



MD880 Series High-performance AC Drive (Single-Drive System) Hardware Guide



Industrial
Automation



Intelligent
Elevator



New Energy
Vehicle



Industrial
Robot



Rail
Transit



Data code 19011400A02

Preface

Thank you for purchasing the MD880 series high-performance AC drive (single-drive system) developed by Inovance.

The MD880 general-purpose high-performance current vector AC drive is used to control and adjust the speed and torque of three-phase AC synchronous and asynchronous motors. The MD880 series AC drive adopts high-performance vector control technology and features high torque output at a low speed, excellent dynamic characteristics, and superior overload capability. It provides user-programmable functions, monitoring software, and communication bus functions. It also supports multiple encoder types to allow flexible function combination.

The MD880 series AC drive can be used to drive automated production equipment in industries including textile, paper-making, wire drawing, machine tool, packaging, food, wind turbine, and water pump.

Precautions	
◆	Drawings in the user guide are sometimes shown without covers or protective guards. Remember to install the covers or protective guards as specified first, and then perform operations in accordance with the instructions.
◆	Drawings in the user guide are for reference only and may vary with the product you purchased.
◆	The instructions are subject to change, without notice, due to product upgrade, specification modification as well as efforts to increase the accuracy and convenience of the user guide.

§ Revision History

Date	Version	Description
October 2020	A00	First release
March 2021	A01	◆ Made minor corrections
May 2024	A02	◆ Added Chapter "Certification and Standards Compliance". ◆ Updated Chapter "Instructions for Selecting AC Input Reactor". ◆ Updated Chapter "Instructions for Selecting AC Output Reactor" ◆ Updated address information on the back cover.

§ Access to the Guide

This guide is not delivered with the product. You can obtain the PDF version by the following methods:

- Access Inovance's website (<http://www.inovance.com>), choose "Support" > "Download", search for the user guide by its name, and then download the PDF file.
- Scan the QR code on the product with your mobile phone.
- Scan the QR code below to install the app, where you can search for and download manuals.



§ Warranty

Inovance provides warranty service within the warranty period (as specified in your order) for any fault or damage that is not caused by improper operation of the user. Maintenance will be charged after the warranty period expires.

Within the warranty period, maintenance will be charged for the following damage:

- Damage caused by operations not following the instructions in the user guide
- Damage caused by fire, flood, or abnormal voltage
- Damage caused by unintended use of the product
- Damage caused by use beyond the specified scope of application of the product
- Damage or secondary damage caused by force majeure (natural disaster, earthquake, and lightning strike)

The maintenance is charged according to the latest Price List of Inovance. If otherwise agreed upon, the terms and conditions in the agreement shall prevail.

For details, see Product Warranty Card.

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Fundamental Safety Instructions

Safety Precautions

- 1) Before installing, using, and maintaining this equipment, read the safety information and precautions thoroughly, and comply with them during operations.
- 2) To ensure personal and equipment safety, observe the notes indicated on the product labels and all the safety instructions in the user guide.
- 3) "CAUTION", "WARNING", and "DANGER" in the user guide only indicate some of the precautions that need to be followed; they just supplement the safety precautions.
- 4) Use this equipment according to the designated environment requirements. Damage caused by improper usage is not covered by warranty.
- 5) Inovance shall take no responsibility for any personal injury or property damage caused by improper usage.

Safety Levels and Definitions

 **DANGER** Indicates that failure to comply with the notice can result in severe personal injuries or even death.

 **WARNING** Indicates that failure to comply with the notice may result in severe personal injuries or even death.

 **CAUTION** Indicates that failure to comply with the notice may result in minor personal injury or damage to the equipment.

Safety Instructions

Unpacking	
 CAUTION	◆ Check whether the package is intact and whether there is damage, water seepage, dampness, and deformation before unpacking. ◆ Unpack the package by following the unpacking sequence. Do not strike the package violently. ◆ Check whether there are signs of damage, rust, or bumping on the surface of the equipment or accessories. ◆ Check whether the package contents are consistent with the packing list.

**WARNING**

- ◆ Do not install the equipment if you find damage, rust, or signs of use on the equipment or accessories.
- ◆ Do not install the equipment if you find water seepage, component missing or damage upon unpacking.
- ◆ Do not install the equipment if you find the packing list does not conform to the equipment you received.

Storage and Transportation**CAUTION**

- ◆ Store and transport this equipment based on the storage and transportation requirements for humidity and temperature.
- ◆ Do not store and transport the drive in environments with water splash, rain, direct sunlight, strong electric field, strong magnetic field, and strong vibration.
- ◆ Do not store this equipment for more than three months. Long-term storage requires strict protection and necessary inspections.
- ◆ Pack the equipment strictly before transportation. Use a sealed box for long-distance transportation.
- ◆ Transport the equipment with a flatcar and ensure the baseplate that holds the product is flat. In case of rainy or snowy days, take protective measures to prevent the equipment from being wetted.
- ◆ Never transport this equipment with other equipment or materials that may damage this equipment.

**WARNING**

- ◆ Use professional loading and unloading equipment to carry large-scale or heavy equipment.
- ◆ When carrying this equipment with bare hands, hold the equipment casing firmly with care to prevent parts from falling. Failure to comply may result in personal injury.
- ◆ Handle the equipment with care during transportation and mind your step to prevent personal injury or equipment damage.
- ◆ Never stand or stay below the equipment when the equipment is lifted by a hoisting tool. Ensure the crane, hoist rope, and hook carry sufficient tonnage when lifting the equipment with a crane.

Installation



WARNING

- ◆ Read through the safety instructions and user guide before installation.
- ◆ Do not retrofit this equipment.
- ◆ Do not fiddle with the bolts used to fix equipment components or the bolts marked in red.
- ◆ Do not install this equipment in places with strong electric or magnetic fields.
- ◆ When the equipment is installed in a cabinet or final assembly, a fireproof enclosure providing both electrical and mechanical protections must be provided. The IP rating must meet IEC standards and local laws and regulations.



DANGER

- ◆ Equipment installation, wiring, maintenance, inspection, or parts replacement must be performed only by professionals.
- ◆ Installation, wiring, maintenance, inspection, or parts replacement must be performed only by experienced personnel who have attended the necessary electrical training courses.
- ◆ Installation personnel must be familiar with equipment installation requirements and relevant technical materials.
- ◆ Before installing equipment with strong electromagnetic interference, such as a transformer, install an electromagnetic shielding device for this equipment to prevent malfunctions.

Wiring



DANGER

- ◆ Equipment installation, wiring, maintenance, inspection, or parts replacement must be performed only by professionals.
- ◆ Never perform wiring with power on. Failure to comply can result in electric shock.
- ◆ Before wiring, cut off all the power supplies of the equipment. After disconnecting the power supply, wait for at least 15 minutes before further operations because residual voltage still exists in the internal capacitor even after power-off.



DANGER

- ◆ Perform wiring only after the equipment is installed in place.
- ◆ Make sure that the equipment is well grounded. Failure to comply will result in an electric shock.
- ◆ During wiring, follow the proper electrostatic discharge (ESD) procedures, and wear an anti-static wrist strap. Failure to comply will result in damage to internal equipment circuits.

**WARNING**

- ◆ Never connect the power cable to output terminals of the equipment. Failure to comply may cause equipment damage or even a fire.
- ◆ When connecting a drive with the motor, make sure that the phase sequences of the drive and motor terminals are consistent to prevent reverse motor rotation.
- ◆ Cables used for wiring must meet cross sectional area and shielding requirements. The shield of the cable must be reliably grounded at one end.
- ◆ After wiring, make sure there are no fallen screws or exposed wire inside the equipment.

Power-on**DANGER**

- ◆ Before power-on, make sure that the equipment is installed properly with reliable wiring and the motor can be restarted.
- ◆ Before power-on, ensure that the power supply meets equipment requirements. Failure to comply will result in equipment damage or even a fire.
- ◆ During power-on, unexpected operations may be triggered on the equipment. Therefore, stay away from the equipment.
- ◆ After power-on, do not open the cabinet door and protective cover of the equipment. Failure to comply will result in an electric shock.
- ◆ For applications with frequent power-on and power-off, the pre-charge resistor maybe overheated. Note that the interval time between two power-on operations is not shorter than 3 minutes.
- ◆ Do not touch any wiring terminals during power-on. Failure to comply will result in an electric shock.
- ◆ After power-on, do not remove any part of the equipment. Failure to comply will result in an electric shock.

Operation**DANGER**

- ◆ Do not touch any wiring terminals during operation. Failure to comply will result in an electric shock.
- ◆ Do not remove any part of the equipment during operation. Failure to comply will result in an electric shock.
- ◆ Do not touch the equipment enclosure, fan, or resistor with bare hands to sense the temperature. Failure to comply may result in personal injury.
- ◆ Signal detection during operation must be performed only by professionals. Failure to comply may result in personal injury or damage to the equipment.



WARNING

- ◆ Prevent metal or other objects from falling into the device during operation. Failure to comply may result in equipment damage.
- ◆ Do not start or stop the equipment by using the contactor. Failure to comply may result in equipment damage.

Maintenance



DANGER

- ◆ Equipment installation, wiring, maintenance, inspection, or parts replacement must be performed only by professionals.
- ◆ Do not maintain the equipment with power ON. Failure to comply can result in an electric shock.
- ◆ Before maintenance, switch off all the power supplies of the equipment and wait for at least 15 min.



WARNING

- ◆ Perform daily and periodic inspection and maintenance for the equipment according to maintenance requirements and keep a maintenance record.

Repair



DANGER

- ◆ Equipment installation, wiring, maintenance, inspection, or parts replacement must be performed only by professionals.
- ◆ Do not repair the equipment with power ON. Failure to comply can result in an electric shock.
- ◆ Before inspection and repair, disconnect all the power supplies of the equipment and wait for at least 15 min.



WARNING

- ◆ Require for repair services according to the product warranty agreement.
- ◆ When the equipment is faulty or damaged, require professionals to perform troubleshooting and repair by following repair instructions and keep a repair record.
- ◆ Replace quick-wear parts of the equipment according to the replacement guide.
- ◆ Do not operate damaged equipment. Failure to comply may result in worse damage.
- ◆ After the equipment is replaced, check the wiring and set parameters again.

Disposal



WARNING

- ◆ Retire the equipment by following local regulations or standards. Failure to comply may result in property damage, personal injuries, or even death.
- ◆ Dispose of and recycle the retired equipment by following industry waste disposal standards to avoid environmental pollution.

Safety Labels

For safe equipment operation and maintenance, comply with safety signs on the equipment, and do not damage or remove the safety labels. See the following table for descriptions of the safety labels.

Safety Labels	Description
WARNING 警告  • This equipment should be serviced by qualified personnel only. • Locate and disconnect all energy sources. Wait 15 minutes then operate. • Observe the instructions described in the instruction manual. • 只有专业人士才能维护。 • 维护前确保切断所有电源，15分钟后方可操作。 • 维护前请阅读维护说明书。	Maintenance can be performed by professionals only. Disconnect all the power supplies and wait for at least 15 minutes before maintenance. Read through the user guide before maintenance.
 注意 为防止预充电电阻过热，两次合闸的时间间隔不小于三分钟	To prevent the pre-charge resistor from being overheated, keep the interval time between two consecutive switch-on operations not shorter than 3 minutes.

1 Product Information

1.1 Overview

The MD880 series AC drive (single-drive system) is a general-purpose low-voltage AC drive developed by Inovance. Featuring high power density, compact structure, and high reliability, it can be used for V/f control, sensorless vector control (SVC), and feedback vector control (FVC) of motors. It covers a power range of 5.5 kW to 450 kW, which is suitable for paper-making equipment, rolling mills, experimental stations, cranes, oil rigs, and mining machineries.

1.2 Nameplate and Model Descriptions

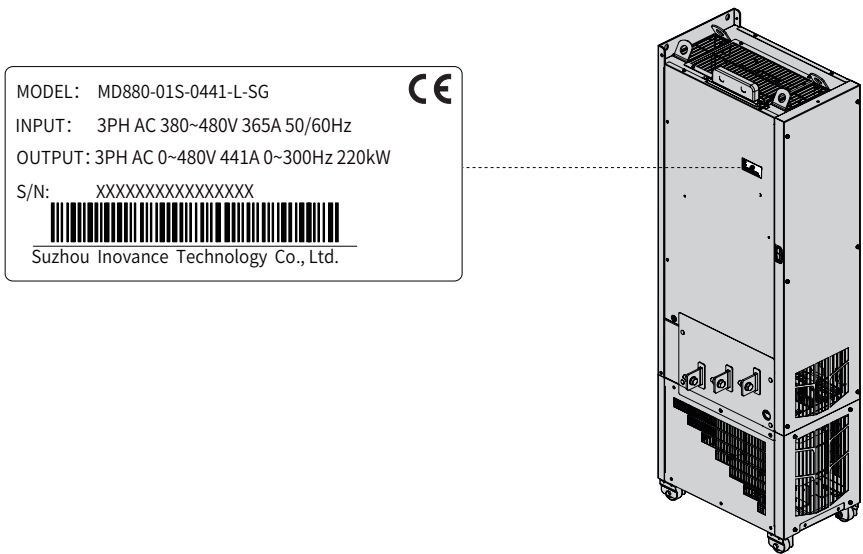


Figure 1-1 Nameplate description

Code 1		Code 2		Code 3		Code 4		Code 5		Code 6	
Product Platform		Product Type		Rated Current		Voltage Class		Standard Accessory		Standard Accessory	
MD880		01S		0441		4		B		SG	
MD880 AC drive series		AC drive (single-drive system)		441 A		Three-phase 400 VAC		Braking module included		Controller symbol	
						7		L			
						Three-phase 690 VAC		With output reactor			
								-			
								None			

Figure 1-2 Model description



NOTE

◆ T10 to T12 models have passed the CE certification.

1.3 Voltage and Power Rating

The grid voltage ranges from 380 VAC to 480 VAC. The power rating is shown in the following table.

Table 1-1 Power rating of the MD880 series AC drive

Structure	Model MD880-01S-...	Rated input current (A)	Rated output current (A)	Rated Power (kW)	Light- duty Current (A)	Light-duty Power (kW)	Heavy- duty Current (A)	Heavy- duty Power (kW)
T2	0012-4-B-SG	15.9	12.0	5.5	12.0	5.5	9.0	3.7
	0017-4-B-SG	22.4	17.0	7.5	17.0	7.5	13.0	5.5
T3	0024-4-B-SG	32.9	24.0	11.0	23.0	11.0	17.0	7.5
	0033-4-B-SG	39.7	33.0	15.0	32.0	15.0	25.0	11
T4	0038-4-B-SG	44.0	38.0	18.5	37.0	18.5	32.0	15
T5	0048-4-B-SG	49.5	48	22	45	22	37	18.5
	0060-4-B-SG	59	60	30	58	30	45	22
T6	0078-4-B-SG	57	78	37	75	37	60	30
	0094-4-B-SG	69	94	45	91	45	75	37
T7	0116-4-B-SG	89	116	55	112	55	91	45
	0149-4-B-SG	106	149	75	143	75	112	55
T8	0183-4-B-SG	139	183	90	176	90	150	75
	0217-4-SG	164	217	110	210	110	176	90
	0262-4-SG	196	262	132	253	132	210	110
T9	0314-4-SG	240	314	160	304	160	253	132
	0383-4-SG	287	383	200	370	200	304	160
T10	0441-4-L-SG	365	441	220	426	220	377	200
	0481-4-L-SG	410	481	250	465	250	426	220
T11	0538-4-L-SG	441	538	280	520	280	465	250
	0605-4-L-SG	495	605	315	584	315	520	280
T12	0673-4-L-SG	565	673	355	650	355	585	315
	0751-4-L-SG	617	751	400	725	400	650	355
	0849-4-L-SG	687	849	450	820	450	725	400

1.4 Specifications and Model Selection

Table 1-2 Selection of MD880 series AC drive

Structure	Product model MD880-01S-...	Applications without overload		Applications with low overload		Applications with high overload		Weight (kg)	Loss (kW)	Overall dimensions (W x H x D) (mm)	Cooling air volume (m³/h)
		Current (A)	Power (kW)	Current (A)	Power (kW)	Current (A)	Power (kW)				
UN: three-phase 400 V (range: 380 V to 480 V)											
T2	0012-4-B-SG	12.0	5.5	12.0	5.5	9.0	3.7	8.5	0.12	140x450x338	48
	0017-4-B-SG	17.0	7.5	17.0	7.5	13.0	5.5		0.195		48
T3	0024-4-B-SG	24.0	11.0	23.0	11.0	17.0	7.5	11	0.262	150x470x348	48
	0033-4-B-SG	33.0	15.0	32.0	15.0	25.0	11		0.445		48
T4	0038-4-B-SG	38.0	18.5	37.0	18.5	32.0	15	12.2	0.553	190x470x348	48
T5	0048-4-B-SG	48	22	45	22	37	18.5	17.6	0.478	230x500x357	140
	0060-4-B-SG	60	30	58	30	45	22		0.551		140
T6	0078-4-B-SG	78	37	75	37	60	30	27.6	0.694	265x510x387	253
	0094-4-B-SG	94	45	91	45	75	37		0.815		253
T7	0116-4-B-SG	116	55	112	55	91	45	37.5	1.01	300x542x425	253
	0149-4-B-SG	149	75	143	75	112	55		1.21		253
T8	0183-4-B-SG	183	90	176	90	150	75	54	1.57	338x580x465	253
	0217-4-SG	217	110	210	110	176	90		1.81		253
	0262-4-SG	262	132	253	132	210	110		2.14		317
T9	0314-4-SG	314	160	304	160	253	132	87.5	2.85	400x915x470	544
	0383-4-SG	383	200	370	200	304	160		3.56		682
T10	0441-4-SG	441	220	426	220	377	200	110	4.15	360x1134x500	544
	0481-4-SG	481	250	465	250	426	220		4.55		544
	0441-4-L-SG	441	220	426	220	377	200	160	4.15	360x1472x500	682
	0481-4-L-SG	481	250	465	250	426	220		4.55		682
T11	0538-4-SG	538	280	520	280	465	250	155	5.06	390x1284x545	544
	0605-4-SG	605	315	584	315	520	280		5.33		544
	0538-4-L-SG	538	280	520	280	465	250	215	5.06	390x1622x545	682
	0605-4-L-SG	605	315	584	315	520	280		5.33		682
T12	0673-4-SG	673	355	650	355	585	315	185	5.69	400x1403x545	544
	0751-4-SG	751	400	725	400	650	355		6.31		544
	0849-4-SG	849	450	820	450	725	400		6.91		682
	0673-4-L-SG	673	355	650	355	585	315	245	5.69	400x1735x545	682
	0751-4-L-SG	751	400	725	400	650	355		6.31		682
	0849-4-L-SG	849	450	820	450	725	400		6.91		682

1.5 Technical Data

Table 1-3 Technical data of MD880 series AC drive

Item		Technical data
Basic performance	Rated input voltage and frequency	400 V system: Three-phase 380 VAC to 480 VAC, 50/60 Hz
	Allowable voltage Voltage fluctuation range	-15% to +10%, or 323 VAC to 528 VAC
	Output voltage	400 V system: 0 VAC to 480 VAC
	Output frequency	0 Hz to 300 Hz
	Overload capacity	Low overload: 110%, 1 minute of continuous overload allowed per every 5 minutes High overload: 150%, 1 minute of continuous overload allowed per every 5 minutes
	Operating efficiency	> 98%
Control features	Motor types supported	Asynchronous motor Permanent magnet synchronous motor
	Motor control mode	Voltage/frequency (V/f) control Sensorless vector control (SVC) Feedback vector control (FVC)
	Carrier frequency	400 V system: 5.5 kW to 55 kW: 3.2 kHz by default; 75 kW: 2.5 kHz by default; 90 kW to 450 kW: 2 kHz by default
	Speed regulation range	V/f control: 1:50
		SVC control: 1:200
		FVC control: 1:1000
	Speed control accuracy	SVC control: $\pm 10\%$ FSL
		FVC control: $\pm 0.01\%$
	Torque response	SVC control: ≤ 5 ms
		FVC control: ≤ 5 ms
Control features	Starting torque	SVC control: 0.5 Hz/150%
		FVC control: 0 Hz/200%
Mechanical data	Anti-vibration performance	Compliant with GB/T2423.10-2008 Frequency: 5–9 Hz; Displacement: 7 mm Frequency: 9–200 Hz; Acceleration rate: 5.9 m/s^2 Scanning speed: 1 oct/min
	Safety performance	Compliant with EN 61800-5-1
	Cooling mode	Forced air cooling (AF), compliant with EN 60146

Item		Technical data
Protective functions	Phase loss protection	Input/output phase loss protection
	Overvoltage protection	Stops the drive upon overvoltage (with the main circuit DC voltage above 800 V).
	Undervoltage protection	Stops the drive upon undervoltage (with the main circuit DC voltage below 350 V).
	Overtemperature protection	Protection is triggered when the inverter bridge gets overheated.
	Overload protection	The drive stops 60s after operating at 150% of the rated current. The drive stops 60s after operating at 110% of the rated current.
	Overcurrent protection	When the current exceeds 2.5 x rated current, the AC drive stops.
	Braking protection	Braking resistor short-circuit protection (unavailable for models of 18.5 kW and below)
	Short circuit protection	Provides protections against output phase short circuit and output short circuit to ground.
Environment requirements	Operating location	Indoors without direct sunlight, dust, corrosive gas, combustible gas, oil mist, water vapor, drip, or salty elements
	Altitude	Derating is not required for altitudes below 1000 m. For altitudes between 1000 m and 3000 m, derate 1% for every additional 100 m. The maximum altitude is 3000 m.
	Operating temperature	-10°C to +40°C For temperatures above 40°C , derate 1.5% for every additional 1°C . The maximum ambient temperature is 50°C .
	Storage temperature	-20°C to +60°C
	Humidity	Less than 95% RH (without condensation)
	Vibration	Below 5.9m/s ² (0.6 g)
	Pollution degree	PD2
	Power grid system	TT/TN IT (VDR and EMC screws removed)
	Overvoltage category	OVCIII
	IP rating	T2 to T9 AC drives: IP20 T10 to T12 AC drives: IP00

1.6 Derating

1) Ambient temperature-based derating

When the temperature is within 40°C to 50°C , the rated output current must be derated by 1.5% for every additional 1° C. The output current can be calculated by multiplying the current value given in the rating table by the derating factor (k):

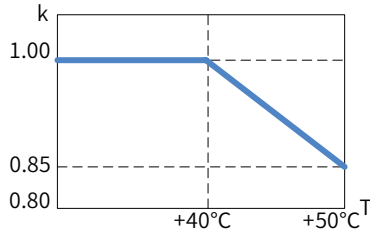


Figure 1-3 Ambient temperature-based derating

2) Altitude-based derating

When the altitude is 1000 m to 3000 m, derate the AC drive output current by 1% for every additional 100 m.

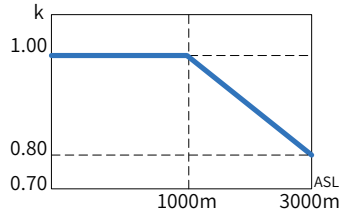


Figure 1-4 Altitude-based derating

3) Carrier frequency-based derating

Table 1-4 Carrier frequency-based derating

Model MD880-01S-...	Rated power P (kW)	Carrier frequency (kHz)									
		1.2	1.5	2	2.5	3.2	4	5	6	7	8
0012-4-B-SG	5.5	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	89.56%	80.86%	73.49%	67.24%
0017-4-B-SG	7.5	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	89.33%	80.42%	72.97%	66.50%
0024-4-B-SG	11	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	91.04%	83.15%	76.32%	70.36%
0033-4-B-SG	15	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	91.54%	84.01%	77.27%	71.24%
0038-4-B-SG	18.5	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	91.29%	83.42%	76.55%	70.43%
0048-4-B-SG	22	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	93.65%	87.90%	82.65%	77.90%
0060-4-B-SG	30	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	93.45%	87.60%	82.20%	77.30%
0078-4-B-SG	37	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	90.60%	82.40%	74.85%	68.30%
0094-4-B-SG	45	100.00%	100.00%	100.00%	100.00%	100.00%	94.40%	86.50%	79.40%	72.85%	67.10%
0116-4-B-SG	55	100.00%	100.00%	100.00%	100.00%	100.00%	94.00%	86.15%	79.20%	73.35%	68.10%
0149-4-B-SG	75	100.00%	100.00%	100.00%	100.00%	95.28%	88.90%	81.75%	75.50%	70.00%	65.20%
0183-4-B-SG	90	100.00%	100.00%	100.00%	93.85%	85.72%	77.50%	—	—	—	—
0217-4-SG	110	100.00%	100.00%	100.00%	93.10%	84.00%	74.90%	—	—	—	—

Model MD880-01S-...	Rated power P (kW)	Carrier frequency (kHz)									
		1.2	1.5	2	2.5	3.2	4	5	6	7	8
0262-4-SG	132	100.00%	100.00%	100.00%	93.93%	85.90%	77.70%	—	—	—	—
0314-4-SG	160	100.00%	100.00%	100.00%	94.83%	87.98%	80.80%	—	—	—	—
0383-4-SG	200	100.00%	100.00%	100.00%	94.45%	87.08%	79.70%	—	—	—	—
0441-4-L-SG	220	100.00%	100.00%	100.00%	92.50%	82.80%	73.10%	—	—	—	—
0481-4-L-SG	250	100.00%	100.00%	100.00%	93.10%	84.16%	75.10%	—	—	—	—
0538-4-L-SG	280	100.00%	100.00%	100.00%	93.40%	84.80%	76.20%	—	—	—	—
0605-4-L-SG	315	100.00%	100.00%	100.00%	93.85%	85.80%	77.80%	—	—	—	—
0673-4-L-SG	355	100.00%	100.00%	100.00%	93.78%	85.46%	77.00%	—	—	—	—
0751-4-L-SG	400	100.00%	100.00%	100.00%	94.23%	86.62%	78.70%	—	—	—	—
0849-4-L-SG	450	100.00%	100.00%	100.00%	93.55%	85.16%	76.80%	—	—	—	—

1.7. Overload Capacity

For some drive systems where overload may occur, a proper reference load current is necessary for the MD880 series AC drive. The criterion for overload is that the drive is operated with its base load current before and after the overload occurs (repeated every 300s).

1) Curve in low overload mode

The reference load current in low overload mode (I_L) is based on a 60s 110% duty cycle.

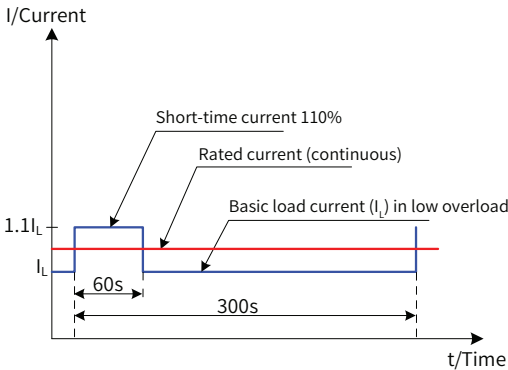


Figure 1-5 Curve in low overload mode

2) Curve in high overload mode

The reference load current in high overload mode (I_H) is based on a 60s 150% duty cycle.

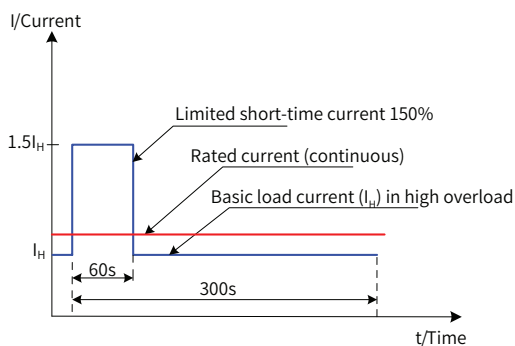


Figure 1-6 Curve in high overload mode

1.8 Dimension Drawings

1.8.1 Outline and Mounting Dimensions of T2 to T9 Drives

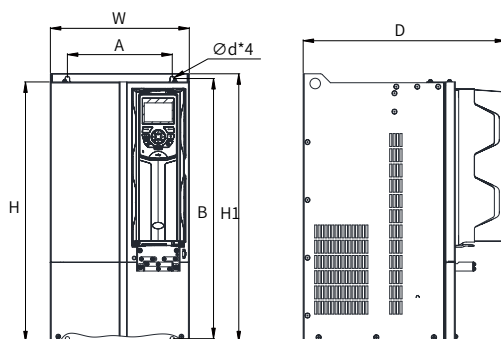


Figure 1-7 Outline and mounting dimensions of T2 to T9 drives

Table 1-5 Outline and mounting dimensions of T2 to T9 drives

Structure	Mounting Hole (mm)		Outline Dimensions (mm)				Mounting Hole Diameter (mm)	Weight (kg)
	A	B	H	H1	W	D		
T2	90	435	433	450	140	338	Ø8	8.5
T3	90	455	453	470	150	348	Ø8	11
T4	140	455	453	470	190	348	Ø8	12.2
T5	170	485	484.5	500	230	357	Ø8	17.6
T6	200	495	493	510	265	387	Ø8	27.6
T7	245	523	525	542	300	425	Ø10	37.5
T8	270	560	554	580	338	465	Ø10	54
T9	320	890	874	915	400	470	Ø10	87.5

1.8.2 Outline and Mounting Dimensions of T10 to T12 Drives (Without Reactor)

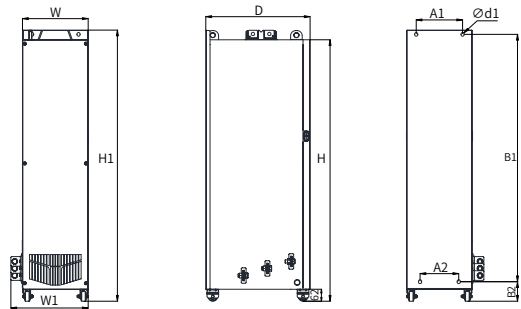


Figure 1-8 Outline and mounting dimensions of T10 to T12 drives (without reactor)

Table 1-6 Outline and mounting dimensions of T10 to T12 drives (without reactor)

Structure	Mounting Hole Dimensions (mm)				Overall Dimensions (mm)					Mounting Hole Diameter (mm)	Weight (kg)
	A1	A2	B1	B2	H	H1	W	W1	D	D1	
T10	240	150	1035	86	1086	1134	300	360	500	φ13	110
T11	225	185	1175	97	1249	1284	330	390	545	φ13	155
T12	240	200	1280	101	1353	1403	340	400	545	φ16	185

1.8.3 Outline and Mounting Dimensions of T10 to T12 Drives (With Reactor)

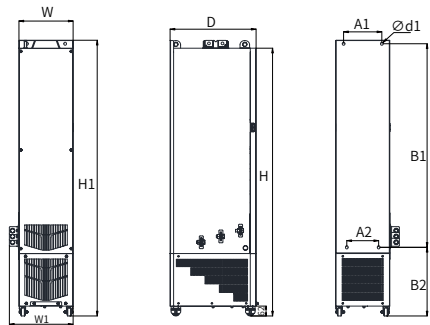


Figure 1-9 Outline and mounting dimensions of T10 to T12 drives (with reactor)

Table 1-7 Outline and mounting dimensions of T10 to T12 drives (with reactor)

Structure	Mounting Hole Dimensions (mm)				Overall Dimensions (mm)					Mounting Hole Diameter (mm)	Weight (kg)
	A1	A2	B1	B2	H	H1	W	W1	D	D1	
T10	240	150	1035	424	1424	1472	300	360	500	φ13	160
T11	225	185	1175	435	1586	1622	330	390	545	φ13	215
T12	240	200	1280	432	1683	1735	340	400	545	φ16	245

1.9 Common Tightening Torque

Table 1-8 Electrical connection

Screw/Bolt	Property class	Max. torque (N · m)
M3	4.6 to 8.8	0.5
M4	4.6 to 8.8	1.2
M5	8.8	2.5
M6	8.8	9
M8	8.8	22
M10	8.8	42
M12	8.8	70
M16	8.8	120

Table 1-9 Mechanical connection

Screw/Bolt	Property class	Max. torque (N · m)
M5	8.8	6
M6	8.8	10
M8	8.8	24

Table 1-10 Insulator connection

Screw/Bolt	Property class	Max. torque (N · m)
M6	8.8	5
M8	8.8	9
M10	8.8	18
M12	8.8	31

Table 1-11 Cable connector

Screw/Bolt	Property class	Max. torque (N · m)
M8	8.8	15
M10	8.8	32
M12	8.8	50

1.10 Power Consumption of Auxiliary Power Supply

Table 1-12 Consumption of auxiliary power supply

Structure	HCU Control Module Power Supply Input	Remarks
T2 to T9	24 VDC/2 A	The internal auxiliary power supply of the AC drive is used by default. External power supply provided by users is also allowed.
T10 to T12	24 VDC/2 A	An external auxiliary power supply is needed for the HCU.

2 Mechanical Installation

2.1 Storage and Transportation Precautions

2.1.1 Storage

The AC drive must be stored in a clean and dry room, with ambient temperature between -20°C and $+60^{\circ}\text{C}$ and temperature change rate lower than $1^{\circ}\text{C}/\text{min}$. If the drive needs to be stored for a long period of time, cover it up or take similar measures to prevent the drive from being polluted or affected by the surrounding environment.

Precautions for the storing AC drives are shown as follows:

- Put the drive in the original packing box provided by Inovance.
- Do not expose the drive to environments with moisture, high temperatures, or direct sunlight for a long time.
- The electrolytic capacitor will deteriorate after long-term storage. Therefore, the drive must be switched on once for at least 5 hours every 6 months. The input voltage must be increased slowly to the rated value by using a voltage regulator.

2.1.2 Handling

- T2 to T5 drives are small and light, which can be handled manually.
- T6 to T12 drives are heavy, requiring suitable hoisting tools and professional operators. Fix T6...T12 drives to a wooden pallet when handling with a forklift. The drive must be placed on a wooden pallet when handled with cranes.

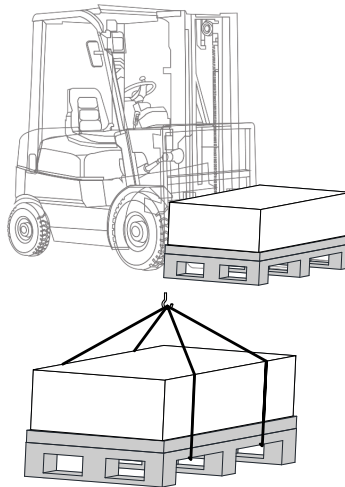


Figure 2-1 Handling before unpacking

- Place the drive on a flat surface firm enough to bear the weight of the drive.
- T9 to T12 drives are heavy and have a high center of gravity, which cannot be placed on a slope with an inclination of more than 5° .
- The drive must always be transported in the upright position indicated. Never transport it upside down or in a horizontal position.

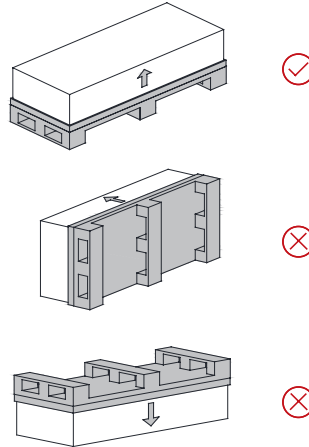


Figure 2-2 Equipment placement

2.1.3 Acceptance

After receiving the drive, inspect it carefully.

Check that you have received all the items specified on the delivery note. Notify the shipping company immediately of any missing components or damage. If necessary, contact Inovance office or the local agent for technical support.



DANGER

- ◆ If the drive is damaged during transportation, the electrical safety of the drive can no longer be guaranteed. Do not connect the drive before a professional high-voltage test is performed. Failure to comply may result in personal injury or death, or severe property loss.
-

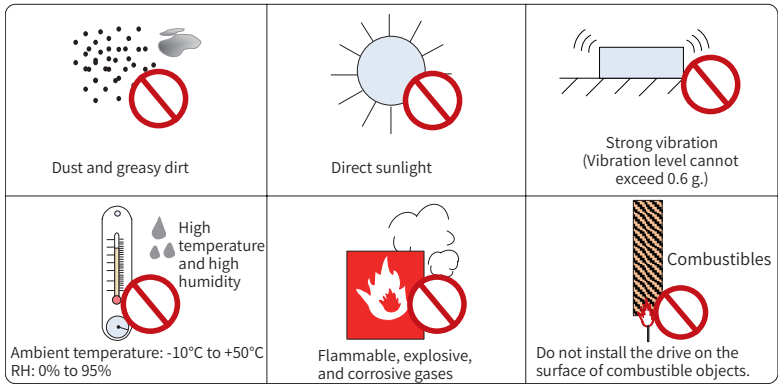
2.1.4 Unpacking

Related documents and accessories are placed in different partitions in the carton. To unpack the carton, follow these steps:

- 1) Remove all the ties and open the cover of the carton.
- 2) Remove all filler materials.
- 3) Take the AC drive out.
- 4) Cut the plastic film and wrapping tape.
- 5) Ensure there is no sign of damage.
- 6) Dispose of or recycle the packaging material according to local regulations.

2.2 Installation Environment

Item	Requirement
Heat dissipation and ventilation	Install the drive on a flame-retardant surface. Ensure that sufficient surrounding space is reserved for efficient heat dissipation. Use screws to install the drive to the mounting bracket vertically.
Installation location	Install the drive in a place that meets the following requirements: No direct sunlight Free from water drops, with $RH \leq 95\%$ No corrosive, inflammable, or explosive gases No greasy dirt or dust
Vibration	Install the drive in a place away from vibration source. The vibration level must be lower than or equal to 0.6 g. Keep the drive away from equipment such as punch presses.
Ambient temperature	The ambient temperature greatly affects the service life of the drive. The operating ambient temperature of the drive cannot exceed the allowable temperature range (-10°C to $+50^{\circ}\text{C}$).
Protective enclosure	The power supply unit must be installed in a cabinet that is used in a final system. The final system must be equipped with a fireproof enclosure providing both electrical and mechanical protection. The installation must conform to local and regional laws and regulations, and relevant IEC standards.



2.3 Installation Clearance and Direction

2.3.1 Installation Clearance

The clearance that needs to be reserved varies with the power rating of the MD880, as shown in the following figure.

1) Installing an individual drive

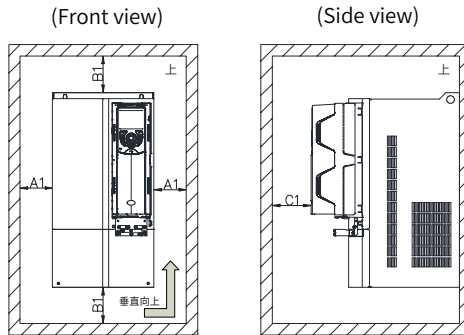


Figure 2-3 Installation clearance of an individual drive (T2 to T9)

Power rating	Required dimensions (mm)		
5.5 kW to 30 kW	$A1 \geq 10$	$B1 \geq 200$	$C1 \geq 20$
37 kW to 45 kW	$A1 \geq 50$	$B1 \geq 200$	$C1 \geq 20$
55 kW to 200 kW	$A1 \geq 50$	$B1 \geq 300$	$C1 \geq 20$

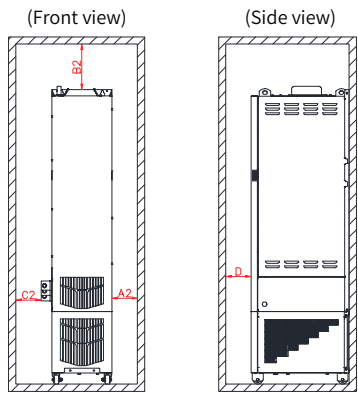


Figure 2-4 Installation clearance of a single drive (T10 to T12)

Power rating	Required dimensions (mm)			
220 kW to 450 kW	$A2 \geq 10$	$B2 \geq 250$	$C2 \geq 50$	$D \geq 30$

2) Installing multiple drives side by side

The drive dissipates heat from bottom to top. If multiple drives are installed together, install them side by side.

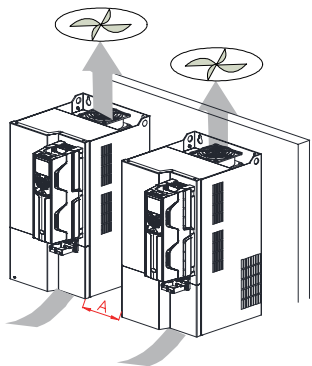


Figure 2-5 Installing multiple drives (T2 to T9) side by side

Power rating	Required clearance (mm)
5.5 kW to 30 kW	$A \geq 10$
37 kW to 45 kW	$A \geq 50$
55 kW to 160 kW	$A \geq 50$



◆ For T10 to T12 drives, only one drive can be installed in a cabinet. If multiple drives need to be installed side by side, contact Invince or the agent.

3) Installing drives one above another

If one drive needs to be installed above another, install an air guide plate to prevent the drive in the lower row from affecting those in the upper row, leading to overtemperature or overload faults.

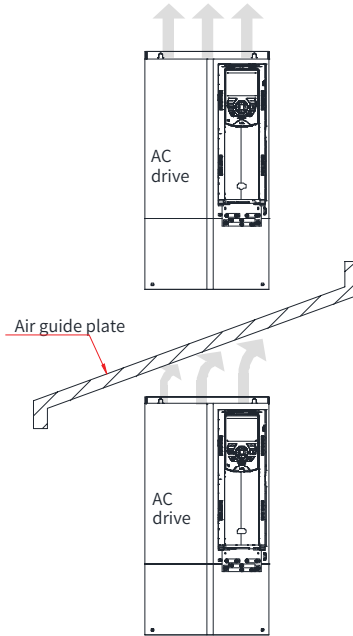


Figure 2-6 Installing drives (T2 to T9) one above another



◆ T10 to T12 drives cannot be installed one above another.

2.3.2 Installation Direction

Always mount the drive in an upright direction.

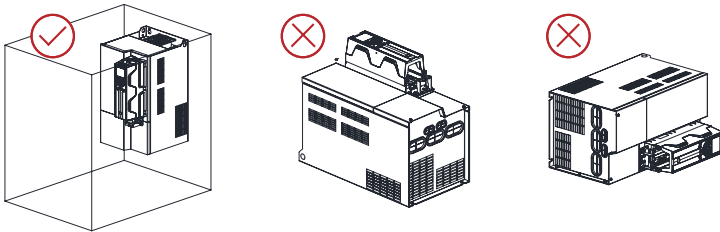


Figure 2-7 Installation direction

2.4 Backplate Mounting

Backplate mounting is available for T2 to T9 drives. See the instructions below for specific model and application scenarios.



NOTE

- ◆ The installation clearance is shown in Figure 2-3. Reserve sufficient clearance for heat dissipation of the drive and other devices in the same cabinet.
- ◆ Install the drive in an upright direction for efficient heat dissipation. If multiple drives are installed in the cabinet, install them side by side. If drives are installed one above another, install an air guide plate, as shown in Figure 2-6.
- ◆ The mounting bracket (if needed) must be made of incombustible materials.
- ◆ If the application site is exposed to metal powders, install the drive in an enclosed cabinet as large as possible to isolate the AC drive from metal powders. In this case, install the heatsink to the outside of the cabinet.

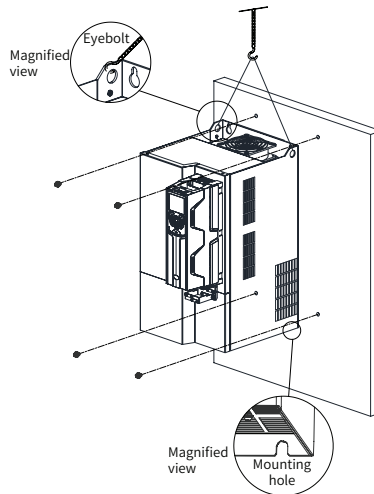


Figure 2-8 Backplate mounting of T2 to T9 drives



NOTE

- ◆ Fasten all the screws to fix the drive, instead of the two upper screws only. Failure to comply may cause the drive to fall off due to uneven stress distribution after long-term operation.

2.5 Floor Mounting

2.5.1 Heat Dissipation Requirements

For T10 to T12 drives, only one drive can be installed in a cabinet. Reserve enough clearances in the cabinet for heat dissipation. Follow the following instructions for specific model and application scenarios.

1) Self-ventilated cabinet (without fans on the top)

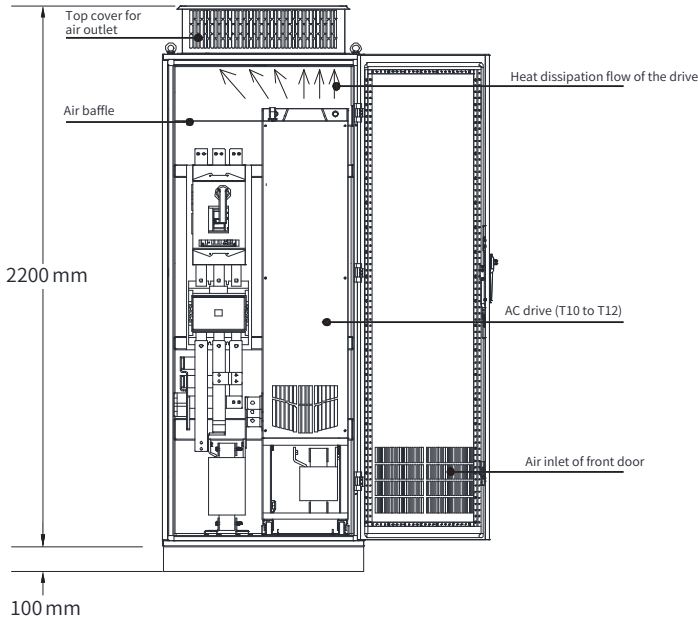


Figure 2-9 Self-ventilated cabinet

Table 2-1 Specifications of a self-ventilated cabinet

Type	Quantity of Fans	Total Air Volume (CFM)	Effective Area of Cabinet Top Air Inlet (mm ²)	Effective Area of Cabinet Top Air Outlet (mm ²)
MD880-01S-0441-4-L-SG	2	586	31809	50894
MD880-01S-0481-4-L-SG	2	722	31809	50894
MD880-01S-0538-4-L-SG	3	789	47713	76341
MD880-01S-0605-4-L-SG	3	882	47713	76341
MD880-01S-0673-4-L-SG	3	644	47713	76341
MD880-01S-0751-4-L-SG	3	796	47713	76341
MD880-01S-0849-4-L-SG	3	796	47713	76341

Type	Quantity of Fans	Total Air Volume (CFM)	Effective Area of Cabinet Top Air Inlet (mm ²)	Effective Area of Cabinet Top Air Outlet (mm ²)
Notes: 1. CFM = 0.0283 m ³ /min 2. "Effective Area" indicates the through-hole area.				

2) Fan-cooled cabinet (with fans on the top)

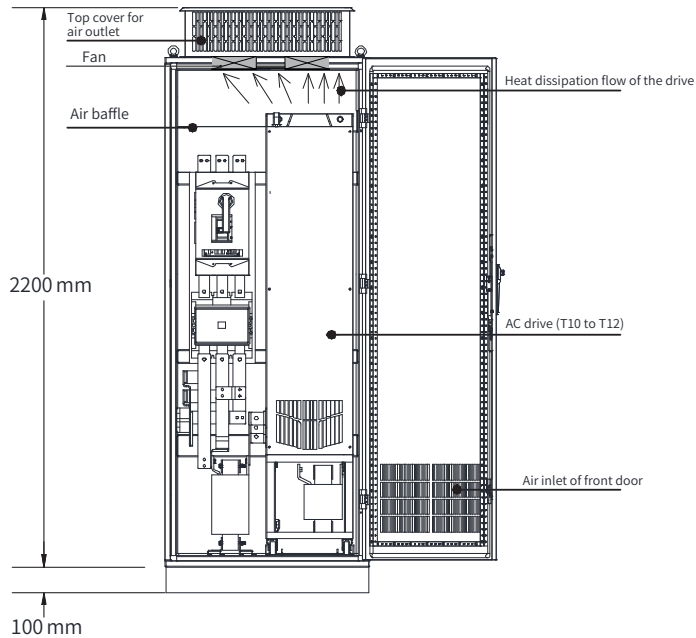


Figure 2-10 Fan-cooled cabinet (with fans on top of the cabinet)

Table 2-2 Specifications for the fan-cooled cabinet

Type	Quantity of Fans	Total Air Volume (CFM)	Effective Area of Top Air Inlet (mm ²)	Max. Air Volume Required by Fan (CFM)	Effective Area of Top Air Outlet (mm ²)
MD880-01S-0441-4-L-SG	2	586	31809	703	S = 0.942 x N x (Dout2 - DHUB2) In the preceding formula, N indicates the number of top fans, Dout indicates the diameter of the top fan, and DHUB indicates the diameter of the top fan center HUB.
MD880-01S-0481-4-L-SG	2	722	31809	866	
MD880-01S-0538-4-L-SG	3	789	47713	978	
MD880-01S-0605-4-L-SG	3	882	47713	1058	
MD880-01S-0673-4-L-SG	3	644	47713	733	
MD880-01S-0751-4-L-SG	3	796	47713	955	
MD880-01S-0849-4-L-SG	3	796	47713	955	

Type	Quantity of Fans	Total Air Volume (CFM)	Effective Area of Top Air Inlet (mm ²)	Max. Air Volume Required by Fan (CFM)	Effective Area of Top Air Outlet (mm ²)
Notes: 1. CFM = 0.0283 m ³ /min 2. "Effective Area" indicates the through-hole area.					

As shown in the following figure, the heat dissipation vent of the drive must be isolated inside the cabinet using a wind shield to ensure that the hot air generated by the drive is dissipated through the cooling hole on the top, stopping circulation of the hot air in the cabinet.

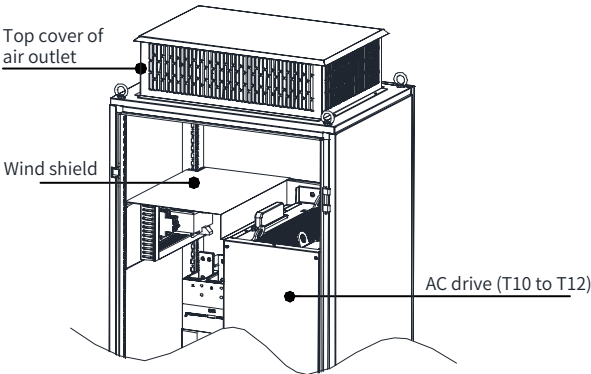


Figure 2-11 Wind shield in the cabinet

2.5.2 Precautions for Installing Drives in a Cabinet

The nine fold profile cabinet (PS cabinet) is recommended. Before installing the AC drive, install the bottom mounting bracket, guide rail, and mounting beam first. The mounting beam must be reserved with mounting holes according to section 1.8 Dimension Drawings. Reserve enough clearance inside the cabinet for connecting the side terminal block of the AC drive.

Align the AC drive casters with the guide rail before pushing in/out the drive. The drive must be pushed in or pulled out of the cabinet by at least two persons.



NOTE

- ◆ Reserve the installation clearances as specified in Figure 2-4 to ensure sufficient space for heat dissipation of the AC drive. Take the heat dissipation of other equipment in the cabinet into consideration.
- ◆ Use a socket tool with an extension rod for handling the power cable terminal block.
- ◆ Align the casters to the guide rail. The drive must be pushed in or pulled out by at least two persons, as shown in Figure 2-18 and Figure 2-19.
- ◆ See the cabinet layout diagram (as shown in Figure 2-12) when installing the drive into a cabinet. The cabinet frame is 2200 x 800 x 600 (in mm, including the H200 cabinet top ventilation cover). Install the H100 cabinet base to ensure proper installation of the cabinet. A wind shield must be installed on the cabinet top to avoid circulation of hot air inside the cabinet. Air inlets must be provided at the lower part of the cabinet door.
- ◆ For details about dimensions of the mounting bracket (delivered with the drive), see section Dimensions of the Mounting Bracket. Besides, check that the strength and stiffness of the guide rail meet the requirements.
- ◆ After the drive is pushed into the cabinet, remove the wind shield from the air outlet of the drive to dissipate the hot air, preventing overtemperature faults.

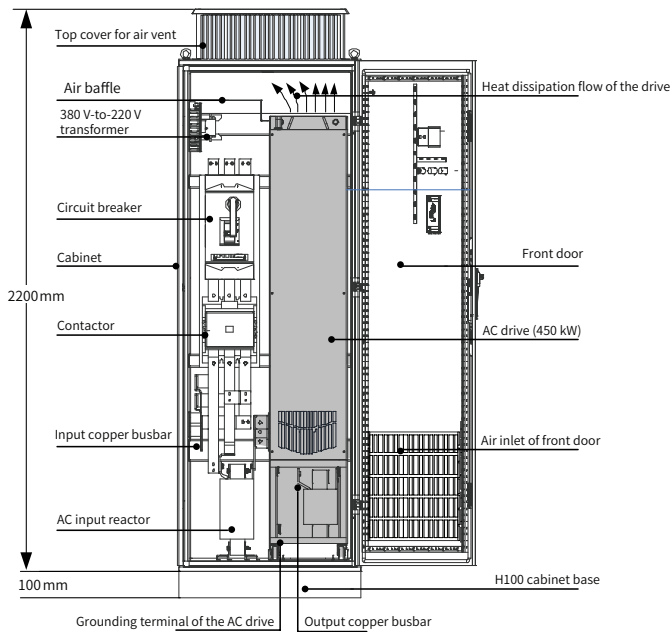


Figure 2-12 Recommended cabinet layout

2.5.3 Procedure for Installing the Drive in a Cabinet

Step	Operation description
1	Install the mounting beam in the nine fold profile cabinet, as shown in Figure 2-13.
2	Secure the bottom mounting bracket, as shown in Figure 2-14.
3	Assemble the guide rail (option) and connect the guide rail to the cabinet.
4	Remove the cover from the AC drive to expose the handle.
5	Align casters of the AC drive with the guide rail and push the drive into the cabinet slowly, as shown in Figure 2-18 and Figure 2-19. Use auxiliary strap during push-in and pull-out to prevent turnover. Such operation must be performed by at least two persons.
6	Remove the auxiliary strap. There are two mounting holes on the back of the AC drive. Secure the top and bottom fixing holes at the back of the drive to fix the drive to the mounting team inside the cabinet, as shown in Figure 2-20.
7	After installation is done, remove the guide rail.

■ Fixing the mounting beam and reserving mounting holes

1. A nine-fold profile cabinet (PS cabinet) is recommended for installing the AC drive. The cross sectional area of the nine-fold profile is shown in Figure 2-13.
2. When T10 to T12 drives are installed in the nine fold profile cabinet with a depth of 600 mm, the mounting beams must be folded inwards, as shown in Figure 2-14. When T10 to T12 drives are installed in the cabinet with a depth of 800 mm, it is not needed to fold the mounting beam inwards.

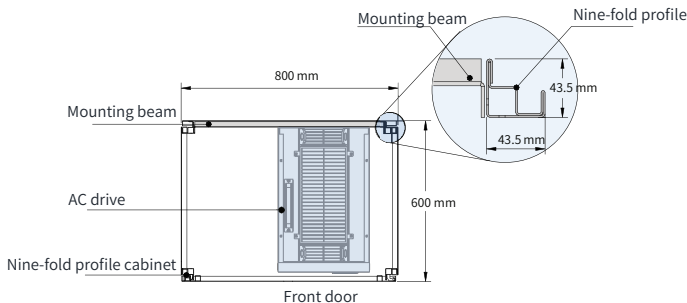


Figure 2-13 Top view of T10 to T12 drive cabinet

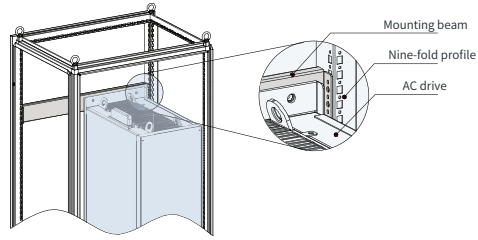


Figure 2-14 3D view of T10 to T12 drive cabinet

**NOTE**

- ◆ If the cabinet has a front door and a rear door, the cabinet with a depth of 600 mm is too small to accommodate T10 to T12 drives. In this case, the cabinet with a depth of 800 mm is recommended.

■ Fixing the bottom mounting bracket

- 1) Use six M5 self-tapping screws to fix the mounting bracket to the nine fold profile cabinet according to the following figure (for the mounting bracket drawing, see section 2.5.4 Dimensions of the Mounting Bracket).
- 2) If the cabinet used by the customer is not a nine-fold profile cabinet, the fixing holes of the mounting bracket need to be drilled and assembled on site.

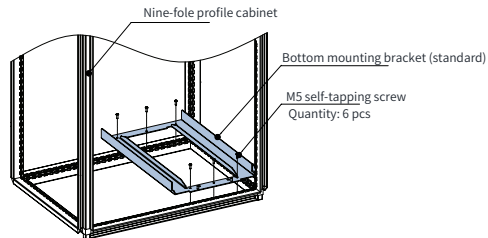
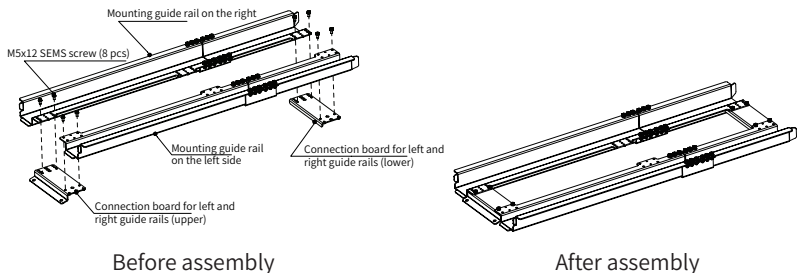


Figure 2-15 Installing the bottom mounting bracket

3) Optional guide rail model: MD500-AZJ-A3T10

As shown in the following figure, align the two holes at the front of the guide rail with the studs of the mounting bracket, and fix them with two M6 nuts.



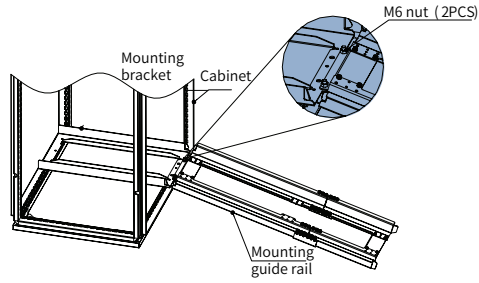


Figure 2-16 Installing the guide rail in the cabinet



NOTE

- ◆ Read through the operation instructions for the guide rail before use.

Pushing the AC drive into the cabinet

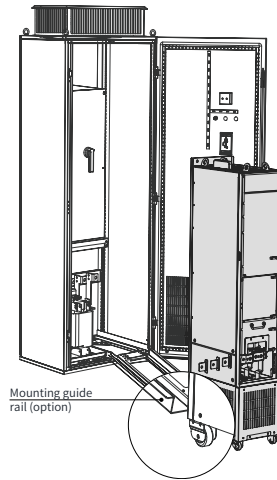


Figure 2-17 Aligning casters of the drive to the guide rail

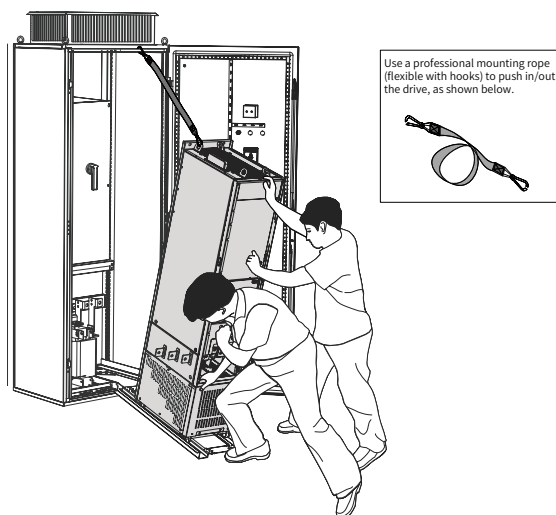


Figure 2-18 Slowly pushing the drive into the cabinet

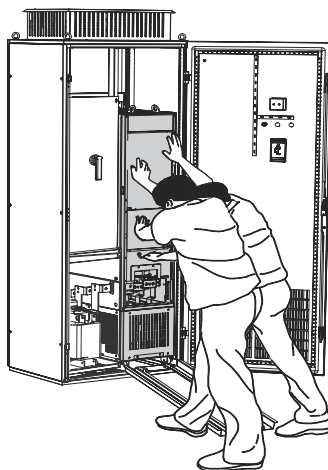


Figure 2-19 Drive pushed into the cabinet

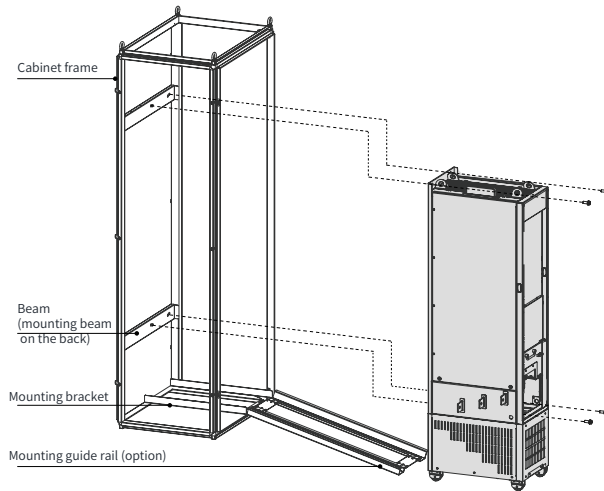
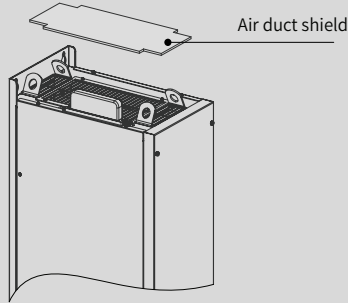
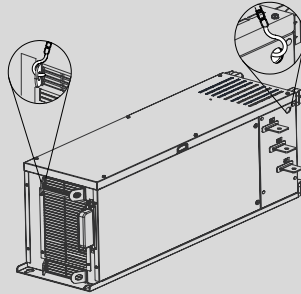


Figure 2-20 Fixing the drive to the beam using the four fixing holes on the back of the drive

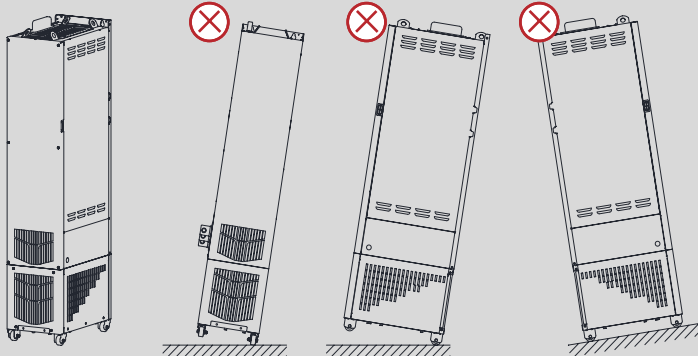
- ◆ Remove the drive from the cabinet in the same procedure, but in the reverse order.
- ◆ Ensure the four mounting holes on the back of the drive are connected to the mounting beam securely.
- ◆ After pushing the drive into the cabinet, remove the top air duct shield that used to prevent falling of screws into the air duct.



- ◆ Use top eyebolts to move or hoist the drive. If the drive needs to be placed in a horizontal position, use the top and bottom eyebolts when hoisting the drive again. Ensure that the DC bus terminals are not subject to any stress.



- ◆ If the drive needs to be placed in an upright position, ensure the tilt angle of the place that holds the drive does not exceed 5° . Failure to comply may lead to turn-over of the drive due to the heavy weight of the drive.



NOTE

2.5.4 Dimensions of the Mounting Bracket

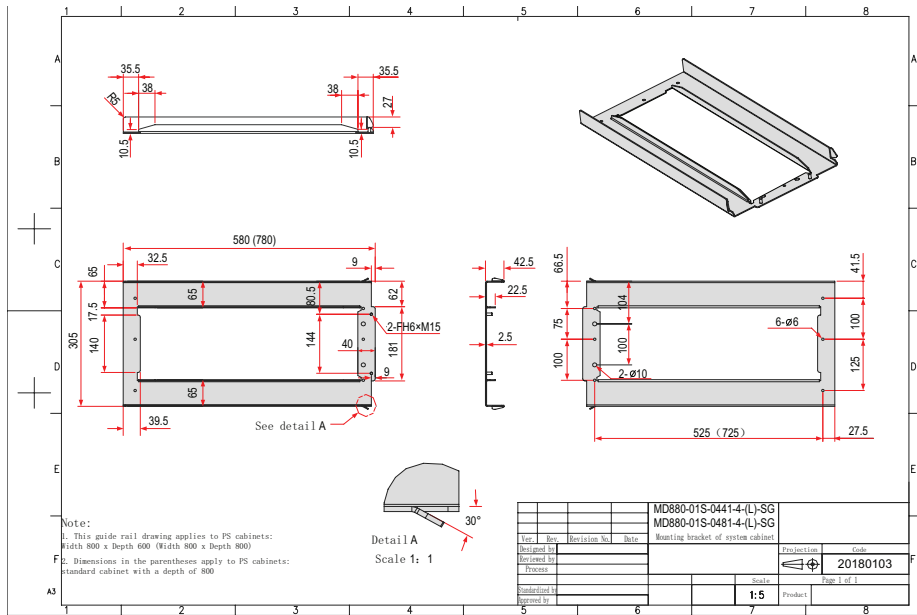


Figure 2-21 Mounting bracket dimensions of MD880-01S-0441-4-L-SG/MD880-01S-0481-4-L-SG (default)

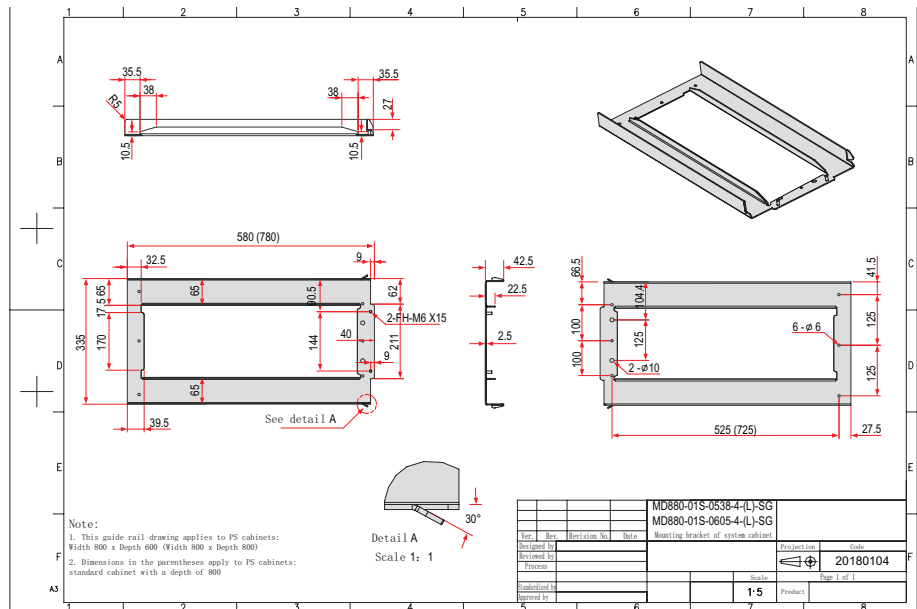


Figure 2-22 Mounting bracket dimensions of MD880-01S-0538-4-L-SG/MD880-01S-0605-4-L-SG (default)

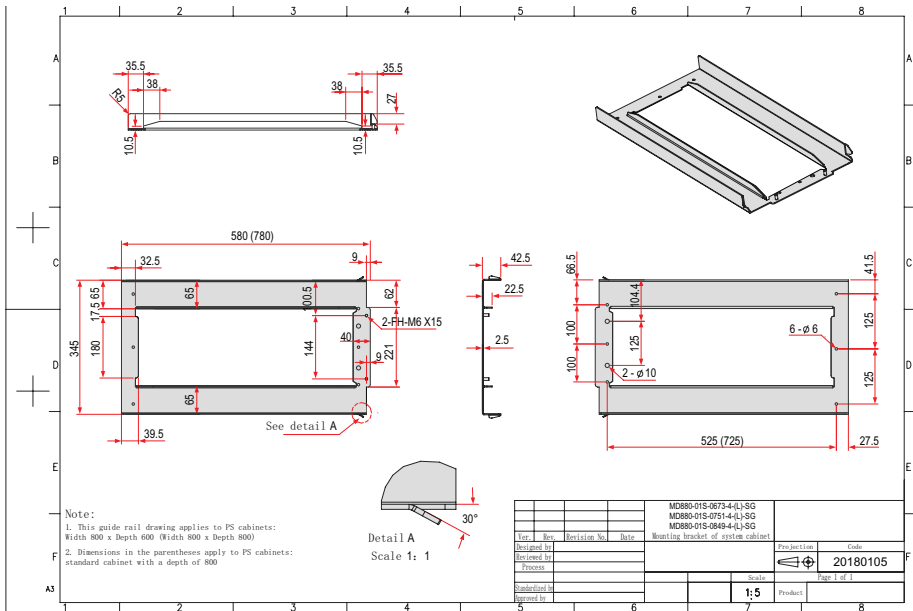


Figure 2-23 Mounting bracket dimensions of MD880-01S-0673-4-L-SG to MD880-01S-0849-4-L-SG (default)



- ◆ The mounting bracket for cabinet with a depth of 800 needs to be purchased separately.

2.6 Removing and Installing the Cover

Remove the cover of the drive before wiring the main circuit and control circuit.



DANGER

- ◆ Before removing the cover, make sure that the drive has been powered off for over 15 minutes.
- ◆ Be careful when removing the front cover. A falling cover may cause device damage or personal injury.

- Removing and installing the cover of T2 to T9 drives

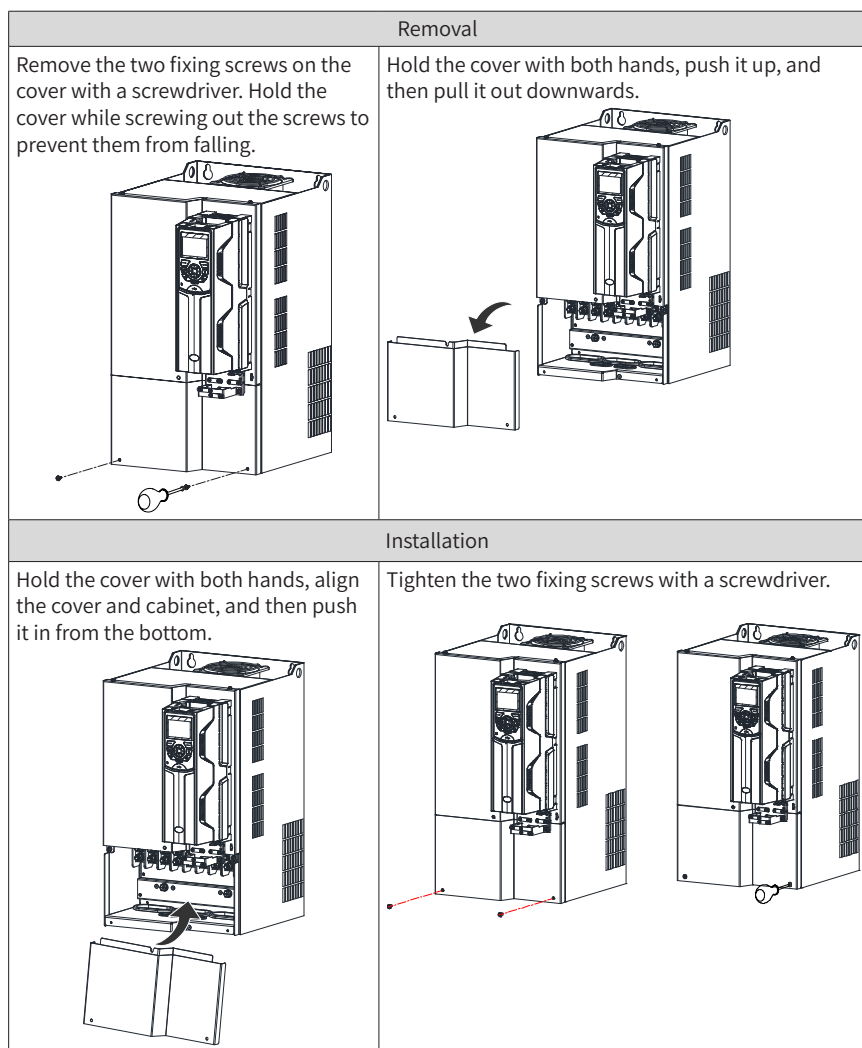


Figure 2-24 Removing and installing the cover of T2 to T9 drives

■ Removing and installing the cover of T10 to T12 drives

- 1) Removing the covers of T10 to T12 drives
 - a) Remove the four screws on the lower cover with a screwdriver. Then, hold the lower cover with both hands and pull it out.
 - b) Remove the six screws on the upper cover. Then, hold the cover with both hands and lift it in the direction shown below to remove the upper cover.

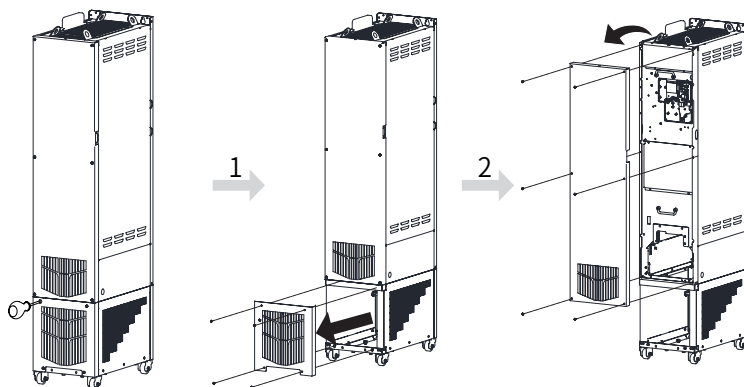


Figure 2-25 Removing the covers of T10 to T12 drives

2) Installing the covers of T10 to T12 drives

Install the cover in the same procedure, but in the reverse order.

- a) Hold the upper cover with both hands and align the top of the upper cover with the snap-fit joint at the top of the cabinet, as shown in the following figure. Align the six screw holes on the upper cover to the fixing holes on the cover of the cabinet. Then, secure the six screws.
- b) Hold the lower cover with both hands and align the four screw holes on the lower cover to the fixing holes on the base of the cabinet. Then, secure the four screws.

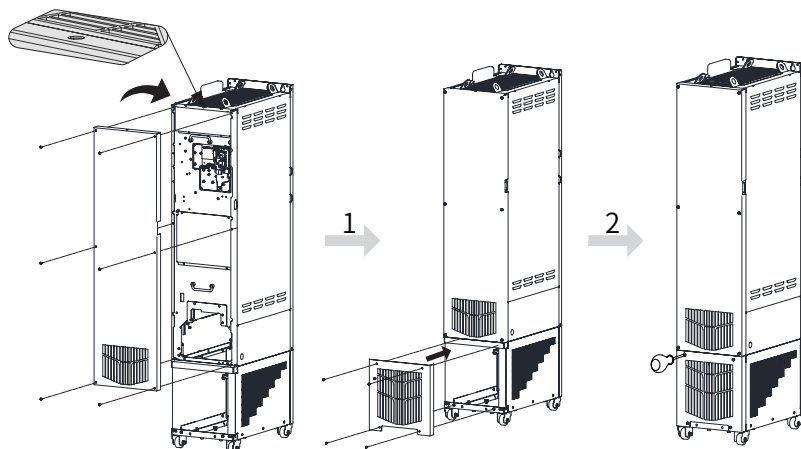


Figure 2-26 Installing the covers of T10 to T12 drives

3 Electrical Installation

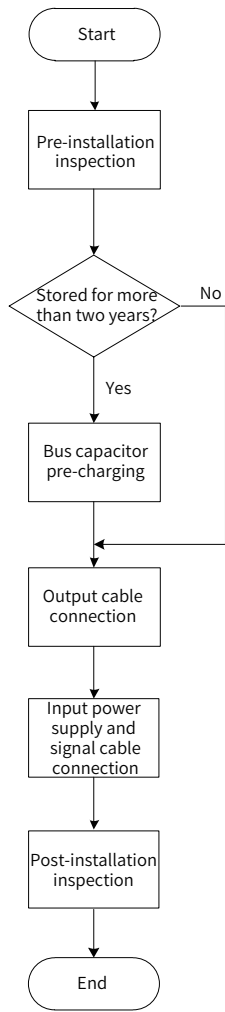


Figure 3-1 Electrical installation flowchart

3.1 Safety Alerts

3.1.1 Safety Precautions Before Installation

Read safety instructions and precautions thoroughly.

Electrical installation must be performed by skilled personnel. The following "five safety rules" must always be observed:

- Disconnect the equipment from power supply.
- Make sure that power supply will not be connected again.
- Make sure that the equipment is de-energized.
- Make sure that the equipment is reliably grounded.
- Cover or isolate the adjacent components that are still live.

3.1.2 Inspection on Electrical Installation

 DANGER	
	◆ The user is responsible for ensuring that the motor, AC drive, and other components are installed and connected in accordance with the recognized technical rules in the country of installation and with other applicable regional regulations. Special attention must be paid to regulations concerning cable dimensions, fuses, grounding, shutdown, isolation, and overcurrent protection. ◆ If a fuse in a branch circuit trips, the fault current may have been cut off. To reduce the risk of fire or an electric shock, the current-carrying parts of the AC drive and other components in the cabinet should be inspected and damaged parts should be replaced. If any fuse trips, figure out the cause and rectify the fault.

3.1.3 General Precautions

 DANGER	
	◆ The circuit board contains components that are sensitive to static electricity. Wear a grounded wrist strap when operating the circuit board. Do not touch the circuit board unless necessary.

 CAUTION	
	◆ Carefully pick and place the optical fiber cables. When removing the optical fiber cable, pull the connector, not the cable itself. Since the optical fiber cable is extremely sensitive to dirt, do not touch the end of the cable with bare hands.

3.1.4 Insulation Test

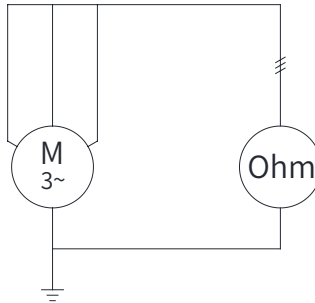
The AC drive has been tested for insulation between the main circuit and the enclosure at the factory. Therefore, do not perform any withstand voltage and insulation resistance tests on the drive again. Check insulation of the motor and motor cables according to the following steps:

- 1) Check that the motor cables are connected to the motor and disconnected from the drive output terminals (U, V, W).
- 2) Measure the insulation resistance between the conductor of each phase and PE conductor with 500 VDC applied.



NOTE

- ◆ High ambient humidity inside the motor cabinet can reduce the insulation resistance. If the insulation resistance does not meet requirements, reduce the ambient humidity inside the motor cabinet and then measure the insulation resistance again.



3.2 Wiring of the System

Install necessary electrical components on the input/output side of the AC drive to ensure safety and stability of the MD880 series AC drive system. The following figure shows the system composition.

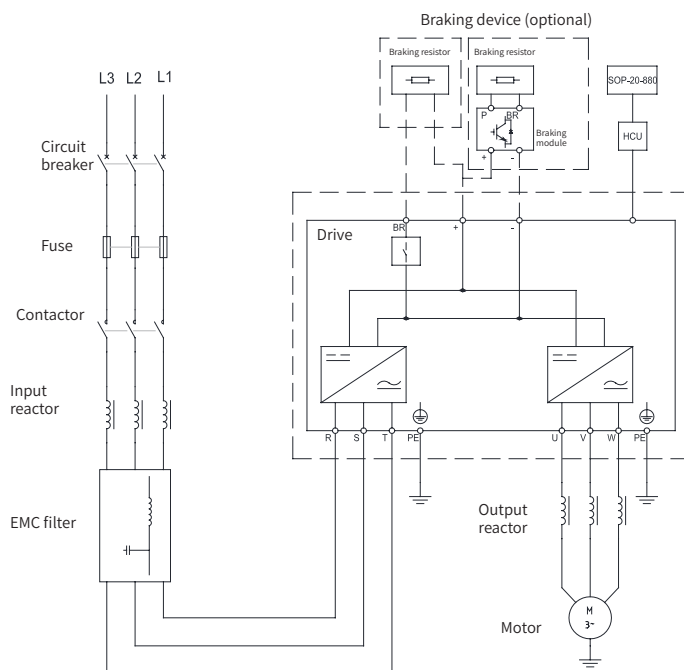


Figure 3-2 Components of MD880 series AC drive system

**NOTE**

- ◆ The preceding figure only shows the system wiring of the MD880 series AC drive. For peripherals and options, see chapter Options.

3.3 System Peripherals

Table 3-1 Descriptions of system peripherals

Name	Installation position	Function
Circuit breaker	Between the power supply and input side of the drive	Short circuit breaker: Cuts off the power supply when overcurrent occurs on downstream devices to prevent accidents.
		Earth leakage circuit breaker (ELCB): Provides protection against potential high-frequency leakage current during operation to prevent electric shock and even a fire. Select proper ELCBs as needed.
Fuse	Between the power supply and input side of the drive	Prevents accidents caused by short circuit to protect downstream semiconductors.
Electromagnetic contactor	Between the circuit breaker and input side of the drive	Do not start/stop the drive frequently by switching on/off the contactor (at an interval less than 1 h) or start the drive directly through the contactor.
Input reactor	Input side of the drive	Improves the power factor on the input side. Eliminates harmonics on the input side and prevents other devices from being damaged due to voltage waveform distortion. Eliminates input current unbalance caused by inter-phase unbalance.
EMC Filter	Input side of the drive	Reduces the conduction and radiation interference generated by the drive to external devices. Decreases conducted interference flowing from the power supply to the drive and improves the anti-interference capacity of the drive.
DC reactor	Between the EMC filter and the braking resistor (The DC reactor is standard in models above 22 kW only.)	Improves the power factor on the input side. Improves the overall efficiency and thermal stability of the drive. Eliminates harmonics on the input side and reduces the conduction and radiation interference generated from the drive to the outside.
Braking resistor	(+) and BR terminals for drives of 90 kW and below	The braking resistor is optional for models below 90 kW. The braking unit is integrated internally. The braking resistor consumes regenerative energy generated during deceleration of the motor.
Braking unit	(+) and (-) terminals for drives of 110 kW and above	Use a MDBUN braking unit and a recommended braking resistor for models of 110 kW and above. The braking resistor consumes regenerative energy generated during deceleration of the motor.

Name	Installation position	Function
Output reactor	Between output side of the drive and the motor, and close to the drive	Harmonics are present in the output side of the drive. If the motor is routed far away from the drive, the following may occur due to large distributed capacitance in the circuit and certain harmonics that may generate resonance in the circuit: 1) The motor is damaged after long-term operation due to deteriorated insulation performance. 2) Fault protections are triggered frequently in the drive due to high leakage current. If distance between a drive and a motor is greater than 100 m, it is recommended that an AC output reactor be installed.
dV/dt reactor	Output side of the drive and close to the drive	Protect motor insulation and reduce bearing current.
Output magnetic ring	Output side of the drive and close to the drive	Reduces the bearing current.

**NOTE**

- ◆ Do not install a capacitor or surge protection device (SPD) on the output side of drive. Failure to comply can result in faults or damage the capacitor and surge protection device.
- ◆ Harmonics are present in the input/output (main circuit) of the drive, which may disturb the communication device connected to the drive. Therefore, install an anti-interference filter to minimize the interference.

3.4 EMC-Compliant Cable Routing

Read chapter Fundamental Safety Instructions thoroughly and follow the instructions.

3.4.1 Basic rules for Cable Routing

Follow the basic rules below when wiring the drive in the cabinet.

- Comply with EMC guidelines.
- Use existing routing for cable set.
- Always use the shield plates provided.
- Use existing cabling path.
- Take protective measures for cables in places with corners or sharp objects.
- Re-install any covers removed during routing before switch-on and commissioning.

3.4.2 Routing Requirements

- 1) Separate routing of signal cables and power cables:

When analog signals are used for remote control of the drive, the signal cables and high-current cables (power input, drive output, and braking resistor cables) of the drive must be routed through different routes with a distance longer than 30 cm to reduce interference on the analog signals. This requirement must be met even inside the control cabinet.

- 2) Requirements on analog control signal cables:

Use shielded twisted pairs for analog signals.

When stripping the sheath of the cable, keep the stripped part as short as possible (5–7 mm), and wrap the stripped shield with the insulation tape to prevent the shielded cable from coming into contact with other cables.

- 3) Requirements on motor cables:

Use shielded cables as motor cables.

The distance between the power unit and the motor must be as short as possible.

The motor cables must be separated from other cables.

To avoid electromagnetic interference caused by rapid change of the power unit output voltage, the motor cables and other cables cannot be laid side by side for a long distance.

- 4) Requirement on power cables:

Use shielded cables as power cables, or protect all cables between the power unit and the motor with ducts.

- 5) Requirements on control cables and power supply cables:

If the power supply cables and control cables must be cross-connected, keep the cross-connection angle as close to 90 degrees as possible.

3.4.3 Routing Suggestions

- 1) During routing, route cables that used to transmit different types of signals through different routes. Separate disturbing cables from disturbed cables with a minimum clearance of 30 cm wherever possible. When these two types of cables must be cross-connected, keep the cross-connection angle as close to 90 degrees as possible.

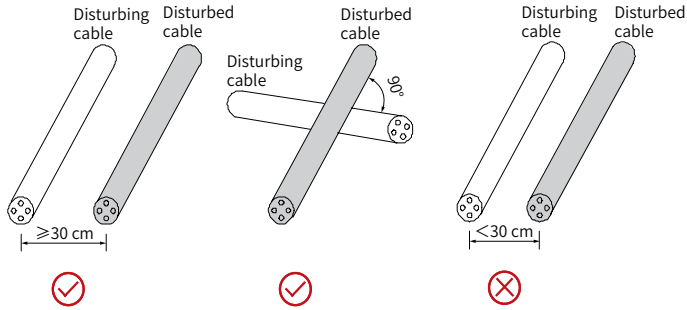


Figure 3-3 Routing disturbing cables and disturbed cables

- 2) It is recommended to route different types of signal cables through different routes and separate different types of signals with equipotential signals. When routing signal cables of the same type, the equipotential signal cable stays in the outer layer and equipotential signals should stay in the middle if possible, as shown below. The following figure shows an example.

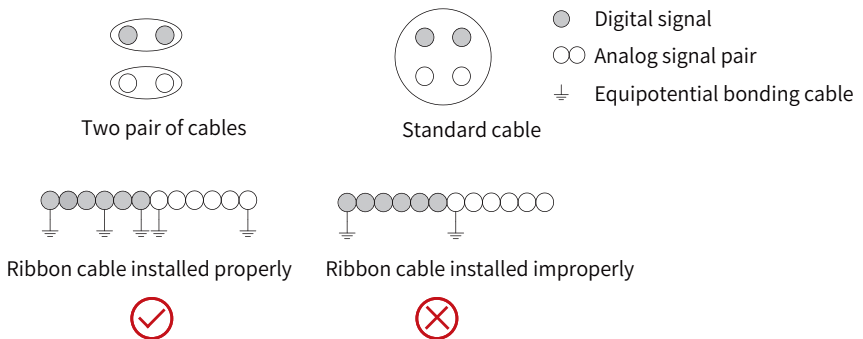


Figure 3-4 Routing of different types of signal cables

- 3) For multi-conductor cables, it is recommended that one cable transmits one type of signals. If one cable is used to transmit different types of signals, use the cable with conductors shielded, as shown in the following figure.

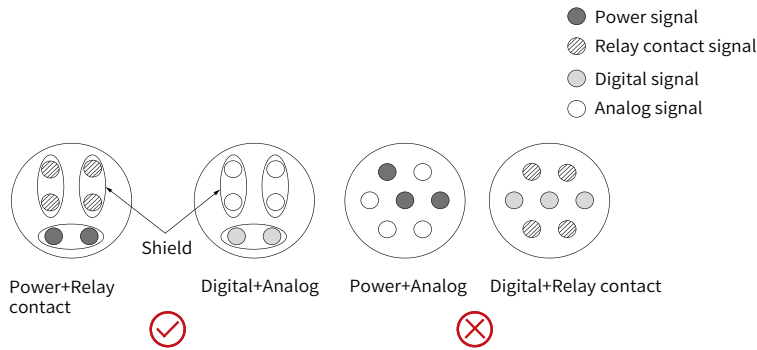


Figure 3-5 Routing of multi-conductor cables

- 4) For unused conductors in a multi-conductor cable, connect the unused (or reserved) conductors to the equipotential bonding point.

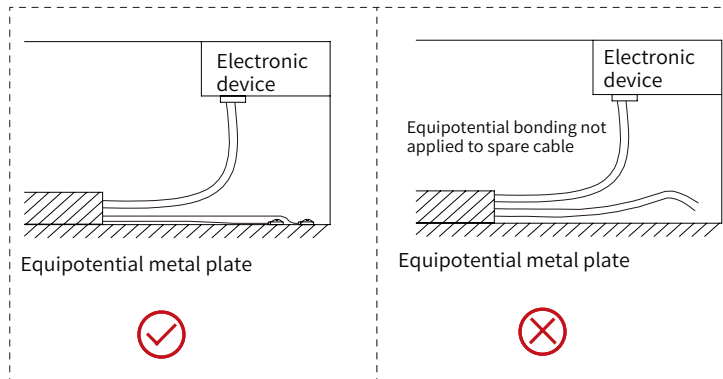


Figure 3-6 Handling of remaining conductors in a multi-conductor cable

- 5) For low-level sensor signals and relay signals that share a common line, route two cables as close as possible to prevent a large loop area. For analog signals, use twisted pairs. For digital signals, ensure signal cables are routed close to each other.

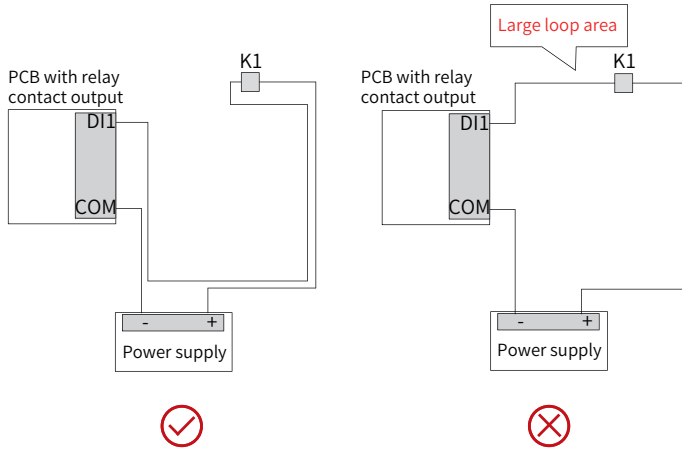


Figure 3-7 Close routing diagram

- 6) For cables of different types, route the cables along the equipotential metal plate. To enhance the internal EMC performance, separate different types of cables or separate cables with metal separators (recommended) in the same metal (zinc-iron or stainless steel) duct.

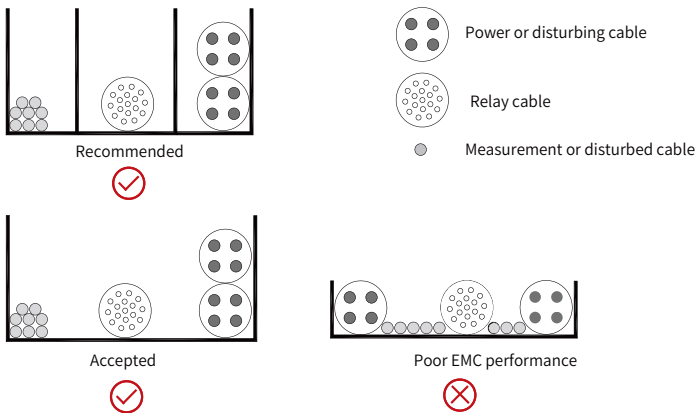


Figure 3-8 Routing of different types of cables

- 7) Minimize the unshielded part of the shielded cable, and connect the shield to the nearest PE terminal. If the unshielded part is too long, the conductor may be prone to signal interference, especially the encoder signals.

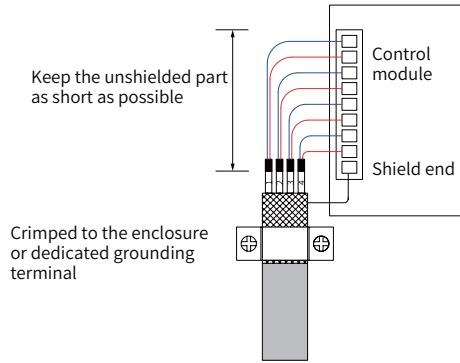


Figure 3-9 Requirements on shielded cable

3.4.4 Connection of Shielded Power Cables

The input/output shielded power cable and the shield inside the power unit must be in contact with the shield plate inside the cabinet in a large area to achieve good EMC performance. See the figure below for the connection diagram.

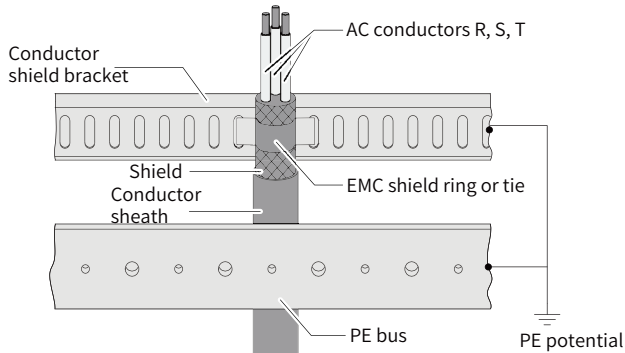


Figure 3-10 Connection of shielded power cables

3.5 Connection

Preparation:

- Power off the device before installing it into the cabinet.
- Take all the necessary safety measures at the installation location.
- Observe the "Five safety rules".

3.5.1 Standard Wiring Diagram

As shown in the following figure, T2 to T9 drives communicate with the control module HCU-51S-CS through RS422. T10 to T12 drives communicate with the control module HCU-50S-CS through high-speed optical fibers.

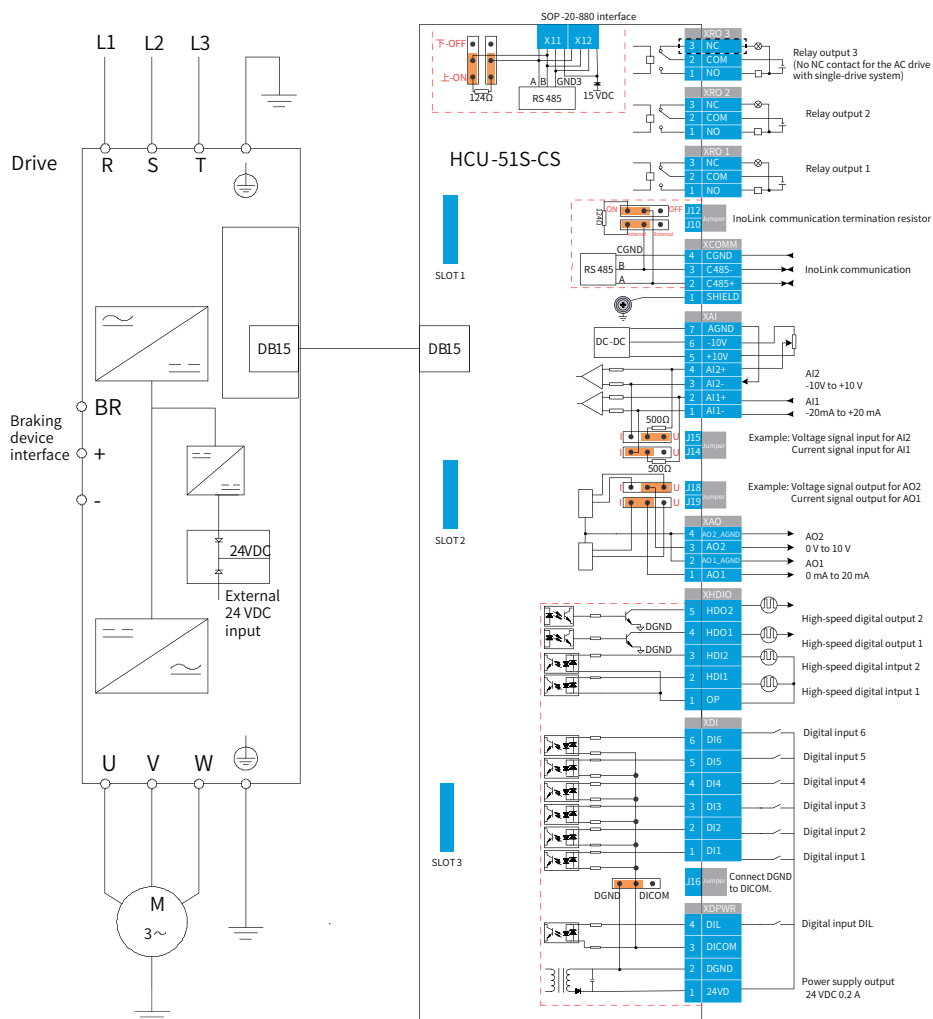


Figure 3-11 Wiring of T2 to T9 drives

The following figure shows the position of the external 24 V power supply terminal.

- ① Remove the two screws.
- ② Remove the sheet metal.
- ③ External 24 V power supply terminal

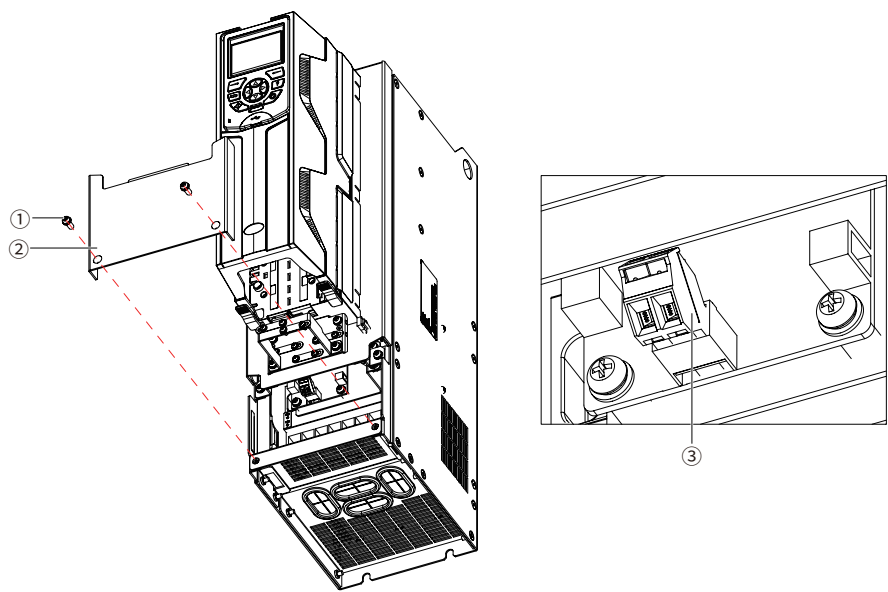


Figure 3-12 Wiring of T10 to T12 drives

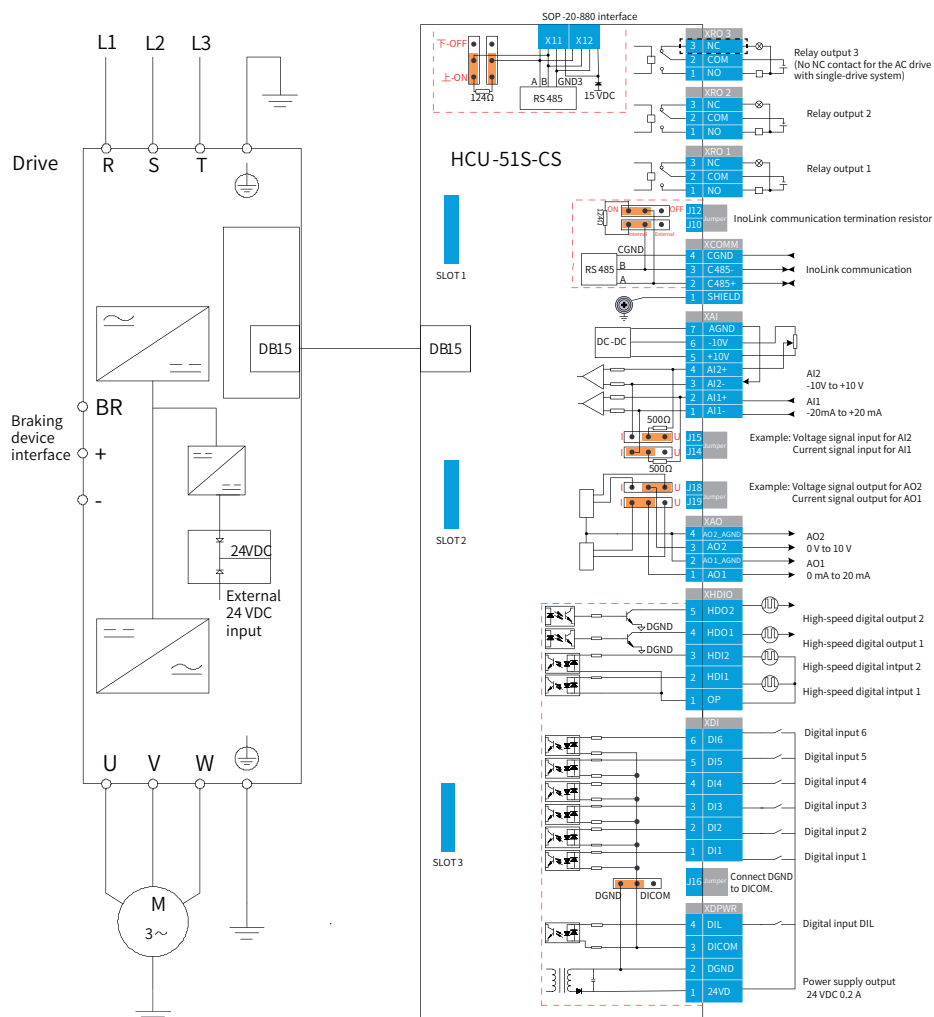


Figure 3-13 Wiring of T2 to T9 drives

3.5.2 Functions of Main Circuit Terminals

1) Main circuit terminals of the MD880 series AC drive

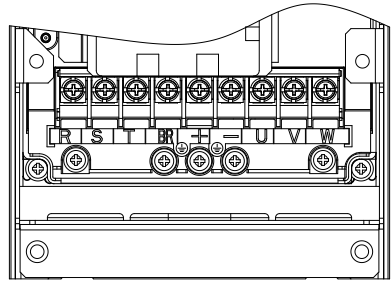


Figure 3-14 Layout of main circuit terminals for T2 to T4 drives

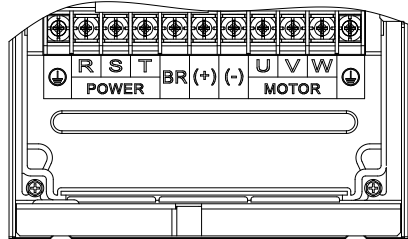


Figure 3-15 Layout of main circuit terminals for T5 to T6 drives

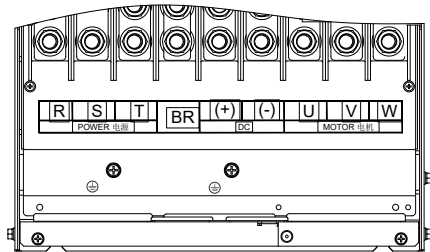


Figure 3-16 Layout of main circuit terminals for T7 to T9 drives

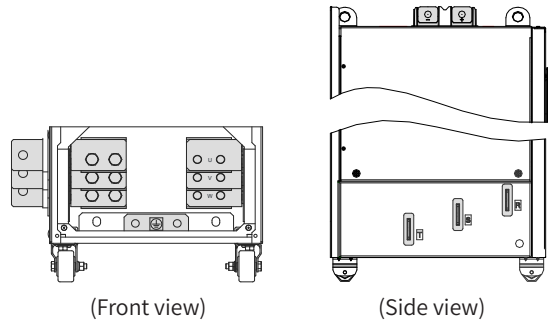


Figure 3-17 Layout of main circuit terminals for T10 to T12 models

Table 3-1 Main circuit terminals of the MD880 series AC drive

Mark	Name	Function
R, S, T	Three-phase power input terminals	The terminals are used to connect the three-phase AC power supply.
(+), (-)	Positive and negative terminals of the DC bus	Common DC bus input terminals, connected to the external braking unit for drives of 90 kW and above
(+), BR	Braking resistor terminals	Connected to the braking resistor for drives of 75 kW and below.
U, V, W	AC drive output terminals	Connected to the three-phase motor.
	Grounding terminal (PE)	Used for protective grounding.

2) Main circuit cable selection

It is recommended that the input and output main circuit cables use symmetrical shielded cables. Compared with four-conductor cables, symmetrical shielded cables can reduce electromagnetic radiation in the whole transmission system.

Power cables recommended - Symmetrical shielded cables

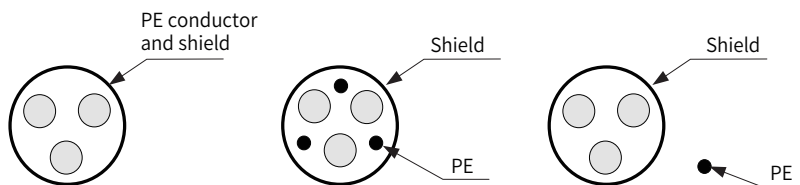


Figure 3-18 Power cables recommended

Power cables not recommended

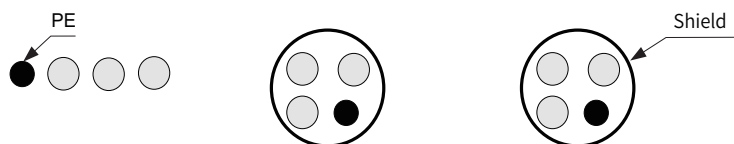


Figure 3-19 Power cables not recommended

3) R, S, and T terminals of the input power supply

- No specific phase sequence is required for wiring on the input side of the drive.
- The specification and installation method of external main circuit cables must comply with local regulations and related IEC standards.
- Use copper conductors of a proper size as main circuit cables according to the

recommended values of power cable selection in section Instructions for Selecting Cables, Circuit Breaker, Contactor.

- Install the filter close to the input side of the AC drive. The cable between the filter and the drive must be shorter than 30 cm. Connect the grounding terminal of the filter and the grounding terminal of the drive together, and install the filter and drive on the same conductive surface that is connected to the main grounding terminal of the cabinet.

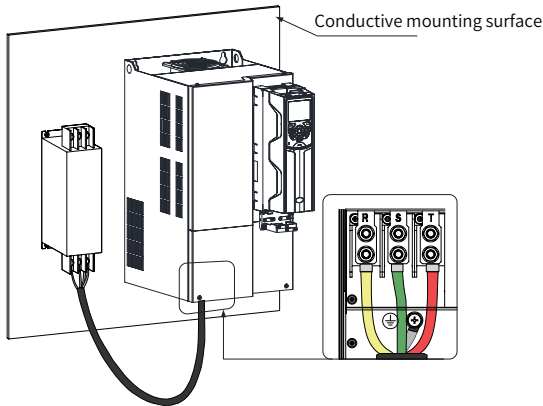


Figure 3-20 Installing the filter

4) DC bus terminals (+) and (-)

- After switching off the AC drive, wait for at least 15 minutes before further operations until the CHARGE indicator is off, because DC bus terminals carry a residual voltage after power-off.
- Note that (+) and (-) must be connected correctly when an external braking component is used for drives of 90 kW and above. Failure to comply will cause damage to the drive and braking component and even a fire.
- The cable for the braking unit cannot exceed 10 m. Use twisted pair cables or closely-paired cables for parallel connection.
- Do not connect the braking resistor to the DC bus directly. Failure to comply can damage the drive or even cause a fire.

5) Braking resistor terminals (+) and BR

- The BR terminal is active only in 90 kW and below models that carry a built-in braking unit.
- Use recommended braking resistors with wiring length shorter than 5 m. Failure to

comply may damage the drive.

- Keep the braking resistor away from combustibles. Avoid igniting the surrounding components due to overtemperature of the braking resistor.
- For drives (with built-in braking unit) of 90 kW and below, the default braking voltage is 700 V.

6) Drive output terminals U, V, W

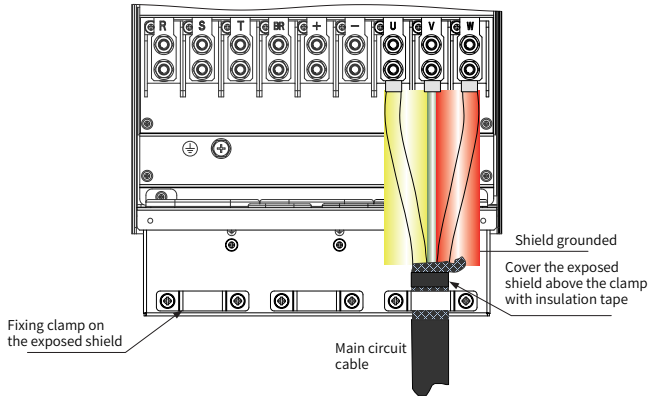


Figure 3-21 Wiring of the shield

- The specifications and installation methods of external main circuit cables must comply with the local regulations and related IEC standards.
- Select proper copper cables as main circuit cables according to section Instructions for Selecting Cables, Circuit Breaker, and Contactor.
- Do not connect a capacitor or surge protection device to the output side of the AC drive. Failure to comply may lead to frequent fault protection or even damage the drive.
- If the motor cable is too long, electrical resonance may be generated due to distributed capacitance, which may damage the motor insulation or generate higher leakage current, triggering overcurrent protection. In this case, install an AC output reactor close to the drive when the motor cable length exceeds 100 m.
- Shielded cables are recommended as motor output cables.
 Grounding mode 1: Strip the cable to expose the shield, crimp the shield to the wire ferrule slot of the bracket with the wire ferrule, and crimp the drain wire of the shield to the PE terminal.
 Grounding mode 2: The shield can be twisted into a strand of flat wire and then

grounded. The shield drain wire must be as short as possible, with the width not lower than $1/5$ of the length.

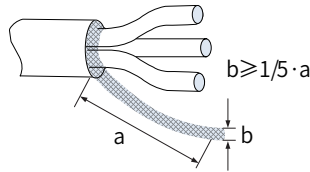


Figure 3-22 Drain wire of the motor cable shield

7) Grounding terminal (PE)

- Ground the PE terminal reliably with the grounding cable resistance lower than $10\ \Omega$. Failure to comply may result in device malfunction or damage.
- Do not connect the grounding terminal to the N terminal of the neutral wire of the power supply.
- The size of protective grounding conductors shall be selected according to Chapter 6 Options.
- Use yellow-green cable as the protective grounding conductor.
- Ground the shield properly.
- It is recommended that the AC drive be installed on a conductive metal surface. Ensure that the whole conductive bottom of the drive is bonded properly with the mounting surface.
- Install the filter and the drive on the same mounting surface to ensure the filtering performance.

8) Main circuit cable protection

- Add a heat-shrink tube to the copper tube of the cable lug and to the cable conductor. Ensure that the heat-shrink tube completely covers the cable conductor, as shown below.

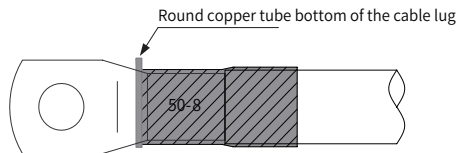


Figure 3-23 Cable conductor with the heat-shrink tube

9) Upstream protective device

Install a proper protective device on the power input side to provide protections against overcurrent, short-circuit and electrical isolation.

When selecting the protective device, take into account the current-carrying capacity of the main circuit cables, system overload capacity, and upstream power distribution short-circuit capacity. Use protective devices with specifications compliant with those recommended values in section 6.1 List of Options.

10) Power grid system

- If a basic rectifier module is used in the TT and TN systems, it is strongly recommended that the two grounding screws on the voltage dependent resistor (VDR) board be installed.
- If an earth leakage circuit breaker is configured and the circuit breaker trips during startup, you can remove the EMC jumper (screw 2 shown in the following figure).

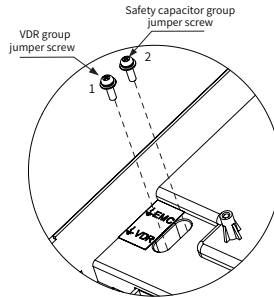


Figure 3-24 VDR and EMC grounding jumper positions



NOTE

- ◆ For details about main circuit terminal dimensions and cables, see section 3.5.3 Layout and Dimensions of Main Circuit Terminals.

3.5.3 Main Circuit Terminal Layout and Dimensions



NOTE

- ◆ By default, T10 to T12 drives are equipped with the side terminal block. You can remove the terminal block according to actual requirements.
- ◆ The data and models recommended in this section are for reference only. The cross sectional area of the cable selected by the user cannot be larger than those shown in the following figures.
- ◆ Select IEC cables based on the following requirements:
 - Compliant with EN 60204-1 and IEC 60364-5-52;
 - PVC-insulated
 - 70°C max. surface temperature at 40°C ambient temperature
 - Symmetrical cable with copper-braided shield
 - Maximum number of cables routed in parallel in the same cable tray cannot exceed 9.

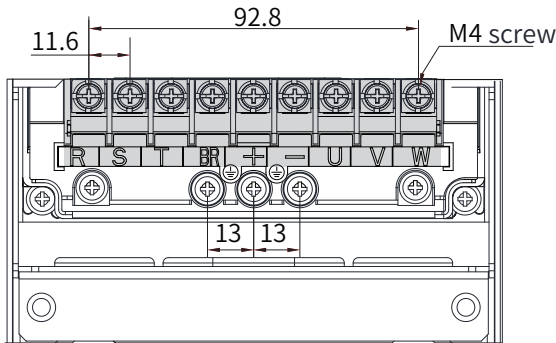


Figure 3-25 MD880-01S-0012-4-B-SG/MD880-01S-0017-4-B-SG

Table 3-2 Recommended main circuit cable selection for MD880-01S-0012-4-B-SG/MD880-01S-0017-4-B-SG

AC Drive Model	Rated Current (A)	Input/Output Power Cable (mm ²)	Cable lug	Grounding Cable (mm ²)	Model of the grounding cable lug	Torque of torque driver (N·m)
MD880-01S-0012-4-B-SG	12.0	3 x 2.5	TVS 3.5-4	2.5	TVS 3.5-4	1.2
MD880-01S-0017-4-B-SG	17.0	3 x 4	TVR 5.5-5	4	TVR 5.5-5	1.2

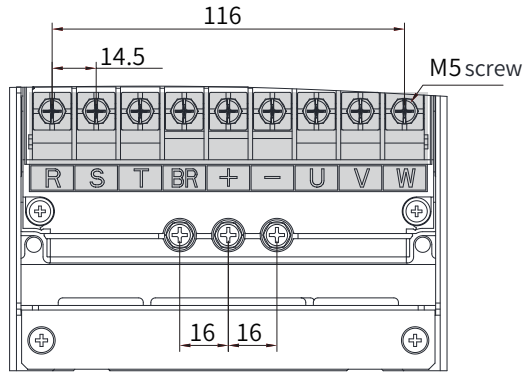


Figure 3-26 MD880-01S-0024-4-B-SG/MD880-01S-0033-4-B-SG

Table 3-3 Recommended main circuit cable selection for MD880-01S-0024-4-B-SG/MD880-01S-0033-4-B-SG

AC Drive Model	Rated Current (A)	Input/Output Power Cable (mm ²)	Cable lug	Grounding Cable (mm ²)	Model of the grounding cable lug	Torque of torque driver (N·m)
MD880-01S-0024-4-B-SG	24.0	3 x 4	TVR 5.5-5	4	TVR 5.5-5	2.5
MD880-01S-0033-4-B-SG	33.0	3 x 6	GTNR 6-5	6	GTNR 6-5	2.5

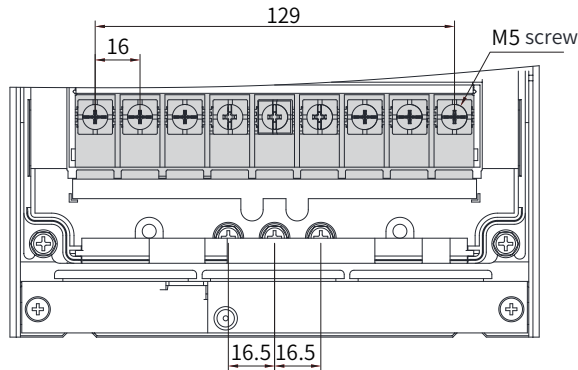


Figure 3-27 MD880-01S-0038-4-B-SG

Table 3-4 Recommended main circuit cable selection of MD880-01S-0038-4-B-SG

AC Drive Model	Rated Current (A)	Input/Output Power Cable (mm ²)	Cable lug	Grounding Cable (mm ²)	Model of the grounding cable lug	Torque of torque driver (N·m)
MD880-01S-0038-4-B-SG	38.0	3 x 10	GTNR 10-6	10	GTNR10-6	2.5

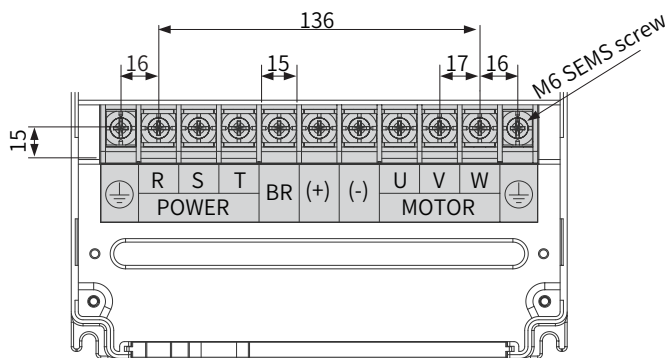


Figure 3-28 MD880-01S-0048-4-B-SG/MD880-01S-0060-4-B-SG

Table 3-5 Recommended main circuit cable selection for MD880-01S-0048-4-B-SG/MD880-01S-0060-4-B-SG

AC Drive Model	Rated Current (A)	Input/ Output Power Cable (mm ²)	Cable lug	Grounding Cable (mm ²)	Model of the grounding cable lug	Torque of torque driver (N·m)
MD880-01S-0048-4-B-SG	48	3 x 10	GTNR16-6	10	GTNR10-6	4.0
MD880-01S-0060-4-B-SG	60	3 x 16	GTNR16-6	16	GTNR16-6	4.0

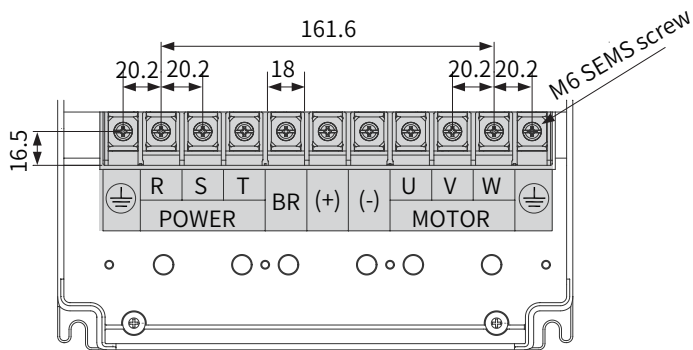


Figure 3-29 MD880-01S-0078-4-B-SG/MD880-01S-0094-4-B-SG

Table 3-6 Recommended main circuit cable selection for MD880-01S-0078-4-B-SG/MD880-01S-0094-4-B-SG

AC Drive Model	Rated Current (A)	Input/Output Power Cable (mm ²)	Cable lug	Grounding Cable (mm ²)	Model of the grounding cable lug	Torque of torque driver (N·m)
MD880-01S-0078-4-B-SG	78	3 x 16	GTNR16-6	16	GTNR16-6	4.0
MD880-01S-0094-4-B-SG	94	3 x 16	GTNR16-6	16	GTNR16-6	4.0

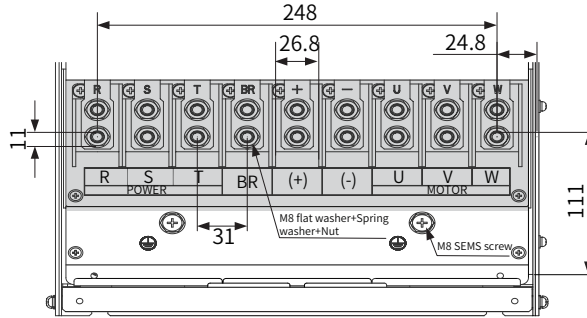


Figure 3-30 MD880-01S-0116-4-B-SG/MD880-01S-0149-4-B-SG

Table 3-7 Recommended main circuit cable selection for MD880-01S-0116-4-B-SG/MD880-01S-0149-4-B-SG

AC Drive Model	Rated Current (A)	Input/Output Power Cable (mm ²)	Cable lug	Grounding Cable (mm ²)	Model of the grounding cable lug	Torque of torque driver (N · m)
MD880-01S-0116-4-B-SG	116	3 x 25	GTNR25-8	25	GTNR25-8	10.5
MD880-01S-0149-4-B-SG	149	3 x 50	GTNR50-8	25	GTNR25-8	10.5

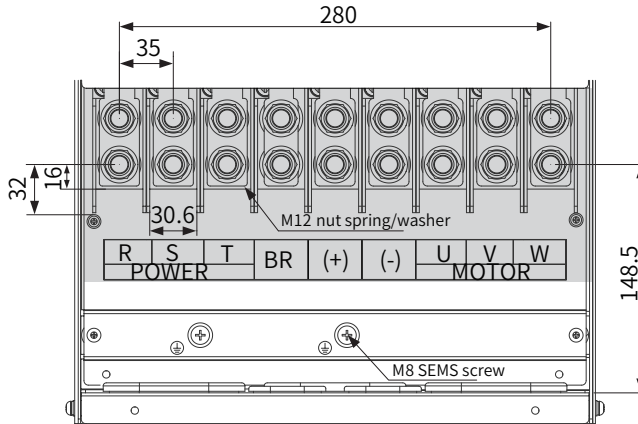


Figure 3-31 MD880-01S-0183-4-B-SG/MD880-01S-0217-4-SG/MD880-01S-0262-4-SG

Table 3-8 Recommended main circuit cable selection for MD880-01S-0183-4-B-SG/MD880-01S-0217-4-SG/MD880-01S-0262-4-SG

AC Drive Model	Rated Current (A)	Input/Output Power Cable (mm ²)	Cable lug	Grounding Cable (mm ²)	Model of the grounding cable lug	Torque of torque driver (N · m)
MD880-01S-0183-4-B-SG	183	3 x 70	GTNR70-12	35	GTNR35-12	35.0
MD880-01S-0217-4-SG	217	3 x 95	GTNR95-12	50	GTNR50-12	35.0

MD880-01S-0262-4-SG	262	3 x 120	GTNR120-12	70	GTNR70-12	35.0
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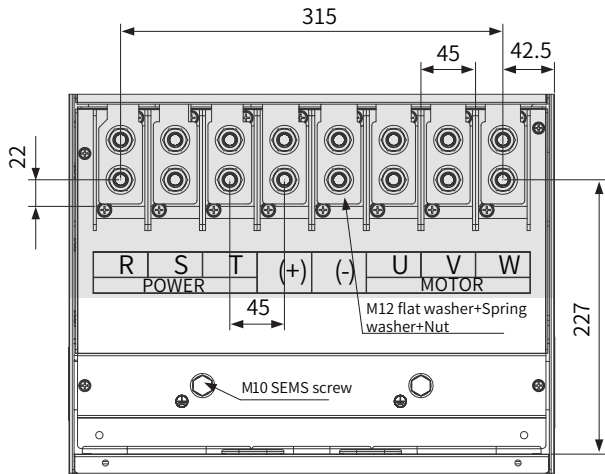


Figure 3-32 MD880-01S-0314-4-SG/MD880-01S-0383-4-SG

Table 3-9 Recommended main circuit cable selection for MD880-01S-0314-4-SG/MD880-01S-0383-4-SG

AC Drive Model	Rated Current (A)	Input/Output Power Cable (mm ²)	Cable lug	Grounding Cable (mm ²)	Model of the grounding cable lug	Torque of torque driver (N·m)
MD880-01S-0314-4-SG	314	3 x 150	BC150-12	95	BC95-12	35.0
MD880-01S-0383-4-SG	383	3 x 185	BC185-12	95	BC95-12	35.0

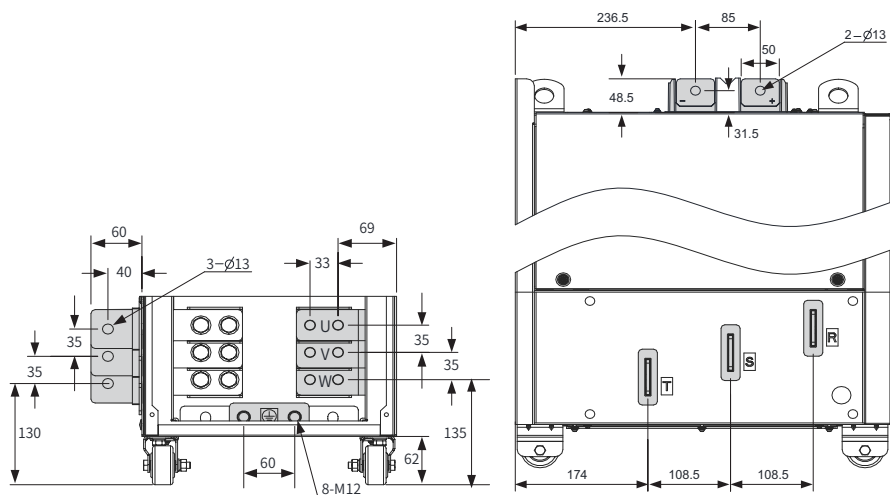


Figure 3-33 Main circuit terminal dimensions of MD880-01S-0441-4-SG/MD880-01S-0481-4-SG (without output reactors)

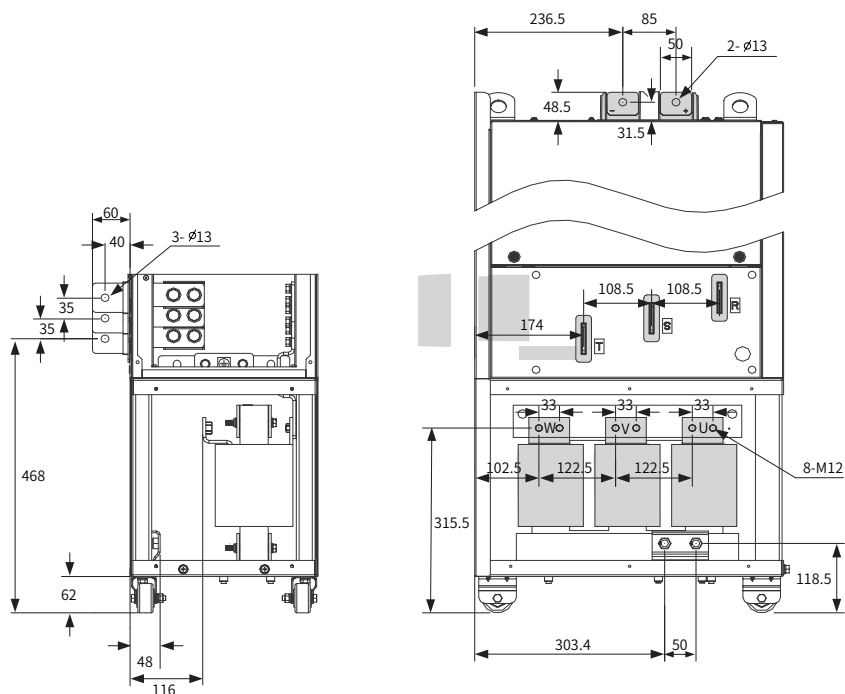


Figure 3-34 Main circuit terminal dimensions of MD880-01S-0441-4-L-SG/MD880-01S-0481-4-L-SG (with output reactors)

In the preceding figure, the side terminal block can be removed if necessary.
Dimensions of main circuit terminals without the side terminal block are shown below.

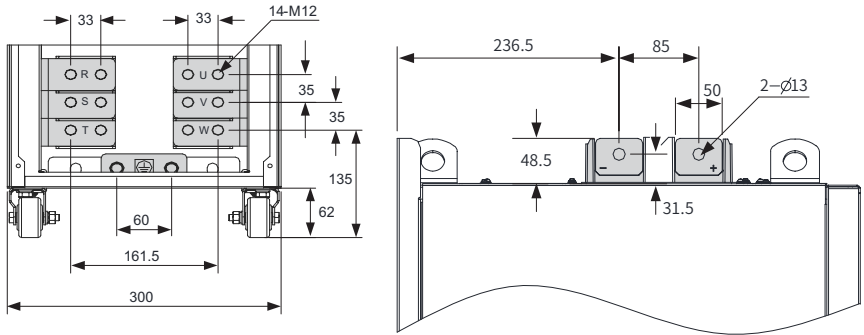


Figure 3-35 Main circuit terminal dimensions of MD880-01S-0441-4-SG/MD880-01S-0481-4-SG (without side terminal block or output reactor)

Table 3-10 Recommended main circuit cable selection for MD880-01S-0441-4-L-SG/MD880-01S-0481-4-L-SG

AC Drive Model	Rated Current (A)	Input/Output Power Cable (mm ²)	Cable lug	Grounding Cable (mm ²)	Model of the grounding cable lug	Torque of torque driver (N·m)
MD880-01S-0441-4-L-SG	441	2 x (3 x 95)	BC95-12	95	BC95-12	35.0
MD880-01S-0481-4-L-SG	481	2 x (3 x 120)	BC120-12	120	BC120-12	35.0

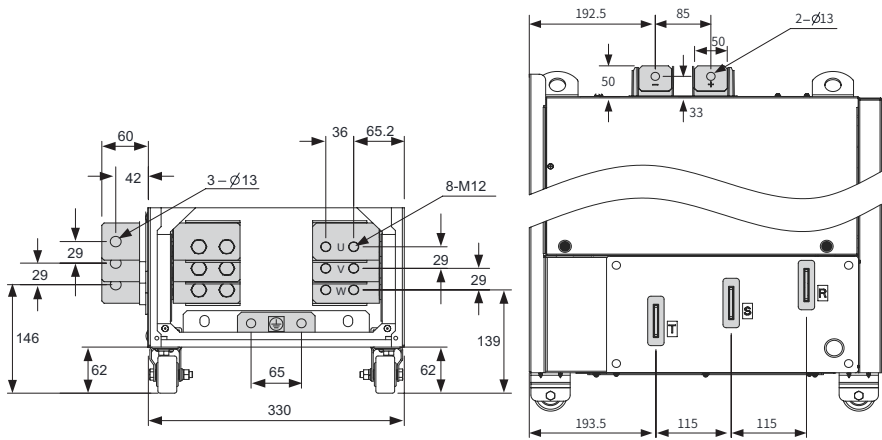


Figure 3-36 Main circuit terminal dimensions of MD880-01S-0538-4-SG/MD880-01S-0605-4-SG (without output reactor)

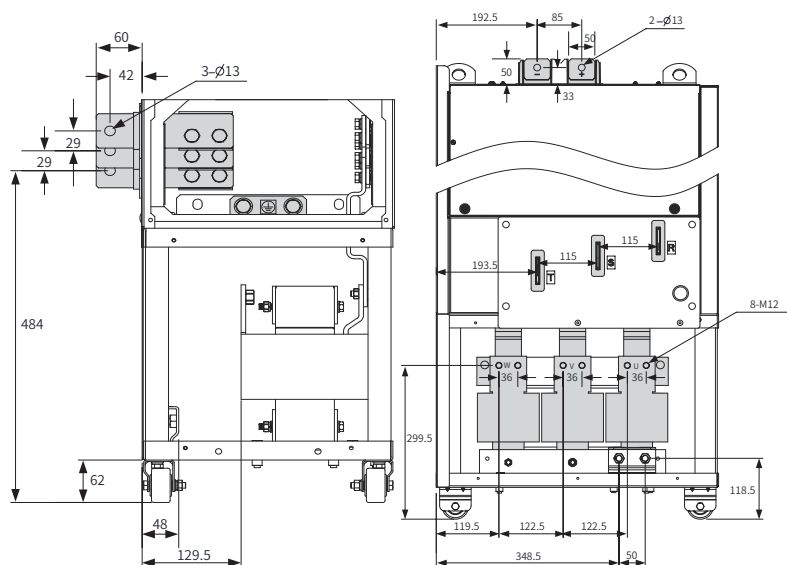


Figure 3-37 Main circuit terminal dimensions of MD880-01S-0538-4-L-SG/MD880-01S-0605-4-L-SG (with output reactor)

In the preceding figure, the side terminal block can be removed if necessary. Dimensions of main circuit terminals without the side terminal block are shown below.

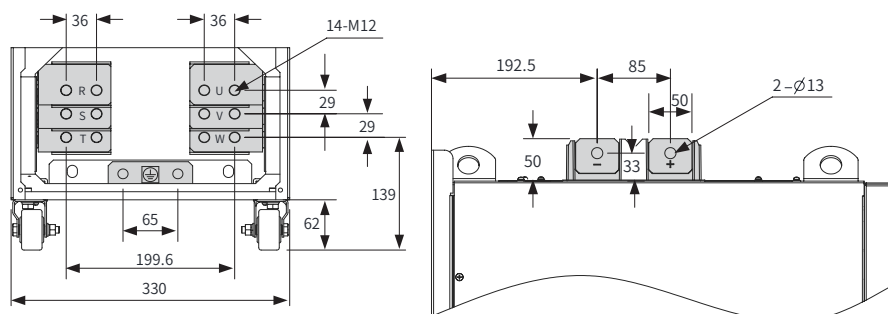


Figure 3-38 Main circuit terminal dimensions of MD880-01S-0538-4-SG/MD880-01S-0605-4-SG (without side busbar or output reactor)

Table 3-11 Recommended main circuit cable selection for MD880-01S-0538-4-L-SG/MD880-01S-0605-4-L-SG

AC Drive Model	Rated Current (A)	Input/Output Power Cable (mm ²)	Cable lug	Grounding Cable (mm ²)	Model of the grounding cable lug	Torque of torque driver (N·m)
MD880-01S-0538-4-L-SG	538	2 x (3 x 120)	BC120-12	120	BC120-12	35.0

MD880-01S-0605-4-L-SG	605	2 x (3 x 150)	BC150-12	150	BC150-12	35.0
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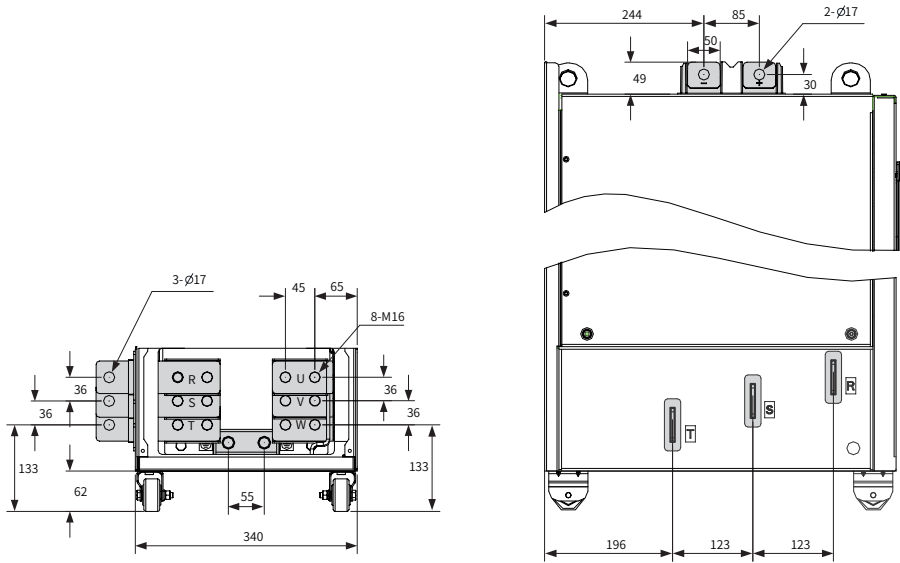


Figure 3-39 Main circuit terminal dimensions of MD880-01S-0673-4-SG to MD880-01S-0849-4-SG (without output reactor)

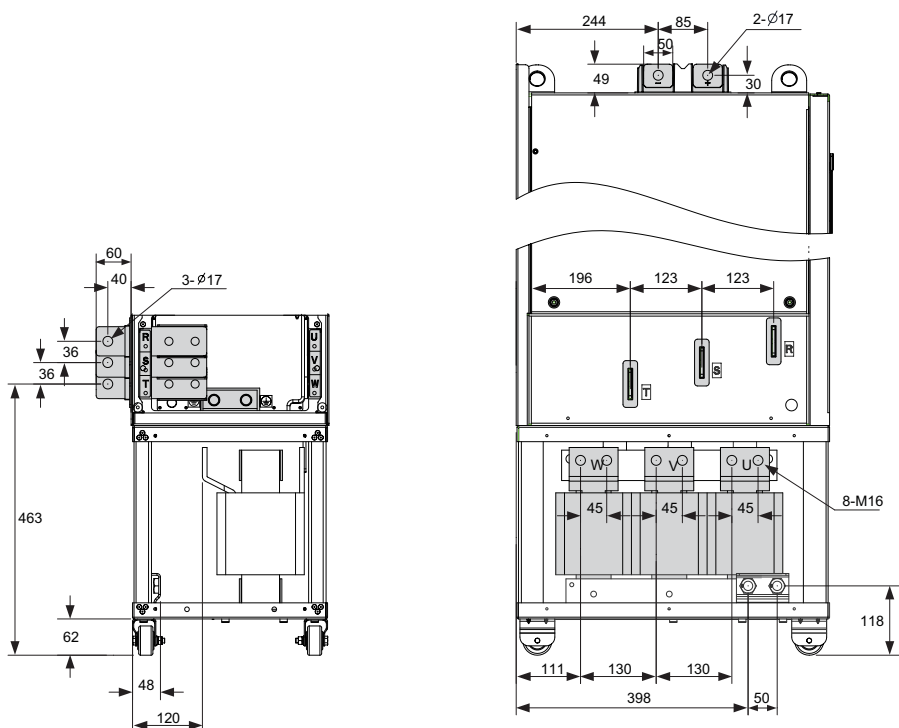


Figure 3-40 Main circuit terminal dimensions of MD880-01S-0673-4-L-SG to MD880-01S-0849-4-L-SG (with output reactor)

In the preceding figure, the side terminal block can be removed if necessary.

Dimensions of main circuit terminals without the side terminal block are shown below.

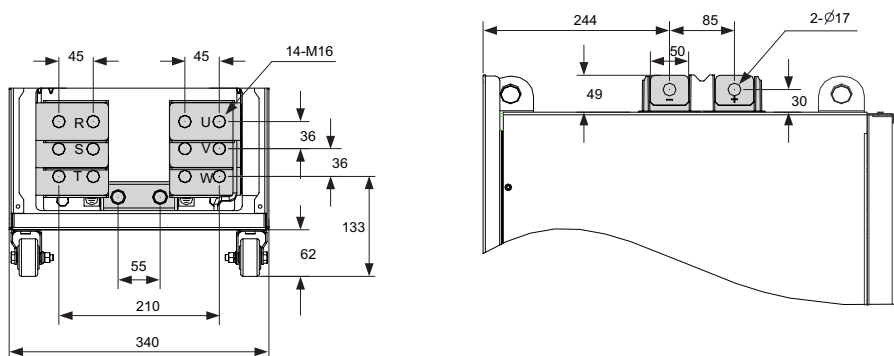


Figure 3-41 Main circuit terminal dimensions of MD880-01S-0673-4-SG to MD880-01S-0849-4-SG (without side busbar or output reactor)

Table 3-12 Recommended main circuit cable selection for MD880-01S-0673-4-L-SG/MD880-01S-0751-4-L-SG/MD880-01S-0849-4-L-SG

AC Drive Model	Rated Current (A)	Input/Output Power Cable (mm ²)	Cable lug	Grounding Cable (mm ²)	Model of the grounding cable lug	Torque of torque driver (N·m)
MD880-01S-0673-4-L-SG	673	2 x (3 x 185)	BC185-16	185	BC185-16	85.0
MD880-01S-0751-4-L-SG	751	2 x (3 x 185)	BC185-16	185	BC185-16	85.0
MD880-01S-0849-4-L-SG	849	2 x (3 x 240)	BC240-16	240	BC240-16	85.0

3.6 Wiring Checklist

Table 3-13 Wiring checklist

No.	Description	Checked
1	The AC drive model is consistent with that on the order.	☐
2	The peripherals (braking components, AC reactor, filter, and circuit breaker) meet the requirements.	☐
3	The installation method and location of the AC drive meet the requirements.	☐
4	The AC drive input voltage is within the range of 323 V to 528 V.	☐
5	The rated motor voltage is consistent with the AC drive output voltage.	☐
6	The power input cables are connected to R, S, and T terminals.	☐
7	The motor cable is connected to the U, V, and W terminals.	☐
8	The cross-sectional area of the main circuit cable meet the requirements.	☐
9	Heat-shrink tube is applied to the copper lug and conductors of the main circuit cable. The cable conductor is fully covered by the heat-shrink tube.	☐
10	Check whether the motor output cable exceeds 50 m. If yes, reduce the carrier frequency.	☐
11	The grounding cable is correctly connected.	☐
12	The drive output terminals are secured properly.	☐
13	The braking resistor and braking unit (if used) are correctly connected. The resistance is proper.	☐
14	The control circuit cables are shielded twisted pair cables.	☐
15	The optional cards are connected correctly.	☐
16	The control circuit cables and main circuit cables are routed through different routes.	☐

4 HCU Control Module

MD880 series AC drives can work with HCU-50S-CS and HCU-51S-CS control modules.

Inverter control module	Communication method	Applicable AC drive	Installation mode
HCU-50S-CS	Communicated through high-speed optical fiber	T10 to T12	Installed separately inside an auxiliary control cabinet.
HCU-51S-CS	Communicated through high-speed RS422	T2 to T9	Installed on the AC drive.

The HCU-50S-CS control module must be supplied with an external 24 VDC power supply. The HCU-51S-CS control module carries an internal 24 V power supply. Multiple isolated power supplies are available inside the HCU, providing the isolated digital power supply, InoLink RS485 isolated power supply, and SOP-20-880 power supply, as well as function modules installed in the HCU expansion slot.

4.1 Components of HCU Control Module

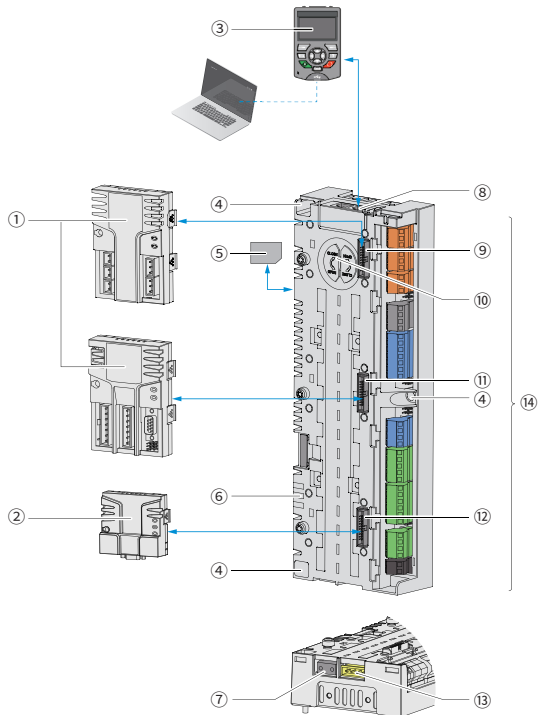


Figure 4-1 HCU control module

Table 4-1 Descriptions of HCU components

Mark	Name	Function
①	Function module size 1	105X73x24 (mm) function modules
②	Function module size 2	75X73x24 (mm) function modules
③	Smart operating panel	Smart operating panel SOP-20-880
④	Fixing hole	Three holes for fixing the HCU
⑤	SD card	8 GB micro SD memory card, which can be flexibly inserted and removed
⑥	Indicator	Power, Run and Fault indicators
⑦	Optical fiber for communication	Optical fiber communication interface between the HCU-50S-CS and the drive
⑧	Smart operating panel (SOP) terminal	Terminal between HCU and SOP-20-880 (The two RJ45 ports are identical and easy to be cascaded.)
⑨	SLOT1	Function module interfaces: SLOT1_1, SLOT1_2, and SLOT1_3
⑩	Battery replacement cover	Spare RTC battery cover (The RTC battery is non-rechargeable lithium battery which must be replaced regularly.)
⑪	SLOT2	Function module interfaces: SLOT2_1, SLOT2_2, and SLOT2_3
⑫	SLOT3	Function module interface: SLOT3_1
⑬	STO port	Safe torque interrupt input (determined based on the actual model)
⑭	DB15 terminal	HCU-51S-CS and AC drive communication terminal

**NOTE**

- ◆ Function modules are directly installed in SLOT1, SLOT2, and SLOT3 (The addresses are SLOT1_1, SLOT2_, and SLOT3_1.)
- ◆ SLOT1 and SLOT2 can be used with the HOFM-30 and HESD-10 modules to achieve slot expansion.
- ◆ SLOT3 does not support slot expansion.

4.2 Standard Terminals

Table 4-2 Description of standard HCU terminals

Name	Description	Function
Input power supply	XPWR: 24VI	HCU power supply
Digital power supply output	XDPWR: 24VD	Digital output power supply that isolated from XPWR
Digital input	XDI: DI1–DI6, DIL	Input type: relay contact, NPN or PNP
High-speed digital input	XHDIO: HDI1, HDI2	Input type: NPN or PNP

Name	Description	Function
High-speed digital output	XHDIO: HDO1, HDO2	Output type: open collector
Analog output	XAO: AO1, AO2	Output type: current or voltage, selected by jumper
Analog input	XAI: AI1, AI2	Input type: current or voltage, selected by jumper
Relay output	XRO1, XRO2, XRO3	Relay output: NO, NC and COM No NC contact for XRO3 of single drive
InoLink communication	XCOMM	High speed RS485, termination resistor selected by jumper
RJ45 terminal	X11, X12	For communication with the SOP-20-880 (Both terminals are identical for cascading of multiple HCUs; connection cable < 3 m)

4.3 Dimensions and Installation Instructions of HCU

4.3.1 Installation Precautions


DANGER



- ◆ Before installing or removing the HCU, the cabinet must be powered off for more than 15 minutes. The HCU input power supply must be disconnected to avoid damage to the HCU control module caused by live installation or removal.
- ◆ When installing or removing a function module on the HCU, ensure that the HCU input power supply has been disconnected to avoid damage to the HCU or function module caused by live installation or removal.
- ◆ Protect the HCU module from falling or shock to avoid damage to the module.
- ◆ Do not disassemble the HCU module, otherwise the module may be damaged.
- ◆ Do not fasten with excessive tightening torque to avoid damage to the terminal.

- Installation tools
 - 1# Phillips screwdriver
- Tightening torque

The following tightening torques apply to the screws used for installing the HCU.

Screw	Tightening Torque
M3	0.55 N·m

4.3.2 Dimensions of HCU

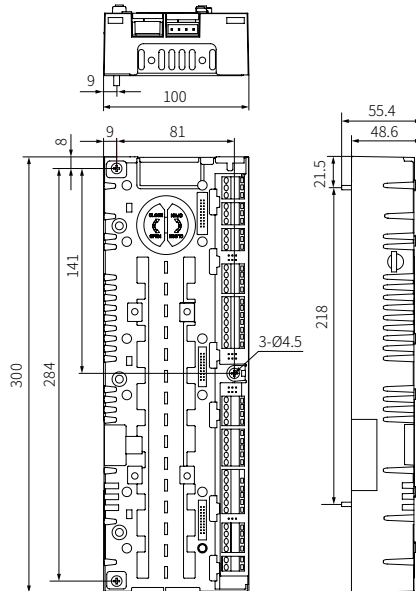


Figure 4-2 Dimensions of the HCU (unit: mm)

4.3.3 Requirements for Mounting Clearance

To install the HCU, certain clearance must be reserved as shown below. The HCU must be mounted on a conductive metal surface, with the entire conductive bottom of the HCU kept in good contact with the mounting surface.

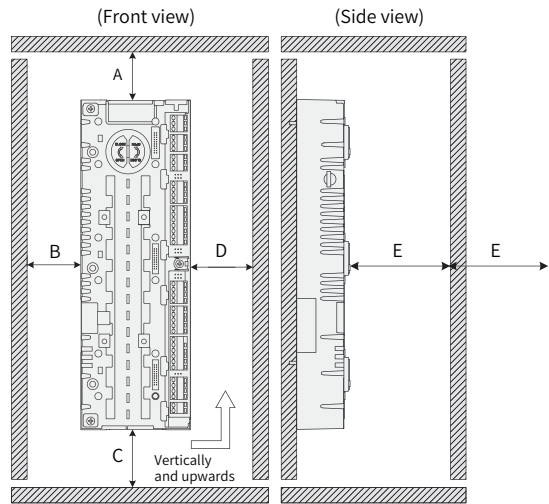


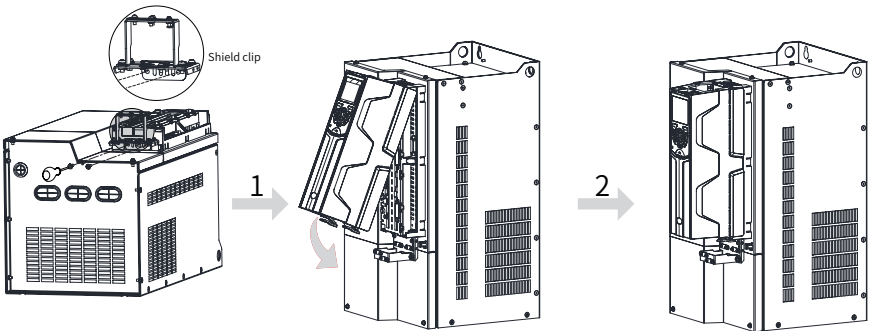
Figure 4-3 Installation clearance (unit: mm)

Table 4-3 Installation clearance (unit: mm)

A	B	C	D	E
≥ 100	≥ 30	≥ 100	≥ 50	≥ 100

4.3.4 Installation Procedure of HCU

■ Installing the HCU for T2 to T9 drives



- 1) For T2 to T9 drives, the HCU has been installed on the AC drive. You need to install the shielding clip on the HCU using M4 x 10 screws.
- 2) Install the HCU cover.

■ Installing the HCU for T10 to T12 drives

- 1) Align the HCU vertically with the two positioning holes on the metal mounting plate.

- 2) Tighten the HCU mounting screws with a 1# Phillips screwdriver (three M4 screws are already fixed in the HCU) as shown below.

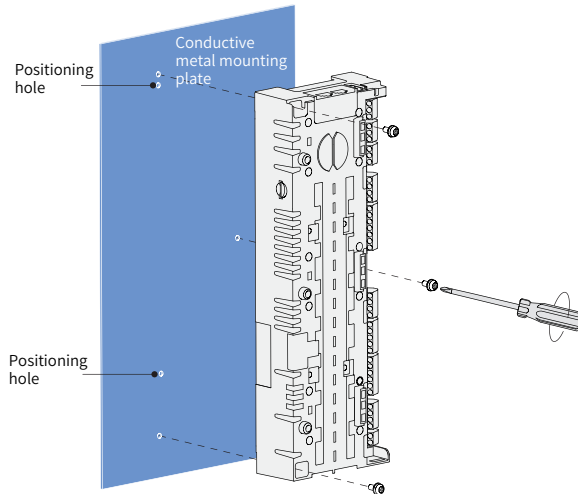


Figure 4-4 Installing the HCU

■ Grounding inside the cabinet

The mounting plate of the HCU must be a bare metal plate and reliably grounded.

The HCU enclosure is grounded to the cabinet enclosure through the screws on the mounting surface.

4.4 Function Module

The HCU can be used with other function modules to expand its functions. See the following for details.

Table 4-4 Function modules used with HCU

Name	Module model	Function	Connection method	Dimensions (Width x Depth x Height in mm)
Encoder detection module	HPG-10	HTL incremental differential, single-ended, OC or OE encoder detection, frequency-division output	SLOT	105 x 73 x 24
	HPG-40	Resolver encoder signal detection	SLOT	105 x 73 x 24
	HPG-50	TTL incremental OC or differential encoder detection and frequency-division output	SLOT	105 x 73 x 24

Name	Module model	Function	Connection method	Dimensions (Width x Depth x Height in mm)
I/O module	HIO-10	Two AIs Two AOs Two DIOS One relay output	SLOT	105 x 73 x 24
PROFIBUS-DP module	HDP-10	PROFIBUS-DP bus adaption	SLOT	75 x 73 x 24
CANbus module	HCAN-10	CANopen bus adaption	SLOT	75 x 73 x 24
	HCAN-30	CAN 2.0 bus adaption	SLOT	75 x 73 x 24
Optical fiber expansion module	HOFM-10	One pair of 50 M optical fibers	SLOT	75 x 73 x 24
	HOFM-30	Three pairs of 50 M optical fibers	SLOT	75 x 73 x 24
Modbus RTU module	HMBA-10	Modbus RTU bus adaption	SLOT	75 x 73 x 24
EtherNet module	HETN-10	Ethernet commissioning module	SLOT	75 x 73 x 24
Profinet I/O module	HPFN-10	Profinet I/O industrial Ethernet adaption	SLOT	75 x 73 x 24
	HPFN-20	Profinet I/O industrial Ethernet adaption (IRT supported)	SLOT	75 x 73 x 24
Modbus TCP module	HMBT-10	Modbus TCP industrial Ethernet adaption	SLOT	75 x 73 x 24
Function expansion module	HESD-10	Expansion of one slot	Optical fiber	105 x 75 x 70
Smart operating panel	SOP-20-880	HMI	Network cable	150 x 100 x 30

**NOTE**

- ◆ The HOFM-30 can only be installed in SLOT1 or SLOT2.
- ◆ HDP-10 is recommended to be installed in SLOT3.

4.5 LED Indicators

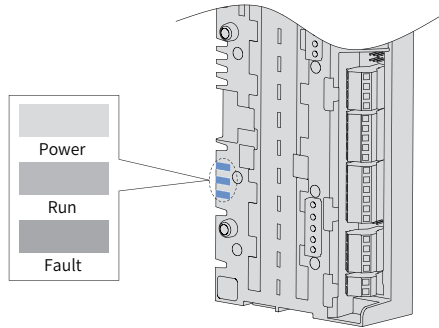


Figure 4-5 Location and Definition of LED indicators

Table 4-5 Description

No.	Name	Status	Description
1	Power	Steady ON	The HCU power supply is normal.
		OFF	HCU is not energized or the power supply has failed.
2	Run	Steady ON	The AC drive is running.
		OFF	The AC drive has stopped.
3	Fault	Steady ON	System fault
		OFF	The system is normal.
		Flashing	The HCU auxiliary power supply has failed. Check 24VD power supplies for short circuit or overload.
4	Fault, Run	Flashing simultaneously	This HCU is selected by PC or SOP-20-880, which ends after 10 seconds.

4.6 SD Memory Card

The HCU is internally equipped with a SD card for saving real-time data of the control module to assist in monitoring and analyzing the AC drive. The data is saved on a microSD memory card and analyzed by a qualified service technician.

4.7 Overview of HCU Interfaces

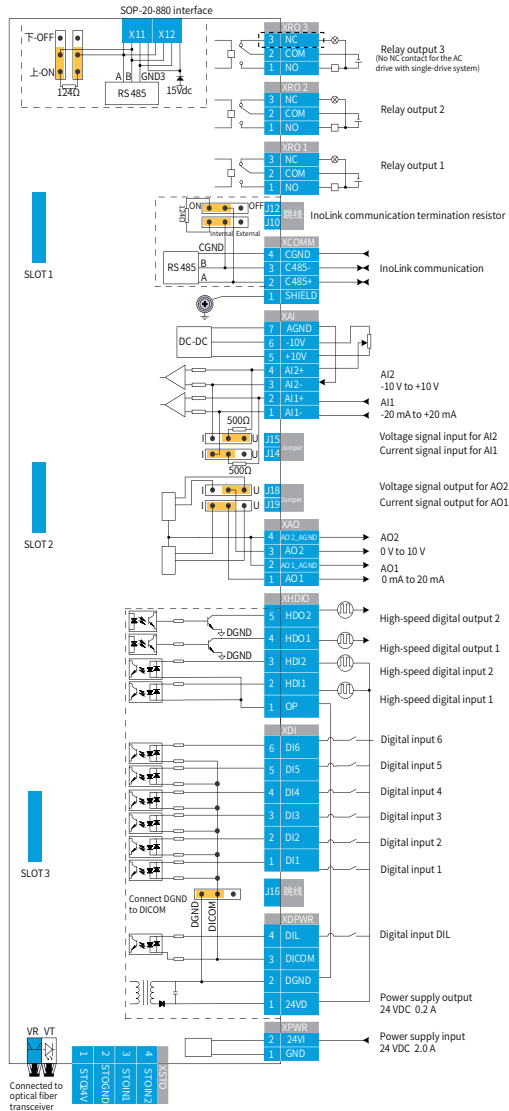
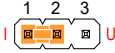
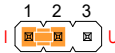
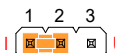


Figure 4-6 Overview of HCU interface circuits

Table 4-6 Description of HCU control module Interfaces

Interface	Name	Function	Cable specifications
XPWR: Input power supply interface			

Interface	Name	Function	Cable specifications
1	GND	24.0 V±10% 2.0 A	Dual-conductor twisted pair cables are recommended. Cross sectional area: 0.5–2.5 mm ²
2	24VI		
XDPWR: DIL terminal			
1	24VD	Power supply for DI, HDI and HDO 24.0 V±10% 0.2 A	Twisted pairs, single-conductor cables Cross sectional area: 0.5–2.5 mm ² Note: Do not exceed 0.2 A for 24 VDC.
2	DGND	24VD ground	
3	DICOM	DI common output, which can be connected to DGND through jumper J16	
4	DIL	Digital interlock or common DI with technical indicators same as common DIs	
Jumper J16: power supply selection			
1 2 3  Shorting DGND and DICOM allows DIs to be powered up by 24VD internal power supply.			
1 2 3  Disconnecting DGND from DICOM allows DIs to be powered up by an external power supply.			
XDI: DI terminal			
1	DI1	24 V logic level: "0" < 5 V; "1" > 15 V Rin: 2.0 kΩ Input type: NPN/PNP, relay contact Hardware filter: 0.04 ms Imax: 15 mA	Single-conductor cable Cross sectional area: 0.5–2.5 mm ²
2	DI2		
3	DI3		
4	DI4		
5	DI5		
6	DI6		
XHDIO: HDIO input terminal			
1	OP	HDI common terminal	Cross sectional area: 0.5–2.5 mm ² Shielded twisted pairs are recommended. HDO and DGND twisted pair HDI and OP twisted pair
2	HDI1	Input type: NPN, PNP 24 V logic level: "0" < 5 V; "1" > 15 V; Rin: 2.0 kΩ	
3	HDI2	Input voltage range: 0 VDC to 30 VDC Input frequency range: 0 kHz to 100 kHz HDI max. load: Imax: 15 mA	
4	HDO1	Output type: OC Output frequency range: 0–100 kHz HDO max. load: Imax: 20 mA Output voltage range: 0 VDC to 26.4 VDC	
5	HDO2		
XAO: AO terminal			

Interface	Name	Function	Cable specifications
1	AO1	AO1 output range: 0 mA to 20 mA, $R_{load} \leq 500 \Omega$	Cross sectional area: 0.5–2.5 mm ² Shielded twisted pairs are recommended. AO1 and AO1_AGND twisted pair AO2 and AO2_AGND twisted pair
2	AO1_ AGND	0 V to 10 V, $R_{load} \geq 10 \text{ k}\Omega$	
3	AO2	AO2 output range: 0 mA to 20 mA, $R_{load} \leq 500 \Omega$	
4	AO2_ AGND	0 V to 10 V, $R_{load} \geq 10 \text{ k}\Omega$ Resolution: 11 bit + sign bit Accuracy: 2% full range	
Jumper J19: AO1 current and voltage signal selection			
 AO1 current signal output applies when pins 1 and 2 are shorted.			
 AO1 voltage signal output applies when pins 2 and 3 are shorted.			
Jumper J18: AO2 current and voltage signal selection			
 AO2 current signal output applies when pins 1 and 2 are shorted.			
 AO2 voltage signal output applies when pins 2 and 3 are shorted.			
XAI: AI terminal			
1	AI1-	Current input: -20 mA to +20mA, $R_{in}: 500 \Omega$ Voltage input: -10 V to +10 V, $R_{in}: 200 \text{ k}\Omega$ Differential input, with input range $\pm 30 \text{ V}$ Sampling interval per channel: 0.25 ms Hardware filter: 0.25 ms Resolution: 11 bit + sign bit Accuracy: 1% of full range	Cross sectional area: 0.5–2.5 mm ² Use two dual-conductor shielded twisted pair cables when using two AIs. Use one quad-conductor shielded twisted pair cable for one AI under the reference voltage.
2	AI1+		
3	AI2-		
4	AI2+		
5	+10 V	+10 V: +10 V $\pm 1\%$	
6	-10 V	-10 V: -10 V $\pm 1\%$	
7	AGND	$R_{load} 1\text{--}10 \text{ k}\Omega$	
Jumper J14: AI1 current or voltage signal Input selection			
 AI1 current signal input applies when pins 1 and 2 are shorted.			
 AI1 voltage signal input applies when pins 2 and 3 are shorted.			
Jumper J15: AI2 current and voltage signal selection			
 AI2 current signal input applies when pins 1 and 2 are shorted.			
 AI2 voltage signal input applies when pins 2 and 3 are shorted.			
XCOMM: InoLink RS485 terminal			

Interface	Name	Function	Cable specifications
1	Shield	RS485 bus, 5 V standard level	Quad-conductor shielded twisted pair cable Cross sectional area: 0.5–2.5 mm ²
2	C485+	Termination resistor of the bus: 124 Ω	
3	C485-	Max. communication speed: 5 Mbps	
4	CGND	Max. number of nodes: 16 (without repeater) Max. transmission distance: 40 m	
Jumpers J10 and J12: RS485 termination resistor selection (J10 and J12 must be in the same status.)			
1 2 3  Connect the termination resistor by shorting 1 and 2.			
1 2 3  Disconnect the termination resistor by shorting 2 and 3.			
XRO1: output terminal of relay 1			
1	RO1_NO	Output type: passive NO and NC contacts Contact specifications: 250 VAC/30 VDC, 2 A	Single-conductor cable Cross sectional area: 0.5–2.5 mm ²
2	RO1_COM		
3	RO1_NC		
XRO2: output terminal of relay 2			
1	RO2_NO	Output type: passive NO and NC contacts Contact specifications: 250 VAC/30 VDC, 2 A	Single-conductor cable Cross sectional area: 0.5–2.5 mm ²
2	RO2_COM		
3	RO2_NC		
XRO3: output terminal of relay 3			
1	RO3_NO	Output type: passive NO and NC contacts Contact specifications: 250 VAC/30 VDC, 2 A No NC contact for XRO3 of the AC drive with single-drive system	Single-conductor cable Cross sectional area: 0.5–2.5 mm ²
2	RO3_COM		
3	RO3_NC		
X11, X12: PC or SOP-20-880 RS485 communication terminal			
1, 2, 7	NC	RS485 bus, 5 V standard level	Standard network cable
3, 8	GND3	Termination resistor of the bus: 124 Ω	
4	A	Max. communication speed: 4 Mbps	
5	B	Max. number of nodes: 32 (without repeater)	
6	15V3	Max. transmission distance: 100 m	
Jumpers J12 and J15: termination resistor selection (J12 and J15 must be in the same status.)			
1 2 3  Connect the termination resistor by shorting 1 and 2.			
1 2 3  Disconnect the termination resistor by shorting 2 and 3.			

Interface	Name	Function	Cable specifications
VR, VT: transceiver			
1	VR	Receives optical fiber communication signals.	Optical fiber type: plastic optical fiber (POF)
2	VT	Transmits optical fiber communication signals.	

4.8 HCU Function Application

4.8.1 SLOT Expansion

- Different function modules are available in the HCU application. The function modules are installed directly in the slots of the HCU.
- The HCU only has three SLOT slots. When more modules are needed, install HOFM and HESD expansion modules. Each HESD can be expanded with one function module.

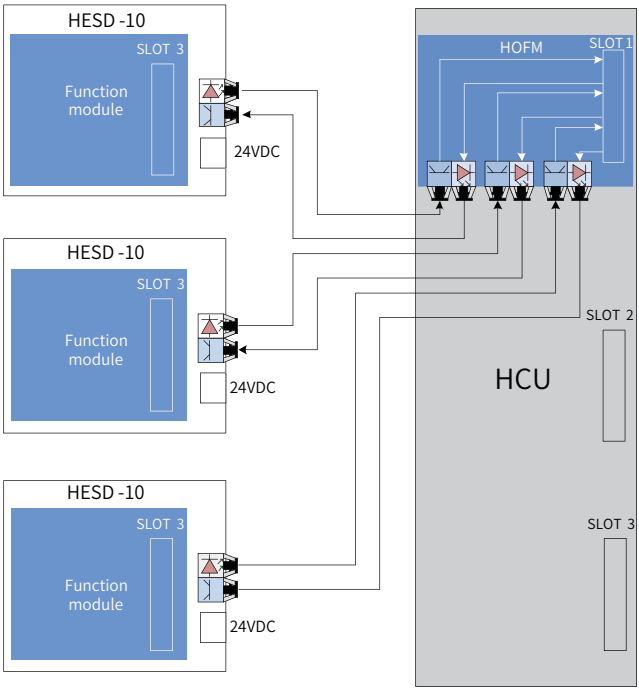


Figure 4-7 HESD wiring example

**NOTE**

- ◆ Functional modules can be directly installed in SLOT1, SLOT2 and SLOT3. The addresses are: SLOT1_1, SLOT2_1, SLOT3_1:
- ◆ The SLOT1 and SLOT2 slots can be used with the HOFM-30 module to achieve expansion of three slots. The addresses are SLOT1_1, SLOT1_2, SLOT1_3 and SLOT2_1, SLOT2_2, SLOT2_3.
- ◆ SLOT3 does not support slot expansion.
- ◆ In this case, the HESD module is not allowed to install another HOFM optical fiber expansion module.

4.8.2 Temperature Measurement with AI and AO

AI and AO, which can be used together to detect the PT100 temperature sensor signal, are generally used for motor temperature detection, with either one PT100 sensor or two and three PT100 sensors connected in series. Select constant current output mode for AOs and voltage signal input mode for AIs. PT1000 and KTY84 temperature sensors are also supported.

Do not directly ground both ends of the cable shield. Directly ground one end and suspend the other end, or directly ground one end and ground the other end through a string capacitor.

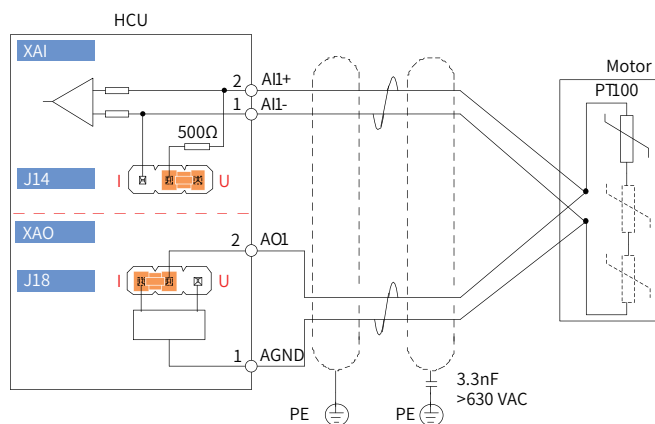


Figure 4-8 Temperature measurement with AI and AO

4.8.3 InoLink Communication Bus

When information exchange is required between several AC drives in the system, use an InoLink bus.

The parameters of the InoLink bus are as follows:

Baud rate: 5 Mbps

Maximum number of nodes: 16

Shielded twisted pair cables must be used for wiring. To achieve the best

communication quality and prevent electromagnetic interference, high quality cables are recommended, such as PROFIBUS cables. Keep the cables as short as possible and the link length not higher than 40 m. Keep the cables away from power cables.

If a HCU is at the end of the InoLink link, it must be equipped with a termination resistor, and the J10 and J12 jumpers must be set to the ON position.

The RS485 link topology of the InoLink bus is as follows:

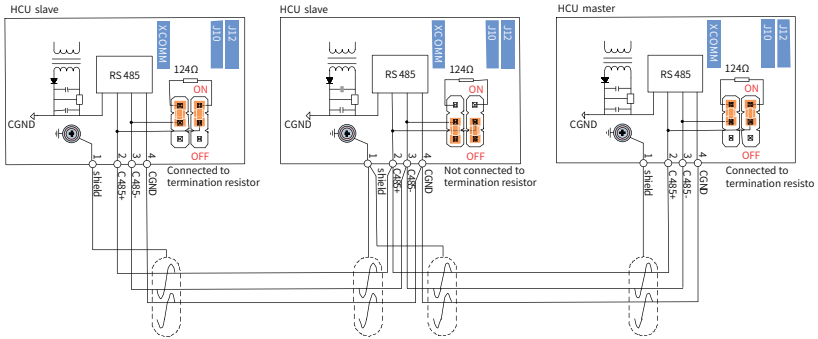


Figure 4-9 Application example

4.8.4 Communication

Case 1: Connection with SOP-20-880

The HCU control module communicates with SOP-20-880 through X11 and X12 terminals and RS485 bus, with one SOP-20-880 as the master, and multiple HCUs as slaves. X11 and X12 are RJ45 terminals with identical pin assignment for cascading.

The SOP-20-880 is the master and the HCU is the slave. The PC can communicate with SOP-20-880 through USB. The far-end HCU on this link must be equipped with a termination resistor.

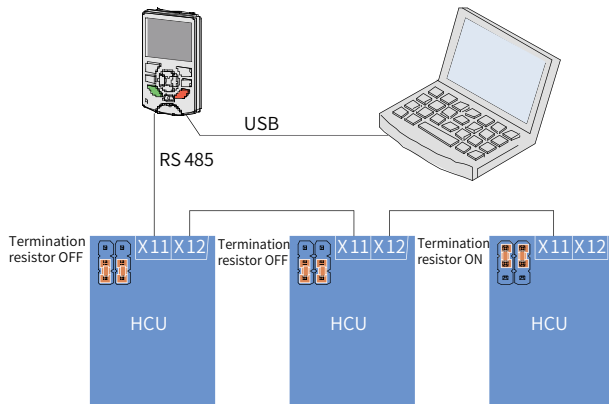


Figure 4-10 Connection with SOP-20-880

Case 2: Commissioning with HGW-10 and data collection principles

The HGW-10 digital gateway module enables centralized drive commissioning and data collection. The basic data path is: AC drive -> Digital gateway -> PC on the user side -> Commissioning software (InoDriveStudio). Remote LAN can be set up using Inovance IOT430DE module or third-party IoT module to enable remote commissioning and maintenance. The following figure shows the typical application topology.

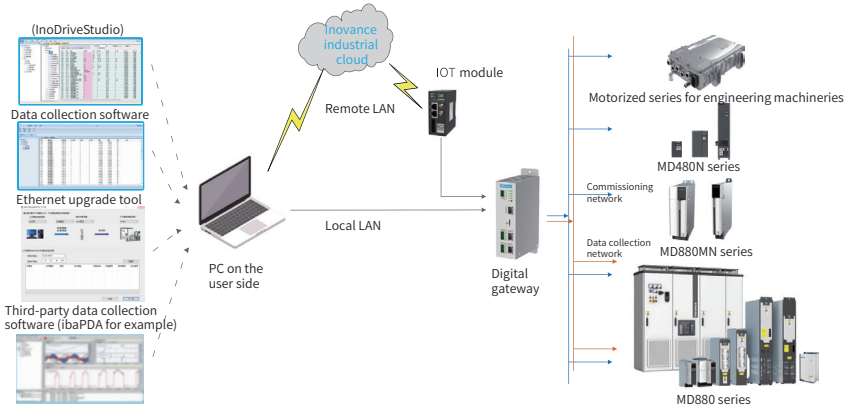


Figure 4-11 Schematic diagram for commissioning with HGW-10 and data collection principles

5 Inspection and Maintenance

5.1 Overview

Before maintenance and repair, read Chapter "Fundamental Safety Instructions" and the safety instructions given in this section. Failure to comply may result in personal injury or equipment damage.

This chapter describes how to perform routine maintenance and regular inspection, as well as how to replace the components of the drive.

5.2 Routine Maintenance

The service life and operation of the components inside the drive is closely related to the ambient temperature, humidity, dust, and vibration. Therefore, it is necessary to carry out routine and regular maintenance for the drive. More frequent maintenance are required if the drive is used in environments subject to the following conditions:

- High ambient temperature
- Frequent start/stop
- AC power supply or load fluctuation
- Strong vibration or impact
- Dust and hydrochloric acid

Check the following items on a daily basis to guarantee normal operation of the drive. It is recommended to make a copy of this checklist and sign the "Checked" column after each inspection.

Item	Content	Solution	Checked
Motor	Check whether unusual vibration or noise exists.	Check whether the mechanical connection is normal. Check whether output phase loss occurs on the motor. Check whether the motor fixing screws are installed securely.	☐
Fan	Check whether the cooling fan of the AC drive and motor work normally.	Check whether the cooling fan of the AC drive works properly. Check whether the cooling fan of the motor works properly. Check whether the ventilation duct is blocked. Check whether the ambient temperature is within the permissible range.	☐
Installation environment	Check whether the cabinet and cable ducts are in good conditions.	Check for insulation damage of input and output cables. Check the mounting bracket for vibration. Check whether terminal blocks and wiring terminals are loosened or corroded.	☐

Item	Content	Solution	Checked
Load	Check whether the operating current of the drive keeps exceeding the rated current of the AC drive and motor.	Check whether motor parameters are set properly. Check whether the motor is overloaded. Check whether the mechanical vibration is severe (> 0.6 g).	☐
Input voltage	Check whether the power supply voltage between the main circuit and control circuit is normal.	Check that the input voltage is within the allowable range (323–528 VAC). Check whether a heavy load is being started around the drive.	☐

5.3 Regular Inspection

5.3.1 Regular Checklist

Always keep the drive clean. Clear the dust especially metal powder on the surface of the drive to prevent dust from entering the drive. Clear greasy dirt from the cooling fan of the drive.

Item	Content	Description	Checked
Controller	Check for waste, dirt and dust on the surface of the controller.	Check whether the cabinet of the drive is powered off. Use a vacuum cleaner to suck up waste and dust to prevent direct contact with the components. Wipe the stubborn surface dirt with alcohol and wait until the surface becomes dry.	☐
Cable	Check whether power cables and the connectors are discolored. Check whether the insulation is aged or cracked.	Replace the cracked cable. Replace the aged or cracked terminal.	☐
Peripherals of the electromagnetic contactor	Check whether the contactor closes improperly or generates unusual noise during closing. Check whether short circuit, water seepage, swelling, or cracking occurs on peripherals.	Replace the abnormal components.	☐

Item	Content	Description	Checked
Air duct	Check whether the air duct and heatsink are blocked. Check whether the fan is damaged.	Clean the air duct. Replace the fan.	☐
Controller	Check for components with poor contact. Check whether terminal screws are connected securely. Check whether the insulation of the control circuit cable is intact without cracking.	Clean up the surface of control circuit cables and terminals. Replace the damaged or corroded control cables.	☐

5.3.2 Insulation Test on the Main Circuit

Before measuring the insulation resistance with a megameter (500 VDC megameter recommended), disconnect the drive from the main circuit. Do not use the insulation resistance meter to test the insulation of the control circuit, as shown in the following figure. The high voltage (> 500 V) test is not required because it has been done before delivery.

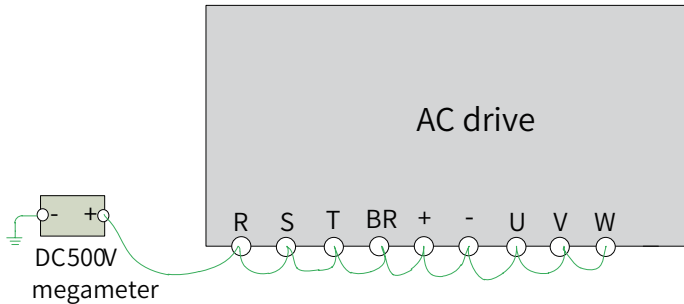


Figure 5-12 Main circuit insulation test

The measured insulation resistance must be greater than 5 MΩ.

Remove the voltage dependent resistor screw before test and disconnect the voltage dependent resistor. For positions of the VDR and safety capacitor (EMC) jumpers, see section 3.5.2 Functions of Main Circuit Terminals.

5.4 Component Replacement

5.4.1 Lifetime of Quick-wear Parts

The quick-wear parts of the drive include the cooling fan and electrolytic capacitor. The service life of such devices is closely related to the operating environment and maintenance conditions. The following table describes the general service life.

Name	Service Life [Note]
Fan	≥ 5 years
Electrolytic capacitor	≥ 5 years

Note: The lifetime is estimated based on the following conditions. You can replace components as needed according to actual operating conditions.

■ Ambient temperature: 40°C

■ Load rate: 80%

■ Operating rate: 24 hours per day

5.4.2 Number of Cooling Fans

Model	Cooling fan
Three-phase 380 V to 480 V, 50/60 Hz	
MD880-01S-0048-4-B-SG	1
MD880-01S-0060-4-B-SG	1
MD880-01S-0078-4-B-SG	1
MD880-01S-0094-4-B-SG	1
MD880-01S-0116-4-B-SG	1
MD880-01S-0149-4-B-SG	1
MD880-01S-0183-4-B-SG	2
MD880-01S-0217-4-SG	2
MD880-01S-0262-4-SG	2
MD880-01S-0314-4-SG	2
MD880-01S-0383-4-SG	2
MD880-01S-0441-4-L-SG	2
MD880-01S-0481-4-L-SG	2
MD880-01S-0538-4-L-SG	3
MD880-01S-0605-4-L-SG	3
MD880-01S-0673-4-L-SG	3
MD880-01S-0751-4-L-SG	3
MD880-01S-0849-4-L-SG	3

5.4.3 Replacing Cooling Fans

Item	Description
Possible cause	Bearing worn out, blade aging
Criteria	Check whether the blade is cracked, whether unusual vibration noise exists upon startup, and whether the blade runs abnormally
Fan replacement	Remove the insulation barrier, press the snap-fit joint on the protective cover, and then pull the cover out. After replacing the fan, ensure the fan blows the air upwards.

■ Removing the fans of T5 to T6 drives

- 1) Loosen the four screws to remove the wind shield.

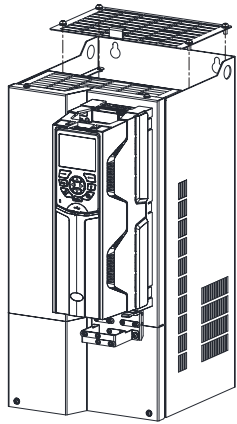


Figure 5-13 Loosening the four screws

- 2) Press the snap-fit joint on the fan cover to take off the cover.

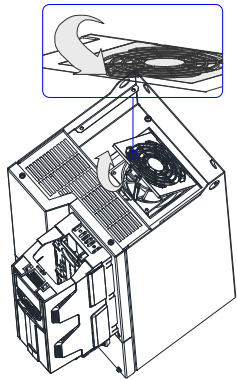


Figure 5-14 Removing the fan cover

- 3) Pull the fan upwards and unplug the power cable connector from the socket.

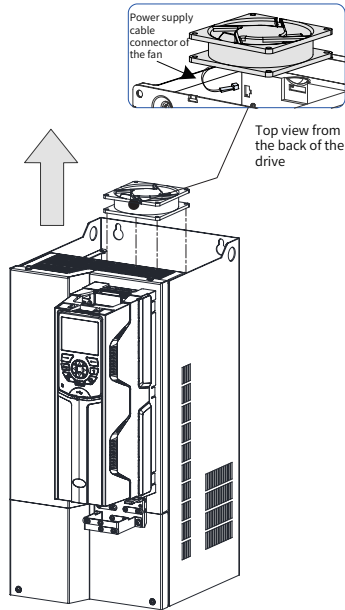


Figure 5-15 Disconnecting the power supply cable

■ Installing the fans of T5 to T6 drives

Install the fan in a reverse procedure to removal. Pay attention to the following items during installation:

- 1) After replacing the fan, check that the fan blows the air upwards.

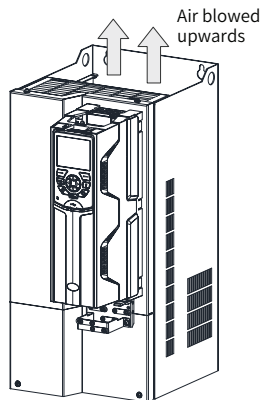


Figure 5-16 Air blown upwards

- 2) Check that the power cables of the fan are connected securely.
- 3) Install the fan into the drive and ensure that the positioning pins are aligned.

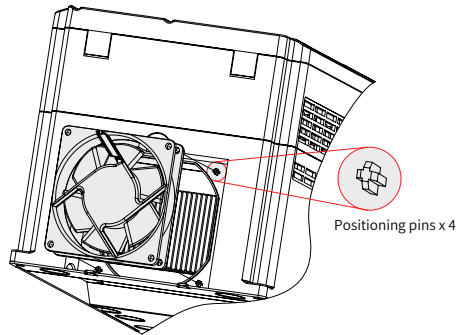


Figure 5-17 Aligning the positioning holes

- 4) Install the fan cover and wind shield.
- Removing the fans of T2 to T4 and T7 to T9 drives
- 1) Disconnect the power cable connector of the fan from the socket (top view).

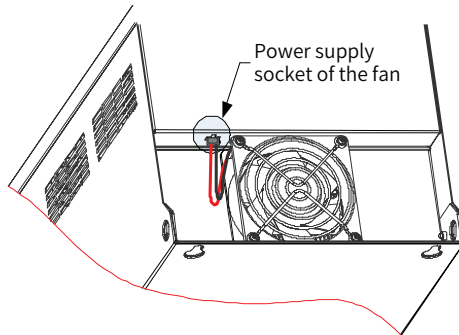


Figure 5-18 Disconnecting the power cable

- 2) Remove the four fixing screws from the fan cover with a screwdriver.

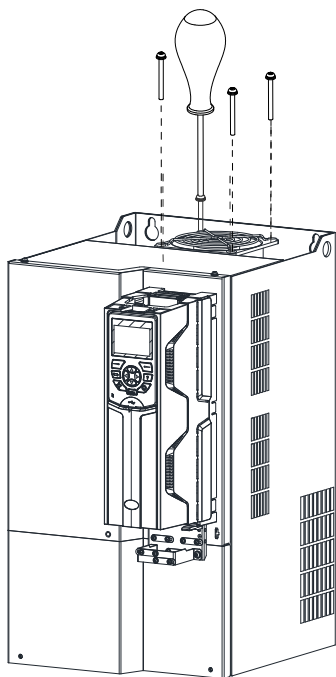


Figure 5-19 Removing the fixing screws

- 3) Remove the fan and fan cover from the drive.

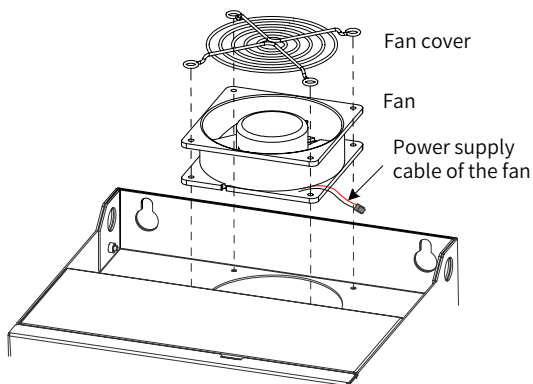


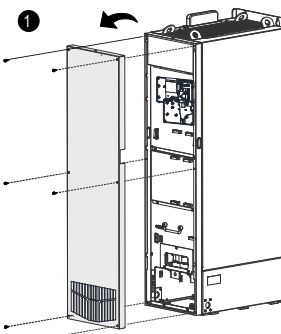
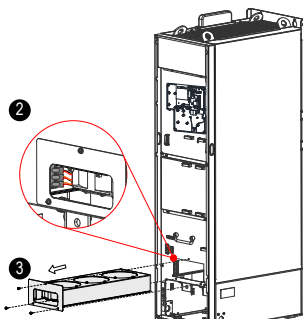
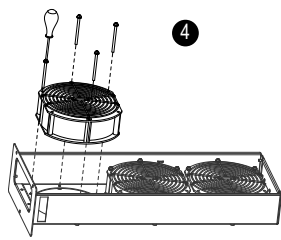
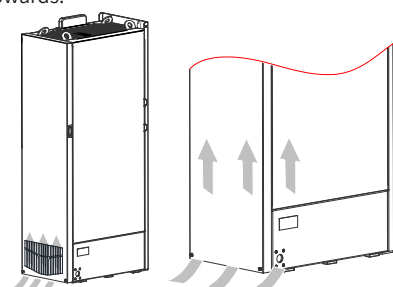
Figure 5-20 Fan removed

- Installing the cooling fans of T2 to T4 and T7 to T9 drives

Install the fan in a reverse procedure to removal. Pay attention to the following items during installation:

- 1) Install the fan in reverse order of removal. Pay attention to the fan direction.
- 2) Install the fan and cover to the drive. Ensure that the mounting holes are aligned.
- 3) After replacing the fan, ensure the fan blows the air upwards. Ensure that the power cable is inserted correctly.
- 4) Ensure that the fan power cable is connected securely.

■ Removing and installing the fans of T10 to T12 drives

Removing the fan (T10 to T12 drives)		
Remove the six screws on the cover. Then, hold the cover with both hands and lift it up in the direction shown below to remove the cover.  ①	Disconnect the fan power cable connector from the drive. Each fan has a power cable connector. Remove three screws from the fan box and draw the fan box out in the direction indicated by the arrow.  ②	Loosen four screws from each fan cover and remove the fan.  ④
Installing the fan (T10 to T12 drives)		
① Install the fan in a reverse procedure to removal. Pay attention to the direction of the fan. ② Align the fan box to the mounting rail and push it into the drive. ③ Connect the fan power cable connectors first before fixing the fan box. After replacing the fan, ensure the fan blows the air upwards. 		

5.4.4 Electrolytic Capacitor

Item	Description
Possible cause	Input power supply unstable, high ambient temperature, frequent load fluctuation and electrolyte aging
Criteria	Check whether there is liquid leakage. Check whether the safety valve has projected. Measure the static capacitance and insulation resistance.
Replacement	As the replacement involves internal components of the AC drive, contact the agent or Inovance to perform the replacement.

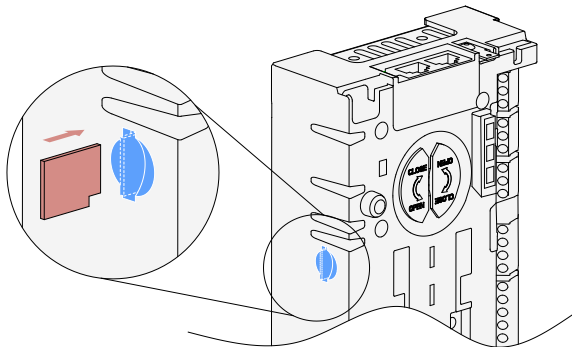
5.5 Maintenance of the HCU Control Module and SOP-20-880

5.5.1 Replacing the Memory Card

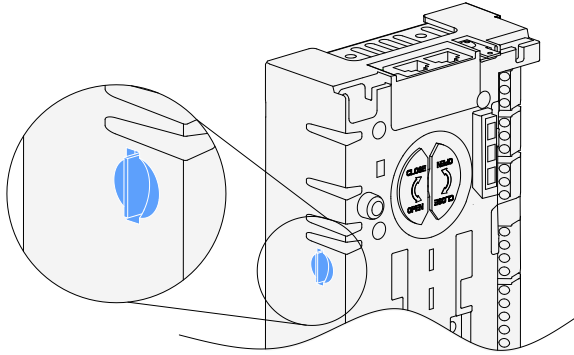
After replacing the HCU control module, the present parameter settings can be retained by transferring the memory card from the faulty HCU control module to the new module. The steps for replacing the memory card are as follows:

Step 1: Press the SD memory card to eject it and pull it straight out.

Step 2: Push the SD memory card into the card slot in the direction shown below.



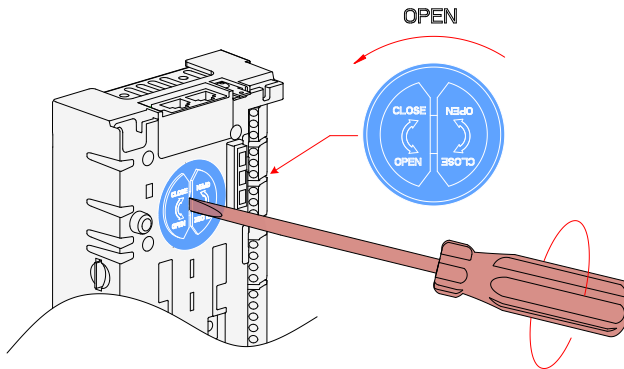
Step 3: Ensure that the SD memory card is pushed in place. Otherwise, an exception will occur due to poor contact.



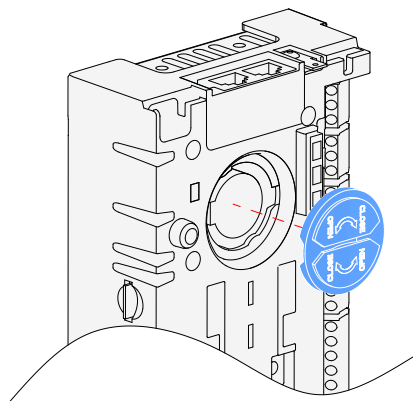
5.5.2 Replacing HCU Control Module Battery

Observe the following steps to replace the battery used for powering up the clock of the HCU control module.

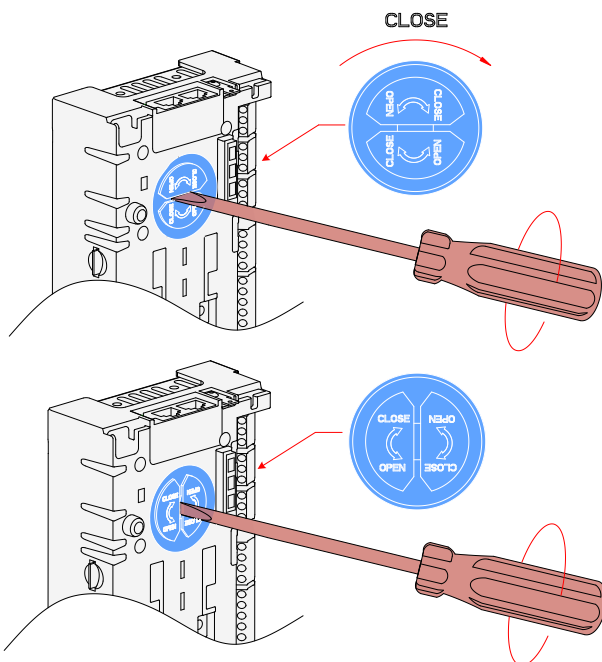
Step 1: Turn the battery cover 90° counterclockwise with a 2# straight screwdriver to open the cover.



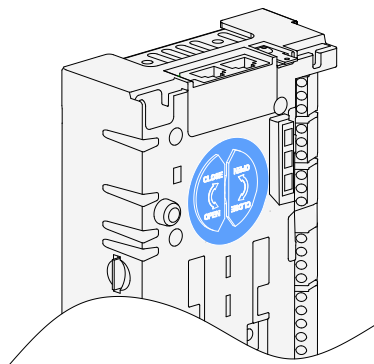
Step 2: Remove the cover and replace the battery.



Step 3: Close the cover and turn it 90° clockwise to secure it.

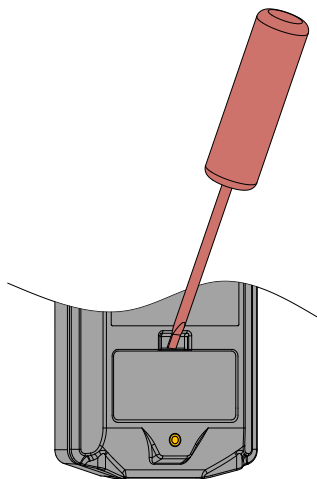


Step 4: Dispose of retired batteries in accordance with local rules or applicable laws.

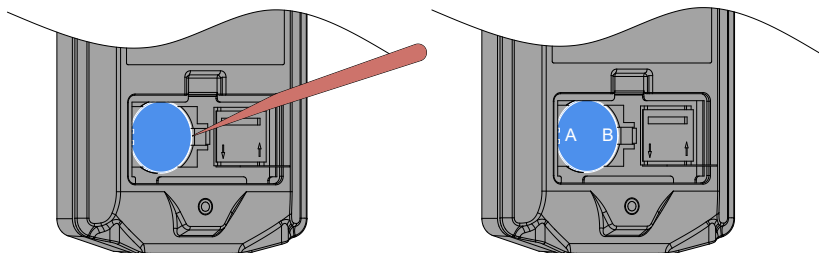


5.5.3 Replacing the Battery of SOP-20-880

Step 1: Use a tool or fingers to open the battery cover.

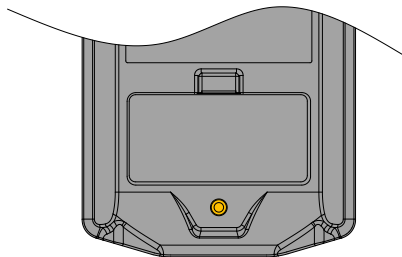


Step 2: Take out the battery with tweezers or a straight screwdriver.



Step 3: Place the battery into the clip (side A) first and then press the other end (side B) of the battery.

Step 4: Put the battery cover back.



6 Options

6.1 List of Options

Peripherals and options include braking units and function modules. For details about the function modules, see section 4.4 Function Module. If any option is required, specify it in your order.

Table 6-1 Options of the MD880 series AC drive

Name	Model	Function	Remarks
External braking unit	MDBUN series	External braking unit for drives of 90 kW and above, which can be used in parallel.	Inovance's product that needs to be purchased separately.
Mounting guide rail	MD500-AZJ-A3T10	Used for installing the drive to the cabinet	Optional (T10 to T12)
Output reactor	MD880-01S-XXXX-X-L-SG	Used to extend the valid transmission distance of the AC drive, which effectively suppresses the instantaneous high voltage generated when the IGBT of the AC drive is turned on and off, reduces the motor noise and eddy current loss, and protects the power switching devices inside the AC drive.	If you need to purchase a drive equipped with an output reactor, select the AC drive whose model includes "L".
Base (sheet metal)	MD880-01S-T10-kit	Used to raise the AC drive for easy wiring.	Option (T10)
	MD880-01S-T11-kit		Option (T11)
	MD880-01S-T12-kit		Option (T12)
Side output copper busbar	MD500-TP-T10-MD500	Used to extend the AC drive output end for easy wiring, which is applicable to the drive model names without "L".	Option (T10)
	MD500-TP-T11-MD500		Option (T11)
	MD500-TP-T12-MD500		Option (T12)

6.2 Instructions for Selecting Cables, Circuit Breakers, and Contactors

- Recommended cables, circuit breakers and contactors

Table 6-2 Selection of electrical peripherals for MD880 series AC drive

Model MD880-01S Series	Input IEC cable (mm²) <1>	IEC grounding cable (mm²)	Output IEC cable (mm²)	Terminal width of the drive (mm)	Screw	Fuse (Bussmann, UL-compliant)		Contactor	Circuit Breaker
						Rated current (A)	Model		
Three-phase 380 V to 480 V, 50/60 Hz									
MD880-01S-0012-4-B-SG	3 x 2.5	2.5	3 x 2.5	4	M4	35	FWH-35B	25	32
MD880-01S-0017-4-B-SG	3 x 4	4	3 x 4	6	M5	35	FWH-35B	25	32
MD880-01S-0024-4-B-SG	3 x 4	4	3 x 4	6	M5	35	FWH-35B	25	32
MD880-01S-0033-4-B-SG	3 x 6	6	3 x 6	10	M5	40	FWH-40B	32	40
MD880-01S-0038-4-B-SG	3 x 10	10	3 x 10	15.0	M6	40	FWH-40B	32	40
MD880-01S-0048-4-B-SG	3 x 10	10	3 x 10	15.0	M6	80	FWH-80B	65	80
MD880-01S-0060-4-B-SG	3 x 16	16	3 x 16	15.0	M6	100	FWH-100B	65	80
MD880-01S-0078-4-B-SG	3 x 16	16	3 x 16	18.0	M6	100	FWH-100B	65	80
MD880-01S-0094-4-B-SG	3 x 16	16	3 x 16	18.0	M6	125	FWH-125B	80	100
MD880-01S-0116-4-B-SG	3 x 25	16	3 x 25	26.8	M8	150	FWH-150B	95	160
MD880-01S-0149-4-B-SG	3 x 50	25	3 x 50	26.8	M8	200	FWH-200B	115	160
MD880-01S-0183-4-B-SG	3 x 70	35	3 x 70	30.6	M12	250	FWH-250A	150	250
MD880-01S-0217-4-SG	3 x 95	50	3 x 95	30.6	M12	275	FWH-275A	170	250
MD880-01S-0262-4-SG	3 x 120	70	3 x 120	30.6	M12	325	FWH-325A	205	400
MD880-01S-0314-4-SG	3 x 150	70	3 x 150	*	M12	400	FWH-400A	245	400
MD880-01S-0383-4-SG	3 x 185	95	3 x 185	*	M12	500	FWH-500A	300	400
MD880-01S-0441-4-L-SG	2 x (3 x 95)	95	2 x (3 x 95)	*	M12	600	FWH-600A	410	500
MD880-01S-0481-4-L-SG	2 x (3 x 120)	120	2 x (3 x 120)	*	M12	700	FWH-700A	410	630
MD880-01S-0538-4-L-SG	2 x (3 x 120)	120	2 x (3 x 120)	*	M12	800	FWH-800A	475	630
MD880-01S-0605-4-L-SG	2 x (3 x 150)	150	2 x (3 x 150)	*	M12	800	FWH-800A	620	700
MD880-01S-0673-4-L-SG	2 x (3 x 185)	185	2 x (3 x 185)	*	M16	1000	170M5016	620	800
MD880-01S-0751-4-L-SG	2 x (3 x 185)	185	2 x (3 x 185)	*	M16	1000	170M5016	620	800
MD880-01S-0849-4-L-SG	2 x (3 x 240)	240	2 x (3 x 240)	*	M16	1250	170M6017	800	1000

**NOTE**

- ◆ Suitable for Chinese standards. "3x10" indicates one three-conductor cable, and "2 x (3x95)" indicates two three-conductor cables.
- ◆ Use copper conductors as main circuit cables according to the recommended values in section 3.5.3 Layout and Dimensions of Main Circuit Terminals.

■ Selecting a residual current device (RCD)

- 1) The earth leakage current of the AC drive exceeds 3.5 mA. Therefore, grounding is required for protection.
- 2) The drive generates DC leakage current in the protective conductor. In this case, select a B-type (delay type) RCD.
- 3) When the RCD operates improperly, take the following measures:
 - a) Use a RCD of higher rated tripping current or use a delay-type RCD.
 - b) Reduce the carrier frequency of the drive.
 - c) Shorten the length of motor drive cables.
 - d) Take additional measures to suppress the leakage current.
- 4) Recommended leakage breaker manufacturers are CHINT and Schneider.

6.3 Instructions for Selecting Braking Components

6.3.1 Resistance of Braking Resistor

During braking, almost all the regenerative energy of the motor is consumed by the braking resistor. The resistance of the braking resistor is calculated by the following formula:

$$R = U \times U / P_b$$

- U indicates the braking voltage upon stable braking. Its value varies with different systems. The default braking voltage of MD880-01S series AC drive is 700 V (reference voltage).

- P_b indicates the braking power.

6.3.2 Power of the Braking Resistor

Theoretically, the power of the braking resistor is the same as the braking power. Due to de-rating K , the relationship is as follows:

$$K \times P_r = P_b \times D$$

- $K = 50\%$
- P_r = Power of the braking resistor
- D = Braking frequency, which is the proportion of the regenerative process to the whole working process

The following formulas can be generated based on the preceding equations:

$$K \times Pr = Pb \times D = U \times U/R \times D$$

$$Pr = (U \times U \times D)/(R \times K)$$

You can then calculate the power of the braking resistor.

K is the derating factor of the braking resistor. A small K value ensures that the braking resistor does not get overheated. You can increase the value of K properly under favorable heat dissipation conditions of the braking resistor. Keep the value of K below 50%; otherwise, the braking resistor can be overheated, which may cause a fire.

The braking frequency D is determined based on actual applications. The typical values of D are listed in the following table.

Table 6-3 Braking frequencies in common applications

Common Application	Elevator	Winding and Unwinding	Centrifuge	Occasional Braking Load	Regular Applications
Braking frequency	20% to 30%	20% to 30%	50% to 60%	5%	10%

6.3.3 Selection of Braking Unit

Table 6-4 Recommended braking unit for the MD880-01S series AC drive

Model	Applicable motor (kW)	Braking unit		125% of braking torque (10% ED; Max.: 10s)		Remarks	Minimum braking resistance (Ω)
		Model	QTY	Braking resistor specification	Quantity of braking resistors		
MD880-01S-0012-4-B-SG	3.7	Built-in		740 W, 150 Ω	1	AC drive with the model name containing "B"	32
MD880-01S-0017-4-B-SG	5.5			1100 W, 100 Ω	1		32
MD880-01S-0024-4-B-SG	7.5			1500 W, 75 Ω	1		32
MD880-01S-0033-4-B-SG	11			2200 W, 50 Ω	1		20
MD880-01S-0038-4-B-SG	15			3000 W, 38 Ω	1		20
MD880-01S-0048-4-B-SG	18.5			4000 W, 32 Ω	1		24
MD880-01S-0060-4-B-SG	22			4500 W, 27 Ω	1		24
MD880-01S-0078-4-B-SG	30			6000 W, 20 Ω	1		19.2
MD880-01S-0094-4-B-SG	37			7000 W, 16 Ω	1		14.8
MD880-01S-0116-4-B-SG	45			9000 W, 13 Ω	1		12.8
MD880-01S-0149-4-B-SG	55			11000 W, 10.5 Ω	1		9.6
MD880-01S-0183-4-B-SG	75			15000 W, 7.7 Ω	1		6.8
MD880-01S-0217-4-SG	90	MDBUN-60-T	2	9000 W, 10.0 Ω	2	Input voltage ≤ 440 VAC	10.2 x 2
	90	MDBUN-60-ST	2	9000 W, 12.8 Ω	2	Input voltage > 440 VAC	11.4 x 2
MD880-01S-0262-4-SG	110	MDBUN-60-T	2	11000 W, 9.4 Ω	2	Input voltage ≤ 440 VAC	10.2 x 2
	110	MDBUN-60-ST	2	11000 W, 10.5 Ω	2	Input voltage > 440 VAC	11.4 x 2

Model	Applicable motor (kW)	Braking unit		125% of braking torque (10% ED; Max.: 10s)		Remarks	Minimum braking resistance (Ω)
		Model	QTY	Braking resistor specification	Quantity of braking resistors		
MD880-01S-0314-4-SG	132	MDBUN-90-T	2	13000 W, 6.8 Ω	2	Input voltage $\leq$ 440 VAC	6.8 x 2
	132	MDBUN-90-5T	2	13000 W, 8.8 Ω	2	Input voltage > 440 VAC	7.7 x 2
MD880-01S-0383-4-SG	160	MDBUN-90-T	2	16000 W, 6.3 Ω	2	Input voltage $\leq$ 440 VAC	6.8 x 2
	160	MDBUN-90-5T	2	16000 W, 7.2 Ω	2	Input voltage > 440 VAC	7.7 x 2
MD880-01S-0441-4-L-SG	200	MDBUN-200-T	2	19000 W, 4.5 Ω	2	Input voltage $\leq$ 440 VAC	2.5 x 2
	200	MDBUN-200-5T	2	19000 W, 5.8 Ω	2	Input voltage > 440 VAC	2.8 x 2
MD880-01S-0481-4-L-SG	220	MDBUN-200-T	2	21000 W, 4.1 Ω	2	Input voltage $\leq$ 440 VAC	2.5 x 2
	220	MDBUN-200-5T	2	21000 W, 5.3 Ω	2	Input voltage > 440 VAC	2.8 x 2
MD880-01S-0538-4-L-SG	250	MDBUN-200-T	2	24000 W, 3.6 Ω	2	Input voltage $\leq$ 440 VAC	2.5 x 2
	250	MDBUN-200-5T	2	24000 W, 4.6 Ω	2	Input voltage > 440 VAC	2.8 x 2
MD880-01S-0605-4-L-SG	280	MDBUN-200-T	2	27000 W, 3.2 Ω	2	Input voltage $\leq$ 440 VAC	2.5 x 2
	280	MDBUN-200-5T	2	27000 W, 4.1 Ω	2	Input voltage > 440 VAC	2.8 x 2
MD880-01S-0673-4-L-SG	315	MDBUN-200-T	3	20000 W, 4.3 Ω	3	Input voltage $\leq$ 440 VAC	2.5 x 3
	315	MDBUN-200-5T	3	20000 W, 5.5 Ω	3	Input voltage > 440 VAC	2.8 x 3
MD880-01S-0751-4-L-SG	355	MDBUN-200-T	3	23000 W, 3.8 Ω	3	Input voltage $\leq$ 440 VAC	2.5 x 3
	355	MDBUN-200-5T	3	23000 W, 4.9 Ω	3	Input voltage > 440 VAC	2.8 x 3
MD880-01S-0849-4-L-SG	400	MDBUN-200-T	3	26000 W, 3.4 Ω	3	Input voltage $\leq$ 440 VAC	2.5 x 3
	400	MDBUN-200-5T	3	26000 W, 4.3 Ω	3	Input voltage > 440 VAC	2.8 x 3

**NOTE**

- ◆ The braking resistance in the preceding table is calculated based on a braking usage rate (ED) of 10% and the longest time braking time of 10s at a time.
- ◆ The default starting voltage for braking of the built-in braking unit is 700 V. The default starting voltage for braking of the external braking units, including MDBUN-60-T, MDBUN-90-T, and MDBU-200-B is 670 V, which is suitable for power grids with input voltage not higher than 440 VAC. The default starting voltage for braking of the external braking units, including MDBUN-60-5T, MDBUN-90-5T, and MDBU-200-C is 760 V, which is suitable for power grids with input voltage higher than 440 VAC. You can adjust the initial braking voltage based on the grid voltage. Higher initial braking voltage requires higher braking resistance.
- ◆ The data in the preceding table is only for reference. You can select the resistance and power of the braking resistor as required. (Note that the resistance cannot be lower than the recommended minimum value, whereas the power can exceed the recommended value.) Select the braking resistor based on the generation power of the motor in the actual system, the system inertia, deceleration time, and potential energy load. Larger system inertia requires shorter deceleration time and more frequent braking. In this case, select a braking resistor with a high power rating and low resistance.

6.3.4 Outline Drawings and Mounting Dimensions of Braking Unit

For details about how to install and use MDBUN, see MDBUN Series Braking Unit User Guide.

6.4 Instructions for Selecting the Motor

The standard applicable motor is four-pole squirrel-cage asynchronous induction motor. For other types of motor, select a proper AC drive based on the rated motor current.

The cooling fan and rotor shaft of a fixed-frequency motor are coaxially connected, and the cooling effect of the fan degrades when the rotating speed reduces. Therefore, install a fan with higher rated power or replace the motor with a variable-frequency motor in cases where the motor is overheated frequently.

The drive may alarm or even be damaged when short circuit occurs in cables or motor. Therefore, perform an insulation short circuit test when the motor and cables are newly installed or during routine maintenance. During the test, make sure that the drive is disconnected from the tested parts.

For details about the recommended motor models, see section 6.3.3 Selection of Braking Units.

6.5 Instructions for Selecting the AC Input Reactor

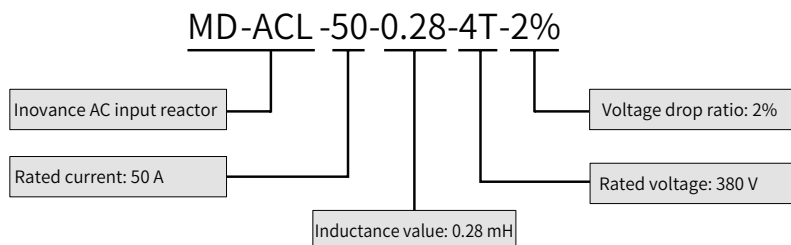
An AC input reactor is used to suppress harmonic current on the input side. Install an AC reactor when strict harmonic suppression is needed. For models above 220 kW, ensure that the cabinet has sufficient space for installing the reactor. The following table lists the recommended manufacturers and models of the input reactor.

1) Recommended models

Table 6-5 Recommended AC input reactor models (three-phase 380–480 V)

AC Drive Model	AC Input Reactor Model (Inovance)
MD880-01S-0012-4-B-SG	MD-ACL-40-1.45-4T
MD880-01S-0017-4-B-SG	MD-ACL-40-1.45-4T
MD880-01S-0024-4-B-SG	MD-ACL-40-1.45-4T
MD880-01S-0033-4-B-SG	MD-ACL-40-1.45-4T
MD880-01S-0038-4-B-SG	MD-ACL-50-0.28-4T-2%
MD880-01S-0048-4-B-SG	MD-ACL-60-0.24-4T-2%
MD880-01S-0060-4-B-SG	MD-ACL-90-0.16-4T-2%
MD880-01S-0078-4-B-SG	MD-ACL-90-0.16-4T-2%
MD880-01S-0094-4-B-SG	MD-ACL-90-0.16-4T-2%
MD880-01S-0116-4-B-SG	MD-ACL-120-0.12-4T-2%
MD880-01S-0149-4-B-SG	MD-ACL-150-0.095-4T-2%
MD880-01S-0183-4-B-SG	MD-ACL-200-0.07-4T-2%
MD880-01S-0217-4-SG	MD-ACL-200-0.07-4T-2%
MD880-01S-0262-4-SG	MD-ACL-200-0.07-4T-2%
MD880-01S-0314-4-SG	MD-ACL-330-0.042-4T-2%
MD880-01S-0383-4-SG	MD-ACL-490-0.028-4T-2%
MD880-01S-0441-4-L-SG	MD-ACL-490-0.028-4T-2%
MD880-01S-0481-4-L-SG	MD-ACL-490-0.028-4T-2%
MD880-01S-0538-4-L-SG	MD-ACL-660-0.021-4T-2%
MD880-01S-0605-4-L-SG	MD-ACL-660-0.021-4T-2%
MD880-01S-0673-4-L-SG	MD-ACL-660-0.021-4T-2%
MD880-01S-0751-4-L-SG	MD-ACL-800-0.017-4T-2%
MD880-01S-0849-4-L-SG	MD-ACL-800-0.017-4T-2%

■ AC input reactor model description



2) Outline dimensions:

■ Dimensions of 40 A AC input reactors

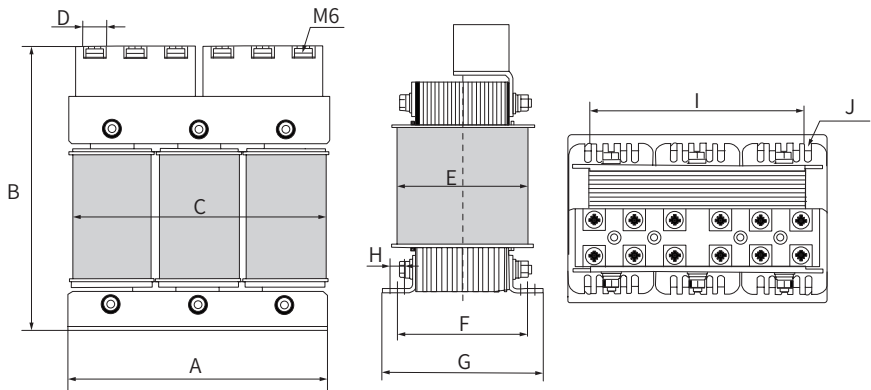


Figure 6-1 Dimensions of 40 A AC input reactors

Table 6-6 Dimensions of 40 A AC input reactors (unit: mm)

Model	A	B	C	D	E	F	G	H	I	J
MD-ACL-40-1.45-4T	180±2	200	185	16	105	95±2	117±2	13	150±1	Ø8x13

■ Dimensions of 50 A/60 A AC input reactor

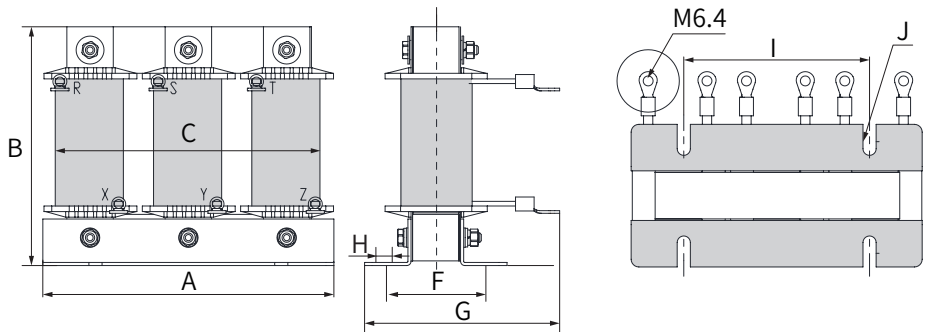


Figure 6-2 Dimensions of 50 A/60 A AC input reactor

Table 6-7 Dimensions of 50 A/60 A AC input reactor (unit: mm)

Model	A	B	C	F	G	H	I	J
MD-ACL-50-0.28-4T	195	160	188±1	72±2	135	8.5	120±1	Ø8.5x20
MD-ACL-60-0.24-4T	195	160	188±1	72±2	135	8.5	120±1	Ø8.5x20

■ Dimensions of AC input reactors (90 A to 120 A)

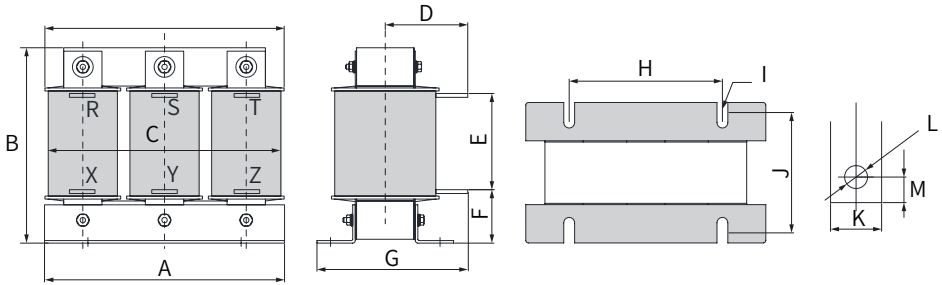


Figure 6-3 Dimensions of AC input reactors (90 A to 120 A)

Table 6-8 Dimensions of AC input reactors (90 A/120 A) (unit: mm)

Model	A	B	C	F	G	H	I	J
MD-ACL-90-0.16-4T	195	160	188±1	72±2	150	8.5	120±1	Ø8.5x20
MD-ACL-120-0.12-4T	195	160	188±1	72±2	/	8.5	120±1	Ø8.5x20

■ Dimensions of the AC input reactors (150 A to 660 A)

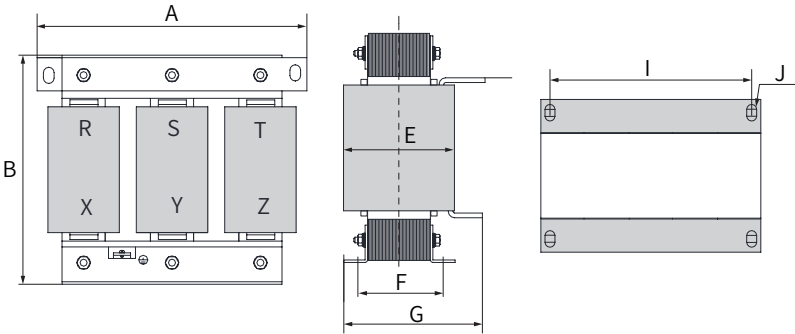


Figure 6-4 Dimensions of AC input reactors (150 A to 660 A)

Table 6-9 Dimensions of AC input reactor (150 A to 660 A) (unit: mm)

Model	A	B	E	F	G	I	J
MD-ACL-150-0.095-4T	250	230	102±2	76±2	155	182±1	Ø11x18
MD-ACL-200-0.07-4T	250	230	122±2	96±2	175	182±1	Ø11x18
MD-ACL-330-0.042-4T	290	275	126±2	100±2	180	214±1	Ø11x18
MD-ACL-490-0.028-4T	320	305	152±2	122±2	220	243±1	Ø12x20
MD-ACL-660-0.021-4T	320	305	167±2	137±2	240	243±1	Ø12x20

■ Dimensions of AC input reactors (800 A/1000 A)

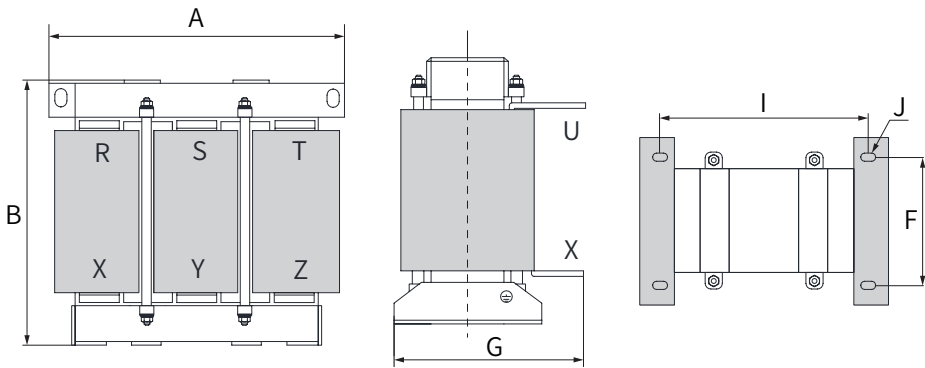


Figure 6-5 Dimensions of AC input reactors (800 A/1000 A)
Table 6-10 Dimensions of AC input reactors (800 A/1000 A) (unit: mm)

Model	A	B	E	F	G	I	J
MD-ACL-800-0.017-4T	385	390	198±1	175±1	250	260±2	Ø12x20
MD-ACL-1000-0.014-4T	385	390	198±1	175±1	250	260±2	Ø12x20



◆ Note: The dimensions of AC input reactors provided here are for reference only. The actual dimensions are subject to the real product.

6.6 Selection of the EMC Filter

6.6.1 Standard EMC filter

The standard EMC filter meets the EN 618003 C2 emission requirement of CE certification. Connect the filter to ground reliably and ensure that the length of the cable connecting the power supply unit and filter is less than 30 cm. For details about the cables, see section 6.2 Instructions for Selecting Cables, Circuit Breakers, and Contactors.



- ◆ Select a cable as short as possible (< 30 cm) to connect the filter and the drive. The filter and drive must be connected to the same grounding reference surface, and the filter must be reliably connected to ground. Failure to comply can affect the filtering performance.
- ◆ MD880-01S-0314-4-SG to MD880-01S-0751-4(-L)-SG drives are equipped with standard built-in EMC filters that comply with EN 61800-3 C3 emission requirement of CE certification. For these drives, external filters are not required.

1) Appearance



Schaffner FN3258 series filter



Schaffner FN3359 series filter



JIANLI series filter

Figure 6-6 Standard EMC filter

2) Recommended selection

SCHAFFNER and JIANLI filters are recommended, as listed in the following table.

Table 6-11 Recommended manufacturers and models of EMC input filters (three-phase 380–480 V)

AC Drive Model	AC input filter model (Schaffner)	AC input filter model (JIANLI)
MD880-01S-0012-4-B-SG	FN 3258-16-33	DL-16EBK5

AC Drive Model	AC input filter model (Schaffner)	AC input filter model (JIANLI)
MD880-01S-0017-4-B-SG	FN 3258-30-33	DL-25EBK5
MD880-01S-0024-4-B-SG	FN 3258-30-33	DL-25EBK5
MD880-01S-0033-4-B-SG	FN 3258-42-33	DL-35EBK5
MD880-01S-0038-4-B-SG	FN 3258-42-33	DL-50EBK5
MD880-01S-0048-4-B-SG	FN 3258-55-34	DL-50EBK5
MD880-01S-0060-4-B-SG	FN 3258-75-34	DL-65EBK5
MD880-01S-0078-4-B-SG	FN 3258-75-34	DL-65EBK5
MD880-01S-0094-4-B-SG	FN 3258-100-35	DL-80EBK5
MD880-01S-0116-4-B-SG	FN 3258-100-35	DL-100EBK5
MD880-01S-0149-4-B-SG	FN 3258-130-35	DL-130EBK5
MD880-01S-0183-4-B-SG	FN 3258-180-40	DL-160EBK5
MD880-01S-0217-4-SG	FN 3258-180-40	DL-200EBK5
MD880-01S-0262-4-SG	FN 3359-250-28	DL-250EBK5
MD880-01S-0314-4-SG	FN 3359-250-28	DL-300EBK3
MD880-01S-0383-4-SG	FN 3359-320-99	DL-400EBK3
MD880-01S-0441-4-L-SG	FN 3359-400-99	DL-400EBK3
MD880-01S-0481-4-L-SG	FN 3359-600-99	DL-600EBK3
MD880-01S-0538-4-L-SG	FN 3359-600-99	DL-600EBK3
MD880-01S-0605-4-L-SG	FN 3359-600-99	DL-600EBK3
MD880-01S-0673-4-L-SG	FN 3359-600-99	DL-600EBK3
MD880-01S-0751-4-L-SG	FN 3359-800-99	DL-700EBK3
MD880-01S-0849-4-L-SG	FN 3359-800-99	DL-800EBK3

3) Mounting dimensions

- Dimensions of Schaffner FN3258 series filters (50 A to 180 A)

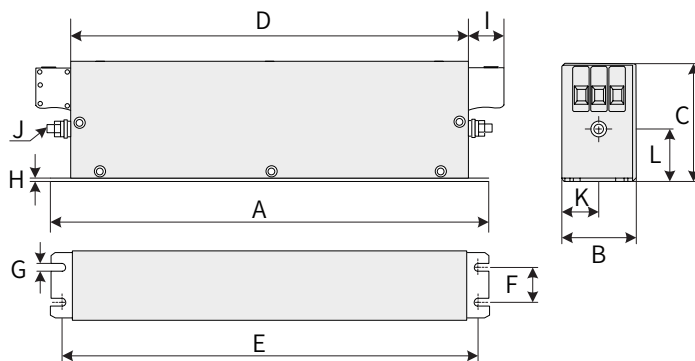


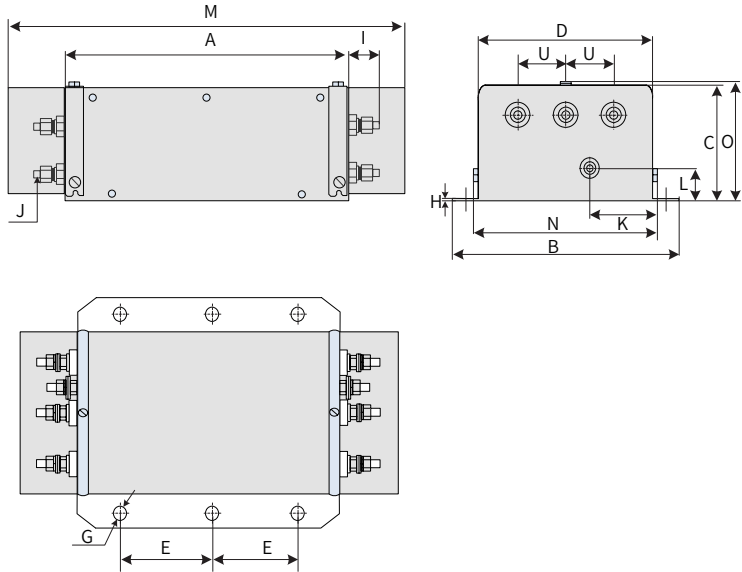
Figure 6-7 Dimension drawing of FN3258 series filters (50 A to 180 A, unit: mm)

Table 6-12 Dimensions of FN3258 series filters (50 A to 180 A, unit: mm)

Rated current (A)	A	B	C	D	E	F	G	H	I	J	K	L
7	190	40	70	160	180	20	4.5	1	22	M5	20	29.5
16	250	45	70	220	235	25	5.4	1	22	M5	22.5	29.5
30	270	50	85	240	255	30	5.4	1	25	M5	25	39.5
42	310	50	85	280	295	30	5.4	1	25	M6	25	37.5
55	250	85	90	220	235	60	5.4	1	39	M6	42.5	26.5
75	270	80	135	240	255	60	6.5	1.5	39	M6	40	70.5
100	270	90	150	240	255	65	6.5	1.5	45	M10	45	64
130	270	90	150	240	255	65	6.5	1.5	45	M10	45	64
180	380	120	170	350	365	102	6.5	1.5	51	M10	60	47

■ Dimensions of FN3359 series filters (150 A to 2500 A)

150-250 A



320-2500 A

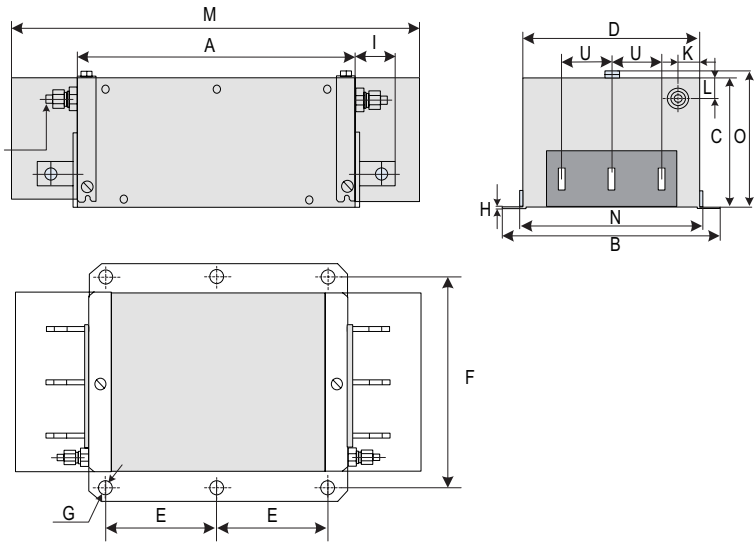


Figure 6-8 Dimensions of FN3359 series filters (150 A to 2500 A, unit: mm)

The following figure shows the dimensions of the copper busbar.

320-1000A

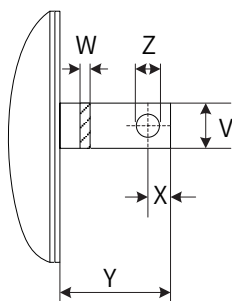


Figure 6-9 Dimensions of the copper busbar

Table 6-13 Dimensions of FN3359 series filters (150 A to 2500 A)

Mark	150 A	180 A	250 A	320 A	400 A	600 A	800 A	1000 A	1600 A	2500 A
A	300	300	300	300	300	300	350	350	400	600
B	210	210	230	260	260	260	280	280	300	370
C	120	120	125	115	115	135	170	170	160	200
D	160	160	180	210	210	210	230	230	250	300
E	120	120	120	120	120	120	145	145	170	250
F	185	185	205	235	235	235	255	255	275	330
G	Φ12	Φ12	Φ12	Φ12	Φ12	Φ12	Φ12	Φ12	Φ12	Φ14
H	2	2	2	2	2	2	3	3	3	3
I	33	33	33	43	43	43	53	53	93	98
J	M10	M10	M10	M12	M12	M12	M12	M12	M12	M16
K	55	55	62.5	20	20	20	25	25	25	25
L	30	30	35	20	20	20	25	25	25	25
M	420	420	420	440	440	440	510	510	-	-
N	171	171	191	221	221	221	241	241	-	-
O	127	127	132	122	122	142	177	177	-	-
S	-	-	-	-	-	-	-	-	26	35
T	-	-	-	-	-	-	-	-	26	35
U	50	50	55	60	60	60	60	60	60	100
V	-	-	-	25	25	25	40	40	60	70
W	-	-	-	6	6	8	8	8	10	15
X	-	-	-	15	15	15	20	20	17	20
Y	-	-	-	40	40	40	50	50	90	95
Z	-	-	-	Φ10.5	Φ10.5	Φ10.5	Φ14	Φ14	Φ14	Φ14

■ Dimensions of JIANLI series filter (50 A to 200 A)

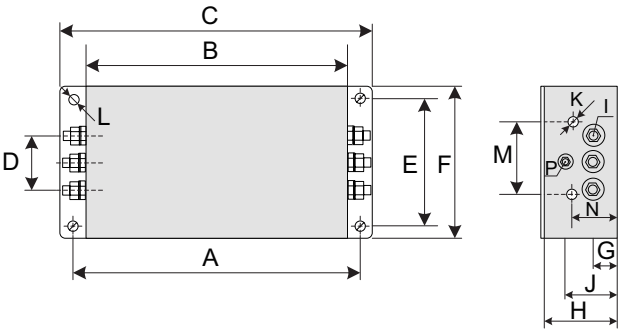
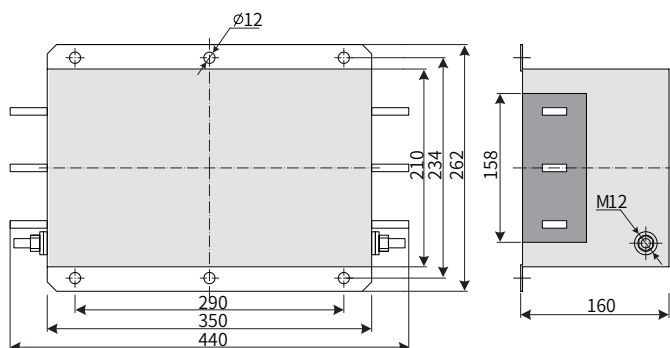


Figure 6-10 Dimensions of JIANLI filters (50 A to 200 A, unit: mm)

Table 6-14 Dimensions of JIANLI filters (50 A to 200 A, unit: mm)

Model	A	B	C	D	E	F	G	H	I	J	K	M	N	P	L
DL-25EBK5	243	224	265	58	70	102	25	92	M6	58	M4	74	49	M6	6.4 x 9.4
DL-35EBK5															
DL-50EBK5															
DL-65EBK5															
DL-80EBK5	354	323	388	66	155	188	30	92	M8	62	M4	86	56	M8	6.4 x 9.4
DL-100EBK5															
DL-130EBK5															
DL-160EBK5															
DL-200EBK5															

■ Dimensions of JIANLI filter in 250 A to 800 A



250-300 A

400-600 A

700-800 A

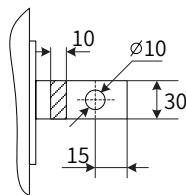
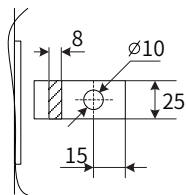
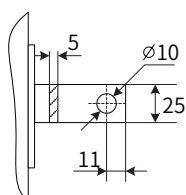


Figure 6-11 Dimension drawing of JIANLI filters in 250 A to 800 A (unit: mm)

■ The following figure shows the dimensions of JIANLI filters (1000 A).

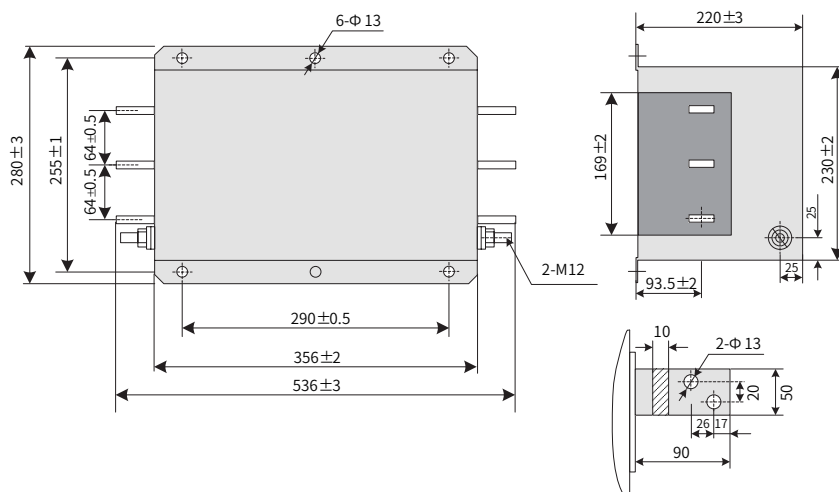


Figure 6-12 Dimensions of JIANLI 1000 A filter (unit: mm)

6.6.2 Simple EMC Input Filter

The simple EMC input filter can efficiently suppress the field interference and the interference generated by the AC drive during operation.

Ground the simple EMC input filter securely and ensure that the cable connecting the filter and drive is shorter than 30 cm.

Table 6-15 Recommended models of simple EMC input filters (three-phase 380–480 V)

AC Drive Model	Filter Model
MD880-01S-0012-4-B-SG	DL-35EB1/10
MD880-01S-0017-4-B-SG	DL-35EB1/10
MD880-01S-0024-4-B-SG	DL-35EB1/10
MD880-01S-0033-4-B-SG	DL-35EB1/10
MD880-01S-0038-4-B-SG	DL65EB1/10
MD880-01S-0048-4-B-SG	DL65EB1/10
MD880-01S-0060-4-B-SG	DL65EB1/10
MD880-01S-0078-4-B-SG	DL65EB1/10
MD880-01S-0094-4-B-SG	DL-120EB1/10
MD880-01S-0149-4-B-SG	DL-180EB1/10
MD880-01S-0183-4-B-SG	DL-180EB1/10

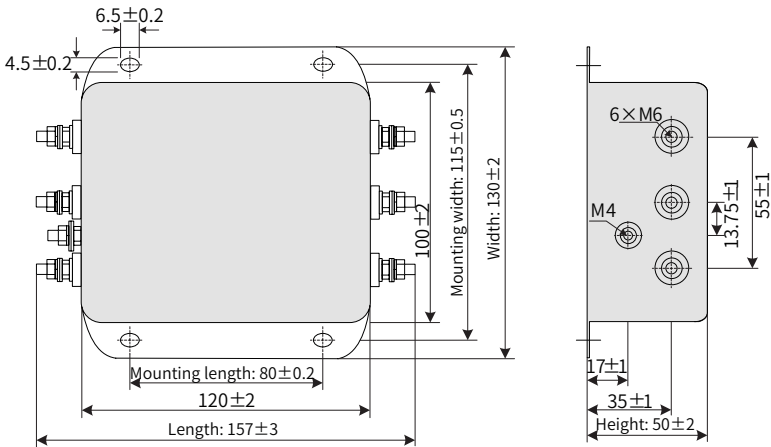


Figure 6-13 Mounting dimensions of the simple EMC filter (unit: mm)
Table 6-16 Outline and mounting dimensions of the simple EMC filter

Filter Model	Outline Dimensions (Width x Depth x Height) (unit: mm)	Mounting dimensions (Width x Depth) (mm)
DL-15EB1/10	157 x 130 x 50	80 x 115
DL-35EB1/10	218 x 140 x 80	184 x 112
DL-65EB1/10	218 x 140 x 80	184 x 112
DL-120EB1/10	334 x 185 x 90	304 x 155
DL-180EB1/10	388 x 220 x 100	354 x 190

6.6.3 Safety Capacitor Box and Magnetic Ring

1) Safety capacitor box

In certain applications, you can connect a safety capacitor installed with a ferrite core to input ports R, S, and T in parallel to alleviate interference generated by the drive during operation.

The grounding terminal of the safety capacitor must be connected to the PE terminal of the drive, and the grounding cable (< 30 cm) must be as short as possible.

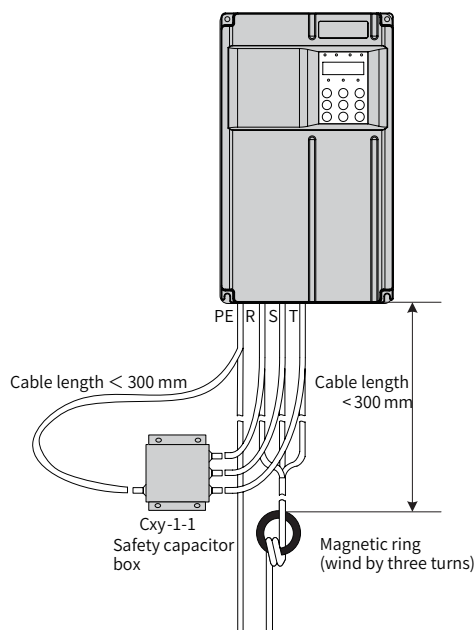


Figure 6-14 Installing the safety capacitor and magnetic ring for the MD880 series AC drive

■ Outline dimensions

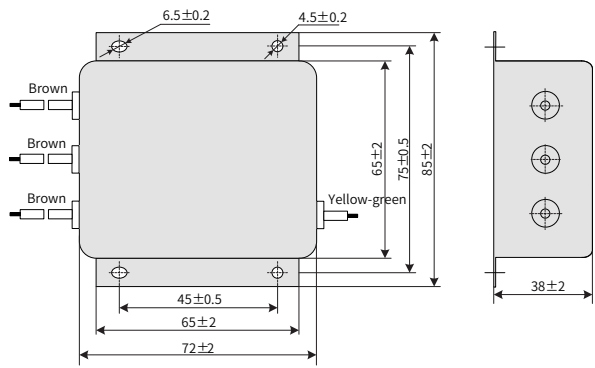


Figure 6-15 Dimension diagram of the safety capacitor box

Table 6-17 Models and dimensions of the safety capacitors

Capacitor box model	Code	Dimension (Width x Depth x Height) (unit: mm)	Mounting dimensions (Width x Depth) (mm)
Cxy-1-1	11025018	85 x 72 x 38	45 x 75

2) Magnetic ring

In certain applications, you can wind the R/S/T cables around the magnetic ring (PE cable excluded) to alleviate interference generated by the drive during operation.

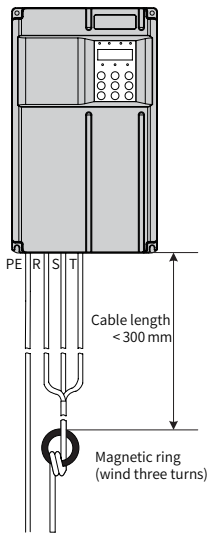


Figure 6-16 Installing the magnetic ring



Figure 6-17 Appearance of the magnetic ring

Table 6-18 List of magnetic ring models

Model	Code	Dimensions (Outer Diameter x Inner Diameter x Thickness) (unit: mm)
DY644020H	11013031	64 x 40 x 20
DY805020H	11013032	80 x 50 x 20
DY1207030H	11013033	120 x 70 x 30

6.7 Instructions for Selecting the AC Output Reactor

Whether to install an AC output reactor on the output side of the drive depends on actual situations. The cables connecting the AC drive and motor cannot be too long. Excessively long cables can cause large distributed capacitance, which may result in high harmonic current.

When the output cable length is greater than or equal to the recommended value in the following table, install an AC output reactor near the drive.

Table 6-19 Minimum cable length for the output reactor (three phase 380–480 V)

AC drive power (kW)	Rated voltage (V)	Min. cable length for optional output reactor (m)
0.4 to 4	200 to 500	50
5.5	200 to 500	70
7.5	200 to 500	100
11	200 to 500	110
15	200 to 500	125
18.5	200 to 500	135
22	200 to 500	150
≥ 30	280 to 690	150

Table 6-20 Minimum cable length for the output reactor (three phase 200–240 V)

AC drive power (kW)	Rated voltage (V)	Min. cable length for optional output reactor (m)
0.4 to 3	200 to 500	50

AC drive power (kW)	Rated voltage (V)	Min. cable length for optional output reactor (m)
3.7	200 to 500	70
5.5	200 to 500	110
7.5	200 to 500	125
≥ 11	200 to 500	150

1) The recommended AC output reactor models are listed in the following table.

Table 6-21 Recommended models of the AC output reactor (three-phase 380–480 V)

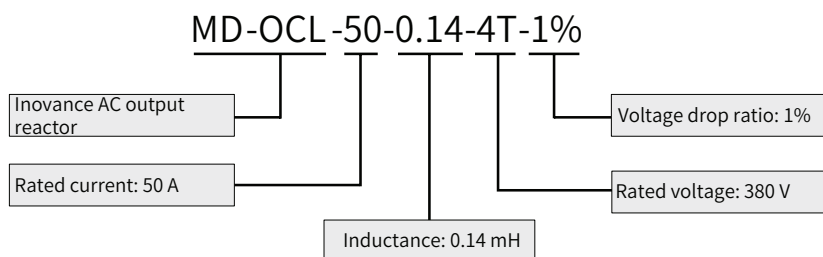
AC Drive Model	Inovance AC output reactor model
MD880-01S-0012-4-B-SG	MD-OCL-15-0.47-4T-1%
MD880-01S-0017-4-B-SG	MD-OCL-20-0.35-4T-1%
MD880-01S-0024-4-B-SG	MD-OCL-30-0.23-4T-1%
MD880-01S-0033-4-B-SG	MD-OCL-40-0.18-4T-1%
MD880-01S-0038-4-B-SG	MD-OCL-40-0.18-4T-1%
MD880-01S-0048-4-B-SG	MD-OCL-50-0.14-4T-1%
MD880-01S-0060-4-B-SG	MD-OCL-60-0.12-4T-1%
MD880-01S-0078-4-B-SG	MD-OCL-80-0.087-4T-1%
MD880-01S-0094-4-B-SG	MD-OCL-120-0.058-4T-1%
MD880-01S-0116-4-B-SG	MD-OCL-120-0.058-4T-1%
MD880-01S-0149-4-B-SG	MD-OCL-150-0.047-4T-1%
MD880-01S-0183-4-B-SG	MD-OCL-200-0.035-4T-1%
MD880-01S-0217-4-SG	MD-OCL-250-0.028-4T-1%
MD880-01S-0262-4-SG	MD-OCL-330-0.021-4T-1%
MD880-01S-0314-4-SG	MD-OCL-330-0.021-4T-1%
MD880-01S-0383-4-SG	MD-OCL-490-0.014-4T-1%



NOTE

◆ If you need to install AC output reactors to MD880-01S-0441-4-SG...MD880-01S-0849-4-SG models, you can order MD880-01S-0441-4(-L)-SG...MD880-01S-0849-4(-L)-SG directly.

2) Designation rules



3) Dimensions of AC output reactor

■ Dimensions of the AC output reactor (15 A)

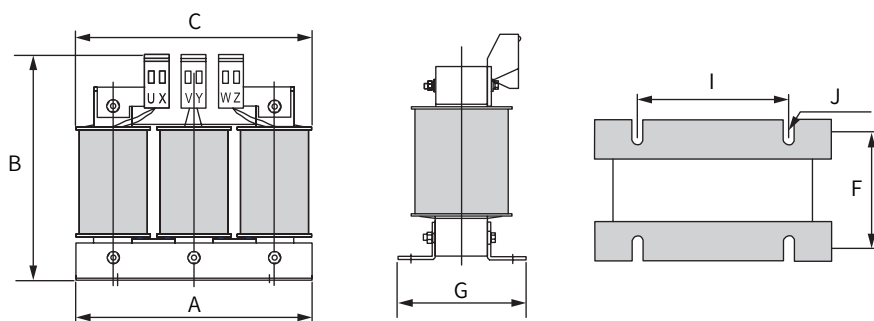


Figure 6-18 Dimensions of AC output reactors (15 A)

Table 6-22 Dimensions of AC output reactors (15 A, unit: mm)

Model	A	B	C	G	F	I	J
MD-OCL-15-0.47-4T-1%	148±1	140	155	76±2	61±2	95±1	Ø6x15

■ Dimensions of AC output reactors (20 A)

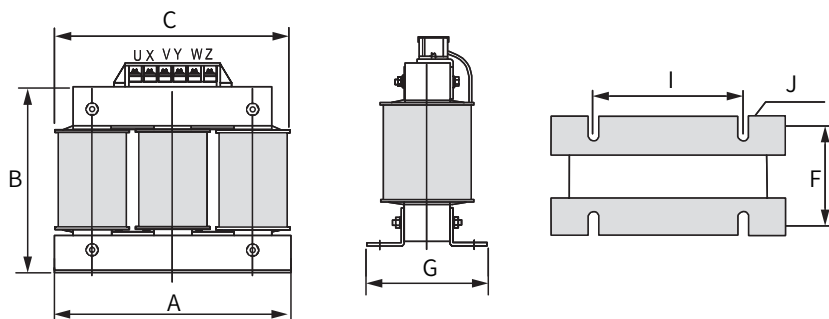


Figure 6-19 Dimensions of AC output reactors (20 A)

Table 6-23 Dimensions of AC output reactors (20 A, unit: mm)

Model	A	B	C	G	F	I	J
MD-OCL-20-0.35-4T-1%	148±1	165	155	76±2	61±2	95±1	Ø6x15

■ Dimensions of AC output reactors (30 A to 60 A)

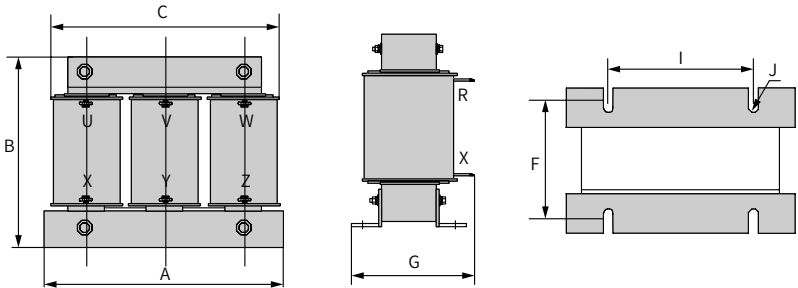


Figure 6-20 Dimensions of AC output reactors (30 A to 60 A)

Table 6-24 Dimensions of AC output reactors (30 A to 60 A, unit: mm)

Model	A	B	C	G	F	I	J
MD-OCL-30-0.23-4T-1%	155	130	148±1	135	80±2	95±1	Ø6x15
MD-OCL-40-0.18-4T-1%	155	130	148±1	135	80±2	95±1	Ø6x15
MD-OCL-50-0.14-4T-1%	155	130	148±1	135	80±2	95±1	Ø6x15
MD-OCL-60-0.12-4T-1%	195	165	188±1	130	72±2	120±1	Ø8.5x20

■ Dimensions of AC output reactors (80 A to 120 A)

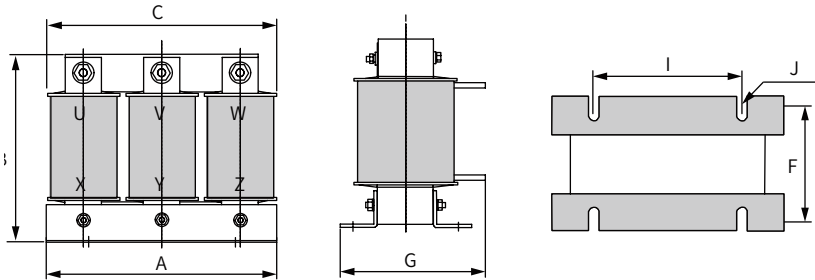


Figure 6-21 Dimensions of AC output reactors (80 A to 120 A)

Table 6-25 Dimensions of AC output reactor (80-120 A, unit: mm)

Model	A	B	C	G	F	I	J
MD-OCL-80-0.087-4T-1%	195	165	188±1	130	72±2	120±1	Ø8.5x20
MD-OCL-120-0.058-4T-1%	195	165	188±1	140	72±2	120±1	Ø8.5x20

■ Dimensions of AC output reactors (150 A to 490 A)

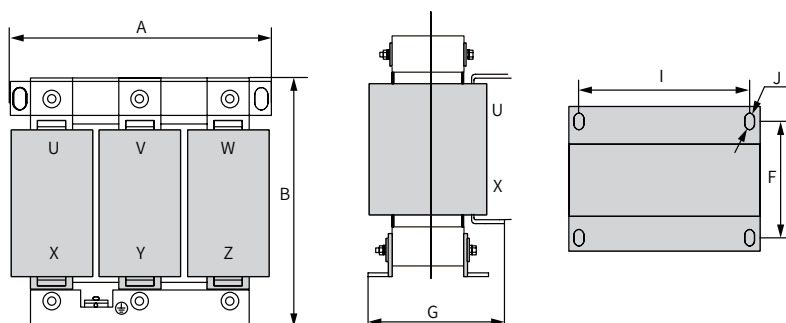


Figure 6-22 Dimensions of AC output reactors (150 A to 490 A)

Table 6-26 Dimensions of AC output reactors (150 A to 490 A, unit: mm)

Model	A	B	G	F	I	J
MD-OCL-150-0.047-4T-1%	250	230	170	87 ± 2	182 ± 1	42 ± 5
MD-OCL-200-0.028-4T-1%	250	230	175	97 ± 2	182 ± 1	42 ± 5
MD-OCL-250-0.028-4T-1%	250	230	175	97 ± 2	182 ± 1	42 ± 5
MD-OCL-330-0.021-4T-1%	290	250	190	106 ± 2	214 ± 1	$\varnothing 11 \times 18$
MD-OCL-490-0.014-4T-1%	320	320	220	113 ± 2	243 ± 1	$\varnothing 12 \times 20$



NOTE

◆ Dimensions of reactors provided are only for reference only. Actual dimensions may vary with drive models.

7 Certifications and Standards Compliance

7.1 Compliance List

The following table lists the certifications, directives, and standards that the product may comply with. For details about the acquired certificates, see the certification marks on the product nameplate.

Certification	Directive		Standard
CE Certification	EMC Directive	2014/30/EU	EN IEC 61800-3
	LVD	2014/35/EU	EN 61800-5-1
	RoHS Directive	2011/65/EU	EN IEC 63000



NOTE

◆ The product meets the requirements of the latest version of instructions and standards of the CE certification.

7.2 CE Certification

7.2.1 Precautions for Compliance with European Standards



Figure 7 1 CE Mark

- The CE mark indicates compliance with the Low Voltage Directive (LVD), Electromagnetic Compatibility (EMC), and Restriction of Hazardous Substances (RoHS) directives for commercial trades (production, import, and sales) in Europe.
- The CE mark is mandatory for engaging in commercial business (production, importation, and distribution) in Europe.
- The drive complies with the LVD, EMC, and RoHS directives and is labeled with the CE mark.
- The machinery and devices equipped with this product must also meet CE requirements when sold in Europe.
- The integrator who integrates this drive into other products and attaches CE mark to the final assembly has the responsibility of ensuring compliance with CE certification.

7.2.2 Requirements for Compliance with EMC Directive

The drive is applicable to the first environment and second environment and complies with EMC directive 2014/30/EU and standard EN IEC 61800-3.



CAUTION

- ◆ Besides the CE compliance described in this chapter, take measures to avoid interference if required.

As required by EMC directives and standards, install an EMC filter on the input side and shielded cables on the output side. Ensure that the filter is grounded properly and the shield of the output cable is grounded 360 degrees.



CAUTION

- ◆ The manufacturer of the system integrated with the drive must ensure that the system meets the requirements of the European EMC Directive and EN IEC 61800-3 standard according to the application environment of the system.

Introduction to EMC standards

Electromagnetic compatibility (EMC) describes the ability of electrical and electronic devices or systems to work properly in the electromagnetic environment without introducing electromagnetic interferences that disturb the operation of other local devices or systems. Therefore, EMC includes the following two aspects. If the equipment is applied in the first environment, radio interference may be generated.

- The electromagnetic interference generated by a device during normal operation must be restricted within a certain limit.
- The device must have sufficient immunity to electromagnetic interference in the environment and can work properly in the environment with electromagnetic interference, which is described as electromagnetic sensitivity.

EN IEC 61800-3 defines the following two environments:

- First environment: It includes domestic premises. It also includes establishments directly connected without intermediate transformer to a low-voltage power supply network which supplies buildings used for domestic purposes.
- Second environment: It includes all establishments other than those directly connected to a low-voltage power supply network which supplies buildings used for domestic purposes.

Devices are divided into the following four categories based on the intended application environment.

- C1 equipment: power drive system (PDS) with the rated voltage lower than 1000 V, which is intended for use in the first environment
- C2 equipment: PDS with the rated voltage lower than 1000 V, which is neither a plug-in device nor a movable device and is intended to be installed and commissioned only by professionals when used in the first environment.
- C3 equipment: PDS with the rated voltage lower than 1000 V, which is intended for use in the second environment and not intended for use in the first environment
- C4 equipment: PDS with the rated voltage equal to or higher than 1000 V or rated current equal to or higher than 400 A, or intended for use in complex systems in the second environment

7.2.3 Requirements for Compliance with the LVD

The drive has been tested in accordance with EN61800-5-1 to acknowledge compliance with the LVD. Observe the following requirements to enable machines and devices integrated with this drive to comply with the LVD.

a) Installation location

Install the drive in a place with overvoltage category III and pollution degree 1 or 2 as specified by IEC 60664-1.

b) Installation environment

For requirements of the installation environment, see section 2.2 Installation Environment.

c) Protective requirements for installation

- The drive serves as a part of a final system. Install the drive as the system component in a fireproof cabinet that provides effective electrical and mechanical protection, and install it in accordance with local laws and regulations and relevant IEC standards.

- Drives (IP20) intended to be installed inside the cabinet must be installed in a structure that prevents intrusion of unwanted objects from the top and the front.

d) Requirements on protective devices

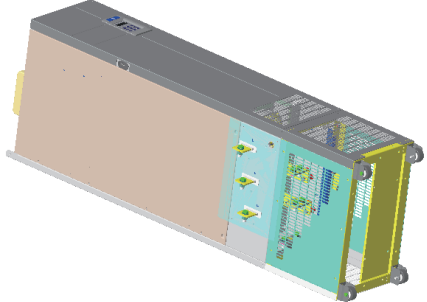
To comply with EN 61800-5-1 standards, install a fuse/circuit breaker on the input side of the drive to prevent accidents caused by short circuit in the internal circuit. See section 6.2 Instructions for Selecting Cables, Circuit Breakers, and Contactors for recommended fuse/circuit breaker.

Appendix Instructions for Installing the Base and Side Output Busbar

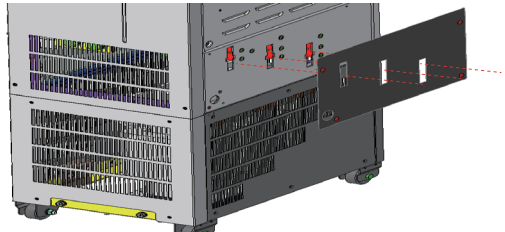
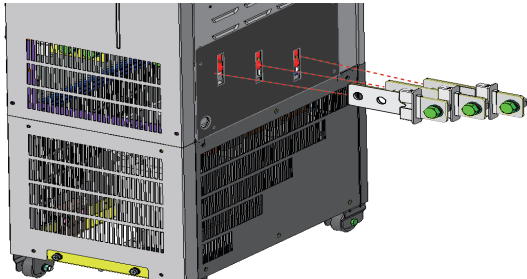
■ Installing the sheet metal base

Procedure	Diagram
Step 1: Remove the rollers and roller brackets at the bottom of the drive. Method: Loosen the hex bolts and nuts to remove the rollers. Loosen the eight M8 x 20 SEMS screws to remove the roller brackets. ◆ Number of rollers: 4 ◆ Number of roller brackets: 4	
Step 2: Remove the plastic baffle.	
Step 3: Remove the left, right, and front baffles (shown by 1, 2, and 3 respectively in the right figure) of the sheet metal base.	

Procedure	Diagram
Step 4: Install the sheet metal base to the bottom of the AC drive by securing the screws. ◆ T10 and T11: Six M8 x 20 SEMS screws ◆ T12: Four M8 x 20 SEMS screws (1, 2, 5, and 6 shown in the right figure); two M6 x 16 SEMS screws (3 and 4 shown in the right figure)	
Step 5: Install the plastic baffle to the sheet metal base.	
Step 6: Install the rollers and roller brackets to the bottom of the sheet metal base. 1) Installing the roller brackets Number of roller brackets: 4 Screws: Eight M8 x 20 SEMS screws 2) Fixing the rollers on the roller brackets Number of rollers: 4 Screws: ◆ Exterior: M8 x 50 hex bolts ◆ Interior: M8 flat washer + spring washer + nut	

Procedure	Diagram
Step 7: After the output cables of the drive is connected correctly, install the left, right, and front baffles on the sheet metal base, as shown in the right figure.	

■ Installing the side output busbar

Procedure	Diagram
Step 1: Remove the knockouts.	
Step 2: Snap in the insulation material.	
Step 3: Install the output busbar.	



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