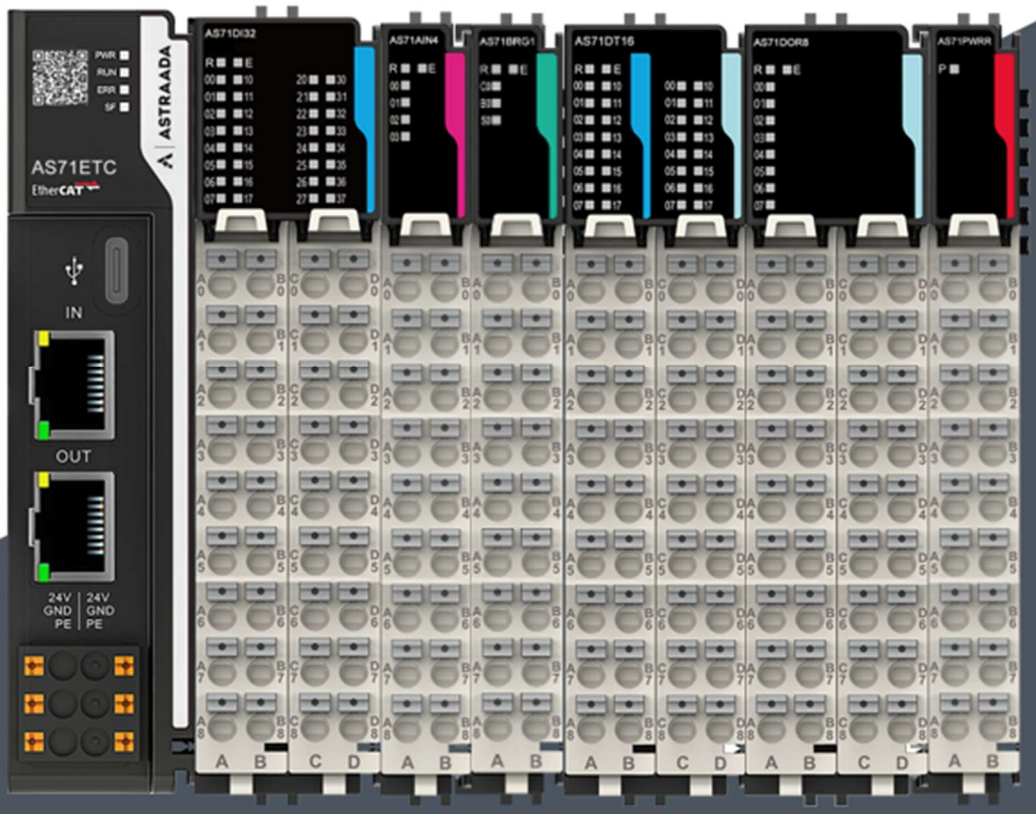
ASTRAADA

Operation Manual

Astraada I/O A-Series



The owner of Astraada brand is ASTOR Sp. z o.o.

Preface

Overview

Thank you for choosing Astraada A-Series I/O system.

Astraada A-Series I/O system adopts a modular structure, featuring flexible configuration, reliable signal transmission, and robust mechanical design. The system supports connection to various standard communication networks, delivers microsecond-level response performance, and offers a wide range of functional modules to meet diverse industrial automation application requirements. It also improves control cabinet space utilization and is suitable for building cost-effective, customized control systems.

Target audience

Personnel with professional electrical knowledge (such as qualified electrical engineers or personnel with equivalent knowledge).

Documentation access

This manual is not delivered with the product. To obtain an electronic version of the PDF file, you can:

Visit our website (https://www.astor.com.pl/wsparcie.html), choose **Astraada > Astraada A-Series**, enter a keyword, and download the manual.

Scan the QR code on the product housing > Astraada A-Series IO > Download the manual.

Change history

Due to product version upgrade or other reasons, this document will be updated from time to time without notice.

Version	Release date	Change description
V1.4.1	June 2026	● Adjusted the document structure. ● Updated the input specifications of section 5.5.2 Digital input module–AS71DI32. ● Revised the power supply specifications in sections 5.5.12 Digital input/output module–AS71DT08. ● Revised the wiring diagrams in sections 5.5.16 Counting and measurement module–AS71AN02, 5.5.17 Counting and measurement module–AS71IN02, 5.5.18 Counting and measurement module–AS71IN01, and 5.5.19 Dual-channel pulse output control module–AS71PUOC. ● Added section 5.5.21 Serial communication module–AS71COM2, section 6.1.8 Bridge measurement module (AS71BRG1&AS71BRG2), section 6.1.9 Pulse module (AS71PUOC), section 6.1.10 Serial communication module (AS71COM2), section 6.2.1.2.7 AS71COM2 serial communication module, and section 8.2 Serial communication module exception code description. ● Added section 6.3.1.2.8 AS71COM2 serial communication module.
V1.2.1	January 2025	● First release

Contents

Preface ..... **i**
Contents **1**
1 Safety precautions **1**
1.1 What this chapter contains 1
1.2 Safety level definition 1
1.3 Personnel requirements 1
1.4 Safety guidelines 1
2 System overview **4**
2.1 System introduction 4
2.2 System composition 4
3 Installation **5**
3.1 Installation preparation 5
3.1.1 Installation precautions 5
3.1.2 Installation environment and site 5
3.1.3 Installation space 6
3.2 DIN rail model selection 6
3.3 Installation procedure 7
3.4 Disassembly procedure 10
4 Wiring **11**
4.1 Wiring requirements 11
4.2 Grounding requirements 11
4.3 Cable specifications 11
5 Product specifications **13**
5.1 Overview 13
5.2 Basic information 13
5.3 Environmental requirements 15
5.4 Communication coupler 16
5.4.1 EtherCAT communication coupler—AS71ETC 16
5.4.2 PROFINET communication coupler—AS71PNS 19
5.4.3 EtherNet/IP communication coupler–AS71EIP 23
5.4.4 Modbus TCP communication coupler–AS71TCP 26
5.5 I/O module 29
5.5.1 Digital input module–AS71DI16 29
5.5.2 Digital input module–AS71DI32 33
5.5.3 Digital output module (source)–AS71DO16 37
5.5.4 Digital output module (source)–AS71DO32 41
5.5.5 Digital output module (relay)–AS71DOR8 45
5.5.6 Analog input module–AS71AIN4 49
5.5.7 Analog input module–AS71AIV8 54
5.5.8 Analog input module–AS71AIC8 58
5.5.9 Analog output module–AS71AOU4 62
5.5.10 Temperature detection module (RTD)–AS71RTD4 67
5.5.11 Temperature detection module (thermocouple)–AS71THC4 71
5.5.12 Digital input/output module–AS71DT08 75
5.5.13 Digital input/output module–AS71DT16 80
5.5.14 Bridge measurement module–AS71BRG1 84

5.5.15 Bridge measurement module–AS71BRG2 89
5.5.16 Counting and measurement module–AS71AN02 94
5.5.17 Counting and measurement module–AS71IN02 98
5.5.18 Counting and measurement module–AS71IN01 102
5.5.19 Dual-channel pulse output control module–AS71PUOC 107
5.5.20 Power feed module–AS71PWRR 112
5.5.21 Serial communication module–AS71COM2 115
6 Configuration 120
6.1 Parameter description 120
6.1.1 Coupler 120
6.1.2 Digital input module 122
6.1.3 Digital output module 123
6.1.4 Analog input module 128
6.1.5 Analog output module 136
6.1.6 Temperature detection module 138
6.1.7 Incremental encoder input detection module 143
6.1.8 Bridge measurement module (AS71BRG1&AS71BRG2) 145
6.1.9 Pulse module (AS71PUOC) 147
6.1.10 Serial communication module (AS71COM2) 149
6.2 EtherCAT configuration 162
6.2.1 CODESYS configuration 162
6.3 PROFINET configuration 183
6.3.1 TIA Portal configuration example 183
6.4 EtherNet/IP configuration 204
6.4.1 Overview 204
6.4.2 CODESYS configuration example 213
6.5 Modbus TCP configuration 219
6.5.1 Astraada A-Series IO Studio configuration example 219
6.5.2 Module configuration application example 221
7 Commissioning 231
7.1 Overview 231
7.2 Commissioning preparation 231
7.2.1 Commissioning requirements 231
7.2.2 Operating precautions 231
7.3 Module identification and project configuration 232
7.3.1 Creating and opening a project 232
7.3.2 Module scanning and configuration verification 233
7.3.3 Module management 234
7.4 Parameter configuration and download 235
7.4.1 Editing parameters 235
7.4.2 Downloading project parameters 236
7.4.3 EDS export 236
7.5 Firmware management and log monitoring 237
7.5.1 Coupler and module firmware upgrade 237
7.5.2 Log viewing 238
7.6 Online monitoring and signal diagnostics 239
7.6.1 Starting and exiting online monitoring 239
7.6.2 Data reading and signal verification 240
7.7 EtherCAT functions and communication commissioning 241
7.7.1 Communication basic verification 241

7.7.2 Object dictionary configuration and mapping verification 241
7.7.3 Scanning function application and configuration verification 242
7.8 Typical commissioning cases 243
8 Troubleshooting 245
8.1 Common faults and solutions 245
8.2 Serial communication module exception code description 248
9 Inspection and maintenance 250
9.1 Daily inspection and regular maintenance 250
Appendix A Product dimensions 251
A.1 Communication coupler 251
A.1.1 Module installation dimensions and weight 251
A.1.2 Connection cable dimensions 252
A.1.3 End cover dimensions 252
A.2 I/O module 253
A.2.1 Module installation dimensions and weight 253
A.2.2 Connection cable dimensions 254
Appendix B Address mapping table description 255
B.1 Function code description 255
B.1.1 Description of Modbus standard function codes 255
B.1.2 BIT access 255
B.1.3 WORD access 255
B.2 Address mapping table 256
B.2.1 Address allocation 256
B.3 Additional notes 258

1 Safety precautions

1.1 What this chapter contains

Read this manual carefully and follow all safety precautions before moving, installing, operating and servicing the product. Otherwise, personal injury, equipment damage, or even death may be caused.

We shall not be liable or responsible for any personal injury, equipment damage, or even death caused due to failure to follow the safety precautions.

1.2 Safety level definition

To ensure personal safety and avoid property damage, you must pay attention to the safety symbols and warnings in the manual.

Warning symbols	Name	Description
	Danger	Severe personal injury or even death can result if related requirements are not followed.
	Warning	Personal injury or equipment damage can result if related requirements are not followed.

1.3 Personnel requirements

Trained and qualified professionals: People operating the equipment must have received professional electrical and safety training and obtained the certificates, and must be familiar with the procedures and requirements for equipment installation, commissioning, operation, and maintenance, and be able to take measures to avoid or handle emergencies.

1.4 Safety guidelines

General principles	
	• Only trained and qualified professionals are allowed to carry out related operations. • Do not perform wiring, inspection or component replacement when power supply is applied. Ensure that all the input power supplies are disconnected before wiring and inspection. • The product is designed for use in indoor electrical environments of Overvoltage Category II. Ensure that the power supply system of the product has lightning protection devices to prevent lightning overvoltage from being applied to the power input or signal I/O terminals of the product so as to avoid equipment damage. • Do not modify the product unless authorized; otherwise fire, electric shock or other injury may result. • Prevent metal scraps, copper wires, screws, cables, and other conductive objects from falling into the product. • Do not contact the product with damp objects or body parts. Otherwise, electric shock may result.

Moving	
	• Select appropriate tools for product delivery, and take mechanical protective measures like wearing safety shoes and working uniforms to avoid personal injury. • Protect the product against physical shock or vibration.

Installation	
	• Do not install the product on flammable materials. Keep flammable materials away from the product, and prevent them from adhering to the product. • Do not operate the product if it is damaged or has missing components.
	• Install the product in a lockable control cabinet with IP20 or higher protection to prevent accidental contact by personnel without relevant knowledge of electrical equipment, which may result in equipment damage or electric shock. Only personnel who have received related electrical knowledge and equipment operation training can operate the control cabinet. • During installation, ensure that all modules are securely connected and fixed in place to prevent communication failures, detachment, or other problems during operation due to loose connections. • After installation, check and ensure that the product vents are not blocked. Otherwise, poor heat dissipation may cause excessive internal temperature, causing the chips to burn out and leading to system control faults or unintended operation.

Wiring	
	• Before wiring, clearly understand the necessary information including interfaces, power supply types, and specifications, and comply with relevant standards and requirements to ensure that the system wiring is correct. • To ensure personnel safety and safe equipment operation, reliably ground the product using cables with proper diameters and specifications. • Route the control signal and communication signal cables separately from cables with strong interference such as power cables. • Apply fastening means to long-distance or heavy cables.
	• Cut off all power supplies connected to the product before performing wiring. • Before power-on for running, ensure that each module terminal cover is properly installed in place after the installation and wiring are completed. This prevents a live terminal from being touched. Otherwise, physical injury, equipment fault or misoperation may result. • Install proper protection components or devices when using external power supplies for the product. This prevents the product from being damaged due to external power supply faults, overvoltage, overcurrent, or other exceptions.

Commissioning and running	
	• Before power-on for running, ensure that the working environment of the product meets the requirements (see 3.1.2 Installation environment and site for details), and a protection circuit has been designed to protect the product so that the product can run safely even if an external device fault occurs. • Do not damage the product's output units, such as relays and transistors; otherwise, their outputs may no longer be controllable to the ON or OFF state. • For modules or terminals requiring external power supply, configure external safety devices such as fuses or circuit breakers to prevent damage caused due to external power supply or device faults.

Commissioning and running	
	• In the external circuit of the product, provide an emergency braking circuit, a protective circuit, an interlock circuit for forward/reverse operation, and upper and lower position limit interlock switches to prevent machine damage. • To ensure the safe running of equipment, design external protection circuits and safety mechanisms for output signals related to major accidents. • Design appropriate external control circuits to ensure proper equipment operation, as a controller system fault may cause outputs to become uncontrollable.

Maintenance, servicing, and component replacement	
	• Keep the product and its components away from combustible materials, and prevent combustible materials from adhering to them. • Before carrying out product maintenance or component operations, cut off all power supplies connected to the product. • During maintenance, servicing, or component replacement, prevent metal scraps, copper wires, screws, cables and other conductive parts from falling into the interior of the product. • During maintenance and component replacement, take proper anti-static measures on the product and its internal parts.
Note	• Use proper torque to tighten screws.

Disposal	
	• The product contains heavy metals. Dispose of the product as industrial waste when it is scrapped.
	• Dispose of a scrap product separately at an appropriate collection point but do not place it in the normal waste stream.

2 System overview

2.1 System introduction

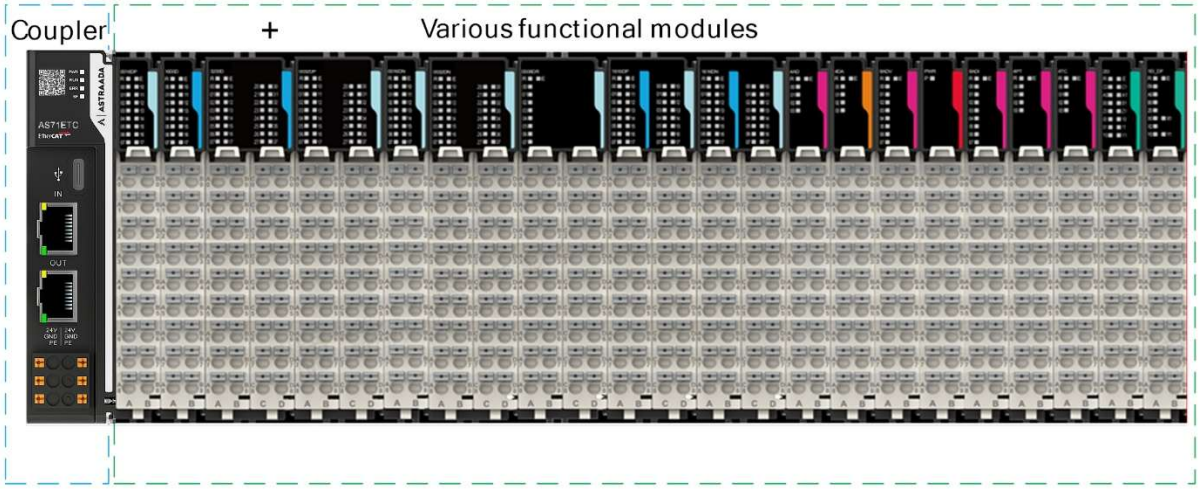
The Astraada A-Series I/O system is a remote I/O expansion solution designed for signal acquisition and signal distribution control, applicable to a wide range of industrial automation applications. Featuring an open and modular architecture, the system supports multiple mainstream industrial fieldbus protocols and offers flexible configuration options, enabling seamless integration with various PLCs and controllers.

By importing the device description file, module configuration can be completed directly within a third-party controller or supervisory system, eliminating the need for dedicated configuration software. The system is equipped with a 100 Mbps backplane bus and supports microsecond-level I/O refresh, enabling high-speed data exchange.

The product adopts a press-fit connection structure and 5 μin gold-plating process, providing excellent corrosion resistance and contact reliability. The entire series is coated with conformal coating to adapt to harsh operating conditions. With a compact module structure and a thickness of only 12 mm, it effectively saves control cabinet space. The PUSH IN wiring method improves wiring efficiency and supports fast tool-free installation. Clear module identification and intuitive status indicators make identification and maintenance easier.

2.2 System composition

The A-Series I/O system consists of couplers supporting different communication protocols and various functional modules, such as digital, analog, temperature acquisition, counter, and encoder modules. These components can be flexibly combined and configured according to actual application requirements.



3 Installation

3.1 Installation preparation

3.1.1 Installation precautions

Before installation	
	● Make sure all product modules have been powered off before installation. ● Before installation, check the planned overall system dimensions to ensure that there is sufficient space to accommodate all modules. The module shall be installed in a control cabinet, with at least 50 mm of clearance around it to ensure proper heat dissipation of the hardware system.

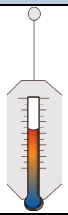
During installation	
	● During installation, use parts that meet the requirements, such as screws and washers. ● During installation, prevent wire clippings, debris, screws, and other objects from falling into the product. Otherwise, short circuits may occur, or heat dissipation may be impaired.

After installation	
	● Ensure that the connected communication cables and terminals are securely fastened. ● Ensure that the rail on which the module is mounted is securely fixed. ● Ensure that power cables and signal cables are routed separately and arranged neatly inside the cabinet to avoid disorderly wiring that may affect heat dissipation. ● After installation, remove the sticker from the module ventilation holes to ensure proper heat dissipation. ● After installation, check the air circulation around the module.

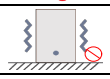
3.1.2 Installation environment and site

Check the installation environment and ensure that the environment meets the working conditions of all the components of the product, which include temperature, humidity, dust and corrosion protection requirements before installation.

■ **Environment requirements**

Environment		Requirement
Temperature		● -20 ℃–55 ℃ ● There is no sudden temperature change. ● When the product is installed in an enclosed space rated IP20, such as a cabinet, use a fan for ventilation and heat dissipation if necessary.
Humidity		● 5–95% RH, no condensation

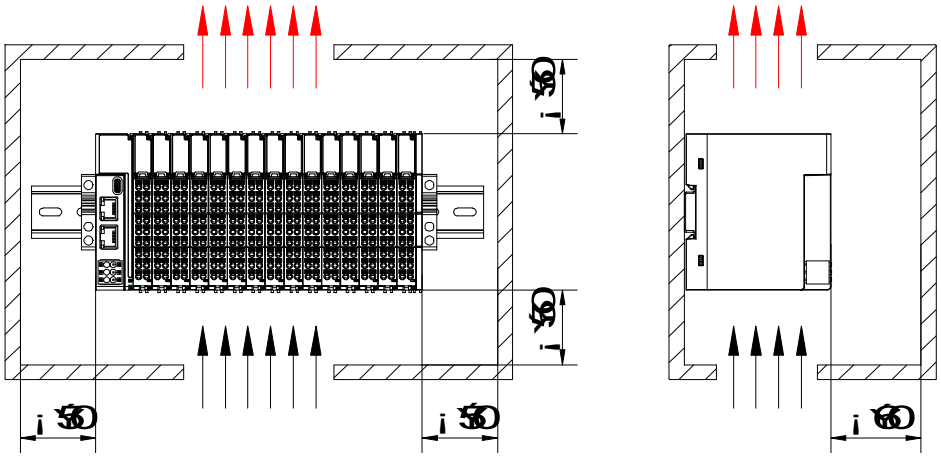
■ **Site requirement**

Site	Requirement	
Indoor, overvoltage category II		● No strong electric field, strong magnetic field, or direct sunlight
		● No dust, conductive powder such as iron powder, oil mist, salt, or organic solvent
		● No corrosive or flammable gases
		● No direct vibration or transmitted shock acting on the product.

3.1.3 Installation space

Reserve sufficient clearance above and below the module from the cabinet and other components to facilitate product replacement, ventilation, and heat dissipation.

Figure 3-1 Installation space (unit: mm)

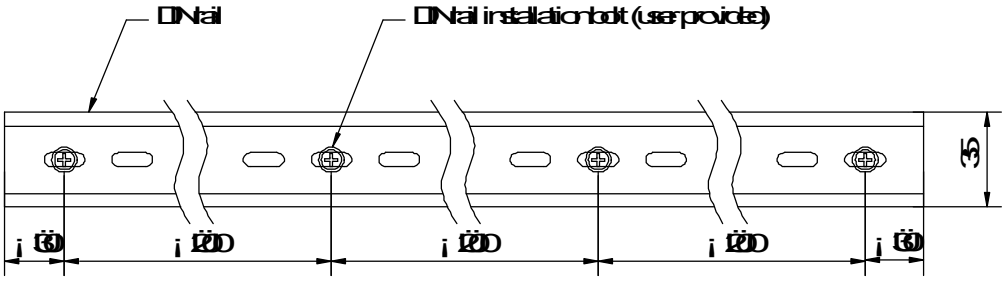


3.2 DIN rail model selection

You can refer to the following table to select the applicable DIN rail model.

Model	Length × Depth (unit: mm)	Fixing screw
TH35-7.5Fe	35×7.5	M4
TH35-7.5A1	35×7.5	M4
TH35-15Fe	35×15	M4

Figure 3-2 DIN rail installation dimensions (unit: mm)

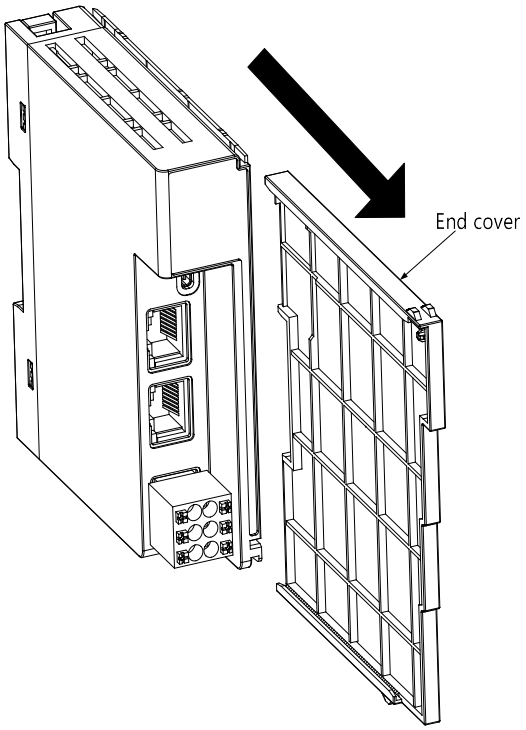


Note: To ensure the strength of the DIN rail, install the user-provided DIN rail mounting bolts within 30 mm from each end of the DIN rail (for details, see Figure 3-2), and ensure that the spacing between two adjacent bolts does not exceed 200 mm.

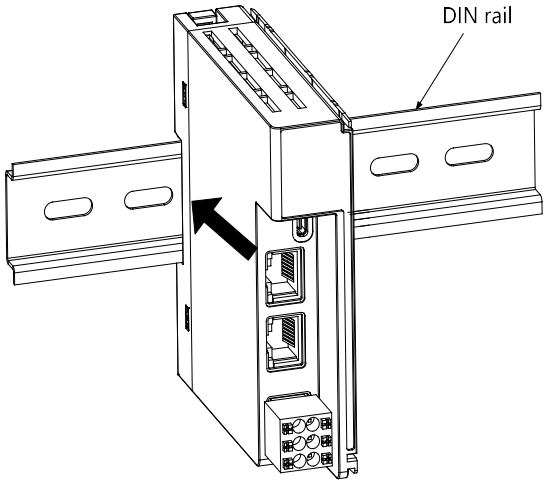
3.3 Installation procedure

The installation steps are as follows.

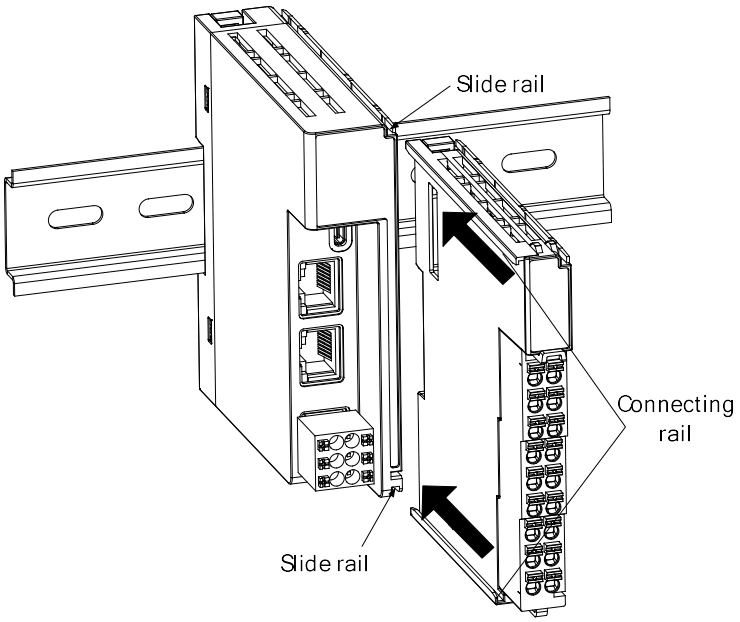
Step 1 Slide the right end cover of the communication coupler forward and remove it.



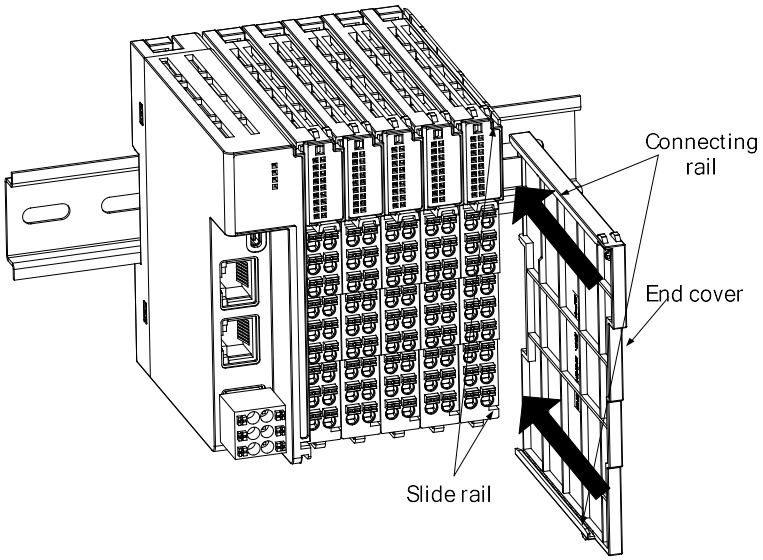
Step 2 Align the communication coupler module with the DIN rail and press inward until the module engages with the DIN rail (there is a noticeable sound of engagement when installed in place).



Step 3 Align the connecting rails of the module to be installed with the slide rails of the module already secured to the DIN rail, and push it inward until the module with the connecting rails engages with the DIN rail (there is a noticeable sound of engagement when installed in place).

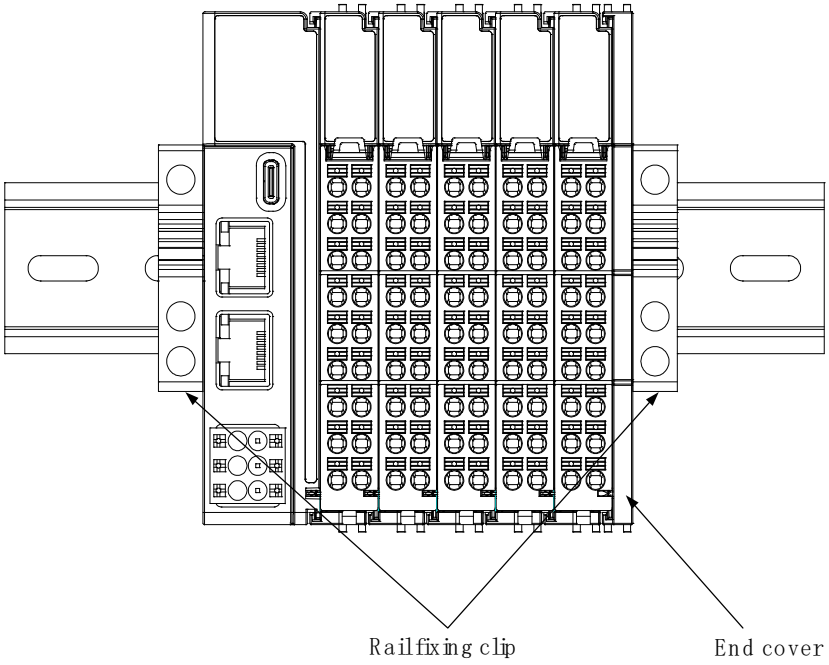


Step 4 Slide the end cover with the connecting rail onto the last I/O module.



Note: The metal pins on the last I/O module must not be exposed outside.

Step 5 Install one rail fixing clip at each end of the module assembly to prevent the module assembly from sliding sideways.



Note:

- For product installation dimensions, see Appendix A Product dimensions.
- Remove the end cover before installing the modules, and install the end cover on the rightmost module when the modules are installed.
- After the module is installed, the DIN rail locking latch automatically engages. If the latch does not lock automatically, press the top of the locking latch toward the DIN rail to secure the module in place.
- The rail fixing clips are user-supplied.

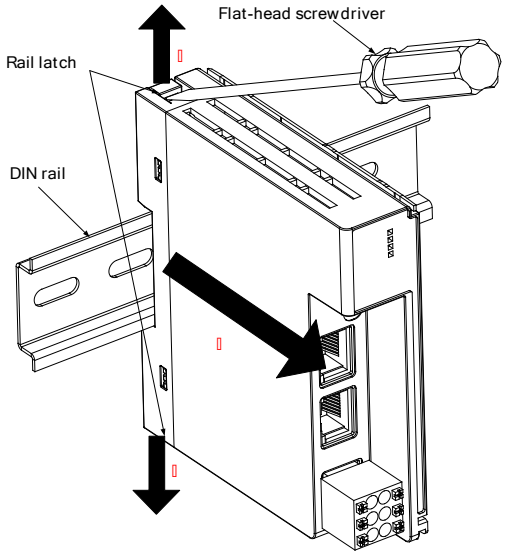
3.4 Disassembly procedure

The disassembly steps are as follows:

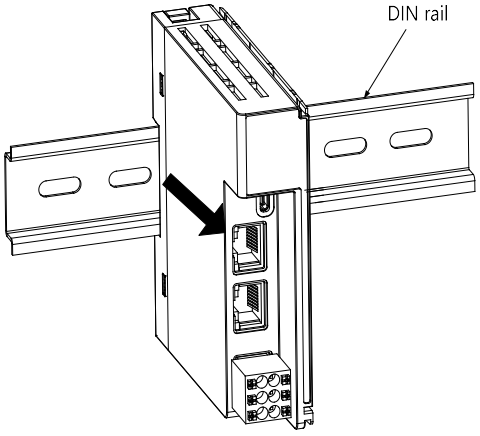
Step 1 Loosen the rail fixing clip to ensure that there is sufficient clearance to pull away the module from the DIN rail.

Note: The rail fixing clips are user-supplied.

Step 2 Use a flat-head screwdriver or a similar tool to pry up the upper and lower rail latches.



Step 3 Pull the module out in the direction perpendicular to the DIN rail.



Note: Refer to 3.3 Installation procedure to remove the end cover.

4 Wiring

4.1 Wiring requirements

- Before wiring, ensure that all external power supplies have been cut off.
- After completing the wiring, ensure that the terminal cover on top of the module is properly installed before powering on or operating the module. Otherwise, electric shock or incorrect operation can result.
- Before wiring, check the rated voltage and terminal configuration according to product specifications to ensure safe wiring. Connecting a power supply that does not match the ratings or wiring the product incorrectly may cause fire or product damage.
- Tighten the screws to the specified torque. If screws are loose, short circuit, fire, or incorrect operation may result.

  Note: Do not overtighten terminal screws. Otherwise, the screws or modules may be damaged, or the screws may fall off, resulting in short circuits or faults.
- Ensure that there are no foreign objects, such as metal shavings or wiring residues, inside each module. The foreign objects may cause short circuit, fire, or incorrect operation.

4.2 Grounding requirements

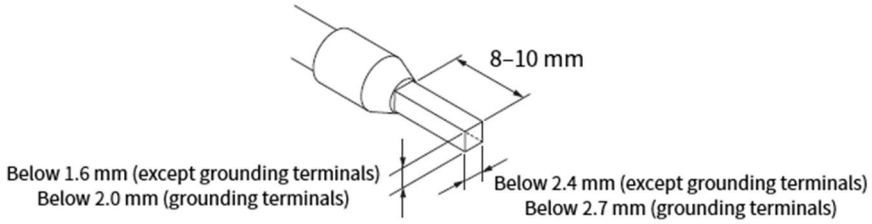
- **Power cable grounding**
  - Ensure proper independent grounding.
  - Use a grounding cable with a cross-sectional area of ≥ 2 mm² and a length of ≤ 30 cm, and connect the grounding terminal of the power supply module to ground ⏚.
  - If the grounding point is close to the product, ensure that the grounding cable is secure.
- **Shielded cable grounding**
  - Use shielded cables for cables transmitting sensitive signals, such as analog I/O, RS485, and EtherCAT signals.
  - The grounding point should be as close as possible to the module.
  - For the exposed shield after a section of the outer sheath of the shielded cable is stripped, connect it to the conductive backplane with the largest possible contact area to ensure good grounding contact.

4.3 Cable specifications

Cable material	Applicable cable size		Crimping tool
	GB size (mm²)	American Wire Gauge (AWG)	
Tubular cable lug	0.3	22	Use a proper crimping tool.
	0.5	20	
	0.75	18	
	1.0	18	
	1.5	16	

Note:

- The cable sizes applicable to the tubular cable lugs in the table above are for reference only and can be adjusted based on actual conditions.
- When using other tubular cable lugs, crimp stranded cables according to the following processing dimension requirements:



5 Product specifications

5.1 Overview

This chapter provides a detailed description of the design, functions, interfaces, hardware specifications, software specifications, and environmental requirements of the communication couplers and I/O modules in the A-Series I/O system.

5.2 Basic information

Model	Ordering code	Description	Applicable to
AS71ETC	11016–00005	Communication coupler, EtherCAT, 24 VDC, RoHS	Applicable to ASTRAADA and third-party EtherCAT master devices
AS71PNS	11016–00012	Communication coupler, PROFINET, 24 VDC, RoHS	Applicable to PROFINET master devices
AS71EIP	11016–00018	Communication coupler, EtherNet/IP, 24 VDC, RoHS	Applicable to EtherNet/IP master devices
AS71TCP	11016–00029	Communication coupler, Modbus TCP, 24 VDC, RoHS	Applicable to Modbus TCP master devices
AS71DI16	11016–00004	Digital input module, 16 channels, source/sink, 500 mA @ 24 VDC, RoHS	Applicable to ASTRAADA A-Series
AS71DI32	11016–00016	Digital input module, 32 channels, source/sink, 500 mA @ 24 VDC, RoHS	Applicable to ASTRAADA A-Series
AS71DO16	11016–00006	Digital output module, 16 channels of PNP transistor output, 500 mA @ 24 VDC, RoHS	Applicable to ASTRAADA A-Series
AS71DO32	11016–00013	Digital output module, 32 channels of PNP transistor output, 500 mA @ 24 VDC, RoHS	Applicable to ASTRAADA A-Series
AS71DOR8	11016–00009	Digital output module, 8 channels of relay outputs, dry contacts, 3 A @ 30 VDC/250 VAC; RoHS	Applicable to ASTRAADA A-Series
AS71AIN4	11016–00011	Analog input module, 4 channels, 16-bit resolution, room temperature accuracy ±0.1% FS, RoHS	Applicable to ASTRAADA A-Series
AS71AIV8	11016–00026	Analog input module, 8 channels, voltage signal, 16-bit resolution, room temperature accuracy ±0.15% FS, RoHS	Applicable to ASTRAADA A-Series
AS71AIC8	11016–00027	Analog input module, 8 channels, current signal, 16-bit resolution, room temperature accuracy ±0.15%	Applicable to ASTRAADA A-Series

Model	Ordering code	Description	Applicable to
		FS, RoHS	
AS71AOU4	11016–00008	Analog output module, 4 channels, 16-bit resolution, room temperature accuracy ±0.1% FS, RoHS	Applicable to ASTRAADA A-Series
AS71RTD4	11016–00007	Resistance temperature detector (RTD) module, 4 channels, 24-bit resolution, sensitivity 0.1 °C/°F, RoHS	Applicable to ASTRAADA A-Series
AS71THC4	11016–00010	Thermocouple module, 4 channels, 24-bit resolution, sensitivity 0.1 ℃/℉, RoHS	Applicable to ASTRAADA A-Series
AS71DT16	11016–00015	Digital input/output module, 16 channels of input and 16 channels of output (PNP), 500 mA @ 24 VDC, RoHS	Applicable to ASTRAADA A-Series
AS71BRG1	11016–00030	Bridge measurement module, 4-/6-wire resistor bridge sensor input, 1 channel, 24-bit, 5 VDC, RoHS	Applicable to ASTRAADA A-Series
AS71BRG2	11016–00031	Bridge measurement module, 4-/6-wire resistor bridge sensor input, 2 channels, 24-bit, 5 VDC, RoHS	Applicable to ASTRAADA A-Series
AS71PWRR	11016–00028	Power feed module, 24 VDC input, 5 VDC 2.5 A output, RoHS	Applicable to ASTRAADA A-Series
AS71AN02	11016–00022	SSI absolute encoder input module, 2 channels, 24 VDC, 2 MHz, RoHS	Applicable to ASTRAADA A-Series
AS71IN02	11016–00019	Incremental encoder input module, 2 channels, 24 V single-ended, 200 kHz, RoHS	Applicable to ASTRAADA A-Series
AS71IN01	11016–00021	Incremental encoder input module, 1 channel, 5 VDC differential, 2 MHz, RoHS	Applicable to ASTRAADA A-Series
AS71DT08	11016–00045	Digital input/output module, 8 channels of input and 8 channels of output (PNP), 500 mA @ 24 VDC, RoHS	Applicable to ASTRAADA A-Series
AS71PUOC	11016–00025	I/O module, pulse output control, 2 channels, 24 VDC, RoHS	Applicable to ASTRAADA A-Series
AS71COM2	11016–00056	I/O module, serial communication module, 2 channels, configurable RS485/RS232, supports master, slave, and free protocol communication, RoHS	Applicable to ASTRAADA A-Series

5.3 Environmental requirements

Item	Specifications
Working environment temperature	-20 ℃–+55 ℃
Working environment relative humidity (RH)	< 95% RH, no condensation
Storage temperature	-40 ℃–+70 ℃
Storage environment RH	< 90% RH, no condensation
Air	No corrosive gas
Altitude	Lower than 3000 m
Pollution degree	Below degree 2
Immunity	Power lines: 2 kV, compliant with IEC 61000-4-4
Overvoltage category	Category II
EMC immunity	Zone B, compliant with IEC 61131-2
Vibration resistance	Compliant with IEC 60068-2-6
Shock resistance	Compliant with IEC 60068-2-27

5.4 Communication coupler

5.4.1 EtherCAT communication coupler—AS71ETC

Figure 5-1 AS71ETC appearance

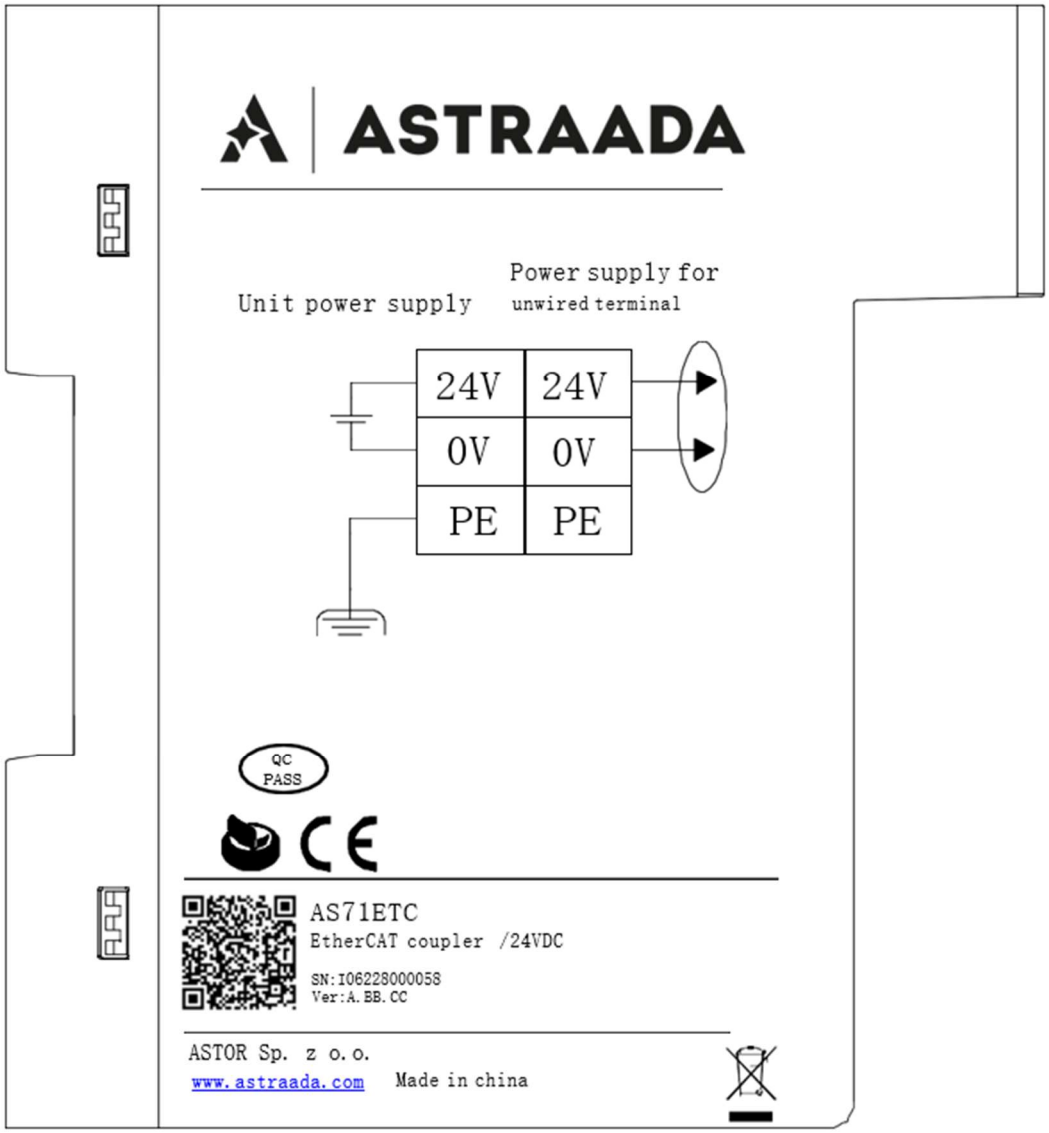


Figure 5-2 Component diagram

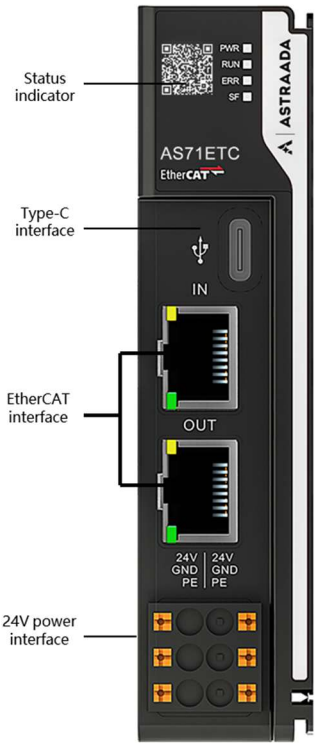


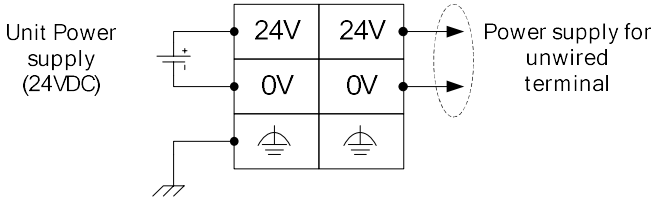
Table 5-1 Component description

Name	Color	Silkscreen	Description
Power supply indicator	Green	PWR	Off: The power connection is abnormal. On: The power connection is normal.
Run indicator	Green	RUN	Off: The communication coupler module is in the INIT state. Blinking: The communication coupler module is in the Pre-Operational state. Single flash: The communication coupler module is in the Safe-Operational state. On: The communication coupler module is in the Operational state.
Fault indicator	Red	ERR	Off: The EtherCAT communication is in the normal state. Blinking: An invalid EtherCAT state transition command has been received. Single flash: Network disconnection or a communication coupler module synchronization error has occurred. Double flash: An EtherCAT communication watchdog error has occurred.
Bus fault indicator	Red	SF	Off: The device is operating normally. Blinking: Configuration error occurs. On: A communication coupler FPGA fault occurs.
Type-C interface	Used for single-board software upgrade		
EtherCAT interface	IN: EtherCAT input port		
	OUT: EtherCAT output port		
24 V power supply interface	24 VDC power input interface of module		

- **Terminal definition**

Diagram	Left signal	Left terminal	Right terminal	Right signal
	24V	**24V**	**24V**	24V
	0V	**GND**	**GND**	0V
	⏚	**PE**	**PE**	⏚

- **Terminal wiring**



- **Hardware specifications**

Item	Specifications
Rated input voltage	24 VDC (20.4 VDC–28.8 VDC)
Rated input current	0.8 A (Typical value at 24 VDC)
Rated backplane bus output voltage	5 VDC (4.75 VDC–5.25 VDC)
Rated backplane bus output current	2.5 A (Typical value at 5 VDC)
Isolation	The input power is not isolated.
Power supply protection	Protection against overcurrent, reverse connection, and surges

- **Software specifications**

Item	Specifications
Alias access	Supports EtherCAT alias access. The station alias can be configured through the configuration interface, with an alias range of 1–65535. **Note:** The expansion modules connected downstream of the EtherCAT communication coupler do not support alias access or setup.
Input/output PDO data size	Max. 768 bytes
Input/output mailbox size	Max. 128 bytes
Max. number of expansion modules	16
Supported min. synchronization interval	512 μs

5.4.2 PROFINET communication coupler—AS71PNS

Figure 5-3 AS71PNS appearance

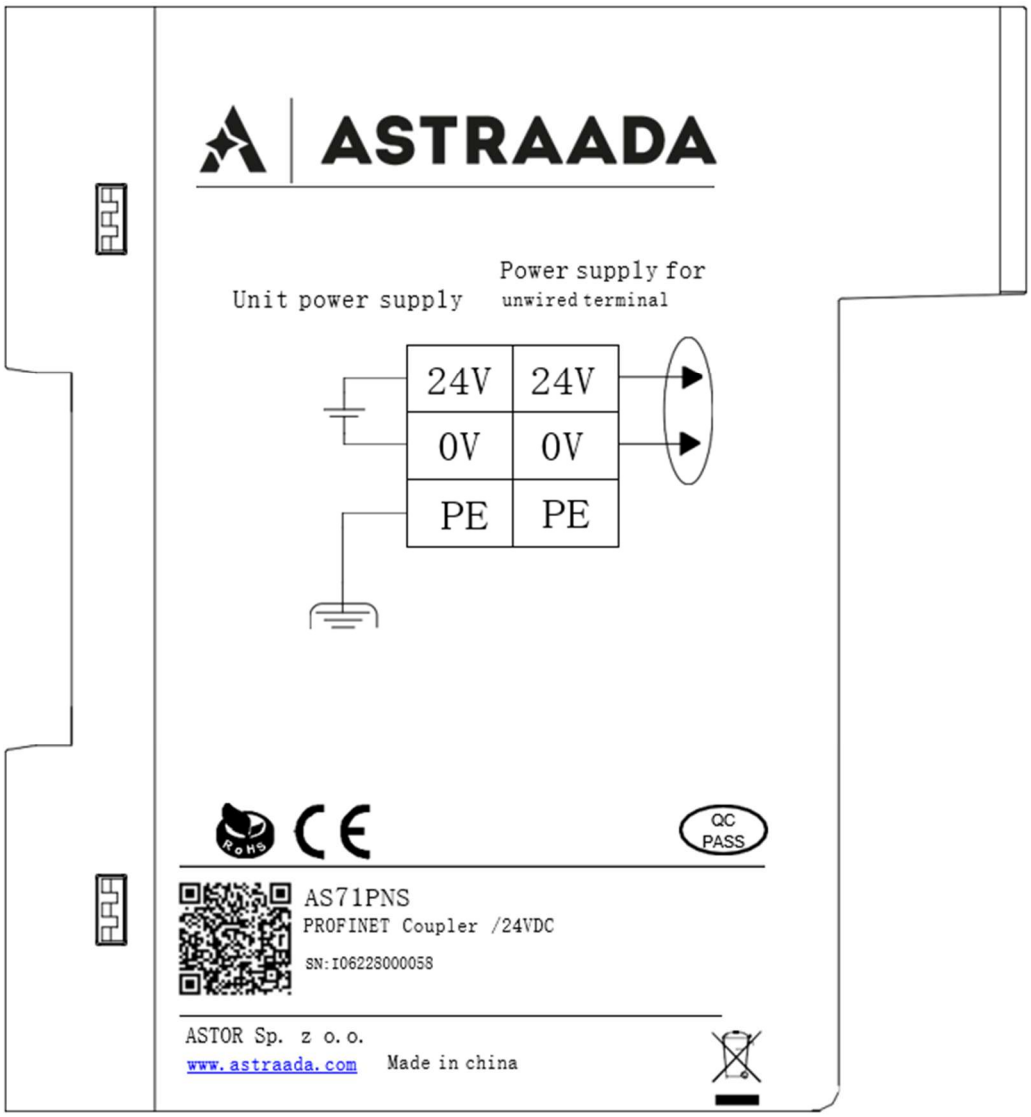


Figure 5-4 Component diagram

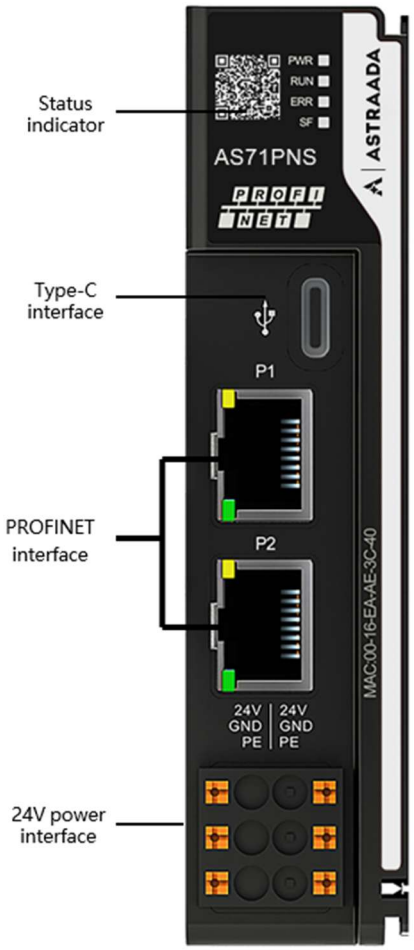


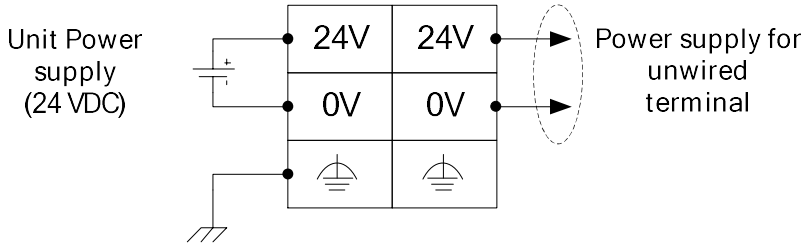
Table 5-2 Component description

Name	Color	Silkscreen	Description
Power supply indicator	Green	PWR	Off: The power connection is abnormal. On: The power connection is normal.
Run indicator	Green	RUN	Off: Initial state Fast blinking: Waiting for connection/Connecting Slow blinking: Safety mode On: The communication is normal
Fault indicator	Red	ERR	Off: Normal Fast blinking: Communication fault Slow blinking: Expansion module error
Bus fault indicator	Red	SF	Off: The device is operating normally. Blinking: Configuration inconsistency On: Expansion function fault
Type-C interface	Used for single-board software upgrade		
PROFINET interface	P1: PROFINET interface 1		
	P2: PROFINET interface 2		
24 V power supply interface	24 VDC power input interface of module		

- **Terminal definition**

Diagram	Left signal	Left terminal	Right terminal	Right signal
	24V	**24V**	**24V**	24V
	0V	**GND**	**GND**	0V
	⏚	**PE**	**PE**	⏚

- **Terminal wiring**



- **Hardware specifications**

Item	Specifications
Rated input voltage	24 VDC (20.4 VDC–28.8 VDC)
Rated input current	0.8 A (Typical value at 24 VDC)
Rated backplane bus output voltage	5 VDC (4.75 VDC–5.25 VDC)
Rated backplane bus output current	2.5 A (Typical value at 5 VDC)
Isolation	The input power is not isolated.
Power supply protection	Protection against overcurrent, reverse connection, and surges

- **Software specifications**

Item	Specifications
Communication mode	RT mode
Min. communication period	1 ms
I&M data	From I&M0 to I&M3
PROFINET version	V2.43
Expansion capability	Supports up to 16 modules
Number of PROFINET interfaces	2
PROFINET switch function	Supports networking
Supported open Industrial Ethernet protocols	TCP/IP, SNMP, and LLDP
Alarm/Diagnosis/Status information	Supports uploading local diagnostic codes to the PLC.
Physical layer	100BASE-TX
Communication rate	10 Mbit/s (standard Ethernet) 100 Mbit/s (PROFINET)
Transmission mode	Full duplex

Item	Specifications
Topology structure	Line, star, or tree topology
Transmission medium	Category 5e or higher network cable
Transmission distance	Distance between two nodes: < 100 m
Startup with priority	Reserved
Port disabling	Not supported
Device replacement without configuration	Supported (PN module of the same type)
Restoring factory settings	Supported

5.4.3 EtherNet/IP communication coupler–AS71EIP

Figure 5-5 AS71EIP appearance

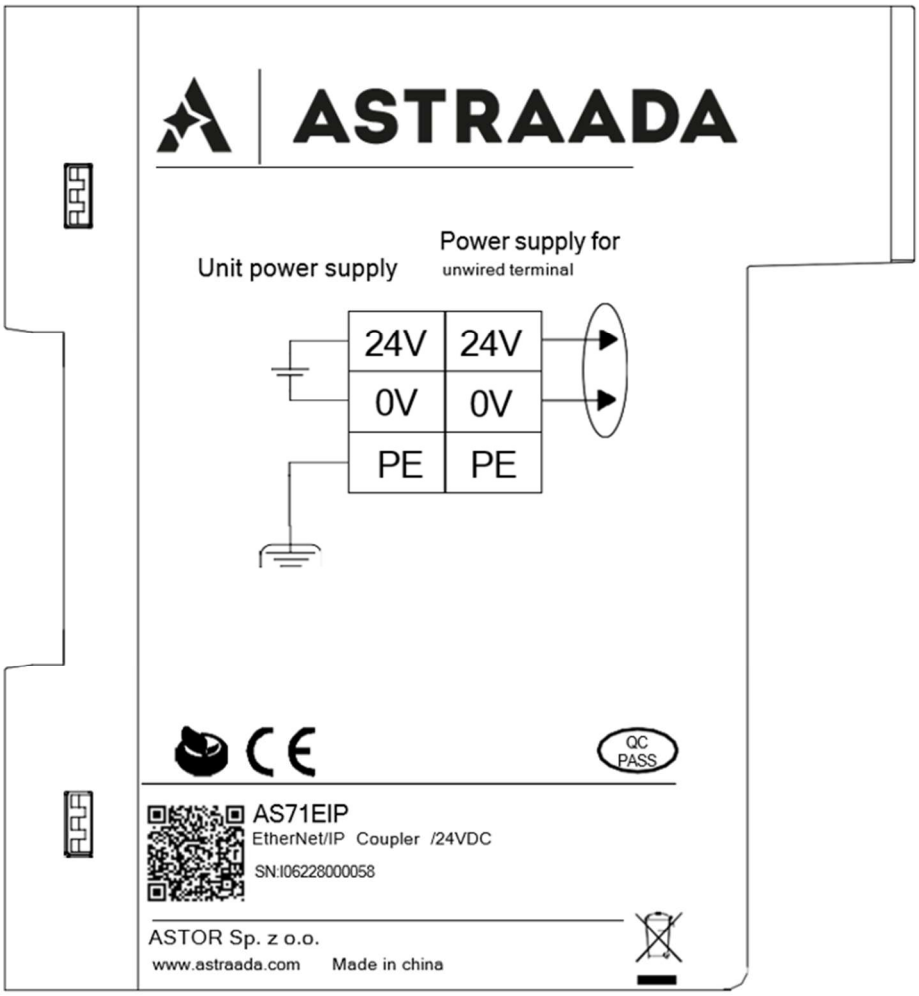


Figure 5-6 Component diagram

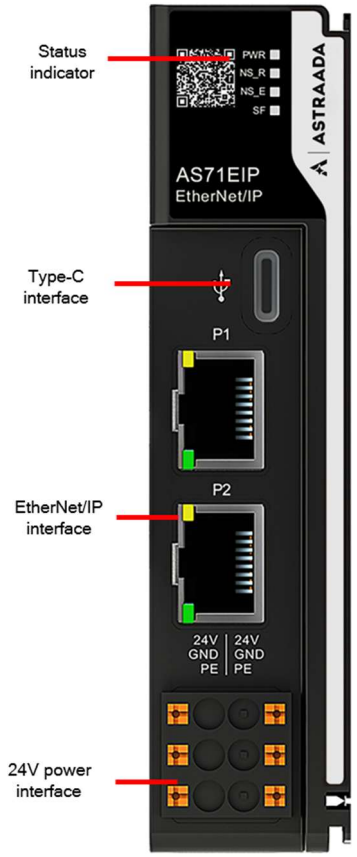


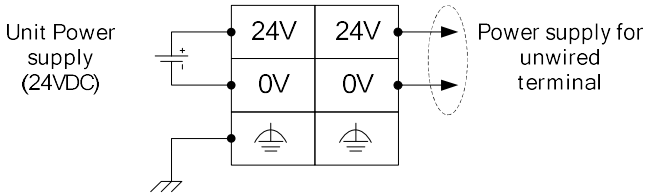
Table 5-3 Component description

Name	Color	Silkscreen	Description
Power supply indicator	Green	PWR	Off: The power connection is abnormal. On: The power connection is normal.
Network status indicator	Green	NS_R	Off: No IP address configured, no Ethernet connection. Blinking (1 Hz): Not connected. Steady on: Connected.
Network status indicator	Red	NS_E	Off: The network is working properly. Blinking (1 Hz): Connection timed out. Steady on: Duplicate IP address
Bus fault indicator	Red	SF	Off: The device is normal. Blinking (1 Hz): Configuration error occurs. Blinking (0.5 Hz): Exception in communication coupler MPU device initialization. On: A communication coupler FPGA fault occurs.
Type-C interface	For functions such as single-board software upgrades, EDS file export, and IP/MAC address configuration		
EtherNet/IP interface	Green	P1, P2	Link indicator Off: Ethernet connection is not established. On: Ethernet connection is successful.
	Yellow	P1, P2	ACK indicator Off: There is no data exchange. On: There is data exchange.
24 V power supply interface	24 VDC power input interface of module		

- **Terminal definition**

Diagram	Left signal	Left terminal	Right terminal	Right signal
	24V	**24V**	**24V**	24V
	0V	**GND**	**GND**	0V
	⏚	**PE**	**PE**	⏚

- **Terminal wiring**



- **Hardware specifications**

Item	Specifications
Rated input voltage	24 VDC (20.4 VDC–28.8 VDC)
Rated input current	0.8 A (Typical value at 24 VDC)
Rated backplane bus output voltage	5 VDC (4.75 VDC–5.25 VDC)
Rated backplane bus output current	2.5 A (Typical value at 5 VDC)
Isolation	The input power is not isolated.
Power supply protection	Protection against overcurrent, reverse connection, and surges

- **Software specifications**

Item	Specifications
Fieldbus protocol	EtherNet/IP
Fieldbus rate	10/100 Mbps, auto-negotiation, full duplex
Max. number of IO expansion modules	32
Max. number of output/input bytes	504 bytes
Network topology	Line, star, tree, or ring topology

5.4.4 Modbus TCP communication coupler–AS71TCP

Figure 5-7 AS71TCP appearance

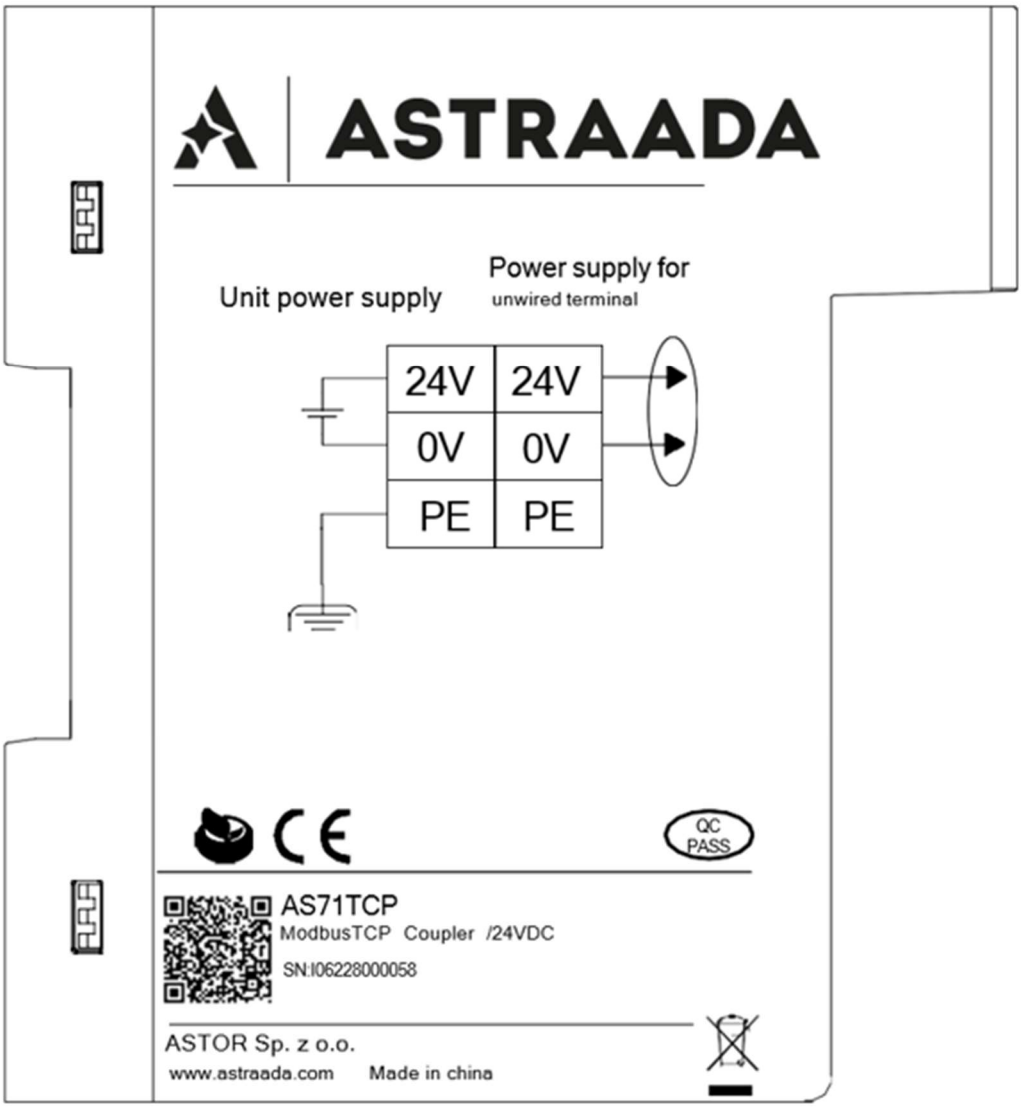


Figure 5-8 Component diagram

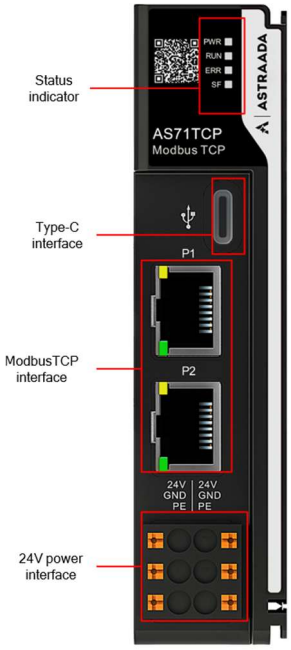


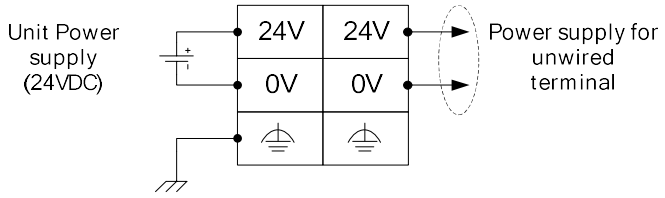
Table 5-4 Component description

Name	Color	Silkscreen	Description
Status indicator	Green	PWR	Power supply indicator Off: The power connection is abnormal. On: The power connection is normal.
	Green	RUN	Network operation status indicator Off: Not connected to the network. Blinking (500 ms): Waiting for connection/Connecting. On: The communication is normal.
	Red	ERR	Network error status indicator Off: The network is working properly. Blinking (500 ms): The network is disconnected abnormally after successful connection. On: IP conflict.
	Red	SF	System fault indicator Off: The device is normal. Blinking (500 ms): Configuration error occurs. Blinking (1000 ms): Exception in communication coupler MPU device initialization. On: A communication coupler initialization failure occurs.
Type-C interface	For functions such as single-board software upgrades, EDS file export, and IP/MAC address configuration		
Modbus TCP interface	Green	P1, P2	Link indicator Off: Not connected to the network. On: Connected to the network.
	Yellow	P1, P2	ACK indicator Off: There is no data exchange. On: There is data exchange.
24 V power supply interface	24 VDC power input interface of module		

- **Terminal definition**

Diagram	Left signal	Left terminal	Right terminal	Right signal
	24V	**24V**	**24V**	24V
	0V	**GND**	**GND**	0V
	⏚	**PE**	**PE**	⏚

- **Terminal wiring**



Note:

- The terminal PE needs to be well grounded through a cable, and the ground resistance is less than 4 Ω.
- Configure an independent system power supply for the coupler whenever possible to avoid sharing it with the external field power supply of expansion modules.

- **Hardware specifications**

Item	Specifications
Rated input voltage	24 VDC (-15%–+20%)
Rated input current	0.8 A
Rated backplane bus output voltage	5 VDC (4.75 VDC–5.25 VDC)
Rated backplane bus output current	2.5 A (Typical value)
Isolation	No
Power supply protection	Protection against reverse connection and overcurrent

- **Software specifications**

Item	Specifications
Max. number of client connections	5
TCP Keepalive	Enabled
Supported function codes	01, 02, 03, 04, 05, 06, 15, 16, 23
IP address settings	Set through the Astraada A-Series IO Studio software
Diagnostic function	Supported
Physical layer	100BASE-TX
Communication rate	10/100 Mbps, auto-negotiation
Transmission mode	Full duplex
Topology structure	Line, star, or tree topology
Transmission medium	Category 5e or higher network cable
Transmission distance	Max. segment length is 100 m.

5.5 I/O module

5.5.1 Digital input module–AS71DI16

Figure 5-9 AS71DI16 appearance



Figure 5-10 Component diagram

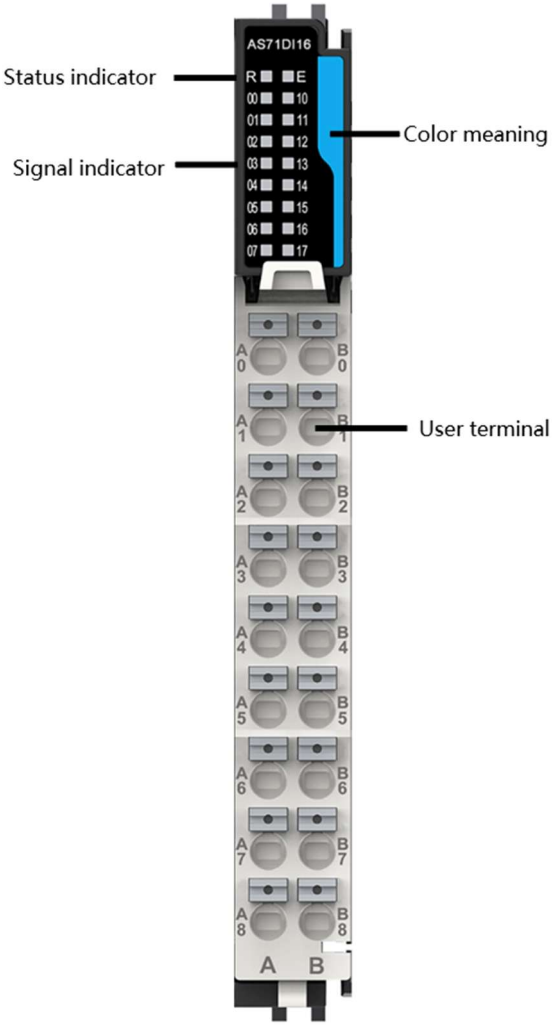
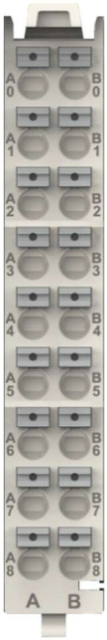


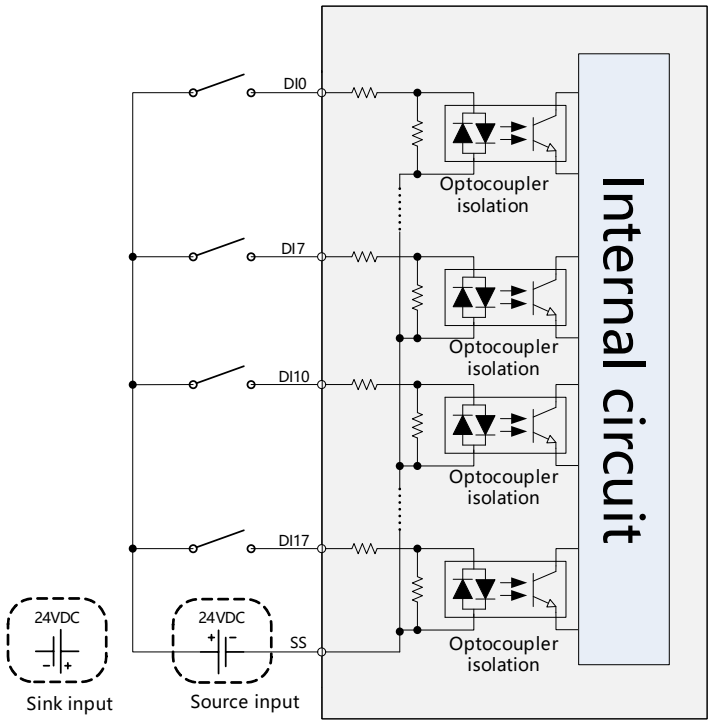
Table 5-5 Component description

Name	Color	Silkscreen	Description
Status indicator	Yellow-green	R	Power-on/Run status indicator On: The module is running. Slow blinking (500 ms): The module is establishing communication. Off: The module is not powered on or it is abnormal.
	Red	E	Module fault indicator Fast blinking (100 ms): The module is offline. Slow blinking (500 ms): Incorrect parameter settings. Off: The module works normally.
Signal indicator	Green	00–07 10–17	Input signal indicators (corresponding to each input channel) On: The input is active. Off: The input is inactive.
User terminal	I/O terminals for external wiringModule hot swapping		
Color meaning	: Digital input : Digital output (source, sink, relay)		: Analog input (voltage, current, thermocouple, RTD) : Analog output

- **Terminal definition**

Diagram	Left signal	Left terminal	Right terminal	Right signal
	DI0	**A0**	**B0**	DI10
	DI1	**A1**	**B1**	DI11
	DI2	**A2**	**B2**	DI12
	DI3	**A3**	**B3**	DI13
	DI4	**A4**	**B4**	DI14
	DI5	**A5**	**B5**	DI15
	DI6	**A6**	**B6**	DI16
	DI7	**A7**	**B7**	DI17
	SS	**A8**	**B8**	SS

- **Terminal wiring**



- **Power supply specifications**

Item	Specifications
Bus input power rated voltage	5 VDC (4.75 VDC–5.25 VDC)
Bus input power rated current	150 mA (Typical value at 5 VDC)
Module hot swapping	Not supported

- **Input specifications**

Item	Specifications
Input type	Digital input
Input mode	Source/Sink
Input channel	16
Input voltage class	24 VDC ±10% (21.6 VDC–26.4 VDC)
Input current (Typical)	7 mA (Typical value at 24 VDC)
ON voltage	>15 V
OFF voltage	<5 V
Hardware ON/OFF response time	100 μs
Software filter time	Supported
Input resistance	Reference value about 3.4 kΩ
Isolation	Yes
Input action display	When the input is in driving state, the input indicator is on.
Input derating	Derate to 75% when operating at 55°C (no more than 12 input points can be ON simultaneously), or reduce the allowable ambient temperature by 10°C when all input points are ON.

- **Software specifications**

Item	Specifications
Software input filter time	Setting range: 1–65535 (Default: 1000) Unit: 10 μs; 1000 indicates 10 ms. Supports two groups of filter parameters, with 8 channels per group. Channels in the same group share one filter parameter.
Input channel logic level configuration	Not supported
Independent channel enable configuration	Not supported
Diagnostic reporting function configuration	Diagnostic information is uploaded by default.
In stop mode	Outputs are not refreshed; inputs support refreshing in the Safe-Operational state.
I/O mapping	Supports bit-level access mapping.

5.5.2 Digital input module–AS71DI32

Figure 5-11 AS71DI32 appearance

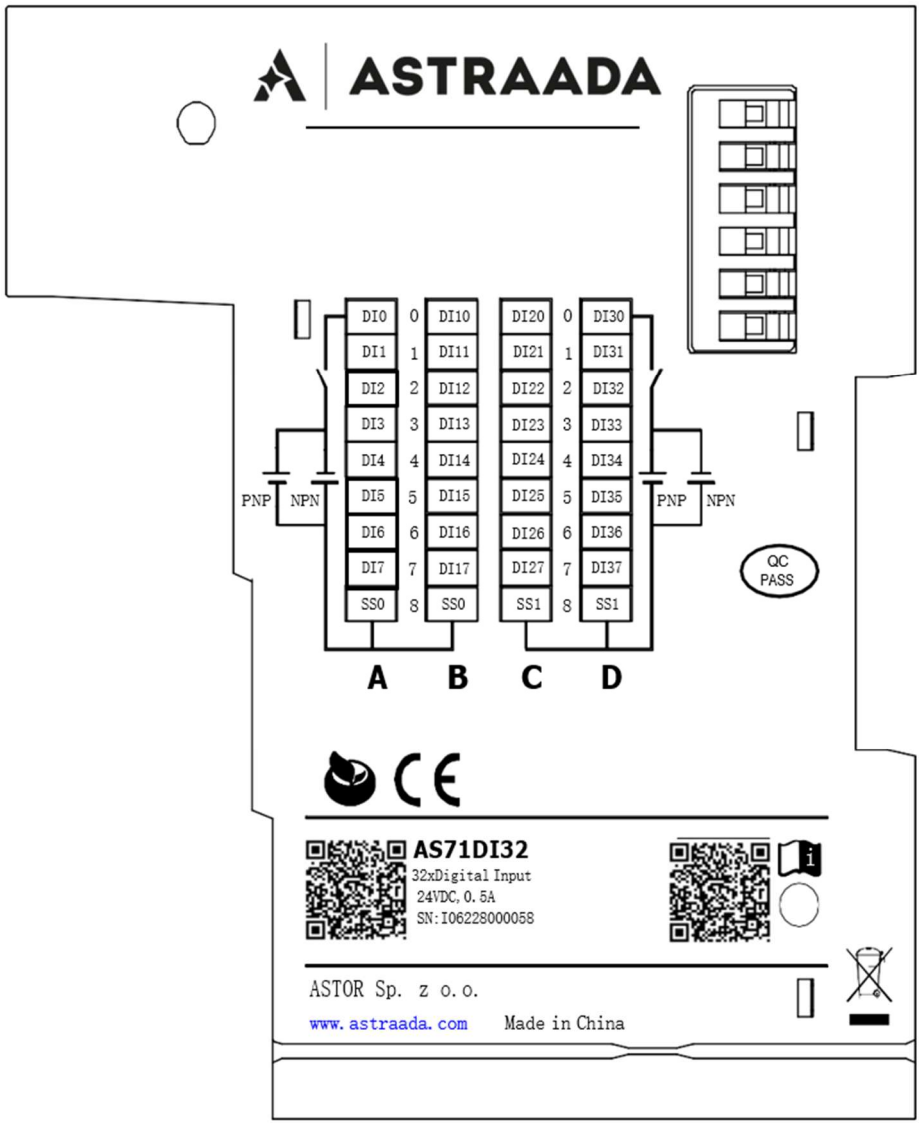


Figure 5-12 Component diagram

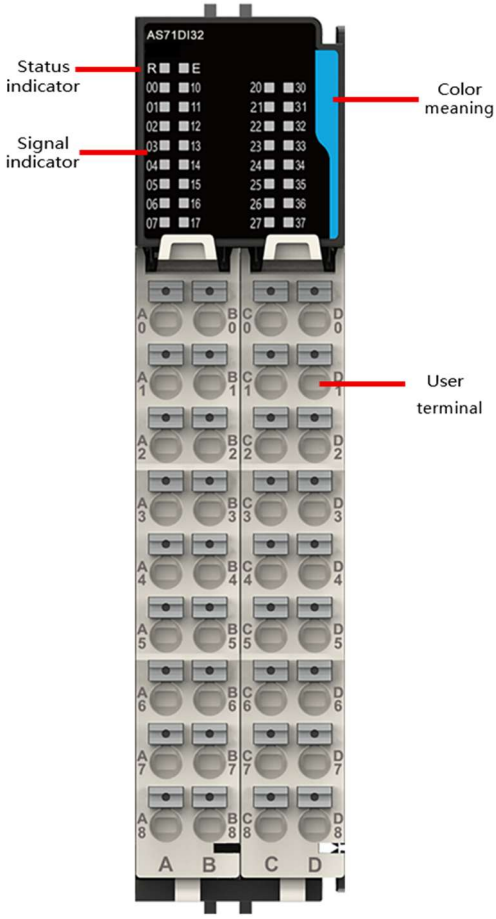
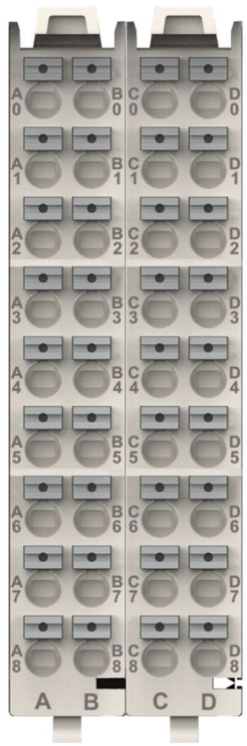


Table 5-6 Component description

Name	Color	Silkscreen	Description
Status indicator	Yellow-green	R	Power-on/Run status indicator On: The module is running. Slow blinking (500 ms): The module is establishing communication. Off: The module is not powered on or it is abnormal.
	Red	E	Module fault indicator Fast blinking (100 ms): The module is offline. Slow blinking (500 ms): Incorrect parameter settings. Off: The module works normally.
Signal indicator	Green	00–07 10–17 20–27 30–37	Input signal indicators (corresponding to each input channel) On: The input is active. Off: The input is inactive.
User terminal	I/O terminals for external wiring		
Color meaning	: Digital input : Digital output (source, sink, relay)		: Analog input (voltage, current, thermocouple, RTD) : Analog output

- **Terminal definition**

Diagram	Left signal	Left terminal	Right terminal	Right signal
	DI0	**A0**	**B0**	DI10
	DI1	**A1**	**B1**	DI11
	DI2	**A2**	**B2**	DI12
	DI3	**A3**	**B3**	DI13
	DI4	**A4**	**B4**	DI14
	DI5	**A5**	**B5**	DI15
	DI6	**A6**	**B6**	DI16
	DI7	**A7**	**B7**	DI17
	SS	**A8**	**B8**	SS
	DI20	**C0**	**D0**	DI30
	DI21	**C1**	**D1**	DI31
	DI22	**C2**	**D2**	DI32
	DI23	**C3**	**D3**	DI33
	DI24	**C4**	**D4**	DI34
	DI25	**C5**	**D5**	DI35
	DI26	**C6**	**D6**	DI36
	DI27	**C7**	**D7**	DI37
	SS	**C8**	**D8**	SS

- **Terminal wiring**

A/B terminal C/D terminal

- **Power supply specifications**

Item	Specifications
Bus input power rated voltage	5 VDC (4.75 VDC–5.25 VDC)
Bus input power rated current	150 mA (Typical value at 5 VDC)

Item	Specifications
Module hot swapping	Not supported

- **Input specifications**

Item	Specifications
Input type	Digital input
Input mode	Source/Sink
Input channel	32
Input voltage class	24 VDC ±10% (21.6 VDC–26.4 VDC)
Input current (Typical)	7 mA (Typical value at 24 VDC)
ON voltage	>15 V
OFF voltage	<5 V
Hardware ON/OFF response time	100 μs
Software filter time	Supported
Input resistance	Reference value about 3.4 kΩ
Isolation	Yes
Input action display	When the input is in driving state, the input indicator is on.
Input derating	Derate to 75% when operating at 55°C (no more than 12 input points can be ON simultaneously), or reduce the allowable ambient temperature by 10°C when all input points are ON.

- **Software specifications**

Item	Specifications
Software input filter time	Setting range: 1–65535 (Default: 1000) Unit: 10 μs; 1000 indicates 10 ms. Supports four groups of filter parameters, with 8 channels per group. Channels in the same group share one filter parameter.
Input channel logic level configuration	Not supported
Independent channel enable configuration	Not supported
Diagnostic reporting function configuration	Diagnostic information is uploaded by default.
In stop mode	Outputs are not refreshed; inputs support refreshing in the Safe-Operational state.
I/O mapping	Supports bit-level access mapping.

5.5.3 Digital output module (source)–AS71DO16

Figure 5-13 AS71DO16 appearance



Figure 5-14 Component diagram

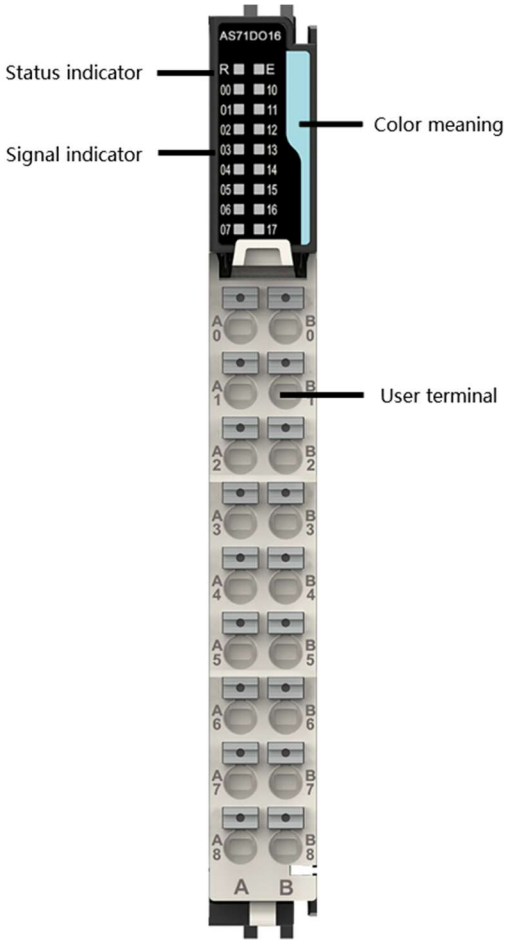
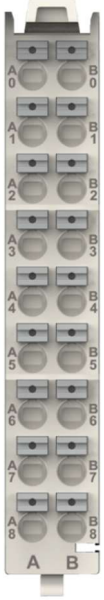


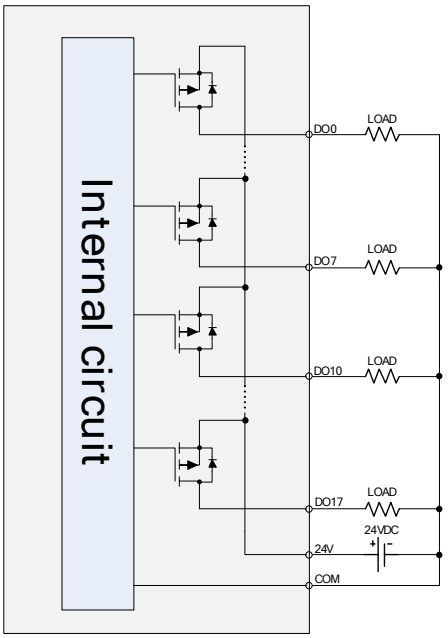
Table 5-7 Component description

Name	Color	Silkscreen	Description
Status indicator	Yellow-green	R	Power-on/Run status indicator On: The module is running. Slow blinking (500 ms): The module is establishing communication. Off: The module is not powered on or it is abnormal.
	Red	E	Module fault indicator Fast blinking (100 ms): The module is offline. Slow blinking (500 ms): External power supply not connected or incorrect parameter settings. Off: The module works normally.
Signal indicator	Green	00–07 10–17	Output signal indicators (corresponding to each output channel) On: Output enabled. Off: Output disabled.
User terminal	I/O terminals for external wiring		
Color meaning	: Digital input : Digital output (source, sink, relay)		: Analog input (voltage, current, thermocouple, RTD) : Analog output

- **Terminal definition**

Diagram	Left signal	Left terminal	Right terminal	Right signal
	DO0	**A0**	**B0**	DO10
	DO1	**A1**	**B1**	DO11
	DO2	**A2**	**B2**	DO12
	DO3	**A3**	**B3**	DO13
	DO4	**A4**	**B4**	DO14
	DO5	**A5**	**B5**	DO15
	DO6	**A6**	**B6**	DO16
	DO7	**A7**	**B7**	DO17
	24 VDC	**A8**	**B8**	COM

- **Terminal wiring**



- **Power supply specifications**

Item	Specifications
Bus input power rated voltage	5 VDC (4.75 VDC–5.25 VDC)
Bus input power rated current	150 mA
Terminal input power rated voltage	24 VDC (20.4 VDC–28.8 VDC)
Terminal input power rated current	2 A (Typical value at 24 VDC)
Module hot swapping	Not supported

- **Output specifications**

Item	Specifications
Output type	Digital output, high-side output
Output mode	Source type
Output channel	16
Output voltage class	24 VDC ±10% (21.6 VDC–26.4 VDC)
Output load (Resistive load)	0.5 A/point, 2 A/module
Output load (Inductive load)	7.2 W/point, 12 W/module
Output load (Lamp load)	5 W/point, 18 W/module
Hardware ON/OFF response time	100 μs
Leakage current at OFF	10 μA
Switch frequency	100 Hz for resistive load, 0.5 Hz for inductive load, and 10 Hz for lamp load
Isolation	Yes
Output action display	When the output is in driving state, the output indicator is on.
Protection function	Protection against short circuits and overcurrent

- **Software specifications**

Item	Specifications
Stop/offline output mode	Keeping output, clearing output, or outputting the preset value, which is configured on a point basis
Preset value of stop/offline output	Single-point 0 or 1
Output channel logic level configuration	Not supported
Configuration of independent channel enabling	Not supported
Diagnostic reporting function configuration	Diagnostic information is uploaded by default.
In stop mode	Outputs are set according to the stop/offline output mode and preset output values, and the output data are no longer refreshed.
I/O mapping	Supports bit-level access mapping.

5.5.4 Digital output module (source)–AS71DO32

Figure 5-15 AS71DO32 appearance



Figure 5-16 Component diagram

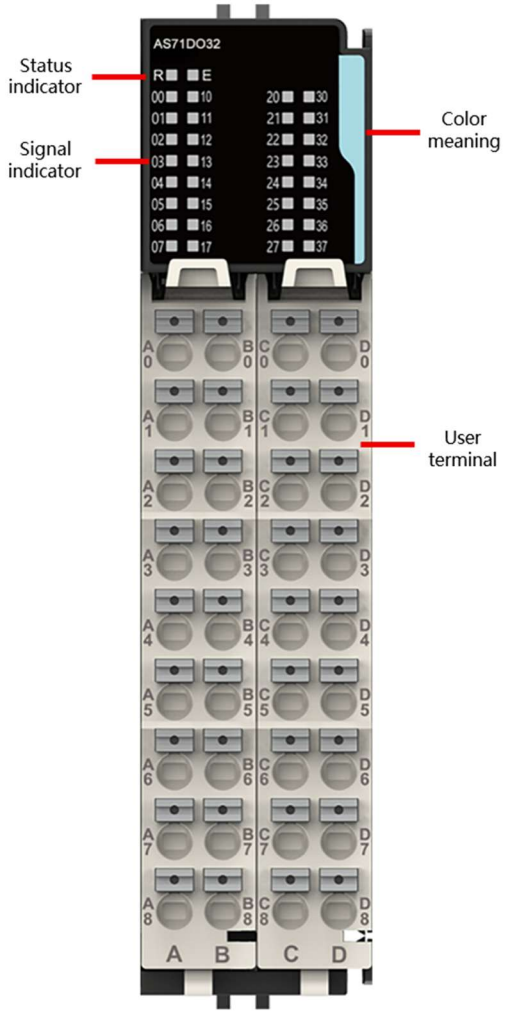
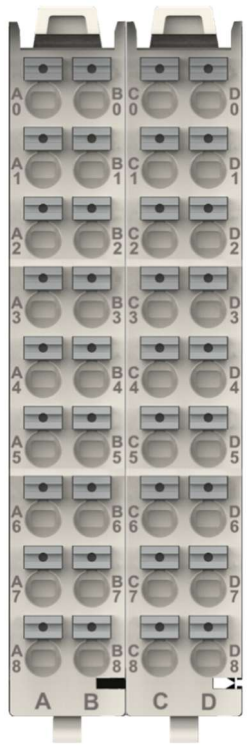


Table 5-8 Component description

Name	Color	Silkscreen	Description
Status indicator	Yellow-green	R	Power-on/Run status indicator On: The module is running. Slow blinking (500 ms): The module is establishing communication. Off: The module is not powered on or it is abnormal.
	Red	E	Module fault indicator Fast blinking (100 ms): The module is offline. Slow blinking (500 ms): External power supply not connected or incorrect parameter settings. Off: The module works normally.
Signal indicator	Green	00–07 10–17 20–27 30–37	Output signal indicators (corresponding to each output channel) On: Output enabled. Off: Output disabled.
User terminal	I/O terminals for external wiring		
Color meaning	: Digital input : Digital output (source, sink, relay)		: Analog input (voltage, current, thermocouple, RTD) : Analog output

- **Terminal definition**

Diagram	Left signal	Left terminal	Right terminal	Right signal
	DO0	**A0**	**B0**	DO10
	DO1	**A1**	**B1**	DO11
	DO2	**A2**	**B2**	DO12
	DO3	**A3**	**B3**	DO13
	DO4	**A4**	**B4**	DO14
	DO5	**A5**	**B5**	DO15
	DO6	**A6**	**B6**	DO16
	DO7	**A7**	**B7**	DO17
	24 VDC	**A8**	**B8**	COM
	DO20	**C0**	**D0**	DO30
	DO21	**C1**	**D1**	DO31
	DO22	**C2**	**D2**	DO32
	DO23	**C3**	**D3**	DO33
	DO24	**C4**	**D4**	DO34
	DO25	**C5**	**D5**	DO35
	DO26	**C6**	**D6**	DO36
	DO27	**C7**	**D7**	DO37
	24 VDC	**C8**	**D8**	COM

- **Terminal wiring**

A/B terminal C/D terminal

- **Power supply specifications**

Item	Specifications
Bus input power rated voltage	5 VDC (4.75 VDC–5.25 VDC)

Item	Specifications
Bus input power rated current	150 mA
Terminal input power rated voltage	24 VDC (20.4 VDC–28.8 VDC)
Terminal input power rated current	2 A (Typical value at 24 VDC)
Module hot swapping	Not supported

- **Output specifications**

Item	Specifications
Output type	Digital output, high-side output
Output mode	Source type
Output channel	32
Output voltage class	24 VDC ±10% (21.6 VDC–26.4 VDC)
Output load (Resistive load)	0.5 A/point, 2 A/module
Output load (Inductive load)	7.2 W/point, 12 W/module
Output load (Lamp load)	5 W/point, 18 W/module
Hardware ON/OFF response time	100 μs
Leakage current at OFF	10 μA
Switch frequency	100 Hz for resistive load, 0.5 Hz for inductive load, and 10 Hz for lamp load
Isolation	Yes
Output action display	When the output is in driving state, the output indicator is on.
Protection function	Protection against short circuits and overcurrent

- **Software specifications**

Item	Specifications
Stop/offline output mode	Keeping output, clearing output, or outputting the preset value, which is configured on a point basis
Preset value of stop/offline output	Single-point 0 or 1
Output channel logic level configuration	Not supported
Configuration of independent channel enabling	Not supported
Diagnostic reporting function configuration	Diagnostic information is uploaded by default.
In stop mode	Outputs are set according to the stop/offline output mode and preset output values, and the output data are no longer refreshed.
I/O mapping	Supports bit-level access mapping.

5.5.5 Digital output module (relay)–AS71DOR8

Figure 5-17 AS71DOR8 appearance



Figure 5-18 Component diagram

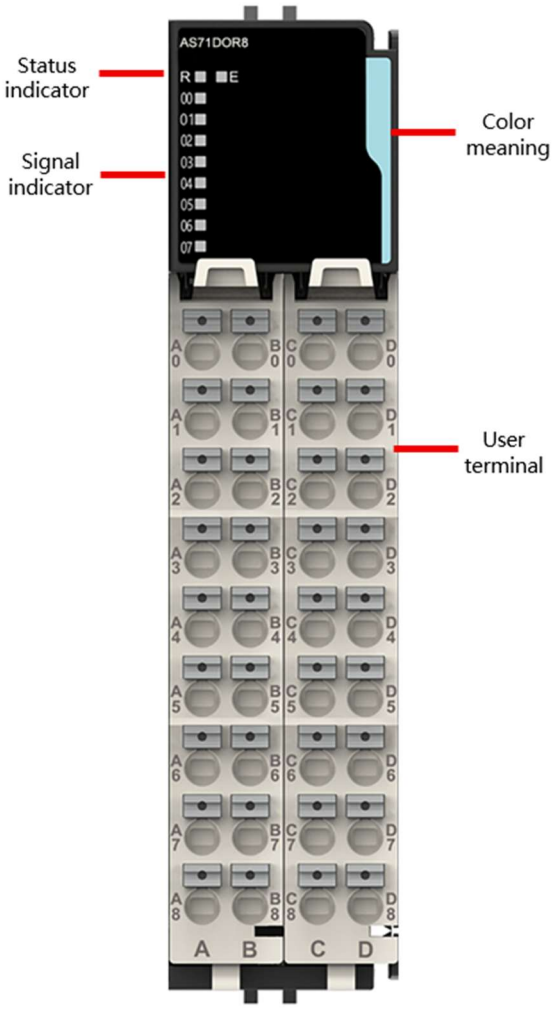
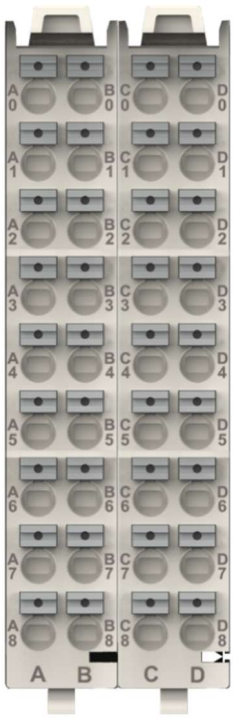


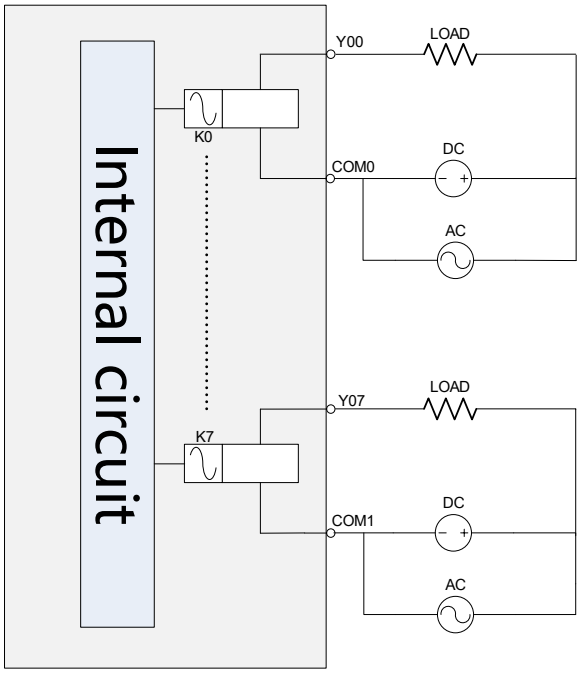
Table 5-9 Component description

Name	Color	Silkscreen	Description
Status indicator	Yellow-green	R	Power-on/Run status indicator On: The module is running. Slow blinking (500 ms): The module is establishing communication. Off: The module is not powered on or it is abnormal.
	Red	E	Module fault indicator Slow blinking (500 ms): Incorrect parameter settings. Fast blinking (100 ms): The module is offline. Off: The module works normally.
Signal indicator	Green	00–07	Output signal indicators (corresponding to each output channel) On: Output enabled. Off: Output disabled.
User terminal	I/O terminals for external wiring		
Color meaning	: Digital input : Digital output (source, sink, relay)		: Analog input (voltage, current, thermocouple, RTD) : Analog output

- **Terminal definition**

Diagram	Left signal	Left terminal	Right terminal	Right signal
	Y00	**A0**	**B0**	COM0
	-	**A1**	**B1**	-
	Y01	**A2**	**B2**	COM0
	-	**A3**	**B3**	-
	Y02	**A4**	**B4**	COM0
	-	**A5**	**B5**	-
	Y03	**A6**	**B6**	COM0
	-	**A7**	**B7**	-
	-	**A8**	**B8**	-
	Y04	**C0**	**D0**	COM1
	-	**C1**	**D1**	-
	Y05	**C2**	**D2**	COM1
	-	**C3**	**D3**	-
	Y06	**C4**	**D4**	COM1
	-	**C5**	**D5**	-
	Y07	**C6**	**D6**	COM1
	-	**C7**	**D7**	-
	-	**C8**	**D8**	-

- **Terminal wiring**



- **Power supply specifications**

Item	Specifications
Bus input power rated voltage	5 VDC (4.75 VDC–5.25 VDC)
Bus input power rated current	300 mA
Module hot swapping	Not supported

- **Output specifications**

Item	Specifications
Output mode	Relay N.O.
Output channel	8
Contact load (resistive load)	3 A 250 VAC/30 VDC
Max. switching voltage	250 VAC/125 VDC (@0.3 A)
Max. switching current	3 A
Contact resistance	< 100 mΩ (1 A 6 VDC)
Min. load	5 VDC 10 mA
Isolation	Power circuits isolated from signal circuits

- **Software specifications**

Item	Specifications
Stop/offline output mode	Keeping output, clearing output, or outputting the preset value, which is configured on a point basis
Preset value of stop/offline output	Single-point 0 or 1
Output channel exception detection indication	Not supported
Output channel logic level configuration	Not supported
Configuration of independent channel enabling	Not supported
Diagnostic reporting function configuration	Not supported
In stop mode	Outputs are set according to the stop/offline output mode and preset output values, and the output data are no longer refreshed.
I/O mapping	Supports bit-level access mapping.

5.5.6 Analog input module–AS71AIN4

Figure 5-19 AS71AIN4 appearance



Figure 5-20 Component diagram

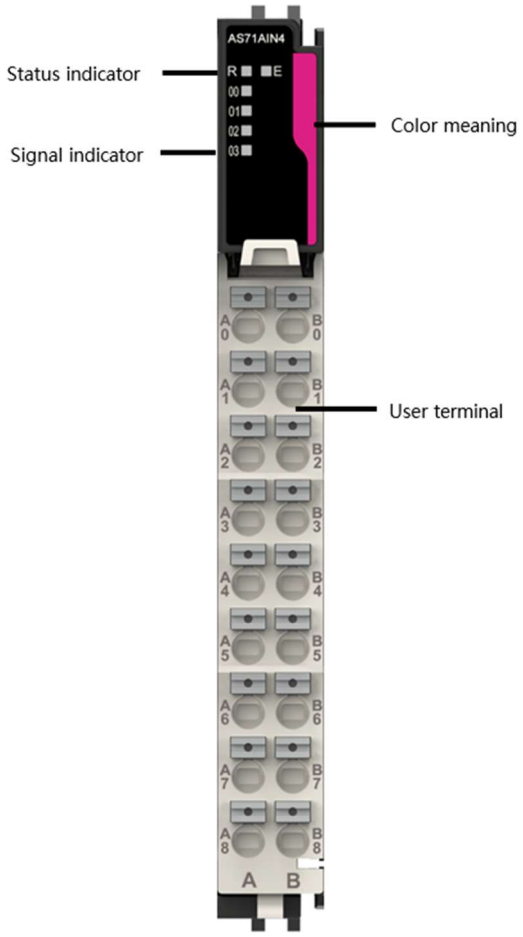
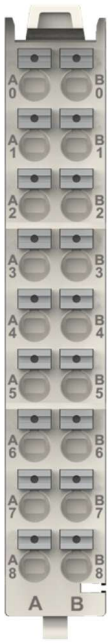


Table 5-10 Component description

Name	Color	Silkscreen	Description
Status indicator	Yellow-green	R	Power-on/Run status indicator On: The module is running. Slow blinking (500 ms): The module is establishing communication. Off: The module is not powered on or it is abnormal.
	Red	E	Module fault indicator Fast blinking (100 ms): The module is offline. Slow blinking (500 ms): ADC chip fault or incorrect parameter settings. Off: The module works normally.
Signal indicator	Green	00–03	Channel status indicator On: Channel enabled Slow blinking (500 ms): Input signal over-range, over-limit, or channel parameter configuration error Fast blinking (100 ms): Disconnection in voltage mode Off: The channel is disabled.
User terminal	I/O terminals for external wiring		
Color meaning	: Digital input : Digital output (source, sink, relay)		: Analog input (voltage, current, thermocouple, RTD) : Analog output

- **Terminal definition**

Diagram	Left signal	Left terminal	Right terminal	Right signal
	VI0+	**A0**	**B0**	I0+
	VI0-	**A1**	**B1**	PE
	VI1+	**A2**	**B2**	I1+
	VI1-	**A3**	**B3**	PE
	VI2+	**A4**	**B4**	I2+
	VI2-	**A5**	**B5**	PE
	VI3+	**A6**	**B6**	I3+
	VI3-	**A7**	**B7**	PE
	-	**A8**	**B8**	-

- **Terminal wiring**

Figure 5-21 Voltage input wiring

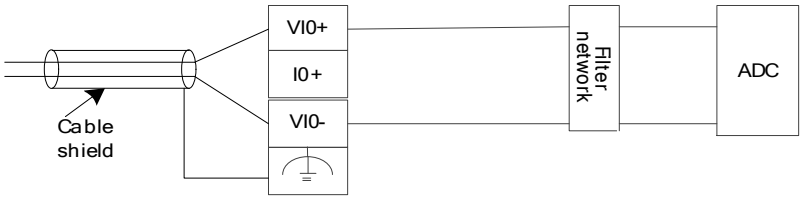
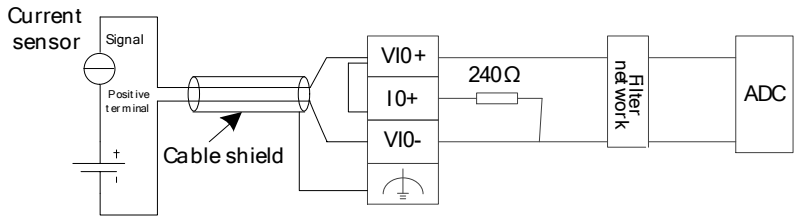
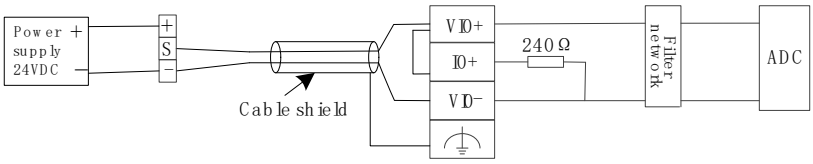


Figure 5-22 Current input wiring (2-wire)



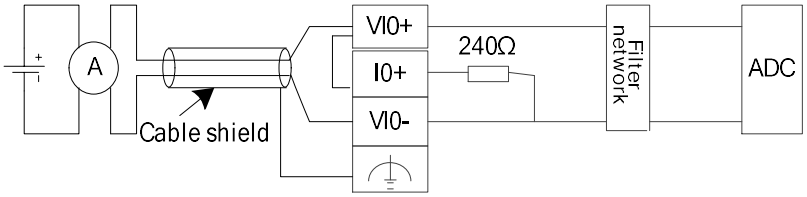
Two-wire current input

Figure 5-23 Current input wiring (3-wire)



Three-wire current input

Figure 5-24 Current input wiring (4-wire)



Four-wire current input

- **Power supply specifications**

Item	Specifications
Bus input power rated voltage	5 VDC (4.75 VDC–5.25 VDC)
Bus input power rated current	200 mA
Module hot swapping	Not supported

- **Input specifications**

Item	Specifications
Input type	Analog input
Input mode	Voltage/current
Input channel	4
Resolution	16-bit
Conversion time	320 μs/channel
Voltage input range	0–5 V, 0–10 V, -5–+5 V, -10–+10 V
Voltage input impedance	2.4 MΩ
Voltage input accuracy (25 ℃)	±0.1%
Voltage input accuracy (in full temperature range)	±0.2%
Voltage input limit	±12 V
Voltage input diagnosis	Disconnection detection supported
Current input range	±20 mA, 0–20 mA, 4–20 mA
Current input resistance	240 Ω
Current input accuracy (25 ℃)	±0.1%
Current input accuracy (in full temperature range)	±0.2%
Current input limit	±24 mA
Current input diagnosis	Not supported
Isolation	No isolation between interface channels; voltage isolated from interface; interface isolated from bus

- **Software specifications**

Item	Specifications
Configuration of independent channel enabling	Supported
Diagnostic reporting	Supported

Item	Specifications
function configuration	
Diagnostic detection enable configuration	Voltage-mode disconnection detection, over-range detection, and over-limit detection
Conversion mode configuration	0–5 V, 0–10 V, ±5 V, ±10 V, 4–20 mA, 0–20 mA, ±20 mA
Filter parameter configuration	Software filter time can be set through the host controller, which ranges from 1 to 255, with the sampling period as the unit.
Over-limit detection enable configuration	Supported
Peak hold enable configuration	Not supported
Converted digital range configuration	±20000
Sampling time	1.28 ms for 4 channels
Sampling refresh	Refreshed asynchronously according to the sampling time; synchronization with the bus cycle is not required.
Stop mode	Holds the current value and stops refreshing.

5.5.7 Analog input module–AS71AIV8

Figure 5-25 AS71AIV8 appearance



Figure 5-26 Component diagram

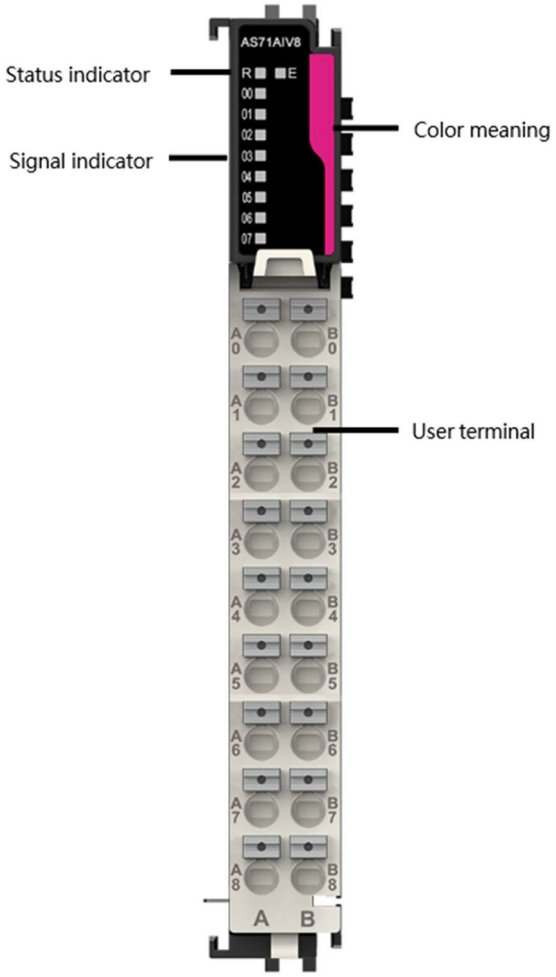
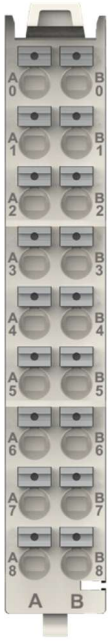


Table 5-11 Component description

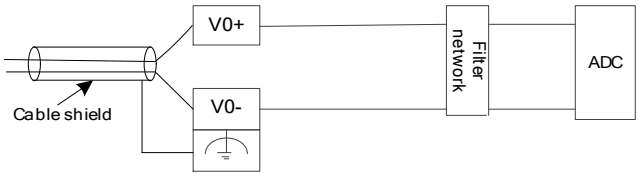
Name	Color	Silkscreen	Description
Status indicator	Yellow-green	R	Power-on/Run status indicator On: The module is running. Slow blinking (500 ms): The module is establishing communication. Off: The module is not powered on or it is abnormal.
	Red	E	Module fault indicator Fast blinking (100 ms): The module is offline. Slow blinking (500 ms): ADC chip fault or incorrect parameter settings. Off: The module works normally.
Signal indicator	Green	00–07	Channel status indicator On: Channel enabled Slow blinking (500 ms): Input signal over-range, over-limit, or channel parameter configuration error Off: The channel is disabled.
User terminal	I/O terminals for external wiring		
Color meaning	: Digital input : Digital output (source, sink, relay)		: Analog input (voltage, current, thermocouple, RTD) : Analog output

- **Terminal definition**

Diagram	Left signal	Left terminal	Right terminal	Right signal
	V0+	**A0**	**B0**	V0-
	V1+	**A1**	**B1**	V1-
	V2+	**A2**	**B2**	V2-
	V3+	**A3**	**B3**	V3-
	V4+	**A4**	**B4**	V4-
	V5+	**A5**	**B5**	V5-
	V6+	**A6**	**B6**	V6-
	V7+	**A7**	**B7**	V7-
	PE	**A8**	**B8**	PE

- **Terminal wiring**

Figure 5-27 Voltage input wiring



- **Power supply specifications**

Item	Specifications
Bus input power rated voltage	5 VDC (4.75 VDC–5.25 VDC)
Bus input power rated current	200 mA
Module hot swapping	Not supported

- **Input specifications**

Item	Specifications
Input type	Analog input
Input mode	Voltage (Differential)
Input channel	8
Resolution	16-bit
Conversion time	<170 μs/channel
Voltage input range	0–5 V, 0–10 V, -5–+5 V, -10–+10 V
Voltage input impedance	1 MΩ
Voltage input accuracy (25 ℃)	±0.15%
Voltage input accuracy (in full temperature range)	±0.3%

Item	Specifications
Voltage input limit	±15 V
Voltage input diagnosis	Over-limit detection, over-range detection supported; disconnection detection not supported
Isolation	No isolation between interface channels; voltage isolated from interface; interface isolated from bus

- **Software specifications**

Item		Specifications
Configuration of independent channel enabling		Supported
Diagnostic reporting function configuration		Supported
Diagnostic detection enable configuration		Over-range detection; over-limit detection
Conversion mode configuration		0–5 V, 0–10 V, ±5 V, ±10 V, 1–5V
Filter parameter configuration		Software filter time can be set through the host controller, which ranges from 1 to 255, with the sampling period as the unit.
Over-limit detection enable configuration		Supported
Peak hold enable configuration		Not supported
Converted digital range configuration	-10–+10 VDC	-20000–20000, -32000–32000, -27648–27648
	0–10 VDC	0–20000, 0–32000, 0–27648
	-5–+5 VDC	-20000–20000, -32000–32000, -27648–27648
	0–5 VDC	0–20000, 0–32000, 0–27648
	1–5 VDC	0–20000, 0–32000, 0–27648
Sampling time		<170 μs/channel
Sampling refresh		Refreshed asynchronously according to the sampling time; synchronization with the bus cycle is not required.

5.5.8 Analog input module–AS71AIC8

Figure 5-28 AS71AIC8 appearance



Figure 5-29 Component diagram

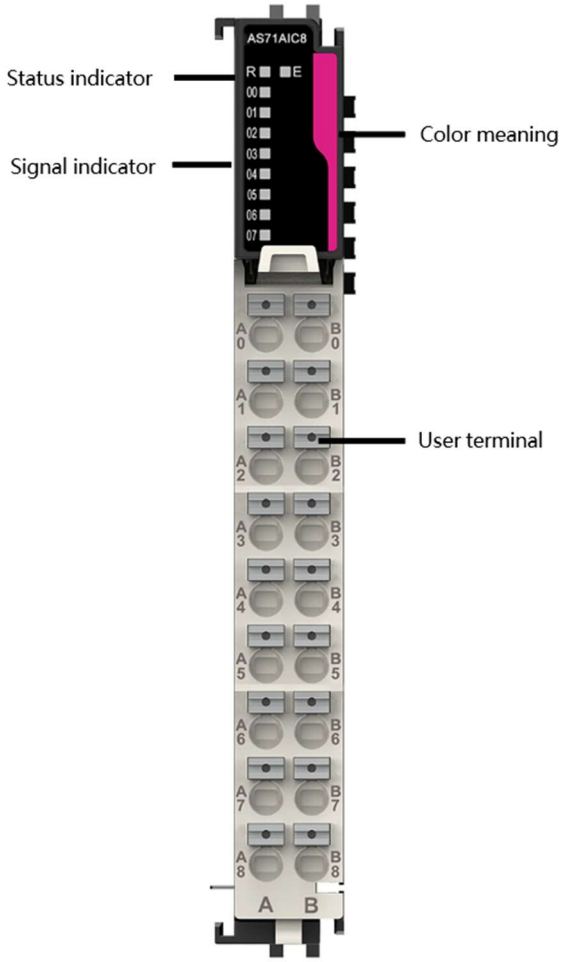


Table 5-12 Component description

Name	Color	Silkscreen	Description
Status indicator	Yellow-green	R	Power-on/Run status indicator On: The module is running. Slow blinking (500 ms): The module is establishing communication. Off: The module is not powered on or it is abnormal.
	Red	E	Module fault indicator Fast blinking (100 ms): The module is offline. Slow blinking (500 ms): ADC chip fault or incorrect parameter settings. Off: The module works normally.
Signal indicator	Green	00–07	Channel status indicator On: Channel enabled Slow blinking (500 ms): Input signal over-range, over-limit, or channel parameter configuration error Off: The channel is disabled.
User terminal	I/O terminals for external wiring		
Color meaning	: Digital input : Digital output (source, sink, relay)		: Analog input (voltage, current, thermocouple, RTD) : Analog output

- **Terminal definition**

Diagram	Left signal	Left terminal	Right terminal	Right signal
	I0+	**A0**	**B0**	I0-
	I1+	**A1**	**B1**	I1-
	I2+	**A2**	**B2**	I2-
	I3+	**A3**	**B3**	I3-
	I4+	**A4**	**B4**	I4-
	I5+	**A5**	**B5**	I5-
	I6+	**A6**	**B6**	I6-
	I7+	**A7**	**B7**	I7-
	PE	**A8**	**B8**	PE

- **Terminal wiring**

Figure 5-30 Current input wiring (2-wire)

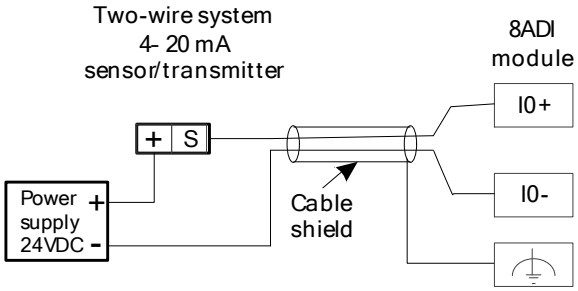


Figure 5-31 Current input wiring (3-wire)

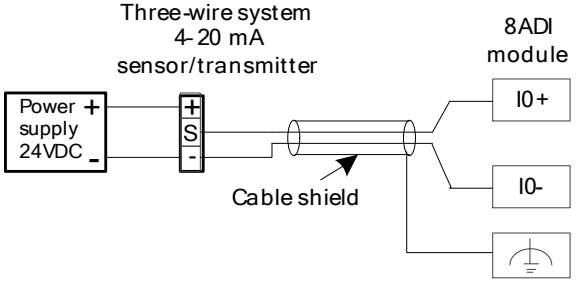
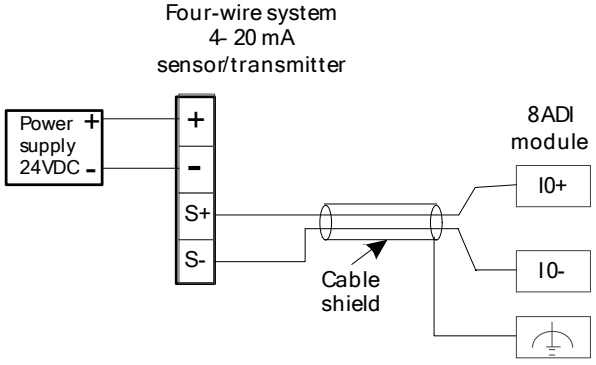


Figure 5-32 Current input wiring (4-wire)



- **Power supply specifications**

Item	Specifications
Bus input power rated voltage	5 VDC (4.75 VDC–5.25 VDC)
Bus input power rated current	200 mA
Module hot swapping	Not supported

- **Input specifications**

Item	Specifications
Input type	Analog input
Input mode	Current (Differential)
Input channel	8
Resolution	16-bit
Conversion time	<170 μs/channel
Current input range	±20 mA, 0–20 mA, 4–20 mA
Current input resistance	240 Ω
Current input accuracy (25 ℃)	±0.15%
Current input accuracy (in full temperature range)	±0.3%
Current input limit	±30 mA
Isolation	No isolation between interface channels; current isolated from interface; interface isolated from bus

- **Software specifications**

Item		Specifications
Configuration of independent channel enabling		Supported
Diagnostic reporting function configuration		Supported
Diagnostic detection enable configuration		Over-range detection; over-limit detection
Conversion mode configuration		4–20 mA, 0–20 mA, ±20 mA
Filter parameter configuration		Software filter time can be set through the host controller, which ranges from 1 to 255, with the sampling period as the unit.
Over-limit detection enable configuration		Supported
Peak hold enable configuration		Not supported
Converted digital range configuration	-20 mA–20 mA	-20000–20000, -32000–32000, -27648–27648
	0 mA–20 mA	0–20000, 0–32000, 0–27648
	4 mA–20 mA	0–20000, 0–32000, 0–27648
Sampling time		<170 μs/channel
Sampling refresh		Refreshed asynchronously according to the sampling time; synchronization with the bus cycle is not required.

5.5.9 Analog output module–AS71AOU4

Figure 5-33 AS71AOU4 appearance



Figure 5-34 Component diagram

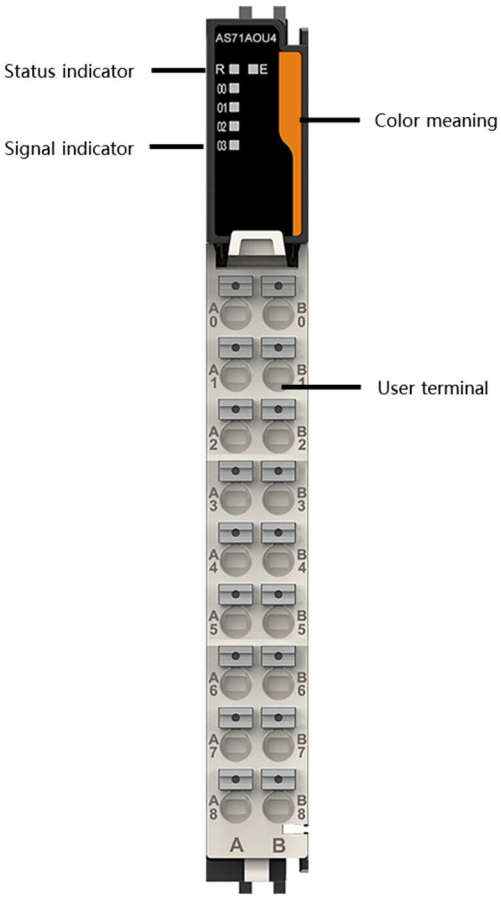
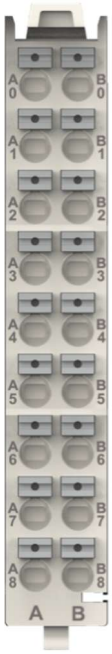


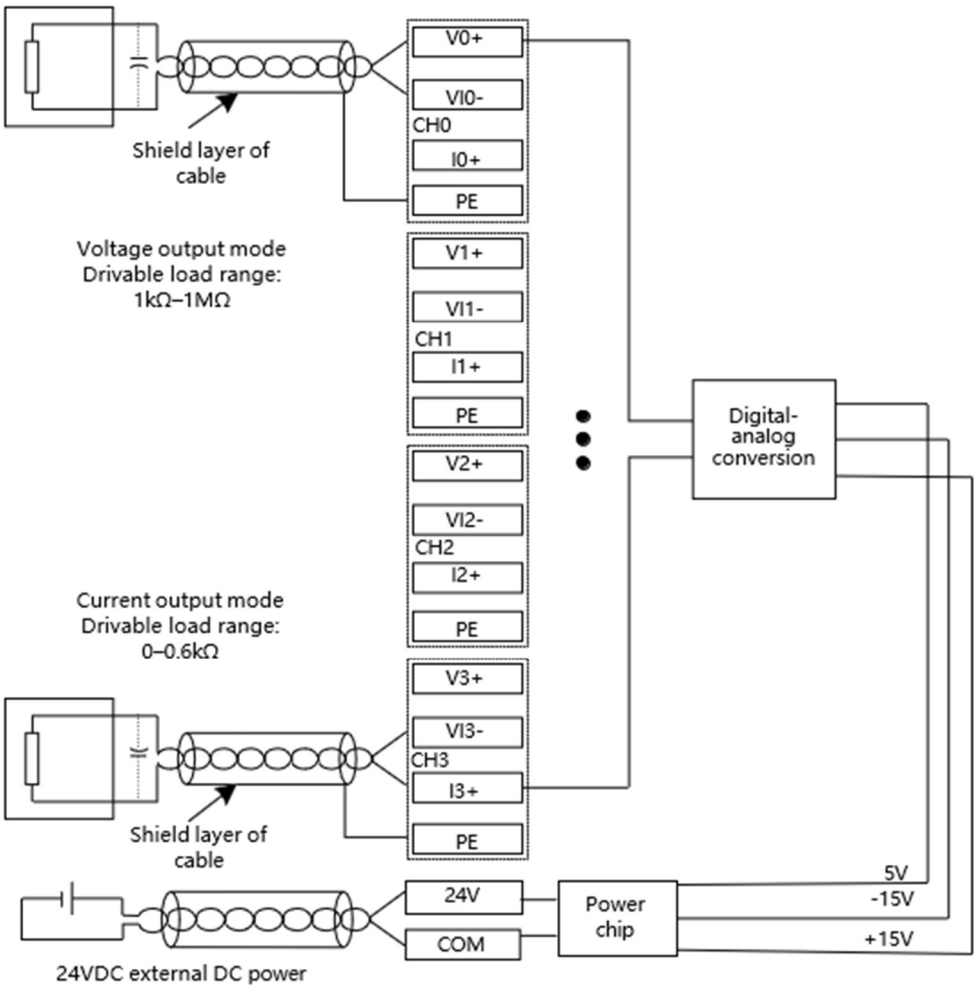
Table 5-13 Component description

Name	Color	Silkscreen	Description
Status indicator	Yellow-green	R	Power-on/Run status indicator On: The module is running. Slow blinking (500 ms): The module is establishing communication. Off: The module is not powered on or it is abnormal.
	Red	E	Module fault indicator Fast blinking (100 ms): The module is offline. Slow blinking (500 ms): DAC chip external power supply abnormal or parameter configuration error Off: The module works normally.
	Green	00–03	Channel status indicator On: Channel enabled Slow blinking (500 ms): Voltage output short circuit or channel parameter configuration error Fast blinking (100 ms): Current disconnection Off: The channel is disabled.
User terminal	I/O terminals for external wiring		
Color meaning	: Digital input : Digital output (source, sink, relay)		: Analog input (voltage, current, thermocouple, RTD) : Analog output

- **Terminal definition**

Diagram	Left signal	Left terminal	Right terminal	Right signal
	V0+	**A0**	**B0**	VI0-
	I0+	**A1**	**B1**	PE
	V1+	**A2**	**B2**	VI1-
	I1+	**A3**	**B3**	PE
	V2+	**A4**	**B4**	VI2-
	I2+	**A5**	**B5**	PE
	V3+	**A6**	**B6**	VI3-
	I3+	**A7**	**B7**	PE
	24 V	**A8**	**B8**	COM

- **Terminal wiring**



- **Power supply specifications**

Item	Specifications
Bus input power rated voltage	5 VDC (4.75 VDC–5.25 VDC)
Bus input power rated current	150 mA
Terminal input power rated voltage	24 VDC (20.4 VDC–28.8 VDC)
Terminal input power rated current	100 mA (Typical value at 24 VDC)
Module hot swapping	Not supported

- **Output specifications**

Item	Specifications
Output type	Analog output
Output mode	Voltage/current
Output channel	4
Resolution	16-bit
Conversion time	40 μs/channel
Voltage output range	0–5 V, 0–10 V, -5–+5 V, -10–+10 V
Voltage output load	1 kΩ
Voltage output accuracy (25 ℃)	±0.1%
Voltage output accuracy (in full temperature range)	±0.5%
Voltage output diagnosis	Short circuit detection and overtemperature protection supported
Current output range	0–20 mA, 4–20 mA
Current output load	<600 Ω
Current output accuracy (25 ℃)	±0.1%
Current output accuracy (in full temperature range)	±0.5%
Current output diagnosis	Open circuit detection and overtemperature protection supported
Isolation	No isolation between interface channels; voltage isolated from interface; interface isolated from bus

- **Software specifications**

Item	Specifications
Configuration of independent channel enabling	Supported
Diagnostic reporting function configuration	Supported
Diagnostic detection enable configuration	Short circuit detection for voltage, and disconnection detection for current
Conversion mode configuration	0–5 V, 0–10 V, ±5 V, ±10 V, 4–20 mA, 0–20 mA
Output status configuration after stop	Clearing, holding the present output, or outputting the preset value

Item	Specifications
Preset value output after stop	Supported
Converted digital range configuration	±20000
Sampling time	160 μs for 4 channels
Sampling refresh	Refreshed asynchronously according to the sampling time; synchronization with the bus cycle is not required.
Stop mode	Output according to the fault-caused stop mode or the preset value, without refreshing any more

5.5.10 Temperature detection module (RTD)–AS71RTD4

Figure 5-35 AS71RTD4 appearance



Figure 5-36 Component diagram

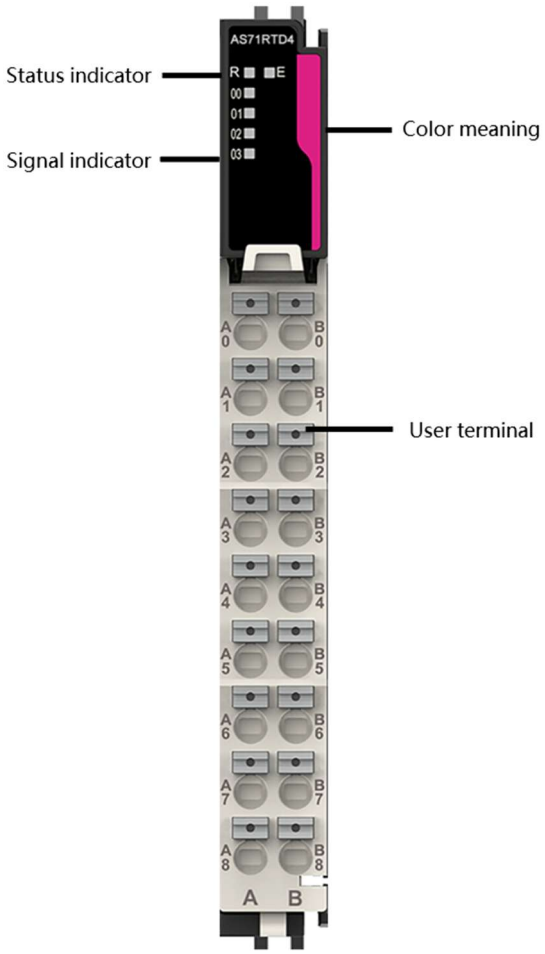
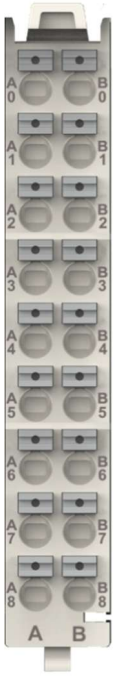


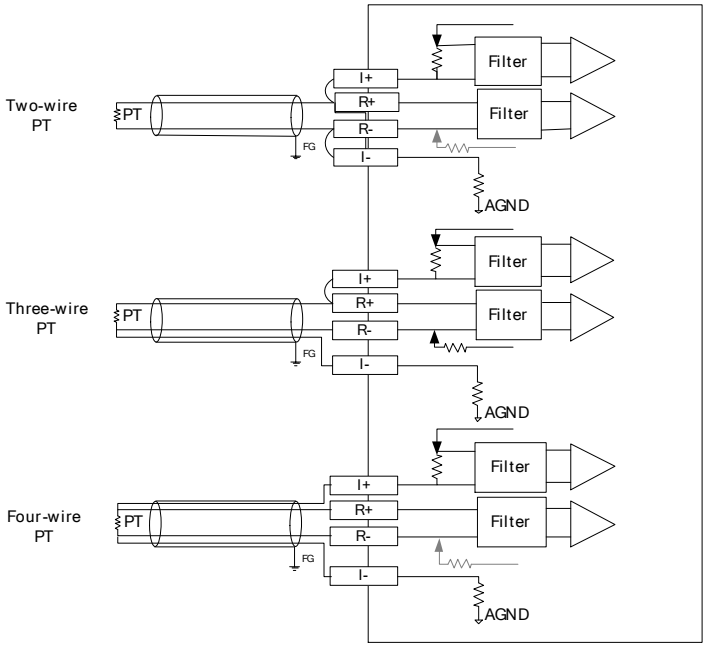
Table 5-14 Component description

Name	Color	Silkscreen	Description
Status indicator	Yellow-green	R	Power-on/Run status indicator On: The module is running. Slow blinking (500 ms): The module is establishing communication. Off: The module is not powered on or it is abnormal.
	Red	E	Module fault indicator Fast blinking (100 ms): The module is offline. Slow blinking (500 ms): Error in temperature detection. Off: The module works normally.
	Green	00–03	Channel status indicator On: Channel enabled Slow blinking (500 ms): Input signal over-range/over-limit Fast blinking (100 ms): disconnection Off: The channel is disabled.
User terminal	I/O terminals for external wiring		
Color meaning	: Digital input : Digital output (source, sink, relay)		: Analog input (voltage, current, thermocouple, RTD) : Analog output

- **Terminal definition**

Diagram	Left signal	Left terminal	Right terminal	Right signal
	I0+	**A0**	**B0**	I0-
	R0+	**A1**	**B1**	R0-
	I1+	**A2**	**B2**	I1-
	R1+	**A3**	**B3**	R1-
	I2+	**A4**	**B4**	I2-
	R2+	**A5**	**B5**	R2-
	I3+	**A6**	**B6**	I3-
	R3+	**A7**	**B7**	R3-
	PE	**A8**	**B8**	PE

- **Terminal wiring**



- **Power supply specifications**

Item	Specifications
Bus input power rated voltage	5 VDC (4.75 VDC–5.25 VDC)
Bus input power rated current	250 mA
Module hot swapping	Not supported

- **Input specifications**

Item	Specifications
Input channel	4
Resolution	24-bit
Display sensitivity	0.0625 ℃, 0.0625 ℉
Input terminals	Four RTD inputs
Sensor type	PT100, PT500, PT1000, Cu100
Wiring method	Two-wire/Three-wire/Four-wire
Accuracy (room temperature 25°C)	±0.3% FS
Accuracy (room temperature -20 ℃–55 ℃)	±1% FS
Sampling period	Channel 1 and channel 2 form a group, while channel 3 and channel 4 form a group. When both channels within a group are enabled and one channel is configured as a three-wire system, the sampling period is 480 ms per channel, and in other cases, the sampling period is 240 ms per channel.
Filter parameter	1–255 (Default: 8)
Isolation method	I/O terminals insulated from the power supply; no insulation between channels

- **Software specifications**

Item	Specifications
Diagnostic reporting function configuration	Supported
Diagnostic detection enable configuration	Over-limit detection and disconnection detection supported
Over-limit detection enable configuration	Supported
Independent channel configuration	Supported
Temperature offset enable configuration	Supported
Temperature setting range	-204.8–204.7 (Temperature unit)
Sampling period	Channel 1 and channel 2 form a group, while channel 3 and channel 4 form a group. When both channels within a group are enabled and one channel is configured as a three-wire system, the sampling period is 480 ms per channel, and in other cases, the sampling period is 240 ms per channel.
Display mode	Celsius (℃), Fahrenheit (℉)
Sensitivity	0.0625 ℃, 0.0625 ℉
Sampling refresh	Refreshed asynchronously according to the sampling time; synchronization with the bus cycle is not required.
Disconnection or over-limit	Outputs the max. value plus 10°C. Disconnection detection supported.
System diagnosis	Not supported
Channel diagnosis	Above upper limit alarm and below lower limit alarm

Item	Specifications
Software diagnosis	Not supported
Configuration diagnosis	Identifying configuration errors, including channel parameter configuration errors.

5.5.11 Temperature detection module (thermocouple)–AS71THC4

Figure 5-37 AS71THC4 appearance



Figure 5-38 Component diagram

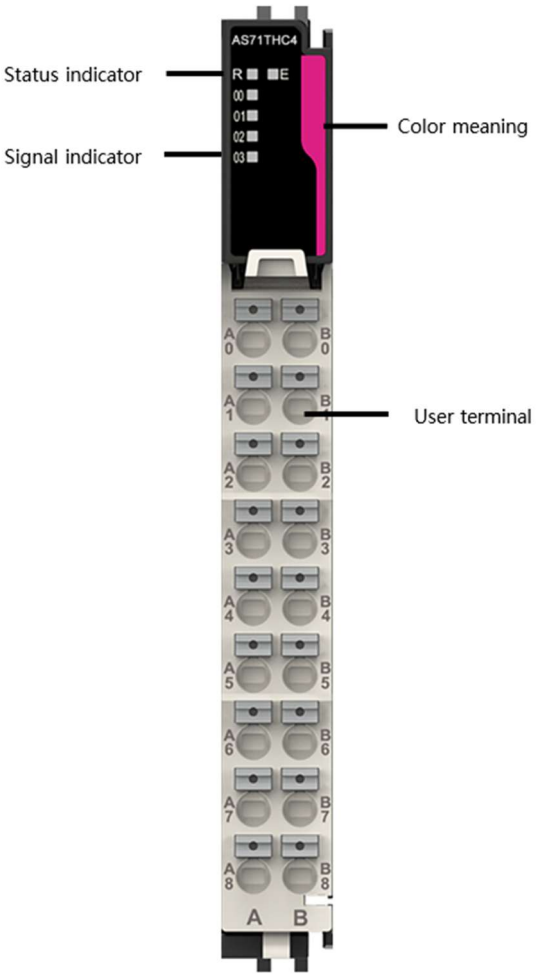
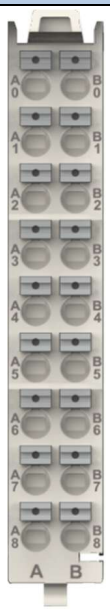


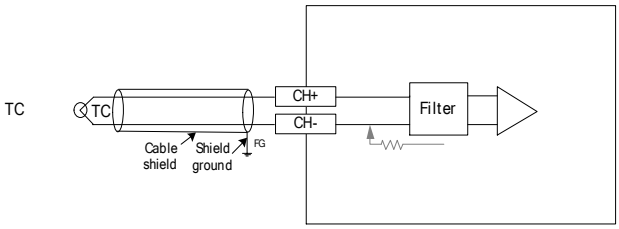
Table 5-15 Component description

Name	Color	Silkscreen	Description
Status indicator	Yellow-green	R	Power-on/Run status indicator On: The module is running. Slow blinking (500 ms): The module is establishing communication. Off: The module is not powered on or it is abnormal.
	Red	E	Module fault indicator Fast blinking (100 ms): The module is offline. Slow blinking (500 ms): Error in temperature detection. Off: The module works normally.
	Green	00–03	Channel status indicator On: Channel enabled Slow blinking (500 ms): Input signal over-range/over-limit Fast blinking (100 ms): disconnection Off: The channel is disabled.
User terminal	I/O terminals for external wiring		
Color meaning	: Digital input : Digital output (source, sink, relay)		: Analog input (voltage, current, thermocouple, RTD) : Analog output

- **Terminal definition**

Diagram	Left signal	Left terminal	Right terminal	Right signal
	CH0+	**A0**	**B0**	CH0-
	CH1+	**A1**	**B1**	CH1-
	CH2+	**A2**	**B2**	CH2-
	CH3+	**A3**	**B3**	CH3-
	-	**A4**	**B4**	-
	-	**A5**	**B5**	-
	-	**A6**	**B6**	-
	-	**A7**	**B7**	-
	-	**A8**	**B8**	-

- **Terminal wiring**



- **Power supply specifications**

Item	Specifications
Bus input power rated voltage	5 VDC (4.75 VDC–5.25 VDC)
Bus input power rated current	250 mA
Module hot swapping	Not supported

- **Input specifications**

Item	Specifications
Input channel	4
Resolution	24-bit
Display sensitivity	0.0625 ℃, 0.0625 ℉
Input terminals	4 thermocouple inputs
Thermocouple type	B, E, N, J, K, R, S, T
Compensation method	Internal cold junction compensation
Accuracy (room temperature 25°C)	±0.1% FS + cold junction compensation error
Accuracy (room temperature -20 ℃–55 ℃)	±0.3% FS + cold junction compensation error
Isolation	I/O terminals insulated from the power supply; No insulation between channels

Item	Specifications
Over-limit and disconnection detection	Supported

- **Cold junction compensation**

Installation direction	Cold junction compensation error (-20 ℃–+55 ℃)
Horizontal upright installation	±3 ℃
Non-horizontal upright installation	±6 ℃

- **Software specifications**

Item	Specifications
Diagnostic reporting function configuration	Supported
Diagnostic detection enable configuration	Over-limit detection and disconnection detection supported
Sensor type configuration	Supported thermocouple types: B, E, N, J, K, R, S, T
Filter parameter	1–255 (Default: 8)
Overflow and underflow detection	Not supported
Over-limit detection enable configuration	Supported
Independent channel configuration	Supported
Temperature offset enable configuration	Supported
Temperature setting range	-204.8–204.7 (temperature unit)
Sampling period	360 ms per channel
Display mode	Celsius (℃), Fahrenheit (℉)
Sensitivity	0.0625 ℃, 0.0625 ℉
Sampling refresh	Refreshed asynchronously according to the sampling time; synchronization with the bus cycle is not required.
Disconnection or over-limit	Output the max. value plus 10°C.
System diagnosis	Not supported
Channel diagnosis	Above upper limit alarm, below lower limit alarm, and disconnection alarm
Software diagnosis	Not supported
Configuration diagnosis	Identifying configuration errors, including channel parameter configuration errors.

5.5.12 Digital input/output module–AS71DT08

Figure 5-39 AS71DT08 appearance



Figure 5-40 Component diagram

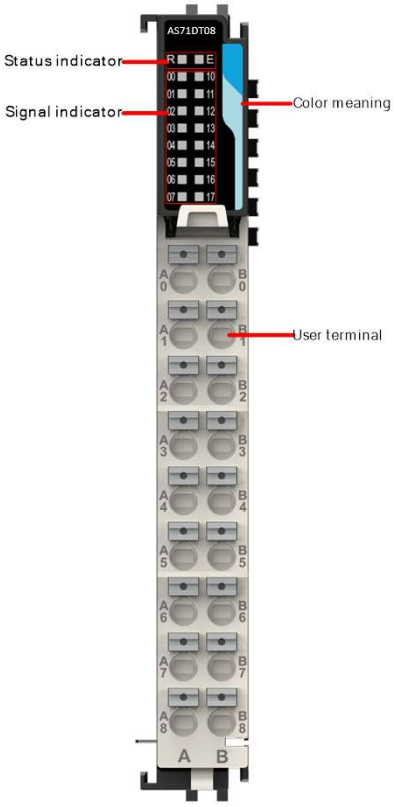
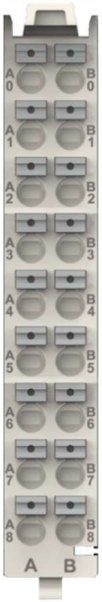


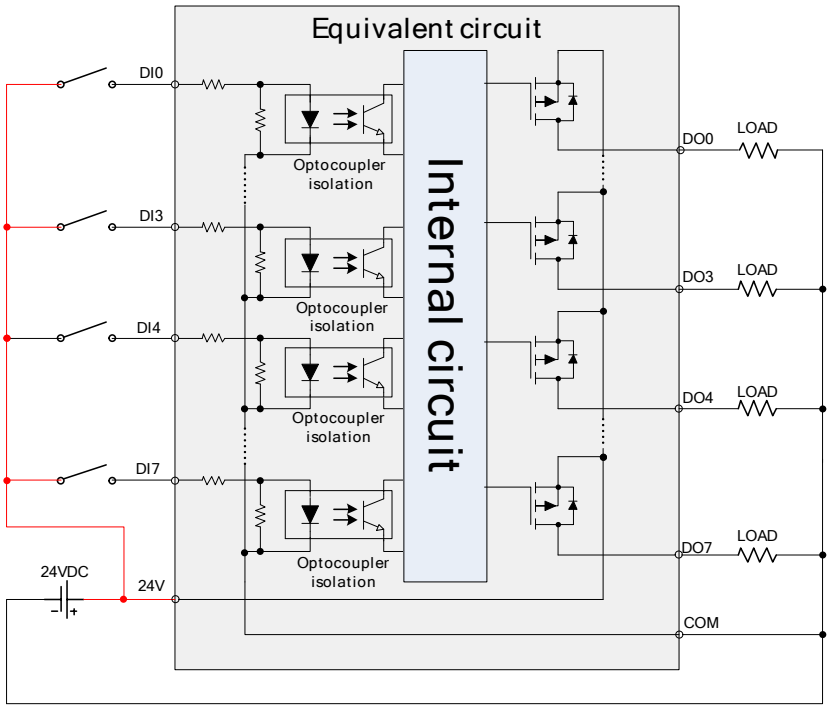
Table 5-16 Component description

Name	Color	Silkscreen	Description
Status indicator	Yellow-green	R	Power-on/Run status indicator On: The module is running. Slow blinking (500 ms): The module is establishing communication. Off: The module is not powered on or it is abnormal.
	Red	E	Module fault indicator Slow blinking (500 ms): External power supply not connected or incorrect parameter settings. Fast blinking (100 ms): The module is offline. Off: The module works normally.
Input signal indicator	Green	00–07	Input signal indicators (corresponding to each input channel) On: The input is active. Off: The input is inactive.
Output signal indicator	Green	10–17	Output signal indicators (corresponding to each output channel) On: Output enabled. Off: Output disabled.
User terminal	I/O terminals for external wiring		
Color meaning	: Digital input : Digital output (source, sink, relay)		: Analog input (voltage, current, thermocouple, RTD) : Analog output

- **Terminal definition**

Diagram	Left signal	Left terminal	Right terminal	Right signal
	DI0	**A0**	**B0**	DO0
	DI1	**A1**	**B1**	DO1
	DI2	**A2**	**B2**	DO2
	DI3	**A3**	**B3**	DO3
	DI4	**A4**	**B4**	DO4
	DI5	**A5**	**B5**	DO5
	DI6	**A6**	**B6**	DO6
	DI7	**A7**	**B7**	DO7
	24 VDC	**A8**	**B8**	COM

- **Terminal wiring**



- **Power supply specifications**

Item	Specifications
Bus input power rated voltage	5 VDC (4.75 VDC–5.25 VDC)
Bus input power rated current	150 mA (Typical value at 5 VDC)
Terminal input power rated voltage	24 VDC (20.4 VDC–28.8 VDC)
Terminal input power rated current	2 A (Typical value at 24 VDC)

Item	Specifications
Terminal output power rated voltage	None
Terminal output power rated current	None
Module hot swapping	Not supported

- **Input specifications**

Item	Specifications
Input type	Digital input
Input mode	Source type
Input channel	8
Input voltage class	24 VDC ±10% (21.6 VDC–26.4 VDC)
Input current (Typical)	4.6 mA (Typical value at 24 VDC)
ON voltage	>15 V
OFF voltage	<5 V
Hardware ON/OFF response time	300 μs/300 μs
Software filter time	Supported
Input resistance	Reference value about 5.2 kΩ
Isolation	Yes
Input action display	When the input is in driving state, the input indicator is on.
Input derating	Derate to 50% when operating at 55 °C (no more than 4 input points can be ON simultaneously), or reduce the allowable ambient temperature by 10°C when all input points are ON.

- **Output specifications**

Item	Specifications
Output type	Digital output, high-side output
Output mode	Source type
Output channel	8
Output voltage class	24 VDC ±10% (21.6 VDC–26.4 VDC)
Output load (Resistive load)	0.5 A/point, 2 A/module
Output load (Inductive load)	7.2 W/point, 12 W/module
Output load (Lamp load)	5 W/point, 9 W/module
Hardware ON/OFF response time	100 μs/100 μs
Leakage current at OFF	10 μA
Switch frequency	100 Hz for resistive load, 0.5 Hz for inductive load, and 10 Hz for lamp load
Isolation	Yes
Output action display	When the output is in driving state, the output indicator is on.
Protection function	Protection against short circuits and overcurrent

- **Software specifications**

Item		Specifications
Input	Software input filter time	Software filter setting supported: Setting range: 1–65535 (default: 1000); filter time unit: 10 μs; default software filter time: 10 ms
	Input port exception detection and indication	None
	Input channel logic level configuration	Not supported
	Independent channel enable configuration	Not supported
	Diagnostic reporting function configuration	Diagnostic information is uploaded by default.
	In stop mode	Outputs are not refreshed; inputs support refreshing in the Safe-Operational state.
	I/O mapping	Supports bit-level and byte-level access mapping.
Output	Stop/offline output mode	Keeping output, clearing output, or outputting the preset value, which is configured on a point basis
	Preset value of stop/offline output	Single-point 0 or 1
	Output channel exception detection indication	Overheat/overcurrent detection and protection on a module basis
	Output channel logic level configuration	Not supported
	Configuration of independent channel enabling	Not supported
	Diagnostic reporting function configuration	Diagnostic information is uploaded by default.
	In stop mode	Outputs are set according to the stop/offline output mode and preset output values, and the output data are no longer refreshed.
	I/O mapping	Supports bit-level and byte-level access mapping.

5.5.13 Digital input/output module–AS71DT16

Figure 5-41 AS71DT16 appearance



Figure 5-42 Component diagram

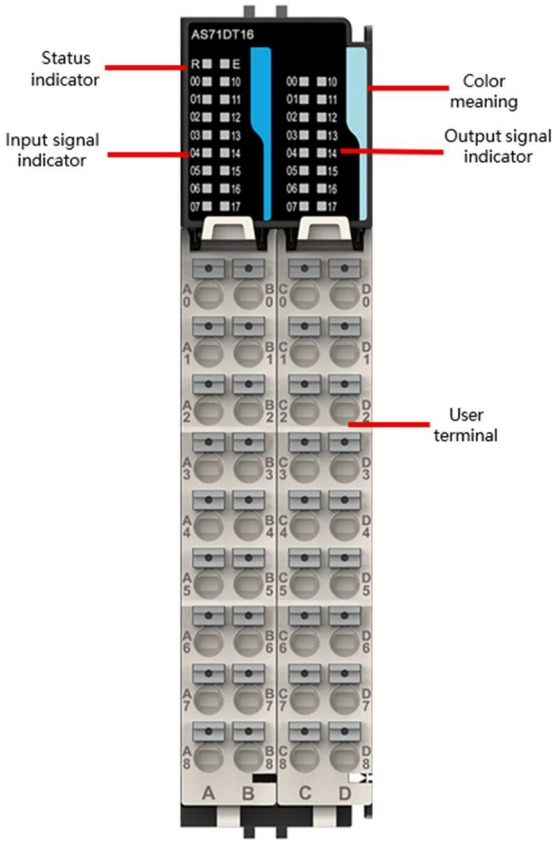
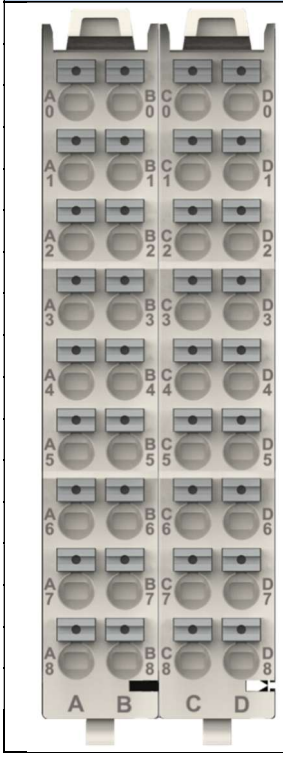


Table 5-17 Component description

Name	Color	Silkscreen	Description
Status indicator	Yellow-green	R	Power-on/Run status indicator On: The module is running. Slow blinking (500 ms): The module is establishing communication. Off: The module is not powered on or it is abnormal.
	Red	E	Module fault indicator Slow blinking (500 ms): External power supply not connected or incorrect parameter settings. Fast blinking (100 ms): The module is offline. Off: The module works normally.
Input signal indicator	Green	00–07 10–17	Input signal indicators (corresponding to each input channel) On: The input is active. Off: The input is inactive.
Output signal indicator	Green	00–07 10–17	Output signal indicators (corresponding to each output channel) On: Output enabled. Off: Output disabled.
User terminal	I/O terminals for external wiring		
Color meaning	: Digital input : Digital output (source, sink, relay)		: Analog input (voltage, current, thermocouple, RTD) : Analog output

- **Terminal definition**

Diagram	Left signal	Left terminal	Right terminal	Right signal
	DI0	**A0**	**B0**	DI10
	DI1	**A1**	**B1**	DI11
	DI2	**A2**	**B2**	DI12
	DI3	**A3**	**B3**	DI13
	DI4	**A4**	**B4**	DI14
	DI5	**A5**	**B5**	DI15
	DI6	**A6**	**B6**	DI16
	DI7	**A7**	**B7**	DI17
	SS	**A8**	**B8**	SS
	DO0	**C0**	**D0**	DO10
	DO1	**C1**	**D1**	DO11
	DO2	**C2**	**D2**	DO12
	DO3	**C3**	**D3**	DO13
	DO4	**C4**	**D4**	DO14
	DO5	**C5**	**D5**	DO15
	DO6	**C6**	**D6**	DO16
	DO7	**C7**	**D7**	DO17
	24 VDC	**C8**	**D8**	COM

- **Terminal wiring**

A/B terminal C/D terminal

- **Power supply specifications**

Item	Specifications
Bus input power rated voltage	5 VDC (4.75 VDC–5.25 VDC)
Bus input power rated current	150 mA (Typical value at 5 VDC)
Module hot swapping	Not supported

- **Input specifications**

Item	Specifications
Input type	Digital input
Input mode	Source/Sink
Input channel	16
Input voltage class	24 VDC ±10% (21.6 VDC–26.4 VDC)
Input current (Typical)	7 mA (Typical value at 24 VDC)
ON voltage	>15 V
OFF voltage	<5 V
Hardware ON/OFF response time	100 μs
Software filter time	Supported
Input resistance	Reference value about 3.4 kΩ
Isolation	Yes
Input action display	When the input is in driving state, the input indicator is on.
Input derating	Derate to 75% when operating at 55°C (no more than 12 input points can be ON simultaneously), or reduce the allowable ambient temperature by 10°C when all input points are ON.

- **Output specifications**

Item	Specifications
Output type	Digital output, high-side output
Output mode	Source type
Output channel	16
Output voltage class	24 VDC ±10% (21.6 VDC–26.4 VDC)
Output load (Resistive load)	0.5 A/point, 2 A/module
Output load (Inductive load)	7.2 W/point, 12 W/module
Output load (Lamp load)	5 W/point, 18 W/module
Hardware ON/OFF response time	100 μs
Leakage current at OFF	10 μA
Switch frequency	100 Hz for resistive load, 0.5 Hz for inductive load, and 10 Hz for lamp load
Isolation	Yes
Output action display	When the output is in driving state, the output indicator is on.
Protection function	Protection against short circuits and overcurrent

- **Software specifications**

Item	Specifications
Software input filter time	Setting range: 1–65535 (Default: 1000) Unit: 10 μs; 1000 indicates 10 ms. Supports two groups of filter parameters, with 8 channels per group. Channels in the same group share one filter parameter.
Input channel logic level configuration	Not supported
Independent channel	Not supported

Item	Specifications
enable configuration	
Diagnostic reporting function configuration	Diagnostic information is uploaded by default.
In stop mode	Outputs are not refreshed; inputs support refreshing in the Safe-Operational state.
I/O mapping	Supports bit-level access mapping.

5.5.14 Bridge measurement module–AS71BRG1

Figure 5-43 AS71BRG1 appearance

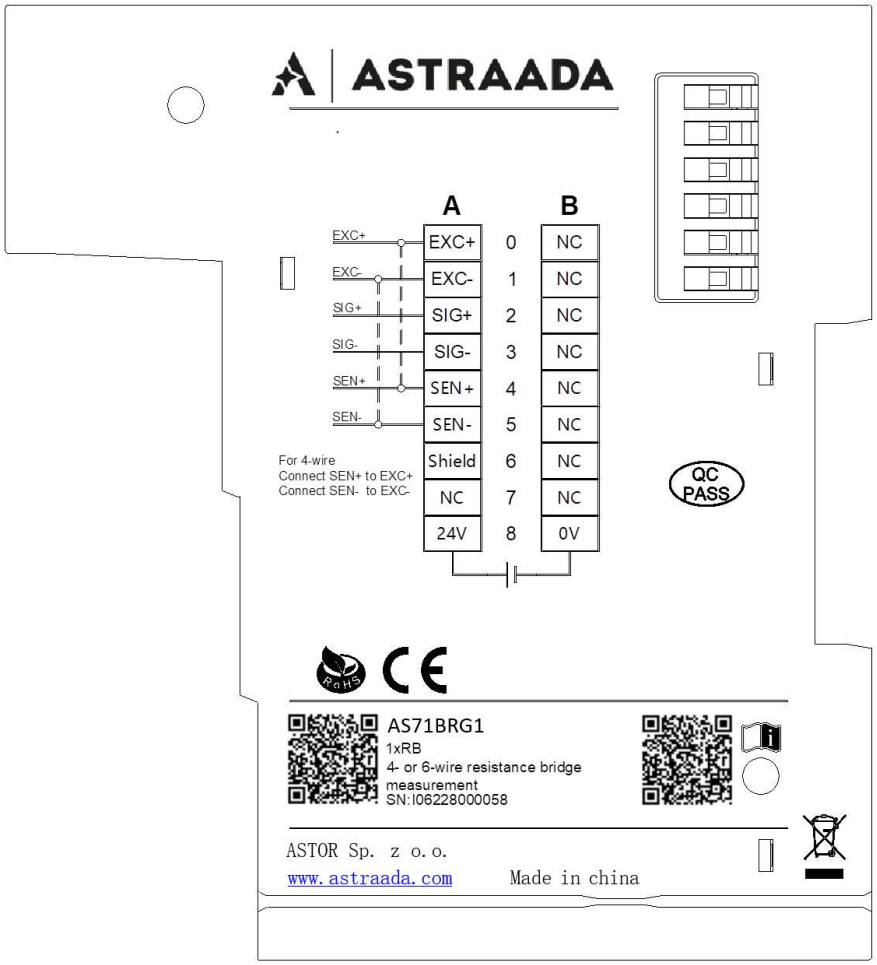


Figure 5-44 Component diagram

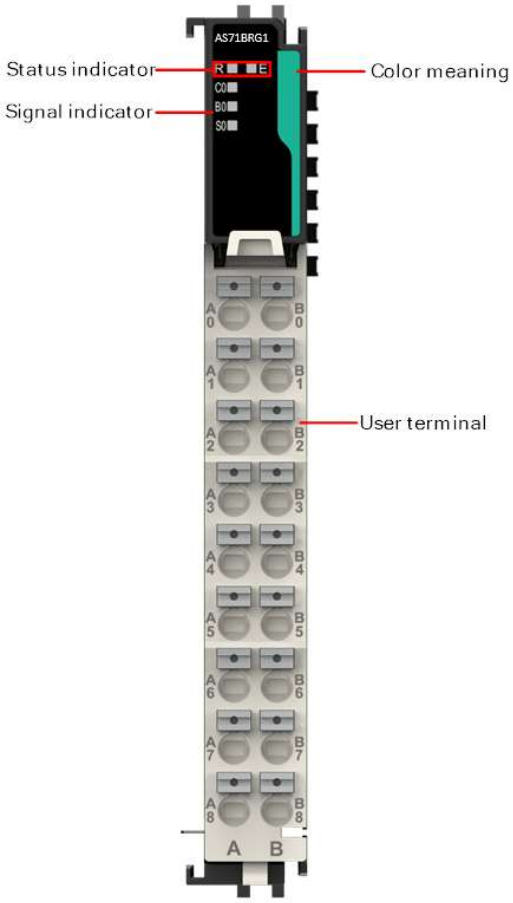


Table 5-18 Component description

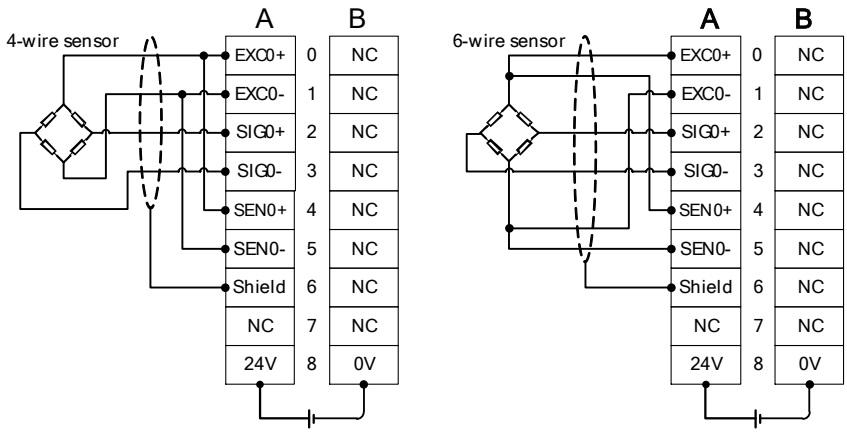
Name	Color	Silkscreen	Description
Run indicator	Green	R	On: The module is running. Slow blinking (500 ms): The module is establishing communication. Off: The module is not powered on or it is abnormal.
Error indicator	Red	E	Slow blinking (500 ms): External power supply not connected or incorrect parameter settings. Fast blinking (100 ms): The module is offline. Off: The module works normally.
Enable indicator	Green	C0	On: Channel enabled Slow blinking (500 ms): Input signal over-range, over-limit, or channel parameter configuration error Off: The channel is disabled.
Disconnection detection indicator	Red	B0	On: The signal wire is disconnected. Off: The signal wire is operating normally.
Short-circuit detection indicator	Red	S0	On: The excitation power output is short-circuited. Off: The excitation power output is not short-circuited.

■ **Terminal definition**

Diagram	Left signal	Left terminal	Right terminal	Right signal
	EXC0+	**A0**	**B0**	NC
	EXC0-	**A1**	**B1**	NC
	SIG0+	**A2**	**B2**	NC
	SIG0-	**A3**	**B3**	NC
	SEN0+	**A4**	**B4**	NC
	SEN0-	**A5**	**B5**	NC
	Shield	**A6**	**B6**	NC
	NC	**A7**	**B7**	NC
	24 V	**A8**	**B8**	0 V

Pin	Name	Description	Specifications
A0	EXC0+	Positive terminal of the excitation voltage output for Channel 0	Input type: Differential input Input voltage range: ±30 mV
A1	EXC0-	Negative terminal of the excitation voltage output for Channel 0	
A2	SIG0+	Positive terminal of the bridge input signal for Channel 0	
A3	SIG0-	Negative terminal of the bridge input signal for Channel 0	
A4	SEN0+	Positive terminal of the bridge feedback voltage for Channel 0	
A5	SEN0-	Negative terminal of the bridge feedback voltage for Channel 0	
A6	Shield	Shield cable ground for Channel 0 bridge	
A7	-	-	
A8	24 V	Positive terminal of the external 24 V power input	Module power input: 24 VDC (20.4 VDC–28.8 VDC)
B8	0 V	Negative terminal of the external 24 V power input	

■ **Terminal wiring**



Note:

- Avoid bundling sensor cables together with power cables (high voltage, high current) or other cables that transmit strong interference signals. Route them separately and avoid parallel routing.
- Keep the sensor and the module grounded at the same potential whenever possible.

■ **Power supply specifications**

Item	Specifications
External input rated voltage	24 VDC (-15%–+20%)
External input rated current	0.5 A
Rated backplane bus output voltage	5 VDC (4.75 VDC–5.25 VDC)
Backplane bus current consumption	120 mA (Typical value)
Isolation	Yes
Power supply protection	Protection against reverse connection and overcurrent

■ **Input/output specifications**

Item	Specifications
Number of channels	1 channel
Input mode	Differential
Voltage range	±30 mVDC
Input sensor type	4-wire or 6-wire bridge sensors
Load cell sensitivity	(1, 2, 4, 6) mV/V
Load range	40–4010 Ω
Accuracy	±0.01% FS (25 °C, sampling rate ≥ 80 ms, and load cell sensitivity > 2 mV/V) ±0.05% FS (-25 °C to +55 °C, sampling rate ≥ 80 ms, and load cell sensitivity > 2 mV/V) ±1% FS (25°C, under CE-certified standard interference conditions)
Max. excitation power	5 V @ 250 mA
Disconnection detection	Supported (signal wire)
Over-limit detection	Supported
Over-range detection	Supported

Item	Specifications
Isolation	No isolation between channels

- **Software specifications**

Item	Specifications
Conversion time	1 ms, 2 ms, 5 ms, 10 ms, 20 ms, 40 ms, 80 ms, 200 ms, 400 ms
Input channel logic level configuration	Not supported
Independent channel enable configuration	Not supported
Diagnostic reporting function configuration	Diagnostic information is uploaded by default.
In stop mode	Outputs are not refreshed; inputs support refreshing in the Safe-Operational state.
I/O mapping	Supports bit-level access mapping.

5.5.15 Bridge measurement module–AS71BRG2

Figure 5-45 AS71BRG2 appearance

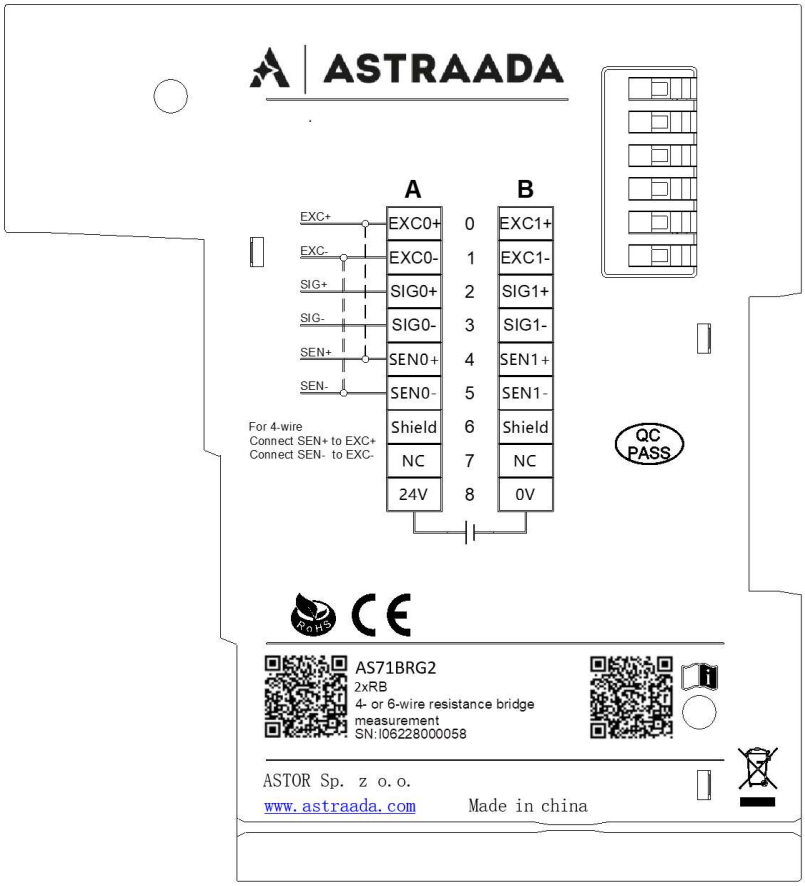


Figure 5-46 Component diagram

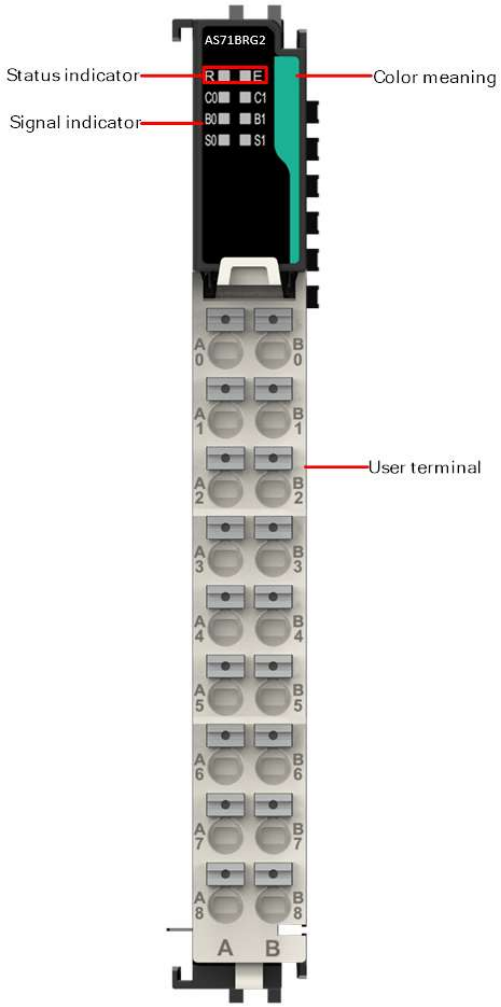


Table 5-19 Component description

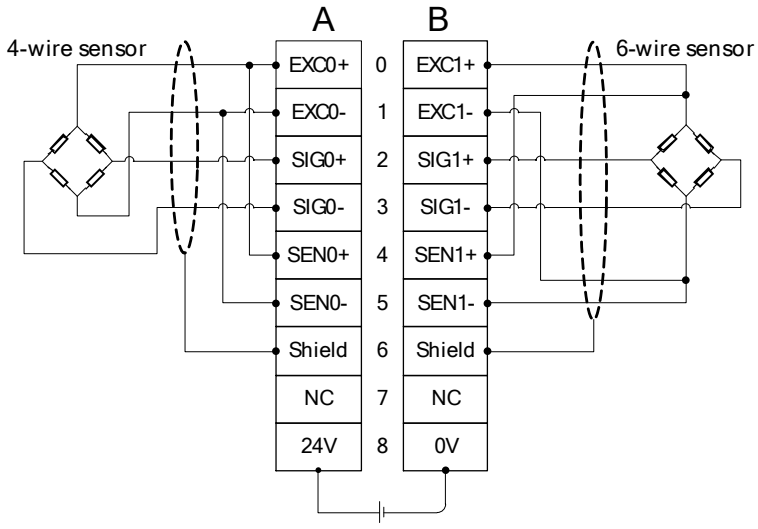
Name	Color	Silkscreen	Description
Run indicator	Green	R	On: The module is running. Slow blinking (500 ms): The module is establishing communication. Off: The module is not powered on or it is abnormal.
Error indicator	Red	E	Slow blinking (500 ms): External power supply not connected or incorrect parameter settings. Fast blinking (100 ms): The module is offline. Off: The module works normally.
Enable indicator	Green	C0, C1	On: Channel enabled Slow blinking (500 ms): Input signal over-range, over-limit, or channel parameter configuration error Off: The channel is disabled.
Disconnection detection indicator	Red	B0, B1	On: The signal wire is disconnected. Off: The signal wire is operating normally.
Short-circuit detection indicator	Red	S0, S1	On: The excitation power output is short-circuited. Off: The excitation power output is not short-circuited.

■ **Terminal definition**

Diagram	Left signal	Left terminal	Right terminal	Right signal
	EXC0+	**A0**	**B0**	EXC1+
	EXC0-	**A1**	**B1**	EXC1-
	SIG0+	**A2**	**B2**	SIG1+
	SIG0-	**A3**	**B3**	SIG1-
	SEN0+	**A4**	**B4**	SEN1+
	SEN0-	**A5**	**B5**	SEN1-
	Shield	**A6**	**B6**	Shield
	NC	**A7**	**B7**	NC
	24 V	**A8**	**B8**	0 V

Pin	Name	Description	Specifications
A0	EXC0+	Positive terminal of the excitation voltage output for Channel 0	Input type: Differential input Input voltage range: ±30 mV
B0	EXC1+	Positive terminal of the excitation voltage output for Channel 1	
A1	EXC0-	Negative terminal of the excitation voltage output for Channel 0	
B1	EXC1-	Negative terminal of the excitation voltage output for Channel 1	
A2	SIG0+	Positive terminal of the bridge input signal for Channel 0	
B2	SIG1+	Positive terminal of the bridge input signal for Channel 1	
A3	SIG0-	Negative terminal of the bridge input signal for Channel 0	
B3	SIG1-	Negative terminal of the bridge input signal for Channel 1	
A4	SEN0+	Positive terminal of the bridge feedback voltage for Channel 0	
B4	SEN1+	Positive terminal of the bridge feedback voltage for Channel 1	
A5	SEN0-	Negative terminal of the bridge feedback voltage for Channel 0	
B5	SEN1-	Negative terminal of the bridge feedback voltage for Channel 1	
A6	Shield	Shield cable ground for Channel 0 bridge	
B6	Shield	Shield cable ground for Channel 1 bridge	
A7	-	-	
B7	-	-	
A8	24 V	Positive terminal of the external 24 V power input	Module power input: 24 VDC (20.4 VDC–28.8 VDC)
B8	0 V	Negative terminal of the external 24 V power input	

■ **Terminal wiring**



Note:

- Avoid bundling sensor cables together with power cables (high voltage, high current) or other cables that transmit strong interference signals. Route them separately and avoid parallel routing.
- Keep the sensor and the module grounded at the same potential whenever possible.

■ **Power supply specifications**

Item	Specifications
External input rated voltage	24 VDC (-15%–+20%)
External input rated current	0.5 A
Rated backplane bus output voltage	5 VDC (4.75 VDC–5.25 VDC)
Backplane bus current consumption	120 mA (Typical value)
Isolation	Yes
Power supply protection	Protection against reverse connection and overcurrent

■ **Input/output specifications**

Item	Specifications
Number of channels	2 channels
Input mode	Differential
Voltage range	±30 mVDC
Input sensor type	4-wire or 6-wire bridge sensors
Load cell sensitivity	(1, 2, 4, 6) mV/V
Load range	40–4010 Ω
Accuracy	±0.01% FS (25 °C, sampling rate ≥ 80 ms, and load cell sensitivity > 2 mV/V) ±0.05% FS (-25 °C to +55 °C, sampling rate ≥ 80 ms, and load cell sensitivity > 2 mV/V) ±1% FS (25°C, under CE-certified standard interference conditions)
Max. excitation power	5 V @ 250 mA
Disconnection detection	Supported (signal wire)
Over-limit detection	Supported

Item	Specifications
Over-range detection	Supported
Isolation	No isolation between channels

- **Software specifications**

Item	Specifications
Conversion time	1 ms, 2 ms, 5 ms, 10 ms, 20 ms, 40 ms, 80 ms, 200 ms, 400 ms
Input channel logic level configuration	Not supported
Independent channel enable configuration	Not supported
Diagnostic reporting function configuration	Diagnostic information is uploaded by default.
In stop mode	Outputs are not refreshed; inputs support refreshing in the Safe-Operational state.
I/O mapping	Supports bit-level access mapping.

5.5.16 Counting and measurement module–AS71AN02

Figure 5-47 AS71AN02 appearance



Figure 5-48 Component diagram

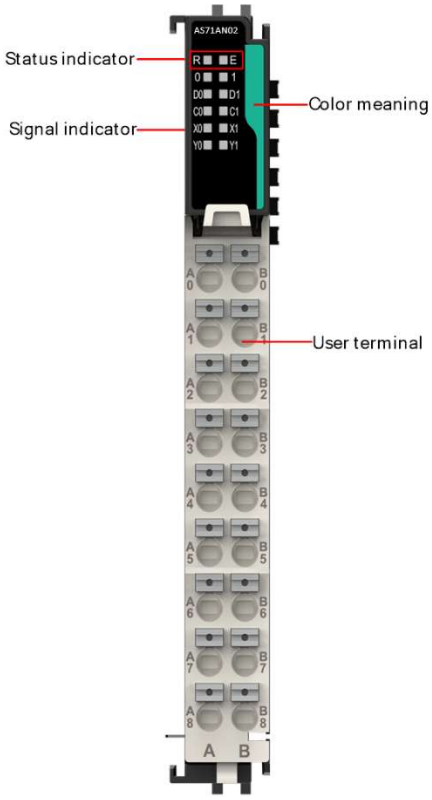
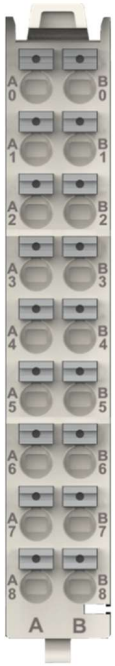


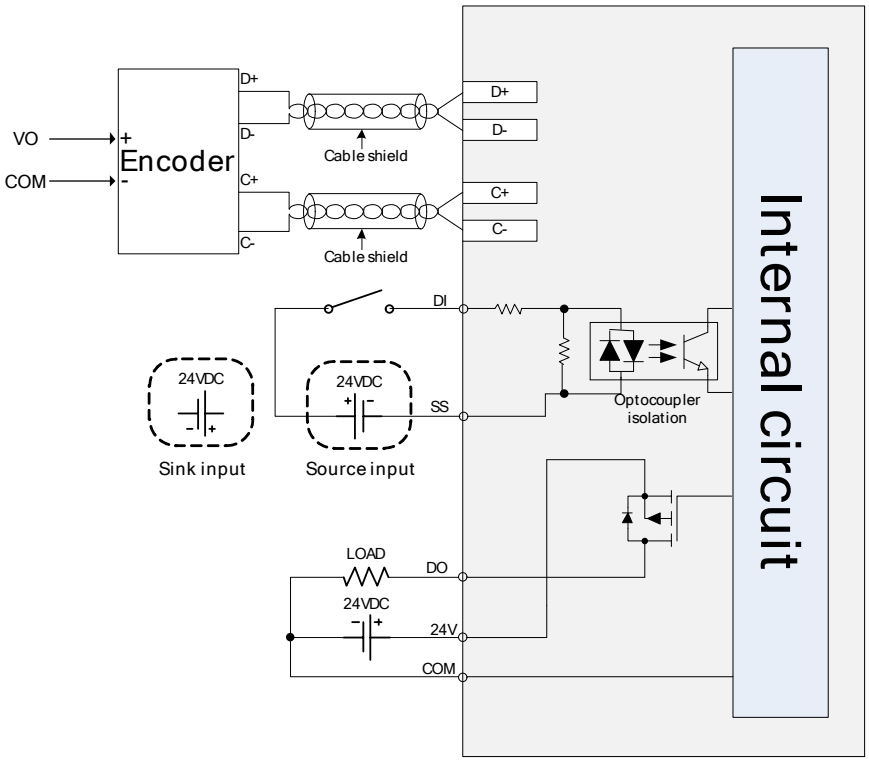
Table 5-20 Component description

Name	Color	Silkscreen	Description
Status indicator	Yellow-green	R	Power-on/Run status indicator On: The module is running. Slow blinking (500 ms): The module is establishing communication. Off: The module is not powered on or it is abnormal.
	Red	E	Module fault indicator Fast blinking (100 ms): The module is offline. Slow blinking (500 ms): External power supply not connected or incorrect parameter settings. Off: The module works normally.
Signal indicator	Green	D0, C0 D1, C1	SSI encoder signal detection indicator On: The data/clock differential voltage remains positive. Off: The data/clock differential voltage remains negative.
	Green	X0, X1	Digital input signal indicator On: Input signal active Off: Input signal inactive
	Green	Y0, Y1	Digital output signal indicator On: Output enabled. Off: Output disabled.
User terminal	I/O terminals for external wiring		
Color meaning	: Digital input : Digital output (source, sink, relay) : Analog input (voltage, current, thermocouple, RTD)		: Analog output : Power feed : Counting and measurement

- **Terminal definition**

Diagram	Left signal	Left terminal	Right terminal	Right signal
	D0+	**A0**	**B0**	D1+
	D0-	**A1**	**B1**	D1-
	C0+	**A2**	**B2**	C1+
	C0-	**A3**	**B3**	C1-
	VO	**A4**	**B4**	COM
	DI0	**A5**	**B5**	DI1
	SS	**A6**	**B6**	PE
	DO0	**A7**	**B7**	DO1
	24 V	**A8**	**B8**	0 V

- **Terminal wiring**



- **Power supply specifications**

Item	Specifications
Bus input power rated voltage	5 VDC (4.75 VDC–5.25 VDC)
Bus input power rated current	140 mA (Typical value at 5 VDC)

Item	Specifications
Terminal input power rated voltage	24 VDC (20.4 VDC–28.8 VDC)
Terminal input power rated current	2 A (Typical value at 24 VDC)
Module hot swapping	Not supported

- **Input specifications**

Item	Specifications
Encoder type	SSI absolute encoder
Input mode	RS-422 level standard, differential input
Input channel	2
Encoder voltage	24 VDC ± 15%
SSI frame length	10–40 (Default: 13)
SSI clock frequency (Hz)	125 kHz, 250 kHz, 500 kHz, 1 MHz, 1.5 MHz, 2 MHz
Signal type	Binary/Gray (default)
Number of DI channels	2
DI detection electrical level	24 VDC
DI type	PNP (source), NPN (sink)
DI edge selection	Rising edge/Falling edge/Rising and falling edge
DI filter time setting	(0–65535) × 0.1 μs
DI function	Latch, preset, and reset
Number of DO channels	2
DO level	24 VDC
DO type	PNP (source), rated output current: 0.16 A
DO function	Comparison output
ON voltage	>15 V
OFF voltage	<5 V
Hardware ON/OFF response time	100 μs
Input resistance	Reference value about 3.4 kΩ
Isolation	Yes
Measurement variable	Frequency/Speed
Update time of the measurement function	20 ms, 100 ms, 500 ms, 1000 ms
Gating function	Software gate

- **Software specifications**

Item	Specifications
Software input filter time	Setting range: 0–65535 (Default: 1000) Unit: 0.1 μs
Diagnostic reporting function configuration	Diagnostic information is uploaded by default.
In stop mode	Outputs are not refreshed; inputs support refreshing in the Safe-Operational state.

5.5.17 Counting and measurement module–AS71IN02

Figure 5-49 AS71IN02 appearance

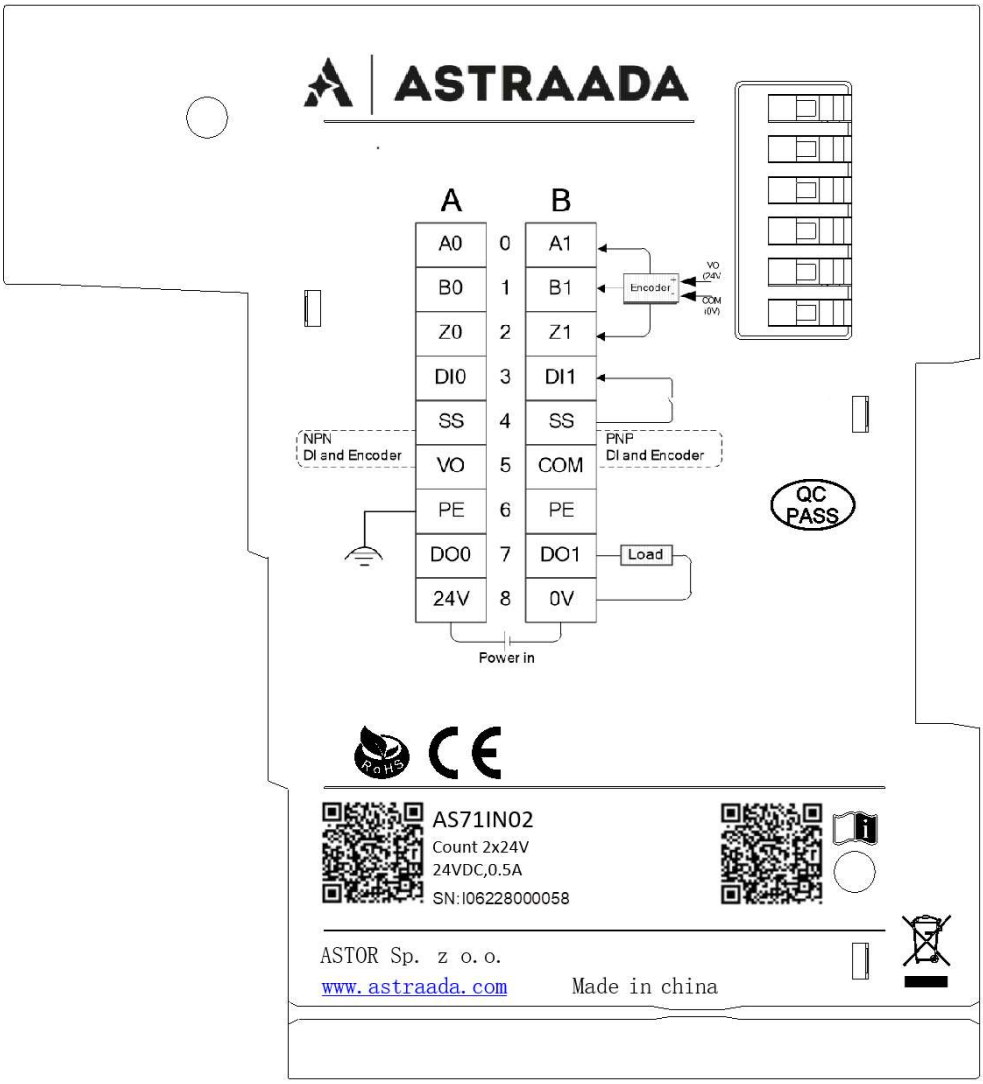


Figure 5-50 Component diagram

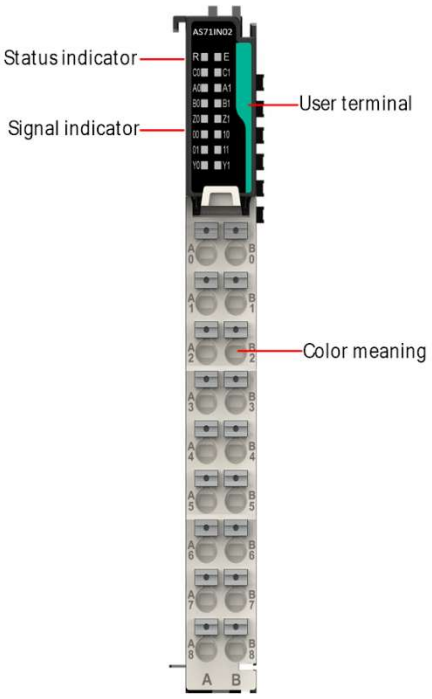


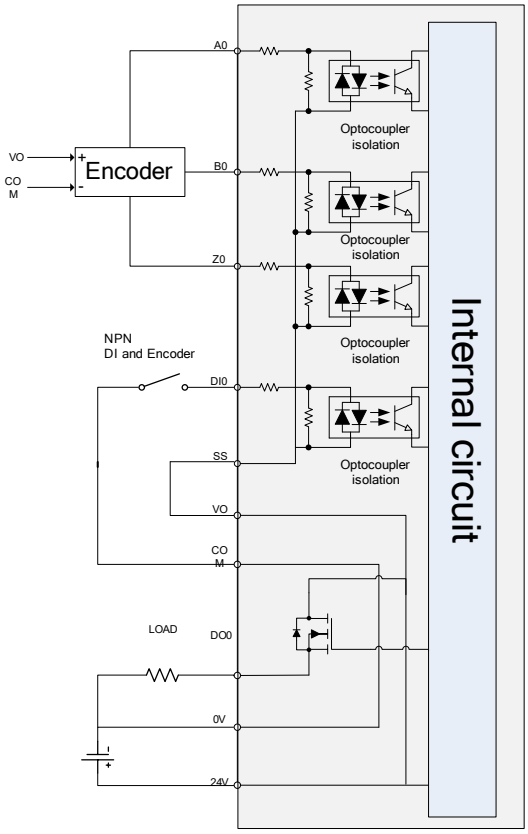
Table 5-21 Component description

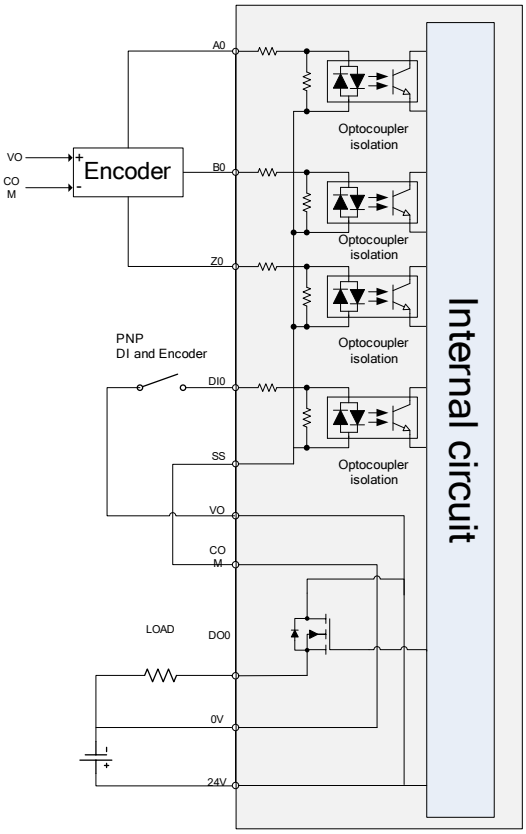
Name	Color	Silkscreen	Description
Status indicator	Yellow-green	R	Power-on/Run status indicator On: The module is running. Slow blinking (500 ms): The module is establishing communication. Off: The module is not powered on or it is abnormal.
	Red	R	Module fault indicator Fast blinking (100 ms): The module is offline. Slow blinking (500 ms): External power supply not connected or incorrect parameter settings. Off: The module works normally.
	Green	C0, C1	Channel 0/1 enable status indicators On: Encoder channel enabled. Off: Encoder channel disabled.
Signal indicator	Green	A0, B0, Z0 A1, B1, Z1	Encoder Channel 0/1 input signal indicators On: Input signal active Off: Input signal inactive
	Green	00, 01 10, 11	Channel 0/1 digital input indicators On: Input signal active Off: Input signal inactive
	Green	Y0, Y1	Channel 0/1 digital output indicators On: Output enabled. Off: Output disabled.
User terminal	I/O terminals for external wiring		
Color meaning	: Digital input : Digital output (source, sink, relay) : Analog input (voltage, current, thermocouple, RTD)		: Analog output : Power feed : Counting and measurement

- **Terminal definition**

Diagram	Left signal	Left terminal	Right terminal	Right signal
	A0	**A0**	**B0**	A1
	B0	**A1**	**B1**	B1
	Z0	**A2**	**B2**	Z1
	DI0	**A3**	**B3**	DI1
	SS	**A4**	**B4**	SS
	VO	**A5**	**B5**	COM
	PE	**A6**	**B6**	PE
	DO0	**A7**	**B7**	DO1
	24V	**A8**	**B8**	0V

- **Terminal wiring**





- **Power supply specifications**

Item	Specifications
Bus input power rated voltage	5 VDC (4.75 VDC–5.25 VDC)
Bus input power rated current	140 mA (Typical value at 5 VDC)

Item	Specifications
Terminal input power rated voltage	24 VDC (20.4 VDC–28.8 VDC)
Terminal input power rated current	2 A (Typical value at 24 VDC)
Module hot swapping	Not supported

- **Input specifications**

Item	Specifications
Encoder type	Incremental encoder
Input channel	2 channels
Encoder voltage	24 VDC ± 15%
Pulse mode	Quadrature pulse input, pulse + direction input (direction signal optional)
Counting range	-2147483648–2147483647
Pulse frequency	200 kHz
Frequency multiplication mode	x1, x2, x4
Resolution	1–65535 PPR (number of pulses per revolution)
Counter preset	Default is 0, which means the preset is disabled.
Z-pulse calibration	Supported by default when Z signal is connected.
Counter filter	(0–65535) × 0.1 μs per channel
Number of DI channels	2
DI function	Latch
DI detection electrical level	24 VDC
DI type	PNP (source), NPN (sink)
DI edge selection	Rising edge/Falling edge/Rising and falling edge
DI filter time setting	(0–65535) × 0.1 μs
Number of DO channels	2
DO function	Comparison output
DO level	24 VDC
DO type	PNP (source), rated output current: 0.16 A
DO function	Comparison output
ON voltage	>15 V
OFF voltage	<5 V
Hardware ON/OFF response time	100 μs
Input resistance	Reference value about 3.4 kΩ
Isolation	Yes

- **Software specifications**

Item	Specifications
Input filter time	Setting range: 0–65535 (Default: 1000) Unit: 0.1 μs
Measurement variable	Frequency/Speed
Update time of the measurement function	20 ms, 100 ms, 500 ms, 1000 ms
Gating function	Software gate

5.5.18 Counting and measurement module–AS71IN01

Figure 5-51 AS71IN01 appearance



Figure 5-52 Component diagram

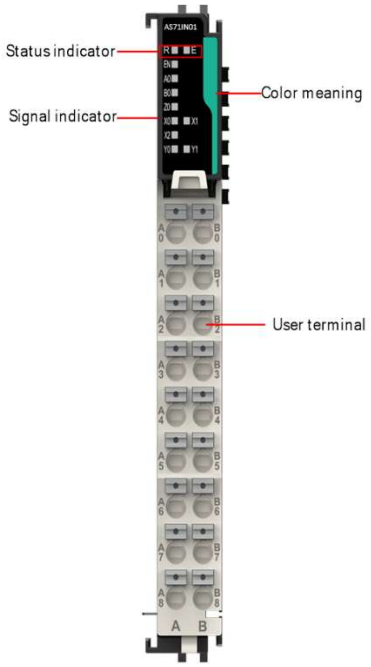
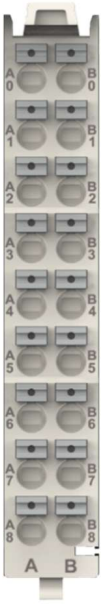


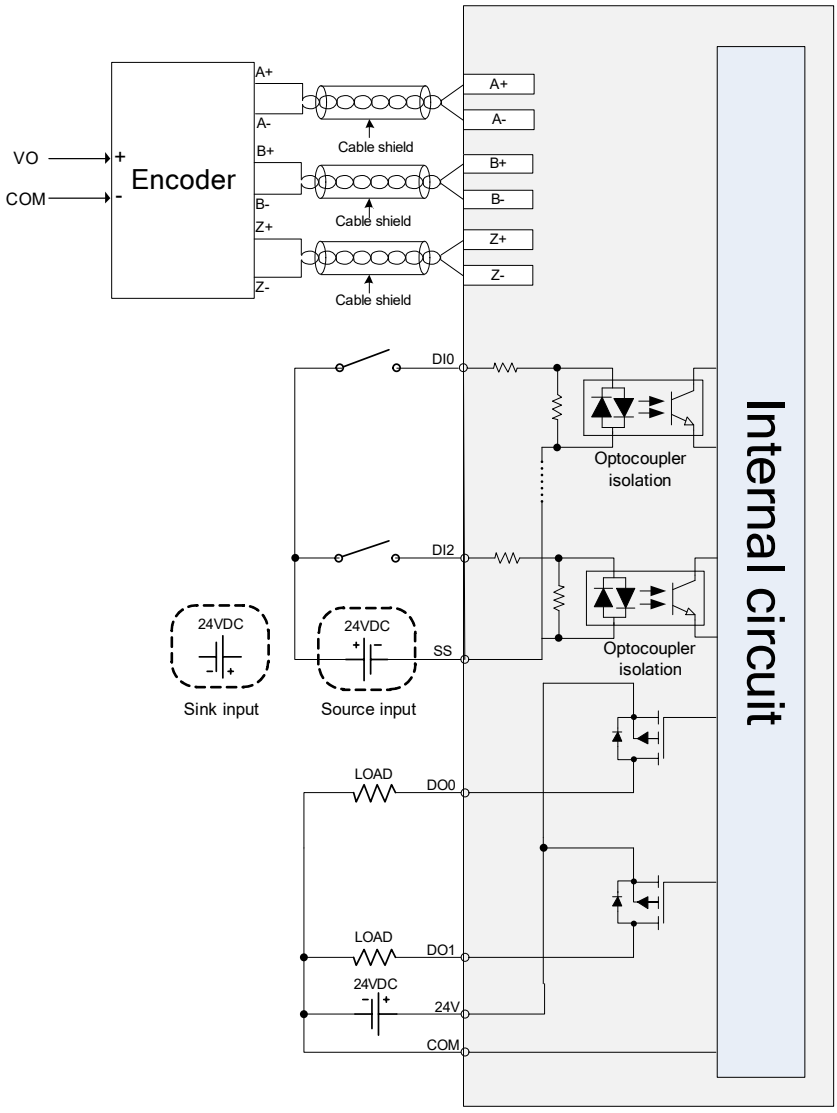
Table 5-22 Component description

Name	Color	Silkscreen	Description
Status indicator	Yellow-green	R	Power-on/Run status indicator On: The module is running. Slow blinking (500 ms): The module is establishing communication. Off: The module is not powered on or it is abnormal.
	Red	E	Module fault indicator Fast blinking (100 ms): The module is offline. Slow blinking (500 ms): External power supply not connected or incorrect parameter settings. Off: The module works normally.
	Green	EN	Enabling status indicator On: Encoder channel enabled. Off: Encoder channel disabled.
Signal indicator	Green	A0, B0, Z0	Encoder channel input signal indicator On: Input signal active Off: Input signal inactive
	Green	X0, X1, X2	Digital input indicator On: Input signal active Off: Input signal inactive
	Green	Y0, Y1	Digital output indicator On: Output enabled. Off: Output disabled.
User terminal	I/O terminals for external wiring		
Color meaning	: Digital input : Digital output (source, sink, relay) : Analog input (voltage, current, thermocouple, RTD)		: Analog output : Power feed : Counting and measurement

- **Terminal definition**

Diagram	Left signal	Left terminal	Right terminal	Right signal
	A+	**A0**	**B0**	A-
	B+	**A1**	**B1**	B-
	Z+	**A2**	**B2**	Z-
	VO	**A3**	**B3**	COM
	DI0	**A4**	**B4**	DI1
	DI2	**A5**	**B5**	/
	SS	**A6**	**B6**	PE
	DO0	**A7**	**B7**	DO1
	24 V	**A8**	**B8**	0 V

- **Terminal wiring**



- **Power supply specifications**

Item	Specifications
Bus input power rated voltage	5 VDC (4.75 VDC–5.25 VDC)
Bus input power rated current	140 mA (Typical value at 5 VDC)
Terminal input power rated voltage	24 VDC (20.4 VDC–28.8 VDC)
Terminal input power rated current	2 A (Typical value at 24 VDC)
Module hot swapping	Not supported

- **Input specifications**

Item	Specifications
Encoder type	Incremental encoder
Input channel	1 channel
Encoder voltage	5 VDC
Input type	RS-422 level standard, differential input
Pulse mode	Quadrature pulse input, pulse + direction input (direction signal optional)
Counting range	-2147483648–2147483647
Pulse frequency	100 Hz–2 MkHz
Frequency multiplication mode	x1, x2, x4
Resolution	1–65535 PPR (number of pulses per revolution)
Counter preset	Default is 0, which means the preset is disabled.
Z-pulse calibration	Supported by default when Z signal is connected.
Counter filter	(0–65535) × 10 ns per channel
Number of DI channels	3
DI function	Latch, preset, and reset
DI detection electrical level	24 VDC
DI type	PNP (source), NPN (sink)
DI edge selection	Rising edge/Falling edge/Rising and falling edge
DI filter time setting	(0–65535) × 10 ns
Hardware reset	Rising edge reset
Number of DO channels	2
DO function	Comparison output
DO level	24 VDC
DO type	PNP (source), rated output current: 0.16 A
ON voltage	>15 V
OFF voltage	<5 V
Hardware ON/OFF response time	100 μs
Input resistance	Reference value about 3.4 kΩ
Isolation	Yes

■ **Software specifications**

Item	Specifications
Input filter time	Setting range: 0–65535 (Default: 1000) Unit: 10 ns
Measurement variable	Frequency, speed
Update time of the measurement function	20 ms, 100 ms, 500 ms, 1000 ms
Gating function	Software gate

5.5.19 Dual-channel pulse output control module–AS71PUOC

Figure 5-53 AS71PUOC appearance



Figure 5-54 Component diagram

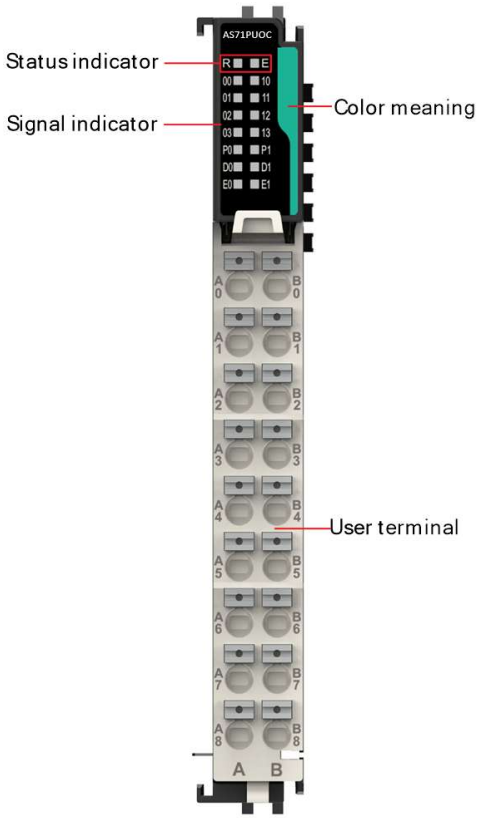


Table 5-23 Component description

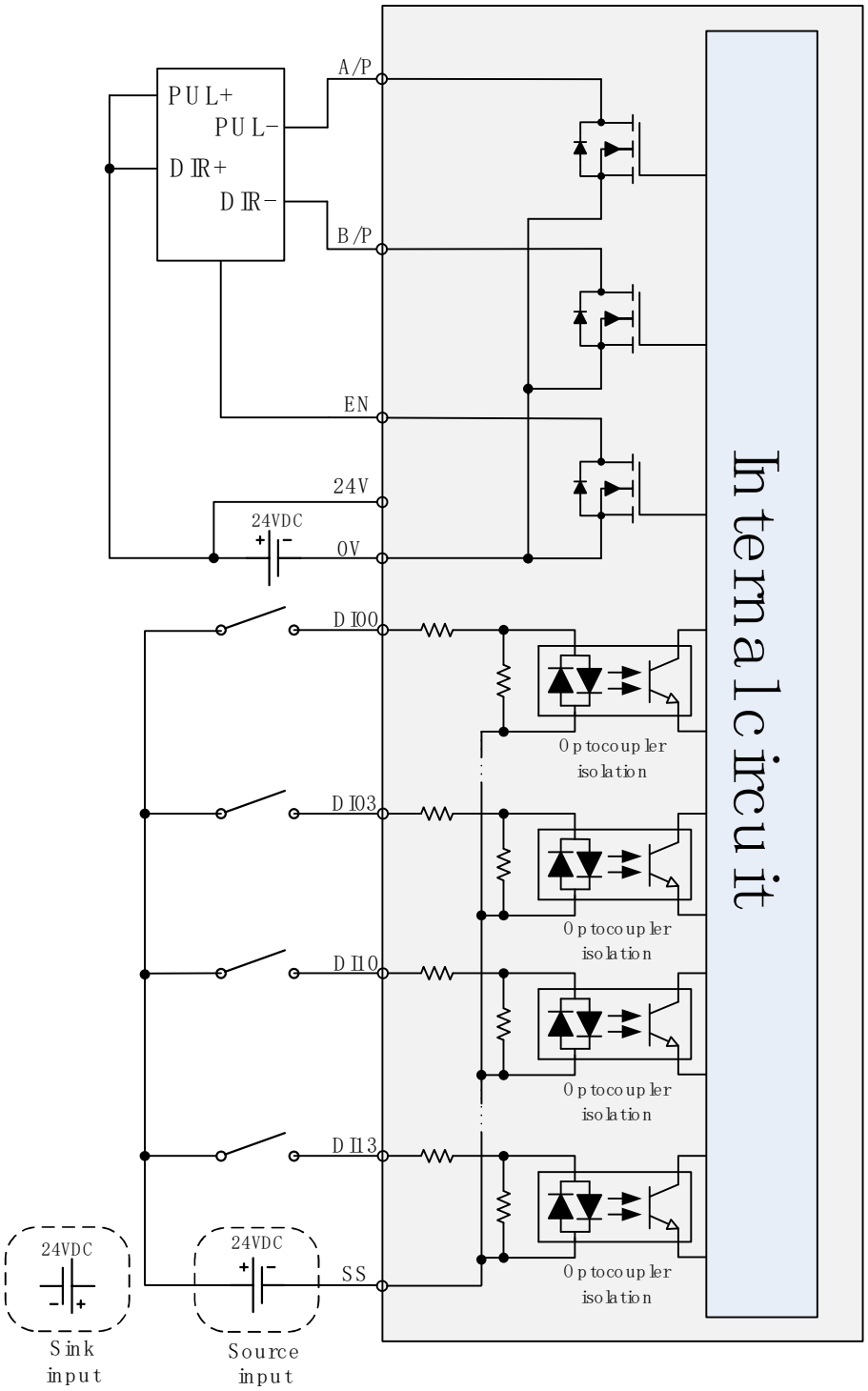
Name	Color	Silkscreen	Description
Status indicator	Yellow-green	R	Power-on/Run status indicator On: The module is running. Slow blinking (500 ms): The module is establishing communication. Off: The module is not powered on or it is abnormal.
	Red	E	Module fault indicator Fast blinking (100 ms): The module is offline. Slow blinking (500 ms): External power supply not connected or incorrect parameter settings. Off: The module works normally.
Signal indicator	Green	P0, D0, E0, P1, D1, E1	Pulse output indicator On: NPN pulse output active Off: NPN pulse output inactive
	Green	00–03, 10–13	Digital input indicator On: Input signal active Off: Input signal inactive
User terminal	I/O terminals for external wiring		

■ **Terminal definition**

Diagram	Left signal	Left terminal	Right terminal	Right signal
	DI00	**A0**	**B0**	DI10
	DI01	**A1**	**B1**	DI11
	DI02	**A2**	**B2**	DI12
	DI03	**A3**	**B3**	DI13
	SS	**A4**	**B4**	SS
	A/P0	**A5**	**B5**	A/P1
	B/D0	**A6**	**B6**	B/D1
	EN0	**A7**	**B7**	EN1
	24 V	**A8**	**B8**	0 V

Pin	Name	Description	Terminal function
A0	DI00	Positive limit signal input for Channel 0	Internal impedance: 1.8 kΩ 15–30 V voltage input is acceptable. Supports sink input Max. input frequency: 200 kHz
B0	DI10	Positive limit signal input for Channel 1	
A1	DI01	Negative limit signal input for Channel 0	
B1	DI11	Negative limit signal input for Channel 1	
A2	DI02	Home signal input for Channel 0	
B2	DI12	Home signal input for Channel 1	
A3	DI03	Emergency stop signal input for Channel 0	
B3	DI13	Emergency stop signal input for Channel 1	
A4	SS	Common terminal	Input common reference terminal
B4	SS	Common terminal	
A5	A/P0	P pulse output for Channel 0	Single-ended NPN pulse output Output voltage: (12–24 VDC) ±15% Max. output frequency: 200 kHz Peak load drive current < 1 A; continuous current < 0.5 A Output impedance: 0.5Ω
B5	A/P1	P pulse output for Channel 1	
A6	B/D0	D pulse output for Channel 0	
B6	B/D1	D pulse output for Channel 1	
A7	EN0	Enable signal output for Channel 0	Enable signal output (reserved; interface performance is similar to pulse output)
B7	EN1	Enable signal output for Channel 1	
A8	24 V	Positive terminal of the external 24 V power input	Pulse output module power supply input: (12–24 VDC) ±15%
B8	0 V	Negative terminal of the external 24 V power input	

■ **Terminal wiring**



■ **Power supply specifications**

Item	Specifications
Bus input power rated voltage	5 VDC (4.75 VDC–5.25 VDC)
Bus input power rated current	140 mA (Typical value at 5 VDC)
Module hot swapping	Not supported

- **Input/output specifications**

Item	Specifications
Output type	Digital pulse output, low-side output
Output mode	Sink
Output channel	Dual channels
Output voltage class	(12 VDC–24 VDC) ±15%
Max. output frequency	200 kHz
Output load	Peak drive current per point < 1 A; continuous current < 0.5 A
Hardware ON/OFF response time	100 μs
Isolation	Yes
Output action display	When the output is in driving state, the output indicator is on.
Protection function	Protection against short circuits and overcurrent
DI type	Digital input
DI mode	Source/Sink
Number of DI channels	8
Input voltage class	15 VDC–30 VDC
Max. input frequency	200 kHz
Hardware ON/OFF response time	100 μs
Software filter time	Supported
Input resistance	Reference value about 1.8 kΩ
Isolation	Yes
Input action display	When the input is in driving state, the input indicator is on.

- **Software specifications**

Item	Specifications
Pulse output mode	Supports single-pulse output (pulse + direction) and dual-pulse output (CW/CCW)
Motion mode	Supports absolute position mode, relative position mode, and speed mode
Trapezoidal acceleration/deceleration	Supported
Motion merge	Supported
Homing mode	Supports 4 homing modes (19, 21, 24, 28)
Software input filter time	Setting range: 1–65535; unit: 10 μs

5.5.20 Power feed module–AS71PWRR

Figure 5-55 AS71PWRR appearance

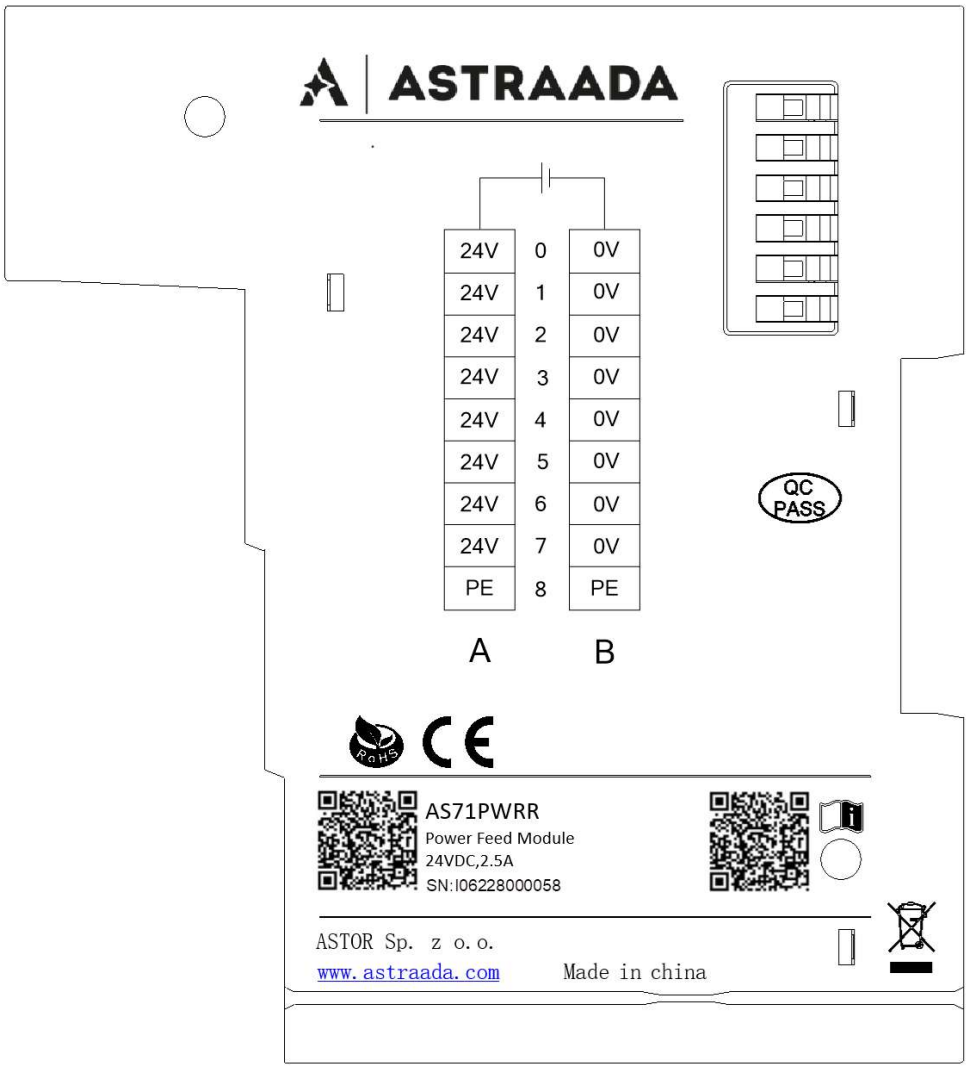


Figure 5-56 Component diagram

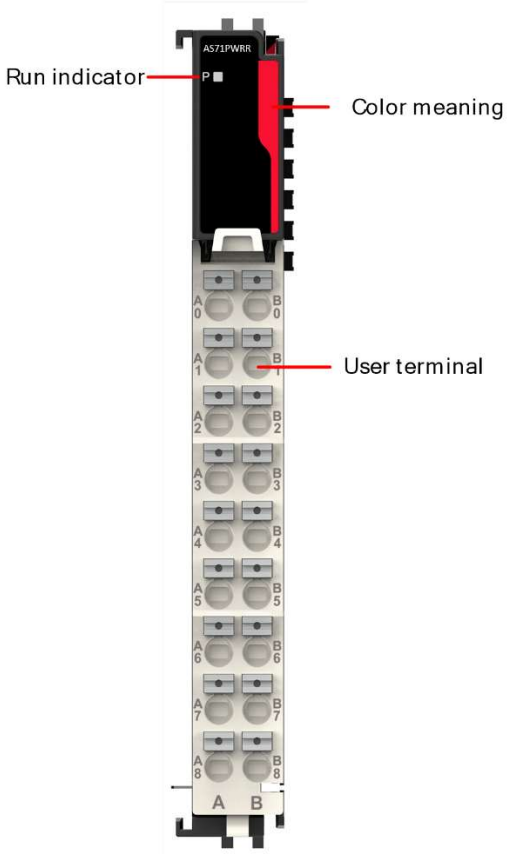


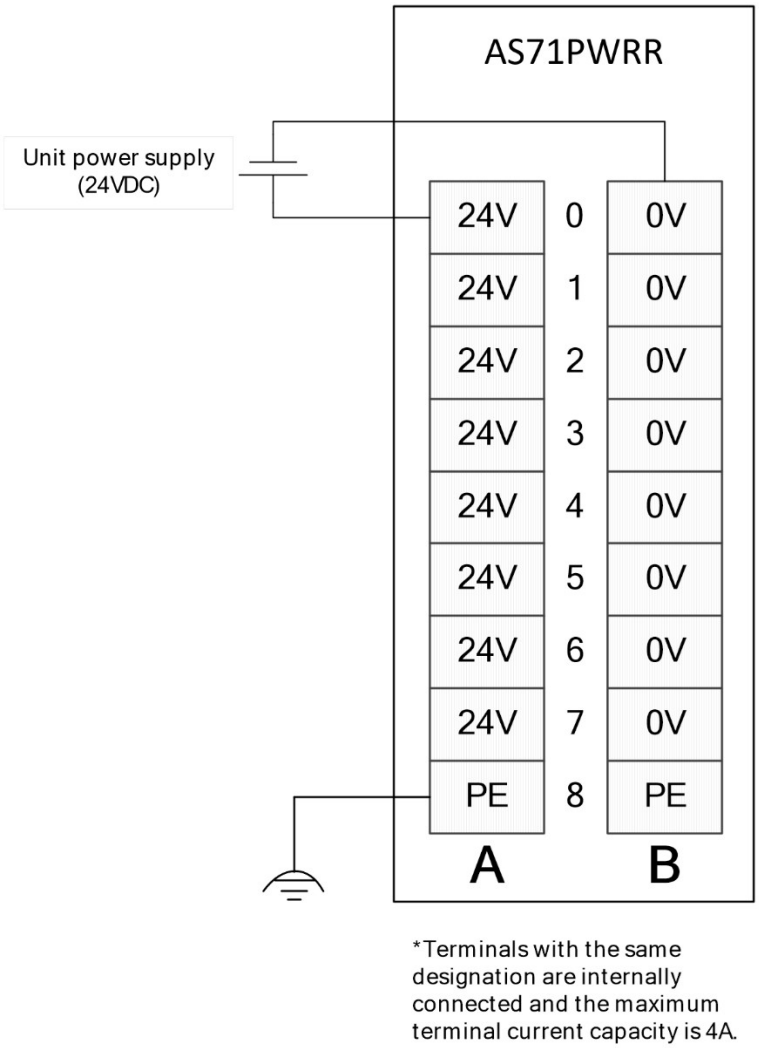
Table 5-24 Component description

Name	Color	Silkscreen	Description
Run indicator	Green	P	On: The module is running. Off: The module is not powered on or it is abnormal.
User terminal	I/O terminals for external wiring		

■ **Terminal definition**

Diagram	Left signal	Left terminal	Right terminal	Right signal
	24 V	**A0**	**B0**	0 V
	24 V	**A1**	**B1**	0 V
	24 V	**A2**	**B2**	0 V
	24 V	**A3**	**B3**	0 V
	24 V	**A4**	**B4**	0 V
	24 V	**A5**	**B5**	0 V
	24 V	**A6**	**B6**	0 V
	24 V	**A7**	**B7**	0 V
	PE	**A8**	**B8**	PE

- **Terminal wiring**



*Terminals with the same designation are internally connected and the maximum terminal current capacity is 4A.

- **Power supply specifications**

Item	Specifications
External input rated voltage	24 VDC (-15%–+20%)
External input rated current	0.8 A
Rated output voltage	5 VDC (4.5–5.5 VDC)
Rated output current	2.5 A (typical value at room temperature 25 °C)
Output protection	Short-circuit protection and hiccup protection

- **Software specifications**

Item	Specifications
Module addressing	Not supported
Module status reading	Not supported

5.5.21 Serial communication module–AS71COM2

Figure 5-57 AS71COM2 appearance



Figure 5-58 Component diagram

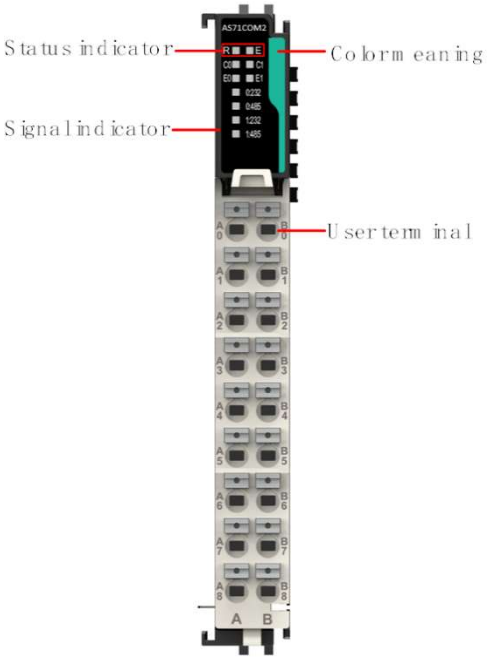
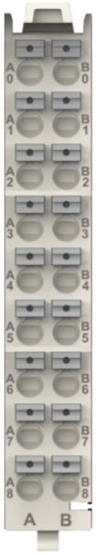


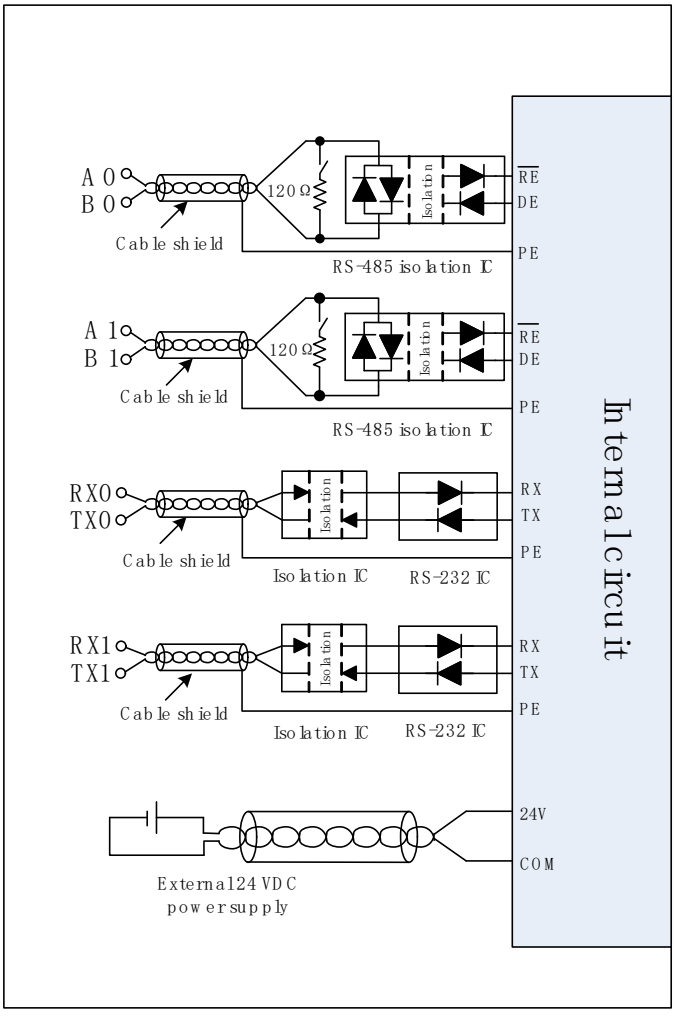
Table 5-25 Component description

Name	Color	Silkscreen	Description
Status indicator	Yellow-green	R	On: The module is running. Slow blinking (2.5 Hz): The module is establishing communication. Off: The module is not powered on or it is abnormal.
	Red	E	Off: The module works normally. Fast blinking (10 Hz): The module is offline. Slow blinking (2.5 Hz): Incorrect parameter settings.
	Green	C0 C1	Blinking: There is data interaction. Off: There is no data interaction.
	Red	E0 E1	Steady on: Communication fault Off: Communication normal
Signal indicator	Green	0:232	On: Channel 0 operates in RS232 mode Off: Channel 0 operates in non-RS232 mode
	Green	1:232	On: Channel 1 operates in RS232 mode Off: Channel 1 operates in non-RS232 mode
	Green	0:485	On: Channel 0 operates in RS485 mode Off: Channel 0 operates in non-RS485 mode
	Green	1:485	On: Channel 1 operates in RS485 mode Off: Channel 1 operates in non-RS485 mode
User terminal	I/O terminals for external wiring		
Color meaning	: Digital input : Digital output (source, sink, relay) : Analog input (voltage, current, thermocouple, RTD)		: Analog output : Power feed : Counting and measurement

- **Terminal definition**

Diagram	Left signal	Left terminal	Right terminal	Right signal
	R0+	**A0**	**B0**	R1+
	R0-	**A1**	**B1**	R1-
	485_A0	**A2**	**B2**	485_A1
	485_B0	**A3**	**B3**	485_B1
	GND	**A4**	**B4**	GND
	232_TX0	**A5**	**B5**	232_TX1
	232_RX0	**A6**	**B6**	232_RX1
	PE	**A7**	**B7**	PE
	24 V	**A8**	**B8**	0 V

- **Terminal wiring**



- **Power supply specifications**

Item	Specifications
Bus input power rated voltage	5 VDC (4.75 VDC–5.25 VDC)
Bus input power rated current	180 mA
Module hot swapping	Not supported

- **Input specifications**

Item	Specifications
Supported protocols	Modbus RTU master/slave, free protocol
Input PDO data size	Max. 1024 bytes
Output PDO data size	Max. 1024 bytes
Number of channels	2
Communication interface type	● The module supports 2-channel serial communication simultaneously. ● Provides two RS485 physical-layer channels and two RS232 physical-layer channels.
Data transmission rate	● 1200/2400/4800/9600/19200/38400/57600/115200 ● Default value: 19200 ● Unit: bit/s
Data bit	7 or 8 bits; default: 8 bits (The 7-data-bit setting cannot be used with no parity; otherwise, a serial-port parameter configuration error is reported.).
Start bit	Fixed at 1 bit
Stop bit	1 bit or 2 bits; default: 1 bit
Parity bit	Odd parity, even parity, or no parity; default: even parity
Number of slaves	● In RS485 mode, each channel supports up to 31 Modbus RTU slaves. ● In RS232 mode, each channel supports only 1 Modbus RTU slave, and the entire module supports a total of 2 slaves.
Communication distance	● RS232: Max. 15 m @ 4800 bit/s. The transmission distance ≈ [(15 m × 4800) / actual baud rate]. Cable distributed capacitance ≤ 100 pF/m. ● RS485: ➢ 1000 m @ 1200 bit/s ➢ 800 m @ 2400 bit/s ➢ 600 m @ 4800 bit/s ➢ 300 m @ 19200 bit/s ➢ 200 m @ 38400 bit/s ➢ 200 m @ 57600 bit/s ➢ 100 m @ 115200 bit/s ➢ (a. Measured using AWG24 shielded twisted-pair cable with a 120 Ω termination resistor and cable distributed capacitance of ≤ 100 pF/m. b. The actual communication distance depends on cable quality, electromagnetic environment, number of nodes, and connector quality.)
Isolation method	● Channels are isolated from internal system signals. ● No isolation between channels
Termination resistor	Implemented by user wiring at the terminal; matching resistance: 120 Ω

Item	Specifications
Diagnostic reporting function configuration	Supported
Communication data refresh mode	Free refresh

■ **Software specifications**

Item	Specifications
Frame end idle time	● Receive frame end detection time; range: 0–10000 ● Unit: 0.1 character ● Default value: 35
Response timeout	● Timeout for the master to wait for a slave response; range: 10–65535 ● Unit: ms ● Default value: 1000
Polling delay	● Delay from when the master receives a slave response frame to when it sends the next command; range: 0–65535 ● Unit: ms ● Default value: 3
Read timeout handling mode	● Holds the last input value or clears the input value. ● Default value: holds the last input value
Response delay	● Delay from when the slave receives a query frame to when it sends a response frame; range: 0–65535 ● Unit: ms ● Default value: 50 ● This parameter is valid only in slave mode.
Module control function	When the read/write commands of Modbus RTU need to be controlled, select the enable mode. The read/write commands of Modbus RTU are controlled by controlling the value of "Module control output". The default value is Disabled.
Module control mode	Modes: level trigger (continuously active), rising-edge trigger (single trigger), and polling mode are supported.
Function code	● Standard commands: 01/02/03/04/05/06/15/16
Slave ID	● Range: 1–247 ● Default value: 1 ● This parameter is valid only in slave mode.

6 Configuration

6.1 Parameter description

6.1.1 Coupler

6.1.1.1 AS71ETC

Name	Index--Subindex	Parameter	Type	Meaning
Configuration parameter SDO	0x3000: 00	Module Enable	UDINT	Expansion module enable/disable control bit. These bits control the enabled/disabled status of the expansion modules connected downstream of the coupler. Each bit controls the enabled/disabled status of one module (1: enable; 0: disable). Bit 0 controls the 1st module. Bit 1 controls the 2nd module ... Bit 31 controls the 32nd module.
Control parameter RxPDO	-	-	-	-
Feedback parameter TxPDO	-	-	-	-
Status parameter SDO	0x3080	Coupler Info	-	Coupler information.
	Subindex 0x01	ActNum	UINT	Number of connected expansion modules.
	Subindex 0x02	HW Version	UINT	Coupler hardware version number.
	Subindex 0x03	SW Version	USINT	Coupler software version number.
	Subindex 0x04	FPGA Version	USINT	Coupler FPGA software version number.
	0xF050	Detected Module IDent List	-	Detection module ID list.
	Subindex 0x01	SubIndex 001	UDINT	ID of 1st module detected
	Subindex 0x02	SubIndex 002	UDINT	ID of 2nd module detected
	...	...	...	...
	Subindex 0x20	SubIndex 032	UDINT	ID of 32nd module detected

6.1.1.2 AS71EIP

Parameter	Type	Meaning	Data type
hwVersion	UINT	Coupler hardware version	Input Data(T→O)
swVersion	UINT	Coupler software version	
SLOT 1–8 Module Enable	USINT	Expansion module enable/disable control bit: controls the	-

<table>
<tr><th>Parameter</th><th>Type</th><th>Meaning</th><th>Data type</th></tr>
<tr><td></td><td></td><td>enabled/disabled status of the expansion modules connected downstream of the coupler. Each bit controls the enabled/disabled status of one module.<table><tr><th>Bit7</th><th>...</th><th>Bit0</th></tr><tr><td>Controls the 8th module</td><td>...</td><td>Controls the 1st module</td></tr></table>TRUE: Enable. FALSE: Disable.</td><td></td></tr>
<tr><td>SLOT 9–16 Module Enable</td><td>USINT</td><td>Expansion module enable/disable control bit: controls the enabled/disabled status of the expansion modules connected downstream of the coupler. Each bit controls the enabled/disabled status of one module.<table><tr><th>Bit7</th><th>...</th><th>Bit0</th></tr><tr><td>Controls module 16.</td><td>...</td><td>Controls module 9.</td></tr></table>TRUE: Enable. FALSE: Disable.</td><td>-</td></tr>
<tr><td>SLOT 17–24 Module Enable</td><td>USINT</td><td>Expansion module enable/disable control bit: controls the enabled/disabled status of the expansion modules connected downstream of the coupler. Each bit controls the enabled/disabled status of one module.<table><tr><th>Bit7</th><th>...</th><th>Bit0</th></tr><tr><td>Controls module 24.</td><td>...</td><td>Controls module 17.</td></tr></table>TRUE: Enable. FALSE: Disable.</td><td>-</td></tr>
<tr><td>SLOT 25–32 Module Enable</td><td>USINT</td><td>Expansion module enable/disable control bit: controls the enabled/disabled status of the expansion modules connected downstream of the coupler. Each bit controls the enabled/disabled status of one module.<table><tr><th>Bit7</th><th>...</th><th>Bit0</th></tr><tr><td>Controls module 32.</td><td>...</td><td>Controls module 25.</td></tr></table>TRUE: enable; FALSE: disable</td><td>-</td></tr>
</table>

6.1.2 Digital input module

6.1.2.1 AS71DI16

Name	Index--Subindex	Parameter	Type	Meaning	Data type
Configuration parameter SDO	0x8001+0x80*n	1600DI SDO Cfg	-	1600DI module filter configuration parameter	Config Param
	Subindex 0x01	Filt0	UINT	I0–I7 filter parameter. Unit: 10 μs	
	Subindex 0x02	Filt1	UINT	Filter parameters I10–I17. Unit: 10 μs	
Control parameter RxPDO	-	-	-	-	-
Feedback parameter TxPDO	0x6001+0x80*n	1600DI TxPDO	-	1600DI module status feedback parameter	-
	Subindex 0x01	ErrID	UINT	Fault ID	Diagnosis Data
	Subindex 0x02	I0	BIT	I0 status feedback	Input (T→O)
	Subindex 0x03	I1	BIT	I1 status feedback	
	…	…	…	…	
	Subindex 0x11	I17	BIT	I17 status feedback	
Status parameter SDO	0x8078+0x80*n	Module Info	-	Module information	-
	Subindex 0x01	HW Version	UINT	Module hardware version number	-
	Subindex 0x02	FPGA Version	UINT	Module FPGA software version number	-
Note: n represents the slot where the expansion module is located, and n∈[0,31].					

6.1.2.2 AS71DI32

Name	Index--Subindex	Parameter	Type	Meaning	Data type
Configuration parameter SDO	0x8002+0x80*n	3200DI SDO Cfg	-	3200DI module filter configuration parameter	Config Param
	Subindex 0x01	Filt0	UINT	Filter parameters I0–I7. Unit: 10 μs	
	Subindex 0x02	Filt1	UINT	Filter parameters I10–I17. Unit: 10 μs	
	Subindex 0x03	Filt2	UINT	Filter parameters I20–I27. Unit: 10 μs	
	Subindex 0x04	Filt3	UINT	Filter parameters I30–I37. Unit: 10 μs	
Control parameter RxPDO	-	-	-	-	-

Name	Index--Subindex	Parameter	Type	Meaning	Data type
Feedback parameter TxPDO	0x6002+0x80*n	3200DI TxPDO	-	3200DI module status feedback parameter	-
	Subindex 0x01	ErrID	UINT	Fault ID	Diagnosis Data
	Subindex 0x02	I0	BIT	I0 status feedback	Input (T→O)
	Subindex 0x03	I1	BIT	I1 status feedback	
	...	...	...	...	
	Subindex 0x21	I37	BIT	I37 status feedback	
Status parameter SDO	0x8078+0x80*n	Module Info	-	Module information	-
	Subindex 0x01	HW Version	UINT	Module hardware version number	-
	Subindex 0x02	FPGA Version	UINT	Module FPGA software version number	-
Note: n represents the slot where the expansion module is located, and n∈[0,31].					

6.1.3 Digital output module

6.1.3.1 AS71DO16

Name	Index--Subindex	Parameter	Type	Meaning	Data type
Configuration parameter SDO	0x8005+ 0x80*n	0016D* SDO Cfg	-	0016DP/DN module stop/offline configuration parameter	Config Param
	Subindex 0x01	Stop Mode0	UINT	Stop/offline output mode Q0 Bit1bit0 Q1 Bit3bit2 ... ... Q7 Bit15bit14 2#00: Hold output in stop/offline mode 2#01: Clear output in stop/offline mode 2#10: Preset output in stop/offline mode	
	Subindex 0x02	Stop Mode1	UINT	Stop/offline output mode Q10 Bit1bit0 Q11 Bit3bit2 ... ... Q17 Bit15bit14 2#00: Hold output in stop/offline mode 2#01: Clear output in stop/offline mode 2#10: Preset output in stop/offline mode	
	Subindex 0x03	Stop Output0	USINT	Preset value of stop/offline output	

Name	Index--Subindex	Parameter	Type	Meaning	Data type
				Bit0: Q0 preset output value in stop/offline mode Bit1: Q1 preset output value in stop/offline mode ... Bit7: Q7 preset output value in stop/offline mode	
	Subindex 0x04	Stop Output1	USINT	Preset value of stop/offline output Bit0: Q10 preset output value in stop/offline mode Bit1: Q11 preset output value in stop/offline mode ... Bit7: Q17 preset output value in stop/offline mode	
Control parameter RxPDO	0x7005+0x80*n	0016D* RxPDO	-	0016DP/DN module output control value	Output (O→T)
	Subindex 0x01	Q0	BIT	Q0 output control	
	Subindex 0x02	Q1	BIT	Q1 output control	
	...	...	...	...	
	Subindex 0x10	Q17	BIT	Q17 output control	
Feedback parameter TxPDO	0x6005+0x80*n	0016D* TxPDO	-	0016 DP/DN module status feedback parameter	-
	Subindex 0x01	ErrID	UINT	Fault ID	Diagnosis Data (Input(T→O))
Status parameter SDO	0x8078+0x80*n	Module Info	-	Module information	-
	Subindex 0x01	HW Version	UINT	Module hardware version number	-
	Subindex 0x02	FPGA Version	UINT	Module FPGA software version number	-
Note: n represents the slot where the expansion module is located, and n∈[0,31].					

6.1.3.2 AS71DO32

Name	Index--Subindex	Parameter	Type	Meaning	Data type
Configuration parameter SDO	0x8006+0x80*n	0032D* SDO Cfg	-	0032DP/DN module stop/offline configuration parameter	Config Param
	Subindex 0x01	Stop Mode0	UINT	Stop/offline output mode Q0 Bit1bit0 Q1 Bit3bit2 ... ... Q7 Bit15bit14	

<table>
<tr><th>Name</th><th>Index--
Subindex</th><th>Parameter</th><th>Type</th><th>Meaning</th><th>Data type</th></tr>
<tr><td rowspan="4"></td><td></td><td></td><td></td><td>2#00: Hold output in stop/offline mode
2#01: Clear output in stop/offline mode
2#10: Preset output in stop/offline mode</td><td rowspan="4"></td></tr>
<tr><td>Subindex 0x02</td><td>Stop Mode1</td><td>UINT</td><td>Stop/offline output mode
<table><tr><td>Q10</td><td>Bit1bit0</td></tr><tr><td>Q11</td><td>Bit3bit2</td></tr><tr><td>...</td><td>...</td></tr><tr><td>Q17</td><td>Bit15bit14</td></tr></table>2#00: Hold output in stop/offline mode
2#01: Clear output in stop/offline mode
2#10: Preset output in stop/offline mode</td></tr>
<tr><td>Subindex 0x03</td><td>Stop Mode2</td><td>UINT</td><td>Stop/offline output mode
<table><tr><td>Q20</td><td>Bit1bit0</td></tr><tr><td>Q21</td><td>Bit3bit2</td></tr><tr><td>...</td><td>...</td></tr><tr><td>Q27</td><td>Bit15bit14</td></tr></table>2#00: Hold output in stop/offline mode
2#01: Clear output in stop/offline mode
2#10: Preset output in stop/offline mode</td></tr>
<tr><td>Subindex 0x04</td><td>Stop Mode3</td><td>UINT</td><td>Stop/offline output mode
<table><tr><td>Q30</td><td>Bit1bit0</td></tr><tr><td>Q31</td><td>Bit3bit2</td></tr><tr><td>...</td><td>...</td></tr><tr><td>Q37</td><td>Bit15bit14</td></tr></table>2#00: Hold output in stop/offline mode
2#01: Clear output in stop/offline mode
2#10: Preset output in stop/offline mode</td></tr>
</table>

Name	Index--Subindex	Parameter	Type	Meaning	Data type
	Subindex 0x05	Stop Output0	USINT	Preset value of stop/offline output Bit0: Q0 preset output value in stop/offline mode Bit1: Q1 preset output value in stop/offline mode ... Bit7: Q7 preset output value in stop/offline mode	
	Subindex 0x06	Stop Output1	USINT	Preset value of stop/offline output Bit0: Q10 preset output value in stop/offline mode Bit1: Q11 preset output value in stop/offline mode ... Bit7: Q17 preset output value in stop/offline mode	
	Subindex 0x07	Stop Output2	USINT	Preset value of stop/offline output Bit0: Q20 preset output value in stop/offline mode Bit1: Q21 preset output value in stop/offline mode ... Bit7: Q27 preset output value in stop/offline mode	
	Subindex 0x08	Stop Output3	USINT	Preset value of stop/offline output Bit0: Q30 preset output value in stop/offline mode Bit1: Q31 preset output value in stop/offline mode ... Bit7: Q37 preset output value in stop/offline mode	
Control parameter RxPDO	0x7006+0x80*n	0032D* RxPDO	-	0032DP/DN module output control value	Output (O→T)
	Subindex 0x01	Q0	BIT	Q0 output control	
	Subindex 0x02	Q1	BIT	Q1 output control	
	...	...	...	...	
	Subindex 0x20	Q17	BIT	Q37 output control	
Feedback parameter TxPDO	0x6006+0x80*n	0032D* TxPDO	-	0032DP/DN module status feedback parameter	-
	Subindex 0x01	ErrID	UINT	Fault ID	Diagnosis Data (Input(T→O))

Name	Index--Subindex	Parameter	Type	Meaning	Data type
Status parameter SDO	0x8078+0x80*n	Module Info	-	Module information	-
	Subindex 0x01	HW Version	UINT	Module hardware version number	-
	Subindex 0x02	FPGA Version	UINT	Module FPGA software version number	-
Note: n represents the slot where the expansion module is located, and n∈[0,31].					

6.1.3.3 AS71DOR8

Name	Index--Subindex	Parameter	Type	Meaning	Data type
Configuration parameter SDO	0x8004+0x80*n	0008DR SDO Cfg	-	0008DR module stop/offline configuration parameter	Config Param
	Subindex 0x01	Stop Mode	UINT	Stop/offline output mode Q0 Bit1bit0 Q1 Bit3bit2 ... ... Q7 Bit15bit14 2#00: Hold output in stop/offline mode 2#01: Clear output in stop/offline mode 2#10: Preset output in stop/offline mode	
	Subindex 0x02	Stop Output	USINT	Preset value of stop/offline output Bit0: Q0 preset output value in stop/offline mode Bit1: Q1 preset output value in stop/offline mode ... Bit7: Q7 preset output value in stop/offline mode	
Control parameter RxPDO	0x7004+0x80*n	0008DR RxPDO	-	0008DR module output control value	Output (O→T)
	Subindex 0x01	Q0	BIT	Q0 output control	
	Subindex 0x02	Q1	BIT	Q1 output control	
	...	...	...	...	
	Subindex 0x08	Q7	BIT	Q7 output control	
Feedback parameter TxPDO	0x6004+0x80*n	0008DR TxPDO	-	0008DR module status feedback parameter	-
	Subindex 0x01	ErrID	UINT	Fault ID	Diagnosis Data (Input(T→O))
Status parameter	0x8078+0x80*n	Module Info	-	Module information	-

Name	Index--Subindex	Parameter	Type	Meaning	Data type
SDO	Subindex 0x01	HW Version	UINT	Module hardware version number	-
	Subindex 0x02	FPGA Version	UINT	Module FPGA software version number	-
Note: n represents the slot where the expansion module is located, and n∈[0,31].					

The digital output module divides every eight channels into a group. Taking configuration 0016DP-Stop_Mode0 as an example, the corresponding output channels are Q0–Q7. The data type of 0016DP-Stop_Mode0 is UINT. The data definition is detailed in the following parameter description table.

Q7		Q6		Q5		Q4		Q3		Q2		Q1		Q0	
Bit15	Bit14	Bit13	Bit12	Bit11	Bit10	Bit9	Bit8	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0

The output modes represented by bit1 and bit0 values are as follows:

Value	Mode
00	Stop/offline output retained
01	Stop/offline output cleared
10	Stop/offline output preset

If Q0 to Q7 are all configured to hold output, the value of Stop Mode0 of 0016DP is 0, that is, 0b0000000000000000.

Q7		Q6		Q5		Q4		Q3		Q2		Q1		Q0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

6.1.4 Analog input module

6.1.4.1 AS71AIN4

Name	Index--Subindex	Parameter	Type	Meaning	Data type
Configuration parameter SDO	0x8015+0x80*n	4AD SDO Cfg	-	4AD module configuration parameter	Config Param
	Subindex 0x01	AI0 Cfg	USINT	Configuration parameter for channel 0. Bit0: Channel enable control (0: disabled; 1: enabled) Bit1: Open-circuit detection enable control (0: disabled; 1: enabled) Bit2: Over-limit detection enable control (0: disabled; 1: enabled) Bit3: Over-range detection enable control (0: disabled; 1: enabled) Bit4: Enhanced filter enable control (0: disabled; 1: enabled) Bit7–bit5: Channel	

Name	Index--Subindex	Parameter	Type	Meaning	Data type
				conversion mode 2#000: Voltage 0–5 V Corresponding code value: 0–20000 2#001: Voltage 0–10 V Corresponding code value: 0–20000 2#010: Voltage -5–5 V Corresponding code value: 20000–20000 2#011: Voltage -10–10 V Corresponding code value: 20000–20000 2#100: Current 4–20 mA Corresponding code value: 0–20000 2#101: Current 0–20 mA Corresponding code value: 0–20000 2#110: reserved 2#111: Current -20–20 mA Corresponding code value: 20000–20000	
	Subindex 0x02	AI1 Cfg	USINT	Same as the configuration parameter for channel 0	
	Subindex 0x03	AI2 Cfg	USINT	Same as the configuration parameter for channel 0	
	Subindex 0x04	AI3 Cfg	USINT	Same as the configuration parameter for channel 0	
	Subindex 0x05	AI0 Filt	USINT	Filter parameter for channel 0 Range: 1–255. A larger value improves filtering performance but increases delay.	
	Subindex 0x06	AI1 Filt	USINT	Same as Channel 0 filter parameter	
	Subindex 0x07	AI2 Filt	USINT	Same as Channel 0 filter parameter	
	Subindex 0x08	AI3 Filt	USINT	Same as Channel 0 filter parameter	
Control parameter RxPDO	-	-	-	-	-
Feedback parameter TxPDO	0x6015+0x80*n	4AD TxPDO	-	4AD module status feedback parameter	Input(T→O)
	Subindex 0x01	AI0	INT	Conversion value for channel 0.	

Name	Index--Subindex	Parameter	Type	Meaning	Data type
	Subindex 0x02	AI1	INT	Conversion value for channel 1.	
	Subindex 0x03	AI2	INT	Conversion value for channel 2.	
	Subindex 0x04	AI3	INT	Conversion value for channel 3.	
	Subindex 0x05	AI0_ErrID	UINT	Fault code for channel 0.	Diagnosis Data (Input(T→O))
	Subindex 0x06	AI1_ErrID	UINT	Fault code for channel 1.	
	Subindex 0x07	AI2_ErrID	UINT	Fault code for channel 2.	
	Subindex 0x08	AI3_ErrID	UINT	Fault code for channel 3.	
Status parameter SDO	0x8078+0x80*n	Module Info	-	Module information	
	Subindex 0x01	HW Version	UINT	Module hardware version number	
	Subindex 0x02	FPGA Version	UINT	Module FPGA software version number	
Note: n represents the slot where the expansion module is located, and n∈[0,31].					

6.1.4.2 AS71AIV8

Name	Index--Subindex	Parameter	Type	Meaning	Data type
Configuration parameter SDO	0x8016+0x80*n	8ADV SDO Cfg	-	8ADV module configuration parameter	Config Param
	Subindex 0x01	AI0 Cfg	USINT	Configuration parameter for channel 0. Bit0: Channel enable flag (0: disabled; 1: enabled) Bit1: Over-range detection enable flag (0: disabled; 1: enabled) Bit2: Enhanced filter enable flag (0: disabled; 1: enhanced filter enabled; 50 Hz/60 Hz suppressed simultaneously) Bit4–bit3: Conversion range selection 2#00: (0–20000) or (-20000–20000) 2#01: (0–27648) or (-27648–27648) 2#10: (0–32000) or (-32000–32000) 2#11: (0–32767) or (-32768–32767) Bit7–bit5: Conversion mode selection 2#000: voltage 0–5 V	

Name	Index--Subindex	Parameter	Type	Meaning	Data type
				2#001: voltage 0–10 V 2#010: voltage -5–5 V 2#011: voltage -10–10 V 2#100: voltage 1–5 V 2#101: reserved 2#110: reserved 2#111: reserved	
	Subindex 0x02	AI1 Cfg	USINT	Same as the configuration parameter for channel 0	
	Subindex 0x03	AI2 Cfg	USINT	Same as the configuration parameter for channel 0	
	Subindex 0x04	AI3 Cfg	USINT	Same as the configuration parameter for channel 0	
	Subindex 0x05	AI4 Cfg	USINT	Same as the configuration parameter for channel 0	
	Subindex 0x06	AI5 Cfg	USINT	Same as the configuration parameter for channel 0	
	Subindex 0x07	AI6 Cfg	USINT	Same as the configuration parameter for channel 0	
	Subindex 0x08	AI7 Cfg	USINT	Same as the configuration parameter for channel 0	
	Subindex 0x09	AI0 Filt	USINT	Filter parameter for channel 0 Range: 1–255. A larger value improves filtering performance but increases delay.	
	Subindex 0x0A	AI1 Filt	USINT	Same as channel 0 filter parameter	
	Subindex 0x0B	AI2 Filt	USINT	Same as channel 0 filter parameter	
	Subindex 0x0C	AI3 Filt	USINT	Same as Channel 0 filter parameter	
	Subindex 0x0D	AI4 Filt	USINT	Same as channel 0 filter parameter	
	Subindex 0x0E	AI5 Filt	USINT	Same as channel 0 filter parameter	
	Subindex 0x0F	AI6 Filt	USINT	Same as channel 0 filter parameter	
	Subindex 0x10	AI7 Filt	USINT	Same as channel 0 filter parameter	
Control parameter RxPDO	-	-	-	-	-
Feedback parameter TxPDO	0x6016+0x80*n	8ADV TxPDO	-	8ADV module status feedback parameter	Input(T→O)
	Subindex 0x01	AI0	INT	Conversion value for channel 0.	
	Subindex 0x02	AI1	INT	Conversion value for channel 1.	
	Subindex 0x03	AI2	INT	Conversion value for channel 2.	
	Subindex 0x04	AI3	INT	Conversion value for channel 3.	

Name	Index--Subindex	Parameter	Type	Meaning	Data type
	Subindex 0x05	AI4	INT	Conversion value for channel 4.	
	Subindex 0x06	AI5	INT	Conversion value for channel 5.	
	Subindex 0x07	AI6	INT	Conversion value for channel 6.	
	Subindex 0x08	AI7	INT	Conversion value for channel 7.	
	Subindex 0x09	AI0_ErrID	UINT	Fault code for channel 0.	Diagnosis Data (Input (T→O))
	Subindex 0x0A	AI1_ErrID	UINT	Fault code for channel 1.	
	Subindex 0x0B	AI2_ErrID	UINT	Fault code for channel 2.	
	Subindex 0x0C	AI3_ErrID	UINT	Fault code for channel 3.	
	Subindex 0x0D	AI4_ErrID	UINT	Fault code for channel 4.	
	Subindex 0x0E	AI5_ErrID	UINT	Fault code for channel 5.	
	Subindex 0x0F	AI6_ErrID	UINT	Fault code for channel 6.	
	Subindex 0x10	AI7_ErrID	UINT	Fault code for channel 7.	
Status parameter SDO	0x8078+0x80*n	Module Info	-	Module information	-
	Subindex 0x01	HW Version	UINT	Manufacturer hardware version	-
	Subindex 0x02	FPGA Version	UINT	Module hardware version number	-
Note: n represents the slot where the expansion module is located, and n∈[0,31].					

6.1.4.3 AS71AIC8

Name	Index--Subindex	Parameter	Type	Meaning	Data type
Configuration parameter SDO	0x8016+0x80*n	8ADI SDO Cfg	-	8ADI module configuration parameter	Config Param
	Subindex 0x01	AI0 Cfg	USINT	Configuration parameter for channel 0. Bit0: Channel enable flag (0: disabled; 1: enabled) Bit1: Over-range detection enable flag (0: disabled; 1: enabled) Bit2: Enhanced filter enable flag (0: disabled; 1: enhanced filter enabled; 50 Hz/60 Hz suppressed simultaneously) Bit4–bit3: Conversion range selection 2#00: (0–20000) or (-20000–20000) 2#01: (0–27648) or (-27648–27648) 2#10: (0–32000) or (-32000–32000) 2#11: (0–32767) or (-32768–32767) Bit7–bit5: Conversion mode	

Name	Index--Subindex	Parameter	Type	Meaning	Data type
				selection 2#000: reserved 2#001: reserved 2#010: reserved 2#011: reserved 2#100: reserved 2#101: Current 4–20 mA 2#110: Current 0–20 mA 2#111: Current -20–20 mA	
	Subindex 0x02	AI1 Cfg	USINT	Same as the configuration parameter for channel 0	
	Subindex 0x03	AI2 Cfg	USINT	Same as the configuration parameter for channel 0	
	Subindex 0x04	AI3 Cfg	USINT	Same as the configuration parameter for channel 0	
	Subindex 0x05	AI4 Cfg	USINT	Same as the configuration parameter for channel 0	
	Subindex 0x06	AI5 Cfg	USINT	Same as the configuration parameter for channel 0	
	Subindex 0x07	AI6 Cfg	USINT	Same as the configuration parameter for channel 0	
	Subindex 0x08	AI7 Cfg	USINT	Same as the configuration parameter for channel 0	
	Subindex 0x09	AI0 Filt	USINT	Filter parameter for channel 0 Range: 1–255. A larger value improves filtering performance but increases delay.	
	Subindex 0x0A	AI1 Filt	USINT	Same as channel 0 filter parameter	
	Subindex 0x0B	AI2 Filt	USINT	Same as channel 0 filter parameter	
	Subindex 0x0C	AI3 Filt	USINT	Same as channel 0 filter parameter	
	Subindex 0x0D	AI4 Filt	USINT	Same as channel 0 filter parameter	
	Subindex 0x0E	AI5 Filt	USINT	Same as channel 0 filter parameter	
	Subindex 0x0F	AI6 Filt	USINT	Same as channel 0 filter parameter	
	Subindex 0x10	AI7 Filt	USINT	Same as channel 0 filter parameter	
Control parameter RxPDO	-	-	-	-	
Feedback	0x6016+0x80*n	8ADI	-	8ADI module status feedback	Input(T→O)

Name	Index--Subindex	Parameter	Type	Meaning	Data type
parameter TxPDO		TxPDO		parameter	
	Subindex 0x01	AI0	INT	Conversion value for channel 0.	
	Subindex 0x02	AI1	INT	Conversion value for channel 1.	
	Subindex 0x03	AI2	INT	Conversion value for channel 2.	
	Subindex 0x04	AI3	INT	Conversion value for channel 3.	
	Subindex 0x05	AI4	INT	Conversion value for channel 4.	
	Subindex 0x06	AI5	INT	Conversion value for channel 5.	
	Subindex 0x07	AI6	INT	Conversion value for channel 6.	
	Subindex 0x08	AI7	INT	Conversion value for channel 7.	
	Subindex 0x09	AI0_ErrID	UINT	Fault code for channel 0.	Diagnosis Data (Input(T→O))
	Subindex 0x0A	AI1_ErrID	UINT	Fault code for channel 1.	
	Subindex 0x0B	AI2_ErrID	UINT	Fault code for channel 2.	
	Subindex 0x0C	AI3_ErrID	UINT	Fault code for channel 3.	
	Subindex 0x0D	AI4_ErrID	UINT	Fault code for channel 4.	
	Subindex 0x0E	AI5_ErrID	UINT	Fault code for channel 5.	
	Subindex 0x0F	AI6_ErrID	UINT	Fault code for channel 6.	
	Subindex 0x10	AI7_ErrID	UINT	Fault code for channel 7.	
Status parameter SDO	0x8078+0x80*n	Module Info	-	Module information	-
	Subindex 0x01	HW Version	UINT	Module hardware version number	-
	Subindex 0x02	FPGA Version	UINT	Module FPGA software version number	-
Note: n represents the slot where the expansion module is located, and n∈[0,31].					

Taking Channel 0 as an example, the parameter type is USINT. See the following table for detailed data definition of AI0 Cfg of AS71AIN4:

Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
Channel conversion mode (range configuration)			Enhanced filter enable	Over-range enable	Over-range detection enable	Open-circuit detection enable	Channel enable
2#000: 0–5 V 2#001: 0–10 V 2#010:-5 V–+5 V 2#011:-10 V–+10 V	2#100: 4–20 mA 2#101: 0–20 mA 2#110: reserved 2#111: -20–+20 mA		0: Disable 1: Enable	0: Disable 1: Enable	0: Disable 1: Enable	0: Disable 1: Enable	0: Disable 1: Enable

Channel 0 is configured as follows: channel enabled, open-circuit detection disabled, over-range detection enabled, over-range enabled, enhanced filter disabled, and the range is 4–20 mA. The value should be 141,

that is, 0b10001101. Details are as follows:

Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
100			0	1	1	0	1
100: 4–20 mA			0: Disable	1: Enable	1: Enable	0: Disable	1: Enable

Range conversion:

Measurement range	Current (I) /Voltage (U)	Decimal (D)	Hexadecimal	Range	Conversion formula
0–5 V	8.19175 V	32767	0x7FFF	Above upper limit	D = 20000×U/5 U = D×5/20000
	5 V	20000	0x4E20	Rated range	
	2.5 V	10000	0x2710		
	0 V	0	0x0000		
	-2.5 V	-10000	0xD8F0	Below lower limit	
	-5 V	-20000	0xB1E0		
	-8.19175 V	-32768	0x8000		
0–10 V	16.3835 V	32767	0x7FFF	Above upper limit	D = 20000×U/10 U = D×10/20000
	10 V	20000	0x4E20	Rated range	
	5 V	10000	0x2710		
	0 V	0	0x0000		
	-5 V	-10000	0xD8F0	Below lower limit	
	-10 V	-20000	0xB1E0		
	-16.3835 V	-32768	0x8000		
±5 V	8.19175 V	32767	0x7FFF	Above upper limit	D = 20000×U/5 U = D×5/20000
	5 V	20000	0x4E20	Rated range	
	2.5 V	10000	0x2710		
	0 V	0	0x0000		
	-2.5 V	-10000	0xD8F0		
	-5 V	-20000	0xB1E0		
	-8.19175 V	-32768	0x8000	Below lower limit	
±10 V	16.3835 V	32767	0x7FFF	Above upper limit	D = 20000×U/10 U = D×10/20000
	10 V	20000	0x4E20	Rated range	
	5 V	10000	0x2710		
	0 V	0	0x0000		
	-5 V	-10000	0xD8F0		
	-10 V	-20000	0xB1E0		
	-16.3835 V	-32768	0x8000	Below lower limit	
4–20 mA	30.2136 mA	32767	0x7FFF	Above upper limit	D = 20000×(I-4)/16 I = D×16/20000+4
	20 mA	20000	0x4E20	Rated range	
	12 mA	10000	0x2710		
	4 mA	0	0x0000		
	0 mA	-5000	0xEC78	Below lower	

Measurement range	Current (I) /Voltage (U)	Decimal (D)	Hexadecimal	Range	Conversion formula
	-22.2136 mA	-32768	0x8000	limit	
0–20 mA	32.767 mA	32767	0x7FFF	Above upper limit	D = 20000×I/20 I = D×20/20000
	20 mA	20000	0x4E20	Rated range	
	10 mA	10000	0x2710		
	0 mA	0	0x0000		
	-10 mA	-10000	0xD8F0	Below lower limit	
	-20 mA	-20000	0xB1E0		
	-32.767 mA	-32768	0x8000		
±20 mA	32.767 mA	32767	0x7FFF	Above upper limit	D = 20000×I/20 I = D×20/20000
	20 mA	20000	0x4E20	Rated range	
	10 mA	10000	0x2710		
	0 mA	0	0x0000		
	-10 mA	-10000	0xD8F0		
	-20 mA	-20000	0xB1E0		
	-32.767 mA	-32768	0x8000	Below lower limit	

6.1.5 Analog output module

6.1.5.1 AS71AOU4

Name	Index--Subindex	Parameter	Type	Meaning	Data type
Configuration parameter SDO	0x8019+0x80*n	4DA SDO Cfg	-	4DA module configuration parameter	Config Param
	Subindex 0x01	AO0 Cfg	USINT	Configuration parameter for channel 0. Bit0: Channel enable control (0: disabled; 1: enabled) Bit1: Output fault detection enable control (0: disabled; 1: enabled) Bit3–bit2: Offline output mode. 2#00: Hold output when offline 2#01: Clear output when offline 2#10: Preset output when offline Bit 4: Reserved Bit7–bit5: Channel conversion mode 2#000: Voltage 0–5 V Corresponding code value: 0–20000 2#001: Voltage 0–10 V	

Name	Index--Subindex	Parameter	Type	Meaning	Data type
				Corresponding code value: 0–20000 2#010: Voltage -5–5 V Corresponding code value: 20000–20000 2#011: Voltage -10–10 V Corresponding code value: 20000–20000 2#100: Current 4–20 mA Corresponding code value: 0–20000 2#101: Current 0–20 mA Corresponding code value: 0–20000 2#110: reserved 2#111: reserved	
	Subindex 0x02	AO1 Cfg	USINT	Same as the configuration parameter for channel 0	
	Subindex 0x03	AO2 Cfg	USINT	Same as the configuration parameter for channel 0	
	Subindex 0x04	AO3 Cfg	USINT	Same as the configuration parameter for channel 0	
	Subindex 0x05	AO0 Stop Output	INT	Preset value of stop/offline output for channel 0.	
	Subindex 0x06	AO1 Stop Output	INT	Preset value of stop/offline output for channel 1.	
	Subindex 0x07	AO2 Stop Output	INT	Preset value of stop/offline output for channel 2.	
	Subindex 0x08	AO3 Stop Output	INT	Preset value of stop/offline output for channel 3.	
Control parameter RxPDO	0x7019+0x80*n	4DA RxPDO	-	4DA module output control value	Output(O→T)
	Subindex 0x01	AO0	INT	Output control value for channel 0.	
	Subindex 0x02	AO1	INT	Output control value for channel 1.	
	Subindex 0x03	AO2	INT	Output control value for channel 2.	
	Subindex 0x04	AO3	INT	Output control value for channel 3.	
Feedback parameter TxPDO	0x6019+0x80*n	4DA TxPDO	-	4DA module status feedback parameter	Diagnosis Data (Input(T→O))
	Subindex 0x01	AO0_ErrID	UINT	Fault code for channel 0.	
	Subindex 0x02	AO1_ErrID	UINT	Fault code for channel 1.	
	Subindex 0x03	AO2_ErrID	UINT	Fault code for channel 2.	
	Subindex 0x04	AO3_ErrID	UINT	Fault code for channel 3.	
Status parameter SDO	0x8078+0x80*n	Module Info	-	Module information	
	Subindex 0x01	HW	UINT	Module hardware version	

Name	Index--Subindex	Parameter	Type	Meaning	Data type
		Version		number	
	Subindex 0x02	FPGA Version	UINT	Module FPGA software version number	
Note: n represents the slot where the expansion module is located, and n∈[0,31].					

6.1.6 Temperature detection module

6.1.6.1 AS71RTD4

Name	Index--Subindex	Parameter	Type	Meaning	Data type
Configuration parameter SDO	0x8029+0x80*n	4PT SDO Cfg	-	4PT module configuration parameter	Config Param
	Subindex 0x01	Temp0 Cfg	USINT	Configuration parameter for channel 0. Bit0: Channel enable control (0: disabled; 1: enabled) Bit1: Over-range detection enable control (0: disabled; 1: enabled) bit3–bit2: RTD wiring mode 2#00: Two-wire system 2#01: Three-wire system 2#10: Four-wire system Bit4: Temperature unit (0: °C; 1: °F) Bit7–bit5: Channel conversion mode 2#000: reserved 2#001: PT100 2#010: PT500 2#011: reserved 2#100: PT1000 2#101: reserved 2#110: reserved 2#111: CU100	
	Subindex 0x02	Temp1 Cfg	USINT	Same as the configuration parameter for channel 0	
	Subindex 0x03	Temp2 Cfg	USINT	Same as the configuration parameter for channel 0	

Name	Index--Subindex	Parameter	Type	Meaning	Data type
	Subindex 0x04	Temp3 Cfg	USINT	Same as the configuration parameter for channel 0	
	Subindex 0x05	Temp0 Filt	USINT	Filter parameter for channel 0 Range: 1–255. A larger value improves filtering performance but increases delay.	
	Subindex 0x06	Temp1 Filt	USINT	Same as channel 0 filter parameter	
	Subindex 0x07	Temp2 Filt	USINT	Same as channel 0 filter parameter	
	Subindex 0x08	Temp3 Filt	USINT	Same as channel 0 filter parameter	
	Subindex 0x09	Temp0 Offset	INT	Channel 0 temperature offset value Amplified by a factor of ten, 999 represents 99.9. Detected value = Actually measured value + Offset value	
	Subindex 0xA	Temp1 Offset	INT	Same as channel 0 temperature offset value	
	Subindex 0xB	Temp2 Offset	INT	Same as channel 1 temperature offset value	
	Subindex 0xC	Temp3 Offset	INT	Same as channel 2 temperature offset value	
	Subindex 0xD	Temp0 Up	INT	Channel 0 temperature upper limit (reserved) Uses the inherent limit of the sensor.	
	Subindex 0xE	Temp1 Up	INT	Channel 1 temperature upper limit (reserved) Uses the inherent limit of the sensor.	
	Subindex 0xF	Temp2 Up	INT	Channel 2 temperature upper limit (reserved) Uses the inherent limit of the sensor.	
	Subindex 0x10	Temp3 Up	INT	Channel 3 temperature upper limit (reserved) Uses the inherent limit of the sensor.	

Name	Index--Subindex	Parameter	Type	Meaning	Data type
	Subindex 0x11	Temp0 Low	INT	Channel 0 temperature lower limit (reserved) Uses the inherent limit of the sensor.	
	Subindex 0x12	Temp1 Low	INT	Channel 1 temperature lower limit (reserved) Uses the inherent limit of the sensor.	
	Subindex 0x13	Temp2 Low	INT	Channel 2 temperature lower limit (reserved) Uses the inherent limit of the sensor.	
	Subindex 0x14	Temp3 Low	INT	Channel 3 temperature lower limit (reserved) Uses the inherent limit of the sensor.	
Control parameter RxPDO	-	-	-	-	-
Feedback parameter TxPDO	0x6029+0x80*n	4PT TxPDO	-	4PT module status feedback parameter	Input(T→O)
	Subindex 0x01	Temp0	REAL32	Conversion value for channel 0.	
	Subindex 0x02	Temp1	REAL32	Conversion value for channel 1.	
	Subindex 0x03	Temp2	REAL32	Conversion value for channel 2.	
	Subindex 0x04	Temp3	REAL32	Conversion value for channel 3.	
	Subindex 0x05	Temp0_ErrID	UINT	Fault code for channel 0.	Diagnosis Data (Input(T → O))
	Subindex 0x06	Temp1_ErrID	UINT	Fault code for channel 1.	
	Subindex 0x07	Temp2_ErrID	UINT	Fault code for channel 2.	
	Subindex 0x08	Temp3_ErrID	UINT	Fault code for channel 3.	
Status parameter SDO	0x8078+0x80*n	Module Info	-	Module information	-
	Subindex 0x01	HW Version	UINT	Module hardware version number	-
	Subindex 0x02	FPGA Version	UINT	Module FPGA software version number	-
Note: n represents the slot where the expansion module is located, and n∈[0,31].					

6.1.6.2 AS71THC4

Name	Index--Subindex	Parameter	Type	Meaning	Data type

Name	Index--Subindex	Parameter	Type	Meaning	Data type
Configuration parameter SDO	0x802D+0x80*n	4TC SDO Cfg	-	4TC module configuration parameter	Config Param
	Subindex 0x01	Temp0 Cfg	USINT	Configuration parameter for channel 0. Bit0: Channel enable control (0: disabled; 1: enabled) Bit1: Over-range detection enable control (0: disabled; 1: enabled) Bit3–bit2: Reserved Bit 4: Temperature unit (0: ℃; 1: ℉) Bit7–bit5: Channel conversion mode 2#000: Type B thermocouple 2#001: Type E thermocouple 2#010: Type J thermocouple 2#011: Type K thermocouple 2#100: Type N thermocouple 2#101: Type R thermocouple 2#110: Type S thermocouple 2#111: Type T thermocouple	
	Subindex 0x02	Temp1 Cfg	USINT	Same as the configuration parameter for channel 0	
	Subindex 0x03	Temp2 Cfg	USINT	Same as the configuration parameter for channel 0	
	Subindex 0x04	Temp3 Cfg	USINT	Same as the configuration parameter for channel 0	
	Subindex 0x05	Temp0 Filt	USINT	Filter parameter for channel 0 Range: 1–255. A larger value improves filtering performance but increases delay.	
	Subindex 0x06	Temp1 Filt	USINT	Same as channel 0 filter parameter	
	Subindex 0x07	Temp2 Filt	USINT	Same as channel 0 filter parameter	
	Subindex 0x08	Temp3 Filt	USINT	Same as channel 0 filter parameter	
	Subindex 0x09	Temp0	INT	Channel 0 temperature offset	

Name	Index--Subindex	Parameter	Type	Meaning	Data type
		Offset		value Amplified by a factor of ten, 999 represents 99.9. Detected value = Actually measured value + Offset value	
	Subindex 0xA	Temp1 Offset	INT	Same as channel 0 temperature offset value	
	Subindex 0xB	Temp2 Offset	INT	Same as channel 1 temperature offset value	
	Subindex 0xC	Temp3 Offset	INT	Same as channel 2 temperature offset value	
	Subindex 0xD	Temp0 Up	INT	Channel 0 temperature upper limit (reserved) Uses the inherent limit of the sensor.	
	Subindex 0xE	Temp1 Up	INT	Channel 1 temperature upper limit (reserved) Uses the inherent limit of the sensor.	
	Subindex 0xF	Temp2 Up	INT	Channel 2 temperature upper limit (reserved) Uses the inherent limit of the sensor.	
	Subindex 0x10	Temp3 Up	INT	Channel 3 temperature upper limit (reserved) Uses the inherent limit of the sensor.	
	Subindex 0x11	Temp0 Low	INT	Channel 0 temperature lower limit (reserved) Uses the inherent limit of the sensor.	
	Subindex 0x12	Temp1 Low	INT	Channel 1 temperature lower limit (reserved) Uses the inherent limit of the sensor.	
	Subindex 0x13	Temp2 Low	INT	Channel 2 temperature lower limit (reserved) Uses the inherent limit of the sensor.	
	Subindex 0x14	Temp3 Low	INT	Channel 3 temperature lower limit (reserved) Uses the inherent limit of the sensor.	
Control parameter RxPDO	-	-	-	-	
Feedback	0x602D+0x80*	4TC TxPDO	-	4TC module status feedback	Input (T→O)

Name	Index--Subindex	Parameter	Type	Meaning	Data type
parameter TxPDO	n			parameter	
	Subindex 0x01	Temp0	REAL32	Conversion value for channel 0.	
	Subindex 0x02	Temp1	REAL32	Conversion value for channel 1.	
	Subindex 0x03	Temp2	REAL32	Conversion value for channel 2.	
	Subindex 0x04	Temp3	REAL32	Conversion value for channel 3.	
	Subindex 0x05	Temp0_ErrID	UINT	Fault code for channel 0.	Diagnosis Data (Input(T→O))
	Subindex 0x06	Temp1_ErrID	UINT	Fault code for channel 1.	
	Subindex 0x07	Temp2_ErrID	UINT	Fault code for channel 2.	
	Subindex 0x08	Temp3_ErrID	UINT	Fault code for channel 3.	
Status parameter SDO	0x8078+0x80*n	Module Info	-	Module information	
	Subindex 0x01	HW Version	UINT	Module hardware version number	
	Subindex 0x02	FPGA Version	UINT	Module FPGA software version number	
Note: n represents the slot where the expansion module is located, and n∈[0,31].					

6.1.7 Incremental encoder input detection module

6.1.7.1 AS71IN02

Parameter	Type	Meaning	Data type
2EI_Cnt0_Cfg	UINT	Bit1–bit0: Channel mode configuration 2#00: A/B-phase ×4 mode 2#01: A/B-phase ×2 mode 2#10: A/B-phase ×1 mode 2#11: Pulse + direction (high level indicates the positive direction) Bit3–bit2: Frequency measurement period 2#00: 20 ms 2#01: 100 ms 2#10: 500 ms 2#11: 1000 ms Bit5–bit4: Edge latch counter value enable 2#00: Disable 2#01: Rising edge 2#10: Falling edge 2#11: Both edges Bit7–bit6: Reserved	Config Param

Parameter	Type	Meaning	Data type
		Bit9–bit8: Comparison match output pulse width 2#00: 1 ms 2#01: 2 ms 2#10: 4 ms 2#11: 8 ms Bit11–bit10: DO comparison output mode 2#00: Comparison match output 2#01: Output between [lower limit of count, comparison value] 2#10: Output between [comparison value, upper limit of count] 2#11: Reserved (comparison match output) Bit15–bit12: Reserved	
2EI_Cnt1_Cfg	UINT	Bit1–bit0: Channel mode configuration 2#00: A/B-phase ×4 mode 2#01: A/B-phase ×2 mode 2#10: A/B-phase ×1 mode 2#11: Pulse + direction (high level indicates the positive direction) Bit3–bit2: Frequency measurement period 2#00: 20 ms 2#01: 100 ms 2#10: 500 ms 2#11: 1000 ms Bit5–bit4: Edge latch counter value enable 2#00: Disable 2#01: Rising edge 2#10: Falling edge 2#11: Both edges Bit7–bit6: Reserved Bit9–bit8: Comparison match output pulse width 2#00: 1 ms 2#01: 2 ms 2#10: 4 ms 2#11: 8 ms Bit11–bit10: DO comparison output mode 2#00: Comparison match output 2#01: Output between [lower limit of count, comparison value] 2#10: Output between [comparison value, upper limit of count] 2#11: Reserved (comparison match output) Bit15–bit12: Reserved	
2EI_Cnt0_Filt	UINT	Filter parameter for Cnt A/B/Z/L/R terminals; unit: 0.1 μs	
2EI_Cnt1_Filt	UINT	Filter parameter for Cnt A/B/Z/L/R terminals; unit: 0.1 μs	
2EI_Cnt0_Ratio	UINT	Encoder resolution, that is, the number of pulses fed back per revolution and the pulse increment	

Parameter	Type	Meaning	Data type
		between two Z pulses	
2EI_Cnt1_Ratio	UINT	Encoder resolution, that is, the number of pulses fed back per revolution and the pulse increment between two Z pulses	
2EI_Cnt0_Status	USINT	Counter status feedback	Input (T→O)
2EI_Cnt1_Status	USINT	Bit0: Forward run flag Bit1: Reverse run flag Bit2: Overflow flag bit Bit3: Underflow flag bit Bit4: L0 latch completion flag Bit7–bit5: Reserved	
2EI_Cnt0_Val	DINT	Count value feedback	
2EI_Cnt1_Val	DINT	Count value feedback	
2EI_Cnt0_Freq	DINT	Count frequency feedback Hz	
2EI_Cnt1_Freq	DINT	Count frequency feedback Hz	
2EI_Cnt0_LatchVal	DINT	Count latch value feedback	
2EI_Cnt1_LatchVal	DINT	Count latch value feedback	
2EI_Cnt0_Velocity	DINT	Running speed feedback r/min	
2EI_Cnt1_Velocity	DINT	Running speed feedback r/min	
2EI_Cnt0_ErrID	UINT	Error code	Diagnosis Data (Input(T → O))
2EI_Cnt1_ErrID	UINT	Error code	
2EI_Cnt0_Ctrl	USINT	Bit0: Counter enable, active high Bit1: Clear counter value, rising edge active Bit2: Write counter preset value, rising edge active Bit3: Clear counter overflow flag, rising edge active Bit4: Counter comparison function enable, active high (requires counter enable first) Bit7–bit5: Reserved	Output (O→T)
2EI_Cnt1_Ctrl	USINT		
2EI_Cnt0_CmpVal	DINT	Counter comparison value	
2EI_Cnt1_CmpVal	DINT	Counter comparison value	
2EI_Cnt0_PresetVal	DINT	Counter preset value	
2EI_Cnt1_PresetVal	DINT	Counter preset value	

6.1.8 Bridge measurement module (AS71BRG1&AS71BRG2)

6.1.8.1 AS71BRG1

Parameter	Type	Meaning	Data type
1RB_RB_Cfg	UINT	Bit0: Channel enable Bit1: Tare mode. 0: Automatic tare; 1: Manual tare Bit3–bit2: Sensor sensitivity 2#00: 1 mV/V 2#01: 2 mV/V 2#10: 4 mV/V 2#11: 6 mV/V Bit7–bit4: Conversion time 4#0000: 1 ms 4#0001: 2 ms	Config Param

Parameter	Type	Meaning	Data type
		4#0010: 5 ms 4#0011: 10 ms 4#0100: 20 ms 4#0101: 40 ms 4#0110: 80 ms 4#0111: 200 ms 4#1000: 400 ms Bit15–bit8: Reserved	
1RB_RB_FullCode	DINT	Channel full-scale code value	
1RB_RB_Status	UINT	Status feedback Bit0: Zero calibration status Bit1: Gain calibration status Bit2: Tare status Bit3–bit15: Reserved	Input (T→O)
1RB_RB_SampleCode	DINT	Channel measurement code value	
1RB_RB_TareCode	DINT	Channel tare code value	
1RB_RB_ErrId	UINT	Channel fault code	Diagnosis Data (Input(T → O))
1RB_RB_Ctrl	USINT	Bit0: Enable zero calibration, rising edge active Bit1: Enable gain calibration, rising edge active Bit2: Update tare value by software, rising edge active Bit3: Restore factory settings, rising edge active Bit7–bit4: Reserved	Output (O→T)
1RB_RB_GainCode	DINT	Gain calibration code value, converted based on the full-scale code value	
1RB_RB_ManualTareCode	DINT	Manual tare code value, converted based on the full-scale code value	

6.1.8.2 AS71BRG2

Parameter	Type	Meaning	Data type
2RB_RB0_Cfg	UINT	Bit0: Channel enable	Config Param
2RB_RB1_Cfg		Bit1: Tare mode. 0: Automatic tare; 1: Manual tare Bit3–bit2: Sensor sensitivity 2#00: 1 mV/V 2#01: 2 mV/V 2#10: 4 mV/V 2#11: 6 mV/V Bit7–bit4: Conversion time 4#0000: 1 ms 4#0001: 2 ms 4#0010: 5 ms 4#0011: 10 ms 4#0100: 20 ms 4#0101: 40 ms 4#0110: 80 ms	

Parameter	Type	Meaning	Data type
		4#0111: 200 ms 4#1000: 400 ms Bit15–bit8: Reserved	
2RB_RB0_FullCode	DINT	Channel full-scale code value	
2RB_RB1_FullCode			
2RB_RB0_Status	USINT	Status feedback Bit0: Zero calibration status Bit1: Gain calibration status Bit2: Tare status Bit15–bit3: Reserved	Input (T→O)
2RB_RB1_Status			
2RB_RB0_SampleCode	DINT	Channel measurement code value	
2RB_RB1_SampleCode			
2RB_RB0_TareCode	DINT	Channel tare code value	
2RB_RB1_TareCode			
2RB_RB0_ErrId	UINT	Channel fault code	Diagnosis Data (Input(T → O))
2RB_RB1_ErrId			
2RB_RB0_Ctrl	USINT	Bit0: Enable zero calibration, rising edge active Bit1: Enable gain calibration, rising edge active Bit2: Update tare value by software, rising edge active Bit3: Restore factory settings, rising edge active Bit7–bit4: Reserved	Output (O→T)
2RB_RB1_Ctrl			
2RB_RB0_GainCode	DINT	Gain calibration code value, converted based on the full-scale code value	
2RB_RB1_GainCode			
2RB_RB0_ManualTareCode	DINT	Manual tare code value, converted based on the full-scale code value	
2RB_RB1_ManualTareCode			

6.1.9 Pulse module (AS71PUOC)

6.1.9.1 AS71PUOC

Parameter	Type	Meaning	Data type
2PTO_Ch0_Filt	UINT	Filter parameters (limit, brake, and home), unit: 10 μs	Config Param
2PTO_Ch1_Filt			
2PTO_Ch0_Brake Time	UINT	Brake time: [20, 5000], unit: ms	
2PTO_Ch1_Brake Time			
2PTO_Ch0_Scale	UINT	Scale factor, similar to a gear ratio. It defines the conversion relationship from user unit (u) to pulse unit (p). Example: 10000 indicates 1u = 10000p. A speed of 1 u/s indicates 10000 p/s. If 10000p = 1r for the controlled object, it indicates 1 r/s.	
2PTO_Ch1_Scale			
2PTO_Ch0_Cfg	USINT	Configuration parameter Bit1–bit0: Pulse output mode	
2PTO_Ch1_Cfg			

Parameter	Type	Meaning	Data type
		0: Pulse + direction 1: CW/CCW 2: Reserved 3: Reserved Bit2: Positive limit input signal logic. 0: normally open; 1: normally closed Bit3: Negative limit input signal logic. 0: normally open; 1: normally closed Bit4: Home input signal logic. 0: normally open; 1: normally closed Bit5: Brake input signal logic. 0: normally open; 1: normally closed Bit 6: Safe output mode. Processing method for the original motion when a specified parameter value error occurs. 0: brake; 1: keep the original operation Bit7: Reserved	
2PTO_Ch0_HomingMode 2PTO_Ch1_HomingMode	USINT	Homing mode 0: mode 19 1: mode 21 2: mode 24 3: mode 28	
2PTO_Ch0_HomingSpeed 2PTO_Ch1_HomingSpeed	DINT	Homing speed [u/s] ≤ 200 kHz	
2PTO_Ch0_HomingApproach Speed 2PTO_Ch1_HomingApproach Speed	DINT	Homing approach speed [u/s] < Homing speed	
2PTO_Ch0_Status 2PTO_Ch1_Status	USINT	Status feedback Bit0: Homing status. 1: Homing completed Bit1: Speed status. 1: Speed reached Bit2: Position status. 1: Position reached Bit3: Actual output direction. 1: Forward rotation; 0: Reverse rotation Bit5–bit4: Actual output status 0: No output 1: Accelerating 2: Decelerating 3: Running at constant speed Bit7–bit6: Current operation mode 0: Homing mode 1: Speed mode 2: Relative position mode 3: Absolute position mode Bit8: Positive limit status Bit9: Negative limit status Bit10: Home status	Input (T→O)

Parameter	Type	Meaning	Data type
		Bit11: Brake status Bit15–bit12: Reserved	
2PTO_Ch0_ActVel	DINT	Current speed [u/s]	
2PTO_Ch1_ActVel			
2PTO_Ch0_ActPos	DINT	Current position [u]	
2PTO_Ch1_ActPos			
2PTO_Ch0_ErrId	UINT	Channel fault code	Diagnosis Data (Input(T → O))
2PTO_Ch1_ErrId			
2PTO_Ch0_MoveMode	USINT	Operation mode 0: Homing mode 1: Speed mode 2: Relative position mode 3: Absolute position mode	Output (O→T)
2PTO_Ch1_MoveMode			
2PTO_Ch0_TargetVel	DINT	Target speed [u/s]. After scale conversion: ≤ 200 kHz. A negative value indicates the running direction only in speed mode. Negative speed values are not allowed in other modes.	
2PTO_Ch1_TargetVel			
2PTO_Ch0_TargetPos	DINT	Target position [u]	
2PTO_Ch1_TargetPos			
2PTO_Ch0_AccTime	UINT	Acceleration time, ms	
2PTO_Ch1_AccTime			
2PTO_Ch0_DecTime	UINT	Deceleration time, ms	
2PTO_Ch1_DecTime			
2PTO_Ch0_MoveCtrl	USINT	Motion control Bit0: Start operation (rising edge active) Bit1: Position reset to zero (rising edge active) Bit2: Software brake (active high; signal logic applies only to external input signals)	
2PTO_Ch1_MoveCtrl			

6.1.10 Serial communication module (AS71COM2)

The AS71COM2 serial communication module consists of the local AS71COM2 module and virtual Modbus RTU master, slave, and free-protocol modules. Virtual modules can be bound to local channels through startup parameter configuration. The operating mode of each bound channel must be configured to match that of the corresponding virtual module. The configuration parameters and PDO parameters of these modules are described below.

"M/S/F" in parentheses in the local parameters indicates the following:

M: Modbus RTU master parameter

S: Modbus RTU slave parameter

F: Free-protocol module parameter

6.1.10.1 Serial communication module–AS71COM2_2COM

Name	Index--Subindex	Parameter	Type	Meaning	Data type

Name	Index--Subindex	Parameter	Type	Meaning	Data type
Configuration parameter SDO	0x8040+0x80*n	2COM SDO Cfg	-	Serial communication module configuration parameter	Config Param
	Subindex 0x01	Com0_Enable (M/S/F)	USINT	1: Enable Com0 port (default) 2: Disable Com0 port	
	Subindex 0x02	Com0_Mode(M/S/F)	USINT	1: RS232 (default) 2: RS485	
	Subindex 0x03	Com0_Baudrate(M/S/F)	USINT	0: 1200 bps 1: 2400 bps 2: 4800 bps 3: 9600 bps 4: 19200 bps (default) 5: 38400 bps 6: 57600 bps 7: 115200 bps	
	Subindex 0x04	Com0_DataBit (M/S/F)	USINT	1: 7 bits 2: 8 bits (default)	
	Subindex 0x05	Com0_StopBit (M/S/F)	USINT	1: 1 bit (default) 2: 2 bits	
	Subindex 0x06	Com0_Parity (M/S/F)	USINT	0: No parity 1: Odd parity 2: Even parity (default)	
	Subindex 0x07	Com0_Type(M/S/F)	USINT	1: Modbus RTU Master, that is, RTU master mode (default) 2: Modbus RTU Slave, that is, RTU slave mode 3: Free Mode, that is, serial free-protocol mode	
	Subindex 0x08	Com0_SlaveID(S)	USINT	1–247 (The default slave ID is 1. In slave mode, each serial port has only one slave ID)	
	Subindex 0x09	Com0_ResponseDelay(S)	UINT	Default: 50 ms; configurable range: 0–65535 ms	
	Subindex 0xA	Com0_Frame interval (ms)(M/S/F)	UINT	Default: 3 ms; configurable range: 0–65535 ms	
	Subindex 0xB	Com0_ResponseTimedout(ms)(M)	UINT	If the slave does not respond within the set time, the master retransmits the command. Range: 10–65535 ms; default: 1000 ms	
	Subindex 0xC	Com0_Polling Delay (ms)(M)	UINT	This parameter is valid only in polling mode. Range: 0–65535 ms; default: 100 ms.	
	Subindex 0xD	Com0_ByteSwap(M)	USINT	0: Disable swap (default)	

Name	Index--Subindex	Parameter	Type	Meaning	Data type
				1: Enable swap	
	Subindex 0xE	Com0_WordSwap(M)	USINT	0: Disable swap (default) 1: Enable swap	
	Subindex 0xF	Com0_ReissuedNum (M)	USINT	If the slave does not respond within the set time, the master retransmits the command. Range: 0–255; default: 3 times	
	Subindex 0x10	Com0_ Errorhanding (M)	USINT	0: Hold the last output value 1: Clear output to zero (default)	
	Subindex 0x11	Com0_OutputMode(M)	USINT	0: Disable the data-change event triggering function (default) 1: Enable the data-change event triggering function: A write command is sent only when Modbus output data changes. This parameter is valid only in polling mode.	
	Subindex 0x12	Com1_Enable (M/S/F)	USINT	1: Enable Com1 port (default) 2: Disable Com1 port	
	Subindex 0x13	Com1_Mode(M/S/F)	USINT	1: RS232 2: RS485 (default)	
	Subindex 0x14	Com1_Baudrate(M/S/F)	USINT	0: 1200 bps 1: 2400 bps 2: 4800 bps 3: 9600 bps 4: 19200 bps (default) 5: 38400 bps 6: 57600 bps 7: 115200 bps	
	Subindex 0x15	Com1_DataBit(M/S/F)	USINT	1: 7 bits 2: 8 bits (default)	
	Subindex 0x16	Com1_StopBit(M/S/F)	USINT	1: 1 bit (default) 2: 2 bits	
	Subindex 0x17	Com1_Parity(M/S/F)	USINT	0: No parity 1: Odd parity 2: Even parity (default)	
	Subindex 0x18	Com1_Type(M/S/F)	USINT	1: Modbus RTU Master, that is, RTU master mode (default) 2: Modbus RTU Slave, that is, RTU slave mode	

Name	Index--Subindex	Parameter	Type	Meaning	Data type
				3: Free Mode, that is, serial free-protocol mode	
	Subindex 0x19	Com1_SlaveID(S)	USINT	1–247 (The default slave ID is 1. In slave mode, each serial port has only one slave ID)	
	Subindex 0x1A	Com1_ResponseDelay(S)	UINT	Default: 50 ms; configurable range: 0–65535 ms	
	Subindex 0x1B	Com1_Frame interval (ms)(M/S/F)	UINT	Default: 3 ms; configurable range: 0–65535 ms	
	Subindex 0x1C	Com1_ResponseTimedout(ms)(M)	UINT	If the slave does not respond within the set time, the master retransmits the command. Range: 10–65535 ms; default: 1000 ms	
	Subindex 0x1D	Com1_Polling Delay (ms)(M)	UINT	This parameter is valid only in polling mode. Range: 0–65535 ms; default: 100 ms.	
	Subindex 0x1E	Com1_ByteSwap(M)	USINT	0: Disable swap (default) 1: Enable swap	
	Subindex 0x1F	Com1_ WordSwap(M)	USINT	0: Disable swap (default) 1: Enable swap	
	Subindex 0x20	Com1_ReissuedNum(M)	USINT	If the slave does not respond within the set time, the master retransmits the command. Range: 0–255; default: 3 times	
	Subindex 0x21	Com1_ Errorhanding (M)	USINT	0: Hold the last output value 1: Clear output to zero (default)	
	Subindex 0x22	Com1_OutputMode(M)	USINT	0: Disable the data-change event triggering function (default) 1: Enable the data-change event triggering function: A write command is sent only when Modbus output data changes. This parameter is valid only in polling mode.	
Control parameter RxPDO	0x7040+0x80*n	2COM Out-Map	-	Serial communication module control parameter	-
	Subindex 0x01	Triger0	BIT	Trigger control bit: Valid when Triger0-Riseedge or	

Name	Index--Subindex	Parameter	Type	Meaning	Data type
				Triger0-levelcontinue is configured for the master module.	
	.....	.....	.....	Triger1–Triger30	
	Subindex 0x20	Triger31	BIT	Trigger control bit: Valid when Triger31-Riseedge or Triger31-levelcontinue is configured for the master module.	
Feedback parameter TxPDO	0x6040+0x80*n	2COM In-Map	-	Serial communication module status feedback parameter	-
	Subindex 0x01	ModuleErrID	UINT	Module error code. See 8.1 Common faults and solutions.	
	Subindex 0x02	Slaver0_errno	USINT	Communication fault code of channel 0 slave. See 8.2 Serial communication module exception code description	
	Subindex 0x03	Slaver1_errno	USINT	Communication fault code of channel 1 slave. See 8.2 Serial communication module exception code description	
Status parameter SDO	0x8078+0x80*n	Module Info	-	Module information	-
	Subindex 0x01	HW Version	UINT	Module hardware version number	-
	Subindex 0x02	FPGA Version	UINT	Module FPGA software version number	-
Note: n represents the slot where the expansion module is located, and n∈[0,31].					

6.1.10.2 Serial communication module – Modbus RTU master virtual module

The Modbus RTU master virtual modules are as follows:

No.	Name	Function	Supported function code
1	M: rw 4 Words	Master virtual module, can access 4 Words of input/output data	01/02/03/04/05/06/15/16
2	M: rw 8 Words	Master virtual module, can access 8 Words of input/output data	01/02/03/04/05/06/15/16
3	M: rw 16 Words	Master virtual module, can access 16 Words of input/output data	01/02/03/04/05/06/15/16
4	M: rw 32 Words	Master virtual module, can access 32 Words of input/output data	01/02/03/04/05/06/15/16
5	M: rw 64 Words	Master virtual module, can access 64 Words of input/output data	01/02/03/04/05/06/15/16

No.	Name	Function	Supported function code
6	M: rw 128 Words	Master virtual module, can access 128 Words of input/output data	01/02/03/04/05/06/15/16

M: rw 4 Words: 0x8041+0x80*n

M: rw 8 Words: 0x8042+0x80*n

M: rw 16 Words: 0x8043+0x80*n

M: rw 32 Words: 0x8044+0x80*n

M: rw 64 Words: 0x8045+0x80*n

M: rw 128 Words: 0x8046+0x80*n

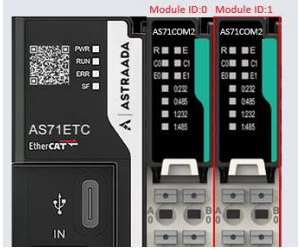
The six master virtual modules have the same parameters, but support different accessible address lengths. Select a module with an appropriate length according to the actual application.

Name	Index--Subindex	Parameter	Type	Meaning	Data type
Configuration parameter SDO	0x8041+0x80*n	Config	-	Virtual module configuration parameter	Config Param
	Subindex 0x01	ModuleID	USINT	See the description after the table. The ID of the serial communication module closest to the coupler in the configuration is 0, and the ID of the second serial communication module is 1. The IDs are counted sequentially in this order. Default: 0	
	Subindex 0x02	PortID	USINT	0: Serial port 0 (default) 1: Serial port 1	
	Subindex 0x03	ControlMode	USINT	See the description after the table. 0: PollingMode, polling mode 1: Triger0-Riseedge Triger0 rising-edge trigger control 2: Triger1-Riseedge Triger1 rising-edge trigger control ..... 32: Triger31-Riseedge Triger31 rising-edge trigger control 33: Triger0-levelcontinue Triger0 high-level continuous active control 34: Triger1-levelcontinue Triger1 high-level continuous active control	

Name	Index--Subindex	Parameter	Type	Meaning	Data type
				…… 64: Triger31- levelcontinue Triger31 high-level continuous active control	
Control parameter RxPDO	0x7041+0x80*n	Output-Map	-	Master virtual module control parameter	-
	Subindex 0x01	SlaveID	USINT	Slave ID: ID of the slave to be read, 1–247	
	Subindex 0x02	Cmd	USINT	Function code: 01/02/03/04/05/06/15/16	
	Subindex 0x03	Address	UINT	Register address	
	Subindex 0x04	Len	UINT	Length (The unit is Word or Bit, depending on the function code)	
	Subindex 0x05	OutputData1	UINT	Corresponds to Address	
	Subindex 0x06	OutputData2	UINT	Corresponds to Address+1	
	Subindex 0x07	OutputData3	UINT	Corresponds to Address+2	
	Subindex 0x08	OutputData4	UINT	Corresponds to Address+3	
Feedback parameter TxPDO	0x6041+0x80*n	In-Map	-	Master virtual module status feedback parameter	-
	Subindex 0x01	StateWord	UINT	=0: Idle; trigger bit is 0 =1: Executing; trigger bit level is 1, and sending has started =2: Execution complete; sent and response received.	
	Subindex 0x02	CmdErrno	UINT	See 8.2 Serial communication module exception code description	
	Subindex 0x03	InputData1	UINT	Corresponds to Address	
	Subindex 0x04	InputData2	UINT	Corresponds to Address+1	
	Subindex 0x05	InputData3	UINT	Corresponds to Address+2	
	Subindex 0x06	InputData4	UINT	Corresponds to Address+3	
Note: n represents the slot where the expansion module is located, and n∈[0,31].					

ModuleID parameter description:

This parameter indicates which serial communication module is bound. In the configuration, there may be multiple serial communication modules. The serial communication module closest to the coupler is numbered 0, and the following modules are numbered sequentially by adding 1. For example, if there are two serial communication modules in one configuration, as shown below:



If the virtual module needs to be bound to the first module, set ModuleID to 0. If it needs to be bound to the second module, set ModuleID to 1.

ControlMode parameter description:

The master module can be configured in modes such as polling, rising-edge trigger, and level trigger. The trigger bit for trigger mode is associated with the PDO control parameters Triger0–Triger31 of the local serial communication module AS71COM2. Selecting Triger0-Riseedge associates the rising-edge trigger of Triger0, while selecting Triger31-Riseedge associates the rising-edge trigger of Triger31. Different master modules can select the same trigger bit or different trigger bits. Level triggering is the same as rising-edge triggering.

6.1.10.3 Serial communication module–Modbus RTU slave virtual module

When a channel needs to be configured in slave mode, define the following resource lengths according to the Modbus protocol:

Resource	Object type	Access type	Function code
Discrete Inputs	Bit operation	Read only	02
Coils	Bit operation	Read/Write	01/05/15
Input Register	Word operation	Read only	04
Holding Register	Word operation	Read/Write	03/06/16

Start address convention: For virtual modules of the same type under the same channel, the virtual module closest to the coupler in the configuration starts from address 0, and the addresses increase sequentially for subsequent modules.

6.1.10.3.1 Discrete input module

No.	Name	Function	Supported function code
1	S: 16 Discrete Inputs	Defines 16-bit discrete inputs	02
2	S: 64 Discrete Inputs	Defines 64-bit discrete inputs	02
3	S: 256 Discrete Inputs	Defines 256-bit discrete inputs	02
4	S: 1024 Discrete Inputs	Defines 1024-bit discrete inputs	02

The four virtual modules have the same parameters, but support different accessible address lengths. Select a module with an appropriate length according to the actual application.

S: 16 Discrete Inputs: 0x804B+0x80*n

S: 64 Discrete Inputs: 0x804C+0x80*n

S: 256 Discrete Inputs: 0x804D+0x80*n

S: 1024 Discrete Inputs: 0x804E+0x80*n

Name	Index--Subindex	Parameter	Type	Meaning	Data type
Configuration parameter SDO	0x804B+0x80*n	Config	-	Virtual discrete input module configuration parameter	Config Param
	Subindex 0x01	ModuleID	USINT	The ID of the serial communication module closest to the coupler in the configuration is 0, and the ID of the second serial communication module is 1. The IDs are counted sequentially in this order.	

Name	Index--Subindex	Parameter	Type	Meaning	Data type
				Default: 0	
	Subindex 0x02	PortID	USINT	0: Serial port 0 (default) 1: Serial port 1	
Control parameter RxPDO	0x704B+0x80*n	Output-Map	-	Discrete input virtual module control parameter	-
	Subindex 0x01	DO0	BIT	Input 0	
	Subindex 0x02	DO1	BIT	Input 1	
	Subindex 0x03	DO2	BIT	Input 2	
	Subindex...	DO...	BIT	Input...	
	Subindex 0x11	DO15	BIT	Input 15	
Note: n represents the slot where the expansion module is located, and n∈[0,31].					

6.1.10.3.2 Coil module

No.	Name	Function	Supported function code
1	S: 16 Coils	Defines 16-bit coils	01/05/15
2	S: 64 Coils	Defines 64-bit coils	01/05/15
3	S: 256 Coils	Defines 256-bit coils	01/05/15
4	S: 1024 Coils	Defines 1024-bit coils	01/05/15

The four virtual modules have the same parameters, but support different accessible address lengths. Select a module with an appropriate length according to the actual application.

S: 16 Coils: 0x804F+0x80*n

S: 64 Coils: 0x8050+0x80*n

S: 256 Coils: 0x8051+0x80*n

S: 1024 Coils: 0x8052+0x80*n

Name	Index--Subindex	Parameter	Type	Meaning	Data type
Configuration parameter SDO	0x804F+0x80*n	Config	-	Virtual coil output module configuration parameter	Config Param
	Subindex 0x01	ModuleID	USINT	The ID of the serial communication module closest to the coupler in the configuration is 0, and the ID of the second serial communication module is 1. The IDs are counted sequentially in this order. Default: 0	
	Subindex 0x02	PortID	USINT	0: Serial port 0 (default) 1: Serial port 1	
Feedback parameter TxPDO	0x604B+0x80*n	Input-Map	-	Virtual coil output module control parameter	-
	Subindex 0x01	DI0	BIT	Output 0	
	Subindex 0x02	DI1	BIT	Output 1	

Name	Index--Subindex	Parameter	Type	Meaning	Data type
	Subindex 0x03	DI2	BIT	Output 2	
	Subindex...	DI...	BIT	Output...	
	Subindex 0x11	DI15	BIT	Output 15	
Note: n represents the slot where the expansion module is located, and n∈[0,31].					

6.1.10.3.3 Input register module

No.	Name	Function	Supported function code
1	S: 4 Input Register	Defines 4 input registers	04
2	S: 8 Input Register	Defines 8 input registers	04
3	S: 16 Input Register	Defines 16 input registers	04
4	S: 32 Input Register	Defines 32 input registers	04
5	S: 64 Input Register	Defines 64 input registers	04

The five virtual modules have the same parameters, but support different accessible address lengths. Select a module with an appropriate length according to the actual application.

S: 4 Input Register: 0x8053+0x80*n

S: 8 Input Register: 0x8054+0x80*n

S: 16 Input Register: 0x8055+0x80*n

S: 32 Input Register: 0x8056+0x80*n

S: 64 Input Register: 0x8057+0x80*n

Name	Index--Subindex	Parameter	Type	Meaning	Data type
Configuration parameter SDO	0x8053+0x80*n	Config	-	Input register virtual module configuration parameter	Config Param
	Subindex 0x01	ModuleID	USINT	The ID of the serial communication module closest to the coupler in the configuration is 0, and the ID of the second serial communication module is 1. The IDs are counted sequentially in this order. Default: 0	
	Subindex 0x02	PortID	USINT	0: Serial port 0 (default) 1: Serial port 1	
Control parameter RxPDO	0x7053+0x80*n	Output-Map	-	Input register virtual module control parameter	-
	Subindex 0x01	OutputData1	UINT	Register 1	
	Subindex 0x02	OutputData2	UINT	Register 2	
	Subindex 0x03	OutputData3	UINT	Register 3	
	Subindex 0x04	OutputData4	UINT	Register 4	
Note: n represents the slot where the expansion module is located, and n∈[0,31].					

6.1.10.3.4 Holding register module

No.	Name	Function	Supported function code
1	S: 4 Holding Register	Defines 4 holding registers	03/06/16
2	S: 8 Holding Register	Defines 8 holding registers	03/06/16
3	S: 16 Holding Register	Defines 16 holding registers	03/06/16
4	S: 32 Holding Register	Defines 32 holding registers	03/06/16
5	S: 64 Holding Register	Defines 64 holding registers	03/06/16

The five virtual modules have the same parameters, but support different accessible address lengths. Select a module with an appropriate length according to the actual application.

S: 4 Holding Register: 0x8058+0x80*n

S: 8 Holding Register: 0x8059+0x80*n

S: 16 Holding Register: 0x805A+0x80*n

S: 32 Holding Register: 0x805B+0x80*n

S: 64 Holding Register: 0x805C+0x80*n

Name	Index--Subindex	Parameter	Type	Meaning	Data type
Configuration parameter SDO	0x8058+0x80*n	Config	-	Holding register virtual module configuration parameter	Config Param
	Subindex 0x01	ModuleID	USINT	The ID of the serial communication module closest to the coupler in the configuration is 0, and the ID of the second serial communication module is 1. The IDs are counted sequentially in this order. Default: 0	
	Subindex 0x02	PortID	USINT	0: Serial port 0 (default) 1: Serial port 1	
Feedback parameter TxPDO	0x6058+0x80*n	Input-Map	-	Output register virtual module control parameter	-
	Subindex 0x01	InputData1	UINT	Register 1	
	Subindex 0x02	InputData2	UINT	Register 2	
	Subindex 0x03	InputData3	UINT	Register 3	
	Subindex 0x04	InputData4	UINT	Register 4	
Note: n represents the slot where the expansion module is located, and n∈[0,31].					

6.1.10.4 Serial communication module–Free-protocol virtual module

6.1.10.4.1 Free-protocol transmit module

No.	Name	Function
1	F: Send 16 Bytes	Module that can send up to 16 bytes
2	F: Send 32 Bytes	Module that can send up to 32 bytes

No.	Name	Function
3	F: Send 64 Bytes	Module that can send up to 64 bytes
4	F: Send 128 Bytes	Module that can send up to 128 bytes
5	F: Send 256 Bytes	Module that can send up to 256 bytes
6	F: Send 512 Bytes	Module that can send up to 512 bytes

The six virtual modules have the same parameters, but support different accessible address lengths. Select a module with an appropriate length according to the actual application.

F: Send 16 Bytes: 0x8060+0x80*n

F: Send 32 Bytes: 0x8061+0x80*n

F: Send 64 Bytes: 0x8062+0x80*n

F: Send 128 Bytes: 0x8063+0x80*n

F: Send 256 Bytes: 0x8064+0x80*n

F: Send 512 Bytes: 0x8065+0x80*n

Name	Index--Subindex	Parameter	Type	Meaning	Data type
Configuration parameter SDO	0x8060+0x80*n	Config	-	Free-protocol transmit virtual module configuration parameter	Config Param
	Subindex 0x01	ModuleID	USINT	The ID of the serial communication module closest to the coupler in the configuration is 0, and the ID of the second serial communication module is 1. The IDs are counted sequentially in this order. Default: 0	
	Subindex 0x02	PortID	USINT	0: Serial port 0 (default) 1: Serial port 1	
Control parameter RxPDO	0x7060+0x80*n	Output-Map	-	Free-protocol transmit virtual module control parameter	-
	Subindex 0x01	ControlWord	UINT	Control word 0: Clear error / return to ready-to-send state 1: Normal transmission	
	Subindex 0x02	Sendlen	UINT	Transmission length	
	Subindex 0x03	OutputData	ARRAY[0..15]	Data	
Feedback parameter TxPDO	0x6060+0x80*n	Input-Map	-	Free-protocol transmit virtual module feedback parameter	-
	Subindex 0x01	SendState	UINT	Transmission status: 0: Idle 1: Transmitting 2: Transmission successful 3: Transmission failed 4: Transmission timeout 5: Parameter setting error (send length exceeds	

Name	Index--Subindex	Parameter	Type	Meaning	Data type
				module capacity or is 0) 11: Serial port busy	
Note: n represents the slot where the expansion module is located, and n∈[0,31].					

6.1.10.4.2 Free-protocol receive module

No.	Name	Function
1	F: Receive 16 Bytes	Module that can receive up to 16 bytes
2	F: Receive 32 Bytes	Module that can receive up to 32 bytes
3	F: Receive 64 Bytes	Module that can receive up to 64 bytes
4	F: Receive 128 Bytes	Module that can receive up to 128 bytes
5	F: Receive 256 Bytes	Module that can receive up to 256 bytes
6	F: Receive 512 Bytes	Module that can receive up to 512 bytes

The six virtual modules share the same parameters, but support different accessible address lengths. Select an appropriate module according to the actual application requirements.

F: Receive 16 Bytes: 0x8066+0x80*n

F: Receive 32 Bytes: 0x8067+0x80*n

F: Receive 64 Bytes: 0x8068+0x80*n

F: Receive 128 Bytes: 0x8069+0x80*n

F: Receive 256 Bytes: 0x806A+0x80*n

F: Receive 512 Bytes: 0x806B+0x80*n

Name	Index--Subindex	Parameter	Type	Meaning	Data type
Configuration parameter SDO	0x8066+0x80*n	Config	-	Free-protocol receive virtual module configuration parameter	Config Param
	Subindex 0x01	ModuleID	USINT	The ID of the serial communication module closest to the coupler in the configuration is 0, and the ID of the second serial communication module is 1. The IDs are counted sequentially in this order. Default: 0	
	Subindex 0x02	PortID	USINT	0: Serial port 0 (default) 1: Serial port 1	
Control parameter RxPDO	0x7066+0x80*n	Output-Map	-	Free-protocol receive virtual module control parameter	-
	Subindex 0x01	ControlWord	UINT	Control word 0: Clear error / return to ready-to-receive state 1: Receive	
	Subindex 0x02	Reserve	UINT	Reserved	

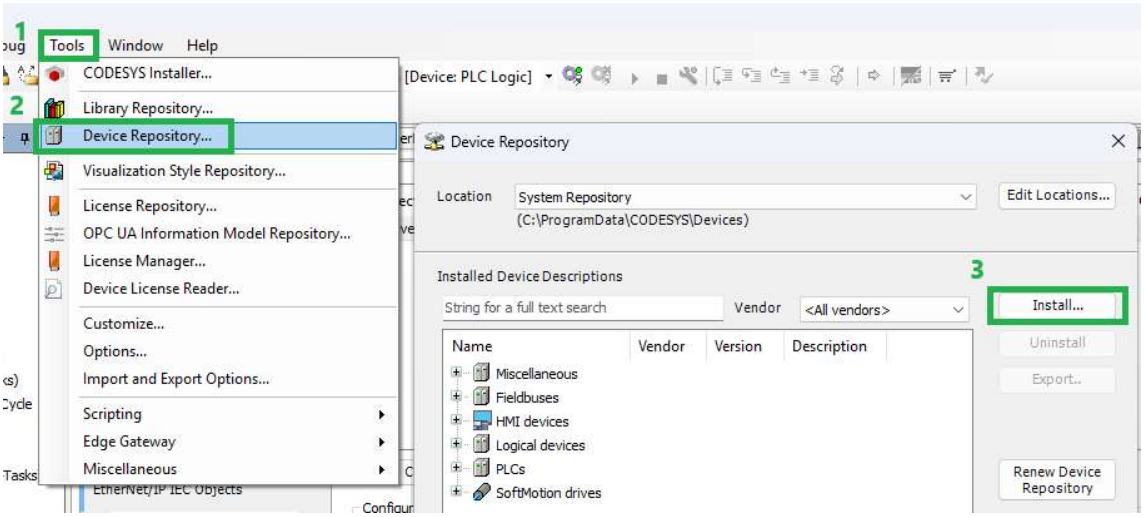
Name	Index--Subindex	Parameter	Type	Meaning	Data type
Feedback parameter TxPDO	0x6066+0x80*n	Input-Map	-	Free-protocol receive virtual module feedback parameter	-
	Subindex 0x01	ReceiveState	UINT	Receive status: 0: Idle 1: Receiving 2: Receive successful 3: Receive failed 4: Receive timeout 10: Received length exceeds module capacity 11: Serial port busy	
	Subindex 0x02	ActRecLen	UINT	Actual received data length	
	Subindex 0x03	InputData	ARRAY[0..15]	Data	
Note: n represents the slot where the expansion module is located, and n∈[0,31].					

6.2 EtherCAT configuration

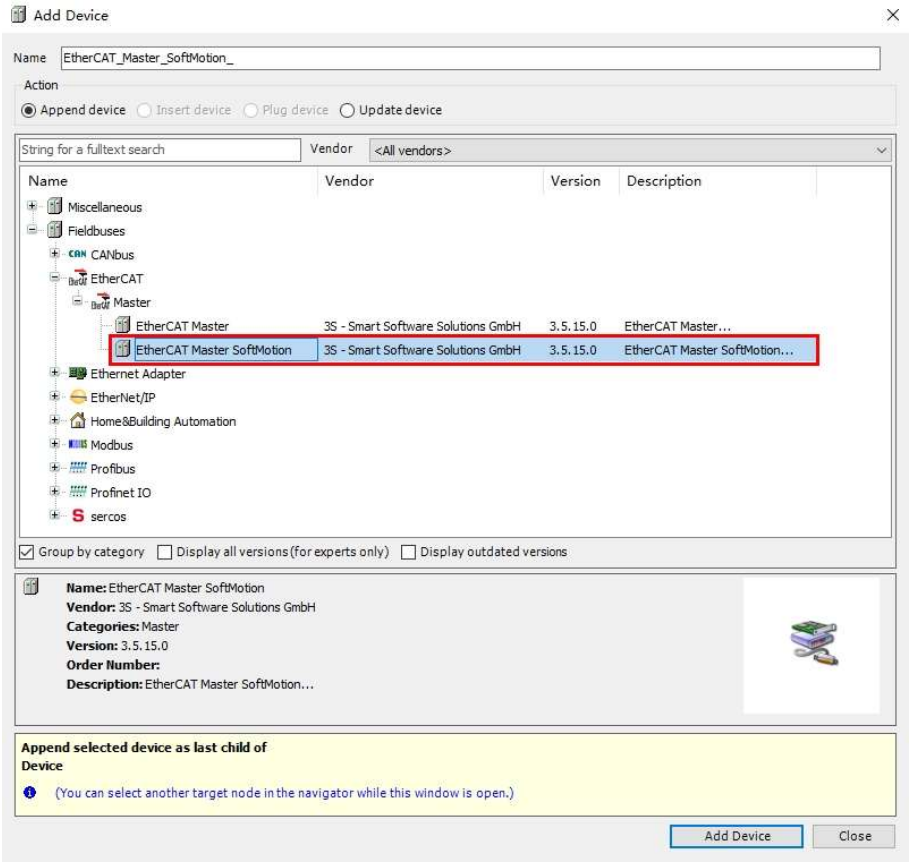
6.2.1 CODESYS configuration

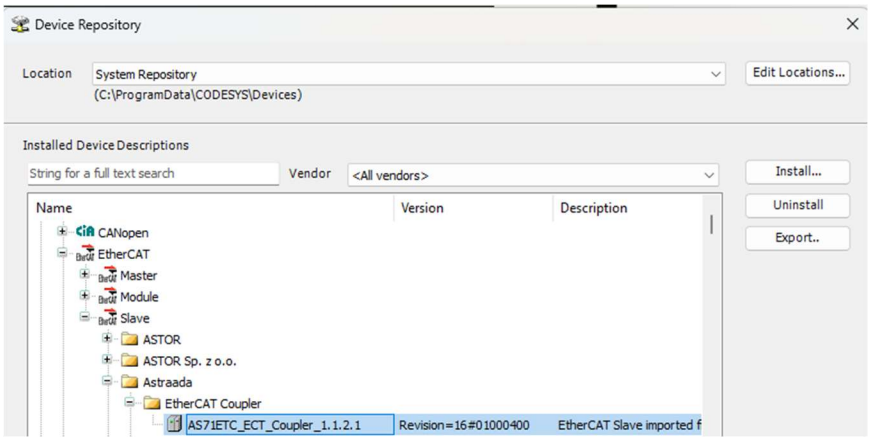
6.2.1.1 EtherCAT communication coupler

Step 1 Click **Install**, and select the device description file. The file name is typically "AS71ETC_ECT_Coupler_x.x.x.x.xml", then click **Open**.

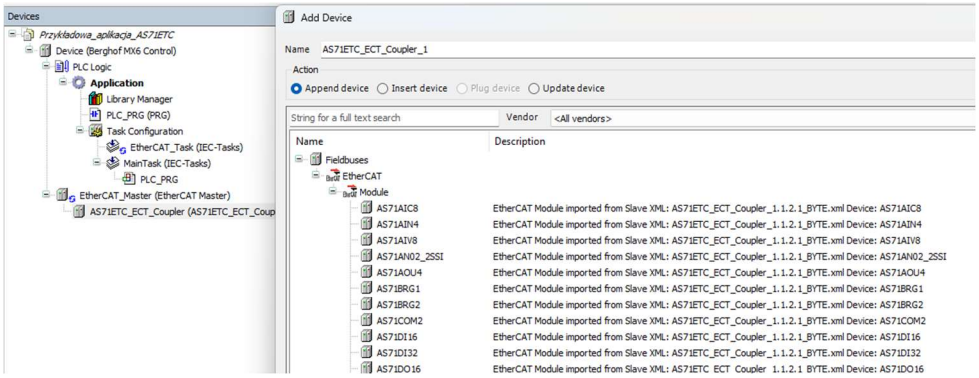


Step 2 Click **Add Device** to add the master and slave devices respectively.





Step 3 Add module network configuration based on actual physical configuration (module connection).



Step 4 After completing the network configuration, set all configuration module parameters. Once compiled, the program can be downloaded and run.

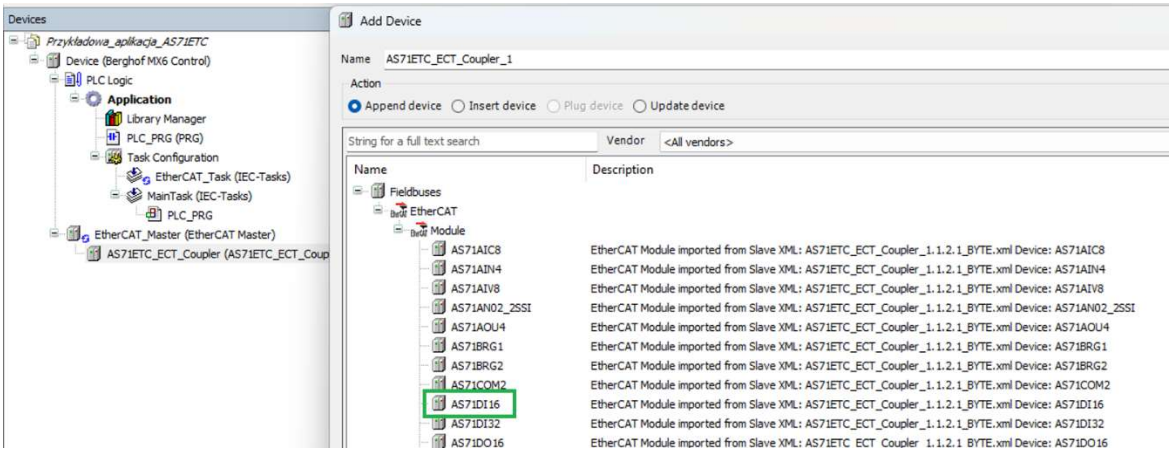
Step 5 (Optional) Enable or disable the module based on actual needs.

For detailed parameter descriptions, refer to section 6.1 Parameter description.

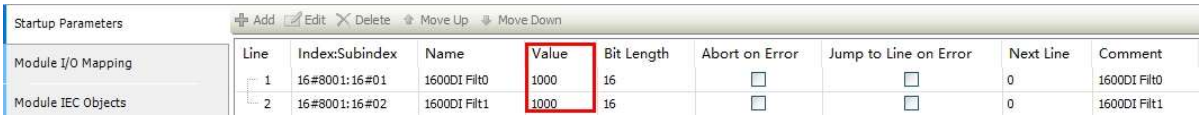
6.2.1.2 Module configuration

6.2.1.2.1 Digital input module

Step 1 Click **Add Device** and add the AS71DI16 module.



Step 2 Set the filter parameter value. The digital input module is divided into groups of 8 points, and different filter parameters can be configured per group. In the startup parameters, adjust the port filter mode according to actual requirements. The unit is 10 μs, and the default value is 10 ms.

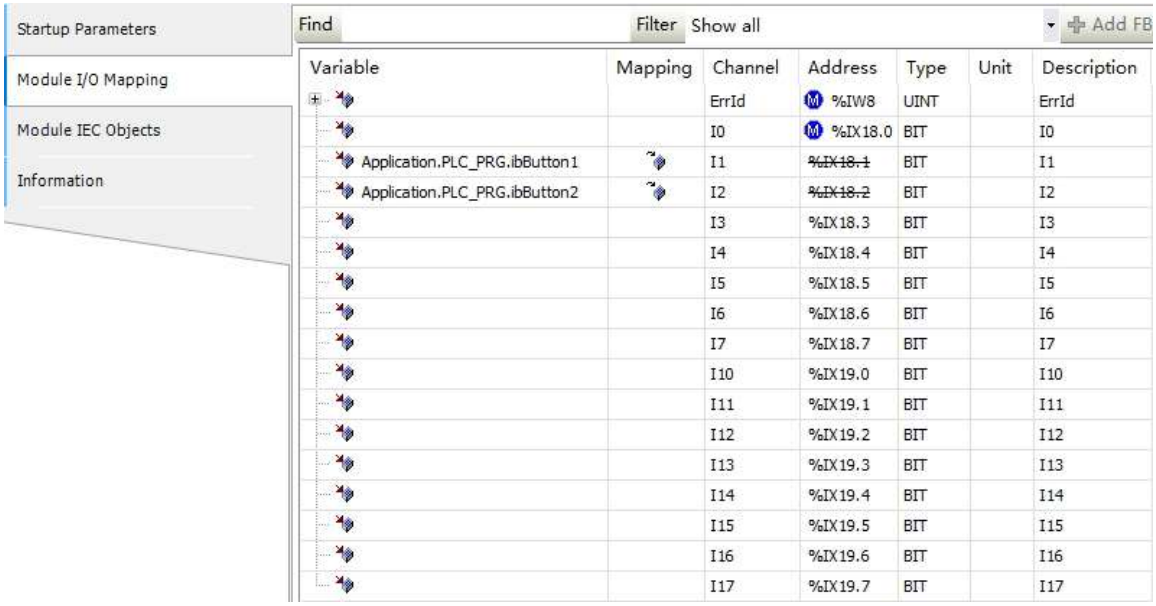


Step 3 Define BOOL variables **ibButton1** and **ibButton2** in the program.

```
VAR
ibButton1      : BOOL;
ibButton2      : BOOL;

END_VAR
```

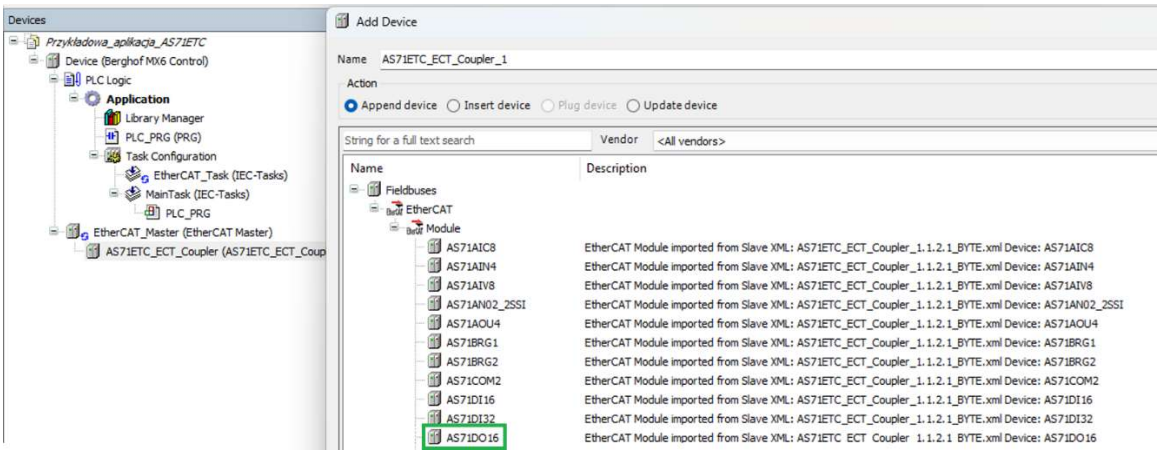
Step 4 Map variables **ibButton1** and **ibButton2** to the corresponding input points in **Module I/O Mapping**. The mapped variables can then be used directly in the program.



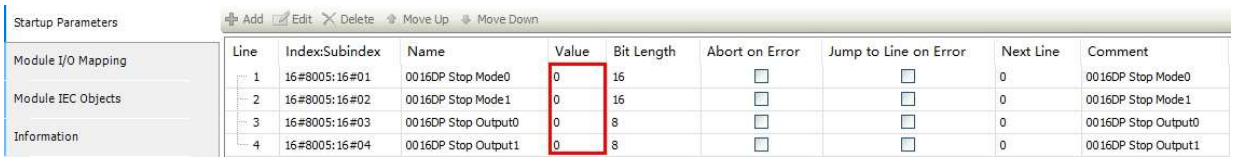
Note: For detailed parameter descriptions, refer to section 6.1 Parameter description.

6.2.1.2.2 Digital output module

Step 1 Click **Add Device** and add the AS71DO16 module.



Step 2 Set the stop/offline output mode and preset value based on actual needs in the startup parameters.



The digital output module divides every eight channels into a group. Taking configuration of Stop Mode0 as an example, the corresponding output channels are Q0–Q7. Stop Mode0 uses a UINT data type, and every 2 bits define one output stop mode. The data definition is shown in the parameter table below.

Q7		Q6		Q5		Q4		Q3		Q2		Q1		Q0	
Bit15	Bit14	Bit13	Bit12	Bit11	Bit10	Bit9	Bit8	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0

Modes corresponding to the two-bit values of each output channel are as follows:

Value	Mode
2#00	Stop/offline output retained
2#01	Stop/offline output cleared
2#10	Stop/offline output preset

Example: If Q0 is set to Stop/offline output retained, Q1 is set to Stop/offline output cleared, and Q2–Q7 are all set to Stop/offline output preset, the value of Stop Mode0 is 43684, that is 2#1010101010100100.

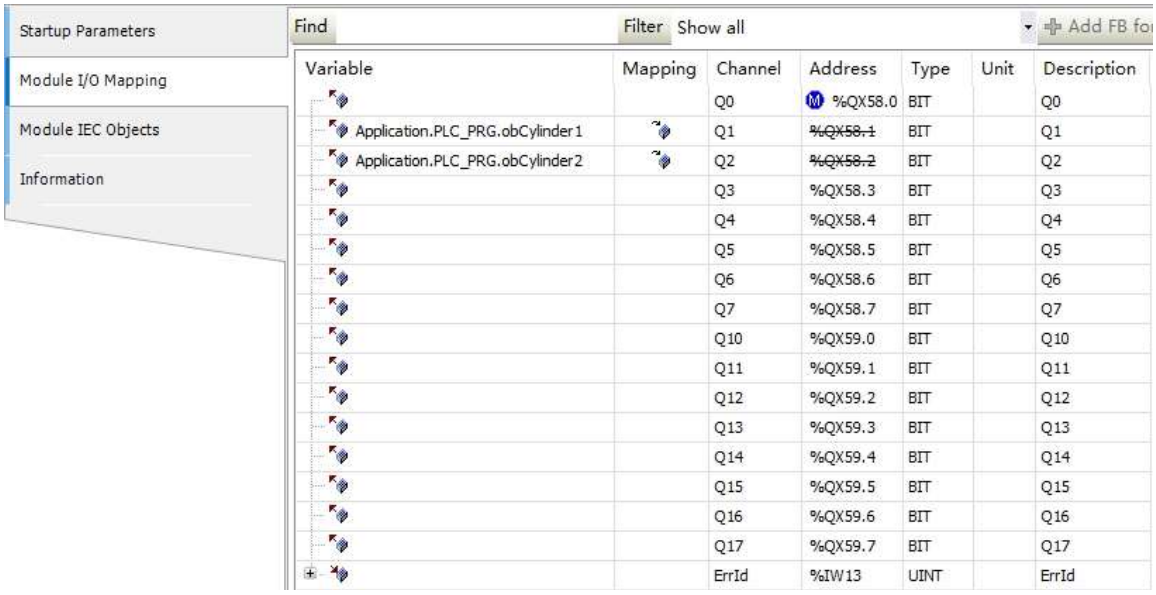
Q7		Q6		Q5		Q4		Q3		Q2		Q1		Q0	
1	0	1	0	1	0	1	0	1	0	1	0	0	1	0	0

Step 3 Define BOOL variables **obCylinder1** and **obCylinder2** in the program.

```
VAR
obCylinder1    : BOOL;
obCylinder2    : BOOL;

END_VAR
```

Step 4 Map variables **obCylinder1** and **obCylinder2** to the corresponding output points in **Module I/O Mapping**. The mapped variables can then be used directly in the program.

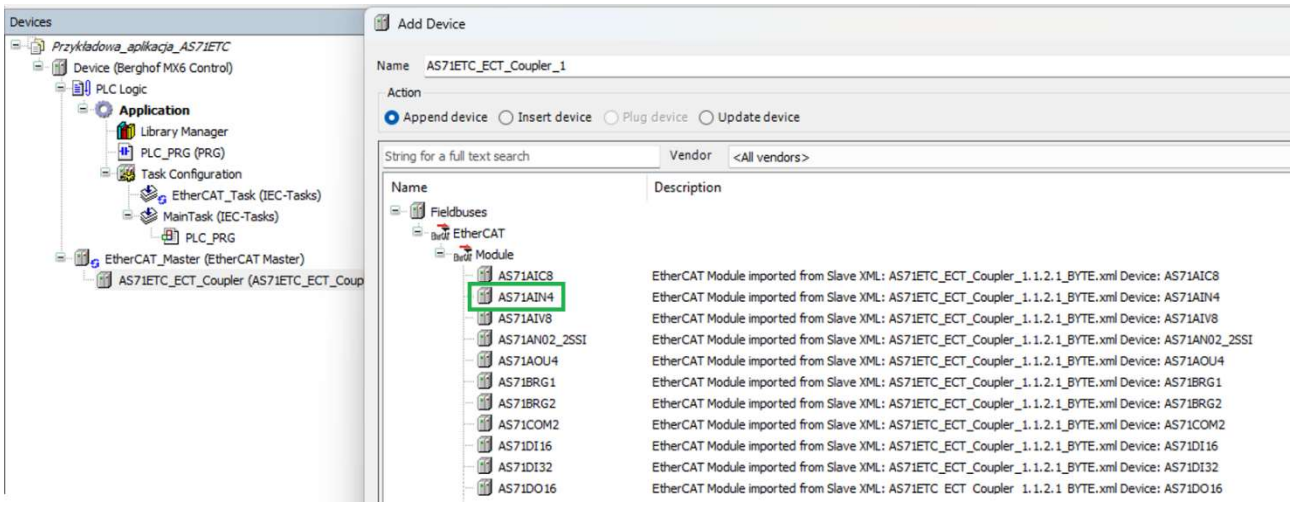


Variable	Mapping	Channel	Address	Type	Unit	Description
		Q0	%QX58.0	BIT		Q0
Application.PLC_PRG.obCylinder1		Q1	~~%QX58.1~~	BIT		Q1
Application.PLC_PRG.obCylinder2		Q2	~~%QX58.2~~	BIT		Q2
		Q3	%QX58.3	BIT		Q3
		Q4	%QX58.4	BIT		Q4
		Q5	%QX58.5	BIT		Q5
		Q6	%QX58.6	BIT		Q6
		Q7	%QX58.7	BIT		Q7
		Q10	%QX59.0	BIT		Q10
		Q11	%QX59.1	BIT		Q11
		Q12	%QX59.2	BIT		Q12
		Q13	%QX59.3	BIT		Q13
		Q14	%QX59.4	BIT		Q14
		Q15	%QX59.5	BIT		Q15
		Q16	%QX59.6	BIT		Q16
		Q17	%QX59.7	BIT		Q17
		ErrId	%IW13	UINT		ErrId

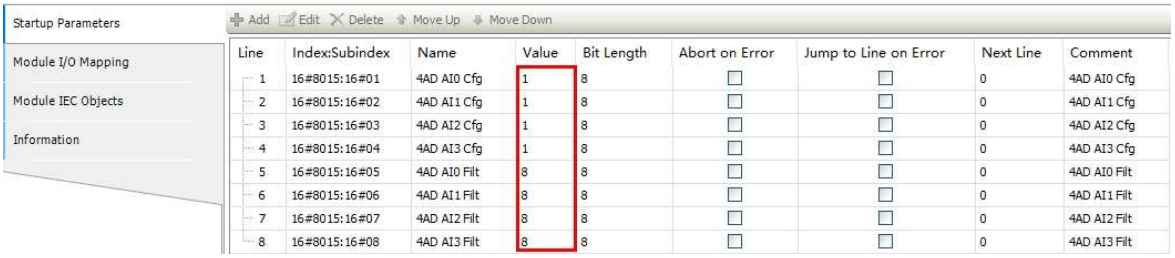
Note: For detailed parameter descriptions, refer to section 6.1 Parameter description.

6.2.1.2.3 Analog input module

Step 1 Click **Add Device** and add the AS71AIN4 module.



Step 2 Set the channel configuration and channel filter parameters based on actual needs in the startup parameters.



AIx_Cfg (x = 0, 1, 2, 3) is the channel configuration parameter, with data type USINT. Taking Channel 0 as an example, the data definition is as follows:

bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
Channel conversion mode (range configuration)			Enhanced filter enable	Over-range enable	Over-range detection enable	Open-circuit detection enable	Channel enable
2#000: 0–5 V 2#001: 0–10 V 2#010:-5 V–5 V 2#011:-10 V–+10 V		2#100: 4–20 mA 2#101: 0–20 mA 2#110: reserved 2#111: -20–+20 mA	0: Disable 1: Enable	0: Disable 1: Enable	0: Disable 1: Enable	0: Disable 1: Enable	0: Disable 1: Enable

Example: If Channel 0 is configured as channel enabled, open-circuit detection disabled, over-range detection enabled, over-range enabled, enhanced filter disabled, and range set to 4–20 mA, the resulting value is 141, that is, 0b10001101.

bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
2#100			0	1	1	0	1
2#100: 4–20 mA			0: Disable	1: Enable	1: Enable	0: Disable	1: Enable

For range conversion, refer to section 6.1.4 Analog input module.

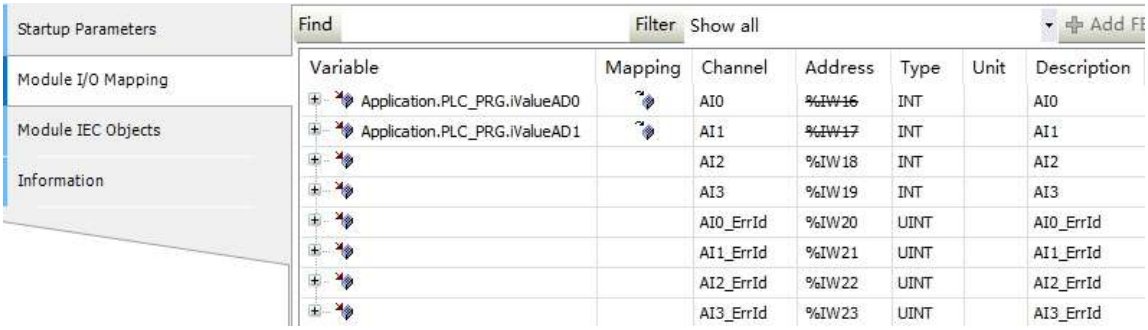
AIx_Filt (x = 0, 1, 2, 3) is the channel filter parameter, with data type USINT. The adjustable range is 1–255. A larger value generally provides better suppression of high-frequency interference, but results in greater delay. Adjustment should be made according to actual application conditions.

Step 3 Define INT variables **iValueAD0** and **iValueAD1** in the program.

```
VAR
iValueAD0      : INT;
iValueAD1      : INT;

END_VAR
```

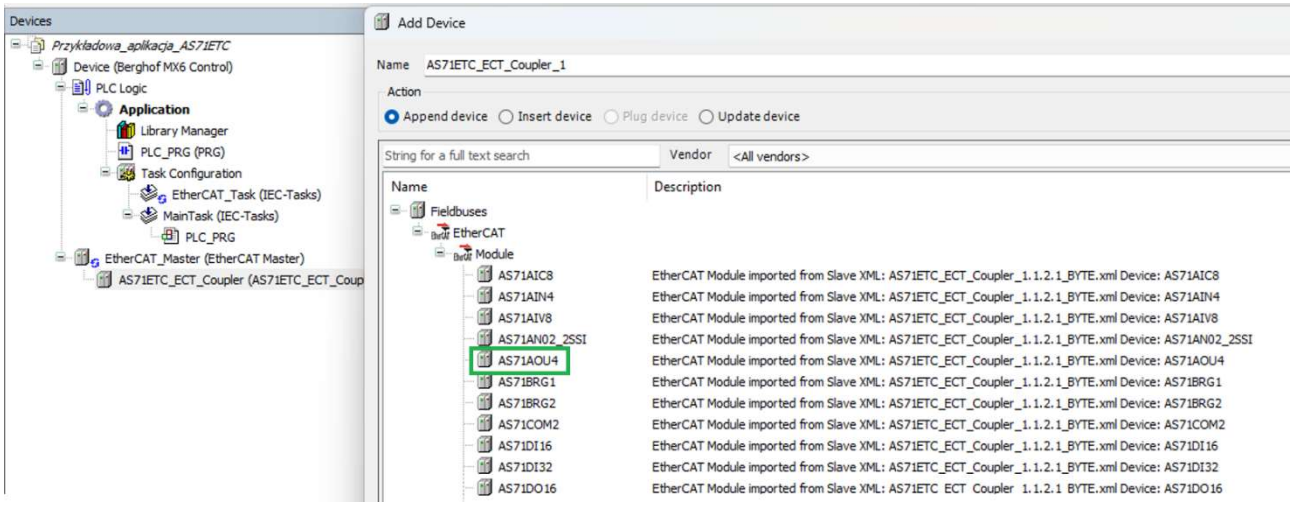
Step 4 Map variables **iValueAD0** and **iValueAD1** to the corresponding input channels in **Module I/O Mapping**. The mapped variables can then be used directly in the program.



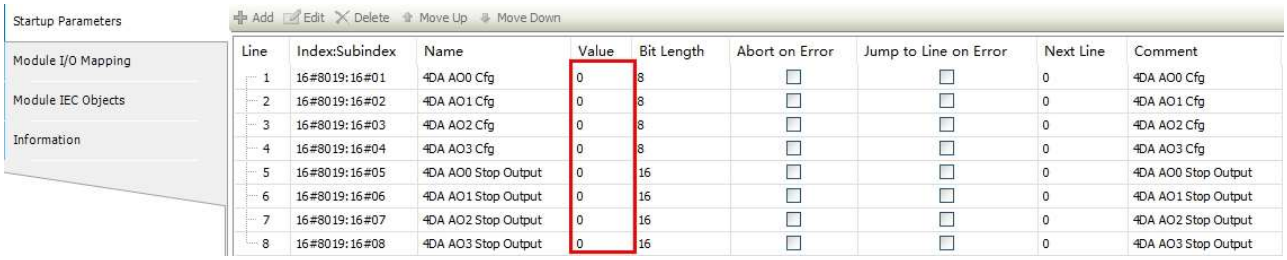
Note: For detailed parameter descriptions, refer to section 6.1 Parameter description.

6.2.1.2.4 Analog output module

Step 1 Click **Add Device** and add the AS71AOU4 module.



Step 2 Set the channel configuration and stop/offline output mode preset value parameters based on actual needs in the startup parameters.



AOx_Cfg (x = 0, 1, 2, 3) is the channel configuration parameter, with data type USINT. Taking Channel 0 as an example, the data definition is as follows:

bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
Channel conversion mode			Reserved	Output when offline		Output fault detection enable control	Channel enable control
2#000: 0–5 V 2#001: 0–10 V 2#010: -5–5 V 2#011: -10–+10 V	2#100: 4–20 mA 2#101: 0–20 mA 2#110: reserved 2#111: reserved		-	2#00: Hold output when offline 2#01: Clear output when offline 2#10: Preset output when offline		0: Disable 1: Enable	0: Disable 1: Enable

Example: If Channel 0 is configured as channel enabled, output fault detection enabled, offline output cleared, and channel conversion mode set to 4–20 mA, the value should be 135, that is, 0b10000111.

bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
2#100			0	2#01		1	1
2#100: 4–20 mA			-	2#01: Clear output when offline		1: Enable	1: Enable

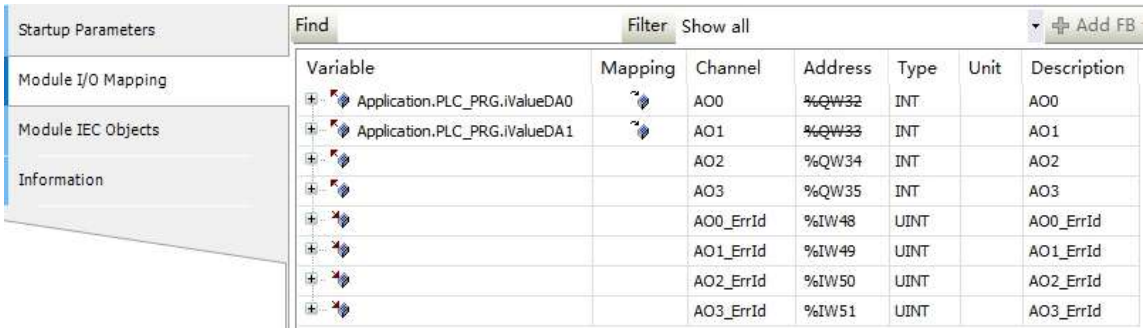
AIx_Stop Output (x = 0, 1, 2, 3) is used to control the stop/offline output mode. The configuration method is similar to that described in section 6.2.1.2.1 Digital input module.

Step 3 Define INT variables **iValueDA0** and **iValueDA1** in the program.

```
VAR
iValueDA0      : INT;
iValueDA1      : INT;

END_VAR
```

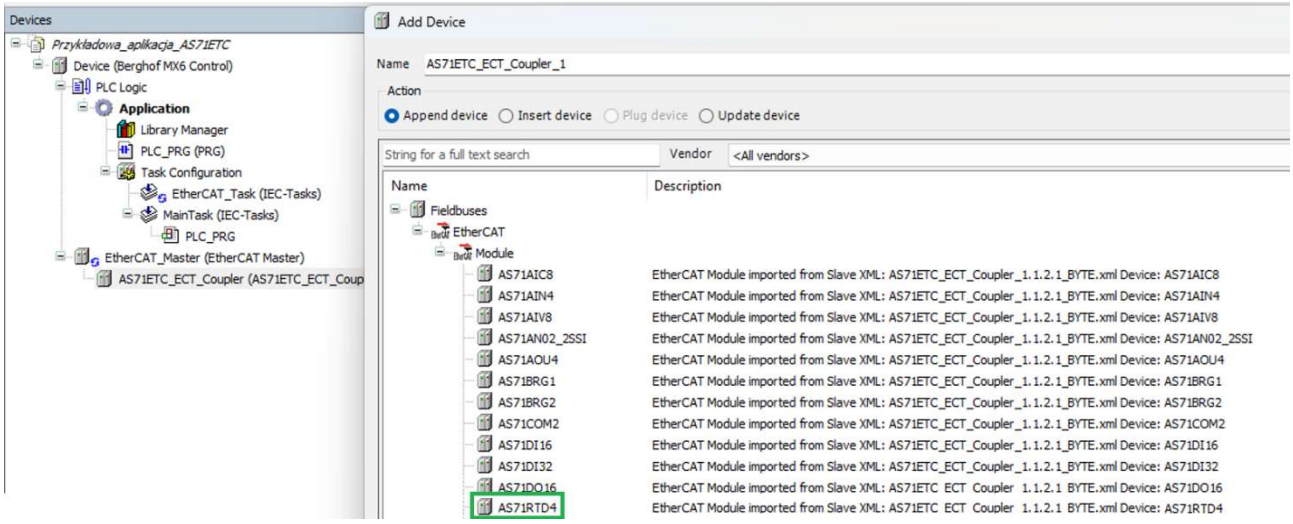
Step 4 Map variables **iValueDA0** and **iValueDA1** to the corresponding output channels in **Module I/O Mapping**. The mapped variables can then be used directly in the program.



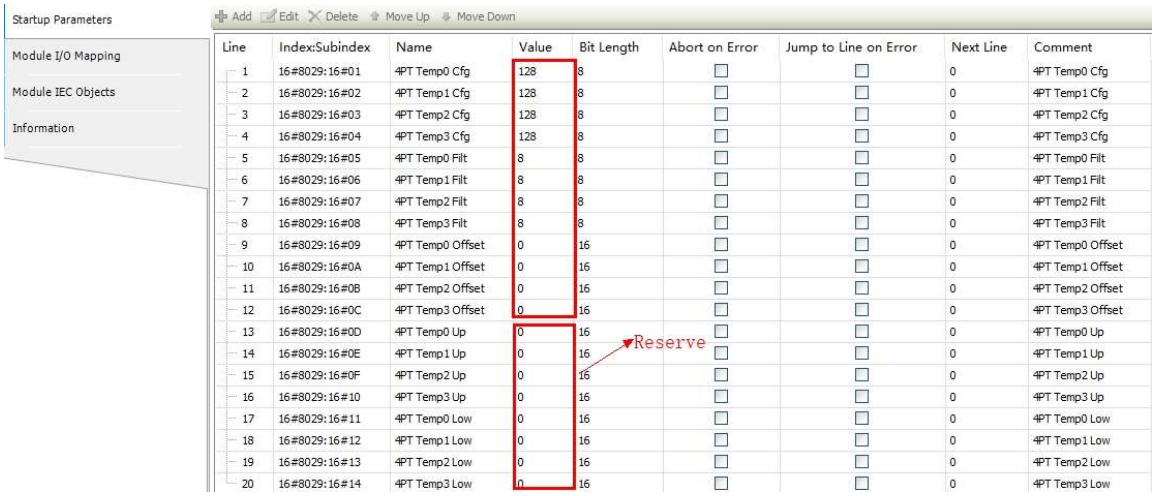
Note: For detailed parameter descriptions, refer to section 6.1 Parameter description.

6.2.1.2.5 Temperature detection module

Step 1 Click **Add Device** and add the AS71RTD4 module.



Step 2 Set the channel configuration, channel filter parameters, and temperature offset values based on actual needs in the startup parameters.



Note: The temperature upper limit and lower limit are reserved configuration parameters and do not need to be configured.

- Tempx_Cfg (x = 0, 1, 2, 3) is the channel configuration parameter, with data type USINT. Taking Channel 0 as an example, the data definition is as follows:

bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
Channel conversion mode (sensor type)			Temperature unit	RTD wiring compensation		Over-range detection enable control	Channel enable control
2#000: reserved 2#001: PT100 2#010: PT500 2#011: reserved		2#100: PT1000 2#101: reserved 2#110: reserved 2#111: CU100	2#0: ℃ 2#1: ℉	2#00: Two-wire system 2#01: Three-wire system 2#10: Four-wire system 2#11: reserved		2#0: Disable 2#1: Enable	2#0: Disable 2#1: Enable

Example: Channel 0 is configured as channel enabled, over-range detection enabled, 3-wire system, temperature unit set to Celsius (°C), and sensor type set to PT1000. The value of Temp0_Cfg is 135, that is, 0b10000111, as shown below:

bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
100			0	01		1	1
100: PT1000			0: ℃	01: Three-wire system		1: Enable	1: Enable

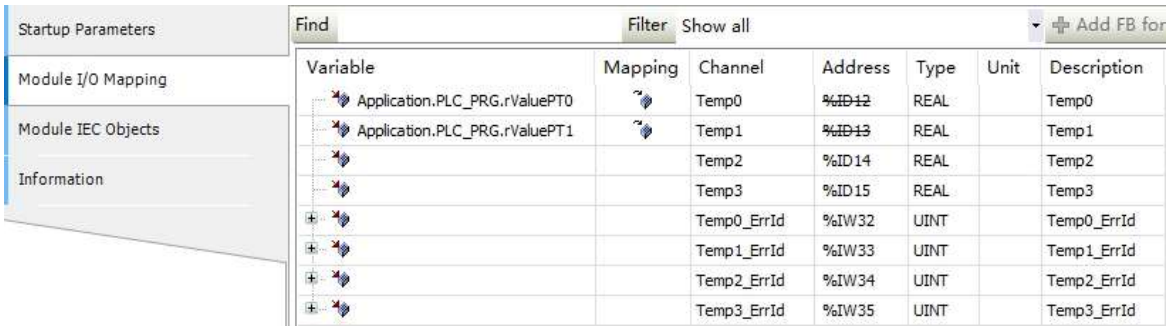
- Tempx_Filt (x = 0, 1, 2, 3) is the channel filter parameter setting. The parameter type is USINT, and the valid range is 1–255. A larger value generally provides better suppression of high-frequency interference, but also results in greater delay. The parameter should be tuned and used according to the actual application requirements.
- Tempx Offset (x = 0, 1, 2, 3) specifies the temperature offset value. The parameter type is USINT. The value is scaled by a factor of 10; for example, a setting of 999 represents 99.9. Measured value = actual value + offset value.

Step 3 Define *rValuePT0* and *rValuePT1* of the REAL type in the program.

```
VAR
rValuePT0      : REAL;
rValuePT1      : REAL;

END_VAR
```

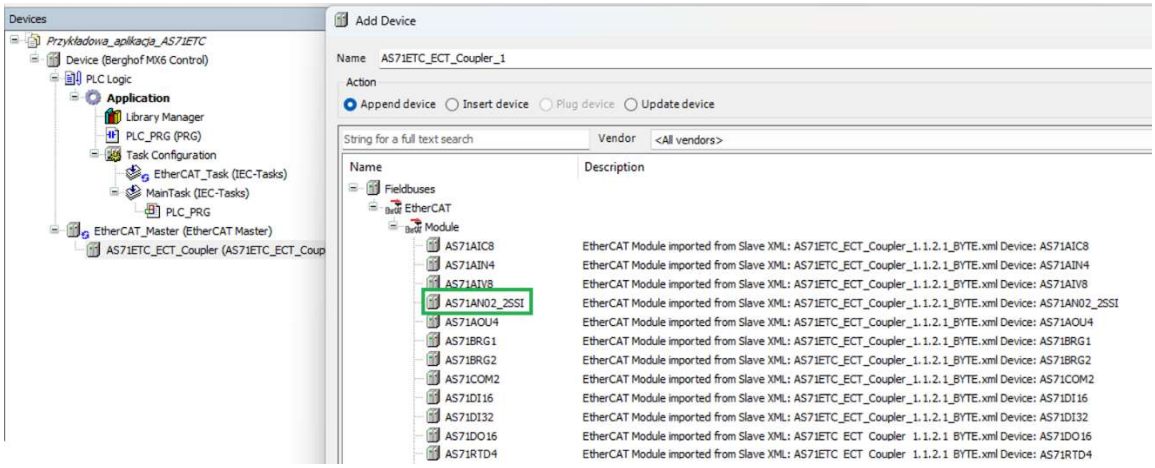
Step 4 Map variables **rValuePT0** and **rValuePT1** to the corresponding input channels in **Module I/O Mapping**. The mapped variables can then be used directly in the program.



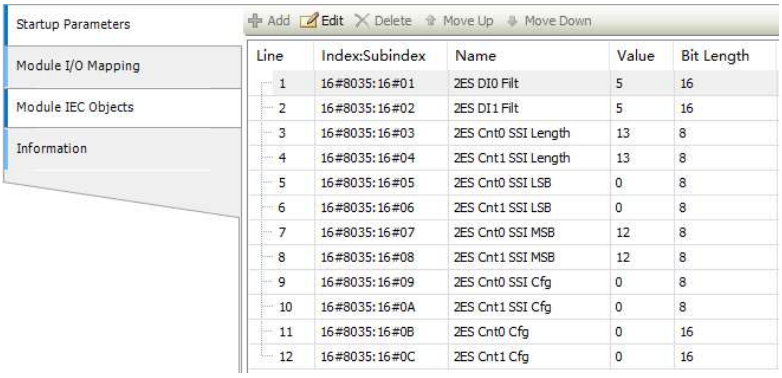
Note: For detailed parameter descriptions, refer to section 6.1 Parameter description.

6.2.1.2.6 Counting and measurement module

Step 1 Click **Add Device** and add the AS71AN02_2SSI module.



Step 2 In the startup parameters, set the counter DI filter time (unit: 0.1 μs), SSI communication frame length, number of bits for the least significant bit of the SSI communication position value, number of bits for the most significant bit of the SSI communication position value, SSI communication configuration, and counter configuration according to actual requirements.



Line	Index:Subindex	Name	Value	Bit Length
1	16#8035:16#01	2ES DI0 Filt	5	16
2	16#8035:16#02	2ES DI1 Filt	5	16
3	16#8035:16#03	2ES Cnt0 SSI Length	13	8
4	16#8035:16#04	2ES Cnt1 SSI Length	13	8
5	16#8035:16#05	2ES Cnt0 SSI LSB	0	8
6	16#8035:16#06	2ES Cnt1 SSI LSB	0	8
7	16#8035:16#07	2ES Cnt0 SSI MSB	12	8
8	16#8035:16#08	2ES Cnt1 SSI MSB	12	8
9	16#8035:16#09	2ES Cnt0 SSI Cfg	0	8
10	16#8035:16#0A	2ES Cnt1 SSI Cfg	0	8
11	16#8035:16#0B	2ES Cnt0 Cfg	0	16
12	16#8035:16#0C	2ES Cnt1 Cfg	0	16

- DIx Filt (x = 0, 1) is the filter parameter for the external DI channel. The unit is 0.1 μs, and the default value is 5. If it is set to 10, it means that only signals that remain stable and do not jump within 1 μs are sampled.
- Cntx SSI Length (x = 0, 1) is the SSI communication frame length of the encoder. The configurable range is 10–40, and the default value is 13. If a 23-bit multi-turn encoder is used, indicating that the position value has 23 bits, set this parameter to 23.
- Cntx SSI LSB (x = 0, 1) indicates the bit position of the least significant bit of the position value in the SSI communication frame. The default value is 0. If a 23-bit multi-turn encoder is used, indicating that the position value has 23 bits, set this parameter to 0.
- Cntx SSI MSB (x = 0, 1) indicates the bit position of the most significant bit of the position value in the SSI communication frame. The default value is 12. If a 23-bit multi-turn encoder is used, indicating that the position value has 23 bits, set this parameter to 22.

Note: Configure the SSI Length/SSI LSB/SSI MSB parameters by referring to the manual of the connected encoder and according to the actual application.

- Cntx SSI Cfg (x = 0, 1) is the SSI communication configuration parameter of the counter. The parameter type is USINT. The data definition is shown in the parameter table below.

Bit	Name	Parameter description
Bit2–bit0	SSI clock frequency	2#000: 125 kHz (default) 2#001: 250 kHz 2#010: 500 kHz 2#011: 1 MHz 2#100: 1.5 MHz 2#101: 2 MHz 2#110: reserved 2#111: reserved
Bit3	SSI data format	2#0: Binary (default) 2#1: Gray code
Bit7–bit4	Read interval of SSI communication position	Unit: 100 μs; default value: 0. For example, 2#0001 (decimal 1) indicates 100 μs; 2#1001 (decimal 9) indicates 900 μs.

- If the counter SSI clock frequency is configured to 500 kHz, the SSI data format is Gray code, and the position read interval is 500 μs, Cntx-SSI-Cfg (x = 0, 1) should be configured to 90, that is, 0b01011010, as shown in the table below.

Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
0101				1	010		
Unit: 100 μs				Gray code	500 kHz		

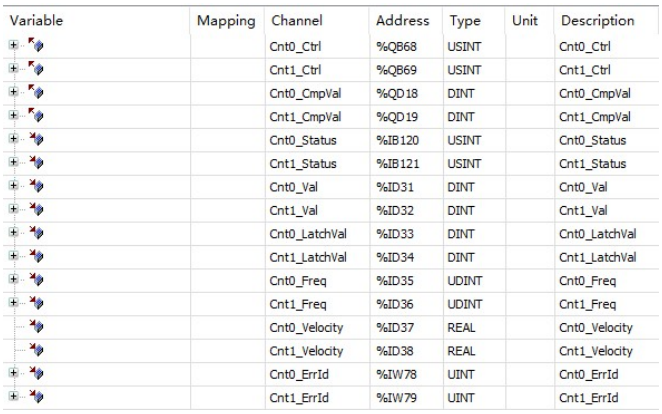
- Cntx Cfg (x = 0, 1) is the counter configuration parameter. The parameter type is UINT. The data definition is shown in the parameter table below.

Bit	Name	Parameter description
Bit1–bit0	Frequency measurement period	2#00: 20 ms (default) 2#01: 100 ms 2#10: 500 ms 2#11: 1000 ms
Bit3–bit2	DI edge latch enable	2#00: Disable (default) 2#01: Rising edge 2#10: Falling edge 2#11: Both edges
Bit5–bit4	Comparison match output pulse width	2#00: 1 ms (default) 2#01: 2 ms 2#10: 4 ms 2#11: 8 ms
Bit7–bit6	Comparison output mode	2#00: Comparison match output (default) 2#01: Output between [lower limit of count, comparison value] 2#10: Output between [comparison value, upper limit of count] 2#11: reserved
Bit15–bit8	Reserved	-

If the counter is configured with a frequency measurement period of 100 ms, DI rising-edge latch enabled, comparison match output pulse width of 8 ms, and comparison output mode set to output within [comparison value, count upper limit], then Cntx Cfg (x = 0, 1) should be configured to 53, that is, 0b0000000000110101, as shown in the table below.

Bit15–bit8	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
00000000	00		11		01		01	
Reserved	Comparison match output		8 ms		Rising edge		100 ms	

Step 3 After configuring the above startup parameters and downloading the program, control the counter on the Module I/O mapping interface.



Variable	Mapping	Channel	Address	Type	Unit	Description
		Cnt0_Ctrl	%QB68	USINT		Cnt0_Ctrl
		Cnt1_Ctrl	%QB69	USINT		Cnt1_Ctrl
		Cnt0_CmpVal	%QD18	DINT		Cnt0_CmpVal
		Cnt1_CmpVal	%QD19	DINT		Cnt1_CmpVal
		Cnt0_Status	%IB120	USINT		Cnt0_Status
		Cnt1_Status	%IB121	USINT		Cnt1_Status
		Cnt0_Val	%ID31	DINT		Cnt0_Val
		Cnt1_Val	%ID32	DINT		Cnt1_Val
		Cnt0_LatchVal	%ID33	DINT		Cnt0_LatchVal
		Cnt1_LatchVal	%ID34	DINT		Cnt1_LatchVal
		Cnt0_Freq	%ID35	UDINT		Cnt0_Freq
		Cnt1_Freq	%ID36	UDINT		Cnt1_Freq
		Cnt0_Velocity	%ID37	REAL		Cnt0_Velocity
		Cnt1_Velocity	%ID38	REAL		Cnt1_Velocity
		Cnt0_ErrId	%IW78	UINT		Cnt0_ErrId
		Cnt1_ErrId	%IW79	UINT		Cnt1_ErrId

- Cntx_Ctrl (x = 0, 1) is the counter control parameter. The data definition is shown in the parameter table below.

Bit	Name	Parameter description
Bit0	Count enable	2#0: Disable 2#1: Enable
Bit1	Reserved	-
Bit2	Reserved	-
Bit3	Reserved	-
Bit4	Counter comparison	2#0: Disable 2#1: Enable
Bit7–bit5	Reserved	-

- Cntx_CmpVal (x = 0, 1) is the counter comparison value. The parameter type is DINT.

Assuming that Cntx_CmpVal is set to 1000000, set Cntx_Ctrl to 17, that is, 0b00010001, to enable the counter and comparison function, as shown below.

Bit7–bit5	Bit4	Bit3	Bit2	Bit1	Bit0
000	1	0	0	0	1
Reserved	Enable	Rising edge active	Reserved	Reserved	Enable

- Cntx_Val (x = 0, 1) is the counter count value. The parameter type is DINT.

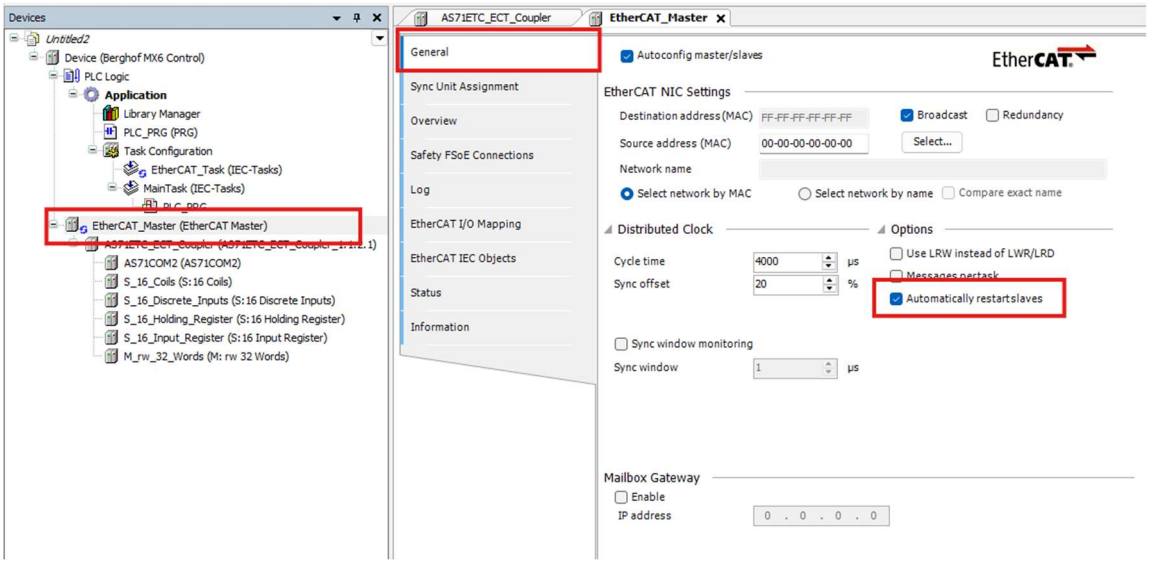
According to the preceding configuration value 53 of Cntx-Cfg (x = 0, 1), which enables DO comparison match output and sets the output pulse width to 8 ms, when the count value Cntx_Val (x = 0, 1) is equal to 1000000, DO outputs for 8 ms.

Note: DI0/DI1 are counter latch inputs, and the corresponding latched value is Cntx_LatchVal (x = 0, 1). For details about the parameter description, see section 6.1 Parameter description.

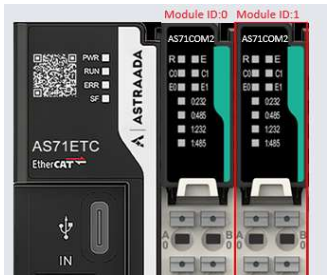
6.2.1.2.7 AS71COM2 serial communication module

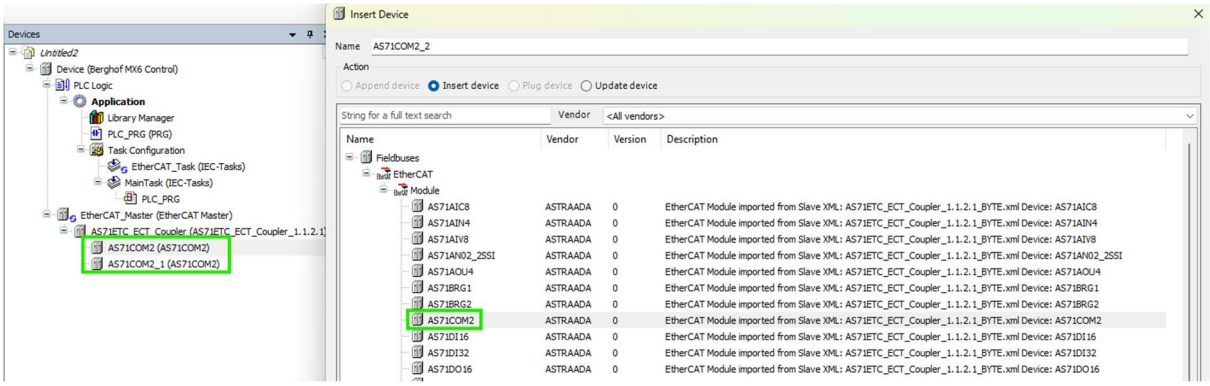
The AS71COM2 serial communication module is a dual-channel module. It can be configured as RS485 or RS232, and can operate in Modbus RTU master/slave mode or free-protocol mode.

Note: The serial communication module implements its functions through a local module and virtual modules. The virtual modules occupy configuration slots. Before the master configuration is downloaded, the coupler does not know how many virtual modules are configured. Therefore, during the first download, the actual configuration may fail to match the master configuration, preventing the module from entering the OP state. After receiving the configuration for the first time, the coupler saves the configuration, resets, restarts, and then waits for the master to establish the connection again. If the master supports automatic slave restart, select this function. If the master does not support automatic slave restart, restart the master (for example, an Omron PLC).



In the following example, two AS71COM2 serial communication modules are used. The configuration is shown below, where the related channels are configured to operate in Modbus RTU master/slave mode, and free-protocol mode.





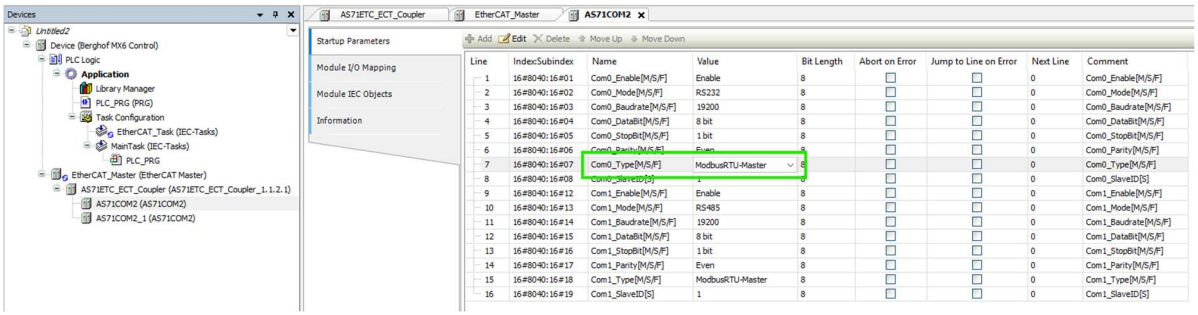
6.2.1.2.7.1 Modbus RTU master operating instructions

Supported function codes of master module

Function code	Name	Description	Operation type
0x01	Read Coils	Read coils	Bit operation (multiple)
0x02	Read Discrete Inputs	Read discrete inputs	Bit operation (multiple)
0x03	Read Holding Registers	Read holding registers	Word operation (multiple)

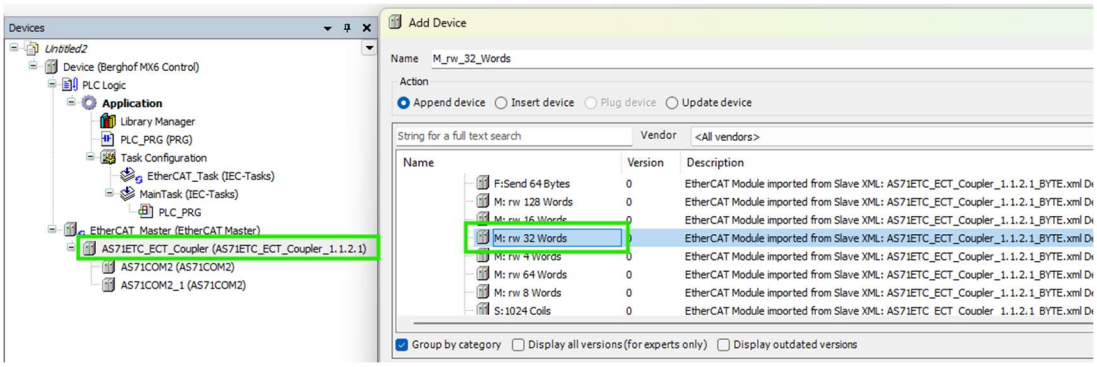
Function code	Name	Description	Operation type
0x04	Read Input Registers	Read input registers	Word operation (multiple)
0x05	Write Single Coil	Write a single coil	Bit operation (single)
0x06	Write Single Register	Write a single holding register	Word operation (single)
0x0F	Write Multiple Coils	Write multiple coils	Bit operation (multiple)
0x10	Write Multiple Registers	Write multiple holding registers	Word operation (multiple)

When the system is configured as a Modbus RTU master, the PDO size allows virtual communication modules with valid data lengths of 4, 8, 16, 32, 64, or 128 words to be configured, enabling users to reasonably allocate PDO resources according to application scenarios. For available virtual module types, refer to section 6.1.10.2 Serial communication module – Modbus RTU master virtual module.

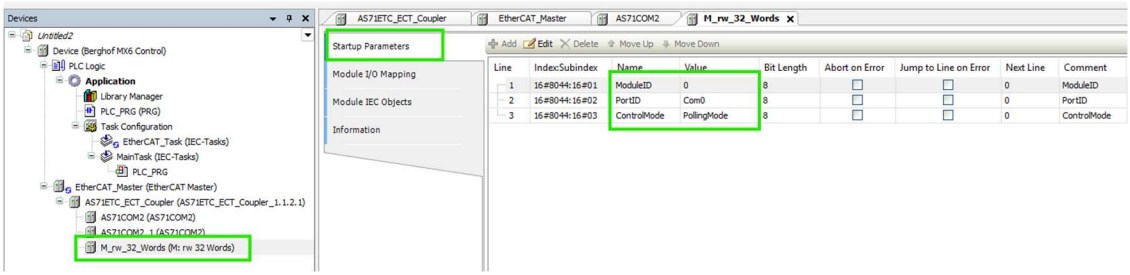


Example: Channel 0 of the first AS71COM2 serial communication module configured as master mode

- **Add a master virtual module: M: rw 32 Words**



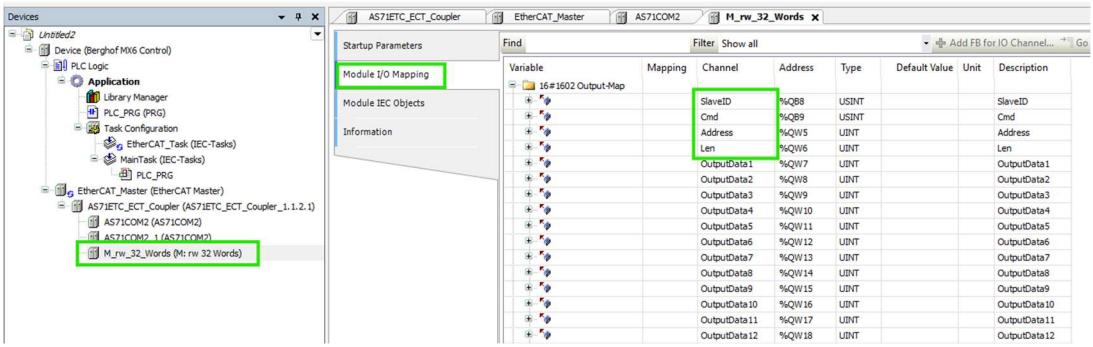
- **M: Startup parameter configuration of the rw 32 Words virtual module**



Multiple master virtual modules can be configured under the same channel.

After a channel is bound to a master virtual module, the module can be configured to operate in polling, trigger, or other operating modes. For details about the parameters, refer to section 6.1.10.2 Serial communication module – Modbus RTU master virtual module.

- **PDO parameters**

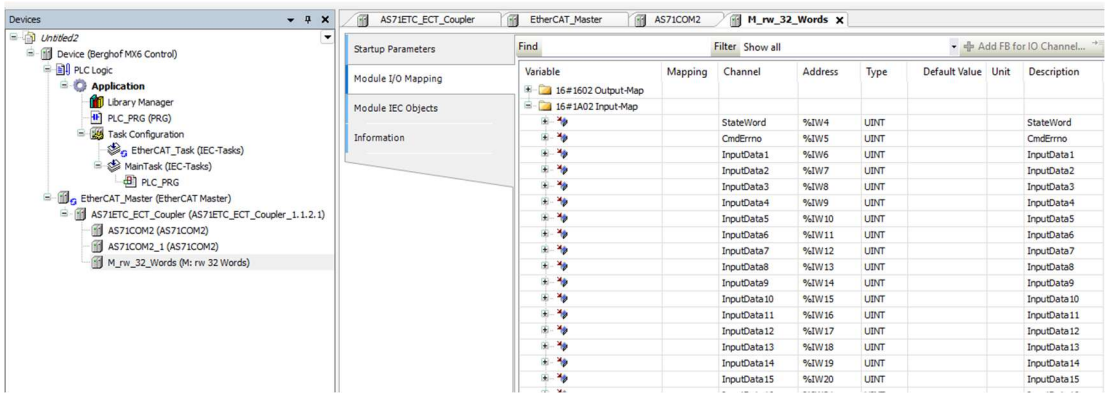


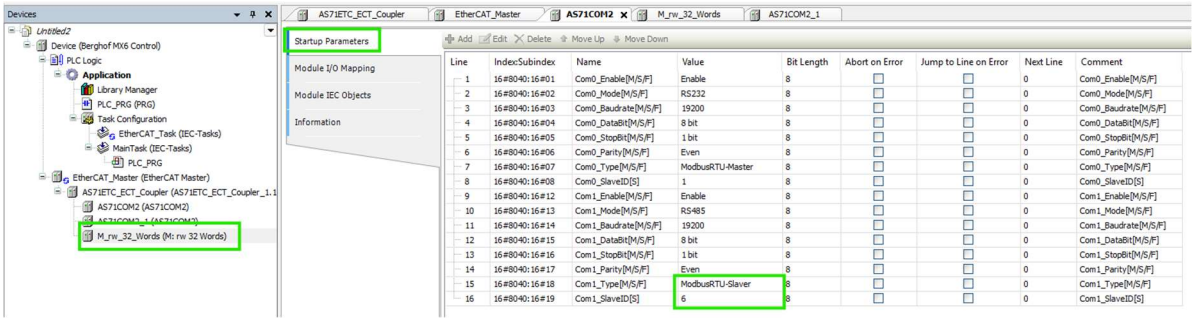
The application can access Modbus RTU slave devices through the bound channel by changing the values of the SlaveID, Cmd, Address, and Len parameters.

6.2.1.2.7.2 Modbus RTU slave operating instructions

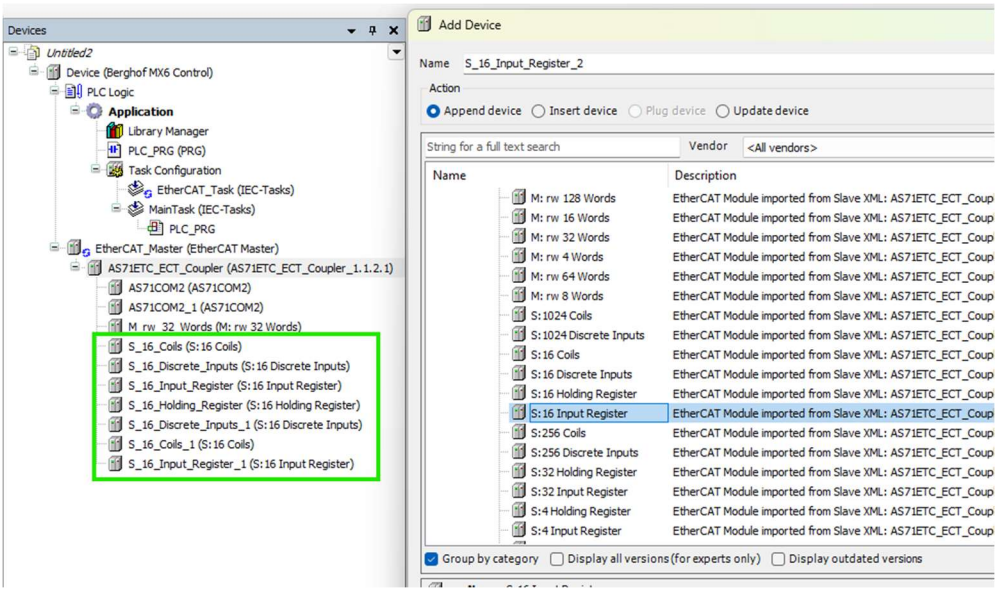
When a channel is configured as slave mode, refer to
section 6.1.10.3 Serial communication module–Modbus RTU slave virtual module for available virtual module types.

Example: Channel 1 of the first AS71COM2 serial communication module configured as slave mode with Slave ID = 6:

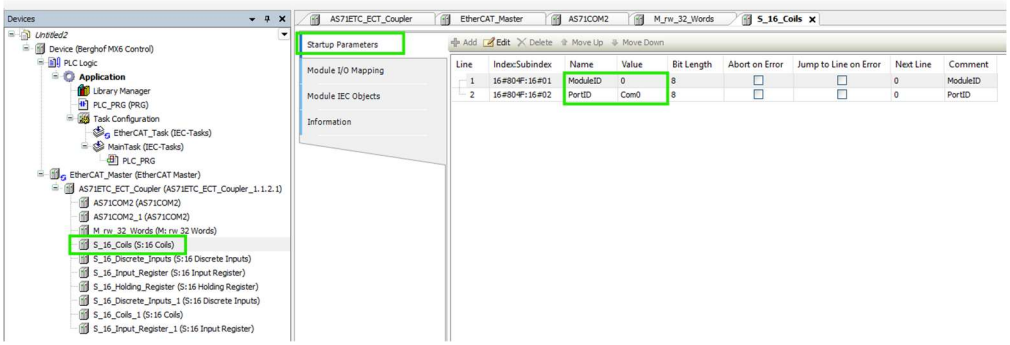




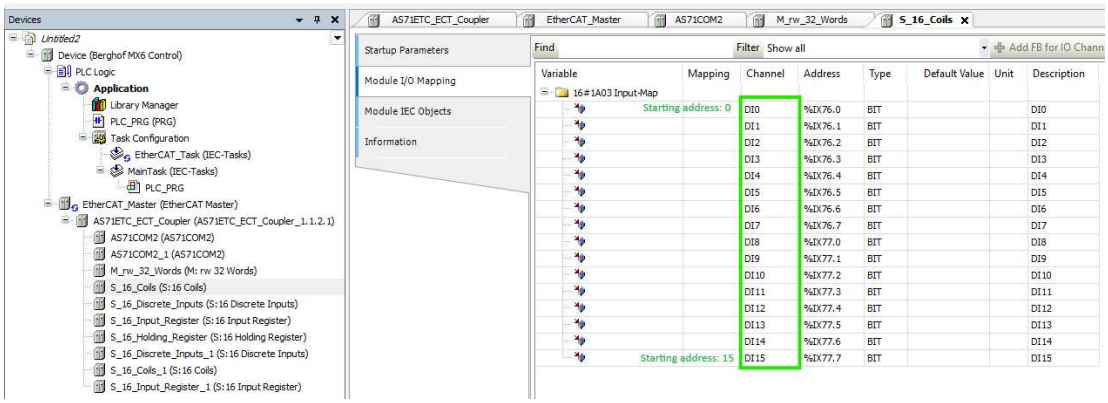
- **Add the following slave virtual modules:**



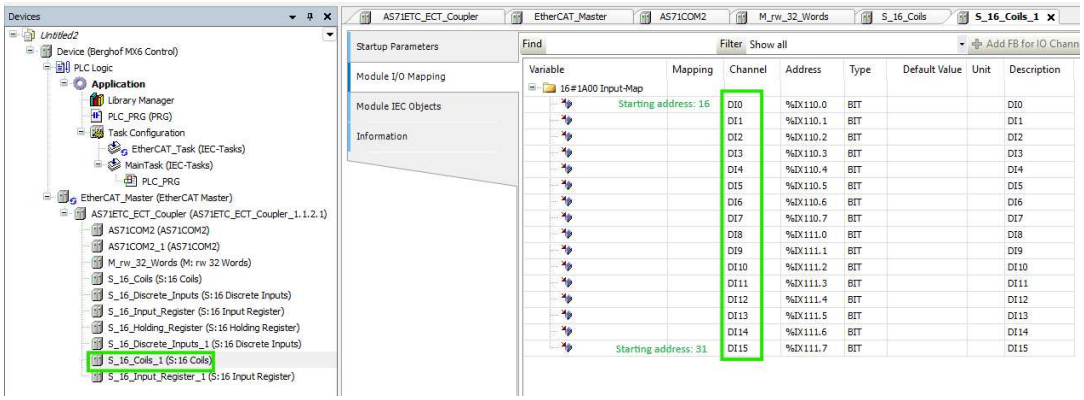
- **Configure slave virtual module startup parameters and bind them to Channel 1 of the first AS71COM2 module:**



- **The start address of the same type of slave virtual modules follows allocation rules: The first virtual module starts from address 0:**

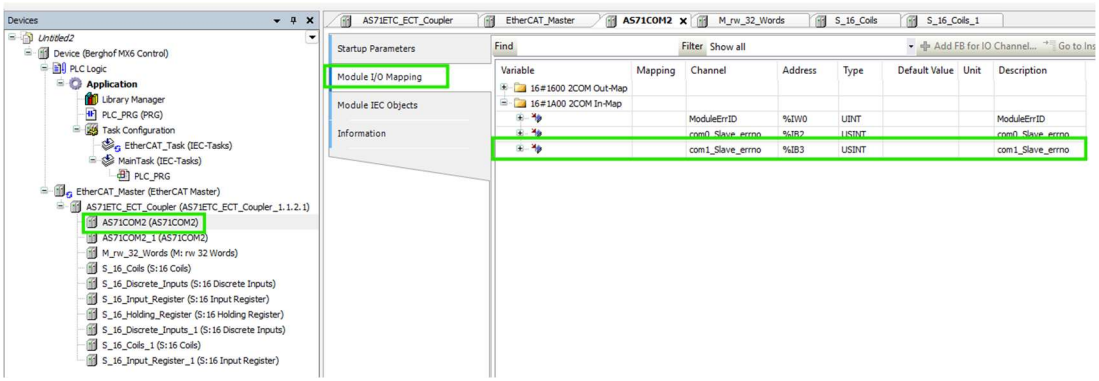


- **The second Coils module continues from the last address of the first module: Starts from 16:**



For the function codes used to access the slave virtual module, see 6.1.10.3 Serial communication module–Modbus RTU slave virtual module. For example, when the master accesses the Coils module defined above, function codes 01, 05, and 15 can be used.

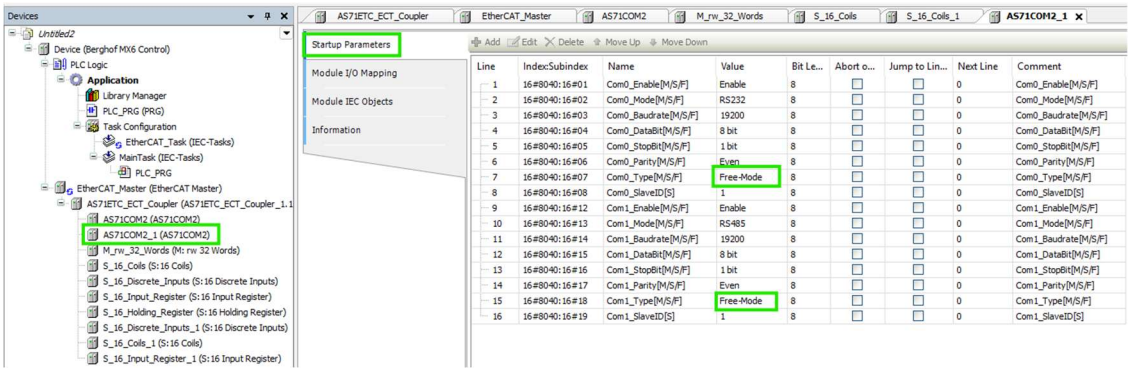
Slave exception codes can be viewed through the feedback parameters of the bound serial communication module.



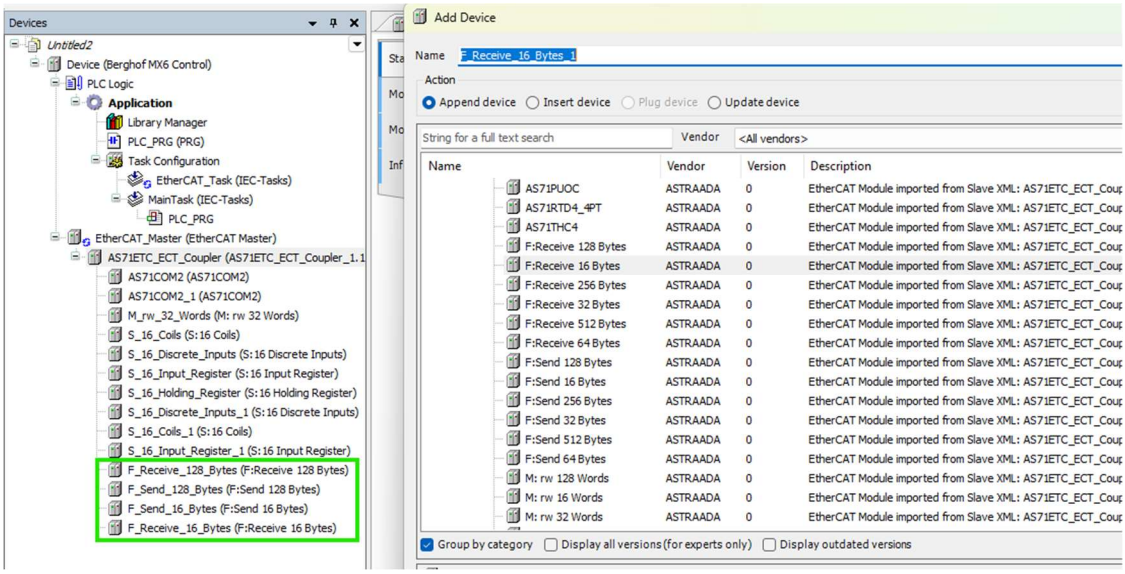
6.2.1.2.7.3 Free-protocol operating instructions

The maximum length of a free-protocol data frame is 512 bytes. Within the same channel, transmit and receive virtual modules can be configured simultaneously. RS232 supports simultaneous transmit and receive without blocking. RS485 does not support simultaneous transmit and receive. For details, refer to section 6.1.10.4 Serial communication module–Free-protocol virtual module.

Example: Channel 0 of the second AS71COM2 serial communication module is configured for free protocol and bound to two free-protocol virtual modules; Channel 1 is also configured for free protocol and bound to two free-protocol virtual modules:

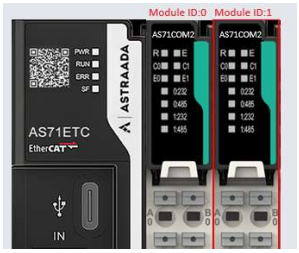


- **Add 4 free-protocol virtual modules.**

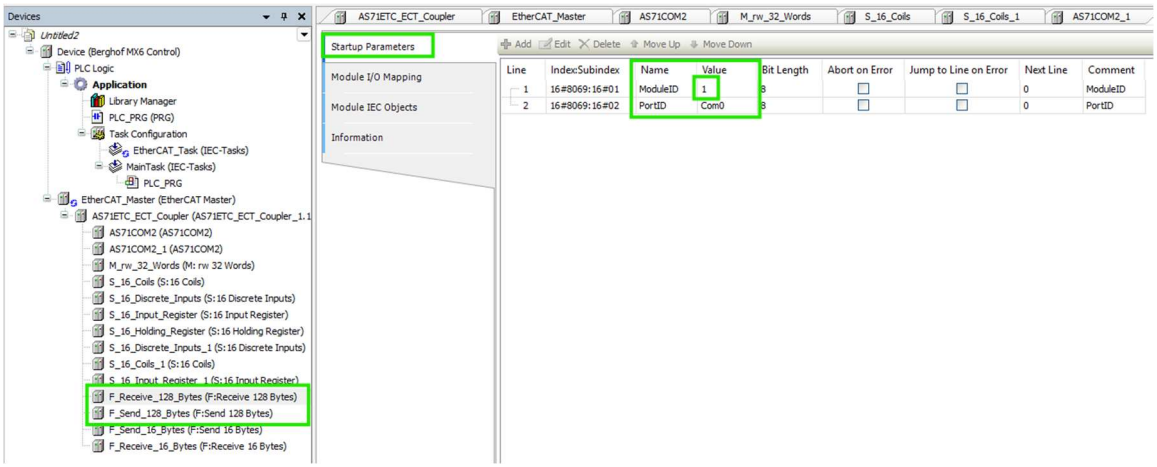


As a reminder: ModuleID parameter description

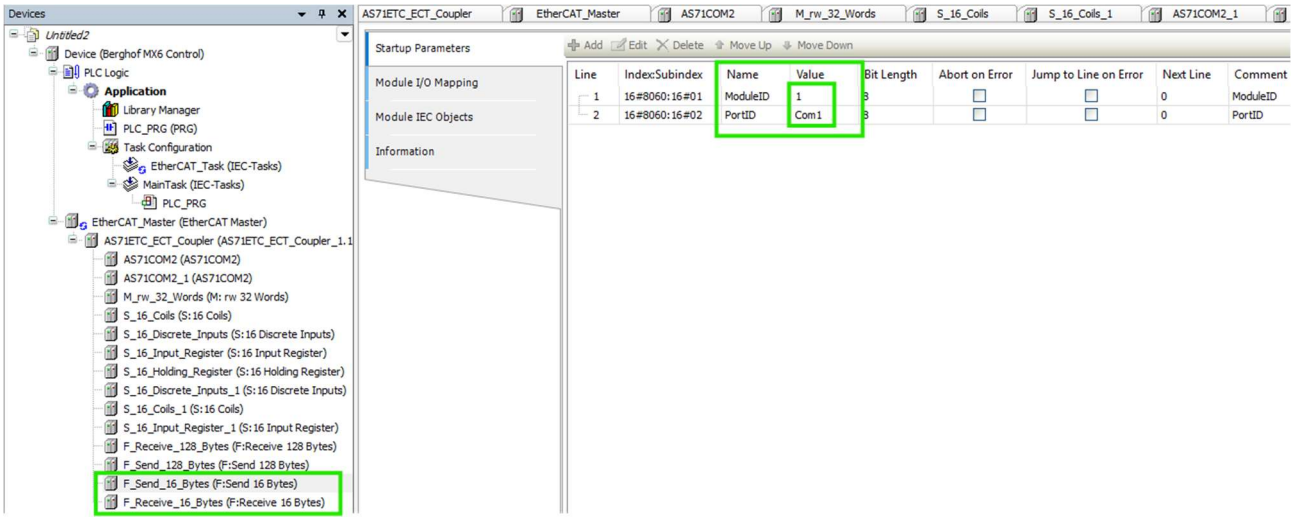
This parameter indicates which serial communication module is bound. In the configuration, there may be multiple serial communication modules. The serial communication module closest to the coupler is numbered 0, and the following modules are numbered sequentially by adding 1. For example, if there are two serial communication modules in one configuration, as shown below:



- **Configure the startup parameters for two free-protocol virtual modules and bind them to Channel 0 (COM 0) of the second AS71COM2 (Module ID 1) serial communication module:**



- **Configure the startup parameters for two free-protocol virtual modules and bind them to Channel 1 (COM 1) of the second AS71COM2 (Module ID 1) serial communication module:**



The free-protocol transmit module sends data by setting the ControlWord to 1, specifying the SendLen and the transmit data, and then the required data can be transmitted.

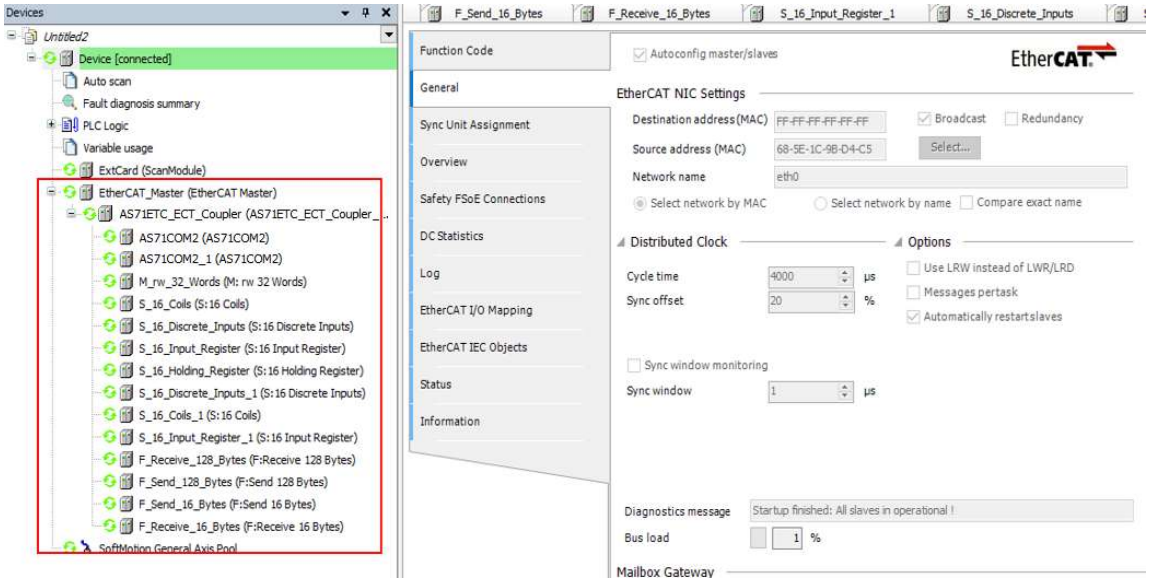
The free-protocol receive module enters the receive state by setting the ControlWord to 1. It does not require a specified receive length. The end of a frame is determined by the frame interval time. If the received frame length exceeds the total receive capacity of the virtual module, the reception fails; otherwise, the reception is successful.

To perform another transmission or reception, the ControlWord must first be set to 0 and then set back to 1 to re-enter the operation state.

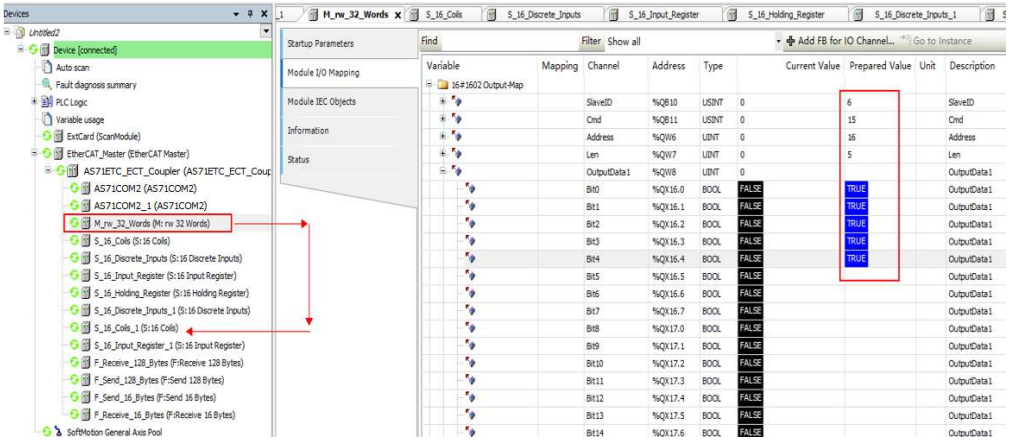
In this example, both channels of the serial communication module are configured to operate in RS485 mode with the same baud rate. The A and B terminals of Channel 0 and Channel 1 are connected so that the two channels can communicate with each other.

Now start the test.

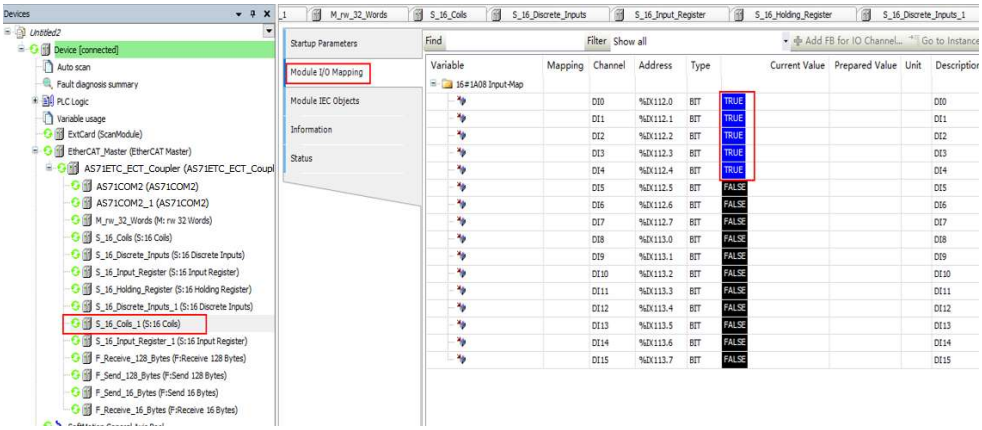
- **After clicking download and run:**



Use Channel 0 (master) of the first module and the virtual module M_rw_32_Words to operate the second Coils module under Channel 1.



- **Result is shown below:**



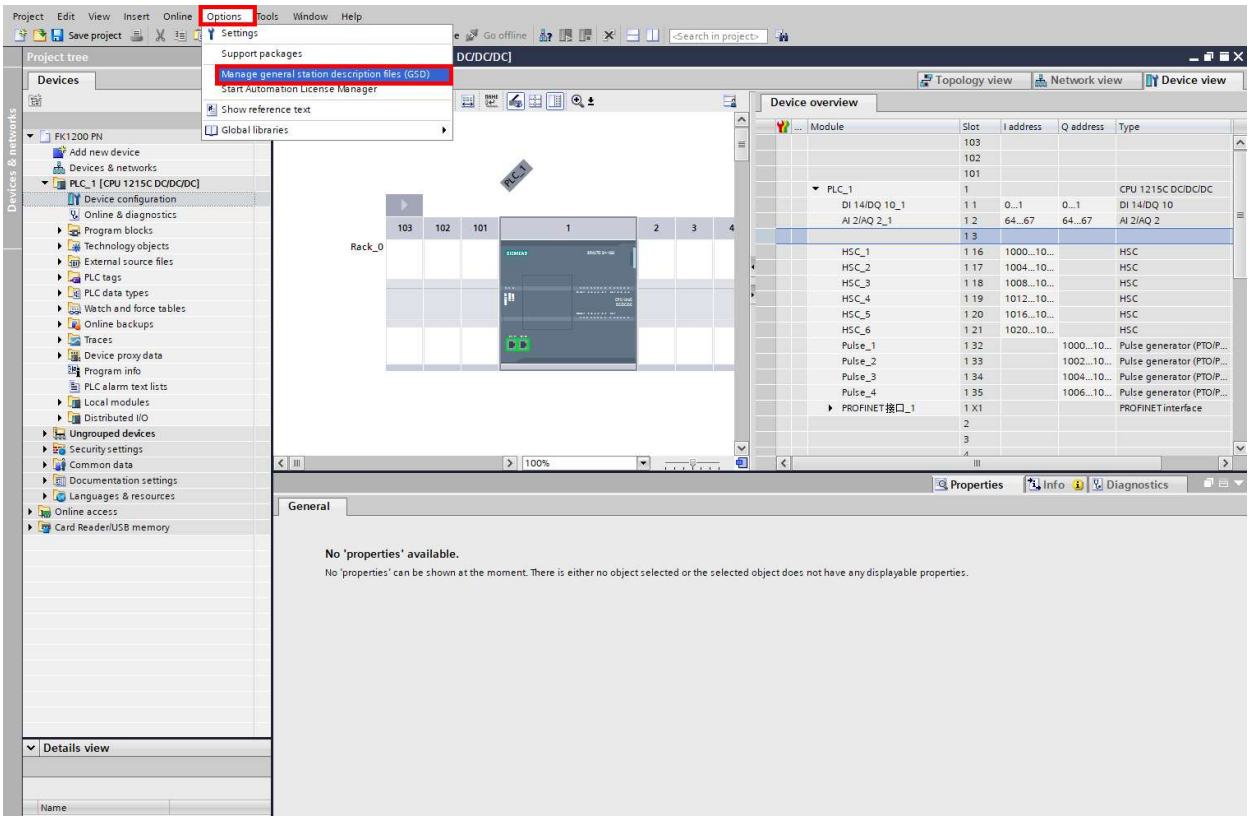
6.3 PROFINET configuration

6.3.1 TIA Portal configuration example

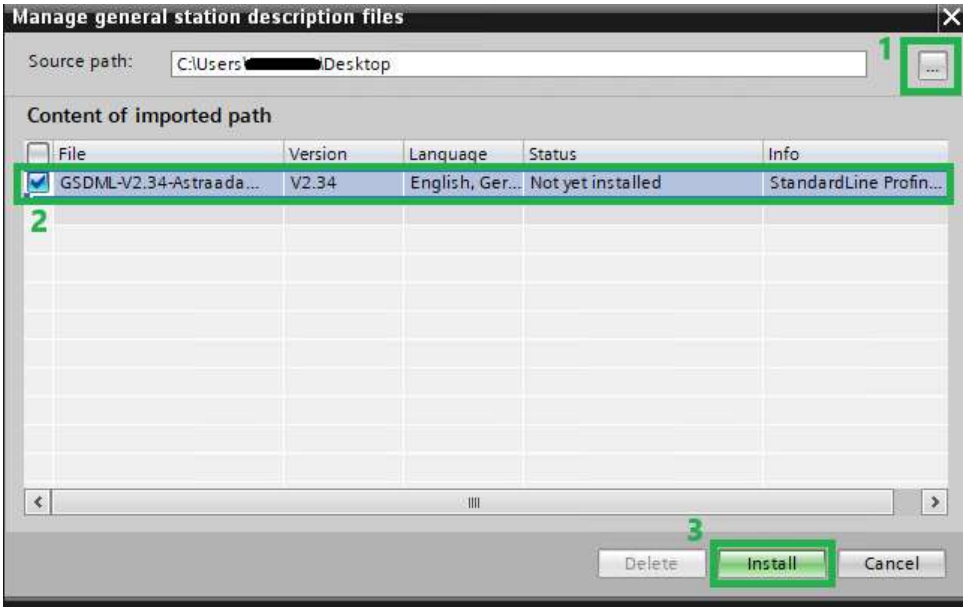
6.3.1.1 PROFINET communication coupler configuration

Step 1 Install the device description file named in the format of GSDML-V2.43-ASTRAADA-AS71PNS-xxxxxxxx.xml.

A. Choose **Options** > **Manage general station description files (GSD)** from the menu bar.

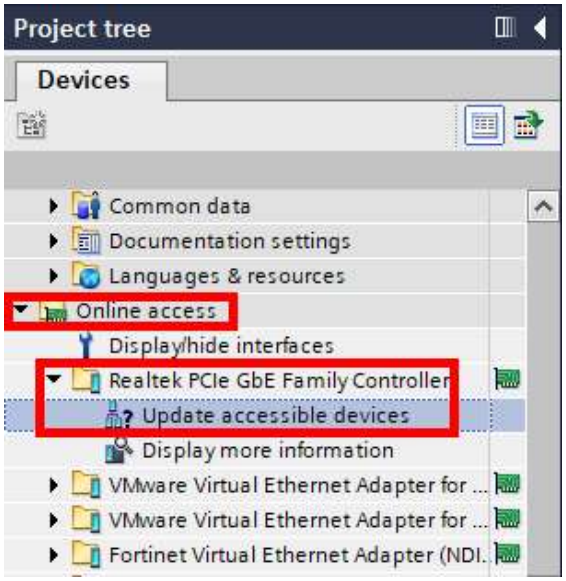


B. In the **Manage general station description files** window that appears, set **Source path** to the GSD file saving path, select the GSD file to be installed, and then click **Install**.



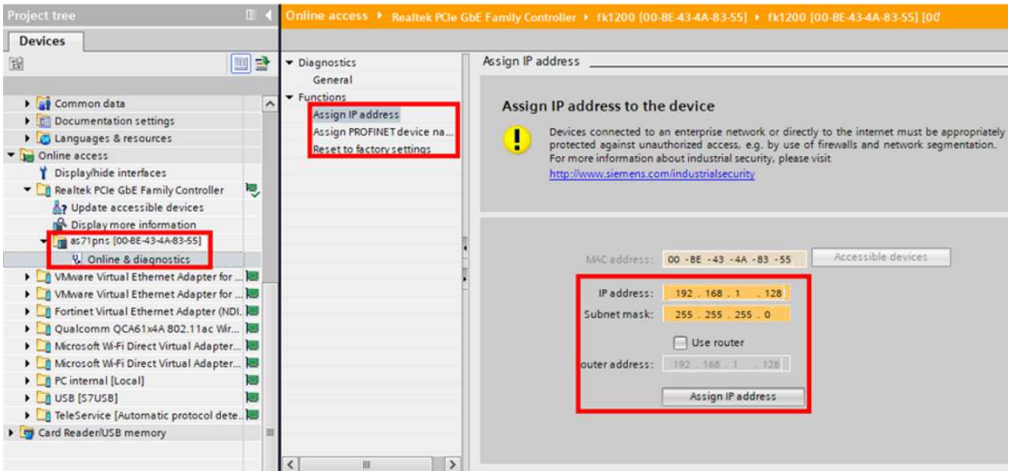
Step 2 Set the PN device name and IP address.

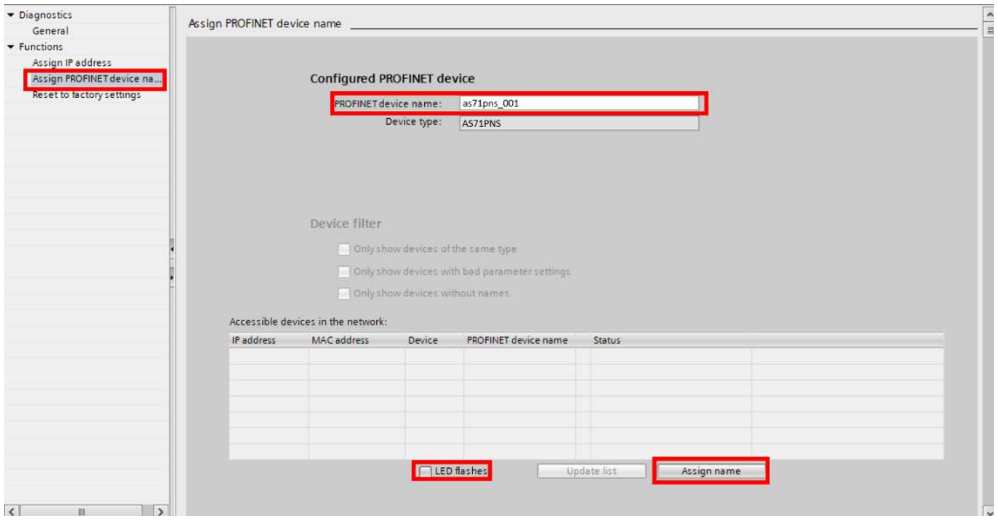
A. Complete the actual physical connection. Under **Project tree**, choose **Devices** > **Online access** > **Realtek PCIe GbE Family Controller** > **Update accessible devices**.



B. Choose the refreshed PN coupler device (you can confirm the device according to the MAC address).

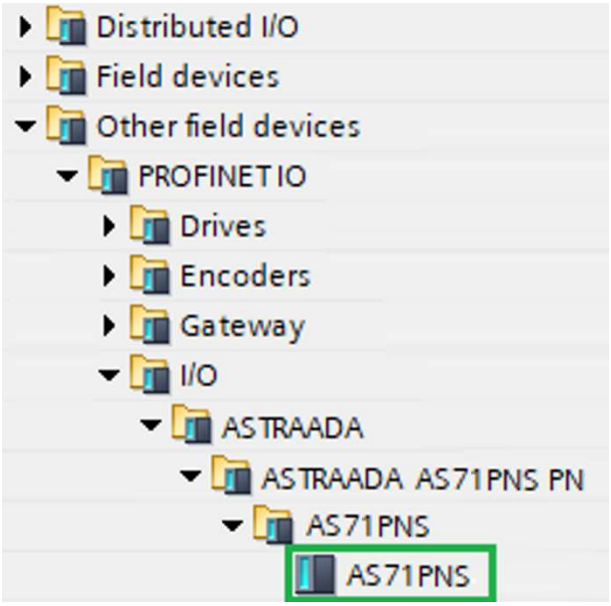
Choose **Online & diagnostics** under **AS71PNS**, choose **Functions** > **Assign IP address**, set **IP address** and **Subnet mask**, and click **Assign IP address**. After the IP address assignment, choose **Assign PROFINET device name**, set **PROFINET device name**, and click **Assign name**.



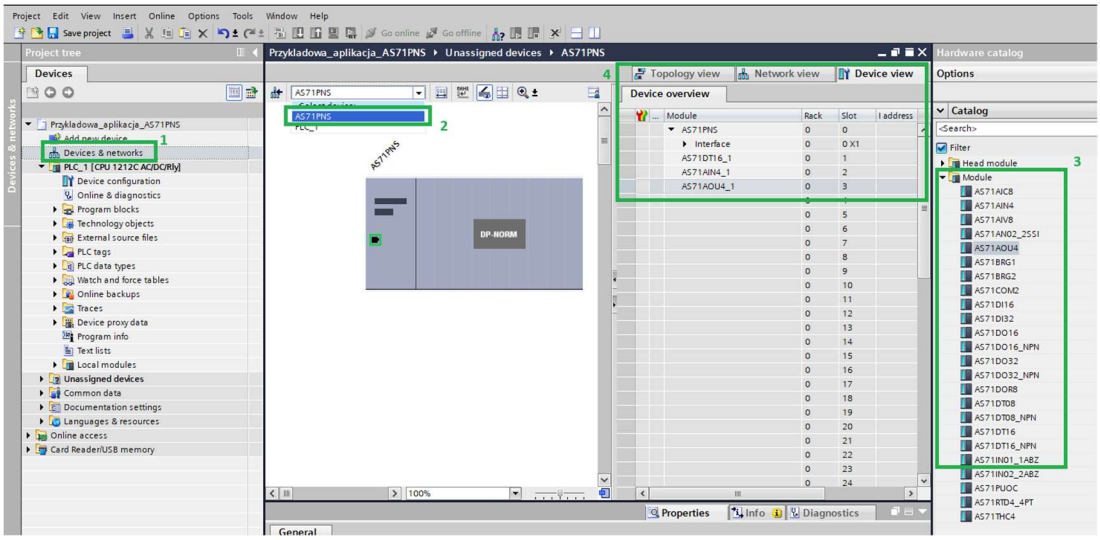


Step 3 Network configuration

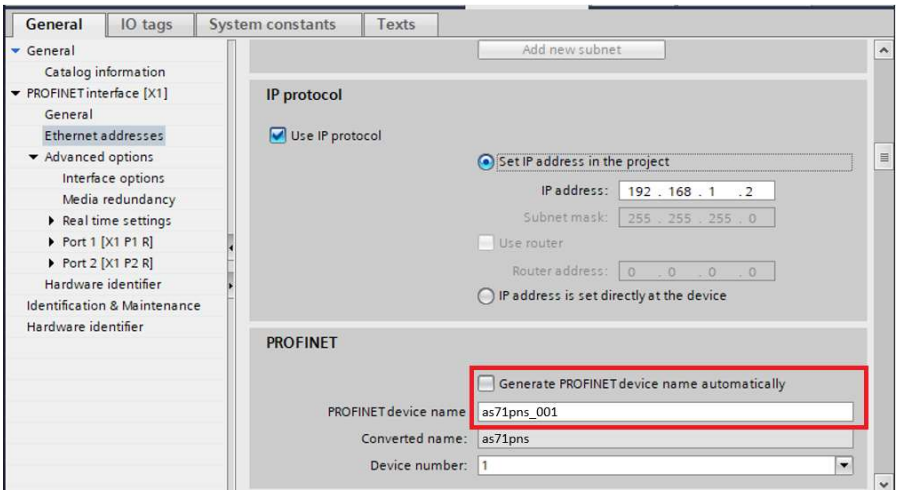
A. Choose **PLC_1** > **Device configuration** on the left, click **Network view** in the main interface, click **Hardware catalog** on the right, choose **Other field devices** > **PROFINET IO** > **I/O** > **ASTRAADA** > **ASTRAADA AS71PNS PN**> **AS71PNS** > **AS71PNS**.



B. Choose **PLC_1** > **Device configuration** on the left, click **Device view** in the main interface, choose the AS71PNS devices, and add modules to the slots according to actual physical configuration on the right.



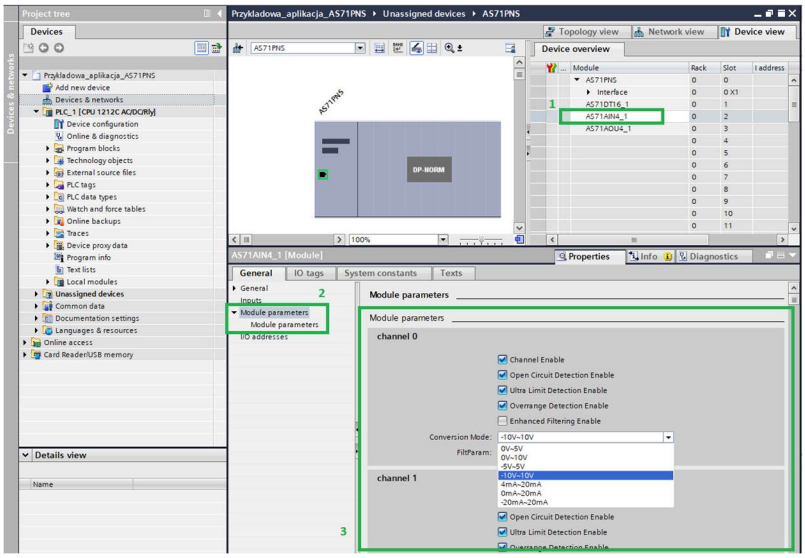
C. In the **Device view** interface, double-click **AS71PNS**. At the bottom of the window, choose **Properties** > **General** > **PROFINET interface [X1]** > **Ethernet addresses**, deselect **Generate PROFINET device automatically**, and set **PROFINET device name** to the current device name.



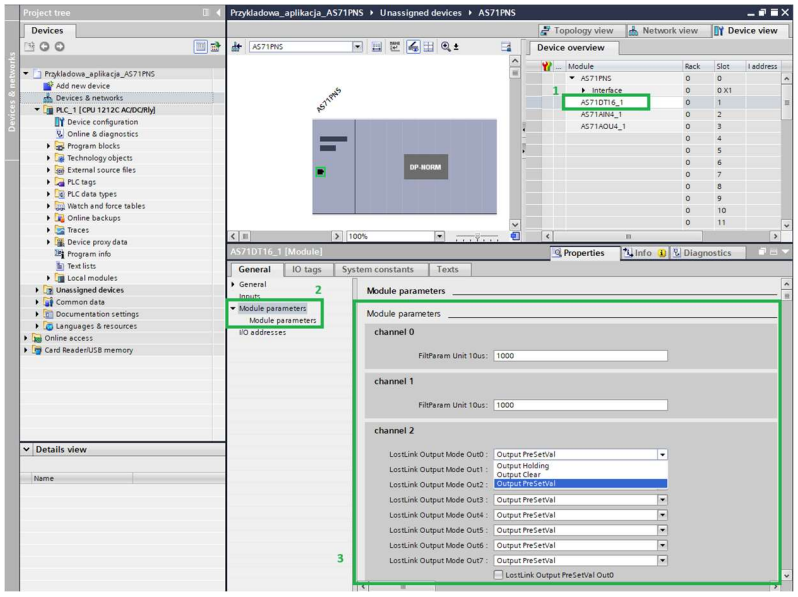
Note: In PROFINET communication, devices are identified through device names. Therefore, the set device names must match the actual device names of modules, and each device name must be unique.

D. Set module parameters.

Example 1: In the **Device view** interface, double-click **AS71AIN4-4AD** under **Module**, choose **Properties** > **General** > **Module parameters** > **General parameters**, and then set module initialization parameters.



Example 2: In the **Device view** interface, double-click **AS71DT16** under **Module**, choose **Properties** > **General** > **Module parameters**, and then set module initialization parameters.

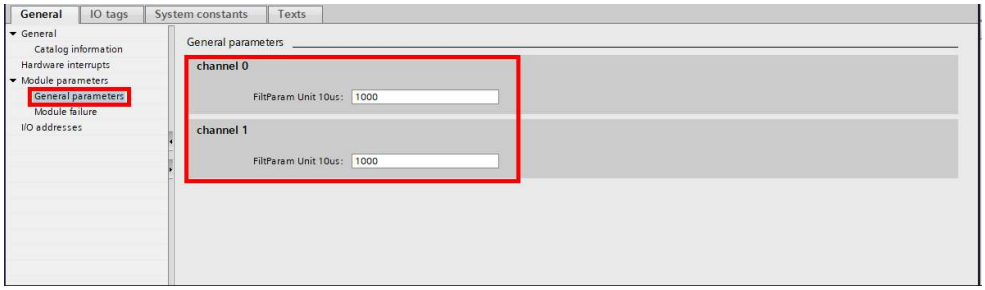


E. After completing the network configuration, set all module configuration parameters. Once compiled, the program can be downloaded and run.

6.3.1.2 Module configuration

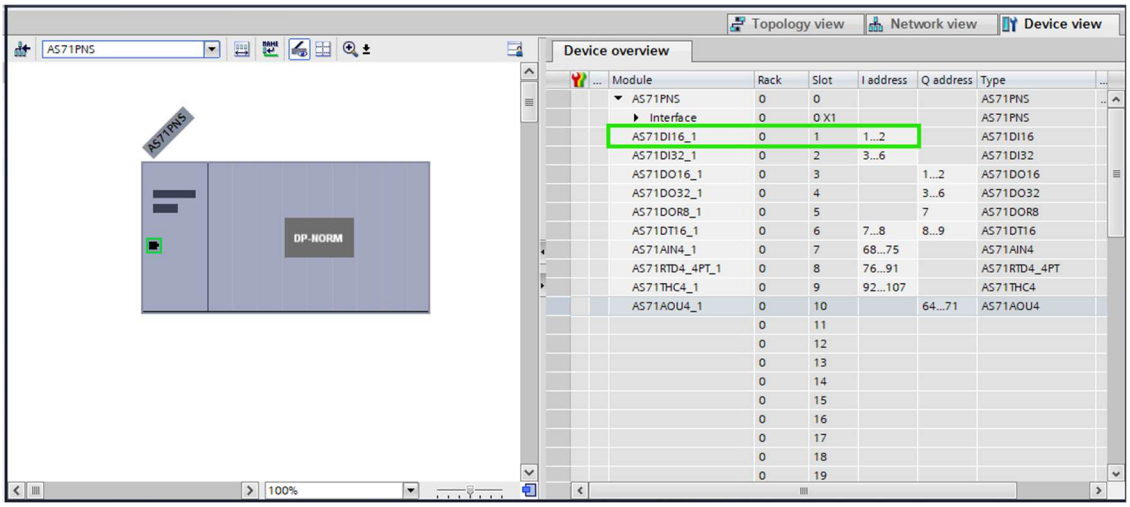
6.3.1.2.1 Digital input module

Step 1 In the **Device view** interface, add **AS71DI16-1600DI**, double-click **AS71DI16-1600DI** under **Module**, choose **Properties** > **General** > **Module parameters > General parameters**, and then set module initialization parameters.



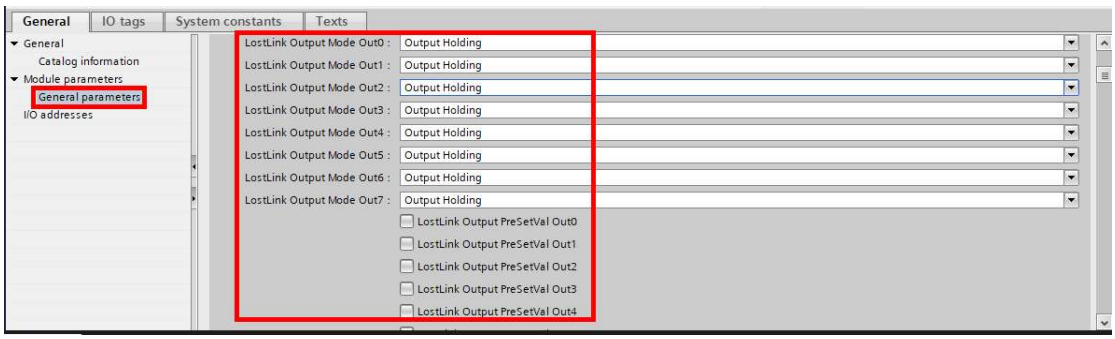
Note: For filtering parameter setting, the digital input module divides every 8 points into a group, and different filtering parameters can be set for each group. In the startup parameters, adjust the port filter mode according to actual requirements. The unit is 10 μs, and the default value is 10 ms.

Step 2 Obtain sampling values through I addresses.

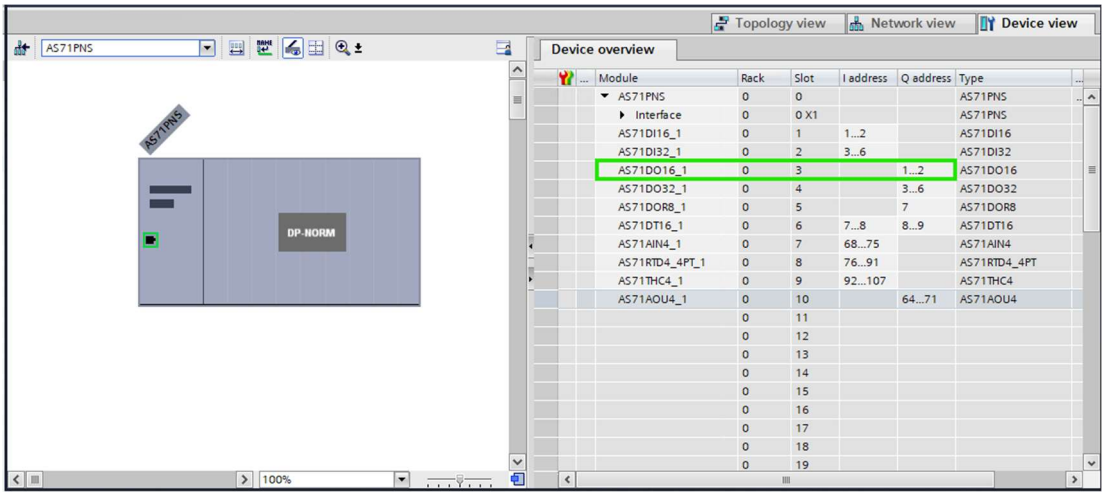


6.3.1.2.2 Digital output module

Step 1 In the **Device view** interface, add **AS71DO16-0016DP**, double-click **AS71DO16-0016DP** under **Module**, choose **Properties** > **General** > **Module parameters > General parameters**, and then set module initialization parameters.

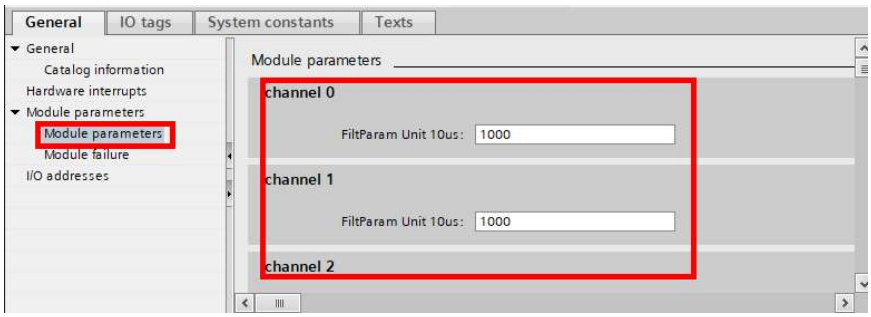


Step 2 Control output through Q addresses.

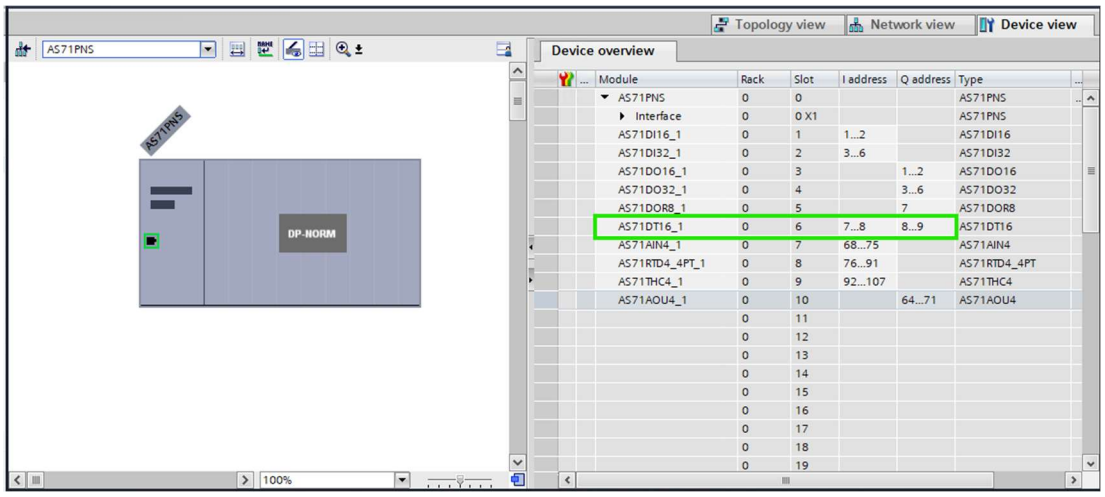


6.3.1.2.3 Digital input/output module

Step 1 In the **Device view** interface, add **AS71DT16**, double-click **AS71DT16** under **Module**, choose **Properties** > **General** > **Module parameters**, and then set module initialization parameters.

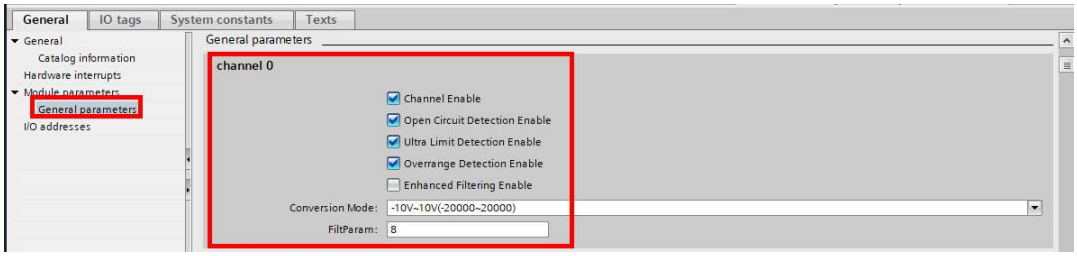


Step 2 Obtain sampling values through I addresses and control output through Q addresses.

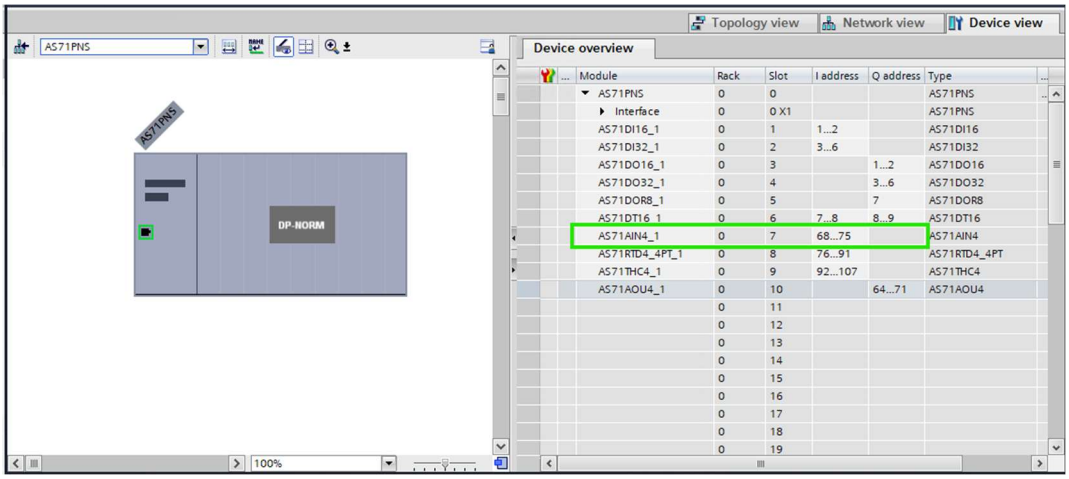


6.3.1.2.4 Analog input module

Step 1 In the **Device view** interface, add **AS71AIN4**, double-click **AS71AIN4** under **Module**, choose **Properties** > **General** > **Module parameters > General parameters**, and then set module initialization parameters.

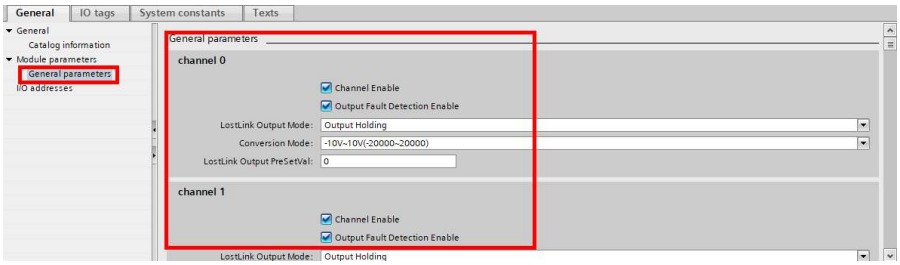


Step 2 Obtain sampling values through I addresses.

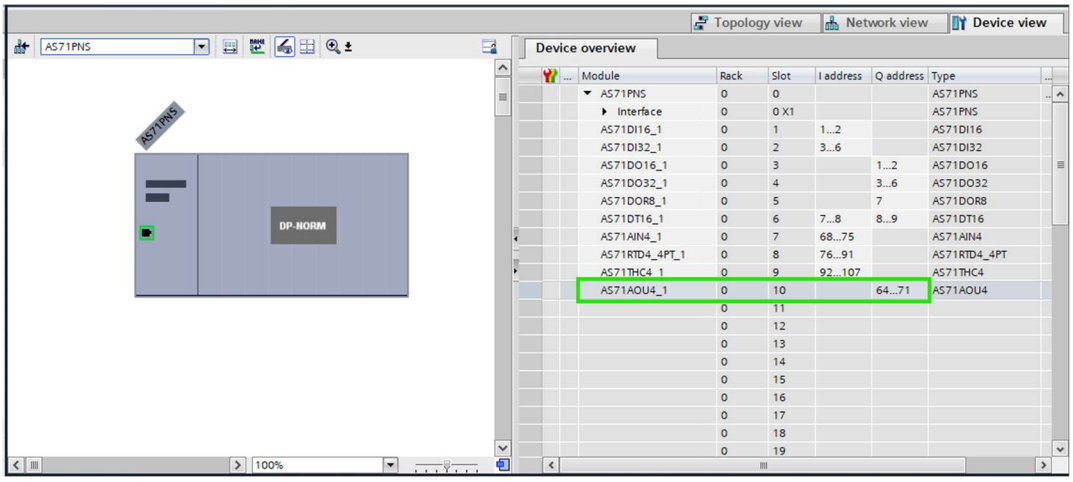


6.3.1.2.5 Analog output module

Step 1 In the **Device view** interface, add **AS71AOU4**, double-click **AS71AOU4** under **Module**, choose **Properties** > **General** > **Module parameters > General parameters**, and then set module initialization parameters.

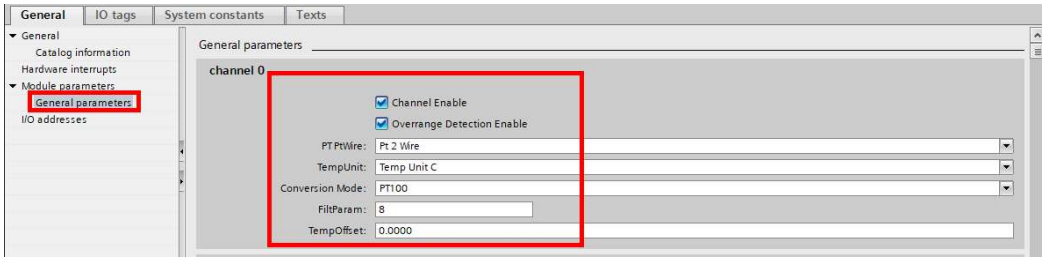


Step 2 Control output through Q addresses.

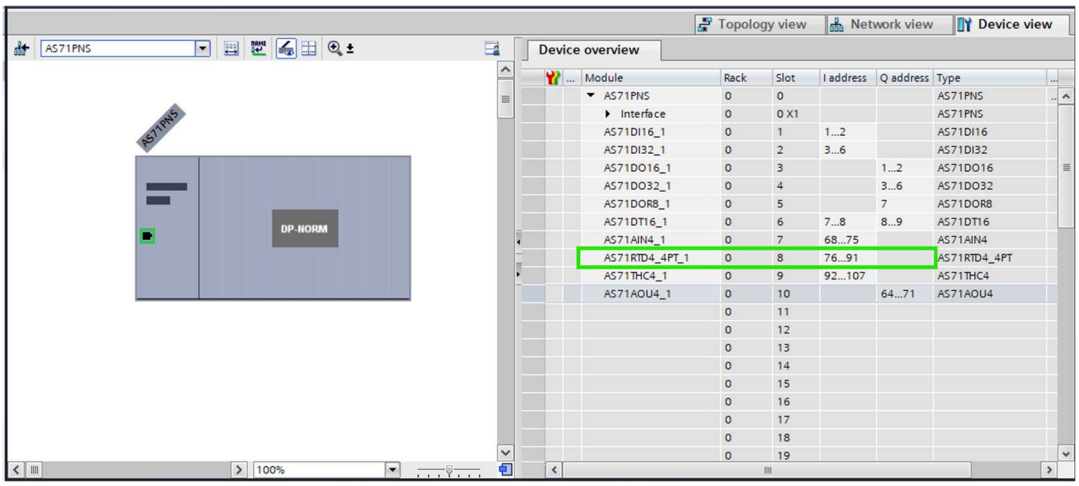


6.3.1.2.6 Temperature detection module

Step 1 In the **Device view** interface, add **AS71RTD4** , double-click **AS71RTD4** under **Module**, choose **Properties** > **General** > **Module parameters > General parameters**, and then set module initialization parameters.

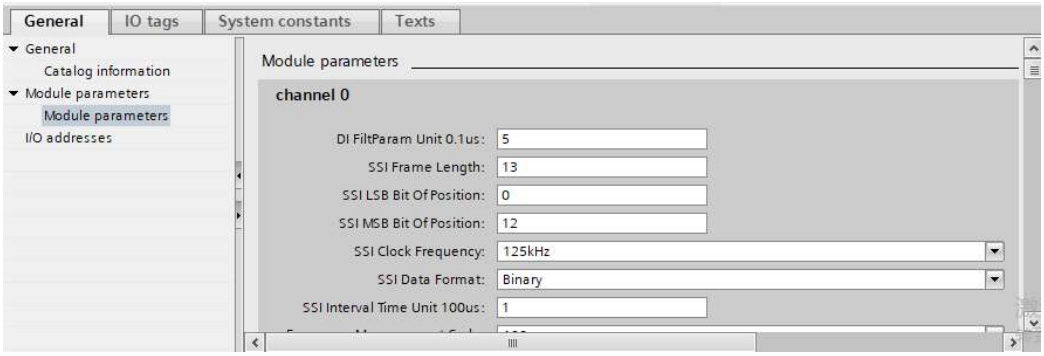


Step 2 Obtain sampling values through I addresses.



6.3.1.2.7 Counting and measurement module

Step 1 In the **Device view** interface, add **AS71AN02** , double-click **AS71AN02** under **Module**, choose **Properties** > **General** > **Module parameters**, and then set module initialization parameters.



Step 2 Obtain sampling values through I addresses and control output through Q addresses.

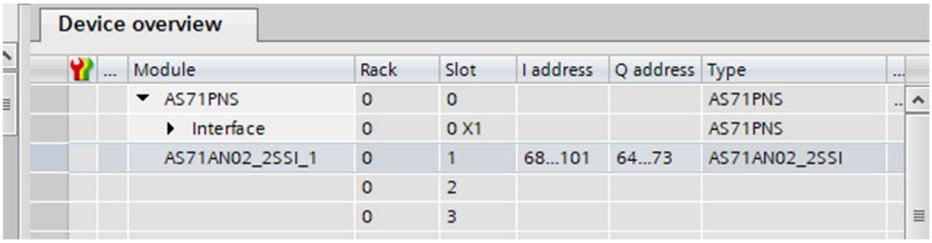


Table 6-1 Q address description

Address	Parameter name	Type	Meaning
%QB64	Cnt0_Ctrl	USINT	Control parameter for counter 0. Bit0: Counter enable, active high Bit 1: Reserved Bit2: Reserved Bit3: Reserved Bit4: Counter comparison function enable, active high (requires counter enable first) Bit7–bit5: Reserved
%QB65	Cnt1_Ctrl	USINT	Control parameter for counter 1. Bit0: Counter enable, active high Bit 1: Reserved Bit2: Reserved Bit3: Reserved Bit4: Counter comparison function enable, active high (requires counter enable first) Bit7–bit5: Reserved
%QD66	Cnt0_CmpVal	DINT	Counter 0 comparison value
%QD70	Cnt1_CmpVal	DINT	Counter 1 comparison value
%IB68	Cnt0_Status	USINT	Counter 0 count state feedback Bit0: Forward run flag Bit1: Reverse run flag Bit2: Reserved Bit3: Reserved Bit4: DI latch completion flag

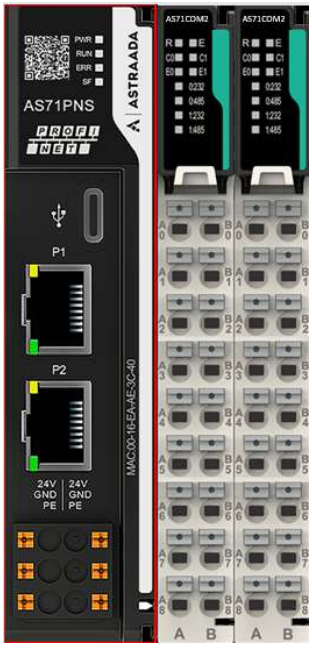
Address	Parameter name	Type	Meaning
			Bit5: Reserved Bit6: Data line idle status Bit7: Reserved
%IB69	Cnt0_Status	USINT	Counter 1 count state feedback Bit0: Forward run flag Bit1: Reverse run flag Bit2: Reserved Bit3: Reserved Bit4: DI latch completion flag Bit5: Reserved Bit6: Data line idle status Bit7: Reserved
%ID70	Cnt0_Val	DINT	Count value of counter 0
%ID74	Cnt1_Val	DINT	Count value of counter 1
%ID78	Cnt0_LatchVal	DINT	Latched value of counter 0
%ID82	Cnt1_LatchVal	DINT	Latched value of counter 1
%ID86	Cnt0_Freq	UDINT	Counter 0 frequency
%ID90	Cnt1_Freq	UDINT	Counter 1 frequency
%ID94	Cnt0_Velocity	REAL	Counter 0 speed (valid for single-turn encoder)
%ID98	Cnt1_Velocity	REAL	Counter 1 speed (valid for single-turn encoder)

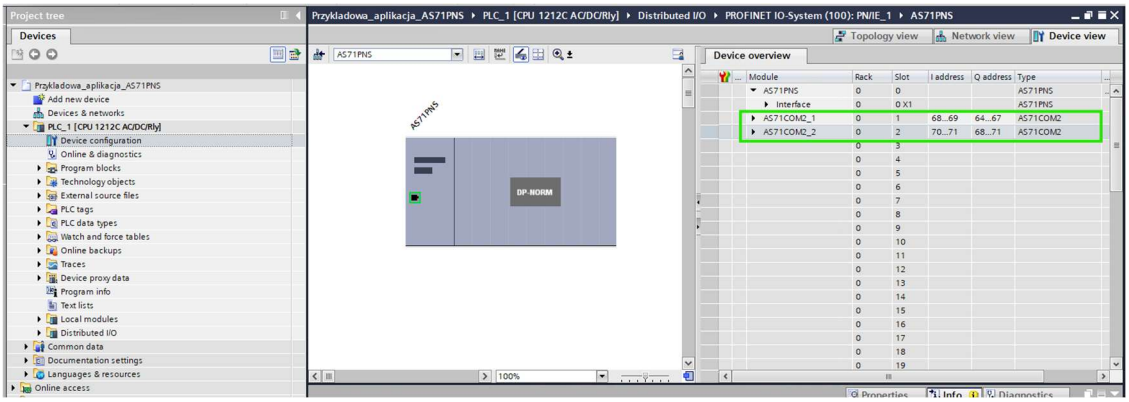
6.3.1.2.8 AS71COM2 serial communication module

The AS71COM2 serial communication module adopts a dual-channel design. It can be configured for RS485 or RS232 communication and can operate in Modbus RTU master/slave mode or free-protocol communication mode.

Note: The serial communication module implements its functions through the base module and function-code subslots. Each function code occupies one subslot, and one serial communication module supports a maximum of 31 subslot configurations.

The configuration is described using two AS71COM2 serial communication modules as an example. Each communication channel in the system can be configured separately as Modbus RTU master, Modbus RTU slave, or free-protocol mode to meet the communication requirements of different application scenarios.





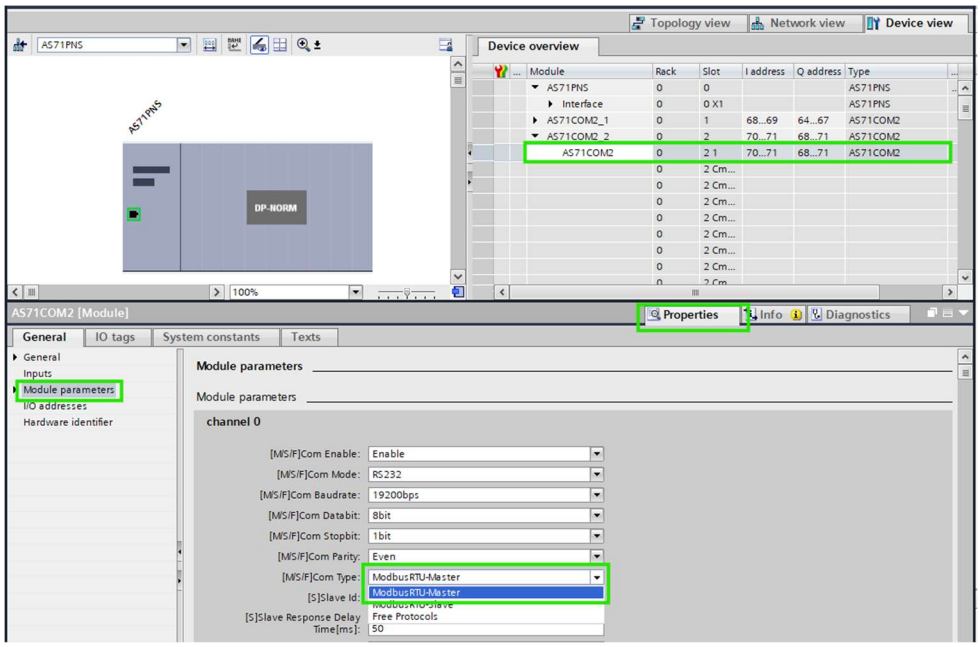
6.3.1.2.8.1 Modbus RTU master instructions

The master module supports the following function codes:

Function code	Name	Description	Operation type
0x01	Read Coils	Read coils	Bit operation (multiple)
0x02	Read Discrete Inputs	Read discrete inputs	Bit operation (multiple)
0x03	Read Holding Registers	Read holding registers	Word operation (multiple)
0x04	Read Input Registers	Read input registers	Word operation (multiple)
0x05	Write Single Coil	Write a single coil	Bit operation (single)
0x06	Write Single Register	Write a single holding	Word operation

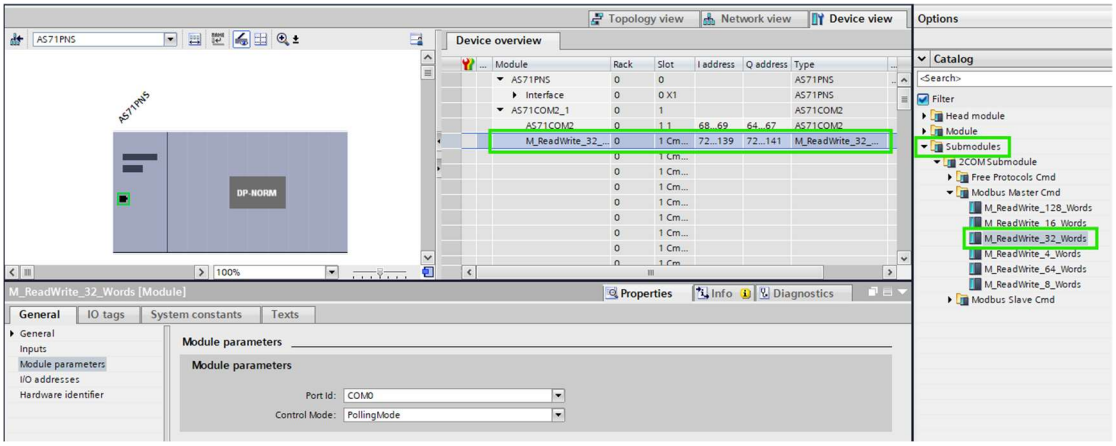
Function code	Name	Description	Operation type
		register	(single)
0x0F	Write Multiple Coils	Write multiple coils	Bit operation (multiple)
0x10	Write Multiple Registers	Write multiple holding registers	Word operation (multiple)

When the serial communication module is configured as a Modbus RTU master, function-code subslots with read/write data sizes of 4, 8, 16, 32, 64, or 128 words can be configured, allowing users to allocate input/output resources properly according to the application scenario. For the configurable function-code subslot types, see section 6.1.10.2 Serial communication module – Modbus RTU master virtual module.

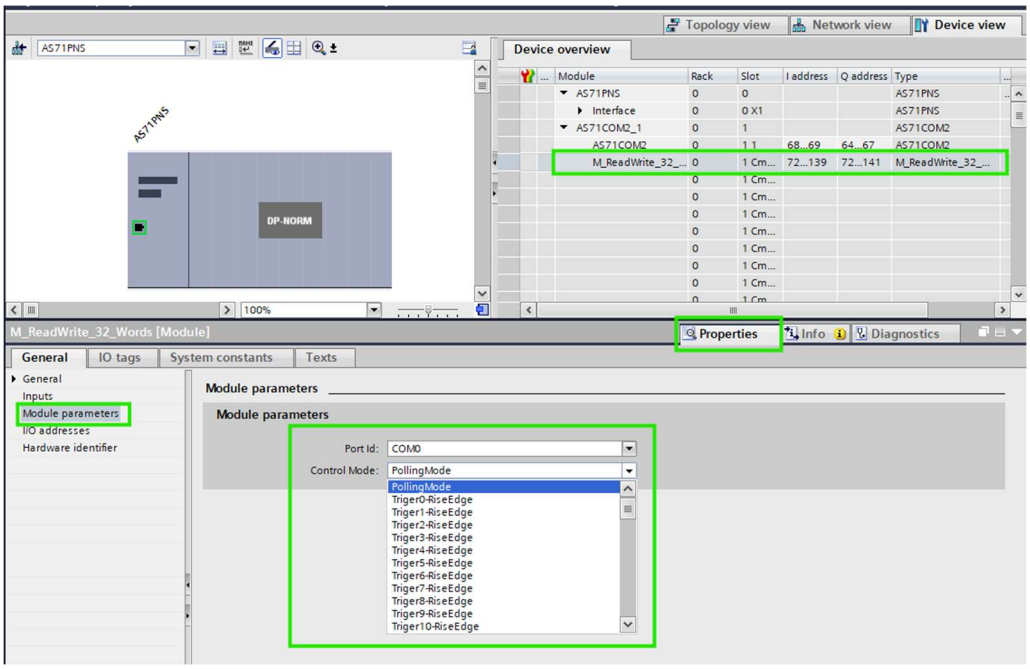


Example: Channel 0 of the first AS71COM2 serial communication module configured as master mode:

- **Add a master function-code subslot: M_ReadWrite_32_Words**



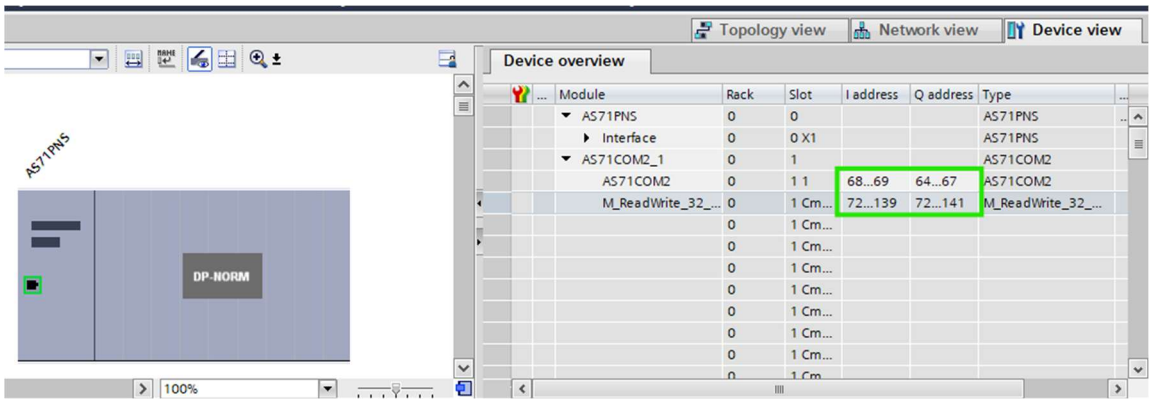
- **Parameter configuration of the M_ReadWrite_32_Words function-code subslot**



Multiple master function-code subslots can be configured under the same module channel.

After a channel is bound to a master function-code subslot, the subslot can be configured to operate in polling, trigger, or other operating modes. For details about the parameters, refer to section 6.1.10.2 Serial communication module – Modbus RTU master virtual module.

- **Input/Output data**



For the meanings of the I-area addresses assigned to input data, refer to the TxPDO feedback parameters of the corresponding submodules in section 6.1.10 Serial communication module (AS71COM2). For the meanings of the Q-area addresses assigned to output data, refer to the RxPDO control parameters of the corresponding submodules in section 6.1.10 Serial communication module (AS71COM2).

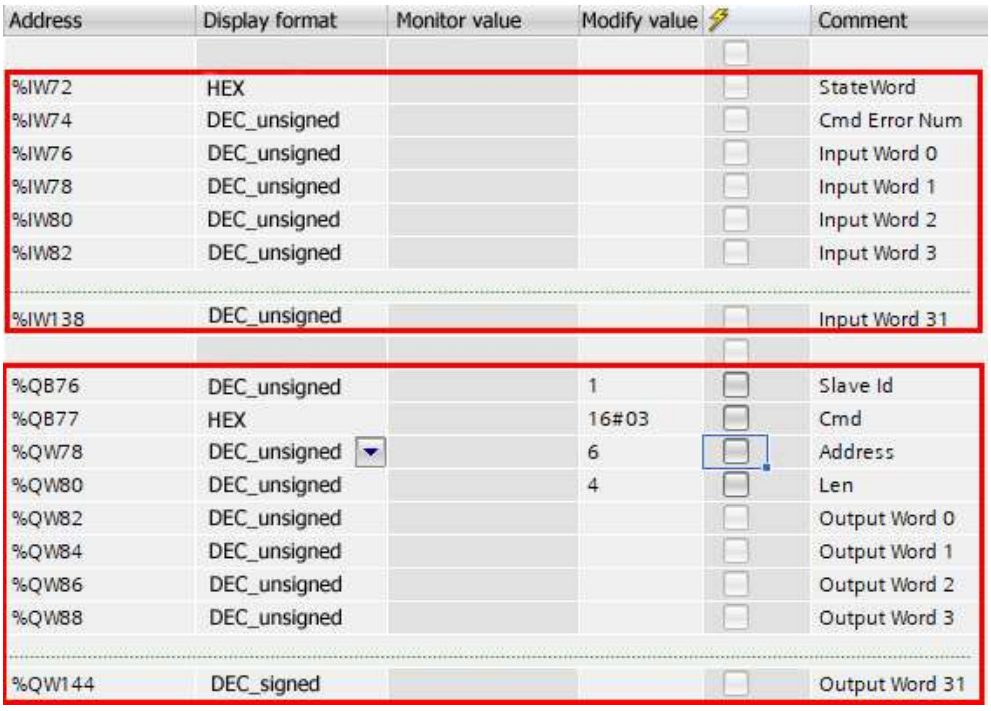
Example 1: The I-area addresses of the AS71COM2module are %IB68 to %IB69. For their meanings, refer to the TxPDO feedback parameters of the submodules in section 6.1.10.1 Serial communication module–AS71COM2_2COM. The Q-area addresses are %QB68 to %QB71. For their meanings, refer to the RxPDO control parameters of the submodules in section 6.1.10.1 Serial communication module–AS71COM2_2COM. The meanings are as follows:

Name	Display format	Monitor value	Modify value	Comment
%IB68	DEC_unsigned			com0 err
%IB69	DEC_unsigned			com1 err
%QB68	HEX			triger00~07
%QB69	HEX			triger10~17
%QB70	HEX			triger20~27
%QB71	HEX			triger30~37

Classification	Index/Subindex	Name	Data type	Description
Control parameter RxPDO	0x7040+0x80*n	2COM Out-Map	-	Serial communication module control parameter
	Subindex 0x01	Triger0	BIT	Trigger control bit: Valid when Triger0-Riseedge or Triger0-levelcontinue is configured for the master module.
	.....	.....	.....	Triger1–Triger30
	Subindex 0x20	Triger31	BIT	Trigger control bit: Valid when Triger31-Riseedge or Triger31-levelcontinue is configured for the master module.
Feedback parameter TxPDO	0x6040+0x80*n	2COM In-Map	-	Serial communication module status feedback parameter
	Subindex 0x01	ModuleErrID	UINT	For module error codes, see 8.1 Common faults and solutions.
	Subindex 0x02	Slaver0_errno	USINT	Communication fault code of Channel 0 slave. See 8.2 Serial communication module exception code description.
	Subindex 0x03	Slaver1_errno	USINT	Communication fault code of Channel 1 slave. See 8.2 Serial communication module exception code description.

Note: The only exception is that the I-area addresses of the AS71COM2module do not include the ModuleErrID data in TxPDO.

Example 2: The I-area addresses of the M_ReadWrite_32_Words function-code subslot are %IB72 to %IB139. For their meanings, refer to the TxPDO feedback parameters of the submodules in section 6.1.10.2 Serial communication module – Modbus RTU master virtual module. The Q-area addresses are %QB76 to %QB145. For their meanings, refer to the RxPDO control parameters of the submodules in section 6.1.10.2 Serial communication module – Modbus RTU master virtual module. The meanings are as follows:



Address	Display format	Monitor value	Modify value	Comment
%IW72	HEX			StateWord
%IW74	DEC_unsigned			Cmd Error Num
%IW76	DEC_unsigned			Input Word 0
%IW78	DEC_unsigned			Input Word 1
%IW80	DEC_unsigned			Input Word 2
%IW82	DEC_unsigned			Input Word 3
%IW138	DEC_unsigned			Input Word 31
%QB76	DEC_unsigned		1	Slave Id
%QB77	HEX		16#03	Cmd
%QW78	DEC_unsigned		6	Address
%QW80	DEC_unsigned		4	Len
%QW82	DEC_unsigned			Output Word 0
%QW84	DEC_unsigned			Output Word 1
%QW86	DEC_unsigned			Output Word 2
%QW88	DEC_unsigned			Output Word 3
%QW144	DEC_signed			Output Word 31

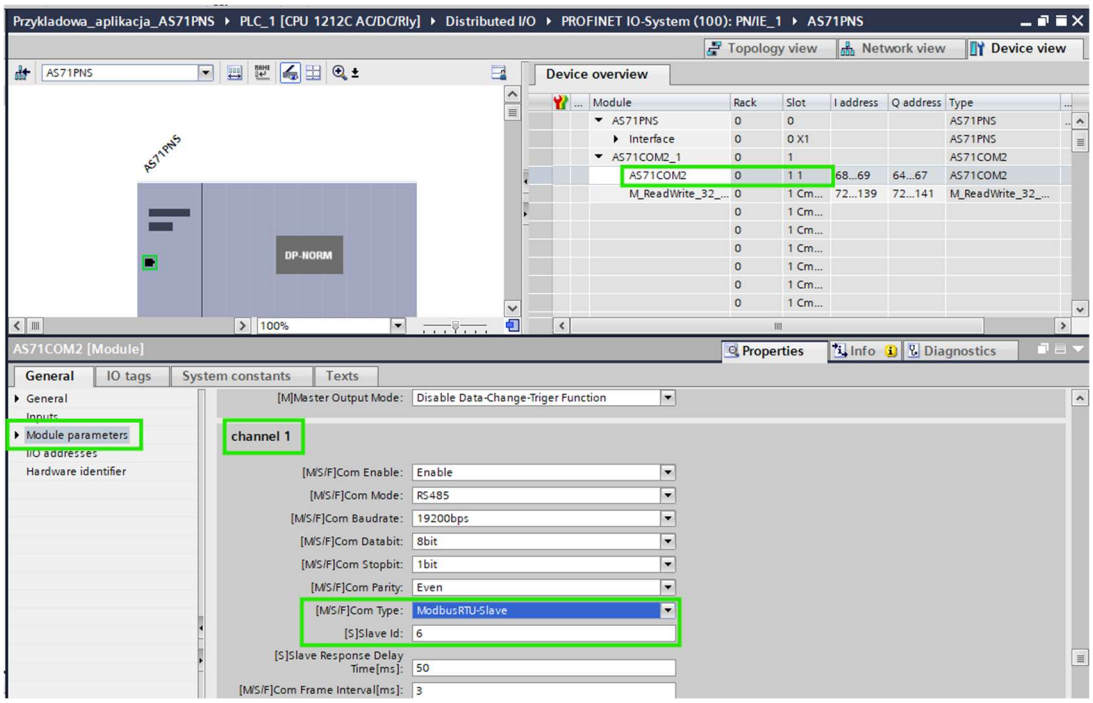
Classification	Index/Subindex	Name	Data type	Description
Control parameter RxPDO	0x7041+0x80*n	Output-Map	-	Master virtual module control parameter
	Subindex 0x01	SlaveID	USINT	Slave ID: ID of the slave to be read, 1–247
	Subindex 0x02	Cmd	USINT	Function code: 01/02/03/04/05/06/15/16
	Subindex 0x03	Address	UINT	Register address
	Subindex 0x04	Len	UINT	Length (The unit is Word or Bit, depending on the function code)
	Subindex 0x05	OutputData1	UINT	Corresponds to Address
	Subindex 0x06	OutputData2	UINT	Corresponds to Address+1
	Subindex 0x07	OutputData3	UINT	Corresponds to Address+2
	Subindex 0x08	OutputData4	UINT	Corresponds to Address+3
Feedback parameter TxPDO	0x6041+0x80*n	In-Map	-	Master virtual module status feedback parameter
	Subindex 0x01	StateWord	UINT	=0: Idle; trigger bit is 0 =1: Executing; trigger bit level is 1, and sending has started =2: Execution complete; sent and response received
	Subindex 0x02	CmdErrno	UINT	See 8.2 Serial communication module exception code description
	Subindex 0x03	InputData1	UINT	Corresponds to Address
	Subindex 0x04	InputData2	UINT	Corresponds to Address+1
	Subindex 0x05	InputData3	UINT	Corresponds to Address+2
	Subindex 0x06	InputData4	UINT	Corresponds to Address+3

The application can access Modbus RTU slave devices through the bound channel by changing the values of the SlaveID, Cmd, Address, and Len parameters and using the configured control mode, either polling or trigger mode.

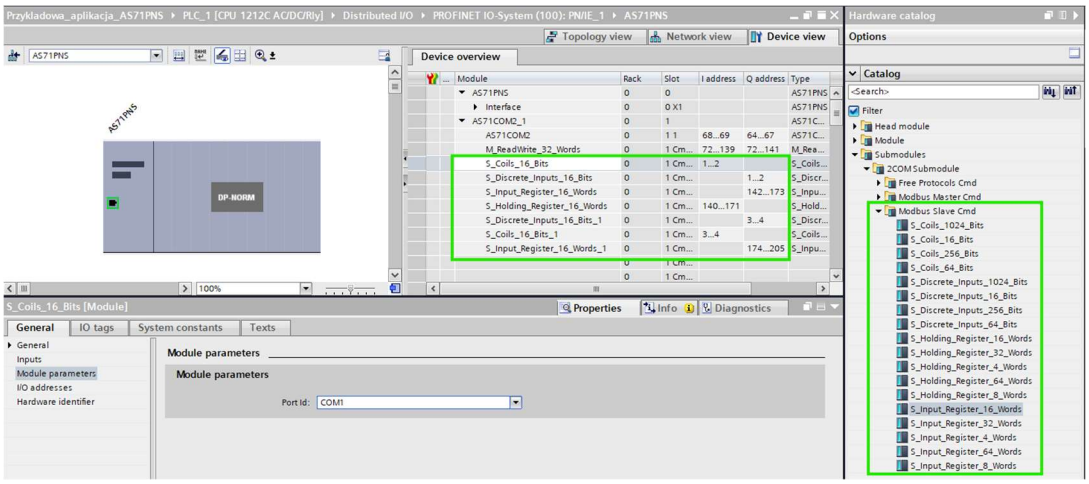
6.3.1.2.8.2 Modbus RTU slave instructions

When a channel is configured as slave mode, the configurable function-code subslot types are described in section 6.1.10.3 Serial communication module–Modbus RTU slave virtual module.

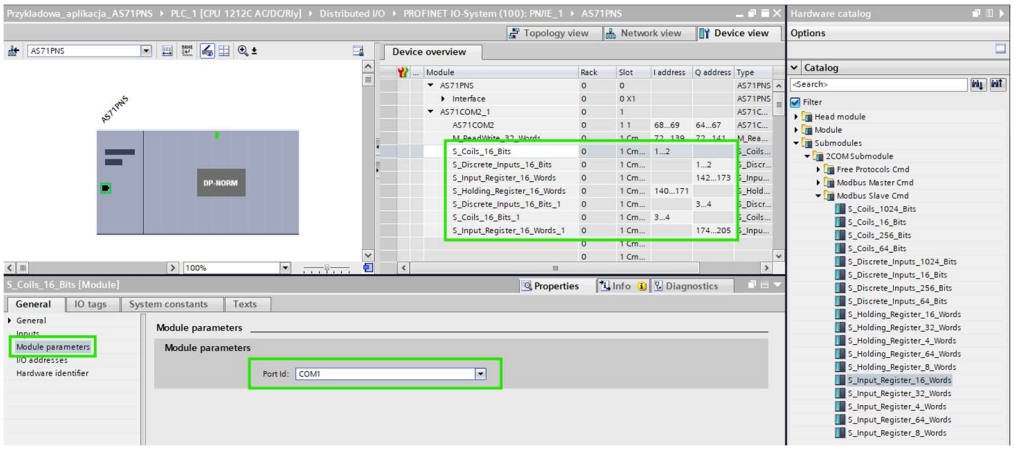
Example: Configure Channel 1 of the AS71COM2 serial communication module as slave mode, and set the slave ID to 6.



- **Add the following slave function-code subslots.**

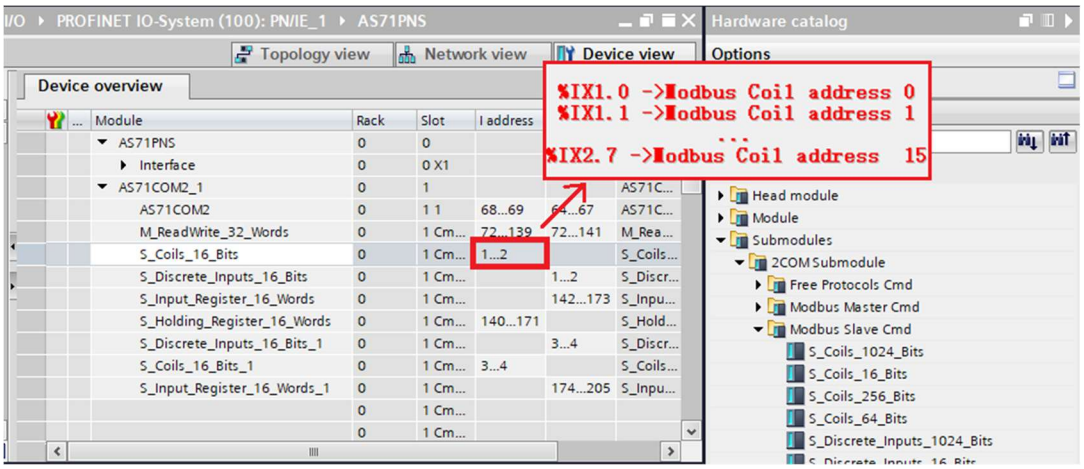


- **Configure the slave function-code subslot parameters and bind them to channel 1 of the AS71COM2 serial communication module.**



- **For slave function-code subslots of the same type, start addresses are assigned according to the allocation rules. The start address of the first function-code subslot starts from 0.**

- **The start address of the second Coils subslot continues from the address following the last address of the previous subslot, starting from 16.**



For the function codes used to access slave function-code subslots, see section 6.1.10.3 Serial communication module–Modbus RTU slave virtual module. For example, the master can use function codes 01/05/15 to access the Coils module defined above.

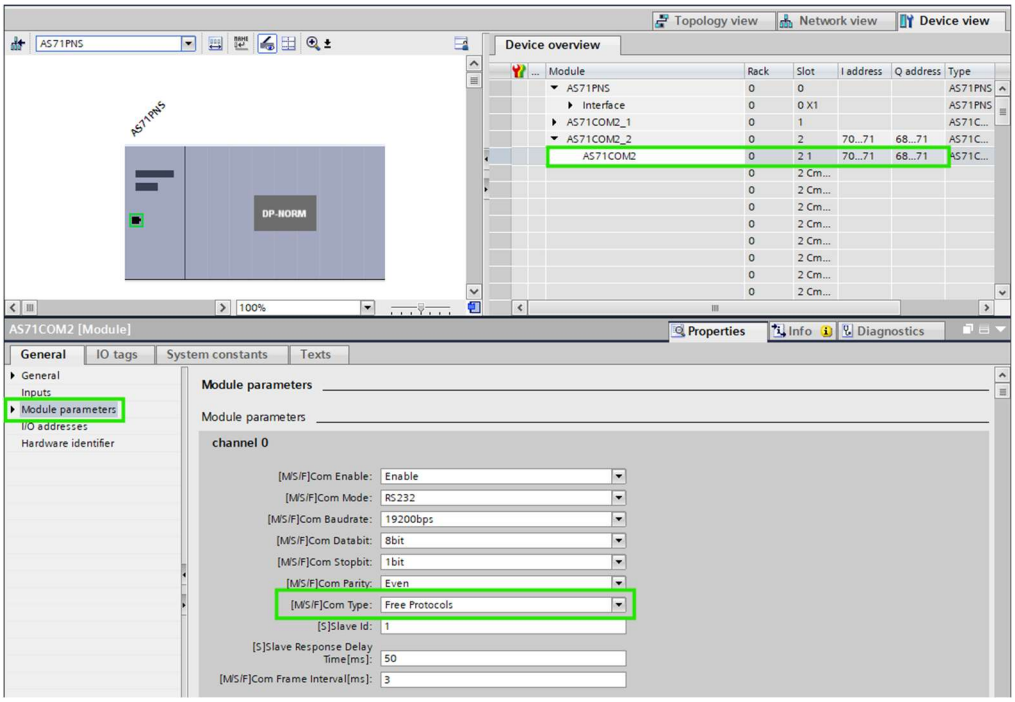
Channel error codes can be viewed through the feedback parameters com0 err and com1 err of the bound serial communication module, as shown in the following figure.

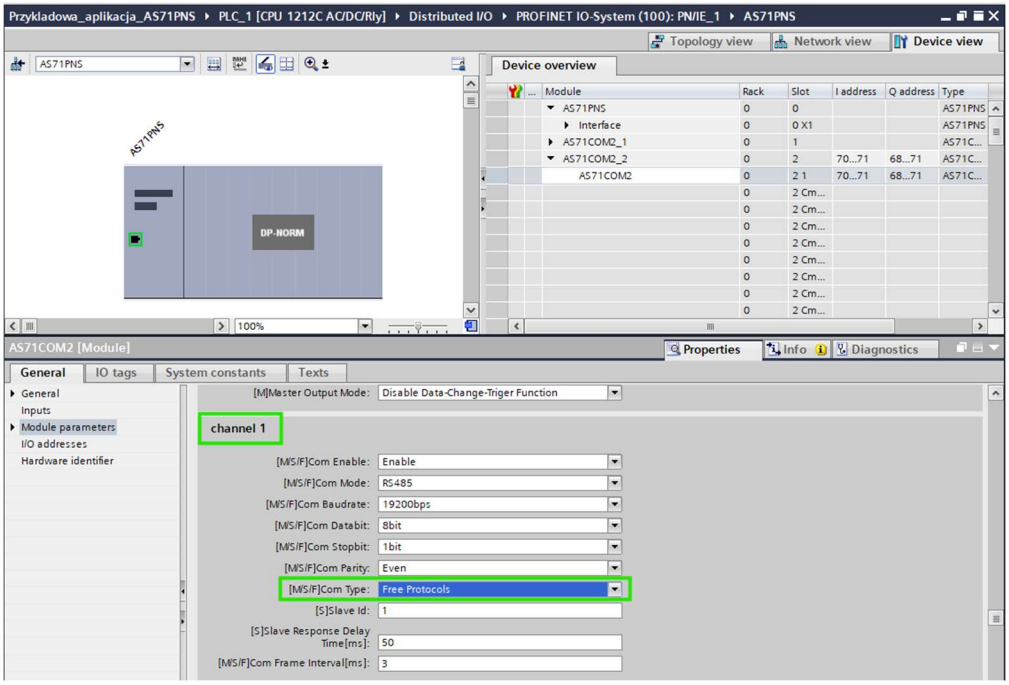
Address	Display format	Monitor value	Modify value	Comment
%IB68	DEC_unsigned			com0 err
%IB69	DEC_unsigned			com1 err
%QB68	HEX			triger00~07
%QB69	HEX			triger10~17
%QB70	HEX			triger20~27
%QB71	HEX			triger30~37

6.3.1.2.8.3 Free protocol instructions

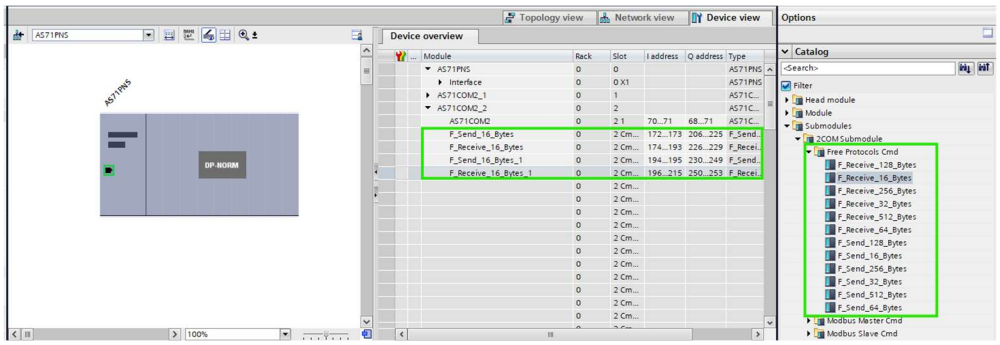
The maximum data frame length supported by the free protocol is 512 bytes. Transmit and receive subslots can be configured together on the same channel. RS232 supports simultaneous transmission and reception without blocking. RS485 does not support simultaneous transmission and reception. For details, see 6.1.10.4 Serial communication module–Free-protocol virtual module.

Example: Configure Channel 0 of the second AS71COM2 serial communication module for the free protocol and bind two free-protocol function subslots to it. Configure Channel 1 for the free protocol as well and bind two free-protocol function subslots to it.

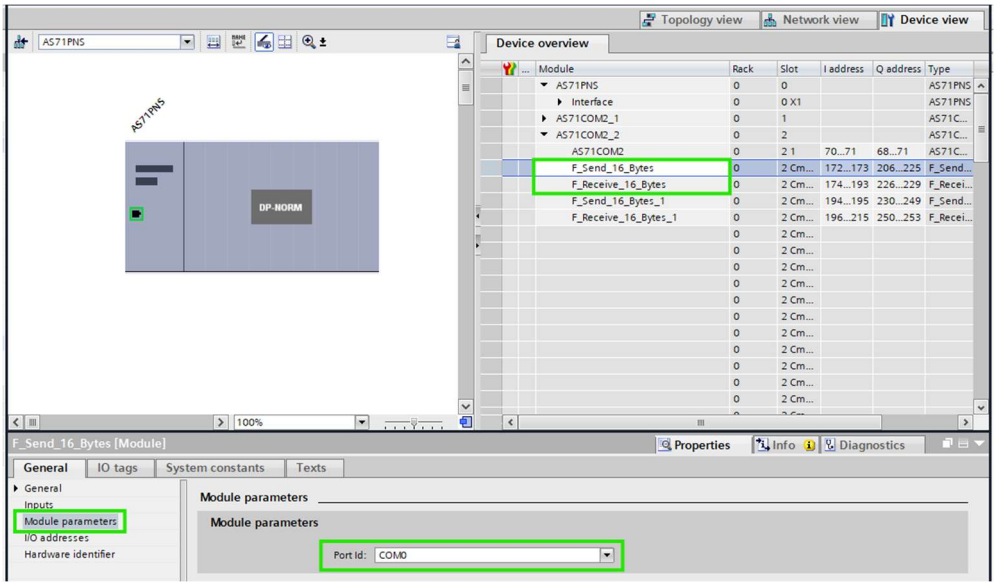




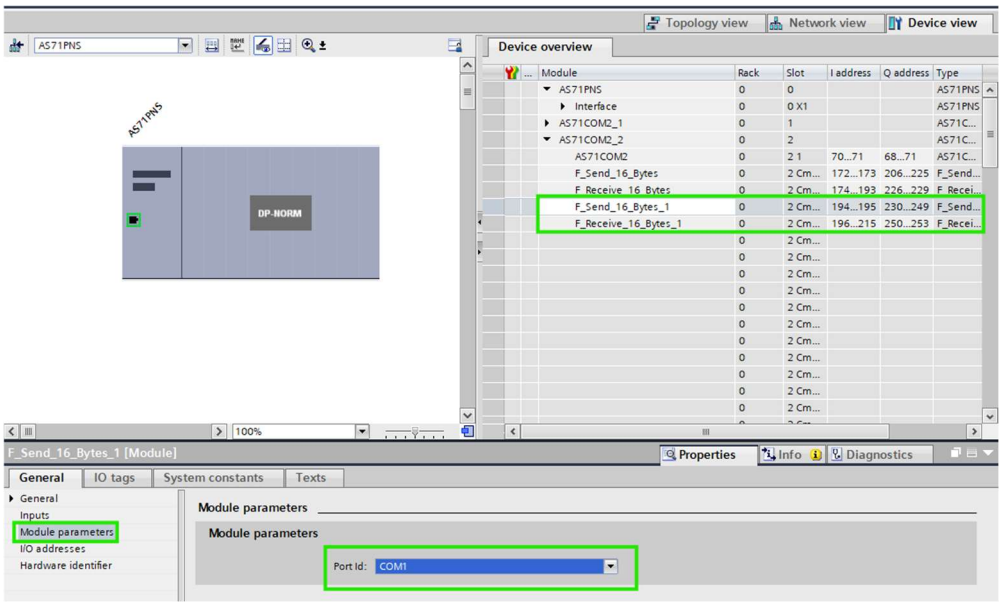
- **Add four free-protocol function subslots.**



- **Configure the parameters of two free-protocol function subslots and bind them to Channel 0 of the second AS71COM2 serial communication module.**



- **Configure the parameters of two free-protocol function subslots and bind them to Channel 1 of the second AS71COM2 serial communication module.**



For free-protocol function subslots, the meanings of the I-area addresses assigned to input data are

described in the TxPDO feedback parameters of the corresponding submodules in section 6.1.10.4 Serial communication module–Free-protocol virtual module. The meanings of the Q-area addresses assigned to output data are described in the RxPDO control parameters of the corresponding submodules in section 6.1.10.4 Serial communication module–Free-protocol virtual module.

Example 1: The I-area addresses of F_Send_16_Bytes are %IB172 to %IB173. For their meanings, refer to the TxPDO feedback parameters of the submodules in section 6.1.10.4.1 Free-protocol transmit module. The Q-area addresses are %QB210 to %QB229. For their meanings, refer to the RxPDO control parameters of the submodules in section 6.1.10.4.1 Free-protocol transmit module. The meanings are as follows:

Address	Display format	Monitor value	Modify value		Comment
%IW172	HEX				SendState
%QW210	DEC_unsigned				ControlWord
%QW212	DEC_unsigned				SendLen
%QB214	DEC_unsigned				OutputData0
%QB215	DEC_unsigned				OutputData1
%QB216	DEC_unsigned				OutputData2
%QB217	DEC_unsigned				OutputData3
%QB218	DEC_unsigned				OutputData4
%QB219	DEC_unsigned				OutputData5
%QB220	DEC_unsigned				OutputData6
%QB221	DEC_unsigned				OutputData7
%QB222	DEC_unsigned				OutputData8
%QB223	DEC_unsigned				OutputData9
%QB224	DEC_unsigned				OutputData10
%QB225	DEC_unsigned				OutputData11
%QB226	DEC_unsigned				OutputData12
%QB227	DEC_unsigned				OutputData13
%QB228	DEC_unsigned				OutputData14
%QB229	DEC_unsigned				OutputData15

Example 2: The I-area addresses of F_Receive_16_Bytes are %IB174 to %IB193. For the their meanings, see the TxPDO feedback parameters of the submodule in 6.1.10.4.2 Free-protocol receive module. The Q-area addresses are %QB230 to %QB233. For their meanings, see the RxPDO control parameters of the submodule in 6.1.10.4.2 Free-protocol receive module, as described below:

Address	Display format	Monitor value	Modify value		Comment
%IW174	HEX				ReceiveState
%IW176	DEC_unsigned				ActRecLen
%IB178	DEC_unsigned				InputData0
%IB179	DEC_unsigned				InputData1
%IB180	DEC_unsigned				InputData2
%IB181	DEC_unsigned				InputData3
%IB182	DEC_unsigned				InputData4
%IB183	DEC_unsigned				InputData5
%IB184	DEC_unsigned				InputData6
%IB185	DEC_unsigned				InputData7
%IB186	DEC_unsigned				InputData8
%IB187	DEC_unsigned				InputData9
%IB188	DEC_unsigned				InputData10
%IB189	DEC_unsigned				InputData11
%IB190	DEC_unsigned				InputData12
%IB191	DEC_unsigned				InputData13
%IB192	DEC_unsigned				InputData14
%IB193	DEC_unsigned				InputData15
%QW230	HEX				ControlWord
%QW232	DEC_unsigned				ReceiveLen

The free-protocol transmit module sends data by setting the ControlWord to 1, specifying the SendLen and the transmit data, and then the required data can be transmitted.

The free-protocol receive module enters the receive state by setting the ControlWord to 1. It does not require a specified receive length. The end of a frame is determined by the frame interval time. If the received frame length exceeds the total receive capacity of the virtual module, the reception fails; otherwise, the reception is successful.

To perform another transmission or reception, the ControlWord must first be set to 0 and then set back to 1 to re-enter the operation state.

6.4 EtherNet/IP configuration

6.4.1 Overview

This section describes how the A-Series I/O system connects to the EtherNet/IP network via the AS71EIP coupler, enabling real-time data exchange with a host controller or PLC.

In EtherNet/IP communication, the Electronic Data Sheet (EDS) file is a prerequisite for system configuration. It not only defines the communication parameters, I/O mapping, and object dictionary information of the coupler and expansion modules, but also provides device identification and data exchange capabilities for the master station software. The master station software can correctly recognize the AS71EIP coupler and its connected I/O modules only after importing the EDS file.

The EDS file of the AS71EIP EtherNet/IP coupler is available in two forms: one is a generic EDS file, and the other is a dedicated EDS file generated by the Astraada A-Series IO Studio configuration software based on the actual system configuration.

6.4.1.1 Generic EDS file

The generic EDS file (AS71EIP_universal_V1.0.eds) can be used directly in most PLC or configuration software environments. It is independent of specific expansion module configurations. The master station software can use this file to correctly identify the coupler and establish basic communication.

The EDS file defines six connection types:

1. Exclusive Owner
2. Input Only
3. Listen Only
4. Exclusive Owner Diagnosis Interface
5. Input Only Diagnosis Interface
6. Listen Only Diagnosis Interface

Note: Generally, connections 1, 2, and 3 are used based on the situation; connections 4, 5, and 6 are for diagnostics (not recommended for use).

- **Input(T→O) size and output(O→T) size settings**

When configuring, it is necessary to set the sizes of the connected input (T→O) and output (O→T). The bytes occupied by each I/O module are listed as follows.

Table 6-2 Number of bytes occupied by I/O modules

No.	Module	Input(T→O): bytes	Output(O→T): bytes
0	AS71EIP	4	0
1	AS71DI16	2	0
2	AS71DI32	4	0
3	AS71DO16	0	2
4	AS71DO32	0	4

No.	Module	Input(T→O): bytes	Output(O→T): bytes
5	AS71DOR8	0	2
6	AS71AIN4	8	0
7	AS71RTD4	16	0
8	AS71THC4	16	0
9	AS71AOU4	0	8
10	AS71DT16	2	2
11	AS71IN02	34	18

Table 6-3 Parameter names for byte mapping of T→O and O→T

T→O byte	T→O parameter name
0	hwVersion
1	
2	swVersion
3	
4	1600DI_IN0
5	1600DI_IN1
6	4PT-Temp0
7	
8	
9	
10	4PT-Temp1
11	
12	
13	
14	4PT-Temp2
15	
16	
17	
18	4PT-Temp3
19	
20	
21	
O→T byte	**O→T parameter name**
0	0008DR-OUT0
1	Satisfy Parameter (Empty parameter)

For example, combination of AS71EIP + AS71DI16 + AS71RTD4 + AS71DOR8

After checking the table:

AS71EIP: 4bytes Input(T→O), Parameter name: hwVersion, swVersion

AS71DI16_1600DI: 2bytes Input(T→O), Parameter name: 1600DI -IN0, 1600DI –IN1

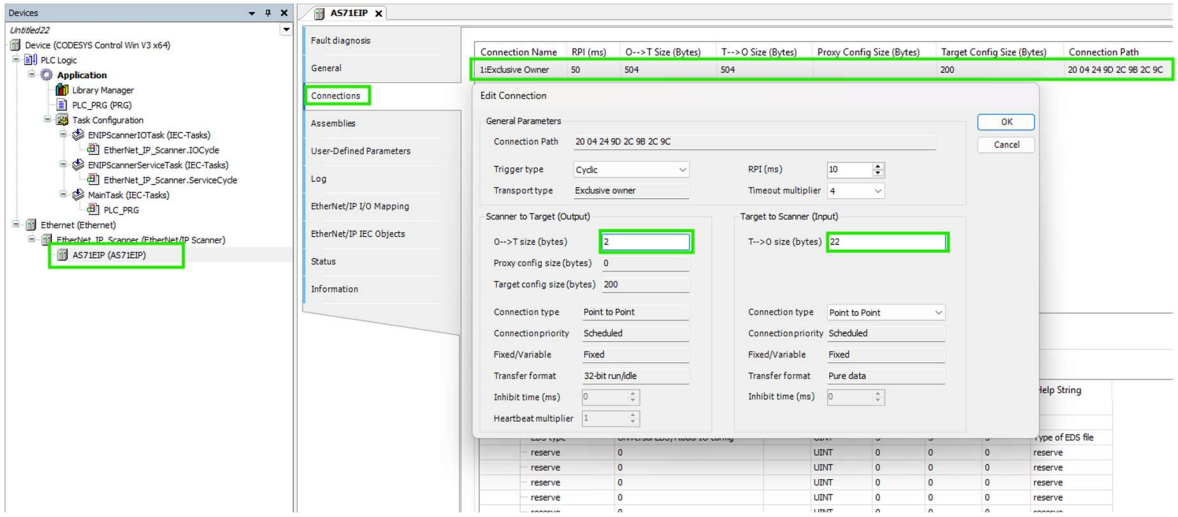
AS71RTD4_4PT: 16bytes Input(T→O), Parameter name: 4PT-Temp0–4PT-Temp4

AS71DOR8_0008DR: 2bytes Output(O→T), Parameter name: 0008DR-OUT0, Satisfy Parameter (empty parameter)

Input(T→O) length: 4+2+16+0=22

Output(O→T) length: 0+0+2=2

The configuration is as follows if in CODESYS:



Note:

- The length of the data in the input and output process must be set correctly; otherwise, a connection cannot be established.
- When calculating the length of input data, please note that the AS71EIP coupler occupies 4 bytes of data.

■ Config Param configuration parameter description

The current ConfigParam field includes the configuration for 14 supported I/O modules, with uniform settings for the same modules within the configuration, with a total length of 206 bytes. The specific offsets are as follows:

Module	Configuration parameter name	Offset	Default value	Configurable
AS71EIP	EDS type	0	1	No
		1		
	SLOT 1–8 Module Enable Bit	2	255	Yes
	SLOT 9–16 Module Enable Bit	3	255	Yes
	SLOT 17–24 Module Enable Bit	4	255	Yes
	SLOT 25–32 Module Enable Bit	5	255	Yes
AS71DI16	slot1_FlexIO (AS71DI16)	6	372330578	No
		7		
		8		
		9		
	slot1_1600DI_Filt0	10	1000	Yes
		11		
	slot1_1600DI_Filt1	12	1000	Yes
		13		
AS71DI32	slot2_FlexIO (AS71DI32)	14	372330579	No
		15		
		16		
		17		
	slot2_3200DI_Filt0	18	1000	Yes
		19		
	slot2_3200DI_Filt1	20	1000	Yes
		21		

Module	Configuration parameter name	Offset	Default value	Configurable
	slot2_3200DI_Filt2	22	1000	Yes
		23		
	slot2_3200DI_Filt3	24	1000	Yes
		25		
AS71DO16	slot3_FlexIO (AS71DO16)	26	372330586	No
		27		
		28		
		29		
	slot3_0016DP_Stop_Mode0	30	0	Yes
		31		
	slot3_0016DP_Stop_Mode1	32	0	Yes
		33		
	slot3_0016DP_Stop_Output0	34	0	Yes
	slot3_0016DP_Stop_Output1	35	0	Yes
AS71DO32	slot4_FlexIO (AS71DO32)	36	372330587	No
		37		
		38		
		39		
	slot4_0032DP_Stop_Mode0	40	0	Yes
		41		
	slot4_0032DP_Stop_Mode1	42	0	Yes
		43		
	slot4_0032DP_Stop_Mode2	44	0	Yes
		45		
	slot4_0032DP_Stop_Mode3	46	0	Yes
		47		
	slot4_0032DP_Stop_Output0	48	0	Yes
	slot4_0032DP_Stop_Output1	49	0	Yes
	slot4_0032DP_Stop_Output2	50	0	Yes
	slot4_0032DP_Stop_Output3	51	0	Yes
AS71DOR8	slot7_FlexIO (AS71DOR8)	78	372330601	No
		79		
		80		
		81		
	slot7_0008DR_Stop_Mode	82	0	Yes
		83		
	slot7_0008DR_Stop_Output	84	0	Yes
AS71AIN4	slot8_FlexIO (AS71AIN4)	85	372330625	No
		86		
		87		
		88		
	slot8_4AD_AI0_Cfg	89	97	Yes
	slot8_4AD_AI1_Cfg	90	97	Yes
	slot8_4AD_AI2_Cfg	91	97	Yes
	slot8_4AD_AI3_Cfg	92	97	Yes
	slot8_4AD_AI0_Filt	93	8	Yes
	slot8_4AD_AI1_Filt	94	8	Yes
	slot8_4AD_AI2_Filt	95	8	Yes

Module	Configuration parameter name	Offset	Default value	Configurable
	slot8_4AD_AI3_Filt	96	8	Yes
AS71RTD4	slot9_FlexIO (AS71RTD4)	97	372330657	No
		98		
		99		
		100		
	slot9_4PT_Temp0_Cfg	101	129	Yes
	slot9_4PT_Temp1_Cfg	102	129	Yes
	slot9_4PT_Temp2_Cfg	103	129	Yes
	slot9_4PT_Temp3_Cfg	104	129	Yes
	slot9_4PT_Temp0_Filt	105	8	Yes
	slot9_4PT_Temp1_Filt	106	8	Yes
	slot9_4PT_Temp2_Filt	107	8	Yes
	slot9_4PT_Temp3_Filt	108	8	Yes
	slot9_4PT_Temp0_Offset	109	0	Yes
		110		
	slot9_4PT_Temp1_Offset	111	0	Yes
		112		
	slot9_4PT_Temp2_Offset	113	0	Yes
		114		
	slot9_4PT_Temp3_Offset	115	0	Yes
		116		
AS71THC4	slot10_FlexIO (AS71THC4)	117	372330665	No
		118		
		119		
		120		
	slot10_4TC_Temp0_Cfg	121	129	Yes
	slot10_4TC_Temp1_Cfg	122	129	Yes
	slot10_4TC_Temp2_Cfg	123	129	Yes
	slot10_4TC_Temp3_Cfg	124	129	Yes
	slot10_4TC_Temp0_Filt	125	8	Yes
	slot10_4TC_Temp1_Filt	126	8	Yes
	slot10_4TC_Temp2_Filt	127	8	Yes
	slot10_4TC_Temp3_Filt	128	8	Yes
	slot10_4TC_Temp0_Offset	129	0	Yes
		130		
	slot10_4TC_Temp1_Offset	131	0	Yes
		132		
	slot10_4TC_Temp2_Offset	133	0	Yes
		134		
	slot10_4TC_Temp3_Offset	135	0	Yes
		136		
AS71AOU4	slot11_FlexIO (AS71AOU4)	137	372330633	No
		138		
		139		
		140		
	slot11_4DA_AO0_Cfg	141	97	Yes
	slot11_4DA_AO1_Cfg	142	97	Yes
	slot11_4DA_AO2_Cfg	143	97	Yes

Module	Configuration parameter name	Offset	Default value	Configurable
	slot11_4DA_AO3_Cfg	144	97	Yes
	slot11_4DA_AO0_Stop_Output	145	0	Yes
		146		
	slot11_4DA_AO1_Stop_Output	147	0	Yes
		148		
	slot11_4DA_AO2_Stop_Output	149	0	Yes
		150		
	slot11_4DA_AO3_Stop_Output	151	0	Yes
		152		
AS71DT16	slot12_FlexIO (AS71DT16)	153	372330610	No
		154		
		155		
		156		
	slot12_1616DP_Filt0	157	1000	Yes
		158		
	slot12_1616DP_Filt1	159	1000	Yes
		160		
	slot12_1616DP_Stop_Mode0	161	0	Yes
		162		
	slot12_1616DP_Stop_Mode1	163	0	Yes
		164		
	slot12_1616DP_Stop_Output0	165	0	Yes
	slot12_1616DP_Stop_Output1	166	0	Yes
AS71IN02	slot14_FlexIO (AS71IN02)	181	372330673	No
		182		
		183		
		184		
	slot14_2EI_Cnt0_Cfg	185	772	Yes
		186		
	slot14_2EI_Cnt1_Cfg	187	772	Yes
		188		
	slot14_2EI_Cnt0_Filt	189	5	Yes
		190		
	slot14_2EI_Cnt1_Filt	191	5	Yes
		192		
	slot14_2EI_Cnt0_Ratio	193	10000	Yes
		194		
	slot14_2EI_Cnt1_Ratio	195	10000	Yes
		196		
	slot14_2EI_Cnt0_PresetVal	197	0	Yes
		198		
		199		
		200		
	slot14_2EI_Cnt1_PresetVal	201	0	Yes
		202		
		203		
		204		
AS71EIP	Satisfy Parameter	205	0	No

Note: For parameter configuration, refer to section 6.1 Parameter description.

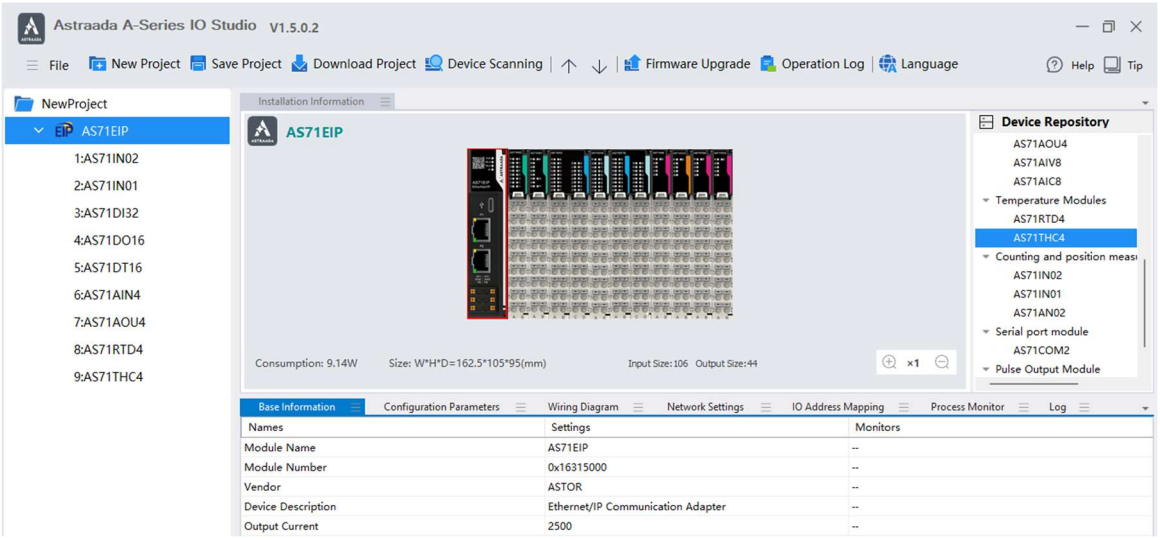
6.4.1.2 Dedicated EDS file

The dedicated EDS file can be automatically generated using the Astraada A-Series IO Studio.exe software tool according to the actual configuration. When configuring the master station, it is not necessary to manually set the Input(T→O) Size/Output(O → T) Size.

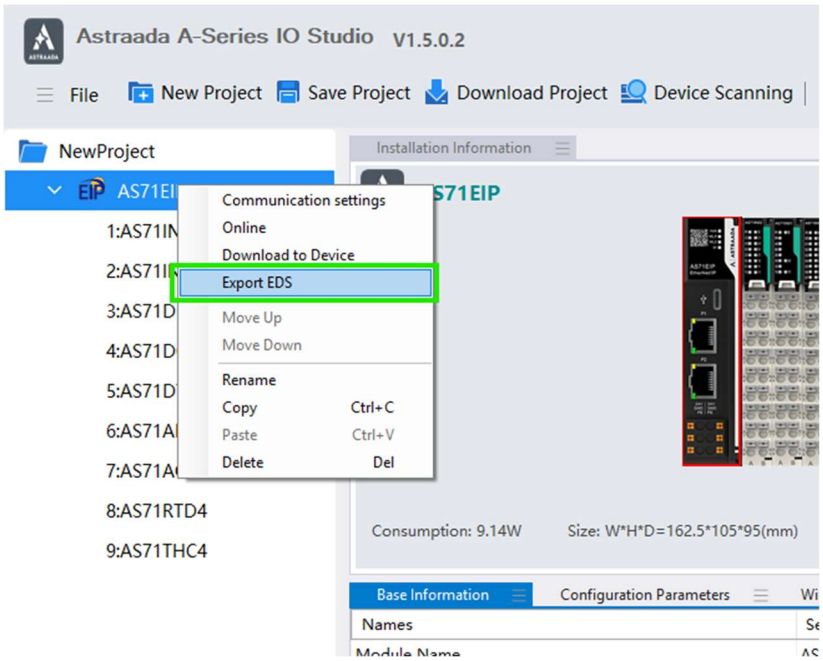
Note: Please use Astraada A-Series IO Studio.exe V1.1.0.10 or later.

- Taking AS71EIP as an example, the steps to generate a dedicated EDS file are as follows:

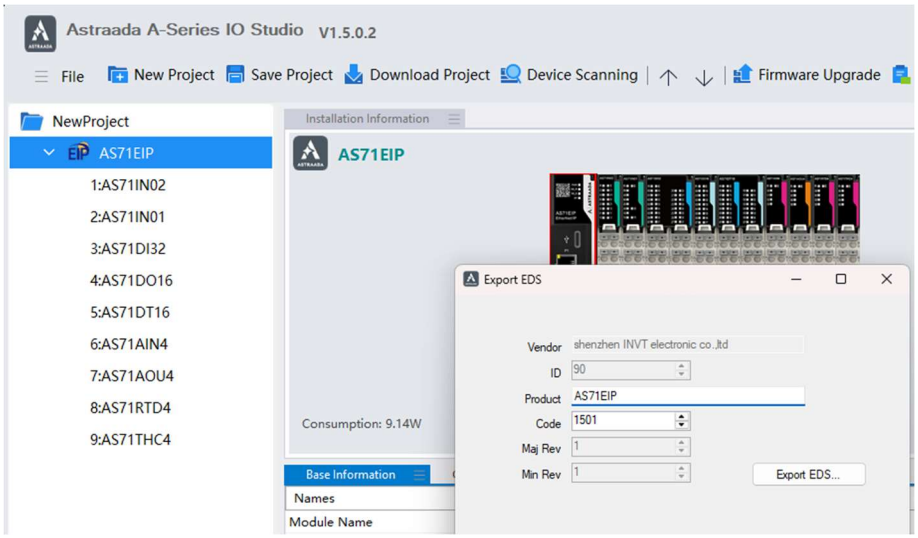
1. Power on the coupler, connect it to the PC using a Type-C cable, and run the Astraada A-Series IO Studio software.



2. Right-click AS71EIP > **EDS export**.

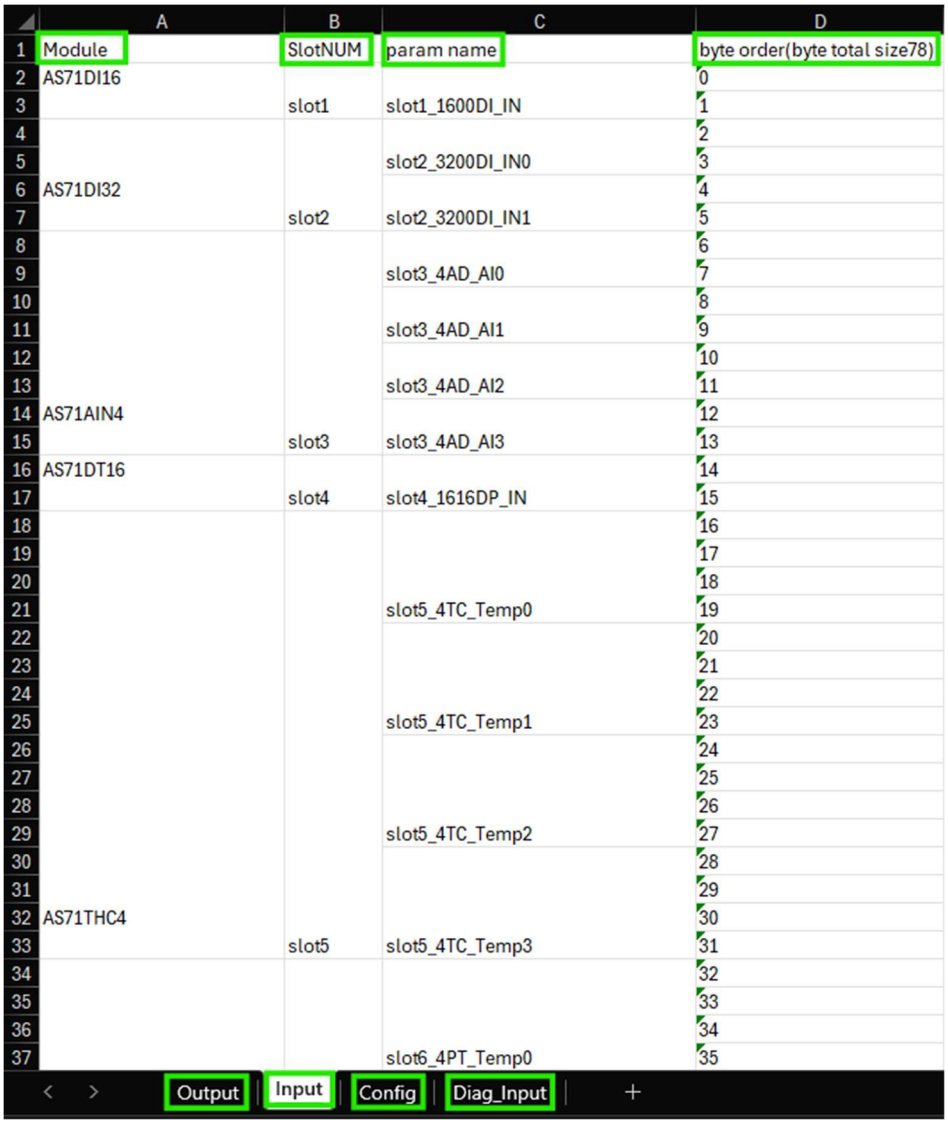


3. Click **Export EDS...**.



Note: The product code can be modified to distinguish non-configured EDS files.

After completing the above steps, two files must be generated: A dedicated EDS file (AS71EIP.eds) and an I/O mapping table (AS71EIP_IO.xlsx). The I/O mapping table includes Input (input process data), Output (output process data), and Config (configuration data). Each mapping table consists of module, name, and byte index. The name is composed of the slot name, module name, and parameter name. From the name, the slot and module type can be identified. From the byte index, the offset address and the number of occupied bytes can be determined. A schematic diagram is shown below:



	A	B	C	D
1	Module	SlotNUM	param name	byte order(byte total size78)
2	AS71DI16			0
3		slot1	slot1_1600DI_IN	1
4				2
5			slot2_3200DI_IN0	3
6	AS71DI32			4
7		slot2	slot2_3200DI_IN1	5
8				6
9			slot3_4AD_AI0	7
10				8
11			slot3_4AD_AI1	9
12				10
13			slot3_4AD_AI2	11
14	AS71AIN4			12
15		slot3	slot3_4AD_AI3	13
16	AS71DT16			14
17		slot4	slot4_1616DP_IN	15
18				16
19				17
20				18
21			slot5_4TC_Temp0	19
22				20
23				21
24				22
25			slot5_4TC_Temp1	23
26				24
27				25
28				26
29			slot5_4TC_Temp2	27
30				28
31				29
32	AS71THC4			30
33		slot5	slot5_4TC_Temp3	31
34				32
35				33
36				34
37			slot6_4PT_Temp0	35

Output | Input | Config | Diag_Input | +

- **Name description**
  - **slot1_1600DI_IN**: slot1 is the first slot counted from the coupler end, the module is 1600DI, and the parameter is **IN**.
  - **slot5_4TC_Temp0**: slot5 is the tenth slot counted from the coupler end, the module is 4TC, and the parameter is **Temp0**.
- **Parameter description**

  See 6.1 Parameter description for the specific module configuration description.

6.4.1.3 Object information

Object attributes can be read or configured via UCMM using the Get Attribute Single (0x0E) and Set Attribute Single (0x10) services. Common object attributes are listed in the table below.

Data object	Class	Instance	Attribute	Service	Remarks
Coupler information	0x04	0x68	0x03	0x0E	Byte 0–1: Number of Act num modules Byte 2–3: Hw version Byte 4–5: Sw version Byte 6–7: Fpga version
Module configuration	0x04	0x69	0x03	0x0E	Byte 0–31: Slot 1–32 module type Module does not exist: 0x00

Data object	Class	Instance	Attribute	Service	Remarks
					AS71DI16: 0x12 AS71DO16: 0x1A AS71DOR8: 0x29 AS71AIN4:0x41 AS71AOU4: 0x49 AS71RTD4: 0x61 AS71THC4: 0x69
Slot 1 module info	0x04	0x70	0x03	0x0E	Byte 0–1: Hw version Byte 2–3: FPGA version
…	0x04	…	0x03	0x0E	
Slot 32 module info	0x04	0x8F	0x03	0x0E	
IP configuration method	0xF5	0x01	0x03	0x0E, 0x10	CIP standard object
IP interface configuration	0xF5	0x01	0x05	0x0E, 0x10	CIP standard object
IP address	0x04	0x92	0x03	0x0E, 0x10	-
Subnet mask	0x04	0x93	0x03	0x0E, 0x10	-
Gateway	0x04	0x94	0x03	0x0E, 0x10	-

6.4.2 CODESYS configuration example

6.4.2.1 Preparation

- **Hardware**

Type	Model	Quantity	Slot
PC	PC (CODESYS V3.5 installed)	1	-
Network cable	Configured according to actual requirements	1	-
Power supply		1	-
PLC	CODESYS Control WIN V3 – x64 SysTray	1	-
Coupler	AS71EIP	1	0
I/O module	AS71DI32	1	1
	AS71THC4	1	2
	AS71AIN4	1	3
	AS71AOU4	1	4
	AS71IN02	1	5
	AS71DI16	1	6
	AS71DT16	1	7
	AS71DOR8	1	8
	AS71RTD4	1	9
	AS71DO32	1	10
	AS71DO16	1	11
Bottom cover	Bottom cover	1	12

For hardware configuration and connection, see the requirements and operations described in chapters 3 Installation and 4 Wiring.

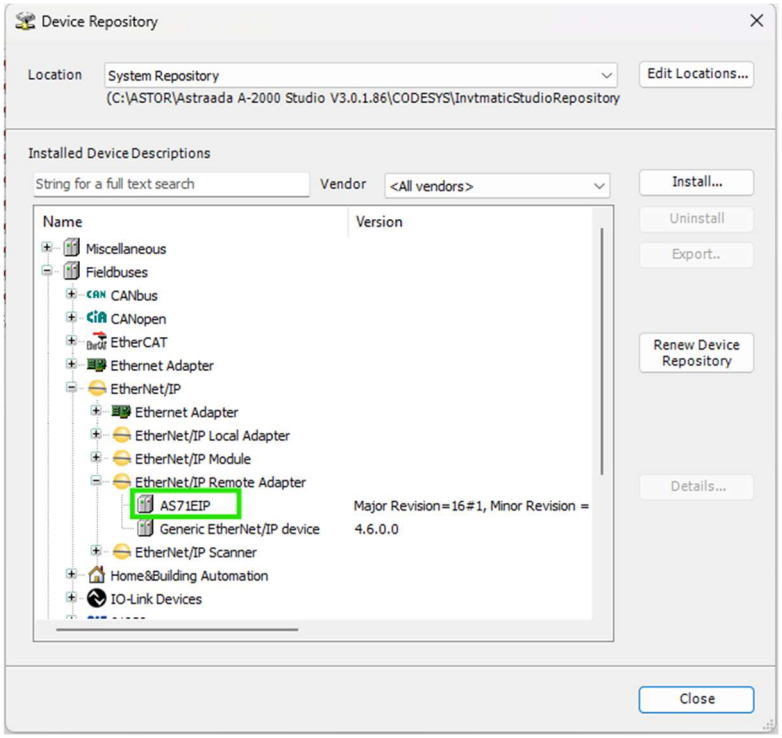
- **Software**

Device configuration file (Choose one of the following two options)

- Generic EDS file: **AS71EIP_universal_V1.0.eds**
- Dedicated EDS file: Generated using the Astraada A-Series IO Studio software based on the description in section 6.4.1.2 Dedicated EDS file, resulting in AS71EIP.eds.

6.4.2.2 EDS file installation

Open the CODESYS software, choose **Tools** > **Device Repository**, click **Install**, and select **AS71EIP_universal_V1.0.eds** to install. The installation is successful as shown in the figure below.

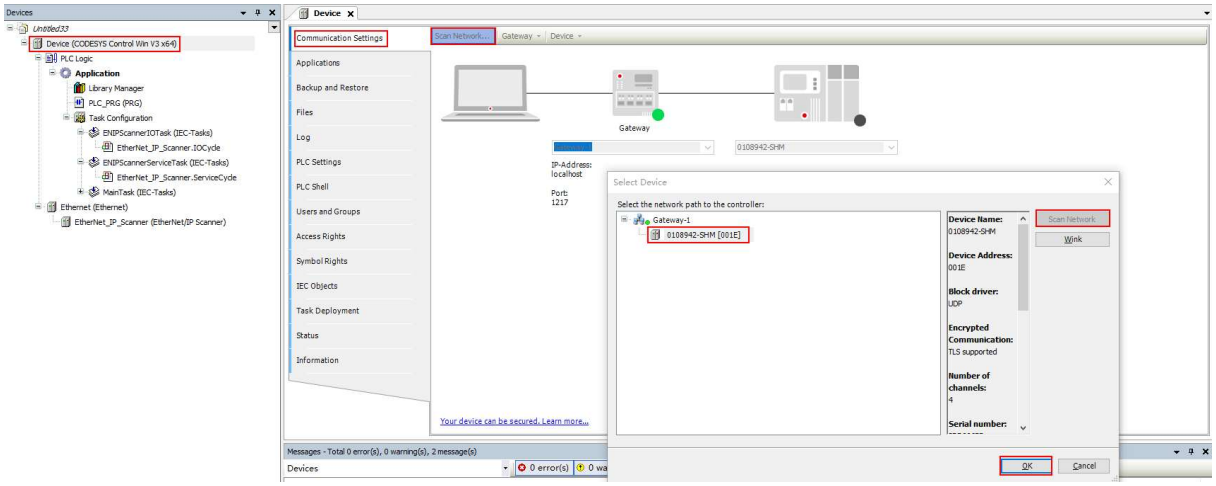


6.4.2.3 Project creation

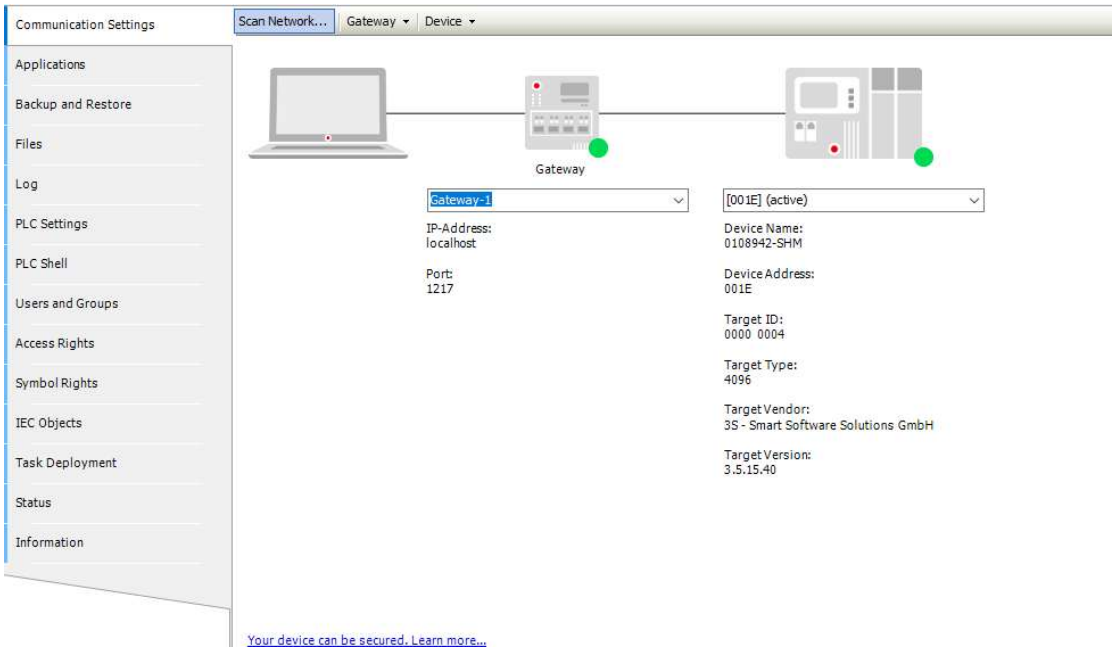
Step 1 Start the PLC: **CODESYS Control Win V3 - x64 SysTray**.

Step 2 Double-click **Device (CODESYS Control Win V3 x64)** on the left, then click **Scan Network** on the right.

Step 3 In the device selection interface, click **Scan Network**, select the network path, and click **OK**.

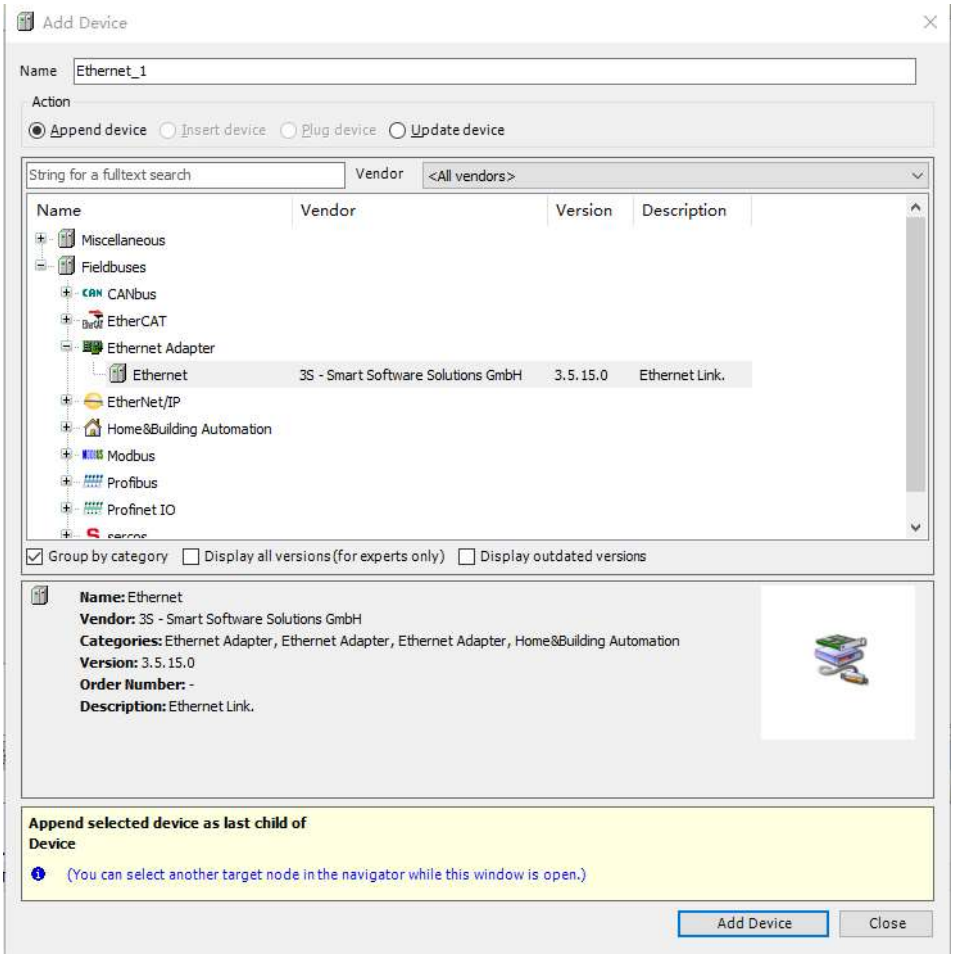


The network status is shown as active, as illustrated below.



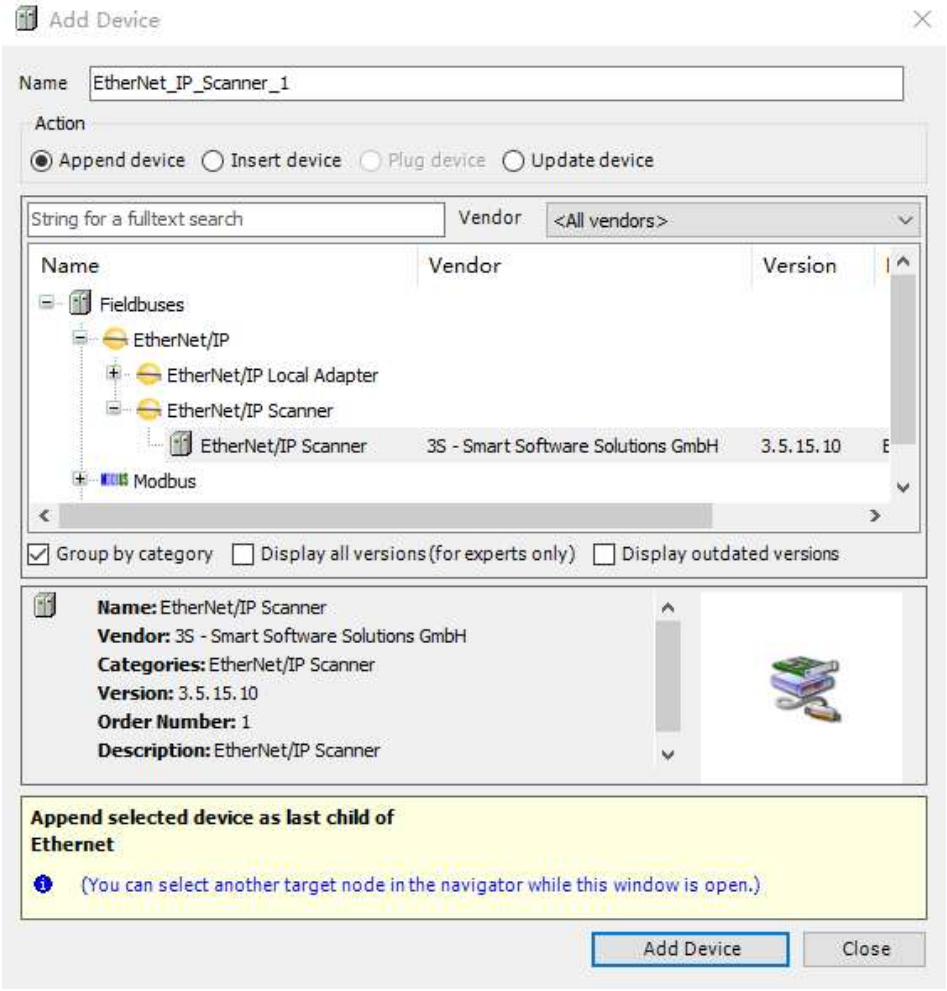
Step 4 Select **Device (CODESYS Control Win V3 x64)** on the left, right-click it, and choose **Add Device**.

Step 5 Select **EthernetIP** > **Ethernet Adapter** > **Ethernet**.

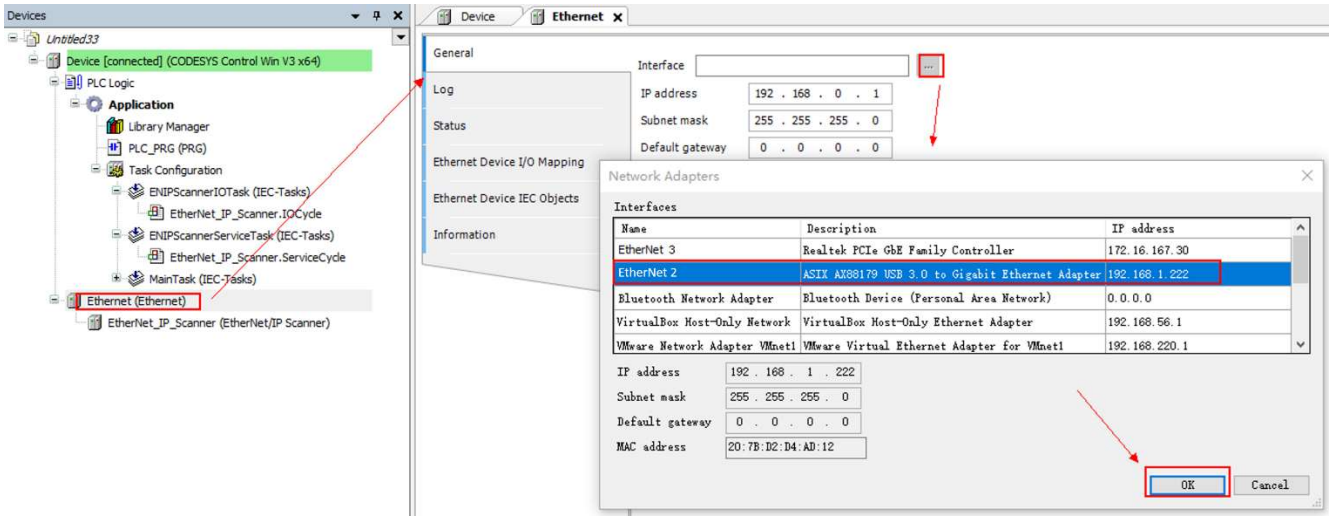


Step 6 Select **Ethernet (Ethernet)** on the left, right-click it, and choose **Add Device**.

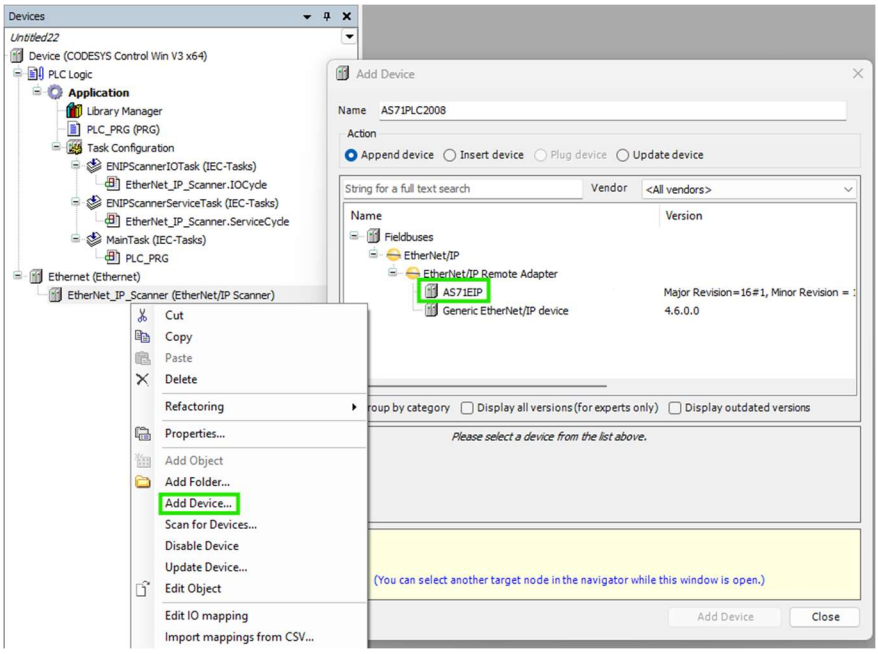
Step 7 Select **EthernetIP** > **EthernetIP Scanner** > **Ethernet/IP Scanner**.



Step 8 Double-click **Ethernet (Ethernet)** on the left. On the **General** page, click the ellipsis (**...**) button to the right of **Interface** and select the network adapter.

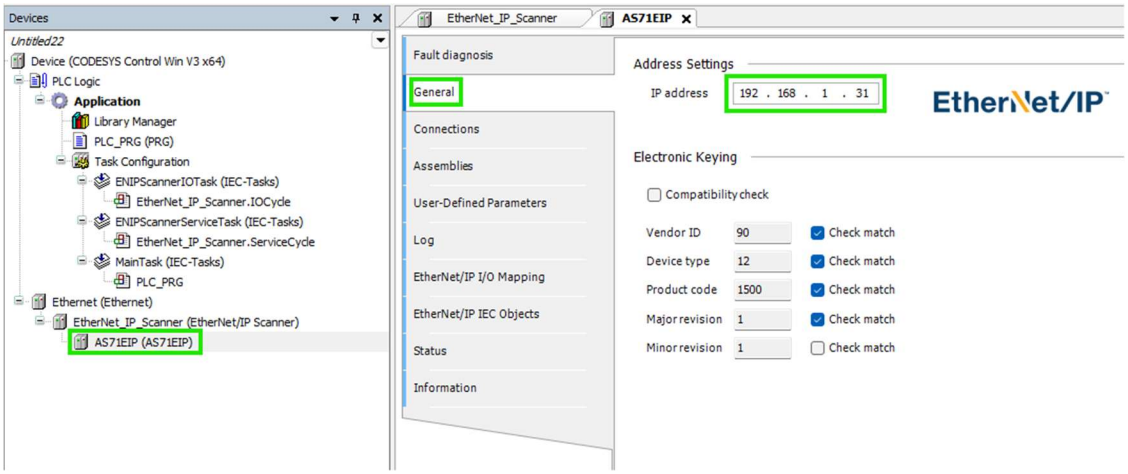


Step 9 Select **EtherNet/IP_Scanner**, right-click it, and in the pop-up window select the appropriate coupler, then click **Add Device**.

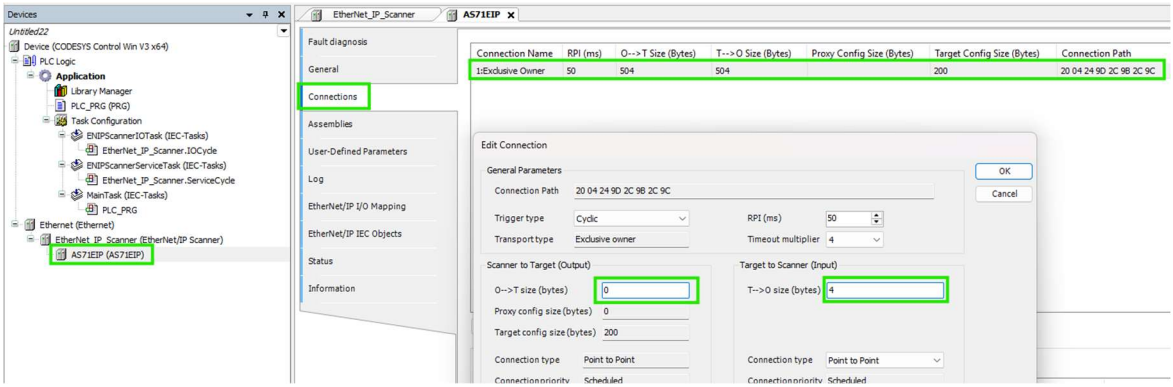


Step 10 After adding the device, configure the device communication parameters and set the IP address to the actual coupler IP address.

Note: The coupler must be in the same network segment as the EtherNet/IP master.



Step 11 Double-click **AS71EIP** on the left. After the device configuration window opens, switch to the **Connection** interface.



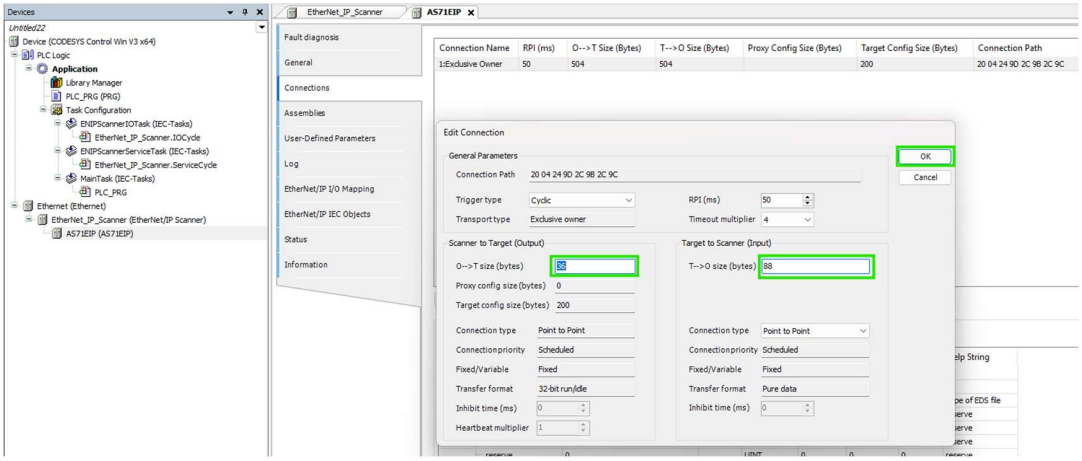
See Table 6-2 Number of bytes occupied by I/O modules for the O→T size (bytes) and T→O size (bytes).

Type	Model	Slot	T→O size (Bytes)	O→T size (Bytes)
I/O module	AS71EIP	0	4	0
	AS71DI32	1	4	0
	AS71THC4	2	16	0
	AS71AIN4	3	8	0
	AS71AOU4	4	0	8
	AS71IN02	5	34	10
	AS71DI16	6	2	0
	AS71DT16	7	2	2
	AS71DOR8	8	0	2
	AS71RTD4	9	16	0
	AS71DO32	10	0	4
	AS71DO16	11	0	2
Summary			86	28

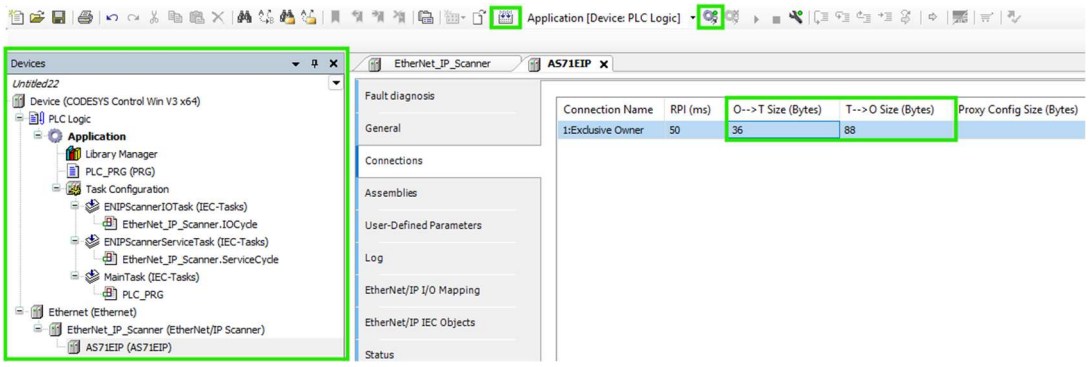
Calculate based on the preceding table: O→T size (bytes): 36

T→O size (Bytes): 88

Enter the parameters in the corresponding fields as shown in the figure below, then click **OK**.



Click the Compile, Download, and Run buttons as shown in the figure below.



Step 12 Configuration is completed and the PLC program can be written and verified.

6.5 Modbus TCP configuration

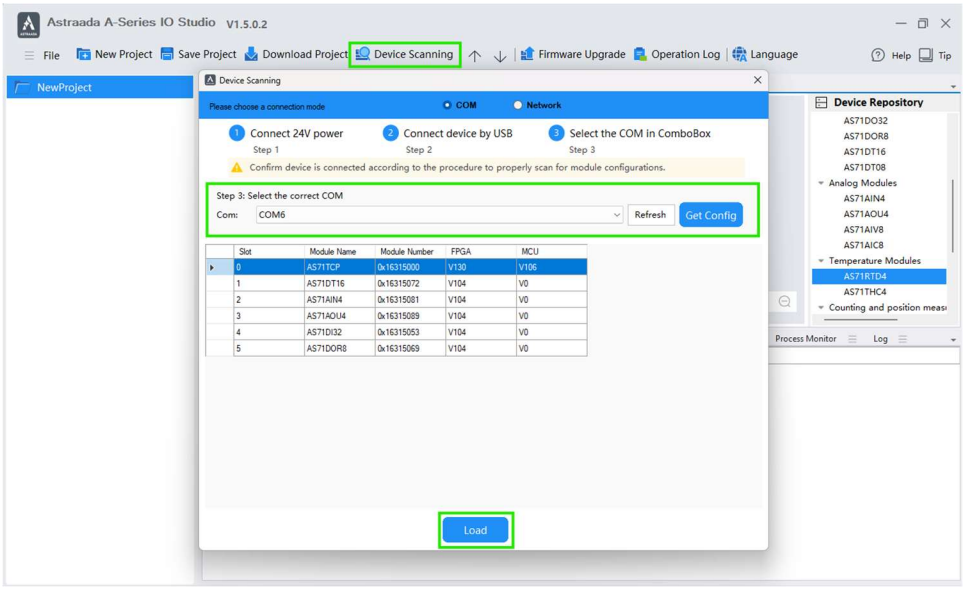
6.5.1 Astraada A-Series IO Studio configuration example

This section describes how to use the Astraada A-Series IO Studio software to configure Modbus TCP for the AS71TCP communication coupler, including steps such as configuration reading, IP address setting, module parameter configuration, and configuration writing. Before configuration, power on the AS71TCP and connect it to the PC using a Type-C cable.

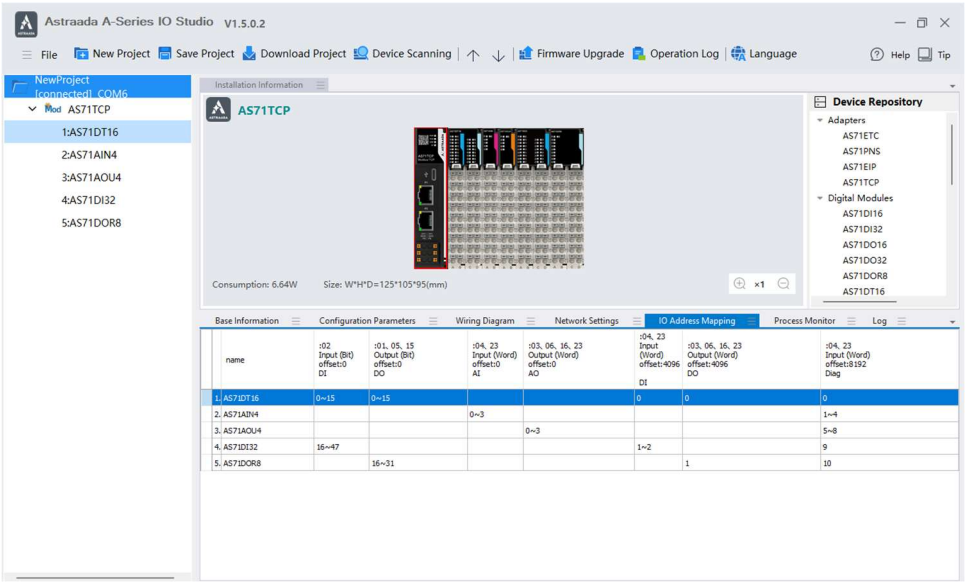
1. Configuration reading

Step 1 Click **Device Scanning** > **Refresh**, and select the COM port corresponding to the device.

Step 2 Click **Get Config**. The software will automatically load the slot numbers and version information of each module in the configuration.



Step 3 Click **Load** to enter the interface shown below:

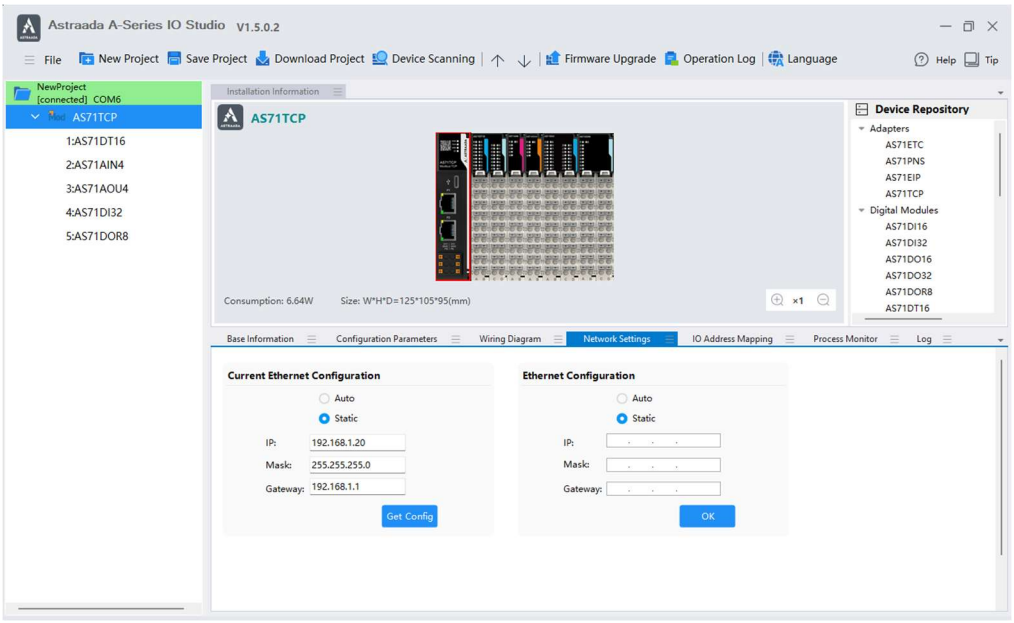


2. IP configuration

Step 1 Click **Network Settings**. In this interface, the current Ethernet configuration information can be read and modified.

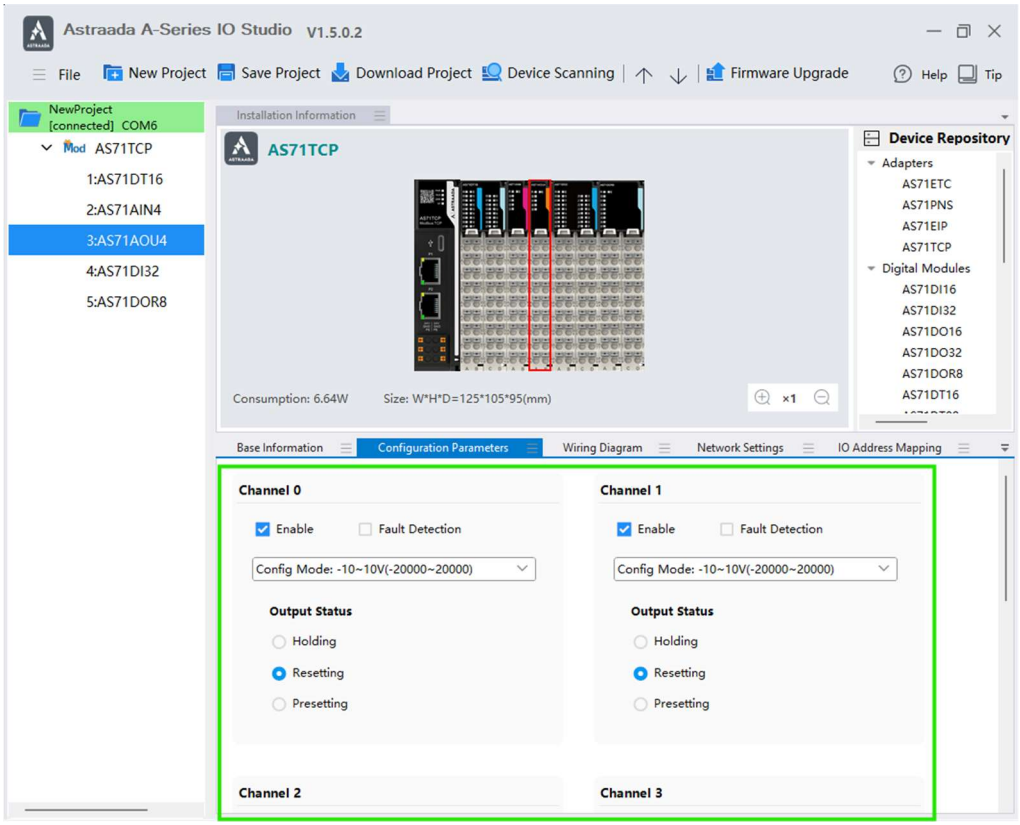
Step 2 Click the **Get Config** button to read the current IP address, subnet mask, and other device configuration information.

Step 3 After entering the IP address, subnet mask, and gateway, click **OK**. The settings will take effect after the device is powered on again.



3. Module parameter configuration

On the left, you can select modules of different slots to enter the **Configuration Parameters** interface, and configure channel parameters as required. The modified parameters will be downloaded to the coupler together with the **Download Project** operation, and the coupler will store the configuration information.



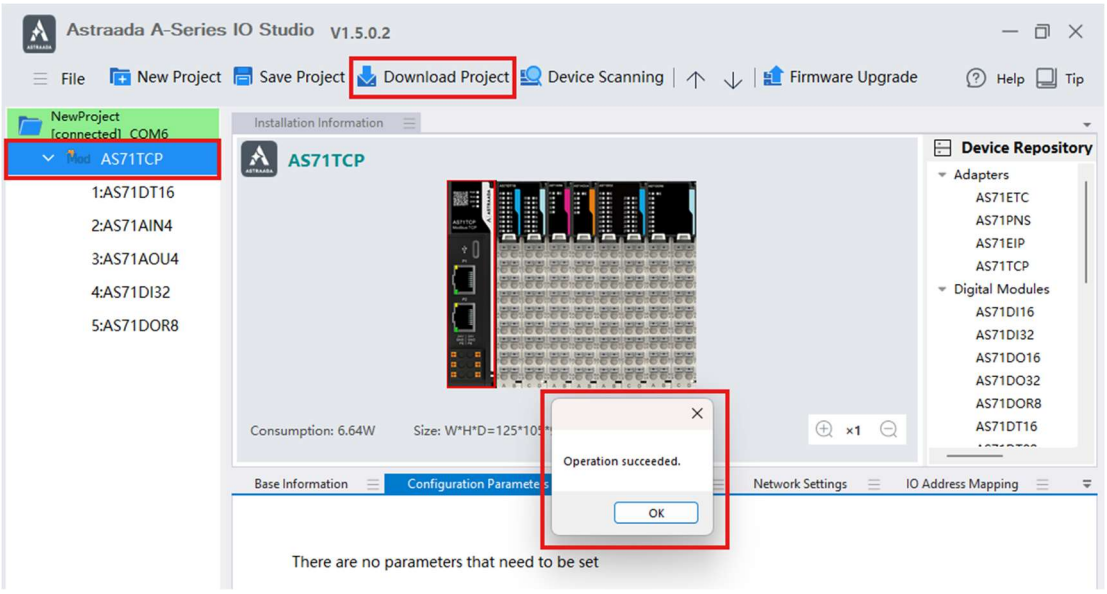
4. Configuration writing

Step 1 When all modules have been configured, click **AS71TCP** > **Download Project**.

Step 2 Click **Refresh** to confirm that the device connection is normal.

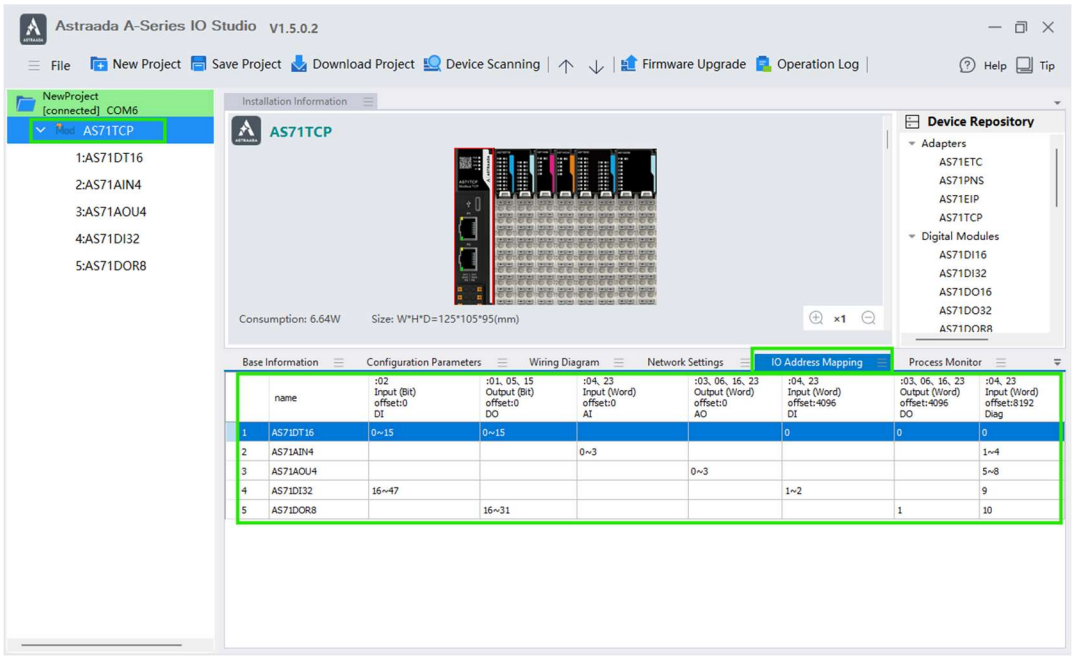
Step 3 Click **Downlo** to write the configuration settings and module configurations to the coupler.

Note: If the configuration information does not match the actual configuration, the SF indicator on the coupler will illuminate to indicate a configuration mismatch. Please carefully verify that the configuration information on the left side of the interface above matches the actual configuration.



5. Address mapping table

Refer to Appendix B Address mapping table description for operation.



6.5.2 Module configuration application example

6.5.2.1 CODESYS configuration example

1. Environment preparation

Perform the configuration operation according to the Astraada A-Series IO Studio setup.

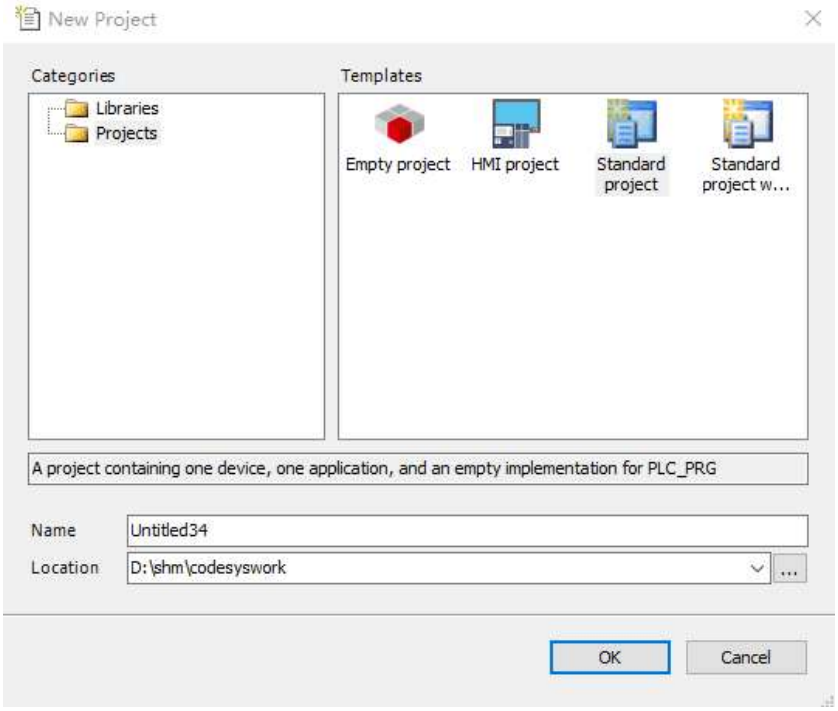
Step 1 Power on the coupler and connect the network cable to the computer.

Step 2 Ensure that the IP address of the coupler and the IP address of the computer are in the same subnet.

Step 3 Pre-install the following software on the PC: CODESYS V3.5 and CODESYS Control Win V3 - x64 SysTray.

2. Creating a new project

Start CODESYS, click **File** > **New Project**, enter the project name, and click **OK** to complete creation, as shown below.

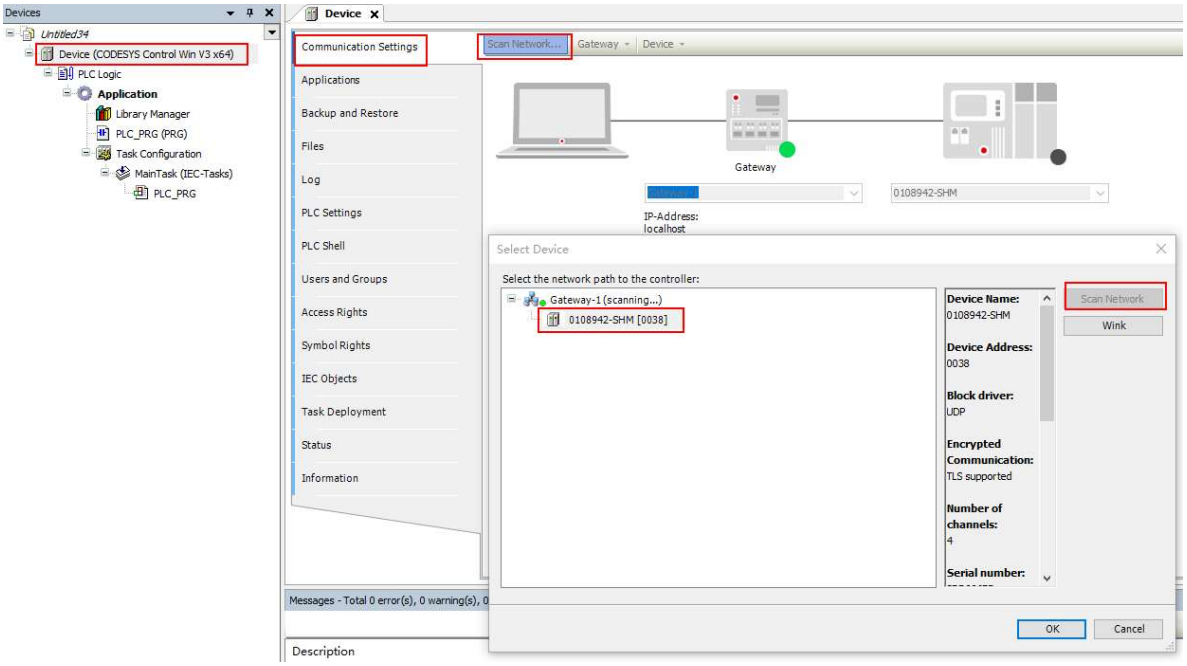


3. Scanning network

Step 1 Start the PLC using **CODESYS Control Win V3 - x64 SysTray**. Locate **CODESYS Control Win V3 - x64 SysTray** in the lower-right corner of the computer, right-click it, and select **Start PLC**.

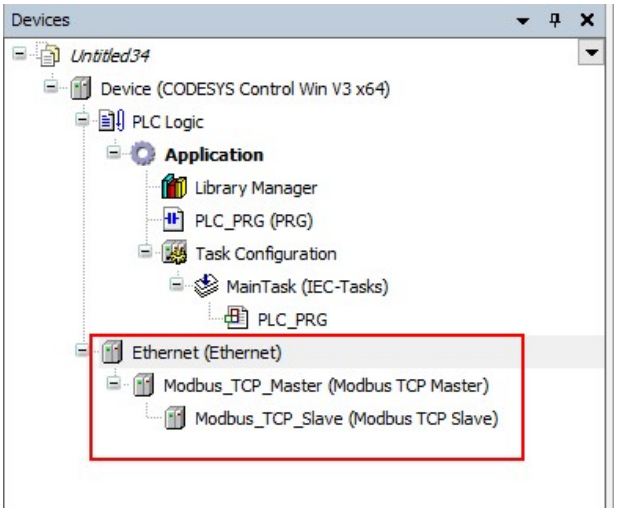
Step 2 Double-click **Device (CODESYS Control Win V3 X64)** in the left navigation tree of **CODESYS**, and then click **Scan Network**.

Step 3 In the scan results, select the target device and choose the correct controller network path, as shown below:



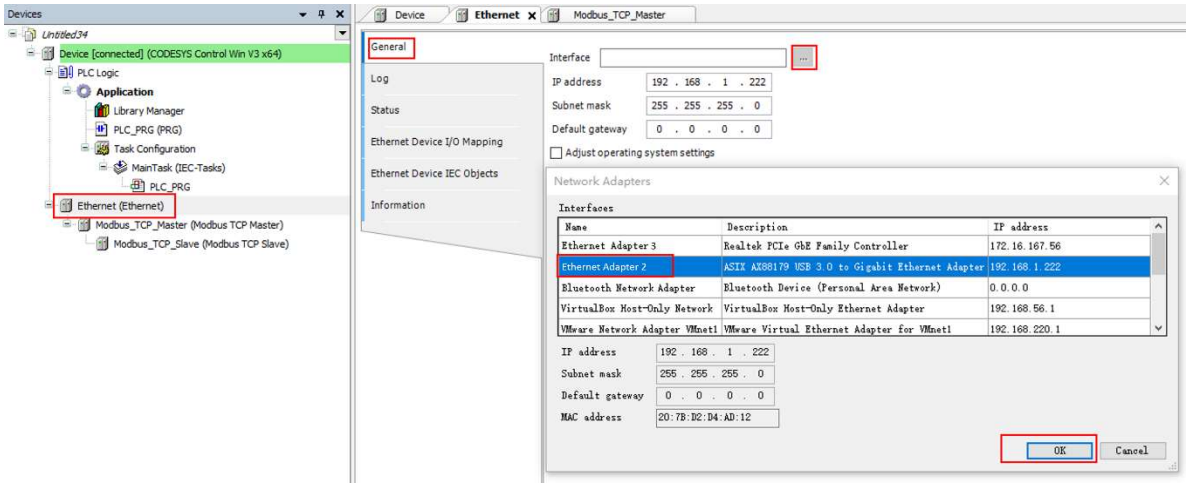
4. Adding devices (Add Ethernet, Modbus TCP Master, and Modbus TCP Slave)

After the devices are successfully added, the interface appears as shown below:



- Ethernet configuration

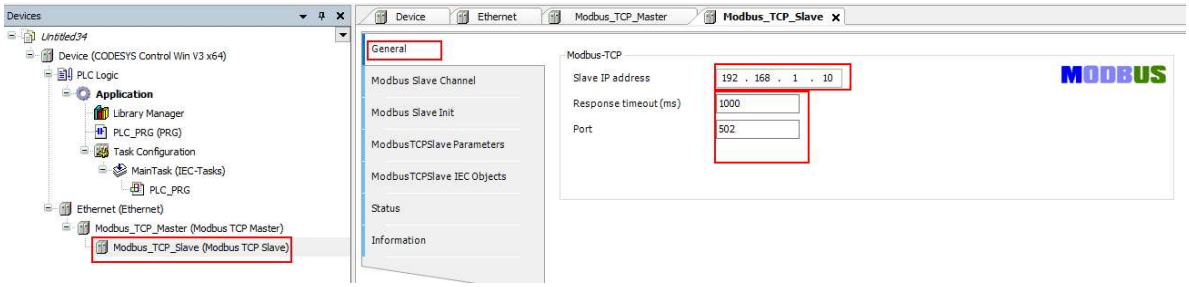
Click **Ethernet (Ethernet)** > **General** > **Interfaces** to configure the parameters, as shown below.



■ Modbus TCP slave configuration

1. Configuring the network

Click **ModbusTCP_Slave (Modbus TCP Slave)** > **General**, and set the **Slave IP address**, **Response timeout**, and **Port**.

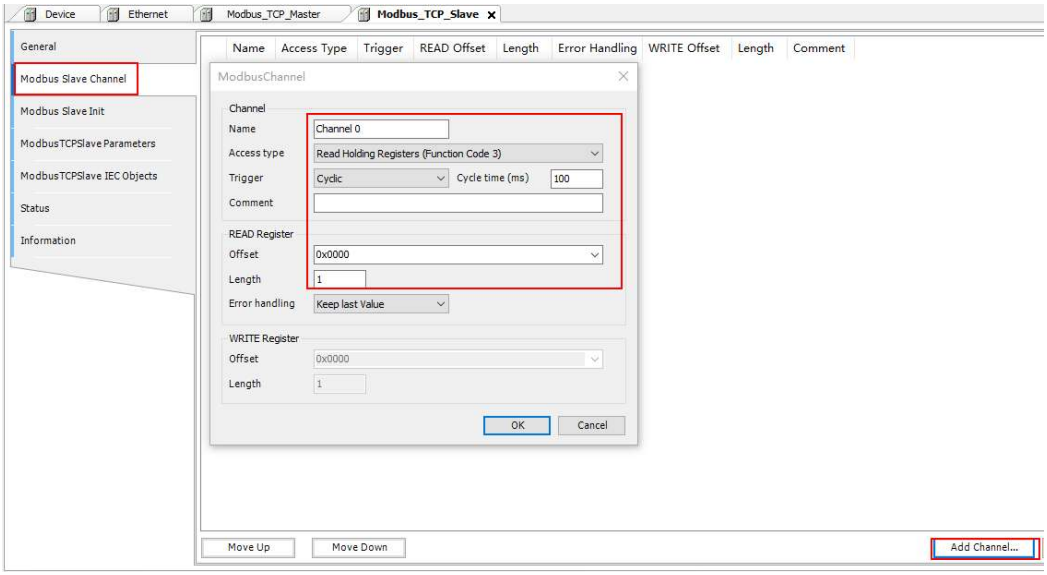


2. Configuring the channel

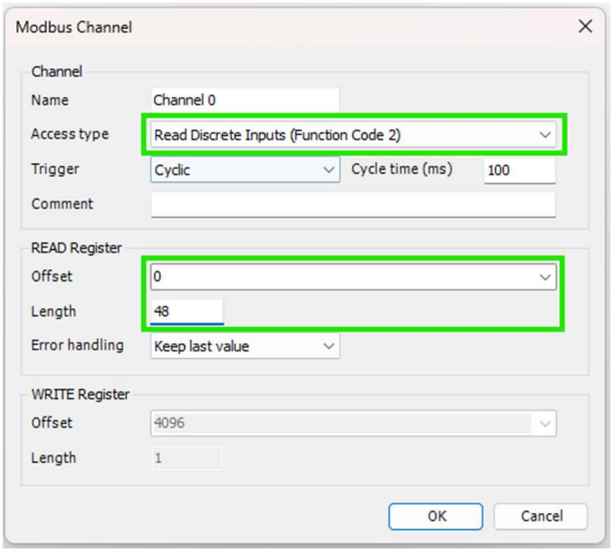
Step 1 Use the Astraada A-Series IO Studio tool to view the system topology and the I/O module address mapping table. The mapping table lists the function code, offset start address, and corresponding monitoring address range of each module, as shown below.

	name	:02 Input (Bit) offset:0 DI	:01、05、15 Output (Bit) offset:0 DO	:04、23 Input (Word) offset:0 AI	:03、06、16、23 Output (Word) offset:0 AO	:04、23 Input (Word) offset:4096 DI	:03、06、16、23 Output (Word) offset:4096 DO	:04、23 Input (Word) offset:8192 Diag
1	AS71DT16	0~15	0~15			0	0	0
2	AS71AIN4			0~3				1~4
3	AS71AOU4				0~3			5~8
4	AS71DI32	16~47				1~2		9
5	AS71DOR8		16~31				1	10

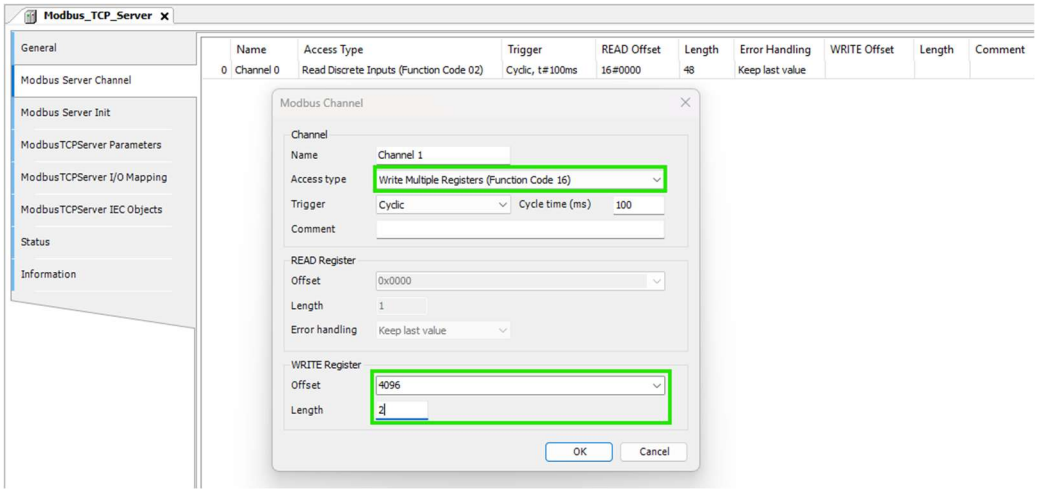
Step 2 On the left side of the Modbus_TCP_Slave page, click **Modbus Slave Channel**, and then click **Add Channel**. A configuration window for Channel 0 will pop up, as shown below.



Step 3 For the following digital input modules: AS71DT16 and AS71DI32, the DI (Input Bit) function code is 02, and the offset address is 0x00. The address ranges are 0–15, 16–47 totaling 48 bits. In the Channel 0 configuration window, set the Access type to **Read Discrete Inputs (Function Code 2)**, set the **READ Register Offset** to 0 and **Length** to 48, and click **OK**, as shown in the following figure. (You may also customize the offset address and length according to actual requirements, referring to the I/O module address mapping table.)

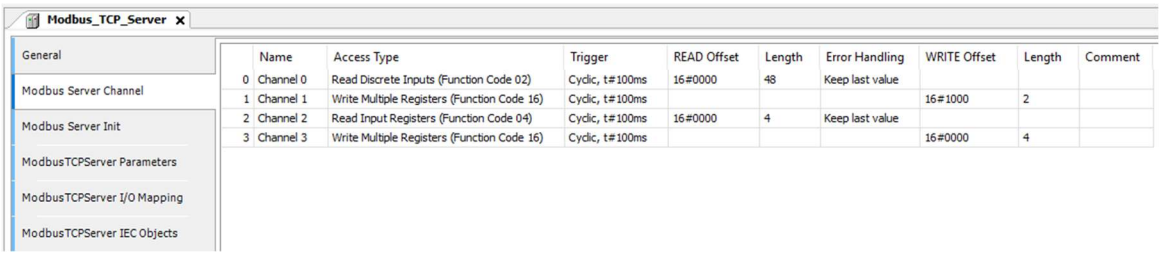


Step 4 For the digital output modules AS71DT16 and AS71DOR8, when using the Output (Word) write function, the corresponding address range is 0–1, the write register offset is 4096, and the length is 2. Select **Write Multiple Registers (Function Code 16)** as the access type to configure Channel 1, as shown below.



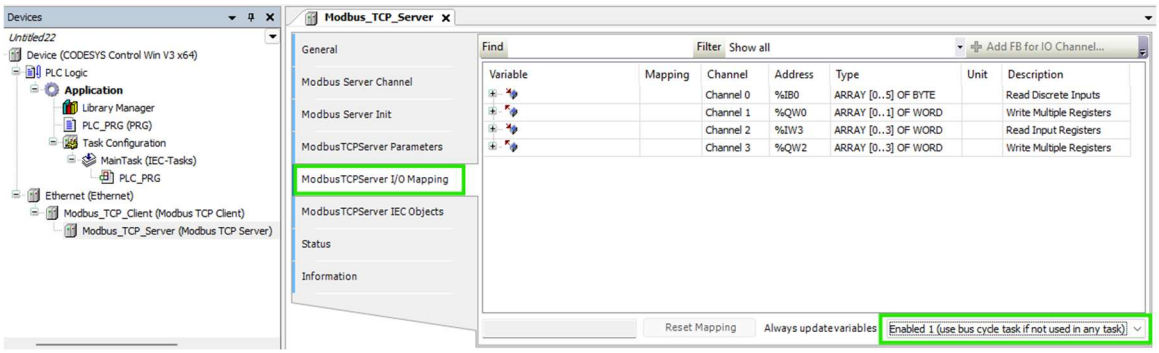
Note: If the Output (Word) write function is used, it is not allowed to perform Output (Bit) write operations simultaneously. Otherwise, multiple write sources may access the same output point, which will cause conflicts.

Proceed to configure the remaining channels as follows:



5. Verifying

Step 1 On the left side of the Modbus_TCP_Slave page, click **ModbusTCPSlave I/O Mapping** to monitor the I/O modules. In the lower-right corner of the interface, select **Enabled 1** for **Always update variables**, as shown below.



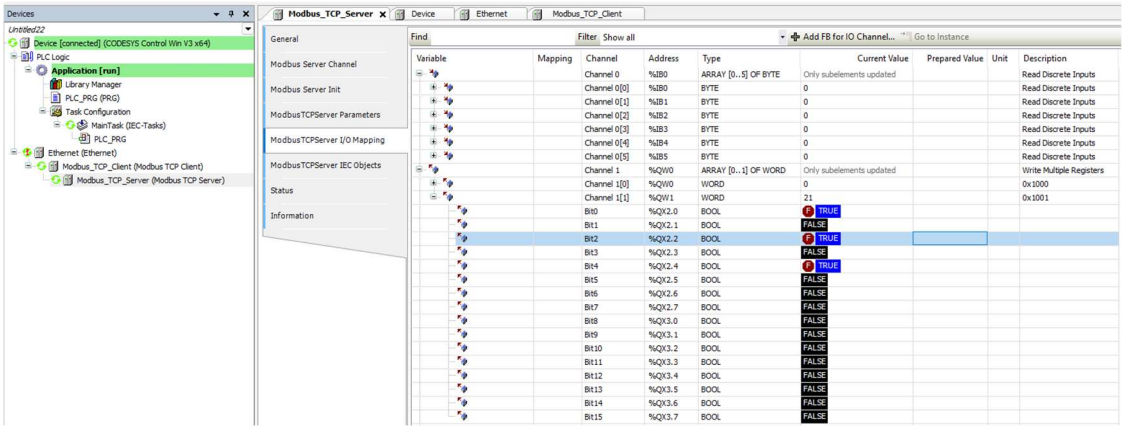
Step 2 On the menu bar, click **Build** > **Build** to start the compilation process.

Step 3 On the menu bar, click **Online** > **Login** or click the login icon to log in.

Step 4 On the menu bar, click **Online** > **Multiple Download**, select **Always perform a full download**, and click **OK**.

Step 5 Click the start icon to perform the verification test.

Output verification: modify the output values and observe the results:



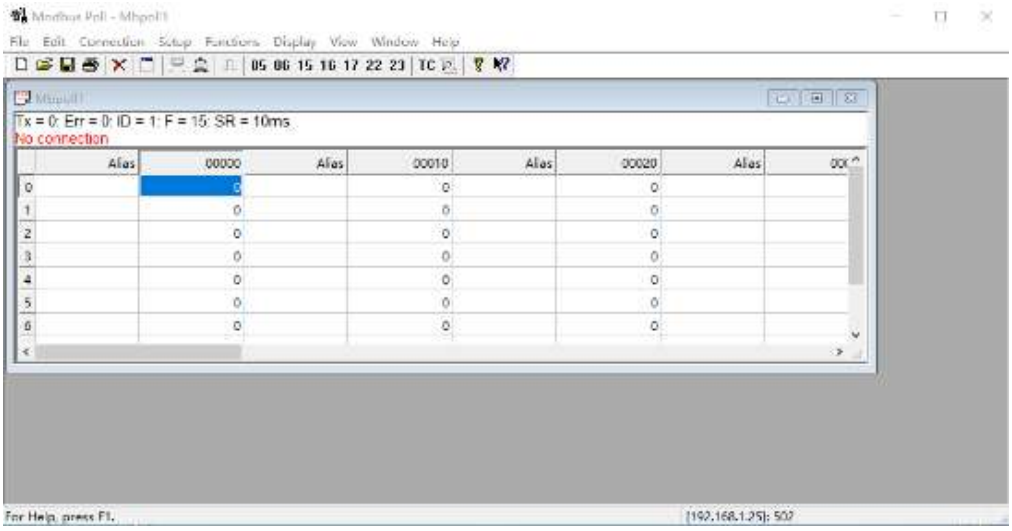
6.5.2.2 Modbus Poll example

1. Environment preparation

Perform the configuration operation according to the Astraada A-Series IO Studio setup. Power on the coupler and connect the network cable to the computer. Ensure that the IP address of the coupler and the IP address of the computer are in the same subnet. The Modbus Poll software must be pre-installed on the PC.

2. Module connection

Step 1 Open the **Modbus Poll** software. The main interface is displayed as follows.



Tx = 0: Indicates the number of data frames sent to the master node, currently 0.

Err = 0: Indicates the number of communication errors, currently 0.

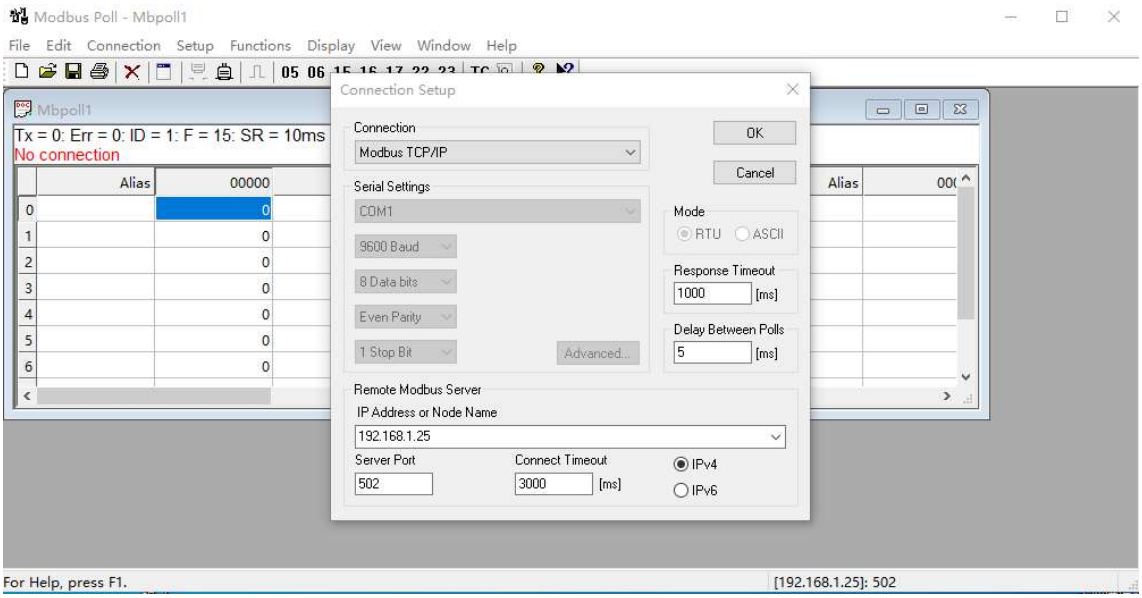
ID = 1: Indicates the device address of the simulated Modbus slave device, currently set to 1.

F = 15: Indicates the Modbus function code in use, currently function code 15.

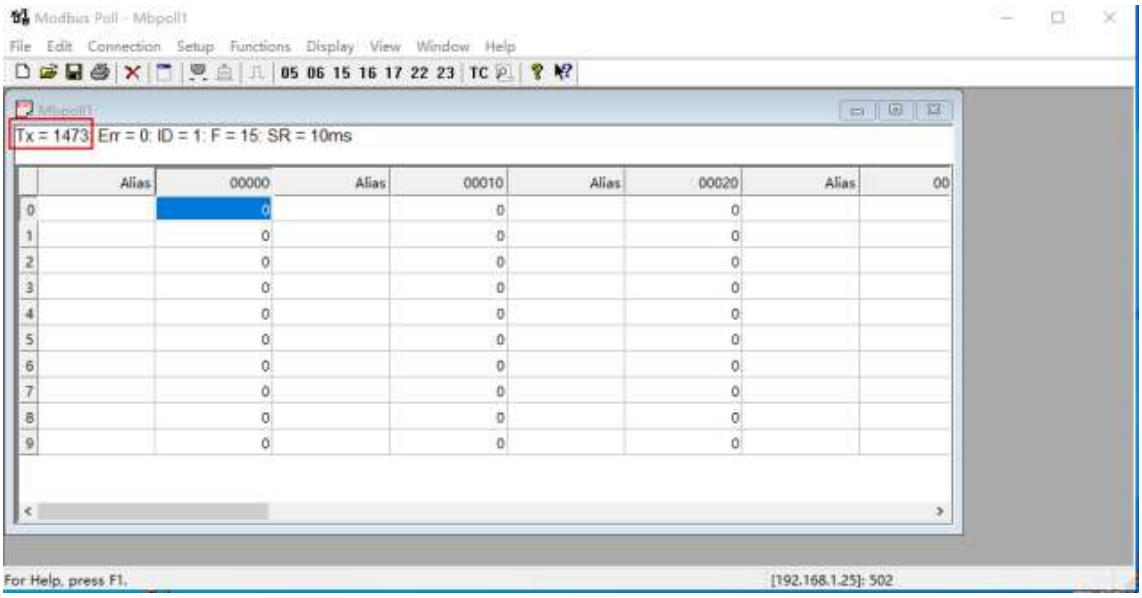
SR = 10 ms: Indicates the scan cycle; the red text shows the current error status.

"No Connection": Indicates that the connection has not been established.

Step 2 Click **Connection** > **Connect** in the menu bar to open the **Connection setup** window. In the **Connection** options, select **Modbus TCP/IP**, which is the communication protocol used by Modbus TCP. Enter the IP address of the coupler in the IP address field, and then click **OK**, as shown below.



Step 3 After the connection is successful, the Tx value will continuously increase. The interface is shown below.



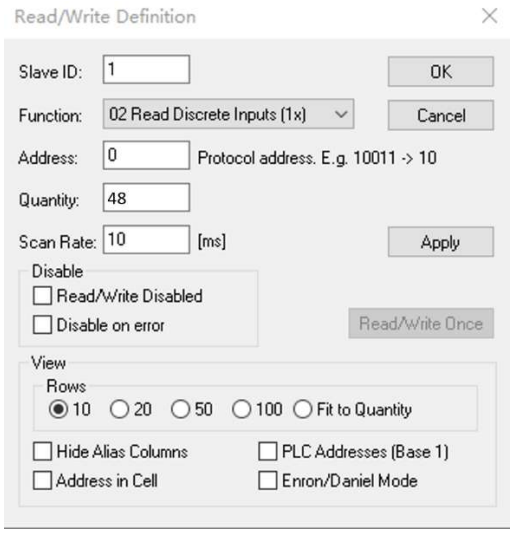
3. Channel configuration and monitoring

Step 1 With the Astraada A-Series IO Studio software, you can view the I/O module address mapping table of the system topology. This table shows the function code, offset start address, and monitoring address range corresponding to each module, as shown below.

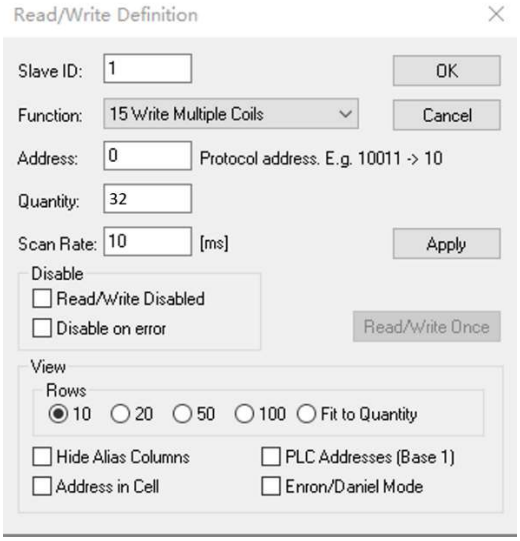
	name	:02 Input (Bit) offset:0 DI	:01、05、15 Output (Bit) offset:0 DO	:04、23 Input (Word) offset:0 AI	:03、06、16、23 Output (Word) offset:0 AO	:04、23 Input (Word) offset:4096 DI	:03、06、16、23 Output (Word) offset:4096 DO	:04、23 Input (Word) offset:8192 Diag
1	AS71DT16	0~15	0~15			0	0	0
2	AS71AIN4			0~3				1~4
3	AS71AOU4				0~3			5~8
4	AS71DI32	16~47				1~2		9
5	AS71DOR8		16~31				1	10

Step 2 Based on the table above, configure the channels sequentially.

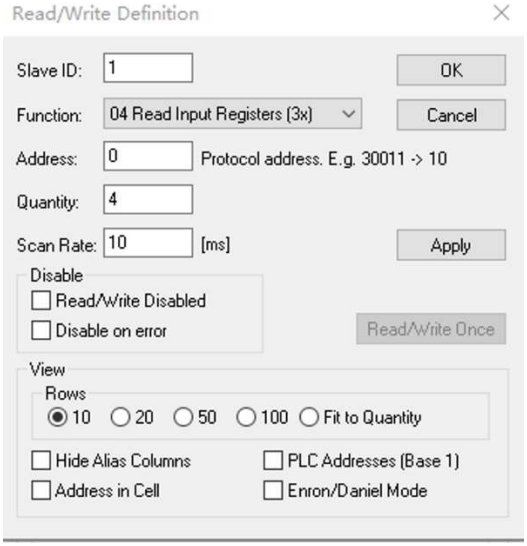
- Function code 2, Input (Bit) offset: 0, length: 48



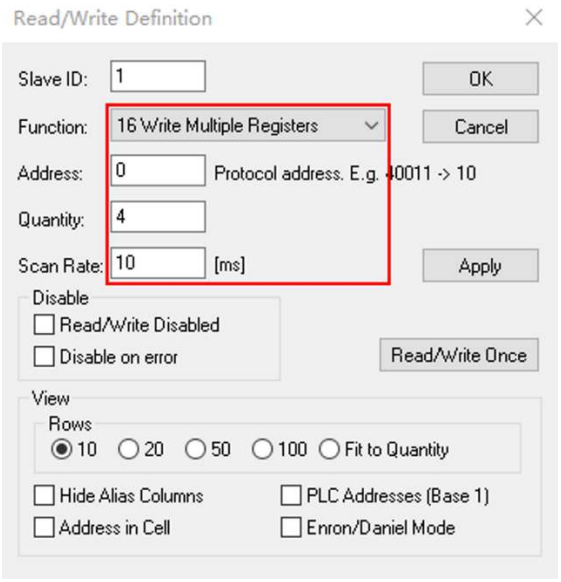
- Function code 15, Output (Bit) offset: 0, length: 32



- Function code 04, Input (Word) offset: 0, length: 4



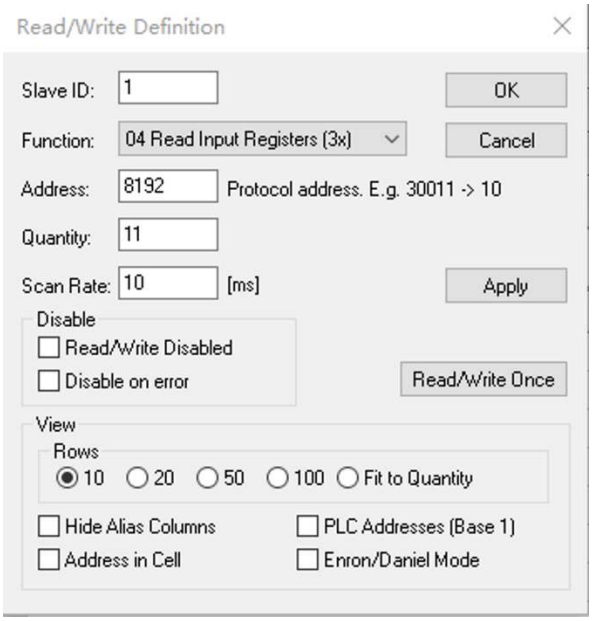
- Function code 16, Output (Word) offset: 0, length: 4



Note: The Input (Word), offset: 4096 and Output (Word), offset: 4096 areas are Word-level mapping interfaces for digital signals. They correspond to the same signals as Input (Bit), offset: 0 and Output (Bit), offset: 0. They should generally be used as needed, and simultaneous Bit and Word access should be avoided. Concurrent write operations to the output signals may cause conflicts.

Step 3 Configure the diagnostic information as follows:

Function code 04, Input(Word), offset: 8192, length: 11



7 Commissioning

7.1 Overview

This chapter describes the use of commissioning tools and methods to ensure the stability and reliability of the I/O system in actual applications, and to quickly identify and eliminate potential problems during system commissioning and operation. This chapter is applicable to commissioning personnel, system integrators, and maintenance engineers with basic knowledge of automation systems.

7.2 Commissioning preparation

7.2.1 Commissioning requirements

Type	Description
Operating system	Windows 7, Windows 10, Windows 11
Communication interface	USB-C (USB-A <-> USB-C cable must be used)
Power supply	24 V
Module	AS71DI16, AS71DI32, AS71DO16, AS71DO32, AS71DOR8, AS71AIN4, AS71RTD4, AS71THC4, AS71BRG1, AS71BRG2, AS71AIV8, AS71AIC8, AS71AOU4, AS71DT16, AS71AN02, AS71IN02, AS71IN01, AS71IN01, AS71COM2, AS71PUOC, AS71PWRR

7.2.2 Operating precautions

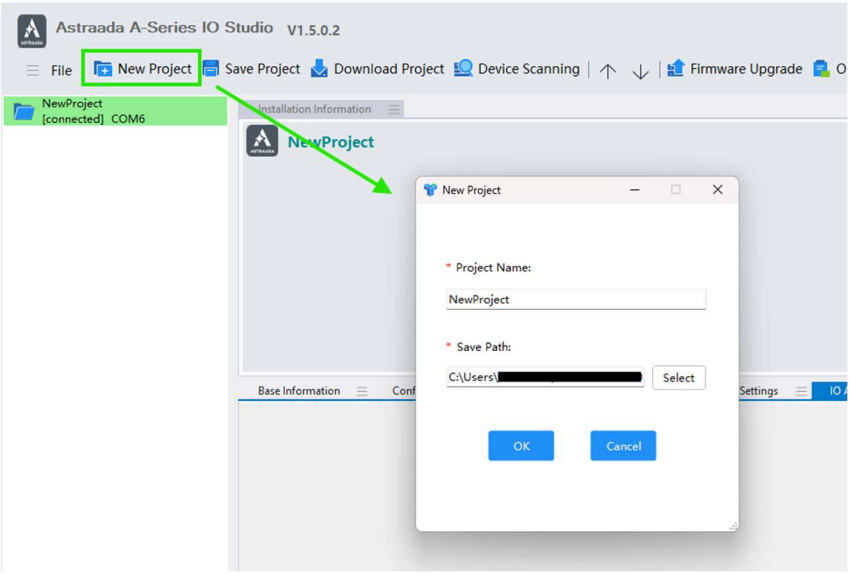
Item	Description
Coupler firmware upgrade sequence	When upgrading the coupler firmware, the USB cable must be connected first, and then the power supply must be turned on. Incorrect connection order may cause upgrade failure.
Module operation connection sequence	When performing operations such as module scanning, firmware upgrade, or parameter download, the power supply must be connected first, and then the USB cable must be plugged in; otherwise, modules may not be recognized.
Power-off restart effect prompt	Some configuration changes or operations (such as firmware upgrade, module upgrade, or IP address modification) require a power cycle to take effect. Follow the prompts in the software carefully.
Coupler module capacity limitation	Each coupler can connect up to 32 modules. When the total power consumption of the modules exceeds the output capacity of the coupler, a power feed module must be added to ensure stable system operation.
USB port selection recommendation	When connecting the coupler via USB, ensure that the correct COM port is selected to avoid communication failure caused by incorrect port selection. It is recommended to operate only one coupler device at a time.
...	...

7.3 Module identification and project configuration

7.3.1 Creating and opening a project

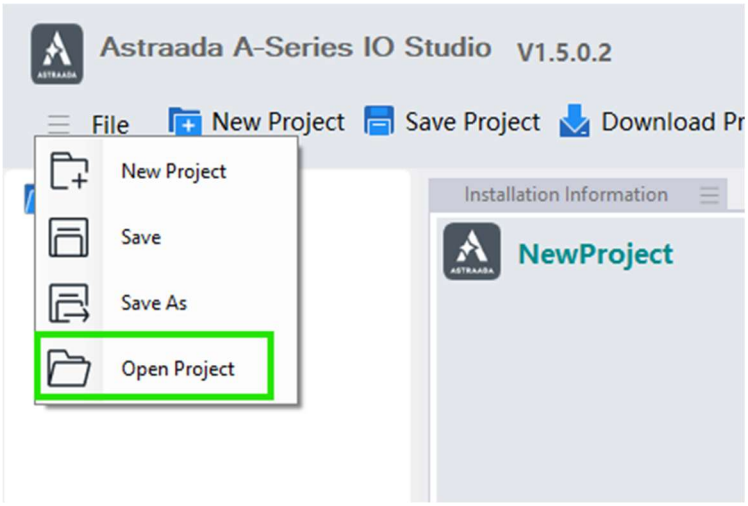
- Creating a new project

1. Click the **New Project** button in the menu bar to open the corresponding window.
2. Enter the project name and select the save path, then click **OK** to create a new project.



- Opening an existing project

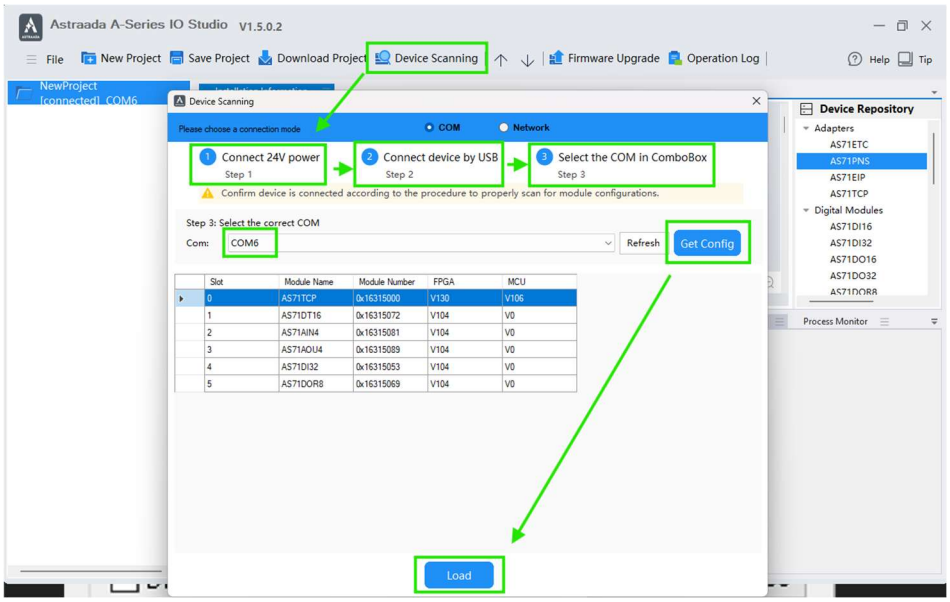
Step 1 Click **File** > **Open Project**.



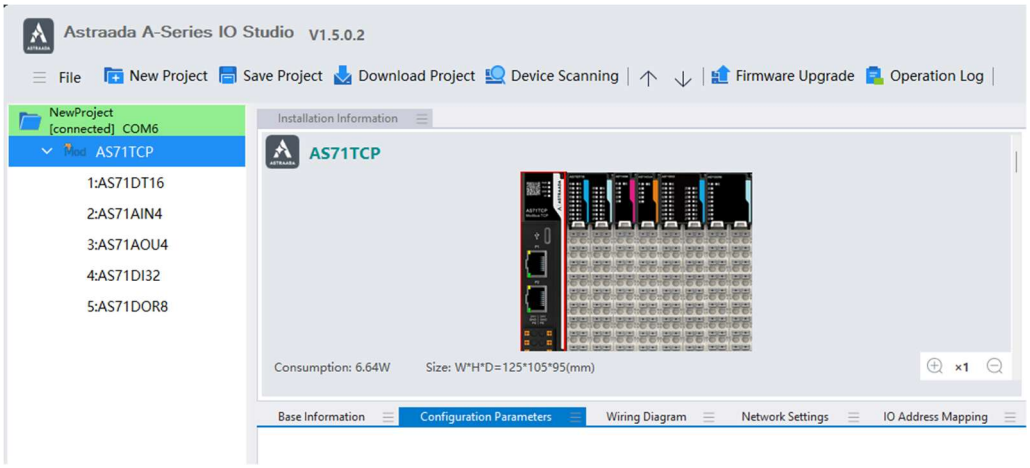
Step 2 In the pop-up window, select the project to be opened and click **OK** to load the existing project.

7.3.2 Module scanning and configuration verification

Device scanning can be used to obtain the physical topology information and verify whether all modules are correctly identified.



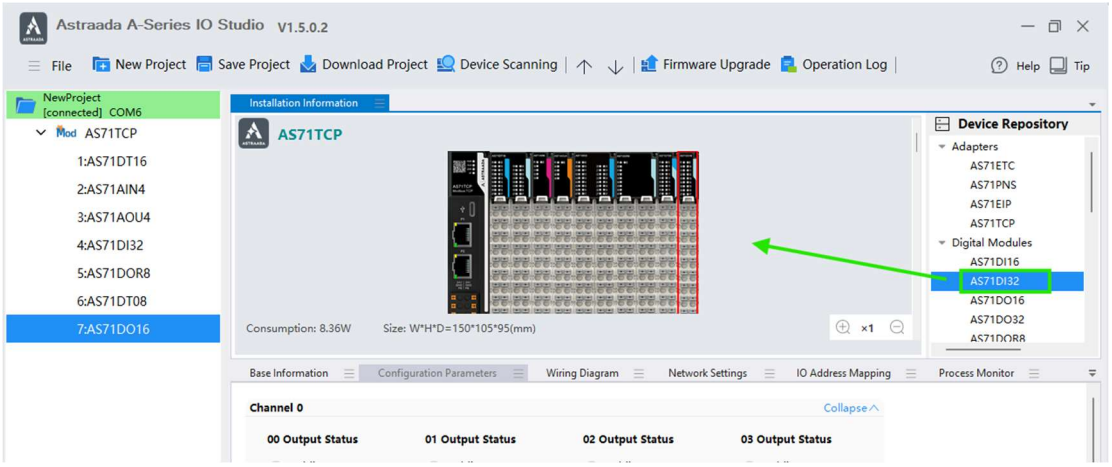
After scanning is completed, you can click the **Load** button to load the module into the project, thereby creating a project that can be saved and facilitating subsequent operations such as parameter editing and download.



7.3.3 Module management

- Adding a module

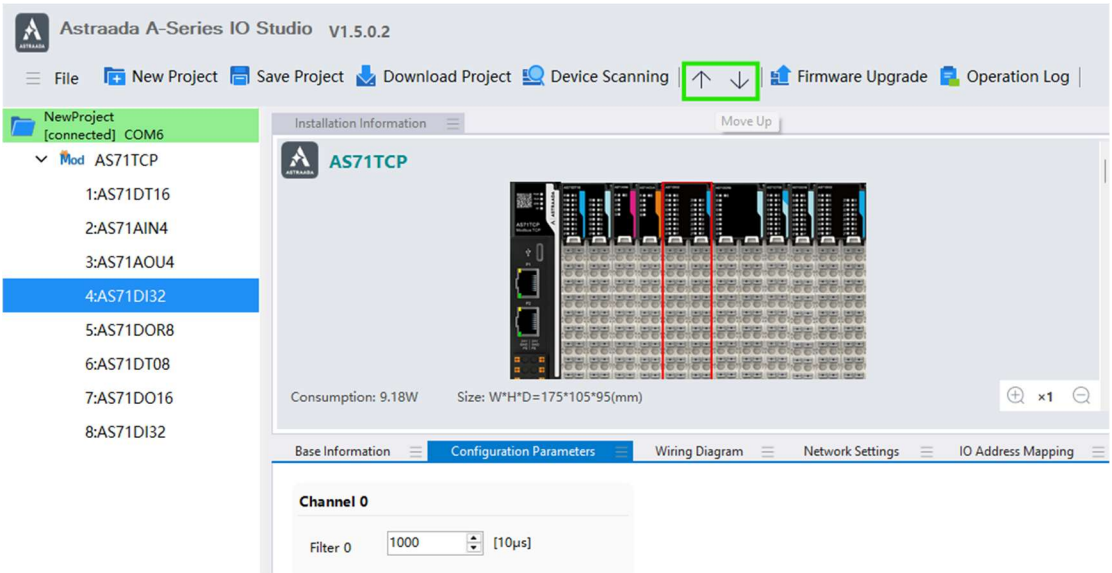
To add a module, double-click the corresponding module in the **Device Repository** or drag the module into the software view.



- Adjusting module order

When selecting a module in the project tree, you can adjust the module order using the move up and move down buttons.

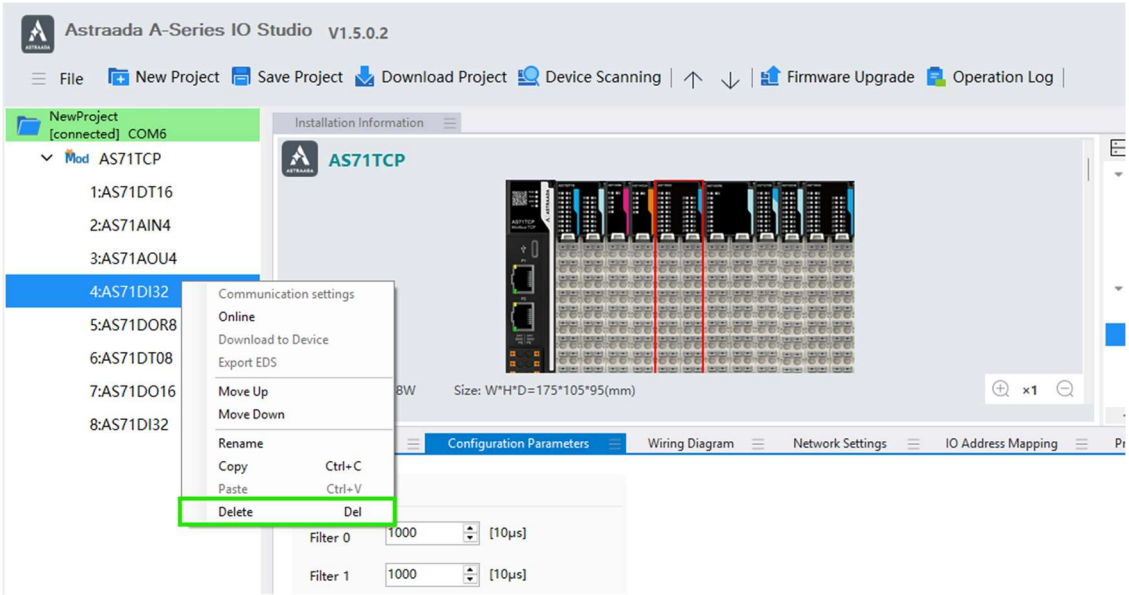
When selecting the configuration window in the **Installation Information** pane, you can adjust the window order using the left and right arrow keys or through the right-click menu.



- Deleting a module

When selecting a module in the project tree, you can delete the module using the Delete key on the keyboard or through the right-click menu.

When selecting the configuration window in the **Installation Information** section, you can delete the corresponding module using the right-click menu.

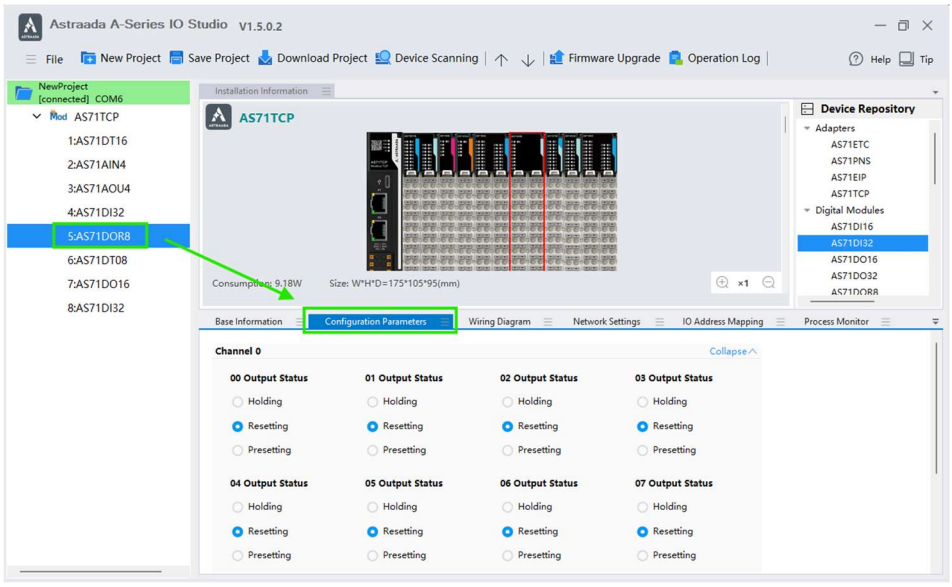


7.4 Parameter configuration and download

7.4.1 Editing parameters

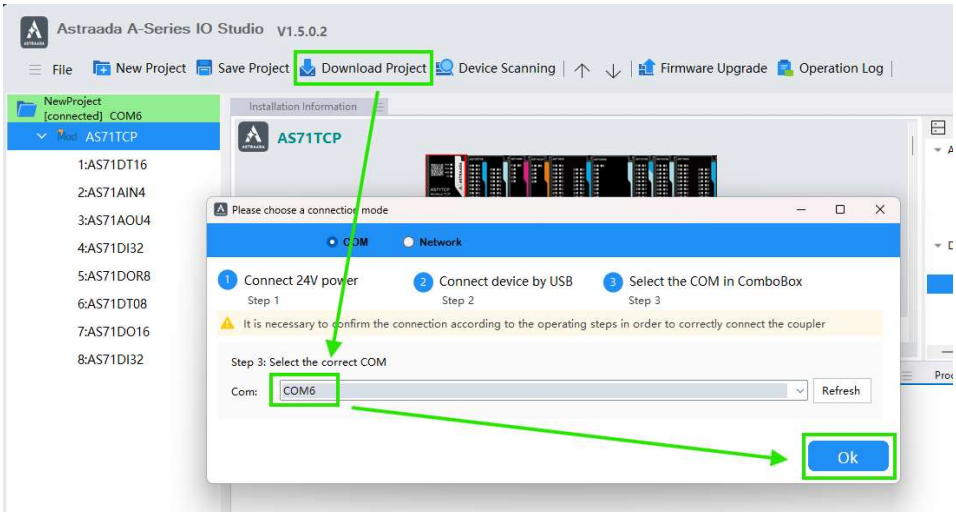
In the project tree interface, after selecting a module or installation information, you can select the **Configuration Parameters** tab to edit the corresponding module's parameters. Once you have finished editing, please remember to save the project.

Save the project promptly after completing the editing to prevent data loss.



7.4.2 Downloading project parameters

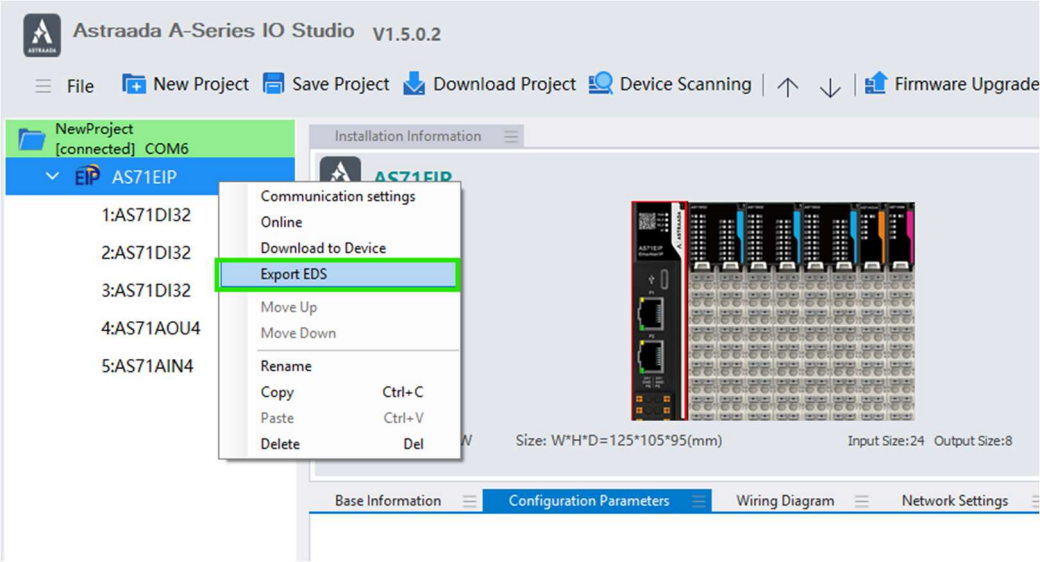
In the project tree, select the coupler and click the **Download Project** button to download all configuration parameters to the module.



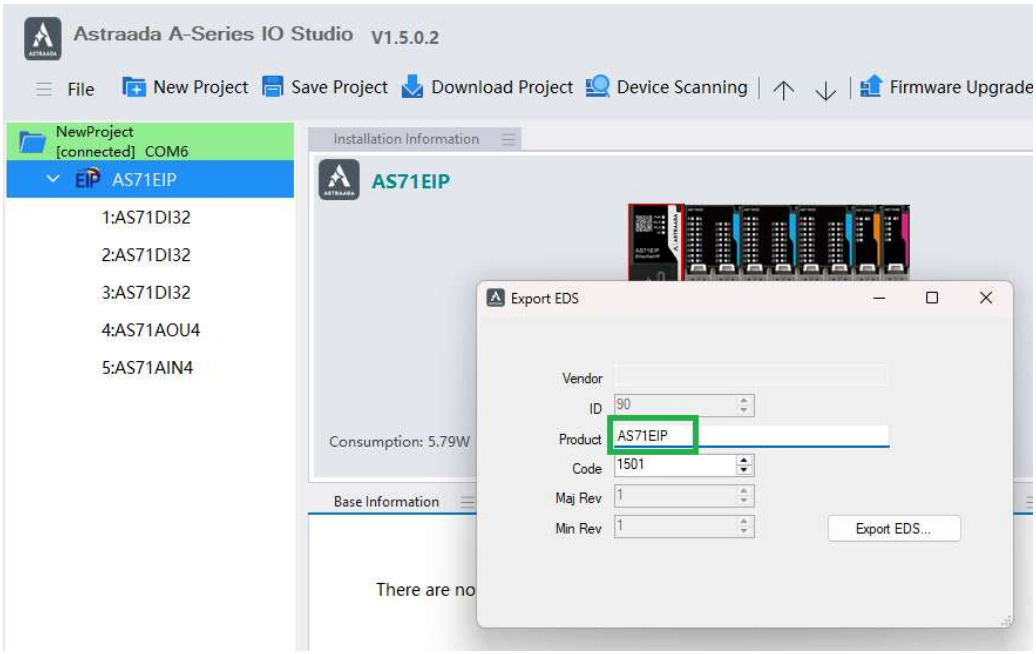
7.4.3 EDS export

Steps to export the EDS file are as follows:

Step 1 Right-click the coupler and select **Export EDS**.



Step 2 In the pop-up window, enter the product name and product code, and then click **Export EDS...**.



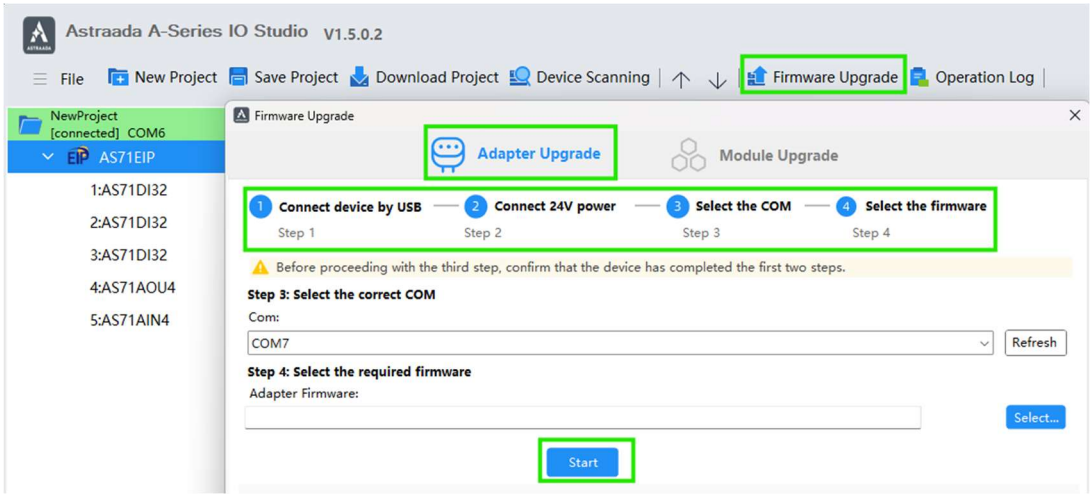
Step 3 Select an appropriate save path.

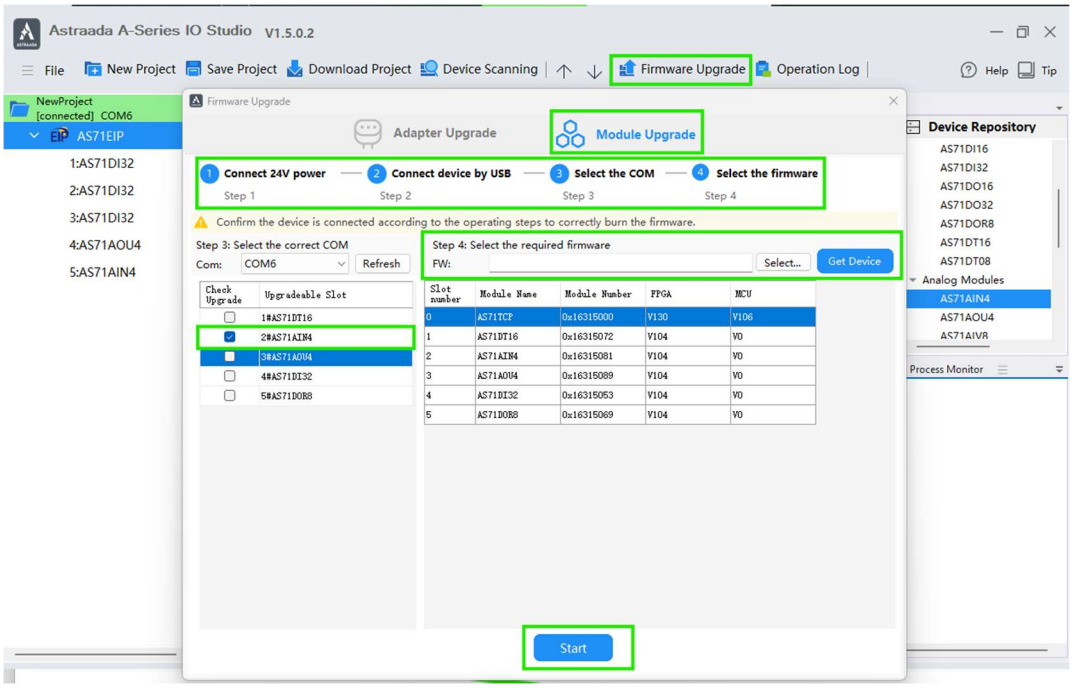
7.5 Firmware management and log monitoring

7.5.1 Coupler and module firmware upgrade

Firmware upgrade entry: **Firmware Upgrade** > **Adapter Upgrade** / **Module Upgrade**.

When selecting the firmware to be upgraded, note that only one type of module can be upgraded at a time. You may upgrade modules one by one, or select multiple modules of the same type at a time. However, different types of modules cannot be selected for simultaneous upgrade. After the upgrade is completed, be sure to power cycle the device and then continue subsequent operations via USB.





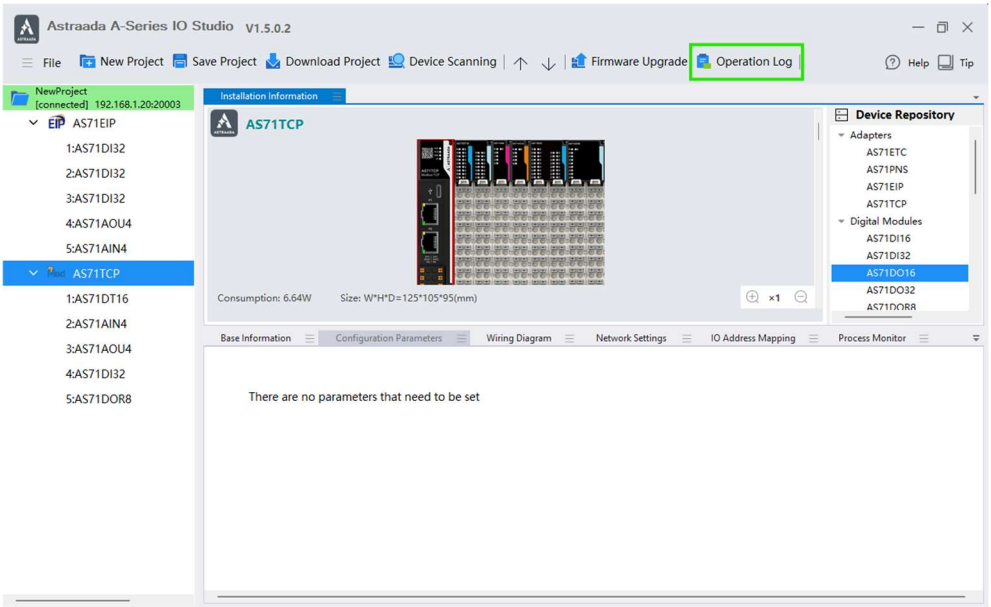
Module firmware upgrade supports batch operations for modules of the same type only, and a power restart is required after upgrading. Module firmware upgrade is performed on the modules connected to the coupler. Select **Firmware Upgrade** from the menu bar, and then choose **Module Upgrade**. Follow the prompts to connect the coupler, select the corresponding COM port, obtain the physical topology, and display it in the interface.

Note: Currently, only coupler firmware upgrade is supported, and module firmware upgrade is not supported yet.

7.5.2 Log viewing

- Viewing logs

The log records key operation information such as parameter changes and module connections.

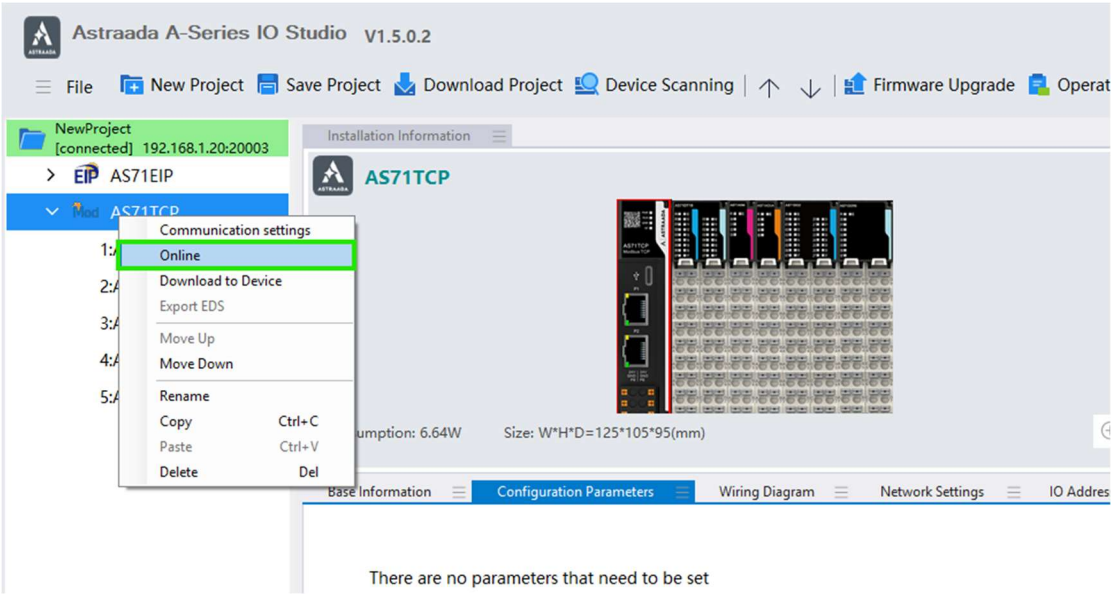


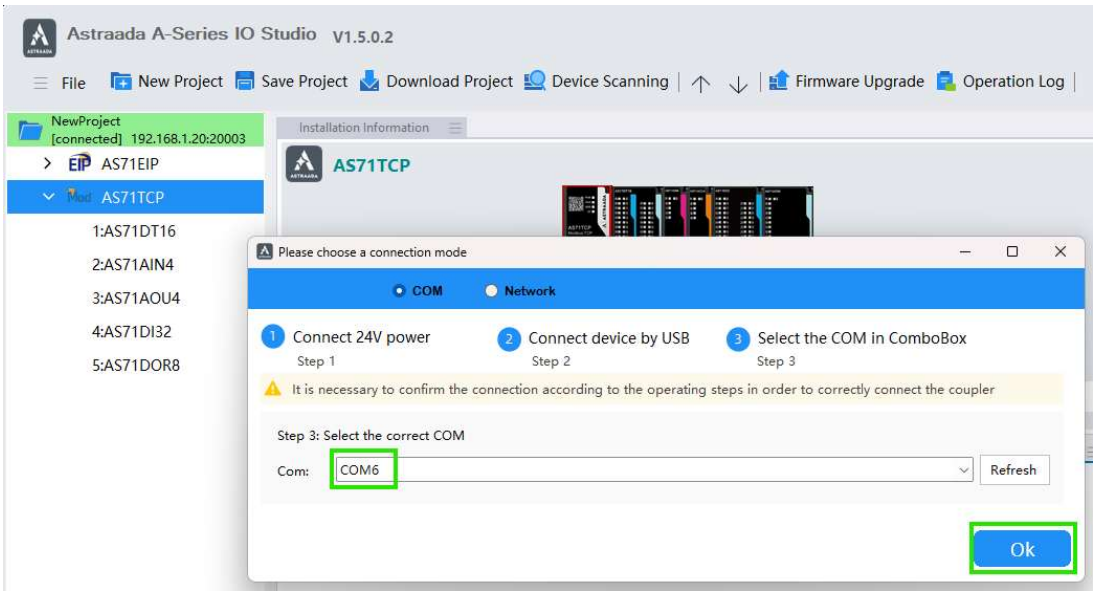
7.6 Online monitoring and signal diagnostics

7.6.1 Starting and exiting online monitoring

- Starting online monitoring

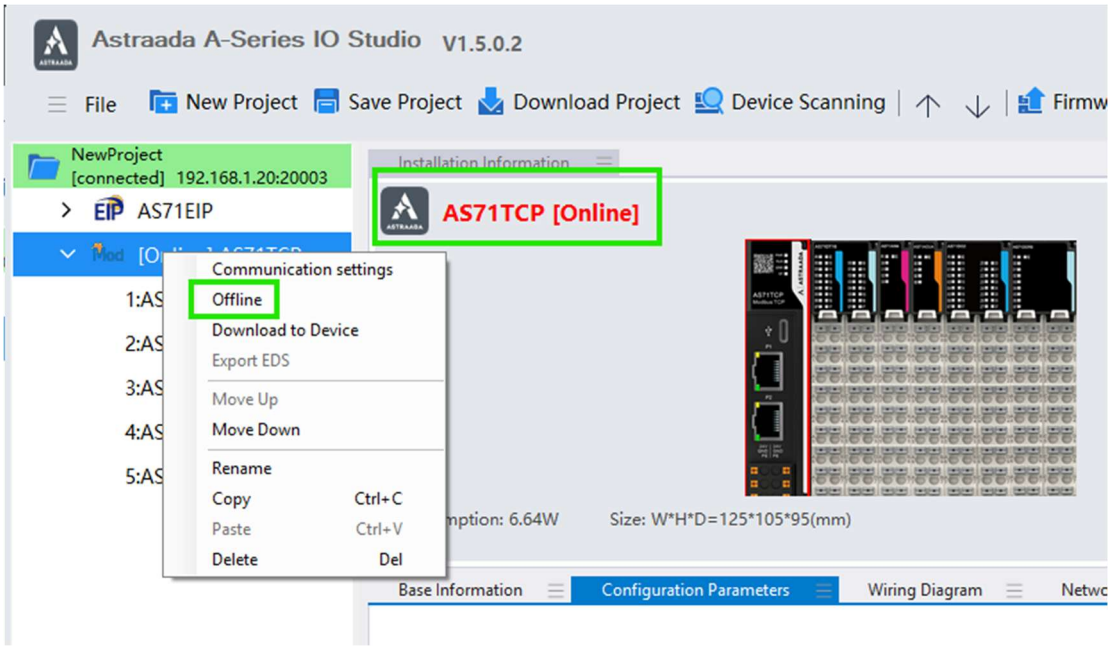
In the project tree, right-click the coupler, select **Online**, and choose the COM port corresponding to the coupler to enter the real-time monitoring interface.





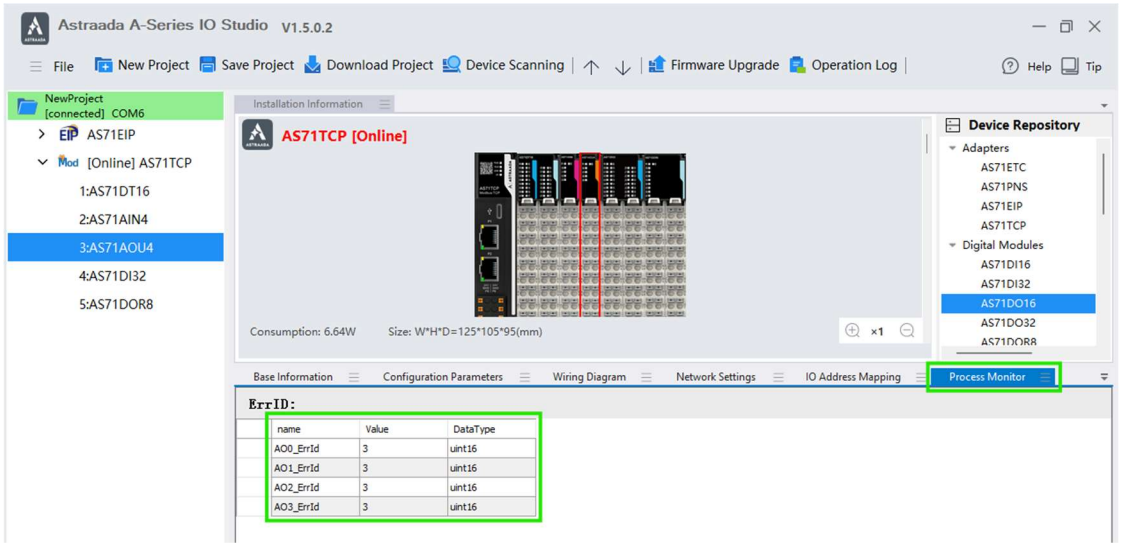
- Exiting online monitoring

Right-click the coupler/module in the project tree and choose **Offline** to stop online monitoring.



7.6.2 Data reading and signal verification

In online mode, select the module to view the real-time status values of input and output.



7.7 EtherCAT functions and communication commissioning

7.7.1 Communication basic verification

The AS71ETC Coupler is an EtherCAT coupler. Through this coupler, the A-Series expansion modules can be integrated into a high-speed EtherCAT network. This enables different types of A-Series expansion modules to be configured as a single EtherCAT slave, helping reduce the number of slave nodes in the network.

Status indicator diagnostics:

Silkscreen	Status	Meaning	Commissioning action
PWR	Off	Coupler 24 V power supply abnormal	● Check the power wiring and ensure proper module power connection ● Measure terminal voltage to verify sufficient power supply capacity
RUN	Off	No EtherCAT communication data	● Check network cable/switch to ensure physical connection between master and slave is correct ● Verify master IP configuration and ensure slave node address mapping is correct
	Blinking	EtherCAT communication not in OP state	● Check system consistency ● Optimize SDO transfer cycle; if SDO data volume is large and master performance is insufficient, slave may remain in Pre-Operational state for a long time
SF	Blinking	Configuration mismatch	The coupler performs automatic scanning to verify whether the scanned physical configuration matches the actual hardware configuration and network configuration, and determines whether module damage exists

7.7.2 Object dictionary configuration and mapping verification

According to the definition of standard protocols, device object dictionaries are uniformly classified. All devices must follow the rules of the protocol for classification.

■ Object dictionary structure:

Index range	Description
0x0000–0x0FFF	Data type
0x1000–0x1FFF	EtherCAT standard communication object dictionary
0x2000–0x5FFF	Manufacturer defined parameters
0x6000–0x6FFF	TxPDO, used to map the output process data of the expansion module.
0x7000–0x7FFF	RxPDO, used to map the input process data of the expansion module.
0x8000–0x8FFF	SDO, used for parameter configuration and status feedback of the expansion module.
0xF000–0xFFFF	Device description area, coupler configuration object dictionary

■ Module index dynamic allocation rules:

Each expansion module connected downstream of the AS71ETC Coupler is treated as an independent module unit. Module configuration parameters, process data (RxPDO/TxPDO), and SDO commands are all

managed as object dictionary entries.

The module object dictionary index is dynamically allocated using the rule: Base value + slot number × offset value (n = 0–31). Each expansion module has a predefined base value (see Table 7-1).

Type	Calculation formula	Offset	Example (slot n)
RxPDO mapping	Base value + n × 0x01	1 byte	0x1600 + n → 0x161F (n=31)
TxPDO mapping	Base value + n × 0x01	1 byte	0x1A00 + n → 0x1A1F (n=31)
TxPDO parameter	Base value + n × 0x80	128 byte	0x6000 + n×0x80 → 0x6F80 (n=31)
RxPDO parameter	Base value + n × 0x80	128 byte	0x7000 + n×0x80 → 0x7F80 (n=31)
SDO parameter	Base value + n × 0x80	128 byte	0x8000 + n×0x80 → 0x8F80 (n=31)

Note:

- n represents the module slot number (0–31), indicating the slot position of the module.
- The upper address limit for slot 31 is 0x8FFF; exceeding this range may cause communication errors.

Table 7-1 Object dictionary base value distribution for A-Series

Module	Object dictionary					
	RxPDO mapping	TxPDO mapping	TxPDO parameter	RxPDO parameter	SDO configuration parameter	SDO status parameter
AS71DI16	-	0x1A00	0x6001	-	0x8001	0x8078
AS71DI32	-	0x1A00	0x6002	-	0x8002	0x8078
AS71DOR8	0x1600	0x1A00	0x6004	0x7004	0x8004	0x8078
AS71DO16	0x1600	0x1A00	0x6005	0x7005	0x8005	0x8078
AS71AIN4	-	0x1A00	0x6015	-	0x8015	0x8078
AS71AOU4	0x1600	0x1A00	0x6019	0x7019	0x8019	0x8078
AS71RTD4	-	0x1A00	0x6029	-	0x8029	0x8078
AS71THC4	-	0x1A00	0x602D	-	0x802D	0x8078

For example, the actual configuration is as follows.

AS71ETC_ECT_Coupler + AS71DI16+ AS71DOR8 + AS71AIN4+ AS71AOU4+ AS71THC4

According to the object dictionary allocation rules, the object dictionary for this configuration is as follows.

Module	Object dictionary					
	RxPDO mapping	TxPDO mapping	TxPDO parameter	RxPDO parameter	SDO configuration parameter	SDO status parameter
AS71DI16 slot 0	-	0x1A00	0x6001	-	0x8001	0x8078
AS71DOR8 slot 1	0x1601	0x1A01	0x6085	0x7085	0x8085	0x80F8
AS71AIN4 slot 2	-	0x1A02	0x6115	-	0x8115	0x8178
AS71AOU4 slot 3	0x1603	0x1A03	0x6199	0x7199	0x8199	0x81F8
AS71THC4 slot 4	-	0x1A04	0x622D	-	0x822D	0x8278

7.7.3 Scanning function application and configuration verification

The internal backplane bus protocol stack of the AS71ETC_ECT_Coupler has an automatic scanning function for modules. A-Series modules can be identified and configuration-verified through the automatic scanning mechanism of the AS71ETC_ECT_Coupler. The workflow is as follows:

1. Module identification mechanism

- Each A-Series expansion module has a unique 32-bit device identification code.
- During coupler power-on initialization, the AS71ETC_ECT_Coupler queries the identification codes

sequentially according to slot order (Slot 0–Slot 31).

- The obtained results are written to the object dictionary index 0xF050 subindex 1–32 as the "actual identification result".

2. Master configuration download process

- The master can obtain the expected module configuration either by reading the 0xF050 object dictionary through the scan function to obtain the device identification codes of the expansion modules connected downstream of the AS71ETC_ECT_Coupler, or by configuring the modules manually.
- When the AS71ETC_ECT_Coupler is in Pre-Operational state, the master writes the expected identification codes into object dictionary index 0xF030 subindex 1–32 as the "configuration reference values".

3. Configuration consistency verification

The AS71ETC_ECT_Coupler will check whether the device identification codes in index 0xF030 match those in index 0xF050. If they match, the system can start normally; if they do not match, an error will be reported.

The module identification codes are shown in the table below:

Expansion module	Module ID identification code
AS71ETC_ECT_Coupler	0x16315000
AS71DI16	0x16315052
AS71DI32	0x16315053
AS71DOR8	0x16315069
AS71DO16	0x16315062
AS71AIN4	0x16315081
AS71AOU4	0x16315089
AS71RTD4	0x163150A1
AS71THC4	0x163150A9

7.8 Typical commissioning cases

Case 1: System fails to enter OP state after module replacement

Symptom:

The original DO module (AS71DO16) was replaced with a new DO module (AS71DO32). After system startup, the RUN indicator on the AS71ETC coupler blinks, and the system cannot enter OP state.

Troubleshooting process:

1. Check object dictionary 0xF050 and find that the actual identification code of Slot 1 has changed.
2. Compare with the master-configured identification code in 0xF030, and find a mismatch.
3. Confirm that the module model has indeed been replaced.

Solution:

1. Re-scan the module configuration in the master.
2. Confirm that the identification codes have been updated.
3. Write the new configuration identification data to 0xF030.
4. Download the configuration and power-cycle the system.

Case 2: Configuration verification failure due to incorrect module order

Symptom:

After the project is downloaded, the system reports an error and the SF indicator on the AS71ETC coupler blinks, causing module operation failure.

Troubleshooting process:

1. Check object dictionary 0xF050 and find that the identification order of modules in Slot 2 and Slot 3 does not match the expected configuration.
2. The actual installation order is inconsistent with the master configuration; modules are installed in reverse order.

Solution:

1. Remove and reinstall the modules to match the physical order with the project configuration.
2. Ensure a one-to-one correspondence between slot positions and configuration index (0xF030).
3. Restart the coupler, and the system successfully enters OP state.

Case 3: Empty identification code due to module scan failure

Symptom:

The master fails to scan modules, and logs show that some slots have no identification code. The corresponding subindex values in object dictionary 0xF050 are 0x00000000.

Troubleshooting process:

1. Check the connection status of downstream modules of the AS71ETC coupler.
2. Check the power supply output and find that the supply voltage is below 18 V, preventing the modules from powering on properly.
3. Replace the power supply, after which normal operation is restored.

Solution:

1. Ensure the power supply is ≥ 24 V and stable.
2. Power cycle the system, and identification codes will be automatically written to 0xF050.
3. Rescan the modules on the master and update the configuration.

8 Troubleshooting

8.1 Common faults and solutions

Fault code (decimal)	Fault code (hexadecimal)	Fault type	Solution
General module fault			
1	0x0001	Module configuration fault	Check whether the network configuration corresponds to the physical configuration of the module.
2	0x0002	Incorrect module parameter setting	Check whether the module parameter settings are correct; reconfigure as described in the manual.
3	0x0003	Module output port power supply fault	Measure the supply voltage at the module output port to check whether it is normal. Check whether the power supply module or the wiring is loose or disconnected.
4	0x0004	Module output fault	Check whether the load connected to the module output port exceeds the rated specifications.
Parameter configuration fault			
18	0x0012	Incorrect parameter setting for channel 0	Check whether the parameter settings for channel 0 are within the permissible range; reconfigure as described in the manual.
34	0x0022	Incorrect parameter setting for channel 1	Same as above; check the parameter configuration for channel 1.
50	0x0032	Incorrect parameter setting for channel 2	Same as above; check the parameter configuration for channel 2.
66	0x0042	Incorrect parameter setting for channel 3	Same as above; check the parameter configuration for channel 3.
82	0x0052	Incorrect parameter setting for channel 4	Same as above; check the parameter configuration for channel 4.
98	0x0062	Incorrect parameter setting for channel 5	Same as above; check the parameter configuration for channel 5.
114	0x0072	Incorrect parameter setting for channel 6	Same as above; check the parameter configuration for channel 6.
130	0x0082	Incorrect parameter setting for channel 7	Same as above; check the parameter configuration for channel 7.
Output fault			
20	0x0014	Output fault on channel 0	Measure the output terminal voltage/current of channel 0 to check whether it is normal. Check whether the load is short-circuited (impedance too low) or open-circuited (disconnected).

Fault code (decimal)	Fault code (hexadecimal)	Fault type	Solution
36	0x0024	Output fault on channel 1	Same as above; check the output of channel 1.
52	0x0034	Output fault on channel 2	Same as above; check the output of channel 2.
68	0x0044	Output fault on channel 3	Same as above; check the output of channel 3.
84	0x0054	Output fault on channel 4	Same as above; check the output of channel 4.
100	0x0064	Output fault on channel 5	Same as above; check the output of channel 5.
116	0x0074	Output fault on channel 6	Same as above; check the output of channel 6.
132	0x0084	Output fault on channel 7	Same as above; check the output of channel 7.
Signal source open-circuit fault			
21	0x0015	Signal source open circuit fault on channel 0	Check whether the physical connection of the signal source (such as sensors or input devices) for channel 0 is secure, and eliminate any open-circuit conditions.
37	0x0025	Signal source open circuit fault on channel 1	Same as above; check the signal source for channel 1.
53	0x0035	Signal source open circuit fault on channel 2	Same as above; check the signal source for channel 2.
69	0x0045	Signal source open circuit fault on channel 3	Same as above; check the signal source for channel 3.
85	0x0055	Signal source open circuit fault on channel 4	Same as above; check the signal source for channel 4.
101	0x0065	Signal source open circuit fault on channel 5	Same as above; check the signal source for channel 5.
117	0x0075	Signal source open circuit fault on channel 6	Same as above; check the signal source for channel 6.
133	0x0085	Signal source open circuit fault on channel 7	Same as above; check the signal source for channel 7.
Sampling signal out-of-range fault			
22	0x0016	Channel 0 sampling signal out-of-range fault	Check whether the sampling value of channel 0 exceeds the maximum or minimum input range allowed by the chip. Adjust the signal source or the attenuation circuit accordingly.
38	0x0026	Channel 1 sampling signal out-of-range fault	Same as above; check the sampling signal of channel 1.
54	0x0036	Channel 2 sampling signal out-of-range fault	Same as above; check the sampling signal of channel 2.
70	0x0046	Channel 3 sampling signal out-of-range fault	Same as above; check the sampling signal of channel 3.
86	0x0056	Channel 4 sampling signal out-of-range fault	Same as above; check the sampling signal of channel 4.

Fault code (decimal)	Fault code (hexadecimal)	Fault type	Solution
102	0x0066	Channel 5 sampling signal out-of-range fault	Same as above; check the sampling signal of channel 5.
118	0x0076	Channel 6 sampling signal out-of-range fault	Same as above; check the sampling signal of channel 6.
134	0x0086	Channel 7 sampling signal out-of-range fault	Same as above; check the sampling signal of channel 7.
Sampling signal above upper limit fault			
23	0x0017	Channel 0 sampling signal above upper limit fault	Check whether the sampled value of channel 0 is above the set upper limit. Adjust the limit or signal source output.
39	0x0027	Channel 1 sampling signal above upper limit fault	Same as above; check the sampling signal of channel 1.
55	0x0037	Channel 2 sampling signal above upper limit fault	Same as above; check the sampling signal of channel 2.
71	0x0047	Channel 3 sampling signal above upper limit fault	Same as above; check the sampling signal of channel 3.
87	0x0057	Channel 4 sampling signal above upper limit fault	Same as above; check the sampling signal of channel 4.
103	0x0067	Channel 5 sampling signal above upper limit fault	Same as above; check the sampling signal of channel 5.
119	0x0077	Channel 6 sampling signal above upper limit fault	Same as above; check the sampling signal of channel 6.
135	0x0087	Channel 7 sampling signal above upper limit fault	Same as above; check the sampling signal of channel 7.
Sampling signal below lower limit fault			
24	0x0018	Channel 0 sampling signal below lower limit fault	Check whether the sampled value of channel 0 is below the set lower limit. Adjust the limit or signal source output.
40	0x0028	Channel 1 sampling signal below lower limit fault	Same as above; check the sampling signal of channel 1.
56	0x0038	Channel 2 sampling signal below lower limit fault	Same as above; check the sampling signal of channel 2.
72	0x0048	Channel 3 sampling signal below lower limit fault	Same as above; check the sampling signal of channel 3.
88	0x0058	Channel 4 sampling signal below lower limit fault	Same as above; check the sampling signal of channel 4.
104	0x0068	Channel 5 sampling signal below lower limit fault	Same as above; check the sampling signal of channel 5.
120	0x0078	Channel 6 sampling signal below lower limit fault	Same as above; check the sampling signal of channel 6.
136	0x0088	Channel 7 sampling signal below lower limit fault	Same as above; check the sampling signal of channel 7.
Operating speed over-limit fault			
25	0x0019	Channel 0 operating speed over-limit fault	Check whether channel 0 operating speed exceeds the specification limit.
41	0x0029	Channel 1 operating speed over-limit fault	Check whether channel 1 operating speed exceeds the specification limit.

Fault code (decimal)	Fault code (hexadecimal)	Fault type	Solution
ACC/DEC time over-limit fault			
26	0x001A	Channel 0 ACC/DEC time over-limit fault	Check whether channel 0 ACC/DEC time exceeds the specification limit.
42	0x002A	Channel 1 ACC/DEC time over-limit fault	Check whether channel 1 ACC/DEC time exceeds the specification limit.

8.2 Serial communication module exception code description

The AS71COM2 module provides three exception code parameters: ModuleErrID, which reports faults related to the serial communication module (see section 8.1 Common faults and solutions), and Slaver0_errno / Slaver1_errno, which report slave virtual module exceptions for channel 0 and channel 1. The master virtual module parameter CmdErrno reflects the corresponding module exception.

The exception codes are listed in the table below. The exception code offset rules are defined as follows: slave exception codes are based on the table values plus an offset of 200; master exception codes are based on the table values plus an offset of 10000.

Exception code (decimal)	Name	Description
1	Illegal function code	For the server (or slave), the function code received in the query is not a permitted operation. This may occur because the function code is only applicable to new devices, and is not implemented in the selected unit. It may also indicate that the server (or slave) is in the wrong state to process this type of request, for example, because it is unconfigured and is being asked to return register values.
2	Illegal data address	For the server (or slave), the data address received in the query is not a permitted address. More specifically, the combination of reference number and transfer length is invalid. For a controller with 100 registers, a request with an offset of 96 and a length of 4 will succeed, while a request with an offset of 96 and a length of 5 will generate exception code 02.
3	Illegal data value	For the server (or slave), the value included in the query is not permitted. This value indicates a fault in the remaining structure of the request, such as an incorrect implied length. It does not mean that the Modbus protocol is aware of the meaning of specific register values. A data item stored in a register may have a value outside the expectations of the application.
4	Slave device failure	An unrecoverable error occurred while the server (or slave) was attempting to execute the requested operation.
12	CRC error	CRC error
13	Data error	Data error
14	Execution error	Execution error
15	Unknown execution	Unknown execution
16	Exceeded protocol data	Exceeded protocol data length

Exception code (decimal)	Name	Description
	length	
17	Slave ID error	Slave ID error
18	Master module (read/write) length exceeds the maximum module length or is 0	Master module (read/write) length exceeds the maximum module length or is 0
19	Timeout	Timeout
20	Invalid parameter	Invalid parameter
21	Incorrect 7-bit mode setting	Incorrect 7-bit mode setting

9 Inspection and maintenance

9.1 Daily inspection and regular maintenance

Due to the effects of ambient temperature, humidity, dust, and vibration, components inside the product may age, which may cause potential faults or shorten the service life of the product. Therefore, to extend the product service life and prevent safety hazards, daily inspection and regular maintenance are required.

Check item	Content	Inspection method
Daily inspection: Recommended daily.		
Ambient environment	Whether the ambient temperature, humidity, vibration, dust, gas, or oil contamination is excessive, and whether there is condensation or water droplets inside and outside the machine	Visual inspection and instrument measurement
	Whether foreign matter, such as tools, or dangerous substances are placed nearby	Visual inspection
Power supply voltage	Whether the supply voltage is abnormal	Multimeter or voltage meter
Indicator	Whether the display is clear	Visual inspection
Regular maintenance: Recommended quarterly, especially in harsh environments with dust, oil, or corrosive gases. Before regular maintenance, cut off the power and wait at least 15 min.		
Entire machine	Whether the DIN rail fixing clip is loose	Visual inspection
	Whether the machine is deformed, cracked, or damaged, or the color changes due to overheating and aging	Visual inspection
	Whether excessive dirt or dust is attached	Visual inspection
	Whether there is any abnormal noise, vibration, odor, or discoloration	Auditory, olfactory, and visual inspection
Connection terminals	● Whether there is any overheating or damage ● Whether the terminals are secure	Visual inspection, instrument-based inspection
Ventilation duct	Whether there are foreign matters blocking or attached to the air inlets or air outlets	Visual inspection

For more details about maintenance, contact the local ASTOR office, or visit our website https://www.astor.com.pl/wsparcie/astor-centrum-wsparcia.html

Appendix A Product dimensions

A.1 Communication coupler

This section includes module installation dimensions and weight, cable connection dimensions, and end cover dimensions.

A.1.1 Module installation dimensions and weight

This section applies to the following models: AS71ETC, AS71PNS, AS71EIP, and AS71TCP.

Figure A-1 Module installation dimensions (unit: mm)

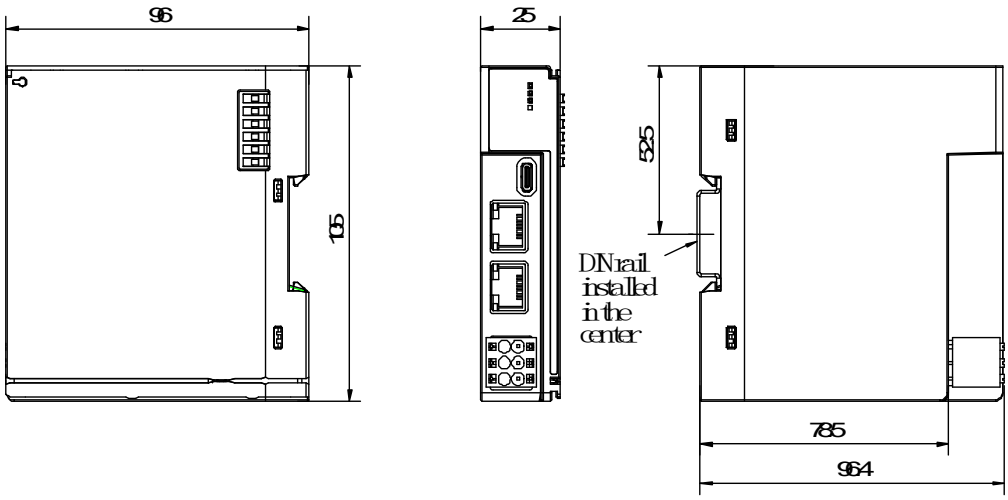


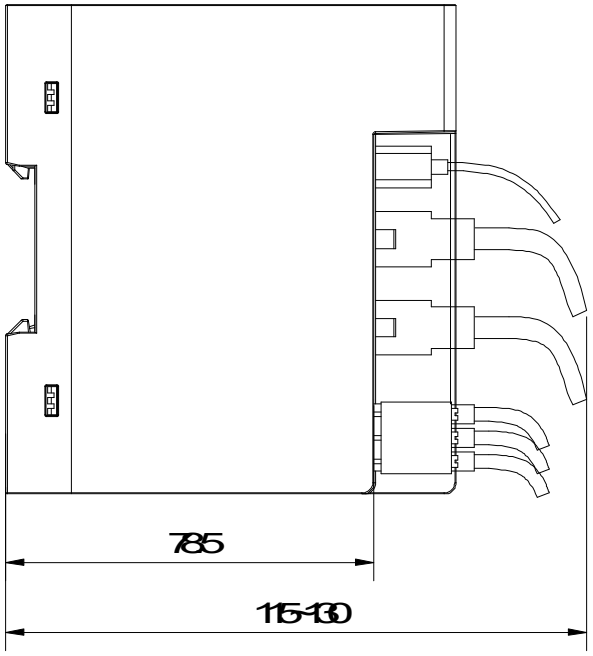
Table A-1 Module dimensions and weight

Product model	Outline dimensions W×H×D (mm)	Packaging outline dimensions W×H×D (mm)	Standard weight (kg)	Gross weight (kg)
AS71ETC	25×105×96	29×109×100	0.25	0.28
AS71PNS				
AS71EIP				
AS71TCP				

A.1.2 Connection cable dimensions

This section applies to the following models: AS71ETC, AS71PNS, AS71EIP, and AS71TCP.

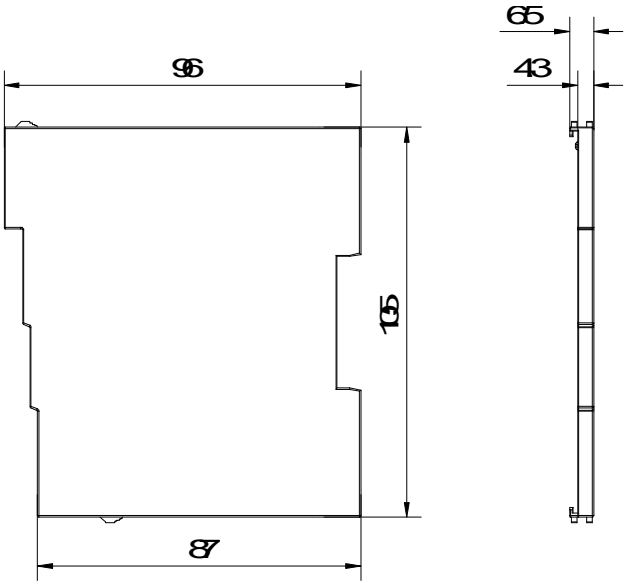
Figure A-2 Connection cable dimensions (unit: mm)



A.1.3 End cover dimensions

This section applies to the following models: AS71ETC, AS71PNS, AS71EIP, and AS71TCP.

Figure A-3 End cover dimensions (unit: mm)



A.2 I/O module

This section includes the installation dimensions and weight of the I/O module, as well as cable connection dimensions.

A.2.1 Module installation dimensions and weight

Figure A-4 Module installation dimensions 1 (unit: mm)

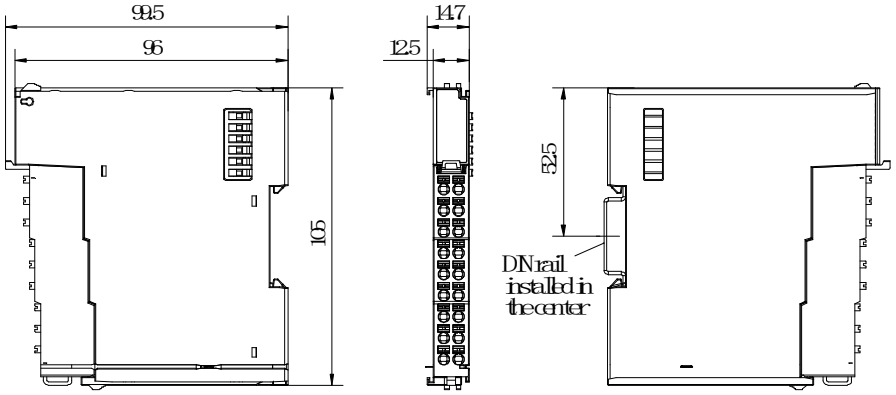


Table A-2 Module dimensions 1 and weight

Product model	Outline dimensions W×H×D (mm)	Packaging outline dimensions W×H×D (mm)	Standard weight (kg)	Gross weight (kg)
AS71DI16	12.5×105×96	17.5×109×100	0.15	0.18
AS71DO16				
AS71AIN4				
AS71RTD4				
AS71THC4				
AS71BRG1				
AS71BRG2				
AS71AIV8				
AS71AIC8				
AS71AOU4				
AS71DT08				
AS71AN02				
AS71IN02				
AS71IN01				
AS71PUOC				
AS71PWRR				
AS71COM2				

Figure A-5 Module installation dimensions 2 (unit: mm)

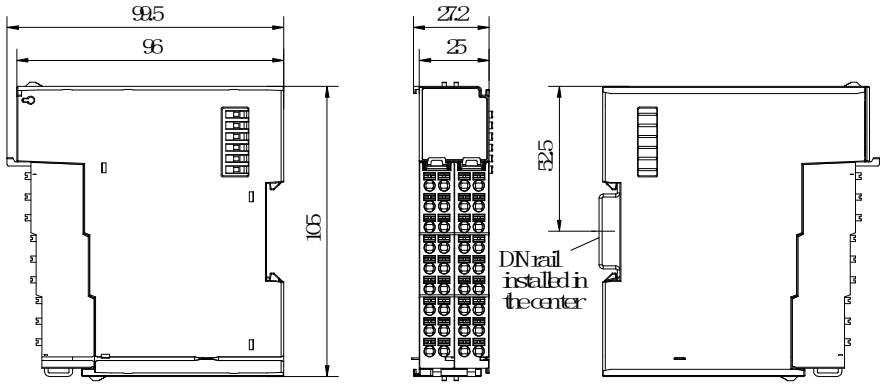


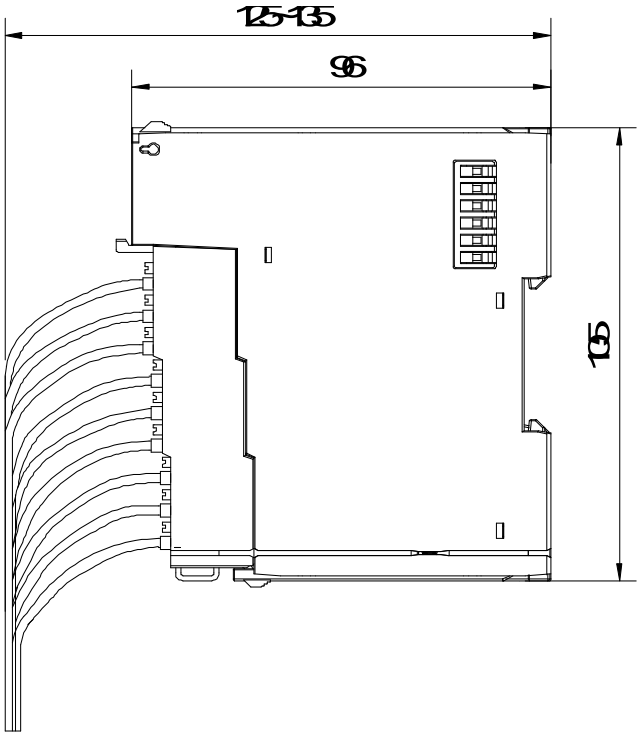
Table A-3 Module dimensions 2 and weight

Product model	Outline dimensions W×H×D (mm)	Packaging outline dimensions W×H×D (mm)	Standard weight (kg)	Gross weight (kg)
AS71DI32	25×105×96	29×109×100	0.30	0.33
AS71DO32				
AS71DOR8				
AS71DT16				

A.2.2 Connection cable dimensions

The dimensions are applicable to all I/O module models.

Figure A-6 Connection cable dimensions (unit: mm)



Appendix B Address mapping table description

B.1 Function code description

The A-Series I/O system supports the following Modbus standard function codes: 01, 02, 03, 04, 05, 06, 15, 16, and 23. The description of the function codes is shown in Table B-1.

B.1.1 Description of Modbus standard function codes

Table B-1 Function code description

Function code	Name	Description	Operation type
01	Read Coils	Read coils	Bit operation (multiple)
02	Read Discrete Inputs	Read discrete inputs	Bit operation (multiple)
03	Read Holding Registers	Read holding registers	Word operation (multiple)
04	Read Input Registers	Read input registers	Word operation (multiple)
05	Write Single Coil	Write a single coil	Bit operation (single)
06	Write Single Register	Write a single holding register	Word operation (single)
15	Write Multiple Coils	Write multiple coils	Bit operation (multiple)
16	Write Multiple Registers	Write multiple holding registers	Word operation (multiple)
23	Read/Write Multiple Registers	Read/Write multiple holding registers	Word operation (multiple)

B.1.2 BIT access

B.1.2.1 BIT read

02: Read Discrete Inputs / Read discrete input status / Bit operation (multiple)

This function code allows bit-level read operations on all configured digital input modules. The address offset starts from 0 and follows the configuration order.

B.1.2.2 BIT write

- 01: Read Coils / Read coil status / Bit operation (multiple)
- 05: Write Single Coil / Write single coil / Bit operation (single)
- 15: Write Multiple Coils / Write multiple coils / Bit operation (multiple)

These three function codes allow bit-level write operations or readback on all configured digital output modules. The address offset starts from 0 and follows the configuration order.

B.1.3 WORD access

B.1.3.1 WORD read

- 04: Read Input Registers / Read input registers / Word operation (multiple)

- 23: Read/Write Multiple Registers / Read/Write multiple holding registers / Word operation (multiple)

Note: For function code 23, the read and write operations do not share the same address mapping.

These two function codes allow word-level read operations on the input data of all configured modules. Digital input modules support bit-level operations via function code 02, and also support word-level operations in this area (offset address 4096). The error diagnostic information for all modules is also mapped to address 8192.

- Analog module parameters are mapped sequentially starting from offset address 0 in configuration order.
- Digital module parameters are mapped sequentially starting from offset address 4096 in configuration order.
- Error diagnostic information parameters for all modules are mapped sequentially starting from offset address 8192 in configuration order.

B.1.3.2 WORD write

- 03: Read Holding Registers / Read holding registers / Word operation (multiple)
- 06: Write Single Register / Write single holding register / Word operation (single)
- 16: Write Multiple Registers / Write multiple holding registers / Word operation (multiple)
- 23: Read/Write Multiple Registers / Read/Write multiple holding registers / Word operation (multiple)

Note: For function code 23, the read and write operations do not share the same address mapping.

These four function codes allow word-level write or readback operations on the output data of all configured modules. For digital output modules, in addition to bit-level operations via function codes 05/15, word-level operations are also supported at offset address 4096. To avoid conflicts, do not perform bit-level and word-level write operations on the same digital output simultaneously from the master.

- Analog output module parameters are mapped sequentially starting from offset address 0 in configuration order.
- Digital output module parameters are mapped sequentially starting from offset address 4096 in configuration order.

B.2 Address mapping table

B.2.1 Address allocation

B.2.1.1 Area

According to the defined access method above, the address space is divided into four areas.

<table>
<tr><th>Address area</th><th colspan="2">Address range</th><th>Data type</th></tr>
<tr><td>BIT read</td><td colspan="2">0–2048</td><td>Digital input module</td></tr>
<tr><td>BIT write</td><td colspan="2">0–2048</td><td>Digital output module</td></tr>
<tr><td rowspan="3">WORD read</td><td rowspan="3">0–12288</td><td>0–4095</td><td>Analog input module</td></tr>
<tr><td>4096–8191</td><td>Digital input module</td></tr>
<tr><td>8192–12287</td><td>Diagnostic information
(module error information)</td></tr>
<tr><td rowspan="2">WORD write</td><td rowspan="2">0–8192</td><td>0–4095</td><td>Analog output module</td></tr>
<tr><td>4096–8191</td><td>Digital output module</td></tr>
</table>

B.2.1.2 Module address count table

No.	Function code	02	01, 05, 15	04, 23	03, 06, 16, 23	04, 23	03, 06, 16, 23	04, 23
	Offset address	0	0	0	0	4096	4096	8192
	Function	Input Bit	Output Bit	Input Word	Output Word	Input Word	Output Word	Input Word
		DI	DO	AI	AO	DI	DO	Diag
0	**AS71TCP**	-	-	-	-	-	-	-
1	AS71DI16	16	-	-	-	1	-	1
2	AS71DI32	32	-	-	-	2	-	1
3	AS71DO16	-	16	-	-	-	1	1
4	AS71DO32	-	32	-	-	-	2	1
5	AS71DOR8	-	8	-	-	-	1	1
6	AS71DT16	16	16	-	-	1	1	1
7	AS71AIN4	-	-	4	-	-	-	4
8	AS71AIV8	-	-	8	-	-	-	8
9	AS71AIC8	-	-	8	-	-	-	8
10	AS71RTD4	-	-	8	-	-	-	4
11	AS71THC4	-	-	8	-	-	-	4
12	AS71AOU4	-	-	-	4	-	-	4
13	AS71IN02	-	-	17	9	-	-	2
14	AS71IN01	-	-	11	7	-	-	1
15	AS71AN02	-	-	17	5	-	-	2

B.2.1.3 Example

Configuration: Total number of modules: 18								
No.	Function code	02	01, 05, 15	04, 23	03, 06, 16, 23	04, 23	03, 06, 16, 23	04, 23
	Offset address	0	0	0	0	4096	4096	8192
	Function	Input Bit	Output Bit	Input Word	Output Word	Input Word	Output Word	Input Word
		DI	DO	AI	AO	DI	DO	Diag
0	AS71TCP	-	-	-	-	-	-	-
1	AS71DI16	0–15	-	-	-	0	-	0
2	AS71DI32	16–47	-	-	-	1–2	-	1
3	AS71DO16	-	0–15	-	-	-	0	2
4	AS71DO32	-	16–47	-	-	-	1–2	3
5	AS71DO16	-	48–63	-	-	-	3	4
6	AS71DO32	-	64–95	-	-	-	4–5	5
7	AS71DOR8	-	96–111	-	-	-	6	6
8	AS71DT16	48–63	112–127	-	-	3	7	7
9	AS71DT16	64–79	128–143	-	-	4	8	8
10	AS71AIN4	-	-	0–3	-	-	-	9–13
11	AS71AIV8	-	-	4–11	-	-	-	14–21
12	AS71AIC8	-	-	12–19	-	-	-	22–29
13	AS71RTD4	-	-	20–27	-	-	-	30–33
14	AS71THC4	-	-	28–35	-	-	-	34–37
15	AS71AOU4	-	-	-	0–3	-	-	38–41
16	AS71IN02	-	-	36–52	4–12	-	-	42–43
17	AS71IN01	-	-	53–63	13–19	-	-	44
18	AS71AN02	-	-	64–80	20–24	-	-	45–46

B.3 Additional notes

The address range accessed by the above function codes is calculated based on the configuration. If the access exceeds the actual configured address range, an illegal data address error will be reported.

For function code 23, the read operation does not read data from the "WORD Write" area, but from the "WORD Read" area. Therefore, if the master supports function code 23, it can be used to perform simultaneous read and write of input and output data, improving communication efficiency.