Hopewind

hopeDrive Series

HD2000 Series
Low Voltage Engineering VFD

User Manual

Version: V1.2

Shenzhen Hopewind Electric Co.,Ltd.

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Thank you for using the HD2000 series VFD from Shenzhen Hopewind Electric Co., Ltd. (Hereinafter referred to as Hopewind). Before using the product, please read this manual carefully.

This manual is prepared based on the “current” product and has been reviewed. The hardware, software and relevant figures in the manual are the “current” latest version, and in case of discrepancies, please refer to the actual product. There are inevitably omissions in the preparation and review of the manual. We will continue to improve the quality of the manual and any content updates will be made without notice.

If you have any questions about the product or the manual, contact the technician of Hopewind or email us at hopewind@hopewind.com.

If you want to know more about the product, please visit the official website of Hopewind at www.hopewind.com.

About the User Manual

✓ Intended Readers

This manual is intended for professionals who install, commission, use and maintain the product. Please read this manual carefully before starting to work on the product. Readers should have some basic knowledge of electricity, wiring, electrical components, electrical symbols and mechanical schematics.

✓ Content

Chapters	Main Content
1 Safety Precautions	Safety precautions that must be observed during transport and storage, installation, operation and commissioning, and maintenance of this variable frequency drive (VFD).
2 Product Description	Basic principle, naming rule, external dimensions, product data, environmental data, etc.
3 Installation and Wiring	Installation tools, space requirements, installation method and wiring method.
4~14 Chapters	Introduction and related functional instructions of VFU, BRU, SRU, PRU, MDU and PBU of HD2000 series VFD. Introduction and related instructions for control unit and optional accessories (encode module, operation panel).

✓ Symbol Convention

Danger	Indicates a significant potential hazard, where serious injury or damage to people or equipment could occur if not operated as required, especially high voltage hazard.
Warning	Indicates a general potential hazard, where general injury or damage to people or equipment could occur if not operated as required.
Caution	Indicates a general potential risk. Failure to operate as required may result in improper operation of the equipment or property damage.

✓ Terms and Abbreviations

Terms/Abbreviations	Description
VFU	Variable Frequency Unit
BRU	Basic Rectifier Unit
SRU	Smart Rectifier Unit
PRU	PWM Rectifier Unit
FIU	Filter Interface Unit
MDU	Motor Drive Unit
PBU	Power Brake Unit
PUCM	Power Unit Control Module
CLVC	Closed Loop Vector Control
OLVC	Open Loop Vector Control

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1 Safety Precautions

This chapter describes the safety precautions to be observed when transporting and storing, installing, and wiring the product. Please read the safety precautions carefully before installing or wiring the product. Safety precautions need to be strictly observed during the operation. Neglecting safety precautions may result in equipment damage and even personal injury or death.

1.1 Transport and storage

 **Danger**	
✓	When handling the product, care should be taken to avoid damage.
✓	During transport, avoid tilting the equipment, otherwise it may cause personal injury.

 **Warning**	
✓	During transport and storage, the product should be protected from physical shocks and vibrations.

1.2 Check before unpack

 **Caution**	
✓	The product has undergone strict outgoing inspection and reliable packaging treatment before shipping. However, damage may occur during transportation due to negligence in the process handling, loading and unloading. Please do the following checks immediately after unpacking the product:
✓	The machine is sealed in a plastic bag, and the appearance of the machine parts is intact.
✓	Check the nameplate of the machine and verify that the machine is as ordered.
✓	Check the shipping order and verify that the accompanying accessories in the package are as ordered.
✓	If you find any of the above problems, please contact our company or the supplier to solve them quickly.

1.3 Machine body warning symbols

The product may have all or part of the following warning signs on the inside and outside of the enclosure, with the following meanings:

	**PE symbol:** This is the protective earth (PE) terminal, which needs to be reliably grounded to ensure the safety of the operator as well as the equipment.
	**General warning:** This part may pose hazards other than high voltage, users should pay attention.
	**Static warning:** This part may be damaged by static discharge.

	**Hazardous voltage warning:** This part may pose a hazard of high voltage, users should pay extra attention.
	**Refer to user manual:** Please refer to the corresponding instructions in the user manual before operation.
	**Safe discharge warning:** This part has energy storage components inside, which may pose a high voltage hazard. The user shall wait not less than the time indicated and confirm that the discharge is complete before operating and maintaining the component.

1.4 Installation

Warning

- ✓ Please install the product on a flame retardant object and keep it away from combustible materials, otherwise it may cause a fire.
- ✓ Do not install the product in an environment containing explosive gases, otherwise there is a risk of explosion.
- ✓ Do not install the product in places with direct or strong vibration.
- ✓ When installing, please ensure that the installation environment of the product is well ventilated and heat dissipated. When more than two of the product are placed in the same cabinet, please pay attention to the installation position to ensure heat dissipation effect.
- ✓ When installing and maintaining the product, it is necessary to prevent liquids, dust or debris from entering its inside, as conductive liquids and debris may cause a short circuit, resulting in damage to the equipment.
- ✓ When connecting an external cable to the internal cable of the product, it must be ensured that the installation torque of the cable is correct, as too small a torque may make the contact resistance larger and lead to overheating, while too large a torque may cause fatigue damage to the screw.
- ✓ The power cable terminals connected to the product must conform to national standards. The use of terminals that do not conform to standards or construction that does not conform to quality criteria will cause overheating of the power cable, and fire in serious cases.

1.5 Wiring

Danger

- ✓ The wiring of all peripheral accessories must comply with the instructions in this manual and they shall be wired correctly according to the circuit connection method provided in this manual, otherwise it will result in hazards.
- ✓ Please make sure the power is off before wiring.
- ✓ Please ground the product properly according to the standard practice.
- ✓ Pay attention to the markings on the output terminals, do not connect the wrong wires, otherwise the equipment may be damaged.
- ✓ It is forbidden to connect the brake resistor directly between the DC bus (DCP/DC+) and (DCN/DC-) terminals, otherwise it will cause a fire.
- ✓ The wire diameter of the conductor must be selected by referring to the recommendations of the manual, otherwise accidents may occur.
- ✓ Do not open the cover of the product after power up, otherwise there is a risk of electric shock.
- ✓ It is strictly forbidden to touch the product and its peripheral circuit with wet hands after power up, otherwise there is a risk of electric shock.
- ✓ It is strictly forbidden to touch any input and output terminals of the product after power up, otherwise

there is a risk of electric shock.

- ✓ Before testing other external devices such as power cables, remove the cables connecting them to the product to prevent accidental damage.

Caution

- ✓ It should be confirmed that the voltage level of input power supply is consistent with the rated voltage level of the product.
- ✓ Any part of the product does not need to be tested for voltage withstanding, which has been tested at the factory before shipping, otherwise accidents may occur.
- ✓ It should be ensured that the wiring line complies with the EMC requirements and the national or regional safety standards.
- ✓ It is not recommended to use a contactor on/off method to control the start/stop of the product, otherwise it may cause unpredictable equipment damage.

1.6 Operation and commissioning

Warning

- ✓ It is strictly forbidden to touch the cooling fan and the discharge resistor during operation, otherwise it may cause burns.
- ✓ It is strictly forbidden to detect signals during operation, otherwise it may cause personal injury or equipment damage.
- ✓ During operation, avoid debris falling into the equipment.
- ✓ Do not cover the ventilation holes of the product while it is in operation.
- ✓ Do not open the panel of the product while it is in operation.

1.7 Maintenance

Danger

- ✓ Do not perform maintenance operations on the product or the motor while the power is on. After disconnecting the power supply, it is necessary to wait for not less than the discharge time marked on the product and use the internal energy storage of the discharge device below 50μC. Otherwise the residual charge on the capacitor can cause harm to the person.
- ✓ Do not perform maintenance and repair on the product without authorization of the company, as this may result in personal injury or equipment damage.
- ✓ All pluggable plug-ins must be plugged and unplugged when power is off, otherwise the device may be damaged.
- ✓ It is strictly forbidden to leave wires or tools in the machine, otherwise it may cause fire or damage to property.

1.8 Other cautions

Caution

- ✓ Switching devices such as contactors are installed on the output side
  If a switching device such as a contactor needs to be installed between the output of the product and

the motor, make sure that the product is turned on and off when there is no output, otherwise it is easy to cause damage to the modules inside the product.

- ✓ Use beyond the rated voltage value

  It is not permitted to use the product outside the operating voltage range. If necessary, use the appropriate boost or step-down device for variable voltage.

- ✓ Altitude and derating

  In areas where the altitude exceeds 2,000m, it is necessary to derate due to the deterioration of insulation performance caused by lower average temperature and thin air. Please contact our company for technical consultation in this case.

- ✓ Product disposal

  When scrapping the product, please note that the electrolytic capacitors in the main circuit and the electrolytic capacitors on the printed circuit board may explode when they are burned. The front panel and other plastic parts will produce toxic gas when burned. Please dispose of it as industrial waste.

--End of this chapter--

2 Product Description

2.1 Common application modes

HD2000 series low-voltage engineering type VFD products mainly include the following units: VFU, BRU, SRU, PRU, FIU and MDU. In order to show the basic functions of each unit, the following common application modes are listed.

✓ VFU drive system

The VFU is a two-quadrant rectifier type AC/DC machine with uncontrollable bus voltage and no ability to feed energy back to the grid. If excessive regenerative energy is generated during braking, it must be dissipated by converting into heat through the brake unit and brake resistor, otherwise it will cause the bus voltage to be over-voltage and thus report a fault and protection.

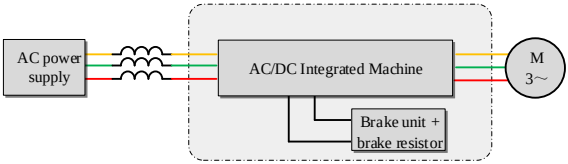


Figure 2-1 VFU system diagram

✓ BRU-MDU drive system

In this system, the BRU rectifies the grid voltage in two quadrants and outputs DC voltage to the MDU unit through busbar, which is inverted into AC voltage to drive the motor. The BRU is internally diode uncontrolled rectifier, the bus voltage is not controllable and not able to feed energy back to the grid. If excessive regenerative energy is generated during braking, it must be dissipated by converting into heat through the brake unit and brake resistor, otherwise it will cause the bus voltage to be over-voltage and thus report a fault.

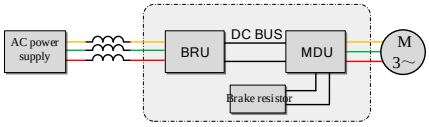


Figure 2-2 BRU-MDU system diagram

✓ SRU-MDU drive system

In this system, the SRU rectifies the grid voltage in four quadrants and outputs DC voltage to the MDU unit through busbar, which is inverted into AC voltage to drive the motor. The SRU can rectify the power supply and can feed energy back to the grid, but the bus voltage is not controllable and is determined by the input grid voltage and load. When a smart rectifier unit is selected, an input reactor matching that rectifier unit must be used.

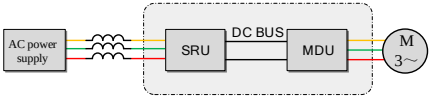


Figure 2-3 SRU-MDU system diagram

✓ PRU-MDU drive system

In this system, the PRU performs four-quadrant PWM rectification of the grid voltage and outputs DC voltage to the MDU unit through busbar, which is inverted to AC voltage to drive the motor. The PRU can rectify the power supply and can feed energy back to the grid. When a PRU is selected, a filter interface unit (FIU) containing an LCL filter that matches the rectifier unit must be used. In contrast to the BRU and SRU, the PRU generates a controlled DC voltage that remains stable within the allowable fluctuation range of the supply voltage. The PRU generates actual current effect close to sine wave on the power side, with small harmonics and high power factor.

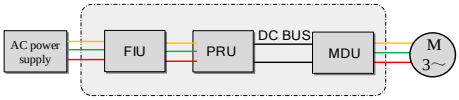
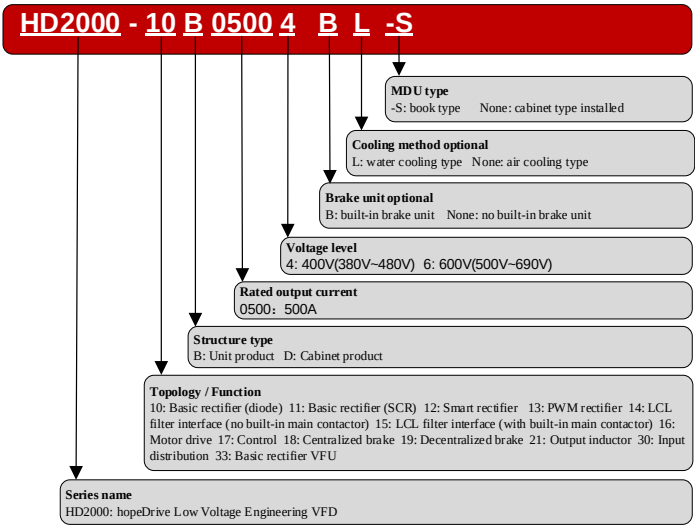


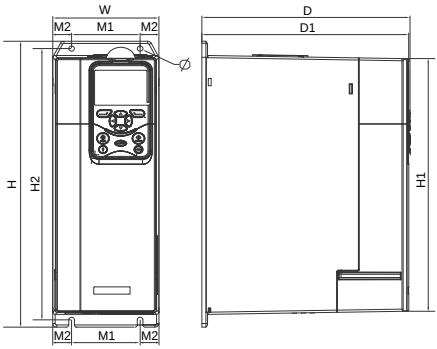
Figure 2-4 PRU-MDU system diagram

2.2 Naming rule

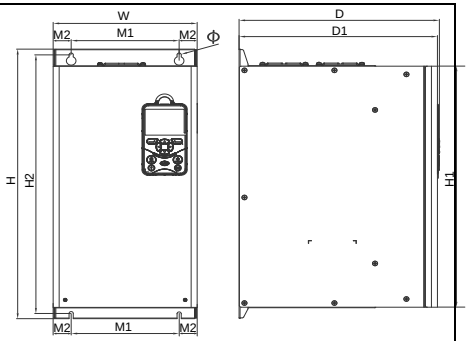


🕮 Note: HD2000-S series book-type motor drive unit is not introduced in this document, please refer to “HD2000 Series Book-type Motor Drive Unit User Manual" for details.

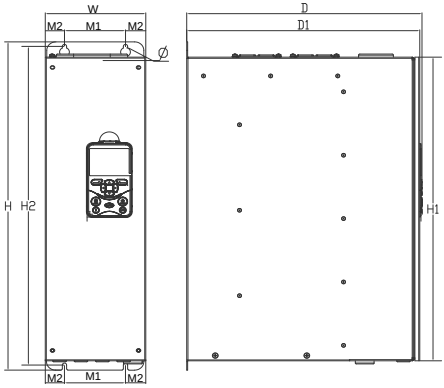
2.3 Structure and dimensions



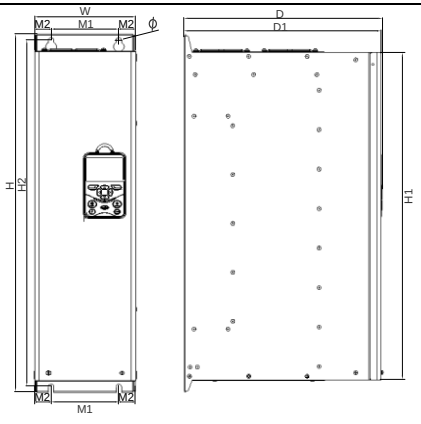
F3, F4, 3U, 4U



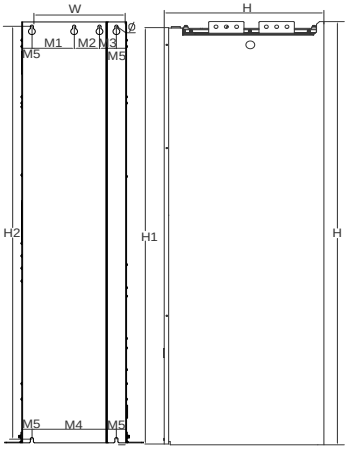
F5, F6



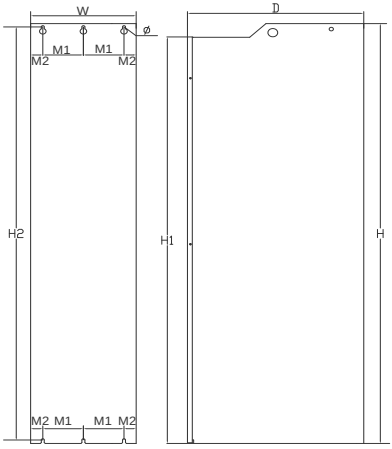
5U, 6U



7U



DU, EU



FU, GU

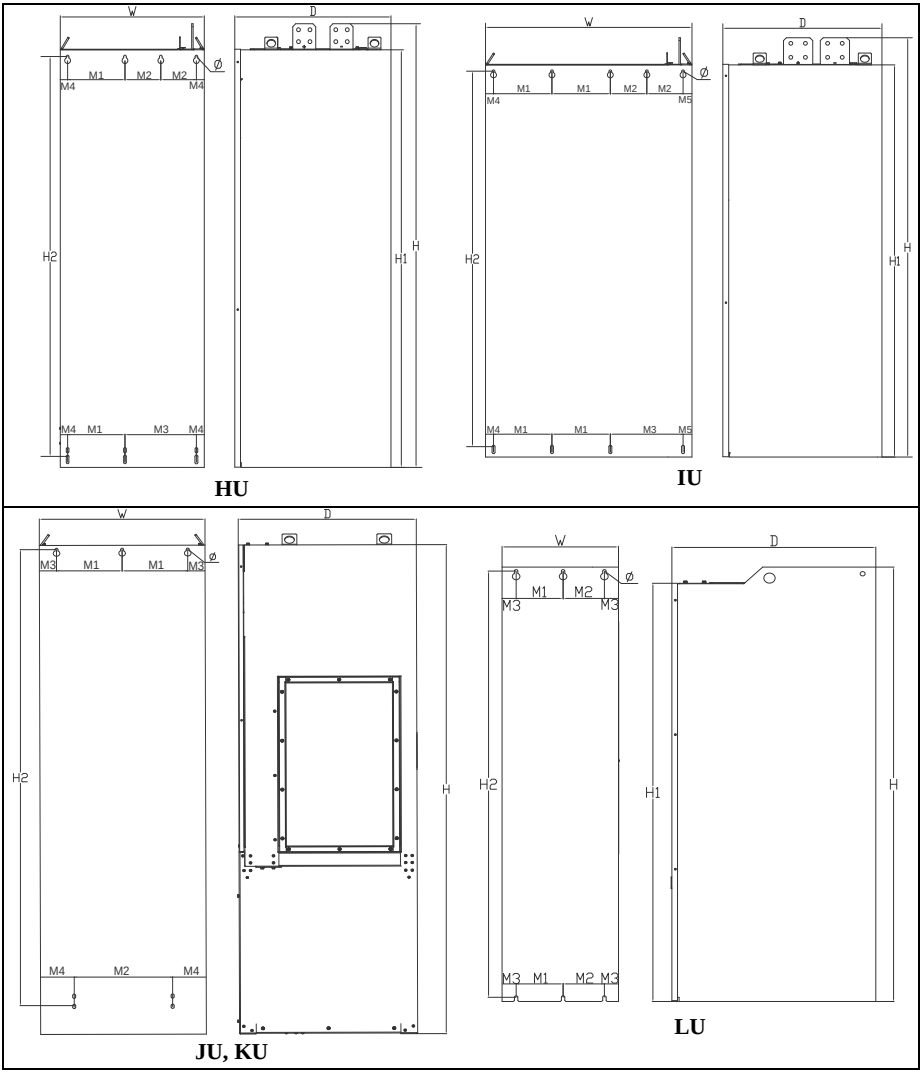


Figure 2-5 HD2000 series structure and installation dimension diagram

Table 2-1 HD2000 series dimensions table (unit: mm)

Dimension code	Structure dimensions					Installation dimensions						
	W	H	D	H1	D1	H2	M1	M2	M3	M4	M5	Φ
F3, 3U	132	393	258	348	256	373	85	23	--	--	--	7
F4, 4U	132	441	298	394	296	421	85	23	--	--	--	7
F5	240	501	334	447	331	480	180	30	--	--	--	7
F6	295	593	386	534	383	570	200	47	--	--	--	9
5U	140	500	335	450	331	480	90	25	--	--	--	7
6U	165	592	385	537	382	563	100	32	--	--	--	7
7U	180	724	407	664	404	700	120	30	--	--	--	7
DU	310	1350	405	1326	--	1323	125	75	50	250	30	9
EU	310	1640	543	1614	--	1600	125	50	75	250	30	9
FU	325	1400	405	1352	--	1376	125	38	--	--	--	9
GU	325	1530	543	1482	--	1506	125	38	--	--	--	9
HU	502	1487	545	1400	--	1341	200	125	250	27	--	9
IU	707	1487	545	1400	--	1341	200	125	250	27	30	9
JU	505	1575	544	--	--	1457	200	300	53	103	--	9
KU	505	1750	544	--	--	1632	200	300	53	103	--	9
LU	310	1300	543	1252	--	1276	125	110	37	--	--	9

2.4 Technical specifications

Table 2-2 HD2000 series VFD technical specifications

BRU	Input voltage	4：380V～480V； 6：500V～690V
	Input frequency	(50Hz/60Hz)±6%
	Output voltage	Input voltage*1.32 (at full load)
	Overload capacity	Relative heavy load rated current 150% overload for 60s, maximum current Imax, DC overload for 5s
	Working efficiency	≤99%
	Protection function	Overheat protection, soft start protection, interlock protection, etc.
SRU	Input voltage	4：380V～480V； 6：500V～690V
	Input frequency	(50Hz/60Hz), ±6%
	Output voltage	Input voltage*1.3 (at full load)
	Overload capacity	Relative heavy load rated current 150% overload for 60s, maximum current Imax, DC overload for 5s
	Working efficiency	≤98.5%
	Protection function	Overheat protection, overcurrent protection, IGBT shoot through protection, etc.
PRU	Input voltage	4：380V～480V； 6：500V～690V
	Input frequency	(50Hz/60Hz), ±6%
	Output voltage	Input voltage*1.5 (rated working condition)
	Overload capacity	Relative heavy load rated current 150% overload for 60s, maximum current Imax, DC overload for 5s
	Working efficiency	≤98% (including LCL filter unit)
	Power factor	Adjustable (default setting is 1)
	Protection function	Overheat protection, overcurrent protection, overload protection, IGBT shoot through protection, etc.
Motor drive	Rated input voltage	4：410Vdc～780Vdc； 6：550Vdc～1100Vdc
	Output voltage	0V ~ rectifier AC input voltage
	Output frequency	0Hz~500Hz
	Variable speed range	V/F: 1:50 OLVC: 1:200 CLVC: 1:1000
	Speed stabilization accuracy	OLVC: 0.2% CLVC: 0.01%
	Speed pulsation	OLVC: 0.2% CLVC: 0.1%
	Starting torque	OLVC: 150% (0.5Hz) CLVC: 200% (0Hz)
	Torque control	V/F: not supported OLVC: supported CLVC: supported
	Torque accuracy	OLVC: 5% CLVC: 5%
	Torque response time	OLVC: 5ms CLVC: 5ms
	Revolving speed	OLVC: 100ms CLVC: 100ms

	response time	
	Dynamic speed drop equivalent	OLVC: 0.5%*s CLVC: 0.3%*s
Environmental conditions		See Table 2-3
Others	IP rating	IP00, IP20
	Anti-vibration performance	IEC 60721-3-3:2002
	Safety level	UL 508C-2004
	Cooling method	Air-cooled

2.5 Environmental data

Table 2-3 HD2000 Series VFD Environmental Requirements

Operating environment	Requirements	Standard	Level
Installation site	Indoor, without temperature control	IEC 61800-2:2016	--
Pollution level	2	IEC 606641	2
Ambient temperature	-15℃~55℃, derating at 40℃ and above	IEC 60721-3-3:2002 GB/T 4798.3-2007	3K3
Relative humidity	15%~95%, no condensation	IEC 60146-1-1:2009	--
Altitude	≥4000m, 1000m or more derating	IEC 60721-3-3:2002 GB/T 4798.3-2007	3K3
Vibration conditions	Vibration shall not exceed the following limits: 2 Hz ≥ f < 9 Hz, displacement 3 mm. 9 Hz ≥ f < 200 Hz, acceleration 10 m/s^2.	IEC 60721-3-3:2002 GB/T 4798.3-2007	3M3/3M5
Chemically active substances	--	IEC 60721-3-3:2002 GB/T 4798.3-2007	3C1
Mechanically active substances	--	IEC 60721-3-3:2002 GB/T 4798.3-2007	3S1
Biological conditions	--	IEC 60721-3-3:2002 GB/T 4798.3-2007	3B1
Storage environment	Requirements	Standard	Level
Chemically active substances	1C2	IEC 60721-3-1:2018	1C2
Climate	1K22	IEC 60721-3-1:2018	1K22
Mechanical conditions	1M11		1M11
Biological conditions	1B1	IEC 60721-3-1:2018	1B1
Mechanically active	1S12	IEC 60721-3-1:2018	1S12

Operating environment	Requirements	Standard	Level
substances			
Transport environment	Requirements	Standard	Level
Transport method	Water, railway, highway, air, etc.	IEC 60721-3-2:2018	--
Chemically active substances	2C2	IEC 60721-3-2:2018	2C2
Climate	2K12	IEC 60721-3-2:2018	2K12
Mechanical conditions	2M5	IEC 60721-3-2:2018	2M5
Biological conditions	2B1	IEC 60721-3-2:2018	2B1
Mechanically active substances	2S5	IEC 60721-3-2:2018	2S5

Note: For operating environment, of the HD2000 series VFD, the vibration of frame F6 below meets 3M3, and that of above F6 meets 3M5.

--End of this chapter--

3 Installation and Wiring

Caution

The instructions in the installation sections of this chapter are introduced by taking the VFU of FU frame of the HD2000 series VFD.

For installation and wiring of other units, please refer to this chapter and the instructions of other units, and take the specific model as standard.

3.1 Installation operations

3.1.1 Prepare installation tools

- ✓ Torque wrench.
- ✓ Complete set of socket wrench, extensions kit.
- ✓ Means of transport such as forklift or crane.
- ✓ Phillips screwdriver for fastening the terminal block wiring.

3.1.2 Remove the fixing strips

For easy transportation, 1 fixing strip is installed on each side of the bottom of the VFU to fix the VFU to the pallet. Before installation, please remove the fixing strips as shown in the figure on the right.

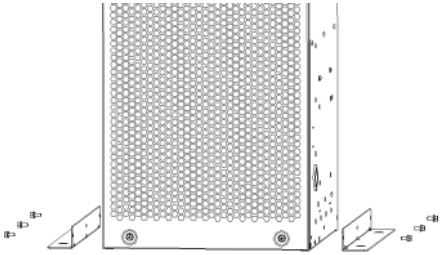


Figure 3-1 Remove the fixing strips

3.1.3 Confirm installation space

The VFU is mounted in a cabinet, and a certain space needs to be reserved around it for wiring, maintenance and heat dissipation.

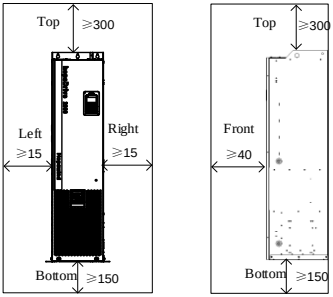


Figure 3-2 Installation space requirements

3.1.4 **Move the VFU to the installation position**

Lifting holes are reserved on the top of the VFU so that the VFU can be moved by lifting equipment. As shown in the figure below, put the lifting slings in the lifting holes of the top beam, adjust the slings and the center of gravity, to lift the unit.

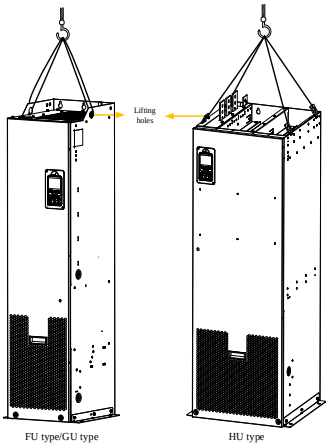


Figure 3-3 Lifting method

Caution:

- ✓ Confirm that the lifting device and slings can bear the weight of the VFU before lifting.
- ✓ For lifting operation, please refer to the safety precautions related to lifting.
- ✓ Make sure the installation inclination of the VFU is ≥ 5%.
- ✓ There are 4 lifting holes at the top of HU type unit, and 4 holes must be lifted at the same time.

3.1.5 **Fix the VFU**

Fix the VFU to the cabinet or rack through the mounting holes on the back

- ➢ FU type/GU type:
  Same in the number and location of mounting holes;
- ➢ HU type:
  There are 4 mounting holes on the upper part of the back and 3 mounting holes on the lower part of the back.

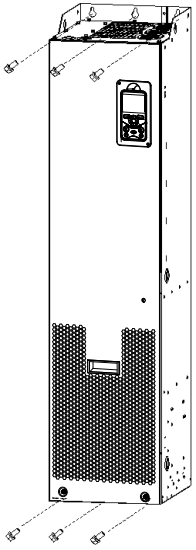


Figure 3-4 Fix the VFU (FU)

3.2 Cable connection

Danger

- ✓ Before connecting the grid side cable, make sure that the grid side voltage will not exceed the specified limit of the VFU and confirm the phase sequence of the grid side cable. Before connecting, make sure that there is no voltage on the incoming cable on the grid side, and short the copper busbar to ground when necessary to ensure personal safety.
- ✓ The voltage withstand performance of the power cables used must meet the working voltage requirements of the VFU.
- ✓ The total load capacity of the power cables used must meet the operating current requirements of the VFU.
- ✓ Do not perform any insulation resistance or withstand voltage test on the VFU or the module inside the VFU. This VFU has been fully tested at the factory before shipping, and incorrect withstand voltage test will cause damage to the VFU.
- ✓ Before connecting the machine side cable, you must ensure that the motor has been braked to ensure personal safety!
- ✓ The external terminal connection points cannot be made of aluminum. If they are copper and aluminum connected to each other, special copper and aluminum connectors are required, and do not connect directly!

3.2.1 Power cable selection

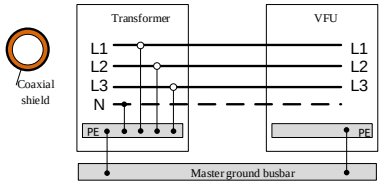
When the material of protective conductor is the same as that of phase conductor, the conductivity of shield layer must meet the requirements of IEC 61439-1.

According to GB7251.1-2005, the cross-sectional area of the protective conductor can be selected by referring to the requirements shown in the following table:

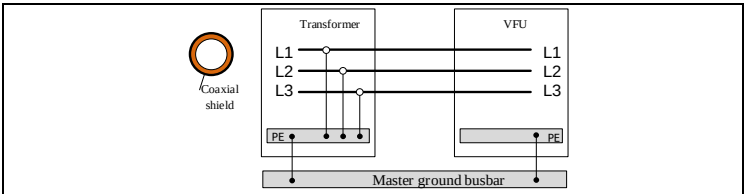
Table 3-1 Cross-sectional area of protective conductor

Cross-sectional area of phase conductor S(mm^2)	Minimum cross-sectional area of the corresponding protective conductor S_p(mm^2)
S≥16	S
16 < S ≥ 35	16
35＜S	S/2

The following diagram shows several ways to connect the grid incoming line. It is recommended that the grid cables be several single-core coaxial shielded cables connected in parallel, and the conductivity of the shield layer must be greater than 1/10 of the conductor conductivity of the cable, and the shield layer must be grounded 360 degrees or grounded as twisted into a bundle, as shown in figures (a)(b) below.



(a) System shielded cable connection with neutral line



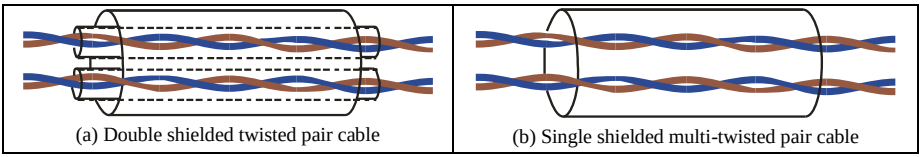
(b) System shielded cable connection without neutral line

Figure 3-5 Shielded cable connection

3.2.2 **Control cable selection**

Since the weak control signal is susceptible to external interference, the general control cable should be one with shield layer, and the routing should be in line with the regulation, that is, the control cable should be directly grounded in the VFU. If both ends of the shielded cable are in the same ground conductor and there is no significant voltage drop, you can also ground both ends of the shielded cable directly.

For analog signals, double-shielded twisted pair cable should be used (see figure a below). Double shielded twisted pair cable is also recommended for being the signal cable of pulse encoder. Do not use the same ground conductor for different analog signals. For low-voltage digital signals, a double-shielded cable is recommended, but a single-shielded multi-twisted pair cable can also be used (see figure b below).



(a) Double shielded twisted pair cable

(b) Single shielded multi-twisted pair cable

Figure 3-6 Twisted pair cables with shield

The analog signal and digital signal cables should be routed separately, and it is recommended that the signal cable controlled by relay be twisted pair. Unless the 24V and 230V control cables are insulated or insulated sleeves are used between them, the wiring method shown in figure (a) below is prohibited. When the control cable and power cable must be crossed for routing, the cross angle should be 90 degrees. Signal and data cables should be routed as close as possible to grounded surfaces, such as support beams, metal rails, etc.

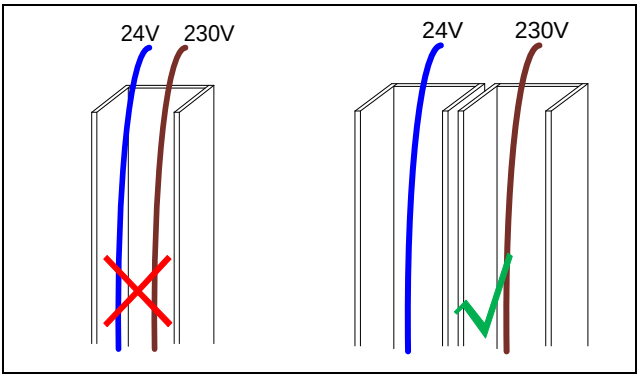


Figure 3-7 24V and 230V cables wiring

3.2.3 **Cable connection torque requirements**

To ensure the reliability of above connection cables, the tightening torque of all fasteners for the connection cables should meet the requirements of Table 3-1.

Table 3-1 List of tightening torque of threaded connections

Thread size	Performance level 4.8		Performance level 8.8		Unit
	General connection	High tightness connection	General connection	High tightness connection	
M3	6	8	---	---	kgf.cm
M4	12	14	---	---	kgf.cm
M5	25	30	---	---	kgf.cm
M6	50	60	---	---	kgf.cm
M8	---	---	110	150	kgf.cm
M10	---	---	300	390	kgf.cm
M12	---	---	550	650	kgf.cm
M16	---	---	1600	2000	kgf.cm

Note: Inside the VFD of Hopewind, all the bolts of M8, M10, M12 and M16 are level 8.8 Dacromet bolts

3.2.4 **Remove the front panel**

The front panel needs to be removed before connection. The keyboard on the front panel is connected to the inside via a network cable. After removing the screws on the front panel, the network cable should be unplugged first to avoid it being broken.

The operation method is shown in the figure on the right.

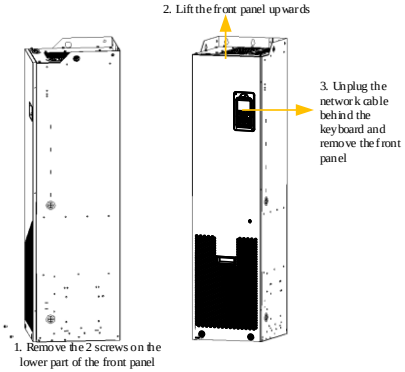


Figure 3-8 Remove the front panel

3.2.5 **Connect ground conductor**

Before doing other conductions, ground the VFU enclosure through the PE connector.

- There are 2 PE connectors on the top of the VFU, located on the top of the panel on both sides, and only one of them needs to be grounded.
- There is a PE copper bar in the lower part of the VFU, and the PE cable can be connected to the PE copper bar by passing it through the bottom hole. The PE copper bar is labeled with a sign ⏚.

The locations of the PE connector, PE copper bar and cable pass through hole are shown in the figure. Recommended PE cable cross-sectional area is 120mm^2, bolt size is M12.

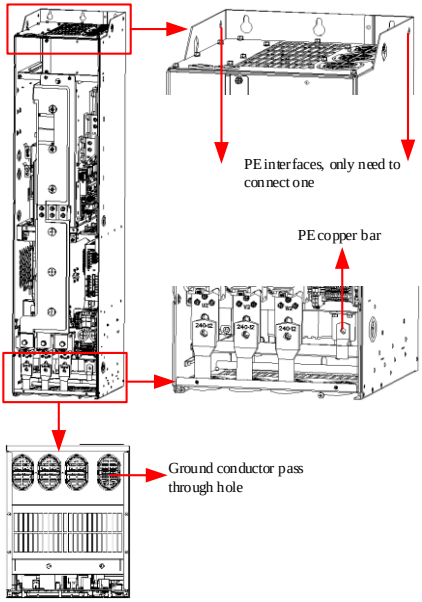
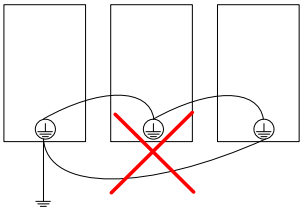


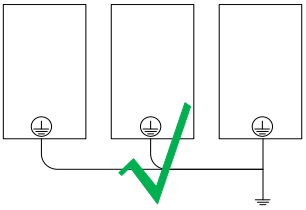
Figure 3-9 Enclosure grounding and PE grounding

Caution:

- For the safety of personnel and to reduce electromagnetic radiation, the VFD and the motor need to be grounded between them.
- The diameter of the ground conductor must meet the requirements of safety regulations.
- The ground conductor should be as short as possible and close to the VFD. Remove the insulation paint from the fixed point.
- When installing multiple VFDs, do not connect the VFDs in series, but connect them with only one end grounded, as shown in the figure.



(a) Wrong grounding method



(b) Correct grounding method

3.2.6 **Connect the grid side cables**

Connect the grid side cables through the 3 cable pass through holes on the top of the VFU in turn to the grid side copper bars L1, L2 and L3 one by one. The locations of the grid side copper bars and cable pass through holes are shown in the figure.

Recommended grid side cable cross-sectional area is 185mm^2, bolt size is M12.

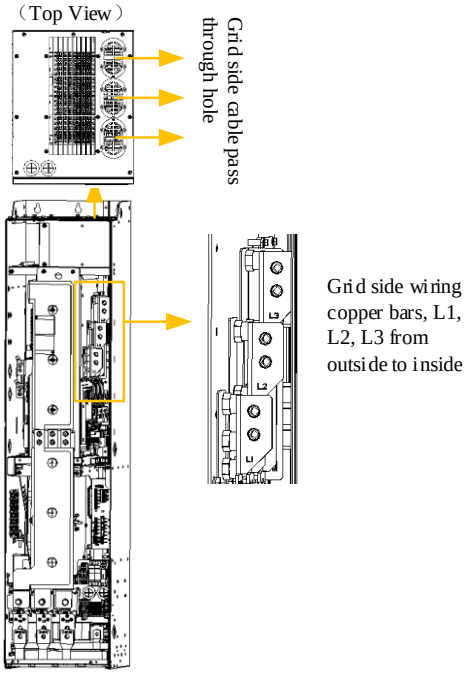


Figure 3-10 Grid side cable connection

3.2.7 **Connect the machine side cables**

Connect the machine side cables through the 3 cable pass through holes on the bottom of the VFU in turn to the machine side copper bars U, V and W one by one. The locations of the machine side copper bars and cable pass through holes are shown in the figure.

Recommended machine side cable cross-sectional area is 185mm^2, bolt size is M12.

Note: The machine side cables are connected to the motor via the du/dt reactor.

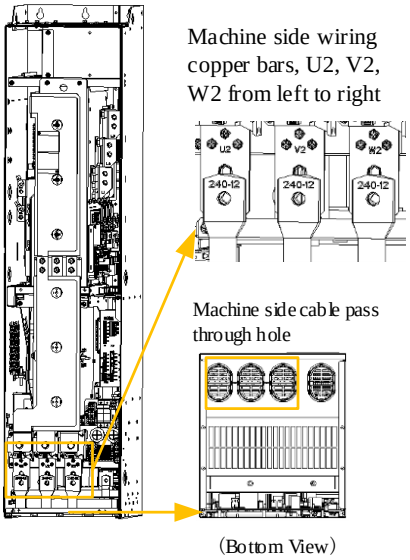


Figure 3-11 Machine side cable connection

3.2.8 **Connect the brake unit/brake resistor**

Brake unit and brake resistor are optional. A position for mounting brake unit is reserved in the VFU. Recommended cable cross-sectional area is 185mm^2, bolt size is M12.

- When connecting the brake unit, connect the DCP (DC+), DCN (DC-) to the positive and negative copper bars of the brake unit one by one through cables. The cables are routed from inside the VFU.
- When connecting the brake resistor, pass the brake resistor cables through the pass through holes on the left panel and connect them to the brake units RA(R1) and RB(R2) one by one.

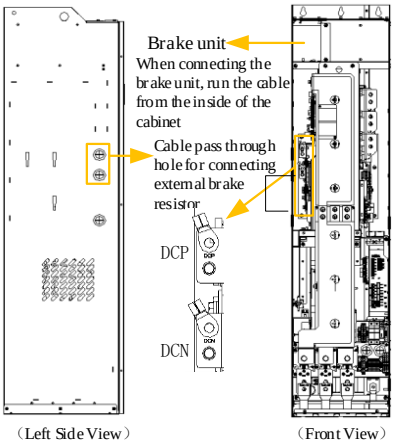


Figure 3-12 Brake unit/brake resistor connection

3.2.9 **Connect the control unit**

Mount the control unit on the left panel of the VFU by means of wall mounting. The locations of the control unit mounting holes and the cable pass through holes are shown in the figure.

Refer to the sections of application examples of power units for the locations of the power module and control connections.

Note: The Hopewind control unit is HCU20 series. Please refer to “11 Control Unit” and “12 Encoder Module” for instructions related to the control unit and encoder module.

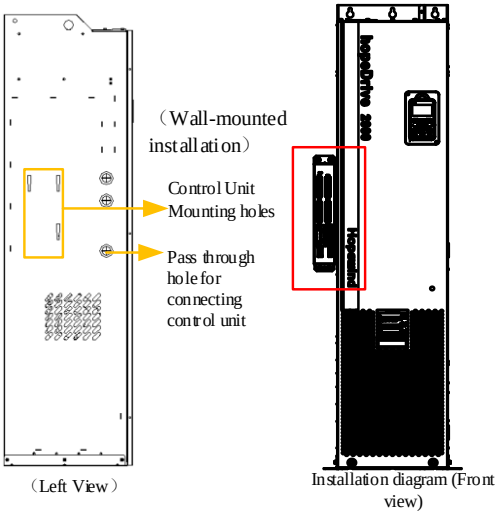


Figure 3-13 Control unit installation

3.2.10 **Connect terminal blocks**

The locations of terminal blocks X1, X2, X3 and X4 are shown in the figure.

Note: The locations of the terminal blocks differ from one another for different models, please refer to the corresponding sections for specific locations and terminal definition.

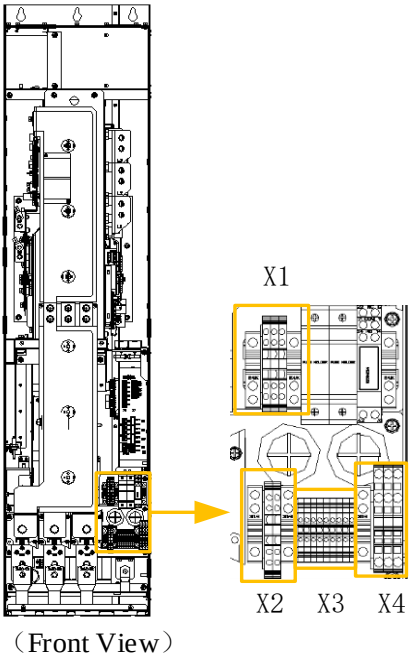


Figure 3-14 Locations of terminal blocks

3.2.11 **Install the front panel**

After all cables are connected, install the front panel. The installation method is shown in the figure.

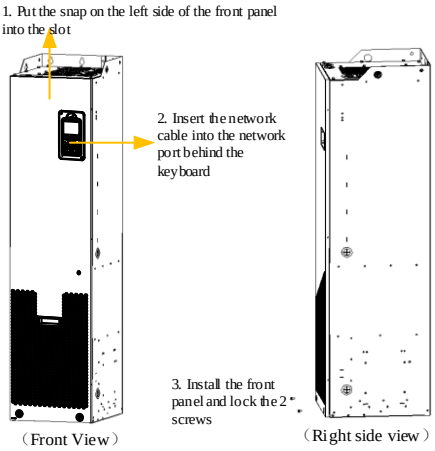


Figure 3-15 Front panel installation diagram

--End of this chapter--

4 Variable Frequency Unit - VFU

4.1 Power specifications

Model	Power (kW)		AC input current Rated(A)	AC output current(A)				Frame type
	Rated	Heavy load		Rated I_N	Heavy load I_H	Light load I_L	Maximum I_{max}	
3-phase AC 400V (380V~480V)								
HD2000-33B00174B	7.5	5.5	13.5	17	15	16	25	F3
HD2000-33B00254B	11	7.5	20	25	22	24	36	
HD2000-33B00324B	15	11	27	32	28	31	47	
HD2000-33B00384B	18.5	15	33	38	34	37	55	
HD2000-33B00464B	22	18.5	40	46	41	45	67	F4
HD2000-33B00604B	30	22	54	60	53	58	87	
HD2000-33B00754(B)	37	30	67	75	67	73	109	F5
HD2000-33B00914(B)	45	37	81	91	81	88	132	
HD2000-33B01254(B)	55	45	99	125	111	121	182	F6
HD2000-33B01564(B)	75	55	135	156	139	151	227	
HD2000-33B01804(B)	90	75	162	180	160	175	262	
HD2000-33B02104(B)	110	90	198	210	187	204	306	FU
HD2000-33B02604(B)	132	110	238	260	231	252	378	
HD2000-33B03104(B)	160	132	289	310	276	301	451	GU
HD2000-33B03804(B)	200	160	361	380	338	369	553	
HD2000-33B04904(B)	250	200	451	490	436	475	713	
HD2000-33B06054(B)	315	250	568	605	538	587	880	HU
HD2000-33B07454(B)	400	315	722	745	663	723	1084	
HD2000-33B08404(B)	450	400	812	840	748	815	1222	
3-phase AC 600V (500V~690V)								
HD2000-33B00636(B)	55	45	57.5	63	56	61	92	F6
HD2000-33B00866(B)	75	55	78	86	77	83	125	
HD2000-33B01016(B)	90	75	94	101	89	97	146	
HD2000-33B01206(B)	110	90	115	120	107	116	175	FU
HD2000-33B01506(B)	132	110	138	150	134	146	218	
HD2000-33B01756(B)	160	132	167	175	156	170	255	GU
HD2000-33B02156(B)	200	160	209	215	191	209	313	
HD2000-33B02606(B)	250	200	261	260	231	252	378	
HD2000-33B03306(B)	315	250	329	330	294	320	480	
HD2000-33B04106(B)	400	315	418	410	365	398	597	HU
HD2000-33B04656(B)	450	400	471	465	414	451	677	
HD2000-33B05756(B)	560	450	586	575	512	558	837	

Note: (1) A model number ending with “B” indicates that the VFD of this model is equipped with a brake unit as standard.

(2) A model number ending with (B) indicates that the VFD of this model can be equipped with a brake unit as optional. For example, the product HD2000-33B00754B has a built-in brake unit; the product HD2000-33B00754 is supplied with no brake unit.

4.2 Internal structure

4.2.1 F3, F4 type

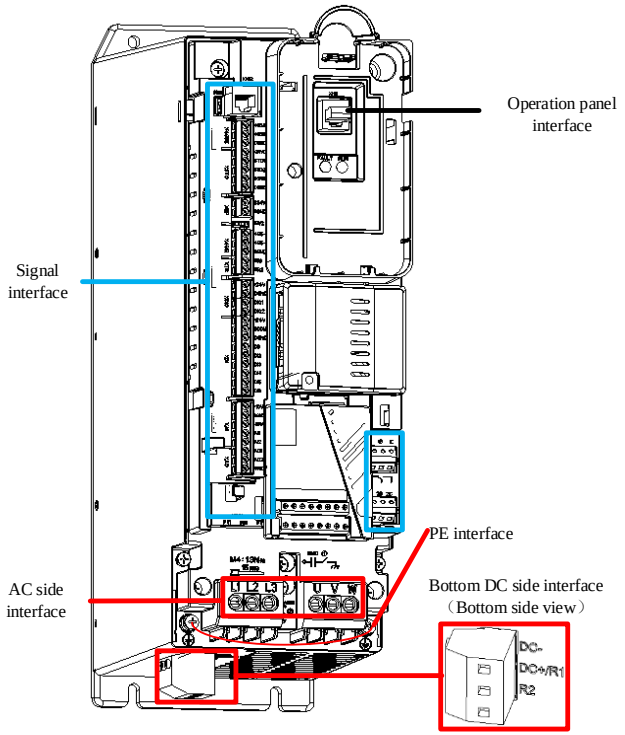


Figure 4-1 F3, F4 type internal structure diagram

Terminal name	Terminal function description	Terminal block (torque, N*m)		Cable cross-sectional area(mm^2)	
		F3	F4	F3	F4
DC-, DC+/R1, R2 (Bottom of the unit)	DC bus terminals and brake resistor terminals	M4(1.7)	M4(1.7)	6	16
L1, L2, L3	3-Phase AC input terminals	M4(1.3)	M5(2.0)	6	16
PE	Protective earth terminal	M3(0.7)	M3(0.7)	See Table 3-1	
U, V, W	3-Phase AC output terminals	M4(1.3)	M5(2.0)	6	16

4.2.2 **F5, F6 type**

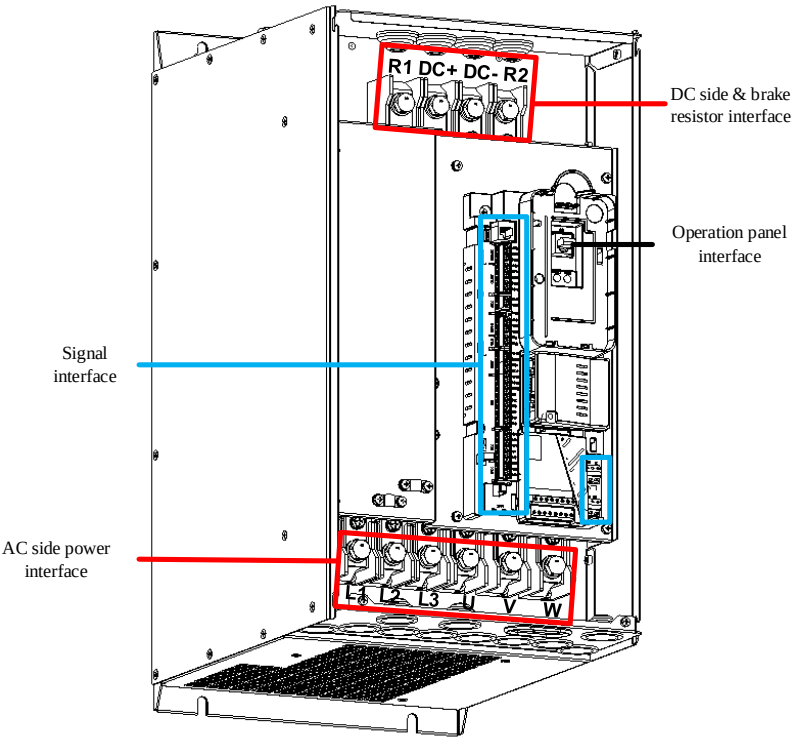


Figure 4-2 F5, F6 type internal structure diagram

Terminal name	Terminal function description	Terminal block (torque, N*m)		Cable cross-sectional area(mm^2)	
		F5	F6	F5	F6
DC+, DC-	DC input and output terminals	M8(4.5)	M10(4.5)	21	65
R1、R2	External brake resistor terminals	M8(4.5)	M10(4.5)	8	21
PE (located on both sides of the AC side power interface)	Protective earth terminal	M6(4.5)	M6(4.5)	See Table 3-1	
L1, L2, L3	3-Phase AC input terminals	M8(4.5)	M10(4.5)	21	65
U, V, W	3-Phase AC output terminals	M8(4.5)	M10(4.5)	21	65

4.2.3 **FU type**

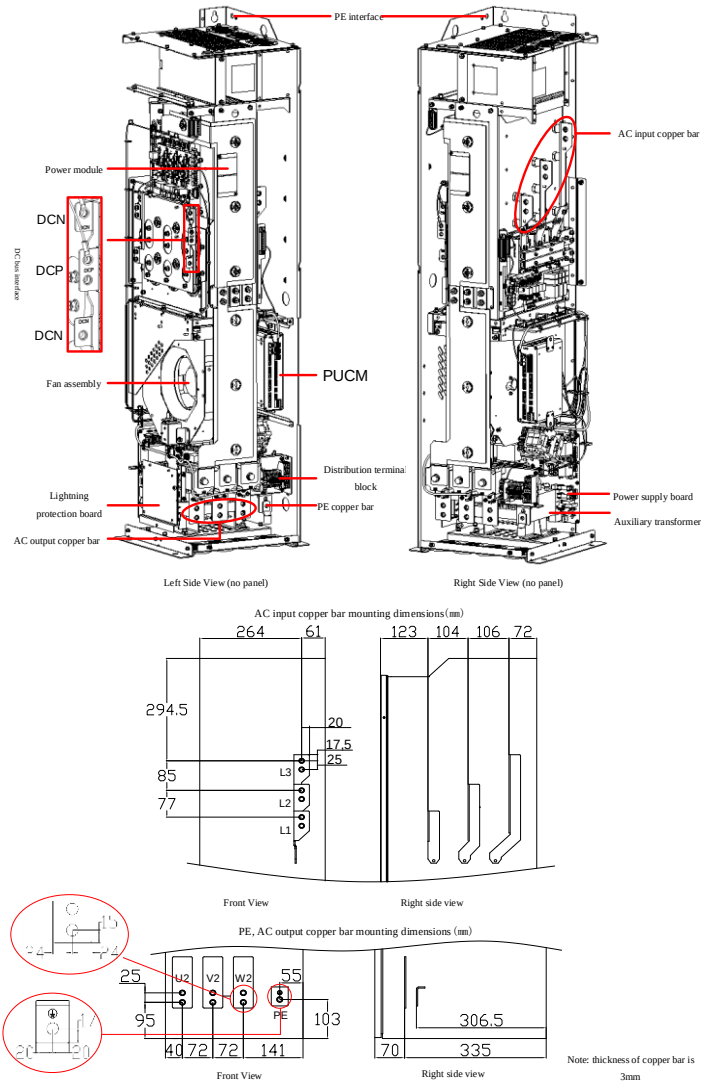


Figure 4-3 FU type internal structure diagram

Terminal name	Terminal function description	Terminal block (torque, N*m)	Cable cross-sectional area(mm^2)
L1, L2, L3	3-Phase AC input terminals	M10(38)	1×240
DCP, DCN	DC busbar connection terminals	M10(38)	1×240
/	Brake module interface	M8(15)	1×25
PE	Protective earth terminal	M10(38)	1×240
U2、V2、W2	3-Phase AC output terminals	M10(38)	1×240

4.2.4 **GU type**

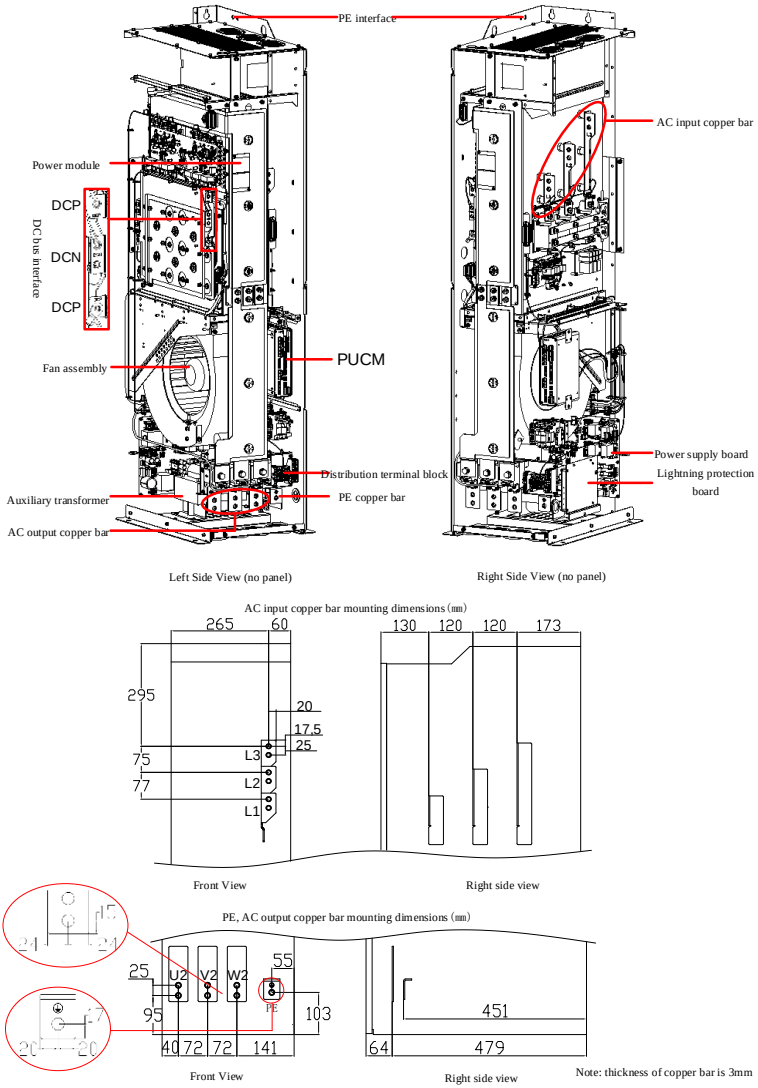


Figure 4-4 GU type internal structure diagram

Terminal name	Terminal function description	Terminal block (torque, N*m)	Cable cross-sectional area(mm^2)
L1, L2, L3	3-Phase AC input terminals	M10(38)	1×240
DCP, DCN	DC busbar connection terminals	M10(38)	2×185
/	Brake module interface	M8(15)	1×25
PE	Protective earth terminal	M10(38)	1×240
U2、V2、W2	3-Phase AC output terminals	M10(38)	1×240

4.2.5 **HU type**

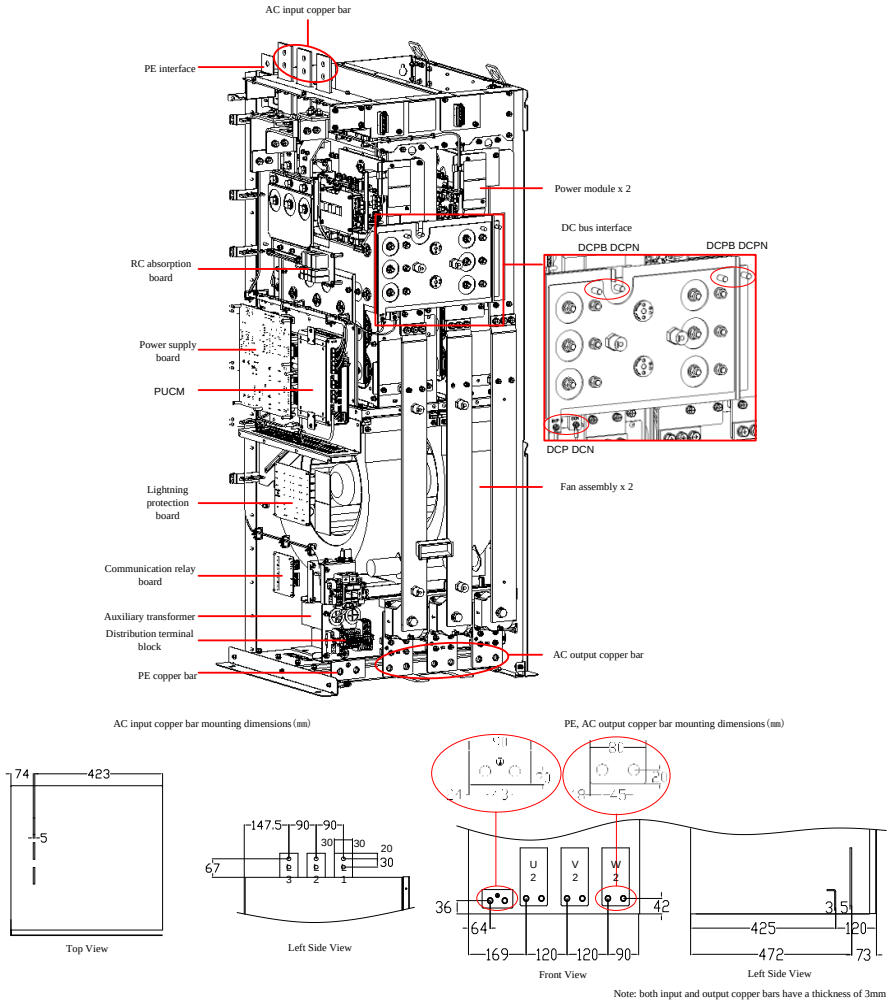


Figure 4-5 HU type internal structure diagram

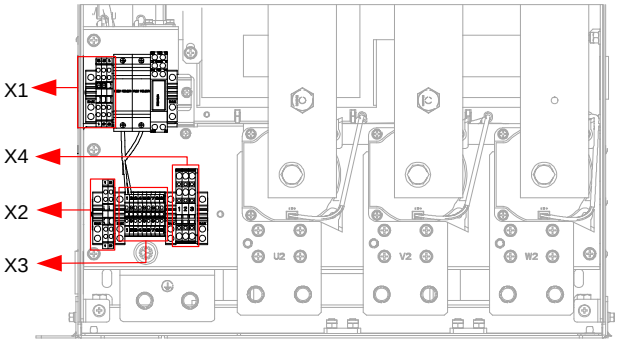
Terminal name	Terminal function description	Terminal block (torque, N*m)	Cable cross-sectional area(mm^2)
L1, L2, L3	3-Phase AC input terminals	M12(64)	2×240
DCP, DCN	DC busbar connection terminals	M12(64)	4×240
DCPB, DCPN	Brake module interface	M8(15)	1×25
PE	Protective earth terminal	M10(38)	1×240
U2、V2、W2	3-Phase AC output terminals	M12(64)	2×240

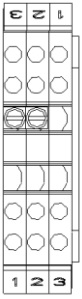
4.2.6 **Signal interface**

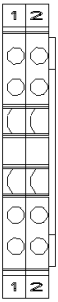
✓ Size F3~F6 model signal interface definition

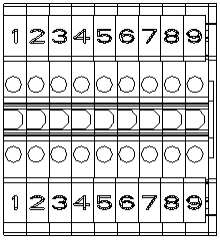
Signal name	I/O	Description
DI1	I	Reserved
DI2	I	Soft start contactor status feedback
DI3	I	Main contactor status feedback
DI4	I	Input reactor over-temperature fault feedback
DI5	I	Reserved
DI6	I	Reserved
DI7	I	Reserved
DI8	I	Reserved
XHI2	I	Keyboard interface
1A	O	Soft start, dry contact NC output
1B	O	Soft start, dry contact common end
1C	O	Soft start, dry contact NO output
2A	O	Main contactor start, dry contact NC output
2B	O	Main contactor start, dry contact common end
2C	O	Main contactor start, dry contact NO output

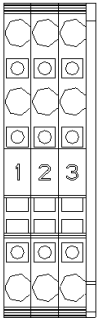
✓ Size FU~HU model signal interface definition



X1 terminal block	Signal name	Pin	I/O	Description
	+24V	1	I	Internal +24V power supply
	+24V	2	I	Internal +24V power supply
	GND	3	I	Internal +24V power ground

X2 terminal block	Signal name	Pin	I/O	Description
	220V-L	1	I	External 220V-L
	220V-N	2	I	External 220V-N

X3 terminal block	Signal name	Pin	I/O	Description
	EP_+24V	1	I	External 24V power supply "24V" input
	EP_GND	2	I	External 24V power supply "GND" input
	DI1	3	I	Soft start contactor status feedback
	DI2	4	I	Main contactor status feedback
	DI3	5	I	Input reactor over-temperature fault feedback
	KA1	6	O	Soft start contactor drive, dry contact output
	KA2	7	O	
	KB1	8	O	Main contactor drive, dry contact output
	KB2	9	O	

X4 terminal block	Signal name	Pin	I/O	Description
	L1	1	I	U-phase voltage detection
	L2	2	I	V-phase voltage detection
	L3	3	I	W-phase voltage detection

4.3 VFU input switch and fuse selection

Table 4-1 380V~480V VFU input switch assembly and fuse selection

3-phase AC supply voltage: 380V~480V					
Unit model	400V Rated power (kW)	AC input rated current (A)	Switching devices		Input semiconductor protection fuse (gR) Recommended parameters
			Contactor Recommended parameters	Load disconnector switch Recommended parameters	
HD2000-33B00174B	7.5	17	25 A/690V	25 A/690V	25 A/690V
HD2000-33B00254B	11	25	32 A/690V	32 A/690V	32 A/690V
HD2000-33B00324B	15	32	40 A/690V	40 A/690V	40 A/690V
HD2000-33B00384B	18.5	38	50 A/690V	50 A/690V	50 A/690V
HD2000-33B00464B	22	46	63 A/690V	63 A/690V	63 A/690V
HD2000-33B00604B	30	60	80 A/690V	80 A/690V	80 A/690V
HD2000-33B00754(B)	37	75	110 A/690V	110 A/690V	110 A/690V
HD2000-33B00914(B)	45	91	125 A/690V	125 A/690V	125 A/690V
HD2000-33B01254(B)	55	125	160 A/690V	160 A/690V	160 A/690V
HD2000-33B01564(B)	75	156	200 A/690V	200 A/690V	200 A/690V
HD2000-33B01804(B)	90	180	250 A/690V	250 A/690V	250 A/690V
HD2000-33B02104(B)	110	210	315 A/690V	315 A/690V	315 A/690V
HD2000-33B02604(B)	132	260	350 A/690V	350 A/690V	350 A/690V
HD2000-33B03104(B)	160	310	400 A/690V	400 A/690V	400 A/690V
HD2000-33B03804(B)	200	380	500 A/690V	500 A/690V	500 A/690V
HD2000-33B04904(B)	250	490	630 A/690V	630 A/690V	630 A/690V
HD2000-33B06054(B)	315	605	800 A/690V	800 A/690V	800 A/690V
HD2000-33B07454(B)	400	745	1000 A/690V	1000 A/690V	1000 A/690V
HD2000-33B08404(B)	450	840	1000 A/690V	1000 A/690V	4 A/690V

Table 4-2 500V~690V VFU input switch assembly and fuse selection

3-phase AC supply voltage: 500V~690V					
Unit model	400V Rated power (kW)	AC input rated current (A)	Switching devices		Input semiconductor protection fuse (gR) Recommended parameters
			Contactor Recommended parameters	Load disconnector switch Recommended parameters	
HD2000-33B00636(B)	55	63	80/690V	80/690V	80/690V
HD2000-33B00866(B)	75	86	110/690V	110/690V	110/690V
HD2000-33B01016(B)	90	101	125/690V	125/690V	125/690V
HD2000-33B01206(B)	110	120	160/690V	160/690V	160/690V
HD2000-33B01506(B)	132	150	200/690V	200/690V	200/690V
HD2000-33B01756(B)	160	175	225/690V	225/690V	225/690V
HD2000-33B02156(B)	200	215	315/690V	315/690V	315/690V
HD2000-33B02606(B)	250	260	350/690V	350/690V	350/690V
HD2000-33B03306(B)	315	330	450/690V	450/690V	450/690V

3-phase AC supply voltage: 500V~690V					
Unit model	400V Rated power (kW)	AC input rated current (A)	Switching devices		Input semiconductor protection fuse (gR) Recommended parameters
			Contactor Recommended parameters	Load disconnector switch Recommended parameters	
HD2000-33B04106(B)	400	410	500/690V	500/690V	500/690V
HD2000-33B04656(B)	450	465	630/690V	630/690V	630/690V
HD2000-33B05756(B)	560	575	800/690V	800/690V	800/690V

4.4 VFU input and output reactors selection

The input reactor of the VFU of HD2000 series VFD is selected according to the rated voltage of 400V/690V, and that the reactor voltage drop is 2% of rated voltage at rated current, while the output reactor is selected according to the rated voltage of 400V/690V, and that the reactor voltage drop is 1% of rated voltage at rated current.

Table 4-3 380V~480V VFU input/output reactors selection

3-phase AC supply voltage: 380V~480V				
Unit model	Rated power (kW)	Rated current (A)	Recommended input reactor inductance (mH)	Recommended output reactor inductance (mH)
HD2000-33B00174B	7.5	17	0.865	0.433
HD2000-33B00254B	11	25	0.588	0.294
HD2000-33B00324B	15	32	0.460	0.230
HD2000-33B00384B	18.5	38	0.387	0.194
HD2000-33B00464B	22	46	0.320	0.160
HD2000-33B00604B	30	60	0.245	0.123
HD2000-33B00754(B)	37	75	0.196	0.098
HD2000-33B00914(B)	45	91	0.162	0.081
HD2000-33B01254(B)	55	125	0.118	0.059
HD2000-33B01564(B)	75	156	0.094	0.047
HD2000-33B01804(B)	90	180	0.082	0.041
HD2000-33B02104(B)	110	210	0.070	0.035
HD2000-33B02604(B)	132	260	0.057	0.028
HD2000-33B03104(B)	160	310	0.047	0.024
HD2000-33B03804(B)	200	380	0.039	0.019
HD2000-33B04904(B)	250	490	0.030	0.015
HD2000-33B06054(B)	315	605	0.024	0.012
HD2000-33B07454(B)	400	745	0.022	0.011
HD2000-33B08404(B)	450	840	0.020	0.010

Table 4-4 500V~690V VFU input/output reactors selection

3-phase AC supply voltage: 500V~690V				
Unit model	Rated power	Rated current	Recommended input	Recommended

3-phase AC supply voltage: 500V~690V				
	(kW)	(A)	reactor inductance (mH)	output reactor inductance (mH)
HD2000-33B00636(B)	55	63	0.403	0.201
HD2000-33B00866(B)	75	86	0.295	0.148
HD2000-33B01016(B)	90	101	0.251	0.126
HD2000-33B01206(B)	110	120	0.211	0.106
HD2000-33B01506(B)	132	150	0.169	0.085
HD2000-33B01756(B)	160	175	0.145	0.072
HD2000-33B02156(B)	200	215	0.118	0.059
HD2000-33B02606(B)	250	260	0.098	0.049
HD2000-33B03306(B)	315	330	0.077	0.038
HD2000-33B04106(B)	400	410	0.062	0.031
HD2000-33B04656(B)	450	465	0.055	0.027
HD2000-33B05756(B)	560	575	0.044	0.022

4.5 Unit application

4.5.1 EMC filter use

✓ F3~F6 VFU built-in EMC filter

For F3, F4, F5 and F6 type VFUs, the use of the built-in EMC module is controlled by an EMC screw. If the EMC module is not required, simply unscrew the EMC screw. The specific location of EMC screw is shown in figure below.

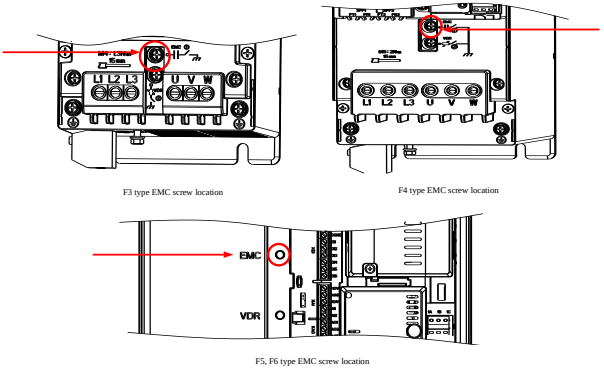


Figure 4-6 F3~F6 VUF EMC screw location

✓ FU type VFU EMC filter board connection cable removal

For the FU type VFU, the circuit board where the EMC filter board cable is located at the lower part of the left side of the unit, so the copper bar and power connector can be removed for easy operation.

The connection cable for the EMC filter board is connected in the B hole and C hole by default. If it is not needed to use an anti-interference module, turn to connect the cable from C hole to A hole.

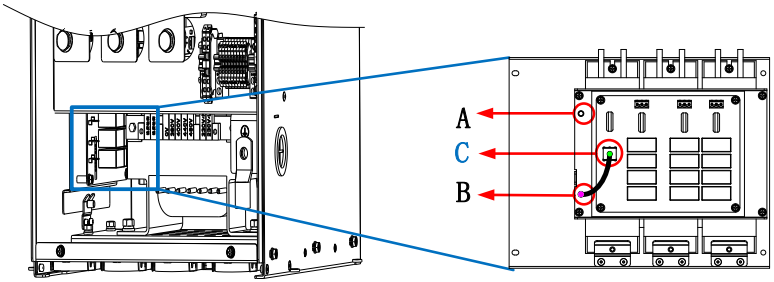


Figure 4-7 FU type EMC filter board connection cable removal

✓ GU type EMC filter board connection cable removal

For the GU type VFU, the circuit board where the EMC filter board cable is located at the lower part of the right side of the unit, so the copper bar and power connector can be removed for easy operation.

The connection cable for the EMC filter board is connected in the B hole and C hole by default. If it is not needed to use an anti-interference module, turn to connect the cable from C hole to A hole.

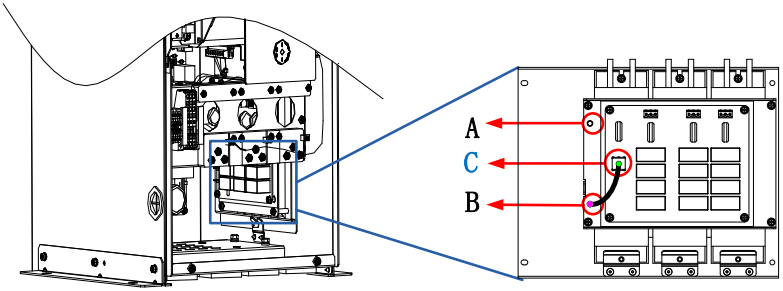


Figure 4-8 GU type EMC filter board connection cable removal

✓ HU type EMC filter board connection cable removal

For the HU type VFU, the circuit board where the EMC filter board cable is located at the lower part of the left side of the unit.

The connection cable for the EMC filter board is connected in the B hole and C hole by default. If it is not needed to use an anti-interference module, turn to connect the cable from C hole to A hole.

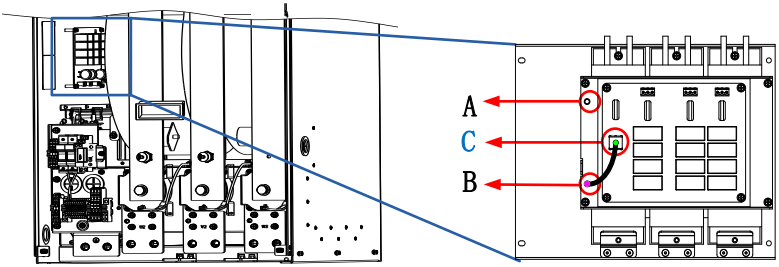
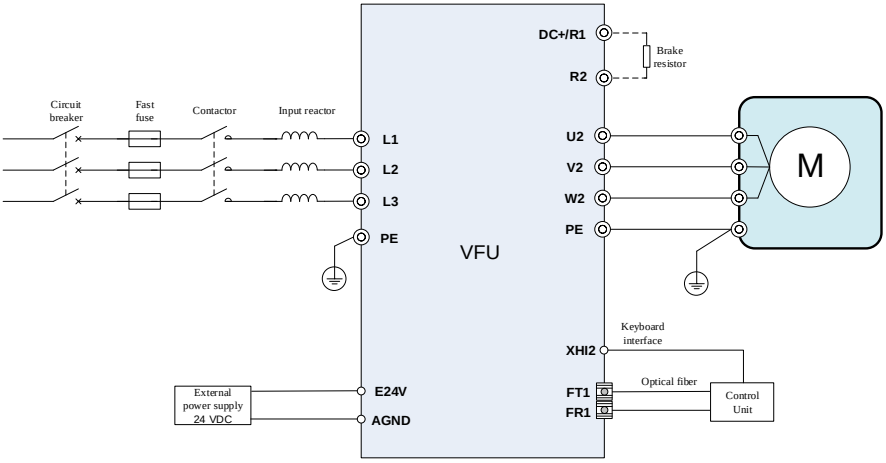


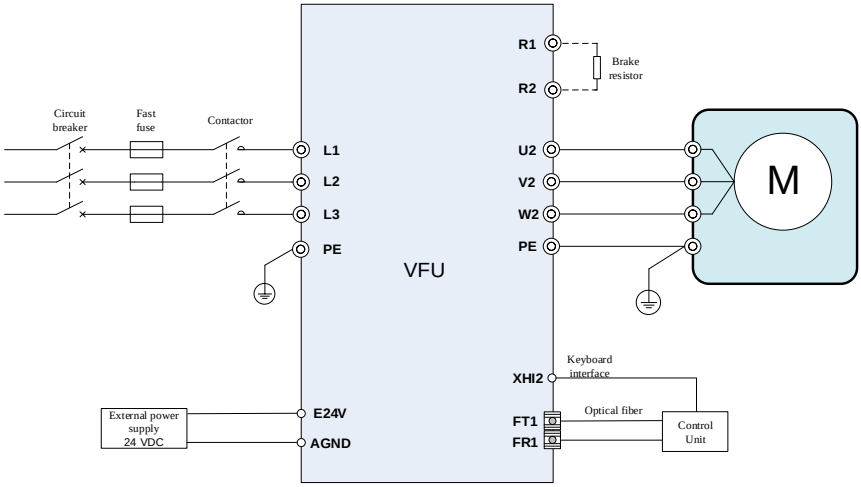
Figure 4-9 HU type EMC filter board connection cable removal

4.5.2 **VFU application example**



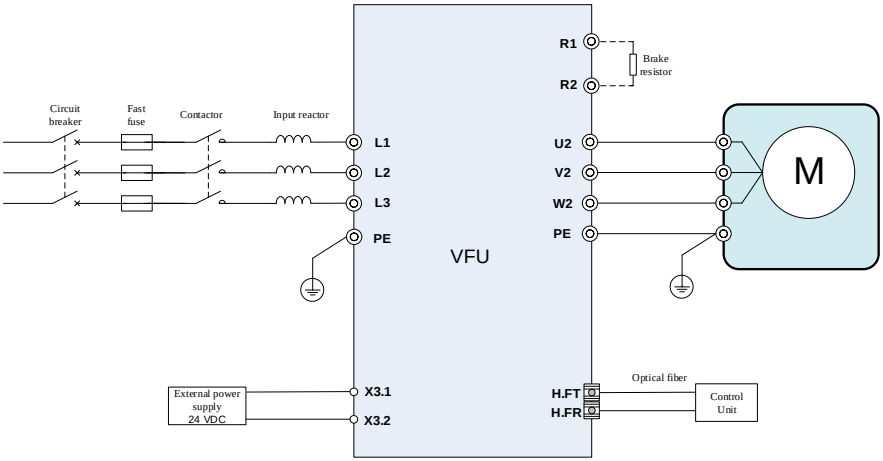
Note: applicable two-quadrant VFU types:
400V 7.5kW~30kW(Size F3、F4)VFU

Figure 4-10 VFU wiring diagram 1



Note: unit comes with built-in AC reactor, applicable two-quadrant VFU types:
400V 37kW~90kW(Size F5、F6)VFU
690V 55kW~90kW(Size F6)VFU

Figure 4-11 VFU wiring diagram 2



Note: applicable two-quadrant VFU types:
400V 110kW~450kW VFU
690V 110kW~560kW VFU

Figure 4-12 VFU wiring diagram 3

--End of this chapter--

5 Basic Rectifier Unit - BRU

5.1 Power specifications

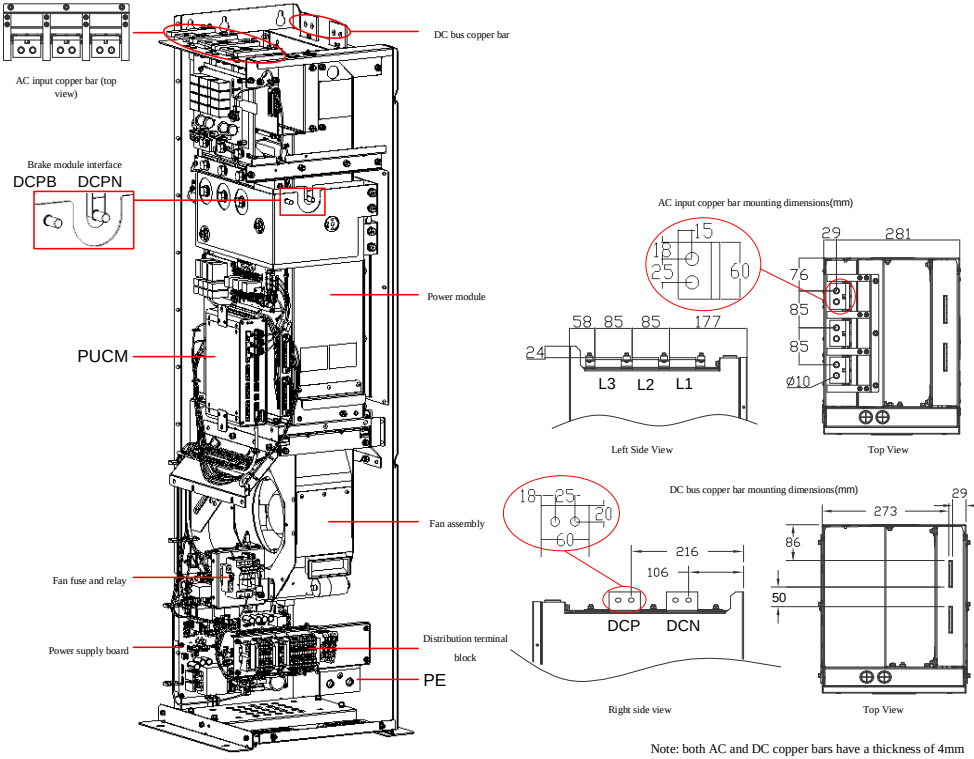
Model	Rated power (kW)	AC input current (A)		DC output current (A)			Rated output voltage VDC		Frame type
		Rated I_N	Maximum I_{max}	Rated I_{N_DC}	Basic load I_{H_DC}	Maximum I_{MAX_DC}	Partial load	Full load	
3-phase AC 400V (380V~480V)									
HD2000-11B01624	90	162	244	193	151	290	1.35*Vin	1.32*Vin	DU
HD2000-11B01984	110	198	298	236	184	354			
HD2000-11B02384	132	238	357	283	221	425			
HD2000-11B02894	160	289	433	343	268	515			
HD2000-11B03614	200	361	541	429	335	644			
HD2000-11B04514	250	451	677	536	418	804			
HD2000-11B07224	400	722	1083	858	669	1287			
HD2000-11B10104	560	1010	1516	1201	937	1802			EU
HD2000-11B12814	710	1281	1922	1523	1188	2285			
HD2000-10B16244(1)	900	1624	2436	1931	1506	2896			
3-phase AC 600V (500V~690V)									
HD2000-11B00946	90	94	141	112	87	168	1.35*Vin	1.32*Vin	DU
HD2000-11B01156	110	115	173	137	107	205			
HD2000-11B01386	132	138	207	164	128	246			
HD2000-11B01676	160	167	251	199	155	298			
HD2000-11B02096	200	209	314	249	194	373			
HD2000-11B02616	250	261	392	311	243	466			
HD2000-11B03716	355	371	557	441	344	662			
HD2000-11B05866	560	586	879	696	543	1045			
HD2000-11B09416	900	941	1412	1119	873	1679			EU
HD2000-11B11516	1100	1151	1726	1368	1067	2052			
HD2000-10B15696(2)	1500	1569	2353	1865	1455	2798			

Note: (1) The 400V/900kW BRU adopts diode rectification method, which requires an additional soft start circuit.

(2) The 690V/1500kW BRU adopts diode rectification method, which requires an additional soft start circuit.

5.2 Internal structure

5.2.1 DU type



Note: both AC and DC copper bars have a thickness of 4mm

Figure 5-1 DU type internal structure diagram

Terminal function description	Terminal block (torque, N*m)	Cable cross-sectional area(mm^2)
3-Phase AC input terminals	M10(38)	1×240
Brake module interface DCPB, DCNB	M8(15)	1×25
Protective earth terminal	M10(38)	1×240
DC bus output	M10(38)	1×240

5.2.2 **EU type**

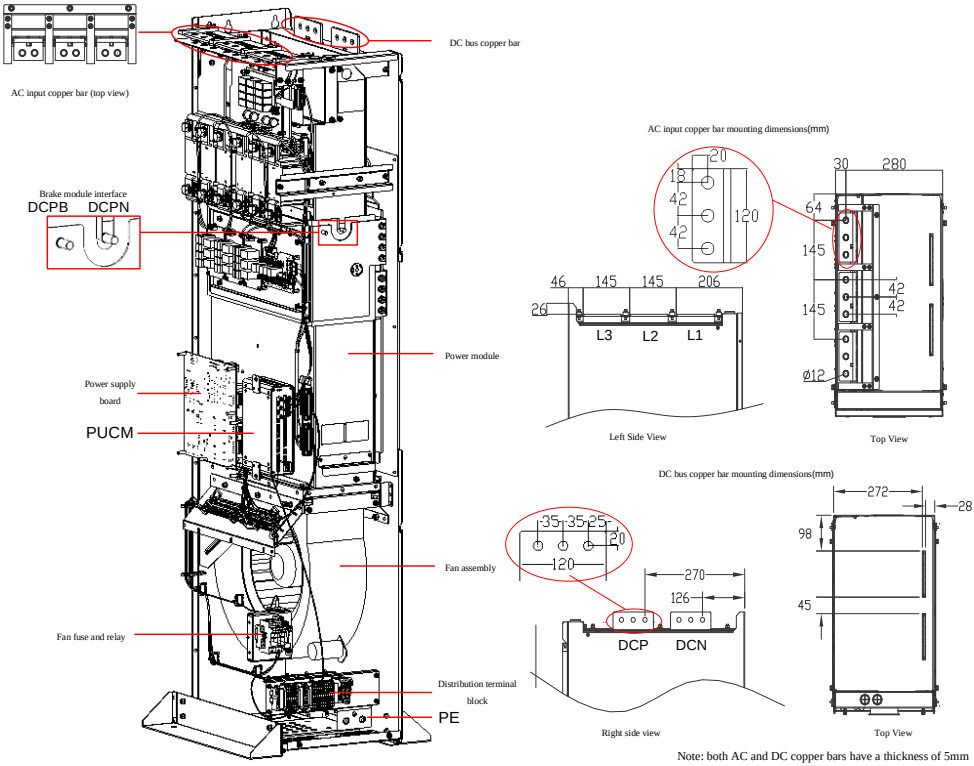


Figure 5-2 EU type internal structure diagram

Terminal function description	Terminal block (torque, N*m)	Cable cross-sectional area(mm^2)
3-Phase AC input terminals	M12(64)	6×185
Brake module interface DCPB, DCNB	M8(15)	1×25
Protective earth terminal	M10(38)	4×240
DC bus output	M10(38)	6×185

5.2.3 **Signal interface**

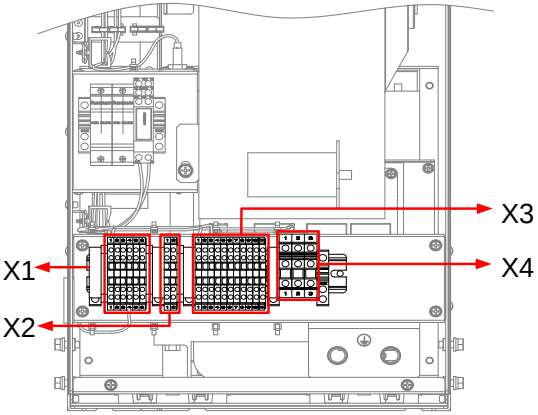


Figure 5-3 DU/EU type terminal block location diagram

Table5-1 X1 terminal block interface information

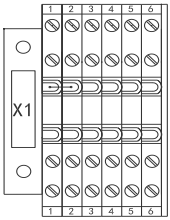
X1 terminal block	Signal name	Pin	I/O	Description
	+24V	1	I	Internal +24V power supply
	+24V	2	I	Internal +24V power supply
	GND	3	I	Internal +24V power ground
	DO1	5	O	Module cooling fan drive
	DO2	6	O	Brake unit enable side
	DO3	7	O	NC

Table5-2 X2 terminal block interface information

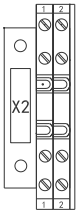
X2 terminal block	Signal name	Pin	I/O	Description
	220V-L	1	I	External 220V-L
	220V-N	2	I	External 220V-N

Table5-3 X3 terminal block interface information (SCR rectification type)

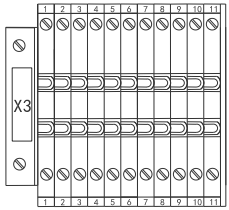
X3 terminal block	Signal name	Pin	I/O	Description
	EP_+24V	1	I	External 24V power supply "24V" input
	EP_GND	2	I	External 24V power supply "GND" input
	DI1	3	I	Auxiliary transformer over-temperature fault feedback
	DI2	4	I	Soft start contactor status feedback
	DI3	5	I	Main contactor status feedback
	DI4	6	I	Input reactor over-temperature fault feedback
	DI5	7	I	Brake unit fault feedback
	KA1	8	O	Soft start contactor drive, dry contact output
	KA2	9	O	
	KB1	10	O	Main contactor drive, dry contact output
	KB2	11	O	

Table5-4 X3 terminal block interface information (diode rectification type)

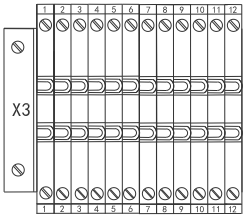
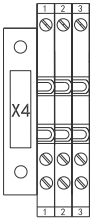
X3 terminal block	Signal name	Pin	I/O	Description
	EP_+24V	1	I	External 24V power supply "24V" input
	EP_GND	2	I	External 24V power supply "GND" input
	DI1	3	I	Auxiliary transformer over-temperature fault feedback
	DI2	4	I	Soft start contactor status feedback
	DI3	5	I	Main contactor status feedback
	DI4	6	I	Input reactor over-temperature fault feedback
	DI5	7	I	Brake unit fault feedback
	KA1	8	O	Soft start contactor drive, dry contact output
	KA2	9	O	
	KA13	10	O	Main contactor drive power L input
	KB1	11	O	Main contactor drive power L output
	KB2/KA14	12	O	Main contactor drive power L input through NC contacts

Table5-5 X4 terminal block interface information

X4 terminal block	Signal name	Pin	I/O	Description
	L1	1	I	U-phase voltage detection
	L2	2	I	V-phase voltage detection
	L3	3	I	W-phase voltage detection

5.3 BRU input switch and fuse selection

Table5-6 380V~480V BRU input switch assembly and fuse selection

3-phase AC supply voltage: 380V~480V					
Unit model	400V Rated power (kW)	AC input rated current (A)	Switching devices		AC side input semiconductor protection fuse (gR) Recommended parameters
			Contactor Recommended parameters	Load disconnector switch Recommended parameters	
HD2000-11B01624	90	162	200/690V	200/690V	200/690V
HD2000-11B01984	110	198	250/690V	250/690V	250/690V
HD2000-11B02384	132	238	315/690V	315/690V	315/690V
HD2000-11B02894	160	289	350/690V	350/690V	350/690V
HD2000-11B03614	200	361	450/690V	450/690V	450/690V
HD2000-11B04514	250	451	630/690V	630/690V	630/690V
HD2000-11B07224	400	722	1000/690V	1000/690V	1000/690V
HD2000-11B10104	560	1010	1250/690V	1250/690V	1250/690V
HD2000-11B12814	710	1281	1600/690V	1600/690V	1600/690V
HD2000-10B16244	900	1624	2000/690V	2000/690V	2000/690V

Table5-7 500V~690V BRU input switch assembly and fuse selection

3-phase AC supply voltage: 500V~690V					
Unit model	690V rated power (kW)	AC input rated current (A)	Switching devices		Recommended parameters for AC side input semiconductor protection fuse (gR)
			Contactor Recommended parameters	Load disconnector switch Recommended parameters	
HD2000-11B00946	90	94	125/690V	125/690V	125/690V
HD2000-11B01156	110	115	160/690V	160/690V	160/690V

HD2000-11B01386	132	138	200/690V	200/690V	200/690V
HD2000-11B01676	160	167	250/690V	250/690V	250/690V
HD2000-11B02096	200	209	315/690V	315/690V	315/690V
HD2000-11B02616	250	261	350/690V	350/690V	350/690V
HD2000-11B03716	355	371	450/690V	450/690V	450/690V
HD2000-11B05866	560	586	800/690V	800/690V	800/690V
HD2000-11B09416	900	941	1250/690V	1250/690V	1250/690V
HD2000-11B11516	1100	1151	1600/690V	1600/690V	1600/690V
HD2000-10B15696	1500	1569	2000/690V	2000/690V	2000/690V

5.4 BRU input reactor selection

The input reactor of the BRU of HD2000 series VFD is selected according to the rated voltage of 400V/690V, and that the reactor voltage drop is 2% of rated voltage at rated current.

Table5-8 380V~480V BRU input reactor selection table

3-phase AC supply voltage: 380V~480V			
Unit model	Rated power (kW)	Rated current (A)	Recommended input reactor inductance (mH)
HD2000-11B01624	90	162	0.091
HD2000-11B01984	110	198	0.074
HD2000-11B02384	132	238	0.062
HD2000-11B02894	160	289	0.051
HD2000-11B03614	200	361	0.041
HD2000-11B04514	250	451	0.033
HD2000-11B07224	400	722	0.020
HD2000-11B10104	560	1010	0.015
HD2000-11B12814	710	1281	0.011
HD2000-10B16244	900	1624	0.009

Table5-9 500V~690V BRU input reactor selection table

3-phase AC supply voltage: 500V~690V			
Unit model	Rated power (kW)	Rated current (A)	Recommended input reactor inductance (mH)
HD2000-11B00946	90	94	0.270
HD2000-11B01156	110	115	0.221
HD2000-11B01386	132	138	0.184

3-phase AC supply voltage: 500V~690V			
Unit model	Rated power (kW)	Rated current (A)	Recommended input reactor inductance (mH)
HD2000-11B01676	160	167	0.152
HD2000-11B02096	200	209	0.121
HD2000-11B02616	250	261	0.097
HD2000-11B03716	355	371	0.068
HD2000-11B05866	560	586	0.043
HD2000-11B09416	900	941	0.027
HD2000-11B11516	1100	1151	0.022
HD2000-10B15696	1500	1569	0.016

5.5 Unit application

5.5.1 EMC filter board connection cable removal

When the rectifier unit runs on the IT grid, the cable connected on the EMC filter board connection line should be connected from hole C to hole A. The basic anti-interference module integrated inside the device should be deactivated. The connection cable for the EMC filter board is connected in the B hole and C hole by default.

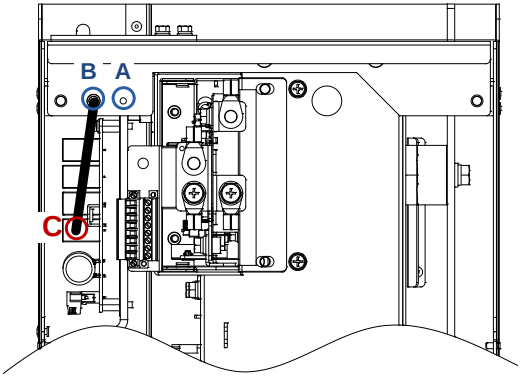


Figure 5-4 BRU EMC filter board connection cable removal

5.5.2 Parallel connection of units

The following must be followed when connecting rectifier units in parallel:

- ✓ Each rectifier unit should be configured with a separate input reactor at its front.
- ✓ Up to four identical rectifier units can be connected in parallel; the parallel units only need to be controlled by a common control unit.
- ✓ In a multi-channel power supply, power should be supplied to the system from a common input point (i.e., different grids are not allowed).

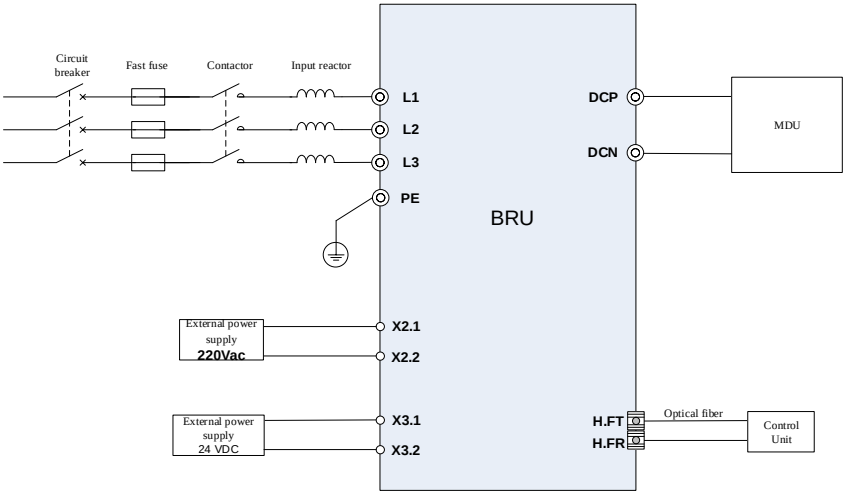
- ✓ The main contactors located upstream of each pre-charge circuit must be switched on simultaneously.
- ✓ Each rectifier unit must be pre-charged via its own pre-charge circuit; the contactors of each pre-charge circuit must be switched on simultaneously, which can be operated by monitoring the answer signals of the contactors.

Note:

(1) It is prohibited to connect the units of the same type with different power levels in parallel.

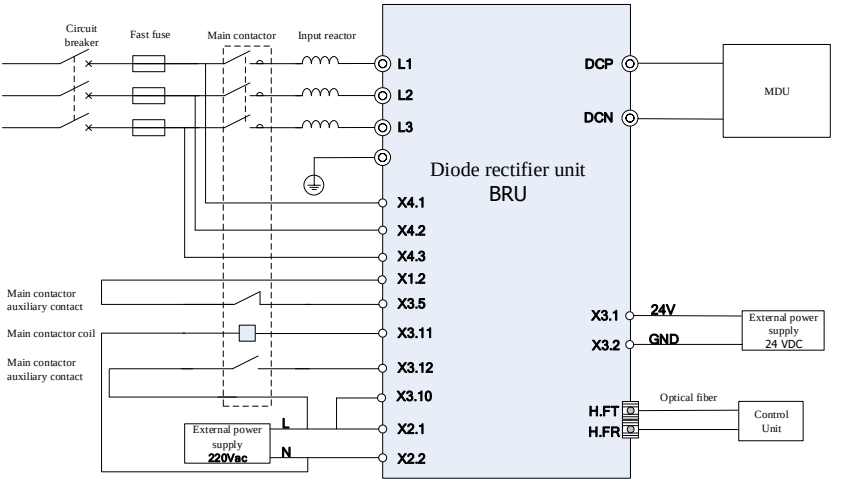
(2) BRU units can be connected in parallel with the SRU units with the same power level; BRU units cannot be connected in parallel with the PRU units with the same power level.

5.5.3 **BRU application example**



Note: The unit uses thyristor rectification, no need to configure soft start circuit
Applicable types:400V 90kW~710kW BRU
690V 90kW~1100kW BRU

Figure 5-5 BRU application example



Note: The unit adopts diode rectification and has been internally configured with soft-start contactor and soft-start resistor

Applicable types: 400V 900kW BRU

690V 1500kW BRU

Figure 5-6 Diode type BRU application example

--End of this chapter--

6 Smart Rectifier Unit - SRU

6.1 Power specifications

Model	Rated power (kW)	AC input current (A)		DC output current (A)			Rated output voltage VDC		Frame type
		Rated I_N	Maximum I_{max}	Rated I_{N_DC}	Basic load I_{H_DC}	Maximum I_{max_DC}	Partial load	Rated	
3-phase AC 400V (380V~480V)									
HD2000-12B00144	7.5	14	21	16	14	24	1.35*Vin	1.32*Vin	3U
HD2000-12B00204	11	20	30	24	21	36			
HD2000-12B00274	15	27	41	33	29	49			
HD2000-12B00344	18.5	34	51	40	36	60			
HD2000-12B00404	22	40	60	48	42	72			4U
HD2000-12B00554	30	55	82	65	58	98			
HD2000-12B00674	37	67	101	80	71	120			5U
HD2000-12B00824	45	82	123	98	87	146			
HD2000-12B01004	55	100	150	119	106	179			6U
HD2000-12B01374	75	137	205	163	145	244			
HD2000-12B01654	90	165	246	195	174	293			
HD2000-12B02004	110	200	301	238	212	358			FU
HD2000-12B02414	132	241	361	286	255	429			
HD2000-12B02924	160	292	437	347	309	520			
HD2000-12B03644	200	364	547	433	386	650			GU
HD2000-12B04564	250	456	683	542	482	813			
HD2000-12B06474	355	647	970	769	685	1154			
HD2000-12B09114	500	911	1367	1083	964	1625			HU
HD2000-12B11484	630	1148	1722	1365	1215	2048			IU
HD2000-12B14584	800	1458	2187	1734	1543	2600			
3-phase AC 600V (500V~690V)									
HD2000-12B00586	55	58	87	69	61	104	1.35*Vin	1.32*Vin	6U
HD2000-12B00796	75	79	119	94	84	141			
HD2000-12B00956	90	95	143	113	101	170			
HD2000-12B01166	110	116	174	138	123	207			FU
HD2000-12B01396	132	139	209	166	148	249			
HD2000-12B01696	160	169	254	201	179	301			
HD2000-12B02116	200	211	317	251	224	377			GU
HD2000-12B02646	250	264	396	314	280	471			
HD2000-12B03336	315	333	499	396	352	594			
HD2000-12B04756	450	475	713	565	503	848			
HD2000-12B07506	710	750	1125	892	794	1338			HU
HD2000-12B10576	1000	1057	1585	1256	1118	1884			IU
HD2000-12B14796	1400	1479	2219	1759	1565	2638			
HD2000-12B16906	1600	1690	2535	2009	1788	3014			

6.2 Internal structure

6.2.1 3U, 4U type

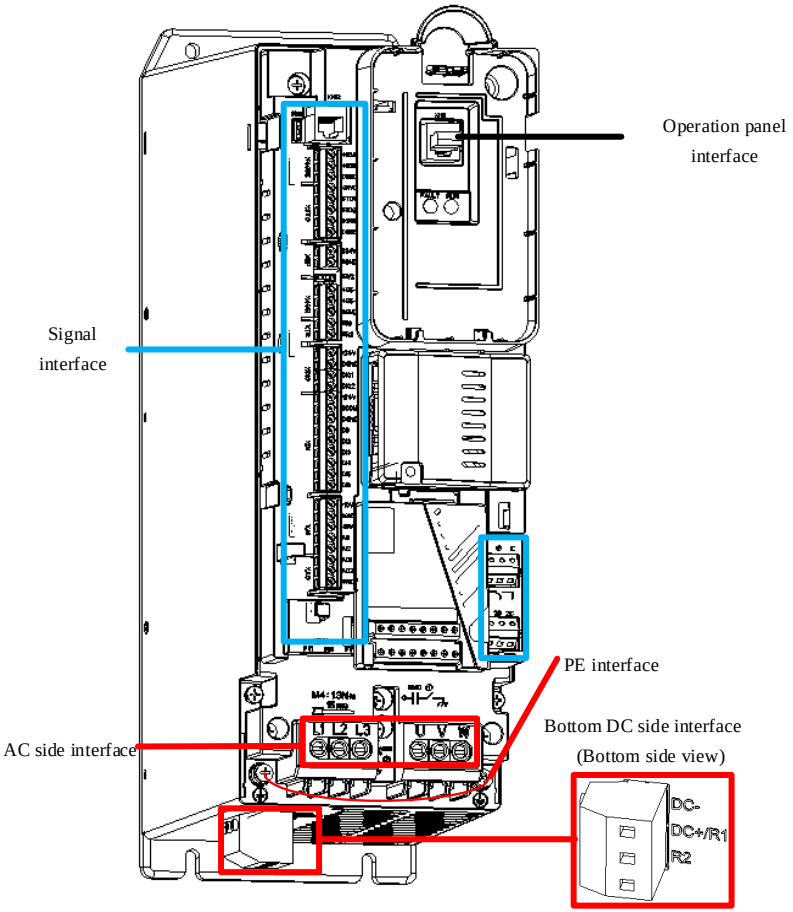


Figure 6-1 3U, 4U type internal structure diagram

Terminal name	Terminal function description	Terminal block (torque, N*m)		Cable cross-sectional area(mm^2)	
		3U	4U	3U	4U
DC-, DC+/R1, R2 (Bottom of the unit)	DC bus terminals and brake resistor terminals	M4(1.7)	M4(1.7)	6	16
L1, L2, L3	Not used	--	--	--	--
PE	Protective earth terminal	M3(0.7)	M3(0.7)	See Table 3-1	
U, V, W	3-Phase AC input terminals	M4(1.3)	M5(2.0)	6	16

6.2.2 **5U, 6U type**

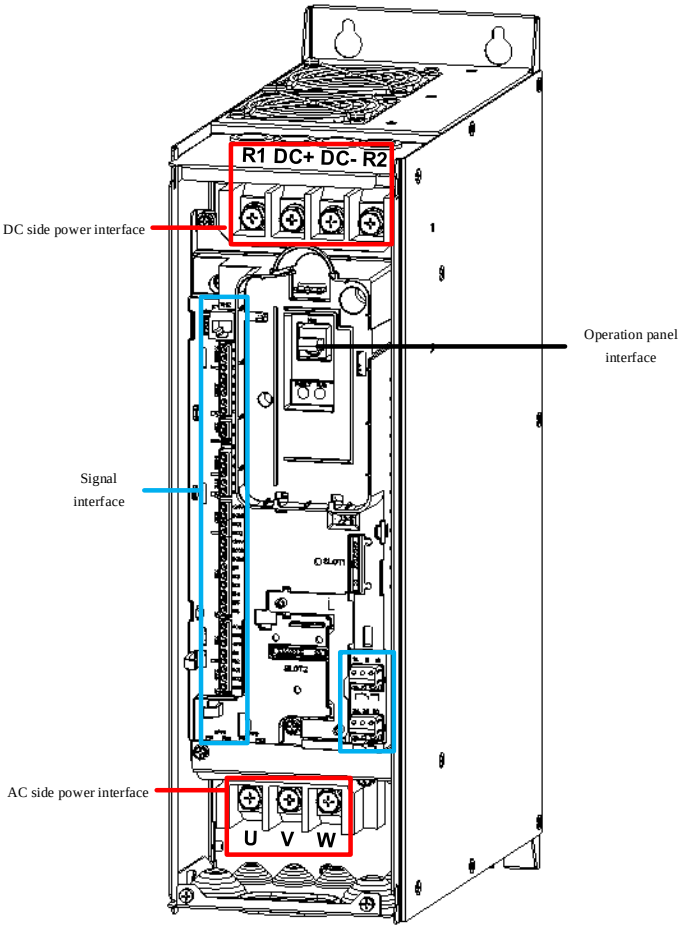
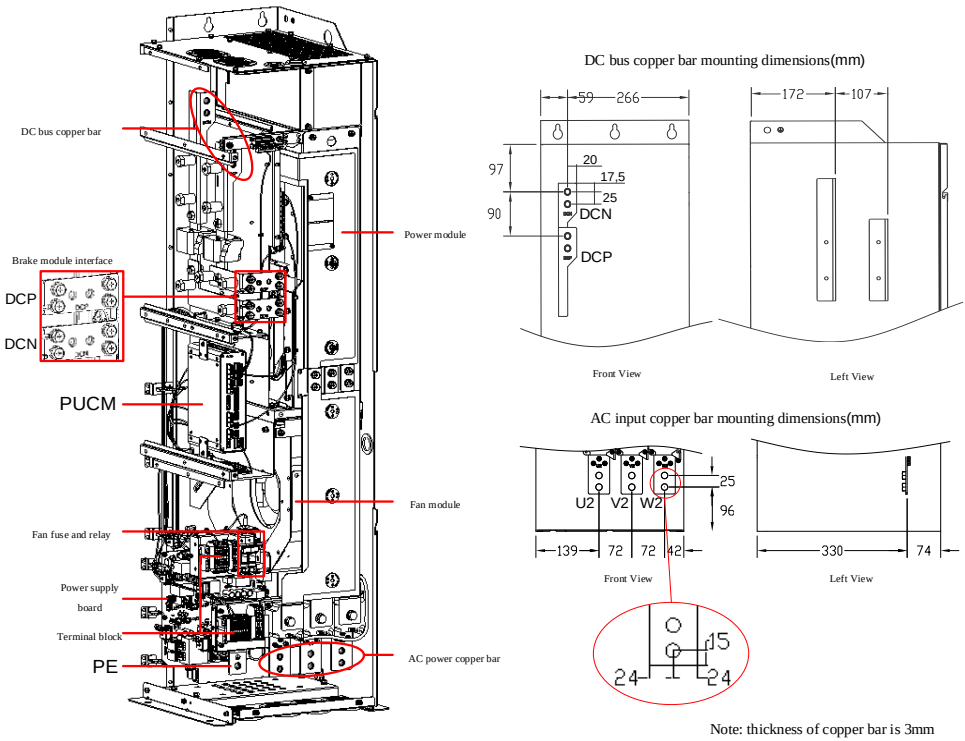


Figure 6-2 5U, 6U type internal structure diagram

Terminal name	Terminal function description	Terminal block (torque, N*m)		Cable cross-sectional area(mm^2)	
		5U	6U	5U	6U
DC+, DC-	DC output terminals	M8(4.5)	M10(4.5)	25	70
R1、R2	External brake resistor terminals	M8(4.5)	M10(4.5)	16	50
PE (right side of AC side power interface)	Protective earth terminal	M6(4.5)	M6(4.5)	16	50
U, V, W	3-Phase AC input terminals	M8(4.5)	M10(4.5)	25	70

6.2.3 **FU type**

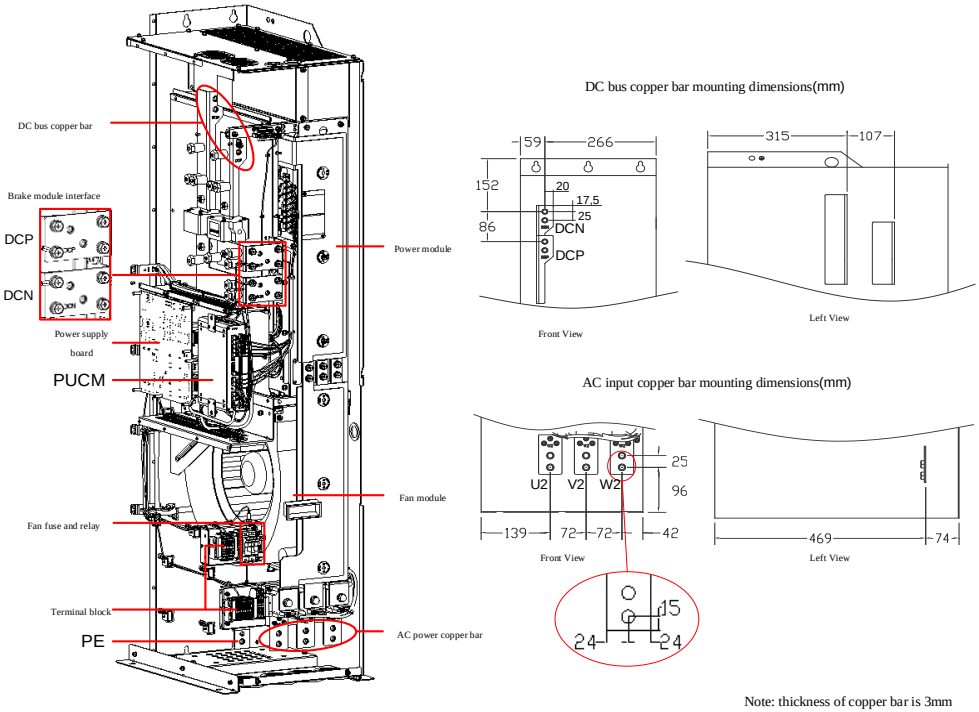


Note: thickness of copper bar is 3mm

Figure 6-3 FU type internal structure diagram

Terminal name	Terminal function description	Terminal block (torque, N*m)	Cable cross-sectional area(mm^2)
U, V, W	3-Phase AC input terminals	M10(38)	1×240
DCPB, DCNB	Brake module interface	M8(15)	1×25
PE	Protective earth terminal	M10(38)	1×240
DC+, DC-	DC bus output	M10(38)	1×240

6.2.4 **GU type**

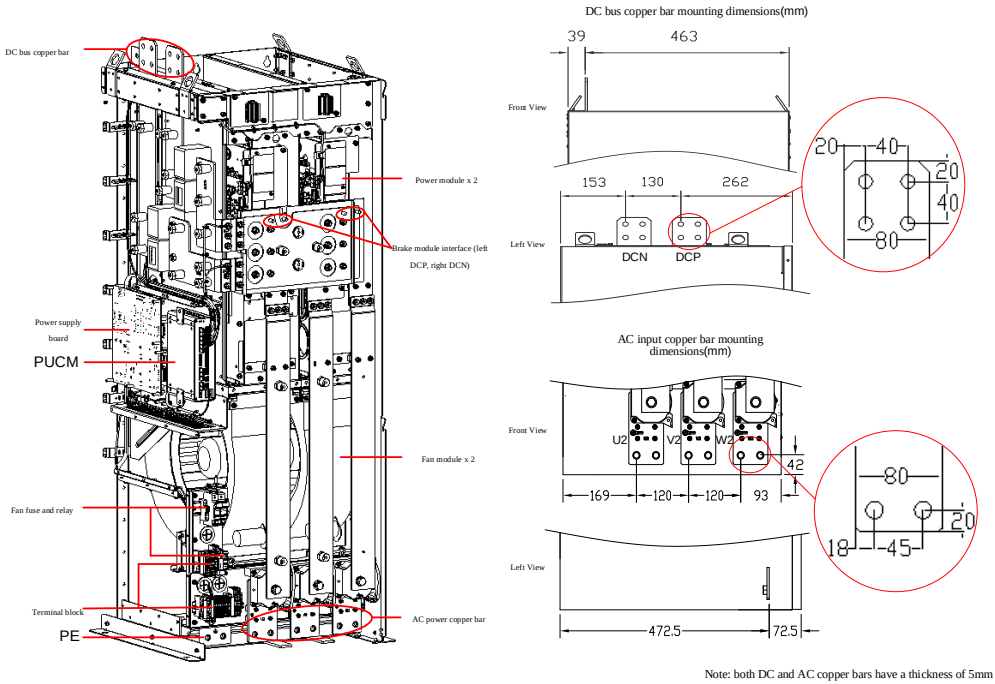


Note: thickness of copper bar is 3mm

Figure 6-4 GU type internal structure diagram

Terminal name	Terminal function description	Terminal block (torque, N*m)	Cable cross-sectional area(mm^2)
U, V, W	3-Phase AC input terminals	M10(38)	1×240
DCPB, DCNB	Brake module interface	M8(15)	1×25
PE	Protective earth terminal	M10(38)	1×240
DC+, DC-	DC bus output	M10(38)	2×185

6.2.5 **HU type**



Note: both DC and AC copper bars have a thickness of 5mm

Figure 6-5 HU type internal structure diagram

Terminal name	Terminal function description	Terminal block (torque, N*m)	Cable cross-sectional area(mm^2)
U, V, W	3-Phase AC input terminals	M12(64)	2×240
DCPB, DCNB	Brake module interface	M8(15)	1×25
PE	Protective earth terminal	M12(64)	1×240
DC+, DC-	DC bus output	M12(64)	4×240

6.2.6 **IU type**

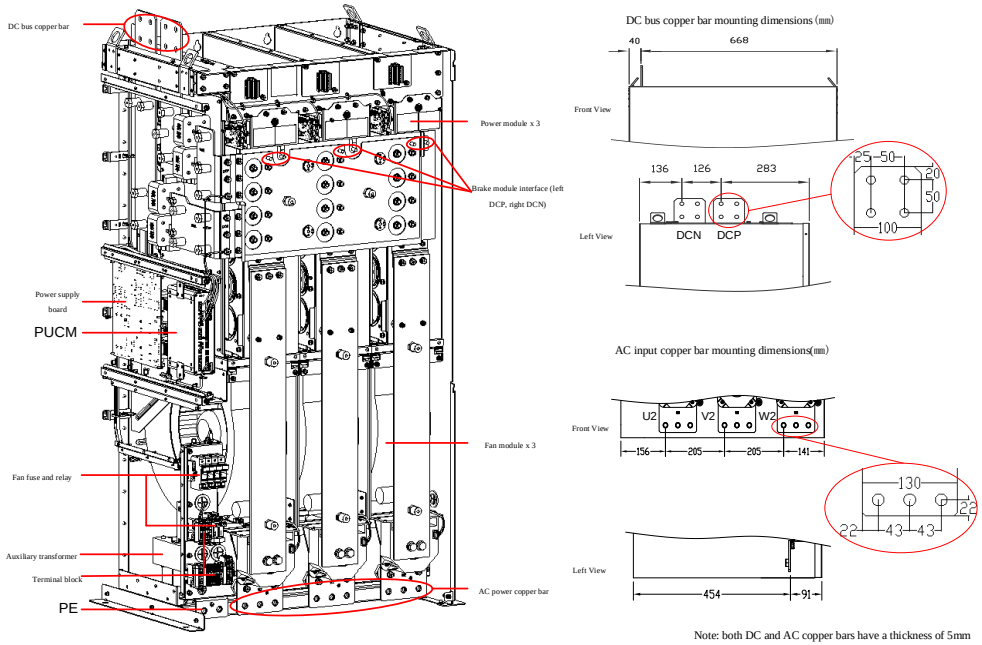


Figure 6-6 IU type internal structure diagram

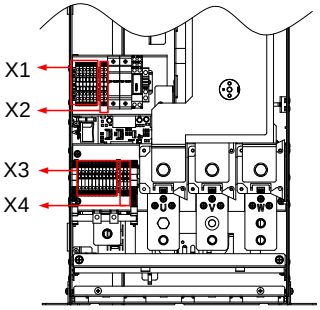
Terminal name	Terminal function description	Terminal block (torque, N*m)	Cable cross-sectional area(mm^2)
U, V, W	3-Phase AC input terminals	M12(64)	2×240
DCPB, DCNB	Brake module interface	M8(15)	1×25
PE	Protective earth terminal	M12(64)	1×240
DC+, DC-	DC bus output	M12(64)	4×240

Signal interface

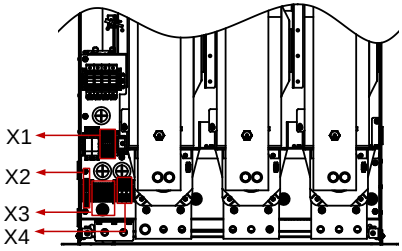
✓ Size 3U~6U type signal interface definition

Signal name	I/O	Description
DI1	I	Reserved
DI2	I	Soft start contactor status feedback
DI3	I	Main contactor status feedback
DI4	I	Input reactor over-temperature fault feedback
DI5	I	Reserved
DI6	I	Reserved
DI7	I	Reserved
DI8	I	Reserved
XHI2	I	Keyboard interface
1A	O	Soft start, dry contact NC output
1B	O	Soft start, dry contact common end
1C	O	Soft start, dry contact NO output
2A	O	Main contactor start, dry contact NC output
2B	O	Main contactor start, dry contact common end
2C	O	Main contactor start, dry contact NO output
V_A	I	Grid voltage sampling A-phase input
V_B	I	Grid voltage sampling B-phase input
V_C	I	Grid voltage sampling C-phase input

✓ Size FU~IU type signal interface definition



FU, GU type terminal blocks location



HU, IU type terminal blocks location

Figure 6-7 Terminal block location diagram

Table 6-1 X1 terminal block interface information

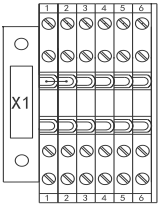
X1 terminal block	Signal name	Pin	I/O	Description
	+24V	1	I	Internal +24V power supply
	+24V	2	I	Internal +24V power supply
	GND	3	I	Internal +24V power ground
	DO1	4	O	Module cooling fan drive
	DO2	5	O	Brake unit enable side
	DO3	6	O	NC

Table 6-2 X2 terminal block interface information

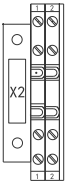
X2 terminal block	Signal name	Pin	I/O	Description
	220V-L	1	I	External 220V-L
	220V-N	2	I	External 220V-N

Table 6-3 X3 terminal block interface information

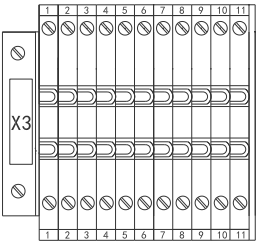
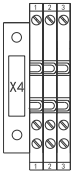
X3 terminal block	Signal name	Pin	I/O	Description
	EP_+24V	1	I	External 24V power supply "24V" input
	EP_GND	2	I	External 24V power supply "GND" input
	DI1	3	I	Auxiliary transformer over-temperature fault feedback
	DI2	4	I	Soft start contactor status feedback
	DI3	5	I	Main contactor status feedback
	DI4	6	I	LCL unit inductor over-temperature fault feedback
	DI5	7	I	Brake unit fault feedback
	KA1	8	O	Soft start contactor drive, dry contact output
	KA2	9	O	
	KBA	10	O	Main contactor drive, dry contact output
	KB2	11	O	

Table 6-4 X4 terminal block interface information

X4 terminal block	Signal name	Pin	I/O	Description
	L1	1	I	U-phase voltage detection/soft start power supply X4.1
	L2	2	I	V-phase voltage detection/soft start power supply X4.2
	L3	3	I	W-phase voltage detection/soft start power supply X4.3

6.3 SRU input reactor selection

The input reactor of the SRU of HD2000 series VFD is selected according to the rated voltage of 400V/690V, and that the reactor voltage drop is 2% of rated voltage at rated current.

Table 6-5 380V~480V SRU input reactor selection

3-phase AC supply voltage: 380V~480V			
Unit model	Rated power (kW)	Rated current (A)	Recommended input reactor inductance (mH)
HD2000-12B00144	7.5	14	2.101
HD2000-12B00204	11	20	1.471
HD2000-12B00274	15	27	1.090
HD2000-12B00344	18.5	34	0.865
HD2000-12B00404	22	40	0.735
HD2000-12B00554	30	55	0.535
HD2000-12B00674	37	67	0.439
HD2000-12B00824	45	82	0.359
HD2000-12B01004	55	100	0.294
HD2000-12B01374	75	137	0.215
HD2000-12B01654	90	165	0.178
HD2000-12B02004	110	200	0.147
HD2000-12B02414	132	241	0.122
HD2000-12B02924	160	292	0.101
HD2000-12B03644	200	364	0.081
HD2000-12B04564	250	456	0.065
HD2000-12B06474	355	647	0.045
HD2000-12B09114	500	911	0.032
HD2000-12B11484	630	1148	0.026
HD2000-12B14584	800	1458	0.020

Table 6-6 500V~690V SRU input reactor selection

3-phase AC supply voltage: 500V~690V			
Unit model	Rated power (kW)	Rated current (A)	Recommended input reactor inductance (mH)
HD2000-12B00586	55	58	0.875
HD2000-12B00796	75	79	0.642
HD2000-12B00966	90	96	0.529
HD2000-12B01166	110	116	0.437

HD2000-12B01396	132	139	0.365
HD2000-12B01696	160	169	0.300
HD2000-12B02116	200	211	0.241
HD2000-12B02646	250	264	0.192
HD2000-12B03336	315	333	0.152
HD2000-12B04756	450	475	0.107
HD2000-12B07506	710	750	0.068
HD2000-12B10576	1000	1057	0.048
HD2000-12B14796	1400	1479	0.034
HD2000-12B16906	1600	1690	0.030

6.4 SRU busbar output fuse selection

The Size FU~IU type SRUs of the HD2000 series VFD have built-in DC fuses as standard, so it is not necessary to configure external DC fuses, but the Size 3U~6U type SRUs do not have built-in DC fuses, so external DC fuses are required, the selection of which is shown in the table below:

Table 6-7 Size 3U~6U 380V~480V SRU external DC fuses selection

3-phase AC supply voltage: 380V~480V, DC bus voltage: 500V~750V			
Unit model	Rated power (kW)	DC rated output current (A)	Recommended parameters for DC output semiconductor protection fuse (gR)
HD2000-12B00144	7.5	16	25A/1000V
HD2000-12B00204	11	24	32 A/1000V
HD2000-12B00274	15	33	50 A/1000V
HD2000-12B00344	18.5	40	63 A/1000V
HD2000-12B00404	22	48	80 A/1000V
HD2000-12B00554	30	65	110 A/1000V
HD2000-12B00674	37	80	125 A/1000V
HD2000-12B00824	45	98	160 A/1000V
HD2000-12B01004	55	119	200 A/1000V
HD2000-12B01374	75	163	250 A/1000V
HD2000-12B01654	90	195	315 A/1000V

Table 6-8 Size 3U~6U 500V~690V SRU external DC fuses selection

3-phase AC supply voltage: 500V~690V, DC bus voltage: 700V~1200V			
Unit model	Rated power (kW)	DC rated output current (A)	Recommended parameters for DC input semiconductor protection fuse (gR)
HD2000-12B00586	55	69	110A/1000V
HD2000-12B00796	75	94	160 A/1000V
HD2000-12B00966	90	113	160 A/1000V

6.5 Unit application

6.5.1 Parallel connection of units

The following must be followed when connecting rectifier units in parallel:

- ✓ Each rectifier unit should be configured with a separate input reactor at its front.
- ✓ Up to four identical rectifier units can be connected in parallel.
- ✓ The parallel units only need to be controlled by a common control unit.
- ✓ In a multi-channel power supply, power should be supplied to the system from a common input point (i.e., different grids are not allowed).
- ✓ Each SRU in the parallel units shall be connected in series to an input reactor.
- ✓ The main contactors located upstream of each pre-charge circuit must be switched on simultaneously.
- ✓ Each rectifier unit must be pre-charged via its own pre-charge circuit.
- ✓ The contactors of each pre-charge circuit must be switched on simultaneously, which can be operated by monitoring the answer signals of the contactors.

Note:

(1) It is prohibited to connect the units of the same type with different power levels in parallel.

(2) SRU units can be connected in parallel with BRU units of the same power level.

(3) SRU units cannot be connected in parallel with PRU units of the same power level.

6.5.2 EMC filter board connection cable removal

When the rectifier unit runs on the IT grid, the cable connected on the EMC filter board connection line should be connected from hole C to hole A. The basic anti-interference module integrated inside the device should be deactivated.

✓ FU type EMC filter board connection cable removal

For the FU type rectifier unit, the circuit board where the EMC filter board cable is located at the lower part of the right side of the rectifier unit, so the copper bar and power connector can be removed for easy operation.

The connection cable for the EMC filter board is connected in the B hole and C hole by default. If it is not needed to use an anti-interference module, turn to connect the cable from C hole to A hole.

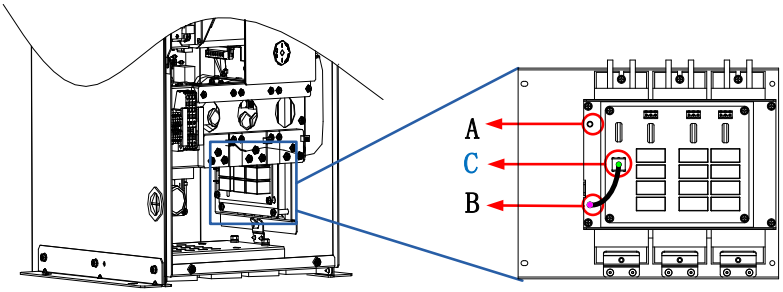


Figure 6-8 FU type EMC filter board connection cable removal

✓ GU type EMC filter board connection cable removal

For the GU type rectifier unit, the copper bar and power connector must be removed before you can see the circuit board (back side) where the EMC filter board cable is located.

The connection cable for the EMC filter board is connected in the B hole and C hole by default. If it is not needed to use an anti-interference module, turn to connect the cable from C hole to A hole.

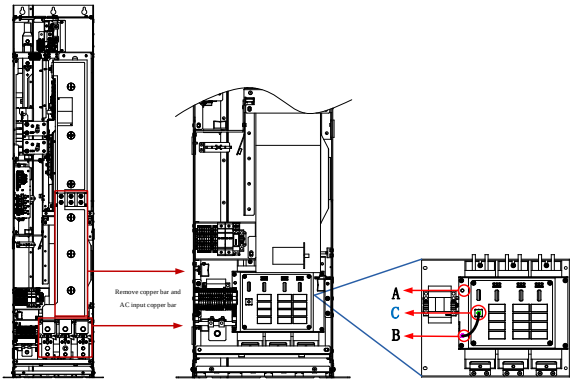


Figure 6-9 GU type EMC filter board connection cable removal

✓ HU/IU type EMC filter board connection cable removal

When using the HU/IU type rectifier units, the copper bar and fan must be removed before you can see the circuit board where the EMC filter board cable is located (left side).

The connection cable for the EMC filter board is connected in the B hole and C hole by default. If it is not needed to use an anti-interference module, turn to connect the cable from C hole to A hole.

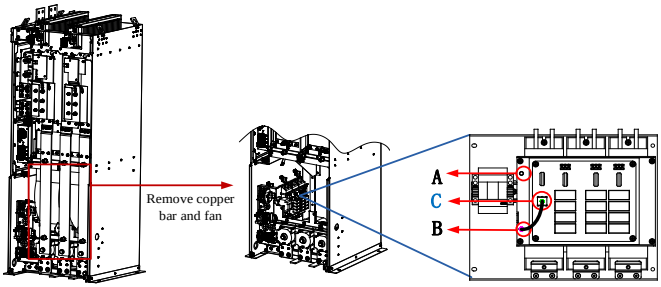
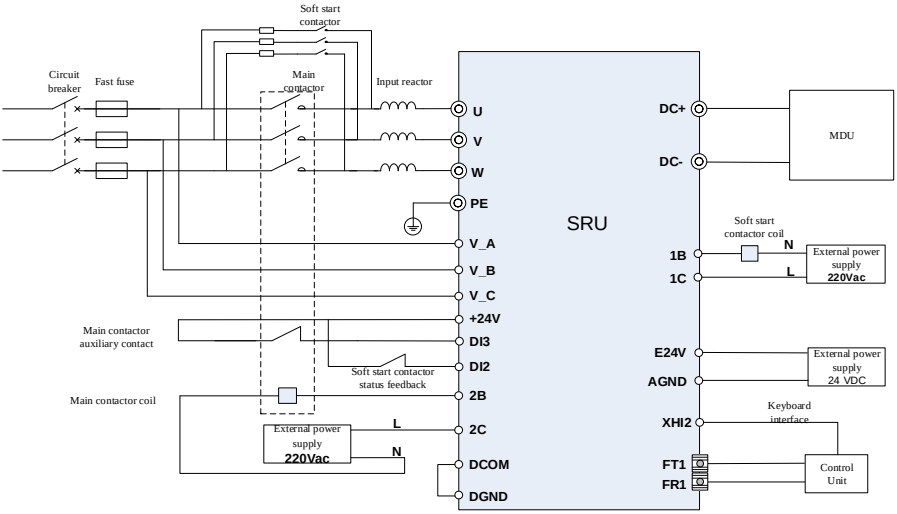


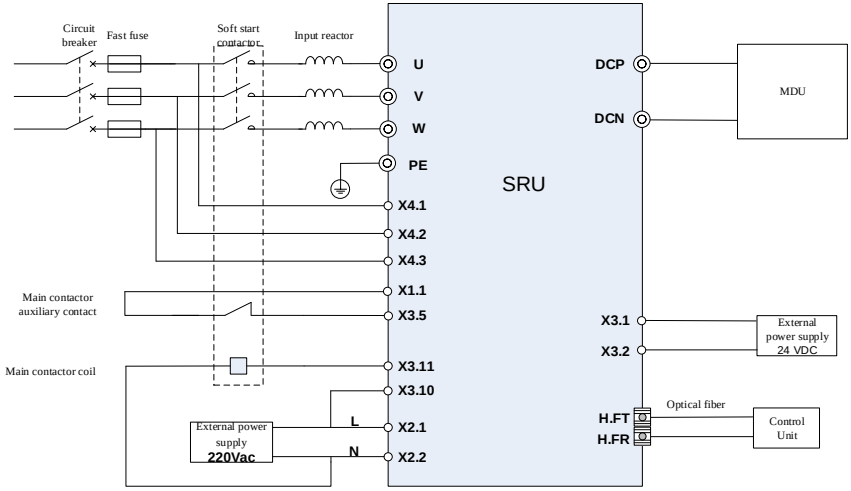
Figure 6-10 HU/IU type EMC filter board connection cable removal

6.5.3 **SRU application example**



Note: This contact method requires the user to provide soft start contactor and soft start resistor
Applicable types: 400V 7.5kW~90kW（3U~6U） SRU
690V 55kW~90kW （6U）SRU

Figure 6-11 SRU wiring diagram 1



Note: The unit has been internally configured with soft-start contactor and soft-start resistor
Applicable types: 400V 110kW~800kW（FU~IU） SRU
690V 110kW~1600kW （FU~IU）SRU

Figure 6-12 SRU wiring diagram 2

--End of this chapter--

7 PWM Rectifier Unit - PRU

7.1 Power specifications

Model	Rated power (kW)	AC input current (A)		DC output current (A)			Rated output voltage VDC		Frame type
		Rated I_N	Maximum I_{max}	Rated I_{N_DC}	Basic load I_{H_DC}	Maximum I_{max_DC}	Partial load	Full load	
3-phase AC 400V (380V~480V)									
HD2000-13B00184	11	18	26	20	18	30	1.6*Vin	1.5*Vin	3U
HD2000-13B00244	15	24	36	27	24	40			
HD2000-13B00304	18.5	30	45	33	30	50			
HD2000-13B00354	22	35	53	40	35	59			
HD2000-13B00484	30	48	72	54	48	81			4U
HD2000-13B00594	37	59	89	66	59	100			
HD2000-13B00724	45	72	108	81	72	121			5U
HD2000-13B00884	55	88	132	99	88	148			
HD2000-13B01204	75	120	180	135	120	202			6U
HD2000-13B01444	90	144	217	162	144	242			
HD2000-13B01764	110	176	265	198	176	296			
HD2000-13B02124	132	212	318	237	211	356			FU
HD2000-13B02574	160	257	385	287	256	431			
HD2000-13B03774	235	377	565	422	376	633			GU
HD2000-13B04814	300	481	722	539	480	808			
HD2000-13B06094	380	609	914	683	607	1024			HU
HD2000-13B07224	450	722	1083	808	719	1212			
HD2000-13B08024	500	802	1203	898	799	1347			
HD2000-13B10104	630	1010	1516	1132	1007	1697			IU
HD2000-13B12834	800	1283	1925	1437	1279	2156			
HD2000-13B14434	900	1443	2165	1617	1439	2425			
3-phase AC 600V (500V~690V)									
HD2000-13B00706	75	70	105	78	70	117	1.6*Vin	1.5*Vin	6U
HD2000-13B00846	90	84	126	94	83	141			
HD2000-13B01026	110	102	153	115	102	172			
HD2000-13B01236	132	123	184	137	122	206			FU
HD2000-13B01496	160	149	223	167	148	250			
HD2000-13B01866	200	186	279	208	185	312			GU
HD2000-13B02326	250	232	349	260	232	390			
HD2000-13B02936	315	293	439	328	292	492			
HD2000-13B03726	400	372	558	417	371	625			
HD2000-13B04656	500	465	697	521	463	781			HU
HD2000-13B05756	560	575	862	644	573	966			
HD2000-13B07446	800	744	1116	833	741	1250			IU
HD2000-13B10236	1100	1023	1534	1145	1019	1718			

Model	Rated power (kW)	AC input current (A)		DC output current (A)			Rated output voltage VDC		Frame type
		Rated I_N	Maximum I_{max}	Rated I_{N_DC}	Basic load I_{H_DC}	Maximum I_{max_DC}	Partial load	Full load	
HD2000-13B13026	1400	1302	1952	1458	1297	2187			
HD2000-13B14886	1600	1488	2231	1667	1484	2501			

7.2 Internal structure

7.2.1 3U, 4U type

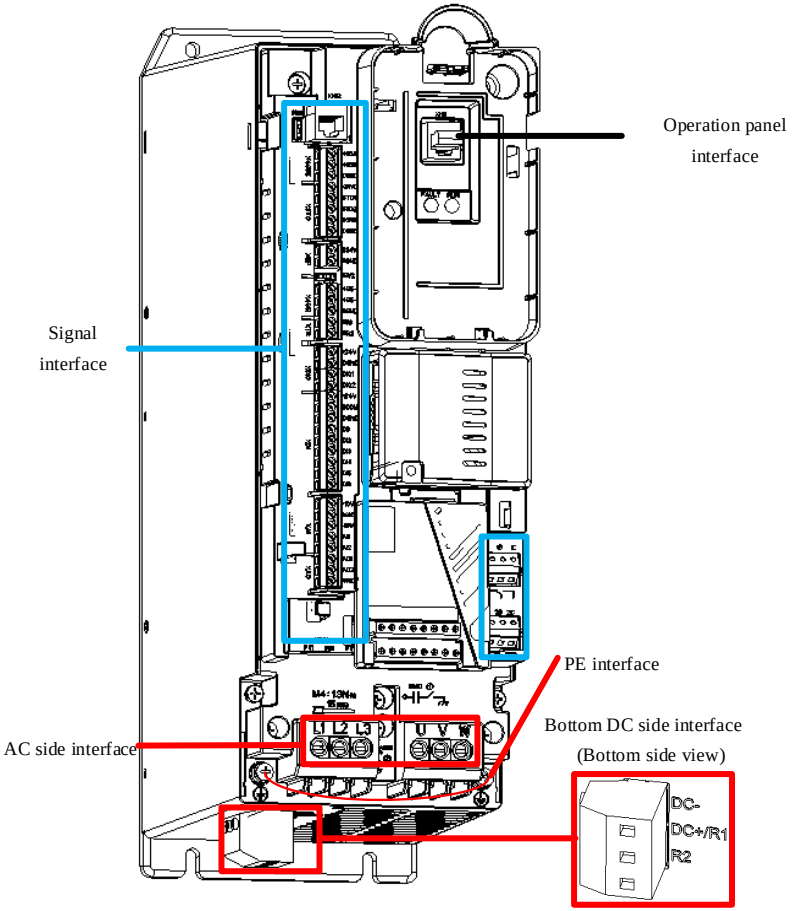


Figure 7-1 3U, 4U type internal structure diagram

Terminal name	Terminal function description	Terminal block (torque, N*m)		Cable cross-sectional area(mm²)	
		3U	4U	3U	4U
DC-, DC+/R1, R2 (Bottom of the unit)	DC bus terminals and brake resistor terminals	M4(1.7)	M4(1.7)	6	16
L1, L2, L3	Not used	--	--	--	--
PE	Protective earth terminal	M3(0.7)	M3(0.7)	See Table 3-1	
U, V, W	3-Phase AC input terminals	M4(1.3)	M5(2.0)	6	16

7.2.2 **5U, 6U type**

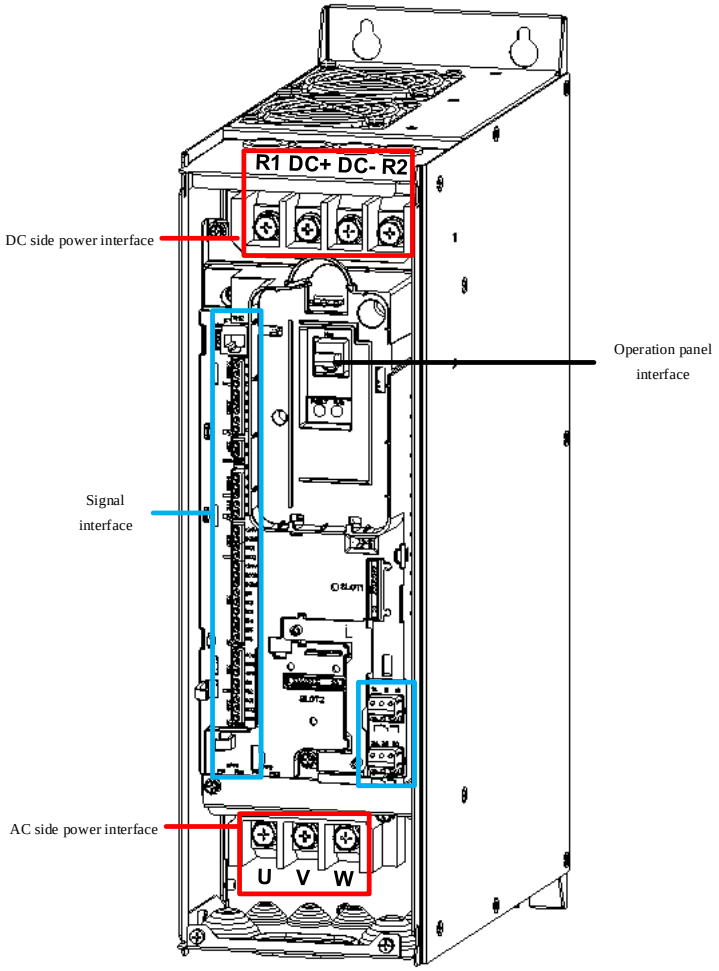
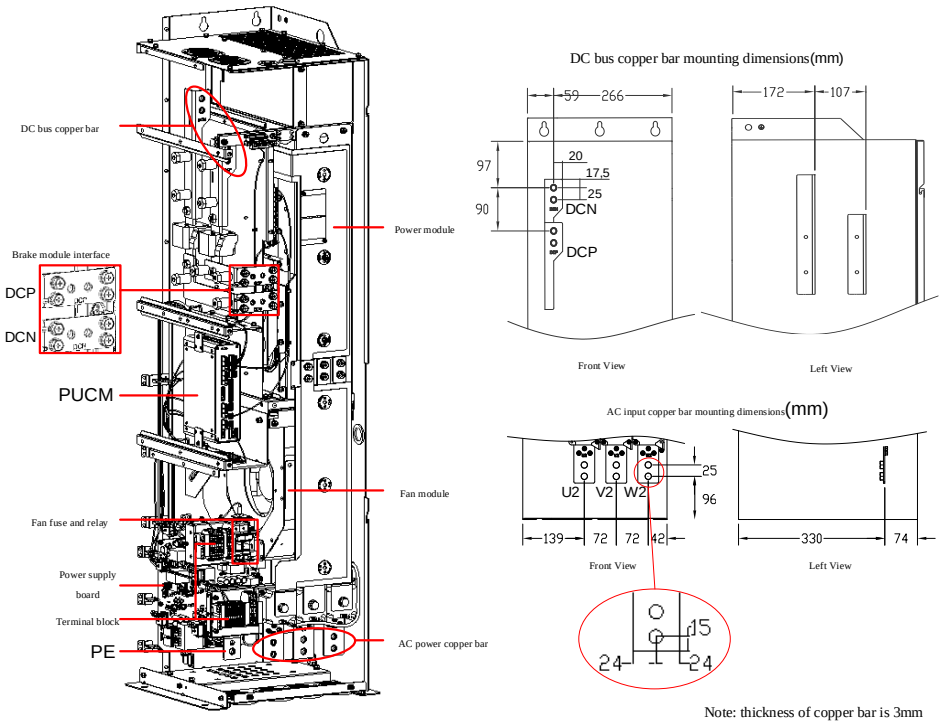


Figure 7-2 5U, 6U type internal structure diagram

Terminal name	Terminal function description	Terminal block (torque, N*m)		Cable cross-sectional area(mm^2)	
		5U	6U	5U	6U
DC+, DC-	DC output terminals	M8(4.5)	M10(4.5)	25	70
R1、R2	External brake resistor terminals	M8(4.5)	M10(4.5)	16	50
PE (right side of AC side power interface)	Protective earth terminal	M6(4.5)	M6(4.5)	16	50
U, V, W	3-Phase AC input terminals	M8(4.5)	M10(4.5)	25	70

7.2.3 **FU type**



Note: thickness of copper bar is 3mm

Figure 7-3 FU type internal structure diagram

Terminal name	Terminal function description	Terminal block (torque, N*m)	Cable cross-sectional area(mm^2)
U, V, W	3-Phase AC input terminals	M10(38)	1×240
DCPB, DCNB	Brake module interface	M8(15)	1×25
PE	Protective earth terminal	M10(38)	1×240
DCP, DCN	DC bus output	M10(38)	1×240

7.2.4 **GU type**

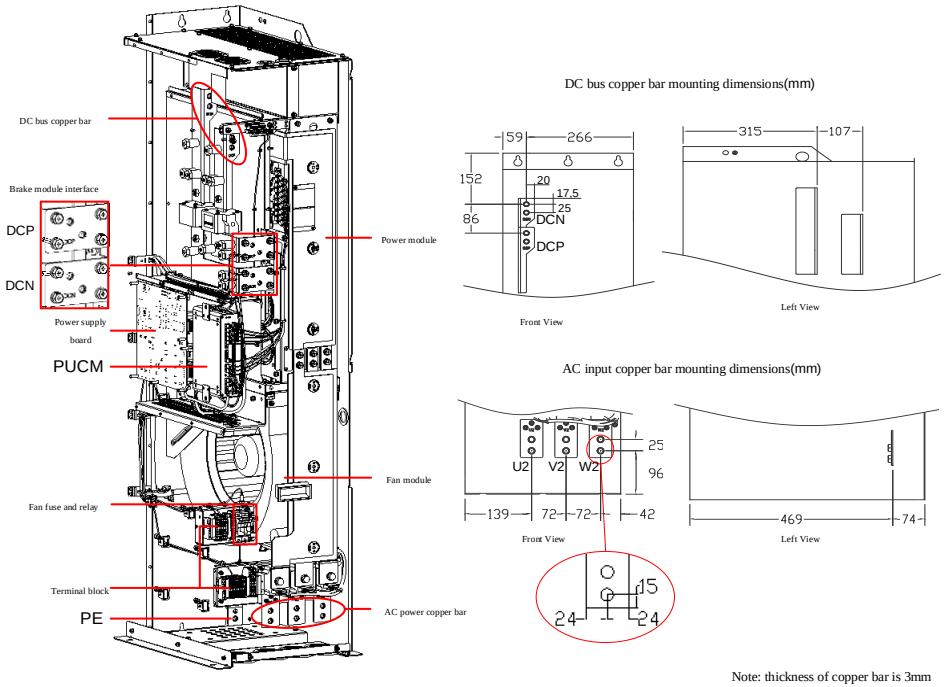


Figure 7-4 GU type internal structure diagram

Terminal name	Terminal function description	Terminal block (torque, N*m)	Cable cross-sectional area(mm^2)
U, V, W	3-Phase AC input terminals	M10(38)	1×240
DCPB, DCNB	Brake module interface	M8(15)	1×25
PE	Protective earth terminal	M10(38)	1×240
DCP, DCN	DC bus output	M10(38)	2×185

7.2.5 **HU type**

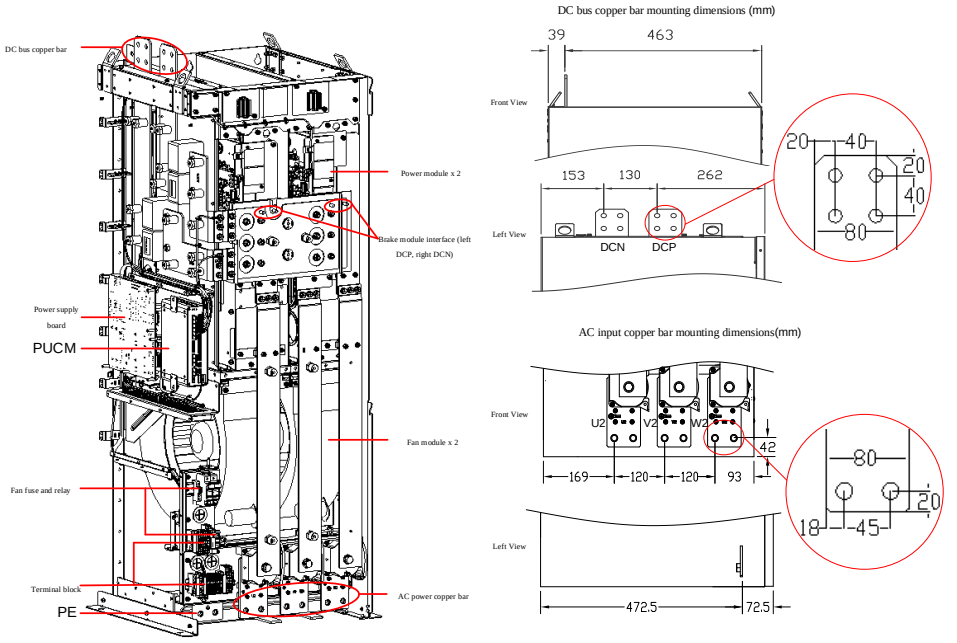


Figure 7-5 HU type internal structure diagram

Terminal name	Terminal function description	Terminal block (torque, N*m)	Cable cross-sectional area(mm^2)
U, V, W	3-Phase AC input terminals	M12(64)	2×240
DCPB, DCNB	Brake module interface	M8(15)	1×25
PE	Protective earth terminal	M12(64)	1×240
DCP, DCN	DC bus output	M12(64)	4×240

7.2.6 **IU type**

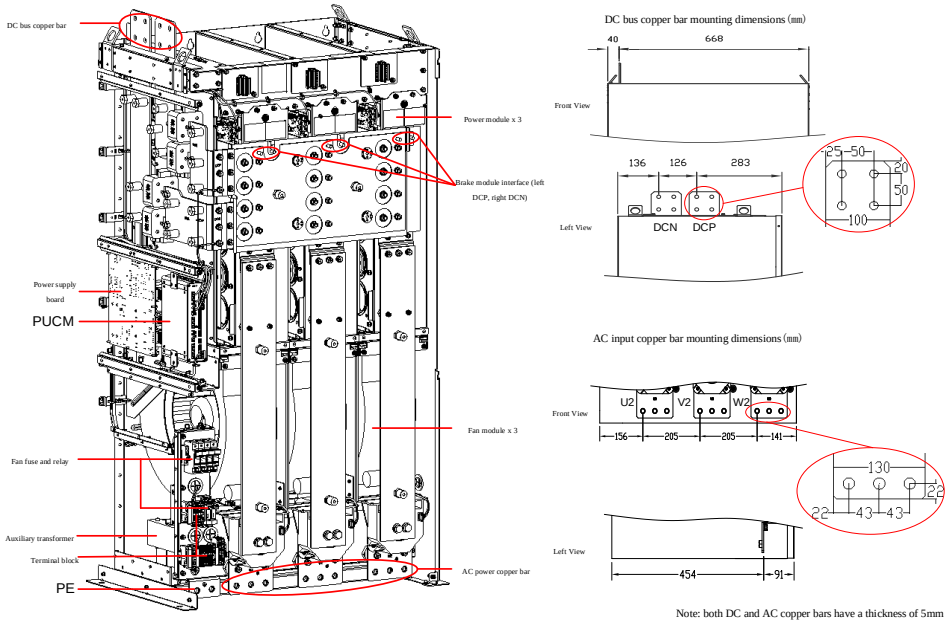


Figure 7-6 IU type internal structure diagram

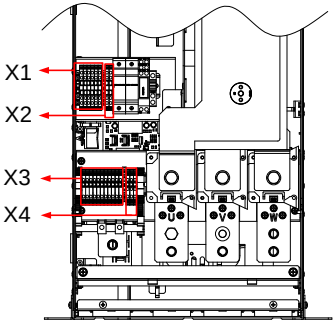
Terminal name	Terminal function description	Terminal block (torque, N*m)	Cable cross-sectional area(mm^2)
U, V, W	3-Phase AC input terminals	M12(64)	2×240
DCPB, DCNB	Brake module interface	M8(15)	1×25
PE	Protective earth terminal	M12(64)	1×240
DCP, DCN	DC bus output	M12(64)	4×240

7.2.7 **Signal interface**

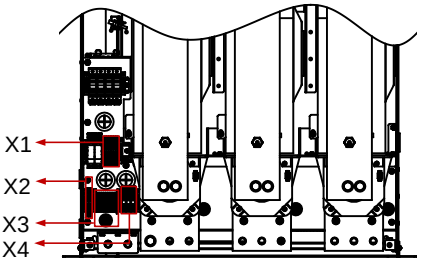
✓ Size 3U~6U type signal interface definition

Signal name	I/O	Description
DI1	I	Reserved
DI2	I	Soft start contactor status feedback
DI3	I	Main contactor status feedback
DI4	I	Input reactor over-temperature fault feedback
DI5~DI8	I	Reserved
XHI2	I	Keyboard interface
1A	O	Soft start, dry contact NC output
1B	O	Soft start, dry contact common end
1C	O	Soft start, dry contact NO output
2A	O	Main contactor start, dry contact NC output
2B	O	Main contactor start, dry contact common end
2C	O	Main contactor start, dry contact NO output
V_A	I	Grid voltage sampling A-phase input
V_B	I	Grid voltage sampling B-phase input
V_C	I	Grid voltage sampling C-phase input

✓ Size FU~IU type signal interface definition



FU, GU type terminal blocks location



HU, IU type terminal blocks location

Figure 7-7 Terminal block location diagram

Table 7-1 X1 terminal block interface information

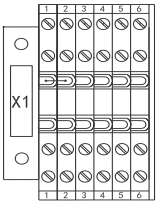
X1 terminal block	Signal name	Pin	I/O	Description
	+24V	1	I	Internal +24V power supply
	+24V	2	I	Internal +24V power supply
	GND	3	I	Internal +24V power ground
	DO1	4	O	Module cooling fan drive
	DO2	5	O	Brake unit enable side
	DO3	6	O	NC

Table 7-2 X2 terminal block interface information

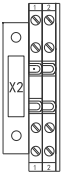
X2 terminal block	Signal name	Pin	I/O	Description
	220V-L	1	I	External 220V-L
	220V-N	2	I	External 220V-N

Table 7-3 X3 terminal block interface information

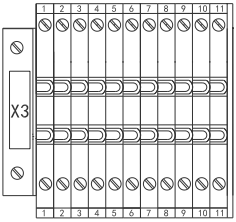
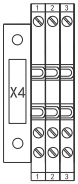
X3 terminal block	Signal name	Pin	I/O	Description
	EP_+24V	1	I	External 24V power supply "24V" input
	EP_GND	2	I	External 24V power supply "GND" input
	DI1	3	I	Auxiliary transformer over-temperature fault feedback
	DI2	4	I	Soft start contactor status feedback
	DI3	5	I	Main contactor status feedback
	DI4	6	I	LCL unit inductor over-temperature fault feedback
	DI5	7	I	Brake unit fault feedback
	KA1	8	O	Soft start contactor drive, dry contact output
	KA2	9	O	
	KBA	10	O	Main contactor drive, dry contact output
	KB2	11	O	

Table 7-4 X4 terminal block interface information

X4 terminal block	Signal name	Pin	I/O	Description
	L1	1	I	U-phase voltage detection/soft start power supply X4.1
	L2	2	I	V-phase voltage detection/soft start power supply X4.2
	L3	3	I	W-phase voltage detection/soft start power supply X4.3

7.3 PRU input switch and fuse selection

Table 7-5 380V~480V PRU input switch assembly and fuse selection

3-phase AC supply voltage: 380V~480V					
Unit model	400V rated power (kW)	Rated current (A)	Switching devices		Recommended parameters for AC side input semiconductor protection fuse (gR)
			Contactor Recommended parameters	Load disconnector switch Recommended parameters	
HD2000-13B00184	11	18	25/690V	25/690V	25/690V
HD2000-13B00244	15	24	32/690V	32/690V	32/690V
HD2000-13B00304	18.5	30	40/690V	40/690V	40/690V
HD2000-13B00354	22	35	50/690V	50/690V	50/690V
HD2000-13B00484	30	48	63/690V	63/690V	63/690V
HD2000-13B00594	37	59	80/690V	80/690V	80/690V
HD2000-13B00724	45	72	110/690V	110/690V	110/690V
HD2000-13B00884	55	88	125/690V	125/690V	125/690V
HD2000-13B01204	75	120	160/690V	160/690V	160/690V
HD2000-13B01454	90	145	200/690V	200/690V	200/690V
HD2000-13B01774	110	177	250/690V	250/690V	250/690V
HD2000-13B02124	132	212	250/690V	250/690V	250/690V
HD2000-13B02574	160	257	315/690V	315/690V	315/690V
HD2000-13B03774	235	377	400/690V	400/690V	400/690V
HD2000-13B04814	300	481	630/690V	630/690V	630/690V
HD2000-13B06094	380	609	800/690V	800/690V	800/690V
HD2000-13B07224	450	722	1000/690V	1000/690V	1000/690V
HD2000-13B08024	500	802	1000/690V	1000/690V	1000/690V
HD2000-13B10104	630	1010	1250/690V	1250/690V	1250/690V
HD2000-13B12834	800	1283	1600/690V	1600/690V	1600/690V
HD2000-13B14434	900	1443	2100/690V	2100/690V	2100/690V

Table 7-6 500V~690V PRU input switch assembly and fuse selection

3-phase AC supply voltage: 500V~690V					
Unit model	690V rated power (kW)	Rated current (A)	Switching devices		Recommended parameters for AC side input semiconductor protection fuse (gR)
			Contactor Recommended parameters	Load disconnector switch Recommended parameters	
HD2000-13B00706	75	70	110/690V	110/690V	110/690V
HD2000-13B00856	90	84	110/690V	110/690V	110/690V
HD2000-13B01036	110	102	125/690V	125/690V	125/690V
HD2000-13B01236	132	123	160/690V	160/690V	160/690V
HD2000-13B01496	160	149	200/690V	200/690V	200/690V
HD2000-13B01866	200	186	250/690V	250/690V	250/690V
HD2000-13B02326	250	232	315/690V	315/690V	315/690V
HD2000-13B02936	315	293	400/690V	400/690V	400/690V
HD2000-13B03726	400	372	450/690V	450/690V	450/690V
HD2000-13B04656	500	465	630/690V	630/690V	630/690V
HD2000-13B05756	560	575	800/690V	800/690V	800/690V
HD2000-13B07446	800	744	1000/690V	1000/690V	1000/690V
HD2000-13B10236	1100	1023	1250/690V	1250/690V	1250/690V
HD2000-13B13026	1400	1302	1600/690V	1600/690V	1600/690V
HD2000-13B14886	1600	1488	2000/690V	2000/690V	2000/690V

7.4 PRU busbar output fuse selection

The Size FU~IU type PRUs of the HD2000 series VFD have built-in DC fuses as standard, so it is not necessary to configure external DC fuses, but the Size 3U~6U type SRUs do not have built-in DC fuses, so external DC fuses are required, the selection of which is shown in the table below:

Table 7-7 Size 3U~6U 380V~480V PRU external DC fuses selection

3-phase AC supply voltage: 380V~480V, DC bus voltage: 500V~750V			
Unit model	Rated power (kW)	DC rated output current (A)	Recommended parameters for DC output semiconductor protection fuse (gR)
HD2000-13B00184	11	20	32 A/1000V
HD2000-13B00244	15	27	40 A/1000V
HD2000-13B00304	18.5	33	50 A/1000V
HD2000-13B00354	22	40	63 A/1000V
HD2000-13B00484	30	54	80 A/1000V
HD2000-13B00594	37	66	110 A/1000V
HD2000-13B00724	45	81	125 A/1000V
HD2000-13B00884	55	99	160 A/1000V
HD2000-13B01204	75	135	200 A/1000V
HD2000-13B01454	90	162	250 A/1000V
HD2000-13B01774	110	198	315 A/1000V

Table 7-8 Size 3U~6U 500V~690V PRU external DC fuses selection

3-phase AC supply voltage: 500V~690V, DC bus voltage: 700V~1200V			
Unit model	Rated power (kW)	DC rated output current (A)	Recommended parameters for DC input semiconductor protection fuse (gR)
HD2000-13B00706	75	78	110/1000V
HD2000-13B00856	90	94	125/1000V

7.5 Unit application

7.5.1 Parallel connection of units

The following must be followed when connecting rectifier units in parallel:

- ✓ Each rectifier unit should be configured with a separate input reactor at its front.
- ✓ Up to four identical rectifier units can be connected in parallel.
- ✓ The parallel units only need to be controlled by a common control unit.
- ✓ In a multi-channel power supply, power should be supplied to the system from a common input point (i.e., different grids are not allowed).
- ✓ Each SRU in the parallel units shall be connected in series to an input reactor.
- ✓ The main contactors located upstream of each pre-charge circuit must be switched on simultaneously.
- ✓ Each rectifier unit must be pre-charged via its own pre-charge circuit.
- ✓ The contactors of each pre-charge circuit must be switched on simultaneously, which can be operated by monitoring the answer signals of the contactors.

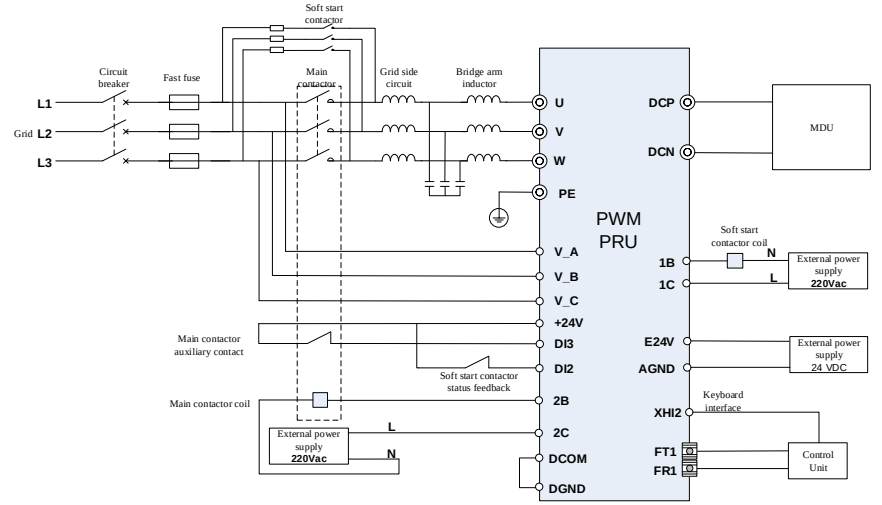
Note:

(1) It is prohibited to connect the units of the same type with different power levels in parallel.

(2) SRU units can be connected in parallel with BRU units of the same power level.

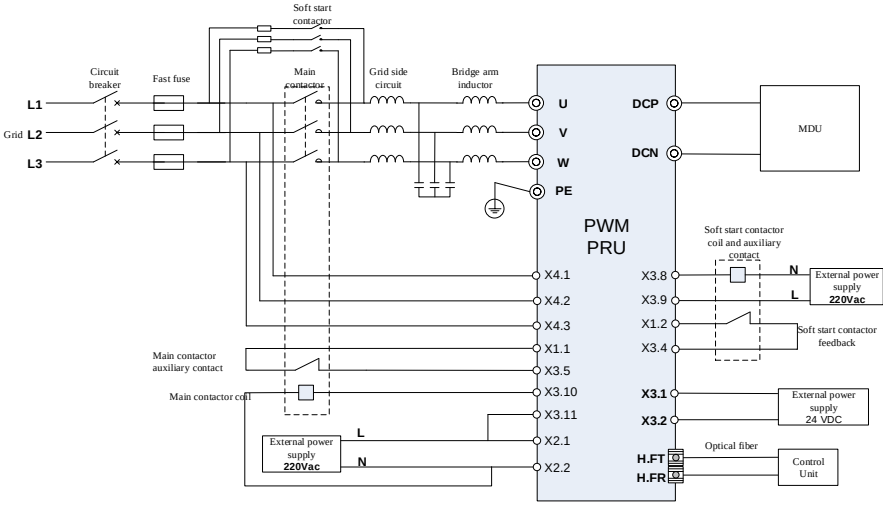
(3) SRU units cannot be connected in parallel with PRU units of the same power level.

7.5.2 **PRU application example**



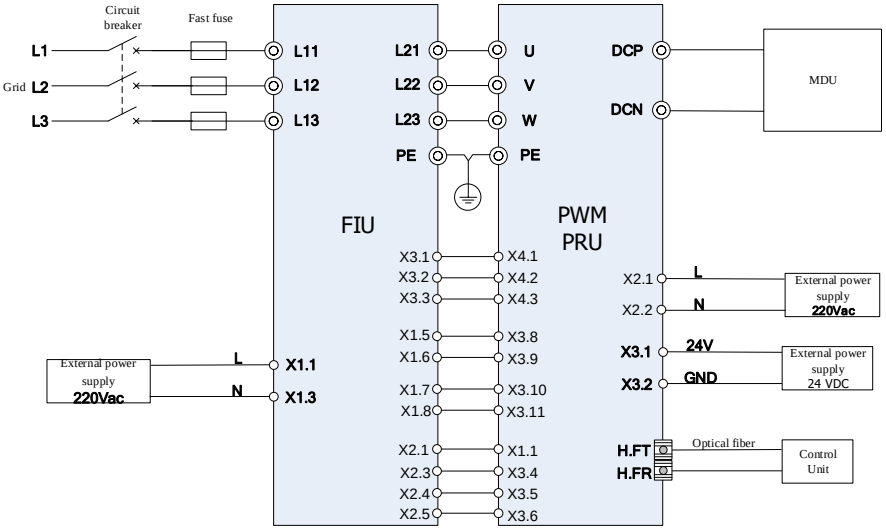
Note: This wiring method requires the user to provide LCL filter, soft start contact and soft start resistor
Applicable types: 400V 11kW~110kW（3U~6U）PRU
690V 75kW~90kW （6U）PRU

Figure 7-8 PRU wiring diagram 1



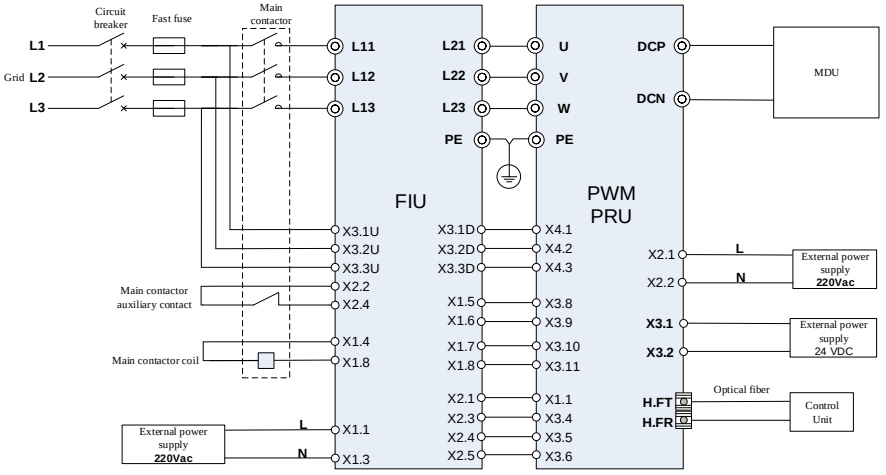
Note: This wiring method requires the user to provide LCL filter, soft start contact and soft start resistor
Applicable types:400V 132kW~900kW PRU
690V 110kW~1600kW PRU

Figure 7-9 PRU wiring diagram 2



Note: This wiring method needs to be used with the Hopewind filter interface unit (built-in main contactor)
Applicable types: 400V 132kW~300kW PRU+FIU
690V 110kW~400kW PRU+FIU

Figure 7-10 PRU wiring diagram 3



Note: This wiring method needs to be used with the Hopewind filter interface unit (without built-in main contactor)
400V 380kW~900kW PRU+FIU
690V 500kW~1400kW PRU+FIU

Figure 7-11 PRU wiring diagram 4

7.6 Filter interface unit FIU

7.6.1 Power specifications

Model	AC current (A)		Matching PRU model	Frame type
	Rated current I_N	Maximum current I_{MAX}		
3-phase AC 400V (380V~480V)				
HD2000-15B00184	18	26	HD2000-13B00184	--
HD2000-15B00244	24	36	HD2000-13B00244	
HD2000-15B00304	30	45	HD2000-13B00304	
HD2000-15B00354	35	53	HD2000-13B00354	
HD2000-15B00484	48	72	HD2000-13B00484	--
HD2000-15B00594	59	89	HD2000-13B00594	
HD2000-15B00724	72	108	HD2000-13B00724	--
HD2000-15B00884	88	132	HD2000-13B00884	
HD2000-15B01204	120	180	HD2000-13B01204	--
HD2000-15B01444	144	217	HD2000-13B01454	
HD2000-15B01764	176	265	HD2000-13B01774	
HD2000-15B02124	212	318	HD2000-13B02124	FU
HD2000-15B02574	257	386	HD2000-13B02574	
HD2000-15B03774	377	566	HD2000-13B03774	GU
HD2000-15B04814	481	722	HD2000-13B04814	
HD2000-14B06094 (1)	609	914	HD2000-13B06094	JU
HD2000-14B07224 (1)	722	1083	HD2000-13B07224	
HD2000-14B08024 (1)	802	1203	HD2000-13B08024	
HD2000-14B10104 (1)	1010	1515	HD2000-13B10104	KU
HD2000-14B12834 (1)	1283	1925	HD2000-13B12834	
HD2000-14B14434 (1)	1443	2165	HD2000-13B14434	
3-phase AC 600V (500V~690V)				
HD2000-15B00706	70	105	HD2000-13B00706	--
HD2000-15B00846	84	126	HD2000-13B00846	
HD2000-15B01026	102	153	HD2000-13B01026	
HD2000-15B01236	123	184	HD2000-13B01236	FU
HD2000-15B01496	149	223	HD2000-13B01496	
HD2000-15B01866	186	279	HD2000-13B01866	GU
HD2000-15B02326	232	349	HD2000-13B02326	
HD2000-15B02936	293	439	HD2000-13B02936	
HD2000-15B03726	372	558	HD2000-13B03726	
HD2000-14B04656 (1)	465	697	HD2000-13B04656	JU
HD2000-14B05756 (1)	575	862	HD2000-13B05756	
HD2000-14B07446 (1)	744	1116	HD2000-13B07446	KU
HD2000-14B10236 (1)	1023	1534	HD2000-13B10236	
HD2000-14B13026 (1)	1302	1952	HD2000-13B13026	
HD2000-14B14886 (1)	1488	2231	HD2000-13B14886	

Note: (1) The marked LCL filter interface unit should be provided with an external bypass contactor. For the selection of the contactor, refer to section 7.3 PRU input switch selection.

(2) The interval time between two soft starts should be longer than 5min. If the interval time is too short, there is a risk of damage to the soft start resistor.

7.6.2 **Internal structure**

✓ FU/GU type

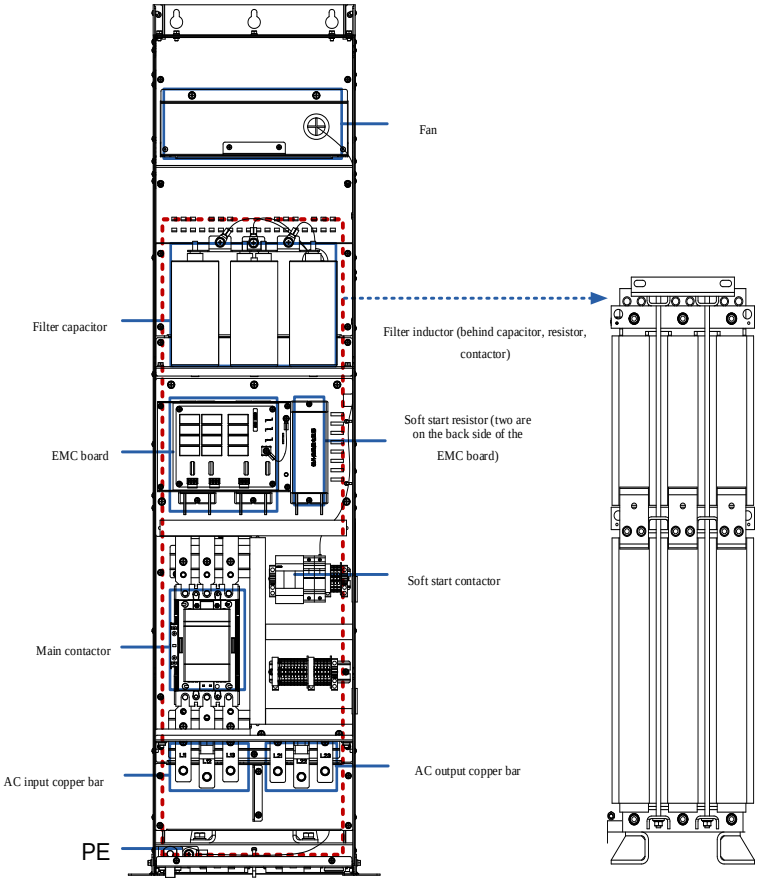


Figure 7-12 FU/GU type internal structure diagram

Terminal name	Terminal function description	Terminal block (torque, N*m)		Cable cross-sectional area(mm^2)	
		FU	GU	FU	GU
L11, L12, L13	3-Phase AC input terminals	M10(38)	M10(38)	2×185	2×185
PE	Protective earth terminal	M10(38)	M10(38)	2×185	2×185
L21, L22, L23	3-Phase AC output terminals	M10(38)	M10(38)	2×185	2×185

✓ JU/KU type

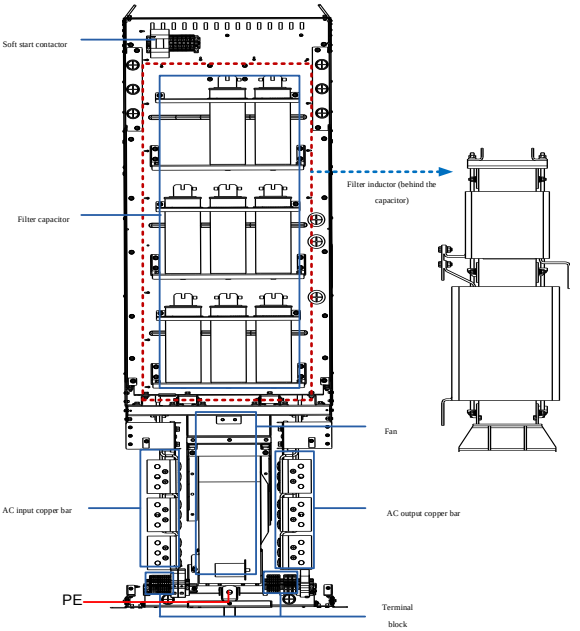


Figure 7-13 JU/KU type internal structure diagram

Terminal name	Terminal function description	Terminal block (torque, N*m)		Cable cross-sectional area(mm^2)	
		JU	KU	JU	KU
L11, L12, L13	3-Phase AC input terminals	M12(64)	M12(64)	4×240	6×240
PE	Protective earth terminal	M12(64)	M12(64)	2×240	6×240
L21, L22, L23	3-Phase AC output terminals	M12(64)	M12(64)	4×240	4×240

7.6.3 **Terminal block**

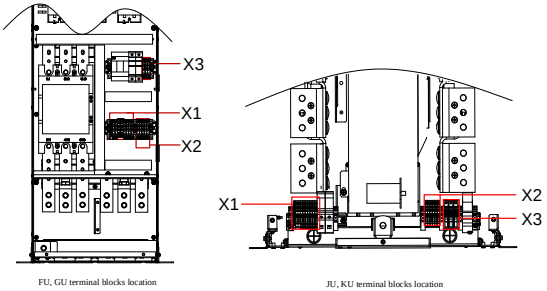


Figure 7-14 Terminal block location diagram

Table 7-9 X1 terminal block interface information

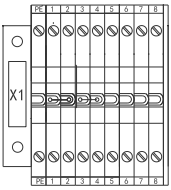
X1 terminal block	Signal name	Pin	I/O	Description
	PE	PE	I	--
	L	1	I	230VAC input
	L	2	I	
	N	3	I	
	N	4	I	
	KA1	5	I	Soft start contactor control
	KA2	6	I	
	KB1	7	I	Main contactor control
	KB2	8	I	

Table 7-10 X2 terminal block interface information

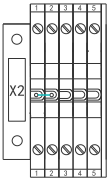
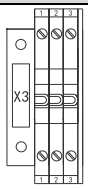
X2 terminal block	Signal name	Pin	I/O	Description
	FBC	1	O	Feedback common output
	FBC	2	O	
	FB1	3	O	Soft start status feedback output
	FB2	4	O	Main contactor status feedback output
	FB3	5	O	Inductor overheating status feedback output

Table 7-11 X3 terminal block interface information

X3 terminal block	Signal name	Pin	I/O	Description
	L1	1	O	Grid voltage detection output terminal
	L2	2	O	
	L3	3	O	

7.6.4 EMC filter board connection cable removal

The PRU does not include an EMC filter board inside, which is on the matching filter interface unit. When the PRU runs on the IT grid, the cable connected on the EMC filter board connection line of the FIU should be connected from hole C to hole A. The basic anti-interference module integrated inside the device should be deactivated.

✓ FU/GU type EMC filter board connection cable removal

For FU type and GU type FIUs, the EMC filter board is located in the middle of the front side of the unit, above the soft start resistor.

The connection cable for the EMC filter board is connected in the B hole and C hole by default. If it is not needed to use an anti-interference module, turn to connect the cable from C hole to A hole.

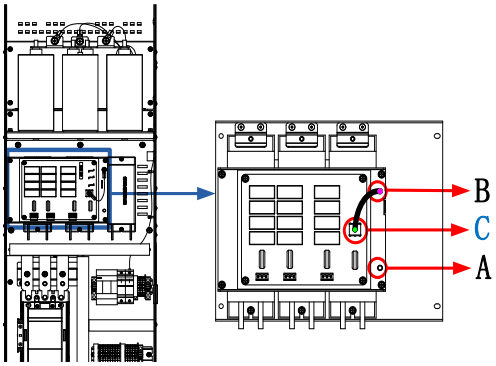


Figure 7-15 FU/GU type EMC filter board connection cable removal

✓ JU/KU type EMC filter board connection cable removal

For JU type and KU type FIUs, the EMC filter board is located on the lower part of the back side inside the unit, behind the cooling fan.

The connection cable for the EMC filter board is connected in the B hole and C hole by default. If it is not needed to use an anti-interference module, turn to connect the cable from C hole to A hole.

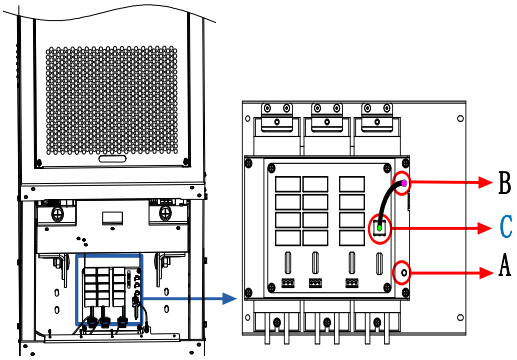


Figure 7-16 JU/KU type EMC filter board connection cable removal

--End of this chapter--

8 Motor Drive Unit - MDU

8.1 Power specifications

Model	Power (kW)		DC input current Rated I_{DC} (A)	AC output current (A)				Frame type
	Rated	Heavy load		Rated I_N	Heavy load I_H	Light load I_L	Maximum I_{max}	
3-phase AC 400V (380V~480V)								
HD2000-16B00174B	7.5	5.5	20	17	15	16	25	3U
HD2000-16B00254B	11	7.5	30	25	22	24	36	
HD2000-16B00324B	15	11	38	32	28	31	47	
HD2000-16B00384B	18.5	15	46	38	34	37	55	
HD2000-16B00464B	22	18.5	55	46	41	45	67	4U
HD2000-16B00604B	30	22	72	60	53	58	87	
HD2000-16B00754(B)	37	30	90	75	67	73	109	5U
HD2000-16B00914(B)	45	37	109	91	81	88	132	
HD2000-16B01254(B)	55	45	150	125	111	121	182	6U
HD2000-16B01564(B)	75	55	187	156	139	151	227	
HD2000-16B01804(B)	90	75	216	180	160	175	262	
HD2000-16B02104(B)	110	90	252	210	187	204	306	FU
HD2000-16B02604	132	110	312	260	231	252	378	
HD2000-16B03104	160	132	372	310	276	301	451	GU
HD2000-16B03804	200	160	456	380	338	369	553	
HD2000-16B04904	250	200	588	490	436	475	713	
HD2000-16B06054	315	250	726	605	538	587	880	HU
HD2000-16B07454	400	315	894	745	663	723	1084	
HD2000-16B08404	450	400	1008	840	748	815	1222	
HD2000-16B09854	560	450	1182	985	877	955	1433	IU
HD2000-16B12604	710	560	1512	1260	1121	1222	1833	
HD2000-16B14054	800	710	1686	1405	1250	1363	2044	
3-phase AC 600V (500V~690V)								
HD2000-16B00636(B)	55	45	76	63	56	61	92	6U
HD2000-16B00866(B)	75	55	103	86	77	83	125	
HD2000-16B01006(B)	90	75	120	100	89	97	146	
HD2000-16B01206	110	90	144	120	107	116	175	FU
HD2000-16B01506	132	110	180	150	134	146	218	
HD2000-16B01756	160	132	210	175	156	170	255	GU
HD2000-16B02156	200	160	258	215	191	209	313	
HD2000-16B02606	250	200	312	260	231	252	378	
HD2000-16B03306	315	250	396	330	294	320	480	
HD2000-16B04106	400	315	492	410	365	398	597	HU
HD2000-16B04656	450	400	558	465	414	451	677	
HD2000-16B05756	560	450	690	575	512	558	837	
HD2000-16B07356	710	630	852	710	632	689	1033	IU

Model	Power (kW)		DC input current Rated I_{DC} (A)	AC output current (A)				Frame type
	Rated	Heavy load		Rated I_N	Heavy load I_H	Light load I_L	Maximum I_{max}	
HD2000-16B08106	800	710	972	810	721	786	1179	
HD2000-16B09106	900	800	1092	910	810	883	1324	
HD2000-16B10256	1000	900	1230	1025	912	994	1491	
HD2000-16B12706	1200	1000	1524	1270	1130	1232	1848	
HD2000-16B14826	1400	1200	1778	1482	1319	1438	2156	

Note: 400V/30kW and below MDUs are configured with brake units as standard, (B) means optional with brake unit, other models of MDU, according to the actual needs of the site, are separately configured with optional brake units of appropriate capacity and number

8.2 Internal structure

8.2.1 3U, 4U type

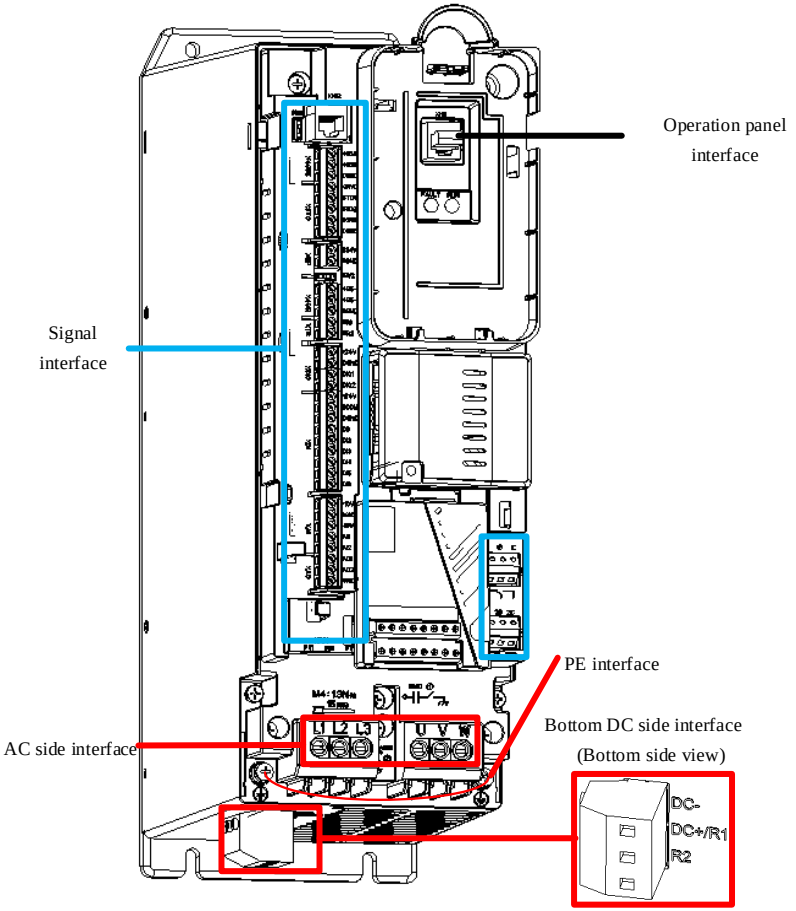


Figure 8-1 3U, 4U type internal structure diagram

Terminal name	Terminal function description	Terminal block (torque, N*m)		Cable cross-sectional area(mm^2)	
		3U	4U	3U	4U
DC-, DC+/R1, R2 (Bottom of the unit)	DC bus terminals and brake resistor terminals	M4(1.7)	M4(1.7)	6	16
L1, L2, L3	Not used	--	--	--	--
PE	Protective earth terminal	M3(0.7)	M3(0.7)	See Table 3-1	
U, V, W	3-Phase AC output terminals	M4(1.3)	M5(2.0)	6	16

8.2.2 **5U, 6U type**

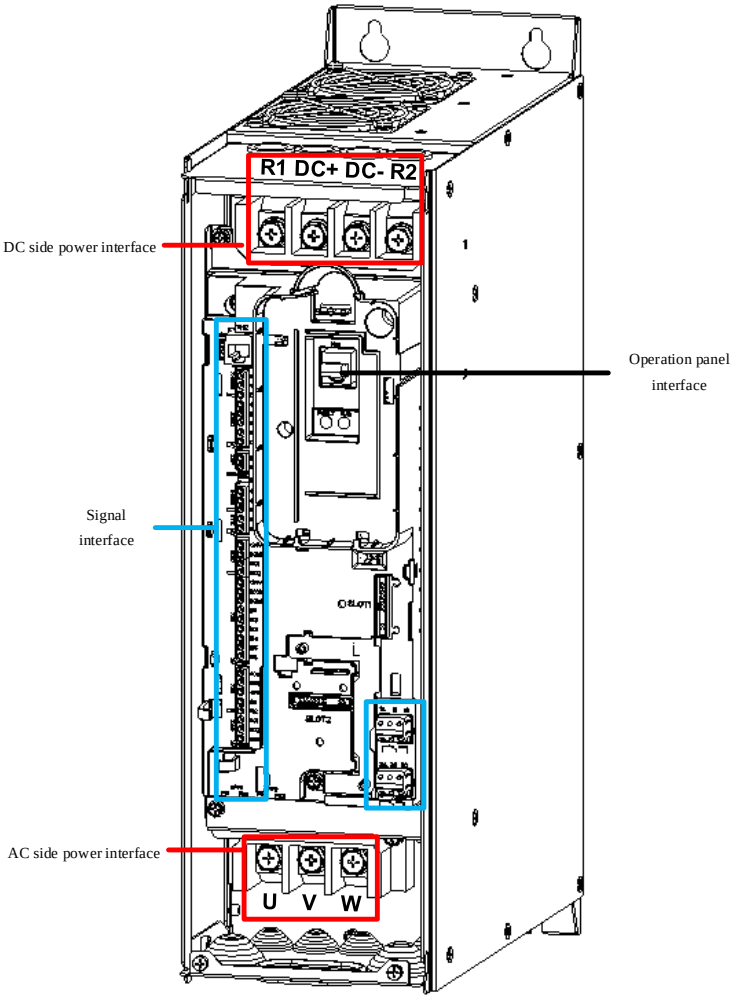


Figure 8-2 5U, 6U type internal structure diagram

Terminal name	Terminal function description	Terminal block (torque, N*m)		Cable cross-sectional area(mm^2)	
		5U	6U	5U	6U
DC+, DC-	DC input terminals	M8(4.5)	M10(4.5)	25	70
R1、R2	External brake resistor terminals	M8(4.5)	M10(4.5)	16	50
PE (right side of AC side power interface)	Protective earth terminal	M6(4.5)	M6(4.5)	16	50
U, V, W	3-Phase AC output terminals	M8(4.5)	M10(4.5)	25	70

8.2.3 **FU type**

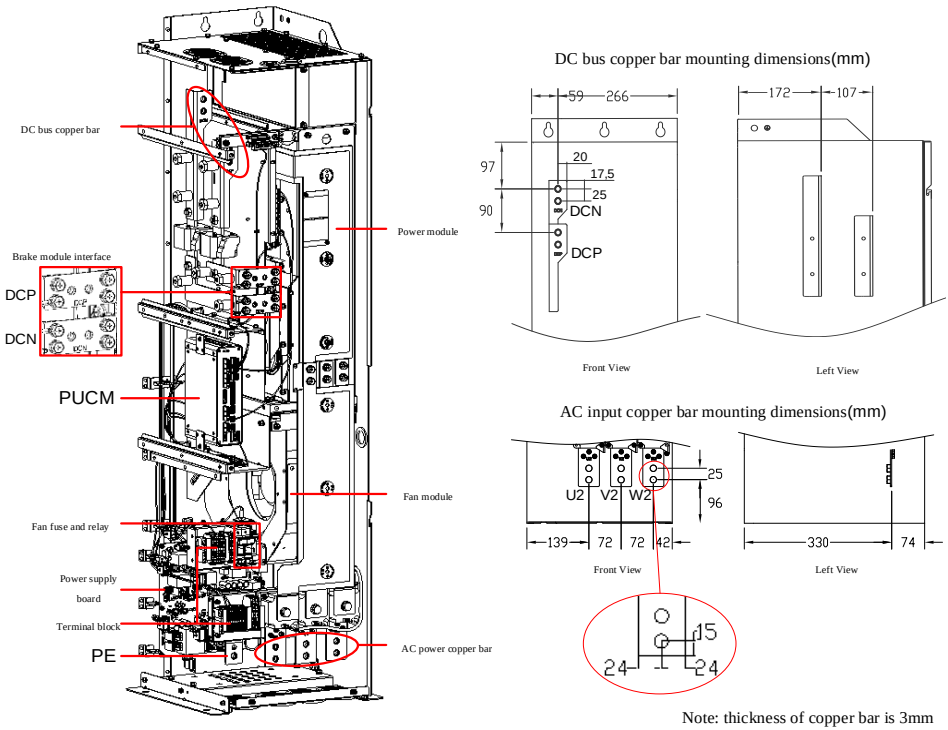
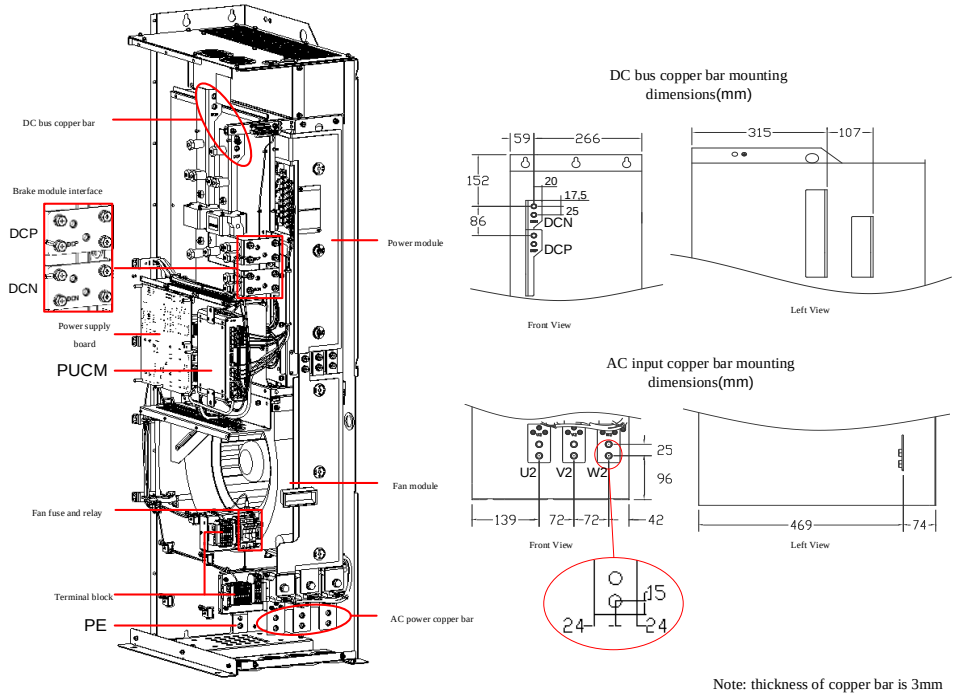


Figure 8-3 FU type internal structure diagram

Terminal name	Terminal function description	Terminal block (torque, N*m)	Cable cross-sectional area(mm^2)
U, V, W	3-Phase AC output terminals	M10(38)	1×240
DCPB, DCNB	Brake module interface	M8(15)	1×25
PE	Protective earth terminal	M10(38)	1×240
DCP, DCN	DC bus input	M10(38)	1×240

8.2.4 **GU type**

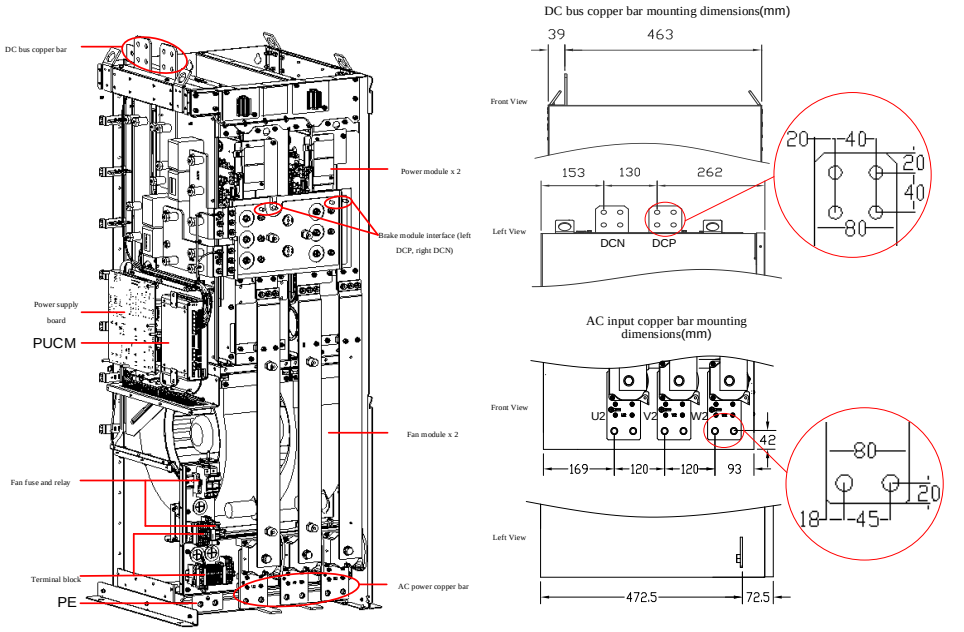


Note: thickness of copper bar is 3mm

Figure 8-4 GU type internal structure diagram

Terminal name	Terminal function description	Terminal block (torque, N*m)	Cable cross-sectional area(mm^2)
U, V, W	3-Phase AC output terminals	M10(38)	1×240
DCPB, DCNB	Brake module interface	M8(15)	1×25
PE	Protective earth terminal	M10(38)	1×240
DCP, DCN	DC bus input	M10(38)	2×185

8.2.5 **HU type**

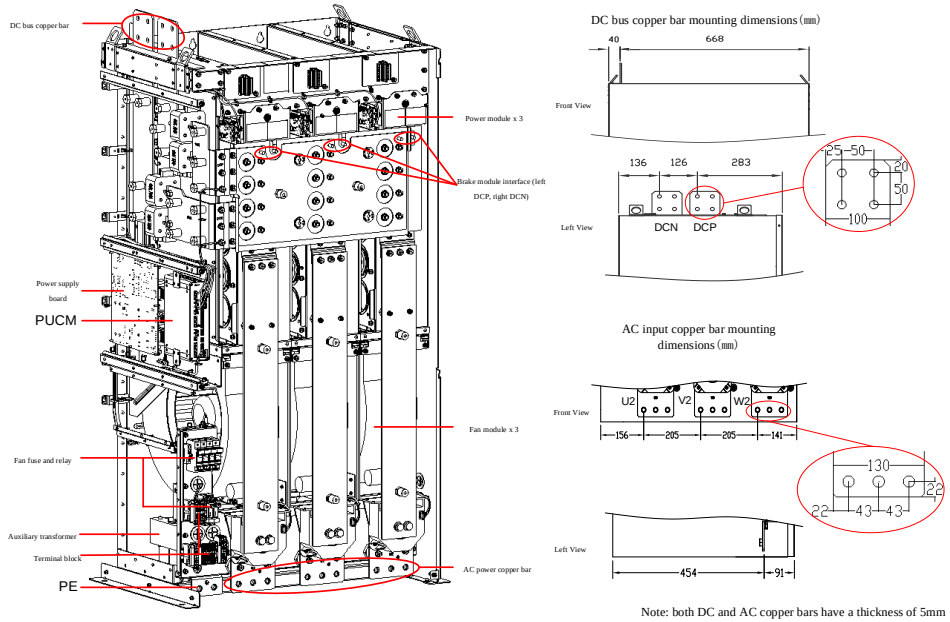


Note: both DC and AC copper bars have a thickness of 5mm

Figure 8-5 HU type internal structure diagram

Terminal name	Terminal function description	Terminal block (torque, N*m)	Cable cross-sectional area(mm^2)
U, V, W	3-Phase AC output terminals	M12(64)	2×240
DCPB, DCNB	Brake module interface	M8(15)	1×25
PE	Protective earth terminal	M12(64)	1×240
DCP, DCN	DC bus input	M12(64)	4×240

8.2.6 **IU type**



Note: both DC and AC copper bars have a thickness of 5mm

Figure 8-6 IU type internal structure diagram

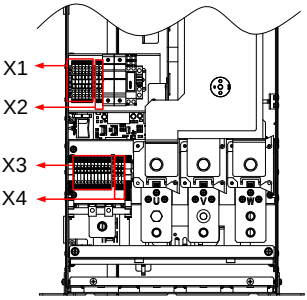
Terminal name	Terminal function description	Terminal block (torque, N*m)	Cable cross-sectional area(mm^2)
U, V, W	3-Phase AC output terminals	M12(64)	2×240
DCPB, DCNB	Brake module interface	M8(15)	1×25
PE	Protective earth terminal	M12(64)	1×240
DCP, DCN	DC bus input	M12(64)	4×240

8.2.7 **Signal interface**

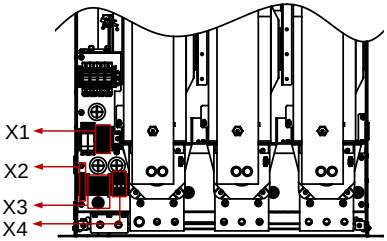
✓ Size 3U~6U type signal interface definition

Signal name	I/O	Description
DI1	I	Reserved
DI2	I	Reserved
DI3	I	Reserved
DI4	I	Reserved
DI5	I	Reserved
DI6	I	Reserved
DI7	I	Reserved
DI8	I	Reserved
XHI2	I	Keyboard interface
1A	O	Reserved
1B	O	Reserved
1C	O	Reserved
2A	O	Reserved
2B	O	Reserved
2C	O	Reserved
V_A	I	Motor port voltage sampling U-phase input
V_B	I	Motor port voltage sampling V-phase input
V_C	I	Motor port voltage sampling W-phase input

✓ Size FU~IU type signal interface definition



FU, GU type terminal blocks location



HU, IU type terminal blocks location

Figure 8-7 Terminal block location diagram

Table 8-1 X1 terminal block interface information

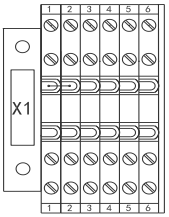
X1 terminal block	Signal name	Pin	I/O	Description
	+24V	1	I	Internal +24V power supply
	+24V	2	I	Internal +24V power supply
	GND	3	I	Internal +24V power ground
	DO1	4	O	Module cooling fan drive
	DO2	5	O	Brake unit enable side
	DO3	6	O	Reserved

Table 8-2 X2 terminal block interface information

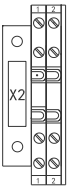
X2 terminal block	Signal name	Pin	I/O	Description
	220V-L	1	I	External 220V-L
	220V-N	2	I	External 220V-N

Table 8-3 X3 terminal block interface information

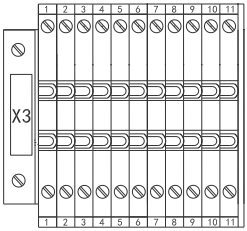
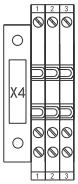
X3 terminal block	Signal name	Pin	I/O	Description
	EP_+24V	1	I	External 24V power supply "24V" input
	EP_GND	2	I	External 24V power supply "GND" input
	DI1	3	I	NC
	DI2	4	I	NC
	DI3	5	I	NC
	DI4	6	I	NC
	DI5	7	I	NC
	KA1	8	O	NC
	KA2	9	O	
	KBA	10	O	NC
	KB2	11	O	

Table 8-4 X4 terminal block interface information

X4 terminal block	Signal name	Pin	I/O	Description
	L1	1	I	U-phase voltage detection
	L2	2	I	V-phase voltage detection
	L3	3	I	W-phase voltage detection

8.3 MDU busbar input fuse selection

The Size FU~IU type MDUs of the HD2000 series VFD have built-in DC fuses as standard, so it is not necessary to configure external DC fuses, but the Size 3U~6U type SRUs do not have built-in DC fuses, so external DC fuses are required, the selection of which is shown in the table below:

Table 8-5 Size 3U~6U 380V~480V MDU external DC fuses selection

3-phase AC supply voltage: 380V~480V, DC bus voltage: 500V~750V			
Unit model	Rated power (kW)	DC rated input current (A)	Recommended parameters for DC input semiconductor protection fuse (gR)
HD2000-16B00174B	7.5	20	32 A/1000V
HD2000-16B00254B	11	30	40 A/1000V
HD2000-16B00324B	15	38	50 A/1000V
HD2000-16B00384B	18.5	46	63 A/1000V
HD2000-16B00464B	22	55	80 A/1000V
HD2000-16B00604B	30	72	110 A/1000V
HD2000-16B00754(B)	37	90	125 A/1000V
HD2000-16B00914(B)	45	109	160 A/1000V
HD2000-16B01254(B)	55	150	200 A/1000V
HD2000-16B01564(B)	75	187	250 A/1000V
HD2000-16B01804(B)	90	216	315 A/1000V

Table 8-6 Size 3U~6U 500V~690V MDU external DC fuses selection

3-phase AC supply voltage: 500V~690V, DC bus voltage: 700V~1200V			
Unit model	Rated power (kW)	DC rated input current (A)	Recommended parameters for DC input semiconductor protection fuse (gR)
HD2000-16B00636(B)	55	76	110 A/1000V
HD2000-16B00866(B)	75	103	160 A/1000V
HD2000-16B01016(B)	90	120	200 A/1000V

8.4 MDU output reactor selection

The output reactor of the MDU of HD2000 series VFD is selected according to the rated voltage of 400V/690V, and that the reactor voltage drop is 2% of rated voltage at rated current.

Table 8-7 380V~480V MDU output reactor selection

3-phase AC supply voltage: 380V~480V			
Unit model	Rated power (kW)	Rated current (A)	Recommended output reactor inductance (mH)
HD2000-16B00174B	7.5	17	0.433
HD2000-16B00254B	11	25	0.294
HD2000-16B00324B	15	32	0.230
HD2000-16B00384B	18.5	38	0.194
HD2000-16B00464B	22	46	0.160
HD2000-16B00604B	30	60	0.123
HD2000-16B00754(B)	37	75	0.098
HD2000-16B00914(B)	45	91	0.081
HD2000-16B01254(B)	55	107	0.069
HD2000-16B01564(B)	75	146	0.050
HD2000-16B01804(B)	90	176	0.042
HD2000-16B02104	110	210	0.035
HD2000-16B02604	132	260	0.028
HD2000-16B03104	160	310	0.024
HD2000-16B03804	200	380	0.019
HD2000-16B04904	250	490	0.015
HD2000-16B06054	315	605	0.012
HD2000-16B07454	400	745	0.010
HD2000-16B08404	450	840	0.009
HD2000-16B09854	560	985	0.007
HD2000-16B12604	710	1260	0.006
HD2000-16B14054	800	1405	0.005

Table 8-8 500V~690V MDU output reactor selection

3-phase AC supply voltage: 500V~690V			
Unit model	Rated power (kW)	Rated current (A)	Recommended output reactor inductance (mH)
HD2000-16B00636(B)	55	63	0.201
HD2000-16B00866(B)	75	86	0.148
HD2000-16B01016(B)	90	101	0.126
HD2000-16B01206	110	120	0.106
HD2000-16B01506	132	150	0.085
HD2000-16B01756	160	175	0.072
HD2000-16B02156	200	215	0.059
HD2000-16B02606	250	260	0.049
HD2000-16B03306	315	330	0.038
HD2000-16B04106	400	410	0.031
HD2000-16B04656	450	465	0.027
HD2000-16B05756	560	575	0.022
HD2000-16B07356	710	735	0.017
HD2000-16B08106	800	810	0.016
HD2000-16B09106	900	910	0.014

HD2000-16B10256	1000	1025	0.012
HD2000-16B12706	1200	1270	0.010
HD2000-16B14886	1400	1488	0.009

8.5 Unit application

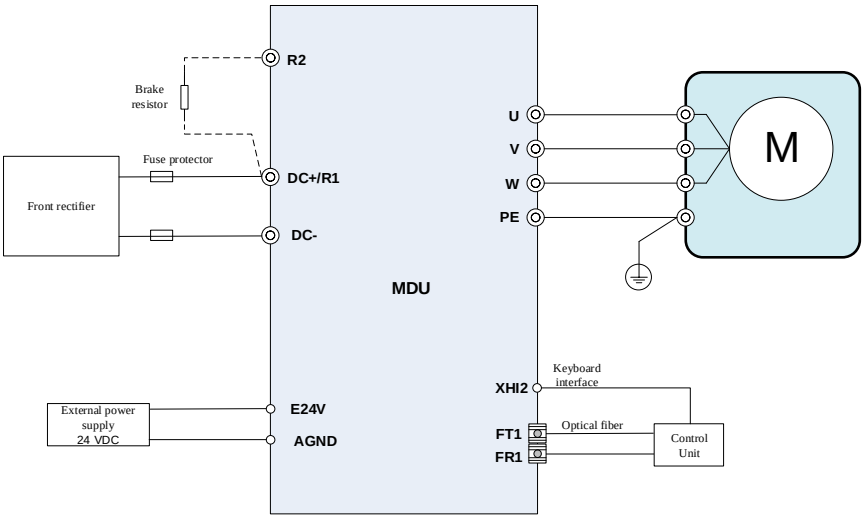
8.5.1 Parallel connection of units

The following must be followed when connecting MDUs in parallel:

- ✓ Up to 4 identical MDUs can be connected in parallel.
- ✓ The units connected in parallel must be controlled by a common control unit.
- ✓ The power cables of the motors must be of the same length to maintain consistent 3-phase impedance.
- ✓ The individual motor modules must be powered by a common DC bus.
- ✓ For motors with single winding systems, motor reactors must be used.

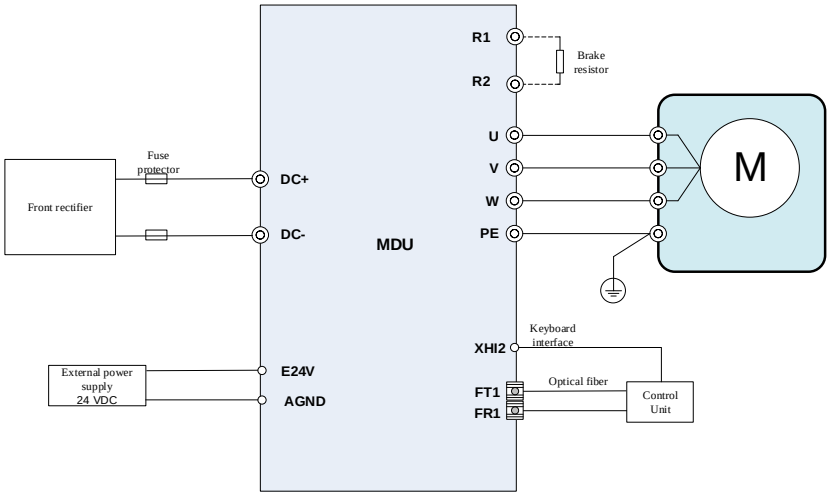
Note: Parallel connection of the units with different power levels is prohibited.

8.5.2 MDU application example



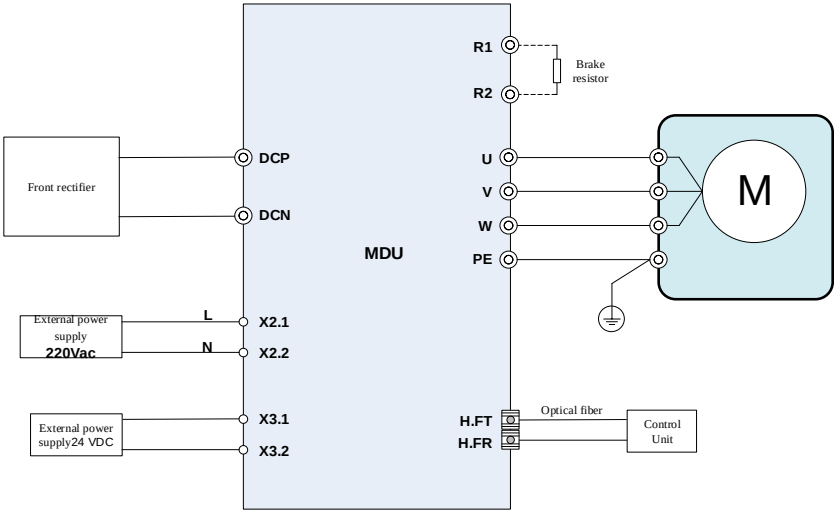
Note: MDU without internal busbar fuse, Applicable types: 400V 7.5kW~30kW MDU Size 3U~4U

Figure 8-8 MDU application example 1



Note: MDU without internal busbar fuse, Applicable types:
400V 37kW~90kW MDU Size 5U~6U
690V 55kW~90kW MDU Size 6U

Figure 8-9 MDU application example 2



Note: MDU with internal busbar fuse, Applicable types:
400V 110kW~800kW MDU Size FU~IU
690V 110kW~1400kW MDU Size FU~IU

Figure 8-10 MDU application example 3

--End of this chapter--

9 Power Brake Unit - PBU

The PBU includes power electronic devices and associated control circuits. The brake unit can run as connected in parallel to other brake units, but each brake unit must be equipped with a separate brake resistor.

9.1 Decentralized brake unit

9.1.1 Power specifications

Table 9-1 Decentralized PBU specifications table

Model	Grid voltage (V)	Minimum brake resistance (Ω)	Rated power P_{DB} (kW)	Peak power P_{15} (kW)	Brake start voltage (V)	Brake end voltage (V)
AC input voltage: 380V~480V						
HD2000-19B01614	480	4.8	25	125	774	735
	380		19	95	673	639
HD2000-19B03234	480	2.4	50	250	774	735
	380		38	189	673	639
AC input voltage: 500V~600V						
HD2000-19B01296	600	7.5	25	125	967	919
	500		19	95	841	799
HD2000-19B02596	600	3.7	50	250	967	919
	500		38	189	841	799
AC input voltage: 660V~690V						
HD2000-19B01086	690	10.7	25	125	1158	1100
	660		21	107	1070	1017
HD2000-19B02166	690	5.4	50	250	1158	1100
	660		43	213	1070	1017

9.1.2 Structure and interface

The side view of the decentralized PBU is as follows:

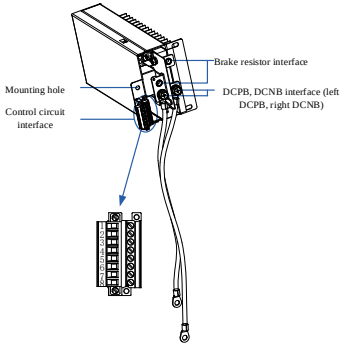


Figure 9-1 Decentralized PBU

✓ Control circuit interface

Pin	Signal name	Description
1	FB	Dry contact terminal 1 for fault feedback
2	FA	Dry contact terminal 2 for fault feedback
3	GND	GND of the power supply
4	MSDO	DO for master-slave control
5	MSDI	DI for master-slave control
6	EN	Brake enable/control
7	24V	Power supply
8	GND	GND of the power supply

✓ Load interface

Terminal function description	Terminal block (torque, N*m)	Cable cross-sectional area(mm^2)
DCPB, DCNB	M8 (12)	1×25
brake resistor interface	M8 (12)	1×25

9.1.3 **Installation and wiring**

According to the size of the units of the HD2000 series VFD, up to three mounting positions are available for use:

Rectifier unit or motor drive unit Size	Number of mounting positions
DU type	1
EU type	1
FU type	1
GU type	1
HU type	2
IU type	3

The decentralized PBU is mounted in a reserved mounting position inside the VFD and is cooled by an internal fan. The brake unit is powered by a 24V power supply in the rectifier unit or drive unit.

If the decentralized PBU is not mounted in a mounting position within the complete VFD, the following requirements must be met:

- ✓ The air flow required for normal heat dissipation from the PBU is required to be not less than 0.1 m3/s.
- ✓ It is necessary to connect any one of the three mounting holes of the PBU to the PE connector at the bottom of the complete VFD.

9.1.3.1 Brake mode setup

The decentralized brake unit has two brake modes:

- ✓ **Self-control mode:** The brake unit detects the bus voltage and enables braking when the bus voltage exceeds the threshold value.

✓ **Controlled mode:** The brake unit does not detect the bus voltage. The PUCM of the rectifier unit or motor drive unit gives the braking signal. After receiving the braking signal, the brake unit enables braking, and its brake start voltage and end voltage are determined by the function code.

The control mode of the brake unit should be set before installing the decentralized brake unit into place. The control mode is set via a dip switch on the brake unit's single board.

Caution

The default dip switch is set as follows:

✓ The default settings are "480V" and "self-control mode" for models with grid voltage at 380V~480V AC.

✓ The default settings are "690V" and "self-control mode" for models with grid voltage at 500V~690V AC.

✓ Setup steps

1. Remove the two screws at the bottom of the brake unit. Push the cover of the brake unit along the bottom until the cover is completely removed.

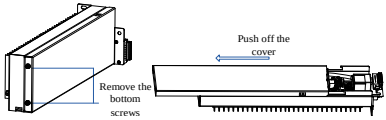


Figure 9-2 Remove the screws and push off the cover

2. Determine the locations of dip switches SW1 and SW2.

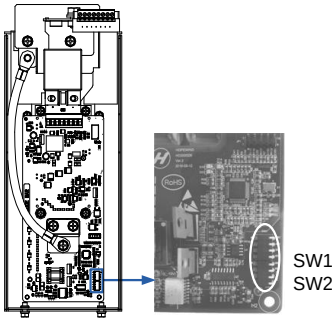


Figure 9-3 Locations of DIP switches

3. Set the control mode according to different working conditions.

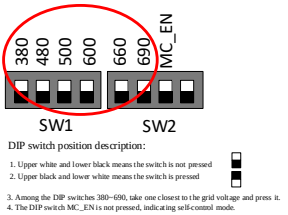


Figure 9-4 Switch settings in self-control mode

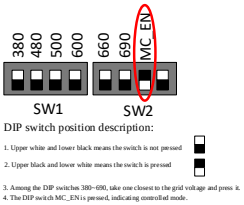


Figure 9-5 Switch settings in controlled mode

4. Once the setup is complete, put the control unit cover on and screw up the two screws on the bottom.

9.1.3.2 Installation and wiring of single brake unit

Single brake unit is usually installed into FU/GU type rectifier unit/motor drive unit.

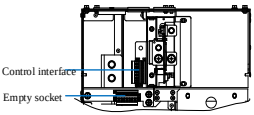
✓ Installation steps

1. Unscrew the two screws on the lower part of the front door panel and remove the front door panel; remove the slot sealing plate at the brake unit mounting position.

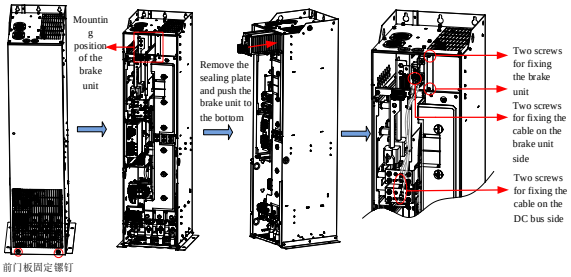
2. Place the brake unit in the mounting position (with the terminal end facing outwards) and push it to the bottom.

3. Fix the brake unit. Fix the connection cable between the brake module and the DC bus.

4. Unplug the terminal from the empty socket and plug it into the control interface of the brake unit as shown in the figure below:



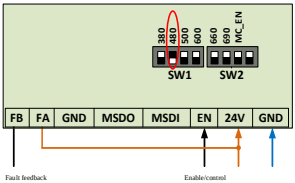
5. Install the front door panel and tighten the two screws on the lower part of the front cover.



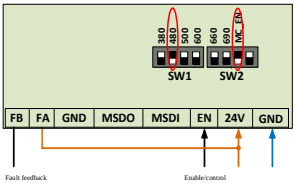
✓ Wiring instructions

When only 1 brake unit is installed in the rectifier unit/motor drive unit:

➢ The system voltage is 400V, the brake unit voltage level is selected at 480V, and the braking mode is self-control mode



➢ The system voltage is 400V, the brake unit voltage gear selects 480V, and the braking mode is controlled mode

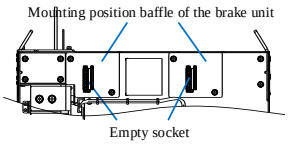


9.1.3.3 Installation and wiring of multiple brake units

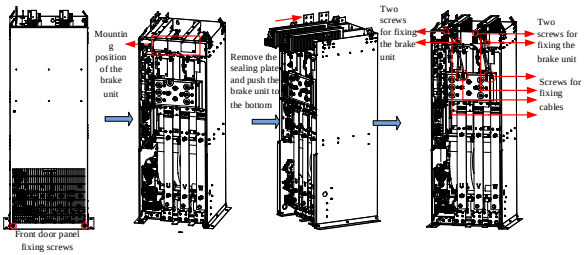
The HU/IU type rectifier unit/motor drive unit can be fitted with up to three brake units. The master brake unit is mounted on the far left side.

✓ Installation steps

1. Unscrew the two screws on the lower part of the front door panel and remove the front door panel.
2. Unplug the terminal connected to the slot sealing plate in the mounting position, the socket position is shown in the figure below. Remove the sealing plate, put the brake unit into the mounting position (with the terminal block end facing outwards) and push it to the bottom.



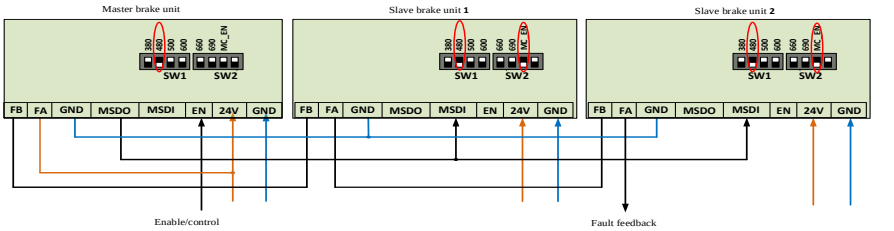
3. Fix the brake unit. Fix the connection cable connecting the brake unit to the DC bus.
4. Plug the previously unplugged terminals into the control interface of the brake unit in the same order as before.
5. Put on the front cover and tighten the two screws on the lower part of the front cover.



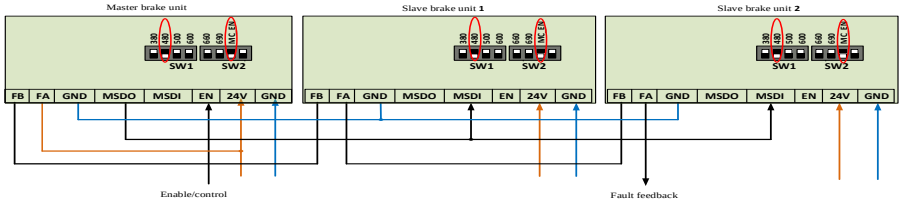
✓ Wiring instructions

When there are 2~3 brake units installed in the unit, it is necessary to connect the brake units in parallel by wiring. The control mode of the brake unit is determined by the master brake unit and the slave brake unit is always in controlled mode, so it is only needed to select the master brake unit operating mode.

For example, if the system voltage is 400V, the brake unit voltage level is 480V, and the braking mode is self-control mode.



For example, if the system voltage is 400V, the brake unit voltage level is 480V, and the braking mode is controlled mode.



9.2 Centralized brake unit

9.2.1 Power specifications

Table 9-2 Centralized brake unit specifications table

Model	Grid voltage (V)	Minimum brake resistance (Ω)	Rated power P_{DB} (kW)	Peak power P_{15} (kW)	Brake start voltage (V)	Brake end voltage (V)
AC input voltage: 380V~480V						
HD2000-18B06504	480	0.82	200	730	774	735

Model	Grid voltage (V)	Minimum brake resistance (Ω)	Rated power P_{DB} (kW)	Peak power P_{15} (kW)	Brake start voltage (V)	Brake end voltage (V)
	380		151	552	673	639
HD2000-18B12004	480	0.43	370	1380	774	735
	380		280	1043	673	639
AC input voltage: 500V~600V						
HD2000-18B05806	600	1.13	220	830	967	919
	500		166	628	841	799
HD2000-18B11006	600	0.59	420	1580	967	919
	500		318	1195	841	799
AC input voltage: 660V~690V						
HD2000-18B05206	690	1.46	240	920	1158	1100
	660		205	785	1070	1017
HD2000-18B10006	690	0.79	460	1700	1158	1100
	660		393	1451	1070	1017

9.2.2 **Structure and interface**

The centralized PBU size (LU type, W*H*D, mm) is 310*1300*543. See Figure 2-5 and Table 2-1 for the installation dimensions. Unit internal structure is shown in the figure below:

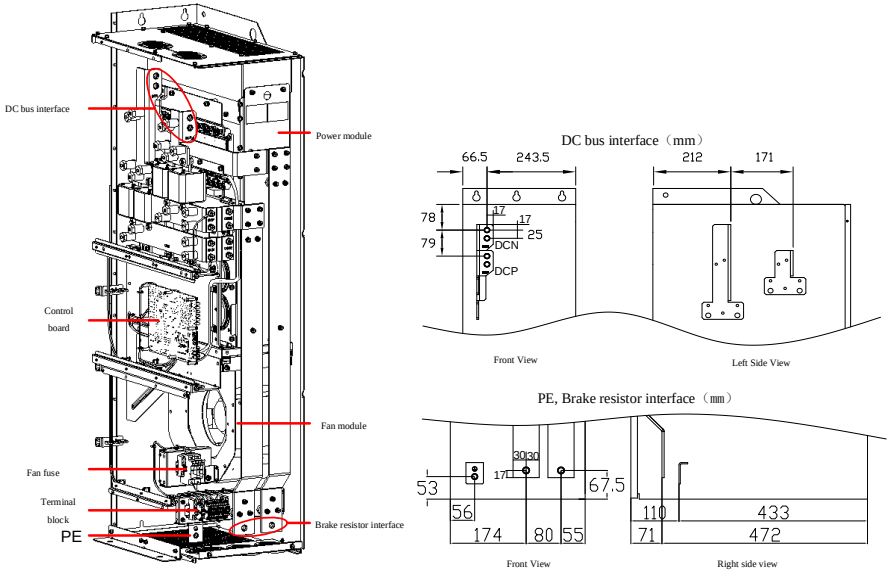


Figure 9-6 Internal structure of centralized brake unit

Terminal function description	Terminal block (torque, N*m)	Cable cross-sectional area(mm^2)
DC bus interface DCP, DCN	M12(64)	See Table 9-30

brake resistor interface	M12(64)	See Table 9-30
PE interface	M10(38)	--

✓ DC busbar interface DCP/DCN

The DC bus copper bar is located internally and it is recommended that the brake unit be installed close to the rectifier/inverter unit with the maximum power (as close as possible while meeting the installation spacing requirements) and connected with a flexible copper bar. For cable connection, please refer to the same type of brake resistor cable for the specification of the cable. The DC bus can be connected to the external common DC busbar via a flexible copper bar (cable) (designed by user, please meet the relevant safety requirements). Please determine the length of the flexible copper bar or cable according to the actual within the range required by the specification.

✓ Recommended cable size for brake resistor interface

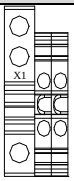
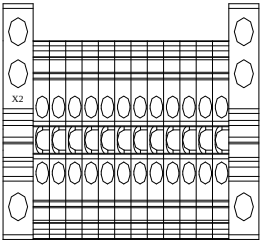
Table 9-3 Recommended specifications for brake resistor interface

Model	Recommended cable cross-sectional area for brake resistor interface (mm^2)
HD2000-18B06504	≤80
HD2000-18B12004	≤180
HD2000-18B05806	≤60
HD2000-18B11006	≤140
HD2000-18B05206	≤50
HD2000-18B10006	≤125

The recommended cable specifications are designed with reference to the rated power P_{DB} of the centralized brake unit. If the actual average braking power of the customer exceeds this parameter, a corresponding cable of higher specification shall be selected.

✓ Terminal block

Table 9-4 Terminal block interface description

X1 terminal block		
	X1-1	220V-L input
	X1-2	220V-N input
X2 terminal block		
	X2-1	24V input
	X2-2	24V input ground
	X2-3	+15V output (output capacity 0.25A)
	X2-4	+15V output (output capacity 0.25A)
	X2-5	Brake resistor over-temperature detection DI
	X2-6	Brake unit fault reset DI
	X2-7	Brake unit power-up/normal status indication dry contact relay (220Vac/24Vdc, 500mA) Normally open when not powered up, normally closed when
	X2-8	

		powered up
	X2-9	Brake unit fault indication dry contact relay (220Vac/24Vdc, 500mA)
	X2-10	Normally closed when not powered up, normally open when powered up
	X2-11	Brake unit fault indication dry contact relay (220Vac/24Vdc, 500mA)
	X2-12	Normally open when not powered up, normally closed when powered up

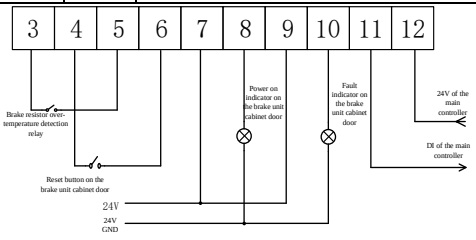
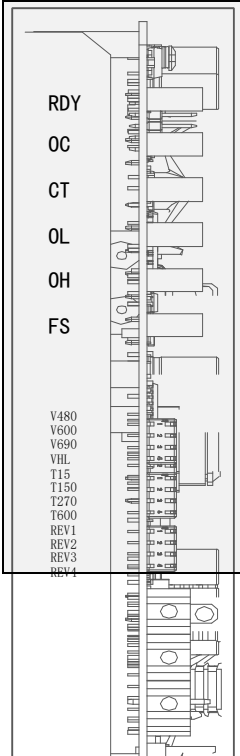


Figure 9-7 Typical terminal block connection

Note: X1-1, X1-2, X2-1 and X2-2 terminals are not specifically introduced, please connect to the corresponding interface according to the actual working environment.

9.2.3 **Control board**

✓ Indicator



Indicator	Description	Fault meaning
RDY (green)	Power on/normal status indicator, the single board has no fault and this indicator lights up when power is on	--
OC (Red)	Brake resistor short-circuit indicator, this indicator lights up when there is an IGBT overcurrent fault	The brake unit determines whether there is a short circuit in the brake resistor by detecting the Vce voltage after the IGBT is turned on. Fault action: blocking pulse Reset mode: reset by turning the unit 24V off
OT (Red)	IGBT over-temperature indicator, this indicator lights up when there is an IGBT over-temperature fault	The brake unit detects the internal NTC of IGBT for temperature protection, the fault has a return difference, and the return temperature is 10℃ Fault action: blocking pulse Reset mode: manual reset

	OL (Red)	Brake unit overload indicator, this indicator lights up when the FPGA calculates overload	Brake unit overload indicator, the brake unit, through the user-set braking time, determines whether the braking time exceeds the set time in the 600s cycle Fault action: blocking pulse Reset mode: manual reset
	OH (Red)	Brake resistor over-temperature indicator, this indicator lights up when the brake resistor has over-temperature	Determine if the brake resistor is over temperature by detecting the opening/closing of the temperature relay inside the brake resistor Fault action: blocking pulse Reset mode: manual reset
	FS (Red)	Single board set fault indicator, this indicator lights up when the dip switch on the single board is set incorrectly	V480/V600/V690, one of these 3 switches must be toggled, toggling no or more than one switches is incorrect setting T15/T150/T270/T600, one of these 4 switches must be toggled, toggling no or more than one switches is incorrect setting Fault action: blocking pulse Reset mode: automatic reset

✓ DIP switch

From top to bottom, there are three DIP switches: brake voltage selector switch, brake time selector switch, and reserve switch.

The first dip switch is used to select the brake voltage. According to the grid voltage, the following settings are usually performed (toggling left means pressing the dip switch, blank means toggling right, and dip switch not pressed)

Grid voltage (V)	DIP switch settings				Brake voltage settings	
	V480	V600	V690	VHL	Brake start voltage (V)	Brake end voltage (V)
380	Toggle left	--	--	Toggle left	673	639
480	Toggle left	--	--	--	774	735
500	--	Toggle left	--	Toggle left	841	799
600	--	Toggle left	--	--	967	919
660	--	--	Toggle left	Toggle left	1070	1017
690	--	--	Toggle left	--	1158	1100

The second dip switch is used to select braking time. This function is to protect the brake resistor to prevent the brake resistor from being in the braking state for a long time causing overload or overheating.

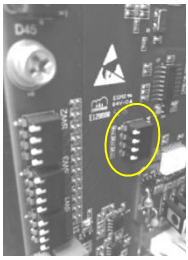
DIP switch	Description
T15	Within the 600s cycle, the braking time must be within 15s. If beyond the set time, a fault message will be given
T150	Within the 600s cycle, the braking time must be within 150s. If beyond the set time, a fault message will be given
T270	Within the 600s cycle, the braking time must be within 270s. If beyond the set time, a fault message will be given
T600	The brake unit allows continuous braking

The third dip switch is a reserved button, which is not recommended to be changed except for special needs.

DIP switch	Description
REV1	Function reserved
REV2	Function reserved
REV3	Function reserved
REV4	Used to select the type of temperature relay inside the brake resistor: Toggle right: normally closed; toggle left: normally open. Sometimes there is no temperature relay inside the brake resistor, then just pressing REV4 is equivalent to shielding the brake resistor over temperature fault.

Caution

There is also a fan manual control dip switch on the inside of the control board as shown below, which is used to determine whether the fan is damaged or whether 220V is connected. When any one of the 4 buttons of the dip switch is pressed, the fan is set to normal rotation. If the fan does not rotate when the switch is pressed, the 220V power supply may not be connected or the fan device may be damaged. It is not recommended to press this switch under normal operating conditions.



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10 Common System Composition Examples

10.1 VFU system control topology

The VFU system control topology is as shown in the figure below. A control unit can only be connected to one VFU, and the PPLink interface for connecting the control unit to the VFU and the encoder module can be selected from any one of PPLink01~PPLink06.

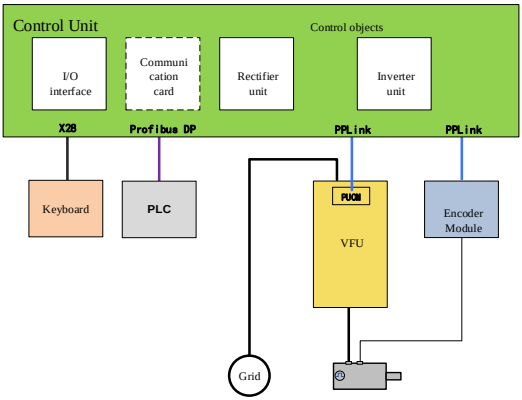

Figure 10-1 Schematic diagram of VFU system control topology topology

10.2 Rectifier unit system control topology

The rectifier unit system control topology is as shown in the figure below. The PPLink interface for connecting the control unit to the rectifier unit can be selected from any one of PPLink01~PPLink06.

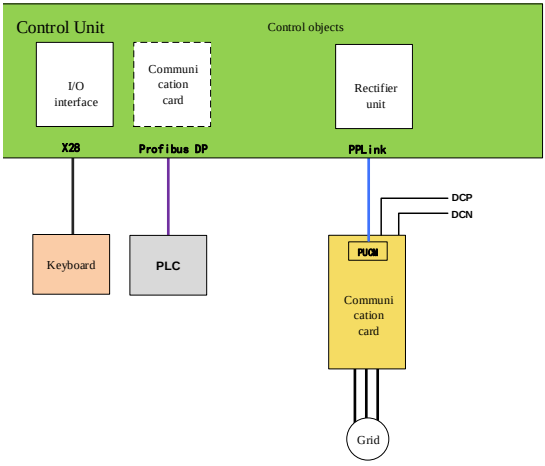

Figure 10-2 Schematic diagram of rectifier unit system control topology

10.3 MDU system control topology

The MDU system control topology is as shown in the figure below. The PPLink interface for connecting the control unit to the MDU and encoder module can be selected from any one of PPLink01~PPLink06.

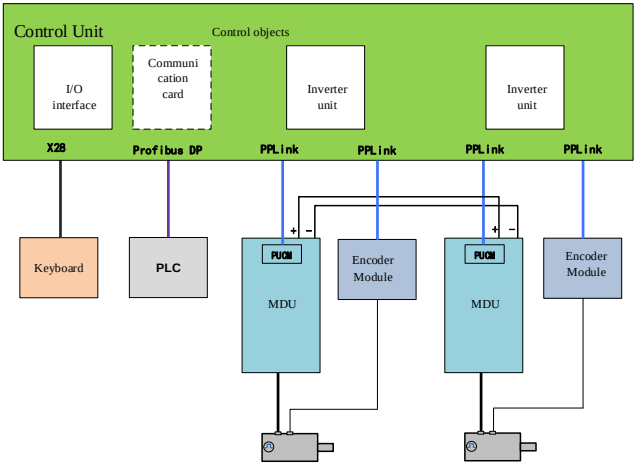

Figure 10-3 Schematic diagram of MDU system control topology

10.4 Multiplex system control topology

The multiplex system control topology is as shown in the figure below. The PPLink interface for connecting the control unit to the MDU, rectifier unit and encoder module can be selected from any one of PPLink01~PPLink06.

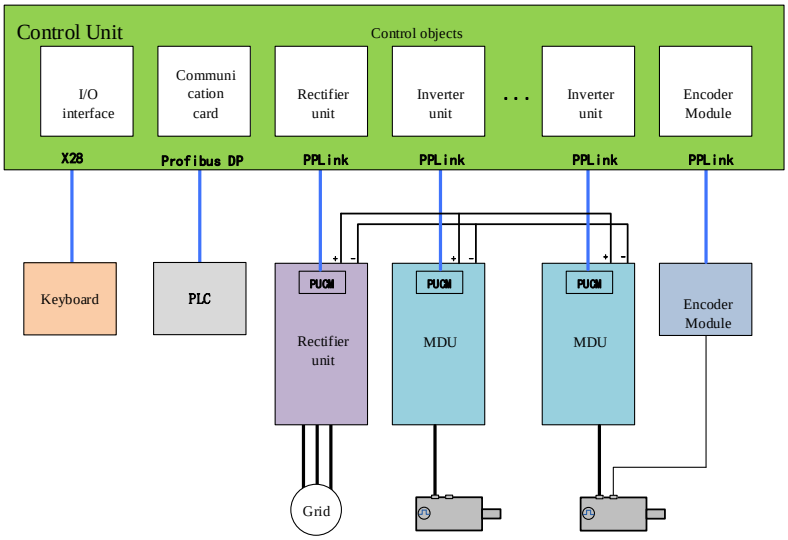

Figure 10-4 Schematic diagram of multiplex system control unit topology

10.5 Multiplex system composition topology

The figure below shows the composition of a multiplex system common bus application. Normally, a rectifier unit provides DC bus power, and as needed, multiple motor drive units connected in parallel on the bus to make up the system. One control unit controls up to four motor drive units simultaneously.

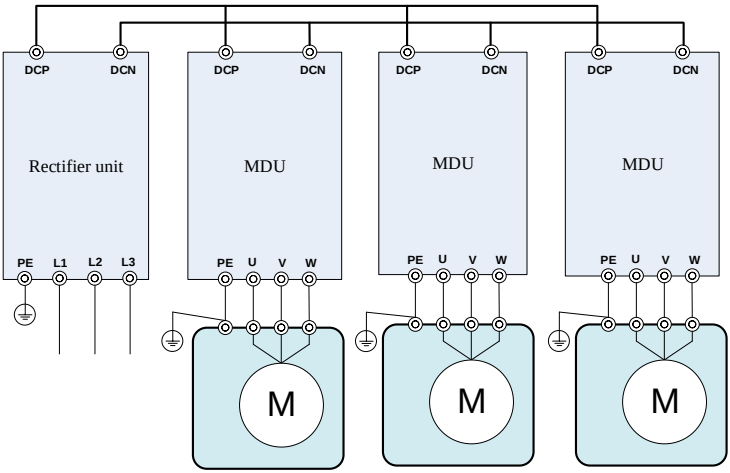

Figure 10-5 Application example of common bus for multiplex system

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11 Control Unit

11.1 Naming rules

The HCU20 control unit naming rules are as follows:

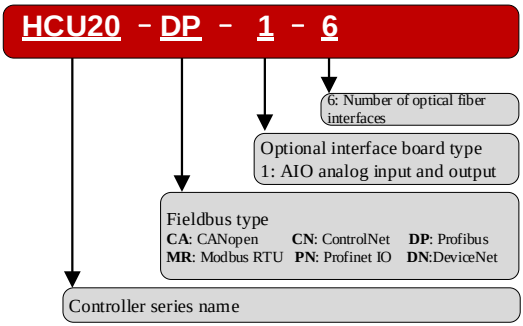


Figure 11-1 HCU20 control unit naming rules

11.2 Basic functions

Table 11-1 HCU20 control unit basic functions

No.	Function classification	Function meaning
1	Communication	Communication with rectifier unit or motor drive unit
2		Communication with host computer
3		Communication with PC
4		Communication with operation panel
5		Communication with expansion modules
6	Digital interface	External digital access, or digital output
7	Analog interface	External analog access, or analog output
8	Control	Control the rectifier and inverter units and interface unit

11.3 Control unit HCU20

11.3.1 Interface description

11.3.1.1 Interface overview

Table 11-2 HCU20-DP-1-6 interface overview

Type	QTY	Bit number
DI interface	10	X1
DIO interface	8	X2
ProfiBus interface	1	X3
Power interface	1	X4
AI interface, AO interface	2, 2	X11
Relay interface	3	X12
PPLink optical fiber interface	6	x21, x22, x23, x24, x25, x26
Ethernet interface	1	X27
Keyboard interface	1	X28
Memory card interface	1	X29
Can master-slave/485 sync	2	X30, X31

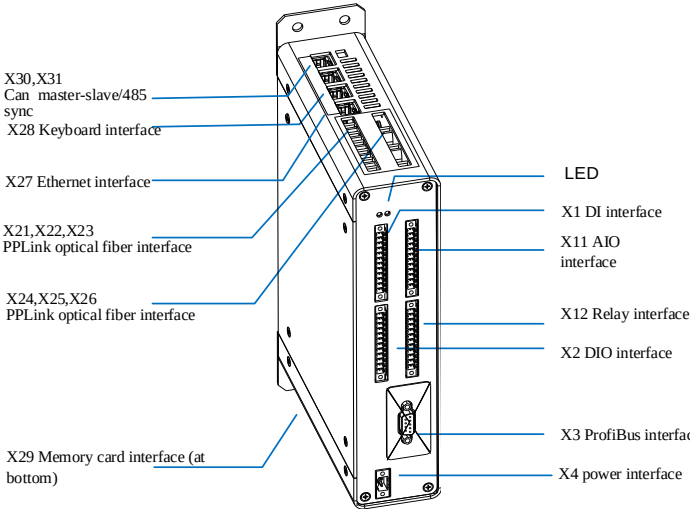
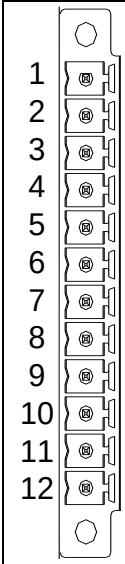


Figure 11-2 HCU20-DP-1-6 interface diagram

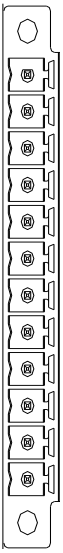
11.3.1.2 X1 DI interface

Table 11-3 X1 DI interface

Interface appearance	Pin	Name	Meaning	Technical data
	1	DI1	Digital input	Electrical isolation: 50V Input voltage range: 0V~30V Input current (typical): 10mA@24VDC Input high level: 15V~30V Input low level: 0V~5V Input delay time (typical): 300μs
	2	DI2	Digital input	
	3	DI3	Digital input	
	4	DI4	Digital input	
	5	DI5	Digital input	
	6	DI_COM	Digital input common	--
	7	DI6	Digital input	Electrical isolation: 50V Input voltage range: 0V~30V Input current (typical): 10mA@24V DC Input high level: 15V~30V Input low level: 0V~5V Input delay time (typical): 300μs
	8	DI7	Digital input	
	9	DI8	Digital input	
	10	DI9	Digital input	
	11	DI10	Digital input	
	12	DI_COM	Digital input common	--
Interface type	Phoenix terminals with 3.81mm pitch - with screws			
External cable requirements	Cross-sectional area: 0.5~1.5mm			

11.3.1.3 X2 DIO interface

Table 11-4 X2 DIO interface

Interface appearance	Pin	Name	Meaning	Technical data
	1	DI_COM	Digital input common	--
	2	GND_D	Common ground	--
	3	DIO21	Digital input and output	Used as DI: DIO2 supports for fast pulse input Input voltage range: 0V~30V Input current (typical): 10mA@24VDC Input high level: 15V~30V Input low level: 0V~5V Input delay time (typical): 5μs Input frequency (fast): 1Hz~100kHz Used as DO: DIO1 is a fast pulse output interface Output high level: 22V~24V Load capacity: 500mA (the sum of all DO load currents cannot exceed 2A) Output delay time (typical): 100μs (normal), 5μs (fast). Output frequency (fast): 0.1kHz~100kHz
	4	DIO22	Digital input and output	
	5	DIO23	Digital input and output	
	6	DIO24	Digital input and output	
	7	GND_D	Common ground	--
	8	DIO25	Digital input and output	Used as DI: Input voltage range: 0V~30V Input current (typical): 10mA@24VDC Input high level: 15V~30V Input low level: 0V~5V Input delay time (typical): 5μs Input frequency (fast): 1Hz~50kHz Used as DO: Output high level: 22V~24V Load capacity: 500mA (the sum of all DO load currents cannot exceed 2A) Output delay time (typical): 100μs (normal), 5μs (fast). Output frequency (fast): 0.1kHz~100kHz
	9	DIO26	Digital input and output	
	10	DIO27	Digital input and output	
	11	DIO28	Digital input and output	
	12	GND_D	Common ground	--
Interface type	Phoenix terminals with 3.81mm pitch - with screws			
External cable requirements	Cross-sectional area: 0.5~1.5mm			

11.3.1.4 X3 Communication interface

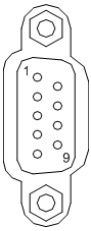
The X3 interface is used to connect to the host computer. The controller uploads the analog and digital signals of the inverter to the host computer for display via the fieldbus supported by the X3 interface, and receives the control commands from the host computer.

Technical data	External baud rate: meet the selected communication protocol specifications Internal interface type: SCI Internal baud rate: less than 625kbps
Function	Host computer communication interface
Interface type	(depending on the specific module)
External cable requirements	0.5~1.0mm
Remarks	Support for specified communication protocols through optional different modules: Profibus, Profinet, Modbus RTU, CANopen, ControlNet, DeviceNet

According to the type of communication protocols supported by the optional different modules, taking HCU20-DP-1-6 Profibus communication as an example, the X3 communication interface is defined in the following table:

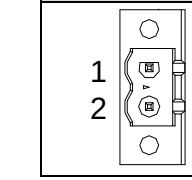
- ProfiBus

Table 11-5 X3 ProfiBus interface

Interface appearance	Pin	Name	Meaning
	1	--	--
	2	--	--
	3	PROFI_B	Data positive
	4	RTS	Request to send
	5	GND_D	Common ground
	6	+5V	+5V power supply
	7	--	--
	8	PROFI_A	Data negative
	9	--	--
Interface type	DB9 socket		

11.3.1.5 X4 power interface

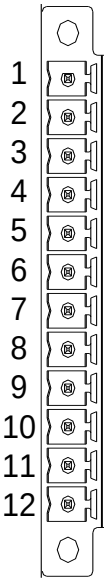
Table 11-6 X4 power interface

Interface appearance	Pin	Name	Meaning	Technical data
	1	GND	Common ground	Input voltage: 24V DC (-15%~+20%) Input current: less than 1A Safety requirements: SELV
	2	+24V	24V power supply	

Interface type	Screw phoenix terminal with 5.08mm pitch - with screw
External cable requirements	0.5~3.0mm

11.3.1.6 X11 AIO interface

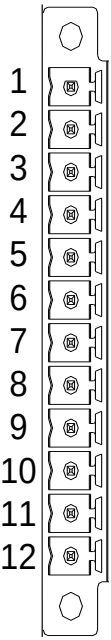
Table 11-7 X11 AIO interface

Interface appearance	Pin	Name	Meaning	Technical data
	1	+10V	+10V power supply	Load capacity: 100mA, accuracy: 1%
	2	GND_D	Common ground	--
	3	-10V	-10V power supply	Load capacity: 100mA, accuracy: 1%
	4	GND_D	Common ground	--
	5	AI1+	Analog input	The input types of AI1 and AI2 are configured via software. **Voltage type:** Input voltage: -12.5V~+12.5V Input impedance: 14kΩ Resolution: 12bit Accuracy: 1% **Current type:** Input current: -25mA ~ +25mA Input impedance: 100Ω Resolution: 12bit Accuracy: 1% Others: Short circuit protection
	6	AI1-		
	7	AI2+		
	8	AI2-		
	9	AO1	Analog output	The output type of AO1 is configured via software. **Voltage type:** Output voltage: -12.5V ~ +12.5V Load capacity: 10mA Resolution: 12bit Accuracy: 1% Others: Overcurrent protection (20mA) **Current type:** Output current: -25mA ~ +25mA Load capacity: 500Ω Resolution: 12bit Accuracy: 1%
	10	GND_D	Common ground	--
	11	AO2	Analog output	The output type of AO2 is configured via software.

Interface appearance	Pin	Name	Meaning	Technical data
				Voltage type: Output voltage: -12.5V ~ +12.5V Load capacity: 10mA Resolution: 12bit Accuracy: 1% Others: Overcurrent protection (20mA) **Current type:** Output current: -25mA ~ 25mA Load capacity: 500Ω Resolution: 12bit Accuracy: 1%
	12	GND_D	Common ground	--
Interface type	Phoenix terminals with 3.81mm pitch - with screws			
External cable requirements	0.5~1.5mm			

11.3.1.7 X12 Relay

Table 11-8 X12 Relay

Interface appearance	Pin	Name	Meaning	Technical data
	1	RO1_NO	Relay RO1 normally open dry contact output	Contact type: Form C Contact load capacity: 2A Contact voltage: 250V AC or 30V DC Mechanical life: 100,000 times
	2	RO1_COM	Relay Common	
	3	RO1_NC	Relay RO1 normally closed dry contact output	
	4	NC	--	
	5	RO2_NO	Relay RO2 normally open dry contact output	
	6	RO2_COM	Relay Common	
	7	RO2_NC	Relay RO2 normally closed dry contact output	
	8	NC	--	
	9	RO3_NO	Relay RO3 normally open dry contact output	
	10	RO3_COM	Relay Common	
	11	RO3_NC	Relay RO3 normally closed dry contact output	
	12	NC	--	

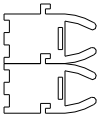
Interface type	Phoenix terminals with 3.81mm pitch - with screws
External cable requirements	0.5~1.5mm

Note: NC terminal is not allowed to be connected.

11.3.1.8 X21~X26 PPLink optical fiber interface

It can be used to connect rectifier module, inverter module, encoder module and interface module.

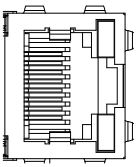
Table 11-9 X21~X26 PPLink optical fiber interface

Interface appearance	Pin	Name	Meaning	Technical data
	Blue	FR	Input	Baud rate: 10Mbps Communication distance: 50m
	Grey	FT	Output	
Interface type	Optical fiber port			
External cable requirements	Φ1mm plastic optical fiber			

11.3.1.9 X27 Ethernet interface

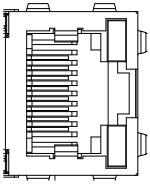
For connecting to a PC. On the PC side, the hopeInsight or hopeView software enables parameter configuration, real-time monitoring and fault location of the VFD.

Table 11-10 X27 backend debug Ethernet interface

Interface appearance	Pin	Name	Meaning	Technical data
	1	TX+	Transmit Data	Interface type: Ethernet Baud rate: 10Mbps/100Mbps Internal interface type: SCI Internal baud rate: 9600~921600bps, can be dynamically switched Communication distance: 50m
	2	TX-	Transmit Data	
	3	RX+	Receive Data	
	4	NC	--	
	5	NC	--	
	6	RX-	Receive Data	
	7	NC	--	
	8	NC	--	
Interface type	RJ45 socket			
External cable requirements	0.5mm standard cable			

11.3.1.10 X28 keyboard interface

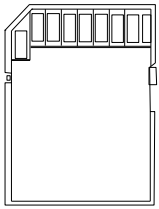
Table 11-11 X28 keyboard interface

Interface appearance	Pin	Name	Meaning	Technical data
	1	RS422_WIFI_A	Port A of RS422	RS485 interface connects to external keyboard, RS422 interface connects to keyboard WIFI. Interface type: RS485/RS422 Baud rate: less than 250kbps Communication distance: 300m
	2	RS485-A	Port A of RS485	
	3	GND	Common ground	
	4	24V	24V power supply	
	5	RS422_WIFI_Y	Port Y of RS422	
	6	RS422_WIFI_B	Port B of RS422	
	7	RS485-B	Port B of RS485	
	8	RS422_WIFI_Z	Port Z of RS422	
Interface type	RJ45 socket			
External cable requirements	0.5mm standard cable			

11.3.1.11 X29 memory card interface

The memory card is used to save the firmware and parameters.

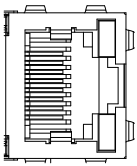
Table 11-12 X29 memory card interface

Interface appearance	Pin	Name	Meaning	Technical data
	1	TF_D3	TF card data	Standard SD card supported Capacity: up to 4G Speed: Class 10
	2	TF_CMD	TF card command	
	3	GND	Common ground	
	4	3.3V	3.3V power supply	
	5	TF_CLK	TF card clock	
	6	GND	Common ground	
	7	TF_D0	TF card data	
	8	TF_D1	TF card data	
	9	TF_D2	TF card data	

11.3.1.12 X30, X31 signal terminals

Any one of X30 and X31 is used as an input and the other is used as an output.

Table 11-13 X30, X31 signal terminals

Interface appearance	Pin	Name	Meaning	Technical data
	1	CAN_H	CAN communication data port	Interface type: CAN/485 Baud rate: less than 1Mbps/16Mbps Communication distance: (at 1M) 40m/1200m Default matched resistance: 240Ω, can be switched to 360Ω in the background (CAN out and 485 sync can be used simultaneously)
	2	CAN_L	CAN communication data port	
	3	SYN_A	485 communication data port	
	4	GND_ISO_1	485 communication isolation ground	

Interface appearance	Pin	Name	Meaning	Technical data
	5	GND_ISO_2	CAN communication isolation ground	
	6	SYN_B	485 communication data port	
	7	NC	--	
	8	NC	--	
Interface type	RJ45 socket			
External cable requirements	0.5mm standard cable			

11.3.2 **Meaning of LED lights**

The running status of HCU20 is indicated by a combination of two LEDs, see “11.3.1.1 Interface Overview" for the exact location.

Red Light	Green Light	Meaning
Always on	Always off	Controller failure or system failure
Blinking	Blinking	System upgrade in progress
Always on	Always on	System not ready
Always off	Always on	System ready
Always off	Blinking	System in operation

11.3.3 **Mechanical data**

The mechanical data of the control unit is shown in Table 11-14, and the detailed dimensional drawing is shown in Figure 11-3.

Table 11-14 Control unit mechanical data

Maximum external dimensions (W*H*D)	56mm*280mm*174mm
Cooling method	Natural cooling
Weight	≥2kg
IP rating	IP20

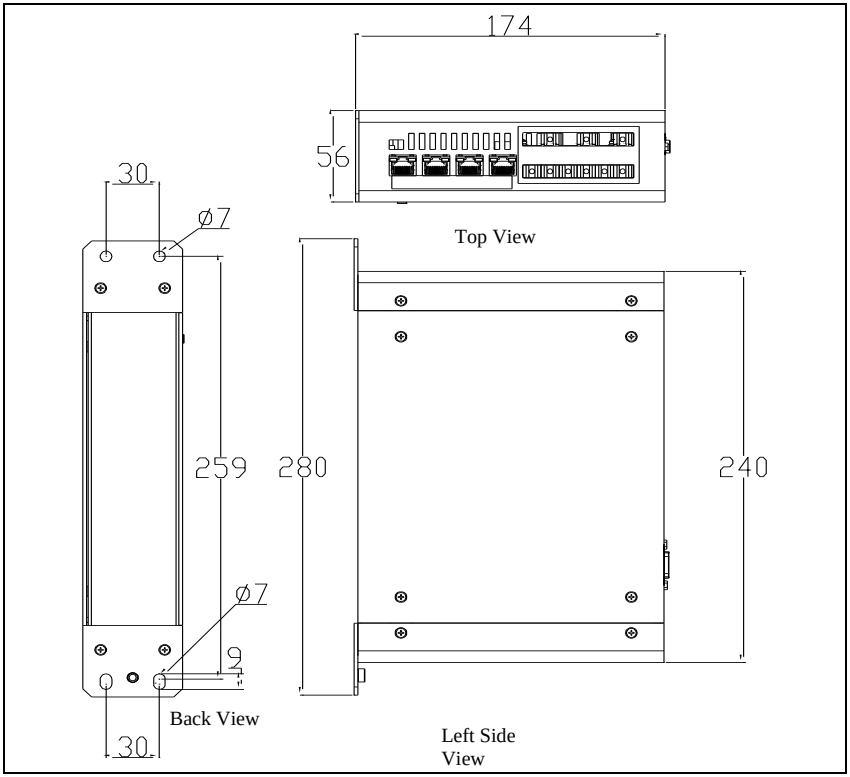


Figure 11-3 Control unit external dimension drawing (unit: mm)

11.3.4 **Installation method**

It must be ensured that the control unit is in the vertical direction and the tilt angle is less than 5 degrees. Two types of installation are available.

Wall-mounted installation uses screws to secure, as shown in Figure 11-4.

Side-mounted installation uses snaps to secure, as shown in Figure 11-5.

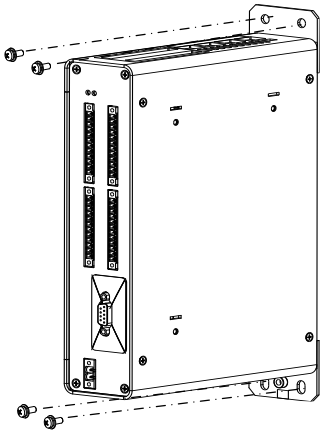


Figure 11-4 Wall-mounted installation

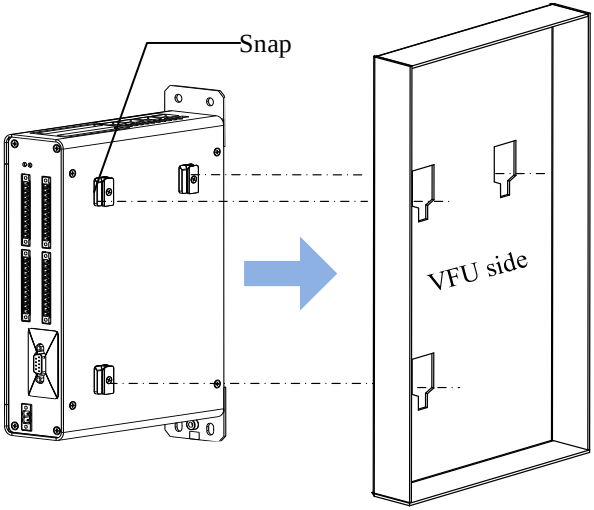


Figure 11-5 Side-mounted installation

11.3.5 **Unit wiring diagram**

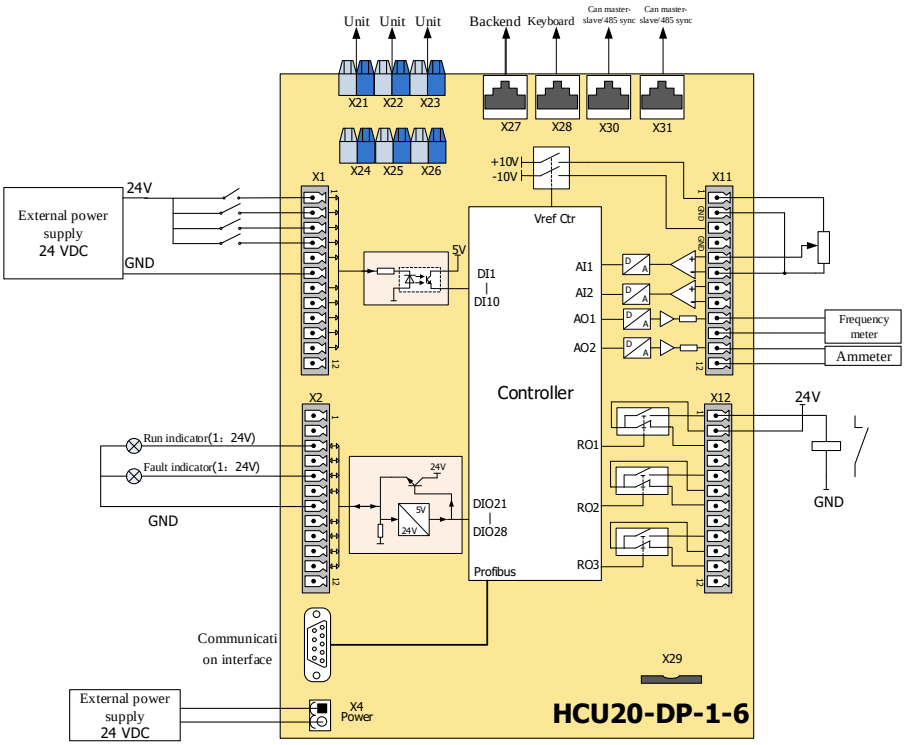


Figure 11-6 HCU20-DP-1-6 wiring diagram

--End of this chapter--

12 Encoder Module

12.1 EIM10

12.1.1 Interface introduction

12.1.1.1 Interface overview

Table 12-1 EIM10 Interface Overview

Type	QTY	Bit number
Encoder interface	1	X1
Power interface	1	X4
PPLink optical fiber interface	1	X5

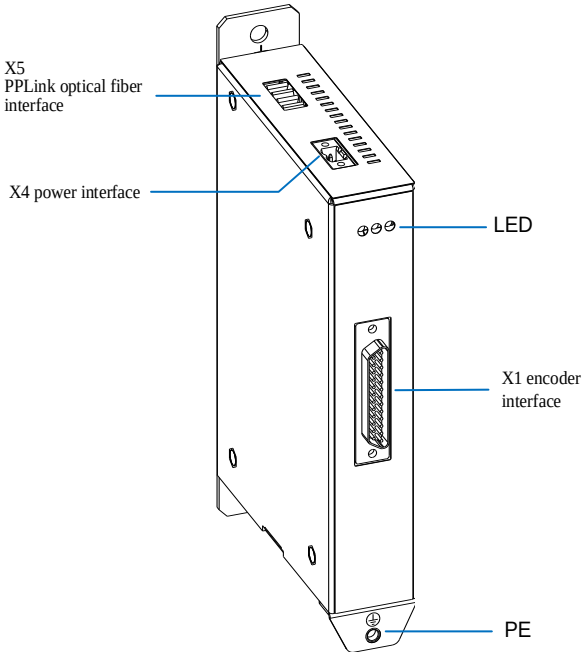
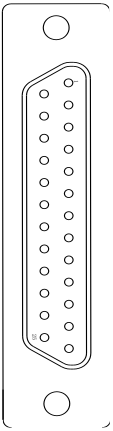


Figure 12-1 EIM10 interface diagram

12.1.1.2 X1 encoder interface

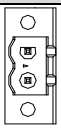
The rotary transformer supports 0.5 and 0.25 ratios of transmission and the sine/cosine encoder supports 1VPP, both encoders cannot be used at the same time.

Table 12-2 Encoder interface

	Pin	Name	Meaning	Technical data
	1	VCC_D5V_ECD	Encoder power supply	For use with sine and cosine encoders and Endat encoder
	2	GND	Ground	--
	3	S_SINA_P	Rotary transformer signal A+ (sin+)/incremental signal A+	--
	4	S_SINA_N	Rotary transformer signal A-(sin-)/incremental signal A-	--
	5	GND	Ground	--
	6	S_SINB_P	Rotary transformer signal B+ (cos+)/incremental signal B+	--
	7	S_SINB_N	Rotary transformer signal B-(cos-)/incremental signal B-	--
	8	GND	Ground	--
	9	EXC_P	Rotary transformer excitation+	10.8VPP (0.286 ratio) 6.17VPP (0.5 ratio) 10kHz excitation
	10	RS485_CLK_P	Endat interface clock CLK+	--
	11	EXC_N	Rotary transformer excitation-	--
	12	RS485_CLK_N	Endat interface clock CLK-	--
	13	TEMP_P	Motor temperature collection (PT100+/KTY84+/PT1000+)	-40℃~200℃
	14	SENSE_P	Signal input for encoder power supply	--
	15	RS485_DATA_P	Endat interface data+	--
	16	SENSE_N	Ground signal input for encoder power supply	--
	17	S_SINR_P	Reference signal R+	--
	18	S_SINR_N	Reference signal R-	--
	19	S_SINC_P	Absolute signal C+	--
	20	S_SINC_N	Absolute signal C-	--
	21	S_SIND_P	Absolute signal D+	--
	22	S_SIND_N	Absolute signal D-	--
	23	RS485_DATA_N	Endat interface data-	--
	24	GND	Ground	--
	25	TEMP_N	Motor temperature collection (PT100-/KTY84-/PT1000-)	--
Interface type	DB25 socket			
External cable requirements	Standard Cable			

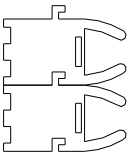
12.1.1.3 X4 power interface

Table 12-3 X4 power interface

	Pin	Name	Meaning	Technical data
	1	24V	Power input	Input voltage: 19~28V DC Input current: less than 700mA
	2	GND	Power input	
Interface type	2PIN socket with 5.08mm pitch (with fixing screw holes)			
External cable requirements	Cross-sectional area less than 2.5 mm^2			

12.1.1.4 X5 PPLink optical fiber interface

Table 12-4 X5 PPLink optical fiber interface

	Pin	Name	Meaning	Technical data
	1	FT1	High-speed transmitting optical fiber	Baud rate: 10Mbps Communication distance: 50m
	2	FR1	High-speed receiving optical fiber	
Interface type	2PIN socket with 5.08mm pitch (with fixing screw holes)			
External cable requirements	Φ1mm plastic optical fiber			

12.1.2 Meaning of LED lights

The encoder module has three indicators, see the “12.1.1.1 Interface Overview" for their location.

Name	Color	Definition
Fault	Red	Fault indicator On: Module failure Off: Module status is normal
Status	Green	Status indicator Blinking at 0.5Hz: PPLink is communicating Off: No PPLink communication
Output power rating	Green	On: encoder power supply is 5V Blinking at 0.5Hz: The power supply of the encoder is 24V Off: Module is not powered on

12.1.3 **Mechanical data**

The mechanical data of the encoder module is shown in Table 12-11 and Table 12-5 and the detailed dimensions are shown in the Figure 12-2.0

Table 12-5 EIM10 encoder module mechanical data

Maximum external dimensions (W*H*D)	35mm*188mm*118mm
Cooling method	Natural cooling
Weight	≥1kg
IP rating	IP20

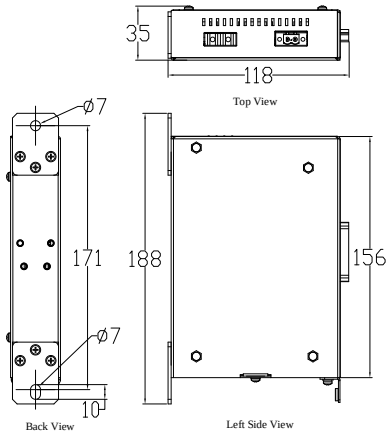


Figure 12-2 EIM10 encoder module external dimensions (unit: mm)

12.1.4 **Installation method**

The encoder module is wall-mounted and secured with screws. It must be ensured that the encoder module is in the vertical direction and the tilt angle is less than 5 degrees.

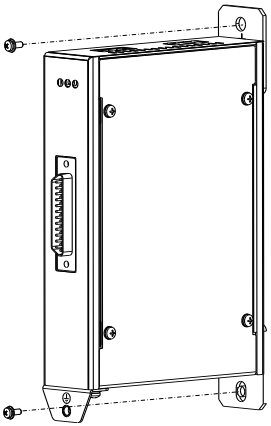


Figure 12-3 Installation of EIM10 encoder module

12.2 EIM30

12.2.1 Interface introduction

12.2.1.1 Interface overview

Table 12-6 EIM30 Interface Overview

Type	QTY	Bit number
Encoder interface	2	X1, X2+X3 (1)
Power interface	1	X4
PPLink optical fiber interface	1	X5

Note: (1) Interface X2 is combined with interface X3 to be used as an encoder interface.

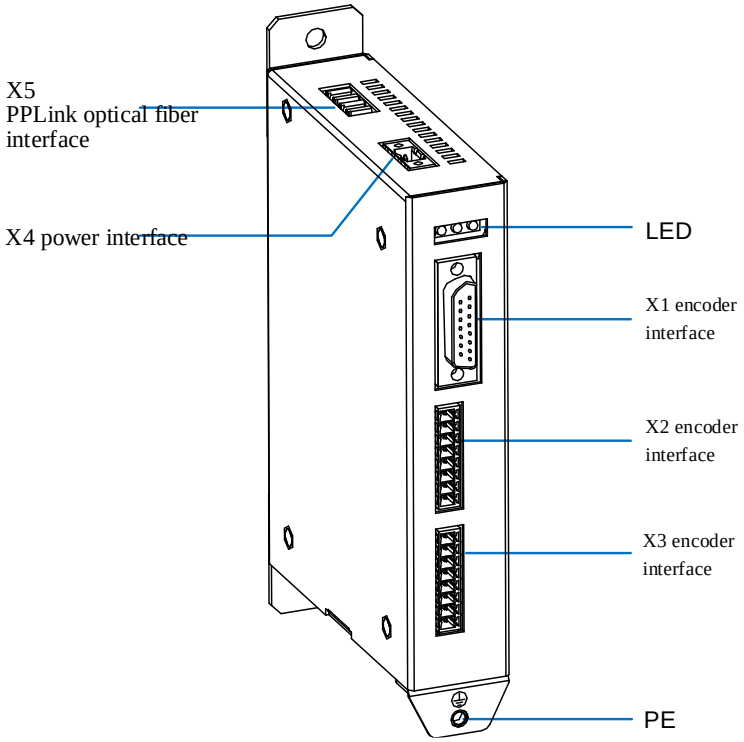
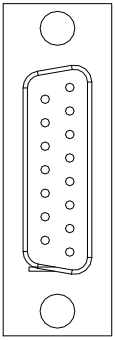


Figure 12-4 EIM30 interface diagram

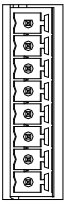
12.2.1.2 X1 encoder interface

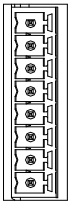
Table 12-7 X1 encoder interface

	Pin	Name	Meaning	Technical data
	1	TEMP1+	Positive terminal of 1st sampling resistor	Support KTY84/PT100/PT1000
	2	SSI_CLK+	SSI Clock+	--
	3	SSI_CLK-	SSI Clock-	--
	4	VCC_ECD	Encoder power supply 5V/24V	--
	5	VCC_ECD	Encoder power supply 5V/24V	--
	6	SENSE+	Feedback input of the encoder power supply +	Valid only when encoder power is 5V
	7	GND	Encoder power ground	--
	8	TEMP1-	Negative terminal of 1st sampling resistor	Support KTY84/PT100/PT1000
	9	SENSE-	Feedback input of encoder power supply-	Valid only when encoder power is 5V
	10	Z+	Incremental signal Z+	--
	11	Z-	Incremental signal Z-	--
	12	B-	Incremental signal B-	--
	13	B+	Incremental signal B+	--
	14	A-/SSI_DATA-	Incremental signal A-/SSI data-	Multiplex port
	15	A+/SSI_DATA+	Incremental signal A+/SSI data+	Multiplex port
Interface type	DB15 socket			
External cable requirements	Standard Cable			

12.2.1.3 X2/X3 encoder interface

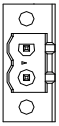
Table 12-8 X2/X3 encoder interface

	Pin	Name	Meaning	Technical data
X2 1 2 3 4 5 6 7 8  X3	1	A+	Incremental signal A+	--
	2	A-	Incremental signal A-	--
	3	B+	Incremental signal B+	--
	4	B-	Incremental signal B-	--
	5	Z+	Incremental signal Z+	--
	6	Z-	Incremental signal Z-	--
	7	SENSE+	Feedback input of the encoder power supply +	Valid only when encoder power is 5V
	8	SENSE-	Feedback input of encoder power supply-	Valid only when encoder power is 5V
	1	VCC_ECD	Encoder power supply 5V/24V	--

	Pin	Name	Meaning	Technical data
1 2 3 4 5 6 7 8 	2	GND	Encoder power ground	--
	3	TEMP2-	Negative terminal of 2nd sampling resistor	Support KTY84/PT100/PT1000
	4	TEMP2+	Positive terminal of 2nd sampling resistor	Support KTY84/PT100/PT1000
	5	SSI_CLK+	SSI Clock+	--
	6	SSI_CLK-	SSI Clock-	--
	7	SSI_DATA+	SSI Data+	--
	8	SSI_DATA-	SSI Data-	--
Interface type	Spring-loaded terminal blocks with 3.81mm pitch			
External cable requirements	Cross-sectional area less than 1.5mm^2			

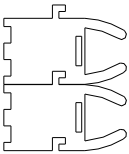
12.2.1.4 X4 power interface

Table 12-9 X4 power interface

	Pin	Name	Meaning	Technical data
	1	GND	Common ground	Input voltage: 24V DC (-15%~+20%) Input current: less than 1A Safety requirements: SELV
	2	+24V	24V power supply	
Interface type	Screw terminals with 5.08mm pitch			
External cable requirements	Cross-sectional area less than 2.5 mm^2			

12.2.1.5 X5 PPLink optical fiber interface

Table 12-10 X5 PPLink optical fiber interface

	Pin	Name	Meaning	Technical data
	Blue	FR	Input	Baud rate: 10Mbps Communication distance: 50m
	Grey	FT	Output	
Interface type	Optical fiber port			
External cable requirements	Φ1mm plastic optical fiber			

12.2.2 **Meaning of LED lights**

The encoder module has three indicators, see the “12.2.1.1 Interface Overview" for their location.

Name	Color	Definition
Fault	Red	Fault indicator On: Module failure Off: Module status is normal
Status	Green	Status indicator Blinking at 0.5Hz: PPLink is communicating Off: No PPLink communication
Output power rating	Green	On: encoder power supply is 5V Blinking at 0.5Hz: The power supply of the encoder is 24V Off: Module is not powered on

12.2.3 **Mechanical data**

The mechanical data of the encoder module is shown in Table 12-11 and Table 12-5 and the detailed dimensions are shown in the Figure 12-2.0

Table 12-11 EIM30 encoder module mechanical data

Maximum external dimensions (W*H*D)	34mm*188mm*118mm
Cooling method	Natural cooling
Weight	≥1kg
IP rating	IP20

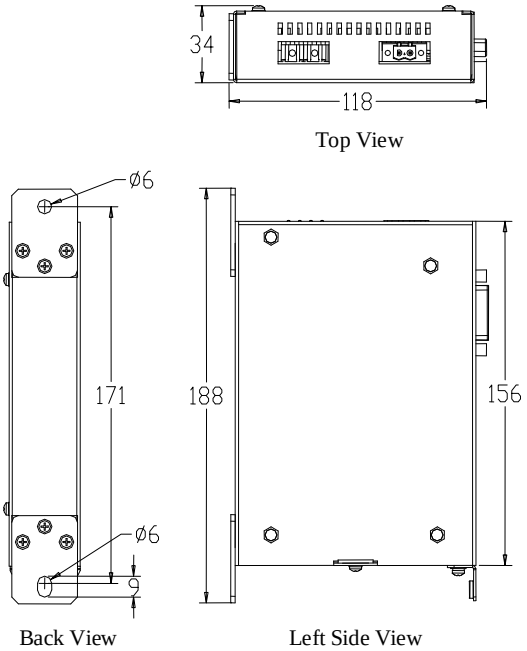


Figure 12-5 EIM30 encoder module external dimensions (unit: mm)

12.2.4 **Installation method**

The encoder module is wall-mounted and secured with screws. It must be ensured that the encoder module is in the vertical direction and the tilt angle is less than 5 degrees.

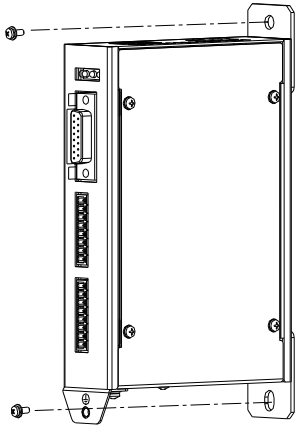


Figure 12-6 Installation of EIM30 encoder module

--End of this chapter--

13 Operation Panel

13.1 Operation panel introduction

OP10 type LCD operation panel is developed by Hopewind, which can provide human-machine interaction for HD2000 series products.

The operation panel has a built-in intelligent IC and memory unit. A physical connection to the drive product is established via RJ45 network port or Wi-Fi interface. Communication is via ModBus protocol. Wi-Fi module is optional as needed.

Main functions of the operation panel:

- ✓ Parameters monitoring, operation status view
- ✓ Parameters setup
- ✓ Fault and alarm view
- ✓ Start, stop, jog
- ✓ All-round control (achieved through the combination of different parameter settings)

13.1.1 Appearance

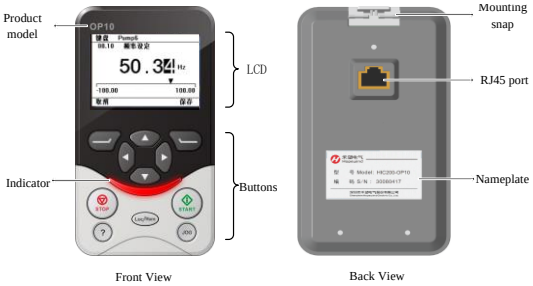
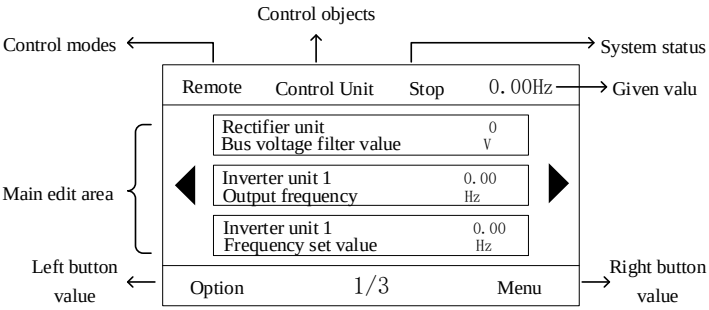


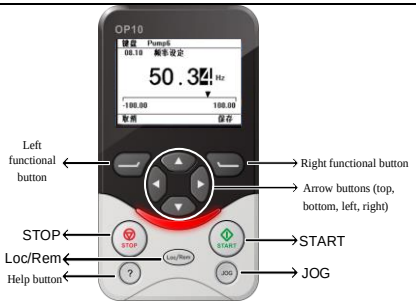
Figure 13-1 Operation panel appearance

13.1.2 **LCD interface description**



	Parameter value	Meaning
Control modes	Local	Indicates that the operation panel has acquired operation control authority. Press the <Loc/Rem> button to switch the control mode to "Remote".
	Remote	Indicates that the operation panel has released the operation control authority, and the START, STOP and JOG buttons are disabled in the control of operation; when there is a fault alarm, the reset function of STOP is effective, and the specific execution is decided by the controller. At this time, the operation panel only has functions such as parameters view and modification. Press the <Loc/Rem> button to switch the control mode to "Local".
Control objects	(depending on actual application)	Indicates the device to which the operation panel is currently connected. For example, system side 1, rectifier unit 1, inverter unit 1, etc. The default is system side 1.
System status	Stop	Indicates that the control object is in the standby state.
	Run	Indicates that the control object is in the running state. Note: When the control object is decelerated, "Run" is still displayed; when the speed is reduced to 0, "Stop" is displayed.
Main edit area	(depending on actual application)	Displays the specific edit page for each function. Page turning and parameter adjustment via arrow keys.
Left button value	(depending on actual application)	Represents the current meaning of the left functional button.
Right button value	(depending on actual application)	Represents the current meaning of the right functional button.

13.1.3 **Buttons description**



Button name	Meaning
Left functional button	"Back" or "Cancel" button, depending on the display of the left button value.
Right functional button	"Confirm" button, depending on the display of the right button value.
Arrow buttons (top, bottom, left, right)	Used to turn pages and adjust parameter values.
STOP	When the control mode is "Local" and the system status is "Run", a stop command can be sent to the control object. Reset function: When a fault occurs, regardless of whether it is in the "local" or "remote" mode, a reset command can be sent by pressing the STOP button. The exact execution depends on HCU20.
START	When the control mode is "Local" and the system status is "Stop", a start command can be sent to the control object. Parameter identification: When the motor parameter identification is valid, press the START button to enter the parameter identification state.
JOG	When the control mode is "Local", a JOG command can be sent to the control object.
Loc/Rem	The control mode can be switched between "Local" and "Remote". Local: has operation control authority, START, STOP and JOG buttons are in effect, and the VFD can be controlled to run according to the settings Remote: START, STOP, and JOG buttons are disabled in this mode and are unable to control the VFD operation. When a fault alarm occurs, the reset function of STOP is effective, and the specific execution is decided by the controller.
Help button	Help for displaying the current menu or parameter (current function is reserved).

Note: The validity of some buttons is related to the composition of the drive system and the control objects of the operation panel, please refer to Table 13-1 and 0. Where, ╳ means the operation is invalid, √ means the operation is valid.

Table13-1 Description of buttons validity (when used for multiplex system)

	START	STOP	Loc/Rem	JOG
System side	╳	╳	╳	╳
Rectifier unit	√	√	√	√
Inverter unit	√	√	√	√

Table13-2 Description of buttons validity (when used for VFU all-in-one)

	START	STOP	Loc/Rem	JOG
System side	×	×	×	×
Rectifier unit	Depends on system configuration, determined by application layer			
Inverter unit	√	√	√	√

13.1.4 **Indicators description**

Table13-3 Indicators Meaning

Status	Meaning
Green, always on	All power units or components of the control object are in standby mode
Green, blinking	At least one power unit or component in the control object is in run mode
Red, blinking	Control object is in alarm state
Red, always on	The control object is in a fault state

13.2 Operation panel installation

13.2.1 **Mounting base (optional)**

✓ Relevant information

The base is mainly used to fix the operation panel. The 3 RJ45 network ports configured on the base provide an adapter feature. The base is usually fixed to the drive product housing. Some drive models are shipped with the base already installed, so users do not need to install it separately. The dimensions of the base are as follows:

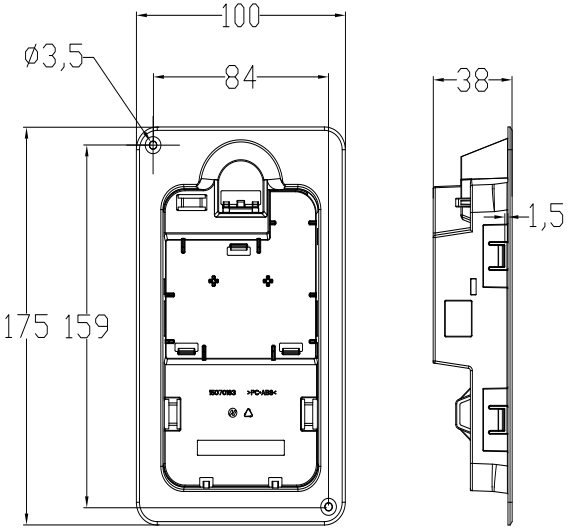


Figure 13-2 Base dimensions (unit: mm)

✓ Operation steps

The base is secured to the drive product housing by screws, as shown below.

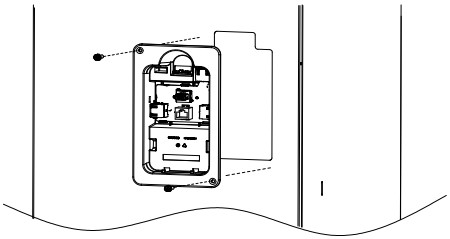


Figure 13-3 Base installation diagram

13.2.2 **Install operation panel**

The operation panel is secured to the base by a snap on the back. When installing, please make sure the RJ45 network port on the back of the panel is in the same direction as the RJ45 network port on the base.

✓ Operation steps

Align the RJ45 network port on the back of the operation panel with the RJ45 network port of the base, and apply an appropriate force to press the operation panel into the base until the snap is secured. The installation diagram is as follows.

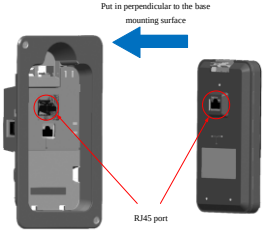


Figure 13-4 Installation diagram

13.2.3 **Remove operation panel**

When removing the panel, simply press the spring pad on the top of the panel until the panel comes loose, then gouge it out horizontally to remove it. The spring pad location is as shown in the figure below.

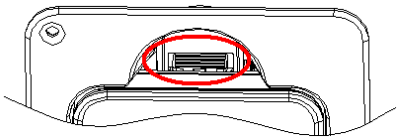


Figure 13-5 Spring pad location

13.2.4 **Connect control unit HCU20**

The base is configured with 3 RJ45 network ports. After the operation panel is secured in the base, connect the X28 keyboard interface of the HCU20 control unit to any RJ45 network port of the base to connect the operation panel to the HCU20 control unit.

Warning

- ✓ Prevent liquids, debris from entering the inside of the operation panel. Conductive liquids and debris may cause a short circuit inside the equipment, resulting in equipment damage.
- ✓ Avoid heavy pressure on the LCD display of the operation panel during installation and operation to avoid screen cracking and interface damage, which will affect the display effect and normal use.

13.3 Common operation guide

13.3.1 **Menu hierarchy**

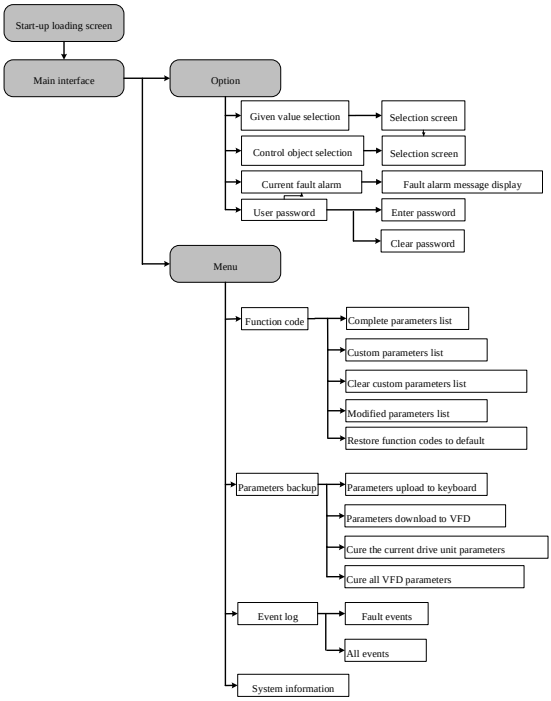


Figure 13-6 Menu hierarchy diagram

13.3.2 **Main screen of operation panel**

After the control unit HCU20 is powered on, the operation panel enters initializing state and enters the main screen after successful connection. The default control object is "System Side 1".

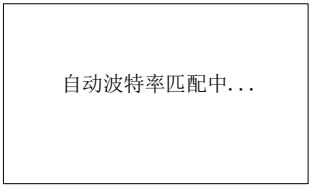


Figure 13-7 Operation panel initialization interface

Figure 13-8 Main screen of operation panel

Note:

The display content in the main screen can be customized, please refer to “13.3.8 Modify operation panel main screen".

P00 denotes system side 1;

P04 denotes rectifier unit 1; P05 denotes rectifier unit 2 ……

P08 denotes inverter unit 1; P09 denotes inverter unit 2 ……

13.3.3 **Switch control modes of the operation panel**

The operation panel has 2 control modes: remote and local. When the operation panel is turned on, the default is in “Local” mode. The control mode is switched by the <Loc/Rem> button.

Differences between the 2 control modes:

Local	Remote
has operation control authority, START, STOP and JOG buttons are in effect, and the VFD can be controlled to run according to the settings	START, STOP, and JOG buttons are disabled in this mode and are unable to control the VFD operation. When the user executes “13.3.14 Download parameters to VFD through control panel", the control mode automatically switches to "Local".

13.3.4 Operation panel password setup

13.3.4.1 Set password

The operation panel is not set with a password before shipping. It is recommended that users set a password to prevent illegal operations. The password must be set to 8 digits.

✓ Operation steps

1. In the main screen, select [Options→User Password→Password Input] in turn to enter the password setup screen.

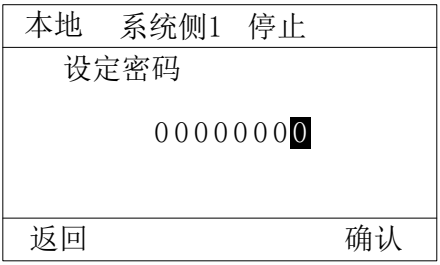


Figure 13-9 Password setup screen

2. The value is adjusted by the up and down arrow keys, and the bit number is selected by the left and right arrow keys.
3. When setting is completed, press the right functional button to confirm. After the password is saved successfully, the operation panel automatically returns to the main screen.

13.3.4.2 Unlock the keyboard

✓ Relevant information

The operations that can be performed in the unlocked state after the password is set for the operation panel:

- ✓ View the main screen parameters.
- ✓ Change control objects.
- ✓ Unlock the password.
- ✓ Clear the password.

In the unlocked state, a lock prompt will pop up when the operation is restricted.

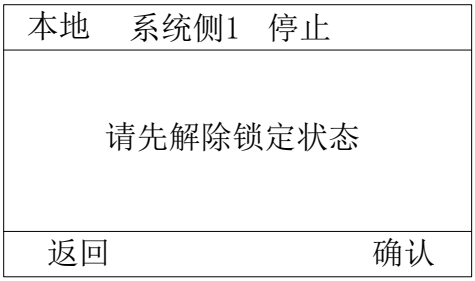


Figure 13-10 Lock prompt

✎ After the operation panel is unlocked, it will re-enter the locked state when one of the following conditions is met:

1) The operation panel restarts after a power failure.
2) Operation timeout: No operation has been performed within 10 minutes.

✓ Operation steps

1. In the main screen, select [Options → User Password → Password Entry] in turn to enter the password unlock screen.

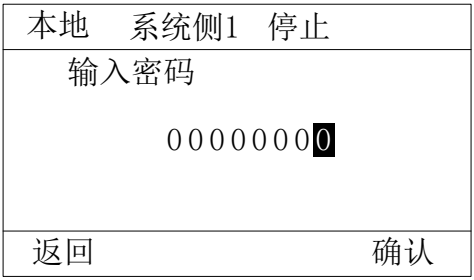


Figure 13-11 Enter a password

2. After entering the correct password, press the right functional button to confirm.

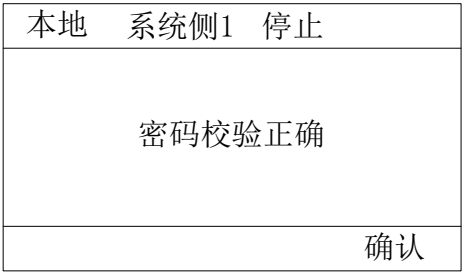


Figure 13-12 Password correct

13.3.4.3 Change password

When the keyboard is unlocked, you can reset the new password, please refer to “13.3.4.1 Set password".

If the keyboard is not unlocked, please unlock the keyboard first, please refer to “13.3.4.2 Unlock the keyboard".

13.3.4.4 Clear password

✓ Relevant information

If the user forgets the password, the current password can be cleared via Supervisor Password. The supervisor password is "12345678".

✓ Operation steps

1. In the main screen, select [Options→User Password→Clear Password] in turn to enter the clear password screen.

2. After entering the supervisor password, press the right functional button to confirm.

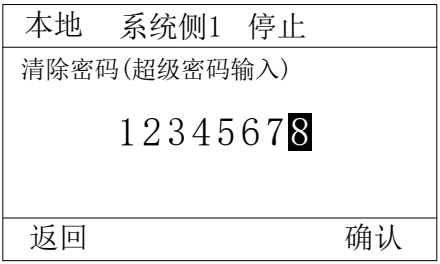


Figure 13-13 Clear password (supervisor password)

13.3.5 **Change system given values via operation panel**

Relevant information

Some of the parameters in the system require a given value as the reference value. Users can make changes as needed.

Operation steps

1. In the main screen, select [Options→Given Value Selection] in turn to enter the given value change screen.

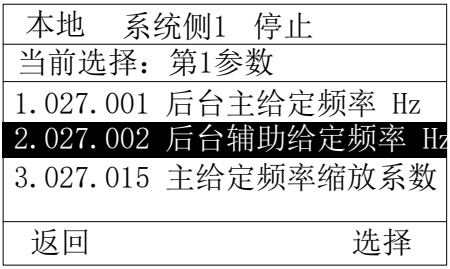


Figure 13-14 Given value selection

2. Press the up and down arrow keys to find the desired given value, and then press the right functional button to select it.

13.3.6 **Change control object of the operation panel**

✓ Relevant information

The default control object of the operation panel is "System Side 1". The user can change it as needed.

✓ Operation steps

1. In the main screen, select [Options→Control Object Selection] in turn to enter the control object change screen.

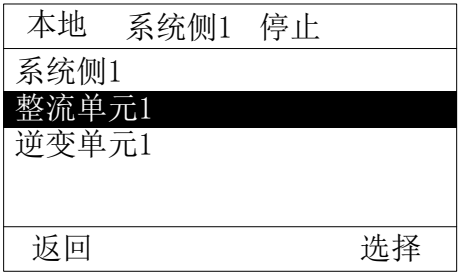


Figure 13-15 Control object change screen

2. Press the up and down arrow keys to find the target control object, and then press the right functional button to select it.
3. After the control object is successfully changed, the LCD screen displays the information of the new control object. In the figure below, the control object has been changed to "Rectifier Unit 1".

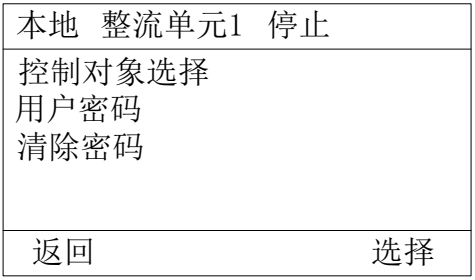


Figure 13-16 Change the control object to "Rectifier Unit 1"

13.3.7 **View fault/alarm message via operation panel**

✓ Relevant information

The operation panel can display real-time fault/alarm message of the control object. For each control object, the operation panel displays up to one fault and alarm. The fault ID starts with F and the alarm ID starts with A. When there are multiple faults and alarms, only the faults and alarms with the smallest ID values are displayed. For the meaning of Fault ID and Alarm ID, please refer to the HD2000 Series Engineering Drive System Parameters Manual.

✓ Prerequisites

- The operation panel has been properly connected to the HCU20.
- The operation panel is not set with a password or is unlocked. To unlock, please refer to “13.3.4.2 Unlock the keyboard".

✓ Operation steps

In the main screen, select [Menu→Fault Alarm] in turn to enter the fault alarm display page.

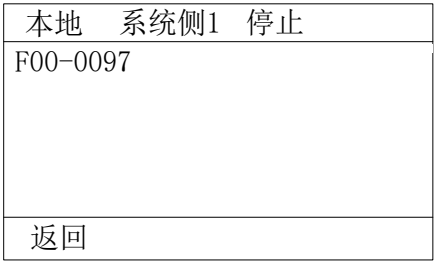


Figure 13-17 Fault alarm

Note: **Fault reset:** When a fault occurs, a reset command can be sent by pressing the stop button. The exact execution depends on HCU20.

13.3.8 **Modify the main screen content of the operation panel**

✓ Relevant information

Users can set the parameters that they are more concerned about as the content of the main screen, so that they can easily view them at any time.

✓ Prerequisites

- The operation panel has been properly connected to the HCU20.
- The operation panel is not set with a password or is unlocked. To unlock, please refer to "13.3.4.2 Unlock the keyboard".

✓ Operation steps

1. In the main screen, select [Menu→Function Code] in turn to enter the parameter group selection screen.

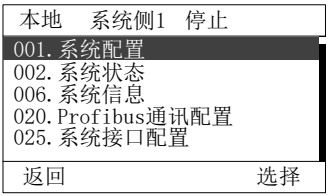


Figure 13-18 Parameter group selection screen

2. Find the target parameters according to the group they belong to.

For example, to set the parameter "001.100 power-on delay time s" as the content in the main screen. As it belongs to the parameter group "001.System configuration", select [001.System configuration → 001.100 Power-on delay time s].

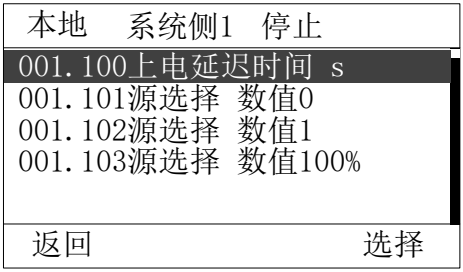


Figure 13-19 Parameter selection screen

3. Press the right arrow button to enter the replacement screen.

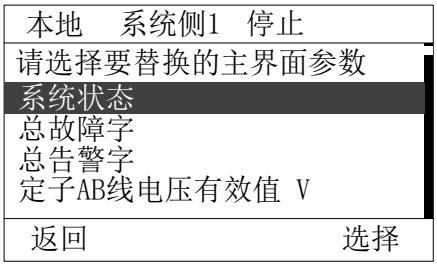


Figure 13-20 Replacement screen

4. Press the up and down arrow buttons to find the parameter you want to replace and press the right functional button to confirm. The target parameters will be displayed in the main screen.

13.3.9 **Modify VFD parameters through the operation panel**

✓ Relevant information

All controls of the VFD (drive product), such as start, stop, torque adjustment, parameter recognition, etc., can be achieved through a series of parameter settings. For parameter settings, please refer to the HD2000 Series Engineering Drive System Parameters Manual.

✓ Prerequisites

- The operation panel has been properly connected to the HCU20.
- The operation panel is not set with a password or is unlocked. To unlock, please refer to “13.3.4.2 Unlock the keyboard".

✓ Operation steps

1. In the main screen, select [Menu→Function Code] in turn to enter the parameter group selection screen.

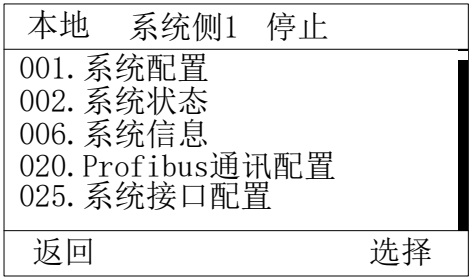


Figure 13-21 Parameter group selection screen

2. Find the parameters to be modified layer by layer by pressing the arrow buttons + right functional button.

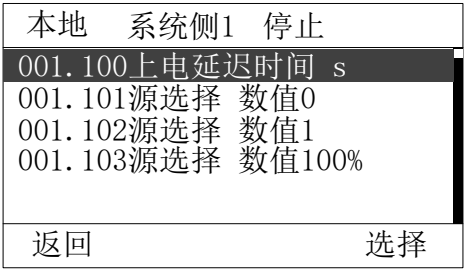


Figure 13-22 Parameter selection screen

3. Press the right functional button “Select” to enter the parameter edit screen.

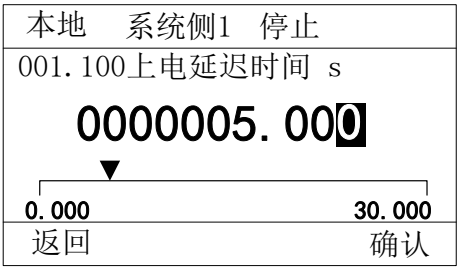


Figure 13-23 Parameter edit screen

4. When the parameter editing is completed, press the right functional button to confirm.
5. Repeat steps 2~4 to complete the setting of all parameters.

13.3.10 **Create custom parameters list**

Relevant information

Users can create a custom parameters list according to their needs for easy follow-up queries, modifications and monitoring.

Prerequisites

- The operation panel has been properly connected to the control device.

- The operation panel is not set with a password or is unlocked. To unlock, please refer to “13.3.4.2 Unlock the keyboard".

Operation steps

1. In the main screen, select [Menu → Function Code → Complete Parameter List] in turn. Enter the parameter group selection screen.

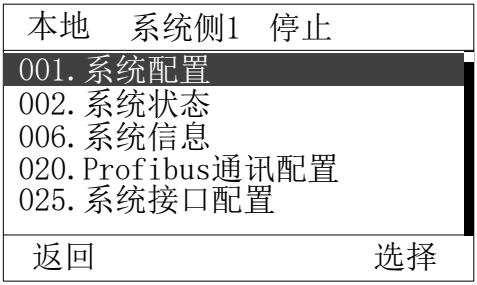


Figure 13-24 Parameter group selection screen

2. Find the target parameter according to the actual need (the black cursor indicates that the parameter is selected).

Figure 13-25 Parameter selection screen

3. Press and hold the left arrow button to enter the add page.

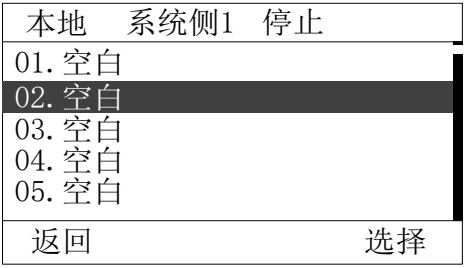


Figure 13-26 Custom parameter add screen

4. Select a blank entry and press the right functional button to confirm. The target parameters have been added to the custom list.

13.3.11 View and empty the list of custom parameters

View steps

In the main screen, select [Menu→Function Code→Custom Parameter List] in turn to view all the custom list information.

Clear steps

In the main screen, select [Menu→Function Code→Clear Custom Parameter List] in turn, and follow the prompts to clear all custom list information.

13.3.12 View and restore modified parameters

View steps

In the main screen, select [Menu→Function Code→Modified Parameter List] in turn to view the information of all the parameters that have been changed.

Restore steps

In the main screen, select [Menu → Function Code → Restore Function Code Defaults] in turn, and operate according to the prompts to restore all the parameters that have been modified to factory default values.

13.3.13 Upload the setup parameters of VFD to the operation panel

Upload the setup parameters of the VFD to the keyboard for storage.

⚠ Caution
Due to the storage space limitation of the operation panel, it currently supports saving parameters of only five control objects: system side 1, rectifier unit 1, rectifier unit 2, inverter unit 1, and inverter unit 2. When you select another control object to save, the LCD screen will indicate "EEPROM error".

✓ Prerequisites

- (a) The operation panel has been properly connected to the HCU20.
- The operation panel is not set with a password or is unlocked. To unlock, please refer to “13.3.4.2 Unlock the keyboard".

✓ Operation steps

In the main screen, select [Menu → Parameter Backup → Parameter Upload to Keyboard] in turn. Please wait for the parameters to finish uploading.

Note: Please keep the device powered and communicated properly to avoid data loss and possible device damage.

Figure 13-27 Parameter upload to keyboard completed

13.3.14 **Download parameters to the VFD via the operation panel**

Relevant information

Download the parameters saved in the EEPROM memory of the operation panel to the VFD.

✓ Prerequisites

- (a) The operation panel has been properly connected to the HCU20.
- The operation panel is not set with a password or is unlocked. To unlock, please refer to "13.3.4.2 Unlock the keyboard".

✓ Operation steps

In the main screen, select [Menu→Parameter Backup→Parameter Download to VFD] in turn. Please wait for the parameters to finish downloading.

Note: During the parameter downloading process, please keep the power supply and communication of the equipment normal to avoid data loss and possible equipment damage.

Figure 13-28 Parameter download to VFD completed

13.3.15 **Copy parameters between VFDs via operation panel**

✓ Relevant information

When there are multiple VFDs of the same type that need to set the same parameters, the user only needs to set up one of them (e.g. A), and then copy its parameters to the remaining VFDs (e.g. B, C, etc.) through the operation panel. This section describes copying the parameters of A to B and C.

✓ Prerequisites

- The operation panel has been properly connected to the HCU20.
- The operation panel is not set with a password or is unlocked. To unlock, please refer to “13.3.4.2 Unlock the keyboard".

✓ Operation steps

1. Upload the parameters of VFD A to the operation panel. Refer to “13.3.13 Upload the setup parameters of VFD to the operation panel".
2. Connect this operation panel to VFD B.
3. Download the parameters to VFD B. Refer to “13.3.13 Upload the setup parameters of VFD to the operation panel".
4. Repeat step 2~step 3 to download the parameters to other VFDs.

13.3.16 **Cure VFD parameters through the operation panel**

✓ Relevant information

If the parameters are modified using the operation panel, the new parameter values will be saved in the RAM of the VFD first, and the setting contents will be lost after the VFD is powered off. To avoid losing settings and affecting the use of the product, the settings must be saved and cured after the parameters are modified. There are two ways to save the modified parameters.

Cure only the parameters of the current panel's control object through [Menu → Parameter Backup → Cure Current Control Object Parameters].

All parameters of the control unit associated with the control unit can be cured by [Menu→Parameter backup→Cure All Parameters of VFD].

✓ Prerequisites

- The operation panel has been properly connected to the HCU20.
- The operation panel is not set with a password or is unlocked. To unlock, please refer to "13.3.4.2 Unlock the keyboard".

✓ Operation steps

The following is an example of "Cure All Parameters of VFD":

1. In the main screen, select [Menu→Parameter Backup→Cure All Parameters of VFD] in turn. Please wait for the parameters curing to be completed. As shown in the figure below.

Figure 13-29 Cure VFD parameters

2. If there are inconsistent parameter settings saved in the operation panel, the operation panel will bring up a prompt if the curing operation is performed at this time, as shown in the figure below: Select "OK", the operation panel starts curing parameters.

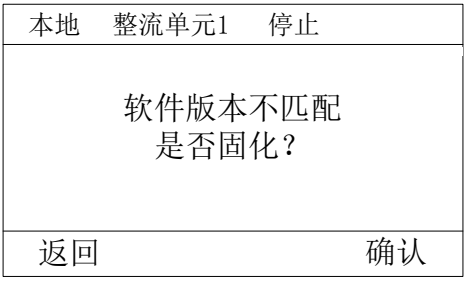


Figure 13-30 Parameter mismatch prompt

Note: Please keep the device powered and communicated properly to avoid data loss and possible device damage.

13.3.17 **View event log via operation panel**

Relevant information

The log list of the operation panel can display event information such as fault alarms according to the time period (e.g. the last 10 days) required by the user.

Prerequisites

- The operation panel has been properly connected to the control device.
- The operation panel is not set with a password or is unlocked. To unlock, please refer to “13.3.4.2 Unlock the keyboard".

Operation steps

1. In the main screen, select [Menu→Event Log] in turn. Select to view the Fault Event Log or All Event Log.

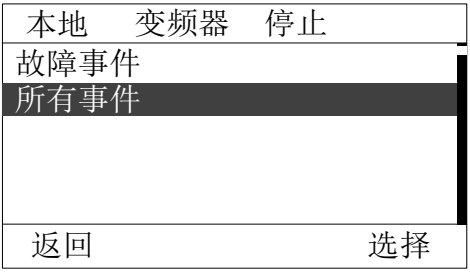


Figure 13-31 Event log selection screen

2. Select the time range to view from the pop-up time selection list as required. Wait for a period of time and display the event log in the operation panel after getting the log successfully.

13.3.18 **View system information through the operation panel**

Prerequisites

- The operation panel has been properly connected to the control device.
- The operation panel is not set with a password or is unlocked. To unlock, please refer to “13.3.4.2 Unlock the keyboard".

Operation steps

On the main screen, select [Menu→System Information] in turn. Select to view the current version number of each part of the control system.

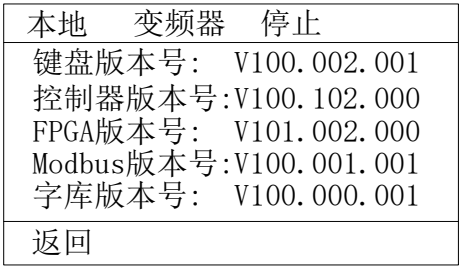


Figure 13-32 System information display screen

--End of this chapter--

14 Optional Card

14.1 HVCOM-DP communication card manual

14.1.1 Product description

- HVCOM-DP is a fieldbus-based industrial network system that realizes periodic high-speed data interaction between master and slave stations.
- HVCOM-DP module is an optional ProfiBus communication module for HD2000 series VFD, which is used for ProfiBus-DP network configuration, enabling the HD2000 VFD to be used as a slave node in the ProfiBus-DP network to realize the functions of control, monitoring and diagnosis of the VFD by the DP master station.
- HVCOM-DP modules are installed inside the HCU20 control unit by default and are not shipped and assembled separately. When purchasing, please directly select the HCU20 control unit that supports ProfiBus communication.

14.1.2 Electrical installation

The HCU20 control unit X3 interface is a fieldbus communication interface, which can support 6 fieldbus communication protocols depending on the communication option card installed inside. The HVCOM-DP module interface is shown below.

14.1.2.1 Interface definition

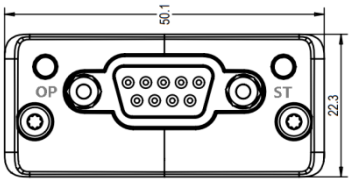


Figure 2-1HVCOM-DP module front view

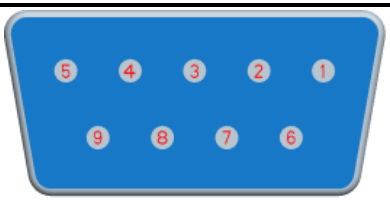


Figure 2-2 D-type female connector pin diagram

Pin number	Function
1	NC
2	NC
3	Positive data signal line (B) - Red
4	RTS
5	Isolation signal ground (GND)
6	Isolation +5V power supply
7	NC

8	Negative data signal line (A) - Green
9	NC

14.1.2.2 DP network bus connector

It is recommended that certified connectors be used:

- These connectors are capable of connecting 2 ProfiBus-DP cables and have 4 built-in terminals in the plug to connect input and output PROFIBUS cables.
- These connectors also feature a shield clamp device that ensures a well-shielded connection and helps maintain the immunity of the ProfiBus-DP network.

14.1.2.3 ProfiBus bus cable

- The ProfiBus-DP cable is the standard cable for Profibus-DP quick connection. The radially symmetrical design of the bus cable enables quick and easy assembly of the bus connector by a stripping tool. Standard bus cables are designed specifically for assembly with solid bare copper conductors, 2-core parallel pairs, and red and green cores. Aluminum foil, bare wire braid double shield, PVC outer sheath, purple appearance.
- ProfiBus-DP is used for high-speed data transfer at the field level and requires the use of specially designed cables to carry high-frequency signals. Poor quality cables will attenuate the signal and may also cause other nodes on the network to fail to recognize the signal.
- A list of cable specifications and licensed manufacturers for the ProfiBus DP network can be found in the website of ProfiBus Nutzerorganisation (PNO) at www.profibus.com.

14.1.2.4 ProfiBus-DP network shield connection

The shield of the ProfiBus-DP bus cable should be grounded at the closest point to the VFD. Good grounding enhances the interference immunity of the ProfiBus-DP network.

When laying bus cables, the following should be noted:

- Do not lay directly against and be parallel to the power cable.
- Separate laying of bus cables and power cables in their respective cable trays.
- The shield is grounded with as large a contact surface with ground as possible.

14.1.3 Quick start operation

✓ Steps for setting VFD parameters in the background (taking the inverter unit as an example)

1) Confirm that the HCU20 control unit is internally configured with HVCOM-DP modules, i.e. the product type is HCU20-DP series.
2) Power up the HCU20 control unit and VFD, ensure that the background software has communication with the equipment, and open [Parameter Monitoring] - [Control Unit].
3) Select [20. Fieldbus Module Configuration], then select [S-20.14 Fieldbus Module Reset], set the value to 1, and click [OK].

4) Then the "ST" indicator on the HVCOM-DP module of the X3 interface of the HCU20 control unit lights up, proving that the hardware communication between the HVCOM-DP and the VFD has been established.

5) Select [S-20.01 Fieldbus communication protocol] to enter and set the communication protocol. After setting up, click [OK].

S-20.01	Remarks
0	Module Defaults
1	ABCC module
2	Siemens S120
3	Siemens 6SE70_CBP module
4	Siemens 6SE70_CB1 module
5	Yaskawa SI-P3
6	Reserved
7	ABCC CanOpen module
8	ABCC ACS800
9	ABCC ACS880
10	Siemens MM440
11	Schneider ATV71
65535	Custom

6) Select [S-20.02 Fieldbus communication slave station address] and set it according to the upper computer address. After setting up, click [OK].

7) Select [S-20.12 Fieldbus small and large end settings] to set the fieldbus small and large end. After setting up, click [OK].

S-20.12	Remarks
0	0-LSB-Small end mode
1	1-MSB-Large end mode

8) Select [S-20.20 Fieldbus communication parameter group 1], set to [I-25.01 Fieldbus communication frame format], and click [Set] after setting.

9) Return to the complete parameter list, select [Inverter Unit] - [25. Fieldbus Interface Configuration] to enter the fieldbus interface configuration parameter list.

10) Select [I-25.01 Fieldbus communication frame format] to set the fieldbus communication frame. It is generally set to 65535. After setting up, click [OK].

I-25.01	Remarks
0	No communication
1	Output 1word, Input 1word
2	Output 2words, Input 2words
3	Output 4words, Input 4words

I-25.01	Remarks
4	Output 5words, input 9words
5	Output 10words, Input 10words
65535	Custom

11) Select [I-25.03 Fieldbus Send Word Count] to set the number of words (0~16) sent by the fieldbus according to the upper computer. After setting up, click [OK].
12) Select [I-25.04 Fieldbus Receive Word Count] and set the number of words (0~16) received by the fieldbus according to the upper computer. After setting up, click [OK].
13) Set [I-25.10 Fieldbus Send Parameter 01 Function Code ID] ~ [I-25.25 Fieldbus Send Parameter 16 Function Code ID] in sequence according to the number of words sent by fieldbus set in step [10]. If the actual number of words to be sent is not enough for the number of words set in [I-25.03], just configure the actual number of words to be sent. See Figure 14-1 below for an example.

Figure 14-1 Example of fieldbus send word configuration

14) The fieldbus receive word set in step [11] does not need to be configured separately, and the data sent from the upper computer to the VFD is pushed to the buffer [I-25.101 fieldbus receive word 01] ~ [I-25.116 fieldbus receive word 16], and the VFD references [I-25.101] ~ [I-25.116] for application configuration. See Figure 14-2 below for an example.

Figure 14-2 Example of fieldbus receive word (continued from Figure 14-1)

15) After ensuring that the parameters are set correctly, select [System Configuration] - [Parameter Curing], select [Cure Current Parameters], and check [Control Unit] [Inverter Unit]. Prompt "Operation successful!" After that, the parameters are cured successfully.

16) Execute steps [2] and [3] to reset the HVCOM-DP communication module. If normal communication with the host computer is established, the "OP" indicator on the HVCOM-DP communication module is always on.

--End of this chapter--

Warranty Information

✓ Quality Assurance

If the product fails within the warranty period, we will repair or replace it with a new one free of charge.

The company has the right not to carry out quality assurance if the following cases occur:

Problems arising when the product is arbitrarily disassembled by the user or not properly maintained.

The whole machine and parts have exceeded the free warranty period.

Exceed the scope of operation and use specified in the relevant international standards.

Problems arising from failure to install and operate the product correctly according to the instructions.

Damage to the product caused by abnormal natural environment.

Damage to the machine caused by the use of non-standard parts or the software not from us.

Damage to the product caused by damage to external equipment.

All accidents caused by the user's own modification or repair of the product.

In case of product failure caused by the above reasons, if the customer requires maintenance service, our service organization will determine that we can provide paid maintenance service. If you need to repair or modify the product, please contact us in advance.

✓ Contact

Shenzhen Hopewind Electric Co., Ltd.

Address: Building 5, Guanlong No.2 Industry Park, Xili Town, Nanshan District, Shenzhen, China

Website:www.hopewind.com

E-mail:hopewind@hopewind.com

Tel.: +86-(0)755-8602 6786

Fax: +86-(0)755-2651 8311

Hotline: 400-111-7588

Address: Building 11, Guanlong No. 2 Industrial Park, Xili, Nanshan District, Shenzhen, PR.China

Postcode: 518055

Customer Service Hotline: 400-8828-705

Tel: + 86- (0) 755-86026786
Web Site: www.hopewind.com

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