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MCR7 Series PLC and Expansion Module Hardware Manual

Version: 02

Release Date: 2026-10-14

Revision History

Date	Version	Revision
2026-05-26	01	Initial publication
2026-10-14	02	Wiring Information Updated

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Preface

Overview

This manual provides a detailed introduction to the hardware structure and specifications of the MCR7 series PLC and its expansion modules.

The content provided in this manual is for general guidance only and does not guarantee coverage of all usage scenarios for all models of products. Due to reasons such as version upgrades, device models, and configuration files, the content provided in this manual may not be consistent with the actual user interface of the equipment used. Please refer to the actual information of the user equipment interface as the standard, and no further explanation will be provided for the differences caused by the aforementioned situations.

For the purpose of functional introduction and configuration examples, the manual may use IP addresses, website URLs, domain names, etc. Unless otherwise specified, the aforementioned content is for illustrative purposes only and does not represent any actual significance.

Target Reader

This document is mainly intended for readers who are interested in learning about the hardware structure and specifications of MCR7 series PLC and its Expansion modules, including hardware engineers, installation engineers, etc. This document assumes that readers have a certain level of knowledge in the following areas:

- Basic network communication protocols such as TCP/IP
- Modbus protocol
- PLC operating principle

Format Convention

This manual follows the following content formatting conventions:

Content	Description
Bold	Bold represents the names and contents of various controls on the software interface. For example, "Select **Window/Current Window Properties** from the menu bar to enter the **Modify Window** page, and select the **Timer** tab."
/	When describing the operation steps on the software interface, slash is used to isolate the clicked objects (menu item, sub-menu, button, etc.). For example, “Select **Component/Switch/Bit Set** from the menu bar, and create a new bit set switch component”.

Content	Description
Italic	Variables, must be replaced by actual values accordingly. For example, “Enter ‘ftp://*the IP of HMI*’ in the browser address bar, and press Enter to enter the file directory interface of the HMI.”

This manual follows the icon formatting conventions below.

Icon	Description
	Tips, operation tips for users to solve problems.
	Description, supplementary and explanatory information for the main text.
	Reminder, reminders for operation precautions, improper operation may cause potential device damage or data loss.
	Warning, the content following this icon requires special attention, otherwise it may result in personal injury.

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1 MCR7 Series PLC

1.1 Product Overview

The MCR7 series PLC is a new generation PLC with integrated advanced industry technology and components. The MCR7 series PLC adopts an object-oriented programming design philosophy, conforms to the IEC61131-3 standard, supports ladder diagram and structured text (ST) programming languages, is compatible with Japanese and European programming methods, and takes into account user habits and the implementation of complex calculation functions. The motion control function meets the PLCOPEN specification.

The object-oriented structured task programming method complies with international standards and industry trends, reduces user difficulty, and extends the product life cycle. The companion programming software MCR Master is based on the current advanced development platform, natively supports cloud architecture; provides a graphical programming configuration interface, with a clear view of device hardware configuration and operating status; the convenient printing function can effectively reduce the workload of engineering archiving, and one-click project document delivery.

1.2 System Structure

The MCR7 series PLC connects to Expansion modules through the connection interfaces on both sides of the main unit.

The CPU of the MCR7 series PLC can connect up to 12 Expansion modules at right side.

Due to the limitations of the CPU's power supply capacity, the exact number of Expansion modules that the CPU can carry is determined by the types and specifications of the modules carried in the specific project.

1.3 Hardware Specifications

Please refer to the table below for the hardware specifications of each model.

Model	Power supply	Input points	Output points	High-speed counting (points)	Pulse output (points)	Ethernet communication ports
MCR7-DN16	24V DC	8	8(NPN)	8	8	1
MCR7-DP16		8	8(PNP)	8	8	1
MCR7-DR14		8	6(RELAY)	8	0	1
MCR7-DN16 01		8	8(NPN)	8	8	1
MCR7-DP16 01		8	8(PNP)	8	8	1
MCR7-DR14 01		8	6(RELAY)	8	0	1

*** 01 models do not support I/O expansion.**

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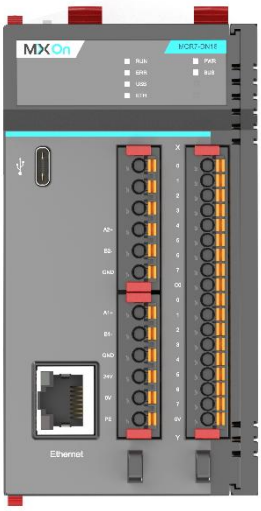
2 Hardware Structure

2.1 Device Appearance



2.2 Component Characteristics

2.2.1 CPU and Memory(Storage)

The MCR7 PLC has built-in 2MB RAM and 2MB ROM. The usable areas for the user are 192KB and 2MB, respectively. The corresponding storage areas are as follows.

Storage Areas	Storage Content
ROM (2MB)	User projects, user configurations, communication configurations, etc.
RAM (192KB)	Variables, variables for mapping addresses, data generated by communication configurations, etc.

2.2.2 Communication Port

The MCR7 series PLC has the following types of built-in communication ports:

- Ethernet port
- USB port (Type-C)
- Serial communication port

2.2.3 General Input/Output

MCR7 has the following types of built-in I/O:

- Digital input
- High-speed pulse input
- High-speed pulse output
- Conventional transistor output

The high-speed channel and hardware mapping relationship is shown in the following figure:

		AB	ABZ	UpDown	PulseDir
HSC0	I0	A	A	Up	Pulse
	I1	B	B	Down	Dir
HSC1	I2	A	Z	Up	Pulse
	I3	B		Down	Dir
HSC2	I4	A	A	Up	Pulse
	I5	B	B	Down	Dir
HSC3	I6	A	Z	Up	Pulse
	I7	B		Down	Dir

		PTO-PulseDir	PWM
PTO0	Q0	Pulse	Output
PTO1	Q1	Pulse	Output
PTO2	Q2	Pulse	Output
PTO3	Q3	Pulse	Output
PTO4	Q4	Pulse	Output
PTO5	Q5	Pulse	Output
PTO6	Q6	Pulse	Output
PTO7	Q7	Pulse	Output

2.2.4 High-speed Transistor Input

Characteristic		**Parameter**
Rated voltage		24V DC
Current input range		19.2~28.8V DC
Logic type		NPN/PNP
Rated input current		0.1A
Input impedance		2.8KΩ
Input limit	Voltage in status 1	> 15V DC (15~28.8V DC)
	Voltage in status 0	< 5V DC (0~5V DC)
	Current in status 1	> 5 mA
	Current in status 0	< 1.5 mA
HSC maximum frequency	A/B phase	100kHz
	Pulse/direction	200kHz
	Uni-phase	200kHz
Supported operation modes		◆ A/B phase counting ◆ Pulse/direction counting ◆ Single-phase/Dual-phase counting
Cable length		Maximum 5m
Cable type.		Shielded cable, including 24V DC power supply cable
Terminal block		Removable screw terminal

2.2.5 High-speed Transistor Output

Characteristic	Parameter
Rated voltage	24V DC
PTO power input range	19.2~28.8V DC
Whether support PTO reverse power supply protection	Yes
Output type	NPN or PNP depending on the model
PTO/PWM output current	0.5A (when used for ordinary output)
	0.1A (when used for high-speed output)
Insulation resistance	> 10 MΩ
Leakage voltage	< 1.5V (current is 0.1A)
Minimum load impedance	80Ω
Maximum PTO output frequency	NPN output: 200kHz PNP output : 100kHz
Operation mode	Pulse + direction output
Cable length	Maximum 5m
Cable type	Shielded cable, including 24V DC power supply cable
Terminal block	Removable screw terminal

2.2.6 Relay Output Characteristics

Item		Specification
Rated Voltage		24V DC; 220V AC
Input Range		5~30V DC; 100~250V AC
Rated Current		Maximum 2A per point
Current/group (4 points)		4A (Relay output, requires derating by 50% at 60℃)
Peak	Maximum switching voltage	250V AC, 30V DC
	Current/point	4A
Isolation type		relay coil
Maximum output frequency	maximum load	0.1Hz
	no load	5Hz
Resistive Load		2A per point, 24V DC / 220V AC
Mechanical Life		At least 5,000,000 times
Electrical Contact Life		At least 100,000 times
Short Circuit Protection		No
Terminal block		Removable Terminal Block

2.2.7 Expansion Module

The number of I/Os can be extended by adding I/O modules to the controller. The types of Expansion modules are as follows:

- Digital input module
- Digital output module
- Digital input/output module
- Analog input module
- Analog output module
- Temperature sensor input module

2.2.8 Real-time Clock

The MCR7 series PLCs are all equipped with built-in RTCs (real-time clocks), which not only provide system date and time information, but also support functions that require a real-time clock. Even after external power is cut off, the real-time clock can still run for one year using the built-in power supply.

3 Device Installation

3.1 Installation Precautions

The MCR7 series PLC can be installed on a panel or standard rail, and can be mounted horizontally or vertically. The size of the MCR7 series PLC is relatively small, allowing users to efficiently utilize space. To avoid device damage or personal injury due to improper use, please follow these precautions:

- Before installing the control system on the mounting rail, mounting plate or panel, all components and modules should be properly assembled. Remove the control system from the mounting rail, mounting plate or panel first, and then disassemble the device.
- According to the electrical equipment standards, the MCR7 series PLC is an open-type device. The MCR7 series PLC must be installed inside an enclosure, control cabinet, or power control room. Only authorized personnel are allowed to open the enclosure, control cabinet, or enter the power control room.
- The PLC should be installed in a dry environment.
- In accordance with applicable electrical and building standards, during installation, approved mechanical strength, flammability protection, and stability protection should be provided for open-type devices in specific locations.
- Conductive pollution caused by dust, humidity, and atmospheric contamination can lead to operational failure and electrical failure in the PLC.
- If the PLC is placed in an area that may have conductive pollution, the PLC must be protected by an enclosure with an appropriate protection level
- Isolate the PLC from thermal radiation source, high voltage and electrical noise.
- As a basic rule for arranging various equipment in the system, devices that generate high voltage and high electrical noise must be isolated from low-voltage logic devices such as the PLC.
- When installing the PLC on a panel, take the heat-generating equipment into consider and arrange the electronic devices in the cooler areas of the control cabinet. Minimizing exposure to high-temperature environment will extend the service life of all electronic devices.
- In addition, the wiring of the devices in the panel should also be taken into consider. Avoid routing low-voltage signal wires and communication cables in the same ducts with AC power lines and high-energy fast-switching DC lines.

3.2 Safety Requirements

3.2.1 Enclosure Requirements

The MCR7 series PLC system components are designed as Class A industrial equipment for Zone B according to the published IEC standards.

If used in environments other than those described in this standard, or in environments that do not meet the specifications in this manual, the ability to meet electromagnetic compatibility requirements (if there is conducted interference and/or radiated interference) may be reduced.

All MCR7 series PLC system components comply with the requirements for open-type devices defined by the

European Union (CE) in EN61131-2. These components must be installed in a dedicated enclosure for the specific environmental conditions to minimize the possibility of accidental contact with dangerous voltages. Using a metal enclosure can improve the electromagnetic immunity of the MCR7 series PLC system. Using an enclosure with a keyed locking mechanism can minimize unauthorized access as much as possible.

3.2.2 Environment Characteristics

This device complies with the CE requirements listed in the table below. This device is intended for use in an industrial environment with pollution degree 2. Please refer to the table below for the specific requirements.

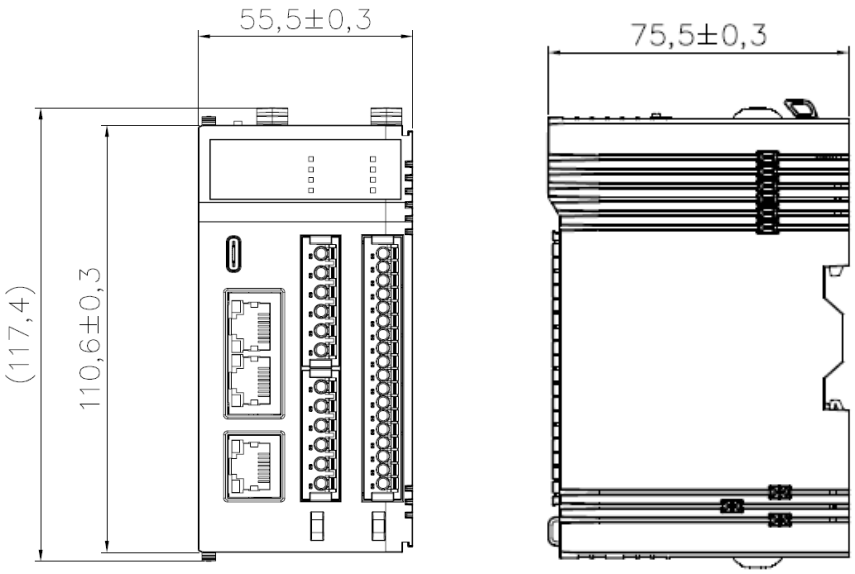
Category	**Characteristic**
Operation environment temperature	-10℃~60℃
Storage temperature	-20℃~70℃
Relative humidity	55%~95%, no condensation.
Pollution level	2（IEC60664）
Protection level	IP20
Coating	Coating protection, dry film thickness ≥20μm; enhanced dry film thickness ≥40μm
Altitude	Operation: 0m~3,000m Transportation: ≤6,000m
Anti-seismic performance	5Hz~13.2Hz, amplitude 7mm; 13Hz~100Hz, acceleration 2G, 20 times in the X, Y, and Z axis directions
Shock resistance	Half-sine wave, acceleration 15G, duration 11ms, 6 times in the X, Y, and Z axis directions.

3.2.3 Electromagnetic Susceptibility

The MCR7 series PLC system meets the electromagnetic compatibility specifications described in the table below.

Standard	Method	Item
EN IEC 61000-6-4:2019	CISPR 16-2-1	Conducted Emissions at AC Mains Power Port (150kHz-30MHz)
	CISPR 32	Conducted Emissions at Wired Network Port(150kHz-30MHz)
	CISPR 16-2-3	Radiated Emissions(30MHz-1GHz)
	CISPR 16-2-3	Radiated Emissions(Above 1GHz)
EN IEC 61000-6-22019	EN 61000-4-6:2014	Conducted Immunity at AC Mains Power Port(150kHz-80MHz)
	EN 61000-4-6:2014	Conducted Immunity at Signal Port(150kHz-80MHz)
	EN 61000-4-4:2012	Electrical Fast Transients Burst at AC Mains Power Port
	EN 61000-4-4:2012	Electrical Fast Transients Burst at Signal Port
	EN 61000-4-2:2009	Electro static Discharge
	EN 61000-4-8:2010	Power FrequencyMagnetic Field
	EN IEC 61000-4-3:2020	Radiated Immunity(80MHz-6GHz)
	EN 61000-4-5:2014+A1:2017	Surge at AC MainsPower Port
	EN 61000-4-5:2014+A1:2017	Surge at Signal Port
	EN IEC 61000-4-11:2020	Voltage Dips and Interruptions

3.3 CPU Dimension



Unit: mm

Model	Rail size	Overall Dimension
		W×H×D
MCR7-* (CPU Module)	35	56×111×76

3.4 Ventilation Requirements

The device should be installed in a well-ventilated cabinet, and ensure that there is enough space around the device to dissipate heat .

- Install the device with the highest heat dissipation at the top of the cabinet to ensure proper ventilation.
- Do not install this device next to or above equipment that may cause overheating.
- To ensure roper operation of the device, please ensure that the operating environment temperature is from 0℃ to 50℃.

3.4.1 Minimum Clearance

To ensure normal heat dissipation of the device, please keep sufficient clearance distance. There are 3 types of clearances as follows:

- The clearance between the device and all sides of the cabinet (including the panel door).
- Clearance between the terminal block and the wiring duct. This distance reduces electromagnetic interference between the controller and the wiring duct.
- Clearance between this device and other heat generating equipment installed in the same cabinet.

Minimum clearance requirements for PLC installation (the space between PLC upper panel, lower panel, left panel, right panel and the sides of the cabinet is at least 30mm, and the space between PLC front panel and the panel door is at least 80mm).

3.4.2 Anti-foreign Matter Sticker

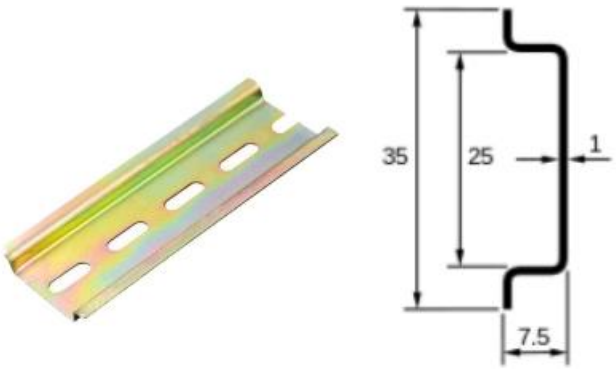
Do not remove the anti-foreign matter protective sticker during installation to avoid foreign matter falling into the inside of the machine, which may cause short circuits and other failures; when installation is completed, the anti-foreign matter protective sticker must be removed before powering on to avoid poor heat dissipation causing the PLC to overheat and malfunction.

3.5 Install the Device on DIN Rail

The device can be installed to the cabinet through DIN rail. The operation steps are as follows:

Step 1. Prepare DIN rails with the following specifications and install the DIN rails into the cabinet.

The recommended DIN rail for PLC installation is 35 mm high and 7.5 mm deep.



Step 2. Press the installation clips of the MCR7 to open the DIN rail installation slot. Then clip the MCR7 onto the DIN rail.

Step 3. Press the installation clips of MCR7 to lock the MCR7 on DIN rail.

4 Wiring

4.1 Safety Precautions

- Before removing any covers or doors, or installing or removing any components, hardware, cables or wires, disconnect the power connection of all equipment (including connected devices), except for special cases specified in the corresponding hardware manual of this equipment.
- Always use a properly rated voltage sensor to confirm that all power sources have been turned off at the indicated locations and times.
- After replacing and tightening all covers, components, hardware, cables and wires, and after confirming it is correctly grounded, power on the equipment.
- Specified voltage must be used when operating this device and related products.

4.2 Wiring Rules and Suggestions

4.2.1 Wiring Rules

The rules below must be followed when wiring PLC:

- I/O and communication cable must be separate from power cable. These two types of wiring cannot be routed in the same cable duct.
- Check whether the operating conditions and environment are within the specified allowable range.
- The specifications of the cables used must meet the voltage and current requirements.
- Only copper conductors can be used.
- Shielded twisted-pair cables must be used for analog and high-speed I/O.
- Use shielded twisted-pair cables for encoders, networks, and field buses.

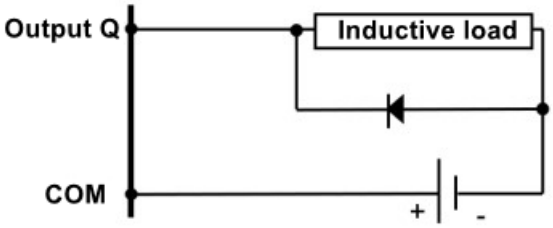
4.2.2 Wiring Suggestions

- Multiple grounding is allowed if connected to an equipotential ground to avoid damage to the cable shielding when a short-circuit current occurs in the power system.
- The cross-sectional area of the wires for the plug-in screw terminal blocks should be 0.33 to 2 square millimeters.
- Screw head: diameter 2.5 to 3.0 mm, slotted screwdriver torque (0.5N*m).
- Wire stripping length: 6.4 mm.
- Protect the output from being damaged by inductive loads.

4.2.3 Protective Circuit

The controller and specific module outputs may require protection circuits based on the load. Using inductive loads powered by DC voltage may generate voltage reflections that can cause overshoot, potentially damaging the output devices or shortening their service life.

- Protective circuit B: This protection circuit can be used for DC load power supply circuits.



Use a diode with the following ratings:

- Reverse withstand voltage rating: 10 times the power supply voltage of the load circuit.
- Forward current rating: Greater than the load current.

4.3 Earthing

The equipment needs to be earthed, including functional earth (to reduce electromagnetic interference between cables) and protective earth (to prevent electric leakage or lightning strikes).

For protective earth (PE), metal pipes or conductors can be used as part of the shielding length, provided the entire earthing connection is continuous and uninterrupted. For functional earth (FE), shielding is used to reduce electromagnetic interference, and the shielding of the entire cable must be continuous and uninterrupted. If the cable serves both functional and protective purposes (which is often the case for communication cables), the cable shielding must be continuous and uninterrupted. Whenever possible, cables carrying different types of signals or power should be kept separated.

Cables that carry high-speed I/O, analog I/O, and fieldbus communication signals must be shielded in the following ways:

Shielded cables must be firmly earthed. The shielding of high-speed I/O and analog I/O cables can be connected to the functional earth (FE) or protective earth (PE) points of the PLC. The shielding of fieldbus communication cables must be connected to the protective earth (PE) point using connecting clamps fixed to the conductive backplane.

The shielding of the following types of cables must be connected to the protective earth (PE) point:

- Ethernet
- Modbus

4.4 Connect Power Supply

Before connecting the power supply, please ensure that the device is properly grounded.

Before powering up the device:

- Remove any tools, instruments, and debris from the device.
- Close the device cabinet doors.
- Disconnect the ground wire from the input power supply cable.
- Perform all start-up tests recommended by the manufacturer.

4.4.1 Connect DC Power Supply

Safety precautions

- If the voltage cannot be kept within the specified range, the output may not be able to switch as expected. Please use appropriate safety interlocks and voltage monitoring circuits.
- According to IEC61140, 24V DC power supplies must be rated as Safety Extra-Low Voltage (SELV) or Protected Extra-Low Voltage (PELV). These power supplies are isolated between the electrical input and output circuits of the power supply.
- PLC must be supplied by a 24V external power supply unit. According to IEC standards, during a power failure, the PLC associated with the appropriate power supply must be able to operate normally for at least 10ms.
- For relay output (greater than or equal to 2A) wiring, please use conductors with a cross-sectional area of at least 0.5 square millimeters and a rated temperature of at least 80° C.

The MCR7 series PLC models that support DC power must be supplied by a DC 24V external power supply unit. The requirements for the characteristics of the DC power supply are as follows:

Characteristic	Value
Rated voltage	24V DC
Power voltage range	20.5~28.8V DC
Power interruption time	10 milliseconds at 24V DC
Maximum peak current	35A
Maximum power consumption	20W

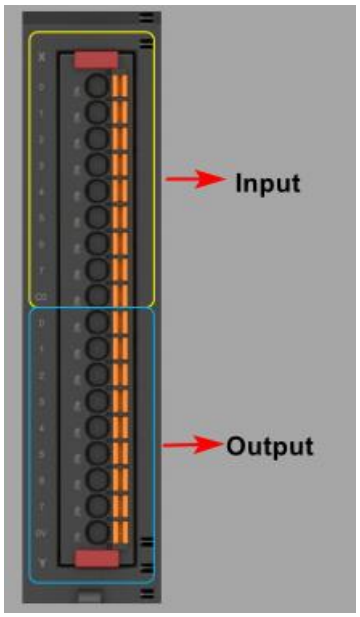
The steps to connect the DC power supply wires are as follows:

Step 1. Connect the positive terminal of the external DC power supply to the "+" terminal of the PLC DC power input.

Step 2. Connect the negative terminal of the external DC power supply to the "-" terminal of the PLC DC power input.

4.5 Connect Input/Output Terminal

The definitions of the MCR7 series PLC input/output terminal are as follows:



From top to bottom are the input X area and the output Y area. Refer to the table below for detailed definitions.

Input X area

Sign	0	1	2	3	4	5	6	7	C0
Definition	Input 0	Input 1	Input 2	Input 3	Input 4	Input 5	Input 6	Input 7	Input common port

Output Y area（NPN）

Sign	0	1	2	3	4	5	6	7	0V
Definition	Output 0	Output 1	Output 2	Output 3	Output 4	Output 5	Output 6	Output 7	Output common port

Output Y area（PNP）

Sign	0	1	2	3	4	5	6	7	P+
Definition	Output 0	Output 1	Output 2	Output 3	Output 4	Output 5	Output 6	Output 7	Output common port

Output Y area（Relay）

Sign	0	1	C1	2	3	C2	4	5	C3
Definition	Output 0	Output 1	Output common port	Output 2	Output 3	Output common port	Output 4	Output 5	Output common port

4.6 Connect USB Interface

Users can program and debug the PLC through the USB interface. The steps to connect the USB interface are as follows:

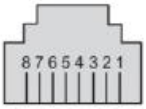
Step 1. Connect the Type-C end of the USB cable to the USB interface of the PLC.

Step 2. Connect the Type-A end of the USB cable to the USB interface of the PC.

4.7 Connect Ethernet Interface

The Ethernet interface of the PLC is an RJ45 interface, with a rate of 10M/100Mbit/s, auto-adaptive half-duplex/full-duplex.

The diagram below shows the pin definitions of the Ethernet connector.



Pin No.	Signal
1	TD+
2	TD-
3	RD+
4	-
5	-
6	RD-
7	-
8	-

Connect the Ethernet port of the PLC to the Ethernet port of the peer device (such as a PC) with a standard Ethernet cable.

5 Technical Specifications of Expansion Module

5.1 General Technical Specifications of Expansion Module

Item	Description
Module failure alarm	Supported
Isolation withstand voltage	500V
Certified test	CE
Protection level	IP20
Working temperature	-25℃~+60℃
Storage temperature	-40℃~+85℃
Relative humidity	95%, no condensation
Dimension（W*H*D）	18mm × 111mm × 76mm

5.2 Technical Specifications of Digital Expansion Module

The corresponding digital Expansion modules are provided as below.

Model	Input points	Output points
MCR-DI16	16 (NPN/PNP)	0
MCR-DX16-N	8 (NPN/PNP)	8 (NPN)
MCR-DX16-P	8 (NPN/PNP)	8 (PNP)
MCR-DO16-N	0	16 (NPN)
MCR-DO16-P	0	16 (PNP)
MCR-DO06-R	0	6 (Relay)

Digital input characteristic		Parameter
Rated voltage		24V DC
Input range		0~28.8V DC
Rated current		7mA
Peak value	Voltage	30V
	Current	9mA
Status	Voltage (status 1)	>15V，15V~28.8V
	Voltage (status 0)	<5V，0V~5V
	Current (status 1)	>2.5mA
	Current (status 0)	<1.0mA
Isolation	-	Optocoupler
Input impedance		3.3kΩ
Filter time		No filtering
Compatibility		Compatible with 2-wire/3-wire sensors
Input type		Source/sink

Digital output characteristic	Parameter
Output type	NPN/PNP depending on the model
Rated voltage	24V DC
Voltage range	19.2~28.8V DC
Rated current	0.5A
Current for each group	0.5A*Number of output points of each group
Voltage drop	Maximum 1V DC
Leakage current when turned off	<5μA
Maximum power of incandescent light	2.4W
Derating	No
Turn-on time	Maximum 34μs
Turn-off time	Maximum 250μs
Maximum output frequency	1kHz
Short circuit protection	Supported
Short-circuit output peak current	1.3A
Self-recovery after short-circuit or overload	Every 10ms
Clamping voltage	Maximum 39±1V DC
Isolation	500V AC between output and internal logic
Electrical channel type	Unshielded
Cable length	Unshielded cable, 50m
Terminal block	Removable terminal block

5.3 Technical Specifications of Analog Input Module

The corresponding analog Expansion module is provided as below.

Model	Number of input channels	Number of output channels
MCR-AI04	4	0

Characteristic	Parameter	
Input range	◆ Voltage input: -10 ~ 10V or 0~10V DC ◆ Current input: 0 ~ 20mA or 4 ~ 20mA	
Input impedance	◆ Voltage input: >200KΩ ◆ Current input: 237.5~262.5Ω	
I/O terminal	Removable terminal block	
Sampling time	1 ms /channel*number of channels+ 1 scanning cycle	
Total input system transmission time	4 ms+1 scanning cycle	
Input deviation	Maximum ±0.2% * full scale range	
Resolution	16-bit signed	
Temperature drift	±0.06% * full scale range, unit ℃	
Common mode rejection	40dB, DC to 60Hz	
Noise rejection	400, 60, 50 or 10Hz	
Nonlinearity	±0.4 % * full scale	
Maximum operating input (without damage)	±30 V DC	±30mA DC
Protection type	Isolation between input and internal power supply	
Incorrect configuration (Voltage -> Current):	◆ When the input is within ±30V DC, it will not cause damage. ◆ When the input exceeds ±30V DC, it will cause permanent damage.	
Incorrect configuration (Current -> Voltage):	◆ When the input is within ±30mA, it will not cause damage. ◆ When the input exceeds ±30mA, it will cause permanent damage.	
Wire type	Shielded cable	
Wire length	Shielded cable 3m~30m	

5.4 Technical Specifications of Analog Output Module

The corresponding analog Expansion module is provided as below.

Model	Number of input channels	Number of output channels
MCR-AO04	0	4
MCR-AX04	2	2

Characteristic	Parameter
Output range	◆ Voltage output: 0 ~10V DC ◆ Current output: 0 ~ 20 mA or 4~20mA
I/O terminal	Removable terminal block
Load impedance	◆ Voltage output: >2kΩ ◆ Current output: <500Ω
Load type	Resistive load
Settling time	750μs
Total output system transmission time	3 ms + 1 scanning cycle
Output deviation (total deviation)	±0.5 % of full scale
Resolution	16-bit signed
Temperature drift	±0.06% * full scale, unit℃
Nonlinearity	±0.5 %*full scale
Protection type	Isolation between input and internal power supply
Output protection	◆ Short-circuit proof, no damage (voltage output) ◆ Open-circuit protection (current output)
Cable type	Shielded cable
Cable length	Shielded cable 3m~30m

5.5 Technical Specifications of Temperature Sensor Module

Model	Number of input channels	Sensor type
MCR-TI04-K	4	K, J, R, S, B, E, T, N, C type thermocouple; NTC
MCR-TI04-P	4	PT100, PT1000, NI100, NI120, NI1000, Cu50, Cu100

Characteristic	Input characteristics of thermocouple temperature sensor
Rated power consumption	≤40mA (fully loaded)
Rated power supply	Bus 24V DC
Input sensor type	K, J, R, S, B, E, T, N, C type thermocouple; NTC
Resolution	Temperature: 0.1℃ Resistance: 15-bit signed
Measurement deviation (at 25 ° C environment emperature)	◆ Thermocouple: ±0.3% or ±1℃ of the displayed value, whichever is greater ◆ NTC: ±0.1% or ±1℃ of the displayed value, whichever is greater
Influence of measurement temperature (temperature range: -20℃～60℃)	◆ Thermocouple input (R, S, B, C): ±1% or ±2.5° C of PV, whichever is greater ◆ Other thermocouple input: ±1% or ±1° C of PV, whichever is greater
Connector type	Screw terminal
Signal type	Electric isolation
Input impedance	≥1 MΩ
Sampling cycle	≤100ms/channel
Input minimum value	0.1℃
Over-range detection	Supported
Disconnection alarm	Supported
Input filter	0~10s (0.01s as unit)
Measurement range	◆ K：–200~1300℃ ◆ J：–200~1000 ℃ ◆ R：0~1760℃ ◆ S：0~1760℃ ◆ B：0~1820 ℃ ◆ E：200~800℃ ◆ T：–200~400℃ ◆ N：–200~1300℃ ◆ C：0~2315℃ NTC： Measurement resistance range: 100 Ω~200 kΩ Calculation temperature range: -90~150℃

Characteristic	Input characteristics of RTD temperature sensor
Rated power consumption	≤30mA (fully loaded)
Rated power supply	Bus 24V DC
Input sensor type	PT100, PT1000, NI120, NI1000, Cu50, Cu100
Resolution	0.1℃
Measurement deviation (at 25 ° C environment emperature)	±0.5% or ±1℃, whichever is greater
Influence of environment temperature (temperature range: -20℃～60℃)	◆ Pt100, Pt1000, Ni120, Ni1000: ±1% or ±1℃ of PV , whichever is greater ◆ Cu50, Cu100：±1% or ±1.5℃of PV , whichever is greater
Input impedance	≥1 MΩ
Sampling cycle	≤100ms/channel
Input minimum value	0.1℃
Over-range detection	Supported
Disconnection alarm	Supported
Input filter	0~10s (0.01s as unit)
Measurement range	◆ Pt100：–200~850℃ ◆ Pt1000：–200~600℃ ◆ Ni100：–60~180℃ ◆ Ni120：–60~180℃ ◆ Ni1000：–60~180℃ ◆ Cu50：-50~150℃ ◆ Cu100：-50~150℃

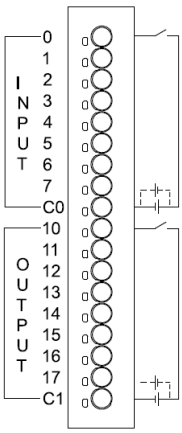
5.6 Expansion Module Terminal Definitions and Wiring Diagram

5.6.1 Digital Input Module (MCR-DI16)

Input X Area

Symbol	0	1	2	3	4	5	6	7	C0
Definition	Input 0	Input 1	Input 2	Input 3	Input 4	Input 5	Input 6	Input 7	Input Public Terminal
Symbol	10	11	12	13	14	15	16	17	C1
Definition	Input 10	Input 11	Input 12	Input 13	Input 14	Input 15	Input 16	Input 17	Input Public Terminal

Terminal Wiring Diagram



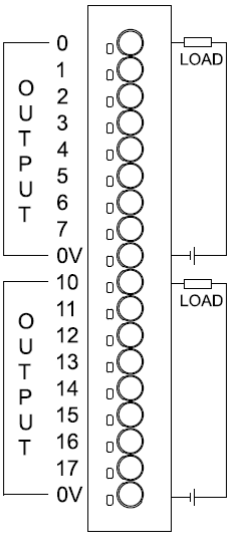
Note: The connection method for the power supply indicates that either the positive or negative terminal can be connected.

5.6.2 Digital Output Module (MCR-DO16-N)

Output Y Area

Symbol	0	1	2	3	4	5	6	7	0V
Definition	Output 0	Output 1	Output 2	Output 3	Output 4	Output 5	Output 6	Output 7	Output Public Terminal
Symbol	10	11	12	13	14	15	16	17	0V
Definition	Output 10	Output 11	Output 12	Output 13	Output 14	Output 15	Output 16	Output 17	Output Public Terminal

Terminal Wiring Diagram

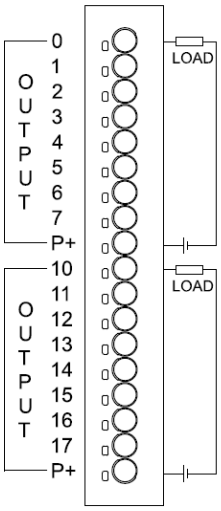


5.6.3 Digital Output Module (MCR-DO16-P)

Output Y Area

Symbol	0	1	2	3	4	5	6	7	P+
Definition	Output 0	Output 1	Output 2	Output 3	Output 4	Output 5	Output 6	Output 7	Output Public Terminal
Symbol	10	11	12	13	14	15	16	17	P+
Definition	Output 10	Output 11	Output 12	Output 13	Output 14	Output 15	Output 16	Output 17	Output Public Terminal

Terminal Wiring Diagram



5.6.4 Digital Mixed Module (MCR-DX16-N)

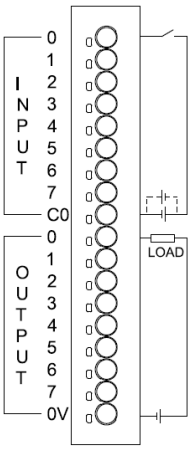
Input X Area

Symbol	0	1	2	3	4	5	6	7	C0
Definition	Input 0	Input 1	Input 2	Input 3	Input 4	Input 5	Input 6	Input 7	Input Public Terminal

Output Y Area

Symbol	0	1	2	3	4	5	6	7	0V
Definition	Output 0	Output 1	Output 2	Output 3	Output 4	Output 5	Output 6	Output 7	Output Public Terminal

Terminal Wiring Diagram



Note: The connection method for the power supply indicates that either the positive or negative terminal can be connected.

5.6.5 Digital Mixed Module (MCR-DX16-P)

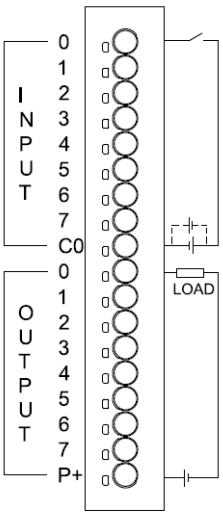
Input X Area

Symbol	0	1	2	3	4	5	6	7	C0
Definition	Input 0	Input 1	Input 2	Input 3	Input 4	Input 5	Input 6	Input 7	Input Public Terminal

Output Y Area

Symbol	0	1	2	3	4	5	6	7	P+
Definition	Output 0	Output 1	Output 2	Output 3	Output 4	Output 5	Output 6	Output 7	Output Public Terminal

Terminal Wiring Diagram

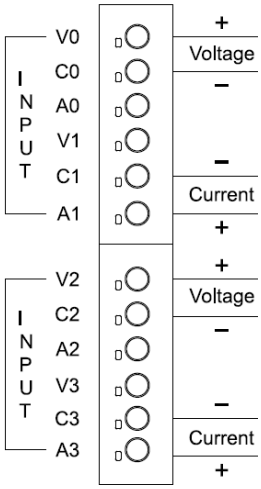


5.6.6 Analog Input Module (MCR-AI04)

Input Area

Symbol	V0	C0	A0	V1	C1	A1	V2	C2	A2	V3	C3	A3
Definition	Voltage input 0	Common terminal0	Current input 0	Voltage input1	Common terminal1	Current input1	Voltage input2	Common terminal2	Current input2	Voltage input3	Common terminal3	Current input3

Terminal Wiring Diagram

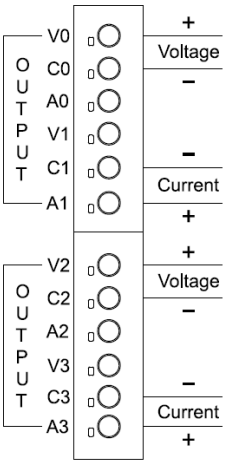


5.6.7 Analog Output Module (MCR-AO04)

Output Area

Symbol	V0	C0	A0	V1	C1	A1	V2	C2	A2	V3	C3	A3
Definition	Voltage output0	Common terminal0	Current output 0	Voltage output1	Common terminal1	Current output1	Voltage output2	Common terminal2	Current output2	Voltage output3	Common terminal3	Current output3

Terminal Wiring Diagram

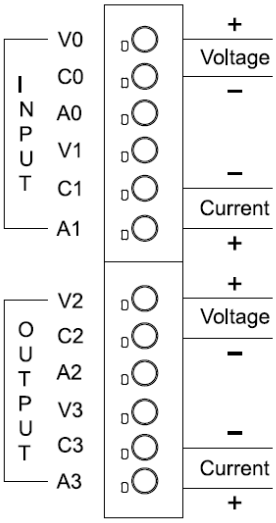


5.6.8 Analog Mixed Module (MCR-AX04)

Input Area / Output Area

Symbol	V0	C0	A0	V1	C1	A1	V2	C2	A2	V3	C3	A3
Definition	Voltage input 0	Common terminal0	Current input 0	Voltage input1	Common terminal1	Current input1	Voltage output2	Common terminal2	Current output2	Voltage output3	Common terminal3	Current output3

Terminal Wiring Diagram

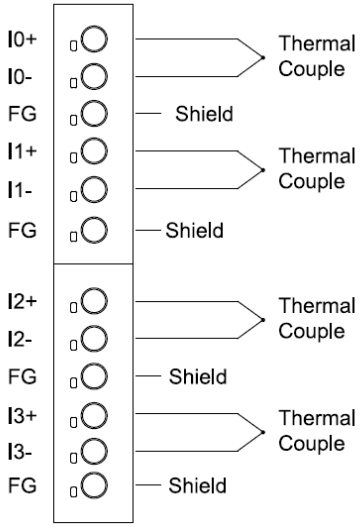


5.6.9 Temperature Sensor Module (MCR-TI04-K)

Input Area

Symbol	I0+	I0-	FG	I1+	I1-	FG	I2+	I2-	FG	And3	And3	FG
Definition	Thermocouple+	Thermocouple-	Shielded wire	Thermocouple+	Thermocouple-	Shielded wire	Thermocouple+	Thermocouple-	Shielded wire	Thermocouple+	Thermocouple-	Shielded wire

Terminal Wiring Diagram

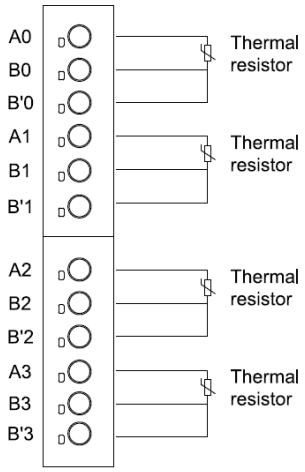


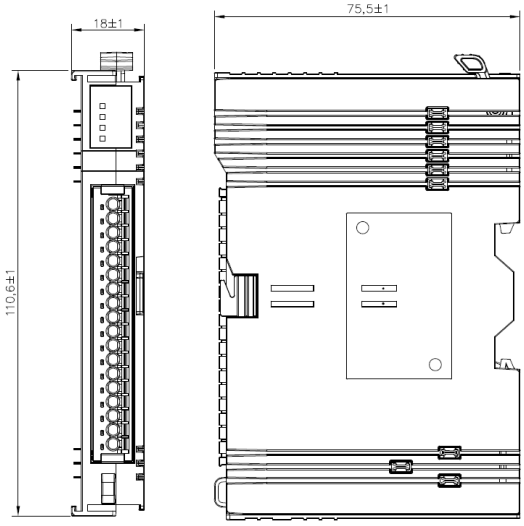
5.6.10 Temperature Sensor Module (MCR-TI04-P)

Input Area

Symbol	A0	B0	B'0	A1	B1	B'1	A2	B2	B'2	A3	B3	B'3
Definition	Platinum Resistance A	Platinum Resistance B	Platinum Resistance B'	Platinum Resistance A	Platinum Resistance B	Platinum Resistance B'	Platinum Resistance A	Platinum Resistance B	Platinum Resistance B'	Platinum Resistance A	Platinum Resistance B	Platinum Resistance B'

Terminal Wiring Diagram



5.7 Expansion Module Dimension

Unit: mm