Preface

Product Introduction

The CM680 is a newly designed series of high-performance general-purpose inverters, featuring a book-type industrial design that effectively enhances the utilization of installation space. The product is equipped with rich hardware configurations and powerful software performance, supports multiple industrial bus communication protocols, and integrates industry-leading vector control technology. It provides excellent driving performance for various types of motors, along with a wealth of industry-specific functions and macros, enabling applications in automation equipment across industries such as metallurgy, lifting, machine tools, printing, wire drawing, glass, food, fans, and pumps.

This manual introduces the installation, wiring, commissioning, and trial operation procedures of the product, including installation dimensions, mechanical installation, electrical installation, commissioning and trial operation, fault handling, and a brief table of function codes.

More Information

Document Name	Summary
CM680 Series General-Purpose Inverter Quick Installation and Commissioning Manual	Introduces detailed content on product installation, wiring, commissioning, troubleshooting, function codes, fault codes, etc.
CM680 Series General-Purpose Inverter Hardware Manual	Introduces the system configuration, technical specifications, components, dimensions, optional accessories (installation accessories, cables, peripheral electrical components), expansion cards, as well as daily maintenance and care guidelines, compliance certifications, and standards related to the product.
CM680 Series General-Purpose Inverter Installation Manual	Introduces the installation dimensions, space design, detailed installation procedures, wiring requirements, cabling requirements, installation requirements for optional accessories, and common EMC issue resolution suggestions, among other detailed content.
CM680 Series General-Purpose Inverter Software Manual	Introduces detailed content about the product's function application, communication, fault codes, function codes, etc.
CM680 Series General-Purpose Inverter Communication Manual	Introduces detailed content about the product communication expansion card's overview, composition, dimensions, installation, electrical connections, communication parameter configuration, fault codes, etc.

Version Change Record

Revision Date	Release Version	Change Content
2023–12	Ver 1.0	First release of the manual.
2024–05	Ver 1.1	Correction of main circuit terminal dimensions and cable selection, etc.

Warranty Statement

Under normal use conditions, we provide warranty service for any faults or damages that occur within the warranty period. After the warranty period, repair fees will be charged.

During the warranty period, repair costs will be charged for product damage caused by the following situations.

- Damage caused by not operating the product according to the specifications in the manual.
- Damage caused by fire, water, or abnormal voltage.
- Damage caused by using the product for purposes other than its intended functions.
- Damage caused by using the product beyond its specified usage range.
- Secondary damage caused by force majeure (natural disasters, earthquakes, lightning strikes).

Service fees are calculated according to the manufacturer's standard rates; if there is a contract, the terms of the contract take precedence. For detailed warranty information, please refer to the 'Product Warranty Card'.

Safety Precautions

Safety Statement

●This chapter describes the safety precautions necessary for the correct use of this product. Before using this product, please read the product manual and correctly understand the relevant information about safety precautions. Failure to comply with the matters specified in the safety precautions can lead to death, serious injury, or equipment damage.

●The 'Hazard' and 'Caution' items in the manual do not represent all the safety precautions that should be followed; they only serve as supplements to all safety precautions.

●This product should be used in an environment that meets the design specifications. Otherwise, it may cause malfunctions, and functional abnormalities or component damage due to non-compliance with these regulations are not covered under the product quality warranty.

● Our company will not be held liable for any personal injuries or property damage resulting from failure to comply with the contents of this manual or improper operation of the product.

Definition of Safety Levels

 Hazard: A situation that may result in serious injury or death due to failure to operate as required;

 Caution: A situation that may result in moderate injury or minor injury, as well as equipment damage, due to failure to operate as required;

Please read this chapter carefully when installing, commissioning, and maintaining this system, and strictly follow the safety precautions specified in this chapter. Our company will not be responsible for any injuries or losses caused by non-compliance with operating procedures.

Use Phase	Safety Level	Matters
Before Installation	 Hazard	●If water ingress, missing parts, or damaged components are found when unpacking the control system, do not install! Do not install if the packing list does not match the actual items!
	 Caution	●Handle with care during transportation; otherwise, there is a risk of damaging the equipment! ●Do not use damaged drives or inverters with missing parts; there is a risk of injury! ●Do not touch the components of the control system with your hands; otherwise, there is a risk of electrostatic damage!

Use Phase	Safety Level	Matters
During Installation	Hazard	●Install on metal or other fire-resistant materials; keep away from flammable materials. Otherwise, a fire may occur! ●Do not arbitrarily loosen the mounting screws of equipment components, especially those marked in red! ●Before performing installation work, ensure that the mechanical strength of the installation location is sufficient to support the weight of the equipment; otherwise, it may lead to mechanical hazards. ●Strictly prohibit modification of this product and loosening of the mounting screws of product parts and components!
	Caution	●Do not allow wire ends or screws to fall into the drive; otherwise, it can cause damage to the drive! ●Install the drive in a place with minimal vibration and avoid direct sunlight. ●When two or more inverters are placed in the same cabinet, pay attention to the installation position to ensure good heat dissipation.
When wiring	Hazard	●Installation must be performed by qualified electrical engineers; otherwise, unexpected hazards may occur! ●A circuit breaker must be installed between the inverter and the power supply; otherwise, a fire may break out! ●Before wiring, ensure that the power supply is in a zero-energy state; otherwise, there is a risk of electric shock! ●Properly ground the inverter according to standards; otherwise, there is a risk of electric shock!
	Caution	●Never connect the input power to the inverter's output terminals (U, V, W). Pay attention to the markings on the wiring terminals and do not connect them incorrectly! Otherwise, it can cause damage to the drive! ●Never connect the braking resistor directly across the DC bus (+), (-) terminals; otherwise, a fire may break out! ●Please refer to the manual for the recommended wire gauge; otherwise, accidents may occur!
Before Powering On	Caution	●Ensure that the voltage level of the input power supply matches the rated voltage level of the inverter; Check if the wiring positions on the power input terminals (R, S, T) and output terminals (U, V, W) are correct; Also, check for any short circuits in the peripheral circuits connected to the drive, and ensure that all connections are secure, otherwise, this may cause damage to the drive! ●No dielectric strength tests are required for any part of the inverter, as this test has already been performed at the factory; otherwise, accidents may occur!
	Hazard	●The inverter must be covered with its cover before it is powered on; otherwise, electric shock may occur! ●The wiring of all peripheral accessories must follow the guidance in this manual and be connected according to the circuit connection methods provided herein; otherwise, accidents may occur!

Use Phase	Safety Level	Matters
After Power-On	 Hazard	●Do not open the cover after power-on. Otherwise, there is a risk of electric shock! ●Do not touch any input or output terminals of the inverter. Otherwise, there is a risk of electric shock!
	 Caution	●If parameter identification is required, be aware of the danger of injury from the rotating motor; otherwise, accidents may occur! ●Do not arbitrarily change the parameters set by the inverter manufacturer; otherwise, damage to the equipment may result!
During Operation	 Hazard	●Non-professional technicians should not test signals during operation; otherwise, personal injury or equipment damage may occur! ●Do not touch the cooling fan or discharge resistor to check the temperature, as it may cause burns!
	 Caution	●While the inverter is running, avoid dropping anything into the equipment, as it can cause damage to the device! ●Do not use contactors to control the start and stop of the drive, as it can cause damage to the equipment!
During maintenance	 Hazard	●Personnel who have not received professional training should not perform repairs or maintenance on the inverter, as it can result in personal injury or equipment damage! ●Do not perform maintenance or repairs on the equipment while it is energized, as there is a risk of electric shock! ●Confirm that the power supply to the inverter has been disconnected for 10 minutes before performing maintenance or repairs on the drive; otherwise, residual charges on the capacitors can cause injury! ●All plug-in modules must be inserted or removed only when the power is off! ●After replacing the inverter, parameter settings and checks must be performed.
When disposing	 Caution	●Dispose of equipment and products according to national regulations and standards to prevent property loss or personal injury! ●Dispose of and recycle decommissioned equipment and products according to industrial waste management standards to avoid environmental pollution.

CONTENT

Preface 1
Safety Precautions 3
Safety Statement 3
Definition of Safety Levels 3
1. Product Information 7
1.1 Product Positioning and Features 7
1.2 Naming Rules and Nameplate Marking 8
1.3 Product Model 9
1.4 Technical Data 9
1.5 Component Introduction 15
2. Electrical Design 19
2.1 System Application Wiring 19
2.2 Basic Electrical Safety Precautions 23
2.3 Main Circuit Wiring 26
2.4 Control Circuit Wiring 35
2.5 Communication Connection 42
2.6 Grounding 54
2.7 STO Safety Design and Wiring 61
3 Optional Accessories Selection 62
3.1 List of Optional Accessories 62
3.2 Peripheral Electrical Components 63
3.3 Expansion Card 79
3.4 PG Card 81
4 Routine Maintenance and Care 87
4.1 Routine Maintenance 87
4.2 List of Regular Inspection Items 88
4.3 Inverter wear parts life 88
4.4 Storage of the Inverter 89
5 Compliance with Certifications, Directives, and Standards 90
5.1 Certifications, Directives, and Standards 90
5.2 CE Certification 90

1. Product Information

1.1 Product Positioning and Features

The CM680 is a high-performance general-purpose inverter that supports multiple types of motor control algorithms, offering superior performance and support for a wide range of peripherals and industry application macros.

Figure 1-1 Product Appearance

This product has the following features:

1. All models have a slim design with vertical airflow and independent cooling channels, allowing multiple inverters to be installed side by side, saving cabinet space.

2. It supports the drive of induction motors, permanent magnet synchronous motors, and synchronous reluctance motors, meeting customers' diverse motor needs; Supports multiple bus communication cards including Profibus DP, CANopen, EtherCAT, Profinet, and Ethernet/IP.

3. Supports automatic energy-saving control, which outputs the optimal current through energy-saving algorithms to reduce system losses and maximize system efficiency.

4. Equipped with an LCD keyboard, parameters are categorized for quick replication, supporting both Chinese and English; upper-level monitoring software for fault monitoring and operational status monitoring; supports STO safety protection function.

1.2 Naming Rules and Nameplate Marking

CM680-4T 4R0 G B

Mark	Product Name
CM	General Purpose VFD

Mark	Voltage Rating
4T	3-Phase 380V-480V

Mark	Power Rating (kW)
4R0	4.0
...	...
450	450

Mark	Output AC Reactor
None	None
(-L)	Optional Output AC Reactor

Mark	Braking Unit
None	None
B	Includes Braking Unit
(B)	Optional Braking Unit

Mark	Compatible Motor Type
G	Heavy Overload Type

Figure 1-2 Product Model

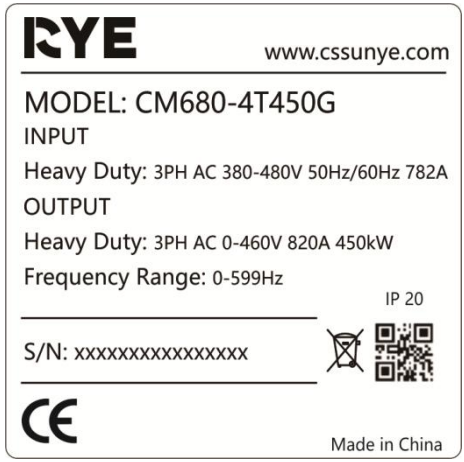


Figure 1-3 Nameplate Marking

Note:

1. Three-phase 380V~480V, models C2~C5 do not support optional DC reactors, while models C6 and above come standard with DC reactors.

2. Three-phase 380V~480V, C2~C4 standard with braking unit, C5~C7 optional braking unit, C8~C11 not available with braking unit.

3. (-L) is an optional output AC reactor, C9~C11 can optionally be equipped with a reactor base.

1.3 Product Model

Table 1-1 CM680 Inverter Model and Technical Data

Structural Design	VFD Model	Input Voltage (V)	Input Current (A)	Output Current (A)	Applicable Motor (kW)
C2	CM680-4T4R0GB	Three-phase 380V~480V Range: -15%~+10%	11.4	9.0	4.0
	CM680-4T5R5GB		16.7	13.0	5.5
	CM680-4T7R5GB		21	17.0	7.5
C3	CM680-4T011GB		32	25.0	11.0
	CM680-4T015GB		41	32.0	15.0
C4	CM680-4T018GB		47	37.0	18.5
	CM680-4T022GB		56	45.0	22.0
	CM680-4T030GB		72	60.0	30.0
C5	CM680-4T037G(B)		88	75.0	37.0
	CM680-4T045G(B)		110	90.0	45.0
C6	CM680-4T055G(B)		106	110.0	55.0
	CM680-4T075G(B)		139	152.0	75.0
	CM680-4T093G(B)		165	176.0	93.0
C7	CM680-4T110G(B)		190	210.0	110.0
	CM680-4T132G(B)		230	253.0	132.0
C8	CM680-4T160G		276	304.0	160.0
	CM680-4T185G		314	340.0	185.0
C9	CM680-4T200G		346	380.0	200.0
	CM680-4T220G		380	426.0	220.0
	CM680-4T250G		435	465.0	250.0
C10	CM680-4T280G		478	520.0	280.0
	CM680-4T315G		534	585.0	315.0
	CM680-4T355G		598	650.0	355.0
C11	CM680-4T400G		672	725.0	400.0
	CM680-4T450G		742	820.0	450.0

1.4 Technical Data

1.4.1 Electrical Parameters

Inverter application mode is heavy-duty mode (Type G machine):

Heavy-duty mode is indicated by the uppercase letter G, under which the inverter operates according to the corresponding rated power, rated input current,

rated output current, and overload curve, etc.

Table 1-2 Electrical Parameters (Three-phase 380V~480V) (C2~C3)

Item		Specification				
Model: CM680-4Txxxx		4R0GB	5R5GB	7R5GB	011GB	015GB
Physical Structure		C2			C3	
Output	Power (kW)	4.0	5.5	7.5	011	015
	Rated Output Current (A)	9.0	13.0	17.0	25.0	32.0
	Output Voltage	AC Three-phase 0~460V				
	Maximum Output Frequency	599Hz (Can be changed through parameters)				
	Carrier Frequency	C2: 2kHz~15kHz; C3: 2kHz~10kHz (Can automatically adjust carrier frequency based on load characteristics)				
	Overload Capacity	Type G machine 150% rated current 60s				
Input	Rated Input Current(A)	11.4	16.7	21.0	32.0	41.0
	Rated Voltage Rated Frequency	AC: Three-phase 380~480V, 50/60Hz				
	Voltage Tolerance Range	-15%~10%				
	Frequency Tolerance Range	±5%				
Overvoltage Category		OVCIII				
Pollution Degree		PD2				
Protection Class		IP20 (open type, IP protection class applies to IEC products)				

Table 1-3 Electrical Parameters (Three-phase 380V~480V) (C4~C5)

Item		Specification				
Model: CM680-4Txxxx		018GB	022GB	030GB	037G(B)	045G(B)
Physical Structure		C4		C5		
Output	Power (kW)	018	022	030	037	045
	Rated Output Current (A)	37.0	45.0	60.0	75.0	90.0
	Output Voltage	AC Three-phase 0~460V				
	Maximum Output Frequency	599Hz (Can be changed through parameters)				
	Carrier Frequency	C4~C5: 2kHz~10kHz (can be automatically adjusted according to load characteristics)				
	Overload Capacity	Type G machine 150% rated current 60s				

Item		Specification				
Model: CM680-4Txxxx		018GB	022GB	030GB	037G(B)	045G(B)
Input	Rated Input Current(A)	47.0	56.0	72.0	88.0	110.0
	Rated Voltage Rated Frequency	AC: Three-phase 380~480V, 50/60Hz				
	Voltage Tolerance Range	-15%~10%				
	Frequency Tolerance Range	±5%				
Overvoltage Category		OVCIII				
Pollution Degree		PD2				
Protection Class		IP20 (open type, IP protection class applies to IEC products)				

Table 1-4 Electrical Parameters (Three-phase 380V~480V) (C6~C7)

Item		Specification				
Model: CM680-4Txxxx		055G(B)	075G(B)	093G(B)	110G(B)	132G(B)
Physical Structure		C6		C7		
Output	Power (kW)	055	075	093	110	132
	Rated Output Current (A)	110.0	152.0	176.0	210.0	253.0
	Output Voltage	AC Three-phase 0~460V				
	Maximum Output Frequency	599Hz (Can be changed through parameters)				
	Carrier Frequency	C6: 2kHz~10kHz; C7: 2kHz~6kHz (Can automatically adjust carrier frequency based on load characteristics)				
	Overload Capacity	Type G machine 150% rated current 60s				
Input	Rated Input Current(A)	106.0	139.0	165.0	190.0	230.0
	Rated Voltage Rated Frequency	AC: Three-phase 380~480V, 50/60Hz				
	Voltage Tolerance Range	-15%~10%				
	Frequency Tolerance Range	±5%				
Overvoltage Category		OVCIII				
Pollution Degree		PD2				
Protection Class		IP20 (open type, IP protection class applies to IEC products)				

Table 1-5 Electrical Parameters (Three-phase 380V~480V) (C8~C9)

Item		Specification				
Model: CM680-4Txxxx		160G	185G	200G	220G	250G
Physical Structure		C8		C9		
Output	Power (kW)	160	185	200	220	250

	Rated Output Current (A)	304.0	340.0	380.0	426.0	465.0
	Output Voltage	AC Three-phase 0~460V				
	Maximum Output Frequency	599Hz (Can be changed through parameters)				
	Carrier Frequency	C8~C9: 2kHz~6kHz (Can automatically adjust carrier frequency based on load characteristics)				
	Overload Capacity	Type G machine 150% rated current 60s				
Input	Rated Input Current(A)	276.0	314.0	346.0	380.0	435.0
	Rated Voltage Rated Frequency	AC: Three-phase 380~480V, 50/60Hz				
	Voltage Tolerance Range	-15%~10%				
	Frequency Tolerance Range	±5%				
Overvoltage Category		OVCIII				
Pollution Degree		PD2				
Protection Class		IP20 (open type, IP protection class applies to IEC products)				

Table 1-6 Electrical Parameters (Three-phase 380V~480V) (C10~C11)

Item		**Specification**				
Model: CM680-4Txxxx		**280G**	**315G**	**355G**	**400G**	**450G**
Physical Structure		C10			C11	
Output	Power (kW)	280	315	355	400	450
	Rated Output Current (A)	520.0	585.0	650.0	725.0	820.0
	Output Voltage	AC Three-phase 0~460V				
	Maximum Output Frequency	599Hz (Can be changed through parameters)				
	Carrier Frequency	C10~C11: 2kHz~6kHz (carrier frequency can be automatically adjusted according to load characteristics)				
	Overload Capacity	Type G machine 150% rated current 60s				
Input	Rated Input Current(A)	478.0	534.0	598.0	672.0	742.0
	Rated Voltage Rated Frequency	AC: Three-phase 380~480V, 50/60Hz				
	Voltage Tolerance Range	-15%~10%				
	Frequency Tolerance Range	±5%				
Overvoltage Category		OVCIII				
Pollution Degree		PD2				
Protection Class		IP20 (open type, IP protection class applies to IEC products)				

1.4.2 Technical Specifications

Table 1-7 Inverter Technical Specifications

Item		Specification
Main Control Performance	Maximum Output Frequency	599.00Hz
	Carrier Frequency	7.5kW and below: 2kHz~15kHz 11kW~93kW: 2kHz~10kHz 110kW~450kW: 2kHz~6kHz Can automatically adjust carrier frequency based on load characteristics
	Input frequency resolution	Digital setting: 0.01Hz Analog setting: Maximum frequency × 0.025%
	Control method	Induction Motor: V/F ; VVC ; SVC ; FVC
		Permanent Magnet Synchronous Motor: SVC ; VVC ; FVC
	Starting torque	SVC 150% ; FVC 180%
	Speed range	1:200 (SVC) 1:1000 (FVC)
	Speed stability accuracy	SVC: ≤±0.5% FVC: ≤±0.02%
	Torque response	Torque step response within 20ms
	Torque accuracy	±10% (SVC) ±5% (FVC)
	Overload Capacity	150% Rated Current 60s *
	Torque Boost	Includes automatic torque boost and manual torque boost
	V/F Curve	Multi-point V/F curve; 1.5 power V/F curve; Square V/F curve
	Acceleration/ Deceleration Curves	Linear or S-curve acceleration/deceleration method; four sets of acceleration/deceleration times; Acceleration/deceleration time range: 0.00s~600.00s or 0.0s~6000.0s
	DC Braking	Includes start DC braking and stop DC braking, braking time 0.0s~60.0s
	Jog Control	Jog frequency range: 0.00Hz~599.00Hz; Jog acceleration and deceleration time range: 0.00s~600.00s or 0.0s~6000.0s
	Tension Control	Includes four control modes: tension closed-loop speed mode, line speed closed-loop speed mode, tension closed-loop torque mode, tension open-loop torque mode
	Multi-speed Operation	Up to 16 multi-speed operations can be achieved through control terminals
	Built-in PID	Provides options for traditional PID or fuzzy PID control, enhancing the parameter adaptability and robustness of process control systems

Item		Specification
Personalized Function Ability	Peripheral Safety Self-Check	Safety checks on peripheral devices are performed before operation to promptly identify issues such as grounding and short circuits, improving system reliability
	Common DC Bus Function	Can achieve multiple inverters sharing a common DC bus
	JOG Key	Can achieve jogging operation through the JOG key on the operation panel
	Rapid Current Limiting Function	Built-in rapid current limiting algorithm reduces the probability of overcurrent faults in the inverter
	Motor Parameter Identification	Can achieve automatic identification of motor parameters
	Automatic Voltage Regulation	When grid voltage changes, it can automatically maintain stable output voltage
	Standardized Panel Extension Cable	Customers can use standard network cables to extend the panel themselves
	Communication Bus	Supports at least 5 types (Profinet, CANopen, Profibus-DP, EtherCAT, Ethernet/IP)
	Supports Expansion Functions	IO Expansion Card; Various Bus Communication Expansion Cards; PG Card (Sine/Cosine, Incremental)
	STO	Safe Torque Off in Emergency Situations
Operation	Operation Command Channel	Supports multiple methods for command signal setting: panel setting, control terminal setting, communication setting, etc.
	Frequency Source	Multiple frequency setting sources: panel setting, analog setting, control terminal setting, communication setting, etc.
	Auxiliary Frequency Source	Multiple auxiliary frequency sources: panel setting, analog setting, control terminal setting, communication setting, etc. Flexible implementation of auxiliary frequency fine-tuning, frequency synthesis
	General Terminal	8*DI (including 1 high-speed), 3*DO (including 1 high-speed), 2*Relay outputs, 3*AI, 2*AO
	Automatic Acceleration and Deceleration	Automatically adjusts acceleration and deceleration time based on load torque
Display and Keyboard Operation	LCD Display	Supports Chinese/English languages
	LCD Parameter Copying	Quick parameter copying via the LCD panel
Protection and Optional Accessories	Protection Functions	Motor short-circuit detection, input/output phase loss protection, overcurrent protection, overvoltage protection, undervoltage protection, overheating protection, overload protection, etc.
	Optional Accessories	Braking Components

Item		Specification
Environment	Usage Location	Indoor, not exposed to direct sunlight, free from dust, corrosive gases, flammable gases, oil mist, water vapor, dripping water, or salt
	Altitude	No derating required for use below 1000m, above 1000m derate by 1% for every 100m increase, maximum operating altitude is 2000m, contact the manufacturer if exceeding 2000m
	Ambient Temperature	－10℃~＋50℃ (derate by 2% for every 1℃ increase when ambient temperature exceeds 40℃)
	Humidity	< 95％RH, no condensation
	Vibration	< 5.9m/s^2(0.6g)
	Storage Temperature	－20℃~＋60℃
	Pollution Degree	2
	Protection Class	IP20
Product Standard	Product Safety Standard Compliance	IEC61800-5-1:2017
	Product EMC Standard Compliance	IEC61800-3:2018

* For overload operation below 5Hz, derating should be considered.

1.5 Component Introduction

1.5.1 Overview

Inverter Structure Types: Models C2 to C4 have a plastic enclosure structure, while models C5 to C11 have a metal enclosure structure.

1.5.2 Components of C2 to C4 Models

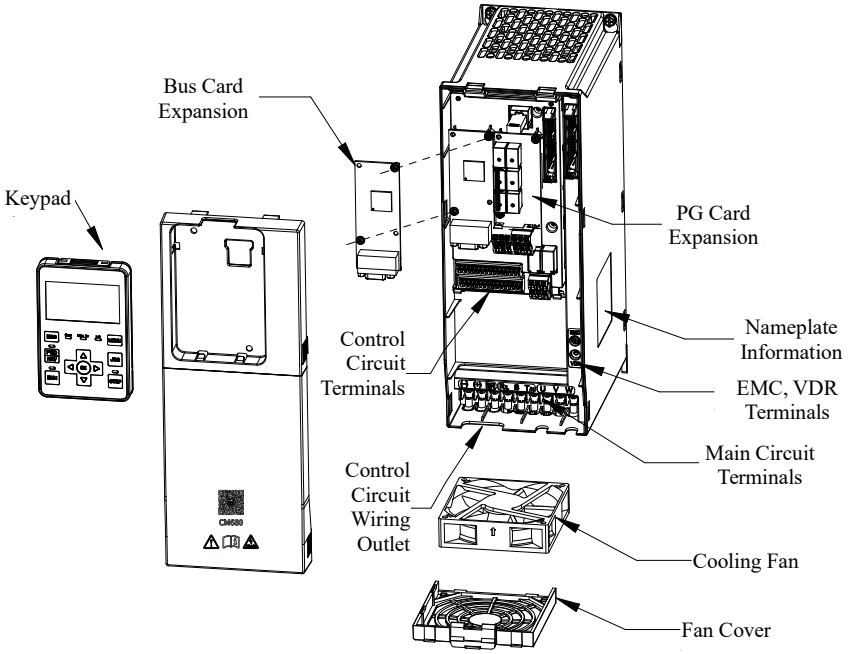


Figure 1-4 Component Diagram (C2 to C4)

1.5.3 Components of C5 to C8 Models

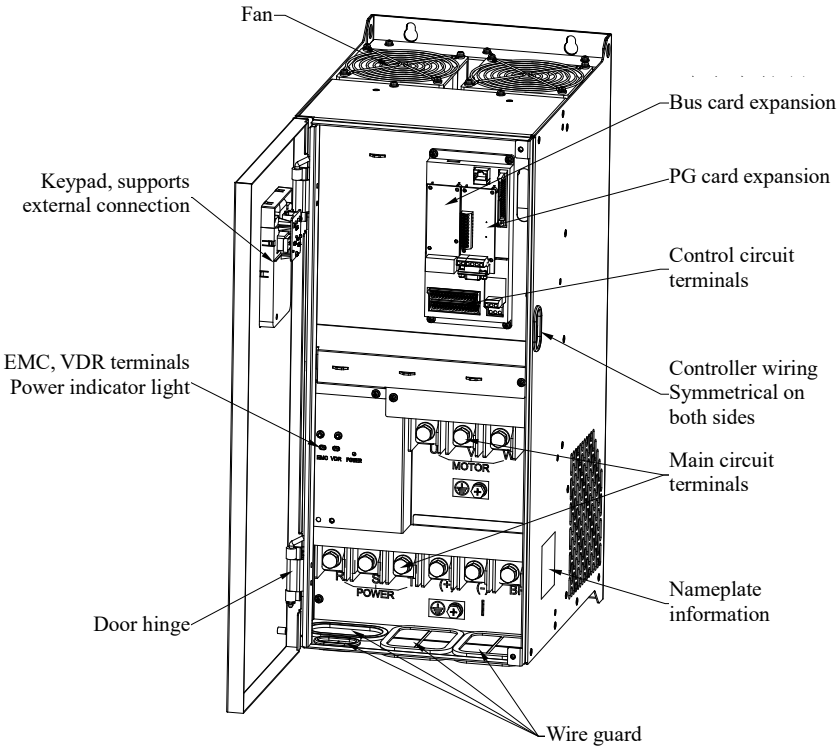


Figure 1-5 Component Diagram (C5 to C8)

1.5.4Components of C9 to C11 Models

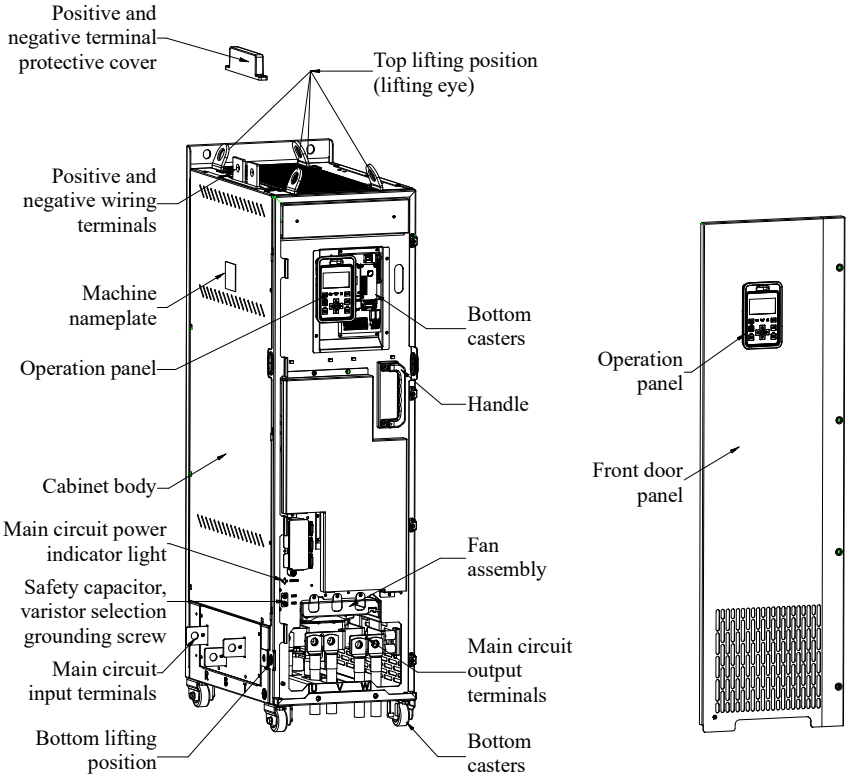


Figure 1-6 Component Diagram (C9 to C11)

2. Electrical Design

2.1 System Application Wiring

2.1.1 System Connection Diagram

When using an inverter to control an induction motor to form a control system, various electrical components need to be installed on the input and output sides of the inverter to ensure the safety and stability of the system. For products with three-phase 380V ~ 480V and 4.0kW or higher power, the system configuration is shown in Figure 2-1:

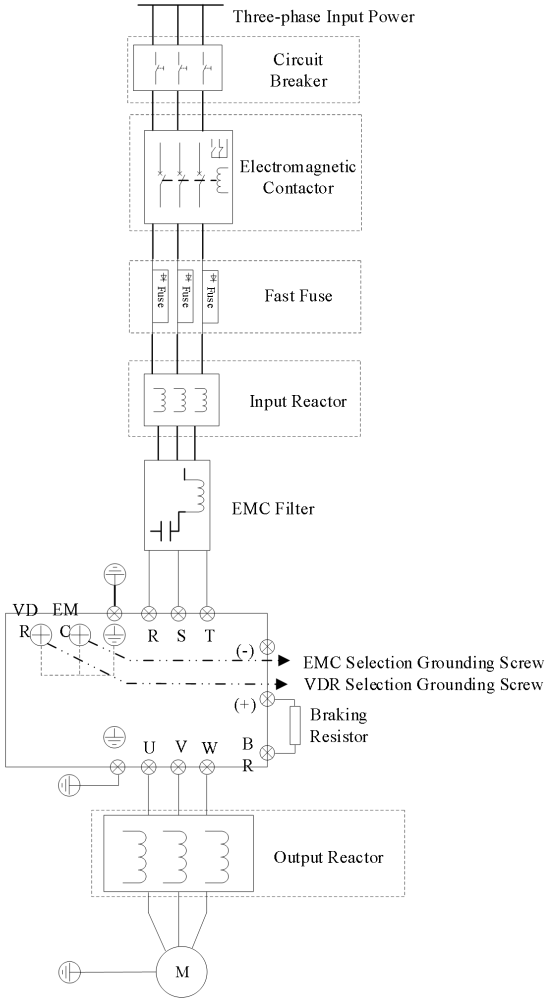


Figure 2-1 System Configuration

Table 2-1 Instructions for Peripheral Electrical Components

Function Section Name	Installation Location	Function Description
Three-phase Input Power	Inverter Input Side	Please supply power according to the rated current specified in this manual. Refer to the specifications table for details.
Air Switch/Circuit Breaker	Inverter Input Side	Disconnects power when overcurrent occurs in downstream equipment
Fast Fuse	Inverter Input Side	Prevents accidents due to short circuits and protects downstream semiconductor devices
Contactor	Inverter Input Side	Inverter power-on and power-off operations. Avoid frequent power-on and power-off operations through contactors (less than twice per minute) or direct start-up operations.
AC Input Reactor	Inverter Input Side	1) Improve the power factor on the input side; 2) Effectively eliminate higher harmonics on the input side, preventing damage to other equipment caused by voltage waveform distortion; 3) Eliminate input current imbalance caused by phase imbalance in the power supply
EMC Input Filter	Inverter Input Side	1) Reduce conducted and radiated interference from the inverter to the outside; 2) Reduce conducted interference from the power supply to the inverter, enhancing the inverter's immunity to interference.
Built-in EMC	Integrated within the inverter	Reduce conducted and radiated interference from the inverter to the outside; Note: Models 7.5kW and below only have an EMC selection grounding bolt; Models 11kW to 450kW can select EMC or VDR grounding through corresponding grounding bolts;
Braking Unit	Some models of the inverter can be equipped with	When the motor decelerates, regenerative energy is dissipated through the braking resistor. Please refer to the manual's braking resistor selection guide to choose an appropriate braking resistor. Note: For models with B, it is only necessary to select an appropriate braking resistor; For models with (B), please refer to this manual and contact our company to purchase a braking unit, then select an appropriate braking resistor; For other models (160kW~450kW), they do not have braking functionality;
DC Reactor	Some models of the invertser come standard with	1) Improve the power factor on the input side; 2) Effectively eliminate higher harmonics on the input side, preventing damage to other equipment due to voltage waveform distortion

Function Section Name	Installation Location	Function Description
AC Output Reactor	Inverter output side	The inverter output side generally contains a significant amount of higher harmonics. When the motor is far from the inverter, there is a large distributed capacitance in the line. A certain harmonic may cause resonance in the circuit, leading to two effects: 1) Deterioration of motor insulation performance, which can damage the motor over time. 2) Generation of significant leakage current, causing frequent protection trips of the inverter. Please refer to **Table 3-2 Inverter Corresponding Cable Length Table to select the appropriate** cable type and length from the inverter to the motor

2.1.2 Electrical Wiring Diagram

Typical wiring is shown in the figure below:

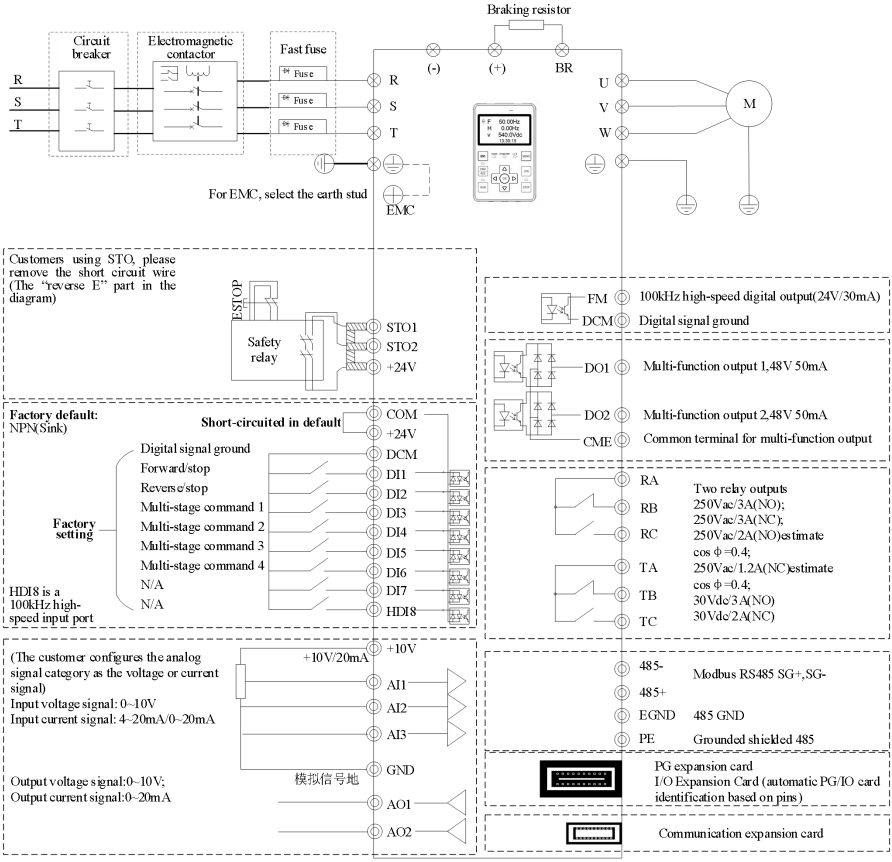


Figure 2-2 4.0-7.5kW Three-Phase Inverter

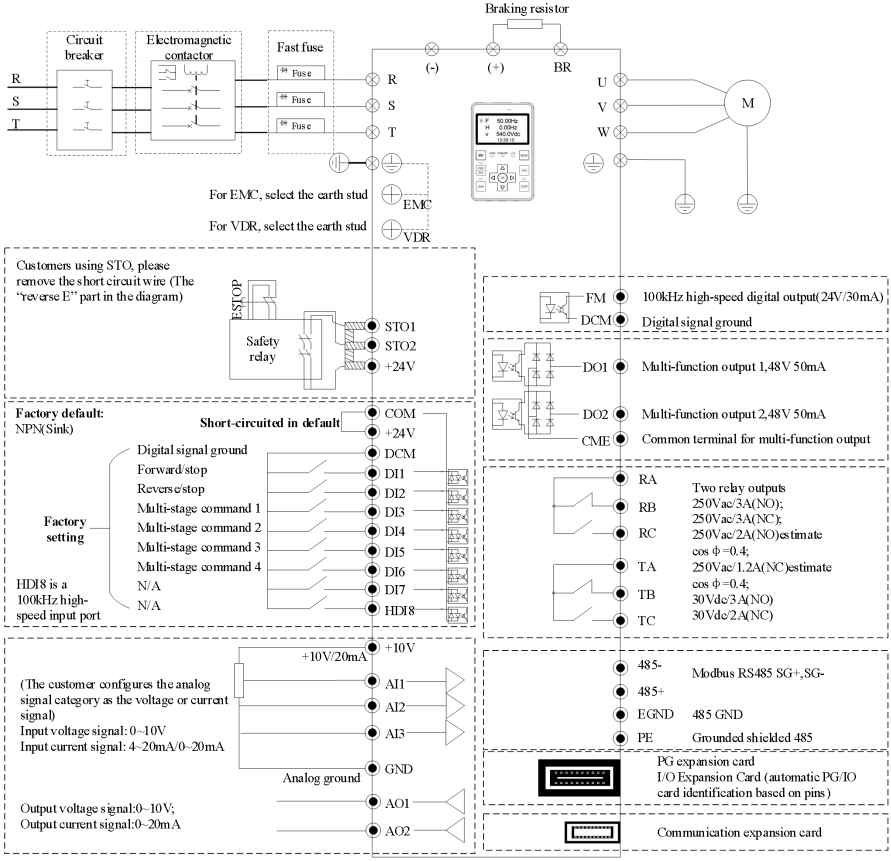


Figure 2-3 11-132kW Three-Phase Inverter

Note: The CM680 series 11~30kW braking units are built-in; for the CM680 series 37~132kW, the braking unit is an optional feature. If required, please specify when ordering.

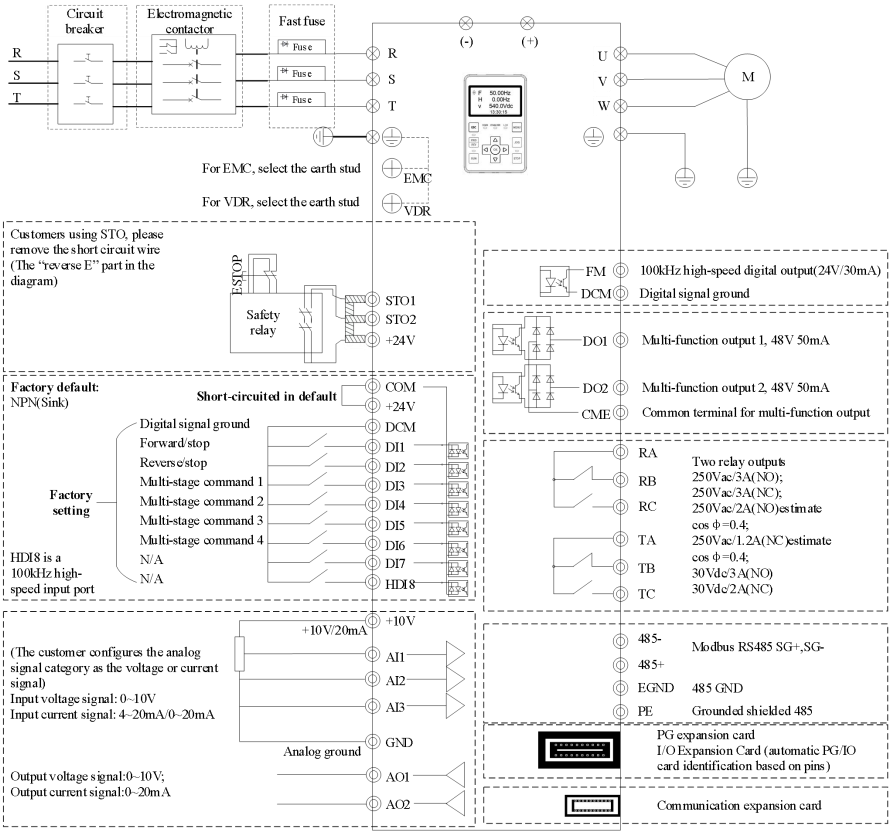


Figure 2-4 160kW~450kW Three-Phase Inverter

Note: The CM680 series 160kW~450kW does not have a braking function option.

2.2 Basic Electrical Safety Precautions

2.2.1 Selecting Power Isolation Equipment

As standard, the inverter input side is equipped with a main isolation device. Depending on the inverter capacity and selected options, this isolation device can be a disconnect switch or an air circuit breaker.

2.2.2 Select the Main Contactor

Depending on the inverter capacity, you can equip it with a main contactor when ordering.

2.2.3 Select the Supply Transformer

Consider these guidelines

1. Use the following formula to define the transformer's apparent power:

SN(kVA) = 1.6 x total power of the motor shaft (kW)

2. Define the rated voltage of the transformer's secondary winding based on the drive's rated input voltage.

3. Ensure the transformer meets the grid specifications defined for the drive.

● Rated input voltage, allowable voltage variation, and imbalance.

● Rated frequency and allowable variation.

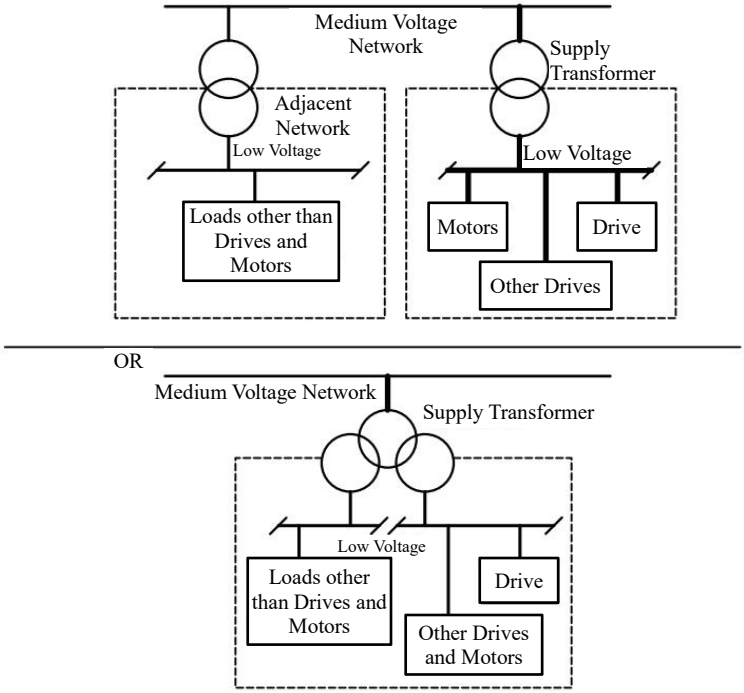


Figure 2-5 Selecting the Supply Transformer

2.2.4 Check the motor compatibility

The inverter can be used with an AC asynchronous induction motor, permanent magnet synchronous motor, or synchronous servo motor. Multiple motors can be connected at once.

Connect multiple induction motors to the inverter.

Based on the AC line voltage and motor load, select the motor capacity and inverter type from the ratings table in the technical data chapter.

2.2.5 Using a Permanent Magnet Synchronous Motor

The inverter output can only drive one permanent magnet motor.

It is recommended to install a circuit breaker between the permanent magnet synchronous motor and the drive. The circuit breaker can safely disconnect the motor from the drive.

Connection. According to the safety instructions, you must ensure that the motor is shut down and there is no energy feedback to the inverter during maintenance work.

2.2.6 Cable Layout Requirements

1. Signal Wire

a. Signal Wire Cable Requirements

Analog control signal wires should use twisted pair shielded cables, and the cable stripping should be as short as possible (about 57mm).-

b. Signal Wire Layout Requirements

The shielding layer of analog signal wires should preferably be connected to terminal PE or wrapped with insulating tape to prevent interference introduced through connections with other equipment or causing a short circuit.

Given that low-voltage signals are susceptible to strong external electromagnetic interference, signal wires must be routed separately from power circuits (power input, inverter output, and braking resistor connection circuits, etc.), and parallel routing should be avoided as much as possible; if parallel routing is necessary, a distance of at least 50cm should be maintained.

2. Power Cable Requirements

a. Motor Cable Requirements

The distance between the inverter control cabinet and the motor should be as close as possible, and the motor cables should be routed separately from other cables, while avoiding long parallel runs of motor cables alongside other cables to reduce electromagnetic interference generated by the du/dt at the inverter output side. For non-shielded cables, it is recommended that they be routed through a metal box or metal pipe, with both ends of the metal box or metal pipe welded to 16mm^2 (or larger) cable for grounding. For shielded cables, the shielding layer should be 360° grounded at both ends.

b. Input Cable Requirements

It is recommended to use shielded cables for input cables, with the shielding layer grounded 360° at both ends.

For non-shielded cables, it is recommended to route them through a metal box or metal pipe, with both ends of the metal box or metal pipe welded to a 16mm^2 (or larger) cable for grounding.

3. Control Cable

Select control cables that comply with national standards (GB/T 5023) or IEC standards (IEC 60227).

If control cables and power cables cross, they should be crossed at a 90-degree angle as much as possible.

2.3 Main Circuit Wiring

2.3.1 Main Circuit Terminal Description

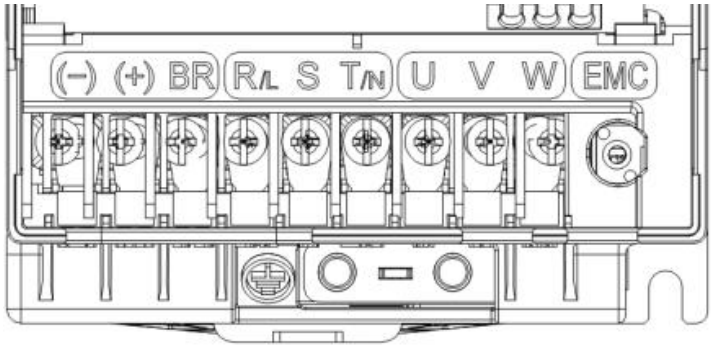


Figure 2-6 4.0~7.5kW Main Circuit Terminal Wiring Diagram

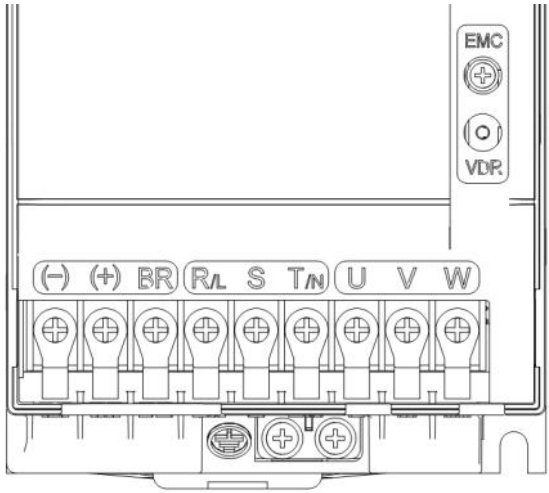


Figure 2-7 11~15kW Main Circuit Terminal Wiring Diagram

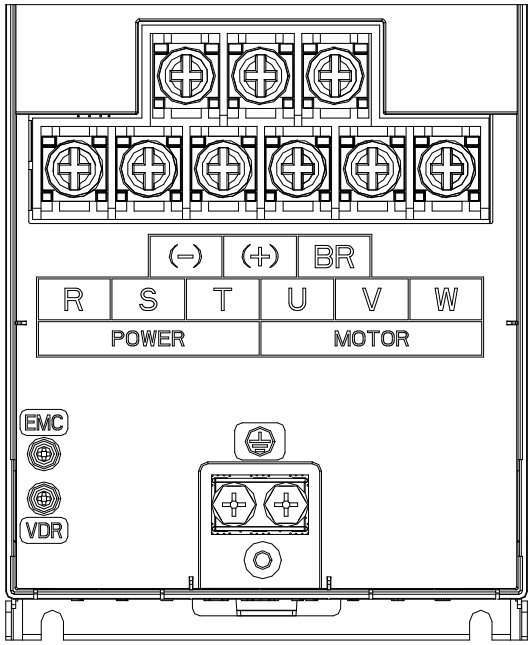


Figure 2-8 18.5~30kW Main Circuit Terminal Wiring Diagram

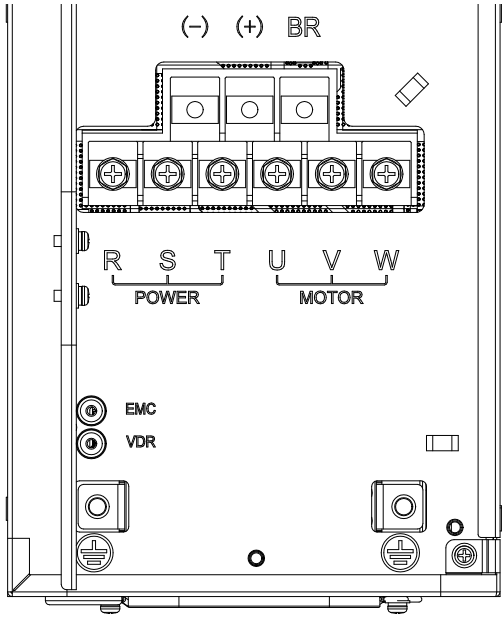


Figure 2-9 37~45kW Main Circuit Terminal Wiring Diagram

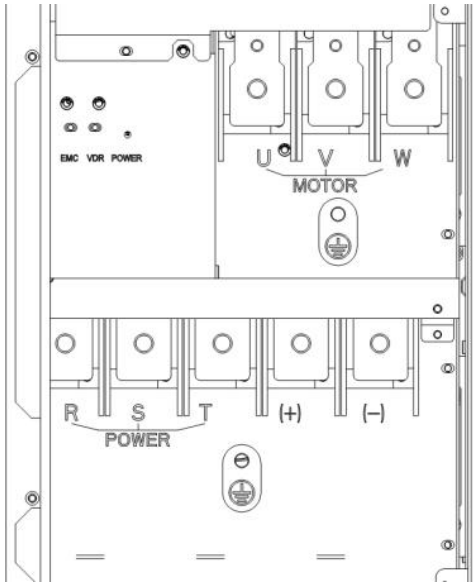


Figure 2-10 55~185kW Main Circuit Terminal Wiring Diagram

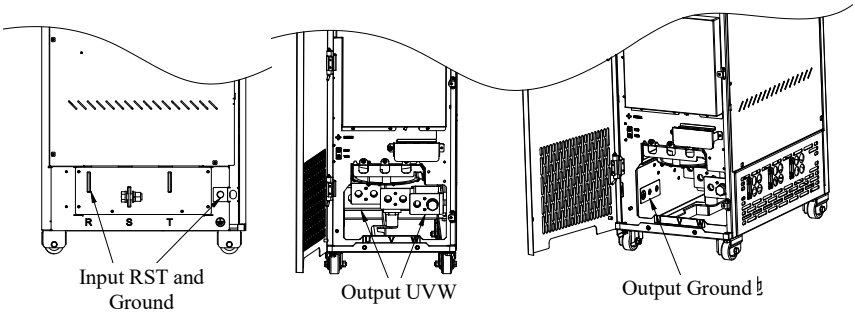


Figure 2-11 200~450kW Main Circuit Terminal Wiring Diagram

Table 2-2 Three-Phase Inverter Main Circuit Terminal Description

Terminal Marking	Name	Description
R, S, T	Three-Phase Power Input Terminals	AC Input Three-Phase Power Connection Points
(+), (-)	DC Bus Positive and Negative Terminals	Common DC Bus Input Point
(+), BR	Braking Resistor Connection Terminals	No Braking Option for 160kW~450kW
U, V, W	Inverter Output Terminals	Connecting Three-Phase Motor
⏚	Grounding Terminal	Grounding Terminal

2.3.2 Selection of Main Circuit Cable

For the selection of power cable size, please comply with the regulations and requirements of each country or region. IEC cable selection reference principles are as follows:

a. Comply with IEC60034-17 and IEC 60364-552 standards or equivalent national standards;--

b. Use PVC or other copper conductor cables with higher temperature resistance.

Note: 1. The operating environment temperature for power cables should be ≤40°C, and the surface temperature of the cable should be ≤70°C. (If the operating environment temperature exceeds 40°C, or the cable surface temperature is below the minimum rated value of the cable, please contact the manufacturer.)

2. It is recommended to use symmetrical cables with copper mesh shielding.

3. If the recommended cable specifications for peripheral devices or options exceed the cable specifications applicable to the product, please contact our company.

To meet EMC standards requirements, it is strongly recommended to use cables with a shielding layer. Common shielded cables come in three-conductor and four-conductor types. When using a three-conductor shielded cable, an additional separate PE line is required, and the shielding layer must be grounded. The requirements for shielded cables are as follows:

a. The shielding layer of the shielded cable should consist of coaxial copper braiding.

To enhance the shielding effectiveness and conductivity, the shielding layer's weave density should be greater than 90%.

Table 2-3 Recommended Wires and Terminal Lugs for Inverters

Inverter Model	RST/UVW Recommended Wires and Terminal Lugs		Recommended Grounding Wires and Terminal Lugs		Screw Specifications	Torque（Nm）
	Wire (mm^2)	Terminal Lug Model	Wire (mm^2)	Terminal Lug Model		
CM680-4T4R0GB	2.5	TNR24M-	2.5	TNR24M-	M4	1.2
CM680-4T5R5GB	2.5	TNR24M-	2.5	TNR24M-	M4	1.2
CM680-4T7R5GB	4	RV3.5-4	4	RV3.5-4	M4	1.2
CM680-4T011GB	6.0	TNR5.5-5	6	TNR5.5-5	M5	2.8
CM680-4T015GB	10	RNB8-4	10	RNB8-4	M5	2.8
CM680-4T018GB	10	GTNR10-6	10	GTNR10-6	M6	4.8
CM680-4T022GB	16	GTNR16-6	16	GTNR16-6	M6	4.8
CM680-4T030GB	16	GTNR16-6	16	GTNR16-6	M6	4.8
CM680-4T037G(B)	25	GTNR25-6	25	GTNR25-6	M6	4.8
CM680-4T045G(B)	35	GTNR35-8	25	GTNR25-6	M8/M6	13/4.8
CM680-4T055G(B)	50	GTNR50-8	25	GTNR25-6	M8/M6	13/4.8

Inverter Model	RST/UVW Recommended Wires and Terminal Lugs		Recommended Grounding Wires and Terminal Lugs		Screw Specifications	Torque (Nm)
	Wire (mm^2)	Terminal Lug Model	Wire (mm^2)	Terminal Lug Model		
CM680-4T075G(B)	70	GTNR70-12	35	GTNR35-8	M12/M8	35/13
CM680-4T093G(B)	95	GTNR95-12	50	GTNR50-8	M12/M8	35/13
CM680-4T110G(B)	120	GTNR120-12	70	GTNR70-12	M12	35
CM680-4T132G(B)	150	GTNR150-12	95	GTNR95-12	M12	35
CM680-4T160G	185	GTNR185-12	95	GTNR95-12	M12	35
CM680-4T185G	185	GTNR185-12	95	GTNR95-12	M12	35
CM680-4T200G	2×120	GTNR120-12	120	GTNR120-12	M12	35
CM680-4T220G	2×150	GTNR150-12	150	GTNR150-12	M12	35
CM680-4T250G	2×150	GTNR150-12	150	GTNR150-12	M12	35
CM680-4T280G	2×150	GTNR150-12	150	GTNR150-12	M12	35
CM680-4T315G	2×150	GTNR150-12	185	GTNR185-12	M12	35
CM680-4T355G	2×185	GTNR185-12	185	GTNR185-12	M12	35
CM680-4T400G	2×240	GTNR240-16	240	GTNR240-16	M16	85
CM680-4T450G	2×240	GTNR240-16	240	GTNR240-16	M16	85

2.3.3 Main Circuit Wiring Requirements

MainCircuit Wiring Requirements

a. The ground wire must be securely connected to the grounding terminal. ⏚

b. BR, (), (+) terminals are for specific functions and cannot be used for other purposes.-

c. The control circuit is a safety extra low voltage circuit, isolated from other circuits with reinforced insulation. Ensure that the control circuit does not connect to other circuits.

d. Be careful not to allow foreign objects to enter the wiring section of the terminal block.

e. Control wires must not be soldered.

f. Tighten the screws according to the specified torque.

g. If using an electric tool to tighten the terminal screws, set a reasonable torque; otherwise, the terminal screws may be damaged.

h. Do not tighten the terminal screws at an angle greater than 5 degrees, as this may damage the terminal screws.

MainCircuit Wiring Requirements

The power input lines and motor cables of the inverter can generate strong electromagnetic interference, and strong electromagnetic interference to the control signals of the inverter may cause malfunction.

Therefore, it is recommended that the input and output power cables and control circuits do not run parallel over long distances. If it is unavoidable for them to run parallel, the distance between the main circuit cables and the signal cables should be more than 50 cm.

Note: Common main circuit cables include input RST lines, output UVW lines, DC bus, and braking cables;

Signal cables include IO signal lines, communication lines, and encoder lines.

Cable trays must maintain good bonding between them, and the cable tray enclosures must be well grounded. A well-grounded metal cable tray can ensure equipotentiality of the equipment.

The inverter, motor, and any optional filters or reactors should all be well bonded with the system (mechanical or apparatus). At the grounding points, paint removal treatment is required, and after installation, anti-corrosion spraying should be applied; non-grounded installation parts should be protected with spray coating and should make good contact with the cabinet.

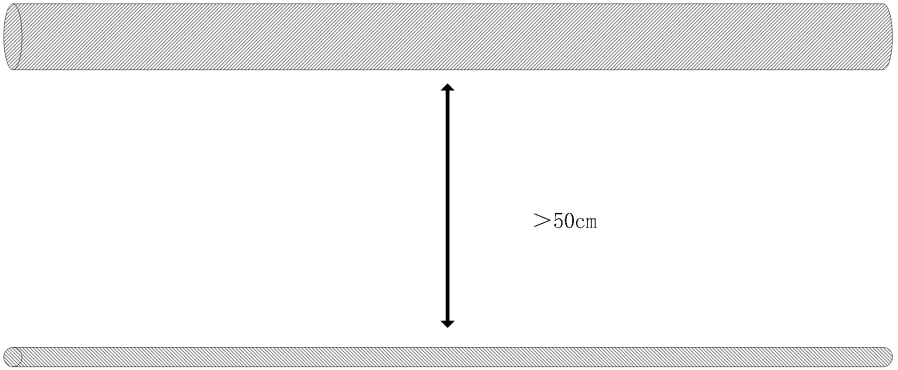


Figure 2-12 Cable Layout Diagram

Wiringin IT or Delta Power Grids

In IT power grids or delta power grid systems, disconnect the optional EMC grounding screw; otherwise, it may cause equipment damage or even personal injury.

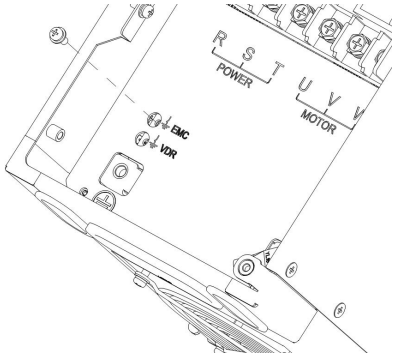


Figure 2-13 Disconnecting the EMC Optional Grounding Screw

Requirements for Shielded Cable Shielding Layer

It is recommended to use shielded cables for power cables, and the shielding layer must be connected to the PE terminal with 360° grounding. Do not twist the cable end shielding layer into a small tail that is exposed outside.

Requirements for Motor Cable Length

When the inverter operates, due to the rapid switching of power transistors, a significant du/dt is generated at the output end. When the motor cable is too

Long-term high du/dt can lead to motor insulation breakdown and bearing damage. To avoid this risk, please refer to the following recommendations:

a. Use motors that meet the IEC6003425 IVIC B technical specifications, or use motors with higher insulation voltage.-

b. The cable length between the inverter and the motor must not exceed the requirements listed in Table 2-4.

c. An output reactor may be required in some applications.

Please select cables of appropriate length according to the cable length requirements specified in this table.

Table 2-4 Cable Length Table

Inverter Model	Rated Output Current (A)	Without Output AC Reactor		With Output AC Reactor Installed	
		Shielded Cable (m)	Unshielded Cable (m)	Shielded Cable (m)	Unshielded Cable (m)
CM680-4T4R0GB	9.0	50	75	75	115
CM680-4T5R5GB	13.0	50	75	75	115
CM680-4T7R5GB	17.0	50	75	75	115
CM680-4T011GB	25.0	50	75	75	115
CM680-4T015GB	32.0	50	75	75	115
CM680-4T018GB	37.0	50	75	75	115
CM680-4T022GB	45.0	50	75	75	115
CM680-4T030GB	60.0	50	75	75	115
CM680-4T037G(B)	75.0	50	75	75	115
CM680-4T045G(B)	90.0	50	75	75	115
CM680-4T055G(B)	110.0	50	75	75	115
CM680-4T075G(B)	152.0	50	75	75	115
CM680-4T093G(B)	176.0	50	75	75	115
CM680-4T110G(B)	210.0	50	75	75	115
CM680-4T132G(B)	253.0	50	75	75	115

Inverter Model	Rated Output Current (A)	Without Output AC Reactor		With Output AC Reactor Installed	
		Shielded Cable (m)	Unshielded Cable (m)	Shielded Cable (m)	Unshielded Cable (m)
CM680-4T160G	304.0	50	75	75	115
CM680-4T185G	340.0	50	75	75	115
CM680-4T200G	380.0	50	75	75	115
CM680-4T220G	426.0	50	75	75	115
CM680-4T250G	465.0	50	75	75	115
CM680-4T280G	520.0	50	75	75	115
CM680-4T315G	585.0	50	75	75	115
CM680-4T355G	650.0	50	75	75	115
CM680-4T400G	725.0	50	75	75	115
CM680-4T450G	820.0	50	75	75	115

2.3.4 Terminal Lug Selection

The terminal lugs recommended in the table below are the GTNR series and BC series from Suzhou Yuanli.

Table 2-5 Appearance Diagrams of Various Series Terminal Lugs

Series	Appearance Diagram
GTNR Series	
TNR Series	
RV Series	
RNB Series	

2.4 Control Circuit Wiring

2.4.1 Control Circuit Terminal Description

The control circuit terminal layout is shown below:

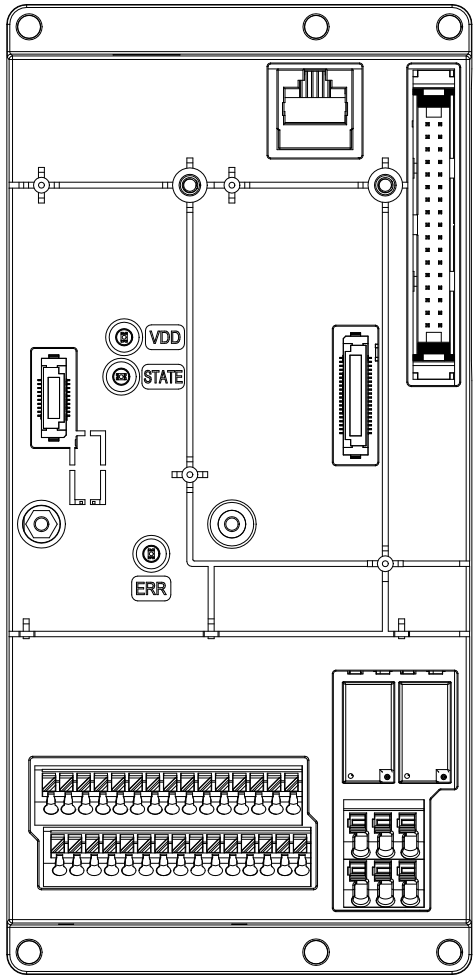


Figure 2-14 Control Panel Terminal Layout Diagram

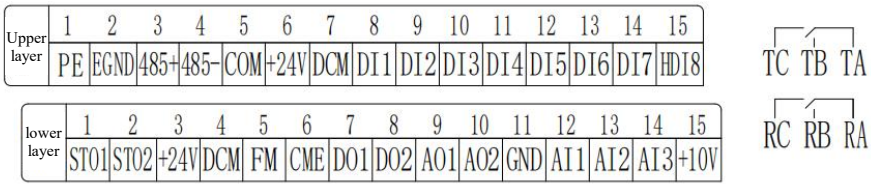


Figure 2-15 Control Circuit Terminal Layout Diagram

Control Terminal Function Description:

Table 2-6 CM680 Inverter Control Terminal Function Description

Category	Terminal Symbol	Terminal Name	Function Description
Power Supply	+24V-DCM	External +24V Power Supply	Provides +24V power supply, generally used as the working power supply for digital input/output terminals and external sensors, Maximum Output Current: 200mA
Analog Input	AI1-GND	Analog Input Terminal 1	1. Input Range: DC 0~10V/0~20mA/4~20mA, configured by the customer. 2. Input Impedance: 10kΩ when voltage input, 500Ω when current input.
	AI2-GND	Analog Input Terminal 2	
	AI3-GND	Analog Input Terminal 3	
Digital Input	DI1-COM	Digital Input 1	1. Optocoupler isolation, compatible with bipolar input 2. Input impedance: 3kΩ 3. Voltage range for DI1~DI7 level inputs: 9~30V; Voltage range for HDI8 level input: 15~30V; 4. HDI8 can be used as a high-speed input port. Default built-in power supply, NPN type (Sink)
	DI2-COM	Digital Input 2	
	DI3-COM	Digital Input 3	
	DI4-COM	Digital Input 4	
	DI5-COM	Digital Input 5	
	DI6-COM	Digital Input 6	
	DI7-COM	Digital Input 7	
	HDI8-COM	Digital Input 8	
Analog Output	AO1-GND	Analog Output 1	Software Configuration for Current Output or Voltage Output Output Voltage Range: 0~10V Output Current Range: 0~20mA
	AO2-GND	Analog Output 2	
Digital Output	DO1-CME	Digital Output 1	Optocoupler Isolation, Bipolar Open Collector Output Output Voltage Range: 0~48V Output Current Range: 0~50mA
	DO2-CME	Digital Output 2	
High Speed Digital Output	FM-DCM	High-Speed Digital Output	Optocoupler Isolated Output Output Voltage Range: 0~24V Output Current Range: 0~30mA Maximum Output Frequency: 100KHz

Category	Terminal Symbol	Terminal Name	Function Description
Function Safety	STO1	STO1	S1~DCM / S2~DCM Rated Input Voltage: +24 VDC ± 10%; Maximum Input Voltage: +30 VDC Rated Input Current: 6.8mA ± 10% Note: When the STO function is not used, S1 and S2 can be short-circuited with +24V to disable the STO function
	STO2	STO2	
Communication Interface	485+ -485-	Modbus Communication Interface	Modbus Communication Interface
	EGND	485GND	485GND
PE	PE	PE	Signal Wire Shield Ground Terminal
Relay Output 1	TA-TB	Normally Closed Terminal	Single Channel Relay Output Capability: 250Vac/3A(NO); 250Vac/3A(NC); 250Vac/2A(NO)estimate cosφ=0.4; 250Vac/1.2A(NC)estimate cosφ=0.4; 30Vdc/3A(NO) 30Vdc/2A(NC)
	TA-TC	Normally Open Terminal	
Relay Output 2	RA-RB	Normally Closed Terminal	
	RA-RC	Normally Open Terminal	
Keyboard Extension Wiring Interface	J6	External Keyboard Interface	Supports external keyboard, the keyboard can support function copying, using standard network cable for extension.

Note:

● When ambient temperature exceeds 23°C, derating is required; for every 1°C increase in ambient temperature, output current decreases by 1.8mA. At 40°C

ambient temperature, the maximum output current is 170mA. When the user shorts COM and 24V, the current on the DI terminal must also be considered.

● Users need to select 500Ωor 250Ωimpedance based on the load capability of the signal source, the selection basis is the maximum output

of the signal source.

Voltage, for example, using 500Ωimpedance, it is necessary to ensure that the maximum output voltage of the signal source is not less than 10V, to ensure that AI2 can

measure 20mA of current.

2.4.2 Control Loop Terminal Wiring Instructions

Signal Input Terminal Wiring Instructions:

AI Analog Input Terminals:

Due to weak analog voltage signals being particularly susceptible to external interference, shielded

cables are generally required, and the wiring distance should be as short as possible, not exceeding 20m, as shown in Figure 2-16. In cases where analog signals are severely interfered with, a filter capacitor or ferrite core should be added on the side of the analog signal source.

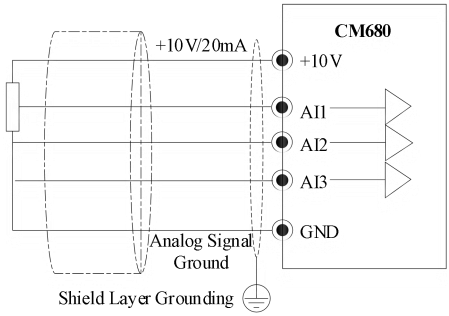


Figure 2-16 Schematic Diagram of Analog Input Terminal Wiring

DI Digital Input Terminals:

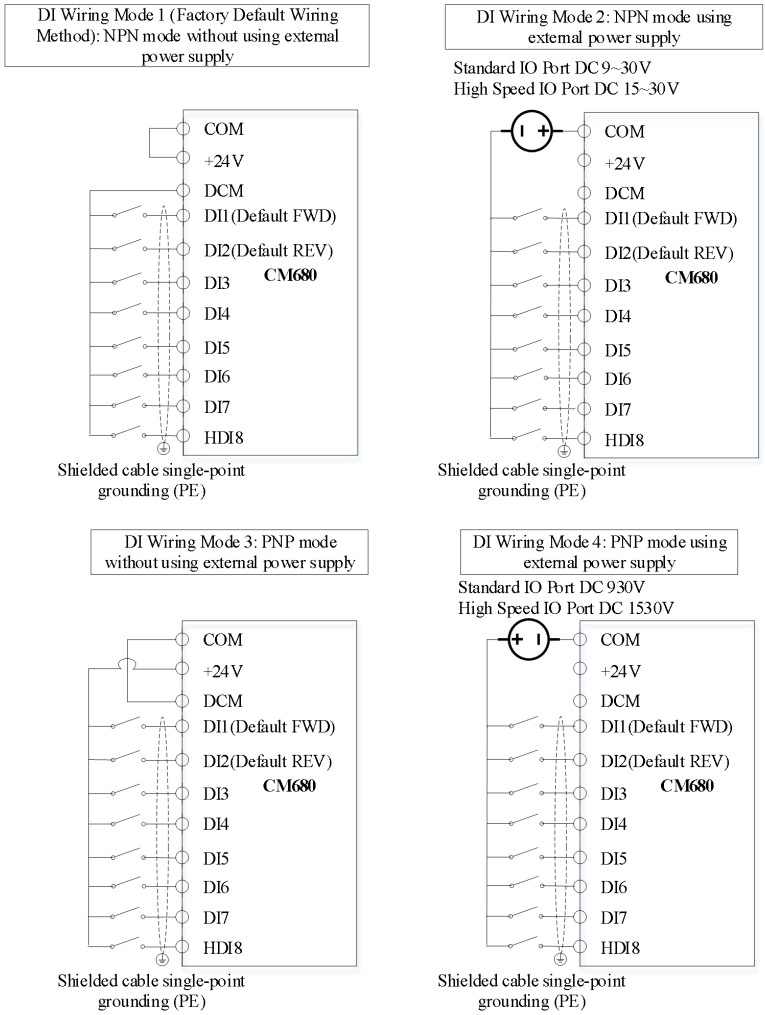


Figure 2-17 Wiring Diagrams for Digital Input Terminals in Four Different Modes

Note: When using an external power supply, the voltage range for standard IO ports (DI1~DI7) should be 9~30V, and for high-speed IO ports (HDI8), it should be 15~30V.

Generally, shielded cables should be used, and the wiring distance should be as short as possible, not exceeding 20 meters.

When using active drive mode, necessary filtering measures should be taken to prevent power supply crosstalk.

It is recommended to use contact control method.

DO Digital Output Terminals:

When the digital output terminal needs to drive a relay, an absorption diode should be installed across the relay coil, with a driving capability not exceeding 50mA. Otherwise, it can easily cause damage to the DC 24V power supply.

Note: The polarity of the absorption diode must be correctly installed as shown in Figure 2-18. Otherwise, when the digital output terminal has an output, it will immediately damage the DC 24V power supply.

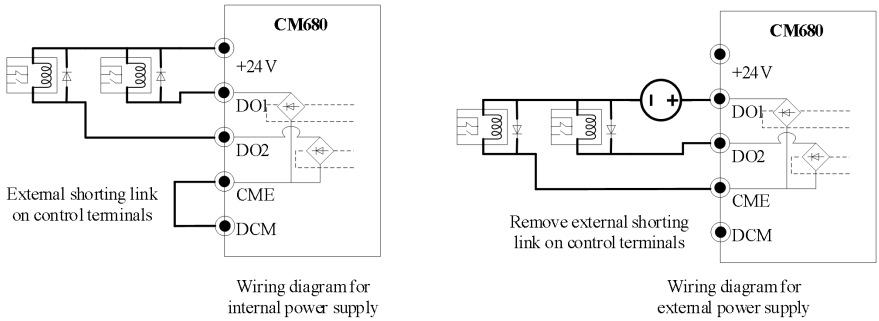


Figure 2-18 Schematic Diagram of Digital Output Terminal DO Wiring

Relay Output Terminal Wiring:

Inductive loads (relays, contactors, and motors) will cause voltage spikes when the current is cut off. For relay contacts,

use a varistor for protection and install an absorption circuit on the inductive load, such as a varistor, RC absorption circuit, or diode.

etc., to ensure the interference is minimized when turned off, as shown in Figure 2-19.

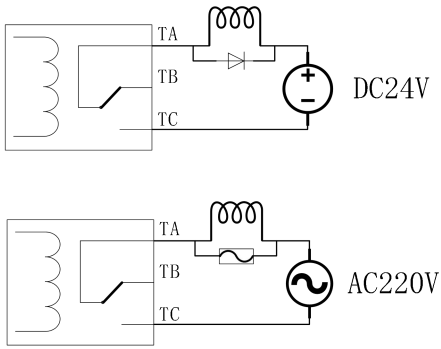


Figure 2-19 Recommended Circuit for Relay Inductive Load

2.4.3 Control Circuit Wiring Requirements

Description

Control circuit wiring should comply with the requirements of EN 60204-1 standard.-

Selection Requirements

Toensure that the control circuit is not affected by strong interference noise around it, it is recommended to use shielded cables with shielding layers for signal cables, and to achieve a reliable 360° connection between the equipment and the signal shielding bracket at both ends of the shielding layer. Different analog signals should use separate shielded cables, and digital signal lines are recommended to use shielded twisted pairs.

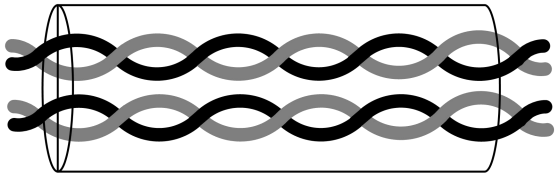


Figure 3-24Figure 220 Schematic of Shielded Twisted Pair Cable-

Grounding Requirements for the Shielding Layer of Analog Terminals

Analog voltage signals are susceptible to external interference, so shielded cables are generally required, and the wiring distance should be as short as possible, not exceeding 20m. In cases where analog signals are severely interfered with, a filter capacitor or ferrite core should be added at the analog signal source side, and it is recommended that the shielding layer of the shielded cable be grounded 360°.

Wiring Requirements for Encoder Signal Lines

When installing the PG card and performing encoder wiring, simply connect the shielding layer of the encoder signal line to the PE terminal on the PG card to achieve the connection between the shielding layer of the signal line and the PE grounding point of the inverter, thus completing the grounding of the signal line's shielding layer. The requirements for connecting the encoder cable are as follows:

1. During on-site installation and commissioning, the encoder cables and power cables must be routed in separate conduits; it is strictly prohibited to bundle the encoder cables with the power cables, as this will cause encoder interference issues.

2. It is recommended to use twisted pair shielded cable. For differential encoders, the twisted pairs must be wired differentially, and the shielding layer should be 360° connected to the inverter's grounding terminal (PE terminal).

3. For some large equipment where the inverter is far from the motor (motor cable length 10m), due to the influence of parasitic inductance in the cable, the grounding impedance of the encoder cable shield will increase. In this case, the encoder shield can be left unconnected to the inverter's grounding terminal (PE terminal).

IO Signal Wiring Requirements

IO signals include analog input AI, analog output AO, digital input DI, digital output DO, and relay output signals. Please disconnect the main power supply and ensure that the inverter's power indicator light is off before operating or wiring the IO terminals.

Note: If the inverter's enclosure has a lightning warning symbol (as shown in Figure 2-21), wait for the longer of the warning time or the time it takes for the light to go out.

Toavoid interference with IO signals, keep the IO signal wires at least 50cm away from the main circuit wiring (RST, UVW) and other power lines (or electrical lines).

Keepthe relay output terminal wiring at least 30cm away from other IO signal wires; otherwise, it may cause the inverter and machine to malfunction.

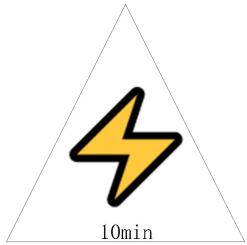


Figure 2-21 Lightning Warning Sign

2.5 Communication Connection

2.5.1 CANopen Communication

2.5.1.1 Overview

The EMH-OP module expansion card is a CANopen fieldbus adapter card that complies with CiA standards. This card is installed on the CM680 inverter to enable communication with CANopen master devices, making the inverter a slave node of the CANopen network, accepting control from the master station.

2.5.1.2 Electrical Connection

The hardware layout of the EMH-OP module expansion card is shown in Figure 2-22. Connector X2 is used for connecting to the inverter and is located on the back of the EMH-OP module expansion card. The EMH-OP module expansion card provides spring-type terminal blocks for communication connections. For detailed descriptions of each hardware component, refer to Table 2-7.

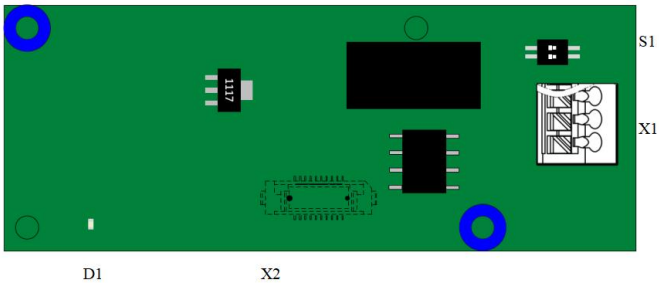


Figure 2-22EMH-OPModule Expansion Card Interface Layout

Table 2-7EMH-OPModule Expansion Card Interface Description

Figure Name	Hardware Name	Function Description
X1	CAN Socket	For module connection to the CANopen network, refer to Figure 1.3 description
X2	Board-to-Board Socket	For connection to the inverter (located on the back of the board)
D1	LED Indicator Light	For indicating power status, refer to Table 1.2 description
S1	Termination Resistor Setting	For setting the CAN bus termination resistor, refer to Table 1.6 description

Terminal Wiring Description

The EMH-OP module expansion card uses a spring-type terminal block X1 to connect to the CAN bus as shown in the figure below:

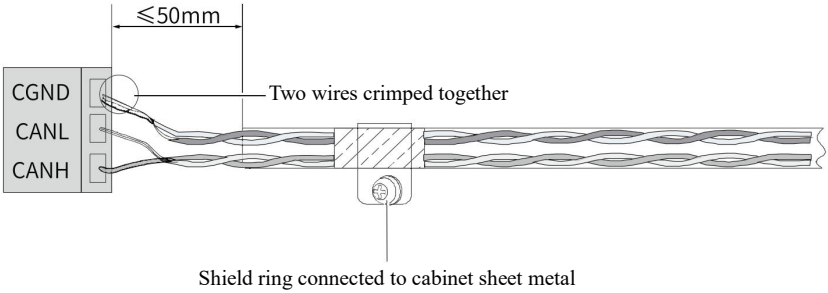


Figure 2-23 Explanation of the CAN Communication Interface for the EMH-OP Module Expansion Card

LED Indicator Light

Table 2-8 Explanation of the LED Indicator Lights on the EMH-OP Module Expansion Card

Figure Name	Indicator Light	Indicator Light Status		Function Description
D1	Hardware Power Indicator Light	Green Light	Constantly On	Module is Normally Powered On
			Off	Module Not Powered On

Termination Resistance

The DIP switch S1 on the EMH-OP module expansion card consists of a 2-bit DIP switch used to configure the CAN bus termination resistor. It is recommended to set the termination resistor at both ends of the network topology. Switching to "ON" represents "1", and switching down represents "0". For detailed information, refer to Table 2-9.

Table 2-9 Setting of Termination Resistors for the EMH-OP Module Expansion Card

DIP Switch Number		Baud Rate
1	2	
0	0	Do Not Use Termination Resistor
1	1	Use Termination Resistor

Bus Topology

The wiring diagram for the CAN bus is shown in Figure 2-24. It is recommended to use shielded twisted pair cables for CAN bus connections, and termination resistors should be connected at both ends of the bus. The DIP switch should be set according to the terminal block diagram. Failing to connect or connecting insufficient termination resistors can affect communication quality, leading to unstable communication.

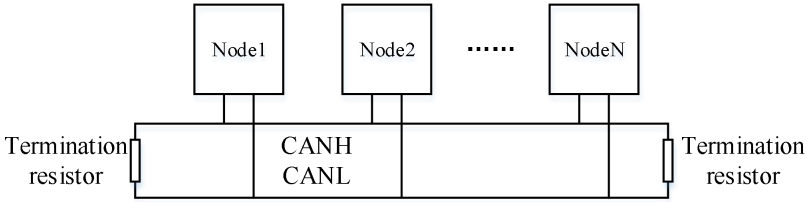


Figure 2-24 Wiring Diagram for the CAN Bus

2.5.2 Profibus DP Communication

2.5.2.1 Overview

The EMH-DP module expansion card is a PROFIBUS fieldbus adapter card that complies with the international standard for PROFIBUS-DP fieldbus. This card is installed on the CM680 inverter to enable communication with PROFIBUS Master devices, making the inverter a slave station of PROFIBUS DP, accepting control from the master station.

2.5.2.2 Electrical Connections

The hardware layout of the EMH-DP module expansion card is shown in Figure 2-25. Pin Header X3 is used for connecting to the inverter and is located on the back of the EMH-DP module expansion card. The EMH-DP module expansion card provides a 9-pin D-type connector for PROFIBUS communication. Detailed descriptions of each hardware component are provided in Table 2-10.

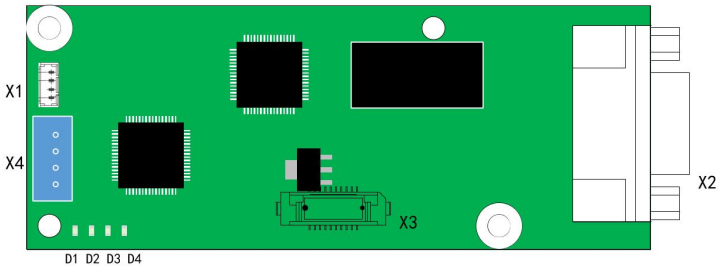


Figure 2-25 EMH-DP Module Expansion Card Interface Layout

Table 2-10 EMH-DP Module Expansion Card Interface Description

Figure Name	Hardware Name	Function Description
X1	Socket	Print Operation Information
X2	9-pin D-type Connector	For connecting modules to the PROFIBUS network, see Figure 1.3 for details
X3	Board-to-Board Socket	For connecting to the inverter
X4	Socket	For downloading firmware and commissioning
D1, D2, D3, D4	LED Indicator Light	For indicating operating status, see Table 1.2 for details

PROFIBUS-DP Communication Interface

The EMH-DP module expansion card uses a standard DB9 socket to connect to the PROFIBUS master station, with pin signal definitions following SIEMENS' DB9 socket standards. As shown below:

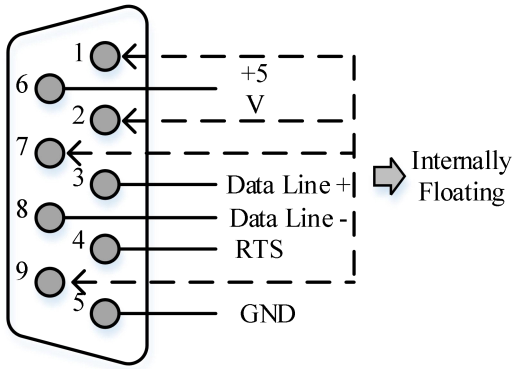


Figure 2-26 Explanation of the EMH-DP Module Expansion Card DP Communication Interface

LED indicator light

Table 2-11 Explanation of the EMH-DP Module Expansion Card LED Indicator Lights

Figure Name	Indicator Light	Indicator Light Status		Function Description
D1	PROFIBUS Communication Status Indicator Light	Red Light	Constantly On	Indicates No Communication Between the Module and PROFIBUS Master (Check PROFIBUS Cable Connection and Station Number)
			Off	Indicates Normal Communication Between the Module and PROFIBUS Master
D2	Inverter Communication Status Indicator Light	Red Light	Constantly On	Communication Timeout with Inverter
			Flashing	Abnormal Communication with Inverter (Interference Exists, Poor Connection, etc.), Communication Format Error (Incorrect Register Address, Data Error, etc.)
			Off	Normal Communication with Inverter
D3	Program Operation Status Indicator Light	Green Light	Constantly On	Main Program Running Normally
			Off	Main Program Not Started Properly
D4	Hardware Power Indicator Light	Green Light	Constantly On	Module is Normally Powered On
			Off	Module Not Powered On

The wiring diagram for the profibus dp bus is shown in Figure 2-27. Terminal matching resistors must be connected at both ends of the PROFIBUS bus. Adjust the dip switch according to the indications on the terminal block. Failing to connect or connecting fewer terminal resistors will affect communication quality and cause unstable communication.

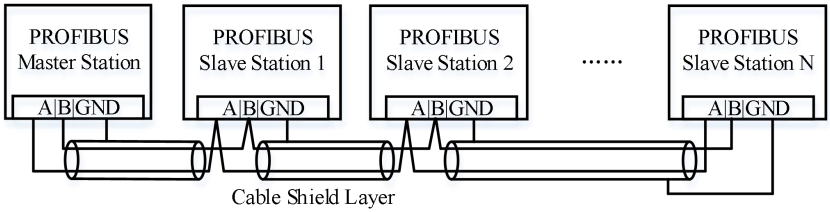


Figure 2-27 Schematic Diagram of PROFIBUS DP Bus Wiring

The communication rate range for PROFIBUS-DP is from 9.6 kbps to 12 Mbps, and the transmission line length depends on the transmission rate, with a transmission distance range of 100m to 1200m. The communication rates supported by the EMH-DP module expansion card and the communication distances at each rate are shown in Table 2-12.

Table 2-12 Maximum Cable Lengths for Different PROFIBUS-DP Transmission Rates

Communication Rate (bps)	9.6k	19.2k	93.75k	187.5k	500k	1.5M	3M	6M	12M
Length (m)	1200	1200	1200	1000	400	200	100	100	100

It is recommended to use dedicated PROFIBUS DP bus cables. Cable parameters are shown in the table below.

Table 2-13 Cable Parameters

Parameter	Description
Conductor	1 pair (2×22AWG) solid copper wire
Insulation Jacket Color	Green, Red
Shielding Layer	Aluminum foil tape + tinned copper braid
Jacket Material	PVC
Appearance	Purple

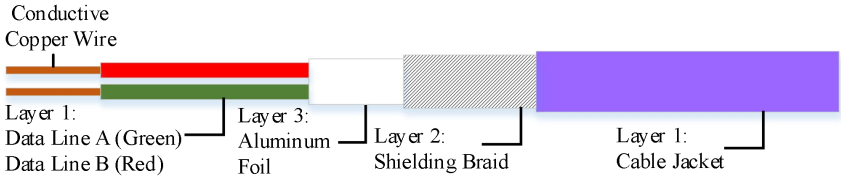


Figure 2-28 Schematic Diagram of Bus Cable Inner Structure

Bus Terminal Description: It is recommended to use SIEMENS's dedicated PROFIBUS DP connector, model: 6ES7 972-0BB12-0XA0.

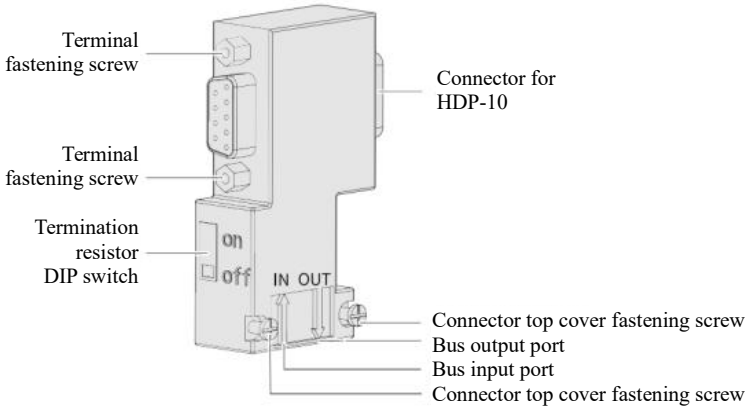


Figure 2-29 Bus Connection Terminal Layout Diagram

Wiring Steps:

1. Remove the outer insulation of the cable and prepare the length according to the dimensions below.

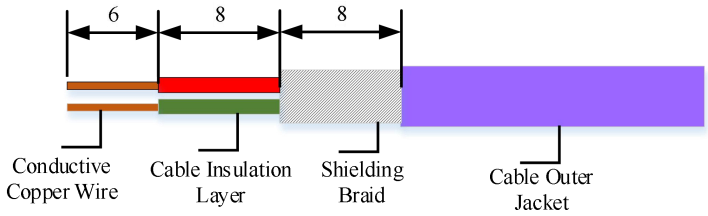


Figure 2-30 Cable Length Reserve Diagram (Unit: mm)

2. Use a No. 1 flathead screwdriver to open the bus connector terminal cover.

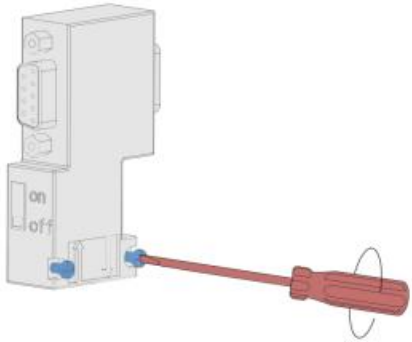


Figure 2-31 Method for Opening the Bus Connector Terminal Cover

3. Use a No. 1 flathead screwdriver to secure the cable at the connector installation position, ensuring that the shielding layer is in tight contact with the shielding layer metal plate, connect the green wire to A, and the red wire to B, as shown in Figure 2-32.

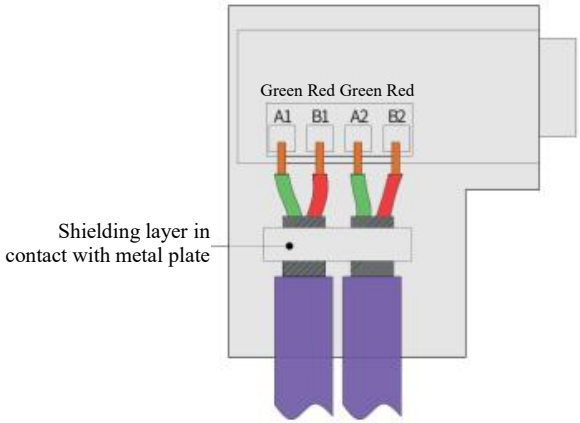


Figure 2-32 Connector Installation Position

4. After covering the connector cover and tightening the screws on the cover, insert it into the corresponding DB9 port of the EMH-DP, and use a screwdriver to tighten the fixing screws on both sides to prevent loosening.

Note: When installing the PROFIBUS DP bus, ensure that the Siemens terminal studs on both sides are securely connected to the EMH-DP module; otherwise, communication may fail or the communication quality may decrease.

2.5.3 Profinet Industrial Ethernet Communication

2.5.3.1 Overview

The EMH-PN module expansion card is a PROFINET fieldbus adapter card that complies with international standard PROFINET Ethernet. This card is installed on the CM680 inverter to enable communication with PROFINET master station devices, making the inverter a PROFINET slave that accepts control from the master station.

2.5.3.2 Electrical Connections

The hardware layout of the EMH-PN module expansion card is shown in Figure 2-33. Pin Header X3 is used for connecting to the inverter and is located on the back of the EMH-PN module expansion card. The EMH-PN module expansion card provides two network ports X2 for communication connections. Detailed descriptions of each hardware component are provided in Table 2-14.

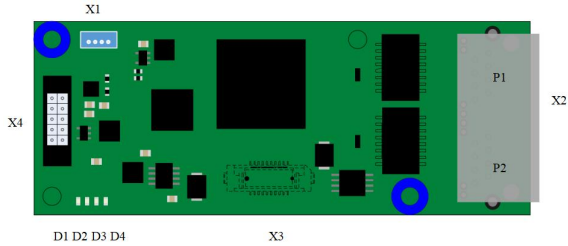


Figure 2-33 EMH-PN Module Expansion Card Interface Layout

Table 2-14 EMH-PN Module Expansion Card Interface Descriptions

Figure Name	Hardware Name	Function Description
X1	Pin Header Connector	Print Operation Information
X2	Ethernet Port	For PROFINET Module Connection to Profinet Network
X3	Pin Header Connector	For connecting to the inverter
X4	Pin Header Connector	For downloading firmware and commissioning
D1	PROFINET Communication Status Indicator Light	See Table 2-15 for EMH-PN Module Expansion Card LED Indicator Light Description
D2	Inverter Communication Status Indicator Light	
D3	Program Operation Status Indicator Light	
D4	Hardware Power Indicator Light	

Table 2-15 EMH-PN Module Expansion Card LED Indicator Light Description

Figure Name	Indicator Light	Indicator Light Status		Function Description
D1	PROFINET Communication Status Indicator Light	Red Light	Constantly On	PROFINET Communication Fault
			Off	PROFINET Communication Normal
D2	Inverter Communication Status Indicator Light	Red Light	Constantly On	Communication Timeout with Inverter
			Flashing	Inverter Communication Message Fault
			Off	Normal Communication with Inverter
D3	Program Operation Status Indicator Light	Green Light	Constantly On	Main Program Running Normally
			Off	Main Program Execution Fault
D4	Hardware Power Indicator Light	Green Light	Constantly On	Module is Normally Powered On
			Off	Module Not Powered On

Insert the network cable into the Ethernet port of the EMH-PN module expansion card, then connect it to the PLC. You can connect to either the P1 or P2 port according to the TIA Portal network topology. If the network topology is not specified, you can connect to either the P1 or P2 port.

It is recommended to use Cat 5e shielded network cable.

The common network topology diagram is as follows:

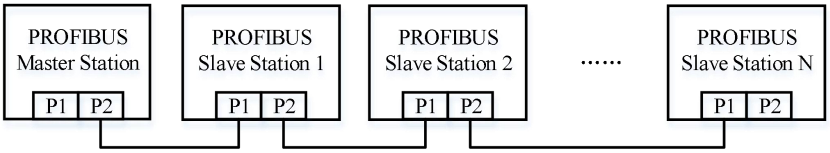


Figure 2-34 Linear Topology

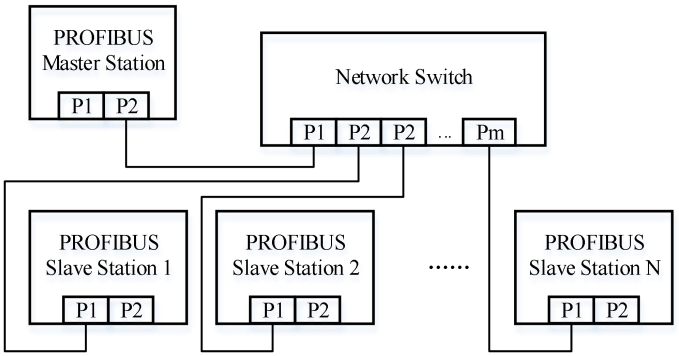


Figure 2-35 Star Topology

2.5.4 Ethernet/IP Industrial Ethernet Communication

2.5.4.1 Overview

The EMH-EN module expansion card is an Ethernet/IP fieldbus adapter card that complies with the general Ethernet/IP fieldbus standard. This card is installed on the CM680 inverter to enable communication with Ethernet/IP master station devices, making the inverter a slave station of Ethernet/IP, accepting control from the master station.

2.5.4.2 Electrical Connections

The hardware layout of the EMH-EN module expansion card is shown in Figure 2-36. Pin Header X3 is used for connecting to the inverter and is located on the back of the EMH-EN module expansion card. The EMH-EN module expansion card provides an Ethernet connector for connecting to Ethernet/IP communication. For detailed descriptions of each hardware component, refer to Table 2-16.

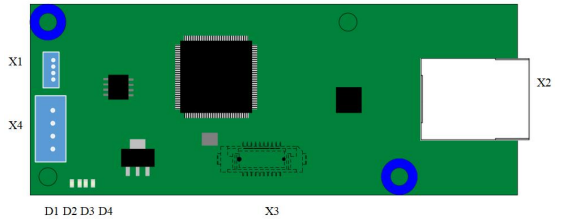


Figure 2-36 EMH-EN Module Expansion Card Interface Layout

Table 2-16 EMH-EN Module Expansion Card Interface Description

Figure Name	Hardware Name	Function Description
X1	Socket	Print Operation Information
X2	Ethernet Socket	For module connection to the Ethernet/IP network
X3	Board-to-Board Socket	For connecting to the inverter
X4	Socket	For downloading firmware and commissioning
D1, D2, D3, D4	LED Indicator Light	For indicating operational status, see Table 2-17 for details

Table 2-17 EMH-EN Module Expansion Card LED Indicator Light Description

Figure Name	Indicator Light	Indicator Light Status		Function Description
D1	Ethernet/IP Communication Status Indicator Light	Red Light	Constantly On	Indicates no communication between the module and the Ethernet/IP master station (check Ethernet/IP cable connections and station number)
			Off	Indicates normal communication between the module and the Ethernet/IP master station

Figure Name	Indicator Light	Indicator Light Status		Function Description
D2	Inverter Communication Status Indicator Light	Red Light	Constantly On	Communication Timeout with Inverter
			Flashing	Inverter Communication Message Fault
			Off	Normal Communication with Inverter
D3	Program Operation Status Indicator Light	Green Light	Constantly On	Main Program Running Normally
			Off	Main Program Not Started Properly
D4	Hardware Power Indicator Light	Green Light	Constantly On	Module is Normally Powered On
			Off	Module Not Powered On

The wiring diagram for the Ethernet/IP bus is shown in Figure 2-37. Insert the network cable into the network port of the EMH-EN module expansion card, then connect it directly to the PLC or indirectly through a switch. It is recommended to use a Cat 5e shielded network cable.

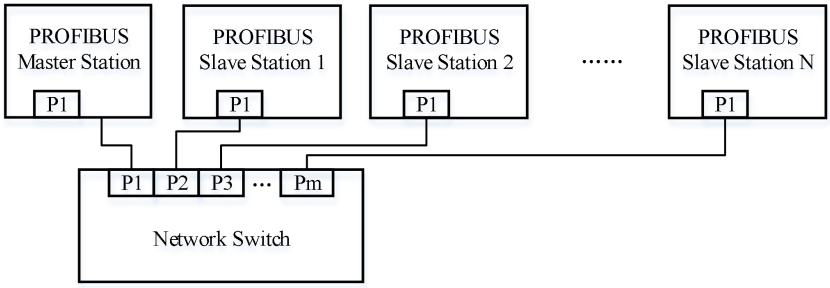


Figure 2-37 CM680-Ethernet/IP Bus Wiring Diagram

2.5.5 EtherCAT Industrial Ethernet Communication

2.5.5.1 Overview

The EMH-EC module expansion card is an EtherCat fieldbus adapter card that complies with international EtherCat fieldbus standards. This card is installed on the CM680 inverter to enable communication with EtherCat master station devices, making the inverter a slave station of the EtherCat network, accepting control from the master station.

2.5.5.2 Electrical Connection

The hardware layout of the EMH-EC module expansion card is shown in Figure 2-38. Pin Header X3 is used for connecting to the inverter and is located on the back of the EMH-EC module expansion card. The EMH-EC module expansion card provides two network ports X1 and X2, which are used for communication between the EMH-EC card and the master station (or the previous slave station) and the next slave station (if any).

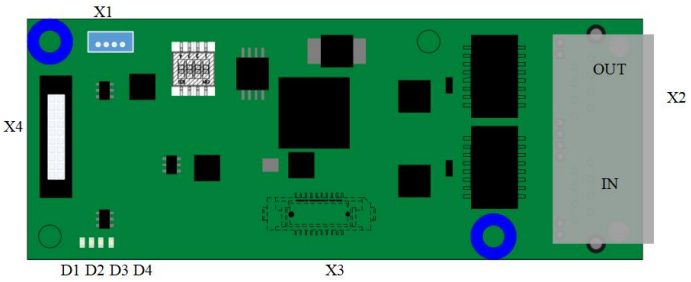


Figure 2-38 Interface Layout Diagram of the EMH-EC Module Expansion Card

Table 2-18 Interface Description of the EMH-EC Module Expansion Card

Figure Name	Hardware Name	Function Description
X1	IN Network Port	Connects to the master station (or the previous slave station)
X2	OUT Network Port	Connects to the next slave station (if any)
X3	Board-to-Board Socket	For connecting to the inverter
X4	Socket	For downloading firmware and commissioning
X5	Socket	Print Operation Information
D1, D2, D3, D4	LED Indicator Light	Used to indicate operating status, see Table 2-19 for details

Table 2-19 EMH-EC Module Expansion Card LED Indicator Light Description

Figure Name	Indicator Light	Indicator Light Status		Function Description
D4	EtherCAT Communication Status Indicator Light	Red Light	Constantly On	Indicates the EtherCAT module and EtherCAT master station are in init
			Blinking (200ms on/off interval)	Indicates normal communication between the module and the EtherCAT master station
			Single Flash (200ms on, 1000ms off)	Indicates the EtherCAT module and master station are in PreOp
			Flickering (1200ms on/off interval)	Indicates the EtherCAT module and master station are in SafeOp
			Double Flash (100ms off, 100ms on, 100ms off, 100ms on, 800ms off)	Indicates communication error between the EtherCAT module and master station
			Off	Indicates normal communication between the EtherCAT module and master station, in OP

Figure Name	Indicator Light	Indicator Light Status		Function Description
D3	Inverter Communication Status Indicator Light	Red Light	Constantly On	The EtherCAT module is powered on or communication with the inverter has timed out
			Off	EtherCAT module communicates normally with the inverter
			Blinking (200ms on/off interval)	Indicates that the EtherCAT module and the inverter receive error codes non-periodically
			Double flash (100ms off 100ms on 100ms off 100ms on 800ms off)	Indicates periodic communication errors between the EtherCAT module and the inverter
D2	Program Operation Status Indicator Light	Green Light	Constantly On	Main Program Running Normally
			Off	Main Program Not Started Properly
D1	Hardware Power Indicator Light	Green Light	Constantly On	Module is Normally Powered On
			Off	Module Not Powered On

The topologies supported by EtherCAT include bus, star, tree, etc., as well as combinations of various topologies, making device connection and wiring very flexible and convenient. The bus connection topology is shown in Figure 2-39.

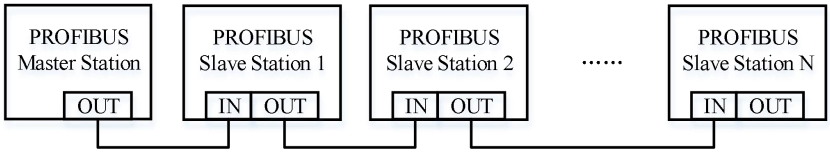


Figure 2-39 EtherCAT Bus Wiring Diagram

2.6 Grounding

2.6.1 Main Circuit Grounding Requirements

To ensure the product is properly grounded, please observe the following precautions:

(1) To prevent electric shock, be sure to ground the grounding terminal. For grounding methods, please comply with the relevant electrical regulations of each country or region.

(2) To prevent electric shock, ensure that the protective earthing conductor meets the technical specifications and local safety standards, and keep the earthing lead as short as possible. The leakage current of the product will exceed 3.5 mA, therefore, it should be installed in accordance with EN 61800-5-1 standard,-- the cross-sectional area of the protective earthing conductor should refer to 2-20.

(3) When using multiple devices, follow the instructions for grounding all devices. Incorrect device grounding can cause malfunction.

(4) This product has an optional VDR grounding screw. When performing dielectric strength tests,

make sure to disconnect the VDR grounding screw before testing, otherwise there is a risk of test failure.

(5) The protective earth conductor must use yellow-green copper cable and must not be connected in series with circuit breakers or other switching devices.

(6) The grounding terminal must be reliably grounded; otherwise, it may cause the equipment to malfunction or even be damaged. The grounding terminal must not be shared with the power neutral line N terminal.

(7) It is recommended to install on a conductive metal surface to ensure that the entire conductive bottom of the equipment is in good contact with the installation surface.

(8) The fixing of the grounding screw must be carried out according to the recommended torque to avoid loose or overly tight fixation of the protective earth conductor.

Table 2-20 Grounding Cable Cross-Sectional Area

Main Cable Cross-sectional Area (mm²)	Minimum Ground Wire Cross-sectional Area (mm²)
S≤16	S
16＜S≤35	16
35＜S	S/2

2.6.2 Control Board Grounding

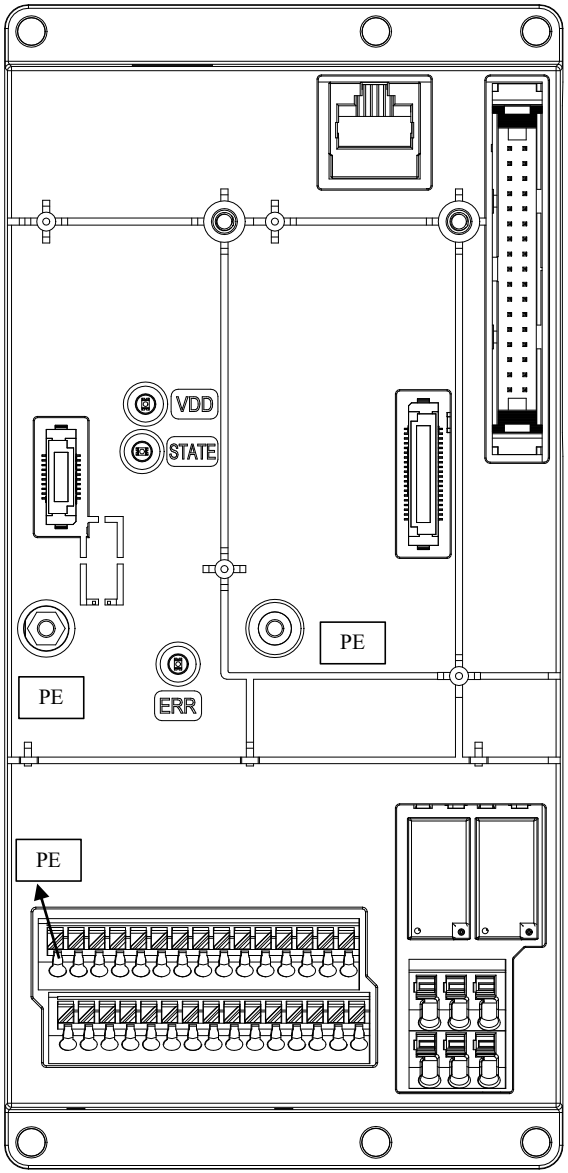


Figure 2-40 Control Board Grounding Position

2.6.3 Single Equipment Grounding

Main Circuit Grounding Schematic:

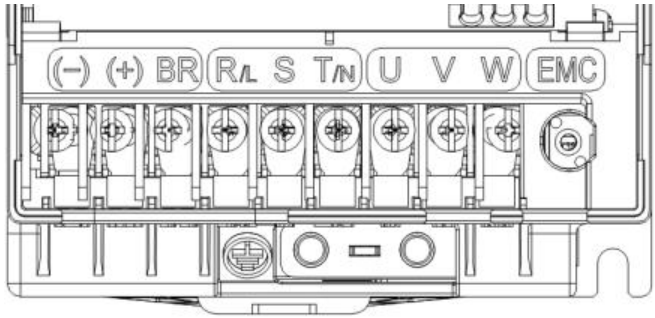


Figure 2-41 4.0~7.5kW Grounding Point Schematic

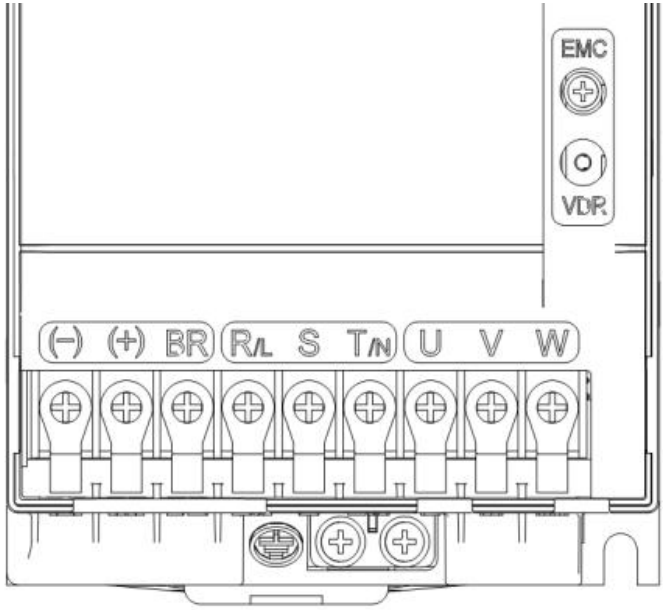


Figure 2-42 11~15kW Grounding Point Schematic

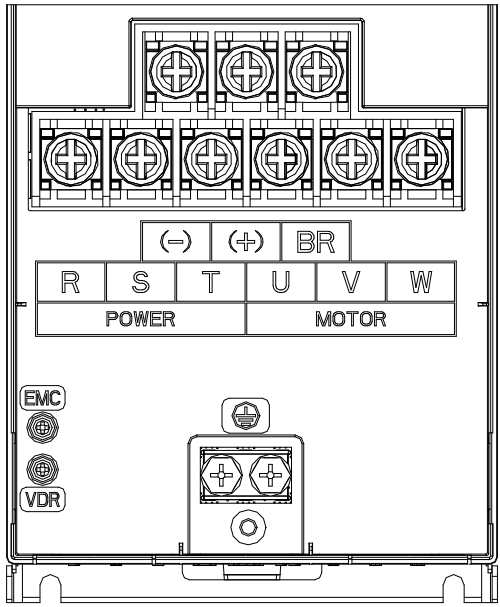


Figure 2-43 18.5~30kW Grounding Point Schematic

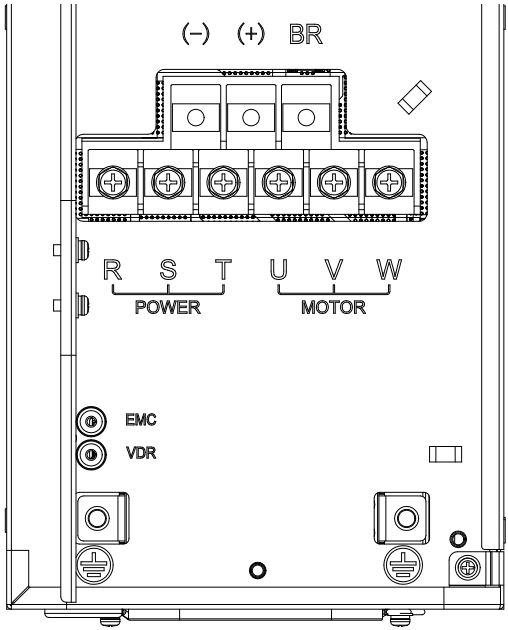


Figure 2-44 37~45kW Grounding Point Schematic

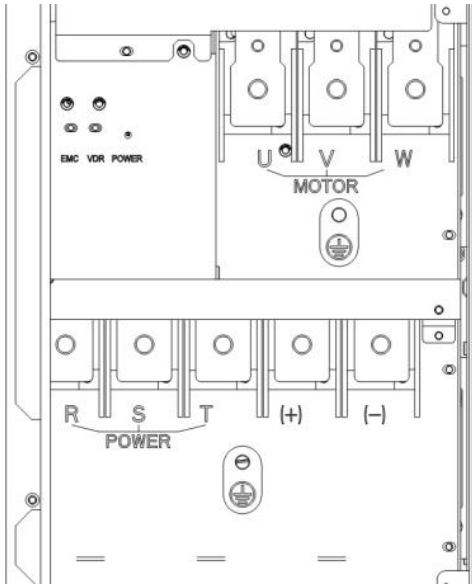


Figure 2-45 55~185kW Grounding Point Schematic

2.6.4 Multiple Equipment Grounding

When multiple devices are installed side by side in a cabinet, the grounding diagram is shown below.

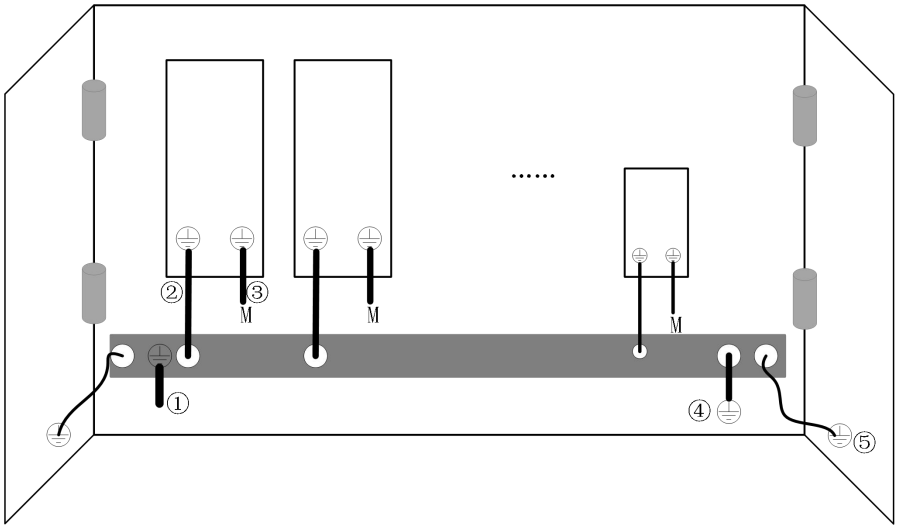


Figure 2-46 Grounding Diagram for Multi-unit Installation

Table 2-21 Grounding Instructions for Multi-unit Installation

No.	Wiring Description
①	Connect the PE cable from the input power supply to the grounding busbar in the control cabinet.
②	Connect the main circuit input PE terminal of the product to the grounding busbar in the control cabinet via a protective earthing conductor.
③	Connect the PE cable and shielding layer of the motor output to the output PE terminal of the product.
④	Connect the grounding busbar in the control cabinet to the cabinet body and door via a protective earthing conductor.

2.6.5 Cabinet System Grounding

The inverter control system is susceptible to electromagnetic interference. In addition to the EMC design of the inverter, there are a large number of control and other weak electrical signals within the cabinet system, making cabinet layout a key focus area. The cabinet can be divided into multiple EMC zones or multiple cabinets based on the strength of interference signals within the cabinet, and equipment should be installed in the corresponding areas according to the principles listed in the table below.

Table 2-22 Wiring Principles

No.	Wiring Principles
1	Please place control equipment and variable frequency drive equipment in separate cabinets.
2	In a multi-cabinet system, cabinets should be connected using grounding wires with a cross-sectional area of at least 16mm^2 to achieve equipotentiality between cabinets. to connect and achieve equipotentiality between cabinets.
3	Within a single cabinet, equipment should be zoned based on signal strength.
4	Equipment in different areas within the cabinet should be connected for equipotentiality.
5	All communication cables (e.g., RS485) and signal cables drawn from the electrical cabinet must be properly shielded.
6	The power input filter in the cabinet should be placed near the cabinet's input interface.
7	After grounding connections are made at each grounding point in the cabinet, anti-rust and anti-corrosion treatment should be applied to the paint removal areas.

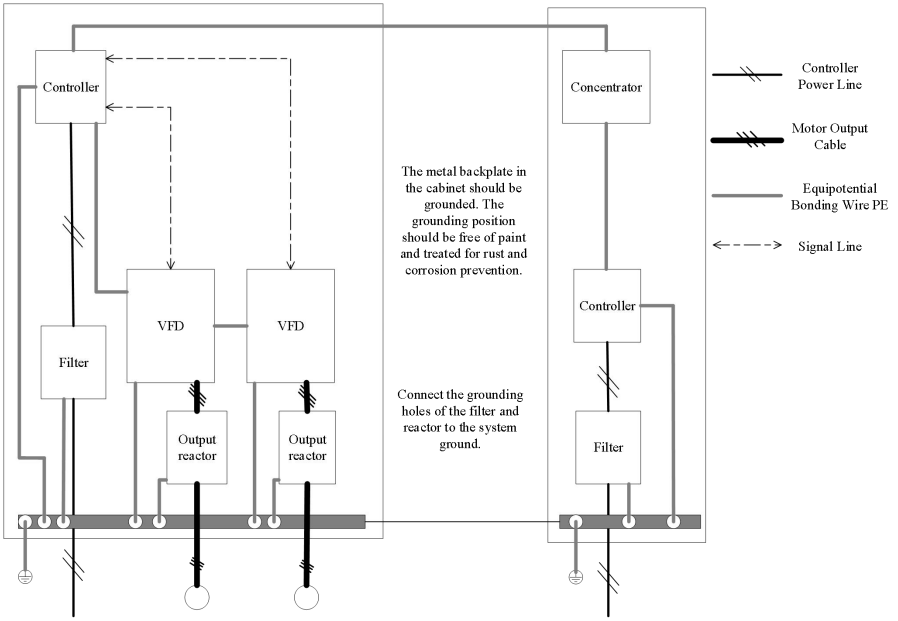


Figure 2-47 Cabinet System Grounding Schematic

2.7 STO Safety Design and Wiring

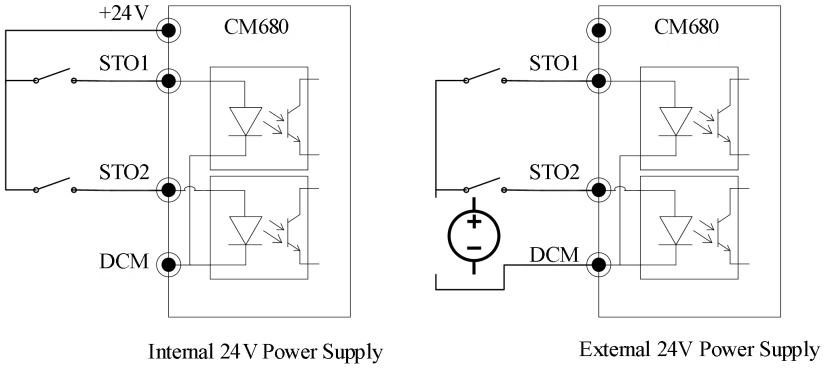


Figure 2-48 STO Wiring

3 Optional Accessories Selection

3.1 List of Optional Accessories

For detailed functions and usage instructions of optional accessories, refer to the relevant accessory documentation.

If any of the following optional accessories are required, please specify when placing your order.

For specific installation methods of the embedded mounting bracket, floor-standing mounting bracket, output reactor base, and push-in tool, refer to the 'CM680 Series General-Purpose Inverter Installation Manual'.

Table 3-1 CM680 Optional Accessories Overview

Name	Model	Function	Notes
Braking Unit	Product model ends with "B"	For energy consumption braking	Braking unit is standard equipment
	Product model ends with "(B)"	For energy consumption braking	Braking unit is optional equipment
C2-C8 Embedded Installation Bracket	/	Embedded installation	Optional equipment
C9-C11 Floor-Mounting Bracket	/	Floor mounting	Optional equipment
C9-C11 Output Reactor Base	/	Reactor base installation	Optional equipment
C9-C11 Push-In Tooling	/	DIN rail mounting	Optional equipment
LCD Keyboard Bracket	CM680-09-01-03	Cabinet Keyboard Installation	Standard equipment for models above 37kW, optional for models below 30kW.
Incremental Encoder Expansion Card	CM680-PG-INC	Suitable for incremental encoders, compatible with differential and non-differential inputs, DB15 interface.	Available for all models
Resolver Encoder Expansion Card	CM680-PG-R	Suitable for resolvers, excitation frequency 10kHz, DB9 interface.	Available for all series models
CANopen Expansion Card	CM680-CANopen	CANopen Communication Expansion Card	Available for all models
PROFIBUS Expansion Card	CM680-PROFIBUS	PROFIBUS Communication Expansion Card	Available for all models
PROFINET Expansion Card	CM680-PROFINET	PROFINET Communication Expansion Card	Available for all models

Name	Model	Function	Notes
Ethernet/IP Expansion Card	CM680-Ethernet/IP	Ethernet/IP Communication Expansion Card	Available for all models
EtherCAT Expansion Card	CM680-EtherCAT	EtherCAT Communication Expansion Card	Available for all models
C2-C4 Sealing Strip	2mm^2 O-Ring Sealing Strip	Enhance the sealing capability of the component chamber	Optional equipment

3.2 Peripheral Electrical Components

3.2.1 Fuses, Contactors, and Circuit Breakers

To comply with EN 61800-5-1 and UL61800-5-1 standards, it is essential to connect fuses and circuit breakers on the input side to prevent accidents caused by internal circuit short circuits.

For the selection of fuses and circuit breakers, refer to Table 3-2; the recommended fuse manufacturer is Bussmann.

Table 3-2 Selection Table for Fuses and Circuit Breakers

Physical Structure	Inverter Model	Rated Input Current(A)	Recommended Fuse Specifications Bussmann		Contactor	Circuit Breaker
			Rated Current (A)	Model	Rated Current (A)	Rated Current (A)
C2	CM680-4T4R0GB	11.4	30	FWP-30B	20	25
	CM680-4T5R5GB	16.7	40	FWP-40B	25	32
	CM680-4T7R5GB	21	60	FWP-60B	38	50
C3	CM680-4T011GB	32	70	FWP-70B	50	63
	CM680-4T015GB	41	80	FWH-80B	50	63
C4	CM680-4T018GB	47	100	FWH-100B	65	80
	CM680-4T022GB	56	125	FWH-125B	80	80
	CM680-4T030GB	72	150	FWH-150B	95	100
C5	CM680-4T037G(B)	88	175	FWH-175B	115	160
	CM680-4T045G(B)	110	250	FWH-250A	150	160
C6	CM680-4T055G(B)	106	250	FWH-250A	150	250
	CM680-4T075G(B)	139	275	FWH-275A	170	250
	CM680-4T093G(B)	165	325	FWH-325A	205	250
C7	CM680-4T110G(B)	190	400	FWH-400A	245	400
	CM680-4T132G(B)	230	500	FWH-500A	300	400
C8	CM680-4T160G	276	600	FWH-600A	410	500
	CM680-4T185G	314	700	FWH-700A	475	500

Physical Structure	Inverter Model	Rated Input Current(A)	Recommended Fuse Specifications Bussmann		Contactor	Circuit Breaker
			Rated Current (A)	Model	Rated Current (A)	Rated Current (A)
C9	CM680-4T200G	346	800	FWH-800A	475	630
	CM680-4T220G	380	800	FWH-800A	620	800
	CM680-4T250G	435	1000	170M5016	620	800
C10	CM680-4T280G	478	1000	170M5016	620	800
	CM680-4T315G	534	1400	170M6017	800	1000
	CM680-4T355G	598	1400	170M6017	800	1000
C11	CM680-4T400G	672	1400	170M6017	1000	1250
	CM680-4T450G	742	1600	170M6019	1000	1250

3.2.2 AC Input Reactor

The AC input reactor is mainly used to reduce harmonics in the input current and is configured as an optional accessory. When the application environment has higher harmonic requirements, an external reactor can be added. Models above 55kW in this series come standard with a DC reactor, which also helps to reduce harmonics in the input current. These models are designed to meet IEC61800-3-4 standards. If the application environment has even higher harmonic requirements, an AC input reactor can still be selected.

Table 3-3 Recommended Parameters for Input Reactors (Yingfeng)

Physical Structure	Inverter Model	Rated Input Current(A)	Reactor Model	Inductance (mH)
C2	CM680-4T4R0GB	11.4	ACL-0010-EISC-E1M4E	1.4
	CM680-4T5R5GB	16.7	ACL-0015-EISCL-EM93E	0.93
	CM680-4T7R5GB	21	ACL-0020-EISCL-EM70E	0.7
C3	CM680-4T011GB	32	ACL-0030-EISCL-EM47E	0.47
	CM680-4T015GB	41	ACL-0040-EISCL-EM35E	0.35
C4	CM680-4T018GB	47	ACL-0050-EISCL-EM28E	0.28
	CM680-4T022GB	56	ACL-0060-EISCL-EM24E	0.24
	CM680-4T030GB	72	ACL-0090-EISCL-EM16E	0.16
C5	CM680-4T037G(B)	88	ACL-0090-EISCL-EM16E	0.16
	CM680-4T045G(B)	110	ACL-0120-EISCL-EM12E	0.12
C6	CM680-4T055G(B)	106	ACL-0150-EISH-E95UE	0.095
	CM680-4T075G(B)	139	ACL-0200-EISH-E70UE	0.070
	CM680-4T093G(B)	165	ACL-0200-EISH-E70UE	0.070

Physical Structure	Inverter Model	Rated Input Current(A)	Reactor Model	Inductance (mH)
C7	CM680-4T110G(B)	190	ACL-0250-EISH-E56UE	0.056
	CM680-4T132G(B)	230	ACL-0290-EISH-E48UE	0.048
C8	CM680-4T160G	276	ACL-0330-EISH-E42UE	0.042
	CM680-4T185G	314	ACL-0390-EISH-E36UE	0.036
C9	CM680-4T200G	346	ACL-0490-EISH-E28UE	0.028
	CM680-4T220G	380	ACL-0490-EISH-E28UE	0.028
	CM680-4T250G	435	ACL-0530-EISH-E26UE	0.026
C10	CM680-4T280G	478	ACL-0600-EISH-E23UE	0.023
	CM680-4T315G	534	ACL-0660-EISH-E21UE	0.021
	CM680-4T355G	598	ACL-0800-EISH-E17UE	0.017
C11	CM680-4T400G	672	ACL-0800-EISH-E17UE	0.017
	CM680-4T450G	742	ACL-1000-EISH-E14UE	0.014

AC Input Reactor Size Description:

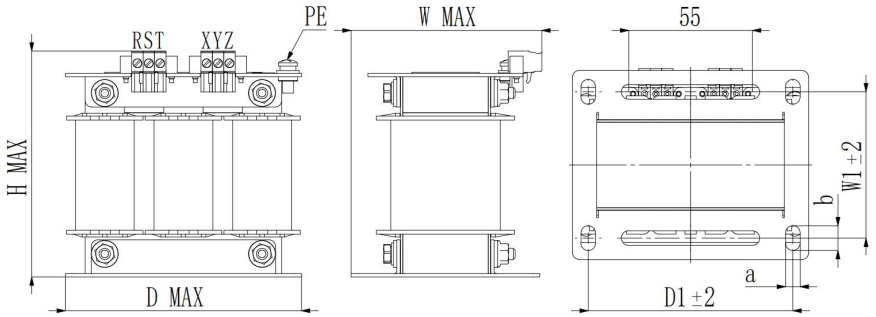


Figure 3-1 10A AC Input Reactor Size Diagram

Table 3-4 10A AC Input Reactor Size Table

Reactor Model	Reactor Rated Current (A)	D*H*W (mm)	D1*W1 (mm)	a*b (mm)	Mounting Hole Diameter (mm)	A*e (mm)
ACL-0010-EISC-E1M4E	10	110*110*90	91*65	65*11	/	/

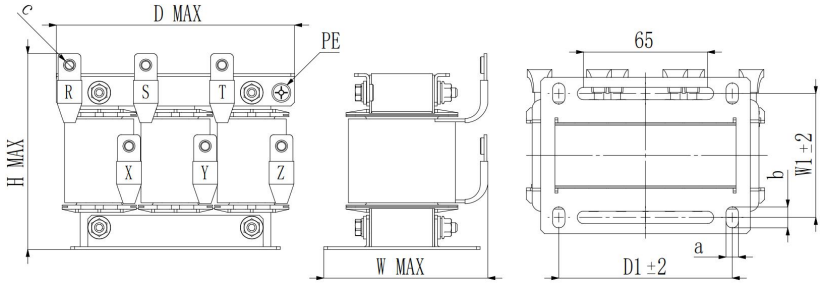


Figure 3-2 15-120A AC Input Reactor Dimensions

Table 3-5 15-120A AC Input Reactor Dimensions

Reactor Model	Reactor Rated Current (A)	D*H*W (mm)	D1*W1 (mm)	a*b (mm)	Mounting Hole Diameter (mm)	A*e (mm)
ACL-0015-EISCL-EM93E	15	130*110*90	91*65	6.5*11	M5	12*1.5
ACL-0020-EISCL-EM70E	20	130*110*90	91*65	6.5*11	M5	12*1.5
ACL-0030-EISCL-EM47E	30	140*110*100	120*72	6.5*11	M5	12*1.5
ACL-0040-EISCL-EM35E	40	140*110*100	120*72	6.5*11	M5	12*1.5
ACL-0050-EISCL-EM28E	50	140*130*105	120*72	6.5*11	M5	12*1.5
ACL-0060-EISCL-EM24E	60	140*130*105	120*72	6.5*11	M5	12*1.5
ACL-0090-EISCL-EM16E	90	200*140*140	120*72	9*15	M8	20*2
ACL-0120-EISCL-EM12E	120	200*140*140	120*72	9*15	M8	20*2

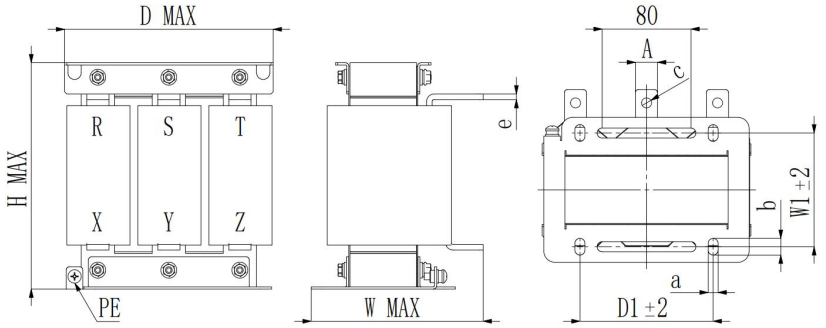


Figure 3-3 150-330A AC Input Reactor Dimensions

Table 3-6 150-330A AC Input Reactor Dimensions

Reactor Model	Reactor Rated Current (A)	D*H*W (mm)	D1*W1 (mm)	a*b (mm)	Mounting Hole Diameter (mm)	A*e (mm)
ACL-0150-EISH-E95UE	150	190*210*160	120*102	9*15	9	20*5

Reactor Model	Reactor Rated Current (A)	D*H*W (mm)	D1*W1 (mm)	a*b (mm)	Mounting Hole Diameter (mm)	A*e (mm)
ACL-0200-EISH-E70UE	200	190*210*160	120*102	9*15	9	20*5
ACL-0250-EISH-E56UE	250	245*230*175	182*102	11*18	11	25*5
ACL-0290-EISH-E48UE	290	245*230*175	182*102	11*18	11	25*5
ACL-0330-EISH-E42UE	330	245*230*175	182*102	11*18	11	25*5

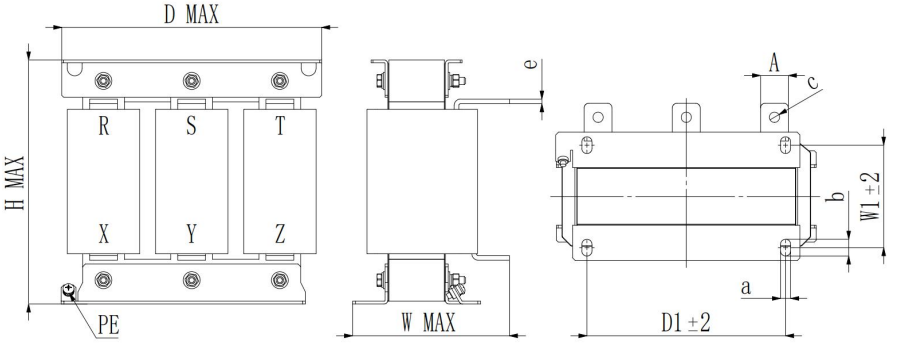


Figure 3-4 390-660A AC Input Reactor Dimensions

Table 3-7 390-660A AC Input Reactor Dimensions

Reactor Model	Reactor Rated Current (A)	D*H*W (mm)	D1*W1 (mm)	a*b (mm)	Mounting Hole Diameter (mm)	A*e (mm)
ACL-0390-EISH-E36UE	390	285*270*180	214*110	11*18	11	30*5
ACL-0490-EISH-E28UE	490	285*270*185	214*110	11*18	11	30*8
ACL-0530-EISH-E26UE	530	285*270*190	214*110	11*18	11	30*8
ACL-0600-EISH-E23UE	600	285*270*225	214*140	11*18	11	30*10
ACL-0660-EISH-E21UE	660	285*270*225	214*140	11*18	11	30*10

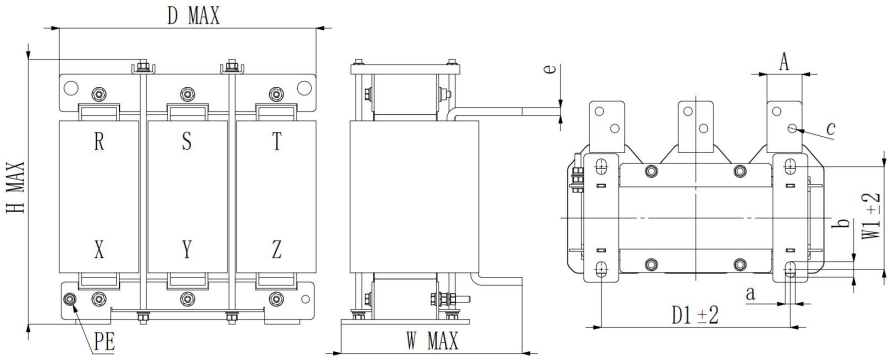


Figure 3-5 Dimensions of 800-1000A AC Input Reactor

Table 3-8 Dimensions of 800-1000A AC Input Reactor

Reactor Model	Reactor Rated Current (A)	D*H*W (mm)	D1*W1 (mm)	a*b (mm)	Mounting Hole Diameter (mm)	A*e (mm)
ACL-0800-EISH-E17UE	800	335*350*235	243*132	13*20	2-11	45*10
ACL-1000-EISH-E14UE	1000	335*400*235	243*132	13*20	2-11	45*10

3.2.3 EMC Filter

To ensure that this product meets the requirements for radiated and conducted emissions as per EN IEC 61800-3, the EMC filters listed in the table below need to be externally connected. The available EMC filter models for this product are shown in the table below.

Table 3-9 Recommended EMC Filter Selection (Yingfeng)

Physical Structure	Inverter Model	Filter Model	Leakage Current (mA)	Dimensions	Weight (kg)
C2	CM680-4T4R0GB	NFI0010-SA	< 6	Figure 3-6	0.8
	CM680-4T5R5GB	NFI0020-SA	< 6	Figure 3-7	1.5
	CM680-4T7R5GB	NFI0020-SA	< 6	Figure 3-7	1.5
C3	CM680-4T011GB	NFI0036-SA	< 6	Figure 3-7	2.8
	CM680-4T015GB	NFI0036-SA	< 6	Figure 3-7	2.8
C4	CM680-4T018GB	NFI0050-SA	< 6	Figure 3-7	3
	CM680-4T022GB	NFI0050-SA	< 6	Figure 3-7	3
	CM680-4T030GB	NFI0065-SA	< 10	Figure 3-8	3.1
C5	CM680-4T037G(B)	NFI0080-SA	< 10	Figure 3-9	5
	CM680-4T045G(B)	NFI0100-SA	< 10	Figure 3-9	7.2

Physical Structure	Inverter Model	Filter Model	Leakage Current (mA)	Dimensions	Weight (kg)
C6	CM680-4T055G(B)	NFI0150-SA	< 10	Figure 3-9	7
	CM680-4T075G(B)	NFI0150-SA	< 10	Figure 3-9	7
	CM680-4T093G(B)	NFI0200-SA	< 30	Figure 3-10	7.7
C7	CM680-4T110G(B)	NFI0250-BA	< 30	Figure 3-11	5.5
	CM680-4T132G(B)	NFI0250-BA	< 30	Figure 3-11	6.9
C8	CM680-4T160G	NFI0300-BA	< 30	Figure 3-11	6.9
	CM680-4T185G	NFI0400-BA	< 30	Figure 3-12	12
C9	CM680-4T200G	NFI0400-BA	< 30	Figure 3-12	12
	CM680-4T220G	NFI0600-BA	< 30	Figure 3-12	12.4
	CM680-4T250G	NFI0600-BA	< 30	Figure 3-12	12.4
C10	CM680-4T280G	NFI0600-BA	< 30	Figure 3-12	12.4
	CM680-4T315G	NFI0600-BA	< 30	Figure 3-12	12.4
	CM680-4T355G	NFI0900-BA	< 30	Figure 3-13	21.5
C11	CM680-4T400G	NFI0900-BA	< 30	Figure 3-13	21.5
	CM680-4T450G	NFI0900-BA	< 30	Figure 3-13	21.5

Size Description:

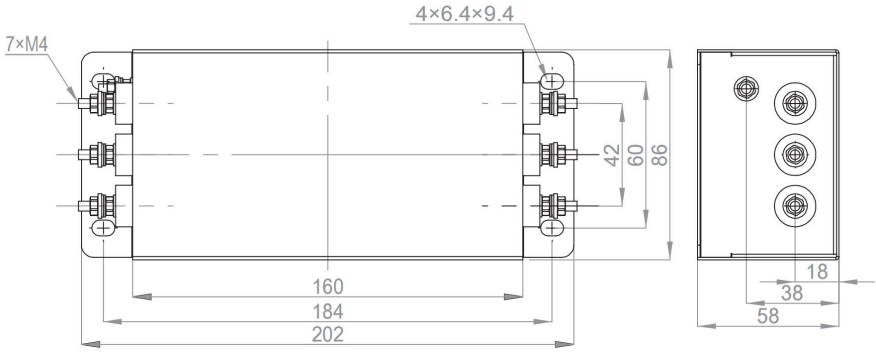


Figure 3-6 Dimensions of NFI0020-SA Model Filter

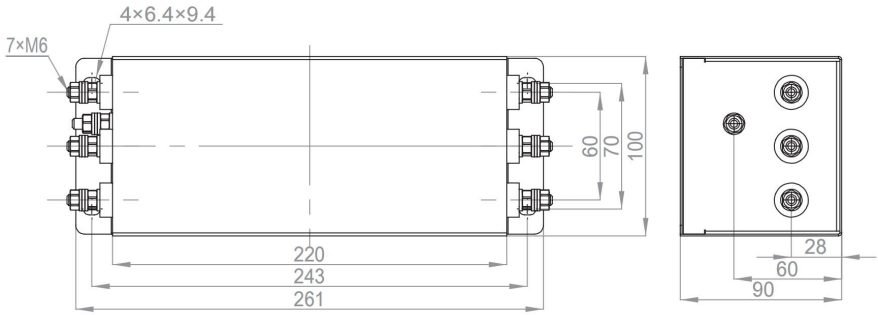


Figure 3-7 Dimensions of NFI0030-SA~NFI0050-SA Model Filters

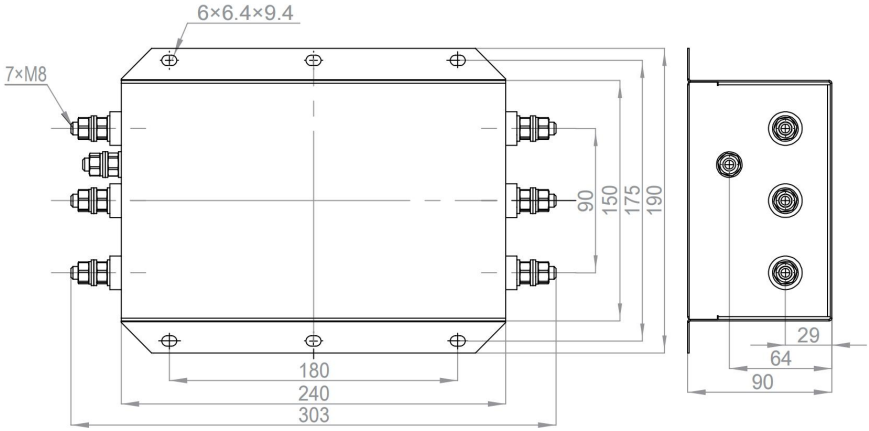


Figure 3-8 Dimensions of NFI0065-SA Model Filter

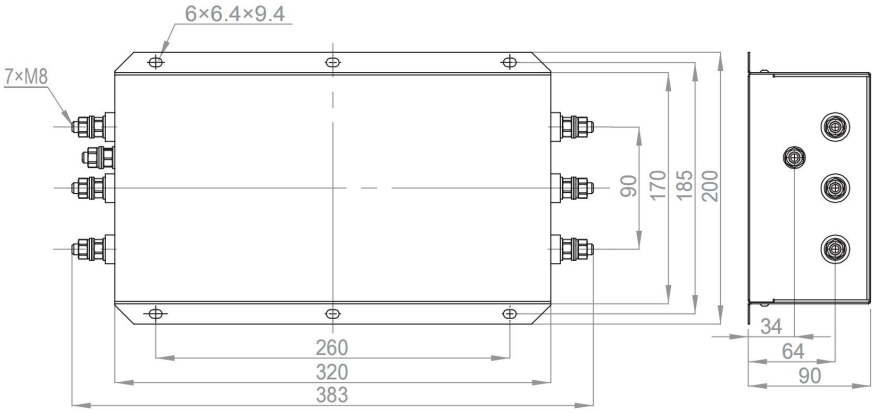


Figure 3-9 Dimensions of NFI0080-SA~NFI0150-SA Model Filters

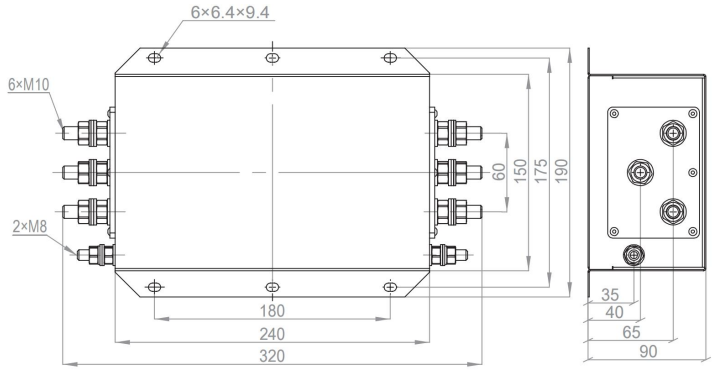


Figure 3-10 Dimensions of NFI0200-SA Model Filter

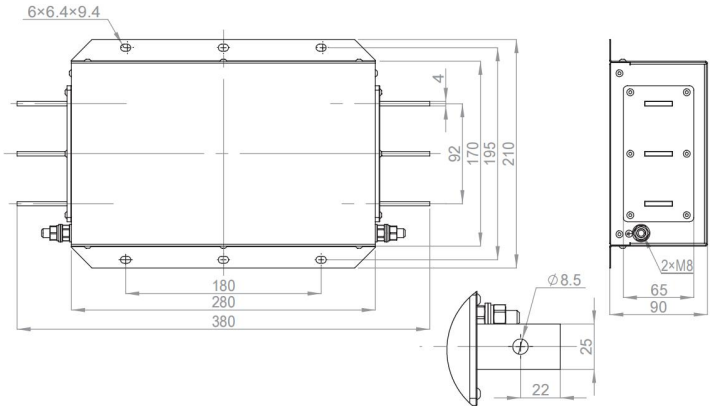


Figure 3-11 Dimensions of NFI0250-BA~NFI0300-BA Model Filters

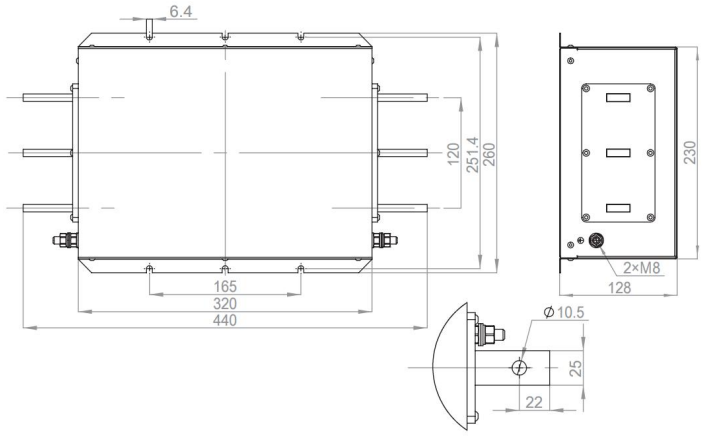


Figure 3-12 Dimensions of NFI0400-BA~NFI0600-BA Model Filters

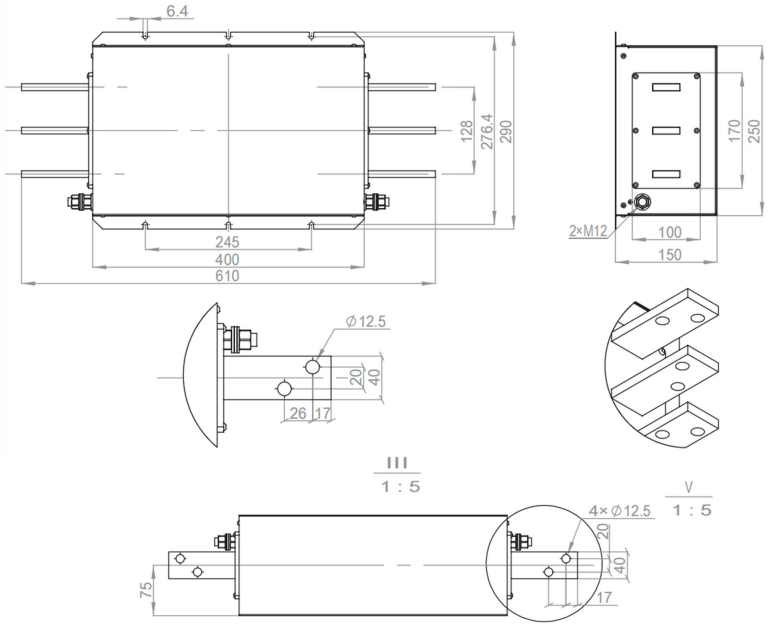


Figure 3-13 Dimensions of NFI0900-BA Model Filter

3.2.4 Braking Components

The braking unit is standard for 4-30kW models, optional for 55-132kW models. If you need the optional braking unit, please note it before placing your order. The braking unit will be installed inside the complete unit before shipment. There is no braking unit for models above 160kW. When selecting the braking resistor, it must be greater than the minimum braking resistor and power listed in the table below.

Table 3-10 Recommended Braking Resistor Selection Table

Appearance Structure	Inverter Model	Braking Unit	125% Braking Torque (10%, maximum 10s)	Minimum Braking Resistor (Ω)
C2	CM680-4T4R0GB	Built-in	1000W/75Ω	54.3
	CM680-4T5R5GB		1100W/75Ω	54.3
	CM680-4T7R5GB		1000W/75Ω	47.5
C3	CM680-4T011GB		1500W/43Ω	42.2
	CM680-4T015GB		2000W/32Ω	26.2
C4	CM680-4T018GB		2000W/32Ω	23
	CM680-4T022GB		3000W/26Ω	23
	CM680-4T030GB		4000W/16Ω	14.1

Appearance Structure	Inverter Model	Braking Unit	125% Braking Torque (10%, maximum 10s)	Minimum Braking Resistor (Ω)
C5	CM680-4T037G(B)	Optional	4800W/15Ω	12.7
	CM680-4T045G(B)		6000W/13Ω	12.7
C6	CM680-4T055G(B)		8000W/10.2Ω	9.5
	CM680-4T075G(B)		9600W/7.5Ω	6.3
	CM680-4T093G(B)		12000W/6.5Ω	6.3
C7	CM680-4T110G(B)		12000W/6Ω	6
	CM680-4T132G(B)		18000W/4Ω	4
C8	CM680-4T160G	No Braking Option	/	
	CM680-4T185G			
C9	CM680-4T200G			
	CM680-4T220G			
	CM680-4T250G			
C10	CM680-4T280G			
	CM680-4T315G			
	CM680-4T355G			
C11	CM680-4T400G			
	CM680-4T450G			

3.2.5 Output Reactor

When the output cable between the inverter and the motor is too long, the distributed capacitance of the cable also becomes too large, leading to excessive higher harmonics current output from the inverter. In this case, an output reactor should be selected. The output reactor can reduce excessive dv/dt, thereby reducing the voltage stress on the motor windings, protecting the motor windings, lowering the motor temperature, and extending the motor's service life. Table 3-11 recommends the cable lengths and reactor models for using an output reactor.

Table 3-11 Recommended Output Reactor Parameters (Yingfeng)

Appearance Structure	Inverter Model	Rated Output Current (A)	Maximum Wire Length Allowed Without Output Reactor (m)	Reactor Model	Inductance (mH)
C2	CM680-4T4R0GB	9.0	50	OCL-0010-EISC-EM70E	0.7
	CM680-4T5R5GB	13.0	50	OCL-0015-EISCL-EM47E	0.47
	CM680-4T7R5GB	17.0	50	OCL-0020-EISCL-EM35E	0.35
C3	CM680-4T011GB	25.0	100	OCL-0030-EISCL-EM23E	0.23
	CM680-4T015GB	32.0	100	OCL-0040-EISCL-EM18E	0.18
C4	CM680-4T018GB	37.0	100	OCL-0050-EISCL-EM14E	0.14
	CM680-4T022GB	45.0	100	OCL-0060-EISCL-EM12E	0.12
	CM680-4T030GB	60.0	100	OCL-0080-EISCL-E87UE	0.087
C5	CM680-4T037G(B)	75.0	100	OCL-0090-EISCL-E78UE	0.078
	CM680-4T045G(B)	90.0	100	OCL-0120-EISCL-E58UE	0.058
C6	CM680-4T055G(B)	110.0	100	OCL-0150-EISH-E47UE	0.047
	CM680-4T075G(B)	152.0	150	OCL-0200-EISH-E35UE	0.035
	CM680-4T093G(B)	176.0	150	OCL-0200-EISH-E35UE	0.035
C7	CM680-4T110G(B)	210.0	150	OCL-0250-EISH-E28UE	0.028
	CM680-4T132G(B)	253.0	150	OCL-0290-EISH-E24UE	0.024
C8	CM680-4T160G	304.0	150	OCL-0330-EISH-E21UE	0.021
	CM680-4T185G	340.0	150	OCL-0390-EISH-E18UE	0.018
C9	CM680-4T200G	380.0	150	OCL-0560-EISH-3352A	0.012
	CM680-4T220G	426.0	150	OCL-0560-EISH-3352A	0.012
	CM680-4T250G	465.0	150	OCL-0560-EISH-3352A	0.012
C10	CM680-4T280G	520.0	150	OCL-0780-EISH-3352A	0.009
	CM680-4T315G	585.0	150	OCL-0780-EISH-3352A	0.009
	CM680-4T355G	650.0	150	OCL-0780-EISH-3352A	0.009
C11	CM680-4T400G	725.0	150	OCL-1000-EISH-3352A	0.007
	CM680-4T450G	820.0	150	OCL-1000-EISH-3352A	0.007

AC Output Reactor Size Description:

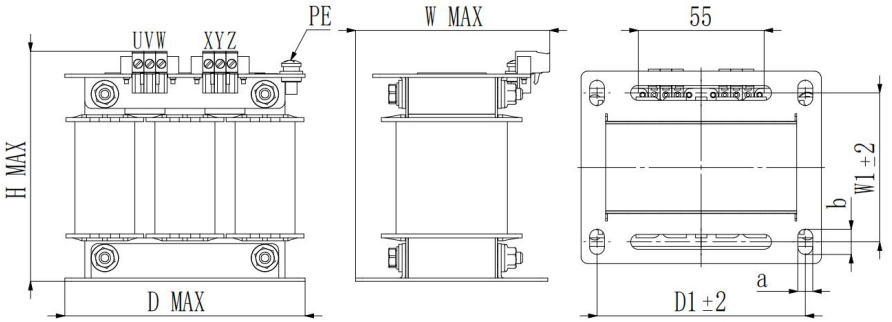


Figure 3-14 10A AC Output Reactor Size Diagram

Table 3-12 10A AC Output Reactor Size Table

Reactor Model	Reactor Rated Current (A)	D*H*W (mm)	D1*W1 (mm)	a*b (mm)	Mounting Hole Diameter c (mm)	A*e (mm)
OCL-0010-EISC-EM70E	10	110*110*90	91*65	6.5*11	/	/

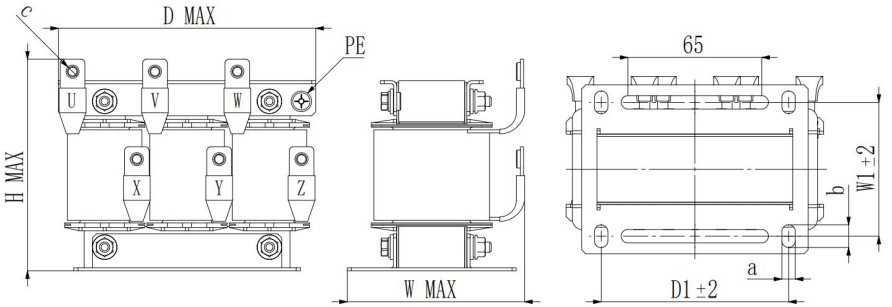


Figure 3-15 15-120A AC Output Reactor Size Diagram

Table 3-13 15-120A AC Output Reactor Size Table

Reactor Model	Reactor Rated Current (A)	D*H*W (mm)	D1*W1 (mm)	a*b (mm)	Mounting Hole Diameter c (mm)	A*e (mm)
OCL-0015-EISCL-EM47E	15	130*110*90	91*65	6.5*11	M5	12*1.5
OCL-0020-EISCL-EM35E	20	130*110*90	91*65	6.5*11	M5	12*1.5
OCL-0030-EISCL-EM23E	30	140*110*100	120*72	6.5*11	M5	12*1.5
OCL-0040-EISCL-EM18E	40	140*110*100	120*72	6.5*11	M5	12*1.5
OCL-0050-EISCL-EM14E	50	140*130*105	120*72	6.5*11	M5	12*1.5

Reactor Model	Reactor Rated Current (A)	D*H*W (mm)	D1*W1 (mm)	a*b (mm)	Mounting Hole Diameter c (mm)	A*e (mm)
OCL-0060-EISCL-EM12E	60	140*130*105	120*72	6.5*11	M5	12*1.5
OCL-0080-EISCL-E87UE	80	200*140*140	120*92	9*15	M8	20*2
OCL-0090-EISCL-E78UE	90	200*140*140	120*92	9*15	M8	20*2
OCL-0120-EISCL-E58UE	120	200*140*140	120*92	9*15	M8	20*2

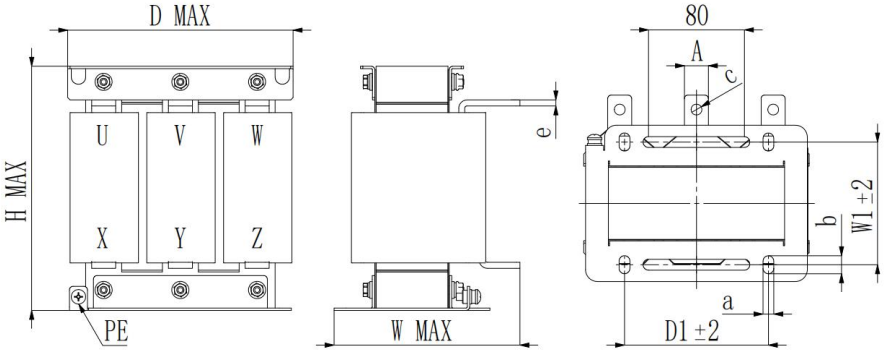


Figure 3-16 150-330A AC Output Reactor Size Diagram

Table 3-14 150-330A AC Output Reactor Dimensions

Reactor Model	Reactor Rated Current (A)	D*H*W (mm)	D1*W1 (mm)	a*b (mm)	Mounting Hole Diameter c (mm)	A*e (mm)
OCL-0150-EISH-E47UE	150	190*210*160	120*102	9*15	9	20*5
OCL-0200-EISH-E35UE	200	190*210*160	120*102	9*15	9	20*5
OCL-0250-EISH-E28UE	250	245*230*175	120*102	11*18	11	25*5
OCL-0290-EISH-E24UE	290	245*230*175	182*102	11*18	11	25*5
OCL-0330-EISH-E21UE	330	245*230*175	182*102	11*18	11	25*5

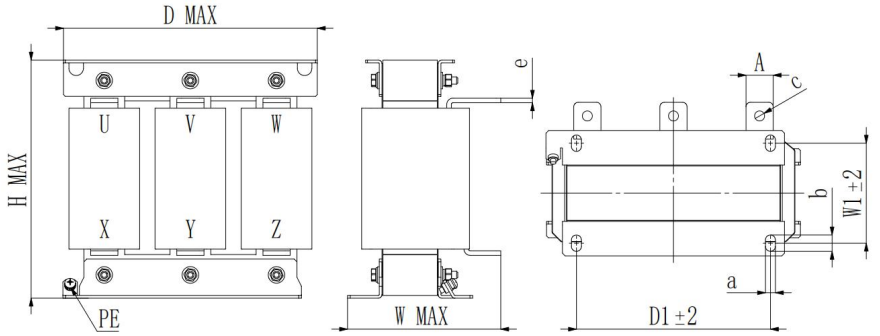


Figure 3-17 390A AC Output Reactor Dimensions

Table 3-15 390A AC Output Reactor Dimensions

Reactor Model	Reactor Rated Current (A)	D*H*W (mm)	D1*W1 (mm)	a*b (mm)	Mounting Hole Diameter c (mm)	A*e (mm)
OCL-0390-EISH-E18UE	390	285*270*180	214*110	11*18	11	30*5

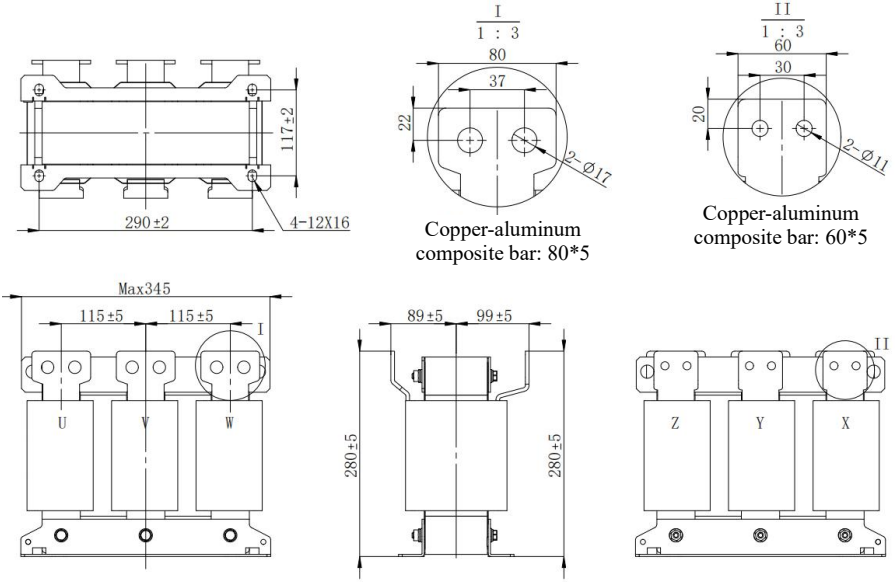


Figure 3-18 560A AC Output Reactor Dimensions

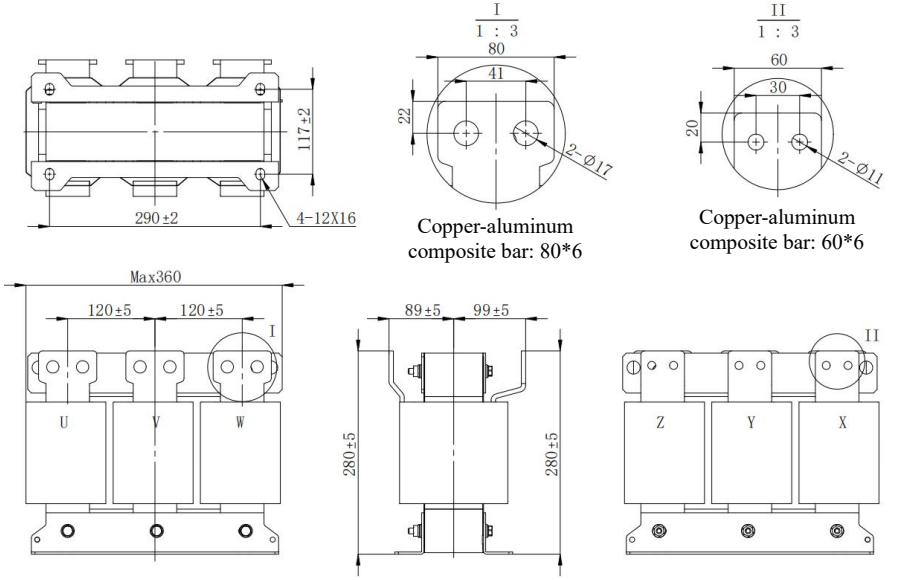


Figure 3-19 730A AC Output Reactor Dimensions

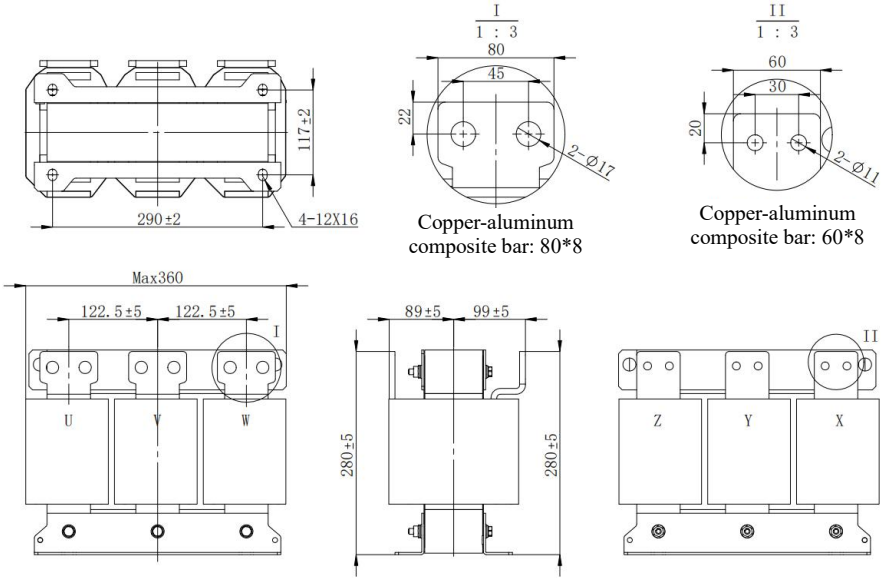


Figure 3-20 1000A AC Output Reactor Dimensions

Table 3-16 560-1000AAC Output Reactor Dimensions

Reactor Model	Reactor Rated Current (A)	D*H*W (mm)	D1*W1 (mm)	a*b (mm)	Mounting Hole Diameter c (mm)	A*e (mm)
OCL-0560-EISH-3352A	560	345*280*188	290*117	12*16	11/17	80*5
OCL-0780-EISH-3352A	780	360*280*188	290*117	12*16	11/17	80*5
OCL-1000-EISH-3352A	1000	360*280*188	290*117	12*16	11/17	80*5

3.2.6 Magnetic Ring and Magnetic Clamp

The magnetic ring is suitable for the input or output side of the inverter's power line. For leakage current issues and other signal interference problems present in some application scenarios, magnetic rings or magnetic clamps can also be selected for suppression. Installing a magnetic ring on the input side can suppress noise in the inverter's input power system. Installing a magnetic ring on the output side is mainly used to reduce interference from the inverter to the outside. When installing magnetic rings and magnetic clamps, please place them as close to the inverter as possible.

Magnetic rings are mainly divided into two types of materials: amorphous magnetic rings and ferrite magnetic clamps. Amorphous material has a very high permeability at frequencies up to 1 MHz, which is very effective for suppressing inverter interference, but it is slightly more expensive. Ferrite materials have better characteristics at frequencies above 1 MHz; for low-power inverters, they effectively suppress interference on various signal lines and are cost-effective.

In applications with significant interference, it is recommended to use amorphous magnetic rings to reduce external interference on the inverter's signal lines. When using them, wind the signal lines near the inverter end around the magnetic ring 4-6 times.

3.3 Expansion Card

3.3.1 Overview of Expansion Cards

Table 3-17 Overview of Expansion Cards

Name	Model	Function	Notes
Incremental Encoder Expansion Card	EMH-PG1	Suitable for incremental encoders, compatible with differential and non-differential inputs, DB15 interface.	Available for all models
Resolver Encoder Expansion Card	EMH-PG2	Suitable for resolvers, excitation frequency 10 kHz, DB9 interface.	Available for all models
CANopen Expansion Card	EMH-OP	CANopen Communication Expansion Card	Available for all models
PROFIBUS Expansion Card	EMH-DP	PROFIBUS Communication Expansion Card	Available for all models

Name	Model	Function	Notes
PROFINET Expansion Card	EMH-PN	PROFINET Communication Expansion Card	Available for all models
Ethernet/IP Expansion Card	EMH-EN	Ethernet/IP Communication Expansion Card	Available for all models
EtherCAT Expansion Card	EMH-EC	EtherCAT Communication Expansion Card	Available for all models

For detailed instructions on the use of communication expansion cards, refer to the 'CM680 Series General-Purpose Inverter Communication Manual'.

3.3.2 Expansion Card Installation

The CM680 inverter is equipped with five types of communication bus cards (Profibus DP, CANopen, Profinet, EtherCAT, Ethernet/IP) and two types of PG cards. The installation positions are shown in the figure below, and the cover plate must be removed during installation.

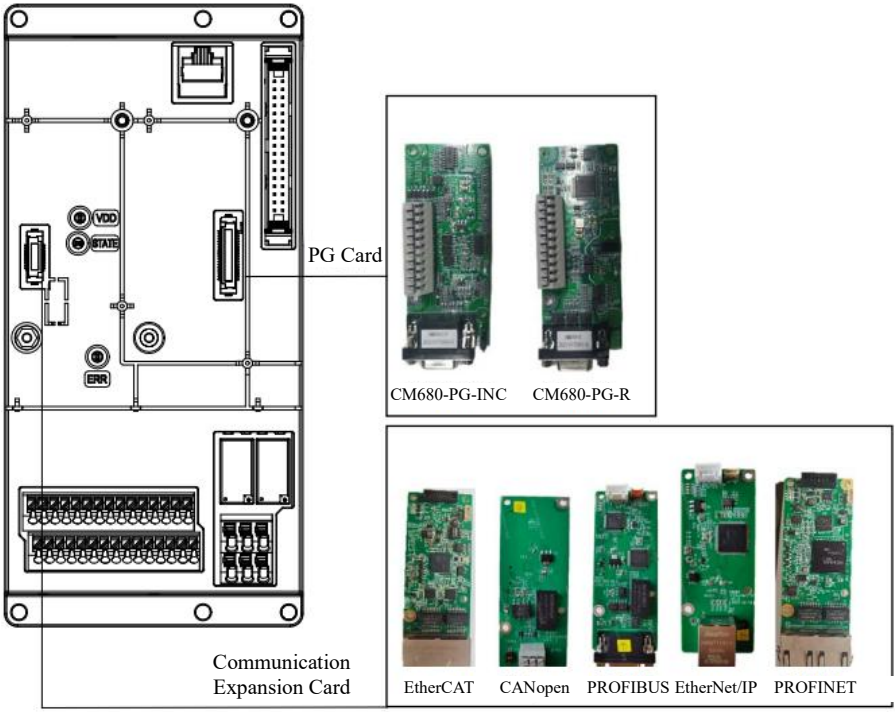


Figure 3-21 Expansion Card Installation Position

3.4 PG Card

3.4.1 Incremental Encoder Expansion Card

The incremental encoder expansion card model name for the CM680 is EMH-PG1, which has the following features:

1) Multi-channel signal detection for incremental encoders, A+/-, B+/-, Z+/- or U+/-, V+/-, W+/-;

2) Supports multiple types of signal inputs, including HTL differential, HTL single-ended, OC (Open collector), and OE (Open emitter);

3) Can provide power supply for encoders, 5Vdc±5%, 200mA, or 15Vdc±10%, 200mA;

4) The module can provide synchronous frequency division output, which can be selected as TTL differential or OC signal output;

5) For HTL differential encoder inputs, the module has a wire break detection function;

6) Can detect signals from one KYT84 or PTC temperature sensor to monitor motor temperature;

7) Can detect two digital DI signals, suitable for applications with travel switches;

8) To improve the stability of the module's detection, it is equipped with adaptive filtering and positive interlock functions;

9) Powered by the control board, no external power supply required.

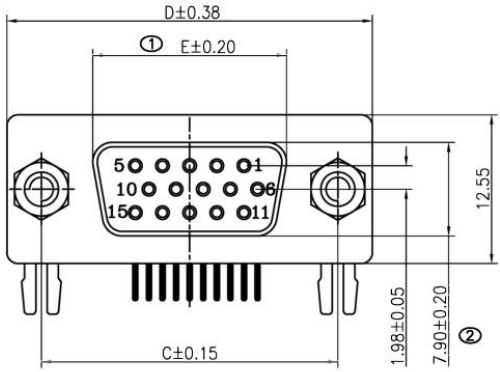
Table 3-18 Terminal Function Specifications for Incremental Encoder Expansion Card

Terminal Item		Description
Encoder PG1	VP	Power output voltage: +5V/+15V±10% Maximum output current: 200 mA
	EGND	Common ground for power and signal
	A+/A- B+/B- Z+/Z-	Encoder signal input (Line driver or Open collector) Open collector input voltage: +5V~+24V (Note 1) Maximum input frequency: 300kHz
	U+/U- V+/V- W+/W-	Encoder signal input (Line driver or Open collector) Open collector input voltage: +5V~+24V (Note 1) Maximum input frequency: 300kHz
Encoder PG2	A2+/A2- B2+/B2-	Pulse Signal Input (Line Driver or Open Collector) Open collector input voltage: +5V~+24V (Note 1) Can be Single Phase Input or Two Phase Input Maximum input frequency: 300kHz
PG- OUT	AO+/AO- BO+/BO- ZO+/ZO- GND	PG Card Signal Output, Can Be Divided: 1:1 Maximum Output Voltage for Line Driver: +5V Maximum Output Current: 15 mA Maximum Output Frequency: 300kHz GND is the Ground of the PG Card, Shared with the Host Computer or PLC to Ensure a Common Reference Point for the Output Signal

Note 1: For Open Collector Application, Each Group's Input Current is 5~15mA, and Each Group Must Adapt Pull-up Resistors According to Different External Voltages. When the Voltage is 5V, a Pull-up Resistor of 100~220Ω, 1/2W or Higher, Should Be Connected; When the voltage is 12V, connect a pull-up resistor, 510~1350Ω, 1/2W or more; When the voltage is 24V, connect a pull-up resistor, 1.8k~3.3kΩ, 1/2W or more.

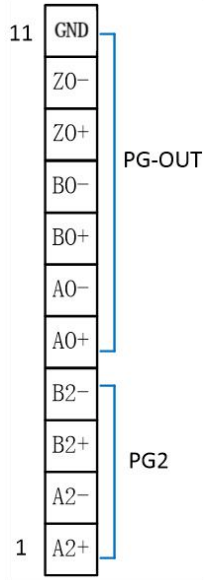
Note 2: If the input bandwidth requirement for the application does not exceed 30kHz, it is recommended to use 30kHz instead of 300kHz to avoid unnecessary interference.

Table 3-19 PG1 Encoder Terminal Pin Definition

Terminal Marking	Function	Notes
1	U-	Encoder Signal Input
2	U+	Encoder Signal Input
3	A-	Encoder Signal Input
4	A+	Encoder Signal Input
5	B+	Encoder Signal Input
6	B-	Encoder Signal Input
7	Z-	Encoder Signal Input
8	Z+	Encoder Signal Input
9	NC	Empty Pin
10	EGND	Common ground for power and signal
11	V-	Encoder Signal Input
12	V+	Encoder Signal Input
13	W-	Encoder Signal Input
14	W+	Encoder Signal Input
15	VP	Power output voltage +5V±5% or +15V±10%, jumper cap S1 selects +5V, 3 selects +15V
Terminal distribution		

Terminal Marking	Function	Notes
Note: 1. Suitable for line drive output type encoders; 2. Supports multiple signal types input, HTL differential, HTL single-ended, OC (Open collector) and OE (Open emitter);		

Table 3-20 PG2 Encoder and PG-OUT Terminal Pin Definition Table

Terminal Marking	Function	Notes	Terminal distribution
1	A2+	Pulse signal input, twisted pair	
2	A2-	Pulse signal input, twisted pair	
3	B2+	Pulse signal input, twisted pair	
4	B2-	Pulse signal input, twisted pair	
5	AO+	ABZ differential signal output	
6	AO-	ABZ differential signal output	
7	BO+	ABZ differential signal output	
8	BO-	ABZ differential signal output	
9	ZO+	ABZ differential signal output	
10	ZO-	ABZ differential signal output	
11	GND	GND is the Ground of the PG Card, Shared with the Host Computer or PLC to Ensure a Common Reference Point for the Output Signal	

3.4.2 Resolver Encoder Expansion Card

The model name of the CM680 resolver encoder expansion card is EMH-PG2, which has the following features:

1) Provides synchronous frequency division signal output, TTL differential signal output;

2) Has a resolver feedback signal disconnection detection function;

3) Can be directly installed on the control board without external power supply, making installation convenient;

Table 3-21 Terminal specifications for the resolver encoder expansion card

Terminal Item		Description
Encoder PG1	EXC+ EXC-	Resolver power output voltage: 7Vrms, 10kHz Maximum output current Ipeak: 120mA
	SIN+/SIN- COS+/COS-	Maximum input frequency of resolver feedback signal: 10kHz 3.5±0.175Vrms
Encoder PG2	A2+/A2- B2+/B2-	Pulse Signal Input (Line Driver or Open Collector) Open collector input voltage: +5V~+24V (requires different pull-up resistors) Can be Single Phase Input or Two Phase Input Maximum input frequency: 300kHz
PG-OUT	AO+/AO- BO+/BO- ZO+/ZO- EGND	PG card signal output, can be divided: 1:1 Line driver maximum output voltage: 5Vdc Maximum output current 15mA Maximum output frequency: 300kHz EGND is the ground for the PG card, which shares the ground with the host computer or PLC to ensure the output signal has a common reference point

Note 1: For Open Collector Application, Each Group's Input Current is 5~15mA, and Each Group Must Adapt Pull-up Resistors According to Different External Voltages. When the Voltage is 5V, a Pull-up Resistor of 100~220Ω, 1/2W or Higher, Should Be Connected; When the voltage is 12V, connect a pull-up resistor, 510~1350Ω, 1/2W or more; When the voltage is 24V, connect a pull-up resistor, 1.8k~3.3kΩ, 1/2W or more.

Table 3-22 Resolver Encoder Expansion Card Indicator Light Status Table

No.	Indicator Light	Status Description
1	Communication indicator light LD3	Red light flashing: Communication with the control board failed
		Red light steady: Normal communication with the control board
2	ENCODER indicator light LD1	Off, encoder input signal normal, speed feedback not exceeded upper limit value or no interference
		On/Blinking, the amplitude of the encoder input signal SIN/COS exceeds the upper limit or the signal feedback is abnormal
	ENCODER indicator light LD2	Off, the encoder input signal is normal, speed feedback has not exceeded the lower limit value or there is no interference
		On/Blinking, the amplitude of the encoder input signal SIN/COS is too low or the signal is disconnected

Note 1: If the amplitude of the sine wave inputs SIN+/SIN- and COS+/COS- is below or exceeds the specifications of the decoding IC, the red light will be displayed, possible reasons include:

1. The turns ratio of the Resolver encoder is not 1:0.5, causing the sine wave inputs SIN+/SIN- and COS+/COS- to not be 3.5±0.175Vrms.

2. The common-mode noise interference generated during motor operation causes the superimposed

voltage to exceed 3.5±0.175Vrms.

Note 2: If the phase angle of the sine wave input at SIN+/SIN- and COS+/COS- compared to the reference sine wave output at R1-R2 exceeds 5°, the red light will be displayed. Possible reasons are as follows:

1. The frequency output by the PG card is incorrect.

2. The specification of the Resolver encoder is not 10kHz.

3. The common-mode noise interference generated during motor operation causes the phase angle of the sine waves induced in the second and third windings to differ significantly from the phase angle of the reference sine wave in the main winding when the motor rotates.

Table 3-23 PG1 Encoder Terminal Pin Definition

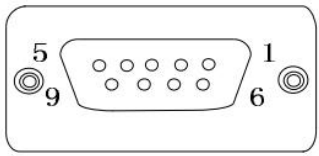
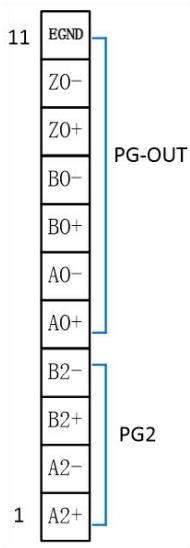
Terminal Marking	Function	Notes
1	EXC-	Resolver Excitation Voltage Negative
2	EXC+	Resolver Excitation Voltage Positive
3	SIN+	Resolver Feedback SIN Positive
4	SIN-	Resolver Feedback SIN Negative
5	COS+	Resolver Feedback COS Positive
6-8	--	--
9	COS-	Resolver Feedback COS Negative
Terminal distribution		
Note: 1. Suitable for line drive output type encoders; 2. PG Card Excitation Frequency: 10kHz, Excitation Voltage VRMS: 7V, Resolution: 12-bit.		

Table 3-24 PG2 Encoder and PG-OUT Terminal Pin Definition

Terminal Marking	Function	Notes	Terminal Distribution
1	A2+	Pulse signal input	
2	A2-	Pulse signal input	
3	B2+	Pulse signal input	
4	B2-	Pulse signal input	
5	AO+	ABZ differential signal output	
6	AO-	ABZ differential signal output	
7	BO+	ABZ differential signal output	
8	BO-	ABZ differential signal output	
9	ZO+	ABZ differential signal output	
10	ZO-	ABZ differential signal output	
11	EGND	EGND is the ground for the PG card, which shares the ground with the host computer or PLC to ensure the output signal has a common reference point	

4 Routine Maintenance and Care

4.1 Routine Maintenance

To ensure the proper functioning of the equipment and prevent product damage, please confirm the following items daily.

Status	Item	Inspection Content	Fault Countermeasures
Before Powering On	Operating Environment	Whether the operating environment is abnormal	●Whether the ambient temperature is within the allowable range; ●Whether there are any obstructions in the fan ducts.
	Installation Environment	Whether the installation cables are abnormal	●Confirm that the copper bars and cable terminals are not loose or corroded; ●Confirm that the inverter installation cables have no insulation damage; ●Confirm that the grounding of the inverter and motor is normal; ●Confirm that the installation mounting brackets are not vibrating.
After Power-On	Motor	Whether the motor has any abnormal noise or vibration.	●Check if the motor mounting screws are loose; ●Check if the motor is missing any phases.
	Fan	Abnormal operation of the inverter and motor cooling fans	●Check if the inverter fan is operating abnormally; ●Check if the motor fan is operating abnormally; ●Check if the cabinet fan is operating abnormally.
	Input Voltage	Check if the power voltage between the main circuit and control circuit is abnormal	●Check if the input voltage is within the allowed range; ●Check if there are large load startups or shutdowns from nearby equipment.
Replace After replacing the motor	Load current	Check if the inverter's operating current exceeds the rated current of the inverter and motor for a certain period	●Check if the motor parameters are set correctly; ●Check if the motor is overloaded; ●Check if mechanical vibration is excessive (normal condition < 1G).

4.2 List of Regular Inspection Items

Item	Inspection Content	Fault Countermeasures
Entire Unit	Check for any garbage, dirt, or dust accumulation on the surface.	●Confirm that the inverter cabinet is powered off; ●Use a vacuum cleaner to remove garbage or dust to avoid contact with components; ●If surface dirt cannot be removed, it can be wiped with alcohol and allowed to dry completely.
Cables	Check if the power lines and connections have changed color; Check if the connection terminals are damaged; Check if the insulation layer is aged or cracked.	●Replace cables with aged or cracked insulation layers ●Replace damaged connection terminals
Peripheral Devices	Check if the motor has any abnormal noise or vibration; check if the contactor fails to engage firmly or produces unusual sounds when actuated; check for any short circuits, water contamination, swelling, or ruptures in peripheral devices.	●Replace faulty components
Air duct	Whether the air duct and heat sink are blocked; Whether the fan is damaged;	●Clean the air duct ●Replace the fan
Control circuit	Whether there is poor contact in control components; Whether terminal screws are loose; whether control cables have insulation cracks.	●Clean foreign objects from the surface of control circuits and connection terminals ●Replace damaged or corroded control cables

4.3 Inverter wear parts life

The main wear parts of this product are cooling fans and electrolytic capacitors used for filtering, whose lifespan is closely related to the usage environment and maintenance conditions. The general lifespan times are listed in the table below.

Component Name	Service Life
Cooling Fan	≥5 years
Electrolytic Capacitor	≥5 years
The service life of components is based on the following conditions; users can determine the replacement period according to specific operating conditions. ●Ambient Temperature: 40°C ●Load: 80% ●Operating Time: 24 hours/day	

4.4 Storage of the Inverter

After purchasing the inverter, the following points must be noted for temporary storage and long-term storage:

● When storing, try to pack it back into the original packaging box provided by the company.

● Do not allow the unit to be placed for a long time in damp, high-temperature, or outdoor exposure conditions.

● Long-term storage can lead to degradation of electrolytic capacitors; it is necessary to power the unit at least once every 6 months, with each power-on lasting at least 6 hours. The input voltage must be gradually increased to the rated value using a voltage regulator or consult technical support from inverter professionals.

5 Compliance with Certifications, Directives, and Standards

5.1 Certifications, Directives, and Standards

For the relevant certification categories, directives, and standards, please refer to the table below.

Table 5-1 Relevant Certification Categories, Directives, and Standards

Certification Name	Directive Name	Compliance Standard
CE Certification	EMC Directive	EN 61800-3
	LVD Directive	EN 61800-5-1

Note:

The product's CE certification complies with the latest version of directives and standards.

5.2 CE Certification

5.2.1 Precautions for Compliance with European Standards

Figure 5-1 CE Mark

● The "CE Mark" is a mark indicating that a product complies with electromagnetic compatibility (EMC), safety (LVD), and other directives when traded commercially (produced, imported, sold) in the European region.

● Commercial trade (production, import, sales) in the European region must have the CE marking.

● This product complies with the Electromagnetic Compatibility (EMC) Directive, Low Voltage Directive (LVD), and bears the CE marking.

● Machinery and equipment installed with this product for sale in the European region must also meet CE requirements.

● When affixing the CE marking to the terminal installed with this product, the responsibility lies with the customer who finally assembles the product, and it is the customer's responsibility to confirm whether the final product's machinery and equipment comply with CE certification.

5.2.2 Conditions for Compliance with the EMC Directive

This product complies with the European EMC Directive, meeting the requirements of standard EN 61800-3, suitable for Class 1 and Class 2 environments.

Caution:

● If this product is used in a Class 1 environment, it may cause radio interference. In addition to

meeting CE compliance requirements, measures should be taken to prevent interference when necessary.

● To ensure that this product complies with EMC directives and standards, an EMC filter must be installed on the input side, and recommended shielded cables must be selected for the output end. It is also necessary to ensure reliable grounding of the filter and a 360° reliable connection of the shielding layer of the output cable.

● The system manufacturer responsible for installing this product must ensure that the system complies with European EMC directives, and according to the application environment of the system, ensure that the system meets the requirements of standard EN 61800-3.

Introduction to EMC Standards

Electromagnetic Compatibility (EMC) refers to the ability of electrical and electronic equipment to function properly in an electromagnetic interference environment and not to release excessive electromagnetic interference that could affect the stable operation of other devices or systems. Therefore, EMC includes the following requirements:

● The electromagnetic interference generated by the equipment during normal operation must not exceed certain limits.

● The ability to operate normally with a certain degree of immunity to electromagnetic interference present in the environment, i.e., electromagnetic sensitivity.

EN 61800-3 defines the following two types of environments:

● First Environment: Includes facilities in civilian settings, as well as those directly connected to the low-voltage power grid supplying electricity to civilian buildings without an intermediate transformer.

These facilities are part of the low-voltage power grid that supplies electricity to civilian buildings.

● Second environment: Facilities other than those directly connected to the low-voltage power grid supplying electricity to residential buildings.

According to the expected usage environment, the product is divided into the following four categories:

● Class C1 Equipment: The rated power supply for electrical drive systems is below 1000V, used in Environment 1.

● Class C2 Equipment: The rated voltage for electrical drive systems is below 1000V, and it cannot be plug-in or portable equipment,

which can only be installed and commissioned by professionals when used in Environment 1.

● Class C3 equipment: The rated voltage of the electrical drive system is below 1000 V, suitable for the second environment, not applicable to the first environment.

● Class C4 equipment: The rated voltage of the electrical drive system is 1000 V or higher, or the rated current is 400 A or greater, or it is used in complex systems in the second environment.

5.2.3 Compliance with LVD Low Voltage Directive

This product has been tested according to EN 61800-5-1 and confirmed to comply with the Low Voltage Directive. To ensure that machinery and installations equipped with this product comply with the Low Voltage Directive, the following requirements must be met.

Installation Location

Please install this product in locations with an overvoltage category III and pollution degree 2 or lower as specified in IEC 60664-1.

Installation Environment

For installation environment requirements, please refer to the 'Installation Environment' section in the CM680 Series General-Purpose Inverter Installation Manual.

Installation Protection Requirements

● This product is designed for installation within an enclosure and must be installed in the final system. The final system should provide appropriate fire-resistant casing, electrical protective casing, and mechanical protective casing, etc., and comply with local laws, regulations, and relevant IEC standards.

Shell, electrical protective casing, and mechanical protective casing, etc., and comply with local laws, regulations, and relevant IEC standards.

● When installing cabinet-mounted (IP20) products, please install them in a structure where foreign objects cannot enter from the top and front.

inside.

Main Circuit Terminal Wiring Requirements

For main circuit terminal wiring requirements, refer to the relevant sections on 'Main Circuit Wiring Requirements' in the CM680 Series General-Purpose Inverter Installation Manual.

Protection Device Requirements

To comply with EN 61800-5-1 standard requirements, it is essential to connect a fuse/circuit breaker on the input side to prevent accidents caused by internal circuit shorts.

circuit faults. Matching the product's maximum input value, recommended fuse selection is detailed in section "3.2.1 Fuses, Contactors and Circuit Breakers."