Kinco 步科

RP20 Series

Remote I/O System

RP20C-ECT
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 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
2024/12/25	RP20C_ECT_usermanual_V000	Initial Revision

Content

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.

During power supply

❖ 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 electrical assembly

❖ Installation, wiring, maintenance, and inspection must be performed by qualified personnel trained in electrical equipment.

❖ Avoid dusty, corrosive, or high-temperature environments.

❖ When processing screw holes or wiring, take care to prevent metal shavings, dust, and wire fragments from entering the controller's ventilation channels, as this may cause fire, malfunctions, or other unintended operations.

During wiring

❖ The installation, wiring, maintenance, and inspection of this product must be carried out by professional electrical maintenance personnel who have received relevant training in electrical equipment and possess sufficient electrical knowledge.

❖ Wiring work must only be performed after ensuring that the external power supply to the system is completely disconnected. Otherwise, there is a risk of electric shock, equipment failure, or unintended operation.

❖ After completing installation and wiring, ensure the product is fully assembled (including end caps and cover plates) before powering on and operating; otherwise, there is a risk of electric shock.

❖ Cable terminals must be properly insulated, and the insulation distance between cables should not decrease after installation on the terminal block. Failure to do so may result in electric shock, short circuit, or equipment damage.

❖ When processing screw holes or wiring, take care to prevent metal shavings, dust, and wire fragments from entering the controller's ventilation channels, as this may cause fire, malfunctions, or unintended operations.

❖ Before connecting cables, confirm the type of interface being connected. Incorrect interface connections or wiring errors may result in controller or external equipment malfunctions or damage.

❖ Tighten the bolts on the terminal block within the specified torque range. Failure to tighten them properly may result in circuit short circuits, loose connections, or fire hazards. Over-tightening could damage the bolts or the controller, causing component detachment, circuit short circuits, or fire hazards.

❖ When connecting external devices via connectors, use tools specified by the manufacturer for proper crimping, pressing, or soldering. Poor connections may lead to short circuits, fire, or unintended operations.

- ❖ Do not bundle control lines or communication cables with main circuit or power supply lines, nor place them too close to each other. Ensure control and communication cables are arranged at least 100 mm apart from main circuit power lines in separate cable ducts or spaces to prevent noise-induced malfunctions.
- ❖ For applications with severe interference, use specialized shielded cables for high-frequency signal input or output to enhance the system's anti-interference capability.

During system design and debugging

❖ Always design a safety circuit to ensure that the control system remains secure in the event of an external power failure or controller malfunction.

❖ If the output circuit experiences prolonged overcurrent due to exceeding the rated load current or a short circuit in the load, the controller may emit smoke or catch fire. Install external fuses or circuit breakers as safety protection devices.

❖ Ensure that the external circuit of the controller includes an emergency brake circuit, protection circuit, interlock circuits for forward/reverse operations, and upper/lower limit interlock switches to prevent machine damage.

- ❖ To ensure safe equipment operation, design external protection circuits and safety mechanisms for output signals related to critical accidents.
- ❖ The controller's CPU may automatically disable all output signals when detecting a system abnormality. If part of the controller's circuitry malfunctions, outputs may become uncontrollable. To ensure proper operation of the equipment, design appropriate external control circuits.
- ❖ If the controller's transistor output unit is damaged, its output state may become uncontrollable.
- ❖ Programmable Logic controllers (PLCs) are designed for indoor use in electrical environments with overvoltage category II. The power supply system should include lightning protection devices to prevent overvoltage caused by lightning from affecting the power input, signal input, or control output ports of the controller, thus avoiding equipment damage.

During operation and maintenance

❖ The installation, wiring, maintenance, and inspection of this product must be carried out by professional electrical maintenance personnel who have received relevant training in electrical equipment and possess sufficient electrical knowledge.

- ❖ Before cleaning or re-tightening the bolts on the terminal block or the connector installation bolts, please ensure that the system’s power supply is completely disconnected.

❖ During equipment debugging, thoroughly read the user manual before performing operations such as online program modifications, forced outputs, start (RUN), and stop (STOP). Ensure that the safety of these operations is fully confirmed before proceeding.

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

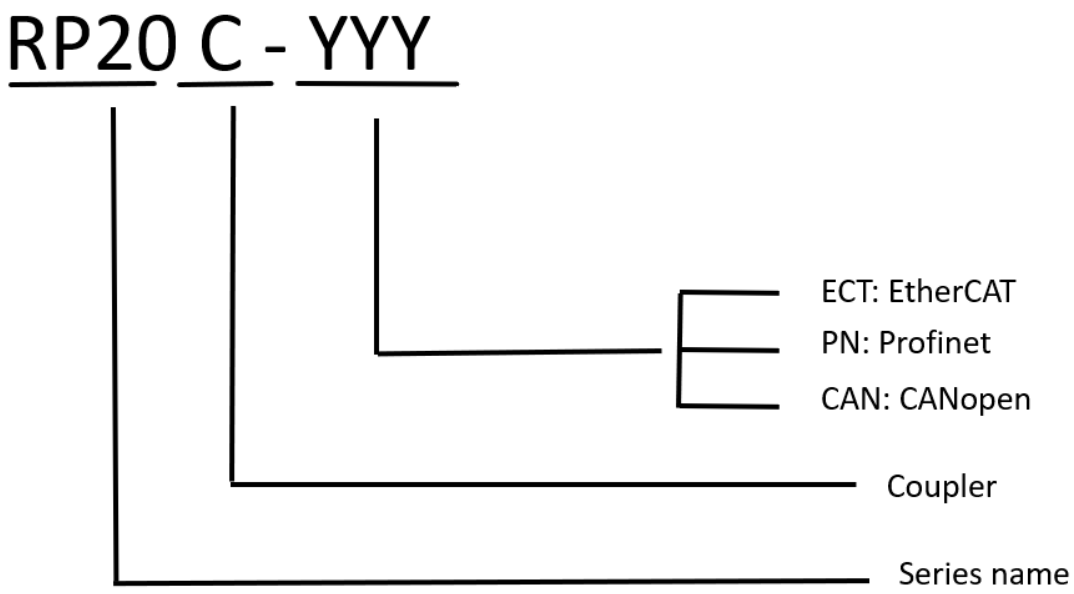

Fig. 2.2-1 RP20 series coupler naming rules

According to the above rules, the functionality of the module can be inferred from the model's name, such as:
RP20C-ECT: A coupler module with EtherCAT protocol.

2.3 Fuselage Label

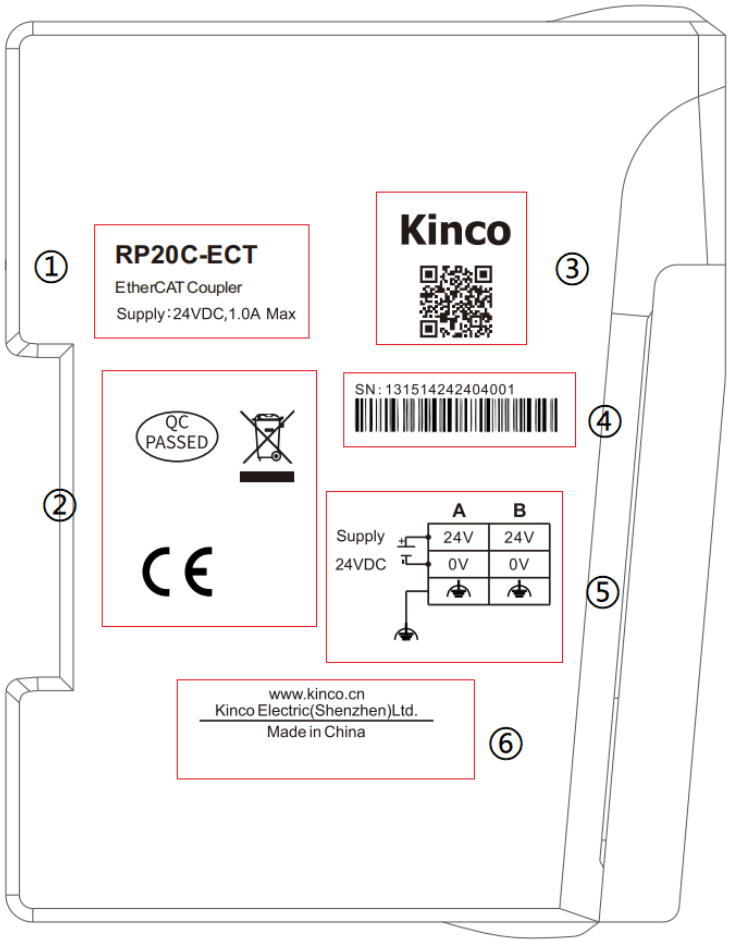

Fig.2.3-1 Coupler label

No.	Item	Description
①	Model and Brief Description	Includes basic information such as product model, power supply, and function description.
②	Certification	Includes the product's certification standards.
③	Kinco official QR Code	Scan the code to directly access Kinco's official website for more information.
④	Product Serial Number	Unique and traceable.
⑤	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 Component Description

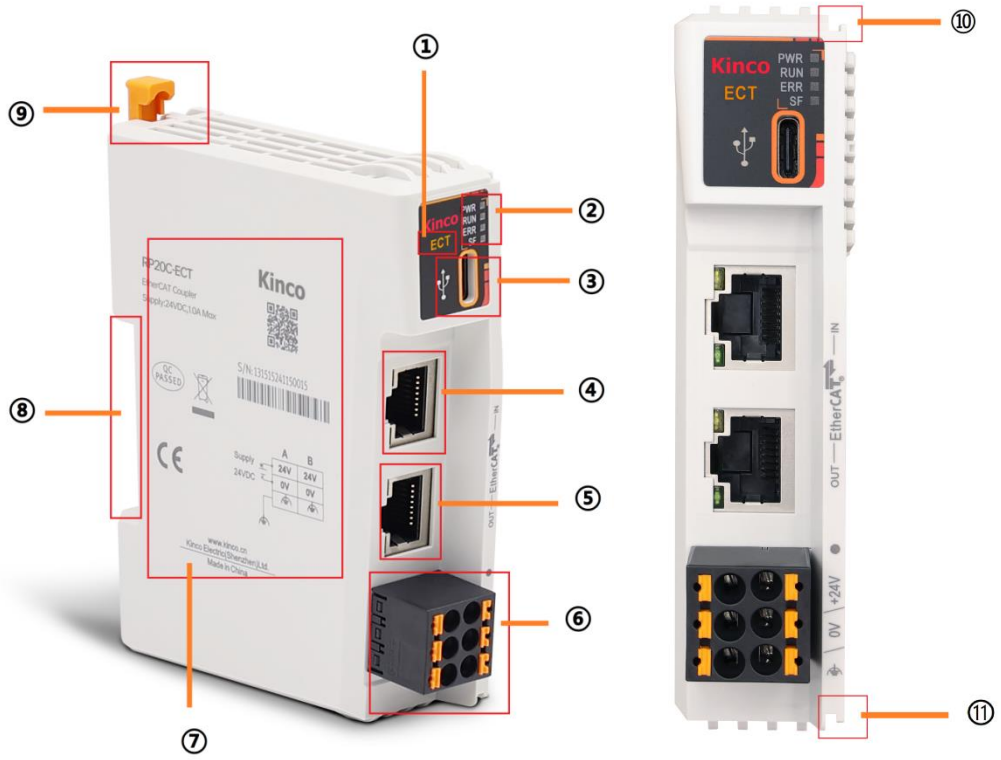

Fig.4.1-1 Component description

No.	Item	Description	
①	Color label	Indicate the type of the module	Refer to Chapter 2.2 Meaning: Orange, Coupler Red, Digital Output Module Blue, Digital Input Module Purple, Mixed DI/O Module Yellow, Analog Output Module Green, Analog Input Module Indigo, Mixed AI/O Module
②	Indicators	PWR: Power Status	Steady On: Normal Off: Power supply is abnormal or not powered
		RUN: Operating Status	Steady On: In normal OP state Off: Not in OP state or coupler is not configured
		ERR: EtherCAT bus Error	Steady On: EtherCAT bus communication error Off: No internal errors
		SF:	Steady On: Expansion bus error occurred

		Expansion bus Error	Off: No internal errors
②	USB-C	Used for coupler firmware upgrades	
④	EtherCAT IN	Connected to the superior device on the EtherCAT bus	
⑤	EtherCAT OUT	Connected to the subordinate device on the EtherCAT bus	
⑥	Power connector	2 sets, designed for continuity and can be used as power jumpers.	
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	DIN Rail Slot	Standard DIN35 rail installation.	
⑨	Locking Latch	Compatible with standard DIN35 rails for assembly.	
⑩	Top Rail	Used for dual-side alignment during module coupling, ensuring vertical alignment with the rear module.	
⑪	Bottom Rail		

5 Technical Specification

Technical Specifications	
Supply Power Rated Voltage	24V DC +/-20%
Rated Power	2.5W(CPU unit only)/20W(Full-load)
Rated Output Voltage of K-bus	5V DC（4.75V DC~5.25V DC）
Rated Output Current of K-bus	2.0A（typical value@5V）
Power Output Derating	At 55°C, the output is derated by 80% (output current should not exceed 2A).
Power protection	Overcurrent Protection Reverse Polarity Protection Surge Absorption
Bus Protocol	EtherCAT
Bus Interfaces	2 × RJ45
EtherCAT bus Communication Rate	100Mbps
Maximum Distance Between Stations	100m
K-Bus Communication Rate	100Mbps
Refresh Mode	DC-Sync mode: Minimum sync-time time at 1ms FreeRun mode SM-Sync mode
Indicators	PWR: Power supply
	RUN：Operating status of the expansion bus
	ERR：Error status of the EtherCAT bus
	SF: Error status of the expansion bus
Expansion Capacity	Supports connection of up to 16 RP20 expansion modules
Dimensions (W × H × D)	24.3mm × 100mm × 80mm
Weight	≈120g
*The K-Bus mentioned here refers to the dedicated expansion bus protocol for the Kinco-RP20 series.	

6 Wiring

6.1 Power Supply

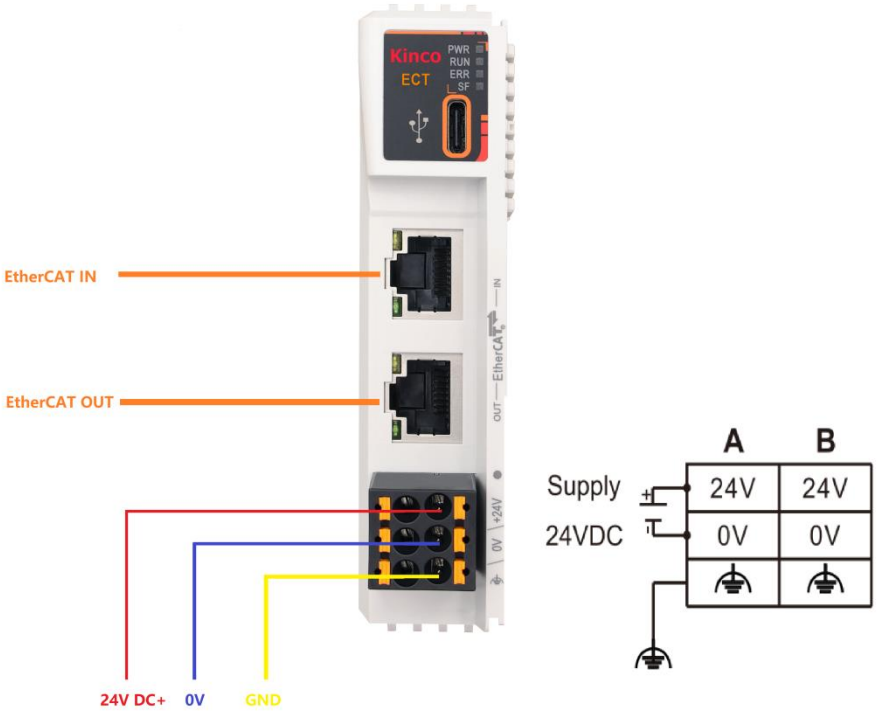

Fig.6.1-1 RP20C-ECT power supply

The RP20C-ECT has two groups of power supply terminal(24V DC+/0V/GND), and the corresponding pins are conneted. When power jumpers are needed for multiple devices on-site, the power terminals of the RP20C-ECT can be used as jumpers:

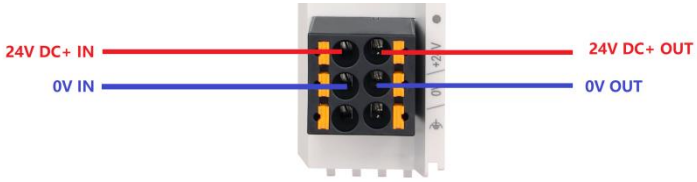

Fig.6.1-2 Power connector

6.2 EtherCAT

Please use Ethernet cables that meet at least the Category 5 (CAT5) requirements specified by EN 50173 or ISO/IEC 11801 (it is recommended to use Cat5e or higher cables). The cable should undergo 100% continuity testing, with no short circuits, open circuits, miswiring, or poor contact issues.

The maximum cable length between two EtherCAT devices should not exceed 100 meters, as longer cable lengths will cause signal attenuation and affect communication performance.
EtherCAT communication cables use RJ45 connectors, with pin assignments compatible with the Ethernet standard (ISO/IEC 8802-3).

Interface Definition:

Pin (RJ45)	Core coloring	Signal	Description
1	Yellow	TD +	Transmission Data +
2	Orange	TD -	Transmission Data -
3	White	RD +	Receiver Data +
6	Blue	RD -	Receiver Data -

7 Dimension

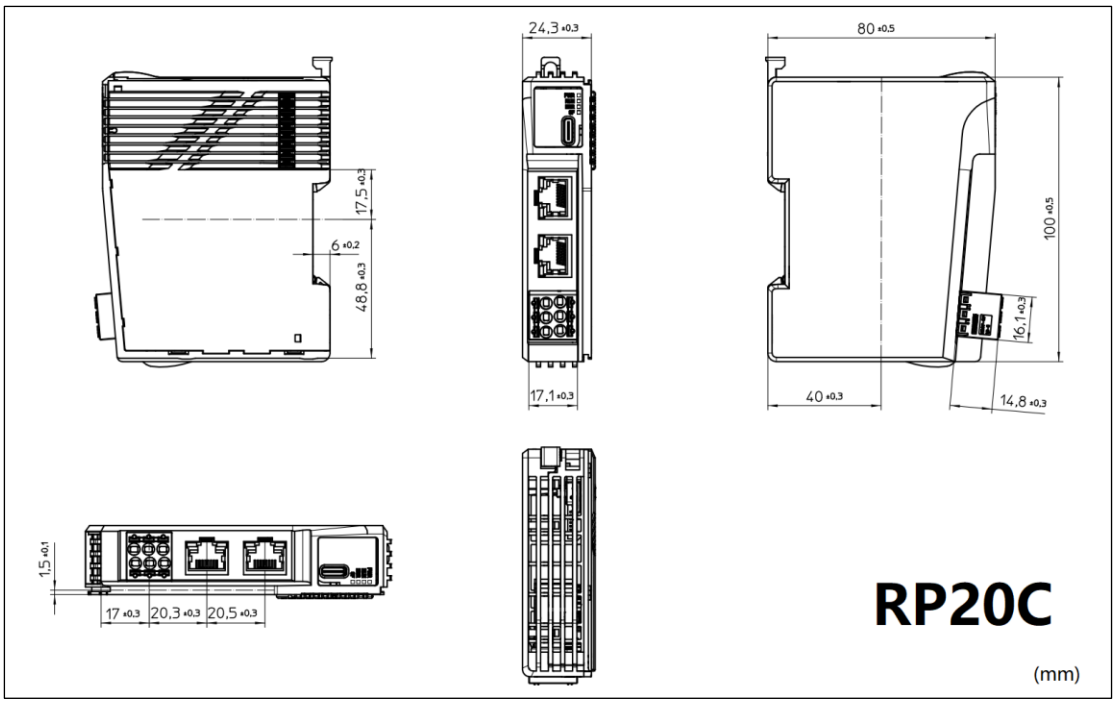

Fig.7.1-1 RP20 series coupler dimension drawing

8 Assembly

8.1 Assembly Dimension

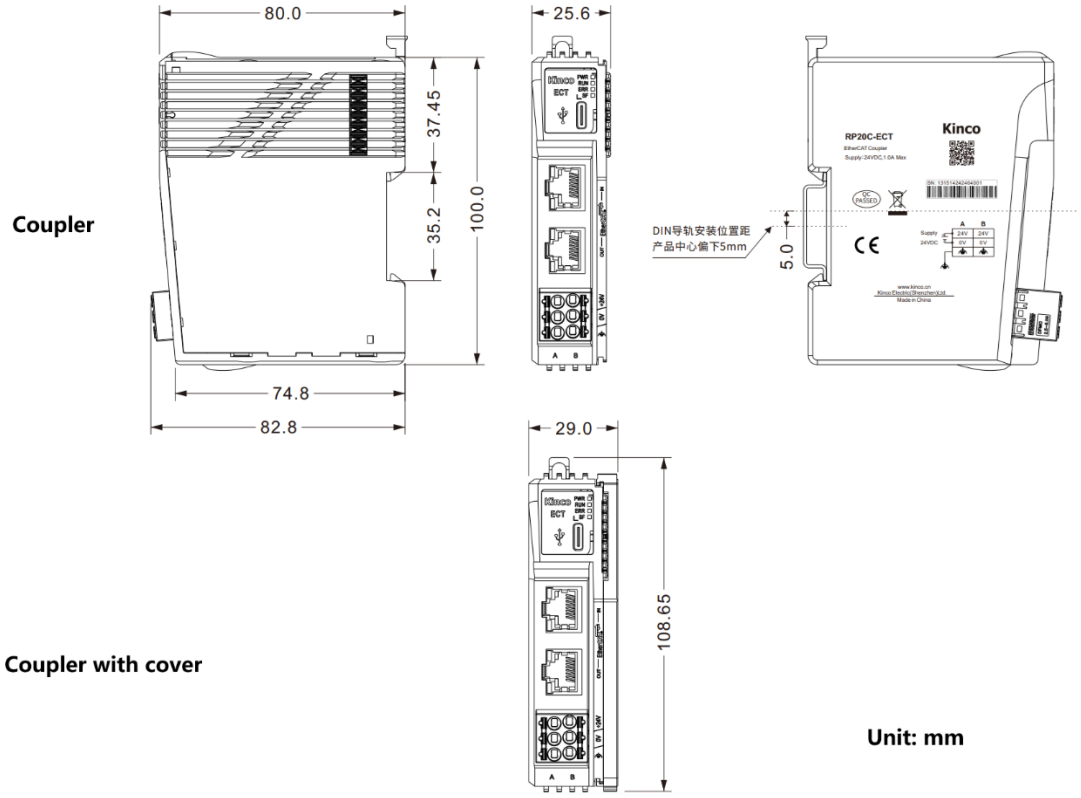

Fig.8.1-1 Assembly dimension drawing

8.2 Assembly Method

8.2.1 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.

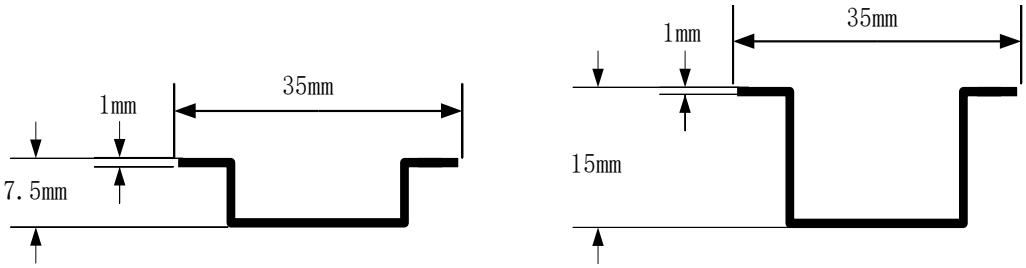

Fig.8.2-1 Standard DIN35 Rail

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

8.2.2 Connect with Modules

The coupler is supplied with a cover plate. Before making the connection between the coupler and the module, please remove the cover plate in the direction shown in the diagram below.

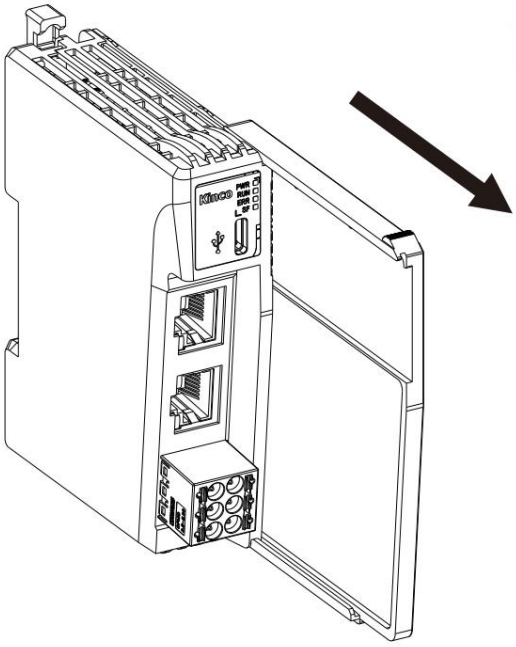

Fig.8.2-2 Remove the cover plate

When connecting, simultaneously clip the top and bottom rails of the module into the corresponding rails of the target module. Then, push the module in and align it properly to ensure a secure connection.

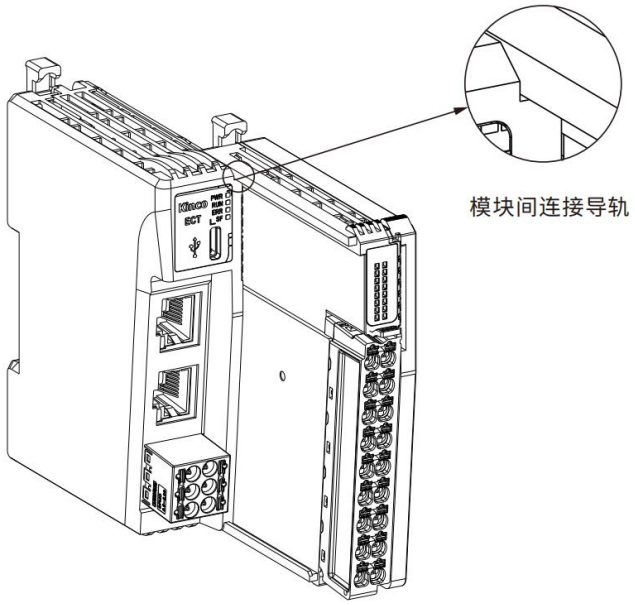

Fig.8.2-3 Assembly with modules

8.2.2 Assembly onto DIN Rail

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.

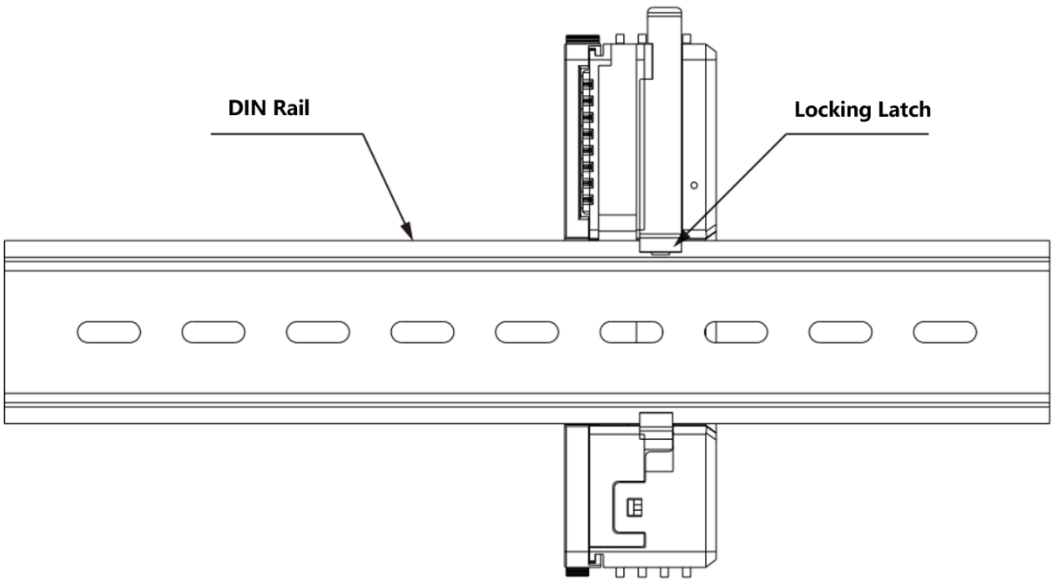

Fig.8.2-4 Fixed onto the DIN35 rail

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.

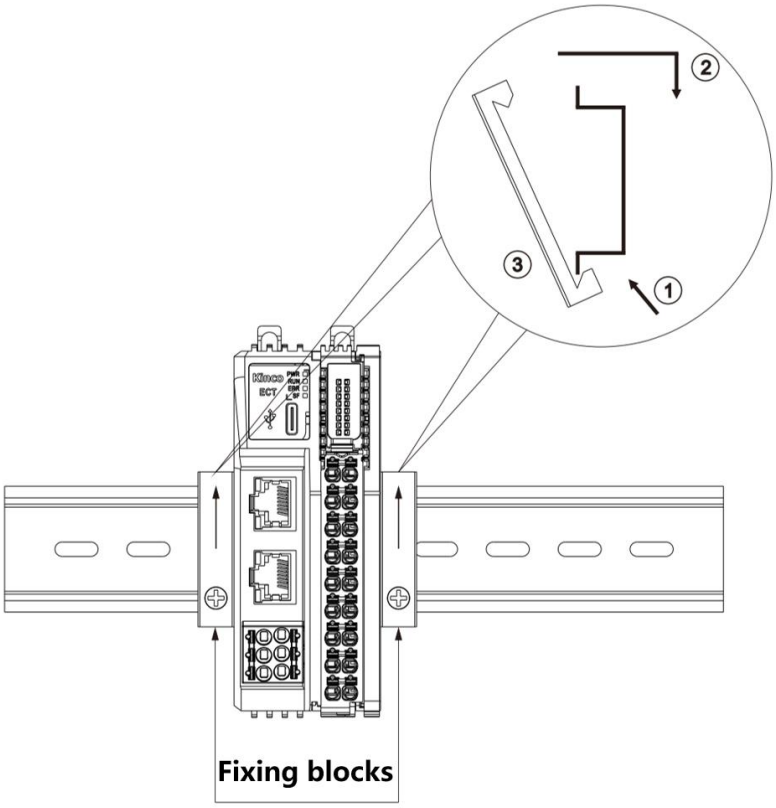

Fig.8.2-5 Fixing blocks assembly

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.

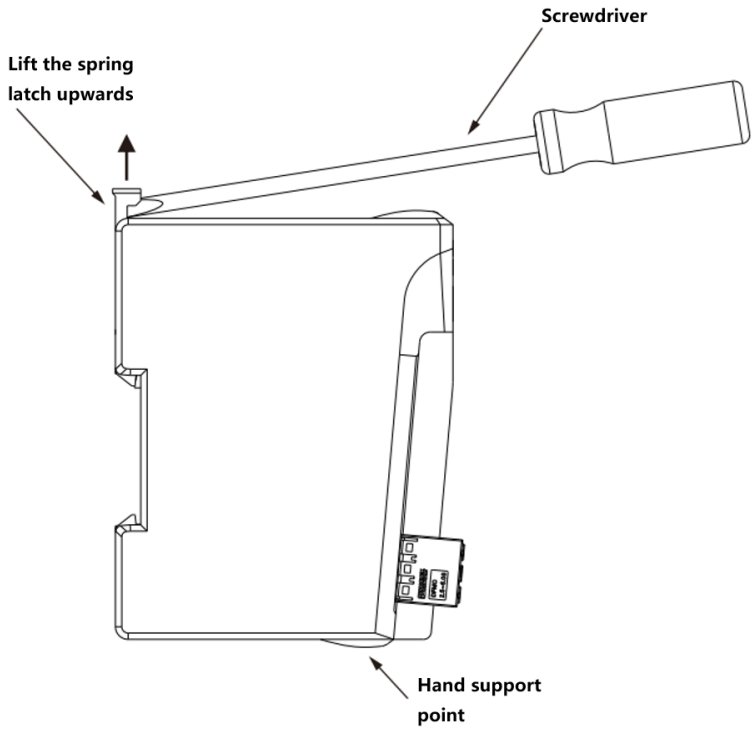

Fig.8.2-6 Disassembly modules

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

9 Getting Start

9.1 Device Description File Acquisition

The device description file (.xml) for RP20C-ETC is integrated into the coupler and its compatible I/O modules.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

9.2 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.

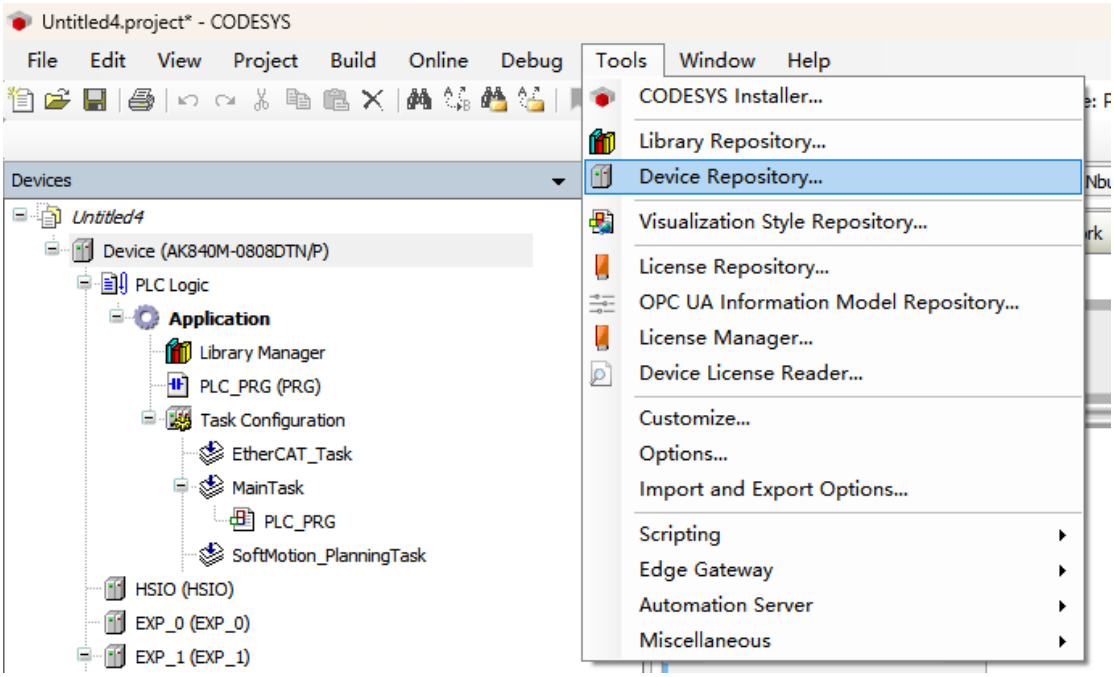

Fig. 9.2-1 Open "Device Repository"

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

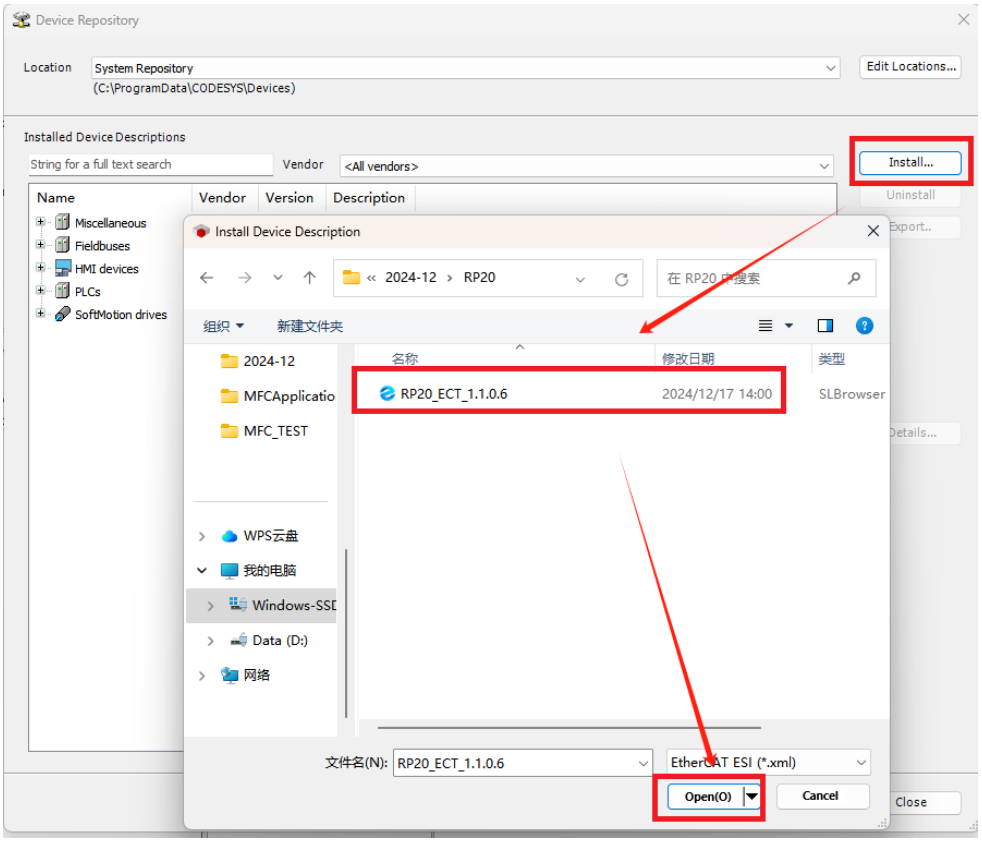

Fig. 9.2-2 Select file and install

Step3: Wait for the installation to finish.

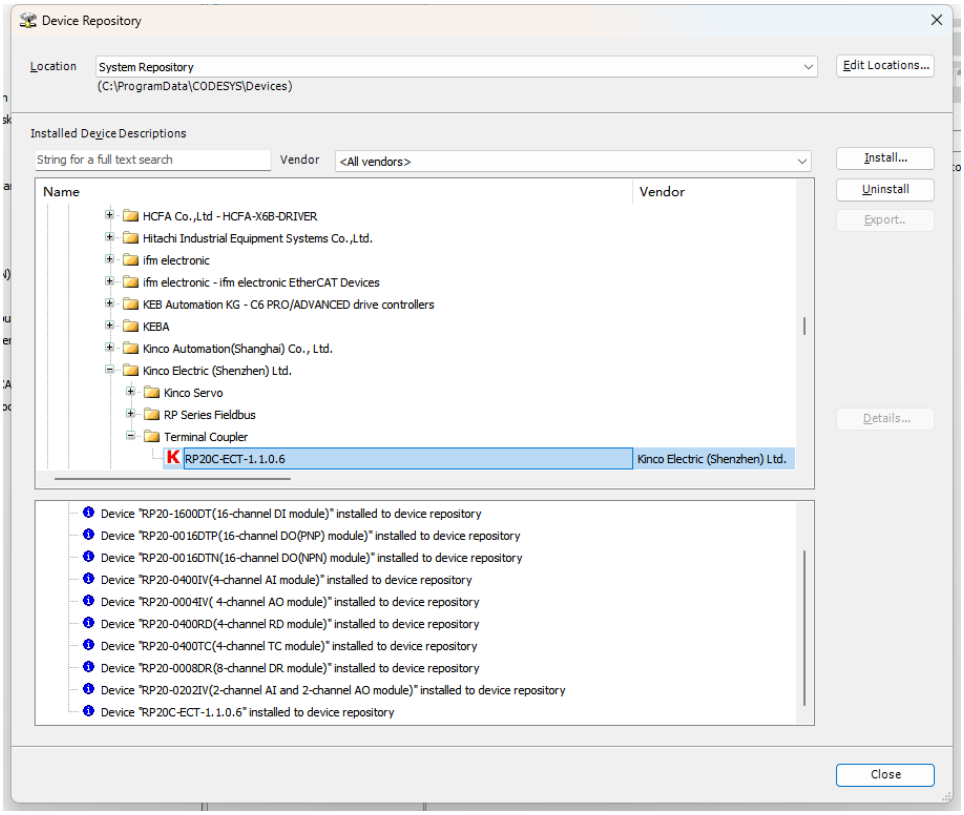

Fig. 9.2-3 Wait for the installation to complete

9.3 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.

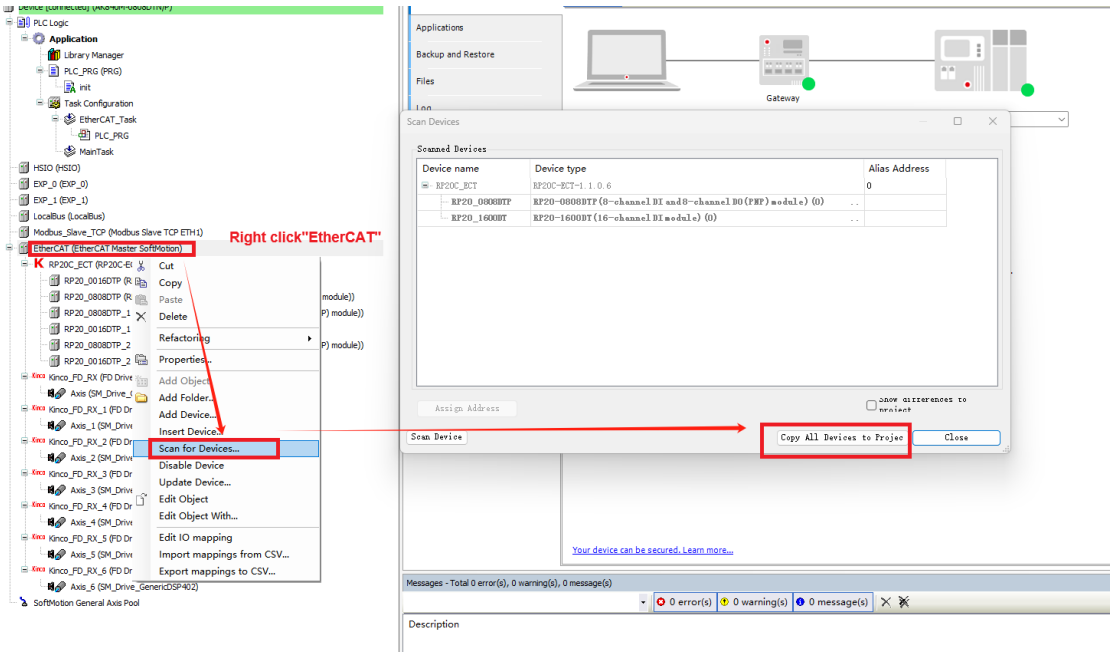

Fig. 9.3-1 Scan for devices

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.

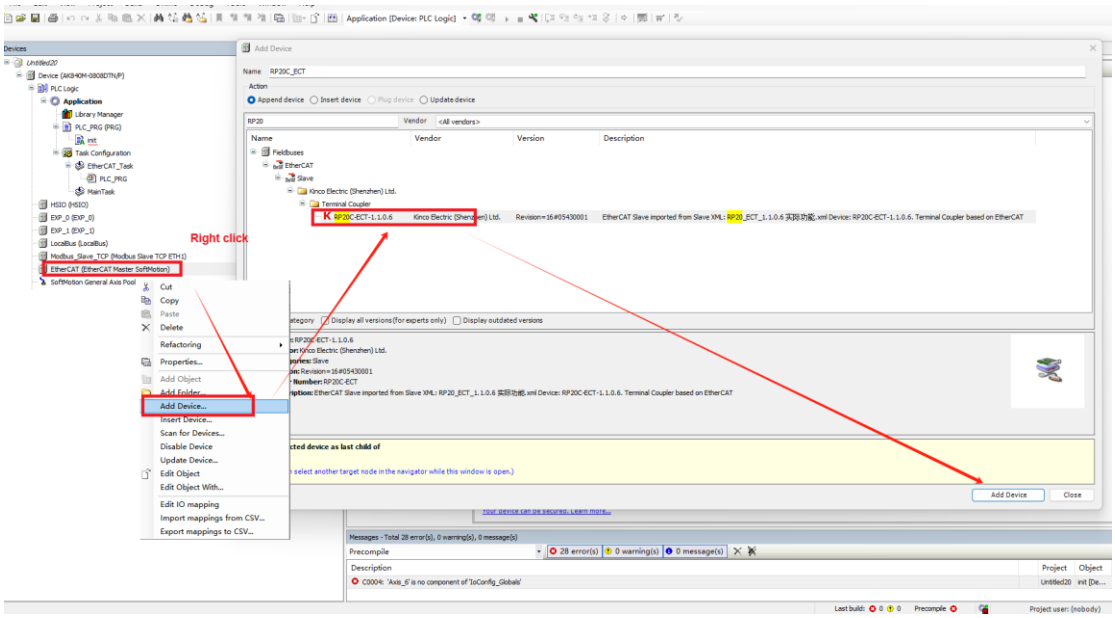

Fig. 9.3-2 Add the coupler

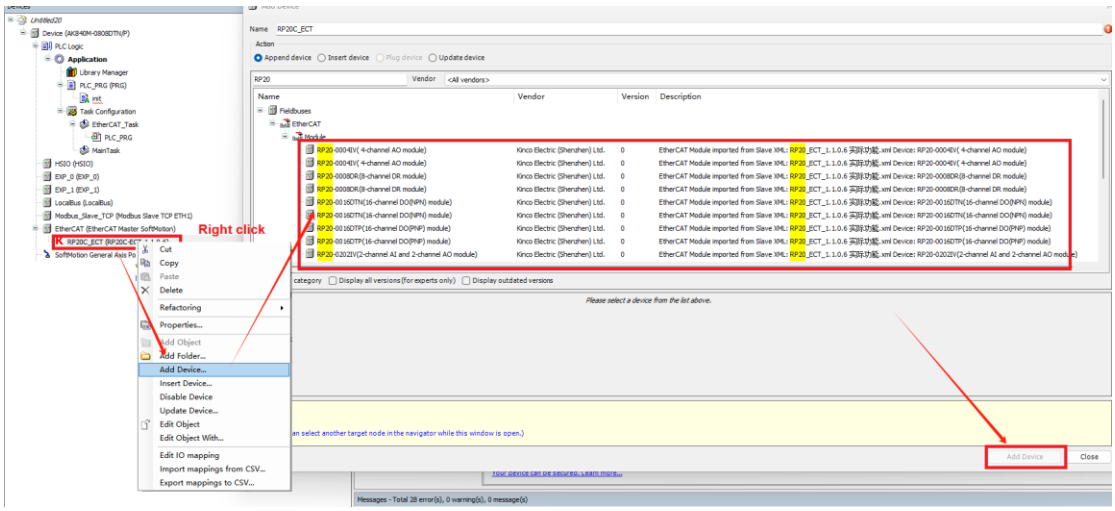

Fig. 9.3-3 Add modules

9.4 Usage Demonstration

The digital modules of the RP20 series are defined as byte transfer in the device description. After configuration, each module is automatically assigned a unique address, which can be viewed and utilized in the "Module I/O Mapping" interface in the configuration panel.

Below is a demonstration of the configuration process using a coupler in CoDeSys V3.5.19.

Method 1: Direct addresses usage (Byte /Bit)

During variable definition, map the corresponding I/O channel address to a specific variable or directly use the channel address.

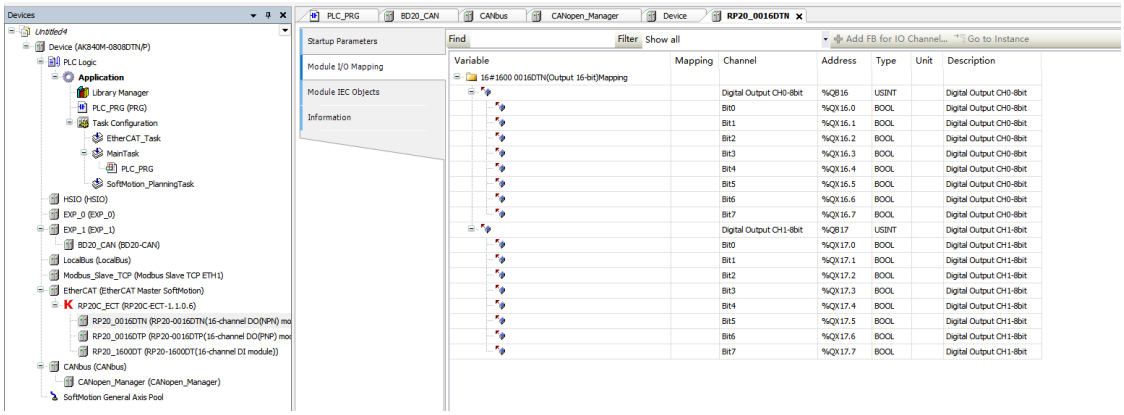

Fig. 9.4-1 “Module I/O Mapping”

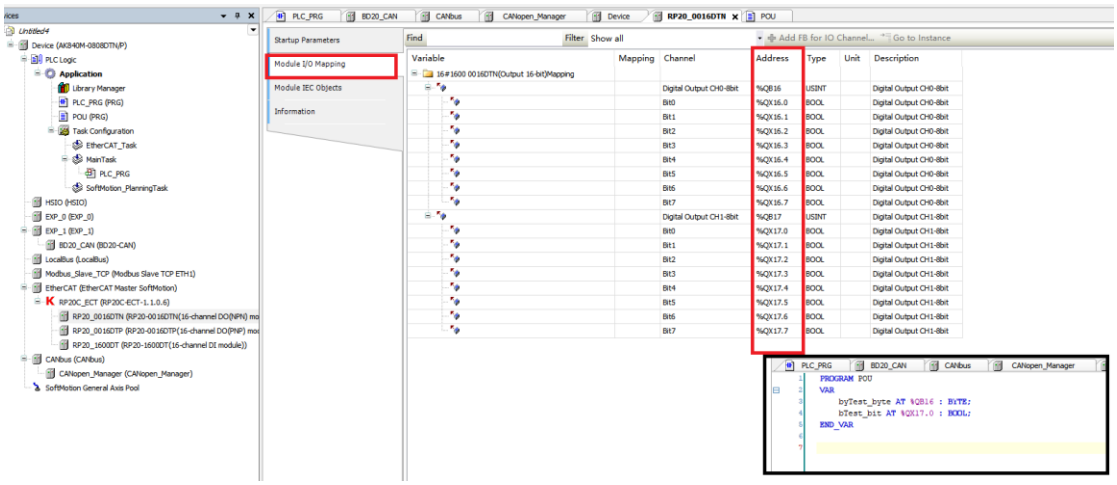

Fig. 9.4-2 Use the address directly

Method 2: Address Mapping (Byte /Bit)

In this method, the I/O channel addresses are directly mapped to specific variables through the "Module I/O Mapping" interface. This allows the variables to be directly associated with the corresponding I/O channels for use in the program.

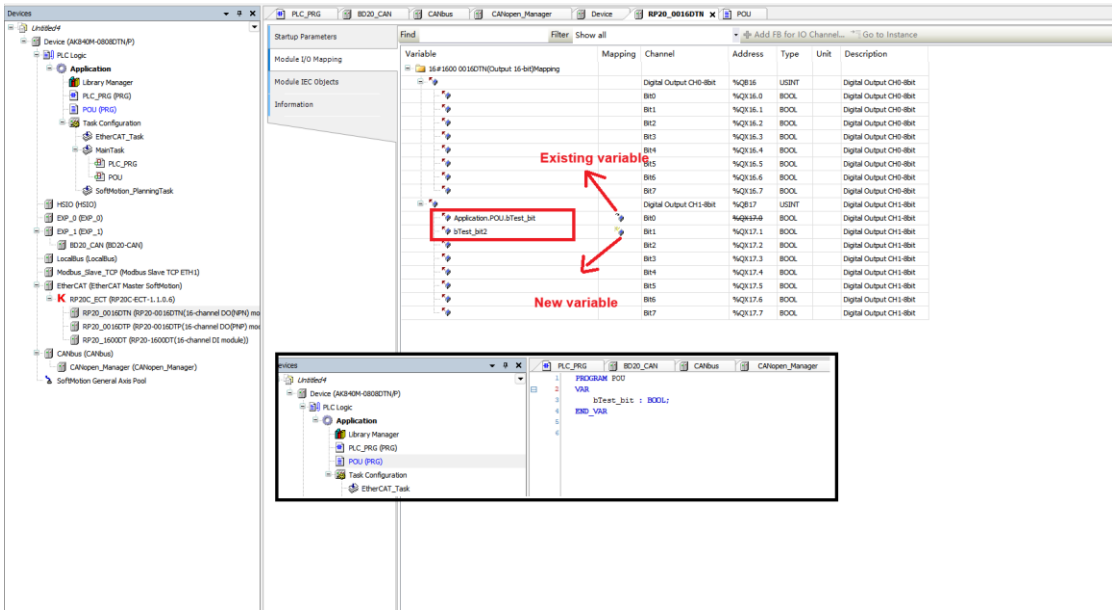

Fig. 9.4-3 Address mapping

10 Error Diagnostics

The RP20C-ECT coupler has two types of faults: K-bus expansion bus errors and EtherCAT bus errors, which are indicated by the SF and ERR lights in the coupler's indicator area, respectively.
When an error occurs, the SF light or the ERR light will be on (red).
In CoDeSys, you can view the error details through the "Online CoE" interface under the coupler device.

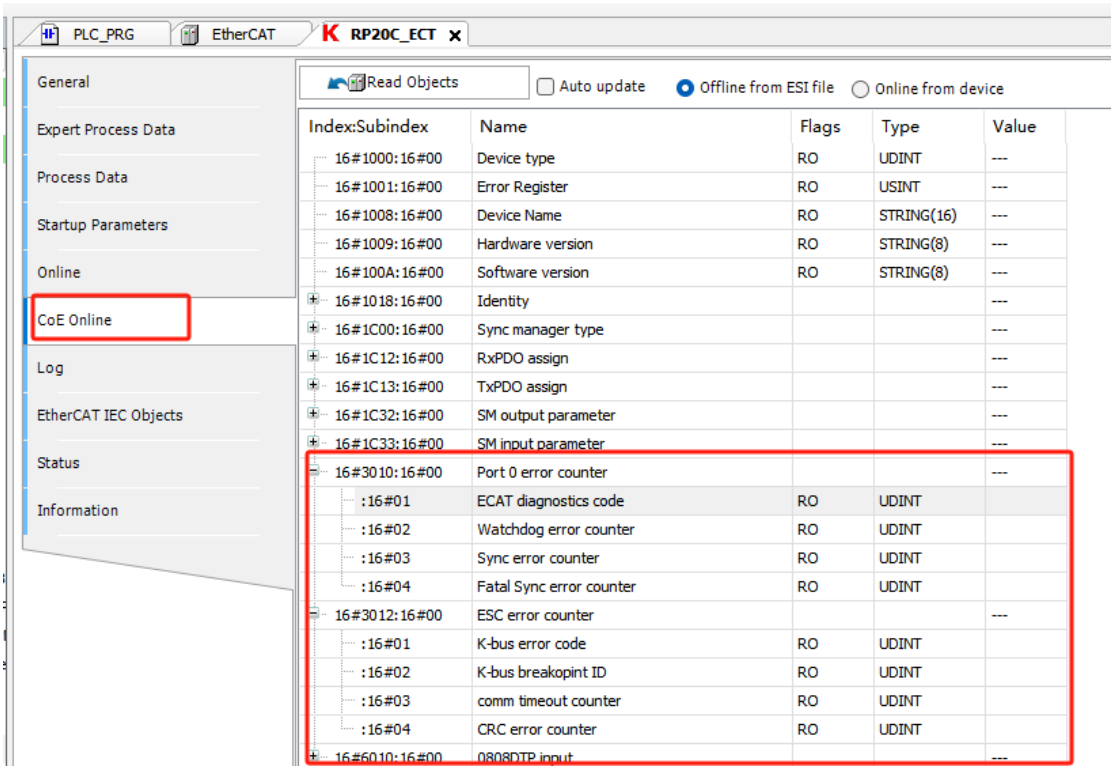

Fig. 10.1-1 “CoE Online” Tag

10.1 K-bus Error Diagnostics

K-bus fault object dictionary index: 0x3010 (OR). The sub-indexes are defined as follows:

Object Dictionary Index Definition		
0x3012		
Sub-index	Type	Definition
01	UINT8	Historical Error Code. The detailed error codes are listed in the table below.
02	UINT8	Disconnection Error and ID: During expansion bus communication, any module failure will cause a disruption in communication. This sub-index records the module ID at the point of the interruption. When communication is normal, the object value will be 0.

03	UINT8	Communication timeout count.
04	UINT8	CRC error count.

Expansion bus error code list (0x3012 04):

Code	Definition
0x00	No error.
0x01	Initialization failed.
0x02	Message transmission timeout (MCU detects no free transmission page), or reception timeout (timeout after sending request message without receiving response from the module).
0x04	Communication message CRC error.
0x08	Expansion bus disconnection. Note: After disconnection, the location of the disconnection can be queried. Modules after the disconnection point cannot communicate, but modules with IDs before the disconnection can continue communication.
0x10	An unknown model is present among the modules actually connected.
0x20	The number or type of modules configured by the master station does not match the actual number or type of connected modules.
0x40	An error occurred in the operation of an expansion module. Specific errors should be checked based on the actual module model.

10.2 EtherCAT Error Diagnostics

EtherCAT bus fault object dictionary index: 0x3010 (OR). The sub-indexes are defined as follows:

Object Dictionary Index Definition		
0x3010		
Sub-index	Type	Definition
01	UINT8	Historical Error Code. The detailed error codes are listed in the table below.
02	UINT8	Watchdog error count.
03	UINT8	Synchronization error count.
04	UINT8	Fatal synchronization error count.

EtherCAT bus error code list (0x3010 01):

Err Code	Definition
0x00	No error.
0x01	The number or type of modules configured by the master does not match the actual number or type of connected modules.
0x02	Unknown object in PDO mapping.

0x04	Watchdog error.
0x08	SYNC Error
0x10	Fatal synchronization error.