INOVANCE

MD880 Series

High Performance Single Drive AC Drive Hardware Guide

User Guide

A01

Data code 19011400

Preface

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

As a general-purpose and high-performance current vector AC drive, this product is mainly used for controlling and adjusting the speed and torque of three-phase AC asynchronous motors. It is a supplement to the MD880 product family. Using high-performance vector control technology, the MD880 series AC drive features high torque output at a low speed, excellent dynamic characteristics, and superior overload capability. It provides user-programmable features and monitoring software, and communication bus functions and supports multiple encoder types, delivering rich and powerful combined functions and stable performance. It can be used to drive textile, papermaking, drawing, machine tools, packaging, foods, fans, water pumps, and other automated production equipment.

Notes
◆ The drawings in the user guide sometimes show the product without covers or protective guards to display more details. Remember to install the covers or protective guards as specified first, and then perform operations in accordance with the instructions. ◆ The drawings in the user guide are shown for reference only and may not match 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.

■ Standards compliance

The MD880 series AC drive complies with the directives and standards listed in the following table.

Directive	Name of Directive	Standard
EMC directive	2004/108/EC	EN 61800-3 EN 55011 EN 61000-6-2
LVD directive	2006/95/EC 93/68/EEC	EN 61800-5-1

NOTE

◆ The product complies with the requirements of standard IEC/EN 61800-3 on the condition of correct installation and use by following the instructions in *"3 Electrical Installation"*.

■ Related User Guide

User Guide	Data Code
SOP-20-880 Series Smart Operating Panel User Guide	19010611

Revision History

Date	Version	Description
October 2020	A00	First release.
March 2021	A01	Minor corrections.

Contents

Safety Instructions

Safety Disclaimer

1) Before installing, using, and maintaining this equipment, read the safety information and precautions thoroughly, and comply with them during operations.
2) To ensure the safety of humans and equipment, follow the signs on the equipment and all the safety instructions in this user guide.
3) "CAUTION", "WARNING", and "DANGER" items in the user guide indicate only part of safety precautions that must be followed. They are supplements to the safety instructions.
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 injuries or property damage caused by improper usage.

Safety Levels and Definitions

DANGER	indicates that failure to comply with the notice will 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 injuries or damage to the equipment.

Safety Instructions

Unpacking
CAUTION ◆ Check whether the packing is intact and whether there is damage, water seepage, damp, and deformation. ◆ Unpack the package by following the package sequence. Do not hit the package with force. ◆ Check whether there are damage, rust, or injuries on the surface of the equipment or equipment accessories. ◆ Check whether the number of packing materials is consistent with the packing list.

- Do not install the equipment if you find damage, rust, or indications 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

- Store and transport this equipment based on the storage and transportation requirements for humidity and temperature.
- Avoid transporting the equipment in environments such as water splashing, rain, direct sunlight, strong electric field, strong magnetic field, and strong vibration.
- Avoid storing this equipment for more than three months. Long-term storage requires stricter protection and necessary inspections.
- Pack the equipment strictly before transportation. Use a sealed box for long-distance transportation.
- Use an even and flat truck to transport the equipment for long distance and ensure that the installation pad is level. On snowy and rainy days, take proper measures to proof rain and snow before transportation, such as, packing the equipment with felt fabric.
- Never transport this equipment with other equipment or materials that may harm or have negative impacts on this equipment.

- 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 falling. Failure to comply may result in personal injuries.
- Handle the equipment with care during transportation and mind your step to prevent personal injuries or equipment damage.
- Never stand or stay below the equipment when the equipment is lifted by hoisting equipment. Ensure sufficient tonnage ratings of the crane, cables, and hooks when lifting the equipment.

Installation

- Thoroughly read the safety instructions and user guide before installation.
- Do not modify this equipment.
- Do not loosen fixed bolts (especially those marked in red) on equipment components.
- Do not install this equipment in places with strong electric or magnetic fields.
- When this equipment is installed in a cabinet or final equipment, protection measures such as a fireproof enclosure, electrical enclosure, or mechanical enclosure 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 been trained with necessary electrical information.
- 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 at power-on. Failure to comply will result in an electric shock.
- Before wiring, cut off all equipment power supplies. Wait at least 15 minutes before further operations because residual voltage exists after power-off.
- Always perform wiring after installation of the equipment is completed.
- 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 antistatic 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.
- Wiring cables must meet diameter and shielding requirements. The shielding layer of the shielded cable must be reliably grounded at one end.
- After wiring, make sure that no screws are fallen and cables are exposed in the equipment.

Power-on

- Before power-on, make sure that the equipment is installed properly with reliable wiring and the motor can be restarted.
- Before power-on, make sure that the power supply meets equipment requirements to prevent equipment damage or even a fire.
- At 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.
- Do not touch any wiring terminals at power-on. Failure to comply will result in an electric shock.
- Do not remove any part of the equipment at power-on. Failure to comply will result in an electric shock.

Operating

- 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 shell, fan, or resistor for temperature detection. Failure to comply will result in heat injuries.
- Signal detection must be performed only by professionals during operation. Failure to comply will result in personal injuries or equipment damage.

- 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 using the contactor. Failure to comply may result in equipment damage.

Maintenance

- Equipment installation, wiring, maintenance, inspection, or parts replacement must be performed only by professionals.
- Do not maintain the equipment at power-on. Failure to comply will result in an electric shock.
- Before maintenance, cut off all equipment power supplies and wait at least 15 minutes.

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

Repairing
DANGER ◆ Equipment installation, wiring, maintenance, inspection, or parts replacement must be performed only by professionals. ◆ Do not repair the equipment at power-on. Failure to comply will result in an electric shock. ◆ Before inspection and repair, cut off all equipment power supplies and wait at least 15 minutes.
WARNING ◆ Require 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, perform wiring inspection and parameter settings again.
Disposal
WARNING ◆ Dispose of retired equipment by following local regulations or standards. Failure to comply may result in property damage, personal injuries, or even death. ◆ Recycle retired equipment by following industry waste disposal standards to avoid environmental pollution.

Safety Signs

For safe equipment operation and maintenance, comply with safety signs on the equipment, and do not damage or remove the safety labels. The following table describes the safety labels.

Safety Label	Description
	This equipment must only be serviced by qualified personnel. Disconnect all energy sources and wait 15 minutes before maintenance. Read the maintenance instructions before maintenance.

Safety Label	Description
	To prevent overheating of the pre-charge resistor, the interval between switch-ons must not be less than three 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 the power range of 5.5 kW to 450 kW, which is suitable for drive scenarios with papermaking equipment, rolling mills, experimental stations, cranes, oil rigs, and mining machinery.

1.2 Nameplate and Model Number

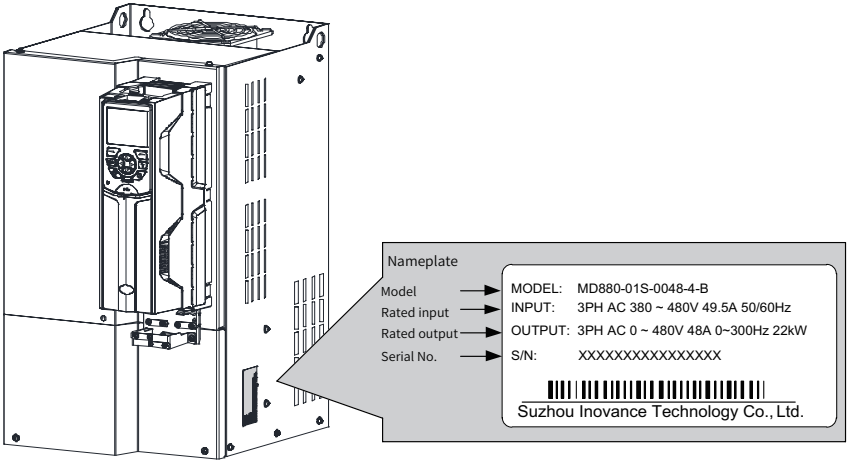


Figure 1-1 Nameplate

MD880 - 01S - 0048 - 4 - B

Code 1	Product Platform
MD880	MD880 series AC drive

Code 2	Product Category
01S	Single drive

Code 3	Rated Current
0048	48 A

Code 4	Voltage Class
4	Three phase 400 VAC
7	Three phase 690 VAC

Code 5	Standard Option
B	Built-in braking module
L	With output reactor
None	None

Figure 1-2 Model number

1.3 Voltage and Power Rating

The grid voltage ranges from 3AC 380 V to 480 V. The following table lists the power rating.

Table 1-1 Power rating of the MD880 series AC drive (single drive system)

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

1.4 Technical Data and Model Selection

Table 1-2 Selection of MD880 series AC drive (single drive system)

Structure	Model	No Overload		Light Overload		Heavy Overload		Weight (kg)	Loss (kW)	Overall Dimensions (W x L x D) (mm)
		Current (A)	Power (kW)	Current (A)	Power (kW)	Current (A)	Power (kW)			
UN: three-phase 400 VAC (range: 380–480 V)										
T2	MD880-01S-0012-4-B	12.0	5.5	12.0	5.5	9.0	3.7	8.5	0.12	140 x 450 x 338
	MD880-01S-0017-4-B	17.0	7.5	17.0	7.5	13.0	5.5		0.195	
T3	MD880-01S-0024-4-B	24.0	11.0	23.0	11.0	17.0	7.5	11	0.262	150 x 470 x 348
	MD880-01S-0033-4-B	33.0	15.0	32.0	15.0	25.0	11		0.445	
T4	MD880-01S-0038-4-B	38.0	18.5	37.0	18.5	32.0	15	12.2	0.553	190 x 470 x 348
T5	MD880-01S-0048-4-B	48	22	45	22	37	18.5	17.6	0.478	230 x 500 x 357
	MD880-01S-0060-4-B	60	30	58	30	45	22		0.551	
T6	MD880-01S-0078-4-B	78	37	75	37	60	30	27.6	0.694	265 x 510 x 387
	MD880-01S-0094-4-B	94	45	91	45	75	37		0.815	
T7	MD880-01S-0116-4-B	116	55	112	55	91	45	37.5	1.01	300 x 542 x 425
	MD880-01S-0149-4-B	149	75	143	75	112	55		1.21	
T8	MD880-01S-0183-4-B	183	90	176	90	150	75	54	1.57	338 x 580 x 465
	MD880-01S-0217-4	217	110	210	110	176	90		1.81	
	MD880-01S-0262-4	262	132	253	132	210	110		2.14	
T9	MD880-01S-0314-4	314	160	304	160	253	132	87.5	2.85	400 x 915 x 470
	MD880-01S-0383-4	383	200	370	200	304	160		3.56	
T10	MD880-01S-0441-4	441	220	426	220	377	200	110	4.15	360 x 1134 x 500
	MD880-01S-0481-4	481	250	465	250	426	220		4.55	
	MD880-01S-0441-4(-L)	441	220	426	220	377	200	160	4.15	360 x 1472 x 500
	MD880-01S-0481-4(-L)	481	250	465	250	426	220		4.55	

Structure	Model	No Overload		Light Overload		Heavy Overload		Weight (kg)	Loss (kW)	Overall Dimensions (W x L x D) (mm)
		Current (A)	Power (kW)	Current (A)	Power (kW)	Current (A)	Power (kW)			
T11	MD880-01S-0538-4	538	280	520	280	465	250	155	5.06	390 x 1284 x 545
	MD880-01S-0605-4	605	315	584	315	520	280		5.33	
	MD880-01S-0538-4(-L)	538	280	520	280	465	250	215	5.06	390 x 1622 x 545
	MD880-01S-0605-4(-L)	605	315	584	315	520	280		5.33	
T12	MD880-01S-0673-4	673	355	650	355	585	315	185	5.69	400 x 1403 x 545
	MD880-01S-0751-4	751	400	725	400	650	355		6.31	
	MD880-01S-0849-4	849	450	820	450	725	400		6.91	
	MD880-01S-0673-4(-L)	673	355	650	355	585	315	245	5.69	400 x 1735 x 545
	MD880-01S-0751-4-L	751	400	725	400	650	355		6.31	
	MD880-01S-0849-4-L	849	450	820	450	725	400		6.91	

1.5 Technical Data

Table 1-3 Technical data of MD880 series AC drive (single drive system)

Item		Specification
Basic performance	Rated input voltage and frequency	400 V system: 380–480 VAC, 50/60 Hz
	Allowed voltage fluctuation	-15% to +10%; actual allowed range: 323 VAC to 528 VAC
	Output voltage	400 V system: 0–480 VAC
	Output frequency	0–300 Hz
	Overload capacity	Light overload: 110% for 1 minute every 5 minutes Heavy overload: 150% for 1 minute every 5 minutes
	Efficiency	More than 98%

Item		Specification
Control characteristics	Motor control mode	V/F control Sensorless vector control (SVC) Feedback vector control (FVC)
	Carrier frequency	400 V system: 5.5–37 kW: 4 kHz by default; 45–55 kW: 3.2 kHz by default; 75 kW: 2.5 kHz by default; 90–450 kW: 2 kHz by default
	Speed range	V/F control: 1:50
		SVC: 1:200
		FVC: 1:1000
	Speed control accuracy	SVC: ±10%Fsl
		FVC: ±0.01%
	Torque response	SVC: ⩽ 5 ms
		FVC: ⩽ 5 ms
	Startup torque	SVC: 0.5 Hz/150%
		FVC: 0 Hz/200%
Mechanical data	Antivibration performance	Compliant with GB/T 2423.10-2008 Frequency: 5–9 Hz, displacement: 7 mm Frequency: 9–200 Hz, acceleration rate: 5.9 m/s^2 Scanning speed: 1 oct/min
	Security performance	Compliant with EN 61800-5-1
	Cooling mode	Forced air cooling (AF), compliant with EN 60146
Protections	Phase loss protection	Input phase loss protection Output phase loss protection
	Overvoltage protection	The AC drive stops when the DC voltage of the main circuit is above 800 V.
	Undervoltage protection	The AC drive stops when the DC voltage of the main circuit is below 350 V.
	Overtemperature protection	Protection is triggered when the inverter bridge gets overheated.
	Overload protection	The AC drive stops after running at 150% of rated heavy-load current for 60 seconds. The AC drive stops after running at 110% of rated light-load current for 60 seconds.
	Overcurrent protection	The AC drive stops when 2.5 times of rated heavy-load current of the AC drive is exceeded.
	Brake protection	Braking resistor short-circuit protection (unavailable for models of 18.5 kW and below)
	Short-circuit protection	Output phase-to-phase short-circuit protection Output phase-to-ground short-circuit protection

Item		Specification
Environment Requirements	Installation location	Free from direct sunlight, dust, corrosive gas, combustible gas, oil smoke, vapor, drip, or salt indoor
	Altitude	Below 1000 m, derated by 1% per 100 m increase when the altitude is above 1000 m Maximum altitude: 3000 m
	Operating ambient temperature	Ambient temperature: -10°C to +40°C , derated by 1.5% per 1° C increase when the ambient temperature exceeds 40°C Maximum temperature: 50° C
	Storage temperature	-20°C to +60°C
	Humidity	Less than 95% RH, non-condensing
	Vibration	Lower than 5.9m/s^2 (0.6g)
	Pollution degree	PD2
	Power system	TT/TN IT (VDR and EMC screws removed)
	Overvoltage category	OVC III
	IP rating	Structures T2 to T9: IP20 Structures T10 to T12: IP00

1.6 Derating

1) Ambient temperature and derating

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

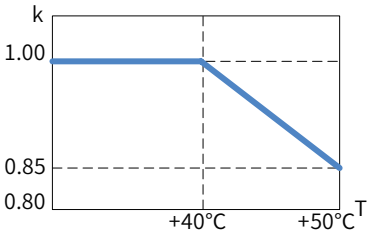


Figure 1-3 Ambient temperature and derating

2) Altitude and derating

When the altitude is 1000 m to 3000 m above the sea level, for every 100 m increase in altitude, the output current of the AC drive must be derated by 1%.

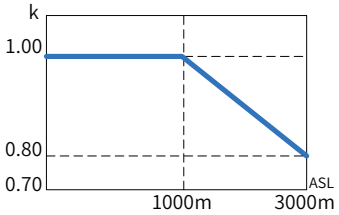


Figure 1-4 Altitude and derating

3) Carrier frequency and derating

Table 1-4 Carrier frequency and derating

Model MD880-01S-...	Rated Power	Carrier Frequency (kHz)									
	P (kW)	1.2	1.5	2	2.5	3.2	4	5	6	7	8
0012-4-B	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	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	11	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	91.04%	83.15%	76.32%	70.36%
0033-4-B	15	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	91.54%	84.01%	77.27%	71.24%
0038-4-B	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	22	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	93.65%	87.90%	82.65%	77.90%
0060-4-B	30	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	93.45%	87.60%	82.20%	77.30%
0078-4-B	37	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	90.60%	82.40%	74.85%	68.30%
0094-4-B	45	100.00%	100.00%	100.00%	100.00%	100.00%	94.40%	86.50%	79.40%	72.85%	67.10%
0116-4-B	55	100.00%	100.00%	100.00%	100.00%	100.00%	94.00%	86.15%	79.20%	73.35%	68.10%
0149-4-B	75	100.00%	100.00%	100.00%	100.00%	95.28%	88.90%	81.75%	75.50%	70.00%	65.20%
0183-4-B	90	100.00%	100.00%	100.00%	93.85%	85.72%	77.50%	—	—	—	—
0217-4	110	100.00%	100.00%	100.00%	93.10%	84.00%	74.90%	—	—	—	—
0262-4	132	100.00%	100.00%	100.00%	93.93%	85.90%	77.70%	—	—	—	—
0314-4	160	100.00%	100.00%	100.00%	94.83%	87.98%	80.80%	—	—	—	—
0383-4	200	100.00%	100.00%	100.00%	94.45%	87.08%	79.70%	—	—	—	—
0441-4-(L)	220	100.00%	100.00%	100.00%	92.50%	82.80%	73.10%	—	—	—	—
0481-4-(L)	250	100.00%	100.00%	100.00%	93.10%	84.16%	75.10%	—	—	—	—
0538-4-(L)	280	100.00%	100.00%	100.00%	93.40%	84.80%	76.20%	—	—	—	—
0605-4-(L)	315	100.00%	100.00%	100.00%	93.85%	85.80%	77.80%	—	—	—	—
0673-4-(L)	355	100.00%	100.00%	100.00%	93.78%	85.46%	77.00%	—	—	—	—
0751-4-(L)	400	100.00%	100.00%	100.00%	94.23%	86.62%	78.70%	—	—	—	—
0849-4-(L)	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 (single drive system). When the drive system runs at the reference load current (load duration 300s), an overload occurs.

1) Curve in light overload mode

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

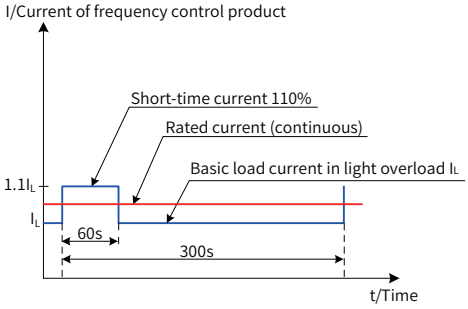


Figure 1-5 Curve in light overload mode

2) Curve in heavy overload mode

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

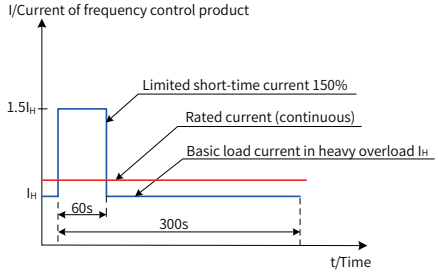


Figure 1-6 Curve in heavy overload mode

1.8 Overall Dimensions

1.8.1 Overall and Mounting Dimensions of Structures T2 to T9

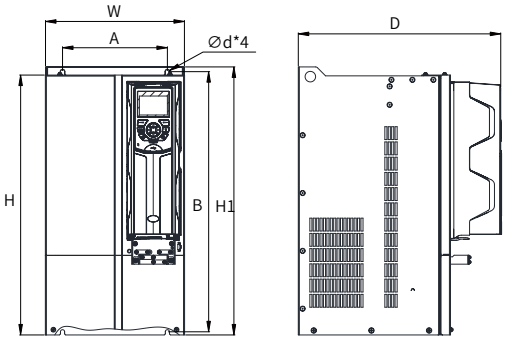


Figure 1-7 Overall and mounting dimensions of structures T2 to T9

Table 1-5 Overall and mounting dimensions of structures T2 to T9

Structure	Mounting Hole Location (mm)		Overall 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 Overall and Mounting Dimensions of Structures T10 to T12 (Without Reactors)

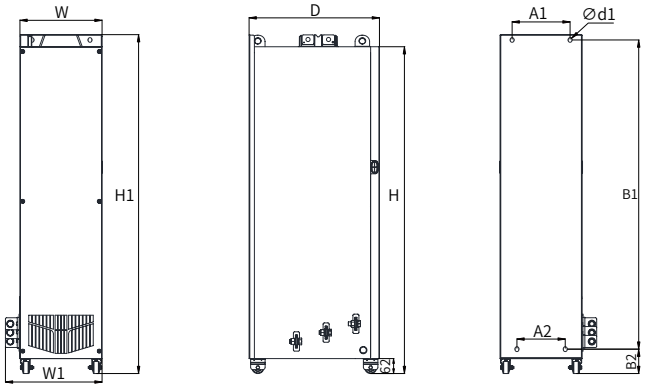


Figure 1-8 Overall and mounting dimensions of structures T10 to T12 (without reactors)

Table 1-6 Overall and mounting dimensions of structures T10 to T12 (without reactors)

Structure	Mounting Hole Location (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 Overall and Mounting Dimensions of Structures T10 to T12 (With Reactors)

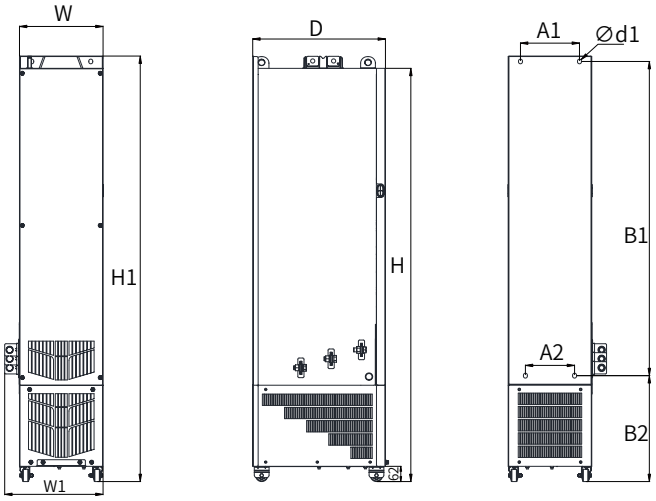


Figure 1-9 Overall and mounting dimensions of structures T10 to T12 (with reactor bases)

Table 1-7 Overall and mounting dimensions of structures T10 to T12 (with reactor bases)

Structure	Mounting Hole Location (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 Tightening Torque of Fasteners

Table 1-8 Electrical connection

Screw/Bolt	Strength Grade	Maximum Torque (N·m)
M3	4.6–8.8	0.5
M4	4.6–8.8	1.2
M5	8.8	2.5
M6	8.8	9
M8	8.8	22
M10	8.8	42

Screw/Bolt	Strength Grade	Maximum Torque (N·m)
M12	8.8	70
M16	8.8	120

Table 1-9 Mechanical connection

Screw/Bolt	Strength Grade	Maximum Torque (N·m)
M5	8.8	6
M6	8.8	10
M8	8.8	24

Table 1-10 Insulator connection

Screw/Bolt	Strength Grade	Maximum 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	Strength Grade	Maximum Torque (N·m)
M8	8.8	15
M10	8.8	32
M12	8.8	50

1.10 Consumption of Auxiliary Power

Table 1-12 Consumption of auxiliary power

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

2 Mechanical Installation

2.1 Storage and Transportation Precautions

2.1.1 Storage

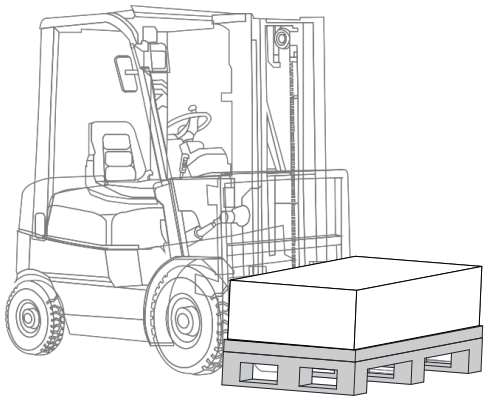
The AC drive must be stored in a clean and dry room, with temperatures between -20°C and +60°C and temperature variation smaller than 1° C/min. If the AC drive is stored for a prolonged period once it has been unpacked, cover it or take other appropriate measures to ensure that it does not become dirty and that it is protected against environmental influences.

For storage of the AC drive, pay attention to the following three aspects:

- Pack the AC drive with the original packing box provided by Inovance.
- Do not expose the AC drive to moisture, high temperature, or outdoor direct sunlight for a long time.
- The electrolytic capacitor will deteriorate after being stored for a long time. Therefore, the AC 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. Contact professionals for technical support if necessary.

2.1.2 Transportation

- Structures T2 to T5 are small and light and can be handled manually.
- However, structures T6 to T12 are heavy, requiring suitable hoisting gear operated by trained personnel. The equipment must be carried on a wooden pallet when transported with forklifts. The equipment must be carried on a wooden pallet when transported with cranes.



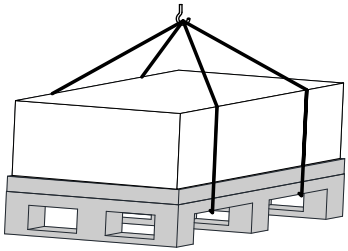


Figure 2-1 Transporting equipment before unpacking

- Ensure that the ground at the installation location is flat and strong enough to bear the weight of the equipment.
- Structures T9 to T12 are heavy with high centers of gravity, which cannot be placed on a slope with an inclination of more than 5° .
- The equipment must always be transported in the upright position indicated. The equipment must not be transported upside down or in a horizontal position.

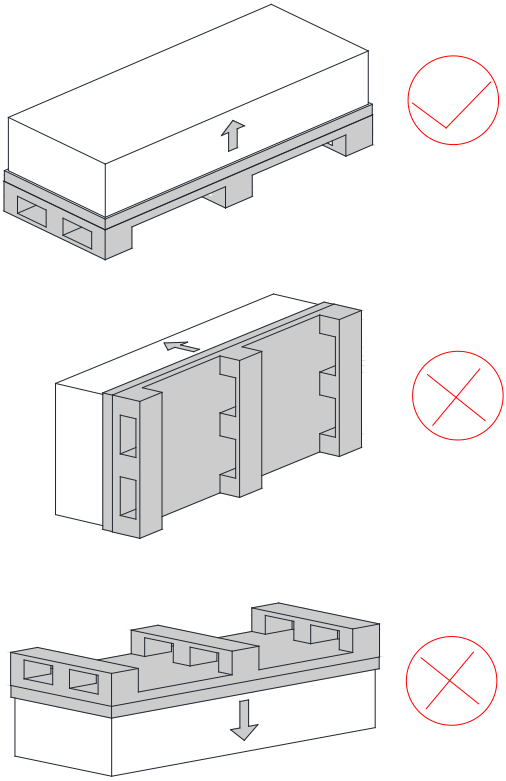


Figure 2-2 Placing

2.1.3 Acceptance

After receiving the equipment, 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 you have any problem, contact Inovance or the local agent for technical support.

DANGER

- If the equipment is damaged during transportation, the electrical safety of the cabinet can no longer be ensured. Do not connect the equipment before high voltage testing.
- Failure to comply may result in death, serious injuries or great property loss.

2.1.4 Unpacking

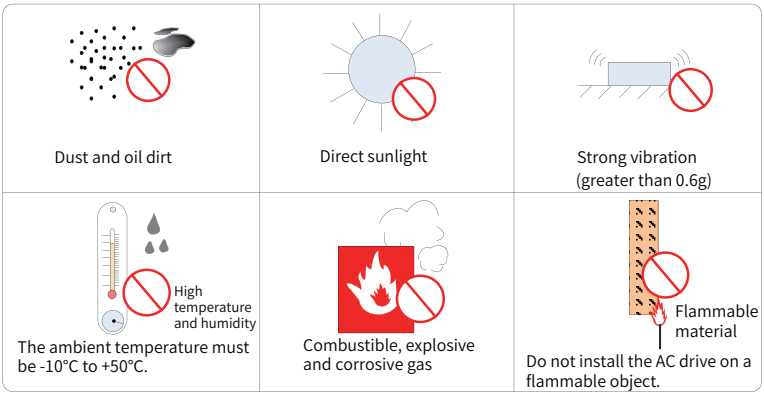
Related user guides and accessories are placed in different cells in the box. The unpacking steps are as follows:

1) Remove all cable ties and open the cover.
2) Remove all filters.
3) Take the AC drive out.
4) Cut the plastic film and wrapping tape.
5) Check that no damage occurs.
6) Handle or recycle the package materials according to the local laws and regulations.

2.2 Installation Environment

Item	Quantity
Heat dissipation and ventilation	Install the AC drive on a flame-retardant surface, and ensure that sufficient space is left around the enclosure to allow for efficient heat dissipation. The AC drive generates significant heat during working. Use screws to install the AC drive on the mounting bracket vertically.
Installation location	Ensure that the following requirements are satisfied: No direct sunlight. No water drops and humidity lower than 95% No corrosive, inflammable, or explosive gas No oil dirt and dust
Vibration	Install the equipment in a place not prone to vibration. Vibration shall not be greater than 0.6 g. Keep away from devices such as punch presses.
Ambient temperature	The AC drive's service life is greatly influenced by the ambient temperature. Do not run the AC drive under a temperature exceeding the allowed temperature range (-10°C to +50°C).

Item	Quantity
Enclosure	This product is installed in a cabinet and must be installed in the final system. The final system must provide a fireproof enclosure, electrical enclosure, and mechanical enclosure, and comply with local laws and regulations and relevant IEC standards.



2.3 Installation Clearances and Direction

2.3.1 Installation Clearances

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

1) Installing a single AC drive

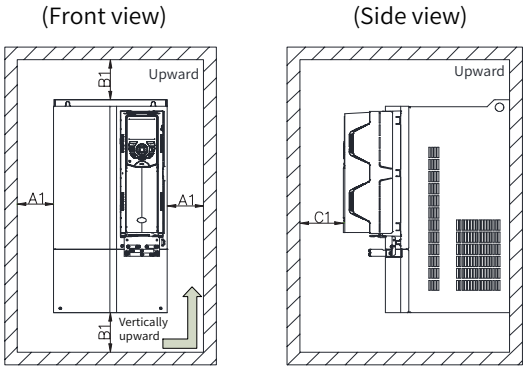


Figure 2-3 Installation clearances of a single AC drive (structures T2 to T9)

Power Rating	Dimension Requirements (mm)		
5.5–30 kW	A1 ⩾ 10	B1 ⩾ 200	C1 ⩾ 20
37–45 kW	A1 ⩾ 50	B1 ⩾ 200	C1 ⩾ 20
55–200 kW	A1 ⩾ 50	B1 ⩾ 300	C1 ⩾ 20

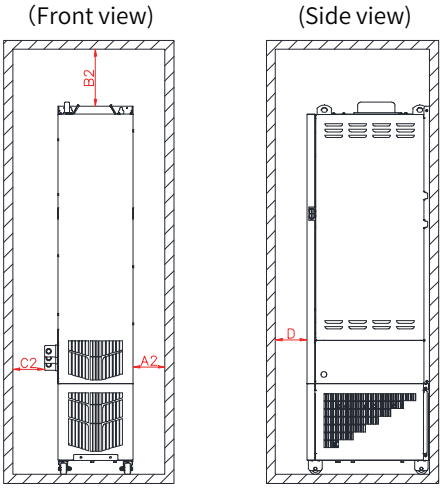


Figure 2-4 Installation clearances of a single AC drive (structures T10 to T12)

Power Rating	Dimension Requirements (mm)			
220–450 kW	A2 ⩾ 10	B2 ⩾ 250	C2 ⩾ 50	D ⩾ 30

2) Installing multiple AC drives side by side

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

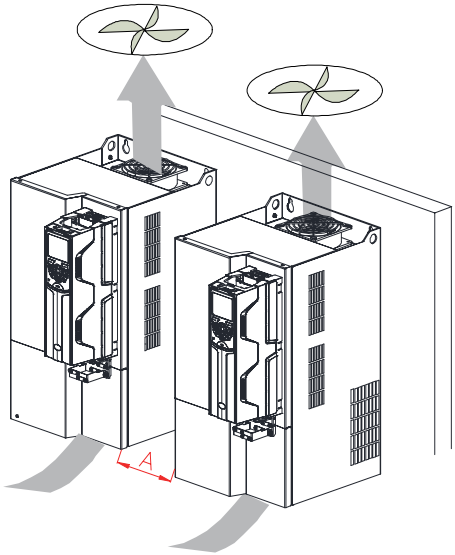


Figure 2-5 Installing multiple AC drives (structures T2 to T9) side by side

Power Rating	Clearance Requirements (mm)
5.5–30 kW	A ⩾ 10
37–45 kW	A ⩾ 50
55–160 kW	A ⩾ 50

NOTE

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

3) Installing AC drives above one another

In scenarios where AC drives are installed above one another, an air guide plate must be installed to avoid overtemperature of the upper AC drive caused by heat generated by the lower AC drive.

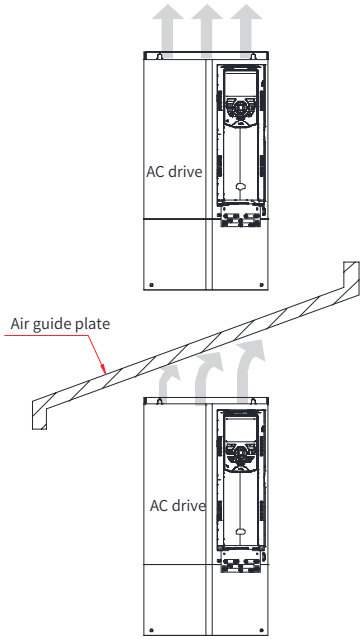


Figure 2-6 Installing AC drives (structures T2 to T9) above one another

NOTE

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

2.3.2 Installation Direction

The AC drive must be installed vertically upward. Other installation directions are not allowed.

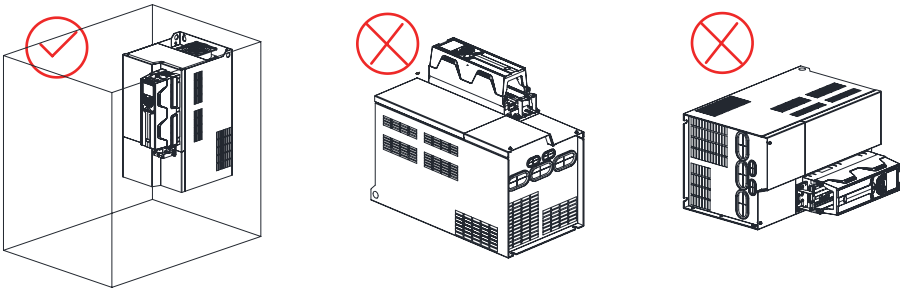


Figure 2-7 Installation direction

2.4 Backplate Mounting

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

NOTE

- Reserve the installation clearances as specified in Figure 2-3 to ensure sufficient space for heat dissipation of the AC drive. Take the heat dissipation of other equipment in the cabinet into consideration.
- Install the AC drive vertically upward to facilitate heat dissipation. If multiple AC drives are installed in the cabinet, install them side by side. If AC drives are installed above one another, install an air guide plate, as shown in Figure 2-6.
- Use an incombustible hanging bracket.
- In scenarios with metal dust, it is recommended that the AC drive be installed in a completely closed cabinet to isolate the AC drive from metal dusts. In this case, the space inside the cabinet must be as large as possible. It is recommended that the heatsink be installed outside the cabinet.

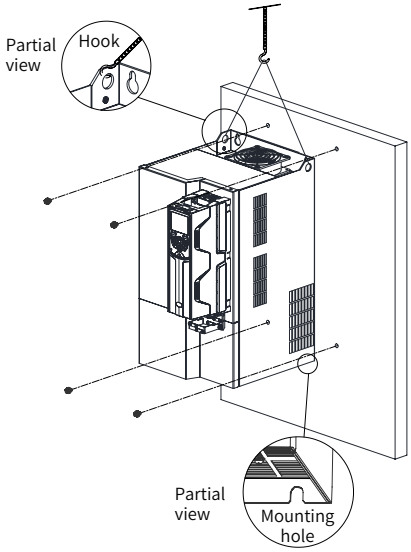


Figure 2-8 Backplate mounting of structures T2 to T9

NOTE

- In this mode, mount the AC drive using all mounting holes; otherwise, the AC drive may fall off or be damaged due to the unbalanced effect on the fixed part during long-time running.

2.5 Floor Mounting

2.5.1 Heat Dissipation Requirements

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

1) Direct discharging cabinet (without fans on the top)

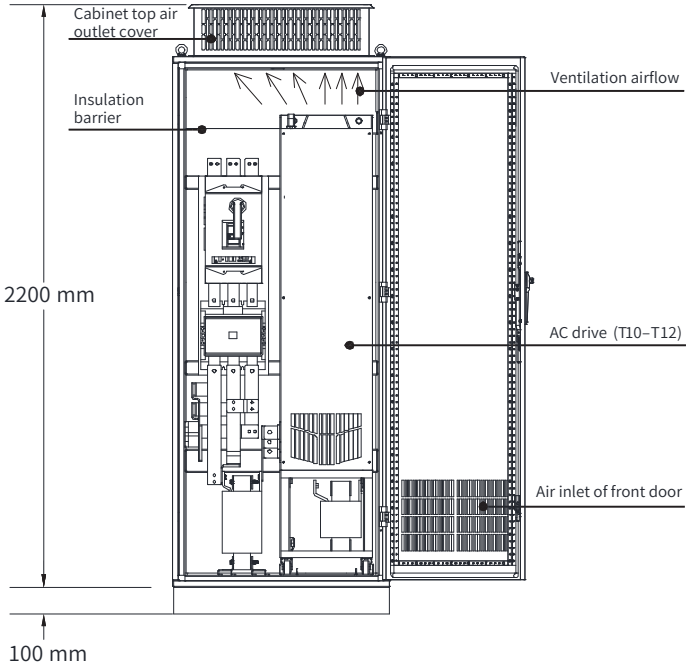


Figure 2-9 Direct discharging cabinet

Table 2-1 Specification of the direct discharging cabinet

AC Drive Model	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)	2	586	31809	50894
MD880-01S-0481-4-(L)	2	722	31809	50894
MD880-01S-0538-4-(L)	3	789	47713	76341
MD880-01S-0605-4-(L)	3	882	47713	76341
MD880-01S-0673-4-(L)	3	644	47713	76341
MD880-01S-0751-4-(L)	3	796	47713	76341
MD880-01S-0849-4-(L)	3	796	47713	76341
Note: 1. CFM = 0.0283 m^3/min 2. "Effective Area" indicates the through-hole area.				

2) Cabinet with fans on the top

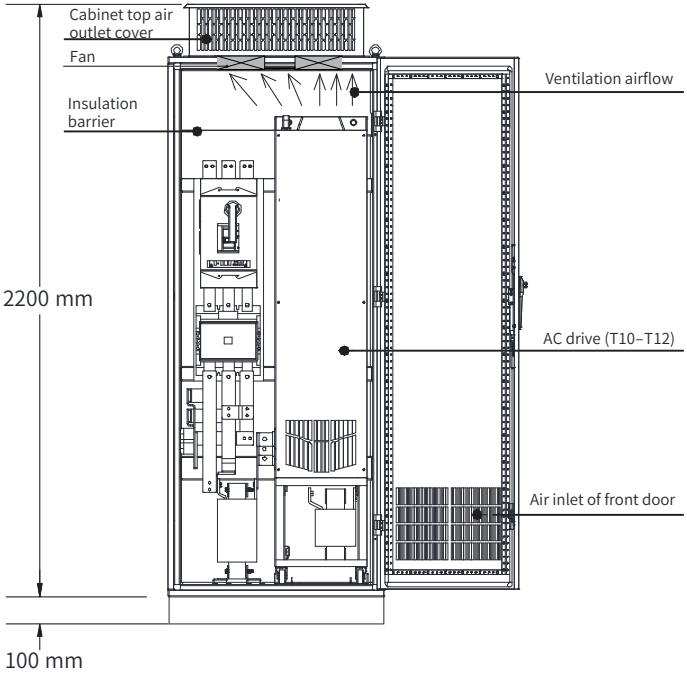


Figure 2-10 Cabinet with fans on the top

Table 2-2 Specification of the cabinet with fans on the top

AC Drive Model	Quantity of Fans	Total Air Volume (CFM)	Effective Area of Cabinet Top Air Inlet (mm^2)	Max. Air Volume Required by the Top Fan (CFM)	Effective Area of Cabinet Top Air Outlet (mm^2)
MD880-01S-0441-4-(L)	2	586	31809	703	S = 0.942×N×(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)	2	722	31809	866	
MD880-01S-0538-4-(L)	3	789	47713	978	
MD880-01S-0605-4-(L)	3	882	47713	1058	
MD880-01S-0673-4-(L)	3	644	47713	733	
MD880-01S-0751-4-(L)	3	796	47713	955	
MD880-01S-0849-4-(L)	3	796	47713	955	
Note: 1. CFM = 0.0283 m^3/min 2. "Effective Area" indicates the through-hole area.					

As shown in the following figure, the heat vent of the AC drive must be isolated inside the cabinet using a windscreen to ensure that the hot air generated by the AC drive exhausts through the louver on the cabinet top, stopping circulation of the hot air in the cabinet.

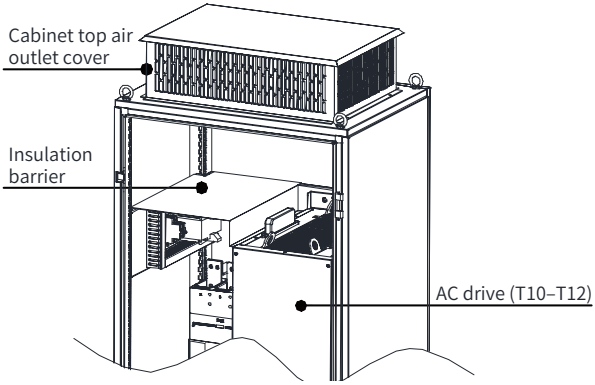


Figure 2-11 Windscreen inside the cabinet

2.5.2 Precautions for Installing AC Drives in Cabinets

The nine fold profile cabinet (PS cabinet) is recommended. Before installing the AC drive, install the bottom mounting bracket and guide rail and fixing beams with mounting holes (see *"1.8 Overall Dimensions"* for specific positions and dimensions) for fixing the AC drive inside the cabinet. Reserve sufficient space in the cabinet for side entry copper busbar joint and operation.

You can push the AC drive into the cabinet or pull it out of the cabinet after moving the AC drive onto the guide rail. Make sure to align the casters to the guide rail and arrange two persons for drive push-in and pull-out to ensure safety.

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.
- A tool such as a sleeve with an extension bar is required for operation on the copper busbar terminals of main circuit power cables.
- Make sure to align the casters to the guide rail and arrange two persons for drive push-in and pull-out to ensure safety, as shown in Figure 2-18 and Figure 2-19.
- See Figure 2-12 for cabinet layout before mounting the AC drive in a cabinet. The dimensions of cabinet rack are 2200 x 800 x 600 (H200 cabinet ventilation top cover included, unit: mm). The H100 cabinet base is required for installing the cabinet. A windscreen 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 product), see *"2.5.4 Dimensions of the Mounting Bracket"*. Besides, check that the strength and stiffness of the guide rail meet requirements.
- After the AC drive is pushed into the cabinet, remove the paperboard from the air outlet of the AC drive to exhaust hot air, preventing the overtemperature fault.

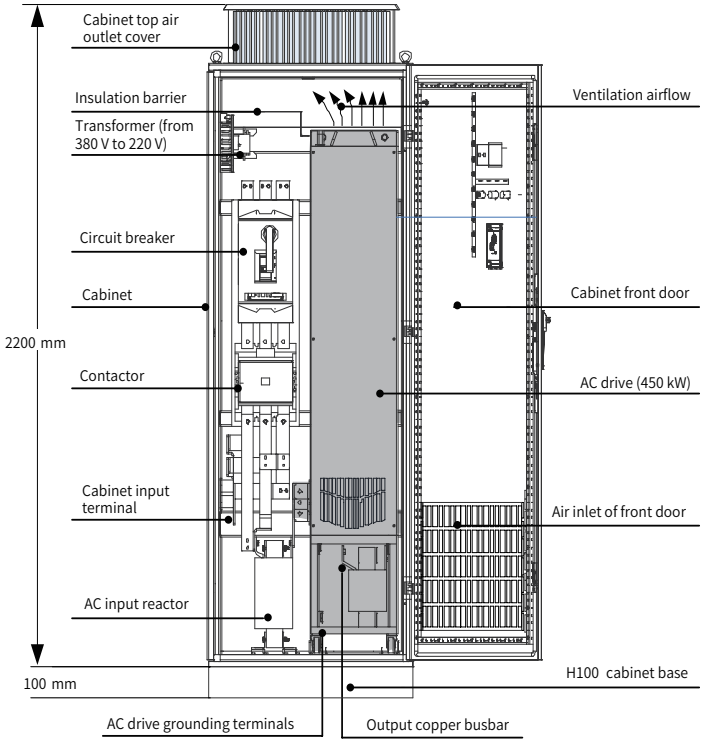


Figure 2-12 Recommended cabinet layout

2.5.3 Procedure for Installing the AC Drive in a Cabinet

Step	Operation
1	Install the fixing 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 cabinet.
4	Remove the cover from the AC drive (see *"2.6 Cover Removal and Mounting"*) to expose the handle.
5	Arrange two persons to align casters of the AC drive to the guide rail and push the AC drive into the cabinet slowly, as shown in Figure 2-18 and Figure 2-19. Use soft strap in the process of push-in and push-out to prevent turnover.
6	Remove the soft strap. There are two mounting holes at the back of the AC drive. Secure the mounting holes at the top and bottom parts at the back of the AC drive to secure the AC drive to the fixing team, as shown in Figure 2-20.
7	Check that installation of the AC drive is secure and remove the guide rail.

■ Installing the fixing beam and reserving mounting holes

1) A nine-fold profile cabinet (PS cabinet) is recommended for installation of the AC drive. The cross section of the nine-fold profile cabinet is shown in Figure 2-13.

2) When structures T10 to T12 are mounted in the nine fold profile cabinets of 600 mm deep, the fixing beams must fold inwards, as shown in Figure 2-14. When the AC drive is mounted in the cabinet of 800 mm deep, folding inwards is not required.

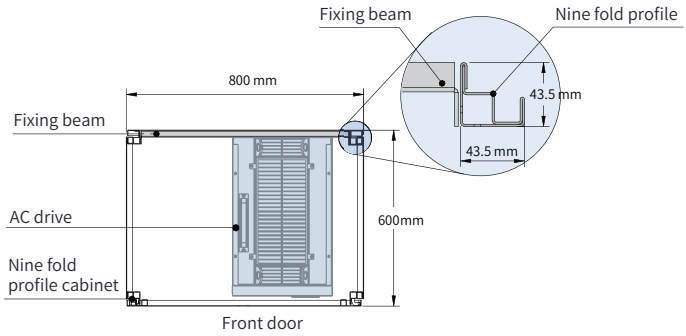


Figure 2-13 Top view of structures T10 to T12 in the cabinet

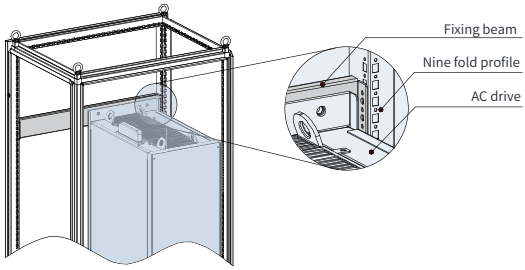


Figure 2-14 3D view of structures T10 to T12 in the cabinet

NOTE

◆ If the cabinet has a front door and a back door, the cabinet of 600 mm deep is too small to accommodate structures T10 to T12. In this case, the cabinet of 800 mm deep is recommended.

■ Fixing the bottom mounting bracket

1) Use six M5 tapping screws to fix the mounting bracket on the nine fold profile cabinet according to the following figure (for the mounting bracket drawing, see *"2.5.4 Dimensions of the Mounting Bracket"*).

2) If a non-nine fold profile cabinet is used, drill mounting holes for the mounting bracket on site.

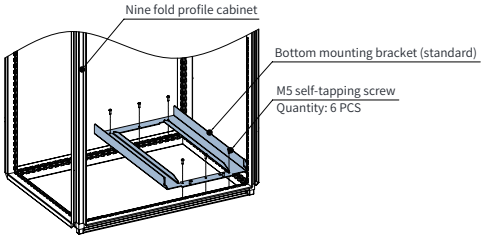
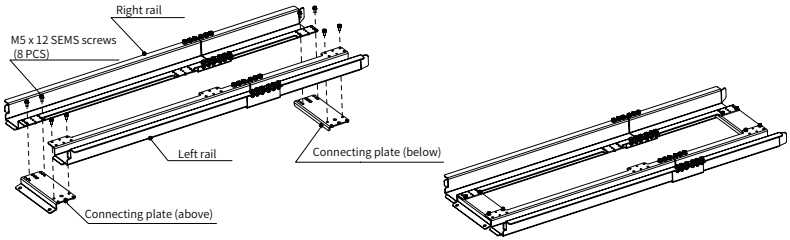


Figure 2-15 Installing the bottom mounting bracket

3) Assemble the guide rail (model: MD500-AZJ-A3T10, option).

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.



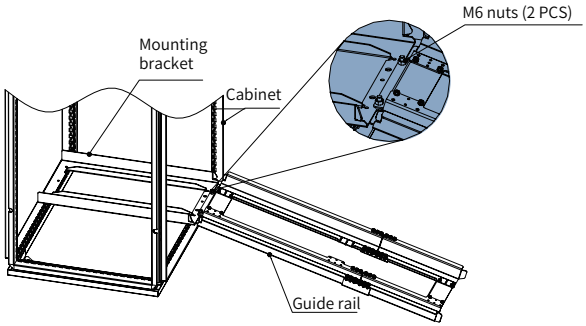


Figure 2-16 Assembling the guide rail in the cabinet

4) Installing the AC drive in the cabinet

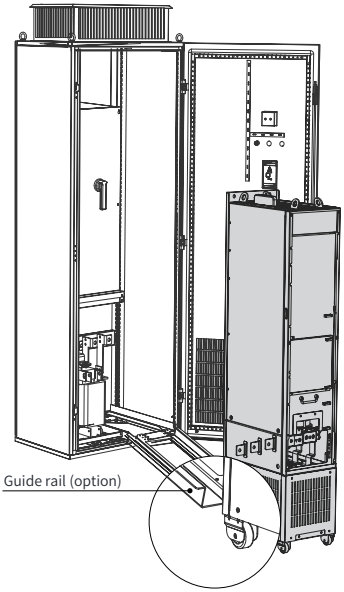


Figure 2-17 Aligning casters of the AC drive to the guide rail

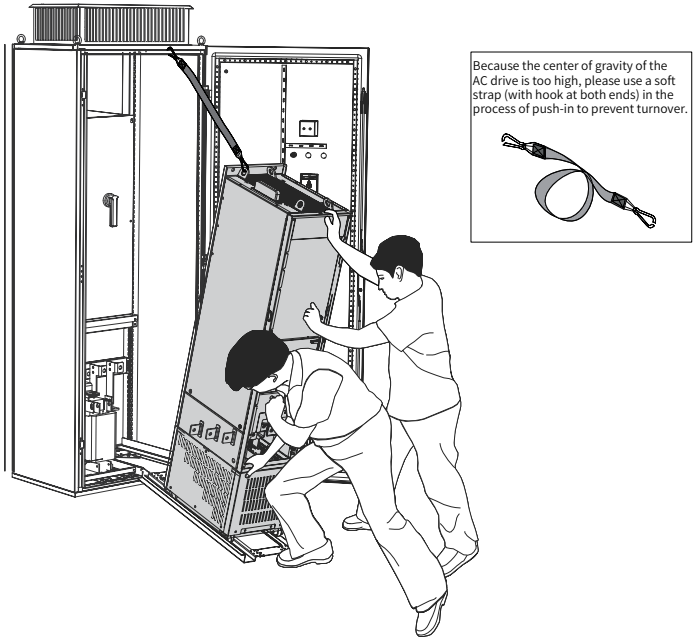


Figure 2-18 Slowly pushing the AC drive into the cabinet

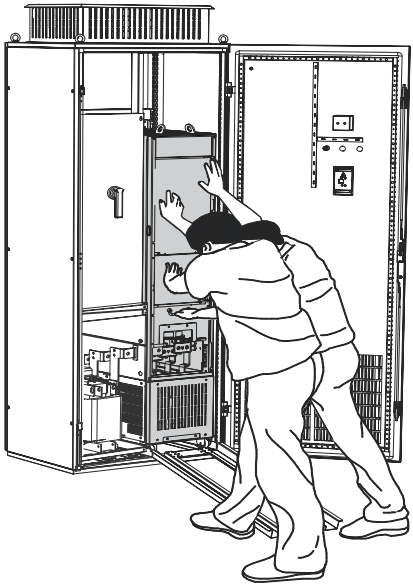


Figure 2-19 Push-in completed

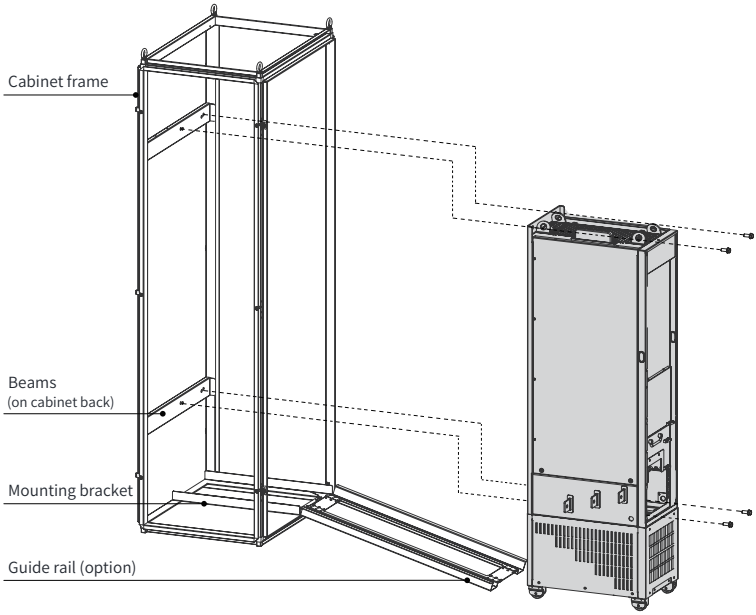
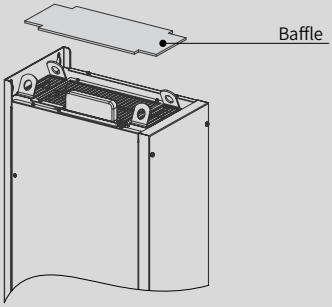


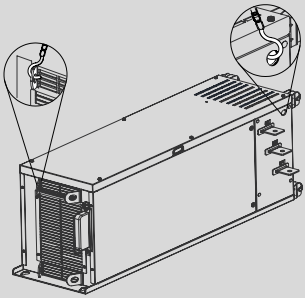
Figure 2-20 Fixing the AC drive to the beam using the four fixed holes on the back of the AC drive

- Remove the AC drive from the cabinet according to above steps in reverse order.
- Ensure the four fixed holes on the back of the AC drive are connected to the beams securely.
- After push-in is complete, remove the baffle on the top of the AC drive. The baffle is used to prevent foreign objects such as screws from falling into the air filter when the AC drive is mounted in the cabinet.

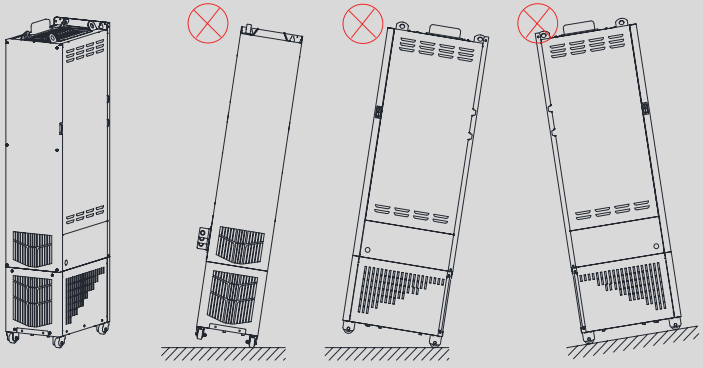


- Use top hoist rings to move or hoist the AC drive. If the AC drive needs to be placed in a horizontal position, use the top hoist ring and bottom hoist hole when hoisting the AC drive again. Ensure that the DC bus terminals suffer no stress.

NOTE



- If the AC drive needs to be placed in an upright position, prevent a stress on both sides of the AC drive and prevent placing the AC drive on a slope because the AC drive weighs almost 200 kg. If the inclination exceeds 5° , the AC drive may turn over.



2.5.4 Dimensions of the Mounting Bracket

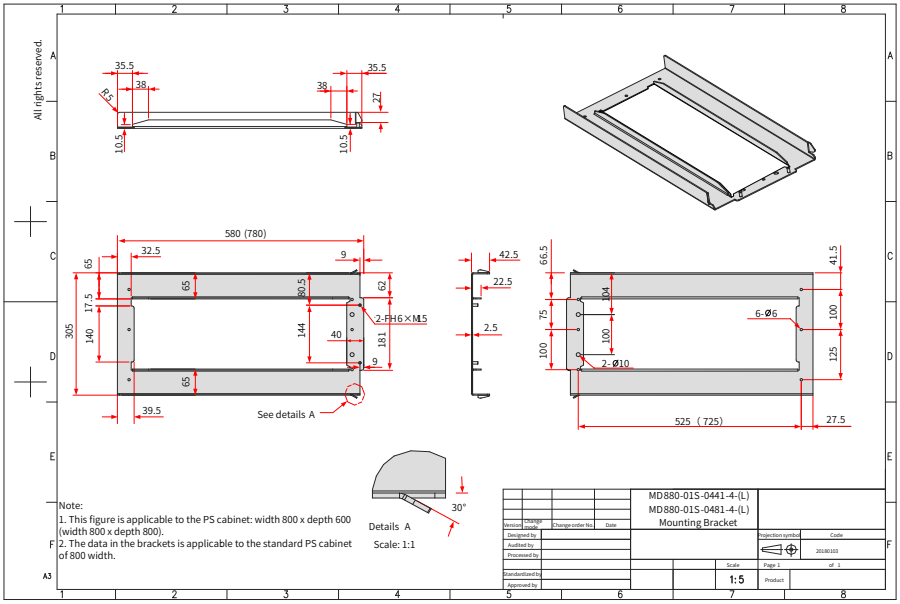


Figure 2-21 Mounting bracket dimensions of MD880-01S-0441-4-(L)/ MD880-01S-0481-4-(L) (standard)

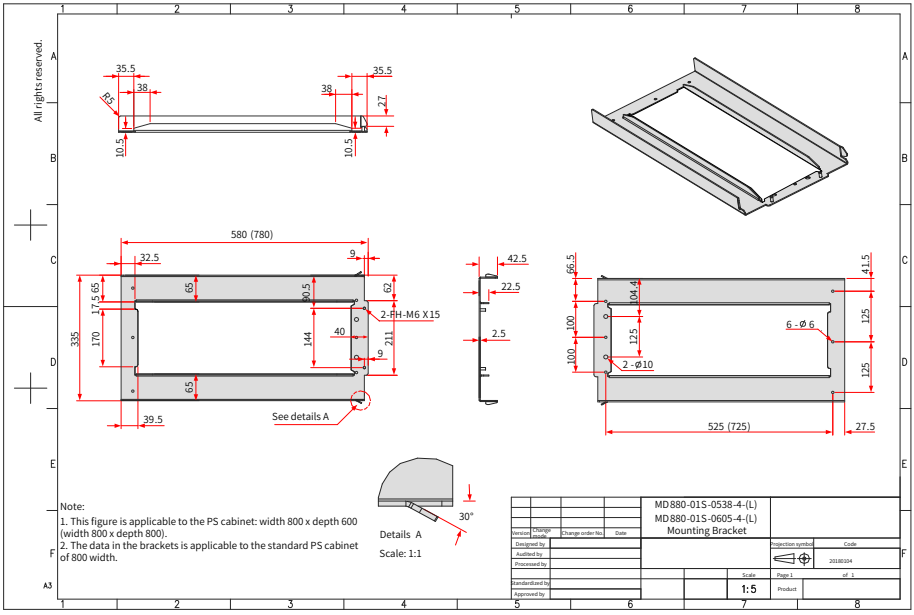


Figure 2-22 Mounting bracket dimensions of MD880-01S-0538-4-(L)/ MD880-01S-0605-4-(L) (standard)

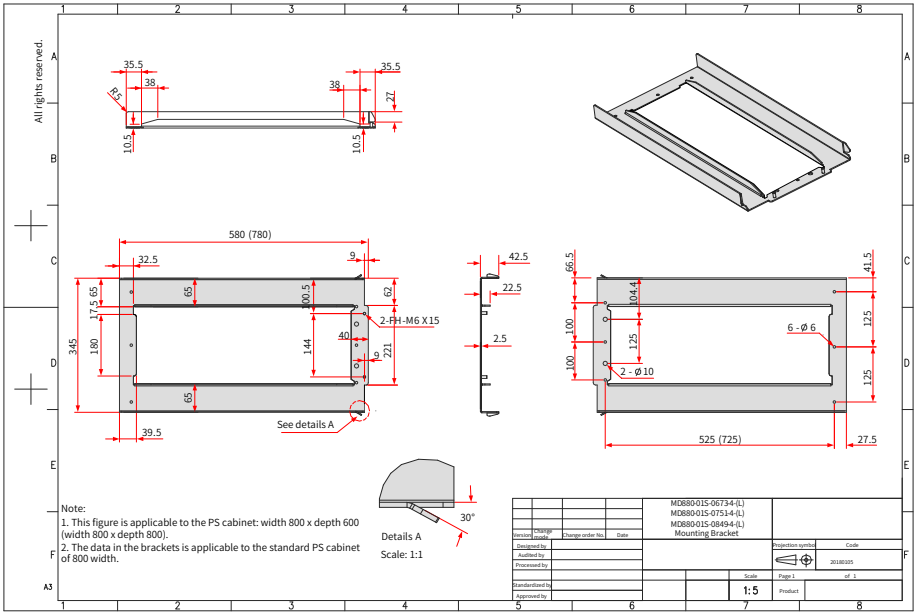


Figure 2-23 Mounting bracket dimensions of MD880-01S-0673-4-(L)~MD880-01S-0849-4-(L) (standard)

2.6 Cover Removal and Mounting

Remove the cover of the AC drive for wiring of the main circuits and control circuits.

DANGER

- Ensure that the power-off time exceeds 15 minutes before removing the cover.
- Be careful when removing the front cover. A falling cover may cause device damage or personal injury.

■ Removing and refitting of the cover of structures T2 to T9

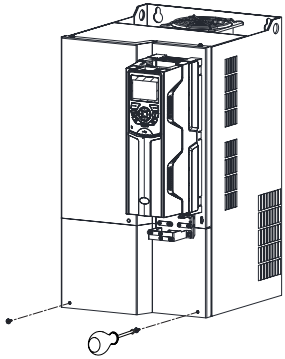
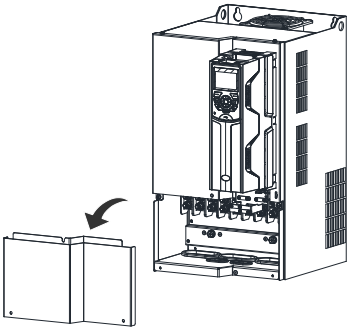
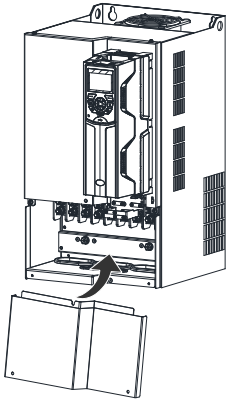
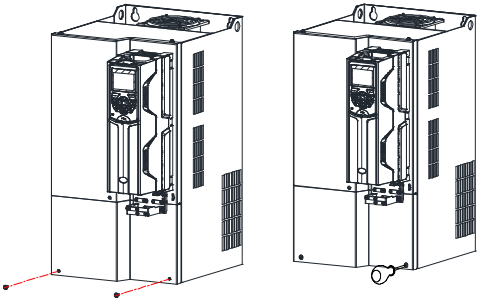
<table>
<tr><th colspan="2">Removal</th></tr>
<tr><td>Remove the two fixing screws on the cover using a screwdriver. Hold the cover while screwing out the screws to prevent it from falling.
  </td><td>Hold the cover with both hands, push it up, and then pull it out downwards to remove the cover.
  </td></tr>
<tr><th colspan="2">Refitting</th></tr>
<tr><td>Hold the cover with both hands, align the cover and cabinet, and then push it in slantways from the bottom.
  </td><td>Tighten the two fixing screws.
  </td></tr>
</table>

Figure 2-24 Removing and refitting of the cover of structures T2 to T9

■ Removing and refitting of the covers of structures T10 to T12

1) Removing the covers of structures T10 to T12

2) Remove the four screws on the lower cover using a screwdriver. Then, hold the lower cover with both hands and pull it out.

3) Remove the six screws on the upper cover. Then, hold the cover with both hands and lift it in the arrow direction shown below to remove the upper cover.

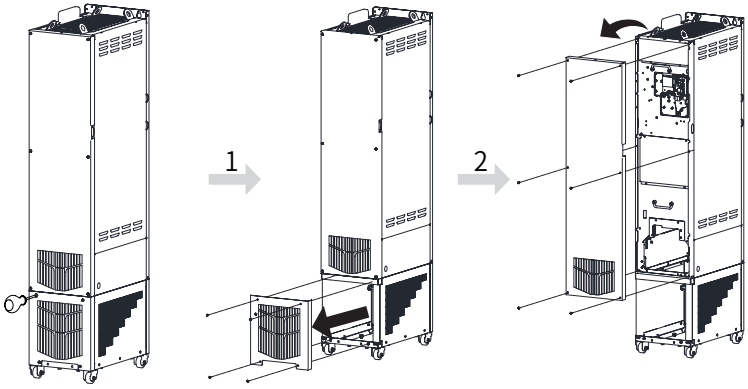


Figure 2-25 Removing the covers of structures T10 to T12

4) Refitting the covers of structures T10 to T12

Refit the covers in a reverse procedure to removal.

5) Hold the upper cover with both hands and align the top of the upper cover with the fixing hooks 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.

6) 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.

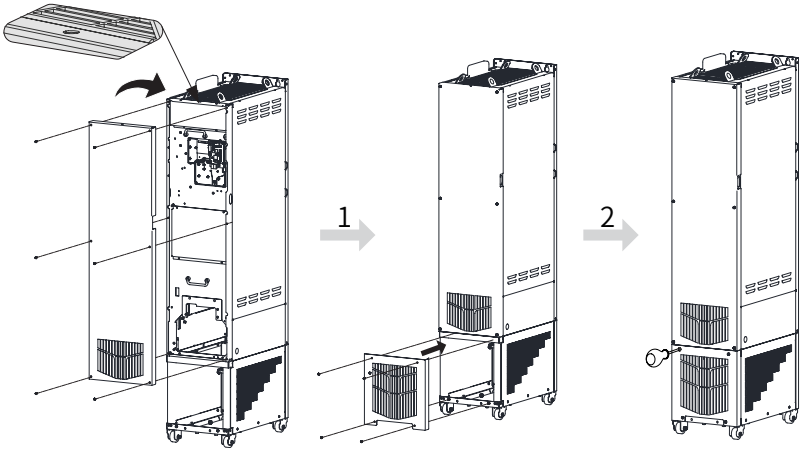


Figure 2-26 Refitting the covers of structures T10 to T12

3 Electrical Installation

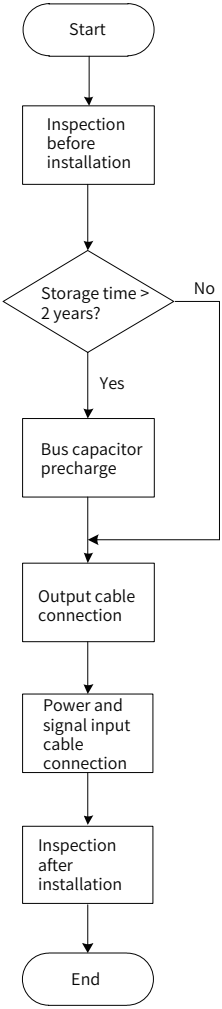


Figure 3-1 Electrical installation flowchart

3.1 Safety Instructions

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 enclose the adjacent components that are still live.

3.1.2 Inspection

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 should be paid to cable dimensions, fuses, grounding, shutdown, disconnection, and overcurrent protection. ◆ If an item of protective gear trips in a branch circuit, a leakage current may have been disconnected. 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. When an item of protective gear trips, the cause of the trip must be identified and rectified.

3.1.3 General

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

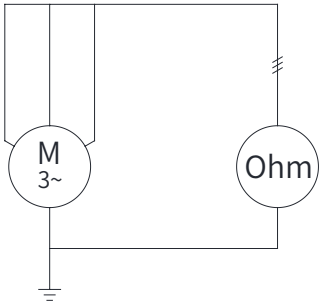
The AC drive has been tested for insulation between the main circuit and the housing at the factory. Therefore, do not perform any withstand voltage and insulation resistance tests on the AC drive again. Check insulation of the motor and motor cables according to the following steps:

1) Check that the motor cables are connected to the motor and they are disconnected from the drive output terminals (U, V, W).

2) Measure the insulation resistance between each phase cable and PE cable with 500 VDC applied. For details about the insulation resistance of the motor, see the motor manufacturer's user guide.

NOTE

- High ambient humidity inside the motor cabinet will 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 control system. The following figure shows the system wiring.

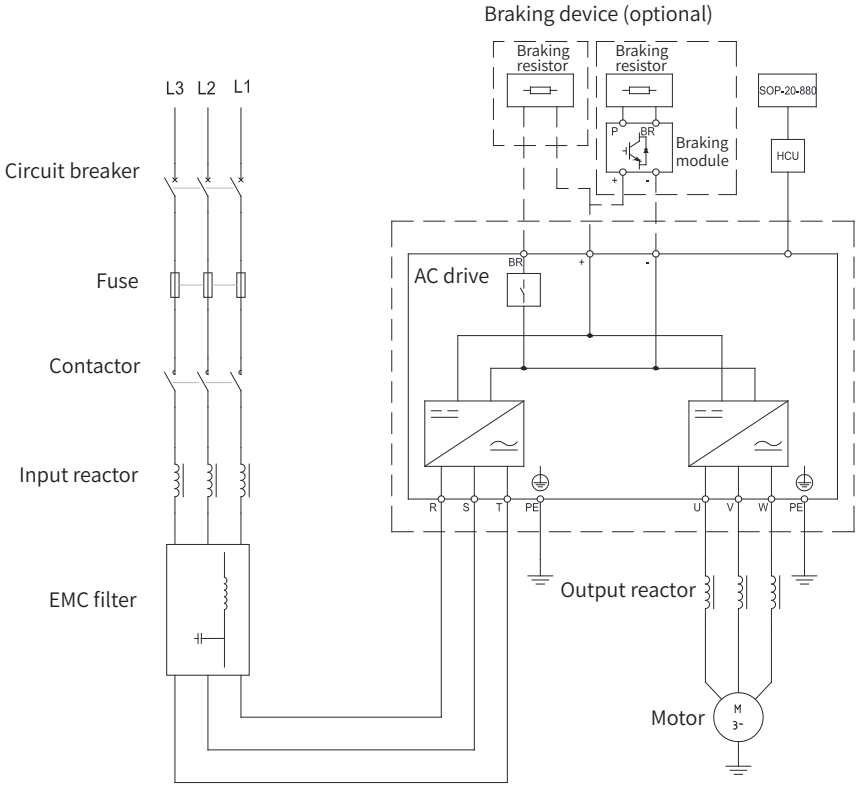


Figure 3-2 System wiring of the MD880 series high-performance AC drive

NOTE

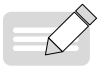
◆ The preceding figure only shows the system wiring of the MD880 series AC drive. For peripherals and options, see "6 Options".

3.3 System Structure

Table 3-1 Descriptions of system peripherals

Peripheral Name	Mounting Location	Function
Circuit breaker	Between power supply and AC drive input side	MCCB: Cuts off power supply when overcurrent occurs on downstream devices.
		Earth leakage circuit breaker (ELCB): Protects against potential leakage current during AC drive running to prevent electric shock which may cause a fire. Select a proper ELCB based on actual applications.
Fuse	Between power supply and AC drive input side	Provides protection in case of short circuit and protect downstream semiconductors.
(Electromagnetic) Contactor	Between the circuit breaker and the AC drive input side	Do not start/stop the AC drive frequently by switching on/off the contactor (at an interval less than 1 h) or start the AC drive directly through the contactor.
Input reactor	AC drive input side	Improves the power factor of power input side. Eliminates higher harmonics of the input side effectively and prevents other devices from being damaged due to distortion of voltage waveform. Eliminates input current unbalance caused by inter-phase unbalance.
EMC filter	AC drive input side	Reduces external conduction and radiation interference of the AC drive. Reduces conduction interference flowing from power supply to the AC drive and improves the anti-interference capacity of the AC 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 of power input side. Improves the overall efficiency and thermal stability of the AC drive. Eliminates harmonics on the input side and reduces conducted and radiated interferences generated from the AC drive to the outside.
Braking resistor	Models of 90 kW and below: terminals (+) and BR	Use a braking resistor for models of 90 kW and below as needed. Dissipates regenerative energy during motor deceleration.
Braking unit	Models of 110 kW and above: terminals (+) and (-)	Use an MDBUN braking unit of Inovance and a recommended braking resistor for models of 110 kW and above as needed. Dissipates regenerative energy during motor deceleration.

Peripheral Name	Mounting Location	Function
Output reactor	Between the AC drive output side and the motor (close to the AC drive)	Harmonics are present in the output side of the AC drive. If the motor is routed far away from the servo drive, the following may occur due to large distributed capacitance in the circuit and certain harmonics that may generate resonance in the circuit: a) Degrade motor insulation performance and damage motor in long run. b) Fault protections are triggered frequently in the servo drive due to large leakage current. If the distance between the AC drive and the motor is greater than 100 m, it is recommended to install an AC output reactor.
dv/dt reactor	AC drive output side (close to the AC drive)	Protects the motor insulation and reduces the bearing current.
Output magnetic ring	AC drive output side (close to the AC drive)	Reduces bearing current.
Motor	AC drive output side	Use an appropriate motor.



NOTE

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

3.4 EMC-Compliant Cable Routing

Read *"Safety Instructions"* thoroughly and follow the instructions.

3.4.1 Basic rules for Cable Routing

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

- Comply with EMC guidelines.
- Use existing routing for cable assemblies.
- Always use the shield plates provided.
- Use existing cabling path.
- Take cable protective measures at places such as cabinet corners or sharp objects.
- Refit any covers removed during cable routing before completing the work and commissioning.

3.4.2 Requirements

1) The signal cables and power cables must be routed separately:

When analog signals are used for remote control of the AC drive, the signal cables

and strong-current circuit cables (power input, AC drive output, and braking resistor connecting cable) of the controlled AC drive must be routed separately with a distance longer than 30 cm to reduce interference on the analog generated by the AC drive and other devices. This requirement must be met even inside the control cabinet.

2) Requirements on the analog control signal cable:

Use the twisted pair shielded cables as the analog control signal cables.
When stripping the sheathing back of the cable, the stripped part must be as short as possible (5–7 mm), and wrap the stripped shield with the insulating tape to prevent the shielded cable from contacting other cables, eliminating interference.

3) Requirements on the motor cable:

Use the shielded cables as the 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 must not be laid side by side for a long distance.

4) Requirements on the power cables:

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

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

If the control cable must run across the power cable, make sure they are arranged at an angle of close to 90° .

3.4.3 Routing Suggestions

1) Separate cables for transmitting different signals.
   Reserve a distance between interfering cables and sensitive cables. If the routing space is large, the recommended distance is 30 cm.
   If these two types of cables must cross, arrange them at an angle of 90° to prevent interference.

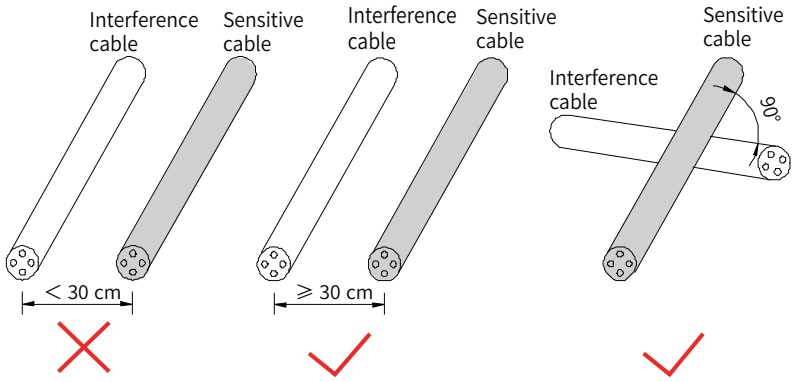


Figure 3-3 Routing of interfering cables and sensitive cables

2) Route different signal cables separately and isolate different types of signals with the equipotential signal. When routing cables of same signal type, lay the equipotential signal cables at the outer layer, and consider the equipotential signal arrangement in the middle. The following figure shows an example.

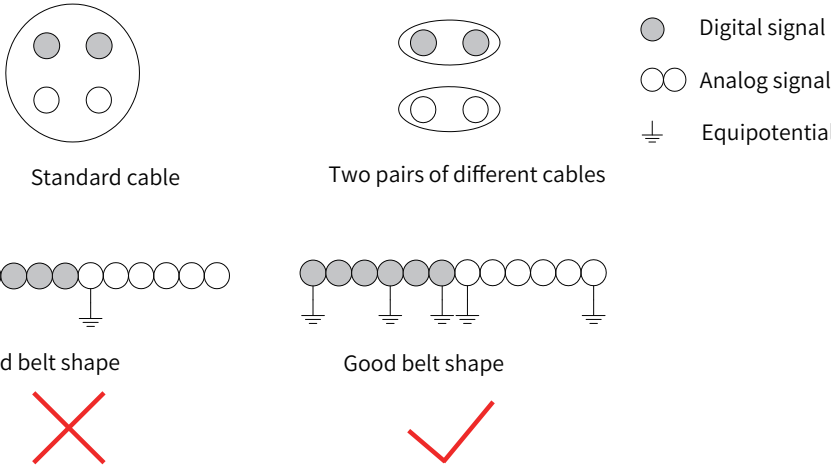


Figure 3-4 Routing of different types of signal cables

3) For the multicore cable, it is recommended that a cable transmit the same type of signals. If a cable is used to transmit different types of signals, use the cable with conductor shielded, as shown in the following figure:

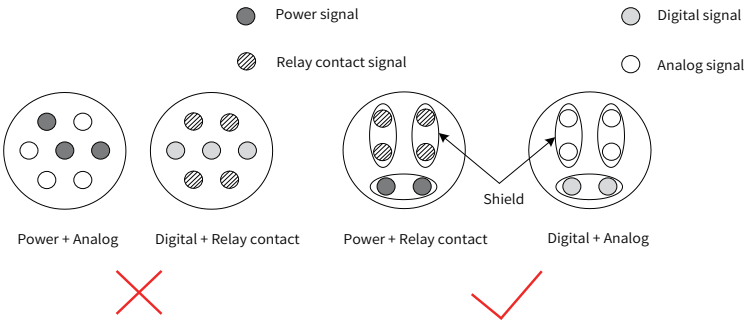


Figure 3-5 Routing of multicore cables

4) When certain conductors in a multicore cable are not used, connect all the unused (or reserved) conductors to the equipotential connection point.

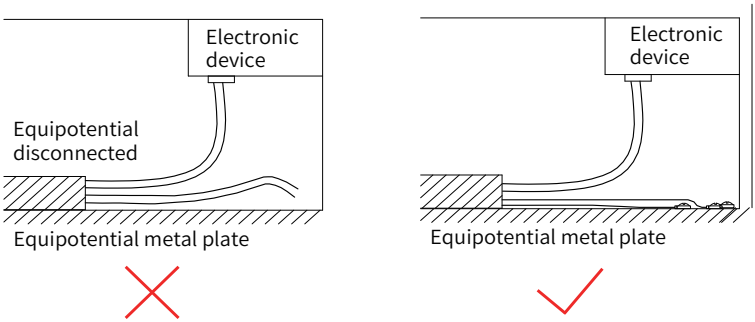


Figure 3-6 Handling of remaining cores in multicore cable

5) For the low-level sensor signals and relay signals with a common, lay the two cables close to each other, preventing too large loop area.
Make sure to use the twisted pair for the analog signal.
Lay the digital signal cables close to each other.

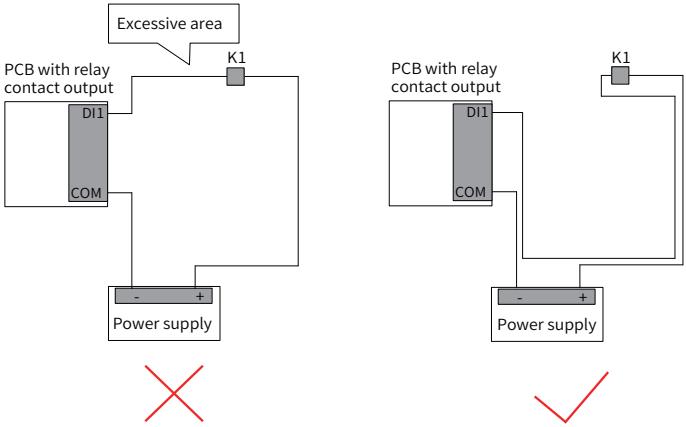


Figure 3-7 Routing for preventing too large loop area

6) Lay multiple types of cables along the metal block with equipotential connection and separate them to improve internal EMC. If cables in the same metal (zinc-iron or stainless steel) duct are separated with metal plate, the effect will be better.

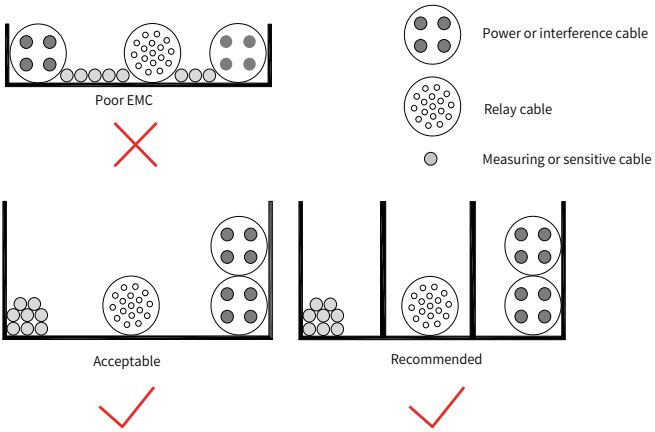


Figure 3-8 Routing of multiple types of cables

7) The unshielded part of the shielded cable must be as short as possible, and the shield braid is connected to the nearest PE end. If the stripped part is long, the cable is prone to interference, especially for encoder signals.

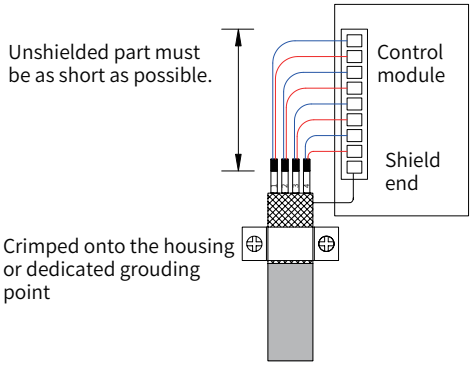


Figure 3-9 Requirements on shielded power cables

3.4.4 Connection of Shielded Power Cables

The input/output shielded power cable and shield inside the power unit must be in large-area contact with the shield plate in the cabinet to achieve good EMC effect. The following figure shows the connection diagram.

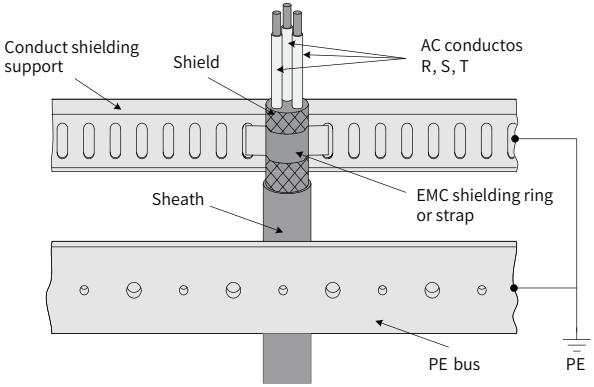


Figure 3-10 Connection of shielded power cables

3.5 Wring of the AC Drive

Preparation:

- Power off the device that will be installed in the cabinet.
- Take all the necessary safety measures at the installation location.
- Observe the "five safety rules".

3.5.1 Standard Wiring Diagram

AC drives in structures T2 to T9 are connected to the HCU-51 control module through high-speed RS422 communication cables. AC drives in structures T10 to

T12 are connected to the HCU-50 control module through high-speed optical fiber communication cables.

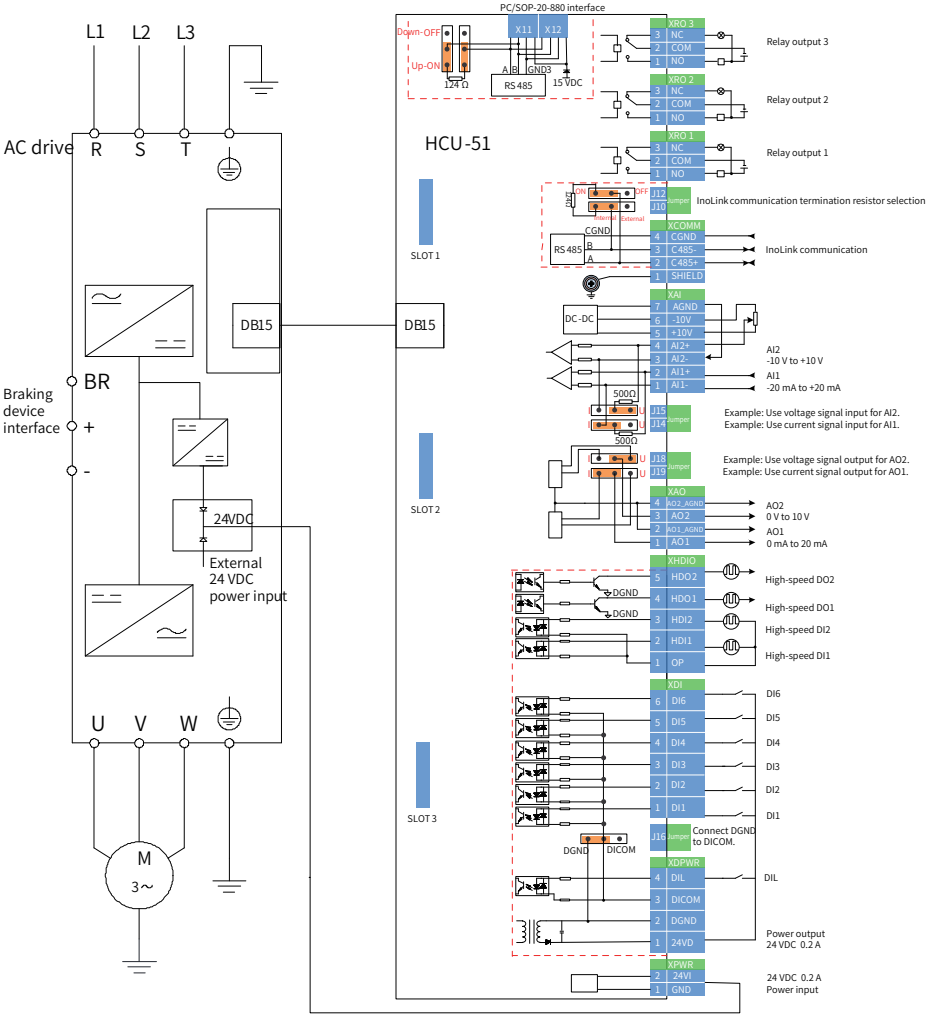


Figure 3-11 Wiring of AC drives in structures T2 to T9

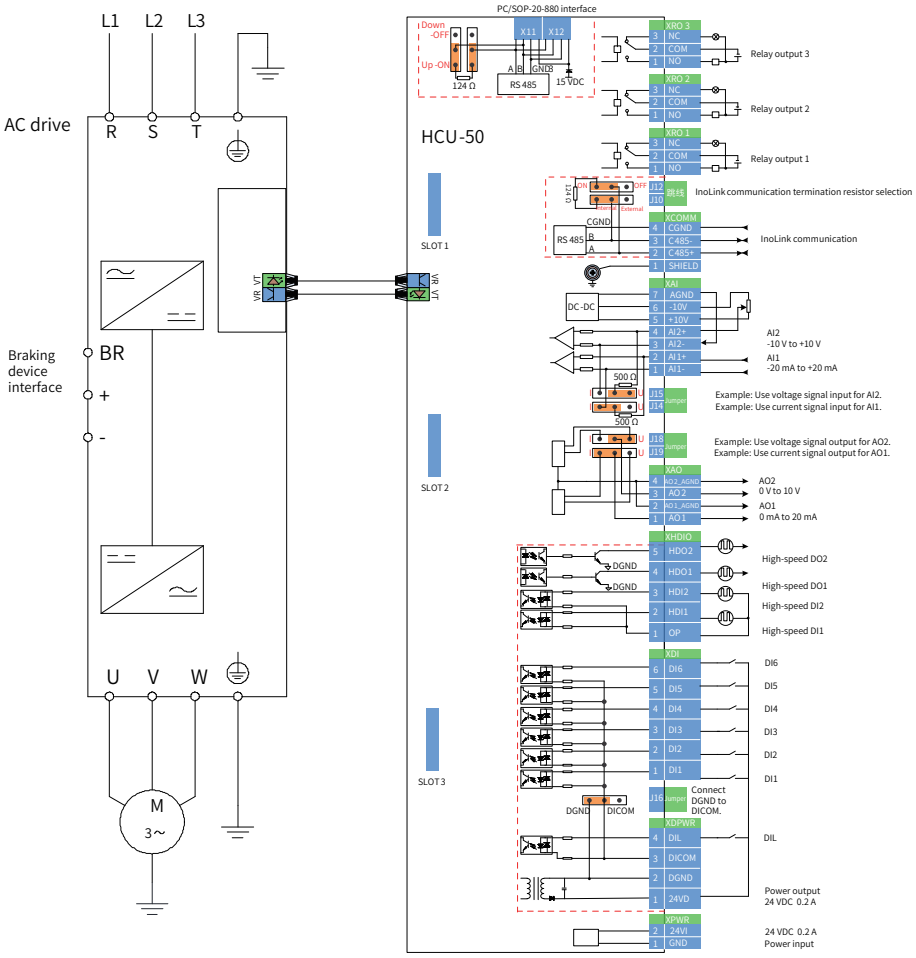


Figure 3-12 Wiring of AC drives in structures T10 to T12

3.5.2 Main Circuit Terminals

1) Main circuit terminals of the MD880 series AC drive

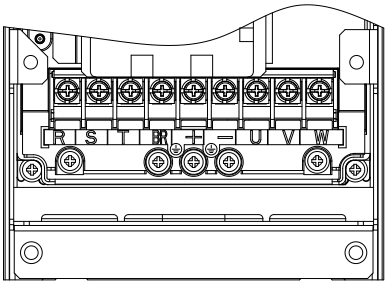


Figure 3-13 Main circuit terminal arrangement of structures T2 to T4

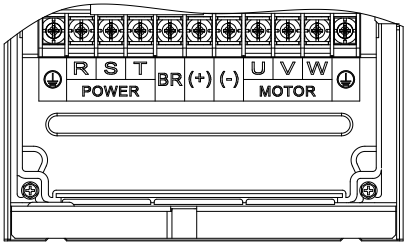


Figure 3-14 Main circuit terminal arrangement of structures T5 to T6

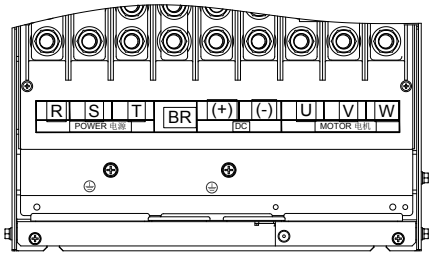
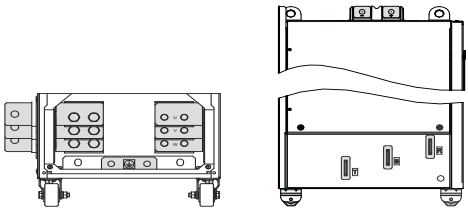


Figure 3-15 Main circuit terminal arrangement of structures T7 to T9



(Front view) (Side view)

Figure 3-16 Main circuit terminal arrangement of structures T10 to T12

Table 3-2 Main circuit terminals of the MD880 series AC drive

Terminal Symbol	Terminal Name	Function
R, S, T	Three-phase power input terminals	Connected to the three-phase AC power supply.
(+), (-)	DC bus positive and negative terminals	Common DC bus input, connected to the external braking unit for AC drives of 90 kW and above
(+), BR	Terminals for connecting braking resistor	Connected to the external braking resistor for AC drive of 75 kW and below
U, V, W	AC drive output terminals	Connected to the three-phase motor.
⏚	Ground (PE) terminal	Must be grounded.

2) Main circuit cable selection

It is recommended that symmetrical shielded cables be used as the input and output main circuit cables. Compared with the quad-core cable, the symmetrical shielded cable can reduce electromagnetic radiation of the whole transmission system.

Recommended power cable type — symmetrical shielded cable:

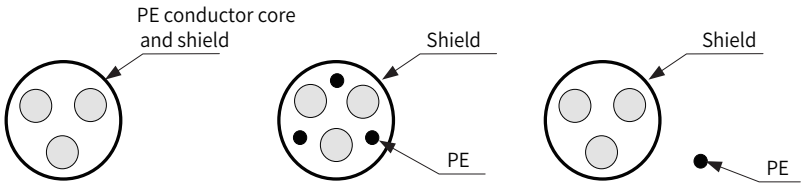


Figure 3-17 Recommended power cable type

Non-recommended power cable type:

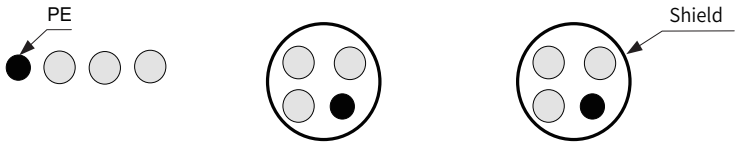


Figure 3-18 Non-recommended power cable type

3) Input power R, S, T

- The cable connection on the input side of the AC drive has no phase sequence requirement.
- The specifications and installation method of external main circuit cables must comply with local regulations and related IEC requirements.

- Use copper conductors of a proper size as main circuit cables according to the recommended values of power cable selection in *"6.2 Selection of Cables, Circuit Breakers, and Contactors"*.
- The filter should be installed close to the input terminal of the AC drive. The connection cable between them must be shorter than 30 cm. The grounding terminals of the filter and AC drive must be connected. Ensure that the filter and AC drive are installed on the same conductive mounting surface, which is connected to the main grounding terminal of the cabinet.

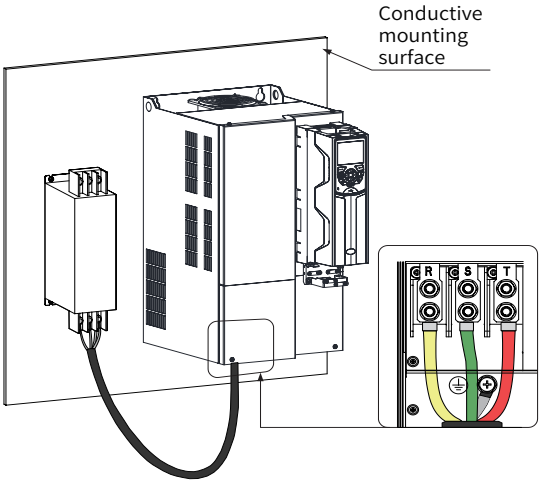


Figure 3-19 Installing the filter

4) DC busbar (+), (-)

- Note that residual voltage exists at the DC bus terminals (+) and (-) just after power-off. After the CHARGE indicator goes off, wait at least 15 minutes before wiring. Failure to comply may result in electric shock.
- Note that (+) and (-) must be connected correctly when an external braking component is used for AC drives of 90 kW and above. Failure to comply will cause damage to the AC drive and braking component and even a fire.
- The cable length of the braking unit cannot be longer than 10 m. Use the twisted pair wire or tight pair wires for parallel connection.
- Do not connect the regenerative resistor directly to the DC bus. Failure to comply may result in damage to the AC drive and even a fire.

5) Terminals (+) and BR for connecting braking resistor

- The terminals for connecting braking resistor are valid only for AC drives of 75 kW and below which are equipped with internal braking units.

- Connect a braking resistor of the recommended model, and ensure that the cable length of the braking resistor is shorter than 5 m. Failure to comply may result in damage to the AC drive.
- Note that no combustibles shall exist around the braking resistor. Avoid igniting the surrounding components due to overtemperature of the braking resistor.
- By default, the braking voltage is 700 V for AC drives of 90 kW and below which are equipped with internal braking units.

6) AC drive output terminals (U, V, W)

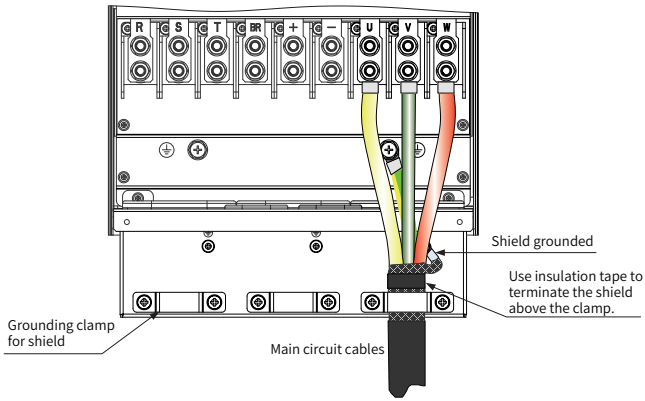


Figure 3-20 Shield connection

- The specifications and installation method of external main circuit cables must comply with local regulations and related IEC requirements.
- Use copper conductors of a proper size as main circuit cables according to the recommended values of power cable selection in *"6.2 Selection of Cables, Circuit Breakers, and Contactors"*.
- Do not connect a capacitor or surge protection device to the output side of the AC drive. Otherwise, frequent AC drive faults and damage to the AC drive will be caused.
- If the motor cable is too long, electrical resonance will be generated due to the impact of distributed capacitance. This will damage the motor insulation or generate high leakage current, causing the AC drive to trip in overcurrent protection. If the motor cable is longer than 100 m, an AC output reactor must be installed close to the AC drive.
- The shielding cables are recommended for the motor. The shielding layer must be wound onto the cable support bracket. The drain wire must be grounded to the grounding (PE) terminal.

- Ensure the drain wire of the motor cable shield is as short as possible and its width must be no less than 1/5 of its length.

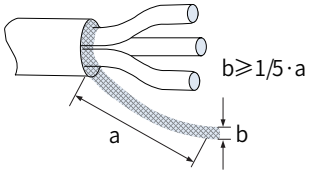


Figure 3-21 Drain wire of motor cable shield

7) Ground (PE) terminal

- For personal safety and reliability of the equipment, connect the grounding (PE) terminal to an effective electrical ground. The resistance value of the ground cable must be less than 10 Ω. Otherwise, the malfunction or even damage to the equipment will be caused.
- Do not connect the grounding (PE) terminal of the AC drive to the neutral conductor of the power system.
- See *"6 Options"* for dimensions of the protective grounding conductor.
- Use the proper grounding cable with yellow/green insulation for the protective grounding conductor.
- Ground the shield.
- It is recommended that the AC drive be installed on a conductive metal mounting surface. Ensure that the entire conductive bottom of the AC drive is in good contact with the surface.
- Install the filter and the AC drive on the same mounting surface to ensure filtering effect.

8) Main circuit cable protection

- Add heat shrink tubes to cable lug copper tubes and cable core parts of main circuit cables and ensure the heat shrink tube completely covers the cable conductor part, as shown in the following figure.

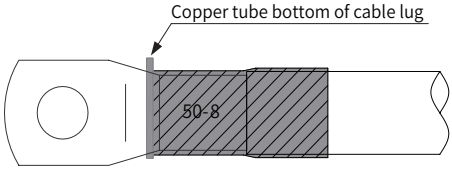


Figure 3-22 Heat shrink tube of the cable conductor part

9) Power input protection

Install protection devices at power input to the AC drive. The protection devices must

provide protection on overcurrent and short-circuit, and be able to completely isolate the AC drive from the electrical power input.

When selecting the protection device, consider the current capacity of the main circuit cables, system overload capacity, and upstream power distribution short-circuit capacity. Use recommended values in "6.1 Options".

10) Power grid system

- If a basic rectifier module is used in the TT and TN power system, it is strongly recommended that the two grounding screws on the voltage dependent resistor (VDR) board be installed.
- If a residual-current device (RCD) is used and it trips at start, remove the EMC screw 2 as shown in the following figure.

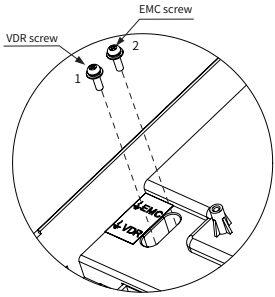


Figure 3-23 VDR screw and EMC screw

NOTE

- For details about main circuit terminal dimensions and cables, see "3.5.3 Main Circuit Terminal Arrangement and Dimensions".

3.5.3 Main Circuit Terminal Arrangement and Dimensions

NOTE

- By default, T10 to T12 are equipped with the side entry copper busbar. You can remove the copper busbar according to actual requirements.
- The data and models recommended in this section are for reference only. The user-selected cable diameter cannot be larger than the terminal width in the following figures.
- Selection of IEC cables is based on:
  Standards EN 60204-1 and IEC 60364-5-52
  PVC insulation
  40°C ambient temperature and 70°C surface temperature
  Symmetrical cable with copper mesh shield
  A maximum of nine cables are allowed in a cable tray.

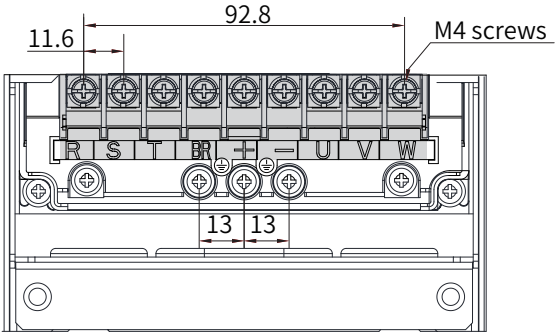


Figure 3-24 MD880-01S-0012-4-B/MD880-01S-0017-4-B

Table 3-3 Main circuit cable selection for MD880-01S-0012-4-B/MD880-01S-0017-4-B

AC Drive Model	Rated Current (A)	Recommended Input/Output Power Cable (mm^2)	Recommended Lug Model	Recommended Grounding Cable (mm^2)	Recommended Grounding Cable Lug Model	Tightening Torque (N·m)
MD880-01S-0012-4-B	12.0	3 x 2.5	TVS 3.5-4	2.5	TVS 3.5-4	1.2
MD880-01S-0017-4-B	17.0	3 x 4	TVR 5.5-5	4	TVR 5.5-5	1.2

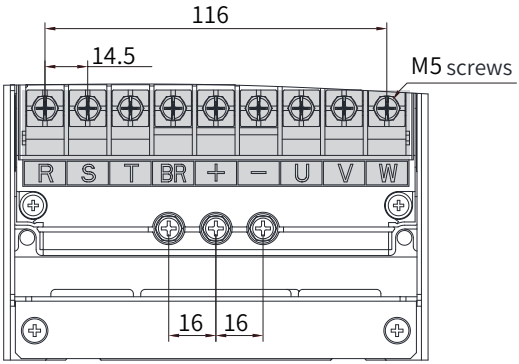


Figure 3-25 MD880-01S-0024-4-B/MD880-01S-0033-4-B

Table 3-4 Main circuit cable selection for MD880-01S-0024-4-B/MD880-01S-0033-4-B

AC Drive Model	Rated Current (A)	Recommended Input/Output Power Cable (mm^2)	Recommended Lug Model	Recommended Grounding Cable (mm^2)	Recommended Grounding Cable Lug Model	Tightening Torque (N·m)
MD880-01S-0024-4-B	24.0	3 x 4	TVR 5.5-5	4	TVR 5.5-5	2.5
MD880-01S-0033-4-B	33.0	3 x 6	GTNR 6-5	6	GTNR 6-5	2.5

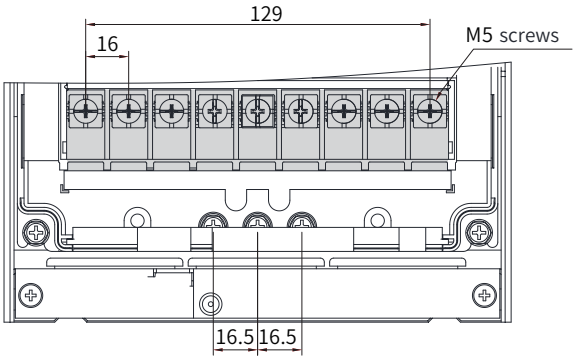


Figure 3-26 MD880-01S-0038-4-B

Table 3-5 Main circuit cable selection for MD880-01S-0038-4-B

AC Drive Model	Rated Current (A)	Recommended Input/Output Power Cable (mm^2)	Recommended Lug Model	Recommended Grounding Cable (mm^2)	Recommended Grounding Cable Lug Model	Tightening Torque (N·m)
MD880-01S-0038-4-B	38.0	3 x 10	GTNR 10-6	10	GTNR10-6	2.5

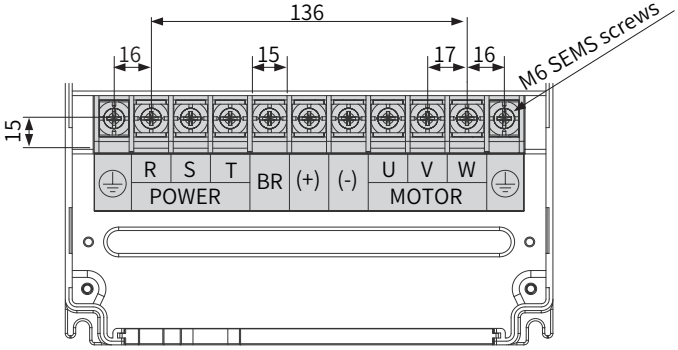


Figure 3-27 MD880-01S-0048-4-B/MD880-01S-0060-4-B

Table 3-6 Main circuit cable selection for MD880-01S-0048-4-B/MD880-01S-0060-4-B

AC Drive Model	Rated Current (A)	Recommended Input/Output Power Cable (mm^2)	Recommended Lug Model	Recommended Grounding Cable (mm^2)	Recommended Grounding Cable Lug Model	Tightening Torque (N·m)
MD880-01S-0048-4-B	48	3 x 10	GTNR16-6	10	GTNR10-6	4.0
MD880-01S-0060-4-B	60	3 x 16	GTNR16-6	16	GTNR16-6	4.0

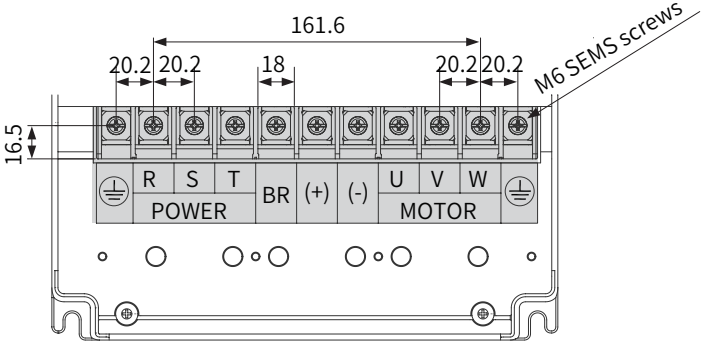


Figure 3-28 MD880-01S-0078-4-B/MD880-01S-0094-4-B

Table 3-7 Main circuit cable selection for MD880-01S-0078-4-B/MD880-01S-0094-4-B

AC Drive Model	Rated Current (A)	Recommended Input/Output Power Cable (mm^2)	Recommended Lug Model	Recommended Grounding Cable (mm^2)	Recommended Grounding Cable Lug Model	Tightening Torque (N·m)
MD880-01S-0078-4-B	78	3 x 16	GTNR16-6	16	GTNR16-6	4.0
MD880-01S-0094-4-B	94	3 x 16	GTNR16-6	16	GTNR16-6	4.0

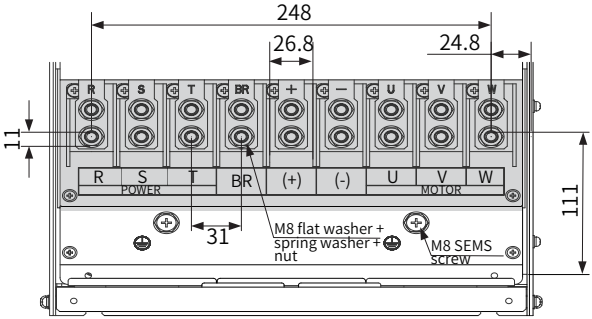


Figure 3-29 MD880-01S-0116-4-B/MD880-01S-0149-4-B

Table 3-8 Main circuit cable selection for MD880-01S-0116-4-B/MD880-01S-0149-4-B

AC Drive Model	Rated Current (A)	Recommended Input/Output Power Cable (mm^2)	Recommended Lug Model	Recommended Grounding Cable (mm^2)	Recommended Grounding Cable Lug Model	Tightening Torque (N·m)
MD880-01S-0116-4-B	116	3 x 25	GTNR25-8	25	GTNR25-8	10.5
MD880-01S-0149-4-B	149	3 x 50	GTNR50-8	25	GTNR25-8	10.5

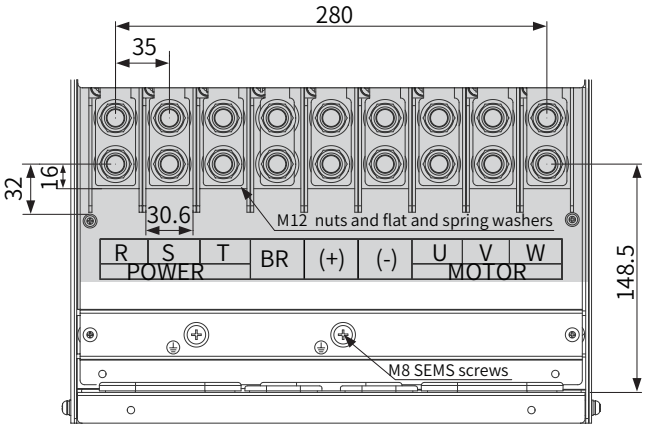


Figure 3-30 MD880-01S-0183-4-B/MD880-01S-0217-4/MD880-01S-0262-4

Table 3-9 Main circuit cable selection for MD880-01S-0183-4-B/MD880-01S-0217-4/MD880-01S-0262-4

AC Drive Model	Rated Current (A)	Recommended Input/Output Power Cable (mm^2)	Recommended Lug Model	Recommended Grounding Cable (mm^2)	Recommended Grounding Cable Lug Model	Tightening Torque (N·m)
MD880-01S-0183-4-B	183	3 x 70	GTNR70-12	35	GTNR35-12	35.0
MD880-01S-0217-4	217	3 x 95	GTNR95-12	50	GTNR50-12	35.0
MD880-01S-0262-4	262	3 x 120	GTNR120-12	70	GTNR70-12	35.0

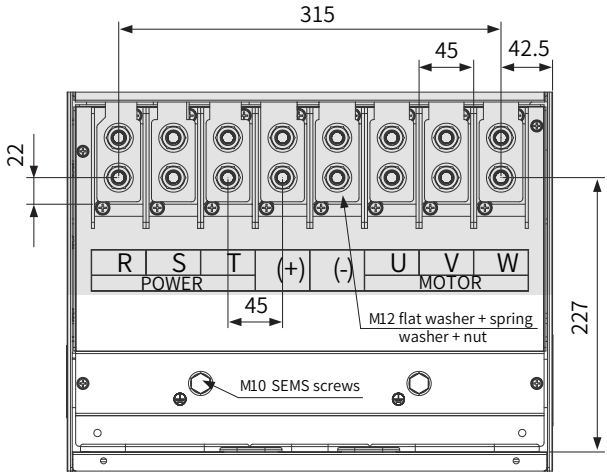


Figure 3-31 MD880-01S-0314-4/MD880-01S-0383-4

Table 3-10 Main circuit cable selection for MD880-01S-0314-4/MD880-01S-0383-4

AC Drive Model	Rated Current (A)	Recommended Input/Output Power Cable (mm^2)	Recommended Lug Model	Recommended Grounding Cable (mm^2)	Recommended Grounding Cable Lug Model	Tightening Torque (N·m)
MD880-01S-0314-4	314	3 x 150	BC150-12	95	BC95-12	35.0
MD880-01S-0383-4	383	3 x 185	BC185-12	95	BC95-12	35.0

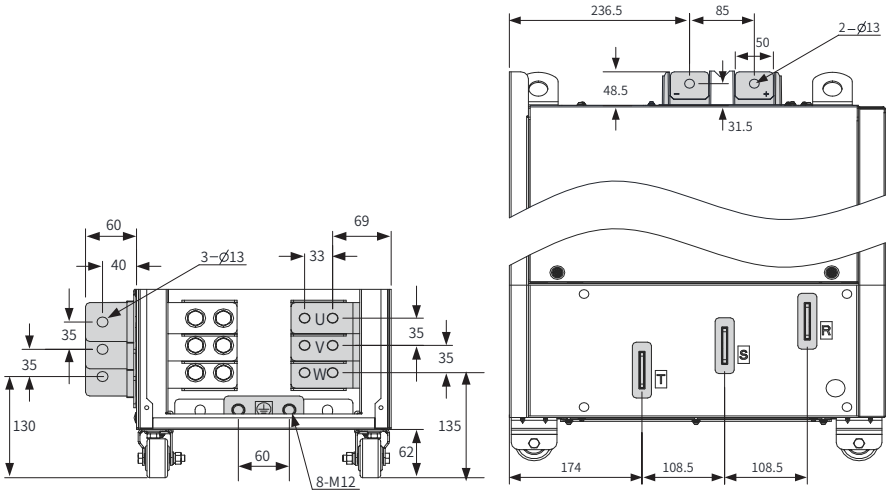


Figure 3-32 Main circuit terminal dimensions of MD880-01S-0441-4/MD880-01S-0481-4 (without output reactors)

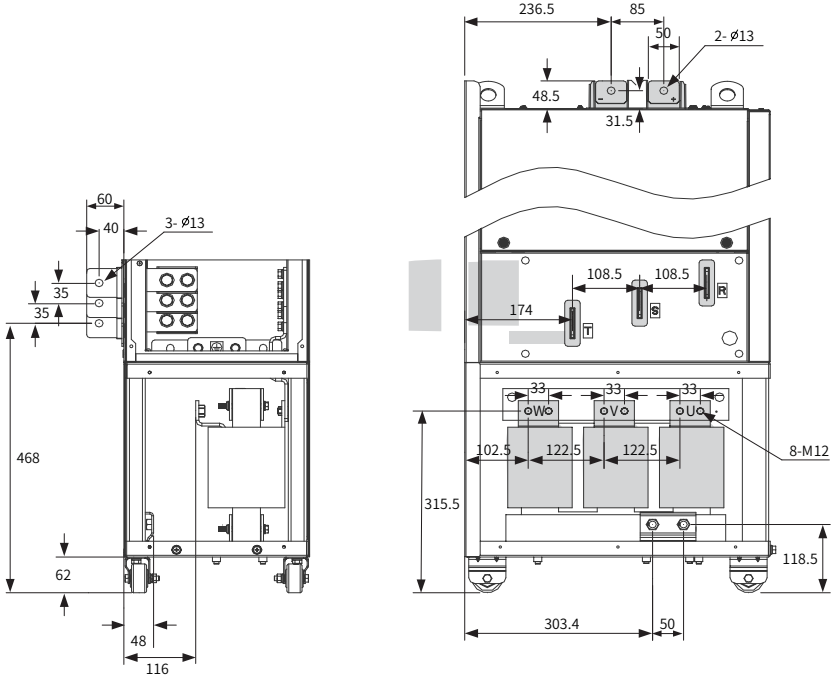


Figure 3-33 Main circuit terminal dimensions of MD880-01S-0441-4(-L)/MD880-01S-0481-4(-L) (with output reactors)

In the preceding figure, the side entry copper busbar can be removed if necessary. Terminal dimensions of main circuit terminals without the side entry copper busbar are shown below.

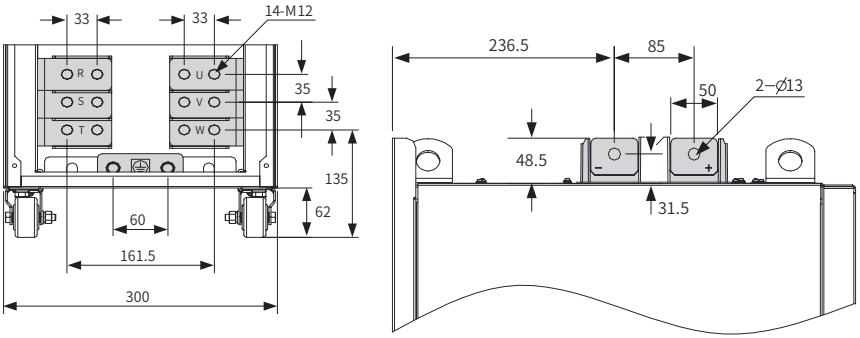


Figure 3-34 Main circuit terminal dimensions of MD880-01S-0441-4/MD880-01S-0481-4 (without side entry copper busbar and output reactors)

Table 3-11 Main circuit cable selection for MD880-01S-0441-4-(L)/MD880-01S-0481-4-(L)

AC Drive Model	Rated Current (A)	Recommended Input/Output Power Cable (mm^2)	Recommended Lug Model	Recommended Grounding Cable (mm^2)	Recommended Grounding Cable Lug Model	Tightening Torque (N·m)
MD880-01S-0441-4-(L)	441	2 x (3 x 95)	BC95-12	95	BC95-12	35.0
MD880-01S-0481-4-(L)	481	2 x (3 x 120)	BC120-12	120	BC120-12	35.0

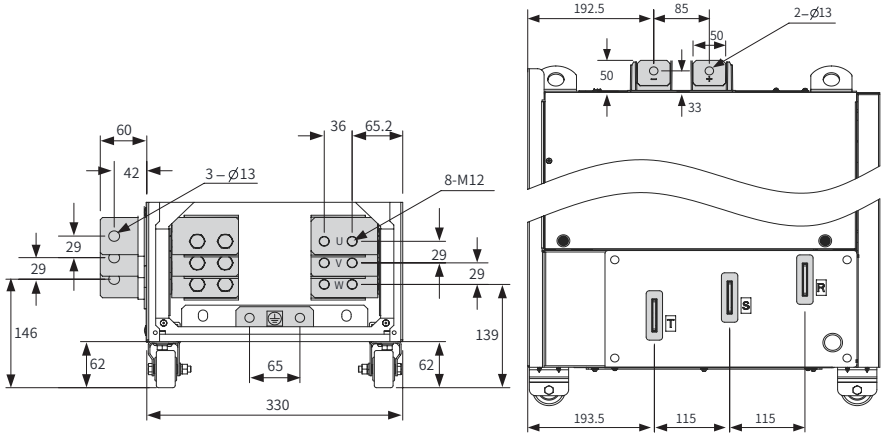


Figure 3-35 Main circuit terminal dimensions of MD880-01S-0538-4/MD880-01S-0605-4 (without output reactors)

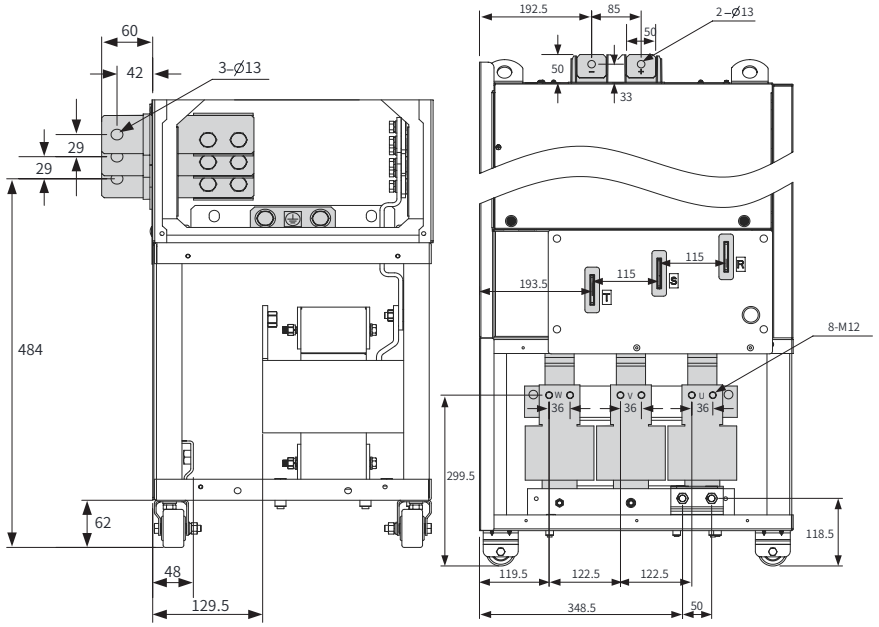


Figure 3-36 Main circuit terminal dimensions of MD880-01S-0538-4(-L)/MD880-01S-0605-4(-L) (with output reactors)

In the preceding figure, the side entry copper busbar can be removed if necessary. Terminal dimensions of main circuit terminals without the side entry copper busbar are shown below.

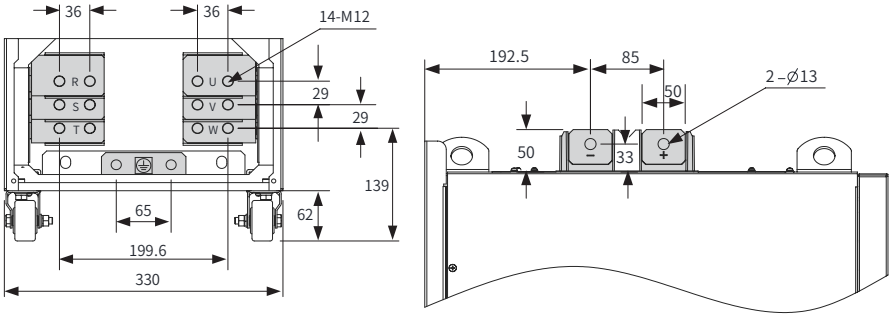


Figure 3-37 Main circuit terminal dimensions of MD880-01S-0538-4/MD880-01S-0605-4 (without side entry copper busbar and output reactors)

Table 3-12 Main circuit cable selection for MD880-01S-0538-4-(L)/MD880-01S-0605-4-(L)

AC Drive Model	Rated Current (A)	Recommended Input/Output Power Cable (mm^2)	Recommended Lug Model	Recommended Grounding Cable (mm^2)	Recommended Grounding Cable Lug Model	Tightening Torque (N·m)
MD880-01S-0538-4-(L)	538	2 x (3 x 120)	BC120-12	120	BC120-12	35.0
MD880-01S-0605-4-(L)	605	2 x (3 x 150)	BC150-12	150	BC150-12	35.0

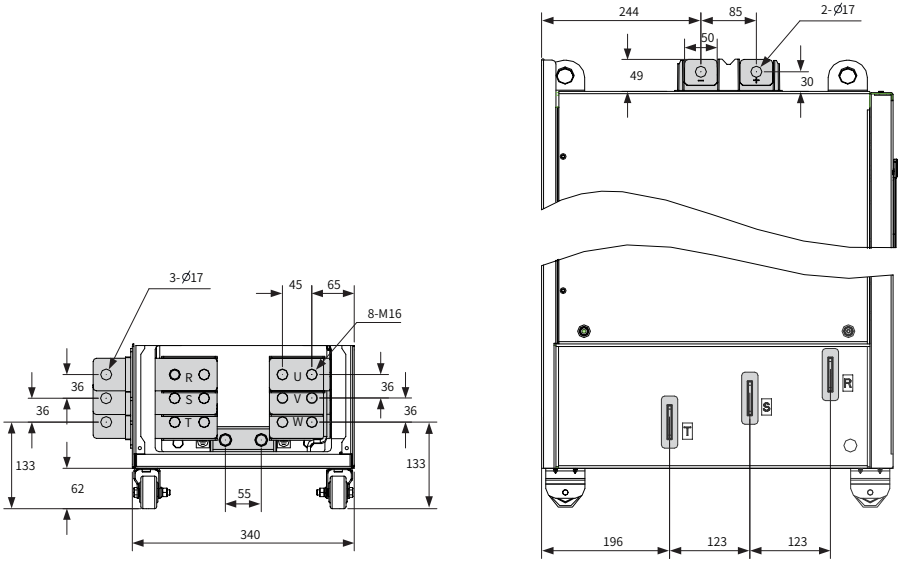


Figure 3-38 Main circuit terminal dimensions of MD880-01S-0673-4 to MD880-01S-0849-4 (without output reactors)

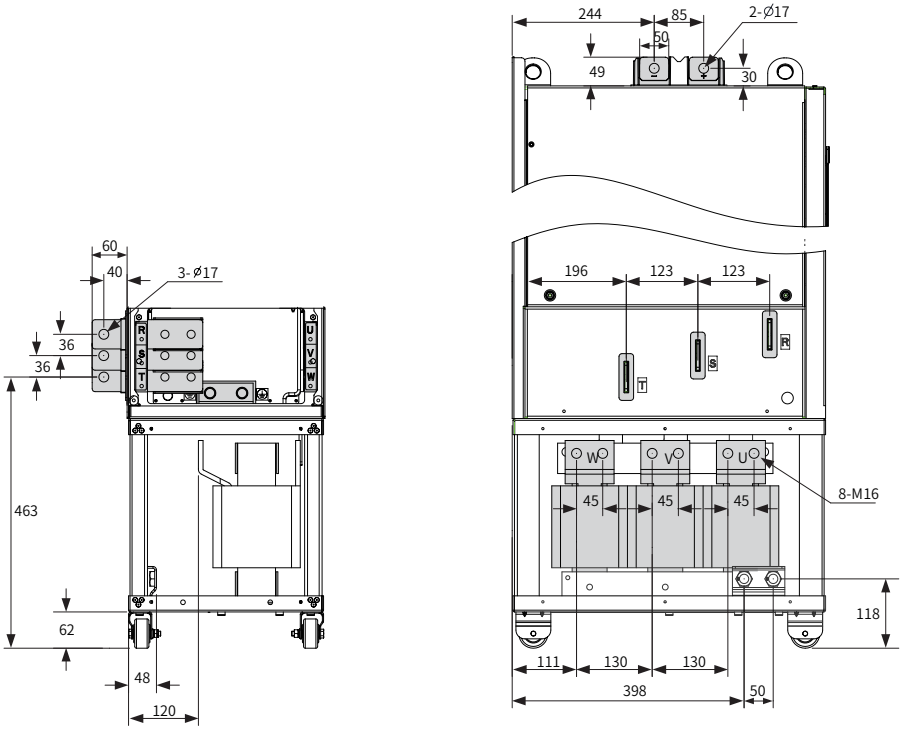


Figure 3-39 Main circuit terminal dimensions of MD880-01S-0673-4(-L) to MD880-01S-0849-4(-L) (with output reactors)

In the preceding figure, the side entry copper busbar can be removed if necessary. Terminal dimensions of main circuit terminals without the side entry copper busbar are shown below.

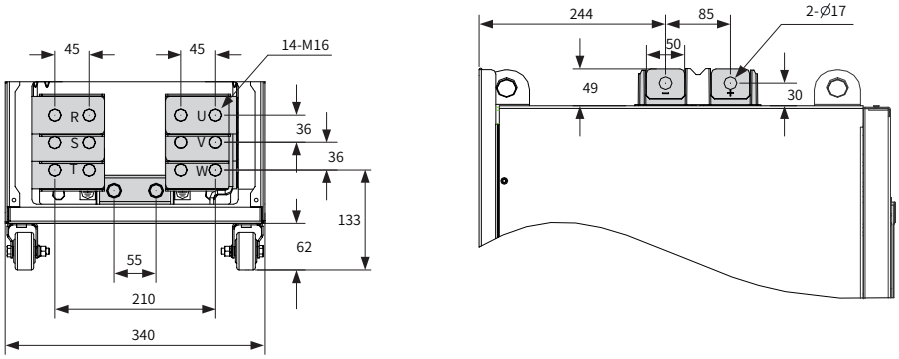


Figure 3-40 Main circuit terminal dimensions of MD880-01S-0673-4 to MD880-01S-0849-4 (without side entry copper busbar and output reactors)

Table 3-13 Main circuit cable selection for MD880-01S-0673-4-(L)/MD880-01S-0751-4-(L)/ MD880-01S-0849-4-(L)

AC Drive Model	Rated Current (A)	Recommended Input/Output Power Cable (mm^2)	Recommended Lug Model	Recommended Grounding Cable (mm^2)	Recommended Grounding Cable Lug Model	Tightening Torque (N·m)
MD880-01S-0673-4-(L)	673	2 x (3 x 185)	BC185-16	185	BC185-16	85.0
MD880-01S-0751-4-(L)	751	2 x (3 x 185)	BC185-16	185	BC185-16	85.0
MD880-01S-0849-4-(L)	849	2 x (3 x 240)	BC240-16	240	BC240-16	85.0

3.6 Wiring Checking

Table 3-14 Wiring checking

No.	Item	Checked
1	Whether the AC drive model is consistent with that on the order	☐
2	Whether peripherals (braking resistors, braking units, AC reactors, filters, and circuit breakers) meet design requirements	☐
3	Whether the installation method and location of the AC drive meet requirements	☐
4	Whether the AC drive input voltage is in the range of 323 V to 528 V	☐
5	Whether the rated motor voltage is consistent with the AC drive output voltage	☐
6	Whether power input cables are connected to the R, S, and T terminals	☐
7	Whether motor input cables are connected to the U, V, and W terminals	☐
8	Whether cable diameter of the main circuit meets requirements	☐
9	Whether heat shrink tubes are added to cable lug copper tubes and cable core parts of main circuit cables and the heat shrink tube completely covers the cable conductor part	☐
10	Whether the motor output cable is longer than 50 m. If yes, reduce the carrier frequency.	☐
11	Whether the grounding cable is connected correctly	☐
12	Whether the AC drive output terminals are secure	☐
13	Whether the braking resistor and braking unit (if used) are connected correctly and whether their resistance is correct	☐
14	Whether the shielded twisted pair (STP) is used as the signal cable of the AC drive control circuit	☐
15	Whether the optional card is connected correctly	☐
16	Whether the control circuit cable and main circuit power cable are routed separately	☐

4 HCU Control Module

MD880 series AC drives can work with HCU-50 or HCU-51 control modules.

Inverter Module	Communication Method	Applicable AC Drive	Installation Method
HCU-50	High-speed optical fiber communication	T10 to T12	Installed separately inside an auxiliary control cabinet.
HCU-51	High-speed RS422 communication	T2 to T9	Installed on the AC drive.

The HCU-50 control module must be provided with an external 24 VDC power supply. The HCU-51 control module, as it is installed on the AC drive, can provide an internal 24 V power supply. Multiple isolated power supplies are available inside the HCU control module, providing the isolated digital power supply, InoLink communication RS485 isolated power supply, and SOP-20-880 power supply and powering up function modules installed on the HCU expansion slots.

4.1 Components of HCU Control Module

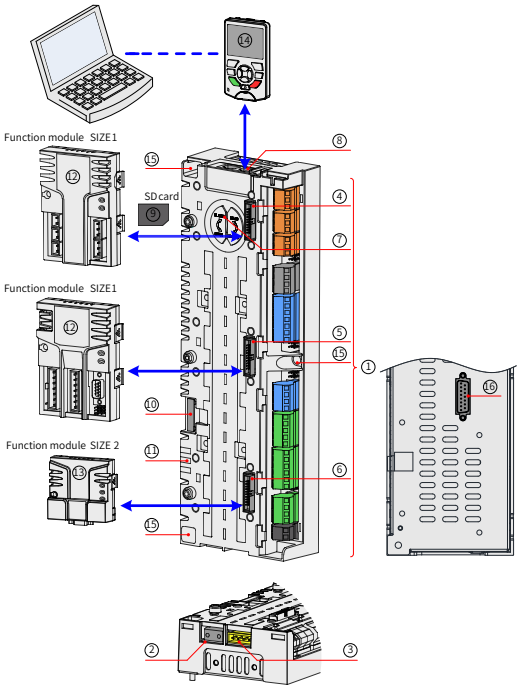


Figure 4-1 HCU control module

Table 4-15 Descriptions of HCU components

No.	Name	Function
1	User terminal	Standard user input and output terminals
2	Optical fiber communication interface	Optical fiber communication interface between the HCU-50 control module and the AC drive
3	XSTO	Reserved
4	SLOT1	Function module interfaces: A1, A2, and A3
5	SLOT2	Function module interface: B1, B2 and B3
6	SLOT3	Function module interface: C1
7	Battery cover	Spare RTC battery cover. The RTC battery is a non-rechargeable lithium battery which must be replaced regularly.
8	Smart operating panel terminal	For the connection between the HCU and SOP-20-880. The two RJ45 ports are identical and easy to cascade.
9	SD card	An 8 GB microSD memory card, which can be flexibly inserted and removed
10	Functional safety slot	For connection of functional safety modules
11	Indicator	Power, Run and Fault indicators
12	Function module SIZE1	105 x 73 x 24 (mm) function module
13	Function module SIZE2	75 x 73 x 24 (mm) function module
14	SOP-20-880 smart operating panel	HMI
15	Fixing hole	Holes for fixing the HCU. Quantity: 3
16	DB15 terminal	Communication interface between the HCU-51 control module and the AC drive

NOTE

- Function modules are directly installed in SLOT1, SLOT2, and SLOT3. The addresses are A1, B1, and C1.
- SLOT1 and SLOT2 can be used with HOFM-30 and HESD-10 to achieve slot extension. The addresses are A1, A2, A3 and B1, B2, B3.
- SLOT3 does not support slot expansion.

4.2 HCU Standard Terminals

Table 4-1 Description of standard terminals of the HCU control module

Name	Mark	Description
Input power supply	XPWR: 24VI	HCU power supply
Digital power output	XDPWR: 24VD	Digital output power 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
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
Inolink communication	XCOMM	High speed RS485, bus resistor is selected by jumper
RJ45 terminal	X11, X12	For communication with the SOP-20-880 or PC (requires RS485-RS232 converter). Both are identical for multiple HCU cascade; connection cable < 3 m

4.3 Dimensions and Installation Instructions

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 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, you must ensure that the HCU input power is disconnected to avoid damage to the HCU or function module caused by live installation or removal.
- Protect the HCU module from falling or impact to avoid damage to the module.
- Do not disassemble the HCU module, otherwise the module may be damaged.
- Do not use excessive torque to tighten the terminals to avoid damage.

■ Tool

1# Phillips screwdriver

■ Tightening torques of fasteners

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

Screw	Tightening Torque
M3	0.55 N · m

4.3.2 Dimensions

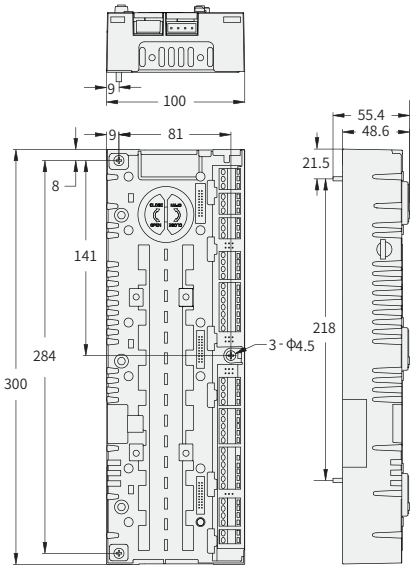


Figure 4-2 Dimensions of the HCU (unit: mm)

4.3.3 Space

To install the HCU, certain space must be reserved as shown below. The HCU must be mounted on a conductive metal surface and ensure that the entire conductive bottom of the HCU is in good contact with the surface.

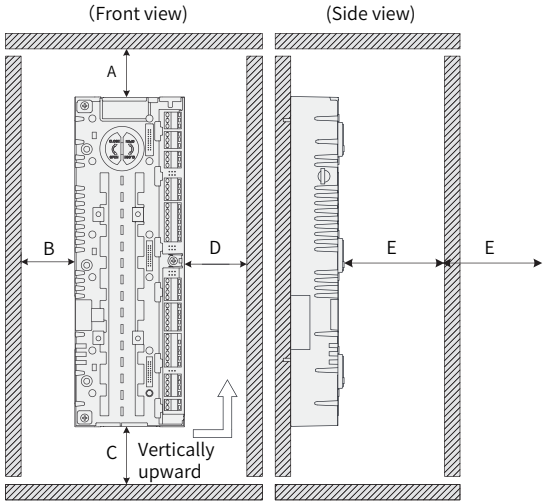


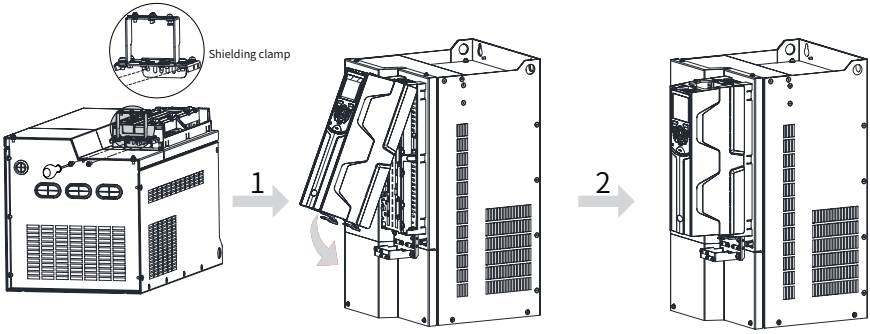
Figure 4-3 Installation space (unit: mm)

Table 2-2 Installation space (unit: mm)

A	B	C	D	E
⩾ 100	⩾ 30	⩾ 100	⩾ 50	⩾ 100

4.3.4 Installation Procedure

■ Installing the HCU for AC drives of structures T2 to T9



1) For AC drives of structures T2 to T9, the HCU has been installed on the AC drive. You need to install the shielding clamp on the HCU using M4 x 10 screws.

2) Install the HCU cover.

■ Installing the HCU for AC drives of structures T10 to T12

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.

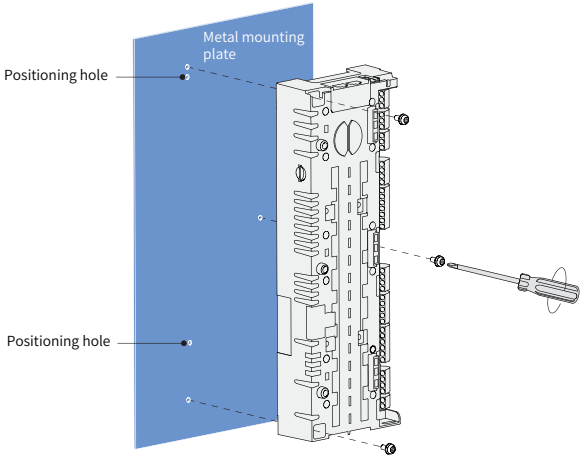


Figure 4-4 Installing the HCU

■ Grounding inside the cabinet

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

The HCU housing will be grounded to the cabinet housing through the screws on the mounting surface.

4.4 Function Module

The HCU can be used with other function modules to expand its functions. Specific information is as follows:

Table 4-3 Function modules used with HCU

Name	Model	Function	Connection Method	Dimensions (Length x Width x Height, mm)
Encoder detection module	HPG-10	HTL incremental encoder signal detection	SLOT	105 x 73 x 24
	HPG-40	Resolver encoder signal detection	SLOT	105 x 73 x 24
	HPG-50	TTL incremental encoder signal detection	SLOT	105 x 73 x 24

Name	Model	Function	Connection Method	Dimensions (Length x Width x Height, mm)
I/O module	HIO-10	Two AIs Two AOs Two DIOs One relay output	SLOT	105 x 73 x 24
PROFIBUS module	HDP-10	PROFIBUS-DP bus adaptation	SLOT	75 x 73 x 24
CANbus module	HCAN-10	CANopen bus adaptation	SLOT	75 x 73 x 24
MODBUS RTU module	HMBA-10	MODBUS RTU bus adaptation	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	SLOT	75 x 73 x 24
MODBUS TCP module	HMBT-10	MODBUS TCP industrial Ethernet	SLOT	75 x 73 x 24
Optical fiber expansion module	HOFM-10	One pair of 50 M optical fiber cables	SLOT	75 x 73 x 24
	HOFM-30	Three pairs of 50 M optical fiber cables	SLOT	75 x 73 x 24
Parallel control module	HPCU-40	Support 2 to 4 parallel modules	Optical fiber	232 x 86 x 40
	HPCU-60	Support 2 to 6 parallel modules	Optical fiber	232 x 86 x 40
	HPCU-A0	Support 2 to 10 parallel modules	Optical fiber	232 x 86 x 40
Expansion module	HESD-10	Expand one SLOT expansion slot	Optical fiber	105 x 75 x 70
SOP	SOP-20-880	HMI	RS485	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

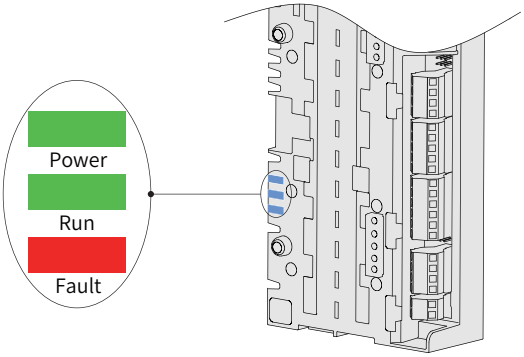


Figure 4-5 Location and Definition of LED indicators

Table 4-4 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 stops.
3	Fault	Steady ON	A system fault occurs.
		OFF	The system is normal.
		Flashing	The HCU auxiliary power has failed. Check all auxiliary power supplies for short circuit or overload.
4	Fault, Run	Flashing	PC or SOP-20-880 selects the HCU and ends after 10s

4.6 SD Memory Card

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

4.7 Terminals

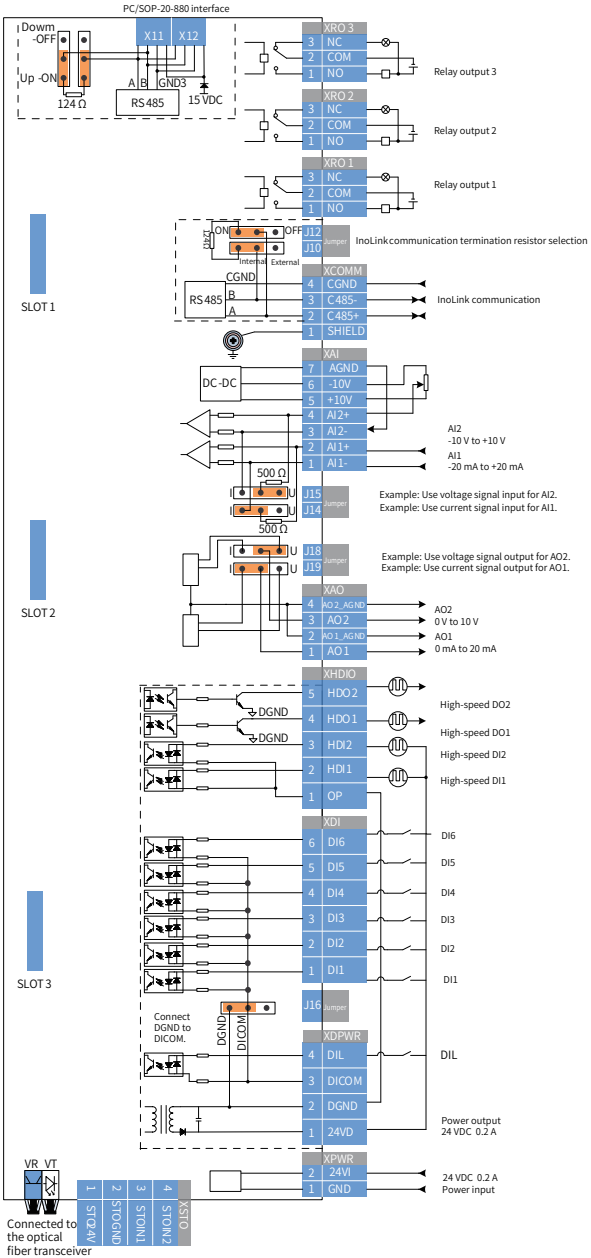
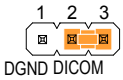
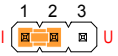
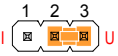


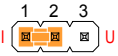
Figure 4-6 Overview of all terminals of the HCU control module

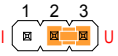
Table 4-5 Detailed description of HCU control module terminals

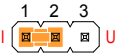
Pin No.	Name	Function	Specification
XPWR: input power terminal			
1	GND	24.0 V±10% 2.0 A	2-core twisted pair cable is recommended Cross sectional area: 0.5–2.5 mm^2
2	24VI		
XDPWR: DIL terminal			
1	24VD	Power supply for DI, HDI and HDO 24.0 V±10% 0.2A	Twisted pairs, single-core cables Cross sectional area: 0.5–2.5 mm^2 Note: The load of 24VD cannot exceed 0.2 A.
2	DGND	24VD GND	
3	DICOM	DI common output which can be connected to DGND through jumper J11	
4	DIL	Digital interlock or common DI; technical parameters are the same as common DI	
Jumper J16: power supply selection			
 Shorting DGND and DICOM allows DIs to be powered up by 24VD internal power supply.			
 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-core 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 The shielded twisted pair cable is 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 Input voltage range: 0–30 VDC Input frequency range: 0–100 kHz HDI max. load Imax: 15 mA	
3	HDI2		
4	HDO1	Output type: OC Output frequency range: 0–100 kHz HDOmax. load Imax: 20 mA Output voltage range: 0–26.4 VDC	
5	HDO2		

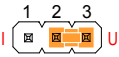
<table>
<tr><th>Pin No.</th><th>Name</th><th>Function</th><th>Specification</th></tr>
<tr><td colspan="4">XAO: AO output terminal</td></tr>
<tr><td>1</td><td>AO1</td><td rowspan="4">AO1 output range: 0–20 mA, Rload ⩽ 500 Ω
0–10 V, Rload ⩾ 10 kΩ
AO2 output range: 0–20 mA, Rload ⩽ 500 Ω
0–10 V, Rload ⩾ 10 kΩ
Resolution: 11 bit + sign bit
Accuracy: 2% full scale range</td><td rowspan="4">Cross sectional area: 0.5–2.5 mm^2
The shielded twisted pair cable is recommended.
AO1 and AO1_AGND twisted pair
AO2 and AO2_AGND twisted pair</td></tr>
<tr><td>2</td><td>AO1_ AGND</td></tr>
<tr><td>3</td><td>AO2</td></tr>
<tr><td>4</td><td>AO2_ AGND</td></tr>
<tr><td colspan="4">Jumper J19: AO1 current and voltage signal selection</td></tr>
<tr><td colspan="4"> 

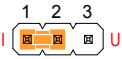
AO1 current signal output by shorting 1 and 2</td></tr>
<tr><td colspan="4"> 

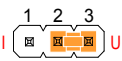
AO1 voltage signal output by shorting 2 and 3</td></tr>
<tr><td colspan="4">Jumper J18: AO2 current and voltage signal selection</td></tr>
<tr><td colspan="4"> 

AO2 current signal output by shorting 1 and 2</td></tr>
<tr><td colspan="4"> 

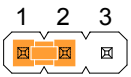
AO2 voltage signal output by shorting 2 and 3</td></tr>
<tr><td colspan="4">XAI: AI input terminal</td></tr>
<tr><td>1</td><td>AI1-</td><td rowspan="4">Current input: -20m to +20mA, Rin: 500 Ω
Voltage input: -10 V to +10 V, Rin: 200 kΩ
Differential input, input range: ±30 V
Sample interval per channel: 0.25 ms
Hardware filtering: 0.25 ms
Resolution: 11 bit + sign bit
Accuracy: 1% full scale range</td><td rowspan="7">Cross sectional area: 0.5–2.5 mm^2
Use two 2-core twisted-pair shielded cables when using two-way AI.
Use one 4-core twisted pair shielded cable for one-way AI when reference voltage is provided.</td></tr>
<tr><td>2</td><td>AI1+</td></tr>
<tr><td>3</td><td>AI2-</td></tr>
<tr><td>4</td><td>AI2+</td></tr>
<tr><td>5</td><td>+10V</td><td rowspan="3">+10 V: +10 V ± 1%
-10V: -10V ± 1%
Rload 1–10 kΩ</td></tr>
<tr><td>6</td><td>-10V</td></tr>
<tr><td>7</td><td>AGND</td></tr>
<tr><td colspan="4">Jumper J14: AI1 current or voltage signal Input selection</td></tr>
<tr><td colspan="4"> 

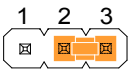
AI1 current signal Input by shorting 1 and 2</td></tr>
<tr><td colspan="4"> 

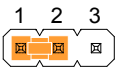
AI1 voltage signal Input by shorting 2 and 3</td></tr>
<tr><td colspan="4">Jumper J15: AI2 current and voltage signal selection</td></tr>
<tr><td colspan="4"> 

AI2 current signal Input by shorting 1 and 2</td></tr>
<tr><td colspan="4"> 

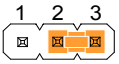
AI2 voltage signal Input by shorting 2 and 3</td></tr>
</table>

<table>
<tr><th>Pin No.</th><th>Name</th><th>Function</th><th>Specification</th></tr>
<tr><td colspan="4">XCOMM: InoLink RS485 communication terminal</td></tr>
<tr><td>1</td><td>SHIELD</td><td rowspan="4">RS485 bus, 5 V standard level
Bus resistor: 124 Ω
Max. communication speed: 5 Mbps
Max. number of nodes: 32 (no repeater)
Max. transmission distance: 1200 m</td><td rowspan="4">4-core shielded twisted pair cable
Cross sectional area: 0.5–2.5 mm^2
When used for Inolink, the maximum number of nodes is 16, the maximum speed is 5 Mbps, and the maximum cable length is 40 m.</td></tr>
<tr><td>2</td><td>C485+</td></tr>
<tr><td>3</td><td>C485-</td></tr>
<tr><td>4</td><td>CGND</td></tr>
<tr><td colspan="4">Jumpers J10 and J12: RS485 termination resistor selection (J10 and J12 must be in the same status.)</td></tr>
<tr><td colspan="4"> 

Connect the termination resistor by shorting 1 and 2.</td></tr>
<tr><td colspan="4"> 

Disconnect the termination resistor by shorting 2 and 3.</td></tr>
<tr><td colspan="4">XRO1: output terminal of relay 1</td></tr>
<tr><td>1</td><td>RO1_NO</td><td rowspan="3">Output type: passive NO and NC contacts
Contact parameters: 250 VAC/30 VDC, 2 A</td><td rowspan="3">Single-core cable
Cross sectional area: 0.5–2.5 mm^2</td></tr>
<tr><td>2</td><td>RO1_ COM</td></tr>
<tr><td>3</td><td>RO1_NC</td></tr>
<tr><td colspan="4">XRO2: output terminal of relay 2</td></tr>
<tr><td>1</td><td>RO2_NO</td><td rowspan="3">Output type: passive NO and NC contacts
Contact parameters: 250 VAC/30 VDC, 2 A</td><td rowspan="3">Single-core cable
Cross sectional area: 0.5–2.5 mm^2</td></tr>
<tr><td>2</td><td>RO2_ COM</td></tr>
<tr><td>3</td><td>RO2_NC</td></tr>
<tr><td colspan="4">XRO3: output terminal of relay 3</td></tr>
<tr><td>1</td><td>RO3_NO</td><td rowspan="3">Output type: passive NO and NC contacts
Contact parameters: 250 VAC/30 VDC, 2 A</td><td rowspan="3">Single-core cable
Cross sectional area: 0.5–2.5 mm^2</td></tr>
<tr><td>2</td><td>RO3_ COM</td></tr>
<tr><td>3</td><td>RO3_NC</td></tr>
<tr><td colspan="4">X11, X12: PC or SOP-20-880 RS485 communication terminal</td></tr>
<tr><td>1, 2, 7</td><td>NC</td><td rowspan="5">RS485 bus, 5 V standard level
Bus resistor: 124 Ω
Max. communication speed: 4 Mbps
Max. number of nodes: 32 (no repeater)
Max. transmission distance: 1200 m</td><td rowspan="5">Standard network cable</td></tr>
<tr><td>3, 8</td><td>GND3</td></tr>
<tr><td>4</td><td>A</td></tr>
<tr><td>5</td><td>B</td></tr>
<tr><td>6</td><td>15V3</td><td>15V3: 15 V ± 15%</td></tr>
<tr><td colspan="4">Jumper J12, J15: bus resistor selection, J12 and J15 must select the same status</td></tr>
<tr><td colspan="4"> 

Connect the termination resistor by shorting 1 and 2.</td></tr>
</table>

Pin No.	Name	Function	Specification
		Disconnect the termination resistor by shorting 2 and 3.	
VR, VT: transceiver			
1	VR	Receive optical fiber communication signals	Optical fiber Type: plastic optical fiber (POF)
2	VT	Transmit optical fiber communication signals	

4.8 HPCU Parallel Control Module

The HPCU parallel control module serves to receive drive and control signals sent from the HCU through communication and transmits such signals to each AC drive synchronously, acting as an intermediary in the system. Meanwhile, it uploads the current, voltage, and status data sent from the AC drive to the HCU and controls synchronization, current sharing, reset, and start/stop operations of AC drives connected in parallel.

Depending on system requirements, HPCU-40 (four parallel modules) or HPCU-60 (six parallel modules) can be selected.

4.8.1 Standard Terminals

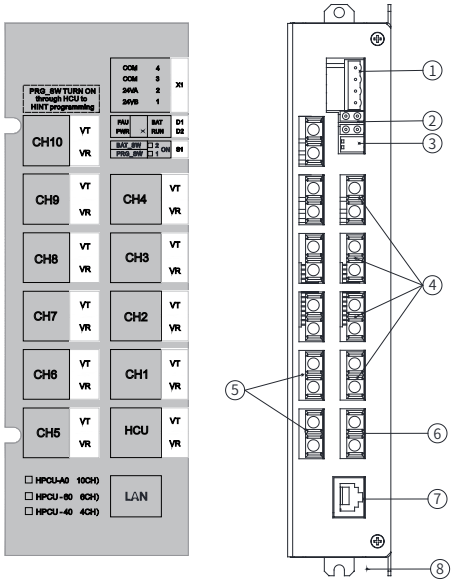


Figure 4-7 Components of HPCU-40/60

Table 4-6 Descriptions of HPCU-40/60 components

No.	Name	Description	Description
1	Input power supply	COM: 24 V GND	External power supply of HPCU X1 terminal: 5.08 mm pitch, 4-pin black pluggable terminal Twisted pair cable Cross sectional area: 0.5–2.5 mm^2
		COM: 24 V GND	
		24VA: Input power A 24.0 V±10% 0.5 A	
		24VB: Input power B (redundant design) 24.0 V±10% 0.5 A	
2	LED indicator	PWR/BAT/TX/RX	Power/battery indication/send/receive
3	Battery DIP switch	S2: BAT_SW	Reserved
4	Optical fiber transceiver	VT/VR: CH1–CH4, parallel module channel 1–channel 4	VT: 50 M, transmit optical fiber communication signals VR: 50 M, receive optical fiber communication signals Optical fiber type: plastic optical fiber (POF) HPCU-40 contains channels: CH1–CH4 HPCU-60 contains channels: CH1–CH6
5	Optical fiber transceiver	VT/VR: CH5/CH6, parallel module channel 5–channel 6	
6	Optical fiber transceiver	VT/VR: HCU Inodrive, communication between HPCU and HCU	
7	LAN	PC control terminal	-
8	Fixing hole	Holes for fixing the HPCU. Quantity: 4	-

4.8.2 LED Indicators

Table 4-7 Description

No.	Name	Status	Function
1	PWR	Steady on in green	The HPCU power supply is normal.
		OFF	The HPCU is not energized or the power supply has failed.
2	RUN	Steady on in green	The AC drive is running.
		OFF	The AC drive stops.
3	FAU	Flashing in red	A system fault occurs.
		OFF	The system is normal.
4	BAT	Steady on in red	Battery undervoltage
		OFF	The battery is normal.

4.8.3 Electrical Connection of HPCU

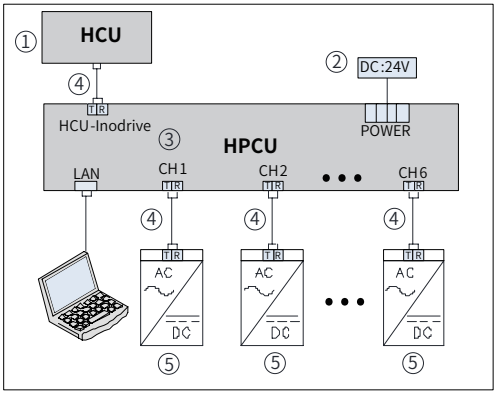


Figure 4-8 Electrical connection

Table 4-8 Description of HPCU components

No.	Name
1	HCU control module
2	24 V external power supply
3	HPCU parallel control module
4	Optical fiber communication interface
5	AC drive

4.9 Applications of HCU

4.9.1 SLOT Expansion

- Different function modules are available in the HCU application. The function modules are installed directly in the SLOT 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 connect to one function module.

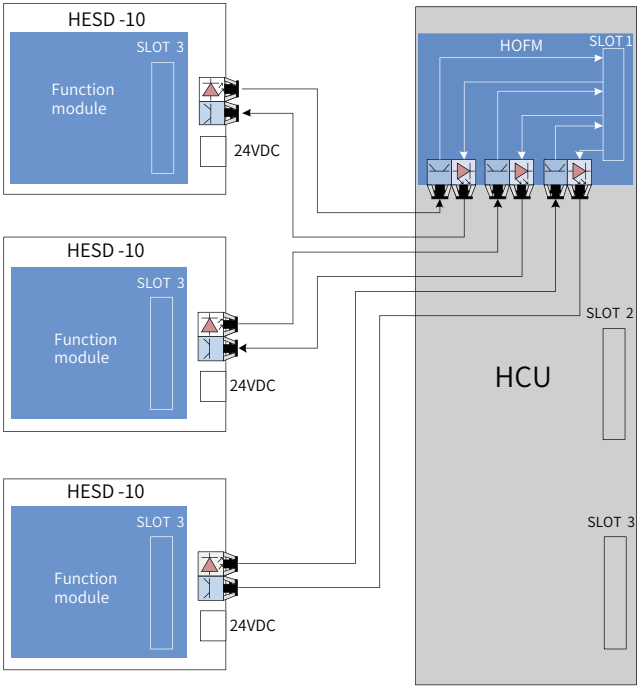


Figure 4-9 HESD wiring example

NOTE

- Functional modules can be directly installed in SLOT1, SLOT2 and SLOT3. The addresses are: A1, B1, C1:
- The SLOT1 and SLOT2 slots can be used with the HOFM-30 module to achieve three SLOT slot expansions respectively. The addresses are A1, A2, A3 and B1, B2, and B3 respectively;
- SLOT3 does not support slot expansion.
- In this case, the HESD module is not allowed to install another HOFM optical fiber expansion module.

4.9.2 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 single PT100 or one to three PT100's in series. AO selects constant current output and AI selects voltage signal input.

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 after passing through a string capacitor.

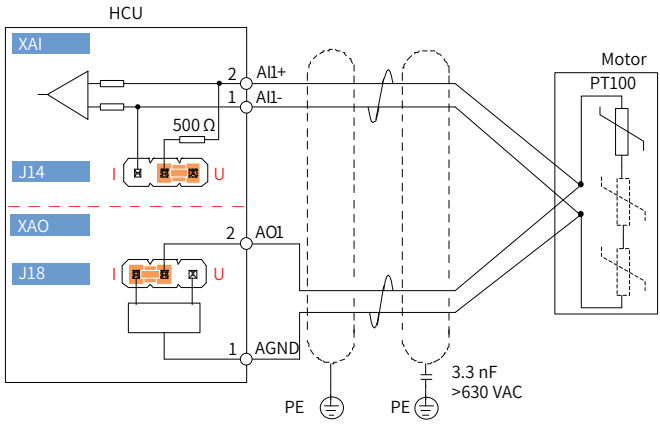


Figure 4-10 Temperature measurement with AI and AO

4.9.3 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, it is recommended to use high quality cables, such as PROFIBUS cables; the cable should be as short as possible, and the link length must not exceed 40 m. Keep the cables from entangling and away from high-voltage cables.

If an 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 turned to the ON position.

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

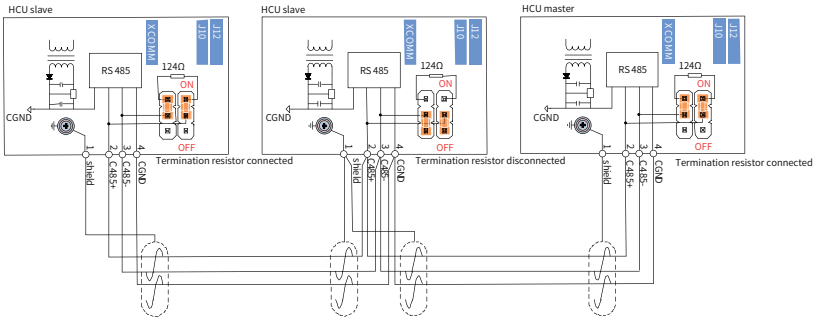


Figure 4-11 Application example

4.9.4 Communication

The communication between the HCU control module and the SOP-20-880 or PC is achieved through X11 and X12 terminals using RS485 mode, with one SOP-20-880 or PC as the master, and multiple HCUs as the slaves. X11 and X12 are RJ45 terminals with identical pin definitions for cascading.

1) Connection with SOP-20-880

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

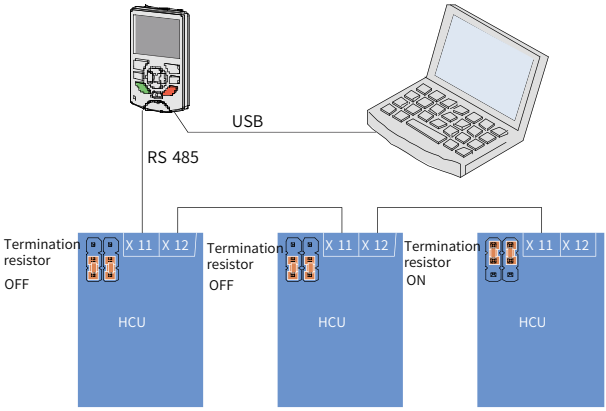


Figure 4-12 Connection with SOP-20-880

2) Connection with PC

The PC is the master, the HCU is the slave. A conversion module (RS485–RS232 converter or USB) is required between the PC and the HCU; the conversion module and the far-end HCU must be equipped with a termination resistor.

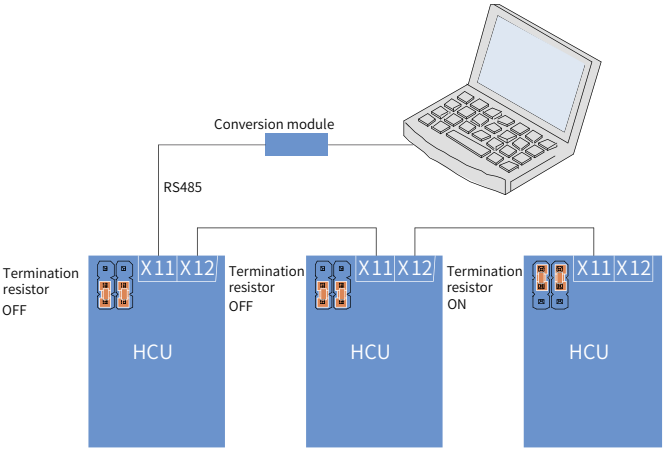


Figure 4-13 Connection with PC

5 Maintenance and Repair

5.1 Overview

Before maintenance and repair, read *"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 periodic inspection and replace components on the AC drive.

5.2 Routine Maintenance

The influence of the ambient temperature, humidity, dust, and vibration will age the components inside the AC drive, which may cause potential faults or reduce the service life of the AC drive. Therefore, it is necessary to carry out routine and periodic maintenance. More frequent inspection will be required if it is used in harsh environments, such as:
High ambient temperature
Frequent starting and stopping
Fluctuations in the AC power supply or load
Excessive vibrations or shock loading
Dust, metal dust, salt, sulfuric acid, chlorine atmospheres
Poor storage conditions.

Check the following items daily to ensure normal running and prevent damage to the AC drive. Copy this checklist and sign the "Checked" column after each inspection.

Inspection Item	Inspection Point	Solution upon Fault	Checked
Motor	Inspect whether abnormal sounds and vibration occur on the motor.	Check whether the mechanical connection is normal. Check whether output phase loss occurs on the motor. Check whether retaining screws of the motor are tightened.	☐
Cooling fan	Inspect whether the cooling fan of the AC drive and motor work normally.	Check running of the cooling fan of the AC drive. Check whether the cooling fan of the motor is normal. Check whether the air filter is clogged. Check whether ambient temperature is within the permissible range.	☐
Installation environment	Inspect whether the cabinet and cable duct are normal.	Check input and output cables for damaged insulation. Check for vibration of hanging bracket. Check whether ground bars and terminals become loose or get corroded.	☐

Inspection Item	Inspection Point	Solution upon Fault	Checked
Load	Inspect whether the running current of the AC drive exceeds the rated current of the AC drive and motor for a certain period.	Check whether motor parameters are set correctly. Check whether the motor is overloaded. Check for mechanical vibration (< 0.6 g on normal condition).	☐
Input voltage	Inspect whether the power voltage of the main and control circuits is within the allowed range.	Check that the input voltage is within the allowed range (323–528 VAC). Check whether heavy load starts.	☐

5.3 Periodic Inspection

5.3.1 Periodic Inspection Items

Always keep the AC drive clean. Clear away dusts especially metal powder on the surface of the AC drive, to prevent dust from entering the AC drive. Clear oil dirt from the cooling fan of the AC drive.

Inspection Item	Inspection Point	Inspection Details	Checked
General	Inspect for wastes, dirt and dust on the surface of the AC drive.	Check whether the cabinet of the AC drive is powered off. Use a vacuum cleaner to suck up wastes and dust to prevent direct touching. Wipe stubborn stains with alcohol and wait until the alcohol evaporates.	☐
Cables	Inspect power cables and connections for discoloration. Inspect wiring insulation for aging or wear.	Replace cracked cables. Replace damaged terminals.	☐
Peripheral devices such as relay and contactor	Inspect contactors and relays for excessive noise during operation. Inspect for short-circuit, water stain, expansion, or cracking on peripheral devices.	Replace abnormal peripheral devices.	☐
Ventilation	Inspect whether the air filter and heatsink are clogged. Check whether the fan is damaged.	Clean the air filter. Replace the fan.	☐

Inspection Item	Inspection Point	Inspection Details	Checked
Controller	Inspect for control components in poor contact. Inspect for loose terminal screws. Inspect for control cables with cracked insulation.	Clear away foreign matters on the surface of control cables and terminals. Replace damaged or corroded control cables.	□

5.3.2 Insulation Test on Main Circuit

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

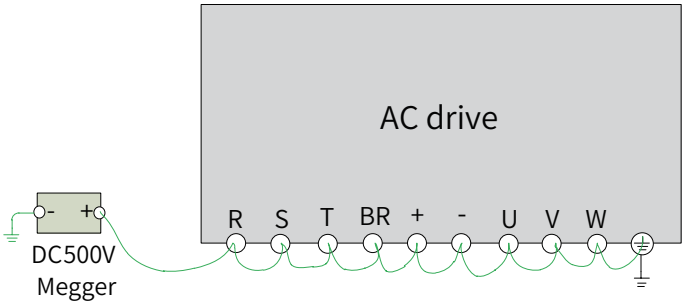


Figure 5-14 Insulation test on the main circuit

The measured insulation resistance must be greater than 5 MΩ.

Before test, remove the VDR screw. For specific locations of the VDR and safety capacitor (EMC) jumpers to ground, see *"3.5.2 Main Circuit Terminals"*.

5.4 Replacement of Wear Parts

5.4.1 Service Life of Wear Parts

Wear parts of the AC drive include the cooling fan and filter electrolytic capacitor. Their service life is related to the operating environment and maintenance. The service life of the two components under general conditions is listed below.

Component	Service Life[1]
Cooling fan	⩾ 5 years
Electrolytic capacitor	⩾ 5 years

[1] The standard service life indicates the lifetime when the components are used in the following conditions. You can determine when to replace these parts according to the actual operating time.

- Ambient temperature: 40°C
- Load rate: 80%
- Operating rate: 24 hours per day

5.4.2 Number of Cooling Fans

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

5.4.3 Replacing Cooling Fans

Item	Description
Possible damage cause	Bearing worn, blade aging
Judging criteria	Whether crack occurs on the blade; whether abnormal vibration noise exists upon startup; 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, check that the air flow direction is upright.

■ Removing the cooling fans of structures T5 to T6

1) Unscrew the four screws to remove the insulation barrier.

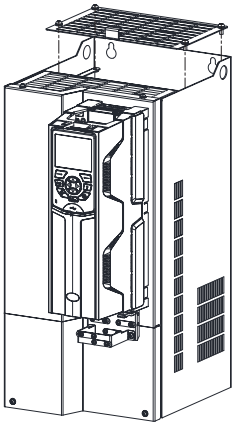


Figure 5-15 Unscrewing the four screws

2) Press the snap-fit joint on the protective cover and remove the fan cover.

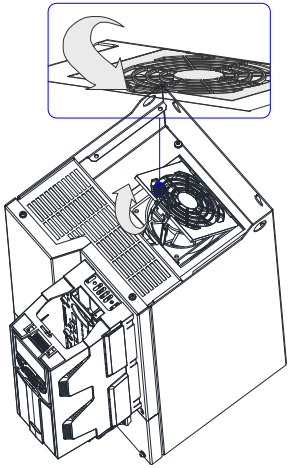


Figure 5-16 Removing the fan cover

3) Pull the fan upward and disconnect the pluggable connector of power cable.

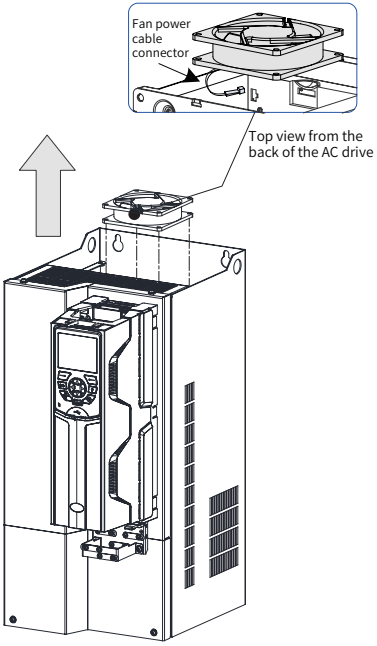


Figure 5-17 Disconnecting the power cable

■ Refitting the cooling fans of structures T5 to T6

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

1) After replacing the fan, check that the air flow direction is upright.

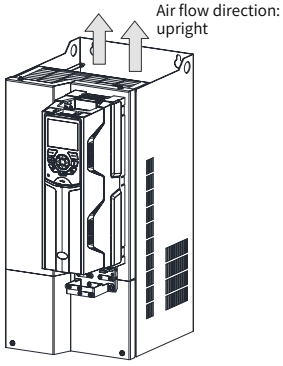


Figure 5-18 Air flow direction: upright

2) Check that the power cables of the fan are connected securely.

3) Install the fan into the AC drive and ensure that the positioning pins are aligned.

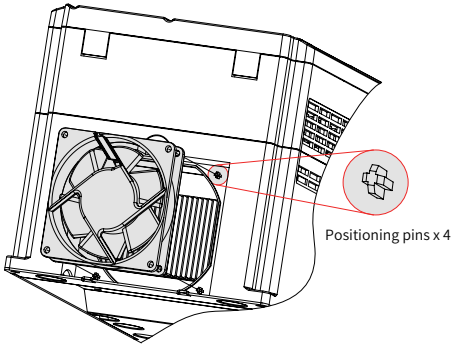


Figure 5-19 Aligning the positioning pins

4) Install the fan cover and insulation barrier.

■ Removing the cooling fans of structures T2 to T4 and T7 to T9

1) Disconnect the fan power cable. (Top view)

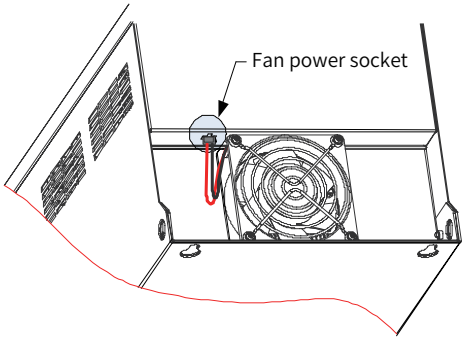


Figure 5-20 Disconnecting the power cable

2) Remove the four screws from the fan cover using a screwdriver.

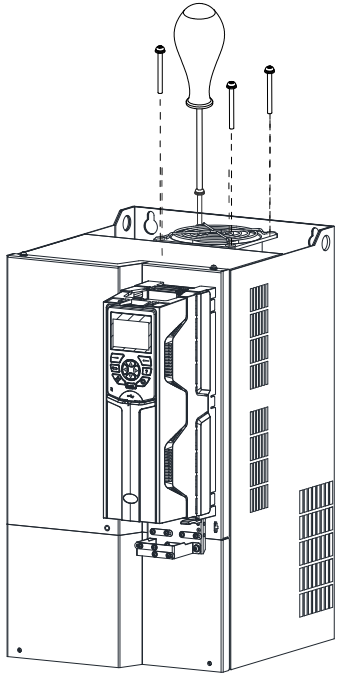


Figure 5-21 Remove the fixing screws.

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

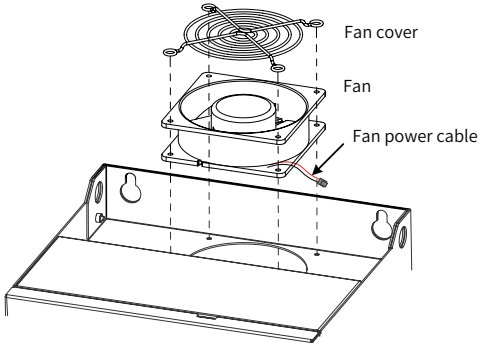


Figure 5-22 Fan removed

■ Refitting the cooling fans of structures T2 to T4 and T7 to T9

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

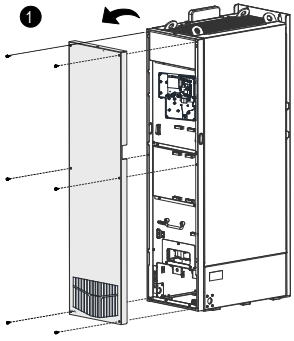
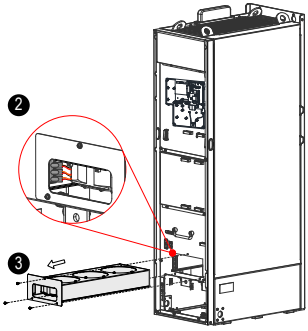
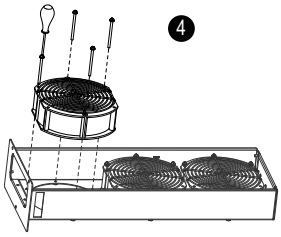
1) Install the fan in a reverse procedure to removal. Pay attention to the direction of the fan.

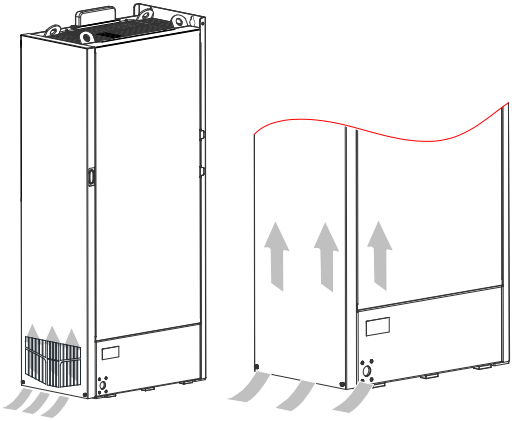
2) Install the fan and fan cover on the AC drive. Note that the fixed holes are aligned.

3) After replacing the fan, check that the air flow direction is upright. Ensure that the power cable is inserted correctly.

4) Ensure that the fan power cable is connected securely.

■ Removing and refitting the cooling fans of structures T10 to T12

Removing the Fan (structures T10 to T12)		
Remove the six screws on the cover. Then, hold the cover with both hands and lift it in the arrow direction shown below to remove the cover.	Disconnect the fan power cable connector from the AC drive. Each fan has a power cable connector. Remove the three screws from the fan box and draw the fan box out in the direction of arrow.	Loosen four screws from each fan cover and remove the fan.
		

Installing the Fan (structures T10 to T12)
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 rail and push it into the AC drive. ③ Connect the fan power cable connectors first before fixing the fan cover. After the replacement is complete, check that the air flow direction is upright. 

5.4.4 Electrolytic Capacitor

Item	Description
Possible Damage Cause	Input power supply in poor quality High ambient temperature Frequent load jumping Electrolytic aging
Judging criteria	Check whether liquid leakage exists. Check whether the safety valve has projected. Measure the static capacitance. Measure the insulation resistance.
Electrolytic capacitor replacement	As the replacement concerns the internal components of the AC drive, contact the agent or Inovance to perform the replacement.

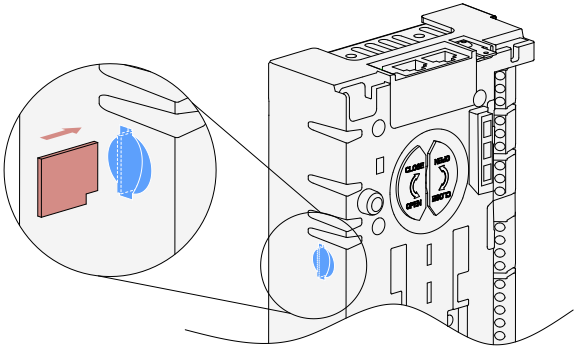
5.5 Maintenance of the HCU Control Module and SOP-20-880 Operating Panel

5.5.1 Replacing the Memory Card

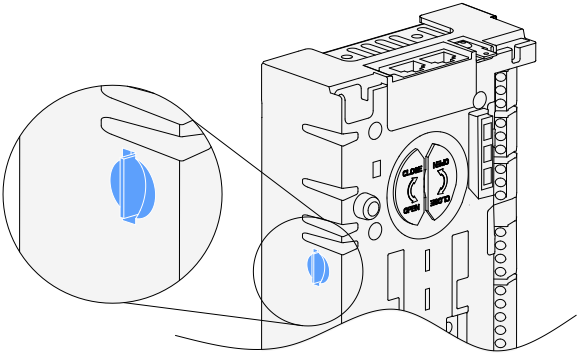
After replacing the HCU control module, the existing parameter settings can be retained by transferring the memory card from the faulty HCU control module to the new module. The steps for replacing the memory card are as follows:

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.



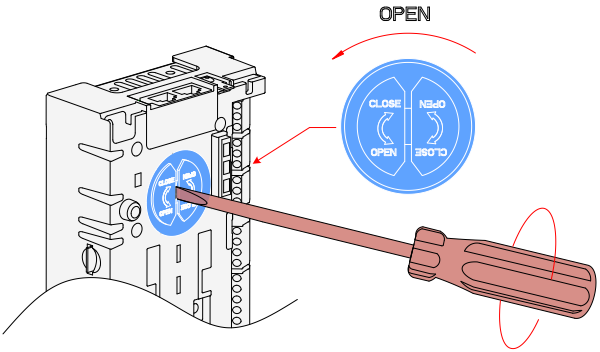
Step 3: Ensure that the SD memory card is pushed into position. Otherwise, an abnormality will occur due to poor contact.



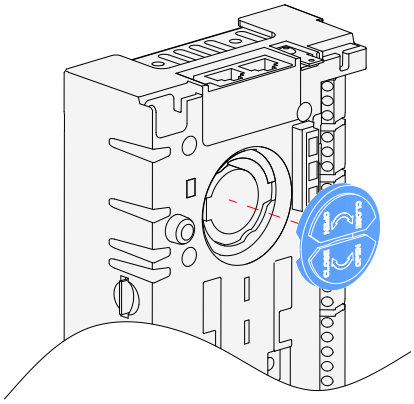
5.5.2 Replacing the Battery of the HCU Control Module

Perform the following steps to replace the battery used for powering the clock of the HCU control module:

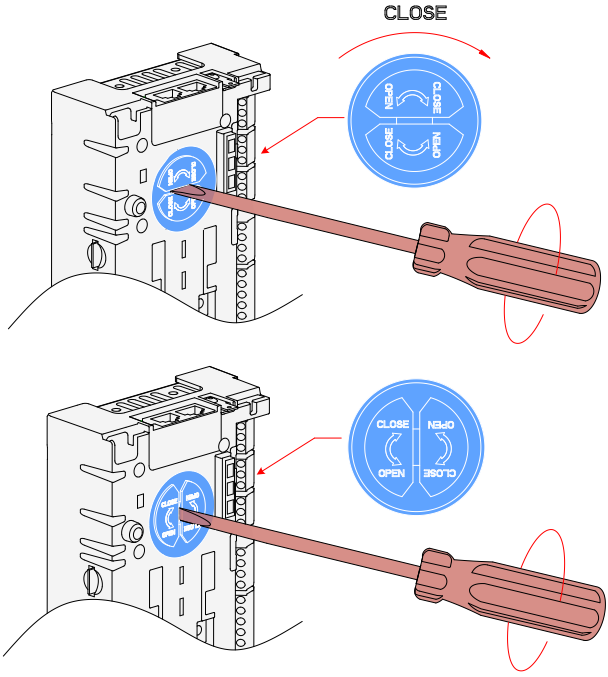
Step 1: Turn the battery cover 90° counterclockwise with a 2 mm slotted screwdriver to open the cover.



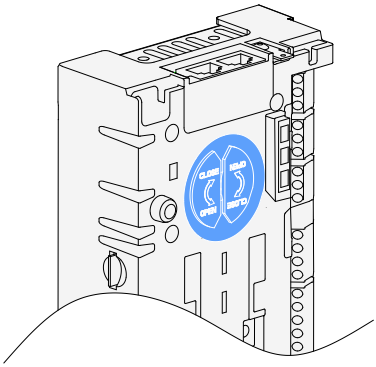
Step 2: Remove the cover and replace the battery.



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

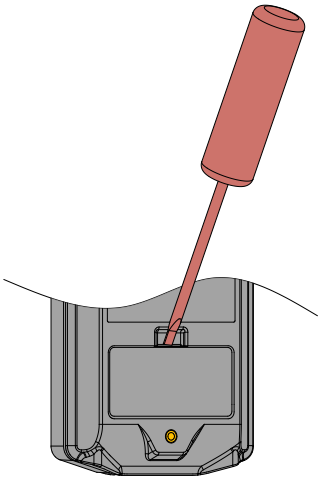


Step 4: Dispose of used batteries in accordance with local disposal rules or applicable laws.

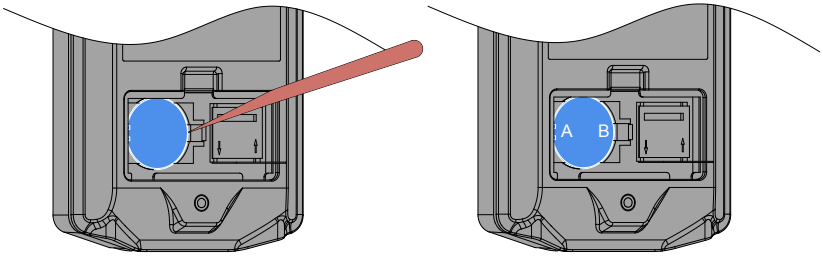


5.5.3 Replacing the Battery of the SOP-20-880 Operating Panel

Step 1: Use a slotted screwdriver or fingers to remove the battery cover.

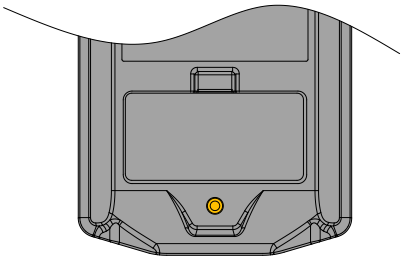


Step 2: Take out the battery with tweezers or a slotted screwdriver.



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

Step 4: Put the battery cover back.



6 Options

6.1 Options

Peripherals and options include braking units and function modules. For details about the function modules, see *"4.4 Function Module"*. For their usage, see their user guides. 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	90 kW and above: external braking unit, parallel connection allowed	Inovance's product, which needs to be purchased separately
Guide rail	MD500-AZJ-A3T10	Used to guide the module into the cabinet when the AC drive is installed in the cabinet.	Optional (T10 to T12)
Output reactor	MD880-01S-XXXX-X-L	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 losses, and protects the power switching devices inside the AC drive.	If you need to purchase an AC 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 wiring. For details about its installation, see *"Installation of the Sheet Metal Base and Side Entry Output Copper Busbar"*.	Optional (T10)
	MD880-01S-T11-kit		Optional (T11)
	MD880-01S-T12-kit		Optional (T12)
Side entry output copper busbar	MD500-TP-T10-MD500	Used to extend the AC drive output to the side for easy wiring. For details about its installation, see *"Installation of the Sheet Metal Base and Side Entry Output Copper Busbar"*.	Optional (T10)
	MD500-TP-T11-MD500		Optional (T11)
	MD500-TP-T12-MD500		Optional (T12)

6.2 Selection of Cables, Circuit Breakers, and Contactors

■ Selection of cables, circuit breakers, and contactors

Table 6-2 Selection of some electrical peripheral components for the MD880 series AC drive

Model MD880-01S Series	Recommended Input IEC Cable Specifications (mm^2) [1]	Recommended IEC Ground Cable (mm^2)	Recommended Output IEC Cable (mm^2)	Terminal Width of the AC Drive (mm)	Screw	Recommended Fuse Bussmann Compliant with UL Certification		Recommended Contactor	Recommended Circuit Breaker
						Rated Current (A)	Model	Rated Current (A)	Rated Current (A)
Three-phase 380 V to 480 V, 50/60 Hz									
MD880-01S-0012-4-B	3 x 2.5	2.5	3 x 2.5	4	M4	35	FWH-35B	25	32
MD880-01S-0017-4-B	3 x 4	4	3 x 4	6	M5	35	FWH-35B	25	32
MD880-01S-0024-4-B	3 x 4	4	3 x 4	6	M5	35	FWH-35B	25	32
MD880-01S-0033-4-B	3 x 6	6	3 x 6	10	M5	40	FWH-40B	32	40
MD880-01S-0038-4-B	3 x 10	10	3 x 10	15.0	M6	40	FWH-40B	32	40
MD880-01S-0048-4-B	3 x 10	10	3 x 10	15.0	M6	80	FWH-80B	65	80
MD880-01S-0060-4-B	3 x 16	16	3 x 16	15.0	M6	100	FWH-100B	65	80
MD880-01S-0078-4-B	3 x 16	16	3 x 16	18.0	M6	100	FWH-100B	65	80
MD880-01S-0094-4-B	3 x 16	16	3 x 16	18.0	M6	125	FWH-125B	80	100
MD880-01S-0116-4-B	3 x 25	16	3 x 25	26.8	M8	150	FWH-150B	95	160
MD880-01S-0149-4-B	3 x 50	25	3 x 50	26.8	M8	200	FWH-200B	115	160
MD880-01S-0183-4-B	3 x 70	35	3 x 70	30.6	M12	250	FWH-250A	150	250
MD880-01S-0217-4	3 x 95	50	3 x 95	30.6	M12	275	FWH-275A	170	250

Model MD880-01S Series	Recommended Input IEC Cable Specifications (mm^2) [1]	Recommended IEC Ground Cable (mm^2)	Recommended Output IEC Cable (mm^2)	Terminal Width of the AC Drive (mm)	Screw	Recommended Fuse Bussmann Compliant with UL Certification		Recommended Contactor	Recommended Circuit Breaker
						Rated Current (A)	Model	Rated Current (A)	Rated Current (A)
MD880-01S-0262-4	3 x 120	70	3 x 120	30.6	M12	325	FWH-325A	205	400
MD880-01S-0314-4	3 x 150	70	3 x 150	*	M12	400	FWH-400A	245	400
MD880-01S-0383-4	3 x 185	95	3 x 185	*	M12	500	FWH-500A	300	400
MD880-01S-0441-4(-L)	2 x (3 x 95)	95	2 x (3 x 95)	*	M12	600	FWH-600A	410	500
MD880-01S-0481-4(-L)	2 x (3 x 120)	120	2 x (3 x 120)	*	M12	700	FWH-700A	410	630
MD880-01S-0538-4(-L)	2 x (3 x 120)	120	2 x (3 x 120)	*	M12	800	FWH-800A	475	630
MD880-01S-0605-4(-L)	2 x (3 x 150)	150	2 x (3 x 150)	*	M12	800	FWH-800A	620	700
MD880-01S-0673-4(-L)	2 x (3 x 185)	185	2 x (3 x 185)	*	M16	1000	170M5016	620	800
MD880-01S-0751-4(-L)	2 x (3 x 185)	185	2 x (3 x 185)	*	M16	1000	170M5016	620	800
MD880-01S-0849-4(-L)	2 x (3 x 240)	240	2 x (3 x 240)	*	M16	1250	170M6017	800	1000

NOTE

- Suitable for the Chinese standard. "3 x 10" indicates one three-conductor cable, and "2 x (3 x 95)" indicates two three-conductor cables.
- Use copper conductors of a proper size as main circuit cables according to the recommended values of power cable selection in *"3.5.3 Main Circuit Terminal Arrangement and Dimensions"*.

■ Selection of the earth leakage circuit breaker (ELCB)

1) The earth leakage current of the AC drive is greater than 3.5 mA, requiring grounding protection.

2) The AC drive generates DC leakage current in protective conductors. In this case, a time-delay B-type ELCB must be used.

When the ELCB malfunctions, you can:

– Use an ELCB of higher rated operating current or use a B-type ELCB.

– Reduce the carrier frequency of the AC drive.
– Shorten the length of motor drive cables.
– Take more leakage current suppression measures.

3) Recommended RCD manufacturers are CHINT and Schneider.

6.3 Selection of Braking Components

6.3.1 Selection of Resistance of Braking Resistor

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

$R = U \times U/Pb$

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

6.3.2 Selection of Power of Braking Resistor

In theory, the power of braking resistor is the same as the braking power. However, in consideration of derating K, the power of braking resistor is calculated using the following formula:

$K \times Pr = Pb \times D$

- K is set to 50% or an approximate value.
- Pr indicates the power of the braking resistor.
- D indicates the braking frequency (percentage of regenerative process to whole deceleration).

The following two formulas can be obtained:

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

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

The braking resistor power is calculated accordingly.

K is the derating coefficient of the braking resistor. A small value of K prevents the braking resistor from overheating. K can be increased properly if the heat dissipation condition is good, but must not exceed 50%; otherwise, the braking resistor may be overheated, which may cause a fire.

The braking frequency (D) is determined by applications. Typical values of braking frequency in different applications are listed in Table 6-3.

Table 6-3 Typical values of braking frequency in different applications

Application	Elevator	Winding and unwinding	Centrifuge	Occasional braking load	General application
Braking Frequency	20% to 30%	20% to 30%	50% to 60%	5%	10%

6.3.3 Selection of Braking Unit

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

AC Drive Model	Applicable Motor (kW)	Braking Unit		125% Braking Torque (10% ED; Max. 10s)		Remarks	Minimum Braking Resistance (Ω)
		Model	QTY	Braking Resistor Specifications	QTY		
MD880-01S-0012-4-B	3.7	Built-in		740 W 150 Ω	1	AC drive models ending with letter "B"	32
MD880-01S-0017-4-B	5.5			1100 W 100 Ω	1		32
MD880-01S-0024-4-B	7.5			1500 W 75 Ω	1		32
MD880-01S-0033-4-B	11			2200 W 50 Ω	1		20
MD880-01S-0038-4-B	15			3000 W 38 Ω	1		20
MD880-01S-0048-4-B	18.5			4000 W 32 Ω	1		24
MD880-01S-0060-4-B	22			4500 W 27 Ω	1		24
MD880-01S-0078-4-B	30			6000 W 20 Ω	1		19.2
MD880-01S-0094-4-B	37			7000 W 16 Ω	1		14.8
MD880-01S-0116-4-B	45			9000 W 13 Ω	1		12.8
MD880-01S-0149-4-B	55			11000 W 10.5 Ω	1		9.6
MD880-01S-0183-4-B	75			15000 W 7.7 Ω	1		6.8
MD880-01S-0217-4	90	MDBUN-60-T	2	9000 W 10.0 Ω	2	Input voltage ⩽ 440 V AC	9.3 × 2
	90	MDBUN-60-5T	2	9000 W 12.8 Ω	2	Input voltage > 440 VAC	10.5 × 2

AC Drive Model	Applicable Motor (kW)	Braking Unit		125% Braking Torque (10% ED; Max. 10s)		Remarks	Minimum Braking Resistance (Ω)
		Model	QTY	Braking Resistor Specifications	QTY		
MD880-01S-0262-4	110	MDBUN-60-T	2	11000 W 9.4 Ω	2	Input voltage ⩽ 440 V AC	9.3 × 2
	110	MDBUN-60-5T	2	11000 W 10.5 Ω	2	Input voltage > 440 V AC	10.5 × 2
MD880-01S-0314-4	132	MDBUN-90-T	2	13000 W 6.8 Ω	2	Input voltage ⩽ 440 V AC	6.2 × 2
	132	MDBUN-90-5T	2	13000 W 8.8 Ω	2	Input voltage > 440 V AC	7.0 × 2
MD880-01S-0383-4	160	MDBUN-90-T	2	16000 W 6.3 Ω	2	Input voltage ⩽ 440 V AC	6.2 × 2
	160	MDBUN-90-5T	2	16000 W 7.2 Ω	2	Input voltage > 440 V AC	7.0 × 2
MD880-01S-0441-4-(L)	200	MDBU-200-B	2	19000 W 4.5 Ω	2	Input voltage ⩽ 440 V AC	2.5 × 2
	200	MDBU-200-C	2	19000 W 5.8 Ω	2	Input voltage > 440 V AC	3.0 × 2
MD880-01S-0481-4-(L)	220	MDBU-200-B	2	21000 W 4.1 Ω	2	Input voltage ⩽ 440 V AC	2.5 × 2
	220	MDBU-200-C	2	21000 W 5.3 Ω	2	Input voltage > 440 V AC	3.0 × 2
MD880-01S-0538-4-(L)	250	MDBU-200-B	2	24000 W 3.6 Ω	2	Input voltage ⩽ 440 V AC	2.5 × 2
	250	MDBU-200-C	2	24000 W 4.6 Ω	2	Input voltage > 440 V AC	3.0 × 2
MD880-01S-0605-4-(L)	280	MDBU-200-B	2	27000 W 3.2 Ω	2	Input voltage ⩽ 440 V AC	2.5 × 2
	280	MDBU-200-C	2	27000W 4.1 Ω	2	Input voltage > 440 V AC	3.0 × 2
MD880-01S-0673-4-(L)	315	MDBU-200-B	3	20000 W 4.3 Ω	3	Input voltage ⩽ 440 V AC	2.5 × 3
	315	MDBU-200-C	3	20000 W 5.5 Ω	3	Input voltage > 440 V AC	3.0 × 3
MD880-01S-0751-4-(L)	355	MDBU-200-B	3	23000 W 3.8 Ω	3	Input voltage ⩽ 440 V AC	2.5 × 3
	355	MDBU-200-C	3	23000 W 4.9 Ω	3	Input voltage > 440 V AC	3.0 × 3

AC Drive Model	Applicable Motor (kW)	Braking Unit		125% Braking Torque (10% ED; Max. 10s)		Remarks	Minimum Braking Resistance (Ω)
		Model	QTY	Braking Resistor Specifications	QTY		
MD880-01S-0849-4-(L)	400	MDBU-200-B	3	26000 W 3.4 Ω	3	Input voltage ⩽ 440 V AC	2.5 × 3
	400	MDBU-200-C	3	26000W 4.3 Ω	3	Input voltage > 440 V AC	3.0 × 3

NOTE

- The minimum braking resistance in the preceding table supports the operating condition with ED of 10% and the longest time for single braking of 10s.
- The default initial braking voltage for built-in braking units is 700 V. For external braking units MDBUN-60-T, MDBUN-90-T, and MDBU-200-B, the default initial braking voltage is 670 V when the input voltage is lower than or equal to 440 VAC. For external braking units MDBUN-60-5T, MDBUN-90-5T, and MDBU-200-C, the default initial braking voltage is 760 V when the input voltage is higher than 440 VAC. The resistance of the braking resistor can be adjusted with the initial braking voltage.
- The data in the preceding table is for reference only. 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, but the power can exceed the recommended value. Selection of the braking resistor model is determined by the generation power of motors and is also related to the system inertia, deceleration time, and potential energy load. For systems with high inertia, and/or short deceleration time, and/or frequent braking, select a braking resistor with higher power and lower resistance.

6.3.4 Overall Dimensions and Mounting Dimensions of Braking Unit

■ Overall dimensions of the MDBUN series braking unit (unit: mm)

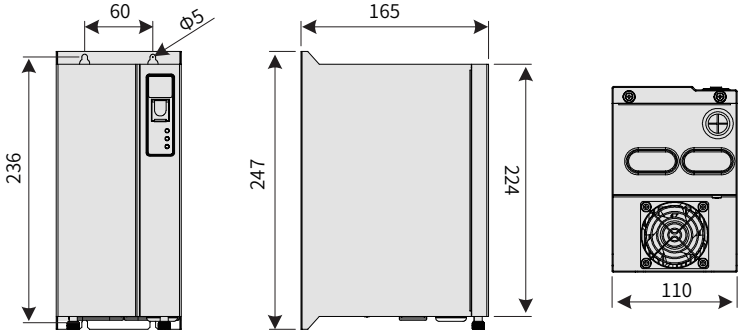


Figure 6-1 Overall dimensions of the MDBUN series braking unit (unit: mm)

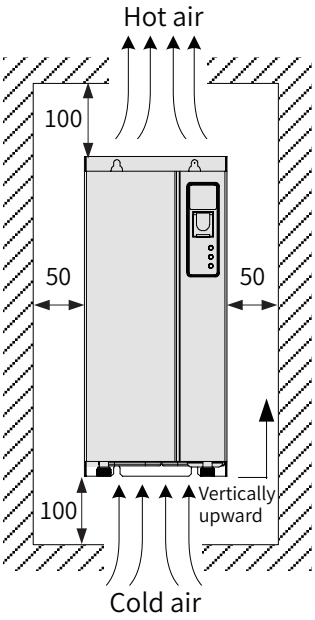


Figure 6-2 Mounting dimensions of the MDBUN series braking unit (unit: mm)

NOTE

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

■ Overall dimensions of the MDBU series braking unit (MDBU-200-X) (unit: mm)

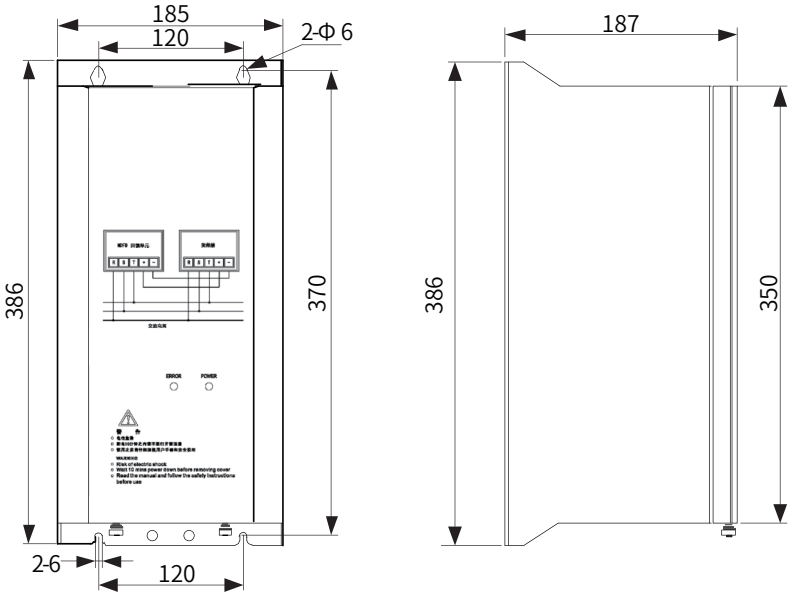


Figure 6-3 Overall dimensions of the MDBU series braking unit (MDBU-200-X) (unit: mm)

NOTE

For details about how to install and use the MDBU series braking unit, see the MDBU Series Braking Unit User Guide.

6.4 Selection of Applicable Motor

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

The cooling fan and rotor shaft of non-variable-frequency motor are coaxial, which results in reduced cooling effect when the rotational speed declines. If variable speed is required, add a more powerful fan or replace it with variable-frequency motor in applications where the motor overheats easily.

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

For details about the recommended motor models, see *"6.3.3 Selection of Braking Unit"*.

6.5 Selection of the AC Input Reactor

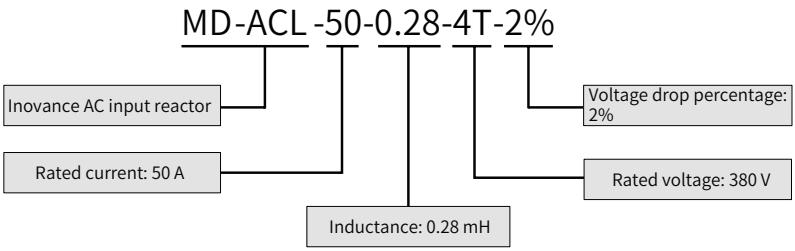
An AC input reactor is connected to suppress harmonic current on the input side. Install an AC reactor when the application has higher requirements on harmonic suppression. For models above 200 kW, ensure that the cabinet has sufficient space for installing the reactor. The following table lists the recommended manufacturers and models of AC input reactors.

1) Recommended AC input reactor 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	MD-ACL-15-3-4T
MD880-01S-0017-4-B	MD-ACL-15-3-4T
MD880-01S-0024-4-B	MD-ACL-40-1.45-4T
MD880-01S-0033-4-B	MD-ACL-40-1.45-4T
MD880-01S-0038-4-B	MD-ACL-50-1.2-4T
MD880-01S-0048-4-B	MD-ACL-50-0.28-4T-2%
MD880-01S-0060-4-B	MD-ACL-60-0.24-4T-2%
MD880-01S-0078-4-B	MD-ACL-80-0.17-4T-2%
MD880-01S-0094-4-B	MD-ACL-90-0.16-4T-2%
MD880-01S-0116-4-B	MD-ACL-120-0.12-4T-2%
MD880-01S-0149-4-B	MD-ACL-150-0.095-4T-2%
MD880-01S-0183-4-B	MD-ACL-200-0.07-4T-2%
MD880-01S-0217-4	MD-ACL-250-0.056-4T-2%
MD880-01S-0262-4	MD-ACL-250-0.056-4T-2%
MD880-01S-0314-4	MD-ACL-330-0.042-4T-2%
MD880-01S-0383-4	MD-ACL-330-0.042-4T-2%
MD880-01S-0441-4(-L)	MD-ACL-490-0.028-4T-2%
MD880-01S-0481-4(-L)	MD-ACL-490-0.028-4T-2%
MD880-01S-0538-4 (-L)	MD-ACL-490-0.028-4T-2%
MD880-01S-0605-4(-L)	MD-ACL-660-0.021-4T-2%
MD880-01S-0673-4(-L)	MD-ACL-660-0.021-4T-2%
MD880-01S-0751-4(-L)	MD-ACL-800-0.017-4T-2%
MD880-01S-0849-4(-L)	MD-ACL-800-0.017-4T-2%

■ Model description



2) Overall dimensions of the AC input reactor

■ Dimensions of 10/15 A AC input reactor

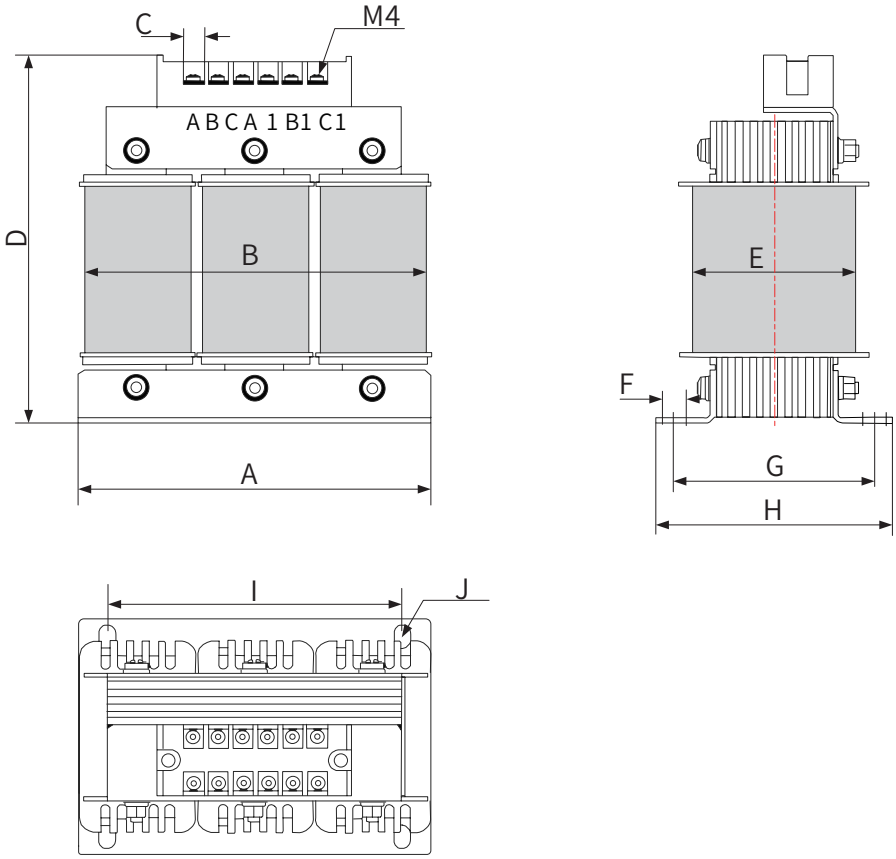


Figure 6-4 Dimensions of 10/15 A AC input reactor

Table 6-6 Dimensions of 10/15 A AC input reactor (unit: mm)

Rated Current (A)	A	B	C	D	E	F	G	H	I	J
10	150±2	155	8	160	80	10	85±2	100±2	125±1	Φ7*10
15	150±2	155	8	160	80	10	85±2	100±2	125±1	Φ7*10

■ Dimensions of 40/50 A (1.2 mH) AC input reactor

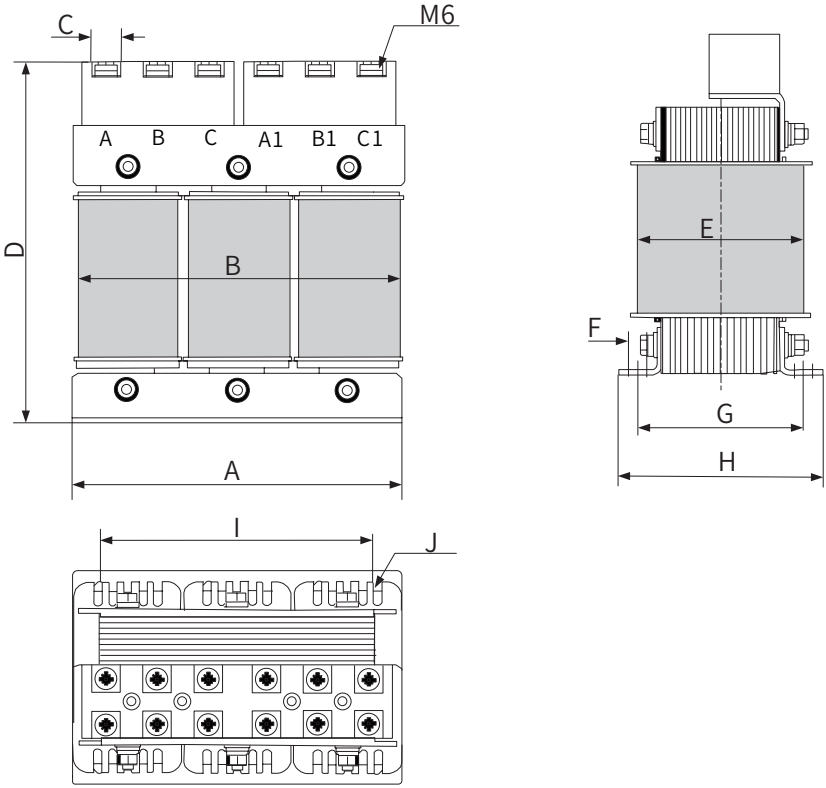


Figure 6-5 Dimensions of 40/50 A (1.2 mH) AC input reactor

Table 6-7 Dimensions of 40/50 A (1.2 mH) AC input reactor (unit: mm)

Rated Current (A)	A	B	C	D	E	F	G	H	I	J
40	180±2	185	16	200	105	10	95±2	117±2	150±1	Φ7*10
50	200±2	210	16	230	110	10	115±2	130±2	170±1	Φ7*10

■ Dimensions of 50 A (0.28 mH) and 60 A AC input reactor

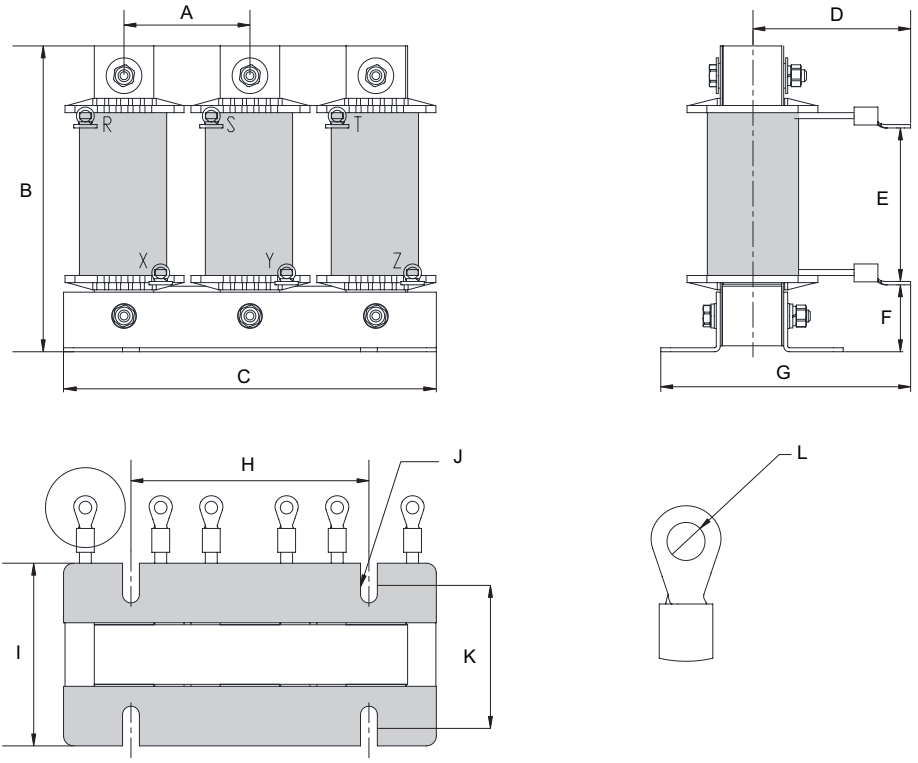


Figure 6-6 Dimensions of 50 A (0.28 mH) and 60 A AC input reactor

Table 6-8 Dimensions of 50 A (0.28 mH) and 60 A AC input reactor (unit: mm)

Rated Current (A)	A	B	C	D	E	F	G	H	I	J	K	L
50	64	160	195	80±10	75±5	35±5	135	120±1	92±2	Φ8.5*20	72±2	Φ6.4
60	64	160	195	80±10	75±5	35±5	135	120±1	92±2	Φ8.5*20	72±2	Φ6.4

■ Dimensions of 90/120 A AC input reactor

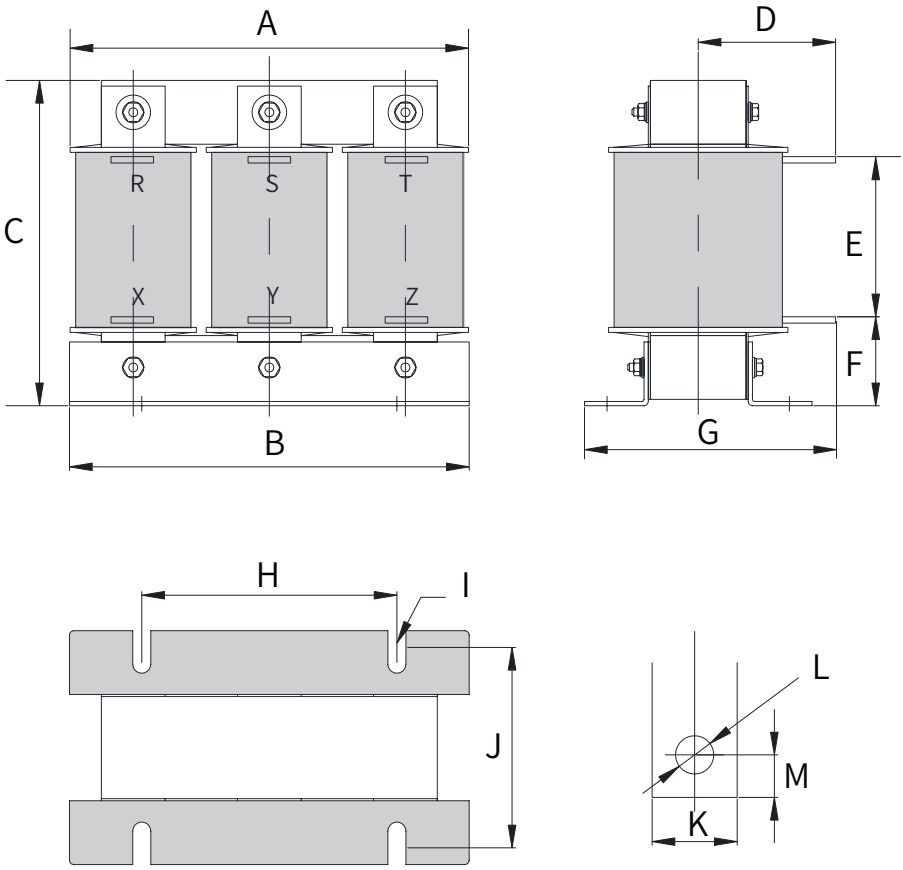


Figure 6-7 Dimensions of 90/120 A AC input reactor

Table 6-9 Dimensions of 90/120 A AC input reactor (unit: mm)

Rated Current (A)	A	B	C	D	E	F	G	H	I	J	K	L	M
90	195	188±1	160	-	-	-	150	120±1	Φ8.5*20	72±2	-	-	-
120	195	188±1	160	78±10	79±5	40±5	135	120±1	Φ8.5*20	92±2	20	Φ9	10

■ Dimensions of 150–330 A AC input reactor

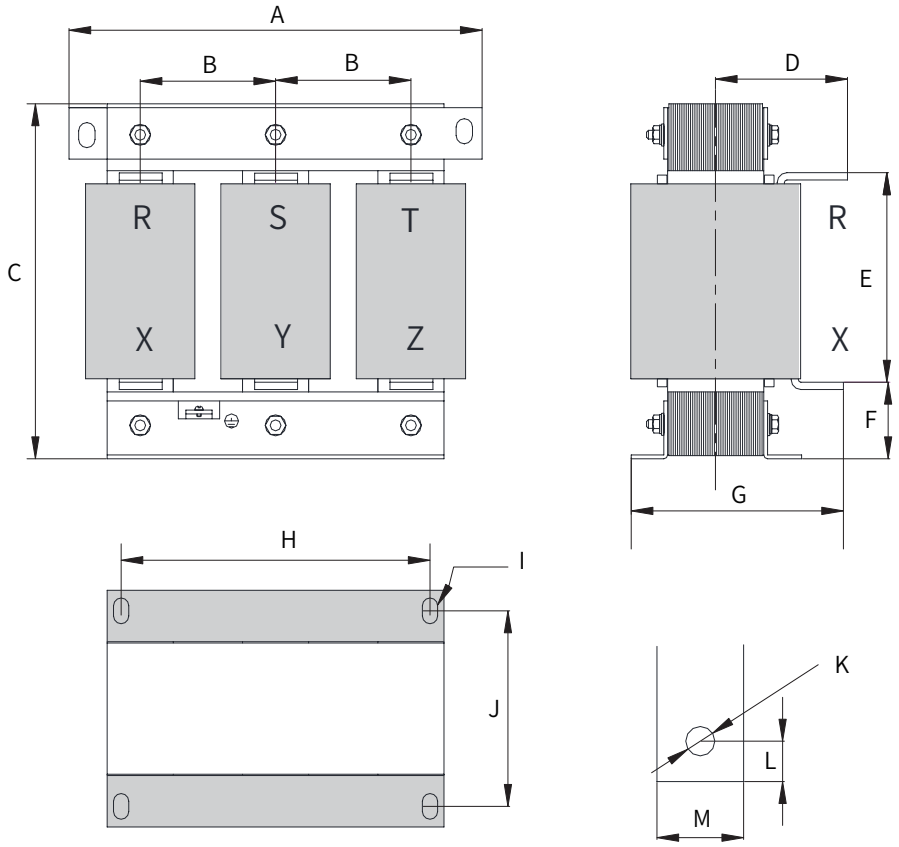


Figure 6-8 Dimensions of 150–330 A AC input reactor

Table 6-10 Dimensions of 150–330 A AC input reactor (unit: mm)

Rated Current (A)	A	B	C	D	E	F	G	H	I	J	K	L	M
150	250	81±5	230	92±10	145±5	38±5	155	182±1	Φ11*18	76±2	Φ11	13	25
200	250	81±5	230	102±10	145±5	40±5	175	182±1	Φ11*18	96±2	Φ11	13	25
250	250	81±5	260	102±10	160±5	50±5	175	182±1	Φ11*18	96±2	Φ11	13	25
330	290	95±5	275	107±10	160±5	60±5	180	214±1	Φ11*18	100±2	φ12	15	30

■ Dimensions of 490/660 A AC input reactor

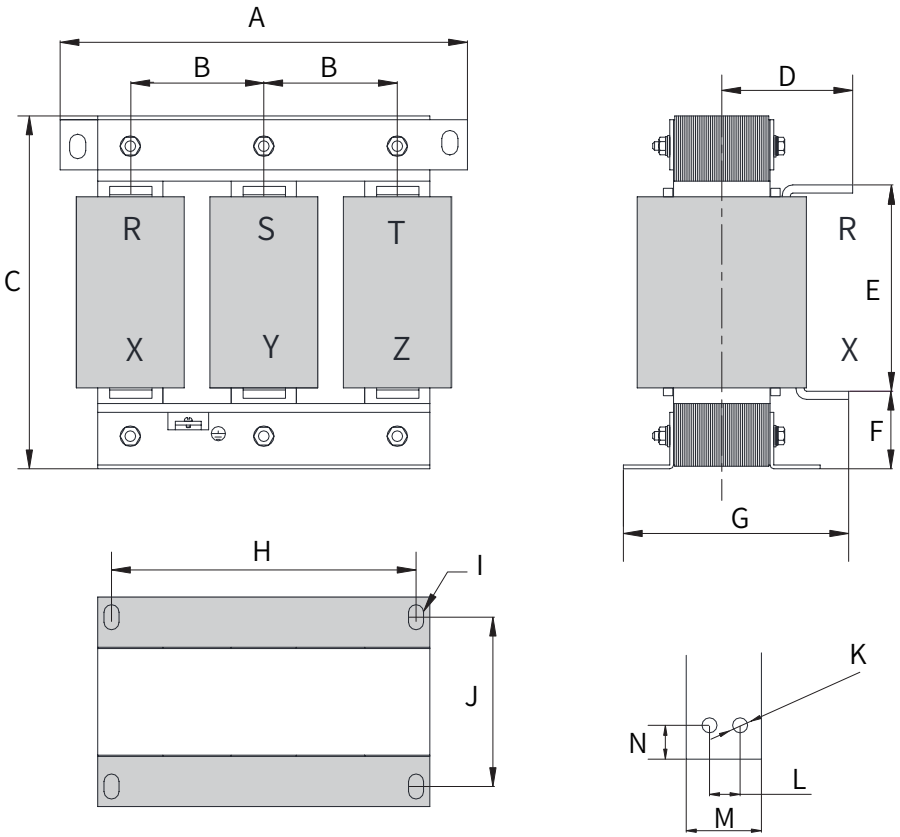


Figure 6-9 Dimensions of 490/660 A AC input reactor

Table 6-11 Dimensions of 490/660 A AC input reactor (unit: mm)

Rated Current (A)	A	B	C	D	E	F	G	H	I	J	K	L	M	N
490	320	106±5	305	137±10	198±5	60±5	220	243±1	Φ12*20	122±2	ϕ12	22	50	23
660	320	106±5	305	145±10	203±5	50±5	240	243±1	Φ12*20	137±2	ϕ12	22	50	23

■ Dimensions of 800/1000 A AC input reactor

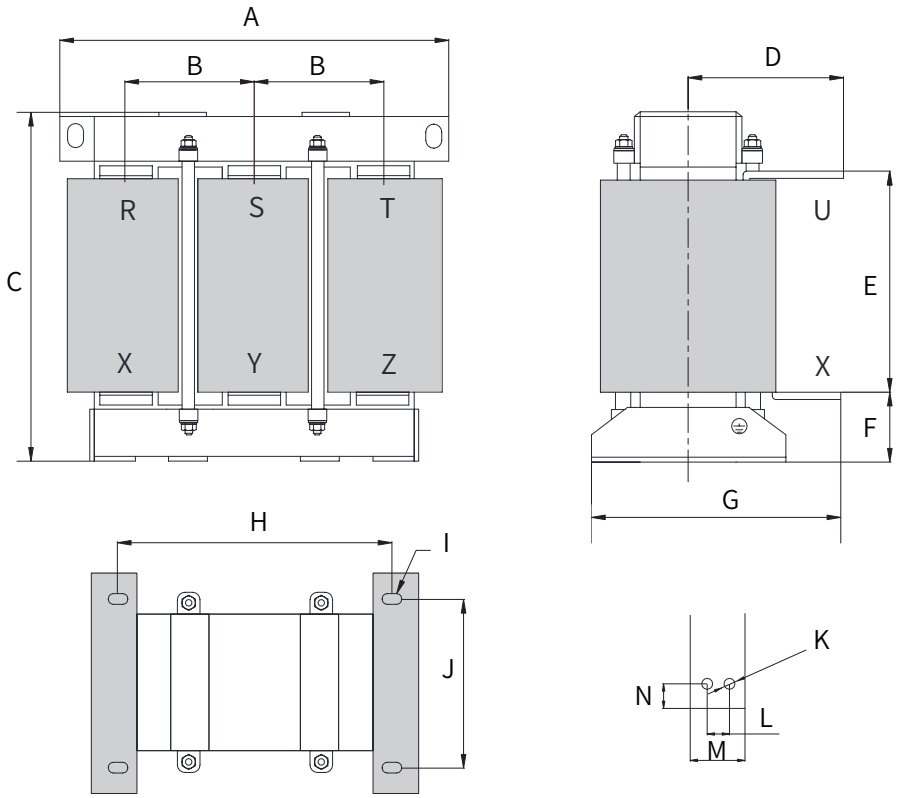


Figure 6-10 Dimensions of 800/1000 A AC input reactor

Table 6-12 Dimensions of 800/1000 A AC input reactor (unit: mm)

Rated Current (A)	A	B	C	D	E	F	G	H	I	J	K	L	M	N
800	385	123±5	390	142±10	238±5	70±5	250	260±2	Φ12*20	175±1	ϕ12	22	50	23
1000	385	123±5	390	142±10	238±5	70±5	250	260±2	Φ12*20	175±1	ϕ12	22	50	23

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 61800-3 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 *"6.2 Selection of Cables, Circuit Breakers, and Contactors"*.

NOTE

- The cable between the filter and the AC drive must be as short as possible (within 30 cm). The filter and AC drive must be connected to the same ground reference plane, and the filter must be reliably connected to ground. Otherwise, desired filtering effect will not be achieved.
- For MD880-01S-0314-4 to MD880-01S-0751-4(-L), external filters are not required. Their standard built-in EMC filters meet EN 61800-3 C3 emission requirement of CE certification.

1) Appearance

Schaffner FN3258 series filter

Schaffner FN3359 series filter

Changzhou Jianli series filter

Figure 6-11 Appearance of standard EMC filters

2) Recommended EMC filter models

Schaffner and Jianli filters are recommended, as listed in the following table.

Table 6-13 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 (Changzhou Jianli)
MD880-01S-0012-4-B	FN 3258-16-33	DL-16EBK5
MD880-01S-0017-4-B	FN 3258-30-33	DL-25EBK5
MD880-01S-0024-4-B	FN 3258-30-33	DL-25EBK5
MD880-01S-0033-4-B	FN 3258-42-33	DL-35EBK5
MD880-01S-0038-4-B	FN 3258-42-33	DL-50EBK5
MD880-01S-0048-4-B	FN 3258-55-34	DL-50EBK5
MD880-01S-0060-4-B	FN 3258-75-34	DL-65EBK5
MD880-01S-0078-4-B	FN 3258-75-34	DL-65EBK5
MD880-01S-0094-4-B	FN 3258-100-35	DL-80EBK5
MD880-01S-0116-4-B	FN 3258-100-35	DL-100EBK5
MD880-01S-0149-4-B	FN 3258-130-35	DL-130EBK5
MD880-01S-0183-4-B	FN 3258-180-40	DL-160EBK5
MD880-01S-0217-4	FN 3258-180-40	DL-200EBK5
MD880-01S-0262-4	FN 3359-250-28	DL-250EBK5
MD880-01S-0314-4	FN 3359-250-28	DL-300EBK3
MD880-01S-0383-4	FN 3359-320-99	DL-400EBK3
MD880-01S-0441-4(-L)	FN 3359-400-99	DL-400EBK3
MD880-01S-0481-4(-L)	FN 3359-600-99	DL-600EBK3
MD880-01S-0538-4(-L)	FN 3359-600-99	DL-600EBK3

AC Drive Model	AC Input Filter Model (Schaffner)	AC Input Filter Model (Changzhou Jianli)
MD880-01S-0605-4(-L)	FN 3359-600-99	DL-600EBK3
MD880-01S-0673-4(-L)	FN 3359-600-99	DL-600EBK3
MD880-01S-0751-4(-L)	FN 3359-800-99	DL-700EBK3
MD880-01S-0849-4(-L)	FN 3359-800-99	DL-800EBK3

3) Mounting dimensions

■ Dimensions of Schaffner FN 3258 series 50–180 A filter

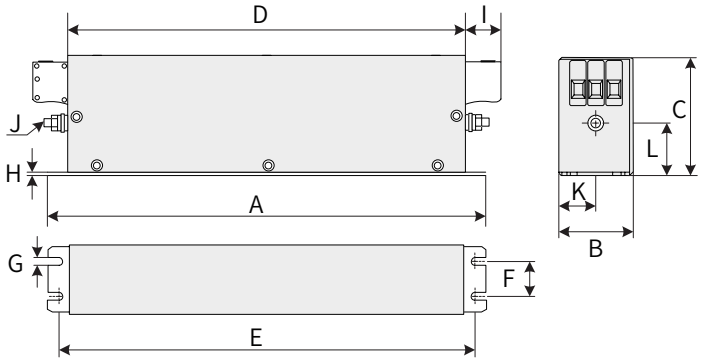


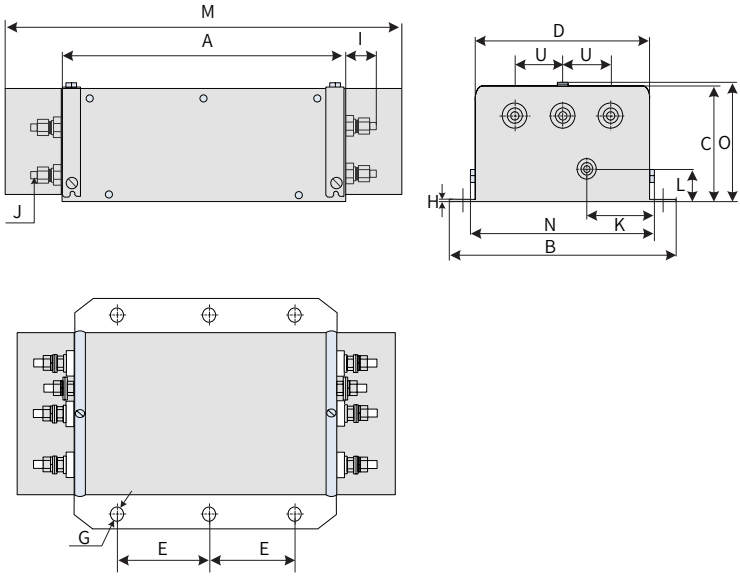
Figure 6-12 Dimensions of Schaffner FN 3258 series 50–180 A filter (unit: mm)

Table 6-14 Dimensions of Schaffner FN 3258 series 50–180 A filter (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 Schaffner FN 3359 series 150–2500 A filter

150–250 A



320–2500 A

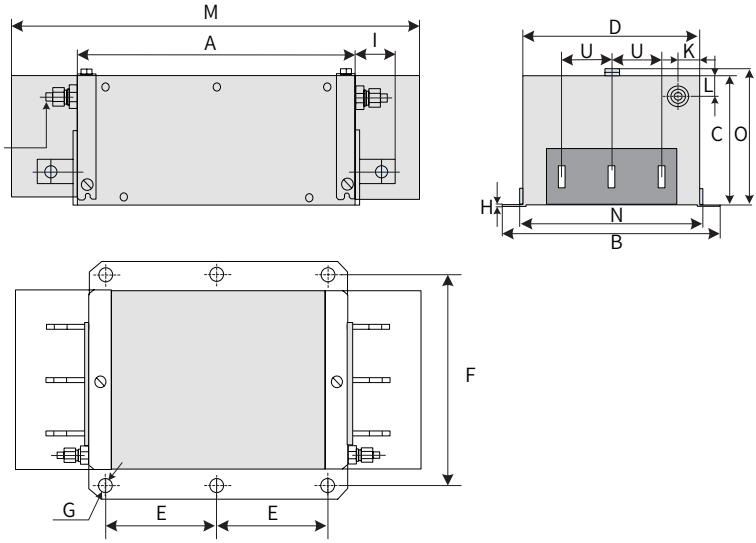


Figure 6-13 Dimensions of Schaffner FN 3359 series 150–2500 A filter (unit: mm)

■ Dimensions of copper busbar

320~1000A

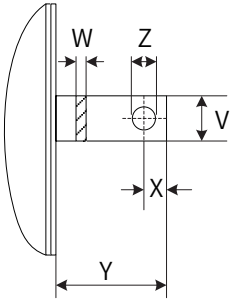


Figure 6-14 Dimensions of copper busbar

Table 6-15 Dimensions of Schaffner FN 3359 series 150–2500 A filter

Symbol	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

Symbol	150 A	180 A	250 A	320 A	400 A	600 A	800 A	1000 A	1600 A	2500 A
Y	-	-	-	40	40	40	50	50	90	95
Z	-	-	-	Φ10.5	Φ10.5	Φ10.5	Φ14	Φ14	Φ14	Φ14

■ Dimensions of Jianli series 50–200 A filter

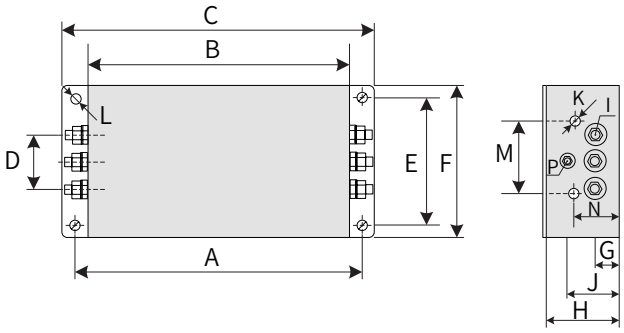


Figure 6-15 Dimensions of Jianli series 50–200 A filter (unit: mm)

Table 6-16 Dimensions of Jianli series 50–200 A filter (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 × 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 × 9.4
DL-100EBK5															
DL-130EBK5															
DL-160EBK5															
DL-200EBK5															

■ Dimensions of Jianli series 250–800 A filter

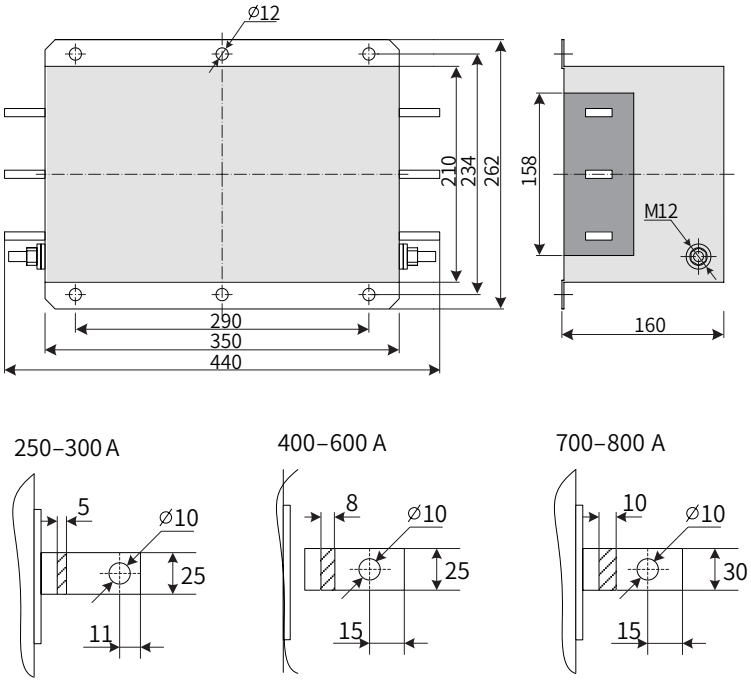


Figure 6-16 Dimensions of Jianli series 250–800 A filter (unit: mm)

■ Dimensions of Jianli series 1000 A filter

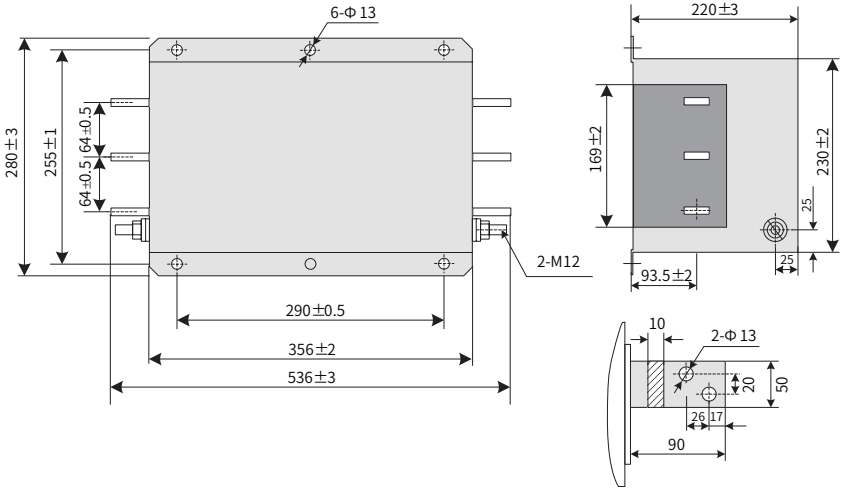


Figure 6-17 Dimensions of Jianli series 1000 A filter (unit: mm)

6.6.2 Simple EMC Input Filter

A simple EMC input filter is installed to prevent the surrounding interference and prevent the interference from the AC drive during running.

Connect the simple EMC filter to ground reliably and ensure that the length of the cable connecting the AC drive and the filter is less than 30 cm.

Table 6-17 Recommended models of simple EMC input filters (three-phase 380–480 V)

AC Drive Model	Simple EMC AC Input Filter Model
MD880-01S-0012-4-B	DL-35EB1/10
MD880-01S-0017-4-B	DL-35EB1/10
MD880-01S-0024-4-B	DL-35EB1/10
MD880-01S-0033-4-B	DL-35EB1/10
MD880-01S-0038-4-B	DL65EB1/10
MD880-01S-0048-4-B	DL65EB1/10
MD880-01S-0060-4-B	DL65EB1/10
MD880-01S-0078-4-B	DL65EB1/10
MD880-01S-0094-4-B	DL-120EB1/10
MD880-01S-0116-4-B	DL-120EB1/10
MD880-01S-0149-4-B	DL-180EB1/10
MD880-01S-0183-4-B	DL-180EB1/10

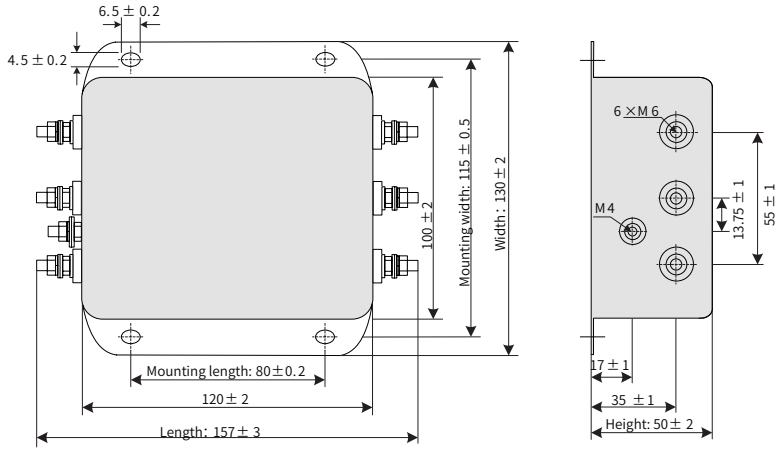


Figure 6-18 Mounting dimensions of the simple EMC filter (unit: mm)

Table 6-18 Overall and mounting dimensions of the simple EMC filter

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

6.6.3 Safety Capacitor and Magnetic Ring

1) Safety capacitor

For certain applications, a safety capacitor can be connected in parallel and a magnetic loop can be added to filter partial interference generated by the AC drive during running.

The grounding terminal of the safety capacitor must be connected to the grounding terminal of the AC drive. The grounding cable must be no longer than 30 cm.

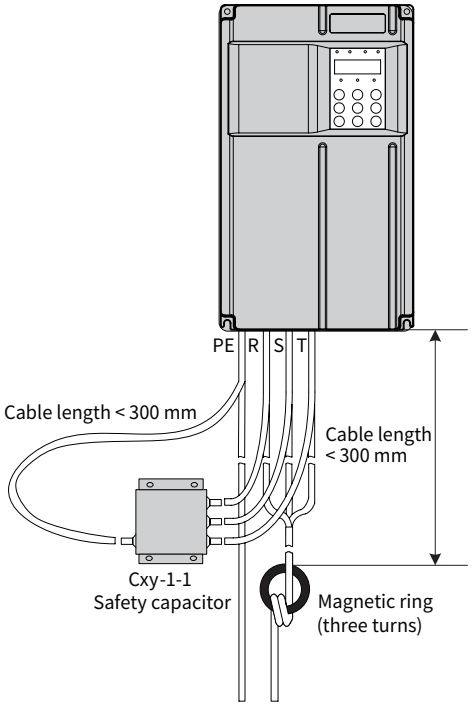


Figure 6-19 Installing the safety capacitor and magnetic ring for the MD880 series AC drive

■ Overall dimensions of the safety capacitor

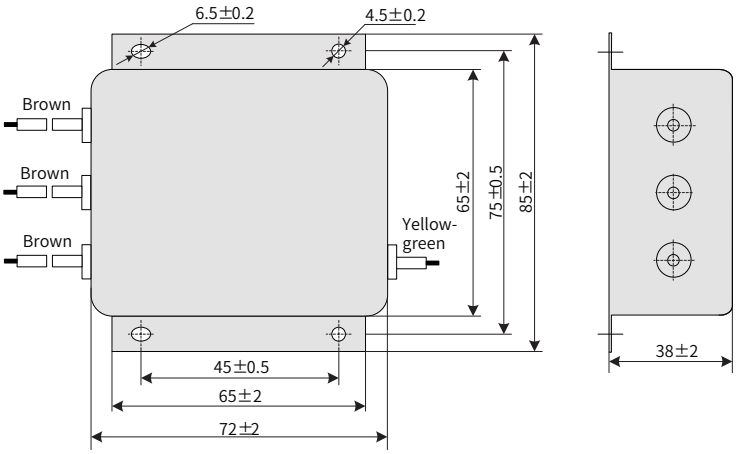


Figure 6-20 Dimensions of the safety capacitor

Table 6-19 Model and dimensions of the safety capacitor

Model	Code	Dimensions (Length × Width × Height, in mm)	Mounting Dimensions (Length x Width) (unit: mm)
Cxy-1-1	11025018	85 x 72 x 38	45 × 75

2) Magnetic ring

For certain applications, a magnetic loop can be wound around input terminals R, S, and T (without PE cable) to filter partial interference generated by the AC drive during running.

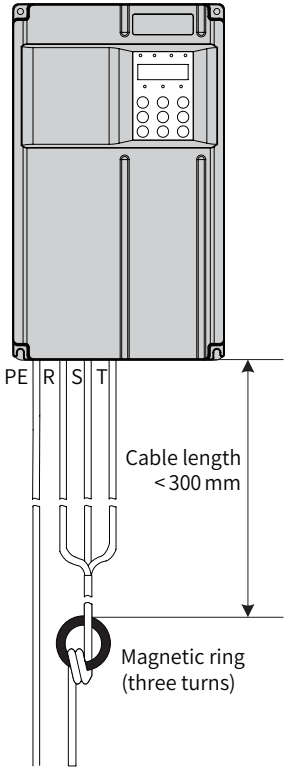


Figure 6-21 Installing the magnetic loop

Figure 6-22 Appearance of the magnetic ring

Table 6-20 Selection of the magnetic ring

Magnetic Ring 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 × 70 × 30

6.7 Selection of the AC Output Reactor

Whether to install an AC output reactor on the output side is dependent on actual situations. The cable connecting the AC drive and motor cannot be too long. Otherwise, capacitance enlarges and thus high-harmonics current may be easily generated.

To avoid these problems, install an AC output reactor close to the AC drive if the cable length is greater than or equal to the values listed in the following table.

Table 6-21 Cable length limit with the output reactor configured (three phase 380–480 V)

AC Drive Power (kW)	Rated Voltage (V)	Minimum Cable Length with Output Reactor Configured (m)
0.4–4	200–500	50
5.5	200–500	70
7.5	200–500	100
11	200–500	110
15	200–500	125
18.5	200–500	135
22	200–500	150
⩾ 30	280–690	150

Table 6-22 Cable length limit with the output reactor configured (three phase 200–240 V)

AC Drive Power (kW)	Rated Voltage (V)	Minimum Cable Length with Output Reactor Configured (m)
0.4–3	200–500	50
3.7	200–500	70
5.5	200–500	110
7.5	200–500	125
⩾ 11	200–500	150

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

Table 6-23 Recommended models of the AC output reactor (three phase 380–480 V)

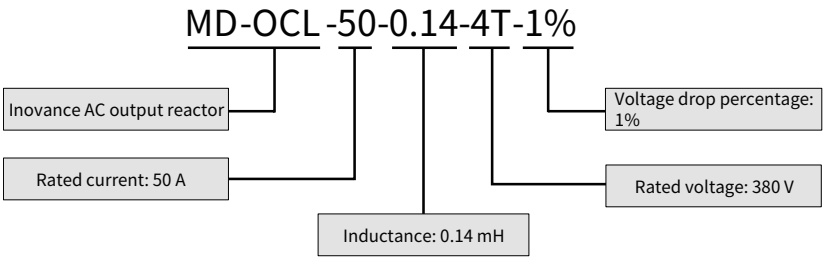
AC Drive Model	AC Output Reactor Model (Inovance)
MD880-01S-0012-4-B	MD-OCL-10-0.7-4T-1%
MD880-01S-0017-4-B	MD-OCL-15-0.47-4T-1%
MD880-01S-0024-4-B	MD-OCL-20-0.35-4T-1%
MD880-01S-0033-4-B	MD-OCL-30-0.23-4T-1%
MD880-01S-0038-4-B	MD-OCL-40-0.18-4T-1%
MD880-01S-0048-4-B	MD-OCL-50-0.14-4T-1%
MD880-01S-0060-4-B	MD-OCL-60-0.12-4T-1%
MD880-01S-0078-4-B	MD-OCL-80-0.087-4T-1%

AC Drive Model	AC Output Reactor Model (Inovance)
MD880-01S-0094-4-B	MD-OCL-90-0.078-4T-1%
MD880-01S-0116-4-B	MD-OCL-120-0.058-4T-1%
MD880-01S-0149-4-B	MD-OCL-150-0.047-4T-1%
MD880-01S-0183-4-B	MD-OCL-200-0.035-4T-1%
MD880-01S-0217-4	MD-OCL-250-0.028-4T-1%
MD880-01S-0262-4	MD-OCL-250-0.028-4T-1%
MD880-01S-0314-4	MD-OCL-330-0.021-4T-1%
MD880-01S-0383-4	MD-OCL-330-0.021-4T-1%

NOTE

◆ Directly order MD880-01S-0441-4(-L) to MD880-01S-0849-4(-L) when AC output reactors are needed for MD880-01S-0441-4 to MD880-01S-0849-4.

2) Model description of the AC output reactor:



3) Dimensions of the AC output reactor

■ Dimensions of 5–10 A AC output reactor

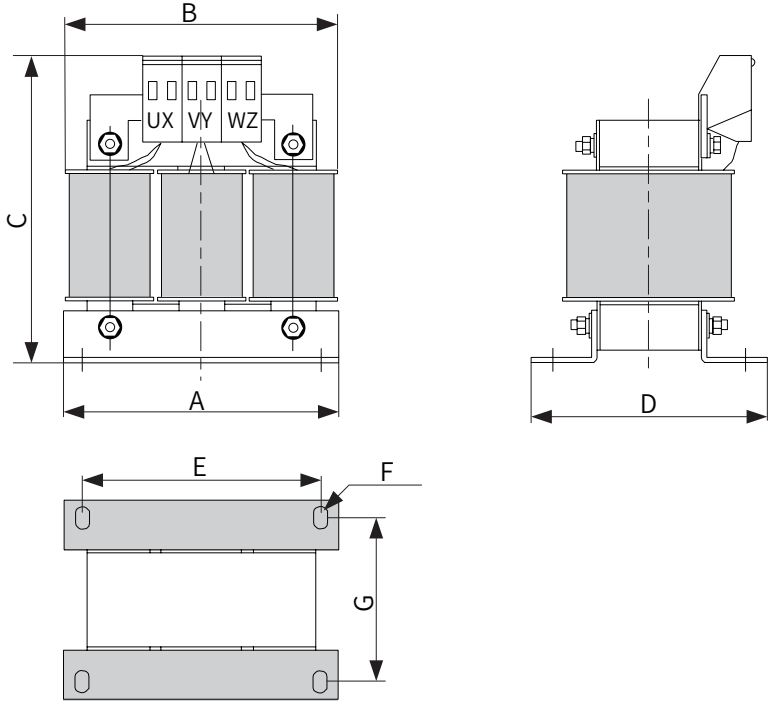


Figure 6-23 Dimensions of 5–10 A AC output reactor

Table 6-24 Dimensions of 5–10 A AC input reactor (unit: mm)

Rated Current (A)	A	B	C	D	E	F	G
5	105±1	110	130	84±2	91±1	Φ6*11	65±2
7	105±1	110	130	84±2	91±1	Φ6*11	65±2
10	105±1	110	130	84±2	91±1	Φ6*11	65±2

■ Dimensions of 15 A AC output reactor

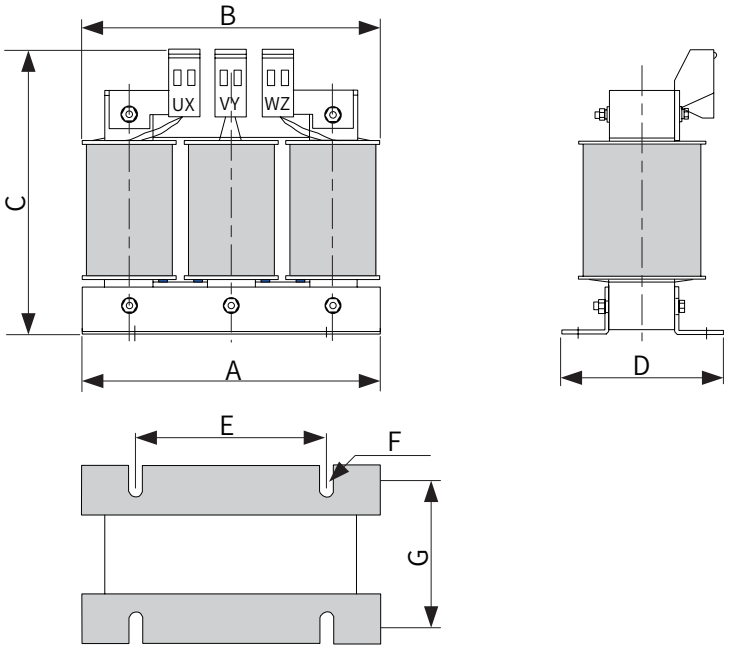


Figure 6-24 Dimensions of 15 A AC output reactor

Table 9-25 Dimensions of 15 A AC output reactor (unit: mm)

Rated Current (A)	A	B	C	D	E	F	G
15	148±1	155	140	76±2	95±1	Φ6*15	61±2

■ Dimensions of 20 A AC output reactor

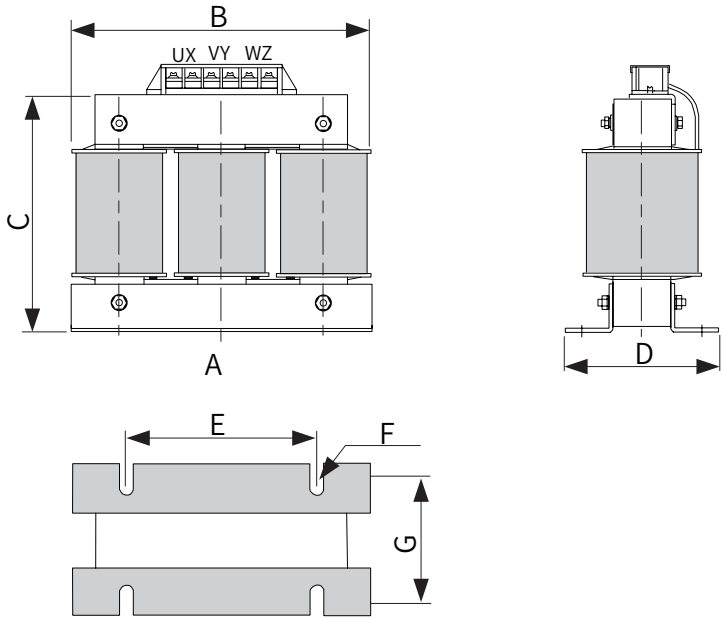


Figure 6-26 Dimensions of 20 A AC output reactor

Table 6-25 Dimensions of 20 A AC output reactor (unit: mm)

Rated Current (A)	A	B	C	D	E	F	G
20	148±1	155	165	76±2	95±1	Φ6*15	61±2

■ Dimensions of 30–60 A AC output reactor

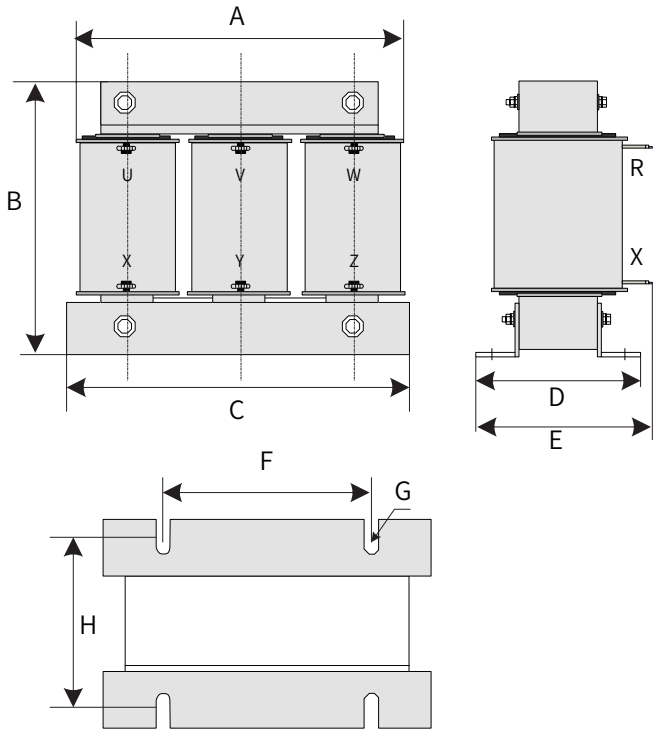


Figure 6-27 Dimensions of 30–60 A AC output reactor

Table 6-26 Dimensions of 30–60 A AC output reactor (unit: mm)

Rated Current (A)	A	B	C	D	E	F	G	H
30	155	130	148±1	95±2	135	95±1	Φ6*15	80±2
40	155	130	148±1	95±2	135	95±1	Φ6*15	80±2
50	155	130	148±1	95±2	135	95±1	Φ6*15	80±2
60	195	165	188±1	92±2	130	120±1	Φ8.5*20	72±2

■ Dimensions of 80–120 A AC output reactor

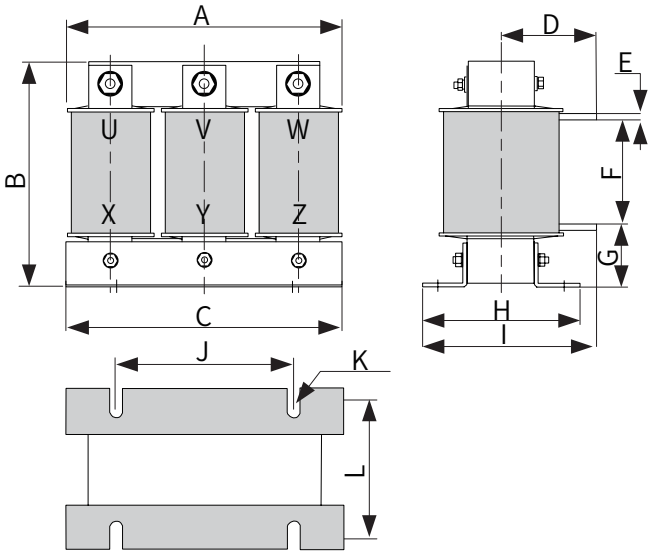


Figure 6-28 Dimensions of 80–120 A AC output reactor

Table 6-27 Dimensions of 80–120 A AC output reactor (unit: mm)

Rated Current (A)	A	B	C	D	E	F	G	H	I	J	K	L
80	195	165	188±1	68±10	4	75±5	40±5	92±2	130	120±1	Φ8.5*20	72±2
90	195	165	188±1	68±10	4	75±5	40±5	92±2	130	120±1	Φ8.5*20	72±2
120	195	165	188±1	78±10	4	75±5	40±5	112±2	135	120±1	Φ8.5*20	72±2

■ Dimensions of 150–250 A AC output reactor

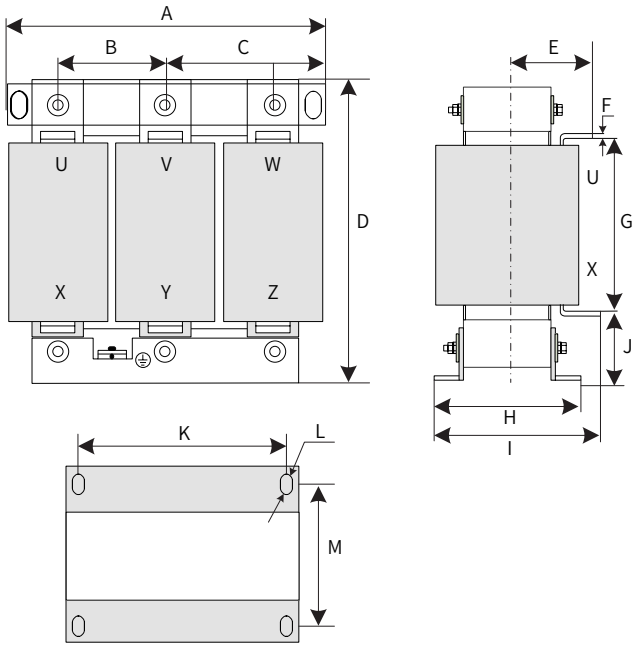


Figure 6-29 Dimensions of 150–250 A AC output reactor

Table 6-28 Dimensions of 150–250 A AC output reactor (unit: mm)

Rated Current (A)	A	B	C	D	E	F	G	H	I	J	K	L	M
150	250	81±5	81±5	230	97±10	5	140±5	113±2	170	42±5	182±1	Φ11*18	87±2
200	250	81±5	81±5	230	102±10	5	140±5	123±2	175	42±5	182±1	Φ11*18	97±2
250	250	81±5	81±5	230	102±10	5	140±5	123±2	175	42±5	182±1	Φ11*18	97±2

■ Dimensions of 330 A AC output reactor

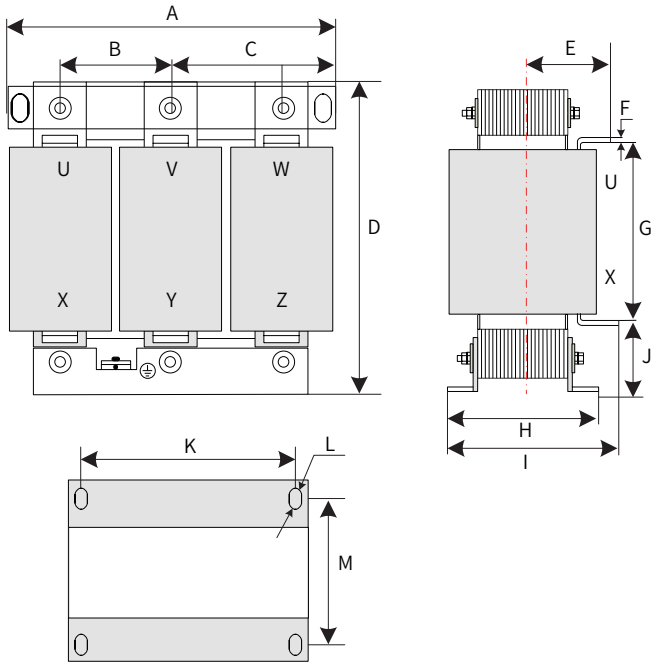


Figure 6-30 Dimensions of 330 A AC output reactor

Table 6-29 Dimensions of 330 A AC output reactor (unit: mm)

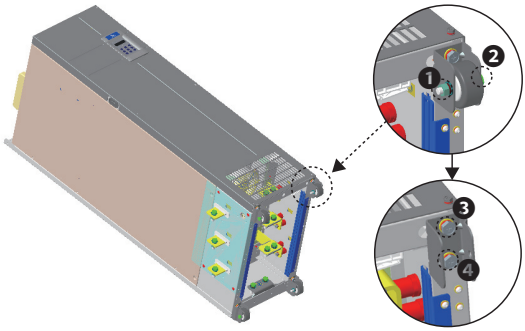
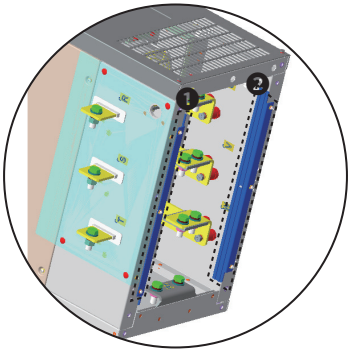
Rated Current (A)	A	B	C	D	E	F	G	H	I	J	K	L	M
330	290	95±5	95±5	250	110±10	5	155±5	132±2	190	45±5	214±1	Φ11*18	106±2

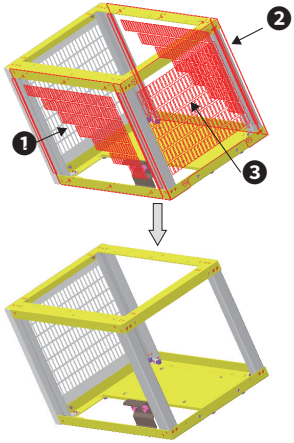
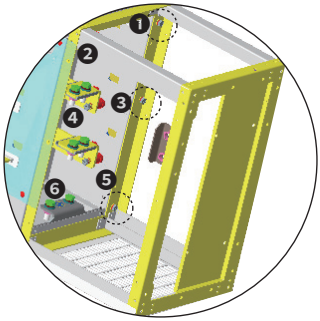
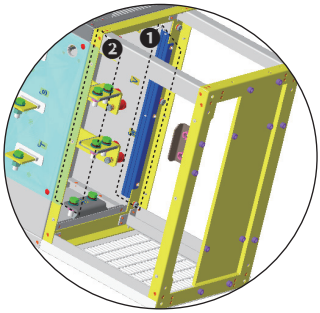
NOTE

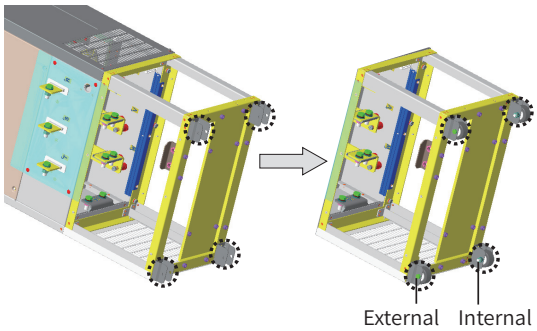
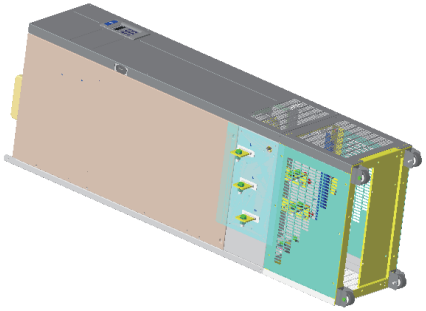
◆ The dimensions of AC output reactors provided here are for reference only. The actual dimensions are subject to the real product.

Appendix: Installation of the Sheet Metal Base and Side Entry Output Copper Busbar

■ Installing the sheet metal base

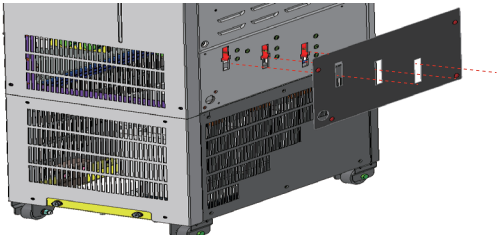
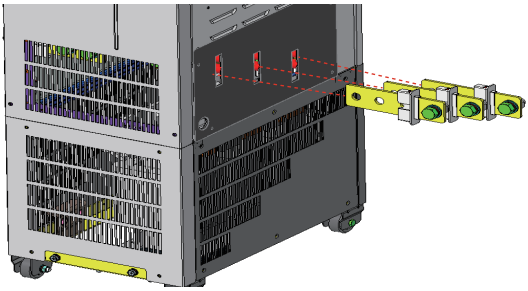
Step	Demonstration
Step 1: Remove the rollers and roller brackets at the bottom of the AC drive. Method: Loosen the hex bolts and nuts to remove the rollers. Loosen the eight M8 x 20 hexagon head SEMS screws to remove the roller brackets. ◆ Number of rollers: 4 ◆ Number of roller brackets: 4	
Step 2: Remove the plastic baffle plate.	

Step	Demonstration
Step 3: Remove the left, right, and front baffle plates (shown by 1, 2, and 3 respectively in the right figure) of the sheet metal base.	
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 hexagon head SEMS screws ◆ T12: Four M8 x 20 hexagon head 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 plates on the sheet metal base.	

Step	Demonstration
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 hexagon head SEMS screws 2) Fixing the rollers on the roller brackets Number of rollers: 4 Screws: ◆ Outside: M8 x 50 hex bolts ◆ Inside: M8 flat washers + spring washers + nuts	
Step 7: After the output cables of the AC drive is connected correctly, install the left, right, and front baffle plates on the sheet metal base, as shown in the right figure.	

■ Installing the side entry output copper busbar

Step	Demonstration
Step 1: Remove the knockouts.	

Step	Demonstration
Step 2: Fit insulating material.	
Step 3: Install the output copper busbar.	

Shenzhen Inovance Technology Co., Ltd.
Add.: Building E, Hongwei Industry Park, Liuxian Road, Baocheng No. 70 Zone, Bao' an District, Shenzhen
Tel: +86-755-2979 9595
Fax: +86-755-2961 9897
http: //www.inovance.com

Suzhou Inovance Technology Co., Ltd.
Add.: No. 16 Youxiang Road, Yuexi Town, Wuzhong District, Suzhou 215104, P.R. China
Tel: +86-512-6637 6666
Fax: +86-512-6285 6720
http: //www.inovance.com

19011400 A01