Goodrive880 Series Regenerative Rectifier

Hardware Manual

SHENZHEN INVT ELECTRIC CO., LTD.

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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, supercalender, 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.

Goodrive880-81 series is the regenerative rectifier unit product of Goodrive880 series. If not otherwise specified, the regenerative rectifier unit in this manual refers to the regenerative rectifier unit of Goodrive880 series and Goodrive880-81 series product. The rated power of a single unit is 64kW–829kW, and the max. parallel power can be 6057kW. The rectifier unit consists of bus capacitor, IGBT, and reactor components. It is compact in structure and easy to integrate and maintain.

This manual is Goodrive880 series regenerative rectifier unit hardware manual, presenting safety precautions, product information, mechanical and electrical installation, and precautions related to daily maintenance. Read 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.

Contents

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.

No.	Name	Description
	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.
	Electrostatic discharge	The PCBA may be damaged if related requirements are not followed.
	Hot sides	Do not touch. The regenerative rectifier base may become hot.
	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

<table>
<tr><td></td><td>listed in the following.
<table>
<tr><th colspan="2">Model</th><th>Minimum waiting time</th></tr>
<tr><td rowspan="3">380V</td><td>76–120kW</td><td>5 minutes</td></tr>
<tr><td>161–341kW</td><td>15 minutes</td></tr>
<tr><td>Higher than 423kW</td><td>25 minutes</td></tr>
<tr><td>690V</td><td>Higher than 685kW</td><td>25 minutes</td></tr>
</table></td></tr>
<tr><td>  </td><td>● Do not modify the product unless authorized; otherwise fire, electric shock or other injury may result.</td></tr>
<tr><td>  </td><td>● The base may become hot when the product is running. Do not touch. Otherwise, you may get burnt.</td></tr>
<tr><td>  </td><td>● The electrical parts and components inside the product are electrostatic sensitive. Take measurements to prevent electrostatic discharge when performing related operations.</td></tr>
</table>

1.4.1 Delivery and installation

<table>
<tr><td>  </td><td>● Do not install the regenerative rectifier on inflammables. In addition, prevent the regenerative rectifier from contacting or adhering to inflammables.
● Do not run the regenerative rectifier if it is damaged or incomplete.
● Do not contact the rectifier unit with damp objects or body parts. Otherwise, electric shock may result.</td></tr>
<tr><td>Note</td><td>● Select appropriate tools for regenerative rectifier delivery and installation to ensure the safe and proper running and avoid physical injury or death. To ensure personal safety, take mechanical protective measures like wearing safety shoes and working uniforms.
● Protect the regenerative 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.
● As regenerative rectifier leakage current caused during running may exceed 3.5mA, ground properly and ensure the grounding resistance is less than 10Ω. The conductivity of PE grounding conductor must meet the following requirements:
<table>
<tr><th>Power cable conductor cross-sectional area S (mm²)</th><th>Grounding conductor cross-sectional area</th></tr>
<tr><td>S⩽16</td><td>S</td></tr>
<tr><td>16<S⩽35</td><td>16</td></tr>
<tr><td>35<S</td><td>S/2</td></tr>
</table>
● 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 regenerative rectifier may be damaged.</td></tr>
</table>

1.4.2 Commissioning and running

<table>
<tr><td>  </td><td>● Cut off all power supplies connected to the regenerative rectifier before terminal wiring, and wait for at least the time designated on the rectifier unit after</td></tr>
</table>

	disconnecting the power supplies. ● High voltage presents inside the regenerative 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 regenerative 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 rectifier during running.
Note	● Do not switch on or switch off the input power supplies of regenerative rectifier frequently. ● If the regenerative rectifier has been stored for a long time without use, perform checking and carry out pilot run for the rectifier unit before using it again. ● Close the regenerative rectifier front cover before running; otherwise, electric shock may occur.

1.4.3 Maintenance and component replacement

	● Only trained and qualified professionals are allowed to perform maintenance, inspection, and component replacement for the regenerative rectifier. ● Cut off all power supplies connected to the product before terminal wiring, and wait for at least the time designated on the rectifier unit after disconnecting the power supplies. ● During maintenance and component replacement, take measures to prevent screws, cables and other conductive matters from falling into the internal of the regenerative rectifier.
Note	● Use proper torque to tighten screws. ● During maintenance and component replacement, keep the regenerative rectifier and its parts and components away from combustible materials and ensure they have no combustible materials adhered. ● Do not carry out insulation voltage-endurance test on the regenerative 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 regenerative rectifier and its internal parts.

1.4.4 Disposal

	● The regenerative 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 regenerative rectifier, the rated power of a module is 76kW–1027kW, while that of parallel units can be up to 5726kW. The regenerative rectifier consists of regenerative rectifier filter unit and regenerative rectifier unit. It is compact in structure and easy to integrate and maintain, reducing cabinet footprint.

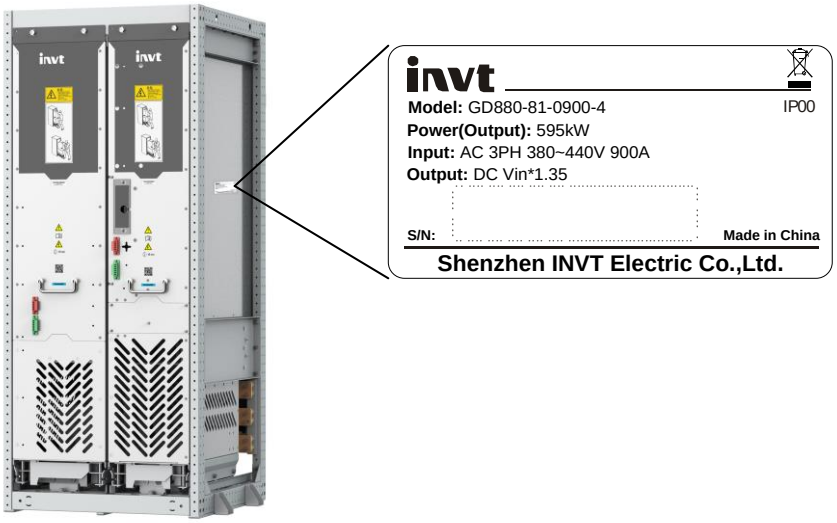
2.1 Product specifications

Table 2-1 Product specifications

Function description		Specifications
Power input	Input voltage (V)	380–440VAC 3PH ±10%, -15%<1min; Rated voltage: 400V 520–690VAC 3PH ±10%, -15%<1min; Rated voltage: 690V
	Input current (A)	For details, see section 2.3 Product ratings.
	Input frequency (Hz)	50Hz or 60Hz; Allowed range: 47–63Hz
Power output	Output voltage (V)	Input voltage * 1.4
	Output current (A)	For details, see section 2.3 Product ratings.
	Output power (kW)	For details, see section 2.3 Product ratings.
Environment condition	Working temperature	-10°C–+50°C; Derating is required when the ambient temperature exceeds 40°C.
	Relative humidity	5%–95%, no condensation
	Installation altitude	Below 1000m (Derating is required when the altitude exceeds 1000m. Derate by 1% for every increase of 100m.)
Mechanical data	Anti-vibration performance	Compliant with 3M4 vibration level in GB/T4798.3
	IP rating	For the module: IP00 For the cabinet: IP20 (Optional: IP23 and IP42)
	Safety performance	Compliant with EN 61800-5-1
	Cooling method	Forced air cooling
Protection function	Protection function	Including functions of protection against overcurrent, overload, overvoltage, undervoltage, overtemperature, and phase loss.

2.2 Product nameplate and model

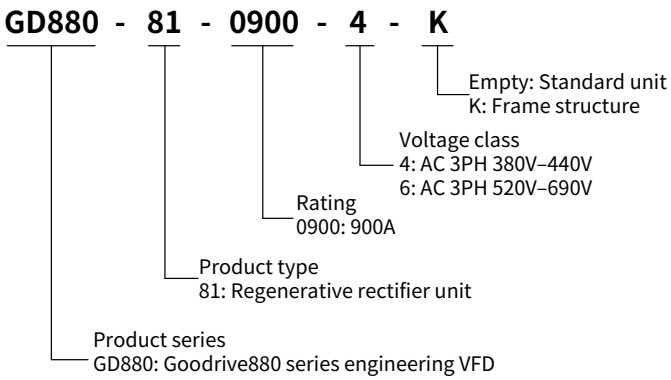
Figure 2-1 Product nameplate



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 designation code on the product nameplate.

Figure 2-2 Product model



Note: The preceding model is only an example of GD880-81 models.

2.3 Product ratings

Table 2-2 AC 3PH 380V–440V

Model GD880-81-...	Rated value					Light overload application		Heavy overload application		External view Structure	Heat dissipa-tion	Air volume
	I_N	I_N	I_{max}	S_N	P_N	I_{Ld}	P_{Ld}	I_{hd}	P_{Hd}			
	A (AC)	A (DC)	A (DC)	kVA	kW (DC)	A (DC)	kW (DC)	A (DC)	kW (DC)		kW	m^3/h
0116–4	116	141	184	80	76	135	73	106	57	A4+L	1.03	255
0149–4	149	181	236	102	97	174	94	136	73	A4+L	1.31	255
0183–4	183	223	290	126	120	214	115	167	90	A4+L	1.62	255

Model GD880-81-…	Rated value					Light overload application		Heavy overload application		External view Structure	Heat dissipa-tion	Air volume
	I_N	I_N	I_{max}	S_N	P_N	I_{Ld}	P_{Ld}	I_{hd}	P_{Hd}			
	A (AC)	A (DC)	A (DC)	kVA	kW (DC)	A (DC)	kW (DC)	A (DC)	kW (DC)		kW	m^3/h
0245–4	245	299	389	169	161	287	155	224	121	A6+L	2.18	1000
0299–4	299	365	475	206	197	351	189	274	148	A6+L	2.66	1000
0349–4	349	426	555	241	230	410	221	320	172	A7+L	2.92	1000
0395–4	395	483	628	273	261	464	250	362	195	A7+L	3.32	1000
0516–4	516	631	820	357	341	606	327	473	255	A7+L	4.34	1000
0640-4-XX	640	783	1018	443	423	752	406	587	317	A8+L	4.9	3000
0900-4-XX	900	1102	1432	624	595	1057	571	826	446	A8+L	6.88	3000
1180-4-XX	1180	1445	1879	818	780	1387	749	1081	584	2*A8+L	8.4	4500
1770-4-XX	1770	2168	2818	1226	1171	2081	1124	1622	876	2*A8+L	12.2	4500
2360-4-XX	2360	2829	3678	1636	1560	2774	1498	2162	1168	2*(2*A8+L)	16.8	9000
3540-4-XX	3540	4336	5636	2452	2342	4162	2248	3244	1752	2*(2*A8+L)	24.4	9000
5310-4-XX	5310	6504	8454	3678	3513	6243	3372	4866	2628	3*(2*A8+L)	36.6	13500

Table 2-3 AC 3PH 520V–690V

Model GD880-81-…	Rated value					Light overload application		Heavy overload application		Structure	Heat dissipa-tion	Air volume
	I_N	I_N	I_{max}	S_N	P_N	I_{Ld}	P_{Ld}	I_{hd}	P_{Hd}			
	A (AC)	A (DC)	A (DC)	kVA	kW (DC)	A (DC)	kW (DC)	A (DC)	kW (DC)		kW	m^3/h
0600-6-XX	600	734	955	717	685	705	657	550	512	A8+L	5.4	3000
0900-6-XX	900	1102	1432	1076	1027	1058	986	824	768	A8+L	7.2	3000
1180-6-XX	1180	1445	1879	1410	1346	1387	1292	1081	1007	2*A8+L	9.3	4500
1770-6-XX	1770	2168	2818	2115	2019	2081	1939	1622	1510	2*A8+L	12.3	4500
2360-6-XX	2360	2890	3758	2820	2692	2774	2584	2162	2014	2*(2*A8+L)	18.6	9000
3540-6-XX	3540	4336	5636	4230	4038	4162	3878	3244	3020	2*(2*A8+L)	24.6	9000
5310-6-XX	5310	6504	8454	6345	6057	6243	5817	4866	4530	3*(2*A8+L)	36.9	13500

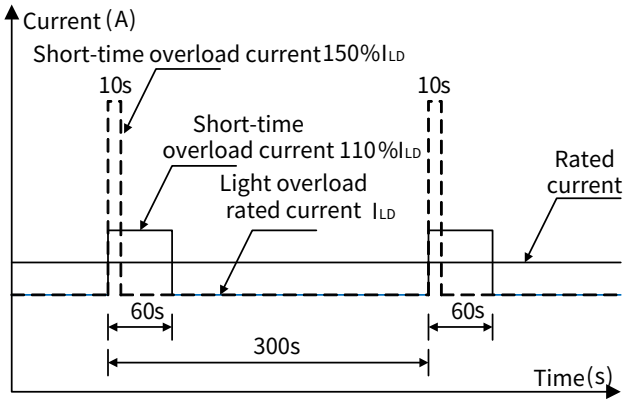
Note:

- The voltage drop of the filter reactor should not be less than 4% at the rated current.
- 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_{Ld} indicates the continuous running current at light overload. Every 5 minutes, the overload with the current of 110%*I_{Ld} can last for 1 minutes at 40°C.
- Heavy overload application: I_{Hd} indicates the continuous running current at heavy overload. Every 5 minutes, the overload with the current of 150%*I_{Hd} can last for 1 minutes at 40°C.
- There are several structures available. The models with the last digit empty are standard units without a frame. The -K models use a frame structure. The -N models use a front-outlet structure without output reactors, which only applies to A8+L frames and not applications where multiple A8 units are connected in parallel.

2.4 Overload capability

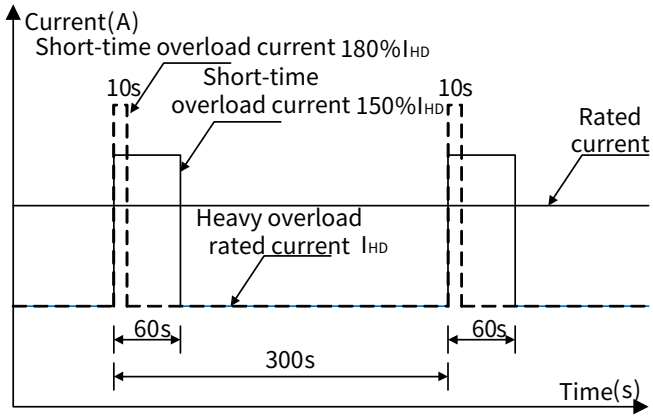
Based on the light overload continuous run current (I_{Ld}), the regenerative rectifier can keep running for 60s at 110% of the rated current. See Figure 2-3.

Figure 2-3 Light overload application



Based on the heavy overload continuous run current (I_{Hd}), the regenerative 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

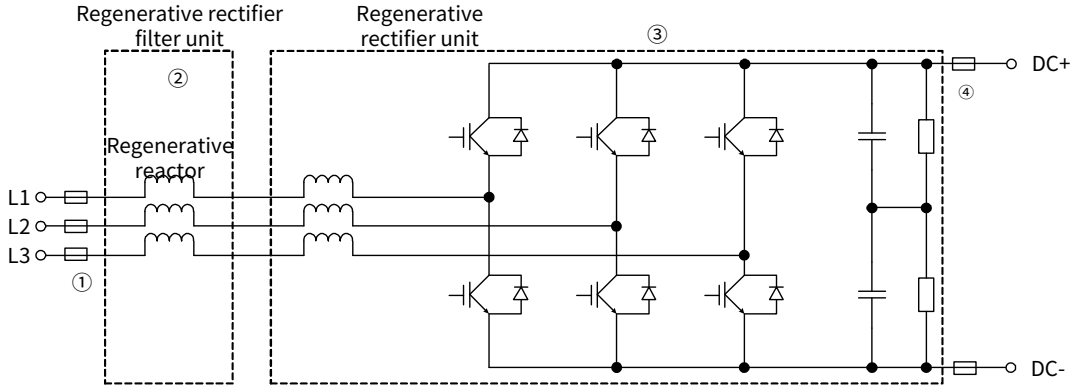
2.5.1 Basic principles

The regenerative rectifier, a four-quadrant rectifier system, mainly consists of regenerative rectifier filter unit and regenerative 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 regenerative 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 regenerative rectifier filter unit, which is the filter, is used to suppress input or regenerative current harmonics.

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

Figure 2-5 Main circuit diagram of the regenerative rectifier



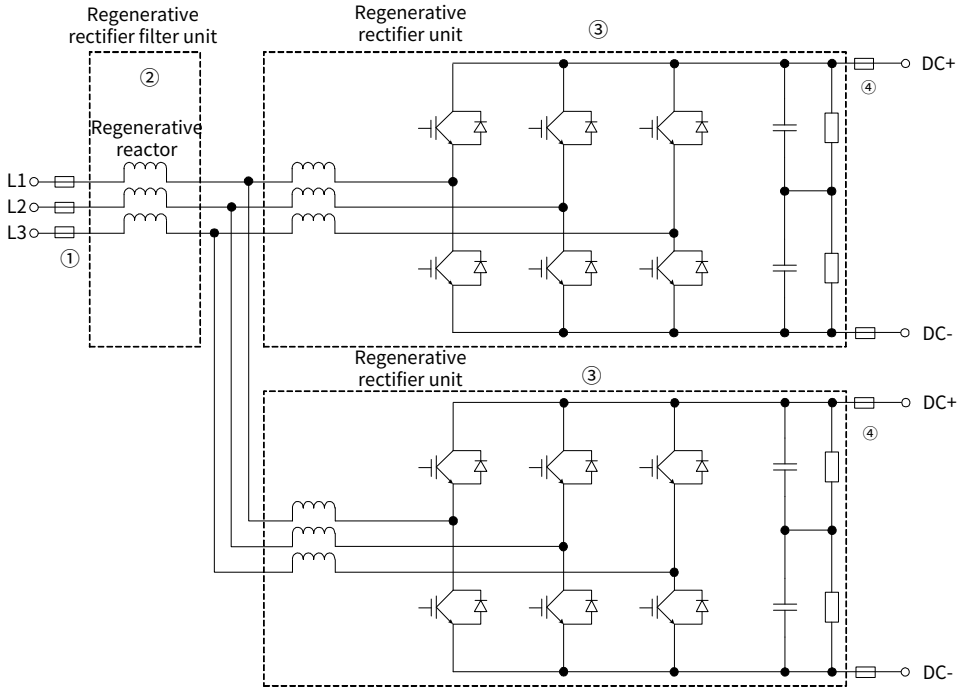
No.	Name	Description
1	AC fuse	To protect against overload and short-circuit on the regenerative rectifier unit side.
2	Regenerative rectifier filter unit	To suppress AC voltage and current harmonics.
3	Regenerative rectifier unit	To convert AC current to DC current.
4	DC fuse	To prevent backend short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

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

2.5.2 Paralleling principle

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

Figure 2-6 Parallel system diagram of the regenerative rectifier



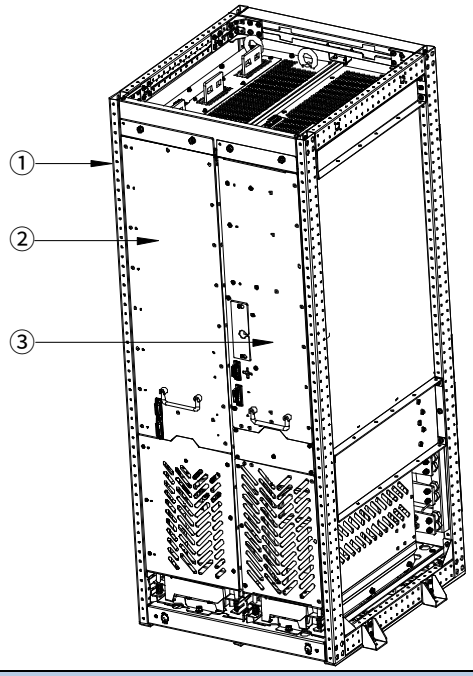
No.	Name	Description
1	AC fuse	To protect against overload and short-circuit on the regenerative rectifier unit side.
2	Regenerative rectifier filter unit	To suppress AC voltage and current harmonics.
3	Regenerative rectifier unit	To convert AC current to DC current.
4	DC fuse	To prevent backend short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

2.6 Product component

2.6.1 Layout of L+A8

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

Figure 2-7 Structure of regenerative rectifier frame (L+A8)

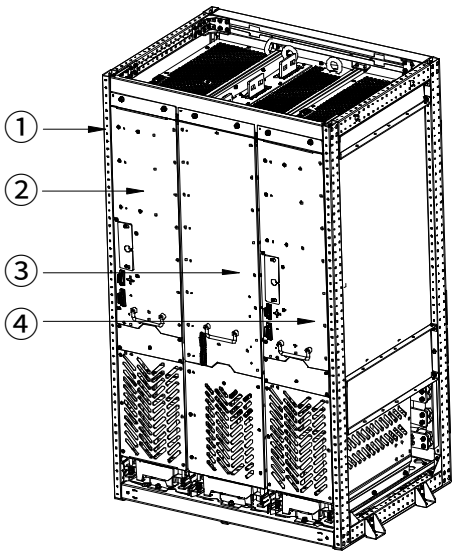


No.	Name
1	Frame
2	Regenerative rectifier filter unit
3	Regenerative rectifier unit

2.6.2 Layout of L+2*A8

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

Figure 2-8 Structure of regenerative rectifier frame (L+2*A8)

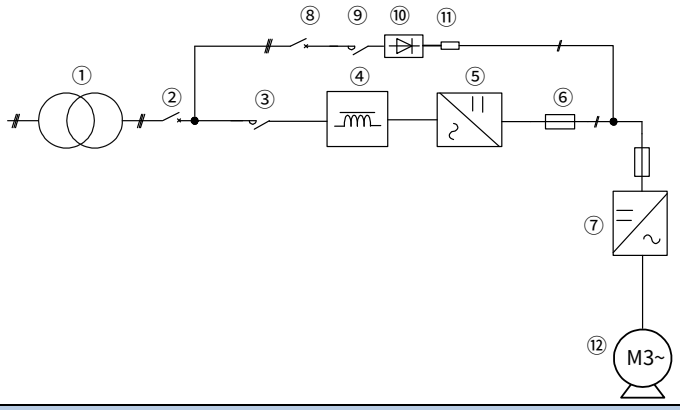


No.	Name
1	Frame
2	Regenerative rectifier unit
3	Regenerative rectifier filter unit
4	Regenerative rectifier unit

2.7 System configuration

Figure 2-9 shows the typical topology in which the regenerative rectifier works with one inverter unit (applicable to A4–A7 modules).

Figure 2-9 System configuration

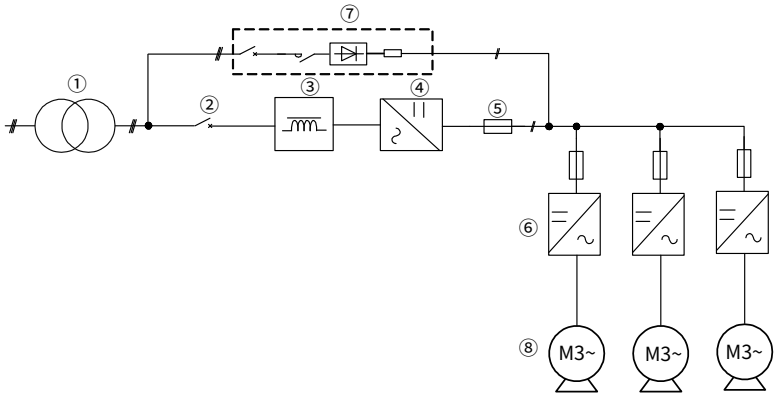


No.	Name
1	Transformer
2	Breaker
3	Main circuit contactor
4	Regenerative rectifier filter unit
5	Regenerative rectifier unit

No.	Name
6	DC fuse
7	Inverter unit
8	Precharge breaker
9	Precharge contactor
10	Rectifier bridge
11	Precharge resistor
12	Motor

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

Figure 2-10 System configuration



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

Note: The induction voltage drop of the transformer should should not be less than 4% at the rated current.

2.8 Electrical model selection

2.8.1 Precharge component

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

Table 2-4 Precharge component selection

Power unit	Frame size	Precharge component model	Qty
GD880-81-0116-4	L+A4	HC-0110-4-Z	1
GD880-81-0149-4	L+A4	HC-0110-4-Z	1
GD880-81-0183-4	L+A4	HC-0110-4-Z	1
GD880-81-0245-4	L+A6	HC-0110-4-Z	1

Power unit	Frame size	Precharge component model	Qty
GD880-81-0299-4	L+A6	HC-200-4	1
GD880-81-0349-4	L+A7	HC-200-4	1
GD880-81-0395-4	L+A7	HC-200-4	1
GD880-81-0516-4	L+A7	BUB800-0900-4	1
GD880-81-0640-4	L+A8	BUB800-0900-4	1
GD880-81-0900-4	L+A8	BUB800-0900-4	1
GD880-81-1180-4	L+2*A8	BUB800-1770-4	1
GD880-81-1770-4	L+2*A8	BUB800-1770-4	1
GD880-81-2380-4	2* (L+2*A8)	BUB800-1770-4	2
GD880-81-3348-4	2* (L+2*A8)	BUB800-1770-4	2
GD880-81-5022-4	3* (L+2*A8)	BUB800-1770-4	3
GD880-81-0600-6	L+A8	BUB800-0900-6	1
GD880-81-0900-6	L+A8	BUB800-0900-6	1
GD880-81-1180-6	L+2*A8	BUB800-1770-6	1
GD880-81-1770-6	L+2*A8	BUB800-1770-6	1
GD880-81-2232-6	2* (L+2*A8)	BUB800-1770-6	2
GD880-81-3348-6	2* (L+2*A8)	BUB800-1770-6	2
GD880-81-5022-6	3* (L+2*A8)	BUB800-1770-6	3

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
GD880-81-0116-4	L+A4	690V 160A	XT4 N160	1
GD880-81-0149-4	L+A4	690V 160A	XT4 N160	1
GD880-81-0183-4	L+A4	690V 200A	XT4 N250	1
GD880-81-0245-4	L+A6	690V 250A	XT4 N250	1
GD880-81-0299-4	L+A6	690V 315A	XT5 N400	1
GD880-81-0349-4	L+A7	690V 400A	XT5 N400	1
GD880-81-0395-4	L+A7	690V 400A	XT5 N400	1
GD880-81-0516-4	L+A7	690V 630A	XT5 N630	1
GD880-81-0640-4	L+A8	690V 800A	XT6 S800M	1
GD880-81-0900-4	L+A8	690V 1000A	XT7 S1000M	1
GD880-81-1180-4	L+2*A8	690V 1250A	XT7 S1250M	1
GD880-81-1770-4	L+2*A8	690V 2000A	E2.2S2000	1
GD880-81-2380-4	2* (L+2*A8)	690V 3200A	E4.2S3200	1
GD880-81-3348-4	2* (L+2*A8)	690V 4000A	E4.2S4000	1
GD880-81-5022-4	3* (L+2*A8)	690V 6300A	E6.2H6300	1
GD880-81-0600-6	L+A8	690V 800A	XT7 S800M	1
GD880-81-0900-6	L+A8	690V 1000A	XT7 S1000M	1
GD880-81-1180-6	L+2*A8	690V 1250A	XT7 S1250M	1
GD880-81-1770-6	L+2*A8	690V 2000A	E4.2S2000	1
GD880-81-2232-6	2* (L+2*A8)	690V 3200	E4.2S3200	1
GD880-81-3348-6	2* (L+2*A8)	690V 4000A	E4.2S4000	1
GD880-81-5022-6	3* (L+2*A8)	690V 6300A	E6.2H6300	1

Note: The breaker should be equipped with an external terminal to control 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.

Table 2-6 AC fuse model selection

Power supply module	Frame size	Voltage (V)	Current (A)	Qty
GD880-81-0116-4	L+A4	690V	200A	3
GD880-81-0149-4	L+A4	690V	250A	3
GD880-81-0183-4	L+A4	690V	300A	3
GD880-81-0245-4	L+A6	690V	400A	3
GD880-81-0299-4	L+A6	690V	500A	3
GD880-81-0349-4	L+A7	690V	550A	3
GD880-81-0395-4	L+A7	690V	630A	3
GD880-81-0516-4	L+A7	690V	800A	3
GD880-81-0640-4	L+A8	690V	1000A	3
GD880-81-0900-4	L+A8	690V	1250A	3
GD880-81-1180-4	L+2*A8	690V	1000A	6
GD880-81-1770-4	L+2*A8	690V	1250A	6
GD880-81-0600-6	L+A8	690V	1000A	3
GD880-81-0900-6	L+A8	690V	1250A	3
GD880-81-1180-6	L+2*A8	690V	1000A	6
GD880-81-1770-6	L+2*A8	690V	1250A	6

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
GD880-81-0116-4	L+A4	690V	250A	2
GD880-81-0149-4	L+A4	690V	300A	2
GD880-81-0183-4	L+A4	690V	350A	2
GD880-81-0245-4	L+A6	690V	500A	2
GD880-81-0299-4	L+A6	690V	630A	2
GD880-81-0349-4	L+A7	690V	700A	2
GD880-81-0395-4	L+A7	690V	800A	2
GD880-81-0516-4	L+A7	690V	1000A	2
GD880-81-0640-4	L+A8	690V	1250A	2
GD880-81-0900-4	L+A8	690V	1000A	4
GD880-81-1180-4	L+2*A8	690V	1250A	4
GD880-81-1770-4	L+2*A8	690V	1000A	8
GD880-81-0600-6	L+A8	1250V	700A	4
GD880-81-0900-6	L+A8	1250V	900A	4
GD880-81-1180-6	L+2*A8	1250V	700A	8
GD880-81-1770-6	L+2*A8	1250V	900A	8

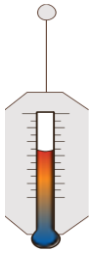
3 Mechanical installation

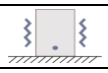
3.1 Safety notes

⚠	● Equipment can tip over if transported incorrectly or with disallowed means of transport. Serious injury, property damage, or even death may result. ● 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 regenerative rectifier power has been disconnected before installation. If the regenerative rectifier has been powered on, disconnect the regenerative 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. ● The equipment installation must be designed and done according to applicable local laws and regulations. We do not assume any liability whatsoever for any equipment installation which breaches local laws or regulations. If recommendations given by us are not followed, the regenerative rectifier may experience problems that the warranty does not cover. ● 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.

3.2 Installation environment and site

■ **Environment requirements**

Environment		Requirement
Temperature		● -10 – +50.0°C ● Do not use the rectifier when the ambient temperature exceeds 50°C. When the ambient temperature exceeds 40°C, derate 1% for every increase of 1°C. ● There is no sudden temperature change. ● When the rectifier is installed in a closed space, such as control cabinet, use a cooling fan or air conditioner for temperature adjustment if necessary. ● When the temperature is too low, if you want to use the rectifier that has been idled for a long time, install an external heating device before the use to eliminate the freeze inside the rectifier. Otherwise, the rectifier may be damaged.
Relative humidity (RH)		● The relative humidity (RH) of the air is less than 90%, and there is no condensation. ● The max. RH cannot exceed 60% in the environment where there are corrosive gases.

Environment	Requirement	
Altitude		● Lower than 1000 meters ● When the altitude exceeds 1000m, derate by 1% for every increase of 100m. ● When the altitude exceeds 3000m, consult our local dealer or office for details.
Vibration		Max. vibration ACC: 5.8m/s² (0.6g)

■ **Site requirement**

Site	Requirement	
Indoor		Without electromagnetic radiation sources and direct sunlight. **Note:** The rectifier 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 rectifier 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

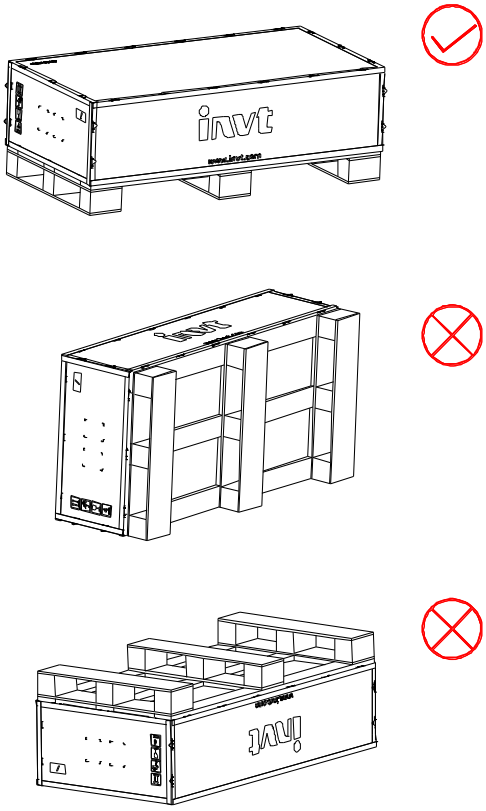
After receiving the product, perform the following steps to ensure the product use safety.

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 regenerative rectifier, keypad, and manual) inside the packing box are complete.

3.3.2 Transportation

The GD880 series regenerative 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.

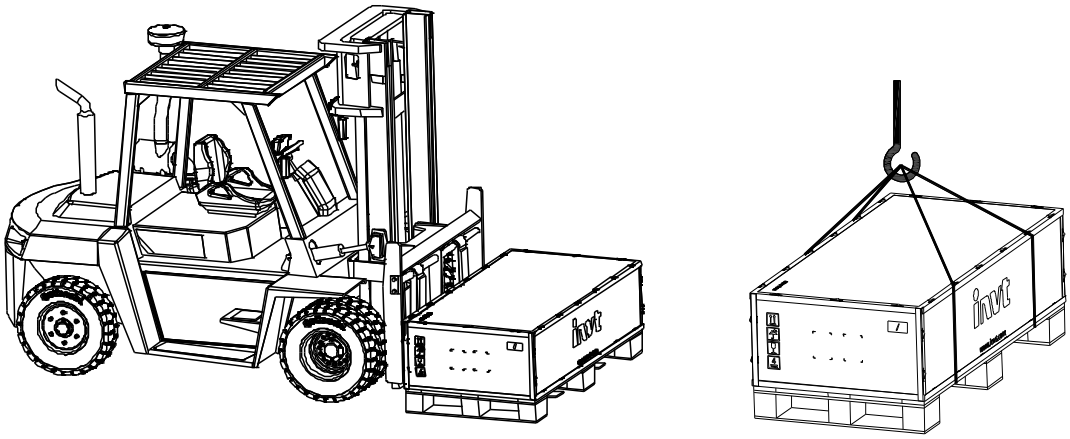
Figure 3-1 Transportation requirements



When transported with a forklift, the regenerative rectifier must be fixed to the pallets and transported together, which means you are not allowed to remove the pallets to transport the regenerative 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 regenerative rectifier 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.

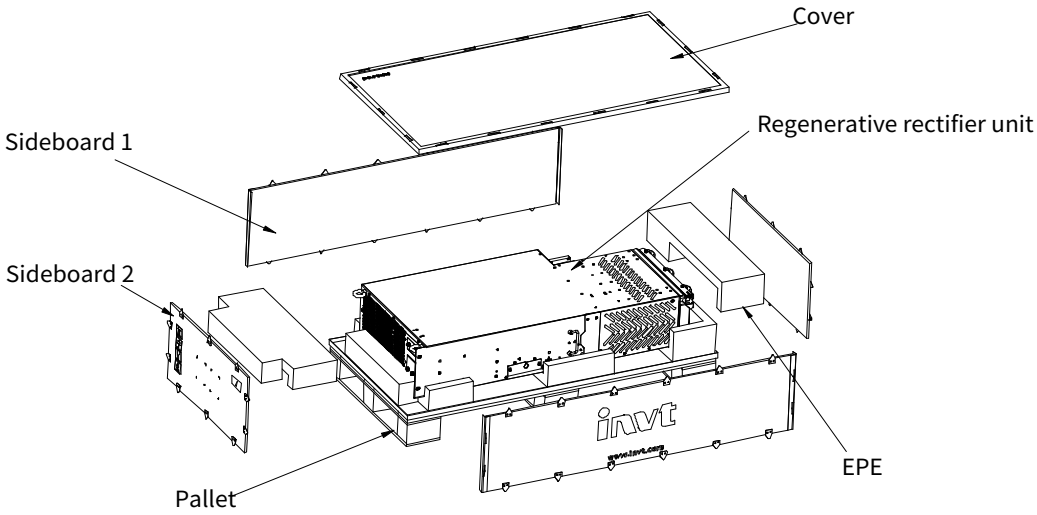
To remove the packing, do as follows:

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.

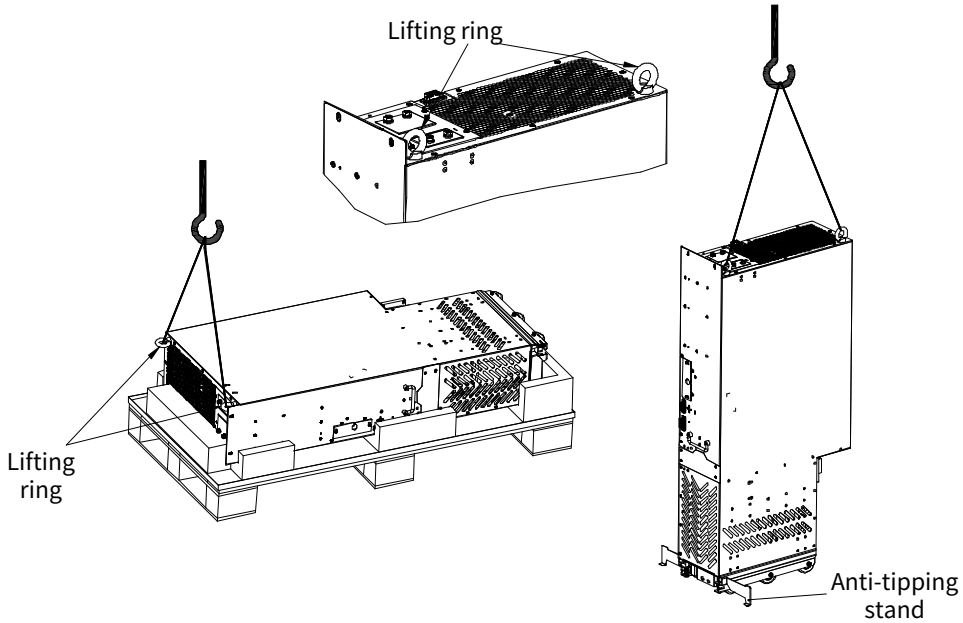
Figure 3-3 Unpacking



3.3.4 Lifting

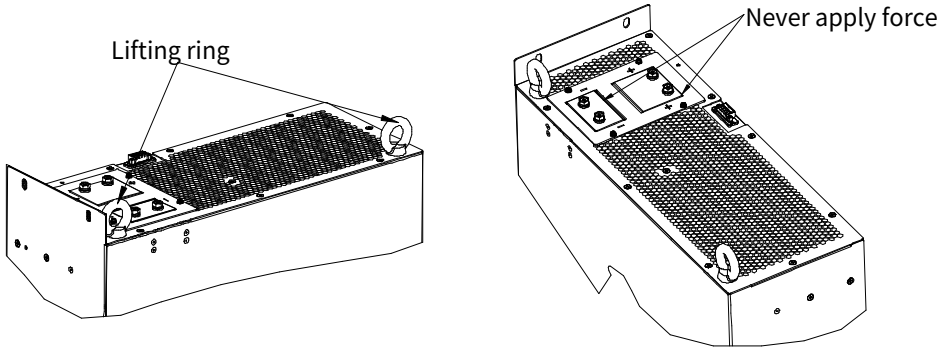
Attach the required lifting ring to the locations shown in the figure, use the sling to slowly lift the unit end, move the unit until it is completely lifted, place it vertically in the empty and flat place, and then unfold the anti-tipping stand at the lower front of the unit. Figure 3-4 shows the anti-tipping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

Figure 3-4 Unit lifting

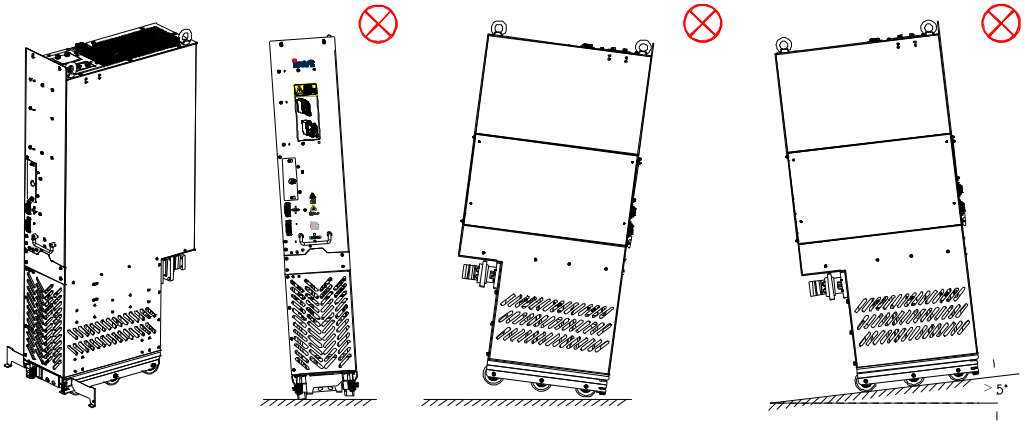


Note: Use the lifting ring on the top of regenerative rectifier unit for lifting and moving. Never apply force to the positive or negative bus terminals.

Figure 3-5 Unit top structure



The regenerative 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.



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 3-7.
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 3-8.
3. The restraint of the pin ensures that the anti-tipping stand will fold properly due to shaking. The anti-tipping stand folds, as shown in Figure 3-6.

Figure 3-6 Unit bottom structure

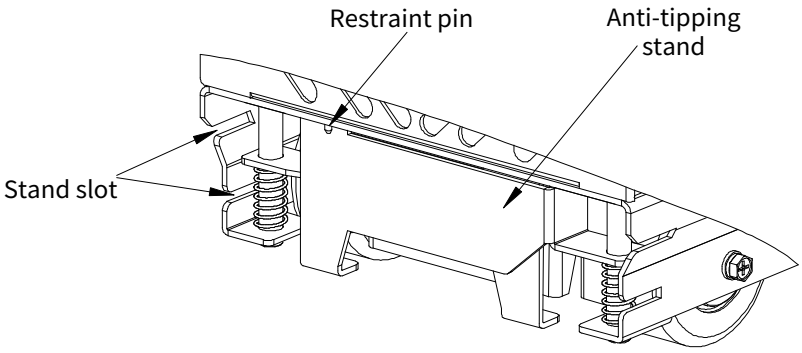


Figure 3-7 Unfolding the anti-tipping stand

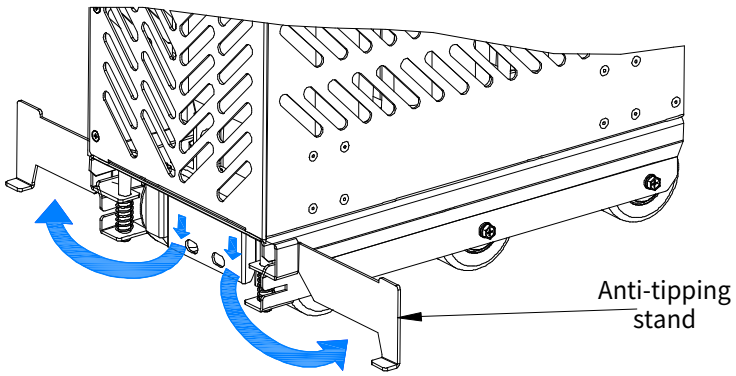
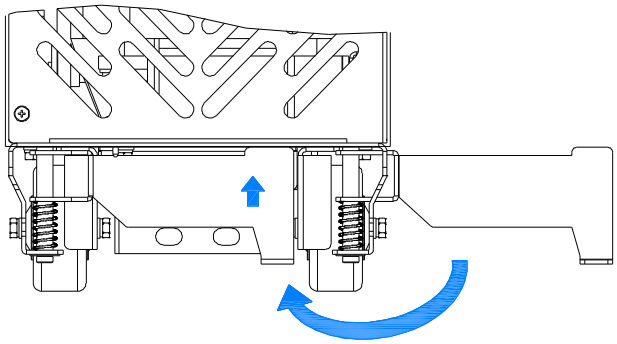


Figure 3-8 Folding the anti-tipping stand



3.3.5 Installation space and heat dissipation

1. Installation space requirements for A4i regenerative rectifier units

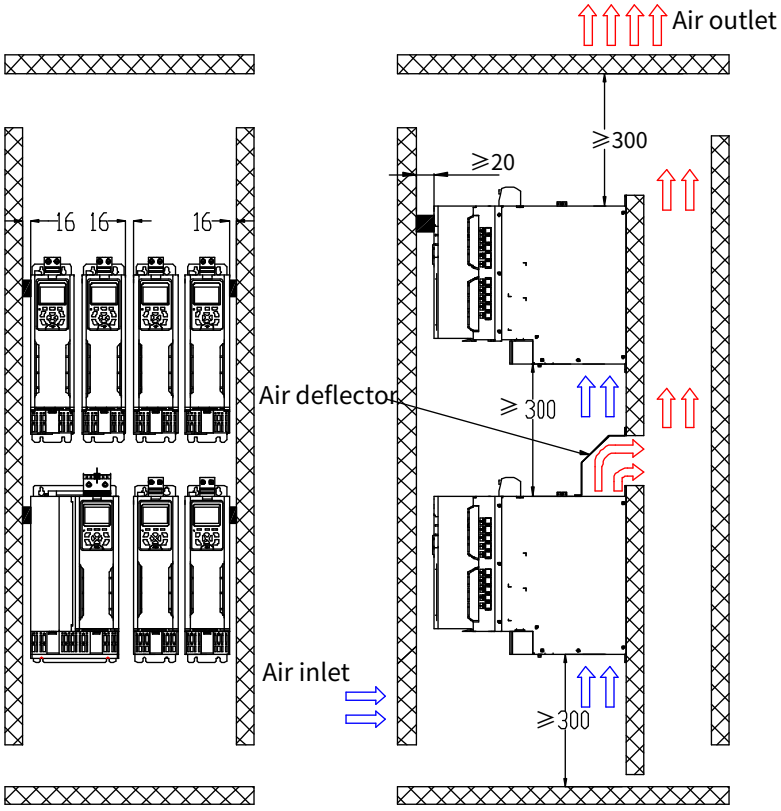
Regenerative rectifier units using A4i frame vary with power class. Note the following requirements to ensure reliable installation and excellent heat dissipation:

The regenerative rectifier unit must be installed and used in a cabinet.

A minimum ventilation clearance must be kept from the top and bottom of each unit to ensure good heat dissipation. For details, see Figure 3-9.

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 3-9.

Figure 3-9 Installation space requirements for A4i regenerative rectifier units



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

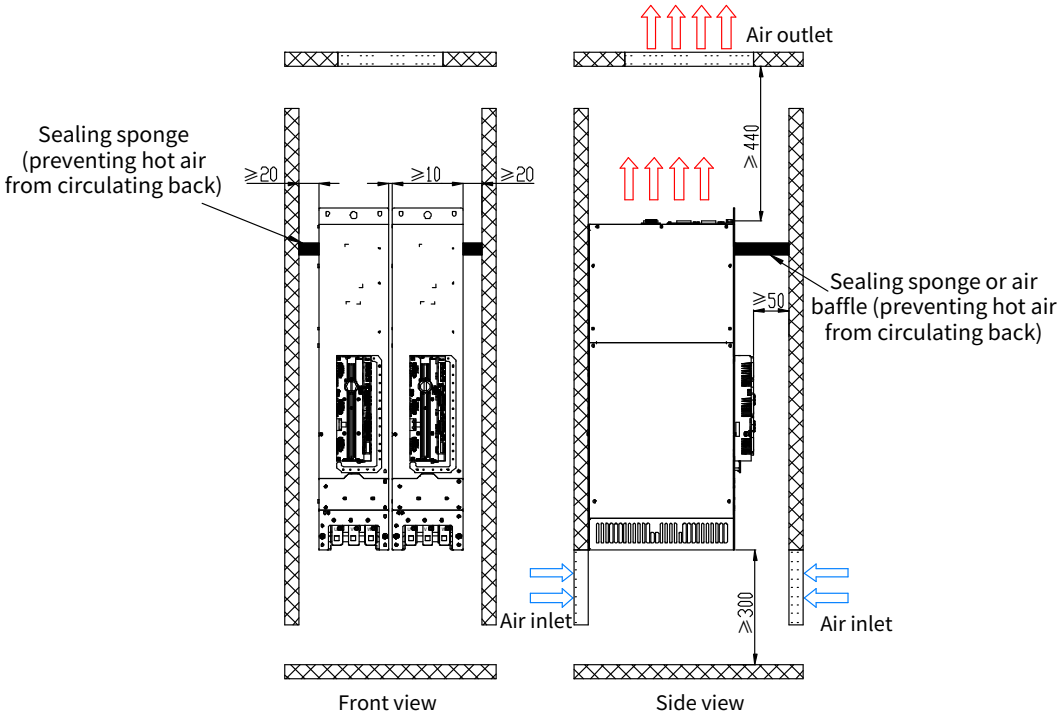
Note the following requirements to ensure reliable installation and excellent heat dissipation for regenerative rectifier units using A6i or A7i frame:

The regenerative rectifier unit must be installed and used in a cabinet.

A minimum ventilation clearance must be kept from the top and bottom of each unit to ensure good heat dissipation. For details, see Figure 3-10.

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 A6i and A7i regenerative rectifier units



3. Installation space requirements for A8i regenerative rectifier units

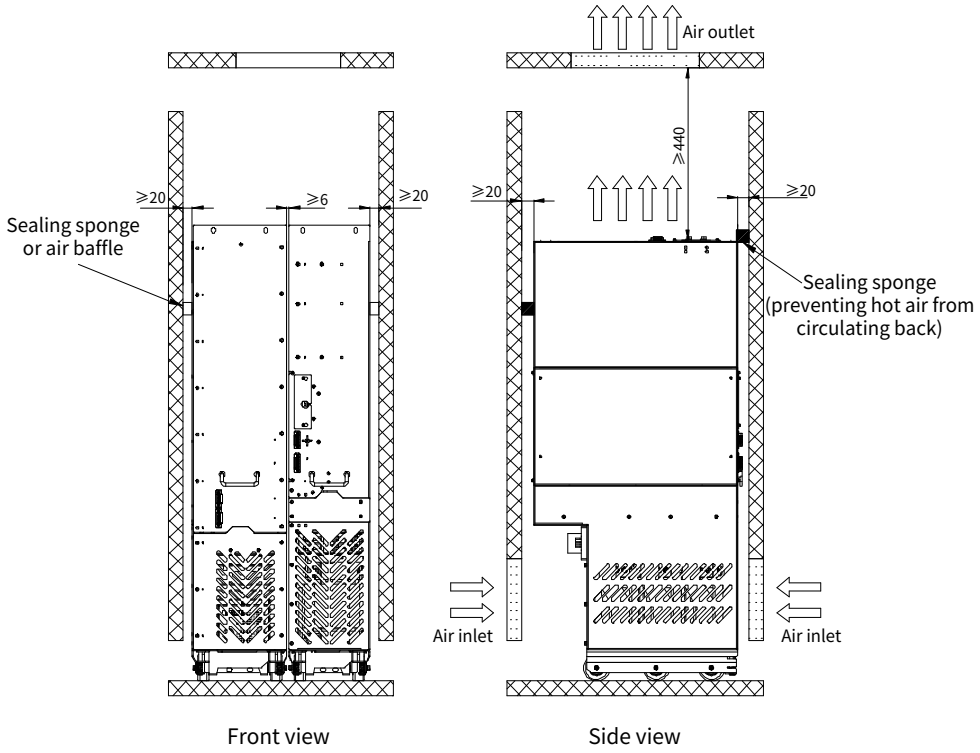
Note the following requirements to ensure reliable installation and excellent heat dissipation for regenerative rectifier units:

The regenerative rectifier unit must be installed and used in a cabinet.

A minimum ventilation clearance must be kept from the top and bottom of each unit to ensure good heat dissipation. For details, see Figure 3-11.

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 A8i regenerative rectifier units



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

Air inlet area formula:

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

S: System ventilation area

S_{module}: Each module ventilation area (cm^2)

Air outlet area formula: S_{out}= (1.2 – 1.5) x S_{in}.

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

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

No.	Frame size	Ventilation area S_{in} (cm^2)	Actual air volume (CFM)
1	A4i	90	150
2	A6i	634	568
3	A7i	654	588
4	L+A8	1550	1460
5	L+2*A8	2360	2340

⚠	Violation of the requirements in section 3.3.5 Installation space and heat dissipation will shorten the regenerative rectifier life and may result in regenerative 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 unit, install two bottom support crossbeams, a mounting bracket, and a mounting rail in the cabinet, and design the mounting crossbeam for regenerative 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:

1. 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 3-12.
3. Install the unit tray on the support crossbeams with ten M8 screws. See Figure 3-13.
4. If you use another type of cabinet but not nine-fold profile cabinet, the fixing holes for the mounting bracket need to be drilled and assembled on site.

Figure 3-12 Installing the support crossbeams

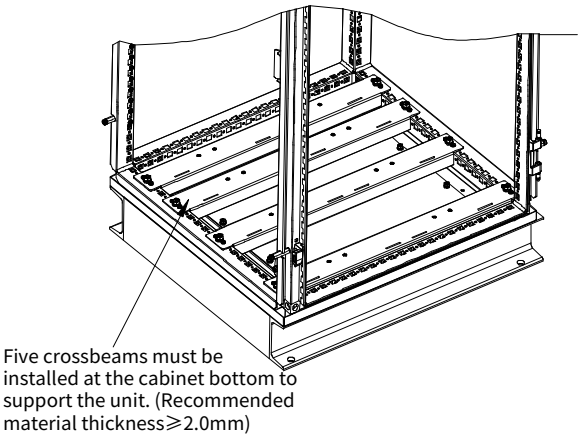
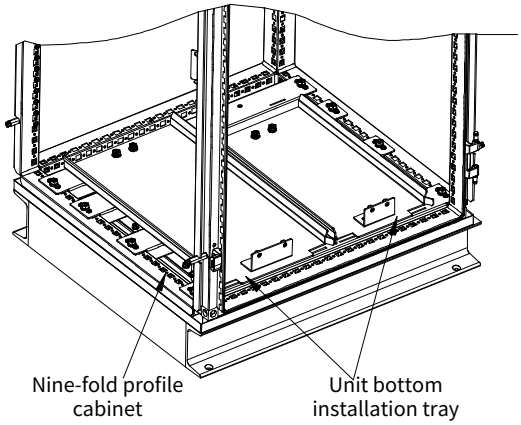


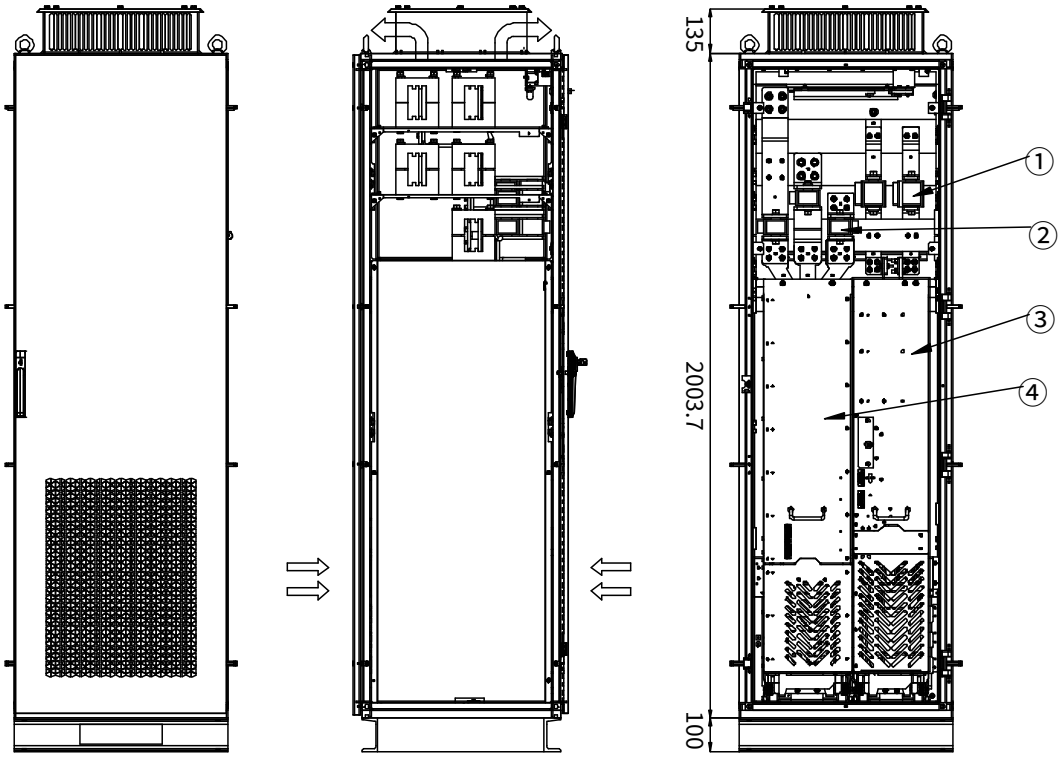
Figure 3-13 Installing the unit tray



3.3.6.2 Layout and mounting for L+A8

Figure 3-14 shows the 600mm-wide cabinet layout for L+A8.

Figure 3-14 Layout of 600mm-wide cabinet for L+A8

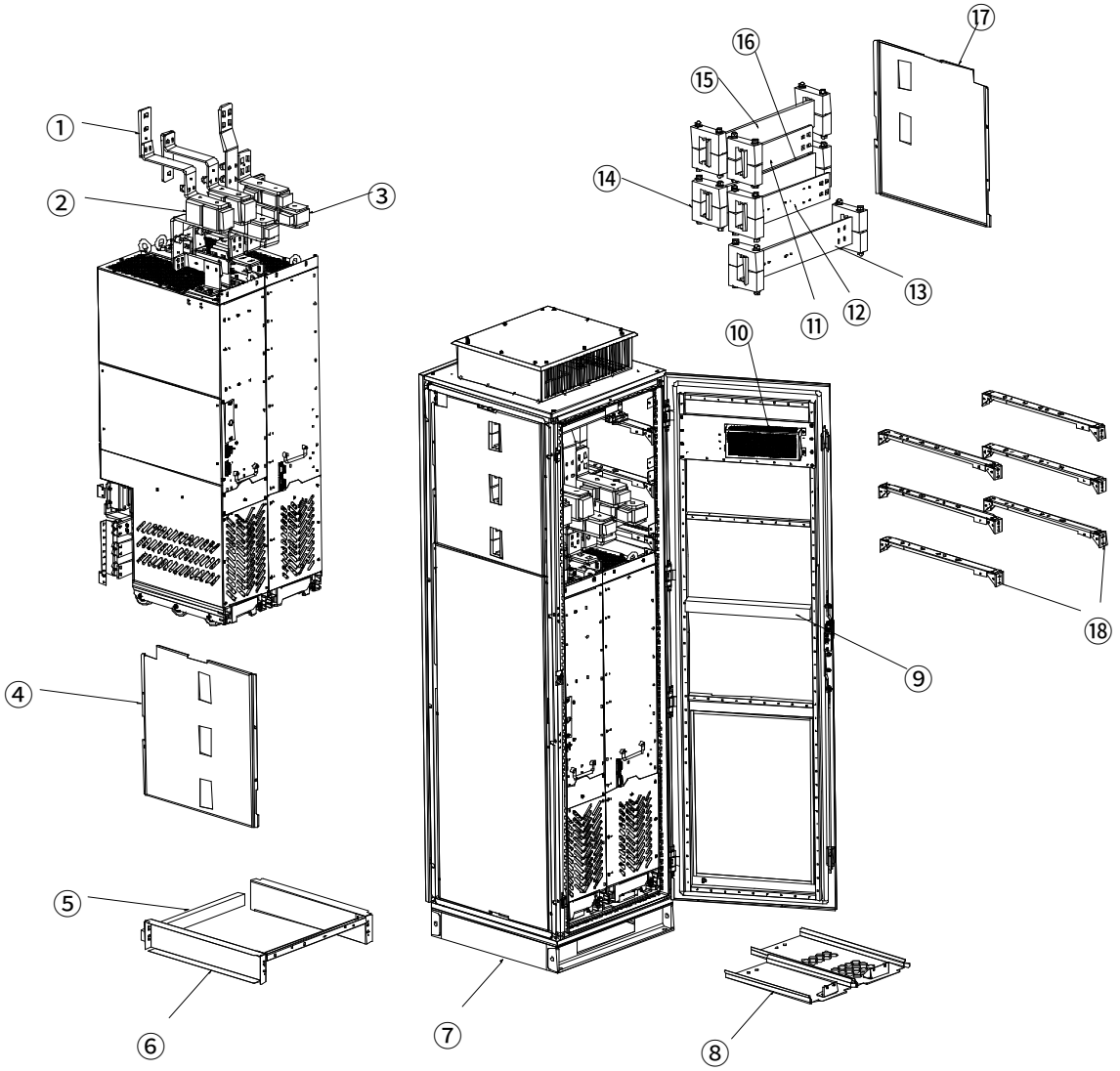


No.	Name
1	DC fuse

No.	Name
2	AC fuse
3	Regenerative rectifier unit
4	Regenerative rectifier filter unit

Figure 3-15 shows the 600mm-wide cabinet installation for L+A8.

Figure 3-15 Installation diagram of L+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

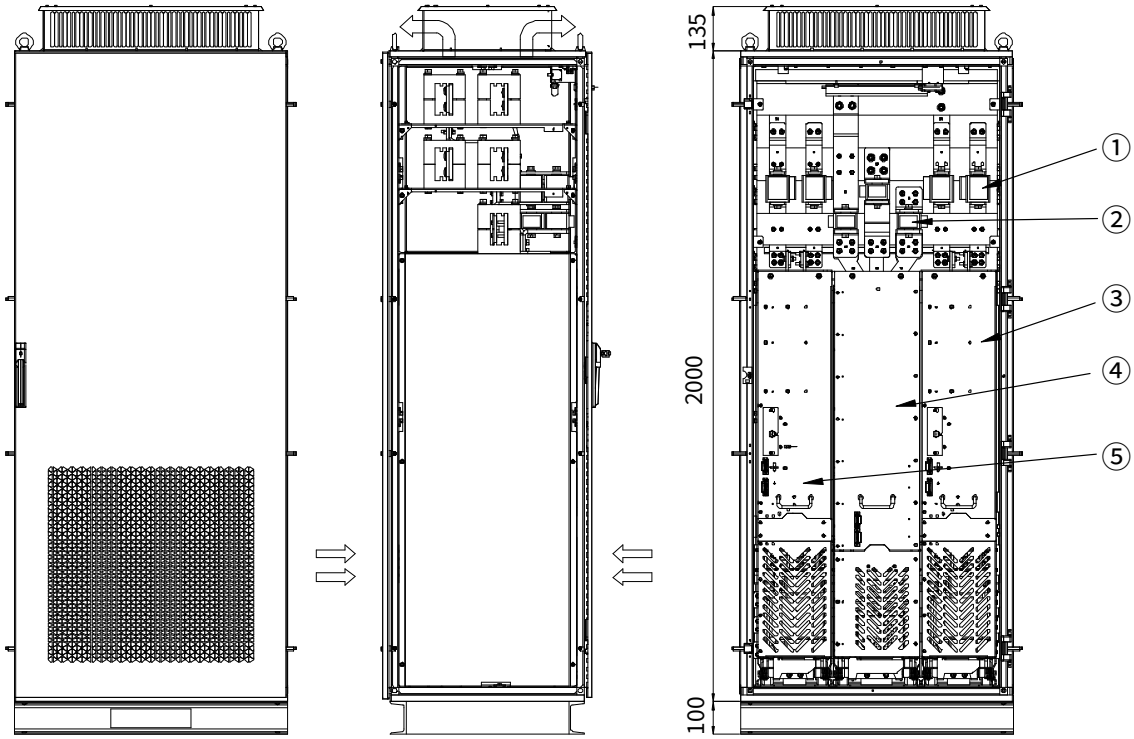
No.	Name
10	Power supply board
11	L1-phase copper busbar
12	L2-phase copper busbar
13	L3-phase copper busbar
14	Busbar fixing clamp
15	Copper busbar of (+)
16	Copper busbar of (-)
17	Right protective plate
18	Busbar clamp support

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 L+2*A8

Figure 3-16 shows the 850mm-wide cabinet layout for L+2*A8.

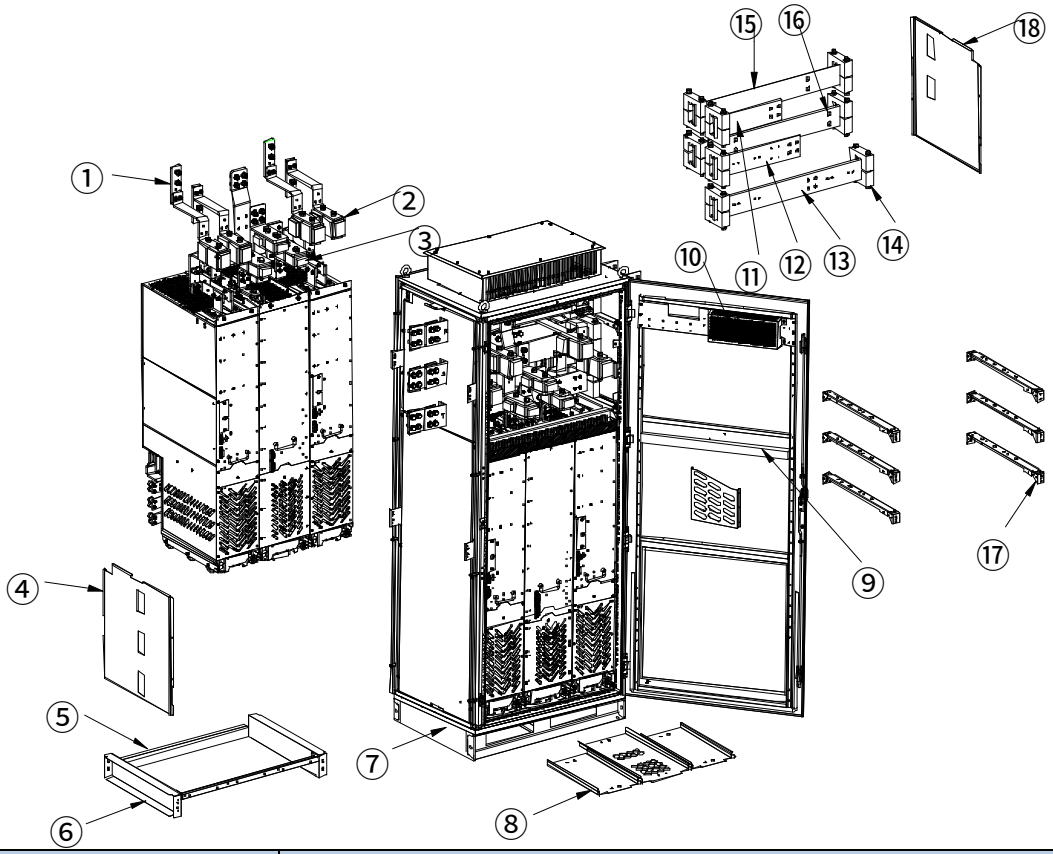
Figure 3-16 Cabinet layout for L+2*A8



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

Figure 3-17 shows the 850mm-wide cabinet installation for L+2*A8.

Figure 3-17 Installation diagram of L+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

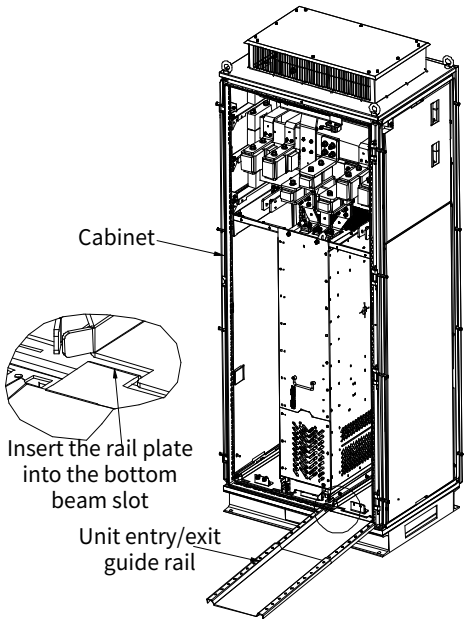
Note: A 40X40 sealing sponge must be used at the position corresponding to the air baffle in the front/back door panel, which prevents air duct reflow.

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 3-18.

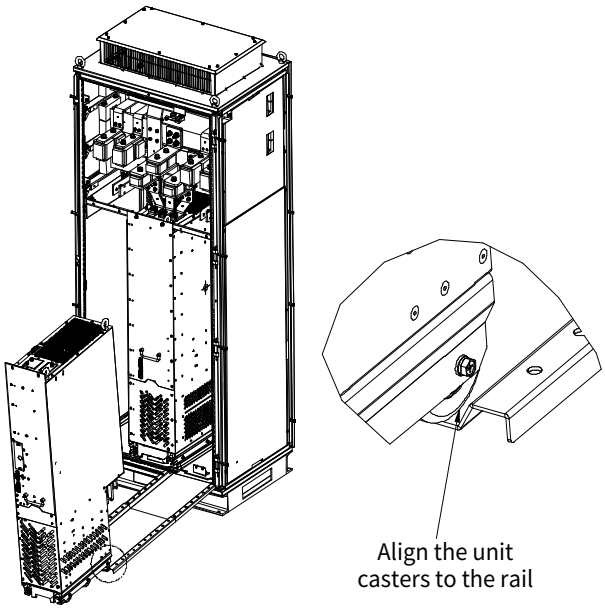
Figure 3-18 Unit entry/exit guide rail placement



Step 2 Push the unit into the cabinet.

1. Align the unit casters to the rail. See Figure 3-19.

Figure 3-19 Unit placement

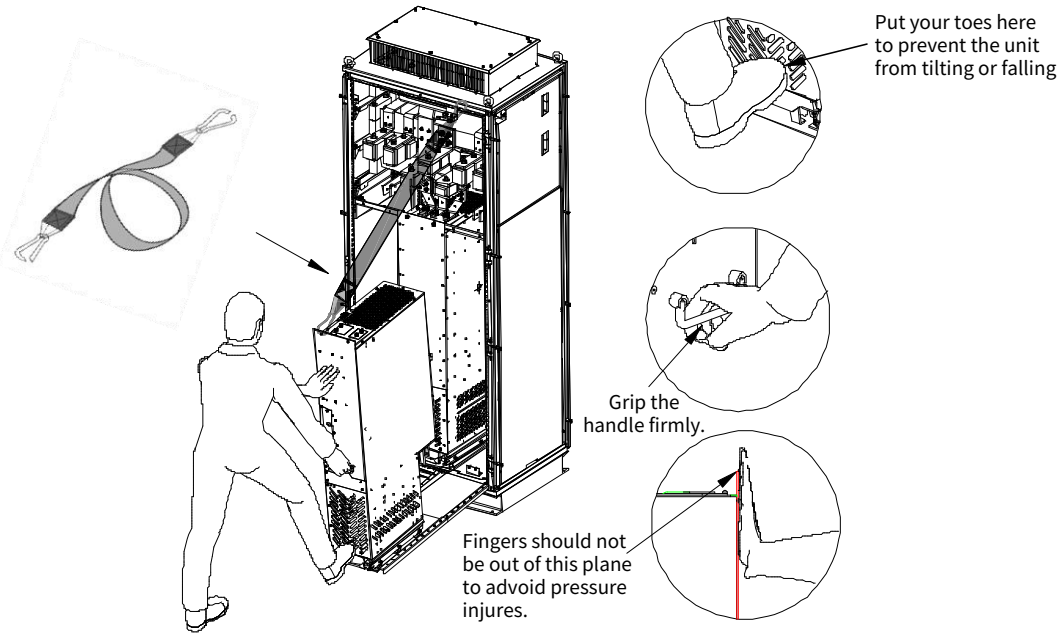


2. Push the regenerative rectifier unit into the cabinet slowly. See Figure 3-20.

Note:

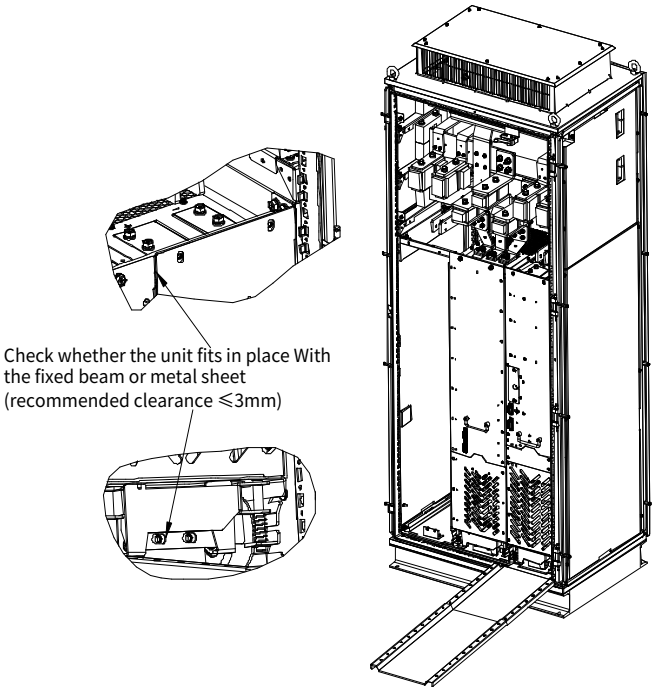
- Since the regenerative rectifier unit barycenter is too high, use the auxiliary rope for mounting to prevent the unit from rollover during the push-in or push-out.
- When pushing in/out the regenerative rectifier unit, use one foot to apply force to the bottom of the unit while holding the handle to prevent the unit from tipping over, falling over, hitting or injury. See Figure 3-20.
- When installing or replacing the unit, wear gloves and safety shoes to prevent against scratching or smashing.

Figure 3-20 Pushing cabinet



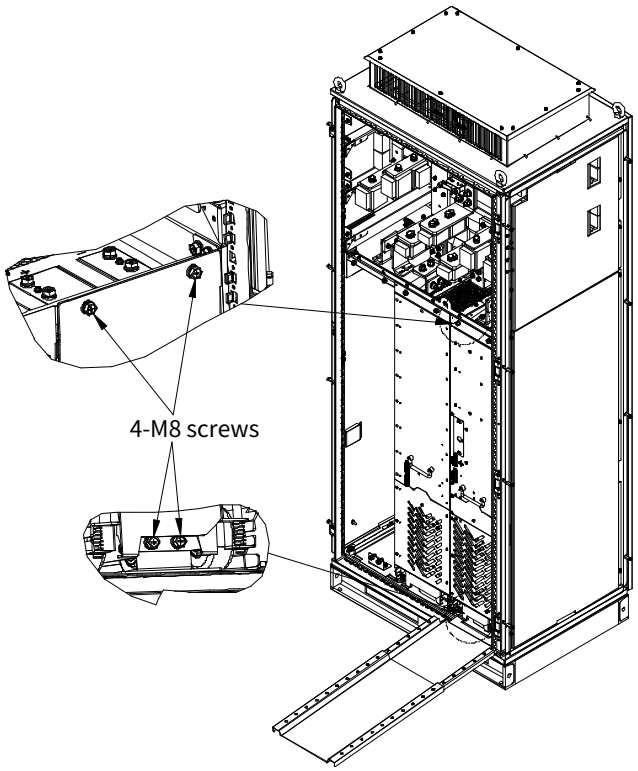
3. Ensure that the unit is pushed into place. See Figure 3-21.

Figure 3-21 Checking whether the unit is pushed into place



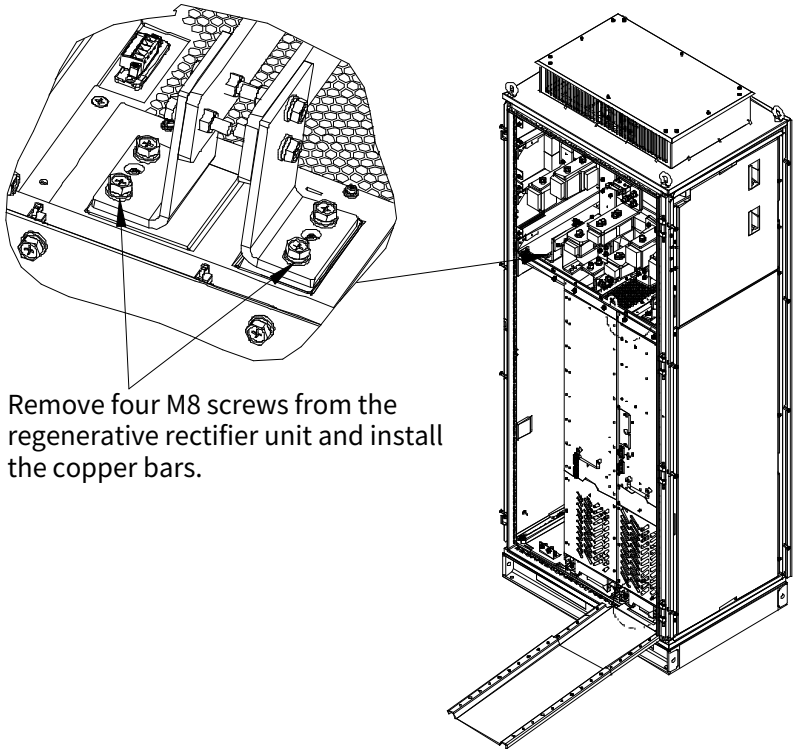
4. After confirming that the unit is pushed into place, install the unit fixing screws and remove the unit entry/exit guide rail. It is shown as Figure 3-22.

Figure 3-22 Unit fixing



5. Install the regenerative rectifier on the other side in the same way.
6. Remove the copper bar fixing screws at the unit top and then install the unit-top copper bars as shown in Figure 3-23.

Figure 3-23 Installing unit-top copper bars



3.4 RCU 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 RCU from falling or shock to avoid damage.
- Do not disassemble the RCU 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.

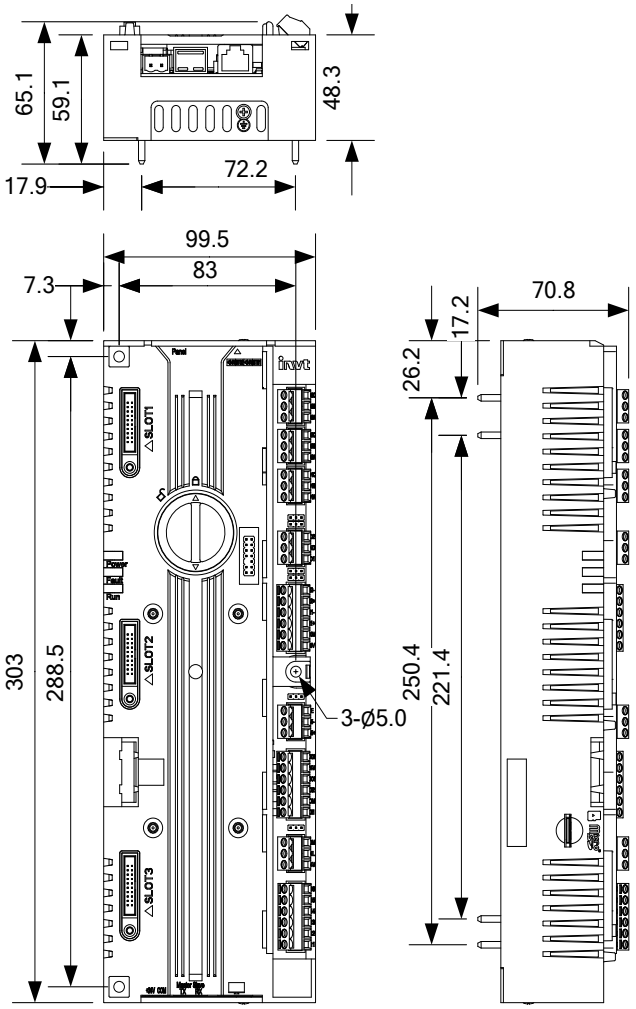
3.4.1.2 Fastening torque

Screws are used to install the RCU with fastening torque.

Screw	Fastening torque
M4	1.5N.m

3.4.2 RCU size

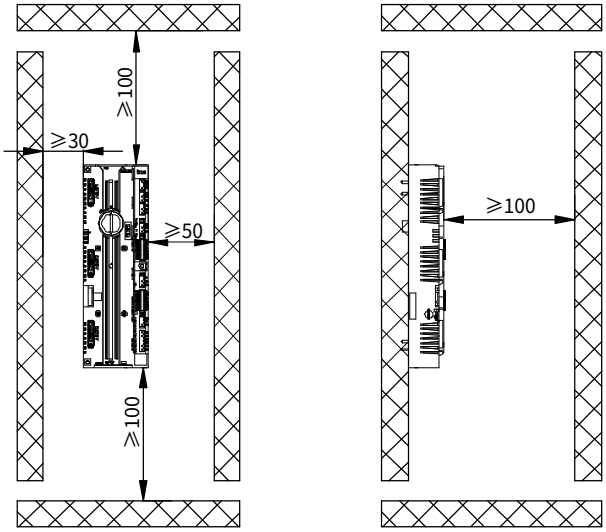
Figure 3-24 RCU dimensions (unit: mm)



3.4.3 RCU installation space

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

Figure 3-25 Requirements on RCU installation space (unit: mm)



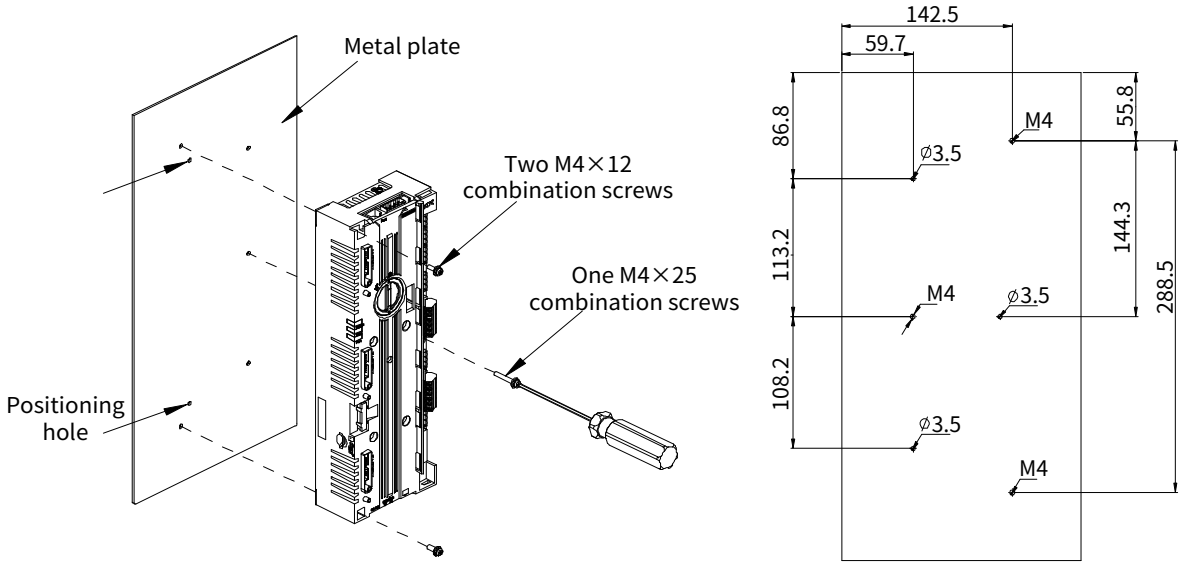
Front view Side view

3.4.4 RCU installation procedure

Step 1 Place the RCU as shown in the figure.

Step 2 Use 1# Phillips screwdriver to tighten the four M4 screws to fix the RCU to the metal plate as shown in Figure 3-26.

Figure 3-26 RCU installation



The RCU assembly plate must be an exposed metal plate and ensure that the metal plate can be reliably grounded.

The RCU housing will be connected to the cabinet housing via a grounding plate.

3.4.5 Keypad installation

The regenerative rectifier is equipped with an externally installed keypad (as shown in Figure 3-27), 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 3-28.

Figure 3-27 LCD keypad structure

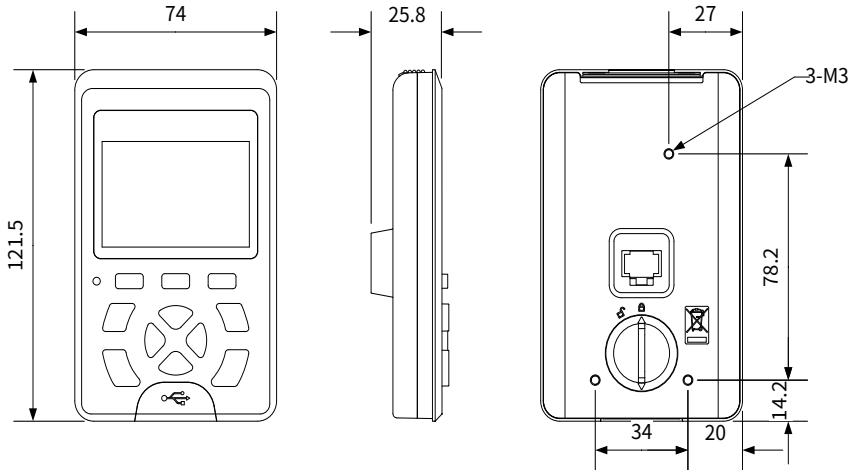


Figure 3-28 Mounting the keypad bracket

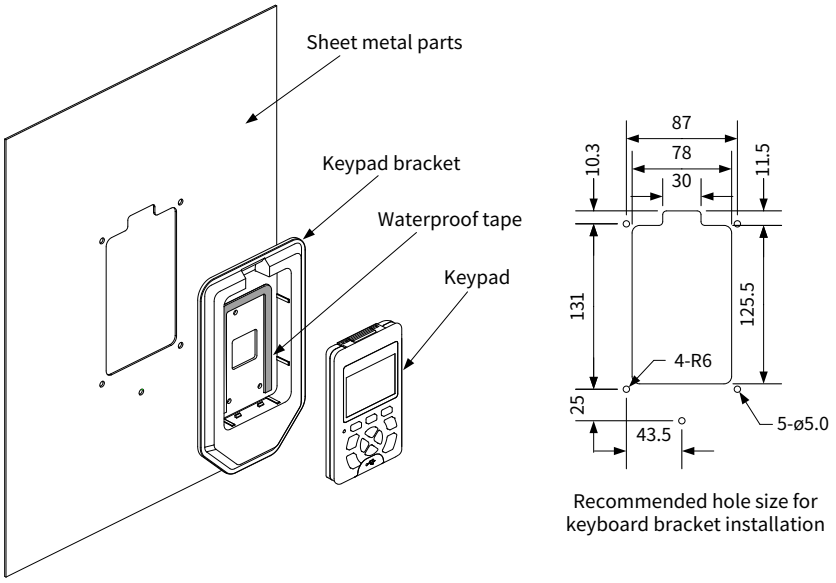
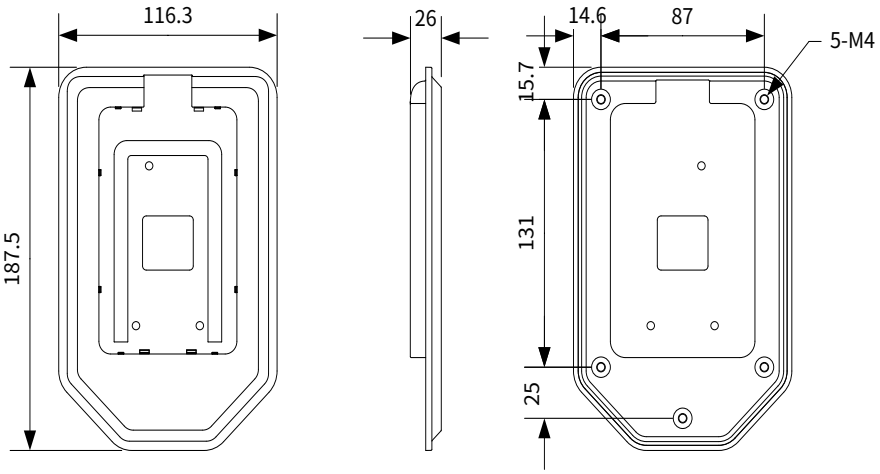


Figure 3-29 Keypad bracket dimensions (unit: mm)



3.4.6 Fastening torque

You need the following tools to install the regenerative 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.

Table 3-2 Recommended values of screw thread tightening torque

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

3.4.7 Checklist

No.	Operation	Compliant	Completed
1	Installed the beam for regenerative rectifier fixing in the nine-fold profile cabinet.	☐	☐
2	Installed the bottom tray for regenerative 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 regenerative rectifier unit casters with the mounting guide rail and pushed the unit to the cabinet. (See Figure 3-20. 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 the unit was pushed into place.	☐	☐
7	Inserted screws into the fixing holes at the unit front top and bottom to fix the unit to the cabinet. (See Figure 3-22.)	☐	☐
8	Installed the (+) and (-) bus copper bars.	☐	☐
9	Removed the mounting rail when you ensure the mounting 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 regenerative 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 high voltage is present in the regenerative 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 regenerative rectifier is supplied externally, disconnecting the circuit break device cannot disconnect the entire power supply. The regenerative 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 regenerative rectifier for the fault cause, rectify the fault, and replace the damaged parts.

4.2 Insulation inspection

Regenerative rectifier unit and regenerative 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 rectifier, and the circuit will automatically cut off the test voltage of the withstand voltage test. Do not carry out insulation withstand test on the rectifier, or measure the control circuit of the rectifier with a megohmmeter.

Input power cable

Check the insulation conditions of the input power cable of the rectifier 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 rectifier.

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 regulations

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 rectifier s in several aspects including noise control, site wiring and grounding for reference in site installation, with consideration of ECM characteristics of rectifier s 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 rectifier control terminals must use shielded wires. The shield layer of wire must be grounded near the rectifier 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 rectifier, which greatly decreases or loses the shield effect.

2. Site wiring

Power supply wiring: The shield layer of power supply incoming cables of the rectifier 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 rectifier 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

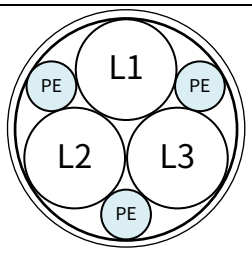
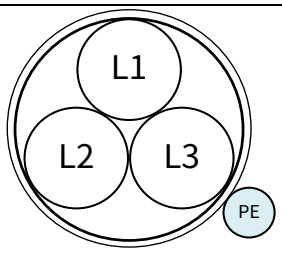
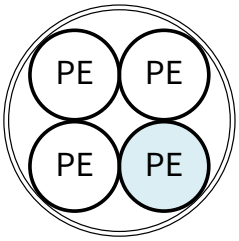
grounding. Different control system needs to use special pole grounding, different devices in the same control system needs to use common pole grounding, and different devices connected by the same power cables needs to use series-wound grounding.

This section introduces general EMC guidelines on Goodrive880 series products 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.

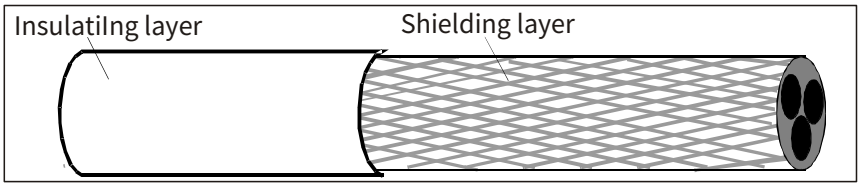
		
Symmetrical shielded cable, PEs in symmetrical manner	Symmetrical shielded cable, PE in separated manner	Asymmetrical four-core cable

Power cables must 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 restrict effectively 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 rectifier. 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 rectifier, check the insulation conditions of the cable according to local regulations.

4.3.2 Control cable

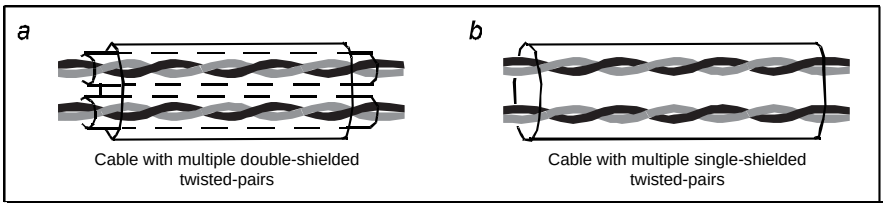
All analog signal cables, communication cables, and encoder cables must be shielded cables.

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 rectifier 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

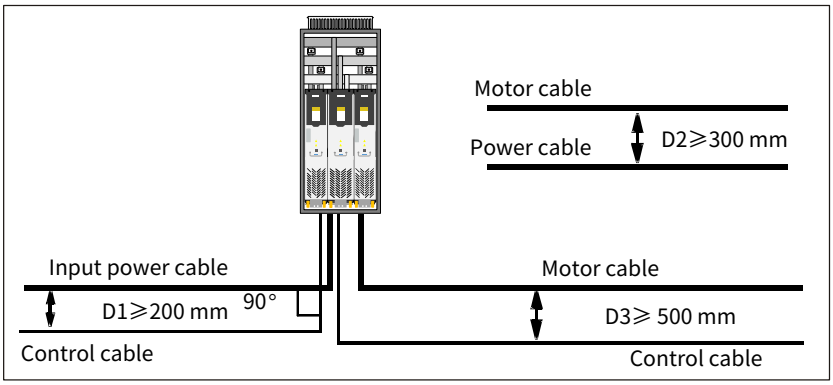


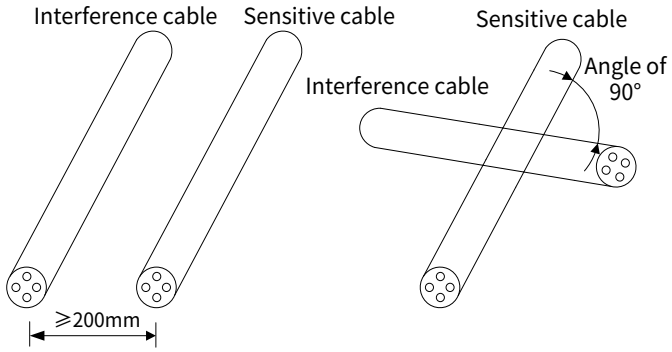
Table 4-1 Recommended values for the spacing between sensitive and interference cables

D1	D2	D3
≥200mm	≥300mm	≥500mm

Note:

- The motor cables of different rectifiers/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.

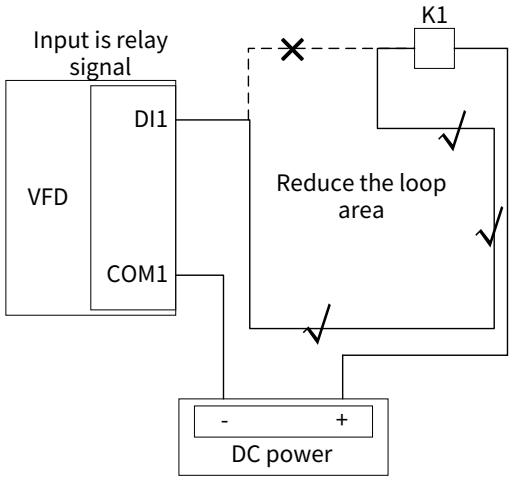
Figure 4-4 Routing sensitive and interference cables



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

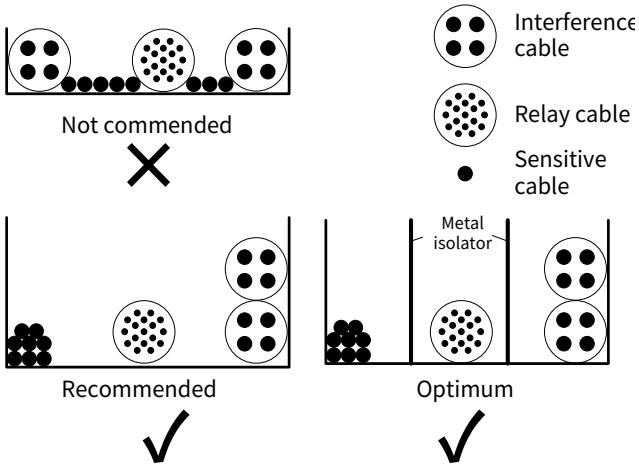
For inputs of such as relay signals and other non-differential signals, non-twisted pair cables can be used, and the wiring should minimize the loop area and a pair of signal lines should be routed as close as possible.

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

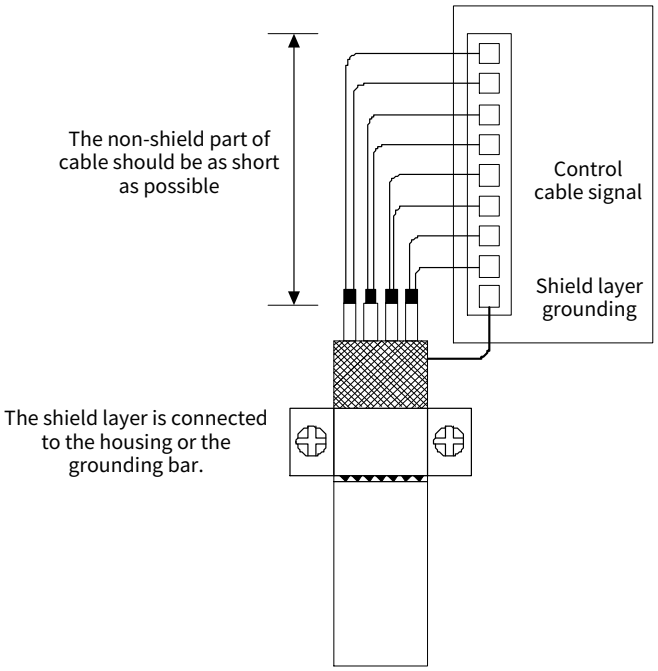


4.3.4 Shielded cable connection

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.

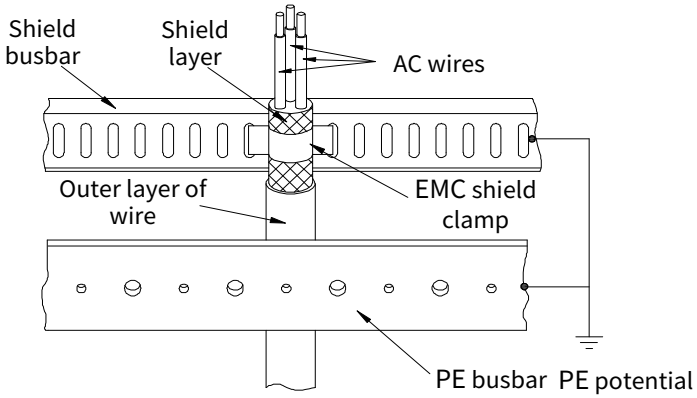
The unshielded part of the control cable that is shielded should be as short as possible, and the shield layer is connected to the nearest PE end. If the cable is stripped too long, the core is susceptible to interference of signals, especially analog, communication, and encoder signals.

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



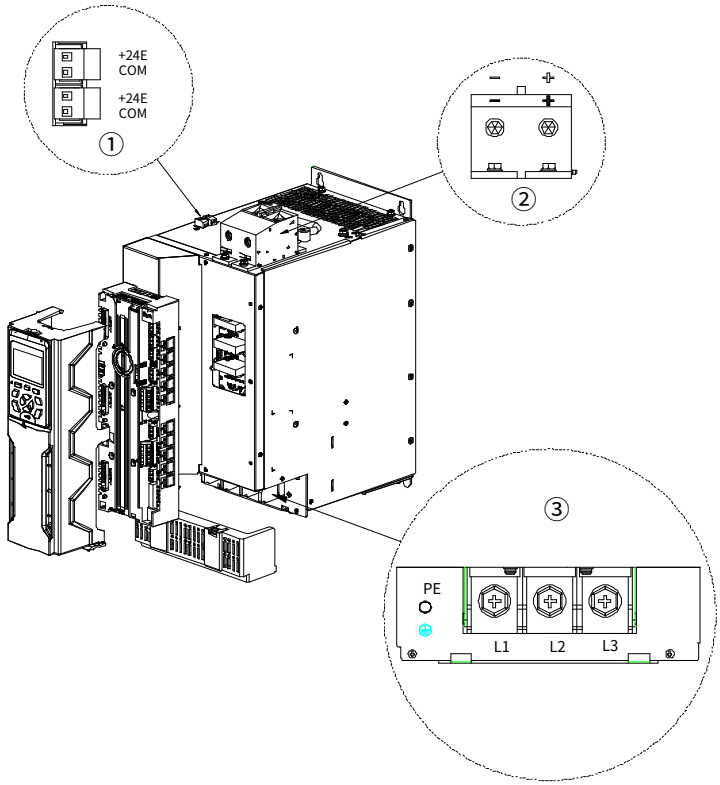
4.4 Electrical wiring

4.4.1 Main circuit wiring

4.4.2 A4+L cable connection

1. A4 unit terminals

Figure 4-9 A4 unit terminals



No.	Terminal name	Description
1	+24E	24V auxiliary power terminal (The auxiliary power supply must be isolated 24V.) Specification: 24Vdc±10% 1A
	COM	
2	+	Positive or negative busbar DC output Voltage: 1.35*Vin Connection: cable terminal of M8/12N・m
	-	
3	L1	3PH AC power input Voltage: 3PH AC 380–440V Connection: A3: cable terminal of M6/5N・m A4: cable terminal of M10/29N・m
	L2	
	L3	

2. 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 -.

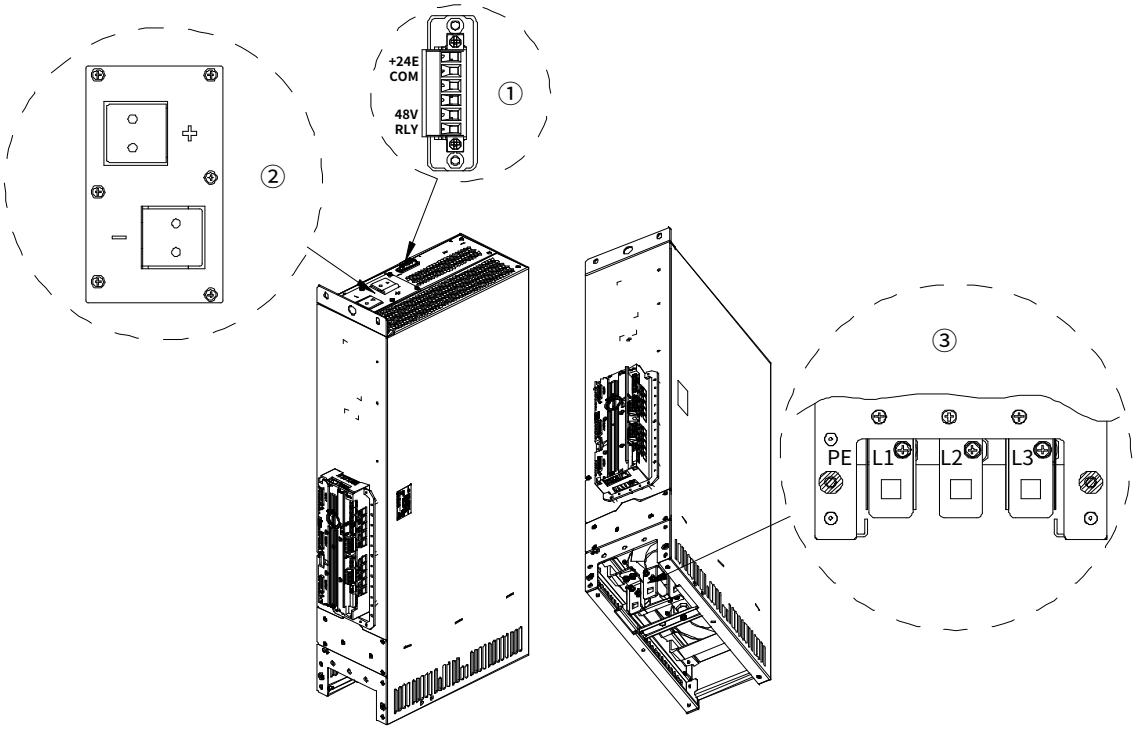
Step 3 Fix the power cable on the cable holder to avoid stress on the terminal.

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 4-10 A6–A7 unit terminals



No.	Terminal name	Description
1	+24E	24V auxiliary power terminal (The auxiliary power supply must be isolated 24V.) Specification: 24Vdc±10% 1A
	COM	
	48V	48V control, reserved function
	RLY	
2	+	Positive or negative busbar DC output Voltage: 510–720VDC Connection: copper bar terminal of M6/9N・m
	-	
3	L1	3PH AC power input Voltage: 3PH AC 380–440V Connection: copper bar terminal of M10/32N・m
	L2	
	L3	

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.

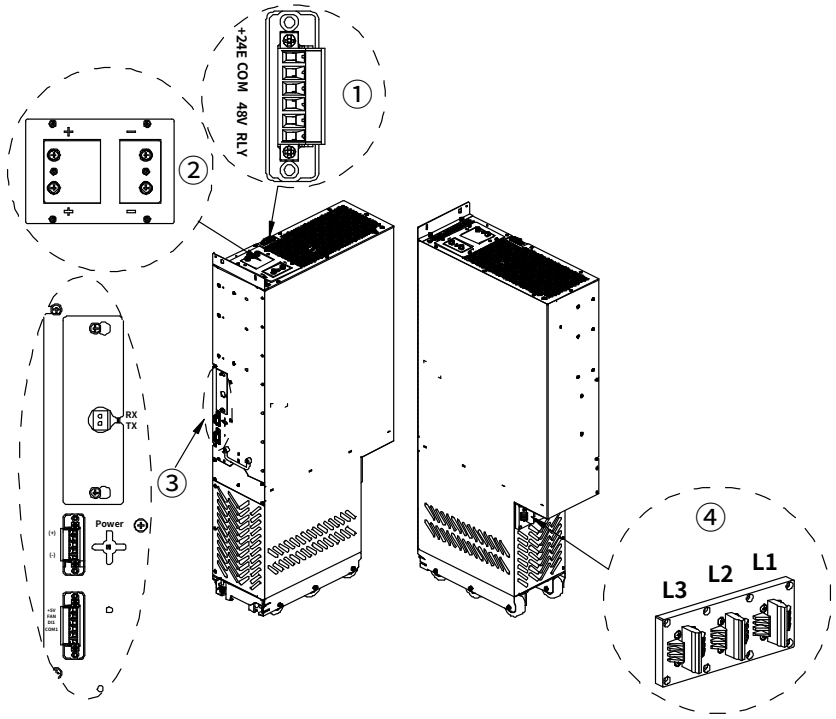
Step 3 Fix the power cable on the cable holder to avoid stress on the terminal.

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

Figure 4-11 A8 unit terminals



No.	Terminal name	Description
1	+24E	24V auxiliary power terminal (The auxiliary power supply must be isolated 24V.) For commissioning, specification: 24Vdc±10% 1A
	COM	
	48V	48V control, reserved function
	RLY	
2	+	Positive or negative busbar DC output Voltage: 1.35*Vin Connection: copper bar terminal of M6/9N・m
	-	
3	+5V	Fan control signal terminal of regenerative rectifier unit
	FAN	
	DI1	Digital input of regenerative rectifier unit
	COM1	
	(+)	Bus power output terminals of regenerative rectifier unit
	(-)	
4	L1	3PH AC power input Voltage: 3PH AC 380–440V Connection: copper bar terminal of M10/32N・m
	L2	
	L3	

2. Wiring procedures for A8 units are as follow:

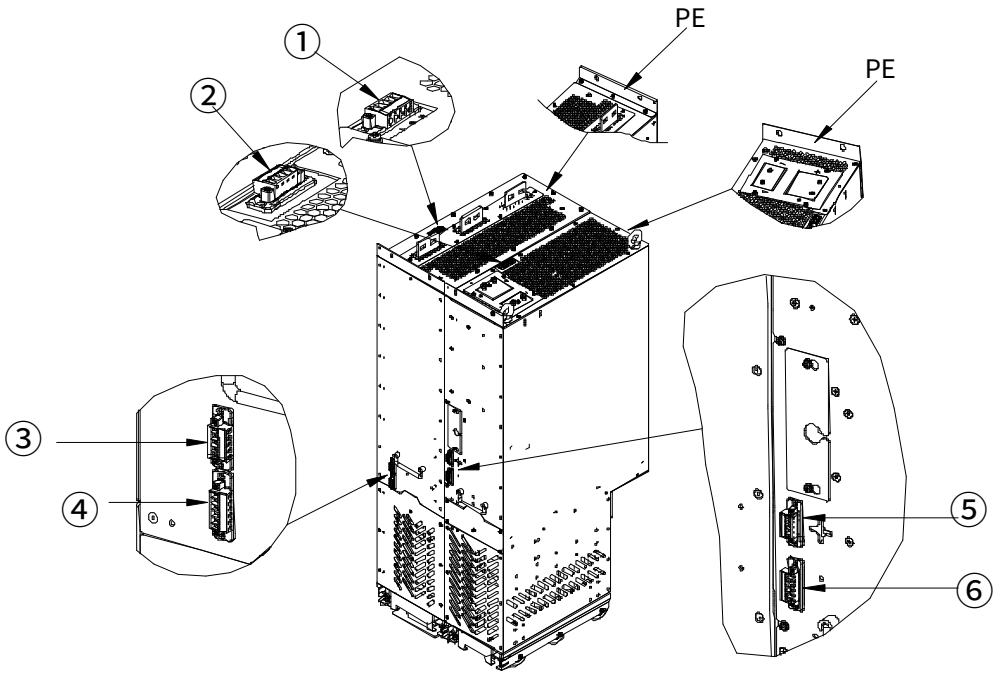
Step 1 Please ensure that all input and output are correctly connected.

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

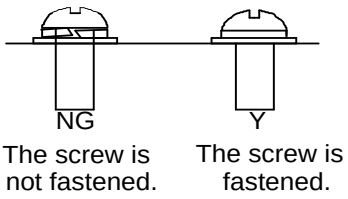
Figure 4-12 Regenerative rectifier filter wiring terminals



No.	Terminal name	Description
1	mL1	Input power signal detection terminal, connected with the AC voltage detection card.
	mL2	
	mL3	
2	+24E	24V auxiliary power terminal (The auxiliary power supply must be isolated 24V.) For commissioning, specification: 24Vdc±10% 1A
	COM	
	48V	Precharge contactor signal. If there is no internal precharge, the control external precharge contactor must be a DC48V coil contactor
	RLY	
3	(+)	Control power input of regenerative rectifier filter unit
	(-)	
4	+5V	Fan control signal of regenerative rectifier filter unit
	FAN	
	TE1	Reactor overtemperature contact terminals of regenerative rectifier filter unit
	TE2	
5	(+)	Bus power output terminals of regenerative rectifier unit
	(-)	
6	+5V	Fan control signal terminal of regenerative rectifier unit
	FAN	
	DI1	Digital input of regenerative rectifier unit
	COM1	

4.4.4.2 Screw tightening

Figure 4-13 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 Regenerative rectifier control unit (RCU)

5.1 RCU composition

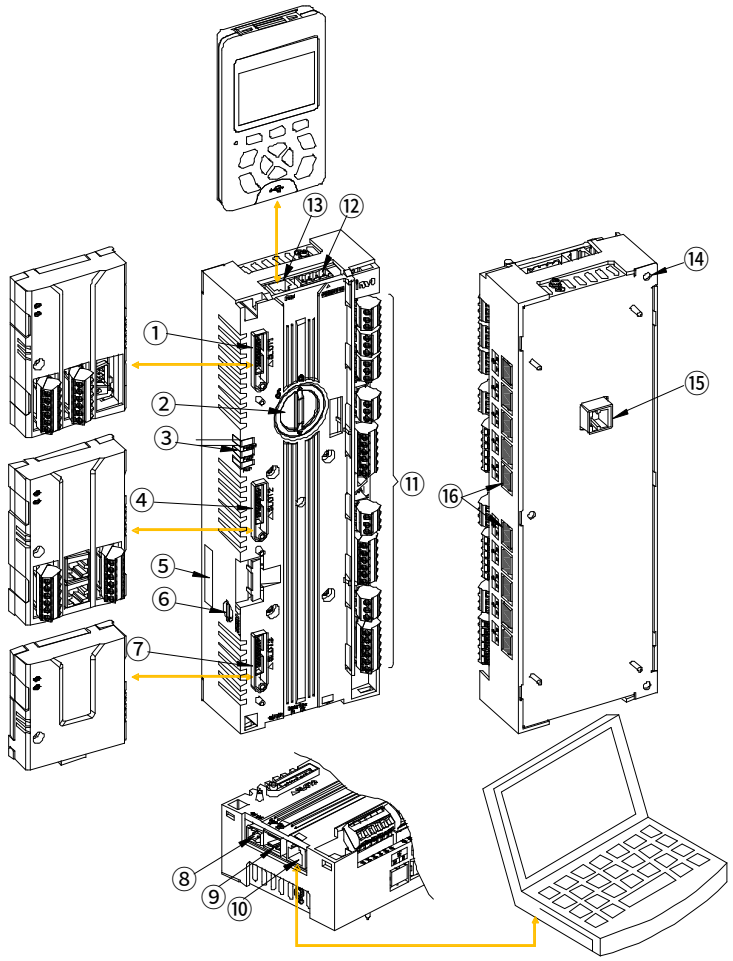


Table 5-1 Function description

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
9	Fiber optic interface	Master/slave fiber optic interface (optional)

Symbol	Component	Function description
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	RCU fixing holes (three holes)
15	RJ45 terminal	Communication interface with power unit (active rectifier A1–A4, A6, A7 units)
16	Fiber optic interface	Fiber optic communication interface with power unit (active rectifier A8 unit)

5.2 LED indicator

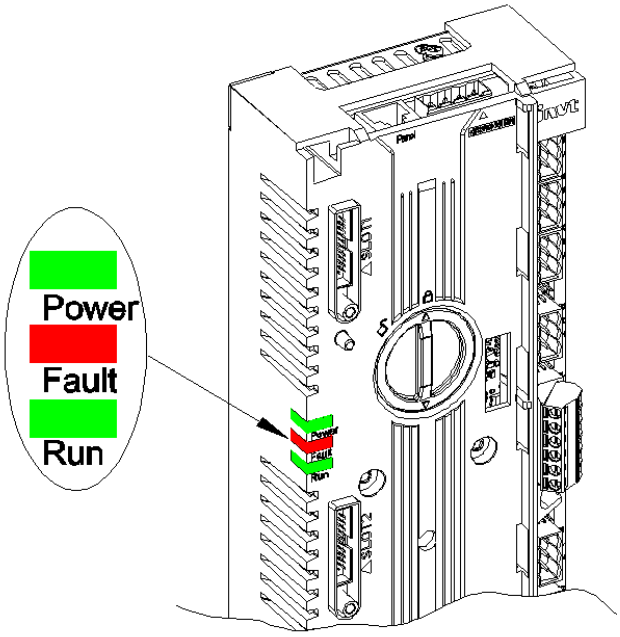
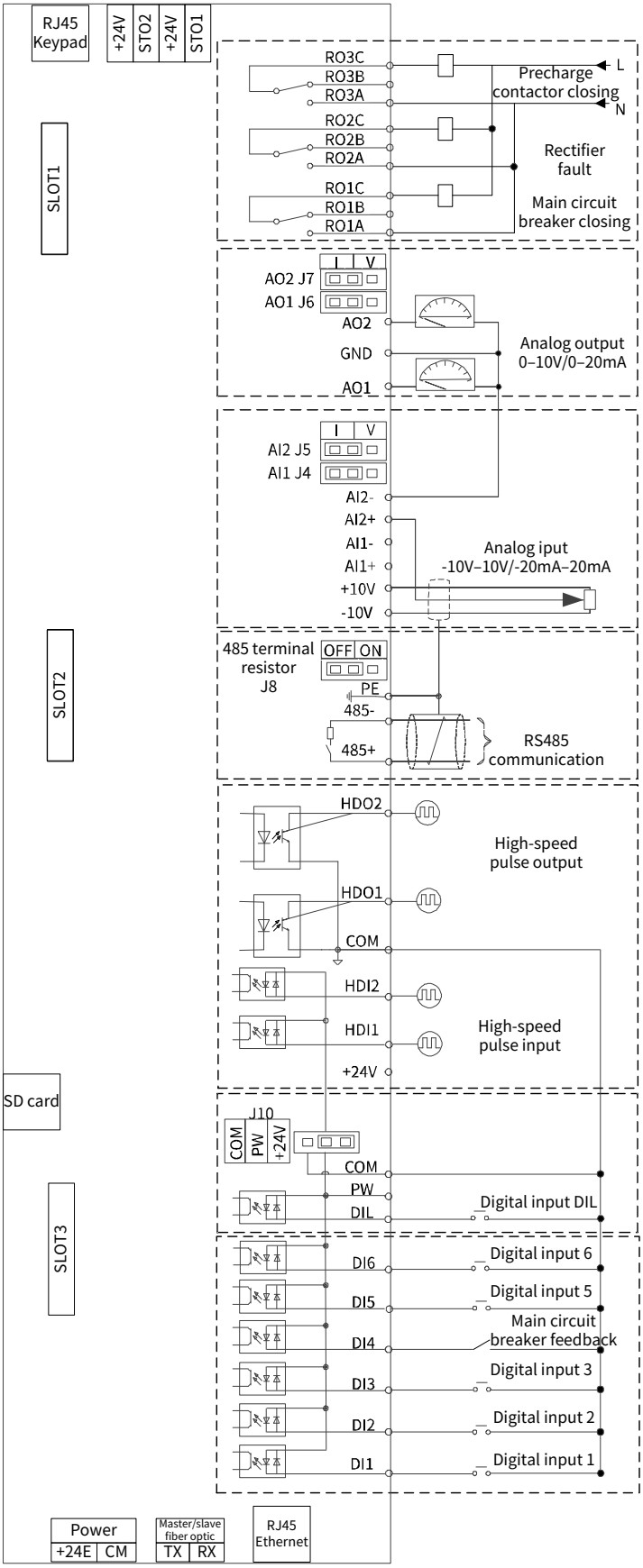


Table 5-2 Indicator description

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

5.3 RCU interface

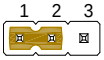
Figure 5-1 Control unit circuit wiring

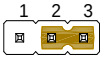


5.3.1 External standard interfaces

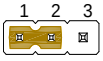
Terminal symbol	Terminal name	Description
Input power	+24E, CM	Power supply for the control unit
Digital input	DI1–DI6, DIL	Input type: relay contact, NPN or PNP
Digital power output	+24V, COM	Digital power, isolated from power input 24V
High-speed digital input	HDI1, HDI2	Input type: NPN or PNP
High-speed 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

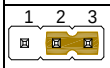
5.3.2 Detailed introduction to external interfaces

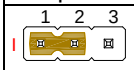
<table>
<tr><th>Terminal</th><th>Terminal symbol</th><th>Function description</th><th>Cable specifications</th></tr>
<tr><td colspan="4">Input power</td></tr>
<tr><td>1</td><td>+24E</td><td rowspan="2">24Vdc±10%2A</td><td rowspan="2">Two-core twisted-pair cable is recommended.
Cross-sectional area: 0.5–2.5mm²</td></tr>
<tr><td>2</td><td>CM</td></tr>
<tr><td colspan="4">DI input terminal</td></tr>
<tr><td>1</td><td>DI1</td><td rowspan="6">1. Input impedance: 3.3kΩ
2. Voltage input range: 12–30V
3. Supports NPN and PNP bi-direction input, relay contact input
4. Max. input frequency: 1kHz</td><td rowspan="6">Single-core wire
Cross-sectional area: 0.5–2.5mm²</td></tr>
<tr><td>2</td><td>DI2</td></tr>
<tr><td>3</td><td>DI3</td></tr>
<tr><td>4</td><td>DI4</td></tr>
<tr><td>5</td><td>DI5</td></tr>
<tr><td>6</td><td>DI6</td></tr>
<tr><td colspan="4">DIL input terminal</td></tr>
<tr><td>1</td><td>DIL</td><td>Digital interlock. When its input is high, all other input terminals are forced to be invalid.</td><td rowspan="3">Two-core twisted-pair cable is recommended.
Cross-sectional area: 0.5–2.5mm²</td></tr>
<tr><td>2</td><td>PW</td><td>Provides power supply for DIL, DI1–DI6, HDI, HDO</td></tr>
<tr><td>3</td><td>COM</td><td>Digital common ground</td></tr>
<tr><td colspan="4">Jumper J10: power supply selection</td></tr>
<tr><td colspan="4"> 

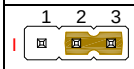
1 is short connected to 2 , PW is short connected to internal COM, and DI uses the internal power ground. If external power is required, you need to remove the shorting cap.</td></tr>
<tr><td colspan="4"> 

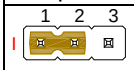
2 is short connected to 3 , PW is short connected to internal +24V, and DI uses the internal power. If external power is required, you need to remove the shorting cap.</td></tr>
</table>

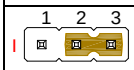
<table>
<tr><th>Terminal</th><th>Terminal symbol</th><th>Function description</th><th>Cable specifications</th></tr>
<tr><td colspan="4">HDIO terminal</td></tr>
<tr><td>1</td><td>+24V</td><td rowspan="3">1. Input type: PNP, NPN
2. Input frequency range: 0–50kHz
3. Input voltage range: 12–30V
4. Duty ratio: 30%–70%</td><td rowspan="6">Two-core twisted-pair cable is recommended.
Cross-sectional area: 0.5–2.5mm²
HDI and COM, HDO and COM use twisted-pair cables.</td></tr>
<tr><td>2</td><td>HDI1</td></tr>
<tr><td>3</td><td>HDI2</td></tr>
<tr><td>4</td><td>COM</td><td rowspan="3">1. Output type: OC
2. Output frequency range: 0–50kHz
3. Max. output load: 20mA/30V
4. Duty ratio: 50%</td></tr>
<tr><td>5</td><td>HDO1</td></tr>
<tr><td>6</td><td>HDO2</td></tr>
<tr><td colspan="4">RS485 communication terminals</td></tr>
<tr><td>1</td><td>485+</td><td rowspan="3">RS485 bus, standard 5V electrical level
Terminal resistor: 120Ω
Max. baud rate: 115200
Max. number of nodes: 32 (without relay)</td><td rowspan="3">Two-core twisted-pair cable is recommended.
Cross-sectional area: 0.5–2.5mm²</td></tr>
<tr><td>2</td><td>485-</td></tr>
<tr><td>3</td><td>PE</td></tr>
<tr><td colspan="4">Jumper J8: terminal resistor selection</td></tr>
<tr><td colspan="4"> 

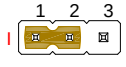
When 1 and 2 are short-circuited, the terminal resistor is disconnected.</td></tr>
<tr><td colspan="4"> 

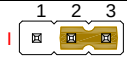
When 2 and 3 are short-circuited, the terminal resistor is connected.</td></tr>
<tr><td colspan="4">Analog input terminal</td></tr>
<tr><td>1</td><td>-10V</td><td rowspan="2">Positive and negative 10V power supply
Max. output current: 10mA</td><td rowspan="6">Cross-sectional area: 0.5–2.5mm²
When two AIs are used, use two two-core shielded twisted-pair cables.
When reference voltage is used, use one four-core shielded twisted-pair cable for one AI.</td></tr>
<tr><td>2</td><td>+10V</td></tr>
<tr><td>3</td><td>AI1+</td><td rowspan="4">Current input: -20mA–20mA, Rin: 500Ω
Voltage input: -10V–10V, Rin: 30kΩ
Differential input range: ±30V
Sampling interval: 0.1ms
Resolution: 11 bit+signbit</td></tr>
<tr><td>4</td><td>AI1-</td></tr>
<tr><td>5</td><td>AI2+</td></tr>
<tr><td>6</td><td>AI2-</td></tr>
<tr><td colspan="4">Jumper J4: Selection between AI1 voltage and current signal inputs</td></tr>
<tr><td colspan="4"> 

When 1 and 2 are short-circuited, AI1 current input is used.</td></tr>
<tr><td colspan="4"> 

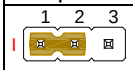
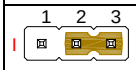
When 2 and 3 are short-circuited, AI1 voltage input is used.</td></tr>
<tr><td colspan="4">Jumper J5: Selection between AI2 voltage and current signal inputs</td></tr>
<tr><td colspan="4"> 

When 1 and 2 are short-circuited, AI2 current input is used.</td></tr>
<tr><td colspan="4"> 

When 2 and 3 are short-circuited, AI2 voltage input is used.</td></tr>
<tr><td colspan="4">Analog output terminal</td></tr>
<tr><td rowspan="3">Analog output</td><td>AO1</td><td rowspan="3">AO output range:
0–20mA, Rload≤500Ω
0–10V, Rload≥10kΩ
Resolution: 11 bit+signbit
Accuracy: 2% of full scale range</td><td rowspan="3">Two-core twisted-pair cable is recommended.
Cross-sectional area: 0.5–2.5mm²
AO1 and GND, AO2 and GND use twisted-pair cables.</td></tr>
<tr><td>GND</td></tr>
<tr><td>AO2</td></tr>
<tr><td colspan="4">Jumper J6: Selection between AO1 voltage and current signal outputs</td></tr>
<tr><td colspan="4"> 

When 1 and 2 are short-circuited, AO1 current output is used.</td></tr>
<tr><td colspan="4"> 

When 2 and 3 are short-circuited, AO1 voltage output is used.</td></tr>
</table>

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

5.4 RCU function application

5.4.1 Function module

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

No.	Name	Model	Function description	Connect with RCU through	Dimensions (W×H×D) (unit: mm)
1	Input/output module	EC-IO801	Two AIs Two AOs Three DIs 1 relay outputs	SLOT	73.5×103×23.5
2	PROFINET IO module	EC-TX809	PROFINET IO industrial Ethernet	SLOT	73.5×74×23.5
3	PROFIBUSDP module	EC-TX803	PROFIBUSDP bus adapter	SLOT	73.5×74×23.5

No.	Name	Model	Function description	Connect with RCU through	Dimensions (W×H×D) (unit: mm)
4	CAN bus module	EC-TX805	CANopen bus adapter	SLOT	73.5×74×23.5
5	Optical fiber expansion module	EC-TX823	Three 50M expansion optical fibers	SLOT	73.5×74×23.5
6	Voltage detection module	IVDM-10	AC voltage detection module	Fiber optic	37.4×180×113
7	Intelligent operation keypad	SOP-880-01	Human-machine interface keypad	RS422	74×121.5×26

Note:

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

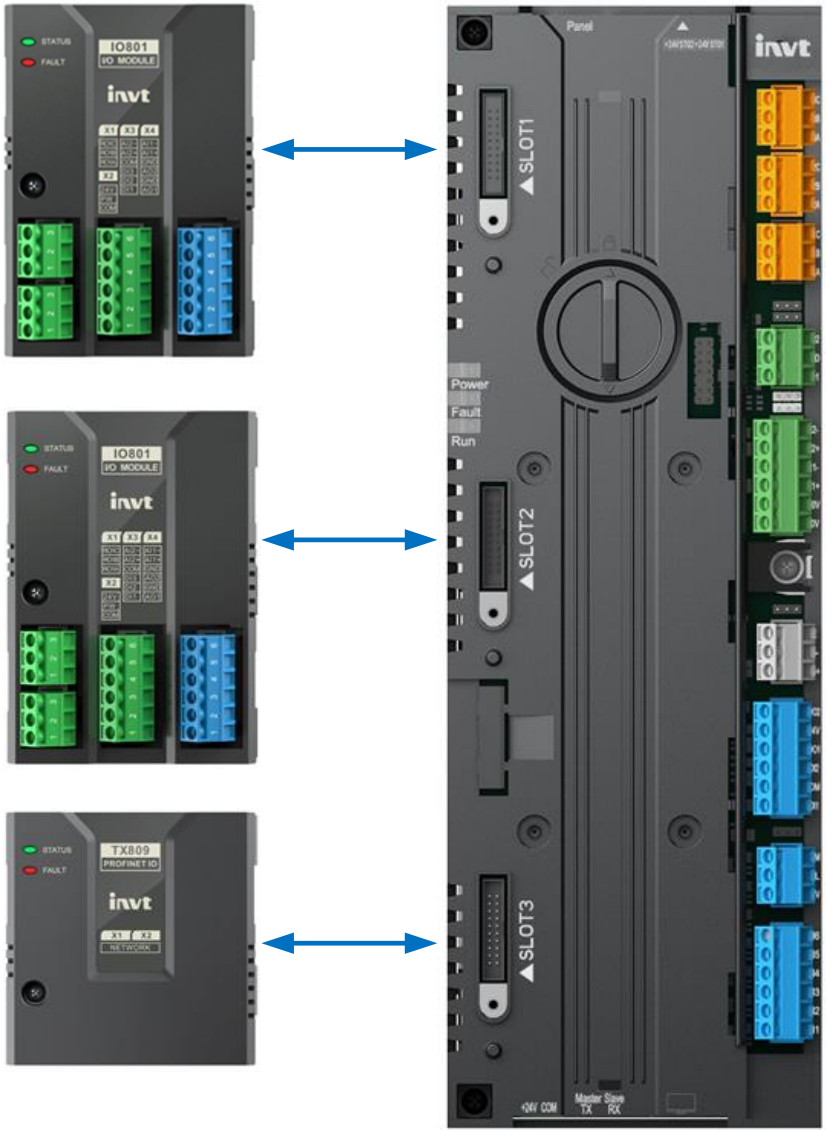


Table 5-3 Expansion card installation description

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

Note:

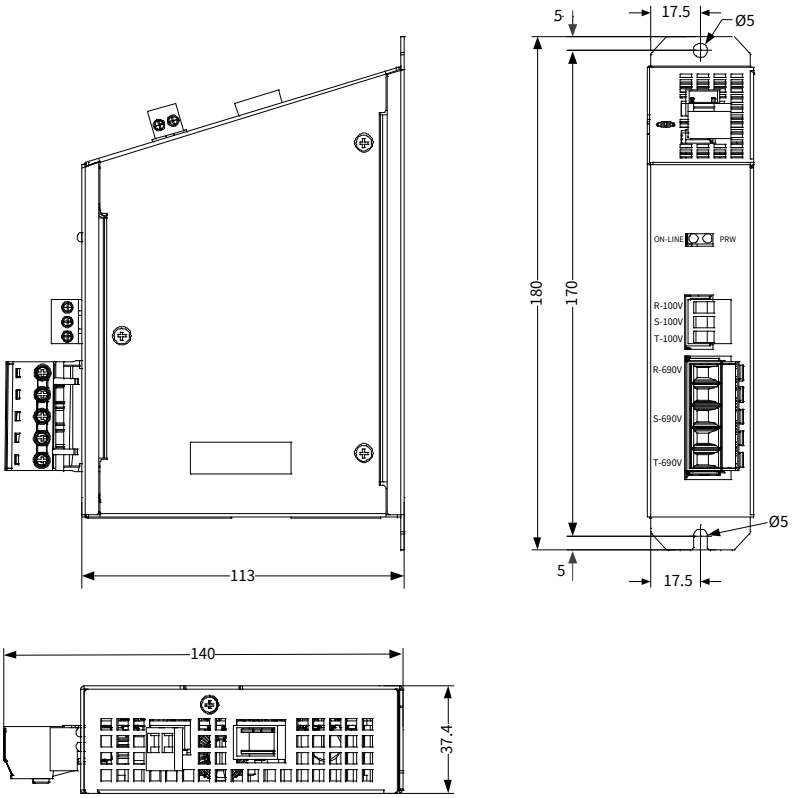
- When SLOT2 is empty, EC-TX803 and EC-TX809 can be installed in SLOT1.
- EC-TX821 and EC-TX823 can only be inserted in SLOT2 or SLOT3.

6 Accessories

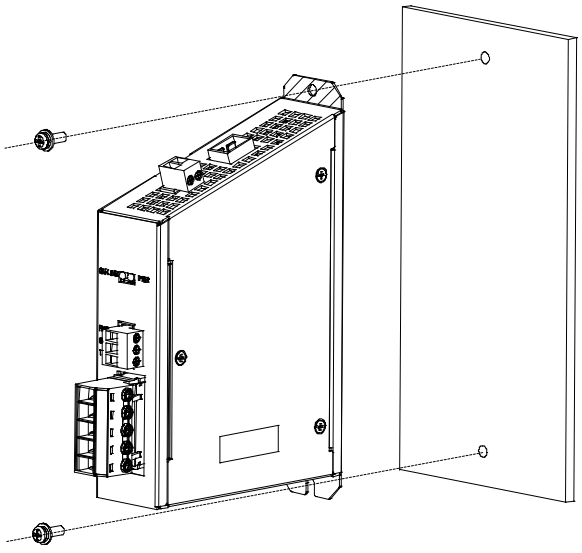
6.1 Function expansion module

The function expansion module mainly used in the regenerative rectifier is an AC voltage detection module, which is 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.

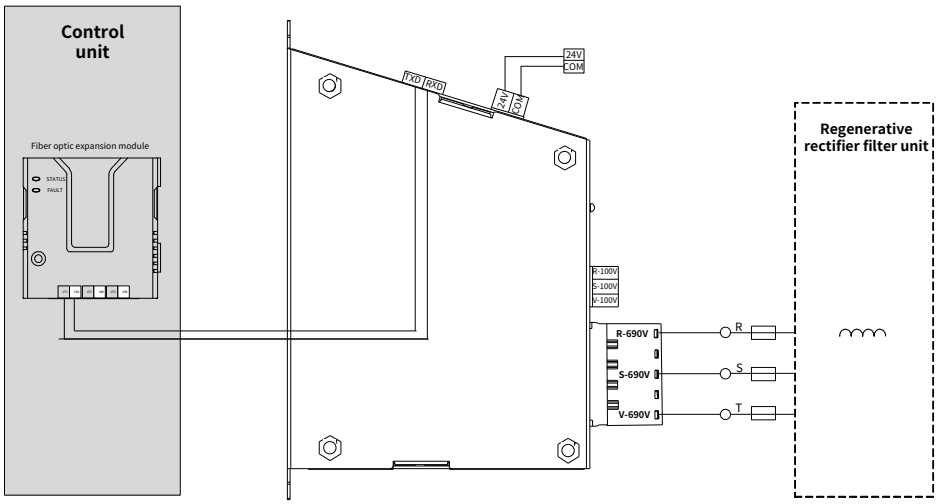


Note:

- 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 unit. Figure 6-2 shows the external wiring diagram of the IVDM-10 module, taking the fiber optic expansion module EC-TX823 and regenerative rectifier filter unit as an example.

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



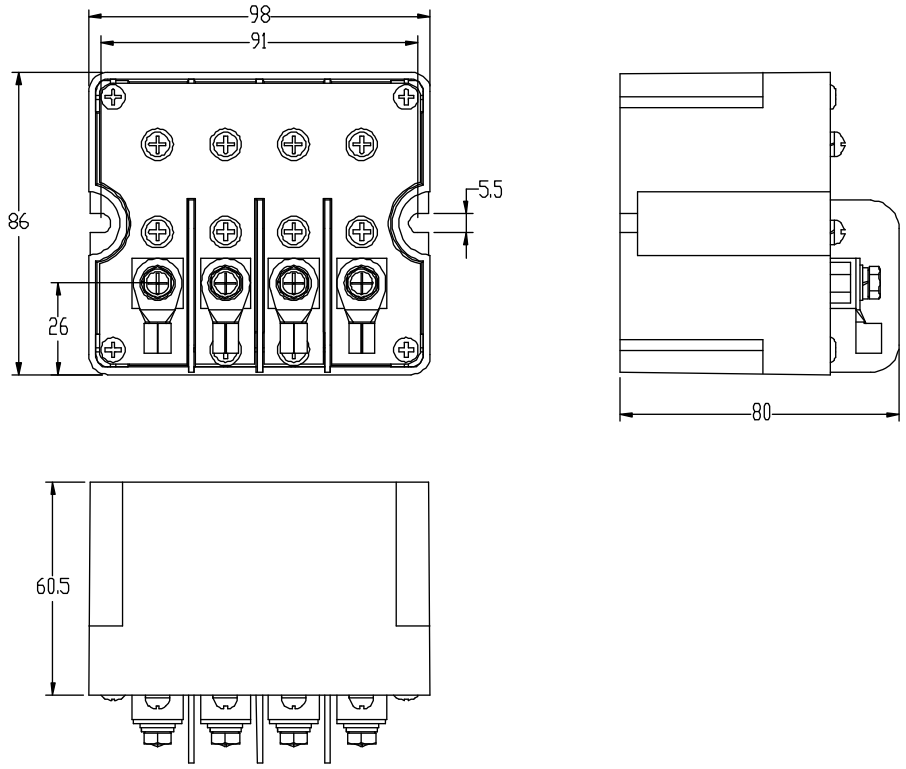
Note: The 3PH AC voltage line sequence of the IVDM-10 module must be consistent with the phase sequence of the incoming cable of the rectifier filter unit. Otherwise, the overcurrent fault will occur in the rectifier unit.

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

6.2 Surge protection module

For products in A4–A7 frames, precharge 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 98x86x80 mm (W*D*H), as shown in Figure 6-3.

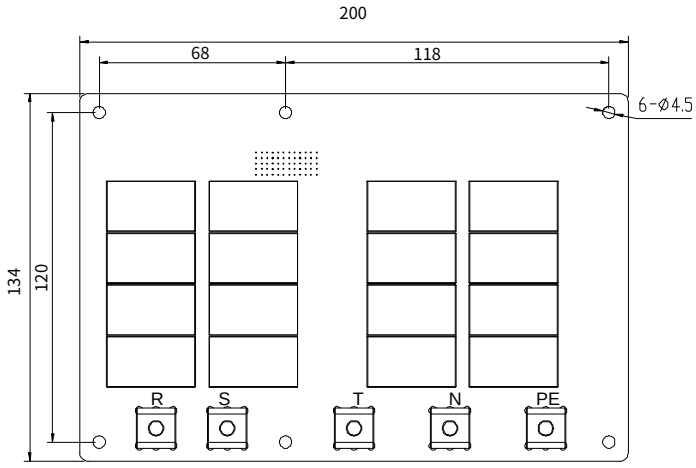
Figure 6-3 Surge protection module



6.3 EMI filter module

For products in A4–A7 frames, precharge 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.

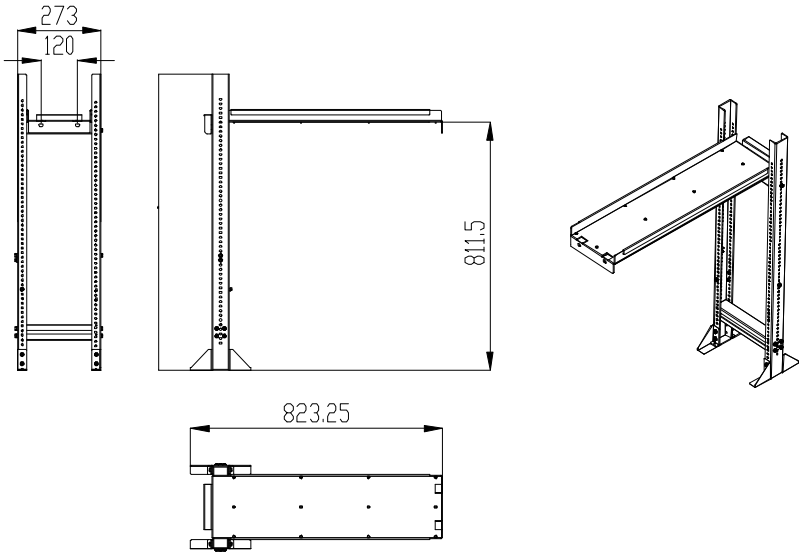
Figure 6-4 EMI filter module



6.4 A6&A7 maintenance bracket

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

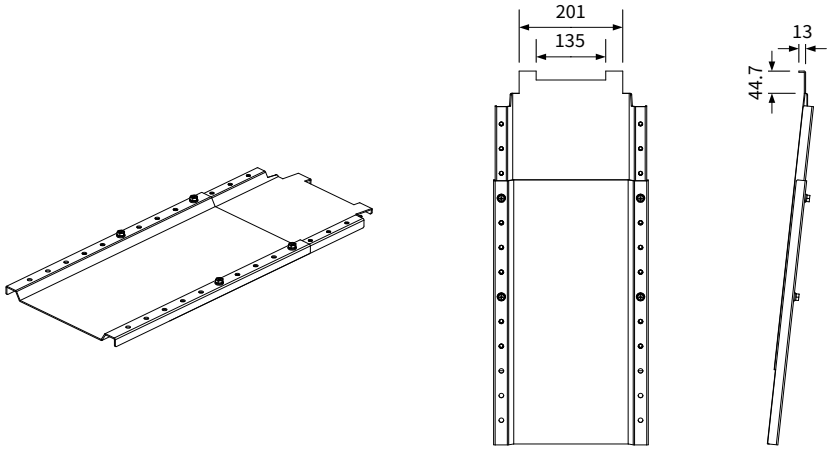
Figure 6-5 Maintenance bracket dimensions (unit: mm)



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.

Figure 6-6 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 regenerative rectifier unit is installed in an environment that meets requirements. The following table describes the routine maintenance periods recommended by us.

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.
Every 6 years	Replace the fans for the filter and power units.
Every 10 years	Capacitor replacement

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

Check scope		Check item	Method	Expected result
Ambient environment		Check the temperature, and humidity, and whether there is vibration, dust, gas, oil spray, and water droplets in the environment.	Visual inspection, and use instruments for measurement.	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.
Voltage		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.)
Keypad		Check the display of information.	Visual inspection	The characters are displayed properly.
		Check whether characters are not completely displayed.	Visual inspection	The requirements stated in this manual are met.
Main circuit	Common	Check whether the bolts loose or come off.	Screw them up.	No exception occurs.
		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 vibration sounds or smells.	Auditory, olfactory, and visual inspection	No exception occurs.
Control circuit	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.
		Check whether there are cracks,	Visual inspection	No exception occurs.

Check scope		Check item	Method	Expected result
		damage, deformation, or rust.		
		Check whether there is electrolyte leakage or deformation.	Visual inspection, and determine the service life based on the maintenance information.	No exception occurs.
Cooling system	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.
		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 www.invt.com, and choose **Support** > **Services**.

7.2 Replacement of wearing parts

7.2.1 Capacitor

7.2.1.1 Capacitor reforming

If the regenerative 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 rectifier is delivered.

Storage time	Operation principle
Less than 1 year	No charging operation is required.
1 to 2 years	The regenerative 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 regenerative rectifier unit: ● Charge the rectifier 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 regenerative rectifier unit: ● Charge the rectifier 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 regenerative rectifier unit is described as follows:

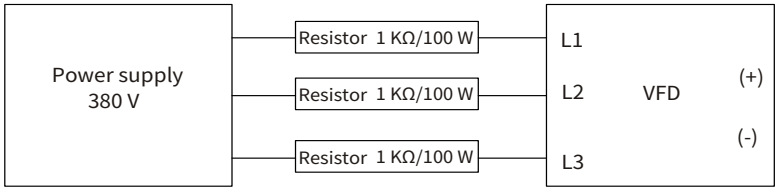
For regenerative rectifier units of a high voltage class, ensure that the voltage requirement (for example, 380 V) is met during charging. Capacitor changing requires little current, and therefore you can use a small-capacity power supply (2 A is sufficient).

The method for using a resistor (incandescent lamp) to charge the regenerative 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 kΩ/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



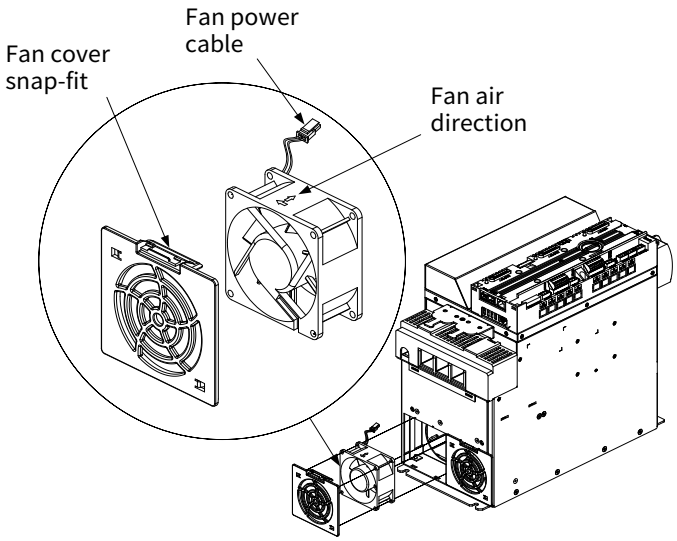
7.2.1.2 Electrolytic capacitor replacement

⚠	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 a regenerative 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 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.

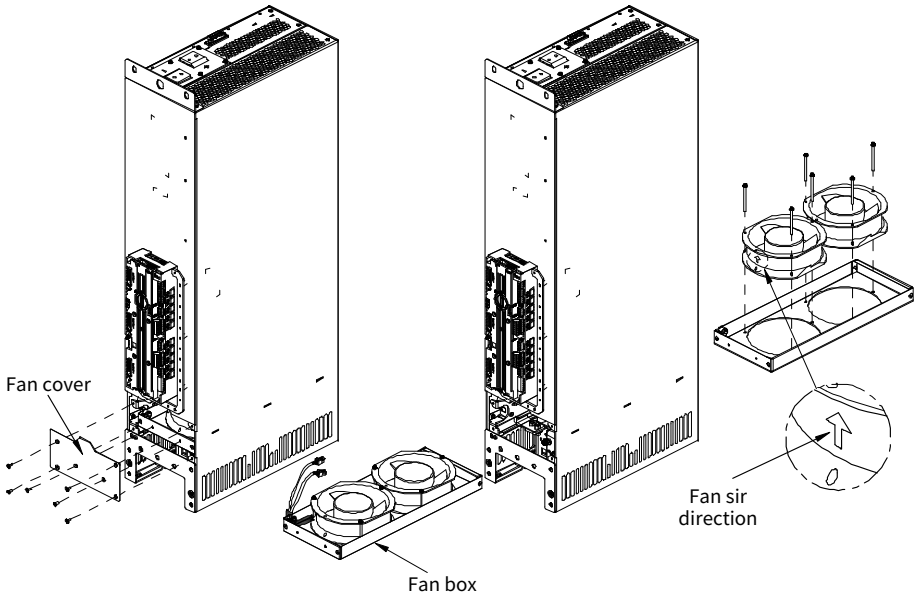
Step 3 Remove the fan module connection cable.

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.

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



3. Replacing the fan for A8

The service life of the cooling fan of the regenerative 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 regenerative 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.

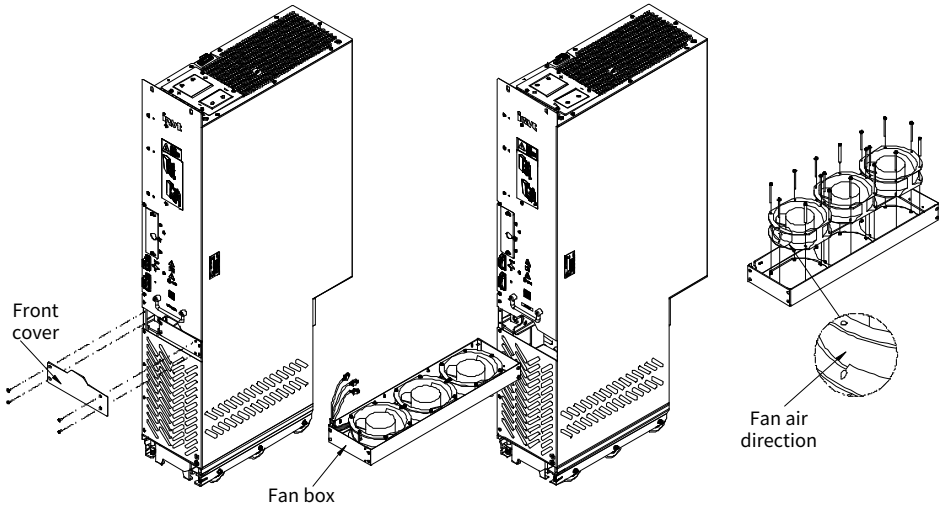
Step 3 Remove the fan module connection cable.

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.

Figure 7-3 Fan maintenance for A8 regenerative rectifier unit



7.2.3 DC fuse

To check and replace the DC fuse of an A8 regenerative 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 Regenerative rectifier unit

1. Replacement of A6&A7 regenerative rectifier unit

To replace the regenerative 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 and disconnect the external connection cables of the regenerative rectifier unit.

Step 4 Disconnect the (+) and (-) DC output copper bars.

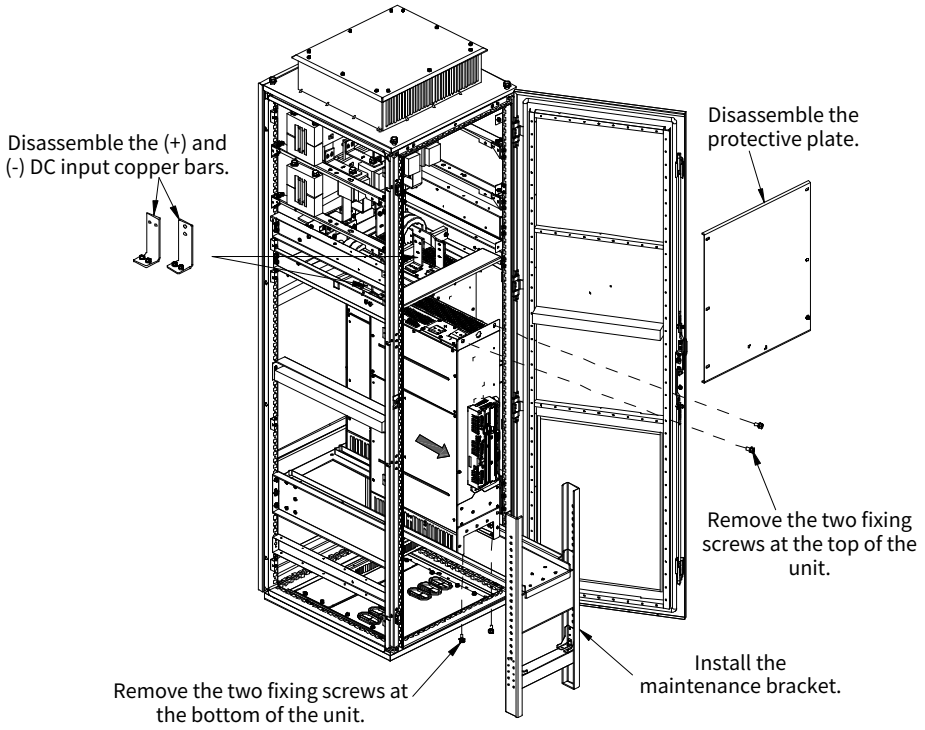
Step 5 Mount the unit maintenance bracket.

Step 6 Remove the (four M8) fixing screws from the top and bottom of the unit.

Step 7 Pull the regenerative rectifier unit to the maintenance bracket until it can be lifted or removed.

Step 8 Install the new regenerative rectifier unit by referring the reverse order of the procedure.

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



2. Replacement of A8 regenerative rectifier unit

To replace the regenerative 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 Disconnect the external connection cables of the regenerative rectifier unit.

Step 4 Disconnect the (+) and (-) DC output copper bars.

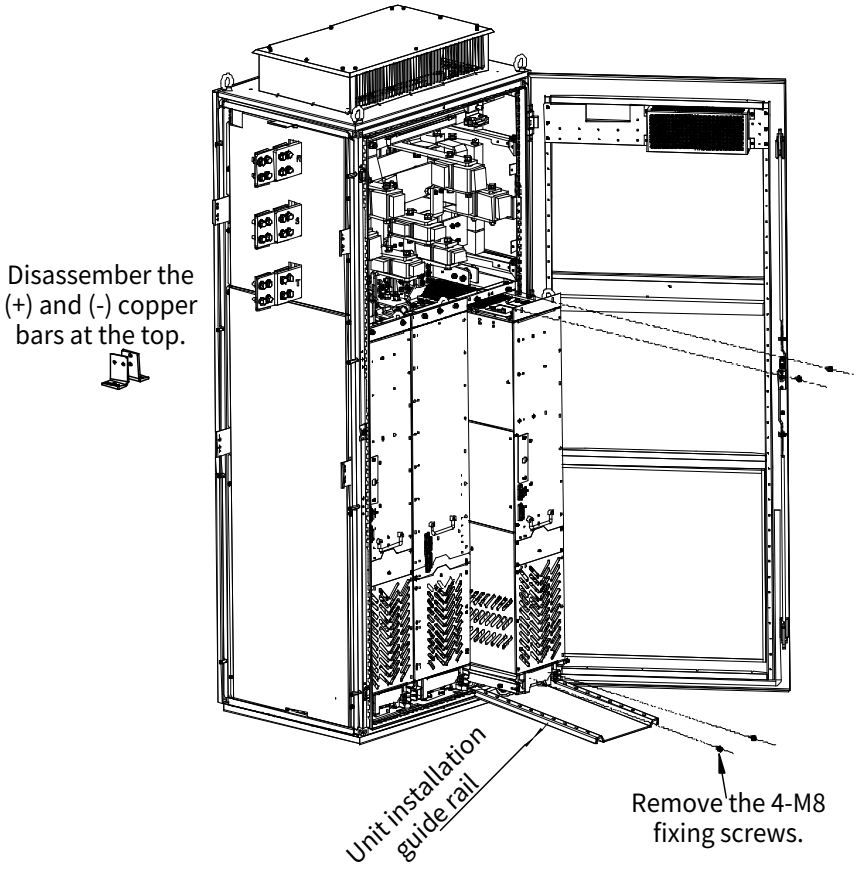
Step 5 Install the unit entry/exit guide rail.

Step 6 Remove the (four M8) fixing screws from the top and bottom of the unit.

Step 7 Pull the unit and unfold the anti-tipping stand.

Step 8 Install the new regenerative rectifier unit by referring the reverse order of the procedure.

Figure 7-5 Replacement of A8 regenerative rectifier unit



3. Replacement of A8n regenerative 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 regenerative 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 regenerative rectifier unit to the maintenance bracket until it can be lifted or removed.

Step 9 Install the new regenerative rectifier unit by referring the reverse order of the procedure.

Figure 7-6 Replacing the A8n rectifier unit

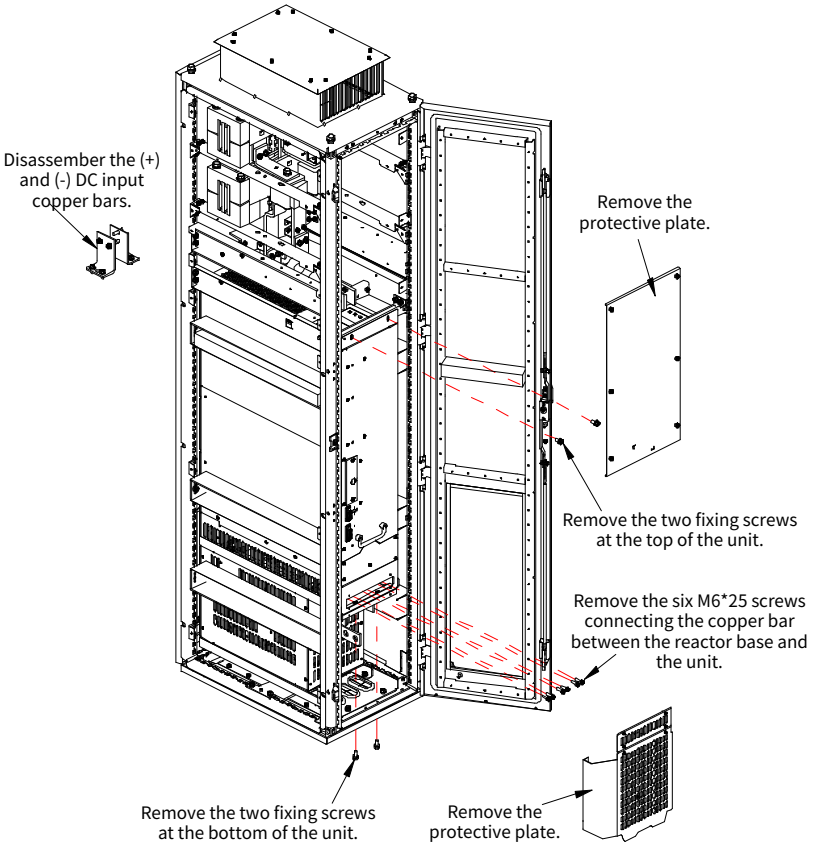
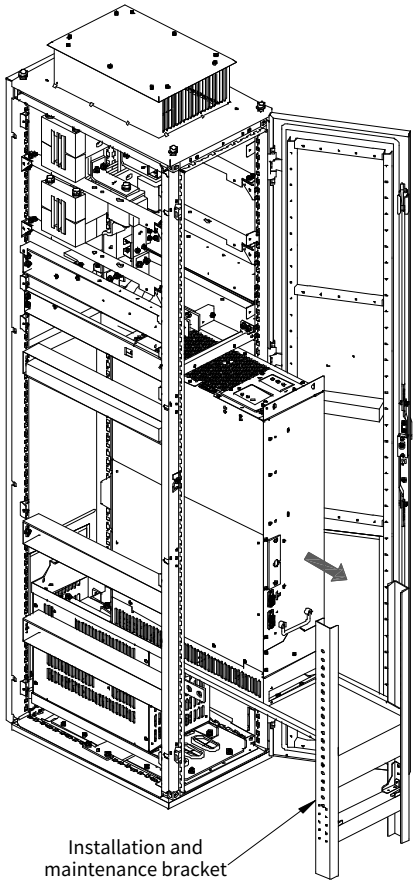


Figure 7-7 Installation and maintenance bracket

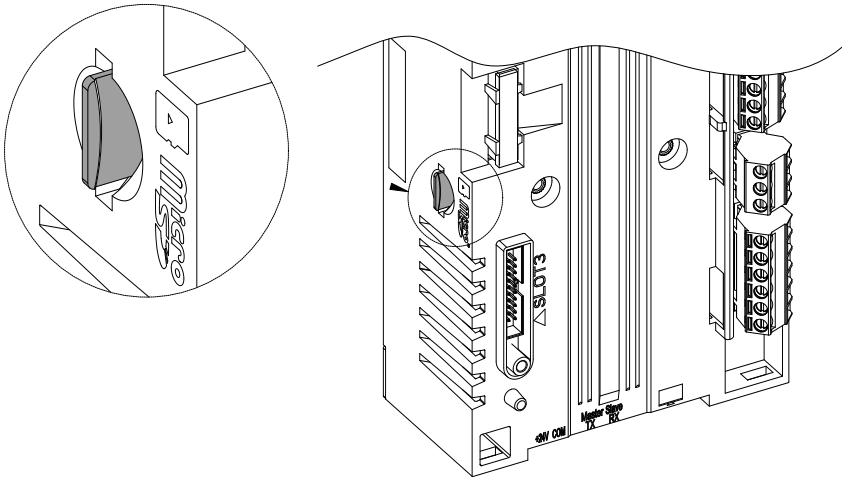


7.2.5 RCU and keypad

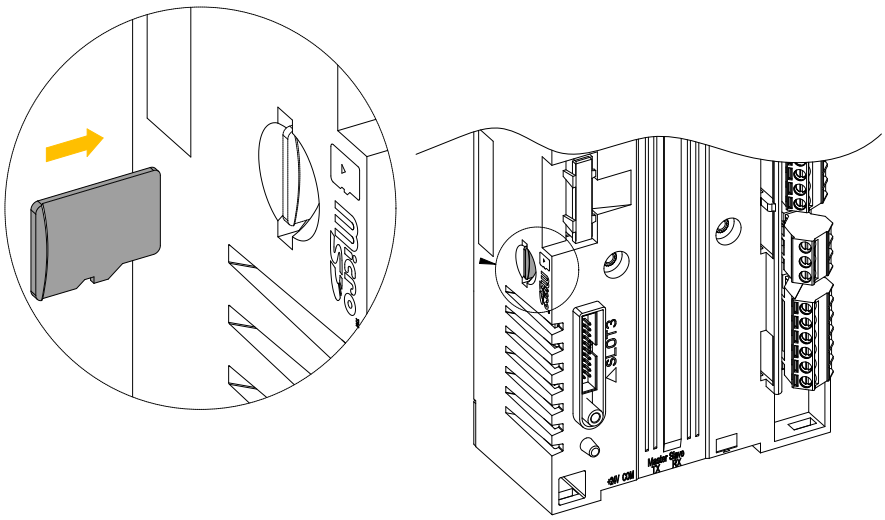
1. Replace the storage card.

After the RCU 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.

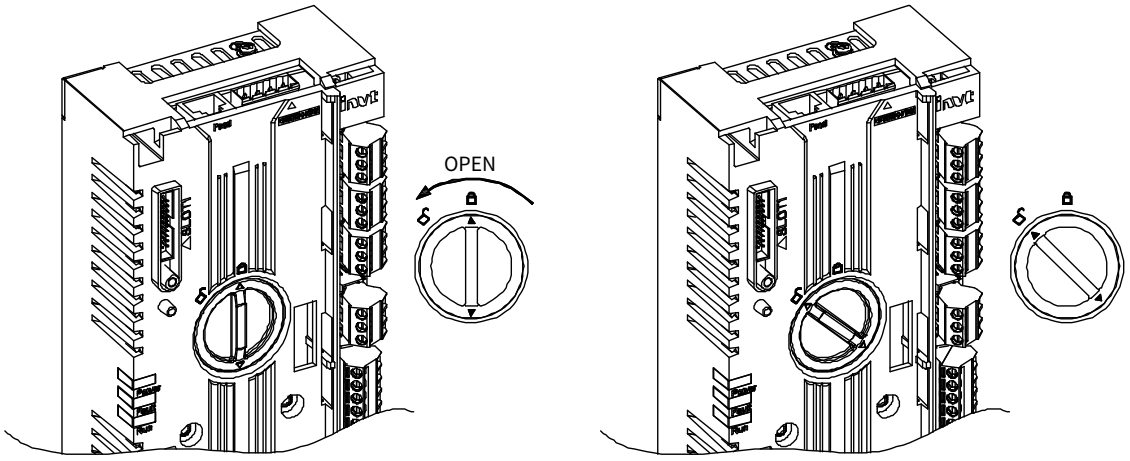


Step 3 Ensure that the SD storage card is pushed into place. Otherwise, abnormalities may occur due to poor contact.

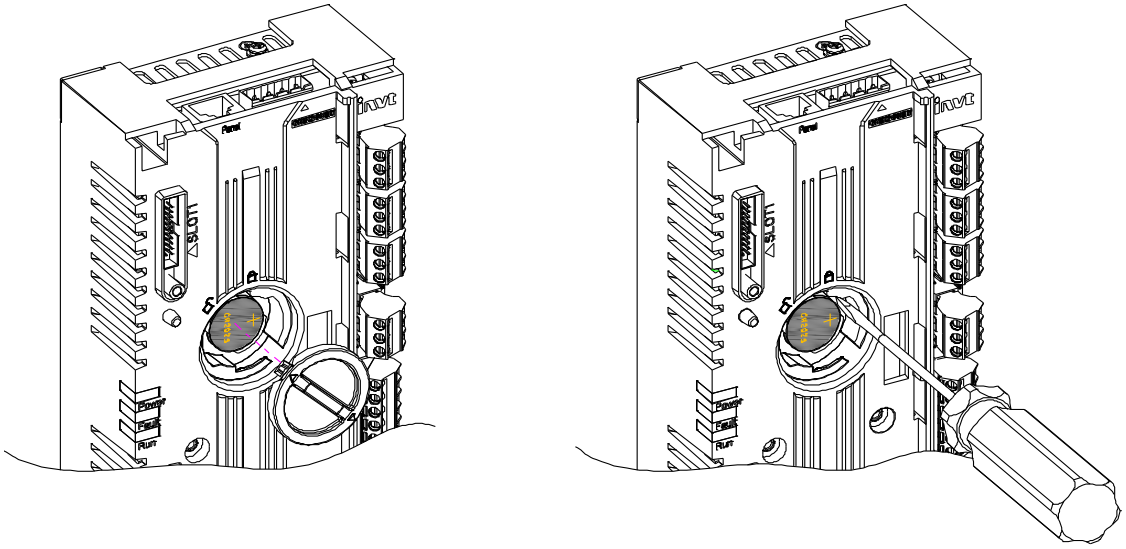
2. Replace the RCU battery.

The procedure is as follows:

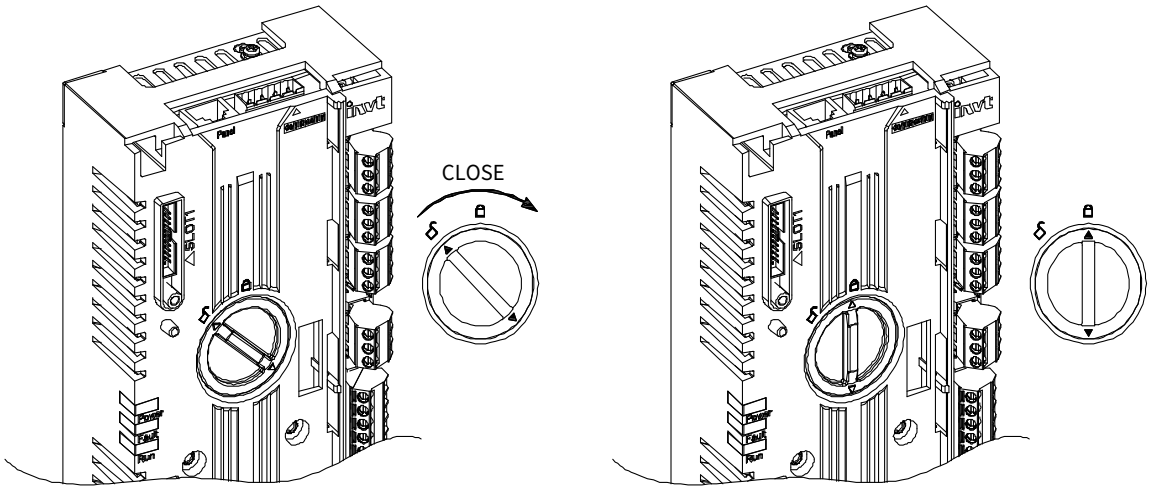
Step 1 Hold the battery cover by hand and rotate it counterclockwise by 45° until the cover opens.



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



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

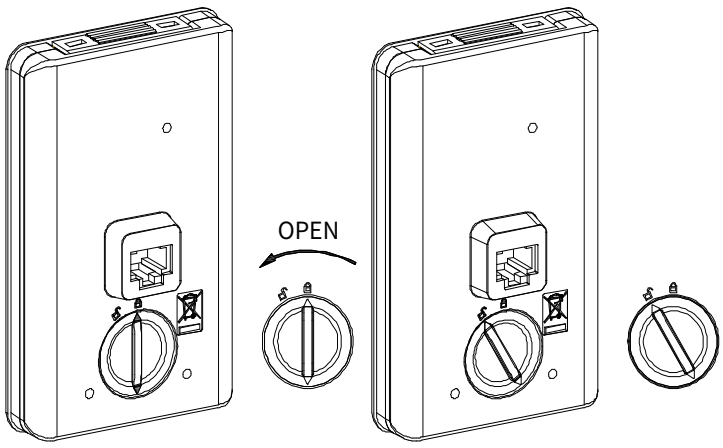


Step 4 Dispose of waste batteries in accordance with local disposal rules or applicable laws.

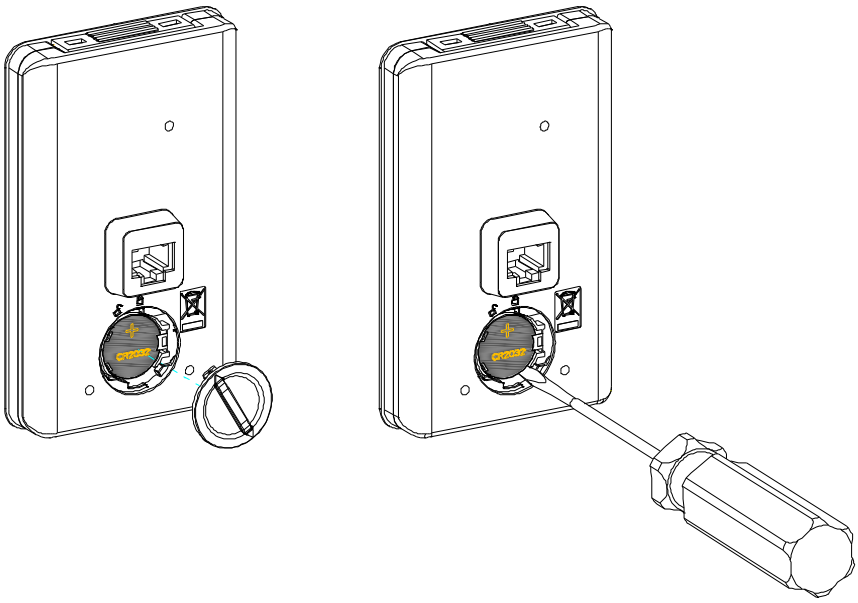
3. Replace the SOP battery.

The procedure is as follows:

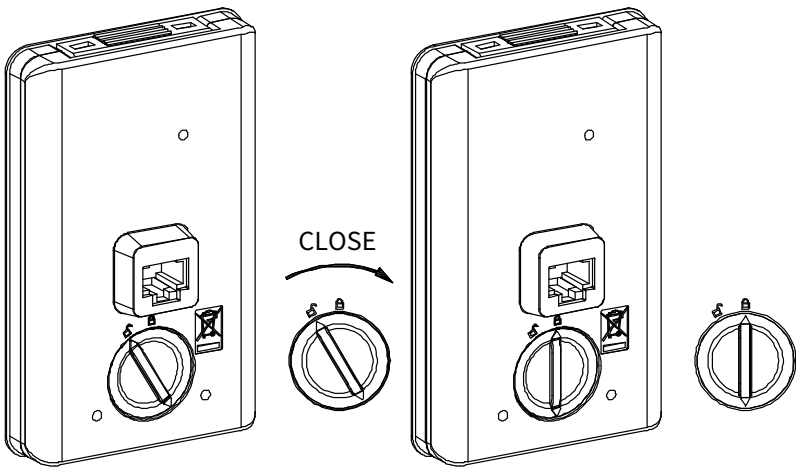
Step 1 Rotate the battery cover counterclockwise by 30° by hand until the cover opens.



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 a regenerative 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 regenerative rectifier must be larger or equal to the rated current of the motor. The rated power of the regenerative 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 regenerative 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 rectifier 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°C – +40°C. Derating is required if the ambient temperature is 40°C – 50°C.	-40 – +70°C The air temperature change rate is less than 1°C/min.	-40 – 70 °C
Relative air humidity	5%–95%, no condensation Not less than 3K3	5%–95%, no condensation 1K4	5%–95%, no condensation 2K3
	Oil mist, salt mist, freezing, condensation, dripping water, spray, and splashing are not allowed. The max. RH cannot exceed 60% in the environment with corrosive gases.		
Environmental class/Hazardous chemical substances	Class 3C2 EN 60721-3-3	Class 1C2 EN 60721-3-1	Class 2C2 EN 60721-3-2
Mechanical active	Class 3S1 EN 60721-3-3	Class 1S1 EN 60721-3-1	Class 2S1 EN 60721-3-2

Item	Run	Storage	Transportation
substances			
Organic/Biological effects	Class 3B1 EN 60721-3-3	Class 1B1 EN 60721-3-1	Class 2B1 EN 60721-3-2
Pollution degree	Class 2 EN 61800-5-1		
Installation altitude	0–2000M. Derating is required when the altitude exceeds 1000m.		
Mechanical stability			
Vibration stress -Displacement -Acceleration -Complaint with	10…57 Hz, 0.075 mm 58…200 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/s^2 1M2	5…9 Hz, 3.1mm 9…200 Hz, 9.8m/s^2 2M2
Impact stress -Acceleration -Complaint with	20 ms, 98 m/s^2 3M4	11 ms, 100 m/s^2 1M2	11 ms, 100 m/s^2 2M2

A.4 **Application standards**

The following table describes the standards that our regenerative 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) the regenerative EMC requirements on regenerative rectifiers.

Application environment categories:

First environment: Civilian environment, including application scenarios where rectifiers are directly connected to the civil power supply low-voltage grids without intermediate transformers.

Second environment: All environments except those in Category I.

Regenerative 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 the first environment.

Note: The EMC standard IEC/EN 61800-3 no longer restricts the power distribution of the regenerative 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 the regenerative second environment.

A.5.1 Regenerative rectifier 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 rectifier 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 Regenerative rectifier category of C3

The anti-interference performance of the rectifier 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 rectifier unit according to the description in the manual.

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

Appendix B Dimension drawings

Figure B-1 Dimensions of A4 unit (unit: mm)

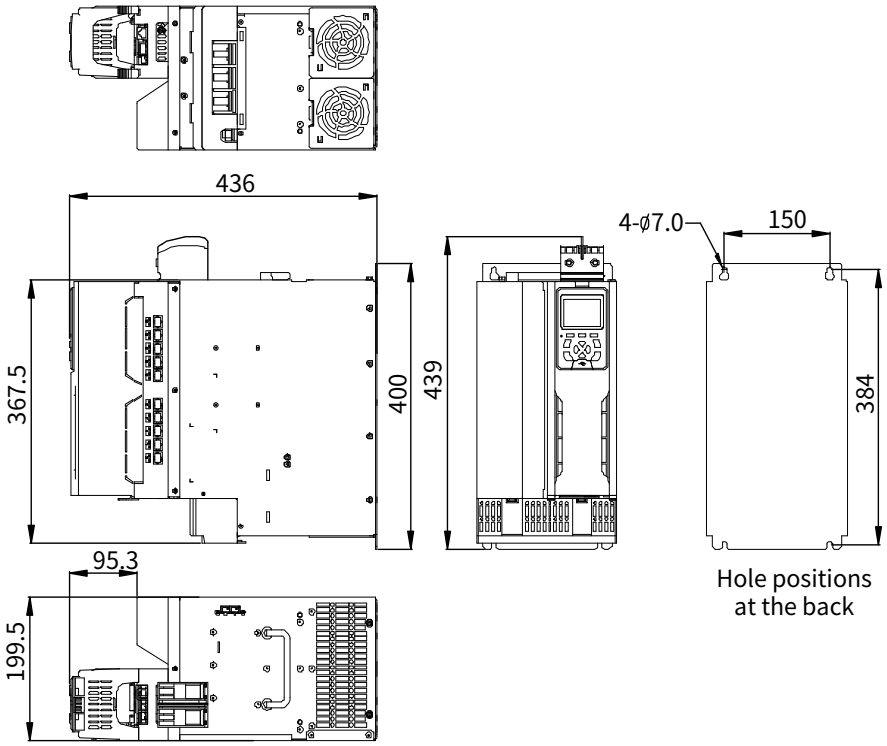


Figure B-2 Installation dimensions of A6 unit (unit: mm)

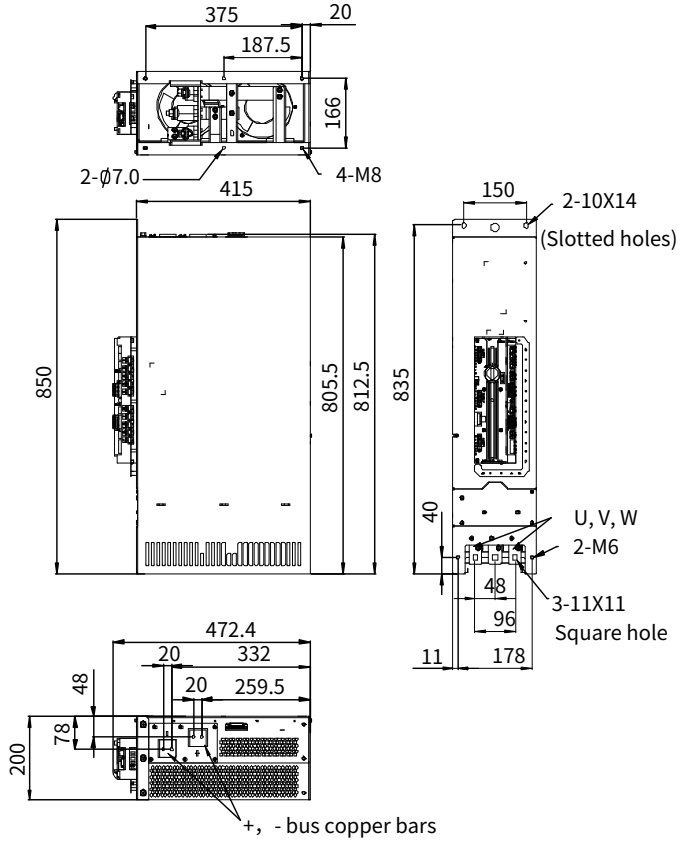


Figure B-3 Installation dimensions of A7 unit (unit: mm)

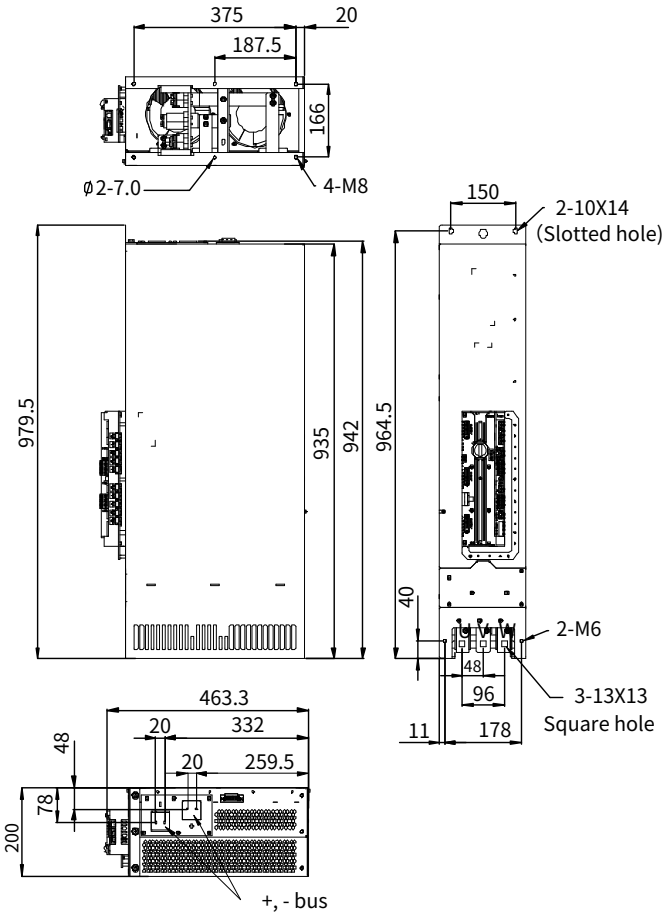


Figure B-4 Installation dimensions of A8 unit (unit: mm)

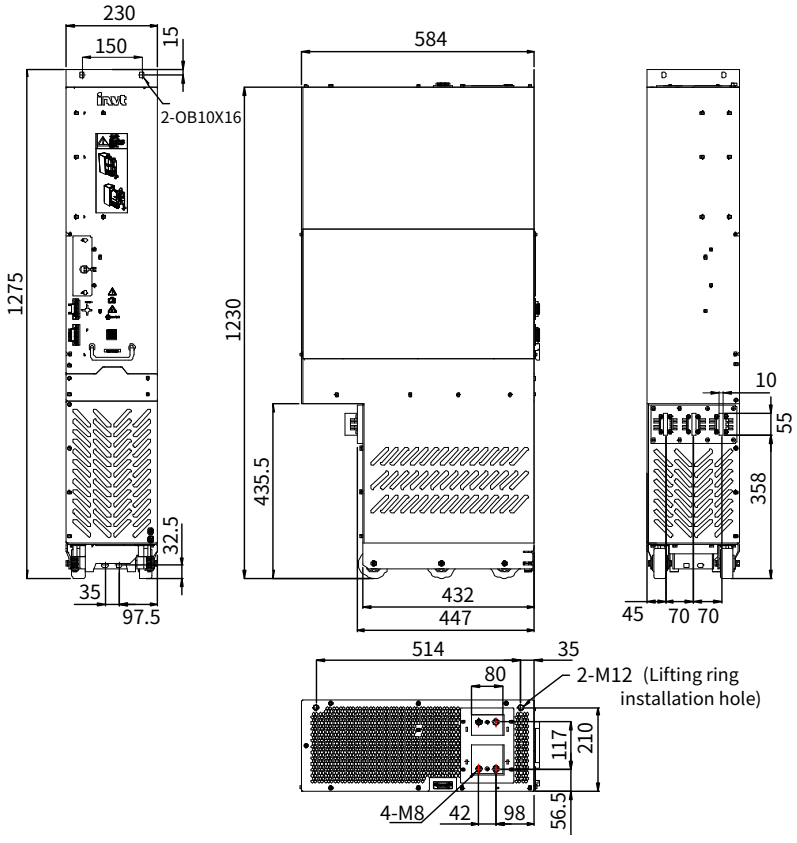


Figure B-5 Installation dimensions of A8 unit fast connector (unit: mm)

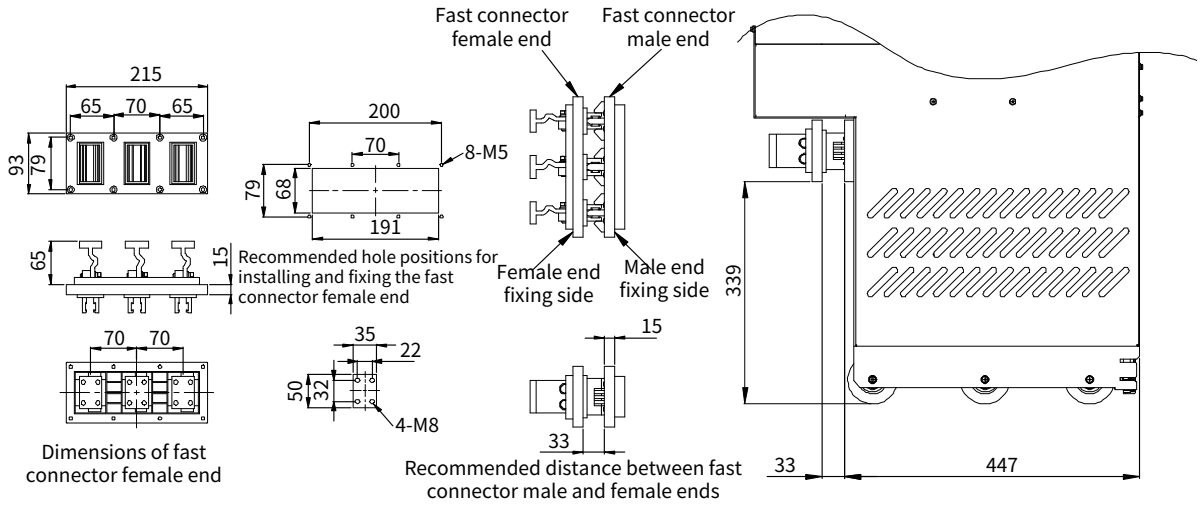


Figure B-6 Layout of 1*A8 frame bottom support

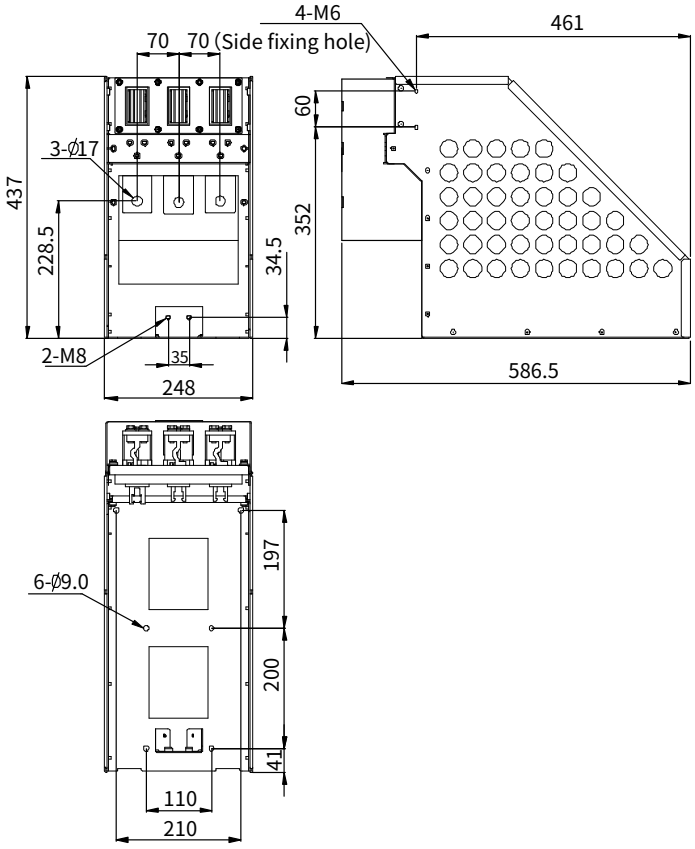


Figure B-7 Installation dimensions of A8+L frame (unit: mm)

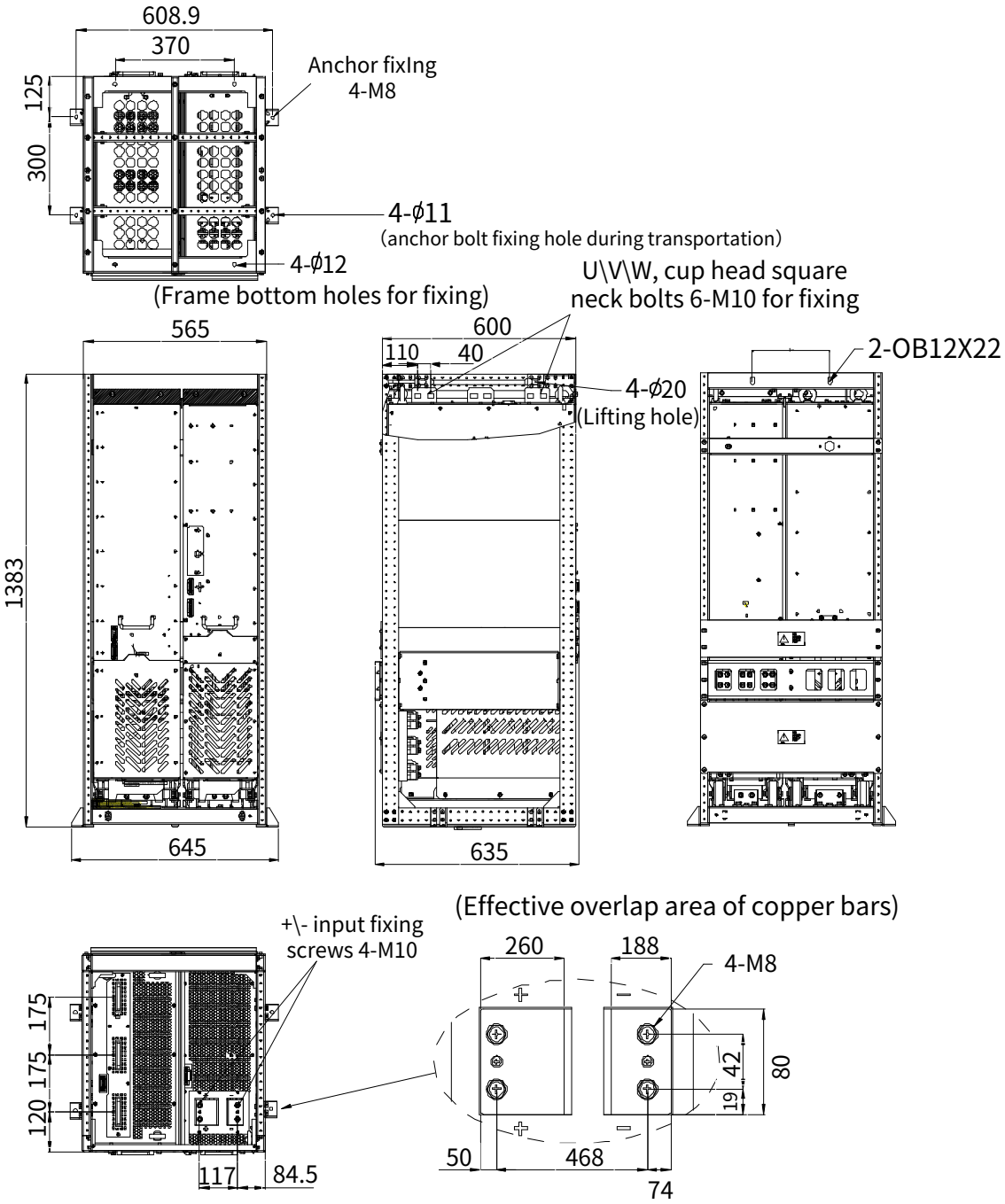


Figure B-8 Installation dimensions of 2*A8+L frame (unit: mm)

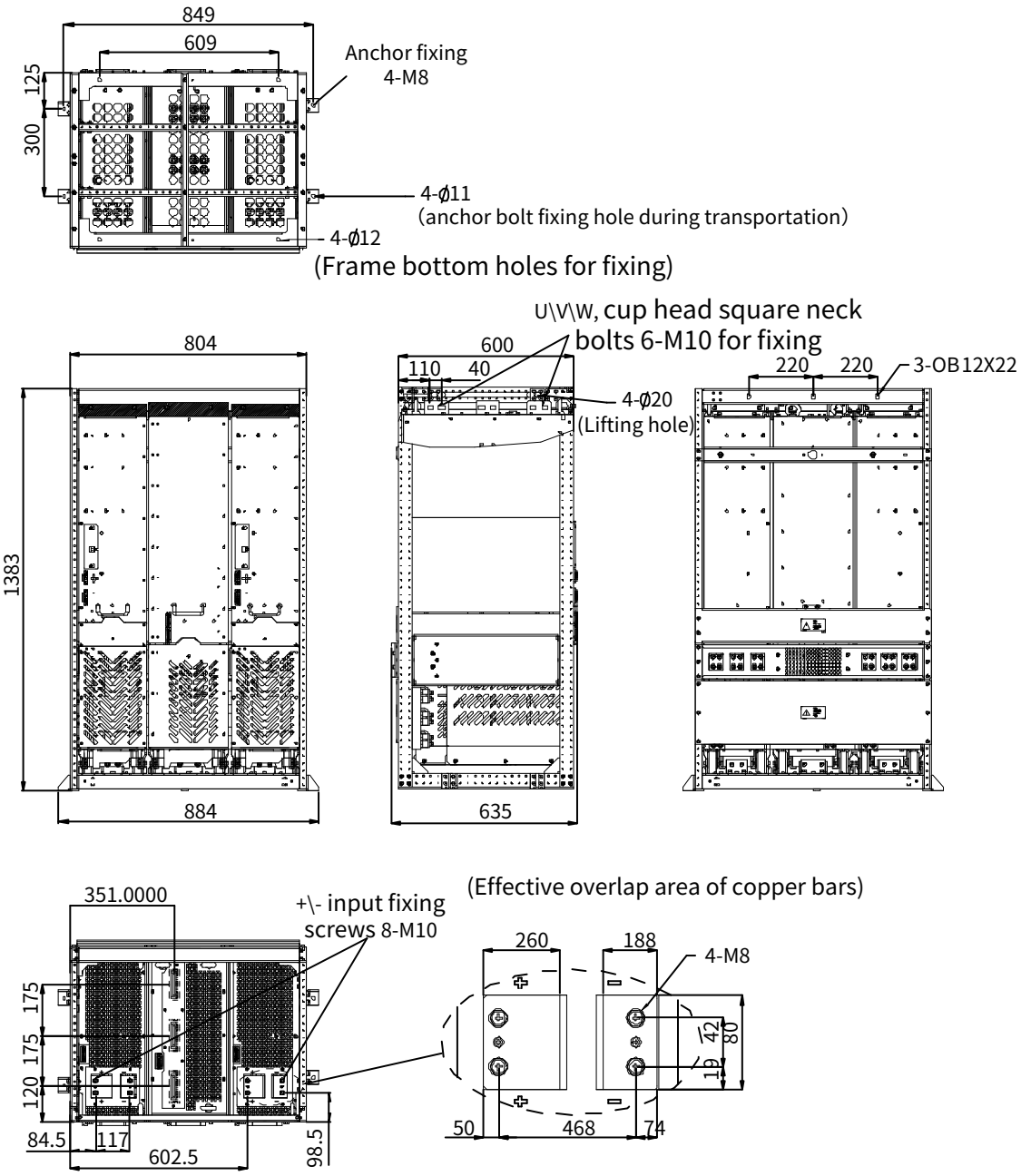


Figure B-9 Installation dimensions of A4i filter reactor (unit: mm)

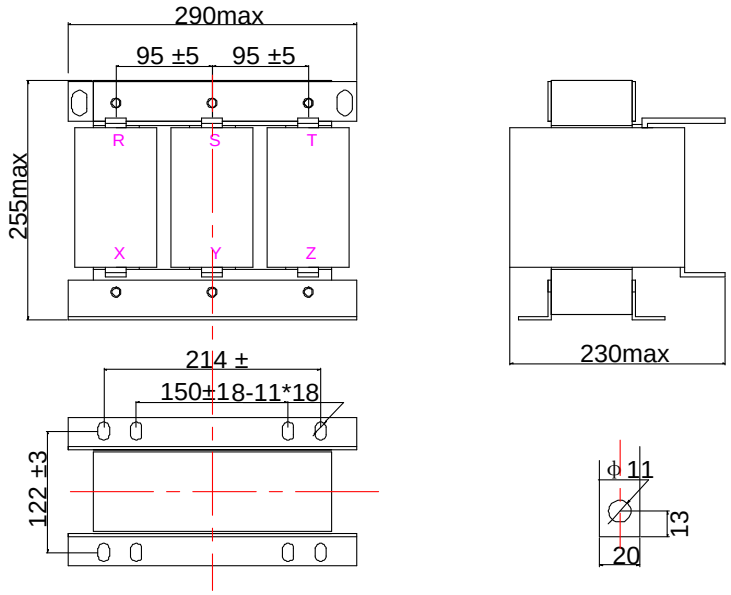
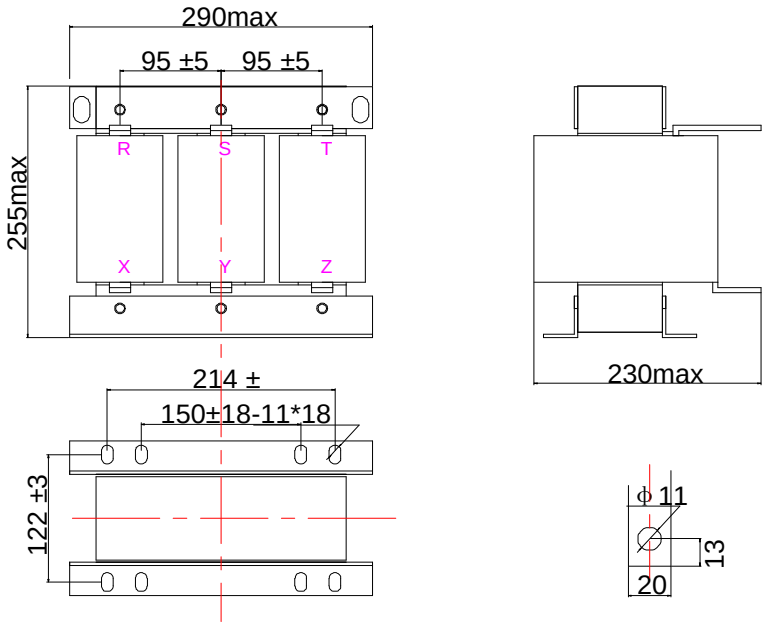


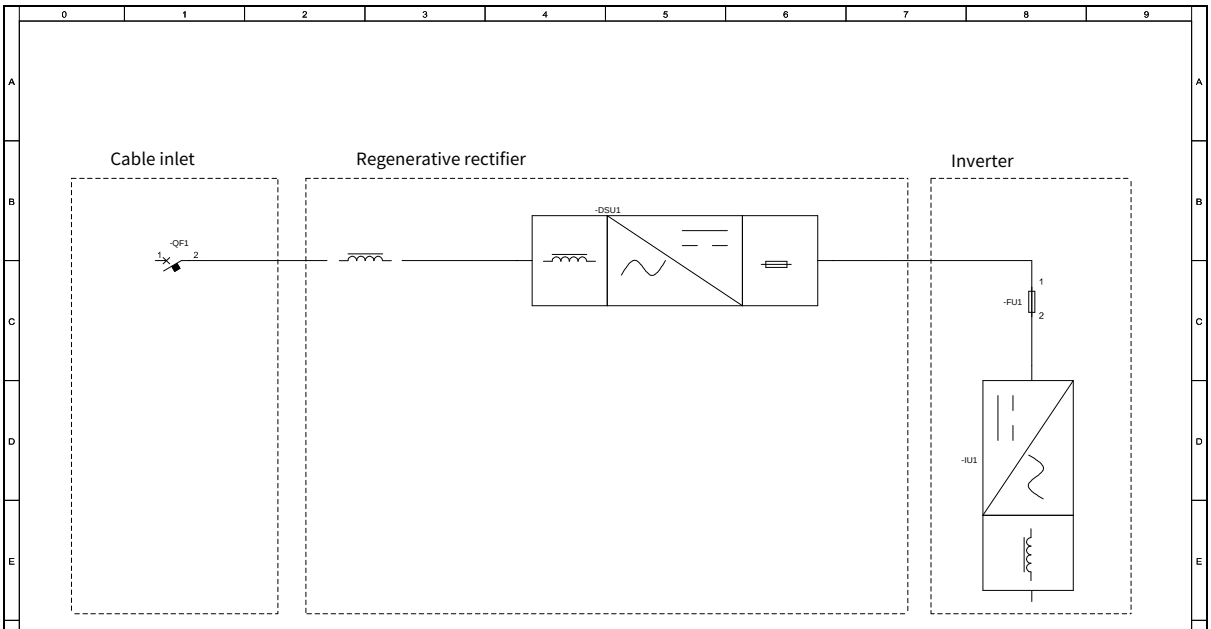
Figure B-10 Installation dimensions of A6i filter reactor (unit: mm)



Appendix C Example electrical diagram

GD880 regenerative rectifier basic electrical drawing example (A4-A7)

深圳市英威腾电气股份有限公司 SHENZHEN INVT ELECTRIC CO.,LTD	设计 Designed	设计日期 Designed Date	审核 Checked	标准化 Std.Checked	批准 Approved	图纸名称 Dwg.Name	封面 Cover	图号 Dwg.No.		功能 Function	=B0	位置 Position	
						产品型号 Product		版本 Revision		规格 Standard	A3	页数 Sheet	1/1



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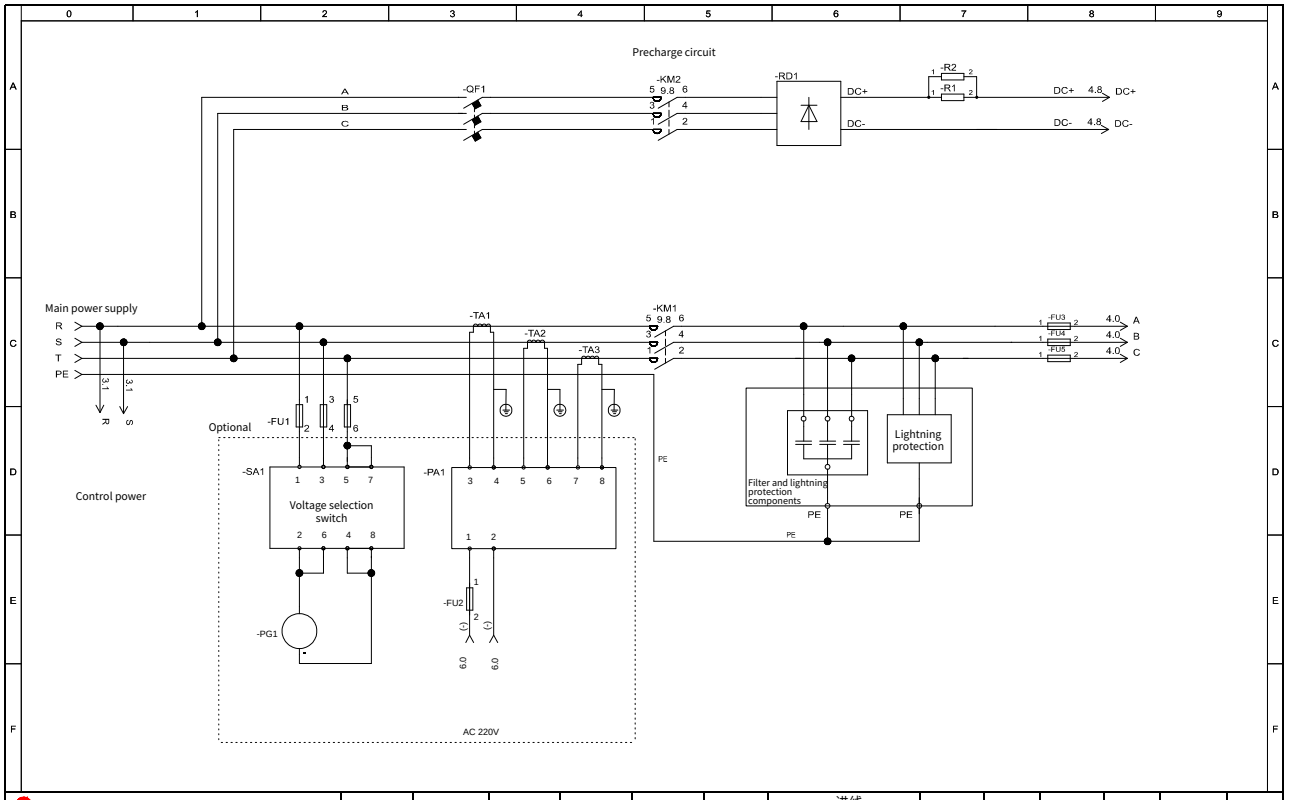
						产品型号 Product		版本 Revision		规格 Standard	A3	页数 Sheet	1/6



深圳市英威腾电气股份有限公司 SHENZHEN INVT ELECTRIC CO.,LTD	设计 Designed	设计日期 Designed Date	审核 Checked	标准化 Std.Checked	批准 Approved	图纸名称 Dwg.Name	进线 Cable inlet	图号 Dwg.No.	02	功能 Function	=B1	位置 Position	
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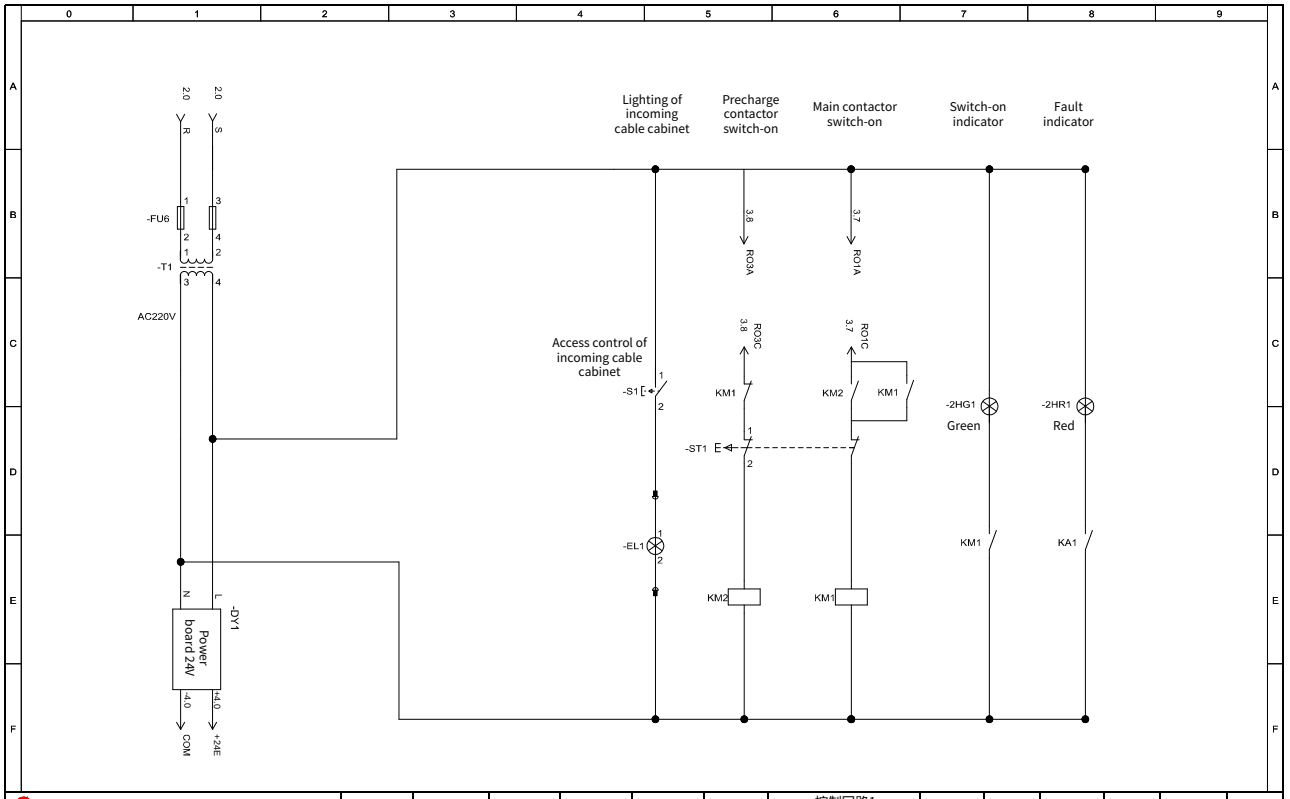

深圳市英威腾电气股份有限公司 SHENZHEN INVT ELECTRIC CO.,LTD	设计 Designed	设计日期 Designed Date	审核 Checked	标准化 Std.Checked	批准 Approved	图纸名称 Dwg.Name	控制回路1 Control circuit 1	图号 Dwg.No.	03	功能 Function	=B1	位置 Position	
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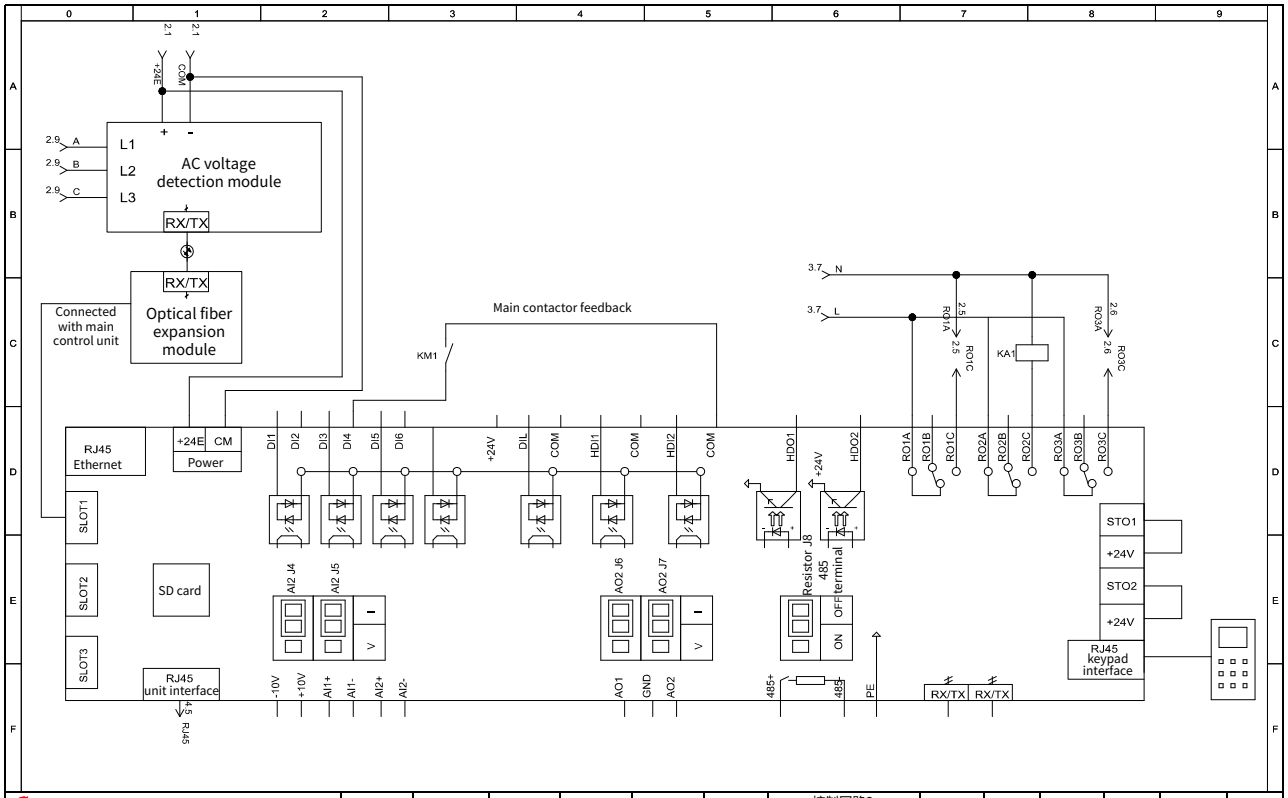

深圳市英威腾电气股份有限公司 SHENZHEN INVT ELECTRIC CO.,LTD	设计 Designed	设计日期 Designed Date	审核 Checked	标准化 Std.Checked	批准 Approved	图纸名称 Dwg.Name	控制回路2 Control circuit 2	图号 Dwg.No.	04	功能 Function	=B1	位置 Position	
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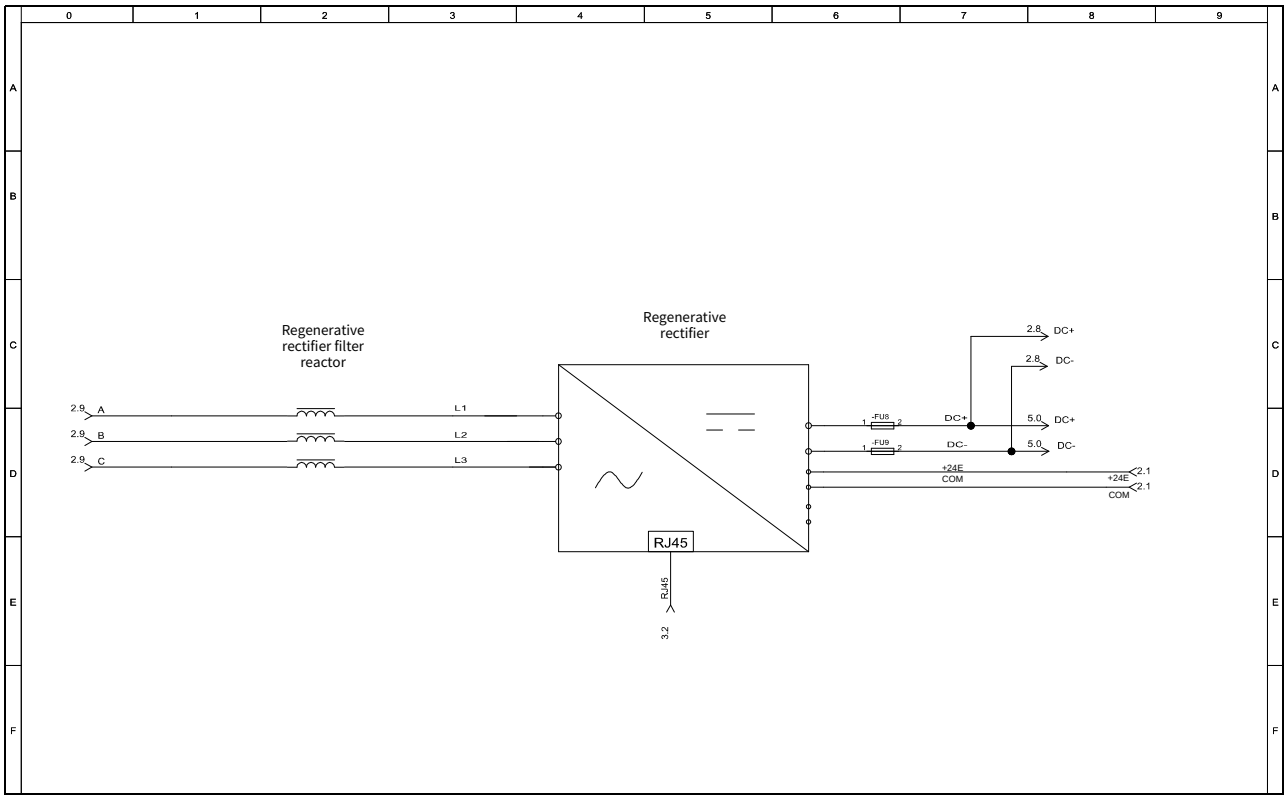

深圳市英威腾电气股份有限公司 SHENZHEN INVT ELECTRIC CO.,LTD	设计 Designed	设计日期 Designed Date	审核 Checked	标准化 Std.Checked	批准 Approved	图纸名称 Dwg.Name	回馈整流控制回路 Regenerative rectifier circuit	图号 Dwg.No.	05	功能 Function	=B1	位置 Position	
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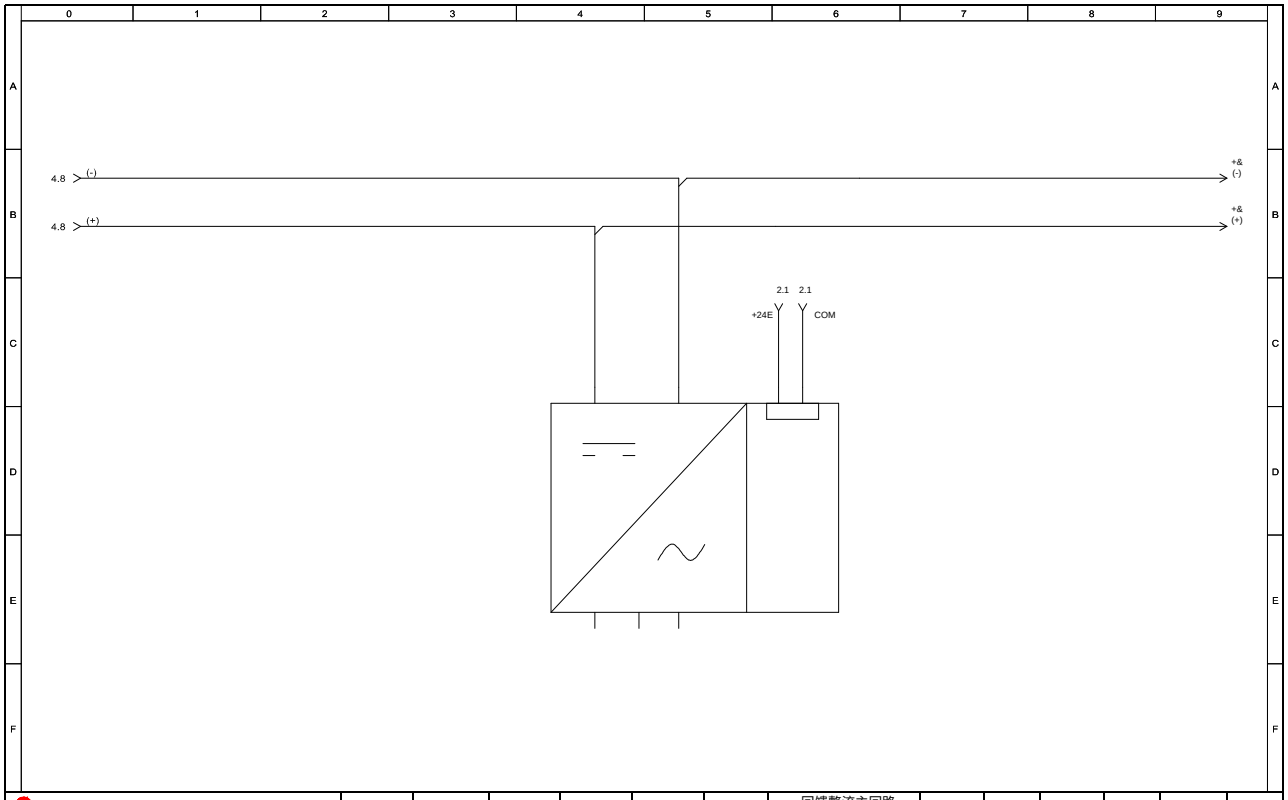

深圳市英威腾电气股份有限公司 SHENZHEN INVT ELECTRIC CO.,LTD	设计 Designed	设计日期 Designed Date	审核 Checked	标准化 Std.Checked	批准 Approved	图纸名称 Dwg.Name	回馈整流主回路 Regenerative rectifier main circuit	图号 Dwg.No.	06	功能 Function	=B1	位置 Position	
						产品型号 Product		版本 Revision		规格 Standard	A3	页数 Sheet	6/6

GD880 regenerative rectifier basic electrical diagram example (A8)

深圳市英威腾电气股份有限公司 SHENZHEN INVT ELECTRIC CO.,LTD	设计 Designed	设计日期 Designed Date	审核 Checked	标准化 Std.Checked	批准 Approved	图纸名称 Dwg.Name	封面 Cover	图号 Dwg.No.		功能 Function	=B0	位置 Position	
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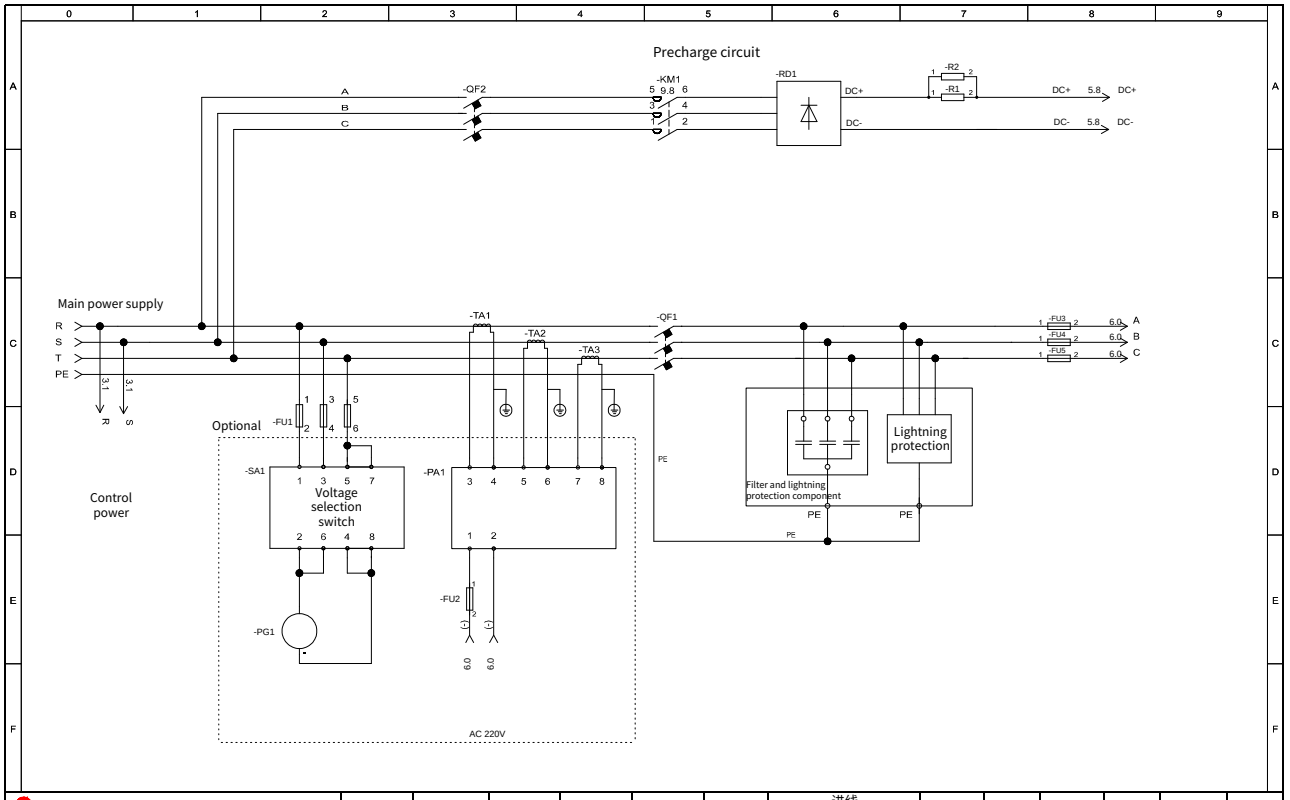

深圳市英威腾电气股份有限公司 SHENZHEN INVT ELECTRIC CO.,LTD	设计 Designed	设计日期 Designed Date	审核 Checked	标准化 Std.Checked	批准 Approved	图纸名称 Dwg.Name	进线 Cable inlet	图号 Dwg.No.	02	功能 Function	=B1	位置 Position	
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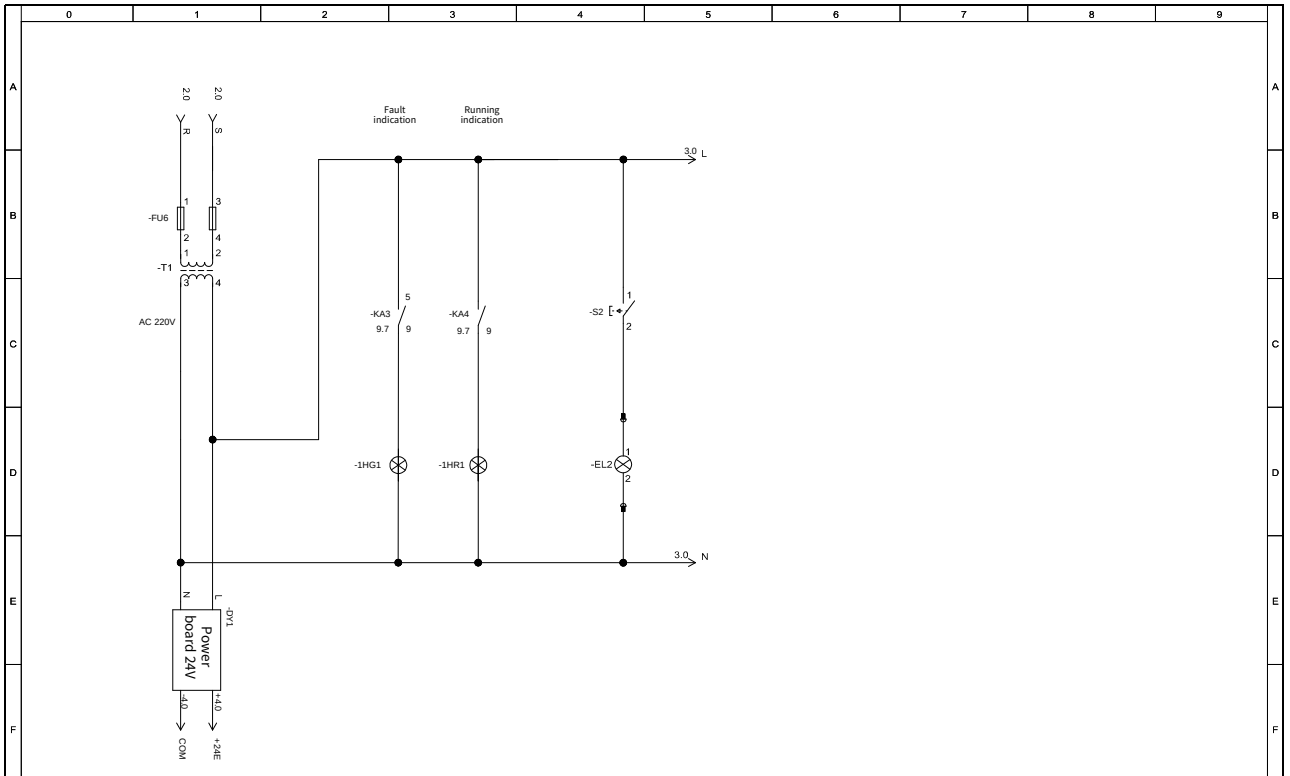
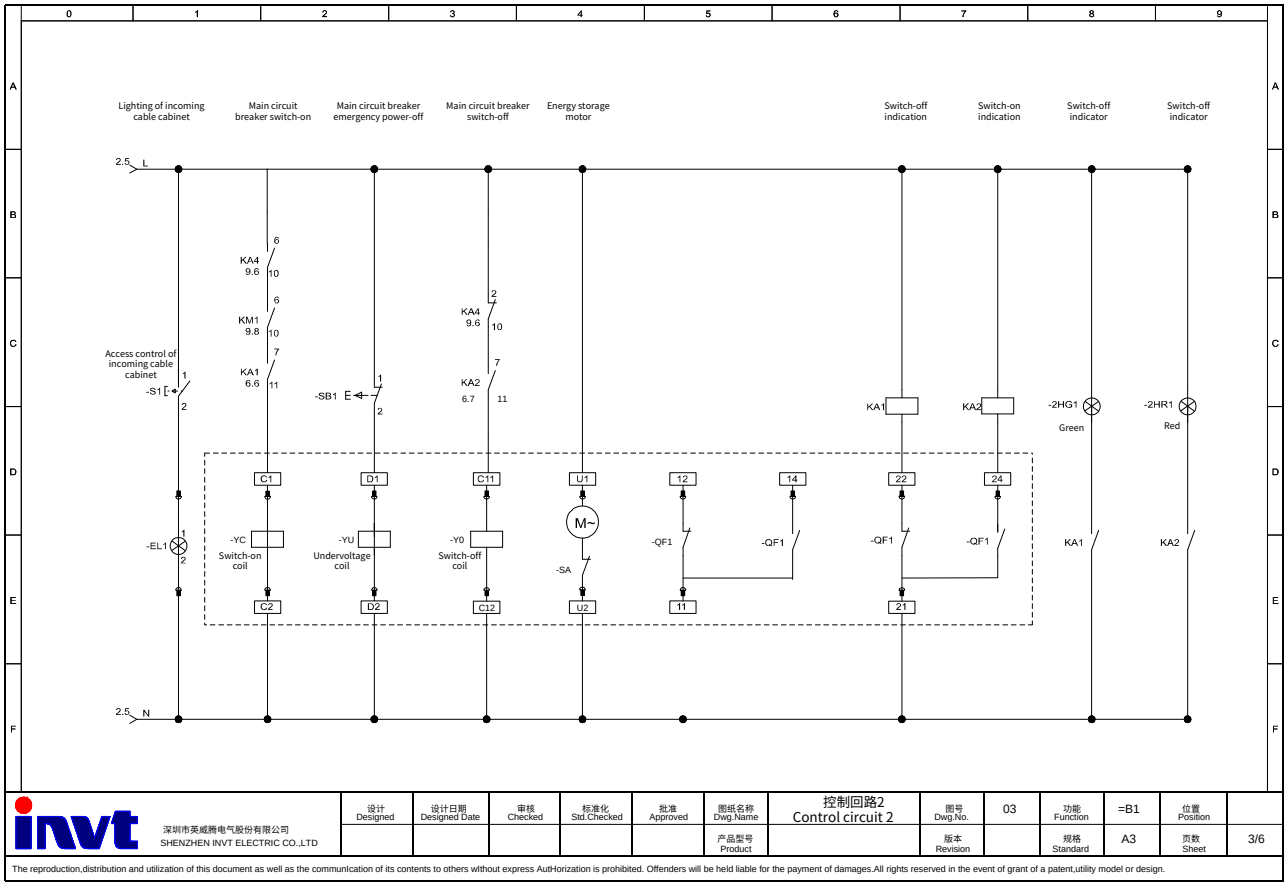


深圳市英威腾电气股份有限公司 SHENZHEN INVT ELECTRIC CO.,LTD	设计 Designed	设计日期 Designed Date	审核 Checked	标准化 Std.Checked	批准 Approved	图纸名称 Dwg.Name	控制回路1 Control circuit 1	图号 Dwg.No.	03	功能 Function	=B1	位置 Position	
						产品型号 Product		版本 Revision		规格 Standard	A3	页数 Sheet	3/6


Lighting of incoming cable cabinet
Main circuit breaker switch-on
Main circuit breaker emergency power-off
Main circuit breaker switch-off
Energy storage motor
Switch-off indication
Switch-on indication
Switch-off indicator
Switch-off indicator
Access control of incoming cable cabinet
-S1
-SB1
KA4 9.6
KM1 9.8
KA1 6.6
KA2 6.7
KA1
KA2
-2HG1
Green
-2HR1
Red
C1
D1
C11
U1
12
14
22
24
-YC
Switch-on coil
-YU
Undervoltage coil
-Y0
Switch-off coil
M~
-SA
-QF1
-EL1
C2
D2
C12
U2
11
21
KA1
KA2
2.5 L
2.5 N
深圳市英威腾电气股份有限公司
SHENZHEN INVT ELECTRIC CO.,LTD
设计 Designed
设计日期 Designed Date
审核 Checked
标准化 Std.Checked
批准 Approved
图纸名称 Dwg.Name
控制回路2 Control circuit 2
图号 Dwg.No.
03
功能 Function
=B1
位置 Position
产品型号 Product
版本 Revision
规格 Standard
A3
页数 Sheet
3/6
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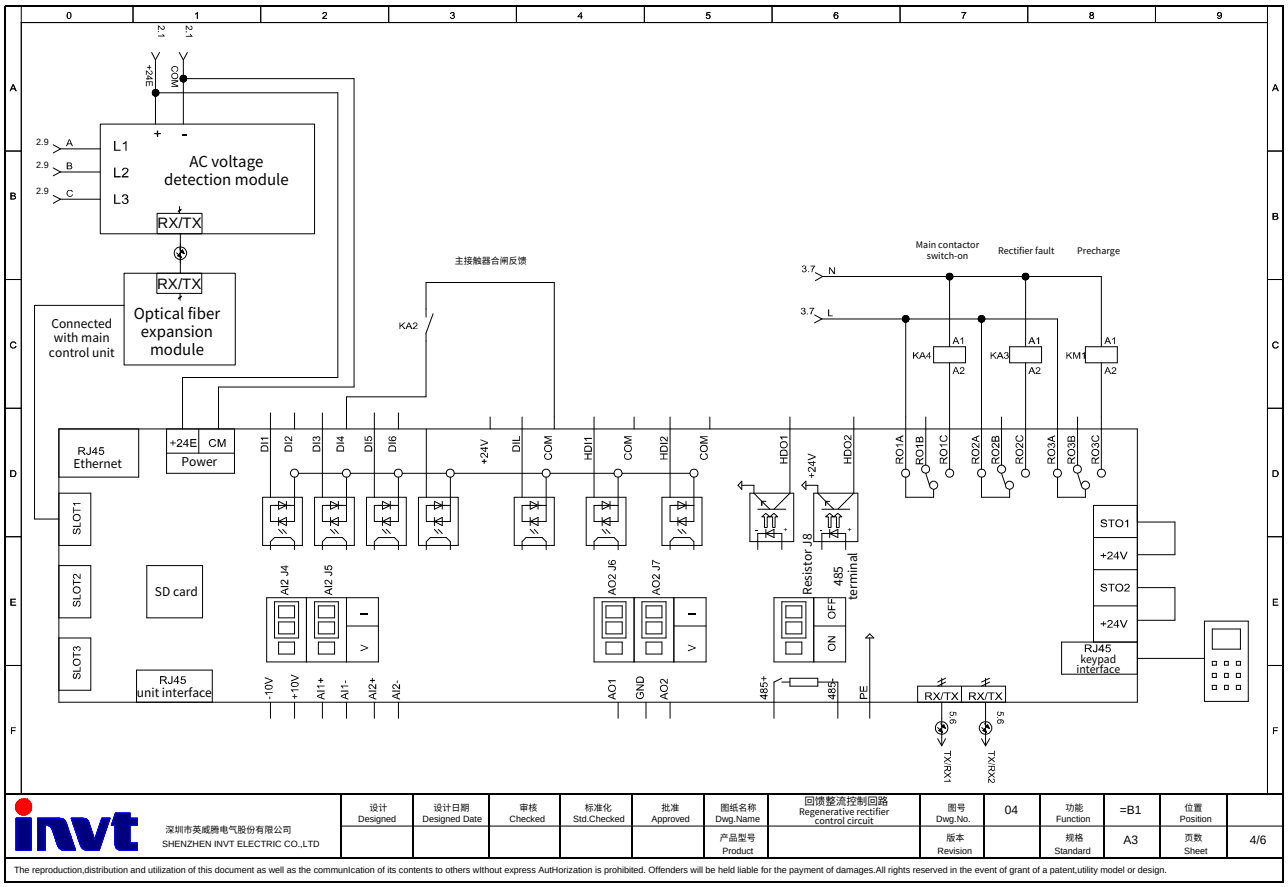
+24E
COM
AC voltage detection module
L1
L2
L3
RX/TX
Optical fiber expansion module
Connected with main control unit
主接触器合闸反馈
KA2
Main contactor switch-on
Rectifier fault
Precharge
KA4
KA3
KM1
RJ45 Ethernet
Power
DI1
DI2
DI3
DI4
DI5
DI6
+24V
DIL
COM
HDI1
HDI2
HDO1
HDO2
RO1A
RO1B
RO1C
RO2A
RO2B
RO2C
RO3A
RO3B
RO3C
SLOT1
SLOT2
SLOT3
SD card
AI2 J4
AI2 J5
AO2 J6
AO2 J7
Resistor J8
485 terminal
OFF
ON
STO1
STO2
RJ45 keypad interface
RJ45 unit interface
-10V
+10V
AI1+
AI1-
AI2+
AI2-
AO1
GND
AO2
485+
485-
PE
TX/RX1
TX/RX2
深圳市英威腾电气股份有限公司
SHENZHEN INVT ELECTRIC CO.,LTD
回馈整流控制回路 Regenerative rectifier control circuit
04
4/6
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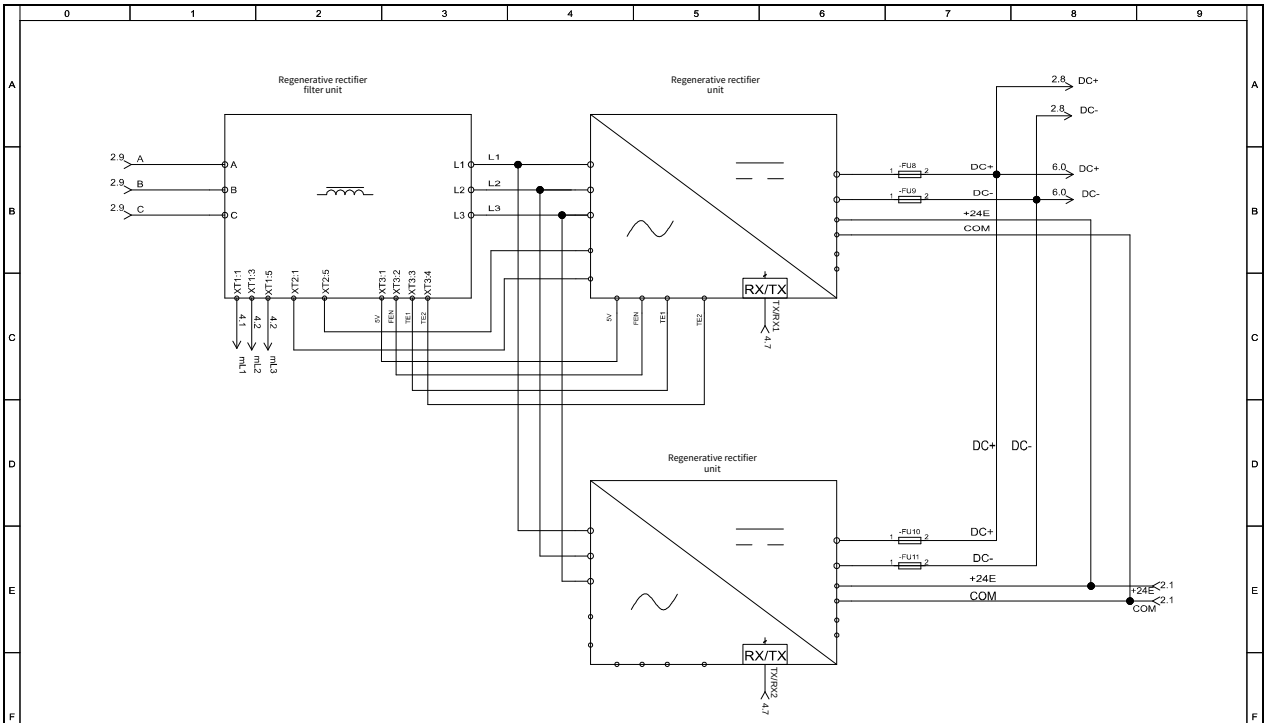
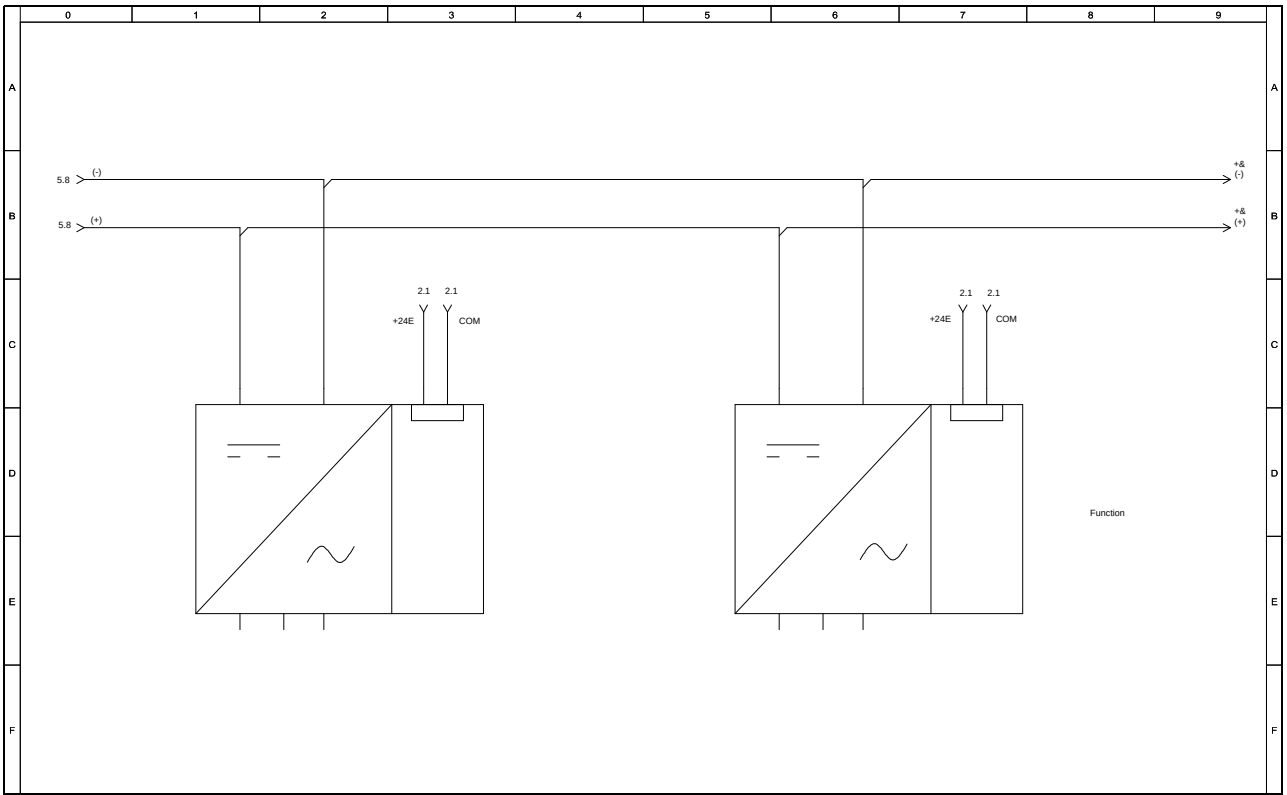


深圳市英威腾电气股份有限公司 SHENZHEN INVT ELECTRIC CO.,LTD	设计 Designed	设计日期 Designed Date	审核 Checked	标准化 Std.Checked	批准 Approved	图纸名称 Dwg.Name	回馈整流主回路 Regenerative rectifier main circuit	图号 Dwg.No.	05	功能 Function	=B1	位置 Position	
						产品型号 Product		版本 Revision		规格 Standard	A3	页数 Sheet	5/6



深圳市英威腾电气股份有限公司 SHENZHEN INVT ELECTRIC CO.,LTD	设计 Designed	设计日期 Designed Date	审核 Checked	标准化 Std.Checked	批准 Approved	图纸名称 Dwg.Name	逆变单元 Inverter unit	图号 Dwg.No.	06	功能 Function	=B1	位置 Position	
						产品型号 Product		版本 Revision		规格 Standard	A3	页数 Sheet	6/6

Appendix D Order No.

Product model	Structure	Order No.	Qty	Remarks
400VAC				
GD880-81-0116-4-Z	A4+L	GD880-81-0116-4	1	Rectifier module
		ACR-0116-0M20-0.4SC-4149-RO	1	Filter reactor
		HC-0110-4-Z	1	Precharge component
		RV-380V	1	Surge protection module
		GD800-LB	1	EMI filter module
		IVDM10	1	AC voltage detection module
		EC-TX821	1	Optical fiber expansion module
		HFBR-1M	1	1m optical fiber
GD880-81-0149-4-Z	A4+L	GD880-81-0149-4	1	Rectifier module
		ACR-0149-0M20-0.4SC-4149-RO	1	Filter reactor
		HC-0110-4-Z	1	Precharge component
		RV-380V	1	Surge protection module
		GD800-LB	1	EMI filter module
		IVDM10	1	AC voltage detection module
		EC-TX821	1	Optical fiber expansion module
		HFBR-1M	1	1m optical fiber
GD880-81-0183-4-Z	A4+L	GD880-81-0183-4	1	Rectifier module
		ACR-0183-0M15-0.4SC-4149-RO	1	Filter reactor
		HC-0110-4-Z	1	Precharge component
		RV-380V	1	Surge protection module
		GD800-LB	1	EMI filter module
		IVDM10	1	AC voltage detection module
		EC-TX821	1	Optical fiber expansion module
		HFBR-1M	1	1m optical fiber
GD880-81-0245-4-Z	A6+L	GD880-81-0245-4	1	Rectifier module
		ACR-0245-0M12-0.4SC-4149-RO	1	Filter reactor
		HC-0110-4-Z	1	Precharge component
		RV-380V	1	Surge protection module
		GD800-LB	1	EMI filter module
		SOP-880-01	1	Keypad
		L=2M (CHV-SE)	1	2M keypad cable
		IVDM10	1	AC voltage detection module
		EC-TX821	1	Optical fiber expansion module
		HFBR-1M	1	1m optical fiber
GD880-81-0299-4-Z	A6+L	GD880-81-0299-4	1	Rectifier unit
		ACR-0299-090U-0.4SC-4149-RO	1	Filter reactor
		HC-0200-4	1	Precharge component
		RV-380V	1	Surge protection module
		GD800-LB	1	EMI filter module
		SOP-880-01	1	Keypad
		L=2M (CHV-SE)	1	2M keypad cable
		IVDM10	1	AC voltage detection module

Product model	Structure	Order No.	Qty	Remarks
		EC-TX821	1	Optical fiber expansion module
		HFBR-1M	1	1m optical fiber
GD880-81-0349-4-Z	A7+L	GD880-81-0349-4	1	Rectifier unit
		ACR-0349-080U-0.4SC-4149-RO	1	Filter reactor
		HC-0200-4	1	Precharge component
		RV-380V	1	Surge protection module
		GD800-LB	1	EMI filter module
		SOP-880-01	1	Keypad
		L=2M (CHV-SE)	1	2M keypad cable
		IVDM10	1	AC voltage detection module
		EC-TX821	1	Optical fiber expansion module
		HFBR-1M	1	1m optical fiber
GD880-81-0395-4-Z	A7+L	GD880-81-0395-4	1	Rectifier unit
		ACR-0395-070U-0.4SC-4149-RO	1	Filter reactor
		HC-0200-4	1	Precharge component
		RV-380V	1	Surge protection module
		GD800-LB	1	EMI filter module
		SOP-880-01	1	Keypad
		L=2M (CHV-SE)	1	2M keypad cable
		IVDM10	1	AC voltage detection module
		EC-TX821	1	Optical fiber expansion module
		HFBR-1M	1	1m optical fiber
GD880-81-0516-4-Z	A7+L	GD880-81-0516-4	1	Rectifier unit
		ACR-0516-055U-0.4SC-4149-RO	1	Filter reactor
		BUB800-0900-4	1	Precharge component
		SOP-880-01	1	Keypad
		L=2M (CHV-SE)	1	2M keypad cable
		IVDM10	1	AC voltage detection module
		EC-TX821	1	Optical fiber expansion module
		HFBR-1M	1	1m optical fiber
GD880-81-0640-4-Z	A8+L	GD880-RCU-11	1	Control module
		GD880-81-0640-4	1	Rectifier unit
		GD880-04-0640-4	1	Filter module
		A8+L-K	1	Fast connector kit (for -K models)
		BUB800-0900-4	1	Precharge component
		HFBR-3M	1	3M fiber optic
		SOP-880-01	1	Keypad
		L=2M (CHV-SE)	1	2M keypad cable
		IVDM10	1	AC voltage detection module
		EC-TX821	1	Optical fiber expansion module
		HFBR-1M	1	1m optical fiber
GD880-81-0900-4-Z	A8+L	GD880-RCU-11	1	Control module
		GD880-81-0900-4	1	Rectifier unit
		GD880-04-0900-4	1	Filter module
		A8+L-K	1	Fast connector kit (for -K models)
		BUB800-0900-4	1	Precharge component
		HFBR-3M	1	3M fiber optic

Product model	Structure	Order No.	Qty	Remarks
		SOP-880-01	1	Keypad
		L=2M (CHV-SE)	1	2M keypad cable
		IVDM10	1	AC voltage detection module
		EC-TX821	1	Optical fiber expansion module
		HFBR-1M	1	1m optical fiber
GD880-81-1180-4-Z	2*A8+L	GD880-RCU-13	1	Control module
		GD880-81-0640-4	2	Rectifier unit
		GD880-04-1180-4	1	Filter module
		2*A8+L-K	1	Fast connector kit (for -K models)
		BUB800-1770-4	1	Precharge component
		HFBR-3M	2	3M fiber optic
		SOP-880-01	1	Keypad
		L=2M (CHV-SE)	1	2M keypad cable
		IVDM10	1	AC voltage detection module
		EC-TX821	1	Optical fiber expansion module
		HFBR-1M	1	1m optical fiber
GD880-81-1770-4-Z	2*A8+L	GD880-RCU-13	1	Control module
		GD880-81-0900-4	2	Rectifier unit
		GD880-04-1770-4	1	Filter module
		2*A8+L-K	1	Fast connector kit (for -K models)
		BUB800-1770-4	1	Precharge component
		HFBR-3M	2	3M fiber optic
		SOP-880-01	1	Keypad
		L=2M (CHV-SE)	1	2M keypad cable
		IVDM10	1	AC voltage detection module
		EC-TX821	1	Optical fiber expansion module
		HFBR-1M	1	1m optical fiber
GD880-81-2360-4-Z	2*(2*A8+L)	GD880-RCU-14	1	Control module
		GD880-81-0640-4	4	Rectifier unit
		GD880-04-1180-4	2	Filter module
		2*A8+L-K	2	Fast connector kit (for -K models)
		BUB800-1770-4	2	Precharge component
		HFBR-5M	4	3M fiber optic
		SOP-880-01	1	Keypad
		L=2M (CHV-SE)	1	2M keypad cable
		IVDM10	1	AC voltage detection module
		EC-TX821	1	Optical fiber expansion module
		HFBR-1M	1	1m optical fiber
GD880-81-3540-4-Z	2*(2*A8+L)	GD880-RCU-14	1	Control module
		GD880-81-0900-4	4	Rectifier unit
		GD880-04-1770-4	2	Filter module
		2*A8+L-K	2	Fast connector kit (for -K models)
		BUB800-1770-4	2	Precharge component
		HFBR-5M	4	3M fiber optic
		SOP-880-01	1	Keypad
		L=2M (CHV-SE)	1	2M keypad cable
		IVDM10	1	AC voltage detection module

Product model	Structure	Order No.	Qty	Remarks
		EC-TX821	1	Optical fiber expansion module
		HFBR-1M	1	1m optical fiber
GD880-81-5310-4-Z	2*(2*A8+L)	GD880-RCU-16	1	Control module
		GD880-81-0900-4	6	Rectifier unit
		GD880-04-1770-4	3	Filter module
		2*A8+L-K	3	Fast connector kit (for -K models)
		BUB800-1770-4	3	Precharge component
		HFBR-5M	6	3M fiber optic
		SOP-880-01	1	Keypad
		L=2M (CHV-SE)	1	2M keypad cable
		IVDM10	1	AC voltage detection module
		EC-TX821	1	Optical fiber expansion module
		HFBR-1M	1	1m optical fiber
690VAC				
GD880-81-0600-6-Z	A8+L	GD880-RCU-11	1	Control module
		GD880-81-0600-6	1	Rectifier unit
		GD880-04-0600-6	1	Filter module
		A8+L-K	1	Fast connector kit (for -K models)
		BUB800-0900-6	1	Precharge component
		HFBR-3M	1	3M fiber optic
		SOP-880-01	1	Keypad
		L=2M (CHV-SE)	1	2M keypad cable
		IVDM10	1	AC voltage detection module
		EC-TX821	1	Optical fiber expansion module
		HFBR-1M	1	1m optical fiber
GD880-81-0900-6-Z	A8+L	GD880-RCU-11	1	Control module
		GD880-81-0900-6	1	Rectifier unit
		GD880-04-0900-6	1	Filter module
		A8+L-K	1	Fast connector kit (for -K models)
		BUB800-0900-6	1	Precharge component
		HFBR-3M	1	3M fiber optic
		SOP-880-01	1	Keypad
		L=2M (CHV-SE)	1	2M keypad cable
		IVDM10	1	AC voltage detection module
		EC-TX821	1	Optical fiber expansion module
		HFBR-1M	1	1m optical fiber
GD880-81-1180-6-Z	2*A8+L	GD880-RCU-13	1	Control module
		GD880-81-0600-6	2	Rectifier unit
		GD880-04-1180-6	1	Filter module
		2*A8+L-K	1	Fast connector kit (for -K models)
		BUB800-1770-6	1	Precharge component
		HFBR-3M	2	3M fiber optic
		SOP-880-01	1	Keypad
		L=2M (CHV-SE)	1	2M keypad cable
		IVDM10	1	AC voltage detection module
		EC-TX821	1	Optical fiber expansion module
		HFBR-1M	1	1m optical fiber

Product model	Structure	Order No.	Qty	Remarks
GD880-81-1770-6-Z	2*A8+L	GD880-RCU-13	1	Control module
		GD880-81-0900-6	2	Rectifier unit
		GD880-04-1770-6	1	Filter module
		2*A8+L-K	1	Fast connector kit (for -K models)
		BUB800-1770-6	1	Precharge component
		HFBR-3M	2	3M fiber optic
		SOP-880-01	1	Keypad
		L=2M (CHV-SE)	1	2M keypad cable
		IVDM10	1	AC voltage detection module
		EC-TX821	1	Optical fiber expansion module
		HFBR-1M	1	1m optical fiber
GD880-81-2360-6-Z	2*(2*A8+L)	GD880-RCU-14	1	Control module
		GD880-81-0640-6	4	Rectifier unit
		GD880-04-1180-6	2	Filter module
		2*A8+L-K	2	Fast connector kit (for -K models)
		BUB800-1770-6	2	Precharge component
		HFBR-5M	4	3M fiber optic
		SOP-880-01	1	Keypad
		L=2M (CHV-SE)	1	2M keypad cable
		IVDM10	1	AC voltage detection module
		EC-TX821	1	Optical fiber expansion module
		HFBR-1M	1	1m optical fiber
GD880-81-3540-6-Z	2*(2*A8+L)	GD880-RCU-14	1	Control module
		GD880-81-0900-6	4	Rectifier unit
		GD880-04-1770-6	2	Filter module
		2*A8+L-K	2	Fast connector kit (for -K models)
		BUB800-1770-6	2	Precharge component
		HFBR-5M	4	3M fiber optic
		SOP-880-01	1	Keypad
		L=2M (CHV-SE)	1	2M keypad cable
		IVDM10	1	AC voltage detection module
		EC-TX821	1	Optical fiber expansion module
		HFBR-1M	1	1m optical fiber
GD880-81-5310-6-Z	2*(2*A8+L)	GD880-RCU-16	1	Control module
		GD880-81-0900-6	6	Rectifier unit
		GD880-04-1770-6	3	Filter module
		2*A8+L-K	3	Fast connector kit (for -K models)
		BUB800-1770-6	3	Precharge component
		HFBR-5M	6	3M fiber optic
		SOP-880-01	1	Keypad
		L=2M (CHV-SE)	1	2M keypad cable
		IVDM10	1	AC voltage detection module
		EC-TX821	1	Optical fiber expansion module
		HFBR-1M	1	1m optical fiber

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Shenzhen INVT Electric Co., Ltd.
Address: INVT Guangming Technology Building, Songbai Road, Matian, Guangming District, Shenzhen, China
INVT Power Electronics (Suzhou) Co., Ltd.
Address: No. 1 Kunlun Mountain Road, Science & Technology Town, Gaoxin District, Suzhou, Jiangsu, China
Website: www.invt.com

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