



MD880-80 Series DC Chopper Integrated Kit Hardware Guide



Industrial
Automation



Intelligent
Elevator



New Energy
Vehicle



Industrial
Robot



Rail
Transit



Data code 19012366 A00

Preface

This product is a DC chopper integrated kit. It features high power density, compact structure, and high reliability, meeting the requirements for wide voltage range, high precision, rapid dynamic response, and programmable power supply output. The product is available in the voltage class of 400 V and 690 V , provides a power of 50 kW to 600 kW per unit, and supports parallel connection of a maximum of 10 units for expansion. It is suitable for battery charge-discharge controllers, power conversion systems, DC test power supplies, and other similar applications.

This guide describes the mechanical installation, electrical installation, control module, quick commissioning, basic parameters, function modules, and troubleshooting of the product.

Precautions
◆ For the illustration purpose, some drawings in this guide show the product without covers or protective guards. Remember to install the covers or protective guards as specified before using the product and operate the product in accordance with this guide. ◆ Drawings in this guide are for general reference only and may differ from the product you purchased. ◆ This guide may be modified without prior notice due to continuous product upgrade. ◆ For any questions encountered during use, please contact your local agent or customer service center.

More Documents

Rectifiers	Data No.
MD880-40 Series Active Rectifier Hardware User Guide	19011311
MD880-30 Series Regenerative Rectifier Hardware User Guide	19011313
MD880-20 Series Basic Rectifier Module Hardware Guide	19011491
Others	Data No.
SOP-20-880 Series Smart Operating Panel User Guide	19010611

Revision History

Date	Version	Description
May 2024	A00	First release

Fundamental Safety Instructions

Safety Disclaimer

- 1) Read the safety precautions before installing, operating, and maintaining this equipment.
- 2) To ensure personal and equipment safety, follow all safety precautions marked on the product and described in the guide when installing, operating, and maintaining this equipment.
- 3) "CAUTION", "WARNING", and "DANGER" messages in the guide are only examples and do not cover all safety precautions.
- 4) Use this equipment according to the designated environment requirements. Malfunction or damage caused by improper use is not covered by warranty.
- 5) Inovance shall not be liable for any physical injury or property loss caused by improper use.

Safety Levels and Definitions



DANGER

"DANGER" indicates that failure to comply with the notice will result in severe physical injury or even death.



WARNING

"WARNING" indicates that failure to comply with the notice may result in severe physical injury or even death.



CAUTION

"CAUTION" indicates that failure to comply with the notice may result in minor or moderate physical injury or equipment damage.

General Safety Precautions

Unpacking



CAUTION

- ◆ Before unpacking, check whether the packing is intact without damage, water seepage, damp, and deformation.
- ◆ Unpack the package layer by layer. Do not strike the package violently.
- ◆ Check the surface of the equipment and accessories for any damage, rust, and scratches.
- ◆ Check the equipment, accessories, and materials in the package against the packing list.

Contents

Preface.....	1
Fundamental Safety Instructions	6
Safety Disclaimer	6
Safety Levels and Definitions	6
General Safety Precautions	6
Safety Labels.....	10
Chapter 1 Product Information.....	11
1.1 Model and Nameplate	11
1.2 Technical Data	13
1.3 Specifications and Model Selection	15
1.4 Hardware	17
1.4.1 Hardware Operating Principle	17
1.4.2 Basic Topology Framework.....	17
1.4.3 Typical Electrical Drive System.....	20
1.4.4 Output Current Characteristics.....	21
1.4.5 Power Module Specifications.....	21
1.4.6 Filter Specifications	22
1.5 Structural Layout and Dimensions of the Modules	24
1.5.1 Structural Layout and Outline Dimensions of H3 Modules.....	25
1.5.2 Structural Layout and Outline Dimensions of H4 Modules	26
1.5.3 Structural Layout and Outline Dimensions of H6 Modules	28
1.5.4 Structural Layout and Outline Dimensions of H7 Modules.....	31
1.5.5 Structural Layout and Outline Dimensions of H8A Modules.....	34
1.6 Hall Sensor Outline Dimensions.....	36
1.7 Pre-charge Resistor Outline Dimensions	37
1.8 Derating	38
1.9 Overload Capacity.....	39
Chapter 2 Mechanical Installation.....	41
2.1 Installation Precautions	42
2.1.1 Storage	42
2.1.2 Transportation	42
2.1.3 Package Check	45
2.1.4 Unpacking.....	45
2.1.5 Installation Checklist	45
2.2 Installation Environment.....	46

2.3 Installation Clearance.....	48
Chapter 3 Electrical Installation	52
3.1 Safety Instructions	53
3.1.1 Safety Precautions Before Installation	53
3.1.2 Electrical Installation Check.....	53
3.1.3 General Statement	53
3.1.4 Insulation Check.....	55
3.2 EMC-Compliant Cable Routing.....	55
3.2.1 Requirements.....	55
3.2.2 Cable Routing Suggestions	55
3.2.3 Connection of Shielded Power Cables.....	58
3.3 Pre-charging of DC Bus Capacitors.....	59
3.4 Module Connection	60
3.4.1 Cable Connection of H3 and H4 DC Chopper Modules	60
3.4.2 Cable Connection of H6 and H7 DC Chopper Modules.....	62
3.4.3 Cable Connection of H8A DC Chopper Modules	64
3.4.4 Cable Specifications and Recommendations.....	66
3.5 Installation Checklist	68
Chapter 4 HCU Control Module	69
4.1 HCU Controller Composition	69
4.2 LED Indicators	72
4.3 SD Memory Card.....	72
4.4 HCU Dimensions and Installation Instructions	72
4.4.1 Installation Precautions.....	72
4.4.2 HCU Dimensions	74
4.4.3 Requirements of Installation Clearance	75
4.4.4 Installation Procedure.....	75
4.5 HCU Ports	76
4.5.1 Standard Ports	78
4.5.2 Port Details	78
4.5.3 HCU Port Definitions	82
4.6 HPCU Parallel Control Module.....	82
4.6.1 Standard Ports of HPCU	83
4.6.2 LED Indicators	84
4.6.3 Electrical Connection of HPCU.....	84
4.7 HCU Function Application.....	85
4.7.1 HCU Function Modules.....	85

4.7.2 Slot Expansion.....	87
Chapter 5 Maintenance and Inspection.....	88
5.1 Overview	88
5.2 Precautions for Cleaning	88
5.3 Precautions for Inspection	89
5.4 Component Replacement	90
5.4.1 Overview.....	90
5.4.2 Safety Instructions.....	91
5.4.3 Replacing DC Fans of the DC chopper Module	91
5.4.4 Replacing HSVM-20.....	96
5.4.6 Maintaining the HCU Control Module.....	99
5.4.7 Replacing the Battery of SOP-20-880.....	102
Chapter 6 List of Electrical Components.....	103



WARNING

- ◆ Do not install the equipment if any damage, rust, or sign of use is found on the equipment or accessories.
- ◆ Do not install the equipment in case of water seepage in the equipment, part missing, or part damage.
- ◆ Do not install the equipment if the packing list does not match the equipment received.

Storage and Transportation



CAUTION

- ◆ Store and transport the equipment in accordance with the storage and transportation requirements. Observe the humidity and temperature requirements.
- ◆ Avoid storing or transporting the equipment in environments with water splash, rain, direct sunlight, strong electric field, strong magnetic field, and strong vibration.
- ◆ Avoid long-term storage. If the storage time exceeds 3 months, take stricter protection and inspection measures.
- ◆ Pack the equipment properly before transportation by vehicle. Use an enclosed box for long-distance transportation.
- ◆ Transport the equipment with a flatcar and ensure the base on which the equipment is installed is horizontal. In case of rainy or snowy days, take protective measures to prevent the equipment from being wetted.
- ◆ Never transport the equipment with devices or materials that may damage or have negative impacts on the equipment.



WARNING

- ◆ Use special loading and unloading devices to move large-scale or heavy equipment.
- ◆ When moving the equipment with bare hands, hold the equipment casing firmly with care to prevent parts from falling. Failure to comply may result in physical injury.
- ◆ Handle the equipment with care and mind your steps. Failure to comply may result in physical injury or equipment damage.
- ◆ Never stand or stay below the equipment that is being lifted by hoisting equipment. Ensure the crane, hoist rope, and hook carry sufficient tonnage when lifting the equipment with a crane.

Installation



WARNING

- ◆ Read through the user guide and safety precautions before installation.
- ◆ Do not modify the equipment.
- ◆ Do not fiddle with the bolts used to fix equipment components or the bolts marked in red.
- ◆ Do not install the equipment in places with strong electric or magnetic fields.
- ◆ When installing the equipment in a cabinet or final assembly, provide a fireproof enclosure with adequate electrical and mechanical protection conforming to relevant IEC standards and local laws and regulations.

**DANGER**

- ◆ Equipment installation, wiring, maintenance, inspection, or parts replacement must be performed only by professionals.
- ◆ Ensure that the installation, wiring, maintenance, inspection, and parts replacement are performed by professional personnel only.
- ◆ Ensure that the installation personnel are familiar with equipment installation requirements and relevant technical information.
- ◆ Before installing equipment with strong electromagnetic interference, such as a transformer, install a shielding device for the equipment to prevent malfunction.

Wiring**DANGER**

- ◆ Equipment installation, wiring, maintenance, inspection, or parts replacement must be performed only by professionals.
- ◆ Never perform wiring while the equipment is energized. Failure to comply may result in an electric shock.
- ◆ Before wiring, cut off all the power supplies of the equipment. Wait at least 15 minutes before further operations because residual voltage exists after power-off.

**DANGER**

- ◆ Perform wiring only after the equipment is installed in place.
- ◆ Ensure that the equipment is well grounded. Failure to comply may result in an electric shock.
- ◆ During wiring, follow the ESD procedures and wear an antistatic wrist strap. Failure to comply may result in damage to internal circuits of the equipment.

**WARNING**

- ◆ Do not connect the input power cable to the output terminal of the equipment. Failure to comply may result in equipment damage or even fire.
- ◆ When connecting a drive with the motor, make sure that the phase sequences of the drive and motor terminals are consistent to prevent reverse motor rotation.
- ◆ Use cables with required diameter and shield. Properly ground one end of the shield if a shielded cable is used.
- ◆ After wiring, make sure that no dropped screws and exposed cables are inside the equipment.

Power-on



DANGER

- ◆ Before power-on, make sure that the equipment is installed properly with reliable wiring and the motor can be restarted.
- ◆ Check that the power supply meets equipment requirements before power-on to prevent equipment damage and fire.
- ◆ Stay away from the equipment at power-on because unexpected operations may be triggered on the equipment.
- ◆ Never open the cabinet door or protective cover of the equipment after power-on. Failure to comply will result in an electric shock.
- ◆ Never touch any wiring terminals of the equipment while power is on. Failure to comply may result in an electric shock.
- ◆ Never disassemble any unit or component of the equipment while power is on. Failure to comply will result in an electric shock.

Operation



DANGER

- ◆ Never touch any wiring terminals of the equipment during operation. Failure to comply may result in an electric shock.
- ◆ Never disassemble any unit or component of the equipment during operation. Failure to comply will result in an electric shock.
- ◆ Do not touch the equipment casing, fan, or resistor to check the temperature. Failure to comply may result in burns.
- ◆ Never allow non-professionals to detect signals during operation. Failure to comply may result in physical injury or equipment damage.



WARNING

- ◆ Prevent metal or other objects from falling into the equipment during operation. Failure to comply may result in fire or equipment damage.
- ◆ Do not use a contactor to start or stop the equipment. Failure to comply may result in equipment damage.

Maintenance



DANGER

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

**WARNING**

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

Repair**DANGER**

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

**WARNING**

- ◆ Require repair services according to the equipment warranty agreement.
- ◆ When the equipment fails or is damaged, arrange for qualified technicians to troubleshoot and repair the equipment in accordance with the maintenance instructions and retain a maintenance record.
- ◆ Replace quick-wear parts of the equipment according to the replacement instructions.
- ◆ Do not use a damaged machine. Failure to comply may result in further damage.
- ◆ After the equipment is replaced, check the wiring and set parameters again.

Disposal**WARNING**

- ◆ Dispose of retired equipment in accordance with local regulations and standards. Failure to comply may result in property damage, physical injury, or even death.
- ◆ Dispose of or recycle retired equipment by following industry waste disposal standards to avoid environmental pollution.

Safety Labels

For safe operation and maintenance, follow the instructions on safety labels on the equipment. Do not stain or remove the safety labels. The following table describes the safety labels.

Safety Label	Description
WARNING  · The equipment must be serviced by qualified personnel only. · Disconnect all energy sources and wait for 15 minutes before maintenance. · Read the maintenance instructions before maintenance.	The equipment must be serviced by qualified personnel only. Disconnect all energy sources and wait for 15 minutes before maintenance. Read the maintenance instructions before maintenance.
 CAUTION To prevent overheating of the pre-charge resistor, the interval between switch-ons must not be less than three minutes!	To prevent overheating of the pre-charge resistor, the interval between switch-ons must not be less than three minutes!

Chapter 1 Product Information

1.1 Model and Nameplate

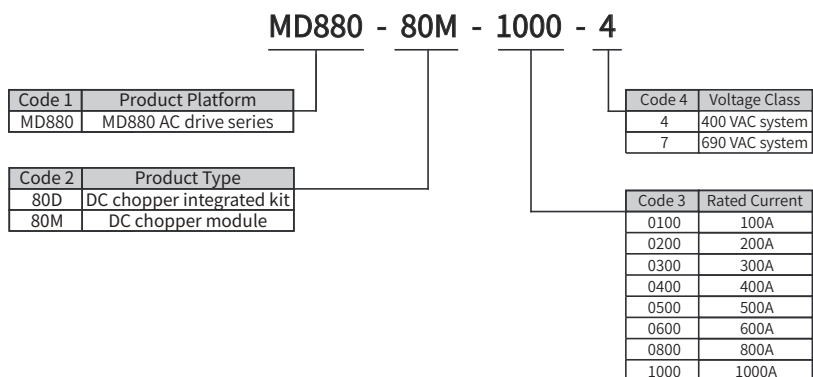


Figure 1-1 Model naming rules

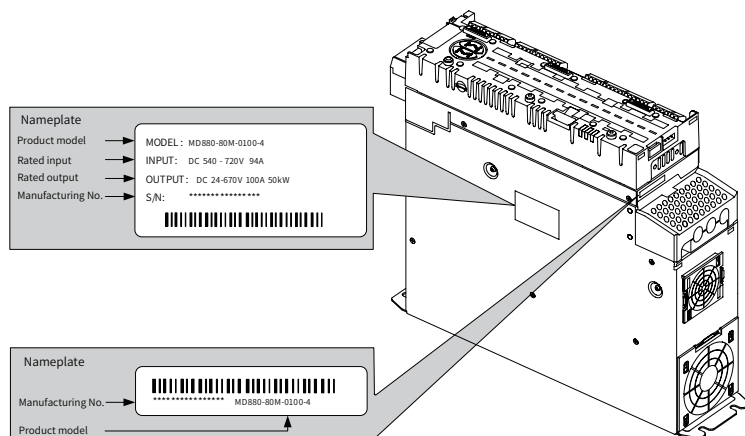


Figure 1-2 Nameplate of the H1 to H4 modules

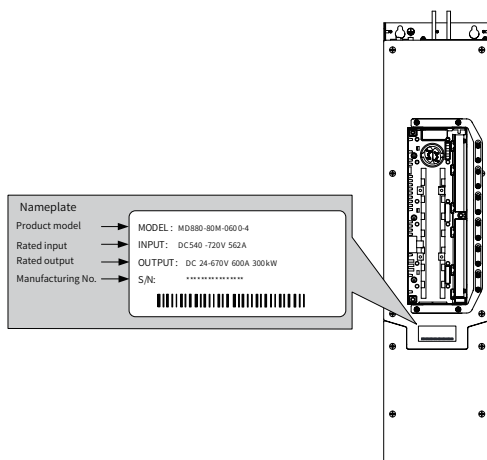


Figure 1-3 Nameplate of the H6 and H7 modules

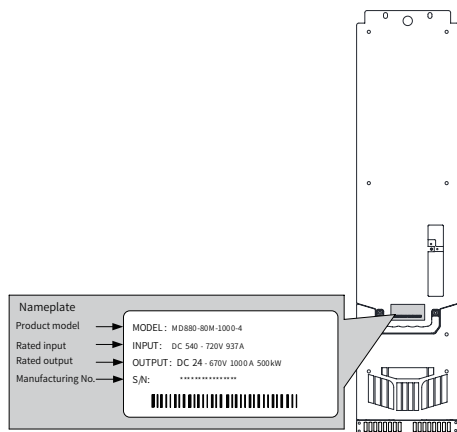


Figure 1-4 Nameplate of the H8A modules

- The nameplate of the H3 and H4 DC chopper modules is affixed to the left side of the module.
- The nameplate of the H6 to H8A DC chopper modules is affixed to the front of the module.



NOTE

- ◆ The codes "H3", "H4" and "H6" to "H8A" denote the structure sizes of the modules. For details, see ["1.4.5 Power Module Specifications"](#).
- ◆ The code "80D" denotes the DC chopper integrated kit. As shown in ["1.4.2 Basic Topology Framework"](#), the 80D kit includes the standard parts of the basic topology framework and forms a basic DC-DC system.
- ◆ The code "80M" denotes the DC chopper power module. The 80M module is included in the 80D kit and is a critical power part of a DC-DC system. To use the 80M module, you need to purchase the 80D kit.

1.2 Technical Data

Table 1-1 Technical data

Item		Specifications
Basic performance	High-voltage side (HVS) voltage	400 V system: 540 VDC to 720 VDC 690 V system: 740 VDC to 1050 VDC (1000 V model) 740 VDC to 1250 VDC (1200 V model)
	Low-voltage side (LVS) voltage	400 V system: 24 VDC to 670 VDC 690 V system: 24 VDC to 1000 VDC (1000 V model) 24 VDC to 1200 VDC (1200 V model)
	Carrier frequency	4 kHz
	Overload capacity	Fast overload: 200% of the basic load current, continuous for 10s per 60s Heavy overload: 150% of the basic load current, continuous for 60s per 300s
	Working efficiency	$\geq 97\%$
	Response time	≤ 5 ms (at the rated voltage of 500 V, 10% to 90% of the rated load added in one way) (Some models support 3 ms response with adjustable parameters.)
	Switching time	≤ 10 ms (at the rated voltage of 500 V, -90% to $+90\%$ of the rated load added in two ways one by one) (Some models support 6 ms switching with adjustable parameters.)
	Regenerative power	100%
	Voltage accuracy	LVS: $\leq 0.1\%F_s$ HVS: $\leq 1\%F_s$
	Voltage ripple (Vrms)	LVS: $\leq 0.2\%F_s$ HVS: $\leq 0.5\%F_s$
	Current accuracy	$\leq 1\%F_s$

Item		Specifications
Mechanical data	Shock and vibration resistance	Class 3M4 in GB/T 4798.3 Steady-state sinusoidal vibration: 2 Hz to 9 Hz, 3 mm 9 Hz to 200 Hz, 10 m/s ² Impact: 100 m/s ² for 11 ms
	Safety performance	EN 61800-5-1
	Cooling mode	Forced air cooling AF, compliant with EN 60146
Protection	Protection	Short circuit, overcurrent, overvoltage, undervoltage, overheat
Environmental requirements	Place of use	Indoors without direct sunlight, dust, corrosive gas, combustible gas, oil mist, water vapor, drip, or salt
	Altitude	1000 m and below: no derating; above 1000 m: derated by 1% for every 100 m increase; maximum altitude: 4000 m
	Ambient temperature	- 10°C to +50°C; above 40°C: derated by 2% for every 1°C increase; maximum ambient temperature: 50°C
	Noise	≤ 85 dB
	Ambient humidity	5% to 95%, non-condensing
	Storage temperature	- 40°C to +70°C
	Storage humidity	5% to 95%, non-condensing
	Pollution degree	PD2
	Overvoltage category	OVC III
	IP rating	H3 and H4 DC chopper modules: IP20 H6 to H8A DC chopper modules: IP00



NOTE

- ◆ Due to the basic topological characteristics of DC choppers, the HVS voltage is at least 50 V higher than the LVS voltage.
- ◆ Fast overload and heavy overload each are based on an appropriate reference current. For details, see “[1.9 Overload Capacity](#)”.
- ◆ When the MD880-80D DC chopper unit is used in test bench conditions, a capacitor box is needed additionally to meet performance requirements.
- ◆ When the MD880-80D DC chopper unit is used in ultra-capacitor or battery charging and discharging conditions, no additional configuration is required.

1.3 Specifications and Model Selection

Table 1-2 Specifications and model selection

Model of DC Chopper Integrated Kit	Model of Included Power Module	No Overload			Fast Overload		Heavy Overload	
		Voltage (V)	Current (A)	Power (kW)	Current (A)	Power (kW)	Current (A)	Power (kW)
MD880-80D-0100-4	MD880-80M-0100-4	500	100	50	75	38	85	43
MD880-80D-0200-4	MD880-80M-0200-4	500	200	100	150	75	170	85
MD880-80D-0300-4	MD880-80M-0300-4	500	300	150	225	113	255	128
MD880-80D-0400-4	MD880-80M-0400-4	500	400	200	300	150	340	170
MD880-80D-0500-4	MD880-80M-0500-4	500	500	250	375	188	425	213
MD880-80D-0600-4	MD880-80M-0600-4	500	600	300	450	225	510	255
MD880-80D-0800-4	MD880-80M-0800-4	500	800	400	600	300	680	340
MD880-80D-1000-4	MD880-80M-1000-4	500	1000	500	750	375	850	425
MD880-80D-0100-7	MD880-80M-0100-7	1000	100	100	75	75	85	85
MD880-80D-0200-7	MD880-80M-0200-7	1000	200	200	150	150	170	170
MD880-80D-0300-7	MD880-80M-0300-7	1000	300	300	225	225	255	255
MD880-80D-0400-7	MD880-80M-0400-7	1000	400	400	300	300	340	340
MD880-80D-0500-7	MD880-80M-0500-7	1000	500	500	375	375	425	425
MD880-80D-0600-7	MD880-80M-0600-7	1000	600	600	450	450	510	510

**NOTE**

- ◆ The wiring length from the LVS output bus to the load should not exceed 10 m (or 15 m if absolutely necessary). Otherwise, a capacitor box should be added to maintain voltage stability (when the wiring length exceeds 20 m).
- ◆ The wiring length from the HVS busbar to the upstream rectifier busbar should not exceed 1 m.
- ◆ When the wiring length to the downstream load reaches 20 m, special attention should be paid to the stability of the LVS bus voltage. If necessary, add a capacitor box to maintain voltage stability. It is not recommended that the wiring length exceeds 15 m.

1.4 Hardware

1.4.1 Hardware Operating Principle

The DC chopper integrated kit is a bidirectional DC-DC system composed of the DC chopper power module and the DC chopper filter module, along with necessary voltage and current detection circuits, the main controller HCU, and accessory cards. The DC chopper device converts constant DC voltage to adjustable DC voltage to be used by loads at the DC output side, such as DC choppers, batteries, and ultra-capacitors. It can also feed energy from the load side back to the bus.

Within the allowable range of bus voltage, the DC chopper integrated kit can output stable and adjustable DC voltage.

This kit is suitable for TN, TT, and IT systems.

1.4.2 Basic Topology Framework

Here is the basic topology framework of the MD880-80 series DC chopper integrated kit.

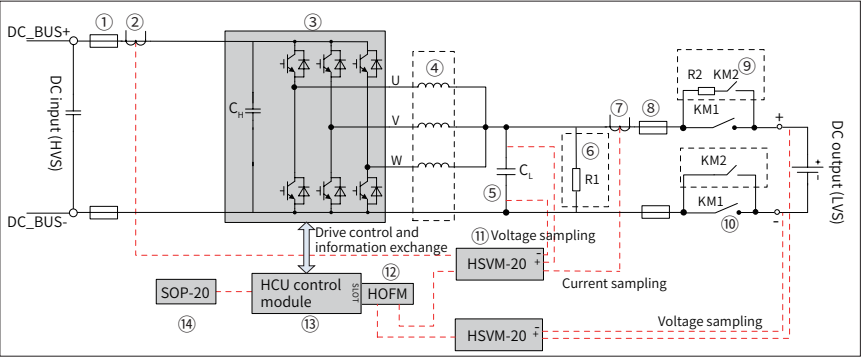


Figure 1-5 Basic topology framework of the MD880 series DC chopper integrated kit

No.	Function	Qty	Importance	Remarks
1	HVS DC fuse	-	Custom	Prevents short circuit.
2	HVS current sampling Hall sensor	1	Optional	Turn on the HVS load current feedforward to improve the HVS dynamic response performance.
3	MD880-80 DC chopper power module	1	Standard	The chopper power module of the MD880-80D kit
4	DC reactor	3	Standard	-
5	Metal film capacitor	-	Standard	The quantity varies with the model.
6	Discharge resistor	-	Custom	Discharges capacitor energy after power-off.

No.	Function	Qty	Importance	Remarks
7	LVS current sampling Hall sensor	1	Standard	Turn on the LVS load current feedforward to improve the LVS dynamic response performance.
8	LVS DC fuse	-	Custom	Prevents short circuit.
9	Pre-charge circuit	-	Standard	Provides pre-charge for device switch-on (including a pre-charge contactor and a pre-charge resistor).
10	Output main contactor	1	Custom	Can be configured by users.
11	HSVM-20 voltage and current detection module	1	Standard	One HSVM-20 module is configured by default to detect the LVS voltage of the DC chopper. If the load is a live device such as a battery, the load-side voltage should be detected during pre-charge to ensure safe switch-on. In this case, an HSVM-20 module is needed to detect the LVS load voltage.
12	HOFM-30 optical fiber expansion module	1	Standard	Inserted into a slot on the HCU module and used with the HSVM-20 module through an optical fiber
13	HCU-80/81 control module	1	Standard	The controller of the DC chopper device
14	SOP-20-880 smart operating panel	1	Standard	Smart operating panel, connected to the HCU module through an LAN cable



NOTE

- ◆ For general requirements, select the basic DC-DC system composed of standard parts. For special requirements, select parts with reference to the remarks in the preceding table.
- ◆ "Standard" parts are included in the DC chopper device (the 80D kit is composed of "standard" parts). "Optional" parts, which are required in specific situations, are not included in the standard kit and can be purchased separately.
- ◆ "Custom" parts are required in specific situations and shall be selected and prepared by users.
- ◆ Due to the topological characteristics of DC chopper devices, the voltage at the DC input side of the DC chopper module is always higher than that at the DC output side. Therefore, the DC input side is also referred to as the high-voltage side (HVS) and the DC output side as the low-voltage side (LVS).
- ◆ As the DC chopper device is a bidirectional DC-DC system, it is necessary to specify the direction of current when issuing a current command. For this purpose, it is defined that the current flowing from the input side (HVS) to the output side (LVS) is forward current, represented by a positive number, while the current flowing from the output side (LVS) to the input side (HVS) is reverse current, represented by a negative number.
- ◆ It is recommended not to start and stop the load pre-charge circuit frequently to avoid damaging the buffer resistor.
- ◆ The interval between power-off and next power-on of the DC chopper device should be at least 30 seconds.
- ◆ When the withstand voltage of the load is low, a discharge resistor can be used to protect the load. In this case, check the resistance and power of the resistor to avoid burning the resistor.

1.4.3 Typical Electrical Drive System

The following figure shows a typical drive system with a common DC bus.

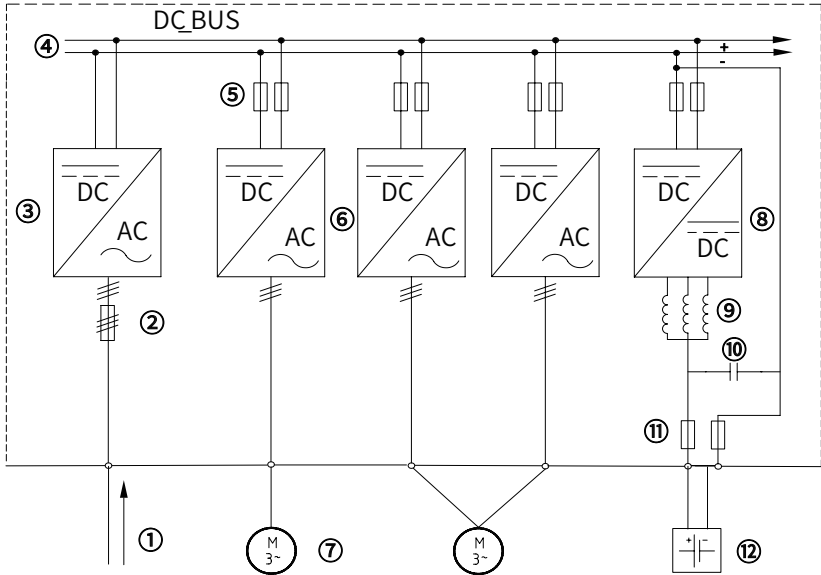


Figure 1-6 Electrical diagram of a typical drive system

No.	Remarks
1	AC power supply
2	Three-phase fuse
3	Rectifier module
4	Common DC bus
5	DC fuse
6	Inverter module
7	Motor
8	DC chopper module
9	DC reactor
10	Metal film capacitor
11	Output DC fuse
12	Load (such as a battery)

The AC power supply system is connected to a rectifier module through an AC fuse. The rectifier module converts AC voltage to DC voltage, which is then distributed to modules connected to the DC bus. The DC chopper module converts the DC voltage to adjustable DC voltage and supplies it to loads, such as a battery. It is recommended to connect a DC fuse between each module and the DC bus.

The MD880-80 series DC chopper integrated kit is often used in battery charge-discharge

controllers, power conversion systems, DC test power supplies, and other similar applications.

1.4.4 Output Current Characteristics

The MD880-80 series DC chopper module can output full-load current in the entire output voltage range and therefore does not need derating.

1.4.5 Power Module Specifications

As shown in [“1.4.2 Basic Topology Framework”](#), the power module is the core device of the entire DC-DC system. The specifications of DC chopper power modules from Inovance are as follows.

Table 1-3 Specifications of DC chopper modules

Size	Model	No Overload			Fast Overload		Heavy Overload		Weight (kg)	Loss (W)	Outline Dimensions (W x D x H, mm)
		Voltage (V)	Current (A)	Power (kW)	Current (A)	Power (kW)	Current (A)	Power (kW)			
Un = 400 VAC (DC range: 540 VDC to 720 VDC)											
H3	MD880-80M-0100-4	500	100	50	75	38	85	43	≤ 11	592	100 x 413 x 415
H4	MD880-80M-0200-4	500	200	100	150	75	170	85	≤ 20	762	200 x 413 x 415
	MD880-80M-0300-4	500	300	150	225	113	255	128		1468	
H6	MD880-80M-0400-4	500	400	200	300	150	340	170	≤ 35	2104	180 x 438 x 770
H7	MD880-80M-0500-4	500	500	250	375	188	425	213	≤ 45	2587	180 x 465 x 920
	MD880-80M-0600-4	500	600	300	450	225	510	255		3203	
H8A	MD880-80M-0800-4	500	800	400	600	300	680	340	≤ 130	4921	230 x 582 x 965
	MD880-80M-1000-4	500	1000	500	750	375	850	425		6701	
Un = 690 VAC (DC range: 740 VDC to 1050 VDC)											
H6	MD880-80M-0100-7	1000	100	100	75	75	85	85	≤ 35	1321	180 x 438 x 770
	MD880-80M-0200-7	1000	200	200	150	150	170	170		2436	
H8A	MD880-80M-0300-7	1000	300	300	225	225	255	255	≤ 130	5109	230 x 582 x 965
	MD880-80M-0400-7	1000	400	400	300	300	340	340		6143	
	MD880-80M-0500-7	1000	500	500	375	375	425	425		7912	
	MD880-80M-0600-7	1000	600	600	450	450	510	510		9086	



- ◆ The rated output voltage of the DC chopper power module in overload conditions is the same as that in no-overload conditions.

1.4.6 Filter Specifications

As shown in [“1.4.2 Basic Topology Framework”](#), the DC chopper kit comes with LC filters. The specifications of standard chopper filters from Inovance are as follows.

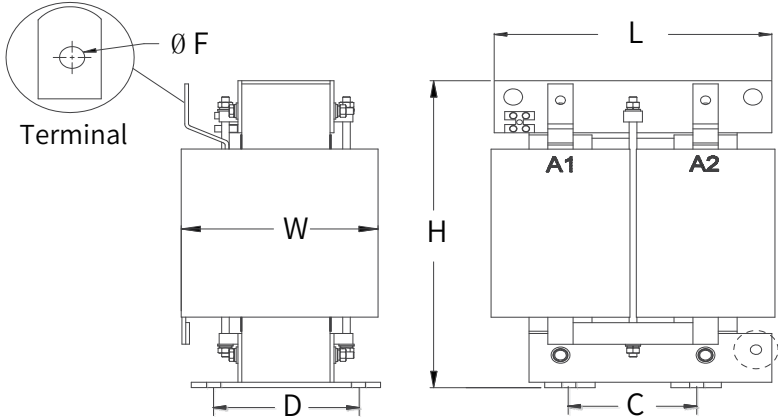


Figure 1-7 Schematic diagram of filter reactor

Table 1-4 Specifications of DC chopper filter reactors

Product Model	Single-Phase Reactor Rated Current (A)	Heat Dissipation Mode	LC Filter Reactor Maximum Outline Dimensions (mm) L x W x H	LC Filter Reactor Installation Dimensions (mm) Hole Dia-C x D	Reactor Terminal Hole Dia F	Weight (kg)	Power Loss (W)
MD880-80D-0100-4	33	Natural	160 x 160 x 228	4-Ø7-140 x 105	Ø8	13	≤ 480
MD880-80D-0200-4	67	Natural	225 x 160 x 283	4-Ø10-100 x 120	Ø8	26	≤ 750
MD880-80D-0300-4	100	Natural	300 x 190 x 315	4-Ø12-100 x 130	Ø8	36	≤ 1200
MD880-80D-0400-4	133	Natural	300 x 190 x 315	4-Ø10-100 x 120	Ø8	38	≤ 1200
MD880-80D-0500-4	167	Natural	300 x 200 x 320	4-Ø12-100 x 130	Ø9	47	≤ 1350
MD880-80D-0600-4	200	Natural	310 x 205 x 355	4-Ø12-100 x 130	Ø11	52	≤ 1500
MD880-80D-0800-4	267	Natural	285 x 200 x 355	4-Ø12-100 x 130	Ø11	48	≤ 1500

Product Model	Single-Phase Reactor Rated Current (A)	Heat Dissipation Mode	LC Filter Reactor Maximum Outline Dimensions (mm) L x W x H	LC Filter Reactor Installation Dimensions (mm) Hole Dia-C x D	Reactor Terminal Hole Dia F	Weight (kg)	Power Loss (W)
MD880-80D-1000-4	333	Natural	300 x 200 x 375	4-Ø12-100 x 130	Ø11	55	≤ 1650
MD880-80D-0100-7	33	Natural	160 x 160 x 228	4-Ø7-140 x 105	Ø8	13	≤ 480
MD880-80D-0200-7	67	Natural	225 x 160 x 283	4-Ø10-100 x 120	Ø8	25	≤ 750
MD880-80D-0300-7	100	Natural	300 x 190 x 315	4-Ø12-100 x 130	Ø8	36	≤ 1200
MD880-80D-0400-7	133	Natural	300 x 190 x 315	4-Ø10-100 x 120	Ø8	38	≤ 1200
MD880-80D-0500-7	167	Natural	300 x 200 x 320	4-Ø12-100 x 130	Ø9	47	≤ 1350
MD880-80D-0600-7	200	Natural	310 x 205 x 355	4-Ø12-100 x 130	Ø11	52	≤ 1500



NOTE

- ◆ In the preceding table, the dimensions and weight are that of a single DC reactor, whereas the power loss is the total loss of the three reactors.
- ◆
- ◆ The MD880-80D series DC chopper integrated kit each comes as standard with three DC reactors.
- ◆ The standard DC chopper reactors from Inovance can meet the thermal requirements of 110 K temperature rise at an ambient temperature of 40°C.

Table 1-5 Specifications of DC chopper filter capacitors

Product Model	Capacitor Dia (mm)	Capacitor Height (mm)	Capacitor Qty	Wiring Method	Connection Mode
MD880-80D-0100-4	116	230	1	M6x8 bolt	-
MD880-80D-0200-4	116	230	1	M6x8 bolt	-
MD880-80D-0300-4	116	230	1	M6x8 bolt	-
MD880-80D-0400-4	116	230	1	M6x8 bolt	-
MD880-80D-0500-4	116	230	1	M6x8 bolt	
MD880-80D-0600-4	116	230	1	M6x8 bolt	
MD880-80D-0800-4	116	230	2	M6x8 bolt	Parallel
MD880-80D-1000-4	116	230	2	M6x8 bolt	Parallel
MD880-80D-0100-7	116	228.5	1	M6x8 bolt	-
MD880-80D-0200-7	116	228.5	1	M6x8 bolt	
MD880-80D-0300-7	116	228.5	1	M6x8 bolt	
MD880-80D-0400-7	116	228.5	1	M6x8 bolt	
MD880-80D-0500-7	116	228.5	2	M6x8 bolt	Parallel
MD880-80D-0600-7	116	228.5	2	M6x8 bolt	Parallel

**NOTE**

- ◆ The filter capacitor comes with an M12 screw at the bottom for fixation. In vibrating environments, the cabinet should be designed with additional capacitor clamps or brackets to enhance fixation.
- ◆ Device installation should take electrical safety regulations and convenience into consideration. A distance of more than 15 mm must be reserved between the device and surrounding electrical components or the chassis.

1.5 Structural Layout and Dimensions of the Modules

1) Overview

The DC input terminal of the DC chopper module is located on the top of the module, and the DC output terminal is on the bottom.

For the H3, H4, H6, and H7 models, the HCU control module is installed on the front of the DC chopper module. For the H8A models, the HCU control module is connected from external and not installed on the DC chopper module.

The DC chopper control system includes standard I/O and optional function modules. For details about the standard I/O terminals on the HCU control module, see [“Chapter 4 HCU Control Module”](#). Other optional function modules are mainly installed on the HCU control module.

The control circuit board of the DC chopper module can be powered by an external source or by the DC bus that provides auxiliary voltage. The fan runs automatically once the DC chopper module starts running. It is powered by the DC input (HVS).

2) External power supply

The HCU control module on the DC chopper module requires an external 24 VDC/2 A power supply, which needs to be connected to the input power terminal (24VI-GND) of the HCU control module.

Before the principal voltage is built up, the internal auxiliary power supply of the DC chopper module can be powered by an external 24 VDC/1 A power supply. After the principal voltage is built up, the internal auxiliary power supply of the DC chopper module draws power from the DC bus and the external 24 VDC/1 A power supply provides redundancy.



NOTE

- ◆ A DC bus pre-charge module is required if:
- ◆ The DC chopper module is connected to the DC bus directly, but the rectifier module of the system does not provide pre-charge upon power-on.
- ◆ The DC chopper module is connected to the DC bus through a switch disconnector.

1.5.1 Structural Layout and Outline Dimensions of H3 Modules

■ Structural layout of H3 DC chopper modules

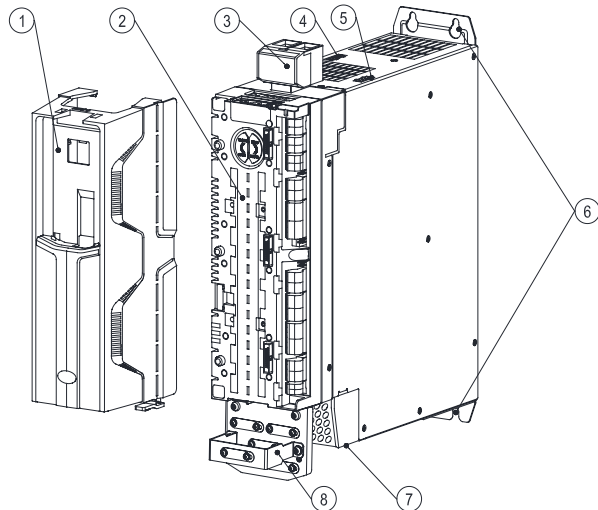


Figure 1-8 Structural layout of H3 DC chopper modules

No.	Remarks
1	Recess for mounting the SOP-20-880 operating panel
2	HCU control module
3	HVS DC bus terminal
4	Internal 24 VDC auxiliary power terminal
5	DC bus pre-charge module control terminal
6	Rear mounting holes
7	LVS U/V/W terminal (concealed)
8	Control cable ground plate

■ Outline dimensions of H3 DC chopper modules

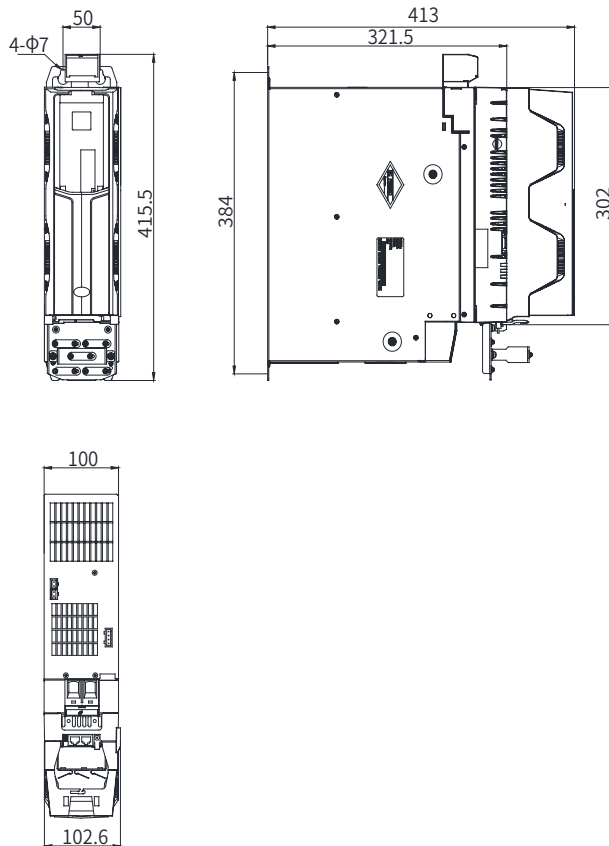


Figure 1-9 Outline dimensions of H3 DC choppers (mm)



NOTE

It is recommended to use M6 bolts to secure the H3 DC chopper module, and use tubular terminals to connect the DC input copper busbar.

1.5.2 Structural Layout and Outline Dimensions of H4 Modules

■ Structural layout of H4 DC chopper modules

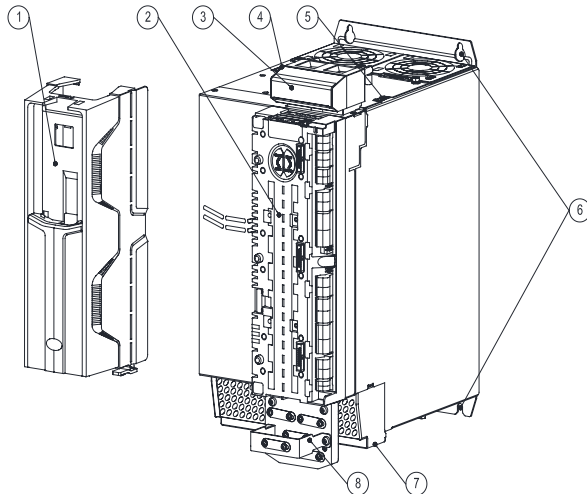


Figure 1-10 Structural layout of H4 DC chopper modules

No.	Remarks
1	Recess for mounting the SOP-20-880 operating panel
2	HCU control module
3	HVS DC bus terminal
4	Internal 24 VDC auxiliary power terminal
5	DC bus pre-charge module control terminal
6	Rear mounting holes
7	LVS U/V/W terminal (concealed)
8	Control cable ground plate

■ Outline dimensions of H4 DC chopper modules

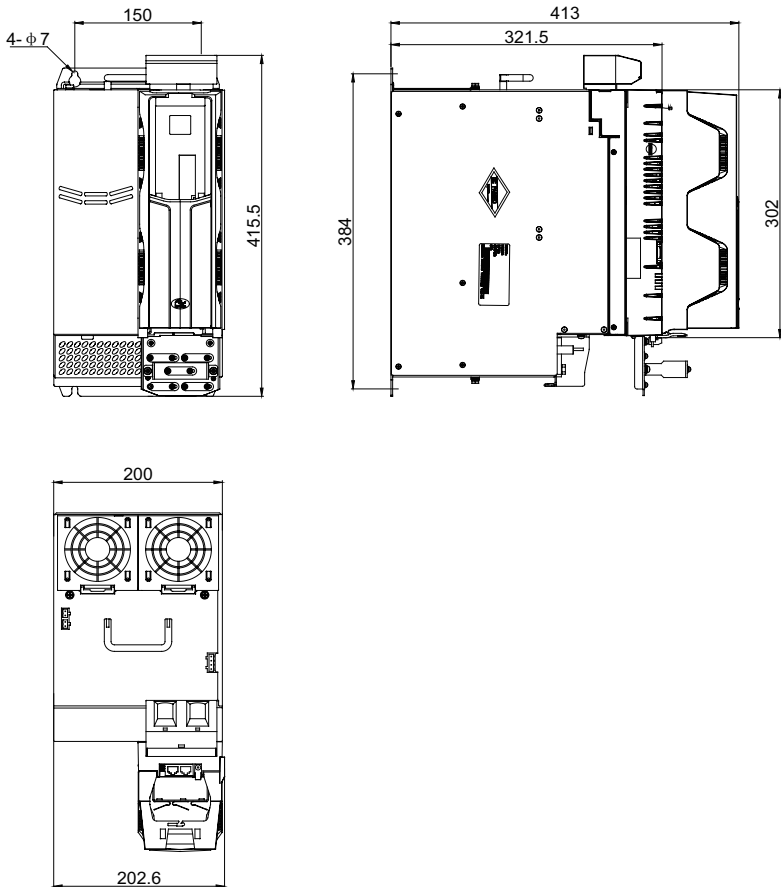


Figure 1-11 Outline dimensions of H4 DC choppers (mm)



NOTE

It is recommended to use M6 bolts to secure the H4 DC chopper module, and use tubular terminals to connect the DC input copper busbar.

1.5.3 Structural Layout and Outline Dimensions of H6 Modules

■ Structural layout of H6 DC chopper modules

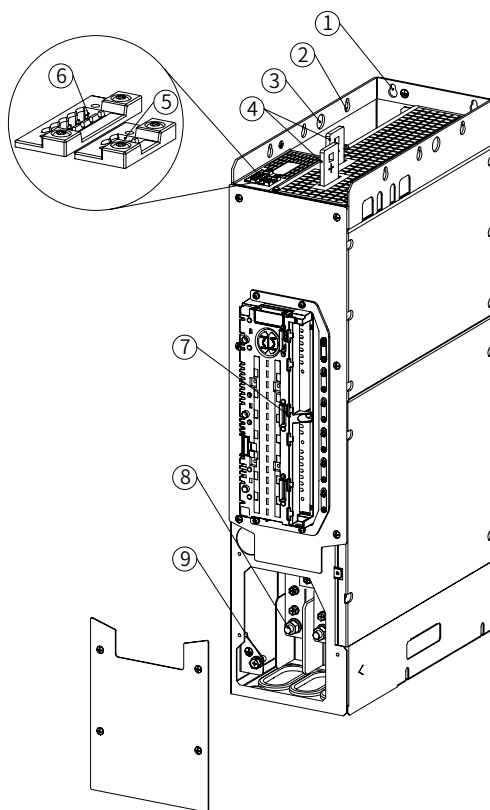


Figure 1-12 Structural layout of H6 DC chopper modules

No.	Remarks
1	Rear mounting holes
2	Mounting hole on the side
3	Lifting lug
4	HVS DC bus terminal
5	Internal 24 VDC auxiliary power terminal
6	External I/O terminal
7	HCU control module
8	LVS U/V/W terminal
9	Grounding (PE) terminal

■ Outline dimensions of H6 DC chopper modules

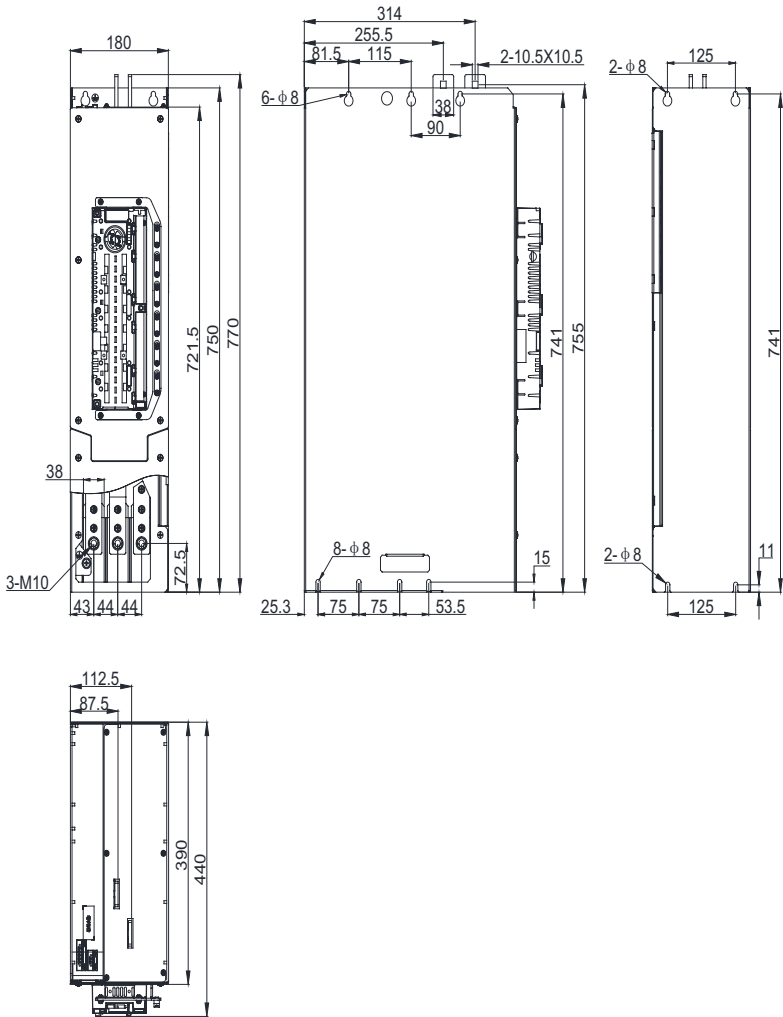


Figure 1-13 Outline dimensions of H6 DC choppers (mm)



It is recommended to use M6 bolts to secure the H6 DC chopper module, and use M10 bolts to connect the DC input copper busbar.

1.5.4 Structural Layout and Outline Dimensions of H7 Modules

■ Structural layout of H7 DC chopper modules

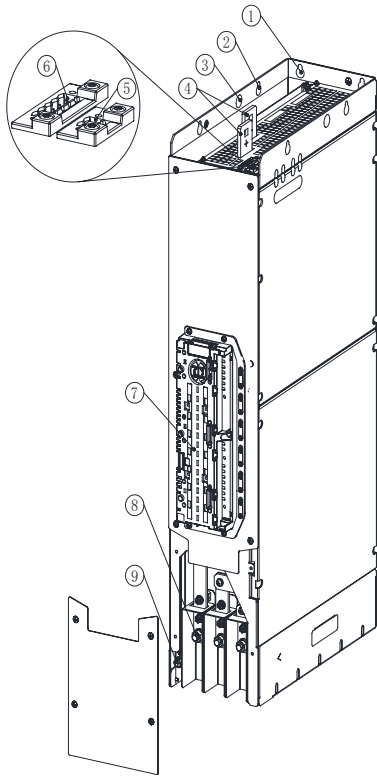


Figure 1-14 Structural layout of H7 DC chopper modules

No.	Remarks
1	Rear mounting holes
2	Mounting hole on the side
3	Lifting lug
4	HVS DC bus terminal
5	Internal 24 VDC auxiliary power terminal
6	External I/O terminal
7	HCU control module
8	LVS U/V/W terminal
9	Grounding (PE) terminal

■ Outline dimensions of H7 DC chopper modules

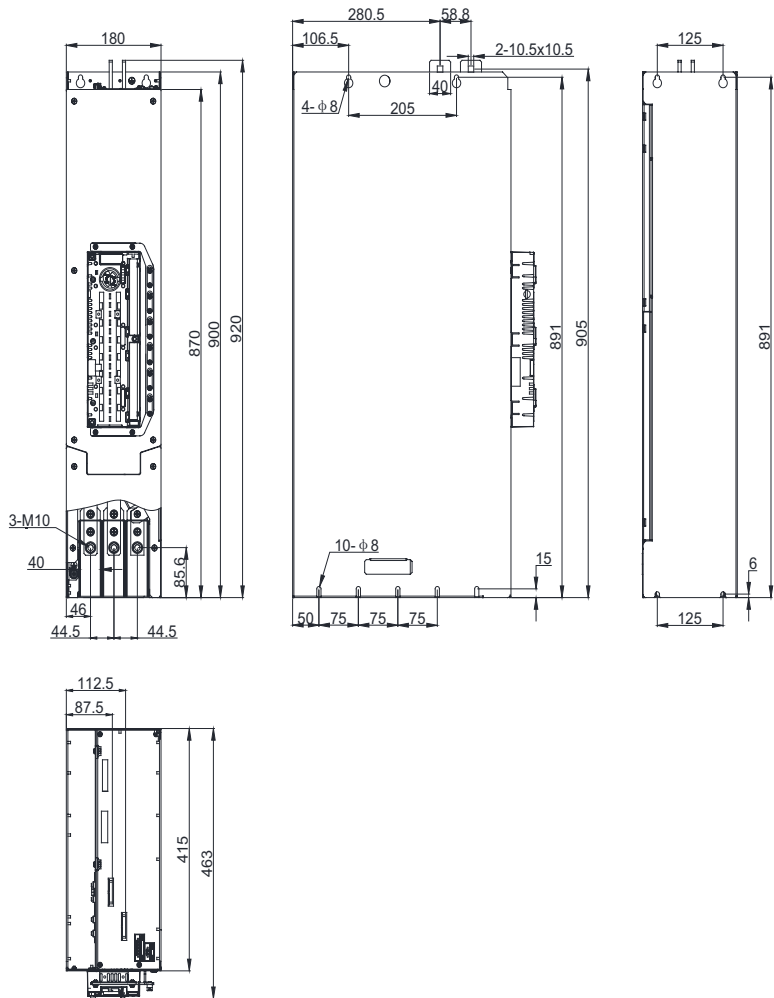


Figure 1-15 Outline dimensions of H7 DC choppers (mm)



It is recommended to use M6 bolts to secure the H7 DC chopper module, and use M10 bolts to connect the DC input copper busbar.

1.5.5 Structural Layout and Outline Dimensions of H8A Modules

■ Structural layout of H8A DC chopper modules

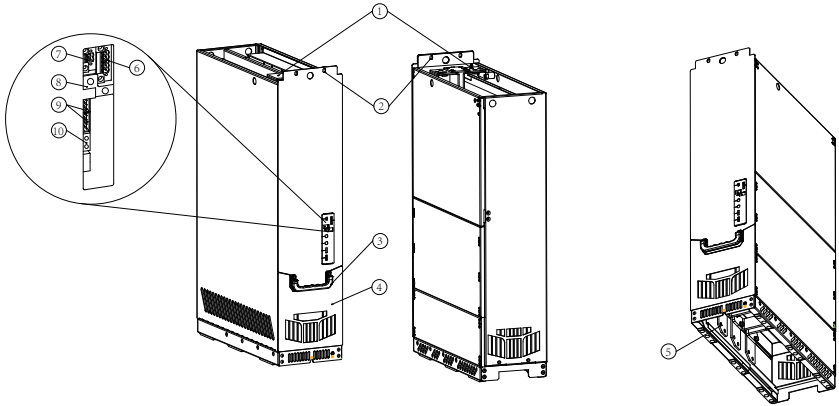


Figure 1-16 Structural layout of H8A DC chopper modules

No.	Remarks
1	DC bus terminal
2	Spray-coated fastening holes on the top; grounding point (PE) between the DC chopper module frame and the cabinet frame
3	Handle
4	Cooling fan
5	LVS three-phase output terminal
6	External I/O terminal
7	Internal 24 VDC auxiliary power terminal
8	Shield terminal clip
9	STO terminal
10	Optical fiber port

■ Outline dimensions of H8A DC chopper modules

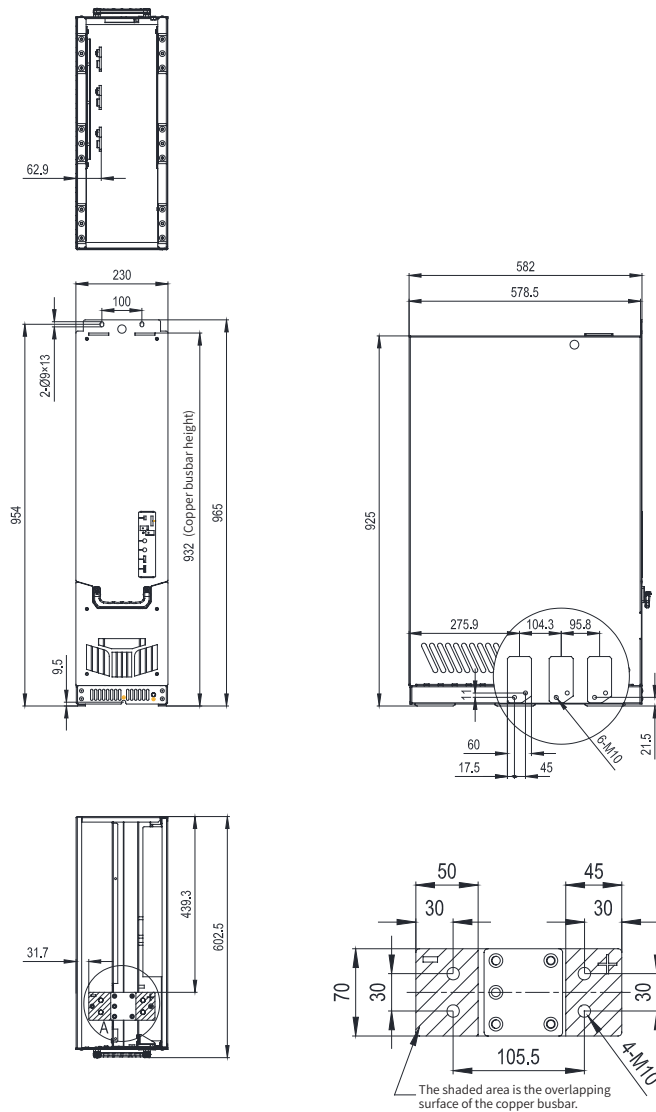


Figure 1-17 Outline dimensions of H8A DC choppers (mm)



NOTE

It is recommended to use M8 bolts to secure the H8A DC chopper module, and use M10 bolts to connect the DC input copper busbar.

1.6 Hall Sensor Outline Dimensions

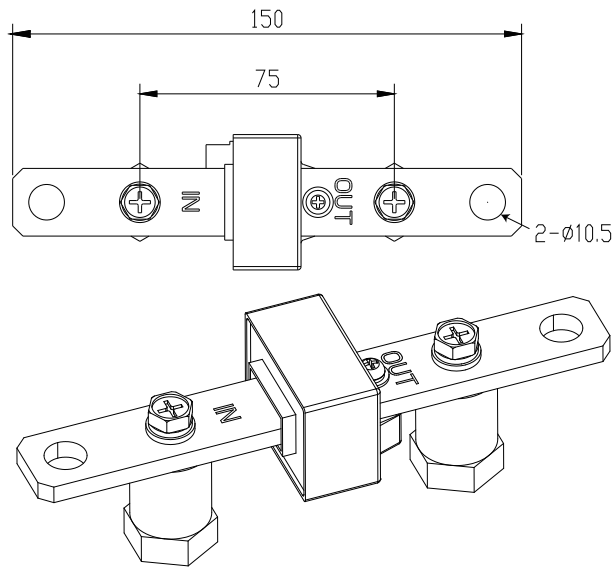


Figure 1-18 Dimensions of the Hall sensor component - HA1

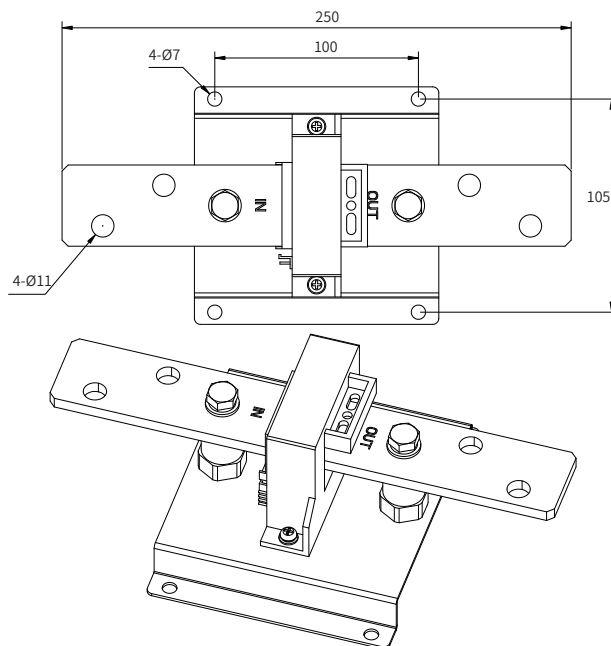


Figure 1-19 Dimensions of the Hall sensor component - HA2

Single-Phase Reactor Hall Specification	Product Model
HA1	MD880-80D-0100-4
	MD880-80D-0200-4
	MD880-80D-0300-4
	MD880-80D-0100-7
	MD880-80D-0200-7
	MD880-80D-0300-7
Single-Phase Reactor Hall Specification	Product Model
HA2	MD880-80D-0400-4
	MD880-80D-0500-4
	MD880-80D-0600-4
	MD880-80D-0800-4
	MD880-80D-1000-4
	MD880-80D-0400-7
	MD880-80D-0500-7
	MD880-80D-0600-7



NOTE

- ◆ The HA1 Hall sensor is fixed by two insulating stubs and M6 threaded holes.
- ◆ The direction of current must be consistent with the direction marked on the Hall copper busbar.
- ◆ Device installation should take electrical safety regulations and convenience into consideration. A distance of more than 15 mm must be reserved between the device and surrounding electrical components or the chassis.

1.7 Pre-charge Resistor Outline Dimensions

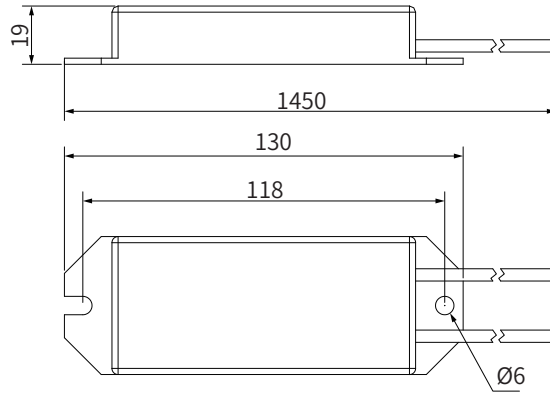


Figure 1-20 Outline dimensions of the pre-charge resistor

**NOTE**

- ◆ As shown in "1.4.2 Basic Topology Framework", the pre-charge contactor and the pre-charge resistor are connected in series and then are connected to the DC output switch KM1 in parallel at the low-voltage side. The feedback contact of the pre-charge contactor is connected to the HCU controller.
- ◆ Device installation should take electrical safety regulations and convenience into consideration. A distance of more than 15 mm must be reserved between the device and surrounding electrical components or the chassis.

1.8 Derating

1 Derating based on ambient temperature

From 40°C to 50°C of ambient temperature, the output current must be derated by 2% for every 1°C increase. The output current can be calculated by multiplying the current value specified in the rating table by the derating factor (k).

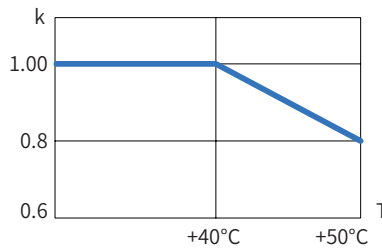


Figure 1-21 Derating based on ambient temperature

2 Derating based on altitude

From 1000 m to 4000 m of altitude, the output current must be derated by 1% for every 100 m increase.

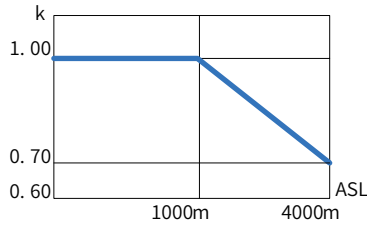


Figure 1-22 Derating based on altitude

1.9 Overload Capacity

When used in a system that requires overload, the MD880-80 series DC chopper module must use a proper reference load current as its reference. The DC chopper module runs at the reference load current before and after overload occurs and this is the criterion for judging system overload.

1 Curve of fast overload mode

In the fast overload mode, the DC chopper module runs at 200% of the reference load current for fast overload (I_{fast}) continuously for 10 seconds per 60 seconds.

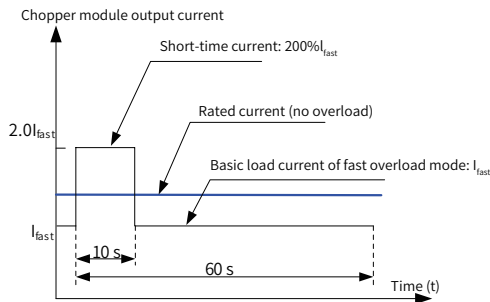


Figure 1-23 Curve of fast overload mode

2 Curve of heavy overload mode

In the heavy overload mode, the DC chopper module runs at 150% of the reference load current for heavy overload (I_H) continuously for 60 seconds per 300 seconds.

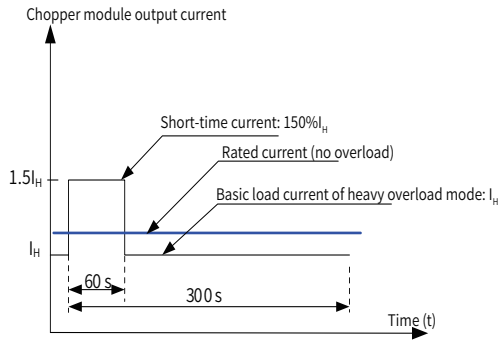


Figure 1-24 Curve of heavy overload mode

Chapter 2 Mechanical Installation

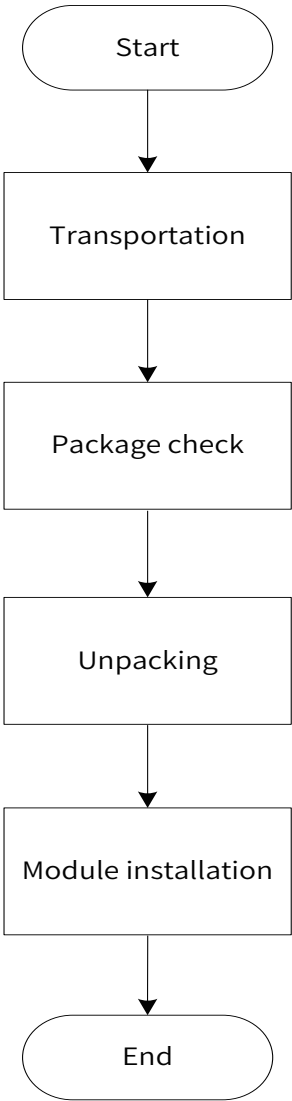


Figure 2-1 Flowchart of mechanical installation

2.1 Installation Precautions

2.1.1 Storage

Store the equipment in a clean dry place, with temperatures between -40°C and $+70^{\circ}\text{C}$ and temperature variations less than $1^{\circ}\text{C}/\text{min}$. For long-term storage, cover the DC chopper module or take other appropriate measures to protect it from contamination and environmental influences.

Both temporary and long-term storage must observe the following precautions:

- Store the equipment in its original package provided by Inovance.
- Do not expose the equipment to moisture, high temperature, or outdoor direct sunlight for a prolonged period.

2.1.2 Transportation

- 1) Packed H3 and H4 DC chopper modules are small and light and can be handled manually.
- 2) Packed H6 to H8A DC chopper modules need to be transported with a forklift and crane operated by trained personnel using the wooden pallets under the packaging. During transportation on a forklift, the DC chopper module must be secured to its wooden pallet. During lifting by a crane, the pallet must be lifted together with the DC chopper module.
- 3) The load capacity of the transport equipment must be greater than the weight of the DC chopper module.

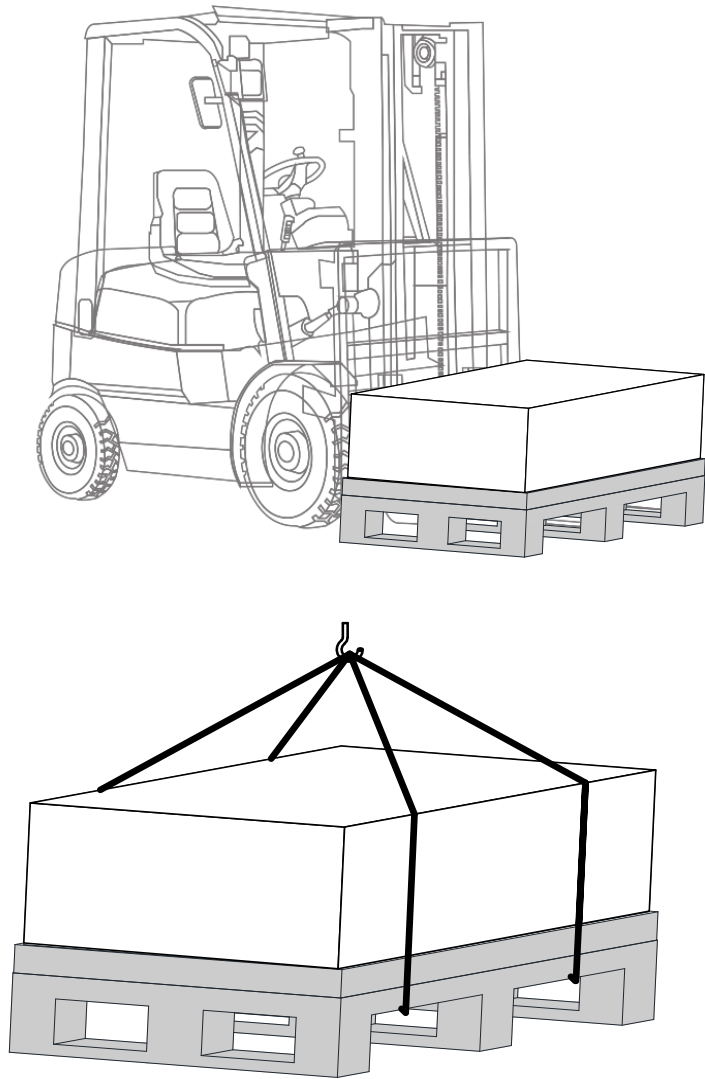


Figure 2-2 Handling before unpacking

- 4) Place the equipment on a flat and sturdy floor capable of bearing the weight of the equipment.
- 5) H6 to H8A DC chopper modules are heavy and have a high center of gravity. Do not place them on a slope with an inclination angle greater than 5° .
- 6) During transportation, keep the equipment upright as indicated on the packaging.

Never place it upside down or on its side.

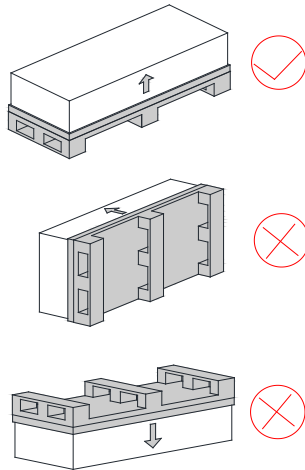


Figure 2-3 Placement during transportation

2.1.3 Package Check

 CAUTION	
	◆ If the equipment is damaged during transportation, its electrical safety performance cannot be guaranteed. Do not connect the equipment before a thorough high-voltage test is performed. ◆ Failure to comply may result in great property loss, serious physical injury, or even death.

After receiving the equipment, inspect it carefully.

Check every item received against the delivery list. In case of any missing components or damage, notify the forwarder immediately. When necessary, contact Inovance or the local agent for technical support.

2.1.4 Unpacking

The H3 and H4 DC chopper modules are packed in corrugated cardboard boxes. The H6 to H8A DC chopper modules are also packed in corrugated cardboard boxes and then secured onto wooden pallets with PET straps. Related documents and accessories are packed in corresponding compartments inside the box.

Unpack the DC chopper module in the following steps:

- ① Remove the straps and the box cover.
- ② Remove all filler materials.
- ③ Take out the DC chopper module.
- ④ Cut and remove the plastic wrap around the DC chopper module.
- ⑤ Check that the module is free of damage.
- ⑥ Dispose of or recycle the packaging according to local regulations.

2.1.5 Installation Checklist

 CAUTION	
	◆ For safe and reliable operation, the DC chopper module must be properly installed and commissioned by qualified personnel observing all warnings and precautions. ◆ Failure to comply may result in great property loss, serious physical injury, or even death.

For applicable items, tick the corresponding boxes on the right to confirm that the work procedures have been completed.

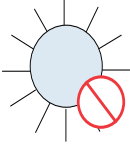
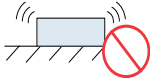
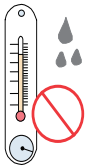
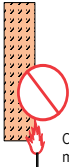
Table 2-1 Checklist for DC chopper module installation

No.	Item	Pass
1	The packing box is intact and free of damage and damp.	☐

No.	Item	Pass
2	The enclosure of the unpacked DC chopper module is free of deformation, paint peeling, and cracks; there is no water stains inside the enclosure.	☐
3	The accessories (such as the user guide and optional parts) inside the packing box are complete.	☐
4	The clearance around the DC chopper module meets requirements (for smooth air flow), and sufficient space is reserved for unobstructed air inlet and outlet.	☐
5	Protective measures around the DC chopper module are taken before commissioning.	☐

2.2 Installation Environment

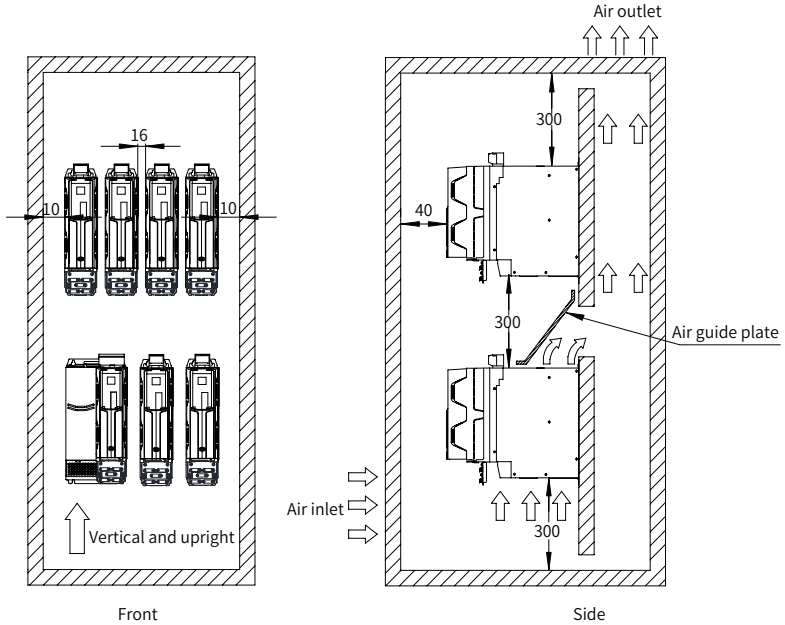
Item	Requirements
Heat dissipation and ventilation	Install the DC chopper module on a flame-retardant surface and reserve sufficient clearance around it for heat dissipation, as the DC chopper module generates significant heat during operation. Use screws to fasten the module onto the mounting support vertically.
Installation site	Do not install the drive in places with: Direct sunlight Humidity greater than 95% or water droplets Corrosive, inflammable, or explosive gas Greasy dirt or dust
Vibration	Install the equipment in a place not prone to vibration. For shock and vibration resistance requirements, see " 1.2 Technical Data ".
Ambient temperature	Derating is required when the ambient temperature exceeds 40°C or the installation altitude exceeds 1000 m. For the derating coefficient, see "1.8 Derating".
Protective enclosure	The DC chopper module is a cabinet-mounted product and needs to be installed and used in a final system. The final system must provide corresponding enclosures for fireproof, electrical, and mechanical protection, and comply with local laws and regulations and relevant IEC standards.

 Dust and oil stain	 Direct sunlight	 Strong vibration Greater than 0.6 · g
 Ambient temperature out of -10°C to +40°C	 Combustible, explosive, and corrosive gases	 Combustible materials Mounting to the surface of flammable objects

2.3 Installation Clearance

1) Installation clearance of the H3 and H4 DC chopper modules

Reserve adequate clearance around the H3 and H4 DC chopper modules, as shown in the following figure.

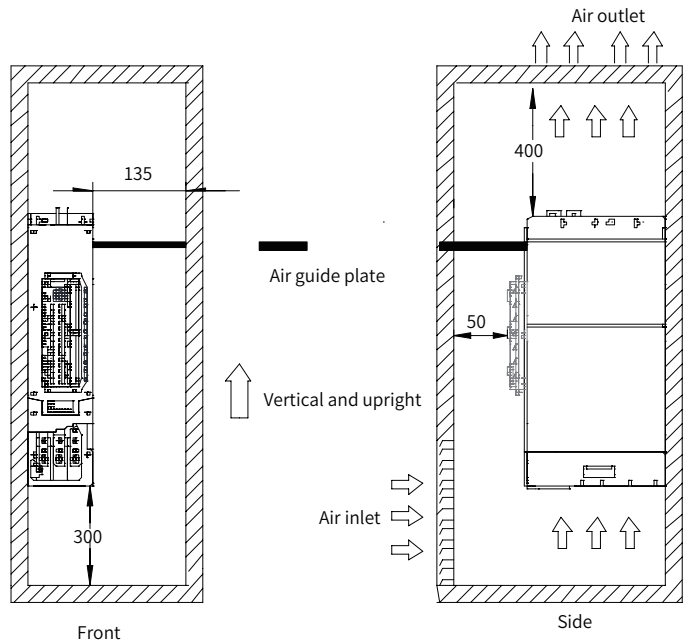


Note: The installation clearances shown in the figure indicate the minimum space requirements (unit: mm).

Figure 2-4 Clearance requirements

2) Installation clearance of the H6 and H7 DC chopper modules

Reserve adequate clearance around the H6 and H7 DC chopper modules, as shown in the following figure.

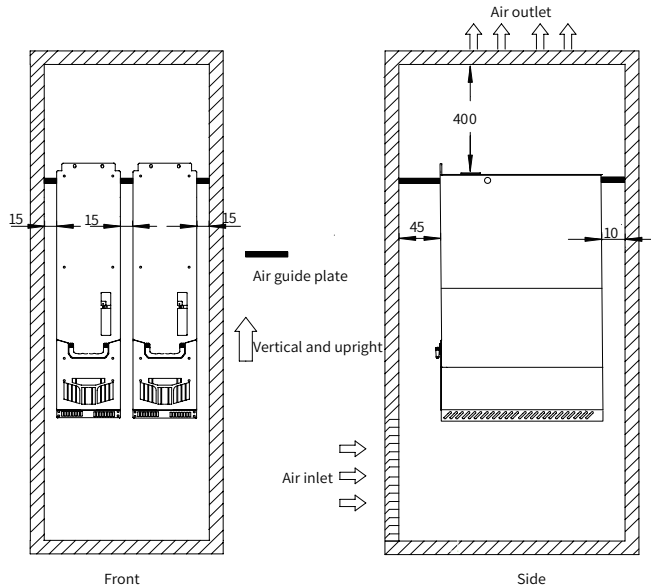


Note: The installation clearances shown in the figure indicate the minimum space requirements (unit: mm).

Figure 2-5 Clearance requirements

3) Installation clearance of the H8A DC chopper modules

Reserve adequate clearance around the H8A DC chopper modules, as shown in the following figure.



Note: The installation clearances shown in the figure indicate the minimum space requirements (unit: mm).

Figure 2-6 Clearance requirements

4) Cabinet air inlet and outlet area

Reserve adequate ventilation space above and below the DC chopper module to allow cooling air to flow smoothly. Do not route any cables or install any components in the ventilation space, especially when cable ducts are used.

When multiple DC chopper modules are arranged one above another, the hot air generated by the lower module will heat the upper one and cause over-temperature or overload of the upper one. In this case, install an air guide plate. As the power density in this arrangement is higher than that in one-row arrangement, the heat dissipation conditions must meet more stringent requirements. In this case, set the air inlet and outlet area as follows:

$$S_{\text{Inlet}} = (1.5 \text{ to } 2.0) \times (S_{\text{Module 1}} + S_{\text{Module 2}} + S_{\text{Module 3}} + \dots + S_{\text{Module N}})$$

S_{Inlet} : Air inlet area of the system, in m^2

S_{Module} : Air inlet area of each module, in m^2

Air outlet area: $S_{\text{Outlet}} = (1.2 \text{ to } 1.5) \times S_{\text{Inlet}}$

The following table lists the air inlet area of the MD880 series DC chopper modules.

Table 2-2 Ventilation area

Structure	Air Inlet Area of DC Chopper Module, S_{Module} (cm^2)
H3	60
H4	120
H6	710
H7	750
H8A	1400



NOTE

Failure to comply with the installation requirements of the DC chopper module will significantly shorten its service life and may result in faults or premature failure of the module.

Chapter 3 Electrical Installation

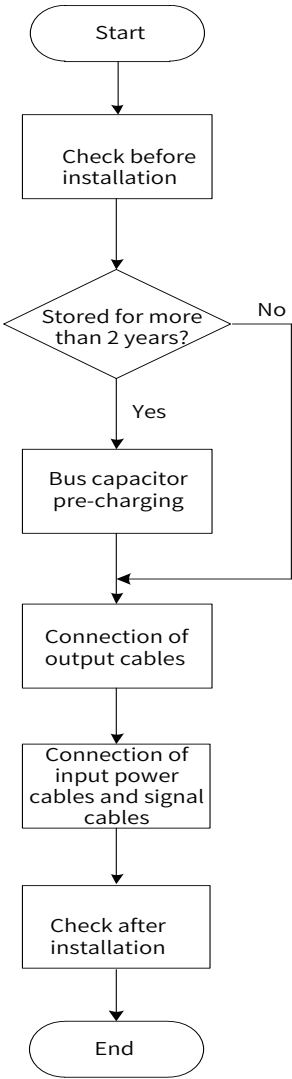


Figure 3-1 Flowchart of electrical installation

3.1 Safety Instructions

3.1.1 Safety Precautions Before Installation

 CAUTION	
	◆ This equipment is typically used in industrial applications involving high voltage. Its parts become live or rotate during operation. Therefore, unauthorized removal of required covers, improper use or operation, or poor maintenance can lead to property loss, severe physical injury, or even death. ◆ This equipment shall only be operated by professional technicians who have read and comply with the safety instructions in this guide. ◆ Before carrying out any work on electrical equipment, observe the following "five safety rules": ① Power off the equipment. ② Ensure that the equipment cannot be re-energized accidentally. ③ Ensure that no voltage is present. ④ Ensure reliable grounding. ⑤ Cover or isolate adjacent live parts.

3.1.2 Electrical Installation Check

 DANGER	
	◆ The equipment carries high voltage during working. Conduct connection work only when there is no voltage. ◆ Only allow qualified technicians to operate the equipment. ◆ Take caution when working on the equipment even after it is 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 in the stop state. ◆ The equipment may still be live after 15 minutes from power-off due to the DC bus capacitors inside. Therefore, ensure that the voltage is below 36 VDC before opening the equipment. ◆ The user is responsible for ensuring that the motor, cabinet, and components are installed and connected in accordance with the recognized technical rules in the country or region of installation and with other applicable regional regulations. Pay special attention to provisions on cable dimensions, safety devices, grounding, disconnection, isolation, and over-current protection. ◆ Tripping of a safety device on a branch circuit may cut off the fault current. To reduce the risk of fire and electric shock, inspect the conductive parts and other components in the cabinet and replace damaged parts as required. After a safety device trips, identify and rectify the cause of the tripping.

3.1.3 General Statement



CAUTION



- ◆ The circuit board contains components sensitive to static electricity. Wear a grounded wrist strap when working on the circuit board. Do not touch the circuit board unless necessary.
- ◆ Handle the optical fiber carefully. When removing the optical fiber, hold and pull the connector rather than the fiber itself. As the optical fiber is extremely susceptible to dirt, do not touch the ends of the fiber with bare hands.

3.1.4 Insulation Check

This product has been tested for insulation between the main circuit and the housing before delivery. Therefore, do not perform any voltage withstand or insulation resistance tests on it again.

3.2 EMC-Compliant Cable Routing

3.2.1 Requirements

1) Routing signal cables and power cables separately

When analog signals are used to control the chopper module remotely, separate the signal cables of the chopper module from high-voltage circuits (power input, chopper output, and braking resistor cables) by a distance of more than 40 cm to protect the analog signals from the interference from the DC chopper module and other devices. Follow this requirement for cable routing even inside the control cabinet.

2) Requirements on analog control signal cables

Use shielded twisted pair cables as the analog control signal cables. Strip a minimum length (5 mm to 7 mm) of the sheathing and wrap the exposed shield with insulating tape to prevent the shielded cable from contacting other devices, which causes interference.

3) Requirements of power cables

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

4) Requirements of control cables and power supply cables

If a control cable must run across a power supply cable, make the crossing angle as close to 90° as possible.

3.2.2 Cable Routing Suggestions

- 1) Separate cables that transmit different types of signals. Separate interfering cables from sensitive cables by 30 cm wherever possible. When two types of cables must run across each other, arrange them at a right angle.

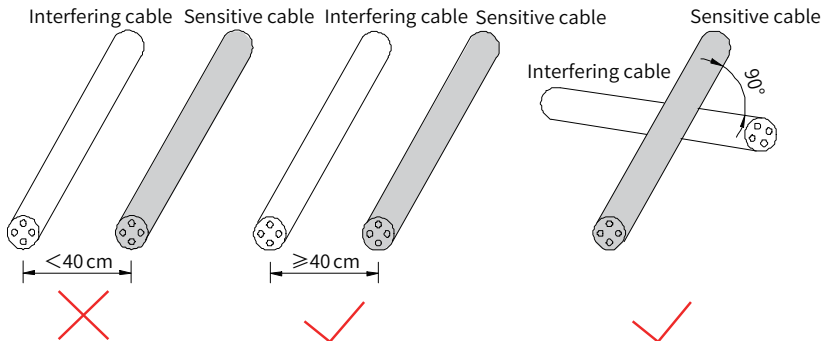


Figure 3-2 Routing interfering cables and sensitive cables

- 2) Isolate different types of signal cables with equipotential signal cables. When routing cables of the same signal type, lay the equipotential signal cables at the outer layer, and arrange as many equipotential signal cables as possible in the middle. The following figure shows an example.

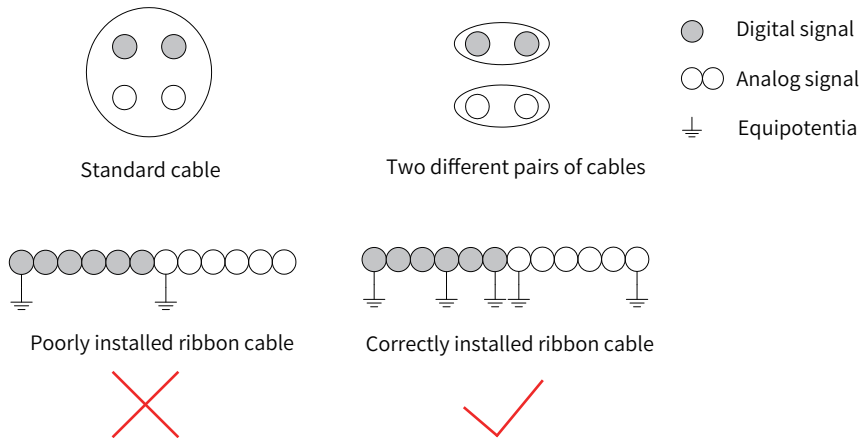


Figure 3-3 Routing cables that transmit different types of signals

- 3) It is recommended to use one multi-conductor cable to transmit only one type of signals. To use one multi-conductor cable to transmit different types of signals, make sure that each conductor of the cable is shielded separately, as shown in the following figure.

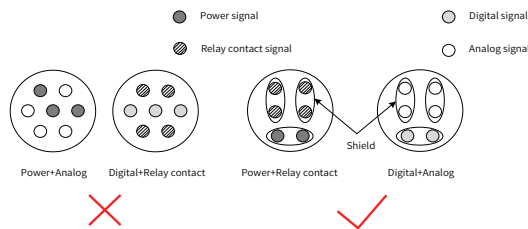


Figure 3-4 Routing multi-conductor cables

- 4) If a multi-conductor cable used to connect the equipment has any spare conductors, connect all the spare (or reserved) conductors to the equipotential bonding point, as shown in the following figure.

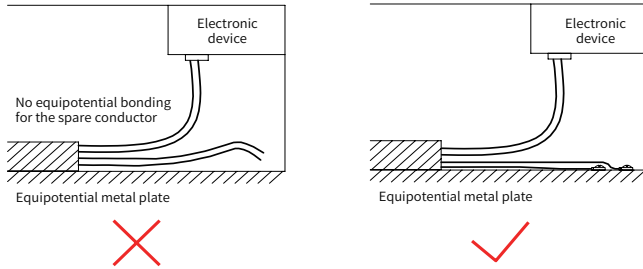


Figure 3-5 Handling spare conductors in multi-conductor cables

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

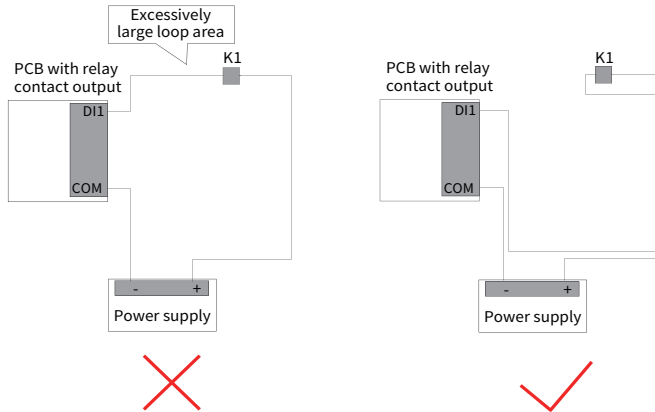


Figure 3-6 Avoiding large loop area

- 6) For cables of different types, route them along an equipotential metal duct and separate them by types. This can significantly enhance the internal EMC performance. For even better internal EMC performance, separate different types of cables in the same metal (zinc-iron or stainless steel) duct with metal spacers.

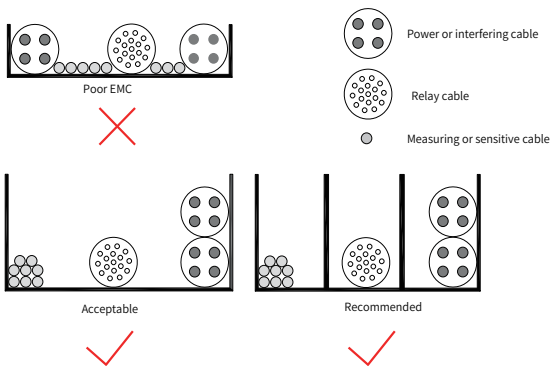


Figure 3-7 Laying multiple types of cables

- 7) Minimize the length of the unshielded part of a shielded cable, and connect the shield to the nearest PE terminal. A long unshielded part makes signals, especially encoder signals, susceptible to interference.

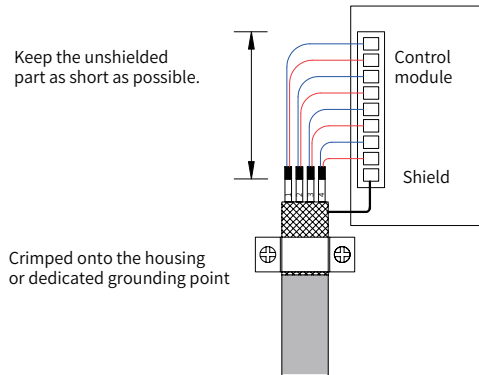


Figure 3-8 Handling shielded cables

3.2.3 Connection of Shielded Power Cables

For input and output shielded power cables inside the DC chopper module, the shield must have large-area contact with the shield plate in the cabinet for good EMC performance. See the following diagram for reference.

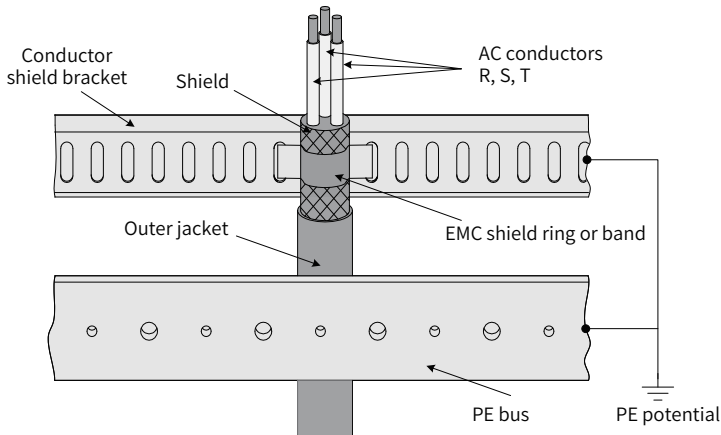


Figure 3-9 Connection of shielded power cables

3.3 Pre-charging of DC Bus Capacitors

The DC chopper module has multiple electrolytic capacitors on the DC side. Their service life depends on the operating hours, load, and ambient temperature. Their service life can be extended by lowering the ambient temperature.

Capacitor failures are often accompanied by equipment damage and input fuse failure or fault trip. If a capacitor failure occurs, contact Inovance. Do use spare parts specified by Inovance.

 CAUTION	
	Do not store the equipment for more than two years. If the storage period exceeds two years, charge the DC bus capacitors before commissioning. The storage period is calculated from the date of manufacture rather than the date of delivery.

Charge the capacitors in accordance with the following instructions.

Charging requirements:

When the DC chopper module is unloaded, charge the capacitors to the rated voltage and maintain the rated voltage for at least 30 minutes. During this period, do not apply any control signals to the DC chopper module.

Recommended components for the charging circuit:

- ① One three-phase fuse switch rated 10 A/400 V or 10 A/690 V
- ② Three 100 W/220 V incandescent lamps, or three 1 k Ω /100 W resistors instead, for the 400 V DC chopper module
- ③ Six 100 W/220 V incandescent lamps, every two connected in series per power phase, for the 690 V DC chopper module
- ④ Necessary accessories, such as lamp holders and 1.5 mm² cables

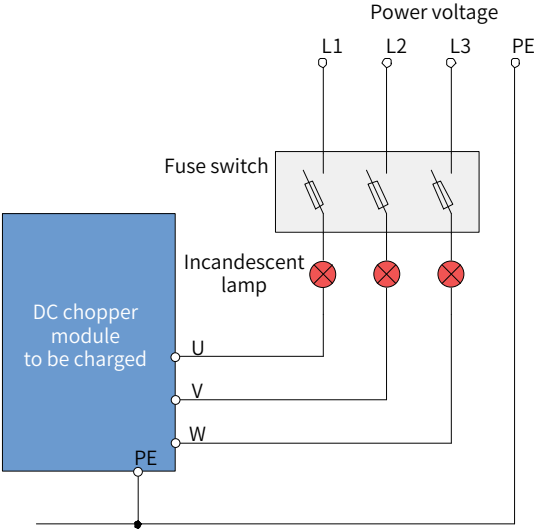


Figure 3-10 Schematic diagram of charging connection

3.4 Module Connection

 CAUTION	
	When connecting the DC chopper module, tighten the screws with standard torque. Otherwise, the connectors will overheat during operation.

3.4.1 Cable Connection of H3 and H4 DC Chopper Modules

1) Terminal layout

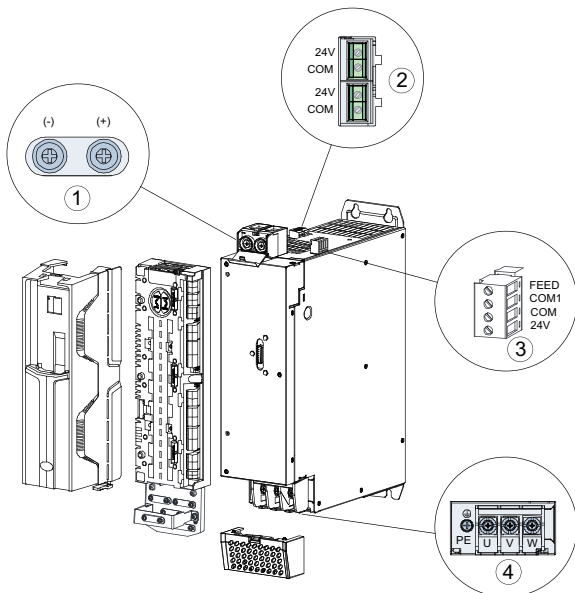


Figure 3-11 Terminal layout of H3 and H4 DC chopper modules

For details about terminals of the HCU control module, see [“Chapter 4 HCU Control Module”](#).

Table 3-1 Terminals of H3 and H4 DC chopper modules

No.	Name	Technical Specifications
1	(+) and (-) DC input	Voltage: 540 VDC to 720 VDC Connection: H3: cable terminal with M6/9 N • m H4: cable terminal with M8/20 N • m
2	Internal 24 VDC auxiliary power terminal	Dual-conductor twisted pair, single-conductor cable; cross-sectional area: 0.5 mm ² to 2.5 mm ²
3	DC bus pre-charge module control terminal	Single-conductor cable; cross-sectional area: 0.5 mm ² to 2.5 mm ²
4	U/V/W DC output	U/V/W terminal: Voltage: 24 VDC to 670 VDC Connection: H3: cable terminal with M6/9 N • m H4: cable terminal with M10/22 N • m PE terminal connection: H3: cable terminal with M6/9 N • m H4: cable terminal with M10/22 N • m

2) Wiring procedure

- ① Remove the protective cover of the terminal area.
- ② Connect the cable to the output terminal in this sequence: U, V, and then W, or (+) and then (-).
- ③ Secure the power cable on the cable mounting bracket to avoid stress on the terminal.

- ④ When a shielded power cable is used, secure the shield on the shielding plate in an EMC-compliant manner.

3.4.2 Cable Connection of H6 and H7 DC Chopper Modules

1) Terminal layout

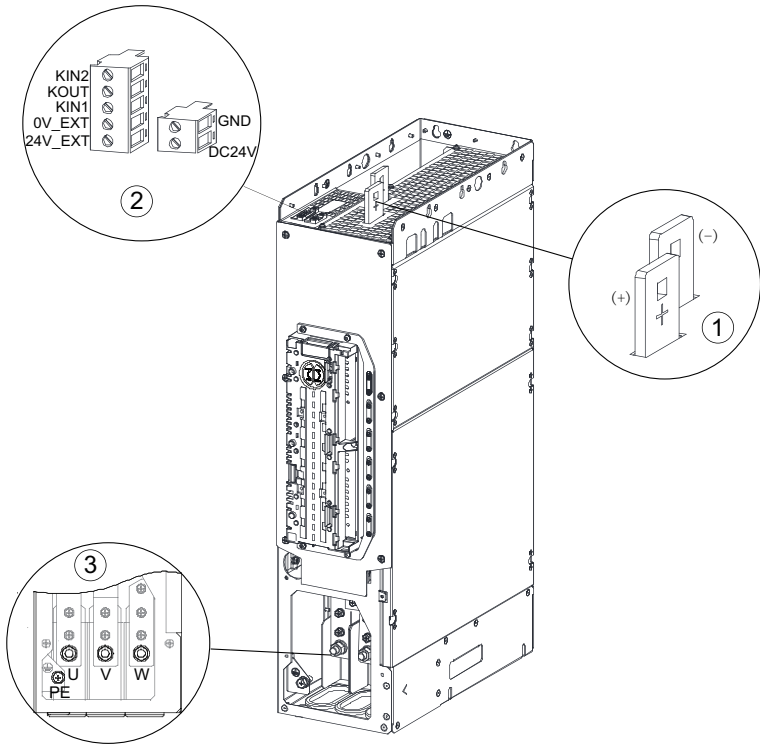


Figure 3-12 Terminal layout of H6 and H7 DC chopper modules

Table 3-2 Terminals of H6 and H7 DC chopper modules

No.	Name	Technical Specifications
1	(+) and (-) DC input	400 V system: 540 VDC to 720 VDC 690 V system: 740 VDC to 1050 VDC Connection: copper busbar terminal with M10/42 N • m
2	2-pin internal 24 VDC auxiliary power terminal 5-pin DIDO terminal	2-pin internal 24 VDC auxiliary power terminal: dual-conductor twisted pair, single-conductor cable; cross-sectional area: 0.5 mm ² to 2.5 mm ² 5-pin DIDO terminal: single-conductor cable; cross-sectional area: 0.5 mm ² to 2.5 mm ²
3	U/V/W DC output	U/V/W terminal: Voltage of 400 V system: 24 VDC to 670 VDC Voltage of 690 V system: 24 VDC to 1000 VDC Connection: cable terminal with M10/32 N • m PE terminal: Connection: cable terminal with M8/20 N • m

2) Wiring procedure

- ① Remove the protective cover of the terminal area.
- ② Connect the cable to the output terminal in this sequence: U, V, and then W, or (+) and then (-).
- ③ Secure the power cable on the cable mounting bracket to avoid stress on the terminal.
- ④ When a shielded power cable is used, secure the shield on the shielding plate in an EMC-compliant manner.

3.4.3 Cable Connection of H8A DC Chopper Modules

1) Terminal layout

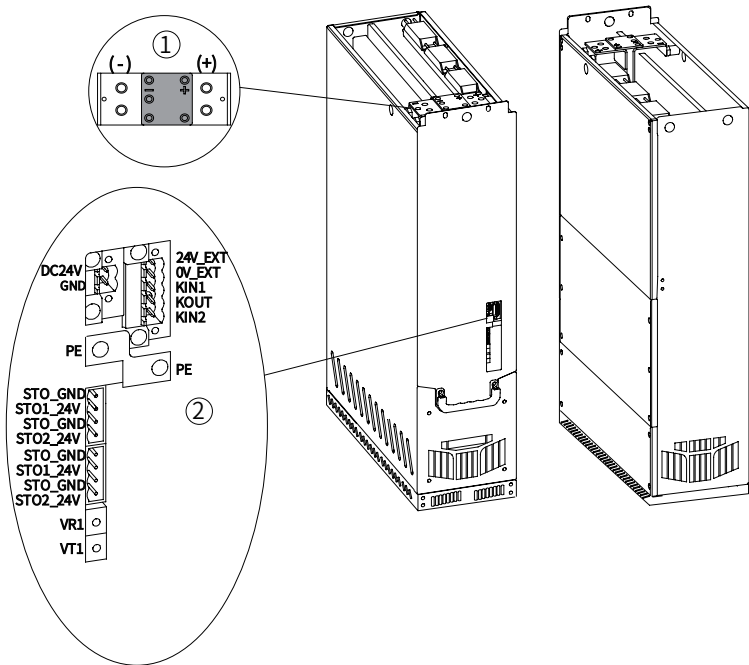


Figure 3-13 Terminal layout of H8A DC chopper modules

Table 3-3 Terminals of H8A DC chopper modules

No.	Name	Technical Specifications
1	(+) and (-) DC input	400 V system: 540 VDC to 720 VDC 690 V system: 740 VDC to 1050 VDC
2	2-pin power supply terminal 4-pin STO1 terminal 4-pin STO2 terminal	2-pin power terminal: dual-conductor twisted pair, single-conductor cable; cross-sectional area: 0.5 mm ² to 2.5 mm ² 5-pin DIDO terminal: single-conductor cable; cross-sectional area: 0.5 mm ² to 2.5 mm ² 4-pin STO1 terminal: 4-conductor shielded cable; cross-sectional area: 0.5 mm ² to 2.5 mm ² 4-pin STO2 terminal: 4-conductor shielded cable; cross-sectional area: 0.5 mm ² to 2.5 mm ²
3	U/V/W DC output	-

2) Wiring procedure

- ① Ensure that all the I/O terminals are correctly connected.
- ② Secure the power cable on the cable mounting bracket to avoid stress on the terminal.
- ③ When a shielded power cable is used, secure the shield on the shielding plate in an

EMC-compliant manner.

3.4.4 Cable Specifications and Recommendations

Table 3-4 Recommended main circuit cables

Model	Rated Output Current (A)	Cable Quantity and Cross-sectional Area for HVS (mm ²)	Terminal	Cable Quantity and Cross-sectional Area for LVS (mm ²)	Terminal
Un: HVS DC voltage range: 540 VDC to 720 VDC					
MD880-80M-0100-4	100	1 x 70	Tubular terminal	1 x 25	OT/25-6
MD880-80M-0200-4	200	1 x 95	Tubular terminal	1 x 50	OT/50-10
MD880-80M-0300-4	300	1 x 120	Tubular terminal	1 x 70	OT/70-10
MD880-80M-0400-4	400	2 x 95	OT/95-10	1 x 70	OT/70-10
MD880-80M-0500-4	500	2 x 120	OT/120-10	1 x 95	OT/95-10
MD880-80M-0600-4	600	2 x 120	OT/120-10	1 x 95	OT/95-10
MD880-80M-0800-4	800	3 x 120	OT/120-10	1 x 120	OT/120-10
MD880-80M-1000-4	1000	4 x 120	OT/120-10	2 x 95	OT/95-10
Un: HVS DC voltage range: 740 VDC to 1050 VDC					
MD880-80M-0100-7	100	1 x 70	OT/120-10	1 x 25	OT/25-10
MD880-80M-0200-7	200	1 x 95	OT/120-10	1 x 50	OT/50-10
MD880-80M-0300-7	300	1 x 120	OT/120-10	1 x 70	OT/70-10
MD880-80M-0400-7	400	2 x 95	OT/120-10	1 x 70	OT/70-10

Model	Rated Output Current (A)	Cable Quantity and Cross-sectional Area for HVS (mm ²)	Terminal	Cable Quantity and Cross-sectional Area for LVS (mm ²)	Terminal
MD880-80M-0500-7	500	2 x 120	OT/120-10	1 x 95	OT/95-10
MD880-80M-0600-7	600	2 x 120	OT/120-10	1 x 95	OT/95-10



NOTE

- ◆ The preceding table lists the cables recommended for the high-voltage side and low-voltage side. The PE terminal needs a separate cable, whose cross-sectional area must be at least half of the cross-sectional area of the power phase line.
- ◆ Remarks for recommended cables: "3 x 120 mm²" means that each phase requires three cables and the cross-sectional area of the cable is 120 mm².
- ◆ Remarks for terminals: "OT/120-12" means that the cable is crimped to an OT-type terminal, the cross-sectional area of the cable matching the terminal is 120 mm², and the size of the wiring screw hole is M12.
- ◆ Observe the upper limits of the terminal sizes listed in the table. Using terminals beyond these limits may compromise the mechanical stability and required electrical clearance.
- ◆ The cable configuration of the negative busbar on the DC low-voltage side shall be consistent with the cable configuration on the DC high-voltage side.
- ◆ Derating calculation is required when multiple cables of the same specifications are connected in parallel.

3.5 Installation Checklist

After completing necessary electrical installation of the DC chopper module, you can check the key items against the following checklist. Read through the safety precautions in "Fundamental Safety Instructions" before carrying out any work on the equipment.

No.	Item	Pass
1	The input power supply is connected to the load cable and the supplied voltage is correct.	☐
2	The auxiliary power supply provides the correct voltage.	☐
3	The input and output power cables are secured to the cable mounting bracket and are not tensed.	☐
4	The cables are properly connected with the required torque to the terminals as specified.	☐
5	In the case of EMC shielded cables, threaded sleeve joints are used on the motor terminal box, and they are grounded and have large-area contact with the cable shields. In the chopper module, the cable shield shall be secured to a shielding plate to ensure EMC compliance.	☐
6	Parallel outputs of the DC chopper module are correctly connected.	☐
7	The date of manufacture can be found on the nameplate of the DC chopper module. If the period from the date of manufacture to initial commissioning or the downtime of the power components is shorter than two years, there is no need to pre-charge the DC bus capacitors. If the downtime exceeds two years, the capacitors must be pre-charged according to "3.3 Pre-charging of DC Bus Capacitors".	☐
8	The control cables are connected in accordance with the terminal layout and by shield. The control cables are routed separately from the power supply cables to prevent interference. Cabling and connections comply with the relevant EMC directives.	☐

Chapter 4 HCU Control Module

There are two models of HCU used for DC chopper control: HCU-80 and HCU-81.

DC Chopper Control Module	Communication with DC Chopper Module	Applicable DC Chopper Module	Installation Mode
HCU-80	High-speed optical fiber communication	H8A	Installed separately inside an auxiliary control cabinet
HCU-81	High-speed RS422 communication	H3, H4, H6, and H7	Installed on the DC chopper module

The HCU control module requires an external 24 VDC power supply. It internally provides multiple isolated power supplies, including the isolated digital power supply, RS485 isolated power supply for InoLink communication, and SOP-20-880 power supply. It also provides power supply for function modules in the HCU expansion slots.

4.1 HCU Controller Composition

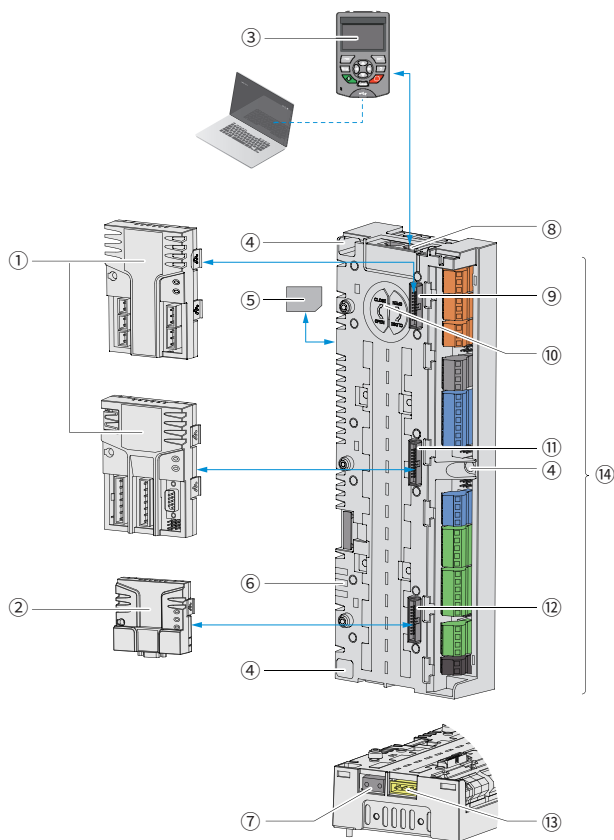


Figure 4-1 Diagram of HCU

Table 4-1 Description of HCU components

No.	Name	Description
①	Function module SIZE1	105 x 73 x 24 (mm) function module
②	Function module SIZE2	75 x 73 x 24 (mm) function module
③	Smart operating panel	SOP-20-880 smart operating panel
④	Fixing hole	Three holes for fixing the HCU
⑤	SD card	HCU's standard 8 GB micro SD card, which can be flexibly inserted and removed
⑥	Indicators	Power, operation, and fault indicators
⑦	Optical fiber	Optical fiber port for communication between the HCU-80 module and the DC chopper module
⑧	Smart operating panel terminal	Two identical RJ45 ports that can be cascaded, connecting the HCU module to the SOP-20-880 panel
⑨	SLOT1	Function module ports: SLOT1_1, SLOT1_2, SLOT1_3
⑩	Battery cover	Cover of the spare RTC battery. The RTC battery is a non-rechargeable lithium battery that must be replaced regularly.
	SLOT2	Function module ports: SLOT2_1, SLOT2_2, SLOT2_3
⑫	SLOT3	Function module port: SLOT3_1
⑬	XSTO	Safe torque off
⑭	DB15 terminal	Electrical port for communication between the HCU-81 module and the DC chopper module (drawing modified)

**NOTE**

- ◆ The SLOT1, SLOT2, and SLOT3 slots can be used to install function modules directly, with the slot No. being SLOT1_1, SLOT2_1, and SLOT3_1, respectively.
- ◆ The SLOT1 and SLOT2 slots can be expanded with the HOFM-30 and HESD-10 modules.
- ◆ The SLOT3 slot cannot be expanded.

4.2 LED Indicators

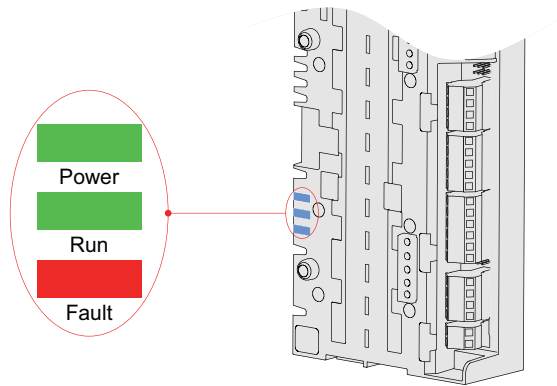


Figure 4-2 Location and definition of LED indicators

Table 4-2 Function description of LED indicators

No.	Name	State	Description
1	Power	Steady on	The HCU is powered normally.
		Off	The HCU is not powered or the power supply is faulty.
2	Run	Steady on	The power module is running.
		Off	The power module is not running.
3	Fault	Steady on	The system is faulty.
		Off	The system is normal.
		Blinking	The HCU auxiliary power supply is faulty. Check the 24VD power supply and other power supplies for short circuit or overload.
4	Fault and Run	Blinking together	The HCU is selected on a PC or SOP-20-880, and the state ends after 10 seconds.

4.3 SD Memory Card

The HCU has a built-in SD card that stores real-time data from all stages of the control module to assist in monitoring and analyzing the power module. Data is stored on a micro SD card and analyzed by qualified maintenance personnel.

4.4 HCU Dimensions and Installation Instructions

4.4.1 Installation Precautions

Make sure that the cabinet has been cut off from power supply (including external power supply) for at least 15 minutes before installation.

Do not drop or impact the HCU module to avoid damage.

Do not disassemble the HCU module to avoid damage.

Do not fasten terminals with excessive torque.

 CAUTION	
	◆ Before installing or removing the HCU, make sure that the cabinet has been powered off for more than 15 minutes and the HCU input power is disconnected. Failure to comply will cause damage to the HCU control module. ◆ When installing or removing a function module on the HCU, make sure that the HCU input power is disconnected. Failure to comply will cause damage to the HCU or function module.

1) Required installation tools

The installation will need a 1# Phillips screwdriver.

2) Tightening torque for screws and screw fasteners

The following table lists the tightening torque for screws during HCU installation.

Screw	Tightening Torque
⑪ M3	0.55 N · m

4.4.2 HCU Dimensions

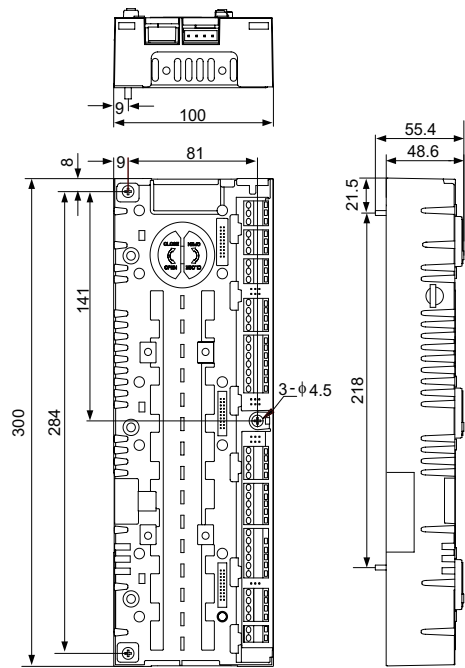


Figure 4-3 HCU dimensions (mm)

4.4.3 Requirements of Installation Clearance

To facilitate installation, reserve certain clearance between the HCU and its surrounding structures and devices, as shown in the following figure.

The HCU must be mounted on a conductive metal surface with its entire conductive back in good contact with the mounting surface.

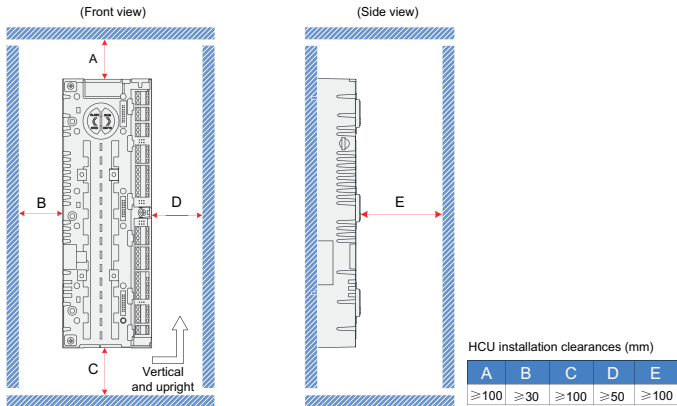


Figure 4-4 HCU installation clearance (mm)

4.4.4 Installation Procedure

- ① Step 1: Hold the HCU vertically and align it with the two positioning holes on the metal mounting plate.
- ② Step 2: Tighten the HCU mounting screws with a 1# Phillips screwdriver (three M4 screws are already fixed in the HCU), as shown in the following figure.

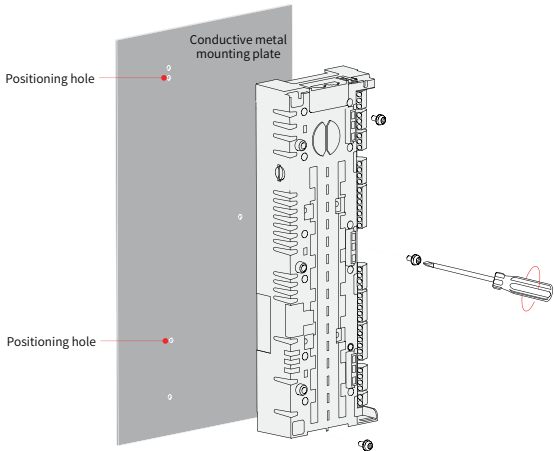


Figure 4-5 Installing the HCU

■ Grounding inside the cabinet

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

The HCU housing is grounded by connecting to the cabinet housing through mounting screws.

4.5 HCU Ports

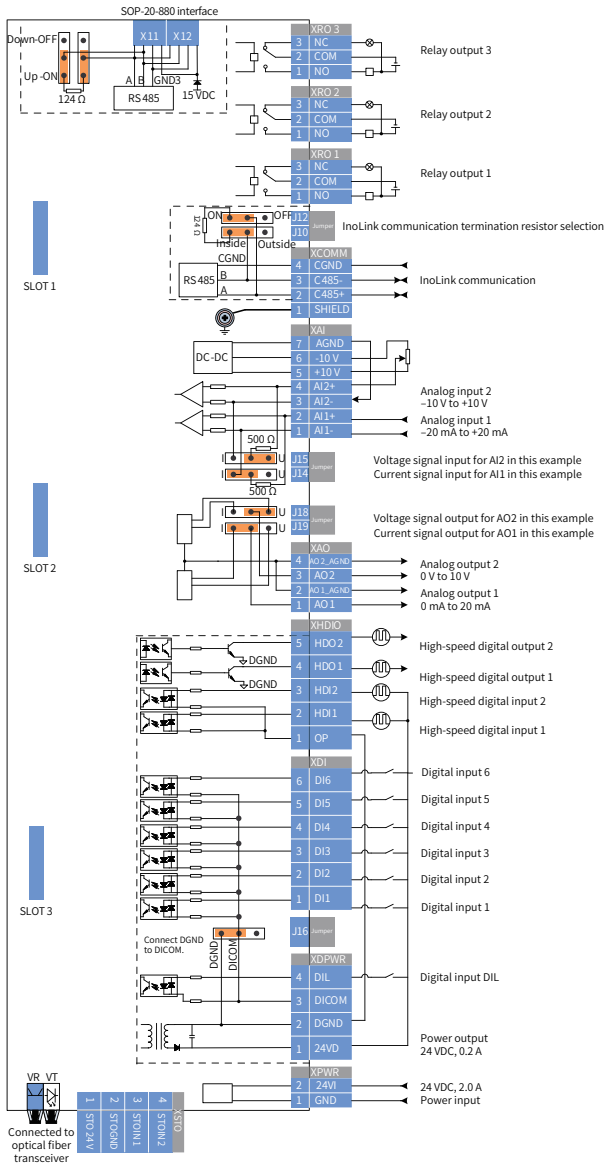


Figure 4-6 Overview of HCU interface circuits

4.5.1 Standard Ports

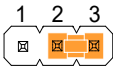
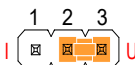
Table 4-3 Standard ports of the HCU control module

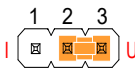
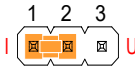
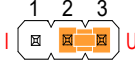
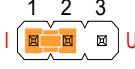
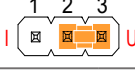
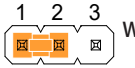
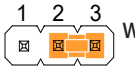
Name	Terminal	Description
Input power supply	XPWR: 24VI	HCU power supply
Digital power output	XDPR: 24VD	Digital output power isolated from XPWR
Digital input	XDI: DI1 to DI6 and DIL	Input type: relay contact, NPN, or PNP
High-speed digital input	XHDIO: HDI1 and HDI2	Input type: NPN or PNP
High-speed digital output	XHDIO: HDO1 and HDO2	Output type: open collector
Analog output	XAO: AO1 and AO2	Output type: current or voltage, selected by jumper
Analog input	XAI: AI1 and AI2	Input type: current or voltage, selected by jumper
Relay output	XRO1, XRO2, and XRO3	Relay output: NO, NC, and COM
InoLink communication	XCOMM	High-speed RS485, bus termination resistor selected by jumper
RJ45 terminal	X11 and X12	Used for communication with the SOP-20-880. The two RJ45 terminals are identical for cascading multiple HCU-20. Connection cable: < 3 m

4.5.2 Port Details

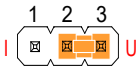
Table 4-4 Details of HCU control module ports

Terminal	Name	Description	Cable Specifications
XPWR: input power terminal			
1	GND	24.0 VDC $\pm$ 10%, 2.0 A	Dual-conductor twisted pair cables recommended Cross-sectional area: 0.5 mm ² to 2.5 mm ²
2	24VI		
XDPWR: DIL terminal			
1	24VD	Power supply for DI, HDI, and HDO 24.0 VDC $\pm$ 10%, 0.2 A	Twisted pairs; single-conductor cable Cross-sectional area: 0.5 mm ² to 2.5 mm ² Note: The load of 24VD must not exceed 0.2 A.
2	DGND	24 VDC ground	
3	DICOM	DI common output; can be connected to DGND through jumper J16	
4	DIL	Digital interlock or common DI; technical parameters being the same as common DIs	
Jumper J16: power supply selection			
1 2 3  When pins 1 and 2 are shorted, DIs are powered by the 24 VDC internal power supply.			

Terminal	Name	Description	Cable Specifications
1 2 3  When pins 2 and 3 are shorted, DIs are powered by an external power supply.			
XDI: DI terminal			
1	DI1	24 V logic level: 0: < 5 V; 1: > 15 V; Rin: 2.0 kΩ Input type: NPN/PNP, relay contact Hardware filter: 0.04 ms I _{max} : 15 mA	Single-conductor cable Cross-sectional area: 0.5 mm ² to 2.5 mm ²
2	DI2		
3	DI3		
4	DI4		
5	DI5		
6	DI6		
XHDIO: HDIO input terminal			
1	OP	HDI common terminal	Cross-sectional area: 0.5 mm ² to 2.5 mm ² Shielded twisted pairs are recommended. HDO and DGND are twisted together. HDI and OP are twisted together.
2	HDI1	Input type: NPN, PNP 24 V logic level: 0: < 5 V; 1: > 15 V; Rin: 2.0 kΩ	
3	HDI2	Input voltage: 0 VDC to 30 VDC Input frequency: 0 kHz to 100 kHz Max. HDI load (I _{max}): 15 mA	
4	HDO1	Output type: OC Output frequency: 0 kHz to 100 kHz	
5	HDO2	Max. HDO load (I _{max}): 20 mA Output voltage: 0 VDC to 26.4 VDC	
XAO: AO output terminal			
1	AO1	AO1 output range: 0 mA to	Cross-sectional area: 0.5 mm ² to 2.5 mm ² Shielded twisted pairs are recommended. AO1 and AO1_AGND are twisted together. AO2 and AO2_AGND are twisted together.
2	AO1_AGND	20 mA, R _{load} ≤ 500 Ω 0 V to 10 V, R _{load} ≥ 10 kΩ	
3	AO2	AO2 output range: 0 mA to	
4	AO2_AGND	20 mA, R _{load} ≤ 500 Ω 0 V to 10 V, R _{load} ≥ 10 kΩ Resolution: 11 bits + sign bit Accuracy: 2% full scale	
Jumper J19: selecting current or voltage as the AO1 signal type			
1 2 3  When pins 1 and 2 are shorted, AO1 is used for current signal output.			
1 2 3  When pins 2 and 3 are shorted, AO1 is used for voltage signal output.			
Jumper J18: selecting current or voltage as the AO2 signal type			
1 2 3  When pins 1 and 2 are shorted, AO2 is used for current signal output.			

Terminal	Name	Description	Cable Specifications
 When pins 2 and 3 are shorted, AO2 is used for voltage signal output.			
XAI: AI terminal			
1	AI1 –	Current input: – 20 mA to +20 mA; Rin: 500 Ω Voltage input: – 10 V to +10 V, Rin: 200 k Ω Differential input; input range: ± 30 V Sampling interval per channel: 0.25 ms Hardware filter: 0.25 ms Resolution: 11 bits + sign bit Accuracy: 1% full scale	Cross-sectional area: 0.5 mm ² to 2.5 mm ² Use two dual-conductor shielded twisted pair cables when two AIs are used. Use one four-conductor shielded twisted pair cable for one AI when the reference voltage is provided.
2	AI1+		
3	AI2 –		
4	AI2+		
5	+10V	+10V: +10 V $\pm$ 1% – 10V: – 10 V $\pm$ 1% Rload: 1 k Ω to 10 k Ω	
6	– 10V		
7	AGND		
Jumper J14: selecting current or voltage as the AI1 signal type			
 When pins 1 and 2 are shorted, AI1 is used for current signal input.			
 When pins 2 and 3 are shorted, AI1 is used for voltage signal input.			
Jumper J15: selecting current or voltage as the AI2 signal type			
 When pins 1 and 2 are shorted, AI2 is used for current signal input.			
 When pins 2 and 3 are shorted, AI2 is used for voltage signal input.			
XCOMM: InoLink communication network terminal			
1	shield	RS485 bus, 5 V standard level Bus termination resistor: 124 Ω Max. communication rate: 5 Mbps Max. number of nodes: 16 (without relay) Max. transmission distance: 40 m	Four-conductor shielded twisted pair cable Cross-sectional area: 0.5 mm ² to 2.5 mm ²
2	C485+		
3	C485 –		
4	CGND		
Jumpers J10 and J12: selecting RS485 bus termination resistor (J10 and J12 must be in the same state to ensure matching termination resistor.)			
 When pins 1 and 2 are shorted, the termination resistor is connected.			
 When pins 2 and 3 are shorted, the termination resistor is disconnected.			

Terminal	Name	Description	Cable Specifications
XRO1: relay 1 output terminal			
1	RO1_ NO	Output type: passive NO and NC contacts Contact specifications: 250 VAC/30 VDC, 2 A	Single-conductor cable Cross-sectional area: 0.5 mm ² to 2.5 mm ²
2	RO1_ COM		
3	RO1_ NC		
XRO2: relay 2 output terminal			
1	RO2_ NO	Output type: passive NO and NC contacts Contact specifications: 250 VAC/30 VDC, 2 A	Single-conductor cable Cross-sectional area: 0.5 mm ² to 2.5 mm ²
2	RO2_ COM		
3	RO2_ NC		
XRO3: relay 3 output terminal			
1	RO3_ NO	Output type: passive NO and NC contacts Contact specifications: 250 VAC/30 VDC, 2 A	Single-conductor cable Cross-sectional area: 0.5 mm ² to 2.5 mm ²
2	RO3_ COM		
3	RO3_ NC		
X11 and X12: RS485 terminal for PC or SOP-20-880 communication			
1	NC	RS485 bus, 5 V standard level Bus termination resistor: 124 Ω Max. communication rate: 4 Mbps Max. number of nodes: 32 (without relay) Max. transmission distance: 1200 m	Standard LAN cable
2	NC		
3	GND3		
4	A		
5	B		
6	15V3	15V3: 15 V ± 15%	
7	NC	-	
8	GND3		
Bus termination resistor selection		DIP switch: Pins 1 and 2 set to ON: termination resistor connected Pins 1 and 2 set to OFF: termination resistor disconnected	-
Jumpers J12 and J15: selecting bus termination resistor (J12 and J15 are valid only when they are in the same state.)			
1 2 3  When pins 1 and 2 are shorted, the termination resistor is connected.			

Terminal	Name	Description	Cable Specifications
			
VR and VT: Optical fiber transceiver			
1	VR	Receive optical fiber communication	Optical fiber type: plastic optical fiber (POF)
2	VT	Send optical fiber communication	

4.5.3 HCU Port Definitions

The DI and DO ports of the HCU are defined to cater to practical applications, as shown in the following table:

Table 4-5 HCU ports for the DC chopper module

No.	Terminal	Default Function	Recommended Function	Remarks
1	XRO1	Output main contactor control	/	Unchangeable
2	XRO2	Fault output control	/	Default function; can be configured
3	XRO3	Pre-charge circuit contactor control	/	Unchangeable
4	DI1	/	Local and remote control switchover	Recommended function; can be configured
5	DI2	Start	/	Default function; can be configured
6	DI3	Main contactor feedback signal	/	Unchangeable
7	DI4	Pre-charge contactor feedback	/	Unchangeable
8	DI5	Stop	/	Default function; can be configured
9	DI6	Fault reset	/	Default function; can be configured
10	DIL	Emergency stop signal	/	Default function; can be configured
11	HDI1	Chopper reactor over-temperature	/	Unchangeable

4.6 HPCU Parallel Control Module

HPCU is a parallel control module serving as a "connecting link" in the system. It receives the driving and control signals sent by the HCU and synchronously transmits these signals to each DC chopper module. Meanwhile, it quickly collects the current, voltage, status, and other information reported by each DC chopper module and uploads the information to the HCU. It also controls the synchronization, current equalization, reset,

and start/stop of the parallel DC chopper modules.

You may select HPCU-40 (supporting up to 4 DC chopper modules in parallel), HPCU-60 (up to 6 in parallel) or HPCU-A0 (up to 10 in parallel) based on the system requirements.

4.6.1 Standard Ports of HPCU

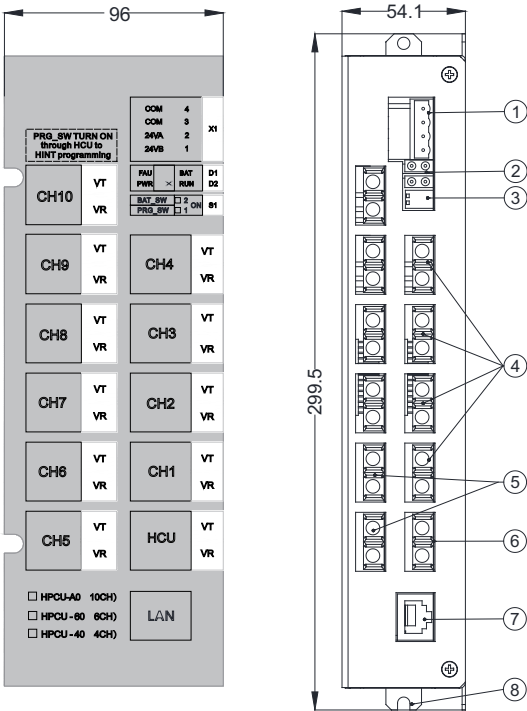


Figure 4-7 Diagram of HPCU

Table 4-6 HPCU functions

No.	Name	Description	Remarks
1	Input power supply	COM: 24 V ground	External power supply of HPCU X1 terminal, 5.08 mm pitch, 4-pin black pluggable terminal Twisted pair Cross-sectional area: 0.5 mm ² to 2.5 mm ²
		COM: 24 V ground	
		24VA: Input power supply A: 24.0 V ± 10%, 0.5 A	
		24VB: Input power supply B (redundant): 24.0 V ± 10%, 0.5 A	
2	LED indicator	PWR/BAT/TX/RX	Power/battery/send/receive

No.	Name	Description	Remarks
3	Battery DIP switch	S2: BAT_SW	Reserved
4	Optical fiber transceiver	VT/VR: CH1 to CH4, parallel module channels 1 to 4	VT: 80 M, send optical fiber communication VR: 80 M, receive optical fiber communication Optical fiber type: plastic optical fiber (POF) HPCU-40 provides channels CH1 to CH4. HPCU-60 provides channels CH1 to CH6. HPCU-A0 provides channels CH1 to CH10.
5	Optical fiber transceiver	VT/VR: CH5/CH6, parallel module channels 5 and 6	
6	Optical fiber transceiver	VT/VR: HCU Inodrive, communication between HPCU and HCU	
7	LAN	PC control and commissioning port	-
8	Fixing hole	Four holes for fixing the HPCU	-

4.6.2 LED Indicators

Table 4-7 Function description of LED indicators

No.	Name	State	Description
1	PWR	Steady green	The HPCU is powered normally.
		Off	The HPCU is not powered or the power supply is faulty.
2	RUN	Steady green	The DC chopper module is running.
		Off	The DC chopper module is not running.
3	FAU	Blinking red	The system is faulty.
		Off	The system is normal.
4	BAT	Steady red	The battery is undervoltage.
		Off	The battery is normal.

4.6.3 Electrical Connection of HPCU

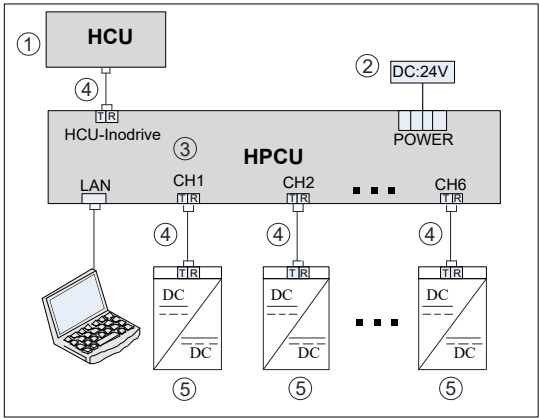


Figure 4-8 Electrical connection of HPCU

Table 4-8 Description of HPCU electrical connection

No.	Name
1	HCU control module
2	External 24 VDC power supply
3	HPCU parallel control module
4	Optical fiber
5	DC chopper module

4.7 HCU Function Application

4.7.1 HCU Function Modules

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

Table 4-9 Function modules working with HCU

No.	Name	Model	Description	Connection Mode	Dimensions (L x W x H, mm)
1	I/O module	HIO-10	2-channel AI 2-channel AO 2-channel DIO 1-channel relay out-put	Slot	105 x 73 x 24
2	PROFIBUS DP module	HDP-10	PROFIBUS DP bus adapter	Slot	75 x 73 x 24
3	CAN bus module	HCAN-10	CANopen bus adapter	Slot	75 x 73 x 24
4	Modbus RTU module	HMBA-10	Modbus RTU bus adapter	Slot	75 x 73 x 24

No.	Name	Model	Description	Connection Mode	Dimensions (L x W x H, mm)
5	Ethernet module	HETN-10	Ethernet commissioning module	Slot	75 x 73 x 24
6	PROFINET IO module	HPFN-10	PROFINET IO Industrial Ethernet	Slot	75 x 73 x 24
7	Modbus TCP module	HMBT-10	Modbus TCP Industrial Ethernet	Slot	75 x 73 x 24
8	Optical fiber expansion module	HOFM-10	One pair of 80M optical fibers	Slot	75 x 73 x 24
		HOFM-30	Three pairs of 80M optical fibers	Slot	75 x 73 x 24
9	Parallel control module	HPCU-40	Parallel connection of 2 to 4 modules	Optical fiber	232 x 86 x 40
		HPCU-60	Parallel connection of 2 to 6 modules	Optical fiber	232 x 86 x 40
		HPCU-A0	Parallel connection of 2 to 10 modules	Optical fiber	232 x 86 x 40
10	Function expansion module	HESD-10	Expansion of one slot	Optical fiber	105 x 75 x 70
11	Sync voltage and current detection module	HSVM-20	DC voltage and current detection	Optical fiber	150 x 100 x 30
12	Smart operating panel	SOP-20-880	Human-machine interaction	RS485	150 x 100 x 30



NOTE

- ◆ The HOFM-30 module can be installed in either the SLOT1 or SLOT2 slot.
- ◆ It is recommended to install the HDP-10 module in the SLOT3 slot.

4.7.2 Slot Expansion

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

The HCU provides only three slots. When more modules are needed, you can install the HOFM and HESD expansion modules. Each HESD supports expansion of one function module.

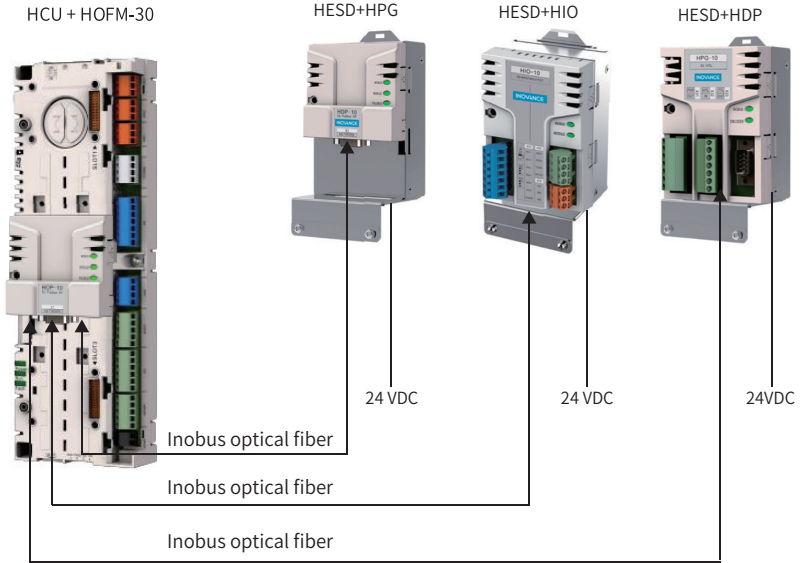


Figure 4-9 HESD wiring example



NOTE

- ◆ Function modules can be directly installed in SLOT1, SLOT2, and SLOT3, and the addresses are SLOT1_1, SLOT2_1, and SLOT3_1, respectively.
- ◆ SLOT1 and SLOT2 each can work with the HOFM-30 module to expand to three slots, that is, SLOT1_1, SLOT1_2, and SLOT1_3, or SLOT2_1, SLOT2_2, and SLOT2_3, respectively.
- ◆ The SLOT3 slot cannot be expanded.
- ◆ The HOFM optical fiber expansion module cannot be installed on the HESD module for further expansion.

Chapter 5 Maintenance and Inspection

5.1 Overview

This chapter describes:

- Precautions for maintenance and inspection of the DC chopper products
- Regular maintenance and inspection of components
- Replacement of parts during maintenance
- Necessary safety precautions to take before maintenance and inspection

Safety precautions for maintenance and inspection

- ◆ The DC chopper module carries high voltage during working. Conduct connection only when the DC chopper module is de-energized.
- ◆ Before maintenance, power off the DC chopper module and wait for at least 15 minutes until the voltage of the DC chopper module is lower than 36 VDC. Failure to comply will result in physical injury due to the residual voltage on the capacitors.
- ◆ When an external power supply is connected, hazardous voltage is still present on the module and cabinet even if the main circuit breaker is open. Check and ensure that the voltage is discharged before maintenance and inspection.
- ◆ Equipment installation, wiring, maintenance, inspection, or parts replacement must be performed only by professionals.
- ◆ Mount and wire the equipment in compliance with relevant national standards, industry standards, and local safety regulations.
- ◆ Take caution when handling heavy equipment and equipment with a high center of gravity. Improper lifting or transportation may result in substantial property loss, severe physical injury, or even death.
- ◆ Be aware of the rotation of the fan due to inertia.

5.2 Precautions for Cleaning

The DC chopper module is basically composed of electronic components. Therefore, no components, except the fan, will wear out and require maintenance or repair. To ensure normal operation of the module, regular cleaning is required to remove dust and contamination.

Pay attention to the following matters.

1 Dust

Remove dust inside the module and cabinet thoroughly and regularly (at least once a year or more frequently depending on the environment) by qualified personnel in accordance with relevant safety regulations. Use a brush and vacuum cleaner to clean the equipment. Use dry compressed air (max. 1 bar) for positions out of reach.

2 Ventilation

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

5.3 Precautions for Inspection

Inspection involves activities and procedures for maintaining normal operation of the equipment and eliminating faults.

 CAUTION	
	◆ Strictly follow the proper operation procedures before beginning any maintenance or inspection work. ◆ Ensure that the DC chopper module has been powered off and cooled down before maintenance and inspection. ◆ Mount and wire the equipment in compliance with relevant national standards, industry standards, and local safety regulations. ◆ Proceed with operations only after verifying that no voltage is present, because residual voltage still exists in the cabinet for a period of time after the input circuit breaker is switched off. ◆ Use only instruments that comply with the voltage withstand requirements and keep the housing of the instruments well grounded. ◆ Be careful when measuring components inside cabinets. Prevent meter leads from shorting or touching other terminals. ◆ Allow only qualified personnel to install, inspect, and maintain the DC chopper module.

1 Required tools

The following tools are needed in inspection and replacement of parts.

- Wrench or socket wrench with width across flats of 6 mm
- Wrench or socket wrench with width across flats of 8 mm
- Wrench or socket wrench with width across flats of 10 mm
- Wrench or socket wrench with width across flats of 12 mm
- Torque wrench
- Phillips screwdrivers of the #1 and #2 sizes

A socket wrench kit with two extension rods is recommended.

2 Service life of components

To ensure long-term proper functioning of the DC chopper, maintain its internal electronic components regularly based on their service life. The service life of the electronic components is influenced by the ambient environment and working conditions. The following table lists the replacement intervals of these components for your reference.

Table 8-7 Component replacement intervals

Component	Standard Replacement Interval
DC fan	3 to 5 years
Electrolytic capacitor	8 years

Component	Standard Replacement Interval
PCB	8 to 10 years



NOTE

- ◆ The intervals in the preceding table are calculated based on the following conditions:
- ◆ Ambient temperature: annual average 30°C
- ◆ Load factor: below 80%
- ◆ Operation time: less than 12 hours per day

3 Tightening torque for screw connectors

Apply the tightening torque as provided in the following table when tightening the connectors of conductive parts (DC bus terminals, DC output terminals, and copper busbars), non-conductive parts (grounding terminals and protective grounding terminals), and common steel parts.

Table 8-8 Tightening torque for current-carrying components

Screw/Bolt	Grounding/Protective Grounding/Steel Connector (N · m) (Fault Current-Conducting)	Busbar with Plastic Housing (N · m) (Operating Current-Conducting)
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 the cable terminals and screw terminals for looseness and re-tighten them as needed. Check the routing for faults and replace damaged components promptly.



NOTE

Determine the actual maintenance period based on the installation environment and operating conditions.

5.4 Component Replacement

5.4.1 Overview

This section describes the replacement of parts typically involved in maintenance and inspection. This section does not cover parts that are not subject to wear.

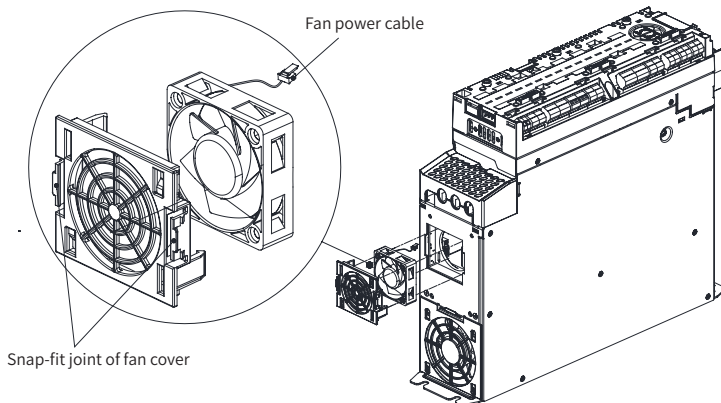
5.4.2 Safety Instructions

Note the following safety information before maintenance and inspection.

 CAUTION	
	◆ Be aware that the DC chopper module carries high voltage during working. ◆ Do not conduct any connection work unless the DC chopper module is de-energized. ◆ Before maintenance, power off the DC chopper module, wait for at least 15 minutes until the voltage on the module is lower than 36 VDC. Failure to comply will result in physical injury due to the residual voltage on the capacitors. ◆ Allow only professionals to perform maintenance and inspection on the DC chopper module. Failure to comply may result in substantial property loss, severe physical injury, or even death. ◆ Exercise extreme caution when working on the equipment that is opened. The power supply and terminals may be live even when the module is not running due to possible presence of external power voltages. ◆ Some equipment is very heavy or top-heavy and thus must be handled by trained personnel with care. Improper hoisting or handling of such equipment may lead to substantial property damage, severe physical injury, or even death.

5.4.3 Replacing DC Fans of the DC chopper Module

1) Replacing DC fans of H3 DC chopper modules



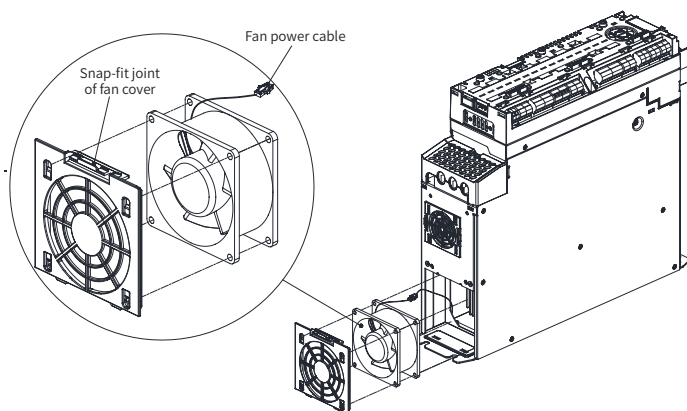


Figure 11-1 Replacing DC fans of H3 DC chopper modules

- ① Disconnect the DC power supply from the drive system and measure to ensure that the DC chopper module carries no residual voltage.
- ② Press the snap-fit joint on the fan cover to remove the cover.
- ③ Remove the power cable plug from the socket while pulling the fan outward.
- ④ Install the new fan in reverse order.



NOTE

- ◆ The air flows from bottom to top. Therefore, install the fan with the arrow on it pointing upward.
- ◆ When installing a fan, avoid squeezing the fan power cable by the fan.

2) Replacing DC fans of H4 DC chopper modules

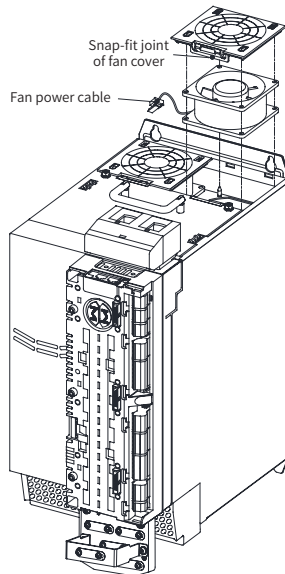


Figure 11-2 Replacing DC fans of H4 DC chopper modules

- ① Disconnect the DC power supply from the drive system and measure to ensure that the DC chopper module carries no residual voltage.
- ② Press the snap-fit joint on the fan cover to remove the cover.
- ③ Remove the power cable plug from the socket while pulling the fan outward.
- ④ Install the new fan in reverse order.



NOTE

- ◆ The air flows from bottom to top. Therefore, install the fan with the arrow on it pointing upward.
- ◆ When installing a fan, avoid squeezing the fan power cable by the fan.

3) Replacing DC fans of H6 and H7 DC chopper modules

The H6 DC chopper module is equipped with one fan, whereas the H7 is equipped with two fans.

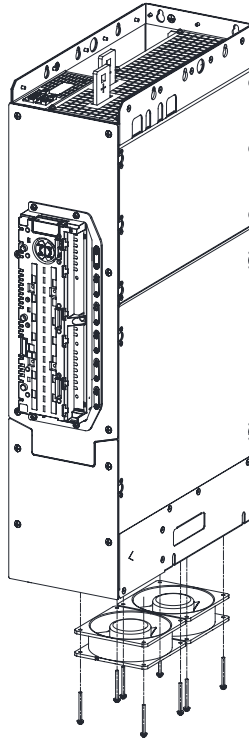


Figure 11-3 Replacing DC fans of H6 and H7 DC chopper modules

Fans of H6 and H7 DC chopper modules include three types to match different power ratings. Select the appropriate type and replace the fans as follows:

- ① Disconnect the DC power supply from the drive system and measure to ensure that the DC chopper module carries no residual voltage.
- ② Open the cabinet door to remove the eight M4 screws at the bottom of the module (four M4 screws for each fan).
- ③ Remove the power cable plug from the socket while pulling the fan outward.
- ④ Install the new fan in reverse order.



NOTE

- ◆ The air flows from bottom to top. Therefore, install the fan with the arrow on it pointing upward.
- ◆ When installing a fan, avoid squeezing the fan power cable by the fan.

4) Replacing DC fans of H8A DC chopper modules

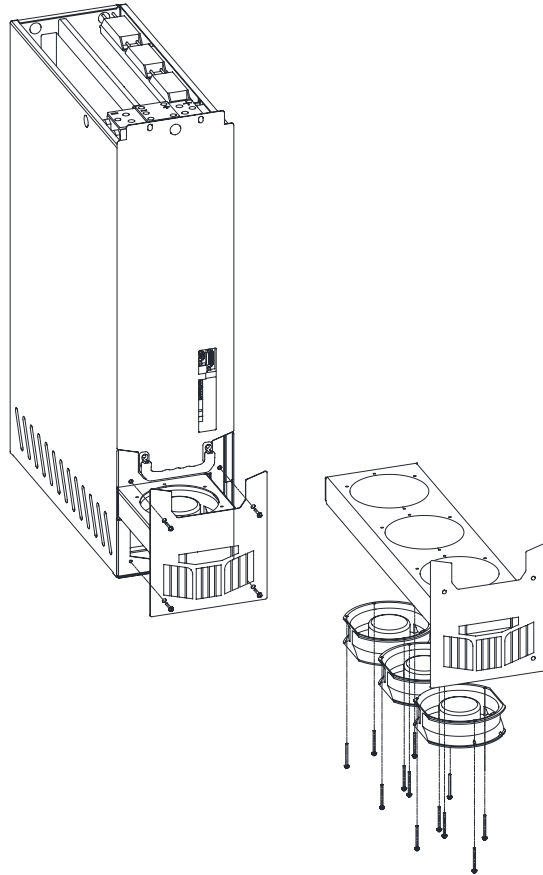


Figure 11-4 Replacing DC fans of H8A DC chopper modules

Fans of H8A DC chopper modules include five types to match different power ratings. Select the appropriate type and replace the fans as follows:

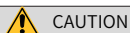
- ① Disconnect the DC power supply from the drive system and measure to ensure that the DC chopper module carries no residual voltage.
- ② Remove the four M5 screws on the fan assembly with a screwdriver.
- ③ Unplug the power cable of the fan assembly while pulling the fan assembly out from the front of the module.
- ④ Remove the twelve M4 screws (four M4 screws per fan) from the fan assembly to remove the fans.

Install new fans of the same specifications in the reverse order.



- ◆ The air flows from bottom to top. Therefore, install the fan with the arrow on it pointing upward.
- ◆ When installing a fan, avoid squeezing the fan power cable by the fan.

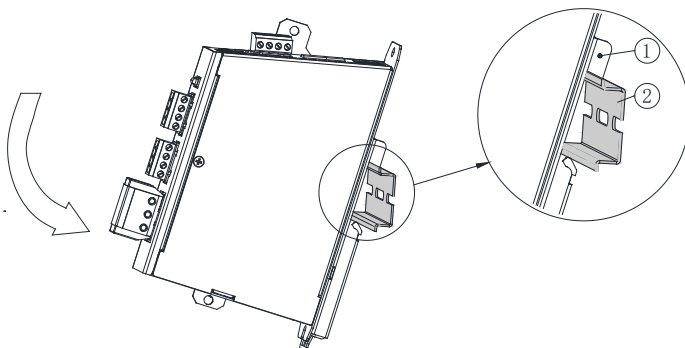
5.4.4 Replacing HSVM-20



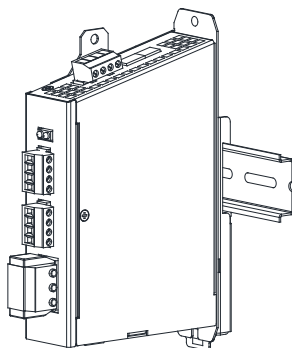
Only professional personnel are allowed to replace parts. Before maintenance and inspection, read the "Fundamental Safety Instructions" chapter and the safety instructions given in this chapter. Failure to comply may result in physical injury or equipment damage.

■ Installation procedure

Step 1: Hold the HSVM-20 module, place the upper part of the module's guide rail groove on the guide rail at an angle, and press the lower part of the module's guide rail groove in the direction of the arrow so that the guide rail groove ① is completely fixed on the guide rail ②.



Step 2: The module is mounted on the guide rail, as shown below:

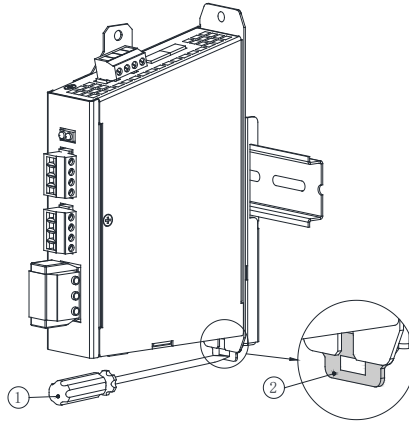


Step 3: Connect the 24 VDC external power supply to the X4 terminal and insert the optical fiber into the corresponding port to complete the installation.

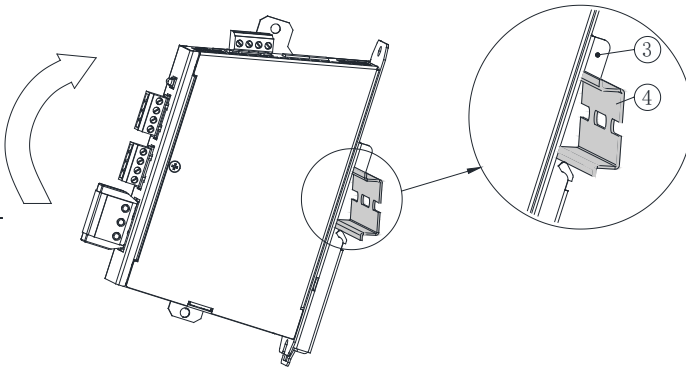
Disassembly procedure

Step 1: Unplug all cables connected to the module.

Step 2: Use a straight screwdriver ① to press down and unlock the guide rail lock ②.



Step 3: Rotate the module in the direction of the arrow and completely remove the module's guide rail groove (3) from the guide rail (4).



NOTE

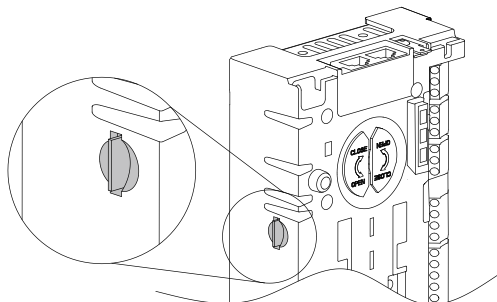
- ◆ The HSVM-20 module is grounded through the contact between its exposed guide rail groove on the housing and the installation guide rail in the cabinet. Therefore, the mounting plate and installation guide rail used in the cabinet must be exposed metal and reliably grounded.
- ◆ Make sure that all terminals and optical fiber connectors are installed in place to ensure correct and effective electrical connections.
- ◆ Maintenance work requires professionals.

5.4.6 Maintaining the HCU Control Module

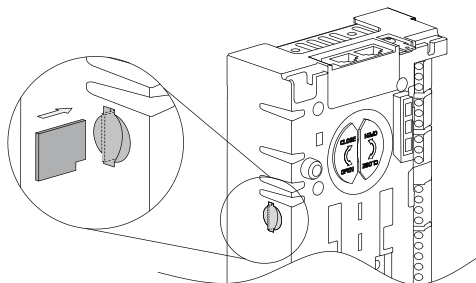
1) Replacing the memory card

After replacing the HCU control module, you can migrate the memory card from the faulty module to the new module to retain the existing parameter settings. See the following 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 toward the notch into the card holder of the new module, as shown in the following figure.

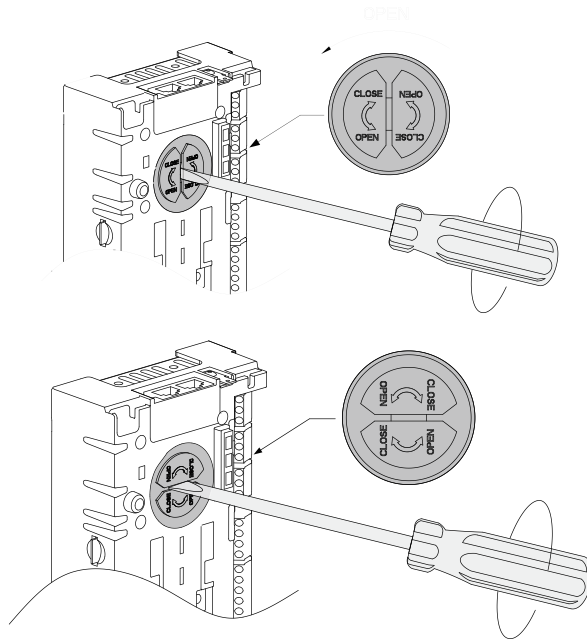


- ③ Make sure that the SD memory card is pushed in place (indicated by a slight spring-back). Otherwise, an exception will occur due to poor contact.

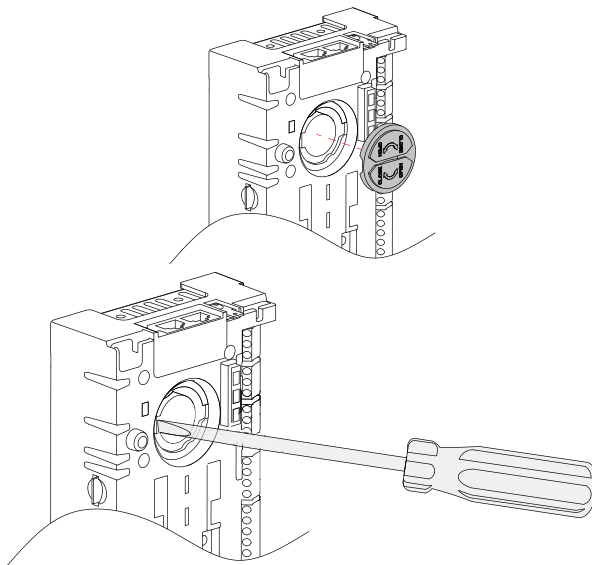
2) Replacing the battery

Steps:

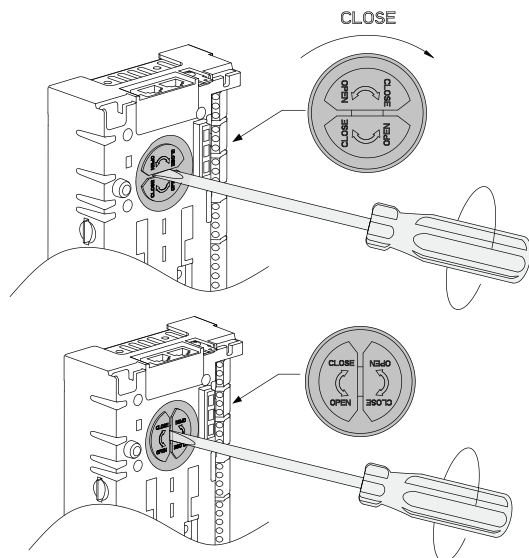
- ① Turn the battery cover 90° counterclockwise with a 2# straight screwdriver until the cover is released.



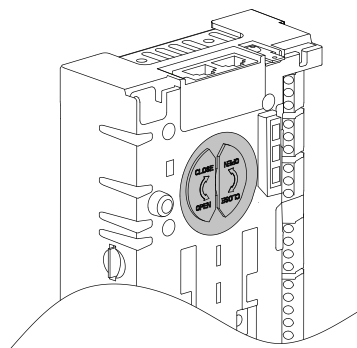
② Remove the cover, press one side of the battery with the screwdriver, take the battery out and replace it with a new one.



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



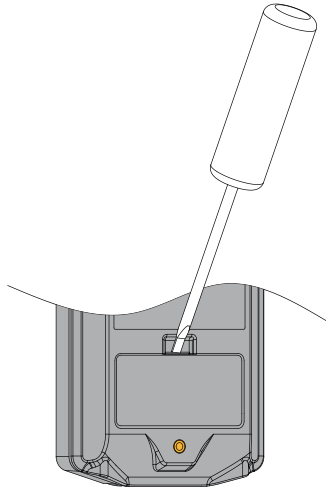
- ④ Dispose of the retired battery in accordance with local laws and regulations.



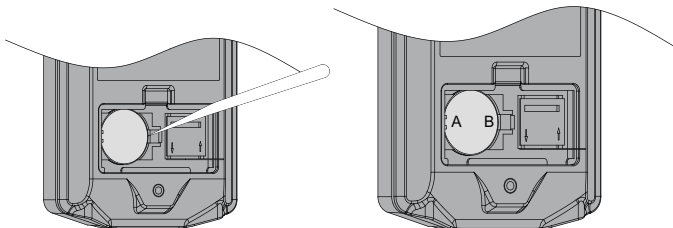
5.4.7 Replacing the Battery of SOP-20-880

Steps:

Remove the battery cover with a tool or your fingers, as shown below.

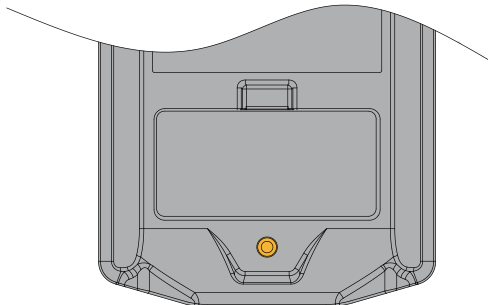


- ② Pry the battery out with tweezers or a small straight screwdriver.



- ③ Install a new battery by inserting it into the snap-fit holder on end A first, then press end B down to put the battery in place.

- ④ Install the battery cover with a tool or your fingers.



Chapter 6 List of Electrical Components

This chapter lists the electrical components for the MD880-80 series DC chopper integrated kit.

Table 6-1 List of electrical components for the MD880-80 series DC chopper integrated kit

Product Model	Description	Part No.	Qty
MD880-80D-0100-4	MD880-80M-0100-4 chopper module	01620431	1
	Metal film capacitor	05030113	1
	DC reactor	11070348	3
	HSVM-20 sync voltage detection module	01620308	1
	HOFM-30 optical fiber extension adapter module	01620040	1
	Optional SOP-20-880 smart operating penal	01610168	1
	SOP-20-MP-IP20 optional mounting base for operating penal	01620002	1
	Pre-charge contact AC-3P-380V-38A-1NO1NC-220VAC	12020277	1
	Hall sampling cable	1504AX18	1
	Pre-charge resistor cable set	1504AX19	1
	3 m LAN cable	1504AG17	1
	Hall current sensor component, 100 A	80090530	1
MD880-80D-0200-4	MD880-80M-0200-4 chopper module	01620321	1
	Metal film capacitor	05030113	1
	DC reactor	11070289	3
	HSVM-20 sync voltage detection module	01620308	1
	HOFM-30 optical fiber extension adapter module	01620040	1
	Optional SOP-20-880 smart operating penal	01610168	1
	SOP-20-MP-IP20 optional mounting base for operating penal	01620002	1
	Pre-charge contact AC-3P-380V-38A-1NO1NC-220VAC	12020277	1
	Hall sampling cable	1504AX18	1
	Pre-charge resistor cable set	1504AX19	1
	3 m LAN cable	1504AG17	1
	Hall current sensor component, open loop, 200 A	80090531	1

Product Model	Description	Part No.	Qty
MD880-80D-0300-4	MD880-80M-0300-4 chopper module	01620322	1
	Metal film capacitor	05030113	1
	DC reactor	11070288	3
	HSVM-20 sync voltage detection module	01620308	1
	HOFM-30 optical fiber extension adapter module	01620040	1
	Optional SOP-20-880 smart operating penal	01610168	1
	SOP-20-MP-IP20 optional mounting base for operating penal	01620002	1
MD880-80D-0300-4	Pre-charge contact AC-3P-380V-38A-1NO1NC-220VAC	12020277	1
	Hall sampling cable set	1504AX18	1
	Pre-charge resistor cable set	1504AX19	1
	3 m LAN cable	1504AG17	1
	Hall sensor component, 300 A	80090532	1
	MD880 integrated kit system wiring diagram	19060311	1
MD880-80D-0400-4	MD880-80M-0400-4 chopper module	01620369	1
	Metal film capacitor	05030113	1
	DC reactor	11070297	3
	HSVM-20 sync voltage detection module	01620308	1
	HOFM-30 optical fiber extension adapter module	01620040	1
	Optional SOP-20-880 smart operating penal	01610168	1
	SOP-20-MP-IP20 optional mounting base for operating penal	01620002	1
	Pre-charge contact AC-3P-380V-38A-1NO1NC-220VAC	12020277	1
	Hall sampling cable set	1504AX18	1
	Pre-charge resistor cable set	1504AX19	1
	3 m LAN cable	1504AG17	1
	Hall sensor component, 400 A	80090533	1

Product Model	Description	Part No.	Qty
MD880-80D-0500-4	MD880-80M-0500-4 chopper module	01620370	1
	Metal film capacitor	05030113	1
	DC reactor	11070298	3
	HSVM-20 sync voltage detection module	01620308	1
	HOFM-30 optical fiber extension adapter module	01620040	1
	Optional SOP-20-880 smart operating penal	01610168	1
	SOP-20-MP-IP20 optional mounting base for operating penal	01620002	1
	Pre-charge contact AC-3P-380V-38A-1NO1NC-220VAC	12020277	1
	Hall sampling cable set	1504AX18	1
	Pre-charge resistor cable set	1504AX19	1
	3 m LAN cable	1504AG17	1
	Hall sensor component, 500 A	80090534	1
MD880-80D-0600-4	MD880-80M-0600-4 chopper module	01620428	1
	Metal film capacitor	05030113	1
	HSVM-20 sync voltage detection module	01620308	1
	HOFM-30 optical fiber extension adapter module	01620040	1
	DC reactor	11070323	3
MD880-80D-0600-4	Optional SOP-20-880 smart operating penal	01610168	1
	SOP-20-MP-IP20 optional mounting base for operating penal	01620002	1
	Pre-charge contact AC-3P-380V-38A-1NO1NC-220VAC	12020277	1
	Hall sampling cable set	1504AX18	1
	Pre-charge resistor cable set	1504AX19	1
	3 m LAN cable	1504AG17	1
	Hall sensor component, 600 A	80090535	1

Product Model	Description	Part No.	Qty
MD880-80D-0800-4	MD880-80M-0800-4-5G-N chopper module	01620454	1
	Metal film capacitor	05030113	2
	DC reactor	11070351	3
	HSVM-20 sync voltage detection module	01620308	1
	HOVM-30 optical fiber extension adapter module	01620040	1
	Optional SOP-20-880 smart operating penal	01610168	1
	SOP-20-MP-IP20 optional mounting base for operating penal	01620002	1
	Pre-charge contact AC-3P-380V-38A-1NO1NC-220VAC	12020277	1
	Hall sampling cable	1504AX18	1
	Pre-charge resistor cable set	1504AX19	1
	3 m LAN cable	1504AG17	1
	Hall current sensor component, 800 A	80090536	1
	MD880 integrated kit system wiring diagram	19060311	1
	HCU-80 power control module	01620278	1
MD880-80D-1000-4	MD880-80M-1000-4-5G-N chopper module	01620453	1
	Metal film capacitor	05030113	2
	DC reactor	11070372	3
	HSVM-20 sync voltage detection module	01620308	1
	HOVM-30 optical fiber extension adapter module	01620040	1
	Optional SOP-20-880 smart operating penal	01610168	1
	HCU-80 power control module	01620278	1
	SOP-20-MP-IP20 optional mounting base for operating penal	01620002	1
	Pre-charge contact AC-3P-380V-38A-1NO1NC-220VAC	12020277	1
	Hall sampling cable set	1504AX18	1
	Pre-charge resistor cable set	1504AX19	1
	3 m LAN cable	1504AG17	1
	Hall sensor component, 1000 A	80090537	1
	Chopper module packaging component	19101279	1

Product Model	Description	Part No.	Qty
MD880-80D-0100-7	MD880-80M-0100-7 chopper module	01620450	1
	Metal film capacitor	05030068	1
	DC reactor	11070348	3
	HSVM-20 sync voltage detection module	01620308	1
	HOFM-30 optical fiber extension adapter module	01620040	1
	Optional SOP-20-880 smart operating penal	01610168	1
	SOP-20-MP-IP20 optional mounting base for operating penal	01620002	1
	Pre-charge contact AC-3P-380V-38A-1NO1NC-220VAC	12020277	1
	Hall sampling cable	1504AX18	1
	Pre-charge resistor cable set	1504AX19	1
	3 m LAN cable	1504AG17	1
	Hall current sensor component, 100 A	80090530	1
MD880-80D-0200-7	MD880-80M-0200-7 chopper module	01620451	1
	Metal film capacitor	05030068	1
	DC reactor	11070289	3
	HSVM-20 sync voltage detection module	01620308	1
	HOFM-30 optical fiber extension adapter module	01620040	1
	Optional SOP-20-880 smart operating penal	01610168	1
	SOP-20-MP-IP20 optional mounting base for operating penal	01620002	1
	Pre-charge contact AC-3P-380V-38A-1NO1NC-220VAC	12020277	1
	Hall sampling cable	1504AX18	1
	Pre-charge resistor cable set	1504AX19	1
	3 m LAN cable	1504AG17	1
	Hall current sensor component, open loop, 200 A	80090531	1

Product Model	Description	Part No.	Qty
MD880-80D-0300-7	MD880-80M-0300-7 chopper module	01620458	1
	Metal film capacitor	05030068	1
	DC reactor	11070288	3
	HSVM-20 sync voltage detection module	01620308	1
	HOFM-30 optical fiber extension adapter module	01620040	1
	Optional SOP-20-880 smart operating penal	01610168	1
	SOP-20-MP-IP20 optional mounting base for operating penal	01620002	1
	Pre-charge contact AC-3P-380V-38A-1NO1NC-220VAC	12020277	1
	Hall sampling cable set	1504AX18	1
	Pre-charge resistor cable set	1504AX19	1
	3 m LAN cable	1504AG17	1
	Hall sensor component, 300 A	80090532	1
MD880-80D-0400-7	MD880-80M-0400-7 chopper module	01620457	1
	Metal film capacitor	05030068	1
	DC reactor	11070297	3
	HSVM-20 sync voltage detection module	01620308	1
	HOFM-30 optical fiber extension adapter module	01620040	1
	Optional SOP-20-880 smart operating penal	01610168	1
	SOP-20-MP-IP20 optional mounting base for operating penal	01620002	1
	Pre-charge contact AC-3P-380V-38A-1NO1NC-220VAC	12020277	1
	Hall sampling cable set	1504AX18	1
	Pre-charge resistor cable set	1504AX19	1
	3 m LAN cable	1504AG17	1
	Hall sensor component, 400 A	80090533	1

Product Model	Description	Part No.	Qty
MD880-80D-0500-7	MD880-80M-0500-7 chopper module	01620456	1
	Metal film capacitor	05030068	2
	DC reactor	11070298	3
	HSVM-20 sync voltage detection module	01620308	1
	HOFM-30 optical fiber extension adapter module	01620040	1
	Optional SOP-20-880 smart operating penal	01610168	1
	SOP-20-MP-IP20 optional mounting base for operating penal	01620002	1
	Pre-charge contact AC-3P-380V-38A-1NO1NC-220VAC	12020277	1
	Hall sampling cable set	1504AX18	1
	Pre-charge resistor cable set	1504AX19	1
	3 m LAN cable	1504AG17	1
	Hall sensor component, 500 A	80090534	1
MD880-80D-0600-7	MD880-80M-0600-7 chopper module	01620426	1
	Metal film capacitor	05030068	2
	HSVM-20 sync voltage detection module	01620308	1
	HOFM-30 optical fiber extension adapter module	01620040	1
	Packing List	19060389	1
	Optional SOP-20-880 smart operating penal	01610168	1
	SOP-20-MP-IP20 optional mounting base for operating penal	01620002	1
	Pre-charge contact AC-3P-380V-38A-1NO1NC-220VAC	12020277	1
	Hall sampling cable set	1504AX18	1
	Pre-charge resistor cable set	1504AX19	1
	3 m LAN cable	1504AG17	1
	Hall sensor component, 600 A	80090535	1



19012366A00

Copyright © Shenzhen Inovance Technology Co., Ltd.

Shenzhen Inovance Technology Co., Ltd.

www.inovance.com

Add.: Inovance Headquarters Tower, High-tech Industrial Park,
Guanlan Street, Longhua New District, Shenzhen

Tel: (0755) 2979 9595

Fax: (0755) 2961 9897

Suzhou Inovance Technology Co., Ltd.

www.inovance.com

Add.: No. 16 Youxiang Road, Yuexi Town,
Wuzhong District, Suzhou 215104, P.R. China

Tel: (0512) 6637 6666

Fax: (0512) 6285 6720