XB6-A20SG

Load Cell Module

User Manual

Nanjing Solidot Electronic Technology Co.

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1 Product Overview

1.1 Products

XB6-A20SG is a plug-in strain collection module, supporting strain sensors. It adopts X-bus bottom bus and adapts to XB6 series coupler module of our company. The module supports the functions of supplying bridge voltage switching and selecting bridge connection mode.

1.2 Product Characteristics

- Disconnection detection
  Each channel supports disconnection detection.
- Range mode
  Two modes of standard range and extended range can be set.
- Supply Bridge Voltage
  Supports selection of supply bridge voltage.
- Bridleway Connection Method
  Supports the selection of bridge connections.
- Small volume
  Compact and small footprint.
- Easy installation
  DIN 35 mm standard rail mounting
  Adopts bullet type terminals for easy and quick wiring.
- Easy diagnosis
  Innovative channel indicator design, close to the channel, at a glance, easy to detect and maintain.
- Easy configuration
  Simple configuration.

2 Product Parameter

2.1 Common parameter

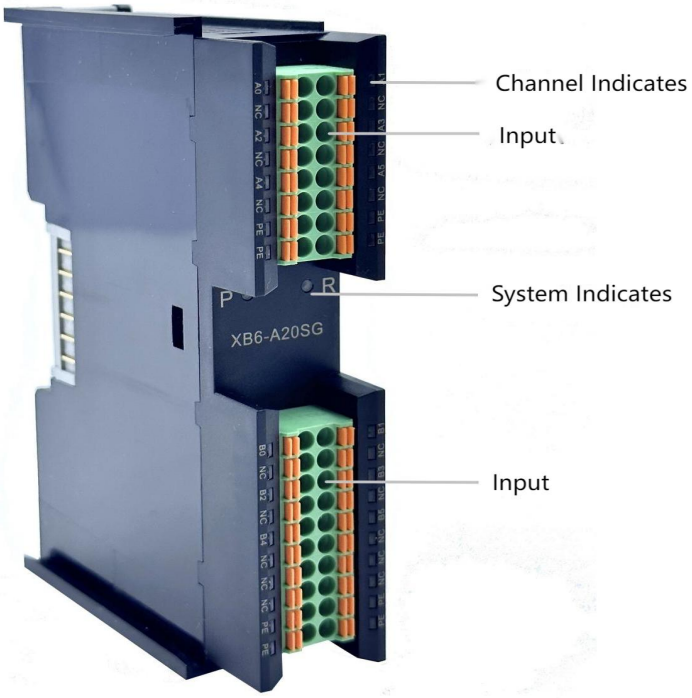
Interface parameter	
Product Model	XB6-A20SG
Bus protocol	X-bus
Process data volume: uplink	12 Bytes
Process data volume: downstream	4 Bytes
Station type	slaves
Power supply	5 VDC, powered via X-bus
Common parameter	
Size	106 x 73 x 25.7 mm
Weights	120 g
Operating temperature	-10℃~+60℃
Storage temperature	-20℃~+75℃
Relative humidity	95%, non-condensing
Protection class	IP20

Technical parameters	
Channel number	2
Sensor type	Full-bridge 4-wire/6-wire sensors, half-bridge 3-wire/5-wire sensors
Connection method	Full bridge 4-wire/6-wire, half bridge 3-wire/5-wire
Supply Bridge Voltage	2v /2.5v /3v /3.5v /4v /4.5v /5v
Conversion speed	5ms
Output speed	1ms
Input range	Full bridge: ±32mV/V Half bridge: ±16mV/V
Range mode	Standard range mode, extended range mode
Input Filtering	configurable
Disconnection detection	adjuvant
Precision Requirements	0.4 per cent
Channel Disable	adjuvant
Channel independence	adjuvant
Zero Compensation	Half-bridge zero compensation (16-bit compensation)
Channel indicator	Green LED light
top and bottom overflow function	adjuvant

3 Kneading board

3.1 Modular structure

Name of each part of the product



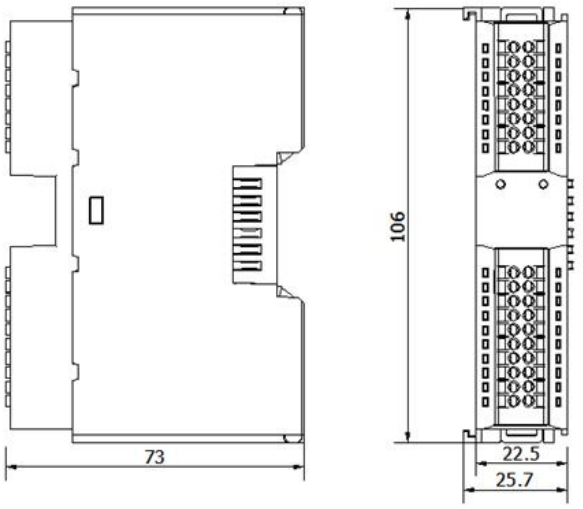
3.2 Indicator light function

Markings	Colour	State of affairs	Descriptions
P	Green	ever-bright	Power supply normal
		go out (of fire)	The product is not powered up or the power supply is abnormal
R	Green	ever-bright	The system is functioning normally
		Flashing 1 Hz	I/O modules connected, X-bus system ready for interaction
		go out (of fire)	Device is not powered up, X-bus is not interacting with data or is abnormal
Channel indicator	Green	Ever Bright	Channel is enabled and sensor is normally connected
		vague (of speech)	Channel enable, sensor not properly connected; sensor input signal over range
		go out (of fire)	channel lock

4 Installation and dismantling

4.1 Overall dimensions

Outline specifications (unit mm)



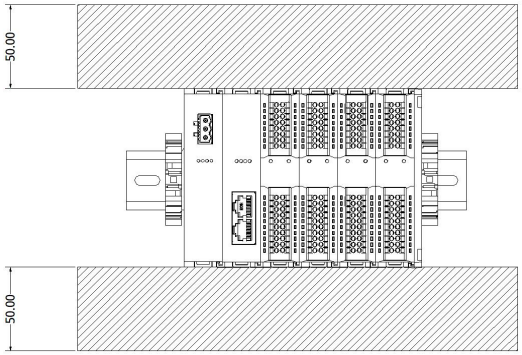
4.2 Installation Guide

Precautions for installation\dismantling

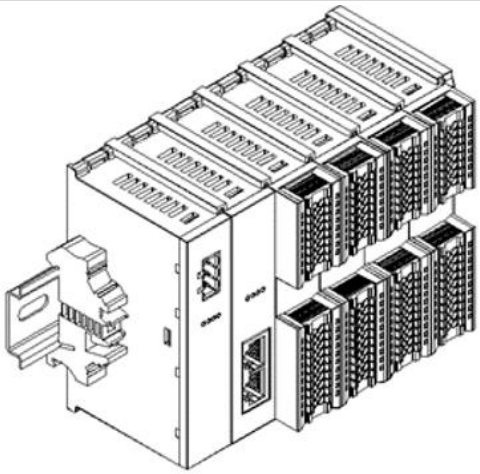
- Ensure that the cabinet is well ventilated (e.g., the cabinet is fitted with an exhaust fan).
- Do not install the unit next to or above equipment that may cause overheating.
- Be sure to install the module vertically and maintain air circulation around it (at least 50 mm air circulation space above and below the module).
- Once the module is installed, be sure to secure the module by installing rail mounts on both ends.

- Be sure to disconnect the power supply when installing/disassembling.

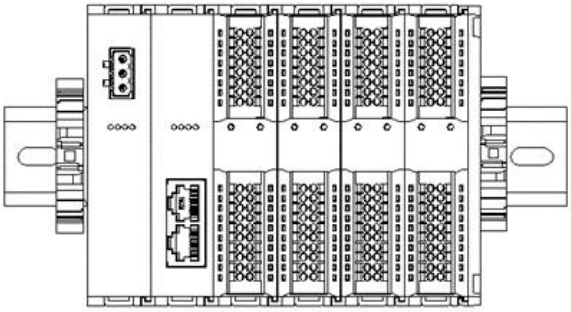
Minimum clearance for module mounting (≥50mm)



Ensure that the module is mounted vertically



Be sure to install the rail fixings

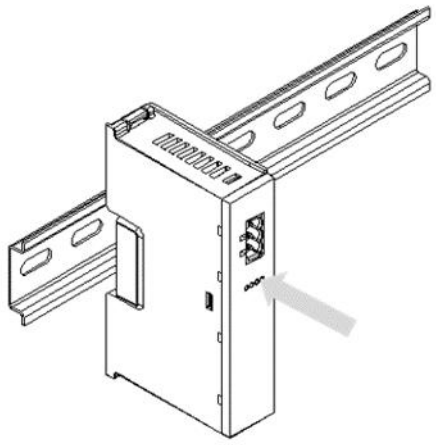


4.3 Installation and dismantling steps

Module Installation and Removal	
Module Installation Procedure	1. Install the power supply module on the fixed rail first.
	2. Install the coupler and the required I/O modules in turn to the right of the power supply module.
	3. After installing all required I/O modules, install the end caps to complete the module assembly.
	4. Install the rail fixings at both ends of the power module and end cap to fix the module.
Module disassembly procedure	1. Loosen the rail fixings at both ends of the module.
	2. Use a one screwdriver to pry off the module snap.
	3. Pull out the disassembled module.

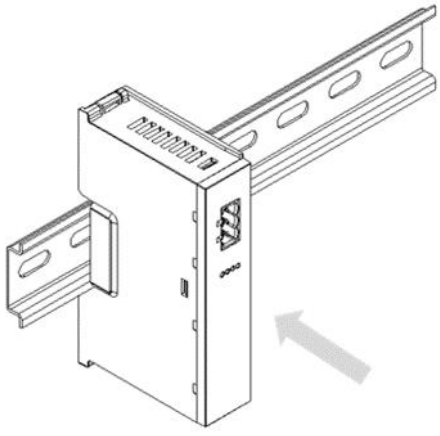
4.4 Installation Diagram

Power Module Installation	**move**



Align the power module rail slots, as shown in Figure ① on the left, vertically to the rails.

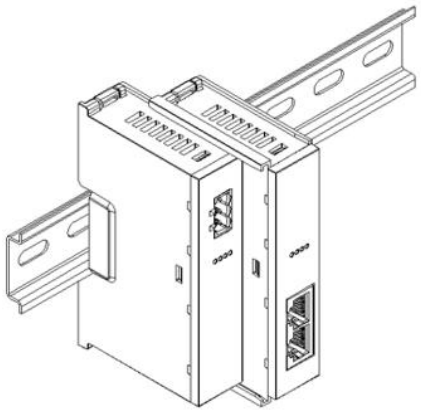
①



As shown in Figure 2 on the left, press the power module firmly, and the module will be installed in place when you hear a "click" sound.

②

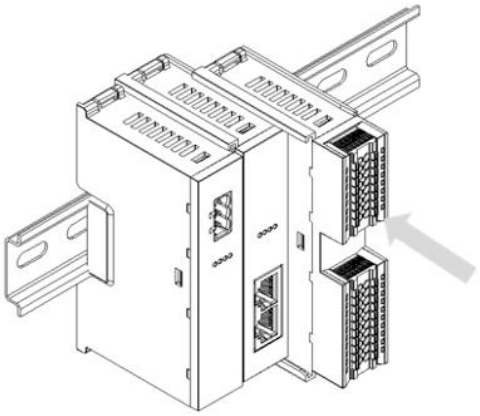
Coupler Module Installation **move**



Align the left slot of the coupler module with the right side of the power supply module and push it in as shown in figure ③ on the left. Press the coupler module firmly and the module will click into place.

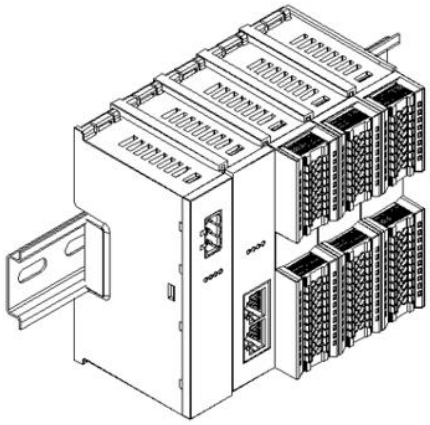
(iii)

I/O Module Installation **move**



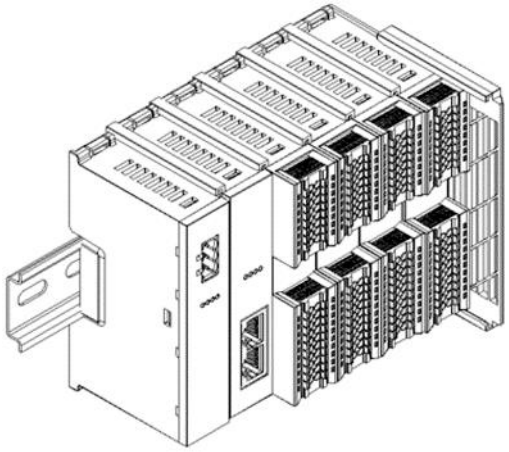
Install the required I/O modules one by one as shown in Figures ④ and ⑤ on the left, following the procedure of installing the coupler module in the previous step.

④



⑤

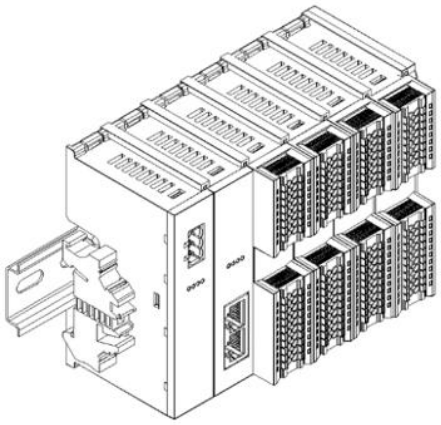
End cap retrofit **move**



Install the end cap on the right side of the last module as shown in Figure 6 on the left, and refer to the installation method of the coupler module.

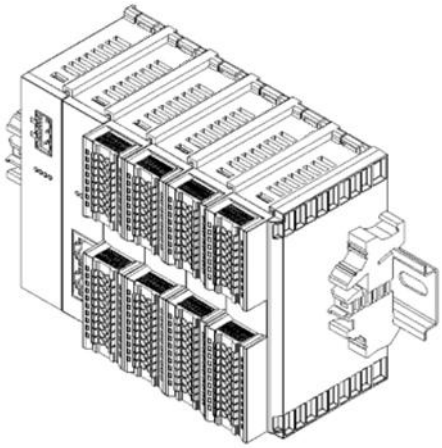
(vi)

Retrofitting of guide rail fixings **move**



Install and lock the rail retainer firmly against the left side face of the coupler as shown in Figure 7 on the left.

(vii)

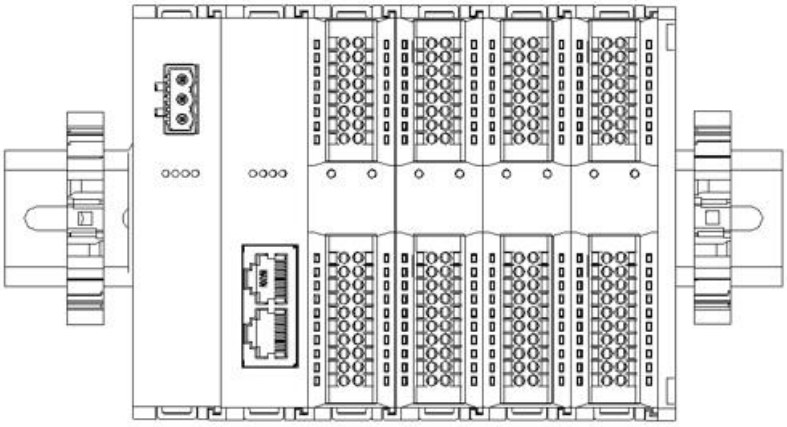


Install the rail fixing on the right side of the end cap, first push the rail fixing firmly in the direction of the coupler to ensure that the module is mounted tightly, and lock the rail fixing with a screwdriver, as shown in Figure 8 on the left.

⑧

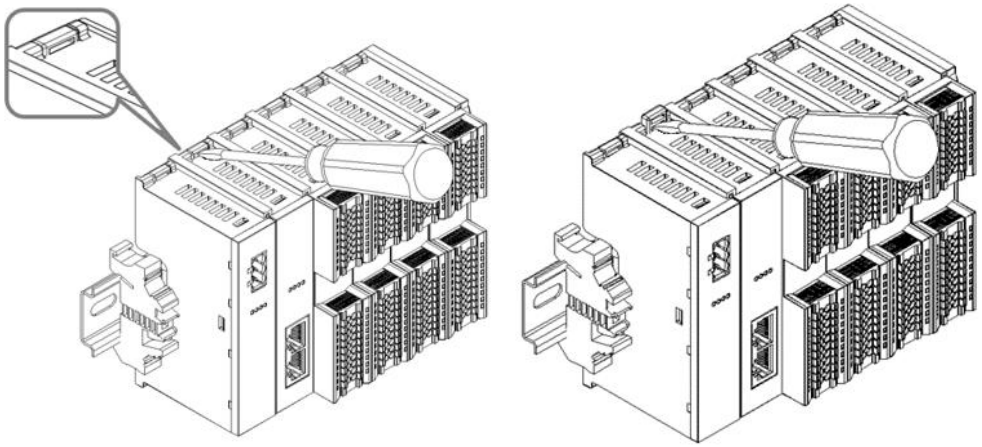
dismantle

move



⑨

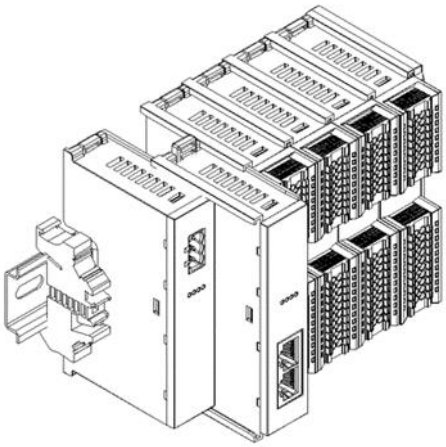
Loosen the rail fixing at one end of the module with a screwdriver and move it to one side, making sure that there is a gap between the module and the rail fixing, as shown in Figure 9 on the left.



⑪ ⑩

Insert a flat head start into the snap of the module to be removed and apply force (hear a rattle) in the direction of the module sideways, as shown in Figures ⑩ and ⑪ on the left.

Note: Each module has one snap at the top and bottom, all operate in this way.

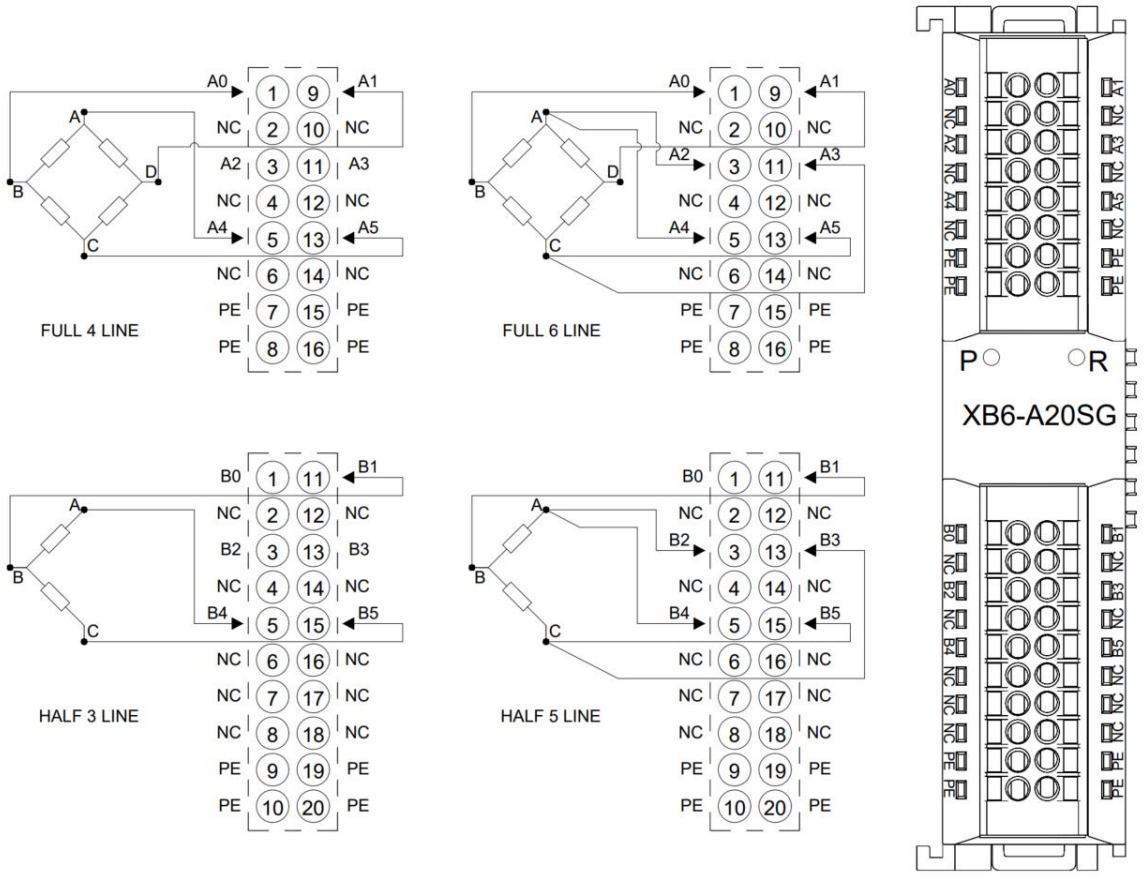


⑫

Remove the module as shown in Figure ⑫ on the left, following the reverse operation of installing the module.

5 Connect a wire

5.1 Wiring Diagram



5.2 Wiring Terminal Definitions

Full Bridge Input					
Terminal Serial Number	**Terminal identification**	**Instructions**	**Terminal Serial Number**	**Terminal identification**	**Instructions**
1	A0	Channel 0 bridge arm voltage +	9	A1	Channel 0 bridge arm voltage -
2	NC	empty terminal	10	NC	empty terminal
3	A2	Channel 0 for bridge compensation+	11	A3	Channel 0 for bridge compensation -
4	NC	empty terminal	12	NC	empty terminal
5	A4	Channel 0 for bridge output voltage +	13	A5	Channel 0 supply bridge output voltage -
6	NC	empty terminal	14	NC	empty terminal
7	PE	Power supply PE	15	PE	Power supply PE
8	PE	Power supply PE	16	PE	Power supply PE
Half Bridge Input					
Terminal Serial Number	**terminal identification**	**instructions**	**Terminal Serial Number**	**terminal identification**	**instructions**
1	B0	Channel 1 bridge arm voltage +	11	B1	Channel 1 bridge arm voltage -
2	NC	empty terminal	12	NC	empty terminal
3	B2	Channel 1 for bridge compensation+	13	B3	Channel 1 for bridge compensation -
4	NC	empty terminal	14	NC	empty terminal
5	B4	Channel 1 supply bridge output voltage +	15	B5	Channel 1 supply bridge output voltage -
6	NC	empty terminal	16	NC	empty terminal
7	NC	empty terminal	17	NC	empty terminal
8	NC	empty terminal	18	NC	empty terminal
9	PE	Power supply PE	19	PE	Power supply PE
10	PE	Power supply PE	20	PE	Power supply PE

6 Make use of

6.1 Parameter setting and function

There are a total of 8 parameters for module configuration, 4 configuration parameters are the same and can be set independently, take channel 0 as an example to introduce the configuration parameters, as shown in the table below.

functionality	parameter name	range of values	default value
Bridge connection options	Bridge Type 0	0: OFF	0
		1: FULL_4LINE	
		2: FULL_6LINE	
		3: HALF_3LINE	
		4: HALF_5LINE	
Bridge voltage selection	Voltage Type 0	0: 5V	0
		1: 4.5V	
		2: 4V	
		3: 3.5V	
		4:3V	
		5: 2.5V	
		6:2V	
Input Filtering	Filter Level 0	0: NO	0
		1: Software Filter Level 1	
		2: Software Filter Level 2	
		3: Software Filter Level 3	
		4: Software Filter Level 4	
		5: Software Filter Level 5	
		6: Hardware Filter Level 1	
		7: Hardware Filter Level 2	
		8: Hardware Filter Level 3	

		9: Hardware Filter Level 4	
		10: Hardware Filter Level 5	
Mode switching	Range Mode 0	0: Extended Range Mode	0
		1: Legacy Range Mode	

6.1.1 Bridge connection options

The module supports the selection of bridge connection methods, which are full 4-wire, full 6-wire, half 3-wire and half 5-wire.

Note: Wiring requires a shielded wire and grounding in an appropriate manner.

6.1.2 Voltage Selection

The module supports the selection of supply bridge voltage, the supply bridge voltage has 2V, 2.5V, 3V, 3.5V, 4V, 4.5V, 5V, the default voltage is 5V.

6.1.3 Input Filtering

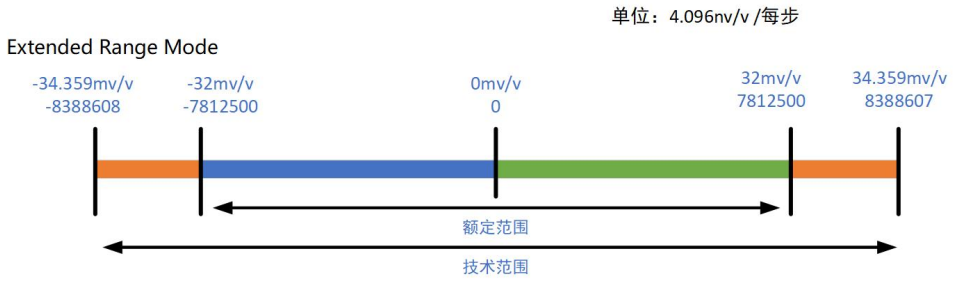
The module supports the selection of input filtering, and the input filtering has five levels of software filtering and five levels of hardware filtering.

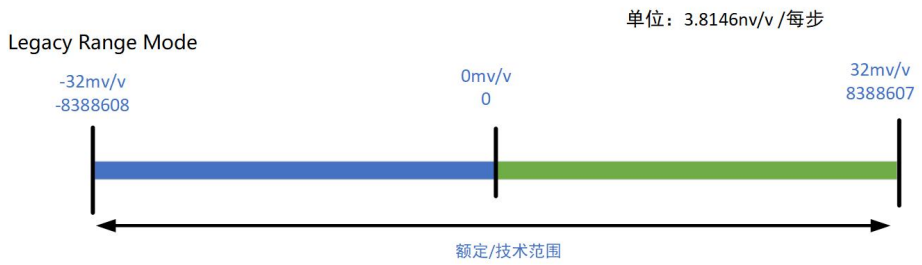
6.1.4 Mode switching

The module supports two range modes, Legacy Range Mode and Extended Range Mode, with the default mode being Extended Range Mode.

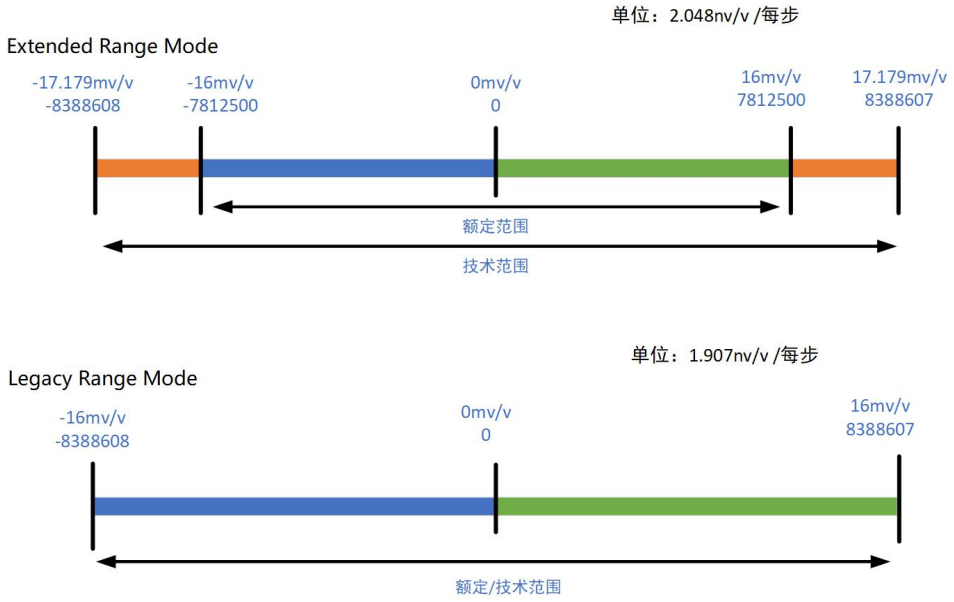
In extended range mode, the range exceeds the rated range and the channel indicator flashes in alarm.

The full bridge 4-wire/6-wire connection measurement range is shown below:





The half bridge 3-wire/5-wire connection measurement range is shown below:



6.2 Upstream and downstream process data and functions

6.2.1 uplink data

Uplink data 12 bytes				
name (of a thing)	**hidden meaning**	**range of values**	**data type**	**lengths**
Channel 0	Channel 0 strain acquisition value	-2^31~2^31-1	Signed32	4 bytes
Warning 0	Channel 0 Alarm	0~100	Signed16	2 bytes
Channel 1	Channel 1 strain acquisition value	-2^31~2^31-1	Signed32	4 bytes
Warning 1	Channel 1 Alarm	0~100	Signed16	2 bytes

Data description:

- **Strain pickup value Channel [n]**
  When the input channel has a strain force input, it can be sampled and analysed to derive a strain force acquisition value.

- **Warning [n]**
  When the strain force is adjusted to the maximum (negative polarity) and the channel overflows, the upstream data channel value displays 8388607, and the number of acquisition times is cumulative, with an upper limit of 100 times; when the strain force is adjusted to the maximum (positive polarity) and the channel underflows, the upstream data channel value displays -8388608, and the number of acquisition times is cumulative, with an upper limit of 100 times.

6.2.2 downlink data

Downlink data 4 bytes				
name (of a thing)	**hidden meaning**	**range of values**	**data type**	**lengths**
Error 0	Channel 0 strain calibration value	-2^15~2^15-1	Signed16	2 bytes
Error 1	Channel 1 strain calibration value	-2^15~2^15-1	Signed16	2 bytes

Data description:

- **Strain calibration value Error [n]**
  Setting the strain calibration value is a manual compensation function for each channel data, you can input the data compensation value in Error according to the actual need. After setting the

compensation value, the compensated strain acquisition value will be calculated automatically in the uplink data, i.e. the uplink data is the final compensated strain acquisition value.

6.3 Module Configuration Description

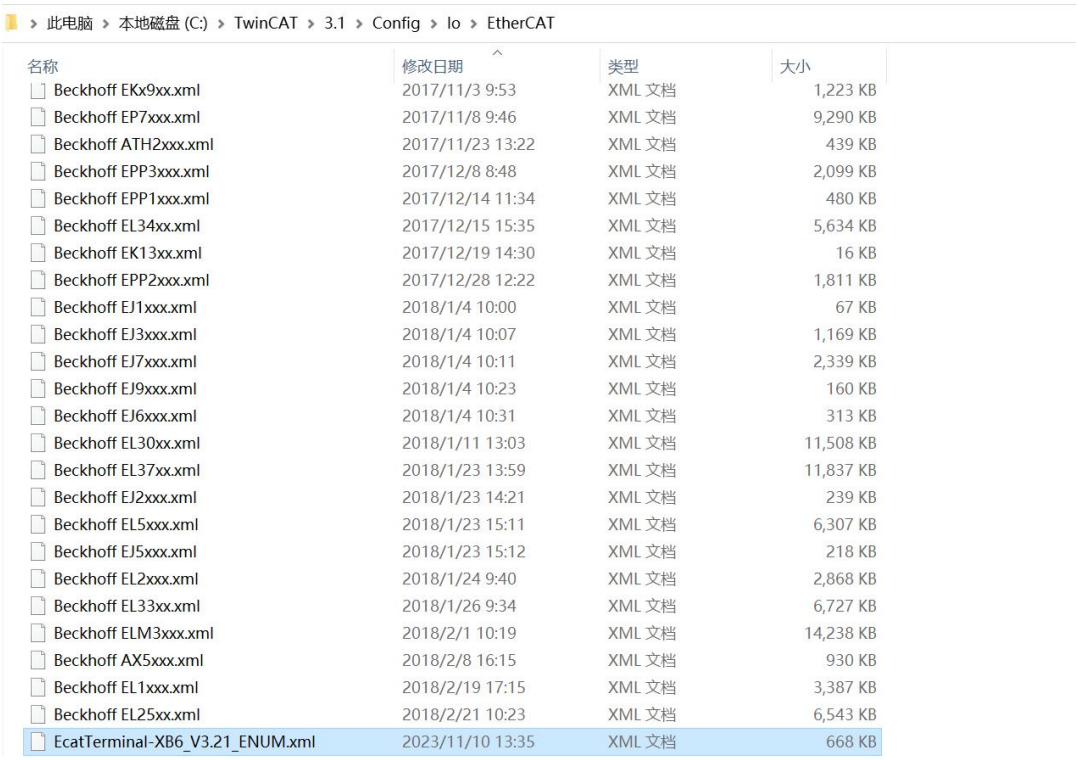
6.3.1 Application in TwinCAT3 software environment

1、 preliminary

- **hardware environment**
  - **Module Model XB6-A20SG**
  - **Power Module, EtherCAT Coupler, Cover End**
    This description takes the XB6-P2000H power supply, XB6-EC0002 coupler as an example
  - **A computer with pre-installed TwinCAT3 software**
  - **Shielded cables for EtherCAT**
  - **Analogue strain calibrator**
  - **One switching power supply**
  - **Module mounting rails and rail fixings**
  - **Device Configuration File**
    Configuration file access: https://www.solidotech.com/documents/configfile
- **Hardware configuration and wiring**
  Follow "4 Mounting and dismounting" and "5 Wiring".

2、 Preset Profiles

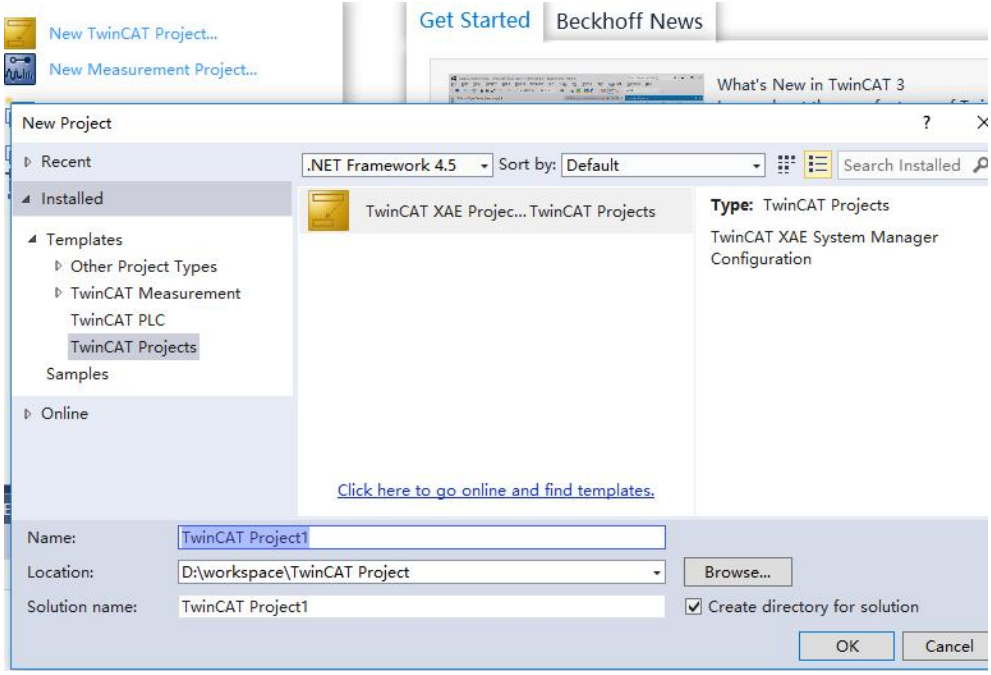
Place the ESI configuration file (EcatTerminal-XB6_V3.21_ENUM.xml) in the TwinCAT installation directory under "C:\TwinCAT\3.1\Config\Io\EtherCAT" as shown below.



3、Create Project

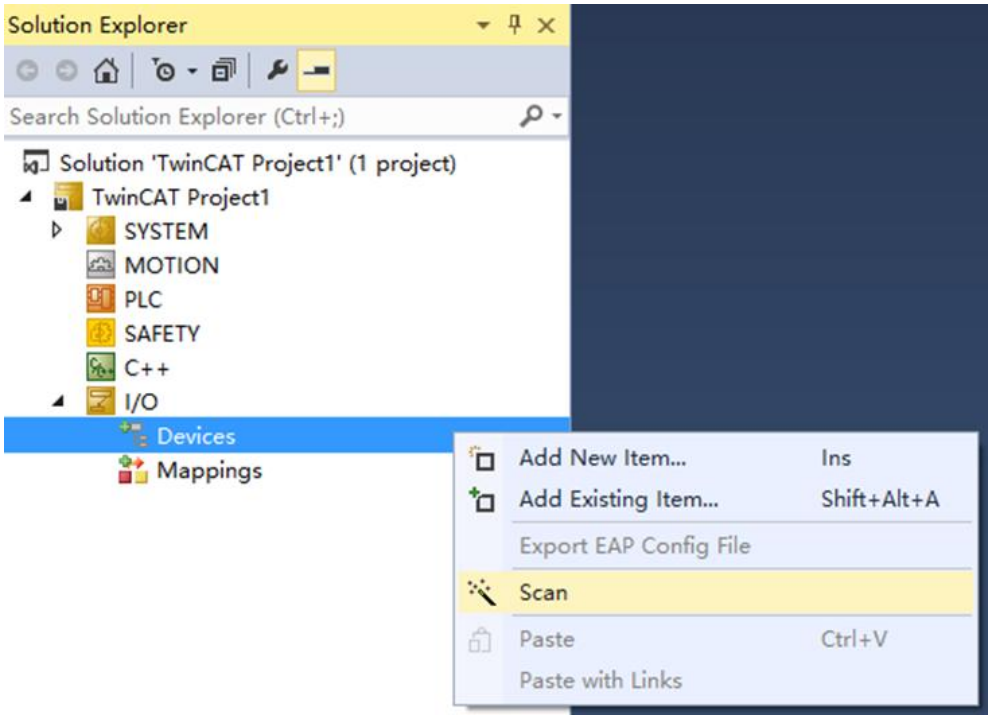
a. Click the TwinCAT icon in the lower right corner of the desktop and select "TwinCAT XAE (VS xxxx)" to open the TwinCAT software as shown below.

b. Click "New TwinCAT Project", in the pop-up window, "Name" and "Solution name" correspond to the project name and solution name respectively. In the pop-up window, "Name" and "Solution name" correspond to the project name and solution name respectively, and "Location" corresponds to the project path, you can choose the default for these three items, and then click "OK", the project is created successfully, as shown in the following figure.

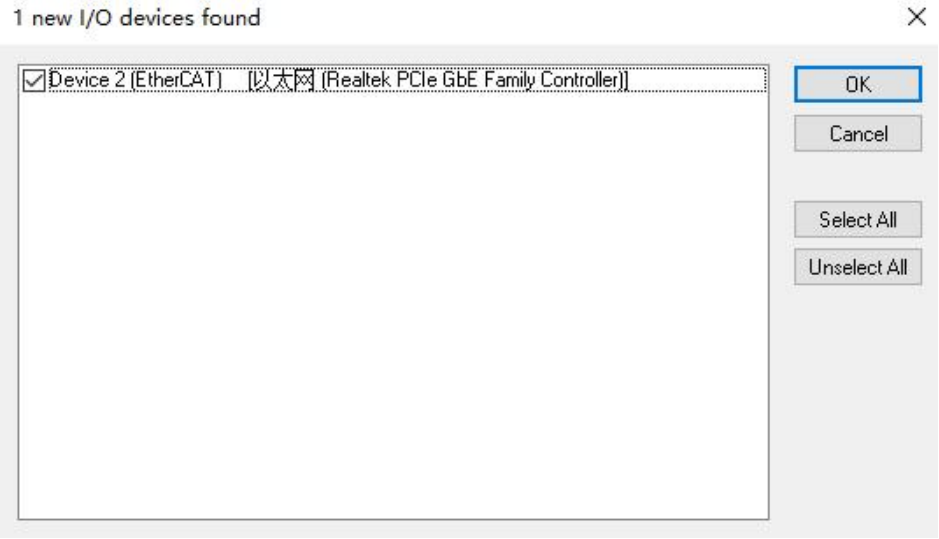


4、scanning device

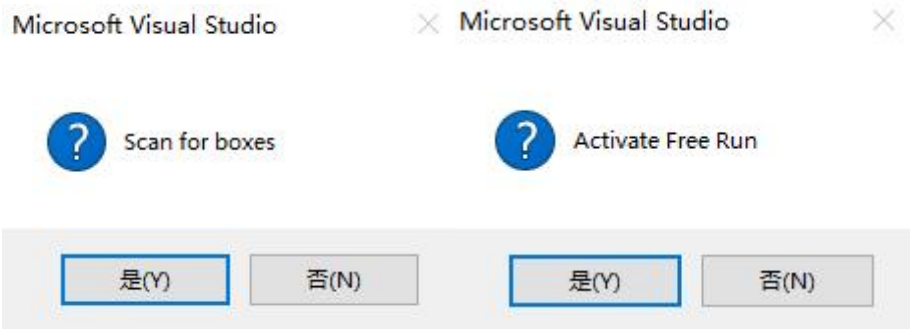
a. After creating the project, right-click on the "Scan" option under "I/O -> Devices" to perform a slave device scan, as shown in the following figure.



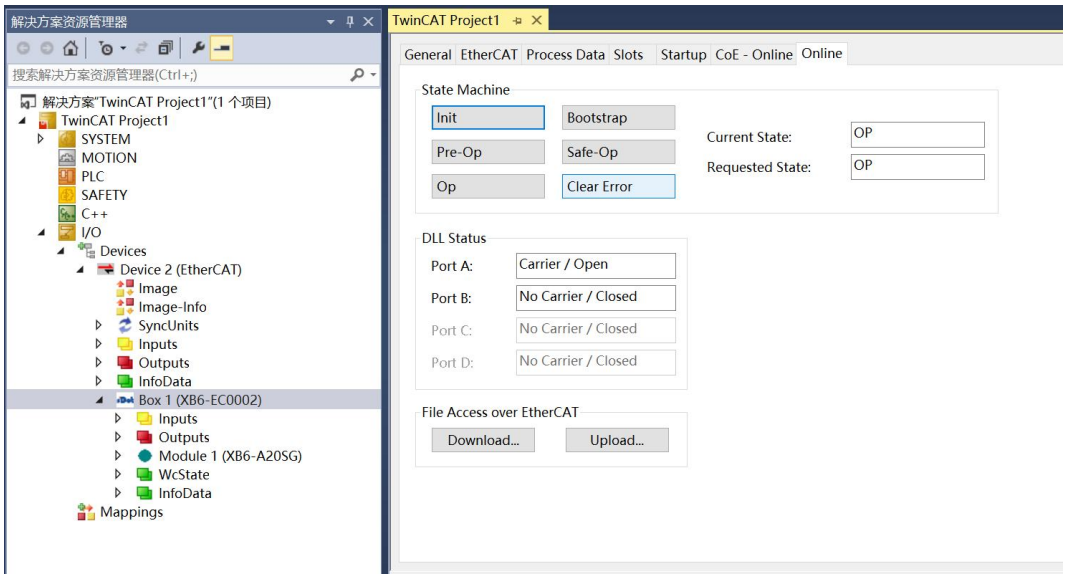
b. Tick the "Local Connections" tab as shown below.



c. Click on the pop-up window "Scan for boxes" and select "Yes"; click on the pop-up window "Activate Free Run" and select "Yes", as shown in the figure below. "Yes", as shown in the figure below.

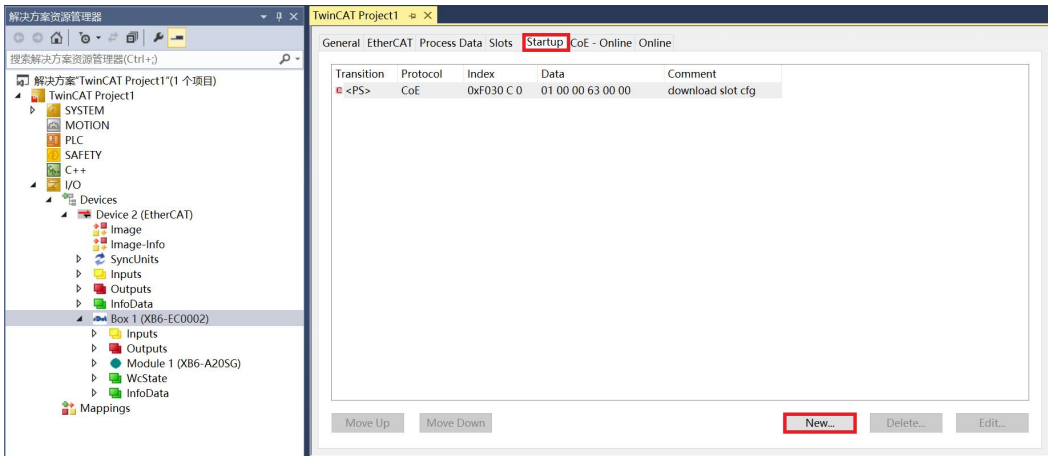


d. After scanning to the device, you can see Box1 (XB6-EC0002) and Module1 (XB6-A20SG) in the left navigation tree, and you can see TwinCAT is in the "OP" state at "Online". At "Online", you can see that TwinCAT is in the "OP" state, and you can observe that the RUN lamp of the slave device is always on, as shown in the figure below.

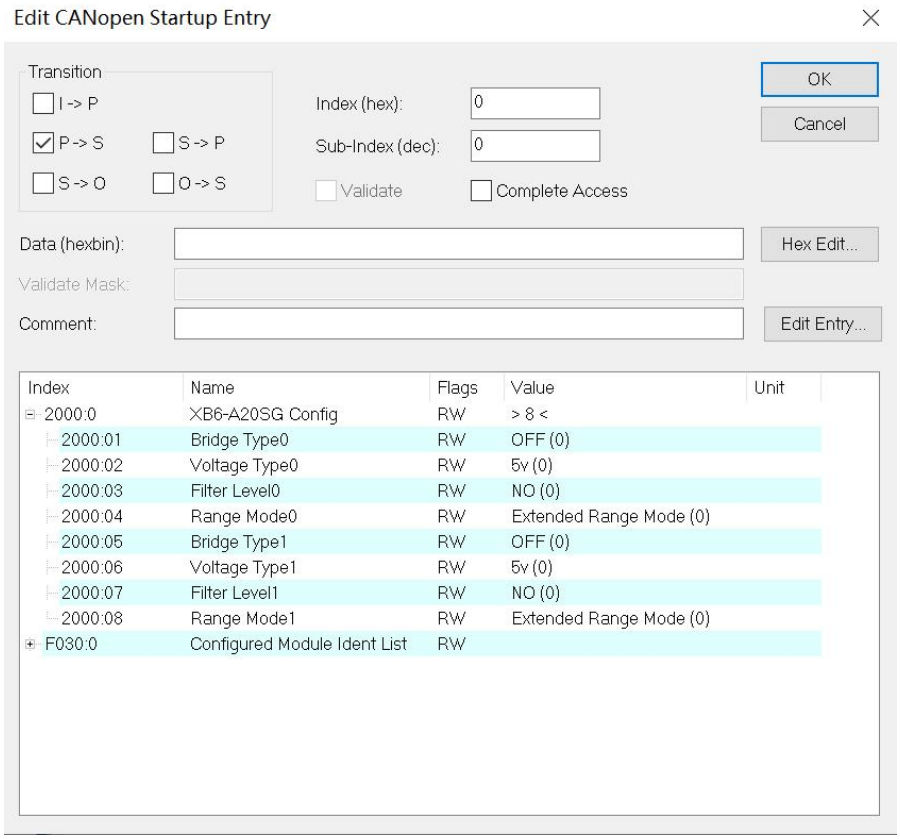


5、 Parameter Configuration

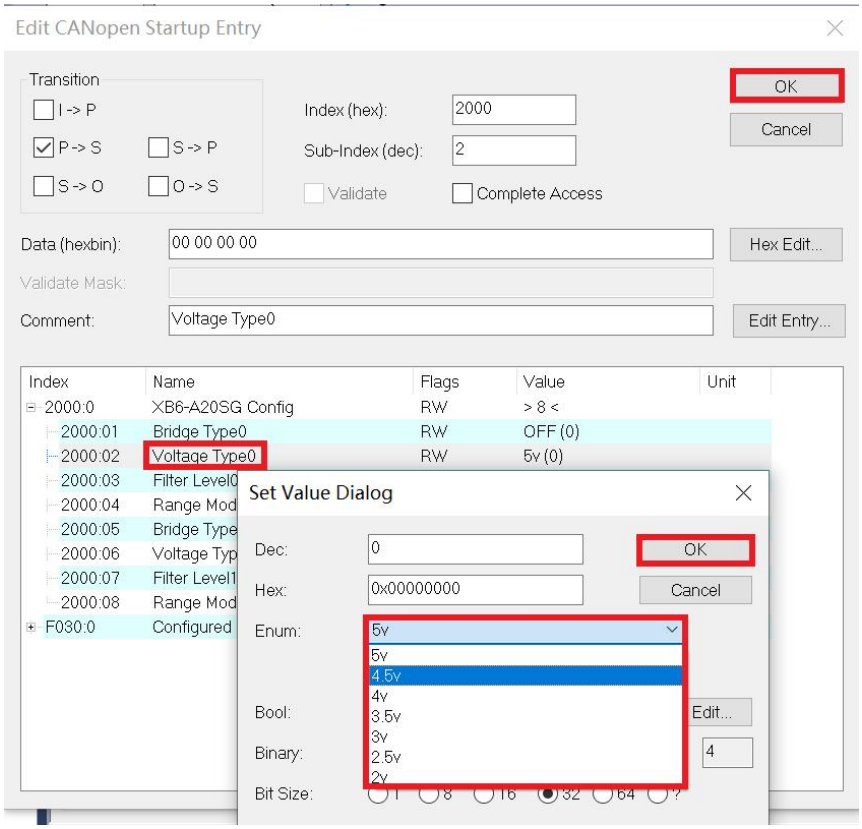
a. Click "Box1 -> Startup -> New" in the left navigation tree to enter the configuration parameter editing page, as shown in the following figure.



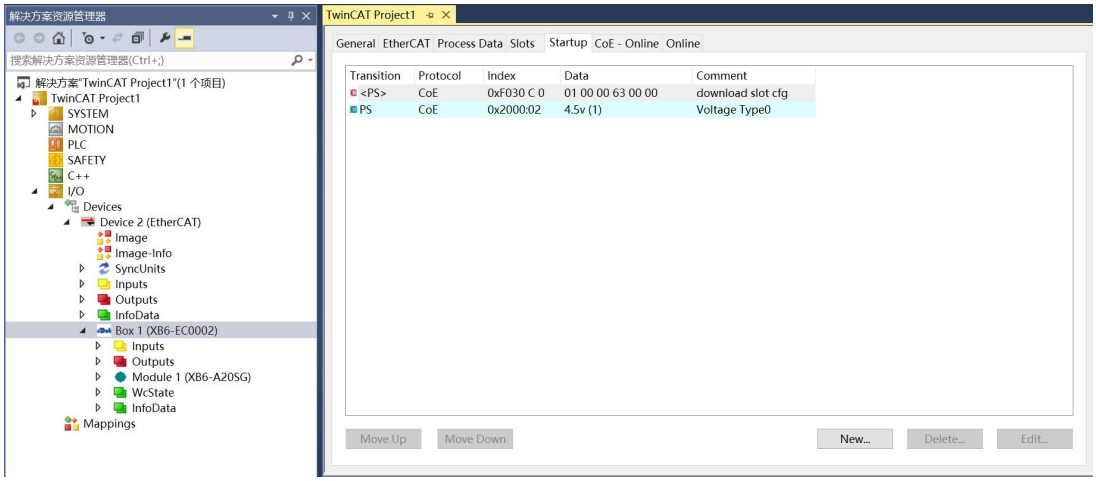
b. In the Edit CANopen Startup Entry pop-up window, click the "+" in front of Index 2000:0 to expand the Configuration Parameters menu, you can see 8 configuration parameters, click on the parameters, you can set the relevant configuration, as shown in the following figure.



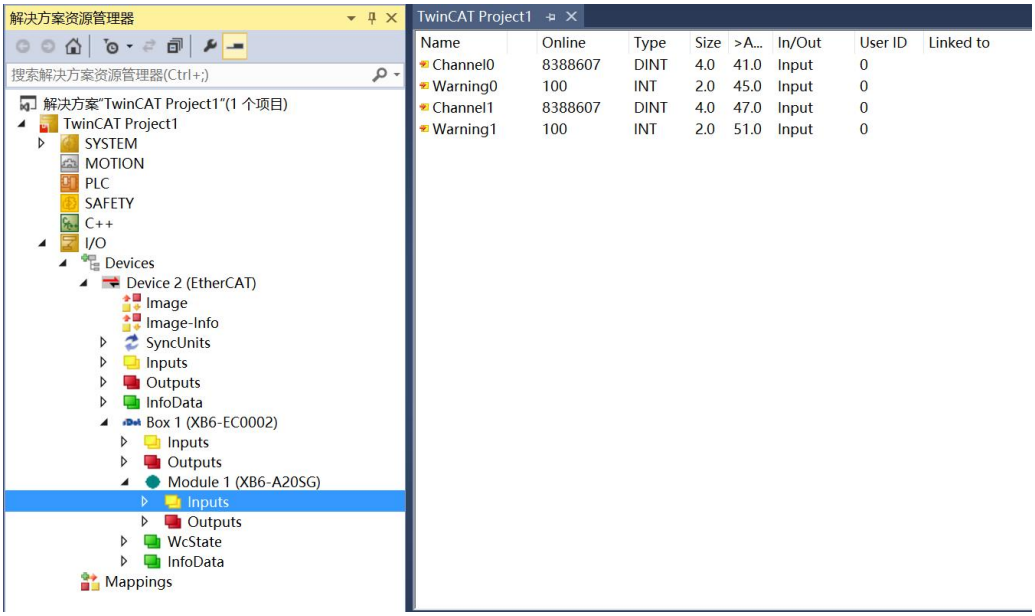
c. For example, to modify the bridge voltage of channel 0, you can double-click "Voltage Type" and modify the parameter value in the drop-down box, as shown in the figure below.



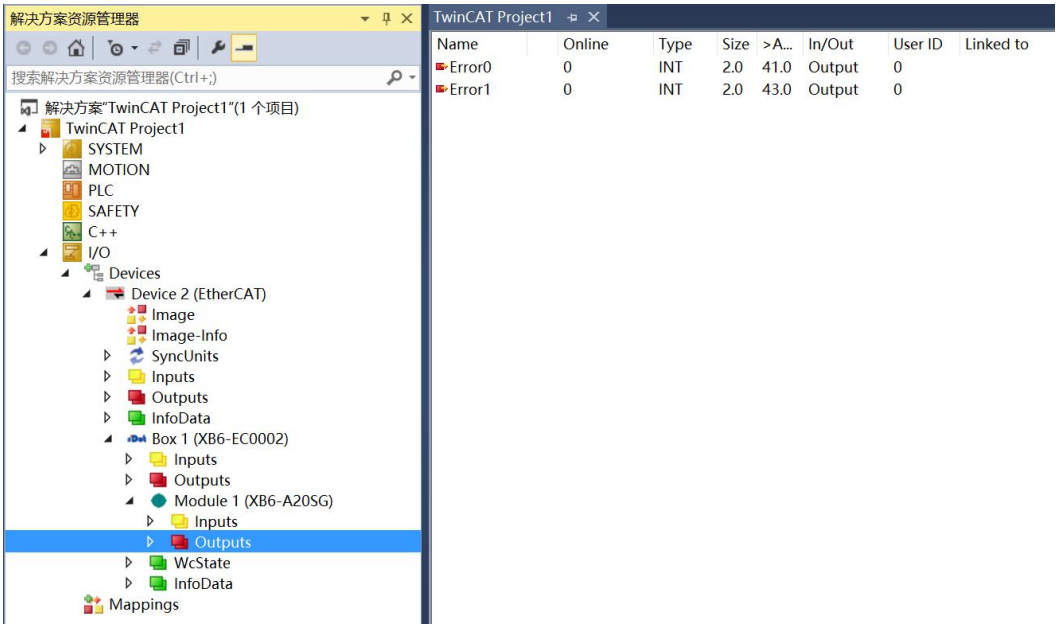
d. After the parameter modification is completed, you can see the modified parameter items and parameter values under Startup, as shown in the following figure. After the parameter setting is completed, it is necessary to carry out Reload operation and re-power up the module to realise that the master station automatically sends down the parameter settings.



e. The left navigation tree "Module 1 -> Inputs" displays the upstream data of the module, which is used to monitor the status of the module, as shown in the figure below.



f. The left navigation tree "Module 1 -> Outputs" displays the downstream data of the module. is used to control the output state of the module as shown in the following figure.



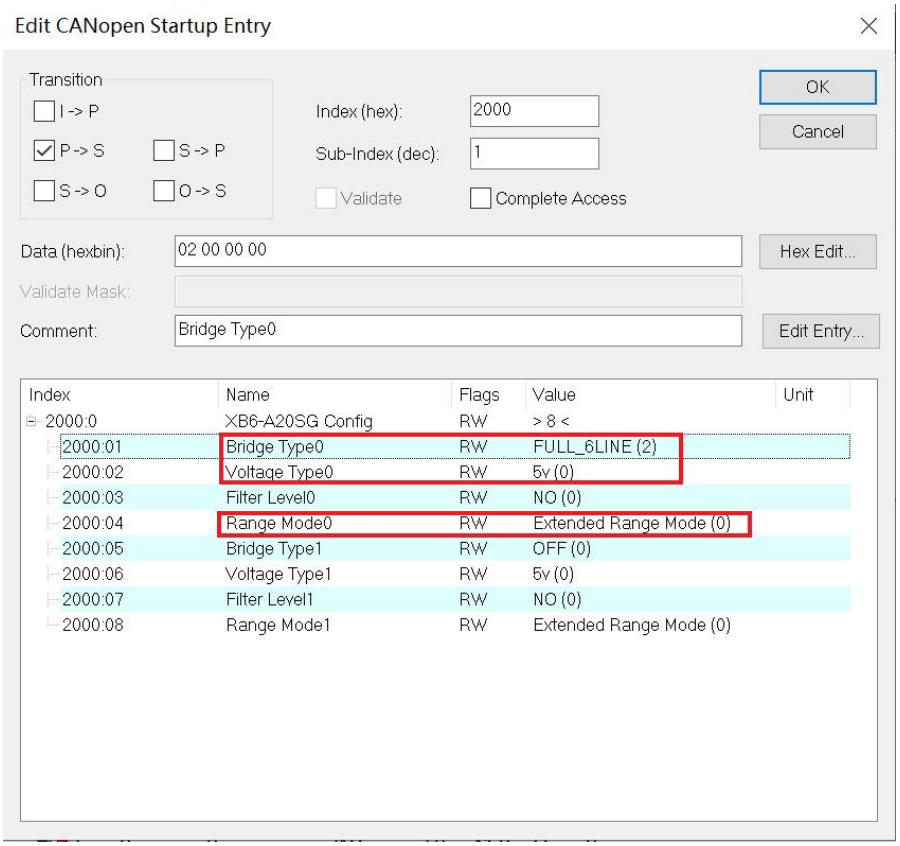
6、Verify Basic Functions

a. Configure the configuration parameters as shown below.

a) The Channel 0 bridge connection method is set to full bridge 6-wire, i.e. Bridge Type0 is set to FULL_6LINE;

b) Channel 0 supply bridge voltage is set to 5V, i.e. Voltage Type0 is set to 5;

c) Channel 0 mode is set to Extended Range Mode, i.e. Range Mode0 is set to Extended Range Mode;



b. Given the input channel strain, you can see that the channel 0 strain acquisition value is 4866930, as shown below.