



MD520 Series General-Purpose AC Drive Installation Guide



Industrial
Automation



Intelligent
Elevator



New Energy
Vehicle



Industrial
Robot



Rail
Transit



Data code 19011714B01

Preface

Introduction

The MD520 series is a general-purpose high-performance vector control AC drive for accurate speed and torque control in high-demand applications. It can drive asynchronous AC induction motors (IM), permanent magnet synchronous motors (PMSM), and synchronous reluctance motors (SynRM). It is also equipped with the STO, limp mode upon fault, position control, and tension control functions.

This guide describes the installation dimensions, space design, specific installation steps, wiring requirements, routing requirements, option installation requirements, and common EMC troubleshooting suggestions.

More Data

Document Name	Date Code	Description
MD520 Series General-Purpose AC Drive User Guide	PS00012134	This guide describes product selection, mechanical design, electrical design, installation, communication, commissioning, function application, faults, parameters, certifications, and standards.
MD520 Series General-Purpose AC Drive Quick Installation and Commissioning Guide	19011712	This guide describes the installation, wiring, commissioning, troubleshooting, parameters, fault codes, and others.
MD520 Series General-Purpose AC Drive Hardware Guide	19011713	This guide describes the system composition, technical specifications, components, dimensions, options (including installation accessories, cables, and peripheral electrical components), expansion cards, routine inspection and maintenance, certifications, and standards of the AC drive.
MD520 Series General-Purpose AC Drive Installation Guide	19011714	This guide describes the installation dimensions, space design, specific installation steps, wiring requirements, routing requirements, option installation requirements, and common EMC troubleshooting suggestions.
MD520 Series General-Purpose AC Drive Commissioning Guide	19011715	This guide describes the software tool, commissioning process/procedure, troubleshooting, fault codes, and parameters.
MD520 Series General-Purpose AC Drive Communication Guide	19011716	This guide describes the communication modes, networking, and communication settings of the AC drive.

Document Name	Date Code	Description
MD520 Series General-Purpose AC Drive Function Guide	19011717	This guide describes function application, communication, faults, and parameters of the AC drive.
MD520 Series General-Purpose AC Drive Safety Function Guide	19011795	This guide describes the safety information, instructions for mechanical and electrical installation, commissioning and maintenance guidance, and safety-related parameters of the AC drive.

Revision History

Date	Version	Description
September 2024	B01	Modified the following content: • Updated "1.2.1 Installation Environment" on page 18. • Made minor corrections.
August 2024	B00	Modified the following content: • Updated "1.3.2 Tools for Wiring" on page 30. • Updated "4.2.4 Cabinet Heat Dissipation" on page 81. • Updated "5.3 Heat Dissipation Design" on page 103. • Updated "8.4.2 Wiring Descriptions of Control Circuit Terminals" on page 165. • Made minor corrections.
November 2023	A05	Corrected some minor errors.
June 2023	A04	Updated section 8.4.2 Wiring Descriptions of Control Circuit Terminals.

Date	Version	Description
May 2023	A03	• Added T13 models to the product model list. • Added the installation flow of T13 models in section 1.1 Installation Flowchart. • Added the clearance requirements on T13 models in section 1.2.3 Clearance. • Added the mechanical installation tools and wiring tools for T13 models in section 1.3 Tools. • Added T13 model descriptions and updated MD38IO1 terminal descriptions in section 1.4.1 Option List. • Added section 6 Mechanical Installation (T13 Models). • Added T13 model dimensions in section 8.3.2 Dimensions and Cable Selection for Main Circuit Terminals. • Added descriptions of STO terminals in section 8.4.1 Main Circuit Terminal Descriptions. • Added descriptions of STO wiring and modified descriptions of DI1 to DI5 in section 8.4.2 Wiring Descriptions of Main Circuit Terminals. • Made minor corrections.
December 2022	A02	• Updated the preface. • Updated the fundamental safety instructions. • Updated the product model list. • Added the air director cover in section 1.2.3 Clearance. • Updated section 7.4.2 Wiring Descriptions of Control Circuit Terminals. • Added descriptions of installation bases for MDKE-10 and SOP-20-810. • Made minor corrections. • Updated the document style.
June 2022	A01	• Updated the contents. • Updated section 1.2 Site Inspection. • Updated the mounting bracket dimensions of T1 and T2 models in section 1.4.1 Through-Hole Mounting Bracket. • Updated the electrical wiring diagram, descriptions of main circuit terminals, and post-wiring check in section 7 Electrical Installation. • Updated section 8.4 EMC Filter. • Made minor corrections.
January 2022	A00	First release.

Access to the Guide

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

- Do keyword search under Service and Support at <http://www.inovance.com>.
- Scan the QR code on the product with your smart phone.
- Scan the QR code below to install the app, where you can search for and download manuals.



Warranty Disclaimer

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

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

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

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

For details, see Product Warranty Card.

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Product Model List

The following table lists the mapping between product models and structures.

Table –1 Mapping between product models and structures

Structure	Product Model		
	Three-Phase 380 V to 480 V	Three-Phase 200 V to 240 V	Single-Phase 200 V to 240 V
T1	MD520-4T0.4B(S) MD520-4T0.7B(S) MD520-4T1.1B(S) MD520-4T1.5B(S) MD520-4T2.2B(S) MD520-4T3.0B(S)	MD520-2T0.4B(S) MD520-2T0.7B(S) MD520-2T1.1B(S) MD520-2T1.5B(S)	-
T2	MD520-4T3.7B(S) MD520-4T5.5B(S)	MD520-2T2.2B(S) MD520-2T3.7B(S)	MD520-2S0.4B(S) MD520-2S0.7B(S) MD520-2S1.5B(S) MD520-2S2.2B(S)
T3	MD520-4T7.5B(S) MD520-4T11B(S)	MD520-2T5.5B(S)	-
T4	MD520-4T15B(S)	MD520-2T7.5B(S)	-
T5	MD520-4T18.5(B)(S)(-T) MD520-4T22(B)(S)(-T)	MD520-2T11(B)(S)	-
T6	MD520-4T30(B)(S) MD520-4T37(B)(S)	MD520-2T15(B)(S) MD520-2T18.5(B)(S)	-
T7	MD520-4T45(B)(S) MD520-4T55(B)(S)	MD520-2T22(B)(S) MD520-2T30(B)(S)	-
T8	MD520-4T75(B)(S) MD520-4T90(S) MD520-4T110(S)	MD520-2T37(B)(S) MD520-2T45(S) MD520-2T55(S)	-
T9	MD520-4T132(S) MD520-4T160(S)	MD520-2T75(S)	-
T10	MD520-4T200(S)(-L) MD520-4T220(S)(-L)	MD520-2T90(S) MD520-2T110(S)	-
T11	MD520-4T250(S)(-L) MD520-4T280(S)(-L)	MD520-2T132(S)	-
T12	MD520-4T315(S)(-L) MD520-4T355(S)(-L) MD520-4T400(S)(-L)	MD520-2T160(S) MD520-2T200(S)	-
T13 (without the auxiliary power distribution cabinet)	MD520-4T500 MD520-4T500(S) MD520-4T560 MD520-4T560(S) MD520-4T630 MD520-4T630(S)	-	-

Structure	Product Model		
	Three-Phase 380 V to 480 V	Three-Phase 200 V to 240 V	Single-Phase 200 V to 240 V
T13 (with the auxiliary power distribution cabinet)	MD520-4T500-A MD520-4T500(S)-A MD520-4T560-A MD520-4T560(S)-A MD520-4T630-A MD520-4T630(S)-A	-	-
Note: • (B): with the braking unit • (S): with the safe torque off (STO) function • (-T): with the DC reactor • (-L): with the AC output reactor			

Fundamental Safety Instructions

Safety Precautions

- This chapter presents essential safety instructions for a proper use of the equipment. Before using this product, read the user guide thoroughly and correctly understand the related safety precautions. Failure to observe the safety precautions may result in serious injuries or death of personnel or device damage.
- "Danger", "Warning", and "Caution" items in this guide do not indicate all safety precautions that need to be followed; instead, they just supplement the safety precautions.
- Use this equipment according to the designated environment requirements. Damage caused by improper use is not covered by warranty.
- Inovance shall take no responsibility for any personal injuries or property damage caused by improper usage.

Safety Levels and Definitions



Indicates that failure to comply with the notice will result in death or severe personal injuries.



Indicates that failure to comply with the notice may result in death or severe personal injury.



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

General Safety Instructions

- Drawings in the guide are sometimes shown without covers or protective guards. Remember to install the covers or protective guards as specified first, and then perform operations in accordance with the instructions.
- The drawings in the guide are shown for illustration only and may be different from the product you purchased.
- Operators must take mechanical precautions to protect personal safety and wear protective equipment, such as anti-smashing shoes, safety clothing, safety glasses, protective gloves, and protective sleeves.

Unpacking **WARNING**

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

 CAUTION

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

Storage and Transportation **WARNING**

- Large-scale or heavy equipment must be transported by qualified professionals using specialized hoisting equipment. Failure to comply may result in personal injuries or equipment damage.
- Before hoisting the equipment, ensure the components such as the front cover and terminal blocks are secured firmly with screws. Loosely-connected components may fall off and result in personal injury or equipment damage.
- Never stand or stay below the equipment when the equipment is being hoisted by the hoisting equipment.
- When hoisting the equipment with a steel rope, ensure the equipment is hoisted at a constant speed without suffering from vibration or shock. Do not turn the equipment over or let the equipment stay hanging in the air. Failure to comply may result in personal injuries or equipment damage.



CAUTION

- Handle the equipment with care during transportation and mind your steps to prevent personal injuries or equipment damage.
- When carrying the equipment with bare hands, hold the equipment casing firmly with care to prevent parts from falling. Failure to comply may result in personal injuries.
- Store and transport the equipment based on the storage and transportation requirements. Failure to comply will result in equipment damage.
- Avoid storing or transporting the equipment in environments with water splash, rain, direct sunlight, strong electric field, strong magnetic field, and strong vibration.
- Avoid storing the product 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.
- Never transport the drive with other equipment or materials that may harm or have negative impacts on the drive.

Installation



DANGER

- The equipment must be operated only by professionals with electrical knowledge.



WARNING

- Read through the guide and safety instructions before installation.
- Do not install this equipment in places with strong electric or magnetic fields.
- Before installation, check that the mechanical strength of the installation site can bear the weight of the equipment. Failure to comply will result in mechanical hazards.
- Do not wear loose clothes or accessories during installation. Failure to comply may result in an electric shock.
- When installing the equipment in a closed environment (such as a cabinet or casing), use a cooling device (such as a fan or air conditioner) to cool the environment down to the required temperature. Failure to comply may result in equipment over-temperature or a fire.
- Do not retrofit the equipment.
- Do not fiddle with the bolts used to fix equipment components or the bolts marked in red.
- When the equipment is installed in a cabinet or final assembly, a fireproof enclosure providing both electrical and mechanical protections must be provided. The IP rating must meet IEC standards and local laws and regulations.
- Before installing devices with strong electromagnetic interference, such as a transformer, install a shielding device for the equipment to prevent malfunction.
- Install the product on an incombustible object such as metal and do not contact or attach the product with combustible objects. Failure to comply will cause fires.

 CAUTION

- Cover the top of the equipment with a piece of cloth or paper during installation. This is to prevent unwanted objects such as metal shavings, oil, and water from falling into the equipment and causing faults. After installation, remove the cloth or paper on top of the equipment to prevent over-temperature caused by poor ventilation due to blocked ventilation holes.
- Resonance may occur when the equipment operating at a constant speed executes variable speed operations. In this case, install the vibration-proof rubber under the motor frame or use the vibration suppression function to reduce resonance.

Wiring

 DANGER

- Equipment installation, wiring, maintenance, inspection, or parts replacement must be performed only by professionals.
- Before wiring, cut off all the power supplies of the equipment, and wait for at least the time designated on the equipment warning label before further operations because residual voltage still exists after power-off. After waiting for the designated time, measure the DC voltage in the main circuit to ensure the DC voltage is within the safe voltage range. Failure to comply will result in an electric shock.
- Do not perform wiring, remove the equipment cover, or touch the circuit board with power ON. Failure to comply will result in an electric shock.
- Check that the equipment is grounded properly. Failure to comply can result in an electric shock.

 WARNING

- Do not connect the input power supply to the output end of the equipment. Failure to comply can result in equipment damage or even a fire.
- When connecting a drive to the motor, check that the phase sequences of the drive and motor terminals are consistent to prevent reverse motor rotation.
- Cables used for wiring must meet cross sectional area and shielding requirements. The shield of the cable must be reliably grounded at one end.
- Fix the terminal screws with the tightening torque specified in the user guide. Improper tightening torque may overheat or damage the connecting part, resulting in a fire.
- After wiring is done, check that all cables are connected properly and no screws, washers or exposed cables are left inside the equipment. Failure to comply may result in electric shock or equipment damage.

 CAUTION

- Follow the proper electrostatic discharge (ESD) procedure and wear an anti-static wrist strap to perform wiring. Failure to comply may result in damage to the equipment or to the internal circuit of the product.
- Use shielded twisted pairs for the control circuit. Connect the shield to the grounding terminal of the equipment for grounding purpose. Failure to comply can result in equipment malfunction.

Power-on



DANGER

- Before power-on, check that the equipment is installed properly with reliable wiring and the motor can be restarted.
- Check that the power supply meets equipment requirements before power-on to prevent equipment damage or a fire.
- Do not open the cabinet door or protective cover of the product, contact any wiring terminal of the product, or remove any part of the product at power-on. Failure to comply will result in an electric shock.



WARNING

- Perform a trial run after wiring and parameter setting to ensure the equipment operates safely. Failure to comply may result in personal injuries or equipment damage.
- Before power-on, check that the rated voltage of the equipment is consistent with that of the power supply. Failure to comply may result in a fire accident.
- Before power-on, check that no one is near the equipment, motor, or machine. Failure to comply may result in death or personal injury.

Operation



DANGER

- The equipment must be operated only by professionals. Failure to comply can result in death or personal injury.
- Do not touch any connecting terminals or disassemble any unit or component of the equipment during operation. Failure to comply can result in an electric shock.



WARNING

- Do not touch the equipment casing, fan, or resistor with bare hands to feel the temperature. Failure to comply may result in personal injuries.
- Prevent metal or other objects from falling into the equipment during operation. Failure to comply may result in a fire or equipment damage.

Maintenance



DANGER

- Equipment installation, wiring, maintenance, inspection, or parts replacement must be performed only by professionals.
- Do not maintain the equipment with power ON. Failure to comply can result in an electric shock.
- Before maintenance, cut off all the power supplies of the equipment and wait for at least the time designated on the equipment warning label.
- In case of a permanent magnet motor, do not touch the motor terminals immediately after power-off because the motor terminals will generate induced voltage during rotation even after the equipment power supply is off. Failure to comply will result in an electric shock.



WARNING

- Perform routine and periodic inspection and maintenance on the equipment according to maintenance requirements and keep a maintenance record.

Repair	
 DANGER	• Equipment installation, wiring, maintenance, inspection, or parts replacement must be performed only by professionals. • Do not repair the equipment with power ON. Failure to comply can result in an electric shock. • Before inspection and repair, cut off all the power supplies of the equipment and wait for at least the time designated on the equipment warning label.
 WARNING	• Submit the repair request according to the warranty agreement. • When the fuse is blown or the circuit breaker or residual current device (RCD) trips, wait for at least the time designated on the equipment warning label before power-on or further operations. Failure to comply may result in death, personal injury or equipment damage. • When the equipment is faulty or damaged, the troubleshooting and repair work must be performed by professionals that follow the repair instructions, with repair records kept properly. • Replace quick-wear parts of the equipment according to the replacement instructions. • Do not operate on damaged equipment. Failure to comply may result in death, personal injury, or severe equipment damage. • After the equipment is replaced, check the wiring and set parameters again.
Disposal	
 WARNING	• Dispose of retired equipment in accordance with local regulations and standards. Failure to comply may result in property damage, personal injury, or even death. • Recycle retired equipment by observing industry waste disposal standards to avoid environmental pollution.

Safety Labels

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

Safety Label		Description
T12 models and below	T13 models	
		• Read through the safety instructions before operating the equipment. Failure to comply may result in death, personal injuries, or equipment damage. • Do not touch the terminals or remove the cover with power ON or within 10 min (for T12 models and below) or 15 min (for T13 models) after power-off. Failure to comply will result in an electric shock.

1 Installation Preparations

1.1 Installation Flowchart

T1 to T9 models

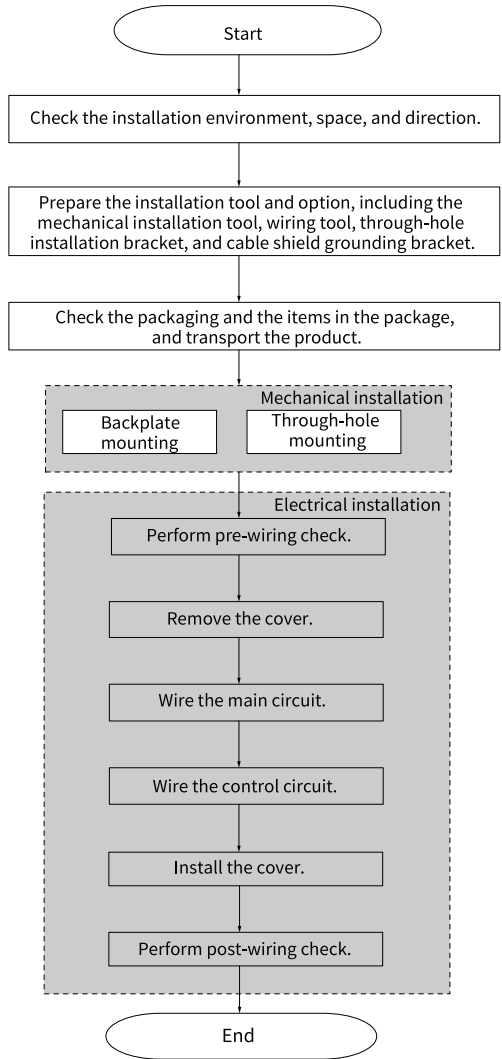


Figure 1-1 General installation process (T1 to T9 models)

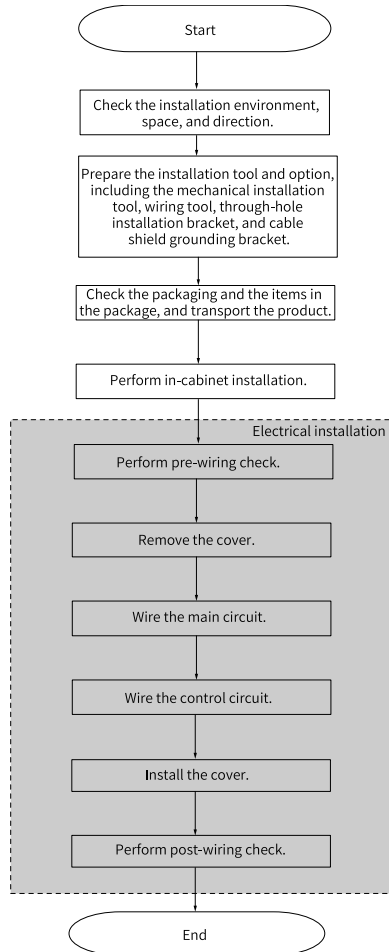
T10 to T12 Models

Figure 1-2 General installation process (T10 to T12 models)

T13 models

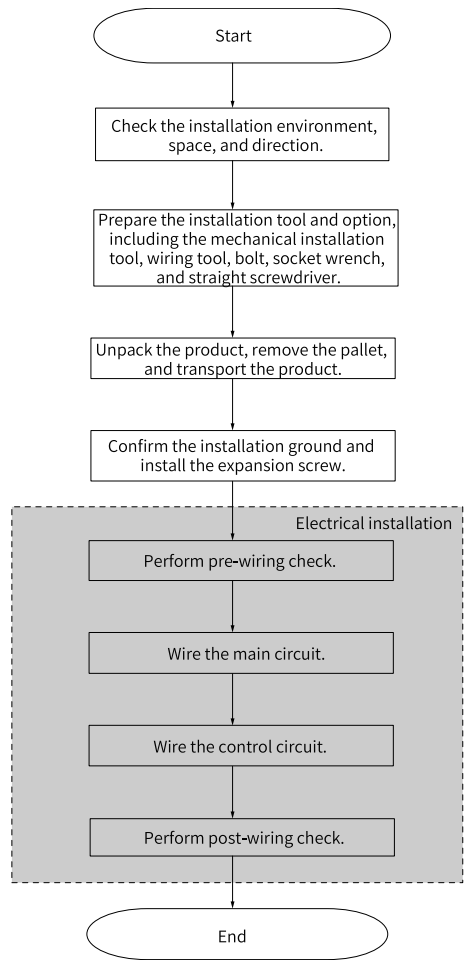


Figure 1-3 General installation process (T13 models)

1.2 Installation Site Inspection

1.2.1 Installation Environment

To maximum the product performance and ensure long-term use, install the drive in an environment meeting the following requirements.

Table 1–1 Environmental requirements

Environment	Requirement
Installation location	Indoor
Grid overvoltage	OVC III
Temperature	• Installation/Ambient temperature: -10°C to $+50^{\circ}\text{C}$. When the temperature ranges from -10°C to $+40^{\circ}\text{C}$, no derating is required. For temperature above 40°C, derate 1.5% for every additional 1°C. • Storage/Transportation temperature: -20°C to $+60^{\circ}\text{C}$. • For better reliability, use the AC drive in places without drastic temperature changes. • When installing the drive into an enclosed environment such as a control cabinet, use a cooling fan or air conditioner to keep the temperature of the inlet air below 50°C. Failure to comply will result in overheat or fire. • Install the drive on a flame-retardant surface, with sufficient clearance reserved for heat dissipation. • Take measures to prevent the drive from being frozen.
Humidity	Storage/Ambient humidity: $\leq 95\%$ RH, non-condensing
Environment	Pollution degree: 2 or below Install the drive in a location that meets the following descriptions: • Free from direct sunlight, dust, corrosive gas, combustible or explosive gas, oil mist, water vapor, drip, or salt • Insusceptible to vibration (away from equipment that may generate strong vibration, such as a punch press) • Free from unwanted objects such as metallic dust, oil, and water that may enter the AC drive • Free from radioactive substances, combustible materials, harmful gases and liquids, and salt corrosion • Away from combustible materials such as wood • Meeting Class 3C3 requirements in IEC 60721-3-3 in terms of chemically active substances.
Altitude	• 1000 m and below: derating is not required. • > 1000 m: derate 1% for every additional 100 m For 0.4 kW to 3 kW models, the maximum altitude is 2000 m; for altitudes above 2000 m, contact Inovance. For models with the power higher than 3 kW, the maximum altitude is 3000 m; for altitudes above 3000 m, contact Inovance.
Vibration resistance	• For transportation in the package: compliant with class 2M3 in EN 60721-3-2 • For installation with the package removed: compliant with ISTA 1H

1.2.2 Installation Personnel

The equipment can be operated only by professionals with electrical knowledge.

1.2.3 Installation Clearance

Reserve sufficient clearance according to the power rating of the AC drive.

T1 to T9 models

- Installing one drive

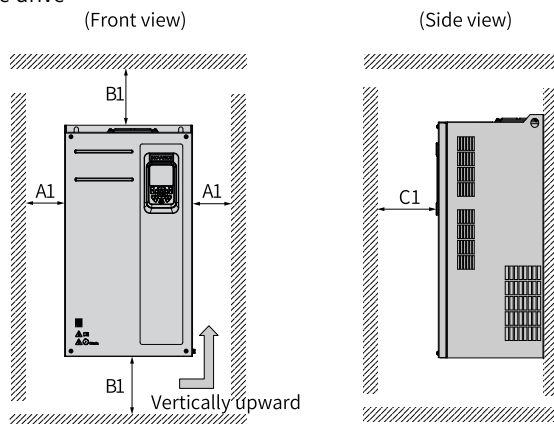


Figure 1-4 Clearance for installing one AC drive (T1 to T9 models)

Table 1-2 Installation clearance

Power Rating	Clearance (mm)		
0.4 kW to 15 kW	$A1 \geq 10$	$B1 \geq 100$	$C1 \geq 40$
18.5 kW to 22 kW	$A1 \geq 10$	$B1 \geq 200$	$C1 \geq 40$
30 kW to 37 kW	$A1 \geq 50$	$B1 \geq 200$	$C1 \geq 40$
45 kW to 160 kW	$A1 \geq 50$	$B1 \geq 300$	$C1 \geq 40$

The clearance for the air inlet and outlet of the AC drive is given based on extreme work conditions. If the clearance for customers is smaller than the recommended clearance, contact Inovance engineers.

- Installing multiple drives side by side

The AC drive dissipates heat upward. When multiple AC drives are required to work together, install them side by side. Keep their tops level with each other, especially for those of different sizes.

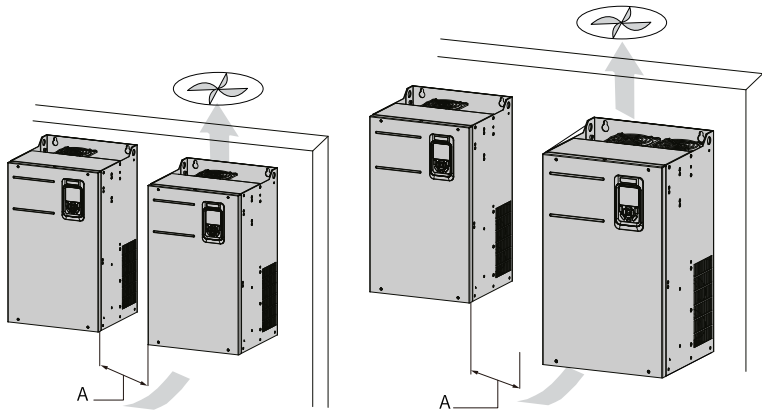


Figure 1-5 Installing multiple AC drives (T1 to T9 models) side by side

Table 1-3 Installation clearance

Power Rating	Clearance (mm)
0.4 kW to 15 kW	$A \geq 10$
18.5 kW to 22 kW	$A \geq 10$
30 kW to 37 kW	$A \geq 50$
45 kW to 160 kW	$A \geq 50$

The clearance for the air inlet and outlet of the AC drive is given based on extreme work conditions. If the clearance for customers is smaller than the recommended clearance, contact Inovance engineers.

- Dual-row installation

If one drive needs to be installed above another one, install an air guide plate, as shown in ["Figure 1-6 Dual-row installation" on page 22](#). This can prevent the drive in the lower row from heating that in the upper row, causing overheat or overload faults.

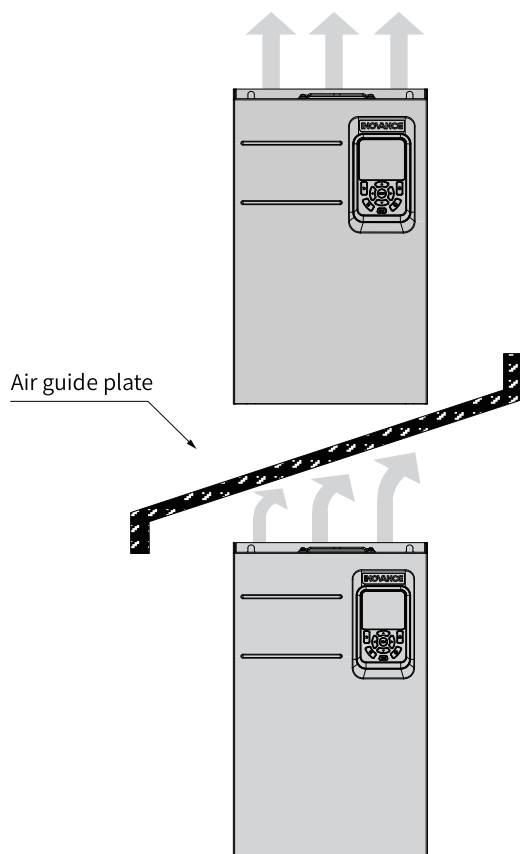


Figure 1-6 Dual-row installation

Air director design

The following figure shows the air director.

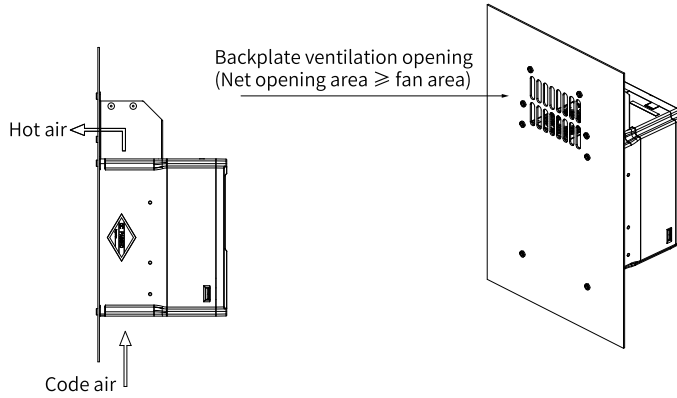


Figure 1-7 Air director

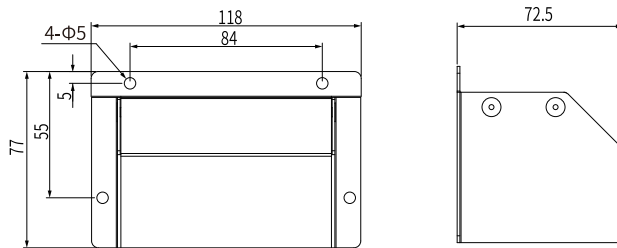


Figure 1-8 Air director dimensions (mm) of T1 models

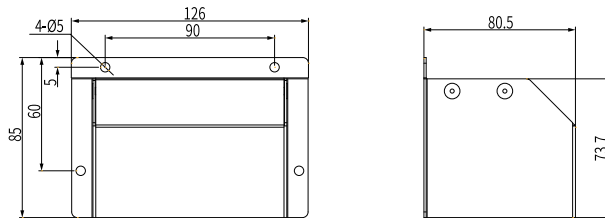


Figure 1-9 Air director dimensions (mm) of T2 models

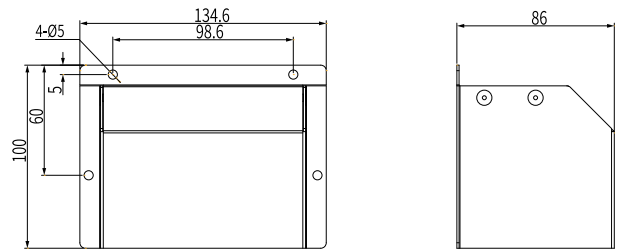


Figure 1-10 Air director dimensions (mm) of T3 models

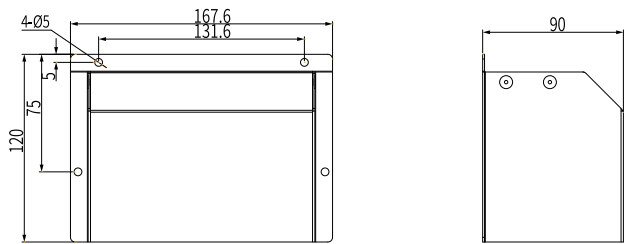


Figure 1-11 Air director dimensions (mm) of T4 models

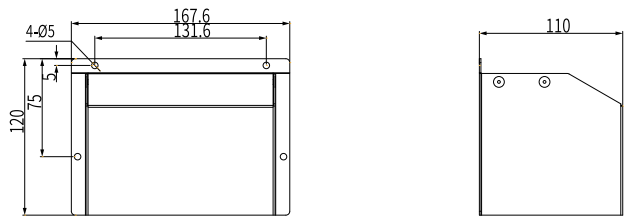


Figure 1-12 Air director dimensions (mm) of T5 models

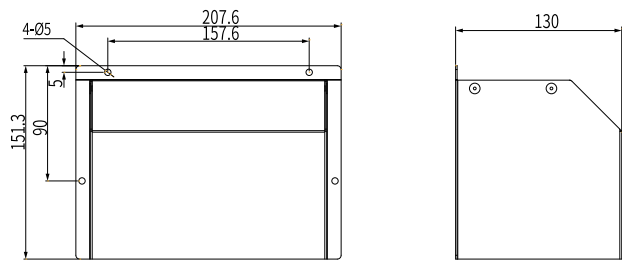


Figure 1-13 Air director dimensions (mm) of T6 models



Caution

Where multiple AC drives are installed in one cabinet, if the fan blows air into the air inlet from the outside, air distribution for the drives in the cabinet will be affected, resulting in poor cooling performance. Therefore, do not install a fan at the air inlet of the cabinet to blow air into the cabinet.

The following table describes the minimum effective ventilation area of the cabinet air inlet after the drive is installed in the cabinet.

Table 1-4 Minimum effective ventilation area of the cabinet air inlet

AC Drive	Minimum Effective Ventilation Area of the Cabinet Air Inlet (cm ²)
T1	20
T2	25
T3 (7.5 kW)	50
T3 (11 kW)	
T4	
T5	60
T6 to T7	102
T8	204
T9	318

The preceding table applies to situations where only one AC drive is mounted in the cabinet. For a cabinet containing multiple AC drives, calculate the total ventilation area by adding the ventilation area of each drive according to the table. For example, if eight T3 models (7.5 kW), two T5 models, and one T9 drives are placed inside the cabinet, the minimum effective ventilation area of the cabinet air inlet is $8 \times 25 + 2 \times 60 + 1 \times 318 = 638 \text{ cm}^2$.

If an air filter is installed at the air inlet, the air inlet resistance will rise significantly. Therefore, the ventilation area of the air inlet must be increased to 1.2 to 1.5 times the value indicated in the table.

The ventilation area in "[Table 1-4 Minimum effective ventilation area of the cabinet air inlet](#)" on page 25 refers to the actual through-hole area of an opening. The ventilation area is calculated by the following: opening area x opening rate.

T10 to T12 models

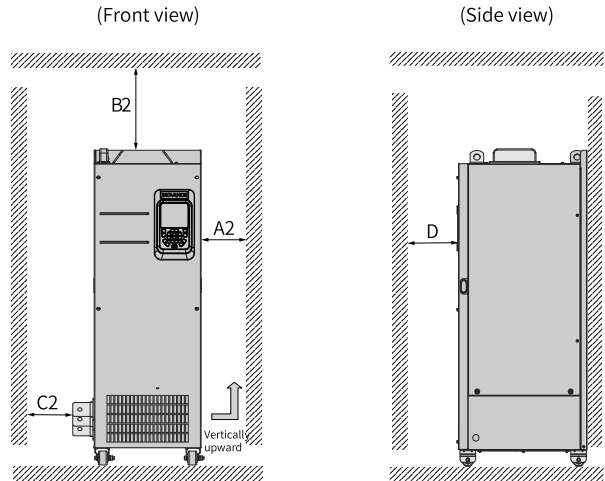


Figure 1-14 Requirements on installation clearance

Table 1-5 Installation clearance

Power Rating	Clearance (mm)			
200 kW to 400 kW	$A2 \geq 10$	$B2 \geq 250$	$C2 \geq 20$	$D \geq 20$

Note

T10 to T12 models can only be installed in cabinets individually. They cannot be installed in a side-by-side or up-down way. If side-by-side or up-down installation is required, contact Inovance.

T13 models

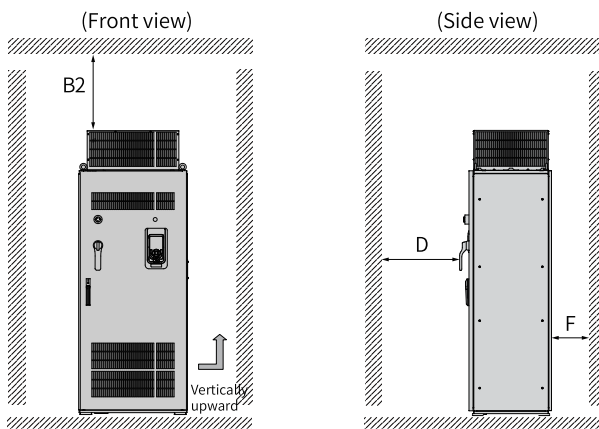


Figure 1-15 Requirements on installation clearance

Table 1-6 Installation clearance

Power Rating	Clearance (mm)		
500 kW to 630 kW	$B2 \geq 250$	$D \geq 800$	$F \geq 100$

1.2.4 Installation Direction

Install the AC drive vertically upright only, as shown in "Figure 1-17" on page 28. Do not lie down the AC drive horizontally or by its side, or install it in the upside-down direction.

If the AC drive needs to be placed in an upright position, ensure the tilt angle of the place that holds the drive does not exceed 5°. Failure to comply may lead to rollover of the drive due to its heavy weight (nearly 200 kg) and large size.

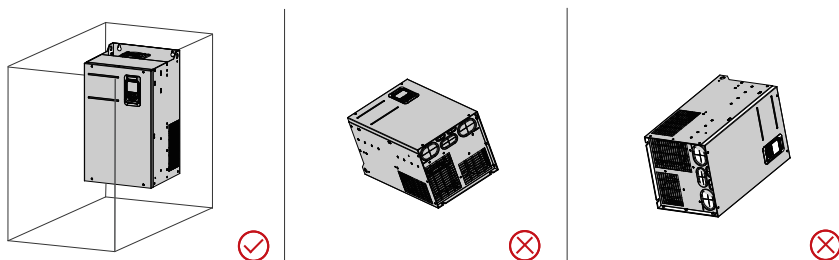


Figure 1-16 Installation direction (T1 to T9 models)

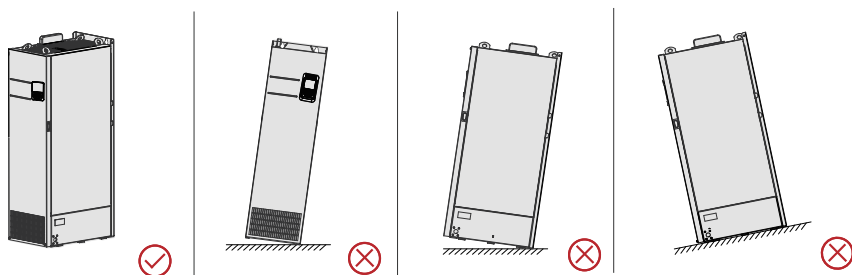


Figure 1-17 Installation direction (T10 to T12 models)

1.3 Installation Tools

1.3.1 Tools for Mechanical Installation

T1 to T9 models

["Table 1-7 Tools for mechanical installation" on page 28](#) lists the tools for mechanical installation.

Table 1-7 Tools for mechanical installation

Tool	Description
Electric drill with appropriate drilling bits	It is used to drill mounting holes on the mounting surface.
Nut wrench or socket wrench	It is used to tighten or loosen screws. The following specifications are required: #13, #16, and #18.
Phillips screwdriver and straight screwdriver (2.5 mm to 6 mm)	It is used to tighten or loosen screws.
Torque wrench	It is used to tighten or loosen screws.
Crowbar	It is used to pry off the cover to facilitate installation.
Crane	It is used to lift the equipment.
Tape measure	It is used to measure the installation dimensions of the equipment.
Gloves	They are used to prevent static electricity during mechanical installation.
Bottom mounting bracket (standard)	It is used to fix the AC drive in the cabinet.
Guide rail (optional)	It is connected to the bottom mounting bracket, enabling you to gently push the AC drive into the cabinet along the guide rails.
Screw	It is used to fix the equipment to the mounting surface.

"Table 1-8 Specifications and quantity of screws" on page 29 lists the specifications and quantity of screws required for mechanical installation.

Table 1-8 Specifications and quantity of screws

Installation Mode	Specification	Quantity (PCS)	Description
Backplate mounting	Users purchase the screw according to the mounting hole diameter.	4	Used to fix the drive onto the wall
Through-hole mounting	Users purchase the screw according to the mounting hole diameter.	4	Used to fix the drive to the backplate of the control cabinet.

T10 to T12 models

"Table 1-7 Tools for mechanical installation" on page 28 lists the tools for mechanical installation.

"Table 1-9 Specifications and quantity of screws" on page 29 lists the specifications and quantity of screws required for mechanical installation.

Table 1-9 Specifications and quantity of screws

Installation Mode	Screw Specification	Quantity (PCS)	Description
Installation within the cabinet	M5 self-tapping screw	6	It is used to fix the bottom mounting bracket to the bottom of the cabinet.
	M5 x 12 SEMS screw	8	It is used to assemble the guide rails.
	M6 nut	2	It is used to connect the guide rail assembly to the bottom mounting bracket.

T13 models

"Table 1-10 Tools for mechanical installation" on page 29 lists the tools for mechanical installation.

Table 1-10 Tools for mechanical installation

Tool	Description
Wrench or socket wrench (18 mm)	It is used to tighten or loosen screws.
Phillips screwdriver and straight screwdriver (2.5 mm to 6 mm)	It is used to tighten or loosen screws.

Tool	Description
Torque wrench (torque above 100 N·m)	It is used to tighten or loosen screws.
Electric drill with an appropriate drilling bit	It is used to drill holes on the floor or steel plates for fastening the cabinet.
Crowbar	It is used to pry off the cover to facilitate installation.
Crane	It is used to lift the equipment.
Tape measure	It is used to measure the installation dimensions of the equipment.
Gloves	They are used to prevent static electricity during mechanical installation.



Caution

Select the screw with correct specifications; otherwise, improper installation may occur.

1.3.2 Tools for Wiring

When wiring the main circuit terminal, select an appropriate installation tool based on the terminal size. ["Table 1–11 Tools for wiring the main circuit terminal" on page 30](#) lists the tools for wiring the main circuit terminal.

Table 1–11 Tools for wiring the main circuit terminal

Drive Model	Recommended Fastener	Tool
T1 to T2	M4 SEMS screw	Phillips screwdriver (#3 slot)
T3 to T4	M5 SEMS screw	Phillips screwdriver (#3 slot)
T5 to T6	M6 SEMS screw	Phillips screwdriver (#3 slot)
T7	M8 nut, spring washer, and flat washer	Socket wrench (#13)
T8 to T9	M12 nut, spring washer, and flat washer	Socket wrench (#19) and socket wrench extension bar (150 mm)
T10 to T11	M12 bolt, spring washer, and flat washer	Socket wrench (#19) and socket wrench extension bar (250 mm)

Drive Model	Recommended Fastener	Tool
T12	M16 bolt, spring washer, and flat washer	Socket wrench (#24) and socket wrench extension bar (250 mm)
T13	M12 bolt, spring washer, and flat washer	Socket wrench (#24) and socket wrench extension bar (250 mm)

1.4 Accessories

1.4.1 List of Options

Optional peripherals include braking units, function expansion cards, and external operating panels. For use of each option, see its user guide. If any option is required, specify it in your order.

Table 1-12 Option list

Name		Option Model	Ordering Code	Supported AC Drive Model	Description
Braking components	External braking unit [1]	MDBUN-60-T	01013133	All models	60 A, 380 VAC series
		MDBUN-60-5T	0101AR57	All models	60 A, 480 VAC series
		MDBUN-90-T	01013126	All models	90 A, 380 VAC series
		MDBUN-90-5T	0101AR58	All models	90 A, 480 VAC series
		MDBUN-200-T	01040104	All models	200 A, 380 VAC series
		MDBUN-200-5T	01040160	All models	200 A, 480 VAC series
	Built-in braking unit	Models with the name containing letter "B"	-	T1 to T8 (75 kW)	For T1 to T4 models (three phase 380 V to 480 V), the built-in braking unit is standard. For T5 to T8 models (three phase 380 V to 480 V, 75 kW), the braking unit is optional.

Name		Option Model	Ordering Code	Supported AC Drive Model	Description
Expansion card	I/O expansion card 1	MD38IO1	01013098	T4 and above	Five DI, one DO, one RO, one AO, one AI (PT100/PT1000), one RS485 or CAN communication signal isolation input terminal
	I/O expansion card 2	MD38IO2	01013103	All models	Three DI
	I/O expansion card 3	MD38IO3	01040051	All models	Three DI, one RO, one RS485 communication signal isolation input terminal
	I/O expansion card 4	MD520IO1	01040250	All models	Three DI, one RS485 communication signal isolation input terminal, one normally open relay output terminal, one AO
	RS485 communication card	MD38TX1	01013112	All models	Modbus communication card with the isolation feature
	CANopen/CANlink communication card	MD38CAN1	01013100	All models	CANopen/CANlink communication card
	PROFIBUS DP communication card	MD-SI-DP2	01040249	All models	PROFIBUS DP communication card
		MD38DP2	01013144	T4 and above	PROFIBUS DP communication card
	PROFINET communication card <1>	MD500-PN1	01040098	All models	PROFINET communication card
		MD500-PN2	01040198	All models	PROFINET communication card
	EtherCAT communication card	MD500-ECAT	01040113	All models	EtherCAT communication card
	Ethernet/IP communication card	MD500-EN1	01040167	All models	Ethernet/IP communication card
	Modbus TCP communication card	MD500-EM1	01040201	All models	Modbus TCP communication card

Name		Option Model	Ordering Code	Supported AC Drive Model	Description
Expansion card	Positioning expansion card 1	MD38DW1	01013096	T4 and above	Multi-function pulse input expansion card Five DI's, one DO, one RO, one AO, one AI, one RS485 or CAN communication signal isolation input terminal, one differential ABZ terminal
	Positioning expansion card 2	MD38DW2	01013097	All models	Mini pulse input expansion card One RS485 communication terminal, one differential ABZ terminal (positioning)
	Resolver frequency division encoder card	MD38PG4D	01040008	T4, T7 models and above	The MD38PG4D card is a PG card specially developed for resolvers. Featuring differential frequency division, it is suitable for various applications such as machine tool electric master axis, master-slave control, and synchronous control.
	Resolver interface card	MD38PG4	01013081	All models	It is applicable to the resolver with the excitation frequency of 10 kHz and with the DB9 interface To meet the MD38PG4 requirements, the excitation input DC resistance of the resolver must be greater than 17 Ω . Failure to comply will result in MD38PG4 malfunction. Select a resolver with a maximum of four pole pairs. Otherwise, the MD38PG4 card will be overloaded. The number of resolver pole pairs must be less than or equal to the number of motor pole pairs, and the number of motor pole pairs divided by the number of resolver pole pairs must be an integer.

Name		Option Model	Ordering Code	Supported AC Drive Model	Description
Expansion card	Multi-functional encoder card	MD38PGMD	01013147	All models	The card is an encoder interface card with the optional multiplied frequency division output function and supports 5 V or 15 V power supply. The card supports differential input, collector input, and push-pull input, as well as differential output and collector output; therefore, it can be used to connect to different encoders and supports A/B phase input of the host controller.
	23-bit PG card	ES510-PG-CT1	01320007	All models	Applicable to 23-bit encoders of Inovance; with a DB9 interface
	Sin-cos encoder	MD520-PG-S1	01040237	All models	The MD520-PG-S1 is a PG card that decodes sin-cos encoders. Working with the AC drive, it can measure the motor speed, and realize speed and position closed loop control and encoder frequency division output.
	Bus adaption card	MD520-CClick	01040283	All models	The MD520-CClick communication expansion card (hereinafter referred to as the MD520-CClick card) is an open fieldbus adaption card for MD520 series AC drives. It communicates with the CClick master through a dedicated interface to achieve efficient data interaction between CClick master and slave. It features flexible topology and easy operation.

Name		Option Model	Ordering Code	Supported AC Drive Model	Description
Mounting accessory	Through-hole mounting bracket	MD500-AZJ-A1T1	01040072	T1	The bracket is used for through-hole mounting. It applies only to T1 to T9 models.
		MD500-AZJ-A1T2	01040073	T2	
		MD500-AZJ-A1T3	01040074	T3	
		MD500-AZJ-A1T4	01040075	T4	
		MD500-AZJ-A1T5	01040001	T5	
		MD500-AZJ-A1T6	01040002	T6	
		MD500-AZJ-A1T7	01040003	T7	
		MD500-AZJ-A1T8	01040004	T8	
		MD500-AZJ-A1T9	01040005	T9	
	Grounding bracket of cable shield	MD500-AZJ-A2T1	01040085	T1	The accessory is used for re-fixing the power cable and stable grounding of the shield in 360°. It applies only to T1 to T9 models.
		MD500-AZJ-A2T2	01040088	T2	
		MD500-AZJ-A2T3	01040083	T3	
		MD500-AZJ-A2T4	01040082	T4	
		MD500-AZJ-A2T5	01040081	T5	
		MD500-AZJ-A2T6	01040086	T6	
		MD500-AZJ-A2T7	01040087	T7	
		MD500-AZJ-A2T8	01040084	T8	
		MD500-AZJ-A2T9	01040089	T9	
	Mounting guide rail	MD500-AZJ-A3T10	01040009	T10 to T12	The option is used for installing the AC drive in a cabinet. For T10 models and models above T10, it is recommended that a guide rail be used to push the AC drive into the cabinet.
	U/V/W output copper busbar	MD500-TP-T10	01040125	T10	MD520 models excluding that with the base (-L) are delivered with the U/V/W output copper busbar.
		MD500-TP-T11	01040126	T11	
		MD500-TP-T12	01040127	T12	

Name		Option Model	Ordering Code	Supported AC Drive Model	Description
Cable	Main circuit cable	Lugs from Suzhou Yuanli are recommended. For details of recommended lugs, see "8.3.3" on page 138.			It is recommended that the input and output main circuit cables use symmetrical shielded cables. Compared with four-conductor cables, symmetrical shielded cables can reduce electromagnetic radiation in the whole transmission system. It is recommended that power cables also use symmetrical shielded cables.
	Control circuit cable	All control circuit cables must be shielded cables. Use a separate shielded cable for each type of analog signal. It is recommended that digital signal cables use shielded twisted pair (STP) cables.			
	External LED operating panel	MDKE-10	01040182	All models	It supports parameter display and modification.
	External LCD operating panel	SOP-20	01040028	All models	It supports parameter copy and download, and supports English and Chinese.
	SOP-20 mounting base	CP600-BASE1	01040022	All models	It is used to install the SOP-20 to the cabinet door.
	MDKE-10 mounting base	MD580-AZJ1	01040202	All models	It is used to install the MDKE-10 to the cabinet door.
	Extension cable	MDCAB	01013008	All models	It is a three-meter cable for the external operating panel. The standard 8-conductor cable can connect to the LED operating panel MDKE-10 and the LCD operating panel SOP-20.
		MDCAB-1.5	15048471	All models	1.5-meter cable for the external operating panel

Note

For details on models and specifications of other peripheral electrical components, such as input reactors, EMC filters, output reactors, and fuses, see the section of peripheral electrical components.

<1> The difference between MD500-PN1 and MD500-PN2 is as follows:

1. Power-on time: The power-on time of the MD500-PN1 is 3s, and that of the MD500-PN2 is 30s.
2. GSD file: The GSD files of the MD500-PN1 and MD500-PN2 are different.
3. Media redundancy protocol: The MD500-PN1 supports the media redundancy protocol, and the MD500-PN2 does not support the media redundancy protocol.

1.4.2 Through-hole Mounting Bracket

The through-hole mounting bracket is an option. Purchase a proper model based on actual needs.

Applicable model

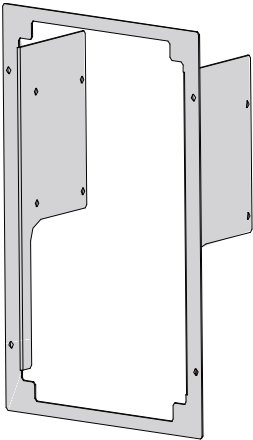


Figure 1-18 Through-hole mounting bracket

Table 1-13 Models of through-hole mounting brackets

Through-hole Mounting Bracket Model	Structure
MD500-AZJ-A1T1	T1
MD500-AZJ-A1T2	T2
MD500-AZJ-A1T3	T3
MD500-AZJ-A1T4	T4
MD500-AZJ-A1T5	T5
MD500-AZJ-A1T6	T6
MD500-AZJ-A1T7	T7
MD500-AZJ-A1T8	T8
MD500-AZJ-A1T9	T9

Mounting hole dimensions

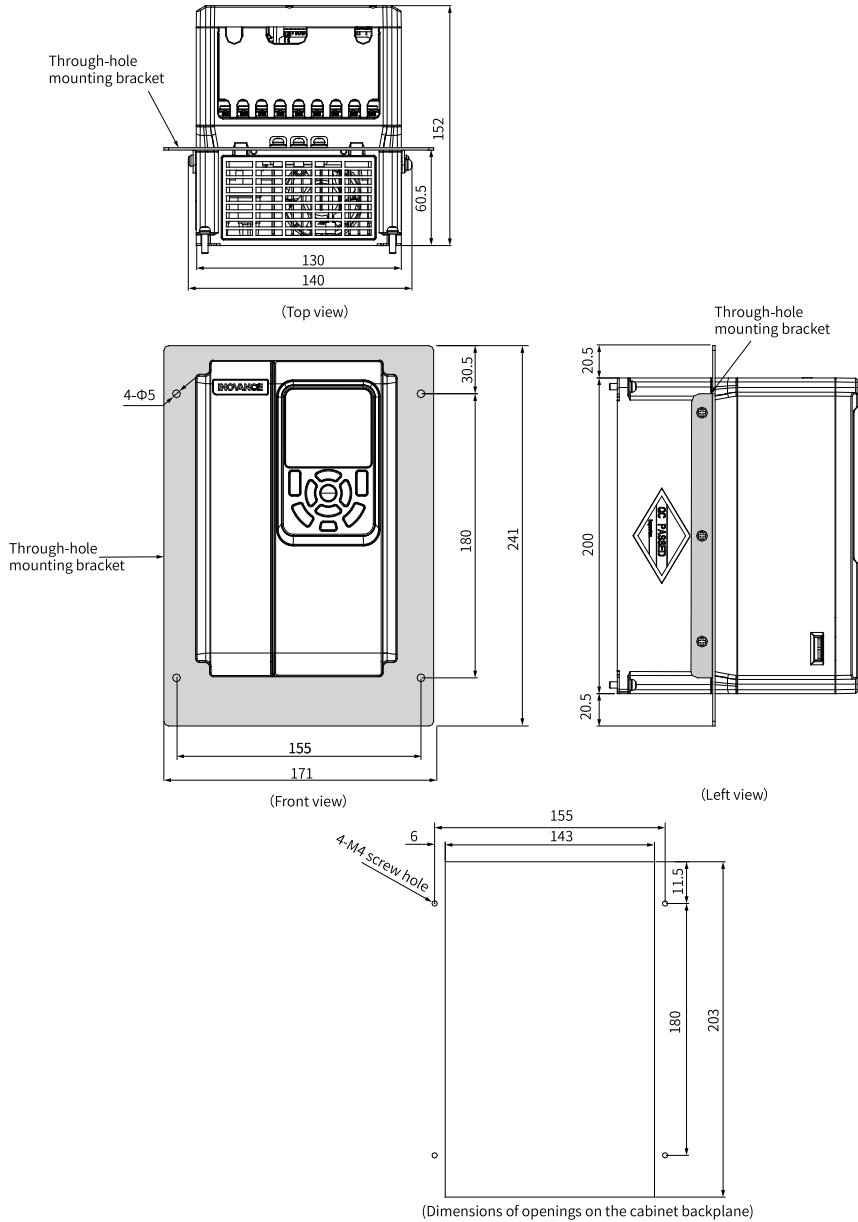


Figure 1-19 MD500-AZJ-A1T1 through-hole mounting bracket and mounting hole dimensions (mm)

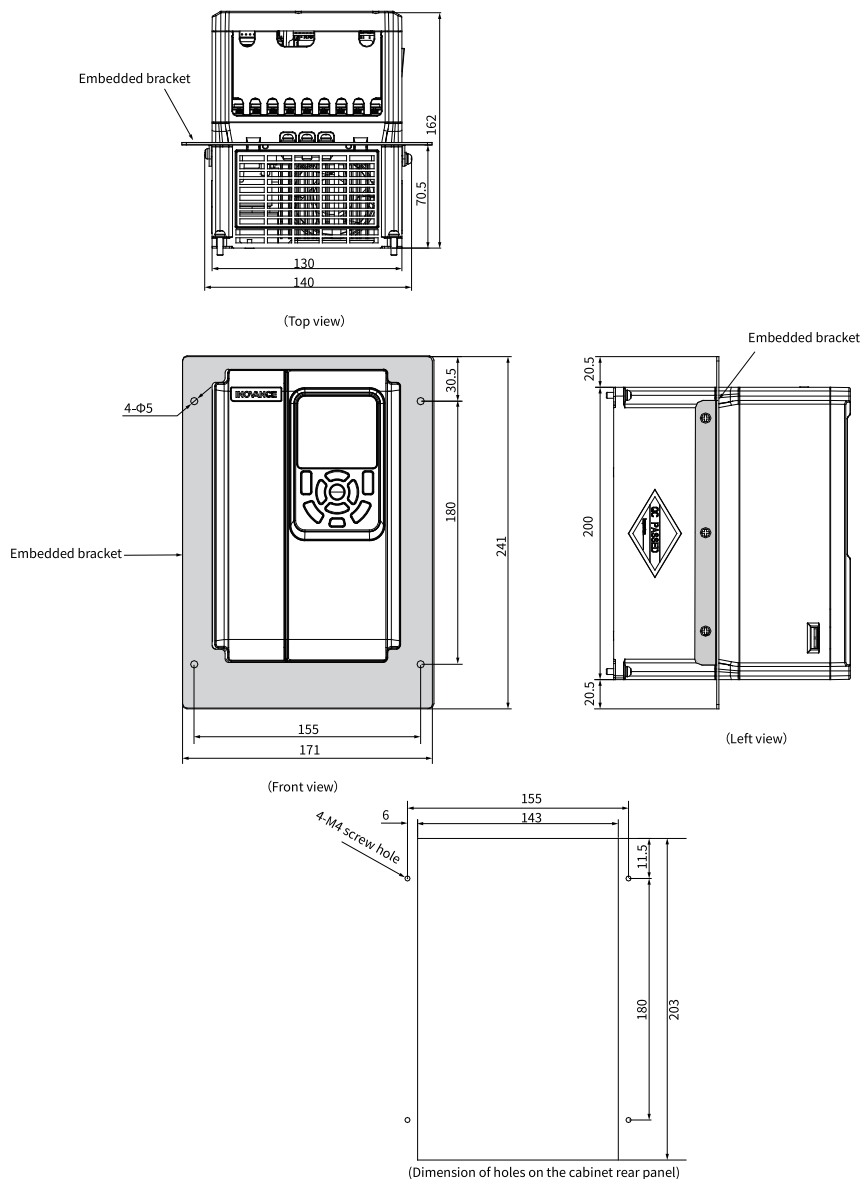


Figure 1-20 MD500-AZJ-A1T2 through-hole mounting bracket and mounting hole dimensions (mm)

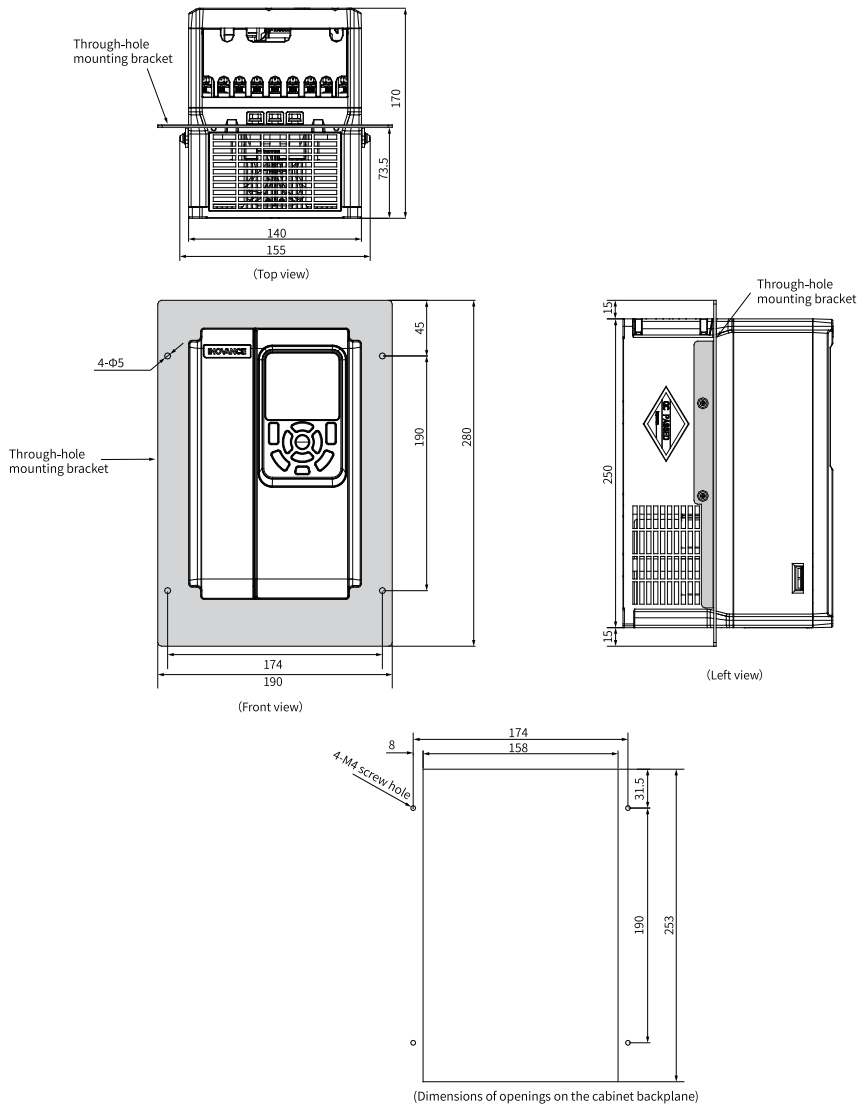


Figure 1-21 MD500-AZJ-A1T3 through-hole mounting bracket and mounting hole dimensions (mm)

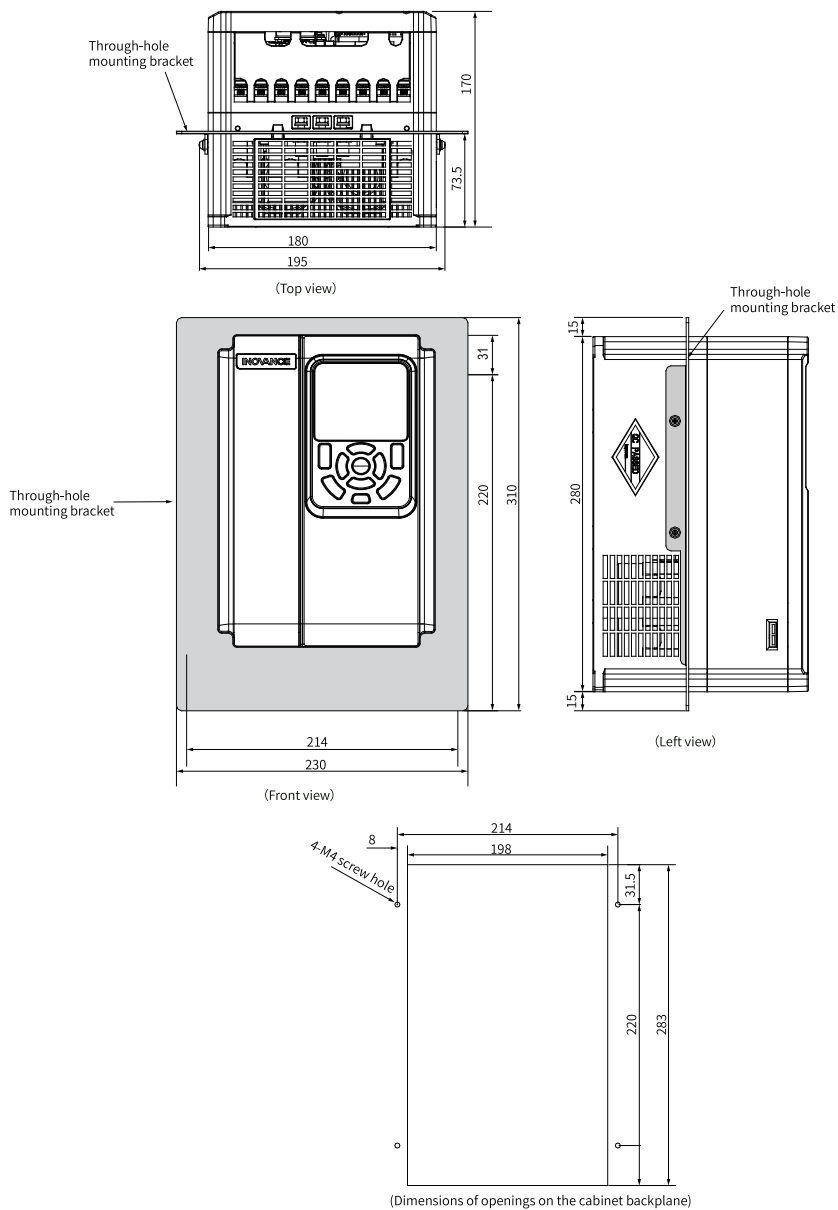


Figure 1-22 MD500-AZJ-A1T4 through-hole mounting bracket and mounting hole dimensions (mm)

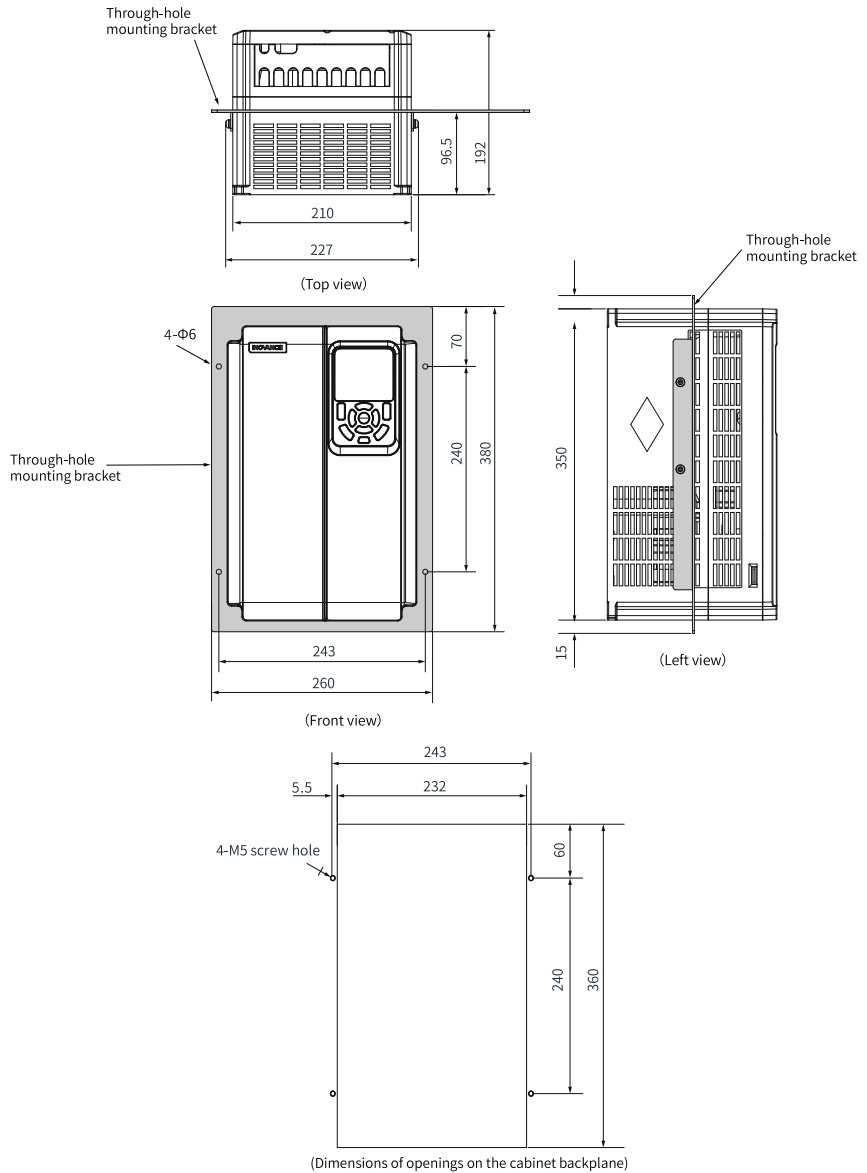


Figure 1-23 MD500-AZJ-A1T5 through-hole mounting bracket and mounting hole dimensions (mm)

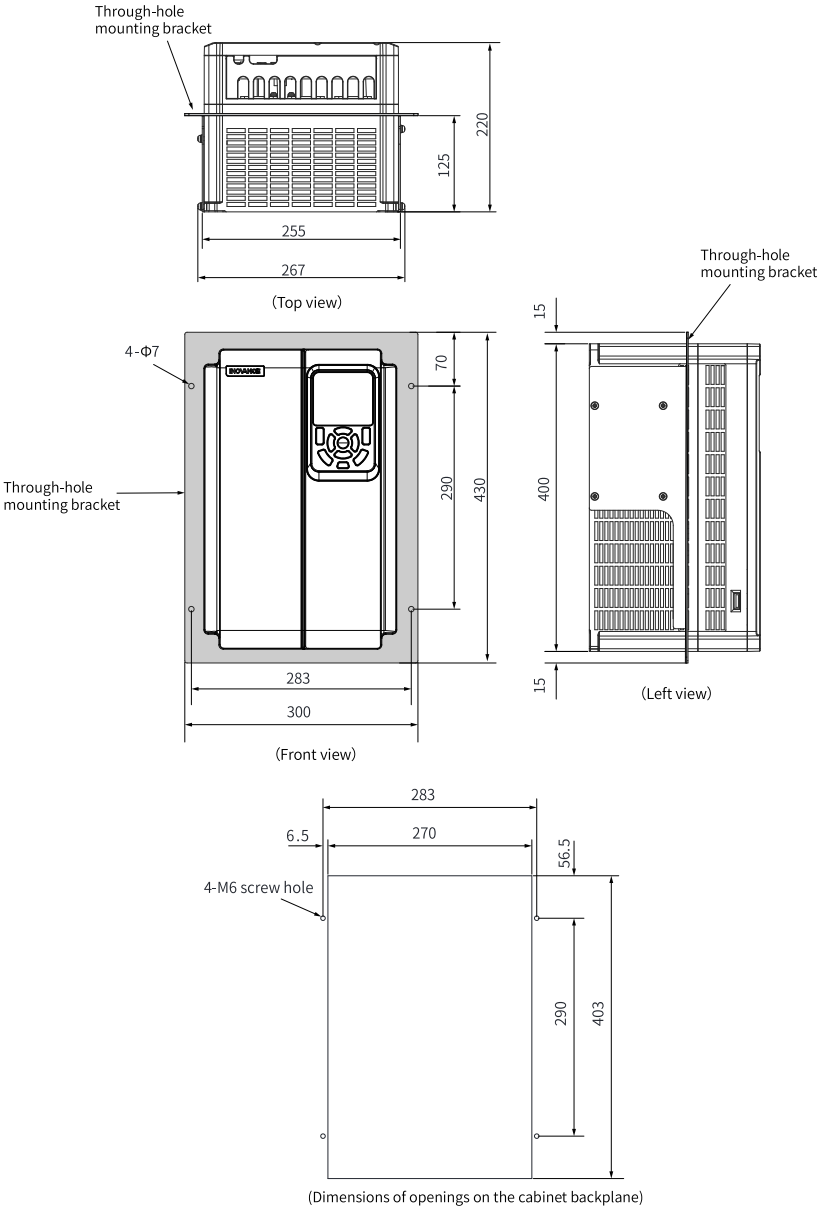


Figure 1-24 MD500-AZJ-A1T6 through-hole mounting bracket and mounting hole dimensions (mm)

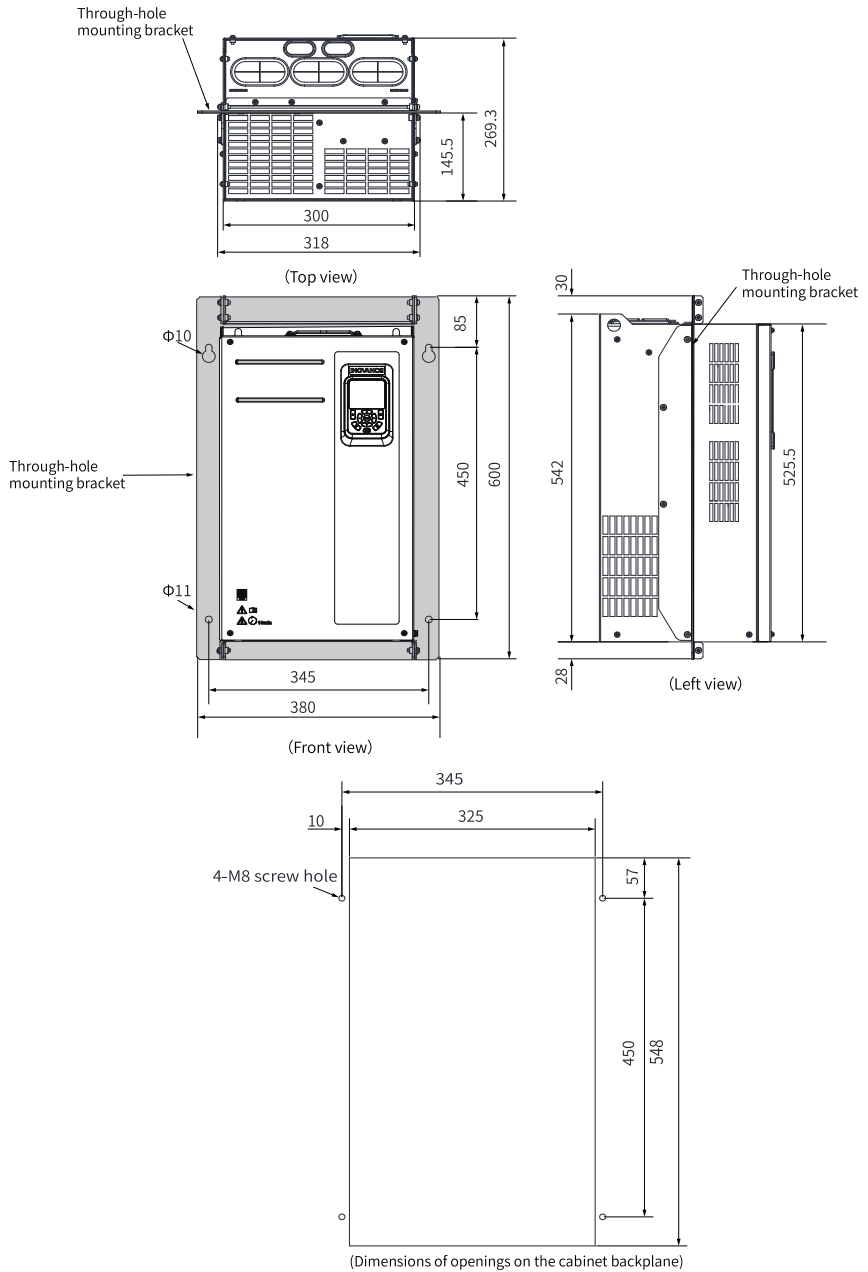


Figure 1-25 MD500-AZJ-A1T7 through-hole mounting bracket and mounting hole dimensions (mm)

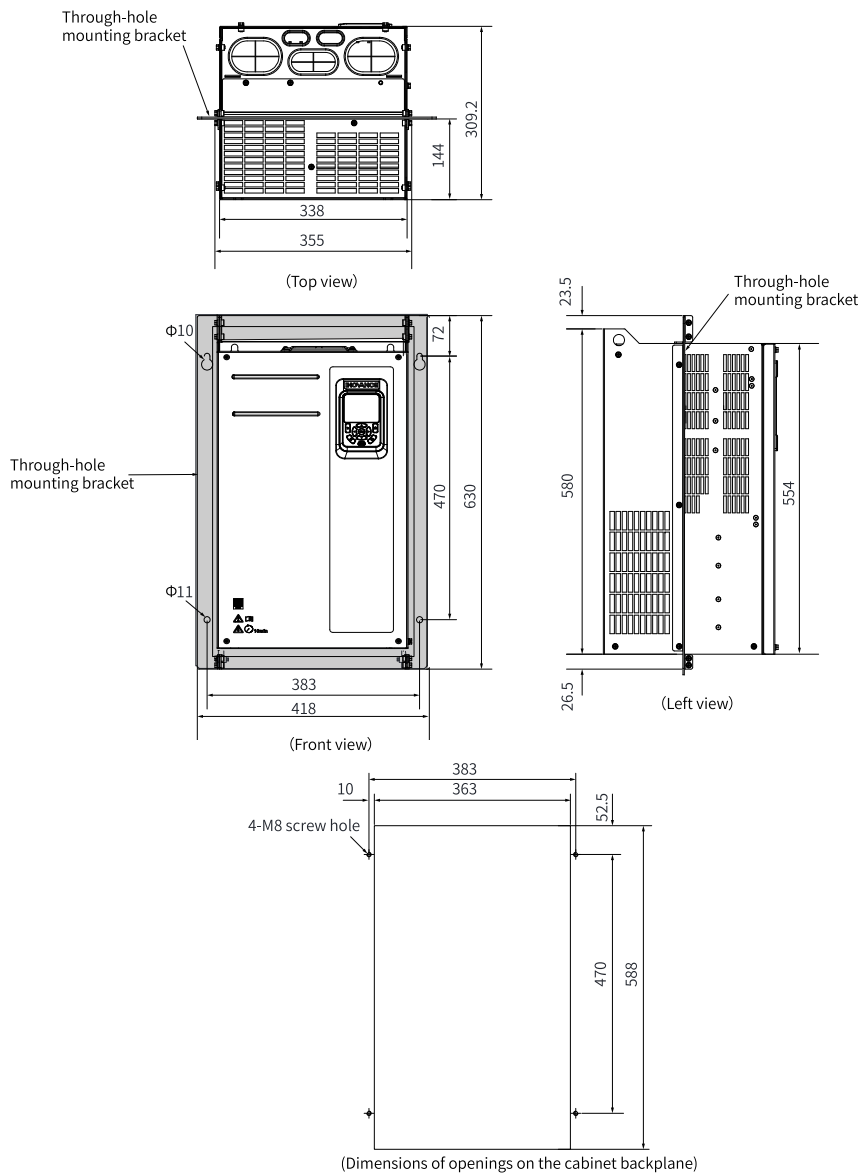


Figure 1-26 MD500-AZJ-A1T8 through-hole mounting bracket and mounting hole dimensions (mm)

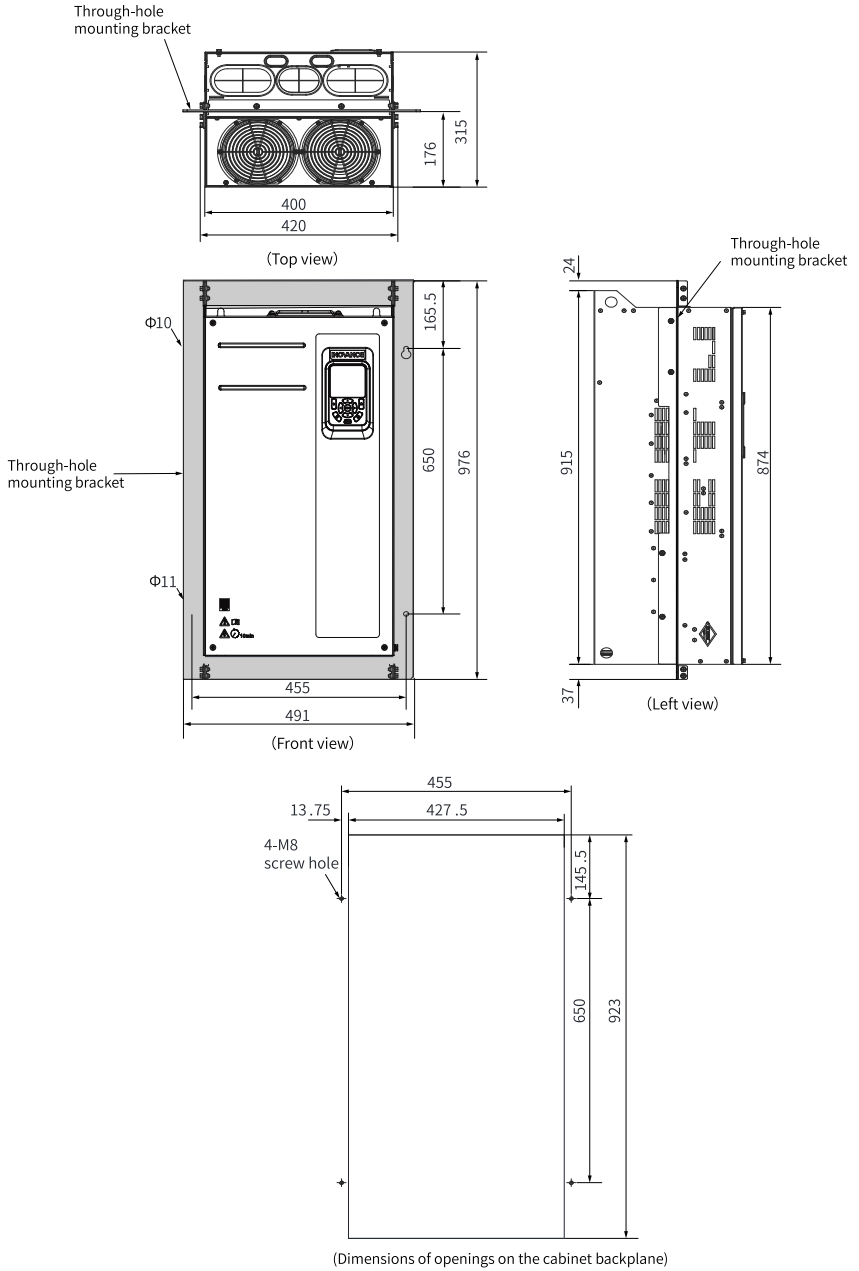


Figure 1-27 MD500-AZJ-A1T9 through-hole mounting bracket and mounting hole dimensions (mm)

1.4.3 Ground Bracket of Cable Shield

The grounding bracket of cable shield is optional and can be purchased separately as required (applicable to T9 models and below).

1.4.4 Bottom Mounting Bracket

T10 to T12 models come with a bottom mounting bracket as standard. When the AC drive is installed in a cabinet, the bottom mounting bracket is required for fixing the AC drive to the cabinet rack base. The dimensions of bottom mounting brackets vary with the power rating, weight, and size of the AC drive, as shown in the following figures.

The bottom mounting bracket provided with the AC drive is applicable to the cabinet with a depth of 600 mm.

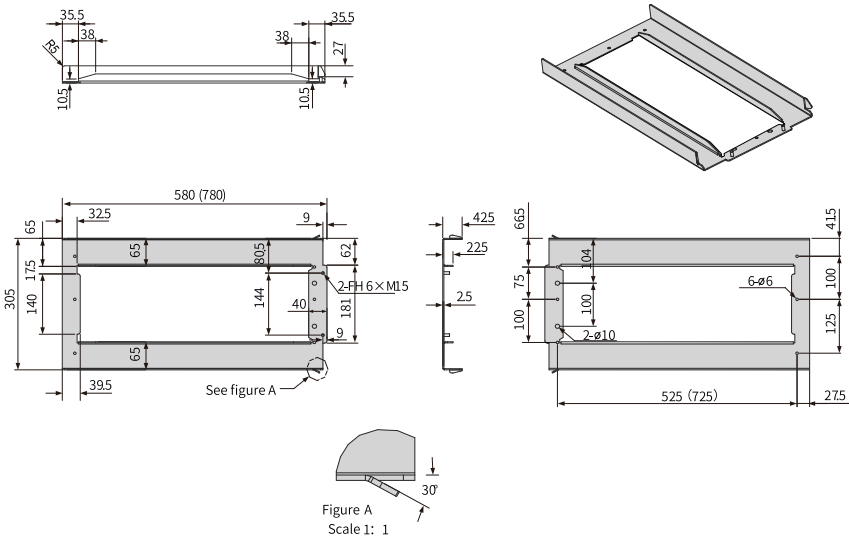


Figure 1-28 Dimensions (mm) of the bottom mounting bracket for T10 models

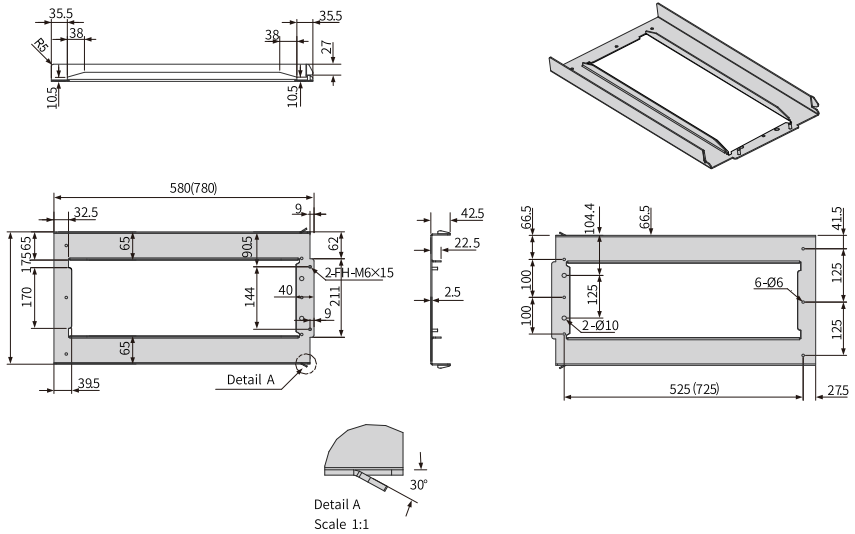


Figure 1-29 Dimensions (mm) of the bottom mounting bracket for T11 models

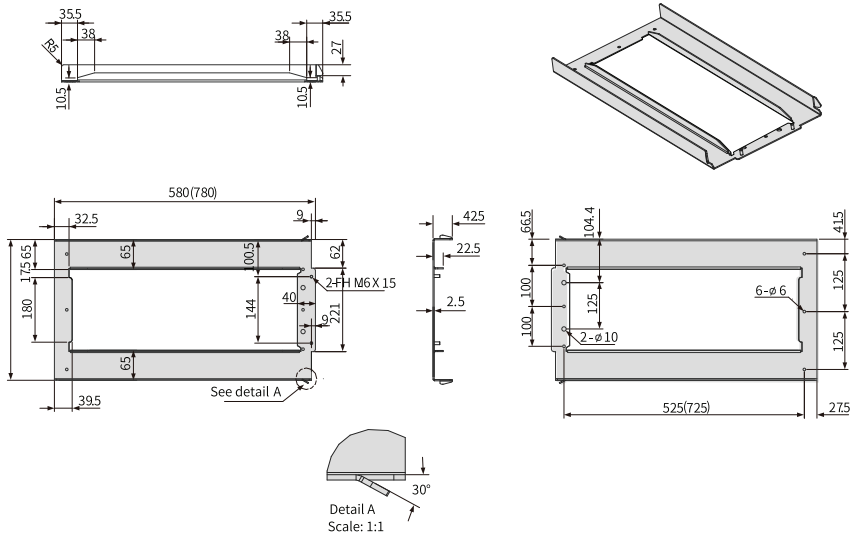


Figure 1-30 Dimensions (mm) of the bottom mounting bracket for T12 models

Note

- The bottom mounting brackets shown in the preceding figures are applicable to PS standard cabinets, sized either Width 800 mm x Depth 600 mm or Width 800 mm x Depth 800 mm. Dimensions in parentheses are applicable to PS standard cabinets sized Width 800 mm x Depth 800 mm.
 - The bottom mounting brackets that come standard with T10 to T12 models are only applicable to PS standard cabinets sized Width 800 mm x Depth 600 mm.
-

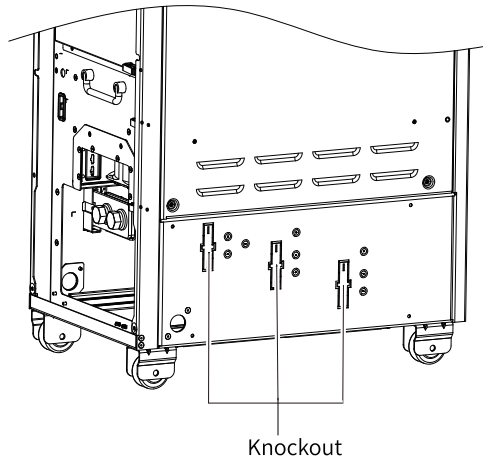
1.4.5 Mounting Guide Rail

For details of the guide rails, see *MD500-AZJ-A3T10 Guide Rail Operation Guide*.

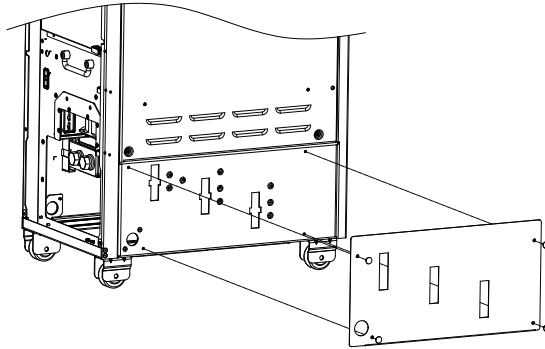
1.4.6 Installing the U/V/W Copper Busbar

All MD520 models excluding those with the base (-L) are delivered with U/V/W output side copper busbars. To install the U/V/W copper busbars, follow the steps below:

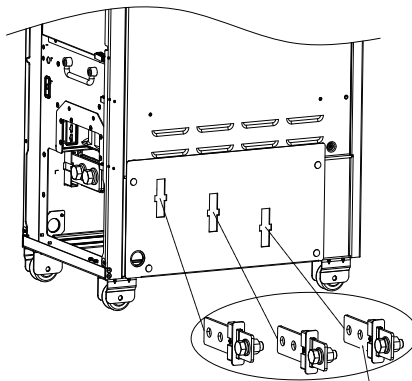
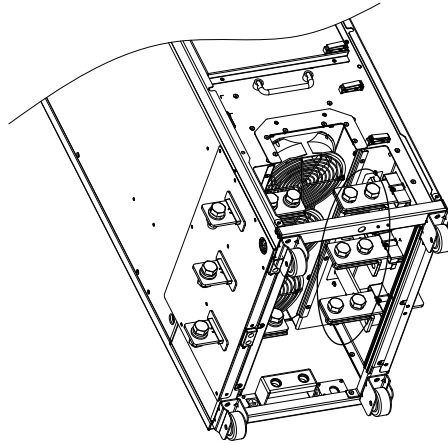
1. Use the screwdriver or cutting pliers to remove the three knockouts.



2. Use the four plastic snap-fit joints in the packing box to fasten the insulating paper to the chassis through the four holes on the paper.

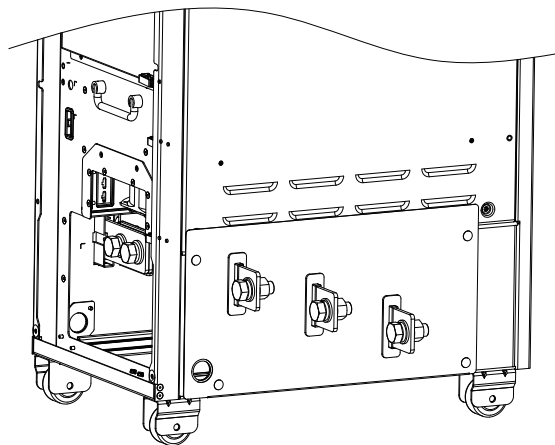


3. Remove the six screws on the drive, install the copper busbars, and then fasten the six screws.



Code of copper busbar package

The following figure shows the installed copper busbars.



Note

For selection of the U/V/W output copper busbar, see ["1.4.1 List of Options" on page 31](#).

2 AC Drive Dimensions

2.1 Dimensions of T1 to T9 Models

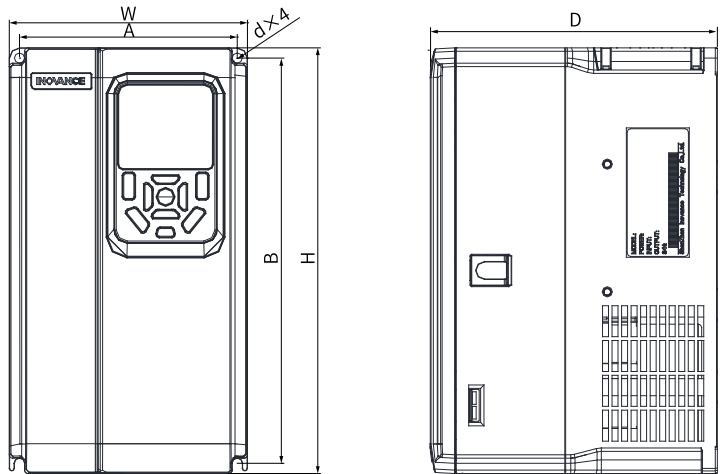


Figure 2-1 Outline dimensions and mounting dimensions of T1 to T4 models

Table 2-1 Outline dimensions and mounting dimensions of T1 to T4 models

Structure	Mounting Hole Dimension mm (in.)		Overall Dimension mm (in.)			Mounting Hole Diameter mm (in.)	Weight kg (lb)
	A	B	H	W	D	d x 4	
T1	119 (4.7)	189 (7.5)	200 (7.9)	130 (5.1)	150 (6.0)	Φ5 (0.2)	1.6 (3.5)
T2	119 (4.7)	189 (7.5)	200 (7.9)	130 (5.1)	160 (6.4)	Φ5 (0.2)	2.0 (4.4)
T3	128 (5.0)	238 (9.4)	250 (9.9)	140 (5.5)	168.3 (6.7)	Φ6 (0.2)	3.3 (7.3)
T4	166 (6.5)	266 (10.5)	280 (11.0)	180 (7.1)	169 (6.7)	Φ6 (0.2)	4.3 (9.5)

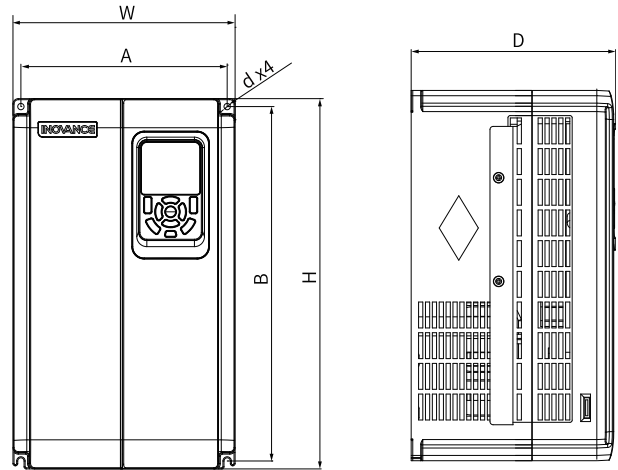


Figure 2-2 Outline dimensions and mounting dimensions of T5 and T6 models

Table 2-2 Outline dimensions and mounting dimensions of T5 to T6 models

Structure	Mounting Hole Dimension mm (in.)		Overall Dimension mm (in.)				Mounting Hole Diameter mm (in.)	Weight kg (lb)
	A	B	H	H1	W	D	d x 4	
T5 (without the DC reactor)	195 (7.7)	335 (13.2)	350 (13.8)	-	210 (8.3)	193.4 (7.6)	Φ6 (0.2)	7.6 (16.8)
T5 (-T models come with the DC reactor)	195 (7.7)	335 (13.2)	350 (13.8)	-	210 (8.3)	193.4 (7.6)	Φ6 (0.2)	10.0 (22.0)
T6	230 (9.1)	380 (15.0)	400 (15.8)	-	250 (9.9)	220.8 (8.7)	Φ7 (0.3)	17.5 (38.6)

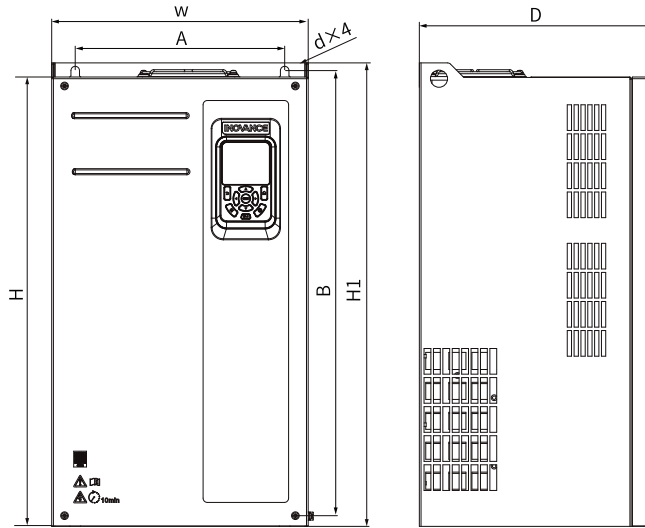


Figure 2-3 Outline dimensions and mounting dimensions of T7 and T9 models

Table 2-3 Outline dimensions and mounting dimensions of T7 to T9 models

Structure	Mounting Hole Dimension mm (in.)		Overall Dimension mm (in.)				Mounting Hole Dimension mm (in.)	Weight kg (lb)
	A	B	H	H1	W	D	d x 4	
T7	245 (9.7)	523 (20.6)	525 (20.7)	542 (21.4)	300 (11.8)	275 (10.8)	Φ10 (0.4)	35 (77.2)
T8	270 (10.6)	560 (22.1)	554 (21.8)	580 (22.9)	338 (13.3)	315 (12.4)	Φ10 (0.4)	51.5 (113.5)
T9	320 (12.6)	890 (35.1)	874 (34.4)	915 (36.1)	400 (15.8)	320 (12.6)	Φ10 (0.4)	85 (187.4)

2.2 Dimensions of T10 to T12 Models (Without AC Output Reactor)

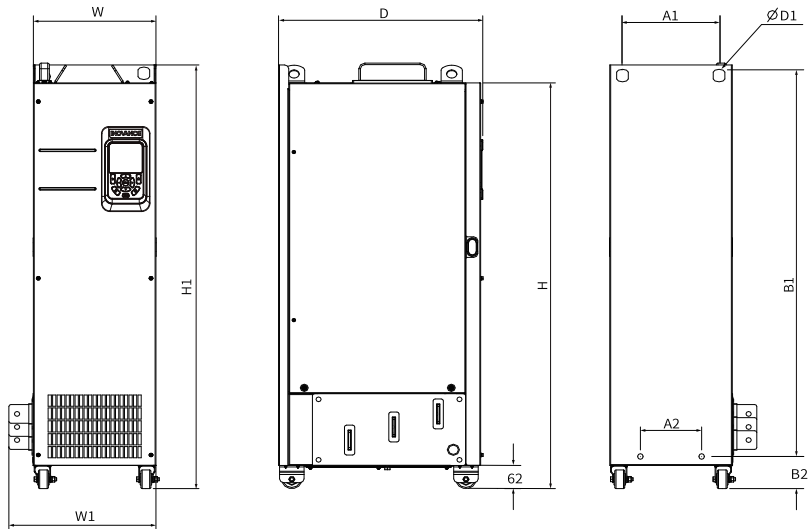


Figure 2-4 Outline dimensions and mounting dimensions of T10 to T12 models (without AC output reactors)

Table 2-4 Outline dimensions and mounting dimensions of T10 to T12 models (without AC output reactors)

Structure	Mounting Hole Dimension mm (in.)				Overall Dimension mm (in.)					Mounting Hole Diameter mm (in.)	Weight kg (lb)
	A1	A2	B1	B2	H	H1	W	W1	D		
T10	240 (9.5)	150 (5.9)	1035 (40.8)	86 (3.4)	1086 (42.8)	1134 (44.7)	300 (11.8)	360 (14.2)	500 (19.7)	φ13 (0.5)	110 (242.5)
T11	225 (8.9)	185 (7.3)	1175 (46.3)	97 (3.8)	1248 (49.2)	1284 (50.6)	330 (13)	390 (15.4)	545 (21.5)	φ13 (0.5)	155 (341.7)
T12	240 (9.5)	200 (7.9)	1280 (50.4)	101 (4)	1355 (53.4)	1405 (55.4)	340 (13.4)	400 (15.8)	545 (21.5)	φ16 (0.6)	185 (407.9)

2.3 Dimensions of T10 to T12 Models (with AC Output Reactor)

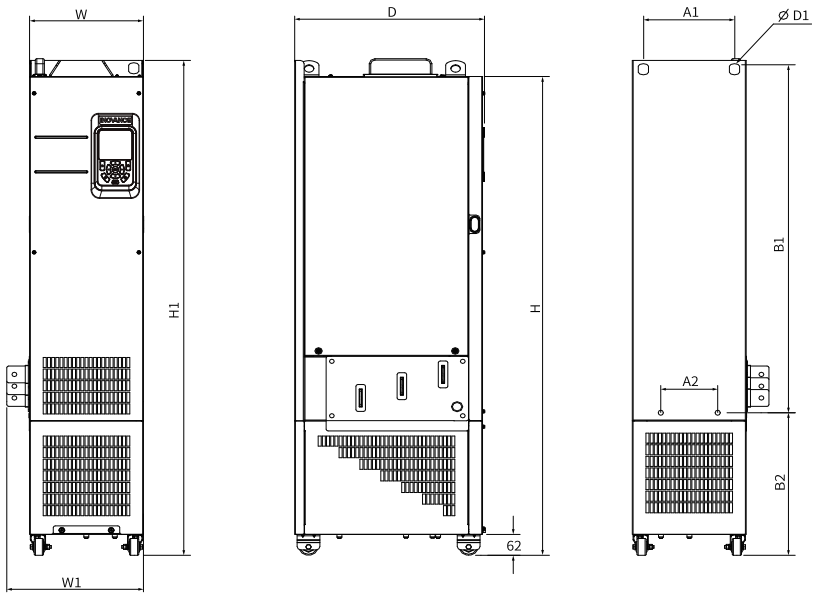


Figure 2-5 Outline dimensions and mounting dimensions of T10 to T12 models (with AC output reactors)

Table 2-5 Outline dimensions and mounting dimensions of T10 to T12 models (with AC output reactor)

Structure	Mounting Hole Diameter mm (in.)				Overall Dimension mm (in.)					Mounting Hole Diameter mm (in.)	Weight kg (lb)
	A1	A2	B1	B2	H	H1	W	W1	D	D1	
T10	240 (9.5)	150 (5.9)	1035 (40.8)	424 (16.7)	1424 (56.1)	1472 (58.0)	300 (11.8)	360 (14.2)	500 (19.7)	φ13 (0.5)	160 (352.7)
T11	225 (8.9)	185 (7.3)	1175 (46.3)	435 (17.1)	1586 (62.5)	1622 (63.9)	330 (13.0)	390 (15.4)	545 (21.5)	φ13 (0.5)	215 (474.0)
T12	240 (9.5)	200 (7.9)	1280 (50.4)	432 (17.0)	1683 (66.3)	1733 (68.3)	340 (13.4)	400 (15.8)	545 (21.5)	φ16 (0.6)	245 (540.1)

2.4 Dimensions of T13 Models (Without Auxiliary Power Distribution Cabinet)

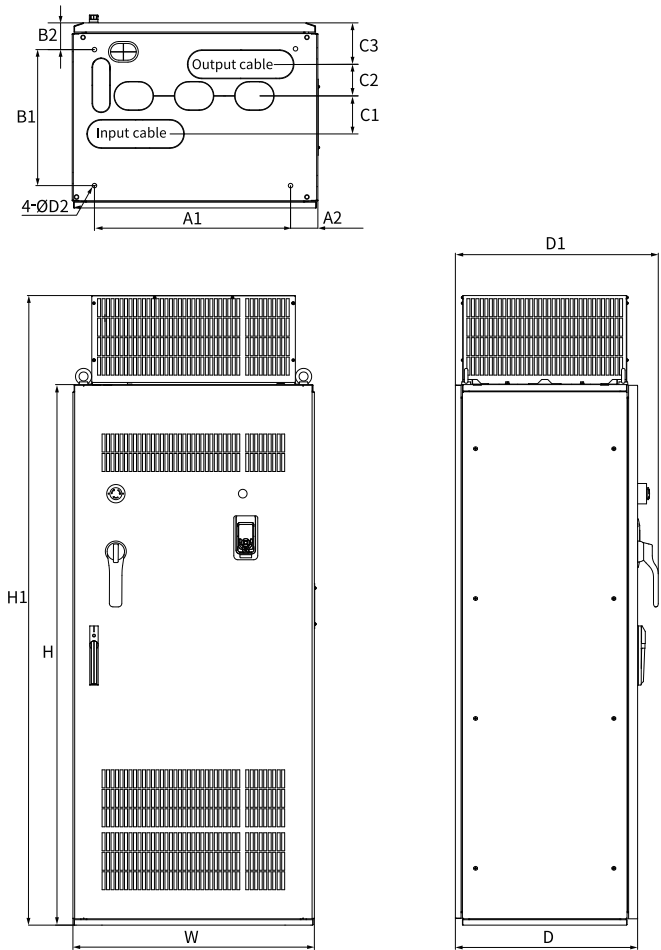


Figure 2-6 Outline dimensions and mounting dimensions of T13 models (without auxiliary power distribution cabinet)

Table 2-6 Outline dimensions and mounting dimensions of T13 models (without auxiliary power distribution cabinet)

Structure	Mounting Hole Dimension mm (in.)						
	A1	A2	B1	B2	C1	C2	C3
T13	660 (26.0)	73.5 (2.9)	450 (17.7)	85 (3.3)	125 (4.9)	104 (4.1)	136 (5.4)

Structure	Overall Dimension mm (in.)					Mounting Hole Diameter mm (in.)	Weight kg (lb)
	H	H1	W	D	D1	D2	
T13	1800 (70.9)	2100 (82.7)	805 (31.7)	610 (24.0)	680 (26.8)	15 (0.6)	530 (1168.4)

2.5 Dimensions of T13 Models (with Auxiliary Power Distribution Cabinet)

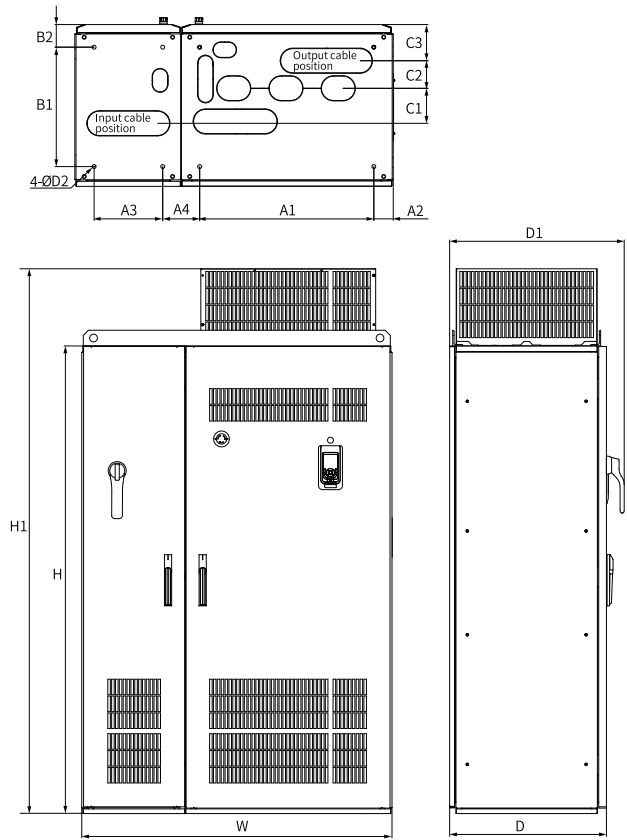


Figure 2-7 Outline dimensions and mounting dimensions of T13 models (with auxiliary power distribution cabinet)

Table 2-7 Outline dimensions and mounting dimensions of T13 models (with auxiliary power distribution cabinet)

Structure	Mounting Hole Dimension mm (in.)								
	A1	A2	A3	A4	B1	B2	C1	C2	C3
T13	660 (26.0)	73.5 (2.9)	260 (10.2)	140 (5.5)	450 (17.7)	85 (3.3)	132 (5.2)	104 (4.1)	136 (5.4)

Structure	Overall Dimension mm (in.)					Mounting Hole Diameter mm (in.)	Weight kg (lb)
	H	H1	W	D	D1	D2	
T13	1800 (70.9)	2100 (82.7)	1205 (47.5)	610 (24.0)	680 (26.8)	15 (0.6)	730 (1609.4)

3 Unpacking and Transportation

3.1 Storage

- The drive must be stored in a clean and dry room, where the temperature ranges from -20°C and +60°C and temperature change rate is smaller than 1°C/min.
- If the drive needs to be stored for a long period of time, cover it or take other appropriate measures to keep it from contamination and environmental influences.
- Try to store the system with the original packing carton of the company.
- Do not expose the AC drive to environments with moisture, high temperatures, or direct sunlight for a long time.
- The electrolytic capacitor will deteriorate after long-term storage. Therefore, switch on the AC drive once for at least 5 hours every 6 months. Increase the input voltage slowly to the rated value by using a voltage regulator. Contact Inovance for technical support if necessary.

3.2 Transportation Before Unpacking

T1 to T12 models

Precautions for transportation of T1 to T12 models:

- T1 to T6 models are small and light and therefore can be handled manually. T7 to T12 models, however, must be transported with an appropriate lifting tool.
- When handling the drive with a forklift, fix the drive to a wooden pallet. When handling the drive with a crane, fix the drive to the pallet and lift them together, as shown below.

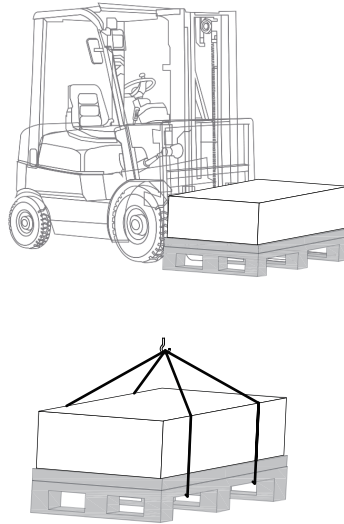


Figure 3-1 Lifting the drive

- T9 to T12 models are heavy with a high center of gravity. Therefore, avoid placing them on an inclined surface with an angle greater than 5 degrees. Place the AC drive on a flat and firm ground that can bear its weight.
- Transport the AC drive only when it is upright as indicated on the packaging box, as shown in the following figure. Never turn it upside down or place it on its side.

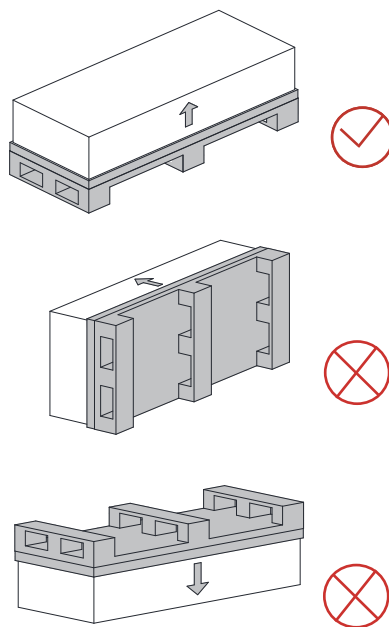


Figure 3-2 Placing the drive

T13 models

Precautions for transportation of T13 models:

- The AC drive is heavy with a high center of gravity. Therefore, avoid placing it on an inclined surface with an angle greater than 5 degrees. Place the AC drive on a flat and firm ground that can bear its weight.
- The equipment must be transported in the upright position as indicated on the packaging box. Never turn it upside down or place it on its side.

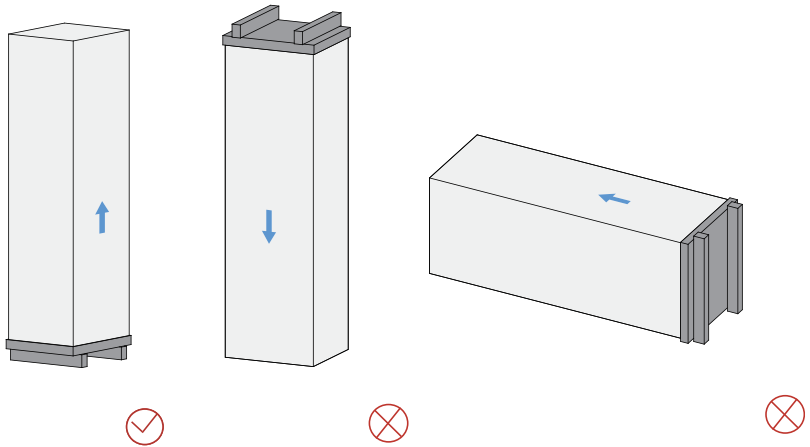


Figure 3-3 Upright position of the cabinet

- Suitable hoisting gear operated by trained personnel is required due to the heavy weight of the cabinet.
- Where applicable, use a forklift and a crane that have a carrying capacity greater than the cabinet weight to transport the cabinet.
- The cabinet must be carried on a wooden pallet when transported with the forklift. Do not remove the cabinet from the pallet during transport. Adjust the spacing between the forks to a distance greater than half the length of the cabinet.
- Considering the weight and length of the cabinet, use the lifting beam fixed at the top of the cabinet and the wooden pallet at the bottom of the cabinet to help lift the cabinet. The lifting strap of the hoist must pass through the pallet under the cabinet, with the relief height less than or equal to 0.3 m.
- The hydraulic vehicle must not move for a long distance or on the slop road.
- When being moved, the equipment must be held by persons from the left and right.

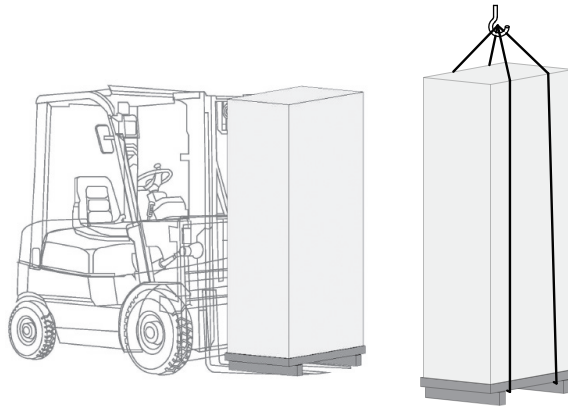


Figure 3-4 Transportation before unpacking

3.3 Package Check

When receiving goods from the shipping company, check that you have received all the items specified on the delivery note. Notify the shipping company immediately of any missing components or damage. Seek support from Inovance office or your local agent if necessary.

AC drives of different structural dimensions are different in size and weight, and hence are packed in different methods with different components incorporated.



Caution

If the equipment is damaged during transportation, its electrical safety can no longer be ensured. Do not connect the equipment before a professional high-voltage test is performed.

Packing list for T1 to T9 models

- T1 and T6 models are packed using cartons.
- T7 to T9 models are packed using cartons and plywood pallets.

The following figure shows the packing list.

- Packing list of T1 to T6 models

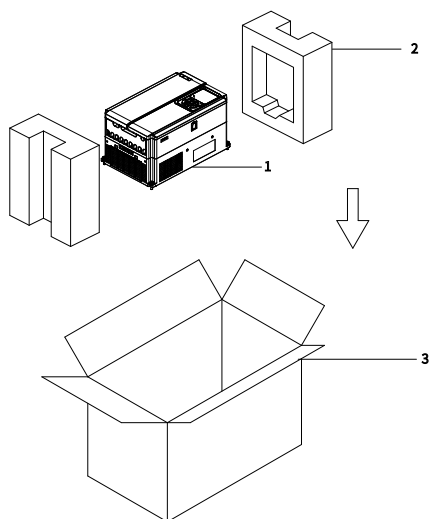


Figure 3-5 Packing list of T1 to T6 models

Table 3-1 Packing list of T1 to T6 models

No.	Name
1	AC drive
2	Cushion
3	Carton

- Packing list of T7 to T9 models

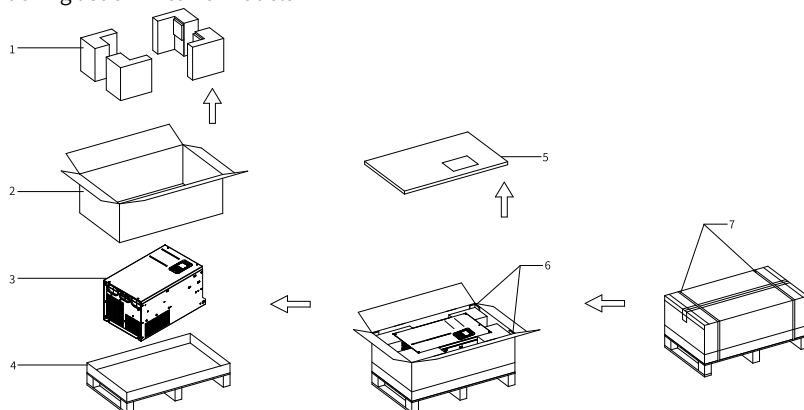


Figure 3-6 Packing list of T7 to T9 models

Table 3-2 Packing list of T7 to T9 models

No.	Name
1	Cushion
2	Carton
3	AC drive
4	Plywood pallet
5	Honeycomb cardboard
6	Paper corner protector
7	Packing strap

Packing list of T10 to T12 models

- T10 to T11 models are packed using cartons and plywood pallets.
- T12 models are packed using wooden crates.

The following figure shows the packing list.

- Packing list of T10 models

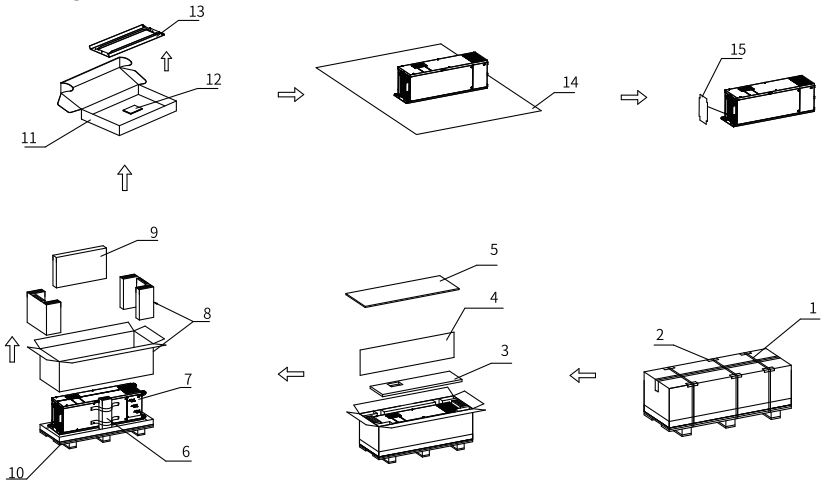


Figure 3-7 Packing list of T10 models

Table 3-3 Packing list of T10 models

No.	Name
1	Packing strap
2	Paper corner protector
3	Honeycomb cardboard
4	Corrugated cardboard
5	Wooden board
6	Paper column

No.	Name
7	AC drive
8	Carton
9	Bracket box
10	Wooden pallet
11	Carton
12	User guide
13	Bracket
14	Plastic bag
15	Corrugated cardboard

● Packing list of T11 models

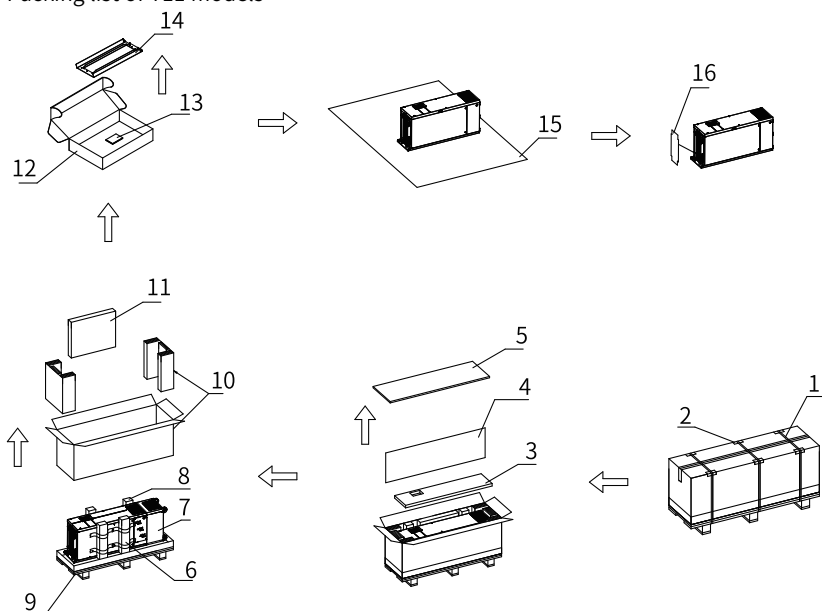


Figure 3-8 Packing list of T11 models

Table 3-4 Packing list of T11 models

No.	Name
1	Packing strap
2	Paper corner protector
3	Honeycomb cardboard
4	Corrugated cardboard
5	Wooden board
6	Paper column
7	AC drive

No.	Name
8	Paper column
9	Wooden pallet
10	Carton
11	Bracket box
12	Carton
13	User guide
14	Bracket
15	Plastic bag
16	Corrugated cardboard

- Packing list of T12 models

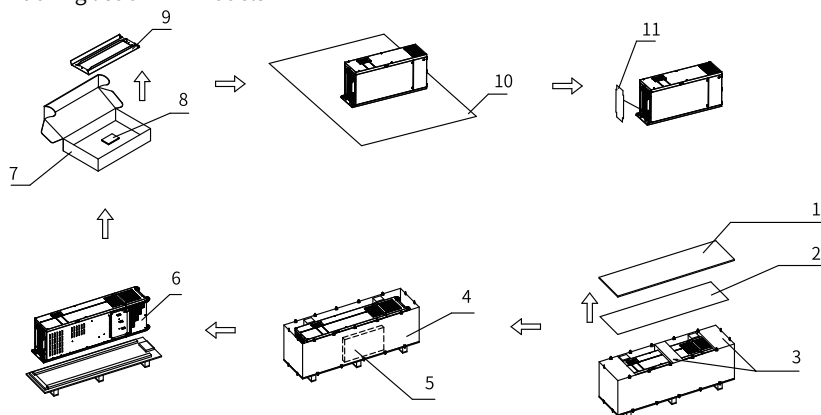


Figure 3-9 Packing list of T12 models

Table 3-5 Packing list of T12 models

No.	Name
1	Cover
2	Corrugated cardboard
3	Expanded polyethylene foam
4	Wooden crate
5	Bracket box
6	AC drive
7	Carton
8	User guide
9	Bracket
10	Plastic bag
11	Corrugated cardboard

Note

The T12 model without the reactor is packed in the same as the T11 model.

Packing list of T13 models

T13 models are provided with a standard cabinet or a cabinet with an auxiliary power distribution cabinet. For the two types of cabinets, the following components are packed.

- Packing list of a T13 model provided with a standard cabinet

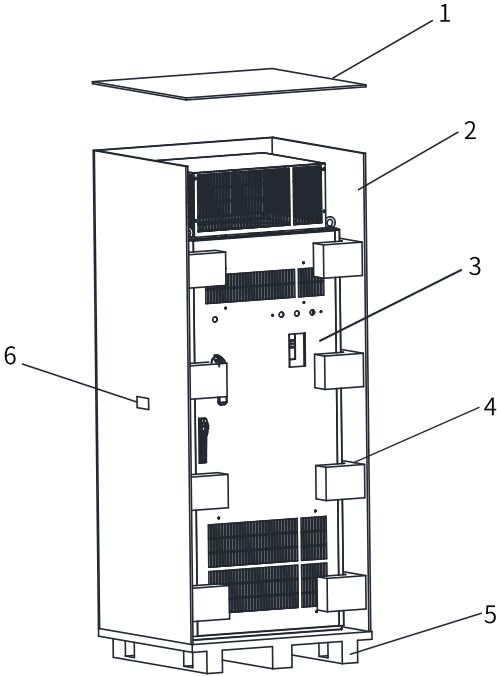


Figure 3-10 Packing list of a T13 model provided with a standard cabinet

No.	Name
1	Cover
2	Wooden crate
3	MD520AC drive
4	Expanded polyethylene foam

No.	Name
5	Base
6	Anti-inclination label

- Packing list of a T13 model provided with a cabinet with an auxiliary power distribution cabinet

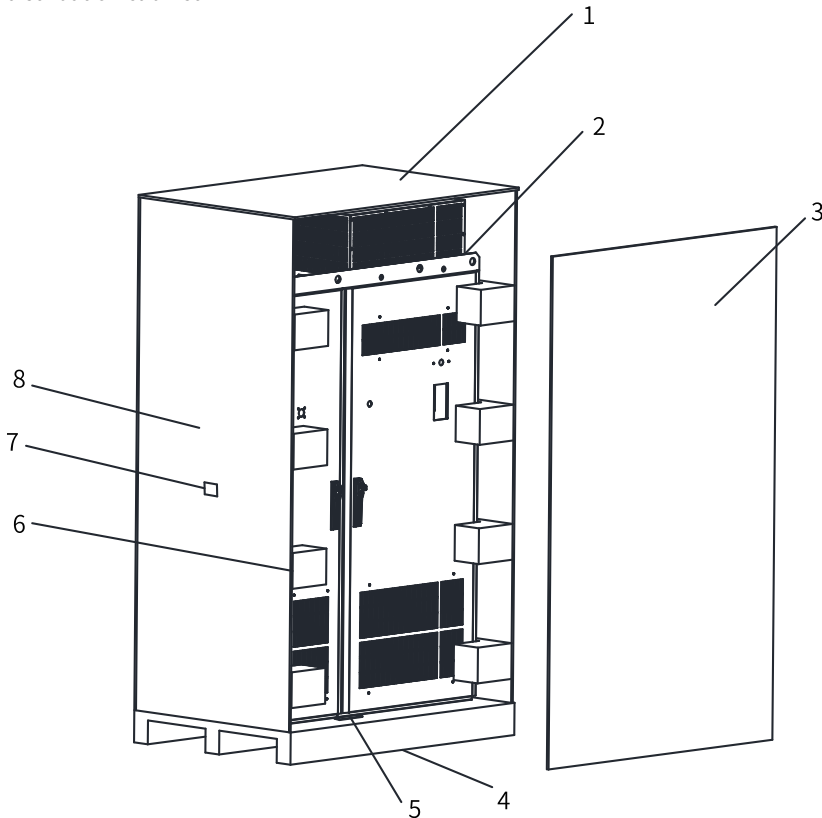


Figure 3-11 Packing list of a T13 model provided with a cabinet with an auxiliary power distribution cabinet

No.	Name
1	Cover
2	MD520AC drive
3	Front panel
4	Base
5	Plywood

No.	Name
6	Expanded polyethylene foam
7	Anti-inclination label
8	Side panel

3.4 Handling and Hoisting After Unpacking

T1 to T6 models are small and light and therefore can be handled manually. T7 to T13 models, however, must be transported with an appropriate lifting tool.

AC Drive Weight	Personnel Required for Handling
< 15 kg	1
≥ 15 kg	2, with proper lifting device

Precautions for handling and hoisting:

- Comply with local regulations when handling the AC drive.
- Avoid handling the AC drive by directly holding its upper cover or enclosure. Before handling, check that all screws have been tightened. Failure to comply may result in AC drive fall-off, causing personal injury.
- For T10 to T12 models, when fastening the AC drive, ensure that the four mounting holes on the back of the AC drive are securely connected to the fixing beam.
- Straighten the flat-lying equipment before further handling.
- Ensure that the load capacity of the crane for transportation is larger than the weight of the drive.
- Ensure that the upper cover, terminals, and other components of the AC drive are secured firmly with screws before vertical lifting. Failure to comply may result in physical injuries due to fall-off of the drive.
- When lifting the AC drive with the lifting rope, avoid subjecting the AC drive to excessive vibration or impact. Failure to comply may result in physical injuries due to fall-off of the drive.
- When lifting the AC drive with the lifting rope, do not turn the AC drive over or leave it suspended for long time. Failure to comply may result in physical injuries due to fall-off of the drive.

T1 to T9 models

To lift T1 to T9 models, do as follows:

1. Hook the lifting rope to the two auxiliary lifting lugs at the top of the drive.
It is recommended that the lifting angle be greater than 45 degrees and the height fluctuation be no greater than 0.3 m.

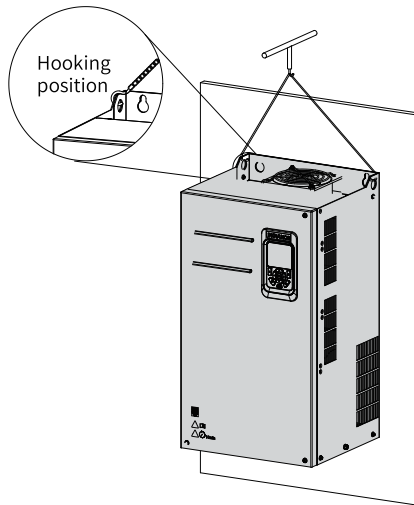


Figure 3-12 Lifting the AC drive

2. Roll up the lifting rope slowly with a crane. After the lifting rope is fully stressed, lift the drive up.
3. Lower the drive down slowly, with a pause at a certain height midway, then continue until the drive reaches the ground or mounting surface. Finally, install the drive to the control cabinet.

T10 to T12 models

To lift T10 to T12 models, do as follows:

1. Hook the lifting lugs at the top of the drive and the lifting holes at the bottom of the drive, take out the AC drive from the packing box, and lay it flat on the floor. Ensure that there is no stress on the positive and negative bus terminals.

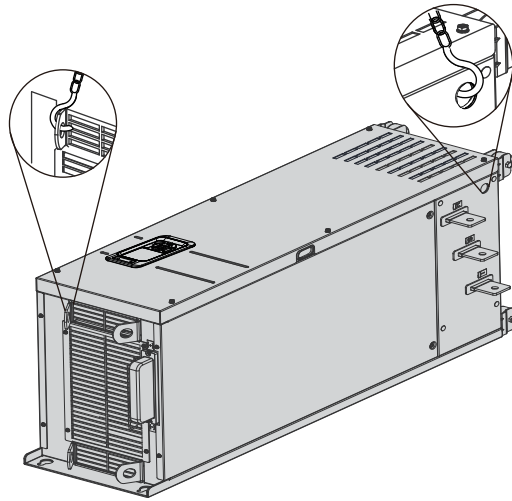


Figure 3-13 Lifting the AC drive

2. Hook the lifting rope to the lifting lugs diagonally placed at the top of the AC drive, slowly place the AC drive upright, and install it to the cabinet.



Caution

If the AC drive needs to be placed in an upright position, ensure the tilt angle of the place that holds the drive does not exceed 5°. Failure to comply may lead to rollover of the drive due to its heavy weight (nearly 200 kg) and large size.

T13 models

1. Before installation, remove the fixing screws from the four corners of the transportation pallet and the cabinet, and remove the pallet.

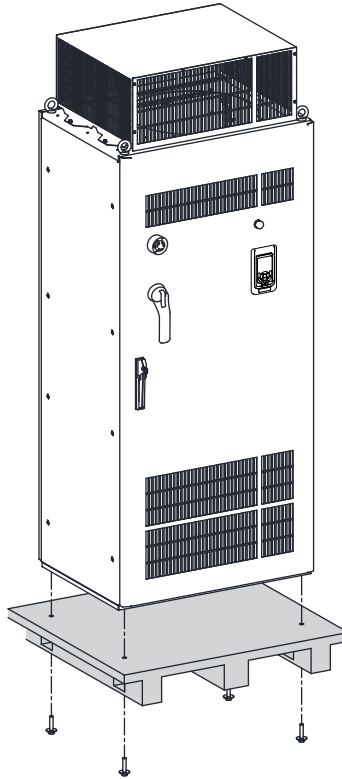


Figure 3-14 Unloading the cabinet from the pallet

2. Transport the cabinet with a crane whose carrying capacity is greater than the cabinet weight.
3. Lift the cabinet through the auxiliary lifting holes or lifting lugs at the top of the cabinet, with the relief height lower than or equal to 0.3 m.
4. Ensure that the cabinet has been locked before moving.
5. The cabinet must be held by hands on the left and right sides during movement.

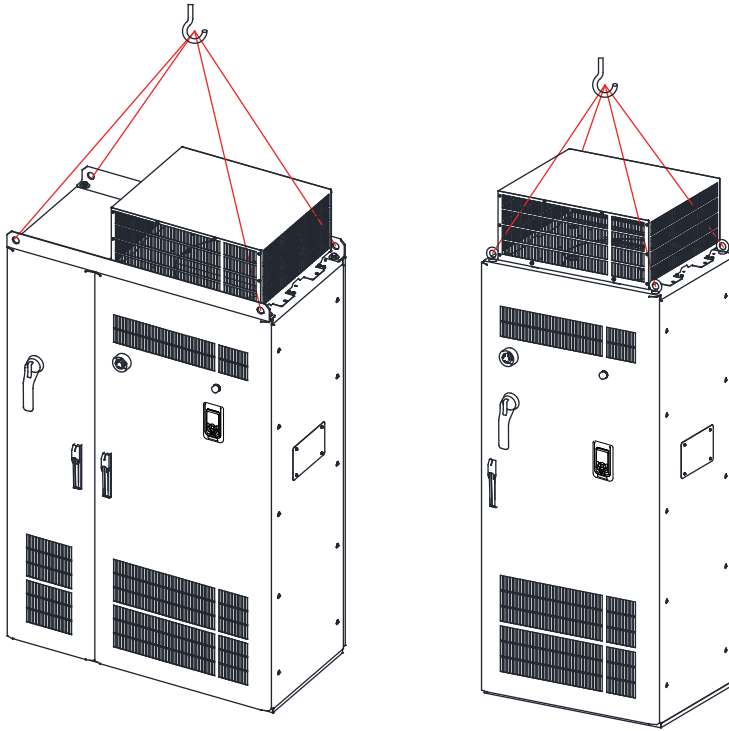


Figure 3-15 Transportation after unpacking

3.5 Unpacking

T1 to T12 models

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

1. Remove all the straps and ties and open the cover of the carton.
2. Remove all filler materials.
3. Take out the AC drive.
4. Cut and remove the plastic wrap around the AC drive.
5. Check the drive for any damage.
6. Dispose of or recycle the packing material according to local regulations.

T13 models

1. During unpacking, put the crowbar into the crate as short as possible to prevent damaging the equipment. Exercise caution to avoid injury by iron nails.

2. When removing the packing materials such as plastic film, do not use sharp tool to avoid scratching the equipment.
3. Place the packed product on the empty and flat ground of the workshop. Use appropriate tools, such as a crowbar, to pry off the crate along the gap at the plate edge. Then, remove the cover plate, side plate, and pallet in the sequence indicated in the figure.

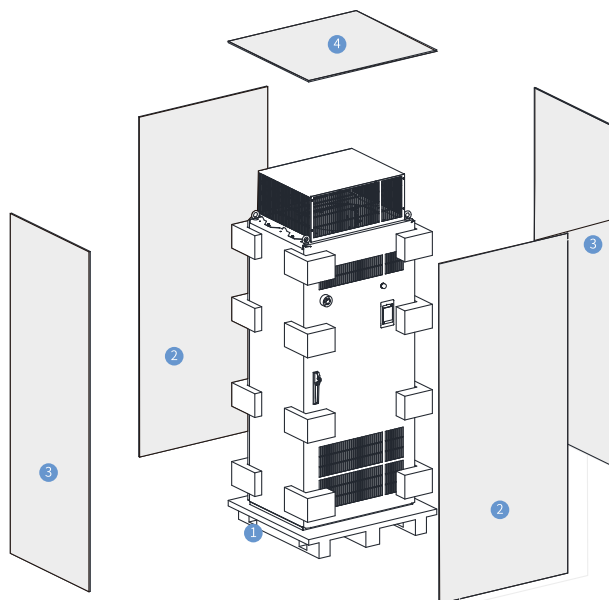


Figure 3-16 Unpacking the AC drive

Note

Dispose of the packing materials according to local laws and regulations.

4 Mechanical Installation (T1 to T9 Models)

4.1 Installation Mode

T1 to T9 models support backplate mounting and through-hole mounting.

4.2 Cabinet Design

4.2.1 Overview

Before installing the AC drive in the cabinet, design the cabinet to ensure sufficient clearances for installation and heat dissipation. Take the following factors into consideration:

- Cabinet clearance requirement
- Mounting backplate
- Cabinet heat dissipation

4.2.2 Cabinet Clearance Requirements

For T1 to T9 models, multi-layer installation is recommended. That is, install one AC drive above another. The following table lists the minimum clearance between the upper and lower AC drives. Install an air guide plate above each AC drive except the top one.

Table 4-1 Minimum clearance (mm) for multi-layer installation

Item	T1 to T4	T5	T6	T7 to T9
S1	≥ 100	≥ 200	≥ 200	≥ 300
S2	≥ 100	≥ 200	≥ 200	≥ 300
...	≥ 100	≥ 200	≥ 200	≥ 300
Sn	≥ 100	≥ 200	≥ 200	≥ 300

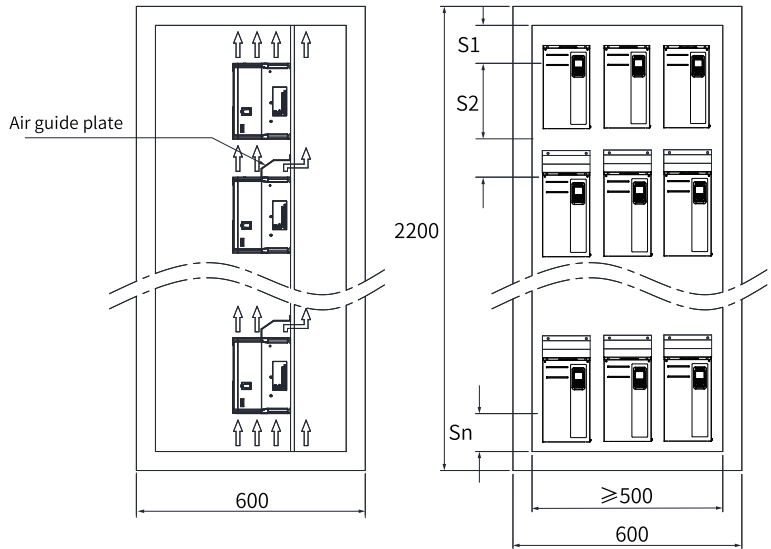


Figure 4-1 Minimum clearance (mm) for multi-layer installation

Note

Observe the ventilation direction when installing the fan to ensure smooth discharge of hot air. Failure to comply may cause failure in hot air exhaust, and over-temperature or damage to the AC drive. Ensure a distance of at least 200 mm between the air exhaust top cover and the fan outlet to avoid adverse effect on the cooling performance of the fan.

4.2.3 Mounting Backplate Requirements

Requirements of backplate thickness, dimensions, and stiffness

To avoid damage to the AC drive during transportation and ensure proper operation of the AC drive, use a mounting plate with excellent stiffness and strength performance, and a thickness of at least 2 mm. Reinforce the backplate where appropriate. For example, weld a lateral reinforcing beam on the back of the backplate, as shown in the following figure.

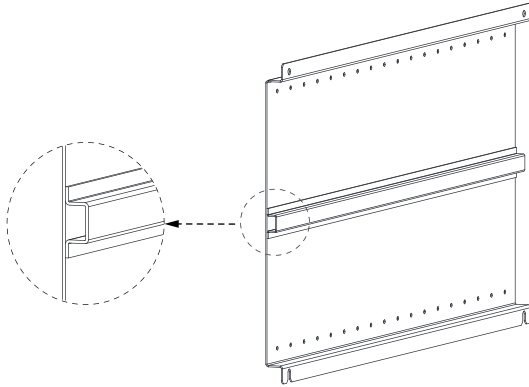


Figure 4-2 Welding a lateral reinforcing beam on the back of the backplate

Requirement on the mounting holes

- You can drill mounting holes on the backplate in advance. For detailed mounting hole dimensions, see ["2.1 Dimensions of T1 to T9 Models" on page 53](#).
- To avoid damage to the AC drive during transportation, fix the drive to the mounting backplate by using screws. In addition, use self-clinching nuts or independent nuts on the back of the backplate to enhance screw-thread fitting and fastening effect.

4.2.4 Cabinet Heat Dissipation

Heat dissipation design of the cabinet door

The AC drive is forcibly cooled by a built-in fan. To ensure that enough cooling air enters the cabinet, open an air inlet with an appropriate size on the cabinet door.

The air flows from bottom to top after being heated. Therefore, the cabinet air inlet must be at least 50 mm lower than the air inlet of the drive, as shown below.

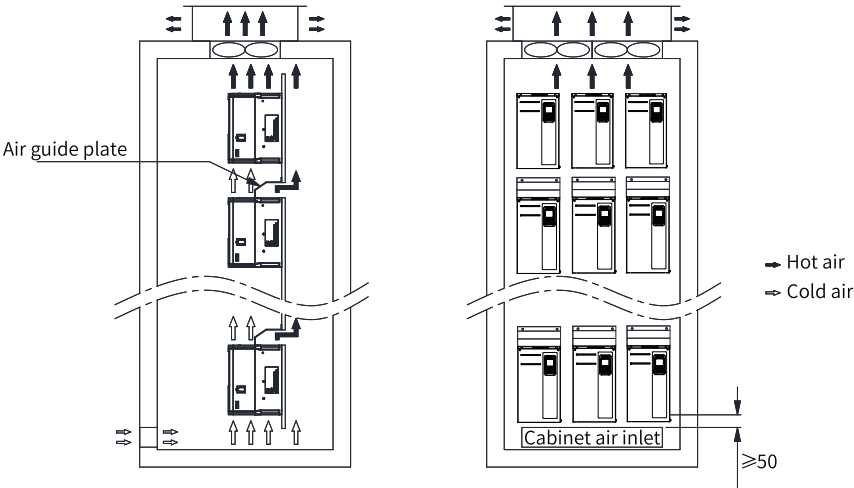


Figure 4-3 Position of the cabinet air inlet

 Caution

Where multiple AC drives are installed in one cabinet, if the fan blows air into the air inlet from the outside, air distribution for the drives in the cabinet will be affected, resulting in poor cooling performance. Therefore, do not install a fan at the air inlet of the cabinet to blow air into the cabinet.

The following table describes the minimum effective ventilation area of the cabinet air inlet after the drive is installed in the cabinet.

Table 4-2 Minimum effective ventilation area of the cabinet air inlet

AC Drive	Minimum Effective Ventilation Area of the Cabinet Air Inlet (cm ²)
T1	20
T2	25
T3 (7.5 kW)	50
T3 (11 kW)	
T4	60
T5	
T6 to T7	102
T8	204
T9	318

The preceding table applies to situations where only one AC drive is mounted in the cabinet. For a cabinet containing multiple AC drives, calculate the total ventilation area by adding the ventilation area of each drive according to the table. For example, if eight T3 models (7.5 kW), two T5 models, and one T9 model are placed inside the cabinet, the minimum effective ventilation area of the cabinet air inlet is $8 \times 25 + 2 \times 60 + 1 \times 318 = 638 \text{ cm}^2$.

If an air filter is installed at the air inlet, the air inlet resistance will rise significantly. Therefore, the ventilation area of the air inlet must be increased to 1.2 to 1.5 times the value indicated in the table.

The ventilation area in *"Table 4-2 Minimum effective ventilation area of the cabinet air inlet" on page 82* refers to the actual through-hole area of an opening. The ventilation area is calculated by the following: opening area x opening rate.

Top ventilation design

To ensure sufficient heat dissipation of the drive, hot air in the cabinet must be exhausted to the outside. The passive or active air ventilation mode can be adopted.

- Passive air ventilation (self-ventilated)

The air flows from bottom to top after being heated. In this mode, the hot air discharged by the drive is exhausted to the outside from the air outlet at the top of the cabinet.

This might cause accumulated hot air at the top of the cabinet, rising the air pressure. The air pressure at the cabinet air inlet is low due to suction of the fan for the drive. Therefore, there is an air pressure difference between the air outlet and air inlet of the cabinet to form an air flow in the cabinet. The air flow forces hot air at the air outlet to flow towards the air inlet so that it is absorbed into the drive again, causing a great temperature rise and an adverse effect on the performance of the drive.

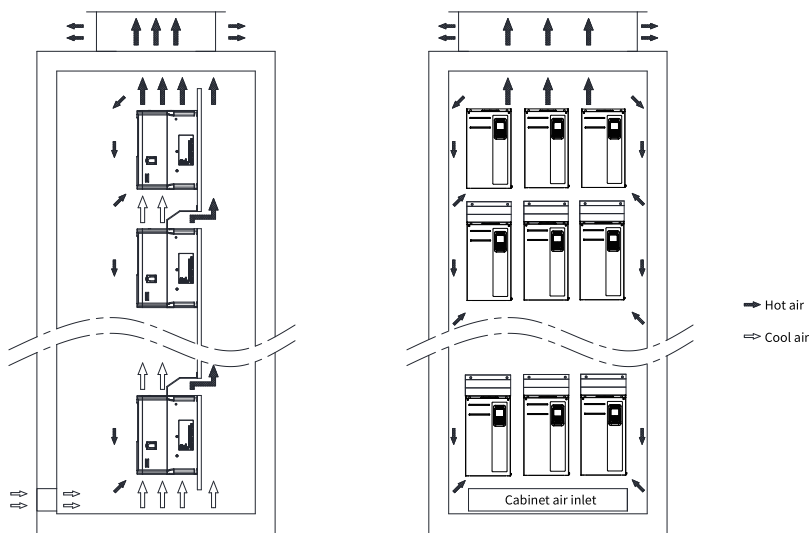


Figure 4-4 Hot air backflow in the passive air ventilation mode (without isolation devices)

For cabinets that adopt the passive air ventilation mode, use an isolation device to prevent hot air backflow, as shown below. The isolation device can be a plate or exhaust duct.

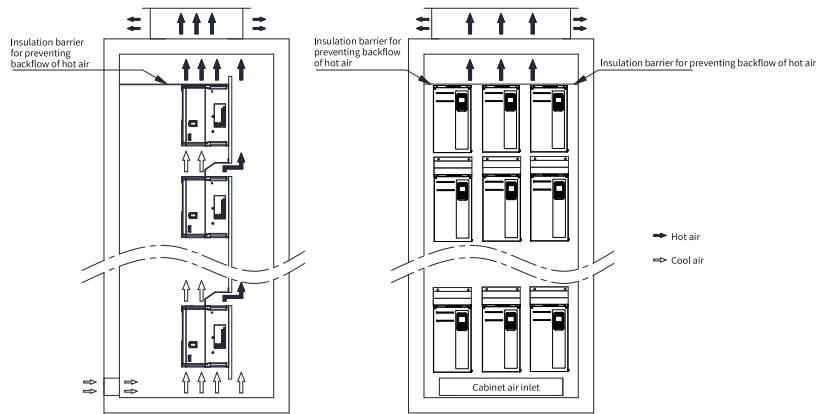


Figure 4-5 Hot air backflow in the passive air ventilation mode (with isolation device)

The temperature at the air outlet of the drive is higher than that at the air inlet and the density at the air outlet is lower than that at the air inlet. To ensure that hot air in the cabinet can be exhausted to the outside, the minimum effective ventilation areas of the cabinet air outlet must meet the requirements in ["Table 4-3 Minimum](#)

effective ventilation area of the air outlet in the passive air ventilation mode" on page 85 when passive air ventilation is used.

Table 4-3 Minimum effective ventilation area of the air outlet in the passive air ventilation mode

AC drive	Minimum Effective Ventilation Area (cm ²)
T1	32
T2	40
T3 (7.5 kW)	
T3 (11 kW)	80
T4	
T5	96
T6 to T7	163
T8	326
T9	509

"Table 4-3 Minimum effective ventilation area of the air outlet in the passive air ventilation mode" on page 85 applies to situations where only one AC drive is mounted in the cabinet. For a cabinet containing multiple AC drives, calculate the total ventilation outlet area by adding the ventilation area of each drive according to the table.

For the air outlet installed with a filtering net, the air outlet resistance increases substantially. In this case, the minimum ventilation area of the air outlet must be increased to 1.2 to 1.5 times the value listed in the preceding table.

The ventilation area in *"Table 4-3 Minimum effective ventilation area of the air outlet in the passive air ventilation mode" on page 85* refers to the actual through-hole area of the opening. The ventilation area is calculated by the following: opening area x opening rate.

- Active air ventilation

In the active air exhaust mode, a fan is installed on the top of the cabinet to draw hot air out of the cabinet. This is a commonly used ventilation mode.

To ensure that the hot air can be exhausted to the outside, the total air volume of the fan cannot be smaller than that of all drives in the cabinet. *"Table 4-4 AC drive cooling air volume" on page 85* lists the cooling air flow required by the drive.

Table 4-4 AC drive cooling air volume

AC Drive Power	Cooling Air Flow (CFM)
0.4 kW to 1.1 kW	/
1.5 kW to 3.0 kW	11
3.7 kW	20
5.5 kW	24
7.5 kW	29
11 kW to 15 kW	50

AC Drive Power	Cooling Air Flow (CFM)
18.5 kW	52
22 kW	58
30 kW	130
37 kW	102
45 kW to 55 kW	125
75 kW to 90 kW	225
110 kW	350
132 kW	541
160 kW	620
Note: 1 CFM = 0.02832 m ³ /min	

Cabinet fan design

To select the fan for the cabinet, do as follows:

1. Calculate the sum of the cooling air volume required by all AC drives based on *"Table 4-4 AC drive cooling air volume" on page 85*.
2. Determine the maximum air volume (Q_{max}) of the cabinet fan.
3. Determine the specification and quantity of the fan based on the maximum air volume (Q_{max}).

Where:

- The maximum air volume of the cabinet is 1.3 to 1.5 times the sum of the cooling air volume.
- The maximum air volume of the cabinet is 1.6 to 2.2 times the sum of the cooling air volume if mesh filters, shutters, or other components are installed at the cabinet air outlet.

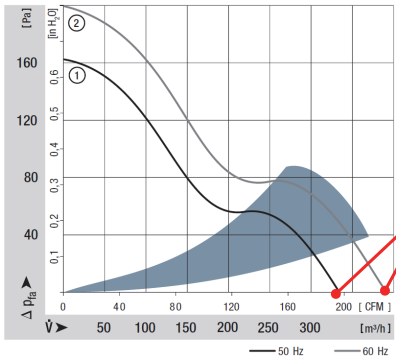
Note

Select a fan whose air volume is not smaller than the maximum air volume Q_{max}. Install multiple fans in parallel if one fan alone cannot meet the requirements.

The common specifications of the fan air volume is shown below.

Air flow	Air flow	Nominal voltage	Frequency	Sound pressure level	Sound power level	Sinter sleeve bearings Ball bearings	Power input	Nominal speed	Temperature range	Service life L ₁₀ at 40 °C	at T _{max}	Curve
m ³ /h	CFM	V	Hz	dB(A)	Bel(A)	■ / ■	Watts	RPM	°C	Hours	Hours	
320	188,3	230	50	51	6,4	■	27,0	2 800	-25...+55	60 000 / 32 000		1
380	223,6	115	60	56	6,8	■	28,0	3 350	-25...+65	55 000 / 18 000		2

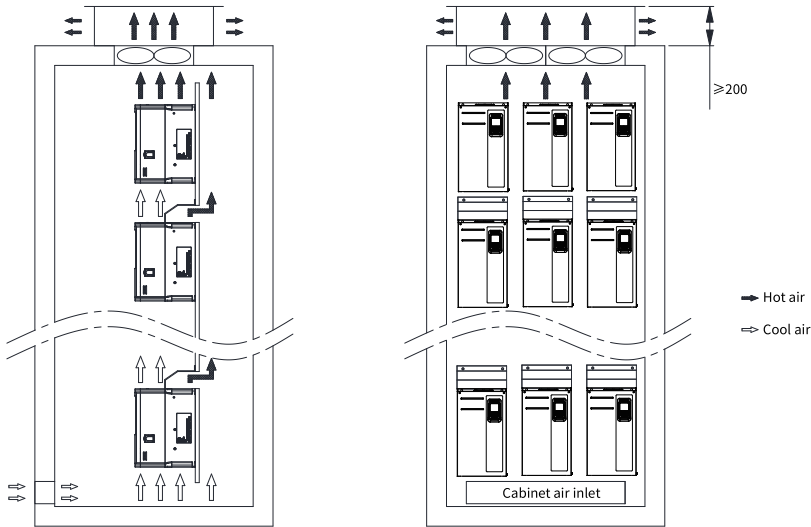
Maximum fan air volume (Q_{max})



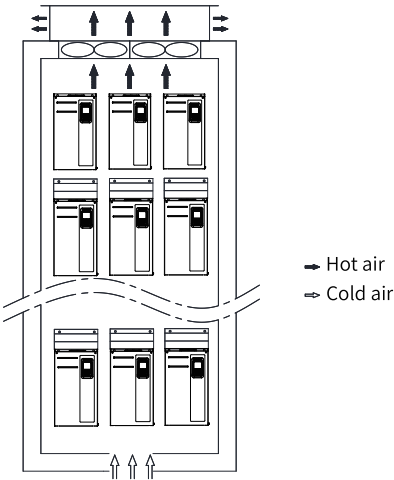
Maximum fan air volume (Q_{max})

Figure 4-6 Q_{max} of a system fan

1. The air inlet is on the front door at the bottom of the cabinet and the air output is at the top of the cabinet.



2. The air inlet is at the bottom of the cabinet and the air output is at the top of the cabinet.



3. The air inlet is at the bottom of the cabinet and the air outlet is on the top side of the cabinet.

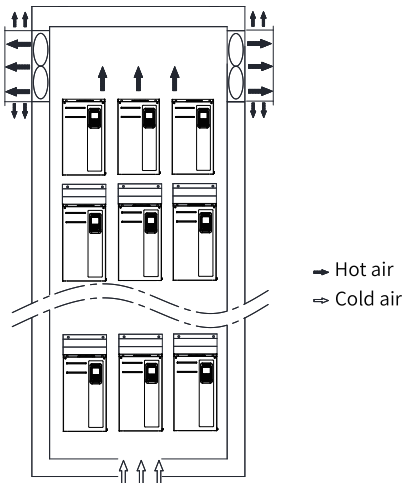


Figure 4-7 Cabinet ventilation system

The air duct layout of the cabinet can be adjusted properly if the installation dimensions are met.

Note

- When installing the fan, ensure a proper direction and smooth flow of hot air. Failure to comply may cause accumulation of hot air, leading to over-temperature or damage to the AC drive.
 - Ensure a distance of at least 200 mm between the top vent and the fan outlet to avoid adverse effect on the cooling performance of the fan.
-

4.3 Pre-installation Precautions

- Ensure the installation location is sturdy enough to bear the mechanical strength of the drive.
- Cover the top of the AC drive with a piece of cloth or paper during installation to prevent unwanted objects such as metal chippings, oil, and water from falling into the drive. Failure to comply may cause malfunction of the AC drive. After installation is done, remove the cloth or paper. Failure to comply may degrade ventilation and result in unexpected heat.
- Reserve sufficient clearance for heat dissipation, including heat dissipation of other components in the cabinet. For details, see "Installing one drive" in ["1.2.3 Installation Clearance" on page 20](#).
- Install the drive vertically upward to facilitate heat dissipation. To install multiple drives in one cabinet, arrange them side by side. When multiple drives need to be installed one above another, install an air guide plate between drives. For details, see "Installing drives one above another" in ["1.2.3 Installation Clearance" on page 20](#).
- The mounting bracket (if needed) must be made of incombustible materials.
- In environments with metal dust, use an enclosed cabinet that can completely isolate the drive from the metal dust. In this case, ensure the maximum possible space in the cabinet and install cooling devices outside the cabinet.
- Tighten all screws with the specified tightening torque. Failure to comply may result in electric shock or fire.
- Keep combustible and explosive materials away from the AC drive.

4.4 Backplate Mounting

Fix the AC drive with all nuts. Do not fasten only the upper two nuts on the drive. Otherwise, the drive may fall off due to uneven force during long-time running.

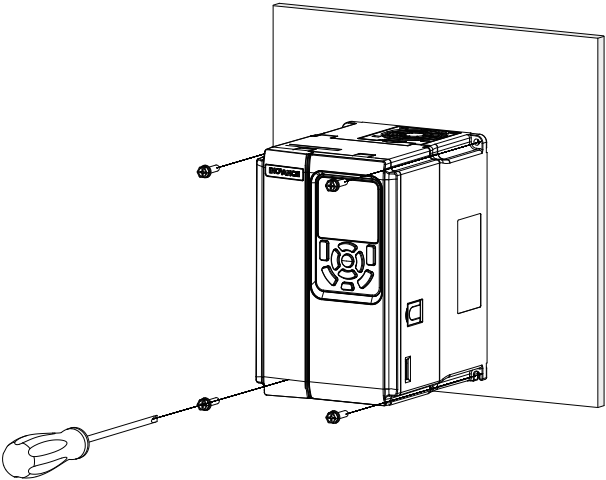


Figure 4-8 Backplate mounting of T1 and T6 models

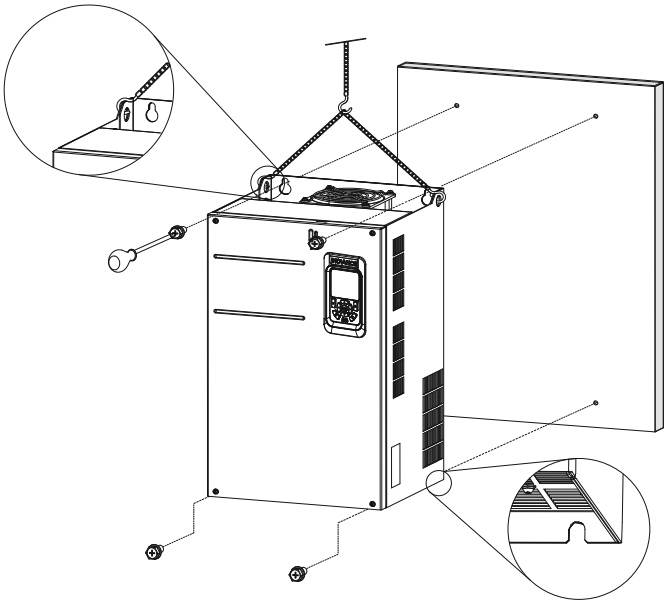
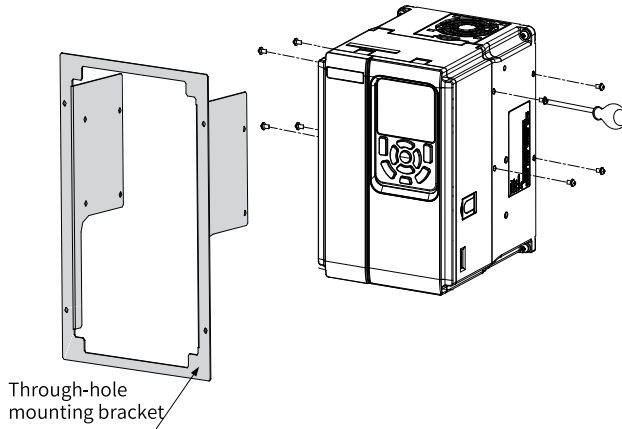


Figure 4-9 Backplate mounting of T7 and T9 models

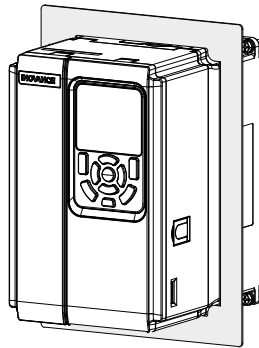
4.5 Through-Hole Mounting

T1 to T6 models

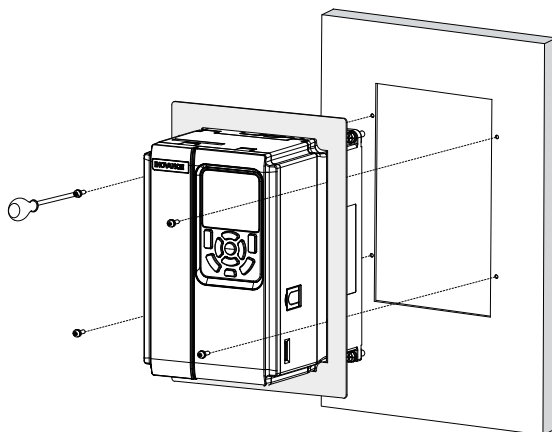
1. Install the AC drive through the mounting bracket, and then fix the screws at both sides of the bracket.



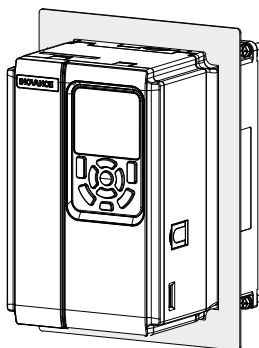
The following figure shows an AC drive with a bracket mounted.



2. Fix the AC drive with the bracket on the backplate of the control cabinet.

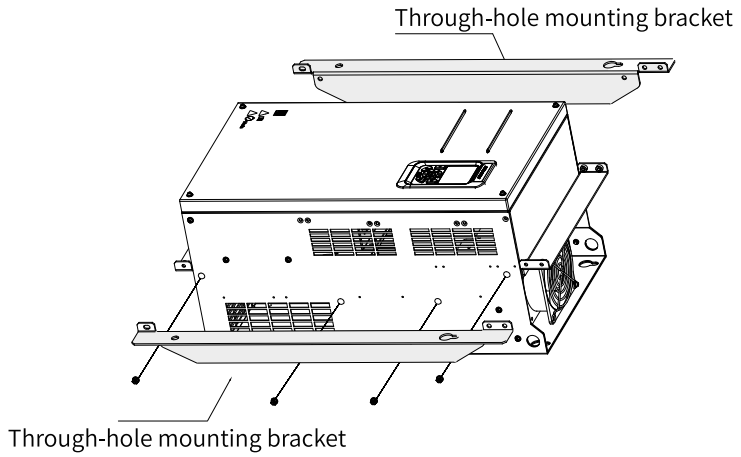


The following figure shows an AC drive with the bracket mounted in the cabinet.

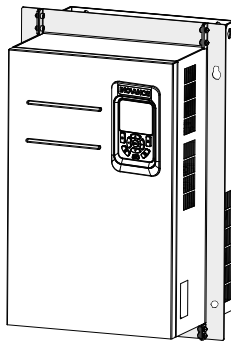


T7 to T9 models

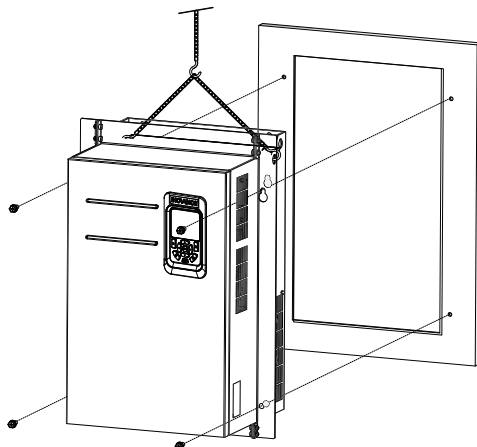
1. Fix the through-hole mounting bracket from both sides of the enclosure.



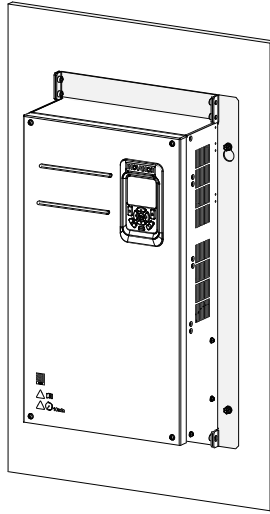
The following figure shows an AC drive with brackets mounted.



2. Fix the drive with brackets to the backplate of the control cabinet.



The following figure shows an AC drive with the bracket mounted in the cabinet.



4.6 Cover Removal and Installation

4.6.1 Removing the Cover

Before wiring the control circuit, for example, connecting the jumper, PG card, or functional expansion card, remove the cover of the AC drive. When removing the cover, hold the cover with your hands and carefully lift the lower part of the cover to prevent it from falling off. Failure to comply will result in equipment damage or personal injury.

Prerequisites

Before removing the cover, ensure that the machine has been powered off for over 10 minutes.

Context

The following figure shows the positions of the control board, jumper, and expansion card after the cover is removed.

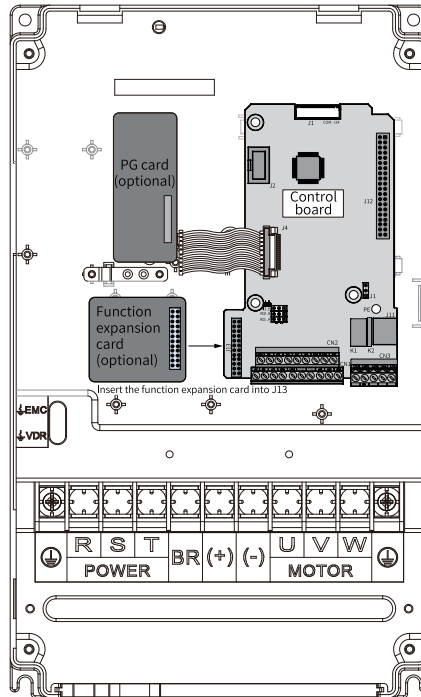
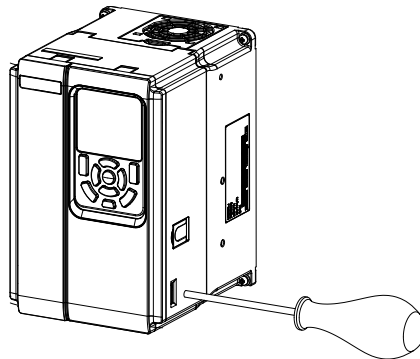


Figure 4-10 Control board position

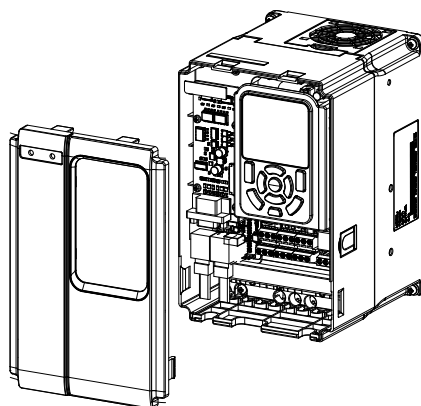
1. Remove the cover for T1 to T6 models.
 - a. Use a tool to push the snap-fit joints inwards at both sides of the drive to release the cover.



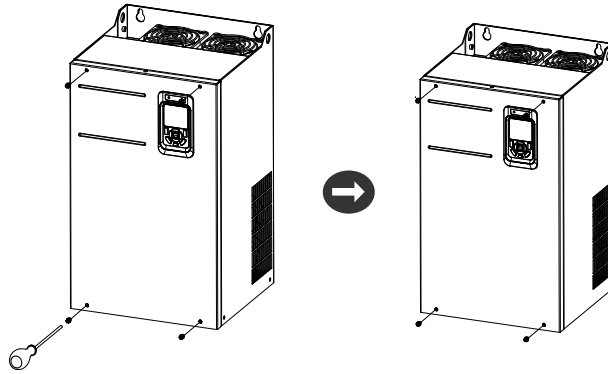
- b. Hold the cover with your hands, lift the lower part of the cover (as shown in ①), push the cover upward, and lift the upper part of the cover (as shown in ②).



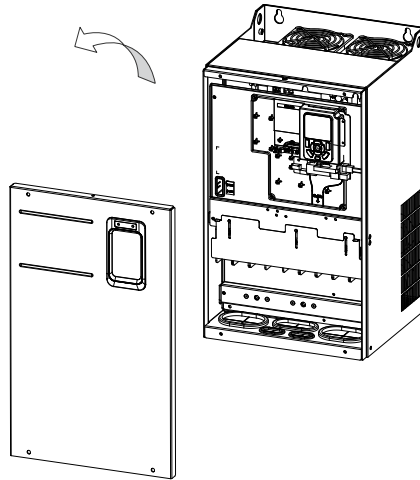
The following figure shows the drive without the cover.



2. Remove the cover for T7 to T9 models.
 - a. Release the four fixing screws on the cover with a screwdriver.



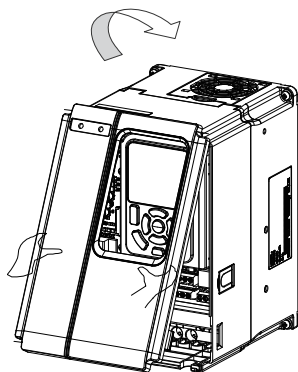
- b. Hold the cover with both hands and lift it up in the direction indicated by the arrow.



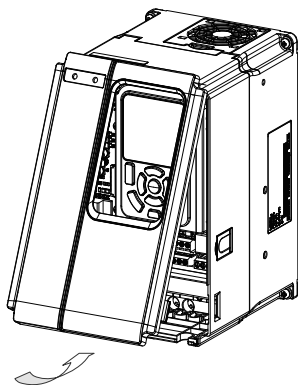
4.6.2 Installing the Cover

The cover of the AC drive must be removed before wiring the main circuit and control circuit. After wiring is done, re-install the cover.

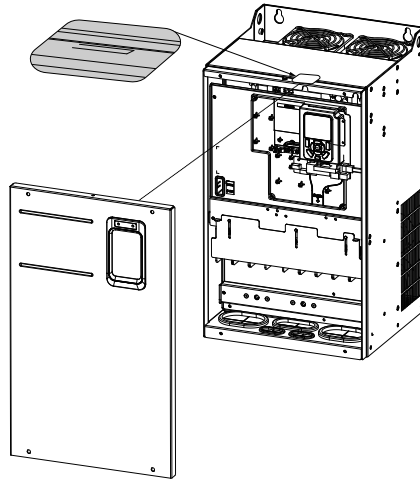
1. Install the cover for T1 to T6 models.
 - a. Hold the cover with both hands and insert the upper edge snap-fit joint of the cover into the hole on the drive.



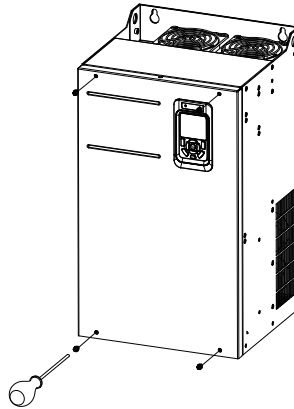
- b. Then, press down the cover in the direction indicated by the arrow.



2. Install the cover for T7 to T9 models.
 - a. Hold the cover with both hands, align the cover with the upper edge snap-fit joint on the chassis and push it in place as shown in the following figure.



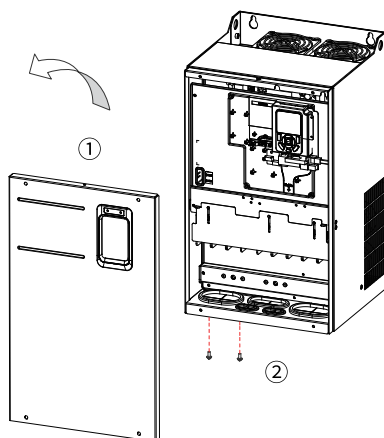
b. Install and fix the four fixing screws with a screwdriver.



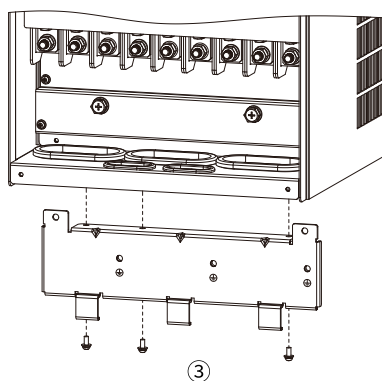
4.7 Installation of Cable Shield Grounding Bracket

Procedure

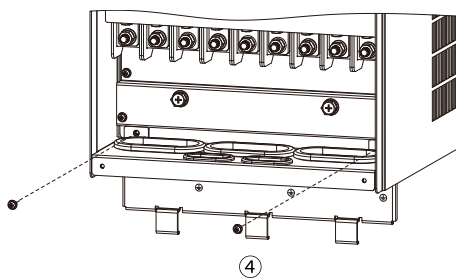
1. Remove the cover as shown in ①. Remove the two M4x12 SEMS screws on the air inlet plate, as shown in ②.



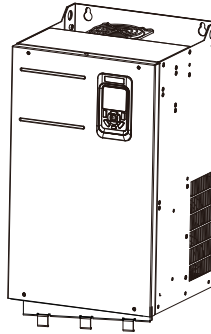
2. Place the ground bracket of the cable shield on the chassis, and fasten the bracket with three M4 x 12 SEMS screws at the positions shown in ③.



3. Tighten two M4x12 SEMS screws at the positions shown in ④.



4. Install the cover.



⑤

Note

For selection of the cable shield ground bracket, see ["1.4.1 List of Options" on page 31.](#)

5 Mechanical Installation (T10 to T12 Models)

5.1 Installation Mode

T10 to T12 models can be installed in a cabinet.

5.2 Pre-installation Precautions

- Before installing the AC drive, install the bottom mounting bracket and mounting guide rail in the cabinet, prepare mounting beams used for fixing the drive, and reserve fixing holes on the mounting beam. Reserve sufficient space for connecting the side copper busbar inside the cabinet.
- Use the guide rails and the four casters of the AC drive to move the AC drive into or out of the cabinet. Align the casters with the guide rails before a push or pull operation. To ensure safety, arrange two persons to pull or push the AC drive together.
- Reserve sufficient clearance for heat dissipation, including heat dissipation of other equipment in the cabinet.
- To push the AC drive into or pull it out of the cabinet, arrange two persons to work together. After pushing the AC drive into the cabinet, remove the cardboard from the air outlet of the cabinet to avoid over-temperature caused by failure to exhaust hot air.
- Install an air deflector at the top of the cabinet to avoid circulation of hot air inside the cabinet. Prepare air inlets at the lower part of the cabinet door.
- The cabinet is 2200 mm x 800 mm x 600 mm (including a ventilation top cover with the height of 200 mm). The cabinet needs to be installed on a base that is 100 mm in height.
- When the drive is installed in an enclosed environment, such as a cabinet or casing box, use a cooling fan or air conditioner to keep the temperature of the air taken in below 50°C. Failure to comply will result in overheat or fire.
- Cover the top of the AC drive with a piece of cloth or paper during installation to prevent unwanted objects such as metal shavings, oil, and water from falling into the drive. Failure to comply may cause malfunction of the AC drive. After installation is done, remove the cloth or paper. Failure to comply will degrade ventilation and result in unexpected heat.
- The mounting bracket (if needed) must be made of incombustible materials.
- In environments with metal dust, use an enclosed cabinet that can completely isolate the drive from the metal dust. In this case, ensure the maximum possible space in the cabinet and install cooling devices outside the cabinet.
- Tighten all screws with the specified tightening torque. Failure to comply may result in electric shock or fire.
- Keep combustible and explosive materials away from the AC drive.

5.3 Heat Dissipation Design

When installing T10 to T12 models in a cabinet, reserve sufficient space for heat dissipation. A passive-ventilated cabinet has no fan on the top.

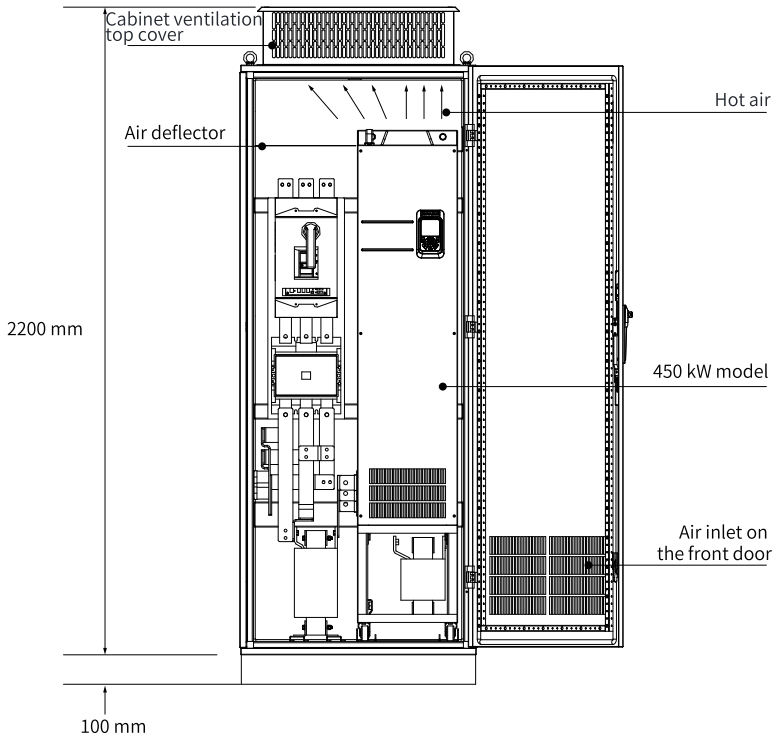


Figure 5-1 Passive-ventilated cabinet

Table 5-1 Parameters of a passive-ventilated cabinet

Model	Quantity of Fans	Total Air Volume (CFM)	Effective Area of the Cabinet Air Inlet (mm ²)	Effective Area of the Cabinet Air Outlet (mm ²)
T9 (132 kW)	2	541	31809	50894
T9 (160 kW)	2	620	31809	50894
T10 (200 kW)	2	586	31809	50894
T10 (220 kW)	2	722	31809	50894
T11 (250 kW)	3	789	47713	76341
T11 (280 kW)	3	882	47713	76341
T12 (315 kW)	3	644	47713	76341

Model	Quantity of Fans	Total Air Volume (CFM)	Effective Area of the Cabinet Air Inlet (mm ²)	Effective Area of the Cabinet Air Outlet (mm ²)
T12 (355 kW)	3	796	47713	76341
T12 (400 kW)	3	796	47713	76341

Note

- CFM = 0.0283 m³/min
- "Actual Effective Area" indicates through-hole area.

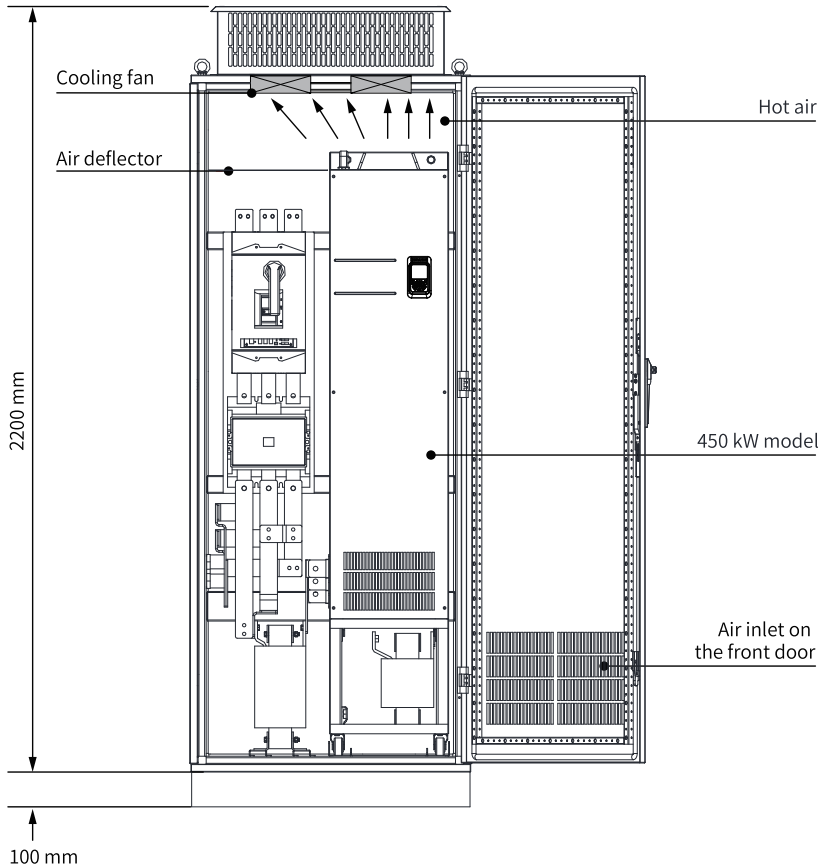


Figure 5-2 Cabinet with top-mounted fans

Table 5-2 Heat dissipation specifications for the cabinet with fans on the top

Model	Quantity of Fans	Total Air Volume (CFM)	Effective Area of the Cabinet Air Inlet (mm ²)	Max. Air Volume Required by Fan (CFM)	Effective Area of the Cabinet Air Outlet (mm ²)
T9 (132 kW)	2	541	31809	649	$S = 0.942 \times N \times (D_{out}^2 - D_{HUB}^2)$ In the preceding formula, N indicates the quantity of top-mounted fans, Dout indicates the diameter of the top-mounted fan, and DHUB indicates the diameter of the top-mounted fan hub.
T9 (160 kW)	2	620	31809	744	
T10 (200 kW)	2	586	31809	703	
T10 (220 kW)	2	722	31809	866	
T11 (250 kW)	3	789	47713	947	
T11 (280 kW)	3	882	47713	1058	
T12 (315 kW)	3	644	47713	773	
T12 (355 kW)	3	796	47713	955	
T12 (400 kW)	3	796	47713	955	

Note

- CFM = 0.0283 m³/min
- "Actual Effective Area" indicates through-hole area.

As shown in the following figure, the heat dissipation duct of the drive must be isolated in the cabinet to prevent the hot air from circulating in the cabinet. Use an air deflector for isolation to ensure that the hot air of the drive can be exhausted from the heat dissipation hole on the top of the cabinet.

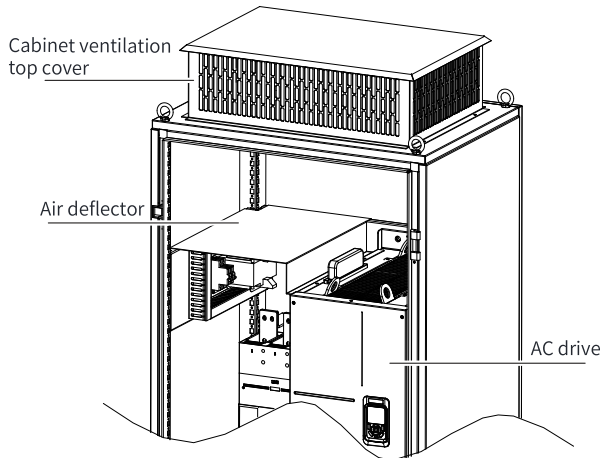


Figure 5-3 Air deflector in the cabinet

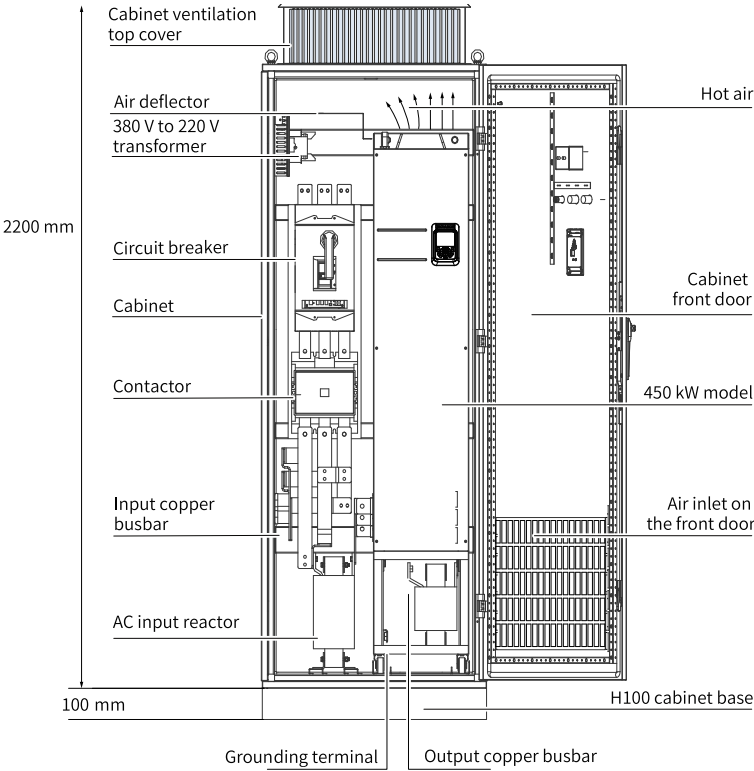


Figure 5-4 Recommended cabinet layout for T12 models

5.4 Installation Within the Cabinet

Context

The nine-fold profile cabinet (PS cabinet) is recommended. This kind of cabinet is in an assembled structure, which is cost effective. The openings on the main column of the cabinet meet the general standards, facilitating the design of mounting beams and structure strengthening. In summary, the nine-fold profile cabinet is a kind of industrial standard cabinet with high reliability. *"Figure 5-5 " on page 107* shows the cross section of the nine-fold profile cabinet.

Procedure

1. In the nine-fold profile cabinet (PS cabinet), install the mounting beam for fixing the AC drive and reserve fixed holes.

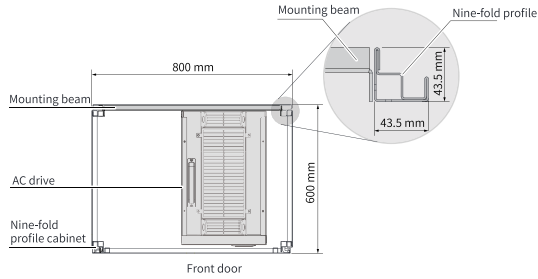


Figure 5-5 Top view of the cabinet for T11 and T12 models

To install T11 to T12 models into the nine-fold profile cabinet with the depth of 600 mm, bend the back mounting board inwards (not required for the cabinet with the depth of 800 mm), as shown in ["Figure 5-6 " on page 107](#) . However, if the cabinet with the depth of 600 mm has both front and back doors, the AC drive cannot be installed in this kind of cabinet. Instead, install the AC drive into the cabinet with the depth of 800 mm.

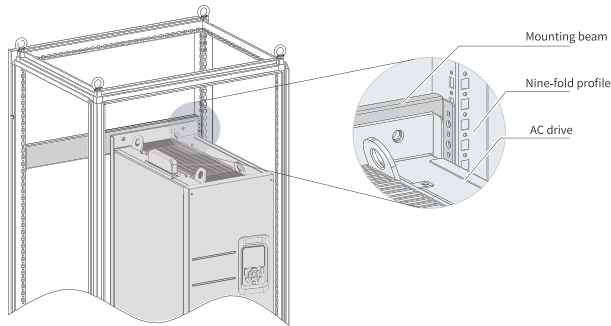


Figure 5-6 3D of the cabinet for T11 and T12 models

2. Fix the bottom mounting bracket in the nine-fold profile cabinet.

Fix the mounting bracket to the base of the nine-fold profile cabinet by using six M5 self-tapping screws, as shown in ["Figure 5-7 " on page 107](#) .

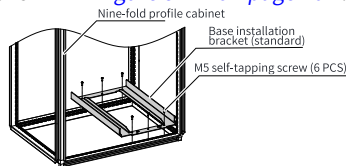


Figure 5-7 Installing the bottom mounting bracket

Drill holes for the mounting bracket and assemble the bracket on site if the cabinet is not a nine-fold profile one.

3. Assemble the guide rails (model: MD500-AZJ-A3T10) and mount the guide rail assembly to the cabinet.

- a. Assemble the guide rail, as shown in *"Figure 5-8 " on page 108 .*

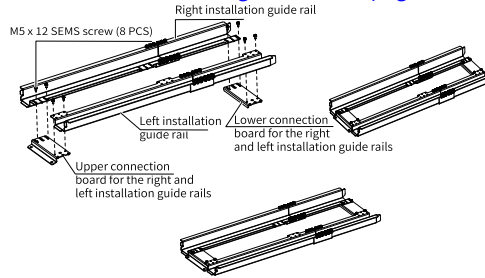


Figure 5-8 Assembling guide rails

- b. Align the two round holes at the front end of the mounting rail with the screws of the mounting bracket, and then lock the guide rail to the cabinet with two M6 nuts, as shown in *"Figure 5-9 " on page 108 .*

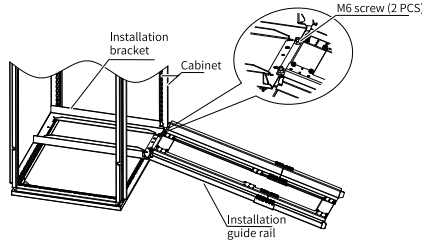


Figure 5-9 Mounting the guide rails to the cabinet

4. Remove the cover from the AC drive.
For details, see *"5.5.1 Removing the Cover" on page 111*. After the cover is removed, the auxiliary handle will be exposed.
5. Align the casters of the AC drive with the guide rails and gently push the AC drive in to the cabinet.
During the push-in or pull-out process, use the auxiliary strap to prevent the drive from toppling over. It is recommended that two people work together.

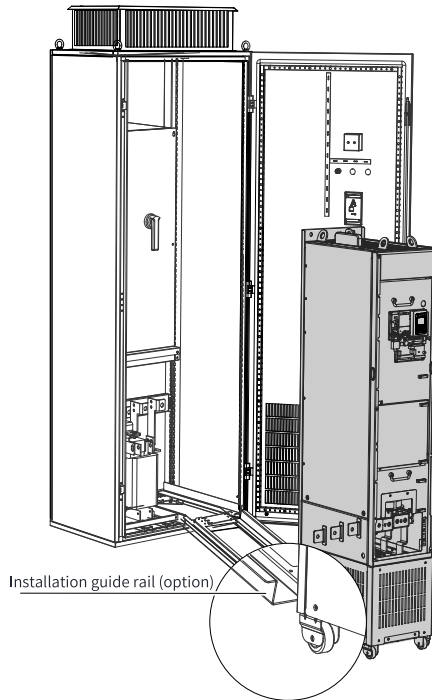


Figure 5-10 Aligning the AC drive caster with the guide rail

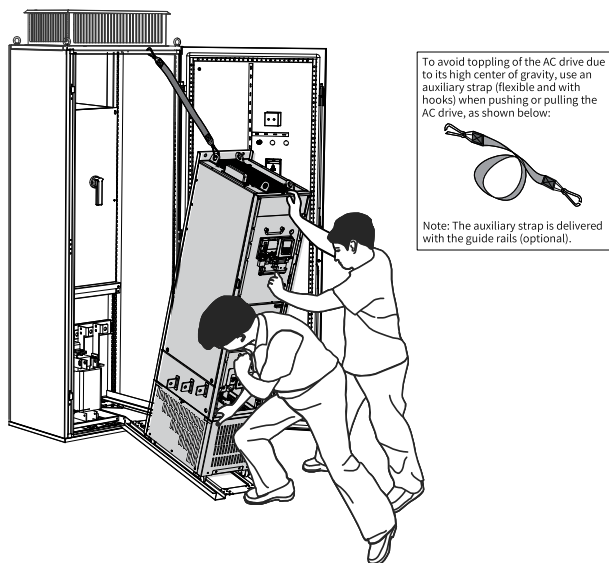


Figure 5-11 Pushing the AC drive into the cabinet

6. Remove the auxiliary strap, install the four screws on the back of the AC drive to fix it to the beam in the cabinet.

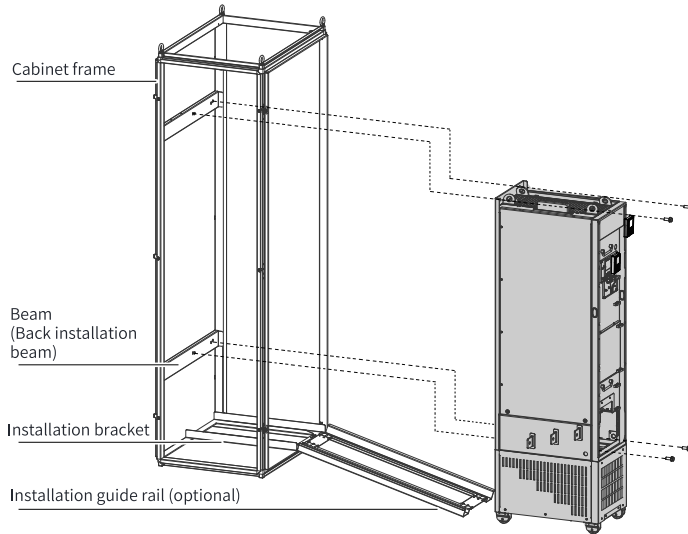


Figure 5-12 Installing the AC drive to the beam

7. After installation is done, remove the guide rail.
8. Remove the air filter paper board at the top of the AC drive. The air filter paper board is used to prevent foreign objects such as screws from falling into the air filter during installation of the AC drive into the cabinet.

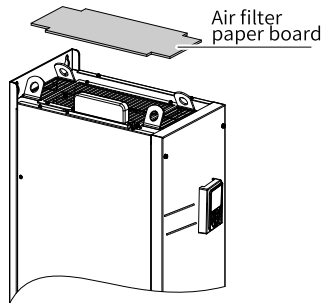


Figure 5-13 Removing the air filter paper board

5.5 Cover Removal and Installation

5.5.1 Removing the Cover

Before wiring the control circuit, such as operating jumpers or connecting PG cards or expansion cards, remove the cover from the AC drive. When removing the cover, hold

the cover with your hands and carefully lift the lower part of the cover to prevent it from falling off. Failure to comply will result in equipment damage or personal injury.

Prerequisites

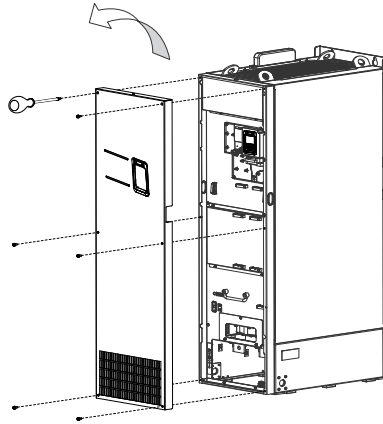
Before removing the cover, ensure that the machine has been powered off for over 10 minutes.

Procedure

1. Use a screwdriver to remove the six fixing screws on the cover.



2. Hold the cover with both hands, and lift it up in the direction indicated by the arrow to remove it.

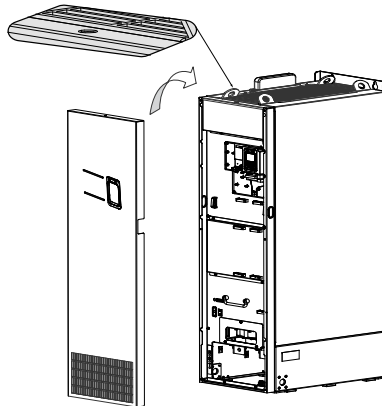


5.5.2 Installing the Cover

The cover of the AC drive must be removed before wiring the main circuit and control circuit. After wiring is done, re-install the cover.

Procedure

1. Hold the cover with both hands, align the upper edge of the cover with the upper edge snap-fit joint on the chassis, and snap them together, as shown in the following figure. Then align the six screw mounting holes in the cover with the cover fixing holes in the chassis and press them tightly against each other.



2. Install six fixing screws into the holes with a screwdriver to fasten the cover.



6 Mechanical Installation (T13 Models)

6.1 Installation Mode

T13 models are cabinet-type AC drives that should be vertically mounted on the floor. Multiple cabinets can be installed in parallel.

6.2 Pre-installation Precautions

- Reserve sufficient clearance for heat dissipation, including the heat dissipation of other devices around the AC drive.
- Cover the top of the AC drive with a piece of cloth or paper during installation to prevent unwanted objects such as metal chippings, oil, and water from falling into the drive. Failure to comply may cause malfunction of the AC drive. After installation is done, remove the cloth or paper. Failure to comply may degrade ventilation and result in unexpected heat.
- Tighten all screws with the specified tightening torque. Failure to comply may result in electric shock or fire.
- Keep combustible and explosive materials away from the AC drive.

6.3 Requirements on Ground Levelness

- The installation base must be level and firm enough to bear the weight of the cabinet.
- Use the door lock in a proper way to open and close the cabinet unit.
- Ensure there is no gap between the cabinet and the ground when cabinets are connected side by side. For any inevitable gap (shown by ①), use a pad (shown by ②) to level the cabinet, and use proper fillings (for example, fireproof mud) to fill the gap.

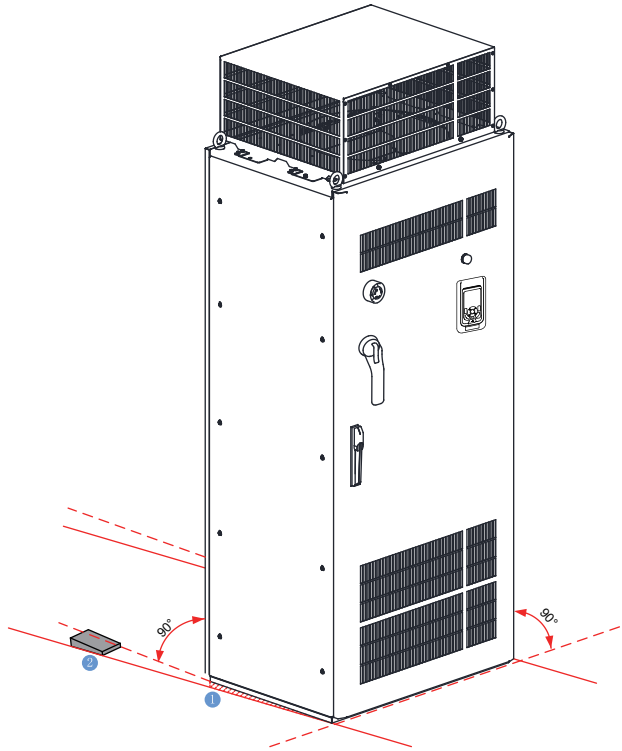


Figure 6-1 Ground requirements

6.4 Expansion Screw Installation

To install the cabinet on a cement floor, embed expansion nuts in advance in the floor at positions corresponding to the fixing holes of the cabinet for fixing the cabinet.

The following figure shows the steps of installing expansion screws, where ① indicates an expansion screw, ② indicates the cabinet, and ③ indicates an M12 bolt.

1. Drill a hole for the expansion screw. The hole diameter shall be slightly smaller than the maximum outer diameter of the screw, and the hole depth shall be greater than the expansion screw length. The expansion screw must be vertical to the ground, as shown by Step 1 in the following figure.
2. The expansion screw consists of a bolt spring enclosure and a screw part. Use a hammer to knock the expansion screw into the hole and ensure that the screw head is below the ground surface, as shown by Step 2 in the following figure.

3. After placing the cabinet in the required position, fasten it with M12 bolts. The expansion screw stem will be pulled up, making the spring shell deform to fasten the cabinet, as shown in Step 3.

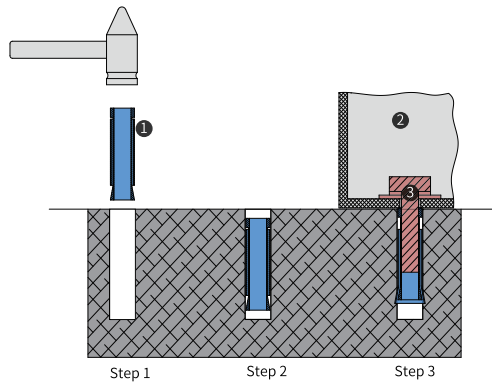


Figure 6-2 Installing an expansion screw

6.5 Requirements on foundation

- Separate high-voltage cables from low-voltage cables by using different brackets. If they cannot be separated, lay low-voltage cables in fully-enclosed metal ducts.
- The cable tray must be made of non-flammable materials and must be smooth, damp-proof, dust-proof, and rat-proof.
- During foundation design, take the following factors into consideration: sufficient space in front of the cabinet for inspection, and wiring and cabling of power supply cables, actuating motor cables, and system control cables. The cabinet comes with a cable tray or cable guide. Separate power cables from signal cables. Failure to comply will affect the operation of the AC drive. The following figure shows the routing and related requirements.

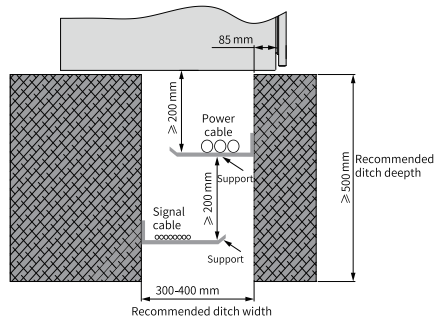
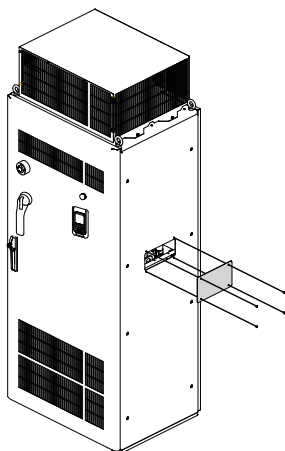


Figure 6-3 Foundation layout

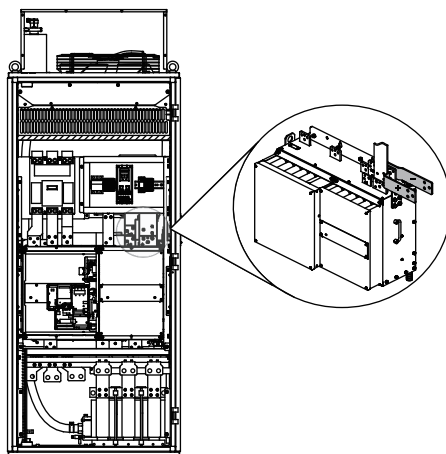
6.6 External Braking Unit Installation

Procedure

1. Remove the lateral closure plate of the cabinet.



2. Open the cabinet door and mount the adapter busbar for the external braking unit, as shown in the following figure.



3. Connect the AC drive to the external braking unit.

Note

The number of required braking units is subject to actual conditions. When multiple braking units are required, connect them in parallel. The following figure takes one braking unit as an example.

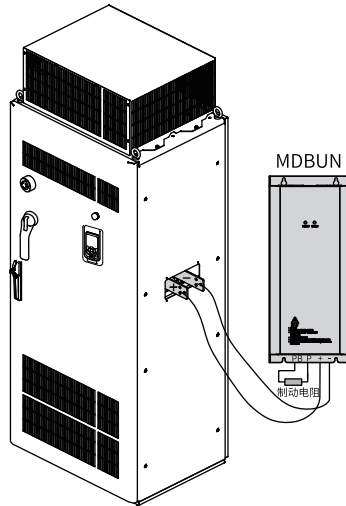


Figure 6-4 Connecting the AC drive to the external braking unit

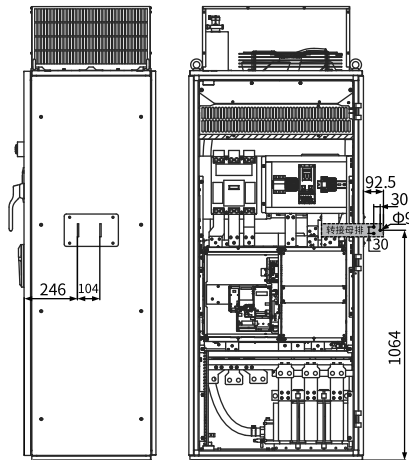


Figure 6-5 Dimensions of the position for installing the adapter busbar (unit: mm)

7 Checklist for Mechanical Installation

If the option in the following table is included in the delivery, check the box in the right column. Before installation, inspect the following items and tick the corresponding check-boxes for confirmation.

Table 7-1 Checklist for mechanical installation

Item	Operation	Passed	Completed
1	Check the anti-inclination label.	☐	☐
2	Check that the packing box is intact and dry.	☐	☐
3	Check that the load-bearing capacity of the floor and the environment meet the installation requirements. For details, see "6.3 Requirements on Ground Levelness" on page 115 and "1.2.1 Installation Environment" on page 18 .	☐	☐
4	Check that the ceiling height meets the minimum requirements (for smooth ventilation). There is sufficient space for air inlet and outlet without obstruction. Sufficient space is reserved for safe passing when the cabinet door is opened. For details, see "1.2.3 Installation Clearance" on page 20 .	☐	☐
5	The cabinet enclosure is free of deformation, paint peeling, cracks, and other defects. The inside of the cabinet is free of water stains and other defects.	☐	☐
6	Check that the accessories (user guide and options) in the cabinet are complete.	☐	☐
7	The wooden pallet is removed before the cabinet is placed at the final installation site. For details, see "3.5 Unpacking" on page 77 .	☐	☐
8	Install the cabinet to the pre-designed anchor point as required.	☐	☐
9	Install all contact protective devices (protection plates) inside and outside the cabinet before commissioning.	☐	☐

8 Electrical Installation

8.1 Electrical Connection

T1 to T12 models

"Figure 8-1 " on page 121 shows a typical wiring method of T1 to T12 models.

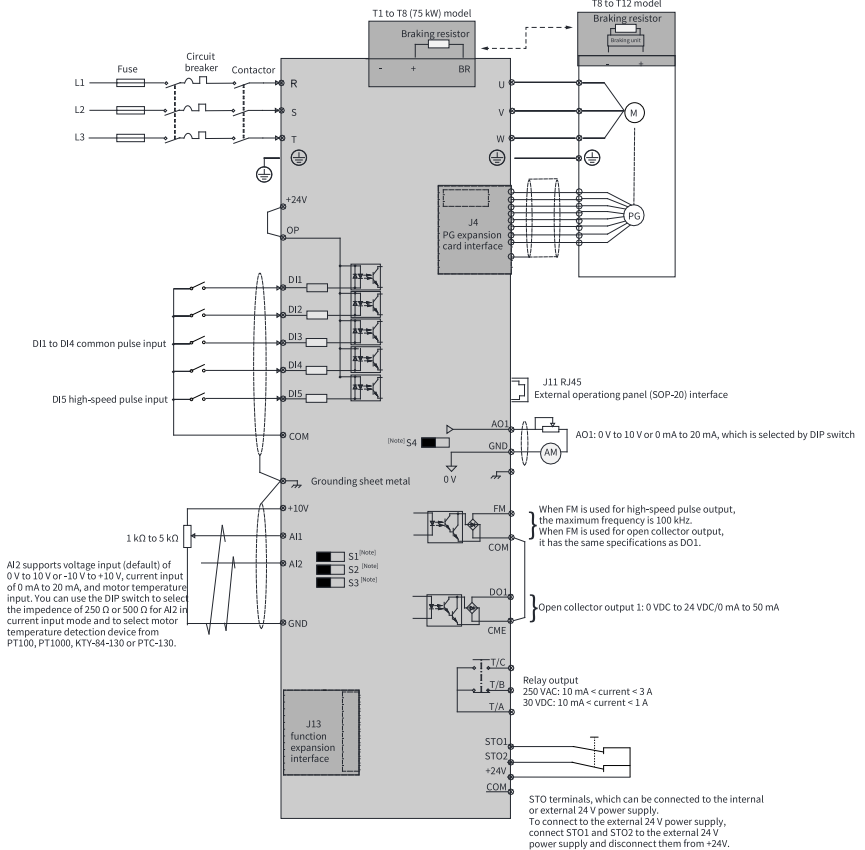


Figure 8-1 Standard wiring (T1 to T12)

Note

- For details on S1 to S4 DIP switches, see *"Table 8–15 Function description of control circuit terminals" on page 162*.
- For three-phase 380–480 V AC drives, a 0.4–75 kW model differs from a 90–450 kW model in the wiring detail marked by the double arrows in the figure.
- For three-phase 200–240 V AC drives, a 0.4–37 kW model differs from a 45–200 kW model in the wiring detail marked by the double arrows in the figure.

T13 models

"Figure 8-2 " on page 122 shows the electrical connection in the cabinet.

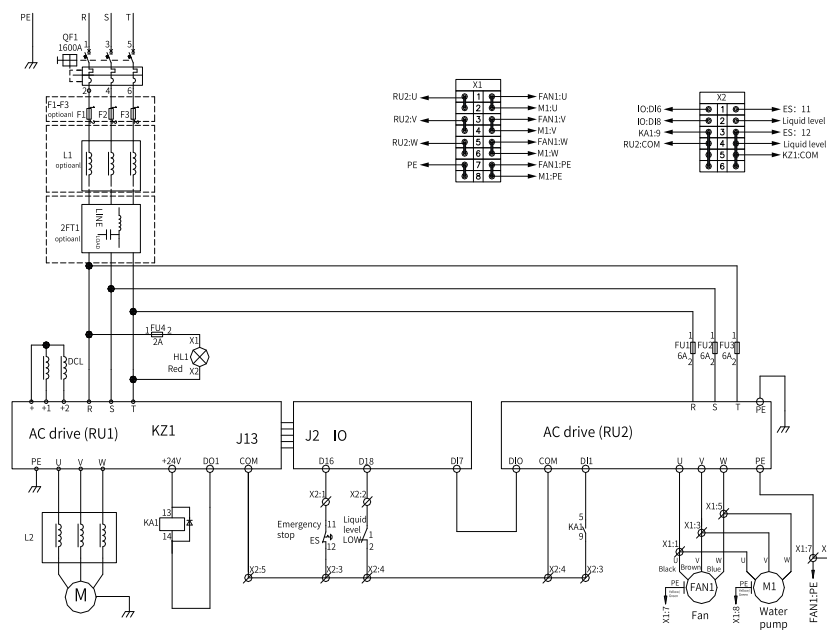


Figure 8-2 Electrical connection in the cabinet (T13)

T13 models

- The cabinet operates under high voltages. Do not attempt to connect any wires while the voltage is live.
- The cabinet can be operated only by qualified professionals.
- Take caution when operating the equipment disconnected from the power supply as external supply voltage may still be present. The main circuit and control circuit terminals may be live even when the motor is in the stop state.

- After disconnecting the input and output power supplies, wait for at least 15 minutes until the bus voltage is lower than 36 V and the power indicator is off before further operation.
- Ensure that the motors, cabinets, and other components are installed and connected in accordance with the recognized technical rules of the country and the region. Pay special attention to regulations on cable dimensions, fuses, grounding, open circuits, isolation, and overcurrent protection.
- If the fuse in a branch circuit trips, the fault current may have been disconnected. To reduce the risk of fire and electric shocks, check the conductive parts and other components of the cabinet and replace the damaged ones. After a fuse trips, identify and rectify the cause of the tripping.

8.2 Pre-wiring Check

Check the following items before wiring.

No.	Item
1	Cables used during wiring comply with the requirements on the cross sectional area and the shield.
2	The device and the drive are grounded properly.
3	Proper electrostatic discharge (ESD) procedures are followed and antistatic wrist straps are worn.
4	Wiring-related options, including cable shield brackets (applicable to T1 to T9 models), are available.

8.3 Main Circuit Connection

8.3.1 Descriptions of Main Circuit Terminals

T1 to T9 models

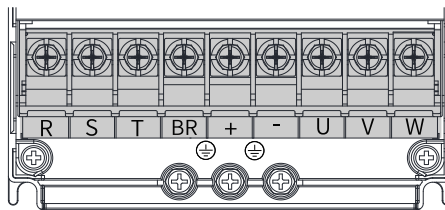


Figure 8-3 Layout of main circuit terminals for T1 to T4 models (three phase)

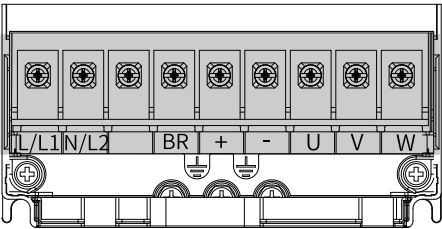


Figure 8-4 Layout of main circuit terminals for T2 models (single phase)

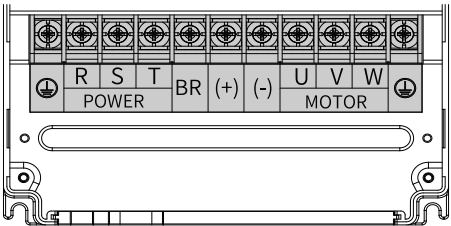


Figure 8-5 Layout of main circuit terminals for T5 to T8 models

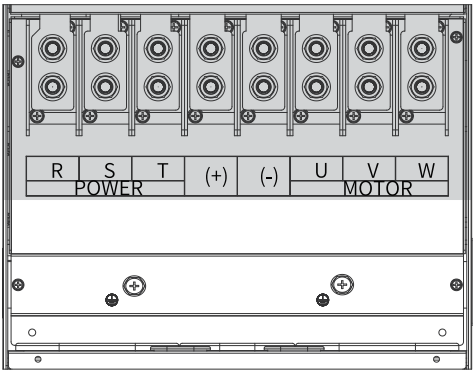


Figure 8-6 Layout of main circuit terminals for T9 models

Table 8–1 Descriptions of main circuit terminals

Terminal Mark	Terminal Name	Function Description
R, S, T	Input terminals of three-phase power supply	Used to connect the three-phase AC input power supply.
(+), (-)	Positive and negative terminals of the DC bus	Common DC busbar input; connected to the external braking unit of T9 models and above.

Terminal Mark	Terminal Name	Function Description
(+), BR	Braking resistor connection terminals	Used to connect to the braking resistor of T8 models and below. Note: Only models with the name containing "B" are equipped with brake resistor terminals. For models with the name excluding "B", external brake units are required.
U, V, W	Output terminals	Used to connect the three-phase motor.
	Grounding terminal (PE)	Used for protective grounding.

T10 to T12 models

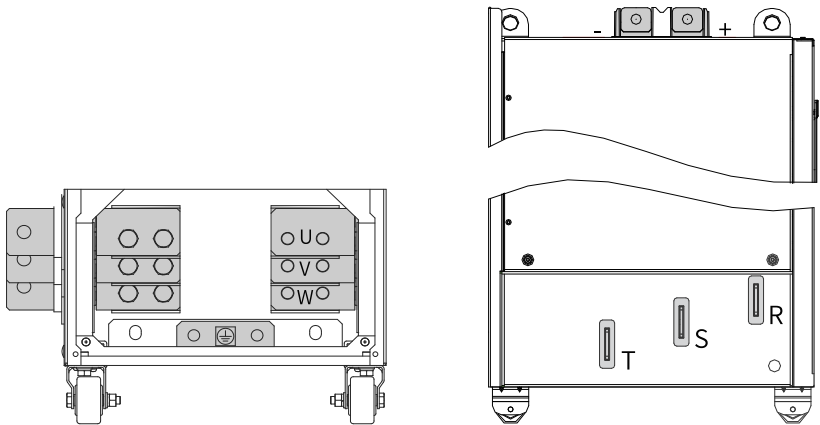


Figure 8-7 Layout of main circuit terminals for T10 to T12 models

Table 8-2 Descriptions of main circuit terminals

Terminal Mark	Terminal Name	Function Description
R, S, T	Input terminals of three-phase power supply	Used to connect the three-phase AC input power supply.
+, -	Positive and negative terminals of the DC bus	Common DC busbar input; connected to an external braking unit.

Terminal Mark	Terminal Name	Function Description
U, V, W	AC drive output terminals	Used to connect the three-phase motor.
	Grounding terminal (PE)	Used for protective grounding.

T13 models

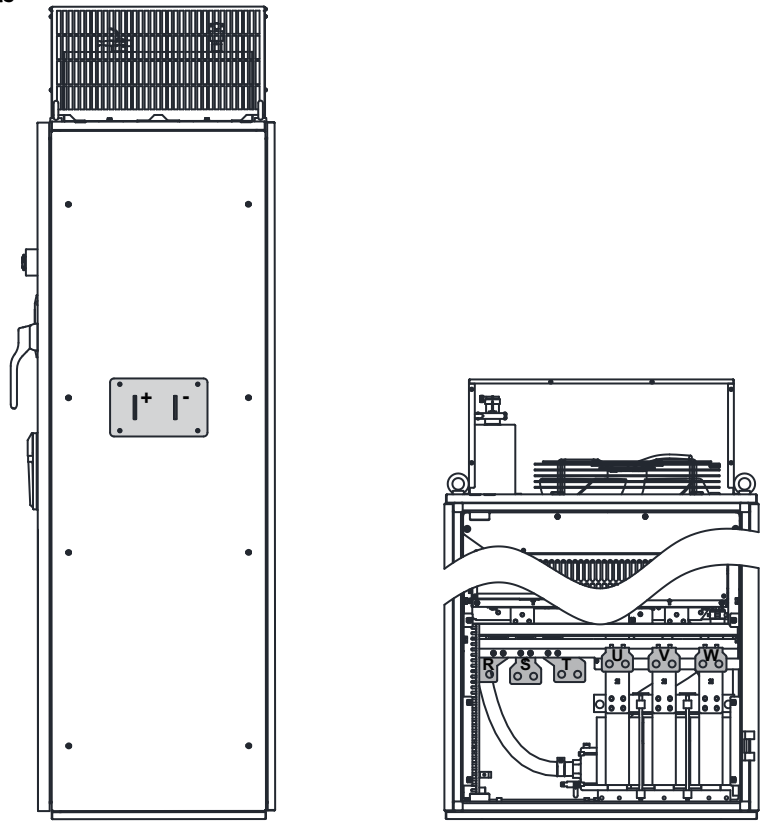


Figure 8-8 Layout of main circuit terminals for T13 models

Table 8-3 Descriptions of main circuit terminals

Terminal Mark	Terminal Name	Function Description
R, S, T	Input terminals of three-phase power supply	Used to connect the three-phase AC input power supply.
+, -	Positive and negative terminals of the DC bus	Common DC busbar input; connected to an external braking unit.

Terminal Mark	Terminal Name	Function Description
U, V, W	AC drive output terminals	Used to connect the three-phase motor.
	Grounding terminal (PE)	Used for protective grounding.

8.3.2 Dimensions of Main Circuit Terminals

T1 to T2 models

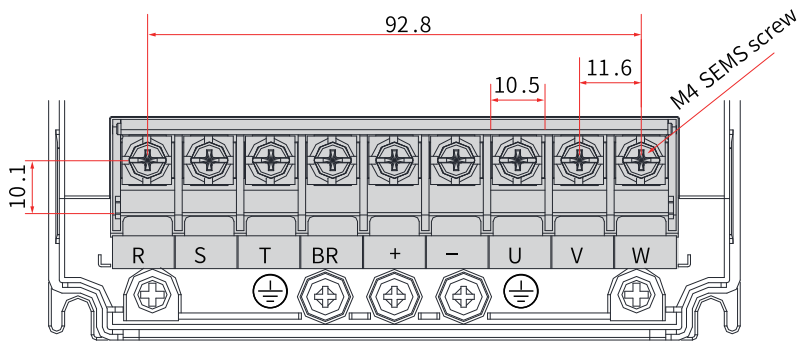


Figure 8-9 Main circuit terminal dimensions (mm) of T1 to T2 models

T3 models

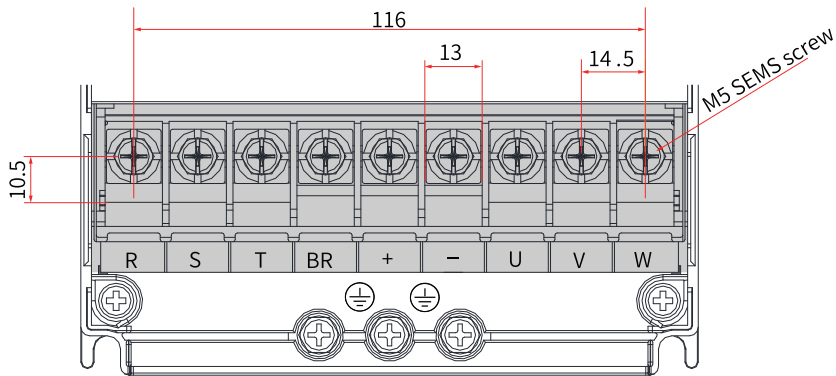


Figure 8-10 Main circuit terminal dimensions (mm) of T3 models

T4 models

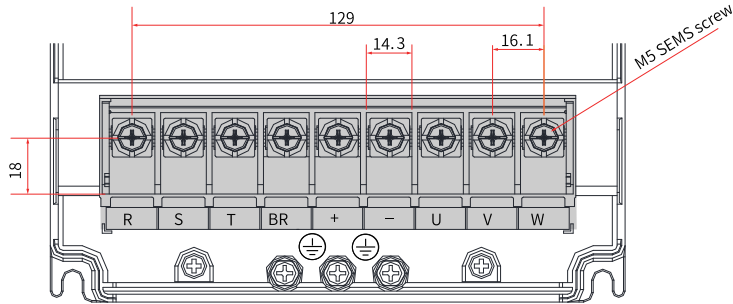


Figure 8-11 Main circuit terminal dimensions (mm) of T4 models

T5 models

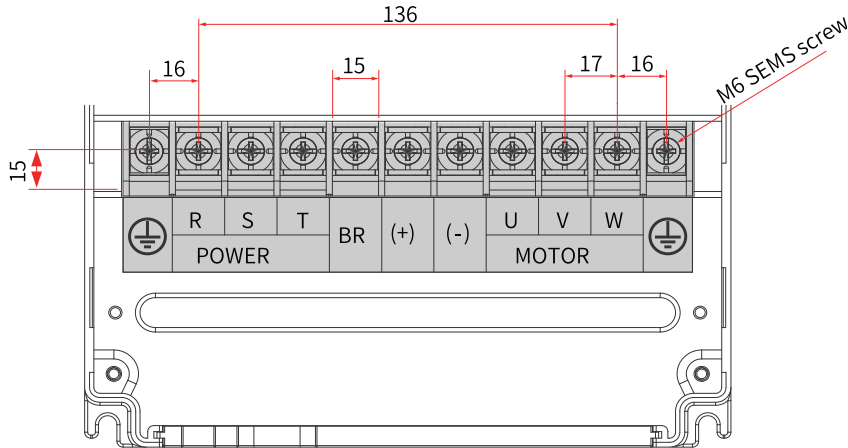


Figure 8-12 Main circuit terminal dimensions (mm) of T5 models

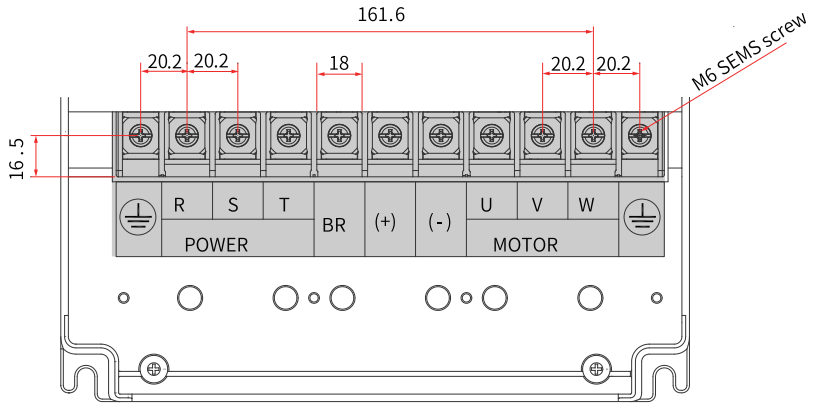
T6 models

Figure 8-13 Main circuit terminal dimensions (mm) of T6 models

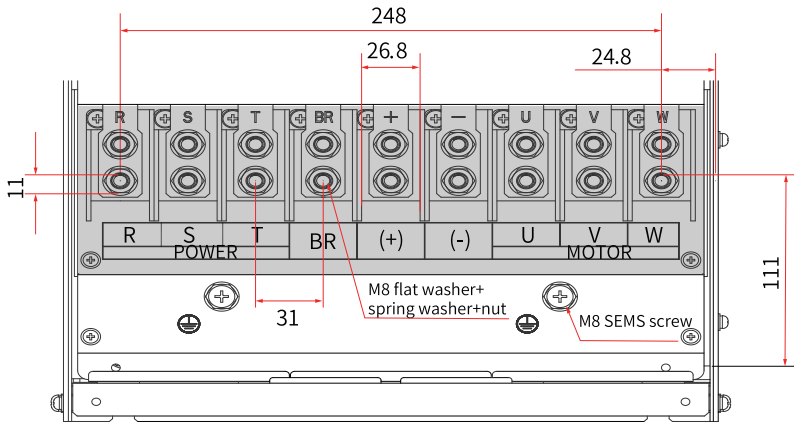
T7 models

Figure 8-14 Main circuit terminal dimensions (mm) of T7 models

T8 models

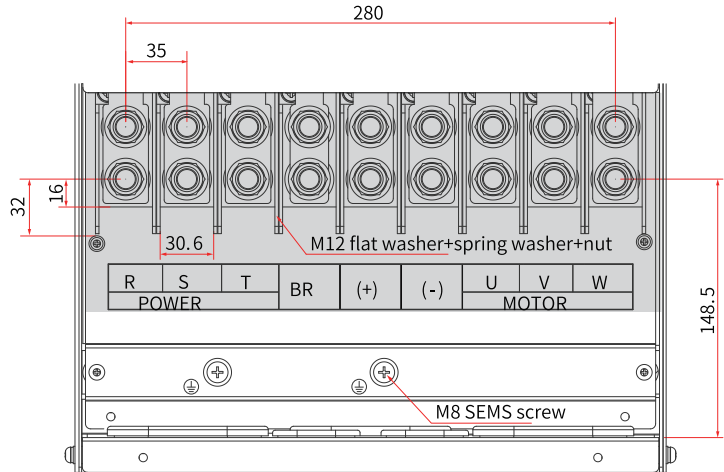


Figure 8-15 Main circuit terminal dimensions (mm) of T8 models

T9 models

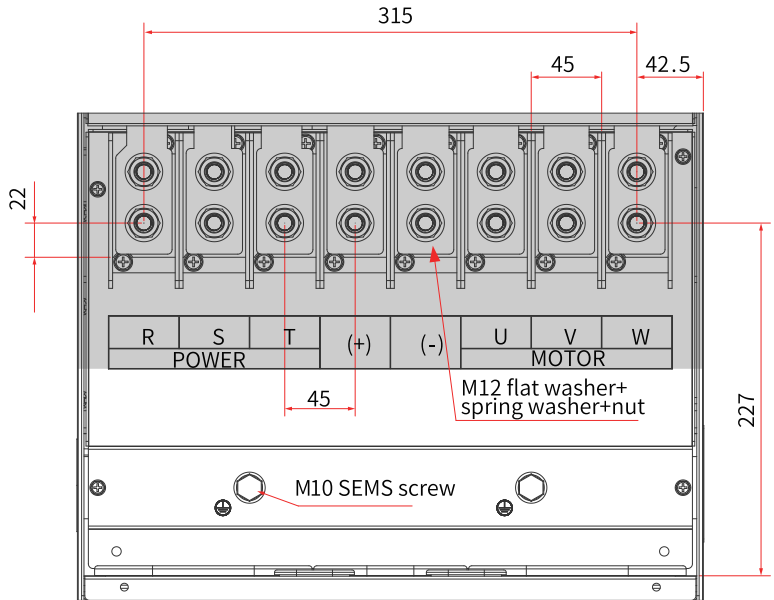


Figure 8-16 Main circuit terminal dimensions (mm) of T9 models

T10 models

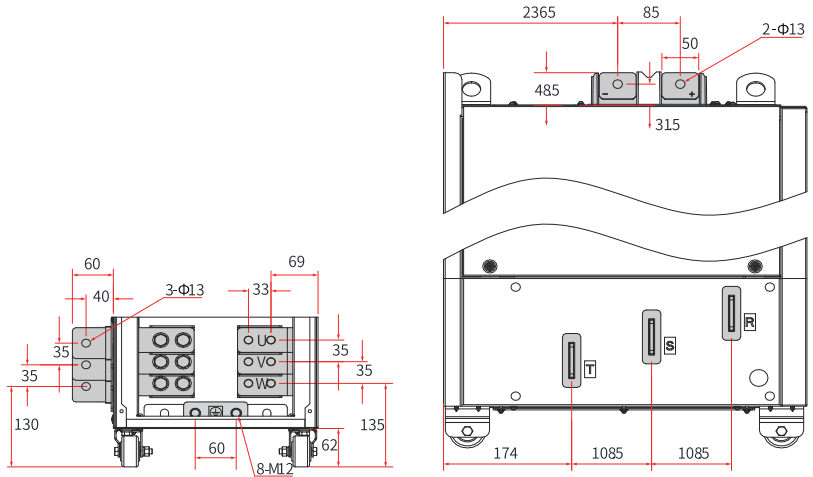


Figure 8-17 Main circuit terminal dimensions (mm) of T10 models (without output reactors)

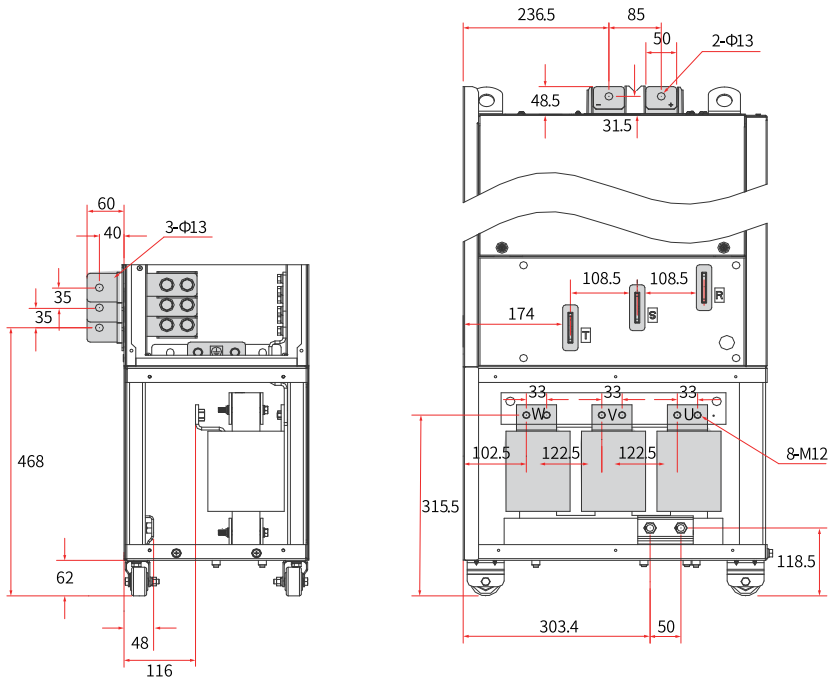


Figure 8-18 Main circuit terminal dimensions (mm) of T10 models (with output reactors)

The side copper busbars in the preceding figures can be removed if necessary. The following figure shows the dimensions of the main circuit terminals without the side copper busbars.

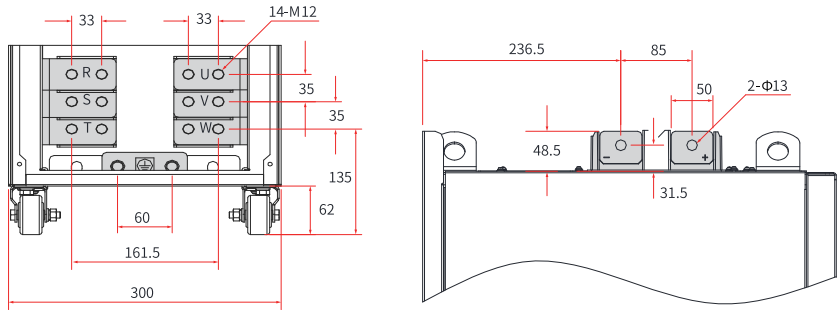


Figure 8-19 Main circuit terminal dimensions (mm) of T10 models without the output reactor or copper busbar

T11 models

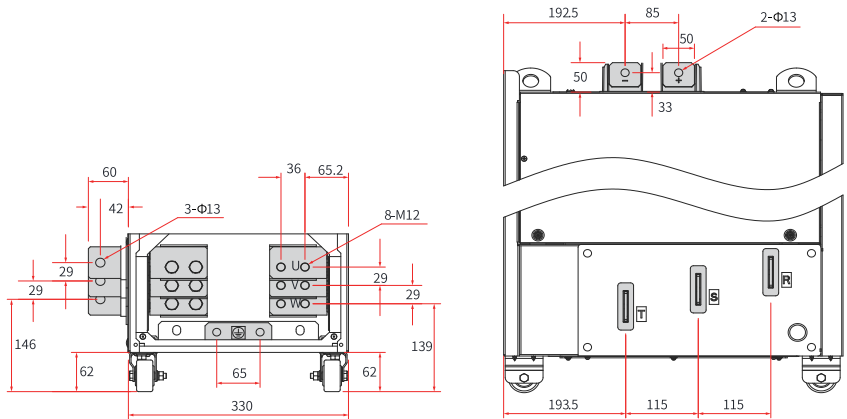


Figure 8-20 Main circuit terminal dimensions (mm) of T11 models (without output reactors)

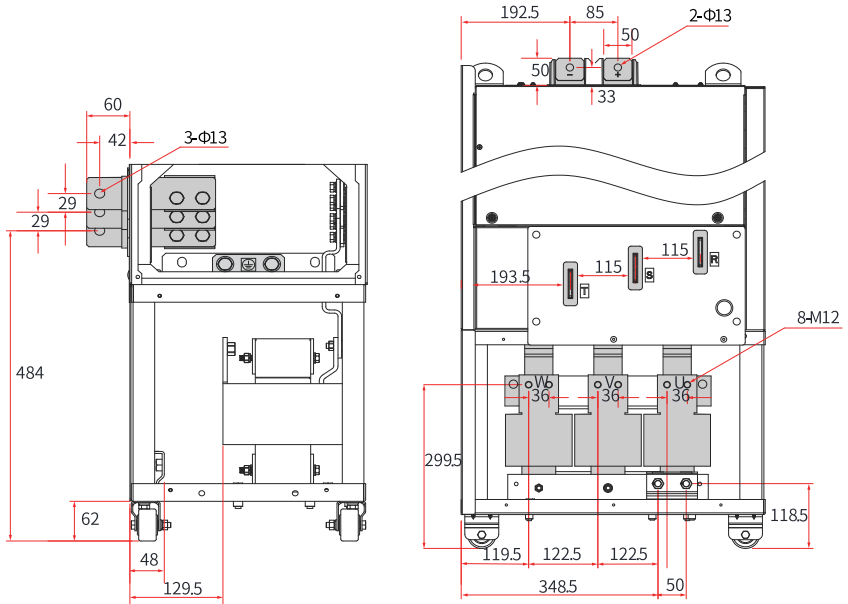


Figure 8-21 Main circuit terminal dimensions (mm) of T11 models (with output reactors)

The side copper busbars in the preceding figures can be removed if necessary. The following figure shows the dimensions of the main circuit terminals without the side copper busbars.

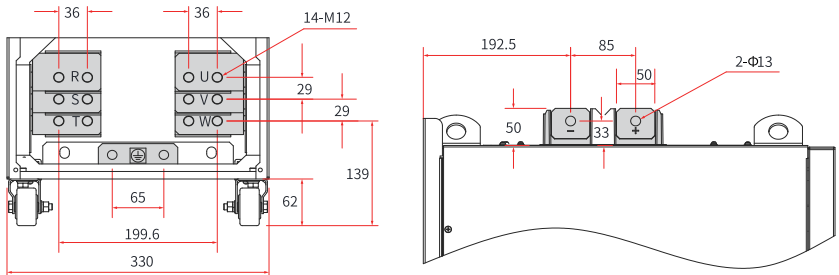


Figure 8-22 Main circuit terminal dimensions (mm) of T11 models without the output reactor or copper busbar

T12 models

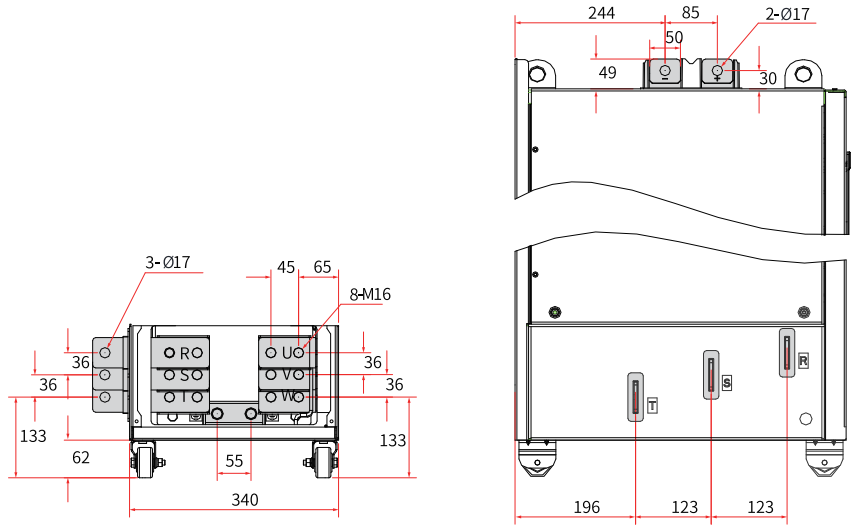


Figure 8-23 Main circuit terminal dimensions (mm) of T12 models (without output reactors)

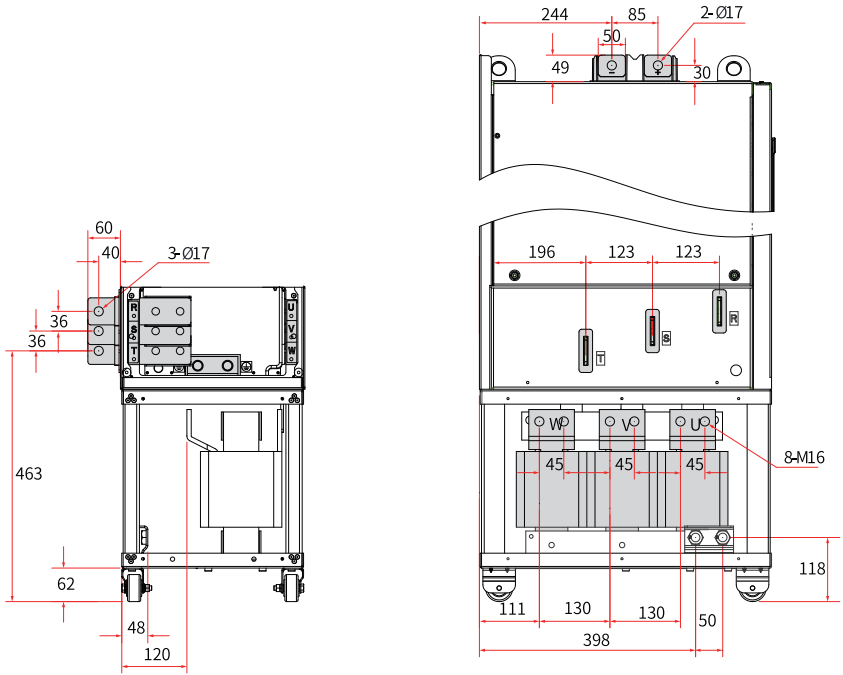


Figure 8-24 Main circuit terminal dimensions (mm) of T12 models (with output reactors)

The side copper busbars in the preceding figures can be removed if necessary. The following figure shows the dimensions of the main circuit terminals without the side copper busbars.

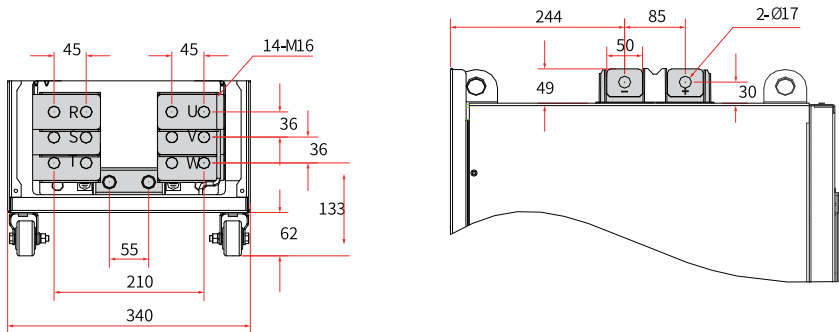


Figure 8-25 Main circuit terminal dimensions (mm) of T12 models without the output reactor or copper busbar

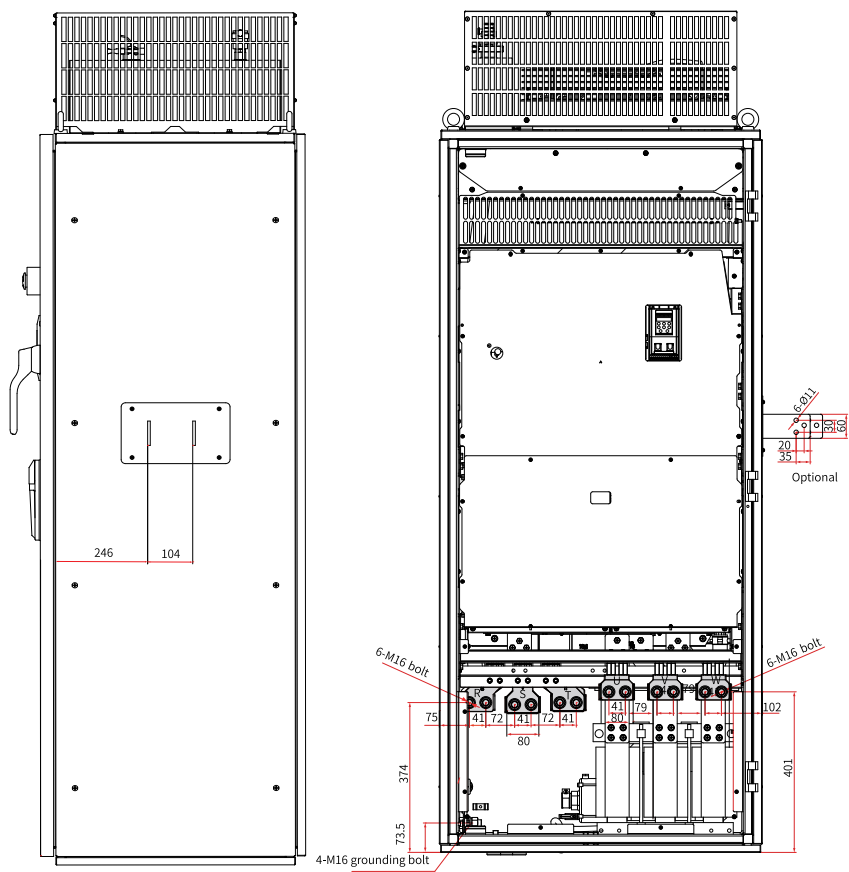


Figure 8-26 Main circuit terminal dimensions (mm) of T13 models (without auxiliary power distribution cabinets, three-phase 380 V to 480 V)

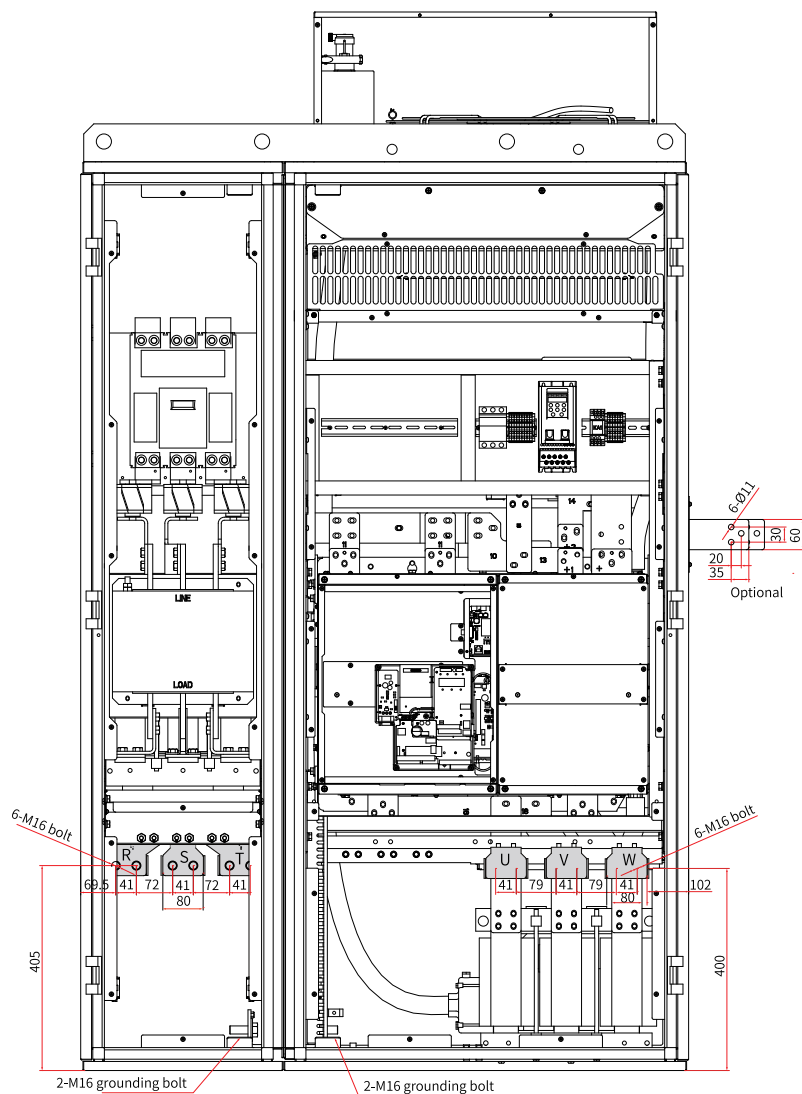


Figure 8-27 Main circuit terminal dimensions (mm) of T13 models (with auxiliary power distribution cabinets, three-phase 380 V to 480 V)

8.3.3 Main Circuit Cables

Power cable selection requirements

For selection of power cables, follow national or regional regulations. Select IEC cables based on the following requirements:

- Compliant with IEC 60204-1 and IEC 60364-5-52 standards.
- PVC insulated cables with copper conductors
- Ambient temperature of 40°C and cable surface temperature of 70°C (Note: When the ambient temperature exceeds 40°C, contact Inovance.)
- Symmetrical cable with copper-braided shield

If recommended cables for peripheral devices or options are not suitable for the product, contact Inovance.

Use shielded cables to comply with the EMC requirements. The shielded cables are divided into three-conductor cables and four-conductor cables, as shown below. If the conductivity of the three-conductor cable shield cannot meet requirements, add an independent PE cable. Alternatively, use a four-conductor cable with one conductor as the PE cable. The shield of the shielded cable is comprised of coaxial copper braids to suppress radio frequency interference. To enhance the shielding performance and conductivity, the braided density of the shield must be greater than 90%.

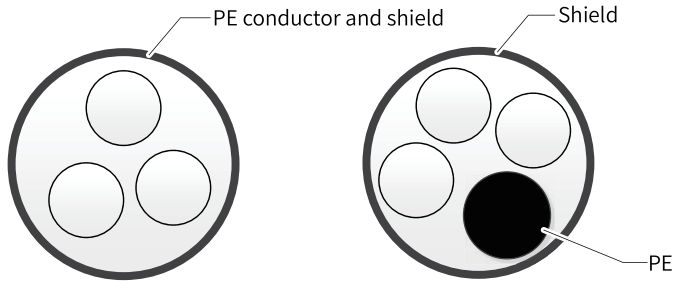


Figure 8-28 Recommended power cable

Recommended cable

Table 8–4 Cable selection (three-phase 380 V to 480 V, compliant with CE certification)

Structure	Drive Model	Rated Input Current (A)	Rated Output Current (A)	R/S/T, U/V/W		Grounding Cable		Screw	Tightening Torque (N·m) (lb.in)
				Recommended Cable (mm ²) ^{<1>}	Recommended Cable Lug	Recommended Cable (mm ²) ^{<1>}	Recommended Cable Lug		
T1	MD520-4T0.4B(S)	1.8	1.5	3 x 0.75	TN R0.75 - 4	0.75	TN R0.75 - 4	M4	1.2 (10.6)
	MD520-4T0.7B(S)	2.4	2.1	3 x 0.75	TN R0.75 - 4	0.75	TN R0.75 - 4	M4	1.2 (10.6)
	MD520-4T1.1B(S)	3.7	3.1	3 x 0.75	TN R0.75 - 4	0.75	TN R0.75 - 4	M4	1.2 (10.6)
	MD520-4T1.5B(S)	4.6	3.8	3 x 0.75	TN R0.75 - 4	0.75	TN R0.75 - 4	M4	1.2 (10.6)
	MD520-4T2.2B(S)	6.3	5.1	3 x 1	TN R1.25 - 4	1	TN R1.25 - 4	M4	1.2 (10.6)
	MD520-4T3.0B(S)	9.0	7.2	3 x 1.5	TN R1.25 - 4	1.5	TN R1.25 - 4	M4	1.2 (10.6)
T2	MD520-4T3.7B(S)	11.4	9.0	3 x 2.5	TNR2-4	2.5	TNR2-4	M4	1.2 (10.6)
	MD520-4T5.5B(S)	16.7	13.0	3 x 4	TN R3.5 - 4	4	TN R3.5 - 4	M4	1.2 (10.6)
T3	MD520-4T7.5B(S)	21.9	17.0	3 x 6	TN R5.5 - 5	6	TN R5.5 - 5	M5	2.8 (24.8)
	MD520-4T11B(S)	32.2	25.0	3 x 10	TNR8-5	10	TNR8-5	M5	2.8 (24.8)
T4	MD520-4T15B(S)	41.3	32.0	3 x 10	TNR8-5	10	TNR8-5	M5	2.8 (24.8)
T5	MD520-4T18.5(B)(S)-T	37.2	37.0	3 x 16	GTNR16-6	16	GTN R16-6	M6	4.8 (42.5)
	MD520-4T18.5(B)(S)	49.5	37.0	3 x 16	GTNR16-6	16	GTN R16-6	M6	4.8 (42.5)
	MD520-4T22(B)(S)-T	43.4	45.0	3 x 25	GTNR25-6	16	GTN R16-6	M6	4.8 (42.5)
	MD520-4T22(B)(S)	59.0	45.0	3 x 25	GTNR25-6	16	GTN R16-6	M6	4.8 (42.5)
T6	MD520-4T30(B)(S)	57.0	60.0	3 x 25	GTNR25-6	16	GTN R16-6	M6	4.8 (42.5)
	MD520-4T37(B)(S)	69.0	75.0	3 x 35	GTNR35-6	16	GTN R16-6	M6	4.8 (42.5)
T7	MD520-4T45(B)(S)	89.0	91.0	3 x 50	GTNR50-8	25	GTN R25-8	M8	13.0 (115.2)
	MD520-4T55(B)(S)	106.0	112.0	3 x 70	GTNR70-8	35	GTN R35-8	M8	13.0 (115.2)

Structure	Drive Model	Rated Input Current (A)	Rated Output Current (A)	R/S/T, U/V/W		Grounding Cable		Screw	Tightening Torque (N·m) (lb.in)
				Recommended Cable (mm ²) ^{<1>}	Recommended Cable Lug	Recommended Cable (mm ²) ^{<1>}	Recommended Cable Lug		
T8	MD520-4T75(B)(S)	139.0	150.0	3 x 95	GTN R95-12	50	GTN R50-8	M12 (main power)	35.0 (310.1)
								M8 (grounding)	13.0 (115.2)
	MD520-4T90(S)	164.0	176.0	3 x 120	GTNR120-12	70	GTNR70-8	M12 (main power)	35.0 (310.1)
								M8 (grounding)	13.0 (115.2)
	MD520-4T110(S)	196.0	210.0	3 x 150	BC150-12	95	GTNR95-8	M12 (main power)	35.0 (310.1)
								M8 (grounding)	13.0 (115.2)
T9	MD520-4T132(S)	240.0	253.0	3 x 185	BC185-12	95	BC95-10	M12 (main power)	35.0 (310.1)
								M10 (grounding)	20 (117)
	MD520-4T160(S)*	287.0	304.0	2 x (3 x 120)	BC120-12	120	BC120-10	M12 (main power)	35.0 (310.1)
								M10 (grounding)	20 (117)
T10	MD520-4T200(S)-(L)	365.0	377.0	2 x (3 x 150)	BC150-12	150	BC150-12	M12	35.0 (310.1)
	MD520-4T220(S)-(L)	410.0	426.0	2 x (3 x 150)	BC150-12	150	BC150-12	M12	35.0 (310.1)
T11	MD520-4T250(S)-(L)*	441.0	465.0	3 x (3 x 120)	BC120-12	185	BC185-12	M12	35.0 (310.1)
	MD520-4T280(S)-(L)*	495.0	520.0	3 x (3 x 150)	BC150-12	2 x 120	BC120-12	M12	35.0 (310.1)

Structure	Drive Model	Rated Input Current (A)	Rated Output Current (A)	R/S/T, U/V/W		Grounding Cable		Screw	Tightening Torque (N·m) (lb.in)
				Recommended Cable (mm ²) ^{<1>}	Recommended Cable Lug	Recommended Cable (mm ²) ^{<1>}	Recommended Cable Lug		
T1 2	MD520-4T315(S)-(L)*	565.0	585.0	3 x (3 x 185)	BC185-16	2 x 150	BC150-16	M16	85.0 (753.1)
	MD520-4T355(S)-(L)*	617.0	650.0	3 x (3 x 240)	BC240-16	2 x 185	BC185-16	M16	85.0 (753.1)
	MD520-4T400(S)-(L)*	687.0	725.0	3 x (3 x 240)	BC240-16	2 x 185	BC185-16	M16	85.0 (753.1)
T1 3	MD520-4T500(S)-(A)*	838.1	900.0	4 x (3 x 240)	BC240-16	2 x 240	BC240-16	M16	85.0 (753.1)
	MD520-4T560(S)-(A)*	949.6	1020.0	4 x (3 x 240)	BC240-16	2 x 240	BC240-16	M16	85.0 (753.1)
	MD520-4T630(S)-(A)*	1043.5	1120.0	4 x (3 x 300)	BC300-16	2 x 300	BC300-16	M16	85.0 (753.1)

Note

^{<1>}: Applicable to GB standards. For example, 3 x 10 indicates one 3-conductor 10 mm² cable; 2 x (3 x 120) indicates two 3-conductor 120 mm² cables. The preceding recommended lugs are the TNR, GTNR, and BC series lugs from Suzhou Yuanli.

Note:

1. Observe national or regional regulations during selection. The cables recommended in the preceding table meet the following conditions: PVC insulation and copper conductor; Ambient temperature of 40°C and cable surface temperature of 70°C (When the ambient temperature exceeds 40°C, contact Inovance); Cable layout type E is adopted (see IEC 60204-1).
2. The cables with the asterisk mark (*) must be connected through the copper busbar.
3. If the conditions are different, you need to select the model according to actual conditions.

Table 8-5 Cable selection (three-phase 380 V to 480 V, compliant with UL certification)

Structure	Drive Model	Rated Input Current (A)	Rated Output Current (A)	R/S/T, U/V/W		Grounding Cable		Screw	Tightening Torque (N·m) (lb.in)
				Recommended Cable (AWG/kcmil) ^{<2>}	Recommended Cable Lug	Recommended Cable (AWG/kcmil) ^{<2>}	Recommended Cable Lug		
T1	MD520-4T0.4B(S)	1.8	1.5	14	TLK2.5-4	14	TLK2.5-4	M4	1.2 (10.6)
	MD520-4T0.7B(S)	2.4	2.1	14	TLK2.5-4	14	TLK2.5-4	M4	1.2 (10.6)
	MD520-4T1.1B(S)	3.7	3.1	14	TLK2.5-4	14	TLK2.5-4	M4	1.2 (10.6)
	MD520-4T1.5B(S)	4.6	3.8	14	TLK2.5-4	14	TLK2.5-4	M4	1.2 (10.6)
	MD520-4T2.2B(S)	6.3	5.1	14	TLK2.5-4	14	TLK2.5-4	M4	1.2 (10.6)
	MD520-4T3.0B(S)	9.0	7.2	14	TLK2.5-4	14	TLK2.5-4	M4	1.2 (10.6)
T2	MD520-4T3.7B(S)	11.4	9.0	12	TLK4-4	12	TLK6-4	M4	1.2 (10.6)
	MD520-4T5.5B(S)	16.7	13.0	10	TLK6-4	10	TLK6-4	M4	1.2 (10.6)
T3	MD520-4T7.5B(S)	21.9	17.0	8	TLK10-5	8	TLK10-5	M5	2.8 (24.8)
	MD520-4T11B(S)	32.2	25.0	8	TLK10-5	8	TLK10-5	M5	2.8 (24.8)
T4	MD520-4T15B(S)	41.3	32.0	6	TLK16-5	6	TLK16-5	M5	2.8 (24.8)
T5	MD520-4T18.5(B)(S)-T	37.2	37.0	4	TLK25-6	6	TLK16-6	M6	4.8 (42.5)
	MD520-4T18.5(B)(S)	49.5	37.0	4	TLK25-6	6	TLK16-6	M6	4.8 (42.5)
	MD520-4T22(B)(S)-T	43.4	45.0	4	TLK25-6	6	TLK16-6	M6	4.8 (42.5)
	MD520-4T22(B)(S)	59.0	45.0	4	TLK25-6	6	TLK16-6	M6	4.8 (42.5)
T6	MD520-4T30(B)(S)	57.0	60.0	2	TLK35-6	4	TLK25-6	M6	4.8 (42.5)
	MD520-4T37(B)(S)	69.0	75.0	2	TLK35-6	4	TLK25-6	M6	4.8 (42.5)
T7	MD520-4T45(B)(S)	89.0	91.0	1/0	TLK50-8	2	TLK35-8	M8	13.0 (115.2)
	MD520-4T55(B)(S)	106.0	112.0	3/0	TLK95-8	1/0	TLK50-8	M8	13.0 (115.2)

Structure	Drive Model	Rated Input Current (A)	Rated Output Current (A)	R/S/T, U/V/W		Grounding Cable		Screw	Tightening Torque (N·m) (lb.in)
				Recommended Cable (AWG/kcmil) ^{<2>}	Recommended Cable Lug	Recommended Cable (AWG/kcmil) ^{<2>}	Recommended Cable Lug		
T8	MD520-4T75(B)(S)	139.0	150.0	4/0	TLK120-12	2/0	TLK70-8	M12 (main power)	35.0 (310.1)
								M8 (grounding)	13.0 (115.2)
	MD520-4T90(S)	164.0	176.0	300 kcmil	SQNB S150-12	3/0	TLK95-8	M12 (main power)	35.0 (310.1)
								M8 (grounding)	13.0 (115.2)
	MD520-4T110(S)	196.0	210.0	2x3/0	TLK95-12	4/0	TLK120-8	M12 (main power)	35.0 (310.1)
								M8 (grounding)	13.0 (115.2)
T9	MD520-4T132(S)	240.0	253.0	500 kcmil	SQNB S250-12	300 kcmil	SQNB S150-10	M12 (main power)	35.0 (310.1)
								M10 (grounding)	20 (117)
	MD520-4T160(S)	287.0	304.0	2 x 300 kcmil	SQNB S150-12	300 kcmil	SQNB S150-10	M12 (main power)	35.0 (310.1)
								M10 (grounding)	20 (117)
T10	MD520-4T200(S)-(L)	365.0	377.0	2 x 350 kcmil	SQNB S180-12	350 kcmil	SQNB S180-12	M12	35.0 (310.1)
	MD520-4T220(S)-(L)*	410.0	426.0	2 x 400 kcmil	SQNB S250-12	400 kcmil	SQNB S250-12	M12	35.0 (310.1)
T11	MD520-4T250(S)-(L)*	441.0	465.0	2 x 500 kcmil	SQNB S250-12	500 kcmil	SQNB S250-12	M12	35.0 (310.1)
	MD520-4T280(S)-(L)*	495.0	520.0					M12	35.0 (310.1)

Structure	Drive Model	Rated Input Current (A)	Rated Output Current (A)	R/S/T, U/V/W		Grounding Cable		Screw	Tightening Torque (N·m) (lb.in)
				Recommended Cable (AWG/kcmil) ^{<2>}	Recommended Cable Lug	Recommended Cable (AWG/kcmil) ^{<2>}	Recommended Cable Lug		
T12	MD520-4T315(S)-(L)*	565.0	585.0	4 x 300 kcmil	SQNB S150-12	2 x 300 kcmil	SQNB S150-12	M16	85.0 (753.1)
	MD520-4T355(S)-(L)*	617.0	650.0	4 x 350 kcmil	TLK185-16	2 x 350 kcmil	TLK185-16	M16	85.0 (753.1)
	MD520-4T400(S)-(L)*	687.0	725.0	4 x 400 kcmil	TLK240-16	2 x 400 kcmil	TL K240-16	M16	85.0 (753.1)
T13	MD520-4T500(S)-(A)*	838.1	900.0	4 x 500 kcmil	SQNB S325-16	2 x 500 kcmil	SQNB S325-16	M16	85.0 (753.1)
	MD520-4T560(S)-(A)*	949.6	1020.0	4 x 500 kcmil	SQNB S325-16	2 x 500 kcmil	SQNB S325-16	M16	85.0 (753.1)
	MD520-4T630(S)-(A)*	1043.5	1120.0	4 x 500 kcmil	SQNB S325-16	2 x 500 kcmil	SQNB S325-16	M16	85.0 (753.1)

Note

<2>: Applicable to AWG standards, in which 8 represents 8AWG, 1/0 represents 0AWG, 3/0 represents 000AWG, and 4/0 represents 0000AWG; 2 x 300 kcmil represents two 300 kcmil cables. The preceding recommended cable lugs are TLK and SQNBS series lugs from KST.

Note:

1. Observe national or regional regulations during selection. The cables recommended in the preceding table meet the following conditions: PVC insulation and copper conductor; Ambient temperature of 40°C and cable surface temperature of 75°C (When the ambient temperature exceeds 40°C, contact Inovance); Cable layout type E is adopted (see IEC 60204-1).
2. The recommended cables must meet requirements for 125% overload.
3. The cables with the asterisk mark (*) must be connected through the copper busbar.
4. If the conditions are different, you need to select the model according to actual conditions.

Table 8-6 Cable selection (three-phase 200 V to 240 V, compliant with CE certification)

Structure	Drive Model	Rated Input Current (A)	Rated Output Current (A)	R/S/T, U/V/W		Grounding Cable		Screw	Tightening Torque (N·m) (lb.in)
				Recommended Cable (mm ²) ^{<1>}	Recommended Cable Lug	Recommended Cable (mm ²) ^{<1>}	Recommended Cable Lug		
T1	MD520-2T0.4B(S)	2.4	2.1	3 x 0.75	TN R0.75 - 4	0.75	TN R0.75 - 4	M4	1.2 (10.6)
	MD520-2T0.7B(S)	4.6	3.8	3 x 0.75	TN R0.75 - 4	0.75	TN R0.75 - 4	M4	1.2 (10.6)
	MD520-2T1.1B(S)	6.3	5.1	3 x 0.75	TN R0.75 - 4	0.75	TN R0.75 - 4	M4	1.2 (10.6)
	MD520-2T1.5B(S)	9.0	7.2	3 x 1.5	TN R1.25 - 4	1.5	TN R1.25 - 4	M4	1.2 (10.6)
T2	MD520-2T2.2B(S)	11.4	9.0	3 x 2.5	TNR2-4	2.5	TNR2-4	M4	1.2 (10.6)
	MD520-2T3.7B(S)	16.7	13.0	3 x 4	TNR3.5 - 4	4	TN R3.5 - 5	M4	1.2 (10.6)
T3	MD520-2T5.5B(S)	32.2	25.0	3 x 10	TNR8-5	10	TNR8-5	M5	2.8 (24.8)
T4	MD520-2T7.5B(S)	41.3	32.0	3 x 10	TNR8-5	10	TNR8-5	M5	2.8 (24.8)
T5	MD520-2T11(B)(S)	59.0	45.0	3 x 16	GTNR16-6	16	GTN R16-6	M6	4.8 (42.5)
T6	MD520-2T15(B)(S)	57.0	60.0	3 x 25	GTNR25-6	16	GTN R16-6	M6	4.8 (42.5)
	MD520-2T18.5(B)(S)	69.0	75.0	3 x 35	GTNR35-6	16	GTNR16-6	M6	4.8 (42.5)
T7	MD520-2T22(B)(S)	89.0	91.0	3 x 50	GTNR50-8	25	GTN R25-8	M8	4.8 (42.5)
	MD520-2T30(B)(S)	106.0	112.0	3 x 70	GTNR70-8	35	GTN R35-8	M8	4.8 (42.5)

Structure	Drive Model	Rated Input Current (A)	Rated Output Current (A)	R/S/T, U/V/W		Grounding Cable		Screw	Tightening Torque (N·m) (lb.in)
				Recommended Cable (mm ²) ^{<1>}	Recommended Cable Lug	Recommended Cable (mm ²) ^{<1>}	Recommended Cable Lug		
T8	MD520-2T37(B)(S)	139.0	150.0	3 x 95	GTNR95-12	50	GTNR35-8	M12 (main power)	35.0 (310.1)
								M8 (grounding)	13.0 (115.2)
	MD520-2T45(S)	164.0	176.0	3 x 120	GTNR120-12	70	GTNR50-8	M12 (main power)	35.0 (310.1)
								M8 (grounding)	13.0 (115.2)
	MD520-2T55(S)	196.0	210.0	3 x 150	BC150-12	95	GTNR70-8	M12 (main power)	35.0 (310.1)
								M8 (grounding)	13.0 (115.2)
T9	MD520-2T75(S)	287.0	304.0	3 x 240	BC240-12	120	BC120-12	M12 (main power)	35.0 (310.1)
								M10 (grounding)	20 (117)
T10	MD520-2T90(S)	365.0	377.0	2 x (3 x 150)	BC150-12	150	BC150-12	M12	35.0 (310.1)
	MD520-2T110(S)*	410.0	426.0	2 x (3 x 185)	BC185-12	185	BC150-12	M12	35.0 (310.1)
T11	MD520-2T132(S)*	441.0	465.0	2 x (3 x 240)	BC240-12	240	BC240-12	M12	35.0 (310.1)
T12	MD520-2T160(S)	565.0	585.0	2 x (3 x 300)	BC300-16	300	BC300-16	M16	85.0 (753.1)
	MD520-2T200(S)*	687.0	725.0	4 x (3 x 185)	BC185-16	2 x 185	BC185-16	M16	85.0 (753.1)

Note

<1>: Applicable to GB standards. For example, 3 x 10 indicates one 3-conductor 10 mm² cable; 2 x (3 x 120) indicates two 3-conductor 120 mm² cables. The preceding recommended lugs are the TNR, GTNR, and BC series lugs from Suzhou Yuanli.

Note:

1. Observe national or regional regulations during selection. The cables recommended in the preceding table meet the following conditions: PVC insulation and copper conductor; Ambient temperature of 40°C and cable surface temperature of 70°C (When the ambient temperature exceeds 40°C, contact Inovance); Cable layout type E is adopted (see IEC 60204-1).
2. The cables with the asterisk mark (*) must be connected through the copper busbar.
3. If the conditions are different, you need to select the model according to actual conditions.

Table 8-7 Cable selection (three-phase 200 V to 240 V, compliant with UL certification)

Structure	Drive Model	Rated Input Current (A)	Rated Output Current (A)	R/S/T, U/V/W		Grounding Cable		Screw	Tightening Torque (N·m) (lb.in)
				Recommended Cable (AWG/kcmil) ^{<2>}	Recommended Cable Lug	Recommended Cable (AWG/kcmil) ^{<2>}	Recommended Cable Lug		
T1	MD520-2T0.4B(S)	2.4	2.1	14	TLK2.5-4	14	TLK2.5-4	M4	1.2 (10.6)
	MD520-2T0.7B(S)	4.6	3.8	14	TLK2.5-4	14	TLK2.5-4	M4	1.2 (10.6)
	MD520-2T1.1B(S)	6.3	5.1	14	TLK2.5-4	14	TLK2.5-4	M4	1.2 (10.6)
	MD520-2T1.5B(S)	9.0	7.2	14	TLK2.5-4	14	TLK2.5-4	M4	1.2 (10.6)
T2	MD520-2T2.2B(S)	11.4	9.0	12	TLK4-4	12	TLK4-4	M4	1.2 (10.6)
	MD520-2T3.7B(S)	16.7	13.0	10	TLK6-4	10	TLK6-4	M4	1.2 (10.6)
T3	MD520-2T5.5B(S)	32.2	25.0	8	TLK10-5	8	TLK10-5	M5	2.8 (24.8)
T4	MD520-2T7.5B(S)	41.3	32.0	6	TLK16-5	6	TLK16-5	M5	2.8 (24.8)
T5	MD520-2T11(B)(S)	59.0	45.0	4	TLK25-6	4	TLK25-6	M6	4.8 (42.5)
T6	MD520-2T15(B)(S)	57.0	60.0	2	TLK35-6	4	TLK25-6	M6	4.8 (42.5)
	MD520-2T18.5(B)(S)	69.0	75.0	2	TLK35-6	4	TLK25-6	M6	4.8 (42.5)

Structure	Drive Model	Rated Input Current (A)	Rated Output Current (A)	R/S/T, U/V/W		Grounding Cable		Screw	Tightening Torque (N·m) (lb.in)
				Recommended Cable (AWG/kcmil) ^{<2>}	Recommended Cable Lug	Recommended Cable (AWG/kcmil) ^{<2>}	Recommended Cable Lug		
T7	MD520-2T22(B)(S)	89.0	91.0	1/0	TLK50-8	2	TLK35-8	M8	4.8 (42.5)
	MD520-2T30(B)(S)	106.0	112.0	3/0	TLK95-8	1/0	TLK50-8	M8	4.8 (42.5)
T8	MD520-2T37(B)(S)	139.0	150.0	4/0	TLK120-12	3/0	TLK95-8	M12 (main power)	35.0 (310.1)
								M8 (grounding)	13.0 (115.2)
	MD520-2T45(S)	164.0	176.0	300 kcmil	SQNB S150-12	3/0	TLK95-8	M12 (main power)	35.0 (310.1)
								M8 (grounding)	13.0 (115.2)
	MD520-2T55(S)*	196.0	210.0	2x3/0	TLK95-12	3/0	TLK95-8	M12 (main power)	35.0 (310.1)
								M8 (grounding)	13.0 (115.2)
T9	MD520-2T75(S)*	287.0	304.0	2 x 300 kcmil	SQNB S150-12	300 kcmil	SQNB S150-10	M12 (main power)	35.0 (310.1)
								M10 (grounding)	20 (117)
T10	MD520-2T90(S)	365.0	377.0	2 x 350 kcmil	SQNB S180-12	350 kcmil	SQNB S180-12	M12	35.0 (310.1)
	MD520-2T110(S)*	410.0	426.0	2 x 400 kcmil	SQNB S250-12	400 kcmil	SQNB S250-12	M12	35.0 (310.1)
T11	MD520-2T132(S)*	441.0	465.0	2 x 500 kcmil	SQNB S250-12	500 kcmil	SQNB S250-12	M12	35.0 (310.1)
T12	MD520-2T160(S)*	565.0	585.0	4 x 300 kcmil	SQNB S150-12	2 x 300 kcmil	SQNB S150-12	M16	85.0 (753.1)
	MD520-2T200(S)*	687.0	725.0	4 x 400 kcmil	TLK240-16	2 x 400 kcmil	TL K240-16	M16	85.0 (753.1)

Note

<2>: Applicable to AWG standards, in which 8 represents 8AWG, 1/0 represents 0AWG, 3/0 represents 000AWG, and 4/0 represents 0000AWG; 2 x 300 kcmil represents two 300 kcmil cables. The preceding recommended cable lugs are TLK and SQNBS series lugs from KST.

Note:

1. Observe national or regional regulations during selection. The cables recommended in the preceding table meet the following conditions: PVC insulation and copper conductor; ambient temperature of 40°C and cable surface temperature of 75°C (When the ambient temperature exceeds 40°C, contact Inovance); Cable layout type E is adopted (see IEC 60204-1).
2. The recommended cables must meet requirements for 125% overload.
3. The cables with the asterisk mark (*) must be connected through the copper busbar.
4. If the conditions are different, you need to select the model according to actual conditions.

Table 8–8 Cable selection (single-phase 200 V to 240 V) (with CE certification)

Structure	Drive Model	Rated Input Current (A)	Rated Output Current (A)	R/S/T, U/V/W		Grounding Cable		Screw	Tightening Torque (N·m) (lb.in)
				Recommended Cable (mm ²) ^{<1>}	Recommended Cable Lug	Recommended Cable (mm ²) ^{<1>}	Recommended Cable Lug		
T2	MD520-2S0.4B(S)	5.4	2.3	3 x 0.75	TNR1.25-4	0.75	TNR1.25-4	M4	1.2 (10.6)
	MD520-2S0.7B(S)	8.2	4.0	3 x 1.5	TNR1.25-4	1.5	TNR1.25-4		
	MD520-2S1.5B(S)	14.0	7.0	3 x 2.5	TNR2-4	2.5	TNR2-4		
	MD520-2S2.2B(S)	20.0	9.6	3 x 4	TNR3.5-4	4	TNR3.5-4		

Note

<1>: Applicable to GB standards. For example, 3 x 4 indicates one 3-conductor 4 mm² cable; 3 x 150 indicates one 3-conductor 150 mm² cables. The preceding recommended cable lugs are the TNR series lugs of Suzhou Yuanli.

Note:

1. Observe national or regional regulations during selection. The cables recommended in the preceding table meet the following conditions: PVC insulation and copper conductor; ambient temperature of 40°C and cable surface temperature of 70°C (When the ambient temperature exceeds 40°C, contact Inovance); Cable layout type E is adopted (see IEC 60204-1).
2. If the conditions are different, you need to select the model according to actual conditions.

Table 8-9 Cable selection (single-phase 200 V to 240 V) (with UL certification)

Structure	Drive Model	Rated Input Current (A)	Rated Output Current (A)	R/S/T, U/V/W		Grounding Cable		Screw	Tightening Torque (N·m) (lb.in)
				Recommended Cable (AWG) <2>	Recommended Cable Lug	Recommended Cable (AWG) <2>	Recommended Cable Lug		
T2	MD520-2S0.4B(S)	5.4	2.3	14	TLK2.5-4	14	TLK2.5-4	M4	1.2 (10.6)
	MD520-2S0.7B(S)	8.2	4.0	14	TLK2.5-4	14	TLK2.5-4		
	MD520-2S1.5B(S)	14.0	7.0	12	TLK4-4	12	TLK4-4		
	MD520-2S2.2B(S)	23.0	9.6	10	RNBL5-4	10	RNBL5-4		

Note

<2>: Applicable to AWG standards; 14 represents 14AWG and 12 represents 12AWG. The preceding recommended cable lugs are TLK and RNB series lugs from KST.

Note:

1. Observe national or regional regulations during selection. The cables recommended in the preceding table meet the following conditions: PVC insulation and copper conductor; ambient temperature of 40°C and cable surface temperature of 75°C (When the ambient temperature exceeds 40°C, contact Inovance); Cable layout type E is adopted (see IEC 60204-1).
2. The recommended cables must meet requirements for 125% overload.
3. If the conditions are different, you need to select the model according to actual conditions.

Recommended Lug

The following table describes recommended lugs, namely, the TNR, GTNR, and BC series lugs of Suzhou Yuanli. The lugs with UL certifications are TLK and SQNBS series lugs of KST.

Table 8-10 Appearances, models, and dimensions of TNR series lugs (unit: mm)

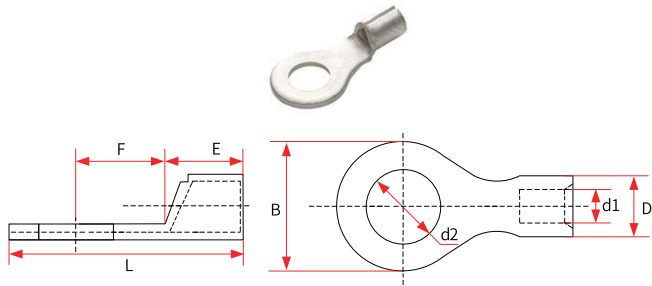
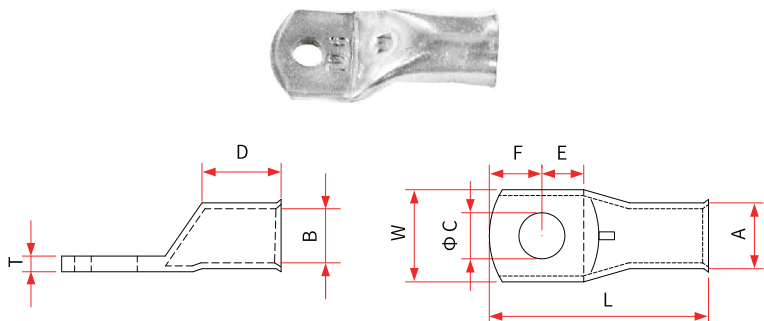
Model	Cable Specification		D	d1	E	F	B	d2	L	Current (A)	Crimping Pliers
	AWG/MCM	mm ²									
											
TNR0.75-4	22-16	0.25-1.0	2.8	1.3	4.5	6.6	8.0	4.3	15.0	10	RYO-8
TNR1.25-4	22-16	0.25-1.65	3.4	1.7	4.5	7.3	8	5.3	15.8	19	AK-1M

Table 8-11 Appearances, models, and dimensions of GTNR series lugs (unit: mm)

Model	D	d1	E	H	K	B	d2	F	L	R	Crimping Pliers
GTNR1.5-5	4.0	2.2	5.0	5.0	2.0	8.0	5.3	1.0	16.0	5	RYO-8 YYT-8 RYO-14
GTNR2.5-4	4.5	2.9	7.0	5.0	2.0	8.0	4.3	1.0	18.0	5	
GTNR2.5-5	4.5	2.9	7.0	6.0	2.0	8.0	5.3	1.0	20.0	7	
GTNR2.5-6	4.5	2.9	7.0	6.0	2.0	10.2	6.4	0.8	20.0	7	
GTNR4-5	5.2	3.6	7.0	6.0	2.0	10.0	5.3	1.0	20.0	7	
GTNR4-6	5.2	3.6	7.0	6.0	2.0	10.0	6.4	1.0	20.0	7	
GTNR6-5	6.0	4.2	9.0	6.0	3.0	10.0	5.3	1.2	23.0	7	
GTNR6-6	6.0	4.2	9.0	7.5	3.0	10.0	6.4	1.2	26.0	7	
GTNR6-8	6.0	4.2	9.0	7.5	3.0	12.0	8.4	1.0	26.0	7	
GTNR10-6	7.0	5.0	9.0	8.0	3.5	12.4	6.4	1.3	26.5	7	
GTNR10-8	7.0	5.0	9.0	8.0	3.5	12.4	8.4	1.3	27.5	7	
GTNR16-6	7.8	5.8	12.0	8.0	4.0	12.4	6.4	1.3	31.0	7	CT-38 CT-100
GTNR16-8	7.8	5.8	12.0	8.0	4.0	12.4	8.4	1.3	31.0	7	
GTNR25-6	9.5	7.5	12.0	8.0	4.5	14.0	6.4	2.0	32.0	10	
GTNR25-8	9.5	7.5	12.0	9.0	4.5	15.5	8.4	1.6	34.0	10	
GTNR25-10	9.5	7.5	12.0	10.5	4.5	17.5	10.5	1.4	37.0	10	
GTNR35-6	11.4	8.6	15.0	9.0	5.0	15.5	6.4	2.8	38.0	10	
GTNR35-8	11.4	8.6	15.0	9.0	5.0	15.5	8.4	2.8	38.0	10	
GTNR35-10	11.4	8.6	15.0	10.5	5.0	17.5	10.5	2.5	40.5	10	
GTNR50-8	12.6	9.6	16.0	11.0	6.0	18.0	8.4	2.8	43.5	10	CT-100
GTNR50-10	12.6	9.6	16.0	11.0	6.0	18.0	10.5	2.8	43.5	10	
GTNR70-8	15.0	12.0	18.0	13.0	7.0	21.0	8.4	2.8	50.0	14	
GTNR70-10	15.0	12.0	18.0	13.0	7.0	21.0	10.5	2.8	50.0	14	
GTNR70-12	15.0	12.0	18.0	13.0	7.0	21.0	13.0	2.8	50.0	14	
GTNR95-10	17.4	13.5	20.0	13.0	9.0	25.0	10.5	3.9	55.0	14	
GTNR95-12	17.4	13.5	20.0	13.0	9.0	25.0	13.0	3.9	55.0	14	

Model	D	d1	E	H	K	B	d2	F	L	R	Crimping Pliers
GTNR120-12	19.8	15.0	22.0	14.0	10.0	28.0	13.0	4.7	60.0	16	RYC-150
GTNR120-16	19.8	15.0	22.0	16.0	10.0	28.0	17.0	4.7	64.0	16	
GTNR150-12	21.2	16.5	26.0	16.0	11.0	30.0	13.0	4.7	69.0	24	
GTNR150-16	21.2	16.5	26.0	16.0	11.0	30.0	17.0	4.7	69.0	24	
GTNR185-16	23.5	18.5	32.0	17.0	12.0	34.0	17.0	5.0	78.0	24	
GTNR240-16	26.5	21.5	38.0	20.0	14.0	38.0	17.0	5.5	92.0	24	
GTNR240-20	26.5	21.5	38.0	20.0	14.0	38.0	21.0	5.5	92.0	24	

Table 8-12 Appearance, models, and dimensions of BC series cable lugs (unit: mm)

Model	A	B	W	E	D	L	T	C	F
									
120-8	19.0	15.0	27.2	16.5	27.0	73.0	4.0	8.5	16.5
120-10				10.5					
120-12				12.8					
120-14				14.7					
120-16				16.7					
120-20				18.8				20.7	
150-8	21.0	16.5	30.0	16.5	27.0	78.0	4.5	8.5	16.5
150-10				10.5					
150-12				12.8					
150-14				14.7					
150-16				16.7					
150-20				18.8				20.7	

Model	A	B	W	E	D	L	T	C	F
185-10	23	18.5	33.5	16.5	30	82	4.5	10.5	16.5
185-12								12.8	
185-14								14.7	
185-16								16.7	
185-20				18.8				20.7	
240-10	26	21	37.7	18.0	32.0	88.0	5.0	10.5	17.0
240-12								12.8	
240-14								14.7	
240-16								16.7	
240-20								20.7	
300-10	28.0	23.0	41.0	18.0	37.0	97.0	5.0	10.5	17.0
300-12								12.8	
300-14								14.7	
300-16								16.7	
300-20								20.7	

8.3.4 Wiring Descriptions of Main Circuit Terminals

This section specifies requirements on wiring of main circuit terminals. For requirements on selection, routing, and wiring of main circuit cables, see ["8.3.5 Requirements on Main Circuit Wiring" on page 155](#).

To prevent accidents caused by short circuit, install a fuse on the input side of the drive. For requirements and selection of fuses at the input side, see "Conditions for Compliance with the LVD" in the *MD520 Series General-Purpose AC Drive Hardware Guide*.

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

- The cable connection on the input side of the drive has no requirements on the phase sequence.
- The specification and installation method of external main circuit cables must comply with local regulations and related IEC standards.
- Use proper copper drain wires for main circuit cables according to the recommended values.

DC bus (+), (-)

- After the drive is switched off, DC bus terminals (+) and (-) have residual voltage. After the CHARGE indicator goes off, wait at least 10 minutes before operating the drive. Failure to comply will result in electric shock.
- When wiring an external braking component for a model with the power of 90 kW or above, ensure correct polarity (+)/(-). Failure to comply will result in damage to the AC drive and braking components or even fire.
- The cable length of the braking unit cannot exceed 10 m. Use the twisted pair cables or closely-paired cables for parallel connection.

- Avoid connecting the braking resistor directly to the DC bus. Failure to comply will result in damage to the AC drive or even fire.

U, V, and W terminals on the output side

- The specification and installation method of external main circuit cables must comply with the local regulations and related IEC standards.
- Use copper lead cables with appropriate dimensions for main circuit cables.
- Do not connect any capacitor or surge protection device at the output side. Failure to comply will result in malfunction or even damage to the AC drive.
- An excessively long motor cable may result in electrical resonance due to the distributed capacitance. The generated electrical resonance may cause damage to motor insulation or high leakage current, triggering the overcurrent protection mechanism of the AC drive. When using a motor cable longer than 100 m, install an AC output reactor close to the AC drive.

Grounding terminal (PE)

For grounding requirements, see ["8.5.1 Grounding Requirement" on page 182](#).

8.3.5 Requirements on Main Circuit Wiring

Main circuit wiring requirements

- Terminals BR, (-), and (+) are used to connect options. Avoid connecting these terminals to an AC power supply.
- To protect the main circuit, separate it from all surfaces that may come into contact with it and provide covers as required.
- The control circuit is the internal safety extra-low voltage (SELV) circuit, which must be insulated and isolated from other circuits. Make sure that the control circuit is connected to an external SELV circuit.
- Prevent foreign matters from entering the wiring part of the terminal block.
- Do not solder the twisted conductors.
- The tightening torque may vary with terminals. Tighten terminal screws with the specified tightening torque. You can use the torque screwdriver, ratchet, or wrench.
- When using an electric screwdriver to tighten terminal screws, set a low speed to prevent damage to the terminal screws.
- Tighten the terminal screws at an angle within 5 degrees. Failure to comply may result in screw damage.

Power cable selection requirements

For selection of power cables, follow national or regional regulations. Select IEC cables based on the following requirements:

- Compliant with EN 60204-1 and IEC 60364-5-52 standards.

- PVC insulated cables with copper conductors
- Ambient temperature of 40°C and cable surface temperature of 70°C (Remark: When the ambient temperature exceeds 40°C, contact Inovance.)
- Symmetrical cable with copper mesh shield

Note

If the recommended cables for peripheral equipment or options are not suitable for the product, contact Inovance.

Use shielded cables to comply with the EMC requirements. The shielded cables are divided into three-conductor cables and four-conductor cables, as shown below. If the conductivity of the three-conductor cable shield cannot meet requirements, add an independent PE cable. Alternatively, use a four-conductor cable with one conductor as the PE cable. The shield of the shielded cable is comprised of coaxial cooper braids to suppress radio frequency interference. To enhance the shielding performance and conductivity, the braided density of the shield must be greater than 90%.

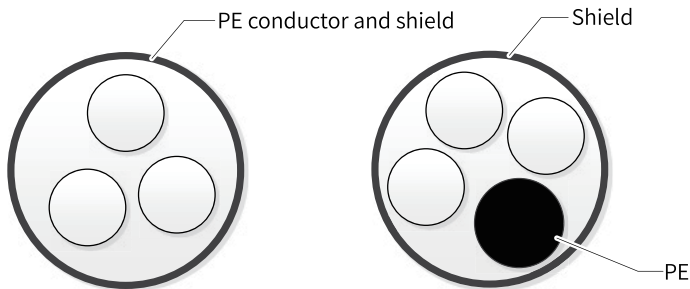


Figure 8-29 Recommended power cable

Requirements on main circuit routing

The power supply input cable of the AC drive and motor cable can generate strong electromagnetic interference. To avoid electromagnetic interference caused by long-distance parallel coupling between the strong disturbing cable and control circuit cable, ensure a distance longer than 30 cm between main circuit cables and signal cables when cabling. Common main circuit cables include input R/S/T cables, output U/V/W cables, DC buses, and braking cables. Signal cables include I/O signal cables, communication cables, and encoder cables.

Cable ducts must be in good connection and well grounded. Use aluminum cable ducts to ensure equipotentiality of the device. Connect the filter, AC drive, and motor to the system (machines or devices) properly. Protect all connections with spray coating and ensure good contact of conductive metal.

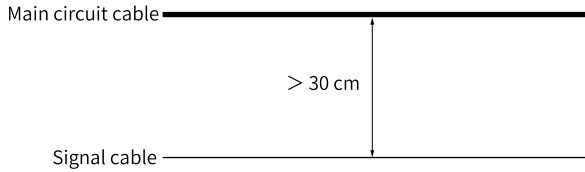


Figure 8-30 Cable layout

Wiring in an IT or delta grid system



Danger

Before wiring in an IT or angular grid system, disconnect the optional EMC grounding screw. Failure to comply will result in damage to the AC drive or even personal injury.

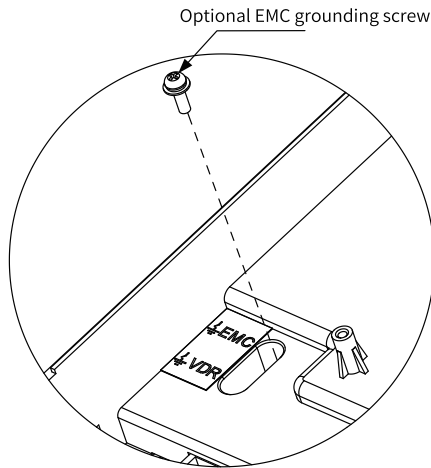


Figure 8-31 Disconnecting the optional EMC grounding screw

Shield of motor cables

Use shielded cables for motor output cables. Strip the cable to expose the shield, crimp the shield to the wire ferrule slot of the bracket with the wire ferrule, and crimp the lead wire of the shield to the PE terminal, as shown below. The following figure shows wiring of the shield.

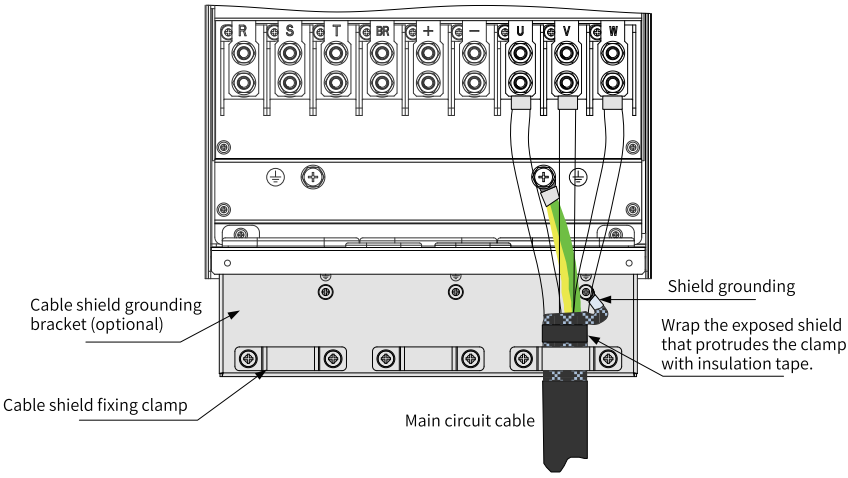


Figure 8-32 Wiring of the shield

Keep the drain wire of the motor cable shield as short as possible, with its width (b in the following figure) no shorter than 1/5 of its length (a in the following figure).

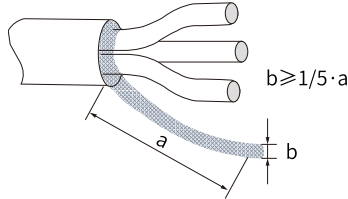


Figure 8-33 Lead wire of the motor cable shield

Length of motor cables

When the AC drive is working, the quick on-off of its power switch triode can lead to excessively large dU/dt at the output side. If the motor cable is too long, the motor winding will experience excessive voltage stress that may cause insulation breakdown. Use motors that comply with technical specifications in IEC 60034-25 IVIC B or motors with high voltage resistance. In addition, when the cable length increases, the distributed capacitance of the cable increases linearly, resulting in high harmonic current.

When the length of the motor cable is longer than the maximum length recommended in the following table, install an output reactor on the output side of the AC drive, or use a motor conforming to technical specifications in IEC 60034-25 IVIC B. The output reactor can reduce the voltage stress on the motor winding.

Table 8-13 Requirement for output reactor based on cable length and motor types

AC Drive Rated Power (kW)	Maximum Cable Length of the Common Asynchronous Motor (Without Output Reactor) (m)	Output Reactor Required (Motor Complying with IEC 60034-25 IVIC B)	Output Reactor Required (Common Asynchronous Induction Motor)
0.4–3.7	50	Not required	Required
5.5	70	Not required	Required
7.5	100	Not required	Required
11	110	Not required	Required
15	125	Not required	Required
18.5	135	Not required	Required
22	150	Not required	Required
≥ 30	150	Not required	Required

Recommended terminal

The following table describes the appearances of the GTNR and BC series cable lugs of Suzhou Yuanli.

Table 8-14 Appearance of cable lugs

Series	Appearance
GTNR series	
TNR series	
BC series	

8.3.6 Protection Requirements

Requirements for protection of main circuit cables

Use the heat-shrinkable tube to wrap the copper tube of the main circuit cable terminal and the cable conductor and ensure the conductor is completely wrapped, as shown in *"Figure 8-34 Cable conductor with the heat-shrinkable tube" on page 160.*

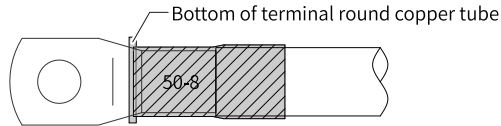


Figure 8-34 Cable conductor with the heat-shrinkable tube

Requirements on upstream protection device

- Install proper protection devices on the power supply input side to provide isolation functions and functions against overcurrent and short circuit.
- When selecting the protective devices, take the main circuit cable current capacity, system overload capacity, and short circuit capacity of upstream power distribution into account. The recommended values in the selection guide of peripheral components apply to most of applications.

8.4 Control Circuit Connection

8.4.1 Descriptions of Control Circuit Terminals

"Table 8-17 " on page 164 shows the layout of control circuit terminals.

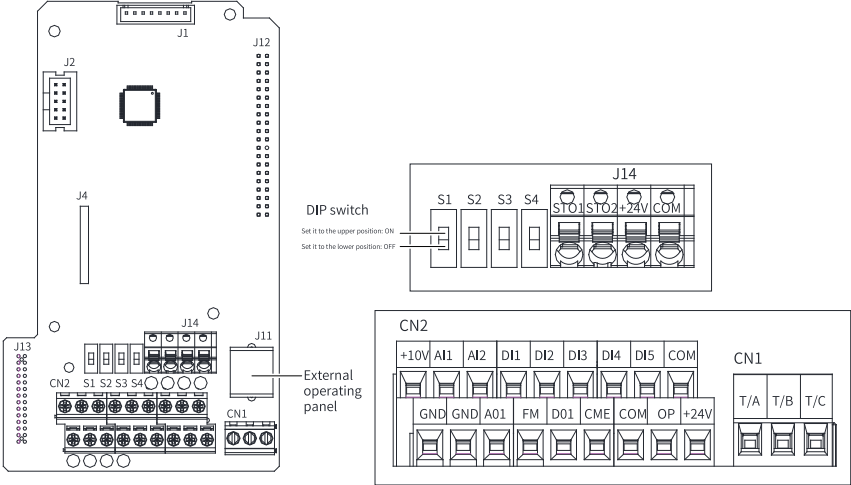


Figure 8-35 Layout of control circuit terminals

Table 8-15 Function description of control circuit terminals

Type	Terminal Mark	Terminal Name	Function Description
Power supply	+10V-GND	External +10 V power supply	The terminal is used to provide +10 V power supply to an external unit with the maximum output current of 10 mA. Generally, it is used to power an external potentiometer with resistance ranging from 1 k Ω to 5 k Ω .
	+24V-COM	External +24 V power supply	The terminal is used to provide +24 V power supply to external devices. Generally, it is used to power the DIs/DOs and external sensor. The maximum output current is 200 mA ^[Note 1] .
	OP	Input terminal for external power supply	It is connected to +24V by default. When DI1 to DI5 are driven by external signals, OP must be disconnected from +24 V and connected to the external power supply.
Analog input	AI1-GND	AI1	Input voltage range: -10 VDC to +10 VDC Input impedance: 22 k Ω
	AI2-GND	AI2	The terminal supports voltage input (default), current input, and temperature input. When used as voltage/current input, the terminal supports 0 V to 10 V, -10 V to +10 V, or 0 mA to 20 mA, and supports 12-bit resolution and the correction accuracy of 1%. The input impedance is 22 k Ω for voltage input and 500 Ω or 250 Ω for current input, which is set by S2 and S3 DIP switches ^{Note [2]} .
Digital input	DI1-OP	DI1	Photocoupler isolation, compatible with dual-polarity input. Input impedance: 1.72 k Ω Operating voltage range: 9 V to 30 V
	DI2-OP	DI2	
	DI3-OP	DI3	
	DI4-OP	DI4	Besides features of DI1 to DI4, DI5 can also be used for high-speed pulse input. Input impedance: 1.16 k Ω Maximum input frequency: 100 kHz Operating voltage range: 15 V to 30 V
	DI5-OP	DI5	
Analog output	AO1-GND	Analog output 1	The DIP switch on the control board is used to determine voltage output (default) or current output. Output voltage range: 0 V to 10 V Output current range: 0 mA to 20 mA

Type	Terminal Mark	Terminal Name	Function Description
Digital output	DO1-CME	Digital output 1	Optocoupler isolation; dual-polarity open collector output Output voltage range: 0 V to 24 V Output current range: 0 mA to 50 mA Note that digital output ground CME and digital input ground COM are internally insulated, but are shorted externally by jumper as the factory settings. In this case, DO1 is driven by +24V by default. To drive DO1 by external power supply, remove the jumper between CME and COM.
	FM-COM	High-speed pulse output	The terminal is set by F5-00 (FM terminal output selection). When the terminal is used for high-speed pulse output, the maximum frequency is 100 kHz. When the terminal is used for collector open output, it has the same specifications as DO1.
Relay output	T/A	Common terminal	Driving capacity of the contact: 250 VAC, 3 A, COS ϕ = 0.4 30 VDC, 1 A
	T/B	Normally closed (NC) terminal	
	T/C	Normally open (NO) terminal	
Auxiliary interface	J4	Local PG card interface	It is used to connect the resolver, ABZ incremental encoder, 23-bit encoder, and sin-cos encoder.
	J11	External operating panel interface	It is used to connect the external LCD operating panel (SOP-20) or the LED operating panel (MDKE-10).
	J13	Expansion card interface	28-core terminal used to connect to expansion cards, including I/O cards, communication cards, and PG card
	J14	Safety function terminal	For details, see "Table 8-16 STO terminal description" on page 164.
DIP switch	S1 S2 S3	ON OFF	For details, see "Table 8-17 DIP switch descriptions" on page 164.
	S4	ON OFF	Current/Voltage mode selection for AO1 On: Current output mode Off: Voltage output mode

Table 8-16 STO terminal description

No.	Terminal Mark	Terminal Name	Performance Requirement
1	STO1	STO channel 1	Internal: STO1 and STO2 are connected to +24V by jumpers by default. External: You can connect STO1 and STO2 to the COM terminal. For detailed wiring methods, see the STO function.
2	STO2	STO channel 2	
3	+24V	STO channel 1 and STO channel 2 power supply+	
4	COM	Power supply ground of STO channel 1 and STO channel 2	

Table 8-17 DIP switch descriptions

DIP Switch Status			Description
S1	S2	S3	
OFF	OFF	OFF	Voltage mode with the range of 0 VDC to 10 VDC for AI2
ON	OFF	OFF	Temperature mode for AI2 Set the temperature sensor type through F9-75. 0: No temperature sensor (AI used for analog input) 1: PT100 temperature detection input signal, -25°C to 200°C, accuracy: $\pm 8^{\circ}\text{C}$ 2: PT1000 temperature detection input signal, -25°C to 200°C, accuracy: $\pm 8^{\circ}\text{C}$ 3: KTY84-130 temperature detection input signal, -40°C to 260°C, accuracy: $\pm 15^{\circ}\text{C}$ 4: PTC130 temperature detection input signal, -20°C to 180°C, accuracy: $\pm 15^{\circ}\text{C}$
OFF	ON	OFF	Current mode for AI2; current range: 0 mA to 20 mA; input impedance: 500 Ω
OFF	ON	ON	Current mode for AI2; current range: 0 mA to 40 mA; input impedance: 250 Ω

Note

- [Note 1]: If the ambient temperature exceeds 23°C, the output current must be derated by 1.8 mA for every additional 1°C. The maximum output current is 170 mA at 40°C. When OP and +24V are shorted, the maximum output current is calculated by the following formula: 170 mA minus current over the DI.
- [Note 2]: Based on the maximum output voltage of the signal source, select impedance of 500 Ω or 250 Ω . For example, if 500 Ω is selected, the maximum output voltage cannot be lower than 10 V so that AI2 can measure 20 mA current.
- S1, S2, and S3 are DIP switches used together for the AI. S4 is the DIP switch for the AO.

8.4.2 Wiring Descriptions of Control Circuit Terminals

Wiring of AI1

Weak analog voltage signals are prone to suffer external interference. Therefore, a shielded cable is required, and the wiring distance must be as short as possible (no longer than 20 m), as shown in ["Figure 8–36 AI wiring" on page 165](#). In scenarios where analog signals experience severe external interference, install a filter capacitor or a ferrite core on the analog signal source, as shown in ["Figure 8–37 Grounding the shield of the analog input cable" on page 166](#). Connect the lead wire of the AI shield to the PE terminal of the AC drive.

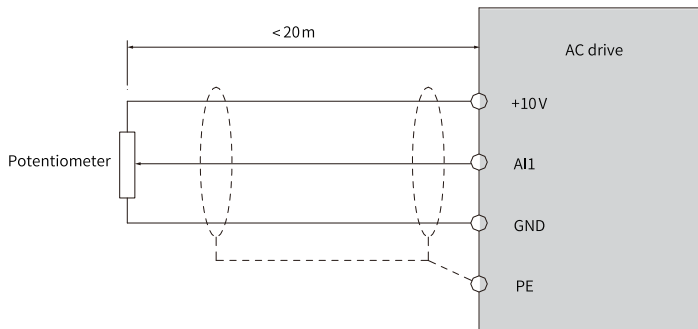


Figure 8-36 AI wiring

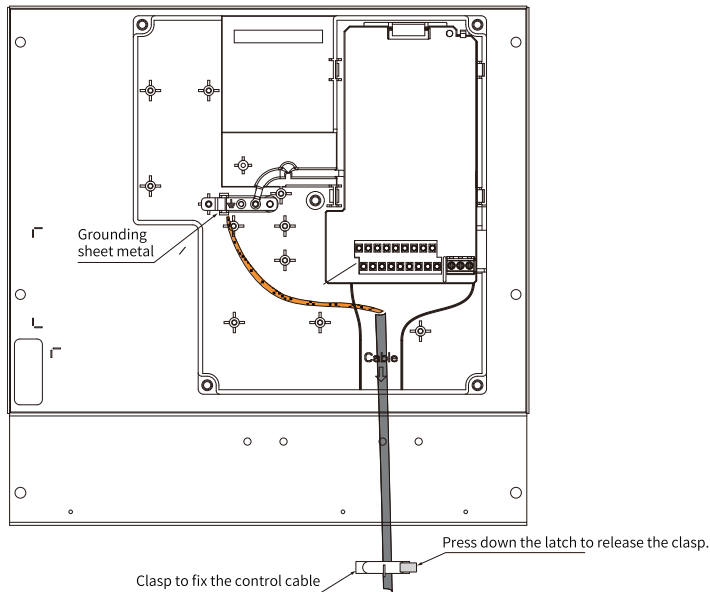


Figure 8-37 Grounding the shield of the analog input cable

Wiring of AI2

- If the AI2 is to be used for voltage signal input, wire it in the same way as that for the AI1.
- If the AI2 is used for current signal input, the current flows to AI2. Toggle S2 (or S2 and S3) to ON. If only S2 is toggled to ON, the impedance is 500 Ω . If both S2 and S3 are toggled to ON, the impedance is 250 Ω .

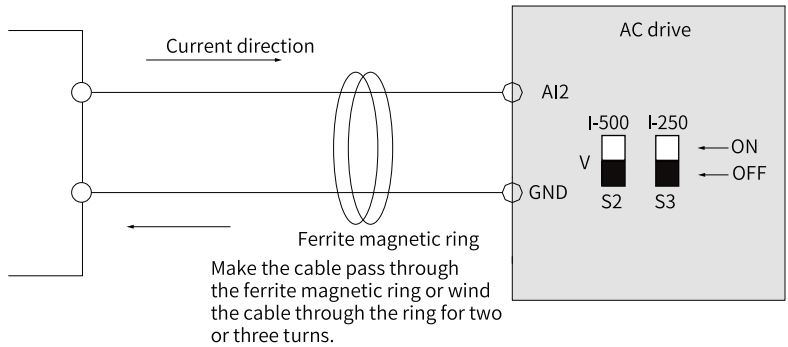


Figure 8-38 Wiring of AI2

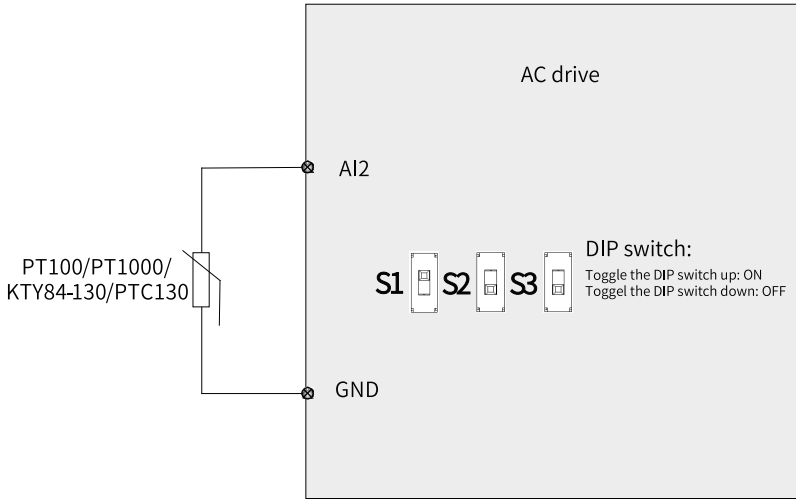


Figure 8-39 Wiring when the AI2 is used for temperature input

Wiring of DI1 to DI5

- Sink wiring mode

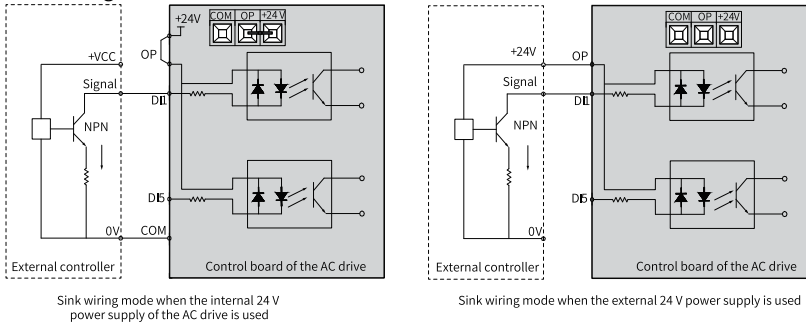


Figure 8-40 Sink wiring mode

The internal 24 V power supply of the drive is the most commonly wiring method. In the sink wiring mode, short the OP and 24V terminals of the drive, and connect the COM terminal of the drive to the 0V terminal of the external controller, as shown in the following figure.

If an external 24 V power supply is used, remove the jumper between +24V and OP. In addition, connect the 24 V positive electrode of the external power supply to the OP terminal. The current flows out of the DI and flows back to 0V of the external power supply via the external controller contact.

In the mode, the DIs of different AC drives cannot be connected in parallel. Otherwise, the DI may malfunction. If DIs of different AC drives must be connected in parallel, connect the anode of a diode to the DI in series and the diode needs to satisfy the following requirement: $IF > 40\text{ mA}$ and $VR > 40\text{ V}$, as shown in *"Figure 8-41 Parallel connection of DIs of multiple AC drives in the sink mode"* on page 168.

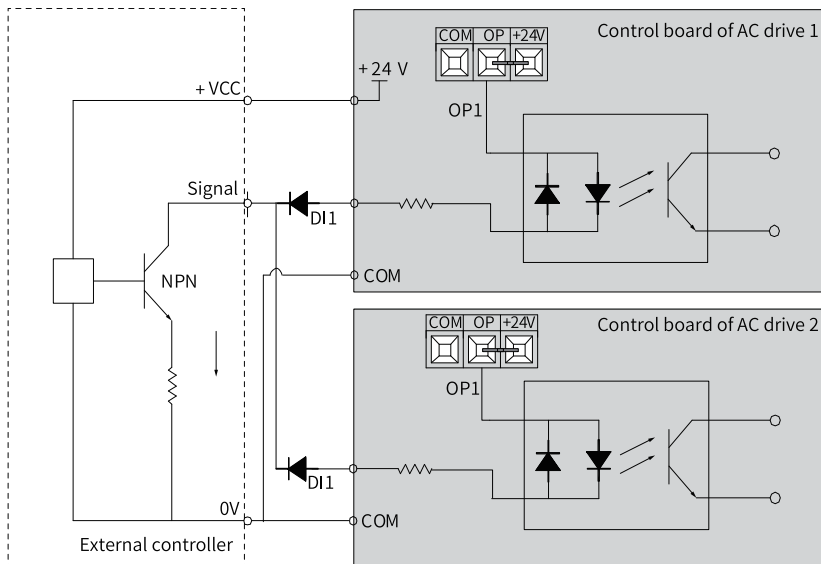


Figure 8-41 Parallel connection of DIs of multiple AC drives in the sink mode

- Source wiring mode

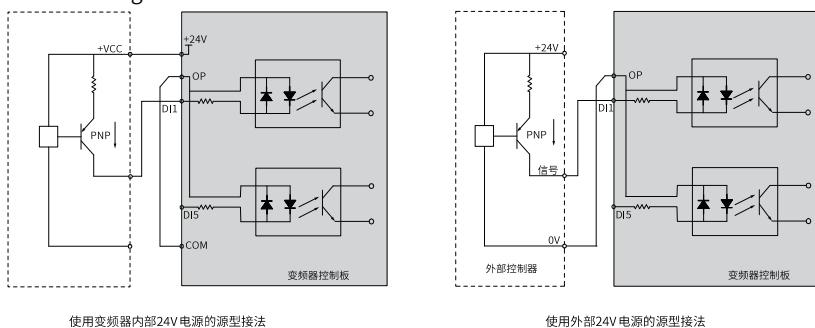


Figure 8-42 Source wiring mode

- To use the internal 24 V power supply of the drive, remove the jumper between the +24V and OP terminals, connect the OP terminal to the COM terminal, and connect the +24V terminal of the drive to the common terminal of the external controller, as shown in the following figure.

- To use an external power supply, remove the jumper between the +24V and the OP terminals, connect the OP terminal of the drive to the 0V terminal of the external power supply, and connect the 24 V positive electrode of the external power supply to the corresponding DI through the external controller contact.

Wiring of DO1

When the DO needs to drive a relay, connect a snubber diode on both sides of the relay coil. Otherwise, the 24 VDC power supply may be damaged. Ensure that the driving capacity does not exceed 50 mA.

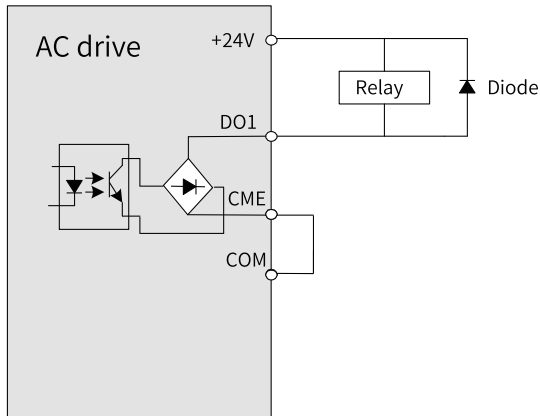


Figure 8-43 Wiring between DO and relay

Note

- Connect the snubber diode with the polarity placed correctly. Otherwise, the 24 VDC power supply will be damaged upon the DO output.
- The digital output ground CME and digital input ground COM are internally insulated, but are shorted externally by jumper as the factory settings. In this case, DO1 is driven by +24V by default. To drive DO1 by external power supply, remove the jumper between CME and COM.

DO1: Photocoupler isolation and bipolar open collector output

Output voltage range: 0 V to 24 V

Output current range: 0 mA to 50 mA

DO1 supports bipolar output. The following wiring methods are available.

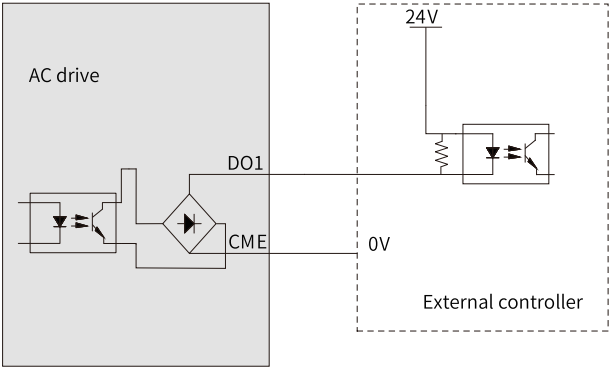


Figure 8-44 DO connecting to external controller 1

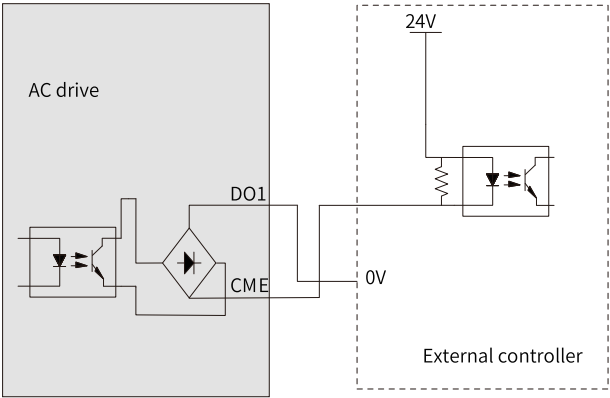


Figure 8-45 DO connecting to external controller 2

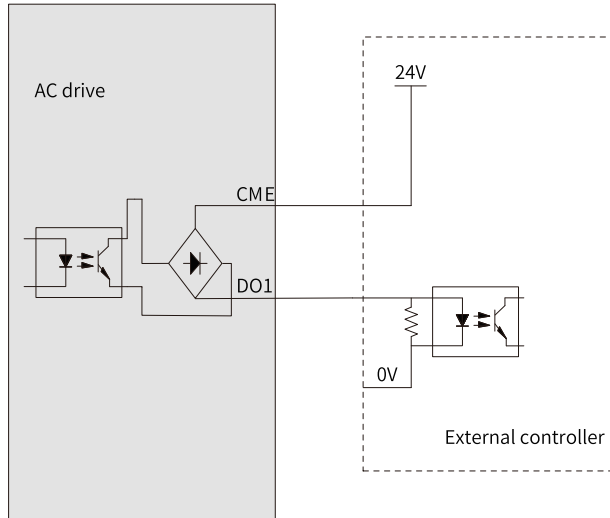


Figure 8-46 DO connecting to external controller 3

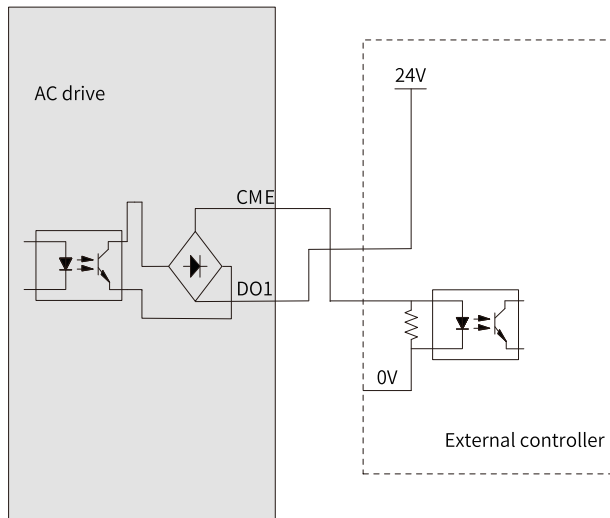


Figure 8-47 DO connecting to external controller 4

Wiring of the high-speed digital output terminal FM

When the FM terminal is used for FMP continuous pulse output, the allowed maximum frequency is 100 kHz.

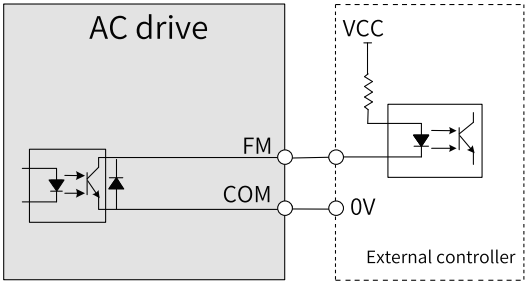


Figure 8-48 Wiring of the high-speed digital output terminal

Wiring of the relay output terminal

The inductive load (relay, contactor, and motor) causes voltage peak after the current is disconnected. To minimize the interference at cutoff, use a voltage dependent resistor (VDR) at the relay contact for protection and install absorption circuits such as VDRs, RC absorption circuits, and diodes on the inductive load, as shown in *"Figure 8-49 Anti-interference treatment for relay output terminals" on page 172.*

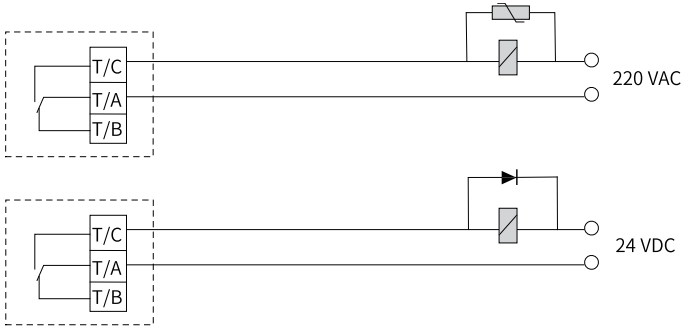


Figure 8-49 Anti-interference treatment for relay output terminals

Note

The power supply connected with the control circuit must use class 2 power supply; otherwise, the operation performance of the AC drive will be degraded.

Requirements on tubular terminals

Use tubular terminals with insulation sheath. Keep the exposed conductor of a single-conductor or twisted-pair cable no longer than 6 mm, as shown in *"Figure 8-50 Requirements on tubular terminals of the control circuit cable" on page 173.*

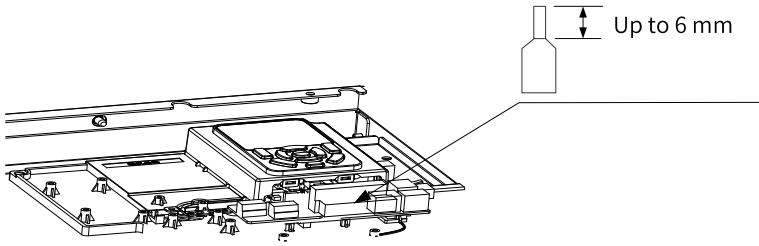


Figure 8-50 Requirements on tubular terminals of the control circuit cable

Table 8-18 Control circuit cable specifications

Single-Conductor Cable mm ² (AWG)	Twisted-Pair Cable mm ² (AWG)	Tightening Torque (N · m)
0.2 to 0.75 (18AWG to 24AWG)	0.75 mm	0.565

Wiring for connecting an external operating panel

To use an external operating panel, connect one end of the connecting cable to the RJ45 port of the AC drive, and lead the other end of the cable from either side of the AC drive, as shown in ["Figure 8-51 Wiring for connecting an external operating panel" on page 173](#).

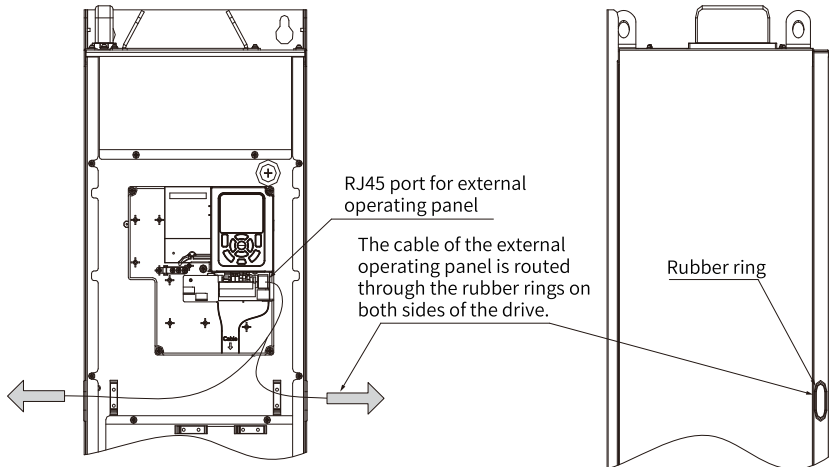
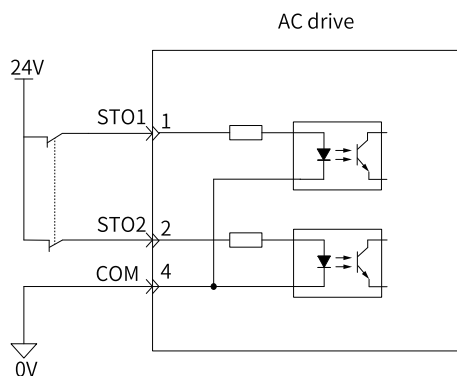


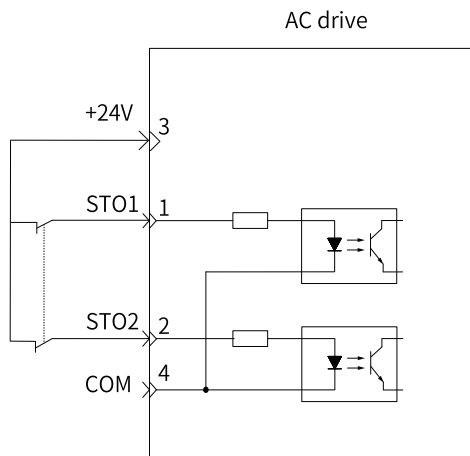
Figure 8-51 Wiring for connecting an external operating panel

STO wiring example

- Wiring example when the external 24 V is used



- Wiring example when the internal 24 V is used



Note

EMC Requirements

- To avoid short circuit between adjacent conductors, use shielded cables and connect the shield to the protective ground. Alternatively, use flat cables and connect a ground cable between adjacent signal conductors.
- Use cables that contain twisted pairs with dual shield layers or single shield layer.
- Fix and ground the cable protective cover using a piece of conductive metal.
- The maximum cable length allowed between the drive and safety switch is 30 m.

8.4.3 Requirements on Control Circuit Wiring

Note

Wire the control circuit cable according to EN 60204-1.

Selection requirements

To ensure that the control circuit will not be interfered by peripherals, use shielded cables with the shield for signal cables, and connect both ends of the shield to the drive 360 degrees with the shield bracket. Use separate shielded cables for different analog signals. It is recommended to use shielded twisted pair (STP) cables for digital signals.

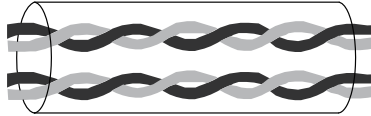


Figure 8-52 Shielded twisted pair cable

Requirements on shield grounding for analog terminals

Weak analog voltage signals are prone to suffer external interference. Therefore, a shielded cable is required, and the wiring distance must be as short as possible (no longer than 20 m). In applications where certain analog signals are subject to severe interference, install a filter capacitor or ferrite core on the analog signal source side.

- It is recommended to use the grounding bracket (optional) together with the shielded cable, so that the cable shield can be grounded 360 degrees.
- Minimize the length of the lead wire of the shield. Fasten the lead wire to the standard grounding copper busbar of the AC drive by using screws. The following figure shows the grounding.

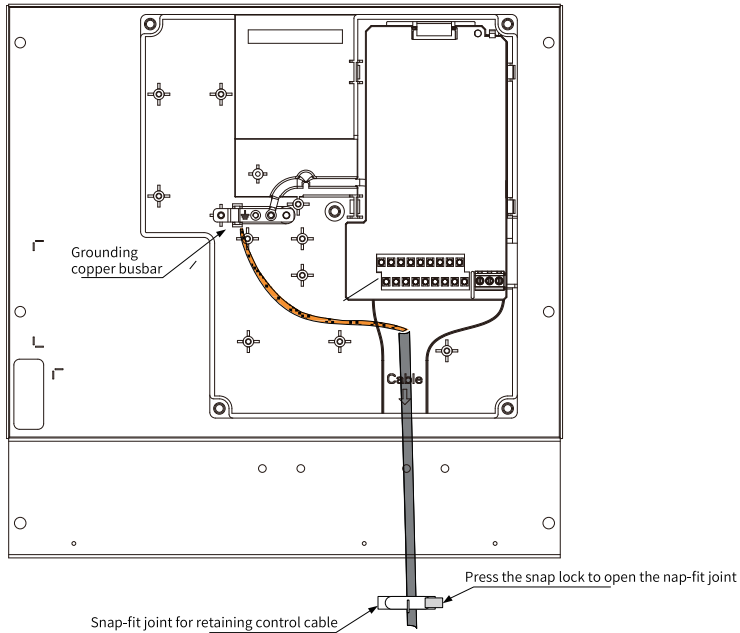


Figure 8-53 Grounding the shield of the analog input cable

Requirements on wiring of encoder signal cables

Before inserting a PG card, remove the screws shown in the enlarged area in the following figure, align the PG card with the three fixing pillars (left part of the enlarged area), and fix the PG card with M3 x 8 screws.

The entire AC drive is grounded in structure. When wiring the encoder after PG card installation, connect the drain wire of the shield of the encoder signal cable to the PE terminal of the PG card to complete shield grounding of the signal cable.

Requirements for connecting the encoder cable:

- Route the encoder cable and power cable through different routes during installation and commissioning. Failure to comply will result in disturbance to the encoder signal.
- It is recommended to use shielded twisted pair cables. For differential encoders, connect the twisted pair cables based on the differential pairs, and connect the shield to the grounding terminal (PE terminal) of the AC drive.
- For large-scale equipment, when the drive is routed far away from the motor (motor cable longer than 10 m), the impedance of the encoder cable shield can be increased due to parasitic inductance of the cable. In this case, the encoder shield needs not be connected to the grounding terminal (PE) of the drive.

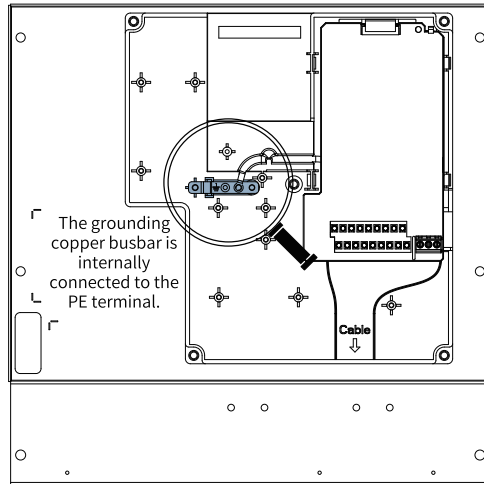


Figure 8-54 PG card installation screws

Requirements on wiring of I/O signal cables

- I/O signals include analog input (AI) signals, analog output (AO) signals, digital input (DI) signals, digital output (DO) signals, and relay output signals. Before wiring the I/O terminal, disconnect the main power supply and ensure that the danger indicator on the AC drive is off.
- To avoid interference to the I/O signals, separate the I/O signal cables at least 30 cm from the main circuit cables (R, S, and T cables and U, V, and W cables) and other power cables (or power supply cables).
- To avoid malfunction of the AC drive and equipment, separate the relay output terminal cable at least 30 cm away from other I/O signal cables.

8.4.4 Cable Routing Requirements

Separate routing of signal cables and power cables

When analog signals are used for remote control on the cabinet module, separate signal cables from high-voltage circuits (power supply input, inverter output, and braking resistor cables) by a distance of above 50 cm. This can reduce interference from the AC drive and other equipment to analog signals. This requirement must be met even inside the control cabinet.

Requirements on analog control signal cables

Use shielded twisted pair cables as analog control signal cables. When stripping the sheath of the cable, keep the stripped part as short as possible (5 mm to 7 mm), and wrap the stripped shield with the insulating tape to prevent the shielded cable from touching other devices, which may result in interference.

Requirement on motor cables

Use shielded cables for motor cables. Minimize the distance between the cabinet module and the motor, and route the motor cables separately from other cables. Also, avoid long-distance parallel routing of the motor cables and other cables to reduce electromagnetic interference caused by rapid changes in the output voltage of the AC drive.

Requirement on power cables

Use shielded cables for power cables, or shield all the cables from the cabinet module to the motor by using conduits.

Requirements on control cables and power supply cables

If the power supply cables and control cables must be intersected, make the intersection angle 90°.

8.4.5 Routing Recommendations

Disturbing cable

Route cables that transmit different types of signals through different routes. Separate disturbing cables from sensitive cables with a minimum clearance of 30 cm wherever possible. When such cables must cross, make sure they are at an angle as near to 90° as possible to prevent interference.

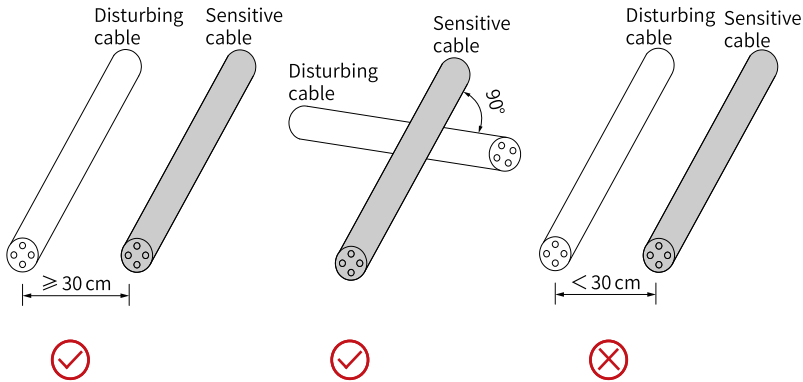


Figure 8-55 Routing of disturbing cables and sensitive cables

Signal cable

Route different signal cables separately and isolate them with the potential equalization cables. When routing cables that transmit the same type of signals, lay equipotential signal cables to the outer layers and lay equipotential bondings as many as possible in the middle, as shown below.

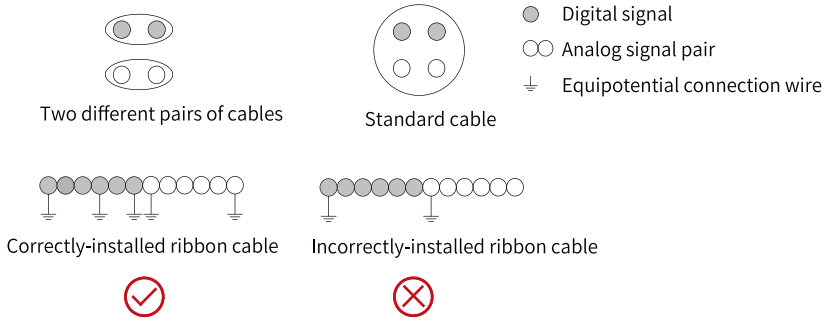


Figure 8-56 Routing cables that transmit different types of signals

Multi-conductor cables

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

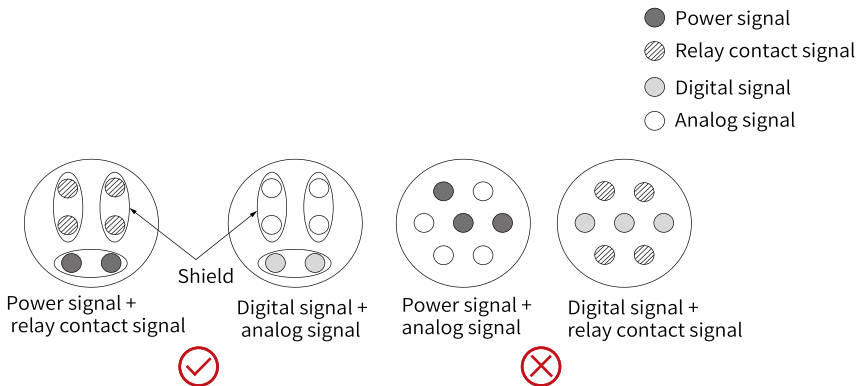


Figure 8-57 Routing of multi-conductor cables

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

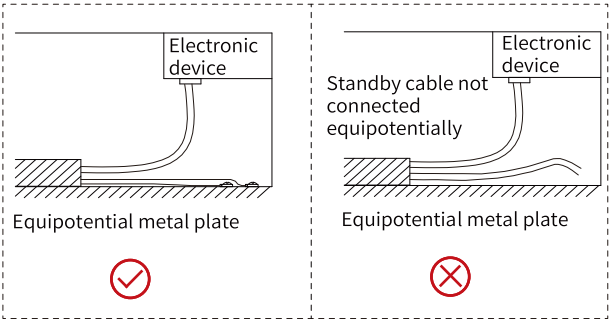


Figure 8-58 Handling reserved or unused conductors

Wiring loop

For cables that transmit low-level sensor signals and shared cables that transmit relay signals, lay them close to each other to avoid the large loop area. Use twisted pair cables for analog signals. Lay digital signal cables close to each other.

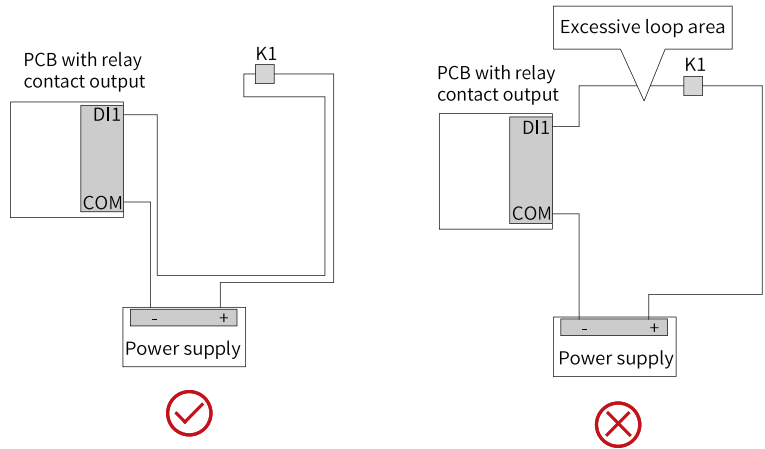


Figure 8-59 Recommended wiring loop area

Multiple types of cables

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

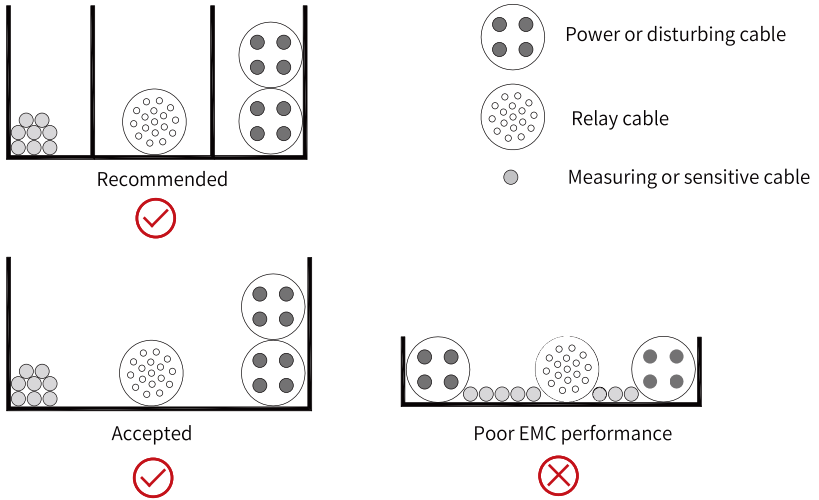


Figure 8-60 Laying multiple types of cables

Handling shielded cables

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

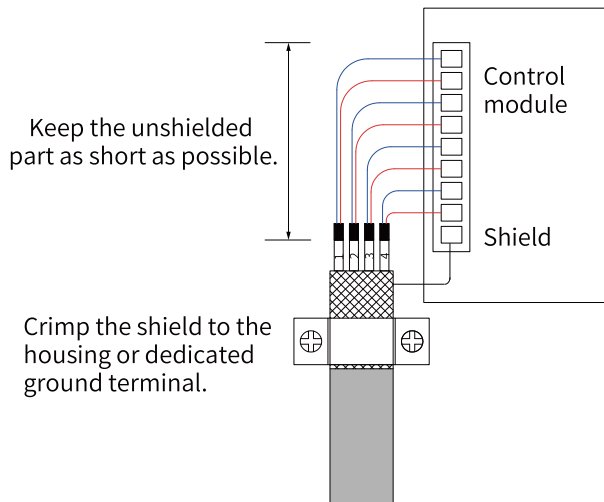


Figure 8-61 Requirements on handling of shielded cables

8.5 Grounding

8.5.1 Grounding Requirement

Observe the following requirements to ensure proper grounding of the drive.



Caution

1. Ground the grounding terminal to avoid electric shocks. Follow the relevant electrical regulations of specific countries or regions on the grounding method.
 2. To prevent electric shocks, ensure the protective grounding conductor complies with technical specifications and local safety standards. Keep the grounding cable as short as possible.
 3. In any case, the cross-sectional area of each protective grounding conductor that does not form part of the power cable or cable jacket cannot be less than 2.5 mm².
 4. The leakage current of a single drive does not exceed 3.5 mA AC or 10 mA DC. You only need to configure one protective grounding conductor with the same specifications as the phase cable.
 5. When using multiple devices, follow the instructions for grounding all devices. Incorrect grounding will cause malfunction of devices.
-

8.5.2 Grounding a Single Device

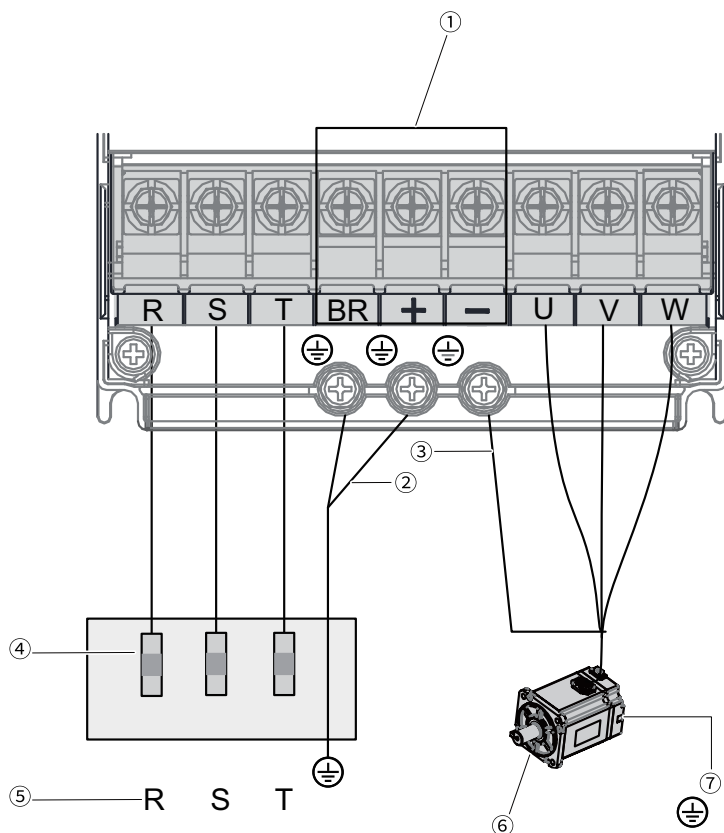


Figure 8-62 Main circuit grounding

Table 8-19 Grounding description of the main circuit

No.	Description
①	Avoid grounding the DC bus terminal and braking resistor terminal.
②	Connect the PE terminal on the input power supply side to the PE terminal on the input side of the AC drive.
③	Connect the output PE terminal of the AC drive to the output cable shield of the motor.
④	Input protection (fuse or circuit breaker). Connect the lower end of the fuse to the filter.
⑤	Input power supply

No.	Description
⑥	Three-phase motor
⑦	Ground the motor enclosure.

Note

The layout of main circuit terminals varies with different models.

8.5.3 Grounding Multiple Devices

The grounding diagram for side-by-side installation of multiple drives is shown below.

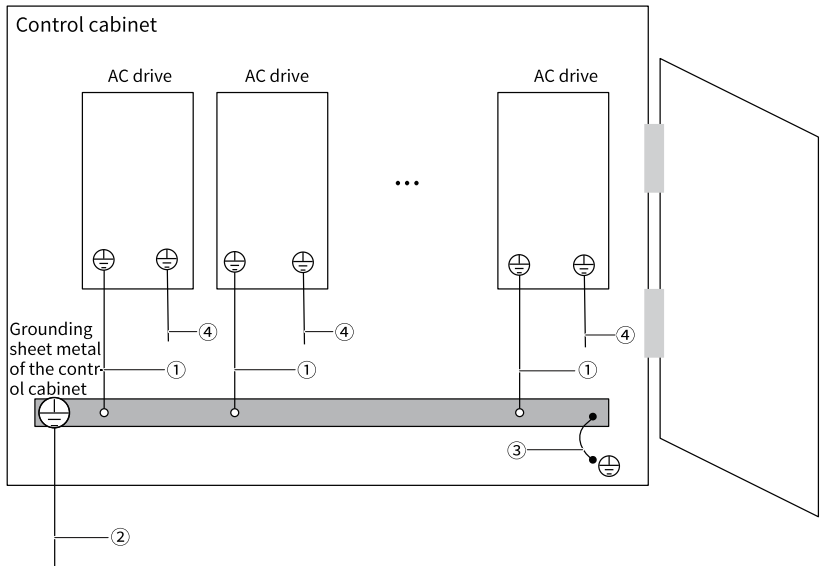


Figure 8-63 Grounding of paralleled drives

Table 8–20 Description for grounding of paralleled drives

No.	Description
①	Connect the main circuit input PE terminal to the grounding sheet metal of the control cabinet through the protective grounding conductor.
②	Connect the PE cable on the input power supply end to the grounding sheet metal of the control cabinet.

No.	Description
③	Connect the grounding sheet metal of the control cabinet to the metal enclosure of the control cabinet through the protective grounding conductor.
④	Connect the motor output cable shield to the output PE terminal of the drive.

8.5.4 Grounding the Cabinet System

The cost-effective method of suppressing interference in a cabinet is to isolate the interference source from the equipment that may be interfered with. Divide a cabinet into multiple EMC compartments or use multiple cabinets based on the intensity of interference sources, and install each device in accordance with the following wiring principles.

Table 8-21 Wiring requirements

No.	Wiring Requirement
1	Install the control devices and drive devices into two separate cabinets.
2	Use grounding cables with a cross-sectional area of at least 16 mm ² to connect different cabinets, therefore realizing equipotential between the cabinets.
3	Place the devices in different areas in the cabinet according to the device signal strength.
4	Carry out equipotential bonding for the devices in different areas of the cabinet.
5	Shield all communication (for example, RS485) and signal cables leading from the electrical cabinet.
6	Install the power supply input filter close to the cabinet input interface.
7	Spray each grounding point in the cabinet.

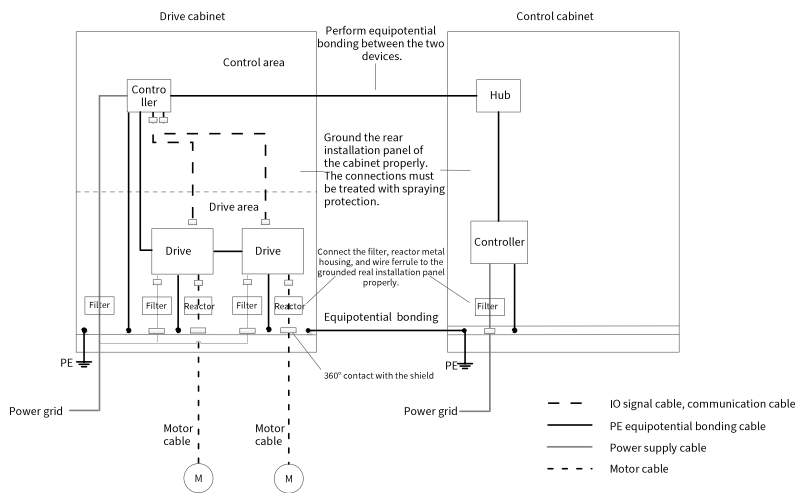


Figure 8-64 Recommended wiring for the cabinet system

8.6 Communication Connection

8.6.1 Wiring of RS485 Communication

RS485 communication connection with PLC

Use a three-conductor shielded cable as the RS485 bus to connect to 485+, 485-, and CGND terminals of the AC drive. Use the twisted pair cable to connect to the 485+ and 485- terminals and use the other cable to connect to the RS485 reference ground terminal CGND. Connect the shield to the equipment ground. Connect a 120 Ω termination resistor at each end of the bus to prevent RS485 signal reflection. The following table specifies the cable pin for the communication between the AC drive and PLC.

Table 8–22 Cable pin for communication between the AC drive and PLC

AC Drive			PLC		
Communication Type	Signal Name	Function Description	Communication Type	Signal Name	Function Description
RS485	485+	RS485 signal (+)	RS485	485+	RS485 signal (+)
	485-	RS485 signal (-)		485-	RS485 signal (-)
	CGND	Signal reference ground		CGND	Signal reference ground
-	GND (CGND)	Enclosure	-	GND (CGND)	Enclosure

RS485 communication for connections of multiple AC drives in parallel

The following table specifies the cable pin for connections of multiple AC drives in parallel in RS485 communication networking.

Table 8–23 Cable pin for parallel communication of multiple AC drives in parallel

AC Drive (Side A)			AC Drive (Side B)		
Communication Type	Signal Name	Function Description	Communication Type	Signal Name	Function Description
RS485	485+	RS485 signal (+)	RS485	485+	RS485 signal (+)
	485-	RS485 signal (-)		485-	RS485 signal (-)
	CGND	Signal reference ground		CGND	Signal reference ground
-	GND (CGND)	Enclosure	-	GND (CGND)	Enclosure

Communication networking

Use the daisy chain connection for the RS485 bus in case of a large number of nodes, as shown in the following figure. Connect the RS485 signal reference ground of all nodes (up to 128 nodes) together.

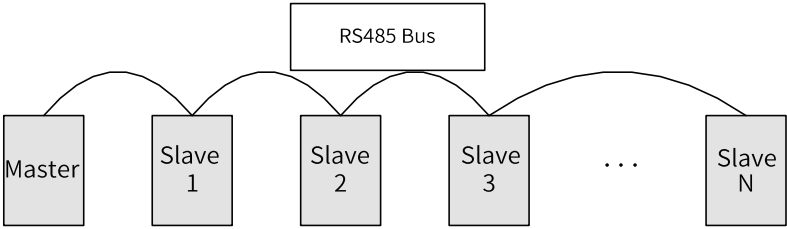


Figure 8-65 Daisy chain connection mode

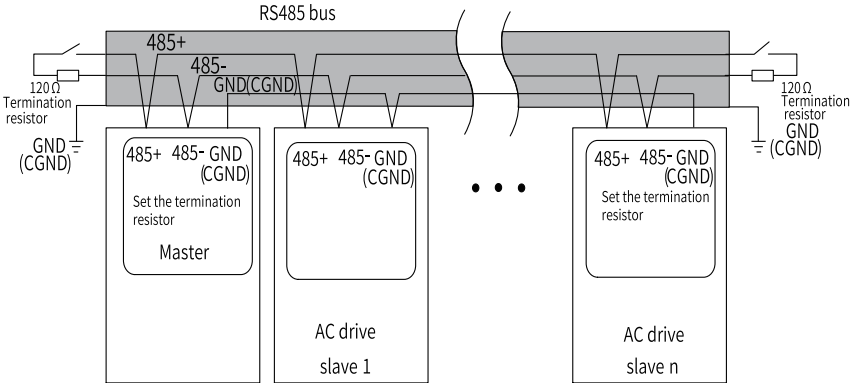


Figure 8-66 RS485 bus topology

The following table lists the maximum number of nodes and transmission distance supported by the standard RS485 circuit at different transmission rates.

Table 8-24 Transmission distance and number of nodes

Transmission Distance (m)	Rate (kbps)	Number of Nodes	Cable Specification
100	115.2	128	26AWG
1000	19.2	128	26AWG

8.6.2 Wiring of CAN Communication

CAN communication with the PLC

Use a three-conductor shielded cable for the CAN bus to connect to the CANH, CANL, and CGND terminals of the AC drive. Use the twisted pair cable to connect to the CANH and CANL terminals and use the other cable to connect to the CAN reference ground CGND. Connect the shield to the equipment ground. Connect a 120 Ω termination resistor at each end of the bus to prevent CAN signal reflection.

The following table specifies the cable pin for the CAN communication between the AC drive and PLC.

Table 8–25 Cable pin for communication between the AC drive and PLC

AC Drive			PLC		
Communication Type	Signal Name	Function Description	Communication Type	Signal Name	Function Description
CAN	CANH	CAN signal (positive)	CAN	CANH	CAN signal (positive)
	CANL	CAN signal (negative)		CANL	CAN signal (negative)
	CGND	Signal reference ground		CGND	Signal reference ground
-	GND (CGND)	Enclosure	-	GND (CGND)	Enclosure

CAN communication for connections of multiple AC drives in parallel

The following table specifies the cable pin for connections of multiple AC drives in parallel in CAN communication networking.

Table 8–26 Cable pin for connections of multiple AC drives in parallel

AC Drive (Side A)			AC Drive (Side B)		
Communication Type	Signal Name	Function Description	Communication Type	Signal Name	Function Description
CAN	CANH	CAN signal (positive)	CAN	CANH	CAN signal (positive)
	CANL	CAN signal (negative)		CANL	CAN signal (negative)
	CGND	Signal reference ground		CGND	Signal reference ground
-	GND (CGND)	Enclosure	-	GND (CGND)	Enclosure

Communication networking

Use the daisy chain mode for the CAN bus, as shown in the following figure. Use shielded twisted pair cables for the CAN bus, and use twisted pair cables for CANH and CANL signal cables. Connect a 120 Ω termination resistor at each end of the bus to prevent signal reflection. Connect the CAN signal reference ground of all the nodes (up to 64 nodes) together.

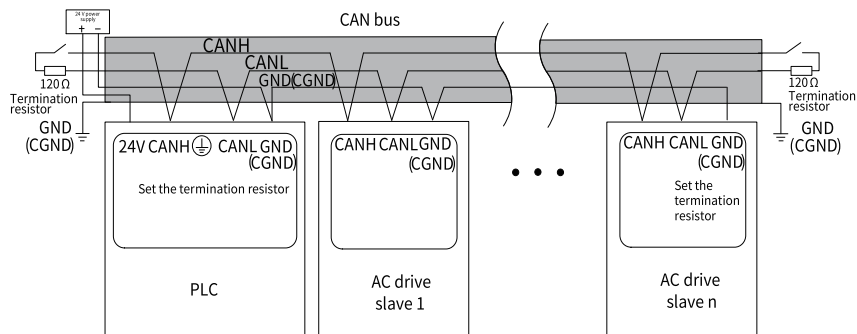


Figure 8-67 CAN bus topology

The transmission distance of the CAN bus is directly related to the baud rate and the communication cable. The following table describes the relationship between the maximum bus length and the baud rate.

Table 8-27 Transmission distance and baud rate

Transmission Distance (m)	Rate (kbps)	Number of Nodes	Cable Specification
25	1024	64	0.205 mm ²
95	500	64	0.34 mm ²
560	100	64	0.5 mm ²
1100	50	64	0.75 mm ²

8.6.3 Wiring of EtherCAT Communication

The EtherCAT bus adopts standard RJ45 network port and standard RJ45 connector. Use Cat 5e shielded twisted pairs and injection cables with iron housing. According to FastEthernet, when an EtherCAT bus is used, the length of the cable between the devices cannot exceed 100 m. Otherwise, the signal will be attenuated, affecting communication.

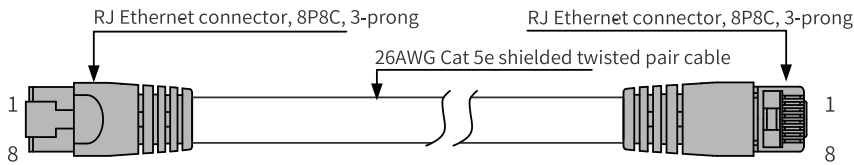


Figure 8-68 Requirement on the EtherCAT cable

Shielded twisted pairs are used as the EtherCAT bus for network data transmission. Cables with the following specifications are recommended.

Table 8–28 EtherCAT cable specifications

Item	Specification
Cable type	Flexible crossover cable, S-FTP, Cat 5e
Standards compliance	EIA/TIA568A, EN 50173, ISO/IEC 11801 EIA/TI Abulletin TSB, EIA/TIA SB40-A&TSB36
Cross sectional area	26AWG
Conductor type	Twisted pair
Number of pairs	4



Figure 8-69 Shielded network cable

To connect the RJ45 network cable, hold the RJ45 connector of the cable and insert it into the RJ45 port of the communication module until you hear a "click" sound. To remove the RJ45 network cable, press down the clip of the RJ45 connector, and then pull it out along the direction parallel with the module.

Fix the cables to a place near one side of the device before EtherCAT communication. This prevents the communication cable from being affected by other tension to ensure communication stability.

8.6.4 Wiring of PROFINET Communication

After communication between the MD500-PN1/MD500-PN2 card and the AC drive is implemented, connect the AC drive to the PROFINET master station and configure related parameters. This can implement communication between the MD500-PN1/MD500-PN2 card and the PROFINET master station, thereby implementing AC drive networking.

PROFINET supports multiple types of topologies including the bus type, star type, and tree type. Multiple types of networking can be achieved through the switch.

Two ports on the AC drive can be used to realize ring topology or linear topology. Connect the cable to only one of the two ports. The cable between two nodes is no longer than 100 m in length.

8.7 Post-wiring Check

After wiring is completed, check the following items and tick compliant items.

Table 8-29 Post-wiring checklist

No.	Item	Compliance
1	The power supply input cables are connected to the R, S, and T terminals.	☐
2	The motor input cables are connected to the U, V, and W terminals.	☐
3	The dimensions of the main circuit cables meet the requirements.	☐
4	Heat-shrinkable tubes are applied to copper tubes of the main circuit cable and conductors, and heat-shrinkable tubes are completely cover the conductors.	☐
5	The motor output cable does not exceed 50 m. Otherwise, the carrier frequency needs to be reduced through F0-15.	☐
6	The ground cables are connected correctly.	☐
7	The output terminals and control signal terminals are securely fastened.	☐
8	The braking resistor and braking unit (if used) are connected correctly and have proper resistance.	☐
9	The control circuit signal cables are shielded twisted pair cables.	☐
10	Optional cards are connected correctly.	☐
11	The control circuit cables and main circuit power cables are routed separately.	☐
12	There are no screws, gaskets, or exposed cables left inside the product.	☐

9 Installation Requirements on Options

9.1 Input reactor

Installing the input reactor on the input side of the AC drive can improve the input power factor, suppress the high harmonics of the input current of the AC drive, and reduce external conduction and radiation interference. The AC input reactor is an option. In applications where harmonics need to be suppressed, install an external AC input reactor to meet requirements of the EN IEC 6100032/12 standard.

If an AC input reactor is required, ensure that sufficient installation space is reserved in the cabinet.

9.2 Output Reactors

With an output reactor installed on the output side of the drive, the excessive dV/dt can be reduced. This can reduce the voltage stress on the motor winding to protect it, lower the motor temperature, and prolong the service life of the motor.

9.3 Fuse, Contactor, and Circuit Breaker



When the fuse is damaged or the circuit breaker trips, do not immediately energize the product or operate the peripheral equipment. Wait at least for the time specified on the warning label. Failure to comply will result in personal injury and equipment damage.

To comply with IEC/EN 61800-5-1 and UL 61800-5-1 standards, install a fuse/circuit breaker on the input side of the drive to prevent accidents caused by short circuit in the internal circuit.

9.4 EMC Filter

The optional EMC filter can meet the EN IEC 618003 C2 emission requirements. For details about models and dimensions, see the *MD520 Series General-Purpose AC Drive Hardware Guide*. Install the EMC filter according to the following requirements:

- Install the EMC filter close to the input terminals, and keep the connection cable shorter than 30 cm.
- Connect the grounding terminal of the EMC filter to that of the AC drive, and install the EMC filter and the AC drive on the same conductive installation surface, which is connected to the main ground of the cabinet.

- Connect the LINE terminal of the EMC filter to the power grid, and the LOAD terminal to the AC drive.

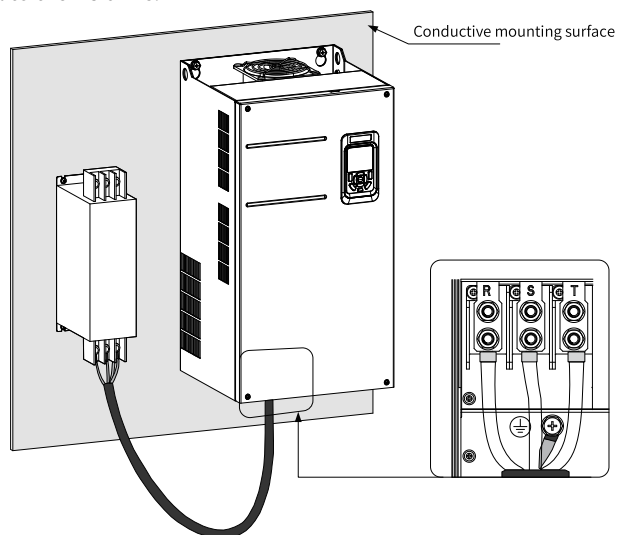


Figure 9-1 Installing an EMC filter

9.5 Magnetic Ring and Ferrite Clamp

The magnetic ring can be used on the input or output side of the AC drive. Install it as close to the AC drive as possible. When installed on the input side, the magnetic ring can suppress the noise in the input power supply system of the drive. When installed on the output side, the magnetic ring can suppress interference generated by the AC drive to external devices and reduce the bearing current.

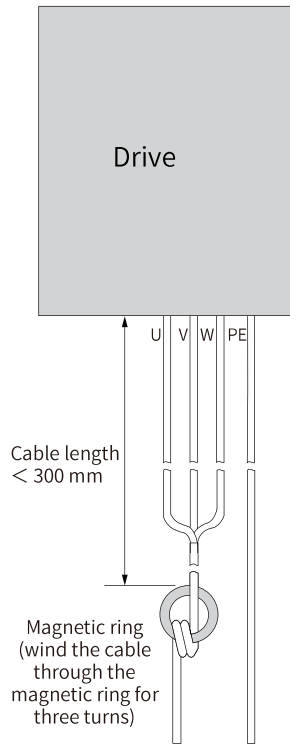


Figure 9-2 Installing the magnetic ring

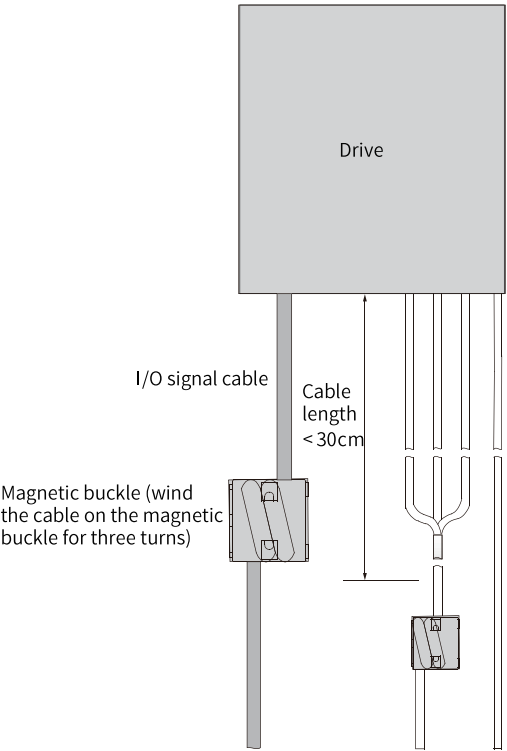


Figure 9-3 Installing the ferrite clamp

Note

The R/S/T or U/V/W cables must pass through the same ferrite core to suppress the common mode noise.

9.6 MDKE-10 Mounting Base

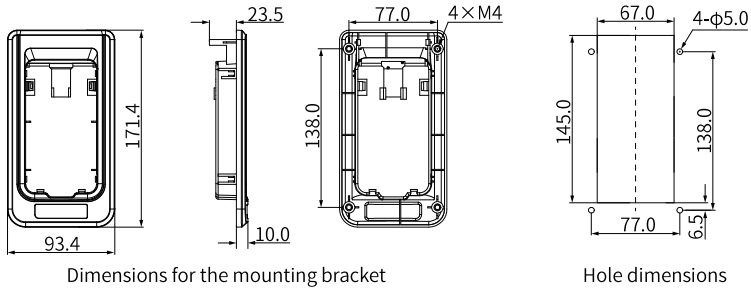


Figure 9-4 Dimensions and opening sizes (mm) of the MDKE-10 mounting base bracket

Note

If the thickness of the door is 1.5 mm, no bolts are required.

9.7 SOP-20 Mounting Base

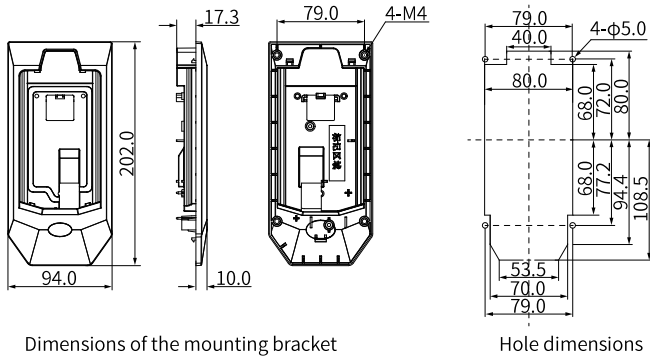


Figure 9-5 Dimensions and opening sizes (mm) of the SOP-20 mounting base bracket

10 Solutions to Common EMC Problems

10.1 Residual Current Device Malfunction

When the residual current device (RCD) malfunctions, perform troubleshooting according to the following table.

Table 10–1 Solution for leakage current

Tripping	Possible Cause	Solution
Trip upon power-on	The anti-interference performance of the RCD is poor.	1. Use a RCD of a recommended brand. 2. Use a RCD with a higher tripping current. 3. Move the unbalanced load to the front end of the RCD. 4. Remove the EMC screw or disconnect the grounding terminal of the external EMC filter to reduce the capacitance of the input end to the ground.
	The action current of the RCD is too low.	
	Unbalanced load is connected to the rear end of the RCD.	
	The capacitance to the ground at the front end of the AC drive is large.	
Trip during operation	The anti-interference performance of the RCD is poor.	1. Use a RCD of a recommended brand. 2. For an individual AC drive, tighten the EMC screw. For multiple AC drives, disconnect the optional EMC grounding screw, as shown in "Figure 10–1 Disconnecting the optional EMC grounding screw" on page 199. 3. Install a simple filter on the input side of the drive, and wind the LN/RST cables through a magnetic ring near the RCD, as shown in "Figure 10–2 Installing a simple filter and magnetic ring on the input side" on page 199. 4. Use a RCD with a higher rated tripping current. 5. Reduce the carrier frequency while ensuring performance. 6. Use shorter motor cables.
	The action current of the RCD is too low.	
	Unbalanced load is connected to the rear end of the RCD.	
	For motor cables and the motor, the distributed capacitance to ground is too high.	

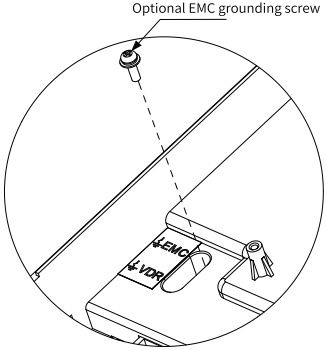


Figure 10-1 Disconnecting the optional EMC grounding screw

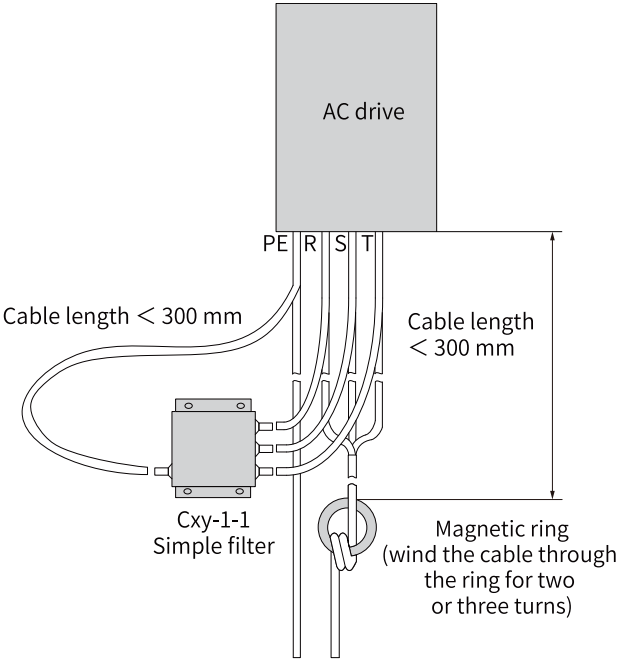


Figure 10-2 Installing a simple filter and magnetic ring on the input side

10.2 Harmonic Suppression

To suppress high-order harmonics of the drive and improve the power factor, install an AC input reactor on the input side of the equipment to meet standard requirements.

10.3 I/O Signal Interference

10.3.1 High-Speed Pulse Interference

In the case of interference, take the following rectification measures.

Step	Solution
1	Use shielded twisted pair cables and ground the cables at both ends.
2	Connect the PE terminal of the AC drive to the motor housing.
3	Connect the PE terminal of the AC drive to that of the power grid.
4	Add an equipotential bonding grounding cable between the host controller and the AC drive.
5	Separate signal cables from power cables with a distance of at least 30 cm.
6	Add a ferrite clamp to the signal cable, or add a magnetic ring and wind the signal cable through the magnetic ring for one to two turns.
7	Install a magnetic ring to the U, V, and W output cables at the drive side and wind the cables through the magnetic ring for two to four turns.
8	Use a shielded power cable and properly ground its shield.

10.3.2 Common I/O Signal Interference

The drive generates strong interference during operation, which may interfere with other devices due to improper wiring or grounding. When the drive interferes with or is interfered by other devices, adopt the following measures.

Procedure	Solution
1	Use shielded cables as I/O signal cables and connect the shield to the PE terminal.
2	Connect the PE terminal of the motor to that of the drive, and connect the PE terminal of the drive to that of the power grid.
3	Add an equipotential bonding grounding cable between the host controller and the AC drive.
4	Install a magnetic ring to the U, V, and W output cables at the drive side and wind the cables through the magnetic ring for two to four turns.
5	Increase the filtering capacitance of the low-speed DI. The recommended maximum value is 0.1 μF .
6	Increase the filtering capacitance of the AI. The recommended maximum value is 0.22 μF .

Procedure	Solution
7	Install a ferrite clamp or a magnetic ring to the signal cable and wind the signal cable through the magnetic ring for one to two turns.
8	Use a shielded power cable and properly ground its shield.

10.4 Communication Interference

10.4.1RS485 and CAN Communication Interference

In the case of interference, take the following rectification measures.

Step	Solution
1	Install a 120 Ω termination resistor at both ends of the bus.
2	Use multi-conductor shielded twisted pair cables and ground the shield at both ends.
3	Separate communication cables from power cables with a distance of at least 30 cm.
4	Adopt the daisy chain mode for multi-node communication.
5	For multi-node communication, add an equipotential bonding grounding cable between nodes.
6	Add a ferrite clamp at both ends of the communication cable or add a magnetic ring at both ends of the communication cable and wind the communication cable through the magnetic ring for one to two turns.
7	Install a magnetic ring to the U, V, and W output cables at the drive side and wind the cables through the magnetic ring for two to four turns.
8	Use a shielded power cable and properly ground its shield.

10.4.2EtherCAT and PROFINET Communication Interference

In the case of interference, take the following rectification measures.

No.	Step
1	Check that the communication network cables meet the specification requirements for shielded Cat 5e cables.
2	Check that the communication port is secure and in good contact.
3	Separate communication cables from power cables with a distance of at least 30 cm.
4	For multi-node communication, add an equipotential bonding grounding cable between nodes.

No.	Step
5	Check that the cable between two nodes is no longer than 100 m in length.
6	Install the ferrite clamp on both sides of the communication cable and wind the cable around the ferrite clamp by one or two turns.
7	Install a magnetic ring to the U, V, and W output cables at the drive side and wind the cables through the magnetic ring for two to four turns.
8	Use a shielded power cable and properly ground its shield.

10.5 Encoder Feedback Signal Errors

Take the measures listed in the following table.

No.	Step
1	Route encoder cables and power cables through different routes.
2	When the AC drive is far away from the motor (the motor cable is 10 m), disconnect the grounding terminal (PE) of the encoder shield on the AC drive side.
3	Install a magnetic ring or ferrite clamp to the encoder signal cable near the AC drive.
4	Install a magnetic ring to the U, V, and W output cables at the drive side and wind the cables through the magnetic ring for two to four turns.
5	Use a shielded power cable and properly ground its shield.



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