

RS Series Multifunction Integrated I/O

User Manual

DECOWELL Industrial Intelligence makes reliable partners



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Preface

■ Profile

Thank you for purchasing the DECOWELL RS Series All-in-One Multifunctional I/O Module.

The RS Series All-in-One Multifunctional I/O Module is DECOWELL's new-generation integrated expansion module. This series adopts a new split-type design and supports multiple signal types, including digital input modules, digital output modules, and digital input/output modules. The signal interfaces provide various connection options, including single-row European terminals, 3-in-1 European terminals, and 3-in-1 E-CON terminals. In addition, this series supports multiple communication protocols, such as PROFINET, EtherCAT, EtherNet/IP, and CC-Link IE Field Basic.

The RS Series All-in-One CC-Link Bus Module is an integrated module within this series that supports the CC-Link communication protocol. This manual mainly describes the specifications, features, and usage of the module. Please read it carefully before use to ensure proper and safe operation of the product.

Due to continuous updates and improvements in products and technologies, the contents of this document may not fully match the actual product. We appreciate your understanding. In case of any discrepancies, the actual product shall prevail. Changes resulting from product upgrades are subject to change without prior notice.

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Safety Precautions

■ Security Statement

1. Before installing, operating, or maintaining the product, please read and comply with these safety precautions.
2. To ensure personal and equipment safety, follow all safety labels on the product and all safety instructions contained in this manual during installation, operation, and maintenance.
3. The “Note”, “Caution”, “Warning”, and “Danger” statements in this manual do not represent all safety precautions that should be observed; they are supplementary to the overall safety requirements.
4. This product must be used under conditions that meet the specified design requirements. Failure to meet these conditions may result in malfunction. Functional abnormalities or component damage caused by non-compliance are not covered by the product warranty.
5. DECOWELL assumes no legal liability for personal injury, property damage, or other losses caused by improper or unauthorized operation of the product.

■ Security level definition



Note

Indicates additional information or explanations that supplement the operating instructions.



Caution

Indicates a hazardous situation that may result in minor to moderate personal injury or equipment damage if not operated as instructed.



Warning

Indicates a hazardous situation that may result in serious personal injury or death if not operated as instructed.

 Warning — During Control System Design

01. When applying this system, please be sure to design a safety circuit to ensure that the control system can still operate safely when the external power supply fails or the expansion module malfunctions.
02. If the output circuit experiences prolonged overcurrent due to exceeding the rated load current or a load short circuit, the module may smoke or catch fire. External safety devices such as fuses or circuit breakers should be installed.

 Caution — During Control System Design

01. It is essential to install an emergency braking circuit, a protection circuit, an interlock circuit for forward and reverse operation, and upper and lower limit interlock switches to prevent machine damage in the external circuit of the expansion module;
02. To ensure the safe operation of the equipment, please design external protection circuits and safety mechanisms for output signals related to major accidents;
03. When the output units of the expansion module, such as relays and transistors, are damaged, their outputs cannot be controlled to be in the ON or OFF state;

 Caution — During Installation

01. During installation, prevent metal shavings and wire ends from falling into the module's ventilation holes, as this may cause fire, malfunction, or misoperation;
02. After installation, ensure that there are no foreign objects on its ventilation surface, otherwise it may cause poor heat dissipation, resulting in fire, malfunction, or misoperation;
03. During installation, ensure that the module is securely connected to its respective connector and that the module connection hooks are firmly locked. Improper module installation may lead to malfunctions, failures, or detachment.

 Warning — During Installation

01. Only professional maintenance personnel who have received relevant electrical equipment training and possess sufficient electrical knowledge can install this product;

02. When installing or removing modules, all external power supplies to the system must be completely disconnected before proceeding. Failure to disconnect the power supply may result in electric shock, module malfunction, or accidental operation.

03. Do not use the module in the following locations: places with dust, fumes, conductive dust, corrosive gases, or flammable gases; places exposed to high temperatures, condensation, or wind and rain; places subject to vibration or impact. Electric shock, fire, or misoperation may also cause product damage and deterioration.

1.Product Introduction

1.1 Product Features

The RS series integrated modules support a variety of industrial fieldbus protocols, such as EtherCAT, PROFINET, EtherNet/IP, DeviceNet, etc. The IO module supports a maximum of 32 channels of digital input/output. Users can select different IO panels based on actual needs, offering base units in both 16-bit and 32-bit specifications. The module supports the following functions:

- ① Module hot swap
- ② Support bus abnormality DO Output status configuration
- ③ Support USB Firmware Upgrade
- ④ Support slave station loss diagnosis and configuration inconsistency detection
- ⑤ Support one-click restoration to factory settings
- ⑥ DIP switch to set device name

1.2 Module Naming Rules

1.2.1 Digital Module Panel Naming Rules

CL2 - 16 DI(**N-1**)

① ② ③ ④ ⑤

NO.	Name	Meaning
①	Bus protocol	CC-Link
②	Number of channels	8:8 channels 16:16 Channel
③	Channel Type	DI: Digital input DO: Digital output
④	Signal Type	N:NPN P:PNP R: Relay
⑤	Interface Type	1: Single row European terminal 2: Trinity Terminal 3. E-CON connectors

1.2.2 Analog Module Panel Naming Rules

CL2 - 8 AI (I5-1)

① ② ③ ④⑤ ⑥

NO.	Name	Meaning
①	Bus protocol	PROFINET
②	Number of channels	4: 4 channels 8: 8 channels
③	Channel Type	AI: Analog Input AO: Analog Output TC/RTD: Temperature Measurement (TC/RTD) Module
④	Signal Type	I: Analog Current U: Analog Voltage C: Compatible with Current and Voltage N: Compatible with Thermocouple and RTD
⑤	Measurement Range	3: 16-bit U/I compatible, ±5V, 0–5V, 0–10V, ±10V, 0–20mA, 4–20mA; user-configurable range 5: 16-bit range compatible, 0–20mA, 4–20mA; user-configurable range 6: 16-bit range compatible, 0–10V, ±10V; user-configurable range 0: 16-bit configurable channel type
⑥	Interface Type	1: Single-row European terminal 2: 3-in-1 terminal 3: E-CON connector

1.3 Version Revision Description

	Before Change	After Change
Firmware version	V1.0.2	V1.0.12
Maximum number of supported stations	2	4
Adaptive number of stations	Supported	Supported
Maximum baud rate	10Mbps	10Mbps
Adaptive baud rate	Not supported	Supported
Supports DI/DO	Supported	Supported
Supports 4AI/8AI/4AO	Not supported	Supported

CC-Link V1	Supported	Supported
CC-Link V2	Not supported	Supported
Supports TesterTool configuration, including switching between protocol V1/V2, switching adaptive baud rate, and switching adaptive station number.	Not supported	Supported
Change Summary	This update optimizes functionality, adds support for analog modules and CC-Link V2 requirements, and introduces adaptive baud rate and configurable features, improving overall user usability. Please note: In V1.0.2 projects, if DIP switches 6–8 are used for communication parameter settings, then when using V1.0.12, the corresponding logical station number and baud rate must be configured accordingly.	

Communication rate setting:

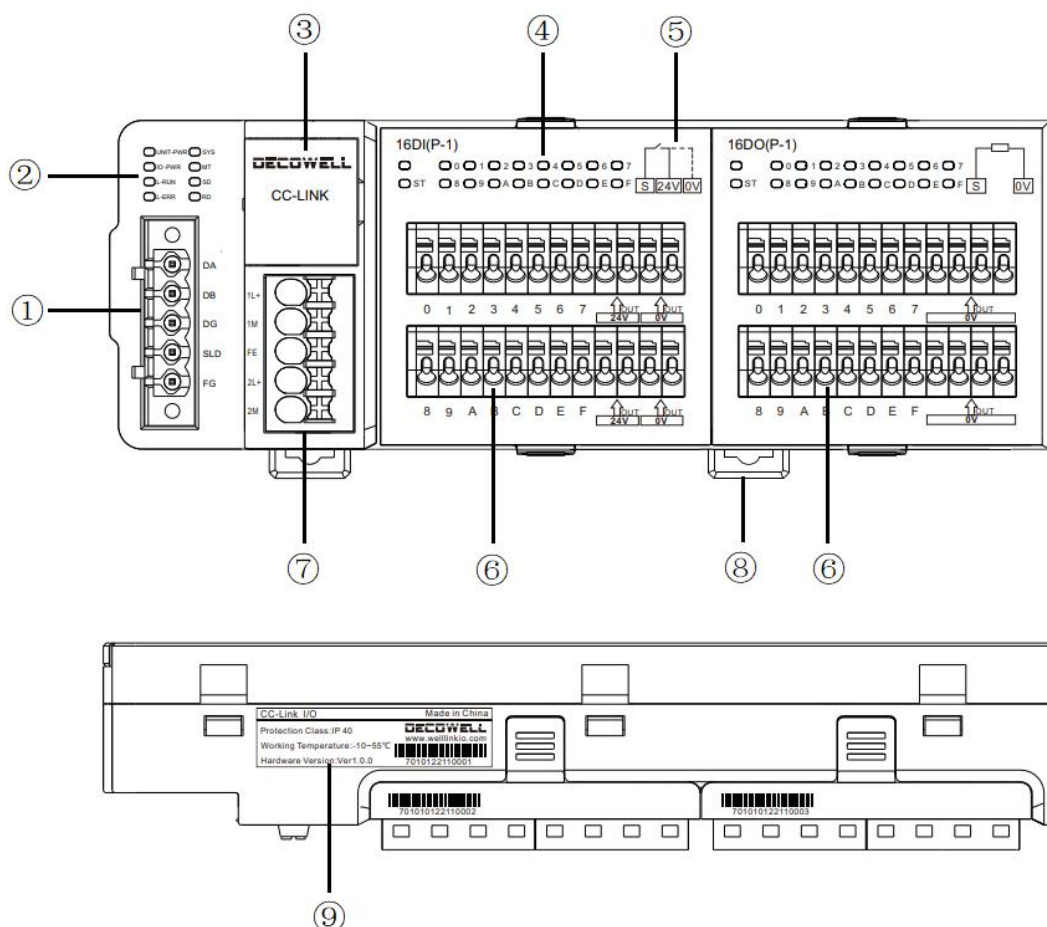
V1.0.2 Communication Rate Setting						
DIP No.	Communication Rate	Number of Stations	DIP No.	Communication Rate	Number of Stations	Distance
0	156Kbps	2	5	156Kbps	Automatic number of stations	1200m
1	625Kbps	2	6	625Kbps	Automatic number of stations	600m
2	2.5Mbps	2	7	2.5Mbps	Automatic number of	200m

					stations	
3	5Mbps	2	8	5Mbps	Automatic number of stations	150m
4	10Mbps	2	9	10Mbps	Automatic number of stations	100m
V1.0.12 Communication Rate Setting						
DIP No.	Communication Rate	Number of Stations	DIP No.	Communication Rate	Number of Stations	Distance
0	156Kbps	2	5	Auto baud rate	Fixed number of stations: 1	1200m
1	625Kbps	2	6	Auto baud rate	Fixed number of stations: 2	600m
2	2.5Mbps	2	7	Auto baud rate	Fixed number of stations: 3	200m
3	5Mbps	2	8	Auto baud rate	Fixed number of stations: 4	150m
4	10Mbps	2	9	Auto baud rate	Automatic number of stations	100m

Note: Orders placed on June 9, 2025, involving CC-Link with analog modules will use firmware version V1.0.12. Orders involving CC-Link with digital modules will continue to use firmware version V1.0.2 until existing stock is depleted, after which they will be naturally transitioned.

2.Product Overview

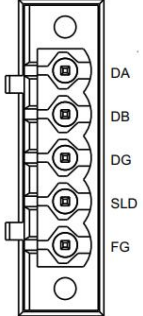
2.1 Hardware Interface Description



- ① CC-Link communication interface
- ② Module status/power indicator
- ③ Communication speed and station number dial; USB firmware upgrade/factory reset button
- ④ IO channel indicator light
- ⑤ IO channel Wiring Diagram
- ⑥ IO channel input/output interface
- ⑦ DC24V Power Connectors
- ⑧ Module mounting buckle
- ⑨ Module information

(protection level/operating temperature range/hardware version/module serial number)

2.1.1 CC-Link Adapter communication interface definition

	1	DA	Communication A wire
	2	DB	Communication B wire
	3	DG	Communication public terminal
	4	SLD	Shielded wire
	5	FG	Chassis grounding

2.1.2 Indicator lights and status description

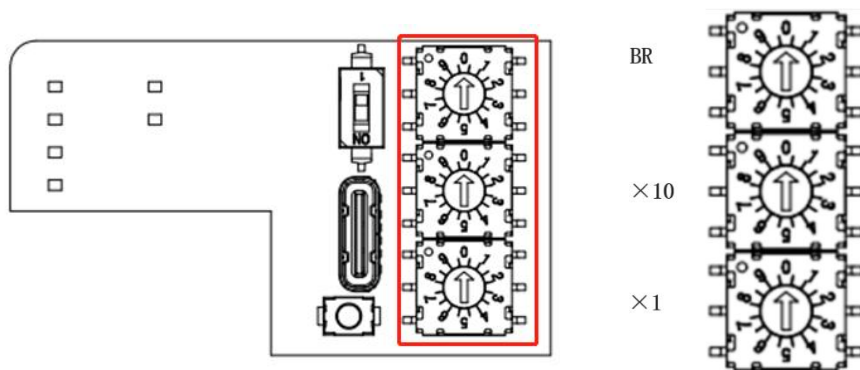
UNIT PWR	SYS
IO-POWER	MT
L_RUN	SD
L_ERR	RD

Indicator	illustrate	Color	State	Meaning
UNIT PWR	System power indicator	green	ON	The system power supply is normal
			OFF	The system power supply is disconnected or faulty.
SYS	System indicator	green	1Hz flash	Communication is normal
			5Hz lash	IO slave lost
IO-POWER	IO power indicator	green	ON	IO power supply is normal
			OFF	IO the power supply is disconnected or faulty.
MT	Maintenance indicator	blue	OFF	No reset operation
			5Hz lash	RST key pressed
			ON	RST key has been pressed more than 5 s, release RST key, RS-CL software reset
L_RUN	Running indicator light	green	ON	Communication is normal, data transmission is normal
			OFF	Communication stops, data transmission stops
SD	Data sending indicator	green	ON	Data sending
			OFF	Data transmission stops or becomes abnormal
L-ERR	System fault	green	ON	CC Link communication error

	indicator		OFF	CC-Link Communication is normal
RD	Data receiving indicator	green	ON	Receiving data
			OFF	Data reception stops or becomes abnormal

2.1.3 Operation Compartment Description

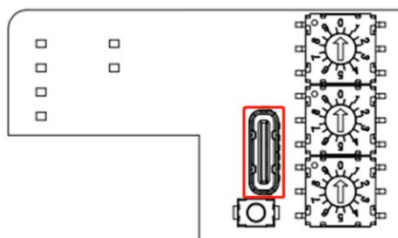
2.1.3.1 IP Address DIP Switch Description



CC-Link communication speed setting						
DIP Switch	Baud Rate	Station Capacity	DIP Switch	Communication Rate	Station Capacity	Transmission Distance
0	156kbps	2	5	Auto Baud Rate	Fixed Station Count: 1	1200m
1	625Kbps	2	6	Auto Baud Rate	Fixed Station Count: 2	600m
2	2.5Mbps	2	7	Auto Baud Rate	Fixed Station Count: 3	200m
3	5Mbps	2	8	Auto Baud Rate	Fixed Station Count: 4	150m
4	10Mbps	2	9	Auto Baud Rate	Automatic Station	100m

The station number and baud rate must match the settings in **Network Parameters** →

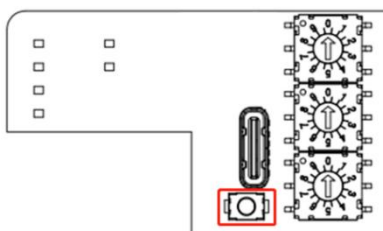
2.1.3.2 USB illustrate



TYPE-C port, mainly used to view device information and firmware upgrade.

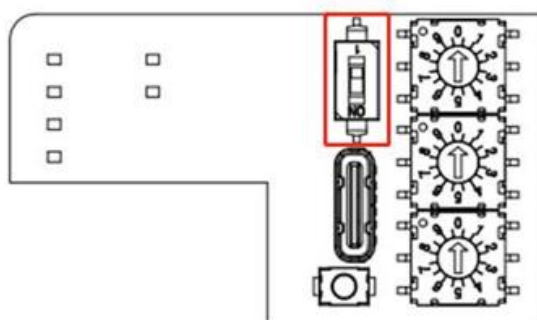
Note: Do not use USB port for other purposes to avoid USB damaged.

2.1.3.3 Reset Button Description



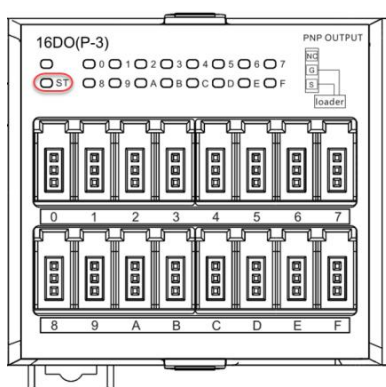
Press and hold the reset button for more than 5 seconds, and the module will automatically restore factory settings (I/O configuration will revert to default values). After pressing the reset button, the MT maintenance indicator will blink at 1Hz. Once the reset is complete, the MT indicator will remain steadily lit.

2.1.3.4 Hardware DIP Switch Description



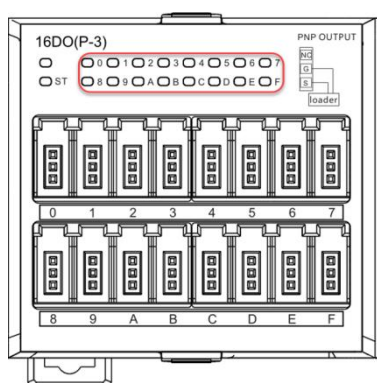
DIP Switch Position	Description	Remarks
Set to "1"	With diagnostics	Diagnostics occupy RX, first 2 bytes
Set to "ON"	Without diagnostics	No RX bytes occupied

2.1.4 IO Module Indicator Light Description



IO module status indicator

Indicator Lights	Color	State	Illustrate
ST indicator Lights	green	OFF	IO module is abnormal or not powered on.
		ON	The system recognizes IO Modules
		Flash	The system does not recognize the IO module



IO channel status indicator

Indicator Lights	color	state	illustrate
DI Channel indicator light	green	OFF	Channel input has no signal or is abnormal
		ON	Channel input signal is normal
DO Channel indicator light	green	OFF	The channel does not output or is abnormal
		ON	Channel output status is normal

2.2 Module combination

When configuring the slot module type for the RS series CC-Link, the same model number can correspond to multiple different actual module models. For specific model numbers, please refer to the following table.

2.2.1 CC-Link CL2-S1/CL2-S2 combination

Base Model	Configuration module model	Actual matching module models
CL2-S1/CL2-S2	8DI8DO	8DI8DO(P-1)

		8DI8DO(N-1)
		8DI8DO(P-2)
		8DI8DO(N-2)
		8DI8DO(P-3)
		8DI8DO(N-3)
	16DI	16DI(P-1)
		16DI(N-1)
		16DI(P-2)
		16DI(N-2)
		16DI(P-3)
		16DI(N-3)
	16DIO	16DIO(N-2)
	8DO	8DO(R-1)
	8AI	8AI(I5-1)
		8AI(I5-2)
		8AI(I5-3)
	4AI	4AI(C3-1)
		4AI(C3-2)
		4AI(C3-3)
	4AI2AO	4AI2AO(I5-2)
	16DO	16DO(P-1)
		16DO(N-1)
		16DO(P-2)
		16DO(N-2)
		16DO(P-3)
		16DO(N-3)

	4AO	4AO(C3-1)
		4AO(C3-2)
		4AO(C3-3)

Note: (Each CI2-S1 can only be paired with one module type, while each CL2-S2 can be paired with up to two module types.)

3. Technical Parameters

3.1 CC-Link Base technical parameters

Communication technical parameters	
Bus protocol	CC Link
Baud rate	156kbps, 625 kbps, 2.5Mbps, 5Mbps, 10Mbps
Station number setting range	1~63
Power supply technical parameters	
System power input	24VDC (±25%)
System power supply provides current	50mA
IO Power Input	24VDC (±25%)
IO Power supply current	10A
Overcurrent protection	Supported
Overvoltage protection	none
Reverse polarity protection	Supported
Electrical isolation on the system side	Supported
Environmental technical parameters	
Operating temperature	-20℃~55℃
Working environment humidity	10%~95% non-condensing
Working environment height	<2000m
Use ambient air	No corrosion
EMC level	CLASS A
General physical parameters	
Protection level	IP40

3.2 Digital Panel Technical Specifications

DI Input technical parameters	
Rated input voltage	NPN: 0~5V
	PNP: 15~30V
ON/OFF response time	11us
Input filter time	0-10ms, default 3ms
Insulation method	Optocoupler Isolation
Current consumption per channel	15V 2.8mA; 24V 5mA; 30V 5.7mA
DO output technical parameters	
Rated output voltage	NPN: 0V
	PNP: 24V
Maximum load current	0.5A (continuous 8-channel maximum total load current 2A)
ON/OFF response time	20us (PNP) and 11us (NPN)
Insulation method	Optocoupler Isolation
Relay output technical parameters	
Rated voltage	AC250V/DC30V
Rated current	AC250V 5A/DC30V 5A
ON/OFF response time	≤15ms
Contact Type	Normally open contact
Relay electrical life	1x10 ⁵ times (AgNi, 3A AC250V/DC30V, resistive load, 85℃, 1s on, 9s off) 5x10 ⁴ times (AgNi, 5A AC250V/DC30V, resistive load, room temperature, 1s on, 9s off)
Relay mechanical life	2×10 ⁷ times
IO module electrical technical parameters	
Port protection	none
Environmental technical parameters	
Operating temperature	-10℃~55℃
Relative humidity of working environment	10%~95% non-condensing
Working environment altitude	<2000m
Storage temperature	-20℃~55℃
EMC level	Area A
General physical parameters	
Protection level	IP40

3.3 Analog Module Panel Technical Specifications

8AI Input Technical Specifications	
Number of channels	8

Input Impedance	<150 Ω		
Signal Type	0~20mA\4~20mA (default)		
Resolution	16 bit		
Accuracy	0.10%		
Converted Digital Range	0-27648	0-30000	0-32767
Input filter time	Configurable: 0~3 levels (default 1)		
4AI Input Technical Specifications			
Number of channels	4		
Signal Type	0~5V/±5V/0~10V/±10V 0~20mA/4~20mA (default)		
Input Impedance	Voltage Type: 1 MΩ / Current Type: <150 Ω		
Resolution	16 bit		
Accuracy	0.10%		
Converted Digital Range	-27648~27648 0~27648 -15000~15000 0~30000 -32767~32767 0~32767		
Input filter time	Configurable: 0~3 levels (default 1)		
4AO Output Technical Specifications			
Number of channels	4		
Signal Type	0~5V/±5V/0~10V/±10V 0~20mA/4~20mA (default)		
Input Impedance	Voltage Type: >1 kΩ / Current Type: <500 Ω		
Resolution	16 bit		
Accuracy	0.10%		
Converted Digital Range	-27648~27648 0~27648 -15000~15000 0~30000 -32767~32767 0~32767		
Input filter time	Configurable: 0~3 levels (default 1)		
4AI2AO (I5-2) Input/Output Technical Specifications			
Number of channels	6		
Terminal Type	3-in-1 European Terminal		
Signal Type	0~20mA\4~20mA (default)		
Input Impedance	<150 Ω		
Output Load	<500 Ω		
Resolution	16 bit		
Accuracy	0.10%		
Converted Digital Range	0-27648	0-30000	0-32767
Input filter time	Configurable: 0~3 levels (default 1)		
IO Module Electrical Technical Specifications			
Port Protection	/		
Environmental technical parameters			
Operating temperature	-20℃~55℃		
Operating Environment Relative	10% - 95%, non-condensing		

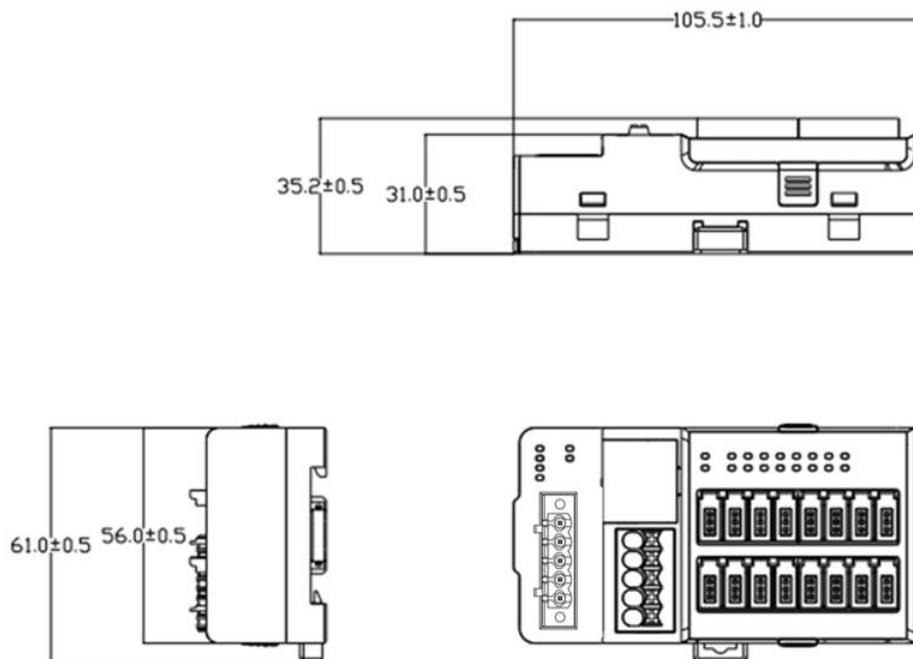
Humidity	
Working environment altitude	<2000m
Storage temperature	-40℃~85℃
EMC level	CLASS A
General Physical Specifications	
Protection Rating	IP20

4. Mechanical Installation

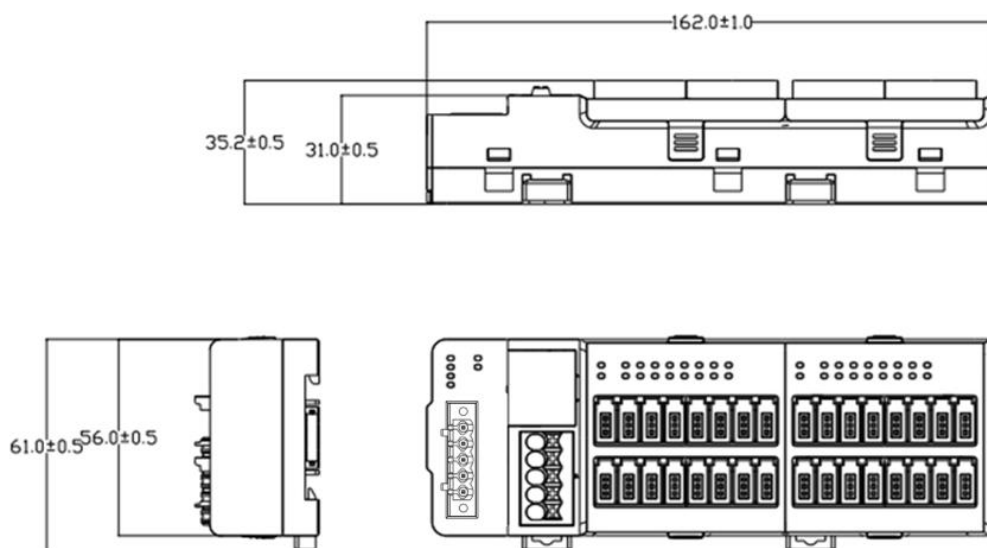
4.1 Module Dimensions

The dimensions in the following figures are all in mm.

4.1.1 CL2-S1 Module Dimensions

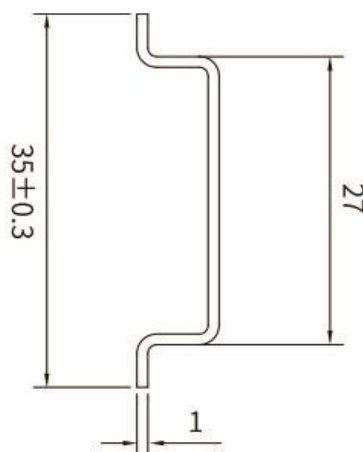


4.1.2 CL2-S2 Module Dimensions



4.2 Module Installation

RS series modules have three installation methods: horizontal rail installation, vertical rail installation, and screw installation (the diameter of the screw installation hole is $\phi 4.5$). The module is mounted on a DIN rail, which must comply with the IEC 60715 standard (35 mm width, 1 mm thickness). The dimensional details are shown in the figure below.



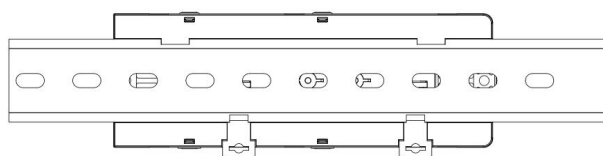
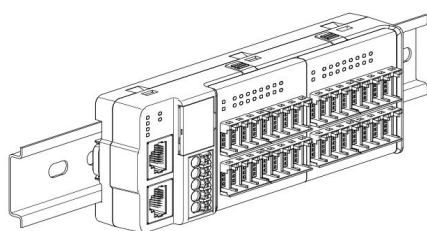
Note: If the module is installed on a DIN rail other than the recommended DIN 35 type, the rail locking clip may not lock properly. Before installing the module, open the locking lever at the top of the module, then proceed with the installation.



- When this product is installed on a DIN rail other than the recommended type (especially when the DIN rail thickness is >1.0 mm), the rail locking clip may fail, preventing proper installation and resulting in malfunction. It is recommended to use a DIN rail with a thickness of <1 mm.

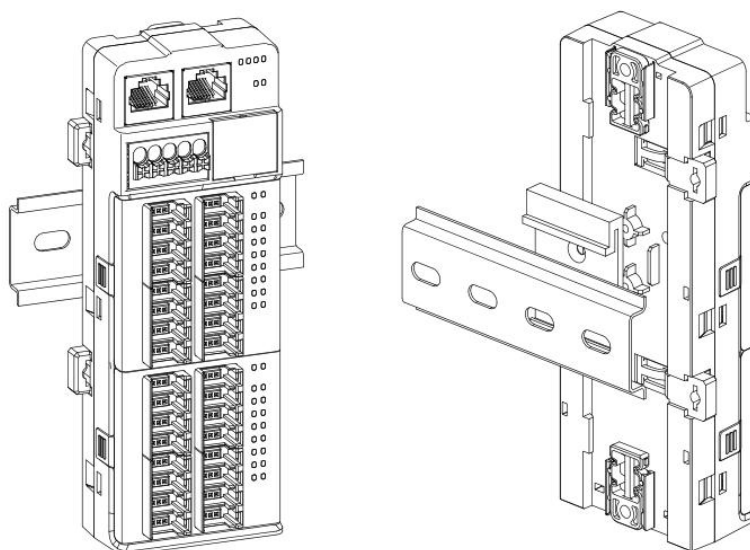
4.2.1 Horizontal rail installation

After fixing the module on the guide rail, push the two clips inwards.



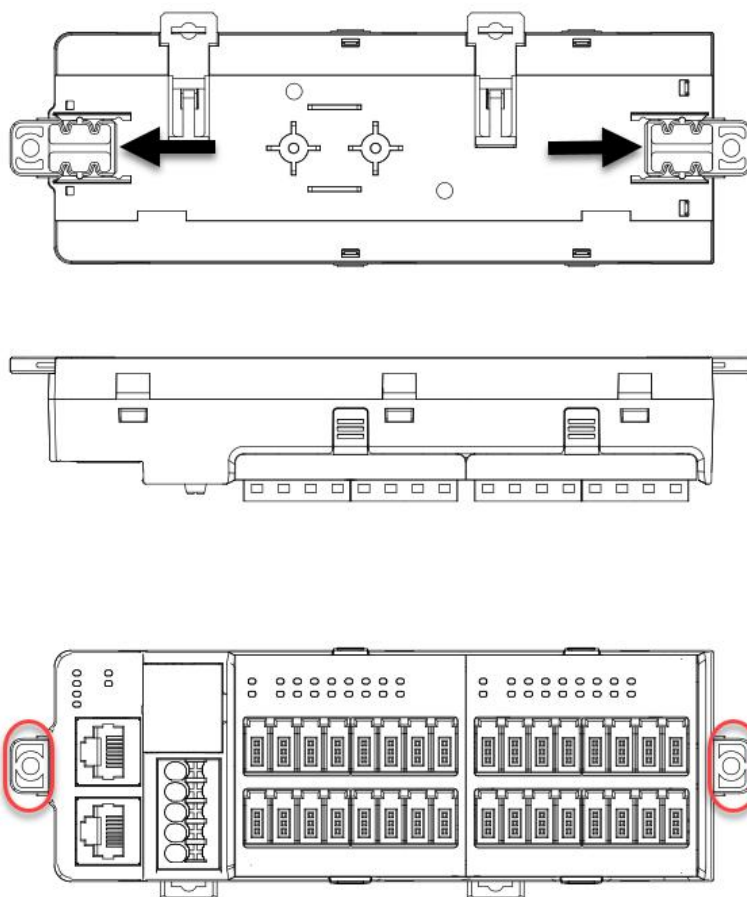
4.2.2 Vertical rail installation

The matching backplane must first be fixed to the module as shown in the diagram. Once it is firmly fixed, it can be installed on the guide rail as shown in the diagram.



4.2.3 Screw-on installation

You need to push out the two fixing buckles on the left and right sides of the bottom, and then fix them with screws.

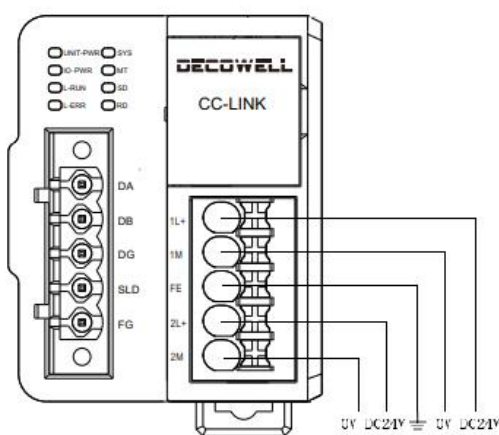


5. Electrical Installation

5.1 Base wiring diagram

5.1.1 Wiring diagram of Ethernet port base

The base needs to be connected to two sets of DC24V, 1L+/1MFor system power, 2L+/2MFor IO power supply, it is recommended to introduce two sets from the same power adapter**DC24V**Plug the wire into the base.

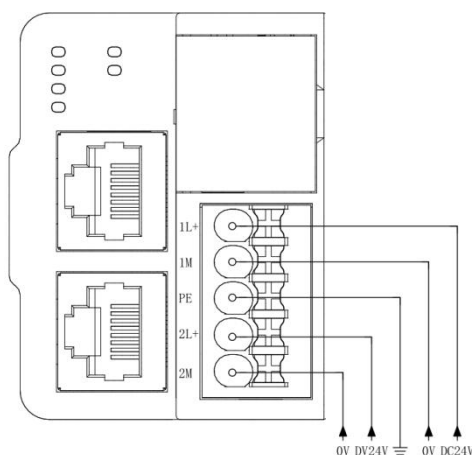


5. Electrical Installation

5.1 Base wiring diagram

5.1.1 Wiring diagram of Ethernet port base

The base needs to be connected to two sets of DC24V, 1L+/1M For system power, 2L+/2M For IO power supply, it is recommended to introduce two sets from the same power adapter **DC24V Plug the wire into the base.**

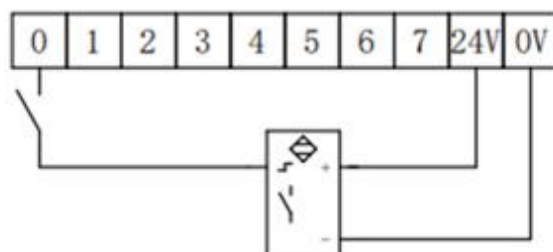
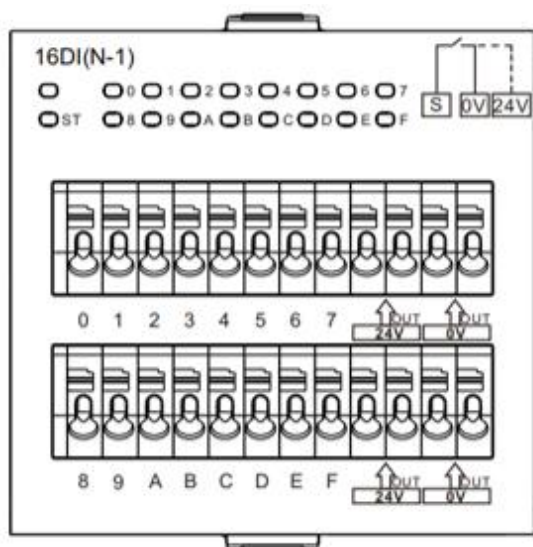


5.2 IO module wiring diagram

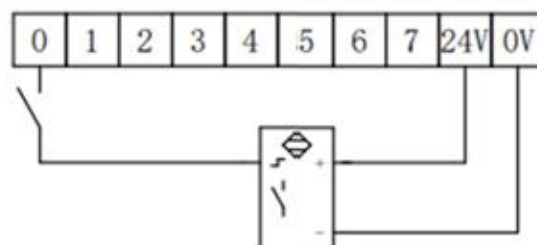
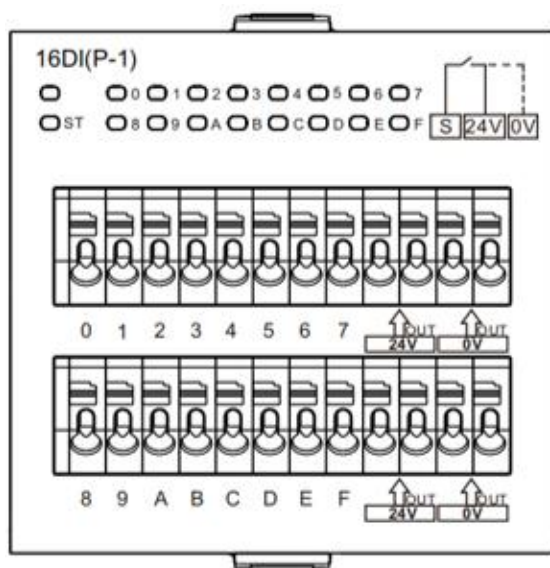
The IO module wiring diagram introduces the wiring methods of various IO modules. 4V or 0V It can power sensors or loads. IO modules can be divided into single-row European terminals, three-in-one terminals, E-CON connectors, relay modules.

IO module terminal type	Wire diameter	Remark
Single row European terminal	0.2-1.0mm ²	The length of the cold-pressed terminal should be 10mm Above
Trinity Terminal	0.2-0.75mm ²	
E-CON Connectors	0.13-0.50mm ²	

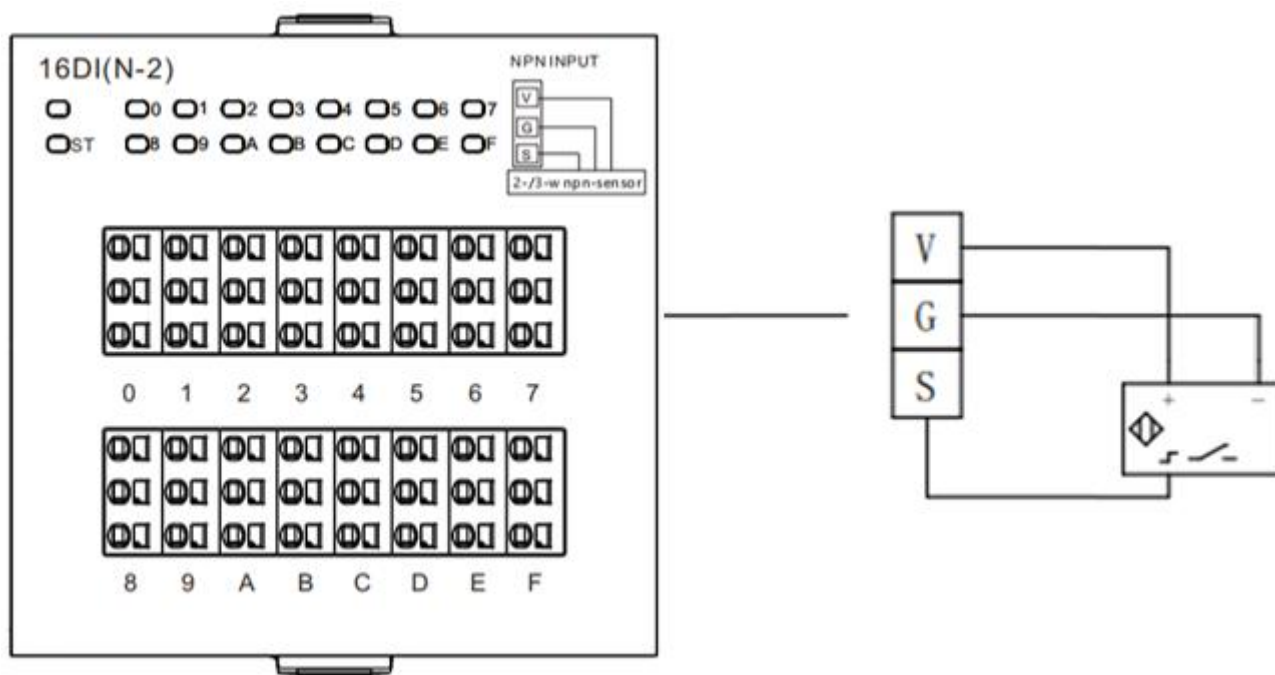
5.2.1 16DI Wiring Diagram



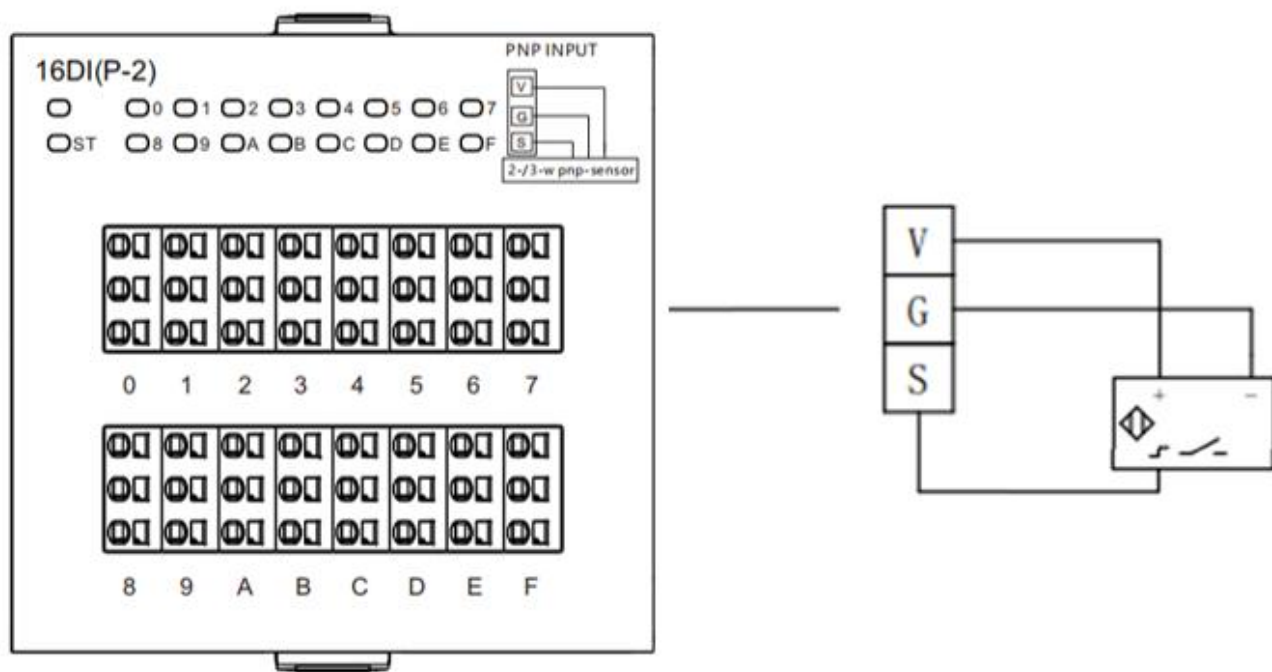
16DI(N-1)



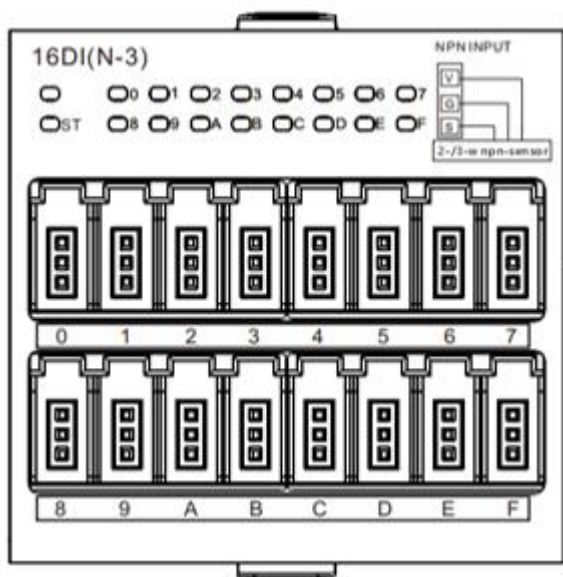
16DI(P-1)



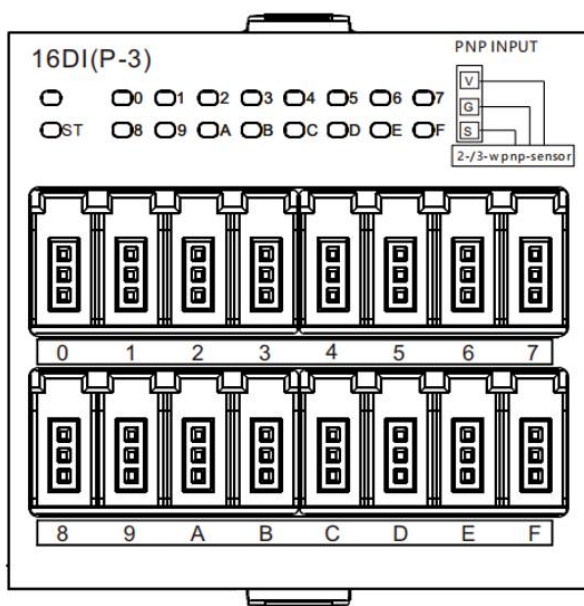
16DI(N-2)



16DI(P-2)

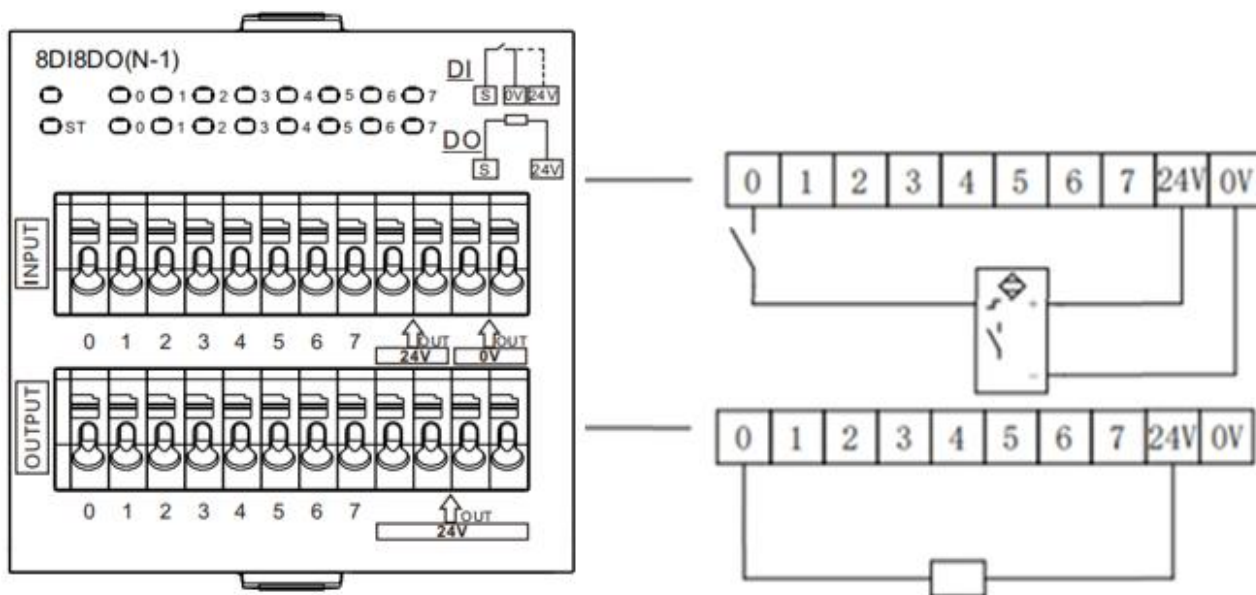


16DI(N-3)

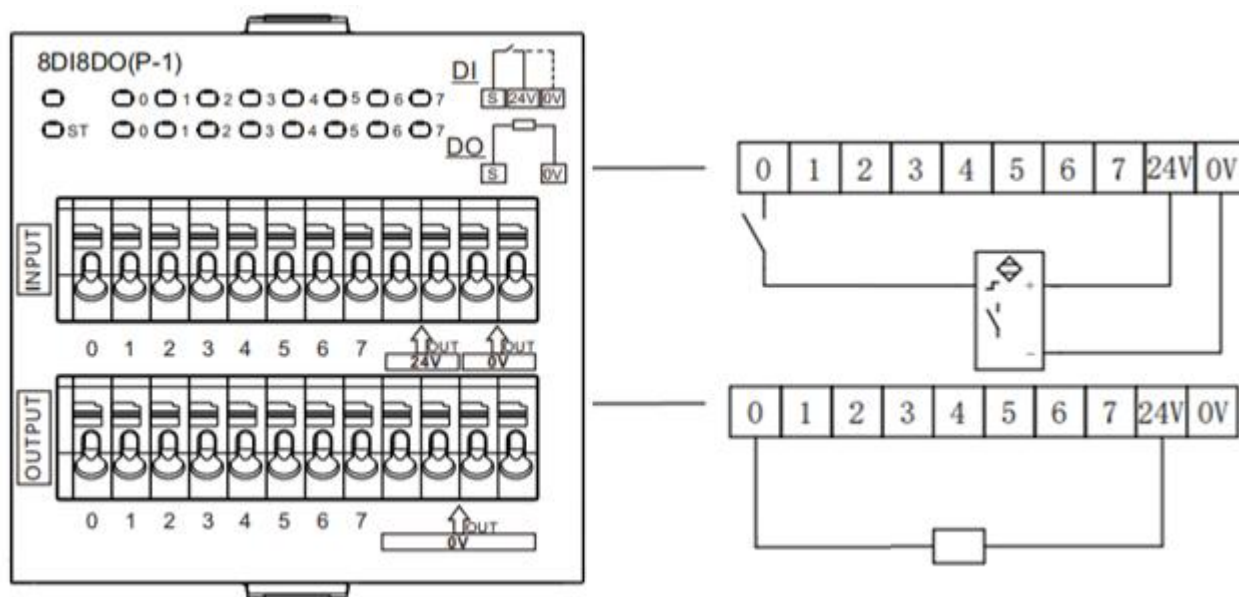


16DI(P-3)

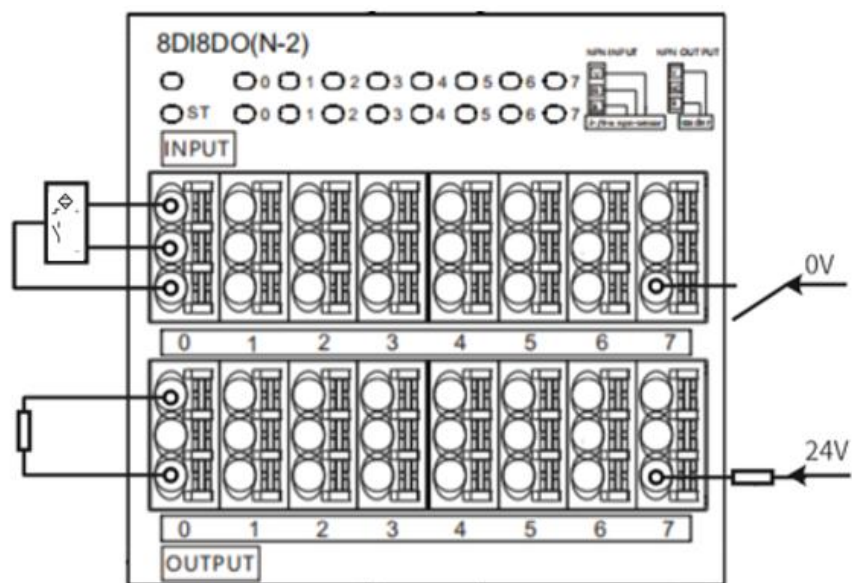
5.2.2 8DI8DO Wiring Diagram



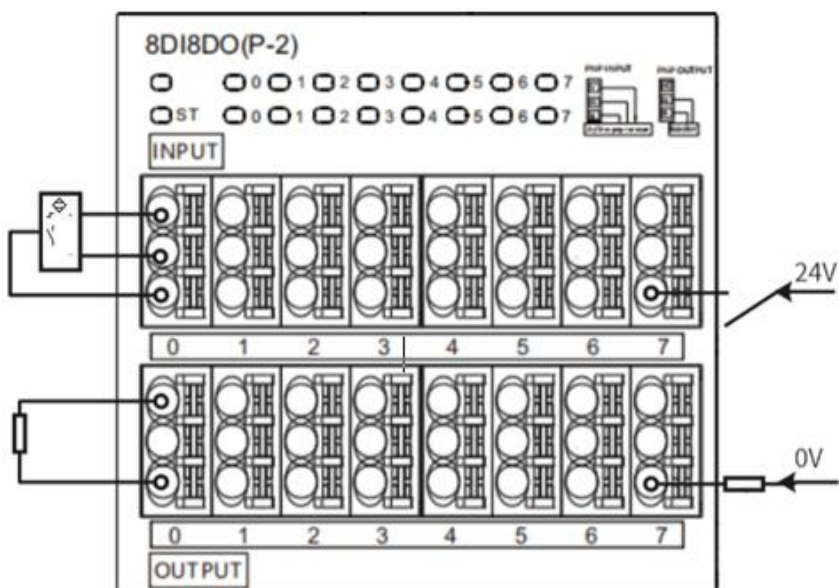
8DI8DO(N-1)



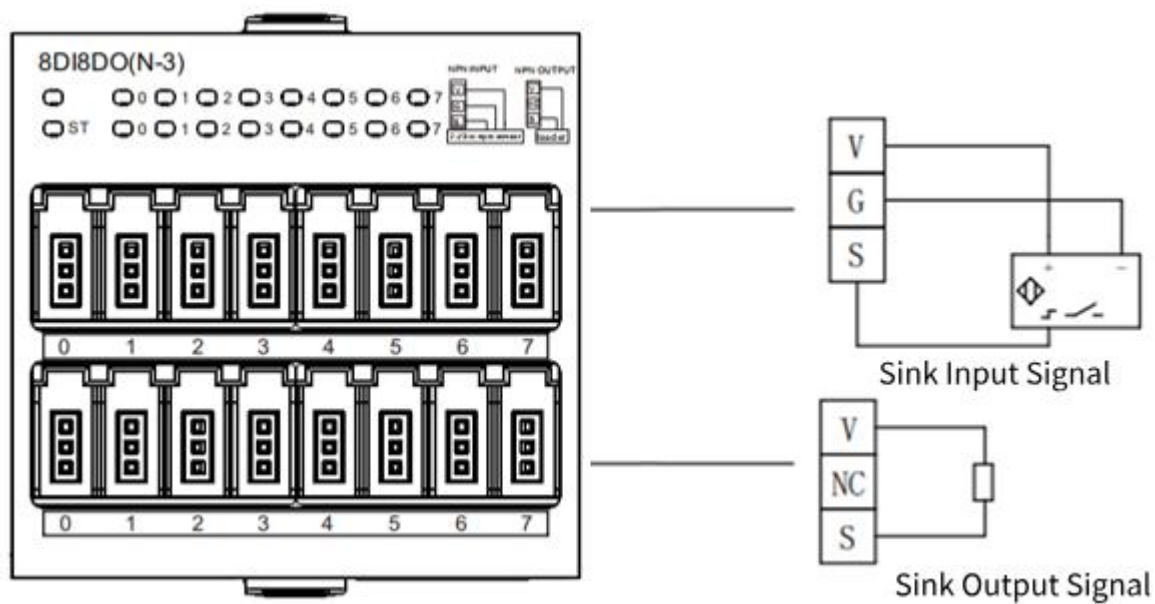
8DI8DO(P-1)



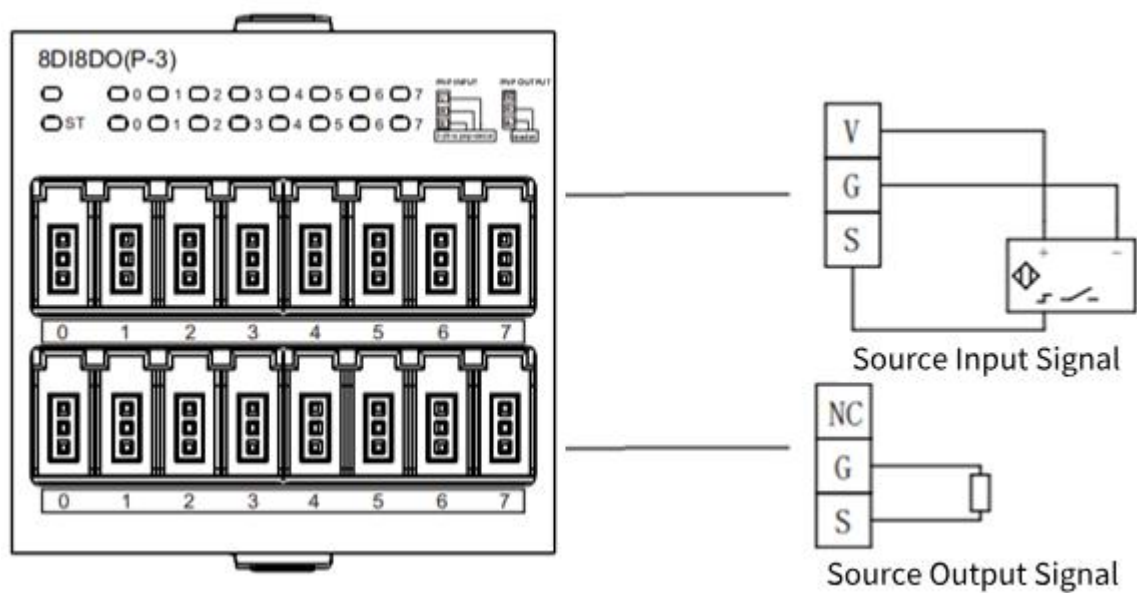
8DI8DO(N-2)



8DI8DO(P-2)

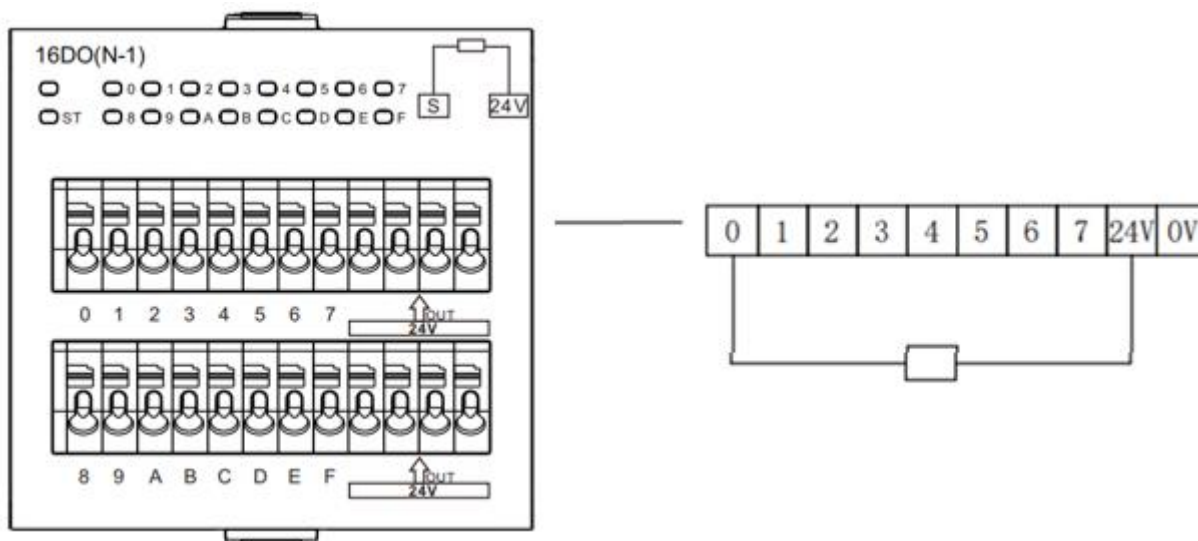


8DI8DO(N-3)

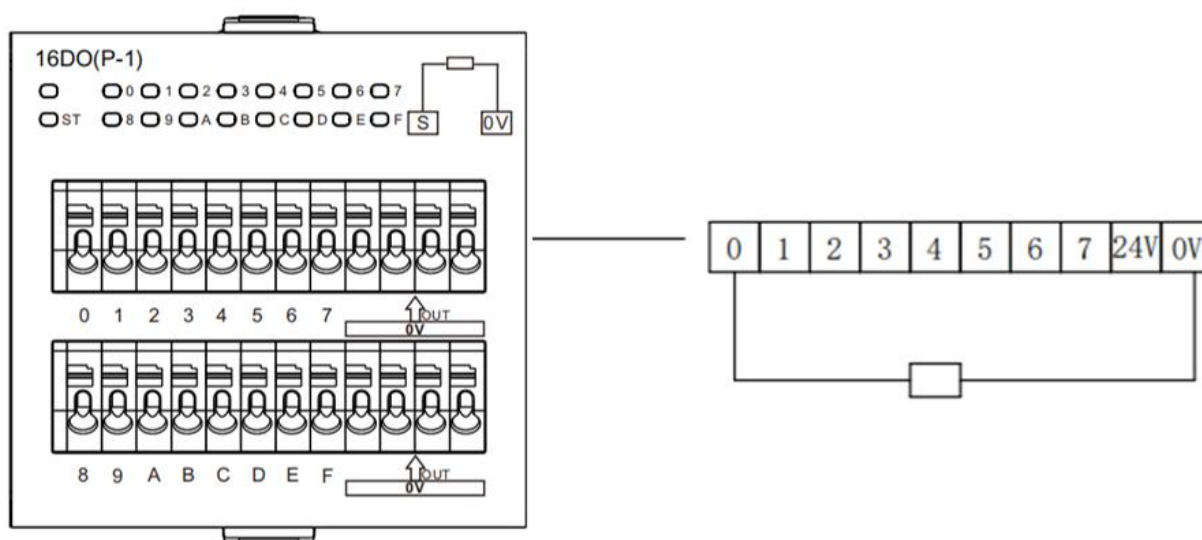


8DI8DO(P-3)

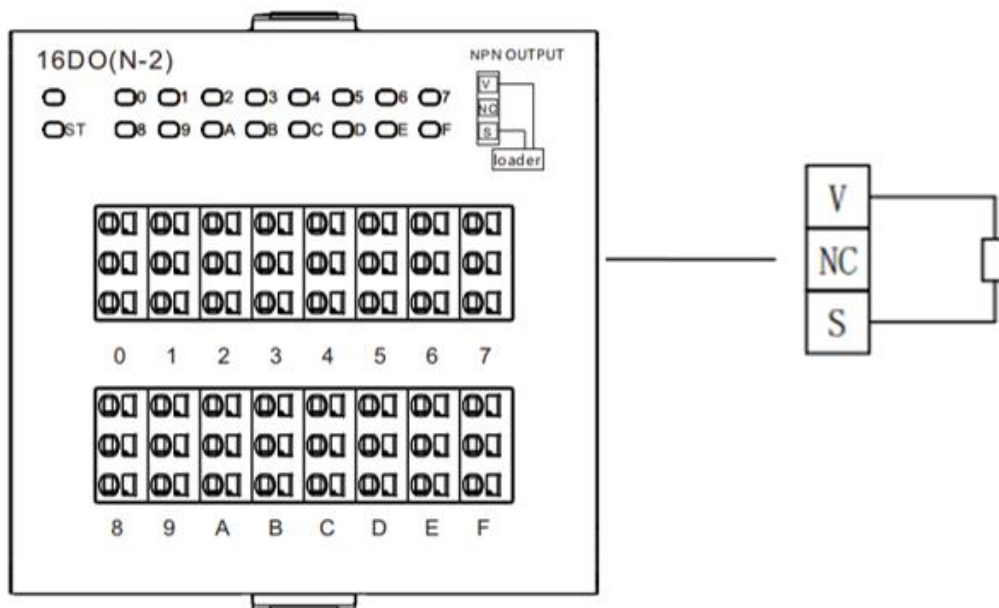
5.2.3 16DO Wiring Diagram



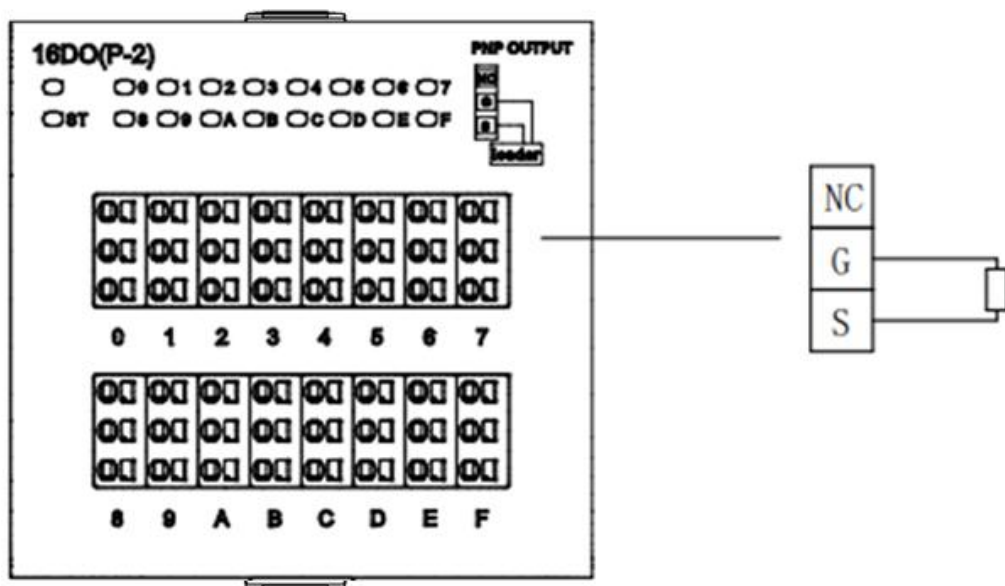
16DO(N-1)



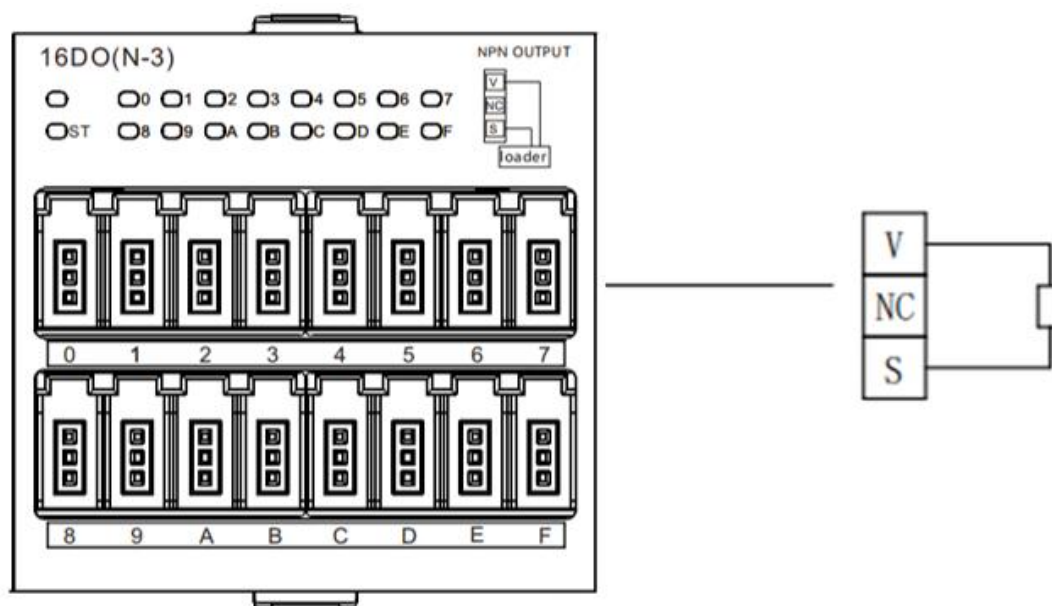
16DO(P-1)



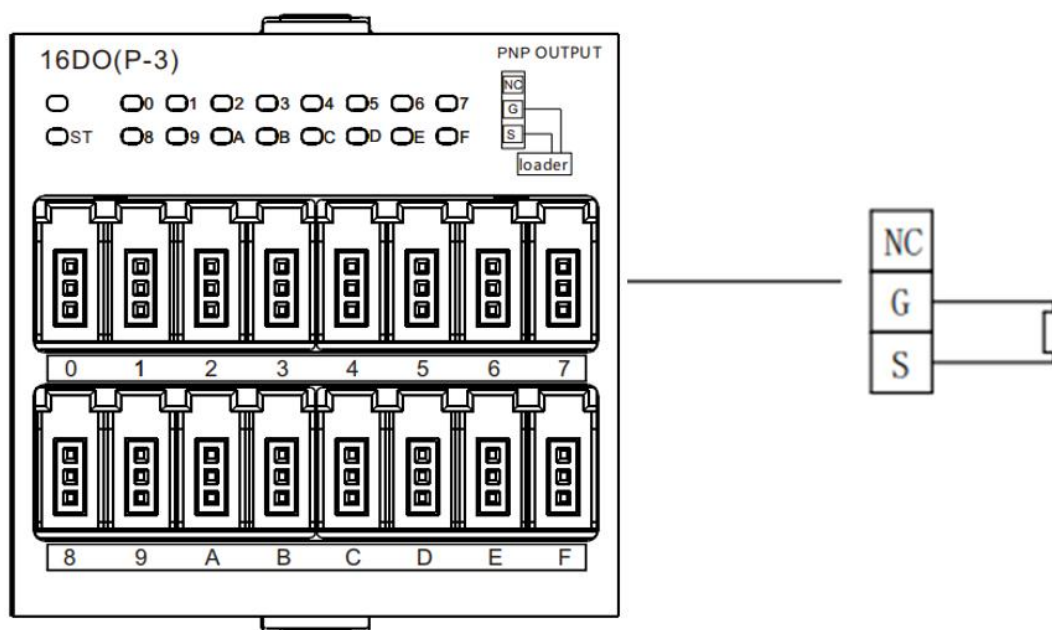
16DO(N-2)



16DO(P-2)

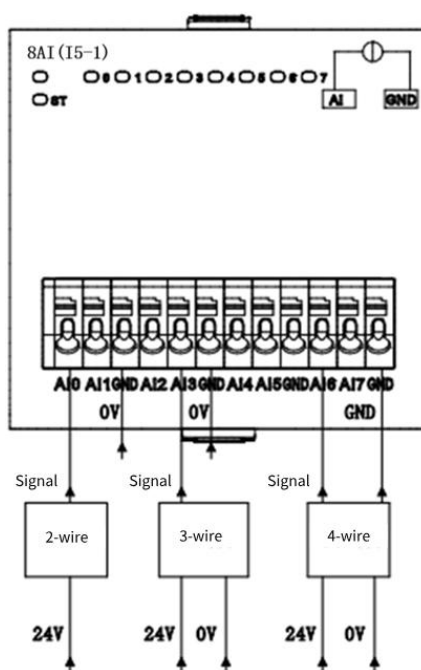


16DO(N-3)

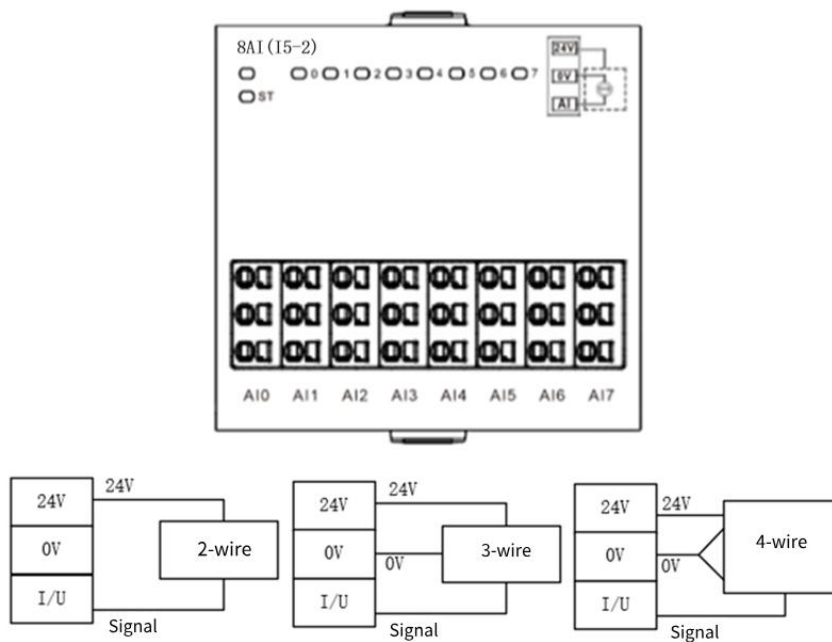


16DO(P-3)

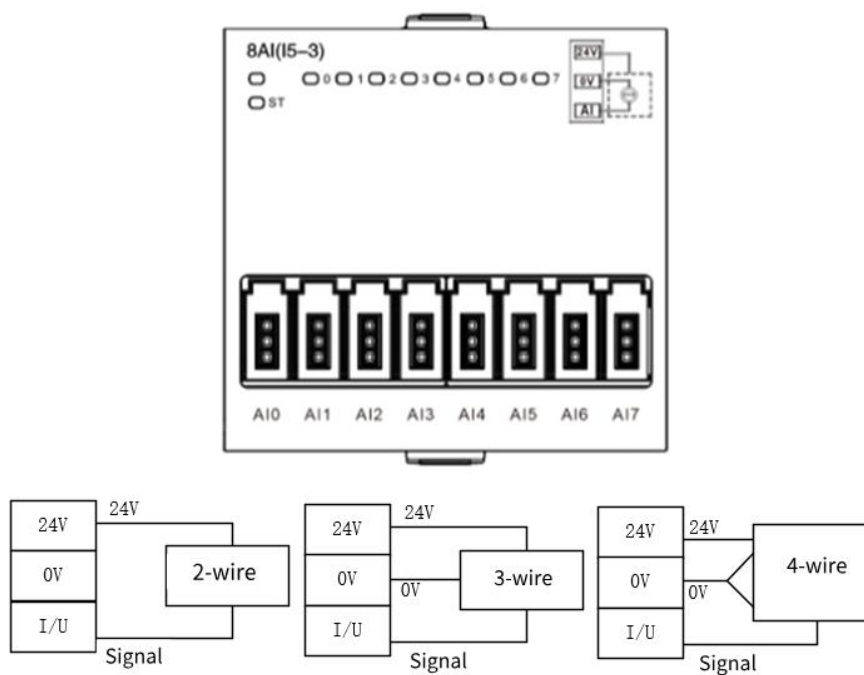
5.2.4 8AI Wiring Diagram



8AI(I5-1)

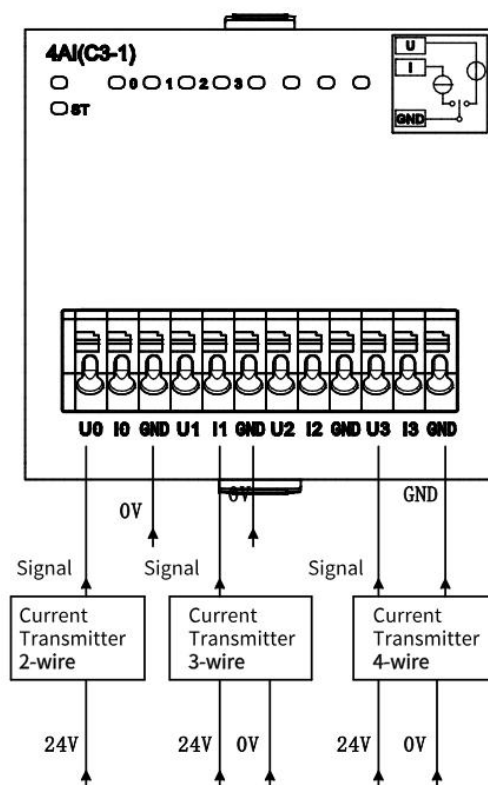


8AI(I5-2)

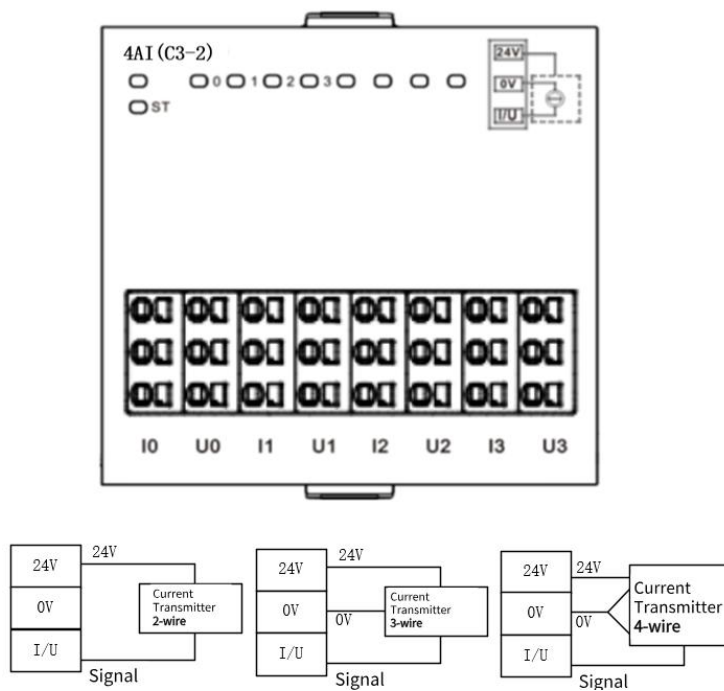


8AI(I5-3)

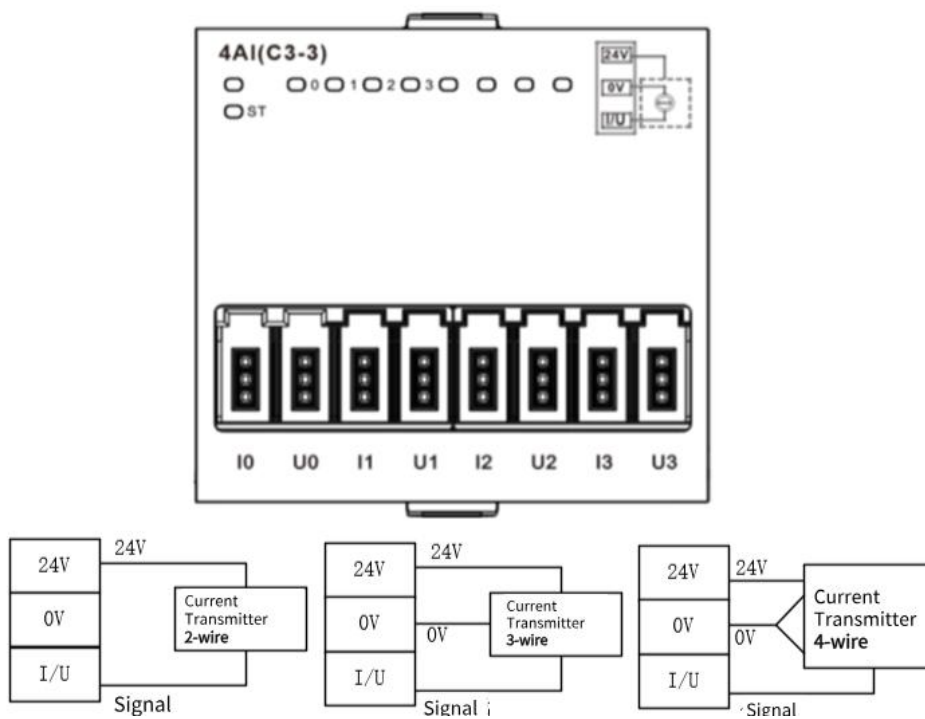
5.2.5 4AI Wiring Diagram



4AI(C3-1)

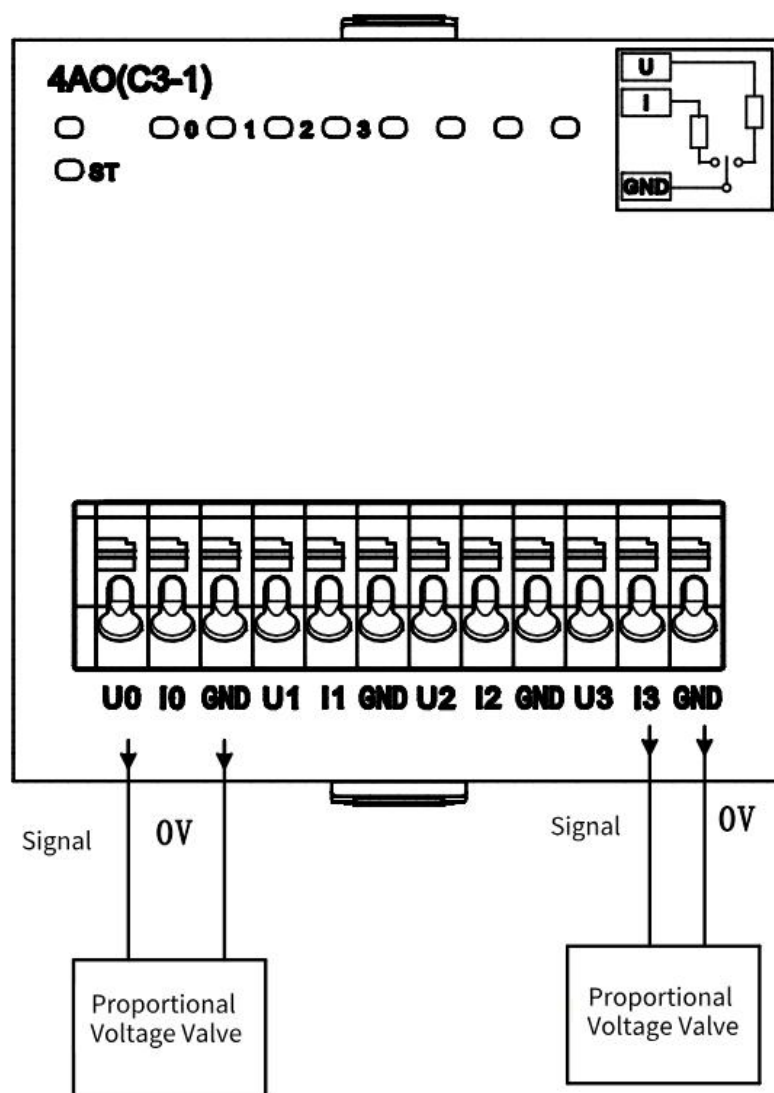


4AI(C3-2)

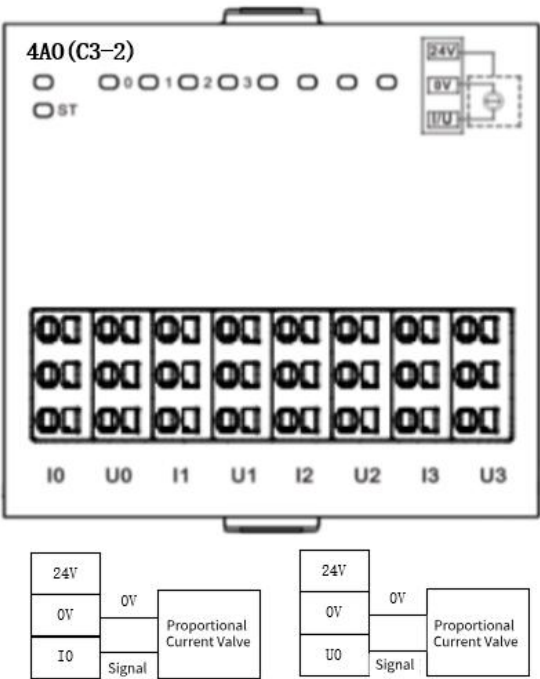


4AI(C3-3)

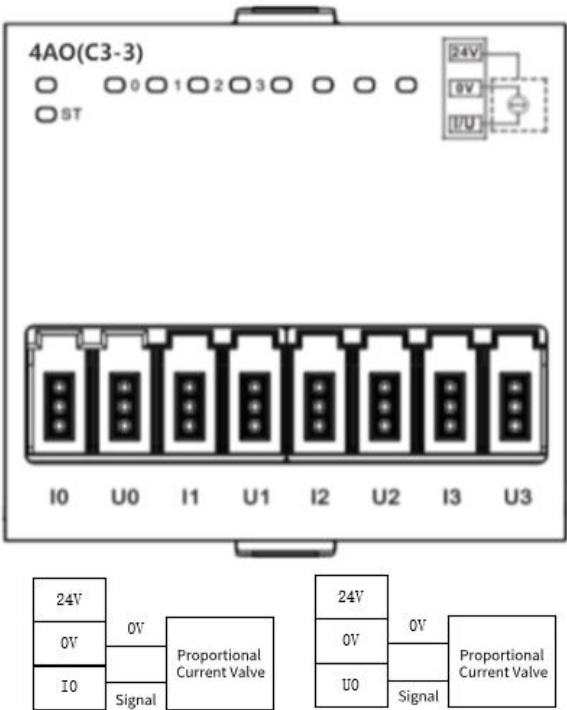
5.2.6 4AO Wiring Diagram



4AO(C3-1)

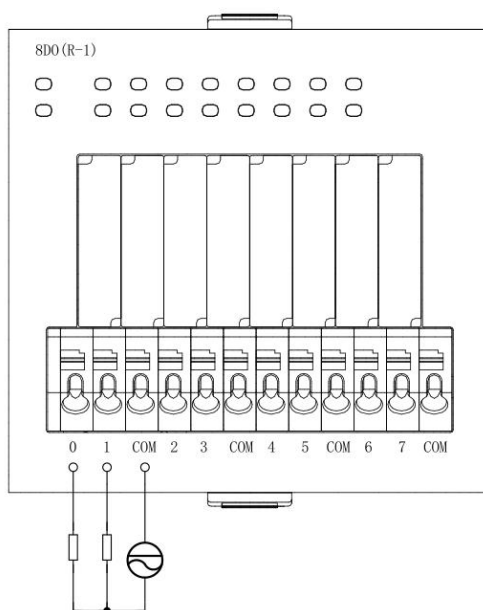


4AO(C3-2)



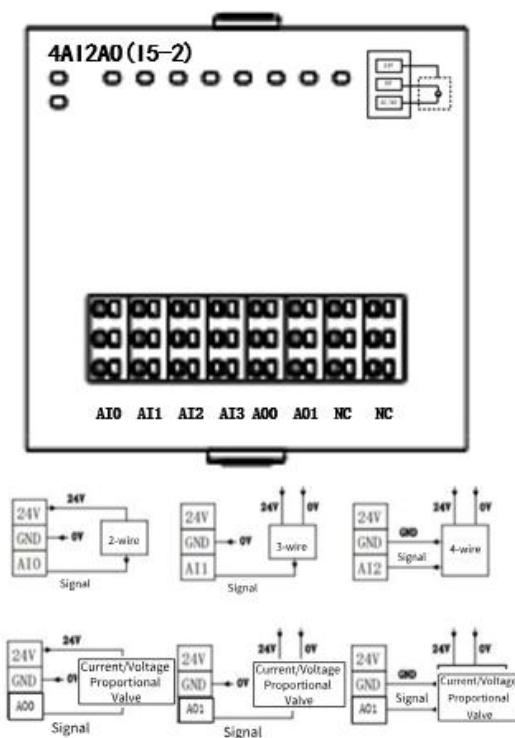
4AO(C3-3)

5.2.7 8DO Wiring Diagram



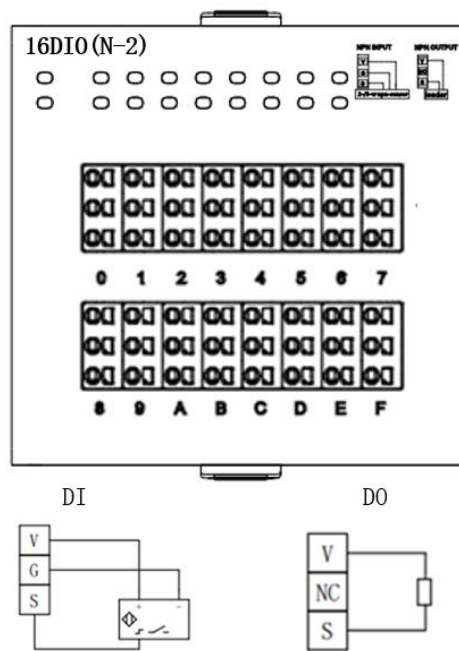
8DO(R-1)

5.2.8 4AI2AO Wiring Diagram



4AI2AO(I5-2)

5.2.9 16DIO Wiring Diagram



16DIO(N-2)

6. Grounding Cable and Field Wiring Instructions

6.1 Introduction

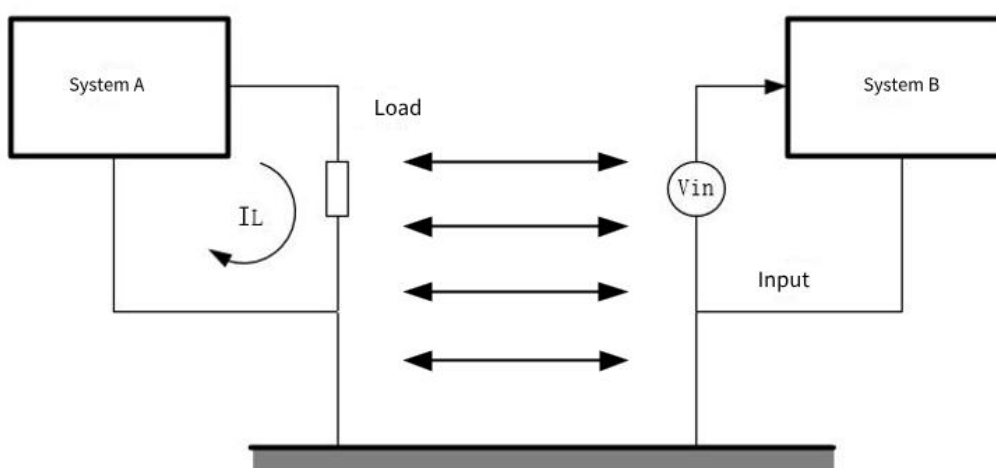
The primary purpose of standardized wiring and shielding in industrial environments is to ensure personnel safety, followed by maintaining system operational stability, and preserving electromagnetic compatibility (EMC) of equipment to ensure reliable system performance and data integrity in industrial control applications.

6.2 Core Suppression Mechanisms of Grounding Systems Against Electromagnetic Interference (EMI)

① Common Impedance Coupling:

When multiple devices share the same grounding path, the impedance of the ground line may cause variations in current, generating potential differences that interfere with sensitive circuits.

Mitigation: Adopt a star-point single grounding approach: all module PE terminals should be connected to a unified grounding copper bar in the control cabinet. The copper bar must establish a low-impedance connection with the cabinet's metal frame (paint must be removed at the contact surface).



② Capacitive Coupling:

Occurs due to electric field interference between parallel cables.

Mitigation: Use shielded twisted pair (STP) cables with single-ended grounding.

③ Inductive Coupling:

A changing current flowing through a cable generates surrounding magnetic and electric fields. Sensitive circuits within these fields may induce unwanted voltages or currents, affecting circuit performance.

Mitigation: Maintain a minimum spacing of ≥ 30 cm between power (high-voltage/current) and signal (low-level) cables. If crossing is required, maintain a 90° angle.

6.3 EMC Optimized Cabling Specifications

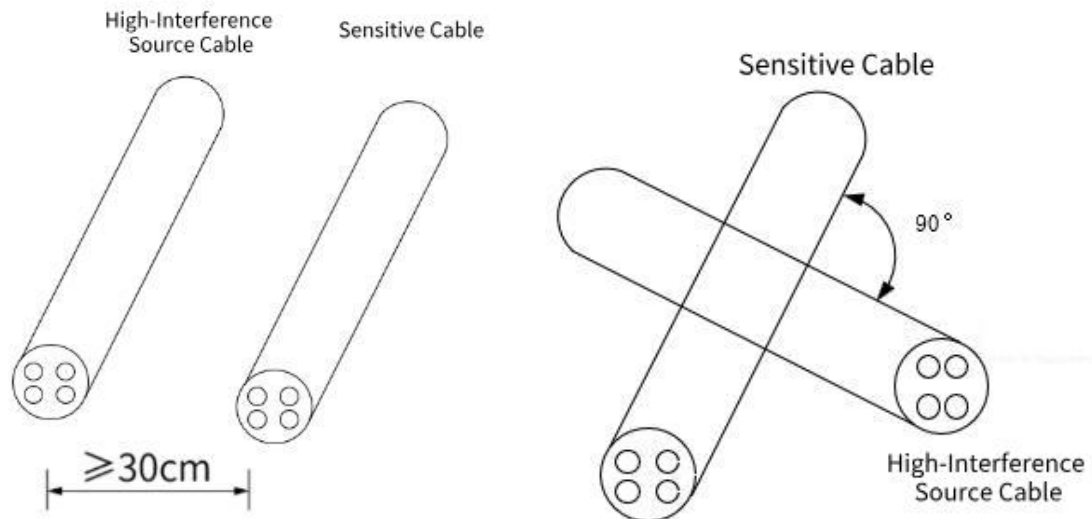
Cable routing requirements

Cable Type	Installation Requirements	Example Cables
Power cable	Routed in a separate metal duct (distance > 20 cm from signal ducts)	(distance > 20 cm from signal ducts) VFD output cables, brake resistor cables
Analog IO cable	Routed in a shielded duct with partitions; twisted pair pitch ≤ 5 cm	AI 4-20mA, CC-Link bus
Digital I/O cable	Grouped and bundled in a non-shielded duct	DI sensor, DO control cable

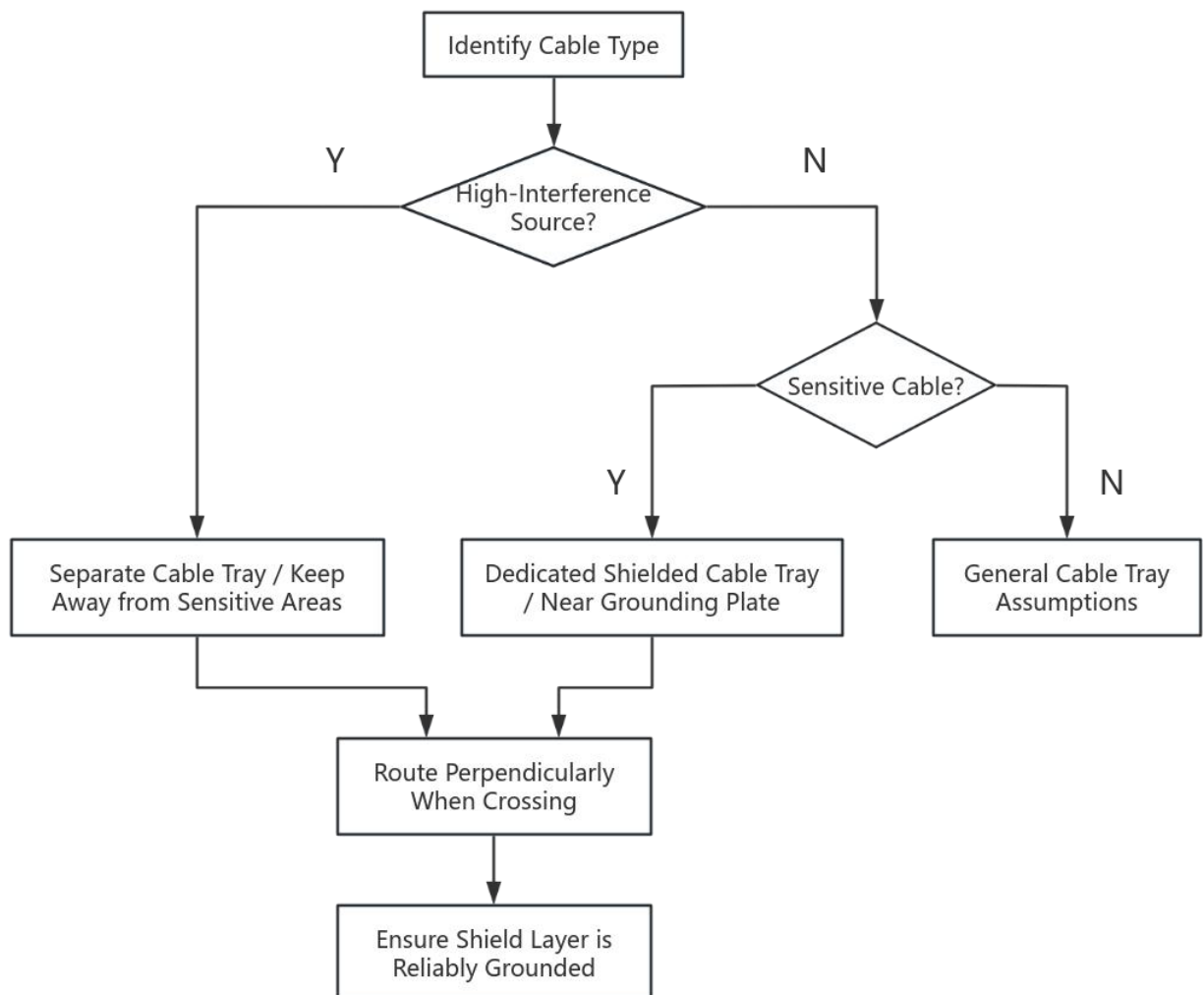
Wiring Recommendation:

To prevent communication interruptions or signal distortion caused by high-interference sources, maintain a minimum spacing of ≥ 30 cm or use shielded cables with both ends grounded. Sensitive cables (such as sensor or communication lines) must be strictly separated from high-interference cables (such as VFD or power lines) and must not be routed in parallel.

If the required spacing cannot be maintained, sensitive cables should be shielded with both ends grounded and installed to cross high-interference cables at a 90° angle.



For wiring, please refer to the following process:



Key Points

Cable Length: It is recommended to keep cable lengths as short as possible to minimize the risk of common-mode interference caused by coupling through the grounding path.

Spare Conductors: In multi-core cables, any spare conductors must be shorted to the PE bus. Leaving spare conductors floating is strictly prohibited.

Duct Connections: Conductive gaskets should be used at duct joints to ensure electromagnetic continuity. Shielded cables can effectively reduce interference from magnetic fields, electric fields, or electromagnetic fields by transferring interference currents from the shield to ground.

Shielded Cable Grounding: Shielded cables shorter than 1 meter should have their shield connected to the nearest PE terminal. Over-stripped cores can easily pick up interference. For modules without dedicated PE terminals, the shield may be connected to an external PE terminal.

Note on Safety Voltage Circuits (SELV / PELV)

According to international standards (IEC 61140), two types of safety extra-low voltage circuits are defined:

SELV (Safety Extra-Low Voltage Circuits): Safety is achieved through protective isolation, not relying on grounding.

PELV (Protective Extra-Low Voltage Circuits): Safety is achieved through grounding protection + voltage limitation, and relies on proper grounding.

Industrial control PLCs are categorized according to their power circuits: most PLC control circuits are SELV, while certain grounded power circuits may fall under PELV. Currently, all PLC and I/O products of our company belong to SELV.

Functional Grounding (FE) vs Protective Grounding (PE)

For SELV circuits, grounding is performed as functional grounding (FE) to meet equipment or system operational requirements. It establishes a stable reference potential to ensure proper device operation, accurate signal transmission, and suppression of electromagnetic interference. FE is not intended for personnel safety, but to maintain equipment performance (e.g., prevent signal drift, reduce noise, ensure correct logic operation).

PE grounding ensures personnel safety by connecting exposed conductive parts (such as metal enclosures or frames) to earth. In case of leakage (e.g., live wire contacting the enclosure), the leakage current is quickly diverted to ground, preventing electric shock. PE is mandatory under safety regulations, with strict impedance requirements (typically $\leq 4 \Omega$), and is directly related to shock protection.

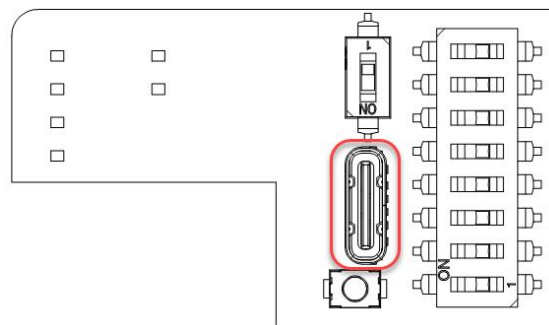
7.1 Reset and Upgrade Functions

7.1.1 Reset Function

The module can be restored to factory settings using the reset button. For details, refer to “Reset Button Instructions.”

7.1.2 Upgrade Function

Connect the computer to the Type-C port in the base operation compartment.



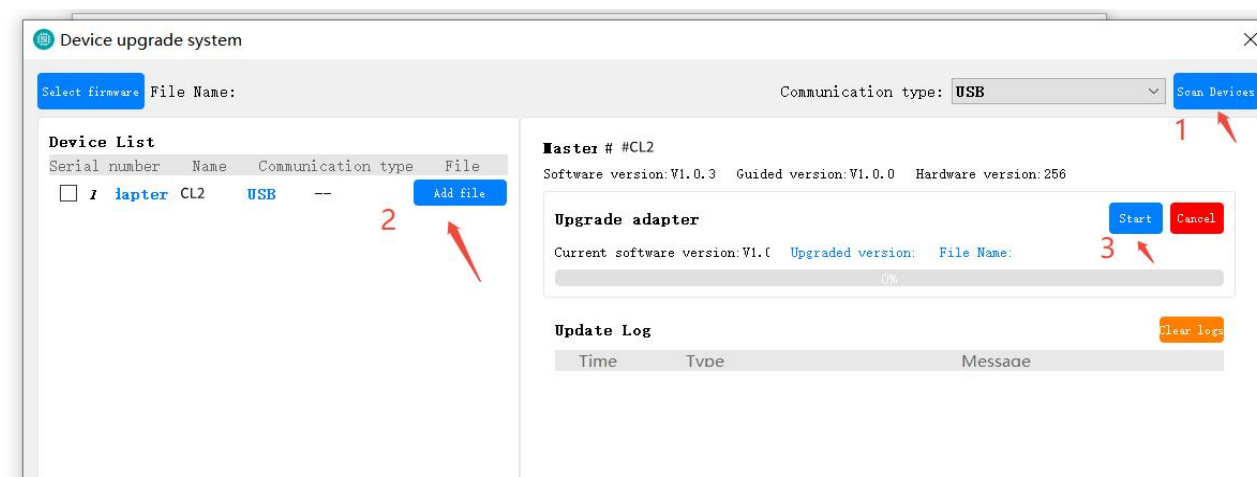
Open the Decowell IOTesterTool software.



Click **Online Upgrade** in IOTesterTool.



Click Scan Devices. After the module is detected, select the corresponding upgrade file, check the module, and then click Start Upgrade.



7.2 Parameter Configuration

The module supports multiple parameter configuration methods. If PLC startup parameter functionality is used, parameters set through other methods will become invalid.

7.2.1 Configuration via Engineering Tool

For configuration operations, please refer to “RS-CL2 Module Configuration and Application.”

7.2.2 Configuration via IO Tester Tool

7.2.2.1 Introduction

IO Tester Tool is a configuration software tool for RS series I/O modules. It can be connected to the Type-C port of the RS-CL2 module via a Type-C cable, enabling the following functions for all modules within the configuration:

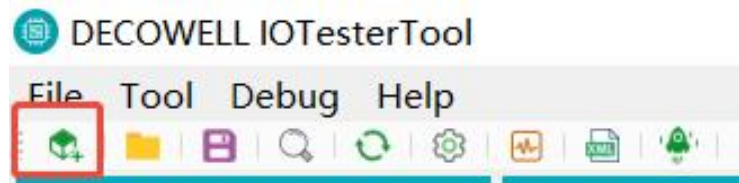
- Quickly obtain module configuration information
- Upgrade module firmware
- Configure module parameters and download them to the module, or verify them by uploading parameters
- Modify the module IP address
- Retrieve real-time diagnostic information of the module
- Force output and monitor input functions

7.2.2.2 Operation Procedure

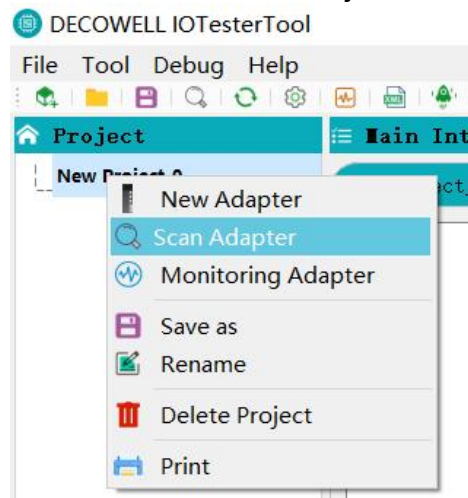
The IO panel of RS series integrated modules supports parameter configuration. This process can be carried out using Decowell’s self-developed upper computer software, IO Tester Tool. The steps are as follows:

Open the Decowell IO Tester Tool software and click the highlighted area shown below to create a new project, as illustrated.

Right-click the created project and click “Scan Adapter.”



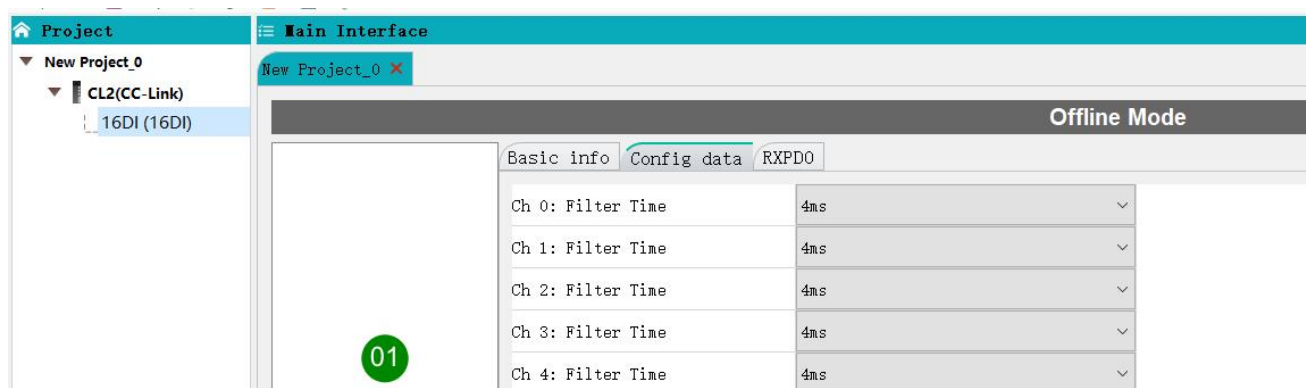
Create a New Project



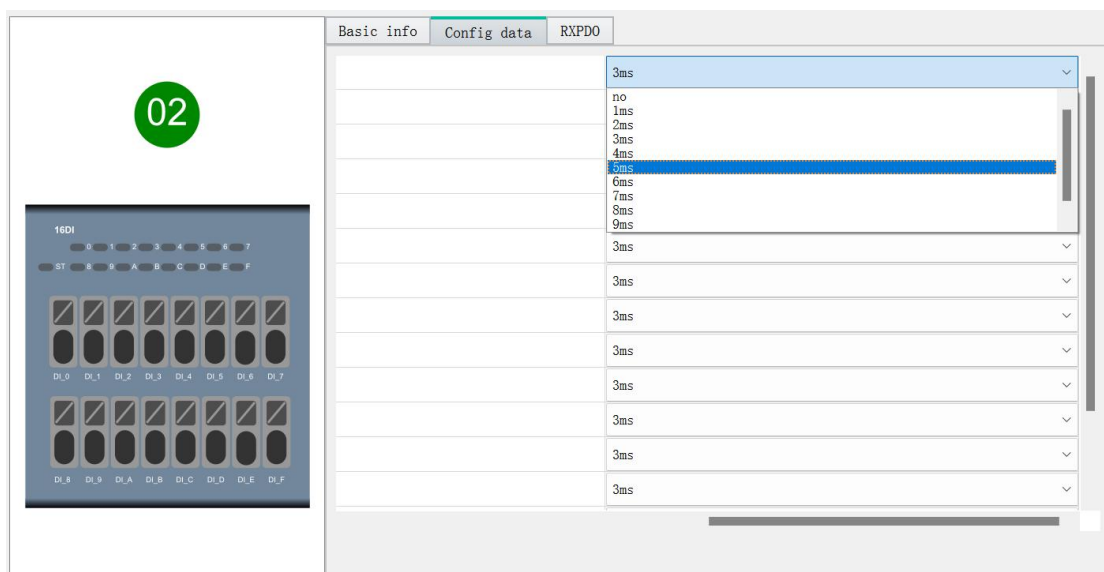
Scan Adapter

Select the communication mode, then scan for modules and add them to the project.

Click the module in the project tree on the left, locate the “Config Data” window, and modify the relevant parameters.



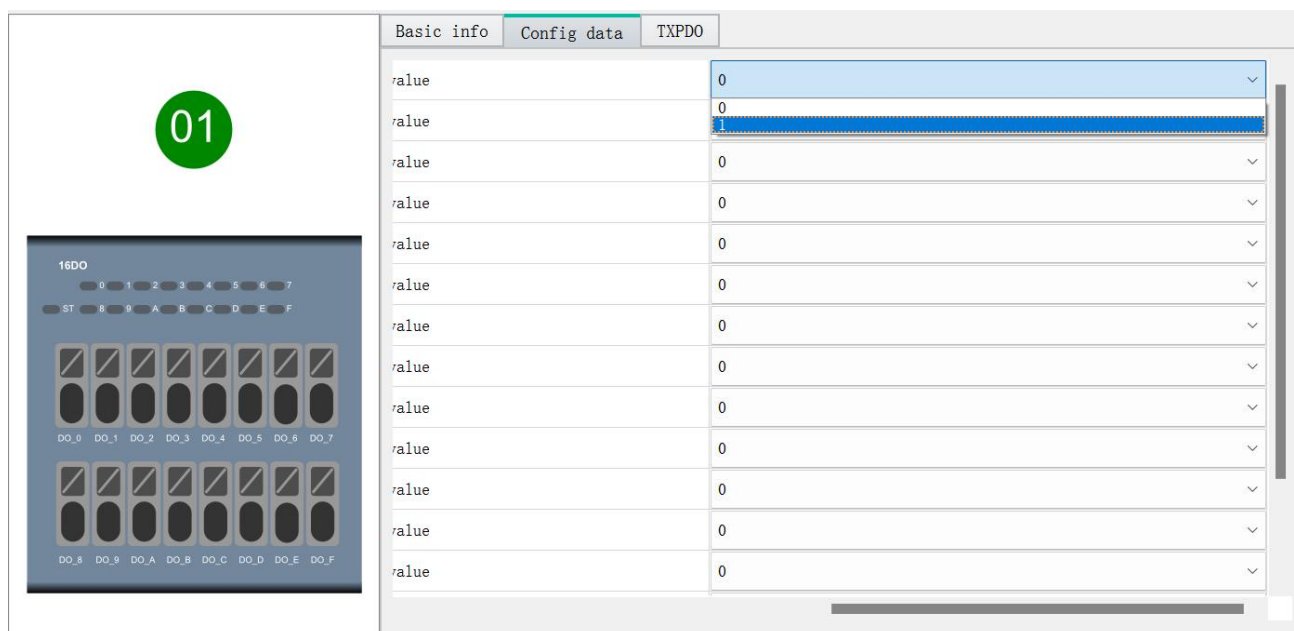
The DI channel parameters support configurable filter time from 0–10 ms, with a default value of 3 ms, as shown in the figure.



DI Parameter Configuration

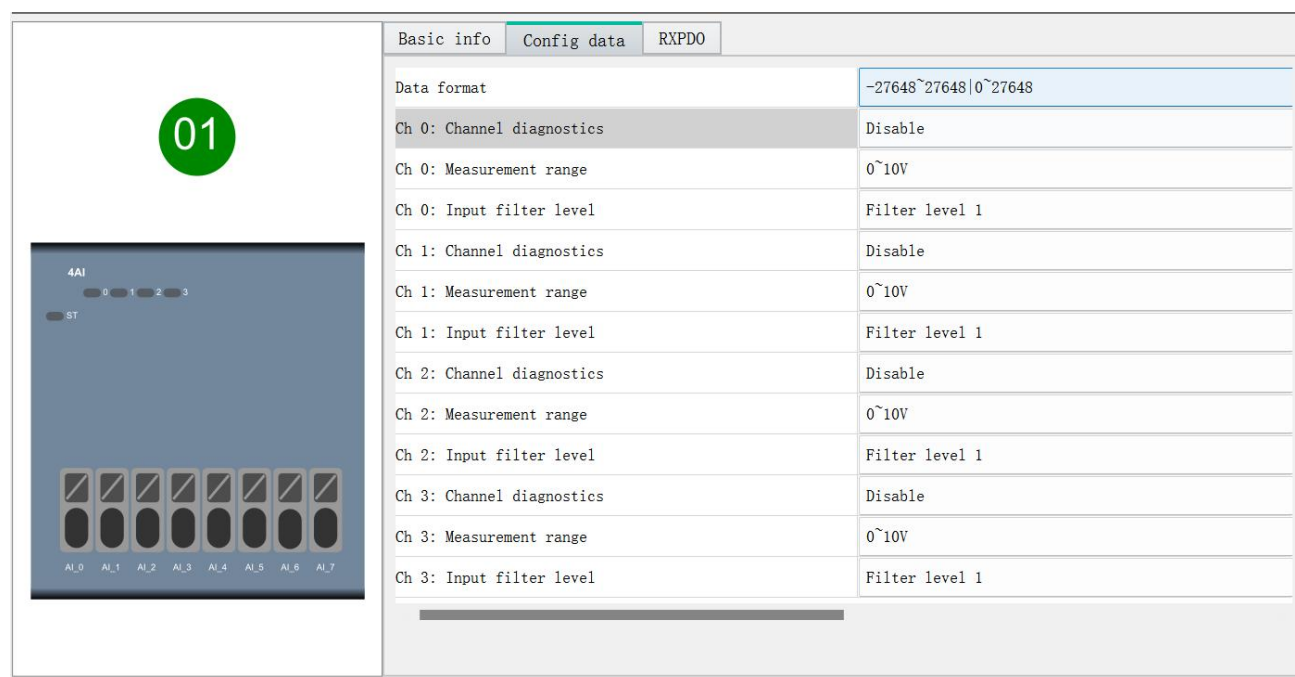
After modifying the parameters, they need to be downloaded to the module. Click **IO Panel - 16DI**, then click **Download Configuration**.

The DO channel parameters allow configuring a substitute value of **0** or **1**.



Bus Output Status Abnormal Value Configuration

The AI channel parameters can be configured for data format, channel diagnostics, range, and filter level.



Data format

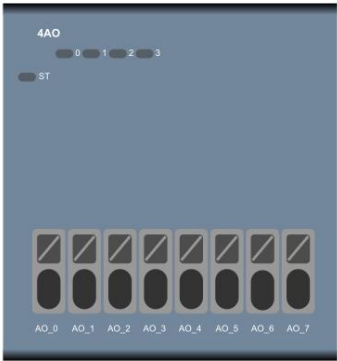
Type	Value Range
S7 Data format	0~27648 -27648~27648
OM Data format	0~30000 -15000~15000
BF Data format	0~32767 -32767~32767

Measurement range

Type	Value Range
Voltage Type	±10V/±5V/0-5V/0-10V
Current Type	0-20mA/4-20mA

The AO module parameters can be configured for **data format**, **range**, and **substitute value**.

02



Basic info
Config data
TXPDO

Data format	-27648~27648 0~27648
Ch 0: Measurement range	0~10V
Ch 0: Substitute value	0
Ch 1: Measurement range	0~10V
Ch 1: Substitute value	0
Ch 2: Measurement range	0~10V
Ch 2: Substitute value	0
Ch 3: Measurement range	0~10V
Ch 3: Substitute value	0

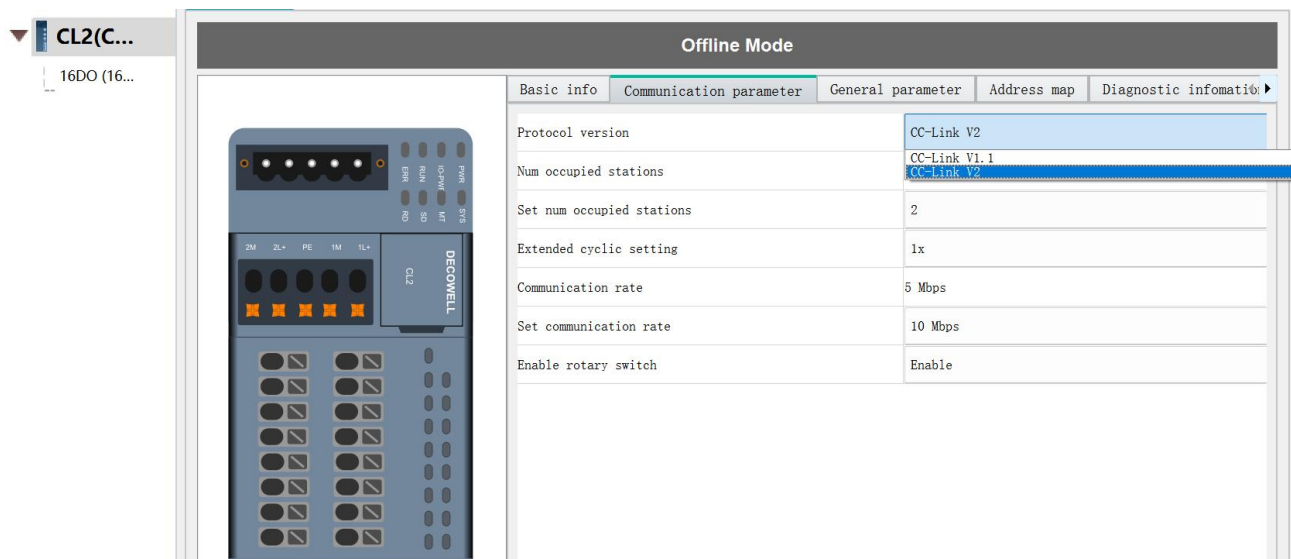
Data format

Type	Value Range
S7 Data format	0~27648 -27648~27648
OM Data format	0~30000 -15000~15000
BF Data format	0~32767 -32767~32767

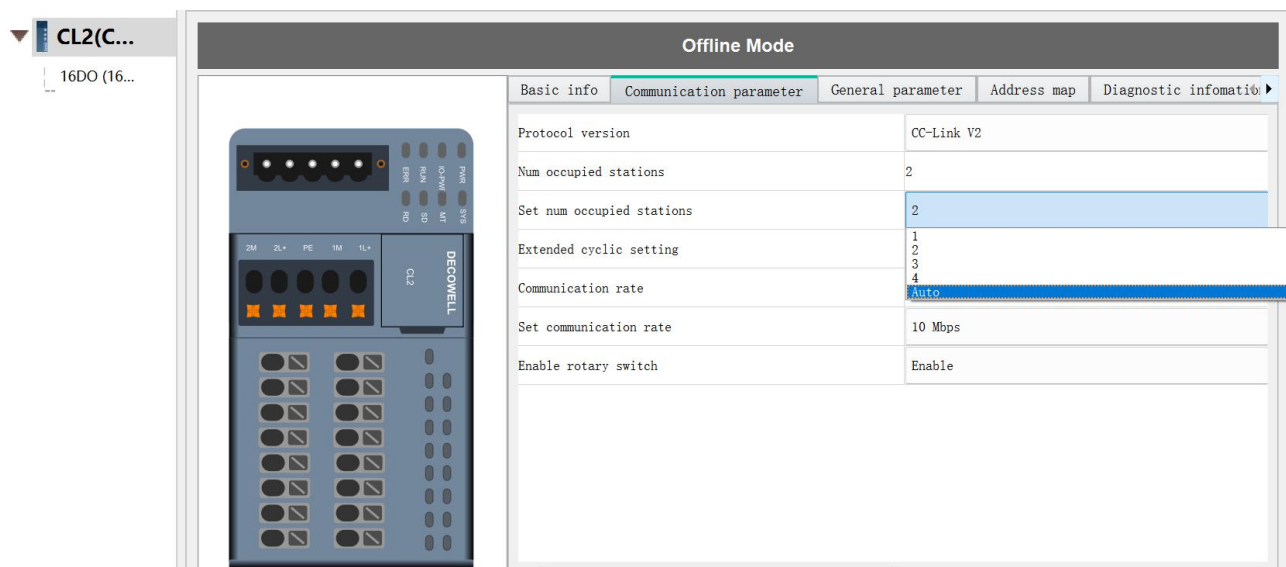
Measurement range

Type	Value Range
Voltage Type	±10V/±5V/0-5V/0-10V
Current Type	0-20mA/4-20mA

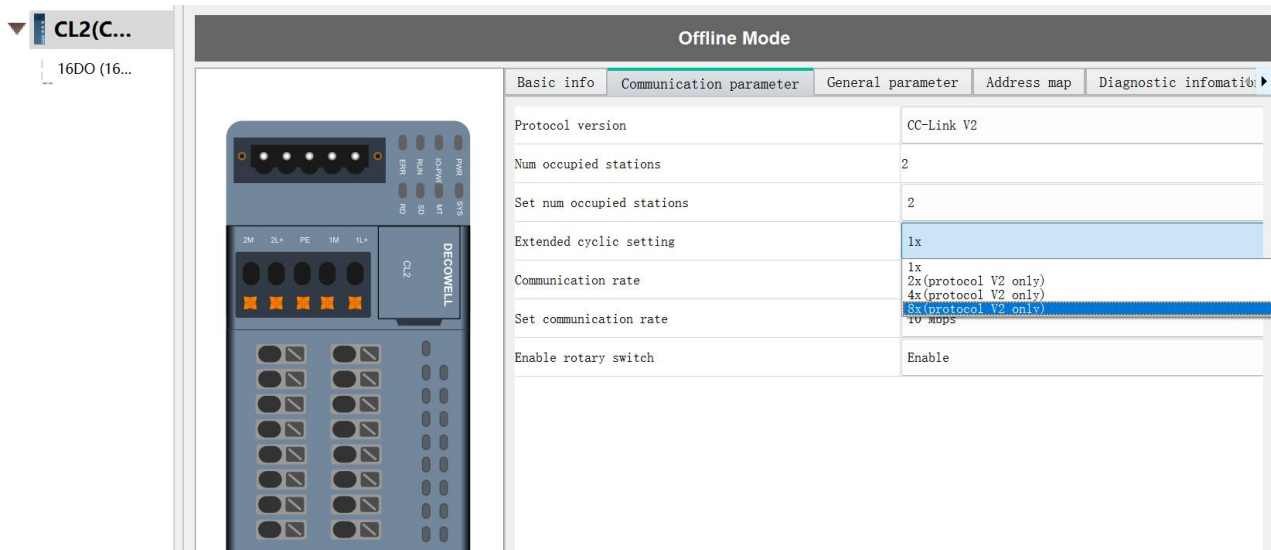
In the **Communication parameter** interface, the CC-Link protocol version can be set to V1.1 or V2.0 via the **Protocol version** option.



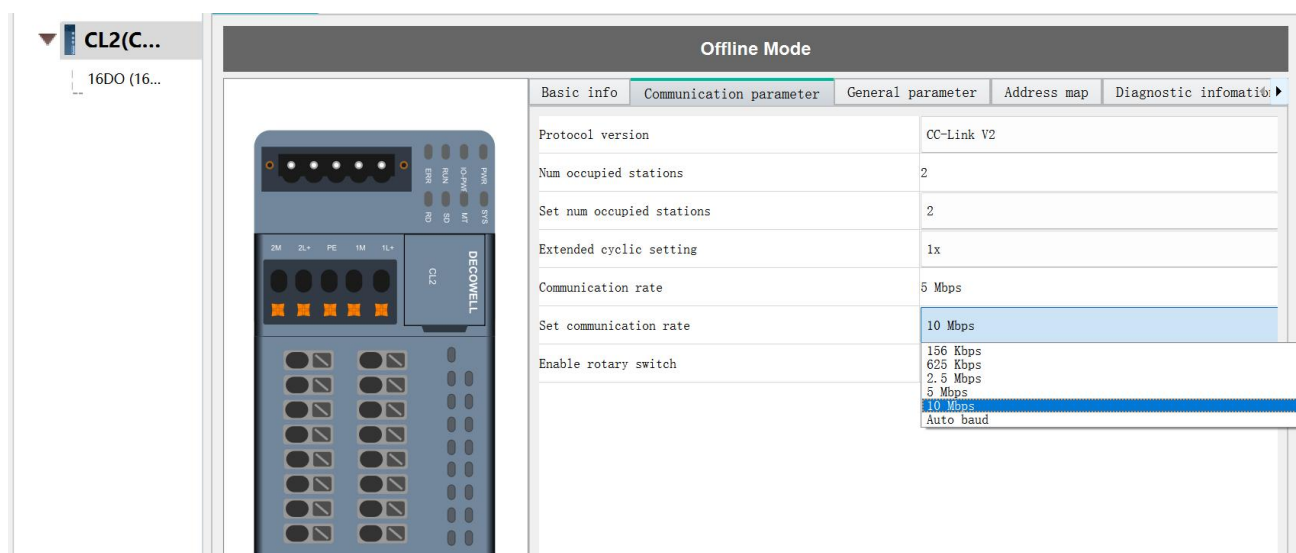
In the **Set num occupied stations** field, the number of occupied stations can be set to 1, 2, 3, 4, or automatic.



In the **Extended cyclic settings** field, the extended cyclic rate can be set to 1x, 2x, 4x, or 8x (2x, 4x, and 8x are only effective under the V2.0 protocol).



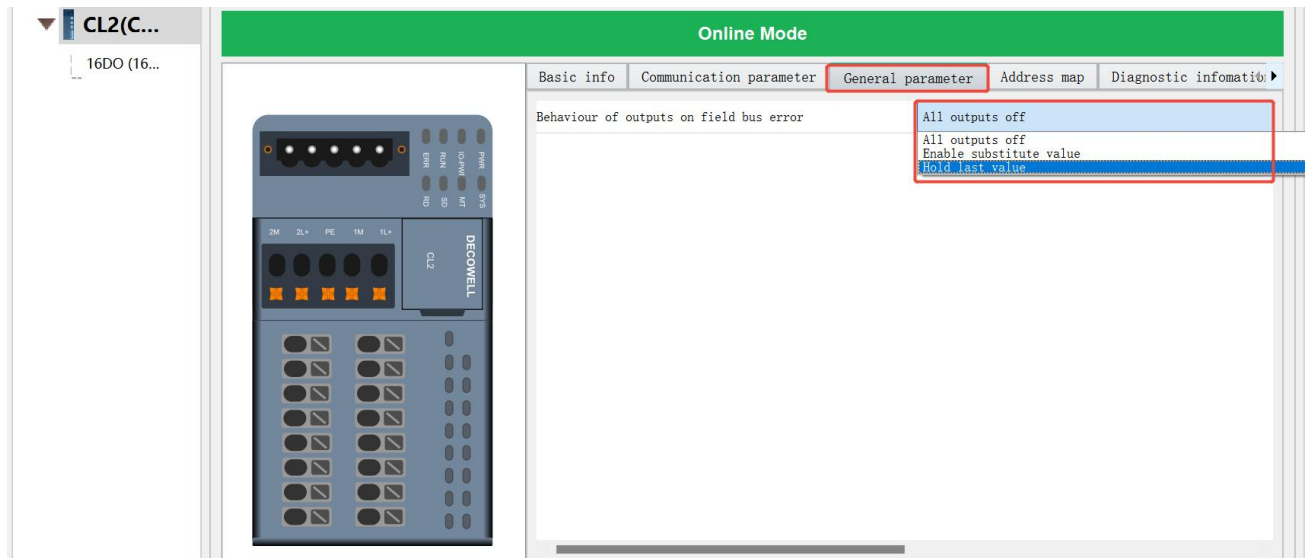
In the **Communication rate** field, the communication rate can be set to 156 Kbps, 625 Kbps, 2.5 Mbps, 5 Mbps, 10 Mbps, or automatic baud rate.



In the **Enable rotary switch** field, you can enable or disable the rotary switch. After enabling it, the baud rate and station number can be set via the rotary switch.

7.2.3 Output Behavior on Bus Error

The module supports three types of output behavior in case of a bus error: reset to zero, substitute value, and hold the last output value. This function can be configured via the Behaviour of outputs on field bus error parameter in the IOTesterTool software.



7.2.4 Hot-Swap Function

The RS-CL2 supports hot-swapping. When the RS-CL2 is powered on, modules in either of the two slots can be inserted or removed while powered. The following conditions may occur:

1. If a module in any slot is removed, the SYS indicator will flash at 5 Hz, while the other module continues to operate normally.
2. If a module is removed from any slot and then replaced with a module of the same specification (e.g., replacing 16DO (N-1) with 16DO (P-2)), the module will operate normally after installation, and the SYS indicator will return to flashing at 1 Hz.
3. If a module is removed and replaced with a module of a different specification (e.g., replacing 16DO with 8DI/8DO), the module will not operate, and its indicator will remain off.
4. The RS-CL2 supports installing modules in both slots, or only in the first slot. If only the second slot is populated, the module will not operate.

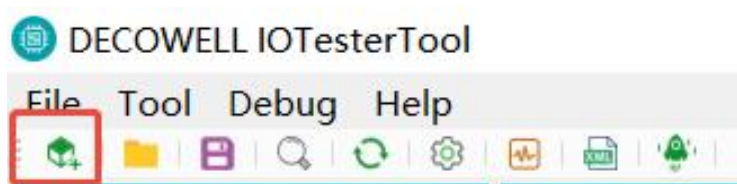
If the RS-CL2 is powered on with only the first slot populated, any module installed in the second slot afterward will not operate.

8. CC Link Module configuration and application

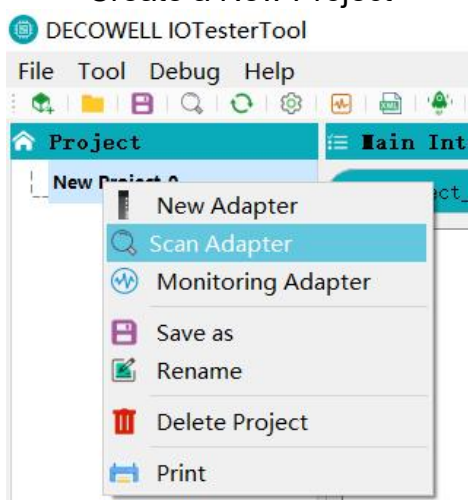
8.1 Module Parameter Configuration

The I/O panel of the RS series integrated module supports parameter configuration. This process can be carried out using DECOWELL's self-developed upper computer software, IO Tester Tool. The operation steps are as follows:

Open the DECOWELL IO Tester Tool software and click the highlighted area shown in the figure below to create a new project, as illustrated.



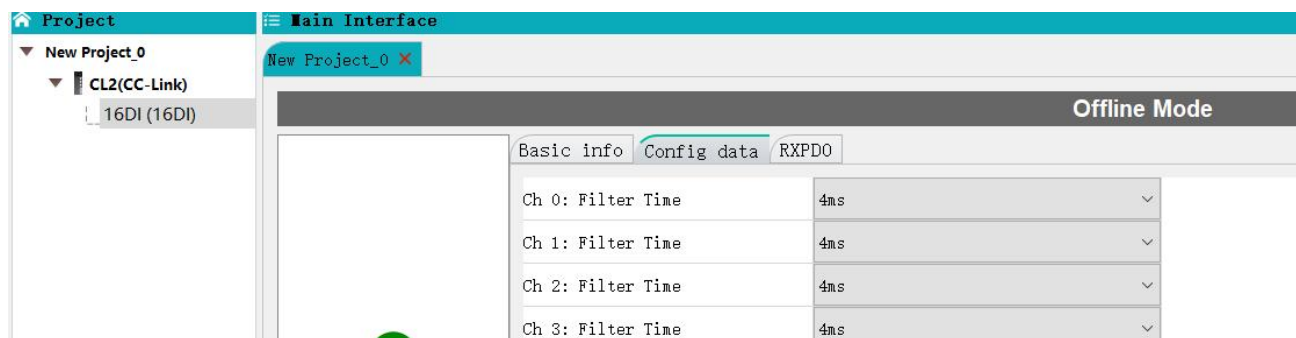
Create a New Project



Scan Adapter

Select the communication mode, then scan for modules and add them to the project.

Click the module in the project tree on the left, locate the “Config Data” window, and modify the relevant parameters.



8.2 Connection and Configuration of GX Works2 with RS-CL2 (S1)

8.1.1 Hardware Configuration

Hardware Configuration Table

Hardware	Quantity	Remark
Programming Computer	1	Install GXWorks2
Controller	1	Support CCLink protocol
CL2-S2	1	CC-Link Base
8DI/8DO(N-1)	1	Digital Module
16DO(P-2)	1	Digital Module
CC-Link communication line	several	

8.1.2 Hardware Hookup

Debugging Setup Using PLC CPU (L02CPU-CM) and CC-Link Master Module (LJ61BT11-CM)

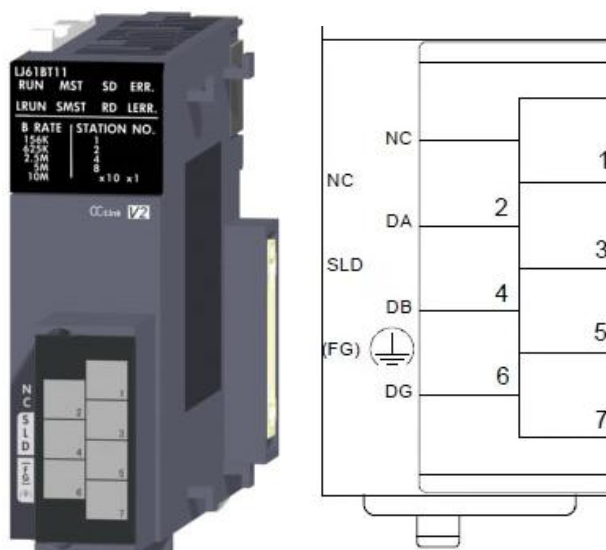


Figure 6-1-2-1 Hardware connection diagram

The DA, DB, DG, and FG wires at one end of the CC-Link communication cable are connected to ports 3, 5, 7, and 6 of the LJ61BT11-CM module, respectively.

8.1.3 New project and communication parameter configuration

Open GX Works2 software, select the actual CPU model, and then in the left navigation bar of the project, select "Parameters" > "Network Parameters" > "CC-Link", and configure the CC-Link slave station setting parameters in the CC-Link parameter setting window, as shown in Figure 6-1-3-1.

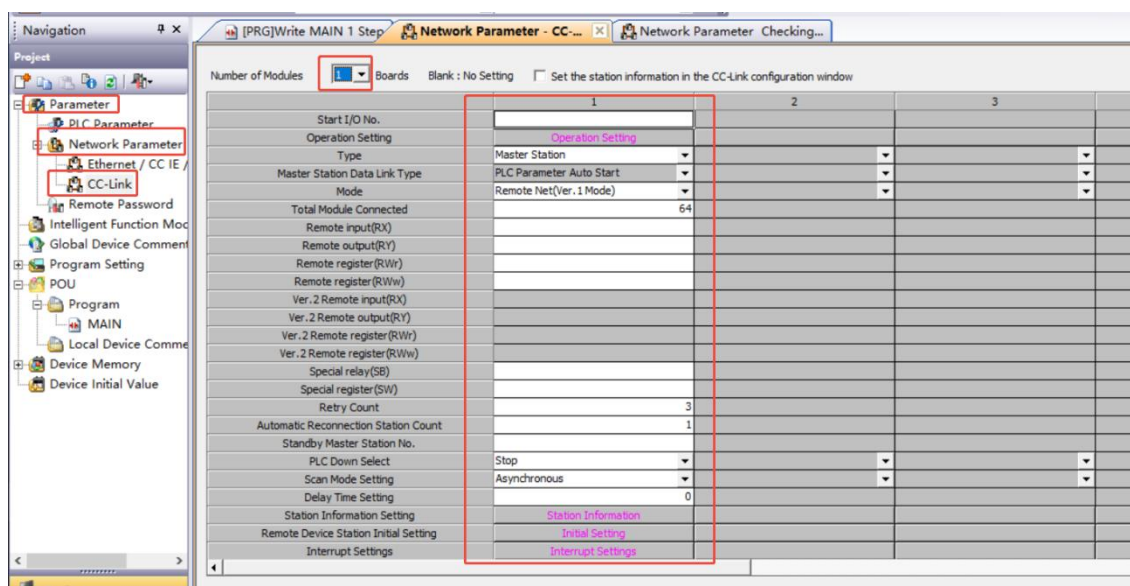


Figure 6-1-3-1 Open CC-Link Parameter setting window

CC-Link network parameters are shown in Figure 6-1-3-2.

	1	2	
Start I/O No.		Set Start I/O Number	
Operation Setting	Operation Setting		
Type	Master Station		
Master Station Data Link Type	PLC Parameter Auto Start		
Mode	Remote Net(Ver.1 Mode)	Set Mode: Remote Net Ver1/Ver2	
Total Module Connected	64		
Remote input(RX)			
Remote output(RY)			
Remote register(RWr)			
Remote register(RWw)			
Ver.2 Remote input(RX)			
Ver.2 Remote output(RY)			
Ver.2 Remote register(RWr)			
Ver.2 Remote register(RWw)			
Special relay(SB)			
Special register(SW)			
Retry Count	3		
Automatic Reconnection Station Count	1		
Standby Master Station No.			
PLC Down Select	Stop		
Scan Mode Setting	Asynchronous		
Delay Time Setting	0		
Station Information Setting	Station Information		
Remote Device Station Initial Setting	Initial Setting		
Interrupt Settings	Interrupt Settings		

Figure6-1-3-2CC-LinkParameter settings

Station No.	Station Type	Expanded Cyclic Setting	Number of Occupied Stations	Remote Station Points	Reserve/Invalid Station Select	Intelligent Buffer Specification (DEC-Word Unit)		
						Send	Receive	Automatic
1/ 1	Remote I/O Station	Single	Occupied Station 1	32Points	No Setting			
2/ 2	Remote I/O Station	Single	Occupied Station 1	32Points	No Setting			
3/ 3	Remote I/O Station	Single	Occupied Station 1	32Points	No Setting			
4/ 4	Remote I/O Station	Single	Occupied Station 1	32Points	No Setting			
5/ 5	Remote I/O Station	Single	Occupied Station 1	32Points	No Setting			
6/ 6	Remote I/O Station	Single	Occupied Station 1	32Points	No Setting			
7/ 7	Remote I/O Station	Single	Occupied Station 1	32Points	No Setting			
8/ 8	Remote I/O Station	Single	Occupied Station 1	32Points	No Setting			
9/ 9	Remote I/O Station	Single	Occupied Station 1	32Points	No Setting			
10/10	Remote I/O Station	Single	Occupied Station 1	32Points	No Setting			
11/11	Remote I/O Station	Single	Occupied Station 1	32Points	No Setting			
12/12	Remote I/O Station	Single	Occupied Station 1	32Points	No Setting			
13/13	Remote I/O Station	Single	Occupied Station 1	32Points	No Setting			
14/14	Remote I/O Station	Single	Occupied Station 1	32Points	No Setting			
15/15	Remote I/O Station	Single	Occupied Station 1	32Points	No Setting			
16/16	Remote I/O Station	Single	Occupied Station 1	32Points	No Setting			

Intelligent device station at station type also includes local station and standby master station.

Default Check End Cancel

Figure6-1-3-3Configure slave parameters

For detailed slave parameter configuration, please refer to the following. The configuration rules for RS-CL2 as a remote device station are as follows:

The CC-Link adapter RS-CL2 is defined as a remote device station in Mitsubishi GX Works software. One station corresponds to 32 points, which can be configured based on the actual number of I/O points connected to the RS-CL2.

The CC-Link logical station number, extended cyclic settings, DIP switch usage, and communication rate can be configured via software. The sequence is shown in the table below.

Upper computer description	Register description	Remarks
Protocol Version	Communication protocol	1.CC-LinkV1.1 2.CC-LinkV2.0
Num occupied stations	View current number of logical stations	0~4
Communication rate	Current communication rate	0: 156Kbps 1: 625Kbps 2: 2.5Mbps 3: 5Mbps 4: 10Mbps
Extended cyclic setting	Extended cyclic settings	1: 1X 2: 2X 4: 4X 8: 8X
Set num occupied station	Set number of logical stations	1~4、Auto
Set communication rate	Set PLC communication rate	0: 156Kbps 1: 625Kbps 2: 2.5Mbps 3: 5Mbps 4: 10Mbps 5: Auto
Enable Hardware switch	Enable DIP switch configuration	Enable DIP Switch Configuration Enable: Turn on DIP switch function Disable: Turn off DIP switch function
Enable PLC diagnostic	Enable PLC diagnostic buffer	Enable: Enable the function Disable: Disable the function
Station number	Current number of stations	1~64

1. When configuring via engineering software, the “**Enable DIP switch configuration**” option must be enabled. After enabling, the settings in the engineering software take effect, allowing automatic baud rate and automatic station number allocation. When disabled, the adapter functions are configured through the engineering software. The communication protocol is not affected by the “**Enable DIP switch configuration**” setting.

2. When the protocol version is 1.1, the “**Extended cyclic**” can only be set to 1×; when the protocol version is 2.0, it can be set to 1×, 2×, 4×, or 8×.

3. The PLC diagnostic buffer function is enabled by default. If it needs to be disabled, it can be configured via the upper computer. In the diagnostic buffer, RX (slave → master) and RY (master → slave) data each occupy one 16-bit register (2 bytes) and are mapped to the last register position in the diagnostic buffer area.

Maximum number of link points (CC-Link Ver.1)				
	Occupies 1 station	Occupies 2 stations	Occupies 3 stations	Occupies 4 stations
RX/RX	32bits	64bits	96bits	128bits
RWr/RWw	4words	8words	12words	16words

Maximum number of link points (CC-Link Ver.2)						
Project			Extended cyclic settings			
			1× setting	2× setting	3× setting	4× setting
Maximum link capacity per unit	Occupies 1 station	RX/RY	32bits	32bits	64bits	128bits
		RWr/RWw	4words	8words	16words	32words
	Occupies 2 stations	RX/RY	64bits	96bits	192bits	384bits
		RWr/RWw	8words	16words	32words	64words
	Occupies 3 stations	RX/RY	96bits	160bits	320bits	640bits
		RWr/RWw	12words	24words	48words	96words
	Occupies 4 stations	RX/RY	128bits	224bits	448bits	896bits
		RWr/RWw	16words	32words	64words	128words
Maximum number of occupied logical stations			4			



Cation

- When using RS-CL for cascading and connecting multiple adapters in a CC-Link network, the station number set by the DIP switch on each RS-CL must match the station number assigned in the station configuration. Otherwise, communication between the master station and the RS-CL will fail.
-

8.2.4 PLC Testing

When the remote output RY is set to RY100, the starting address of RY for RS-CL2 No.1 is Y100; for RS-CL2 No.2, the starting address is Y140 (with the number of occupied stations set to 2, occupying 64 points). The starting addresses of other adapters follow the same pattern.

In GX Works, click the menu: **Online** → **Monitor** → **Device/Buffer Memory Batch Monitor Window**, and enter the device name (e.g., Y100) to observe the status of RY. You can also directly click the YXXX device to set the target state and observe whether the DO points of the corresponding module on the adapter output according to the setting.

9. FAQ

9.1 Common DI Issues

DI Failure – *Description*: Communication between the PLC or upper computer and the module is normal. DI channels are connected to signals, but the software does not detect any signal value, and the DI channel indicator LED is off.

Troubleshooting Steps:

1. Check the panel indicator LEDs.
2. Verify whether the DI input signal type matches the module specification.
3. Check whether the DI signal shares the 24V supply with the load (common source).

Troubleshooting Outcome:

- If the panel ST LED is abnormal, check whether the 24V load supply is connected.
- If a load power supply is present, verify the digital-to-analog mapping for different data formats.
- Check for any loose panels.
- If the LED is correct, verify that the DI signal type matches the module signal type (NPN/PNP).
- If all above are correct, confirm whether the DI signal and module load supply are from the same source and share a common 0V.
- If all steps are correct but the issue persists, it is likely a hardware problem.

DI Channel Abnormality – *Description*: Input channel 1 has a signal. Both channels 1 and 2 show signals, and their indicator LEDs light up simultaneously.

Troubleshooting Steps:

1. Slightly press the panel and observe the input indicator LEDs.
2. Disconnect the panel and measure the continuity of the two signal channels.
3. Inspect the panel and base for metal wires or foreign objects.

Troubleshooting Outcome:

- If pressing the panel makes the issue intermittent, the channel pins may be too long, causing a short to base components (this issue has been optimized).

- If step 1 passes, proceed to step 2 to determine whether the panel or base causes the issue.
- Finally, perform step 3.
- If all steps pass, the problem is likely hardware-related.

DI Channel Abnormality – *Description*: Communication between the PLC or upper computer and module is normal. After powering on, some DI channels show signals, but the corresponding indicator LEDs do not light up.

Troubleshooting Steps:

1. Check whether the DI channel corresponds to multiple variables.
2. Inspect the connector for damage or detached solder joints.

Troubleshooting Outcome:

- If no multiple-variable mapping exists, check the connector condition.
- If all checks pass, the issue is likely hardware-related.

9.2 Common DO Issues

DO Failure – *Description*: The DO channel indicator LED is off. The software has not set the corresponding DO channel to 1, but the DO channel actually outputs.

Troubleshooting Steps:

1. Check whether the corresponding DO has 24V voltage.
2. Verify the load wiring.

Troubleshooting Outcome:

- If the DO channel has no 24V, check the load wiring.
- When the load wiring is from a different source, potential differences may cause false load activation.

DO Failure – *Description*: DO directly drives a load, but the output DO signal cannot drive it; the channel LED is normal.

Troubleshooting Steps:

1. Check the 24V output and whether the load's inrush current exceeds 0.5A.

2. Confirm whether the DO remains in a TRUE state while the IO 24V supply is unstable.

Troubleshooting Outcome:

- If output voltage and load inrush current are correct, check step 2.
- After power cycling the IO supply, a new output control command must be manually sent for the DO to resume output (resolved in version V2.1.4 and later).

9.3 Common AI Issues

AI Value Abnormality – *Description:* A 16-bit current acquisition module shows a negative value.

Troubleshooting Steps:

1. Confirm whether the configured range matches the actual input current.
2. Check whether the channel's data type is double-word.

Troubleshooting Outcome:

- If the range is correct, verify the channel's data type.
- Storing 16-bit precision in a single word may cause overflow, resulting in negative values.

AI Failure – *Description:* Communication between the PLC or upper computer and the module is normal. The AI channel is connected to a valid analog signal, but the software cannot monitor the value, and the AI channel indicator LED is abnormal.

Troubleshooting Steps:

1. Check whether the module's configured range matches the actual input signal range.
2. Confirm that the input signal type matches the module channel type.

Troubleshooting Outcome:

- If the range configuration is correct, verify the signal type.
- If both range and signal type are correct but the software still cannot read values, the issue is likely hardware-related.

AI Value Fluctuation – *Description:* Communication is normal. The AI channel receives a signal, but the monitored AI value fluctuates.

Troubleshooting Steps:

1. Check the module's current filter level configuration.
2. Verify whether the input signal has large fluctuations.
3. Inspect the site for strong electromagnetic interference sources (e.g., VFDs, motors, high-power equipment).

Troubleshooting Outcome:

- If the filter level is set to default, increase the filter level and observe whether the value stabilizes.
- If fluctuations persist, perform steps 2 and 3.
- Large fluctuations may be caused by on-site electromagnetic interference.

9.4 Common AO Issues

AO Failure – *Description:* Communication between the PLC or upper computer and the module is normal. The AO channel outputs a signal, and the channel LED is normal, but it cannot drive an external load.

Troubleshooting Steps:

1. Check whether the module's configured range matches the load's required range.
2. Verify whether the AO output signal has voltage or current.

Troubleshooting Outcome:

- If the range matches, check the output signal.
- If no voltage or current is detected, the issue is most likely hardware-related.

AO Output Abnormality – *Description:* Communication is normal. The AO outputs 5V or 10mA, but the load receives a signal higher than 5V or 10mA.

Troubleshooting Steps:

1. Verify whether the module's configured range matches the load's required range.
2. Confirm whether the load's 0V is connected to the AO module GND.

Troubleshooting Outcome:

- If the range matches, check for a common ground.
- If the load and module do not share a common ground, abnormalities may occur.

- If all above checks pass, the issue is likely hardware-related.

9.5 Common Panel Issues

Panel Signal Abnormality – *Description:* Communication between the PLC or upper computer and the module is normal. DI/DO/AI/AO signals are intermittent, occasionally failing.

Troubleshooting Steps:

1. Gently press the module panel and observe whether the input indicator LEDs recover or change.
2. Swap or replace the panel to confirm whether the issue disappears.

Troubleshooting Outcome:

- This issue is most likely due to tolerance variations between the panel and base connectors.
- Pressing the panel and panel replacement can help diagnose the problem.

9.6 Common Module Issues

Module Abnormality – *Description:* After powering on, all module LEDs are unresponsive, and the 24V power cable becomes hot.

Troubleshooting Steps:

1. Verify whether the two 24V connections are correct.
2. Check whether cold-pressed terminals are properly seated.
3. Inspect the baseboard for burn marks.

Troubleshooting Outcome:

- If wiring and terminals are correct but the module is still unresponsive, the issue is most likely hardware-related.

Usage Abnormality – *Description:* RS module is correctly configured, but the PLC shows errors, and the panel ST LED is abnormal.

Troubleshooting Steps:

1. Check whether the IO PWR LED is steady and confirm that the 24V IO supply is normal.
2. Verify whether the panel is loose.
3. Confirm whether the PLC supports slot configuration and whether the panel order matches the configuration.

Troubleshooting Outcome:

- If the supply is correct and the LED is steady, swap panels.
- If swapping resolves the issue, it is likely due to connector tolerance between the panel and base.
- If unresolved, check step 3.
- If all steps pass and the issue persists, it is likely hardware-related.

9.7 Common Network Port Issues

Network Port Abnormality – *Description*: During operation, the network connection drops intermittently. The port LED is off when the fault occurs.

Troubleshooting Steps:

1. Check whether both ends of the network cable are loose.
2. Test a direct connection to confirm whether the device can be pinged.
3. Inspect the network cable connectors for cold soldering or detached pins.

Troubleshooting Outcome:

- If the cable is secure but ping fails, inspect the port soldering.

9.8 Common Configuration Issues

Configuration Abnormality – *Description*: During configuration, the IO base is automatically scanned, but the panel information is not detected.

Troubleshooting Steps:

1. Verify whether the IO supply 24V is normal and the panel ST LED is on.
2. Perform a panel cross-test.
3. Disconnect the panel and inspect the connector for damage.

Troubleshooting Outcome:

- If power and LED are normal, perform the panel cross-test.
- If the issue persists, inspect the connector.
- If still unresolved, create a new PLC or upper computer project and rescan, confirming that the PLC or upper computer supports slot configuration.
- If all checks pass but the issue persists, it is likely hardware-related.

10. Appendix

10.1 Relay Output Module Usage Requirements

Relay output modules are suitable for low-frequency, status-type control applications. They use passive contacts to control the on/off state of external loads, offering good electrical isolation and strong voltage adaptability.

10.1.1 Recommended Use Scenarios

1. Equipment start/stop or mode switching
2. Alarm signal output
3. Indicator lamps and buzzer control
4. Driving intermediate relays or contactor coils
5. Signal isolation control between systems with different voltages

Typical Characteristics:

- Low operating frequency
- Control logic is primarily “status-based”
- High-speed or precise timing is not required

10.1.2 Application Limitations

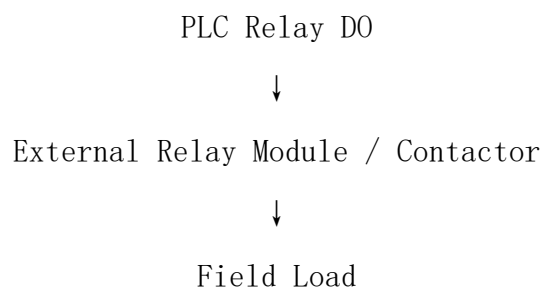
To ensure long-term stable operation, relay output modules are **not suitable** for the following situations:

1. **High-frequency or pulse control** (e.g., running lights, flashing outputs, PWM/pulse signals, high-frequency jog control)
 - Explanation: Relays have mechanical contacts that are not suitable for frequent switching.
2. **Precise synchronization or high-speed timing control** (e.g., multi-channel millisecond-level synchronous output, strict timing interlock control)
 - Explanation: Relay pull-in/release times vary physically and cannot guarantee precise synchronization.

3. **Direct driving of high-power or highly inductive loads** (e.g., motors, heaters, brake coils, high-power solenoid valves)
 - Recommendation: Such loads should be controlled via contactors or intermediate relays.

10.1.3 Recommended Usage Structures

To improve system reliability and maintainability, the following typical structure is recommended:



Advantages:

1. Effectively protects PLC output points
2. Relay wear or replacement does not affect the PLC module
3. Adapts to changes in field loads
4. Reduces on-site maintenance costs

10.1.4 Selection & Usage Suggestions

Usage Requirement	Recommended Solution
Low-frequency status control	Relay DO
Inductive load	Relay DO + External relay
High-frequency / pulse	Transistor DO
High reliability / easy maintenance	External relay module
Safety control	Dedicated safety module



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