



M-Series *Motion Controller*

211

Hardware Manual



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❖ Preface

Thank you for purchasing and using the M211-series controller products independently developed and manufactured by Hechuan Technology Co., Ltd.

The M211-series controller is a pulse-type motion controller independently developed and manufactured by HCFA, featuring rich functionalities, superior performance, and user-friendly operation. It integrates the functions of a Programmable Logic Controller (PLC) and motion control. The controller is equipped with built-in input/output channels and multiple communication interfaces. Its built-in input/output channels support high-speed I/O, with a maximum of 10 high-speed output channels and 4 high-speed input channels. Additionally, it supports expansion of 16 IO modules on the right side.

This manual primarily describes the products listed in the table:

Name	Model	I/O quantity	Brief description
M-series CPU unit	HCM211-20MR-A	12-channel input	The M211-series CPU unit is equipped with built-in input/ output channels and multiple communication interfaces. It supports high-speed input/output, with a maximum of 10 high-speed output channels and 4 high-speed input channels. All models are standard-equipped with Ethernet, USB, RS485 and CAN communication interfaces; some models can expand RS485, RS232 and other communication interfaces via expansion cards. Additionally, it supports expansion of 16 IO modules on the right side.
	HCM211-20MT4-A	8-channel output	
	HCM211-32MR-A	18-channel input	
	HCM211-32MT6-A	14-channel output	
	HCM211-42MR-A	24-channel input	
	HCM211-42MT8-A	18-channel output	
	HCM211-60MR-A	36-channel input	
	HCM211-60MT10-A	24-channel output	

Target reader

Users who purchase or use HCFA's M211-series motion controllers can refer to this manual for wiring, installation, diagnoses, post-maintenance procedures, and other related tasks. Users are required to have a basic understanding of electrical and automation knowledge.

This manual contains essential information for using HCFA's M211-series motion controllers. Please read this manual carefully before use and operate correctly while paying full attention to safety.

Related manual

Partial specifications or restrictions for products in this manual may be described in other manuals, as detailed in the table below:

Name	Main content
M200 installation instruction	Instruction sheet (installation & operation)
M-Series Controller Basic Logic Instruction Manual	Instruction manual
M-Series Controller Motion Control Instruction Manual	Instruction manual
M-Series Controller Communication Instruction Manual	Instruction manual

※ Safety precautions

Safety icons

To ensure safe use of this product, this manual uses the following icons and icon descriptions to indicate precautions. The precautions listed here are all of critical importance to safety. These must be strictly observed. The icons and their meanings are as follows.

DANGER 	Improper operation may cause minor to moderate injuries, or major injuries/death in severe cases, and potential property damage.
WARNING 	Improper operation may cause minor to moderate injuries or equipment damage.
CAUTION 	Improper operation may cause minor injuries or equipment damage.
NOTE	Improper operation may damage the environment/equipment or cause data loss.

Safety rules

Precautions for startup and maintenance

DANGER 

- Do not touch terminals in a powered state. There is a risk of electric shock and potential malfunctions.
- Ensure the power supply is completely disconnected from the external source before cleaning or wiring the module or terminals.
- Operating with power applied poses a risk of electric shock.
- For operations such as program changes, forced outputs, RUN, and STOP on running equipment, ensure familiarity with this manual and confirm safety beforehand. Incorrect operations may lead to mechanical damage or accidents.

Precautions during startup and maintenance

CAUTION 

- Do not disassemble or modify the module, as this may cause malfunctions, errors, or fires.
- For equipment repairs, consult Hechuan Technology Co., Ltd.
- Always disconnect the power supply before installing or removing equipment cables; otherwise, module malfunctions or errors may occur.
- Ensure the power supply is disconnected before installing or removing the following equipment; otherwise, module malfunctions or errors may occur:
 - Peripheral devices, display modules, functional expansions
 - Expansion modules, special adapters
 - Batteries, power supply terminals, memory cards

Precautions for disposal

CAUTION 

- When disposing of the product, treat it as industrial waste. For battery disposal, follow the specific regulations designated by each region for separate processing.

CAUTION

- As the equipment is precision equipment, avoid subjecting it to impacts exceeding the general specification values stated in Section 3.1 during transportation. Otherwise, it may cause equipment malfunctions. After transportation, perform an operational check on the equipment.

Safety key points

■ Transportation and disassembly

- When transporting the unit, use a dedicated packaging box. Additionally, avoid applying excessive vibration or impact to the unit during transportation.
- Do not disassemble, repair, or modify this product; otherwise, malfunctions or fires may occur.
- Do not drop the product or subject it to abnormal vibration or impact; otherwise, product malfunctions or burnout may occur.

■ During installation

- Always cut off the power supply when assembling the unit. Failure to disconnect the power supply may cause the unit to malfunction or become damaged.
- When connecting the power supply unit, controller, or I/O unit, ensure that the connectors between the units are properly engaged.

■ During wiring

- Follow the specified wiring procedures outlined in this manual.
- Before powering on, carefully check the settings of all wiring and switches.
- Perform terminal wiring using the methods described in this manual.
- Use appropriate wiring components and tools during wiring; otherwise, cable disconnection, short circuits, or broken wires may occur.
- Select suitable cables for wiring. For details, refer to Section 5.2. Do not forcefully twist or pull the cables.

■ During power supply design

- When selecting an external power supply, consider the power capacity and surge current during turn-on specified in this manual, and choose a power supply with sufficient margin. Otherwise, the external power supply may fail to start or the power voltage may be unstable, leading to malfunctions.
- Use the capacity of the IO power supply within the unit's specifications.
- Do not apply a voltage exceeding the rated value to the input unit.
- Do not apply a voltage or load exceeding the rated value to the output unit or slave devices.
- A surge current may be generated when the power is turned on. When selecting fuses or circuit breakers for the external circuit, consider the melting characteristics and the above points, and ensure sufficient margin in the design.
- For surge current specifications, refer to this manual.

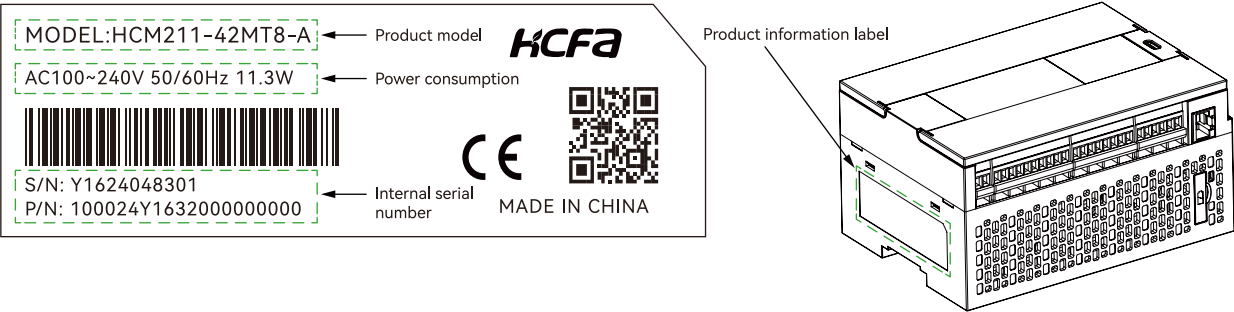
❖ Version information confirmation

Each unit and slave device in the M211 series is identified by a unique number that represents its hardware revision or version. When there are changes to the hardware or software specifications, the respective hardware revision or version is updated. As a result, even units or slave devices of the same model can have different functions or performance if their hardware revisions or versions differ.

Hardware version

The version can be confirmed via the identification information on the product's side label.

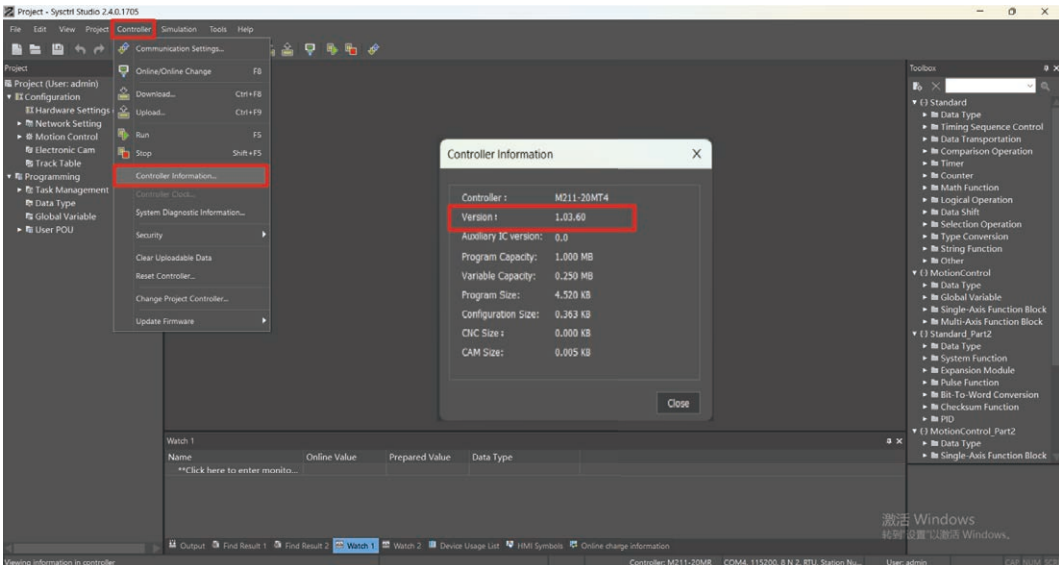
The identification information label for the M211-series CPU unit HCM2 □□ - □□□□ - □ is shown in the figure below.



Item	Description
Product information label	Describes basic product information such as the current product model and power consumption.
Product model	Displays the product model. MODEL: Product model
Power consumption	Displays the rated voltage and power consumption required for normal operation of the product.
Internal serial number	Displays the internal serial number of the product. P/N, S/N: Internal serial number.

Software version

Select **【Controller】** - **【Controller Information】** from the top menu bar of Sysctrl Studio. The current controller's software version can be viewed in the pop-up **【Controller Information】** window.



Manual version record

Version number	Update description
V1.0	Initial version

※ Term description

Term	Description
CPU unit	The control center of the automation controller. It executes tasks, refreshes I/O of each unit and slave device, etc. In the M211 series, it is denoted as HCM2 □□ - □□□□ - □ .
Axis	A functional unit in the motion control function module. It assigns drive mechanisms of external servo drives, detection mechanisms of encoder inputs, etc.
Upload	Transfer data from the controller to Sysctrl Studio.
Download	Transfer data from Sysctrl Studio to the controller.
Motion control command	Motion control definition commands required for executing motion control functions. Motion control commands include those based on PLCopen's motion control function blocks and those independent of the motion control function module.

※ Copyright notice

- Unauthorized printing, reproduction, or republication of any part or all of this manual is strictly prohibited.
- Product specifications and other information in this manual may change due to product improvements, and no prior notice will be given.
- While efforts have been made to ensure the accuracy of this manual, please contact 400@hcfa.cn if there are any unclear or incorrect points. Please include the manual number indicated on the cover when doing so.

Chapter 1 M-Series Controllers Overview

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1.1 Product feature and main function description of M211-series controller

1.1.1 Hardware feature

Model	IO quantity	Pulse axis quantity	Communication interface			
			Ethernet	Serial port	CAN	USB
HCM211-20MR-A	12-channel input	/	1 Channel	2*RS485	1 Channel	1 Channel
HCM211-20MT4-A	8-channel output	4 Axes				
HCM211-32MR-A	18-channel input	/				
HCM211-32MT6-A	14-channel output	6 Axes				
HCM211-42MR-A	24-channel input	/				
HCM211-42MT8-A	18-channel output	8 Axes				
HCM211-60MR-A	36-channel input	/				
HCM211-60MT10-A	24-channel output	10 Axes				

1.2 M-series controller definition

The M211-series controller is a pulse-type motion controller independently developed and manufactured by HCFA, featuring rich functionalities, superior performance, and user-friendly operation. It integrates the functions of a Programmable Logic Controller (PLC) and motion control. The controller is equipped with built-in input/output channels and multiple communication interfaces. Its built-in input/output channels support high-speed I/O, with a maximum of 10 high-speed output channels and 4 high-speed input channels. All models are standard-equipped with Ethernet, USB, RS485 and CAN communication interfaces; some models can expand RS485, RS232 and other communication interfaces via expansion cards. Additionally, it supports expansion of 16 IO modules on the right side.

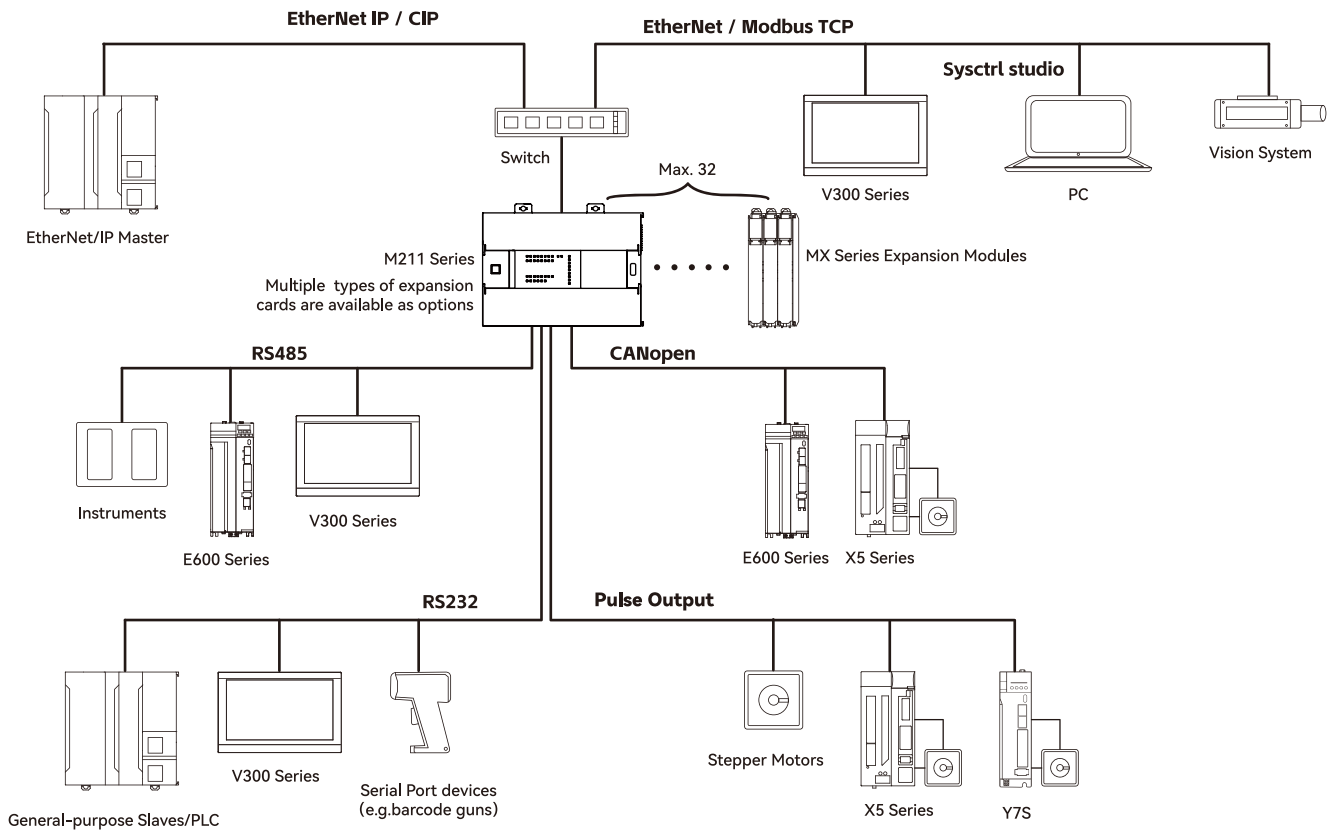
The M211-series controller is equipped with multiple communication interfaces, including Ethernet, USB, RS485, RS232 and CAN. Among these, the RS485 and RS232 interfaces support Modbus protocol and custom serial protocol; the Ethernet interface supports multiple protocols such as ModbusTCP, EIP, and Socket; the CAN communication interface supports the CANopen DS301v4.02 protocol and can function as both a master and a slave.

The M211-series controller offers a comprehensive and user-friendly range of motion control functions. It adheres to the standard motion commands outlined by the international organization PLCopen, supporting single-axis commands such as homing, positioning, and speed control. Additionally, it features electronic gears and multi-axis commands, including electronic cams, rotary cutting, and axis grouping. This controller can be widely utilized in various automatic control applications, such as packaging, woodworking, wire winding, and wire cutting.

1.3 Controller overview

1.3.1 System configuration

The system topology of the M211-series controller is shown below.



Note: Some models are supported. For details, refer to Chapter 3.

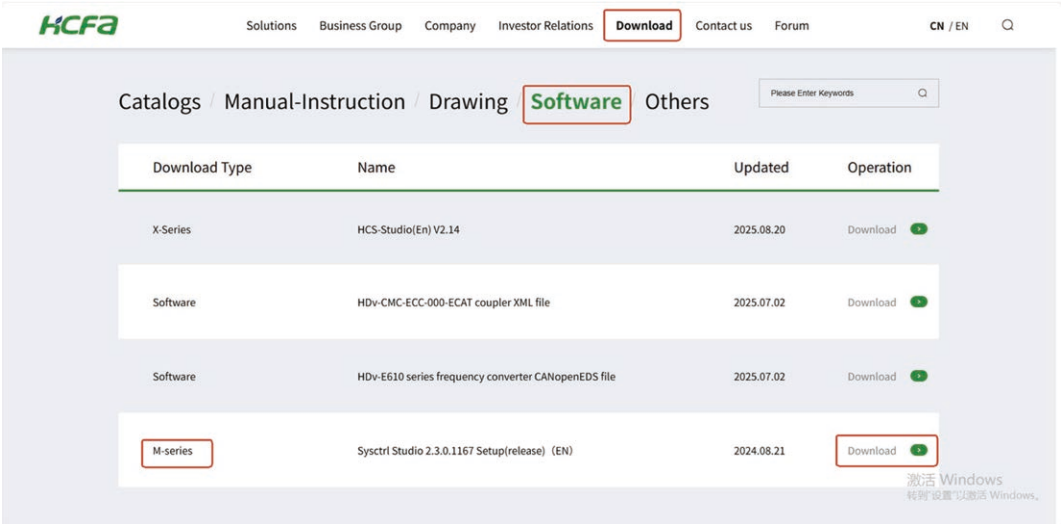
1.3.2 Software description

◆ Supported connection method

Model		M211-series controller
USB	Quantity	1x Type-C (USB 2.0)
	Supported function	Program upload and download ,software monitoring and debugging, firmware upgrade etc.
EtherNet	Quantity	1x EtherNet
	Supported function	Software monitoring and debugging, program upload and download

◆ Software download link

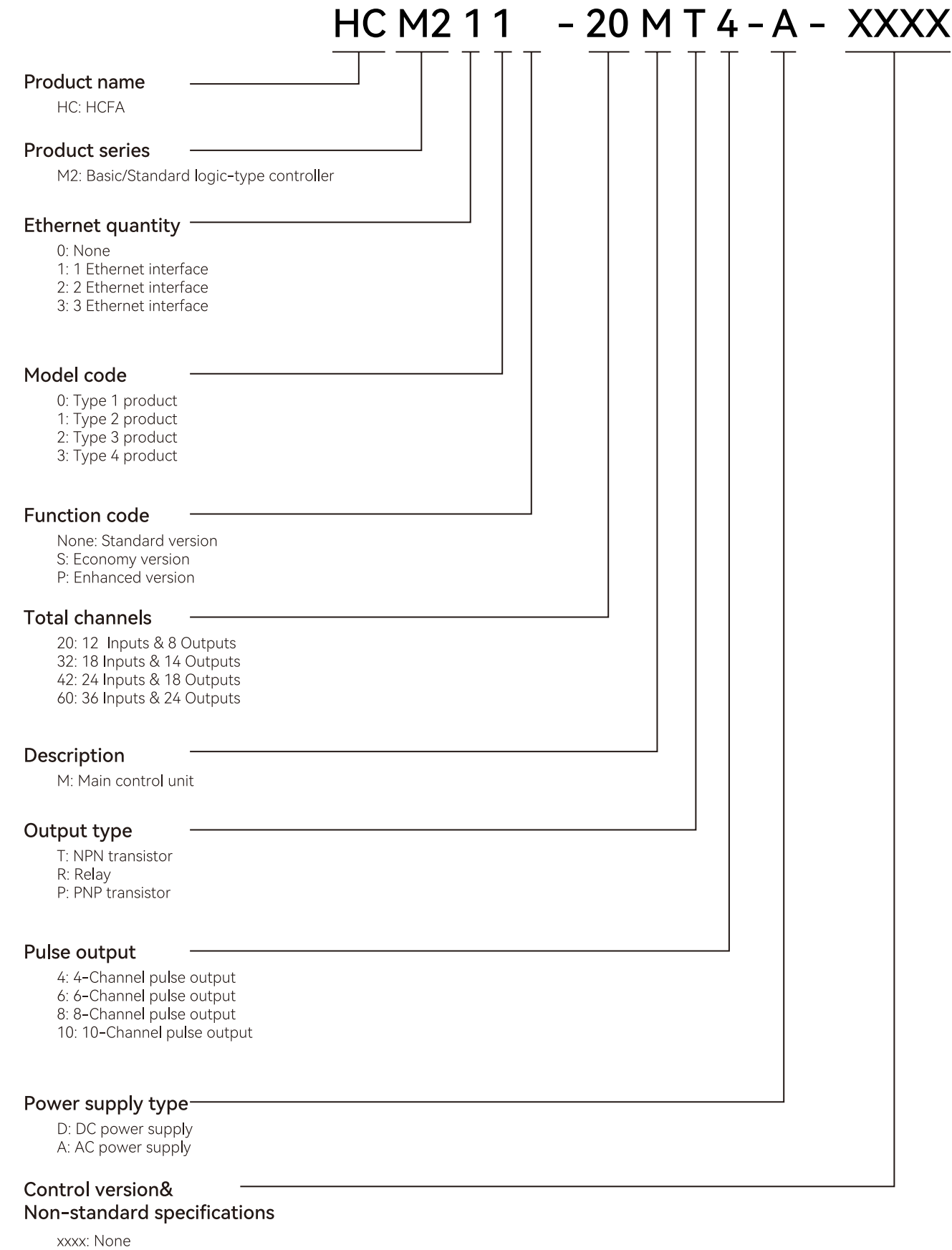
To download the software, please visit the official English website of Zhejiang Hechuan Technology Co., Ltd.: <https://www.hcfaglobal.com/>. Click [Download] at the top of the page, then on the redirected page, click **【Software】** → **【Sysctrl Studio 2.3.0.1167 Setup (Release) (EN)】** → **【Download】** .



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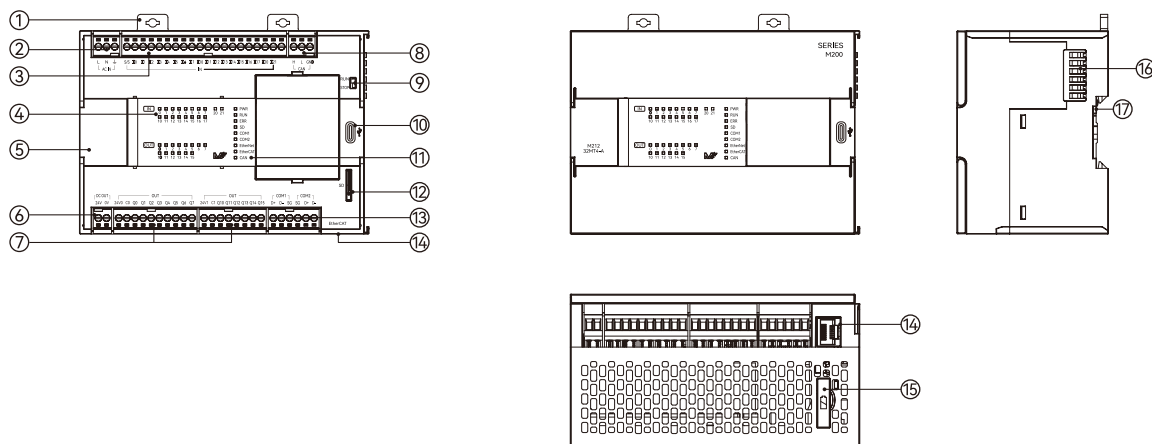
2.1 Product model



2.2 Basic composition

2.2.1 Names and functions of CPU components

◆ M211 CPU unit



No.	Name	Function
(1)	DIN rail mounting latch	Latch structure for mounting the controller on a DIN rail
(2)	AC power supply input terminal	Power supply terminal
(3)	Input terminal	Digital input channels and common terminal
(4)	Channel status indicator	Indicates the current channel status. For details on the indicators, refer to 2.2.2 Indicator description.
(5)	Product name	Product model
(6)	DC24V power supply terminal	DC24V power supply interface
(7)	Output terminal	Digital output channels and common terminal
(8)	CAN communication interface	Supports CAN master or slave mode
(9)	RUN/STOP switch	Starts or stops the operation of the controller's programs. Toggle to RUN to start, and to STOP to stop.
(10)	Type-C interface	USB 2.0 interface, supporting user program upload/download, firmware upgrades, etc. after connecting to a host computer
(11)	System status indicator	Displays the operating status of the controller system
(12)	SD card slot	SD card slot* (SD card needs to be purchased by the customer)
(13)	RS485 communication interface	Supports Modbus master or slave mode, and custom communication protocols
(14)	EtherNet communication interface	EtherNet interface supporting Modbus TCP, EtherNet/IP, and custom socket protocol. Default IPv4: 192.168.1.8 Subnet mask: 255.255.255.0
(15)	RTC battery compartment	Place the RTC battery
(16)	Expansion module communication interface	Communication and power supply interface between the host and IO modules (hot-swapping not supported)
(17)	Grounding spring tab	Functional earthing

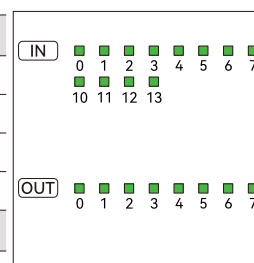
2.2.2 Indicator description

◆ M211 CPU unit

Silkscreen	Indicator	Color	State	Function
PWR	Power status	Green	Not lit	Power not connected
			Lit	Power normally connected
RUN	Operation status	Green	Not lit	Controller stopped
			Lit	Normal operation
ERR	System fault status	Red	Not lit	No fault occurs
			Lit	Fault occurs
SD	SD card status	Yellow	Not lit	SD card not inserted
			Blinking	SD card being read/written
			Lit	SD card inserted but not reading/writing
COM1	RS485 communication status	Yellow	Not lit	No data sent
COM2			Blinking	Sending data to other devices
NC	-	-		-
EtherNet	Communication status	Green	Not lit	No physical connection
			Blinking	Physical connection established with data transmission
			Lit	Physical connection established but no data transmission
CAN	Communication status	Green	Single blinking	CAN bus in stopped state
			Blinking	CAN bus in pre-operation state
			Lit	Normal communication with other CAN stations (running state)
		Red	Not lit	CAN bus no error
			Single blinking	CAN bus errors exceeding warning threshold
			Double blinking	Slave station offline
			Lit	CAN bus excessive errors (communication impossible)
20MR/20MT4				
IN N (0~7,10~13)	Input status	Green	Not lit	Input signal not detected on channel N
			Lit	Input signal detected on channel N
OUT N (0~7)	Output status	Green	Not lit	No signal output on channel N
			Lit	Signal output on channel N
32MR/32MT6				
IN N (0~7,10~17,20~21)	Input status	Green	Not lit	Input signal not detected on channel N
			Lit	Input signal detected on channel N
OUT N (0~7, 10~15)	Output status	Green	Not lit	No signal output on channel N
			Lit	Signal output on channel N
42MR/42MT8				
IN N (0~7, 10~17, 20~27)	Input status	Green	Not lit	Input signal not detected on channel N
			Lit	Input signal detected on channel N
OUT N (0~7, 10~17, 20~21)	Output status	Green	Not lit	No signal output on channel N
			Lit	Signal output on channel N

M211

■	PWR
■	RUN
■	ERR
■	SD
■	COM1
■	COM2
□	NC
■	EtherNet
■	CAN



60MR/60MT10				
IN N (0~7,10~17,20~27,30~37,40~43)	Input status	Green	Not lit	Input signal not detected on channel N
			Lit	Input signal detected on channel N
OUT N (0~7, 10~17, 20~27)	Output status	Green	Not lit	No signal output on channel N
			Lit	Signal output on channel N

2.2.3 Expansion card

Item		Specification
		M211-series controller
Supported quantity		1
Model	RS485 communication	HCMXB-2RS485-200-BD
	RS232 communication	HCMXB-2RS232-200-BD

* For details on the RS485 communication expansion card, refer to 6.4 RS485 communication.

* For details on the RS232 communication expansion card, refer to 6.5 RS232 communication.

2.2.4 USB/Type-C interface

Item		Specification
		M211-series controller
USB	Number of interfaces	1x Type-C (USB 2.0)
	Supported function	Program upload and download ,software monitoring and debugging, firmware upgrade

2.2.5 SD card

The M211-series controller supports SD card expansion. The following specifications are applicable for SD cards.

Item		Specification
Supported model		M211-series controller
SD card type		SD SDHC
SD card capacity		0~2GB 4GB~32GB
SD card file format		FAT/FAT32 FAT32
Function		Reserved

2.2.6 Expansion module

◆ Supported expansion module

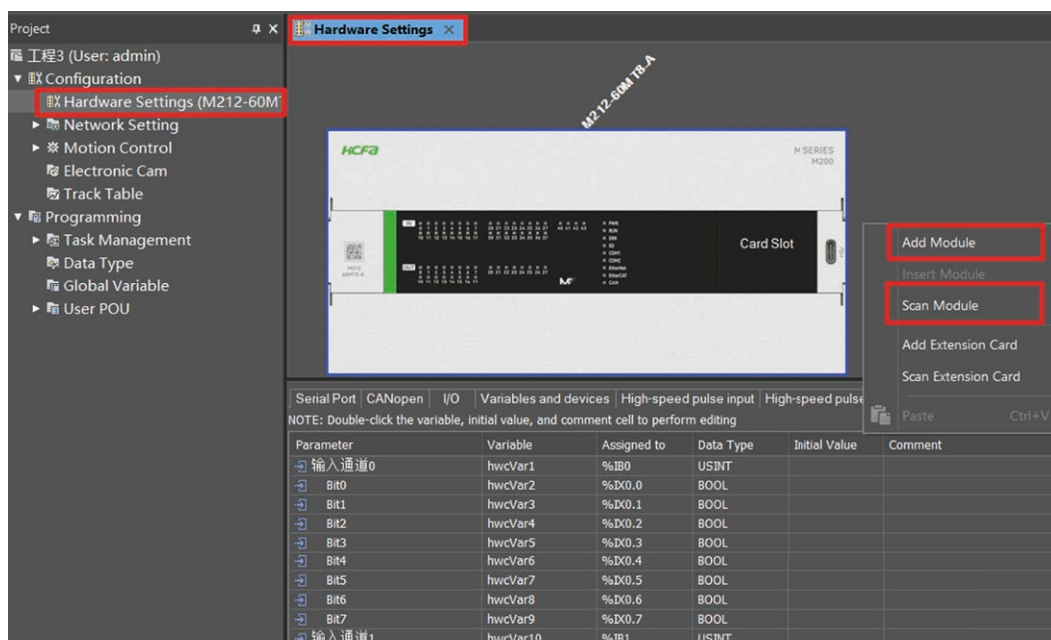
Module name	Number of input channels	Number of output channels
HCMX-ID08-D	8-channel DI	-
HCMX-ID16-D	16-channel DI	-
HCQX-ID32-D	32-channel DI	-
HCMX-OD08-D	-	8-channel DO
HCMX-OD08-D-PNP	-	8-channel DO
HCMX-OD16-D	-	16-channel DO

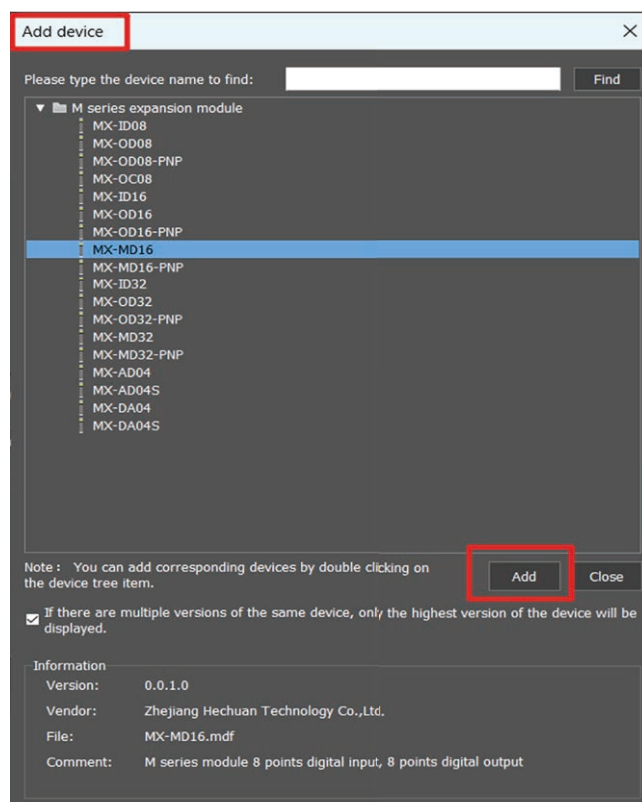
HCMX-OD16-D-PNP	-	16-channel DO
HCMX-OD32-D	-	32-channel DO
HCMX-OD32-D-PNP	-	32-channel DO
HCMX-MD16-D	8-channel DI	8-channel DO
HCMX-MD16-D-PNP	8-channel DI	8-channel DO
HCMX-MD32-D	16-channel DI	16-channel DO
HCMX-MD32-D-PNP	16-channel DI	16-channel DO
HCMX-OC08-D	-	8-channel relay output
HCMX-AD04-D	4-channel 16-bit AI	-
HCMX-AD04S-D	4-channel 14-bit AI	-
HCMX-DA04-D	-	4-channel 16-bit AO
HCMX-DA04S-D	-	4-channel 14-bit AO

◆ Mapping of expansion modules to controller variables and addresses

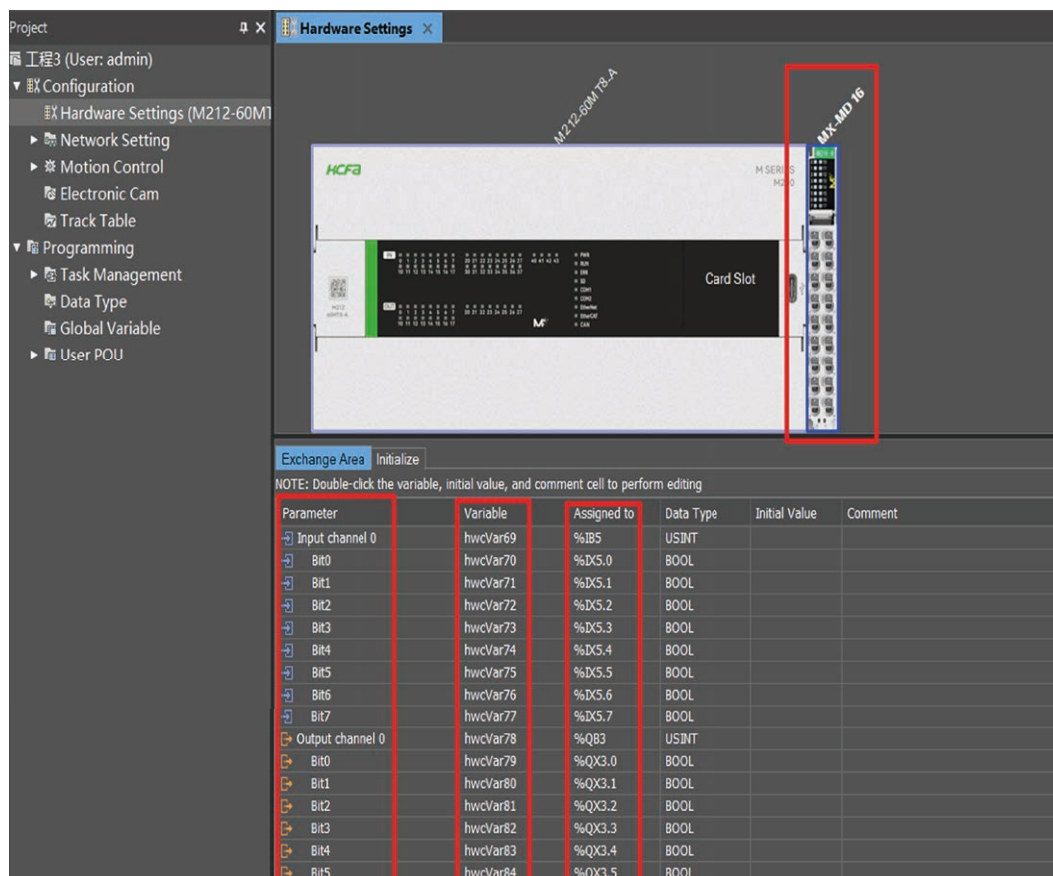
Expansion modules on the right side of the CPU can be added in the sysctrl Studio software interface by right-clicking in the left tree menu **【Configuration】** -> **【Hardware Settings】**, then selecting either **【Add Module】** or **【Scan Module】** in the pop-up dialog. After clicking **【Add Module】**, options for M-series expansion modules will appear. Select the device to add below these options, then click **【Add】** to complete the configuration.

Note: Manually added modules in the software must match the externally connected modules; otherwise, the controller will report an error.





After adding or scanning is completed, the address and variable mapping information of the current expanded IO will be displayed in the **【Exchange Area】** below the **【Hardware Settings】** page.



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3.1 General specifications

Item		Specification				
Weight		HCM211-20MR-A: 436.8g (net weight); HCM211-20MT4-A: 404.0g (net weight); HCM211-32MR-A: 513.6g (net weight); HCM211-32MT6-A: 470.6g (net weight); HCM211-42MR-A: 590.8g(net weight); HCM211-42MT8-A: 525.1g (net weight); HCM211-60MR-A: 711.2g(net weight); HCM211-60MT10-A: 646.6g (net weight);				
		HCM211-20MR-A / HCM211-20MT4-A: 122.30mm(W) *108.00mm(H)*74.50mm(D) HCM211-32MR-A / HCM211-32MT6-A: 142.30mm(W) *108.00mm(H)*74.50mm(D) HCM211-42MR-A / HCM211-42MT8-A: 172.30mm(W) *108.00mm(H)*74.50mm(D) HCM211-60MR-A / HCM211-60MT10-A: 214.30mm(W) *108.00mm(H)*74.50mm(D)				
Operating environment	Operating temperature	0~55℃				
	Storage temperature	-25~70℃				
	Ambient humidity	10% ~95%, (no-condensing)				
	Ambient environment	Low levels of dust and corrosive gases				
	Altitude/Pressure	Below 2000 m (80 kPa)				
	Noise immunity	≥ 1500Vp-p, pulse width 1μs, 50ms (based on noise simulator); compliant with IEC standards (IEC 61000-4-2/3/4/6)				
	Vibration resistance	Installation condition	Frequency (Hz)	Acceleration (m/s²)	Single amplitude (mm)	10 times in each of X, Y, Z directions (total 80 times each)
		When installed on a DIN rail:	10~57	—	0.035	
			57~150	4.9	—	
	Shock (Impact) resistance	Acceleration: 150 m/s²; Duration: 11 ms; 2 times in each of X, Y, Z directions.				
	IP rating	IP20				
	Pollution degree	Pollution degree II,Generally only non-conductive contamination, but temporary conductivity due to occasional condensation should be expected.				
Isolation method		Digital isolation				
Heat dissipation method		Passive heat dissipation, natural air cooling				
Installation position		Inside the control cabinet				
Main body material		Standard PPE material				
Certification		CE				

3.2 Electrical specifications

Item	Specification							
	HCM211-20MT4-A	HCM211-20MR-A	HCM211-32MT6-A	HCM211-32MR-A	HCM211-42MT8-A	HCM211-42MR-A	HCM211-60MT10-A	HCM211-60MR-A
Power supply voltage	AC100 ~ 240V (-15% ~ 10%) , 50 / 60Hz ± 5%							
Power consumption	7W	8W	8W	10W	12W	13W	13W	16W
Power fuse rating	3.15A							
24V output power protection	Short circuit protection							
DC24V output voltage	DC24V(-10%~+10%)							
DC24V output current	Max. 500mA							
Communication port isolation specifications	Isolation voltage: 3750 VAC for COM1, COM2, and CAN ports; 1500 VAC for Ethernet port							
Insulation resistance	5 MΩ or more (between all inputs/outputs and ground: 500 V AC)							

3.3 Performance specifications

Item		Specification							
		HCM211-20MT4-A	HCM211-20MR-A	HCM211-32MT6-A	HCM211-32MR-A	HCM211-42MT8-A	HCM211-42MR-A	HCM211-60MT10-A	HCM211-60MR-A
Progr- amming	Program capacity	512KBytes							
	Variable capacity	256KBytes (including 32KBytes of persistent data memory)							
	I area (%)	128Bytes							
	Q area (%Q)	128Bytes							
	M area (%M)	128KBytes							
Programming language		LD, ST, C/C++							
Axis capacity	Number of pulse axes	4 Axes 200k	/	6 Axes 200k	/	8 Axes 200k	/	10 Axes 200k	/
	Number of encoder axes	2				4			
	Number of virtual axes	≤ 16							
	Number of virtual encoder axes	≤ 16							
	Total number of axes (pulse axes + encoder axes + virtual axes)	≤ 16							
Right expansion	Maximum number of expansion modules	16							
RTC battery		Built-in							
Optional card	Maximum number of optional cards	1							
Host IO channel	Input	Number of channels	12-channel inputs		18-channel inputs		24-channel inputs		36-channel inputs
		Function	Supports 8-channel external interrupts and 2-channel high-speed pulse inputs (200kHz) (AB phase, pulse+ direction, single pulse)				Supports 8-channel external interrupts and 4-channel high-speed pulse inputs (200kHz) (AB phase, pulse+ direction, single pulse)		
	Output	Number of channels	8-channel outputs		14-channel outputs		18-channel outputs		24-channel outputs
		Function	Supports 4-channel pulse outputs (200KHz) (pulse+direction)		Supports 6-channel pulse outputs (200KHz) (pulse+direction)		Supports 8-channel pulse outputs (200KHz) (pulse+direction)		Supports 10-channel pulse outputs (200KHz) (pulse+direction)

Electronic cam	Number of cam profiles		16
	Number of key points per curve		32
Axis groups	Maximum number of axis groups		1 Axis groups (each supporting up to 8-axis interpolation)
SD card			1 Slot
USB	Number of interfaces		1 USB2.0 Type-C
	Supported function		Program upload and download ,software monitoring and debugging, firmware upgrade
Serial port	RS485	Number of interfaces	Max. 4 channels: 2 built-in channels, expandable by 2 more with optional HCMXB-2RS485-200-BD card
		Supported protocol	Modbus master/slave (ASCII/RTU); custom communication protocol
		Max. number of slaves	32
		Baud rate (bps)	9600, 19200, 38400, 57600, 115200
	RS232	Number of interfaces	Expandable by 2 more with optional HCMXB-2R232-200-BD card
		Supported protocol	Modbus master/slave (ASCII/RTU); custom communication protocol
		Max. number of slaves	1
		Baud rate (bps)	9600, 19200, 38400, 57600, 115200
CAN	Number of interfaces		1 channel
	Supported protocol		CANopen protocol (DS301), can act as master or slave; supports 32 slaves when acting as master
EtherNet	Number of interfaces		1 channel
	Function		Communication, program upload/download, etc.
	Data transfer speed		100/10Mbps
	Total number of TCP connections		16(ModbusTCP+Socket + EtherNet/IP)
	Modbus TCP		Maximum number of client (master) connections: 16; Maximum number of server (slave) connections: 16
	Socket		Max. quantity: 8 (UDP+TCP)
	Cable		Standard industrial Ethernet communication cable
	Number of simultaneous communications for Modbus TCP and Socket		16
	CIP service type: Cyclic communication (IO Connection)		Max. number of connections: 8; Max. data volume per connection: 200 Bytes; Cycle interval time: 5~1000 ms
	CIP service type: Explicit message		Number of Class 3 connections: 8; Number of clients that can be accessed simultaneously via UCMM (Unconnected message manager): 16
	Number of simultaneous communications for Modbus TCP, EtherNet/IP, and Socket		16(ModbusTCP+Socket + EtherNet/IP)

3.4 IO specifications

3.4.1 Terminal configuration of M211-series controller

M211-20MR-A																
L	N	$\perp$	S/S	I0	I1	I2	I3	I4	I5	I6	I7	I10	I11	I12	I13	GND

24V	0V	C0	Q0	Q1	Q2	Q3	C1	Q4	Q5	Q6	Q7	D+	D-	SG	SG	D+	D-
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M211-20MT4-A																
L	N	$\perp$	S/S	I0	I1	I2	I3	I4	I5	I6	I7	I10	I11	I12	I13	GND

24V	0V	24V0	C0	Q0	Q1	Q2	Q3	Q4	Q5	Q6	Q7	D+	D-	SG	SG	D+	D-
-----	----	------	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----

M211-32MR-A																								
L	N		S/S	I0	I1	I2	I3	I4	I5	I6	I7	I10	I11	I12	I13	I14	I15	I16	I17	I20	I21	H	L	GND

24V	0V	C0	Q0	Q1	Q2	Q3	C1	Q4	Q5	Q6	Q7	C2	Q10	Q11	Q12	Q13	C3	Q14	Q15	D+	D-	SG	SG	D+	D-
-----	----	----	----	----	----	----	----	----	----	----	----	----	-----	-----	-----	-----	----	-----	-----	----	----	----	----	----	----

M211-32MT6-A																								
L	N	$\perp$	S/S	I0	I1	I2	I3	I4	I5	I6	I7	I10	I11	I12	I13	I14	I15	I16	I17	I20	I21	H	L	GND

24V	0V	24V0	C0	Q0	Q1	Q2	Q3	Q4	Q5	Q6	Q7	24V1	C1	Q10	Q11	Q12	Q13	Q14	Q15	D+	D-	SG	SG	D+	D-
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M211-42MR-A																														
L	N	$\perp$	S/S	I0	I1	I2	I3	I4	I5	I6	I7	I10	I11	I12	I13	I14	I15	I16	I17	I20	I21	I22	I23	I24	I25	I26	I27	H	L	GND

24V	0V	C0	Q0	Q1	Q2	Q3	C1	Q4	Q5	Q6	Q7	C2	Q10	Q11	Q12	Q13	C3	Q14	Q15	Q16	Q17	C4	Q20	Q21	-	D+	D-	SG	SG	D+	D-
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Z4V	UV	C0	Q10	Q11	Q12	Q13	C1	Q4	Q3	Q6	Q7	CZ	Q10	Q11	Q12	C5	Q14	Q15	Q16	Q17	C4	Q20	Q21	-	D7	D-	S0	S0	D7	D-	
M211-42MT8-A																															
I	N	+	S/S	I0	I1	I2	I3	I4	I5	I6	I7	I10	I11	I12	I13	I14	I15	I16	I17	I20	I21	I22	I23	I24	I25	I26	I27	H	L	GND	

24V	0V	24V0	C0	Q0	Q1	Q2	Q3	Q4	Q5	Q6	Q7	24V1	C1	Q10	Q11	Q12	Q13	Q14	Q15	Q16	Q17	24V2	C2	Q20	Q21	D+	D-	SG	SG	D+	D-
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M211-60MR-A																																											
L	N	$\perp$	S/S	I0	I1	I2	I3	I4	I5	I6	I7	I10	I11	I12	I13	I14	I15	I16	I17	I20	I21	I22	I23	I24	I25	I26	I27	I30	I31	I32	I33	I34	I35	I36	I37	I40	I41	I42	I43	H	L	GND	

24V	0V	C0	Q0	Q1	Q2	Q3	C1	Q4	Q5	Q6	Q7	C2	Q10	Q11	Q12	Q13	C3	Q14	Q15	Q16	Q17	C4	Q20	Q21	Q22	Q23	C5	Q24	Q25	Q26	Q27	D+	D-	SG	SG	D+	D-
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24V 0V	C0	Q0	Q1	Q2	Q3	C1	Q4	Q5	Q6	Q7	C2	Q10	Q11	Q12	Q13	C3	Q14	Q15	Q16	Q17	C4	Q20	Q21	Q22	Q23	C5	Q24	Q25	Q26	Q27	D+	D-	SG	SG	D+	D-	
M211-60MT10-A																																					

24V	0V	24V0	C0	Q0	Q1	Q2	Q3	Q4	Q5	Q6	Q7	24V1	C1	Q10	Q11	Q12	Q13	Q14	Q15	Q16	Q17	24V2	C2	Q20	Q21	Q22	Q23	Q24	Q25	Q26	Q27	D+	D-	SG	SG	D+	D-
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3.4.2 Terminal description of input channel and output channel of M211 series

Item		M211-20MR	M211-20MT4	M211-32MR	M211-32MT6	M211-42MR	M211-42MT8	M211-60MR	M211-60MT10
Input	General input	12 (I0~I7) (I10~I13)		18 (I0~I7) (I10~I17) (I20~I21)		24 (I0~I7) (I10~I17) (I20~I27)		36 (I0~I7) (I10~I17) (I20~I27) (I30~I37) (I40~I43)	
	High-speed input channel	2 (I0~I3)				4 (I0~I3) (I20~I23)			
Output	General output	8 (Q0~Q7)		14 (Q0~Q7) (Q10~Q15)		18 (Q0~Q7) (Q10~Q17) (Q20~Q21)		24 (Q0~Q7) (Q10~Q17) (Q20~Q27)	
	High-speed output channel	0	4 (Q0~Q7)	0	6 (Q0~Q7) (Q10~Q13)	0	8 (Q0~Q7) (Q10~Q17)	0	10 (Q0~Q7) (Q10~Q17) (Q20~Q23)

3.4.3 General IO input/output

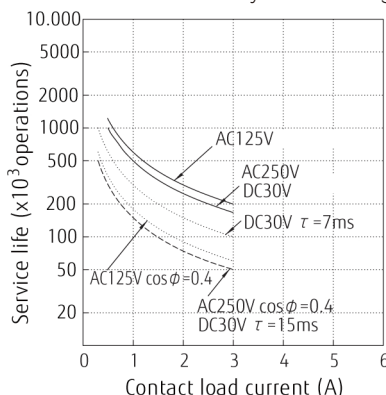
◆ General IO input

Item		Specification			
		HCM211-20MT4-A HCM211-20MR-A	HCM211-32MT6-A HCM211-32MR-A	HCM211-42MT8-A HCM211-42MR-A	HCM211-60MT10-A HCM211-60MR-A
Number of input channels		12	18	24	36
Input channel number		I0~I7,I10~I13	I0~I7,I10~I17,I20~I21	I0~I7,I10~I17,I20~I27	I0~I7,I10~I17,I20~I27,I30~I37,I40~I43
Device corresponding to the input channel		%IX0.0~%IX0.7, %IX1.0~%IX1.3	%IX0.0~%IX0.7, %IX1.0~%IX1.7, %IX2.0~%IX2.1	%IX0.0~%IX0.7, %IX1.0~%IX1.7, %IX2.0~%IX2.7	%IX0.0~%IX0.7,%IX1.0~%IX1.7,%IX2.0~%IX2.7,%IX3.0~%IX3.7,%IX4.0~%IX4.3
Input signal mode		Sink mode or source mode Sink mode: The common terminal is connected to the 24V of the DC 24V power supply. Source mode: The common terminal is connected to the 0V of the DC 24V power supply.			
Input channel terminal type		Detachable terminal			
Common terminal configuration		All channels/common terminals; common terminal S/S can be connected to 24V or 0V of a DC 24V power supply			
Input voltage/current		DC 24V/5mA			
Voltage when ON		≥ DC 15V			
Voltage when OFF		≤ DC 5V			
Input current when ON		> 4mA			
Input current when OFF		< 2.5mA			
Response time	OFF -> ON	< 2.5μs			
	ON -> OFF	< 2.5μs			
Input impedance		2.7kΩ			
Isolation method		Integrated chip capacitive isolation			
Input operation indication		When the isolated digital input receiver is driven, the input channel indicator lights up.			

◆ General IO output

Item	Specification			
	HCM211-20MT4-A	HCM211-32MT6-A	HCM211-42MT8-A	HCM211-60MT10-A
Number of output channels	8	14	18	24
Output channel number	Q0~Q7	Q0~Q7,Q10~Q15	Q0~Q7,Q10~Q17, Q20~Q21	Q0~Q7,Q10~Q17, Q20~Q27
Device corresponding to the output channel	%QX0.0~%QX0.7	%QX0.0~%QX0.7, %QX1.0~%QX1.5	%QX0.0~%QX0.7, %QX1.0~%QX1.7, %QX2.0~%QX2.1	%QX0.0~%QX0.7, %QX1.0~%QX1.7, %QX2.0~%QX2.7
Output channel type	Transistor sink output			
Common terminal configuration	Max. 8 channels/common terminal, i.e., up to 8 output channels share a common terminal			
Output channel terminal type	Detachable terminal			
Leakage current when OFF	<10μA			
Maximum load	Resistive load: 0.5A per channel, 4A per common channel			
	Inductive load: 7.2W per channel, 24W per common channel			
	Bulb load: 5W per channel, 18W per common channel			
Minimum load	1mA / 5V			

Maximum response time	OFF -> ON	< 2.5μs
	ON -> OFF	< 2.5μs
Output isolation voltage		3.75kV

Item	Specification			
	HCM211-20MR-A	HCM211-32MR-A	HCM211-42MR-A	HCM211-60MR-A
Number of output channels	8	14	18	24
Output channel number	Q0~Q7	Q0~Q7,Q10~Q15	Q0~Q7,Q10~Q17, Q20~Q21	Q0~Q7,Q10~Q17, Q20~Q27
Device corresponding to the output channel	%QX0.0~%QX0.7	%QX0.0~%QX0.7, %QX1.0~%QX1.5	%QX0.0~%QX0.7, %QX1.0~%QX1.7 %QX2.0~%QX2.1	%QX0.0~%QX0.7, %QX1.0~%QX1.7 %QX2.0~%QX2.7
Output channel type	Relay output			
Common terminal configuration	Max. 4 channels/common terminal, i.e., up to 4 output channels share a common terminal			
Output channel terminal type	Detachable terminal			
Output voltage level	250VAC 24VDC			
Maximum load	Resistive load: 2A per channel, 8A per common channel			
	Inductive load: Relay contacts are non-polarized and can be connected to both AC and DC power supplies. Each relay can handle a maximum current of 2A. The service life of relay contacts depends on several factors, including the contact operating voltage, contact current magnitude, and load type (time-constant t, power-factor cos ψ). The relationship among these parameters is illustrated in the life cycle curve diagram below.			
				
	Bulb load: 100W (220VAC)			
Minimum load	1mA / 5V			
Max. response time	OFF -> ON	Approx. 15ms		
	ON -> OFF	Approx. 15ms		
Max. switching frequency	1Hz			
Isolation (Y/N)	Y			

3.4.4 High-speed input/output

◆ High-speed input

Item		Specification			
		HCM211-20MT4-A HCM211-20MR-A	HCM211-32MT6-A HCM211-32MR-A	HCM211-42MT8-A HCM211-42MR-A	HCM211-60MT10-A HCM211-60MR-A
Maximum pulse frequency		200KHZ			
Number of input channels		2		4	
Input channel number		I0~I3		I0~I3,I20~I23	
Device corresponding to the input channel		%IX0.0~%IX0.3		%IX0.0~%IX0.3, %IX2.0~%IX2.3	
Input form	AB phase	Channel 1: I0~I1; Channel 2: I2~I3		Channel 1: I0~I1; Channel 2: I2~I3; Channel 3: I20~I21; Channel 4: I22~I23	
	Pulse+direction	In channel 1: I0 is pulse, I1 is direction; In channel 2: I2 is pulse, I3 is direction		In channel 1: I0 is pulse, I1 is direction; In channel 2: I2 is pulse, I3 is direction; In channel 3: I20 is pulse, I21 is direction; In channel 4: I22 is pulse, I23 is direction	
	Single pulse	In channel 1: I0 is pulse, In channel 2: I2 is pulse		In channel 1: I0 is pulse; In channel 2: I2 is pulse; In channel 3: I20 is pulse; In channel 4: I22 is pulse	
Interrupt		I0~I7 Supports interrupt tasks (rising edge or falling edge), Additionally, the position of the high-speed input channel can be accurately captured through the input channel			

◆ High-speed output

Item		Specification			
		HCM211-20MT4-A	HCM211-32MT6-A	HCM211-42MT8-A	HCM211-60MT10-A
Maximum pulse frequency		200KHZ			
Number of pulse axes		4 Axes	6 Axes	8 Axes	10 Axes
Number of output channels		4	6	8	10
Output channel number		Q0~Q7	Q0~Q7,Q10~Q13	Q0~Q7,Q10~Q17	Q0~Q7,Q10~Q17, Q20~Q23
Device corresponding to the output channel		%QX0.0~%QX0.7	%QX0.0~%QX0.7, %QX1.0~%QX1.3	%QX0.0~%QX0.7, %QX1.0~%QX1.7	%QX0.0~%QX0.7, %QX1.0~%QX1.7, %QX2.0~%QX2.3
Output form	Pulse+direction	Q0~Q7 Even-numbered channels are pulse, odd-numbered channels are direction	Q0~Q7,Q10~Q13 Even-numbered channels are pulse, odd-numbered channels are direction	Q0~Q7,Q10~Q17 Even-numbered channels are pulse, odd-numbered channels are direction	Q0~Q7,Q10~Q17, Q20~Q23 Even-numbered channels are pulse, odd-numbered channels are direction

3.5 Communication specifications

3.5.1 Ethernet specifications

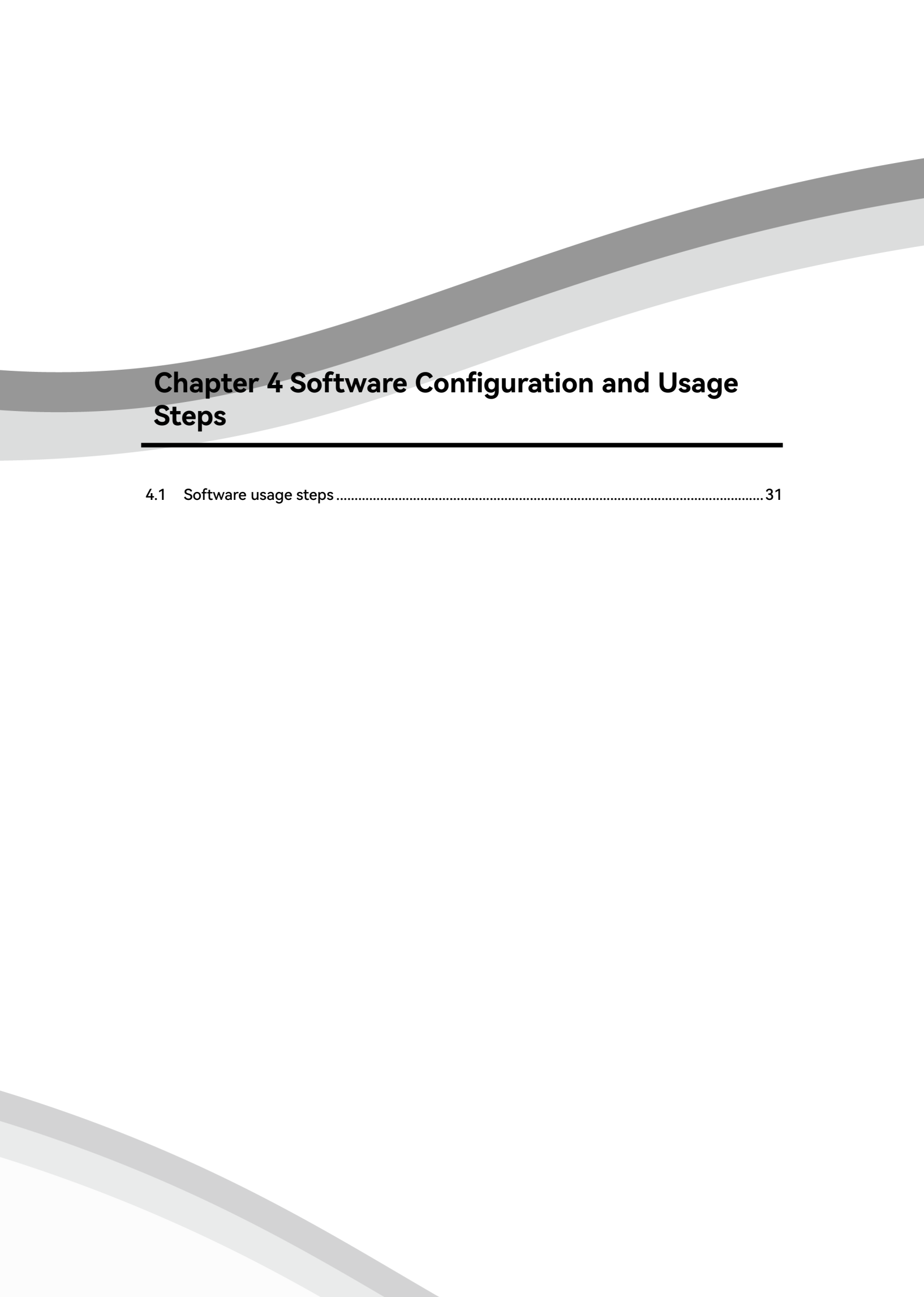
Item	Specification
Interface type	RJ45
Data transfer speed	100/10Mbps
Maximum transmission distance (length between hub and node)	100m
Supported protocol	Modbus TCP, EtherNet/IP, Socket, custom communication protocols
IP address	Initial value: 192.168.1.8
Cable	Category 5e shielded twisted pair cable

3.5.2 RS485 specifications

Item	Specification
Interface type	Detachable terminal
Data transfer rate	9600, 19200, 38400, 57600, 115200bps
Maximum transmission distance	500m (at 9600bps)
Supported protocol	Modbus master/slave (ASCII/RTU); custom communication protocol
Isolation method	Digital isolator insulation
Termination resistor	External 120Ω
Number of supported slaves	32

3.5.3 CAN specifications

Item	Specification
Interface type	Detachable terminal
Data transfer rate	Maximum 1Mbps
Maximum transmission distance	2500m (at 20kbit/s)
Supported protocol	CANOpen
Isolation method	Digital isolator insulation
Termination resistor	External 120Ω
Number of supported slaves	32



Chapter 4 Software Configuration and Usage Steps

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4.1 Software usage steps

◆ Step1. Installation

Step	Content	Reference
1-1 Establish configuration	• Install on DIN rail • Connect units to each other	Chapter 5 Installation and Wiring
1-2 Configure slave	• Slave node address setting	

◆ Step 2. Wiring

Step	Content	Reference
2-1 EtherNet cable wiring	• Wiring of built-in EtherNet/IP interface	Chapter 5 Installation and Wiring
2-2 I/O wiring	• Wiring of basic I/O unit	
2-3 Computer (Sysctrl Studio) wiring	• USB cable wiring • Wiring of built-in EtherNet/IP interface	

◆ Step 3. Software configuration and setup

Step	Content	Reference
3-1 Configure IO and addresses	• Create a new project • Assign device variables to I/O interfaces • Create axes and assign to real or virtual axes	Chapter 2 CPU Unit Model and Component Description
3-2 Configure communication	• Establish communication between modules	Software Instruction Manual
3-3 Configure hardware configuration	• Create slave/unit configurations	
3-4 Configure task cycles	• Relationship between tasks and programs • Cycle of each tasks • Refresh cycle of slaves/units	
3-5 Design programs	• Design POU (Program Organization Unit) • Design variables	

◆ Step 4. Download and debugging

Step	Content	Reference
4-1 Online connection with Sysctrl Studio and project download	• Turn on the power of the controller and connect online with Sysctrl Studio.	Chapter 5 Installation and Wiring Software Instruction Manual

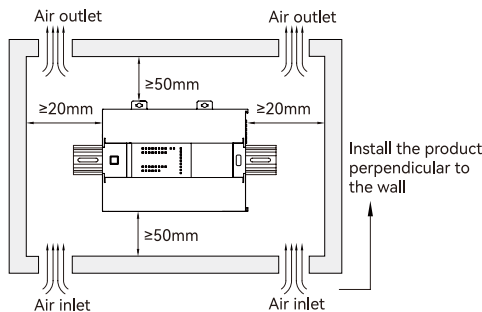
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5.1 Installation instructions

5.1.1 Installation within a control cabinet

Please install the product perpendicular to the wall and ensure a sufficient cooling effect via natural air or a cooling fan. Please leave enough clearance around the product as shown in the right figure. During a side-by-side installation, please leave a horizontal clearance of more than 20 mm on both sides.



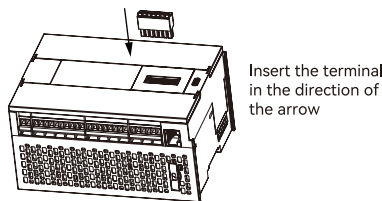
5.1.2 DIN rail mounting and dismounting

Before installation, check that the DIN rail mounting latch is in a locked state. During mounting, position the upper part of the mounting latch of the module on the DIN rail, and then press the controller against the DIN rail until a clear click is heard (which indicates the latch is momentarily opened and locked onto the rail). During dismounting, pull the latch upwards until a clear click is heard (which indicates the latch is unlocked), and then directly remove the controller.

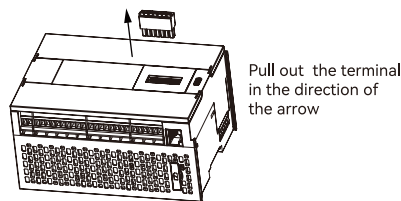
① Pull the latch	② Detach the controller	Locked	Unlocked

5.1.3 Removable terminal block mounting and dismounting

The mounting and dismounting of the removable terminal block are shown in the figures below.



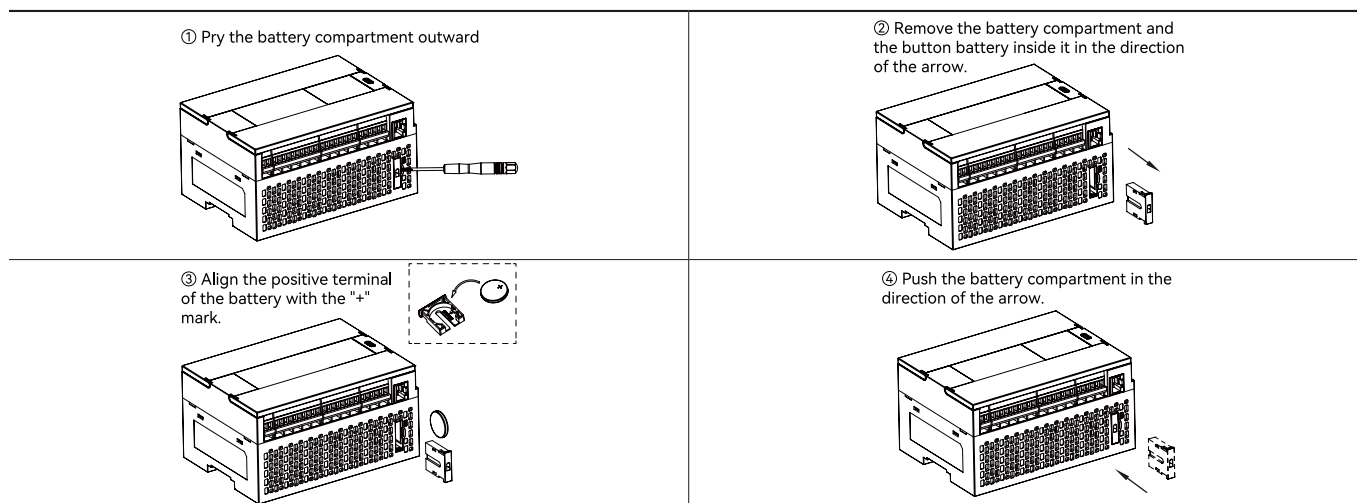
Insert the terminal
in the direction of
the arrow



Pull out the terminal
in the direction of
the arrow

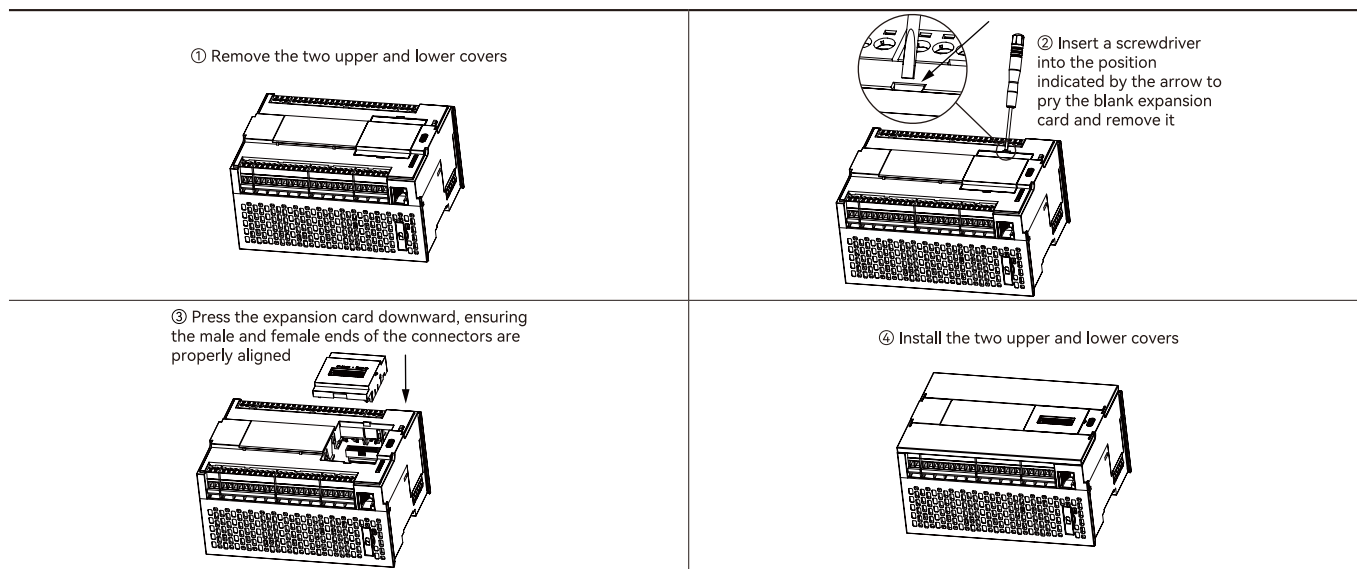
5.1.4 Battery mounting and dismounting

Insert a flat-blade screwdriver into the semicircular hole on the right side of the battery compartment, pry it outward, and then take out the battery compartment and the button battery inside along the direction of the arrow to complete the dismounting. Align the positive terminal of the battery with the "+" sign inside the battery compartment, insert the battery into the compartment, and then push the battery compartment into the device along the direction of the arrow to complete the mounting.



5.1.5 Expansion card mounting and dismounting

During mounting, place the controller horizontally. Remove the two upper and lower covers. Insert a flat-head screwdriver into the position indicated by the arrow and pry the blank expansion card until it detaches from the controller, then remove the blank expansion card. Press the expansion card down in the direction of the arrow, aligning the male connector of the controller with the female connector of the expansion card. Finally, install the two upper and lower covers; the installation is now complete. During dismounting, the reverse process is followed.



5.1.6 Cable connecting and disconnecting

During connecting, insert the flat-blade screwdriver into the unlocking tab vertically with a force of more than 25 N. Then insert a cable into the circular hole. Gently tug the cable after pulling out the screwdriver. If the cable is secured firmly, then the connection is finished. The reverse is the procedure for unplugging the cable.



5.2 Wiring instructions

5.2.1 Terminal configuration of M211-series controller

M211-20MR-A																			
L	N	⏏	S/S	I0	I1	I2	I3	I4	I5	I6	I7	I10	I11	I12	I13	H	L	GND	

24V	0V	C0	Q0	Q1	Q2	Q3	C1	Q4	Q5	Q6	Q7	D+	D-	SG	SG	D+	D-		
M211-20MT4-A																			
L	N	⏏	S/S	I0	I1	I2	I3	I4	I5	I6	I7	I10	I11	I12	I13	H	L	GND	
24V	0V	24V0	C0	Q0	Q1	Q2	Q3	Q4	Q5	Q6	Q7	D+	D-	SG	SG	D+	D-		

M211-32MR-A																			
L	N	⏏	S/S	I0	I1	I2	I3	I4	I5	I6	I7	I10	I11	I12	I13	I14	I15	I16	I17
24V	0V	C0	Q0	Q1	Q2	Q3	C1	Q4	Q5	Q6	Q7	C2	Q10	Q11	Q12	Q13	C3	Q14	Q15
M211-32MT6-A																			
L	N	⏏	S/S	I0	I1	I2	I3	I4	I5	I6	I7	I10	I11	I12	I13	I14	I15	I16	I17
24V	0V	24V0	C0	Q0	Q1	Q2	Q3	Q4	Q5	Q6	Q7	24V1	C1	Q10	Q11	Q12	Q13	Q14	Q15

M211-42MR-A																			
L	N	⏏	S/S	I0	I1	I2	I3	I4	I5	I6	I7	I10	I11	I12	I13	I14	I15	I16	I17
24V	0V	C0	Q0	Q1	Q2	Q3	C1	Q4	Q5	Q6	Q7	C2	Q10	Q11	Q12	Q13	C3	Q14	Q15
M211-42MT8-A																			
L	N	⏏	S/S	I0	I1	I2	I3	I4	I5	I6	I7	I10	I11	I12	I13	I14	I15	I16	I17
24V	0V	24V0	C0	Q0	Q1	Q2	Q3	Q4	Q5	Q6	Q7	24V1	C1	Q10	Q11	Q12	Q13	Q14	Q15

M211-60MR-A																			
L	N	⏏	S/S	I0	I1	I2	I3	I4	I5	I6	I7	I10	I11	I12	I13	I14	I15	I16	I17
24V	0V	C0	Q0	Q1	Q2	Q3	C1	Q4	Q5	Q6	Q7	C2	Q10	Q11	Q12	Q13	C3	Q14	Q15
M211-60MT10-A																			
L	N	⏏	S/S	I0	I1	I2	I3	I4	I5	I6	I7	I10	I11	I12	I13	I14	I15	I16	I17
24V	0V	24V0	C0	Q0	Q1	Q2	Q3	Q4	Q5	Q6	Q7	24V1	C1	Q10	Q11	Q12	Q13	Q14	Q15

5.2.2 Power supply wiring

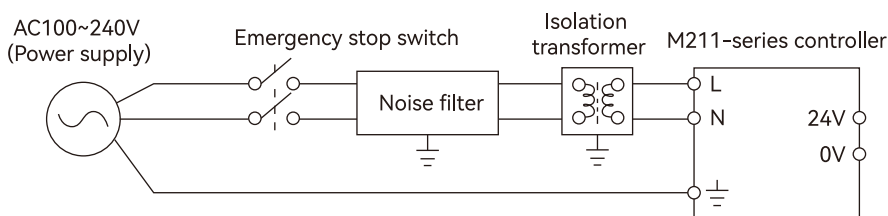
Please connect the L and N terminals of the power supply to the L and N terminals of the M211-series controller respectively. It is mandatory to connect the ground wire of the power supply to the grounding terminal of the M211-series controller to prevent system abnormalities.

It is recommended to install a noise filter and an isolation transformer in front of the controller's power supply. The isolation transformer should be placed between the noise filter and the controller's power supply.

It is recommended to add an emergency stop switch to the power input terminal of the controller to enable immediate power-off in case of emergency.

The 24V and 0V terminals of the M211-series controller are output power supplies, with a maximum output current of 500mA. The 24V terminal must not be powered by other power supplies.

It is recommended to route the AC power cables and the DC 24V power supply cables separately, with a distance of at least 100mm between the cables.



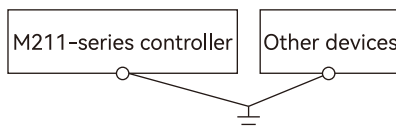
5.2.3 Grounding

The wire diameter of the grounding cable must not be smaller than that of the L and N wires of the power cable.

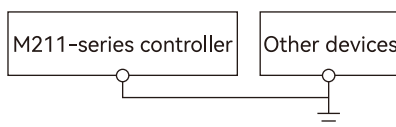
When multiple devices need to be grounded simultaneously, it is recommended to ground each device independently, as shown in the figure below.



When multiple devices are grounded simultaneously, if it is not possible to ground each device independently, it is recommended to ground them in the manner shown in the figure below.



When multiple devices are grounded simultaneously, the grounding method shown in the figure below must not be used.



5.2.4 I/O wiring

◆ IO terminal description

Item		M211-20MR	M211-20MT4	M211-32MR	M211-32MT6	M211-42MR	M211-42MT8	M211-60MR	M211-60MT10
Input	General input	12		18		24		36	
	High-speed input channels	2 (I0~I3)				4 (I0~I3) (I20~I23)			
Output	General output	8		14		18		24	
	High-speed output channels	0	4 (Q0~Q7)	0	6 (Q0~Q7) (Q10~Q13)	0	8 (Q0~Q7) (Q10~Q17)	0	10 (Q0~Q7) (Q10~Q17) (Q20~Q23)

Type		General IO wiring	High-speed IO wiring
Input	Sink input		
	Source input		

Output	Transistor type		
	Relay type		-

*Note: Connect a resistor of about 500 Ω between the output terminal and the 24V terminal when the output channel is used as a high-speed output.

5.2.5 Communication wiring

Please refer to Chapter 6 for communication wiring in this chapter.

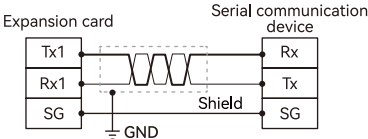
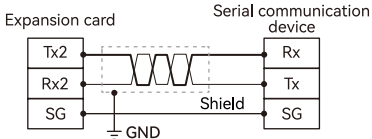
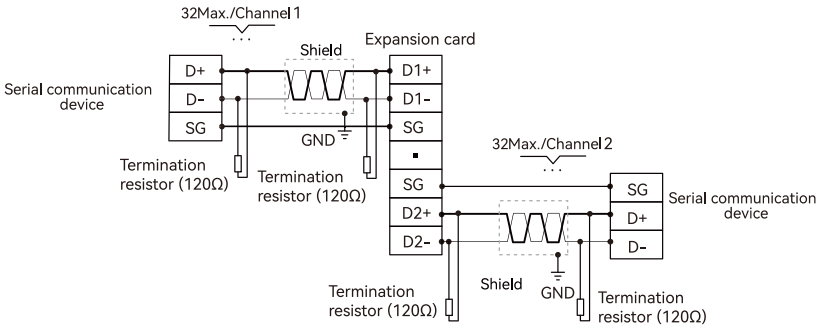
◆ CAN communication terminal

CAN communication terminal		CANOpen wiring	
CAN communication signal (high)	H		CAN communication device
CAN communication signal (low)	L		
CAN communication signal reference ground	GND		

◆ RS485 communication terminal

RS485 communication terminal		RS485 wiring	
COM1 RS485 communication signal +	D+		Serial communication device
COM1 RS485 communication signal -	D-		
COM1 signal reference ground	SG		
COM2 signal reference ground	SG		
COM2 RS485 communication signal +	D+		
COM2 RS485 communication signal -	D-		

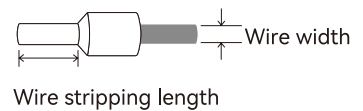
◆ Expansion card communication terminals

RS232 communication terminal		RS232 channel 1 wiring	RS232 channel 2 wiring
RS232 channel 1 data transmission	Tx1		
RS232 channel 1 data reception	Rx1		
RS232 channel 1 signal reference ground	SG*		
-	■		
RS232 channel 2 signal reference ground	SG*		
RS232 channel 2 data transmission	Tx2		
RS232 channel 2 data reception	Rx2		
RS485 communication terminal		RS485 wiring	
RS485 channel 1 communication signal +	D1+		
RS485 channel 1 communication signal -	D1-		
RS485 channel 1 signal reference ground	SG*		
-	■		
RS485 channel 2 signal reference ground	SG*		
RS485 channel 2 communication signal +	D2+		
RS485 channel 2 communication signal -	D2-		

Note: Signal reference ground (SG) is internally conductive.

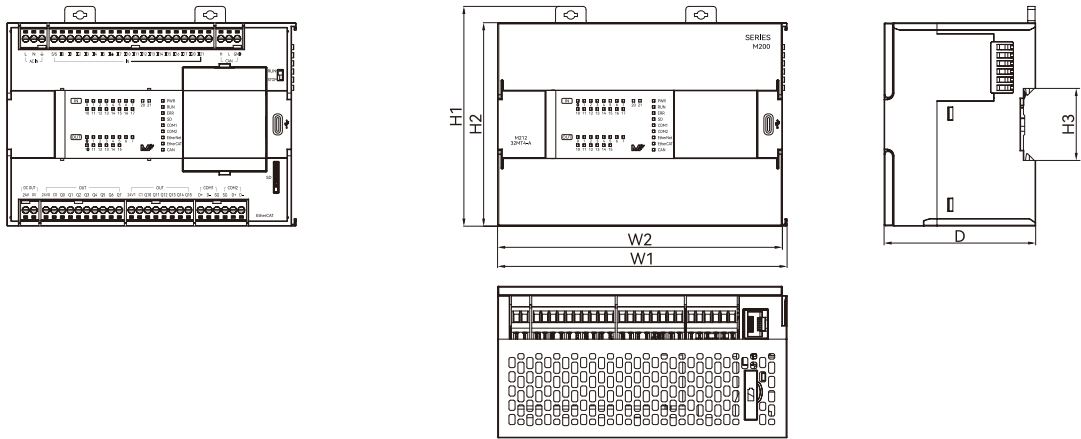
5.2.6 Installation and wire gauge specifications

Controller terminal	Wire gauge range: AWG	Wire stripping length: mm
I/O, power supply, grounding terminals	24~14	6~7
CAN communication terminal	24~14	6~7
RS485 communication terminal	24~14	6~7



5.3 Product dimensions

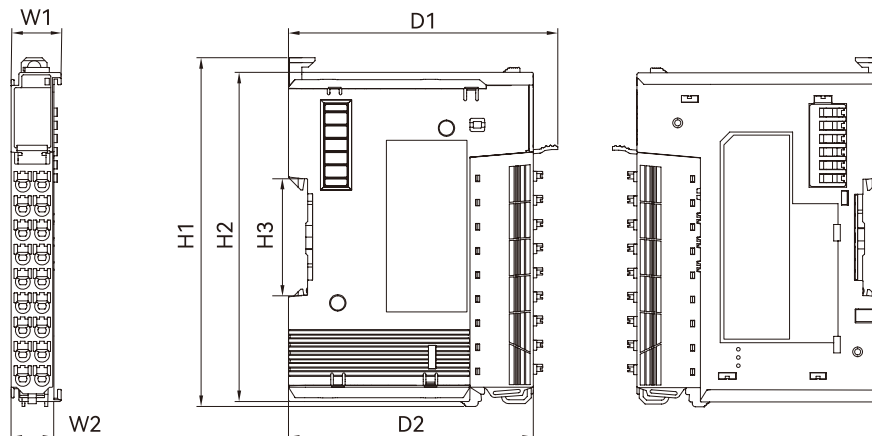
5.3.1 CPU unit dimensions



Model	Outline dimensions:mm						Weight:g
	W1	W2	H1	H2	H3	D	
HCM211-20MR-A	122.30	120.00	108.00	100.00	35.40	74.50	436.8
HCM211-20MT4-A							404.0
HCM211-32MR-A	142.30	140.00					513.6
HCM211-32MT6-A							470.6
HCM211-42MR-A	172.30	170.00					590.8
HCM211-42MT8-A							525.1
HCM211-60MR-A	214.30	212.00					711.2
HCM211-60MT10-A							646.6

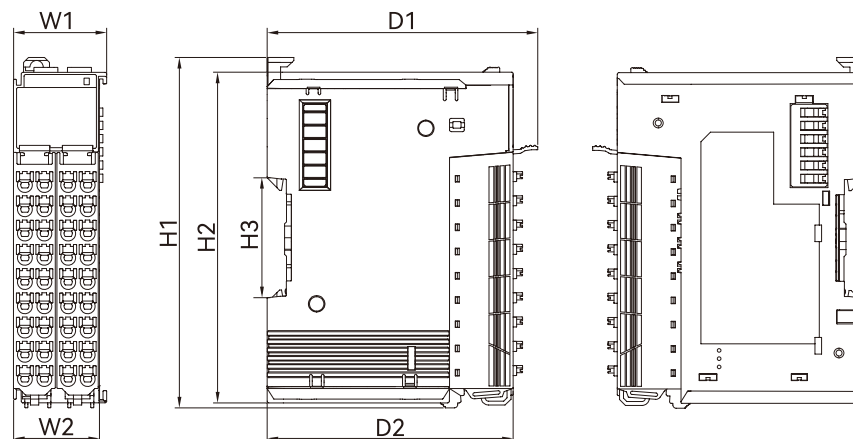
5.3.2 Expansion module dimensions

◆ Single-row terminal module



Single-row terminal module	Outline dimensions:mm						
	W1	W2	H1	H2	H3	D1	D2
HCMX-OD08-D	15.20	13.00	122.15	104.50	35.40	95.64	80.20
HCMX-OD08-D-PNP							
HCMX-OD16-D							
HCMX-OD16-D-PNP							
HCMX-ID08-D							
HCMX-ID16-D							
HCMX-MD16-D							
HCMX-MD16-D-PNP							
HCMX-AD04-D							
HCMX-AD04S-D							
HCMX-DA04-D							
HCMX-DA04S-D							

◆ Double-row terminal module



Double-row terminal module	Outline dimensions:mm						
	W1	W2	H1	H2	H3	D1	D2
HCMX-OD32-D	32.30	30.00	122.15	104.50	35.40	95.64	80.20
HCMX-OD32-D-PNP							
HCMX-ID32-D							
HCMX-MD32-D							
HCMX-MD32-D-PNP							
HCMX-OC08-D							

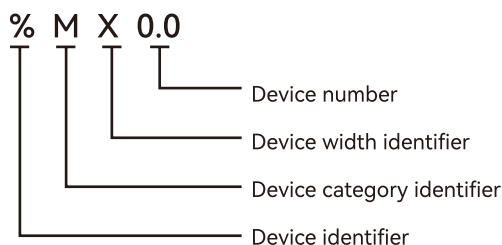
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6.1 Device and Modbus address

6.1.1 Device name and range

◆ Device representation method



M-series controller devices use the "%" symbol for identification. Users can select the required device based on the device category and width. Devices can be accessed by bit, byte, word, double word, or quad word. The representation method is shown in the table below:

Item	Content				
Device identifier	%: Indicates the use of a device				
Device category	I	Q	M	-	-
	Input device	Output device	Intermediate device	-	-
Device width	X	B	W	D	L
	Bit device	Byte device	Word device	Double word device	Quad word device
Device index	-	-	-	-	-
Bit offset	-	-	-	-	-
Device example	%IX0.0	%IB0	%IW0	%ID0	%IL0
	%QX0.0	%QB0	%QW0	%QD0	%QL0
	%MX0.0	%MB0	%MW0	%MD0	%ML0

◆ The device correspondence is shown in the table below:

As shown in the table, %ML0 consists of %MB0~%MB7, %MW0~%MW3, and %MD0~%MD1; %MD0 consists of %MB0~%MB3 and %MW0~%MW1; %MW0 consists of %MB0~%MB1. The numbering of bit devices is consistent with the labeling of byte devices. For example, Bit 0 of %MB2 corresponds to %MX2.0; %MB2 consists of %MX2.0~2.7; %MW1 consists of %MX2.0~2.7 and %MX3.0~3.7.

Device category	Device correspondence																							
	The 1st WORD						The 2nd WORD						The 3rd WORD						The 4th WORD					
	Bit 0	...	Bit 7	Bit 8	...	Bit 15	Bit 0	...	Bit 7	Bit 8	...	Bit 15	Bit 0	...	Bit 7	Bit 8	...	Bit 15	Bit 0	...	Bit 7	Bit 8	...	Bit 15
%MX	%MX0.0~0.7			%MX1.0~1.7			%MX2.0~2.7			%MX3.0~3.7			%MX4.0~4.7			%MX5.0~5.7			%MX6.0~6.7			%MX7.0~7.7		
%MB	%MB0			%MB1			%MB2			%MB3			%MB4			%MB5			%MB6			%MB7		
%MW	%MW0						%MW1						%MW2						%MW3					
%MD	%MD0												%MD1											
%ML	%ML0																							

As shown in the table, %ML1 consists of %MB8~%MB15, %MW4~%MW7, and %MD2~%MD3; %MD2 consists of %MB8~%MB11 and %MW4~%MW5; %MW4 consists of %MB8~%MB9. The numbering of bit devices is consistent with the labeling of byte devices. For example, Bit 0 of %MB8 corresponds to %MX8.0; %MB8 consists of %MX8.0~8.7. %MW4 consists of %MX8.0~8.7 and %MX9.0~9.7.

Device category	Device correspondence																							
	The 5th WORD						The 6th WORD						The 7th WORD						The 8th WORD					
	Bit 0	...	Bit 7	Bit 8	...	Bit 15	Bit 0	...	Bit 7	Bit 8	...	Bit 15	Bit 0	...	Bit 7	Bit 8	...	Bit 15	Bit 0	...	Bit 7	Bit 8	...	Bit 15
%MX	%MX8.0~8.7			%MX9.0~9.7			%MX10.0~10.7			%MX11.0~11.7			%MX12.0~12.7			%MX13.0~13.7			%MX14.0~14.7			%MX15.0~15.7		
%MB	%MB8			%MB9			%MB10			%MB11			%MB12			%MB13			%MB14			%MB15		
%MW	%MW4						%MW5						%MW6						%MW7					
%MD	%MD2												%MD3											
%ML	%ML1																							

◆ Device range:

The device range of the M211-series controller is shown in the table below:

Device category	Device representation method	Device range
%IX	%IX0.0~%IX0.7 %IX1.0~%IX1.7	%IX0.0~%IX127.7
%QX	%QX0.0~%QX0.7 %QX1.0~%QX1.7	%QX0.0~%QX127.7
%MX	%MX0.0~%MX0.7 %MX1.0~%MX1.7	%MX0.0~%MX131071.7
%IB	%IB0	%IB0~%IB127
%QB	%QB0	%QB0~%QB127
%MB	%MB0	%MB0~%MB131071
%IW	%IW0	%IW0~%IW63
%QW	%QW0	%QW0~%QW63
%MW	%MW0	%MW0~%MW65535
%ID	%ID0	%ID0~%ID31
%QD	%QD0	%QD0~%QD31
%MD	%MD0	%MD0~%MD32767
%IL	%IL0	%IL0~%IL15
%QL	%QL0	%QL0~%QL15
%ML	%ML0	%ML0~%ML16383

Note: %MW0~%MW999 are default as power-outage retention addresses.

6.1.2 Modbus addresses corresponding to devices

The devices listed in the table below support standard MODBUS function codes (e.g., 03/06/10/01/02/05/0F, etc.) and can be accessed via Ethernet, RS232, or RS485 communication. When users need to read/write the bit devices of the controller through an HMI (Human-Machine Interface), they can use the bit devices of output devices as intermediate bit devices. For example, %QX50.0~%QX127.7 can be used as intermediate bit devices; any output device without control output channels can serve as an intermediate bit device.

Device area	Device category	Device range	Modbus address
I (Input device)	Bit device (bit)	%IX0.0~%IX0.7	0x6000~0x6007
		%IX1.0~%IX1.7	0x6008~0x600F
			
		%IX127.0~%IX127.7	0x63F8~0x63FF
	Word device (word)	%IW0~%IW63	0x8000~0x803F
Q (Output device)	Bit device (bit)	%QX0.0~%QX0.7	0xA000~0xA007
		%QX1.0~%QX1.7	0xA008~0xA00F
			
		%QX127.0~%QX127.7	0xA3F8~0xA3FF
	Word device (word)	%QW0~%QW63	0xA000~0xA03F
M (Intermediate device)	Word device (word)	%MW0~%MW32767	0x0000~0x7FFF

Conversion method for QX-related bit devices to Modbus addresses:

For example, QXA.B: Convert $A \times 8 + B$ to hexadecimal, then +16#A000

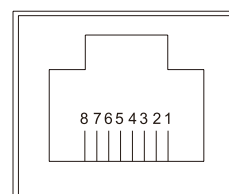
Example: %QX50.1 corresponds to Modbus address 0xA191. Calculation: $50 \times 8 + 1 = 401 = 16\#191$; $16\#191 + 16\#A000 = 0xA191$

6.2 EtherNet communication

6.2.1 EtherNet communication interface pin definition

The default IP address of EtherNet is 192.168.1.8.

Pin	Signal	Description
1	Tx+	Transmit data positive (TX+)
2	Tx-	Transmit data negative (TX-)
3	Rx+	Receive data positive (RX+)
4	Reserved	Reserved
5	Reserved	Reserved
6	Rx-	Receive data negative (RX-)
7	Reserved	Reserved
8	Reserved	Reserved



Ethernet

6.2.2 EtherNet communication interface function description

The M211-series motion controller with an Ethernet communication interface supports Modbus TCP, EtherNet/IP, and Socket. It can act as a Modbus TCP master or slave, while EtherNet/IP only supports slave mode. The Ethernet communication interface automatically detects 10/100 Mbps transmission rates.

The Ethernet communication interface can be used to download hardware configurations, programs, electronic cams, etc. Touchscreens, PLCs, or other Modbus TCP devices can perform read/write operations on the internal devices of the M211-series motion controller via the Ethernet communication interface.

The detailed specifications of the Ethernet communication interface is shown in the table below:

Item				Description
Communication protocol				Modbus TCP, EtherNet/IP, Socket
Maximum transmission distance (between hub and node)				100 meters
Number of simultaneous communication connections for Modbus TCP, EtherNet/IP, Socket				16
Modbus TCP	Sum of client and server connection counts			16
Socket	Sum of TCP and UDP connection counts			8
Modbus TCP, Socket	Sum of simultaneous communication connections for Modbus TCP and Socket			16
EtherNet/IP (slave only)	CIP service type: Cyclic communication (IO connection)	CIP connection count		8
		Requested Packet Interval (RPI)		5ms~1000ms
		Maximum data volume per connection		200bytes
	CIP service type: Explicit message	Class 3 (Connection count)		8
		UCMM (Unconnected message management)	Maximum number of simultaneous communication clients	16

6.2.3 Function codes and exception response codes supported by the EtherNet communication interface using Modbus TCP protocol

The following table lists the function codes supported by the EtherNet communication interface of the M211-series motion controller when using the Modbus TCP protocol:

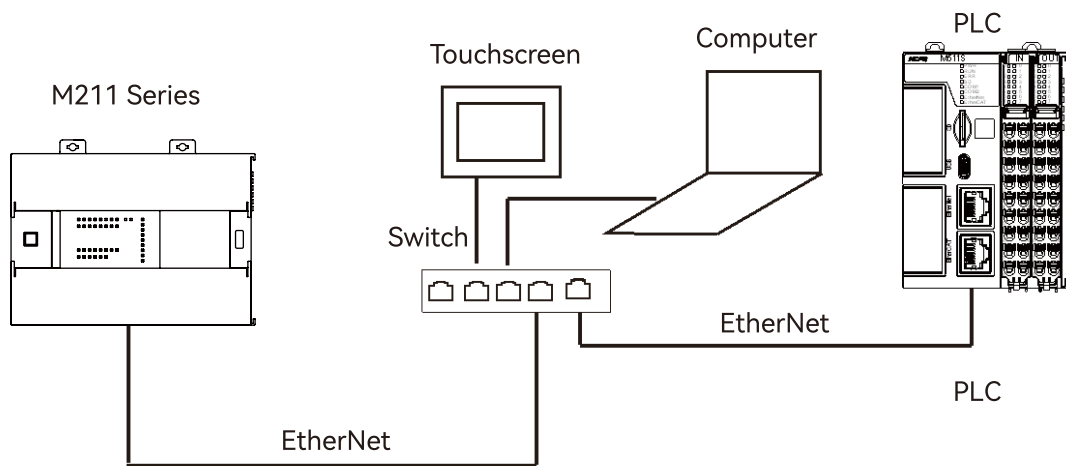
Category	Function code	Description	Broadcastable (Y/N)	Read/Write maximum length	Operable device
Bit device	0x01	Definition: Read the value of bit devices. M-series controller bit device values can all be read using function code 01.	N	256	%IX,%QX
	0x02	Definition: Read the value of input bit devices. M-series controller bit device values can all be read using function code 02.	N	256	%IX,%QX
	0x05	Write the value of a single bit device.	Y	1	%QX
	0x0F	Write the values of multiple bit devices.	Y	256	%QX
Word device	0x03	Read the value of single or multiple word devices.	N	100	%MW,%QW,%IW
	0x04	Definition: Read the value of single or multiple input word devices. M-series controller word device values can all be read using function code 04.	N	100	%MW,%QW,%IW
	0x06	Write the value of a single word device.	Y	1	%MW,%QW
	0x10	Write the values of multiple word devices.	Y	100	%MW,%QW
	0x17	Read/Write the value of single or multiple word devices.	Y	100	%MW,%QW, %IW (read only)

The following table lists the exception response codes supported by the EtherNet communication interface of the M211-series motion controller when using the Modbus TCP protocol:

Exception response code	Description	Troubleshooting
1	The slave does not support the function code specified by the master.	Specify a function code supported by the slave.

2	The slave does not support the Modbus address specified by the master.	Specify a Modbus address supported by the slave.
3	The read/write data length specified exceeds the limit.	When the controller acts as a slave: For word devices, the maximum read/write length per operation is 100 WORDs. For bit devices, the maximum read/write length per operation is 256 bits. The controller returns this exception code if the limits are exceeded.
7	The checksum calculated by the master and slave differs.	Confirm that the baud rate and communication format of the master and slave are consistent. Check for interference near the bus. Check that the bus is a shielded cable. Ensure both the master and slave are grounded.

6.2.4 EtherNet network connection



6.3 CAN communication

6.3.1 CAN communication interface pin definition

The M211-series controller has one built-in independent CAN communication interfaces. The pin definitions of the CAN communication interface are shown in the figure below:

CAN communication terminal			CANOpen wiring
CAN communication signal (high)	H	H L GND L CAN	32Max./Channel CAN communication device ... CAN communication device Termination resistor (120Ω) ... Termination resistor (120Ω)
CAN communication signal (low)	L		
CAN communication signal reference ground	SG		

The CAN communication interface can be used as a master in a CANopen network or as a slave to another master. The master/slave role can be selected in the software.

◆ **When used as a master, it supports the following functions:**

- Supports the CANopen protocol DS301v4.02.

- Supports master services for network management (Network Management Object: NMO).
- Supports monitoring of slave disconnection.
 - * The master's slave disconnection monitoring mechanism includes two types: Heartbeat and NodeGuarding. The controller only supports Heartbeat.
 - * Other stations can send Heartbeat messages to the controller, which monitors their disconnection status.
- Supports up to 32 slaves.
- Supports Process Data Object (PDO) services:
 - * Up to 200 RxPDOs are supported, with a total data size of up to 1000 bytes for all RxPDOs.
 - * Up to 200 TxPDOs are supported, with a total data size of up to 1000 bytes for all TxPDOs.
 - * PDO transmission types: Data change trigger (asynchronous 255), synchronous periodic trigger (synchronous 1~240), synchronous aperiodic trigger (synchronous 0).
 - * PDO mapping: Each PDO can map up to 8 bytes of parameters.
- Supports Service Data Object (SDO) services
- Data types that PDO and SDO can operate on:

Number of data bits	Data type
8-bit	SINT, USINT, BYTE
16-bit	INT, UINT, WORD,
32-bit	DINT, UDINT, REAL, DWORD

- Synchronous message range: 1~65535ms. Synchronous messages enable synchronized actions among multiple devices.

◆ When used as a slave, it supports the following functions:

- Supports the CANopen protocol DS301v4.02.
- Supports Network Management Object (NMO) services.
- Supports monitoring of other stations' disconnection status.
 - * Supports Heartbeat error control but not NodeGuarding error control.
 - * Other stations can send Heartbeat messages to the controller, which monitors their disconnection status.
- Supports PDO services
 - * Up to 8 RxPDOs are supported, with each PDO mapping up to 8 bytes of parameters. The total data size of all RxPDOs is up to 64 bytes.
 - * Up to 8 TxPDOs are supported, with each PDO mapping up to 8 bytes of parameters. The total data size of all TxPDOs is up to 64 bytes.
- PDO transmission types: Event trigger, data change trigger, synchronous periodic trigger, synchronous aperiodic trigger.
- Supports Service Data Object (SDO) services.

6.3.2 PDO mapping of CANopen communication interface

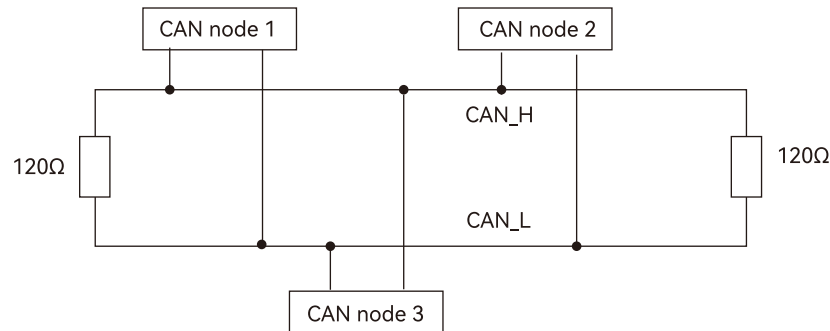
When the M211-series motion controller is configured as a CANopen master, the PDO data area for controlling slaves has a length of 500 WORDs, ranging from %MW63500 to %MW63999; the data area for receiving slave data also has a length of 500 WORDs, ranging from %MW63000 to %MW63499.

When the M211-series motion controller is configured as a CANopen slave, the PDO data area for receiving master data has a length of 32 WORDs, ranging from %MW63000 to %MW63031; the data area for sending data to the master also has a

length of 32 WORDs, ranging from %MW63500 to %MW63531.

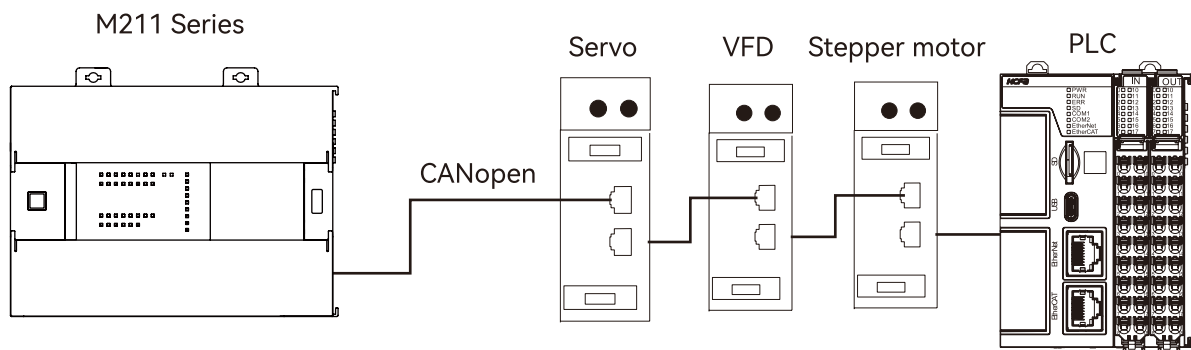
6.3.3 CANopen bus hardware connection

To enhance the stability of CANopen communication, both ends of the CANopen bus network need to be connected to a 120Ω termination resistor. The diagram below shows a schematic of the basic CANopen network topology.



- When building a CANopen network, it is recommended to use dedicated CANopen cables.
- Connect a 120Ω resistor in series between CAN_H and CAN_L at both ends of the CANopen network.

6.3.4 CANopen bus network topological architecture



6.3.5 Communication rate and distance of CANopen communication interface

The transmission distance of the CANopen bus is related to its baud rate. The table below shows the maximum communication distance corresponding to different baud rates.

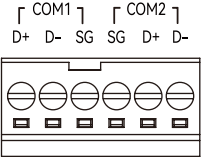
Transmission speed (bits per second)	20K	50K	125K	250K	500K	1M
Maximum communication distance (meters)	2500	1000	500	250	100	40

6.4 RS485 communication

6.4.1 RS485 communication interface pin definition

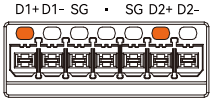
The M211-series controller has two built-in independent RS485 communication interfaces. The pin definitions of the RS485 communication interface are shown in the figure below:

Pin definition	Function
D1+	COM1 RS485 communication signal +
D1-	COM1 RS485 communication signal -
SG	COM1 signal reference ground
SG	COM2 signal reference ground
D2+	COM2 RS485 communication signal +
D2-	COM2 RS485 communication signal -



The M211-series motion controller can be expanded with one expansion card to add two independent RS485 communication interfaces. Only one RS485 expansion card can be installed. The model of the RS485 expansion card is HCMXB-2RS485-200-BD. The pin definitions of the RS485 expansion card communication interface are shown in the figure below:

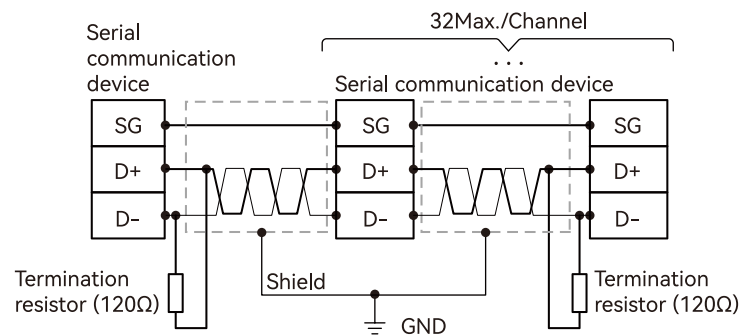
Pin definition	Function
D1+	RS485 channel 1 communication signal +
D1-	RS485 channel 1 communication signal -
SG	RS485 channel 1 signal reference ground
■	-
SG	RS485 channel 2 signal reference ground
D2+	RS485 channel 2 communication signal +
D2-	RS485 channel 2 communication signal -



6.4.2 RS485 communication interface function description

The RS485 communication interfaces of the M211-series motion controller support the same functions: they support Modbus communication protocols, can act as a Modbus master or slave, and support custom communication protocols. Touch screens, PLCs, or other Modbus master devices can read/write data from/to the internal devices of the M211-series motion controller via the RS485 communication interface. When the RS485 communication interface acts as a master, it can connect to 32 slaves; when acting as a slave, the station number range is 1~255, and broadcast functionality is not supported.

6.4.3 RS485 bus network topological architecture



◆ Recommended RS-485 wiring method:

- Install a 120Ω termination resistor (with power $\geq 1/4$ W) at both the start and end of the RS485 bus.

- Use shielded twisted-pair cables with grounded shielding wires to ensure stable communication.
- Connect the RS485 reference grounds of different devices together to prevent communication instability caused by differing system reference grounds.

6.4.4 RS485 supported communication format

The RS485 communication interface supports ASCII or RTU communication formats, with a maximum baud rate of up to 115200 bps.

Baud rate	9600; 19200; 38400; 57600; 115200					
Mode	ASCII				RTU	
Communication format	7,E,1	7,E,2	7,N,1	7,N,2	8,E,1	8,E,2
	7,O,1	7,O,2	8,E,1	8,E,2	8,N,1	8,N,2
	8,N,1	8,N,2	8,O,1	8,O,2	8,O,1	8,O,2

6.4.5 Function codes and exception response codes supported by RS485

◆ The function codes supported by the RS485 communication interface of the M211-series motion controller are listed in the table below:

Category	Function code	Description	Broadcastable (Y/N)	Read/Write maximum length	Operable device
Bit device	0x01	Definition: Read the value of bit devices. M-series controller bit device values can all be read using function code 01.	N	256	%IX,%QX
	0x02	Definition: Read the value of input bit devices. M-series controller bit device values can all be read using function code 02.	N	256	%IX,%QX
	0x05	Write the value of a single bit device.	Y	1	%QX
	0x0F	Write the values of multiple bit devices.	Y	256	%QX
Word device	0x03	Read the value of single or multiple word devices.	N	100	%MW,%QW,%IW
	0x04	Definition: Read the value of single or multiple input word devices. M-series controller word device values can all be read using function code 04.	N	100	%MW,%QW,%IW
	0x06	Write the value of a single word device.	Y	1	%MW,%QW
	0x10	Write the values of multiple word devices.	Y	100	%MW,%QW
	0x17	Read/Write the value of single or multiple word devices.	Y	100	%MW,%QW, %IW (read only)

◆ The following table lists the exception response codes supported by the RS485 communication interface of the M211-series motion controller:

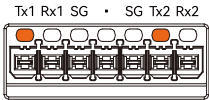
Exception response code	Description	Troubleshooting
1	The slave does not support the function code specified by the master.	Specify a function code supported by the slave.
2	The slave does not support the Modbus address specified by the master.	Specify a Modbus address supported by the slave.

3	The read/write data length specified exceeds the limit.	When the controller acts as a slave: For word devices, the maximum read/write length per operation is 100 WORDs. For bit devices, the maximum read/write length per operation is 256 bits. The controller returns this exception code if the limits are exceeded.
7	The checksum calculated by the master and slave differs.	Confirm that the baud rate and communication format of the master and slave are consistent. Check for interference near the bus. Check that the bus is a shielded cable. Ensure both the master and slave are grounded.

6.5 RS232 communication

6.5.1 RS232 communication interface pin definition

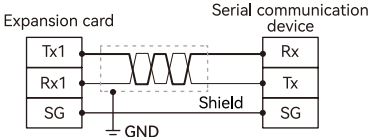
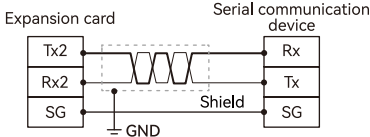
The M211-series motion controller does not have a built-in RS232 communication interface, but it can be expanded with one expansion card to add two independent RS232 communication interfaces. Only one RS232 expansion card can be installed. The model of the RS232 expansion card is HCMXB-2RS232-200-BD. The pin definitions and wiring method of the RS232 expansion card communication interface are shown in the figure below:

Pin definition	Function	
Tx1	RS232 channel 1 data transmission	
Rx1	RS232 channel 1 data reception	
SG	RS232 channel 1 signal reference ground	
■	-	
SG	RS232 channel 2 signal reference ground	
Tx2	RS232 channel 2 data transmission	
Rx2	RS232 channel 2 data reception	

6.5.2 RS232 communication interface function description

The RS232 communication interfaces of the M211-series motion controller support the same functions: they support the Modbus communication protocol, can act as a Modbus master or slave, and support custom communication protocols. Touchscreens, PLCs, or other Modbus master devices can read/write data from/to the internal devices of the M211-series motion controller via the RS232 communication interface. Each RS232 communication interface can connect to one slave when acting as a master. When the controller acts as a slave, the station number range is 1~255, and broadcast functionality is not supported.

6.5.3 RS232 bus network topological architecture

RS232 channel 1 wiring	RS232 channel 2 wiring
	

6.5.4 RS232 supported communication format

The RS232 communication interface supports ASCII or RTU communication formats, with a maximum baud rate of up to

115200 bps.

Baud rate	9600; 19200; 38400; 57600; 115200					
Mode	ASCII				RTU	
Communication format	7,E,1	7,E,2	7,N,1	7,N,2	8,E,1	8,E,2
	7,O,1	7,O,2	8,E,1	8,E,2	8,N,1	8,N,2
	8,N,1	8,N,2	8,O,1	8,O,2	8,O,1	8,O,2

6.5.5 Function codes and exception response codes supported by RS232

◆ The function codes supported by the RS232 communication interface of the M211-series motion controller are listed in the table below:

Category	Function code	Description	Broadcastable (Y/N)	Read/Write maximum length	Operable device
Bit device	0x01	Definition: Read the value of bit devices. M-series controller bit device values can all be read using function code 01.	N	256	%IX,%QX
	0x02	Definition: Read the value of input bit devices. M-series controller bit device values can all be read using function code 02.	N	256	%IX,%QX
	0x05	Write the value of a single bit device.	Y	1	%QX
	0x0F	Write the values of multiple bit devices.	Y	256	%QX
Word device	0x03	Read the value of single or multiple word devices.	N	100	%MW,%QW,%IW
	0x04	Definition: Read the value of single or multiple input word devices. M-series controller word device values can all be read using function code 04.	N	100	%MW,%QW,%IW
	0x06	Write the value of a single word device.	Y	1	%MW,%QW
	0x10	Write the values of multiple word devices.	Y	100	%MW,%QW
	0x17	Read/Write the value of single or multiple word devices.	Y	100	%MW,%QW, %IW (read only)

◆ The following table lists the exception response codes supported by the RS232 communication interface of the M211-series motion controller:

Exception re- sponse code	Description	Troubleshooting
1	The slave does not support the function code specified by the master.	Specify a function code supported by the slave.
2	The slave does not support the Modbus address specified by the master.	Specify a Modbus address supported by the slave.
3	The read/write data length specified exceeds the limit.	When the controller acts as a slave: For word devices, the maximum read/write length per operation is 100 WORDs. For bit devices, the maximum read/write length per operation is 256 bits. The controller returns this exception code if the limits are exceeded.
7	The checksum calculated by the master and slave differs.	Confirm that the baud rate and communication format of the master and slave are consistent. Check for interference near the bus. Check that the bus is a shielded cable. Ensure both the master and slave are grounded.

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