Kinco 步科

RP20 Series I/O System

RP20-0400RD
RP20-0202IV
RP20-0400TC
RP20-0400IV
RP20-0004IV
Analog I/O Module
User Manual

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Support

If you have questions during product selection or usage, customers in China can call our technical support hotline at 400-700-5281 (Chinese service only).

For inquiries about the products described in this manual, please contact your local Kinco office or distributor. For information on user training, visit our company website or consult your local distributor for training plans.

Manual Acquisition

This manual is a paperless document. To obtain a PDF version, visit the Kinco official website (https://en.kinco.cn/), navigate to "Service → Download", and search by keywords to download.

Device Description File Acquisition

The RP20 series I/O modules file (.xml) integrates device descriptions for all CPU modules in the AK8X0 series or RP20 series couplers. Please visit the Kinco official website https://www.kinco.cn/ (CN), https://en.kinco.cn/ (EN) or contact Kinco's official customer service department to obtain the latest device description files.

Reversion History

Reversion Date	Release Version	Description
2025/01/16	RP20AIO_usermanual_V000	Initial Revision

Catalogue

1 Safety Instructions

This chapter outlines safety precautions for proper use of the product. Before use, read this manual and any related documentation to understand the safety instructions. Failure to follow these precautions may result in death, serious injury, or equipment damage.

The "Danger," "Warning," and "Caution" notes in this manual are not exhaustive but supplement general safety measures.

Use this product within its design specifications to avoid malfunctions. Damage or issues caused by non-compliance are not covered under warranty.

Kinco assumes no legal responsibility for personal injury, property damage, or other accidents resulting from non-compliance with this manual or improper operation of the product.

To ensure safe use, this manual employs specific symbols and graphical markings to highlight important safety-related information. Please adhere strictly to these precautions.

	**Danger/Prohibited** Indicates prohibited actions. If proper precautions are not taken, it may result in serious personal injury or even death.
	**Warning** Indicates cautionary actions. If proper precautions are not taken, it may result in serious personal injury or even death.
	**Caution** Indicates general information or directives. If the corresponding precautions are not followed, it may lead to unintended results.

When Power is Supplied	
	❖ During power supply, do not touch terminals or attempt disassembly. Wait for capacitors to discharge after turning off the power to avoid electric shock or hazards.
During Assembly	
	❖ Assembly, wiring, maintenance, and inspection of this product should all be conducted by professional personnel who have received relevant training in electrical equipment. ❖ Do not use PLC in the following places: environments with dust, oil fumes, conductive dust, corrosive gases, or flammable gases; exposure to high temperatures, condensation, wind, or rain; environments with vibration or impact. Electric shock, fire, or misuse may also result in product damage.
	❖ During screw assembly or wiring, be careful not to allow metal shavings, dust, or wire ends to fall into the ventilation holes of the PLC. Otherwise, it may cause fire, malfunction, or unintended actions of the PLC.
Wiring	
	❖ During power supply, do not touch any terminals or terminal blocks, and do not attempt to disassemble any units. Especially during power supply or just after power is turned off, capacitors need time to discharge, which may cause electric shock or other personal or equipment hazards. ❖ Before wiring operations, please ensure that all external power supplies to the system are completely disconnected. Otherwise, there is a risk of electric shock to personnel and equipment malfunction.
	❖ After completing the installation and wiring operations, before energizing and operating the product, ensure that it is fully assembled (including end caps, plate covers, etc.), otherwise there may be a risk of electric shock. ❖ Cable terminals should be properly insulated to ensure that the insulation distance between cables does not decrease after the cables are installed on the terminal block. Otherwise, there is a risk of electric shock, short circuit, or equipment damage.

- ❖ During screw assembly or wiring, be careful not to allow metal shavings, dust, or wire ends to fall into the ventilation holes of the PLC. Otherwise, it may cause fire, malfunction, or unintended actions of the PLC.
- ❖ Before connecting relevant cable connections, confirm the type of interface to be connected. Incorrect wiring may lead to controller or external equipment malfunctions or damage.
- ❖ Tighten the bolts on the terminal block within the specified torque range. Loose terminal bolts may result in circuit shorts, disconnections, fires, and other hazards. Over-tightening the bolts may damage the bolts and the controller, leading to component detachment, circuit shorts, fires, and other hazards.
- ❖ When using connectors and connecting external devices, use the tools specified by the manufacturer for pressing, crimping, or correct soldering. Poor connections may lead to shorts, fires, and other hazards.
- ❖ Do not bundle control lines and communication cables with main circuit or power supply lines, or place them too close to each other. Control lines and communication cables should be arranged at least 100mm away from main circuit power lines in cable ducts or spaces to avoid interference due to electromagnetic noise.
- ❖ For applications with severe interference, use special shielded cables for high-frequency signal input or output to improve the system's anti-interference capability.

During System Design

- ❖ When applying, it is essential to design a safety circuit to ensure that the control system remains safe even in the event of a power failure or controller malfunction.
- ❖ If the output circuit experiences prolonged overcurrent due to exceeding the rated load current or load short circuits, the controller may smoke or catch fire. Therefore, external safety devices such as fuses or circuit breakers should be installed to interrupt power.

- ❖ It is crucial to set up emergency braking circuits, protection circuits, interlocking circuits for forward and reverse operations, and upper and lower limit interlock switches in the external circuits of the controller to prevent machine damage.
- ❖ To ensure safe equipment operation, design external protection circuits and safety mechanisms for significant accident-related output signals.
- ❖ When the controller's CPU detects abnormalities in its system, it may automatically shut off all output signals. Additionally, partial circuit failures in the controller may result in uncontrolled outputs.
- ❖ To ensure equipment's normal operation, suitable external control circuits need to be designed.
- ❖ Damage to the transistor output unit of the controller may render its output status uncontrollable.
- ❖ Programmable controllers should be designed for use in indoor electrical environments with overvoltage level II. The power supply system level should include lightning protection devices to prevent lightning-induced overvoltage from affecting the programmable controller's power input terminals, signal input terminals, control output terminals, and other ports, thus avoiding equipment damage.

During Operation and Maintenance

- ❖ Assembly, wiring, maintenance, and inspection of this product should all be conducted by
- ❖ professional personnel who have received relevant training in electrical equipment.
- ❖ Before cleaning or tightening the bolts on the terminal block or installing connector bolts, please ensure that the system's power supply is completely disconnected.

- ❖ Before making any online modifications to the program, forcing outputs, starting (RUN), or stopping (STOP) operations during equipment debugging, it is essential to thoroughly read the user manual. Only proceed with these operations after ensuring their safety.

2 Overview

To explore diverse automation application scenarios and providing customers with more comprehensive automation solutions, Kinco has launched the Kinco-RP20 series bus-based I/O system.

2.1 Introduction

The RP20 series products, with their robust industrial design and manufacturing quality, outstanding performance, and comprehensive feature integration, are not only widely applicable in the field of general industrial automation but also highly suitable for various specialized smart sectors such as building automation,agricultural intelligence, energy monitoring, and energy management. They are designed to offer customers versatile and flexible solution possibilities.

2.2 Naming Rules

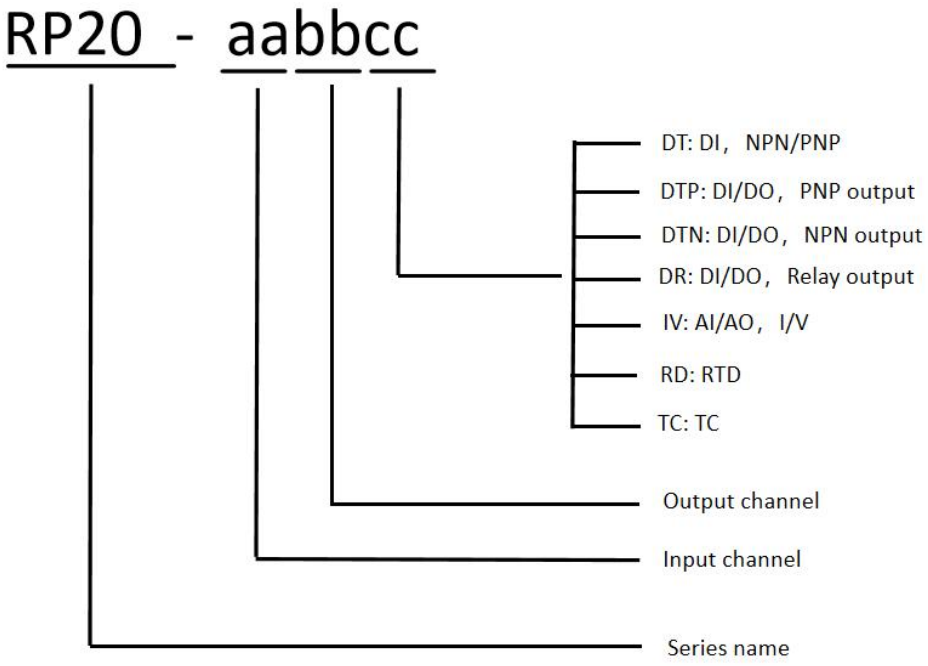


Fig. 2.2-1 RP20 series naming rule

According to the naming rules, the functionality of I/O modules can be inferred from their model numbers. For example:

- **RP20-0202IV**: 2 -channel analog input, 2- channel analog output, both support current and voltage signal.
- **RP20-0400RD**:4-channel RTD input module.
- **RP20-0400TC**: 4-channel thermocouple input module.

2.3 Fuselage Label

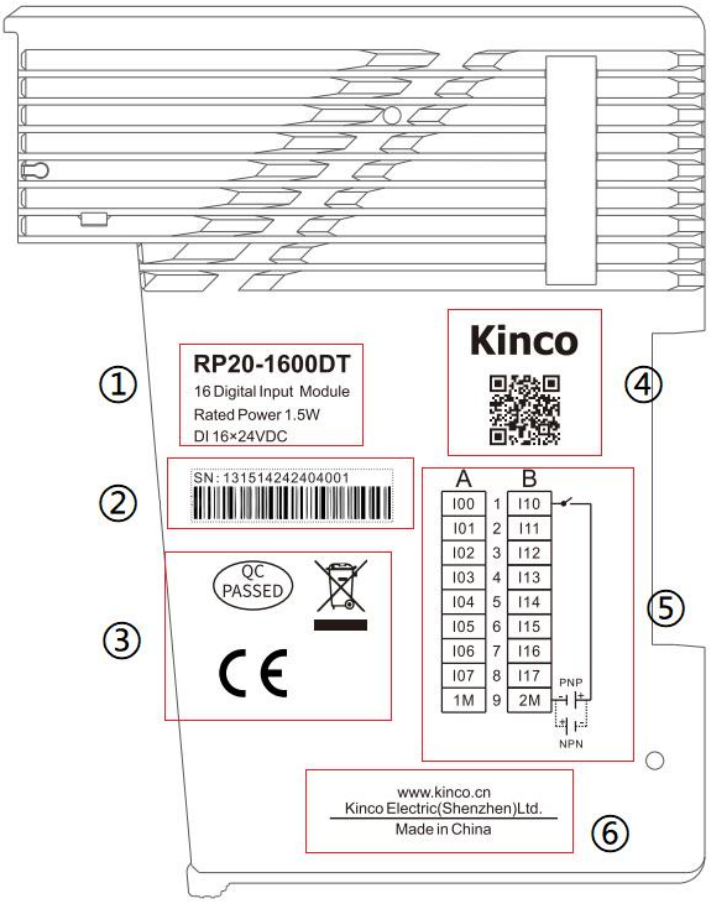


Fig.2.3-1 A sample of naming description

No.	Item	Description
①	Model and brief description	Includes basic information such as product model, power supply, and function description.
②	Product serial number	Unique and traceable.
③	Certification	Includes the product's certification standards.
④	Kinco official QR Code	Scan the code to directly access Kinco's official website for more information.
⑤	I/O wiring diagram	Provides a clear view of wiring information.
⑥	Kinco official website	Enter the website address to visit Kinco's official website for more information.

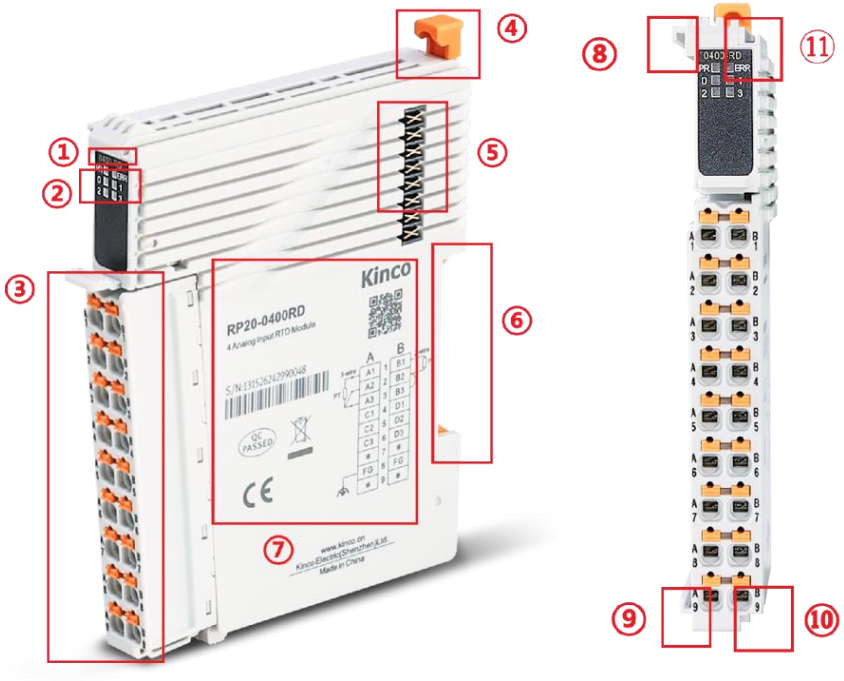
3 General Specification

Transportation and Storage Conditions		
Climatic Conditions	Ambient Temperature	-40℃～+70℃
	Relative Humidity	10%～95%,no condensation
	Atmospheric Pressure	Equivalent to 0-3000 meters above sea level.
Mechanical Conditions	Free Fall	With transport packaging, allows 5 drops from 1m height to the cement floor.
Operating Conditions		
Climatic Conditions	Ambient Temperature	Open device with natural ventilation, ambient temperature range: -20℃ ～ 55℃.
	Relative Humidity	10%～95%,no condensation
	Atmospheric Pressure	Altitude ≤2000 meters
	Pollution Level	Suitable for pollution level 2
Mechanical Conditions	Sine Vibration	5 < f < 8.4 Hz, Random: 3.5mm displacement; Continuous: 1.75mm displacement.
		8.4 < f < 150 Hz, Random: 1.0g acceleration; Continuous: 0.5g acceleration
	Shock	Half sine wave, 15g, 11ms, 6 times per axis.
Electromagnetic Compatibility	EMC Immunity Level	Zone B，IEC61131-2
	Electrostatic Discharge	Air discharge 8kV, contact discharge 4kV.
		Performance Leve A
	Surge	DC power supply 0.5kV CM, 0.5kV DM.
		I/O and communication ports: 1kV CM.
		Performance Leve A
	Fast Transient Burst	Power coupling: 2kV, 5kHz. I/O and communication coupling: 1kV, 5kHz.
		Performance Level A
Protection Level		IP20
Cooling Type		Natural air cooling
Installation Type		DIN35 rail mounting

4 Product List

Order Number	Description
RP20-0202IV	AI 2×IV, 4-20mA/0-20mA/0-10V/1-5V AO 2×IV, 4-20mA/0-20mA/0-10V/1-5V
RP20-0400RD	AI 4×RTD, Pt100/Pt1000/Cu50
RP20-0400TC	AI 4×TC, J/K/E/S/T/mV
RP20-0400IV	AI 4×IV, 4-20mA/1-5V/±10V/±20mA
RP20-0004IV	AO 4×IV, 4-20mA/0-20mA/±10V/1-5V

5 Component Description



No.	Item	Comment	
①	Color label	Indicate the type of the module	Refer to Chapter 2.2 Meaning: Orange, Coupler Yellow, Analog output module Green, Analog input module Indigo, Mixed AI/AO module
②	Indicator lights	PR: Module operating status	Steady On: Normal operating state Fast Blinking (50ms / 50ms): Error event Slow Blinking (200ms / 200ms):Uninitialized ID Single Blinking (200ms / 1000ms): Stopped state Double Blinking (200ms / 200ms / 1000ms): Safe operating state

		Err：Error state	Steady On: An internal error has occurred, refer to Chapter 12 for error diagnosis. Off: No internal error has occurred.
		0-3 : Channel operating status	Red light indicate the channel input exceed the range
③	I/O connector	Plug-In Spring Terminals: Tool-free installation and efficient connections. For details, refer to specific model connection diagrams.	
④	Locking latch	Compatible with standard DIN35 rails for assembly.	
⑤	Side connector	Used for backplane (expansion) communication and power supply.	
⑥	DIN rail slot	Standard DIN35 rail installation.	
⑦	Fuselage label	Includes basic product information such as model number, serial number, certifications, and wiring diagrams. Refer to Chapter 2.3 for details.	
⑧	Top front Rail	Used for dual-side alignment during module coupling, ensuring vertical alignment with the front module.	
⑨	Bottom front rail		
⑩	Top rear rail	Used for dual-side alignment during module coupling, ensuring vertical alignment with the rear module.	
⑪	Bottom rear rail		

6 Technical Specification

6.1 RP20-0202IV

Input Specifications	
Input channel	2
Resolution ratio	12 bit
Conversion rate	15 time/s
Signal type	4～20mA,0～20mA,1～5V,0～10V
Measuring precision	0.3%F.S.
Input resistance	Current mode: 100 Ω Voltage mode: 50 kΩ
Signal limit value	Current input does not exceed 24mA Voltage input does not exceed 12V

Channel diagnosis	Disconnection warning(Only supported in 1-5V and 4-20mA modes)
Output Specifications	
Output channel	2
Resolution ratio	12 bit
Conversion rate	15 time/s
Signal type	4～20mA,0～20mA,1～5V,0～10V
Measuring precision	0.3%F.S.
External loading	Current mode: Max 500 Ω Voltage mode: Min 1 kΩ
General Specifications	
Hot swapping	×
K-Bus current consumption	150mA (5V DC, room temperature)
Indicator	PR: power light ERR: working status indicator light 0-1: corresponding channel input signal transfinite indicator light
Terminal rated input voltage	24V DC（20.4V DC ～ 28.8V DC）
Terminal rated input current	80mA（Typical value at 24V）
Dimensions (W × H × D)	12mm × 100mm × 80mm
Weight	≈70g

6.2 RP20-0400RD

Technical Specifications	
Input channel	4
Resolution ratio	24 bit
Sensor	Pt100,Pt1000,Cu50,Cu100
Wiring	Two-wire、Three-wire
Temperature resolution ratio	0.1℃
Measuring precision	±0.2%
Conversion rate	1 time/s
Filter	None filtering or average filtering
Channel diagnosis	Transfinite , disconnection warning
Isolation	√
Hot swapping	×
K-Bus current consumption	160mA (5V DC, room temperature)

Indicator	PR: power light ERR: working status indicator light 0-3: corresponding channel input signal transfinite indicator light
Dimensions (W × H × D)	12mm × 100mm × 80mm
Weight	≈70g

6.3 RP20-0400TC

Technical Specifications	
Input channel	4
ADC resolution ratio	24 bit
Sensor	J/K/E/S/T/mV
Wiring	Two-wire
Temperature resolution ratio	0.1℃
Cold-junction	Internal cold junction/external cold junction
Measuring precision	±0.2%F.S.[1]
Conversion rate	1 time/s
Filter	None filtering or average filtering
Channel diagnosis	Transfinite , disconnection warning
Isolation	√
Hot swapping	×
K-Bus current consumption	160mA (5V DC, room temperature)
Indicator	PR: power light ERR: working status indicator light 0-3: corresponding channel input signal transfinite indicator light
Dimensions (W × H × D)	12mm × 100mm × 80mm
Weight	≈70g

*[1]: The data here represents ADC sampling accuracy, and the actual temperature measurement accuracy is related to cold junction compensation.

6.4 RP20-0400IV

Technical Specifications	
Input channel	4
Resolution ratio	16 bit
Signal type	4～20mA,0～20mA,1～5V,0～10V
Measuring precision	±0.2%F.S.
Conversion rate	30 time/s

Input resistance	Current mode: 100 Ω Voltage mode: 50 kΩ
Input limit value	Current:±30mA Voltage:±15V
Filter	None filtering or average filtering
Channel diagnosis	Disconnection warning(Only supported in 1-5V and 4-20mA modes)
Isolation	√
Hot swapping	×
K-Bus current consumption	150mA (5V DC, room temperature)
Indicator	PR: power light ERR: working status indicator light 0-3: corresponding channel input signal transfinite indicator light
Dimensions (W × H × D)	12mm × 100mm × 80mm
Weight	≈70g

6.5 RP20-0004IV

Technical Specifications	
Output channel	4
Resolution ratio	16 bit
Conversion rate	30 time/s
Signal type	4～20mA,0～20mA,1～5V,0～10V
Measuring precision	±0.2%F.S.
External loading	Current mode: 500 Ω Voltage mode: 1 kΩ
Isolation	×
Hot swapping	×
Terminal rated input voltage	24V DC（20.4V DC ～ 28.8V DC）
Terminal rated input current	100mA（Typical value at 24V）
K-Bus current consumption	140mA (5V DC, room temperature)
Indicator	PR: power light ERR: working status indicator light
Dimensions (W × H × D)	12mm × 100mm × 80mm
Weight	≈70g

7 Wiring

7.1 RP20-0202IV

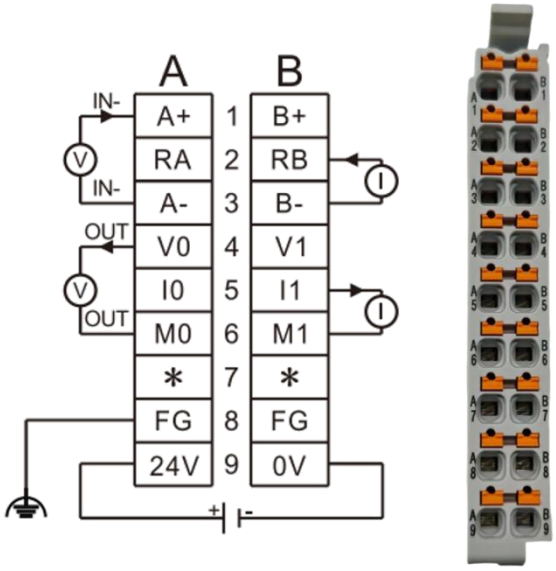


Fig.7.1-1 RP20-0202IV wiring diagram

7.2 RP20-0400RD

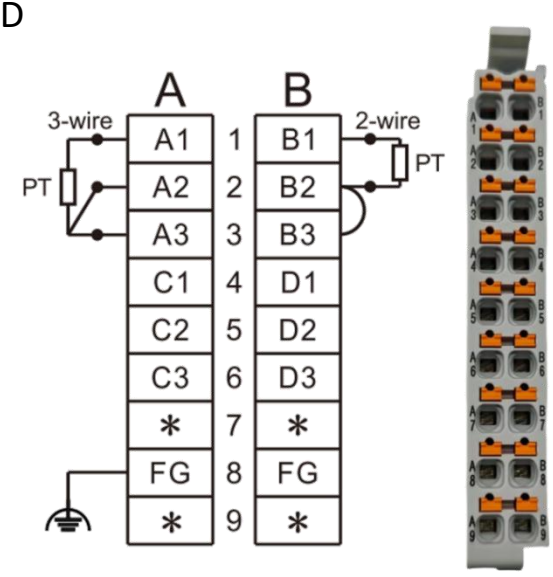


Fig.7.2-1 RP20-0400RD wiring diagram

7.3 RP20-0400TC

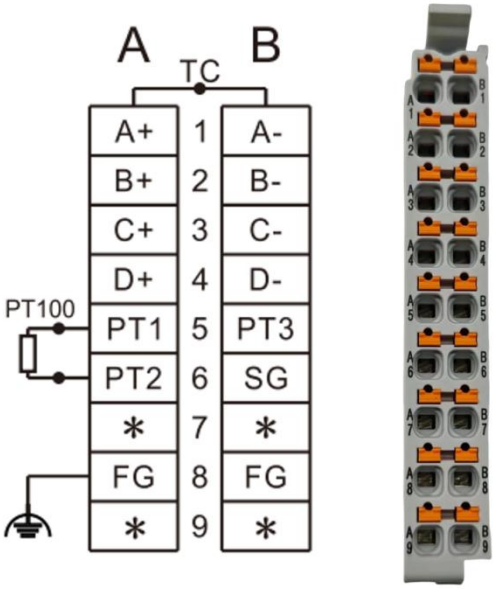


Fig.7.3-1 RP20-0400TC wiring diagram

7.4 RP20-0400IV

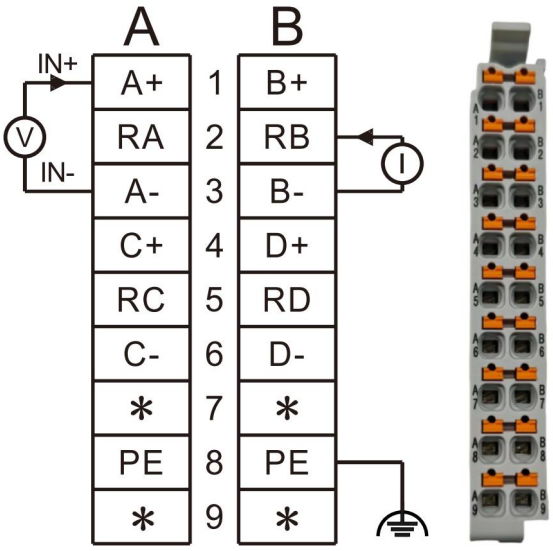


Fig.7.4-1 RP20-0400IV wiring diagram

7.5 RP20-0004IV

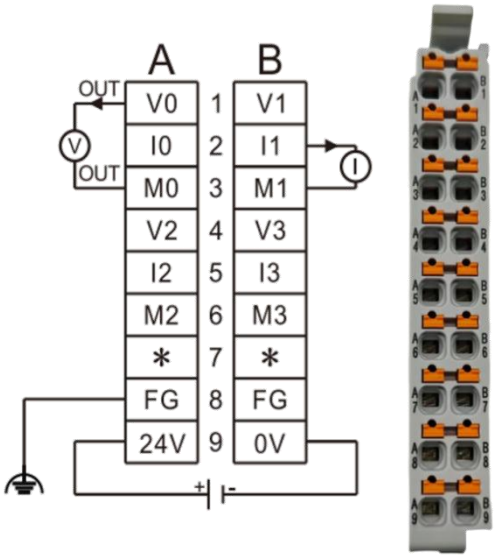


Fig.7.5-1 RP20-0004IV wiring diagram

8 Use introduction

8.1 RP20-0202IV

8.1.1 Measurement range and measurement value

The following table shows the input range and input value format of RP20-0202IV.
I: Actual current value, V: Actual voltage value.

Signal form	Measurement range	Measurement value representation format
4～20mA	3.2～21 mA	I×1000
0～20mA	0～21mA	
1～5V	0.8～5.1V	V×1000
0～10V	0～11V	

The following table shows the output range and output value format of RP20-0202IV.
I: Actual current value, V: Actual voltage value.

Signal form	Output range	Output value specified in the user program
4～20mA	3.92～20.4mA	I×1000
0～20mA	0～20.4mA	
1～5V	0.96～5.1V	V×1000
0～10V	0～10.2V	

Note: If the output value specified in the user program exceeds the upper and lower limits of the selected range, the output signal will remain at the upper and lower limit.

8.1.2 Startup parameter description

Name	Represent value and corresponding meaning
Signal Form	4～20mA 0～20mA 1～5V 0～10V
Filtering Mode	None Filtering Average Filtering
Stopmode After Lost Link	Keep Current Value：Keep the current value output when stopped Retain Preset： Output the set value when stopped
Stopvalue After Lost link	Output value when disconnected, please write according to the selected output mode

8.1.3 Use demonstration

8.1.3.1 Configuration

Step1：

Right-click RP20C_ECT , select Add device, and select RP20-0202IV to add it.

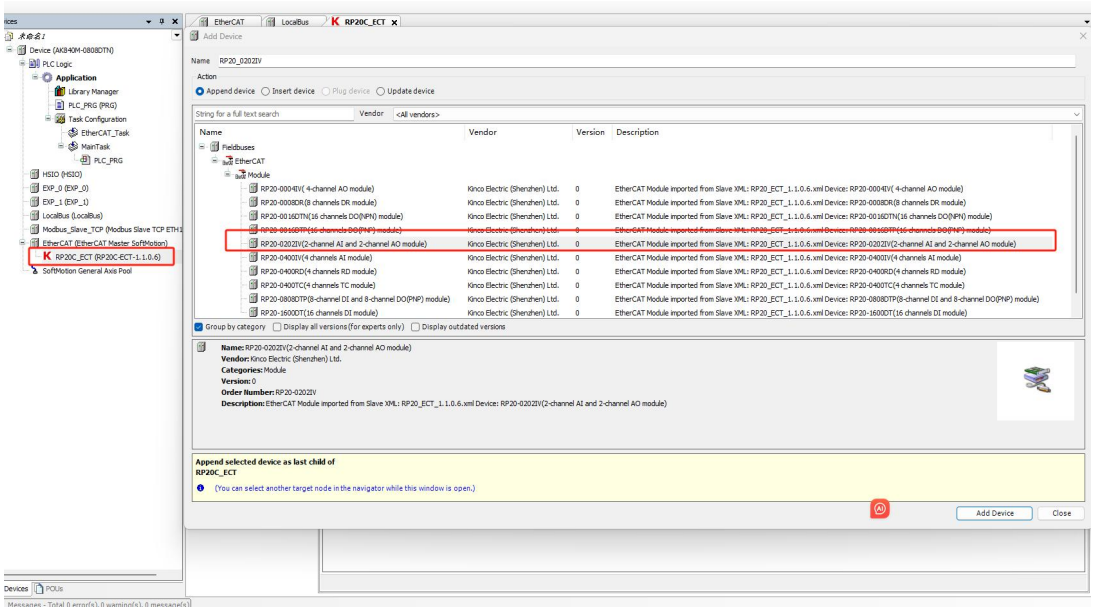


Fig.8.1.3-1 Add device

Step2：

Left click RP20-0202IV device to enter the configuration , select the startup parameters to configure the required parameters.The default configuration is shown in the figure. AI channel mode is set to 4-20mA, AI channel filtering mode is set to average filtering, AO channel mode is set to 4-20mA, and AO channel stopmode after EtherCAT lost link is set to keep current value.

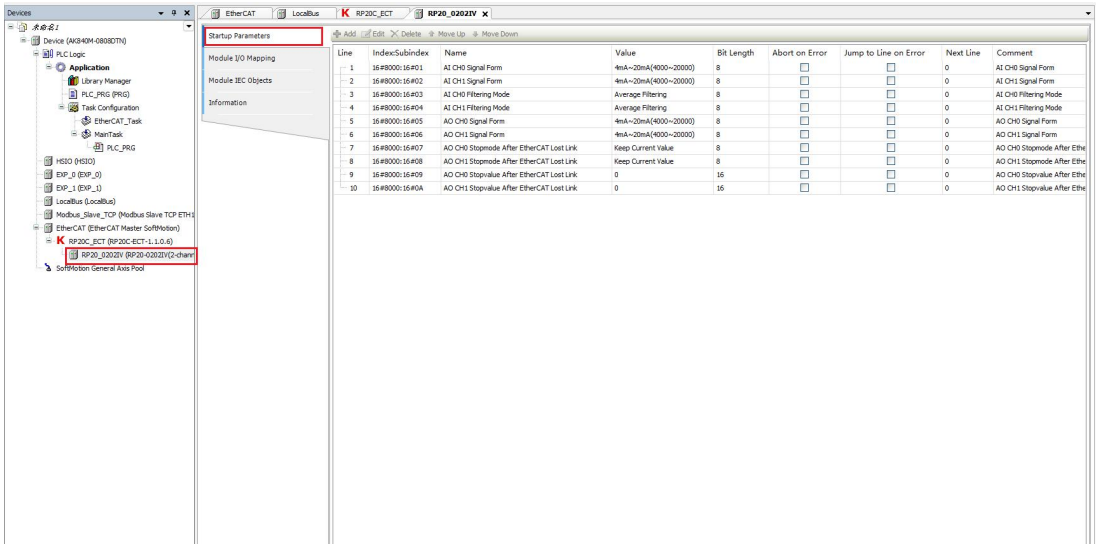


Fig.8.1.3-2 Configure startup parameters

Step3:

Declare variables in the program and map them to the IO map.

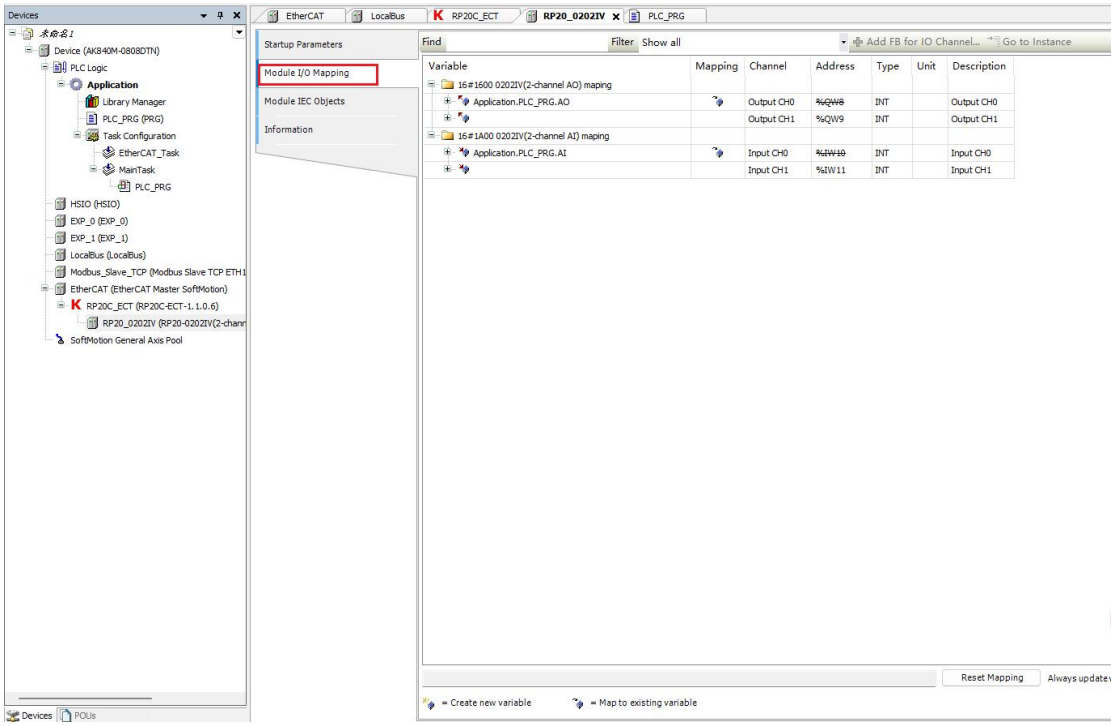


Fig.8.1.3-3 Mapping variable

8.1.3.2 Transfinite alarm and lost link detection method

Transfinite alarm

When the measured value exceeds the limit, the transfinite alarm is triggered, and the corresponding channel indicator light is steady red. The indicating value is the upper and lower limit of the corresponding mode. For example, if the set mode is

4-20mA and the actual input is 30mA, the indicating value is 21000(corresponding upper limit is 21mA); Set the mode 4-20mA, the actual input is 2mA, then the indicated value is 3200(corresponding to the lower limit value of 3.2mA).

Lost link detection

When measuring the lost link , for 4-20mA and 1-5V mode, the lost link detection is triggered, and the corresponding channel indicator light is steady red with an indicator value of -32768.

8.2 RP20-0400RD

8.2.1 Measurement range and measurement value

The following table shows the measurement range and measurement format of the RP20-0400RD module. The RD module can be connected to thermal resistors (Pt100, Pt1000, Cu100, Cu50) for temperature measurement, and supports two wire and three wire connection method. For details, please refer to Section 7.2.

T： Measured temperature R: Measured resistance value

For example, when the signal channel configuration is Pt100, the read analog value is 365, and the actual corresponding temperature value is 36.5 ℃.

Signal form	Measurement range	Measurement value representation format
Pt100	-200～850℃	T (℃) × 10
Pt1000	-50～300℃	
Cu50	-50～150℃	
Cu100	-50～150℃	

8.2.2 Startup parameter description

Name	Represent value and corresponding meaning
Signal Form	PT100 PT1000 Cu50 Cu100
Filtering Mode	None Filtering Average Filtering

8.2.3 Use demonstration

8.2.3.1 Configuration

Step1：

Right-click RP20C_ECT , select Add device, and select RP20-0400RD to add it.

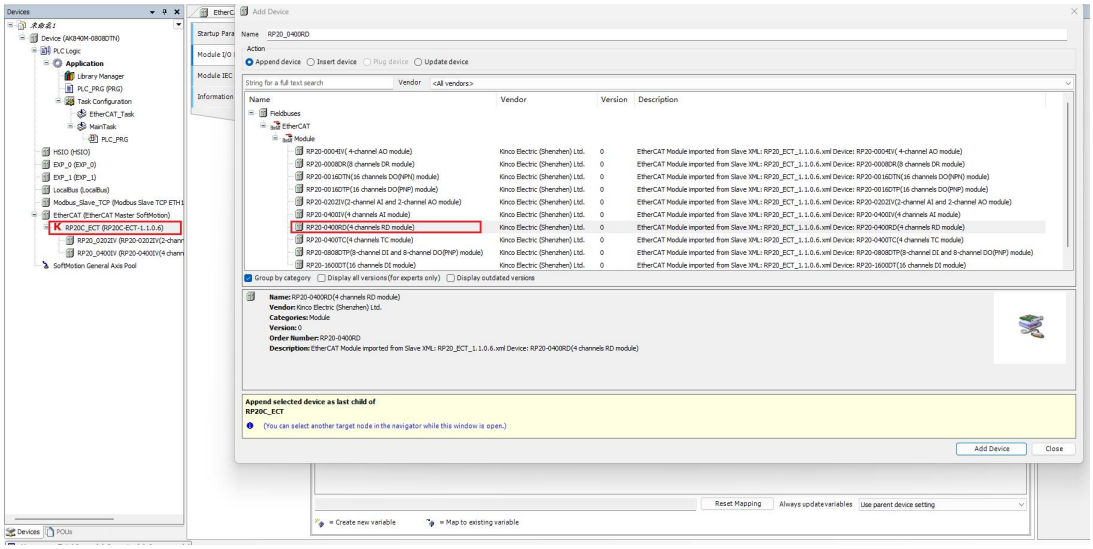


Fig.8.2.3-1 Add device

Step2:

Left click RP20-0400RD device to enter the configuration , select the startup parameters to configure the required parameters.The default configuration is shown in the figure, signal form is PT100， filtering mode is average filtering.

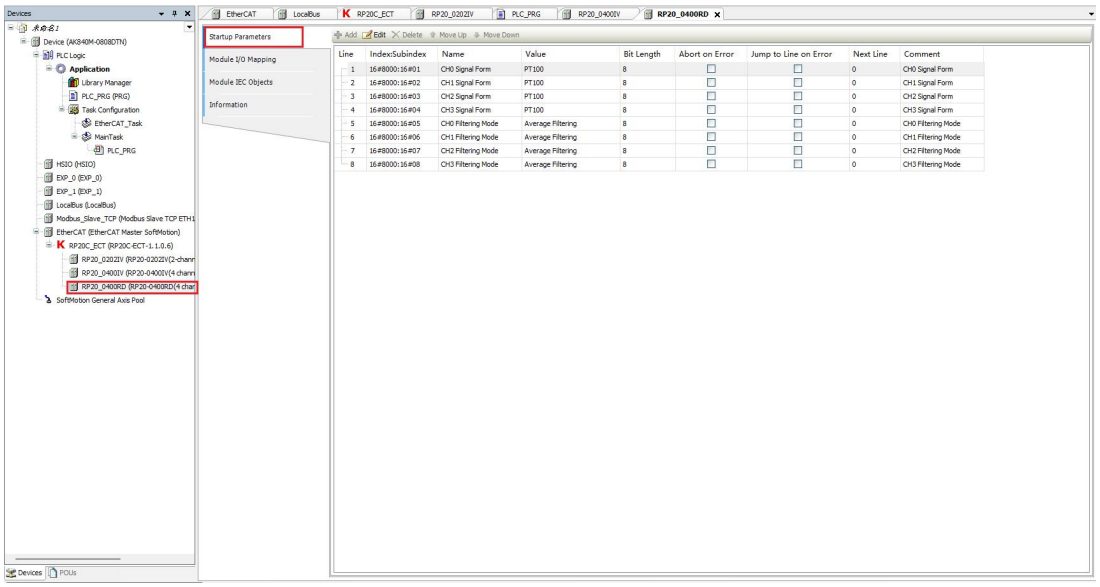


Fig.8.2.3-2 Configure startup parameters

Step3:

Declare variables in the program and map them to the IO map.

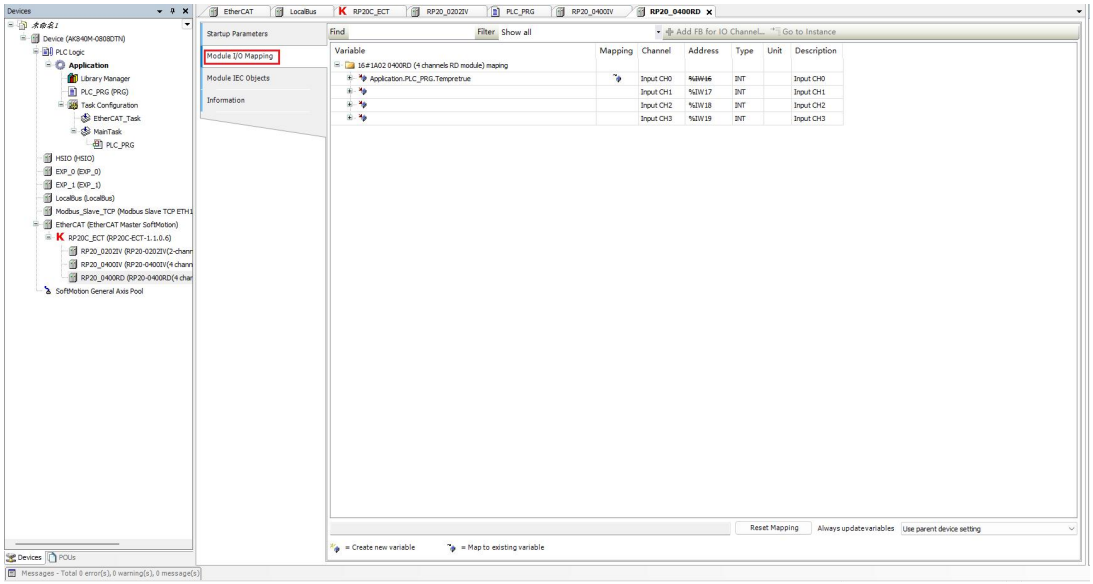


Fig.8.2.3-3 Mapping variable

8.2.3.2 Transfinite alarm and lost link detection method

Transfinite alarm

When the measured value exceeds the limit, the transfinite alarm is triggered, and the corresponding channel indicator light is steady red. The indicating value is the upper and lower limit of the corresponding mode. For example, if the set mode is PT100 and the actual input is 900℃, the indicating value is 8500(corresponding upper limit is 850℃); Set the mode is PT100, the actual input is -300℃, then the indicated value is -2000(corresponding to the lower limit value is 200℃).

Lost link detection

When measuring the lost link , the lost link detection is triggered, and the corresponding channel indicator light is steady red with an indicator value of -32768.

8.3 RP20-0400TC

8.3.1 Measurement range and measurement value

The following table shows the measurement range and measurement format of the RP20-0400TC module. The TC channel supports different types of thermocouples, including J, K, E, S, and T. The default configuration is J thermocouple. For details, see Section 7.3. In addition, the module can also measure mV signal.

T :Measured temperature mV : Measured mV signal value

Note:In the operating temperature range, when the temperature change rate is less than 0.3℃/min, the temperature measurement accuracy =ADC sampling accuracy + cold junction compensation error.

Signal form	Measurement range	Measurement value representation format
J	-210~1200℃	T (℃) × 10
K	-270~1300℃	
E	-270~1000℃	

S	-50~1600℃	
T	-200~400℃	
mV	0~99mV	mV × 10

8.3.2 Startup parameter description

Name	Represent value and corresponding meaning
Signal Form	PT100 PT1000 Cu50 Cu100
Filtering Mode	None Filtering Average Filtering
Cold Junction Compensation Mode	Internal Cold Junction Compensation External Cold Junction Compensation

8.3.3 Use demonstration

8.3.3.1 Configuration

Step1:

Right-click RP20C_ECT , select Add device, and select RP20-0400TC to add it.

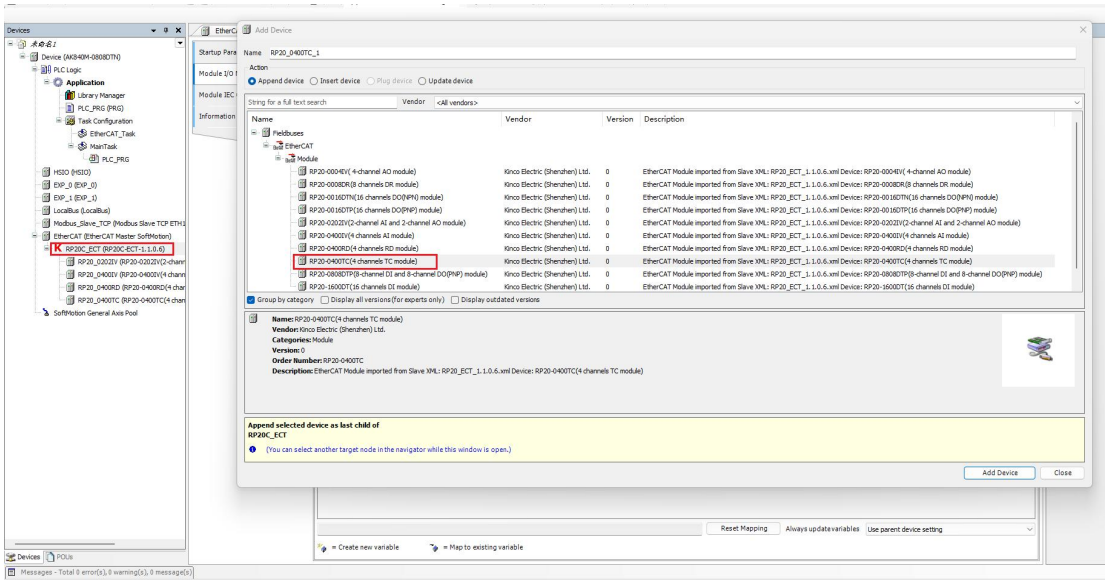


Fig.8.3.3-1 Add device

Step2:

Left click RP20-0400TC device to enter the configuration , select the startup parameters to configure the required parameters.The default configuration is shown in the figure, signal form is J， filtering mode is average filtering,cold junction compensation mode is internal cold junction compensation(When using the default internal cold junction compensation configuration, the module needs to run for about 45 minutes after starting work from the program end to warm up to achieve relatively stable measurement accuracy).

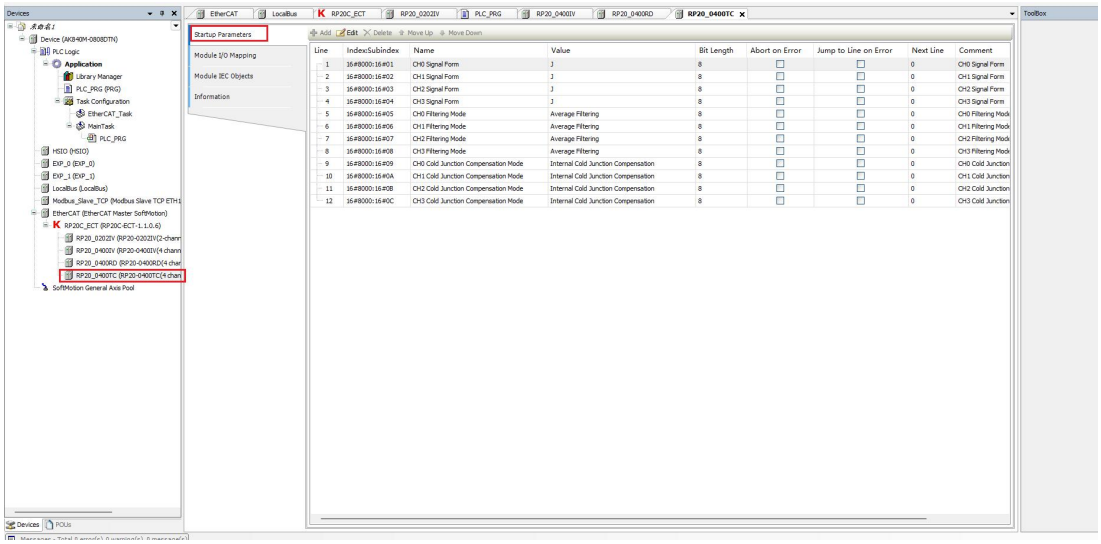


Fig.8.3.3-2 Configure startup parameters

Step3:

Declare variables in the program and map them to the IO map.

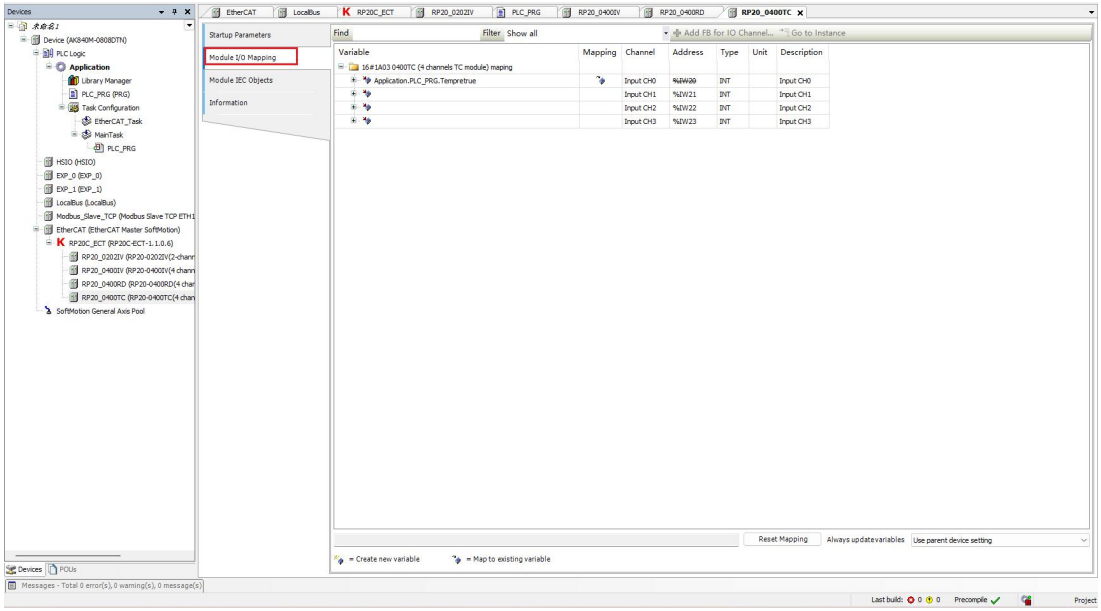


Fig.8.3.3-3 Mapping variable

8.3.3.2 Transfinite alarm and lost link detection method

Transfinite alarm

When the measured value exceeds the limit, the transfinite alarm is triggered, and the corresponding channel indicator light is steady red. The indicating value is the upper and lower limit of the corresponding mode. For example, if the set form is J and the actual input is 1300℃, the indicating value is 12000(corresponding upper limit is 1200℃); Set the form to J, the actual input is -300℃, then the indicated value is -2100(corresponding to the lower limit value is -210℃).

8.3.4 Cold junction compensation instruction

Internal cold junction compensation

The temperature measuring element of the cold junction is integrated in the module. When the internal compensation method is selected, the measurement result of the cold junction will be affected by the heating when the module is working. The temperature rise process is different in different environments, so the time required for the stability of the measurement value at the cold junction is also slightly different. Usually, it takes 30-45 minutes to reach the stability measurement, during this period, the temperature value of the channel measurement has a large error (the maximum error may reach 8℃). In addition, when the temperature module is configured with different types of modules, the internal cold junction value will also be affect: when the temperature module is a low heating module on both sides, the error is small after the cold junction compensation is stable; when the temperature module is a power module on both sides, the error is slightly larger after the cold junction compensation is stabilized. The maximum error of the internal compensation method (after the cold junction temperature stabilizes) is within 6 ℃.

Recommended usage:

- Within the operating temperature range / horizontal and upright installation direction
- Adjacent modules should be low-heating modules, such as RP20-1600DT (16-point digital input module), RP20-0400RD, RP20-0400TC or RP20-0400IV.

Not recommended usage:

- Adjacent modules are high heating modules, such as the coupler (RP20C-ECT) itself, RP20-PW and all output types of power modules.

External cold junction compensation

When higher measurement accuracy is required, a 2-wire or 3-wire PT100 sensor can be supported by setting the channel cold compensation mode to external cold junction compensation mode and connecting an external PT100 to the compensation terminal as a cold junction external compensation sensor. The external compensation method can avoid the problem that the internal compensation needs to stabilize for a long time and the adjacent module heats up, and improve the measurement accuracy of the system.

An external junction box can be used for external compensation,placing the PT100 resistor and the cold junction of the thermocouple together and away from various hot objects can greatly reduce the measurement inconsistency caused by compensation. The best accuracy of using external compensation method can reach 0.5℃.

The external compensation wiring method are as follows:

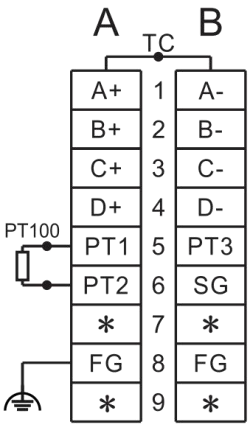


Fig.8.3.4-1 2-wire PT100 cold junction external compensation wiring

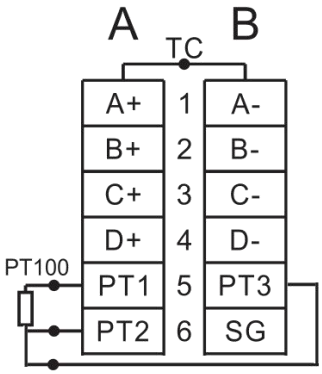


Fig.8.3.4-2 3-wire PT100 cold junction external compensation wiring

8.4 RP20-0400IV

8.4.1 Measurement range and measurement value

The following table shows the measurement range and expression format of the input current and voltage signal of RP20-0400IV

I: input current value V: input voltage value:

For example, if the signal form is current, if the analog value read is 9965, the actual corresponding current value is 9.965mA.

Signal form	Measurement range	Measurement value representation format
4～20mA	3.2～21 mA	I × 1000
-20～20mA	-21～21mA	
1～5V	0.8～5.1V	V × 1000
-10～10V	-11～11V	

When the measured value exceeds the allowed measurement range, the fault LED of the corresponding channel will light up.

8.4.2 Startup parameter description

Name	Represent value and corresponding meaning
Signal Form	4-20mA -20-20mA：This option supports -20-20mA or 0-20mA input 1-5V -10-10V：This option supports -10-10V or 0-10V input
Filtering Mode	None Filtering Average Filtering

8.4.3 Use demonstration

8.4.3.1 Configuration

Step1：

Right-click RP20C_ECT , select Add device, and select RP20-0400IVto add it.

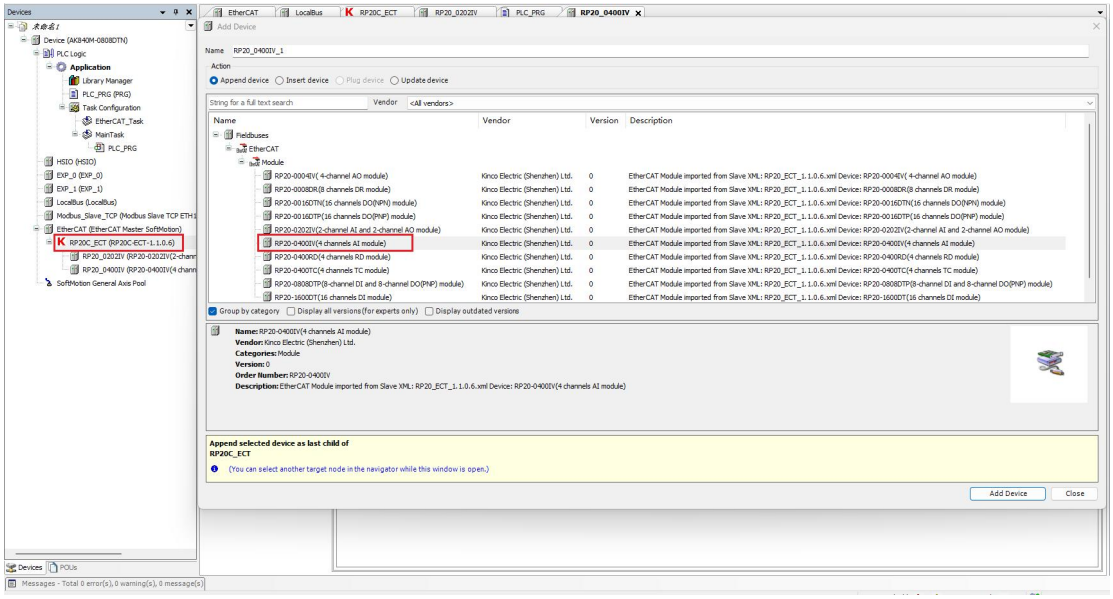


Fig.8.4.3-1 Add device

Step2：

Left click RP20-0400IV device to enter the configuration , select the startup parameters to configure the required parameters.The default configuration is shown in the figure, signal form is 4-20mA， filtering mode is average filtering.

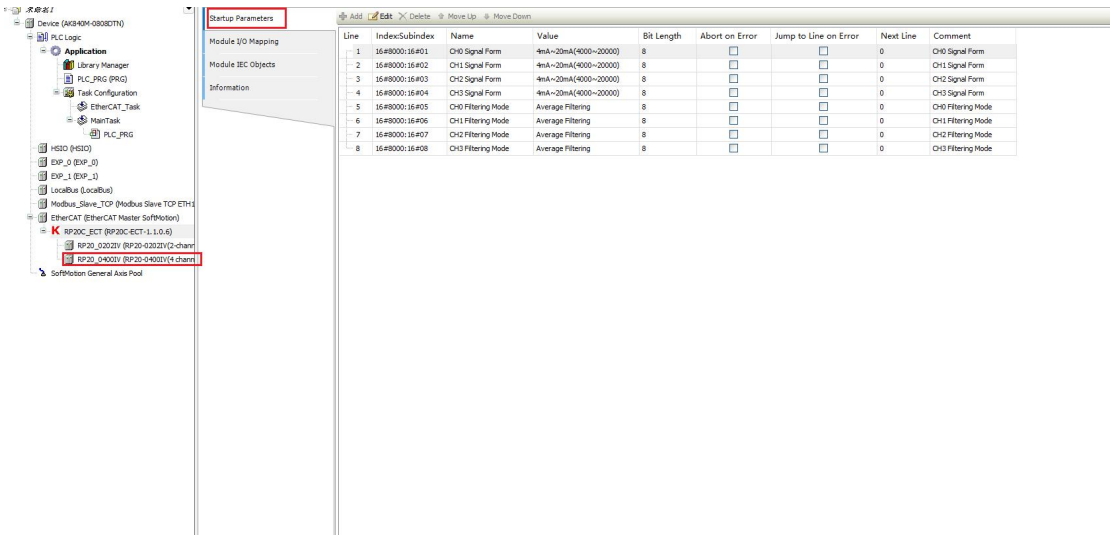


Fig.8.4.3-2 Configure startup parameters

Step3:

Declare variables in the program and map them to the IO map.

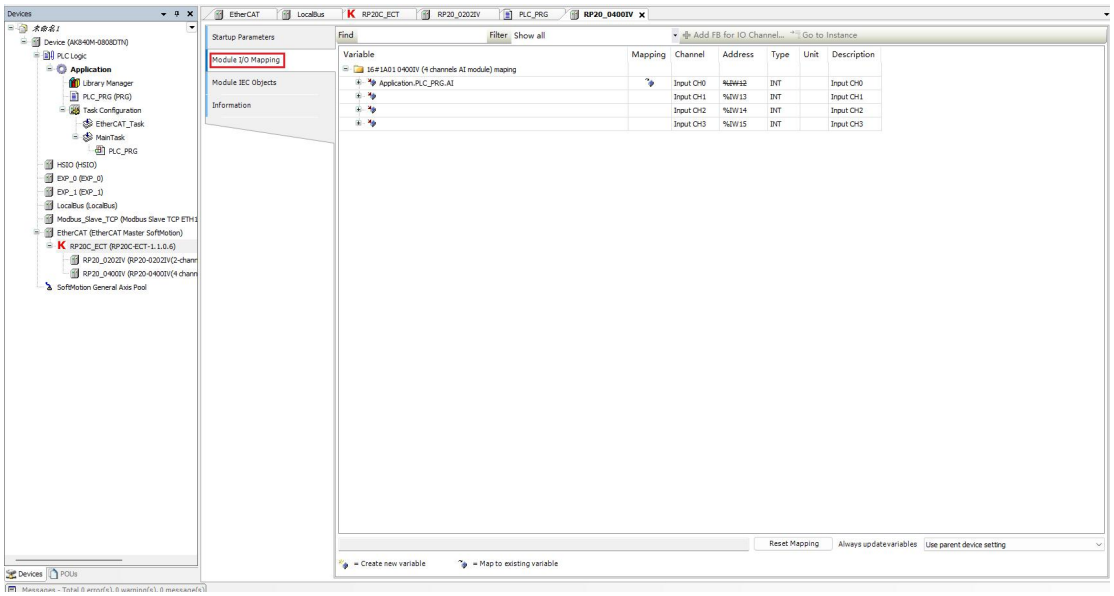


Fig.8.4.3-3 Mapping variable

8.4.3.2 Transfinite alarm and lost link detection method

Transfinite alarm

When the measured value exceeds the limit, the transfinite alarm is triggered, and the corresponding channel indicator light is steady red. The indicating value is the upper and lower limit of the corresponding mode. For example, if the set form is 4-20mA and the actual input is 30mA, the indicating value is 21000(corresponding upper limit is 21mA); Set the form is 4-20mA , the actual input is 2mA, then the indicated value is 3200(corresponding to the lower limit value is 3.2mA).

Lost link detection

When measuring the lost link , for 4-20mA and 1-5V mode, the lost link detection is triggered, and the corresponding channel indicator light is steady red with an indicator value of -32768.

8.5 RP20-0004IV

8.5.1 Measurement range and measurement value

The following table shows the output range and output value format of RP20-0004IV
I: Actual current value V: Actual voltage value:
For example, if the signal form is current, if the analog value read is 9965, the actual corresponding current value is 9.965mA.

Signal type	Measurement range	Measurement value representation format
4-20mA	3.92-20.4mA	I × 1000
0-20mA	0-20.4mA	
1-5V	0.96-5.1V	V × 1000
-10-10V	-10.2-10.2V	

Note: If the output value specified in the user program exceeds the upper and lower limits of the selected range, the output signal will remain at the upper and lower limits.

8.5.2 Startup parameter description

Name	Represent value and corresponding meaning
Signal Form	4-20mA 0-20mA 1-5V -10-10V： This option can support -10-10V or 0-10V configuration
Stopmode After Lost Link	Keep Current Value： Keep the current output value when stopped Retain Preset： Output the set value when stopped
Stopvalue After Lost Link	Output value when lost link Stopmode After Lost Link takes effect when it is set to Retain Preset.

8.5.3 Use demonstration

Step1：

Right-click RP20C_ECT , select Add device, and select RP20-0004IVto add it.

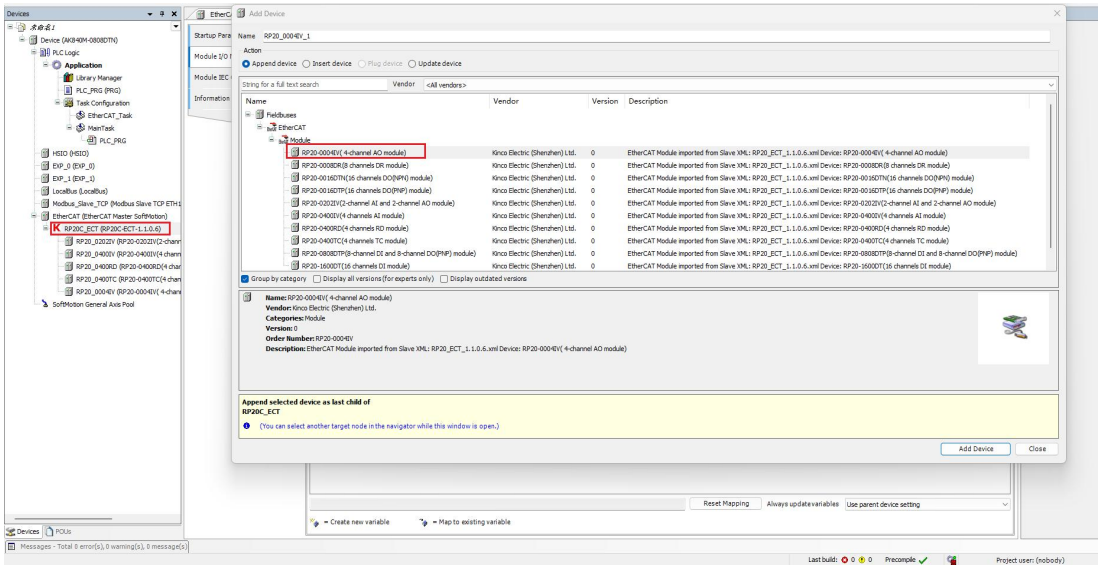


Fig.8.5.3-1 Add device

Step2:

Left click RP20-0004IV device to enter the configuration , select the startup parameters to configure the required parameters.The default configuration is shown in the figure, signal form is 4-20mA， Stopmode After Lost Link is keep current value.

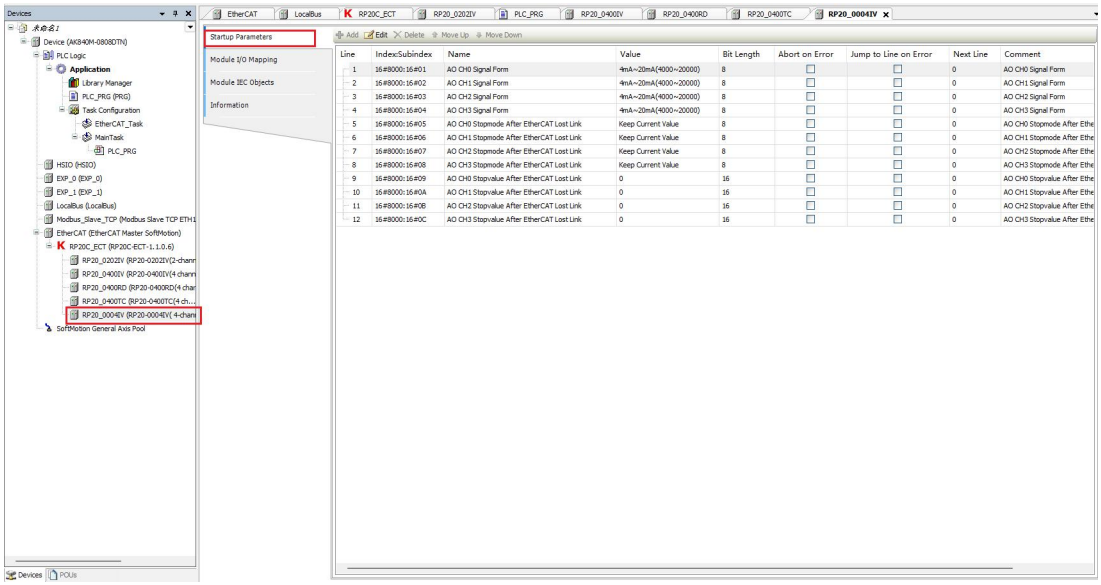


Fig.8.5.3-2 Configure startup parameters

Step3:

Declare variables in the program and map them to the IO map.

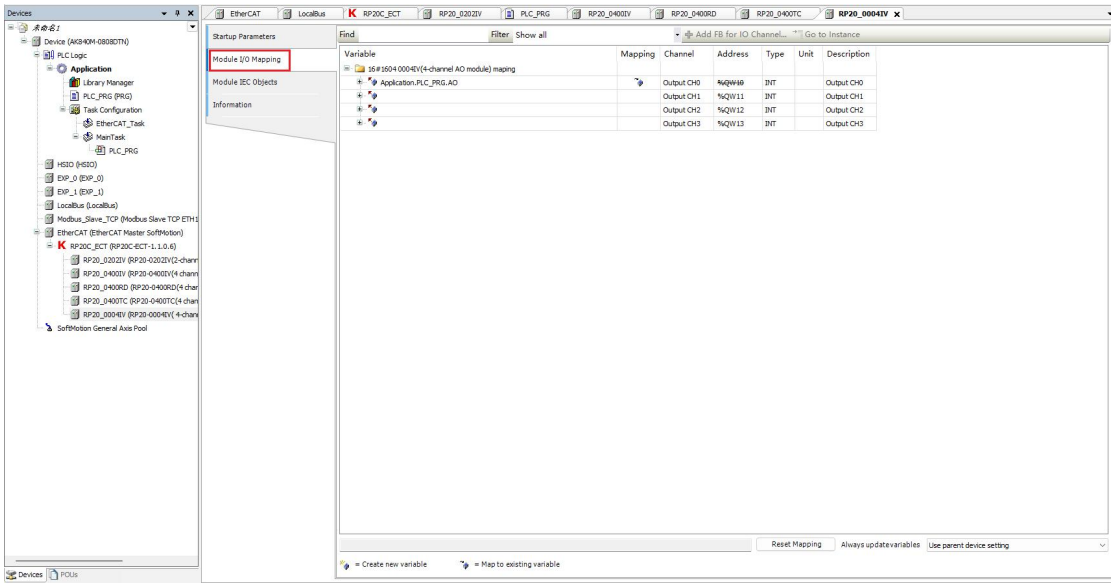


Fig.8.5.3-3 Mapping variable

9 Product dimension

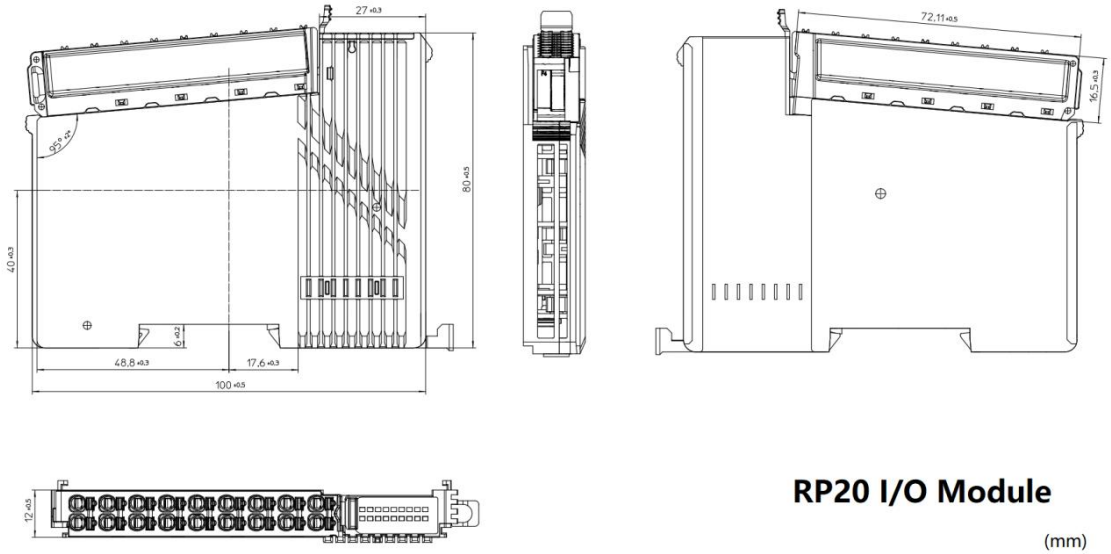


Fig.9-1 RP20 series I/O modulesAssembly dimension drawing

The above product dimension is applicable to the following models:
RP20-0202IV, RP20-0400RD, RP20-0400TC,RP20-0400IV and RP20-0004IV.

10 Installation criteria

10.1 Installation dimension

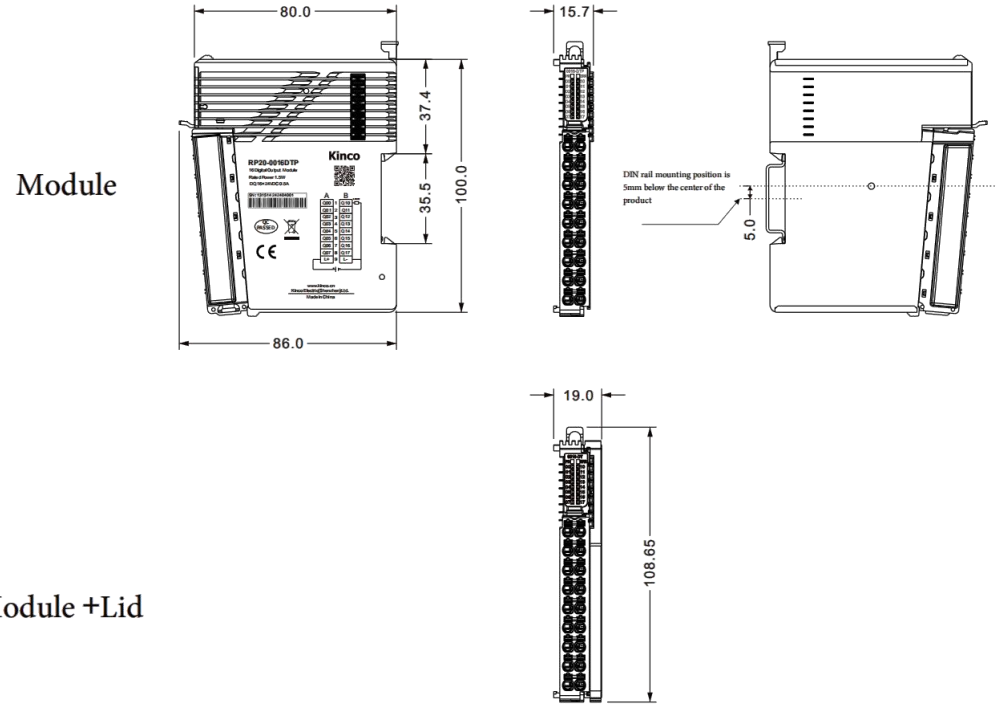


Fig.10.1-1 Installation dimension

The above installation dimension is applicable to the following models:
RP20-0202IV, RP20-0400RD, RP20-0400TC,RP20-0400IV and RP20-0004IV.

10.2 Installation method

10.2.1 DIN rail dimension

It is recommended to use a standard 35mm wide, 1mm thick DIN rail for assembly. The following two heights are commonly used.

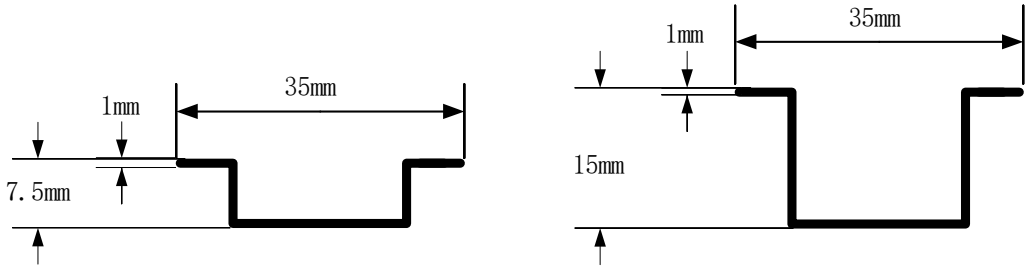


Fig.10.2-1 Standard DIN Rail

Notes: When the rail thickness <1mm, the latch may not lock securely, causing looseness. When rail thickness >1mm, the latch may not close properly, and forcing it to lock could damage the module.

10.2.2 Module assembly

Modules are effectively connected through the positional relationship between the top rail and the bottom rail.

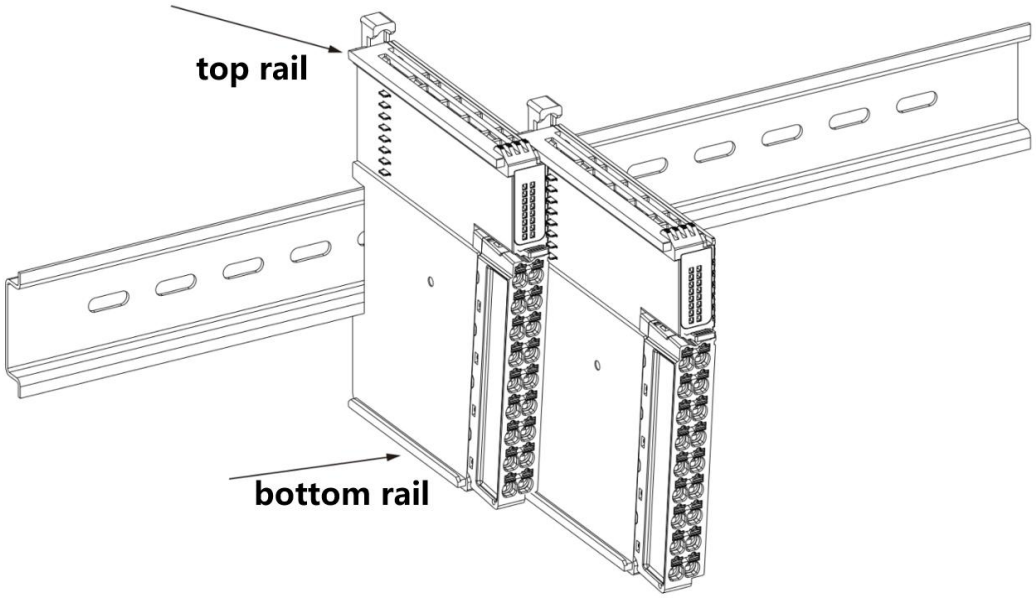


Fig.10.2-2 Module assembly

When assembling modules, align the top and bottom rails of the module to be connected with the rails of the target module. Simultaneously clip them onto the rails, then push the module vertically until it is fully inserted and aligned.

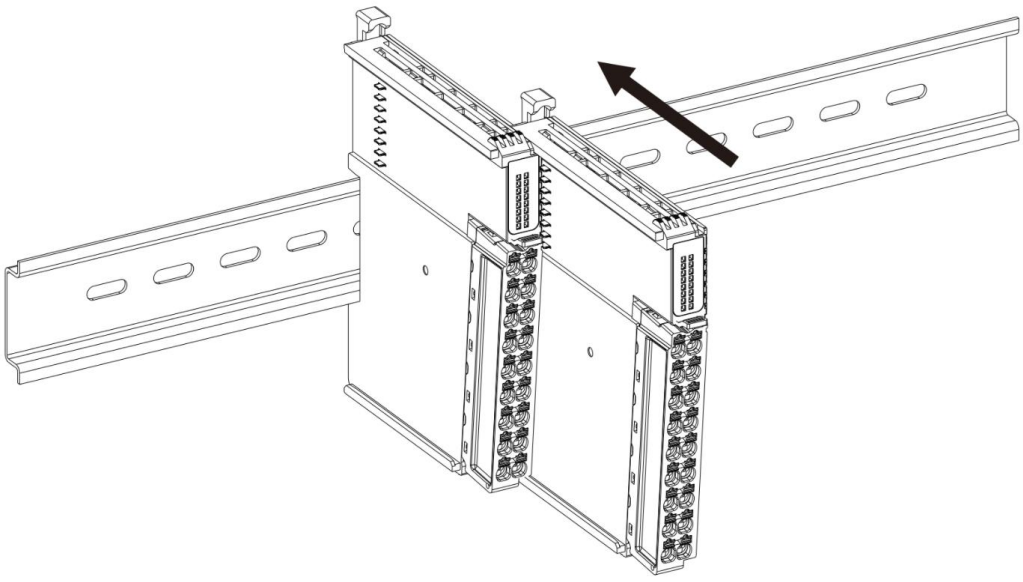


Fig.10.2-3 Module assembly

To secure the module onto the DIN35 rail, first pull the spring lever at the top of the module upward. Then, clip the module vertically onto the rail. Release the lever, and the locking mechanism will automatically snap back to secure the module in place.

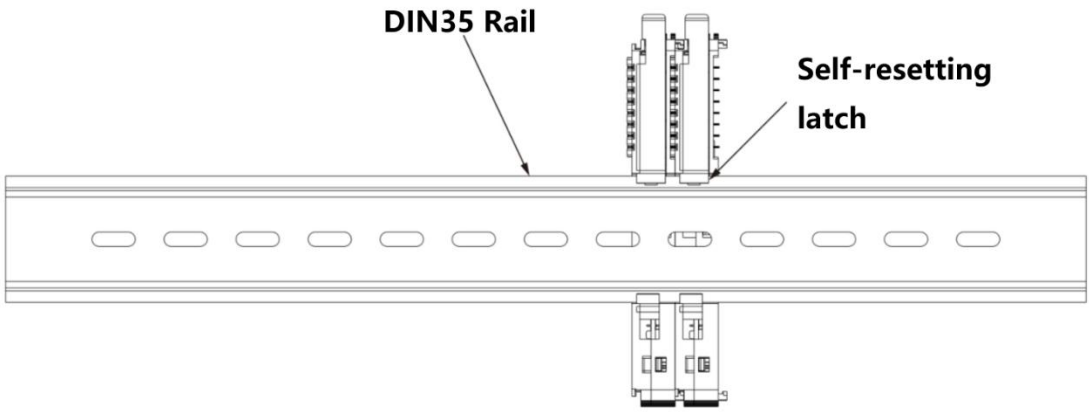


Fig.10.2-4 Secure the module onto the DIN35 rail

After all modules are assembled, use rail fixing blocks that are compatible with the rail size to secure the modules in their intended positions on the rail. This prevents improper displacement during mechanical vibrations or transportation, ensuring system safety.

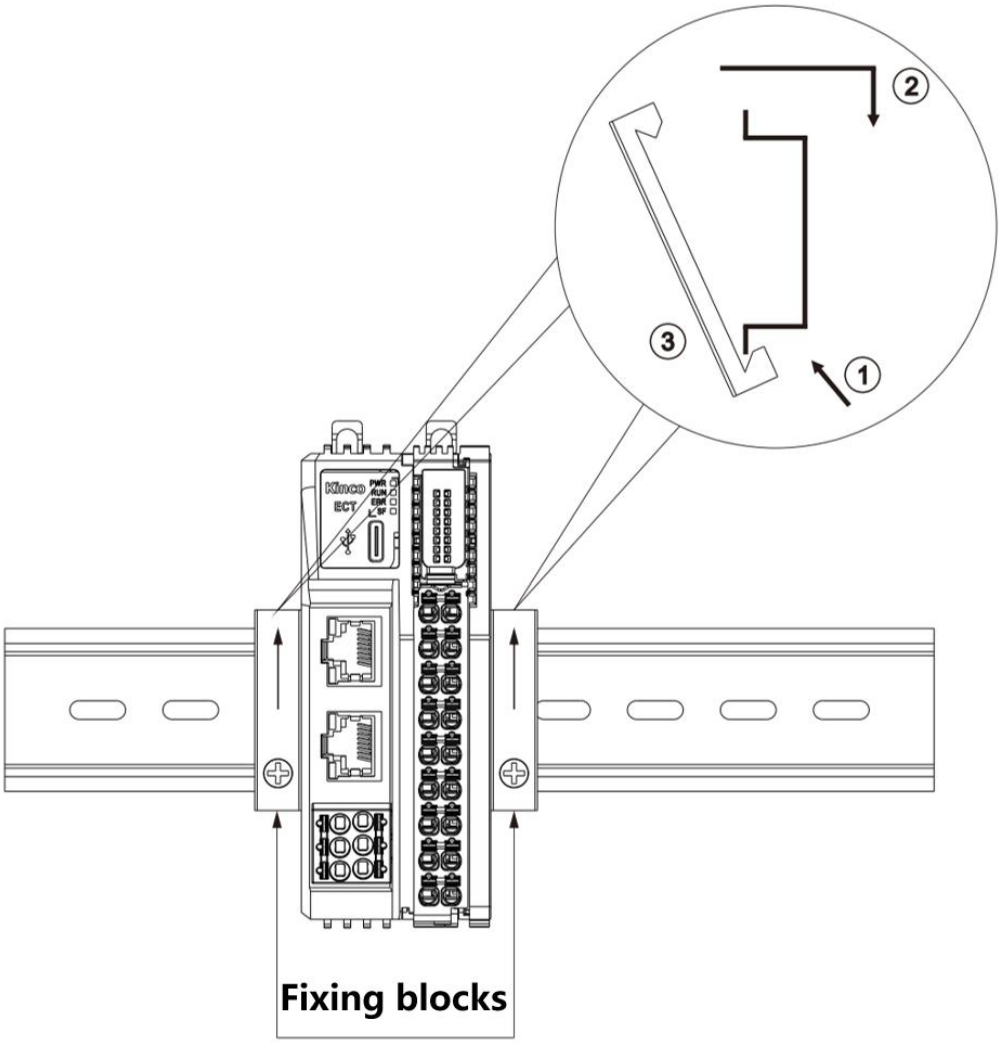


Fig.10.2-5 Fixing blocks assembly

During disassembly, first loosen the rail fixing block, then use a flathead screwdriver or other tools to lift the spring-loaded self-locking latch on top of the module. Afterward, remove the module from the rail.

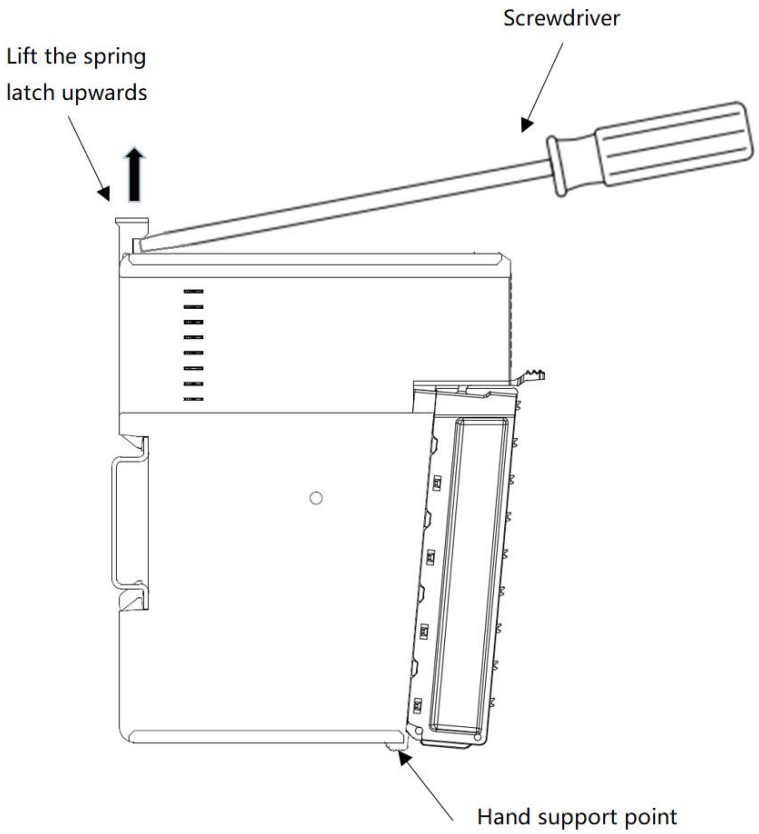


Fig.10.2-6 Module disassembly

Notes: Rail fixing blocks must match the size of the DIN rail. Customers should purchase the blocks separately based on their specific requirements.

10.2.2 Connector Assembly

When connector disassembly：

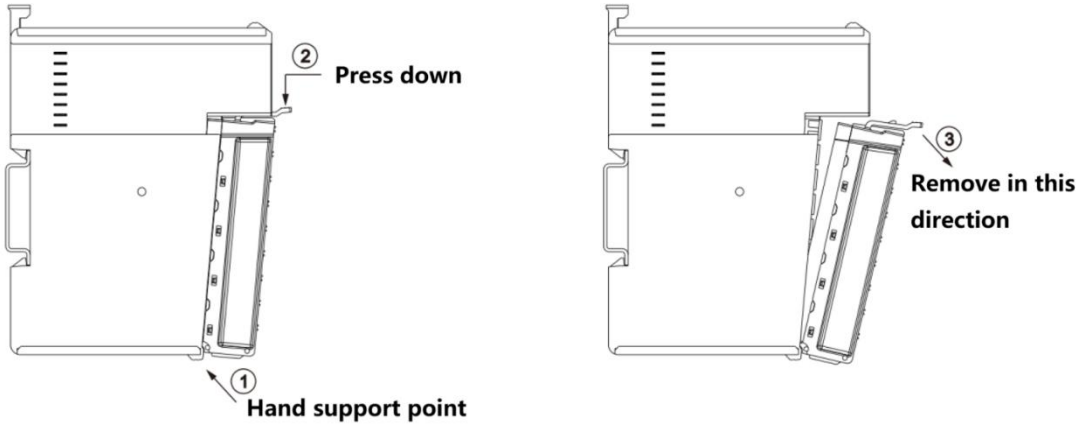


Fig.10.2-7 Connector disassembly

When connector assembly：

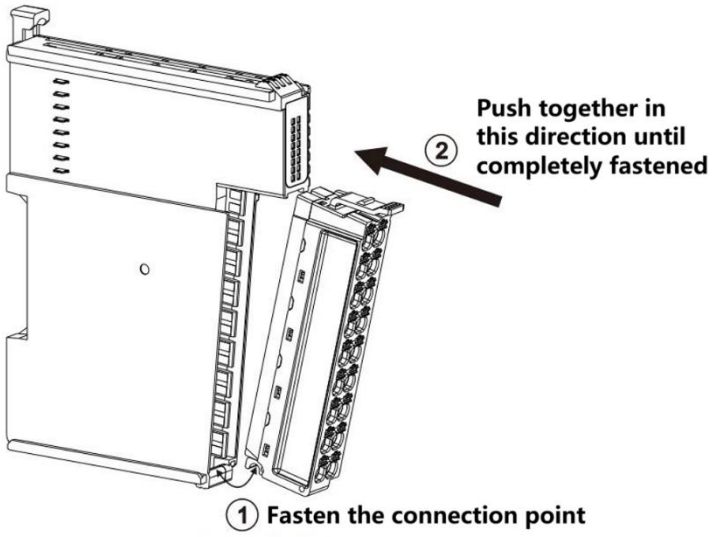


Fig.10.2-8 connector assembly

The module terminals (front connection area) are equipped with cable fixing points. Using accessories such as cable clamps or straps, I/O cables can be secured, making cable management easier and more organized.

Fig.10.2-9 Cable management

11 Getting start

11.1 Device description file acquisition

The I/O modules do not have separate device description files. Instead, they are integrated into the device description file of the RP20 series coupler or the device installation package of the AK8X0 series PLC. Please visit the Kinco official website https://www.kinco.cn/(CN), https://en.kinco.cn/ (EN) or contact Kinco's official customer service department to obtain the latest device description files.

11.2 Install device description file

11.2.1 When Used with RP20 Coupler

11.2.1.1 Installation

This chapter demonstrates the device installation process using the standard CoDeSys-style interface (CoDeSys V3.5.19) and RP20 EtherCAT coupler.

Step 1: Open CoDeSys V3.5.19, locate and open the "Device Repository" under the "Tools" menu.

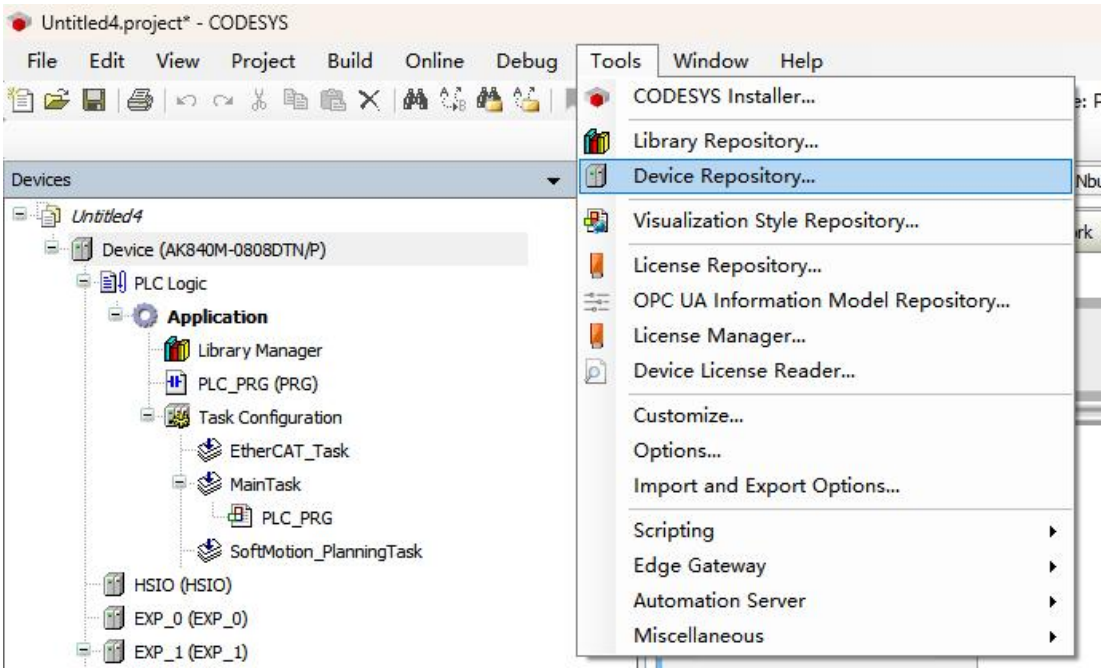


Fig. 11.2.1-1 Open "Device Repository"

Step2: Select the "Install.." option, locate the target file in the opened directory, and open it.

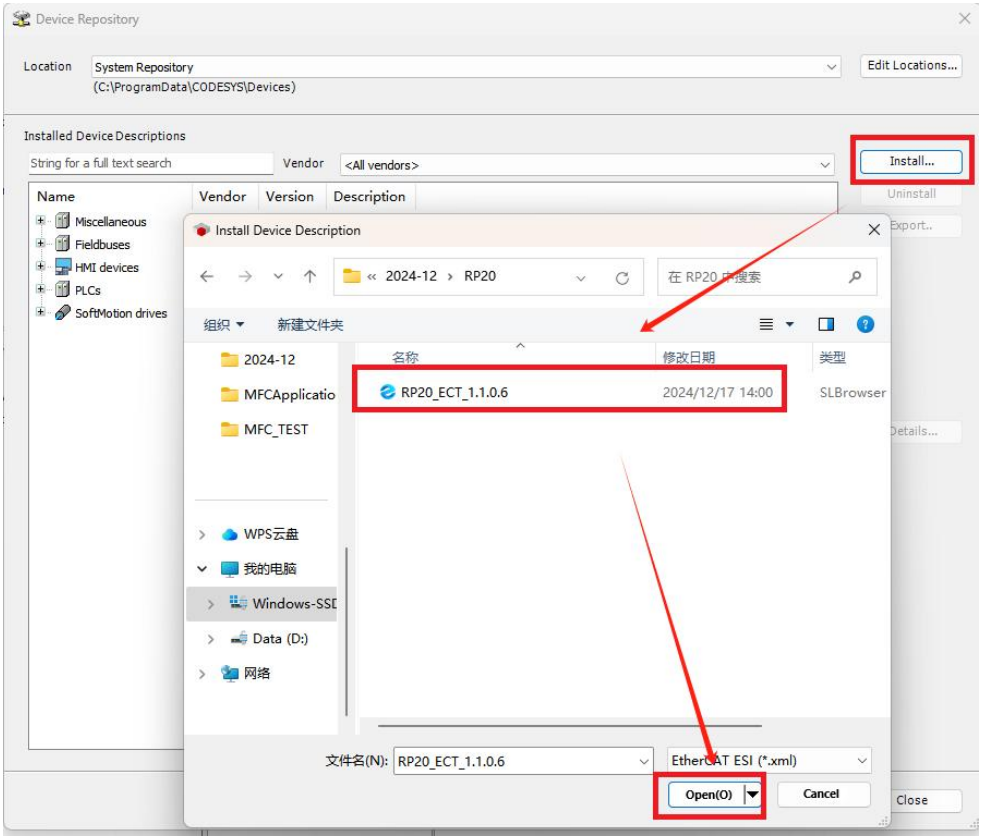


Fig. 11.2.1-2 Select file and install

Step3: Wait for the installation to finish.

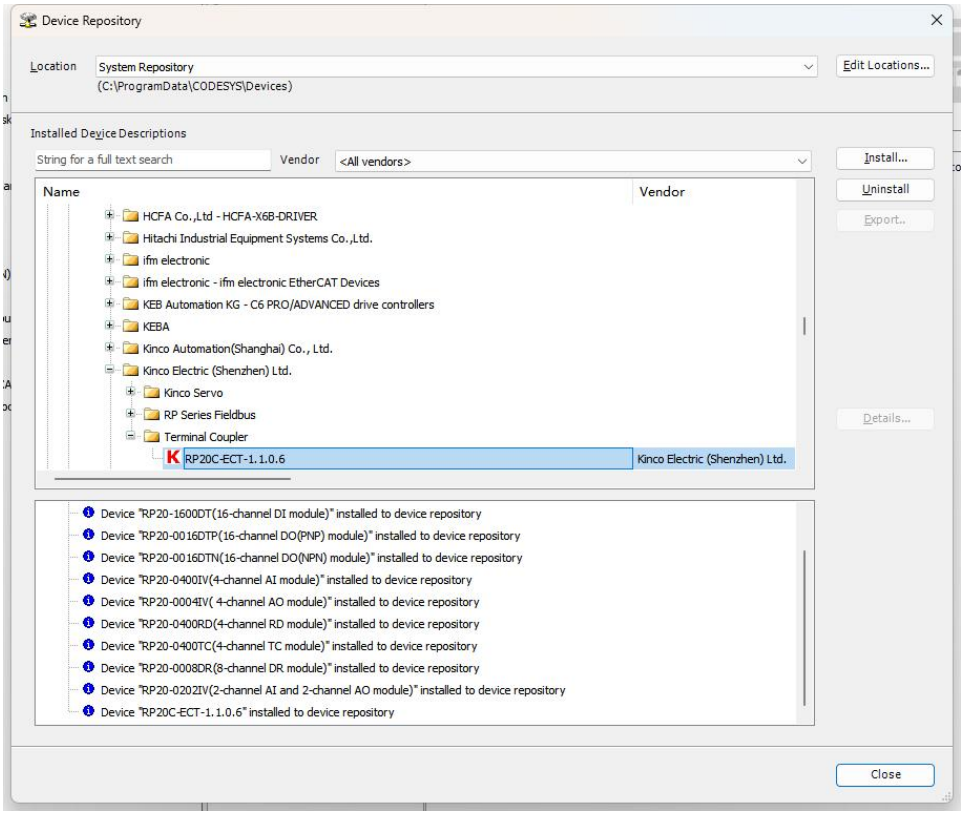


Fig. 11.2.1-3 Wait for the installation to complete

11.2.1.2 Configuration

This section demonstrates the configuration process for RP20 series I/O modules using the RP20 series EtherCAT coupler as an example. The RP20 series offers 2 configuration methods:

Method 1: Configuration via scanning. This method requires an actual slave device to be connected.

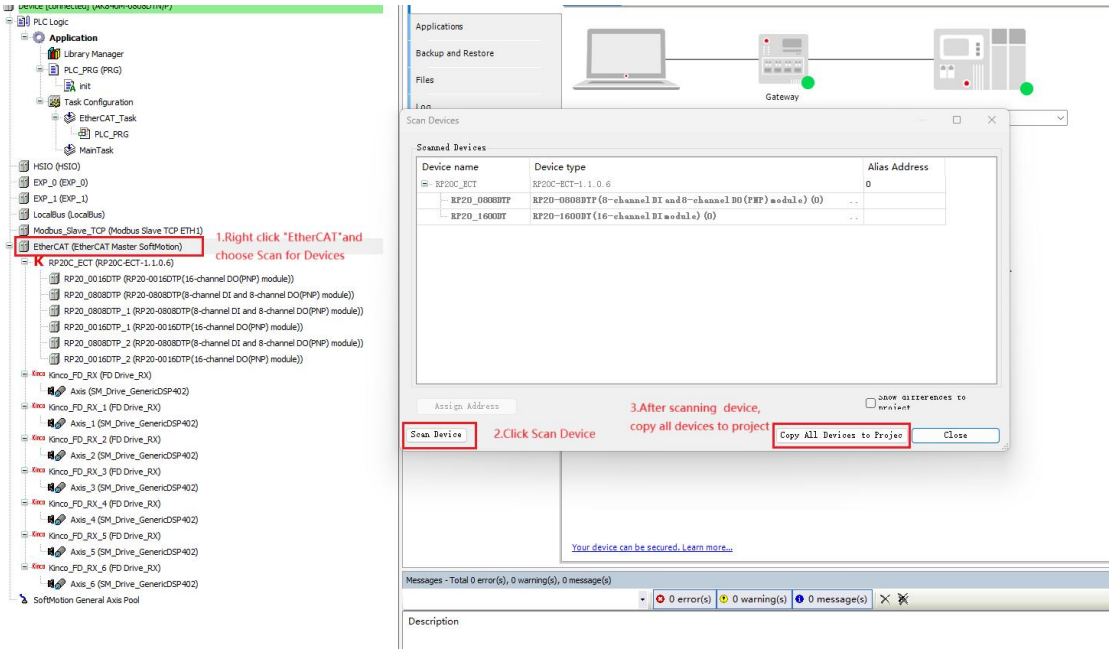


Fig. 11.2.1-4 Scan for device

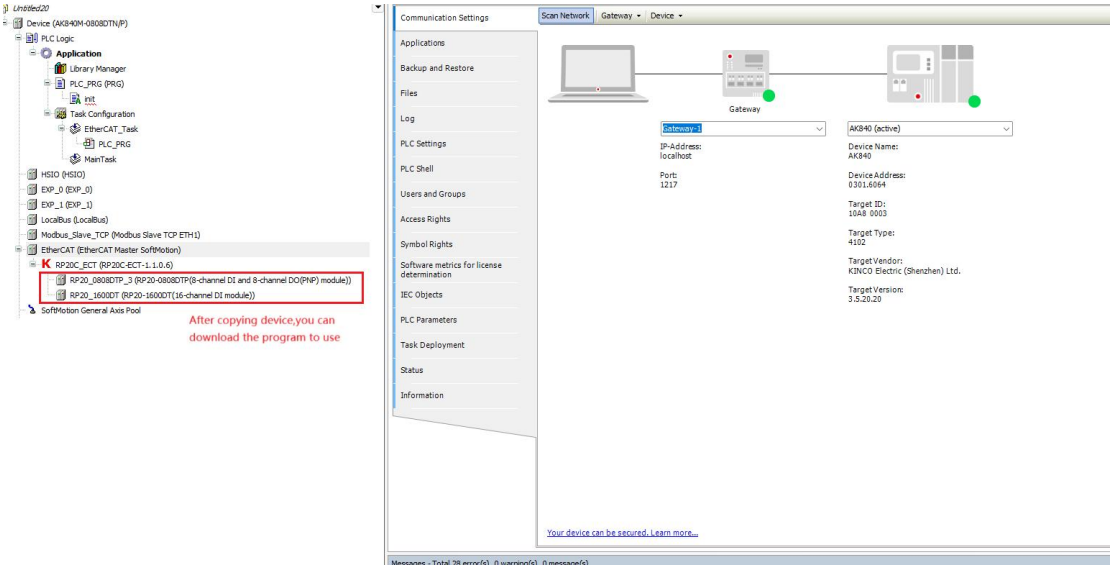


Fig. 11.2.1-5 Copy all devices to project

Method 2: Configuration by manually adding modules. For this method, the order of module addition must match the actual connection sequence of the modules; otherwise, communication errors will occur.

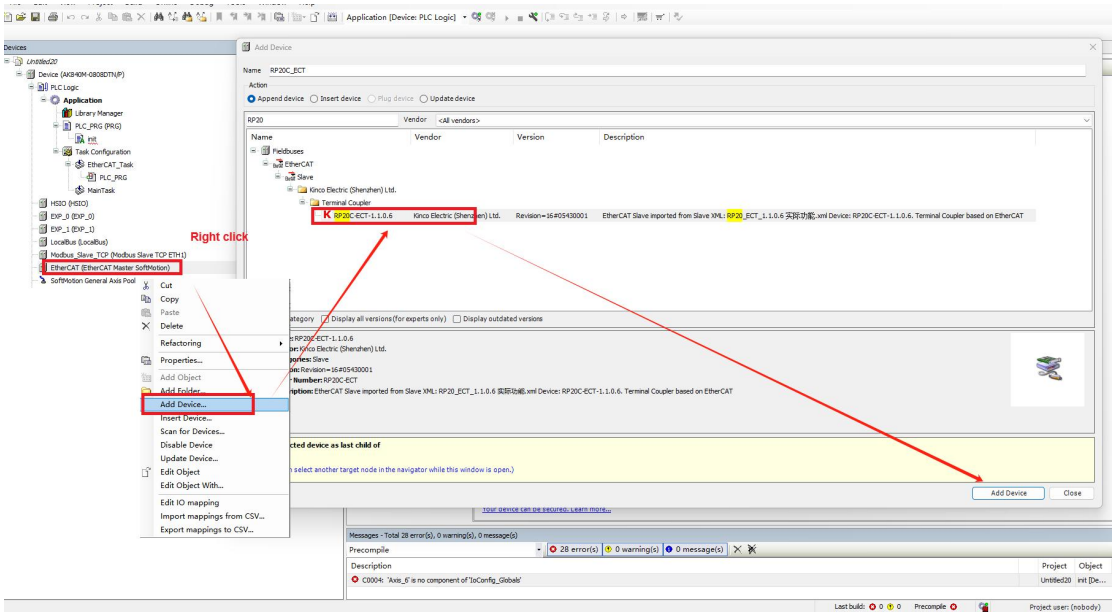


Fig. 11.2.1-6 Add the coupler

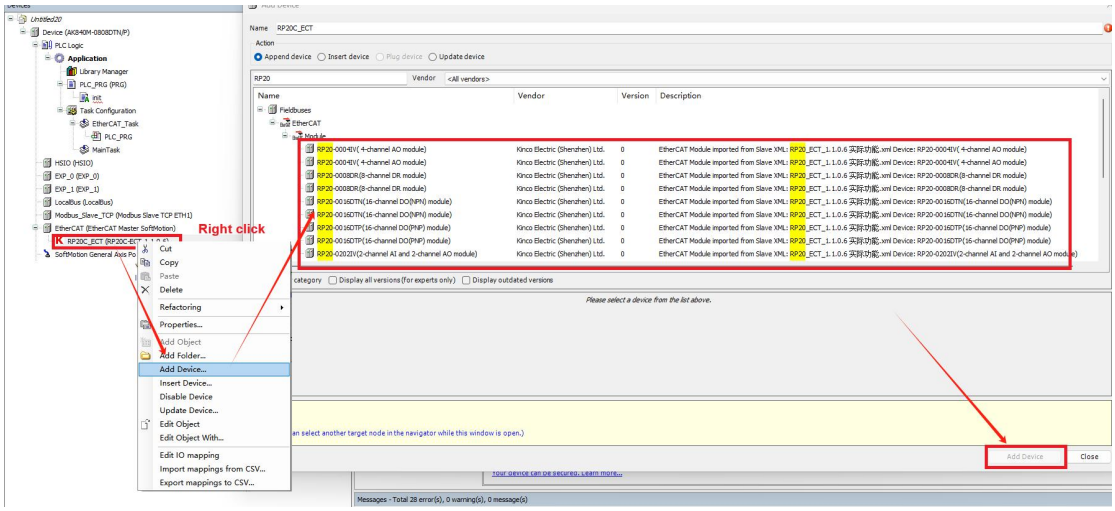


Fig. 11.2.1-7 Add modules

11.2.2 When used with AK840M Controller

11.2.2.1 Configuration

Configure under "localbus" by manually adding modules. This method requires manually adding I/O modules, ensuring the addition sequence matches the actual module connection sequence. Otherwise, communication errors may occur.

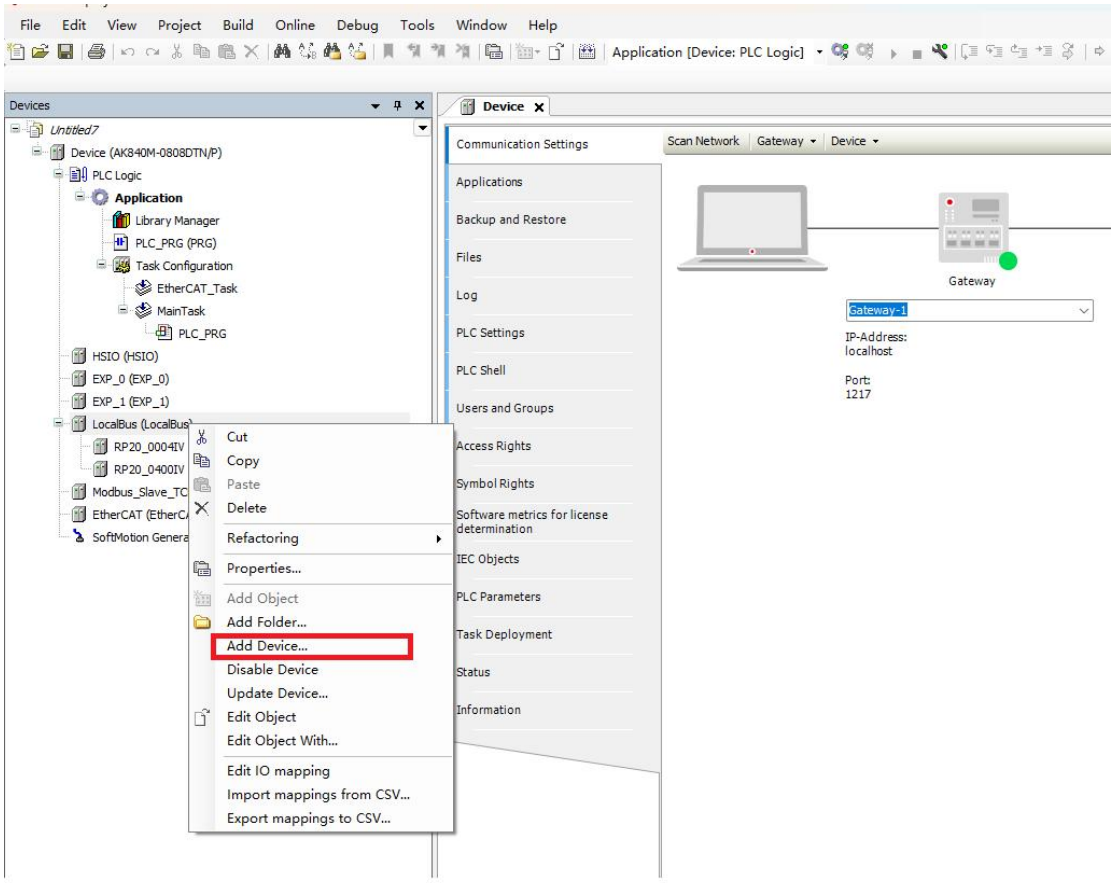


Fig. 11.2.2-1 Configure under "localbus"

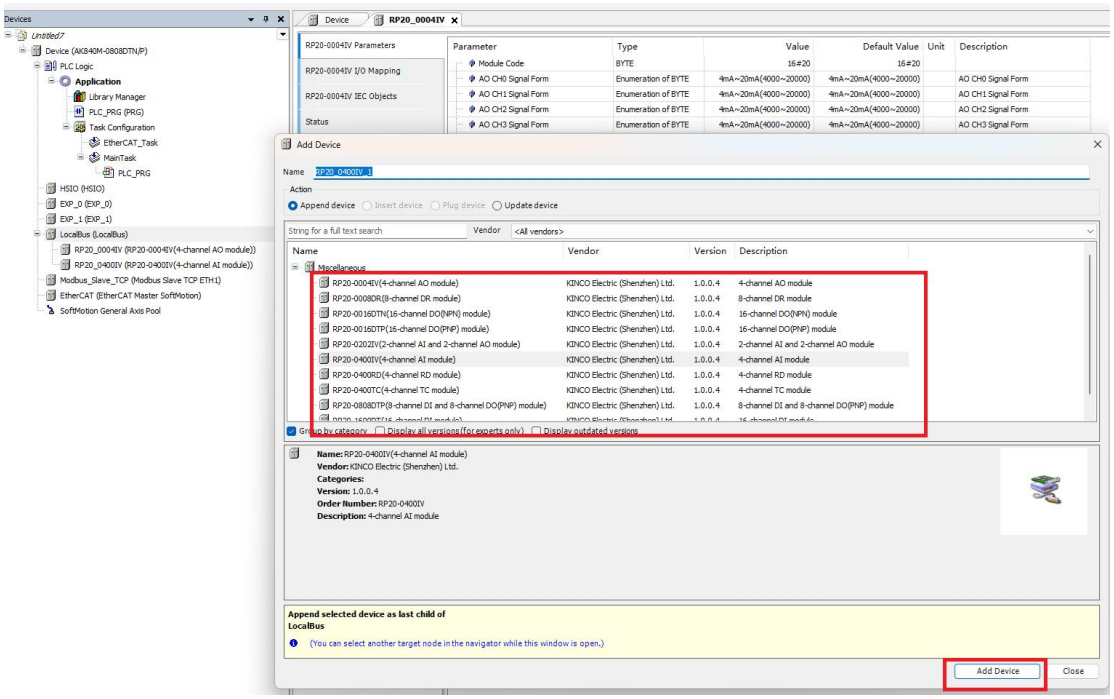


Fig. 11.2.2-2 Add I/O devices to the slave station list in actual order

11.2.2.2 Usage Demonstration

Step 1: Variable mapping

Method 1: Address mapping (Byte /Bit). Map the address of the corresponding I/O channel to the specific variable or use the channel address directly when the variable is defined.

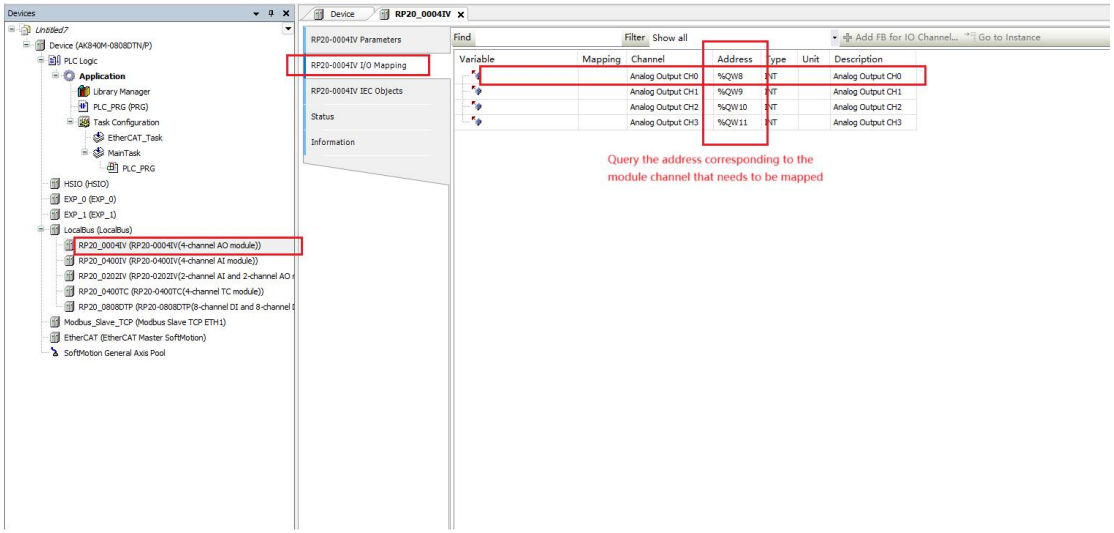


Fig. 11.2.2-3 “Module I/O Mapping”

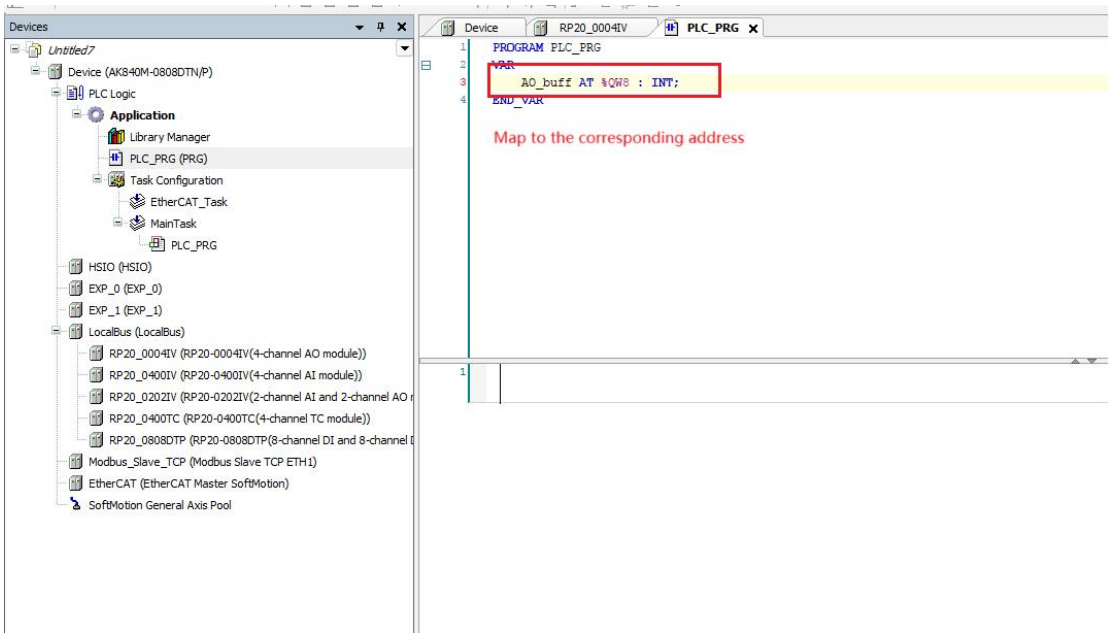


Fig. 11.2.2-4 Map the desired address to a custom variable

Method 2: Direct address mapping (Byte /Bit). On the" Module I/O Mapping" page, map the I/O channel address to a specific variable.

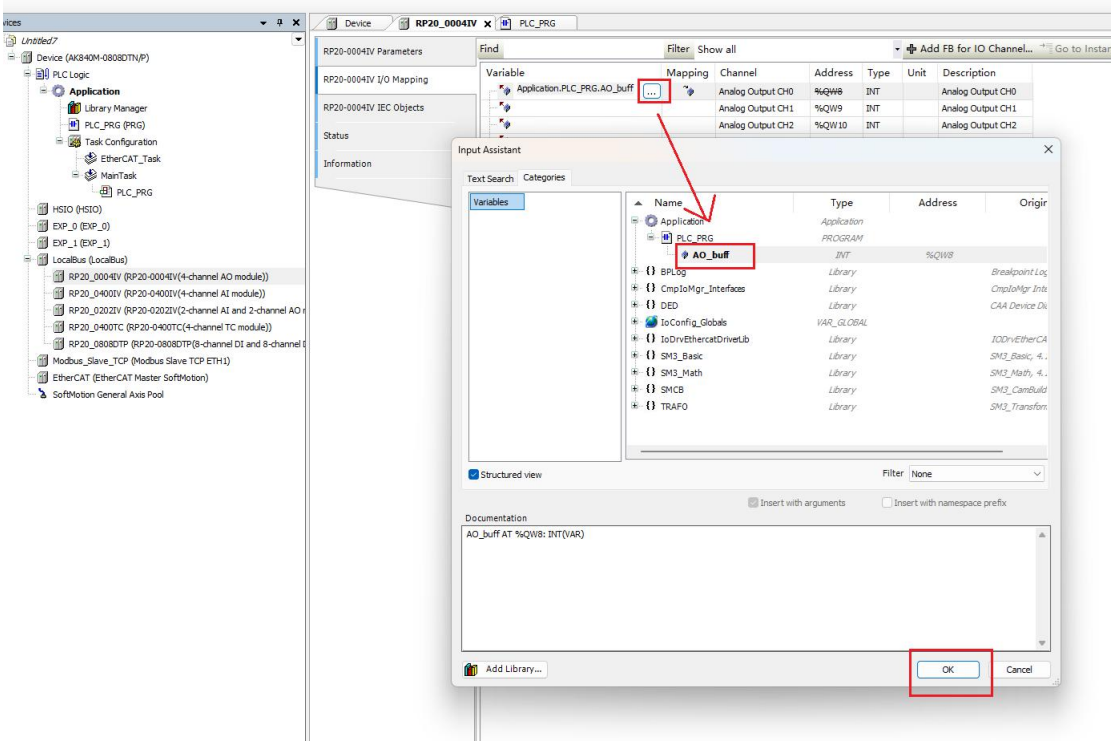


Fig. 11.2.2-5 Map variables in Byte format on the Module I/O Mapping page

Step 2: Configure startup parameters

On the parameter page of the corresponding module, set startup parameters. As shown in the figure, default parameters of RP20-0004IV:

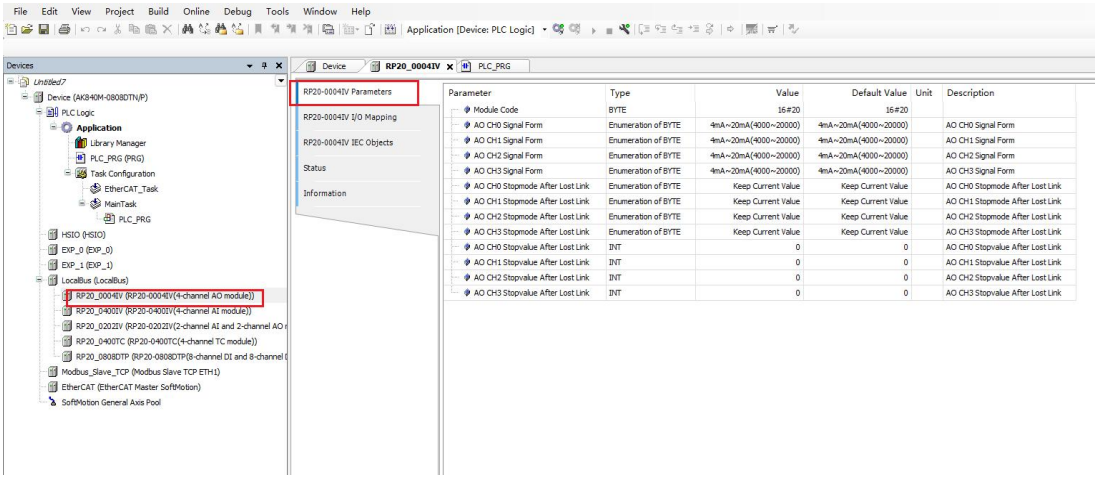


Fig. 11.2.2-6 Set startup parameters

12 Error Diagnostics

When the module's Err indicator (red) lights up, it indicates a fault in the module. The fault code can be obtained through the online monitoring interface of the master station software. The object dictionary for the fault code is 0xAXXX.
The corresponding module object dictionary index is related to the module's position under the coupler (n=1~16). The relationship between the index and the position is as follows:
Index = 0xA000 + 0x10 × (n-1)
For example, if three modules are connected in the "Online CoE" interface in CoDeSys (Fig. 12-1), the corresponding fault indices would be: 0xA010, 0xA020, 0xA030.

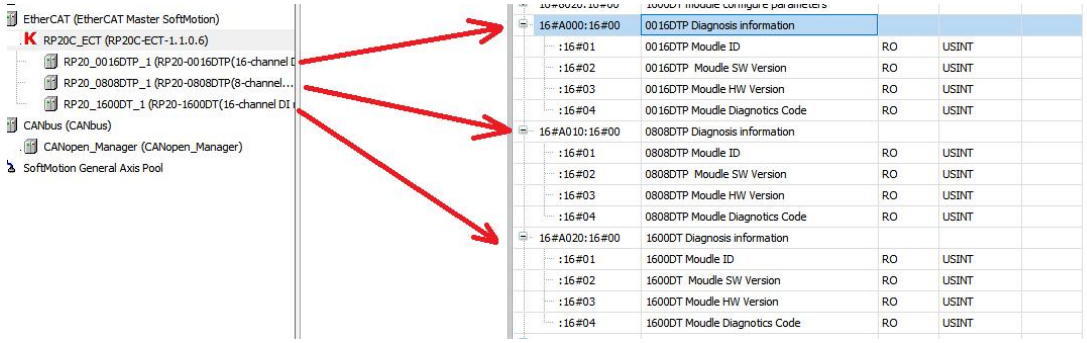


Fig. 12-1 “CoE Online” Tag

Object Dictionary Index Definition		
0xA000+0x10*(n-1)		
Sub-index	Type	Definition
01	UINT8	Module ID
02	UINT8	Module SW Version / Software version
03	UINT8	Module HW Version / Hardware version
04	UINT8	Module Diagnosis information / Error code

The object dictionary index **0xA000 + 0x10 × (n-1)** has a specific entry for the module error code at 0x04. Below are some common error codes and their meanings:

Code	Definition
0x01	Error caused by the master device. Please check the master device's status and perform fault diagnosis (refer to the corresponding user manual of the master device).
0x02	Error caused by the module itself.
0x03	The module ID returned by the module is invalid. Please check the module configuration and module position.