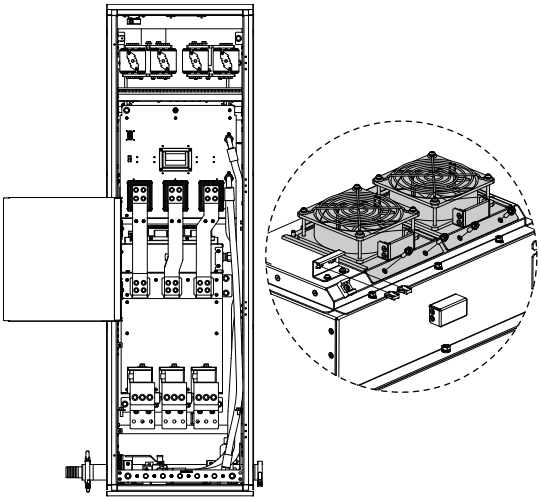
1. Take electrical safety precautions before operation according to *"6.1 Safety Instructions for Maintenance and Repair" on page 45*.
2. Opening the distribution panel:
   a. Open the cabinet door and remove the four M6 x 16 screws that secure the distribution panel and the lightning protection plate with an M6 socket wrench (opening size 10).
   b. Hold the handle on the right side of the panel and open it to the left. The opening angle of the panel can be up to 180°.



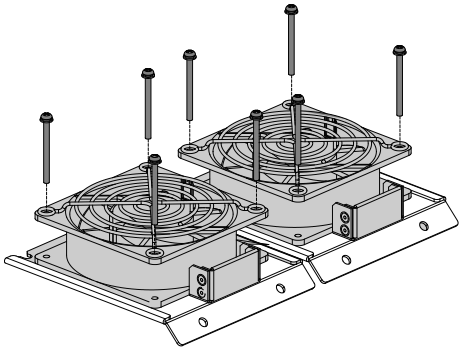
3. Removing fan components:

   a. Unplug the two male power connectors that used to power up the fan.
   b. Remove the four M6 x 16 bolts that fasten the fan components with an M6 socket wrench (opening size 10).
   c. Use the space on the right side of the cabinet to remove the fan components directly or remove the copper busbar to take out the fan components.

   Note: There are two fan components on the top of the heat exchanger, which are independent of each other.



4. Removing the fan: Use an M4 screwdriver to remove the M4 x 50 SEMS screws that secure the fan and the DC fan.
   Note: Each fan is fixed to the base with four screws.



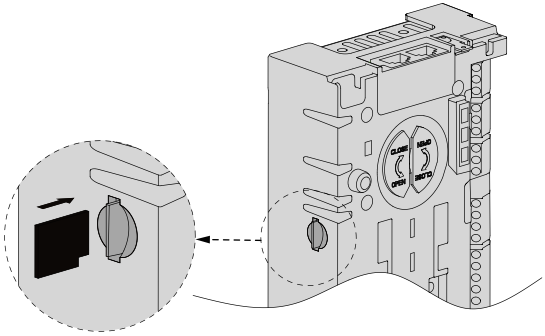
5. Installing the fan: Install a new fan of the same specifications based on the same procedure, but in the reverse order.

6.4.11Replacing the SD Card and Battery of the HCU Control Module

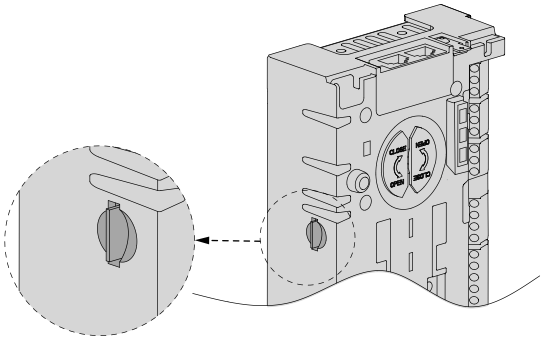
Replacing the memory card

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

1. Take electrical safety precautions before operation according to *"6.1 Safety Instructions for Maintenance and Repair" on page 45*.
2. Press the SD card to take it out straightly from the faulty module.
3. Push the SD card into the SD card base of the HCU control module, as shown below.



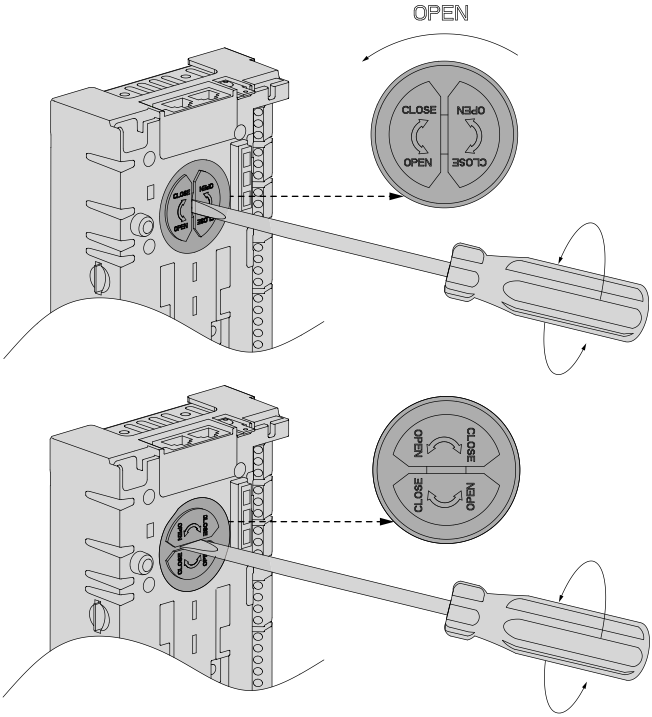
4. Ensure the SD card is inserted in place, and then check whether the SD card floats. Otherwise, an exception can occur due to poor contact.



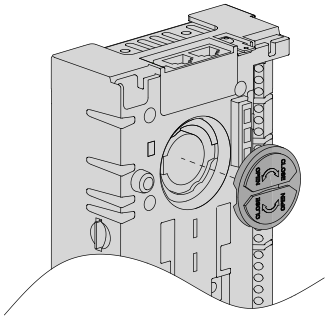
Replacing the battery

To replace the battery, do as follows:

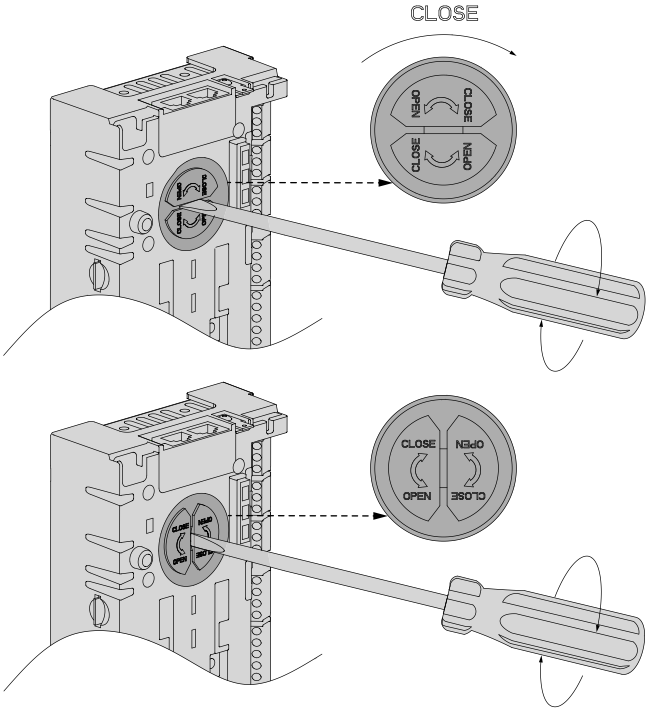
1. Turn the battery cover 90° counterclockwise with a #2 straight screwdriver until the cover is released.

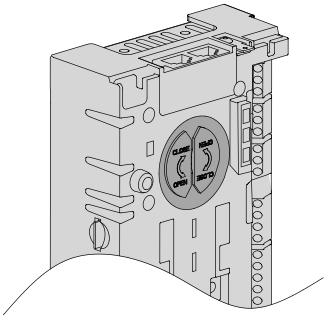


2. Remove the cover. Press one side of the battery with the screwdriver to remove the battery. Then, install a new battery.



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

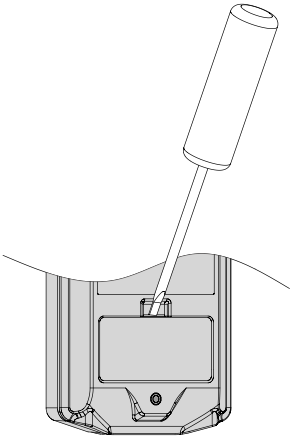




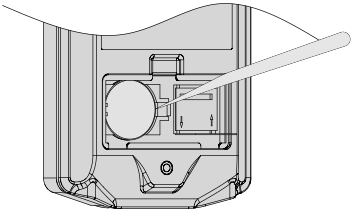
4. Dispose of the retired battery in accordance with local rules or applicable laws.

6.4.12Replacing the SOP-20-880 Battery

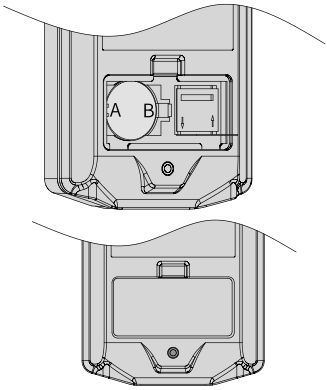
1. Take electrical safety precautions before operation according to *"6.1 Safety Instructions for Maintenance and Repair" on page 45*.
2. Use straight screwdriver or fingers to open the battery rear cover, as shown below.



3. Pry the battery out with tweezers or a small straight screwdriver.



4. 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.

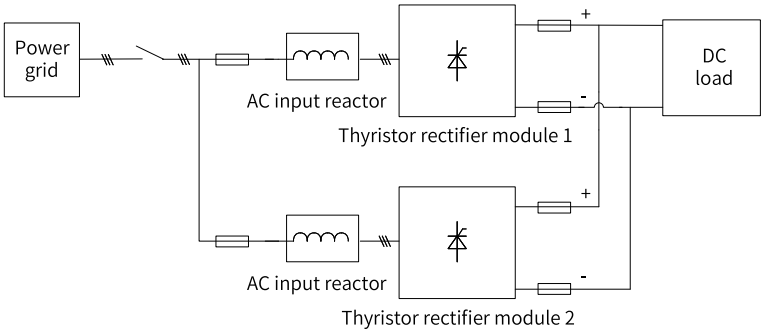


5. Install the battery cover with a tool or your finger.

7 Ordering Instructions

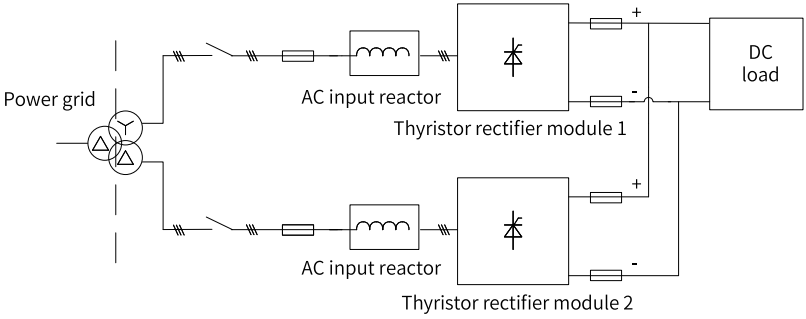
Two paralleled 6-pulse thyristor rectifiers

The derating coefficient for two paralleled 6-pulse thyristor rectifiers of 1520 A/690 V is 0.93. After derating, overload current threshold is 2827 A. The system topology is shown in the following figure.



Two paralleled 12-pulse thyristor rectifiers

The derating coefficient for two paralleled 12-pulse thyristor rectifiers of 1520 A/690 V is 0.93. After derating, overload current threshold is 2827 A. A 12-pulse rectifier can eliminate the 5th and 7th harmonics of the power grid, thus greatly reducing harmonic distortion and conducted emission in the line current. A 12-pulse rectifier system requires a phase-shifting transformer or two independent transformers with the same primary-to-secondary transformation ratio. A phase difference of 30° must be present between windings on the secondary side. The system topology is shown in the following figure.



List of ordering numbers

The following table describes the product models and ordering numbers of the MD880 series 690 VAC high-performance water-cooled basic rectifier module.

Table 7–1 Ordering instructions

Model MD880LC-20M-⋯	Frame	Part No.	Quantity	Remark
2000-7	D3D	1. MD880LC-20M-2000-7	1	Basic rectifier module
		2. MD880LC-WAHE-1.8 kW	1	Water-to-air heat exchanger assembly with fan (optional)
		3. HE300-110-1000-7-L1	2	AC input reactor (optional)
3720-7	2 x D3D	1. MD880LC-20M-2000-7	2	Basic rectifier module
		2. MD880LC-WAHE-1.8 kW	2	Water-to-air heat exchanger assembly with fan (optional)
		3. HE300-110-1000-7-L1	4	AC input reactor (optional)
1520-7+SCR	D3T	1. MD880LC-20M-2827-7+SCR	1	Basic rectifier module
		2. HCU-20	1	Basic rectifier control module
		3. HFAN-10	1	Fan fault detection module (optional)
		4. MD880LC-20M-1520-7-L1	2	AC input reactor (optional)
		5. MD880LC-WAHE-3.4 kW	2	Water-to-air heat exchanger assembly with fan (optional)
2827-7+SCR	2 x D3T	1. MD880LC-20M-1520-7+SCR	2	Basic rectifier module
		2. HCU-20	1	Basic rectifier control module
		3. HPCU-40	1	Parallel control module
		4. HFAN-10	2	Fan fault detection module (optional)
		5. MD880LC-20M-1520-7-L1	2	AC input reactor (optional)
		6. MD880LC-WAHE-3.4 kW	2	Water-to-air heat exchanger assembly with fan (optional)
4241-7+SCR	3 x D3T	1. MD880LC-20M-1520-7-SCR	3	Basic rectifier module
		2. HCU-20	1	Basic rectifier control module
		3. HPCU-40	1	Parallel control module
		4. HFAN-10	2	Fan fault detection module (optional)
		5. MD880LC-20M-1520-7-L1	3	AC input reactor (optional)
		6. MD880LC-WAHE-3.4 kW	3	Water-to-air heat exchanger assembly with fan (optional)

Model MD880LC-20M-⋯	Frame	Part No.	Quantity	Remark
5654-7+SCR	4 x D3T	1. MD880LC-20M-1520-7-SCR	4	Basic rectifier module
		2. HCU-20	1	Basic rectifier control module
		3. HPCU-40	1	Parallel control module
		4. HFAN-10	3	Fan fault detection module (optional)
		5. MD880LC-20M-1520-7-L1	4	AC input reactor (optional)
		6. MD880LC-WAHE-3.4 kW	4	Water-to-air heat exchanger assembly with fan (optional)

Note

When four parallel units are configured with three fan fault detection modules, three slots on the HCU will be occupied. If additional function modules are needed, slot expansion can be achieved by using an optical fiber expansion module (HOFM-10 or HOFM-30) and a function expansion module (HESD-10) in combination. For specific model selection and usage instructions, see the *HCU Control Module Hardware Guide*.

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