

RB Series IO Module

User Manual

DECOWELL Industrial Intelligence makes reliable partners



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Preface

■ Profile

Thank you for purchasing DECOWELL RB Series of card-type I/O modules!

RB series card-type I/O modules are distributed expansion modules developed by DECOWELL. This series of modules consists of adapters, I/O modules, power modules, and terminal modules. The adapter can support a variety of communication buses, such as PROFINET, EtherCAT, CC-Link, Modbus TCP, etc. I/O modules can be divided into digital input modules, digital output modules, analog input modules, analog output modules, and functional modules. Users can match them according to actual applications.

Analog input modules and analog output modules are commonly used I/O modules in the RB series. Analog modules are categorized into input and output types. Based on signal type, they are divided into voltage type and current type; based on resolution, into 12-bit and 16-bit; and based on the number of channels, into 4-channel and 8-channel.

This manual mainly describes the specifications, features and usage of the module. Please read it carefully before use so that you can use this product more clearly and safely.

Due to continuous product and technical updates and improvements, the content in this document may not fully correspond to the actual product. Please understand. In case of any discrepancies, the actual product shall prevail. Content changes resulting from product upgrades are subject to change without prior notice.

CONTENTS

Preface	2
Safety Precautions	4
1.Product Information	7
1.1 Analog Input Module	7
1.1.1 Product model information	7
1.1.2 Technical specifications	10
1.2 Analog output module	12
1.2.1 Product model information	12
1.2.2 Technical specifications	16
1.3 Environmental parameters	17
2.Mechanical Installation	19
2.2 Installation method	19
2.2.1 Inter-module installation	19
2.2.2 Installation on the rail	21
3.Electrical installation	22
3.1 Cable Selection	22
3.2 Terminal Wiring	23
3.2.1 Analog Input (RB-4054/RB-4454/RB-4058/RB-4458)3-wire / 4-wire Wiring Method	23
3.2.2 Analog output module wiring diagram	24
4.Module configuration information	25
4.1 How to change analog channel parameters	25

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 Information

1.1 Analog Input Module

Analog input modules are divided into voltage type and current type. The voltage-type input module supports four switchable ranges: 0–10V, $\pm 10V$, 0–5V, and $\pm 5V$. The current-type input module supports two switchable ranges: 4–20mA and 0–20mA. The resolution of the analog input module is 16-bit (accuracy 0.1%).

1.1.1 Product model information

model	Specifications	Order
RB-4054	4-channel voltage input, resolution 16bit, accuracy 0.1%, range $\pm 10V$, $\pm 5V$, 0~5V, 0~10Vcompatible,Default 0~10V	18-05-01
RB-4058	8-channel voltage input, resolution 16bit, accuracy 0.1%, range $\pm 10V$, $\pm 5V$, 0~5V, 0~10Vcompatible,Default 0~10V	18-05-07
RB-4454	4-channel current input, resolution 16bit, accuracy 0.1%, range0~20mA,4~20mAcompatible,Default 4~20mA	18-05-02
RB-4458	8-channel current input, resolution 16bit, accuracy 0.1%, range0~20mA,4~20mAcompatible,Default 4~20mA	18-05-08

● Module channel indicator

Channel indicator light	state	definition
green	Flash	Analog signal input
	ON	Full scale or overrange
	OFF	No analog signal input

● PWR/STA Indicator Description



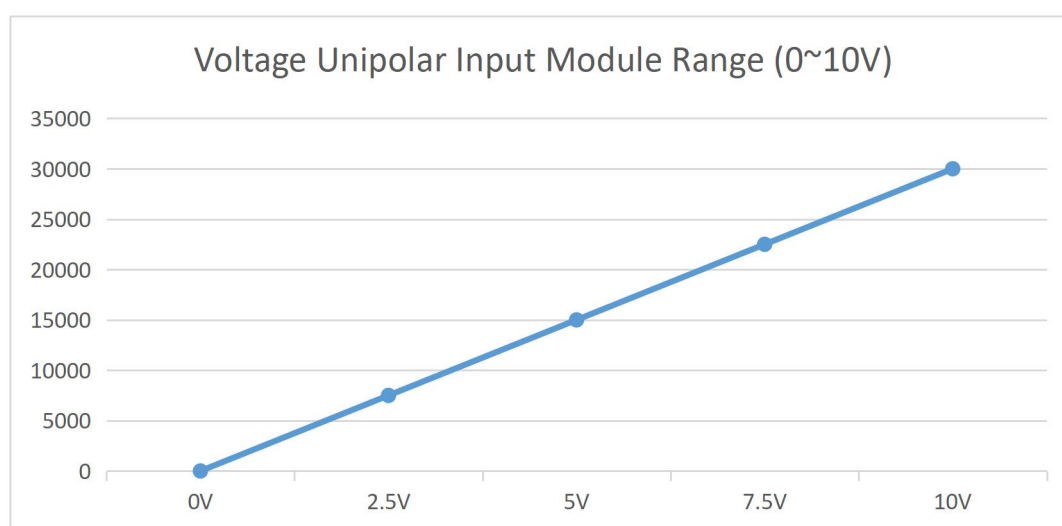
led	state	describe
STA	5Hz Flashing(red)	Module self-test abnormality (internal fault)
	ON(red)	The module has not established communication with the adapter, and configuration information loading failed.
	ON(green)	The module works fine
	1Hz Flashing(red)	An overrange error or disconnection error exists
PWR	ON(green)	Internal power supply is normal
	OFF	No power supply/abnormal power supply

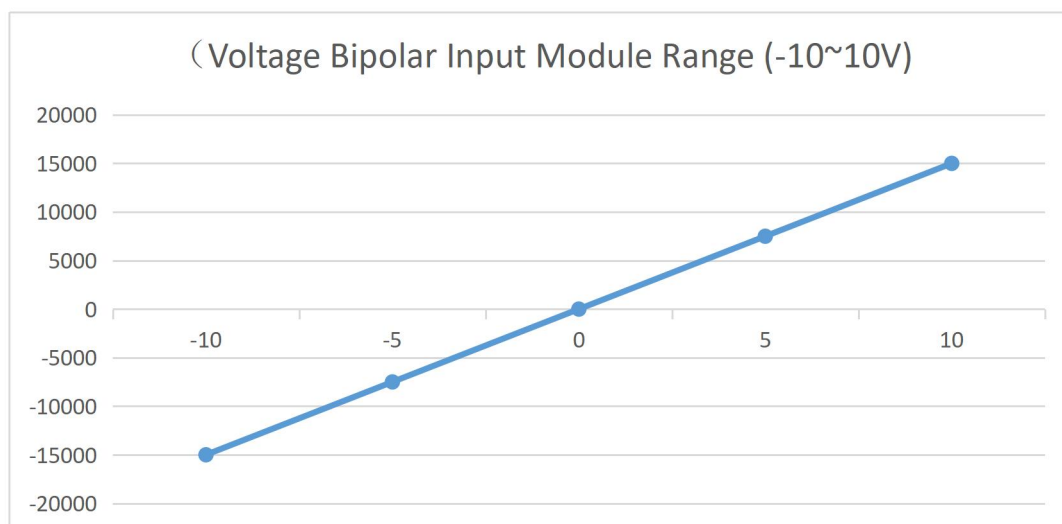
●Analog range corresponding value

Input type		analog input value	
		Voltage type	Current type
Resolution	Polarity	0~10V,±10V,0~5V,±5V	4~20mA, 0~20mA
16Bit	Unipolar	0~32767,0~27648, 0~30000	0~32767,0~27648 0~30000
	Bipolar	-32767~32767 -27648~27648 -15000~15000	-32767~32767, -27648~27648, -15000~15000,

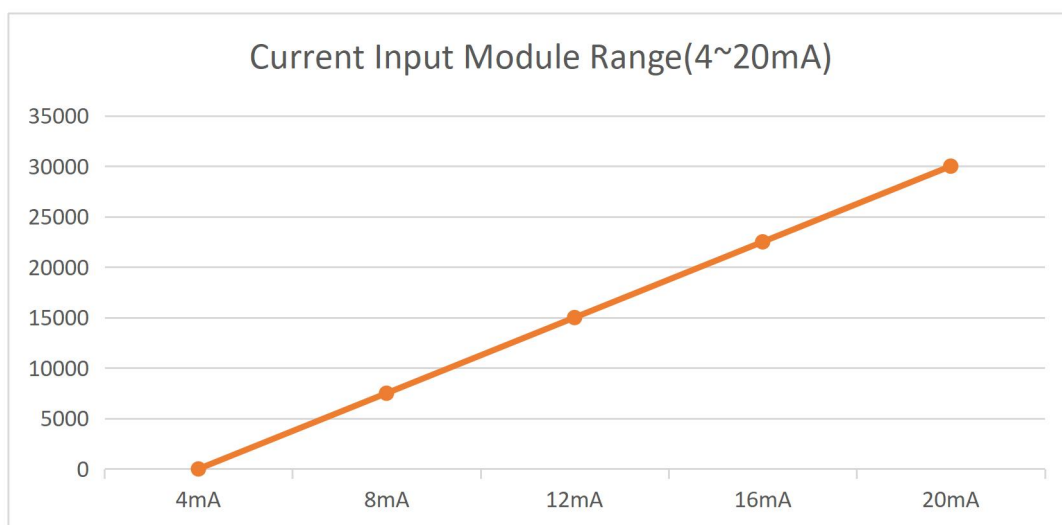
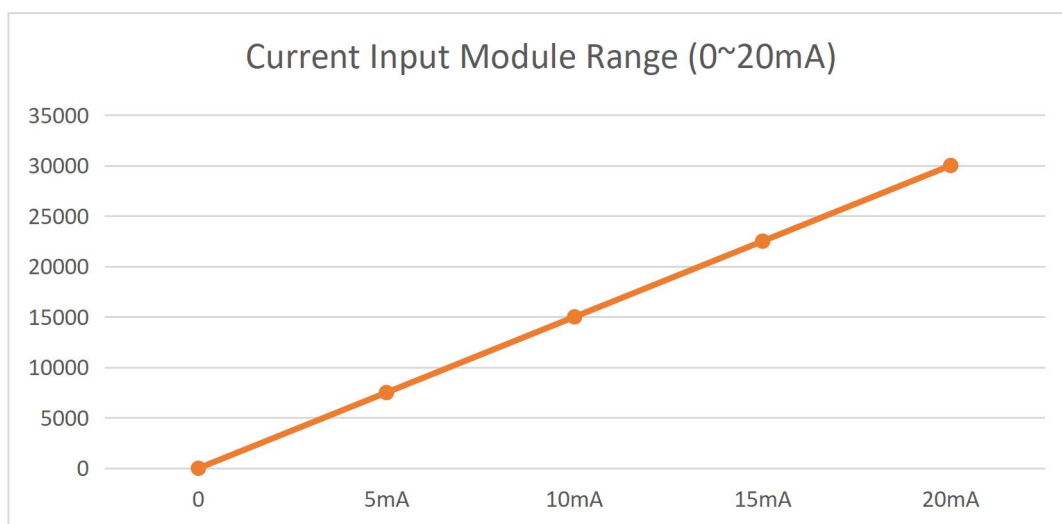
●Analog Voltage-type Input Module DA/AD Conversion Curve

(e.g., 0~30000 / -15000~15000)





●Analog Current-type Input Module DA/AD Conversion Curve



●16-bit 4-20mA digital-to-analog conversion formula (X is the current value, Y is the value corresponding to the current current value):

$$\frac{X - 4}{20 - 4} = \frac{Y}{30000}$$

●16-bit 0-20mA digital-to-analog conversion formula (X is the current value, Y is the value corresponding to the current current value):

$$\frac{X}{20} = \frac{Y}{30000}$$

●16-bit 0-10V digital-to-analog conversion formula (X is the voltage value, Y is the corresponding value for the current voltage):

$$\frac{X}{10} = \frac{Y}{30000}$$

●16-bit 0-5V digital-to-analog conversion formula (X is the voltage value, Y is the corresponding value for the current voltage):

$$\frac{X}{5} = \frac{Y}{30000}$$

●16-bit ±10V Digital-to-analog conversion formula (X is the voltage value, Y is the corresponding value for the current voltage):

$$\frac{X}{10} = \frac{Y}{15000} / \frac{X}{-10} = \frac{Y}{-15000}$$

●16-bit ±5V Digital-to-analog conversion formula (X is the voltage value, Y is the corresponding value for the current voltage):

$$\frac{X}{5} = \frac{Y}{15000} / \frac{X}{-5} = \frac{Y}{-15000}$$

1.1.2 Technical specifications

● Input module parameter introduction (RB-4054/RB-4454)

Technical Parameters		
model	RB-4054	RB-4454
Product Name	Analog Input Modules	
Signal Type	±10V, ±5V, 0~5V, 0~10V	0~20mA, 4~20mA
Power consumption	Max 85mA	Max 31mA
Input characteristics		
Number of input channels	4	
Input filtering	Configurable: 0 to 3 levels (default 1)	

Total channel conversion time	1ms	
Input Impedance	> 1MΩ	> 150Ω
Resolution	16Bit	
Accuracy（25℃/-20～55℃）	±0.1% /±0.2% FSR	
Inrush Current value	0.15k A(± 10%)	
instantaneous power	>0.01s	
Absolute Maximum Input	±30V	30mA
Overvoltage protection	support	
Isolation withstand voltage	500VAC on the field side and digital side, no isolation between channels	
Physical parameters		
Dimensions	100mm×77mm×12mm	
Operating temperature	-20～55℃	
Storage temperature	-40～85℃	
Protection level	IP20	
Wiring specifications	0.2～1.5mm²	
Wiring method	Straight-through spring terminal connection	
weight	70g	

● Input module parameter introduction (RB-4058/RB-4458)

Technical Parameters		
model	RB-4058	RB-4458
Product Name	Analog Input Modules	
Signal Type	±10V, ±5V, 0~5V, 0~10V	0~20mA, 4~20mA
Power consumption	Max 33mA	Max 26mA
Input characteristics		
Number of input channels	8	
Input filtering	Configurable: 0 to 3 levels (default 1)	
Total channel conversion time	1ms	
Input Impedance	> 1MΩ	> 150Ω
Resolution	16Bit	
Accuracy (25°C/-20~55°C)	±0.1% /±0.2% FSR	
Inrush Current value	0.15k A(± 10%)	

instantaneous power	>0.01s	
Absolute Maximum Input	±30V	30mA
Overvoltage protection	support	
Isolation withstand voltage	500VAC on the field side and digital side, no isolation between channels	
Physical parameters		
Dimensions	100mm×77mm×12mm	
Operating temperature	-20~55℃	
Storage temperature	-40~85℃	
Protection level	IP20	
Wiring specifications	0.2~1.5mm ²	
Wiring method	Straight-through spring terminal connection	
weight	70g	

1.2 Analog output module

Analog output modules are divided into voltage type and current type. outModules4 output ranges are switchable, 0~10, ±10V, 0~5V, ±5V respectively; current type inputoutModules2 output ranges can be switched, They are 0~20mA, 4~20mA. Analog output module resolution for 16 bits (0.1% accuracy).

1.2.1 Product model information

model	Specifications	Order
RB-5054	4-channel voltage output, resolution 16bit, accuracy 0.1%, range ±10V, ±5V, 0~5V, 0~10V compatible, Default 0~10V	18-07-01
RB-5058	4-channel voltage output, resolution 16bit, accuracy 0.1%, range ±10V, ±5V, 0~5V, 0~10V compatible, Default 0~10V	18-07-07
RB-5454	4-channel current output, resolution 16bit, accuracy 0.1%, range 0~20mA, 4~20mA compatible, Default 4~20mA	18-07-02
RB-5458	4-channel current output, resolution 16bit, accuracy 0.1%, range 0~20mA, 4~20mA compatible, Default 4~20mA	18-07-08

- Module indicator light

Channel indicator light	state	definition
green	Flash	With analog signal output
	constant	Full scale or overrange
	Destroy	No analog signal output

● PWR/STA Indicator Description



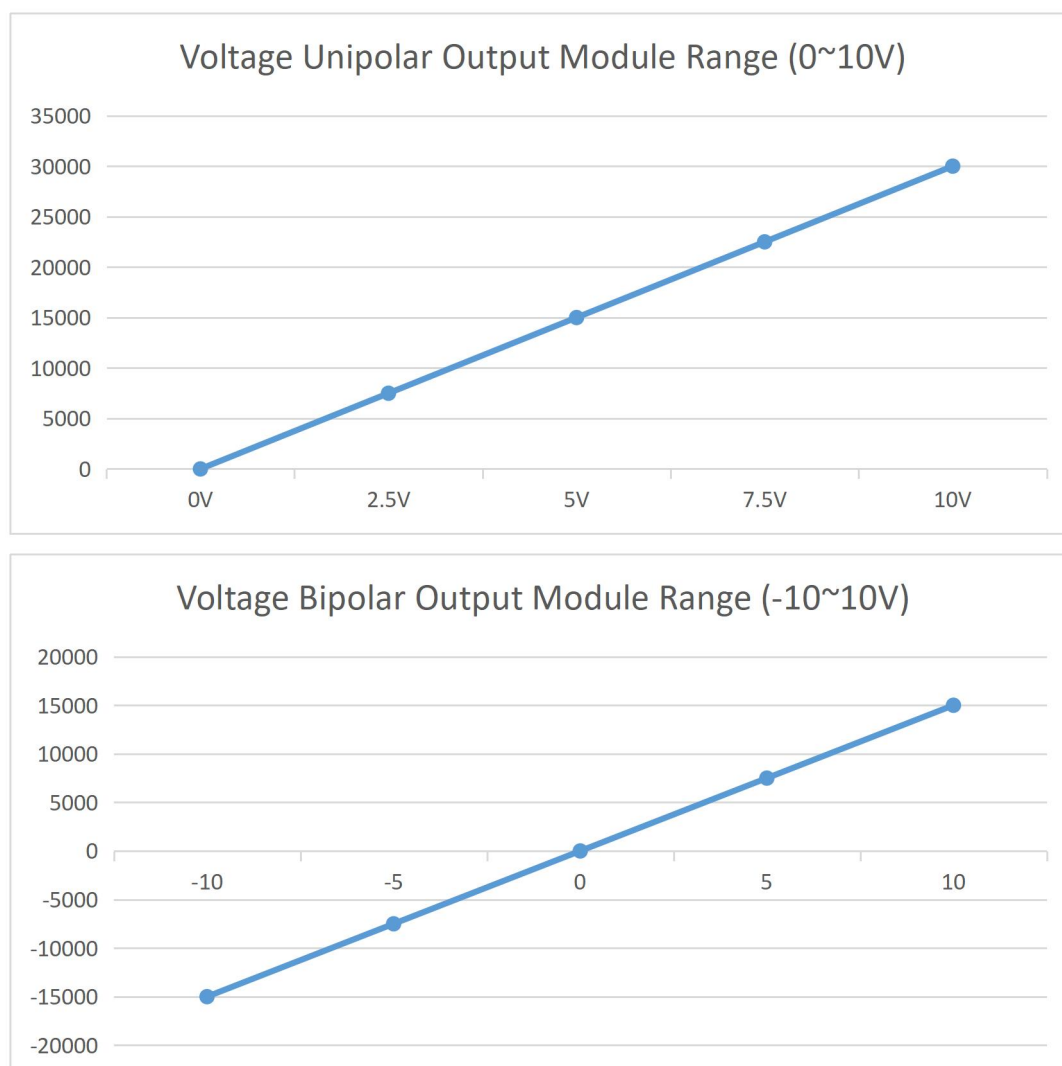
led	state	describe
STA	5Hz Flashing(red)	Module self-test abnormality (internal fault)
	ON(red)	The module has not established communication with the adapter, and configuration information loading failed.
	ON(green)	The module works fine
	1Hz Flashing(red)	Module hardware abnormality
PWR	ON(green)	Internal power supply is normal (5V System side)
	OFF	No power supply/abnormal power supply (5V System side)

●Analog range corresponding value

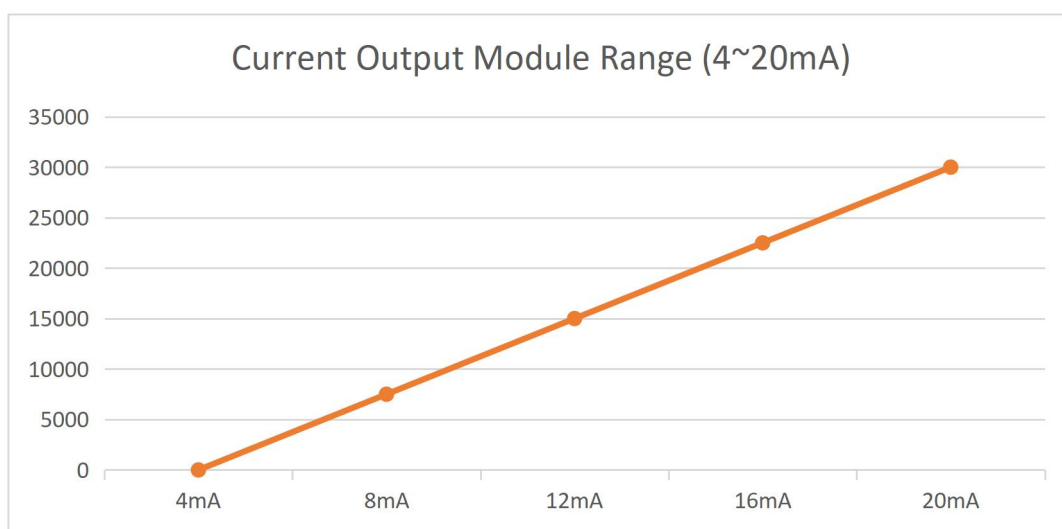
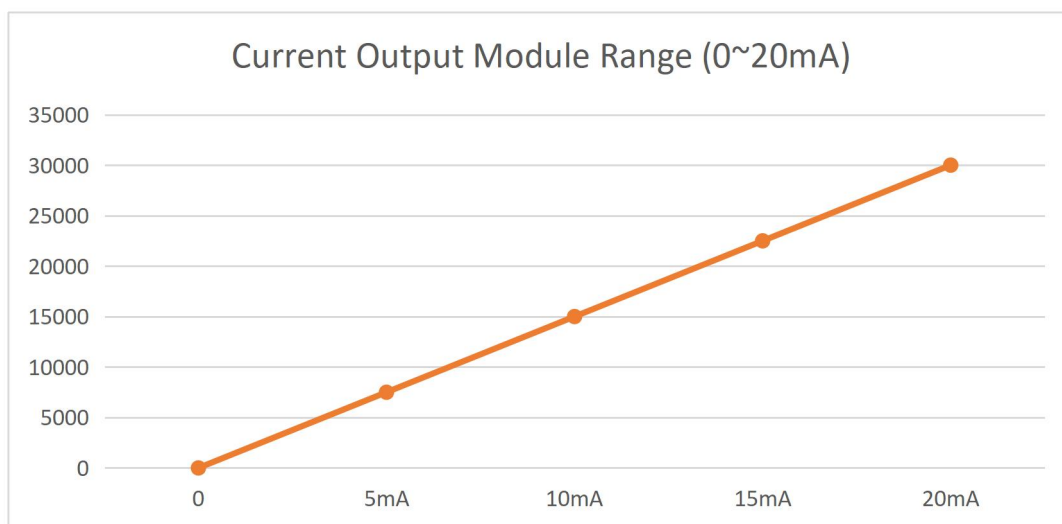
output type		analog output value	
		Voltage type	Current type
Resolution	Polarity	0~10V,±10V,0~5V,±5V	4~20mA, 0~20mA
16Bit	Unipolar	0~32767,0~27648, 0~30000	0~32767,0~27648 0~30000
	Bipolar	-32767~32767 -27648~27648 -15000~15000	-32767~32767, -27648~27648, -15000~15000.

●Analog Voltage-type Output Module DA/AD Conversion Curve

(e.g., 0~30000 / -15000~15000)



●Analog current-type input module DA/AD conversion Curve



●16-bit 4-20mA digital-to-analog conversion formula (X is the current value, Y is the value corresponding to the current current value):

$$\frac{X - 4}{20 - 4} = \frac{Y}{30000}$$

●16-bit 0-20mA digital-to-analog conversion formula (X is the current value, Y is the value corresponding to the current current value):

$$\frac{X}{20} = \frac{Y}{30000}$$

●16-bit 0-10V digital-to-analog conversion formula (X is the voltage pressure value, Y is the current pressure value corresponding to value):

$$\frac{X}{10} = \frac{Y}{30000}$$

●16-bit 0-5V digital-to-analog conversion formula (X is the voltage pressure value, Y is the current pressure value corresponding to value):

$$\frac{X}{5} = \frac{Y}{30000}$$

●16-bit±10V Digital-to-analog conversion formula (X is the voltage pressure value, Y is the current pressure value corresponding to value):

$$\frac{X}{10} = \frac{Y}{15000} / \frac{X}{-10} = \frac{Y}{-15000}$$

●16-bit±5V Digital-to-analog conversion formula (X is the voltage pressure value, Y is the current pressure value corresponding to value):

$$\frac{X}{5} = \frac{Y}{15000} / \frac{X}{-5} = \frac{Y}{-15000}$$

1.2.2 Technical specifications

●Output module parameter introduction (RB-5054/RB-5454)

Technical Parameters		
model	RB-5054	RB-5454
Product Name	Analog output modules	
Signal Type	±10V, ±5V, 0~5V, 0~10V	0~20mA,4~20mA
Power consumption	Max 41mA	Max 19mA
Input characteristics		
Number of output channels	4	
Output Impedance	> 1kΩ	< 500Ω
Conversion speed	50 μ s/channel	
Resolution	16Bit	
Inrush Current value	0.15k A(± 10%)	
instantaneous power	>0.01s	
Accuracy (25°C/-20~55°C)	±0.1% /±0.2% FSR	
Overvoltage protection	support	
Isolation withstand voltage	500VAC on the field side and digital side, no isolation between channels	
Physical parameters		
Dimensions	100mm×77mm×12mm	
Operating temperature	-20~55℃	
Protection level	IP20	

Wiring specifications	0.2~1.5mm ²
Wiring method	Straight-through spring terminal connection
weight	70g

●Output module parameter introduction (RB-5058/RB-5458)

Technical Parameters		
model	RB-5058	RB-5458
Product Name	Analog output modules	
Signal Type	±10V, ±5V, 0~5V, 0~10V	0~20mA,4~20mA
Power consumption	Max 24mA	Max 21mA
Input characteristics		
Number of output channels	8	
Output Impedance	>1kΩ	<500Ω
Conversion speed	50 μ s/channel	
Resolution	16Bit	
Inrush Current value	0.15k A(± 10%)	
instantaneous power	>0.01s	
Accuracy（25℃/-20~55℃）	±0.1% /±0.2% FSR	
Overvoltage protection	support	
Isolation withstand voltage	500VAC on the field side and digital side, no isolation between channels	
Physical parameters		
Dimensions	100mm×77mm×12mm	
Operating temperature	-20~55℃	
Protection level	IP20	
Wiring specifications	0.2~1.5mm²	
Wiring method	Straight-through spring terminal connection	
weight	70g	

1.3 Environmental parameters

Environmental parameters

Operating temperature	-20~55℃
Operating humidity	95% non-condensing
atmosphere	≥795 hPa (altitude ≤ 2000 m) as per IEC 61131-2
Storage temperature	-40~85℃
Overvoltage category	I

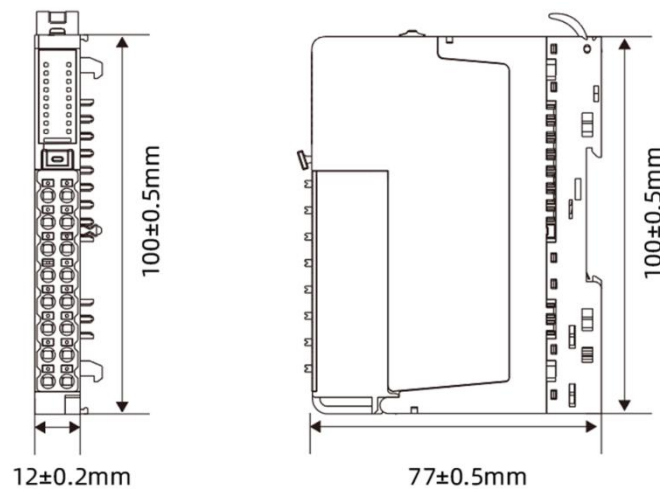
2. Mechanical Installation

The installation dimension information is shown in the figure below, with the unit in (mm).



Notice

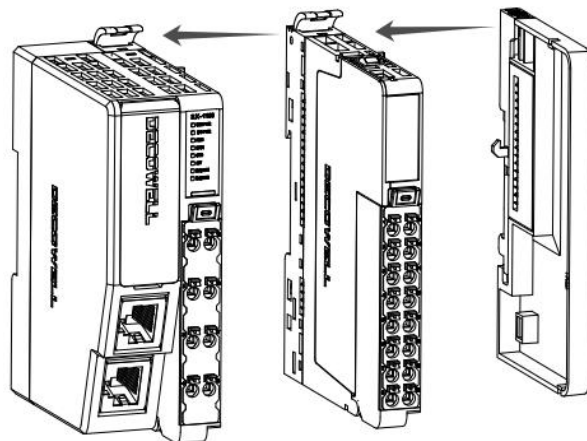
- The dimensions in the figure below are for the temperature module.



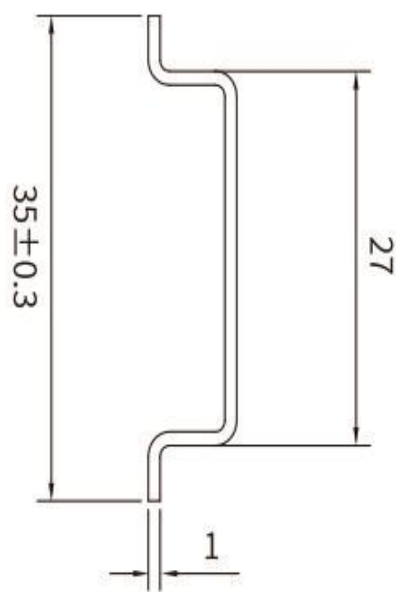
2.2 Installation method

2.2.1 Inter-module installation

Before installation, push the lock and release lever on the top of the module backward. After all the module levers are open, insert the modules horizontally. After installation, push the lever back to its original position.



The module is installed on a DIN rail. The DIN rail must comply with the IEC 60715 standard (35 mm wide and 1 mm thick). The dimensions are as follows:



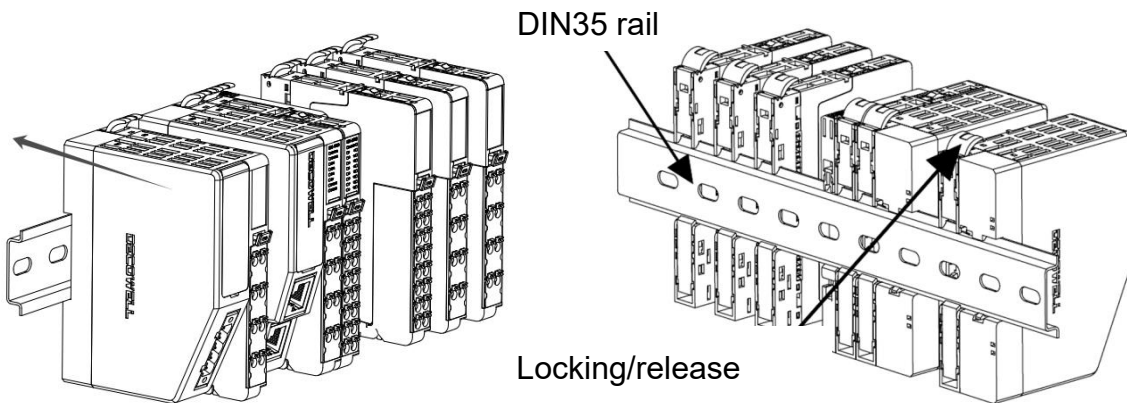
Note: When the module is installed on a DIN35 rail other than the one recommended above, the DIN rail lock may not lock properly. Before installing the module, open the lock lever on the top of the module before proceeding to the next step of installation.

**Notice**

- **When** this product is installed on a DIN rail other than the one recommended above (especially when the thickness of the DIN rail is $\leq 1.0\text{mm}$), the DIN rail lock will fail and the product will not be installed properly, causing the product to not work properly.

2.2.2 Installation on the rail

During installation, align the module with the DIN35 rail and press the module in the direction indicated by the arrow, as shown in the figure below.

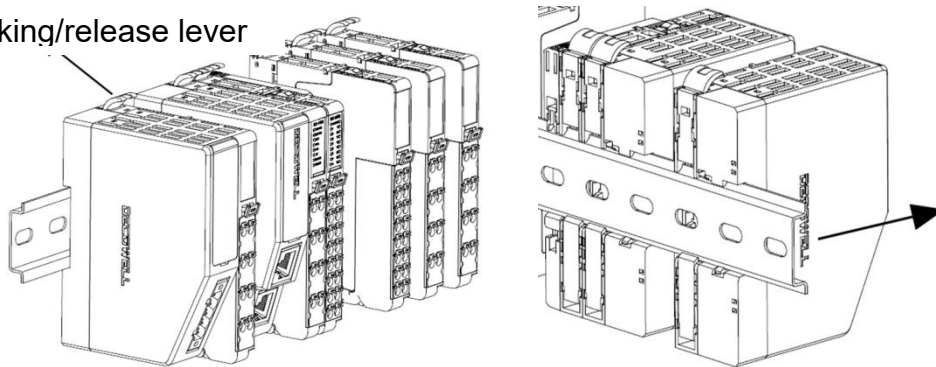


Note: After installing the module, press the lock-release lever downward by hand to secure the module onto the guide rail, ensuring it is properly installed.

Disassembly:

Push the lock lever upwards by hand, and then pull the module away from the DIN35 rail.

lifting the locking/release lever



3. Electrical installation

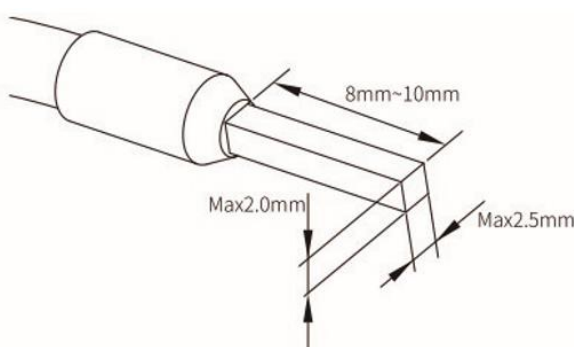
3.1 Cable Selection

Signal related cables. The wire lug diameters in the following table are for reference only and can be reasonably calculated and adjusted based on actual use.

Name	Compatible Wire Gauge		KST	
Ferrule Type	Standard (mm ²)	AWG	Model	Crimping Tool
	0.25	24	E0208	KST2000L
	0.5	20	E0510	
	0.75	18	E7510	
	1.0	18	E1010	
	1.5	16	E1510	

Stripping length: 8–10 mm

The shape and size requirements of the riveted terminals are shown in the figure below.



3.2 Terminal Wiring



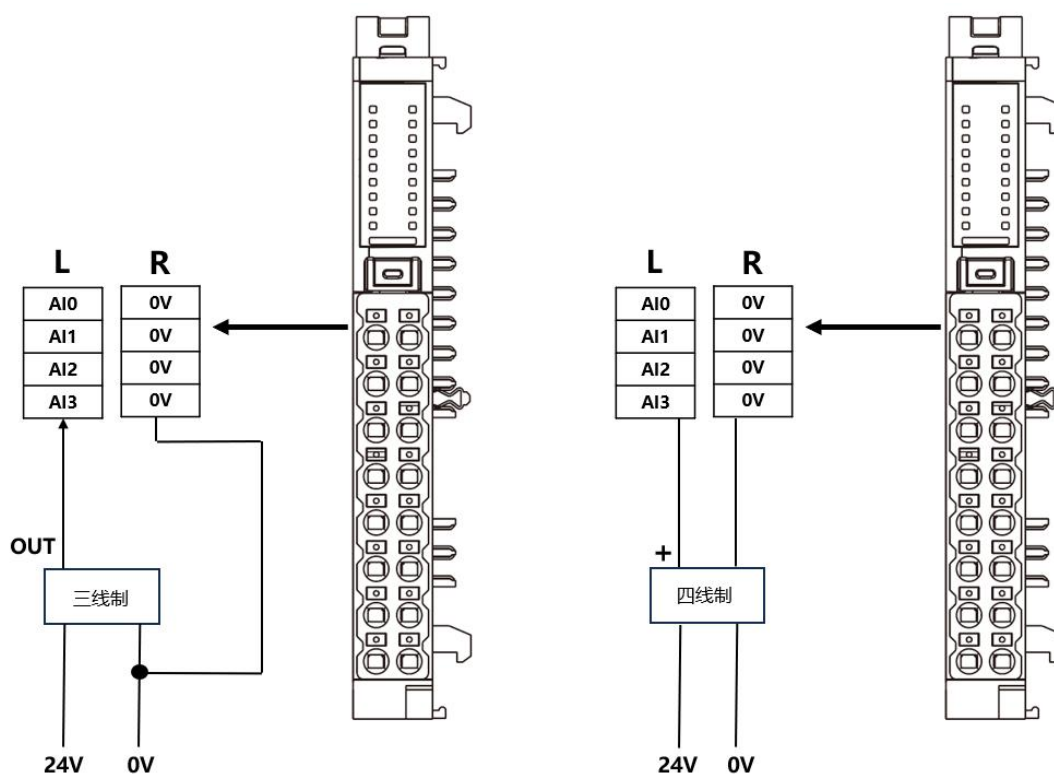
Notice

- RB Series analog input modules support 2/3/4-wire wiring

3.2.1 Analog Input (RB-4054/RB-4454/RB-4058/RB-4458)3-wire / 4-wire

Wiring Method

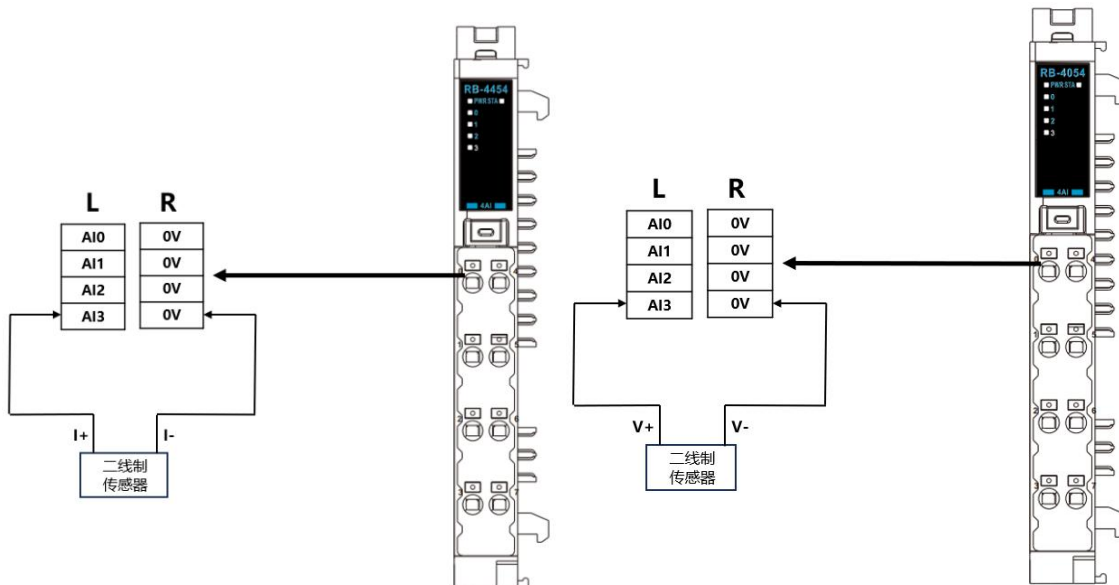
Note: The wiring method of 4 channels and 8 channels is the same



- RB-4054/RB-4058The module wiring diagram is shown in the figure.

- RB-4454/RB-4458The module wiring diagram is shown in the figure.

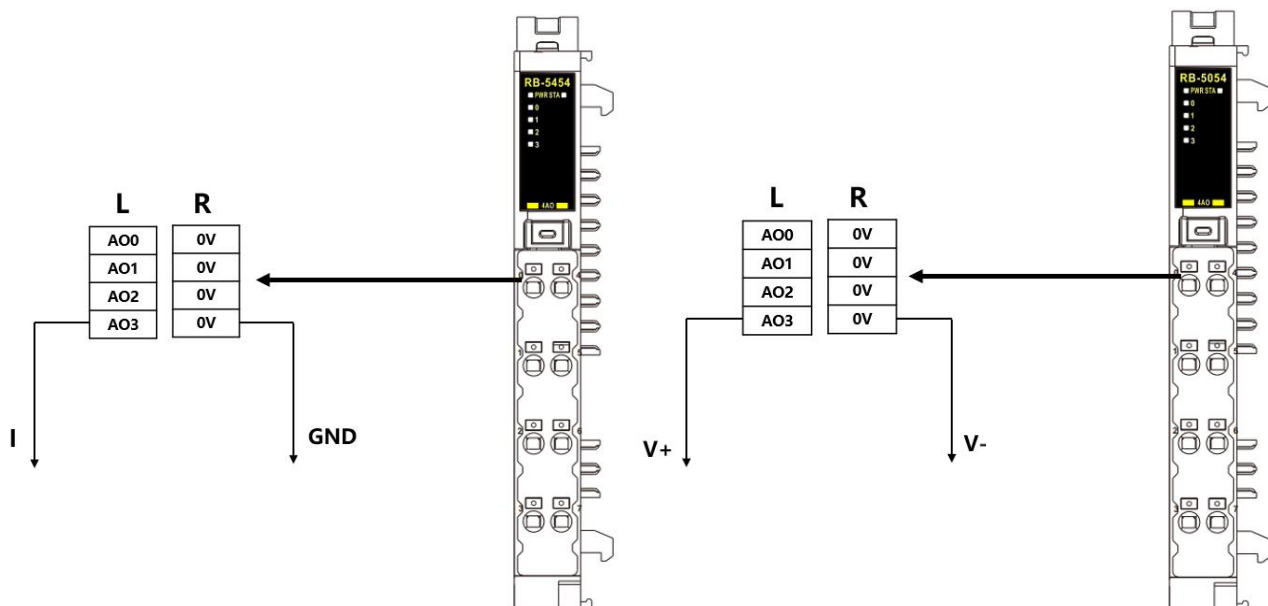
Note: The wiring method of 4 channels and 8 channels is the same



3.2.2 Analog output module wiring diagram

- The wiring diagram of the RB-5054 module is shown in the figure.
- The wiring diagram of the RB-5454 module is shown in the figure.

Note: The wiring method of 4 channels and 8 channels is the same



4. Module configuration information

4.1 How to change analog channel parameters

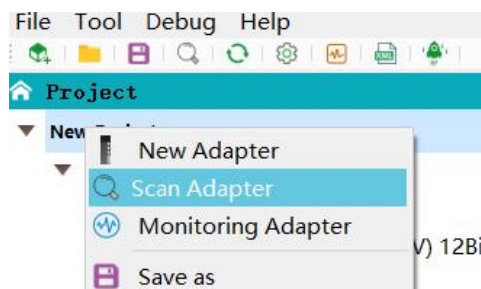
Open DECOWELL IOTesterTool software



Click on the selected area in the image below to create a new project.



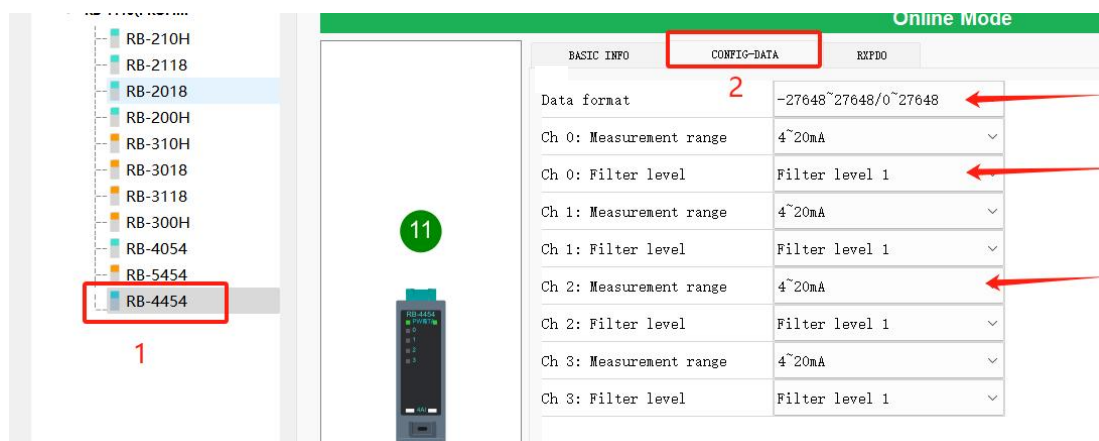
Right-click the created project and click Scan Adapter.



After selecting the communication mode, scan the module and add it to the project.

Click the module in the project column on the left, find the window "Config Data", you can modify the module parameters in it.

Analog input



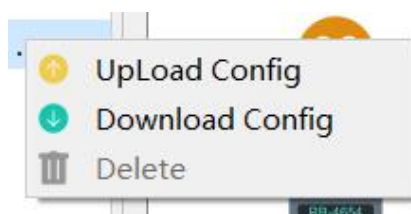
Analog output

The screenshot displays the software interface for configuring the RB Series I/O Modules. On the left, a list of modules is shown, with RB-5454 highlighted and circled in red, labeled with a red '1'. In the center, a physical module is shown with a green circle labeled '10' indicating its position. On the right, the 'CONFIG-DATA' tab is active, showing the configuration for the selected module. The 'Data format' is set to '2' and the range is '-27648~27648/0~27648', with a red arrow pointing to the dropdown. The 'Ch 0: Measurement range' is set to '4~20mA'. The 'Ch 0: Substitute value' is set to '0'. The 'Ch 1: Measurement range' is set to '4~20mA', with a red arrow pointing to the dropdown. The 'Ch 1: Substitute value' is set to '0'. The 'Ch 2: Measurement range' is set to '4~20mA'. The 'Ch 2: Substitute value' is set to '0', with a red arrow pointing to the dropdown. The 'Ch 3: Measurement range' is set to '4~20mA'. The 'Ch 3: Substitute value' is set to '0'.

BASIC INFO		CONFIG-DATA	TXPDO
Data format	2	-27648~27648/0~27648	
Ch 0: Measurement range		4~20mA	
Ch 0: Substitute value		0	
Ch 1: Measurement range		4~20mA	
Ch 1: Substitute value		0	
Ch 2: Measurement range		4~20mA	
Ch 2: Substitute value		0	
Ch 3: Measurement range		4~20mA	
Ch 3: Substitute value		0	

Note: Whether to enable the substitute value function needs to be set in the adapter

Right-click the module and click "Download Config" to download relevant configuration parameters to the module, which will take effect after power off and restart.





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