

# **Goodrive880 Series Active rectifier Unit**

# Hardware Manual



No.	Change description	Version	Release date
1	First release.	V1.0	January 2024

# **Preface**

Thank you for choosing INVT Goodrive880 series engineering variable-frequency drive (VFD).

For ease of use, read the manual carefully before using the product.

As an upgrade product of Goodrive800 series engineering VFD, Goodrive880 series engineering VFD inherits the high reliability feature of Goodrive800 platform but optimizes the upgrade, structure, and components, achieving unit modularization, flexible cabinet configuration, more compact structure, easier installation and maintenance, and optimum protection.

- Excellent speed and torque control performance
- Modular design, as flexible as building blocks, which makes the project integration simple and efficient
- Long-life component selection and fast fault recovery design to ensure efficient process control
- Ergonomic design to make installation and maintenance easier
- Enriched expansion capability to support various protection options

Goodrive880 series engineering VFD can be widely used in:

Metallurgy: Such as high-speed wire rod and hot strip rolling equipment, wide and thick plate equipment, cold rolling equipment, pickling lines, annealing lines, galvanizing line, color coating lines, non-ferrous metal alloy manufacturing equipment, and non-ferrous metal rolling equipment.

Petroleum: All-electric oil drilling rigs, large well repair machines, large oil machinery and equipment electric-drive power transformation, oilfield water injection equipment and other heavy oil equipment.

Paper making: Paper making joint equipment, including flow box, net section, press section, drying section, sizing, hard calendering, coating, super calender, rewinder and other continuous production lines.

Port and other large lifting equipment: Such as shore-side container overhead cranes, tire-type (orbital) container gantry cranes, grab unloaders, grab gantry cranes, large shipbuilding gantry cranes, and large metallurgical casting cranes.

Others: Such as unit test benches, military equipment, oil and gas transmission, and mining transmission equipment.

Goodrive880-91 series is the active rectifier unit product of Goodrive880 series. If not otherwise specified, the active rectifier unit in this manual refers to the active rectifier unit of Goodrive880 series and Goodrive880-91 series product. The rated power of a single unit is 64kW-639kW, and the max. parallel power can be 3642kW. The active unit consists of bus capacitor, IGBT, and filtering components. It is compact in structure and easy to integrate and maintain.

This manual is Goodrive880 series active rectifier unit hardware manual, presenting safety precautions, product information, mechanical and electrical installation, and precautions related to daily maintenance. Read through this manual carefully before installation to ensure the product is installed and operated in a proper manner to give full play to its excellent performance and powerful functions. If you have any question about the function and performance of the product, please consult our technical support.

If the product is ultimately used for military affairs or weapon manufacture, comply with the export control regulations in the Foreign Trade Law of the People's Republic of China and complete related formalities.

To continuously improve the performance of the product to meet higher application requirements, we reserve the right to continuously improve the product and accordingly the product manual, which may be made without prior notice. We have the final interpretation of the manual content.

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# 1 Safety precautions

# 1.1 Safety declaration

Read this manual carefully and follow all safety precautions before moving, installing, operating and servicing the product. Otherwise, equipment damage or physical injury or death may be caused.

We shall not be liable or responsible for any equipment damage or physical injury or death caused due to your or your customers' failure to follow the safety precautions.

# 1.2 Safety definition

**Danger**: Severe personal injury or even death can result if related requirements are not followed.

Warning: Personal injury or equipment damage can result if related requirements are not followed.

Note: Actions taken to ensure proper running.

**Trained and qualified professionals**: People operating the equipment must have received professional electrical and safety training and obtained the certificates, and must be familiar with all steps and requirements of equipment installing, commissioning, running and maintaining and capable to prevent any emergencies.

# 1.3 Warning symbols

Warnings caution you about conditions that can result in severe injury or death and/or equipment damage and advice on how to prevent dangers. The following table lists the warning symbols in this manual.

Symbol	Name	Description
4	Danger	Severe personal injury or even death can result if related requirements are not followed.
$\triangle$	Warning	Personal injury or equipment damage can result if related requirements are not followed.
	Electrostatic discharge	The PCBA may be damaged if related requirements are not followed.
	Hot sides	Do not touch. The active rectifier base may become hot.
<b>A</b> © 25 min	Electric shock	As high voltage still presents in the bus capacitor after power off, wait for at least 25 minutes (depending on the warning symbols on the machine) after power off to prevent electric shock.
Note	Note	Actions taken to ensure proper running.

# 1.4 Safety guidelines



- Only trained and qualified professionals are allowed to carry out related operations.
- Do not perform wiring, inspection or component replacement when power supply is applied. Ensure all the input power supplies have been disconnected before wiring or inspection, and wait for at least the time designated on the Goodrive880 series product or until the DC bus voltage is less than 36V. The minimum waiting time is

	listed i	in the following.								
			Model	Minimum waiting time						
			64-126kW	5 minutes						
		380V	151–345kW	15 minutes						
			Higher than 422kW	25 minutes						
		690V	>437kW	25 minutes						
<u> </u>		Do not modify the VFD unless authorized; otherwise fire, electric shock or other injury may result.								
	The base may become hot when the VFD is running. Do not touch. Otherwise, you may get burnt.									
	<ul> <li>The electrical parts and components inside the VFD are electrostatic sensitive. Take measurements to prevent electrostatic discharge when performing related operations.</li> </ul>									

#### 1.4.1 Delivery and installation



- Do not install the active rectifier on inflammables. In addition, prevent the active rectifier from contacting or adhering to inflammables.
- Do not run the active rectifier If it is damaged or incomplete.
- Do not contact the rectifier unit with damp objects or body parts. Otherwise, electric shock may result.
- Select appropriate tools for active rectifier delivery and installation to ensure the safe and proper running and avoid physical injury or death. The installation personnel must take mechanical protective measures like wearing safety shoes and working uniforms to protect personal safety.
- Protect the active rectifier against physical shock or vibration during the delivery and installation.
- Do not carry the product only by its front cover as the cover may fall off.
- The installation site must be away from children and other public places.
- Prevent the screws, cables and other conductive parts from falling into the rectifier unit.

Note

• As the leakage current caused during active rectifier running may exceed 3.5mA, ground properly and ensure the grounding resistance is less than  $10\Omega$ . The conductivity of PE grounding conductor must meet the following requirements:

Power cable conductor cross-sectional area S(mm²)	Grounding conductor cross-sectional area
S≤16	S
16 <s≤35< td=""><td>16</td></s≤35<>	16
35 <s< td=""><td>S/2</td></s<>	S/2

• L1, L2, and L3 are the power input terminals, while + and - are the DC bus output terminals. Connect the input power cables and output busbars properly; otherwise, the active rectifier may be damaged.

# 1.4.2 Commissioning and running

	• Cut off all power supplies connected to the active rectifier unit before terminal
	wiring, and wait for at least the time designated on the active rectifier unit after
	disconnecting the power supplies.
	• Medium voltage presents inside the active rectifier during running. Do not carry out
	any operation on the rectifier unit during running except for keypad setup. For
	products at voltage class of 4 or 6, the control terminals form extra-low voltage
	circuits. Therefore, you need to prevent the control terminals from connecting to
	accessible terminals of other devices.
	Before turning on the power supply, check the cable connection status.
	Prevent anyone from directly touching the energized part of the cabinet door. Pay
	special attention to safety when handling shields that are made of metal sheets.
	Do not do any withstand voltage testing during active rectifier connection.
	Disconnect the motor cable before performing any insulation and voltage withstand
	tests for the motor or motor cable.
	Do not open the cabinet door since medium voltage presents inside the VFD during
	running.
	• Do not switch on or switch off the input power supplies of the active rectifier
	frequently.
Note	• If the active rectifier has been stored for a long time without use, perform checking
Note	and carry out pilot run for the active rectifier before using it again.
	• Close the active rectifier front cover before running; otherwise, electric shock may
	occur.

# 1.4.3 Maintenance and component replacement

	<ul> <li>Only trained and qualified professionals are allowed to perform maintenance,</li> </ul>
	inspection, and component replacement for the active rectifier.
	<ul> <li>Cut off all power supplies connected to the active rectifier before terminal wiring,</li> </ul>
$\wedge$	and wait for at least the time designated on the rectifier unit after disconnecting the
14	power supplies.
	• During maintenance and component replacement, take measures to prevent
	screws, cables and other conductive matters from falling into the internal of the
	active rectifier.
	Use proper torque to tighten screws.
	• During maintenance and component replacement, keep the active rectifier and its
	parts and components away from combustible materials and ensure they have no
Note	combustible materials adhered.
Note	• Do not carry out insulation voltage-endurance test on the active rectifier, or
	measure the control circuits of the rectifier unit with a megohmmeter.
	• During maintenance and component replacement, take proper anti-static measures
	on the active rectifier and its internal parts.

# 1.4.4 Disposal



 The active rectifier contains heavy metals. Dispose of a scrap rectifier unit as industrial waste.



 Dispose of a scrap product separately at an appropriate collection point but not place it in the normal waste stream.

# 2 Product overview

For Goodrive880 series active rectifier products, the rated power of a single unit is 64kW–639kW, while that of parallel units can be up to 3642kW. The active rectifier consists of the active rectifier filter unit and the active rectifier unit. It is compact in structure and easy to integrate and maintain, reducing cabinet footprint.

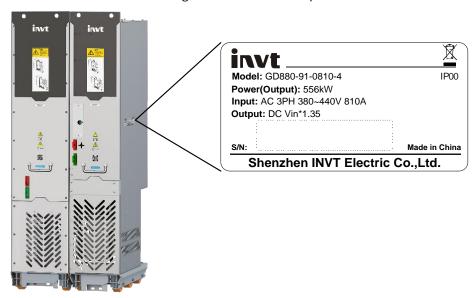
# 2.1 Product specifications

Table 2-1 Product specifications

Functi	on description	Specifications					
		380-440VAC 3PH ±10%, -15%<1min;					
	Input voltage (V)	Rated voltage: 400V					
Power input		520–690VAC 3PH ±10%, -15%<1min; Rated voltage: 690V					
rower input	Input current (A)	See section 2.3 Product ratings.					
	Input frequency	50Hz or 60Hz; Allowed range: 47–63Hz					
	(Hz)	33112 01 00112,71110Wed Tdilige. 41 03112					
	Output voltage (V)	Input voltage * 1.5					
Power output	Output current	See section 2.3 Product ratings.					
rower output	(A)	See Section 2.5 Froduct ratings.					
	Output power	See section 2.3 Product ratings.					
	(kW)						
	Working	-10°C – +50°C; Derating is required when the ambient temperature					
	temperature	exceeds 40°C.					
Environment	Relative	5%–95%, no condensation					
condition	humidity						
	Installation	Below 1000m (Derating is required when the altitude exceeds					
	altitude	1000m. Derate by 1% for every increase of 100m.)					
	Anti-vibration performance	Compliant with 3M4 vibration level in GB/T4798.3					
Maabaaiaal	ID votino	For the module: IP00					
Mechanical data	IP rating	For the cabinet: IP20 (Optional: IP23 and IP42)					
uata	Safety	Compliant with EN C1900 E 1					
	performance	Compliant with EN 61800-5-1					
	Cooling method	Forced air cooling					
Protection	Protection	Including functions of protection against overcurrent, overload,					
function	function	overvoltage, undervoltage, overtemperature, and phase loss.					

# 2.2 Product nameplate and model

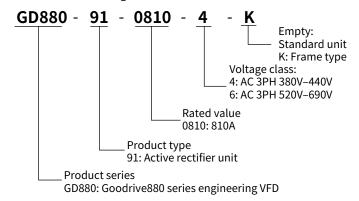
Figure 2-1 Product nameplate



**∠Note:** The preceding nameplate is a standard product nameplate example. The marking varies slightly depending on the model.

The model designation code contains basic product information such as rated current and rated voltage. You can find the model code on the product nameplate.

Figure 2-2 Product model



Note: The preceding model is only an example of GD880-91 models.

# 2.3 Product ratings

Table 2-2 AC 3PH 380V-440V

Model	Rated value						Light overload application a		avy load cation	External	Heat dissi patio	Air volu
GD880-91-···	I <sub>N</sub>	I <sub>N</sub>	I <sub>max</sub>	S <sub>N</sub>	P <sub>N</sub>	I <sub>Ld</sub>	$P_{Ld}$	I <sub>hd</sub>	P <sub>Hd</sub>	view Structure	n	me
	Α	Α	Α	kVA	kW	A kW	A kW	Structure	kW	m³/h		
	(AC)	(DC)	(DC)	KVA	(DC)	(DC)	(DC)	(DC)	(DC)		KVV	III /II
0094-4	94	115	150	67	64	111	62	92	48	A3+LCL	1.2	255
0116-4	116	142	185	82	78	136	76	113	59	A4+ LCL	1.2	255
0149-4	149	183	237	107	102	175	98	141	77	A4+ LCL	1.7	255

Model	Rated value					Light overload application		Heavy overload application		External view	Heat dissi patio	Air volu
GD880-91-···	I <sub>N</sub>	I <sub>N</sub>	I <sub>max</sub>	S <sub>N</sub>	P <sub>N</sub>	I <sub>Ld</sub>	$P_{Ld}$	I <sub>hd</sub>	P <sub>Hd</sub>	Structure	n	me
	A (AC)	A (DC)	A (DC)	kVA	kW (DC)	A (DC)	kW (DC)	A (DC)	kW (DC)	Structure	kW	m³/h
0183-4	183	224	291	132	126	215	120	184	94	A4+ LCL	2.0	255
0220-4	220	270	350	158	151	259	145	202	113	A6+LCL	2.5	1000
0260-4	260	319	414	186	178	306	171	239	133	A6+LCL	3.7	1000
0312-4	312	382	497	224	214	367	205	287	161	A7+LCL	4.1	1000
0395-4	395	484	629	284	271	465	260	363	203	A7+LCL	5.3	1000
0516-4	516	632	822	371	354	607	339	474	265	A7+LCL	6.4	1000
0615-4-XX	615	753	979	442	422	723	405	565	317	A8+LCL	9.0	3000
0681-4-XX	681	834	1084	485	463	801	449	626	347	A8+LCL	10.2	3000
0810-4-XX	810	992	1290	582	556	953	533	744	417	A8+LCL	14.1	3000
0980-4-XX	980	1201	1561	699	667	1152	646	900	500	2* A8+ LCL	17.7	4500
1168-4-XX	1168	1431	1860	840	802	1374	769	1073	602	2* A8+ LCL	20.1	4500
1295-4-XX	1295	1586	2062	930	888	1523	852	1190	666	2* A8+ LCL	22.1	4500
1539-4-XX	1539	1885	2451	1106	1056	1810	1013	1414	792	2* A8+ LCL	24.1	4500
2185-4-XX	2185	2677	3480	1570	1499	2570	1439	2007	1124	2*(2* A8+ LCL)	40.2	9000
3078-4-XX	3078	3771	4902	2211	2111	3620	2027	2828	1583	2*(2* A8+ LCL)	48.2	9000
4617-4-XX	4617	5656	7353	3317	3167	5430	3040	4242	2375	3*(2* A8+ LCL)	72.3	13500

Table 2-3 AC 3PH 520V-690V

Model		Ra	ted va	lue		Light overload application		Heavy overload application		Structure	Heat dissi patio	Air volu
GD880-91-···	I <sub>N</sub>	I <sub>N</sub>	I <sub>max</sub>	S <sub>N</sub>	P <sub>N</sub>	I <sub>Ld</sub>	P <sub>Ld</sub>	I <sub>hd</sub>	P <sub>Hd</sub>	Structure	n	me
	A (AC)	A (DC)	A (DC)	kVA	kW (DC)	A (DC)	kW (DC)	A (DC)	kW (DC)		kW	m³/h
0369-6-XX	369	452	588	458	437	434	419	339	327	A8+L	13.2	3000
0477-6-XX	477	584	760	591	564	561	541	438	422	A8+L	14.5	3000
0540-6-XX	540	662	860	669	639	635	613	496	479	A8+L	15.8	3000
0701-6-XX	701	859	1116	868	829	824	796	644	622	2*A8+L	22.3	4500
0906-6-XX	906	1110	1443	1123	1072	1065	1029	832	804	2*A8+L	24.8	4500
1026-6-XX	1026	1257	1634	1272	1214	1207	1165	943	910	2*A8+L	27.5	4500
1402-6-XX	1402	1717	2233	1738	1659	1649	1592	1288	1244	2*(2*A8+L)	49.6	9000
2052-6-XX	2052	2514	3268	2543	2428	2413	2331	1885	1821	2*(2*A8+L)	55	9000
3078-6-XX	3078	3771	4902	3815	3642	3620	3496	2828	2731	3*(2*A8+L)	82.5	13500

#### ∠Note:

- The active filter components consist of LCL components, using manufacturer's original parts.
- $I_N$  indicates the rated current for continuous running when no overload occurs at 40°C, while  $I_{max}$  indicates the max. output current.

- Light overload application: I<sub>Ld</sub> indicates the continuous running current at light overload. Every 5 minutes, the overload with the current of 110%\*I<sub>Ld</sub> can last for 1 minutes at 40°C.
- Heavy overload application: I<sub>Ld</sub> indicates the continuous running current at heavy overload. Every 5 minutes, the overload with the current of 150%\*I<sub>Hd</sub> can last for 1 minutes at 40°C.
- The structure offers default, -K, and -N. The default is standard unit without frame, -K is frame structure, and -N is a structure without reactor, front outlets. The power units of -N structure are only applicable to A8+LCL structure, and not applicable to applications consisting of multiple A8 units connected in parallel.

# 2.4 Overload capability

Based on the light overload continuous run current (I<sub>Ld</sub>), the active rectifier can keep running for 60s at 110% of the rated current. See Figure 2-3.

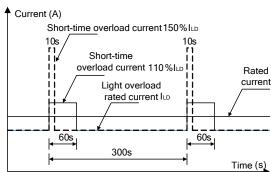


Figure 2-3 Light overload application

Based on the heavy overload continuous run current (I<sub>Hd</sub>), the active rectifier can keep running for 60s at 150% of the rated current. See Figure 2-4.

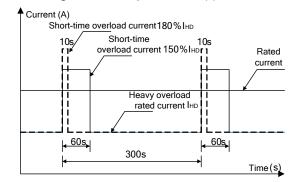


Figure 2-4 Heavy overload application

# 2.5 Hardware principles

#### 2.5.1 Basic principles

The active rectifier, a four-quadrant rectifier system, mainly consists of active rectifier filter unit and active rectifier unit. It is used with the pre-charge circuit and control unit. The intermediate DC voltage can supply the subsequent inverter modules. One or more inverter modules can be installed.

The active rectifier converts 3PH AC voltage into DC voltage, and the DC voltage can supply the subsequent inverter modules to drive motors. It can also feed the regenerative energy of the motor back to the grid. The active rectifier filter unit, which is the filter, is used to suppress input or regenerative current harmonics.

The active rectifier mainly consists of AC fuse, active rectifier filter unit, active rectifier unit, and DC fuse. Figure 2-5 shows the simplified main circuit diagram.

Active rectifier filter unit

Active rectifier power unit

R
S
T
O
DC+

Figure 2-5 Main circuit diagram of the active rectifier

No.	Name	Description		
1	AC fuse	To protect against overload and short-circuit on the active rectifier side.		
2	Active rectifier filter unit	To suppress AC voltage and current harmonics.		
3	Active rectifier unit	To convert AC current to DC current.		
4	DC fuse	To prevent backend short circuit from causing machine burndown.		

**Note:** The AC/DC fuse is not a component of the active rectifier. You can choose to configure AC/DC fuses according to the actual application requirements.

#### 2.5.2 Paralleling principle

The active rectifier supports parallel use in 2\*A8+LCL frame structure, that is, one active rectifier filter unit is connected with two active rectifier units, as shown in Figure 2-6. To meet the requirements of greater capacity, the parallel pattern (2\*A8+LCL)\*N should be used, where N can be up to 3. In parallel connection, ensure that the active rectifier filter units have the same specifications and active rectifier units use the same software and hardware.

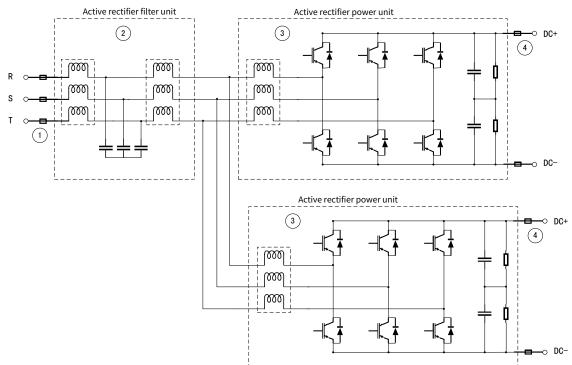


Figure 2-6 Parallel system diagram of the active rectifier

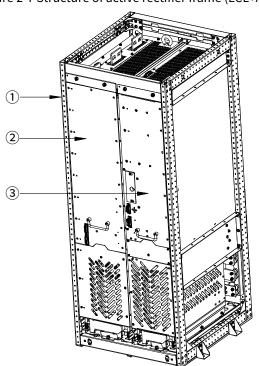
No.	Name	Description			
1	AC fuse	To protect against overload and short-circuit on the			
1		active rectifier side.			
2	Active rectifier filter unit	To suppress AC voltage and current harmonics.			
3	Active rectifier unit	To convert AC current to DC current.			
4	DC fuse	To prevent backend short circuit from causing machine			
4		burndown.			

# 2.6 Product structure

# 2.6.1 Layout of LCL+A8

The following figure shows the frame layout of LCL+A8.



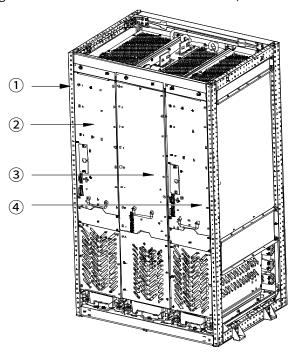


No.	Name			
1	Frame			
2	Active rectifier unit			
3	Active rectifier filter unit			

## 2.6.2 Layout of LCL +2\*A8

The following figure shows the frame layout of LCL +2\*A8.

Figure 2-8 Structure of active rectifier frame (LCL +2\*A8)

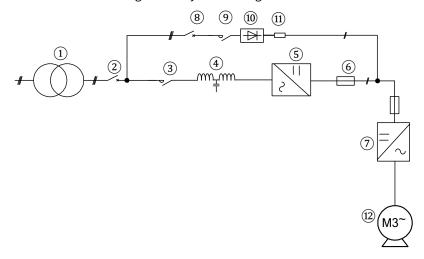


No.	Name			
1	Frame			
2	Active rectifier unit			
3	Active rectifier filter unit			
4	Active rectifier unit			

# 2.7 System configuration

Figure 2-9 shows the typical topology in which the active rectifier works with one inverter unit (applicable to A3–A7 modules).

Figure 2-9 System configuration



No.	Name	
1	Transformer	
2	Breaker	
3	Main circuit contactor	
4	Active rectifier filter component	
5	Active rectifier unit	
6	DC fuse	
7	Inverter unit	
8	Buffer breaker	
9	Buffer contactor	
10	Rectifier bridge	
11	Buffer resistor	
12	Motor	

Figure 2-10 shows the typical topology in which the active rectifier works with three inverter units (applicable to A8 power module).

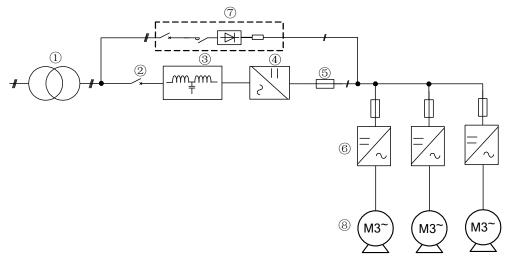


Figure 2-10 System configuration

No.	Name			
1	Transformer			
2	Breaker			
3	Active rectifier filter unit			
4	Active rectifier unit			
5	DC fuse			
6	Inverter unit			
7	Buffer component			
8	Motor			

**∠Note:** The active filter components consist of LCL components, using manufacturer's original parts.

#### 2.8 Electrical model selection

#### 2.8.1 Buffer component

The buffer component consists of breaker, contactor, rectifier bridge, and buffer resistor, as shown in Figure 2-10.

**Power unit** Frame size **Buffer component model** Qty GD880-91-0094-4 LCL+A3 HC-0110-4-Z 1 GD880-91-0116-4 LCL+A4 HC-0110-4-Z 1 LCL+A4 GD880-91-0149-4 HC-0110-4-Z 1 GD880-91-0183-4 LCL+A4 1 HC-0110-4-Z GD880-91-0220-4 LCL+A6 HC-0200-4 1 GD880-91-0260-4 LCL+A6 HC-0200-4 1 GD880-91-0312-4 LCL+A7 HC-0200-4 1 GD880-91-0395-4 LCL+A7 HC-0200-4 1 1 GD880-91-0516-4 LCL+A7 HC-0200-4 GD880-91-0615-4 LCL+A8 BUB800-0900-4 1 GD880-91-0681-4 LCL+A8 BUB800-0900-4 1 GD880-91-0810-4 LCL+A8 BUB800-0900-4 1 GD880-91-0980-4 LCL +2\* A8 BUB800-1770-4 1 LCL +2\* A8 1 GD880-91-1168-4 BUB800-1770-4 GD880-91-1295-4 LCL +2\* A8 BUB800-1770-4 1 GD880-91-1539-4 LCL +2\* A8 BUB800-1770-4 GD880-91-2185-4 2 2\*(LCL+2\*A8) BUB800-1770-4 GD880-91-3078-4 2\*(LCL+2\*A8) BUB800-1770-4 2 GD880-91-4617-4 3\*(LCL+2\*A8) BUB800-1770-4 3 GD880-91-0369-6 LCL+A8 BUB800-0900-6 1 GD880-91-0477-6 LCL+A8 1 BUB800-0900-6 GD880-91-0540-6 LCL+A8 BUB800-0900-6 1 GD880-91-0701-6 LCL +2\* A8 BUB800-1770-6 1 GD880-91-0906-6 LCL +2\* A8 BUB800-1770-6 1 GD880-91-1026-6 LCL +2\* A8 BUB800-1770-6 1 GD880-91-1402-6 2\*(LCL+2\*A8) BUB800-1770-6 2 GD880-91-2052-6 BUB800-1770-6 2\*(LCL+2\*A8) 2 GD880-91-3078-6 3\*(LCL+2\*A88) BUB800-1770-6 3

Table 2-4 Buffer component selection

#### 2.8.2 Breaker

A breaker can effectively prevent the overload of the variable-frequency equipment and break the fault current generated by the phase-to-phase or to-ground short circuit, and at the same time it has the function of isolation so as to avoid electric shock accidents during maintenance.

Table 2-5 Breaker model selection

Power supply module	Frame size	Recommended specification	Recommended breaker (ABB)	Qty
GD880-91-0094-4	LCL+A3	690V 160A	XT4 N160	1
GD880-91-0116-4	LCL+A4	690V 160A	XT4 N160	1
GD880-91-0149-4	LCL+A4	690V 160A	XT4 N160	1

Power supply module	Frame size	Recommended specification	Recommended breaker (ABB)	Qty
GD880-91-0183-4	LCL+A4	690V 200A	XT4 N250	1
GD880-91-0220-4	LCL+A6	690V 250A	XT4 N250	1
GD880-91-0260-4	LCL+A6	690V 315A	XT5 N400	1
GD880-91-0312-4	LCL+A7	690V 315A	XT5 N400	1
GD880-91-0395-4	LCL+A7	690V 400A	XT5 N400	1
GD880-91-0516-4	LCL+A7	690V 630A	XT5 N630	1
GD880-91-0615-4	LCL+A8	690V 630A	XT5 N630	1
GD880-91-0681-4	LCL+A8	690V 800A	XT6 S800M	1
GD880-91-0810-4	LCL+A8	690V 1000A	XT7 S1000M	1
GD880-91-0980-4	LCL +2* A8	690V 1000A	XT7 S1000M	1
GD880-91-1168-4	LCL +2* A8	690V 1250A	XT7 S1250M	1
GD880-91-1295-4	LCL +2* A8	690V 1600A	XT7 S1600M	1
GD880-91-1539-4	LCL +2* A8	690V 1600A	XT7 S1600M	1
GD880-91-2185-4	2*(LCL+2*A8)	690V 2500A	E2.2S2500	1
GD880-91-3078-4	2*(LCL+2*A8)	690V 3200A	E4.2S3200	1
GD880-91-4617-4	3*(LCL+2*A8)	690V 5000A	E6.2S5000	1
GD880-91-0369-6	LCL+A8	690V 400A	XT5 N400	1
GD880-91-0477-6	LCL+A8	690V 630A	XT5 N630	1
GD880-91-0540-6	LCL+A8	690V 630A	XT5 N630	1
GD880-91-0701-6	LCL +2* A8	690V 800A	XT6 S800M	1
GD880-91-0906-6	LCL +2* A8	690V 1000A	XT7 S1000M	1
GD880-91-1026-6	LCL +2* A8	690V 1250A	XT7 S1250M	1
GD880-91-1402-6	2*(LCL+2*A8)	690V 1600A	XT7 S1600M	1
GD880-91-2052-6	2*(LCL+2*A8)	690V 2500A	E2.2S2500	1
GD880-91-3078-6	3*(LCL+2*A8)	690V 3200A	E4.2S3200	1

**∠Note:** A7 and lower units are recommended to be equipped with main contactors, and A8 and above breakers should be equipped with an external terminal to controls the opening and closing of the breaker and a status feedback auxiliary contact.

#### 2.8.3 AC fuse

An AC fuse protects the rectifier unit and input power cable in case of short circuit, avoiding thermal overload. See the following table for selection.

Table 2-6 AC fuse model selection

Power supply module	Frame size	Voltage (V)	Current (A)	Qty
GD880-91-0094-4	LCL+A3	690V	160A	3
GD880-91-0116-4	LCL+A4	690V	200A	3
GD880-91-0149-4	LCL+A4	690V	250A	3
GD880-91-0183-4	LCL+A4	690V	300A	3
GD880-91-0220-4	LCL+A6	690V	400A	3
GD880-91-0260-4	LCL+A6	690V	450A	3
GD880-91-0312-4	LCL+A7	690V	500A	3
GD880-91-0395-4	LCL+A7	690V	630A	3
GD880-91-0516-4	LCL+A7	690V	800A	3
GD880-91-0615-4	LCL+A8	690V	1000A	3
GD880-91-0681-4	LCL+A8	690V	1100A	3
GD880-91-0810-4	LCL+A8	690V	1250A	3

Power supply module	Frame size	Voltage (V)	Current (A)	Qty
GD880-91-0980-4	LCL +2* A8	690V	1600A	3
GD880-91-1168-4	LCL +2* A8	690V	900A	6
GD880-91-1295-4	LCL +2* A8	690V	1000A	6
GD880-91-1539-4	LCL +2* A8	690V	1250A	6
GD880-91-2185-4	2*(LCL+2*A8)	690V	1000A	12
GD880-91-3078-4	2*(LCL+2*A8)	690V	1250A	12
GD880-91-4617-4	3*(LCL+2*A8)	690V	1250A	18
GD880-91-0369-6	LCL+A8	690V	630A	3
GD880-91-0477-6	LCL+A8	690V	800A	3
GD880-91-0540-6	LCL+A8	690V	900A	3
GD880-91-0701-6	LCL +2* A8	690V	1100A	3
GD880-91-0906-6	LCL +2* A8	690V	800A	6
GD880-91-1026-6	LCL +2* A8	690V	900A	6
GD880-91-1402-6	2*(LCL+2*A8)	690V	630A	12
GD880-91-2052-6	2*(LCL+2*A8)	690V	800A	12
GD880-91-3078-6	3*(LCL+2*A8)	690V	800A	18

## 2.8.4 DC fuse

A DC fuse protects the rectifier unit and DC bus in case of short circuit, avoiding thermal overload. The same brand replacement principle should be followed. See the following table for selection.

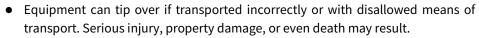
Table 2-7 DC fuse model selection

Power supply module	Frame size	Voltage (V)	Current (A)	Qty
GD880-91-0094-4	LCL+A3	690V	160A	2
GD880-91-0116-4	LCL+A4	690V	200A	2
GD880-91-0149-4	LCL+A4	690V	250A	2
GD880-91-0183-4	LCL+A4	690V	300A	2
GD880-91-0220-4	LCL+A6	690V	400A	2
GD880-91-0260-4	LCL+A6	690V	450A	2
GD880-91-0312-4	LCL+A7	690V	500A	2
GD880-91-0395-4	LCL+A7	690V	630A	2
GD880-91-0516-4	LCL+A7	690V	900A	2
GD880-91-0615-4	LCL+A8	690V	1000A	2
GD880-91-0681-4	LCL+A8	690V	1250A	2
GD880-91-0810-4	LCL+A8	690V	1250A	2
GD880-91-0980-4	LCL +2* A8	690V	900A	4
GD880-91-1168-4	LCL +2* A8	690V	1000A	4
GD880-91-1295-4	LCL +2* A8	690V	1250A	4
GD880-91-1539-4	LCL +2* A8	690V	1250A	4
GD880-91-2185-4	2*(LCL+2*A8)	690V	1000A	8
GD880-91-3078-4	2*(LCL+2*A8)	690V	1250A	8
GD880-91-4617-4	3*(LCL+2*A8)	690V	1250A	12
GD880-91-0369-6	LCL+A8	1250V	700A	2
GD880-91-0477-6	LCL+A8	1250V	800A	2
GD880-91-0540-6	LCL+A8	1250V	1000A	2
GD880-91-0701-6	LCL +2* A8	1250V	700A	4
GD880-91-0906-6	LCL +2* A8	1250V	800A	4

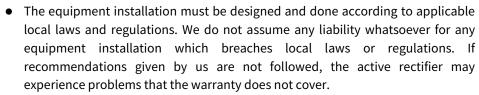
Power supply module	Frame size	Voltage (V)	Current (A)	Qty
GD880-91-1026-6	LCL +2* A8	1250V	1000A	4
GD880-91-1402-6	2*(LCL+2*A8)	1250V	700A	8
GD880-91-2052-6	2*(LCL+2*A8)	1250V	1000A	8
GD880-91-3078-6	3*(LCL+2*A8)	1250V	1000A	12

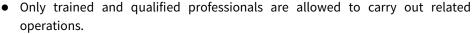
# 3 Mechanical installation

## 3.1 Safety notes



- Only trained and qualified professionals are allowed to carry out the operations mentioned in this chapter. Please carry out operations according to instructions presented in section 1.4.1 Delivery and installation. Ignoring these safety precautions may lead to physical injury or death, or device damage.
- Ensure the active rectifier power has been disconnected before installation. If
  the active rectifier has been powered on, disconnect the active rectifier unit
  power and wait for at least the time specified on the rectifier unit, and ensure the
  POWER indicator is off. You are recommended to use a multimeter to check and
  ensure the rectifier unit DC bus voltage is below 36V.





• Do not perform wiring, inspection or component replacement when power supply is applied. Ensure all the input power supplies have been disconnected before wiring or inspection, and wait for at least the time designated on the Goodrive880 series product or until the DC bus voltage is less than 36V.



#### 3.2 Installation environment and site

#### ■ Environment requirements

Environ ment	Requirement	
Tempera ture		<ul> <li>-10-+50°C</li> <li>Do not use the VFD when the ambient temperature exceeds 50°C. When the ambient temperature exceeds 40°C, derate 1% for every increase of 1°C.</li> <li>The temperature does not change rapidly.</li> <li>When the VFD is installed in a closed space, such as control cabinet, use a cooling fan or air conditioner for temperature adjustment if necessary.</li> <li>When the temperature is too low, if you want to use the VFD that has been idled for a long time, install an external heating device before the use to eliminate the freeze inside the VFD. Otherwise, the VFD may be damaged.</li> </ul>
Relative humidity (RH)		<ul> <li>The relative humidity (RH) of the air is less than 90%, and there is no condensation.</li> <li>The max. RH cannot exceed 60% in the environment where there are corrosive gases.</li> </ul>
Altitude		<ul> <li>Lower than 1000 meters</li> <li>When the altitude exceeds 1000m, derate 1% for every increase of 100m.</li> </ul>

Environ ment		Requirement	
		<ul> <li>When the altitude exceeds 3000m, consult our local dealer or office for details.</li> </ul>	
Vibration	} }	Max. vibration ACC: 5.8m/s²(0.6g)	

#### Location requirement

Locati on	Requirement	
Indoor		Without electromagnetic radiation sources and direct sunlight.  Note: The VFD must be installed in a clean and well-ventilated environment based on the housing IP rating.
		Without foreign objects such as oil mist, metal powder, conductive dust, and water.
		Without radioactive, corrosive, hazard, and combustible and explosive substances.  Note: Do not install the VFD onto combustible objects.
		With low salt content

# 3.3 Installation procedure

The installation procedures are as follows:

- Step 1 Perform unpacking inspection. For details, see section 3.3.1 Unpacking inspection.
- Step 2 Transport before unpacking. For details, see section 3.3.2 Transportation.
- Step 3 Unpack. For details, see section 3.3.3 Unpacking.
- Step 4 Lift the modules. For details, see section 3.3.4 Lifting.
- Step 5 Install the modules. For details, see section 3.3.5 Installation space and heat dissipation.

#### 3.3.1 Unpacking inspection

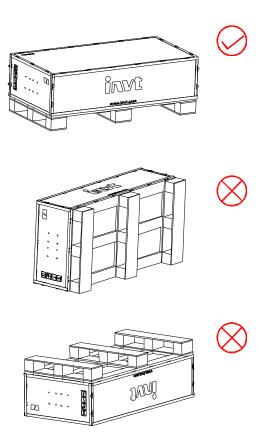
After receiving the product, perform the following steps to ensure the product use safety.

- 1. Before unpacking, check whether the product package is intact-whether the package is damaged, dampened, soaked, or deformed.
- 2. Check whether the nameplate and label on the product body are consistent with the model ordered.
- 3. After unpacking, check whether the interior surface of the packing box is abnormal, for example, in wet condition, and whether the equipment enclosure is damaged or cracked.
- 4. Check whether the parts (including the complete equipment of active rectifier, keypad, and manual) inside the packing box are complete.

#### 3.3.2 Transportation

The GD880 series active rectifier is shipped in a wooden box with pallets, which are heavy as a whole and must be carried with a lifting tool, such as a forklift and crane; operators must be professionally trained; the regenerative rectifier must be transported in strict accordance with the allowed ways marked on the box, and not allowed to be transported upside down or on the sides.

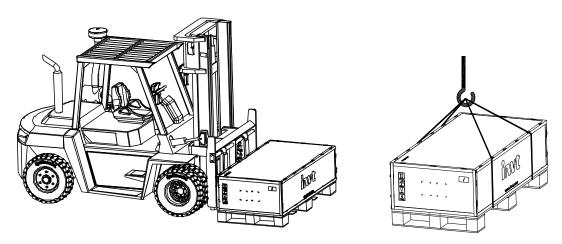
Figure 3-1 Transportation requirements



When transported with a forklift, the active rectifier must be fixed to the pallets and transported together, which means you are not allowed to remove the pallets to transport the active rectifier. If the forklift's fork tines are too short, it may cause the unit/cabinet to tip over, resulting in serious injury, property damage or even death.

When transported with a crane, the active rectifier unit must be fixed to the pallets and lifted together.

Figure 3-2 Transportation means



## 3.3.3 Unpacking

The unit is delivered in the wooden box padded with EPE.

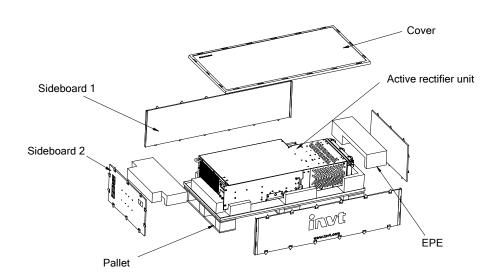
To remove the packing, do as follows:

1. Place the well-packed unit in an empty and flat place.

- 2. Use tools such as a pry bar or large one-piece screwdriver to remove the wooden box cover and the steel tongue nails of the surrounding boards.
- 3. Remove the surrounding boards and EPE filling materials from the wooden box.
- 4. Cut off the plastic windings.
- 5. Take out of the unit.
- 6. Ensure that the unit is intact without any damage.

Dispose of or recycle packaging in accordance with local regulations.

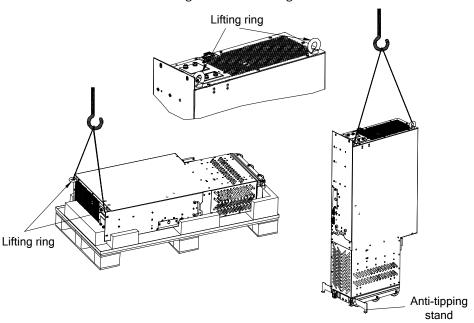
Figure 3-3 Unpacking



# 3.3.4 Lifting

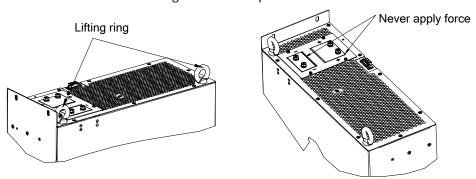
Attach the required lifting ring to the locations shown in the figure, use the sling to slowly lift the unit end, move the unit until it is completely lifted, place it vertically in the empty and flat place, and then unfold the anti-tipping stand at the lower front of the unit. Figure 3-4 shows the anti-tipping stand location.

Figure 3-4 Unit lifting



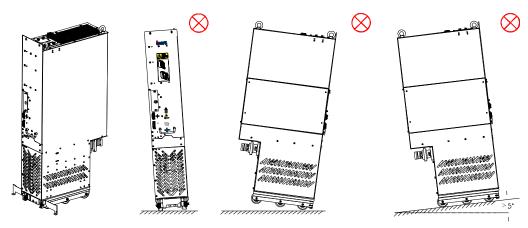
**∠Note:** Use the lifting ring on the top of active rectifier unit for lifting and moving. Never apply force to the positive or negative bus terminals.

Figure 3-5 Unit top structure



The active rectifier unit has a high center of gravity and must be placed on a flat and solid ground with sufficient support strength and a tilt angle of less than 5°. Failure to comply with this requirement will cause the unit to tip over or topple over, which may result in serious injury or property damage.

Figure 3-6 Unit placing requirements



Note the following to fold or unfold the anti-tipping stand:

- 1. To unfold the anti-tipping stand, pull down the anti-tipping stand to press the spring, wrap it around the restraining pin and rotate it 180° to snap into the slot as shown in Figure 3-8.
- 2. To fold the anti-tipping stand, rotate the anti-tipping stand in the slot by 180° to restore the pressed spring back to its original state to clamp the anti-tipping stand, as shown in Figure 3-9.
- 3. The restraint of the pin ensures that the anti-tipping stand will not unfold due to shaking. The anti-tipping stand folds, as shown in Figure 3-7.

Figure 3-7 Unit bottom structure

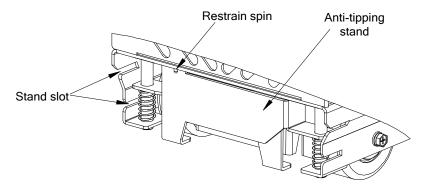


Figure 3-8 Unfolding the anti-tipping stand

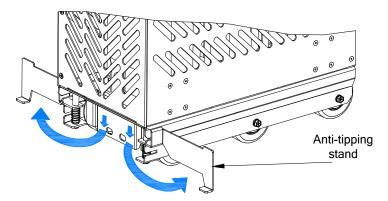
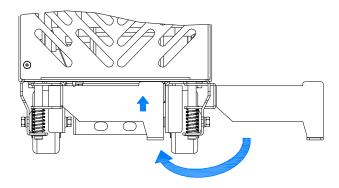


Figure 3-9 Folding the anti-tipping stand



#### 3.3.5 Installation space and heat dissipation

- 1. Installation space requirements for A3i& A4i active rectifier units
  Active rectifier units using A3i or A4i frame vary with power class. Note the following requirements to ensure reliable installation and excellent heat dissipation:
- A. The active rectifier unit must be installed and used in a cabinet.
- B. A minimum ventilation clearance must be kept from the top and bottom of the active rectifier unit to ensure good heat dissipation. See Figure 3-10.
- C. Both sides of each unit are designed with air baffle and sealing sponge for isolation to prevent the hot air at the unit top outlet from circulating inside the cabinet and ensure that the heat of the unit is discharged from the heat dissipation holes at the cabinet top outlet cover. See Figure 3-10.

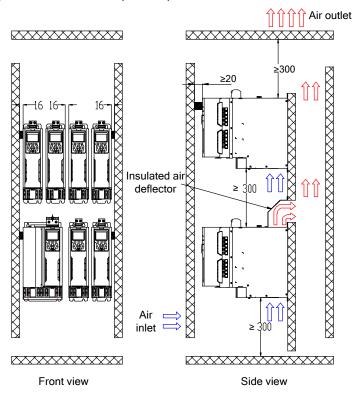


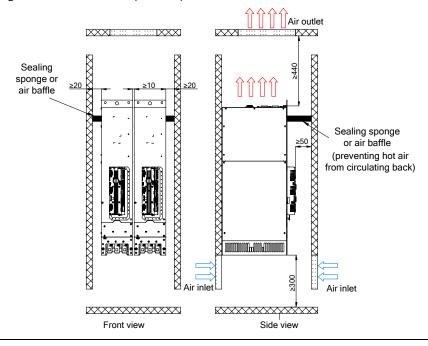
Figure 3-10 Installation space requirements for A4i active rectifier units

2. Installation space requirements for A6i& A7i active rectifier units

Note the following requirements to ensure reliable installation and excellent heat dissipation for active rectifier units using A6i or A7i frame:

- A. The active rectifier unit must be installed and used in a cabinet.
- B. A minimum ventilation clearance must be kept from the top and bottom of the active rectifier unit to ensure good heat dissipation. See Figure 3-11.
- C. Both sides of each unit are designed with air baffle and sealing sponge for isolation to prevent the hot air at the unit top outlet from circulating inside the cabinet and ensure that the heat of the unit is discharged from the heat dissipation holes at the cabinet top outlet cover. See Figure 3-11.

Figure 3-11 Installation space requirements for A6i and A7i active rectifier units

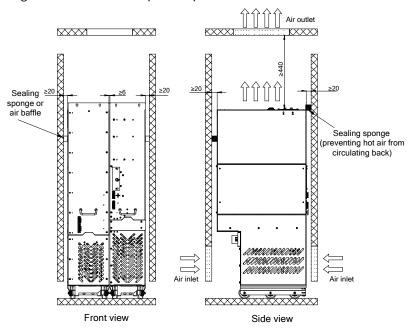


3. Installation space requirements for A8i active rectifier units

To ensure that the active rectifier unit is installed reliably and in good heat dissipation, pay attention to the following:

- A. The active rectifier unit must be installed and used in a cabinet.
- B. A minimum ventilation clearance must be kept from the top and bottom of the active rectifier unit to ensure good heat dissipation. See Figure 3-12.
- C. Both sides of each unit are designed with air baffle and sealing sponge for isolation to prevent the hot air at the unit top outlet from circulating inside the cabinet and ensure that the heat of the unit is discharged from the heat dissipation holes at the cabinet top outlet cover. See Figure 3-12.

Figure 3-12 Installation space requirements for A8i active rectifier units



To ensure good heat dissipation of the active rectifier, design the air inlet and outlet as follows:

Air inlet area formula:

$$S_{in}$$
= (1.5~2.0) x ( $S_{module1} + S_{module2} + S_{module3} + \cdots + S_{module N}$ )

S: System ventilation area

S<sub>module</sub>: Each module ventilation area (cm<sup>2</sup>)

Air outlet area formula: Sout= (1.2-1.5) x Sin.

For details about the air volumes required by the active rectifier, see Table 3-1.

Table 3-1 Ventilation areas and actual air volumes of active rectifier

No.	Frame size	Ventilation area S <sub>in</sub> (cm²)	Actual air volume (CFM)
1	A3i	70	105
	A4i	90	150
2	A6i	634	568
3	A7i	654	588
4	LCL+A8	1550	1460
5	LCL +2* A8	2360	2340



Violation of the requirements in section 3.3.5 Installation space and heat dissipation will shorten the active rectifier life and may result in active rectifier failure or malfunction.

#### 3.3.6 Cabinet installation

#### 3.3.6.1 Cabinet requirements

It is recommended that the cabinet adopts the nine-fold profile cabinet (PS cabinet). Before mounting the inverter unit, install two bottom support crossbeams, a mounting bracket, and a mounting rail in the cabinet, and design the mounting crossbeam for active rectifier unit fixing, and reserve fixing holes on the mounting crossbeam (see Appendix B for the specific location and size).

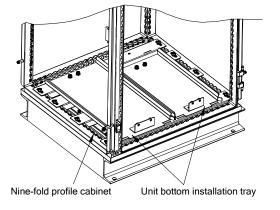
To fix the bottom support crossbeams and install the unit tray:

- Use ten M8 cage nuts to fix the five bottom support crossbeams to the base of the nine-fold profile cabinet frame. (For the support crossbeams, T≥2.0mm, firmly installed)
- 2. Fix the mounting bracket to the nine-fold profile cabinet frame base with twenty M5 self-tapping screws. See Figure 3-13.
- 3. Install the unit tray on the support crossbeams with ten M8 screws. See Figure 3-14.
- 4. If you use another type of cabinet but not nine-fold pr
- 5. ofile cabinet, the fixing holes for the mounting bracket need to be drilled and assembled on site.

Five crossbeams must be installed at the cabinet bottom to support the unit. (Recommended material thickness ≥ 2.0mm)

Figure 3-13 Installing the support crossbeams

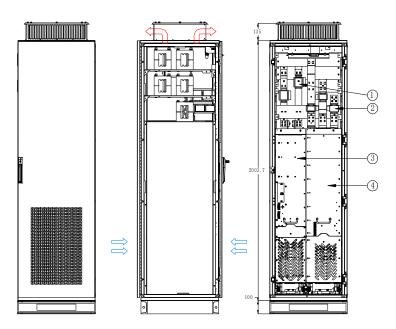
Figure 3-14 Installing the unit tray



# 3.3.6.2 Layout and mounting for LCL+A8

Figure 3-15 shows the 600mm-wide cabinet layout for LCL+A8.

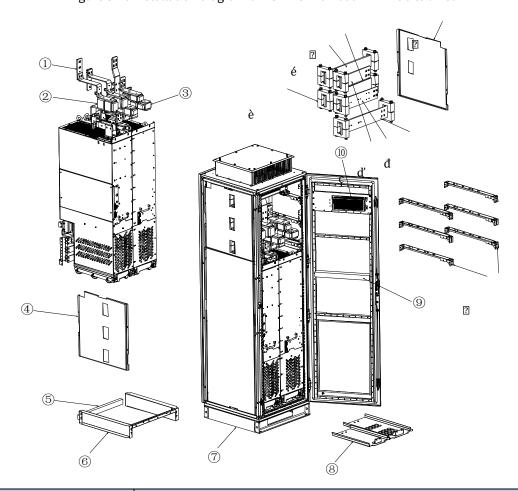
Figure 3-15 Layout of 600mm-wide cabinet for LCL+A8



No.	Name
1	DC fuse
2	AC fuse
3	Active rectifier unit
4	Active rectifier filter unit

Figure 3-16 shows the 600mm-wide cabinet installation for LCL+A8.

Figure 3-16 Installation diagram of LCL+A8 in an 600mm-wide cabinet



No.	Name
1	Unit-top copper bar assembly
2	AC fuse
3	DC fuse
4	Left protective plate
5	Back sealing sponge
6	Unit-top fixing assembly
7	Cabinet
8	Unit bottom fixed plate
9	Front sealing sponge
10	Power supply board
11	L1-phase copper busbar
12	L2-phase copper busbar

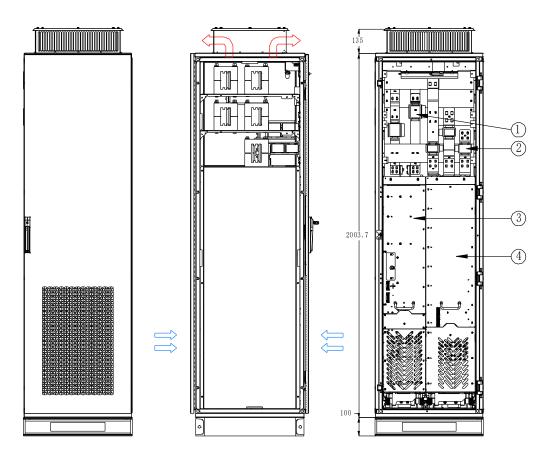
No.	Name
13	L3-phase copper busbar
14	Busbar fixing clamp
15	Copper busbar of (+)
16	Copper busbar of (-)
17	Right protective plate
18	Busbar clamp support

**∠Note:** A 40X40 sealing sponge must be used at the position corresponding to the air baffle in the front/back door panel, which prevents air duct reflow.

#### 3.3.6.3 Layout and mounting for LCL +2\* A8

Figure 3-17 shows the 850mm-wide cabinet layout for LCL +2\* A8.

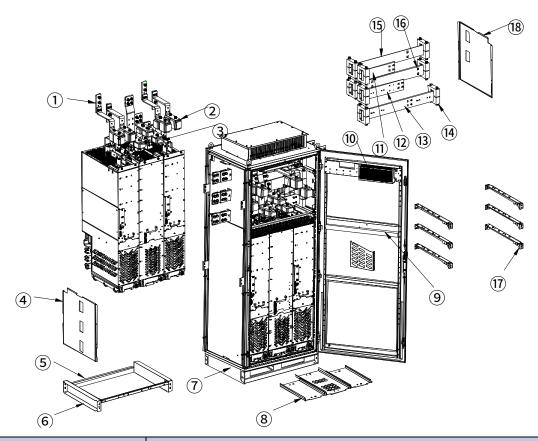
Figure 3-17 Cabinet layout for LCL+2\*A8



No.	Name
1	DC fuse
2	AC fuse
3	Active rectifier unit
4	Active rectifier filter unit
5	Active rectifier unit

Figure 3-18 shows the 850mm-wide cabinet installation for LCL +2\* A8.

Figure 3-18 Installation diagram of LCL +2\* A8 in an 850mm-wide cabinet



No.	Name
1	Unit-top copper bar assembly
2	AC fuse
3	DC fuse
4	Left protective plate
5	Back sealing sponge
6	Unit-top fixing assembly
7	Cabinet
8	Unit bottom fixed plate
9	Front sealing sponge
10	Power supply board
11	L1-phase copper busbar
12	L2-phase copper busbar
13	L3-phase copper busbar
14	Busbar clamp
15	Copper busbar of (+)
16	Copper busbar of (-)
17	Busbar clamp support
18	Right protective plate

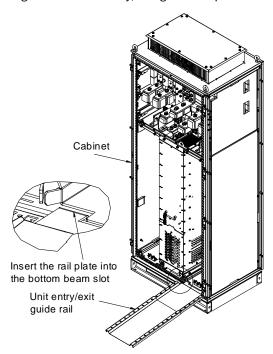
**∠Note:** A 40X40 sealing sponge must be used at the position corresponding to the air baffle in the front/back door panel, which prevents air duct reflow.

#### 3.3.6.4 Unit installation and replacement

The installation procedure is as follows:

Step 1 Insert the unit entry/exit guide rail into the slot of the cabinet front bottom beam. See Figure 3-19.

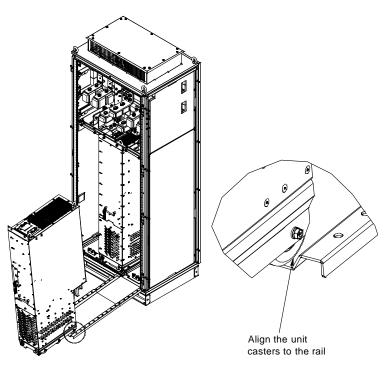




Step 2 Push the unit into the cabinet.

A. Align the unit casters to the rail. See Figure 3-20.

Figure 3-20 Unit placement

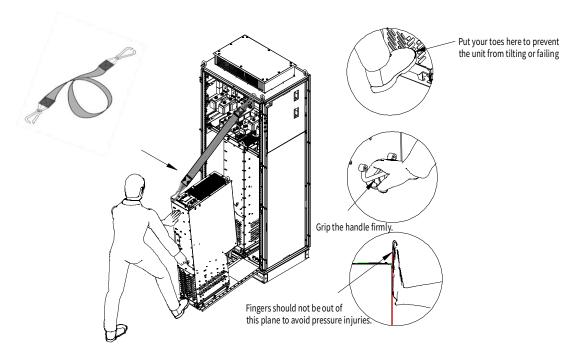


B. Push the active rectifier unit into the cabinet slowly. See Figure 3-21.

#### ∠Note:

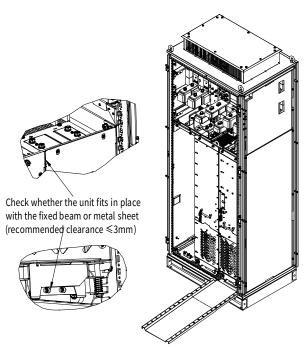
- Since the active rectifier unit barycenter is too high, use the auxiliary rope for mounting to prevent the unit from rollover during the push-in or push-out.
- When pushing in/out the active rectifier unit, use one foot to apply force to the bottom of the unit while holding the handle to prevent the unit from tipping over, falling over, hitting or injury. See Figure 3-21.
- When installing or replacing the unit, wear gloves and safety shoes to prevent against scratching or smashing.

Figure 3-21 Pushing the active rectifier unit into the cabinet



C. Ensure that the unit is pushed into place. See Figure 3-22.

Figure 3-22 Checking whether the unit is pushed into place



D. After confirming that the unit is pushed into place, install the unit fixing screws and remove the unit entry/exit guide rail. See Figure 3-23.

4-M8 fastening screws

Figure 3-23 Unit fixing

- E. Install the active rectifier on the other side in the same way.
- F. Remove the copper bar fixing screws at the unit top and then install the unit-top copper bars as shown in Figure 3-24.

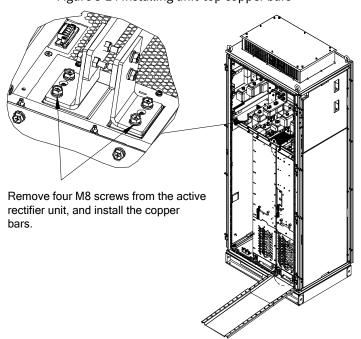


Figure 3-24 Installing unit-top copper bars

# 3.4 ACU size and installation

## 3.4.1 Preparing

- Before installation, ensure the cabinet has been powered off (excluding external power) for at least 25 minutes
- Prevent the ACU from falling or shock to avoid damage.
- Do not disassemble the ACU to avoid damage.
- Do not fasten with excessive torque; otherwise, terminals may be damaged.

### 3.4.1.1 Required tools

1# Phillips screwdriver may be required during installation.

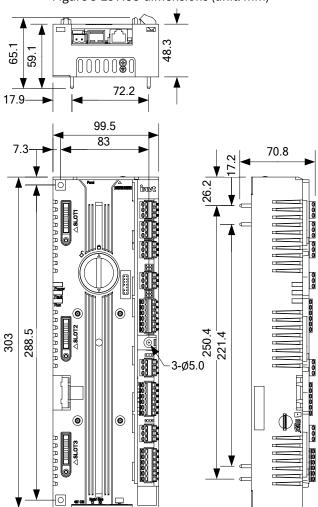
### 3.4.1.2 Fastening torque

Screws are used to install the ACU with fastening torque.

Screw	Fastening torque
M4	1.5N.m

### **3.4.2 ACU size**

Figure 3-25 ACU dimensions (unit: mm)



## 3.4.3 ACU installation space

To make the ACU installation smooth, the distance between the upper and lower parts of the ACU and the building and its components should be left as shown in the following figure, and the ACU must be installed on a conductive metal plate, the entire conductive bottom of the ACU must properly work with the installation surface.

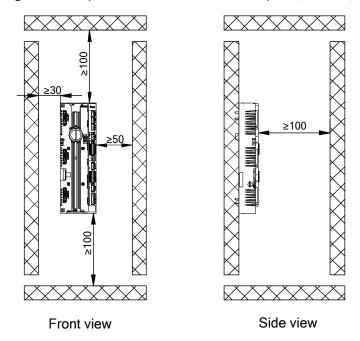


Figure 3-26 Requirements on ACU installation space (unit: mm)

# 3.4.4 ACU installation procedure

Step 1 Place the ACU as shown in the figure.

Step 2 Use 1# Phillips screwdriver to tighten the four M4 screws to fix the ACU to the metal plate as shown in Figure 3-27.

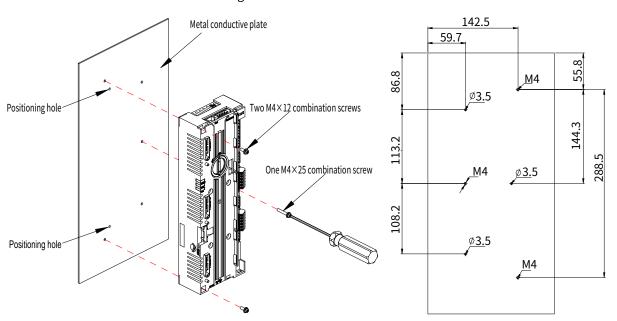


Figure 3-27 ACU installation

### ✓Note:

- The ACU assembly plate must be a exposed metal plate and ensure that the metal plate can be reliably grounded.
- The ACU housing will be connected to the cabinet housing via a grounding plate.

# 3.4.5 Keypad installation

The GD880-91 active rectifier is equipped with an externally mounted keypad (as shown in Figure 3-28), which is used with a keypad bracket that can be fixed to the cabinet door or external support sheet metal, and the keypad bracket mounting structure is shown in Figure 3-29.

Figure 3-28 LCD keypad structure

25.8

27

3-M3

28

27

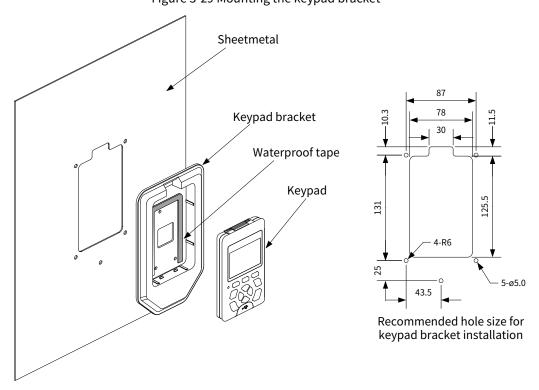
27

27

27

3-M3

Figure 3-29 Mounting the keypad bracket



116.3 14.6 87 5-M4

Figure 3-30 Keypad bracket dimensions (unit: mm)

## 3.4.6 Fastening torque

You need the following tools to install the active rectifier unit:

- Standard toolbox, including screwdrivers, nut wrenches, socket wrenches
- Torque wrenches with torques from 1.5 N m to 100 N m
- Socket wrench extension bars, 400 mm long

The unit installation involves conductive components (AC input connectors, DC bus connectors, and cable terminals) and other component connections (grounding terminals, protective ground terminals, and fixing screws), and the screw tightening torques must meet the requirements in the following table.

Screw/Bolt	Strength grade	Recommended torque (N • m)
M4	4.8	1.5
M5	4.8	3
M6	4.8	5
M8	4.8	11
M10	4.8	22
M12	4.8	39

Table 3-2 Recommended values of screw thread tightening torque

### 3.4.7 Checklist

No.	Operation	Compliant	Completed
1	Installed the beam for active rectifier fixing in the nine-fold profile cabinet.		
2	Installed the bottom tray for active rectifier fixing in the nine-fold profile cabinet.		
3	Installed the copper bars of the unit in the cabinet.		
4	Assemble the mounting rail (optional part) and mount it in the cabinet.		
5	In the cooperation of two people, aligned the active rectifier unit casters with the mounting guide rail and pushed the active rectifier unit to the cabinet. (See Figure3-21. The auxiliary rope for mounting has been used to prevent the unit from side tipping during the push-in or push-out.)		
6	Removed the auxiliary rope for mounting, and ensured that		

No.	Operation	Compliant	Completed
	the unit was pushed into place.		
7	_ Inserted screws into the fixing holes at the unit front top and		٦
'	bottom to fix the unit to the cabinet. (See Figure 3-23.)		
8	Installed the (+) and (-) bus copper bars.		
0	Removed the mounting rail when you ensure the mounting		]
9	is secure.		
10	Checked the screw tightening state.		

# 4 Electrical installation

# 4.1 Safety notes

- All safety precautions in this manual must be read and followed. Only trained and qualified professionals are allowed to carry out the operations mentioned in this chapter.
- All work on electrical equipment must comply with the following:
  - ♦ The power is off.
  - ♦ Re-power on must not occur.
  - ♦ Wait for at least the time designated on the active rectifier, and ensure the voltage between (+) and (-) is lower than 36V through measurement.
  - ♦ The equipment is well grounded.
  - Live parts have been shielded or isolated.



- All installation work can be performed only in power-off (no voltage) state since medium voltage is present in the active rectifier internal during the running.
- Do not perform wiring, inspection or component replacement when power supply is applied. Before wiring or inspection, ensure all the input power supplies have been disconnected, and wait for at least 15 minutes or until the DC bus voltage is lower than 36V.
- If the auxiliary control power of the active rectifier is supplied externally, disconnecting the circuit break device cannot disconnect the entire power supply.
   The active rectifier control system may be live even if not started. Please refer to the electrical schematic diagram for inspection to avoid personal injury caused by contacting the live part of the unit.
- If the safety device on a current branch trips, check the active rectifier for the fault cause, rectify the fault, and replace the damaged parts.

# 4.2 Insulation inspection

### Active rectifier unit and active rectifier filter unit

Before delivery, each unit has been tested for insulation of the main circuit to the housing. Moreover, there is voltage limiting circuit inside the VFD, and the circuit will automatically cut off the test voltage of the withstand voltage test. Do not carry out insulation withstand test on the VFD, or measure the control circuit of the VFD with a megohmmeter.

### Input power cable

Check the insulation conditions of the input power cable of the VFD according to the local regulations before connecting it.

### Motor and motor cable

Check the motor and motor cable insulation status as follows:

- Step 1 Ensure that the motor cable has been connected to the motor.
- Step 2 Remove the motor cable from the L1, L2, and L3 output terminals of the VFD.
- Step 3 Measure the insulation resistance between the motor cable and each phase of the motor and the protective ground with a 1kV DC megohmmeter. Insulation resistance must be greater than 1M Ohm.

# 4.3 EMC requirements

### General knowledge of electromagnetic compatibility

EMC is short for electromagnetic compatibility, which refers to the ability of a device or system to function properly in its electromagnetic environment and not constitute an unbearable electromagnetic disturbance to anything in that environment. EMC includes two aspects: electromagnetic interference and electromagnetic immunity.

Electromagnetic interference can be divided into two categories according to the transmission paths: conducted interference and radiation interference.

- Conducted interference propagates along any conductor. Therefore, any conductor, such as wire, transmission line, inductor, and capacitor, is a transmission channel for conducted interference.
- Radiated interference is in the form of electromagnetic waves that propagate with energy that is inversely proportional to the square of the distance.

Electromagnetic interference must have three conditions or three elements at the same time: interference source, transmission channel, and sensitive receiver, each of which is indispensable. The solution of EMC problem mainly focuses the three elements. For users, the solution of EMC problem is mainly in transmission channels because the equipment as interference source or receiver cannot be changed.

Different electric and electronic devices have different EMC capacities because of adopting different EMC standards or classes.

### General EMC guidelines on variable-frequency regulation system wiring

The following introduces general EMC guidelines on VFDs in several aspects including noise control, site wiring and grounding for reference in site installation, with consideration of ECM characteristics of VFDs where the input current and output voltage harmonics are relatively small but the voltage is high and the current is large.

### 1. Noise control:

All the connections to the VFD control terminals must use shielded wires. The shield layer of wire must be grounded near the VFD entrance. The ground mode is 360-degree loop connection formed by cable clips. It is not allowed to connect the twisted shield layer to the ground of the VFD, which greatly decreases or loses the shield effect.

- 2. Site wiring
- Power supply wiring: The shield layer of power supply incoming cables of the VFD shall be grounded reliably. It is not allowed to route the power cables and control cables in parallel.
- Device categorization: There are different electric devices in the same distribution system, which have
  different ability of emitting and withstanding electromagnetic noise. Therefore, it needs to categorize
  these devices into strong noise device and noise sensitive device. The same kind of devices needs to be
  placed in the same area, and the distance between devices in different categories needs to be more
  than 20cm.
- Wiring in the control cabinet: During wiring, signal cables and power cables need to be arranged in different areas. It is not allowed to arrange them in parallel or in interlaced state at a close distance (less than 20cm) or tie them together. If the signal cables have to cross the power cables, they need to be arranged in 90 degree angle.

### 3. Grounding

The VFD must be grounded safely and reliably in operation. Grounding has the priority in all EMC methods because it does not only ensure the safety of equipment and persons, but also it is the simplest, most effective and lowest-cost solution for EMC problems.

Three categories of grounding: special pole grounding, common pole grounding and series-wound grounding. Different control system needs to use special pole grounding, different devices in the same

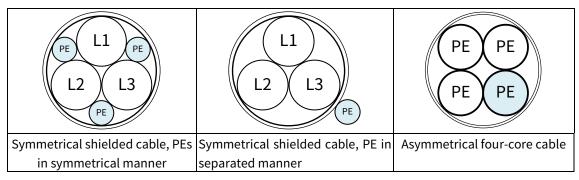
control system needs to use common pole grounding, and different devices connected by the same power cables needs to use series-wound grounding.

This section introduces general EMC guidelines on VFDs in several aspects including noise control, site wiring and grounding for reference in site installation.

### 4.3.1 Power cable

To meet the EMC requirements stipulated in the CE standards, you must use symmetrical shielded cables as motor cables.

Four-core cables can be used as input cables, but symmetrical shielded cables are recommended. Compared with four-core cables, symmetrical shielded cables can reduce electromagnetic radiation as well as the current and loss of the motor cables.

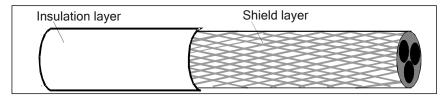


Power cables mut meet the following requirements:

- The sizes of the input power cables and motor cables must comply with local regulations.
- The input power cables and motor cables must be able to carry the corresponding load currents.
- The maximum temperature margin of the motor cables in continuous operation cannot be lower than 70°C.
- PE grounding conductor conductivity must be as good as possible to reduce the grounding resistance to
  achieve better impedance continuity. If the electrical conductivity of the motor cable shield layer does
  not meet the requirements, a separate PE conductor must be used.

To effectively restrict the emission and conduction of radio frequency (RF) interference, the conductivity of the shielded cable must at least be 1/10 of the conductivity of the phase conductor. This requirement can be well met by a copper or aluminum shield layer. The following figure shows the minimum requirement on motor cables of a VFD. The cable must consist of a layer of spiral-shaped copper strips. The denser the shield layer is, the more effectively the electromagnetic interference is restricted.

Figure 4-1 Cross-section of the cable



Note: Before connecting the input power cable of the VFD, check the insulation conditions of the cable according to local regulations.

### 4.3.2 Control cable

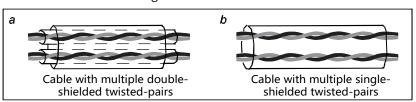
All analog signal cables, communication cables, and encoder cables must be shielded cables.

Analog signal cables need to be double-shielded twisted-pair cables (as shown in figure a). Use one separate shielded twisted pair for each signal. Do not use the same ground wire for different analog signals.

Communication cables and encoder cables need to be single-shielded twisted-pair cables (as shown in figure b). The shield layer of cable is connected to the system PE by means of a 360-degree connection or twisting into a single bundle, and the exposed shield layer is wrapped with insulating tape to prevent interference introduced by the shield layer in contact with other equipment and structural components.

The keypad needs to be connected by using a network cable. In complicated electromagnetic environments, a shielded network cable is recommended.

Figure 4-2 Control cable



**∠Note:** Analog signals and digital signals cannot share a same cable, and their cables must be routed separately.

## 4.3.3 Wiring suggestions

Motor cables and input cables in a drive system are interference cables, while communication cables, encoder cables, analog signals, and high-speed signal cables are sensitive cables. It is recommended that you arrange the motor cables, input power cables, and control cables separately in different trays, reducing electromagnetic interference caused by the du/dt of the VFD output to other cables. The general cable arrangement rules are shown in Figure 4-3. The recommended values for the spacing between sensitive and interference cables are shown in Table 4-1.

Figure 4-3 General cable arrangement rules

Table 4-1 Recommended values for the spacing between sensitive and interference cables

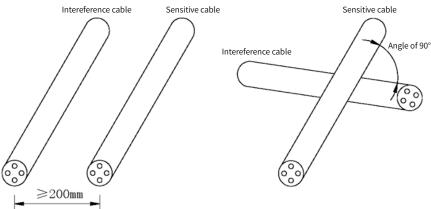
D1	D2	D3
≥200mm	≥300mm	≥500mm

### ∠Note:

- The motor cables of different VFDs/inverters can be arranged in parallel, but motor cables must be arranged far away from sensitive cables.
- Analog signals and digital signals cannot share a same cable, and their cables must be routed separately.
- If a control cable and power cable must cross each other, ensure that the angle between them is 90 degrees.

Table 4-4 Routing sensitive and interference cables

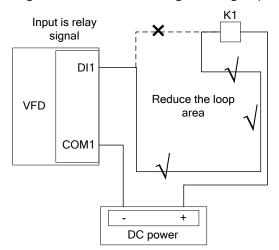
Intereference cable Sensitive cable Sensitive



The cable trays must be connected properly and well grounded. Aluminum trays can implement local equipotential.

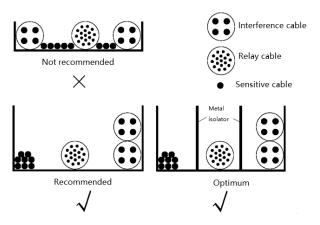
For inputs of such as relay signals and other non-differential signals, non-twisted pair cables can be used, and the wiring should minimize the loop area and a pair of signal lines should be routed as close as possible.

Figure 4-5 Non-differential signal wiring loop



When laying multiple types of cables, the cables should always be routed along the alignment grooves or metal pipes in equipotential connection, with different types of cables separated as much as possible. You can better improve electromagnetic compatibility by using metal spacers to isolate different types of cables in the same metal groove or metal pipe.

Figure 4-6 Routing multiple types of cable



### 4.3.4 Shielded cable connection

The shield layer of signal cable is grounded at both ends, of which the grounding points must be the same. That is, if the shield layer at the upper computer side is connected to PE, the shield layer at the drive side is also connected to PE; if the shield layer at the upper computer side is connected to GND, the shield layer at the drive side is also connected to GND. It is recommended to connect the both ends of the shield layer to PE, which is the housing.

The unshielded part of the control cable that is shielded should be as short as possible, and the shield layer is connected to the nearest PE end. If the cable is stripped too long, the core is susceptible to interference of signals, especially analog, communication, and encoder signals.

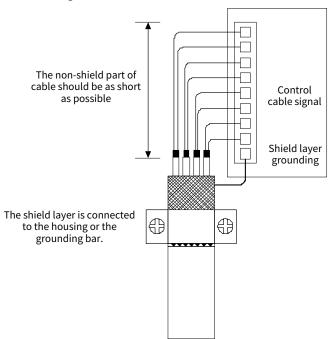


Figure 4-7 Control cable shield connection

The shield layers of the input power and output motor cables should have large contact with the shield board inside the installation cabinet to achieve good EMC shield effect. The specific installation and fixing method can be referred to Figure 4-8.

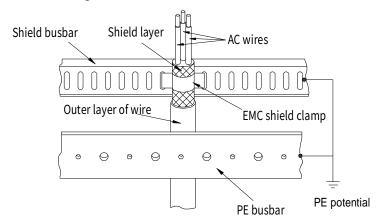


Figure 4-8 Power cable shield connection

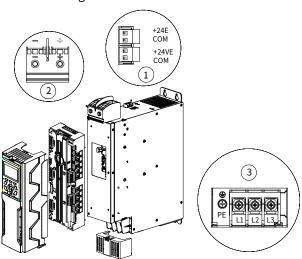
# 4.4 Electrical wiring

# 4.4.1 Main circuit wiring

## 4.4.2 A3&A4 cable connection

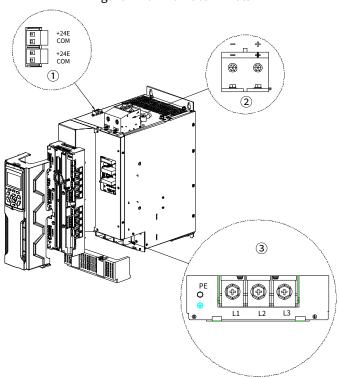
1. A3 unit terminals

Figure 4-9 A3 unit terminals



### 2. A4 unit terminals

Figure 4-10 A4 unit terminals



No.	Terminal name	Description
	+24E	24V auxiliary power terminal (The auxiliary power supply
1	COM	must be isolated 24V.)
	СОМ	Specification: 24Vdc±10% 1A

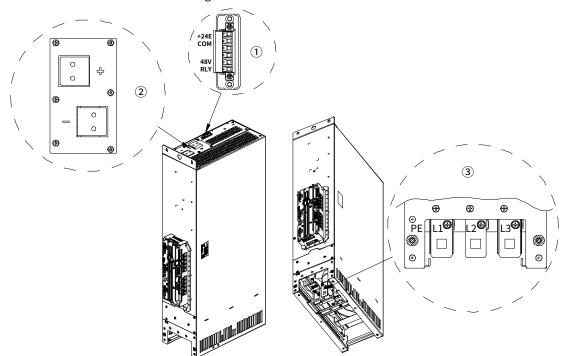
No.	Terminal name	Description
	+	Positive or negative busbar DC output
2		Voltage: 1.5*Vin
	-	Connection: cable terminal of M8/12N • m
3 -	L1	3PH AC power input
	L2	Voltage: 3PH AC 380–440V
		Connection: A3: cable terminal of M6/5N • m
	L3	A4: cable terminal of M10/29N • m

- 3. Wiring procedures for A3–A4 units are as follow:
- Step 1 Remove the plastic case protective cover from the cable terminal area.
- Step 2 Connect the cable to the output terminal in the correct wire connection sequence: L1, L2, L3 or + and -.
- Step 3 Fix the power cable on the cable holder to avoid stress on the terminal.
- Step 4 When using shielded power cables, the shielding layer must be fixed to the shielding board according to EMC requirements.

# 4.4.3 A6-A7 unit wiring

### 1. A6-A7 unit terminals

Figure 4-11 A6-A7 unit terminals



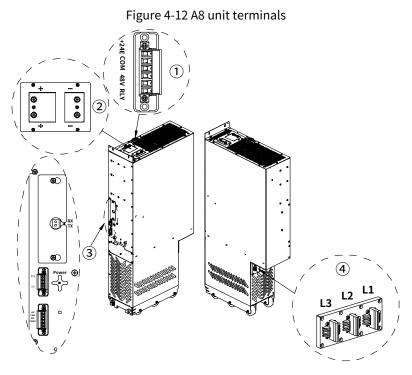
No.	Terminal name	Description
	+24E	24V auxiliary power terminal (The auxiliary power supply
1	СОМ	must be isolated 24V.) Specification: 24Vdc±10% 1A
48V RLY 48V control, reserved func	40V control recommed function	
	RLY	48V control, reserved function
	+	Positive or negative busbar DC output
2		Voltage: 510–720VDC
	-	Connection: copper bar terminal of M6/9N • m

No.	Terminal name	Description
	L1	3PH AC power input
3		Voltage: 3PH AC 380–440V
	L3	Connection: copper bar terminal of M10/32N • m

- 2. Wiring procedures for A6–A7 units are as follow:
- Step 1 Connect the cable to the output terminal in the correct wire connection sequence: L1, L2, L3 or + and -.
- Step 2 Please ensure that all input and output are correctly connected.
- Step 3 Fix the power cable on the cable holder to avoid stress on the terminal.
- Step 4 When using shielded power cables, the shielding layer must be fixed to the shielding board according to EMC requirements.

# 4.4.4 A8 unit wiring

### 1. A8 unit terminals



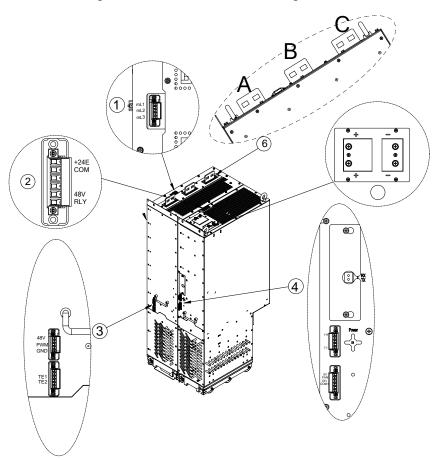
No.	Terminal name	Description
	+24E	24V auxiliary power terminal (The auxiliary power supply must be isolated 24V.)
,	СОМ	For commissioning, specification: 24Vdc±10% 1A
1	48V	48V control, reserved function
	RLY	
	+	Positive or negative busbar DC output
2		Voltage: 1.5*Vin
	-	Connection: copper bar terminal of M6/9N • m
2	+5V	
3	FAN	Fan control signal terminal of active rectifier unit

No.	Terminal name	Description
	DI1	Disital input of active weetifier unit
	COM1	Digital input of active rectifier unit
	(+)	Pus nower output terminals of active rectifier unit
	(-)	Bus power output terminals of active rectifier unit
	L1	3PH AC power input
4	L2	Voltage: 3PH AC 380–440V
	L3	Connection: copper bar terminal of M10/32N • m

- 2. Wiring procedures for A8 units are as follow:
- Step 1 Please ensure that all input and output are correctly connected.
- Step 2 Fix the power cable on the cable holder to avoid stress on the terminal.
- Step 3 When using shielded power cables, the shielding layer must be fixed to the shielding board according to EMC requirements.

### 4.4.4.1 Main circuit wiring terminals

Figure 4-13 Active rectifier filter wiring terminals

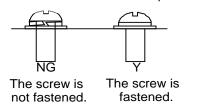


No.	Terminal name	Description
	mL1	Input power signal detection terminal, connected with the
1	mL2	Input power signal detection terminal, connected with the AC voltage detection card.
	mL3	
2	+24E	24V auxiliary power terminal (The auxiliary power supply

No.	Terminal name	Description	
	СОМ	must be isolated 24V.)	
	СОМ	For commissioning, specification: 24VDC±10% 1A	
	48V	Buffer contactor signal. If there is no internal buffer, the control external buffer contactor must be a 48VDC coil	
	RLY	contactor	
	48V		
3	PWM	Fan power input of active rectifier filter	
	GND		
4	TE1	Reactor overtemperature contact terminals of active	
4	TE2	rectifier filter unit	
5	(+)	Bus nower output terminals of active rectifier unit	
5	(-)	Bus power output terminals of active rectifier unit	
	+5V	For control signal townshed of active vactifies unit	
6	FAN	Fan control signal terminal of active rectifier unit	
0	DI1	Digital input of active rectifier unit	
	COM1	Digital input of active rectifier unit	

# 4.4.4.2 Screw tightening

Figure 4-14 Screw installation requirements



# 4.4.5 Electrical installation checklist

No.	Operation	Compliant	Completed
1	Checked the input and output power wiring and ensured the wiring positions and voltages were correct.		
2	Ensured that the input and output power wiring was correct and fastened.		
3	Ensured that the input and output power cable carrying capacity selection was correct.		
4	Ensured that routing the input and output power cables that were shielded complied with EMC regulations.		
5	Checked the external auxiliary power wiring and ensured the wiring positions and voltages are correct.		
6	Routed the control power cables and power cables separately, complying with EMC regulations.		

# 5 Active rectifier control unit (ACU)

# **5.1 ACU composition**

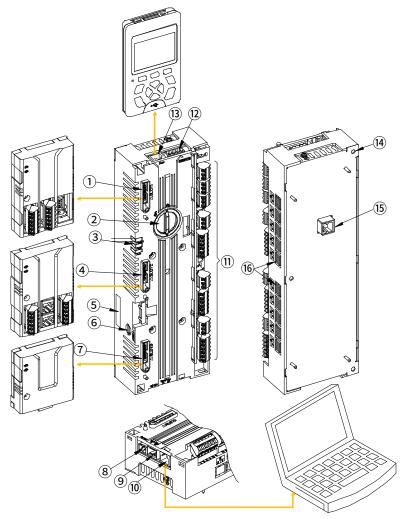


Table 5-1 Function description

Symbol	Component	Function description				
1	Slot 1	Applied to 73.5×103×23.5(mm) function expansion modules and communication expansion card				
2	Battery cover plate	Button battery replacement cover. The internal button battery is a non rechargeable lithium battery that needs to be replaced regularly.				
3	Indicator	Power supply, fault, running indicator				
4	Slot 2	Applied to 73.5×103×23.5(mm) function expansion modules, communication expansion card, and optical fiber expansion card				
5	Nameplate	Nameplate information				
6	SD card	Standard microSD memory card, flexible to plug and unplug, capacity: 32GB				
7	Slot 3	Applied to 73.5×74×23.5(mm) function expansion modules, communication expansion card, and optical fiber expansion card				
8	Power interface	24V power input terminal				

Symbol	Component	Function description		
Fiber optic		Master/slave fiber optic interface (optional)		
9	interface	Master/stave liber optic interface (optional)		
10	RJ45 terminal	Upper computer interface, connecting to a PC for status monitoring		
11	User terminal	Standard input and output terminals for users		
12	STO terminal	Safe Torque Off input		
13	RJ45 terminal	HMI, connecting to the SOP-880 keypad		
14	Fixed hole	ACU fixing holes (three holes)		
15	RJ45 terminal	Communication interface with power unit (active rectifier A1–A4, A6, A7		
13	KJ45 terminat	units)		
16	Fiber optic	Fiber optic communication interface with power unit (active rectifier A8		
16	interface	unit)		

# **5.2 LED indicator**

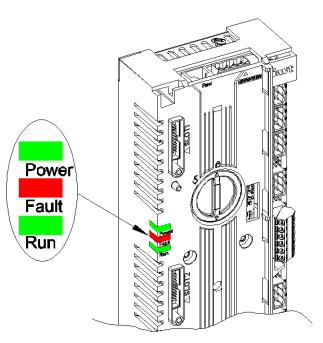


Table 5-2 Indicator description

No.	Name	State	Description		
1	1 DOWED ON		The ACU is properly powered.		
1 POWER		OFF	The ACU is not powered or power failure occurs.		
2			The system is faulty.		
2 Fault		OFF	The system is normal.		
2 5111		ON The power module is runni		ON	The power module is running.
3	RUN	OFF	The power module is stopped.		

# 5.3 ACU interface

+24V RJ45 +24V ST02 ST01 keypad RO3C RO3B Buffer contactor closing • N RO3A RO2C RO2B Rectifier RO2A fault SLOT1 RO1C RO1B Main breaker RO1A closing \_ AO2 J7 AO1 J6 🗆 🗆 🗆 AO2 Analog output 0–10V/0–20mA GND AI2 J5 Al1 J4 AI2-AI2+ Analog input -10V–10V/-20mA–20mA AI1-AI1+ +10V -10V 485 terminal OFF ON resistor J8 SLOT2 PE 485-RS485 485+ communication HDO2 (II) High-speed pulse output HDO1 COM HDI2 High-speed pulse input HDI1 +24V SD card J10 PW +24V PW Digital input DIL DIL SLOT3 Digital input 6 D₹₽ DI6 Digital input 5 D₹₹₫ DI5 Main breaker N. 24 DI4 feedback **□**₹4 Digital input 3 DI3 Digital input 2 DI2 Digital input 1 DI1 RJ45 Master/slave Power supply fiber optic Ethernet +24E | CM

Figure 5-1 ICU circuit wiring

### **5.3.1 External standard interfaces**

Terminal symbol	Name	Description
Input power	+24E, CM	Power supply for the control box
Digital input	DI1-DI6, DIL	Input type: relay contact, NPN or PNP
Digital power output	+24V, COM	Digital power, isolated from power input 24V
High-speed digital input	HDI1, HDI2	Input type: NPN or PNP
High-speed digital output	HDO1, HDO2	Output type: Open collector
Analog input	AI1, AI2	Input type: current or voltage, selected through the jumper
Analog output	AO1, AO2	Output type: current or voltage, selected through the jumper
Relay output	ROxA, ROxB, ROxC	Contacts: NO, NC, common point
RS485 communication	485+, 485-	RS485 communication. The terminal resistor is selected through the jumper.
RJ45 terminal	RJ45 keypad	Communication interface with keypad
RJ45 terminal	RJ45 Ethernet	Ethernet communication with a PC

# **5.3.2 Detailed introduction to external interfaces**

Terminal	Terminal symbol	Function description	Cable specifications					
Input powe	Input power							
1	+24E	24Vdc±10%2A	Two-core twisted-pair cable is recommended.					
2	СМ		Cross-sectional area: 0.5– 2.5mm <sup>2</sup>					
DI input ter	minal							
1	DI1	1						
2	DI2	<ol> <li>Input impedance: 3.3kΩ</li> <li>Voltage input range: 12–30V</li> </ol>	Single core wire					
3	DI3	3 . 3	Single-core wire Cross-sectional area: 0.5–					
4	DI4	3、Supports NPN and PNP bi-direction input, relay contact input	2.5mm <sup>2</sup>					
5	DI5	4、 Max. input frequency: 1kHz	2.511111					
6	DI6	Max. Input frequency. 1km2						
DIL input te	rminal							
1	DIL	Digital interlock. When its input is high, all other input terminals are forced to be invalid.  Two-core twisted-pair or recommended.						
2	PW	Provides power supply for DIL, DI1–DI6, HDI, HDO	Cross-sectional area: 0.5– 2.5mm²					
3	СОМ	Digital common ground	·					
Jumper J10	Jumper J10: power supply selection							
1 2 3 1 is short connected to 2, PW is short connected to internal COM, and DI uses the internal								
	power ground. If external power is required, you need to remove the shorting cap.							
	2 3 2 is short connected to 3, PW is short connected to internal +24V, and DI uses the internal							

Terminal	Terminal symbol	Function description	Cable specifications			
power. If ex	kternal powei	r is required, you need to remove the shorti	ng cap.			
HDIO terminal						
1	+24V	1. Input type: PNP, NPN				
2	HDI1	2. Input frequency range: 0–50kHz	Two-core twisted-pair cable is			
3	HDI2	3. Input voltage range: 12–30V 4. Duty ratio: 30%–70%	recommended. Cross-sectional area: 0.5–			
4	СОМ	1. Output type: OC	2.5mm²			
5	HDO1	2. Output frequency range: 0–50kHz	HDI and COM, HDO and COM use			
6	HDO2	3. Max. output load: 20mA/30V 4. Duty ratio: 50%	twisted-pair cables.			
RS485 com	munication t	erminals				
1	485+	RS485 bus, standard 5V electrical level	Two-core twisted-pair cable is			
2	485-	Terminal resistor: 120Ω	recommended.			
2	DE	Max. baud rate: 115200	Cross-sectional area: 0.5–			
3	PE	Max. number of nodes: 32 (without relay)	2.5mm²			
Jumper J8:	terminal res	istor selection				
	When 1 and 2	2 are short-circuited, the terminal resistor i	is disconnected.			
1 2 3 V	Vhen 2 and 3	are short-circuited, the terminal resistor i	s connected.			
Analog inpu	ut terminal					
1	-10V	Positive and negative 10V power supply	Cross-sectional area: 0.5–			
2	+10V	Max. output current: 10mA	2.5mm <sup>2</sup>			
3	AI1+	Current input: -20mA–20mA, Rin: 500Ω	When two Als are used, use two			
4	AI1-	Voltage input: -10V–10V, Rin: 30kΩ	two-core shielded twisted-pair			
5	AI2+	Differential input range: ±30V	cables.			
	AI2-	Sampling interval: 0.1ms	When reference voltage is used,			
6		Resolution: 11 bit+signbit	use one four-core shielded twisted-pair cable for one AI.			
lumner 14:	Salaction ha	I tween AI1 voltage and current signal inputs	,			
1 2 3		and 2 are short-circuited, Al1 current input				
1 2 3	U When 2 a	and 3 are short-circuited, AI1 voltage input	is used.			
Jumper J5:	Selection be	tween AI2 voltage and current signal inputs	S			
1 2 3	U When 1 a	and 2 are short-circuited, AI2 current input	is used.			
1 2 3	U When 2 a	and 3 are short-circuited, AI2 voltage input	is used.			
Analog out	put terminal					
	AO1	AO output range:	Two-core twisted-pair cable is			
		0–20mA, Rload≤500Ω	recommended.			
Analog	GND	0–10V, Rload≥10kΩ	Cross-sectional area: 0.5–			
output		Resolution: 11 bit+signbit	2.5mm <sup>2</sup>			
	AO2	Accuracy: 2% of full scale range	AO1 and GND, AO2 and GND use twisted-pair cables.			
Jumper J6: Selection between AO1 voltage and current signal outputs						
When 1 and 2 are short-circuited, AO1 current output is used.						

Terminal	Terminal symbol	Function description	Cable specifications				
	When 2 and 3 are short-circuited, AO1 voltage output is used.						
Jumper J7:	Selection be	tween AO2 voltage and current signal inpu	ts				
1 2 3	U When 1 a	and 2 are short-circuited, AO2 current outp	out is used.				
1 2 3	U When 2 a	and 3 are short-circuited, AO2 voltage outp	out is used.				
Relay 1 out	put terminal						
1	RO1A	Output turns massive NO and NC contacts	Single-core wire				
2	RO1B	Output type: passive NO and NC contacts	Cross-sectional area: 0.5–				
3	RO1C	Contact parameters: 250Vac/30Vdc, 3A	2.5mm <sup>2</sup>				
Relay 2 out	put terminal						
1	RO2A		Single-core wire				
2	RO2B	Output type: passive NO and NC contacts	Cross-sectional area: 0.5-				
3	RO2C	Contact parameters: 250Vac/30Vdc, 3A	2.5mm <sup>2</sup>				
Relay 3 out	put terminal						
1	RO3A		Single-core wire Cross-sectional area: 0.5– 2.5mm <sup>2</sup>				
2	RO3B	Output type: passive NO and NC contacts					
3	RO3C	Contact parameters: 250Vac/30Vdc, 3A					
Master/slav	e fiber optic						
1	TX	Transmitting optical fiber communication	Dedicated fiber optic cable				
2	RX	Receiving optical fiber communication					
Safe torque	e off terminal						
1	STO1	1	Four-core shielded twisted-pair				
2	+24V	Inverter module STO input	cable				
3	STO2	They has been short connected before	Cross-sectional area: 0.5–				
4	+24V	delivery by default.	2.5mm²				
RJ45 keypa	ıd						
1 RJ45		Connected to SOP-880-01 keypad	Standard shielded network cable				
RJ45 Etheri	net						
1	RJ45	Ethernet communication with a PC	Standard shielded network cable				

# **5.4 ACU function application**

## **5.4.1 Function module**

ACU can be used with other function modules to achieve corresponding functions. The details are as follows.

No.	Name	Model	Function description	Connect with ACU through	Dimensions (W×H×D) (unit: mm)
,	Input/output	FC 10001	Two Als	CLOT	72 5 × 102 × 22 5
1	module	EC-IO801	Two AOs Three DIs	SLOT	73.5×103×23.5

No.	Name	Model	Function description	Connect with ACU through	Dimensions (W×H×D) (unit: mm)
			1 relay outputs		
2	PROFINET IO module	EC-TX809	PROFINET IO industrial Ethernet	SLOT	73.5×74×23.5
3	PROFIBUS-DP module	EC-TX803	PROFIBUS-DP bus adapter	SLOT	73.5×74×23.5
4	CAN bus module	EC-TX805	CANopen bus adapter	SLOT	73.5×74×23.5
5	Optical fiber expansion module	EC-TX821	One 50M expansion optical fiber	SLOT	73.5×74×23.5
6	Optical fiber expansion module	EC-TX823	Three 50M expansion optical fibers	SLOT	73.5×74×23.5
7	Voltage detection module	IVDM-10	AC voltage detection module	Fiber optic	37.4×180×113
8	Intelligent operation keypad	SOP-880-01-REC	Human-machine interface keypad	RS422	74×121.5×26

### ∠Note:

- EC-TX821 and EC-TX823 can only be inserted in SLOT2 or SLOT3.
- It is recommended to install the EC-TX803 card in SLOT3.

# 5.4.2 SLOT expansion application

The ACU can cooperate with different functional modules, which are directly installed on the SLOT card slot of the ACU, as shown in the following figure.

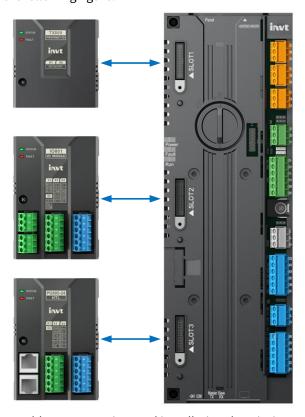


Table 5-3 Expansion card installation description

Expansion card	SLOT1	SLOT2	SLOT3	Expansion card type
EC-TX803	-	-	✓	PROFIBUS-DP
EC-TX805	<b>√</b>	<b>√</b>	✓	CANopen
EC-TX809	<b>√</b>	-	-	PROFINET IO
EC-TX821	-	-	<b>√</b>	Expansion module with one optical fiber interface
EC-TX823	-	-	<b>√</b>	Expansion module with three optical fiber interfaces
EC-IO801	<b>√</b>	<b>√</b>	-	IO expansion card

### **∠**Note:

- When SLOT2 is empty, EC-TX803 and EC-TX809 can be installed in SLOT1.
- EC-TX821 and EC-TX823 can only be inserted in SLOT2 or SLOT3.

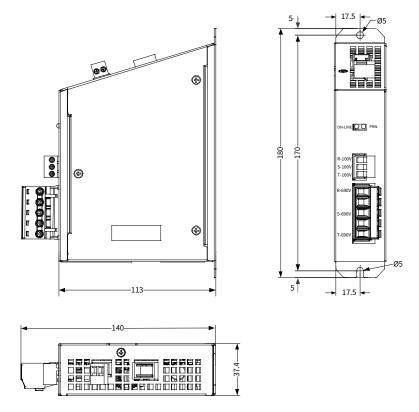
# **6 Accessories**

# **6.1 Function expansion module**

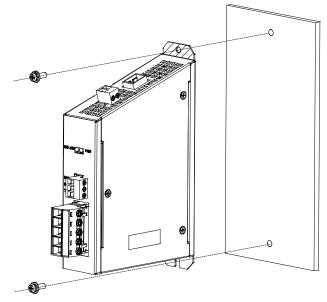
The function expansion module in active rectifier mainly use the AC voltage detection module which is mainly used for input voltage detection. The following figure shows the outline structure.

The dimensions of the AC voltage detection module is 37.4x113x180 mm (W\*D\*H), as shown in Figure 6-1.

Figure 6-1 Product outline and mounting dimensions (unit: mm)



Installation of voltage detection module: The rear mounting method is used. Align the installation holes and tighten the screws.



#### ✓ Note:

- Ensure that all terminals and fiber optic plugs are installed in place for effective electrical connection.
- The module is grounded through contact between its exposed metal shell and the assembly board inside the cabinet, so the assembly board must be an exposed metal plate. To ensure the reliable operation of the module and meet the EMC requirements, please tighten the screws to ensure reliable grounding.

The IVDM-10 AC voltage detection module is connected to the fiber optic expansion module EC-TX821/TX823 through optical fibers, transmitting the detection signal to the control box. Figure 6-2 shows the external wiring diagram of the IVDM-10 module, taking the fiber optic expansion module EC-TX823 and active rectifier filter unit as an example.

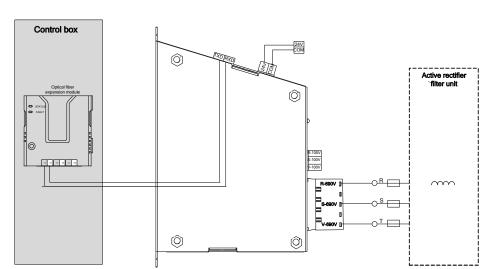


Figure 6-2 External wiring diagram when using IVDM-10

Note: The 3PH AC voltage line sequence of the IVDM-10 module must be consistent with the phase sequence of the incoming cable of the rectifier filter unit. Otherwise, the overcurrent fault will occur in the rectifier unit.

For details about AC voltage detection module, refer to the AC Voltage Detection Module Manual.

# 6.2 Surge protection module

For A3–A7 structure products, buffer components are not configured with surge protection modules, it is necessary to configure additional surge protection module on the grid side. The surge protection module is used to absorb the surge or peak voltage among the AC power grid, ensuring that the rectifier module is not damaged. The dimensions of the surge protection module is 98x86 x 80 mm (W\*D\*H), as shown in Figure 6-3.

98 91 91 5.5 60.5

Figure 6-3 Surge protection module

# 6.3 EMI filter module

For A3–A7 structure products, buffer components are not configured with EMI filtering modules which can be used for interference generated by the system and external interference to improve EMC performance. The dimensions of the EMI filter module is 200\*134\*37 mm (W\*D\*H), as shown in Figure 6-4.

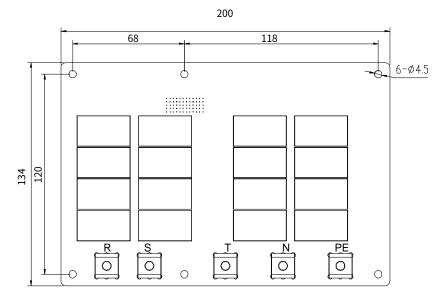


Figure 6-4 EMI filter module

# 6.4 A6&A7 maintenance bracket

When installing or maintaining the A6&A7 active rectifier units in a cabinet, to make it convenient for the active rectifier module to enter or exit the cabinet, it is necessary to use the active rectifier unit maintenance bracket.

273
120
996
823.25

Figure 6-5 Maintenance bracket dimensions (unit: mm)

# 6.5 A8 installation guide rail

When installing or maintaining the A8 active rectifier units in a cabinet, to make it convenient for the active rectifier module to enter or exit the cabinet, it is necessary to use the active rectifier unit mounting rail. For details, see section 3.3.5 Installation space and heat dissipation.

Tigure o-3 installation rail unifersions (unit. min)

Figure 6-3 Installation rail dimensions (unit: mm)

# 7 Maintenance and inspection

# 7.1 Periodical inspection

### 7.1.1 Overview

Only trained and qualified professionals are allowed to maintain the equipment.

Before operating the interior of the equipment:

- Disconnect the power from the equipment (note that no switch/breaker installed in the cabinet can disconnect the power to the equipment).
- Wait 25 minutes for the DC circuit capacitor to discharge.
- Ensure that the DC bus voltage is lower than 36V.

## 7.1.2 Required tools

These tools are used to remove and install devices, screws, and other components during maintenance and repair.

- A set of torque wrench or sleeve
- A set of open end wrench or sleeve
- A set of hexagonal wrench
- A medium-sized straight screwdriver and a small-sized straight screwdriver
- A medium-sized cross screwdriver
- Cart

Table 7-1 Screw thread tightening torque (Fastener grade: 4.8; unit: N • m)

Screw thread specification	Copper bar connection	Metal sheet connection
M5	3	2
M6	4.5	3
M8	11	8.5
M10	22	16.4
M12	39	28.5
M16	98	71

# 7.1.3 Maintenance cycle

Little maintenance is required when the active rectifier unit is installed in an environment that meets requirements. The following table describes the routine maintenance periods recommended by us.

Table 7-2 Maintenance cycle

Maintenance cycle	Maintenance work description
Once per 6–12 months (based on the site installation environment)	Check according to the following table
Once per 6–12 months (based on the site installation environment)	Heat sink inspection and cleaning
Once per year (stored without use)	Capacitor aging
Once per year	Air filter check. Replace it when necessary.

Maintenance cycle	Maintenance work description
Every 6 years	Replace the fans for the filter and power units
Every 10 years	Capacitor replacement

Table 7-3 Checklist

Table 7-3 Checklist				
Chec	k scope	Item	Method	Criterion
Ambient environment		Check the temperature, and humidity, and whether there is vibration, dust, gas, oil spray, and water droplets in the environment.		The requirements stated in this manual are met.
		Check whether there are foreign matters, such as tools, or dangerous substances placed nearby.	Visual inspection	There are no tools or dangerous substances placed nearby.
Vo	ltage	Check the voltage of the main circuit and control circuit.	Use multimeters or other instruments for measurement.	Comply with the requirements stated in this manual. (Do not use a multimeter to measure the bus voltage.)
		Check the display of information.	Visual inspection	The characters are displayed properly.
Ke	Keypad	Check whether characters are not completely displayed.	Visual inspection	The requirements stated in this manual are met.
	Common	Check whether the bolts loose or come off.	Screw them up.	No exception occurs.
Main circuit		Check whether the machine is deformed, cracked, or damaged, or their color changes due to overheating and aging.	Visual inspection	No exception occurs.
		Check whether there are stains and dust attached.	Visual inspection	No exception occurs.  Note: Discoloration of copper bars does not mean that they cannot work properly.
	Conductor and wire	Check whether conductors are deformed or color change for overheat.	Visual inspection	No exception occurs.
		Check whether the wire sheaths are cracked or their color changes.	Visual inspection	No exception occurs.
	Terminal block	Check whether there is damage.	Visual inspection	No exception occurs.
	Reactor	Check whether there is unusual	Auditory,	No exception

Chec	k scope	Item	Method	Criterion
		vibration sounds or smells.	olfactory, and visual inspection	occurs.
	Control PCB and connector	Check whether the screws and connectors loose.	Screw them up.	No exception occurs.
		Check whether there is unusual smell or discoloration.	Olfactory and visual inspection	No exception occurs.
Control		Check whether there are cracks, damage, deformation, or rust.	Visual inspection	No exception occurs.
circuit		Check whether there is electrolyte leakage or deformation.	Visual inspection, and determine the service life based on the maintenance information.	No exception occurs.
	Cooling fan	Check whether there are unusual sounds or vibration.	Auditory and visual inspection, and turn the fan blades with your hand.	The rotation is smooth.
		Check whether the bolts loose.	Screw them up.	No exception occurs.
Cooling system		Check whether there is decoloration caused due to overheat. Check whether there is dust.	Visual inspection, and determine the service life based on the maintenance information.	No exception occurs.
	Ventilation duct	Check whether there are foreign matters blocking or attached to the cooling fan, air inlets, or air outlets. Check whether there are foreign objects attached.	Visual inspection	No exception occurs.

For more details about maintenance, contact the local INVT office, or visit our website <a href="https://www.invt.com">https://www.invt.com</a>, and choose **Support** > **Services**.

# 7.2 Replacement of wearing parts

# 7.2.1 Capacitor

### 7.2.1.1 Capacitor reforming

If the active rectifier unit has been left unused for a long time, you need to follow the instructions to reform the DC bus capacitor before using it. The storage time is calculated from the date the VFD is delivered.

Storage time	Operation principle
Less than 1 year	No charging operation is required.
1 to 2 years	The active rectifier unit needs to be powered on for 1 hour before the first running
	command.
2 to 3 years	Use a voltage controlled power supply to charge the active rectifier unit:

Storage time	Operation principle	
	Charge the VFD at 25% of the rated voltage for 30 minutes,	
	• and then charge it at 50% of the rated voltage for 30 minutes,	
	• at 75% for another 30 minutes,	
	• and finally charge it at 100% of the rated voltage for 30 minutes.	
More than 3 years	Use a voltage controlled power supply to charge the active rectifier unit:	
	• Charge the VFD at 25% of the rated voltage for 2 hours,	
	• and then charge it at 50% of the rated voltage for 2 hours,	
	• at 75% for another 2 hours,	
	• and finally charge it at 100% of the rated voltage for 2 hours.	

 The method for using a voltage controlled power supply to charge the active rectifier unit is described as follows:

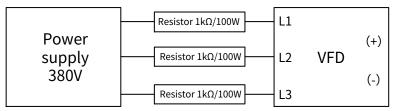
For active rectifier units of a high voltage class, ensure that the voltage requirement (for example, 380 V) is met during charging. Capacitor changing requires little current, and therefore you can use a small-capacity power supply (2 A is sufficient).

• The method for using a resistor (incandescent lamp) to charge the active rectifier unit is described as follows:

If you directly connect the drive device to a power supply to charge the DC bus capacitor, it needs to be charged for a minimum of 60 minutes. The charging operation must be performed at a normal indoor temperature without load, and you must connect a resistor in series mode in the 3PH circuit of the power supply.

For a 380V drive device, use a resistor of 1 k $\Omega$ /100W. If the voltage of the power supply is no higher than 380 V, you can also use an incandescent lamp of 100W. If an incandescent lamp is used, it may go off or the light may become very weak.

Figure 7-1 380V driving-device charging circuit example



### 7.2.1.2 Electrolytic capacitor replacement

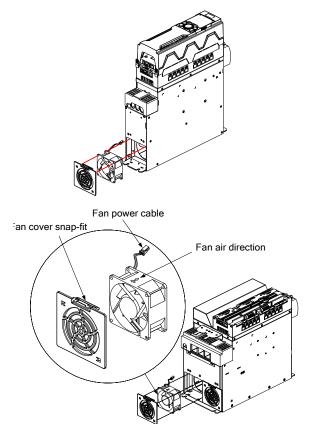


Read chapter 1 Safety precautions carefully and follow the instructions to perform operations. Ignoring these safety precautions may lead to physical injury or death, or device damage.

The electrolytic capacitor of an active rectifier unit must be replaced if it has been used for more than 35,000 hours. For details about the replacement, contact the local INVT office.

## 7.2.2 Cooling fan

### 1. Replacing the fan for A3&A4



- Step 1 Disconnect the DC power supply of the drive system and check to ensure there is no voltage in the equipment.
- Step 2 Press and hold the snap-fits of the fan cover, and remove the fan cover.
- Step 3 Pull the fan out slowly and unplug the fan power cord plug to complete the fan disassembly.
- Step 4 Install the new fan in the reverse order of the disassembly steps.
- 2. Replacing the fan for A6&A7
- Step 1 Stop the unit, disconnect the AC power supply, and wait for a time no shorter than the waiting time designated on the unit.
- Step 2 Remove the fan module front cover from the unit housing.
- Step 3 Remove the fan module connection cable.
- Step 4 Pull out the fan box and remove the fan with a screwdriver.
- Step 5 Install a new fan in the fan box. Insert the fan module connection cable to the connector in reverse sequence. Install the front cover. Ensure that the air direction of the fan is consistent with that of the unit, as shown in Figure 7-2.
- Step 6 Connect to the power.

Fan cover Fan air direction

Figure 7-2 Fan maintenance for A6&A7 active rectifier unit

### 3. Replacing the fan for A8

The service life of the cooling fan of the active rectifier unit is more than 35000 hours. The actual service life of the cooling fan is related to the use of the unit and the temperature in the ambient environment.

You can view the running duration of the active rectifier unit through P07.14 (Accumulated running time).

The increase of the bearing noise indicates a fan fault. If the unit is applied in a key position, replace the fan once the fan starts to generate unusual noise. You can purchase spares of fans from INVT.



Read chapter 1 Safety precautions carefully and follow the instructions to perform operations. Ignoring these safety precautions may lead to physical injury or death, or device damage.

- Step 1 Stop the unit, disconnect the AC power supply, and wait for a time no shorter than the waiting time designated on the unit.
- Step 2 Remove the fan module front cover from the unit housing.
- Step 3 Remove the fan module connection cable.
- Step 4 Pull out the fan box and remove the fan with a screwdriver.
- Step 5 Install a new fan in the fan box. Insert the fan module connection cable to the connector in reverse sequence. Install the front cover. Ensure that the air direction of the fan is consistent with that of the unit, as shown in Figure 7-3.

Step 6 Connect to the power.

Front cover Fan air direction

Figure 7-3 Fan maintenance for A8 active rectifier unit

### 7.2.3 DC fuse

To check and replace the DC fuse of an A8 active rectifier unit, do as follows:



Only qualified electricians can perform this task. Read all the safety precautions. Ignoring these safety precautions may lead to physical injury or death, or device damage.

- Step 1 Stop the unit, disconnect the AC power supply, and wait for a time no shorter than the waiting time designated on the unit.
- Step 2 Remove the screws of the protective cover plate of the unit DC fuse and remove the cover plate.
- Step 3 Remove the copper bar fixing screws of the DC fuse assembly and remove the DC fuse assembly.
- Step 4 Check the condition of the fuse and replace it as needed. When replacing it, install the new fuse and copper bar as an assembly and tighten the screws according to the tightening torque table.
- Step 5 Install the protective cover and close the cabinet door.
- Step 6 Connect to the power.

### 7.2.4 Active rectifier unit

1. Replacement of A6&A7 active rectifier unit

To replace the active rectifier unit, do as follows:

- Step 1 Stop the machine and disconnect the AC power.
- Step 2 Open the cabinet door and check to ensure there is no voltage in the equipment.
- Step 3 Remove the protective plate and disconnect the external connection cables of the active rectifier unit.
- Step 4 Disconnect the (+) and (-) DC output copper bars.
- Step 5 Mount the unit maintenance bracket.
- Step 6 Remove the (four M8) fixing screws from the top and bottom of the unit.
- Step 7 Pull the active rectifier unit to the maintenance bracket until it can be lifted or removed.
- Step 8 Install the new active rectifier unit by referring the reverse order of the procedure.

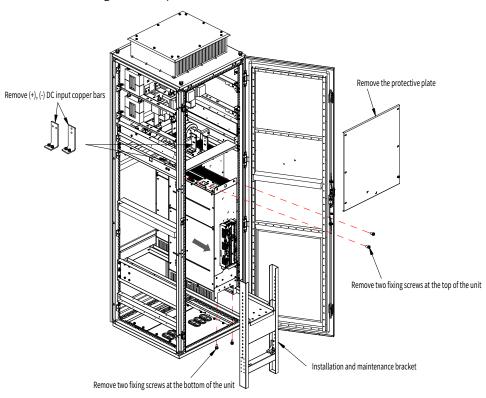


Figure 7-4 Replacement of A6&A7 active rectifier unit

### 2. Replacement of A8 active rectifier unit

To replace the active rectifier unit, do as follows:

- Step 1 Stop the machine and disconnect the AC power.
- Step 2 Open the cabinet door and check to ensure there is no voltage in the equipment.
- Step 3 Disconnect the external connection cables of the active rectifier unit.
- Step 4 Disconnect the (+) and (-) DC output copper bars.
- Step 5 Install the unit entry/exit guide rail.
- Step 6 Remove the (four M8) fixing screws from the top and bottom of the unit.
- Step 7 Pull the active rectifier unit and unfold the anti-tipping stand.
- Step 8 Install the new active rectifier unit by referring the reverse order of the procedure.

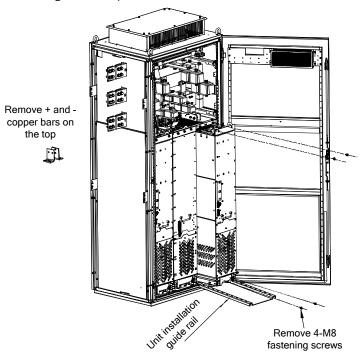


Figure 7-5 Replacement of A8 active rectifier unit

#### 3. Replacement of A8n active rectifier unit

- Step 1 Stop the machine and disconnect the AC power.
- Step 2 Open the cabinet door and check to ensure there is no voltage in the equipment.
- Step 3 Remove the protective plate in the cabinet.
- Step 4 Disconnect the external connection cables of the active rectifier unit.
- Step 5 Disconnect the (+) and (-) DC input copper bars.
- Step 6 Remove the screws connecting the copper bar between the reactor base and the unit (six M6\*25 screws in total).
- Step 7 Mount the maintenance bracket.
- Step 8 Pull the active rectifier unit to the maintenance bracket until it can be lifted or removed.
- Step 9 Install the new active rectifier unit by referring the reverse order of the procedure.

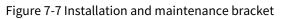
Remove (+), (-) DC input copper bar

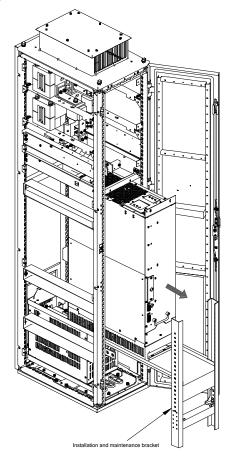
Remove two fixing screws at the top of the unit

Remove six M6\*25 screws connecting the copper bar between the reactor base and the unit.

Remove two screws at the bottom of the unit

Figure 7-6 Replacing the A8n active rectifier unit





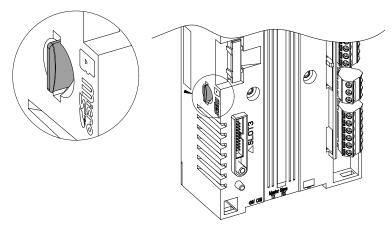
#### 7.2.5 ACU and keypad

1. Replace the storage card.

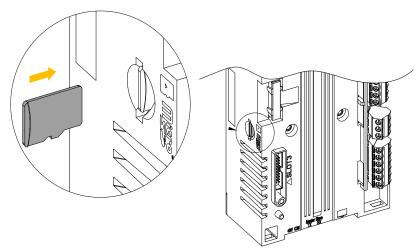
After the ACU control module is replaced, the existing parameter settings can be preserved by transferring the storage card from the faulty module to a new module.

The procedure is as follows:

Step 1 Press the SD storage card once, and pull the SD storage card out from the faulty module after the SD card is ejected.



Step 2 Insert and push the SD card into the card holder of the new module in the direction shown in the figure.

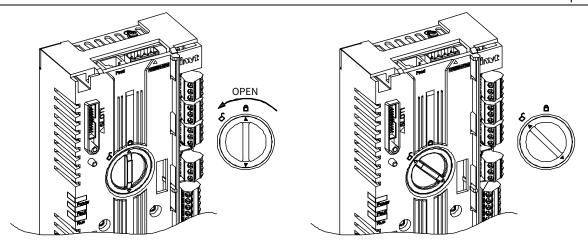


Step 3 Ensure that the SD storage card is pushed into place. Otherwise, abnormalities may occur due to poor contact.

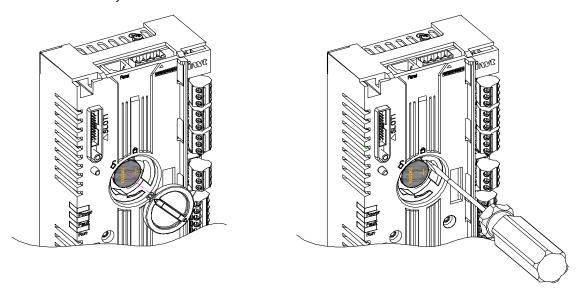
2. Replace the ACU battery.

The procedure is as follows:

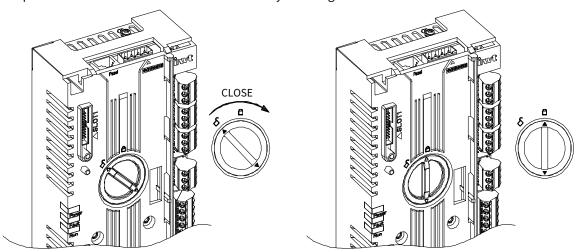
Step 1 Hold the battery cover by hand and rotate it counterclockwise by 45° until the cover opens.



Step 2 Remove the cover, press one side of the battery with a screwdriver, remove and replace the ACU module battery with a new one.



Step 3 Close the cover and rotate it clockwise by 45° to tighten it.

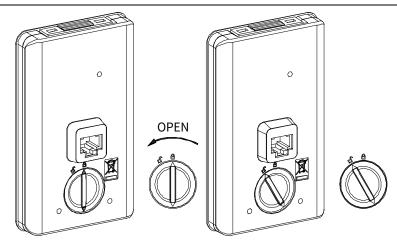


Step 4 Dispose of waste batteries in accordance with local disposal rules or applicable laws.

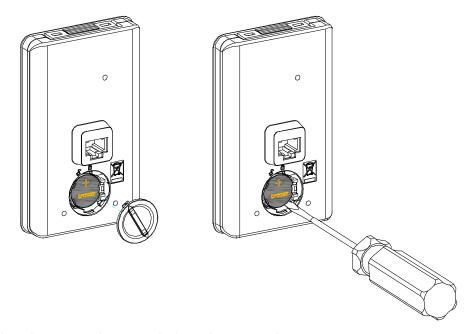
3. Replace the SOP battery.

The procedure is as follows:

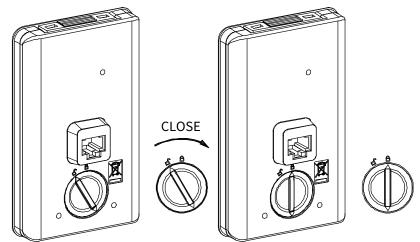
Step 1 Rotate the battery cover counterclockwise by 30° by hand until the cover opens.



Step 2 Remove the cover, press one side of the battery with a screwdriver, remove and replace the battery with a new one.



Step 3 Close the cover and rotate it clockwise by 30° to tighten it.



Step 4 Dispose of waste batteries in accordance with local disposal rules or applicable laws.

# **Appendix A Technical data**

#### A.1 Capacity

Choose an active rectifier model based on the rated current and power of the motor. To endure the rated power of the motor, the rated output current of the active rectifier must be larger or equal to the rated current of the motor. The rated power of the active rectifier must be higher or equal to that of the motor.

#### ∠Note:

- The maximum allowable shaft power of the motor is limited to 1.5 times the rated power of the motor. If the limit is exceeded, the active rectifier automatically restricts the torque and current of the motor. This function effectively protects the input shaft against overload.
- The rated capacity is the capacity at the ambient temperature of 40°C.
- You need to check and ensure that the power flowing through the common DC connection in the common DC system does not exceed the rated power of the motor.

### **A.2 Grid specifications**

Grid voltage	AC 3PH 380V(-15%)-440V(+10%) AC 3PH 520V(-15%)-690V(+10%)
Short-circuit capacity	According to the definition of IEC61439-1, the short-circuit capacity indicates the apparent power during 3PH short circuit when the power system is in the specified running mode, the size of which is equal to the product of the short-circuit current and the rated voltage at the short-circuit. According to the short-circuit current requirement, the maximum allowable short-circuit current at the incoming end is 100kA. Therefore, the product is applicable to scenarios where the transmitted current in the circuit is no larger than 100kA when the VFD runs at the maximum rated voltage.
Frequency	50/60Hz±5%, with a maximum change rate of 20%/s

#### **A.3 Environment condition**

Item	Run	Storage	Transportation
Ambient temperature	-10–40°C 40°C–50°C. Derating is required.	-40-70°C The air temperature change rate is less than 1°C/min.	-40-70°C
Relative air	5%–95%, no condensation Not less than 3K3	5%–95%, no condensation Not less than 1K4	5%–95%, no condensation Not less than 2K3
humidity	No oil mist, salt spray, freezi splashing. The max. allowabl corrosive gases.	, , , ,	
Environmental class/hazardous chemicals	EN 60721-3-3 3 C2	EN 60721-3-1 1 C2	EN 60721-3-2 2 C2
Mechanical active	EN 60721-3-3 3 S1	EN 60721-3-1 1 S1	EN 60721-3-2 2 S1

Item	Run	Storage	Transportation				
substance							
Organic/biological impact	EN 60721-3-3 3 B1	EN 60721-3-1 1 B1	EN 60721-3-2 2 B1				
Pollution level	EN 61800-5-1, level 2						
Installation altitude	10-2000m. Derating is required when the altitude exceeds 1000m.						
Mechanical stability	у						
Vibration stress - Displacement -Acceleration -Compliant level	1057 Hz, 0.075 mm 58200 Hz, 9.8m/s2mm 2M2 Cabinet: 5–13.2 Hz, 1 mm 13.2–100 Hz, 0.7g	5···9 Hz, 1.5mm 9···200 Hz, 4.9m/s² 1M2	5···9 Hz, 3.1mm 9···200 Hz, 9.8m/s² 2M2				
Shock stress -Acceleration -Compliant level	20 ms, 98 m/s <sup>2</sup> 3M4	11 ms , 100 m/s <sup>2</sup> 1M2	11 ms, 100 m/s <sup>2</sup> 2M2				

### A.4 Application standards

The following table describes the standards that our active rectifier products comply with.

EN/ISO 13849-1	Safety of machinery—Safety-related parts of control systems—Part 1: General principles for design					
IEC/EN 60204-1	Safety of machinery. Electrical equipment of machines. Part 1: General requirements					
IEC/EN 62061	Safety of machinery—Safety-related functional safety of electrical, electronic, and programmable electronic control systems					
IEC/EN 61800-3	Adjustable speed electrical power drive systems. Part 3: EMC requirements and specific test methods					
IEC/EN 61800-5-1	Adjustable speed electrical power drive systems—Part 5-1: Safety requirements—Electrical, thermal and energy					
IEC/EN 61800-5-2	Adjustable speed electrical power drive systems—Part 5-2: Safety requirements—Function					
GB/T 30844.1-2014	General-purpose variable-frequency adjustable-speed equipment of 1 kV and lower—Part 1: Technical conditions					
GB/T 30844.2-2014	General-purpose variable-frequency adjustable-speed equipment of 1 kV and lower—Part 2: Test methods					
GB/T 30844.3-2017	General-purpose variable-frequency adjustable-speed equipment of 1 kV and lower—Part 3: Safety requirements					

#### A.4.1 CE marking

The CE marking on the product nameplate indicates that the product is CE-compliant, meeting the regulations of the European low-voltage directive (2014/35/EU) and EMC directive (2014/30/EU).

### A.4.2 EMC compliance declaration

European union (EU) stipulates that the electric and electrical devices sold in Europe cannot generate electromagnetic disturbance that exceeds the limits stipulated in related standards, and can work properly in environments with certain electromagnetic interference. The EMC product standard (EN 61800-3) describes the EMC standards and specific test methods for adjustable speed electrical power drive systems. Our products have been compliant with these regulations.

#### A.5 EMC regulations

The EMC product standard (EN 61800-3) describes the EMC requirements on VFDs.

- Application environment categories:
  - ♦ First environment: Civilian environment, including application scenarios where VFDs are directly connected to the civil power supply low-voltage grids without intermediate transformers.
  - Second environment: All environments except those in Category I.
- Active rectifier categories:
  - ♦ C1: Rated voltage lower than 1000V, applied to the first environment.
  - C2: Rated voltage lower than 1000V, non-plug, socket, or mobile devices; power drive systems that must be installed and operated by specialized personnel when applied to environments of Category I

**Note:** The EMC standard IEC/EN 61800-3 no longer restricts the power distribution of the active rectifier, but it specifies their use, installation, and commissioning. Specialized personnel or organizations must have the necessary skills (including the EMC-related knowledge) for installing and/or performing commissioning on the electrical drive systems.

- ♦ C3: Rated voltage lower than 1000 V, applied to environments of Category II. They cannot be applied to environments of Category I.
- ♦ C4: Rated voltage higher than 1000 V, or rated current higher or equal to 400 A, applied to complex systems in the second environment.

#### A.5.1 VFD category of C2

The induction disturbance limit meets the following stipulations:

- 1. Select the motor and control cables according to the description in the manual.
- 2. Install the inverter unit according to the description in the manual.



The product may generate radio interference, you need to take measures to reduce the interference.

### A.5.2 VFD category of C3

The anti-interference performance of the inverter unit meets the requirements of the second environment in the IEC/EN 61800-3 standard.

The induction disturbance limit meets the following stipulations:

- 1. Select the motor and control cables according to the description in the manual.
- 2. Install the inverter unit according to the description in the manual.



Inverters of category C3 cannot be applied to civilian low-voltage common grids. When applied to such grids, the inverter may generate radio frequency electromagnetic interference.

# **Appendix B Dimension drawings**

Figure B-1 A3 structure dimensions (unit: mm)

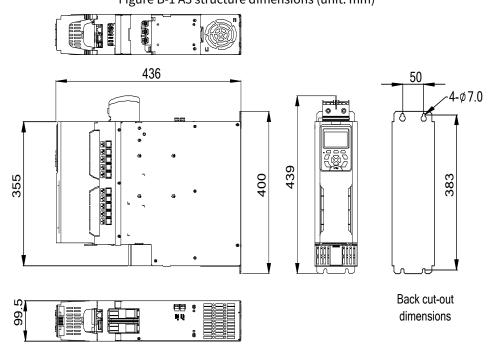
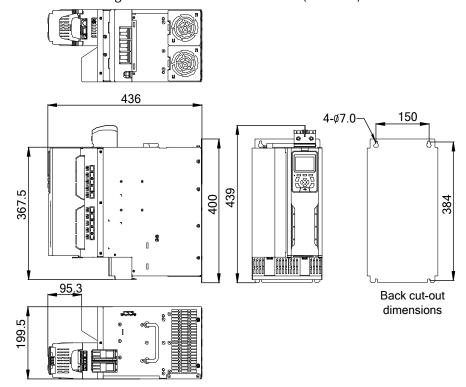


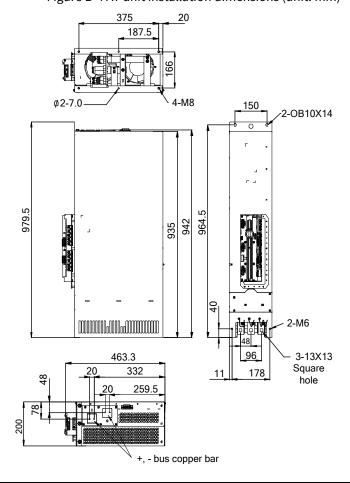
Figure B-2 A4 structure dimensions (unit: mm)



187.5 166 2-Ø7.0 4-M8 150 2-OB10X14 805.5 850 835 L10 L20 L3 2-M6 48 3-11X11 96 Square 472.4 332 178 hole 259.5 +, - bus copper bar

Figure B-3 A6 unit installation dimensions (unit: mm)





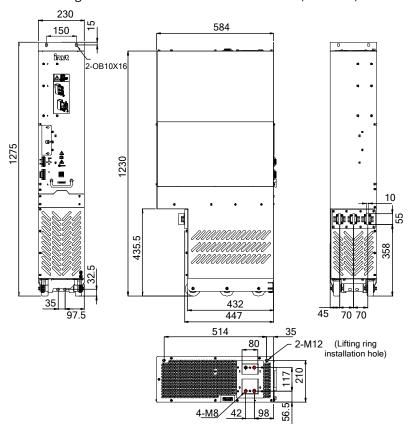
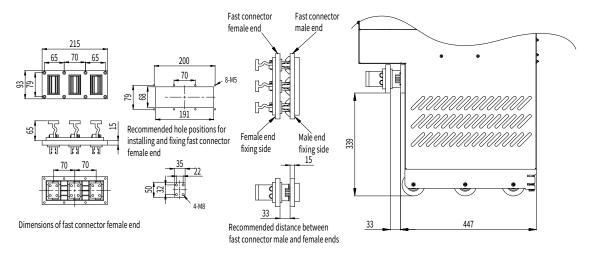


Figure B-5 A8 unit installation dimensions (unit: mm)

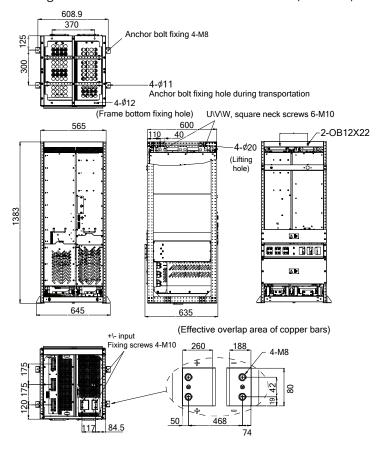
Figure B-6 Installation dimensions of A8 unit fast connector (unit: mm)



461 (Side fixing hole) 00 3-017 00000 000000 437 352 228.5 34.5 35 2-M8 586.5 248 197 6-Ø9.0 200 110 210

Figure B-7 Layout of 1\*A8 frame bottom support

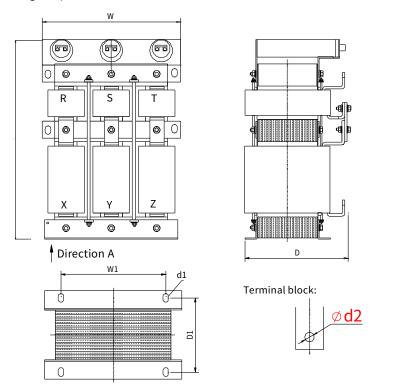




609 Anchor bolt fixing 4-M8 Anchor bolt fixing hole during transportation (Frame bottom fixing hole) U\V\W, square neck screws 6-M10 804 -3-OB12X22 4-Ø20 (Lifting hole) 1383 Δ 635 (Effective overlap area of copper bars) +\- input Fixing screws 8-M10 602.5

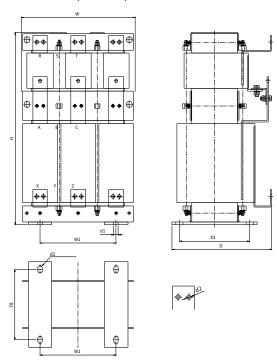
Figure B-9 2\*A8+L frame installation dimensions (unit: mm)

• 0094–0312 LCL filtering component dimensions (unit: mm):



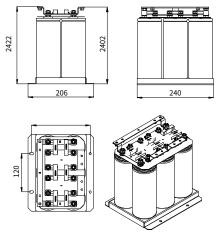
LCL model	Outline dimension (mm)		Installation dimension (mm)			Net weight	Heat dissipation		
	W	Н	D	W1	D1	d1	d2	(kg)	(kW)
LCL-0116-0.4SA-4149-RO	325	560	285	243±1	149±2	4-M12	11	75	0.428
LCL-0180-0.4SA-4149-RO	390	590	330	260±1	174±2	4-M15	13	136	0.513
LCL-0220-0.4SA-4149-RO	630	390	340	260±1	184±2	4-M15	13	146	0.66
LCL-0335-0.4SA-4149-RO	430	725	350	350±1	196±2	4-M15	13	180	1.448

• 0395–0516 reactor component dimensions (unit: mm):



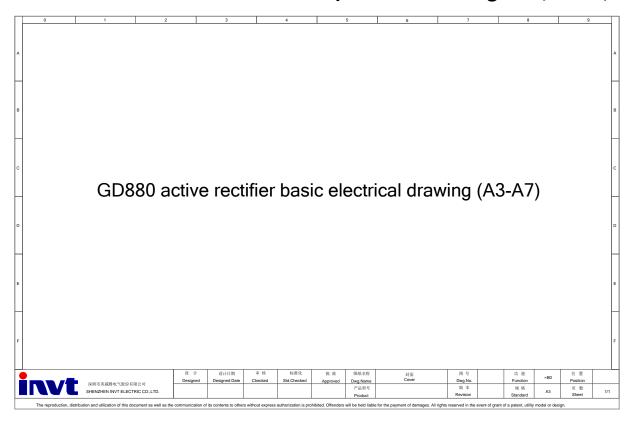
Model of reactor with double L	Outline dimension (mm)		Installation dimension (mm)			Net weight	Heat dissipation (kW)		
	W	Н	D	W1	D1	d1	d2	(kg)	(KVV)
LCL-380A-00214-2	390	630	340	260 <b>±2</b>	184±3	4-M15	13	200	1.3
LCL-516A-01504-2	390	665	350	260±1	240±2	4-M15	2*12	220	1.15

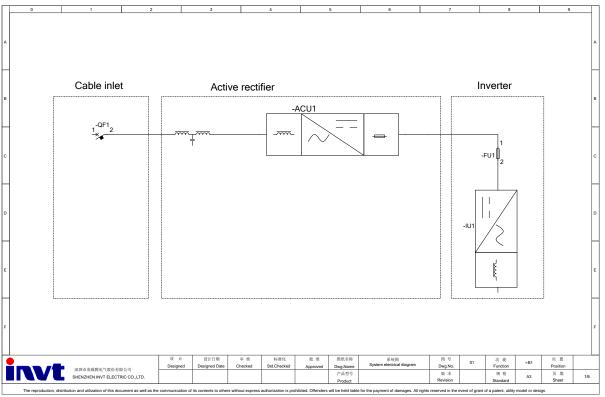
• 0395–0516 capacitor component dimensions (unit: mm):

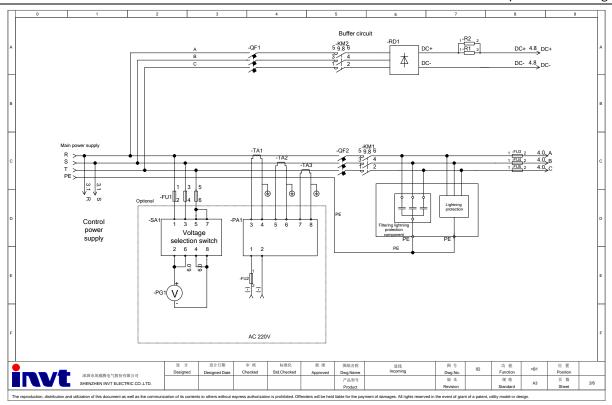


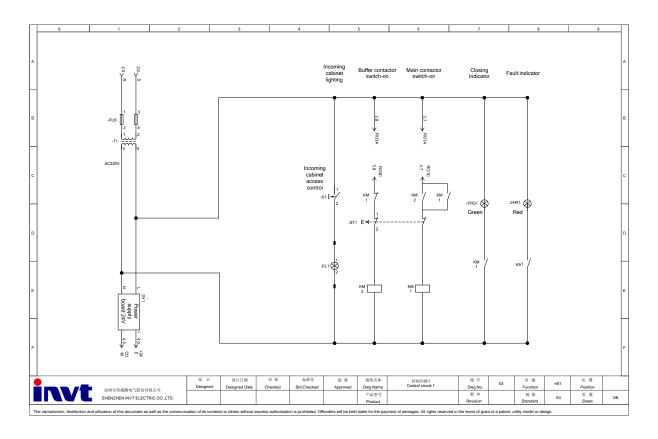
# Appendix C Example electrical diagram

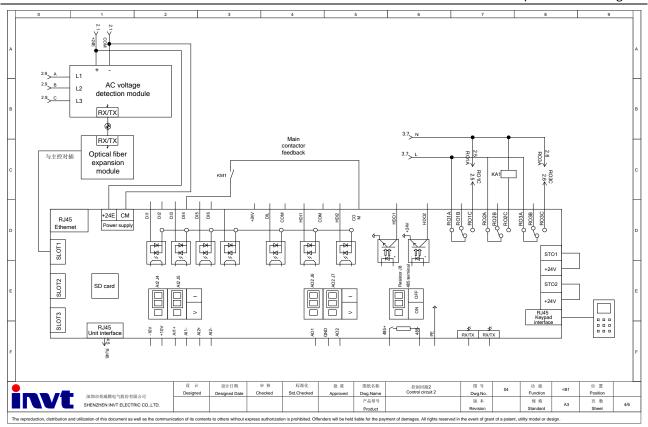
## C.1 GD880 active rectifier basic example electrical diagram (A3-A7)

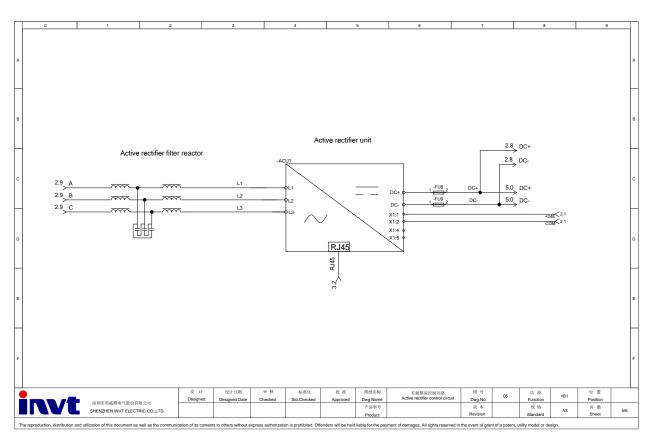


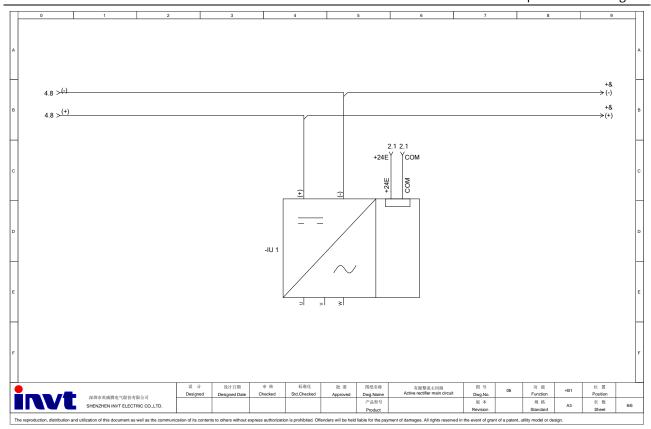




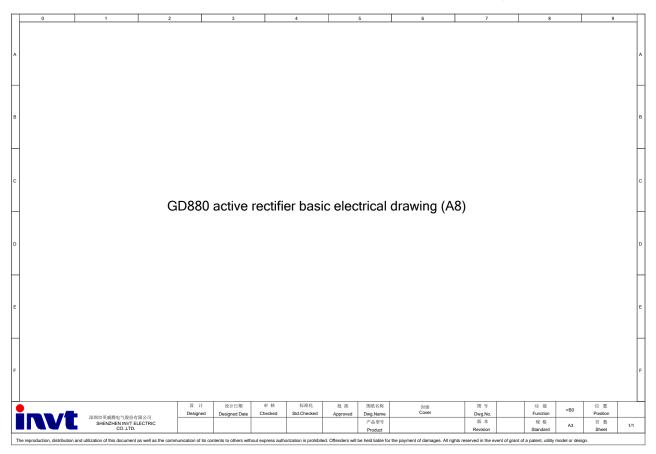


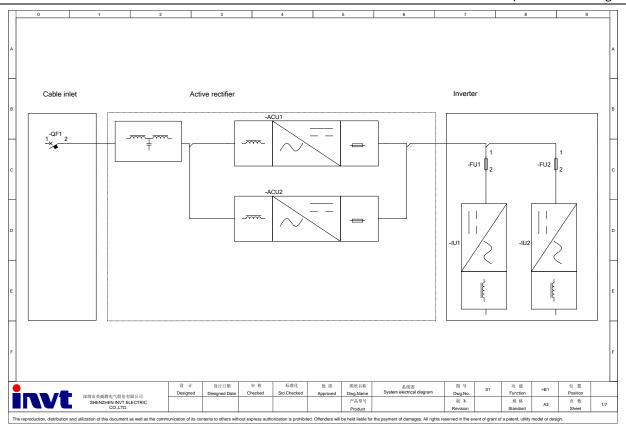


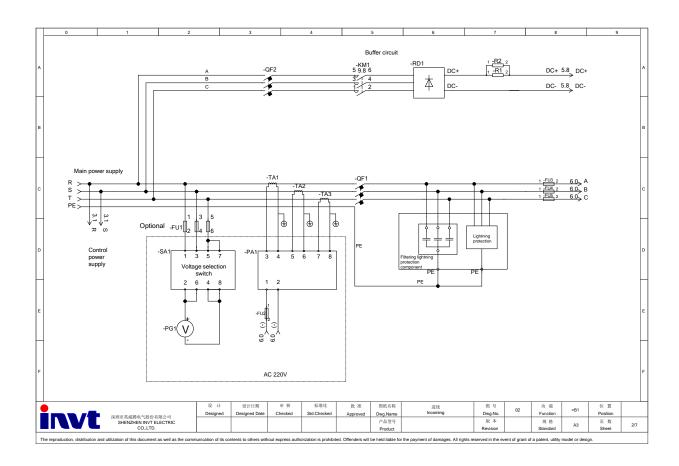


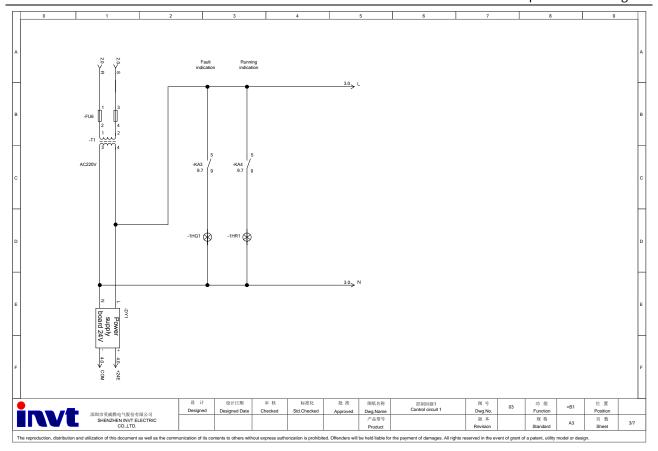


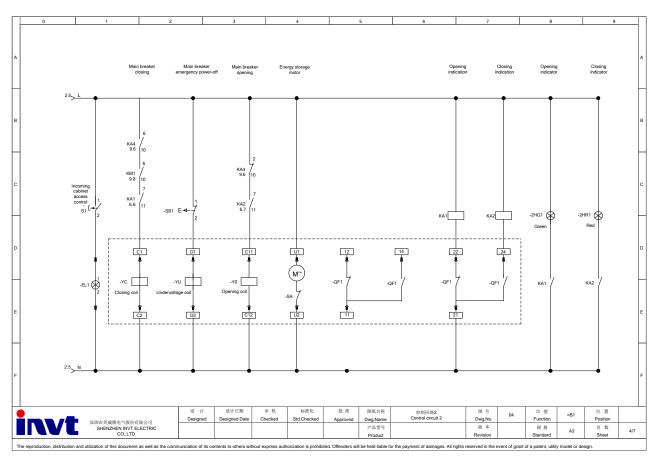
## C.2 GD880 active rectifier basic example electrical diagram (A8)

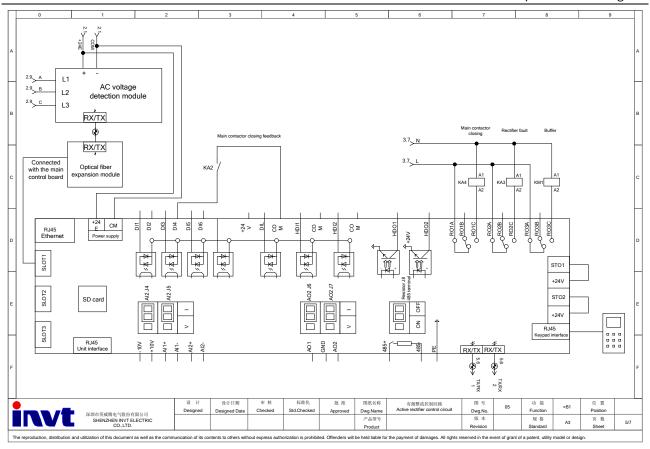


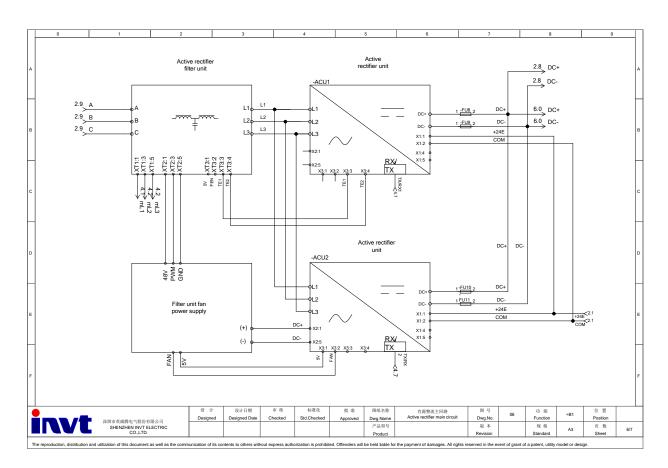


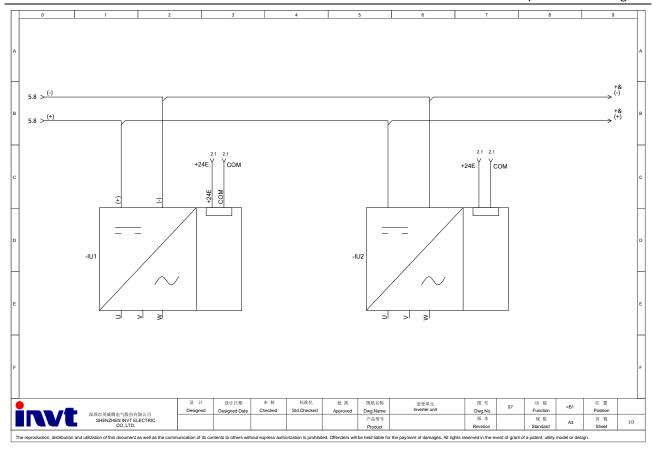












# Appendix D Order No.

Product model	Structure	Order No.	Qty	Remarks
400VAC		•		
		GD880-91-0094-4	1	Rectifier module
		LCL-0116-0.4SA-4149-RO	1	Filtering component
		HC-0110-4-Z	1	Buffer component
		RV-380V	1	Surge protection module
GD880-91-0094-4-ZJ	A3+LCL	GD800-LB	1	EMI filter module
		IVDM-10	1	AC voltage detection module
		EC-TX821	1	Optical fiber expansion module
		HFBR-1M	1	1m optical fiber
		GD880-91-0116-4	1	Rectifier module
	A4+LCL	LCL-0116-0.4SA-4149-RO	1	Filtering component
		HC-0110-4-Z	1	Buffer component
		RV-380V	1	Surge protection module
GD880-91-0116-4-ZJ		GD800-LB	1	EMI filter module
		IVDM-10	1	AC voltage detection module
		EC-TX821	1	Optical fiber expansion module
		HFBR-1M	1	1m optical fiber
		GD880-91-0149-4	1	Rectifier module
		LCL-0180-0.4SA-4149-RO	1	Filtering component
		HC-0110-4-Z	1	Buffer component
		RV-380V	1	Surge protection module
GD880-91-0149-4-ZJ	A4+LCL	GD800-LB	1	EMI filter module
		IVDM-10	1	AC voltage detection module
		EC-TX821	1	Optical fiber expansion module
		HFBR-1M	1	1m optical fiber
GD880-91-0183-4-ZJ	A4+LCL	GD880-91-0183-4	1	Rectifier module

Product model	Structure	Order No.	Qty	Remarks
		LCL-0180-0.4SA-4149-RO	1	Filtering component
		HC-0110-4-Z	1	Buffer component
		DV 200V	1	Surge protection
		RV-380V	1	module
		GD800-LB	1	EMI filter module
		IVDM-10	1	AC voltage detection module
		EC-TX821	1	Optical fiber expansion module
		HFBR-1M	1	1m optical fiber
		GD880-91-0220-4	1	Rectifier module
		LCL-0220-0.4SA-4149-RO	1	Filtering component
		HC-0200-4	1	Buffer component
		RV-380V	1	Surge protection module
	A6+LCL	GD800-LB	1	EMI filter module
GD880-91-0220-4-ZJ		SOP-880-01-REC	1	Chinese keypad
		L=2M (CHV-SE)	1	2M keypad cable
		IVDM-10	1	AC voltage detection module
		EC-TX821	1	Optical fiber expansion module
		HFBR-1M	1	1m optical fiber
		GD880-91-0260-4	1	Rectifier unit
		LCL-0355-0.4SC-4149-RO	1	Filtering component
		HC-0200-4	1	Buffer component
		RV-380V	1	Surge protection module
		GD800-LB	1	EMI filter module
GD880-91-0260-4-ZJ	A6+LCL	SOP-880-01-REC	1	Chinese keypad
		L=2M (CHV-SE)	1	2M keypad cable
		IVDM-10	1	AC voltage detection module
		EC-TX821	1	Optical fiber expansion module
		HFBR-1M	1	1m optical fiber
GD880-91-0312-4-ZJ	A7+LCL	GD880-91-0312-4	1	Rectifier unit

Product model	Structure	Order No.	Qty	Remarks
		HC-0200-4	1	Buffer component
		DV 200V	1	Surge protection
		RV-380V	1	module
		GD800-LB	1	EMI filter module
		SOP-880-01-REC	1	Chinese keypad
		L=2M (CHV-SE)	1	2M keypad cable
		IVDM-10	1	AC voltage detection module
		EC-TX821	1	Optical fiber expansion module
		HFBR-1M	1	1m optical fiber
		GD880-91-0395-4	1	Rectifier unit
		LCL-0380-0.4SC-4149-RO	1	Filtering component
		HC-0200-4	1	Buffer component
	A7+LCL	RV-380V	1	Surge protection module
		GD800-LB	1	EMI filter module
GD880-91-0395-4-ZJ		SOP-880-01-REC	1	Chinese keypad
		L=2M (CHV-SE)	1	2M keypad cable
		IVDM-10	1	AC voltage detection module
		EC-TX821	1	Optical fiber expansion module
		HFBR-1M	1	1m optical fiber
		GD880-91-0516-4	1	Rectifier unit (A7 structure)
		LCL-0516-0.4SC-4149-RO	1	Filtering component
		HC-0200-4	1	Buffer component
		SOP-880-01-REC	1	Chinese keypad
GD880-91-0516-4-ZJ	A7+LCL	L=2M (CHV-SE)	1	2M keypad cable
		IVDM-10	1	AC voltage detection module
		EC-TX821	1	Optical fiber expansion module
		HFBR-1M	1	1m optical fiber
		GD880-ACU-11	1	Control module
GD880-91-0615-4-XX	A8+LCL	GD880-91-0615-4	1	Rectifier unit
		GD880-01-0615-4	1	Filter module

Product model	Structure	Order No.	Qty	Remarks
			_	Fast connector kit (-K is
		A8+L-K	1	optional)
		BUB800-0900-4	1	Buffer component
		HFBR-3M	1	3M fiber optic
		SOP-880-01-REC	1	Chinese keypad
		L=2M (CHV-SE)	1	2M keypad cable
		IVDM-10	1	AC voltage detection module
		EC-TX821	1	Optical fiber expansion module
		HFBR-1M	1	1m optical fiber
		GD880-ACU-11	1	Control module
		GD880-91-0681-4	1	Rectifier unit
		GD880-01-0810-4	1	Filter module
	A8+LCL	A8+L-K	1	Fast connector kit (-K is optional)
		BUB800-0900-4	1	Buffer component
GD000 01 0001 4 VV		HFBR-3M	1	3M fiber optic
GD880-91-0681-4-XX		SOP-880-01-REC	1	Chinese keypad
		L=2M (CHV-SE)	1	2M keypad cable
		IVDM-10	1	AC voltage detection module
		EC-TX821	1	Optical fiber expansion module
		HFBR-1M	1	1m optical fiber
		GD880-ACU-11	1	Control module
		GD880-91-0810-4	1	Rectifier unit
		GD880-01-0810-4	1	Filter module
		A8+L-K	1	Fast connector kit (-K is optional)
		BUB800-0900-4	1	Buffer component
GD880-91-0810-4-XX	A8+LCL	HFBR-3M	1	3M fiber optic
		SOP-880-01-REC	1	Chinese keypad
		L=2M (CHV-SE)	1	2M keypad cable
		IVDM-10	1	AC voltage detection module
		EC-TX821	1	Optical fiber expansion module

Product model	Structure	Order No.	Qty	Remarks
		HFBR-1M	1	1m optical fiber
		GD880-ACU-13	1	Control module
		CD000 01 051C 4	1	Rectifier unit (A8
		GD880-91-0516-4	2	structure)
		GD880-01-1092-4	1	Filter module
		2*A8+L-K	1	Fast connector kit (-K is optional)
		BUB800-1770-4	1	Buffer component
GD880-91-0980-4-XX	2* A8+ LCL	HFBR-3M	2	3M fiber optic
05000 31 0300 1700	2 710 202	SOP-880-01-REC	1	Chinese keypad
		L=2M (CHV-SE)	1	2M keypad cable
		2111 (01114 32)		AC voltage detection
		IVDM-10	1	module
				Optical fiber expansion
		EC-TX821	1	module
		HFBR-1M	1	1m optical fiber
		GD880-ACU-13	1	Control module
		GD880-91-0615-4	2	Rectifier unit
		GD880-01-1092-4	1	Filter module
		2*A8+L-K	1	Fast connector kit (-K is
				optional)
		BUB800-1770-4	1	Buffer component
GD880-91-1168-4-XX	2* A8+ LCL	HFBR-3M	2	3M fiber optic
GD000-91-1100-4-XX	Z AOT LCL	SOP-880-01-REC	1	Chinese keypad
		L=2M (CHV-SE)	1	2M keypad cable
		IVDM-10	1	AC voltage detection
		1VDM 10		module
		EC-TX821	1	Optical fiber expansion module
		HFBR-1M	1	1m optical fiber
		GD880-ACU-13	1	Control module
		GD880-91-0810-4	2	Rectifier unit
		GD880-01-1539-4	1	Filter module
GD880-91-1295-4-XX				Fast connector kit (-K is
	2* A8+ LCL	2*A8+L-K	1	optional)
		BUB800-1770-4	1	Buffer component
		HFBR-3M	2	3M fiber optic
		SOP-880-01-REC	1	Chinese keypad

Product model	Structure	Order No.	Qty	Remarks
		L=2M (CHV-SE)	1	2M keypad cable
		IVDM 10		AC voltage detection
		IVDM-10	1	module
		FC TV021	,	Optical fiber expansion
		EC-TX821	1	module
		HFBR-1M	1	1m optical fiber
		GD880-ACU-13	1	Control module
		GD880-91-0810-4	2	Rectifier unit
		GD880-01-1539-4	1	Filter module
		2*A8+L-K	1	Fast connector kit (-K is optional)
		BUB800-1770-4	1	Buffer component
		HFBR-3M	2	3M fiber optic
GD880-91-1539-4-XX	2* A8+ LCL	SOP-880-01-REC	1	Chinese keypad
		L=2M (CHV-SE)	1	2M keypad cable
		IV/DM 10	1	AC voltage detection
		IVDM-10	1	module
		EC-TX821	1	Optical fiber expansion module
		HFBR-1M	1	1m optical fiber
		GD880-ACU-14	1	Control module
		GD880-91-0615-4	4	Rectifier unit
		GD880-01-1092-4	2	Filter module
		2*A8+L-K	2	Fast connector kit (-K is optional)
		BUB800-1770-4	2	Buffer component
GD880-91-2185-4-XX	2*(2* A8+1C1)	HFBR-5M	4	5M fiber optic
GD660-31-2163-4-AX	Z (Z AO' LCL)	SOP-880-01-REC	1	Chinese keypad
		L=2M (CHV-SE)	1	2M keypad cable
		IVDM-10	1	AC voltage detection module
		EC-TX821	1	Optical fiber expansion module
		HFBR-1M	1	1m optical fiber
		GD880-ACU-14	1	Control module
CD000 01 2070 4 207	2*/2* AO. I CI \	GD880-91-0810-4	4	Rectifier unit
GD880-91-3078-4-XX	2"(2" A8+ LCL)	GD880-01-1539-4	2	Filter module
		2*A8+L-K		

Product model	Structure	Order No.	Qty	Remarks
				optional)
		BUB800-1770-4	2	Buffer component
		HFBR-5M	4	5M fiber optic
		SOP-880-01-REC	1	Chinese keypad
		L=2M (CHV-SE)	1	2M keypad cable
		IVDM-10	1	AC voltage detection module
		EC-TX821	1	Optical fiber expansion module
		HFBR-1M	1	1m optical fiber
		GD880-ACU-16	1	Control module
		GD880-91-0810-4	6	Rectifier unit
		GD880-01-1539-4	3	Filter module
		2*A8+L-K	3	Fast connector kit (-K is optional)
		BUB800-1770-4	3	Buffer component
CD000 01 4C17 4 VV	2*/2* AO. LCL\	HFBR-5M	6	5M fiber optic
GD880-91-4617-4-XX	3*(2* A8+ LCL)	SOP-880-01-REC	1	Chinese keypad
		L=2M (CHV-SE)	1	2M keypad cable
		IVDM-10	1	AC voltage detection module
		EC-TX821	1	Optical fiber expansion module
		HFBR-1M	1	1m optical fiber
690VAC				·
	A8+LCL	GD880-ACU-11	1	Control module
		GD880-91-0369-6	1	Rectifier unit
		GD880-01-0369-6	1	Filter module
GD880-91-0369-6-XX		A8+L-K	1	Fast connector kit (-K is optional)
		BUB800-0900-6	1	Buffer component
		HFBR-3M	1	3M fiber optic
		SOP-880-01-REC	1	Chinese keypad
		L=2M (CHV-SE)	1	2M keypad cable
		IVDM-10	1	AC voltage detection module
		EC-TX821	1	Optical fiber expansion module

Product model	Structure	Order No.	Qty	Remarks
		HFBR-1M	1	1m optical fiber
		GD880-ACU-11	1	Control module
		GD880-91-0477-6	1	Rectifier unit
		GD880-01-0540-6	1	Filter module
		A8+L-K	1	Fast connector kit (-K is optional)
		BUB800-0900-6	1	Buffer component
	A8+LCL	HFBR-3M	1	3M fiber optic
GD880-91-0477-6-XX		SOP-880-01-REC	1	Chinese keypad
		L=2M (CHV-SE)	1	2M keypad cable
		IVDM-10	1	AC voltage detection module
		EC-TX821	1	Optical fiber expansion module
		HFBR-1M	1	1m optical fiber
		GD880-ACU-11	1	Control module
		GD880-91-0540-6	1	Rectifier unit
		GD880-01-0540-6	1	Filter module
		A8+L-K	1	Fast connector kit (-K is optional)
		BUB800-0900-6 1	1	Buffer component
CD000 01 0540 C VV	A8+LCL	HFBR-3M	1	3M fiber optic
GD880-91-0540-6-XX		SOP-880-01-REC	1	Chinese keypad
		L=2M (CHV-SE)	1	2M keypad cable
		IVDM-10	1	AC voltage detection module
		EC-TX821	1	Optical fiber expansion module
		HFBR-1M	1	1m optical fiber
	2* A8+ LCL	GD880-ACU-13	1	Control module
		GD880-91-0369-6	2	Rectifier unit
		GD880-01-0701-6	1	Filter module
GD880-91-0701-6-XX		2*A8+L-K	1	Fast connector kit (-K is optional)
		BUB800-1770-6	1	Buffer component
		HFBR-3M	2	3M fiber optic
		SOP-880-01-REC	1	Chinese keypad
		L=2M (CHV-SE)	1	2M keypad cable

Product model	Structure	Order No.	Qty	Remarks
			1	AC voltage detection
		IVDM-10		module
		EC-TX821	1	Optical fiber expansion
		EC-17021	1	module
		HFBR-1M	1	1m optical fiber
		GD880-ACU-13	1	Control module
		GD880-91-0477-6	2	Rectifier unit
		GD880-01-1026-6	1	Filter module
		2*A8+L-K	1	Fast connector kit (-K is optional)
		BUB800-1770-6	1	Buffer component
CD000 01 000C C VV	2* 40. 1.61	HFBR-3M	2	3M fiber optic
GD880-91-0906-6-XX	2* A8+ LCL	SOP-880-01-REC	1	Chinese keypad
		L=2M (CHV-SE)	1	2M keypad cable
		IVDM-10	1	AC voltage detection module
		EC-TX821	1	Optical fiber expansion module
		HFBR-1M	1	1m optical fiber
	2* A8+ LCL	GD880-ACU-13	1	Control module
		GD880-91-0540-6	2	Rectifier unit
		GD880-01-1026-6	1	Filter module
		2*A8+L-K	1	Fast connector kit (-K is optional)
		BUB800-1770-6	1	Buffer component
CD000 01 103C C VV		HFBR-3M	2	3M fiber optic
GD880-91-1026-6-XX		SOP-880-01-REC	1	Chinese keypad
		L=2M (CHV-SE)	1	2M keypad cable
		IVDM-10	1	AC voltage detection module
		EC-TX821	1	Optical fiber expansion module
		HFBR-1M	1	1m optical fiber
GD880-91-1402-6-XX	2*(2* A8+ LCL)	GD880-ACU-14	1	Control module
		GD880-91-0369-6	4	Rectifier unit
		GD880-01-1026-6	2	Filter module
		2*A8+L-K	2	Fast connector kit (-K is optional)

Product model	Structure	Order No.	Qty	Remarks
		BUB800-1770-6	2	Buffer component
		HFBR-5M	4	5M fiber optic
		SOP-880-01-REC	1	Chinese keypad
		L=2M (CHV-SE)	1	2M keypad cable
		IVDM-10	1	AC voltage detection module
		EC-TX821	1	Optical fiber expansion module
		HFBR-1M	1	1m optical fiber
		GD880-ACU-14	1	Control module
		GD880-91-0540-6	4	Rectifier unit
		GD880-01-1026-6	2	Filter module
		2*A8+L-K	2	Fast connector kit (-K is optional)
		BUB800-1770-6	2	Buffer component
	2*(2* A8+ LCL)	HFBR-5M	4	5M fiber optic
GD880-91-2052-6-XX		SOP-880-01-REC	1	Chinese keypad
		L=2M (CHV-SE)	1	2M keypad cable
		IVDM-10	1	AC voltage detection module
		EC-TX821	1	Optical fiber expansion module
		HFBR-1M	1	1m optical fiber
		GD880-ACU-16	1	Control module
		GD880-91-0540-4	6	Rectifier unit
		GD880-01-1026-6	3	Filter module
		2*A8+L-K	3	Fast connector kit (-K is optional)
		BUB800-1770-4	3	Buffer component
GD880-91-3078-4-XX		HFBR-5M	6	5M fiber optic
		SOP-880-01-REC	1	Chinese keypad
		L=2M (CHV-SE)	1	2M keypad cable
		IVDM-10	1	AC voltage detection module
		EC-TX821	1	Optical fiber expansion module
		HFBR-1M	1	1m optical fiber

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