



User Guide

MD880-40 Series

Active Rectifier Hardware



User Guide

Preface

Thank you for purchasing the Unity Drive MD880 high-performance multidrive system.

The MD880 has set an new industrial benchmark in terms of structure, power density, response, control precision, and scope of application. Product Advantages:

- Voltage class: 400/690 V
- Rated power range: 3.7 to 5,600kW
- Complete rectifier module types: basic rectifier, feedback rectifier and active rectifier
- Compatible with asynchronous induction motors, permanent magnet synchronous motors and synchronous reluctance motors
- Excellent dynamic response and control accuracy

Wide application range:

- Metallurgy

High-speed wire rod and hot steel strip continuous rolling equipment, wide and thick plate equipment, cold rolling machine, pickling line, annealing line, galvanizing line, color coating line, non-ferrous metal alloy manufacturing equipment, and non-ferrous metal rolling equipment

- Papermaking

Papermaking combined equipment, including continuous production lines such as headbox, wire section, press section, drying section, sizing, hard calendering, coating, supercalender, and rewinding machine

- Harbor equipment and other large lifting equipment

Shore container bridge crane, rubber tired (rail type) container gantry crane, grab ship unloader, grab door seat crane, large shipbuilding gantry crane, and large metallurgical casting crane

- Ships

Marine electric main and auxiliary machine system equipment and installation ships

- Cables

Large frame stranding machine, coiling machine, copper aluminum multi-motor large drawing machine

- Others

Wind power converter, unit test bench, military equipment, power low voltage control, oil and gas transportation, mine transmission

The MD880-40 series products are active rectifiers in the MD880 system, with stand-alone power up to 394–639 kW, and maximum parallel power up to 6069 kW. The highly integrated active rectifier module allows for convenient assembly and maintenance, better utilization of the cabinet space, fewer cabinets and less space occupation.

This guide describes the hardware of the MD880-40 series active rectifier, covering safety instructions, product information, mechanical and electrical installation, control module, maintenance and inspection, and ordering instructions. Read and understand this manual before use. Contact our customer service center if you have any question during the use.

Precautions
◆ The drawings in the user guide sometimes show the product without covers or protective guards to display more details. Remember to install the covers or protective guards as specified first, and then perform operations in accordance with the instructions. ◆ The drawings in the user guide are shown for reference only and may not match the product you purchased. ◆ The guide is the property of Unity Drive. The guide is subject to change without notice due to product upgrade. ◆ Contact our agents or customer service center if you have problems during the use.

Related Manuals

Rectifiers	Manual Code
◆ MD880-40 Series Active Rectifier Hardware User Guide	19010582
◆ MD880-40 Series Active Rectifier Software User Guide	19010583
◆ MD880-20 Series Basic Rectifier Hardware User Guide	19010517
◆ MD880-20 Series Basic Rectifier Software User Guide	19010567
Inverters	
◆ MD880-50 Series Inverter Hardware User Guide	19010447
◆ MD880-50 Series Inverter Software User Guide	19010602
Others	
◆ SOP-20-880 Smart Operation Panel User Guide	19010367
◆ SOP-20-880 Base Kit Installation Guide	19010401
◆ HCU Control Module User Guide	19010528
◆ HPG-10-HTL Incremental Encoder Signal Detection Module User Guide	19010500
◆ HPG-50-TTL Incremental Encoder Signal Detection Module User Guide	19010501
◆ HDP-10 PROFIBUS DP Fieldbus Adaptation Module User Guide	19010490
◆ HSVM-10 Synchronous Voltage Detection Module User Guide	19010588
◆ HOFM-10 Optical Fiber Expansion Module User Guide	19010443

Revision History

Date	Revised Version	Change Description
2020.5	A00	First issue.
2020.11	A01	Made minor corrections

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Safety Instructions

Safety Disclaimer

- 1) Before installing, using, and maintaining this product, read the safety information and precautions thoroughly, and comply with them during operations.
- 2) To ensure the safety of humans and products, follow the signs on the product and all the safety instructions in this user guide.
- 3) The "CAUTION" "WARNING" and "DANGER" signs are only supplements to the safety instructions.
- 4) Use this product according to the designated environment requirements. Damage caused by improper usage is not covered by warranty.
- 5) Unity Drive shall take no responsibility for any personal injuries or property damage caused by improper usage.

Safety Levels and Definitions

-  **DANGER** indicates that failure to comply with the notice will result in severe personal injuries or even death.
-  **WARNING** indicates that failure to comply with the notice may result in severe personal injuries or even death.
-  **CAUTION** indicates that failure to comply with the notice may result in minor personal injuries or damage to the equipment.

Safety Instructions

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

**CAUTION**

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

Storage and Transportation**WARNING**

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

**CAUTION**

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

Installation**DANGER**

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



WARNING

- ◆ Thoroughly read the safety instructions and user guide before installation.
- ◆ Do not modify this product.
- ◆ Do not rotate the product components or loosen fixed bolts and bolts marked in red on product components.
- ◆ Do not install this product in places with strong electric or magnetic fields.
- ◆ When this product is installed in a cabinet or terminal equipment, protection measures such as a fireproof enclosure, electrical enclosure, or mechanical enclosure must be provided. The IP rating must meet IEC standards and local laws and regulations.
- ◆ Do not drop conductors such as wire ends and screws, or other foreign objects into the equipment. Failure to comply may cause damage to the device!
- ◆ Install the equipment in such a way as to ensure good heat dissipation.

Wiring



DANGER

- ◆ Equipment installation, wiring, maintenance, inspection, or parts replacement must be performed by only professionals.
- ◆ Never perform wiring at power-on. Failure to comply will result in an electric shock.
- ◆ Before wiring, cut off all equipment power supplies. Wait at least 15 minutes before further operations because residual voltage exists after power-off.
- ◆ Make sure that the equipment and product are well grounded. Failure to comply will result in an electric shock.
- ◆ During wiring, follow the proper electrostatic discharge (ESD) procedures, and wear an antistatic wrist strap. Failure to comply will result in damage to the equipment or internal product circuits.



WARNING

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

Power-on
 DANGER ◆ Before power-on, make sure that the equipment and product are installed properly with reliable wiring and the motor can be restarted. ◆ Before power-on, make sure that the power supply meets equipment requirements to prevent equipment damage or even a fire. ◆ At power-on, unexpected operations may be triggered on the equipment or product. Therefore, stay away from the equipment or product. ◆ After power-on, do not open the cabinet door of the equipment and protective cover of the product. Failure to comply will result in an electric shock. ◆ Do not touch any wiring terminals at power-on. Failure to comply will result in an electric shock. ◆ Do not remove any part of the equipment or product at power-on. Failure to comply will result in an electric shock.
Operation
 DANGER ◆ Do not touch any wiring terminals during operation. Failure to comply will result in an electric shock. ◆ Do not remove any part of the equipment during operation. Failure to comply will result in an electric shock. ◆ Do not touch the equipment shell, fan, or resistor for temperature detection. Failure to comply will result in heat injuries. ◆ Signal detection must be performed by only professionals during operation. Failure to comply will result in personal injuries or equipment damage.
 WARNING ◆ Prevent metal or other objects from falling into the device during operation. Failure to comply may result in equipment damage. ◆ Do not start or stop the equipment using the contactor. Failure to comply may result in equipment damage.
Maintenance
 DANGER ◆ Equipment installation, wiring, maintenance, inspection, or parts replacement must be performed by only professionals. ◆ Do not maintain the equipment at power-on. Failure to comply will result in an electric shock. ◆ Before maintenance, cut off all equipment power supplies and wait at least 15 minutes.



WARNING

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

Repair



DANGER

- ◆ Equipment installation, wiring, maintenance, inspection, or parts replacement must be performed by only professionals.
- ◆ Do not repair the equipment at power-on. Failure to comply will result in an electric shock.
- ◆ Before inspection and repair, cut off all equipment power supplies and wait at least 15 minutes.



WARNING

- ◆ Require for repair services according to the product warranty agreement.
- ◆ When the equipment is faulty or damaged, require professionals to perform troubleshooting and repair by following repair instructions and keep a repair record.
- ◆ Replace quick-wear parts of the product according to the replacement guide.
- ◆ Do not operate damaged equipment. Failure to comply may result in worse damage.
- ◆ After the equipment is replaced, perform wiring inspection and parameter settings again.

Disposal



WARNING

- ◆ Dispose of retired equipment and products by following local regulations or standards. Failure to comply may result in property damage, personal injuries, or even death.
- ◆ Recycle retired equipment and products by following industry waste disposal standards to avoid environmental pollution.

Safety Signs

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

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

Safety Sign	Description
WARNING 警告  • This equipment should be serviced by qualified personnel only. • Locate and disconnect all energy sources. Wait 15 minutes then operate. • Observe the instructions described in the instruction manual. • 只有专业人士才能维护。 • 维护前确保切断所有电源，15分钟后方可操作。 • 维护前请阅读维护说明书。	◆ This equipment must only be serviced by qualified personnel. ◆ Disconnect all energy sources and wait 15 minutes before maintenance. ◆ Read the maintenance instructions before maintenance.
  注意 为防止预充电电阻过热，两次合闸的时间间隔不小于三分钟	◆ To prevent overheating of the pre-charging resistor, the interval between switch-ons must not be less than three minutes!

1 Product Information

The MD880-40 series product is a general low-voltage active rectifier developed by Unity Drive. It features high power density, compact structure and high reliability. This series is available in 400 V and 690 V, with rate power ranging from 394 kW to 639 kW. By paralleling multiple modules, higher rated output power up to 6069kW can be achieved, which is provided to one or more subsequent inverter modules or other loads.

1.1 Nameplate and Model Number

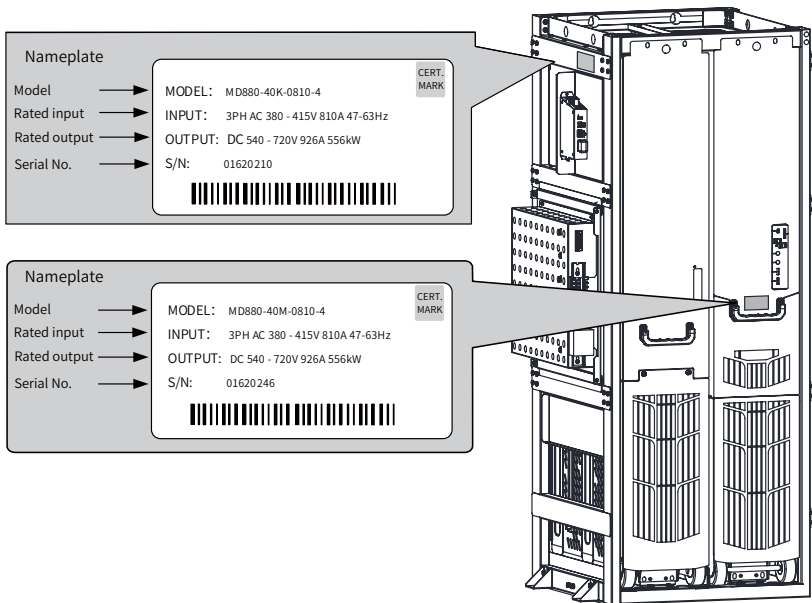


Figure 1-1 Nameplate

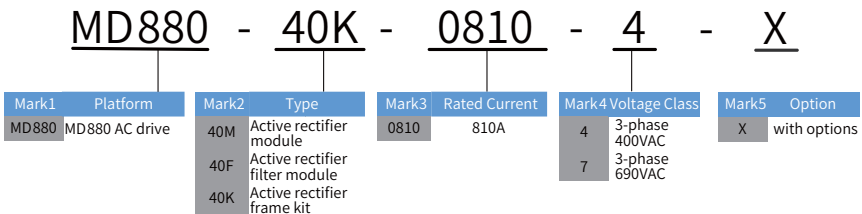


Figure 1-2 Model Number

1.2 Voltage and Power Class

Table 1-1 Voltage and power class of active rectifier frame kit

Product type	Rated Voltage	Rated Power
Active rectifier frame kit	380–415 VAC	394–1056 kW
	525–690 VAC	437–1214 kW

1.3 Specifications and Selection

Table 1-2 Specifications and Selection of MD880-40 Series Active Rectifier

Active Rectifier Model MD880-40-...	No Overload					Light Overload		Heavy Overload		Loss	Structure
	I _N	I _N	I _{max}	S _N	P _N	I _{Ld}	P _{Ld}	I _{Hd}	P _{Hd}	P _{loss}	
	Aac	Adc	Adc	kVA	kW	Adc	kW	Adc	kW	kW	
U _N = 400 V (380–415 V) , ±10%(-15%, < 1 min) (power: 400 V)											
0575-4	575	657	854	398	394	631	379	493	296	10.7	BLCL+H8
0810-4	810	926	1204	561	556	889	533	694	417	15.5	BLCL+H8
1092-4	1092	1248	1623	757	749	1198	719	936	562	20.3	BLCL+2H8
1539-4	1539	1759	2287	1066	1056	1689	1013	1319	792	29.5	BLCL+2H8
2185-4	2185	2498	3247	1514	1499	2398	1439	1873	1124	40.6	2*(BLCL+2H8)
3078-4	3078	3519	4574	2132	2111	3378	2027	2639	1583	58.9	2*(BLCL+2H8)
4617-4	4617	5278	6861	3199	3167	5067	3040	3958	2375	88.4	3*(BLCL+2H8)
U _N = 690 V (525–690 V) , ±10%(-15%, < 1 min) (power: 690 V)											
0369-7	369	422	548	441	437	405	419	316	327	12.4	BLCL+H8
0540-7	540	617	802	645	639	593	613	463	479	16.5	BLCL+H8
0701-7	701	801	1042	838	829	769	796	601	622	23.6	BLCL+2H8
1026-7	1026	1173	1525	1226	1214	1126	1165	880	910	31.4	BLCL+2H8
1402-7	1402	1603	2083	1676	1659	1539	1592	1202	1244	47.2	2*(BLCL+2H8)
2052-7	2052	2346	3049	2452	2428	2252	2331	1759	1821	62.8	2*(BLCL+2H8)
3078-7	3078	3519	4574	3678	3642	3378	3496	2639	2731	94.2	3*(BLCL+2H8)
4104-7	4104	4691	6099	4905	4856	4504	4661	3519	3642	126	4*(BLCL+2H8)
5130-7	5130	5864	7623	6131	6069	5630	5827	4398	4552	157	5*(BLCL+2H8)

1) Definition:

I_N : rated input (AC), output (DC) current;

P_{loss} : total loss of active rectifier frame kit;

I_{Max} : maintains the maximum output current for at least 10s (every 300s) at startup;

S_N : rated apparent power;

P_N : rated output power;

I_{Ld} : continuous output current in light overload applications;

P_{Ld} : output power in light overload applications;

I_{Hd} : continuous output current in heavy overload applications;

P_{Hd} : output power in heavy overload applications;

H8: structure of active rectifier module;

BLCL: structure of active rectifier filter module.

1.4 Product Dimensions and Weight

Table 1-3 Dimensions and Weight of MD880-40 Series Active Rectifier

Active Rectifier Model MD880-...	Structure	Dimensions W x D x H (mm)	Weight (kg)	Corresponding Module Model MD880-...	Quantity	Structure	Dimensions W x D x H (mm)	Weight (kg)
40K-0575-4	BLCL+H8	631x624x1450	440	40M-0575-4	1	H8	230x582x1394	130
				40F-0575-4	1	BLCL	230x564x1394	240
40K-0810-4	BLCL+H8	631x624x1450	440	40M-0810-4	1	H8	230x582x1394	130
				40F-0810-4	1	BLCL	230x564x1394	240
40K-1092-4	BLCL+2H8	874x624x1450	650	40M-0575-4	2	H8	230x582x1394	130
				40F-1092-4	1	BLCL	230x564x1394	300
40K-1539-4	BLCL+2H8	874x624x1450	650	40M-0810-4	2	H8	230x582x1394	130
				40F-1539-4	1	BLCL	230x564x1394	300
40K-0369-7	BLCL+H8	631x624x1450	430	40M-0369-7	1	H8	230x582x1394	130
				40F-0369-7	1	BLCL	230x564x1394	240
40K-0540-7	BLCL+H8	631x624x1450	480	40M-0540-7	1	H8	230x582x1394	130
				40F-0540-7	1	BLCL	230x564x1394	240
40K-0701-7	BLCL+2H8	874x624x1450	680	40M-0369-7	2	H8	230x582x1394	130
				40F-0701-7	1	BLCL	230x564x1394	330
40K-1026-7	BLCL+2H8	874x624x1450	680	40M-0540-7	2	H8	230x582x1394	130
				40F-1026-7	1	BLCL	230x564x1394	330

1.5 Technical Data

Table 1-4 Technical Data of MD880-40 Series Active Rectifier

Item		Specification
Basic	Input AC voltage	400 V system: 380–415 VAC, $\pm 10\%$ (-15%, < 1 min) 690 V system: 525–690 VAC, $\pm 10\%$ (-15%, < 1 min)
	Input frequency	47–63Hz
	Unbalance	$\pm 3\%$ of rated voltage at most
	Output voltage	400 V system: 540–720 V DC 690 V system: 740–975 V DC
	Overload capacity	Light overload: 110% for 1 minute every 5 minutes Heavy overload: 150% for 1 minute every 5 minutes
	Working efficiency	More than 97%
	Power factor	> 0.99 (at rated power)
	Carrier frequency	400 V system: Default 3 kHz 690 V system: Default 3 kHz
	Total harmonics THD	THDI < 5% (rated power) THDU < 5% (Rsc > 20)
Operating environment	Ambient temperature	-10°C to +40°C , derated at +40°C to +50°C
	Ambient humidity	5%–95%, no condensation
	Altitude	Max. 4000 m ≤ 1000 m: full performance > 1000 m: derated
Storage environment	Storage temperature	-40°C to +70°C
	Storage humidity	5%–95%, no condensation
Mechanical data	Antivibration performance	Comply with 3M4 vibration level in GB/T4798.3 Steady-state sinusoidal vibration: 2–9 Hz, 3 mm 9–200 Hz, 10 m/s ² Impact: 100 m/s ² , 11 ms
	IP rating	Frame: IP00 Cabinet: IP21
	Security performance	Complies with EN 61800-5-1
	Cooling	Forced air cooling (AF), compliant with EN 60146
Protection functions	Protection functions	Short circuit, overcurrent, overload, overvoltage, undervoltage, phase loss, phase unbalance, overtemperature

1.6 Hardware Description

1.6.1 Operating Principle

The active rectifier is a four-quadrant rectification system, consisting of a combination of an active rectifier module and a active rectifier filter module, a pre-charging circuit, an HCU control module and expansion modules. The active rectifier rectifies three-phase AC to DC power, which is provided to inverters or other loads on a DC bus, and transfers the energy fed back by the loads to the power grid. The active rectifier filter module is an LCL filter for suppressing AC voltage and current harmonics, and can control the voltage and current harmonics at the power grid side to a lower level.

The active rectifier can output a stable and adjustable bus voltage within the allowable power grid voltage range.

The active rectifier is suitable for TN, TT and IT systems.

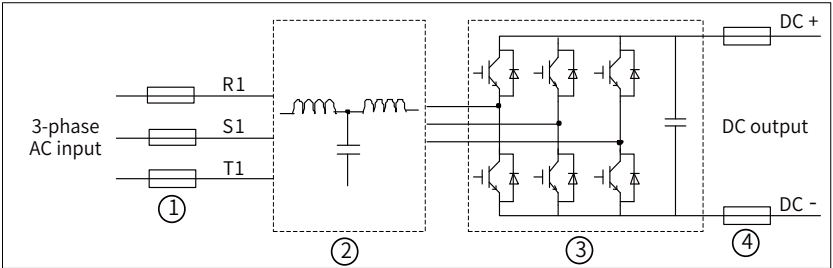


Figure 1-3 Diagram of the main circuit of the stand-alone active rectifier

No.	Component
1	AC side fuse
2	Active rectifier filter module
3	Active rectifier module
4	DC side fuse

1.6.2 Parallel Active Rectifier System

The active rectifier can be paralleled for capacity expansion. The two parallel units adopt the BLCL+2H8 frame structure, that is, two active rectifier modules share one active rectifier filter module. If larger capacity is required, use the (BLCL+2H8)*N structure instead. The maximum value of N for the 400 V system is 3, and the 690 V system is 5; However, parallel is only possible when the software and hardware of the active rectifier modules are identical and the specifications of the active rectifier filter modules are also identical.

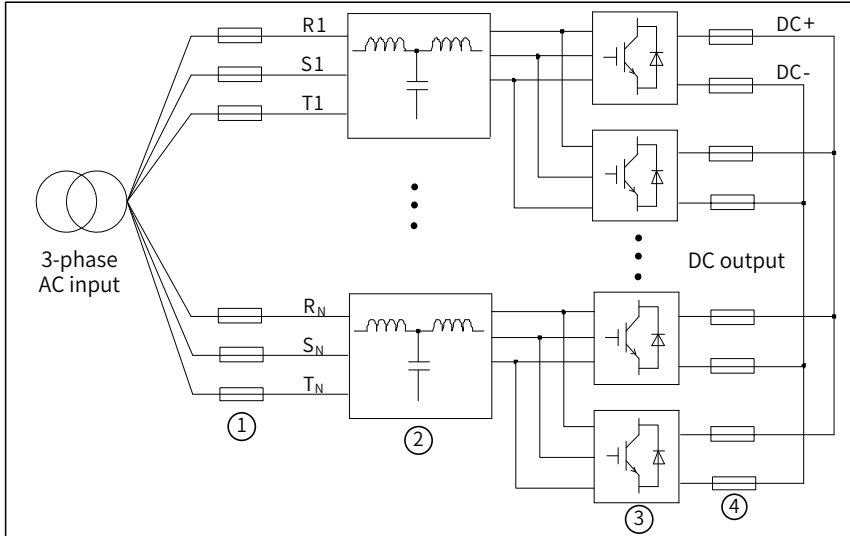


Figure 1-4 Diagram of the main circuit of the parallel active rectifier system

No.	Component
1	AC side fuse
2	Active rectifier filter module
3	Active rectifier module
4	DC side fuse

1.6.3 Electrical Diagram of a Typical Drive System

The following diagram shows the electrical wiring of the active rectifier and drive system.

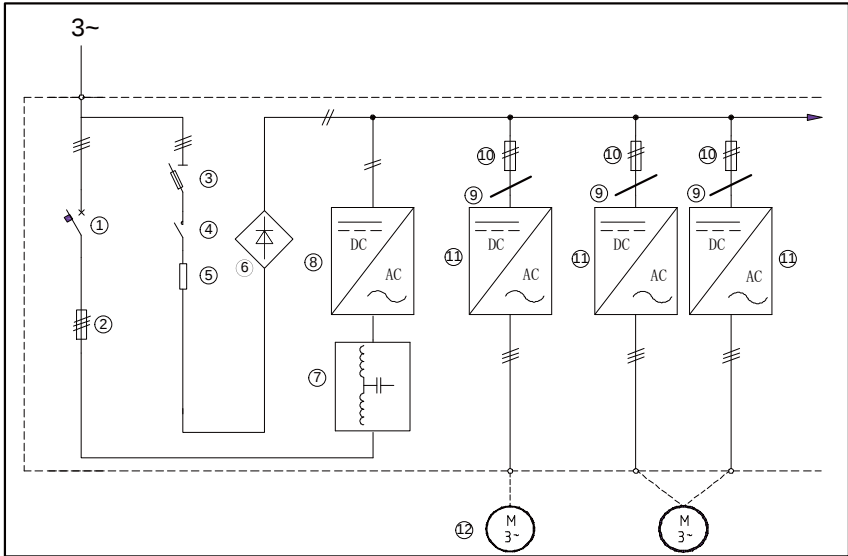


Figure 1-5 Electrical wiring of the active rectifier and drive system

No.	Component
1	Main circuit breaker
2	AC side fuse
3	Pre-charge fuse switch
4	Pre-charge contactor
5	Pre-charge resistor
6	Pre-charge rectifier bridge
7	Active rectifier filter module
8	Active rectifier module
9	Common mode filter
10	DC side fuse
11	Inverter module
12	Motor

1.7 Layout and Dimensions of Module

1.7.1 Layout of Active Rectifier Module

The active rectifier module can be used either as a stand-alone unit or in parallel. In the case of the stand-alone mode, the maximum output current of the active rectifier module in a 400 V system is 810 A.

The AC input side of the active rectifier module is equipped with a quick connector, which is plugged into the quick connector socket inside the cabinet when the rectifier module is inserted into the cabinet. Each module in parallel can be individually wired to the bus.

A pre-charge circuit must be installed in the following cases:

- The active rectifier module is connected to the DC bus through an isolating switch;
- The active rectifier module is directly connected to the DC bus, and the bus is incapable of charging.

Layout of the Active Rectifier Module

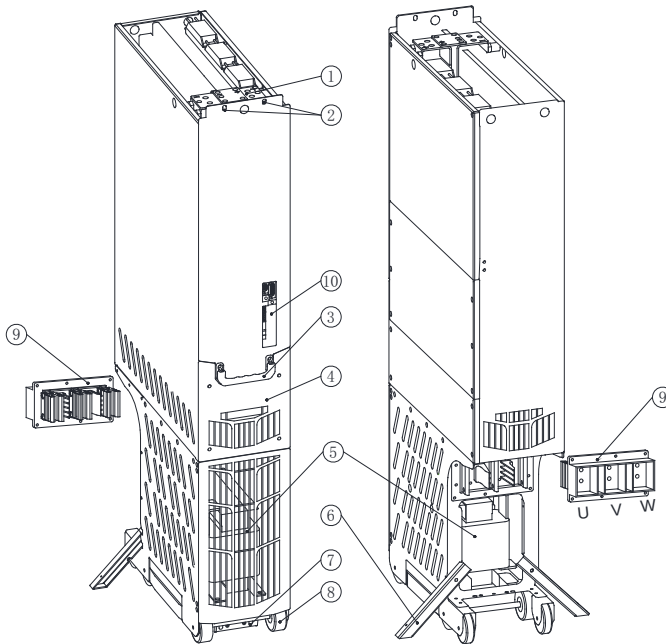


Figure 1-6 Layout of the active rectifier module

No.	Component
1	DC output terminal
2	Top spray protected fastening hole
3	Handle
4	Cooling fan
5	AC reactor
6	Anti-tipping support
7	Bottom sprayed protected fastening hole, the grounding point (PE) between the active rectifier module frame and the cabinet frame
8	Pulley
9	Quick connector plug (matching the quick connector socket inside the cabinet)
10	24 V power terminal/optical fiber connection terminal (see "3.3.1 Connecting Active Rectifier Module" for details)

1.7.2 Dimensions of Active Rectifier Module

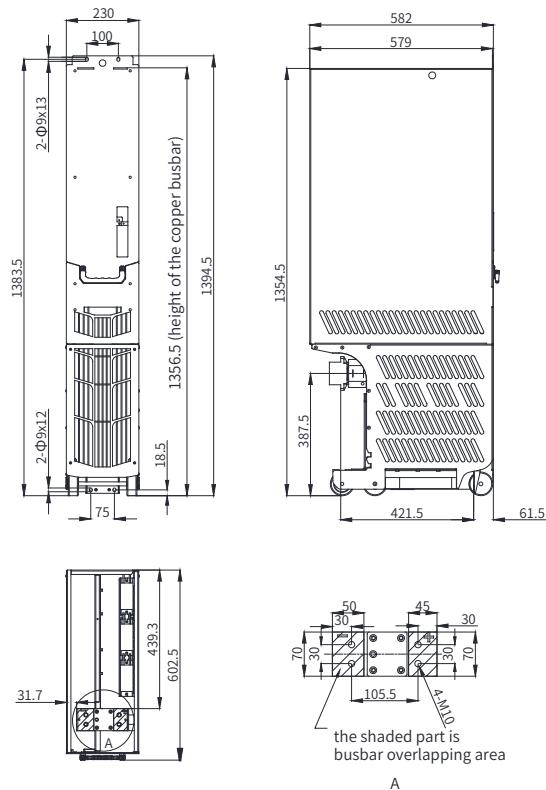


Figure 1-7 Dimensions of the active rectifier module (mm)

1.7.3 Layout of Active Rectifier Filter Module

The active rectifier filter module is used to suppress current harmonics and is an important part of the active rectifier. Its layout is as follows:

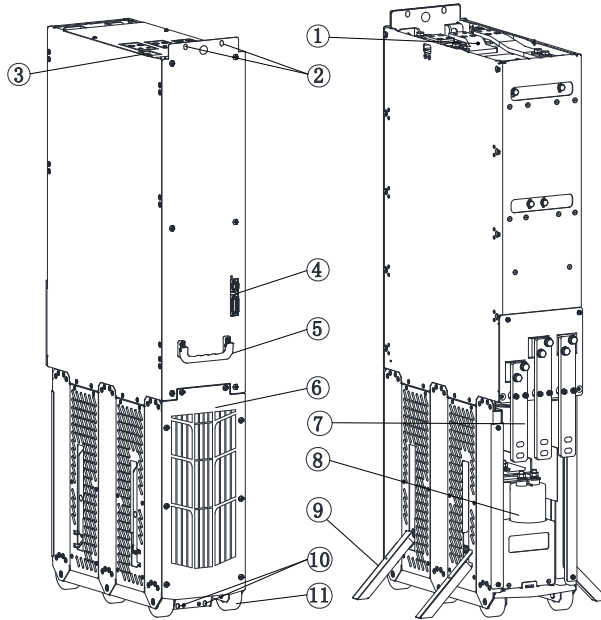


Figure 1-8 Layout of the active rectifier filter module

No.	Component
1	Input copper busbar
2	Fastening hole
3	AC voltage sampling terminal
4	Fan power terminal, BLCL temperature switch connection terminal (see "3.3.2 Connecting the Active Rectifier Filter Module" for details)
5	Handle
6	Cooling fan
7	Output copper bar
8	Capacitor
9	Anti-tipping support
10	Spray protected fastening hole, the grounding point (PE) between the module frame and the cabinet frame
11	Pulley

1.7.4 Dimensions of Active Rectifier Filter Module

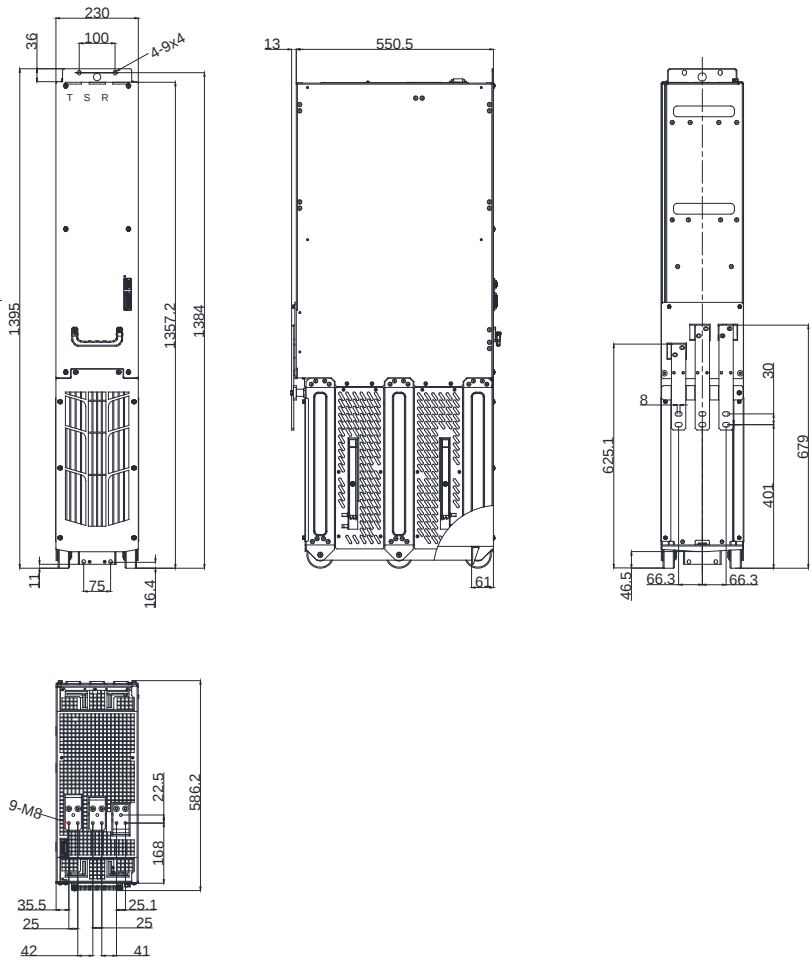


Figure 1-9 Dimensions of the active rectifier filter module (mm)

1.8 Layout and Dimensions of Frame Kit

1.8.1 Layout and Dimensions of BLCL+H8 Frame Kit

Introduction to the active rectifier BLCL+H8 frame

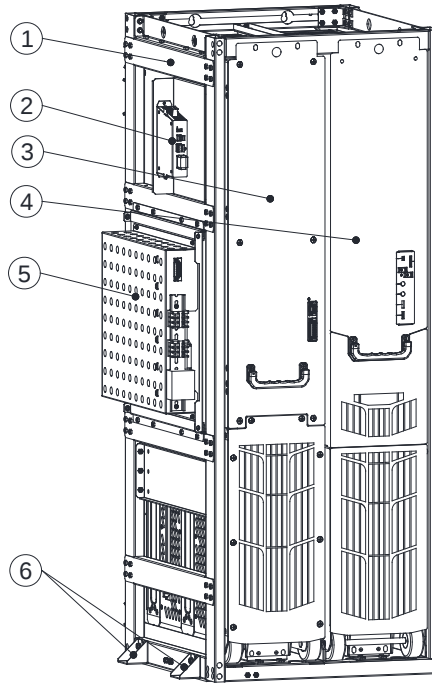


Figure 1-10 Active rectifier BLCL+H8 frame

No.	Component
1	Frame
2	HSVM -10 synchronous voltage detection module (option)
3	Active rectifier filter module
4	Active rectifier module
5	Active rectifier frame kit accessory kit (For details on the terminal, see "3.4.1 Connection of BLCL+H8 Frame Kit")
6	Fastening parts for transportation

1.8.2 Dimensions of BLCL+H8 Frame Kit

Dimensions of the active rectifier BLCL+H8 frame

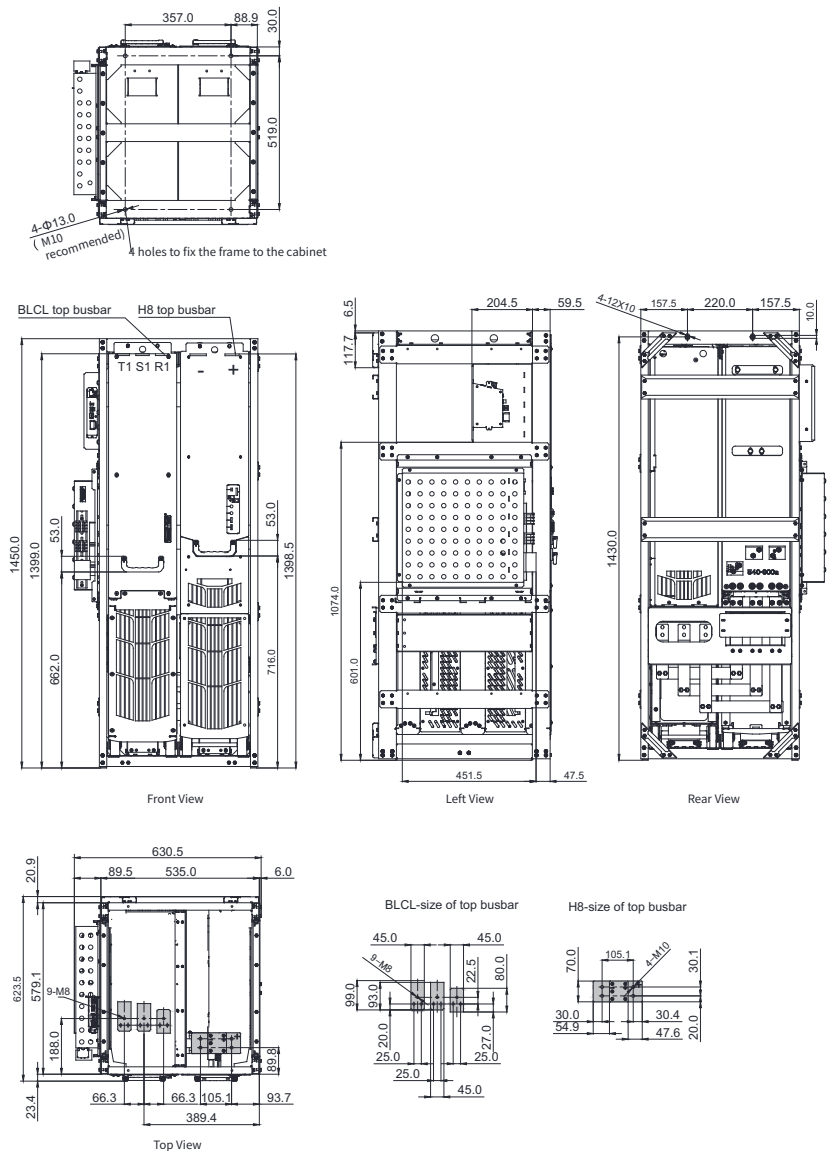


Figure 1-11 Dimensions of the active rectifier BLCL+H8 frame (mm)

1.8.3 Layout of BLCL+2H8 Frame Kit

Introduction to the active rectifier BLCL+2H8 frame

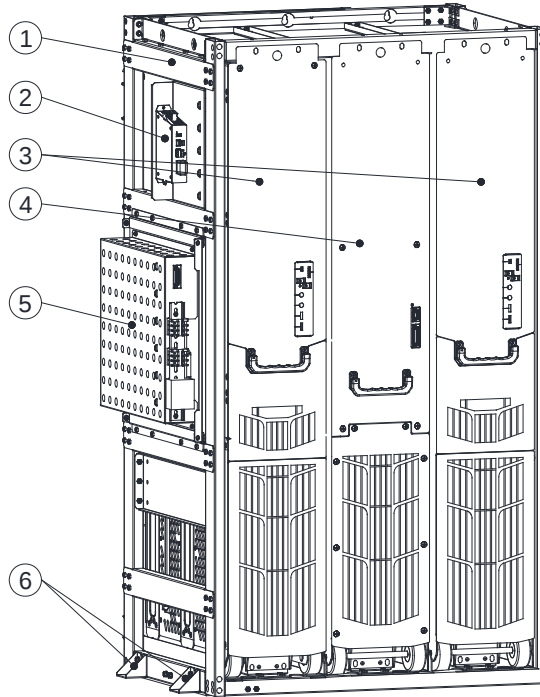


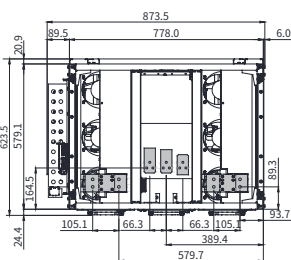
Figure 1-12 Active rectifier BLCL+2H8 frame

No.	Component
1	Frame
2	HSVM -10 synchronous voltage detection module (option)
3	Active rectifier module
4	Active rectifier filter module
5	Active rectifier frame kit accessory kit (For details on the terminal, see (" 3.4.2 Connection of BLCL+2H8 Frame Kit ").)
6	Fastening parts for transportation

[illegible]

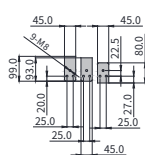
Technical drawing of a rectangular frame assembly. The drawing shows a top-down view of the assembly. The overall dimensions are 104.0 (width) and 60.0 (height). The top horizontal dimension is 204.5, and the right vertical dimension is 59.5. The drawing includes a detailed view of a corner joint and a section view labeled 'A-A' showing the internal structure. The assembly consists of a central panel with a grid of small circles, surrounded by a frame with various components labeled with letters (A, B, C, D, E, F, G, H, I, J, K, L, M, N, O, P, Q, R, S, T, U, V, W, X, Y, Z) and numbers (1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100). The drawing is a technical illustration of a mechanical or structural component.

Rear View

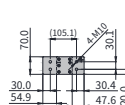


Top View

BLCL-size of top busbar



H8-size of top busbar



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1.9 Cabinet Layout

1.9.1 Layout of Active Rectifier And Drive System

The following diagram shows the layout of the active rectifier and drive system. The actual model used is determined according to the load current.

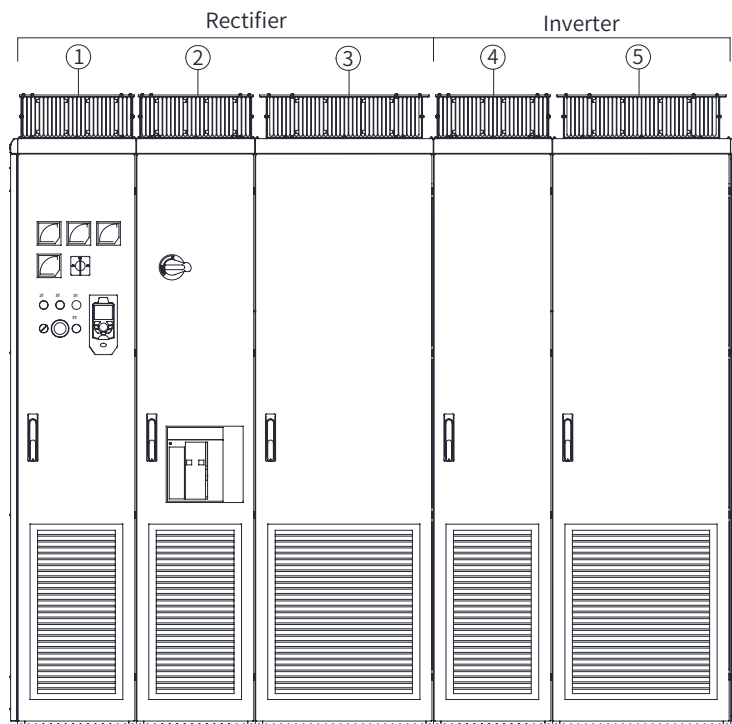


Figure 1-14 Layout of the active rectifier and drive system

No.	Component	Function
1	Auxiliary control cabinet	Including control power, control module, instruments, and control panel
2	Active line connection module	Including the main circuit breaker and pre-charge circuit
3	Active rectifier cabinet	Including the active rectifier filter module, active rectifier module, synchronous voltage detection module (HSVM), and fan power module
4	Inverter cabinet	Including different types of inverter power modules
5	Inverter cabinet	Including different types of inverter power modules

1.9.2 Layout of Auxiliary Cabinet

The auxiliary cabinet is used to accommodate the control devices and auxiliary devices of the rectifier and drive system, including the control circuit power supply transformer, power supply module, HCU control module, HPCU parallel control module, and SOP-20-880 operation panel. The structure and dimensions of the cabinet vary with different optional components.

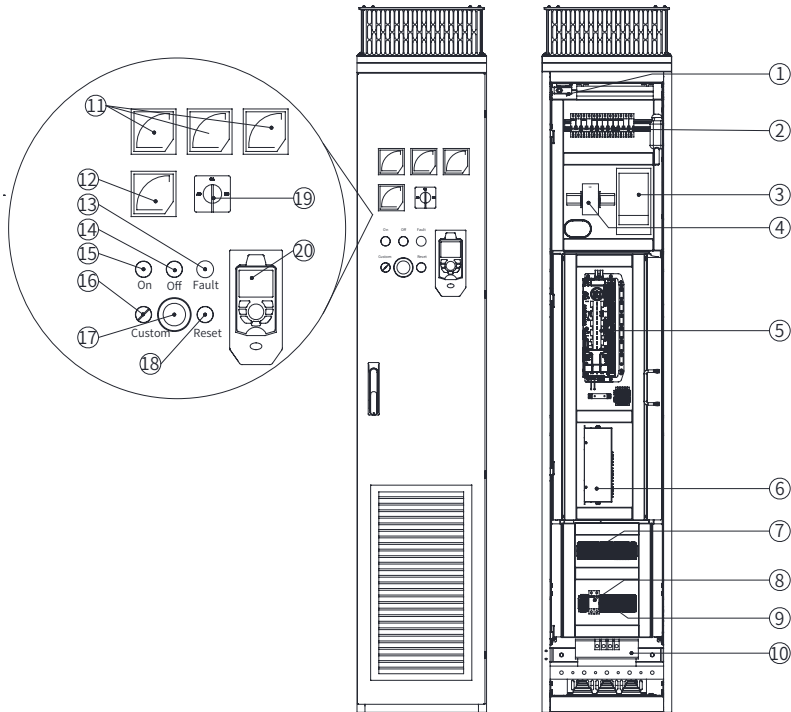


Figure 1-15 Layout of the auxiliary cabinet

No.	Component	Function
1	Door limit switch	User-controlled cabinet light
2	Auxiliary power circuit breaker	Switch on/off the auxiliary power supply and provide overload short circuit protection
3	Isolation switch of the auxiliary power circuit breaker	Open/close the auxiliary power circuit and provide overload protection
4	Power module	For auxiliary power internal connection
5	HCU control module	For active rectifier control
6	HPCU parallel control module	For parallel expansion control
7	Terminal block	For DC 24 V power output
8	Maintenance receptacle	Provide AC 220 V power
9	Terminal block	Input interface for external I/O signals
10	Transformer	Auxiliary power source transformer
11	AC ammeter	Display input current value of the main power supply
12	AC voltmeter	Display the interphase voltage of the main power supply
13	Fault indicator	For fault indication
14	Off switch	Power off
15	On switch	Power on
16	Custom	User-defined function
17	Emergency stop switch	Cut off the main circuit breaker upon emergency
18	Reset button	Reset after a fault occurs
19	Voltage selector	Switch the display of different interphase voltage values
20	SOP-20-880	For rectifier/drive control and parameter display

1.9.3 Layout of Line Connection Cabinet

The active line connection cabinet is used for the connection between the power grid and the active rectifier. The cabinet includes components such as a main breaker and pre-charge resistors. The structure and dimensions of the cabinet vary with different optional components.

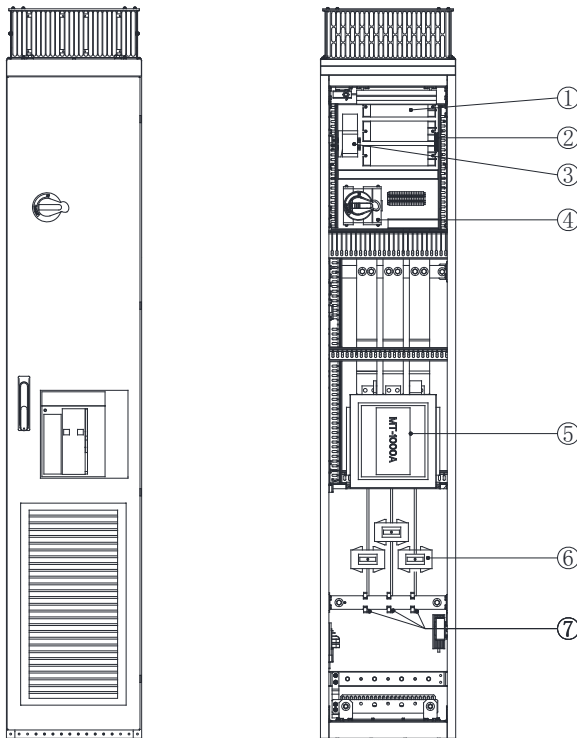


Figure 1-16 Layout of the active line connection cabinet

No.	Component	Function
1	Pre-charge resistor	Restrict the charging current of the bus capacitor
2	Pre-charge rectifier bridge	Used in the pre-charge circuit to convert AC input to DC output
3	Pre-charge contactor	Open/close the pre-charge circuit
4	Pre-charge circuit fuse switch	Open/close the pre-charge circuit and provide overload and short circuit protection
5	Main circuit breaker	Open/close the main circuit and provide overload and short circuit protection
6	Current transformer	Measure current at the input side
7	AC power input	R, S, and T input terminals

1.9.4 Layout of Active Line Cabinet

1) Layout of the active line cabinet (BLCL+H8)

The active line cabinet mainly includes a active rectifier filter module and a active rectifier module. The figure below shows a BLCL+H8 structure layout.

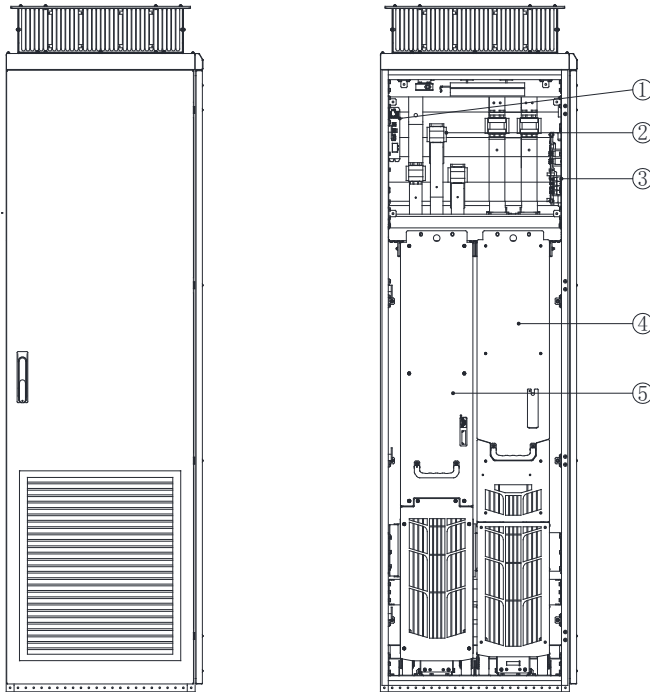


Figure 1-17 Layout of the active line cabinet

No.	Component	Function
1	HSVM Synchronous voltage detection module	For three phase AC voltage sampling
2	AC fuse	Provide overload and short circuit protections at the active rectifier side
3	Fan power	Power supply for the fan of the active rectifier filter module
4	Active rectifier module	The active rectifier IGBT power module, which must be used with an active rectifier filter module
5	Active rectifier filter module	For LCL filtering at the active rectifier input side

2) Layout of the active line cabinet (BLCL+2H8)

The active line cabinet mainly includes a active rectifier filter module and a active rectifier module. The figure below shows a BLCL+2H8 structure layout.

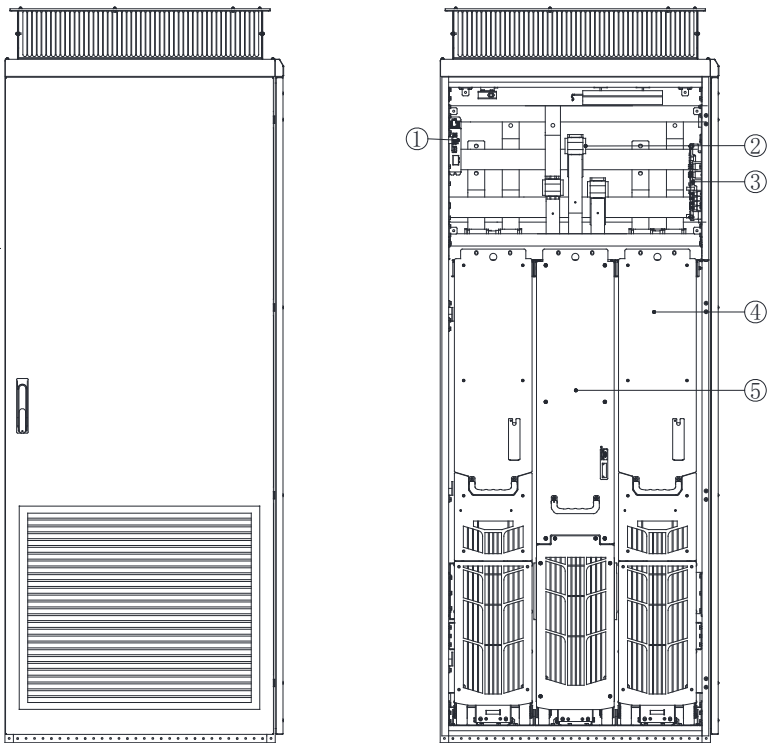


Figure 1-18 Layout of the active line cabinet

No.	Component	Function
1	HSVM Synchronous voltage detection module	For three phase AC voltage sampling
2	AC fuse	Provide overload and short circuit protections at the active rectifier side
3	Fan power	Power supply for the fan of the active rectifier filter module
4	Active rectifier module	The active rectifier IGBT power module, which must be used with an active rectifier filter module
5	Active rectifier filter module	For LCL filtering at the active rectifier input side

1.10 Derating

1) Ambient temperature

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

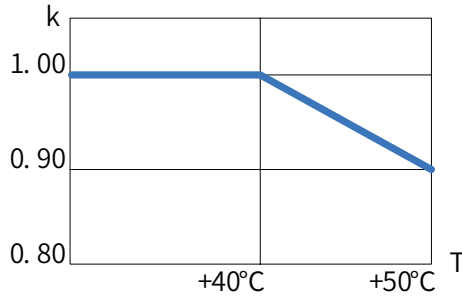


Figure 1-19 Ambient temperature

2) Altitude

When the altitude is 1000 m to 4000 m above sea level, for every 100 m increase in altitude, the output current of the active rectifier must be derated by 1%.

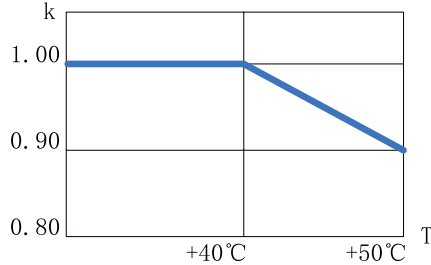


Figure 1-20 Altitude

1.11 Overload Capacity

For some drive systems where overload may occur, a proper reference load current is necessary for the MD880-40 series active rectifier. When the drive system runs at the reference load current (load duration 300s), an overload occurs.

1) Curve in light overload mode

The reference load current in light overload mode (I_L) is based on a 60s 110% duty cycle.

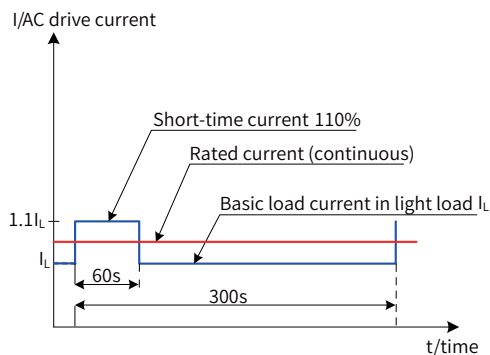


Figure 1-21 Curve in light overload mode

2) Curve in heavy overload mode

The reference load current in heavy overload mode (I_H) is based on a 60s 150% duty cycle.

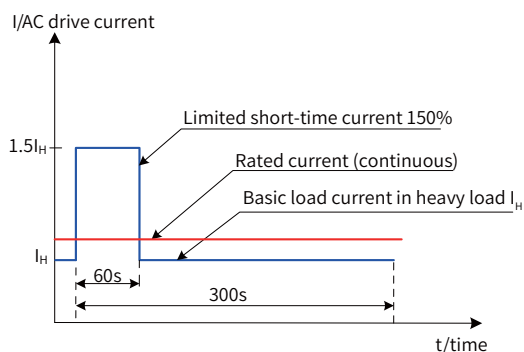


Figure 1-22 Curve in heavy overload mode

1.12 Tightening Torque of Fasteners

Table 1-5 Electrical Connection

Screw/Bolt	Strength Grade	Max. Torque (N · m)
M3	Strength grade: 4.8	0.5
M4	Strength grade: 4.8	1.2
M5	Strength grade: 4.8	2.8
M6	Strength grade: 4.8	4.8
M8	Strength grade: 8.8	20
M10	Strength grade: 8.8	40
M12	Strength grade: 8.8	70
M16	Strength grade: 8.8	200

Table 1-6 Mechanical connection

Screw/Bolt	Strength Grade	Max. Torque (N · m)
M5	Strength grade: 4.8	2.8
M6	Strength grade: 4.8	4.8
M8	Strength grade: 8.8	20

Table 1-7 Insulator connection

Screw/Bolt	Strength Grade	Max. Torque (N · m)
M6	Strength grade: 4.8	4.8
M8	Strength grade: 8.8	9
M10	Strength grade: 8.8	18
M12	Strength grade: 8.8	31

Table 1-8 Cable connector

Screw/Bolt	Strength Grade	Max. Torque (N · m)
M8	Strength grade: 8.8	15
M10	Strength grade: 8.8	32
M12	Strength grade: 8.8	50

1.13 Selection of Fuse

1) AC side fuse

Table 1-9 AC side fuse

Active Rectifier Frame Kit Model	Structure	AC side fuse selection (BUSSMANN)	Quantity	Specifications
MD880-40K-0575-4	BLCL+H8	170M6413	3	900 A, 690 V, SIZE: 3, single hole and flush end contact
MD880-40K-0810-4	BLCL+H8	170M6416	3	1250 A, 690 V, SIZE: 3, single hole and flush end contact
MD880-40K-1092-4	BLCL+2H8	170M6413	6	900 A, 690 V, SIZE: 3, single hole and flush end contact
MD880-40K-1539-4	BLCL+2H8	170M6416	6	1250 A, 690 V, SIZE: 3, single hole and flush end contact
MD880-40K-0369-7	BLCL+H8	170M4416	3	630 A, 690 V, SIZE: 3, single hole and flush end contact
MD880-40K-0540-7	BLCL+H8	170M6413	3	900A, 690 V, SIZE: 3, single hole and flush end contact
MD880-40K-0701-7	BLCL+2H8	170M6415	3	1100A, 690 V, SIZE: 3, single hole and flush end contact
MD880-40K-1026-7	BLCL+2H8	170M6413	6	900A, 690 V, SIZE: 3, single hole and flush end contact

2) DC side fuse

Table 1-10 DC side fuse

Active Rectifier Module Model	Structure	DC Side Fuse Selection (BUSSMANN)	Quantity	Specifications
MD880-40M-0575-4	H8	170M6415	2	1100A, 690 V, SIZE: 3, single hole and flush end contact
MD880-40M-0810-4	H8	170M6418	2	1500A, 690 V, SIZE: 3, single hole and flush end contact
MD880-40M-0369-7	H8	170M6545	2	700A, 1250V, SIZE: 3, single hole and flush end contact
MD880-40M-0540-7	H8	170M6548	2	1000A, 1250V, SIZE: 3, single hole and flush end contact

1.14 Selection of Pre-charge Circuit

Table 1-11 Selection of pre-charge resistor and rectifier bridge

Voltage Class	Rated Current	Pre-charge Resistor Resistance	Pulse Load Power	Three Phase Rectifier Bridge
400V	575–1539 A	2ohm	36000Ws	100 A/1800 V
690V	369–1026 A	5ohm	36000Ws	100 A/1800 V



NOTE

- ◆ To prevent overheating of the pre-charge resistor, the interval between switch-ons must not be less than three minutes!

2 Mechanical Installation

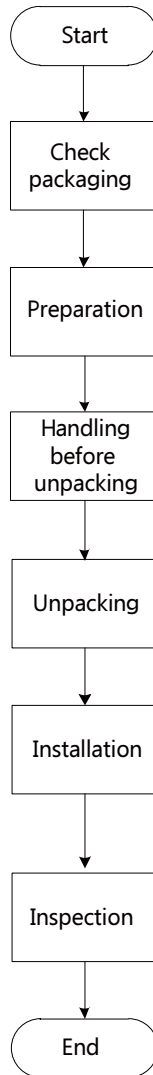


Figure 2-1 Installation flowchart

2.1 Installation precautions

2.1.1 Transportation and Storage

1) Transportation

The cabinet units are heavy and have high center of gravity. Their center of gravity is labeled.

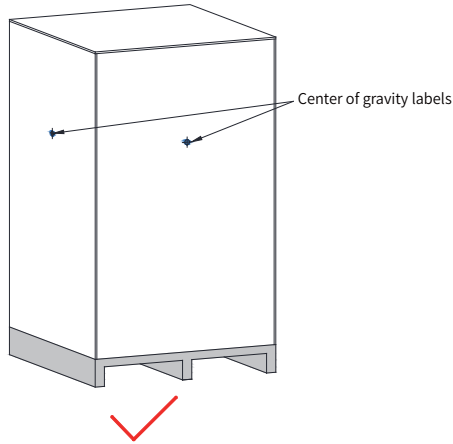


Figure 2-2 Label for center of gravity

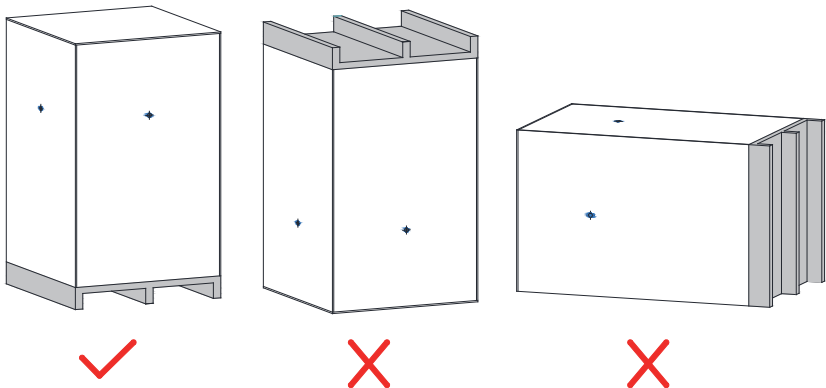


Figure 2-3 Transportation

- Ensure that the ground at the installation location is flat and strong enough to bear the weight of the cabinet units.
- Suitable hoisting gear operated by trained personnel is also required due to the weight of the cabinet units.
- The cabinet units must always be transported in the upright position indicated. The

cabinet modules must not be transported upside down or in a horizontal position. Due to the weight and length of the cabinet modules, they can be transported only with the auxiliary hoisting angle iron on top of the cabinet units and the wooden pallet under the cabinet units.

- The cabinet units must be carried on a wooden pallet when transported with fork-lift trucks. The cabinet units must not be disassembled while still on wooden pallets and awaiting transport.
- When a hoist is used to move the cabinet units, the auxiliary hoisting angle iron must be installed on the cabinet units.

2) Transportation

Transport the packed product by using the pallet under it.

The cabinet units can be transported with a fork-lift truck and hoist. The transportation equipment must have the load capacity larger than the weight of one set of cabinet units.

Adjust the distance between fork-lift feet (larger than one half of the cabinet unit length).

The lifting rope of the hoist must pass through the pallet under the cabinet units, with the relief height not larger than 0.3 m.

- The pallet jack must not move for a long distance or on the slop road.
- When being moved, the cabinet units need to be held by persons on left and right sides.

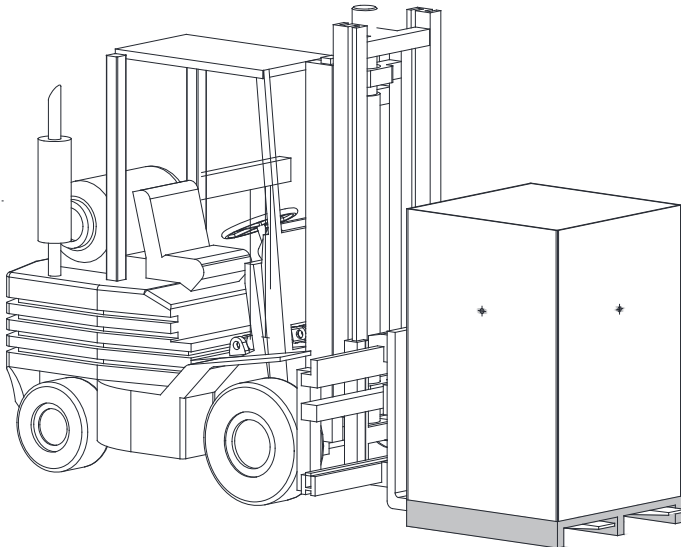


Figure 2-4 Forklift

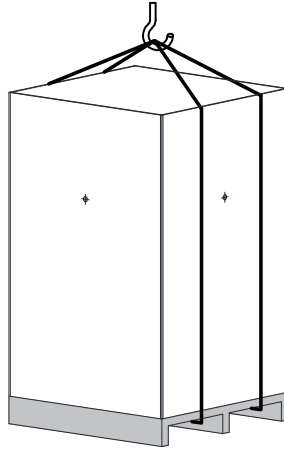


Figure 2-5 Transporting the IPV800 by Crane

3) Acceptance

After receiving the equipment, inspect it carefully. 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 Unity Drive.



- ◆ If the cabinet modules are damaged during transportation, the electrical safety of the cabinet can no longer be ensured. They must not be connected until a thorough high-voltage test has been carried out. Do not connect the equipment before high voltage testing.
- ◆ Personal injury or even death or material damage can result if these factors are not taken into account.

4) Storage

The cabinet units must be stored in a clean and dry room, with temperatures between -40°C and $+70^{\circ}\text{C}$ and temperature variation smaller than 1°C/min . If the cabinet is stored for a prolonged period once it has been unpacked, cover it or take other appropriate measures to ensure that it does not become dirty and that it is protected against environmental influences.

For storage of the equipment, pay attention to the following three aspects:

- Try to store the equipment with the original packing carton of the company.
- Do not expose the AC drive to moisture, high temperature, or outdoor direct sunlight for a long time.

2.1.2 Mechanical Installation Checklist



- ◆ To ensure safe and reliable running, the equipment must be properly installed and commissioned by qualified personnel, taking into account all the warning notices provided.
- ◆ In particular, the general and national installation and safety guidelines for high-voltage installations as well as the guidelines relating to the proper use of tools and personal protective equipment must be observed.
- ◆ Personal injury or even death or material damage can result if these factors are not taken into account.

Check the boxes accordingly in the right-hand column if the activity applies to the cabinet unit in your scope of delivery. In the same way, check the boxes once you have finished the installation procedure to confirm that the activities are complete.

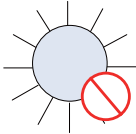
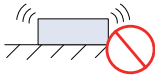
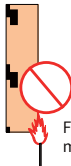
Table 2-1 Mechanical installation checklist

Item	Check That	Compliance
1	The center of gravity is labeled.	☐
2	The packing box is free of loss, damage, and dampness.	☐
3	The load-bearing capacity and properties of the ground must fulfill the requirements for installation of the equipment. For details, see " 2.2.1 Environment ".	☐
4	The minimum ceiling height required (for unhindered air discharge) must be observed. The cooling air supply and exhaust must not be obstructed and must have sufficient space. Sufficient space after cabinet doors are open must be reserved as safety passageway. For details, see " 2.4.1 Installation Requirements ".	☐
5	The cabinet unit housing is intact without distortion, peeling, or crack, and there is no water stain.	☐
6	The accessories (user manual, optional parts) inside the cabinet units are complete.	☐
7	Before the cabinet units are finally installed, the wooden pallets supplied with the transport unit must be removed properly.	☐
8	The cabinet must be firmly attached to the fixing points provided. Connect the equipment as specified. For details, see " 4) Installation of expansion screws ".	☐
9	All shock protection measures (guards) in and on the cabinet modules must be installed before commissioning.	☐

2.2 Installation Preparations

2.2.1 Environment

Item	Quantity
Heat dissipation and ventilation	Install the active rectifier module on the surface of a flame-retardant object and mount it vertically to a mounting bracket with screws. The active rectifier module generates a lot of heat when it is running. Reserve enough space for heat dissipation around the cabinet.
Installation location	Ensure the following requirements are satisfied: The installation base is flat and strong enough to bear the weight of the equipment Avoid direct sunlight Avoid places with humidity higher than 95% and where water drops exist. Avoid places with corrosive, inflammable, or explosive gas. Avoid places with oil dirt and dust
Vibration	Install the equipment in a place not prone to vibration. For the antivibration performance, see " 1.5 Technical Data ".
Ambient temperature	Derating is required for ambient temperatures greater than 40°C and altitudes above 1000 m. For the derating factor, see " 1.10 Derating ".
Enclosure	This product is installed in a cabinet and must be installed in the final system. The final system must provide a fireproof enclosure, electrical enclosure and mechanical enclosure, and comply with local laws and regulations and relevant IEC standards.

 Dust and oil dirt	 Direct sunlight	 Strong vibration
 Ambient temperature must be -10°C to +40°C	 Combustible, explosive and corrosive gas	 Do not install the equipment on a flammable object

2.2.2 Installation Tools

- 13 mm spanner or socket spanner;
- 16 mm spanner or socket spanner;
- 18 mm spanner or socket spanner;
- Cross screwdriver and straight screwdriver (2.5–6 mm);
- Torque wrench
- Crowbar

2.3 Installation of Frame Kit

2.3.1 Installation Space for BLCL+H8 Frame Kit

- 1) Minimum requirement on cabinet dimensions:

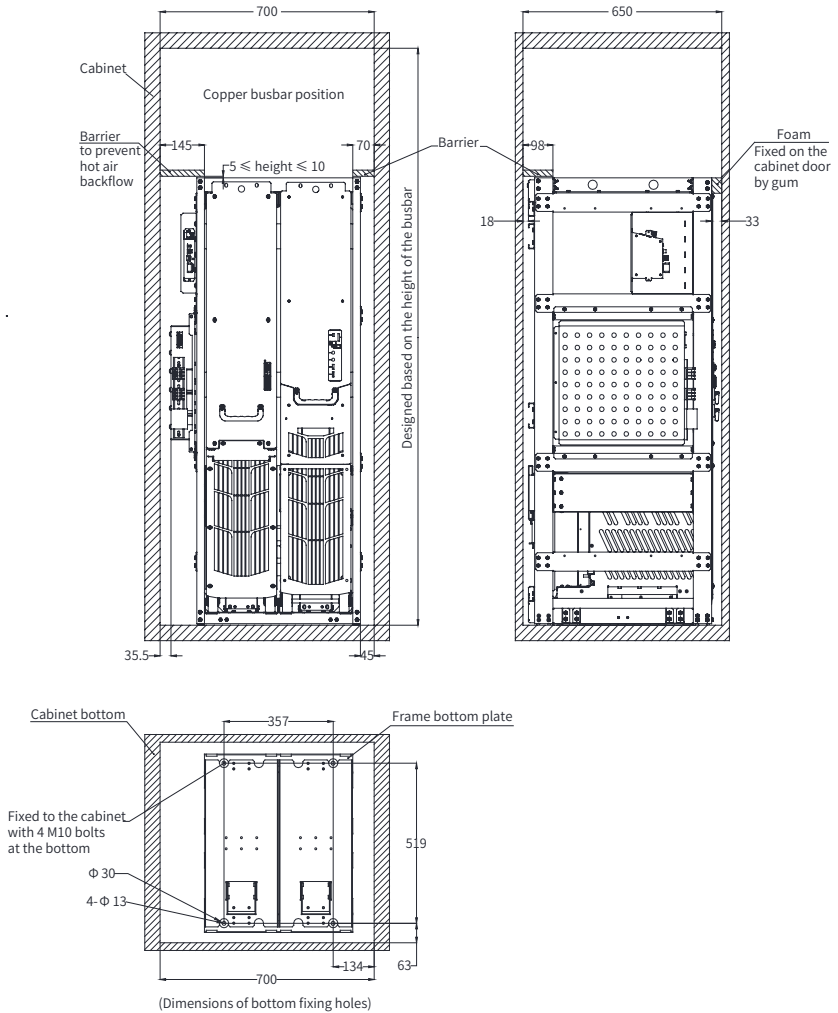


Figure 2-6 Minimum requirement on cabinet dimensions (mm)



NOTE

- ◆ It is recommended to use a 800 mm deep standard cabinet. For a special cabinet, the internal depth must be at least 650 mm.

- 2) Two beams are required at the bottom of the cabinet so that the frame can be pushed in easily.

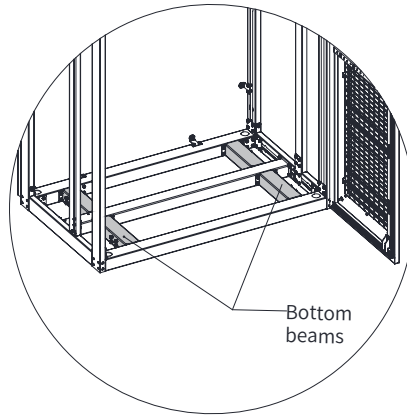


Figure 2-7 Bottom beams

The dimensions are as follows:

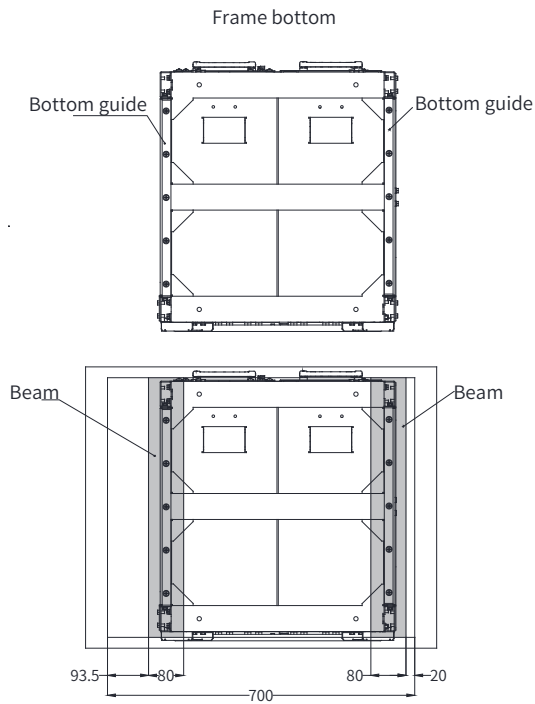


Figure 2-8 Beam dimensions (mm)

2.3.2 Installing BLCL+H8 Frame Kit

Install the frame kit by the following steps:

- 1) Pull the H8 active rectifier module out of the frame (to reduce the weight of the frame kit).
- Remove the 4 transportation fixing parts (b).
 - Lift the frame onto a flat surface.
 - Remove the 4 M8 bolts (a) of the H8 module.
 - Place the mounting rail (c) and take out the H8 module.

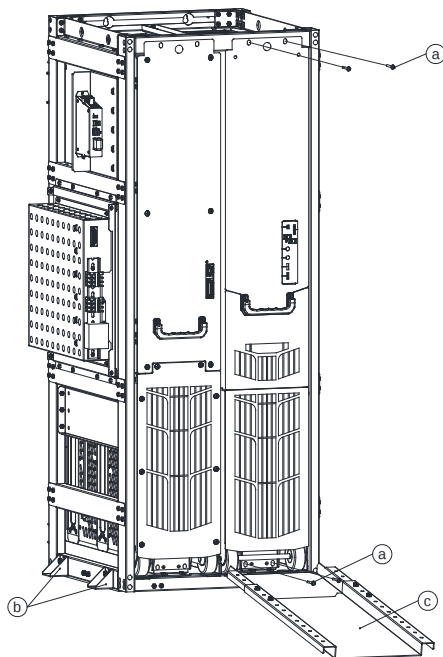


Figure 2-9 Pull the H8 module out of the frame.

- 2) Lift the frame into the cabinet.

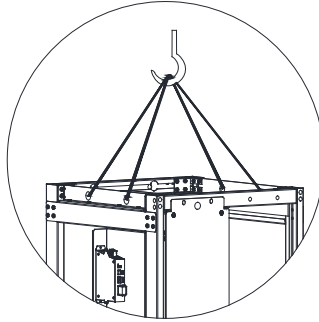


Figure 2-10 Lift the frame into the cabinet

- 3) When the bottom of the frame comes into contact with the bottom of the cabinet, manually push the frame to the specified position. Secure the screws on the bottom and top of the frame.

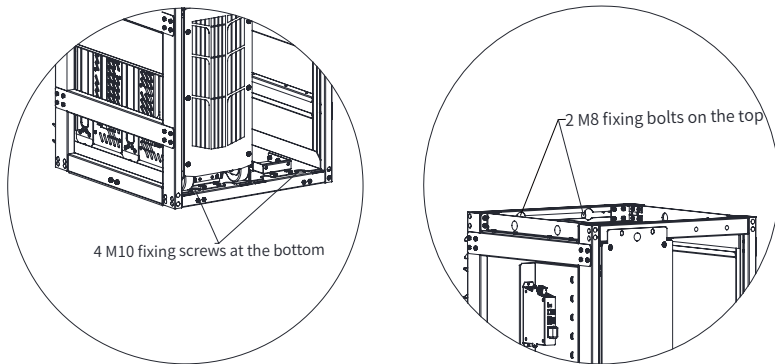


Figure 2-11 Fixing the frame and cabinet

- 4) Place the mounting rail and push the H8 module into the frame to complete the installation.

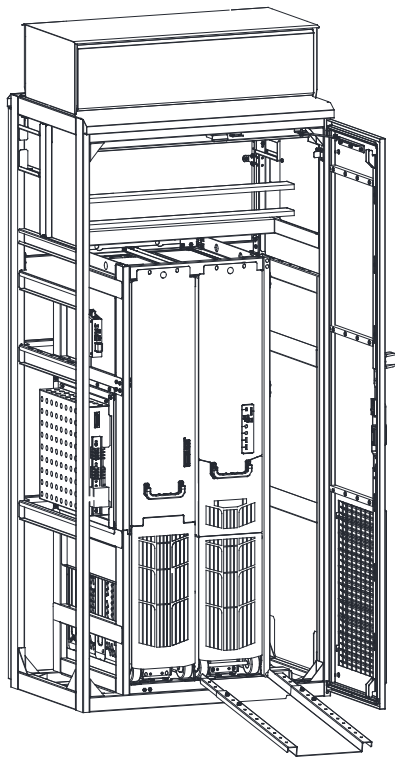
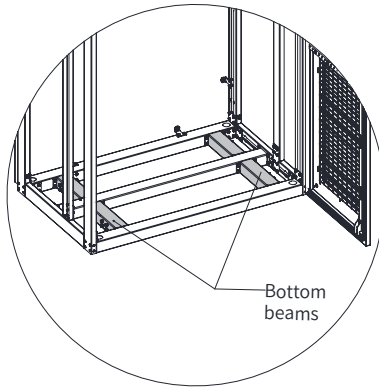


Figure 2-12 Push in the H8 module back

- 2) Two beams are required at the bottom of the cabinet so that the frame can be pushed in easily.



The dimensions are as follows:

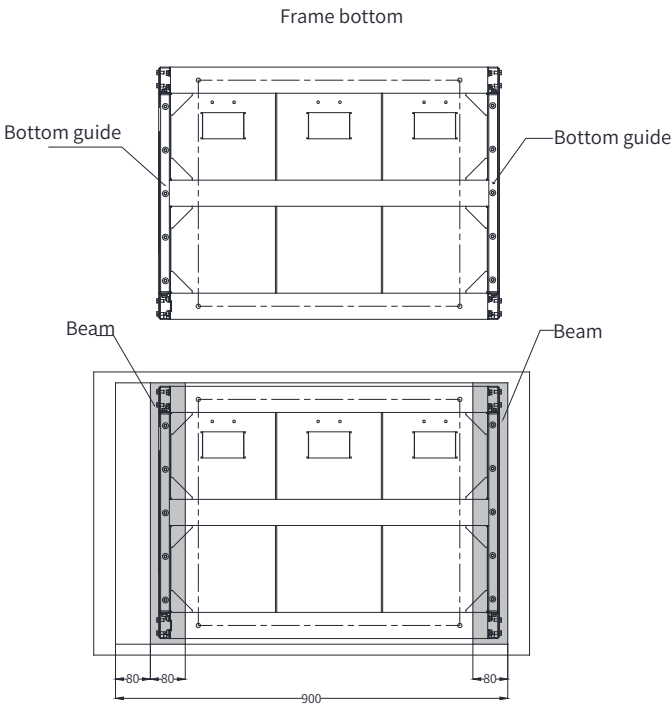


Figure 2-14 Dimensions of bottom beams (mm)

2.3.4 Installing BLCL+2H8 Frame Kit

Install the frame kit by the following steps:

- 1) Pull the two H8 active rectifier module out of the frame (to reduce the weight of the frame kit).
- Remove the 4 transportation fixing parts (b).
 - Lift the frame onto a flat surface.
 - Remove the 4 M8 bolts (a) of the H8 module.
 - Place the mounting rail (c) and take out the H8 module.

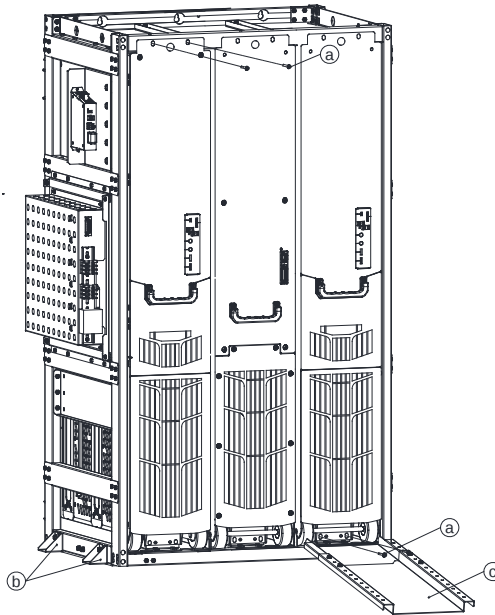


Figure 2-15 Pulling the H8 module out of the frame

- 2) Lift the frame into the cabinet.

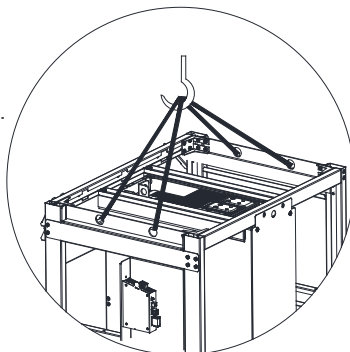


Figure 2-16 Lifting the frame into the cabinet

- 3) When the bottom of the frame comes into contact with the bottom of the cabinet, manually push the frame to the specified position. Lock the bottom and rear screws.

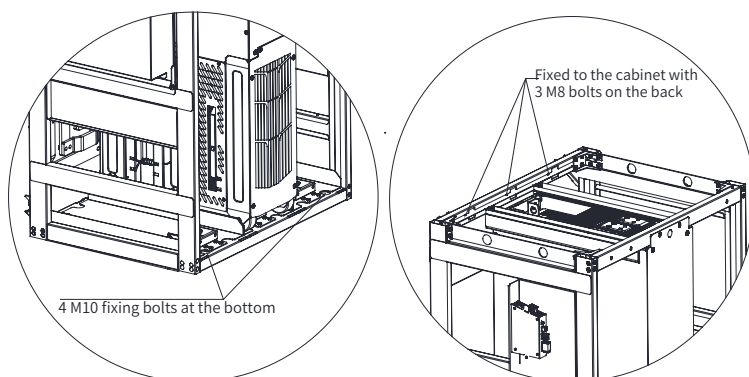


Figure 2-17 Fixing the frame and cabinet

- 4) Place the mounting rail and push the H8 module into the frame to complete the installation.

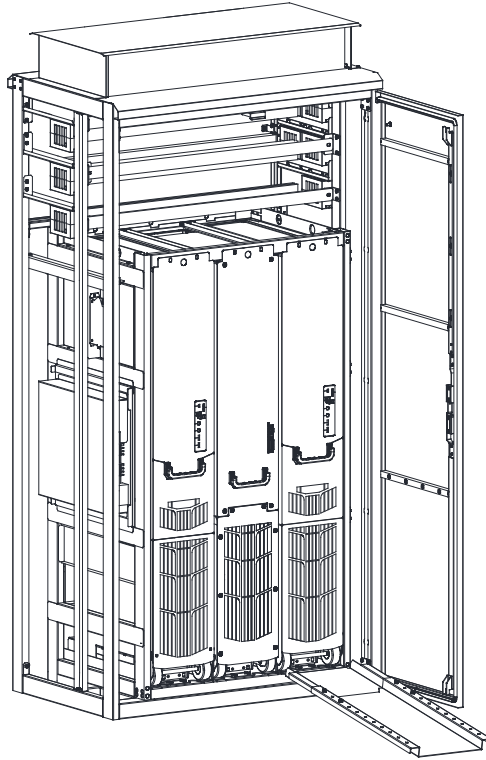


Figure 2-18 Pushing in the H8 module back

2.4 Installing the Cabinet

2.4.1 Installation Requirements

- 1) Space on the top of the cabinet

The cabinet must not be installed in an environment without any cover. All cabinets must be installed according to the drawings, with sufficient space around for air flow, door open/close restarting maintenance. The passageway for entering the installation foundation and the space for the auxiliary device need to be reserved.

The operating areas must be dry and free of dust. The air supplied must not contain any electrically conductive gas, vapors, or dust, which could impair operation. It may be necessary to filter the air supplied to the installation room. If the air contains dust, filter mats can be installed in front of the ventilation grilles in the cabinet doors and also in front of the hoods. Cabinet modules complies with IP21.



- ◆ To comply with IP21, The MD880-40 cabinet must be enclosed by installing a side panel on the left and right sides.

The cabinet units are installed in accordance with the dimension drawings supplied. The distance between the cabinet top and the ceiling is related to the IP options, as shown in the following figure:

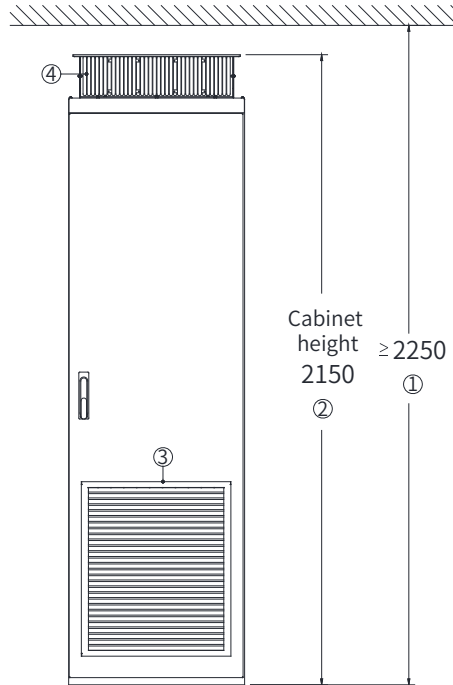


Figure 2-19 Distance between cabinet top and ceiling (IP21)

- ① min. height of the ceiling (mm); ② total height of the cabinet (mm); ③ air inlet area;
- ④ air outlet area

2) Space in front of the cabinet

The cooling air for the power unit is drawn in from the front through the ventilation holes or window blinds in the lower part of the cabinet doors. The warmed air is discharged through the perforated top cover or the ventilation holes in the hood.

Cabinet units are allowed to lay against the wall, with the distance between the front of the cabinet and the wall for equipment placement 1500 mm. Sufficient space must be reserved for two sides of cabinet units.

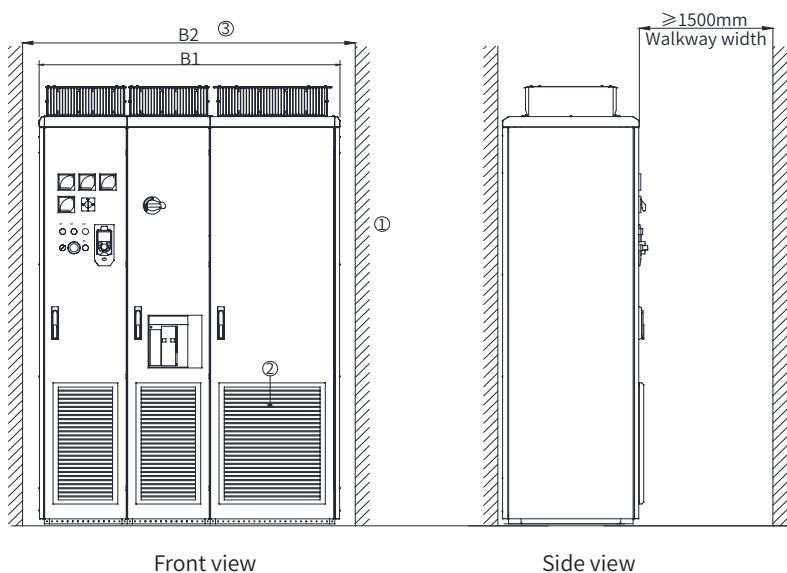


Figure 2-20 Space in front of the cabinet

① building wall; ② air inlet area; ③ the space width B2 of the building must be larger than the total cabinet width B1.



NOTE

- ◆ Take the front door handle into consideration. Reserve sufficient space to ensure that the front door open/close angle is larger than 90° (maximum door open/close angle is about 100° without obstruction), so that there is sufficient operation space during maintenance and repair.

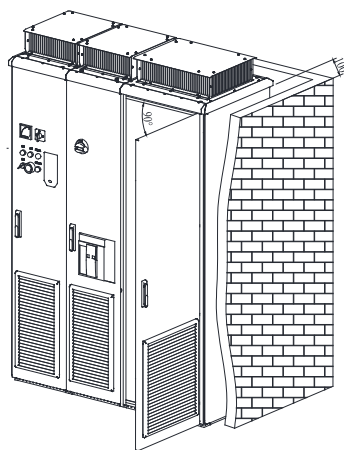


Figure 2-21 Space reserved for door open/close (mm)

3) Requirements for ground flatness

The installation foundation is flat and strong enough to bear the weight of the cabinet units, so that the following function of the cabinet units can be performed properly. The door lock is used properly when the cabinet doors open and close.

When cabinet modules are connected side by side, there is no gap between the cabinet modules and the ground. If the gap is unavoidable (① in the following figure), use a pad (② in the following figure) to keep the cabinet horizontal, and use proper fillings (for example, fireproofing mud) to fill the space.

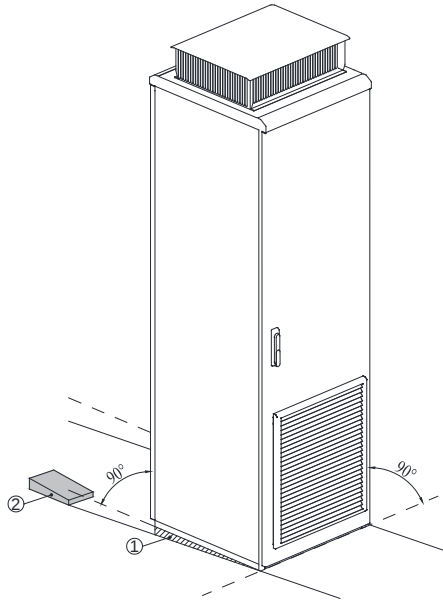


Figure 2-22 Requirements on ground

4) Installation of expansion screws

If the cabinet modules are installed on the concrete ground, install the expansion screws in the ground corresponding to the fixing holes of the cabinet modules.

The procedure of installing the expansion screw is described as follows:

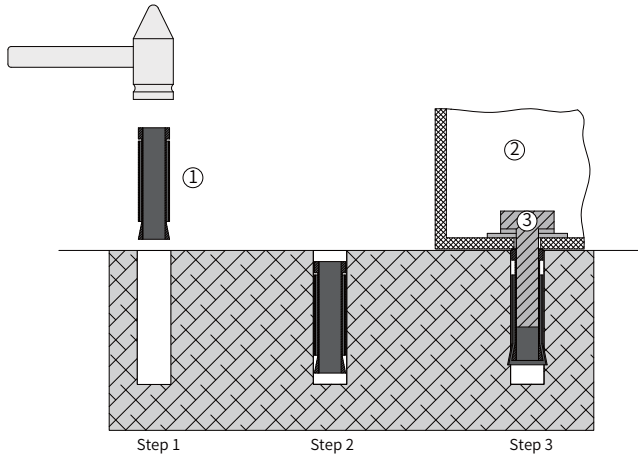


Figure 2-23 Installing the expansion screws

① expansion screw; ② cabinet equipment; ③ M12 bolt

The installation procedure is as follows:

Drill holes.

Hole diameter < Maximum outer diameter of expansion screw

Hole depth > Length of expansion screw

Perpendicular to the ground

Knock the expansion screw into the hole (below the surface) by using the hammer, as shown in Step 2. The expansion screw consists of two movable parts: bolt spring shell and stem.

After placing the cabinet unit in the required position, fasten it with M12 bolts, and the expansion screw stem will be pulled up, making the spring shell deform to fasten the cabinet unit, as shown in Step 3.

5) Requirements on the foundation



- ◆ Lay medium voltage cables and low voltage cables in different brackets. If they cannot be separated due to restricted conditions, lay low voltage cables in full enclosed metal pipes.
- ◆ The cable trench must use non-flammable materials and be smooth. Damp-proof, dust-proof and rat-proof measures are required.
- ◆ Personal injury or even death or material damage can result if these factors are not taken into account.

During foundation design, take the following factors into consideration:

- Inspection space in front of the cabinet modules
- Routing of power cables, Rectifier cable, and system control cables

Design the cable trench or cable channel below the cabinet. The MV cables, power cables and signal cables must be separated.

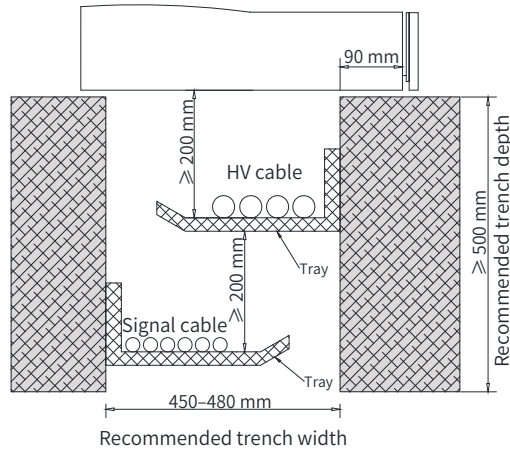


Figure 2-24 Foundation layout

2.4.2 Installing the Cabinet

1) Unpacking

Place the packed product on the empty and flat ground of the workshop, and prepare the tools such as crowbar.

Use the crowbar to pry off the crate along the gap from the plate edge. Then remove the cover plate, side plates, and ends plates.

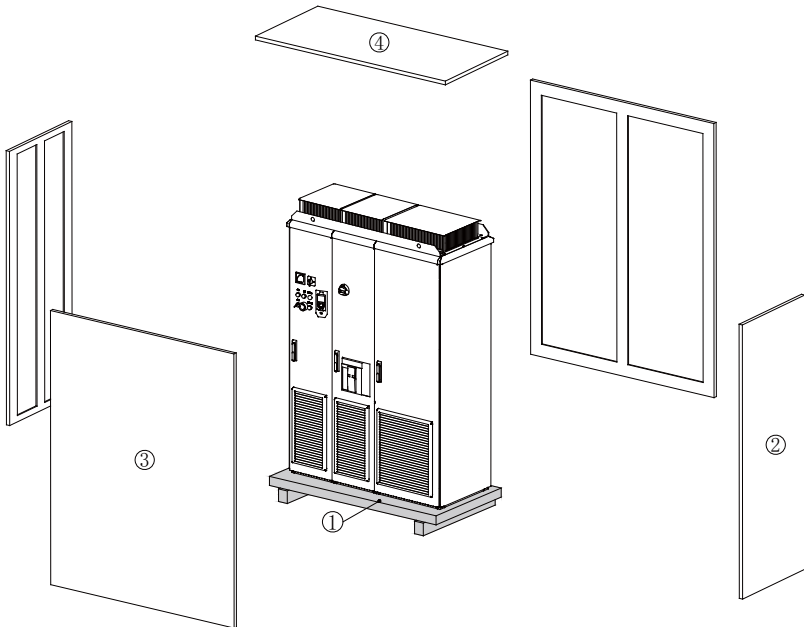


Figure 2-25 Unpacking the product

① pallet; ② end panels; ③ side panels; ④ cover



- ◆ During unpacking, put the crowbar into the crate as short as possible so as to prevent damaging the equipment. Pry off the crate with care and protect yourself from being injured by nails. Exert extreme caution to avoid injury caused by nails.
- ◆ When removing the inner packing materials such as plastic film, do not use sharp tool to avoid scratching the equipment.
- ◆ The packaging material must be discarded in accordance with the applicable country-specific guidelines and rules.

2) Removing the pallet

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

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

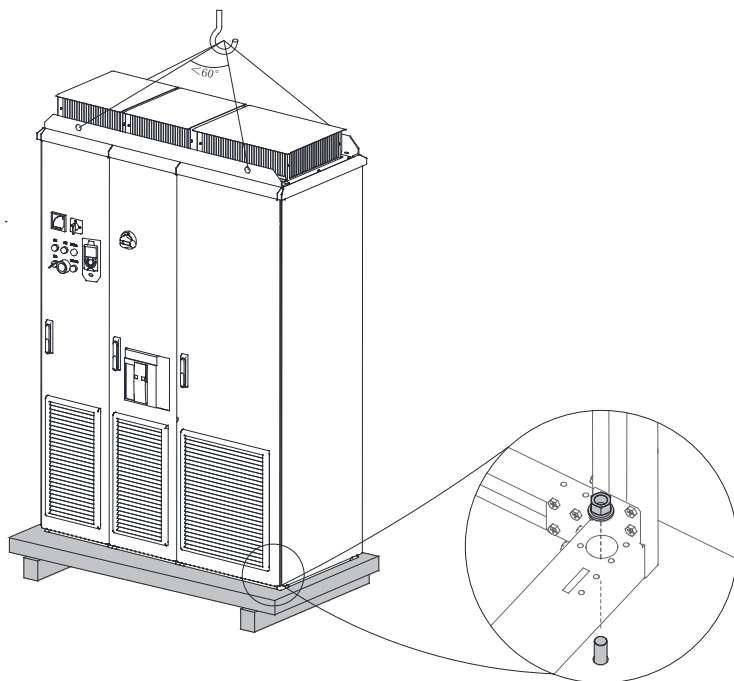


Figure 2-26 Lifting the cabinet units off the pallet

3) Handling after unpacking

- Handle the cabinet units with a hoist with a load capacity larger than the weight of one set of cabinet units.
- When the cabinet is hoisted, the maximum angle of the hoisting rope is 60° .
- Use the auxiliary hoisting angle iron on the top of the cabinet for lifting and handling, with the relief height not larger than 0.3 m.
- Ensure that the cabinet unit doors are locked before handling. The cabinet must be held at both sides by hands during handling.

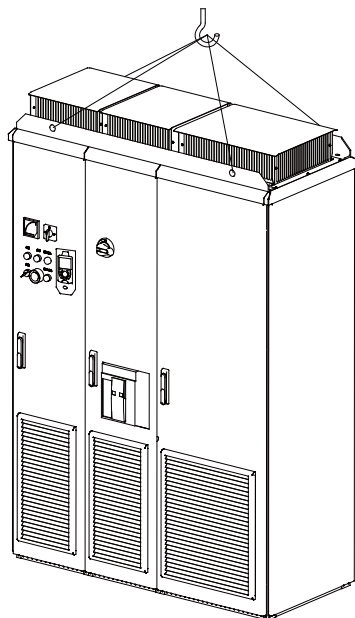


Figure 2-27 Handling the cabinet after unpacking

Open the cabinet door, align the anchor bolt mounting hole at the bottom of the cabinet with the expansion screw on the ground, fasten the twelve M12 bolts to fix the cabinet, close the cabinet door, and the installation is completed.

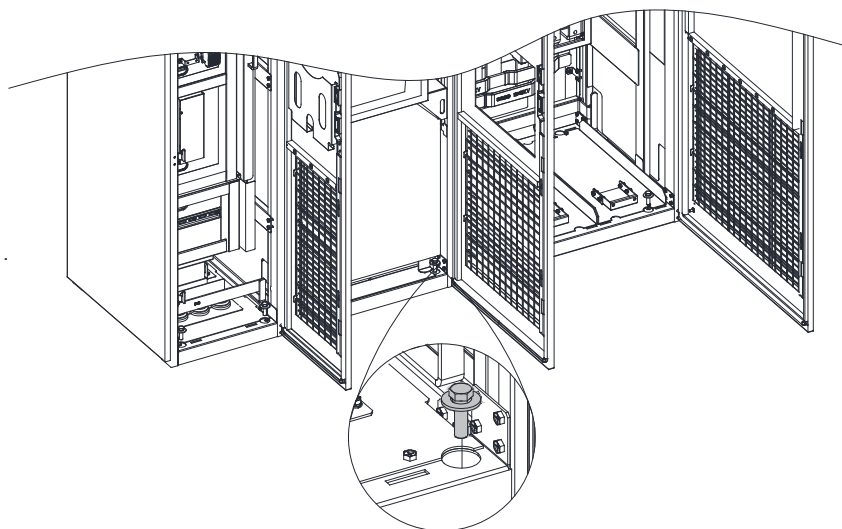


Figure 2-28 Fixing the cabinet

3 Electrical Installation

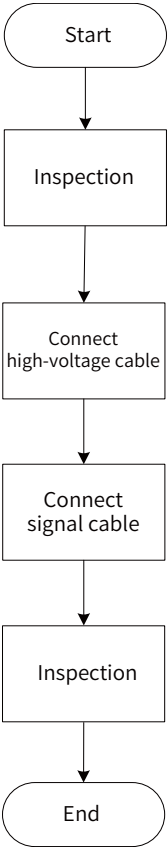


Figure 3-1 Electrical installation flowchart

3.1 Safety Instructions

3.1.1 Safety Precautions Before Installation

Safety precautions before installation	
 DANGER	◆ This product is often used in industrial applications involving high voltage. The equipment contains live and rotating components. Therefore, there is a risk of severe injury or significant material damage if the required covers are removed without authorization during operation, if it is used or operated incorrectly, or if it has not been properly maintained. ◆ Only professional technicians are allowed to perform operations and they must read and comply with safety information provided in this guide. ◆ When carrying out any kind of work on electrical devices, the following "five safety rules" must always be observed: ① Disconnect the equipment from power supply. ② Make sure that power supply will not be connected again. ③ Make sure that the equipment is de-energized. ④ Make sure that the equipment is reliably grounded. ⑤ Cover or enclose the adjacent components that are still live.

3.1.2 Inspection

Inspection	
 DANGER	◆ The equipment runs with high voltage. All connection work must be carried out when the cabinet unit is de-energized. ◆ Only qualified technicians are allowed to operate the equipment. ◆ Take caution when operating the cabinet unit disconnected from power supply, as there may still be external supply voltage. The power and control terminals may be live even when the equipment is not running. ◆ Dangerously high voltage levels are still present in the cabinet even 15 minutes after power disconnection due to the DC bus capacitors. Therefore, open the cabinet unit after ensuring that the voltage is lower than 36 VDC. ◆ The user is responsible for ensuring that the motor, cabinet, and other components are installed and connected in accordance with the recognized technical rules in the country of installation and with other applicable regional regulations. Special attention should be paid to cable dimensions, fuses, grounding, shutdown, disconnection, and overcurrent protection. ◆ If an item of protective gear trips in a branch circuit, a leakage current may have been disconnected. To reduce the risk of fire or an electric shock, the current-carrying parts and other components in the cabinet should be inspected and damaged parts should be replaced. When an item of protective gear trips, the cause of the trip must be identified and rectified.

3.1.3 General

Electrostatic/optical components	
 DANGER	◆ The circuit board contains components that are sensitive to static electricity. Wear a grounded wrist strap when operating the circuit board. Do not touch the circuit board unless necessary.
 CAUTION	◆ Carefully pick and place the optical fiber cables. When removing the optical fiber cable, pull the connector, not the cable itself. Since the optical fiber cable is extremely sensitive to dirt, do not touch the end of the cable with bare hands.

3.1.4 Insulation Test

The MD880-40 series of active rectifier products have been tested for insulation between the main circuit and the housing at the factory. Therefore, do not perform any withstand voltage and insulation resistance tests on them again.

3.2 EMC-Compliant Cable Routing

3.2.1 Requirements

- 1) The signal cables and power cables must be routed separately:

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

- 2) Requirements on the analog control signal cable:

Use the twisted pair shielded cables as the analog control signal cables.

When stripping the sheathing back of the cable, the stripped part must be as short as possible (5–7 mm), and wrap the stripped shield with the insulating tape to prevent the shielded cable from contacting other cables, eliminating interference.

- 3) Requirements on the power cables:

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

- 4) Requirements on the control cables and power supply cables:

If the control cable must run across the power cable, make sure they are arranged at an angle of close to 90°.

3.2.2 Routing Suggestions

- 1) Separate cables for transmitting different signals.
Reserve a distance between interfering cables and sensitive cables. If the routing space is large, the recommended distance is 30 cm.
If these two types of cables must cross, arrange them at an angle of 90° to prevent interference.

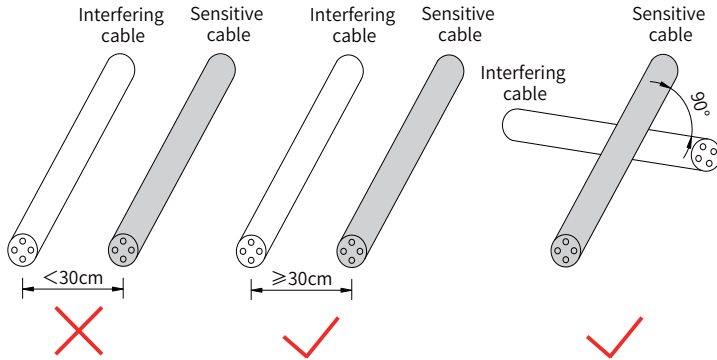


Figure 3-2 Routing of interfering cables and sensitive cables

- 2) Route different signal cables separately and isolate different types of signals with the equipotential signal. When routing cables of same signal type, lay the equipotential signal cables at the outer layer, and consider the equipotential signal arrangement in the middle. The following figure shows an example.

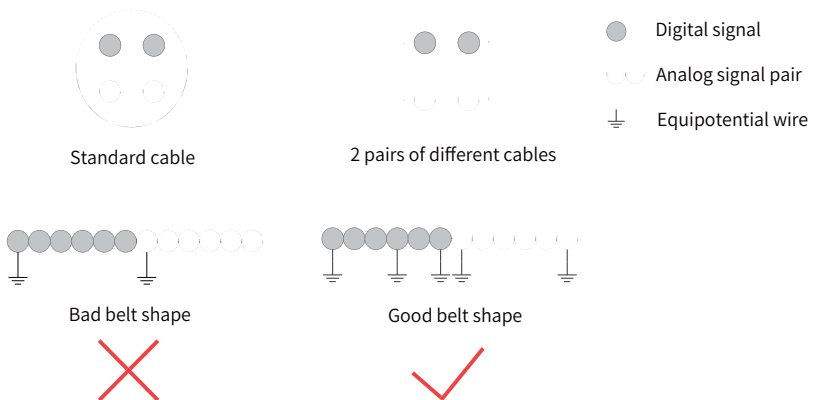


Figure 3-3 Routing of different types of signal cables

- 3) For the multi-conductor cable, it is recommended that a cable transmits the same type of signals. If a cable is used to transmit different types of signals, use the cable with conductor shielded, as shown in the following figure:

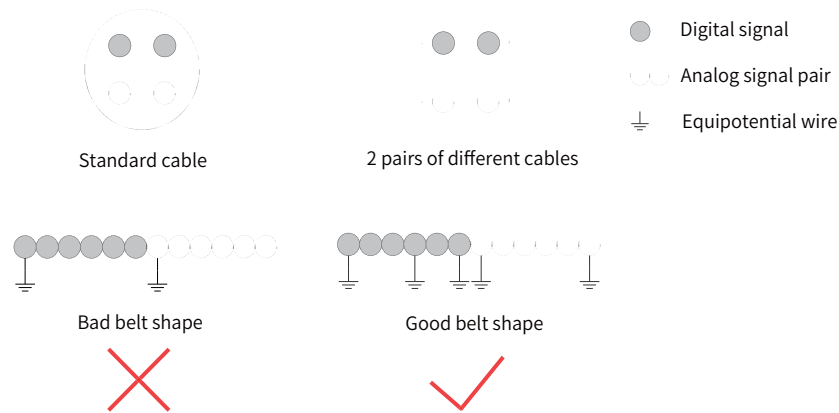


Figure 3-4 Routing of multi-core cables

- 4) When certain conductors in a multi-conductor cable are not used, connect all the unused (or reserved) conductors to the equipotential connection point.

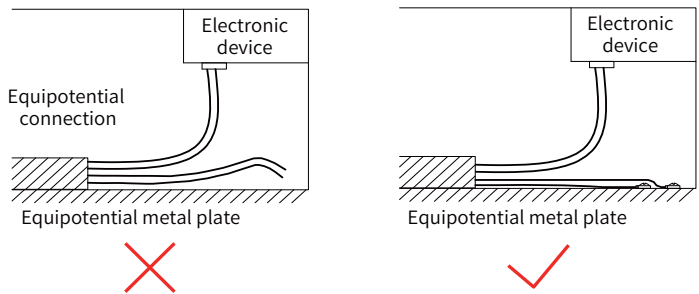


Figure 3-5 Handling of remaining cores in multi-core cable

- 5) For the low-level sensor signals and relay signals with a common, lay the two cables close to each other, preventing too large loop area. Make sure to use the twisted pair for the analog signal. Lay the digital signal cables close to each other.

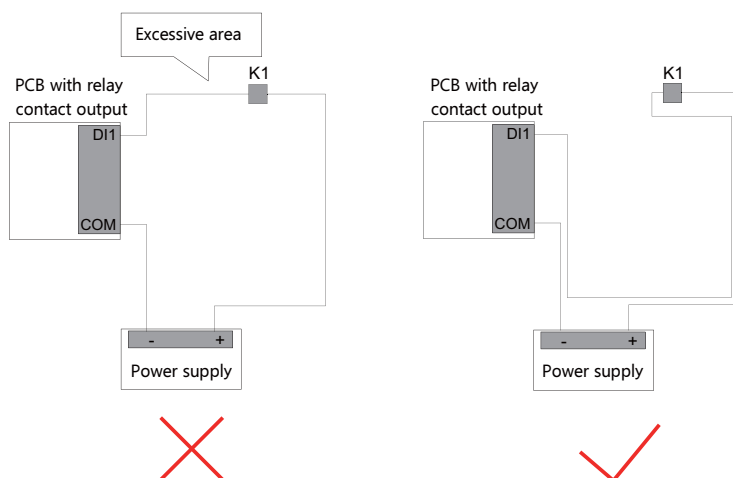


Figure 3-6 Routing for preventing too large loop area

- 6) Lay multiple types of cables along the metal block with equipotential connection and separate them to improve internal EMC. If cables in the same metal (zinc-iron or stainless steel) duct are separated with metal plate, the effect will be better.

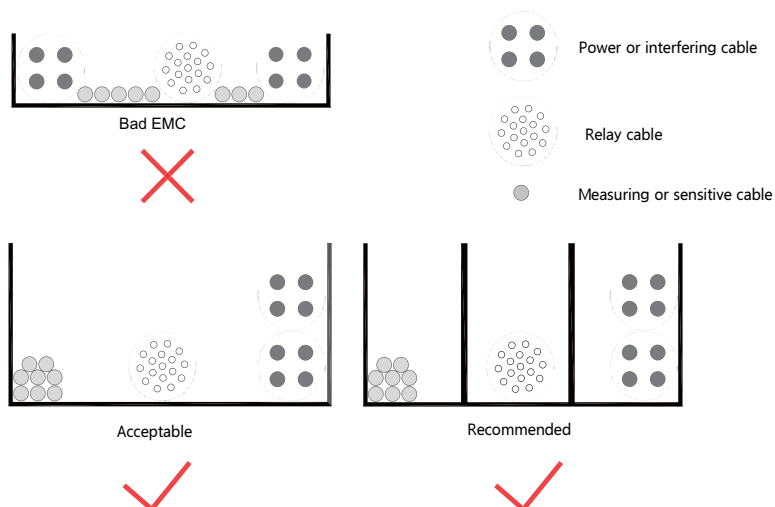


Figure 3-7 Routing of multiple types of cables

- 7) The unshielded part of the shielded cable must be as short as possible, and the shield braid is connected to the nearest PE end. If the stripped part is long, the cable is prone to interference, especially for encoder signals.

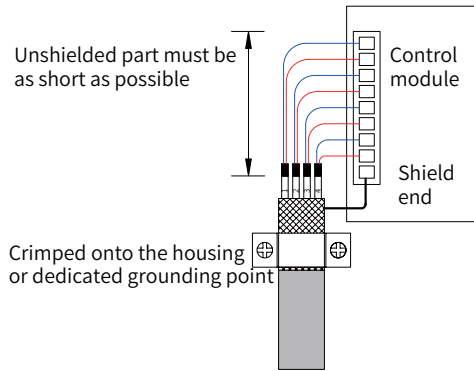


Figure 3-8 Requirements on shielded power cables

3.2.3 Connection of Shielded Power Cables

The input power cable and shield inside the active rectifier module must be in large-area contact with the shield plate in the cabinet modules to achieve good EMC effect. The following figure shows the connection diagram.

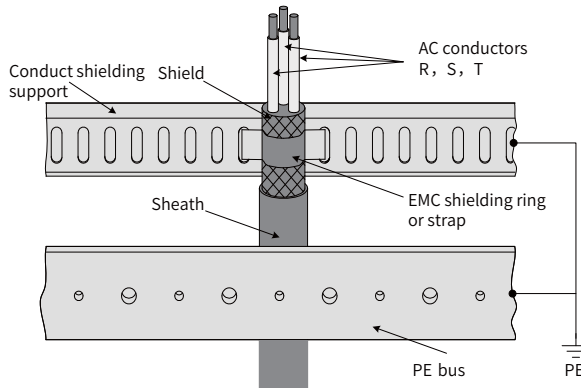


Figure 3-9 Connection of shielded power cables

3.3 Module Connection

3.3.1 Connecting Active Rectifier Module

Terminals in the module are as follows:

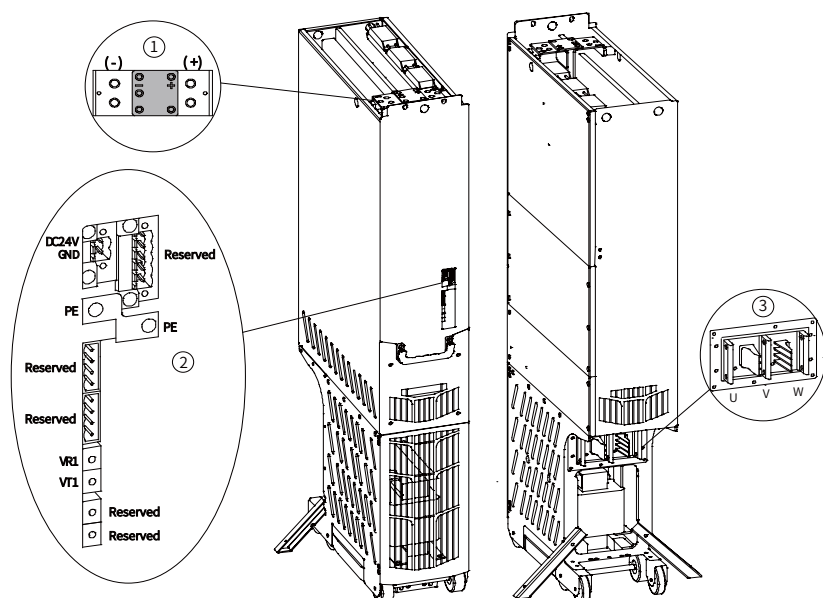


Figure 3-10 Terminals in the active rectifier module (H8)

Table 3-2 Terminal connection parameters of the active rectifier module (H8)

No.	Terminal	Description
1	(+), (-) DC output	400 V system: 540–720 V DC 690 V system: 740–975 V DC Connected to the M10/42N · m copper busbar
2	Power terminal (DC 24 V, GND) Optical fiber cable terminal (VR1/VT1)	Power terminal: 2-core twisted pair, single core, cross-sectional area: 0.5–2.5 mm ² Optical fiber cable terminal: for optical fiber cable connection
3	U, V, and W AC input terminals	Connected to the cabinet by quick connector

3.3.2 Connecting the Active Rectifier Filter Module

Terminals in the module are as follows:

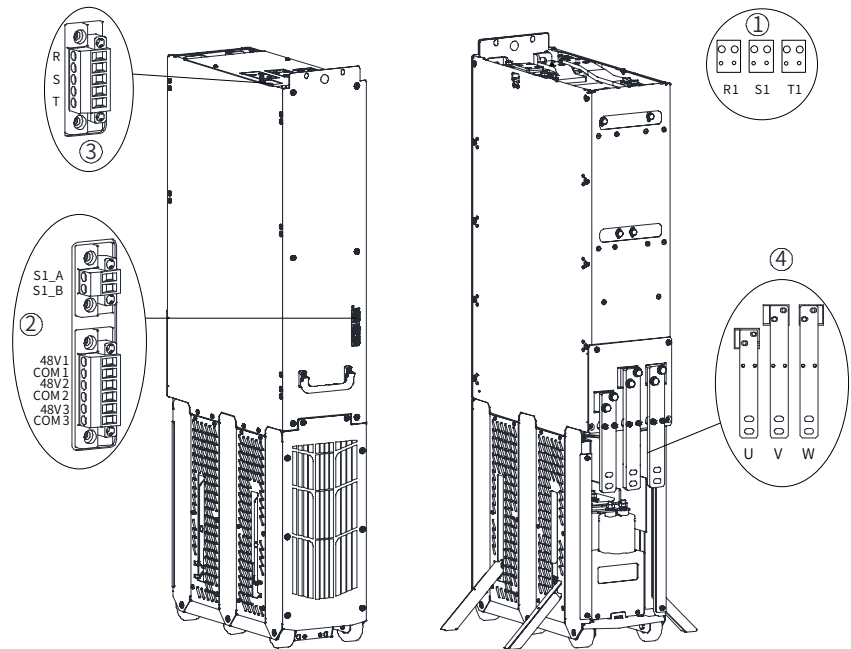


Figure 3-11 Terminals in the active rectifier filter module (BLCL)

Table 3-3 Terminal connection parameters of the active rectifier filter module (BLCL)

No.	Terminal	Description
1	R1, S1 and T1 AC input terminals	-
2	Reactor overtemperature switch (S1_A, S1_B) DC 48 V fan power input (48V1) DC 48 V fan power input (COM1) DC 48 V fan power input (48V2) DC 48 V fan power input (COM2) DC 48 V fan power input (48V3) DC 48 V fan power input (COM3)	- Do not connect to the wrong pole.
3	AC voltage detection (R) AC voltage detection (S) AC voltage detection (T)	Connect with HSVM -10 synchronous voltage detection module Connect according to the phase sequence
4	U, V and W AC output terminals	-

3.4 Connection of Frame Kit

3.4.1 Connection of BLCL+H8 Frame Kit

Terminals:

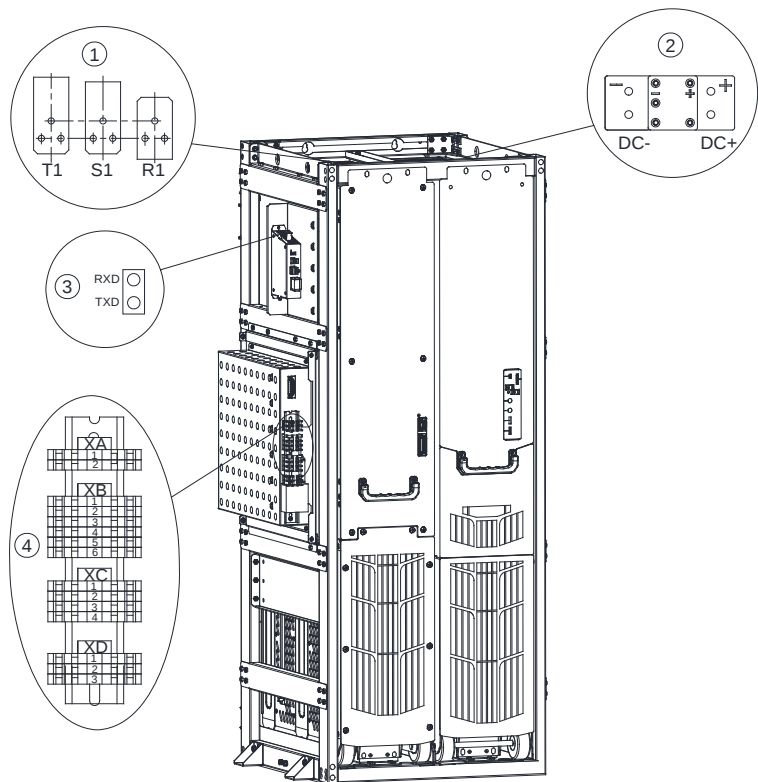


Figure 3-12 Terminals in the BLCL+H8 frame kit

Table 3-4 BLCL+H8 terminal connection parameters

No.	Terminal Mark	Description
1	R1	Three-phase AC input
	S1	
	T1	
2	DC-	DC output
	DC+	

No.	Terminal Mark	Description
3	RXD	Receive cable, , communicate with HCU through HOFM optical fiber expansion module with Inobus dedicated communication protocol
	TXD	Transmission cable, , communicate with HCU through HOFM optical fiber expansion module with Inobus dedicated communication protocol
4	XA:1	BLCL reactor overtemperature switch S1_A
	XA:2	BLCL reactor overtemperature switch S1_B
	XB:1	24 V terminal of external DC 24 V input
	XB:4	COM terminal of external DC 24 V input
	XC:1	Pre-charge circuit rectifier bridge output 1DC+
	XC:2	Pre-charge circuit rectifier bridge output 1DC-
	XC:3	Fan power board input 2DC+
	XC:4	Fan power board input 2DC-
	XD:1	Pre-charge circuit input R2, S2, T2
	XD:2	
	XD:3	

Electrical connection of terminals:

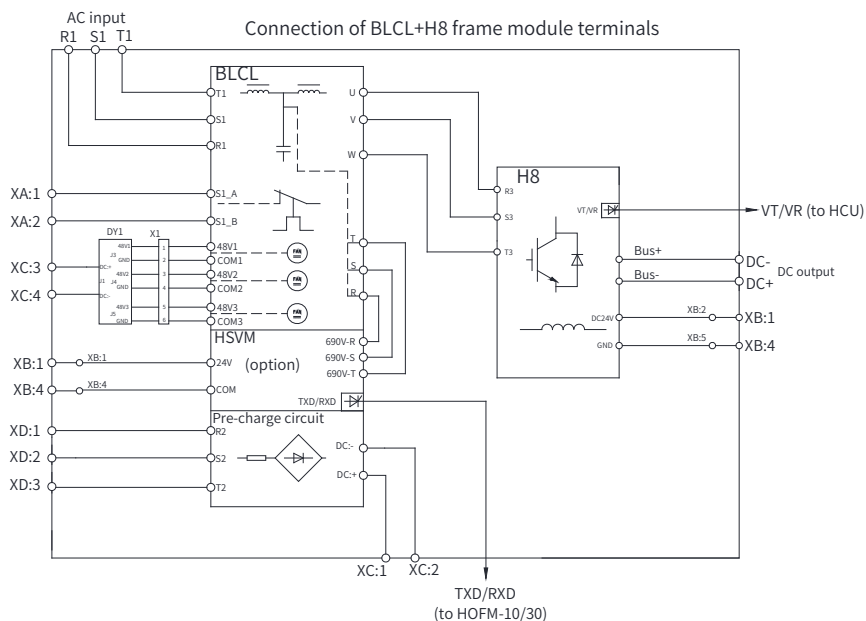


Figure 3-13 Terminals in the BLCL+H8 frame kit

3.4.2 Connection of BLCL+2H8 Frame Kit

Terminals:

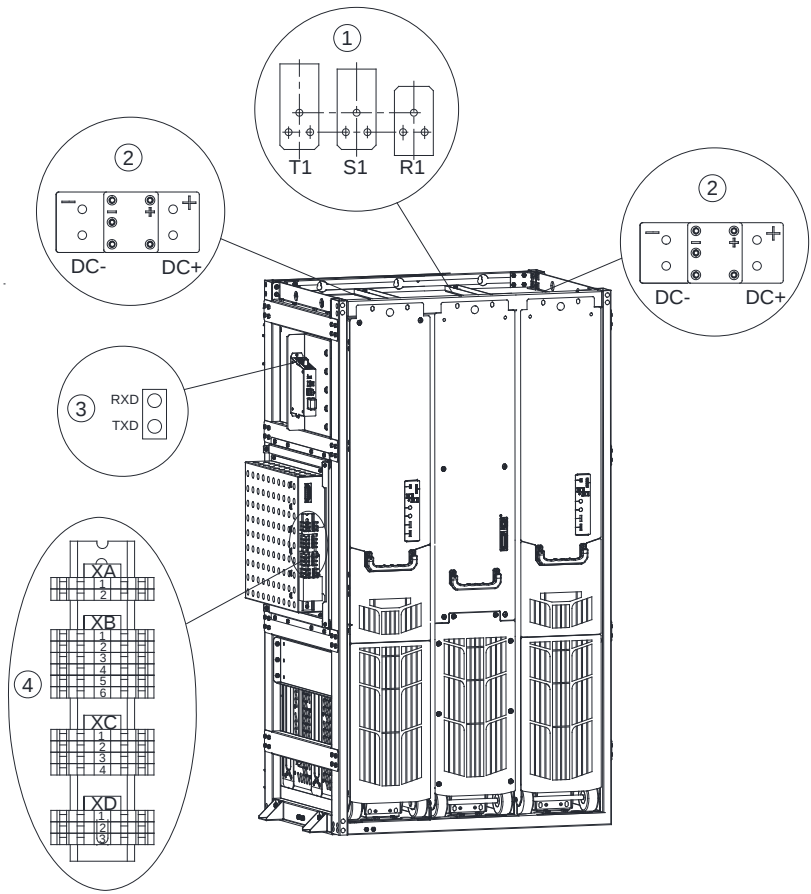


Figure 3-14 Terminals in the BLCL+2H8 frame kit

Table 3-5 BLCL+2H8 terminal connection parameters

No.	Terminal Mark	Description
1	R1	Three-phase AC input
	S1	
	T1	
2	DC-	DC output
	DC+	

No.	Terminal Mark	Description
3	RXD	Receive cable, , communicate with HCU through HOFM optical fiber expansion module with Inobus dedicated communication protocol
	TXD	Transmission cable, , communicate with HCU through HOFM optical fiber expansion module with Inobus dedicated communication protocol
4	XA:1	BLCL reactor overtemperature switch S1_A
	XA:2	BLCL reactor overtemperature switch S1_B
	XB:1	24 V terminal of external DC 24 V input
	XB:4	COM terminal of external DC 24 V input
	XC:1	Pre-charge circuit rectifier bridge output 1DC+
	XC:2	Pre-charge circuit rectifier bridge output 1DC-
	XC:3	Fan power board input 2DC+
	XC:4	Fan power board input 2DC-
	XD:1	Pre-charge circuit input R2, S2, T2
	XD:2	
	XD:3	

Electrical connection of terminals:

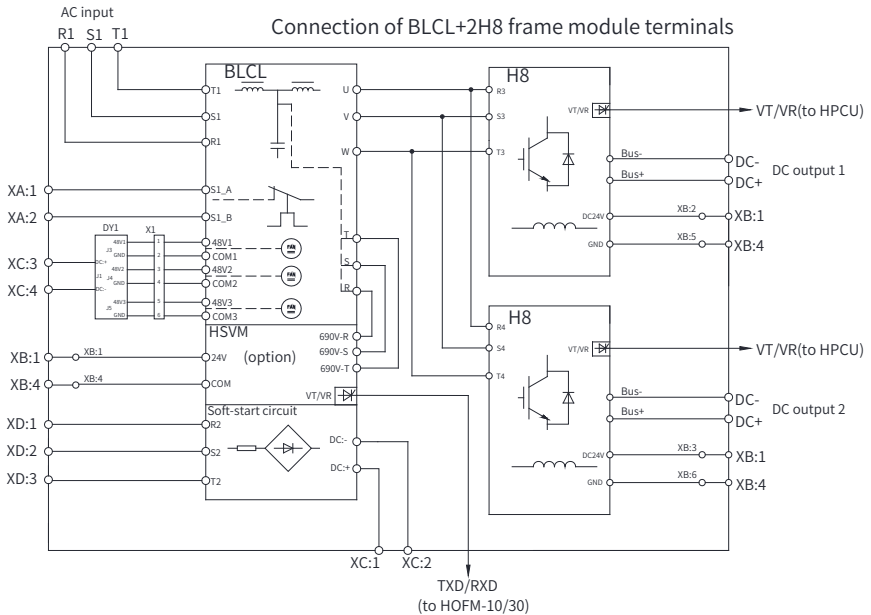


Figure 3-15 Terminals in the BLCL+2H8 frame kit

3.5 Connection of the Cabinet

3.5.1 Connecting the Incoming Cables

- 1) Preparation
 - Install and secure the cabinet units properly;
 - Take all the necessary safety measures at the installation location.
 - Obey the "Take 5 safety" rules.
- 2) The input cable is connected to the R/S/T terminals of the input copper busbar of the active rectifier cabinet. The following figure shows the position of the input copper busbar:

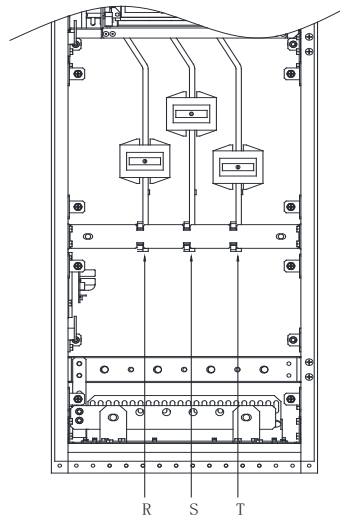


Figure 3-16 Position of the input copper busbar

Connection steps:

- ① Open the cabinet and remove the cover protecting the power cable terminal area;
- ② Feed the cables into the cabinet from the bottom;
- ③ Connect the PE cable to the PE busbar;
- ④ Lead the cables up to the terminals R, S, T on the copper bar.
- ⑤ Connect the cables to the copper busbar and secure them in appropriate position.
- ⑥ When shielded power cables are used, the shields must be secured to the shield plate in an EMC-compliant manner.

3.6 Cable Specifications and Recommendation

Table 3-6 Recommended main circuit cables

Model	Rated input current (A)	Recommended Quantity and Diameter (mm ²)	Wiring terminal
U _N : three-phase 400 VAC (range: 380–415 V)			
MD880-40K-0575-4	575	3 × 95	OT95-12
MD880-40K-0810-4	810	4 × 95	OT95-12
MD880-40K-1092-4	1092	4 × 120	OT120-12
MD880-40K-1539-4	1539	4 × 240	OT240-12
U _N : three-phase 690 VAC (range: 525–690 V)			
MD880-40K-0369-7	369	2 × 95	OT95-12
MD880-40K-0540-7	540	3 × 95	OT95-12
MD880-40K-0701-7	701	3 × 120	OT120-12
MD880-40K-1026-7	1026	4 × 120	OT120-12



- ◆ The cables recommended in the table are all symmetric 3-core shielded cables, which are connected to the three phases of the AC output busbar. The sectional area of the PE cable must fulfill the following:
 - When the sectional area of the phase line $S \leq 16 \text{ mm}^2$, the sectional area of the PE cable = S ;
 - When the sectional area of the phase line $16 \text{ mm}^2 < S \leq 35 \text{ mm}^2$, the sectional area of the PE cable = 16 mm^2 ;
 - When the sectional area of the phase line $S > 35 \text{ mm}^2$, the sectional area of the PE cable = $S/2$;
- ◆ Note: $3 \times 120 \text{ mm}^2$ indicates that each phase requires 3 cables and the sectional area is 120 mm^2 .
- ◆ Note: OT/120-12 indicates a cable crimping ring tongue terminal, with a cable sectional area of 120 mm^2 and an M12 screw hole.
- ◆ Note the maximum size of the cable terminals listed in the following table. Use cable terminals within these limits. Otherwise, the mechanical stability and electrical clearance cannot be ensured.
- ◆ Derating calculations are required when using multiple cables of the same specification in parallel.

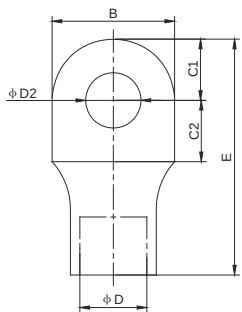


Figure 3-17 Terminal appearance

Table 3-7 Max. size of terminal

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

3.7 Connection of HCU Control Module

For details about how to install the HCU control module and connect the control cable, see ["4 HCU Control Module"](#).

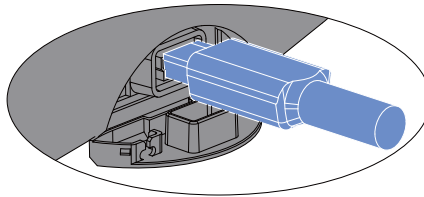
3.8 Connection between SOP-20-880 and PC

The mini-B type USB connector of the SOP-20-880 is to connect the PC, the USB cable length cannot exceed 3 m. The communication protocol is USB2.0 between the SOP-20-880 and the PC.

- 1) Open the cover at the USB connection terminal



- 2) Plug in the USB cable. It is recommended to use a cable with ferrite bead. See the following figure.



- 3) Connect the cable to the PC.

After the cable is connected to the PC, you are prompted to choose between the USB intermediate mode and USB mass storage mode.

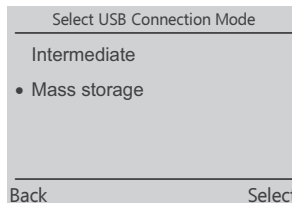


Figure 3-18 USB mode

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

3.9 Connection between SOP-20-880 and Drive

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

Table 3-8 Transmission distance, node quantity, and baud rate of SOP -20-880 bus

Distance (m)	Baud Rate (kbps)	Node Quantity	Wire Size	Remarks
100	1,000	32	$\geq 0.5 \text{ mm}^2$	When there are repeaters, the maximum number of nodes is 128; When there is no repeater, up to 32 nodes are allowed; When there is polarity offset, the maximum number of nodes is reduced by 4.
50	2,000	32	$\geq 0.5 \text{ mm}^2$	
25	4,000	32	$\geq 0.5 \text{ mm}^2$	

3.10 Installation Checklist

Use the checklist below to guide the electrical installation procedure for the cabinet. Read all the safety information in the section "Safety Instructions" before carrying out any work on the unit.

Item	Check That	Compliance	Completed or Not
1	Check the connection of input power and DC bus and ensure that the correct voltage is supplied.	☐	☐
2	Check that the auxiliary power provides the correct voltage.	☐	☐
3	For strain relief, the cables must be clamped on the cable rack.	☐	☐
4	Check that the cables are properly connected with the required torque to the terminals provided.	☐	☐
5	When EMC shielded cables are used, the cable shields must be secured to the shield plate in the active rectifier equipment to ensure EMC compliance.	☐	☐
6	For the active rectifier, when the parallel output is connected to the DC bus, ensure that the connection is correct. The cable length must be above the specified minimum length.	☐	☐

Item	Check That	Compliance	Completed or Not
7	The date of manufacture can be found on the nameplate of the active rectifier. If the period from the date of manufacture to initial commissioning or the downtime of the power components is shorter than two years, the DC link capacitors do not have to be pre-charged. If the downtime is longer than 2 years, the capacitors must be pre-charged as described in section 4.5.	☐	☐
8	The control cables must be connected in accordance with the interface assignment and the shield applied. To prevent interference, the control cables must be laid separately from the power cables. Cabling and connections must always comply with the relevant EMC directives.	☐	☐
9	Check that the control cable (if any) is connected to the corresponding terminal and the terminal is tightened. Check by pulling the cable	☐	☐
10.	Check that the input power cable is connected to the corresponding terminals, the phase sequence is correct, and the terminals are tightened. Check by pulling the cable	☐	☐

4 HCU Control Module

The HCU-40 control module controls the active rectifier module through high-speed optical fiber, which is normally installed in the auxiliary control cabinet.

The HCU-40 control module has an external 24 V DC power supply, and internal multiple isolated power supplies which provide isolated digital power 24 VD, InoLink communication RS485 isolated power and SOP-20-880 power. It can also provide power to the function modules installed on HCU-40 expansion slots. The HCU-40 control module program can be upgraded through a PC or SOP-20-880.

4.1 Components of HCU Control Module

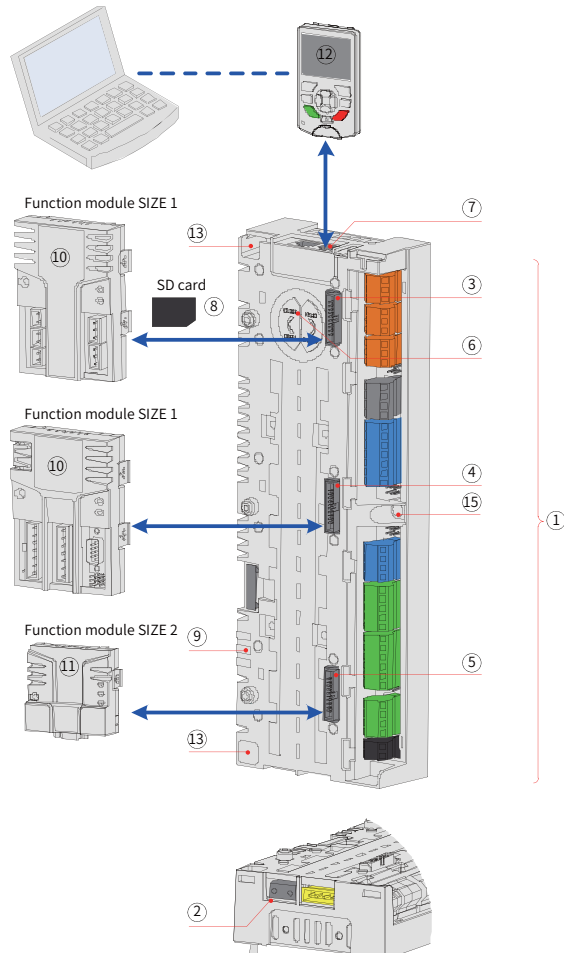


Figure 4-1 HCU control module

Table 4-1 Functions

No.	Component Name	Function
1	User terminal	Standard user input and output terminals
2	Optical fiber communication port	Optical fiber communication port between the HCU-40 and the active rectifier module
3	SLOT1 slot	Function module interface: SLOT1_1, SLOT1_2 and SLOT1_3
4	SLOT2 slot	Function module interface: SLOT2_1, SLOT2_2 and SLOT2_3
5	SLOT3 slot	Function module interface: SLOT3_1
6	Battery cover	Spare RTC battery cover. The RTC battery is non-rechargeable lithium battery which must be replaced regularly
7	Smart operation panel (SOP) terminal	For connection between the HCU and SOP-20-880. The two RJ45 ports are identical and easy to cascade
8	MicroSD card	An 8 G microSD memory card, which can be flexibly inserted and removed
9	Indicators	Power, run and fault indicators
10	Function module SIZE1	105 x 73 x 24 (mm) function module
11	Function module SIZE2	75 x 73 x 24 (mm) function module
12	SOP-20-880 smart operation panel	Display and control
13	Fixing hole	Holes for fixing the HCU. Quantity: 3



NOTE

- ◆ Functional modules are directly installed in SLOT1, SLOT2 and SLOT3. The addresses are SLOT1_1, SLOT2_1 and SLOT3_1;
- ◆ The SLOT1 and SLOT2 slots can be used with the HOFM-30 and HESD-10 to achieve slot expansion;
- ◆ SLOT3 does not support slot expansion.

4.2 LED indicator

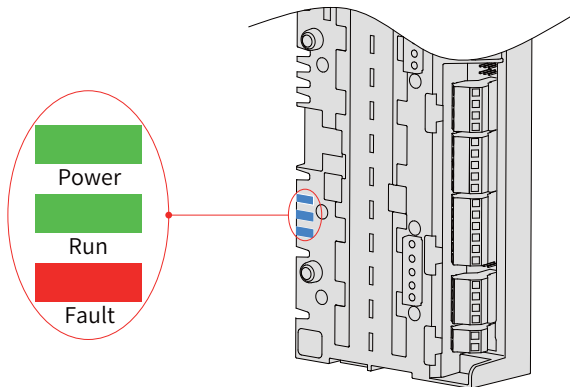


Figure 4-2 Position and Definition of LED indicators

Table 4-2 Description

No.	Name	Status	Description
1	Power	Steady ON	HCU power supply is normal
		OFF	HCU is not energized or the power supply has failed
2	Run	Steady ON	Power module is running
		OFF	Power module is not running
3	Fault	Steady ON	System fault occurs
		OFF	System is normal
		Flashing	HCU auxiliary power has failed. Check all auxiliary power supplies for short circuit or overload
4	Fault, Run	Flashing	PC or SOP-20-880 selects the HCU and ends after 10s

4.3 SD Memory Card

The HCU is internally equipped with an SD card for storing real-time data from all stages of the control module to assist in monitoring and analyzing the power module. The data is stored on a microSD memory card and analyzed by a qualified service technician.

4.4 Dimensions and Installation Instructions

4.4.1 Preparation

Cautions	
 DANGER	◆ Before installing or removing the HCU, the cabinet must be powered off for more than 15 minutes. The HCU input power must be disconnected to avoid damage to the HCU control module caused by live installation or removal.
	◆ When installing or removing a function module on the HCU, you must ensure that the HCU input power is disconnected to avoid damage to the HCU or function module caused by live installation or removal.
	◆ Protect the HCU module from falling or impact to avoid damage to the module;
	◆ Do not disassemble the HCU module, otherwise the module may be damaged;
	◆ Do not use excessive torque to tighten the terminals to avoid damage.

1) Tools

The following tools are required:

- 1# Phillips screwdriver

2) Tightening torques of fasteners

The following tightening torques apply to the screws used for HCU installation.

Screw	Tightening Torque
M3	0.55 N·m

4.4.2 Dimensions

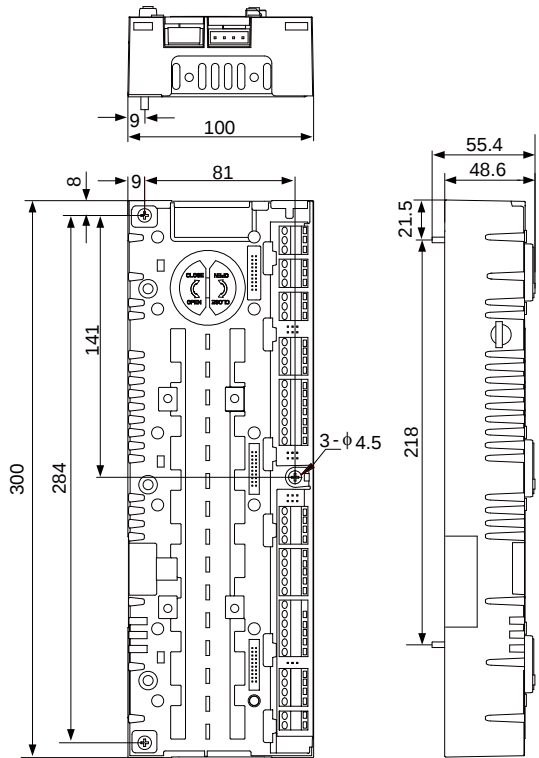


Figure 4-3 Dimensions of the HCU (unit: mm)

4.4.3 Space

To install the HCU, certain space must be reserved 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 surface.

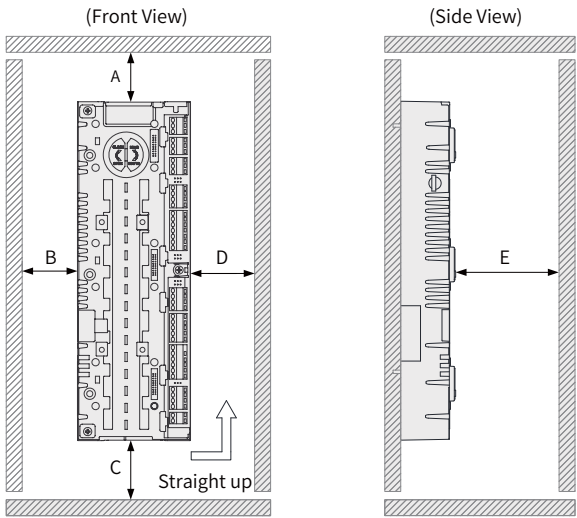


Figure 4-4 Installation space (unit: mm)

Table 4-3 Installation space (unit: mm)

A	B	C	D	E
≥ 100	≥ 30	≥ 100	≥ 50	≥ 100

4.4.4 Installation Procedure

Step 1: Align the HCU vertically with the two positioning holes on the metal mounting plate.

Step 2: Tighten the HCU mounting screws with a 1# Phillips screwdriver (3 M4 screws are already fixed in the HCU) as shown below.

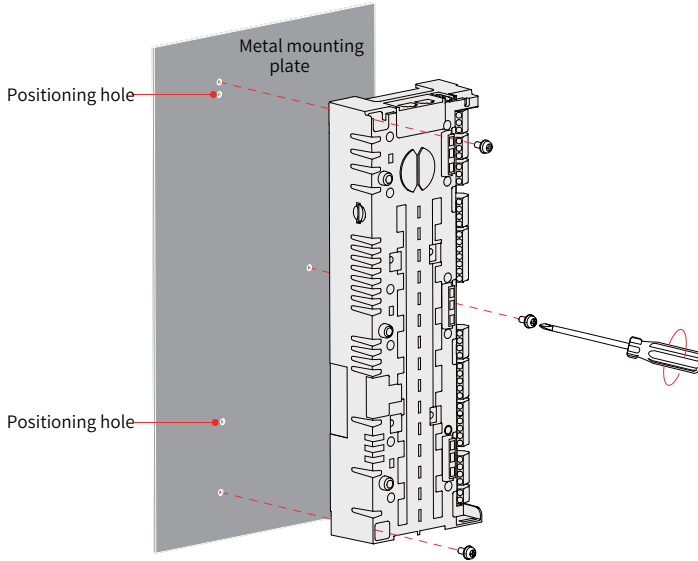


Figure 4-5 Installing the HCU control module

■ Grounding inside the cabinet

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

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

4.5 Terminals

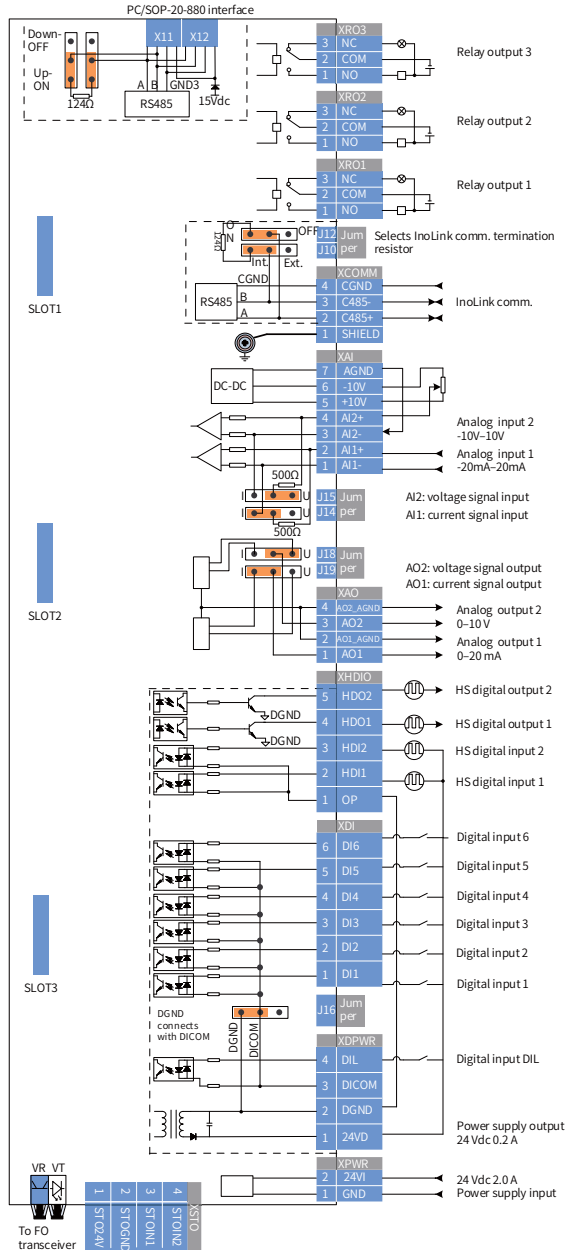


Figure 4-6 Overview of all terminals of the HCU control module

4.5.1 HCU Standard Terminals

Table 4-4 HCU standard terminals

Name	Mark	Description
Input Power	XPWR: 24VI	HCU power supply
Digital power output	XDPWR: 24VD	Digital output power isolated from XPWR
Digital input	XDI: DI1–DI6, DIL	Input type: relay contact, NPN or PNP
High-speed digital input	XHDIO: HDI1, HDI2	Input type: NPN or PNP
High-speed digital output	XHDIO: HDO1, HDO2	Output type: open collector
Analog output	XAO: AO1, AO2	Output type: current or voltage, selected by jumper
Analog input	XAI: AI1, AI2	Input type: current or voltage, selected by jumper
relay output	XRO1, XRO2, XRO3	Relay output: NO, NC and COM
Inolink Communication	XCOMM	High speed RS485, bus resistor is selected by jumper
RJ45 terminal	X11, X12	For communication with the SOP-20-880. Both terminals are identical for multiple HCU cascade; connection cable < 3 m
Inodrive communication	VR, VT	Communication with the active rectifier module

4.5.2 HCU-40 Terminals

Table 4-5 HCU-40 default I/O terminals

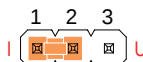
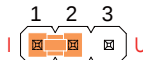
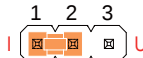
No.	Terminal	Function Description	Remarks
1	XRO1	Main circuit breaker control signal	Unmodifiable
2	XRO2	Fault output	Default function, configurable
3	XRO3	Pre-charge contactor control signal	Unmodifiable
4	DI1	Reserved	Configurable
5	DI2	Power on signal	Default function, configurable
6	DI3	Main circuit breaker contact NC feedback signal	Unmodifiable
7	DI4	Reserved	Configurable
8	DI5	Power off signal	Default function, configurable
9	DI6	Fault reset signal	Default function, configurable
10	HDI1	LCL NC temperature switch signal	Unmodifiable
11	DIL	Emergency stop	Default function, configurable

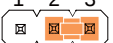


◆ To modify the default configuration, see MD880-40 Series Active Rectifier Software User Guide.

4.5.3 Detailed Description of Terminals

Terminal	Name	Function	Specification
XPWR: input power terminal			
1	GND	24.0 VDC±10% 2.0 A	2-core twisted pair cable is recommended Cross-sectional area: 0.5–2.5 mm ²
2	24VI		
XDPWR: DIL terminal			
1	24VD	Provide power for DI, HDI and HDO 24.0 VDC±10% 0.2 A	Twisted pair, single core Cross-sectional area: 0.5–2.5 mm ² Note: the load of 24VD must not exceed 0.2 A
2	DGND	24VD GND	
3	DICOM	DI common output; can be connected to DGND through jumper J11	
4	DIL	Digital interlock or common DI; technical parameters are the same as common DI	
Jumper J16: power supply selection			
1 2 3  By shorting 1 and 2, DI is powered by 24VD internal power supply			
1 2 3  By shorting 2 and 3, DI is powered by external power supply			
XDI: DI input terminal			
1	DI1	24V logic level: "0" < 5 V; "1" > 15 V; Rin: 2.0 kohm Input type: NPN/PNP, relay contact Hardware filtering: 0.04 ms Imax: 15 mA	Single core cable Cross-sectional area: 0.5–2.5 mm ²
2	DI2		
3	DI3		
4	DI4		
5	DI5		
6	DI6		
XHDIO: HDIO input terminal			
1	OP	HDI common terminal	Cross-sectional area: 0.5–2.5 mm ² Shielded twisted pair cable is recommended HDO and OP twisted pair HDI and DGND twisted pair
2	HDI1	Input type: NPN, PNP 24V logic level: "0" < 5 V; "1" > 15 V; Rin: 2.0 kohm	
3	HDI2	Input voltage range: 0–30 VDC Input frequency range: 0–100 kHz HDI max. load Imax: 15 mA	
4	HDO1	Output type: OC Output frequency range: 0–100 kHz	
5	HDO2	HDOmax. load Imax: 20 mA Output voltage range: 0–26.4 VDC	

Terminal	Name	Function	Specification	
XAO: AO output terminal				
1	AO1	AO1 output range:0–20 mA, Rload ≤ 500 ohm 0–10 V, Rload ≥ 10 kohm AO2 output range: 0–20 mA, Rload ≤ 500 ohm 0–10 V, Rload ≥ 10 kohm Resolution: 11 bit + sign bit Accuracy: 2% full scale range	Cross-sectional area: 0.5–2.5 mm ² Shielded twisted pair cable is recommended AO1 and AO1_AGND twisted pair AO2 and AO2_AGND twisted pair	
2	AO1_AGND			
3	AO2			
4	AO2_AGND			
Jumper J19: AO1 current and voltage signal selection				
 AO1 current signal output by shorting 1 and 2				
 AO1 voltage signal output by shorting 2 and 3				
Jumper J18: AO2 current and voltage signal selection				
 AO2 current signal output by shorting 1 and 2				
 AO2 voltage signal output by shorting 2 and 3				
XAI: AI input terminal				
1	AI1-	Current input: -20mA to +20mA, Rin: 500 ohm Voltage input: -10 V to +10 V, Rin: 200 kohm Differential input, input range: ±30 V Sample interval per channel: 0.25 ms Hardware filtering: 0.25 ms Resolution: 11 bit + sign bit Accuracy: 1% full scale range	Cross-sectional area: 0.5–2.5 mm ² Use two 2-core twisted-pair shielded cables when using two-way AI; Uses one 4-core twisted pair shielded cable for one-way AI when reference voltage is provided	
2	AI1+			
3	AI2-			
4	AI2+			
5	+10V	+10 V: +10 V ± 1%		
6	-10V	-10V: -10V ± 1%		
7	AGND	Rload 1–10 kohm		
Jumper J14: AI1 current or voltage signal Input selection				
 AI1 current signal Input by shorting 1 and 2				
 AI1 voltage signal Input by shorting 2 and 3				
Jumper J15: AI2 current and voltage signal selection				
 AI2 current signal Input by shorting 1 and 2				
 AI2 voltage signal Input by shorting 2 and 3				

Terminal	Name	Function	Specification
XCOMM: InoLink RS485 communication terminal			
1	SHIELD	RS485 bus, 5 V standard level	4-core shielded twisted pair cable Cross-sectional area: 0.5–2.5 mm ²
2	C485+	Bus resistor: 124 ohm	
3	C485-	Max. communication speed: 5 Mbps Max. number of nodes: 16 (no repeater)	
4	CGND	Max. transmission distance: 40 m	
Jumper J10, J12: RS485 bus termination resistor selection, must select the same status			
1 2 3  Connect the termination resistor by shorting 1 and 2			
1 2 3  Disconnect the termination resistor by shorting 2 and 3			
XRO1: output terminal of relay 1			
1	RO1_NO	Output type: passive NO and NC contacts Contact parameters: 250 VAC/30 VDC, 2 A	Single core cable Cross-sectional area: 0.5–2.5 mm ²
2	RO1_COM		
3	RO1_NC		
XRO2: output terminal of relay 2			
1	RO2_NO	Output type: passive NO and NC contacts Contact parameters: 250 VAC/30 VDC, 2 A	Single core cable Cross-sectional area: 0.5–2.5 mm ²
2	RO2_COM		
3	RO2_NC		
XRO3: output terminal of relay 3			
1	RO3_NO	Output type: passive NO and NC contacts Contact parameters: 250 VAC/30 VDC, 2 A	Single core cable Cross-sectional area: 0.5–2.5 mm ²
2	RO3_COM		
3	RO3_NC		
X11, X12: SOP-20-880 RS485 communication terminal			
1, 2, 7	NC	RS485 bus, 5 V standard level	Standard network cable
3, 8	GND3	Bus resistor: 124 ohm	
4	A	Max. communication speed: 4 Mbps Max. number of nodes: 32 (no repeater)	
5	B	Max. transmission distance: 100m	
6	15V3	15V3: 15 V ± 15%	
Jumper J12, J15: bus resistor selection, J12 and J15 must select the same status			
1 2 3  Connect the resistor by shorting 1 and 2			
1 2 3  Disconnect the resistor by shorting 2 and 3			
VR, VT: transceiver			
1	VR	Receive optical fiber communication signals	Optical fiber Type: plastic optical fiber (POF)
2	VT	Transmit optical fiber communication signals	

4.6 HPCU Parallel Control Module

The HPCU is a parallel control module, which acts as an intermediate device. The HPCU can receive the driving signals and control signals delivered by the HCU and synchronously transmit them to each active rectifier module; at the same time, the current, voltage, status and other information reported by each active rectifier module are quickly collected and transmitted to the HCU; it also controls the synchronization, current sharing, reset, and start and stop of all paralleled active rectifier modules.

Depending on system requirements, HPCU-40 (up to 4 parallel modules), HPCU-60 (up to 6 parallel modules) or HPCU-A0 (up to 10 parallel modules) can be selected.

4.6.1 HPCU Standard Terminals

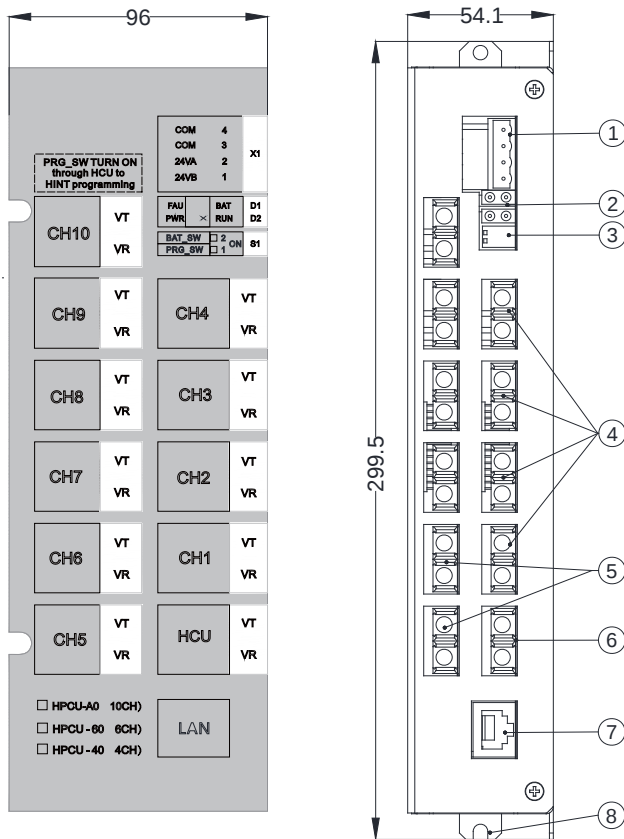


Figure 4-7 HPCU control module

Table 4-6 HPCU functions

No.	Component	Description	Description
1	Input Power	COM: 24 V GND	External power supply of HPCU X1 terminal: 5.08 mm pitch, 4-pin black pluggable terminal twisted pair cable Cross-sectional area: 0.5–2.5 mm ²
		COM: 24 V GND	
		24VA: Input power A 24.0 V±10% 0.5 A	
		24VB: Input power B (redundant design) 24.0 V±10% 0.5 A	
2	LED indicator	PWR/BAT/TX/RX	Power/battery indication/ send/receive
3	Battery DIP switch	S2: BAT_SW	Reserved
4	Optical fiber transceiver	VT/VR: CH1–CH4, parallel module channel 1– channel 4	VT: 50 M, transmit optical fiber communication signals VR: 50 M, receive optical fiber communication signals Optical fiber Type: plastic optical fiber (POF) HPCU-40 contains channels: CH1–CH4 HPCU-60 contains channels: CH1–CH6 HPCU-A0 contains channels: CH1–CH10
5	Optical fiber transceiver	VT/VR: CH5/CH6, parallel module channel 5– channel 6	
6	Optical fiber transceiver	VT/VR: HCU Inodrive, communication between HPCU and HCU	
7	LAN	PC control terminal	-
8	Fixing hole	Holes for fixing the HPCU. Quantity: 4	-

4.6.2 LED Indicators

Table 4-7 Description

No.	Name	Status	Function
1	PWR	Steady on in green	HPCU power supply is normal
		OFF	HPCU is not energized or the power supply has failed
2	RUN	Steady on in green	The active rectifier module is running
		OFF	The active rectifier module is not running
3	FAU	Flashing in red	System fault occurs
		OFF	System is normal
4	BAT	Steady on in red	Battery undervoltage
		OFF	Battery is normal

4.6.3 Electrical Connection of HPCU

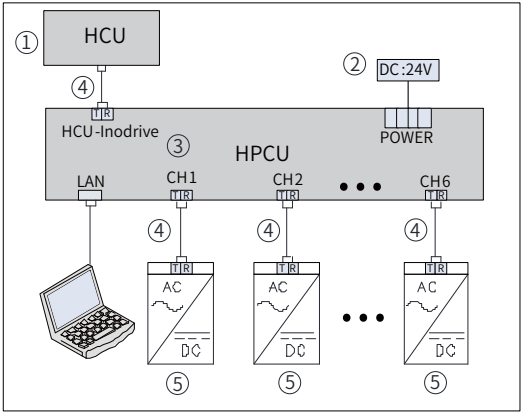


Figure 4-8 Electrical connection block diagram

Table 4-8 HPCU components

No.	Description	No.	Description
1	HCU control module	2	24 V external power supply
3	HPCU parallel control module	4	Optical fiber communication port
5	Active rectifier module	-	-

4.7 Applications of HCU

4.7.1 Function Modules Used with HCU

The HCU can be used with other function modules to expand its functions. Specific information is as follows:

Table 4-9 Function modules used with HCU

No.	Component	Model	Function Description	Connection Method	Dimensions
1	I/O module	HIO-10	2 AIs 2 AOs 2 DIOs One relay output	SLOT	105 x 73 x 24
2	PROFIBUS DP module	HDP-10	PROFIBUS-DP bus adaptation	SLOT	75x73x24
3	CANbus module	HCAN-10	CANopen bus adaptation	SLOT	75x73x24
4	MODBUS RTU module	HMBA-10	MODBUS RTU bus adaptation	SLOT	75x73x24

No.	Component	Model	Function Description	Connection Method	Dimensions
5	Ethernet Module	HETN-10	EtherNet commissioning module	SLOT	75x73x24
6	PROFINET I/O module	HPFN-10	PROFINET I/O Industrial Ethernet	SLOT	75x73x24
7	MODBUS TCP module	HMBT-10	MODBUS TCP industrial Ethernet	SLOT	75x73x24
8	Optical fiber expansion module	HOFM-10	1 pair of 50 M optical fiber cables	SLOT	75x73x24
		HOFM-30	3 pair of 50 M optical fiber cables	SLOT	75x73x24
9	Parallel control module	HPCU-40	Support 2–4 parallel modules	Optical Fiber	232x86x40
		HPCU-60	Support 2–6 parallel modules	Optical Fiber	232x86x40
		HPCU-A0	Support 2–10 parallel modules	Optical Fiber	232x86x40
10	Expansion module	HESD-10	Expand one SLOT expansion slot	Optical Fiber	105x75x70
11	Synchronous Voltage Detection Module	HSVM-10	AC voltage detection	Optical Fiber	150x100x30
		HSVM-20	DC voltage detection	Optical Fiber	150x100x30
12	SOP	SOP-20-880	display and control	RS485	150x100x30
13	Optical Fiber routing control module	HOFR-50	Support data exchange between 5 HCU control modules	Optical Fiber	232x86x40
14	Pulse-by-pulse current limit module	HCBC-A0	Wave-by-wave current limiting control for parallel power modules	Optical Fiber	232x86x40



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

4.7.2 Combination of HSVM-10 and HCU

The HSVM-10 synchronous voltage detection module is used to detect the AC line voltage of the active rectifier products. It transmits the detection signal to the HCU through the optical fiber to control and protect the rectification system.

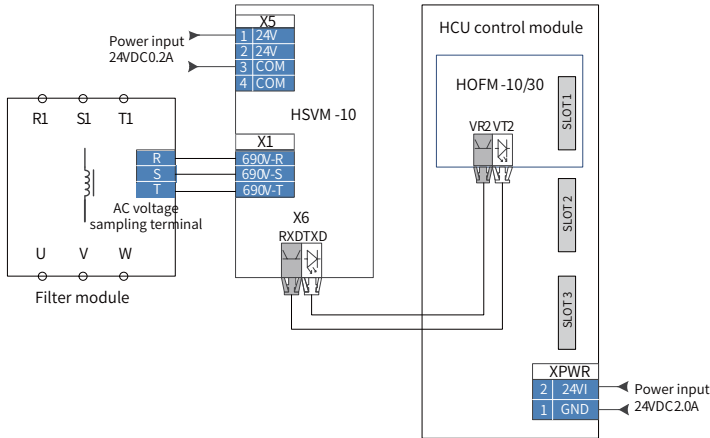


Figure 4-9 Cable connection example



NOTE

- ◆ The HSVM-10 uses SLOT1 by default. After power-on, the HCU-40 can automatically recognize the HSVM-10 module.
- ◆ For details on how to use the HSVM-10 module, see HSVM-10 Synchronous Voltage Detection Module User Guide.

4.7.3 SLOT Expansion

Different function modules are available in the HCU application. The function modules are installed directly in the SLOT slots of the HCU.

The HCU only has three SLOT slots. When more modules are needed, install HOFM and HESD expansion modules. Each HESD can connect to one function module.

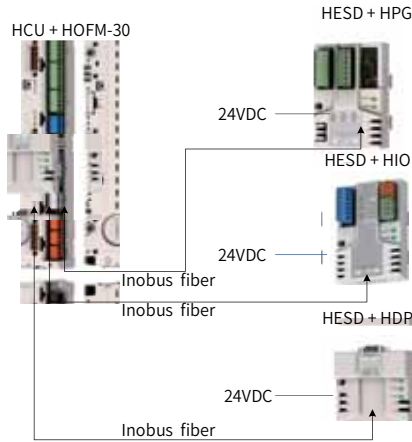


Figure 4-10 HESD wiring example



- ◆ Functional modules can be directly installed in SLOT1, SLOT2 and SLOT3. The addresses are: SLOT1_1, SLOT2_1 and SLOT3_1 respectively;
- ◆ The SLOT1 and SLOT2 slots can be used with the HOFM-30 module to achieve three SLOT slot expansions respectively. The addresses are SLOT1_1, SLOT1_2, SLOT1_3 and SLOT2_1, SLOT2_2, SLOT2_3 respectively;
- ◆ SLOT3 does not support slot expansion.
- ◆ In this case, the HESD module is not allowed to install another HOFM optical fiber expansion module.

4.7.4 Temperature Measurement with AI and AO

AI and AO, which can be used together to detect the PT100 temperature sensor signal, are generally used for motor temperature detection, with either single PT100 or 1–3 PT100's in series. AO selects constant current output and AI selects voltage signal input.

Do not directly ground both ends of the cable shield. Directly ground one end and suspend the other end, or directly ground one end and ground the other end after passing through a string capacitor.

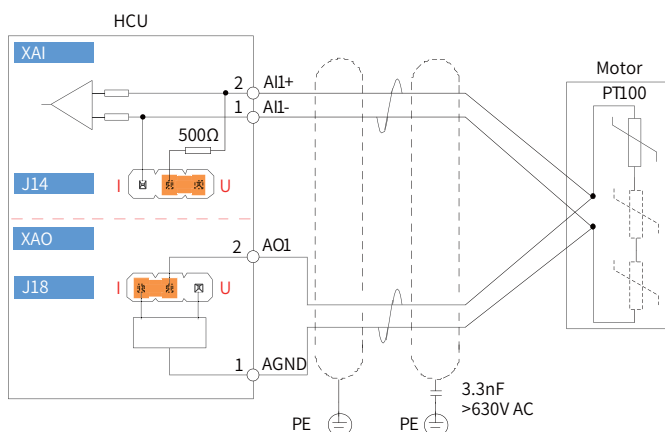


Figure 4-11 Temperature measurement with AI and AO

4.7.5 InoLink Communication Bus

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

The parameters of the InoLink bus are as follows:

Baud rate: 4 Mbps

Max. number of nodes: 16

Shielded twisted pair cables must be used for wiring. To achieve the best communication quality and prevent electromagnetic interference, it is recommended to use high quality cables, such as PROFIBUS cables; the cable should be as short as possible, and the link length must not exceed 40 m. Keep the cables from entangling and away from high-voltage cables.

If an 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 turned to the ON position.

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

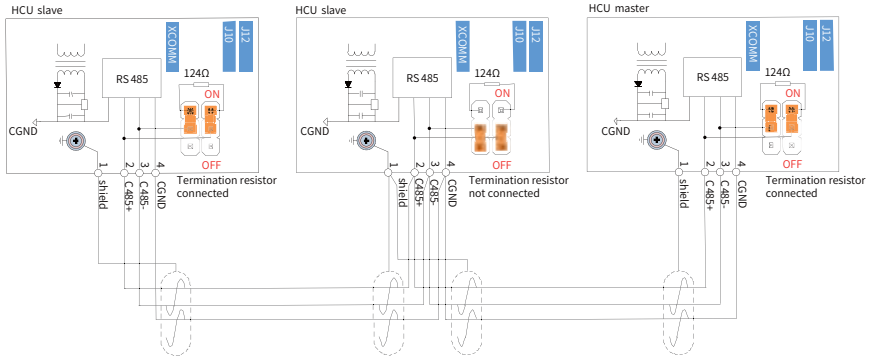


Figure 4-12 Application example

4.7.6 Communication

The communication between the HCU control module and the SOP-20-880 or PC is achieved through X11 and X12 terminals using RS485 mode, with one SOP-20-880 or PC as the master, and multiple HCUs as the slaves. X11 and X12 are RJ45 terminals with identical pin definitions for cascading.

1) Connection with SOP-20-880

The SOP-20-880 is the master and the HCU is the slave. The PC can communicate with the SOP-20-880 through USB. The far-end HCU on this link must be equipped with a termination resistor.

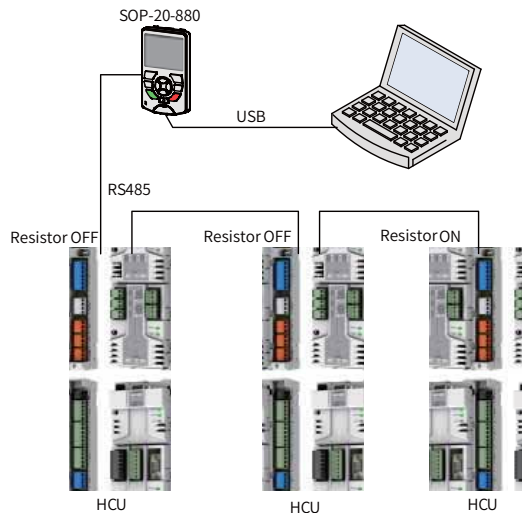


Figure 4-13 Connection with SOP-20-880

2) Connection with PC

The PC is the master, the HCU is the slave. A conversion module (RS485–RS232 converter or USB) is required between the PC and the HCU; the conversion module and the far-end HCU must be equipped with a termination resistor.

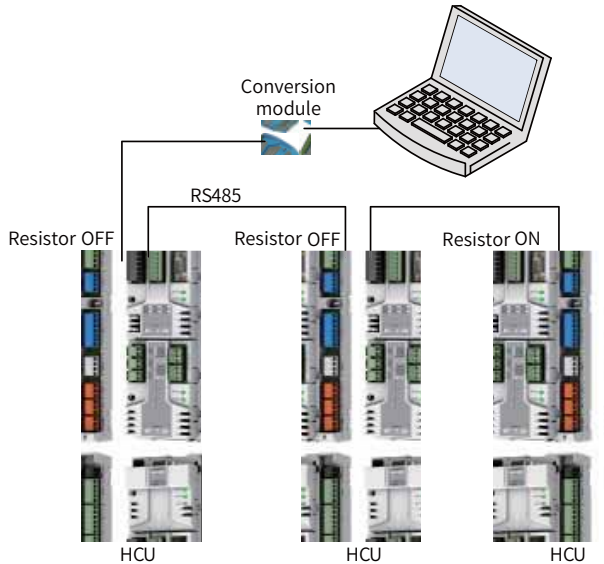


Figure 4-14 Connection with PC



- ◆ Do not connect the RJ45 ports of X11 and X12 on the HCU directly to the network port of the PC through a network cable. Otherwise, the PC or HCU may be damaged.

5 Maintenance and Inspection

5.1 Overview

This section describes:

- Cautions on maintenance and inspection:
- Periodical maintenance and inspection of components
- Replacement of components

Necessary safety measures must be taken before starting maintenance and inspection.

Safety instructions	
 DANGER	◆ Note that the active rectifier module is energized with high voltage, and all connection work must be carried out with the module de-energized! ◆ Before maintenance, power off the module, wait for 15 minutes and confirm that the voltage of the module is lower than 36 VDC, otherwise the residual charge on the capacitor will cause personal injury! ◆ When external power supply is connected, hazardous voltage are still present in the cabinet and modules even if the main breaker is open. Ensure that no voltage is present before operation. ◆ Equipment installation, wiring, maintenance, inspection, or parts replacement must be performed by only professionals. ◆ Mount and wire the equipment in line with the national standards, industry standards and local safety codes. ◆ Some equipments are very heavy or top heavy and thus must be handled with care. If they are hoisted or transported improperly, severe personal injury or even death or severe property loss may occur. ◆ Be aware of the possibly residual rotation of the cooling fan.

5.2 Precautions on Cleaning

To keep stable running of the equipment, remove the dust and contamination periodically.

Generally, observe the following points:

1) Dust

The dusts inside the cabinet and modules must be removed by professional personnel at a regular interval according to the using environment (at least once a year). The cleaning must comply with the relevant safety regulations. A brush and vacuum cleaner must be used to clean the dust. For the positions that cannot be easily reached, use dry compressed air (max. 1 bar) for cleaning.

2) Ventilation

Always keep the ventilation openings of the cabinet and modules unobstructed and ensure that the cooling fan is functioning properly.

5.3 Precautions on Inspection

Inspection means taking measures to maintain normal operation of the equipment and eliminate any fault.

1) Required tools

The following tools are required to inspect and replace the components.

- Spanner or socket spanner with width across flats 6
- Spanner or socket spanner with width across flats 8
- Spanner or socket spanner with width across flats 10
- Spanner or socket spanner with width across flats 12
- Torque wrench
- Screwdriver of size 1/2
- A socket spanner kit with two extensions is recommended.

2) Service life of components

To ensure long-term normal operation of cabinet modules, regular maintenance and inspection must be performed on the electronic components according to their service life. The service life of the electronic components is influenced by the operating environment and conditions. The following tables lists the replacement interval of these components for your reference:

Table 5-1 Service life of components

Component	Standard Service Life
DC fan	3 to 5 years
Electrolytic capacitor	8 years
PCB	8 to 10 years

3) Tightening torques of connectors

When tightening the connector of conductive parts (DC bus connections, motor connections and busbar), non-conductive parts (grounding terminals and protective grounding terminals) and common steel-made parts, obey the following tightening torques.

Table 5-2 Tightening torque for current-carrying components

Screw/ Bolt	Grounding Terminals, protective grounding terminals and steel connectors (N · m) (Conductive fault current)	Plastic case busbar (N · m) (Conductive operating current)
M2.5	0.3	0.3
M3	1	0.8
M4	1.2	1.2
M5	2.8	2.5
M6	4.8	4.8
M8	20	10.5
M10	40	20
M12	70	45

4) Cable terminals and fasteners

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



NOTE

- ◆ The actual maintenance and inspection period is determined by the equipment mounting environment and operating conditions.

5.4 Replacement of Components

5.4.1 Replacement of Filter Screen



WARNING

- ◆ Only professional personnel are allowed to perform the replacement. Before maintenance and inspection, read the "Safety Instructions" section and the safety instructions given in this section. Failure to comply may result in personal injury or equipment damage.
- ◆ Before the replacement, the equipment must be de-energized to prevent the fan from sucking contaminated air from outside. When applying external power supply to the fan, be aware of the residual rotation of the fan or disconnect the external power supply.
- ◆ If the dirt filter mats are not replaced, the cabinet modules may stop due to the overtemperature fault.

1) Removing the filter screen

If the cabinet uses an IP42 air inlet kit, clean the air inlet as follows:

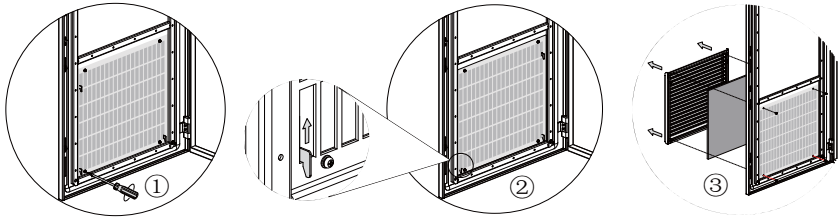


Figure 5-1 Removing the filter screen

- ① Power off the cabinet and cut off the fan power.
 - ② Open the cabinet front door and remove the four M4 screws from the window blind.
 - ③ Lift up the window blind and remove it.
 - ④ Remove the filter screen from the window blind and clean (or replace) it.
- 2) Installing the filter screen

Perform the procedure above in reverse order:

- ① Insert the filter screen that has been cleaned or a new filter screen into the window blind.
- ② Snap the window blind back into the preset position.
- ③ Fix the window blind with the four M4 screws from the inside of the front cabinet door.

Replace all filter mats as described in the preceding procedure.

5.4.2 Replacing DC Fan of the Active Rectifier Module



- ◆ Only professional personnel are allowed to perform the replacement. Before maintenance and inspection, read the "Safety Instructions" section and the safety instructions given in this section. Failure to comply may result in personal injury or equipment damage.
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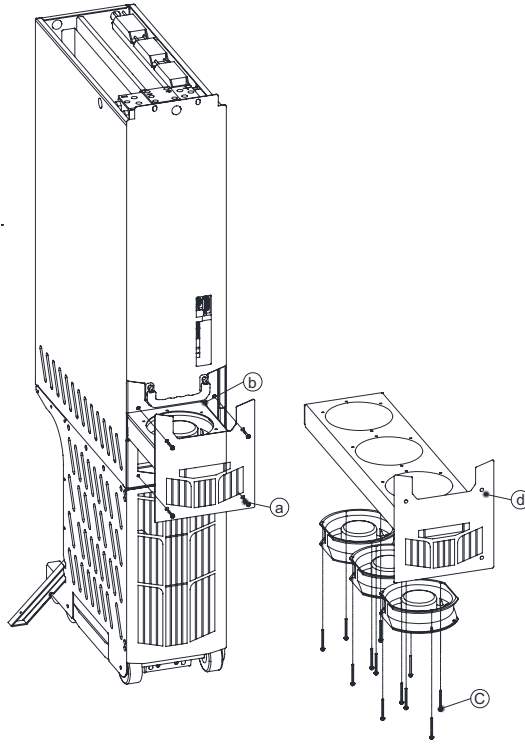


Figure 5-2 Replacing the DC fan of the active rectifier module

Steps:

- ① Disconnect the DC power from the drive cabinet and ensure that the equipment is voltage-free.
- ② Open the cabinet door and use a screwdriver to remove the four M5 screws (a) from the fan assembly (d).
- ③ Pull out the fan power cable (b) while pulling out the fan assembly from the front of the module.
- ④ Remove the twelve (four in case of one fan) M4 screws from the fan assembly .
- ⑤ Install a new fan of the same specification in the reverse order.



- ◆ The direction of the airflow is from bottom to top. Install the fan with the arrow on it pointing upwards.
- ◆ When installing the fan, be careful that the fan power cord must not be squeezed by the fan.

5.4.3 Replacing DC Fan of the Active Rectifier Filter Module



- ◆ Only professional personnel are allowed to perform the replacement. Before maintenance and inspection, read the "Safety Instructions" section and the safety instructions given in this section. Failure to comply may result in personal injury or equipment damage.

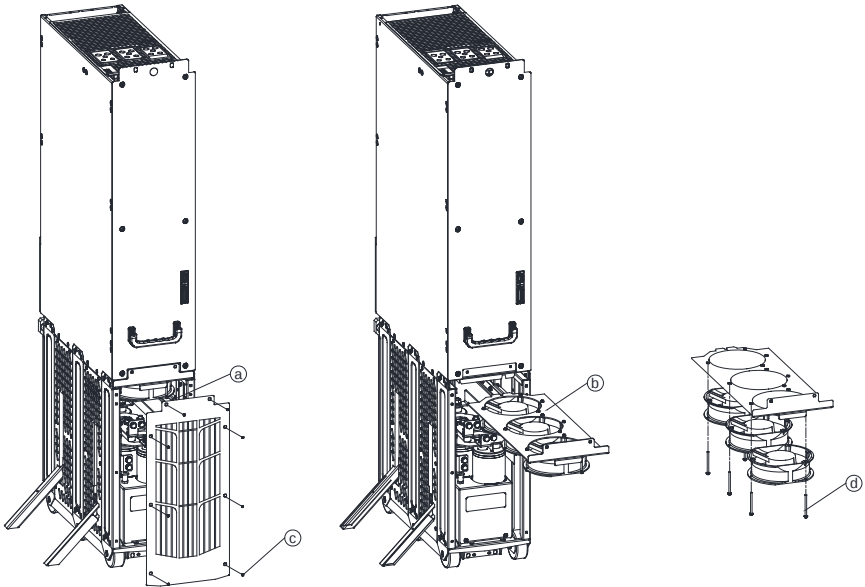


Figure 5-3 Replacing the DC fan of the active rectifier filter module

Steps:

- ① Disconnect the AC power from the drive cabinet and ensure that the equipment Null voltage-free.
- ② Open the cabinet door and use a screwdriver to remove the eight M5 screws (c) from the panel and remove the panel.
- ③ Disconnect the fan wiring from the module (a).
- ④ Pull out the fan assembly (b).
- ⑤ Unscrew the twelve M4 screws (d) from the fan and remove the fan.
- ⑥ Install a new fan and new fan assemblies in reverse order.
- ⑦ Wire the fan to the power module and install the panel.



NOTE

- ◆ The direction of the airflow is from bottom to top. Install the fan with the arrow on it pointing upwards.
- ◆ When installing the fan, be careful that the fan power cord must not be squeezed by the fan.

5.4.4 Replacing the Frame Accessory Kit



WARNING

- ◆ Only professional personnel are allowed to perform the replacement. Before maintenance and inspection, read the "Safety Instructions" section and the safety instructions given in this section. Failure to comply may result in personal injury or equipment damage.

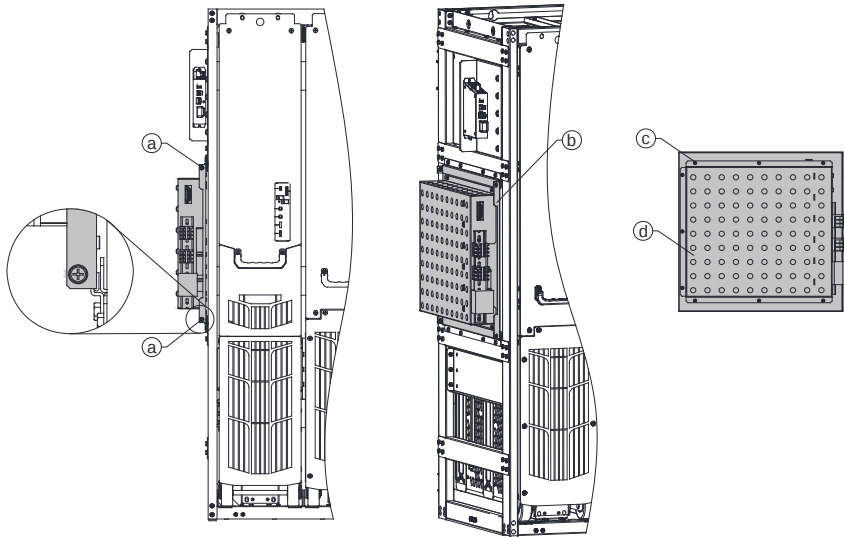


Figure 5-4 Replacing the frame accessory kit

Steps:

- ① Disconnect the AC power from the drive cabinet and ensure that the equipment Null voltage-free.
- ② Disconnect all terminals that are connected to the accessory kit.
- ③ Use a screwdriver to remove the two M6 screws (a) on the front side.
- ④ Pull the edge of the sheet metal (b) and pull out the accessory kit.
- ⑤ Use a screwdriver to remove the nine M4 screws (c) that secure the accessory kit cover, remove the accessory cover (d), maintain internal components, and connect cables.
- ⑥ Install the accessory kit in reverse order.
- ⑦ Connect cables and complete the maintenance.

5.4.5 Replacing the Fan Power



- ◆ Only professional personnel are allowed to perform the replacement. Before maintenance and inspection, read the "Safety Instructions" section and the safety instructions given in this section. Failure to comply may result in personal injury or equipment damage.

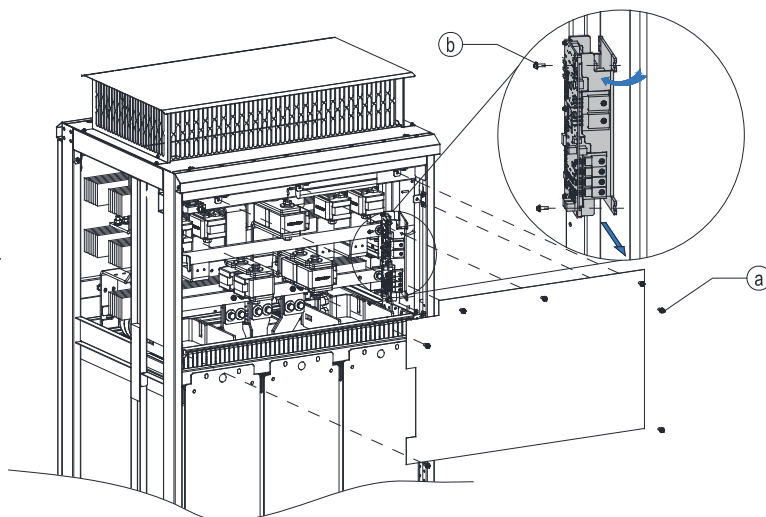


Figure 5-5 Replacing the fan power

Steps:

- ① Disconnect the AC power from the drive cabinet and ensure that the equipment is voltage-free.
- ② Open the cabinet door.
- ③ Loosen the screw (a) on the upper cover of the cabinet and remove the cover.
- ④ Pull out the terminal of the fan power supply.
- ⑤ Remove the two screws (b) on the power supply and remove the power supply. Be careful not to drop the screws inside the module!
- ⑥ Install a new power supply in the reverse order.
- ⑦ Re-connect the power supply terminals.
- ⑧ Tighten the cover and close the door.



- ◆ Do not damage the fastening screws: Tighten the power supply fastening screws with 1.2 N · m.

5.4.6 Replacing HSVM-10



- ◆ Only professional personnel are allowed to perform the replacement. Before maintenance and inspection, read the "Safety Instructions" section and the safety instructions given in this section. Failure to comply may result in personal injury or equipment damage.

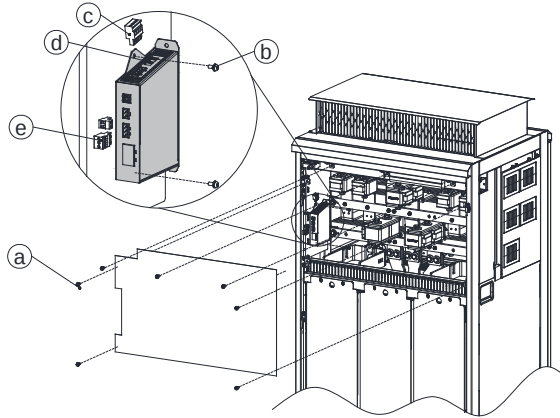


Figure 5-6 Replacing HSVM-10

Steps:

- ① Disconnect the AC power from the drive cabinet and ensure that the equipment Null voltage-free.
- ② Open the cabinet door.
- ③ Loosen the screw (a) on the upper cover of the cabinet and remove the cover.
- ④ Pull out the optical fiber (d) on the top of the HSVM-10.
- ⑤ Pull out the 24 V power terminal (c) on the top of the HSVM-10 .
- ⑥ Pull out the three-phase AC voltage detection terminal (e) at the front of the HSVM-10.
- ⑦ Remove the two screws (b) on the HSVM-10 and take out the HSVM-10. Be careful not to drop the screws inside the module!
- ⑧ Install a new HSVM-10 in the reverse order.
- ⑨ Tighten the cover and close the door.



- ◆ Do not damage the fastening screws: Tighten the fastening screws with 1.2 N · m.

5.4.7 Replacing the Lightning Protection Board



- ◆ Only professional personnel are allowed to perform the replacement. Before maintenance and inspection, read the "Safety Instructions" section and the safety instructions given in this section. Failure to comply may result in personal injury or equipment damage.

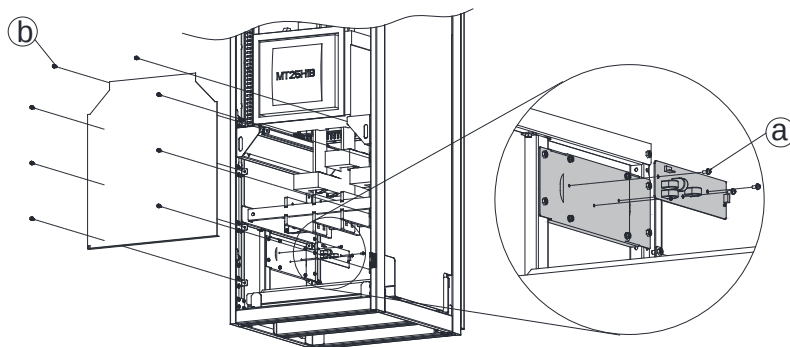


Figure 5-7 Replacing the lightning protection board

Steps:

- ① Disconnect the AC power from the drive cabinet and the isolating switch of the charging circuit. Ensure that the equipment is voltage-free.
- ② Open the cabinet door.
- ③ Loosen the screws (a) on the lower cover of the cabinet and remove the cover.
- ④ Disconnect the lightning protection board terminal and remove the fixing screws (a).
- ⑤ Install a new lightning protection board in the reverse order.
- ⑥ Re-connect the terminal.
- ⑦ Tighten the cover and close the door.



- ◆ Do not damage the fastening screws: Tighten the fastening screws with 1.2 N · m.

5.4.8 Replacing the Fuse



- ◆ Only professional personnel are allowed to perform the replacement. Before maintenance and inspection, read the "Safety Instructions" section and the safety instructions given in this section. Failure to comply may result in personal injury or equipment damage.

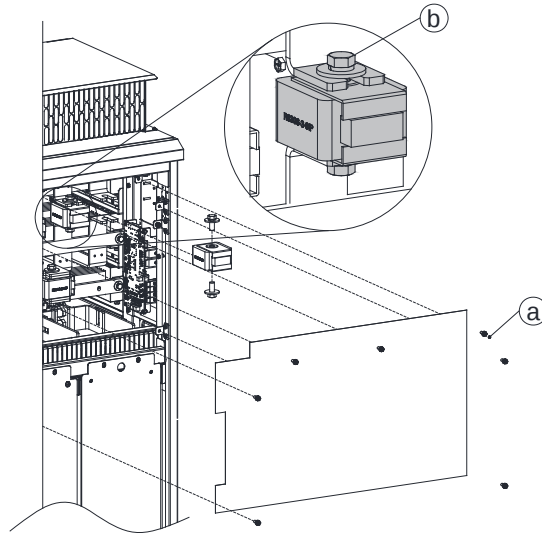


Figure 5-8 Replacing the fuse

Steps:

- ① Disconnect the AC power from the drive cabinet and the isolating switch of the pre-charge circuit. Ensure that the equipment is voltage-free.
- ② Open the cabinet door.
- ③ Loosen the screw (a) on the upper cover of the cabinet and remove the cover.
- ④ Loosen the fuse nut (b) and pull out the fuse together with the nut. Note: do not loosen the nut completely to prevent the nut from falling into the module.
- ⑤ Remove the nut and check the condition of the fuse. If the fuse burns out, replace all fuses and tighten the nut. The maximum tightening torque of the nut is $35 \text{ N} \cdot \text{m}$.
- ⑥ Install the cover in the reverse order and close the cabinet door.

5.4.9 Replacing the Active Rectifier Module



- ◆ Only professional personnel are allowed to perform the replacement. Before maintenance and inspection, read the "Safety Instructions" section and the safety instructions given in this section. Failure to comply may result in personal injury or equipment damage.
 - ◆ Due to the heavy weight and the high center of gravity of the module, exert extreme caution when operating. The module is highly prone to rollover.
 - ◆ When removing the module, carefully pull the module out of the cabinet along the ramp plate. While holding the handle, apply a constant pressure to the base of the module with one foot to prevent the module from falling backwards.
 - ◆ When installing the module, push the module back into the cabinet along the ramp plate. Keep your fingers away from the edge of the front panel of the module to prevent them from getting stuck between the module and the cabinet. In addition, use one foot to apply constant pressure to the base of the module to prevent the module from falling backwards.
 - ◆ Do not tilt the module and do not place the module on a sloping floor.
-

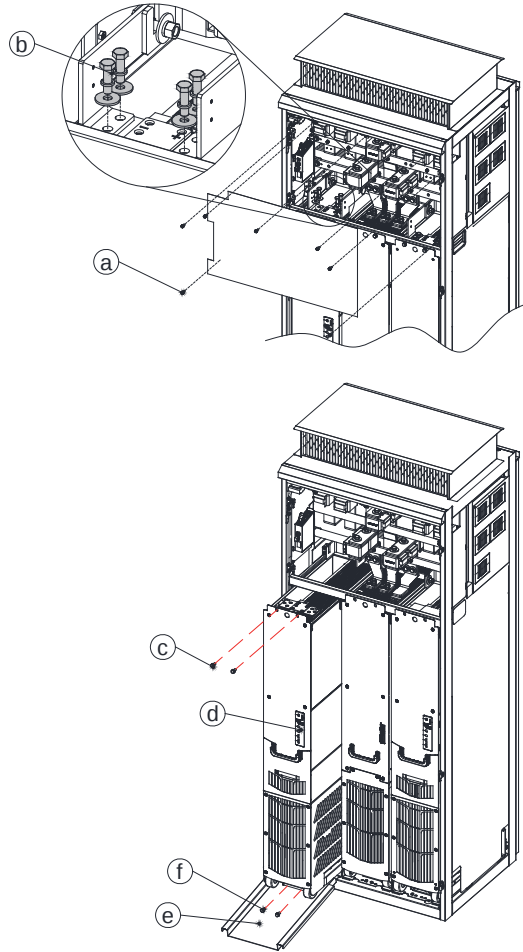


Figure 5-9 Replacing the active rectifier module

Steps:

- ① Disconnect the AC power from the drive cabinet and ensure that the equipment Null voltage-free.
- ② Open the cabinet door.
- ③ Loosen the screw (a) on the upper cover of the cabinet and remove the cover.
- ④ Disconnect the two DC busbars at the top of the module (b). Do not drop the screws into the module!
- ⑤ Remove the cap (d) on the optical fiber terminal on the front of the module and pull out the fiber cable.

- ⑥ Remove the two M8 screws (f) that secure the bottom of the module to the base of the cabinet.
- ⑦ Fix the mounting rail (e): Pull the mounting rail from the cabinet base so that the base hook engages with the mounting rail hole.
- ⑧ Remove the two M8 screws (c) that secure the top of the module to the cabinet frame.
- ⑨ Carefully pull the module out of the cabinet along the rail. While holding the handle, apply a constant pressure to the base of the module with one foot to prevent the module from falling backwards.
- ⑩ Install a new module in the reverse order. Mind your fingers. Use one foot to apply constant pressure to the base of the module to prevent the module from falling backwards.
- ⑪ Reconnect the optical fiber cable and tighten the cover.
- ⑫ Remove the mounting rail and close the cabinet door.



NOTE

◆ Do not damage the fastening screws: Tighten the fastening screws of the module with $20 \text{ N} \cdot \text{m}$ and those of the DC busbars with $40 \text{ N} \cdot \text{m}$.

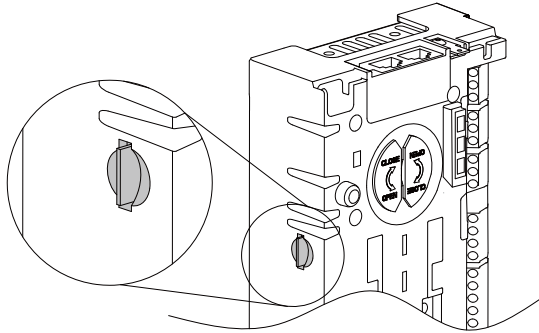
5.4.10 Maintain the HCU Control Module

1 Replace the memory card

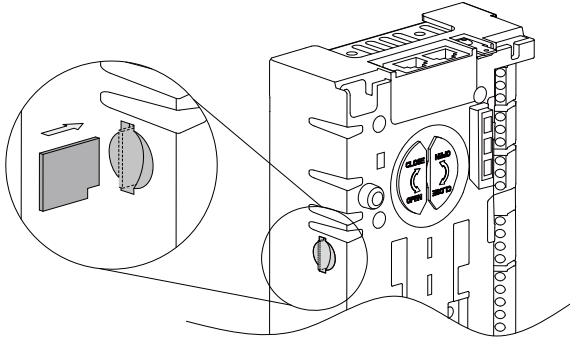
After replacing the HCU control module, the existing parameter settings can be retained by transferring the memory card from the faulty module to the new module.

Steps:

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



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

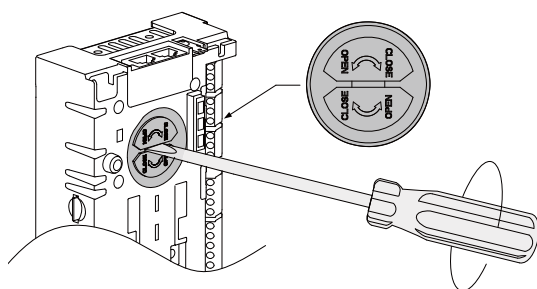
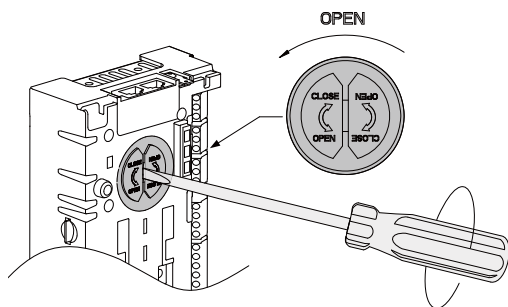


- 3) Ensure that the SD memory card is pushed into position. Otherwise, an abnormality will occur due to poor contact.

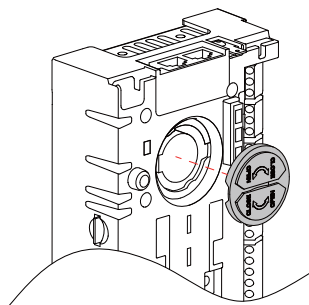
2 Replacing the battery

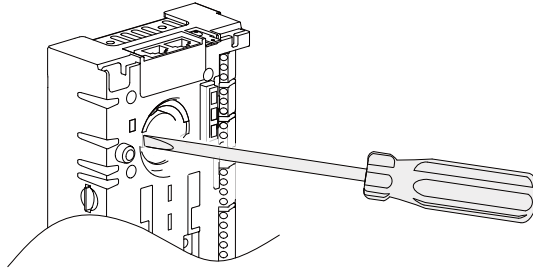
Steps:

- 1) Turn the battery cover 90° counterclockwise with a 2 mm slotted screwdriver to open the cover.

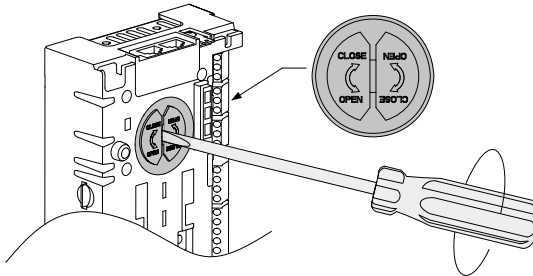
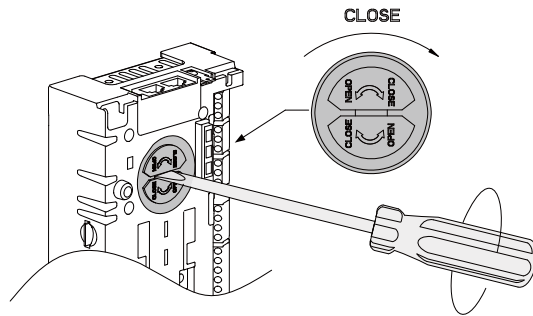


- 2) Remove the cover. Press one side of the battery with the screwdriver, and remove the battery. Install a new battery.

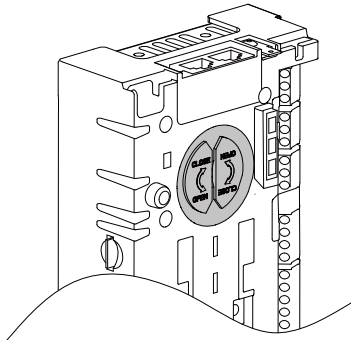




- 3) Close the cover and turn it 90° clockwise to secure it.



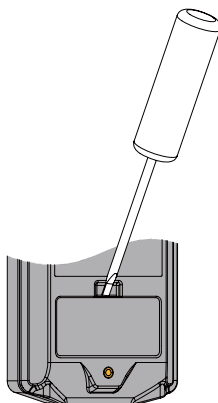
- 4) Dispose of used batteries in accordance with local disposal rules or applicable laws.



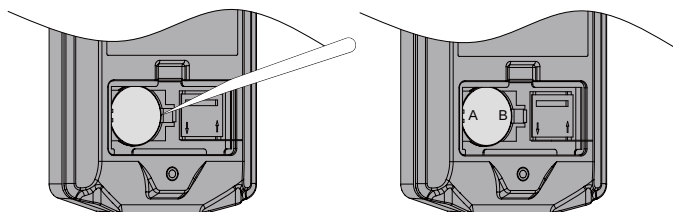
5.4.11 Replacing the Battery of SOP-20-880

Steps:

Use a slotted screwdriver or fingers to remove the battery cover.

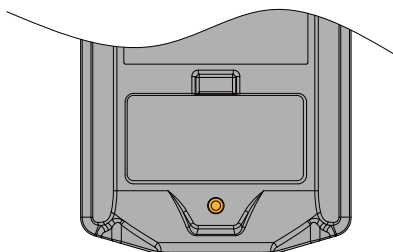


Take out the battery with tweezers or a slotted screwdriver.



Place the battery into the clip (A side) first and then press the other end (B side) of the battery.

Put the battery cover back.



6 Ordering Instructions

6.1 Order Number

This chapter lists the model numbers and order numbers of the active rectifier products.

Table 6-1 MD880-40 Series Active Rectifier Ordering Instructions

Model MD880-40-...	Frame	Order Number	Quantity	Remarks
0575-4	BLCL+H8	1.MD880-40K-0575-4	1	Active rectifier frame kit
		2. HCU-40	1	Active rectifier controller
		3. HOFM-10	1	Optical fiber expansion module
		4. HSVM-10	1	Synchronous voltage detection module
0810-4	BLCL+H8	1. MD880-40K-0810-4	1	Active rectifier frame kit
		2. HCU-40	1	Active rectifier controller
		3. HOFM-10	1	Optical fiber expansion module
		4. HSVM-10	1	Synchronous voltage detection module
1092-4	BLCL+2H8	1. MD880-40K-1092-4	1	Active rectifier frame kit
		2. HCU-40	1	Active rectifier controller
		3. HPCU-40	1	Parallel control module
		4. HOFM-10	1	Optical fiber expansion module
		5. HSVM-10	1	Synchronous voltage detection module
1539-4	BLCL+2H8	1. MD880-40K-1539-4	1	Active rectifier frame kit
		2. HCU-40	1	Active rectifier controller
		3. HPCU-40	1	Parallel control module
		4. HOFM-10	1	Optical fiber expansion module
		5. HSVM-10	1	Synchronous voltage detection module
2185-4	2*(BLCL+2H8)	1.MD880-40K-1092-4	2	Active rectifier frame kit
		2. HCU-40	1	Active rectifier controller
		3. HPCU-40	1	Parallel control module
		4. HOFM-10	1	Optical fiber expansion module
		5. HSVM-10	1	Synchronous voltage detection module

Model MD880-40-...	Frame	Order Number	Quantity	Remarks
3078-4	2*(BLCL+2H8)	1.MD880-40K-1539-4	2	Active rectifier frame kit
		2. HCU-40	1	Active rectifier controller
		3. HPCU-40	1	Parallel control module
		4. HOFM-10	1	Optical fiber expansion module
		5. HSVM-10	1	Synchronous voltage detection module
4617-4	3*(BLCL+2H8)	1.MD880-40K-1539-4	3	Active rectifier frame kit
		2. HCU-40	1	Active rectifier controller
		3. HPCU-60	1	Parallel control module
		4. HOFM-10	1	Optical fiber expansion module
		5. HSVM-10	1	Synchronous voltage detection module
0369-7	BLCL+H8	1.MD880-40K-0369-7	1	Active rectifier frame kit
		2. HCU-40	1	Active rectifier controller
		3. HOFM-10	1	Optical fiber expansion module
		4. HSVM-10	1	Synchronous voltage detection module
0540-7	BLCL+H8	1.MD880-40K-0540-7	1	Active rectifier frame kit
		2. HCU-40	1	Active rectifier controller
		3. HOFM-10	1	Optical fiber expansion module
		4. HSVM-10	1	Synchronous voltage detection module
0701-7	BLCL+2H8	1.MD880-40K-0701-7	1	Active rectifier frame kit
		2. HCU-40	1	Active rectifier controller
		3. HPCU-40	1	Parallel control module
		4. HOFM-10	1	Optical fiber expansion module
		5. HSVM-10	1	Synchronous voltage detection module
1026-7	BLCL+2H8	1.MD880-40K-1026-7	1	Active rectifier frame kit
		2. HCU-40	1	Active rectifier controller
		3. HPCU-40	1	Parallel control module
		4. HOFM-10	1	Optical fiber expansion module
		5. HSVM-10	1	Synchronous voltage detection module

Model MD880-40-...	Frame	Order Number	Quantity	Remarks
1402-7	2*(BLCL+2H8)	1.MD880-40K-0701-7	2	Active rectifier frame kit
		2. HCU-40	1	Active rectifier controller
		3. HPCU-40	1	Parallel control module
		4. HOFM-10	1	Optical fiber expansion module
		5. HSVM-10	1	Synchronous voltage detection module
2052-7	2*(BLCL+2H8)	1.MD880-40K-1026-7	2	Active rectifier frame kit
		2. HCU-40	1	Active rectifier controller
		3. HPCU-40	1	Parallel control module
		4. HOFM-10	1	Optical fiber expansion module
		5. HSVM-10	1	Synchronous voltage detection module
3078-7	3*(BLCL+2H8)	1.MD880-40K-1026-7	3	Active rectifier frame kit
		2. HCU-40	1	Active rectifier controller
		3. HPCU-60	1	Parallel control module
		4. HOFM-10	1	Optical fiber expansion module
		5. HSVM-10	1	Synchronous voltage detection module
4104-7	4*(BLCL+2H8)	1.MD880-40K-1026-7	4	Active rectifier frame kit
		2. HCU-40	1	Active rectifier controller
		3. HPCU-A0	1	Parallel control module
		4. HOFM-10	1	Optical fiber expansion module
		5. HSVM-10	1	Synchronous voltage detection module
5130-7	5*(BLCL+2H8)	1.MD880-40K-1026-7	5	Active rectifier frame kit
		2. HCU-40	1	Active rectifier controller
		3. HPCU-A0	1	Parallel control module
		4. HOFM-10	1	Optical fiber expansion module
		5. HSVM-10	1	Synchronous voltage detection module

Unity Drive Warranty Agreement

- 1) Unity Drive provides an 18-month free warranty to the equipment itself from the date of manufacturing for the failure or damage under normal use conditions.
- 2) Within the warranty period, maintenance will be charged for the damage caused by the following reasons:
 - a. Improper use or repair/modification without prior permission
 - b. Fire, flood, abnormal voltage, natural disasters and secondary disasters
 - c. Hardware damage caused by dropping or transportation after procurement
 - d. Operations not following the user instructions
 - e. Damage out of the equipment (for example, external device factors)
- 3) The maintenance fee is charged according to the latest Maintenance Price List of Unity Drive.
- 4) If there is any problem during the service, contact Unity Drive's agent or Unity Drive directly.
- 5) Unity Drive reserves the rights for explanation of this agreement.

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