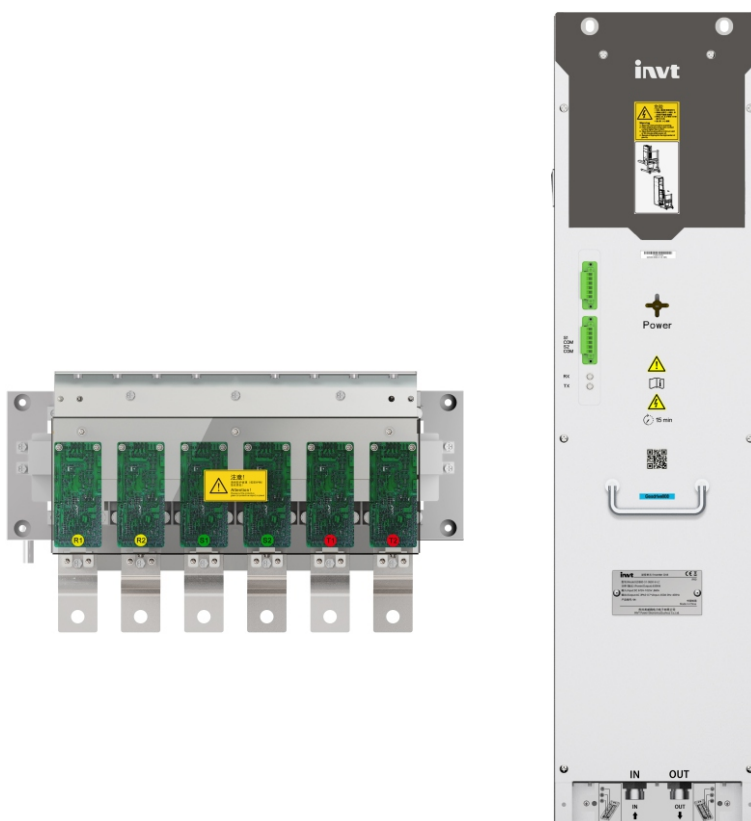


Goodrive880 Series Water-cooled Drive Hardware Manual



No.	Change description	Version	Release date
1	First release.	V1.0	December 2022

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. Product overview:

- Rated voltage class: 690V AC
- 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:

Petroleum: Offshore drilling rig platform

Marine: main and auxiliary thrust drives for ships

Others: 690V AC water-cooled test platform

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

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

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

Contents

Preface.....	i
Contents.....	ii
1 Safety precautions	1
1.1 Safety declaration.....	1
1.2 Safety definition.....	1
1.3 Warning symbols.....	1
1.4 Safety guidelines.....	1
1.4.1 Delivery and installation.....	2
1.4.2 Commissioning and running.....	2
1.4.3 Maintenance and component replacement.....	3
1.4.4 Disposal.....	3
2 Product overview	4
2.1 Product specifications.....	4
2.2 Product nameplate and model.....	7
2.3 Product ratings.....	7
2.4 Unit outline dimensions and weight.....	8
2.5 Derated application.....	8
2.5.1 Derating due to coolant and ambient temperature.....	8
2.5.2 Derating due to altitude.....	9
2.5.3 Derating due to carrier frequency.....	9
2.6 Overload capability.....	10
2.7 Hardware principles	11
2.7.1 Basic principles.....	11
2.7.2 Paralleling principle	12
2.8 Product structure.....	14
2.9 System configuration	17
2.10 Electrical model selection.....	17
2.10.1 AC fuse.....	17
2.10.2 DC fuse.....	18
2.10.3 Isolation switch.....	18
3 Mechanical installation	19
3.1 Safety notes.....	19
3.2 Installation environment.....	19
3.3 Installation procedure.....	20
3.3.1 Unpacking inspection	20
3.3.2 Transportation.....	21
3.3.3 Unpacking	22
3.3.4 Lifting.....	23
3.3.5 Installation	24
3.3.6 Fastening torque	35
3.3.7 Checklist.....	35
4 Electrical installation	37
4.1 Safety notes.....	37
4.2 Insulation inspection.....	37
4.3 EMC regulations	38

4.3.1 Power cable.....	39
4.3.2 Control cable.....	40
4.3.3 Wiring suggestions	40
4.3.4 Shielded cable connection	42
4.3.5 Cable specification and recommendation.....	43
4.4 Electrical wiring.....	45
4.4.1 Main circuit wiring	45
4.4.2 Electrical installation checklist	47
5 Water resistance curve of coolant.....	48
5.1 Flow resistance curve of water-cooled inverter cold plate.....	48
5.2 Flow resistance curve of water-cooled rectifier cold plate.....	48
5.3 Flow resistance curve of water-cooled VFD cold plate	48
5.4 Protection against condensation	49
6 Maintenance and inspection.....	50
6.1 Periodical maintenance	50
6.1.1 Overview.....	50
6.1.2 Required tools.....	50
6.1.3 Maintenance cycle.....	50
6.2 Replacement of wearing parts.....	52
6.2.1 Capacitor	52
6.2.2 Cooling fan	53
6.2.3 DC fuse.....	54
6.2.4 Water-cooled unit (including rectifier, inverter, and VFD).....	55
6.3 Warranty description	58
Appendix A Technical data	59
A.1 Capacity	59
A.2 Grid specifications	59
A.3 Application standards	59
A.3.1 CE marking.....	60
A.3.2 EMC compliance declaration	60
A.4 EMC regulations	60
A.4.1 VFD category of C2	60
A.4.2 VFD category of C3	60
Appendix B Dimension drawings.....	61

1 Safety precautions

1.1 Safety declaration

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

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

1.2 Safety definition

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






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

Note: Actions taken to ensure proper running.


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




1.3 Warning symbols

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


Symbol	Name	Description
	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 power unit 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


	<ul style="list-style-type: none"> 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 power unit or
---	--

	<p>until the DC bus voltage is less than 36V. The minimum waiting time is listed in the following.</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th colspan="2">Power unit model</th> <th>Minimum waiting time</th> </tr> </thead> <tbody> <tr> <td>690V</td> <td>315kW and higher</td> <td>25 minutes</td> </tr> </tbody> </table>	Power unit model		Minimum waiting time	690V	315kW and higher	25 minutes
Power unit model		Minimum waiting time					
690V	315kW and higher	25 minutes					
	<ul style="list-style-type: none"> Do not refit the power unit unless authorized; otherwise fire, electric shock or other injury may result. 						
	<ul style="list-style-type: none"> The base may become hot when the power unit is running. Do not touch. Otherwise, you may get burnt. 						
	<ul style="list-style-type: none"> The electrical parts and components inside the power unit are electrostatic sensitive. Take measurements to prevent electrostatic discharge when performing related operations. 						

1.4.1 Delivery and installation


	<ul style="list-style-type: none"> Do not install the power unit on inflammables. In addition, prevent the power unit from contacting or adhering to inflammables. Do not run the power unit if it is damaged or incomplete. Do not contact the power unit with damp objects or body parts. Otherwise, electric shock may result. 								
Note	<ul style="list-style-type: none"> Select appropriate tools for power unit 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 power unit against physical shock or vibration during the delivery and installation. Do not carry the unit 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 power unit. As power unit 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 border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>Power cable conductor cross-sectional area S (mm²)</th> <th>Grounding conductor cross-sectional area (mm²)</th> </tr> </thead> <tbody> <tr> <td>$S \leq 16$</td> <td>S</td> </tr> <tr> <td>$16 < S \leq 35$</td> <td>16</td> </tr> <tr> <td>$35 < S$</td> <td>$S/2$</td> </tr> </tbody> </table> (+) and (-) are the DC bus input terminals, while U, V, and W are the output terminals. Connect the input power and motor cables properly; otherwise, the power unit may be damaged. 	Power cable conductor cross-sectional area S (mm ²)	Grounding conductor cross-sectional area (mm ²)	$S \leq 16$	S	$16 < S \leq 35$	16	$35 < S$	$S/2$
Power cable conductor cross-sectional area S (mm ²)	Grounding conductor cross-sectional area (mm ²)								
$S \leq 16$	S								
$16 < S \leq 35$	16								
$35 < S$	$S/2$								

1.4.2 Commissioning and running



	<ul style="list-style-type: none"> Cut off all power supplies connected to the power unit before terminal wiring, and wait for at least the time designated on the power unit after disconnecting the power supplies. High voltage presents inside the power unit during running. Do not carry out any operation on the power unit during running except for keypad setup. For products at voltage class of 4 or 6, the control terminals form extra-low voltage circuits.
---	--

	<p>Therefore, you need to prevent the control terminals from connecting to accessible terminals of other devices.</p> <ul style="list-style-type: none"> ● 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 unit 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 high voltage presents inside the power unit during running.
<p>Note</p>	<ul style="list-style-type: none"> ● Do not switch on or switch off the input power supplies of the power unit frequently. ● If the power unit has been stored for a long time without use, perform checking and carry out pilot run for the inverter unit before using it again. ● Close the power unit front cover before running; otherwise, electric shock may occur.

1.4.3 Maintenance and component replacement

	<ul style="list-style-type: none"> ● Only trained and qualified professionals are allowed to perform maintenance, inspection, and component replacement for the power unit. ● Cut off all power supplies connected to the power unit before terminal wiring, and wait for at least the time designated on the power 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 power unit.
<p>Note</p>	<ul style="list-style-type: none"> ● Use proper torque to tighten screws. ● During maintenance and component replacement, keep the power unit 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 power unit, or measure the control circuits of the power unit with a megohmmeter. ● During maintenance and component replacement, take proper anti-static measures on the power unit and its internal parts.

1.4.4 Disposal

	<ul style="list-style-type: none"> ● The power unit contains heavy metals. Dispose of a scrap power unit as industrial waste.
	<ul style="list-style-type: none"> ● Dispose of a scrap product separately at an appropriate collection point but not place it in the normal waste stream.

2 Product overview

GD880-51 (LC) series are Goodrive880 series 690V AC water-cooled inverter unit products (hereinafter referred to as water-cooled inverter units) with a single unit rated power of 400kW–630kW. The water-cooled inverter unit consists of buffer component, bus capacitor, IGBT, and other components. It is compact in structure and easy to integrate and maintain.

GD880-61 (LC) series are Goodrive880 series 690V AC water-cooled basic rectifier unit products (hereinafter referred to as water-cooled rectifier units) with a single unit rated power of 2283kW. The water-cooled rectifier unit consists of rectifier bridge, snubber capacitor, RC absorber plate, and other components. It is compact in structure and easy to integrate and maintain.

GD880-11 (LC) series are Goodrive880 series 690V AC water-cooled VFD unit products (hereinafter referred to as water-cooled VFD units) with a single unit rated power of 315kW–500kW. The water-cooled VFD unit consists of rectifier bridge, IGBT, bus capacitor, and other components. It is compact in structure and easy to integrate and maintain.

2.1 Product specifications

Table 2-1 GD880-51 (LC) technical specifications

Description		Specifications
Power input	Input voltage (V)	690V system: 735–976V DC
	Input current (A)	See section 2.3Product ratings.
Power output	Output voltage (V)	0–0.7*Vin
	Output current (A)	See section 2.3Product ratings.
	Output power (kW)	See section 2.3Product ratings.
	Output frequency (Hz)	0–400Hz
	Working efficiency	≥98% (at the rated current)
Protection function	Protection against overheating	Triggered by IGBT module overheating
	Overcurrent protection	150% of rated current: 60s, 180% of rated current: 10s, 200% of rated current: 1s
	Overvoltage protection	520–690V: Bus 1200V triggers overvoltage, software can be reset in special cases.
	Undervoltage protection	520–690V: Bus 570V triggers undervoltage, software can be reset in special cases.
Water cooling system	Cooling liquid component	Pure water or a mixture of pure water and glycol + preservative. Antifreeze must be added for temperatures below +5°C.
	Max. pressure	6bar
	Flow rate requirement	100% of water: ≥16L/min Water/glycol solution in a ratio of 80:20: ≥18L/min Water/glycol solution in a ratio of 60:40: ≥21L/min
Environment requirement	Cooling method	Water cooling
	Ambient temperature	-10°C–55°C; Derating is required if the ambient temperature exceeds 45°C. Derate 0.5% for each increase of 1°C.
	Cooling water temperature	0°C–40°C; Derating is required if the ambient temperature exceeds 40°C. Derate 2% for each increase of 1°C.
	Storage temperature	-40°C–70°C (It is recommended to drain the water from the cavity.)
	Relative humidity (RH)	<95%RH, no condensation

Description		Specifications
Water quality requirement	PH value	6–8
	Hardness	<10.dH
	Conductivity	<300um/cm
	Chloride	<50mg/l
	Fluoride	<50mg/l
	Sulphate	<100mg/l
	Total dissolved solids	<200mg/l
	Preservative	0.5%Cortec VCI-649 (biennial)
Other	Mounting method	Unit installation
	IP rating	IP00

Table 2-2 GD880-61 (LC) technical specifications

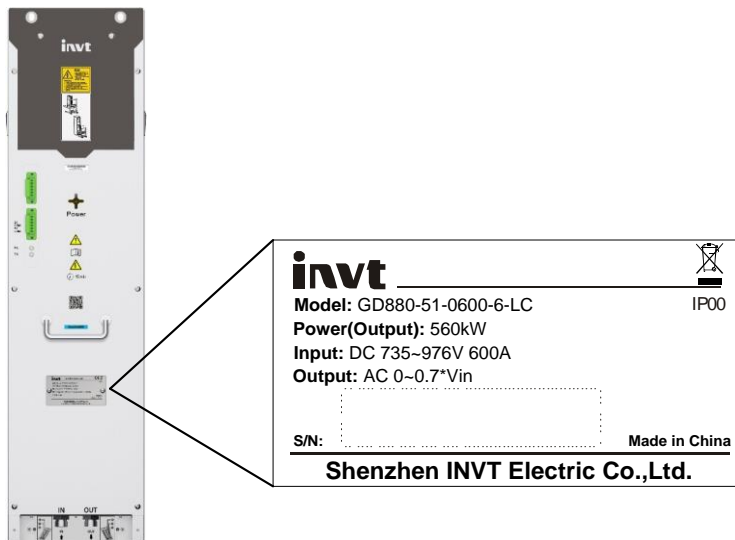
Description		Specifications
Power input	Input voltage (V)	690V system: 520–690V AC 3PH ± 10%; the running time < 1min at -15%
	Input current (A)	See section 2.3Product ratings.
Power output	Output voltage (V)	690V system: 735–976V DC
	Output current (A)	See section 2.3Product ratings.
	Output power (kW)	See section 2.3Product ratings.
	Working efficiency	≥99% (at the rated current)
Protection function	Protection against overheating	Triggered by rectifier bridge module overheating
Water cooling system	Cooling liquid component	Pure water or a mixture of pure water and glycol + preservative. Antifreeze must be added for temperatures below +5°C.
	Max. pressure	6bar
	Flow rate requirement	100% of water: ≥16L/min Water/glycol solution in a ratio of 80:20: ≥18L/min Water/glycol solution in a ratio of 60:40: ≥21L/min
Environment requirement	Cooling method	Water cooling
	Ambient temperature	-10°C–55°C; Derating is required if the ambient temperature exceeds 45°C. Derate 0.5% for each increase of 1°C.
	Cooling water temperature	0°C–40°C; Derating is required if the ambient temperature exceeds 40°C. Derate 2% for each increase of 1°C.
	Storage temperature	-40°C–70°C (It is recommended to drain the water from the cavity.)
	Relative humidity (RH)	<95%RH, no condensation
Water quality requirement	PH value	6–8
	Hardness	<10.dH
	Conductivity	<300um/cm
	Chloride	<50mg/l
	Fluoride	<50mg/l
	Sulphate	<100mg/l
	Total dissolved solids	<200mg/l
	Preservative	0.5%Cortec VCI-649 (biennial)
Other	Mounting method	Unit installation
	IP rating	IP00

Table 2-3 GD880-11 (LC) technical specifications

Description		Specifications
Power input	Input voltage (V)	690V system: 520–690V AC 3PH $\pm 10\%$; the running time < 1min at -15%
	Input current (A)	See section 2.3Product ratings.
Power output	Output voltage (V)	690V system: 0–Vin
	Output current (A)	See section 2.3Product ratings.
	Output power (kW)	See section 2.3Product ratings.
	Output frequency (Hz)	0–400Hz
	Working efficiency	$\geq 98\%$ (at the rated current)
Protection function	Protection against overheating	Triggered by IGBT module overheating
	Overcurrent protection	150% of rated current: 60s, 180% of rated current: 10s, 200% of rated current: 1s
	Overvoltage protection	520–690V: Bus 1200V triggers overvoltage, software can be reset in special cases.
	Undervoltage protection	520–690V: Bus 570V triggers undervoltage, software can be reset in special cases.
Water cooling system	Cooling liquid component	Pure water or a mixture of pure water and glycol + preservative. Antifreeze must be added for temperatures below +5°C.
	Max. pressure	6bar
	Flow rate requirement	100% of water: $\geq 16\text{L}/\text{min}$ Water/glycol solution in a ratio of 80:20: $\geq 18\text{L}/\text{min}$ Water/glycol solution in a ratio of 60:40: $\geq 21\text{L}/\text{min}$
Environment requirement	Cooling method	Water cooling
	Ambient temperature	-10°C–55°C; Derating is required if the ambient temperature exceeds 45°C. Derate 0.5% for each increase of 1°C.
	Cooling water temperature	0°C–40°C; Derating is required if the ambient temperature exceeds 40°C. Derate 2% for each increase of 1°C.
	Storage temperature	-40°C–70°C (It is recommended to drain the water from the cavity.)
	Relative humidity (RH)	<95%RH, no condensation
Water quality requirement	PH value	6–8
	Hardness	<10.dH
	Conductivity	<300um/cm
	Chloride	<50mg/l
	Fluoride	<50mg/l
	Sulphate	<100mg/l
	Total dissolved solids	<200mg/l
	Preservative	0.5%Cortec VCI-649 (biennial)
Other	Mounting method	Unit installation
	IP rating	IP00

2.2 Product nameplate and model

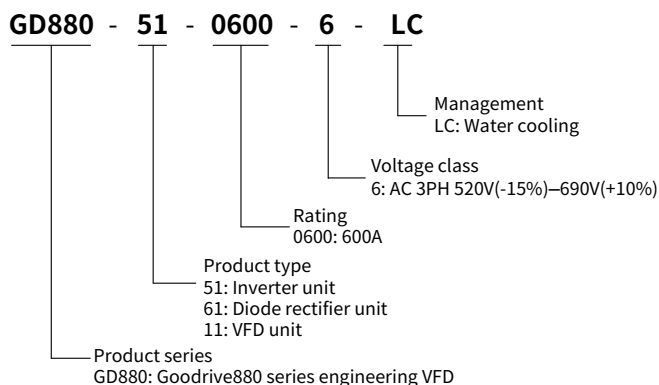
Figure 2-1 Product nameplate



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



2.3 Product ratings

Table 2-4 GD880-51 (LC) parameters

735-976V DC										
Model	Rating			Light overload application		Heavy overload application		Structure	Heat dissipation c/a/T	Rated water flow rate
	I _N	I _{max}	P _N	I _{Ld}	P _{Ld}	I _{Hd}	P _{Hd}			
	A (AC)	A (AC)	kW	A (AC)	kW	A (AC)	kW		kW	L/min
GD880-51-0410-6-LC	410	492	400	394	355	308	315	A8LC	6.8/0.4/7.2	16
GD880-51-0530-6-LC	530	636	500	509	450	398	355		8.8/0.5/9.3	
GD880-51-0600-6-LC	600	720	560	576	560	450	400		9.9/0.7/10.6	
GD880-51-0650-6-LC	650	780	630	624	560	488	450		10.7/0.7/11.4	

Table 2-5 GD880-61 (LC) parameters

520-690V AC										
Model	Rating			Light overload application		Heavy overload application		Structure	Heat dissipation c/a/T	Rated water flow rate
	I _N	I _{max}	P _N	I _{Ld}	P _{Ld}	I _{Hd}	P _{Hd}			
	A (AC)	A (DC)	kW	A (DC)	kW	A (DC)	kW		kW	L/min
GD880-61-2000-6-LC	2000	2450	2283	2352	2192	1833	1708	D3T	11	16

Table 2-6 GD880-11 (LC) parameters

520-690V AC										
Model	Rating			Light overload application		Heavy overload application		Structure	Heat dissipation c/a/T	Rated water flow rate
	I _N	I _{max}	P _N	I _{Ld}	P _{Ld}	I _{Hd}	P _{Hd}			
	A (AC)	A (AC)	kW	A (AC)	kW	A (AC)	kW		kW	L/min
GD880-11-0340-6-LC	340	408	315	326	315	255	250	A8LC	5.8/0.4/6.2	16
GD880-11-0410-6-LC	410	492	400	394	355	308	315		7.0/0.4/7.4	
GD880-11-0530-6-LC	530	636	500	509	450	398	355		9.0/0.5/9.5	

Note:

- I_{max} indicates the maximum output current for a start-up duration of 10s (every 300s)
- Typical capacity for light overload applications (110% overload capacity): P_{Ld} indicates the typical values of adapted motor power; I_{Ld} indicates the continuous output effective current; Overload is allowed for 1 minute every 5 minutes and the overload current is 110%*I_L.
- Typical capacity for heavy overload applications (150% overload capacity): P_{Hd} indicates the typical values of adapted motor power; I_{Hd} indicates the continuous output effective current. Overload is allowed for 1 minute every 5 minutes and the overload current is 150%*I_{Hd}.
- c = power loss dissipated in the coolant.
a = power loss dissipated in the air.
T = total power loss.
The above losses are unit losses only and do not include reactor losses.

Note:

1. The continuous output effective current is affected by the supply voltage.
2. The continuous output effective current and overload current are defined a coolant temperature of 40°C and an ambient temperature of 45°C.

2.4 Unit outline dimensions and weight

Outline dimensions	Height (mm)	Width (mm)	Depth (mm)	Weight (kg)
A8LC	910	230	538	85
D3T	197	580	332	40

2.5 Derated application

2.5.1 Derating due to coolant and ambient temperature

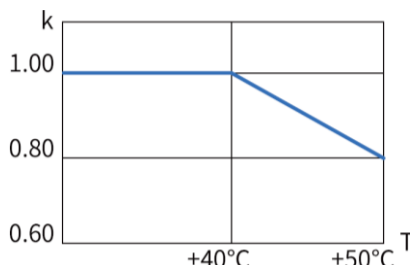
Coolant temperature:

When the coolant is pure water, the device provides 100% of the output current in the temperature range of 5°C to 40°C, and the maximum output current decreases linearly to 80% in the range of 40°C to 50°C.

When the coolant a mixture of water and antifreeze, the device provides 100% of the output current in the temperature range of 0°C to 40°C, and the maximum output current decreases linearly to 80% in the range of 40°C to 50°C.

The curve of derating coefficient is shown as follows:

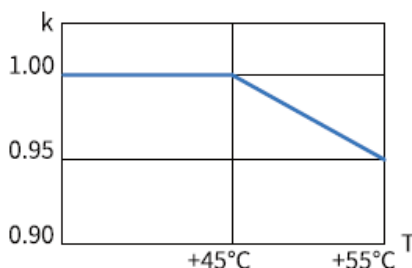
Figure 2-3 Derating due to coolant temperature



Ambient temperature:

When the device works under the ambient temperature of +45–+55°C, the rated current must be derated by 0.5% for each increase of 1°C. The curve of derating coefficient is shown as follows:

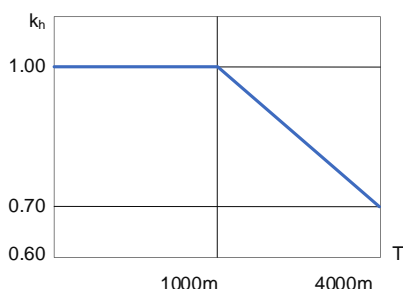
Figure 2-4 Derating due to ambient temperature



2.5.2 Derating due to altitude

The inverter unit needs to be derated by 1% for each increase of 100m when the altitude exceeds 1000m. Contact our local technical support for model selection when the altitude exceeds 2000m.

Figure 2-5 Derating due to altitude



2.5.3 Derating due to carrier frequency

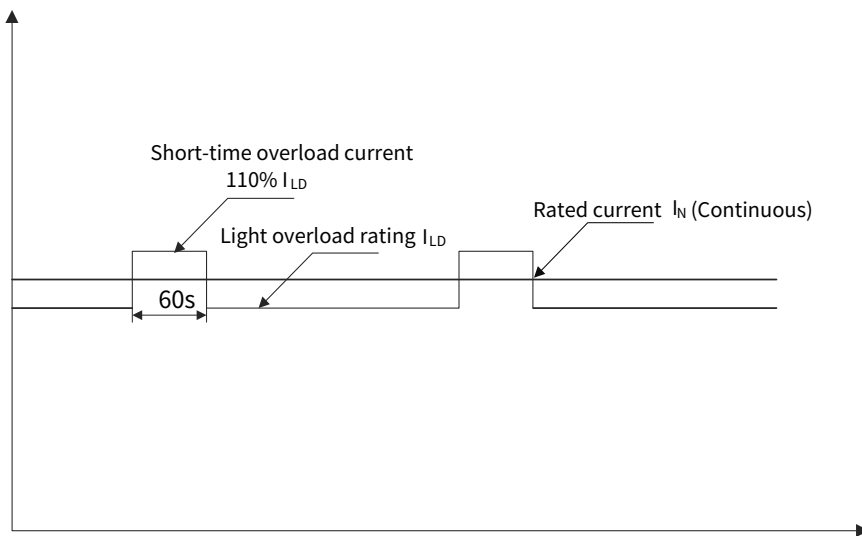
Model	Rated power P (kW)	Carrier frequency (kHz)						
		2.5	3.2	4	5	6	7	8
GD880-51-0410-6-LC	400	100%	88%	76%	62%	53%	46%	40%
GD880-51-0530-6-LC	500	100%	88%	76%	62%	53%	46%	40%

Model	Rated power	Carrier frequency (kHz)						
	P (kW)	2.5	3.2	4	5	6	7	8
GD880-51-0600-6-LC	560	100%	86%	73%	61%	52%	45%	40%
GD880-51-0650-6-LC	630	100%	86%	73%	61%	52%	45%	40%
GD880-11-0340-6-LC	315	100%	88%	76%	62%	53%	46%	40%
GD880-11-0530-6-LC	500	100%	88%	76%	62%	53%	46%	40%

2.6 Overload capability

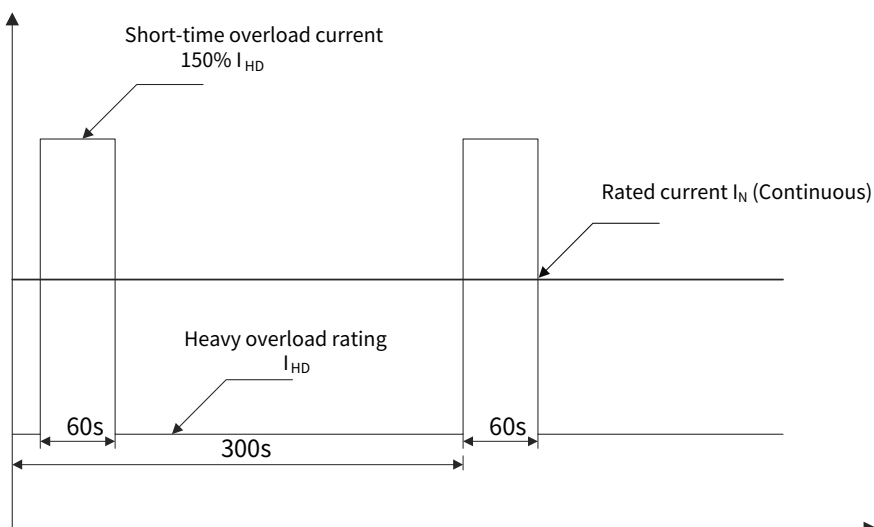
Based on the light overload continuous run current (I_{LD}), the inverter unit can keep running for 60s at 110% of the rated current. See Figure 2-6.

Figure 2-6 Light overload application



Based on the heavy overload continuous run current (I_{HD}), the inverter unit can keep running for 60s at 150% of the rated current. See Figure 2-7.

Figure 2-7 Heavy overload application



2.7 Hardware principles

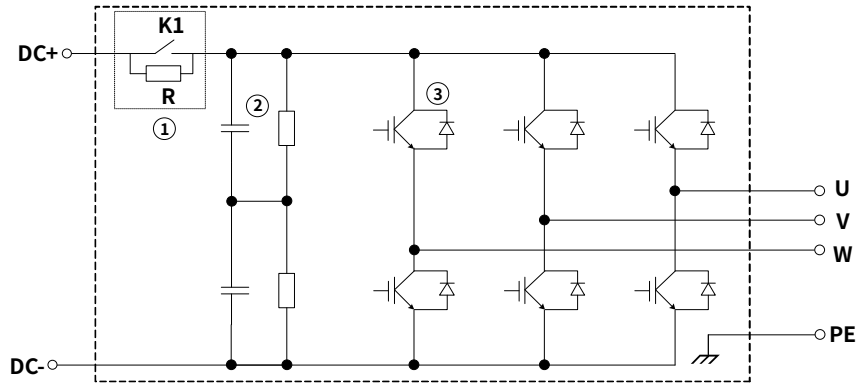
2.7.1 Basic principles

Water-cooled inverter unit

The inverter unit converts DC voltage into AC frequency-variable voltage and supports driving asynchronous and synchronous motors. The voltage class is 690V.

The water-cooled inverter unit consists of DC precharge, bus capacitor, IGBT, and other components. Figure 2-8 shows the simplified main circuit.

Figure 2-8 Main circuit diagram of the water-cooled inverter unit



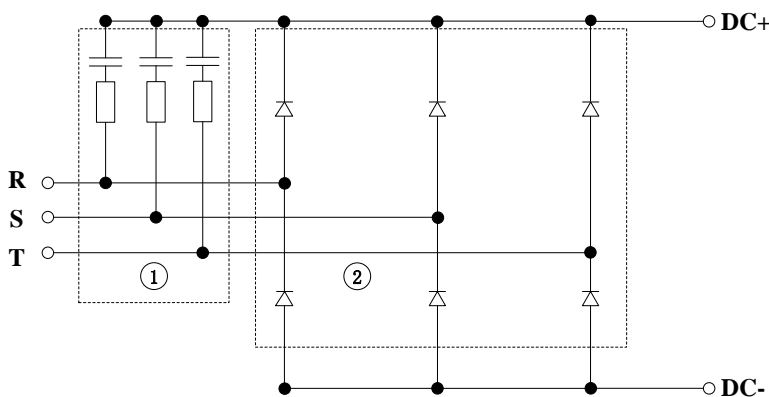
No.	Name	Description
1	DC precharge	Optional accessory to buffer the bus capacitor charge.
2	Bus capacitor	To make the voltage stable by filtering out the AC part from the bus voltage.
3	Inverter module	To convert DC current to AC current.

Rectifier unit

The rectifier unit converts three-phase AC voltage to DC voltage and provides power for the subsequent inverter module to drive the motor. One or more inverter modules can be installed.

The A8LC rectifier unit mainly consists of RC filter board and rectifier bridge. Figure 2-9 shows the simplified main circuit.

Figure 2-9 Main circuit diagram of the rectifier unit



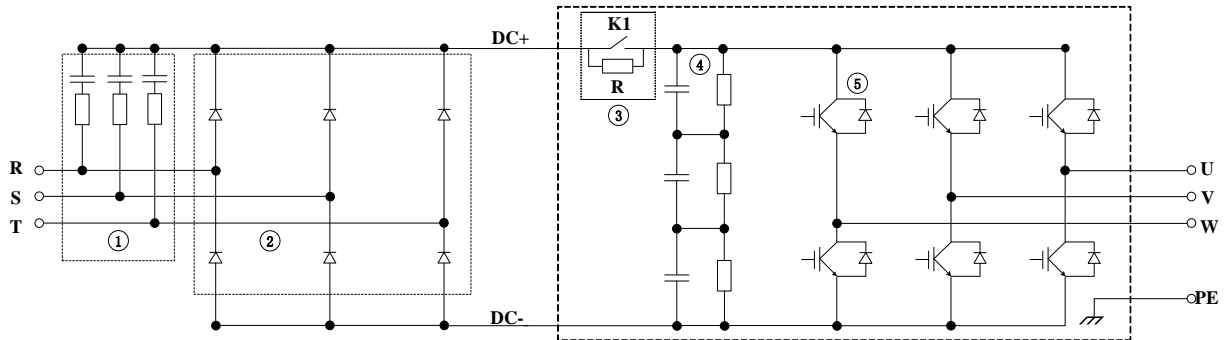
No.	Name	Description
1	RC filter board	To absorb the surge current.
2	Rectifier bridge	To convert AC current to DC current.

VFD unit

The VFD unit converts three-phase AC voltage to DC voltage through the rectifier module, and then converts the DC voltage to the AC voltage with adjustable frequency and voltage through the inverter module, and finally drives the motor.

The A8LC VFD unit mainly consists of RC filter board, rectifier bridge, DC precharge, bus capacitor, and inverter bridge. Figure 2-10 shows the simplified main circuit.

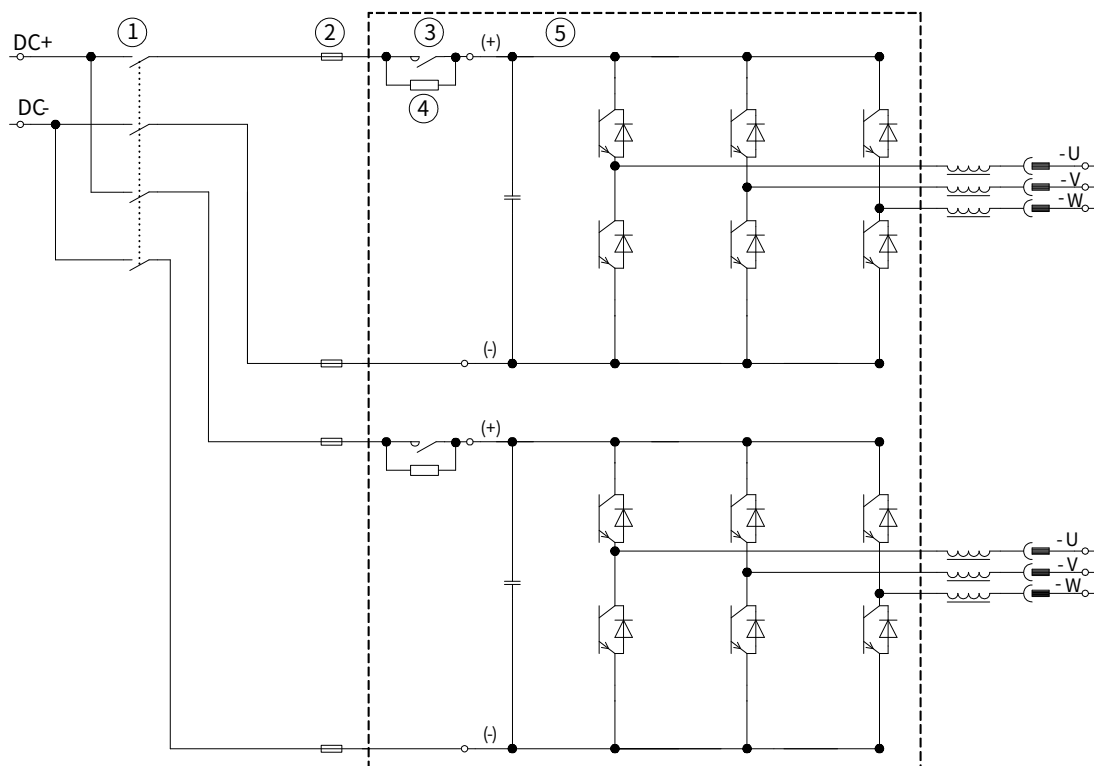
Figure 2-10 Main circuit diagram of the VFD unit



No.	Name	Description
1	RC filter board	To absorb the surge current.
2	Rectifier bridge	To convert AC current to DC current.
3	DC precharge	Power-on buffering to buffer the bus capacitor charge.
4	Bus capacitor	To make the voltage stable by filtering out the AC part from the bus voltage.
5	Inverter module	To convert DC current to AC current.

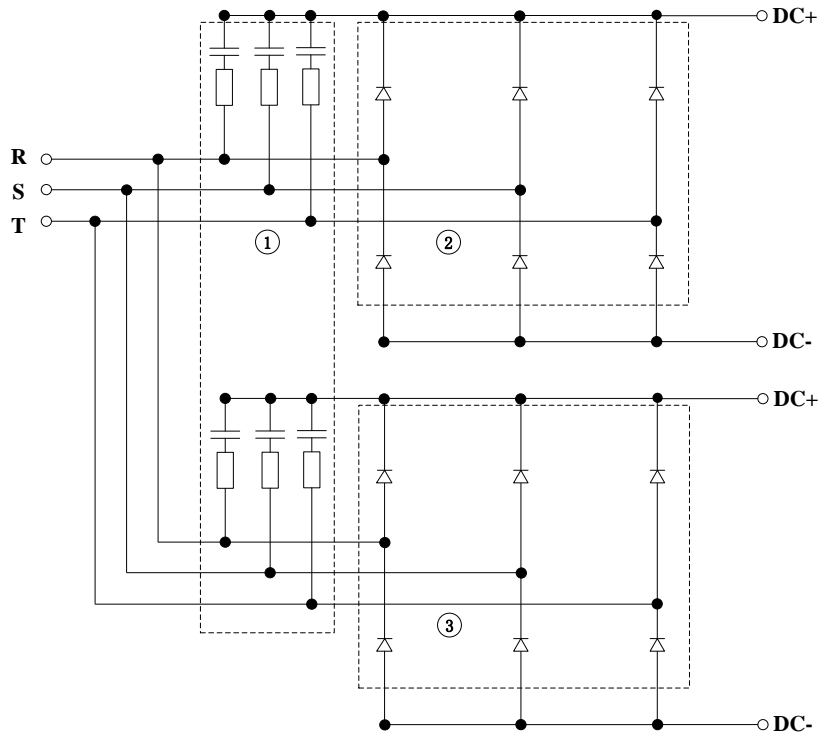
2.7.2 Paralleling principle

Figure 2-11 Main circuit diagram of the parallel water-cooled inverter unit



No.	Name
1	(Optional) Isolation switch
2	DC fuse
3	(Optional) DC contactor
4	(Optional) Buffer resistor
5	Inverter unit

Figure 2-12 Water-cooled rectifier unit

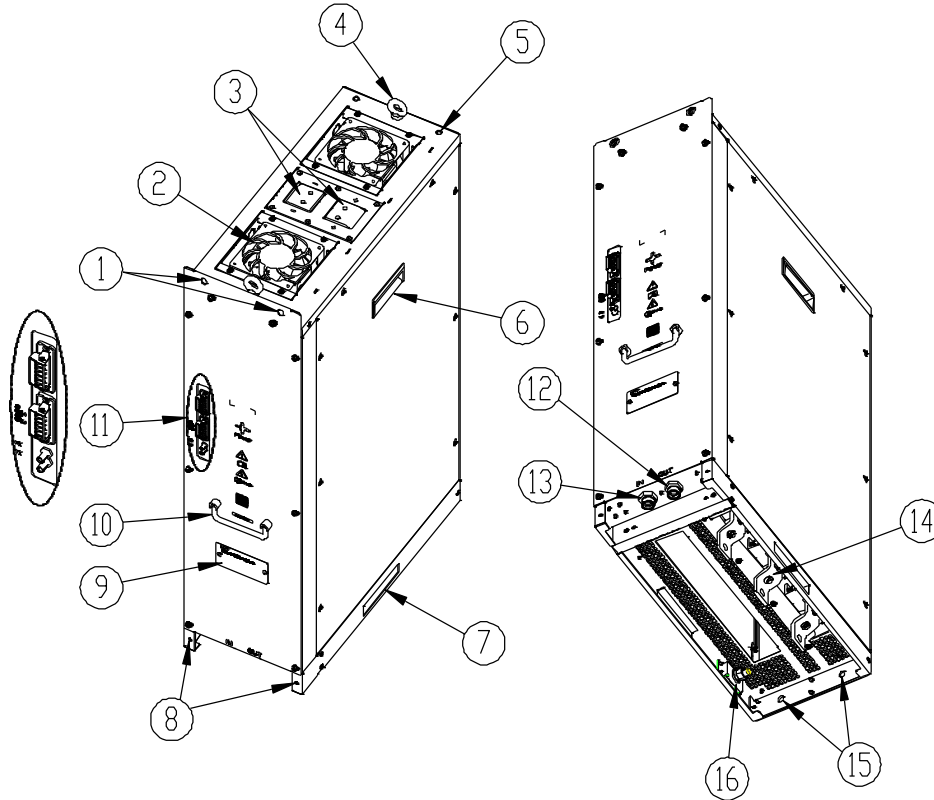


No.	Name
1	RC filter board
2,3	Rectifier unit

2.8 Product structure

1. Water-cooled inverter unit

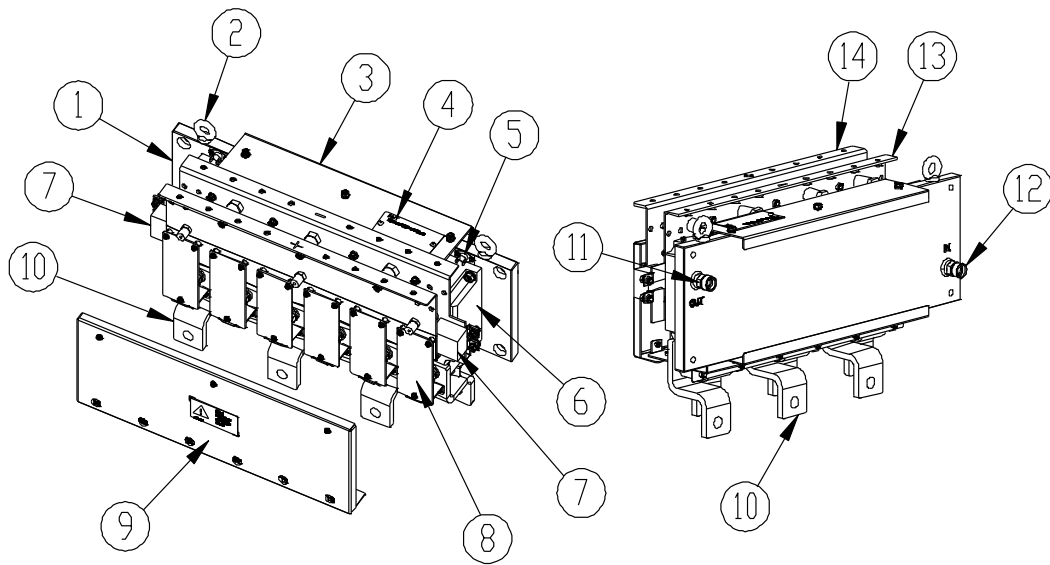
Figure 2-13 Water-cooled inverter unit structure



No.	Description
1	Fixing hole at the top front end of the unit
2	Auxiliary cooling fan
3	+, - poles of input copper bar
4	Rings
5	Fixed hole at the top rear end of the unit (for wall mounting)
6	Embedded side handle
7	Bottom handle
8	Fixing hole at the bottom front end of the unit
9	Nameplate
10	Front handle
11	User terminals on the fiber optic and control boards
12	Water outlet connector
13	Water inlet connector
14	UVW AC output terminals
15	Fixed hole at the bottom rear end of the unit (for wall mounting)
16	Ground (PE) terminal

2. Water-cooled rectifier unit

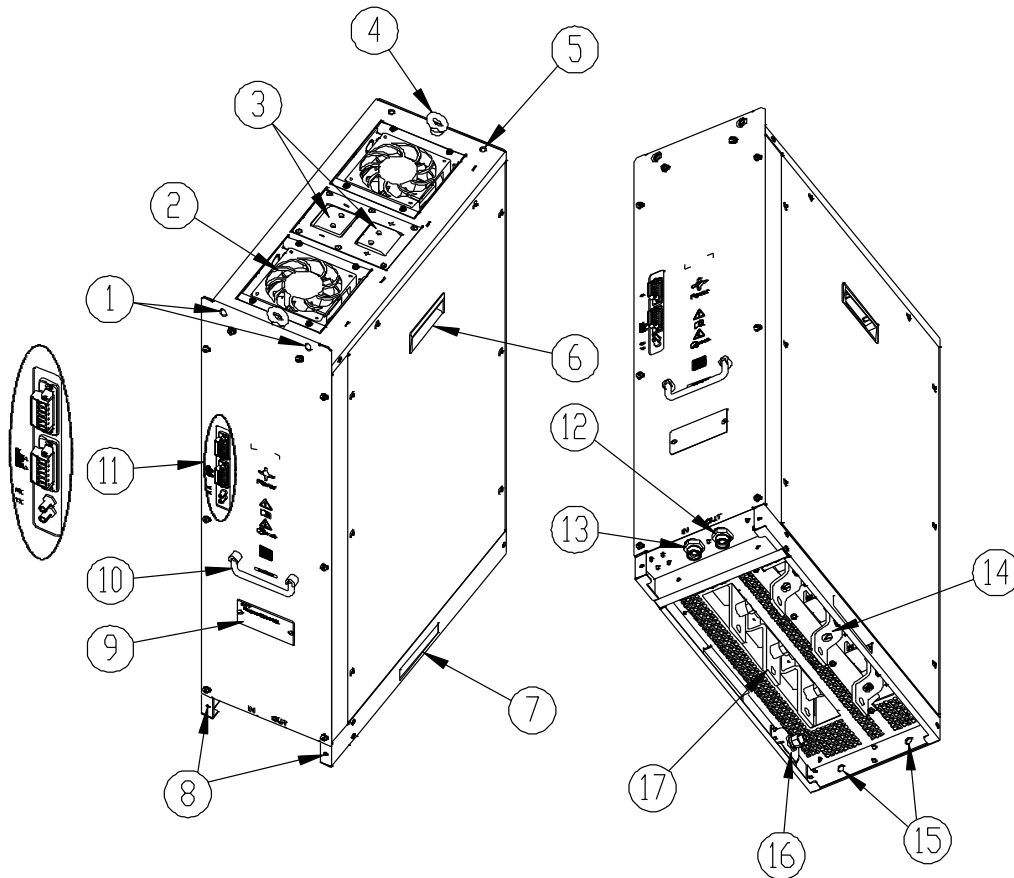
Figure 2-14 Water-cooled rectifier unit structure



No.	Description
1	Water-cooled heat-dissipating plate
2	Rings
3	Sheet metal hanging plate
4	Nameplate
5	Temperature switch
6	Diode
7	Snubber capacitor
8	RC absorber plate
9	PC protective plate
10	3PH input copper bar terminal
11	Water outlet connector
12	Water inlet connector
13	- pole of output copper bar
14	+ pole of output copper bar

3. Water-cooled VFD unit

Figure 2-15 Water-cooled VFD unit structure



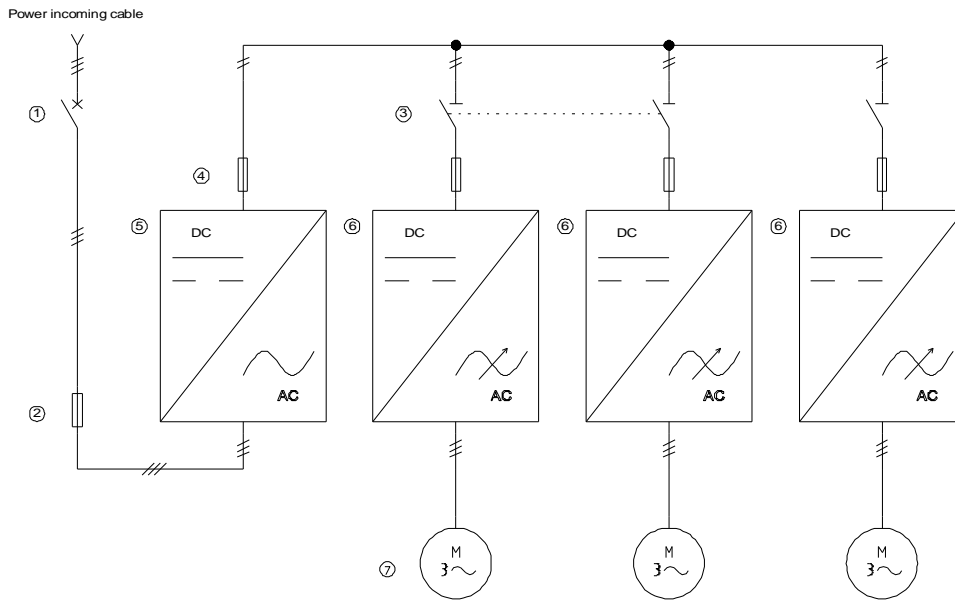
No.	Description
1	Fixing hole at the top front end of the unit
2	Auxiliary cooling fan
3	+, - poles of input copper bar
4	Rings
5	Fixed hole at the top rear end of the unit (for wall mounting)
6	Embedded side handle
7	Bottom handle
8	Fixing hole at the bottom front end of the unit
9	Nameplate
10	Front handle
11	User terminals on the fiber optic and control boards
12	Water outlet connector
13	Water inlet connector
14	UVW AC output terminals
15	Fixed hole at the bottom rear end of the unit (for wall mounting)
16	Ground (PE) terminal
17	RST AC input terminals

2.9 System configuration

Figure 2-16 shows a typical water-cooled common DC bus drive system.

The water-cooled rectifier module converts AC voltage to DC voltage, and the DC voltage is distributed to all inverter modules through the DC bus, then the water-cooled inverter modules convert the DC voltage to AC voltage to drive the motor to rotate. An external DC fuse is required for the connection between each inverter module and DC bus.

Figure 2-16 System configuration



No.	Description
1	Power supply incoming circuit breaker (customer supplied)
2	(Optional) AC fuse
3	(Optional) Isolation switch
4	(Optional) DC fuse
5	Water-cooled rectifier unit
6	Water-cooled inverter unit (built-in buffer)
7	Motor

2.10 Electrical model selection

2.10.1 AC fuse

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

Unit model	Frame size	Voltage (V)	Current (A)	Model	Qty
GD880-61-2000-6-LC	D3T	690	1500	170M6468	6
GD880-11-0340-6-LC	A8LC	690	630	170M6410	3
GD880-11-0530-6-LC	A8LC	690	900	170M6413	3

2.10.2 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.

Unit model	Frame size	Voltage (V)	Current (A)	Model	Qty
GD880-51-0410-6-LC	A8LC	1250	800	170M6546	2
GD880-51-0530-6-LC	A8LC	1250	900	170M6547	2
GD880-51-0600-6-LC	A8LC	1250	1000	170M6548	2
GD880-51-0650-6-LC	A8LC	1250	1100	170M6549	2
GD880-61-2000-6-LC	D3T	1250	2500	170M7595	4


2.10.3 Isolation switch

An isolation switch acts as an isolator for the circuit, causing an obvious break in the circuit and ensuring work safety during inspection or maintenance. The same brand replacement principle should be followed. See the following table for selection.

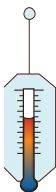
Unit model	Frame size	Voltage (V)	Current (A)	Model	Qty
GD880-51-0410-6-LC	A8LC	1000	1000	OT1000E11P	1
GD880-51-0530-6-LC	A8LC	1000	1000	OT1000E11P	1
GD880-51-0600-6-LC	A8LC	1000	1000	OT1000E11P	1
GD880-51-0650-6-LC	A8LC	1000	1000	OT1000E11P	1
GD880-51-0410-6-LC*2	A8LC*2	1000	1000	OT1000E22P	1
GD880-51-0530-6-LC*2	A8LC*2	1000	1000	OT1000E22P	1
GD880-51-0600-6-LC*2	A8LC*2	1000	1000	OT1000E22P	1
GD880-51-0650-6-LC*2	A8LC*2	1000	1000	OT1000E22P	1







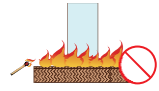



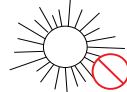
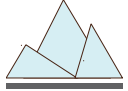
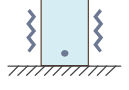
3 Mechanical installation

3.1 Safety notes

	<p>Equipment can tip over if transported incorrectly or with disallowed means of transport. Serious injury, property damage, or even death may result.</p> <ul style="list-style-type: none"> ✧ 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 chapter 1.4.1 Delivery and installation. Ignoring these safety precautions may lead to physical injury or death, or device damage. ✧ Ensure the inverter unit power has been disconnected before installation. If the inverter unit has been powered on, disconnect the inverter unit power and wait for at least the time specified on the inverter unit, and ensure the POWER indicator is off. You are recommended to use a multimeter to check and ensure the inverter 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 inverter unit 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

Environment	Condition
<p>Ambient temperature</p> 	<ul style="list-style-type: none"> ● -10~+55°C ● When the ambient temperature exceeds 45°C, derate 0.5% for each increase of 1°C. ● Do not use the inverter unit when the ambient temperature exceeds 50°C. ● To improve reliability, do not use the inverter unit in the places where the temperature changes rapidly. ● When the VFD is used in a closed space, such as control cabinet, use a cooling fan or air conditioner for cooling, preventing the internal temperature from exceeding the temperature required. ● When the temperature is too low, if you want to use the VFD that has been idled for a long time, install an external heating device before the use to eliminate the freeze inside the VFD. Otherwise, the VFD may be damaged.

Environment	Condition			
Relative humidity (RH)	 RH: less than 90%	 Condensation is not allowed.	 The max. RH cannot exceed 60% in the environment where there are corrosive gases.	
Running environment	Install the inverter unit in a place:			
	 Away from electromagnetic radiation sources	 Away from oil mist, corrosive gases, or combustible gases	 Without the chance for foreign objects such as metal powder, dust, oil and water to fall into the inverter unit	 Do not install the inverter unit onto combustible objects.
Running environment	 Without radioactive substances or combustible objects	 Without hazard gases and liquids	 With low salt content	 Without direct sunlight
	Altitude	 <ul style="list-style-type: none"> Lower than 1000 meters When the altitude exceeds 1000m, derate by 1% for every additional 100m. When the installation site altitude exceeds 3000m, consult the local INVT dealer or office. 		
Vibration		The max. ACC speed cannot exceed 5.8m/s ² (0.6g).		

3.3 Installation procedure

The installation procedure is as follows:

- Step 1 Perform unpacking inspection. For details, see section 3.3.1.
- Step 2 Transport before unpacking. For details, see section 3.3.2.
- Step 3 Unpack. For details, see section 3.3.3.
- Step 4 Lift the modules. For details, see section 3.3.4.
- Step 5 Install the modules. For details, see section 3.3.5.

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

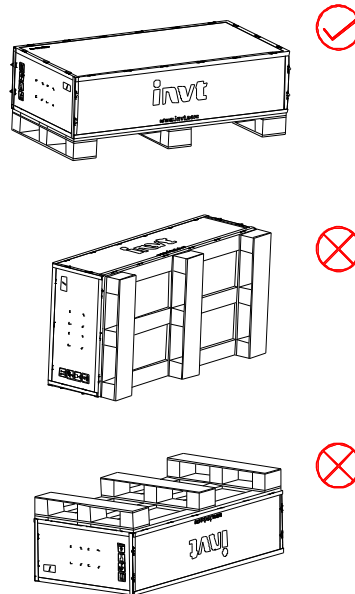
condition, and whether the equipment enclosure is damaged or cracked.

4. Check whether the parts (including the complete equipment of unit, keypad, and manual) inside the packing box are complete.

3.3.2 Transportation

The inverter unit 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 inverter unit 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.

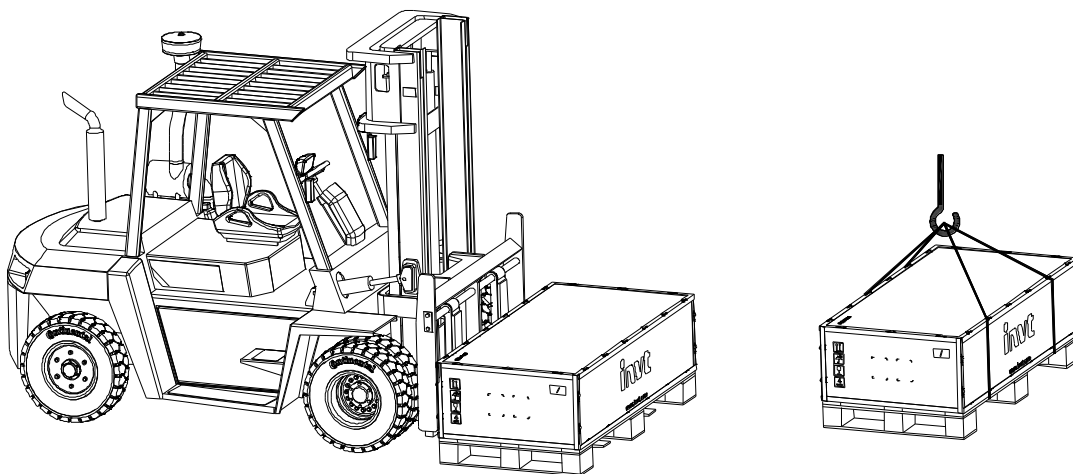
Figure 3-1 Transportation requirements



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

Figure 3-2 Transportation means



3.3.3 Unpacking

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

To remove the packing, do as follows:

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

Step 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.

Step 3 Remove the surrounding boards and EPE filling materials from the wooden box.

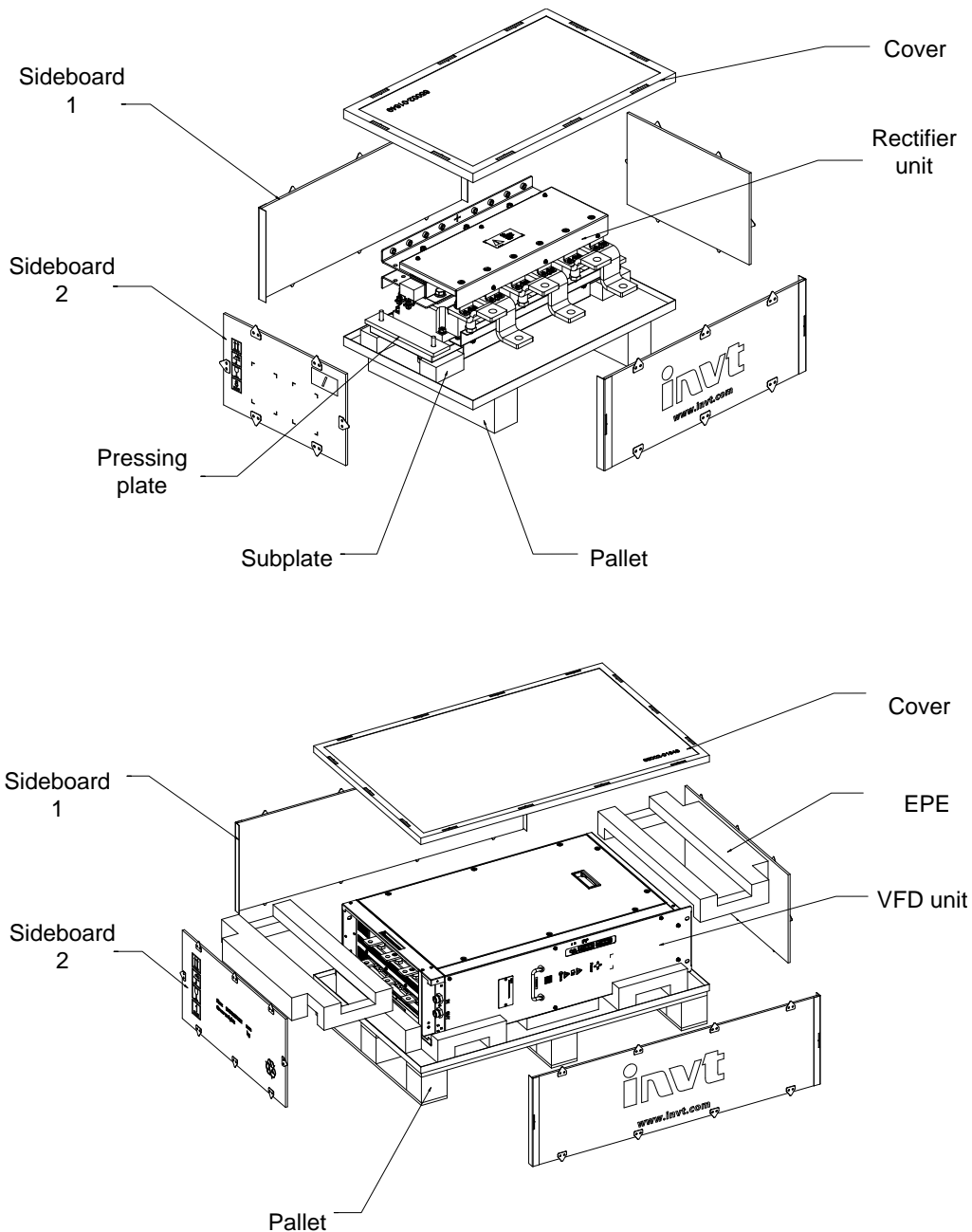
Step 4 Cut off the plastic windings and remove the fixing bolts between the unit and the pallet.

Step 5 Take out of the unit.

Step 6 Ensure that the unit is intact without any damage.

Dispose of or recycle packaging in accordance with local regulations.

Figure 3-3 Unpacking

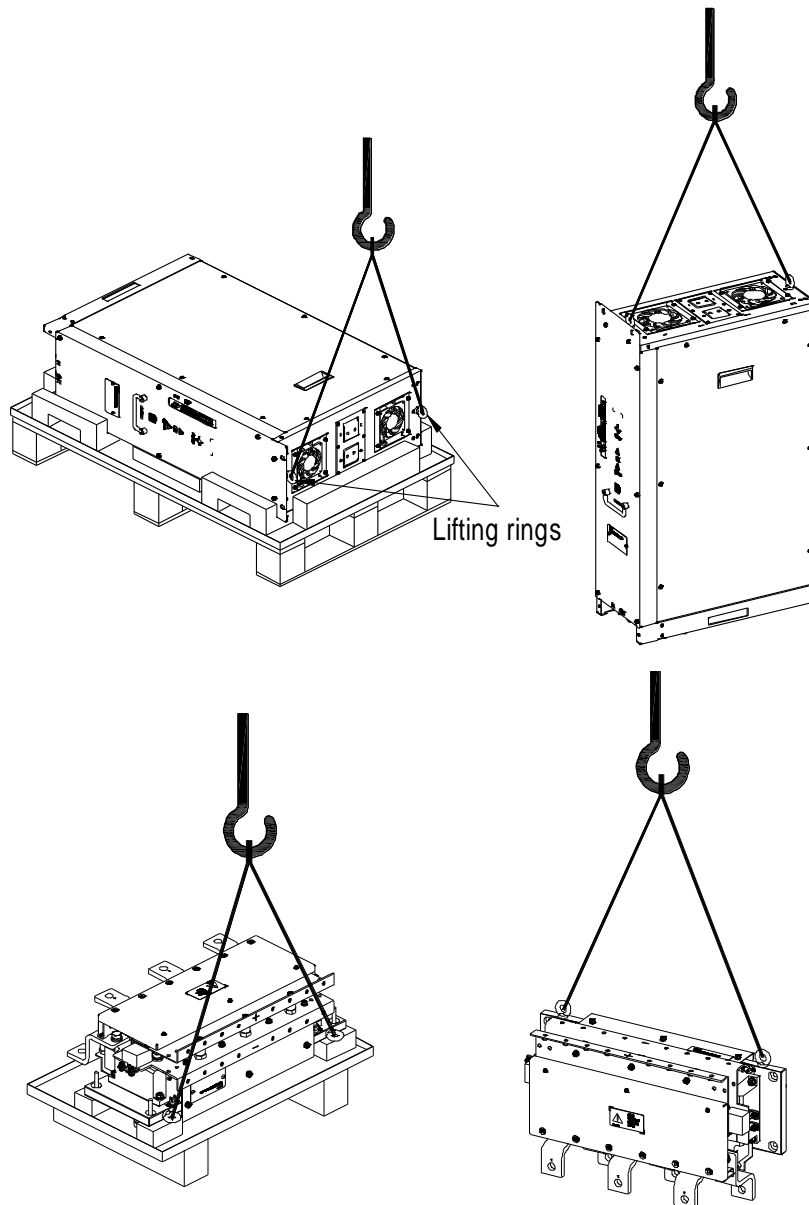


3.3.4 Lifting

Water-cooled VFD (inverter) unit

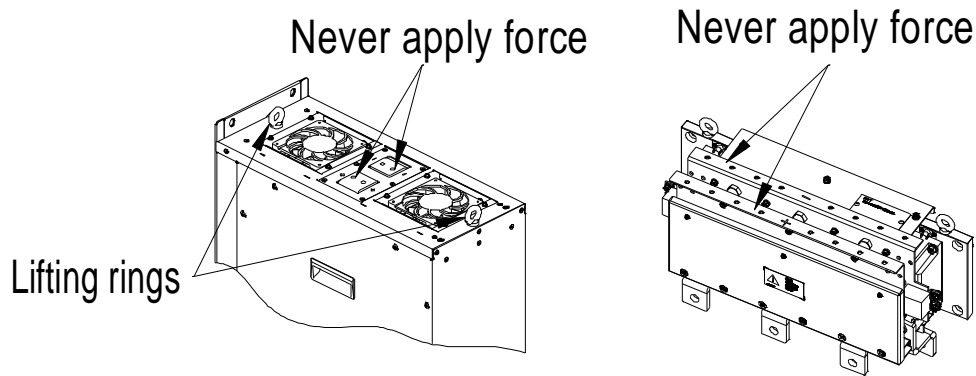
Attach the required lifting ring to the locations shown in the figure, use the sling to slowly lift the unit end, move the unit until it is completely lifted, place it vertically in the empty and flat place, and then unfold the anti-tipping stand at the lower front of the unit. Figure 3-4 shows the anti-tipping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

Figure 3-4 Unit lifting



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

Figure 3-5 Unit top structure



3.3.5 Installation

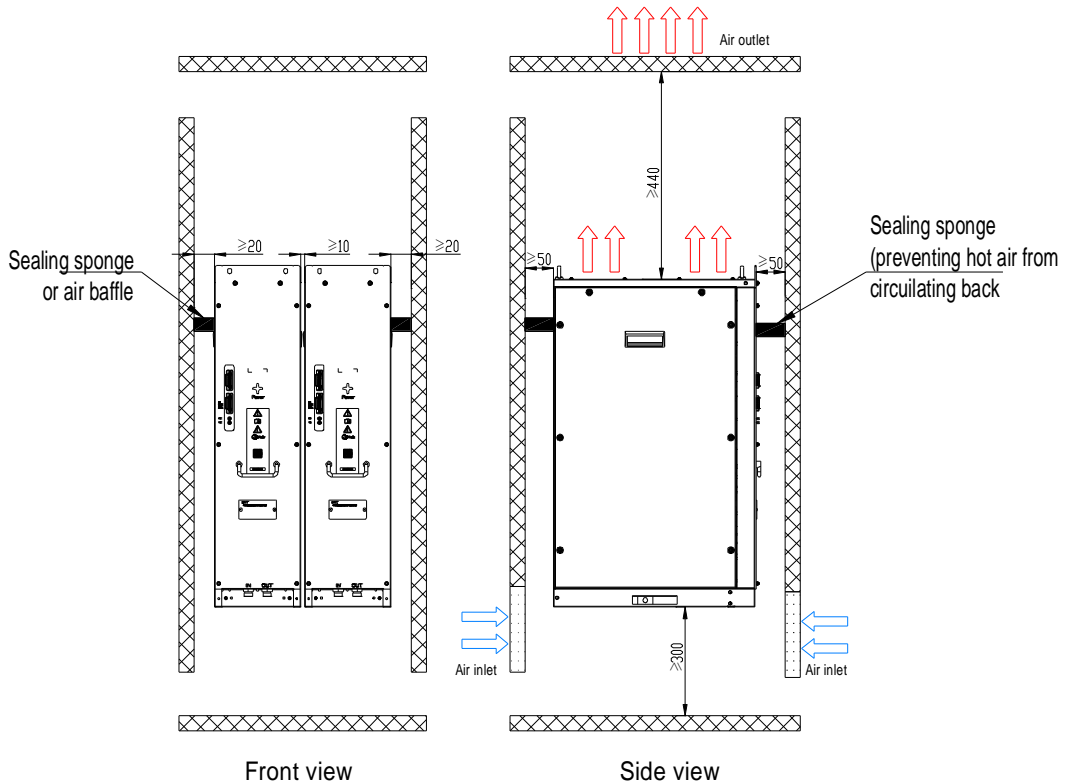
3.3.5.1 Installation space and heat dissipation

1. For water-cooled VFD and inverter units

To ensure that the VFD and inverter units using A8LC structure are installed reliably and in good heat dissipation, pay attention to the following:

- The unit must be installed and used in a cabinet.
- A minimum ventilation clearance must be kept from the top and bottom of the unit to ensure good heat dissipation. See Figure 3-6.
- Both sides of the 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 3-6.

Figure 3-6 Installation space requirements for water-cooled VFD and inverter units

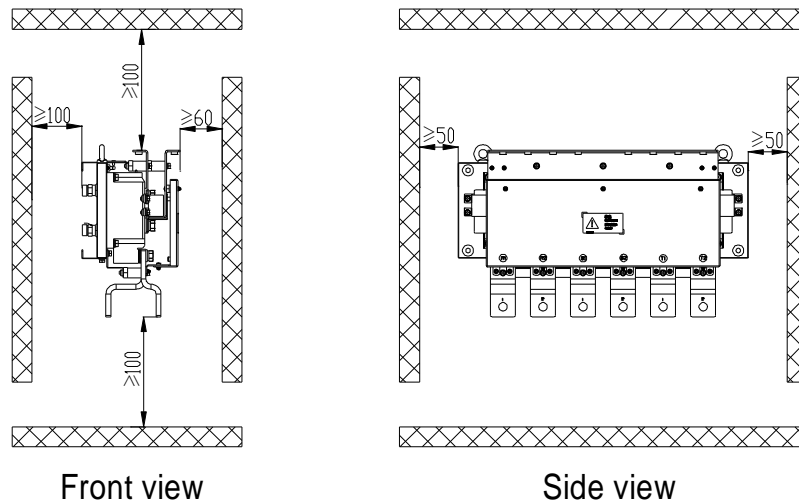


2. For water-cooled rectifier units

To ensure that water-cooled rectifier units are installed reliably and in good heat dissipation, pay attention to the following:

- The unit must be installed and used in a cabinet.
- A minimum ventilation clearance must be kept from the top and bottom of the rectifier unit to ensure good heat dissipation. See Figure 3-7.

Figure 3-7 Installation space requirements for water-cooled rectifier units



3. Cabinet inlet and outlet area

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

Air inlet area formula: $S_{in} = (1.5 \sim 2.0) \times (S_{module1} + S_{module2} + S_{module3} + \dots + S_{moduleN})$;

S indicates the system ventilation area;


S_{module} indicates the each module ventilation area with a unit of cm^2 .

Air outlet area formula: $S_{out} = (1.2 \sim 1.5) \times S_{in}$.

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

Table 3-1 Ventilation areas and actual air volumes of units

No.	Frame size	Ventilation area S_{in} (cm^2)	Actual air volume (CFM)
1	DTLC	416	460
2	2A8LC	832	920

	<ul style="list-style-type: none"> ● Violation of the requirements in section 3.3.5.1 Installation space and heat dissipation will shorten the inverter unit life and may result in inverter unit failure or malfunction.
---	--

3.3.5.2 Cabinet requirements

1. The cabinet frame must be strong enough to withstand the weight of components, control circuits and other equipments installed in it.
2. The cabinet must provide contact-proof shields for the powered circuits, and meet the requirements in terms of dust and humidity.
3. To facilitate installation, it is recommended to leave sufficient space around the device: space for cooling air flow, necessary clearance, and space required by the cable and cable support structure. Do

not install the control board near the main circuit or high-temperature components.

4. Ensure that any straddle components or racks with components installed are properly grounded and that the connection surface is not painted.
5. Ensure that the module is properly grounded through the fixing point on its mounting base.
6. It is recommended to use nickel-plated copper for the internal conductive parts of the cabinet. Besides, aluminum can also be used.
7. If there is a risk of condensation in the cabinet, use a cabinet heater. Though the heater is mainly used to keep the air dry in this case, it can also be used for heating in low temperature environments. When placing the heater, follow the instructions provided by its manufacturer.
8. When placing coolant pipes, be careful to ensure that the pipes are installed properly and check for leaks.

3.3.5.3 Layout and installation of A8LC inverter cabinet

The following layout is recommended for the A8LC inverter cabinet

Figure 3-8 Cabinet layout for A8LC water-cooled inverter unit cabinet with isolation switch

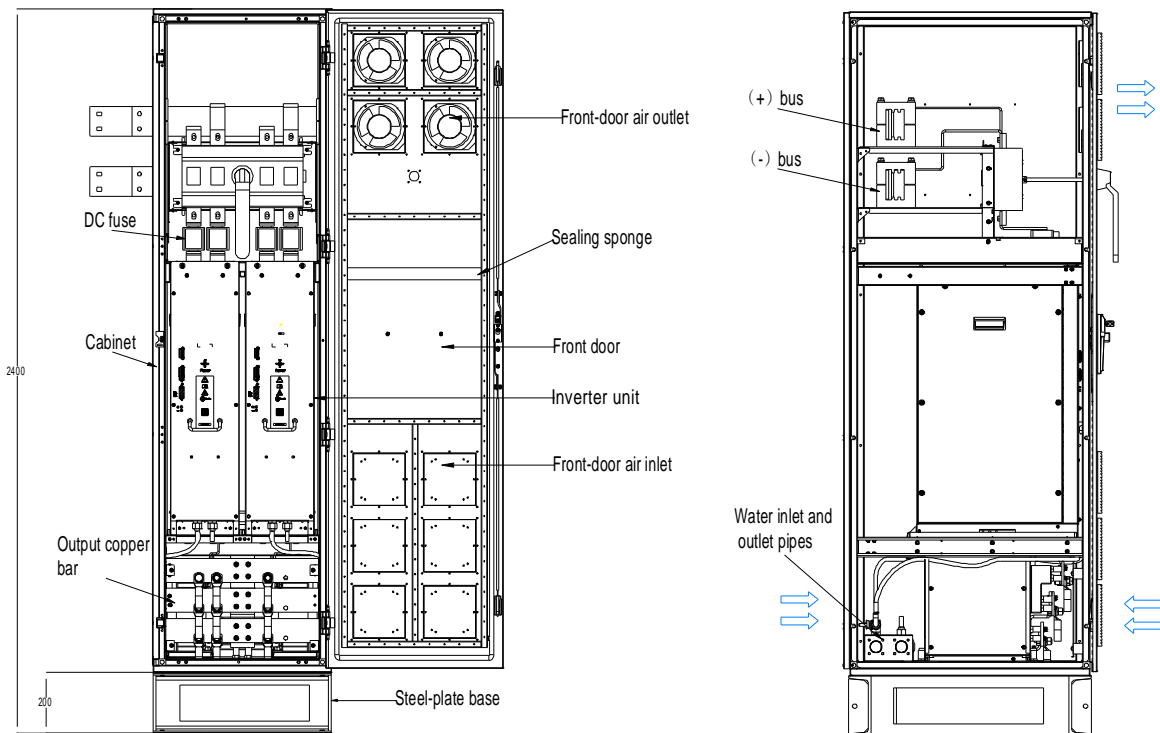
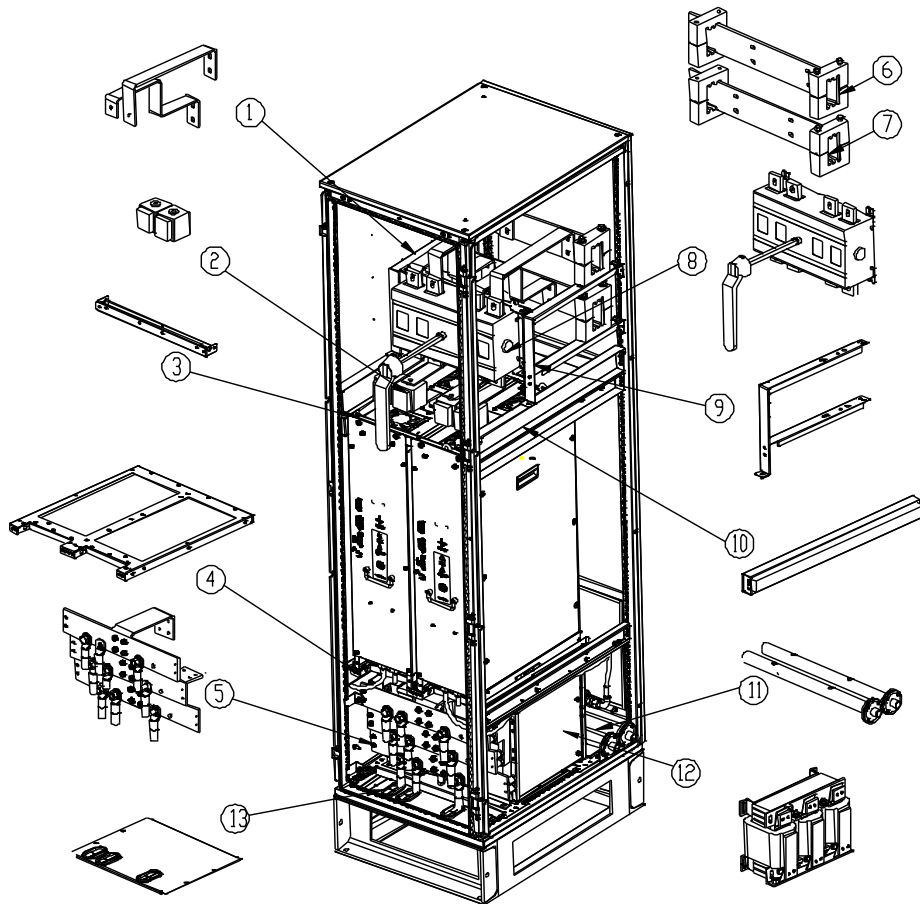


Figure 3-9 shows the installation of A8LC water-cooled inverter unit cabinet.

Figure 3-9 Installing inverter units with the isolation switch in a 600mm-wide cabinet



No.	Description
1	Input copper bar
2	DC fuse
3	Unit top fixed beam
4	Unit bottom fixed plate
5	Output copper bar
6	(+), (-) bus
7	Busbar clamp
8	Isolation switch
9	Busbar clamp fixed support
10	Side air baffle assembly (with sealing sponge)
11	Inlet and outlet pipes
12	Output reactor
13	Bottom outgoing hole

Layout and installation of two A8LC inverter cabinets without the isolation switch

Figure 3-10 shows the cabinet layout for two A8LC inverter units without the isolation switch.

Figure 3-10 Layout of inverter units without the isolation switch in a 600mm-wide cabinet

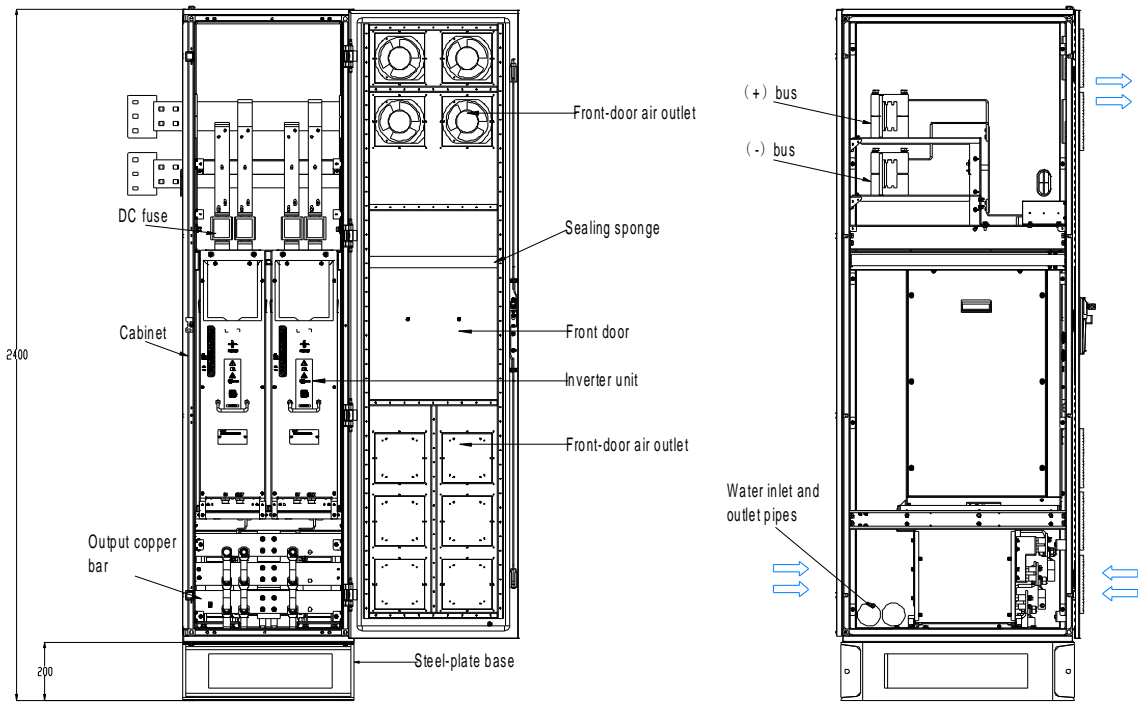
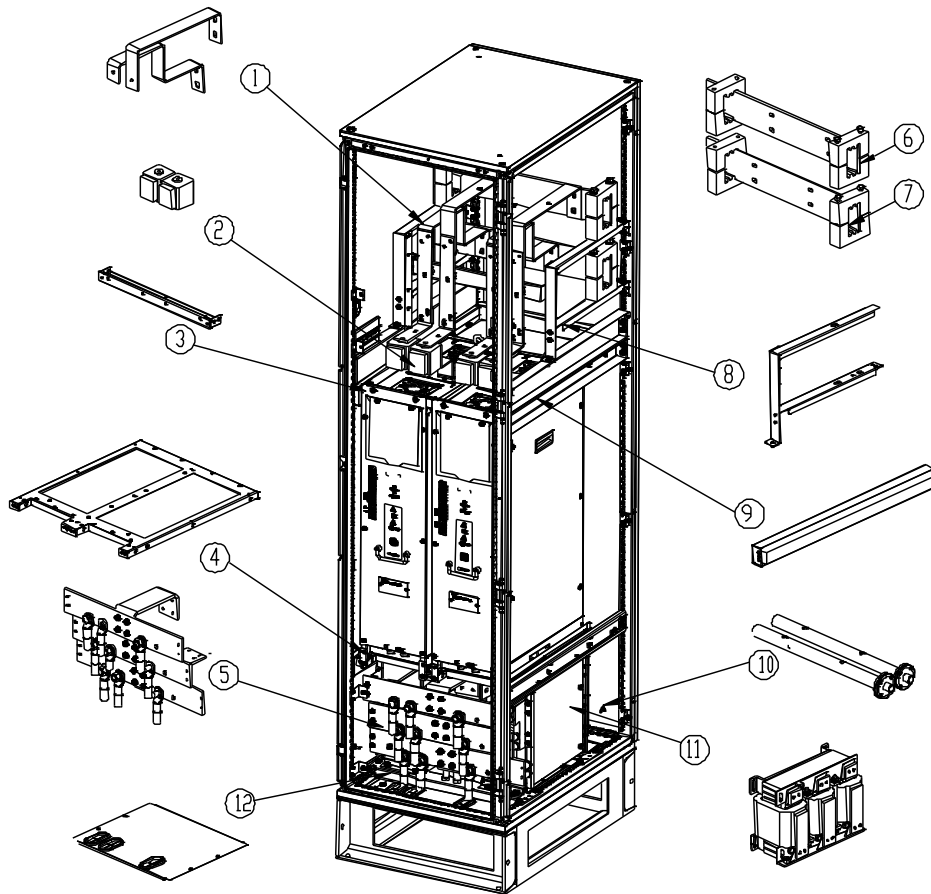


Figure 3-11 shows the installation of two A8LC inverter units without the isolation switch.

Figure 3-11 Installing inverter units without the isolation switch in a 600mm-wide cabinet



No.	Description
1	Input copper bar
2	DC fuse
3	Unit top fixed beam
4	Unit bottom fixed plate
5	Output copper bar
6	(+), (-) bus
7	Busbar clamp
8	Busbar clamp fixed support
9	Side air baffle assembly (with sealing sponge)
10	Inlet and outlet pipes
11	Output reactor
12	Bottom outgoing hole

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.

3.3.5.4 Layout and installation of water-cooled rectifier cabinet

Figure 3-12 shows the recommended cabinet layout of the water-cooled rectifier unit.

Figure 3-12 Layout of 400mm-wide cabinet

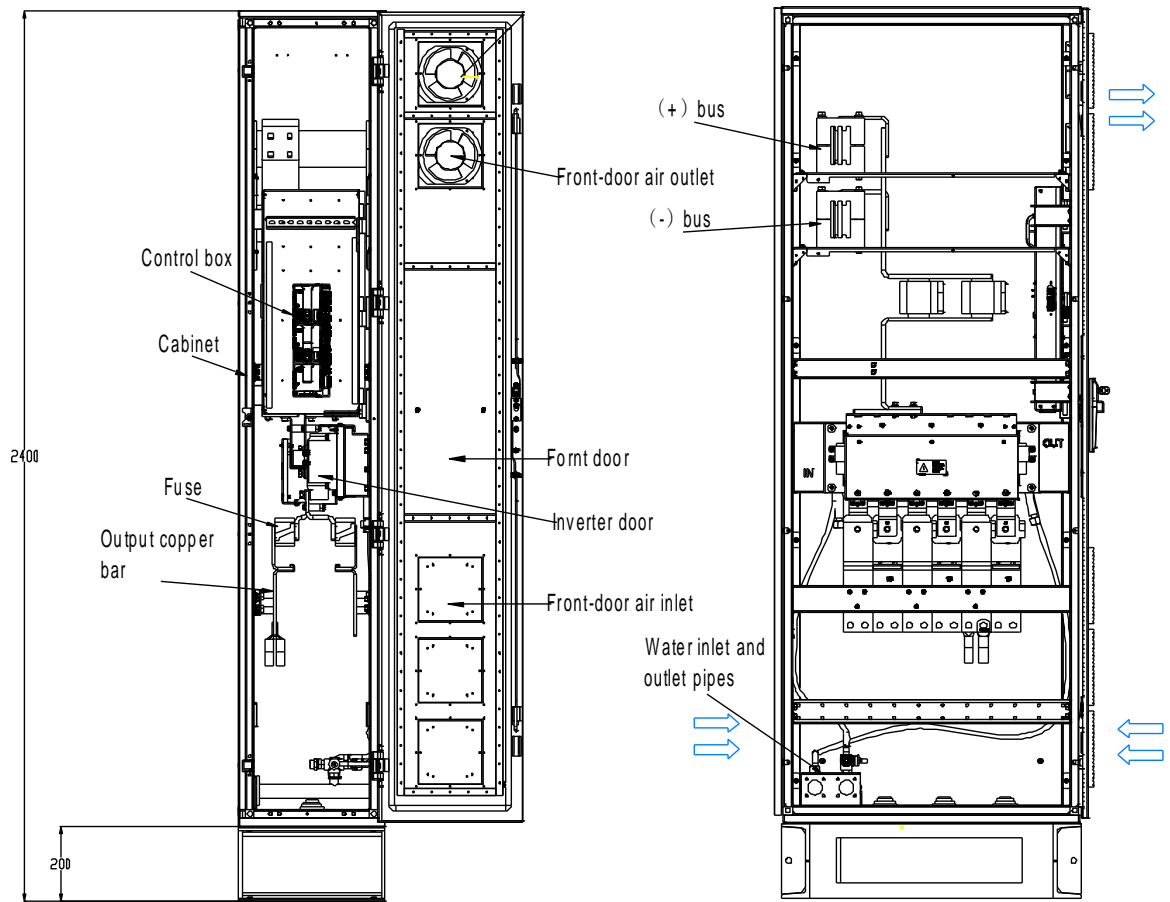
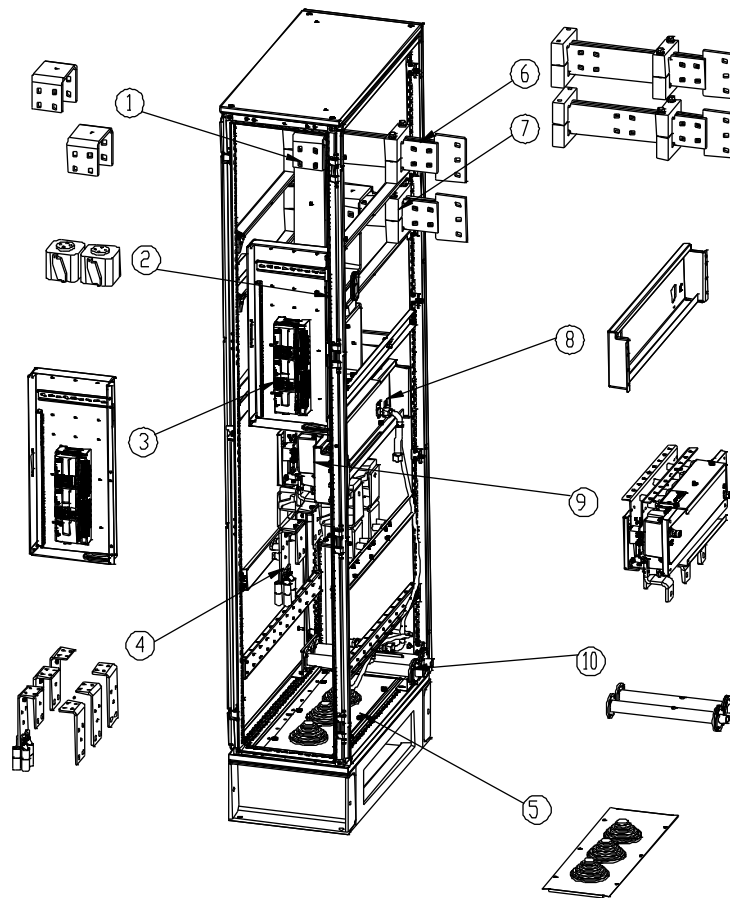


Figure 3-13 shows the installation of the water-cooled rectifier units in a 400mm-wide cabinet.

Figure 3-13 Installing rectifier units in a 400mm-wide cabinet



No.	Description
1	Input copper bar
2	DC fuse
3	Control box
4	Output copper bar
5	Bottom outgoing hole
6	(+) busbar and busbar clamp
7	(-) busbar and busbar clamp
8	Unit fixed bracket
9	Rectifier water-cooled unit
10	Inlet and outlet pipes

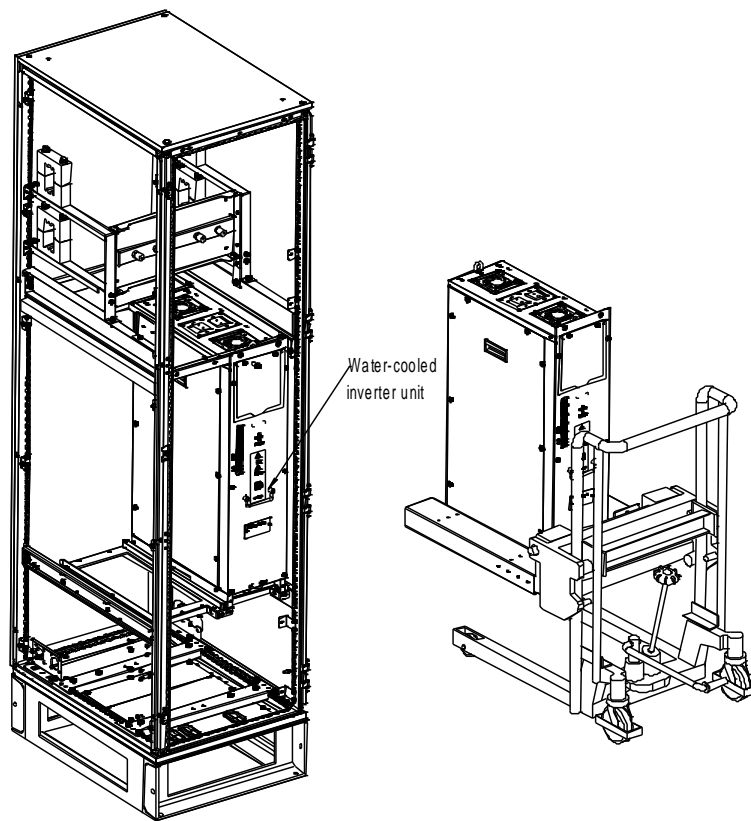
3.3.5.5 Unit installation (including rectifier, inverter and VFD units)

Installation procedure

1. Installation of water-cooled inverter and VFD units

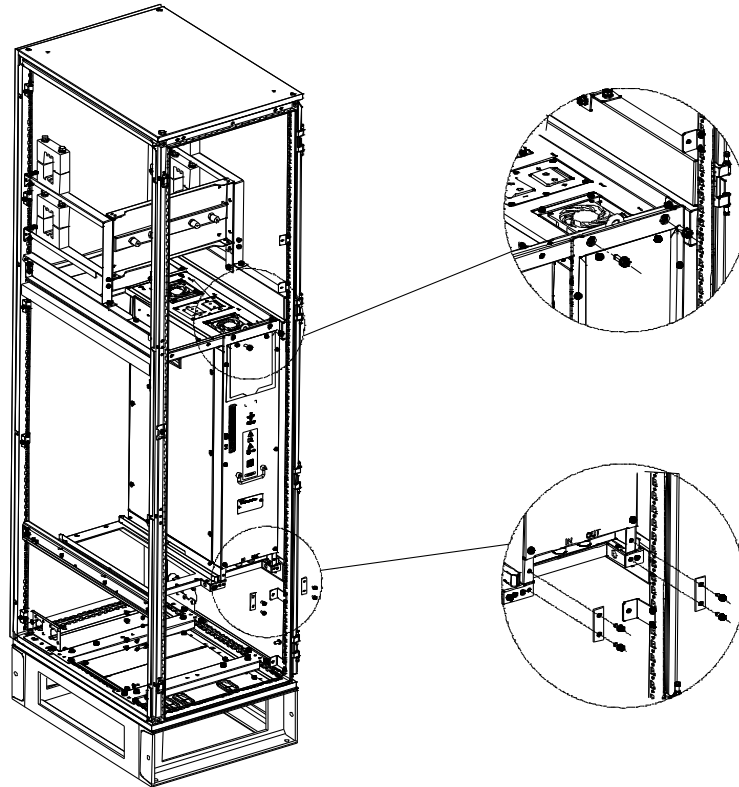
Step 1 Push the inverter module into the cabinet with a lifting device along the mounting limit slot, as shown in Figure 3-14.

Figure 3-14 Unit entry to the cabinet



Step 2 After pushing the inverter unit into the cabinet slowly, lock the two fixing bolts (M8X20) at the top of the inverter module, and then fix the bottom of the unit with the fixed plate, as shown in Figure 3-15.

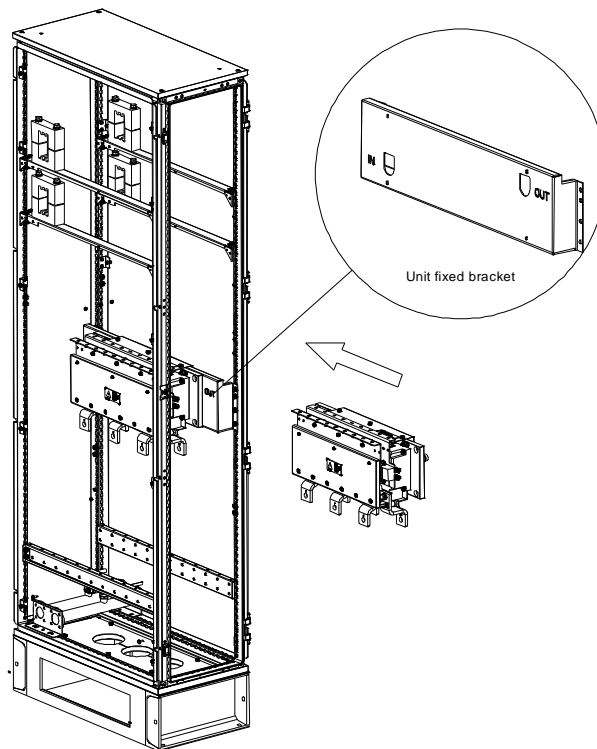
Figure 3-15 Unit entry to the cabinet



2. Installation of water-cooled rectifier units

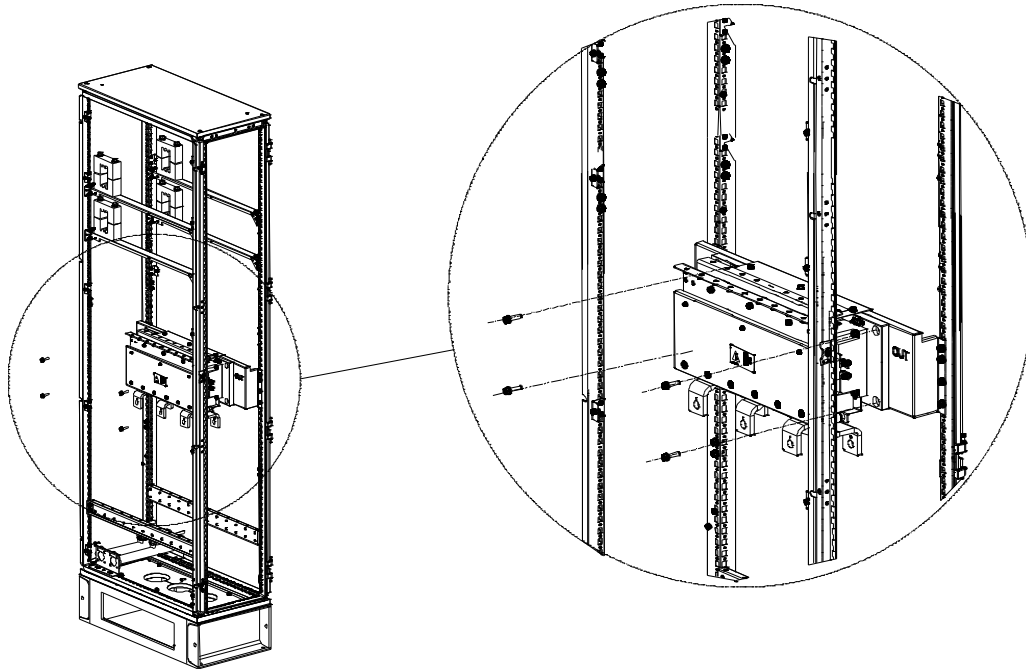
Step 1 Hang the water-cooled rectifier unit on the sheet metal fixed bracket and push it along the sheet metal to the right position (the unit mounting hole position), as shown in Figure 3-16.

Figure 3-16 Unit entry to the cabinet



Step 2 When the water-cooled unit mounting holes reach the fixed holes on the sheet metal, lock the four fixing screws (M8X30) on the water-cooling plate of the water-cooled rectifier unit to fix the unit in the cabinet, as shown in Figure 3-17.

Figure 3-17 Unit entry to the cabinet



Note:

- When installing or replacing the unit, wear gloves and safety shoes to prevent against scratching or smashing.

3.3.5.6 Keypad installation

The VFD is equipped with an externally mounted keypad (as shown in Figure 3-18), 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 3-19.

Figure 3-18 LED keypad structure

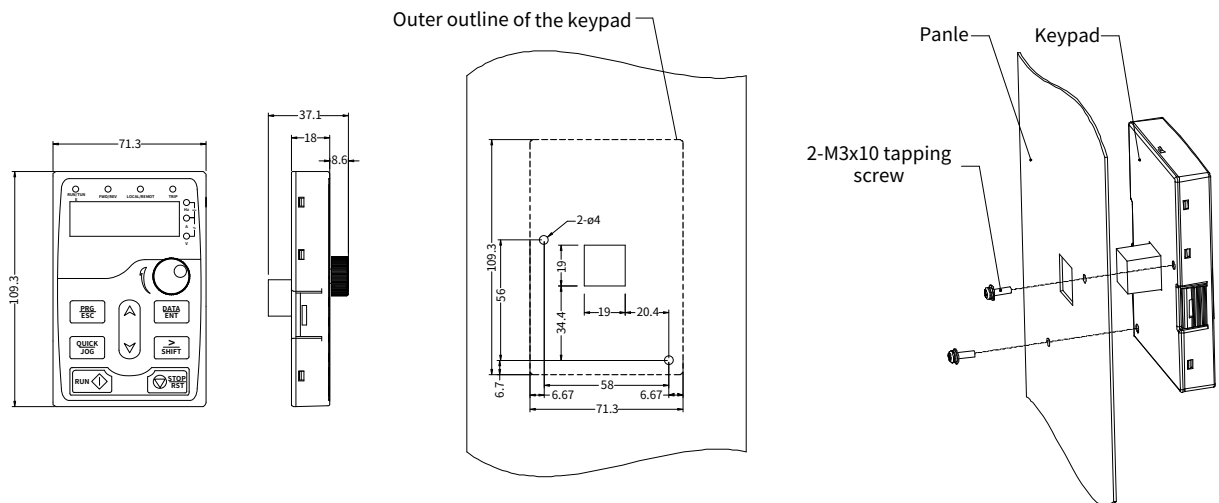
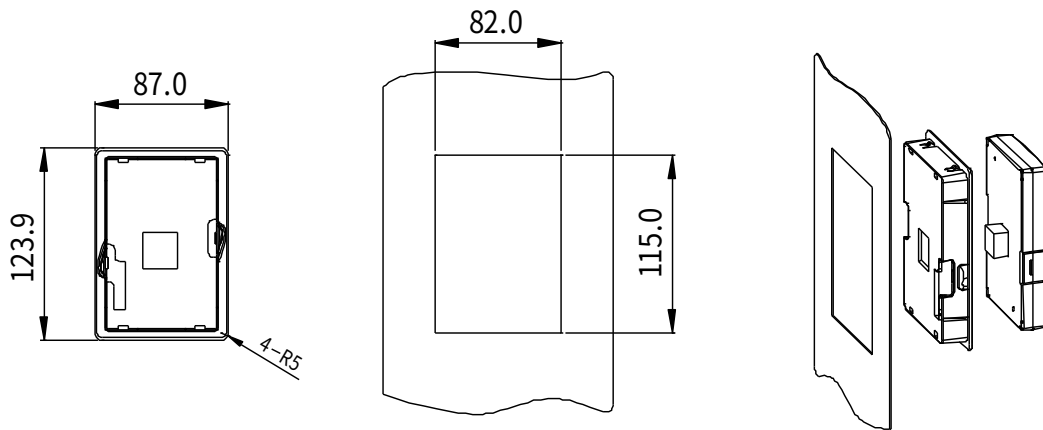


Figure 3-19 Mounting the keypad bracket



3.3.6 Fastening torque

You need the following tools to install the inverter unit:

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

The inverter 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 (Nm)
M4	4.8	1.5
M5	5.8	3
M6	5.8	5
M8	5.8	11
M10	4.8	22
M12	4.8	39


3.3.7 Checklist

No.	Operation	Compliant	Completed
1	Installed the beam for power unit fixing in the nine-fold profile cabinet.	<input type="checkbox"/>	<input type="checkbox"/>
2	Installed the bottom tray for power unit fixing in the nine-fold profile cabinet.	<input type="checkbox"/>	<input type="checkbox"/>
3	Installed the copper bars of the cabinet.	<input type="checkbox"/>	<input type="checkbox"/>
4	Assembled the installation guide rail (optional part) and installed it in the cabinet.	<input type="checkbox"/>	<input type="checkbox"/>
5	In the cooperation of two people, pushed the power unit to the cabinet. (The auxiliary rope for mounting has been used to prevent the unit from side tipping during the push-in or	<input type="checkbox"/>	<input type="checkbox"/>

No.	Operation	Compliant	Completed
	push-out.)		
6	Removed the auxiliary rope for mounting, and ensured that the unit was pushed into place.	<input type="checkbox"/>	<input type="checkbox"/>
7	Inserted screws into the fixing holes at the unit front top and bottom to fix the unit to the cabinet.	<input type="checkbox"/>	<input type="checkbox"/>
8	Checked the screw tightening state.	<input type="checkbox"/>	<input type="checkbox"/>

4 Electrical installation

4.1 Safety notes

	<ul style="list-style-type: none"> • 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: <ul style="list-style-type: none"> ■ The power is off. ■ Re-power on must not occur. ■ Wait for at least the time designated on the inverter unit, 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 inverter unit 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 inverter unit is supplied externally, the disconnecting the circuit break device cannot disconnect the entire power supply. The inverter unit 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 inverter unit. • If the safety device on a current branch trips, check the inverter unit for the fault cause, rectify the fault, and replace the damaged parts.
---	---

4.2 Insulation inspection

Inverter unit

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

Input power cable

Check the insulation conditions of the input power cable of the inverter unit 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 U, V, and W output terminals of the inverter unit.

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 variable-frequency regulation system wiring in several aspects including noise control, site wiring and grounding for reference in site installation, with consideration of ECM characteristics of VFDs where the input current and output voltage harmonics are relatively small but the voltage is high and the current is large.

1. Noise control

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

2. Site wiring

Power supply wiring: The shield layer of power supply incoming cables of the VFD shall be grounded reliably. It is not allowed to route the power cables and control cables in parallel.

Device categorization: There are different electric devices in the same distribution system, which have different ability of emitting and withstanding electromagnetic noise. Therefore, it needs to categorize these devices into strong noise device and noise sensitive device. The same kind of devices needs to be placed in the same area, and the distance between devices in different categories needs to be more than 20cm.

Wiring in the control cabinet: During wiring, signal cables and power cables need to be arranged in different areas. It is not allowed to arrange them in parallel or in interlaced state at a close distance (less than 20cm) or tie them together. If the signal cables have to cross the power cables, they need to be arranged in 90 degree angle.

3. Grounding

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

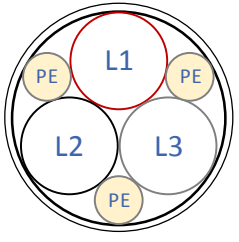
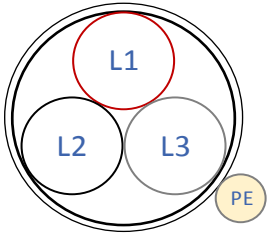
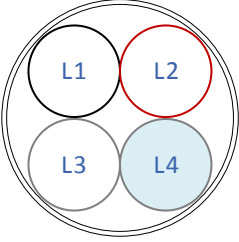
Three categories of grounding: special pole grounding, common pole grounding and series-wound

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

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.

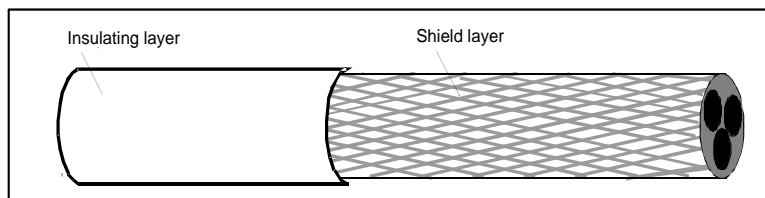
		
Symmetrical shielded cable, PEs in symmetrical manner	Symmetrical shielded cable, PE in separated manner	Asymmetrical four-core cable

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 effectively restrict the emission and conduction of radio frequency (RF) interference, the conductivity of the shielded cable must at least be 1/10 of the conductivity of the phase conductor. This requirement can be well met by a copper or aluminum shield layer. The following figure shows the minimum requirement on motor cables of an inverter unit. 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: Check the insulation conditions of the input power cable of inverter according to the local regulations before connecting it.

Table 4-1 Recommended output cables for water-cooled inverter units

Model	Cross-sectional area (mm ²)	Number of cables per phase
GD880-51-0410-6-LC	95	2

Model	Cross-sectional area (mm ²)	Number of cables per phase
GD880-51-0530-6-LC	150	2
GD880-51-0600-6-LC	150	2
GD880-51-0650-6-LC	185	2

Table 4-2 Recommended input cables for water-cooled rectifier units

Model	Cross-sectional area (mm ²)	Number of cables per phase (single channel of input)
GD880-61-2000-6-LC	300	2

Table 4-3 Recommended output cables for water-cooled VFD units

Model	Cross-sectional area (mm ²)	Number of cables per phase
GD880-11-0340-6-LC	185	1
GD880-11-0530-6-LC	150	2

4.3.2 Control cable

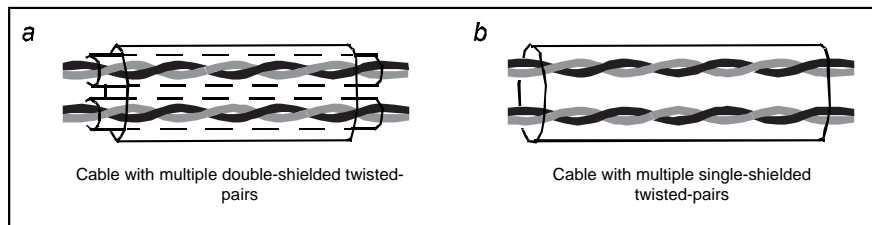
All analog signal cables, communication cables, and encoder cables must be shielded cables.

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 inverter 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 the following table.

Figure 4-3 General cable arrangement rules

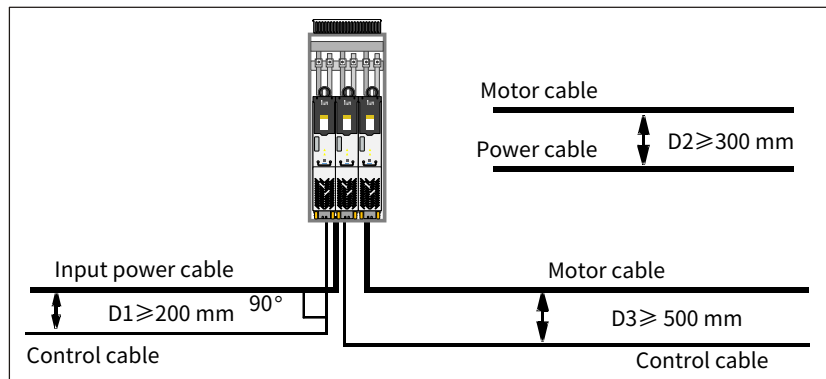


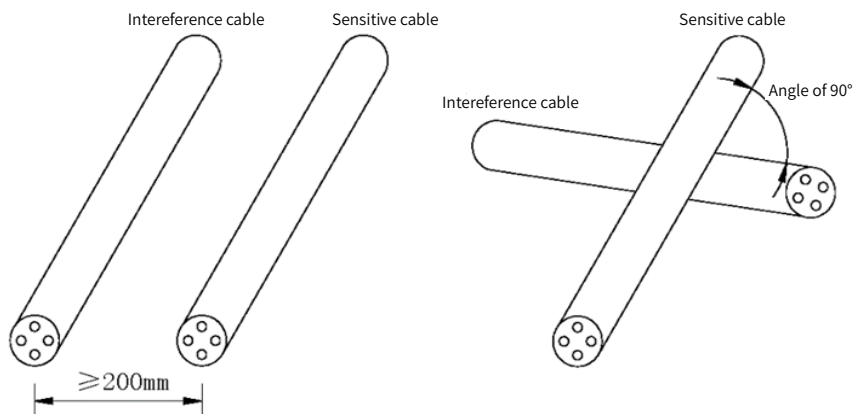
Table 4-4 Recommended values for the spacing between sensitive and interference cables

D1	D2	D3
≥200mm	≥300mm	≥500mm

Note:

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

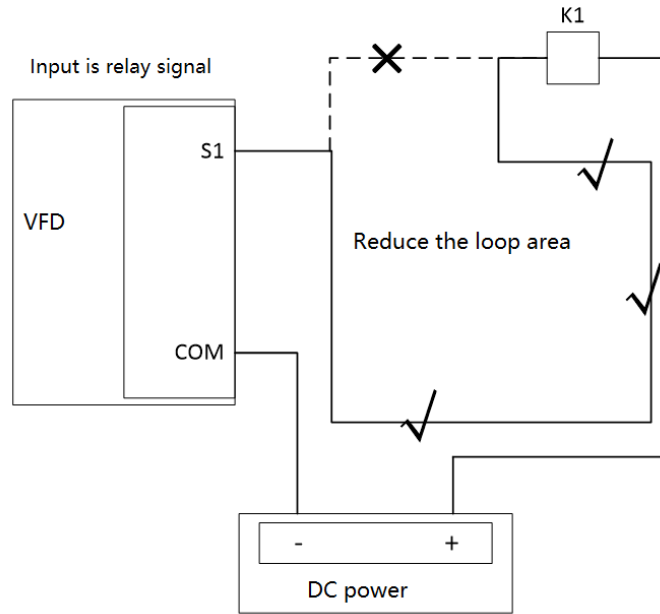
Figure 4-4 Routing sensitive and interference cables



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

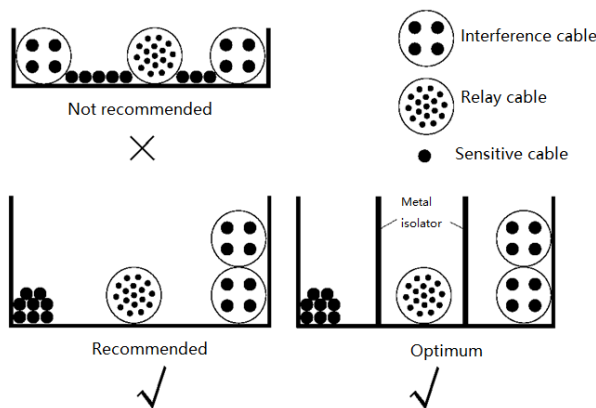
For inputs of such as relay signals and other non-differential signals, non-twisted pair cables can be used, and the wiring should minimize the loop area and a pair of signal lines should be routed as close as possible.

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

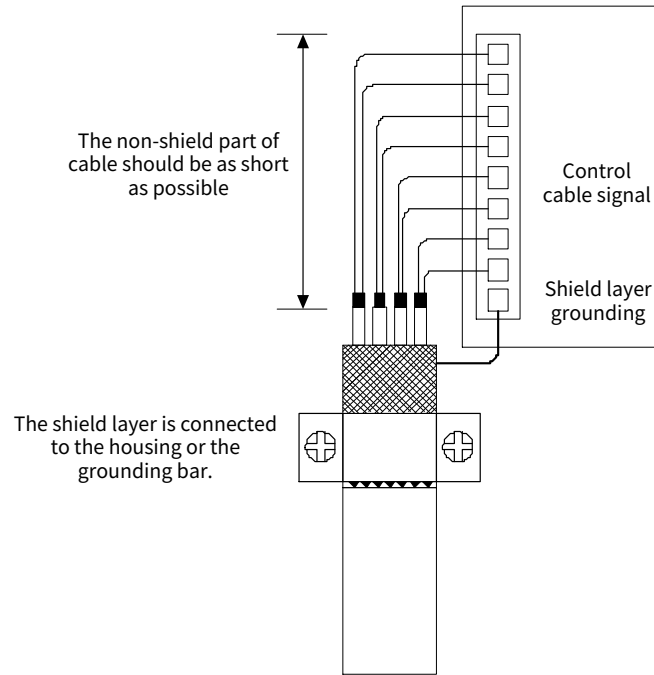


4.3.4 Shielded cable connection

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.

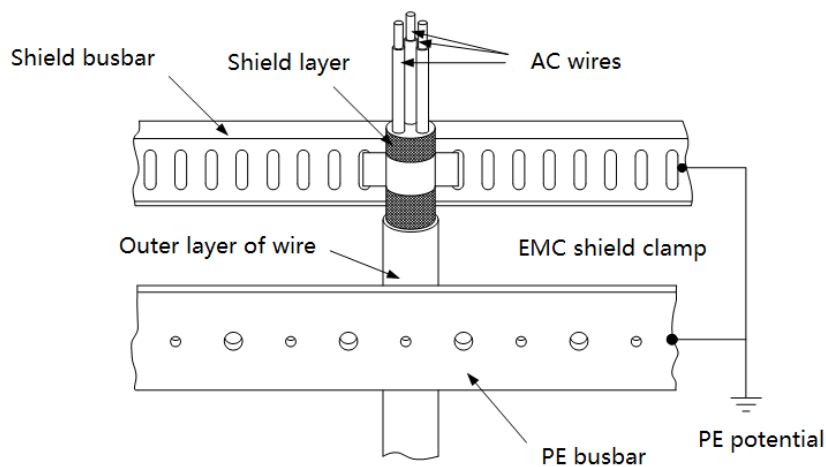
The unshielded part of the control cable that is shielded should be as short as possible, and the shield layer is connected to the nearest PE end. If the cable is stripped too long, the core is susceptible to interference of signals, especially analog, communication, and encoder signals.

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 the following diagram.

Figure 4-8 Power cable shield connection



4.3.5 Cable specification and recommendation

Table 4-5 Recommended water-cooled inverter output cables

Model	Number of single-phase cables*cable size (mm ²)	Terminal specification
GD880-51-0410-6-LC	2*120	OT/120-12
GD880-51-0530-6-LC	2*150	OT/150-12
GD880-51-0600-6-LC	2*185	OT/185-12
GD880-51-0650-6-LC	2*185	OT/185-12

Table 4-6 Recommended water-cooled rectifier output cables

Model	Number of single-phase cables*cable size (mm ²)	Terminal specification
GD880-61-2000-6-LC	6*185	OT/185-12

Table 4-7 Recommended water-cooled VFD output cables

Model	Number of single-phase cables*cable size (mm ²)	Terminal specification
GD880-11-0340-6-LC	1*185	OT/185-12
GD880-11-0410-6-LC	2*120	OT/120-12
GD880-11-0530-6-LC	2*150	OT/150-12

Note: In the "Terminal specification" column, "OT/185-12" indicates that the cable is connected to the OT terminal, the cable size corresponding to the terminal is 185mm², and the size of the screw hole is M12.

4.4 Electrical wiring

4.4.1 Main circuit wiring

4.4.1.1 Wiring diagram of the main circuit

Figure 4-9 A8LC inverter unit wiring

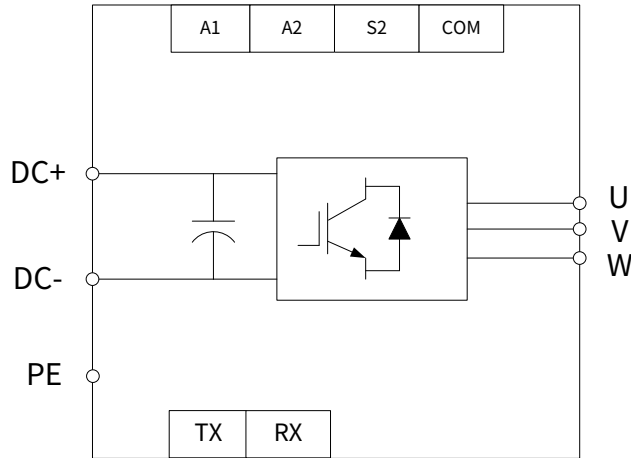
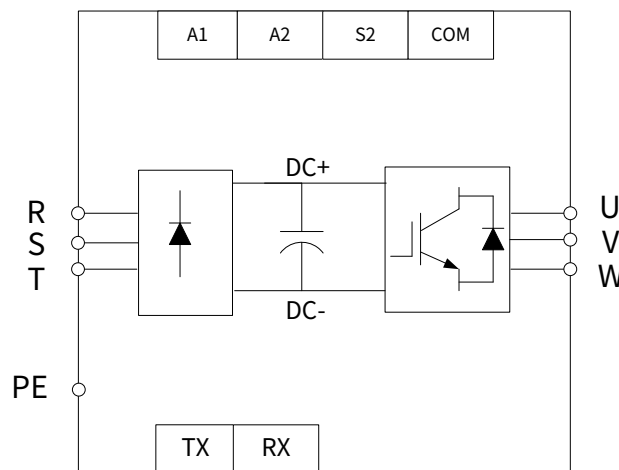
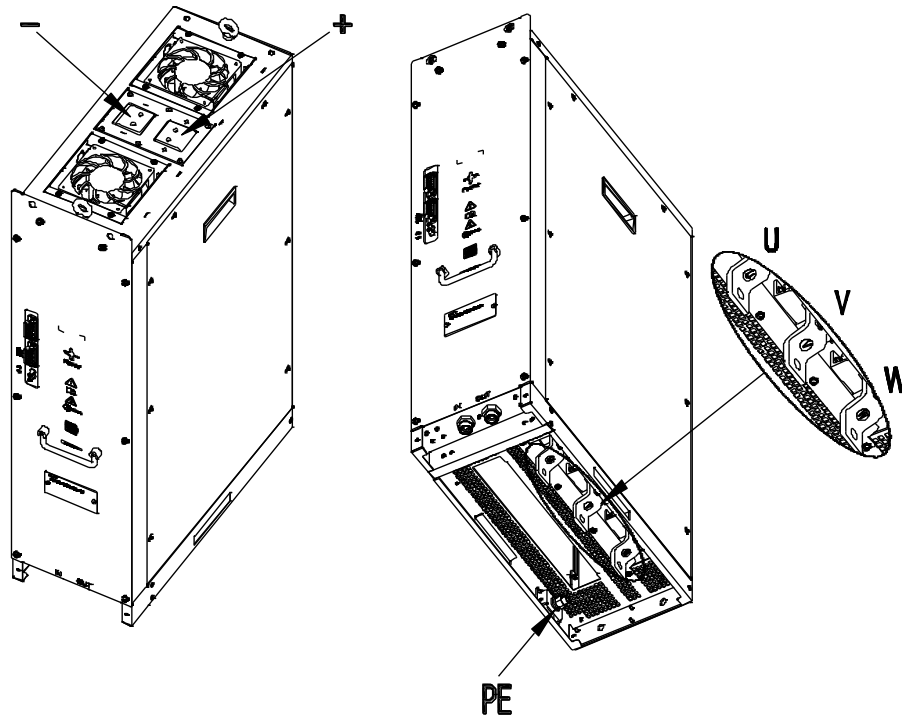


Figure 4-10 A8LC VFD unit wiring



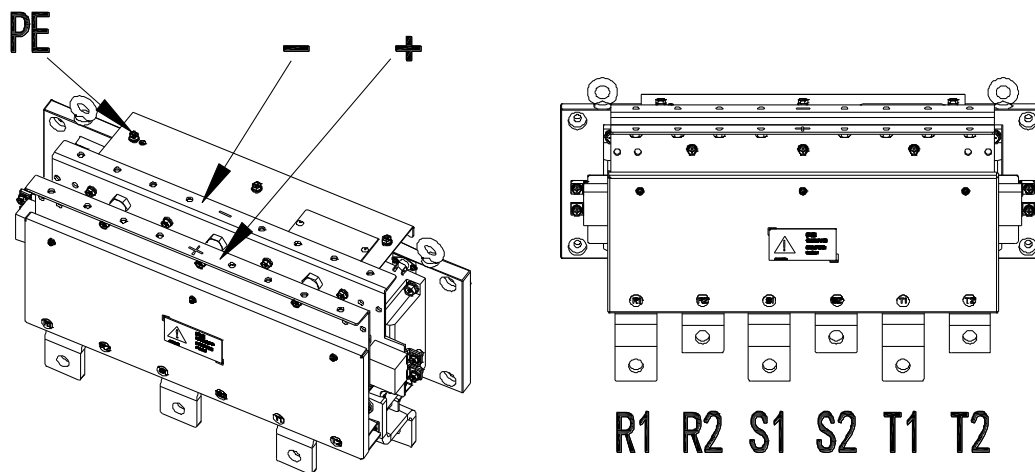
4.4.1.2 Main circuit wiring terminals

Figure 4-11 Water-cooled inverter unit terminal diagram



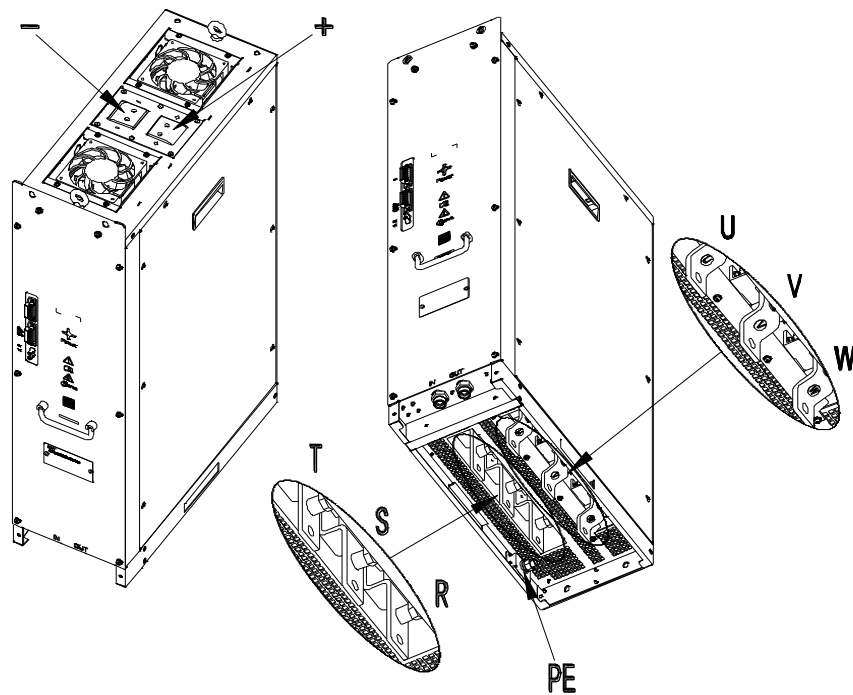
Name	Description
(+), (-)	DC bus voltage input terminals
U, V, W	3PH AC output terminals
PE	Grounding terminal

Figure 4-12 Water-cooled rectifier unit terminal diagram



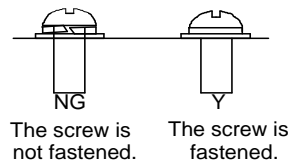
Name	Description
(+), (-)	DC bus voltage input terminals
U, V, W	3PH AC output terminals
PE	Grounding terminal

Figure 4-13 Water-cooled VFD unit terminal diagram



4.4.1.3 Screw tightening

Figure 4-14 Screw installation requirements

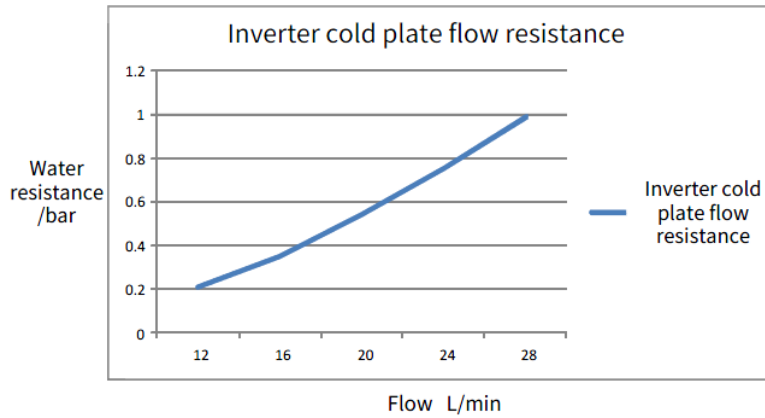


4.4.2 Electrical installation checklist

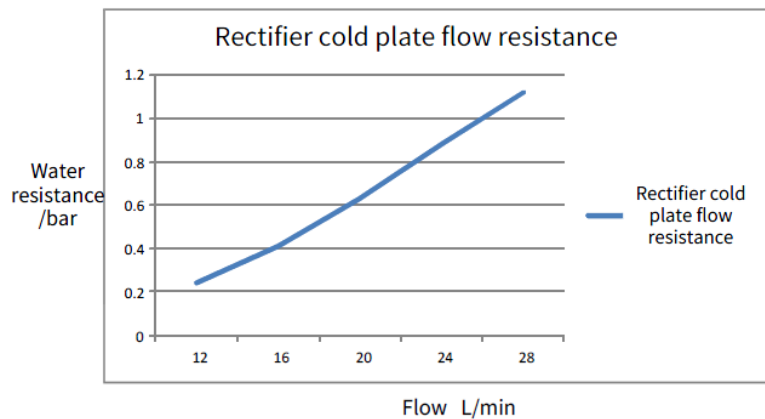
No.	Operation	Compliant	Completed
1	Checked the input and output power wiring and ensured the wiring positions and voltages were correct.	<input type="checkbox"/>	<input type="checkbox"/>
2	Ensured that the input and output power wiring was correct and fastened.	<input type="checkbox"/>	<input type="checkbox"/>
3	Ensured that the input and output power cable carrying capacity selection was correct.	<input type="checkbox"/>	<input type="checkbox"/>
4	Ensured that routing the input and output power cables that were shielded complied with EMC regulations.	<input type="checkbox"/>	<input type="checkbox"/>
5	Checked the external auxiliary power wiring and ensured the wiring positions and voltages are correct.	<input type="checkbox"/>	<input type="checkbox"/>
6	The date of manufacture can be known from the inverter unit nameplate. If the interval to the first commissioning time or the power module downtime is less than 2 years, precharge for the DC bus capacitors is not needed; if the downtime is more than 2 years, precharge for the DC bus capacitors is needed. For details about precharge, see 6.2.1Capacitor.	<input type="checkbox"/>	<input type="checkbox"/>
7	Routed the control power cables and power cables separately, complying with EMC regulations.	<input type="checkbox"/>	<input type="checkbox"/>

5 Water resistance curve of coolant

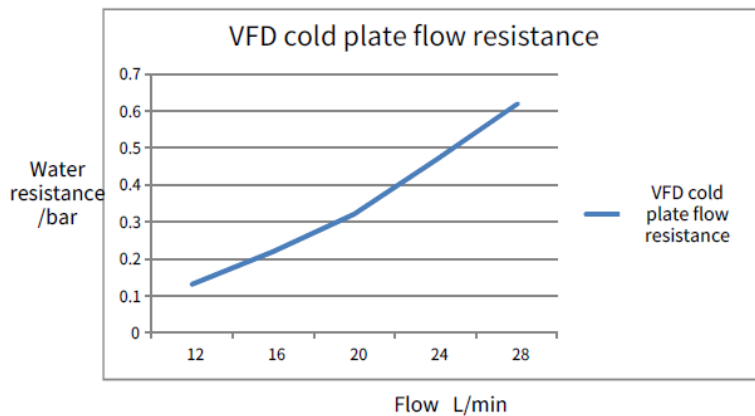
5.1 Flow resistance curve of water-cooled inverter cold plate



5.2 Flow resistance curve of water-cooled rectifier cold plate



5.3 Flow resistance curve of water-cooled VFD cold plate



5.4 Protection against condensation

You should take your own measures to prevent condensation from appearing on the device. Once condensation appears, the power must be cut off and the equipment must be dried before it is powered on. Condensation occurs preferentially on the inlet pipe of the device when the inflow temperature of coolant is significantly lower than the ambient temperature. The temperature at which air condenses into water is called the dew point.

The following table shows the dew point for different relative humidity and room temperature at 1 bar atmospheric pressure. If the coolant temperature is lower than the dew point, condensation will occur, so the coolant temperature needs to be higher than the dew point temperature. Control the coolant temperature according to the table below.

Table 5-1 Dew point (°C) for different relative air humidity ϕ and room temperature T at 0m altitude

Room temperature T (°C)	ϕ =20%	ϕ =30%	ϕ =40%	ϕ =50%	ϕ =60%	ϕ =70%	ϕ =80%	ϕ =85%	ϕ =90%	ϕ =95%	ϕ =100%
10	<0	<0	<0	0.2	2.7	4.8	6.7	7.6	8.4	9.2	10
20	<0	2	6	9.3	12	14.3	16.4	17.4	18.3	19.1	20
25	0.6	6.3	10.5	13.8	16.7	19.1	21.2	22.2	23.2	24.1	24.9
30	4.7	10.5	14.9	18.4	21.3	23.8	26.1	27.1	28.9	29	29.9
35	8.7	14.8	19.3	22.9	26	28.6	30.9	32	33	34	34.9
38	11.1	17.4	22	25.7	28.8	31.5	33.8	34.9	36	36.9	37.9
40	12.8	19.1	23.7	27.5	30.6	33.4	35.8	36.9	37.9	38.9	39.9
45	16.8	23.3	28.2	32	35.3	38.1	40.6	41.8	42.9	43.9	44.9
50	20.8	27.5	32.6	36.6	40	42.9	45.5	46.6	47.8	48.9	49.9

The dew point is also related to the absolute pressure, i.e. to the installation height. For air pressures below 1 bar, the dew point is lower than that in the above table. Therefore, the coolant inflow temperature needs to be controlled according to Table 5-1 to meet the need for condensation prevention.

6 Maintenance and inspection

6.1 Periodical maintenance

6.1.1 Overview

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

Before operating the interior of the equipment:

- Disconnect the power to 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.

6.1.2 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 6-1 Screw thread tightening torque (Fastener grade: 4.8; unit: kgf.cm)

Screw thread specification	Copper bar connection	Metal sheet connection	Remarks
M5	30	20	-
M6	45	30	-
M8	110	85	-
M10	220	164	-
M12	390	285	-
M16	980	710	-

6.1.3 Maintenance cycle

Little maintenance is required when the VFD 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.

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

The following table describes the routine check items recommended by INVT.

Check scope	Item	Method	Criterion	
Ambient environment	Check the temperature, and humidity, and whether there is vibration, dust, gas, oil spray, and water droplets in the environment.	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	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.

Check scope		Item	Method	Criterion
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, damage, deformation, or rust.	Visual inspection	No exception occurs.
		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 <http://www.invt.com>, and choose Support > Services.

6.2 Replacement of wearing parts

6.2.1 Capacitor

6.2.1.1 Capacitor reforming

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

Storage time	Operation principle
Less than 1 year	No charging operation is required.
1 to 2 years	The inverter 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 inverter unit: <ul style="list-style-type: none"> Charge the VFD at 25% of the rated voltage for 30 minutes,

Storage time	Operation principle
	<ul style="list-style-type: none"> 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 inverter unit: <ul style="list-style-type: none"> Charge the VFD at 25% of the rated voltage for 2 hours, and then charge it at 50% of the rated voltage for 2 hours, at 75% for another 2 hours, and finally charge it at 100% of the rated voltage for 2 hours.

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

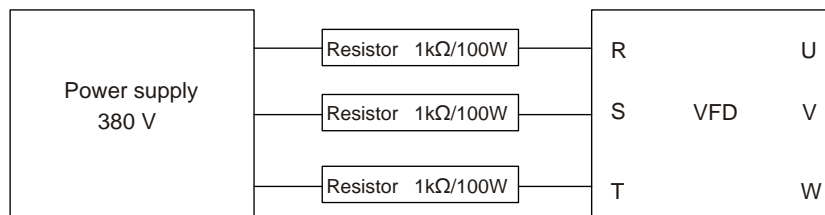
For inverter units of a high voltage class, ensure that the voltage requirement (for example, 380 V) is met during charging. Capacitor charging requires little current, and therefore you can use a small-capacity power supply (2 A is sufficient).

The method for using a resistor (incandescent lamp) to charge the inverter 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 380 V 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 6-1 380V driving-device charging circuit example



6.2.1.2 Electrolytic capacitor replacement

	<ul style="list-style-type: none"> Read chapter 1 Safety precautions carefully and follow the instructions to perform operations. Ignoring these safety precautions may lead to physical injury or death, or device damage.
---	--

The electrolytic capacitor of an inverter 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.

6.2.2 Cooling fan

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

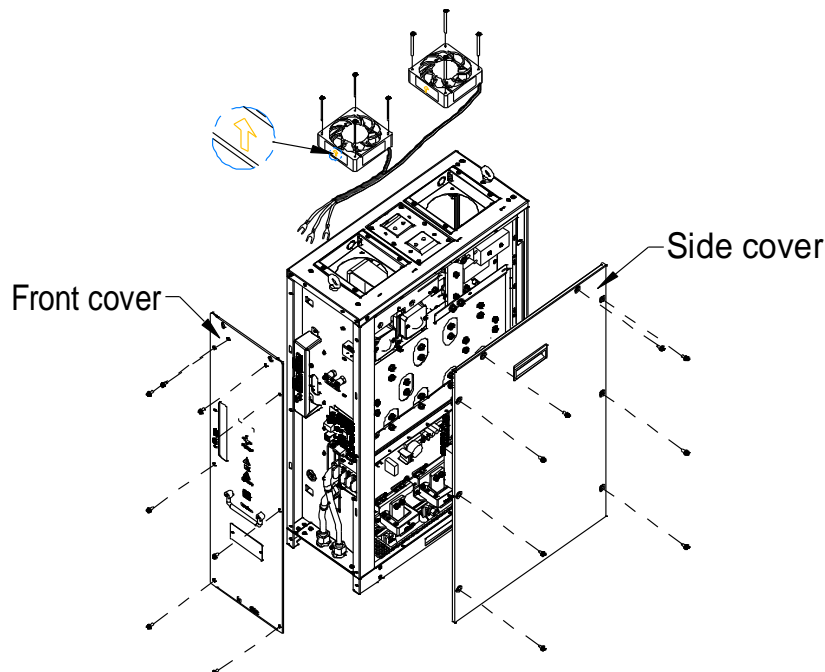
Cooling fan replacement:



- 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.

- 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 the Figure 6-2.
- Step 6 Connect to the power.

Figure 6-2 Water-cooled inverter unit fan maintenance



6.2.3 DC fuse

To check and replace the DC fuse of an A8i inverter 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.

6.2.4 Water-cooled unit (including rectifier, inverter, and VFD)

1. To replace the water-cooled inverter unit and VFD unit, do as follows:

Step 1 Stop the machine and disconnect the AC power.

Step 2 Open the cabinet door and check to ensure there is no voltage in the equipment.

Step 3 Disconnect the external connection cables of the inverter unit and remove the optical fiber.

Step 4 Drain all coolant from the inverter module. Remove the cooling duct, as shown in Figure 6-3.

Step 5 Remove the main circuit incoming and outgoing copper strips (or cable).

Step 6 Remove the (six M8) fixing screws from the top and bottom fixed plates of the inverter unit, as shown in Figure 6-4.

Step 7 Pull out the unit with a lifting device, as shown in Figure 6-5.

Step 8 Install the new water-cooled inverter unit by referring the reverse order of the procedure.

Figure 6-3 Removing the cooling duct

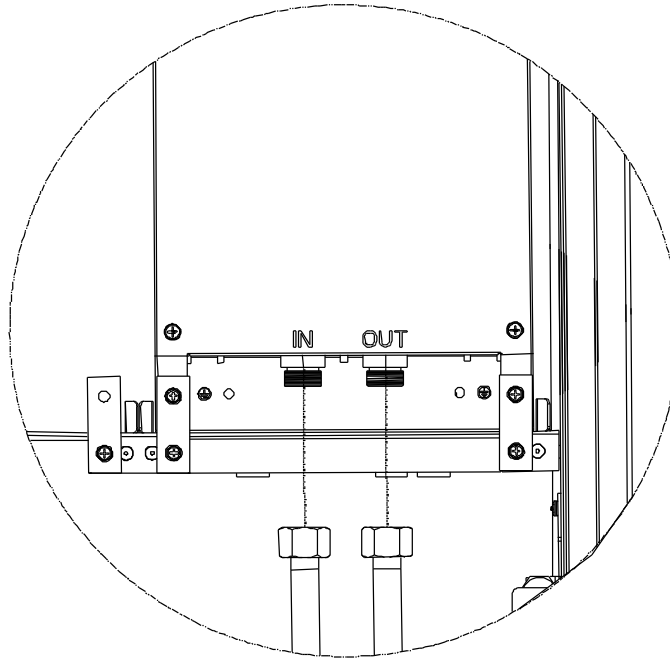


Figure 6-4 Removing the fixing screws at the top and bottom of the unit

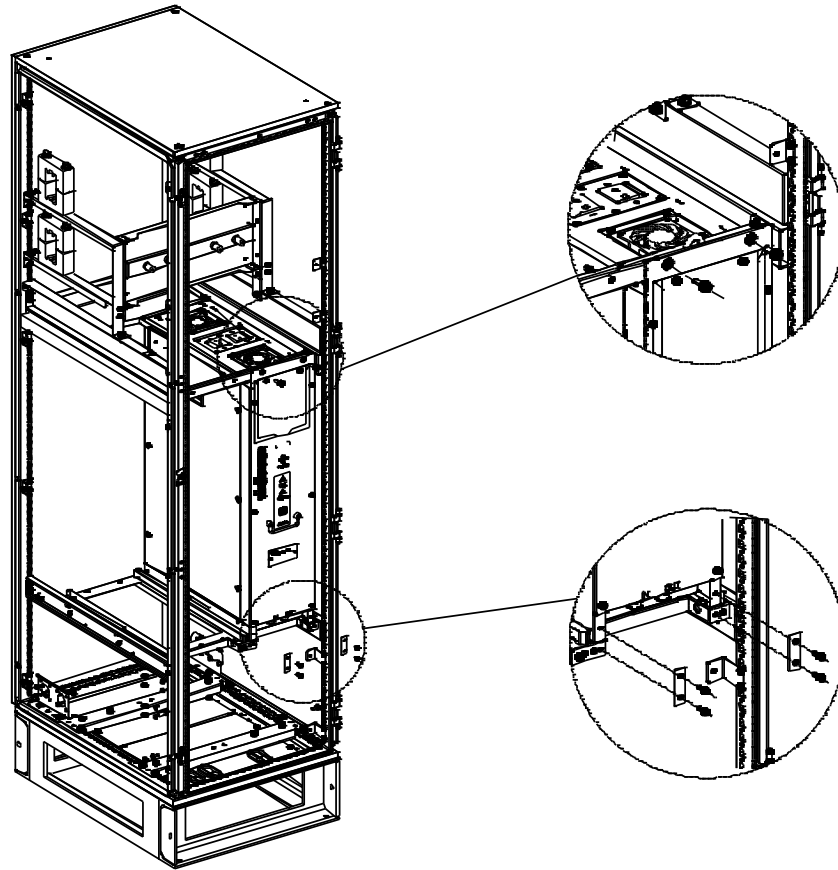
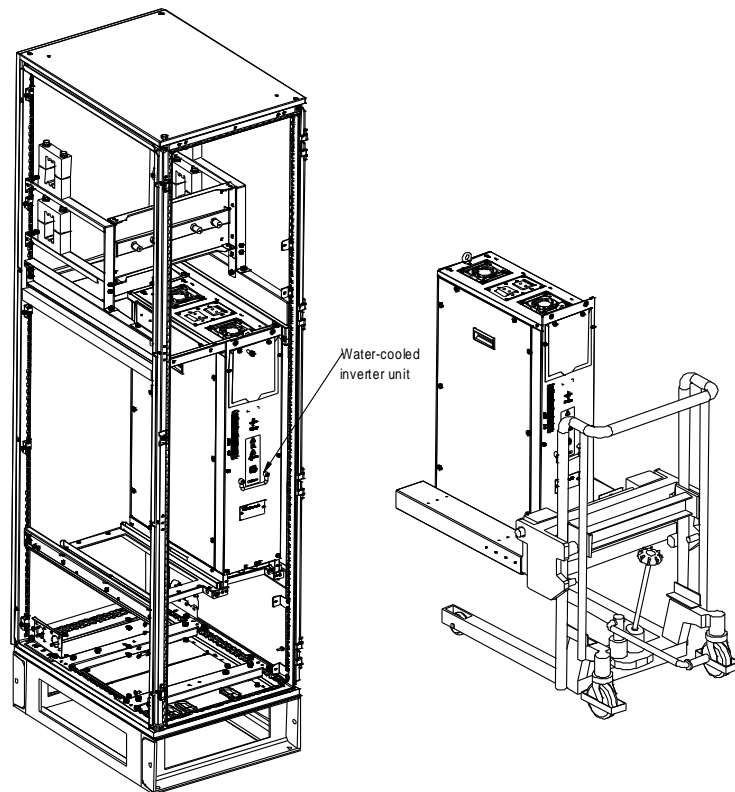


Figure 6-5 Pulling out the water-cooled inverter unit



2. The replacement procedure of the water-cooled rectifier is as follows:

Step 1 Stop the machine and disconnect the AC power.

Step 2 Open the cabinet door and check to ensure there is no voltage in the equipment.

Step 3 Disconnect the external connection cables of the inverter unit.

Step 4 Drain all coolant from the rectifier module. Remove the cooling duct, as shown in Figure 6-6.

Step 5 Remove the (four M8) fixing screws from the unit water-cooled plate, as shown in Figure 6-7.

Step 6 Remove the water-cooled rectifier unit, as shown in Figure 6-8.

Step 7 Install the new water-cooled rectifier unit by referring the reverse order of the procedure.

Figure 6-6 Removing the cooling duct

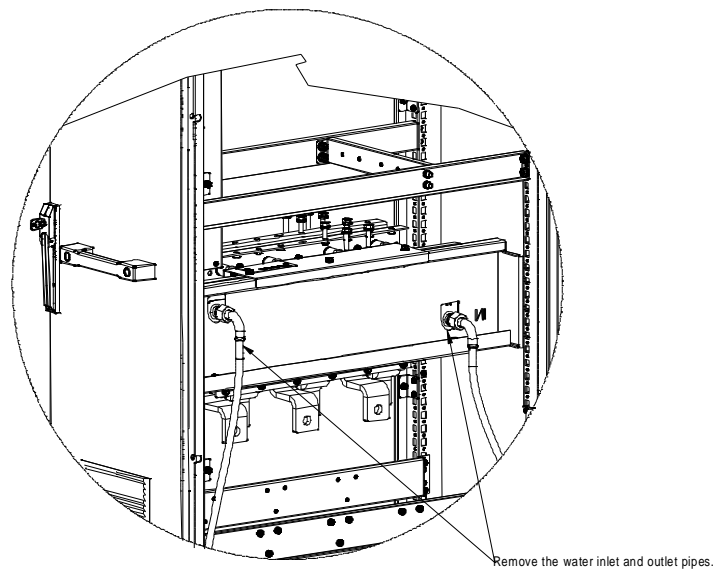


Figure 6-7 Removing four fixing screws from the unit water-cooled plate

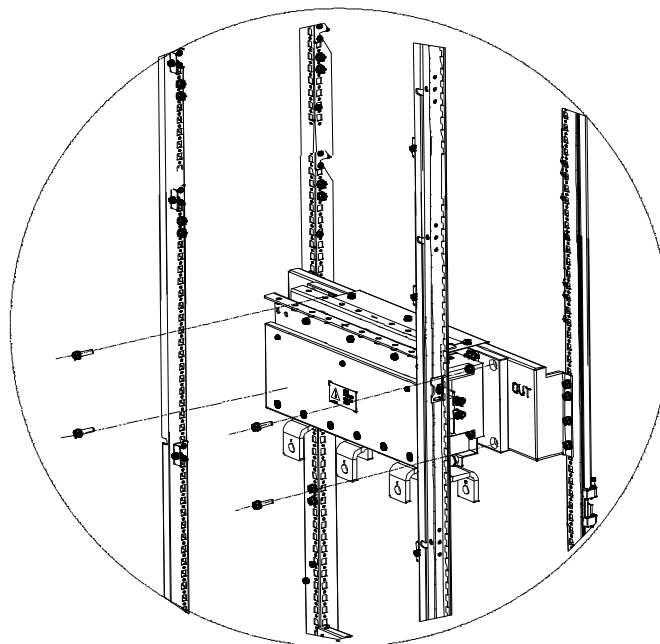
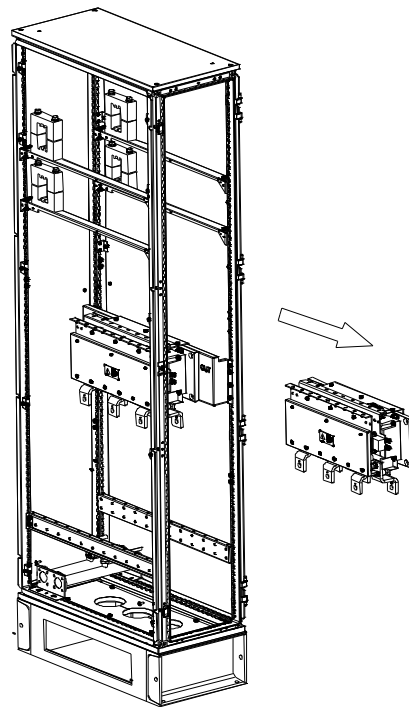


Figure 6-8 Removing water-cooled rectifier unit



6.3 Warranty description

Goodrive880 series is warranted for 24 months from the date of shipment from INVT.

Repair or replacement of parts during the warranty period does not affect the warranty period of the original product as a whole. If the warranty period of the original product is less than 3 months, the repaired or replaced parts will still enjoy the 3-month warranty period.

1. Product faults caused by the following reasons are not covered by the manufacturer's 24-month free warranty service commitment.

- (1) Failure to follow the correct procedures listed in the manual
- (2) Product faults caused by unauthorized repair or modification on the product without communication with the manufacturer
- (3) Product faults caused by the application out of the standard application scope
- (4) Abnormal product component aging or faults caused by improper application environments
- (5) Product damage due to force majeure causes such as earthquake, fire, wind and water disaster, lightning strike, abnormal voltage or other natural disasters
- (6) Product wear and tear due to product falling or external force application caused by improper transport method (the transport method is customer selected; the manufacturer assists in the consignment procedures).

2. The manufacturer has the right not to provide warranty service in the following cases:

- (1) The brand, trademark, serial number, nameplate and other identification marked by the manufacturer in the product is destroyed or illegible.
- (2) The customer does not pay for the goods in accordance with the Purchase and Sales Contract signed by both parties.
- (3) The customer intentionally conceals the improper product use in installation, wiring, operation, maintenance or other processes from the manufacturer's after-sales service provider.
- (4) See the Product Warranty Card for detailed warranty instructions.

Appendix A Technical data

A.1 Capacity

Choose a VFD 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 VFD must be larger or equal to the rated current of the motor. The rated power of the VFD must be higher or equal to that of the motor.

Note:

1. 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 VFD automatically restricts the torque and current of the motor. This function effectively protects the input shaft against overload.
2. The rated capacity is the capacity at the ambient temperature of 45°C.
3. 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 in IEC60439-1, the maximum allowable short-circuit current at the incoming end is 100kA. Therefore, the inverter is applicable to scenarios where the transmitted current in the circuit is no larger than 100kA when the inverter runs at the maximum rated voltage.
Frequency	50/60Hz±5%, with a maximum change rate of 20%/s

A.3 Application standards

The following table describes the standards that our inverters 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.3.1 CE marking

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

A.3.2 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.4 EMC regulations

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

Application environment categories:

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

Second environment: All locations outside a residential area.

VFD categories:

Category C1: VFD of rated voltage lower than 1000V, applied to the first environment.

Category C2: VFD of rated voltage lower than 1000V, which is neither a non-plug, socket, nor mobile devices and must be installed and commissioned by a professional person when used in the first environment.

Note: The EMC standard IEC/EN 61800-3 no longer restricts the power distribution of VFDs, 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.


Category C3: VFD of rated voltage lower than 1000V, applied to the second environment. They cannot be applied to the first environment.

Category C4: Inverter of rated voltage higher than 1000V, or rated current higher or equal to 400A, applied to complex systems in the second environment.

A.4.1 VFD category of C2

The induction disturbance limit meets the following stipulations:

1. Select the motor and control cables according to the description in the manual.
2. Install the VFD according to the description in the manual.


	<ul style="list-style-type: none"> • The VFD may generate radio interference, you need to take measures to reduce the interference.
---	--

A.4.2 VFD category of C3

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

	<ul style="list-style-type: none"> • VFDs of category C3 cannot be applied to civilian low-voltage common grids. When applied to such grids, the VFD may generate radio frequency electromagnetic interference.
---	--

Appendix B Dimension drawings

Figure B-1 Installation dimensions of water-cooled inverter unit

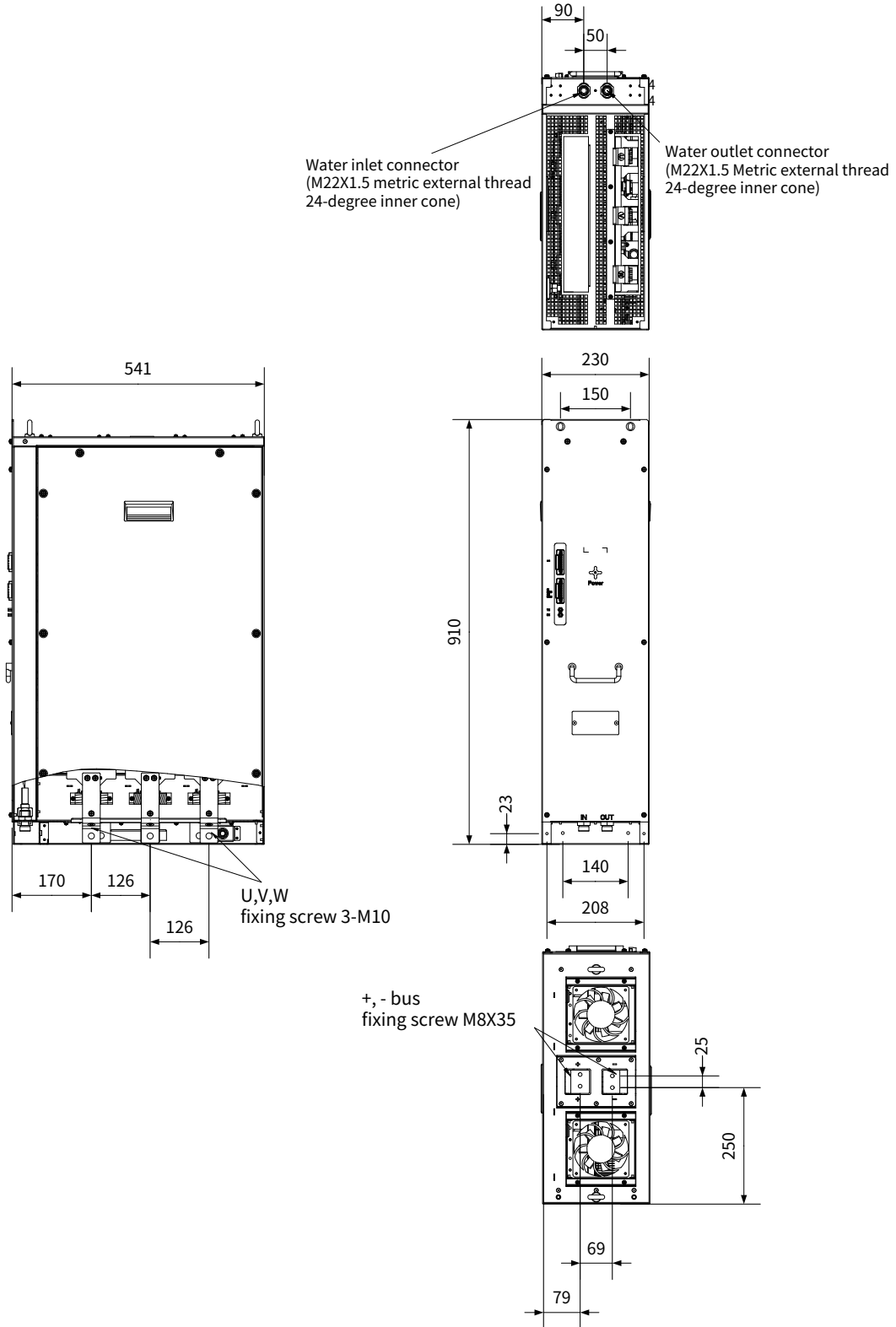
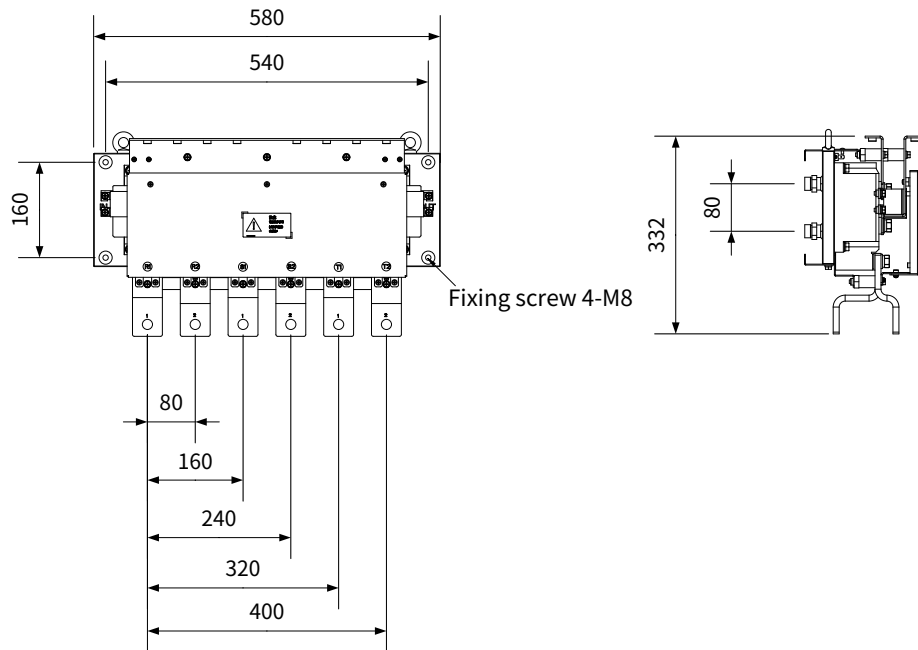


Figure B-2 Installation dimensions of water-cooled rectifier unit



Water inlet connector
(M22X1.5 metric external thread
24-degree inner cone)

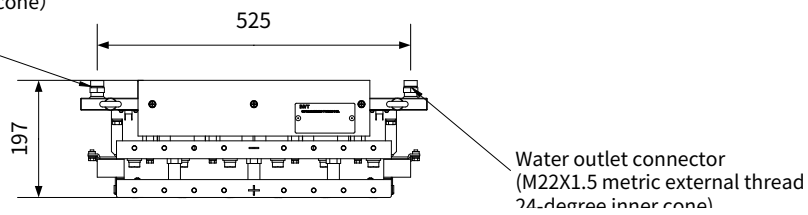
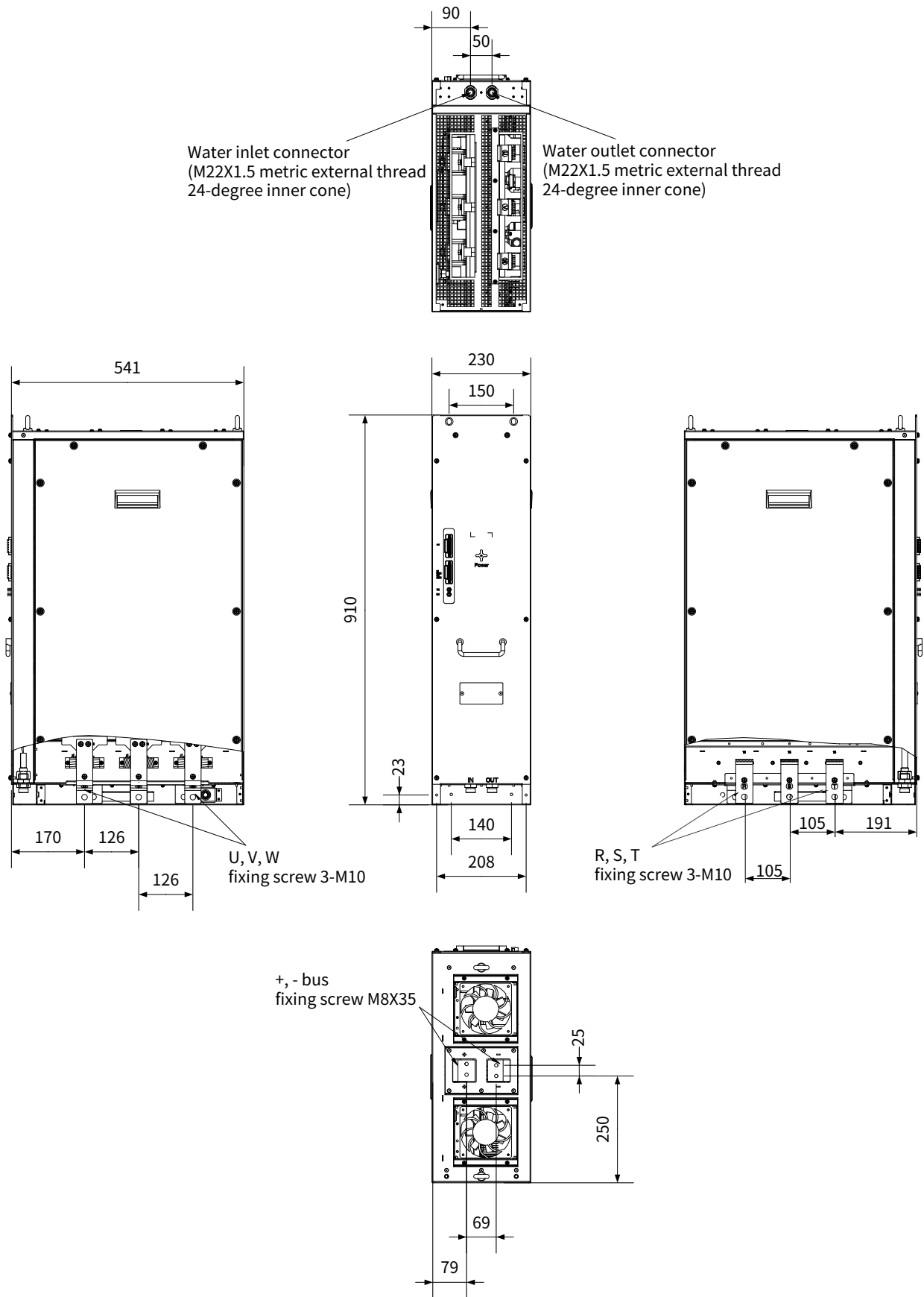


Figure B-3 Installation dimensions of water-cooled VFD unit



Your Trusted Industry Automation Solution Provider



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



INVT mobile website



INVT e-manual



66001-01053