Goodrive880 Series Single-Drive VFD

Hardware Manual

SHENZHEN INVT ELECTRIC CO., LTD.

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1	First release.	V1.0	March 2024

Preface

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

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

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

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

Goodrive880 series engineering VFD can be widely used in:

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

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

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

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

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

Goodrive880-11 series is the single-drive unit of Goodrive880 Pro series. If not otherwise specified, the single-drive unit in this manual refers to the single-drive unit of Goodrive880 series, that is, Goodrive880-11 series product. The rated power of a single unit is 4 –710kW, and the max. parallel power can be 1300kW. The single-drive unit consists of rectifier, bus capacitor, IGBT, and some models carry built-in reactors. It is compact in structure and easy to integrate and maintain.

This manual is Goodrive880 series single-drive VFD cabinet 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

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 drive 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

	• 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 drive unit or until the DC bus voltage is less than 36V. The minimum waiting time is listed in the following.

<table>
<tr><td></td><td>
<table>
<tr><th colspan="2">Drive unit model</th><th>Minimum waiting time</th></tr>
<tr><td rowspan="3">380V</td><td>3.7–90kW</td><td>5 minutes</td></tr>
<tr><td>110–200kW</td><td>15 minutes</td></tr>
<tr><td>Higher than 355kW</td><td>25 minutes</td></tr>
<tr><td rowspan="2">690V</td><td>55–315kW</td><td>15 minutes</td></tr>
<tr><td>Higher than 400kW</td><td>25 minutes</td></tr>
</table>
</td></tr>
<tr><td>  </td><td>• Do not refit the drive unit unless authorized; otherwise fire, electric shock or other injury may result.</td></tr>
<tr><td>  </td><td>• The base may become hot when the drive unit is running. Do not touch. Otherwise, you may get burnt.</td></tr>
<tr><td>  </td><td>• The electrical parts and components inside the drive unit are electrostatic sensitive. Take measurements to prevent electrostatic discharge when performing related operations.</td></tr>
</table>

1.4.1 Delivery and installation

<table>
<tr><td>  </td><td>• Do not install the drive unit on inflammables. In addition, prevent the drive unit from contacting or adhering to inflammables.
• Do not run the drive unit if it is damaged or incomplete.
• Do not contact the drive unit with damp objects or body parts. Otherwise, electric shock may result.</td></tr>
<tr><td>Note</td><td>• Select appropriate tools for drive 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 drive unit against physical shock or vibration during the delivery and installation.
• Do not carry the product only by its front cover as the cover may fall off.
• The installation site must be away from children and other public places.
• Prevent the screws, cables and other conductive parts from falling into the drive unit.
• As drive unit leakage current caused during running may exceed 3.5mA, ground properly and ensure the grounding resistance is less than 10Ω. The conductivity of P grounding conductor must meet the following requirements:
<table>
<tr><th>Power cable conductor cross-sectional area S (mm²)</th><th>Grounding conductor cross-sectional area (mm²)</th></tr>
<tr><td>S≤16</td><td>S</td></tr>
<tr><td>16<S≤35</td><td>16</td></tr>
<tr><td>35<S</td><td>S/2</td></tr>
</table>
• (+) 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 drive unit may be damaged.</td></tr>
</table>

1.4.2 Commissioning and running

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

	supplies. • High voltage presents inside the drive unit during running. Do not carry out any operation on the drive unit during running except for keypad setup. The control terminals of the product form extra-low voltage (ELV) circuits. Therefore, you need to prevent the control terminals from connecting to accessible terminals of other devices. • Before turning on the power supply, check the cable connection status. • Prevent anyone from directly touching the energized part of the cabinet door. Pay special attention to safety when handling shields that are made of metal sheets. • Do not do any withstand voltage testing during 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 drive unit during running.
Note	• Do not switch on or switch off the input power supplies of the drive unit frequently. • If the drive unit has been stored for a long time without use, perform checking and carry out pilot run for the drive unit before using it again. • Close the drive unit front cover before running; otherwise, electric shock may occur.

1.4.3 Maintenance and component replacement

	• Only trained and qualified professionals are allowed to perform maintenance, inspection, and component replacement for the drive unit. • Cut off all power supplies connected to the drive unit before terminal wiring, and wait for at least the time designated on the drive 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 drive unit.
Note	• Use proper torque to tighten screws. • During maintenance and component replacement, keep the drive 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 drive unit, or measure the control circuits of the drive unit with a megohmmeter. • During maintenance and component replacement, take proper anti-static measures on the drive unit and its internal parts.

1.4.4 Disposal

	• The drive unit contains heavy metals. Dispose of a scrap power unit as industrial waste.
	• Dispose of a scrap product separately at an appropriate collection point but not place it in the normal waste stream.

2 Product overview

For Goodrive880-11 series single-drive units, the rated power of a single unit is 5.5kW–710kW, while that of parallel units can be up to 1300kW. The single-drive unit products consists of rectifier, bus capacitor, IGBT, control unit, and some models carry built-in reactors. It is compact in structure and easy to integrate and maintain.

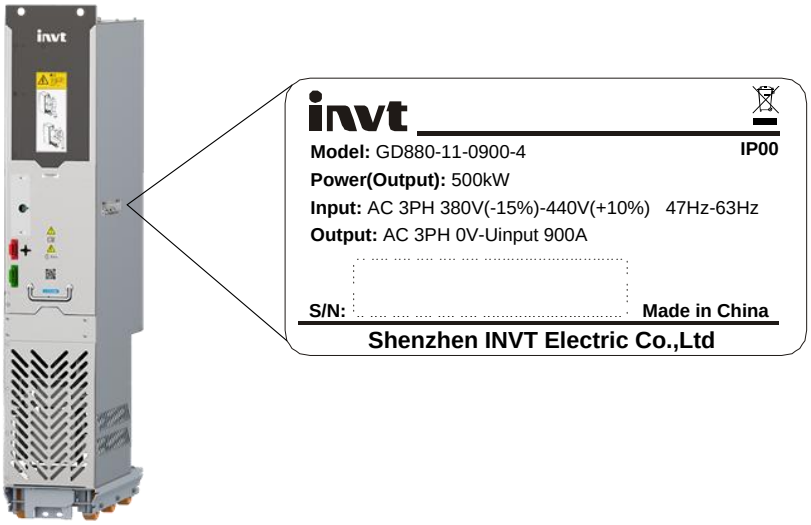
2.1 Product specifications

Table 2-1 Product specifications

Function description		Specifications
Power input	Input voltage (V)	AC 3PH 380–440VAC ±10%, -15%<1min AC 3PH 520–690VAC±10%, -15%<1min
	Input current (A)	See section 2.3 Product ratings
Power output	Output voltage (V)	0–Input voltage (V)
	Output current (A)	See section 2.3 Product ratings
	Output power (kW)	See section 2.3 Product ratings
	Output frequency (Hz)	0–400
	Working efficiency	⩾98.5% (at the rated current)
Control performance	Control mode	Space voltage vector control mode Sensorless vector control (SVC) mode Feedback vector control (FVC) mode
	Motor type	Asynchronous motor (AM) and synchronous motor (SM)
	Speed ratio	For AMs: 1: 200 (SVC) For SMs: 1: 20 (SVC); 1: 1000 (FVC)
	Starting torque	For AMs: 0.25Hz/150% (SVC); 0Hz/200% (FVC) For SMs: 2.5Hz/150% (SVC); 0Hz/200% (FVC)
	Stable speed accuracy	±0.1% (SVC); ±0.01% (FVC)
	Dynamic speed drop	0.3–0.5%s (SVC) 0.1–0.3%s (FVC) (100% torque step)
	Torque accuracy	<5% (SVC, >5Hz); <3% (FVC)
	Torque response	<10ms (SVC); <5ms (FVC)
Environment condition	Working temperature	-10°C – +50°C; Derating is required when the ambient temperature exceeds 40°C.
	Relative humidity	5%–95%, no condensation
	Installation altitude	Below 1000m (Derating is required when the altitude exceeds 1000m. Derate by 1% for every increase of 100m.)
Mechanical data	Anti-vibration performance	Compliant with 3M4 vibration level in GB/T4798.3
	IP rating	For the module: IP00 For the cabinet: IP20 (Optional: IP23 and IP42)
	Safety performance	Compliant with EN 61800-5-1
	Cooling method	Forced air cooling
Protection function		Including functions of protection against short circuit, overcurrent, overload, overvoltage, undervoltage, overtemperature, and phase loss

2.2 Product nameplate and model

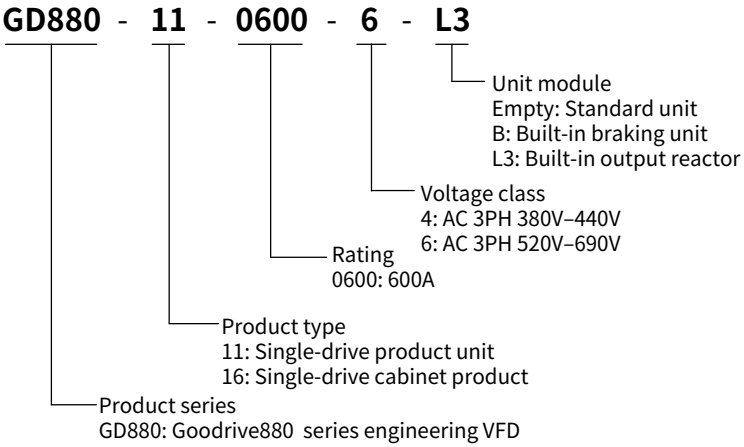
Figure 2-1 Product nameplate



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

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

Figure 2-2 Product model



2.3 Product ratings

Table 2-2 Rated value for product in E frame (incoming voltage of 3PH 380–440VAC)

VFD model	Rated value			Light overload application		Heavy overload application		Frame	Heat dissipation (kW)	Air volume (m^3/h)
	Input current (A)	Output current (A)	Output power (kW)	Output current (A)	Output power (kW)	Output current (A)	Output power (kW)			
GD880-11-0013-4-B	20	14	5.5	13.5	5.5	9.5	4	E3	0.18	68
GD880-11-0017-4-B	25	19	7.5	17	7.5	13.5	5.5		0.31	
GD880-11-0023-4-B	30	23	11	23	11	17	7.5	E4	0.34	149
GD880-11-0033-4-B	40	32	15	32	15	25	11		0.52	

VFD model	Rated value			Light overload application		Heavy overload application		Frame	Heat dissipation (kW)	Air volume (m³/h)
	Input current (A)	Output current (A)	Output power (kW)	Output current (A)	Output power (kW)	Output current (A)	Output power (kW)			
GD880-11-0038-4-B	45	38	18.5	38	18.5	32	15	E5	0.53	192
GD880-11-0048-4-B	51	45	22	45	22	38	18.5		0.59	
GD880-11-0060-4-B	64	60	30	60	30	45	22	E6	0.75	341
GD880-11-0078-4-B	80	75	37	75	37	60	30		0.96	
GD880-11-0094-4-B	98	92	45	92	45	75	37		1.13	
GD880-11-0116-4	128	115	55	115	55	92	45	E7	1.19	752
GD880-11-0149-4	139	150	75	150	75	115	55		1.50	
GD880-11-0170-4	168	170	90	170	90	150	75		1.82	
GD880-11-0215-4	201	215	110	215	110	180	90	E8	2.21	850
GD880-11-0260-4	265	260	132	260	132	215	110		2.59	
GD880-11-0305-4	310	305	160	305	160	260	132	E9	3.16	1443
GD880-11-0340-4	345	340	185	340	185	305	160		3.68	
GD880-11-0380-4	385	380	200	380	200	340	185	E11	3.96	1798
GD880-11-0425-4	430	425	220	425	220	380	200		4.23	
GD880-11-0480-4	460	480	250	480	250	425	220		4.83	
GD880-11-0530-4	500	530	280	530	280	480	250		5.53	2697
GD880-11-0600-4	580	600	315	600	315	530	280		6.13	
GD880-11-0650-4	625	650	355	650	355	600	315		6.81	
GD880-11-0720-4	715	720	400	720	400	650	355	E12	7.62	
GD880-11-0820-4	840	820	450	820	450	720	400		8.55	
GD880-11-0860-4	890	860	500	860	500	820	450		9.38	

Table 2-3 Ratings of 11A8 unit

VFD model	Rated value			Light overload application		Heavy overload application		Frame	Heat dissipation (kW)	Air volume (m³/h)
	Input current (A)	Output current (A)	Output power (kW)	Output current (A)	Output power (kW)	Output current (A)	Output power (kW)			
Incoming voltage 3PH 380–440VAC										
GD880-11-0639-4	556	639	355	613	315	479	250	11A8	6.80	1500
GD880-11-0757-4	627	757	400	727	400	568	315	11A8	8.00	1500
GD880-11-0900-4	783	900	500	864	450	675	355	11A8	10.00	1500
GD880-11-0975-4	878	975	560	945	500	731	400	11A8	10.10	1500
GD880-11-1213-4	987	1213	630	1165	630	910	500	2*11A8	13.60	3000
GD880-11-1439-4	1254	1439	800	1381	800	1079	630	2*11A8	16.00	3000
GD880-11-1710-4	1566	1710	1000	1642	900	1283	710	2*11A8	20.00	3000
GD880-11-1852-4	1696	1852	1100	1795	1000	1388	800	2*11A8	21.20	3000
Incoming voltage 3PH 520–690VAC										
GD880-11-0410-6	364	410	400	394	355	308	315	11A8	6.20	1500
GD880-11-0530-6	455	530	500	509	450	398	355	11A8	8.00	1500
GD880-11-0600-6	509	600	560	576	560	450	400	11A8	9.10	1500
GD880-11-0650-6	573	650	630	624	560	488	450	11A8	10.30	1500
GD880-11-0720-6	645	720	710	690	630	540	500	11A8	11.70	1500

VFD model	Rated value			Light overload application		Heavy overload application		Frame	Heat dissipation (kW)	Air volume (m³/h)
	Input current (A)	Output current (A)	Output power (kW)	Output current (A)	Output power (kW)	Output current (A)	Output power (kW)			
GD880-11-0779-6	727	779	800	748	710	584	560	2*11A8	12.40	3000
GD880-11-1007-6	910	1007	1000	967	900	755	710	2*11A8	16.00	3000
GD880-11-1140-6	1000	1140	1100	1094	1000	855	800	2*11A8	18.20	3000
GD880-11-1235-6	1090	1235	1200	1186	1000	927	900	2*11A8	20.60	3000
GD880-11-1368-6	1182	1368	1300	1311	1200	1026	1000	2*11A8	22.50	3000

Table 2-4 Ratings of single-drive cabinet products

VFD model	Rated value			Light overload application		Heavy overload application		Frame	Heat dissipation (kW)	Air volume (m³/h)
	Input current (A)	Output current (A)	Output power (kW)	Output current (A)	Output power (kW)	Output current (A)	Output power (kW)			
Incoming voltage 3PH 380–440VAC (11A8 frame)										
GD880-16-0639-4	556	639	355	613	315	479	250	16S4	7.50	1500
GD880-16-0757-4	627	757	400	727	400	568	315		9.50	1500
GD880-16-0900-4	783	900	500	864	450	675	355		10.70	1500
GD880-16-0975-4	878	975	560	945	500	731	400		112.00	1500
GD880-16-1213-4	987	1213	630	1165	630	910	500	16S5	15.00	3000
GD880-16-1439-4	1254	1439	800	1381	800	1079	630		19.00	3000
GD880-16-1710-4	1566	1710	1000	1642	900	1283	710		21.40	3000
GD880-16-1852-4	1696	1852	1100	1795	1000	1388	800		24.00	3000
Incoming voltage 3PH 380–440VAC (E frame)										
GD880-16-0215-4	201	215	110	215	110	180	90	16S6	2.20	850
GD880-16-0260-4	265	260	132	260	132	215	110		2.80	850
GD880-16-0305-4	310	305	160	305	160	260	132	16S7	3.16	1443
GD880-16-0340-4	345	340	185	340	185	305	160		3.68	1443
GD880-16-0380-4	385	380	200	380	200	340	185	16S8	3.96	1798
GD880-16-0425-4	430	425	220	425	220	380	200		4.23	1798
GD880-16-0480-4	460	480	250	480	250	425	220		4.85	1798
GD880-16-0530-4	500	530	280	530	280	480	250	16S9	6.70	2697
GD880-16-0600-4	580	600	315	600	315	530	280		7.00	2697
GD880-16-0650-4	625	650	355	650	355	600	315		7.80	2697
GD880-16-0720-4	715	720	400	720	400	650	355	16S10	8.30	2697
GD880-16-0820-4	840	820	450	820	450	720	400		9.10	2697
GD880-16-0860-4	890	860	500	860	500	820	450		9.50	2697
Incoming voltage 3PH 520– 690VAC (11A8)										
GD880-16-0410-6	364	410	400	394	355	308	315	16S4	9.50	1500
GD880-16-0530-6	455	530	500	509	450	398	355		10..8	1500
GD880-16-0600-6	509	600	560	576	560	450	400		12.10	1500
GD880-16-0650-6	573	650	630	624	560	488	450		13.40	1500
GD880-16-0720-6	645	720	710	690	630	540	500		15.00	1500
GD880-16-0779-6	727	779	800	748	710	584	560	16S5	19.00	3000
GD880-16-1007-6	910	1007	1000	967	900	755	710		21.60	3000

VFD model	Rated value			Light overload application		Heavy overload application		Frame	Heat dissipation (kW)	Air volume (m³/h)
	Input current (A)	Output current (A)	Output power (kW)	Output current (A)	Output power (kW)	Output current (A)	Output power (kW)			
GD880-16-1140-6	1000	1140	1100	1094	1000	855	800		24.20	3000
GD880-16-1235-6	1090	1235	1200	1186	1000	927	900		26.00	3000
GD880-16-1368-6	1182	1368	1300	1311	1200	1026	1000		30.00	3000

2.4 Product dimensions and weight

Table 2-5 Product dimensions and weight

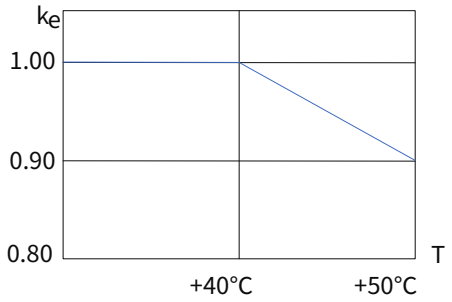
Frame	Width (mm)	Height (mm)	Depth (mm)	Net weight (kg)
E3	146	263	181	3.5
E4	170	320	219	6
E5	230	330	217	7.8
E6	250	400	223	16
E7	282	560	258	25
E8	338	554	330	41
E9	338	825	398	78
E11	330	1288	544	124
E12	330	1398	544	175
11A8	250	1340	584	150

2.5 Derated application

2.5.1 Derating due to temperature

If the drive unit works at the temperature of 40°C – 50°C, the rated output current of inverter unit must be derated by 1% for every 1°C increase. The current reference value multiplied by the derating coefficient (ke) is the output current at the temperature higher than 40°C.

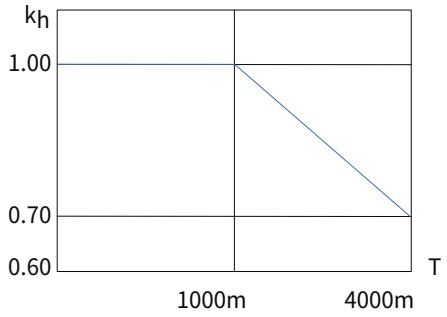
Figure 2-3 Derating due to ambient temperature



2.5.2 Derating due to altitude

The drive 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 2-4 Derating due to altitude



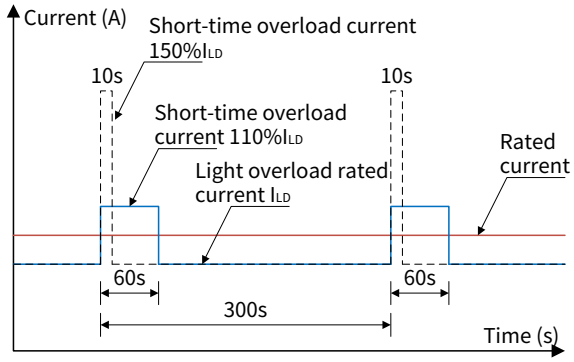
2.5.3 Derating due to carrier frequency

VFD model	Rated power P (kW)	Carrier frequency (kHz)					
		1.2	1.5	2	2.5	3.2	4
GD880-11-0013-4-B	5.5	100%	100%	100%	100%	100%	100%
GD880-11-0017-4-B	7.5	100%	100%	100%	100%	100%	100%
GD880-11-0023-4-B	11	100%	100%	100%	100%	100%	100%
GD880-11-0033-4-B	15	100%	100%	100%	100%	100%	100%
GD880-11-0038-4-B	18.5	100%	100%	100%	100%	100%	100%
GD880-11-0048-4-B	22	100%	100%	100%	100%	100%	100%
GD880-11-0060-4-B	30	100%	100%	100%	100%	100%	100%
GD880-11-0078-4-B	37	100%	100%	100%	100%	100%	100%
GD880-11-0094-4-B	45	100%	100%	100%	100%	100%	100%
GD880-11-0116-4	55	100%	100%	100%	100%	100%	100%
GD880-11-0149-4	75	100%	100%	100%	100%	100%	100%
GD880-11-0170-4	90	100%	100%	100%	97%	89%	86%
GD880-11-0215-4	110	100%	100%	100%	98%	95%	93%
GD880-11-0260-4	132	100%	100%	100%	96%	91%	86%
GD880-11-0305-4	160	100%	100%	100%	95%	89%	83%
GD880-11-0340-4	185	100%	100%	100%	95%	89%	83%
GD880-11-0380-4	200	100%	100%	100%	95%	88%	81%
GD880-11-0425-4	220	100%	100%	100%	95%	89%	82%
GD880-11-0480-4	250	100%	100%	100%	96%	90%	84%
GD880-11-0530-4	280	100%	100%	100%	96%	90%	84%
GD880-11-0600-4	315	100%	100%	100%	95%	88%	81%
GD880-11-0650-4	355	100%	100%	100%	95%	88%	82%
GD880-11-0720-4	400	100%	100%	100%	96%	90%	83%
GD880-11-0820-4	450	100%	100%	100%	95%	88%	81%
GD880-11-0860-4	500	100%	100%	100%	95%	88%	81%
GD880-11-0639-4	355	100%	100%	100%	94%	87%	78%
GD880-11-0757-4	400	100%	100%	100%	95%	88%	80%
GD880-11-0900-4	500	100%	100%	100%	90%	79%	68%
GD880-11-0975-4	560	100%	100%	95%	82%	76%	65%
GD880-11-0410-6	400	100%	100%	87%	76%	65%	54%
GD880-11-0530-6	500	100%	100%	85%	74%	61%	50%
GD880-11-0600-6	560	100%	100%	85%	74%	62%	52%
GD880-11-0650-6	630	100%	100%	85%	74%	62%	51%
GD880-11-0720-6	710	100%	100%	85%	75%	62%	52%

2.6 Overload capability

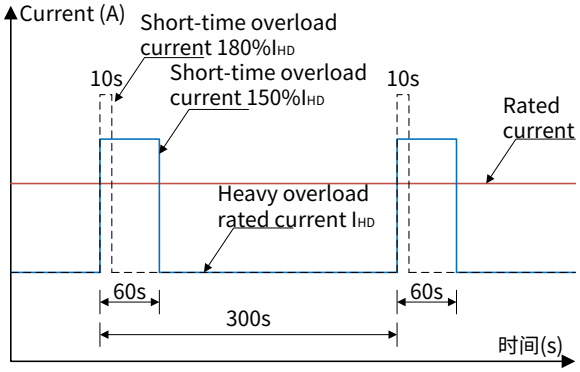
Based on the light overload continuous run current (I_{Ld}), the single-drive unit can keep running for 60s at 110% of the rated current. See Figure 2-5.

Figure 2-5 Light overload application



Based on the heavy overload continuous run current (I_{Hd}), the single-drive unit can keep running for 60s at 150% of the rated current. See Figure 2-6.

Figure 2-6 Heavy overload application



2.7 Hardware principles

2.7.1 Basic principles

The single-drive unit converts AC voltage into AC frequency-variable voltage and supports driving asynchronous and synchronous motors. The single-drive unit models are classified into the 400V voltage class and 690V voltage class. The E2–E12 drive unit consists of rectifier, energy storage capacitor, IGBT, and other components. Figure 2-7 shows the simplified main circuit.

Figure 2-7 Main circuit diagram of the E3–E5 drive unit

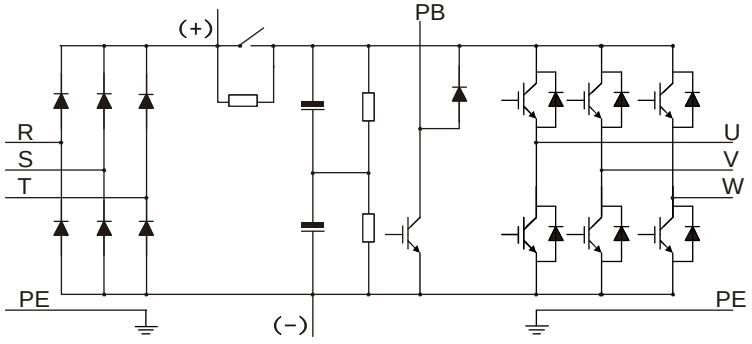


Figure 2-8 Main circuit diagram of the E6 drive unit

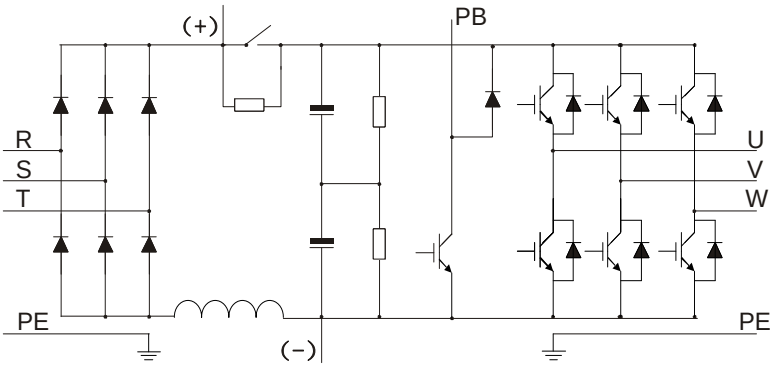


Figure 2-9 Main circuit diagram of the E7–E8 drive unit

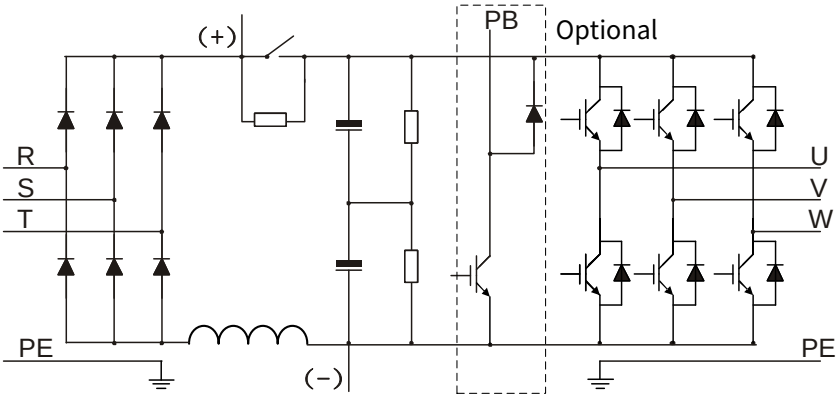


Figure 2-10 Main circuit diagram of the E9–E12 drive unit

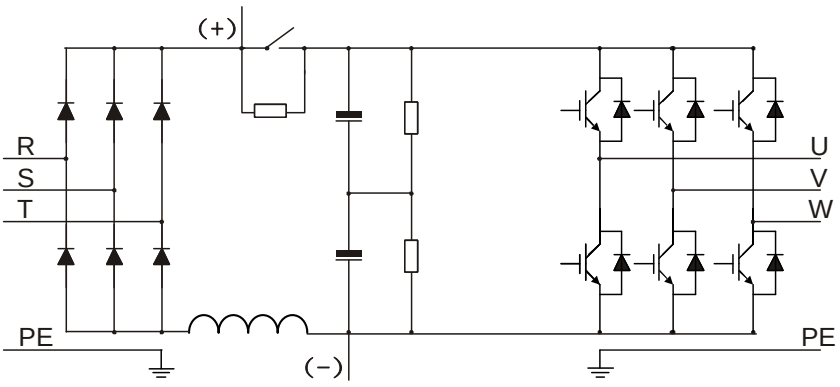
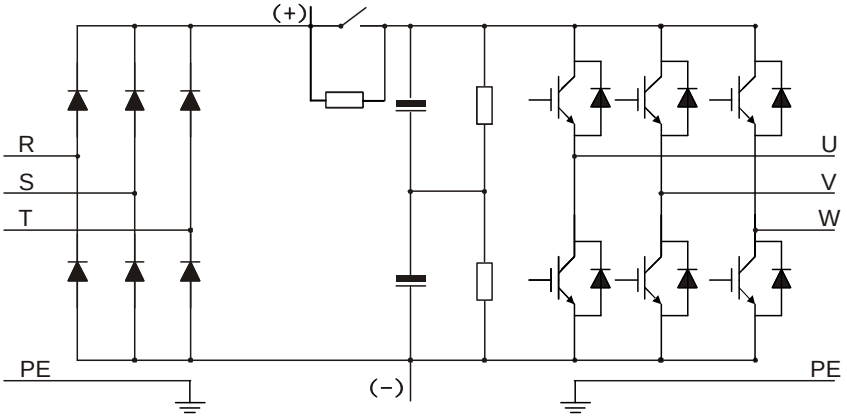
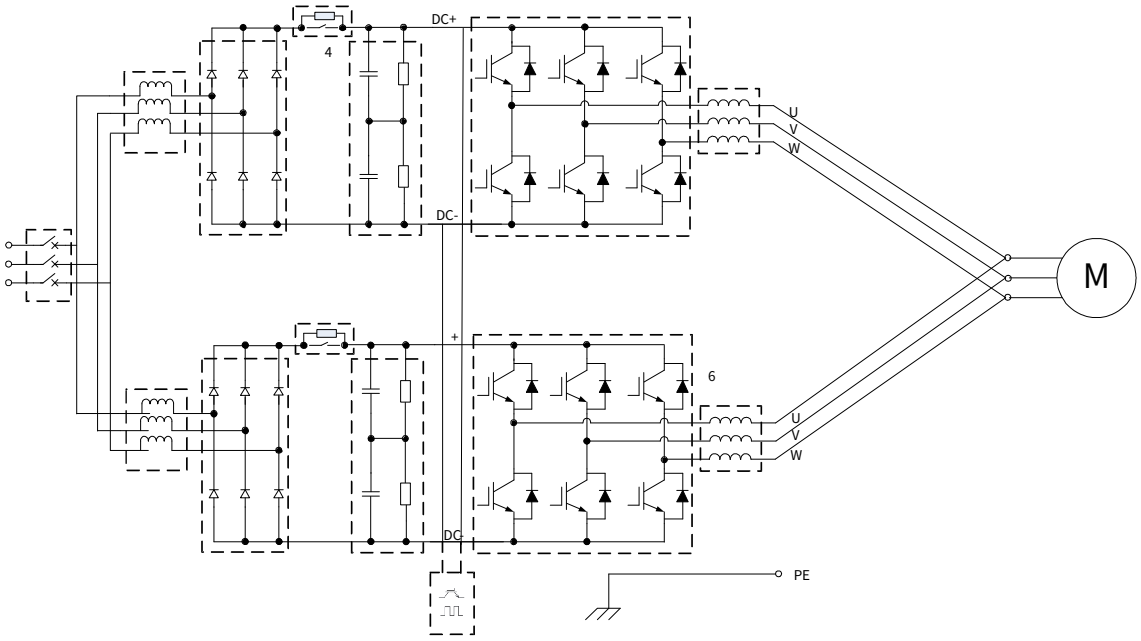


Figure 2-11 Main circuit diagram of the 11A8 drive unit



2.7.2 Paralleling principle of 11A8

Figure 2-12 Main circuit diagram of the parallel 11A8 drive unit

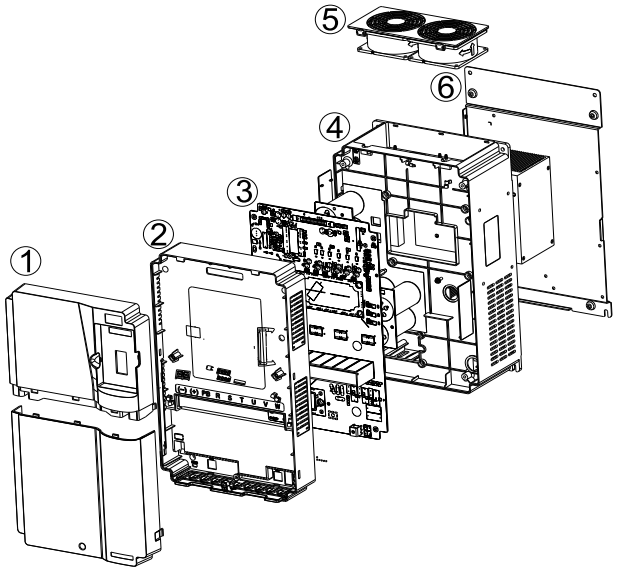


Note: In general, the paralleling is only applicable to the units corresponding to 11A8.

2.8 Structure diagram

2.8.1 Single-drive unit structure

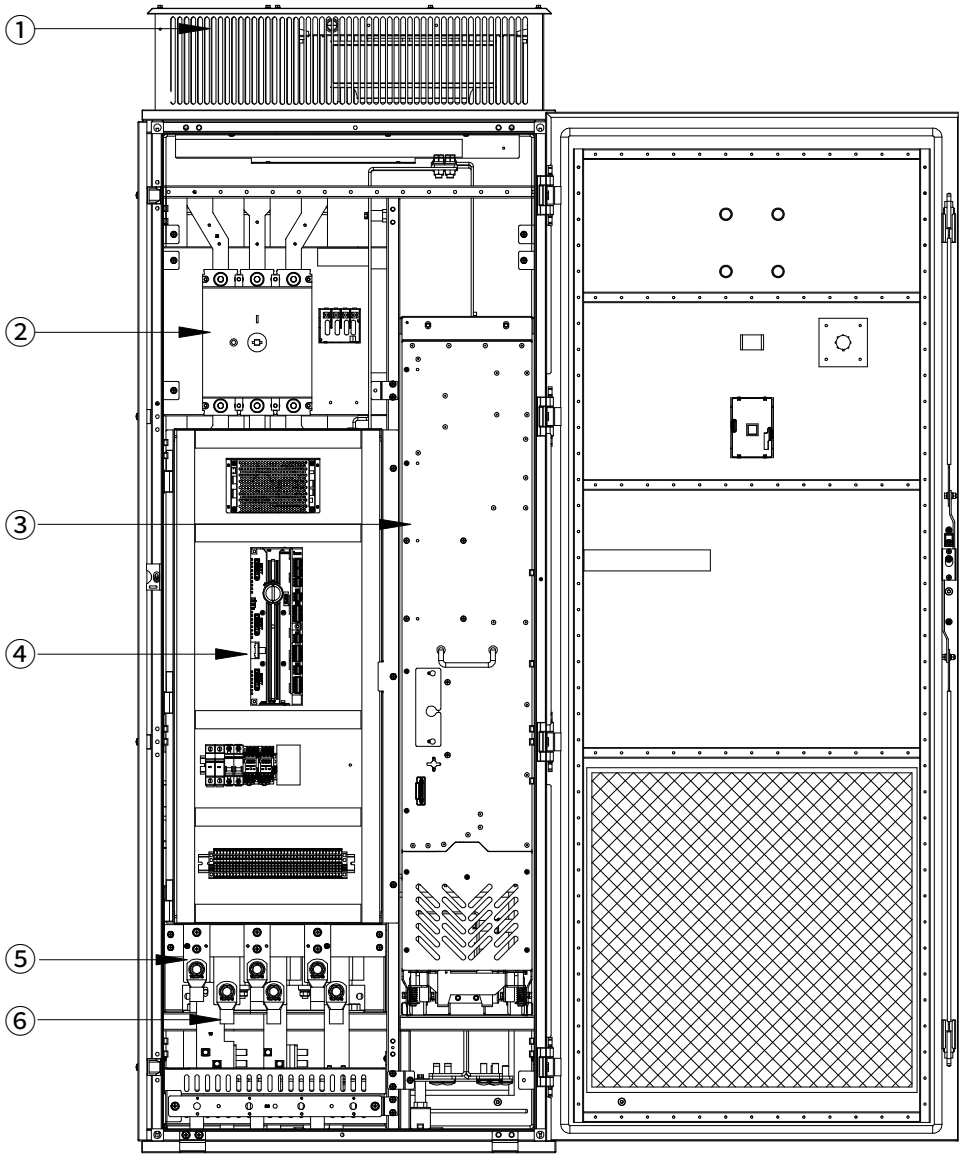
Figure 2-13 Structure of a drive unit



No.	Description
1	Front protective cover
2	Control layer
3	Drive layer
4	Heat sink layer
5	Fan component
6	Back protective cover

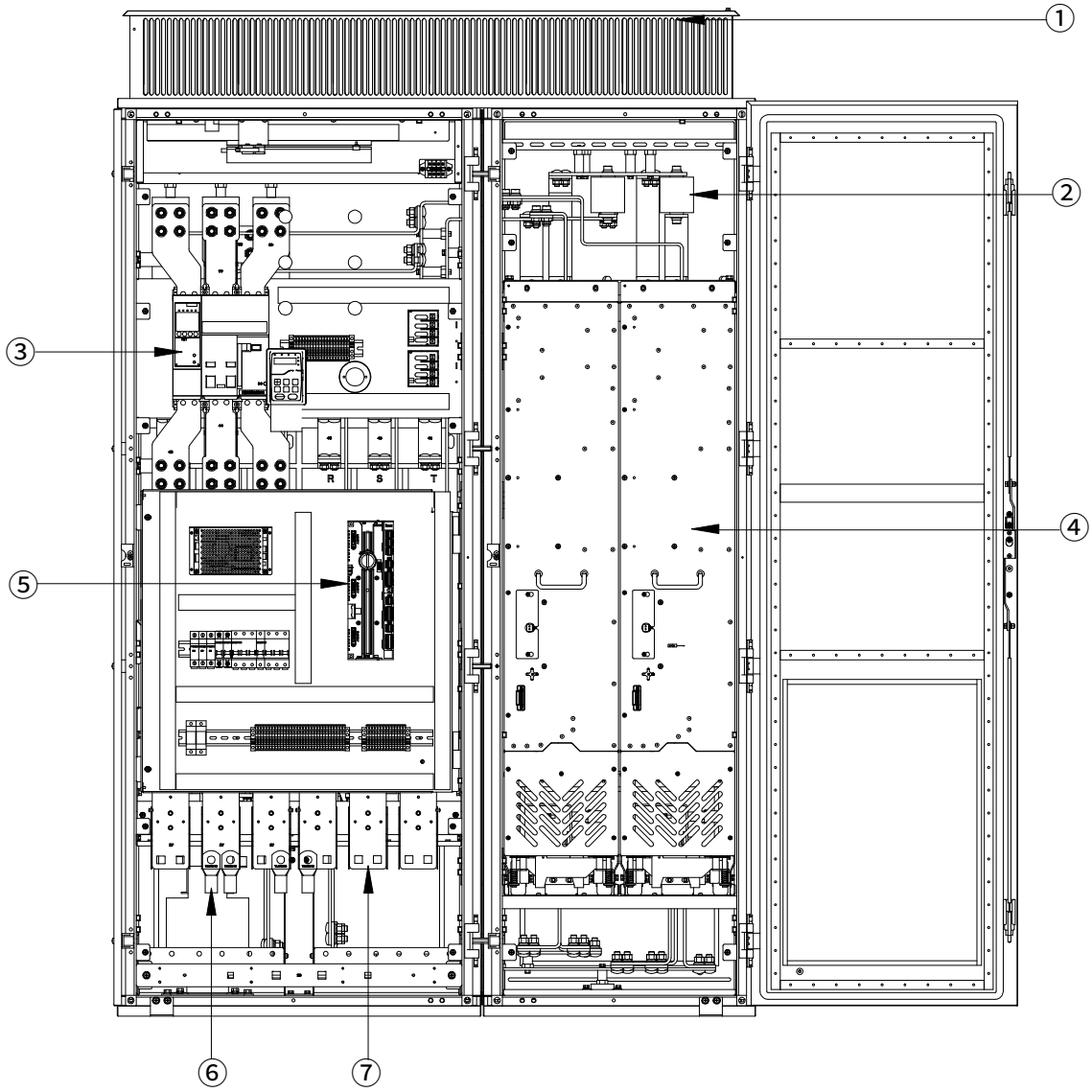
2.8.2 Single-drive cabinet structure

Figure 2-14 Layout of the 16S4 drive cabinet



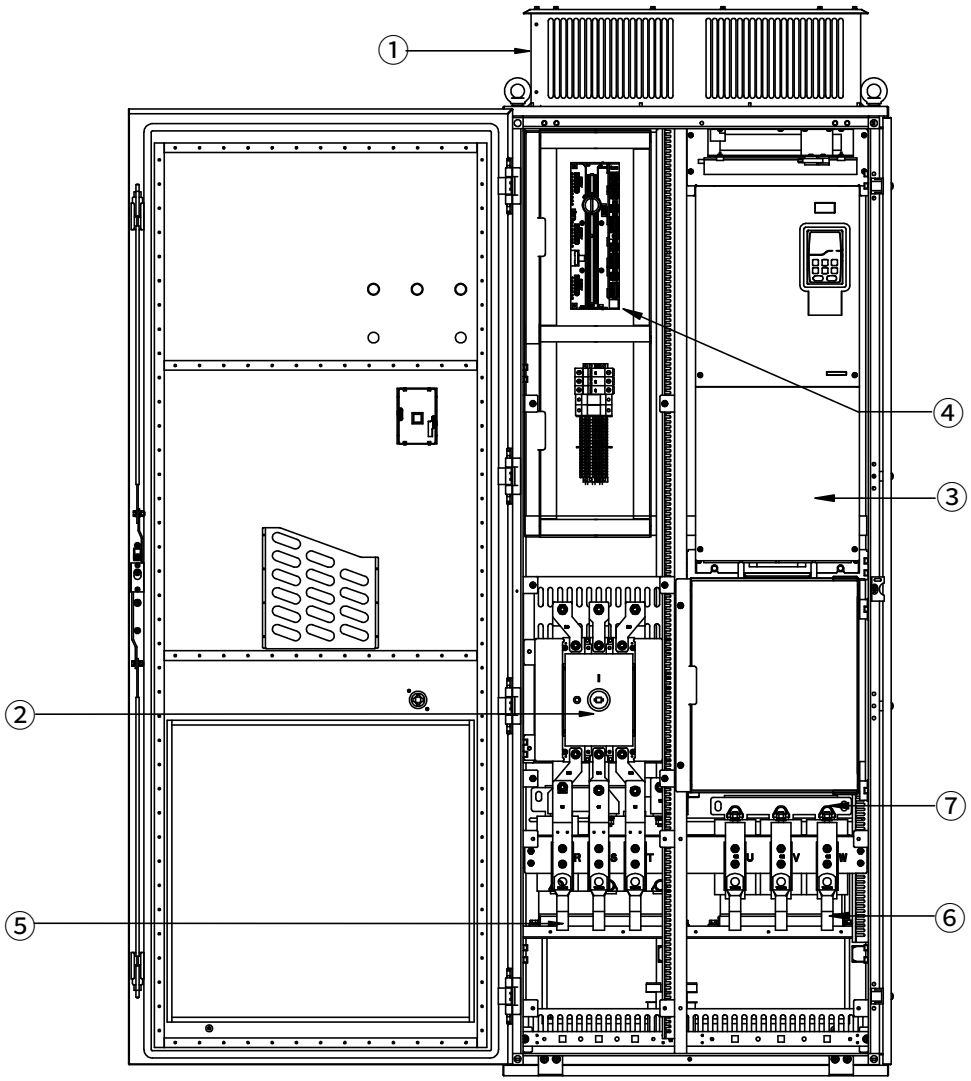
No.	Description	Remarks
1	Air outlet hood	-
2	AC breaker	-
3	VFD unit	GD880-11
4	Control unit	GD880-ICU
5	3PH AC input	R, S, T
6	3PH AC output	U, V, W

Figure 2-15 Layout of the 16S5 drive cabinet



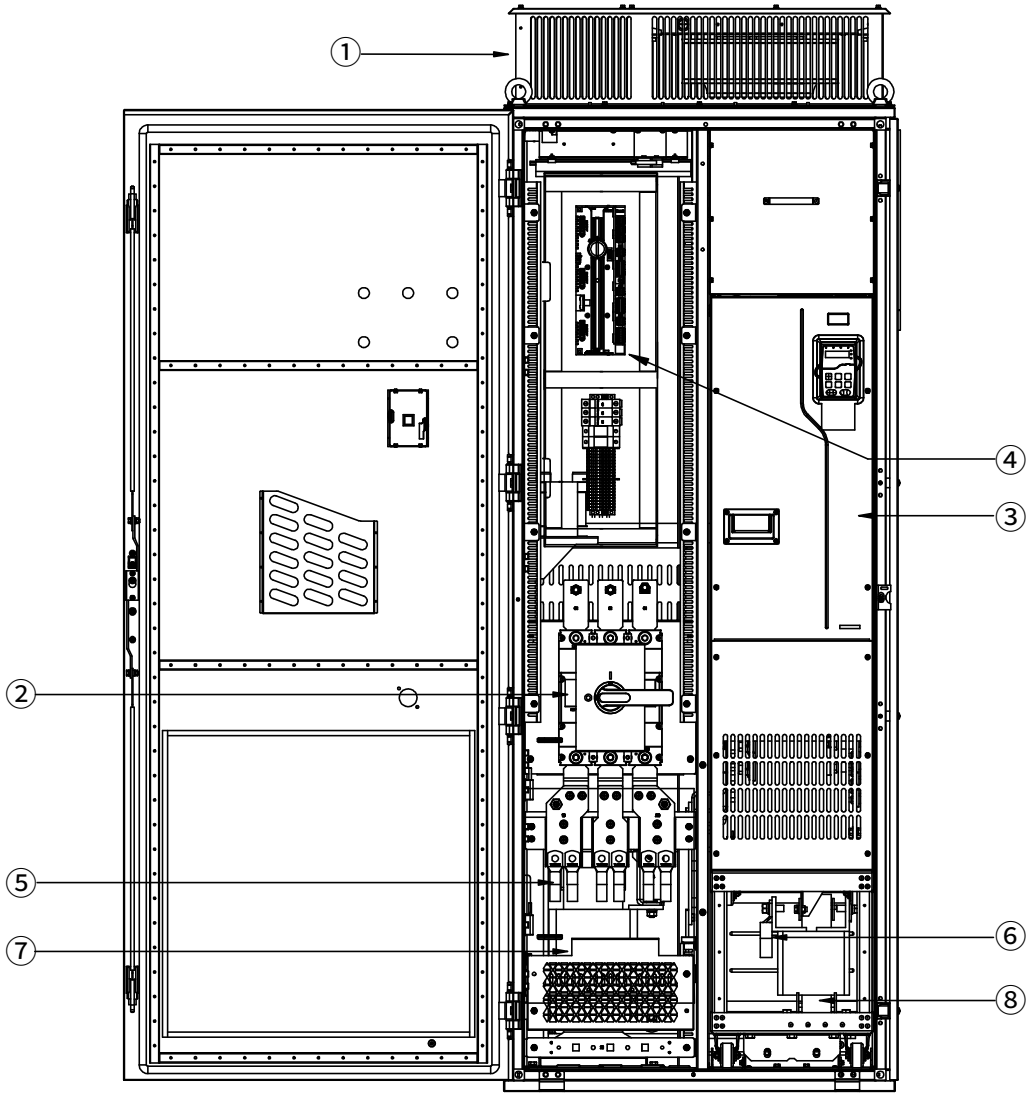
No.	Description	Remarks
1	Air outlet hood	-
2	DC fuse	-
3	AC breaker	-
4	VFD unit	GD880-11
5	Control unit	GD880-ICU
6	3PH AC input	R, S, T
7	3PH AC output	U, V, W

Figure 2-16 Layout of the 16S6–16S7 drive cabinet



No.	Description	Remarks
1	Air outlet hood	-
2	AC breaker	-
3	VFD unit	GD880-11
4	Control unit	GD880-ICU
5	3PH AC input	R, S, T
6	3PH AC output	U, V, W
7	Output reactor	-

Figure 2-17 Layout of the 16S8–16S10 drive cabinet



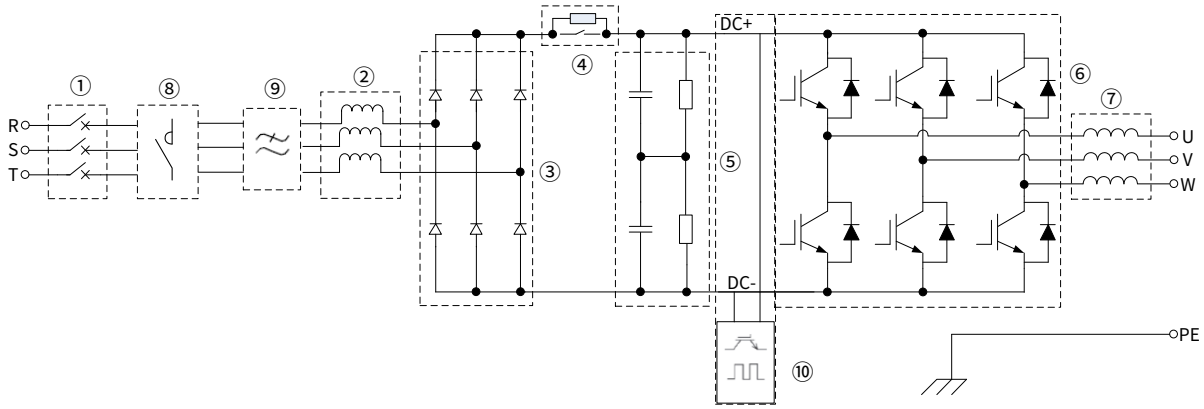
No.	Description	Remarks
1	Air outlet hood	-
2	AC breaker	-
3	VFD unit	GD880-11
4	Control unit	GD880-ICU
5	3PH AC input	R, S, T
6	3PH AC output	U, V, W
7	Input reactor	-
8	Output reactor	-

Note: The configuration of different power cabinet products varies. For details, please refer to the instructions in section 2.9.2 Cabinet configuration table.

2.9 System configuration

2.9.1 Single-drive cabinet system

Figure 2-18 Main circuit diagram of single-drive cabinet system



The rectifier module converts AC voltage to DC voltage, and the DC voltage is distributed to inverter modules through the DC bus, then the inverter modules convert the DC voltage to AC voltage to drive the motor to rotate.

Table 2-6 System configuration description for single-drive cabinet

No.	Name	Description
1	Breaker	To switch the circuit on and off, and automatically cut off the circuit to protect the power supply and VFD in case of abnormality.
2	AC input reactor	To suppress AC voltage and current harmonics.
3	Rectifier	To convert AC current to DC current.
4	Precharge component	To prevent excessive impulse current at power-up.
5	Capacitor component	To stabilize the DC voltage, and filter out the AC part from the DC voltage.
6	Inverter	To convert DC current to AC current.
7	AC output reactor	To suppress peak voltage to protect the motor and VFD.
8	Contactor	To switch the circuit on and off, optional. (This is not available for cabinets in 11A8 frame.)
9	Input filter	To suppress harmonics to reduce interference to the grid, optional. (This is not available for cabinets in 11A8 frame.)
10	Braking unit	To transfer excess energy to the braking resistor at dynamic braking, optional. (When a braking resistor is selected for the cabinet in 2*11A8 frame, it is required to use a separate cabinet.)

2.9.2 Cabinet configuration table

Code	Description	16S4	16S5	16S6	16S7	16S8	16S9	16S10
Main circuit configuration								
-	Breaker	●	●	●	●	●	●	●
E250	AC fast-acting fuse	-	-	□	□	□	□	□
E255	Main contactor	-	-	□	□	□	□	□

Code	Description	16S4	16S5	16S6	16S7	16S8	16S9	16S10
E150	Braking unit	①	②	□	□	□	□	□
E203	Input reactor	●	●	□	□	●	●	●
E204	DC reactor	-	-	●	●	□	□	□
E205	Output reactor	●	●	□	□	□	□	□
-	VFD unit	●	●	●	●	●	●	●
Control circuit								
-	Safety relay	□	□	□	□	□	□	□
-	Cabinet lighting	●	●	●	●	●	●	●
E108	Cabinet heater	□	□	□	□	□	□	□
-	Emergency stop, class 0	●	●	●	●	●	●	●
E110	Emergency stop, class 1	□	□	□	□	□	□	□
-	Local and remote switching	□	□	□	□	□	□	□
E112	Motor fan output (4–6A)	□	□	□	□	□	□	□
E113	Motor fan output (6–10A)	□	□	□	□	□	□	□
E114	Motor fan output (10–16A)	□	□	□	□	□	□	□
Ingress protection (IP) rating								
-	IP20	●	●	●	●	●	●	●
C121	IP21	□	□	□	□	□	□	□
Installation								
C201	100mm base	□	□	□	□	□	□	□
C202	200mm base	□	□	□	□	□	□	□
C211	Lifting ring	●	-	●	●	●	●	●

Note:

- "●" indicates a standard configuration, "□" indicates an optional configuration, and "-" indicates not available.
- "①" can only be equipped with one DUB100H braking unit. If a braking unit needs to be configured, "②" needs to be separately installed as a cabinet.

2.10 Electrical model selection

2.10.1 Breaker and contactor

The circuit breaker is mainly used to prevent electric shock accidents and short circuits to the ground that may cause leakage current fire. The electromagnetic contactor is mainly used to control the main circuit power on and off, which can effectively cut off the input power of the VFD in case of system failure to ensure safety.

	According to the working principle and structure of breakers, if the manufacturer's regulation is not followed, hot ionized gases may escape from the breaker enclosure when a short-circuit occurs. To ensure safe use, exercise extra caution when installing and placing the breaker. Follow the manufacturer's instructions.

Table 2-7 Recommended breaker and contactor

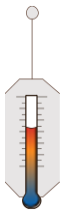
VFD model	Breaker rated current (A)	High speed fuse rated current (A)	Contactor rated current (A)
GD880-11-0013-4-B	20	20	18
GD880-11-0017-4-B	25	32	18
GD880-11-0023-4-B	32	40	25
GD880-11-0033-4-B	40	50	32
GD880-11-0038-4-B	50	63	38
GD880-11-0048-4-B	63	63	38
GD880-11-0060-4-B	80	80	50
GD880-11-0078-4-B	80	100	65
GD880-11-0094-4-B	100	125	80
GD880-11-0116-4	160	160	95
GD880-11-0149-4	160	200	115
GD880-11-0170-4	200	250	150
GD880-11-0215-4	250	315	170
GD880-11-0260-4	315	400	205
GD880-11-0305-4	400	400	245
GD880-11-0340-4	400	500	300
GD880-11-0380-4	500	630	300
GD880-11-0425-4	500	630	410
GD880-11-0480-4	630	800	410
GD880-11-0530-4	630	800	410
GD880-11-0600-4	800	800	475
GD880-11-0650-4	800	1000	475
GD880-11-0720-4	800	1000	620
GD880-11-0820-4	1000	1250	620
GD880-11-0860-4	1000	1250	800
GD880-11-0639-4	800	800	475
GD880-11-0757-4	800	100	475
GD880-11-0900-4	1000	1250	620
GD880-11-0975-4	1000	1250	620
GD880-11-0410-6	400	500	410
GD880-11-0530-6	500	630	500
GD880-11-0600-6	630	800	620
GD880-11-0650-6	630	800	620
GD880-11-0720-6	800	1000	800

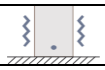
3 Mechanical installation

3.1 Safety notes

⚠	Equipment can tip over if transported incorrectly or with disallowed means of transport. Serious injury, property damage, or even death may result. • Only trained and qualified professionals are allowed to carry out the operations mentioned in this chapter. Please carry out operations according to instructions presented in section 1.4.1 Delivery and installation. Ignoring these safety precautions may lead to physical injury or death, or device damage. • Ensure the drive unit power has been disconnected before installation. If the drive unit has been powered on, disconnect the drive unit power and wait for at least the time specified on the drive unit, and ensure the POWER indicator is off. You are recommended to use a multimeter to check and ensure the drive 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 drive 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	
Ambient temperature		• -10–+50°C • When the ambient temperature exceeds 40°C, derate 1% for every increase of 1°C. • Do not use the drive unit when the ambient temperature exceeds 50°C. • To improve reliability, do not use the drive 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.
Relative humidity (RH)		• The relative humidity (RH) of the air is less than 90%, and there is no condensation. • The max. RH cannot exceed 60% in the environment where there are corrosive gases.

Environment	Condition	
Running environment	Install the drive unit in a place:	
		Without electromagnetic radiation sources and direct sunlight. **Note:** The unit must be installed in a clean and well-ventilated environment based on the housing IP rating.
		Without foreign objects such as oil mist, metal powder, conductive dust, and water.
		Without radioactive, corrosive, hazard, and combustible and explosive substances. **Note:** Do not install the unit onto combustible objects.
Altitude		• 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 procedures are as follows:

Step 1 Perform unpacking inspection. For details, see section 3.3.1 Unpacking inspection.

Step 2 Transport before unpacking. For details, see section 3.3.2 Transportation.

Step 3 Unpack. For details, see section 3.3.3 Unpacking.

Step 4 Lift the modules. For details, see section 3.3.4 Lifting.

Step 5 Install the modules. For details, see section 3.3.5 Installation.

3.3.1 Unpacking inspection

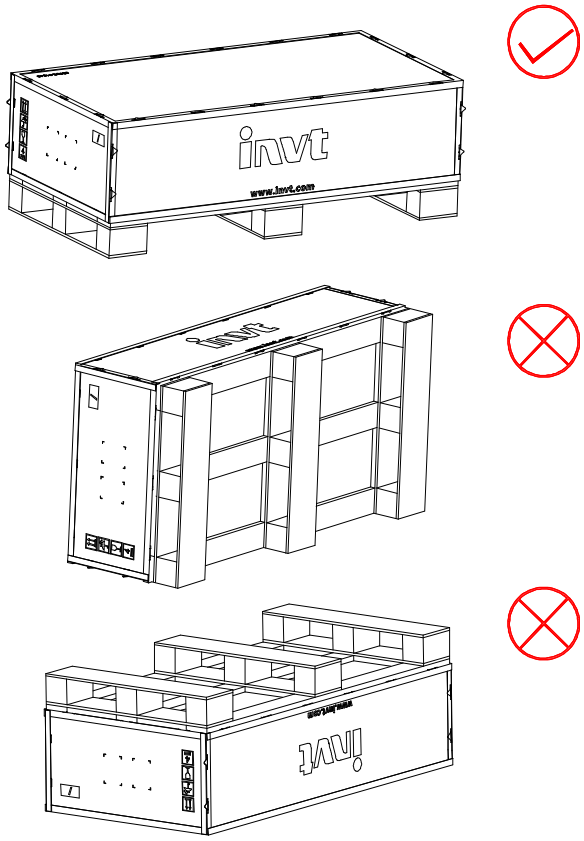
After receiving the product, perform the following steps to ensure the product use safety.

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 single-drive unit of 160kW and higher 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 product 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.

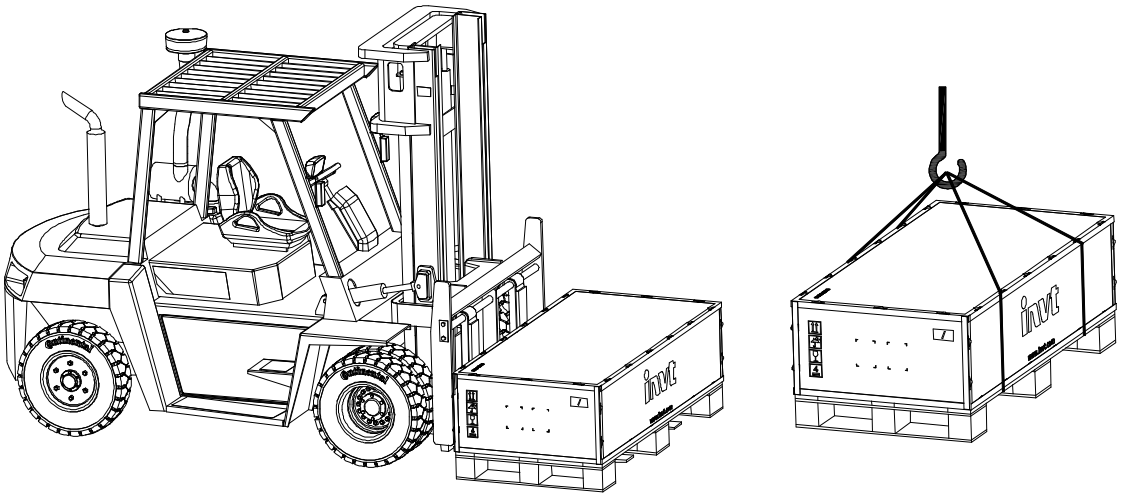
Figure 3-1 Transportation requirements



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

Note: When transported with a crane, the single-drive unit must be fixed to the pallets and lifted together.

Figure 3-2 Transportation means



3.3.3 Unpacking

The single-drive 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.

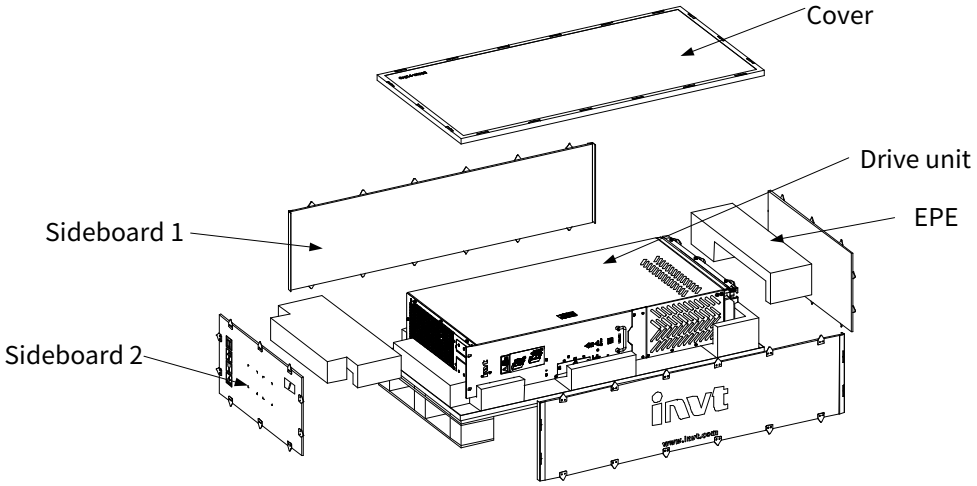
Step 4 Cut off the plastic windings.

Step 5 Take out of the unit.

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

Note: Dispose of or recycle packaging in accordance with local regulations.

Figure 3-3 Unpacking

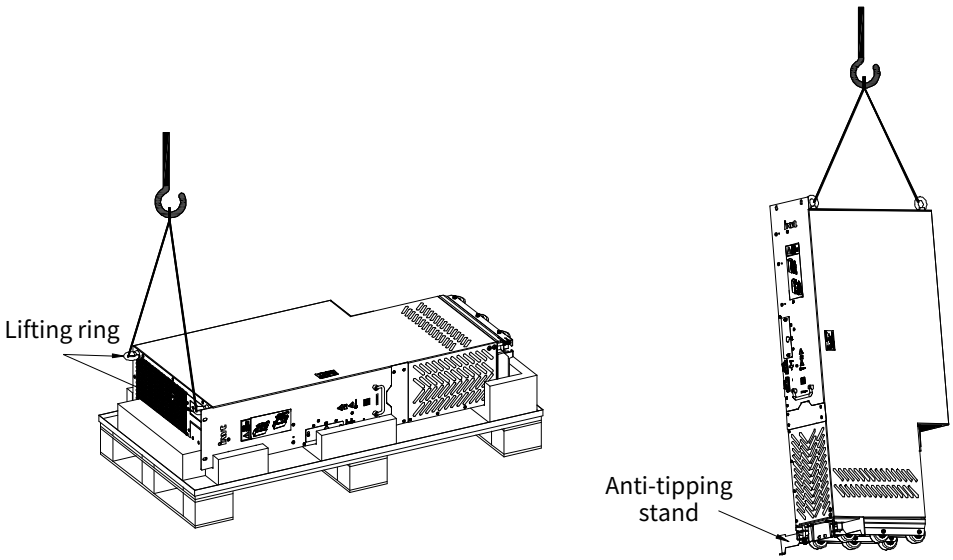


3.3.4 Lifting

3.3.4.1 Single-drive unit

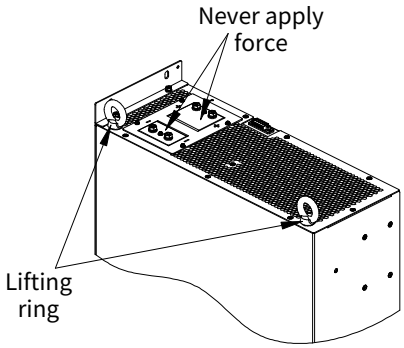
Attach the required lifting ring to the locations shown in the figure, use the sling to slowly lift the unit end, move the unit until it is completely lifted, place it vertically in the empty and flat place, and then unfold the anti-tipping stand at the lower front of the unit. Figure 3-4 shows the anti-tipping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

Figure 3-4 Unit lifting



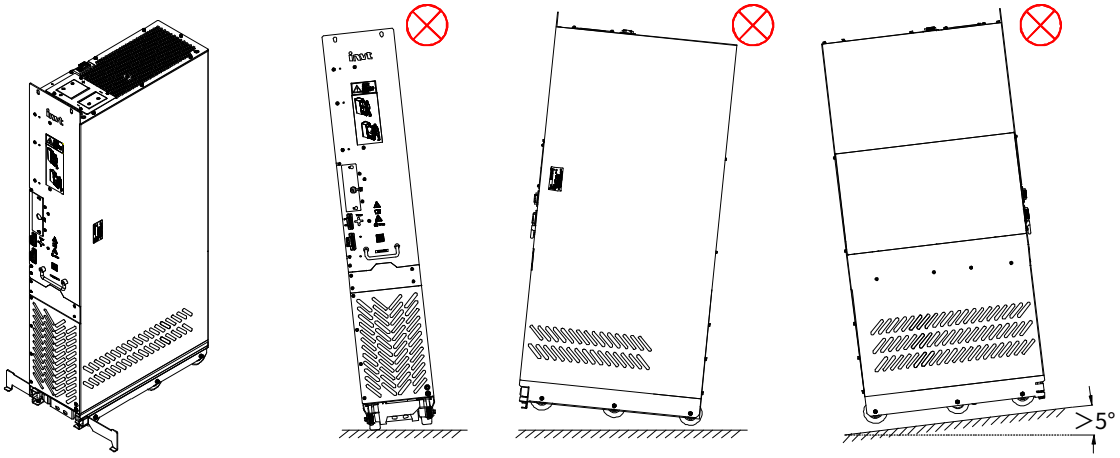
Note: Use the lifting ring on the top of the drive unit for lifting and moving. Never apply force to the positive or negative bus terminals.

Figure 3-5 Unit top structure



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

Figure 3-6 Unit placing requirements



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

Unfold the anti-tipping stand: pull down the anti-tipping stand to press the spring, wrap it around the restraining pin and rotate it 180° to snap into the slot, as shown in Figure 3-8.

Fold the anti-tipping stand: rotate the anti-tipping stand in the slot by 180° to restore the pressed spring back to its original state to clamp the anti-tipping stand, as shown in Figure 3-9. The restraint of the pin ensures that the anti-tipping stand will not unfold due to shaking. See Figure 3-7.

Figure 3-7 Unit bottom structure

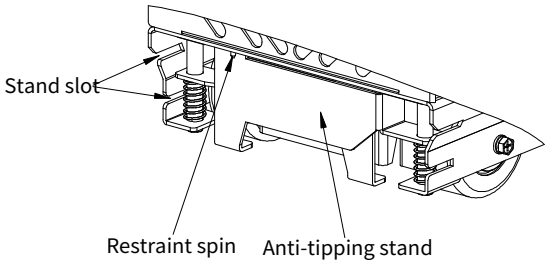


Figure 3-8 Unfolding the anti-tipping stand

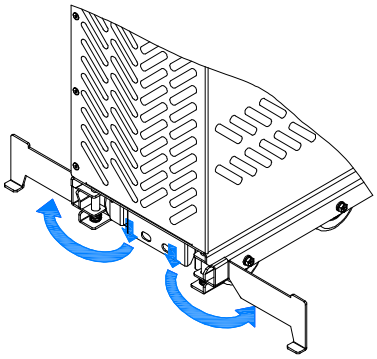
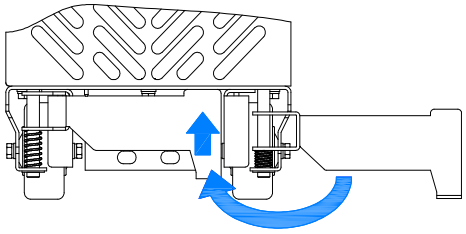


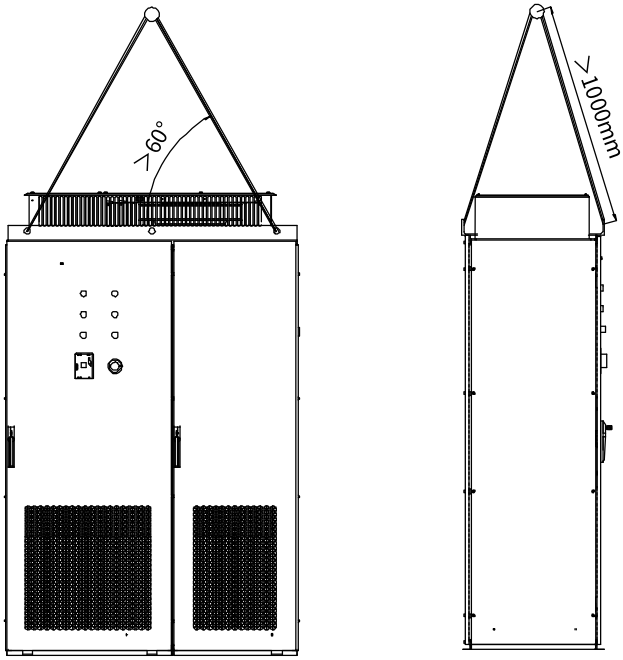
Figure 3-9 Folding the anti-tipping stand



3.3.4.2 Single-drive cabinet

To lift the device with the steel lifting holes at the top corners, the lifting rope or slings must be installed into the hole of the lifting holes and fixed to ensure safety. See Figure 3-10 for details.

Figure 3-10 Unit lifting



3.3.5 Installation

3.3.5.1 Installation space and heat dissipation

1. Installation requirements for E1–E8 drive units

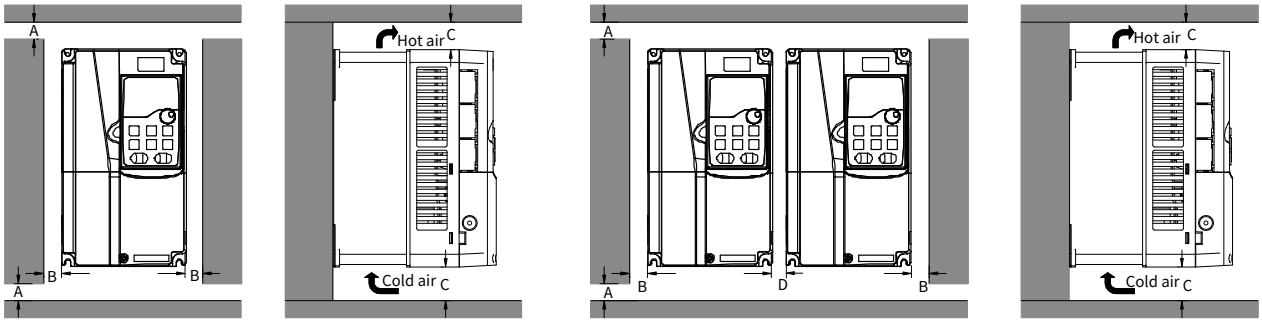
Drive units using E1–E8 frames vary with power class. Note the following requirements to ensure reliable installation and excellent heat dissipation:

A. The drive unit must be installed and used in a cabinet.

B. A minimum ventilation clearance must be kept from the top and bottom of the drive unit to ensure good heat dissipation. See Figure 3-11.

C. Both sides of the drive unit are designed with air baffle and sealing sponge for isolation to prevent the hot air at the drive unit top outlet from circulating inside the cabinet and ensure that the heat of the drive unit is discharged from the heat dissipation holes at the cabinet top outlet cover. See Figure 3-11.

Figure 3-11 Installation requirements for E2–E8 drive units



Single-unit installation Multiple-unit installation

Note:

- When you install VFDs in different sizes, align the top of each VFD before installation for the convenience of future maintenance.
- For clearances A, B, C, and D, each must be 100mm at least.

2. Installation requirements for E9–E11 drive units

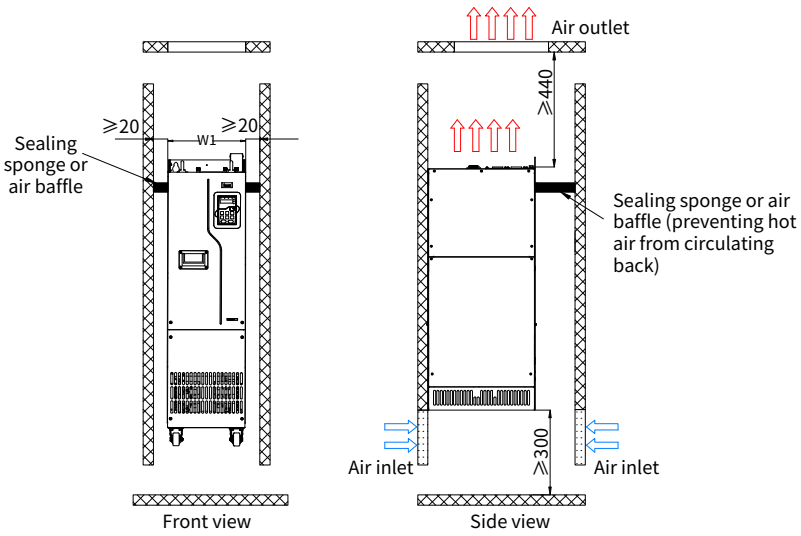
Note the following requirements to ensure reliable installation and excellent heat dissipation for drive units using E9–E11 frames:

A. The units using E9–E11 frames must be installed and used in a cabinet.

B. A minimum ventilation clearance must be kept from the top and bottom of the drive unit to ensure good heat dissipation. See Figure 3-12.

C. Both sides of the drive unit are designed with air baffle and sealing sponge for isolation to prevent the hot air at the drive unit top outlet from circulating inside the cabinet and ensure that the heat of the drive unit is discharged from the heat dissipation holes at the cabinet top outlet cover. See Figure 3-12.

Figure 3-12 Installation requirements for E9–E11 drive units



3. Installation requirements for 11A8 drive units

To ensure that the drive units are installed reliably and in good heat dissipation, pay attention to the

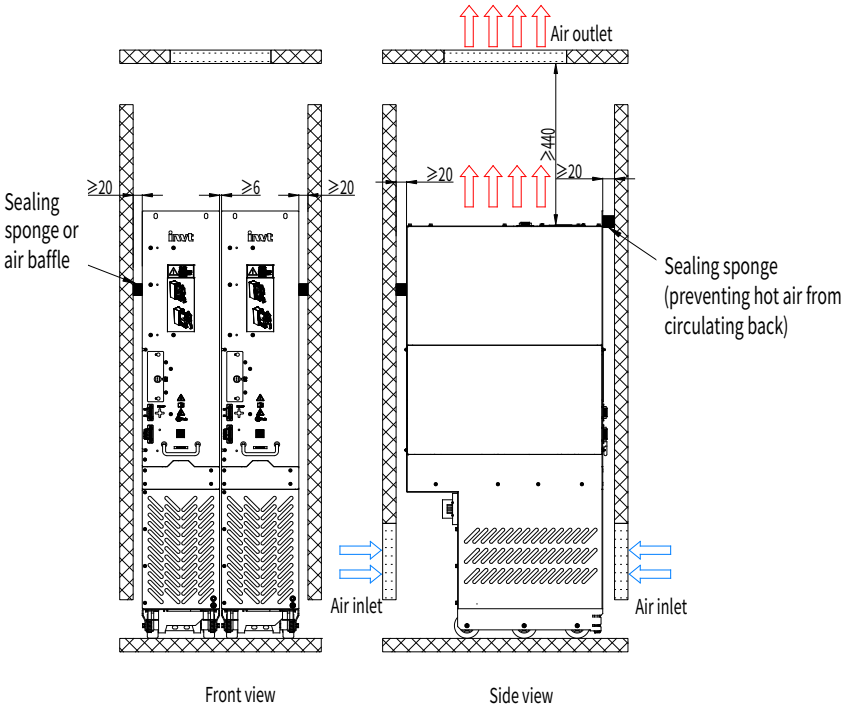
following:

A. The drive unit must be installed and used in a cabinet.

B. A minimum ventilation clearance must be kept from the top and bottom of the drive unit to ensure good heat dissipation. See Figure 3-13.

C. Both sides of the drive unit are designed with air baffle and sealing sponge for isolation to prevent the hot air at the drive unit top outlet from circulating inside the cabinet and ensure that the heat of the drive unit is discharged from the heat dissipation holes at the cabinet top outlet cover. See Figure 3-13.

Figure 3-13 Installation requirements for 11A8 drive units



4. 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}= (1.5–2.0) x ($S_{module1}$ + $S_{module2}$ + $S_{module3}$+·····+ $S_{module\ N}$)

S: System ventilation area

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

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

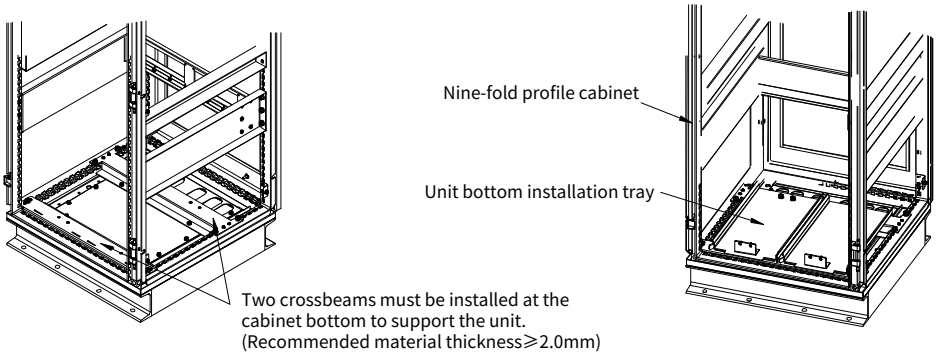
3.3.5.2 Cabinet requirements

It is recommended that the cabinet adopts the nine-fold profile cabinet (PS cabinet). Before mounting the drive unit, install two bottom support crossbeams, a mounting bracket, and a mounting rail in the cabinet, and design the mounting crossbeam for drive unit fixing, and reserve fixing holes on the mounting crossbeam (see Appendix B.1 Installation dimensions for the specific location and size).

Fix the bottom support crossbeams and mounting bracket as shown in Figure 3-14.

1. Use eight M8 cage nuts to fix the two bottom support crossbeams to the base of the nine-fold profile cabinet frame. (For the support crossbeams, T≥2.0mm, firmly installed)
2. Fix the mounting bracket to the nine-fold profile cabinet frame base with six M5 self-tapping screws, as shown in the following figure.

Figure 3-14 Bottom bracket mounting



Note: If you use another type of cabinet but not nine-fold profile cabinet, the fixing holes for the mounting bracket need to be drilled and assembled on site.

3.3.5.3 Keypad installation

The GD880-11 drive unit is equipped with an externally mounted keypad (as shown in Figure 3-14), 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 3-16.

Figure 3-15 LCD keypad structure (unit: mm)

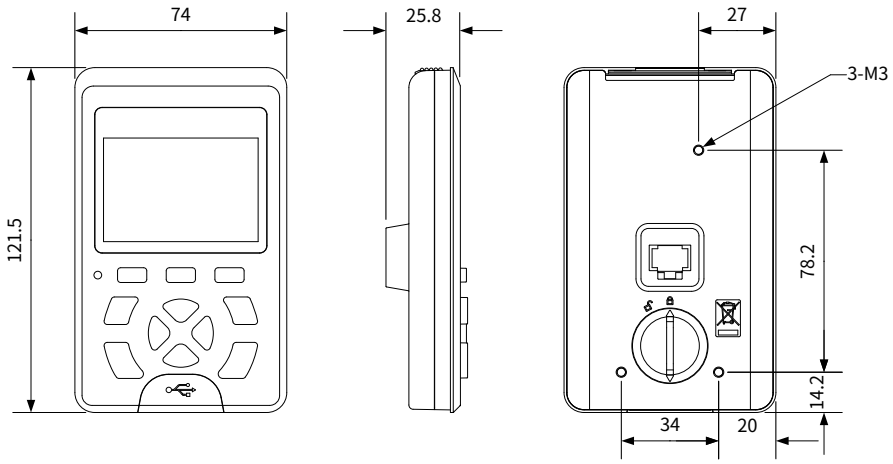


Figure 3-16 Mounting the keypad bracket

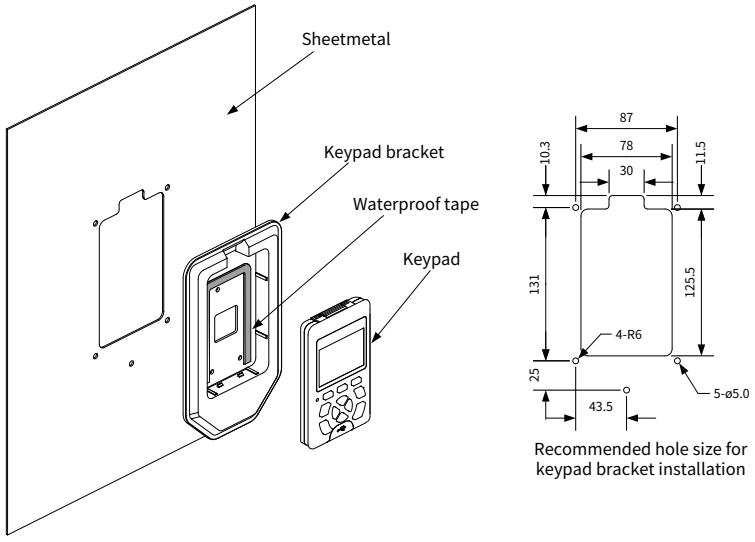
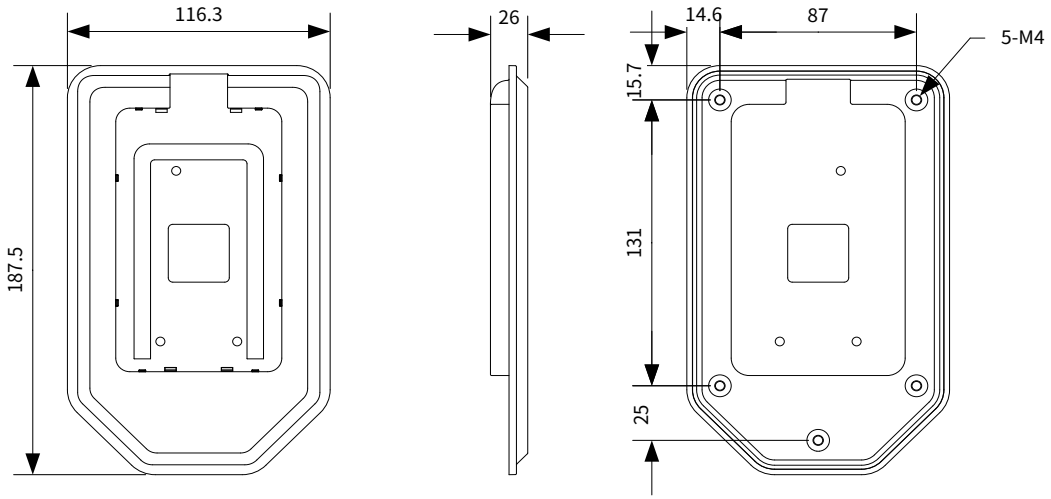


Figure 3-17 Keypad bracket dimensions (unit: mm)



3.3.6 Fastening torque

You need the following tools to install the drive unit:

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

Drive 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 Table 3-1.

Table 3-1 Recommended values of screw thread tightening torque

Screw/Bolt	Strength grade	Recommended torque (N・m)
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 drive unit fixing in the nine-fold profile cabinet.	☐	☐
2	Installed the bottom tray for drive unit fixing in the nine-fold profile cabinet.	☐	☐
3	Installed the copper bars of the drive unit in the cabinet.	☐	☐
4	Assembled the installation guide rail (optional part) and installed it in the cabinet.	☐	☐
5	In the cooperation of two people, aligned the drive unit casters with the mounting guide rail and pushed the unit to the cabinet. The auxiliary rope for mounting has been used to prevent the unit from side tipping during the push-in or push-out.	☐	☐
6	Removed the auxiliary rope for mounting, and ensured that the unit	☐	☐

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

4 Electrical installation

4.1 Safety notes

	• All safety precautions in this manual must be read and followed. Only trained and qualified professionals are allowed to carry out the operations mentioned in this chapter. • All work on electrical equipment must comply with the following: ➢ The power is off. ➢ Re-power on must not occur. ➢ Wait for at least the time designated on the 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 drive 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 drive auxiliary control power of the unit is supplied externally, disconnecting the circuit break device cannot disconnect the entire power supply. The drive 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 drive live part of the unit. • If the safety device on a current branch trips, check the drive unit for the fault cause, rectify the fault, and replace the damaged parts.

4.2 Insulation inspection

- **Drive unit**

Before delivery, each drive 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 drive unit according to the local regulations before connecting it.

- **Motor and motor cable**

Insulation inspection procedure is 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 drive unit.

Step 3 Measure the insulation resistance between the motor cable and each phase of the motor and the protective ground with a 1kVDC megohmmeter. Insulation resistance must be greater than 1MΩ.

4.3 EMC regulations

General knowledge of electromagnetic compatibility

EMC is short for electro magnetic 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.

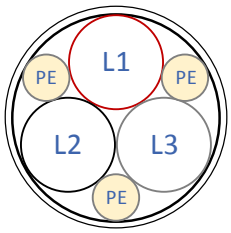
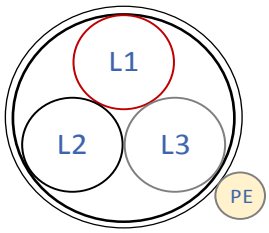
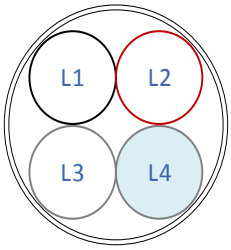
Three categories of grounding: special pole grounding, common pole grounding and series-wound

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.

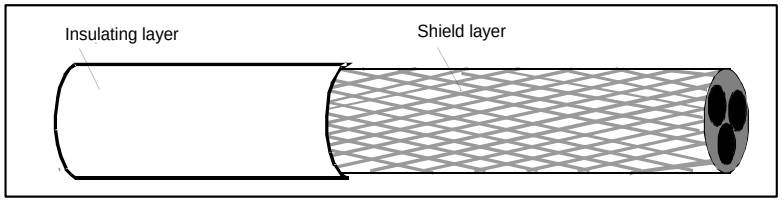
		
Symmetrical shielded cable, PEs in symmetrical manner	Symmetrical shielded cable, PE in separated manner	Asymmetrical four-core cable

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. Figure 4-1 shows the minimum requirement on motor cables of a drive 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 Cable cross section



Note: Check the insulation conditions of the input power cable of the drive unit according to the local regulations before connecting it.

4.3.2 Control cable

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

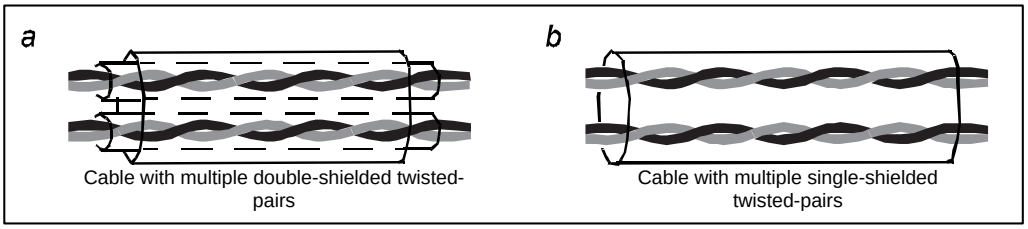
Analog signal cables need to be double-shielded twisted-pair cables (as shown in figure a). Use one separate

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 drive output to other cables. The general cable arrangement rules are shown in Figure 4-3. The recommended values for the spacing between sensitive and interference cables are shown in Table 4-1.

Figure 4-3 General cable arrangement rules

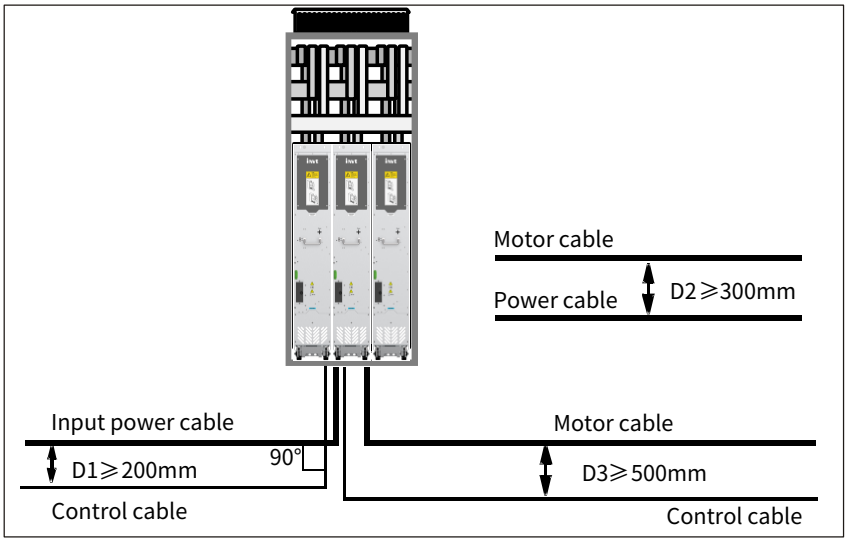


Table 4-1 Recommended values for the spacing between sensitive and interference cables

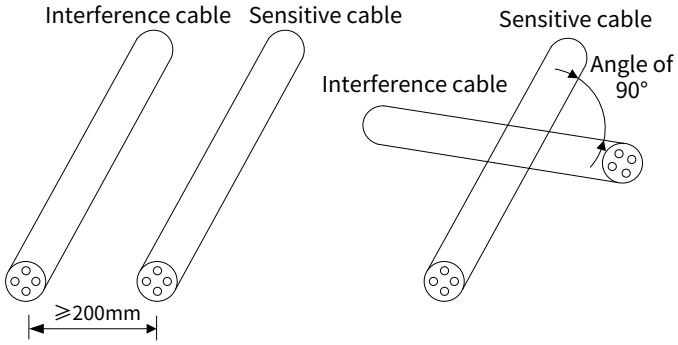
D1	D2	D3
⩾200mm	⩾300mm	⩾500mm

Note:

- The motor cables of different VFDs/drives 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°.

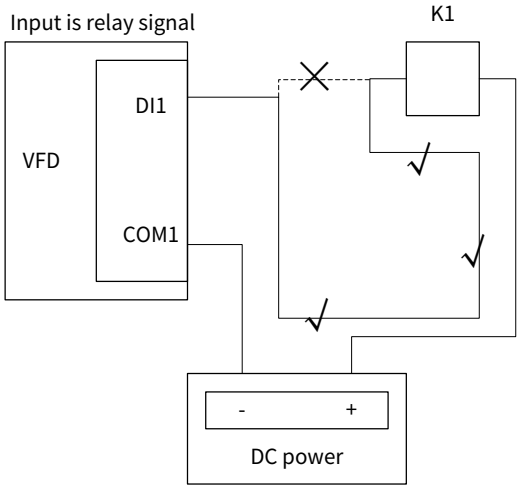
Figure 4-4 Routing sensitive and interference cables



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

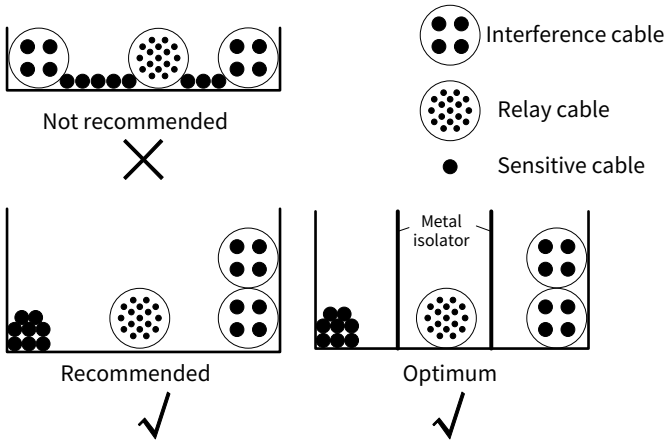
For inputs of such as relay signals and other non-differential signals, non-twisted pair cables can be used, and the wiring should minimize the loop area and a pair of signal lines should be routed as close as possible.

Figure 4-5 Non-differential signal wiring loop



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

Figure 4-6 Routing multiple types of cable

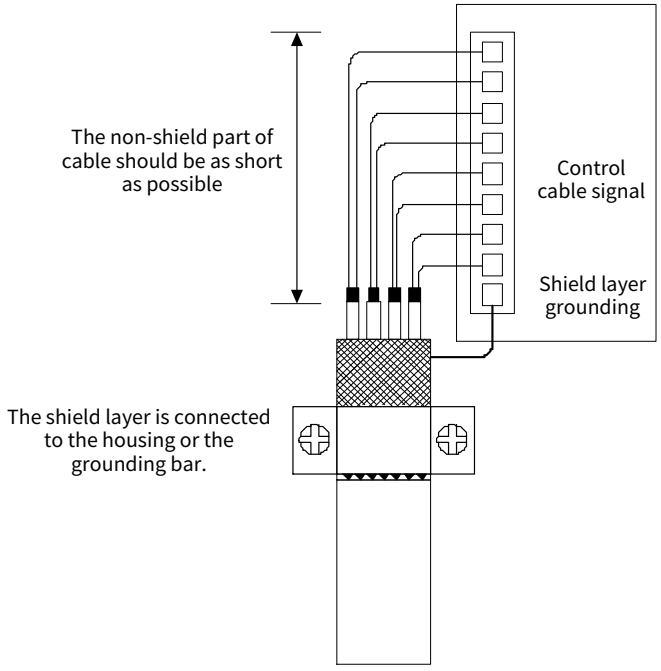


4.3.4 Shielded cable connection

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

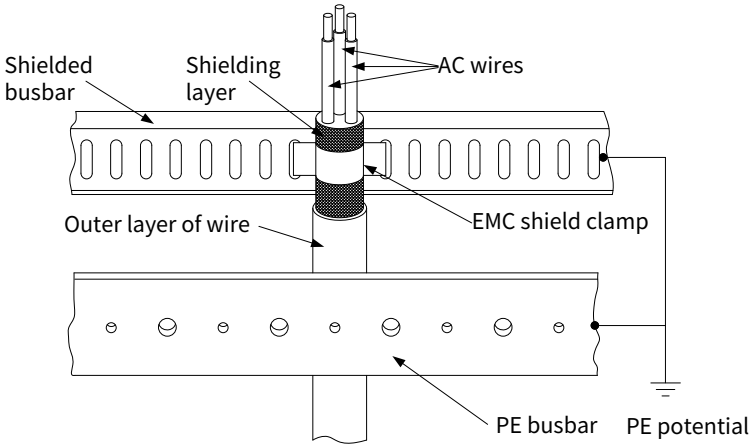
The unshielded part of the control cable that is shielded should be as short as possible, and the shield layer is connected to the nearest PE end. If the cable is stripped too long, the core is susceptible to interference of signals, especially analog, communication, and encoder signals.

Figure 4-7 Control cable shield connection



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

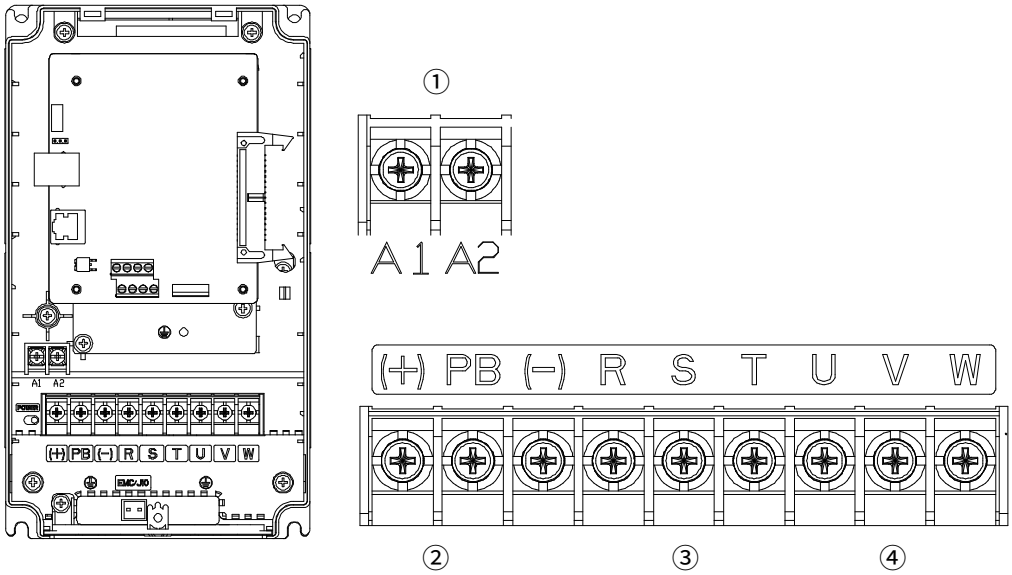
Figure 4-8 Power cable shield connection



4.4 Electrical wiring

4.4.1 E2–E5 unit wiring

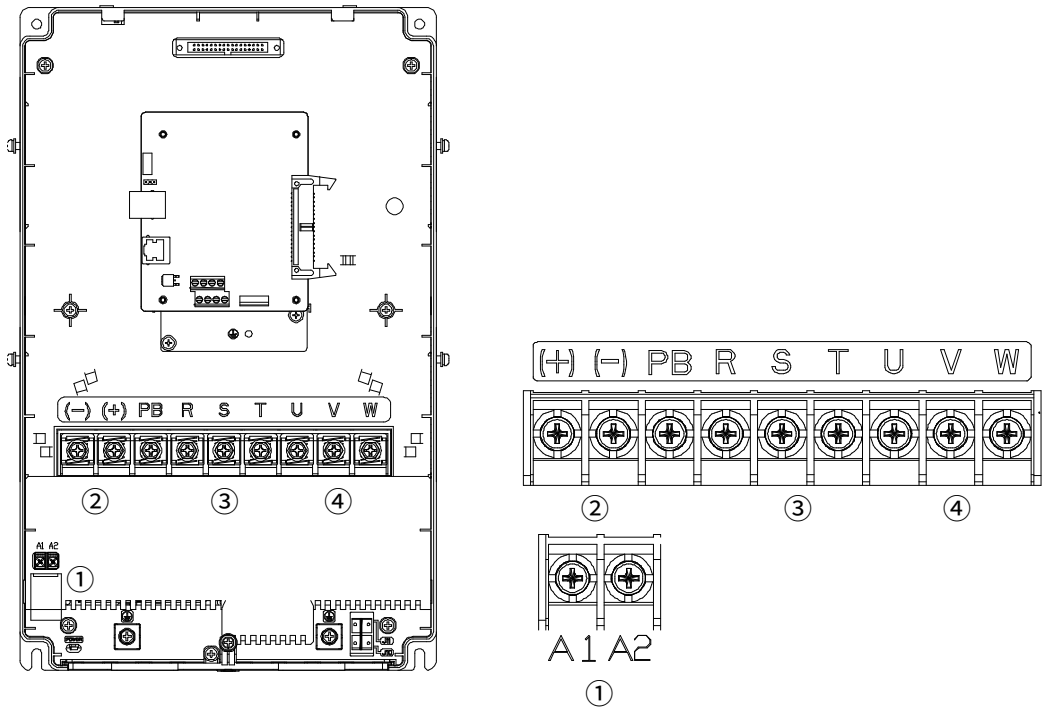
Figure 4-9 E2–E5 unit terminals



No.	Terminal name	Description
1	A1	220V auxiliary power terminals
	A2	
2	(+)	(+), (-) positive or negative busbar DC terminals Voltage: 510–720VDC (+), PB connected to the braking resistor
	PB	
	(-)	
3	R	AC input: Voltage: 0–Rated voltage
	S	
	T	
4	U	AC output: Voltage: 0–0.7VDC
	V	
	W	

4.4.2 E6 unit wiring

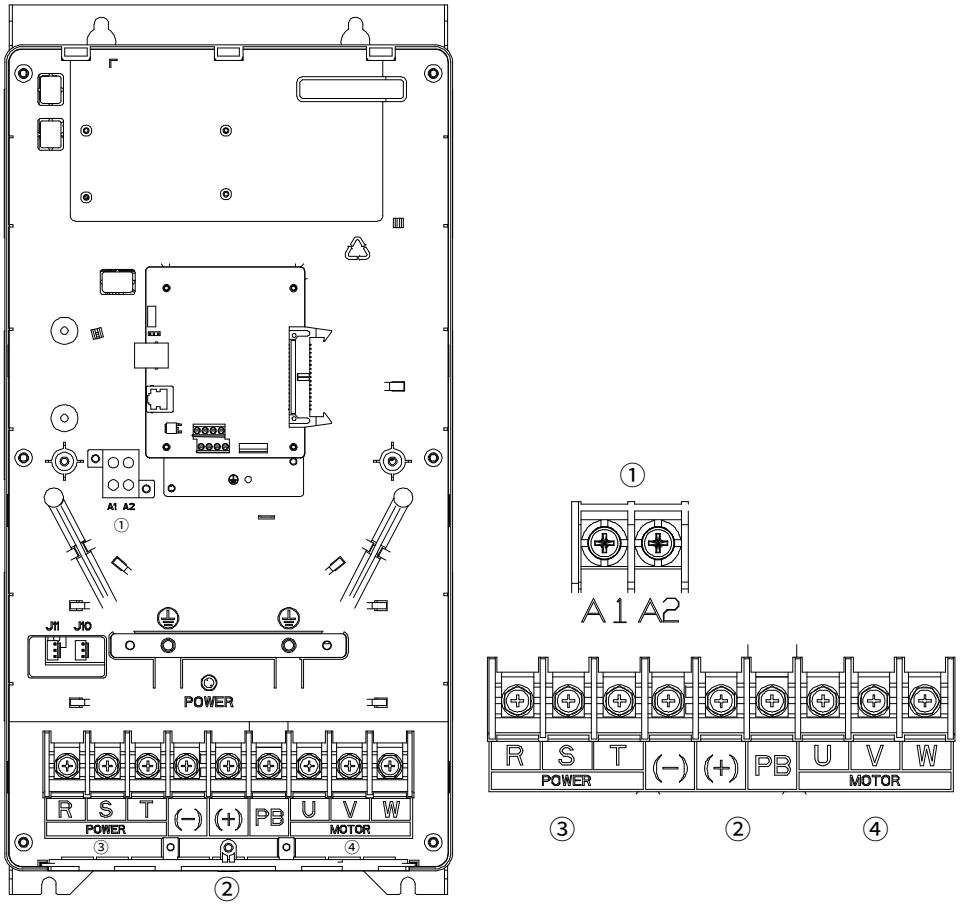
Figure 4-10 E6 main circuit terminals



No.	Terminal name	Description
1	A1	220V auxiliary power terminal
	A2	
2	(+)	(+), (-) positive or negative busbar DC terminals Voltage: 510–720VDC (+), PB connected to the braking resistor
	PB	
	(-)	
3	R	AC input: Voltage: 0–Rated voltage
	S	
	T	
4	U	AC output: Voltage: 0–0.7VDC
	V	
	W	

4.4.3 E7–E8 unit wiring

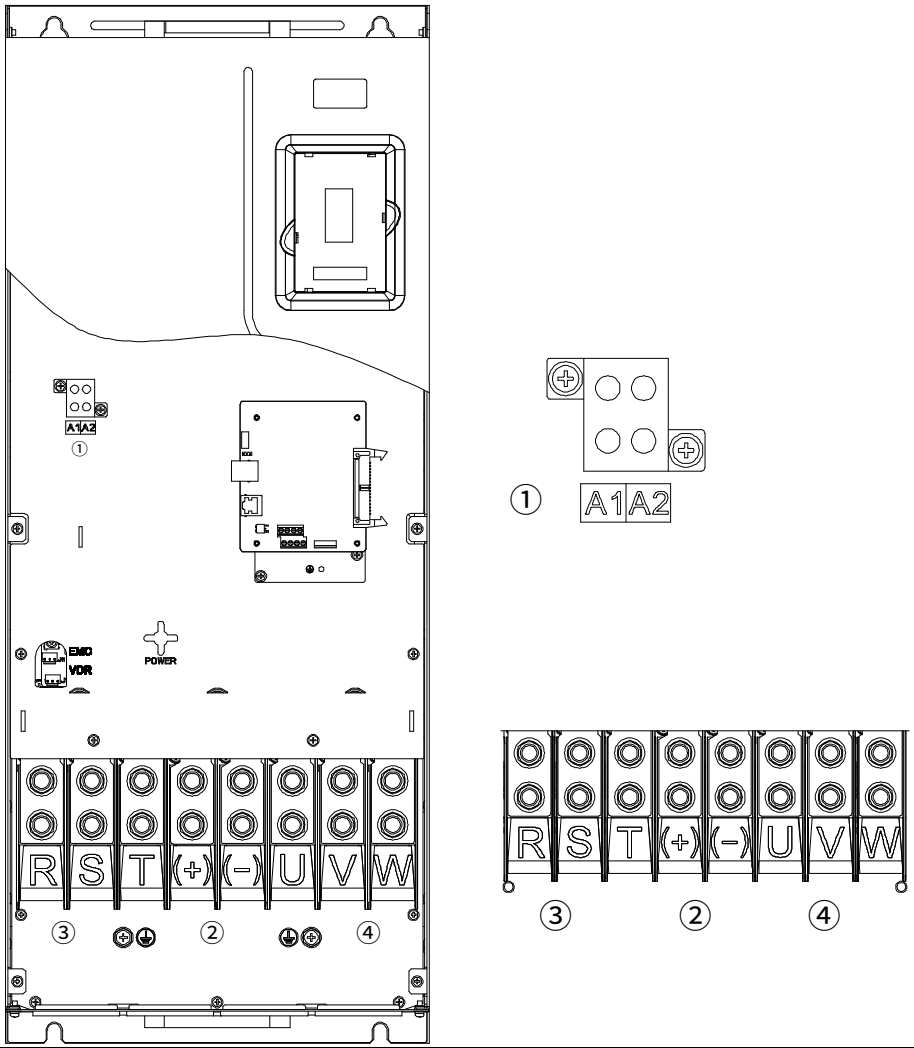
Figure 4-11 E7–E8 unit terminals



No.	Terminal name	Description
1	A1	220V auxiliary power terminal
	A2	
2	(+)	(+), (-) positive or negative busbar DC terminals Voltage: 510–720VDC (+), PB connected to the braking resistor (Connect the braking resistor when using the braking function.)
	PB	
	(-)	
3	R	AC input: Voltage: 0–Rated voltage
	S	
	T	
4	U	AC output: Voltage: 0–0.7VDC
	V	
	W	

4.4.4 E9 unit wiring

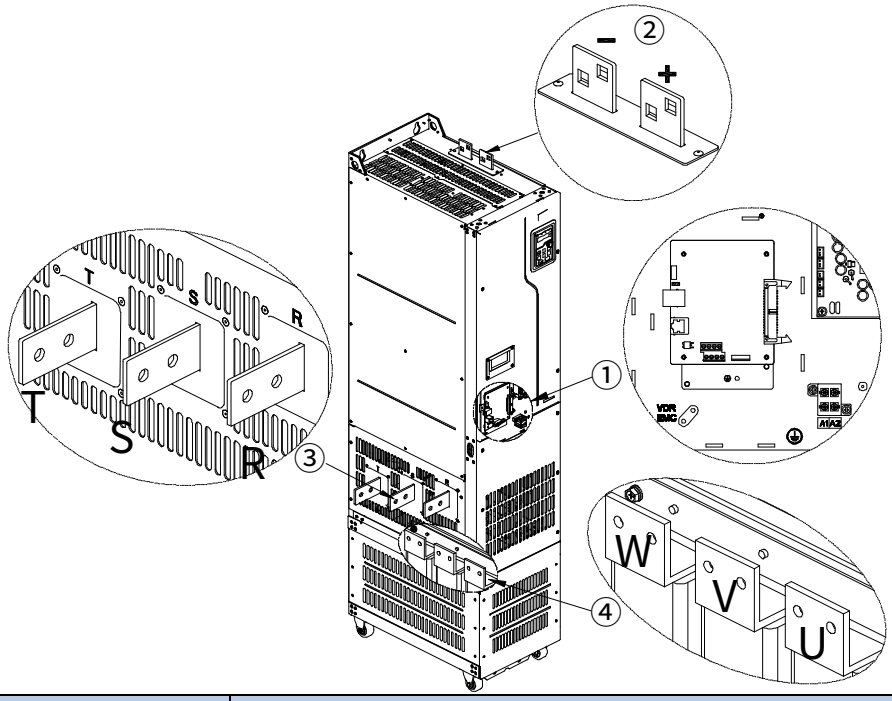
Figure 4-12 E9 unit terminals



No.	Terminal name	Description
1	A1	220V auxiliary power terminal
	A2	
2	(+)	(+), (-) positive or negative busbar DC terminals Voltage: 510–720VDC
	(-)	
3	R	AC input: Voltage: 0–Rated voltage
	S	
	T	
4	U	AC output: Voltage: 0–0.7VDC
	V	
	W	

4.4.5 E11–E12 unit wiring

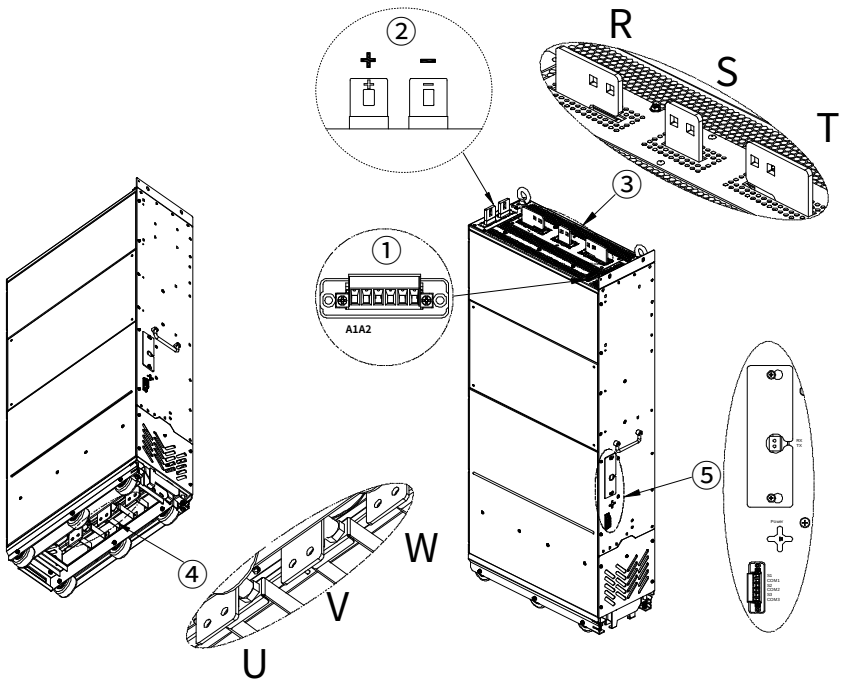
Figure 4-13 E11–E12 unit terminals



No.	Terminal name	Description
1	A1	220V auxiliary power terminal
	A2	
2	(+)	(+), (-) positive or negative busbar DC terminals Voltage: 510–720VDC
	(-)	
3	R	AC input: Voltage: 0–Rated voltage
	S	
	T	
4	U	AC output: Voltage: 0–0.7VDC
	V	
	W	

4.4.6 11A8 unit wiring

Figure 4-11 11A8 unit terminals



No.	Terminal name	Description
1	A1	220V auxiliary power terminal
	A2	
2	(+)	(+), (-) positive or negative busbar DC terminals Voltage: 400V 510–720VDC; 690V 700–1100VDC
	(-)	
3	R	AC input: Voltage: 0–Rated voltage
	S	
	T	
4	U	AC output: Voltage: 0–0.7VDC
	V	
	W	
5	RX/TX	Fiber optic interface

4.4.7 Recommended input and output power cables for drive units

Model	Number of cables per phase*cable diameter (mm^2)	Connection terminal
GD880-11-0013-4-B	1*4	OT/4-5
GD880-11-0017-4-B	1*6	OT/6-6
GD880-11-0023-4-B	1*6	OT/6-6
GD880-11-0033-4-B	1*10	OT/0-6
GD880-11-0038-4-B	1*10	OT/10-6
GD880-11-0048-4-B	1*16	OT/16-6
GD880-11-0060-4-B	1*16	OT/16-6
GD880-11-0078-4-B	1*25	OT/25-6
GD880-11-0094-4-B	1*35	OT/35-6
GD880-11-0116-4	1*50	OT/50-8

Model	Number of cables per phase*cable diameter (mm^2)	Connection terminal
GD880-11-0149-4	1*70	OT/70-8
GD880-11-0170-4	1*95	OT/95-12
GD880-11-0215-4	1*120	OT/120-12
GD880-11-0260-4	1*150	OT/150-12
GD880-11-0305-4	1*185	OT/185-12
GD880-11-0340-4	1*185	OT/185-12
GD880-11-0380-4	2*120	OT/120-12
GD880-11-0425-4	2*120	OT/120-12
GD880-11-0480-4	2*150	OT/150-12
GD880-11-0530-4	2*150	OT/150-12
GD880-11-0600-4	2*185	OT/185-12
GD880-11-0650-4	2*185	OT/185-12
GD880-11-0720-4	2*240	OT/240-16
GD880-11-0820-4	2*240	OT/240-16
GD880-11-0639-4	2*185	OT/185-12
GD880-11-0757-4	2*240	OT/240-16
GD880-11-0900-4	2*300	OT/300-16
GD880-11-0975-4	2*300	OT/300-16
GD880-11-0410-6	2*120	OT/120-12
GD880-11-0530-6	2*150	OT/150-12
GD880-11-0600-6	2*185	OT/185-12
GD880-11-0650-6	2*185	OT/185-12
GD880-11-0720-6	2*240	OT/240-16

Note: In the Connection terminal column, OT/185-12 indicates that the cable is connected to a OT-type terminal, the matching cable diameter is 185mm^2, and the screw hole size is M12.

4.4.8 Electrical installation checklist

No.	Operation	Compliant	Completed
1	Checked the input and output power wiring and ensured the wiring positions and voltages were correct.	☐	☐
2	Ensured that the input and output power wiring was correct and fastened.	☐	☐
3	Ensured that the input and output power cable carrying capacity selection was correct.	☐	☐
4	Ensured that routing the input and output power cables that were shielded complied with EMC regulations.	☐	☐
5	Checked the external auxiliary power wiring and ensured the wiring positions and voltages are correct.	☐	☐
6	The date of manufacture can be known from the drive 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 section 7.2.1 Capacitor.	☐	☐
7	Routed the control power cables and power cables separately, complying with EMC regulations.	☐	☐

5 Control unit

5.1 Control unit composition

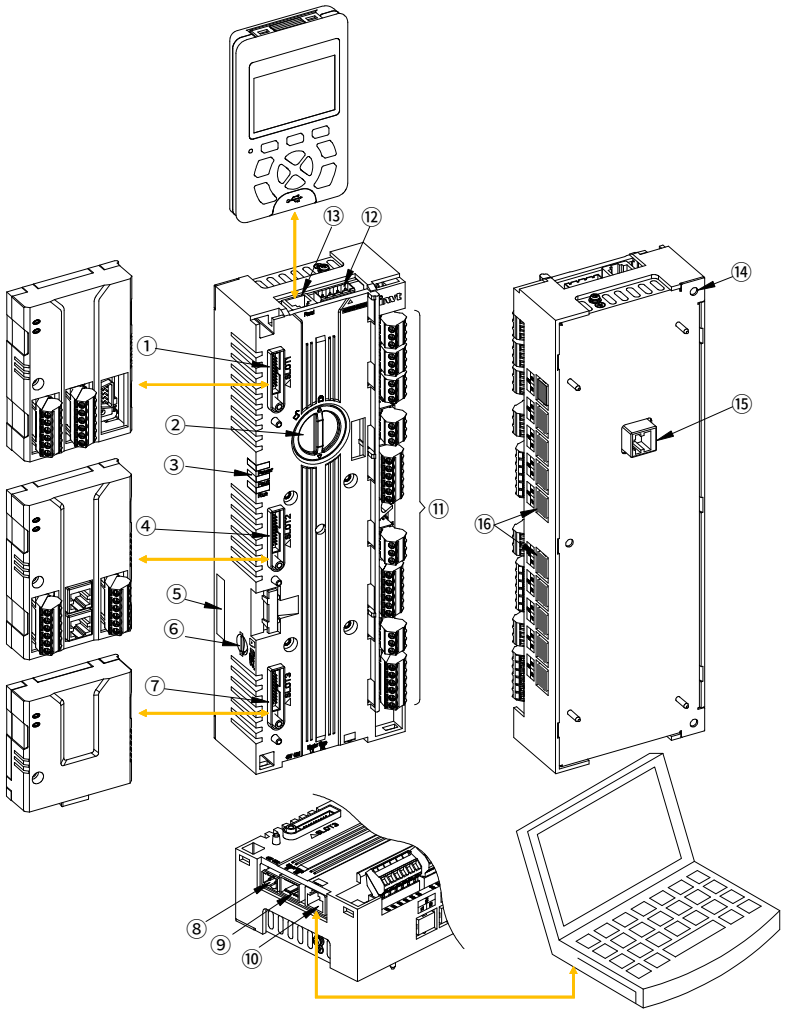


Table 5-1 Function description

No.	Component	Function description
1	Slot 1	Applied to 73.5×103×23.5(mm) function expansion modules and communication expansion card
2	Battery cover plate	Button battery replacement cover. The internal button battery is a non rechargeable lithium battery that needs to be replaced regularly.
3	Indicator	Power supply, fault, running indicator
4	Slot 2	Applied to 73.5×103×23.5(mm) function expansion modules, communication expansion card, and optical fiber expansion card
5	Nameplate	Nameplate information
6	Micro SD card	Standard micro SD memory card, flexible to plug and unplug, capacity: 32GB
7	Slot 3	Applied to 73.5×74×23.5(mm) function expansion modules, communication expansion card, and optical fiber expansion card

No.	Component	Function description
8	Power interface	24V power input terminal
9	Fiber optic interface	Master/slave fiber optic interface
10	RJ45 terminal	Upper computer interface, connecting to a PC for status monitoring
11	User terminal	Standard input and output terminals for users
12	STO terminal	Safe Torque Off input
13	RJ45 terminal	HMI, connecting to the SOP-880 keypad
14	Fixed hole	Control unit fixing holes (three holes)
15	RJ45 terminal	Communication interface with power unit
16	Fiber optic interface	Fiber optic communication interface with power unit

5.2 LED indicator

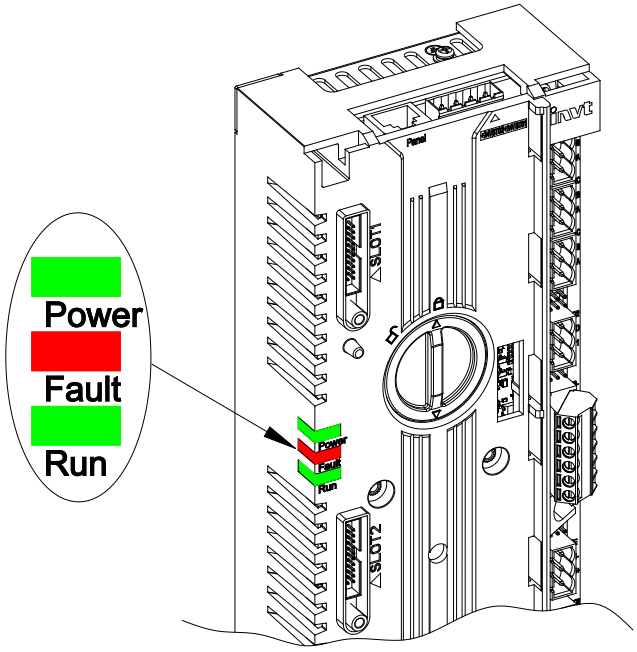


Table 5-2 Indicator description

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

5.3 Control unit size and installation

5.3.1 Preparing

- Before installation, ensure the cabinet has been powered off (excluding external power) for at least 25 minutes.
- Prevent the control unit from falling or shock to avoid damage.
- Do not disassemble the control unit to avoid damage.

- Do not fasten with excessive torque; otherwise, terminals may be damaged.

5.3.1.1 Required tools

1# Phillips screwdriver may be required during installation.

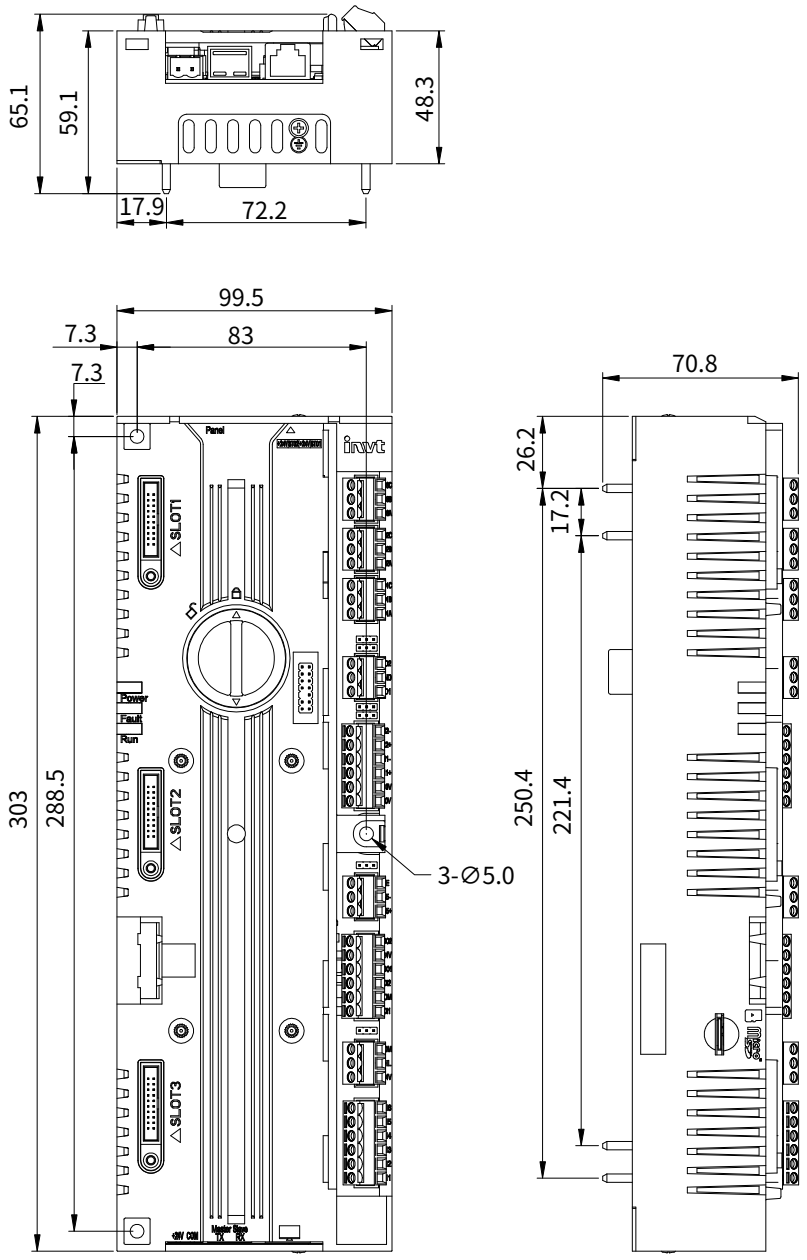
5.3.1.2 Fastening torque

Screws are used to install the control unit with fastening torque.

Screw	Fastening torque
M4	1.5N.m

5.3.2 Control unit size

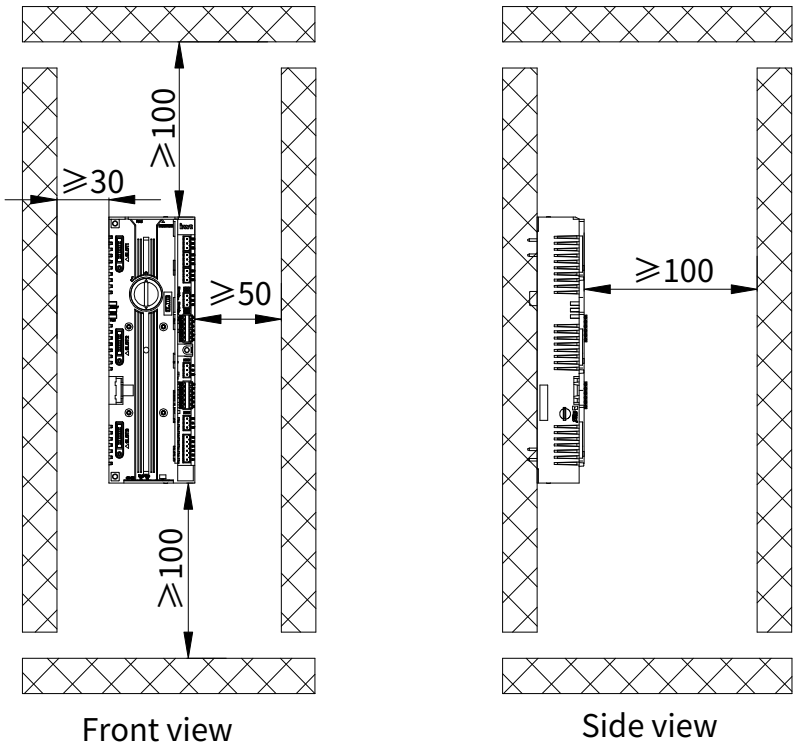
Figure 5-1 Control unit dimensions (unit: mm)



5.3.3 Control unit installation space

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

Figure 5-2 Requirements on control unit installation space (unit: mm)



5.3.4 Control unit installation procedure

Step 1 Place the control unit as shown in the figure.

Step 2 Use 1# Phillips screwdriver to tighten the four M4 screws to fix the control unit to the metal plate as shown in Figure 5-3.

Figure 5-3 Control unit installation

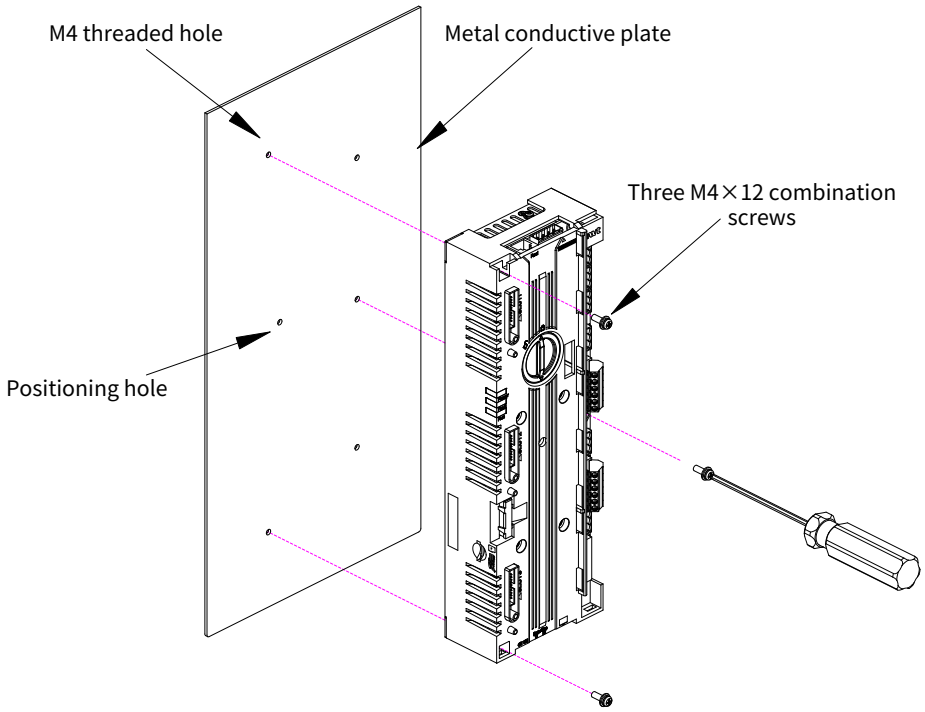
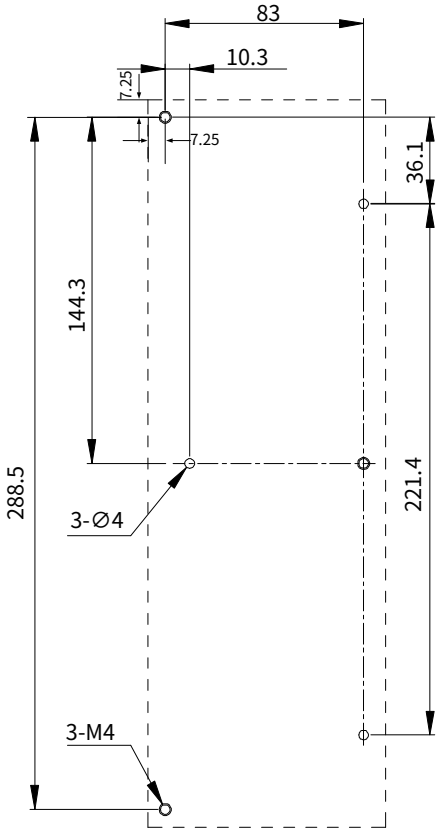


Figure 5-4 Recommended hole position for the main control box installation

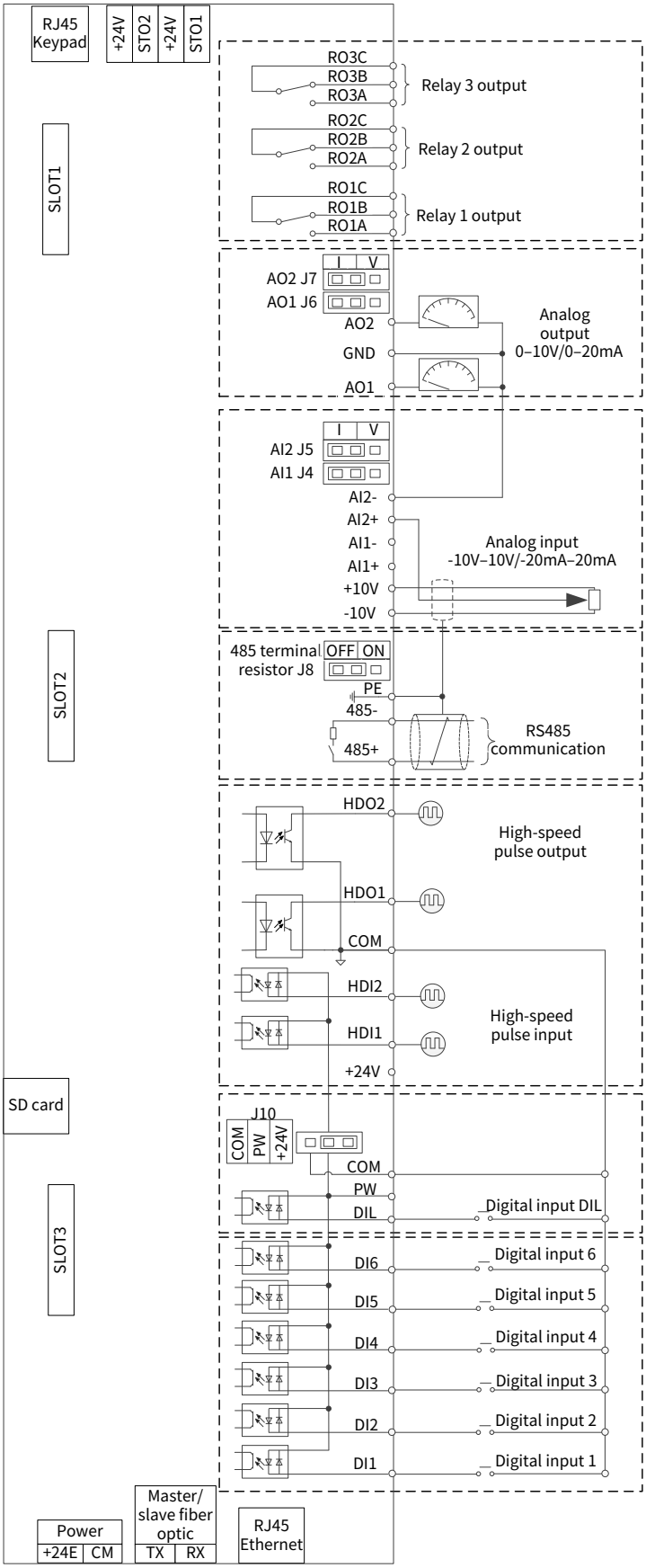


Note:

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

5.4 Control unit interface

Figure 5-5 Control unit circuit wiring

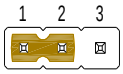
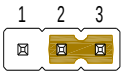
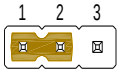
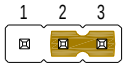
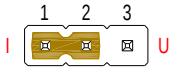
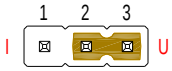


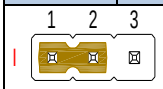
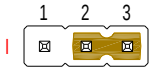
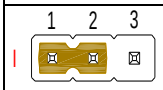
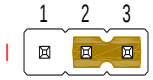
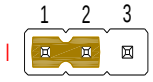
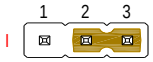
5.4.1 External standard interfaces

Terminal symbol	Terminal name	Description
Input power	24E, CM	Power supply for the control box
Digital input	DI1–DI6,DIL	Input type: relay contact, NPN or PNP
Digital power output	+24V, COM	Digital power, isolated from power input 24V
High-speed digital input	HDI1, HDI2	Input type: NPN or PNP
High-speed digital output	HDO1, HDO2	Output type: Open collector
Analog input	AI1, AI2	Input type: current or voltage, selected through the jumper
Analog output	AO1, AO2	Output type: current or voltage, selected through the jumper
Relay output	RO1, RO2, RO3	Contacts: NO, NC, common point
RS485 communication	485+, 485-	RS485 communication. The terminal resistor is selected through the jumper.
RJ45 terminal	RJ45 keypad	Communication interface with keypad
RJ45 terminal	RJ45 Ethernet	Ethernet communication with a PC

5.4.2 Detailed introduction to external interfaces

No.	Terminal symbol	Function description	Cable specifications
Input power			
1	24E	24Vdc±10%2A	Two-core twisted-pair cable is recommended. Cross-sectional area: 0.5–2.5mm²
2	CM		
DI input terminal			
1	DI1	• Input impedance: 3.3kΩ • Voltage input range: 12–30V • Supports NPN and PNP bi-direction input, relay contact input • Max. input frequency: 1kHz	Single-core wire Cross-sectional area: 0.5–2.5mm²
2	DI2		
3	DI3		
4	DI4		
5	DI5		
6	DI6		
DIL input terminal			
1	DIL	Digital interlock. When its input is high, all other input terminals are forced to be invalid.	Two-core twisted-pair cable is recommended. Cross-sectional area: 0.5–2.5mm²
2	PW	Provides power supply for DIL, DI1–DI6, HDI, HDO	
3	COM	Digital common ground	
Jumper J10: power supply selection			

No.	Terminal symbol	Function description	Cable specifications
 When pin 1 and pin 2 are short-circuited, i.e. the PW and internal COM are connected, DI uses the internal power ground. If the external power supply is used, the shorting cap should be removed.			
 When pin 2 and pin 3 are short-circuited, i.e. the PW and internal +24V are connected, DI uses the internal power. If the external power supply is used, the shorting cap should be removed.			
HDIO terminal			
1	+24V	Input type: PNP, NPN Input frequency range: 0–50kHz Input voltage range: 12–30V Duty ratio: 30%–70%	Two-core twisted-pair cable is recommended. Cross-sectional area: 0.5–2.5mm² HDI and COM, HDO and COM use twisted-pair cables.
2	HDI1		
3	HDI2		
4	COM	Output type: OC Output frequency range: 0–50kHz Max. output load: 20mA/30V Duty ratio: 50%	
5	HDO1		
6	HDO2		
RS485 communication terminals			
1	485+	RS485 bus, standard 5V electrical level Terminal resistor: 120Ω Max. baud rate: 115200 Max. number of nodes: 32 (without relay)	Two-core twisted-pair cable is recommended. Cross-sectional area: 0.5–2.5mm²
2	485-		
3	PE		
Jumper J8: terminal resistor selection			
 When 1 and 2 are short-circuited, the terminal resistor is disconnected.			
 When 2 and 3 are short-circuited, the terminal resistor is connected.			
Analog input terminal			
1	-10V	Positive and negative 10V power supply Max. output current: 10mA	Cross-sectional area: 0.5–2.5mm² When two AIs are used, use two two-core shielded twisted-pair cables. When reference voltage is used, use one four-core shielded twisted-pair cable for one AI.
2	+10V		
3	AI1+	Current input: -20mA–20mA, Rin: 500Ω Voltage input: -10V–10V, Rin: 30kΩ Differential input range: ±30V Sampling interval: 0.1ms Resolution: 11 bit+signbit	
4	AI1-		
5	AI2+		
6	AI2-		
Jumper J4: Selection between AI1 voltage and current signal inputs			
 When 1 and 2 are short-circuited, AI1 current input is used.			
 When 2 and 3 are short-circuited, AI1 voltage input is used.			
Jumper J5: Selection between AI2 voltage and current signal inputs			

No.	Terminal symbol	Function description	Cable specifications
		When 1 and 2 are short-circuited, AI2 current input is used.	
		When 2 and 3 are short-circuited, AI2 voltage input is used.	
Analog output terminal			
Analog output	AO1	AO output range: 0–20mA, Rload≤500Ω 0–10V, Rload≥10kΩ Resolution: 11 bit+signbit Accuracy: 2% of full scale range	Two-core twisted-pair cable is recommended. Cross-sectional area: 0.5–2.5mm²
	GND		AO1 and GND, AO2 and GND use twisted-pair cables.
	AO2		
Jumper J6: Selection between AO1 voltage and current signal outputs			
		When 1 and 2 are short-circuited, AO1 current output is used.	
		When 2 and 3 are short-circuited, AO1 voltage output is used.	
Jumper J7: Selection between AO2 voltage and current signal inputs			
		When 1 and 2 are short-circuited, AO2 current output is used.	
		When 2 and 3 are short-circuited, AO2 voltage output is used.	
Relay 1 output terminal			
1	RO1A	Output type: passive NO and NC contacts Contact parameters: 250Vac/30Vdc, 3A	Single-core wire Cross-sectional area: 0.5–2.5mm²
2	RO1B		
3	RO1C		
Relay 2 output terminal			
1	RO2A	Output type: passive NO and NC contacts Contact parameters: 250Vac/30Vdc, 3A	Single-core wire Cross-sectional area: 0.5–2.5mm²
2	RO2B		
3	RO2C		
Relay 3 output terminal			
1	RO3A	Output type: passive NO and NC contacts Contact parameters: 250Vac/30Vdc, 3A	Single-core wire Cross-sectional area: 0.5–2.5mm²
2	RO3B		
3	RO3C		
Master/slave fiber optic			
1	TX	Transmitting optical fiber communication	Dedicated fiber optic cable
2	RX	Receiving optical fiber communication	
Safe torque off terminal			
1	STO1	Drive unit safe torque off input They has been short connected before	Four-core shielded twisted-pair cable
2	+24V		

No.	Terminal symbol	Function description	Cable specifications
3	STO2	delivery by default.	Cross-sectional area: 0.5–2.5mm²
4	+24V		
RJ45 keypad			
1	RJ45	Connected to SOP-880-01 keypad	Standard shielded network cable
RJ45 Ethernet			
1	RJ45	Ethernet communication with a PC	Standard shielded network cable

5.5 Control unit function application

5.5.1 Function module

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

No.	Name	Model	Function description	Connect with ICU through	Dimensions (W×H×D) (unit: mm)
1	Encoder detection module	EC-PG805-05	TTL incremental encoder signal detection	SLOT	73.5×103×23.5
		EC-PG805-24	HTL incremental encoder signal detection	SLOT	73.5×103×23.5
		EC-PG804	Resolver encoders signal detection	SLOT	73.5×103×23.5
2	Input/output module	EC-IO801	Two AIs Two AOs Three DIs 1 relay outputs	SLOT	73.5×103×23.5
3	PROFINET IO module	EC-TX809	PROFINET IO industrial Ethernet	SLOT	73.5×74×23.5
4	PROFIBUSDP module	EC-TX803	PROFIBUS-DP bus adapter	SLOT	73.5×74×23.5
5	CAN bus module	EC-TX805	CANopen bus adapter	SLOT	73.5×74×23.5
6	Optical fiber expansion module	EC-TX821	One 50M expansion optical fiber	SLOT	73.5×74×23.5
		EC-TX823	Three 50M expansion optical fibers	SLOT	73.5×74×23.5
7	Voltage detection module	I-VDM-10	AC voltage detection module	Fiber optic	37.4×180×113
8	SLOT expansion module	I-ESM-30	SLOT expansion module	Fiber optic	99.5×303×65
9	Intelligent operation keypad	SOP-880-01	Human-machine interface keypad	RS422	74×121.5×26

Note:

- EC-TX823 and EC-TX821 can only be inserted in SLOT2 or SLOT3.
- It is recommended to install the EC-PG805 card in SLOT1.
- It is recommended to install the EC-TX803 card in SLOT3.

5.5.2 SLOT expansion application

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

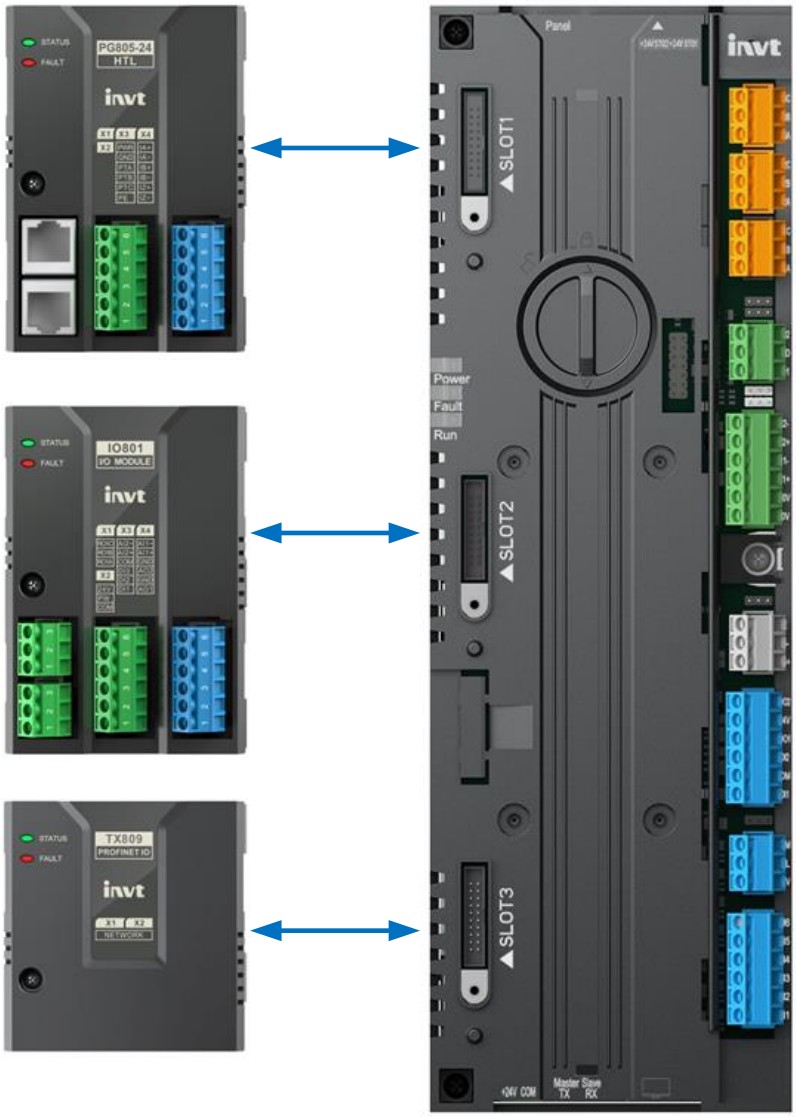


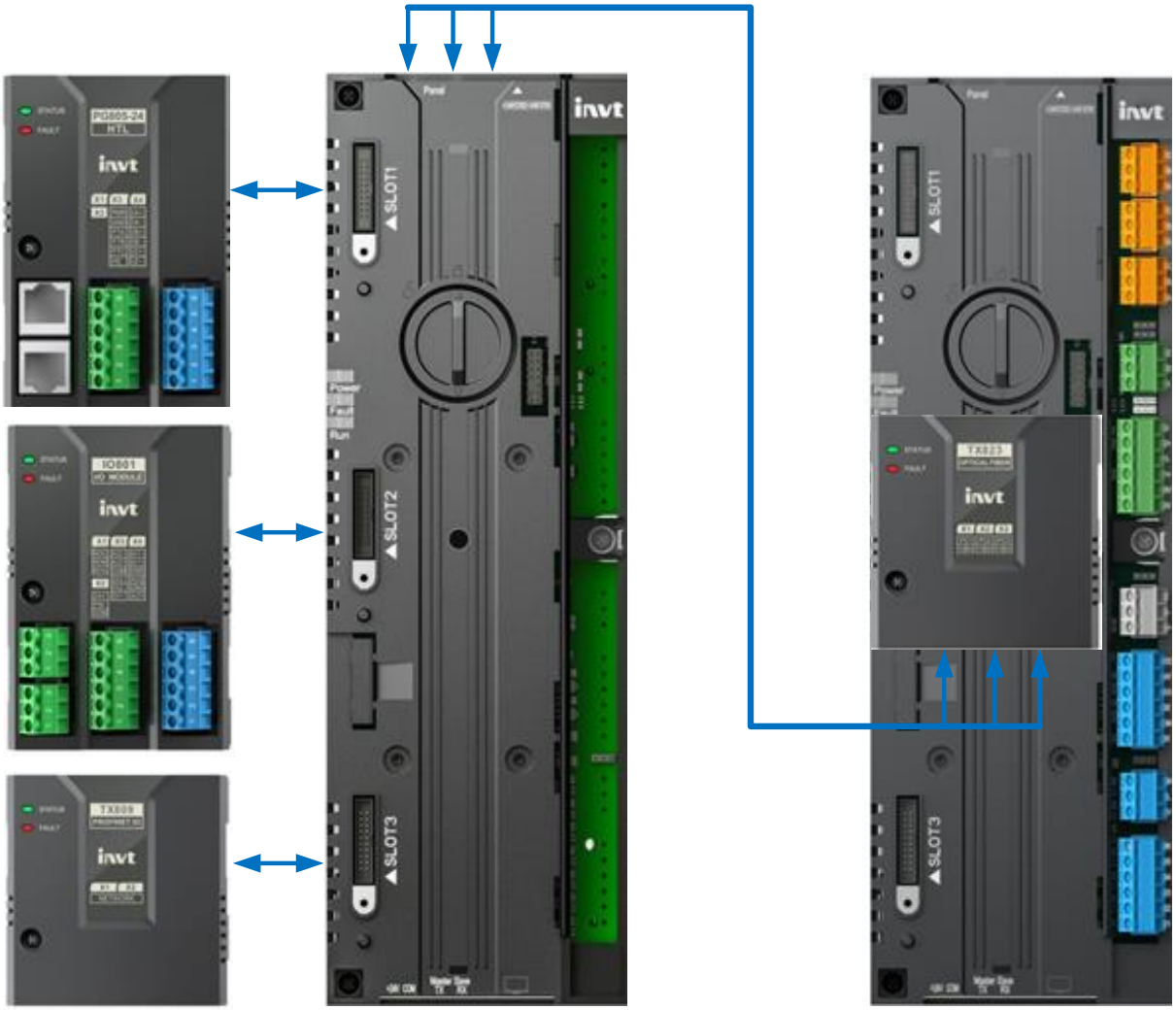
Table 5-3 Expansion card installation description

Expansion card	SLOT1	SLOT2	SLOT3	Expansion card type
EC-TX803	-	-	✓	PROFIBUS-DP
EC-TX805	✓	✓	✓	CANopen
EC-TX809	-	-	✓	PROFINET IO
EC-TX821	-	-	✓	Expansion module with one optical fiber interface
EC-TX823	-	-	✓	Expansion module with three optical fiber interfaces
EC-PG805-05	✓	✓	-	TTL PG card
EC-PG805-24	✓	✓	-	HTL PG card
EC-PG804	✓	✓	-	Resolver PG card
EC-IO801	✓	✓	-	IO expansion card

Note:

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

The ICU has three SLOT card slots. When more modules are needed, install the fiber optic expansion module EC-TX823 and SLOT expansion module I-ESM-30. Each SLOT expansion module can expand three functional modules, as shown in the following figure.



Note:

- SLOT1, SLOT2, and SLOT3 card slots can hold function modules, with addresses for expansion card slots 1, 2, and 3, respectively.
- SLOT2 and SLOT3 card slots can be extended to up to 6 expansion modules through the cooperation of fiber optic expansion module EC-TX823 and SLOT expansion module I-ESM-30. The addresses are SLOT2-1, SLOT2-2, SLOT2-3, and SLOT3-1, SLOT3-2, and SLOT3-3, respectively.
- The SLOT1 card slot has no expansion function, which means it does not support the EC-TX823 module.
- The SLOT expansion module I-ESM-30 does not support the installation of the EC-TX823 fiber expansion module.

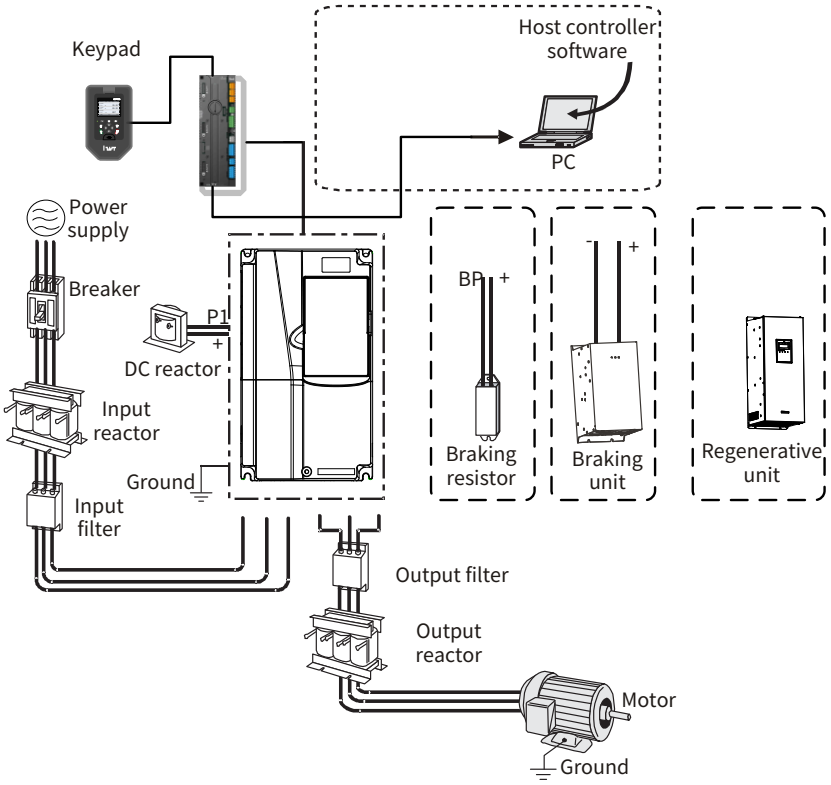
6 Accessories

6.1 Function expansion module

For details of the function expansion module, see section 5.5.1 Function module.
This chapter describes how to select optional accessories for the GD880-11 series single-drive product.

6.2 External wiring

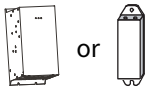
The following figure shows the external wiring of the product.



Note:

- The 380V 0094 and lower models are equipped with built-in braking units, and the 380V 0116–0260 models can be configured with optional built-in braking units.
- The 380V 0048–0820 (E5–E12) models are equipped with built-in DC reactors.
- The braking units are INVT DBU series standard braking units. For details, see the DBU operation manual.

Image	Name	Description
	Cable	Accessory for signal transmission.
	Breaker	Device for electric shock prevention and protection against short-to-ground that may cause current leakage and fire. Select residual-current circuit breakers (RCCBs) that are applicable to VFDs and can restrict high-order harmonics, and of which the rated sensitive current for one VFD is larger than 30 mA.
	Input reactor	Accessories used to improve the power factor on the input side of the VFD, and thus restrict high-order harmonic currents.

Image	Name	Description
	DC reactor	The 380V 0048–0820 (E5–E12) models are equipped with built-in DC reactors.
	Input filter	Accessory that restricts the electromagnetic interference generated by the VFD and transmitted to the public grid through the power cable. Try to install the input filter near the input terminal side of the VFD.
	Braking unit or braking resistor	Accessories used to consume the regenerative energy of the motor to reduce the DEC time. Products of 380V 0094 and lower need only to be configured with braking resistors, those of 380V 0305 and higher and 660V series also need to be configured with braking units, and those of 380V 0116–0260 to 110kW can be configured with optional built-in braking units.
	Output filter	Accessory used to restrict interference generated in the wiring area on the output side of the VFD. Try to install the output filter near the output terminal side of the VFD.
	Output reactor	Accessory used to lengthen the valid transmission distance of the inverter, which effectively restrict the transient high voltage generated during the switch-on and switch-off of the IGBT module of the inverter.

6.3 Power supply

See chapter 4 Electrical installation.

	Ensure that the voltage class of the VFD is consistent with that of the grid.

6.4 Reactor

When the voltage of the grid is high, the transient large current that flows into the input power circuit may damage rectifier components. You need to configure an AC reactor on the input side, which can also improve the current adjustment coefficient on the input side.

When the distance between the VFD and motor is longer than 50 m, the parasitic capacitance between the long cable and ground may cause large leakage current, and overcurrent protection of the VFD may be frequently triggered. To prevent this from happening and avoid damage to the motor insulator, compensation must be made by adding an output reactor. When a VFD is used to drive multiple motors, take the total length of the motor cables (that is, sum of the lengths of the motor cables) into account. When the total length is longer than 50 m, an output reactor must be added on the output side of the VFD. If the distance between the VFD and motor is 50 m to 100 m, select the reactor according to the following table. If the distance is longer than 100 m, contact INVT's technical support technicians.

DC reactors can improve the power factor, avoid damage to bridge rectifiers caused due to large input current of the VFD when large-capacity transformers are connected, and also avoid damage to the rectification circuit caused due to harmonics generated by grid voltage transients or phase-control loads.

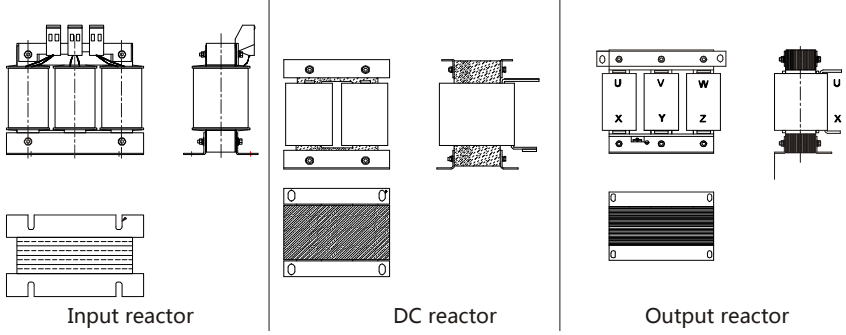


Table 6-1 Reactor

VFD model	Input reactor	DC reactor	Output reactor
GD880-11-0013-4-B	ACL2-5R5-4	-	OCL2-5R5-4
GD880-11-0017-4-B	ACL2-7R5-4	-	OCL2-7R5-4
GD880-11-0023-4-B	ACL2-011-4	-	OCL2-011-4
GD880-11-0033-4-B	ACL2-015-4	-	OCL2-015-4
GD880-11-0038-4-B	ACL2-018-4	Built-in DC reactor	OCL2-018-4
GD880-11-0048-4-B	ACL2-022-4	Built-in DC reactor	OCL2-022-4
GD880-11-0060-4-B	ACL2-037-4	Built-in DC reactor	OCL2-037-4
GD880-11-0078-4-B	ACL2-037-4	Built-in DC reactor	OCL2-037-4
GD880-11-0094-4-B	ACL2-045-4	Built-in DC reactor	OCL2-045-4
GD880-11-0116-4	ACL2-055-4	Built-in DC reactor	OCL2-055-4
GD880-11-0149-4	ACL2-075-4	Built-in DC reactor	OCL2-075-4
GD880-11-0170-4	ACL2-110-4	Built-in DC reactor	OCL2-110-4
GD880-11-0215-4	ACL2-110-4	Built-in DC reactor	OCL2-110-4
GD880-11-0260-4	ACL2-160-4	Built-in DC reactor	OCL2-200-4
GD880-11-0305-4	ACL2-160-4	Built-in DC reactor	OCL2-200-4
GD880-11-0340-4	ACL2-200-4	Built-in DC reactor	OCL2-200-4
GD880-11-0380-4	ACL2-200-4	Built-in DC reactor	OCL2-200-4
GD880-11-0425-4	ACL2-280-4	Built-in DC reactor	OCL2-280-4
GD880-11-0480-4	ACL2-280-4	Built-in DC reactor	OCL2-280-4
GD880-11-0530-4	ACL2-280-4	Built-in DC reactor	-L3 (with built-in output reactor)
GD880-11-0600-4	ACL2-350-4	Built-in DC reactor	-L3 (with built-in output reactor)
GD880-11-0650-4	ACL2-350-4	Built-in DC reactor	-L3 (with built-in output reactor)
GD880-11-0720-4	ACL2-400-4	Built-in DC reactor	-L3 (with built-in output reactor)
GD880-11-0820-4	ACL2-500-4	Built-in DC reactor	-L3 (with built-in output reactor)
GD880-11-0860-4	ACL2-500-4	Built-in DC reactor	-L3 (with built-in output reactor)
GD880-11-0639-4	ACL2-350-4	-	OCL2-280-4
GD880-11-0757-4	ACL2-400-4	-	OCL2-350-4
GD880-11-0900-4	ACL2-500-4	-	OCL2-400-4
GD880-11-0975-4	ACL2-500-4	-	OCL2-500-4
GD880-11-0410-6	ACL2-350-6	-	OCL2-350-6
GD880-11-0530-6	ACL2-500-6	-	OCL2-400-6
GD880-11-0600-6	ACL2-500-6	-	OCL2-400-6
GD880-11-0650-6	ACL2-630-6	-	OCL2-560-6
GD880-11-0720-6	ACL2-630-6	-	OCL2-630-6

Note:

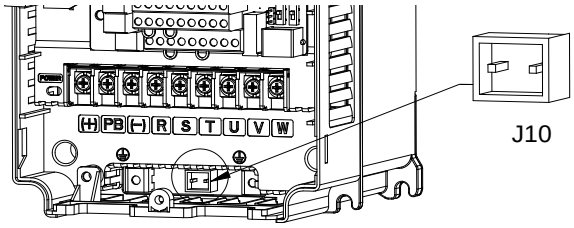
- The rated input voltage drop of input reactor is designed to 2%.
- The current adjustment coefficient on the input side is higher than 90% after a DC reactor is configured.
- The rated output voltage drop of output reactor is designed to 1%.
- The preceding table lists only external accessories. You need to specify whether external or built-in accessories are needed in your purchase order.

6.5 Filters

J10 is not connected in factory for the 400V 0260 and lower product models. Connect the J10 packaged with the manual if the requirements of level C3 need to be met. J10 is connected in factory for the 400V 0305 and higher product models, all of which meet the requirements of level C3.

Note: Disconnect J10 in the following situations:

1. The EMC filter is applicable to the neutral-grounded grid system. If it is used for the IT grid system (that is, non-neutral grounded grid system), disconnect the filter.
2. If leakage protection occurs during configuration of a residual-current circuit breaker, disconnect the filter.



Interference filters on the input side can reduce the VFD interference on the surrounding devices.

Noise filters on the output side can decrease the radio noise caused by the cables between VFDs and motors and the leakage current of conducting wires.

INVT provides some of the filters for you to choose.

Table 6-2 Filter model selection

VFD model	Input filter	Output filter
GD880-11-0013-4-B	FLT-P04016L-B	FLT-L04016L-B
GD880-11-0017-4-B	FLT-P04032L-B	FLT-L04032L-B
GD880-11-0023-4-B		
GD880-11-0033-4-B	FLT-P04045L-B	FLT-L04045L-B
GD880-11-0038-4-B		
GD880-11-0048-4-B	FLT-P04065L-B	FLT-L04065L-B
GD880-11-0060-4-B		
GD880-11-0078-4-B	FLT-P04100L-B	FLT-L04100L-B
GD880-11-0094-4-B		
GD880-11-0116-4	FLT-P04150L-B	FLT-L04150L-B
GD880-11-0149-4		
GD880-11-0170-4	FLT-P04240L-B	FLT-L04240L-B
GD880-11-0215-4		
GD880-11-0260-4		
GD880-11-0305-4	FLT-P04400L-B	FLT-L04400L-B
GD880-11-0340-4		
GD880-11-0380-4		
GD880-11-0425-4	FLT-P04600L-B	FLT-L04600L-B
GD880-11-0480-4		
GD880-11-0530-4		
GD880-11-0600-4	FLT-P04800L-B	FLT-L04800L-B
GD880-11-0650-4		
GD880-11-0720-4		
GD880-11-0820-4	FLT-P041000L-B	FLT-L041000L-B
GD880-11-0860-4		
GD880-11-0639-4	FLT-P04800L-B	FLT-L04800L-B
GD880-11-0757-4		
GD880-11-0900-4	FLT-P041000L-B	FLT-L041000L-B
GD880-11-0975-4		
GD880-11-0410-6	FLT-P06400H-B	FLT-L06400H-B
GD880-11-0530-6	FLT-P061000H-B	FLT-L061000H-B
GD880-11-0600-6		
GD880-11-0650-6		
GD880-11-0720-6		

Note:

- The input EMI meets the C2 requirements after an input filter is configured.
- The preceding table describes external accessories. You need to specify the ones you choose when purchasing accessories.
- Do not connect filters in IT power systems.

6.6 Braking system

6.6.1 Braking component selection

When the VFD driving a high-inertia load decelerates or needs to decelerate abruptly, the motor runs in the power generation state and transmits the load-carrying energy to the DC circuit of the VFD, causing the bus voltage of the VFD to rise. If the bus voltage exceeds a specific value, the VFD reports an overvoltage fault. To prevent this from happening, you need to configure braking components.

	• The design, installation, commissioning, and operation of the device must be performed by trained and qualified professionals. • Follow all the "Warning" instructions during the operation. Otherwise, major physical injuries or property loss may be caused. • Only qualified electricians are allowed to perform the wiring. Otherwise, damage to the VFD or braking components may be caused. • Read the braking resistor or unit instructions carefully before connecting them to the VFD. • Connect braking resistors only to the terminals PB and (+), and braking units only to the terminals (+) and (-). Do not connect them to other terminals. Otherwise, damage to the braking circuit and VFD and fire may be caused.
	• Connect the braking components to the VFD according to the wiring diagram. If the wiring is not properly performed, damage to the VFD or other devices may be caused.

The 380V 0094 and lower product models are equipped with built-in braking units, The product of 380V 0116–0260 models can be configured with built-in braking units, and then the product model will have a suffix "B", for example, GD880-11-0094-4-B. Only external braking units can be configured for the 380V 0305 and higher models. Select braking resistors according to the specific requirements (such as the braking torque and braking usage) on site.

6.6.2 Braking unit

VFD model	Braking unit model	Resistance applicable for 100% braking torque (Ω)	Braking resistor dissipation power(kW)			Min. allowed braking resistance (Ω)
			10% braking usage	50% braking usage	80% braking usage	
GD880-11-0013-4-B	Built-in braking unit	122	0.6	3	4.8	80
GD880-11-0017-4-B		89	0.75	4.1	6.6	60
GD880-11-0023-4-B		65	1.1	5.6	9	47
GD880-11-0033-4-B		44	1.7	8.3	13.2	31
GD880-11-0038-4-B		32	2	11	18	23
GD880-11-0048-4-B		27	3	14	22	19
GD880-11-0060-4-B		22	3	17	26	17
GD880-11-0078-4-B		17	5	23	36	17
GD880-11-0094-4-B		13	6	28	44	11.7

VFD model	Braking unit model	Resistance applicable for 100% braking torque (Ω)	Braking resistor dissipation power(kW)			Min. allowed braking resistance (Ω)
			10% braking usage	50% braking usage	80% braking usage	
GD880-11-0116-4	DBU100H-110-4 or select built-in braking unit	10	7	34	54	6.4
GD880-11-0149-4		8	8	41	66	
GD880-11-0170-4		6.5	11	56	90	
GD880-11-0215-4	DBU100H-160-4 or select built-in braking unit	5.4	14	68	108	4.4
GD880-11-0260-4		4.5	17	83	132	
GD880-11-0305-4	DBU100H-220-4	3.7	20	99	158	3.2
GD880-11-0340-4	DBU100H-320-4	3.1	24	120	192	2.2
GD880-11-0380-4		2.8	28	139	222	
GD880-11-0425-4		2.5	30	150	240	
GD880-11-0480-4	DBU100H-400-4	2.2	33	165	264	1.8
GD880-11-0530-4		2.0	38	188	300	
GD880-11-0600-4	Quantity: Two DBU100H-320-4	3.6*2	21*2	105*2	168*2	2.2*2
GD880-11-0650-4		3.2*2	24*2	118*2	189*2	
GD880-11-0720-4		2.8*2	27*2	132*2	210*2	
GD880-11-0820-4		2.4*2	30*2	150*2	240*2	
GD880-11-0860-4	Quantity: Two DBU100H-400-4	2.2*2	34*2	168*2	270*2	1.8*2
GD880-11-0639-4	Quantity: Two DBU100H-320-4	3.2*2	24*2	118*2	189*2	2.2*2
GD880-11-0757-4		2.8*2	27*2	132*2	210*2	
GD880-11-0900-4	Quantity: Two DBU100H-400-4	2.2*2	34*2	168*2	270*2	1.8*2
GD880-11-0975-4		2.0*2	38*2	186*2	300*2	
GD880-11-0410-6	DBU100H-320-6	3.8	47	236	378	3.4
GD880-11-0530-6		3.5	53	263	420	
GD880-11-0600-6	Quantity: Two DBU100H-320-6	5.5*2	34*2	168*2	270*2	3.4*2
GD880-11-0650-6		4.8*2	38*2	188*2	300*2	
GD880-11-0720-6		4.3*2	42*2	210*2	336*2	

Note:

- Select braking resistors according to the resistance and power data provided by INVT.
- The braking resistor may increase the braking torque of the VFD. The preceding table describes the resistance and power for 100% braking torque, 10% braking usage, 50% braking usage, and 80% braking usage. You can select the braking system based on the actual operation conditions.
- When using an external braking unit, set the brake voltage class of the braking unit properly by referring to the manual of the dynamic braking unit. If the voltage class is set incorrectly, the VFD may not run properly.

	• Do not use braking resistors whose resistance is lower than the specified minimum resistance. The VFD does not provide protection against overcurrent caused by resistors with low resistance.
	• In scenarios where braking is frequently implemented, that is, the braking usage is greater than 10%, you need to select a braking resistor with higher power as required by the operation conditions according to the preceding table.

6.6.3 Braking resistor cable selection

Braking resistor cables should be shielded cables.

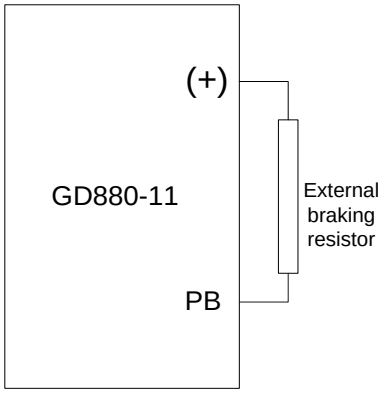
6.6.4 Braking resistor installation

All resistors must be installed in places with good cooling conditions.

	• The materials near the braking resistor or braking unit must be flame resistant. since the surface temperature of the resistor is high and air flowing from the resistor is of hundreds of degrees Celsius. Prevent any materials from coming into contact with the resistor.

Braking resistor installation

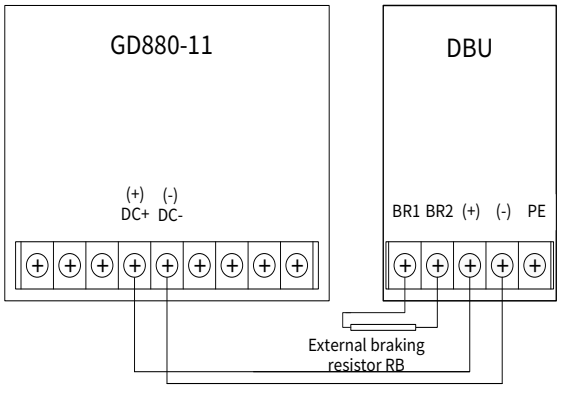
	• For 380V 0094 and lower or 380V 0116–0260 models equipped with a built-in braking unit, only an external braking resistor is required. • PB and (+) are the terminals for connecting braking resistors.



Braking unit installation

	• 380V 0116 and higher models or 660V models can be configured with external braking units. • (+) and (-)are the terminals for connecting braking units. • The connection cable length between the (+) and (-) terminals of the VFD and those of a braking unit must be shorter than 5 m, and the connection cable length between the BR1 and BR2 terminals of a braking unit and the terminals of a braking resistor must be shorter than 10 m.

Single connection:



7 Maintenance and inspection

7.1 Periodical inspection

7.1.1 Overview

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

Before operating the interior of the equipment:

- Disconnect the power from the equipment.
- Wait 25 minutes for the DC circuit capacitor to discharge.
- Ensure that the DC bus voltage is lower than 36V.

Note: No switch and breaker installed in the cabinet can disconnect the power to the equipment.

7.1.2 Required tools

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

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

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

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

7.1.3 Maintenance cycle

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

Maintenance cycle	Maintenance work description
Once per 6–12 months (based on the site installation environment)	Check according to Table 7-2
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	Check air filter and replace it when necessary
Every 6 years	Replace the fans for the filter and power units
Every 10 years	Capacitor replacement

Table 7-2 Check items

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

Check scope		Check item	Method	Expected result
		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 www.invt.com, and choose **Support** > **Services**.

7.2 Replacement of wearing parts

7.2.1 Capacitor

7.2.1.1 Capacitor reforming

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

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

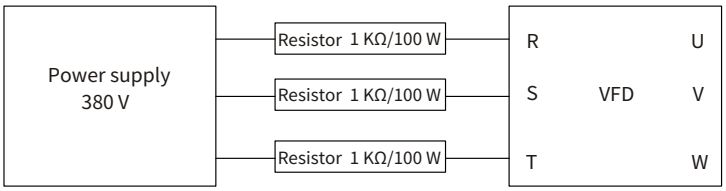
For drive units of a high voltage class, ensure that the voltage requirement (for example, 380 V) is met during charging. Capacitor changing requires little current, and therefore you can use a small-capacity power supply (2 A is sufficient).

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

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

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

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



7.2.2 Electrolytic capacitor replacement

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

When the electrolytic capacitor in the drive unit is used for more than 70000 hours (8 years) at an ambient temperature of 30°C and a load rate of less than 70%, it must be replaced. The actual service life is related to the load rate and the ambient temperature. For details about the replacement, contact the local INVT office.

7.2.3 Cooling fan

The service life of the cooling fan of the drive unit is more than 45000 hours (5 years). The actual service life of the cooling fan is related to the use of the unit and the temperature in the working environment.

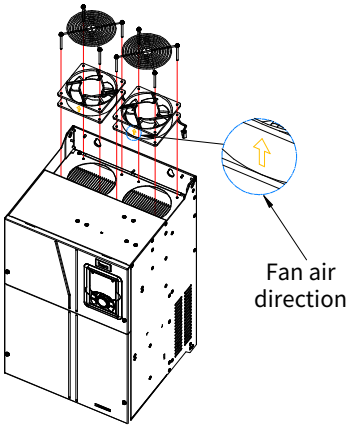
You can view the running duration of the drive unit through P21.47 (Accumulated Run running time).

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. We offer spares of fans.

⚠	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 procedure is as follows (The number of fans varies with different models):

Figure 7-2 Replacing the fan for E2–E9



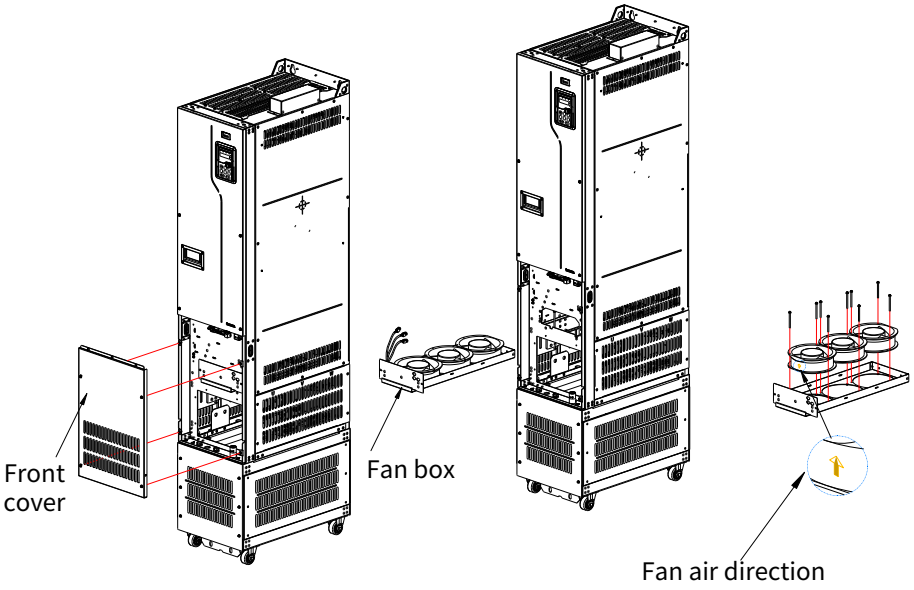
Step 1 Disconnect the DC power supply of the drive system and check to ensure there is no voltage in the equipment.

Step 2 Press and hold the snap-fits of the fan cover, and remove the fan cover.

Step 3 Pull the fan out slowly and unplug the fan power cord plug to complete the fan disassembly.

Step 4 Install the new fan in the reverse order of the disassembly steps.

Figure 7-3 Replacing the fan for E11–E12



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.

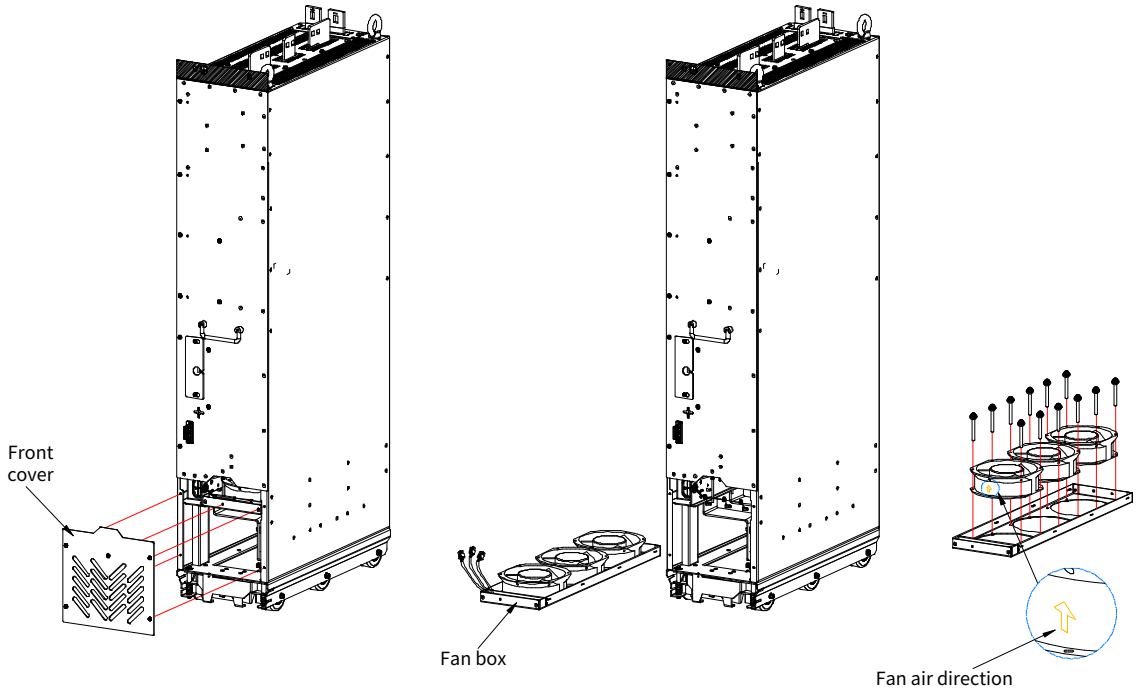
Step 3 Remove the fan module connection cable.

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 plate. Ensure that the air direction of the fan is consistent with that of the unit.

Step 6 Connect to the power supply.

Figure 7-4 Replacing the fan for 11A8



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 plate. Ensure that the air direction of the fan is consistent with that of the unit.

Step 6 Connect to the power supply.

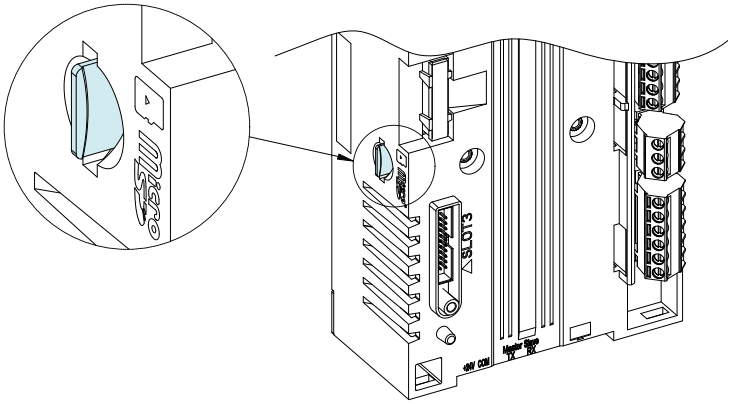
7.2.4 Control unit

1. Replace the storage card.

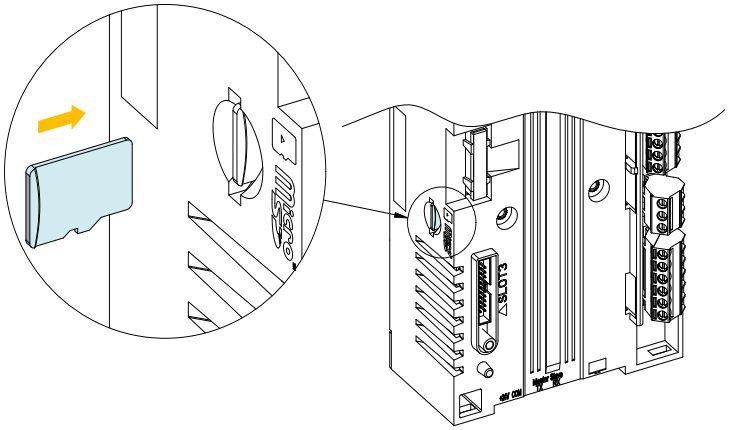
After the control module is replaced, the existing parameter settings can be preserved by transferring the storage card from the faulty module to a new module.

The procedure is as follows:

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



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

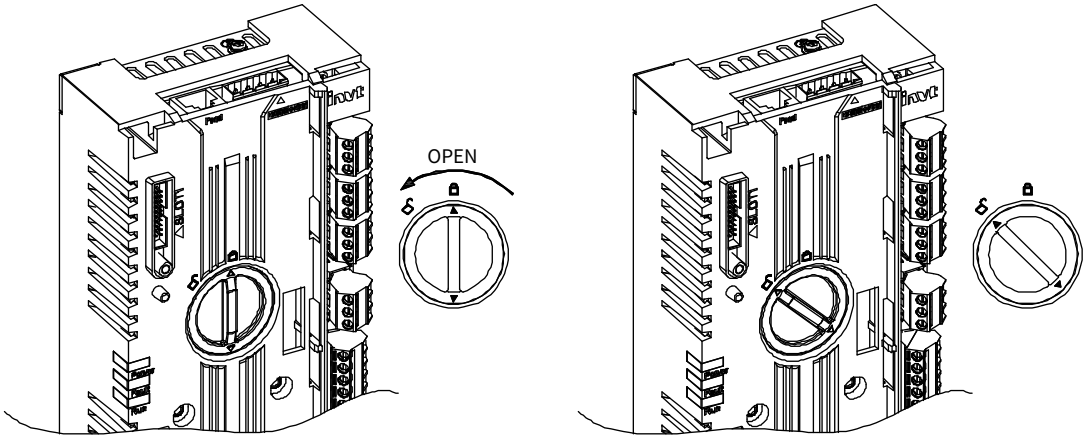


Step 3 Ensure that the micro SD storage card is pushed into place. Otherwise, abnormalities may occur due to poor contact.

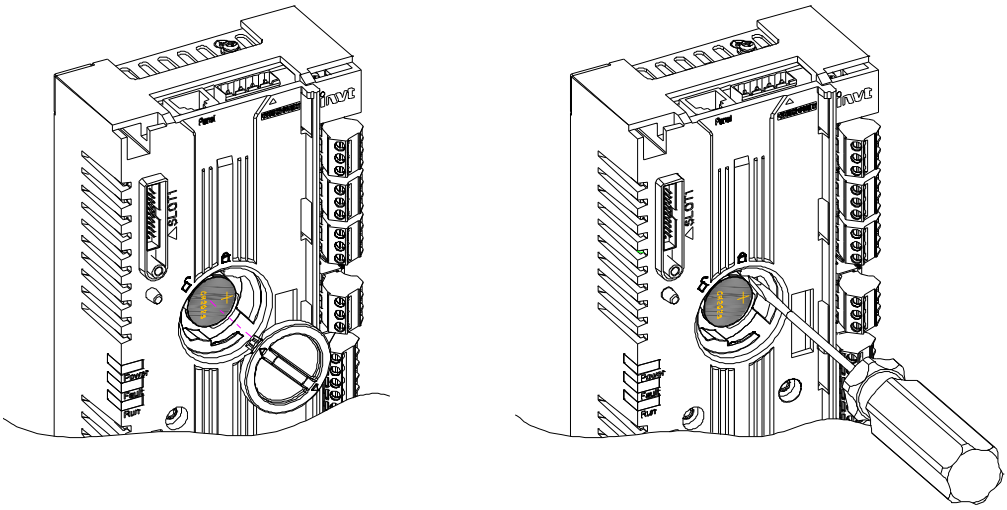
2. Replace the control unit battery.

The procedure is as follows:

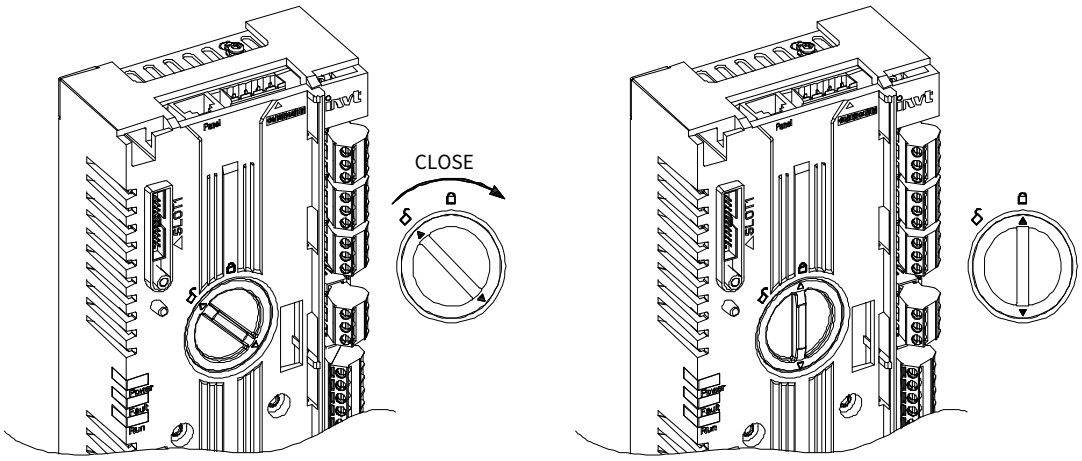
Step 1 Hold the battery cover by hand and rotate it counterclockwise by 45° until the cover opens.



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



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

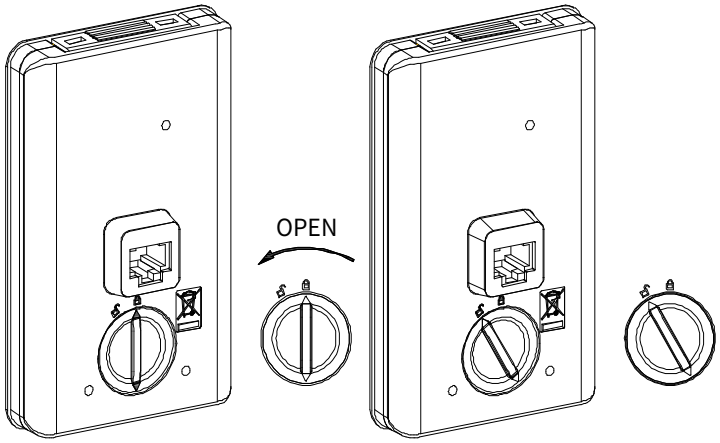


Step 4 Dispose of waste batteries in accordance with local disposal rules or applicable laws.

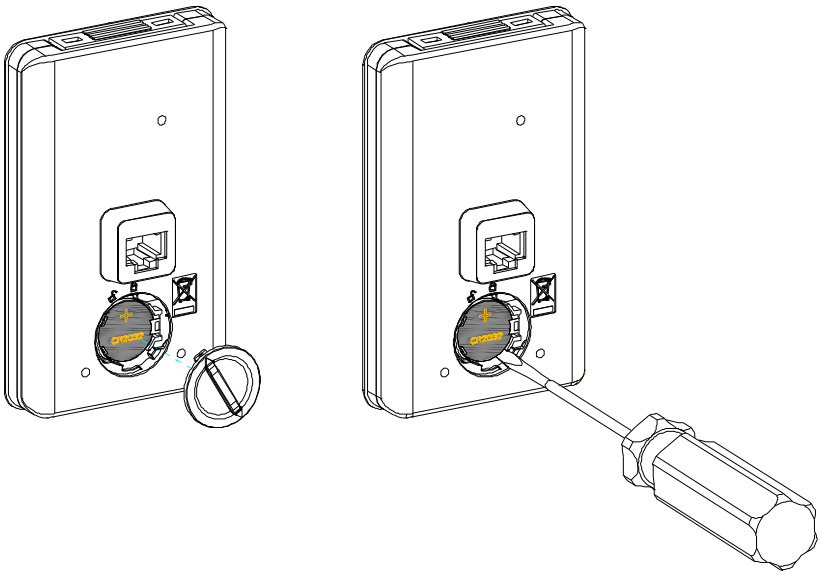
3. Replace the SOP battery.

The procedure is as follows:

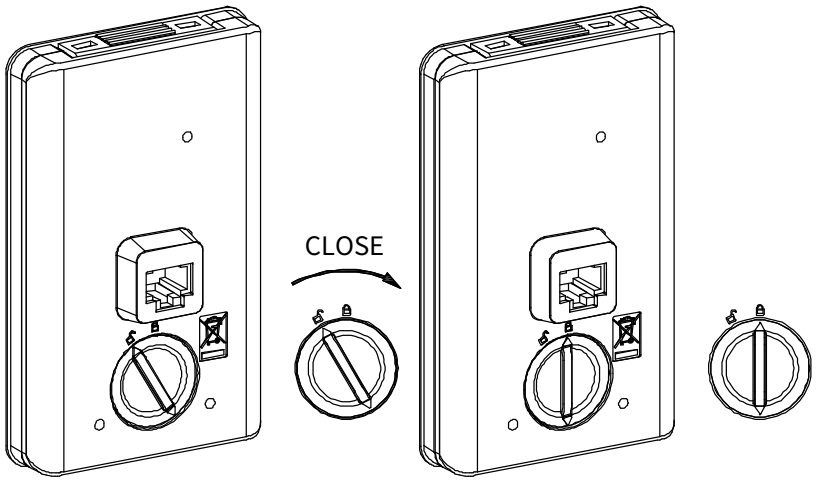
Step 1 Rotate the battery cover counterclockwise by 30° by hand until the cover opens.



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



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



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

Appendix A Technical data

A.1 Capacity

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

Note:

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

A.2 Grid specifications

Grid voltage	AC 3PH 380V(-10%)–440V(+10%), -15%<1min AC 3PH 520V(-10%)–690V(+10%), -15%<1min
Short-circuit capacity	According to the definition in IEC61439-1, the maximum allowable short-circuit current at the incoming end is 100kA. Therefore, the product is applicable to scenarios where the transmitted current in the circuit is no larger than 100 kA when the VFD runs at the maximum rated voltage.
Frequency	50/60 Hz±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 product nameplate indicates that the inverter 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 inverter products.

Application environment categories:

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

Second environment: All environments except those in Category I.

Inverter unit categories:

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

Category C2: Inverter of rated voltage lower than 1000V, non-plug, socket, or mobile devices; power drive systems that must be installed and operated by specialized personnel when applied to the first environment.

Note: The EMC standard IEC/EN 61800-3 no longer restricts the power distribution of inverter units, 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: Inverter of rated voltage lower than 1000 V, 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 inverter unit according to the description in the manual.

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

A.4.2 VFD category of C3

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

The induction disturbance limit meets the following stipulations:

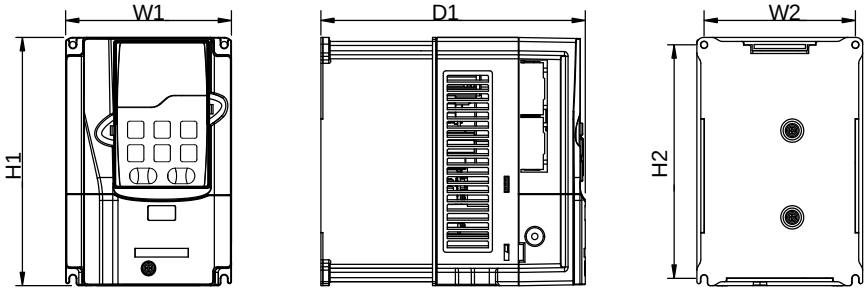
1. Select the motor and control cables according to the description in the manual.
2. Install the inverter unit according to the description in the manual.

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

Appendix B Dimension drawings

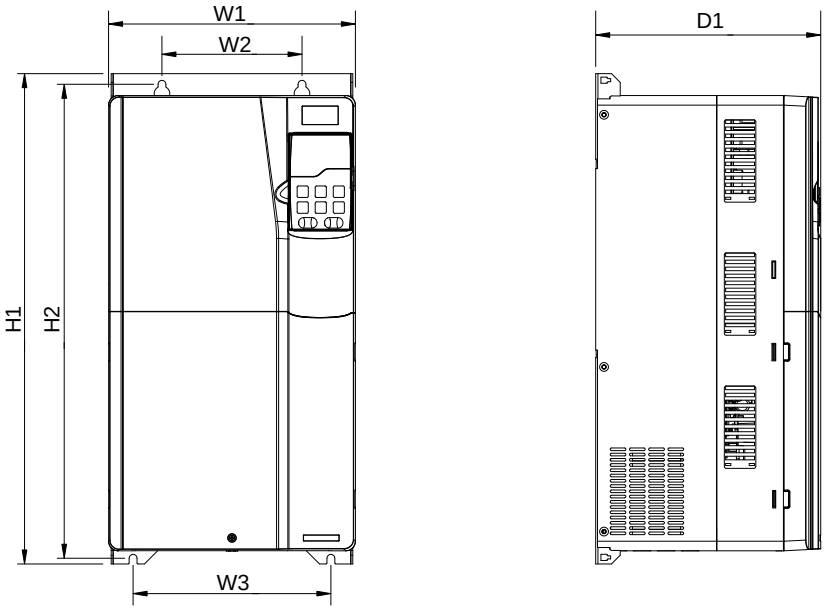
B.1 Single-drive unit

Figure B-1 Dimensions of frame E3–E6



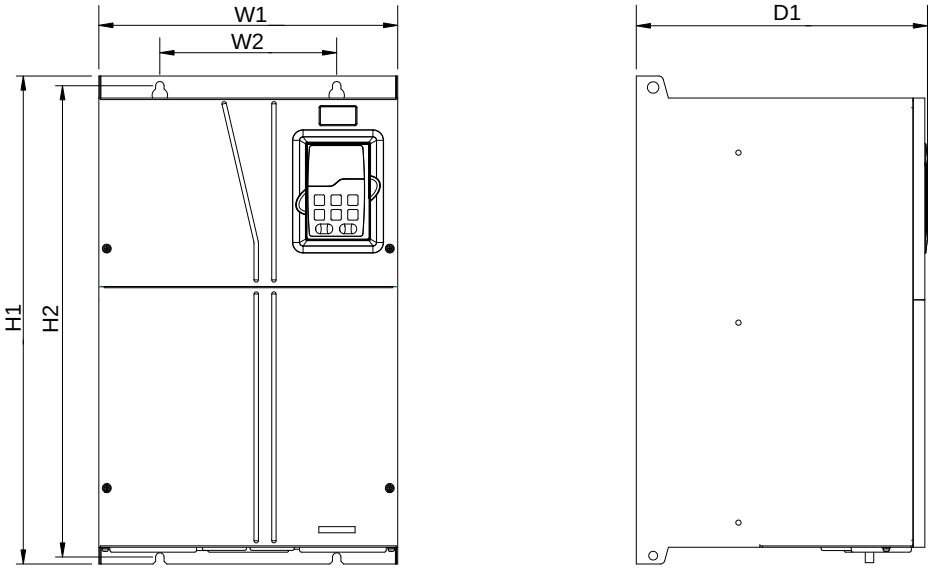
Frame	Outline dimensions (mm)			Installation dimensions (mm)		Hole diameter (mm)	Fixing screw
	W1	H1	D1	W2	H2		
E3	146	256	192	131	243.5	Ø6	M5
E4	170	320	219	151	303.5	Ø6	M5
E5	230	330	217	210	311	Ø6	M5
E6	250	400	223	230	380	Ø6	M5

Figure B-2 Dimensions of frame E7



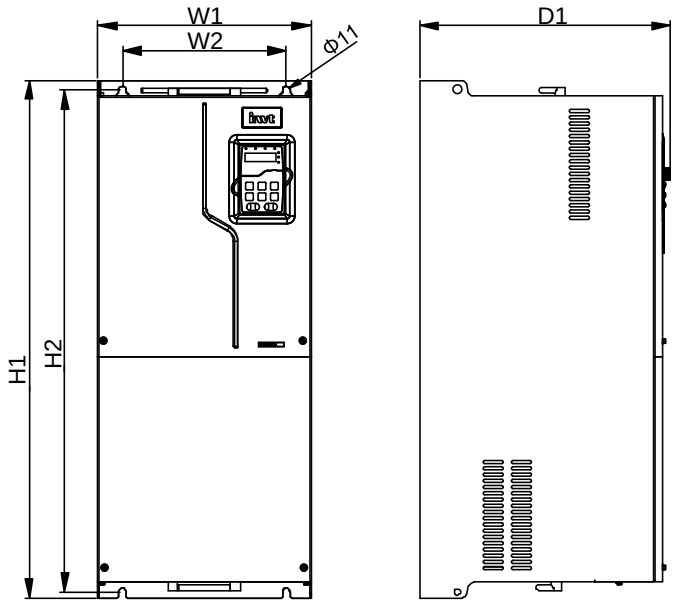
Frame	Outline dimensions (mm)			Installation dimensions (mm)			Hole diameter (mm)	Fixing screw
	W1	H1	D1	W2	W3	H2		
E7	282	560	258	160	226	542	Ø9	M8

Figure B-3 Dimensions of frame E8



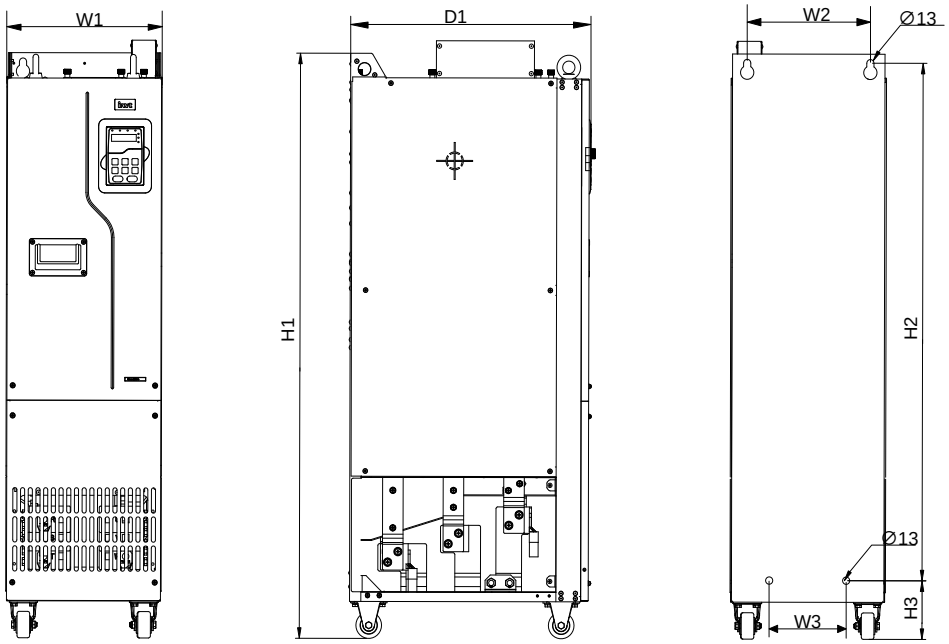
Frame	Outline dimensions (mm)			Installation dimensions (mm)		Hole diameter (mm)	Fixing screw
	W1	H1	D1	W2	H2		
E8	338	554	330	200	535	Ø10	M8

Figure B-4 Installation dimensions of frame E9



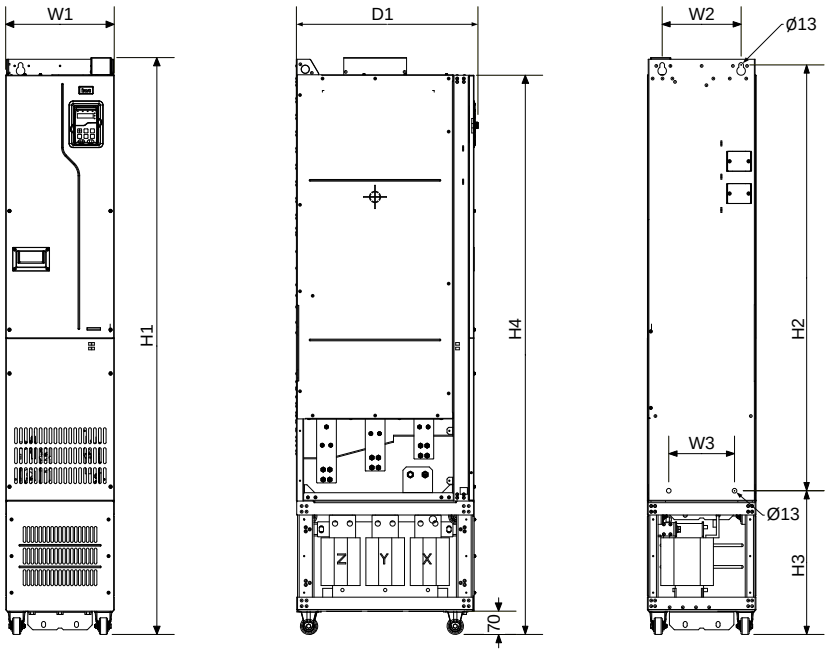
Frame	Outline dimensions (mm)			Installation dimensions (mm)		Hole diameter (mm)	Fixing screw
	W1	H1	D1	W2	H2		
E9	338	825	398	260	800	Ø 11	M10

Figure B-5 Installation dimensions of frame E11–E12(without an output reactor)



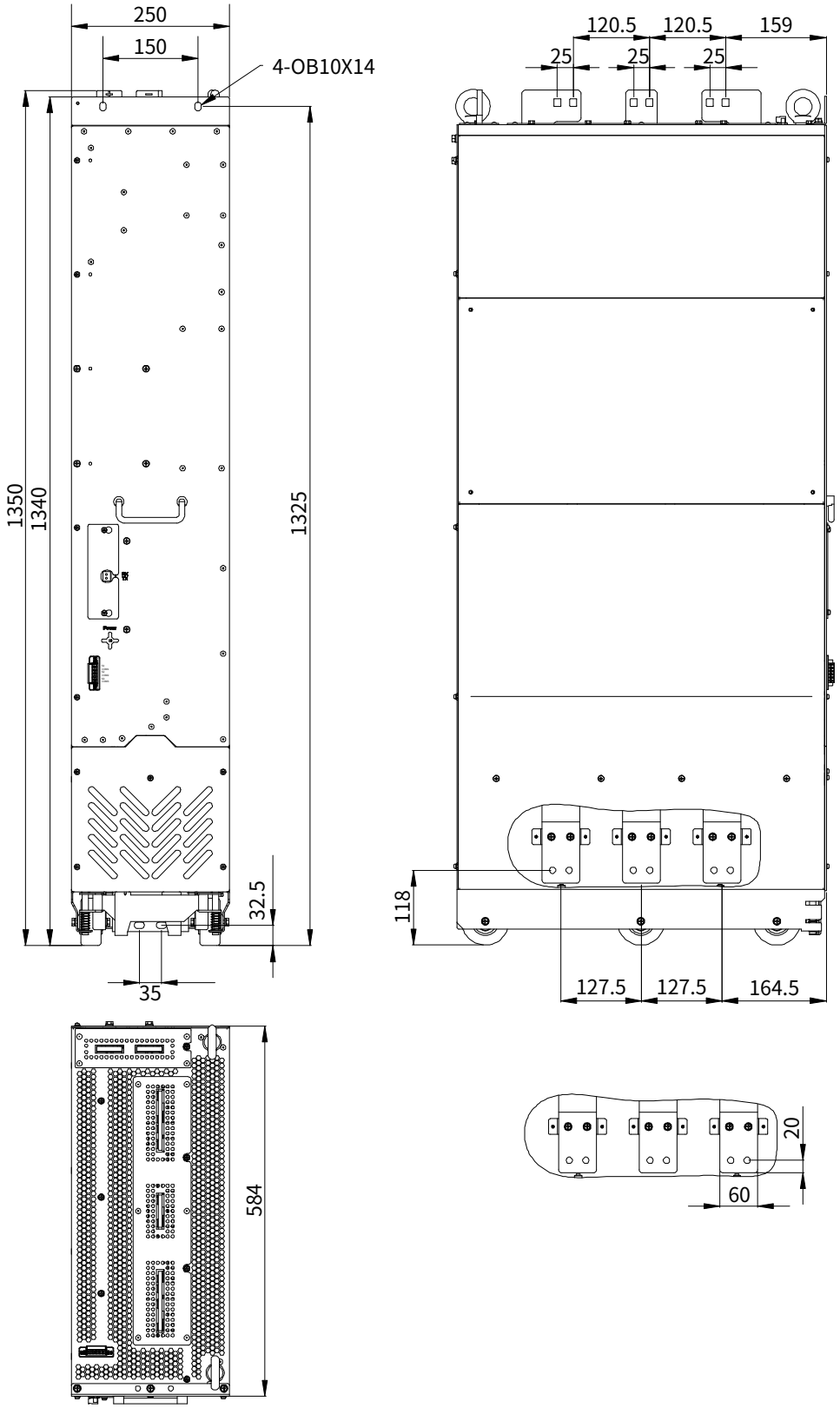
Frame	Outline dimensions (mm)			Installation dimension (mm)				Hole diameter (mm)	Fixing screw
	W1	H1	D1	H2	H3	W2	W3		
E11	330	1288	544	1150	122	225	180	Ø13	M10
E12	330	1398	544	1280	101	240	200	Ø13	M10

Figure B-6 Installation dimensions of frame E11–E12(with an output reactor)



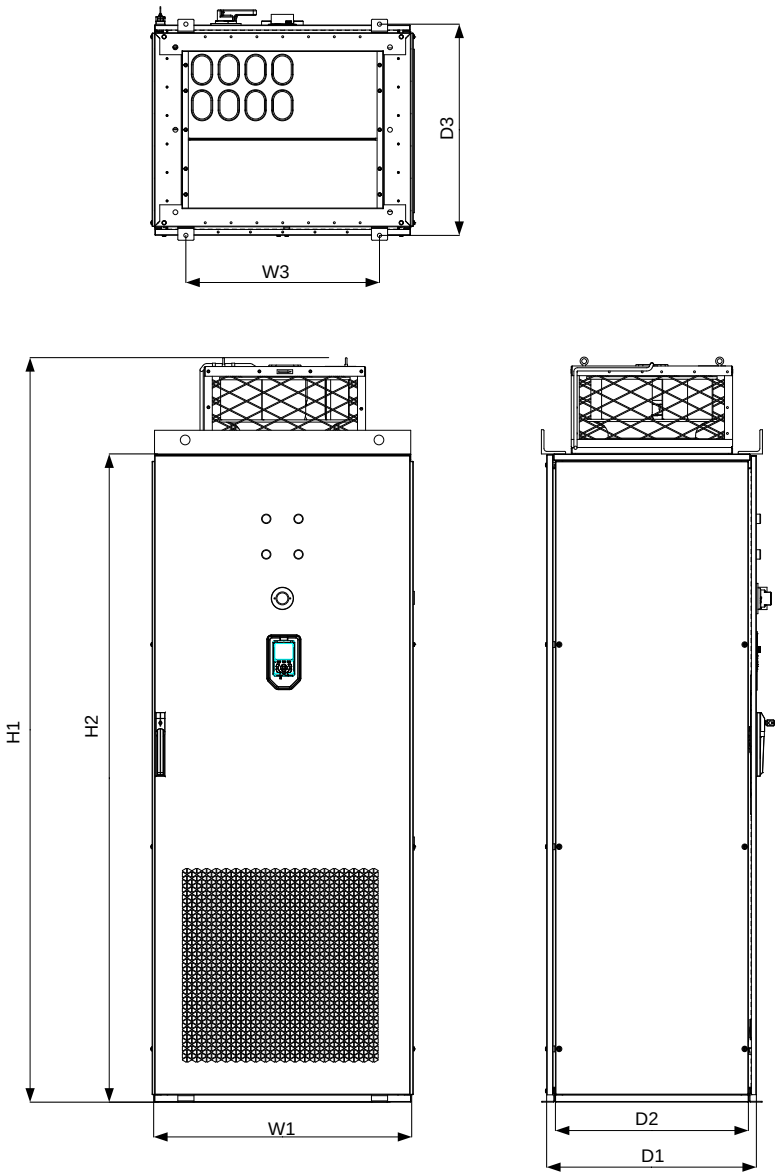
Frame	Outline dimensions (mm)			Installation dimension (mm)				Hole diameter (mm)	Fixing screw
	W1	H1	D1	H2	H3	W2	W3		
E11	330	1288	544	1150	122	225	180	Ø13	M10
E12	330	1398	544	1280	101	240	200	Ø13	M10

Figure B-7 Installation dimensions of frame 11A8



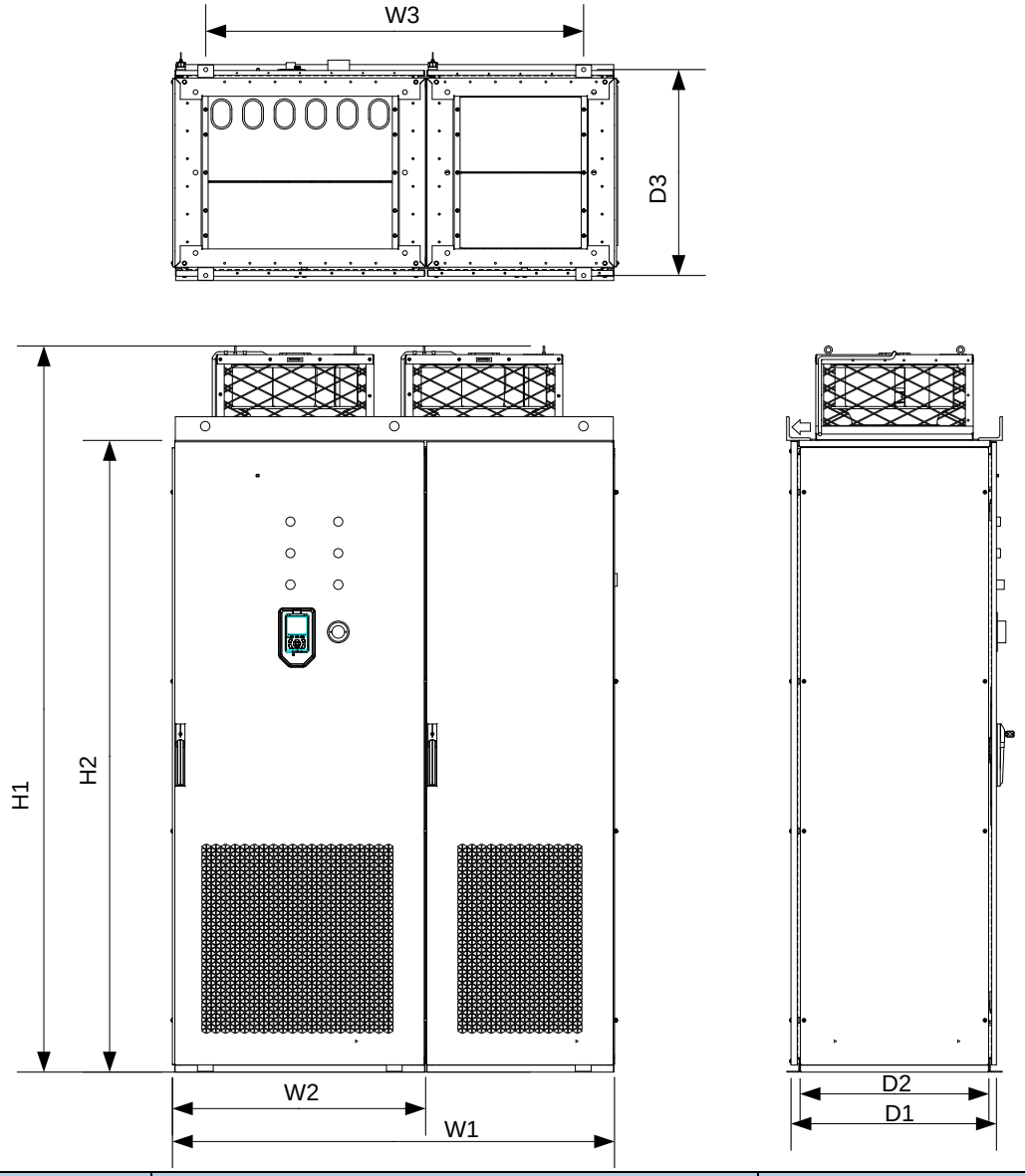
B.2 Single-drive cabinet

Figure B-8 Outline dimensions of 16S4 cabinet



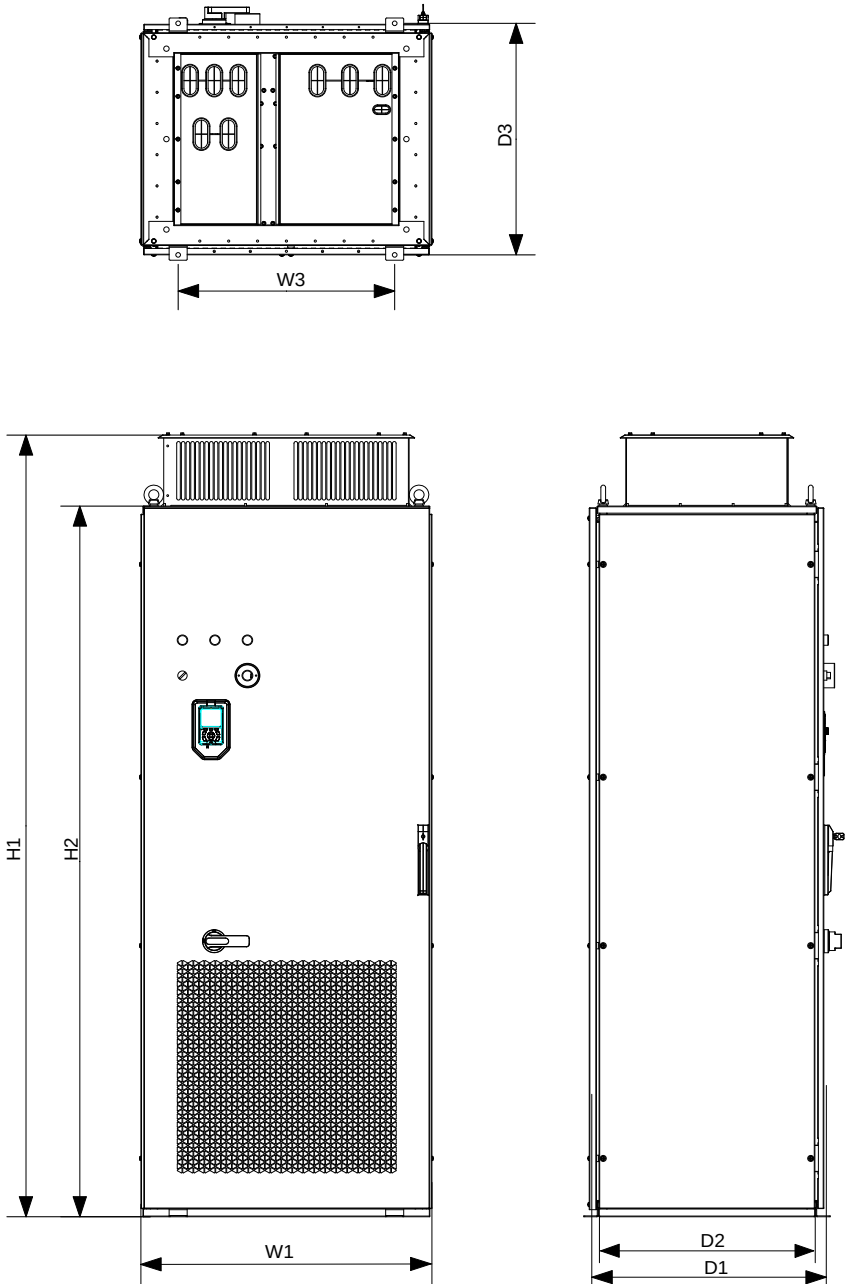
VFD model	Outline dimensions (mm)					Installation dimension (mm)	
	W1	H1	D1	H2	D2	W3	D3
16S4	800	2300	650	2000	600	600	653

Figure B-9 Outline dimensions of 16S5 cabinet



VFD model	Outline dimensions (mm)						Installation dimension (mm)	
	W1	H1	D1	W2	H2	D2	W3	D3
16S5	1400	2300	650	800	2000	600	1200	653

Figure B-10 Outline dimensions of 16S8–16S10 cabinet

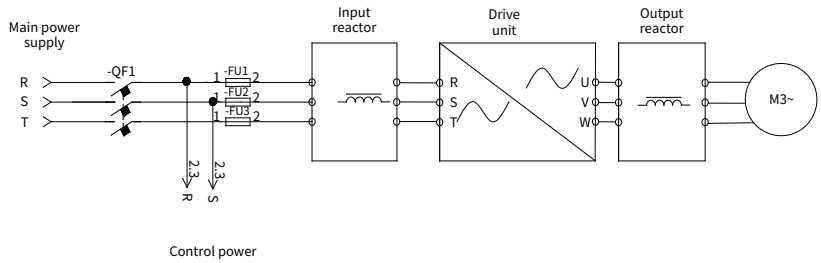


VFD model	Outline dimensions (mm)					Installation dimension (mm)	
	W1	H1	D1	H2	D2	W3	D3
16S6–16S7	600	2140	650	2000	600	400	653
16S8–16S10	800	2140	650	2000	600	600	653

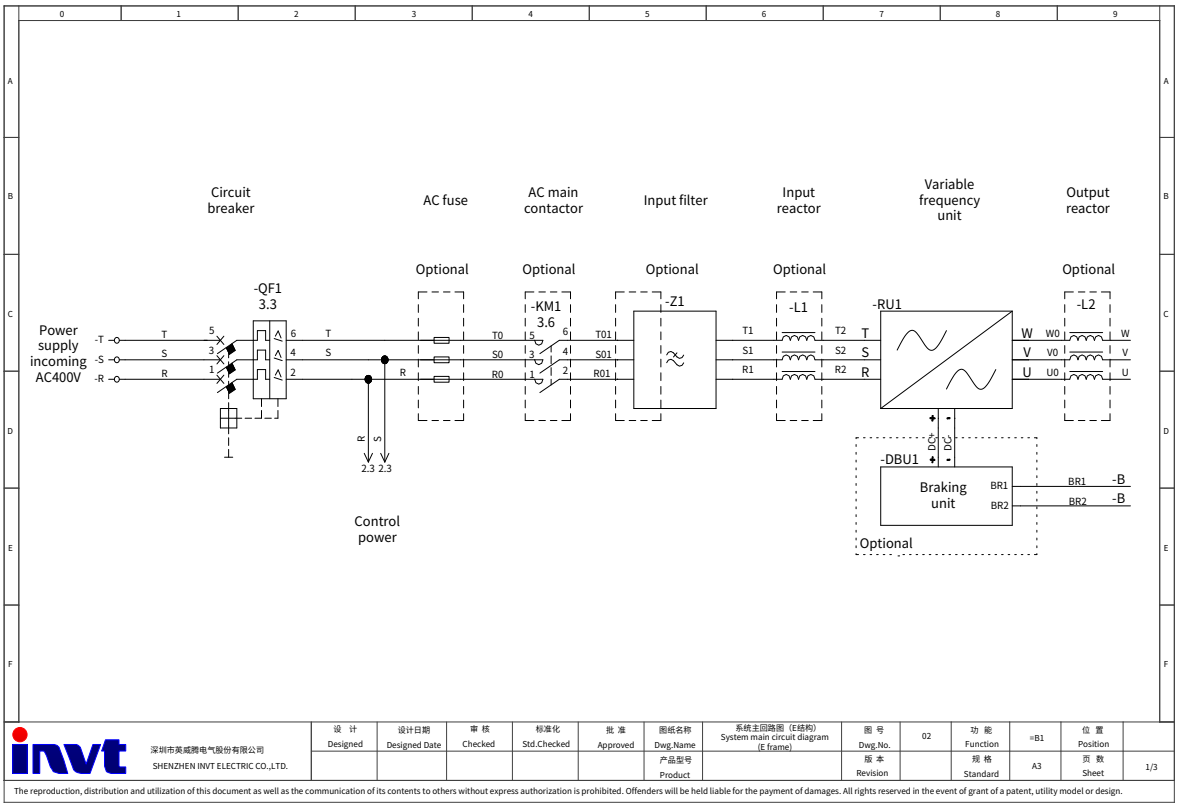
Appendix C Example electrical diagram

GD880 single-drive
basic electrical drawing

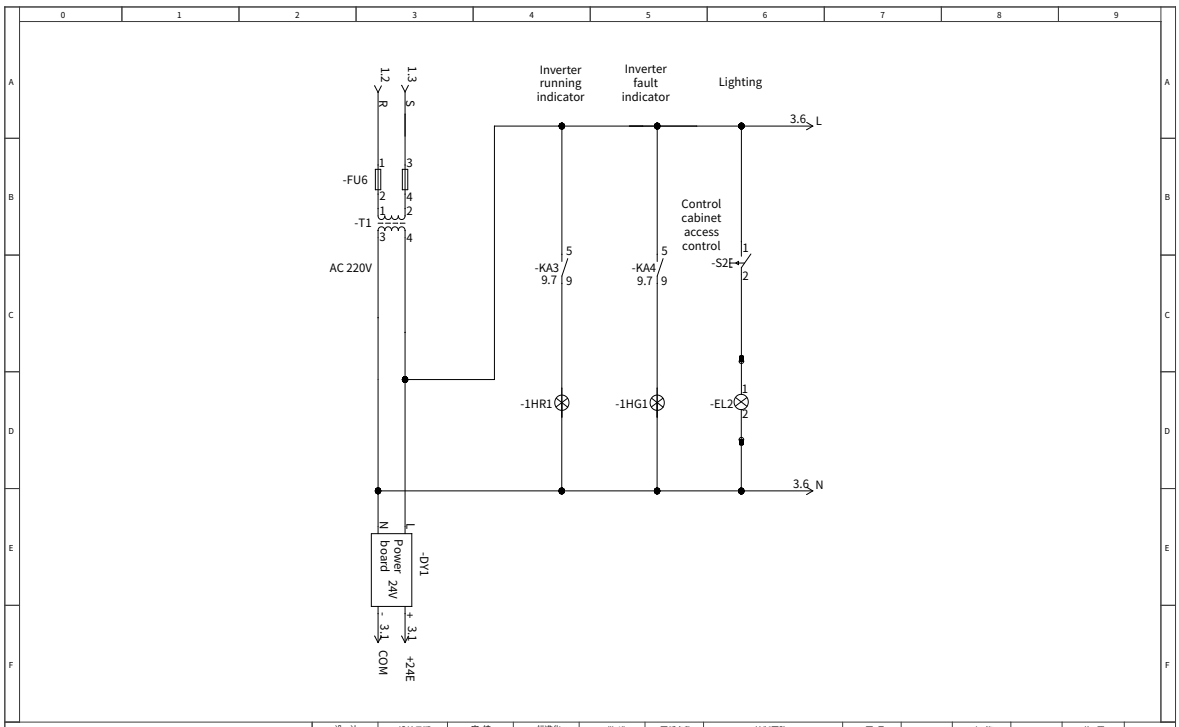
深圳市英威腾电气股份有限公司 SHENZHEN INVT ELECTRIC CO.,LTD.	设 计 Designed	设计日期 Designed Date	审 核 Checked	标准化 Std.Checked	批 准 Approved	图纸名称 Dwg.Name	封面 Cover	图 号 Dwg.No.		功 能 Function	=B0	位 置 Position	
						产品型号 Product		版 本 Revision		规 格 Standard	A3	页 数 Sheet	1/1



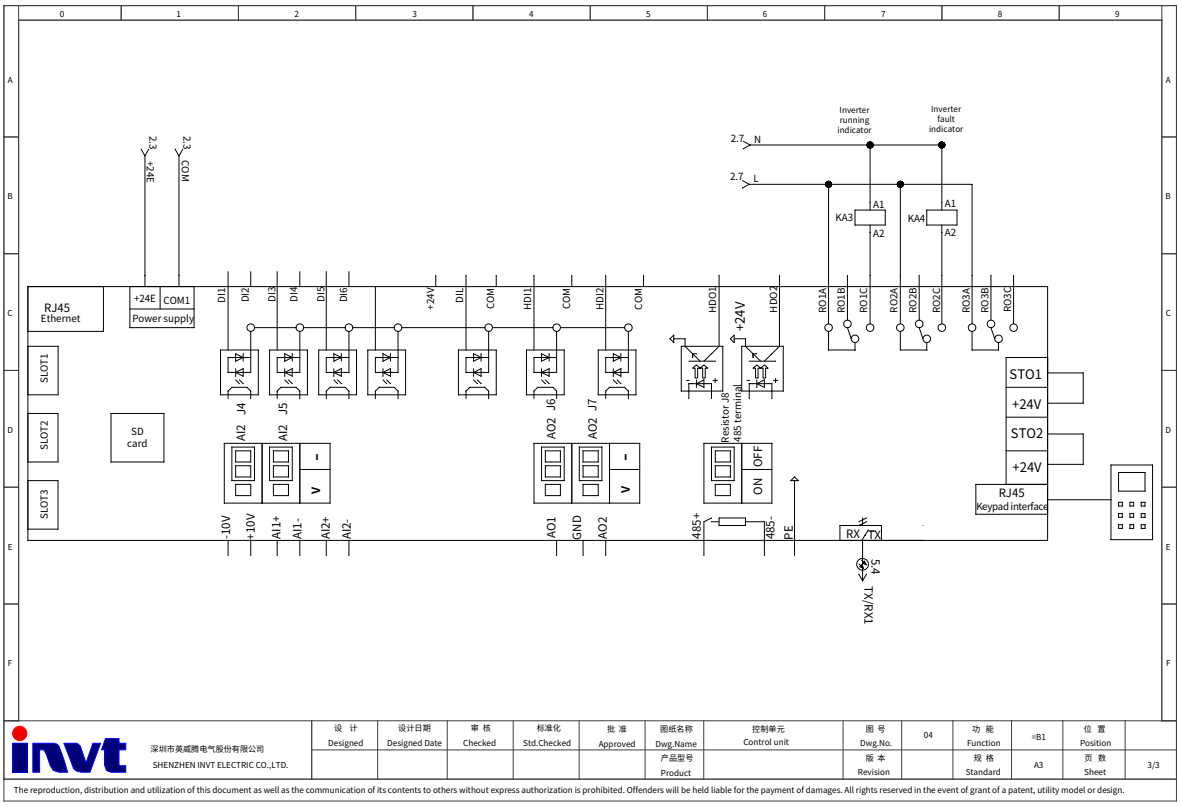
深圳市英威腾电气股份有限公司 SHENZHEN INVT ELECTRIC CO.,LTD.	设 计 Designed	设计日期 Designed Date	审 核 Checked	标准化 Std.Checked	批 准 Approved	图纸名称 Dwg.Name	系统主回路图（11A8） System main circuit diagram (11A8)	图 号 Dwg.No.	02	功 能 Function	=B1	位 置 Position	
						产品型号 Product		版 本 Revision		规 格 Standard	A3	页 数 Sheet	1/3



深圳市英威腾电气股份有限公司 SHENZHEN INVT ELECTRIC CO.,LTD.	设 计 Designed	设计日期 Designed Date	审 核 Checked	标准化 Std.Checked	批 准 Approved	图纸名称 Dwg.Name	系统主回路图（E结构） System main circuit diagram (E frame)	图 号 Dwg.No.	02	功 能 Function	=B1	位 置 Position	
						产品型号 Product		版 本 Revision		规 格 Standard	A3	页 数 Sheet	1/3



深圳市英威腾电气股份有限公司 SHENZHEN INVT ELECTRIC CO.,LTD.	设 计 Designed	设计日期 Designed Date	审 核 Checked	标准化 Std.Checked	批 准 Approved	图纸名称 Dwg.Name	控制回路 Control circuit	图 号 Dwg.No.	03	功 能 Function	=B1	位 置 Position	
						产品型号 Product		版 本 Revision		规 格 Standard	A3	页 数 Sheet	2/3



深圳市英威腾电气股份有限公司 SHENZHEN INVT ELECTRIC CO.,LTD.	设 计 Designed	设计日期 Designed Date	审 核 Checked	标准化 Std.Checked	批 准 Approved	图纸名称 Dwg.Name	控制单元 Control unit	图 号 Dwg.No.	04	功 能 Function	=B1	位 置 Position	
						产品型号 Product		版 本 Revision		规 格 Standard	A3	页 数 Sheet	3/3

Appendix D Ordering information

Product model	Structure	Ordering code	Qty	Remarks
GD880-11-0013-4-B	E3	GD880-11-0013-4-B	1	Drive unit
GD880-11-0017-4-B		GD880-11-0017-4-B	1	Drive unit
GD880-11-0023-4-B	E4	GD880-11-0023-4-B	1	Drive unit
GD880-11-0033-4-B		GD880-11-0033-4-B	1	Drive unit
GD880-11-0038-4-B	E5	GD880-11-0038-4-B	1	Drive unit
GD880-11-0048-4-B		GD880-11-0048-4-B	1	Drive unit
GD880-11-0060-4-B	E6	GD880-11-0060-4-B	1	Drive unit
GD880-11-0078-4-B		GD880-11-0078-4-B	1	Drive unit
GD880-11-0094-4-B		GD880-11-0094-4-B	1	Drive unit
GD880-11-0116-4	E7	GD880-11-0116-4	1	Drive unit
GD880-11-0149-4		GD880-11-0149-4	1	Drive unit
GD880-11-0170-4		GD880-11-0170-4	1	Drive unit
GD880-11-0215-4	E8	GD880-11-0215-4	1	Drive unit
GD880-11-0260-4		GD880-11-0260-4	1	Drive unit
GD880-11-0305-4	E9	GD880-11-0305-4	1	Drive unit
GD880-11-0340-4		GD880-11-0340-4	1	Drive unit
GD880-11-0380-4	E11	GD880-11-0380-4	1	Drive unit
GD880-11-0425-4		GD880-11-0425-4	1	Drive unit
GD880-11-0480-4		GD880-11-0480-4	1	Drive unit
GD880-11-0530-4		GD880-11-0530-4	1	Drive unit
GD880-11-0600-4		GD880-11-0600-4	1	Drive unit
GD880-11-0650-4		GD880-11-0650-4	1	Drive unit
GD880-11-0720-4	E12	GD880-11-0720-4	1	Drive unit
GD880-11-0820-4		GD880-11-0820-4	1	Drive unit
GD880-11-0860-4		GD880-11-0860-4	1	Drive unit
GD880-11-0639-4	11A8	GD880-11-0639-4	1	Drive unit
GD880-11-0757-4		GD880-11-0757-4	1	Drive unit
GD880-11-0900-4		GD880-11-0900-4	1	Drive unit
GD880-11-0975-4		GD880-11-0975-4	1	Drive unit
GD880-11-1213-4	2*11A8	GD880-11-0639-4	2	Drive unit
GD880-11-1439-4		GD880-11-0757-4	2	Drive unit
GD880-11-1710-4		GD880-11-0900-4	2	Drive unit
GD880-11-1852-4		GD880-11-0975-4	2	Drive unit
GD880-11-0410-6	11A8	GD880-11-0410-6	1	Drive unit
GD880-11-0530-6		GD880-11-0530-6	1	Drive unit
GD880-11-0600-6		GD880-11-0600-6	1	Drive unit
GD880-11-0650-6		GD880-11-0650-6	1	Drive unit
GD880-11-0720-6		GD880-11-0720-6	1	Drive unit
GD880-11-0779-6	2*11A8	GD880-11-0410-6	2	Drive unit
GD880-11-1007-6		GD880-11-0530-6	2	Drive unit
GD880-11-1140-6		GD880-11-0600-6	2	Drive unit
GD880-11-1235-6		GD880-11-0650-6	2	Drive unit
GD880-11-1368-6		GD880-11-0720-6	2	Drive unit

Product model	Structure	Ordering code	Qty	Remarks
GD880-ICU-11-Z	Applicable to frame E2–E12 and 11A8	GD880-ICU-11	1	Control unit
		HFBR-3M	1	Fiber optic
		SOP-880-01	1	Keypad and mounting bracket
		L=2M (CHV-SE)	1	Network cable
GD880-ICU-13-Z	Applicable to 2*11A8	GD880-ICU-13	1	Control unit
		HFBR-3M	2	Fiber optic
		SOP-880-01	1	Keypad and mounting bracket
		L=2M (CHV-SE)	1	Network cable

Note: A single-drive product consists of a drive unit and control components, so the product selection should include two parts.

Your Trusted Industry Automation Solution Provider

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