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User Manual
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MR

MRS

MRM

MRMS

MR□ Panel Type Distributed I/O

ETHERCAT protocol
Remote IO Module
Distributed IO Module

CATALOGUE

1.Preface

1.1 Document Usage Instructions

This document describes the product's functional specifications, installation, operation and settings, as well as the content related to network protocols. This document is only applicable for trained electrical automation engineers.

(1) Disclaimer

The author has conducted necessary checks on the document, but as the product evolves and upgrades, the document may contain technical parameters or editing errors. We reserve the right to make adjustments and modifications without prior notice to users.

(2) Trademark

ETHERCAT® is a registered trademark of the ETHERCAT Association.

(3) Patent Information

The designer of this product has applied for patent protection for the product's appearance and technical implementation methods. Any attempt to copy, imitate or reverse engineer may violate the law.

(4) Copyright

Without the author's authorization, it is prohibited to copy, distribute and use this document.

1.2 Safety Matters

This product is a professional equipment for industrial use and can only be used by personnel with electrical operation experience. Before use, please carefully read this manual and operate in accordance with the instructions to avoid causing personal injury or product damage.

This product is designed to meet the IP20 protection level. When using, it needs to be installed in a distribution cabinet with dust-proof and moisture-proof functions.

1.3 Document History

Version	Date	Explanation
V1.00	2019.5.1	First release
V1.10	2021.5.7	Change the wiring diagram.

1.4 Reference document

《IEC11631-22007 Programmable controllers –Part 2:Equipment requirements and tests》;

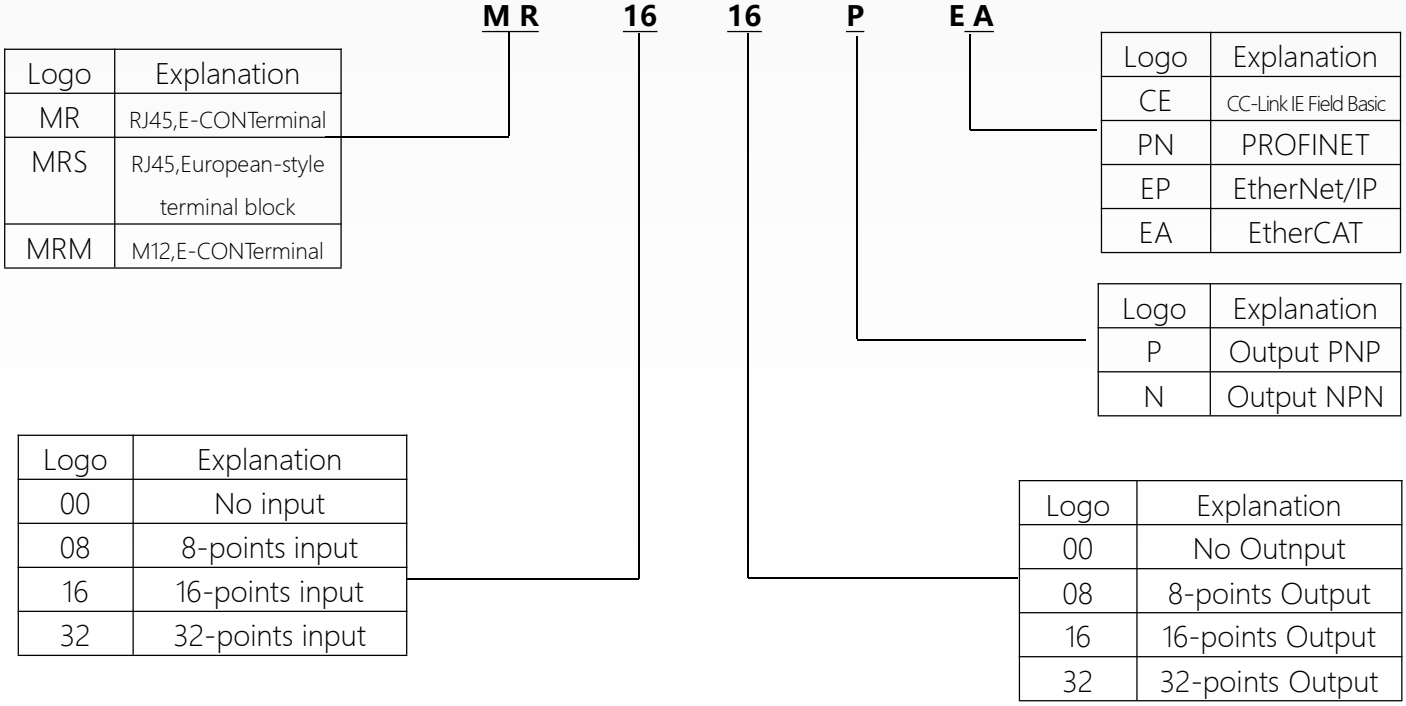
《IEC/TR 61158 Industrial Communication Network - Fieldbus Specification》;

《IEC61784-1 Industrial Communication Network - Industry Standards Part 1: Fieldbus Standards》;

2.Product Overview

2.1 Model list

The MR□-EA series remote I/O supports the high-performance EtherCAT bus communication protocol. Through the digital I/O interface integrated in the module body, it can directly provide high-performance input and output functions without the need for other EtherCAT bus couplers.



Number	Model number	Explanation
1	MR□1600P-EA	16DI, Fixed IO count, EtherCAT remote I/O module, PNP
2	MR□1600N-EA	16DI, Fixed IO count, EtherCAT remote I/O module, NPN
3	MR□0016P-EA	16DQ, Fixed IO count, EtherCAT remote I/O module, PNP
4	MR□0016N-EA	16DQ, Fixed IO count, EtherCAT remote I/O module, NPN
5	MR□0808P-EA	8DI/8DQ, Fixed IO count, EtherCAT remote I/O module, PNP
6	MR□0808N-EA	8DI/8DQ, Fixed IO count, EtherCAT remote I/O module, NPN
7	MR□3200P-EA	32DI, Fixed IO count, EtherCAT remote I/O module, PNP
8	MR□3200N-EA	32DI, Fixed IO count, EtherCAT remote I/O module, NPN
9	MR□0032P-EA	32DQ, Fixed IO count, EtherCAT remote I/O module, PNP
10	MR□0032N-EA	32DQ, Fixed IO count, EtherCAT remote I/O module, NPN
11	MR□1616P-EA	16DI/16DQ, Fixed IO count, EtherCAT remote I/O module, PNP
12	MR□1616N-EA	16DI/16DQ, fixed IO points, EtherCAT remote I/O module, NPN

Table 1 ETHERCAT Remote I/O Module

2.2 MR□-EA Specification Parameters

2.2.1 DI specification

The specifications for digital input (DI) are shown in Table 2.

Number	Project	Specification
1	Number of channels	16
2	Input type	PNP or NPN (determined during selection)
3	Input voltage	PNP: 24V DC (±20%), NPN: 0V DC (±3V)
4	Input current	Typical value: 3mA (EN61131-2, Type 1)
5	Input filtering	2.0ms
6	Electrical isolation	500V

Table 2 Specifications for Digital Input

2.2.2 DQ Specification

The specifications and parameters of the digital output (DQ) of the optocoupler relay are shown in Table 3.

Number	Project	Specification
1	Channel count	16
2	Output signal type	PNP or NPN (determined during selection)
3	Output rated voltage	PNP: 24V DC (±20%), NPN: 0V DC (±3V)
4	Drive capability	Single channel: 500mA
5	Load type	Resistive load, inductive load, lamp load
6	Isolation withstand voltage	500V
7	Isolation method	Optical isolation

Table 3 Digital Output Specifications

2.3 EtherCAT Communication Specification

The EtherCAT communication specification parameters are shown in Table 4.

Number	Project	Specification
1	Tasks in the EtherCAT system	As a slave station in the EtherCAT network
2	Data transmission medium	Ethernet/EtherCAT CAT5 cable
3	Distance between sites	100m
6	Agreement	EtherCAT
7	Delay	Approximately 1 microsecond
8	Data transmission rate	100Mbaud
9	Bus interface	2×RJ45
10	Power supply	24V DC (-15%~+20%)

Table 4 ETHERCAT Communication Specifications

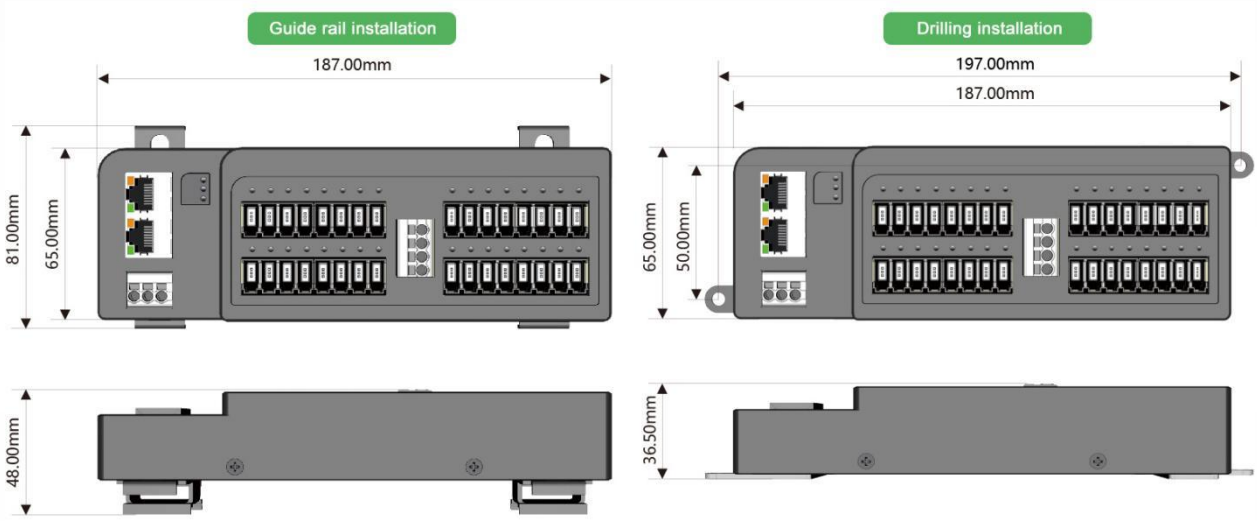
2.4 Power supply specifications

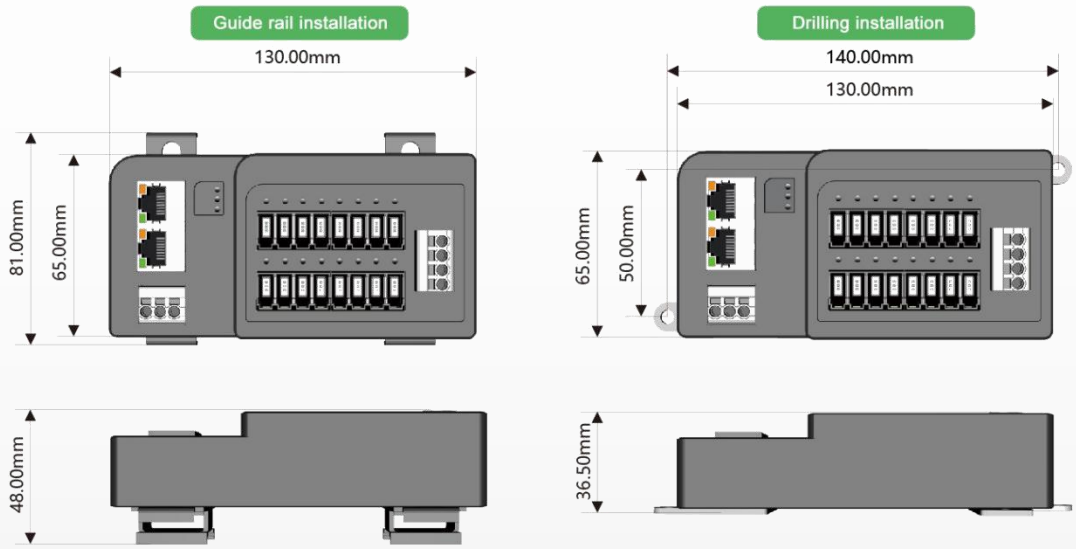
- The module power supply is divided into two independent parts: the communication part and the digital input/output section. They are isolated from each other.
- The communication voltage uses 24V DC (-15% / +20%), with a maximum current consumption of 0.5A, and has polarity reverse protection; the electrical isolation withstand voltage between this part and other I/O sections is 500V DC.

3. Structure description

3.1 Appearance description of the MR series

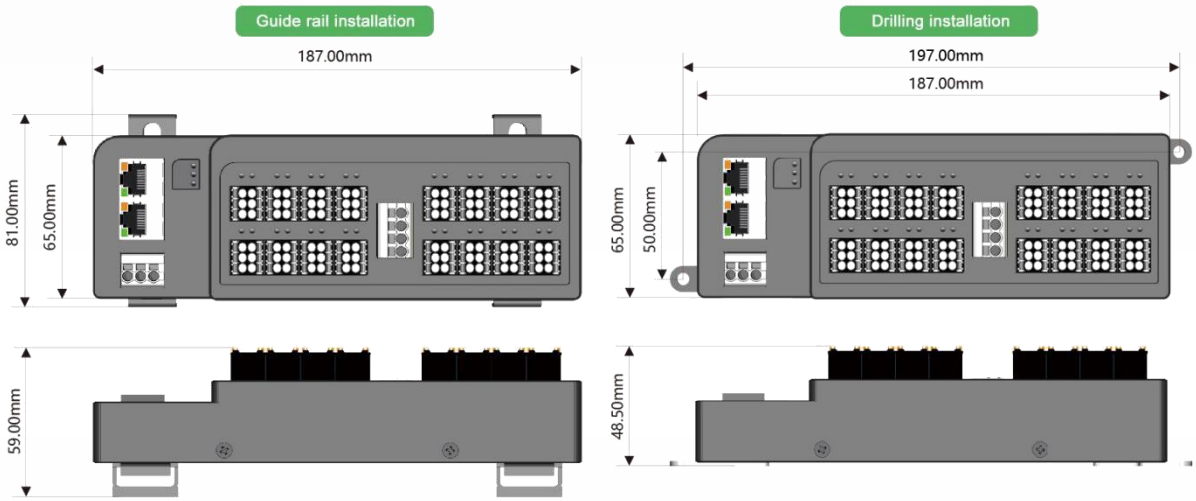
Installation method: Standard DIN35 rail or hole drilling installation
Installation accessories: Spring-type metal clips x2, hole-drilling installation metal sheets x2
Power interface 1: 3Pin European spring terminal
Power interface 2: 4Pin European spring terminal
Network interface: RJ45 x2
I/O connector: Piercing-type e-CON connector
Shell material: Metal aluminum shell
Heat dissipation method: Shell heat dissipation
Protection level: IP50

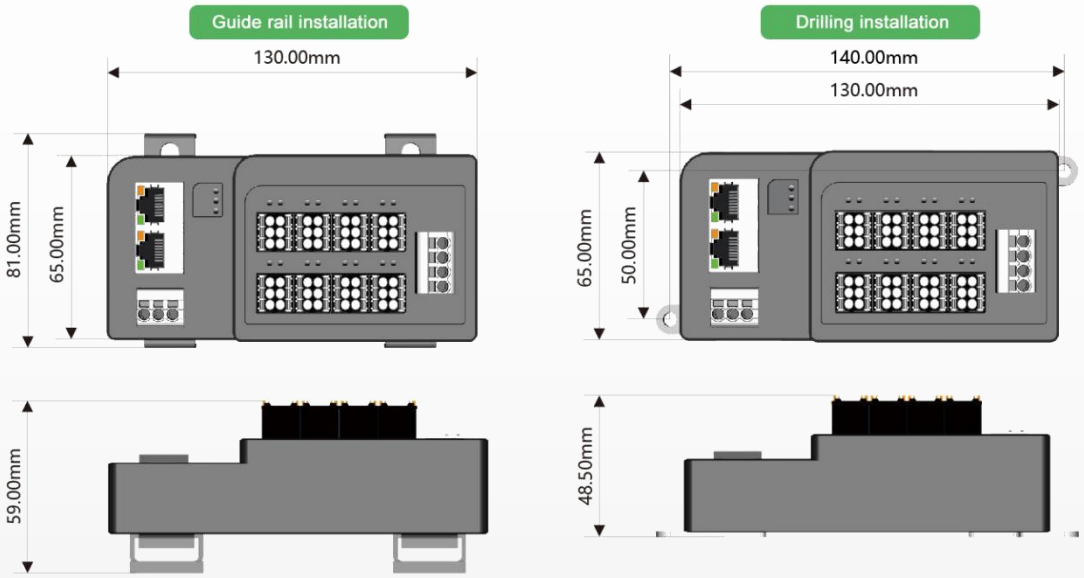




3.2 Appearance description of the MRS series

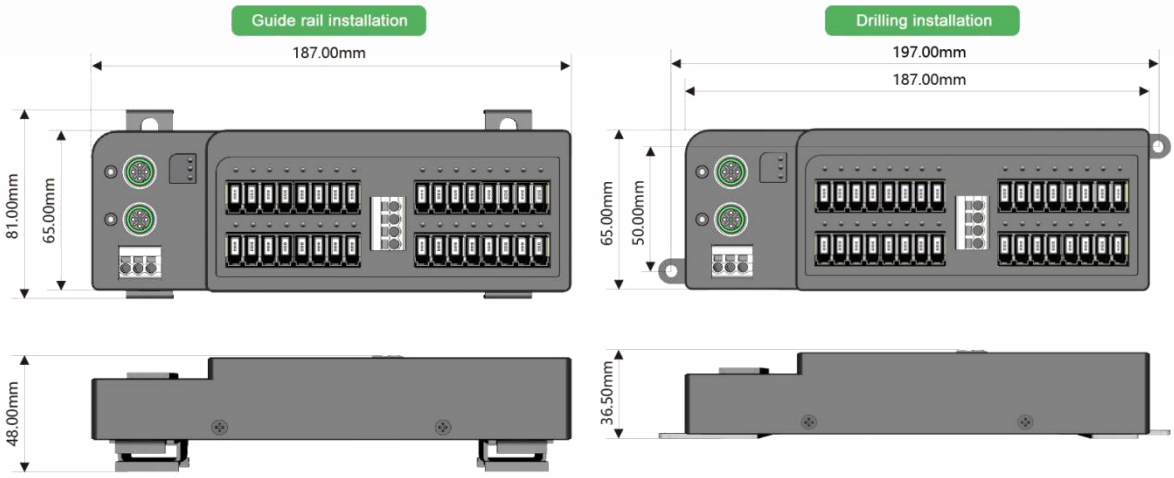
Installation method: Standard DIN35 rail or hole drilling installation
Installation accessories: Spring-type metal clips x2, hole-drilling installation metal sheets x2
Power interface 1: 3Pin European spring terminal
Power interface 2: 4Pin European spring terminal
Network interface: RJ45 x2
I/O connector: Plug-in European spring terminal
Shell material: Metal aluminum shell
Heat dissipation method: Shell heat dissipation
Protection level: IP50

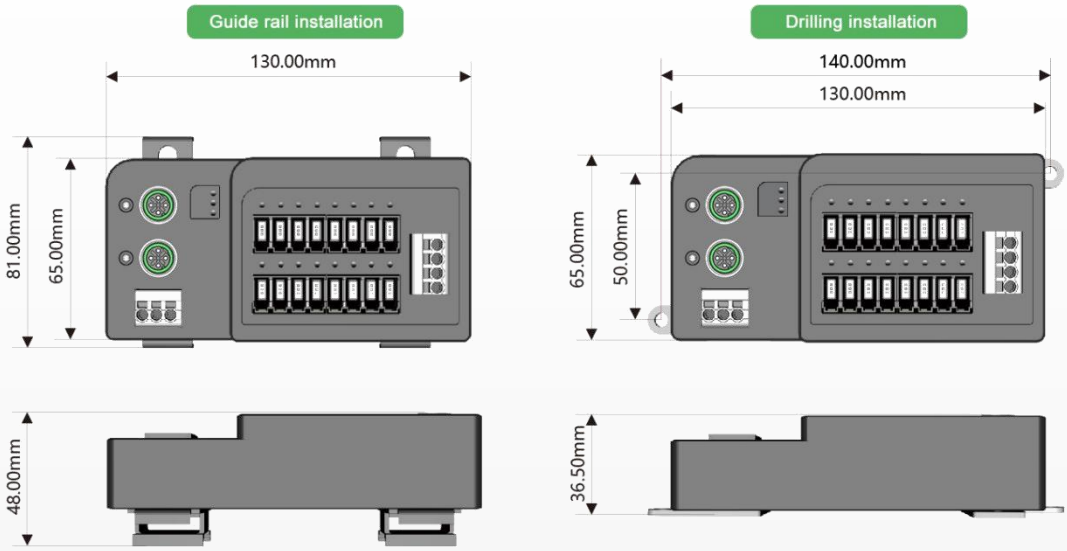




3.3 Appearance description of the MRM series

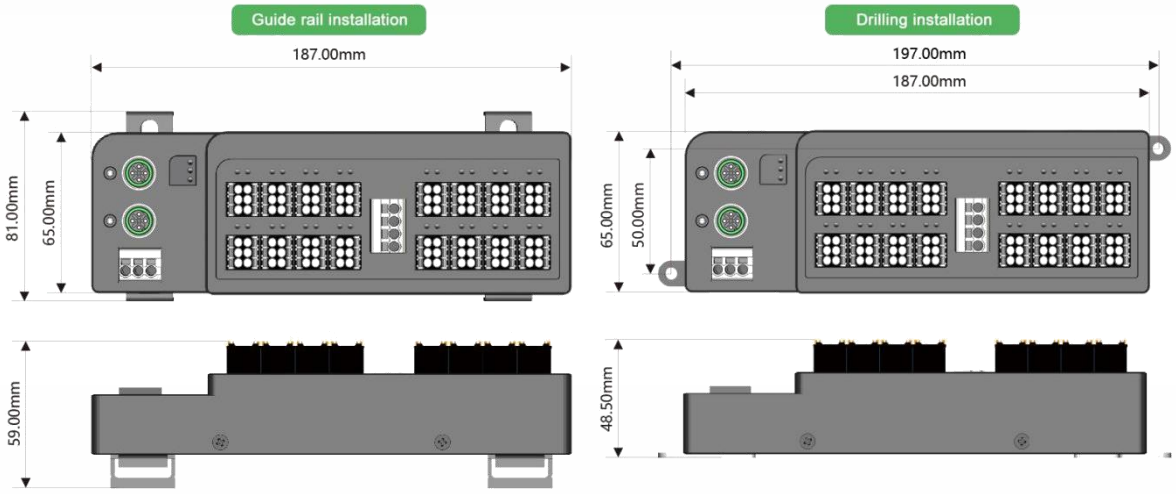
Installation method: Standard DIN35 rail or hole drilling installation
Installation accessories: Spring-type metal clips x2, hole-drilling installation metal sheets x2
Power interface 1: 3Pin European spring terminal
Power interface 2: 4Pin European spring terminal
Network interface: M12x2
I/O connector: Piercing-type e-CON connector
Shell material: Metal aluminum shell
Heat dissipation method: Shell heat dissipation
Protection level: IP50

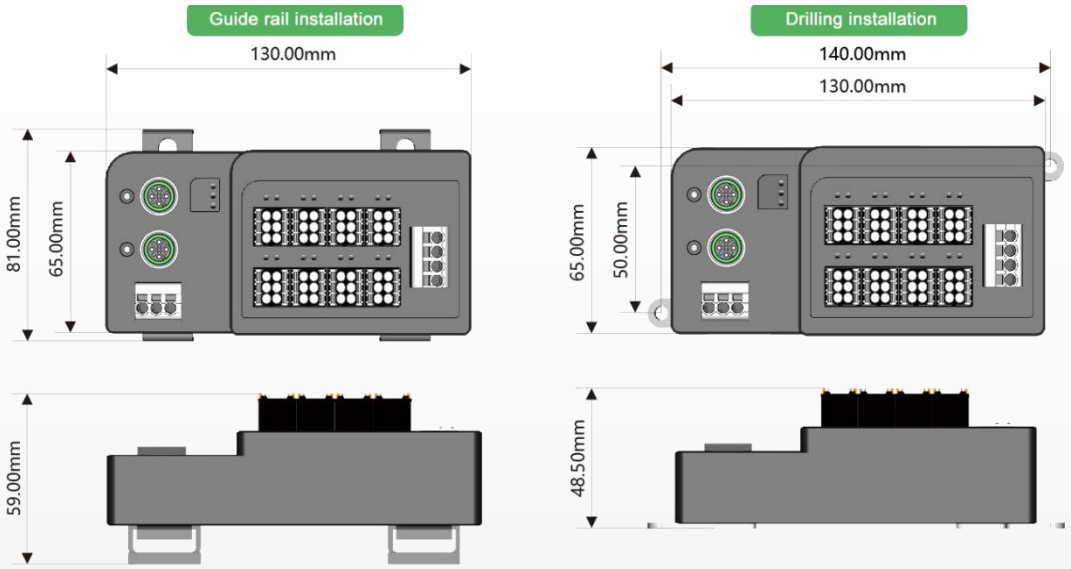




3.4 Appearance description of the MRMS series

Installation method: Standard DIN35 rail or hole drilling installation
Installation accessories: Spring-type metal clips x2, hole-drilling installation metal sheets x2
Power interface 1: 3Pin European spring terminal
Power interface 2: 4Pin European spring terminal
Network interface: M12x2
I/O connector: Plug-in European spring terminal
Shell material: Metal aluminum shell
Heat dissipation method: Shell heat dissipation
Protection level: IP50

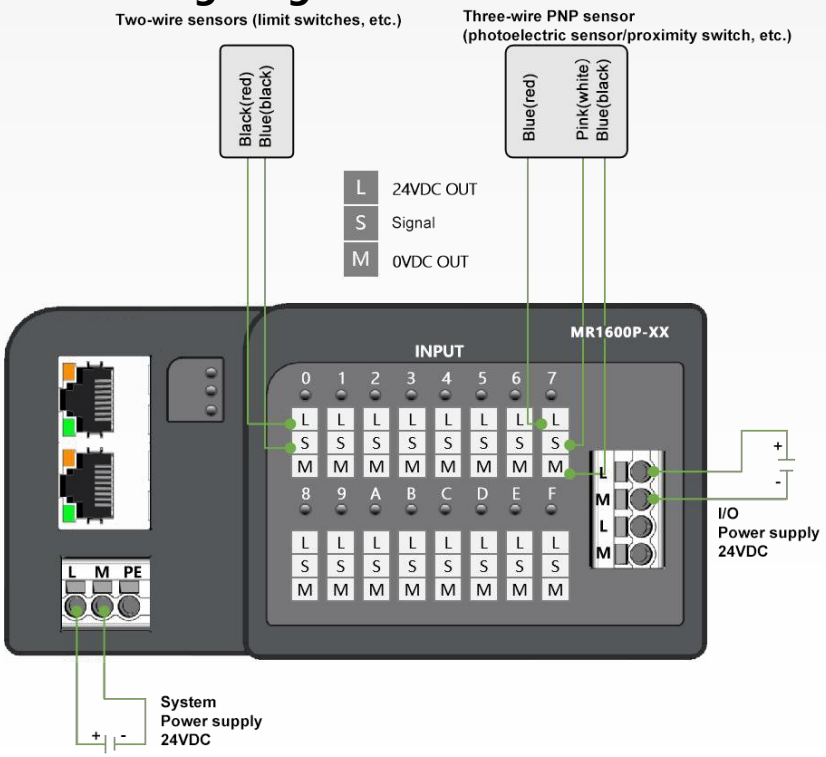




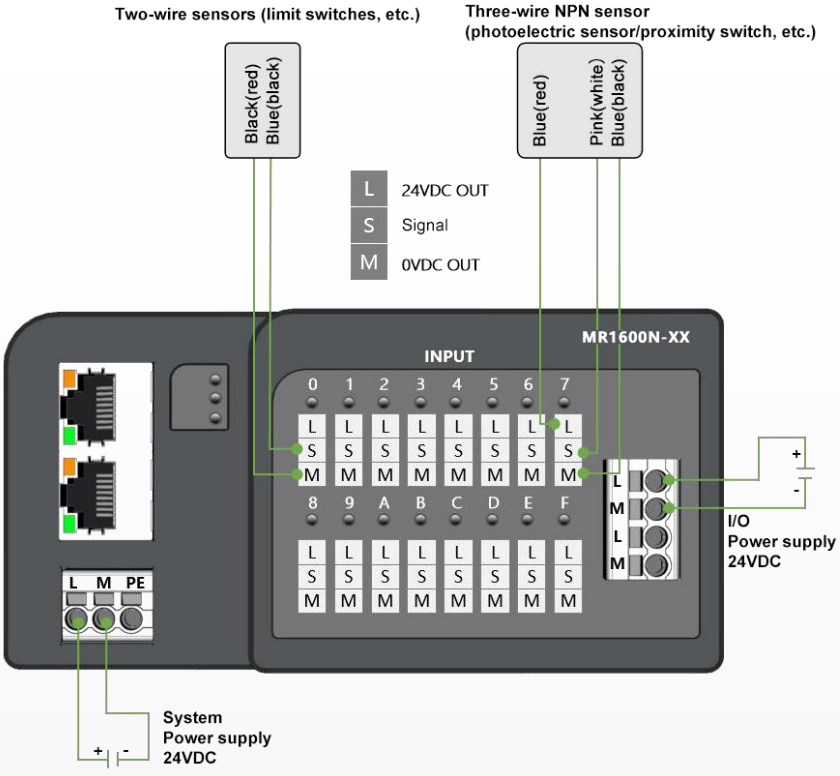
4.Hardware description

4.1 Circuit diagram

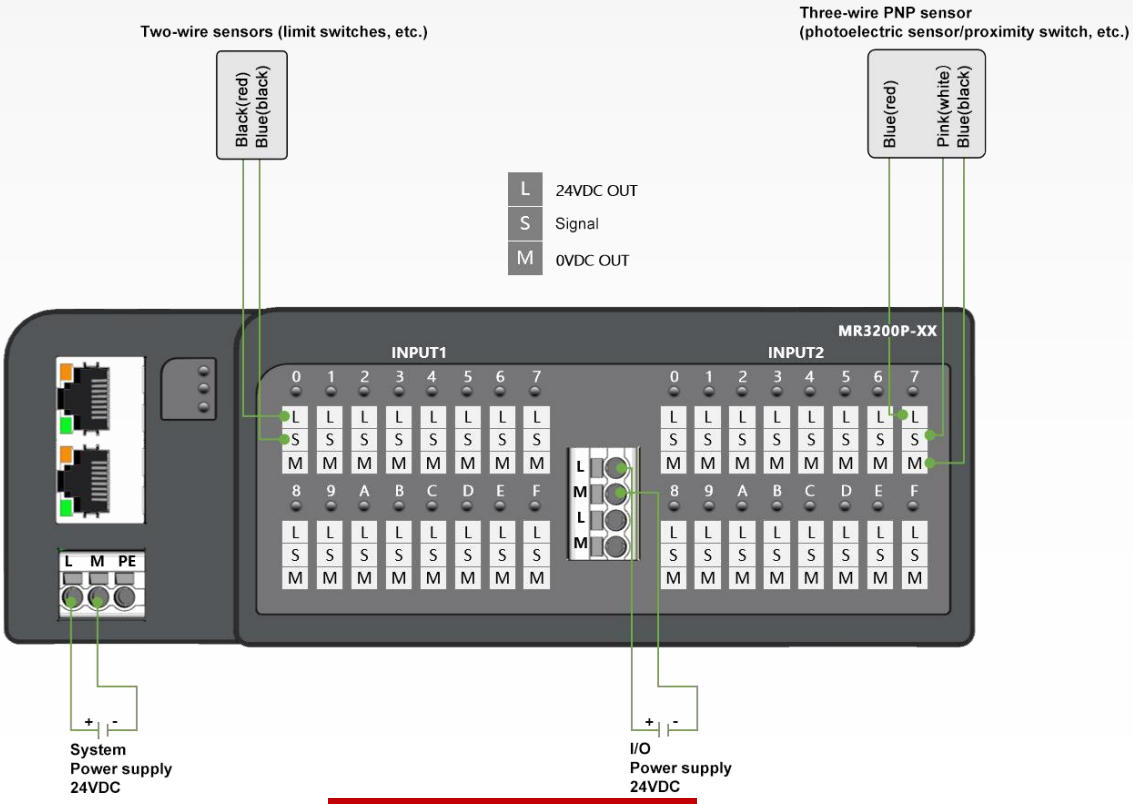
4.1.1 Module wiring diagram



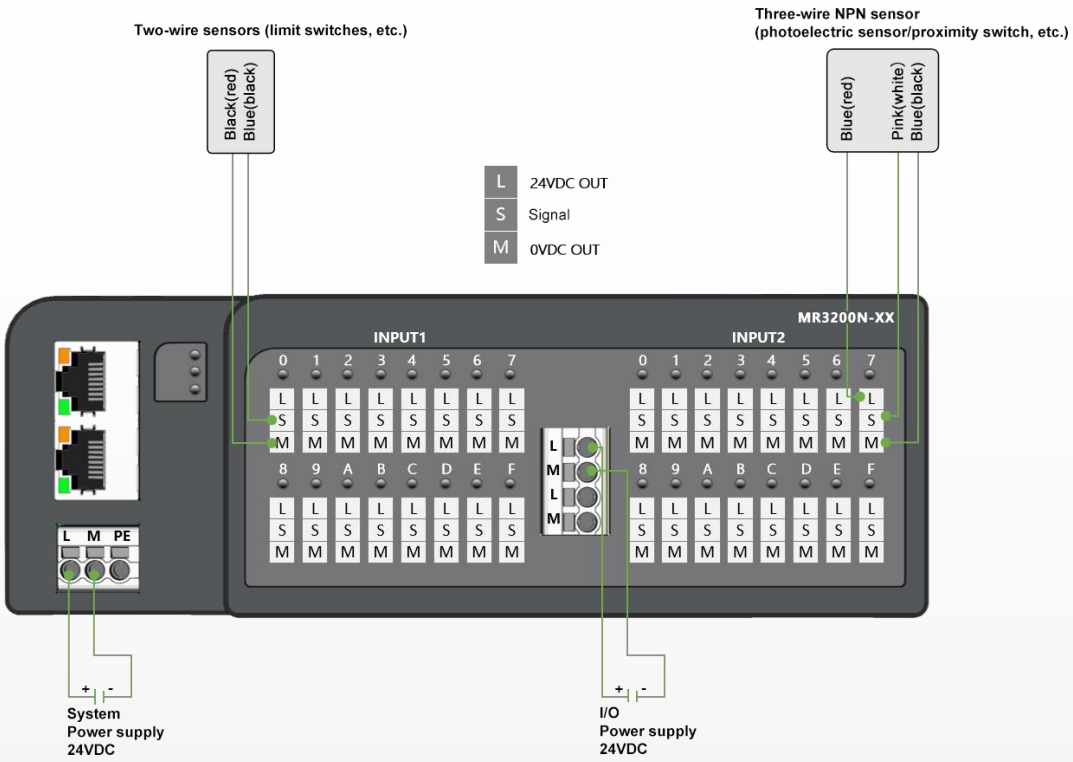
16 points input PNP



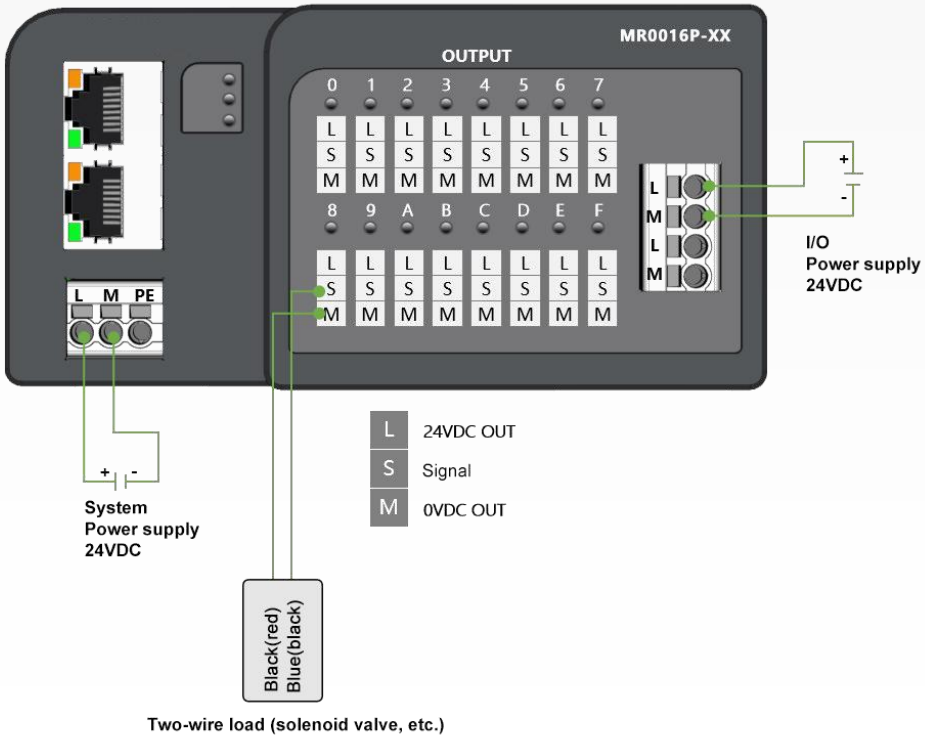
16 points input NPN



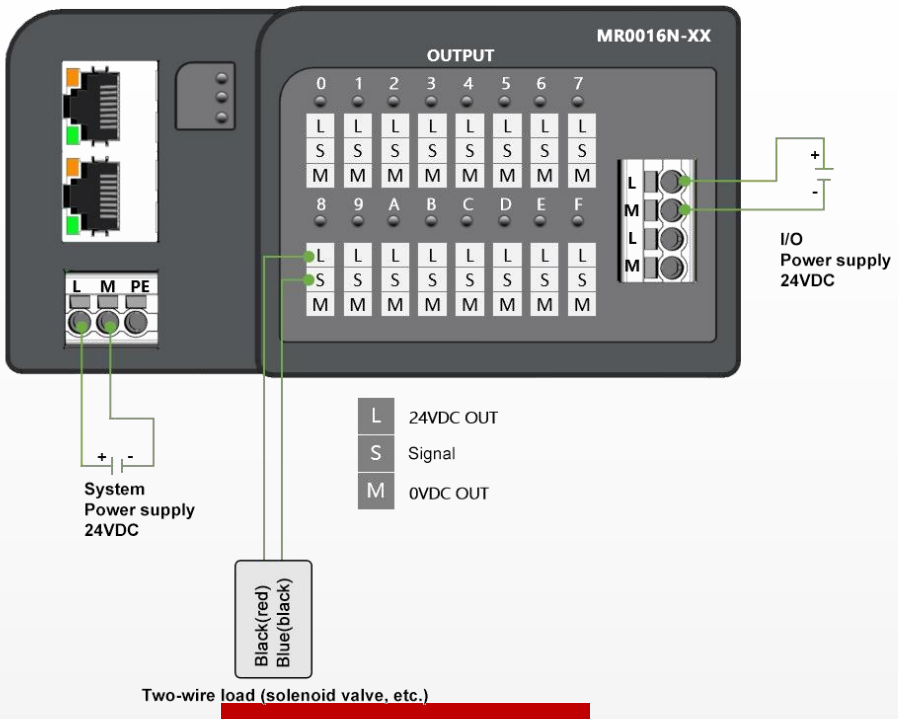
32 points input PNP



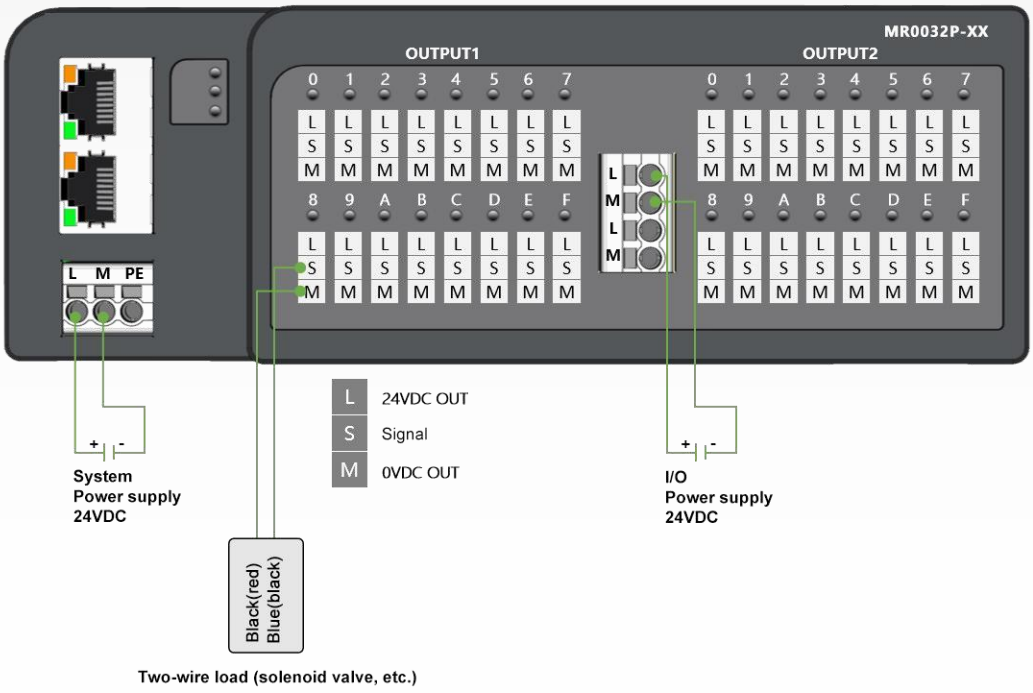
32 points input NPN



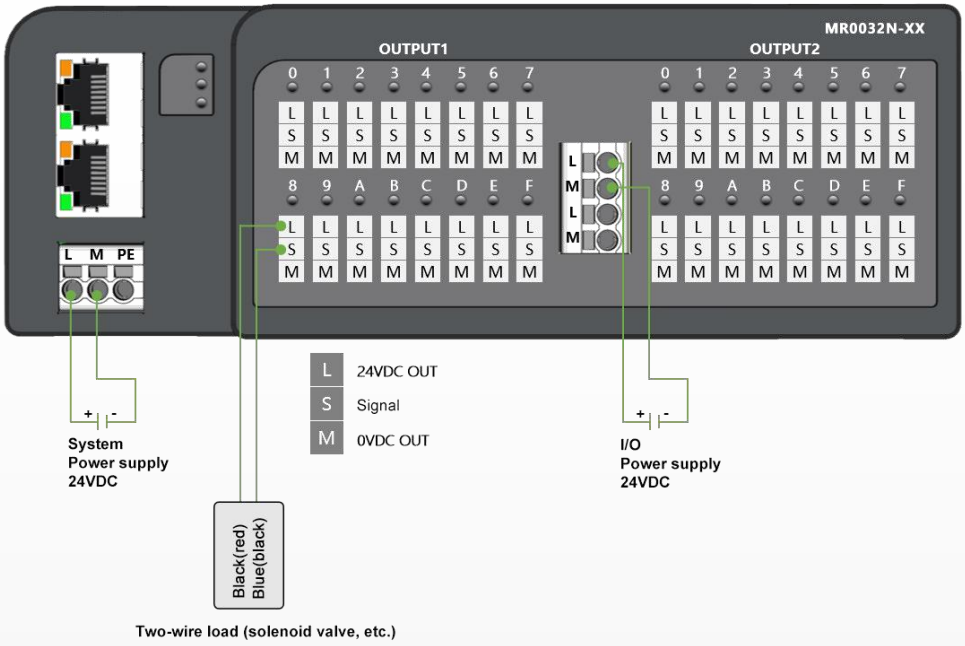
16 points output PNP



16 points output NPN

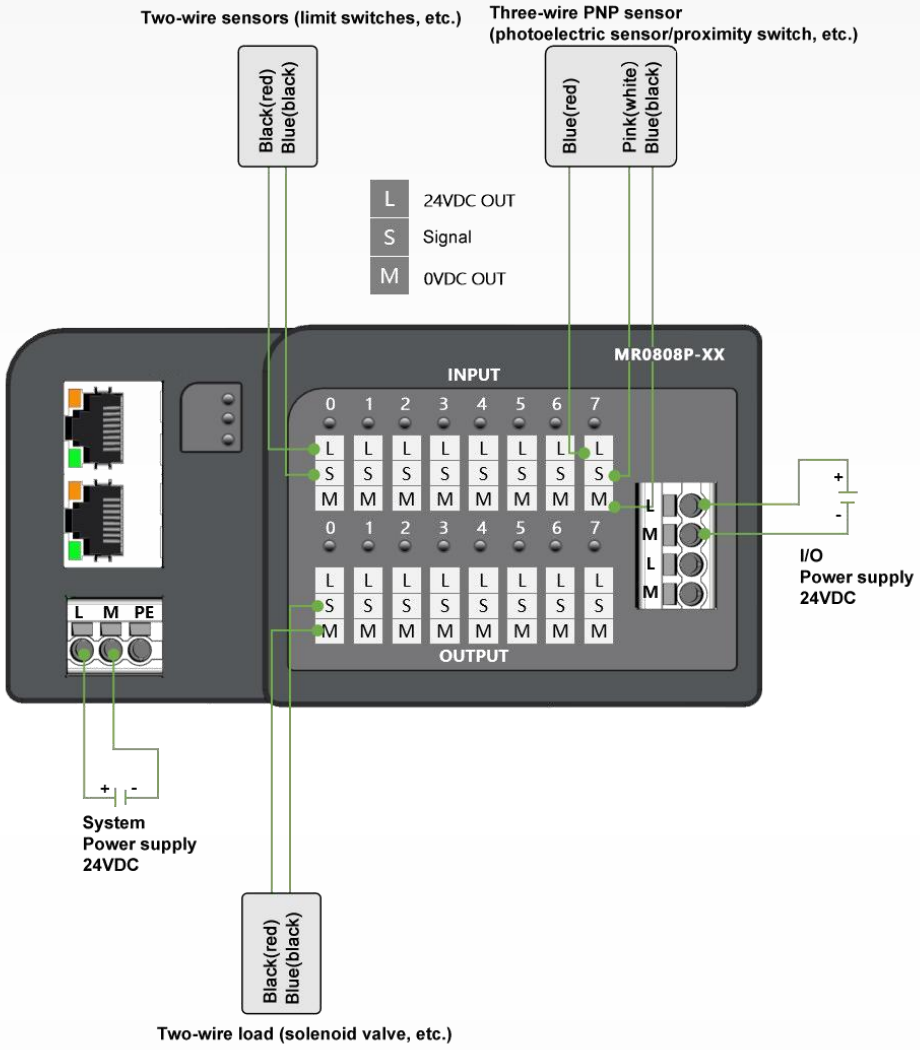


32 points output PNP



32 points output NPN

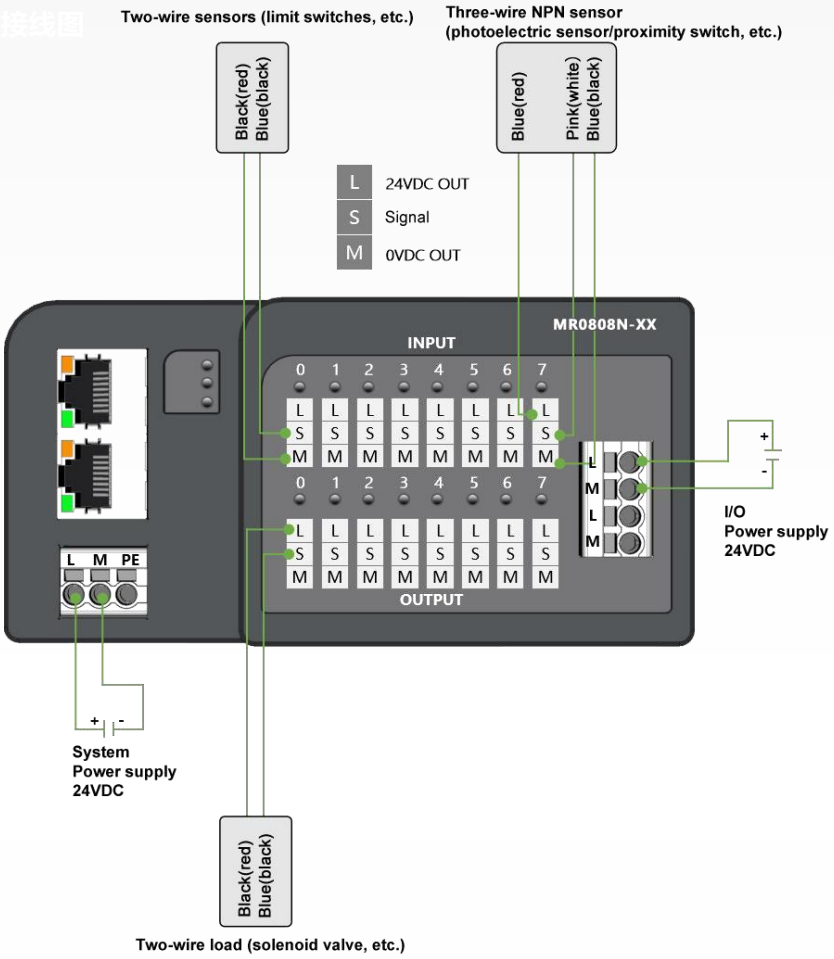
MR2102-CE 接线图



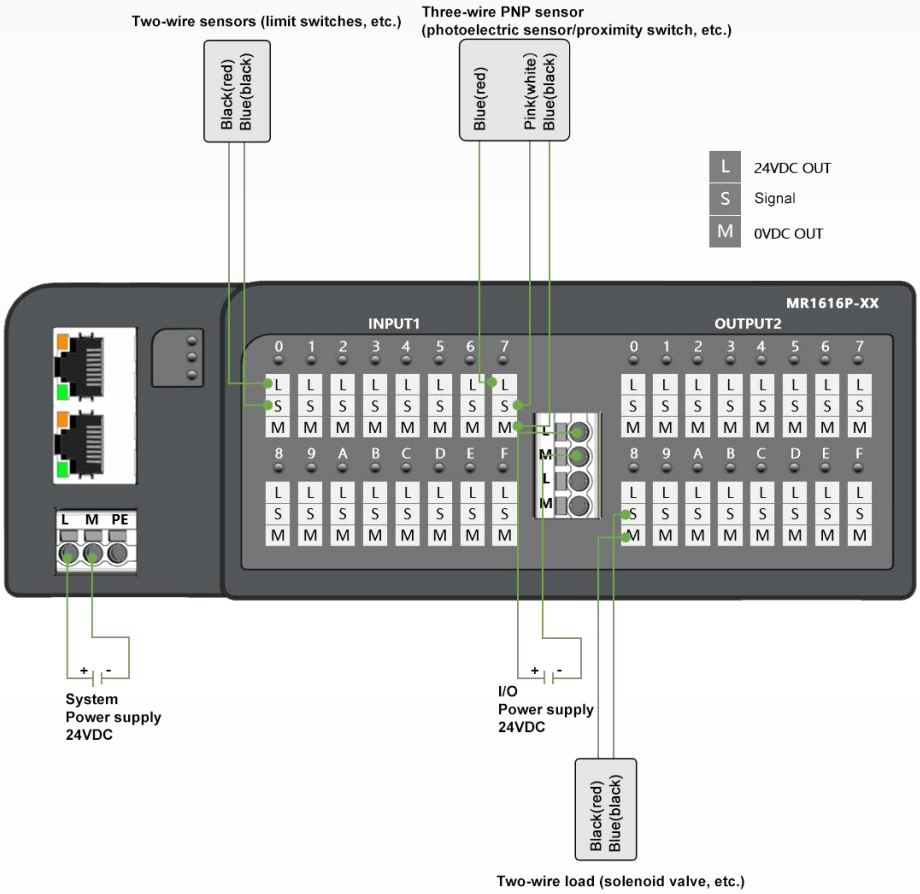
8 input, 8 output PNP

接线图

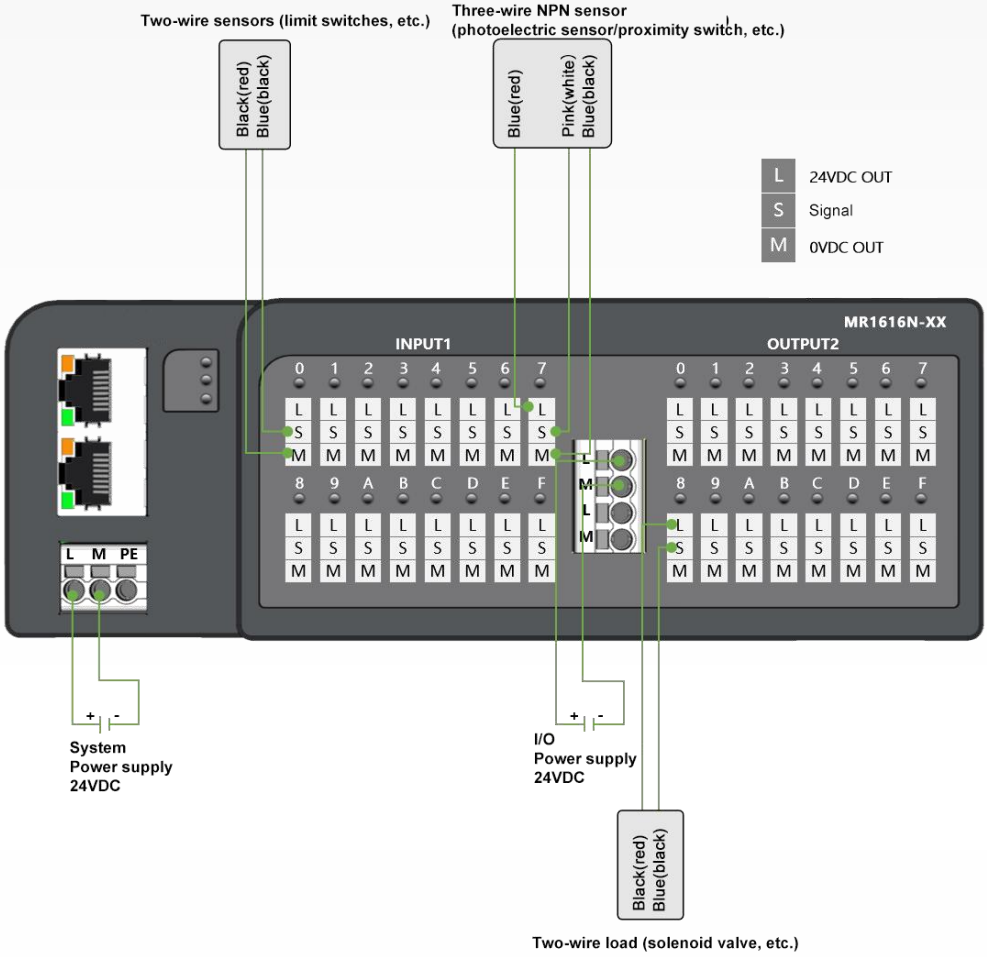
MR5101-CE 接线图



8 input, 8 output NPN



16 input, 16 output PNP

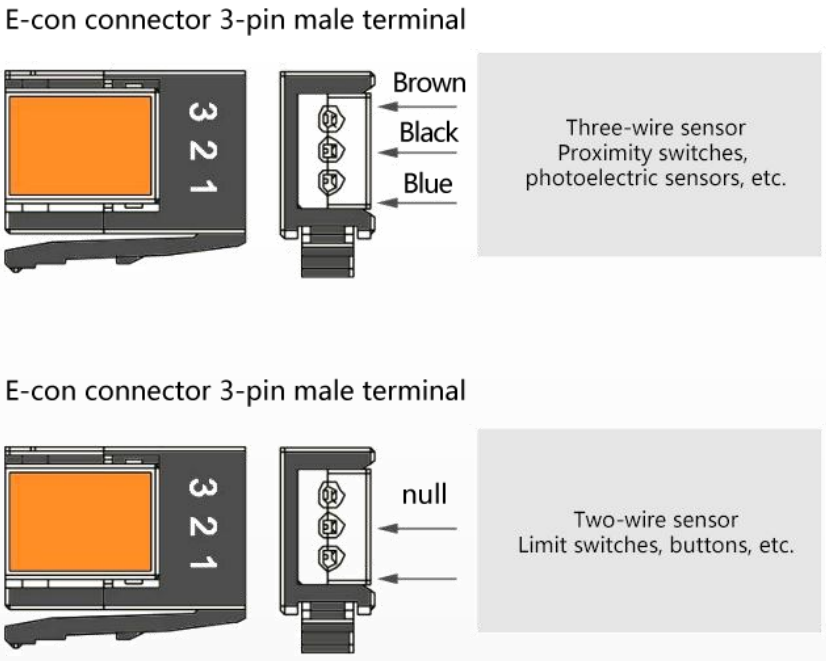


16 input, 16 output NPN

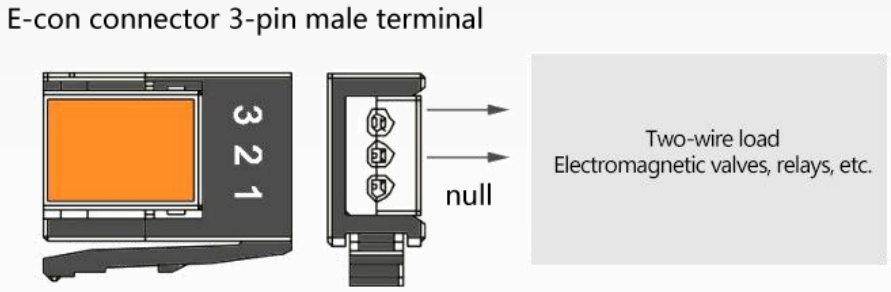
4.1.2 E-CON connector wiring

① MR series INPUT input (NPN) connection method

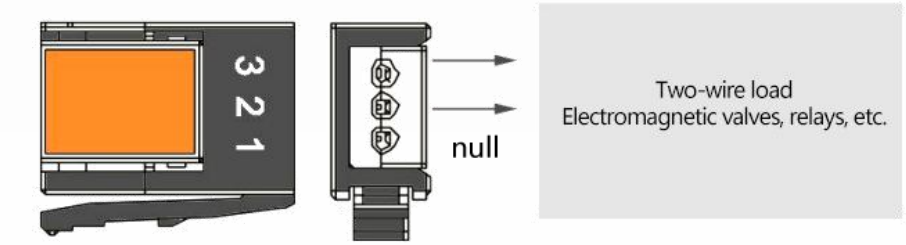
② MR series INPUT input (PNP) connection method



③ MR series OUTPUT input (NPN) connection method



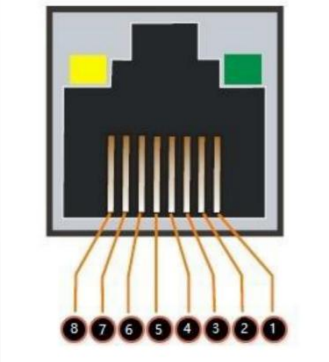
④ MR series OUTPUT input (PNP) connection method



4.2 Communication interface

The module uses a dual RJ45 socket for communication, which are respectively identified as IN and OUT.

Table 5 Ethercat Communication Interface



Pin	Signal	Description
1	TD+	Data transmission positive terminal
2	TD-	Data transmission negative terminal
3	RD+	Data reception positive terminal
4	NC	Unused
5	NC	Unused
6	RX-	Data reception negative terminal
7	NC	Unused
8	NC	Unused

4.3 LED indication

The LED indicators of the module are divided into three parts: system status indicator, I/O status indicator, and RJ45 link indicator.

4.3.1 System status indicates the working condition of the system as shown in the table.

ERR(red)	RUN(green)	PWR(green)	Explanation
○	○	○	Power supply abnormality
●	○	●	Communication interface failure
○	●	●	The module has successfully entered the operating (operate) state and successfully established a cyclic data exchange with the main station.

Table 8 System Status Indicators ● Indicates that the green light remains constantly on ● Indicates that the red light remains constantly on ○ Indicates that it is not lit

4.3.2 I/O Status Indication

The digital input/output ports use green LEDs to indicate the status of the corresponding channels. When the light is on, it indicates that the logic state of the input/output port is "1", and when the light is off, it indicates that the logic state of the input/output port is "0".

4.3.3 RJ45 indicator light

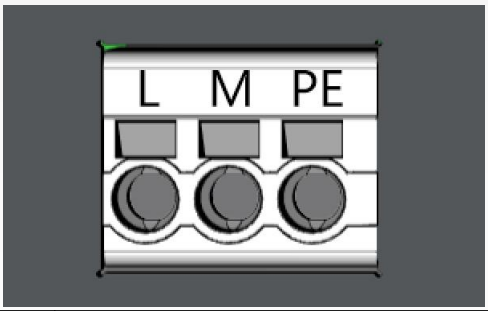
Under normal circumstances, the RJ45 port indicator lights should be the green light constantly on and the yellow light flashing. If this is not the case, it indicates that a fault has occurred. If the green light is not on, it means there is a connection fault with the RJ45 port that is connected to a Hub or switch; if the yellow light is not on, it might be a fault with the module itself.

As shown in Table 7: RJ45 Indicator Light Explanation

LINK1/LINK2	ACT1/ACT2	Explanation
○	Not related	The RJ45 port is not connected to a network cable or the connection is poor.
●	Not related	The RJ45 port has correctly identified the Ethernet network.
Not related	○	There is no data exchange at the RJ45 port.
Not related	●	There is data exchange at the RJ45 port.

Table 7 RJ45 Indicator Light Explanation

4.4 Communication power supply



24V	24V, positive terminal of the DC power supply
0V	0V, negative terminal of the DC power supply
PE	Connect to the ground

Table 8 Power Connection Terminals

4.5 Digital Input Interface

The digital input interface is connected using e-CON connectors. There are a total of 16 input signals, divided into 0-F (or 8 input signals divided into 0-7).

4.6 Digital Output Interface

The digital output interface is connected using e-CON connectors. There are a total of 16 output signals, divided into 0-F (or 8 output signals divided into 0-7). Each digital output port is equipped with an independent 0.5A overcurrent protection.

4.7 Module Configuration and Address Allocation

MR□ -EA series remote I/O address mapping. The DI/DQ data of the MR□ -EA series remote I/O is mapped to the main station memory space through the configuration file. Taking MR520X-EA as an example, as shown in the figure.

- 16 digital input signals are mapped to 2-byte In addresses;
- 12 digital output signals are mapped to 2-byte Out addresses;

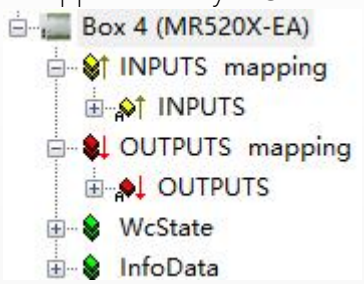


Figure 5 Module (MR□-EA) Address Mapping

4.8 Module Parameters

Each module has specific parameters, which need to be flexibly configured according to the actual situation on the hardware configuration interface. These parameters will be simultaneously downloaded to the controller along with the hardware configuration. In the initial running state, the controller will send these data to the module. If the actual configuration of the module at the site is inconsistent with the hardware configuration in the program, the transmitted parameters will not be consistent with the actual situation, resulting in unsuccessful configuration of the module parameters. The controller will report an error during operation.

The following is an explanation of the configuration parameters for the modules based on the Twincat2 software from BECKHOFF.

4.9 Device Database File (XML)

EtherCAT uses the device database file (XML) to describe the communication characteristics of the device. The device database file for EtherCAT can be written using a standard XML editor.

File name: MR-EAVH.xml. The corresponding device database file.

- The "MR520X-EA" configuration file includes the address mapping for MR5201-EA and MR5202-EA.

4.10 Installation of the equipment database file

The following is based on the installation instructions for the Twincat2 software.

1. Shut down TwinCat2
2. Copy the MR-EAVH.xml file to the C:\TwinCAT\Io\EtherCAT directory
3. Open the TwinCat2 software to complete

The following is the installation instructions for CODESYS V3.5 SP6 Patch 1 software.

1. In the "Tools" menu, find the "Install Device Description" option and click on it.
2. Click on the file type at the bottom right corner.
3. Select MR-EAVH.xml.
4. Installation is complete.

6. Communication connection with PLC

Please go to the official website to download the corresponding communication settings file for PLC and MR□-EA. www.latcos.cn

Official website

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