EtherCAT
XB6 Series Slice I/O

User Manual

Nanjing Solidot Electronic Technology Co., Ltd.

Copyright © 2018 Nanjing Solidot Electronic Technology Co., Ltd. All rights reserved.
Without written permission of our company, no organization or individual may extract, copy or transmit part or all of this document.

Trademark notice

and other Solidot trademarks are all trademarks of Nanjing Solidot Electronic Technology Co., Ltd. All other trademarks or registered trademarks referred to in this document belong to their respective owners.

Note

The products, services or features you purchase shall be subject to the commercial contracts and terms of Solidot. All or part of the products, services or features given in this document may not be within the scope of your purchase or use. Unless otherwise agreed in the contracts, Solidot does not make any express or implied statement or warranty for the content of this document

Due to product version upgrading or other reasons, the content of this document is subject to changes from time to time. Unless otherwise agreed, this document shall be only used as reference. None of the statements, information and suggestions in this document shall constitute any express or implied warranty.

Nanjing Solidot Electronic Technology Co., Ltd.
Address: Angying Building , No. 91 Shengli Road, Jiangning Zone, Nanjing, Jiangsu
Postal code: 210038
Telephone: 4007788929
Website: http://www.solidotech.com

Table of Contents

1 Product Features 3
1.1 Product overview 3
1.2 Product features 3
2 Designation Rules 4
2.1 Designation rules 4
2.1.1 Coupler designation rules 4
2.1.2 I/O module designation rules 5
2.2 List of common modules 5
3 Product Parameters 7
3.1 General parameters 7
3.2 Power parameters 7
3.3 Interface parameters 7
3.4 Digital parameters 8
3.5 Analog parameters 8
3.5.1 Technical parameters 8
3.5.2 Voltage I/O range selection and code value table 10
3.5.3 Current I/O range selection and code value table 11
3.6 Common terminal expansion module parameters 12
4 Panel 13
4.1 Coupler panel 13
4.2 I/O module panel 14
5 Installation and Disassembly 16
5.1 Installation instructions 16
5.2 Application configuration 17
5.3 Installation and disassembly steps 18
5.4 Installation schematic diagrams 18
5.4 Dimensions 22
6 Wiring 25
6.1 Wiring terminal 25
6.2 Wiring instructions and requirements 25

Copyright © 2018 Nanjing Solidot Electronic Technology Co., Ltd.

6.3 I/O module wiring diagrams 29
6.4 Common terminal expansion module wiring diagrams 38
7 Operation 41
7.1 Module application 41
7.1.1 Application modes 41
7.1.2 Number of power modules configured and power consumption calculation 42
7.2 Coupler functional description 42
7.3 Module parameter configuration function 45
7.3.1 Filtering time of digital inputs 45
7.3.2 Analog filtering configuration function 45
7.3.2 Output clearing and holding function 46
7.3.4 Analog range selection 48
7.4 Bus module configuration description 49
7.4.1 Application in TwinCAT3 software environment 49
7.4.2 Application in Sysmac Studio software environment 54
7.4.3 Application in CODESYS V3.5 software environment 62

Copyright © 2018 Nanjing Solidot Electronic Technology Co., Ltd.

1 Product Features

1.1 Product overview

XB6 series slice I/O modules feature a combination of couplers and I/O modules. The couplers connect extendable I/O modules to a real-time industrial Ethernet system. The I/O modules communication backplane is equipped with X-bus with high real-time performance and a variety of modules. It helps users collect high-speed data, optimize system configuration, simplify field wiring, and improve system reliability.

1.2 Product features

Fewer nodes required

A node consists of a bus coupler, 1~32 X-bus series I/O modules and an end cover.

Flexible configuration

Multiple types of slice I/O modules are offered for free combination.

Diverse functional expansion options

Flexible expansion is supported, and a complete range of IO types are provided. It is possible to integrate digital, analog, temperature, pulse and other modules to meet different application needs.

High compatibility

The coupler communication interface conforms to industrial Ethernet communication standards and supports mainstream EtherCAT master stations.

Support to parameter configuration

Parameters can be configured and automatically saved.

High speed

X-bus on the backplane leads to a maximum scan cycle of 1 ms.

Easy diagnosis

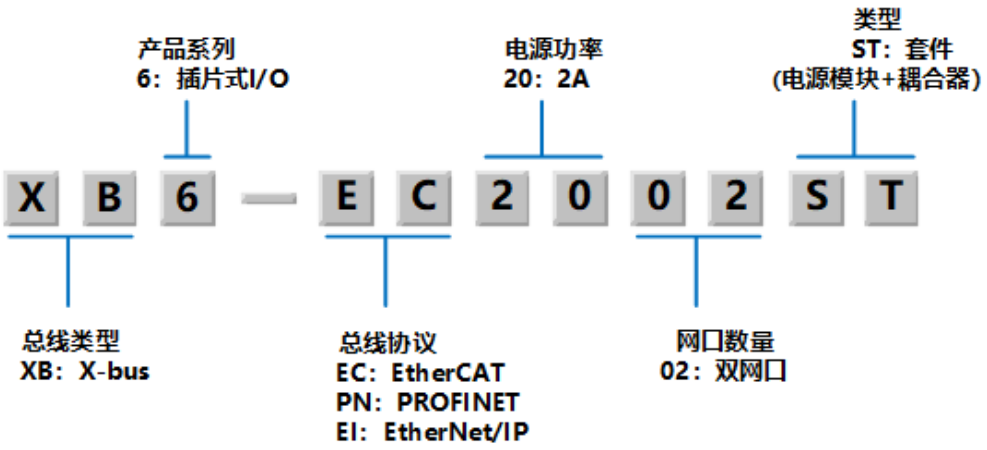
An innovative channel indicator design is adopted. As the indicators are placed close to the channels, channel status is displayed intuitively and clearly, facilitating detection and maintenance.

Copyright © 2018 Nanjing Solidot Electronic Technology Co., Ltd.

2 Designation Rules

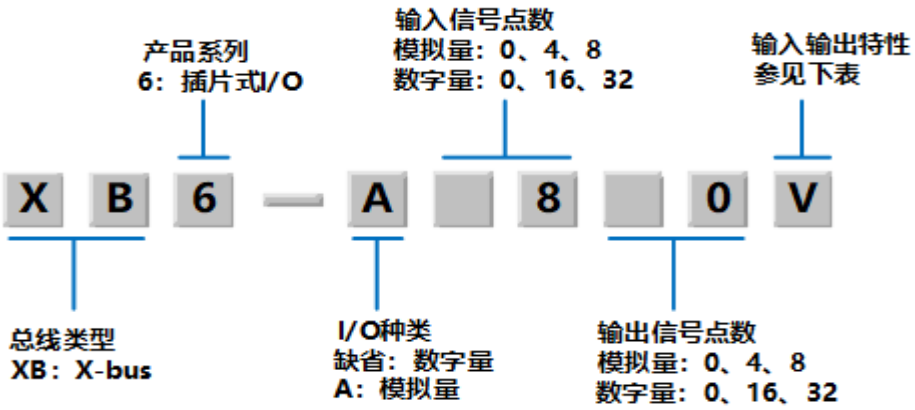
2.1 Designation rules

2.1.1 Coupler designation rules



Copyright © 2018 Nanjing Solidot Electronic Technology Co., Ltd.

2.1.2 I/O module designation rules



I/O characteristics				
Digital			**Analog**	
Code	**Input**	**Output**	**Code**	
A	NPN	NPN, 0.25 A	**V**	-10~+10 V, 0~+10 V
B	PNP	PNP, 0.5 A	**I**	4~20 mA, 0~20 mA
BW	PNP	PNP, 0.25 A	**VW**	-10~+10 V, 0~+10 V
N	NPN/PNP		**IW**	4~20 mA, 0~20 mA
AN		NPN, 0.25A	**TM**	Thermo resistor, thermocouple
BN		PNP, 0.5A		

2.2 List of common modules

Model	Product description	
XB6-EC2002ST	EtherCAT coupler kit (power supply, coupler)	
XB6-P2000	Extended power module	
XB6-3200A/B	32-channel digital input module, NPN/PNP type	
XB6-0032A/B/BW	32-channel digital output module, NPN/PNP type	
XB6-1600A/B	16-channel digital input module, NPN/PNP type	
XB6-0016A/B/BW	16-channel digital output module, NPN/PNP type	
XB6-0800A/B	8-channel digital input module, NPN/PNP type	
XB6-0008A/B/BW	8-channel digital output module, NPN/PNP type	
XB6-1616A/B/BW	16-channel digital I/O module, NPN/PNP type	
XB6-3200N	32-channel digital input, NPN/PNP compatible	
XB6-0032AN	32-channel digital output, NPN type	
XB6-0032BN	32-channel digital output, PNP type	
XB6-0012J	12-channel relay output module	
XB6-A80V	8-channel analog input module	Optional ranges: 0~+10 V, -10~+10 V
XB6-A40V	4-channel analog input module	
XB6-A08V	8-channel analog output module	

Copyright © 2018 Nanjing Solidot Electronic Technology Co., Ltd.

XB6-A04V	4-channel analog output module	
XB6-A80I	8-channel analog input module	Optional ranges: 0~20 mA, 4~20 mA
XB6-A40I	4-channel analog input module	
XB6-A08I	8-channel analog output module	
XB6-A04I	4-channel analog output module	
XB6-A80VW	8-channel analog input module	Optional ranges: 0~+10 V, -10~+10 V
XB6-A40VW	4-channel analog input module	
XB6-A08VW	8-channel analog output module	
XB6-A04VW	4-channel analog output module	
XB6-A80IW	8-channel analog input module	Optional ranges: 0~20 mA, 4~20 mA
XB6-A40IW	4-channel analog input module	
XB6-A08IW	8-channel analog output module	
XB6-A04IW	4-channel analog output module	
XB6-A40TM	4-channel thermal resistor and thermocouple temperature collection module	
XB6-A80TM	8-channel thermal resistor and thermocouple temperature collection module	
XX6-C18_2	Common terminal extended module	

Copyright © 2018 Nanjing Solidot Electronic Technology Co., Ltd.

3 Product Parameters

3.1 General parameters

General technical parameters		
Size	Power module	106◊61◊22.5 mm
	Coupler module	106◊61◊22.5 mm
	I/O module	106◊73◊25.7 mm
Weight	power module	110 g
	coupler module	80 g
	I/O module	90 g
Working temperature	-10~+60℃	
Storage temperature	-20℃~+75℃	
Relative humidity	95%, non-condensing	
Protection degree	IP20	

3.2 Power parameters

Power parameters		
power module	Working power supply	18~36 VDC
	Output voltage	5 VDC
	Output current	2 A, 4 A
coupler module	Working power supply	5 VDC
	Working current	400 mA
I/O module	Working power supply	5 VDC

3.3 Interface parameters

EtherCAT interface parameter	
Bus protocol	EtherCAT (MDP)
Number of I/O stations	Depending on master station configuration
Data transmission medium	Ethernet/EtherCAT CAT5 cable
Transmission distance	≤100 m (distance between stations)
Transmission rate	100 Mbps

Copyright © 2018 Nanjing Solidot Electronic Technology Co., Ltd.

Bus interface	2◊RJ45

3.4 Digital parameters

Signal type		
Digital input		
	Rated voltage	24 VDC (±25%)
	Number of signal points	8, 16, 32
	Signal type	NPN/ PNP
	“0” signal voltage (PNP)	-3~+3 V
	“1” signal voltage (PNP)	15~30 V
	“0” signal voltage (NPN)	15~30 V
	“1” signal voltage (NPN)	-3~+3 V
	Input filtering	3 ms (default)
	Input current	4 mA
	Isolation method	Optically-coupled isolation
	Isolation withstand voltage	500 V
	Channel indicator	Green LED
Transistor output		
	Rated voltage	24 VDC (±25%)
	Number of signal points	8, 16, 32
	Signal type	NPN/ PNP
	Load type	resistive load, inductive load
	Single-channel rated current(A/B)	Max: 500 mA
	Single-channel rated current(BW)	Max: 250 mA
	Port protection	Overvoltage and overcurrent protection
	Isolation method	Optically-coupled isolation
	Isolation withstand voltage	500 V
	Channel indicator	Green LED
Relay output		
	Rated voltage	24 VDC (±25%)
	Number of signal points	12
	Isolation method	Optically-coupled, relay
	Rated load	5 A
	Channel indicator	Green LED

3.5 Analog parameters

3.5.1 Technical parameters

Type			
Analog input	Number of input points	4, 8	
	Input signal (voltage type)	0~+10 V, -10 V~+10 V (adjustable range)	

Copyright © 2018 Nanjing Solidot Electronic Technology Co., Ltd.

	input signal (current type)	0~20 mA, 4~20 mA (adjustable range)	
	Resolution	16 bit	
	Sampling rate	Ax0V	≤1 ksps
		Ax0VW	≤62.5 sps
		Ax0I	≤1 ksps
		A40IW	≤100 sps
		A80IW	≤62.5 sps
	Accuracy	Ax0V	±0.1%
		Ax0VW	±0.3%
		Ax0I	±0.1%
		Ax0IW	±0.3%
	Input impedance (voltage type)	≥2 kΩ	
	Input impedance (current type)	100 Ω	
	Isolation withstand voltage	500 V	
	Channel indicator	Green LED	
Temperature input	Number of channels	4, 8	
	Sensor type	Thermocouple	Thermal resistor
		K: -200~1370℃ **J**: -200~1200℃ **E**: -200~1000℃ **S**: -50~1690℃ **B**: 50~1800℃	**Pt100**: −200~850℃ **Pt200**: −200~600℃ **Pt500**: −200~600℃ **Pt1000**: −200~600℃
	Resolution	16 bit	
	Sensitivity	0.1℃	
	Channel indicator	Green LED	
Analog output	Number of output points	4, 8	
	Output signal (voltage type)	0~+10 V, -10~+10 V (adjustable range)	
	Output signal (current type)	0~20 mA, 4~20 mA (adjustable range)	
	Resolution	16 bit	
	Load impedance (voltage type)	≥2 kΩ	
	Load impedance (current type)	≤200 Ω	
	Accuracy	A0xV	±0.1%
		A0xVW	Not available
		A0xI	±0.1%
		A0xIW	±0.3%

Copyright © 2018 Nanjing Solidot Electronic Technology Co., Ltd.

	Isolation withstand voltage	500 V	
	Channel indicator	Green LED	

3.5.2 Voltage I/O range selection and code value table

Voltage I/O range selection and cold value range				
Range selection	0	1	2	3
Range	-10 V~+10 V	0~+10 V	-10 V~+10 V	0~+10 V
Code value range	-32768~32767	0~32767	-27648~27648	0~27648
Voltage input formula	D=(65535/20)*U	D=(32767/10)*U	D=(55296/20)*U	D=(27648/10)*U
Voltage output formula	U=(D*20)/65535	U=(D*10)/32767	U=(D*20)/55296	U=(D*10)/27648
Code value table	See Table 1 Voltage			

Note: D: code value; U: voltage

Table 1 Voltage code values

Range / voltage	**0 (default)**	**1**	**2**	**3**
	Code value	**Code value**	**Code value**	**Code value**
-10	-32768		-27648	
-9	-29491		-24883	
-8	-26214		-22118	
-7	-22937		-19354	
-6	-19661		-16589	
-5	-16384		-13824	
-4	-13107		-11059	
-3	-9830		-8294	
-2	-6554		-5530	
-1	-3277		-2765	
0	0	0	0	0
1	3277	3277	2765	2765
2	6554	6553	5530	5530
3	9830	9830	8294	8294
4	13107	13107	11059	11059
5	16384	16384	13824	13824
6	19661	19660	16589	16589
7	22937	22937	19354	19354
8	26214	26214	22118	22118
9	29491	29490	24883	24883
10	32767	32767	27648	27648
	Code value= (65535/20) *voltage	Code value= (32767/10) *voltage	Code value= (55296/20) *voltage	Code value= (27648/10) *voltage
	voltage= (Code	voltage= (Code	voltage= (Code	voltage= (Code

Copyright © 2018 Nanjing Solidot Electronic Technology Co., Ltd.

	value*20) /65535	value*10) /32767	value*20) /55296	value*10) /27648

3.5.3 Current I/O range selection and code value table

Analog current I/O range selection and code value range				
Range selection	**0**	**1**	**2**	**3**
Range	4~20 mA	0~20 mA	4~20 mA	0~20 mA
Code value range	0~65535		0~27648	
Current input formula	D=65535/16*I-16384	D=(65535/20)*I	D=(27648/16)*I-6192	D=(27648/20)*I
Current output formula	I=(D+16384)*16/65535	I=(D*20)/65535	I=((D+6192)*16)/27648	I=(D*20)/27648
Code value table	See Table 2 Current code value			

Note: D: Code value; I: current

Table 2 Current code value

Range selection / Range current	**0 (default)**	**1**	**2**	**3**
	4-20mA	**0-20mA**	**4-20mA**	**0-20mA**
	Code value	**Code value**	**Code value**	**Code value**
0		0		0
1		3277		1382
2		6554		2765
3		9830		4147
4	0	13107	0	5530
5	4096	16384	1728	6912
6	8192	19661	3456	8294
7	12288	22937	5184	9677
8	16384	26214	6912	11059
9	20479	29491	8640	12442
10	24575	32768	10368	13824
11	28671	36044	12096	15206
12	32767	39321	13824	16589
13	36863	42598	15552	17971
14	40959	45875	17280	19354
15	45055	49151	19008	20736
16	49151	52428	20736	22118
17	53247	55705	22464	23501
18	57343	58982	24192	24883

Copyright © 2018 Nanjing Solidot Electronic Technology Co., Ltd.

19	61439	62258	25920	26266
20	65535	65535	27648	27648
21	65535	65535	29376	29030
22			31104	30413
22.81423611			32511	31538
22.96238426			32767	31743
23			32767	31795
23.51779514				32511
23.70298032				32767
24				32767
25				
	Code value=65535/16*current-16384	Code value= (65535/20) *current	Code value= (27648/16) *current-6912	Code value= (27648/20) *current

Notes:

In Range 2, when input current > 22.81 mA, the code value displayed is always 32767; when the specified Code value > 32511, the output current is always 22.81 mA.

In Range 3, when input current > 23.52 mA, the code value displayed is always 32767; when the specified code value > 32511, the output current is always 23.52 mA.

3.6 Common terminal expansion module parameters

Common terminal	
Rated voltage	125 VDC/AC 250V
Rated current	8 A
Number of common terminals	2 sets

Copyright © 2018 Nanjing Solidot Electronic Technology Co., Ltd.

4 Panel

4.1 Coupler panel

The name and function of different coupler parts will be described in this section.

Description of IDs and indicators of the power part				
ID	**Name**	**Color**	**Indicator status**	**Meaning**
P	5V indicator	Green	ON	Normal status of working power supply
			Flashing	80% overload. The power supply to real stage load is cut off.
			OFF	Unpowered or abnormal power supply
O	Overload indicator	Red	OFF	No overload
			ON	90% overload
			Flashing	80% overload. The power supply to real stage load is cut off.

Copyright © 2018 Nanjing Solidot Electronic Technology Co., Ltd.

Description of IDs and indicators of the system part				
ID	**Name**	**Color**	**Status**	**Meaning**
P	Power indicator	Green	ON	Normal status of working power supply
			OFF	Unpowered or abnormal power supply
L		Green	OFF	In initialization or unpowered
			ON	X-bus in the process of interaction
			Flashing: 1 Hz	Normal initialization of bottom bus
			Flashing: 5 Hz	Abnormal initialization of bottom bus
			Flashing: 10 Hz	Loss of response of an I/O module during operation
E	Error indicator	Red	ON	Abnormal coupler status
			OFF	In initialization, unpowered, or no error
R		Green	OFF	In initialization or unpowered EtherCAT Init status
			ON	EtherCAT OP status
			Flashing: 5 Hz	EtherCAT PreOP status
			Flashing: OFF for 1 s, ON for 200 ms	EtherCAT SafeOP status
IN		Yellow	Flashing	Connection established with data interaction
			OFF	No data interaction or abnormal status
OUT		Yellow	Flashing	Connection established with data interaction
			OFF	No data interaction or abnormal status

4.2 I/O module panel

The name and function of different module parts are described in this section.

Copyright © 2018 Nanjing Solidot Electronic Technology Co., Ltd.

Indicator description			
P	Green	ON	Normal status of working power supply
		OFF	Unpowered or abnormal power supply
R	Green	ON	Normal system operation
		Flashing 1 Hz	I/O module connected, X-bus system ready for interaction
		OFF	Unpowered, no X-bus data interaction, or abnormal status
Input channel indicator	Green	ON	Presence of signal input in module detection channel
		OFF	Absence of signal input in module channel or abnormal signal input
Output channel indication	Green	ON	Presence of signal output in module channel
		ON/OFF	Absence of signal output in module channel or abnormal signal output

Copyright © 2018 Nanjing Solidot Electronic Technology Co., Ltd.

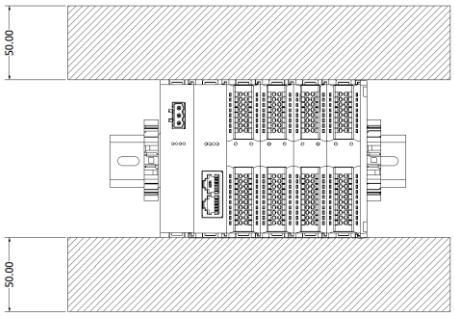
5 Installation and Disassembly

5.1 Installation instructions

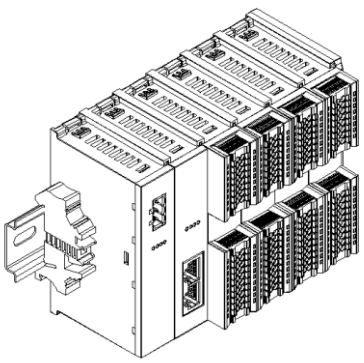
Module installation precautions

- **Ensure that the cabinet is well ventilated.**
- **Do not install this equipment near or above any equipment that may cause overheating.**
- **Make sure to install the module vertically and maintain adequate air circulation around it (at least 50 mm air circulation space should be provided above and below the module).**
- **After the modules are installed, remember to install guide rail fasteners at both ends to fix them.**
- **Installation/disassembly operation may only be carried out after the power supply is cut off.**

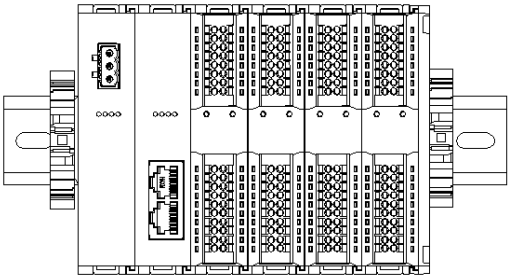
Minimum clearance for module installation (≥50 mm)



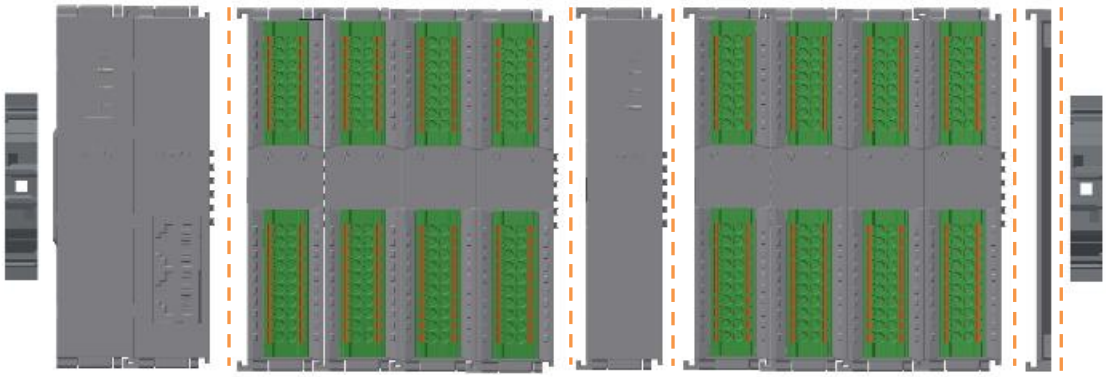
Make sure the modules are installed vertically



Make sure to install guide rail fasteners



5.2 Application configuration



Application method:

Different modules can be combined, including power supply, coupler, digital, analog, relay, temperature, pulse, encoder interface, step driver and other modules.

Application configuration:

Different I/O module combinations can be adopted depending on master station access capacity, number of stations, I/O points, function type, and other requirements.

Configuration rule:

From left to right, the modules should be arranged in the order of power supply, coupler module, I/O module, and end cover (required).

Copyright © 2018 Nanjing Solidot Electronic Technology Co., Ltd.

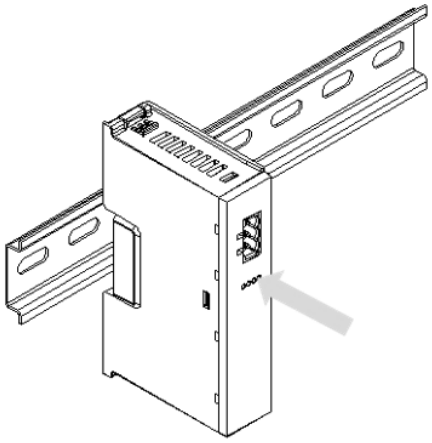
5.3 Installation and disassembly steps

Module installation and disassembly	
Module installation steps	1. Install the power module on the fixed guide rail first.
	2. Install the coupler and the required I/O modules on the right side of the power module.
	3. After installing all required I/O modules, install the end cover to complete module assembly.
	4. Install guide rail fasteners at both ends of the power module and end cover to fix the module.
Module disassembly steps	1. Loosen the rail fasteners at both ends of the module.
	2. Pry loose the module snap fitting with a slotted screwdriver.
	3. Pull out the removed module.

5.4 Installation schematic diagrams

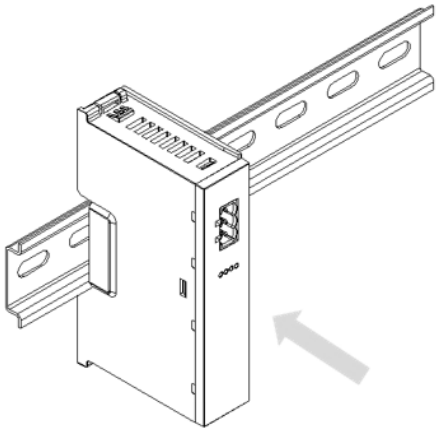
I. Power module installation

1. Align the power module guide rail slot vertically with the guide rail, as shown below.



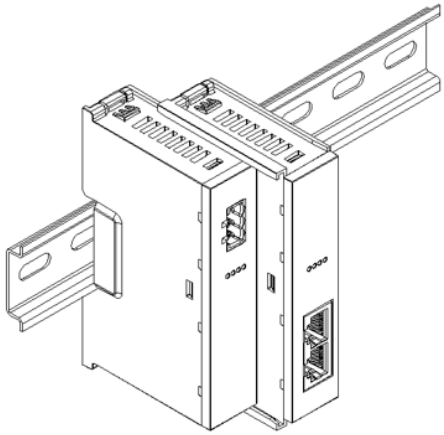
Copyright © 2018 Nanjing Solidot Electronic Technology Co., Ltd.

2. Press the power module with force until a "click" sound is heard. The module is now installed in place, as shown in the figure below.



II. Coupler module installation

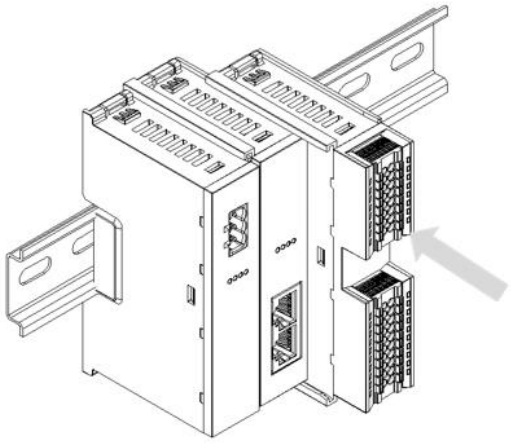
1. Align the left slot of the coupler module with the right side of the power module, and push it in as shown below.



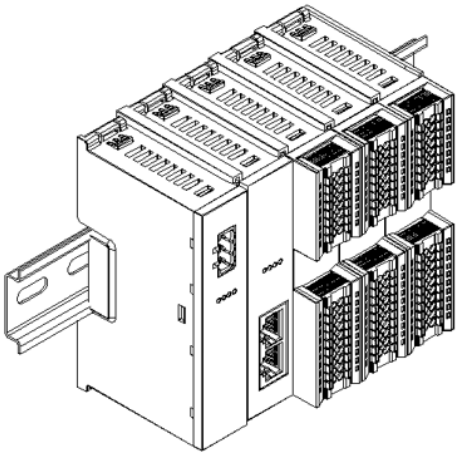
2. Press the module with force into the guide rail until a "click" sound is heard. The module is now installed in place.

III. I/O module installation

Install the required IO modules one by one using the same the steps as coupler module installation.

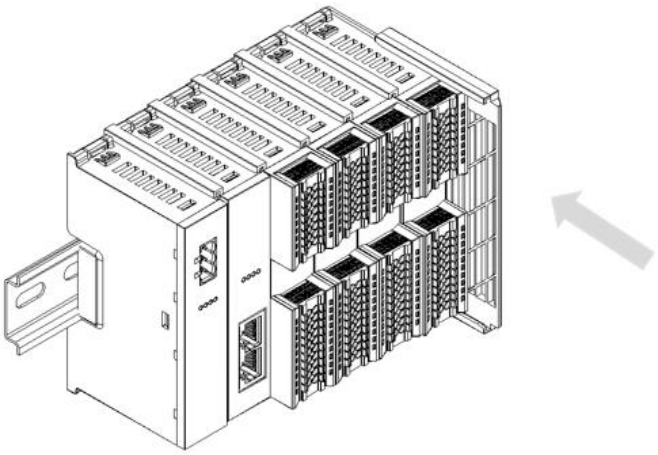


Copyright © 2018 Nanjing Solidot Electronic Technology Co., Ltd.



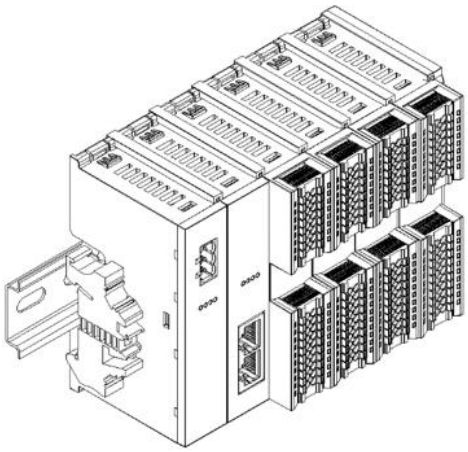
IV. End cover installation

Install the end cover on the right side of the last module using the same installation method as the coupler module.



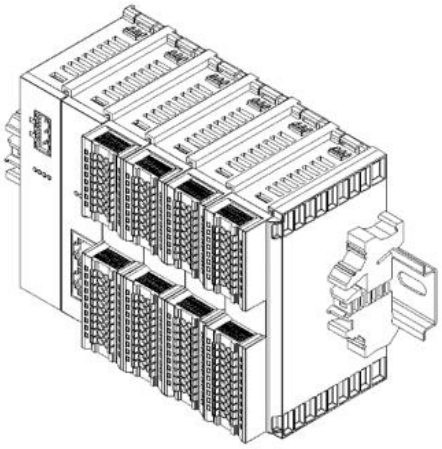
V. Installation of guide rail fasteners

1. Install a guide rail fastener next to the left side of the coupler, and lock it tightly.



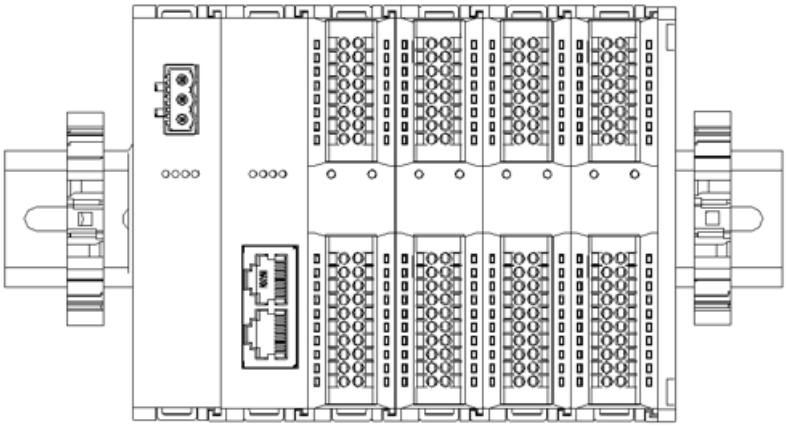
2. Install a guide rail fastener on the right side of the end cover. In this process, first push the guide rail fastener towards the coupler to ensure that the module is installed firmly, and then lock the fastener with a screwdriver.

Copyright © 2018 Nanjing Solidot Electronic Technology Co., Ltd.



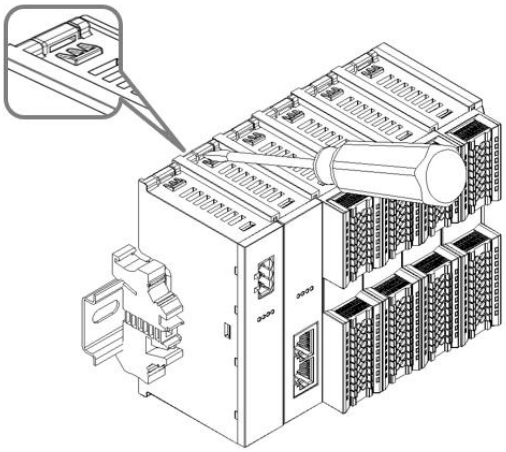
VI. Disassembly (with a slotted screwdriver)

1. Using a screwdriver, loosen the guide rail fastener at one end of the module, and move it to one side to create a gap between the module and the fastener.

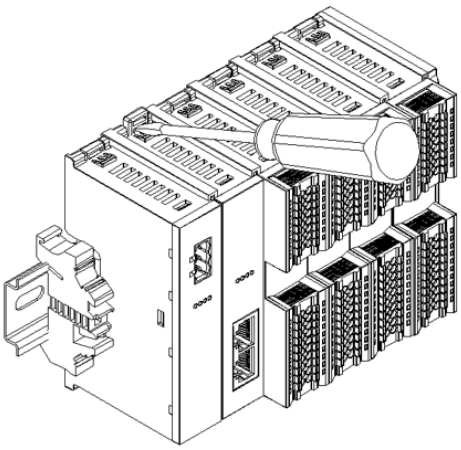


2. Insert the slotted screwdriver into the snap fitting of the module to be removed, and exert force along lateral direction of the module (until a click sound is heard).

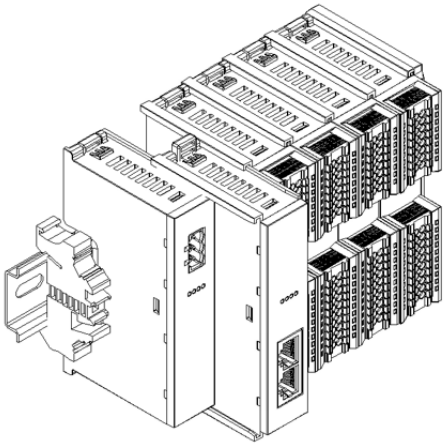
   Note: Each module has two snap fittings, one on the top and the other at the bottom. Both should be operated in this way.



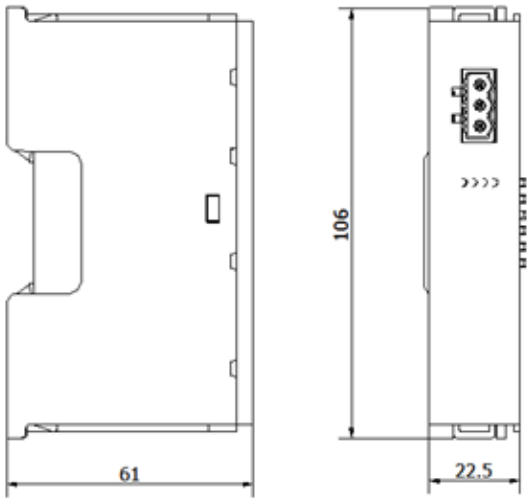
Copyright © 2018 Nanjing Solidot Electronic Technology Co., Ltd.



3. Remove the module in the reverse order of installation.

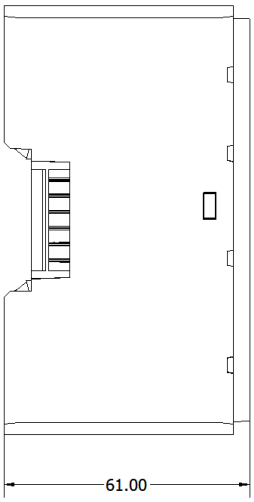


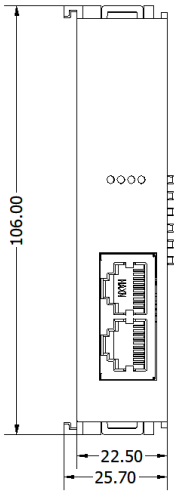
5.4 Dimensions

Power module dimensions	Installation method
	DIN 35 mm guide rail installation

Coupler dimensions	Installation method

Copyright © 2018 Nanjing Solidot Electronic Technology Co., Ltd.

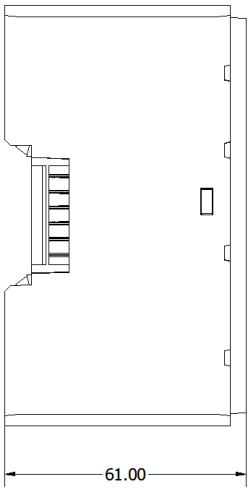


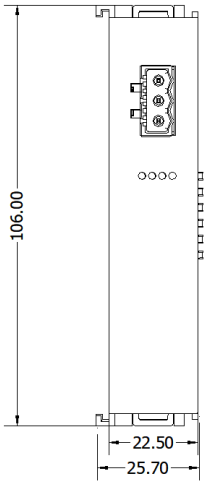


DIN 35 mm guide rail installation

Dimensions of middle power module

Installation method

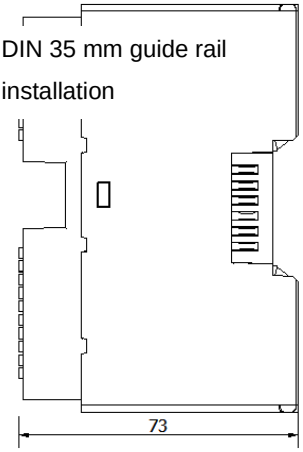


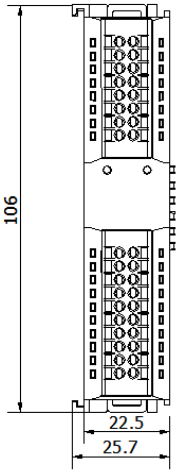


I/O module dimensions

Installation method

DIN 35 mm guide rail installation



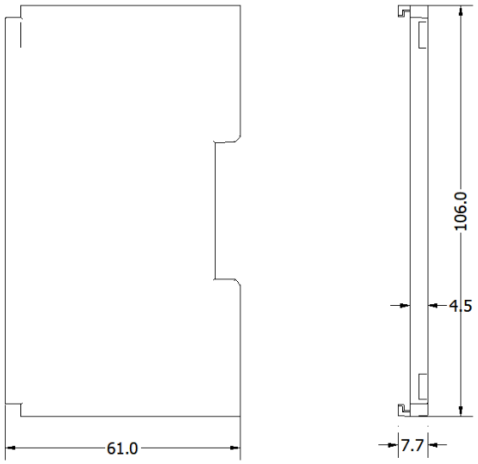


DIN 35 mm guide rail installation

End cover dimensions

Installation method

Copyright © 2018 Nanjing Solidot Electronic Technology Co., Ltd.



***DIN guide rail dimensions: 35*7.5*1.0, 35*15*1.0**

Copyright © 2018 Nanjing Solidot Electronic Technology Co., Ltd.

6 Wiring

6.1 Wiring terminal

Wiring terminal		
Signal wire terminal	Number of poles	16 P
	Number of poles	20 P
	Wire gauge	28 -16 AWG 0.2-1.5 mm²
Power terminal	Number of poles	3P
	Wire gauge	26 -12 AWG 0.5-2.5mm²
Bus interface	2*RJ45	Category 5 or better UTP or STP (STP preferred)

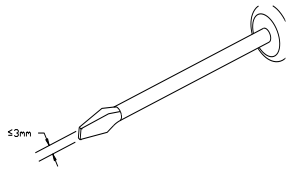
6.2 Wiring instructions and requirements

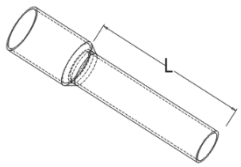
Power wiring precautions

- **The power supply on the module system side and that on the field side should be wired separately. Mixing should be avoided.**
- **PE should be grounded reliably.**

Copyright © 2018 Nanjing Solidot Electronic Technology Co., Ltd.

Tool and wiring requirements

Wiring tool required	
As the terminals are based on a screw-free design, cable installation and removal can realized with a slotted screwdriver (size: ≤ 3 mm).	
Stripping length required	
Recommended stripping length: 10 mm	
Wiring method	
For a single-strand hard wire, after stripping a required length, press the button while inserting the single-strand wire.	
For a multi-strand flexible wire, after stripping a required length, directly connect it or use a compatible cold-pressed terminal (tubular insulated terminal, as shown in the table below). Press the button whiling inserting the wire.	

Specification of tubular insulated terminal		
Specification	**Model**	**Cable section area (mm²)**
 Length of tubular insulated terminal L ≥10 mm	E0510	0.5
	E7510	0.75
	E7512	
	E1010	1.0
	E1012	
	E1510	1.5
Length of tubular insulated terminal L ≥10 mm	E1518	

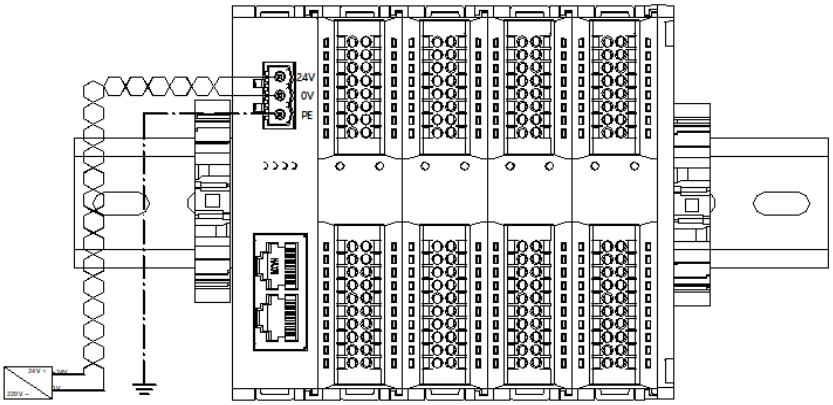
Power supply wiring

3P terminal of power module

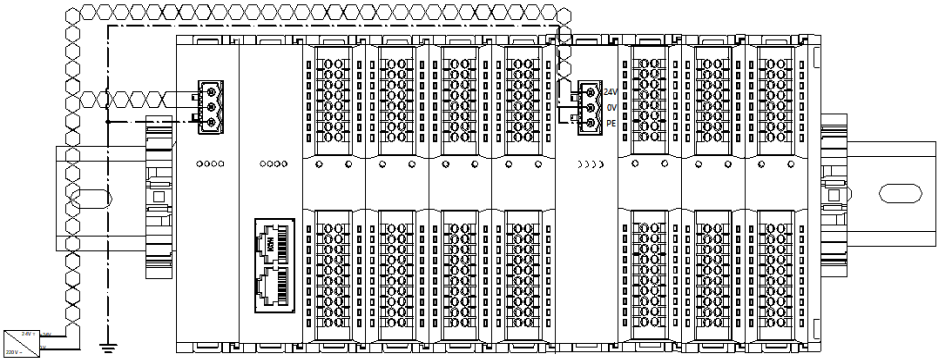
Connect the DC24V power module using the given wiring method based on the circuit shown in the figure below, and meanwhile ground the PE reliably (twisted pair cable is recommended for power supply).

- Wiring of coupler, IO modules, and power module in sequence, as shown below:

Copyright © 2018 Nanjing Solidot Electronic Technology Co., Ltd.



- Wiring of coupler, IO modules, power module, IO modules, and power module in sequence, as shown below:



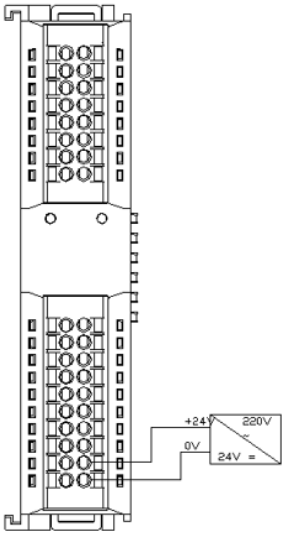
Copyright © 2018 Nanjing Solidot Electronic Technology Co., Ltd.

Load power supply wiring

20P terminal on the field side

Press the signal cable into the wiring terminal by referring to the I/O module wiring diagram and wiring method.

24 VDC power supply is used for loads. Using the given wiring method, connect the power supply according to the circuit shown in the left figure. Refer to 6.3 I/O module wiring diagram for details.



Signal terminal wiring

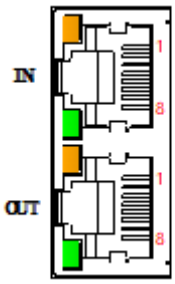
16P\20P terminal

Press the signal cable into the wiring terminal by referring to the I/O module wiring diagram and wiring method.

Bus wiring

Industrial Ethernet bus communication interface

Standard RJ45 network interface and standard RJ45 connector are adopted. The pins are assigned as follows.



Pin	signal
1	TD+
2	TD-
3	RD+
4	-
5	-
6	RD-
7	-
8	-

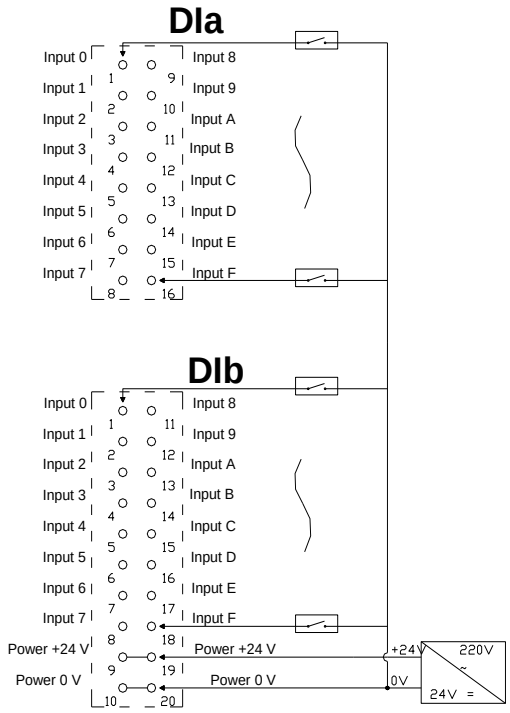
- Category 5 or higher-level double-shielded (braided wire + aluminum foil) STP cable is recommended as communication cable.
- The cable between any two devices should not exceed 100 m.

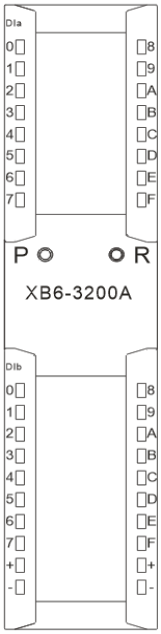
Copyright © 2018 Nanjing Solidot Electronic Technology Co., Ltd.

6.3 I/O module wiring diagrams

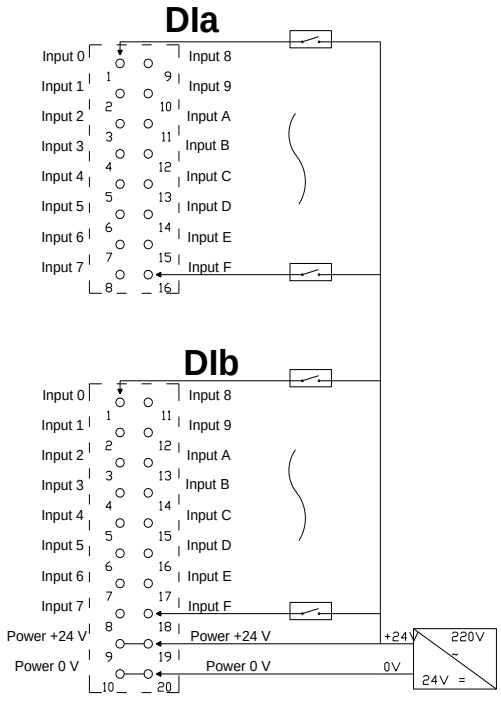
In the course of wiring, only one group of positive and negative poles needs to be connected to respective points.

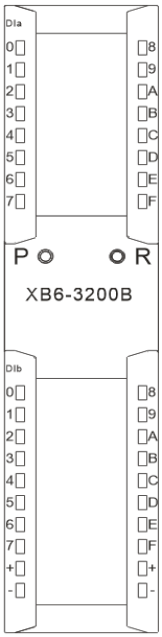
XB6-3200A	Module panel





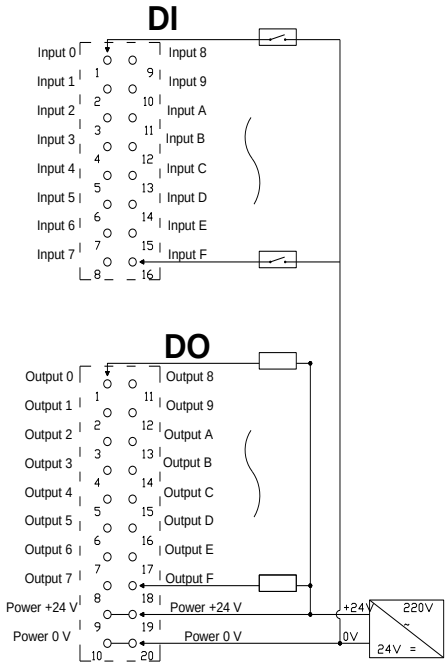
XB6-3200B	Module panel

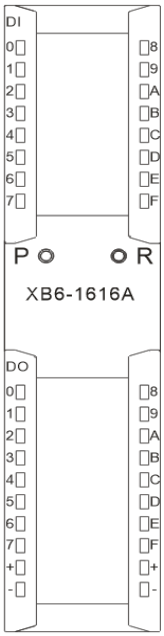




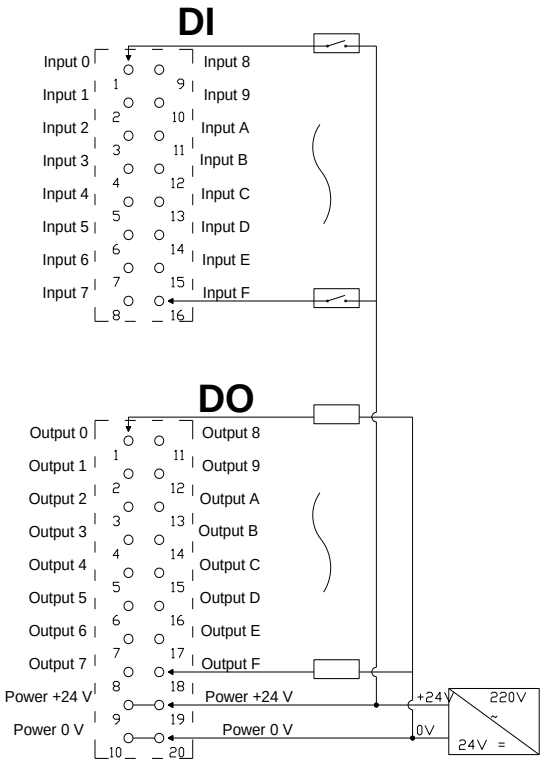
Copyright © 2018 Nanjing Solidot Electronic Technology Co., Ltd.

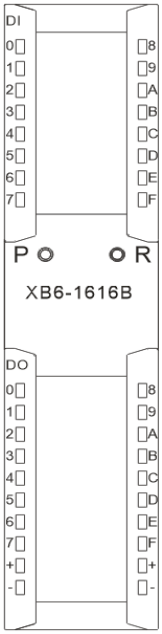
XB6-1616A	Module panel





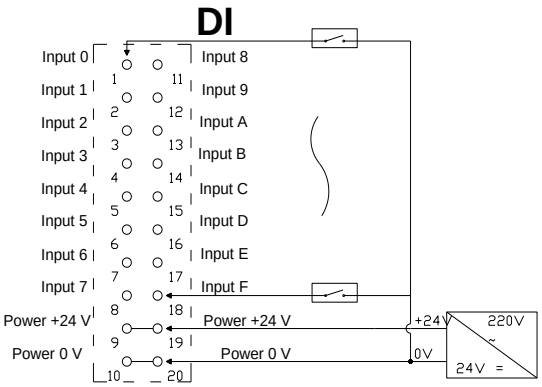
XB6-1616B	Module panel

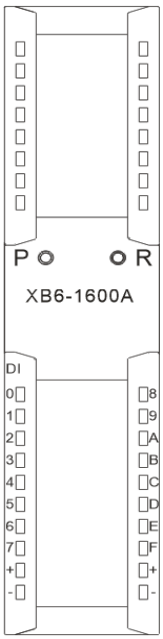




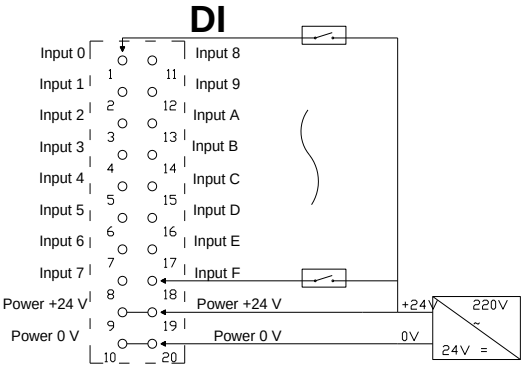
XB6-1600A	Module panel

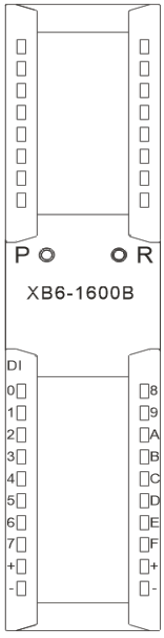
Copyright © 2018 Nanjing Solidot Electronic Technology Co., Ltd.





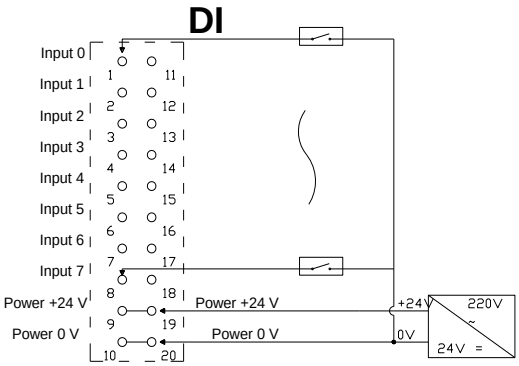
XB6-1600B **Module panel**

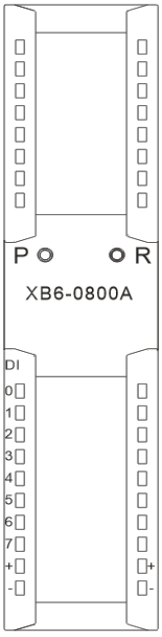




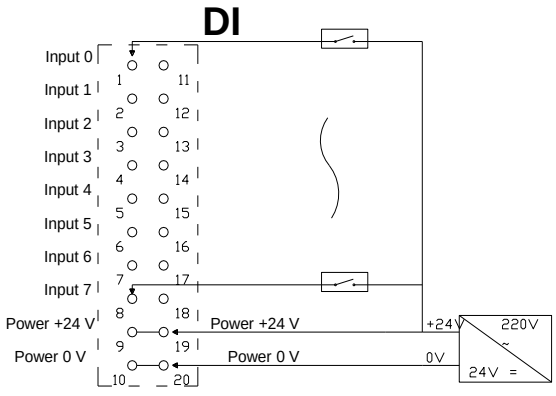
XB6-0800A **Module panel**

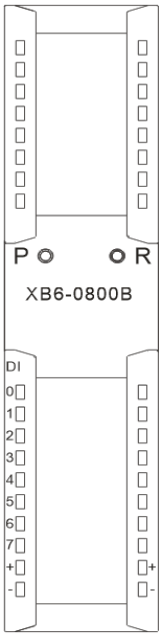
Copyright © 2018 Nanjing Solidot Electronic Technology Co., Ltd.





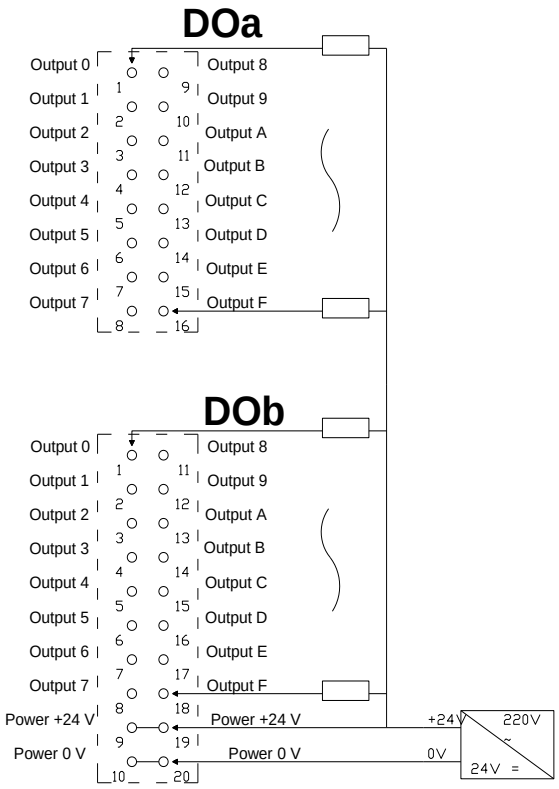
XB6-0800B **Module panel**

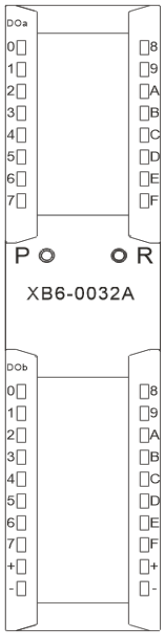




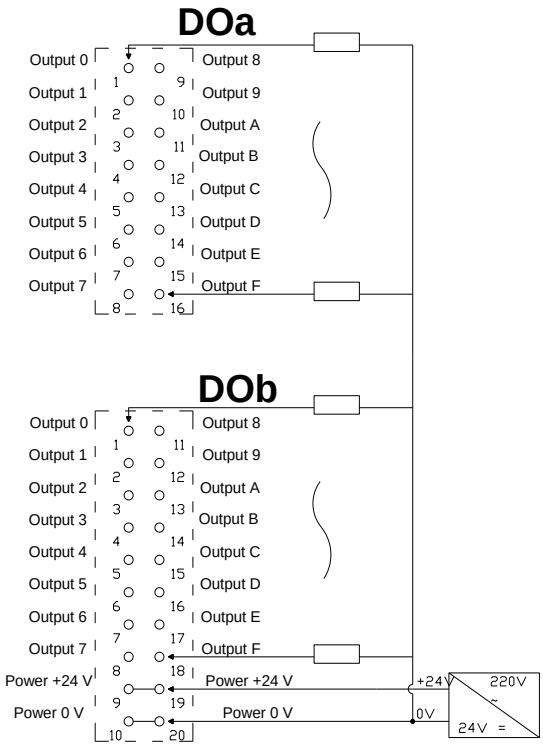
XB6-0032A **Module panel**

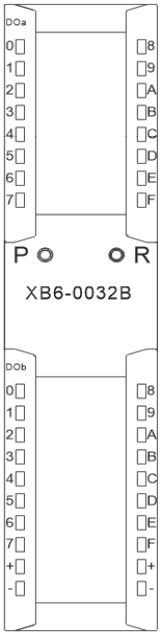
Copyright © 2018 Nanjing Solidot Electronic Technology Co., Ltd.





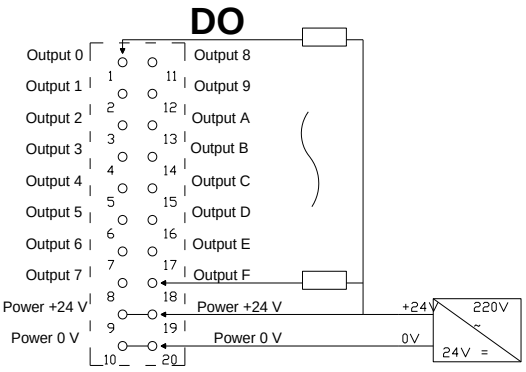
XB6-0032B **Module panel**

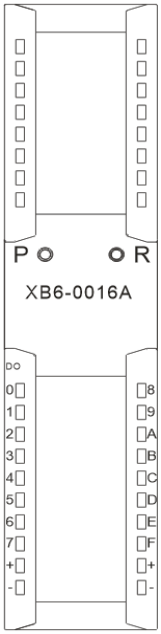




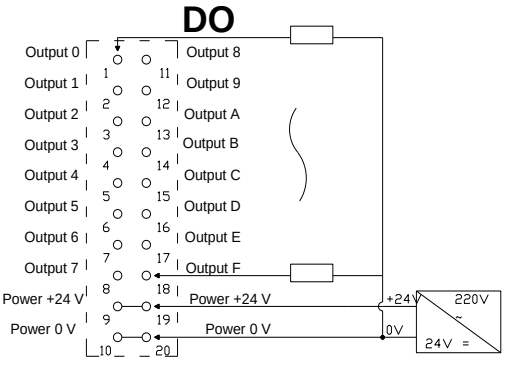
XB6-0016A **Module panel**

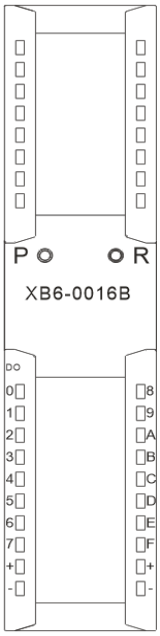
Copyright © 2018 Nanjing Solidot Electronic Technology Co., Ltd.





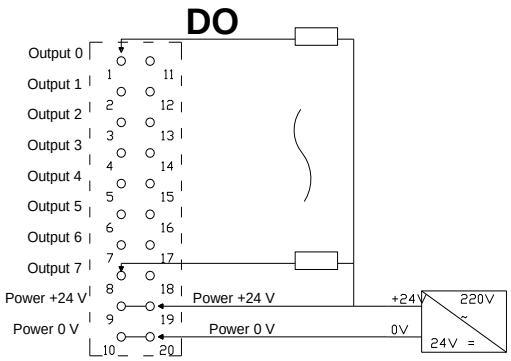
XB6-0016B **Module panel**

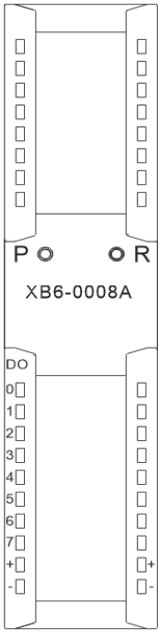




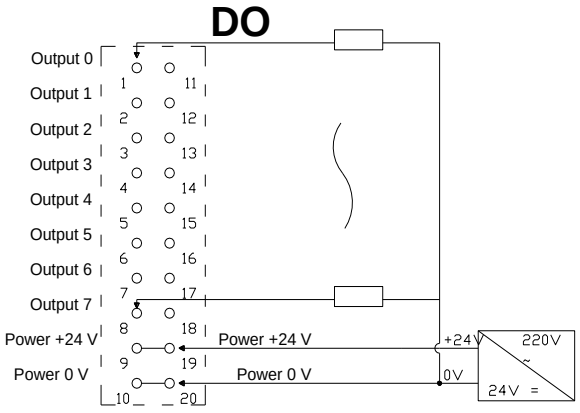
XB6-0008A **Module panel**

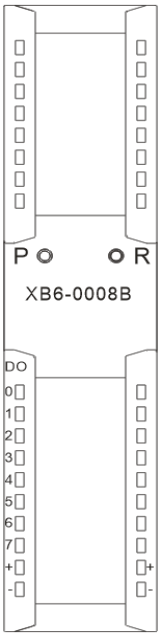
Copyright © 2018 Nanjing Solidot Electronic Technology Co., Ltd.





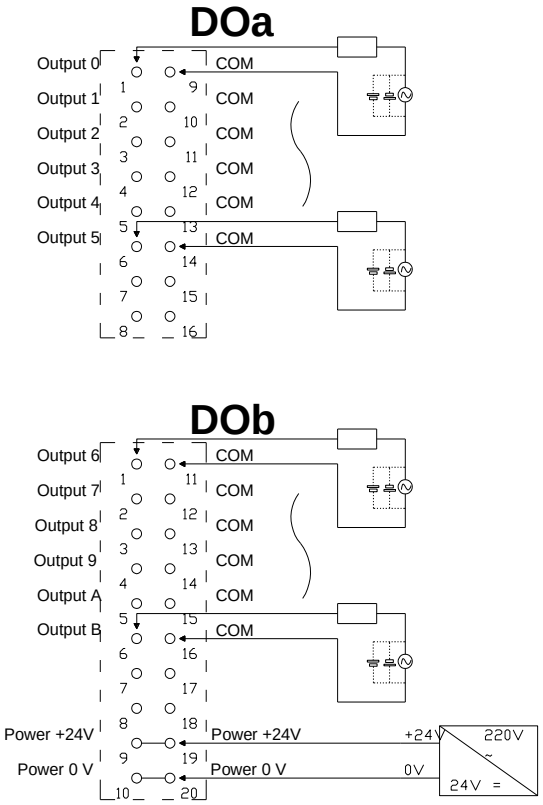
XB6-0008B | **Module panel**

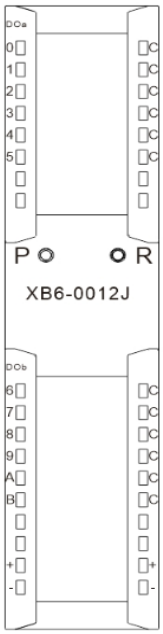




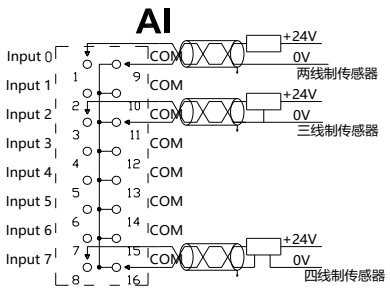
XB6-0012J | **Module panel**

Copyright © 2018 Nanjing Solidot Electronic Technology Co., Ltd.

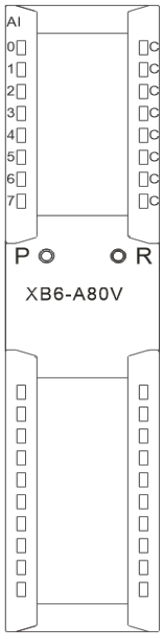




XB6-A80V/XB6-A80I **Module panel**



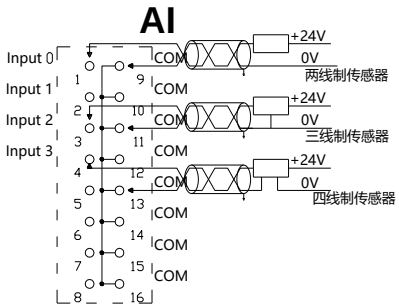
* 信号线缆：建议采用屏蔽双绞线



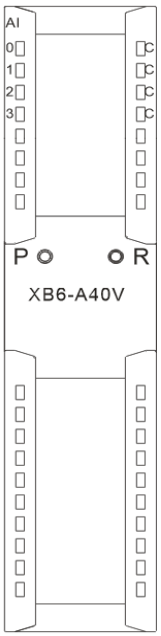
Note: The screen printing of module XB6-A80I is XB6-A80I.

XB6-A40V/XB6-A40I **Module panel**

Copyright © 2018 Nanjing Solidot Electronic Technology Co., Ltd.

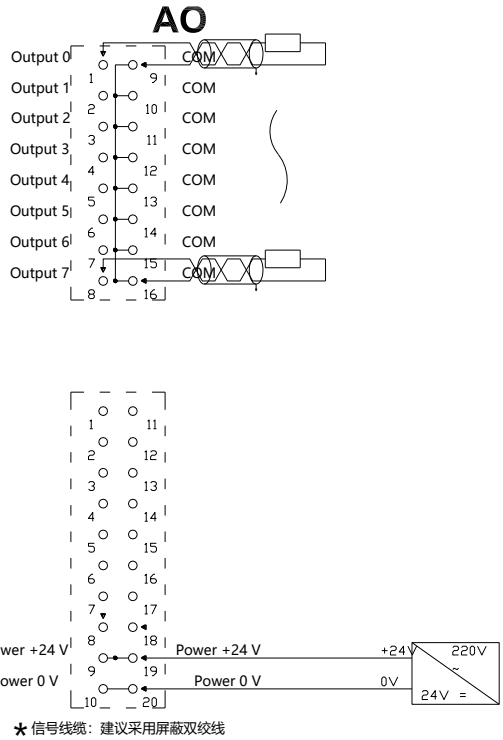


* 信号线缆：建议采用屏蔽双绞线

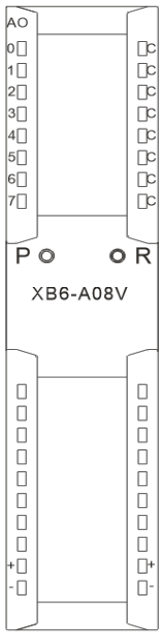


Note: The screen printing of module XB6-A40I is XB6-A40I.

XB6-A08V\XB6-A08I **Module panel**



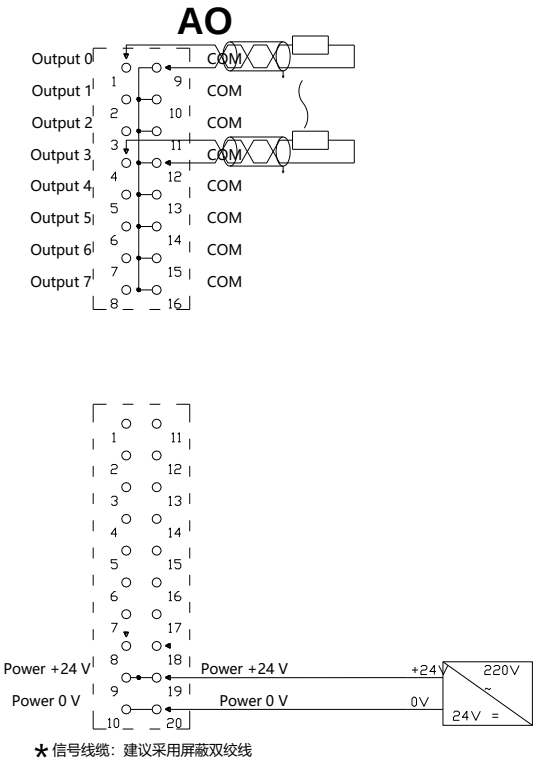
* 信号线缆：建议采用屏蔽双绞线

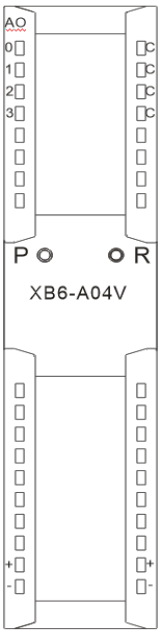


Note: The screen printing of module XB6-A08I is XB6-A08I.

XB6-A04V\XB6-A04I **Module panel**

Copyright © 2018 Nanjing Solidot Electronic Technology Co., Ltd.



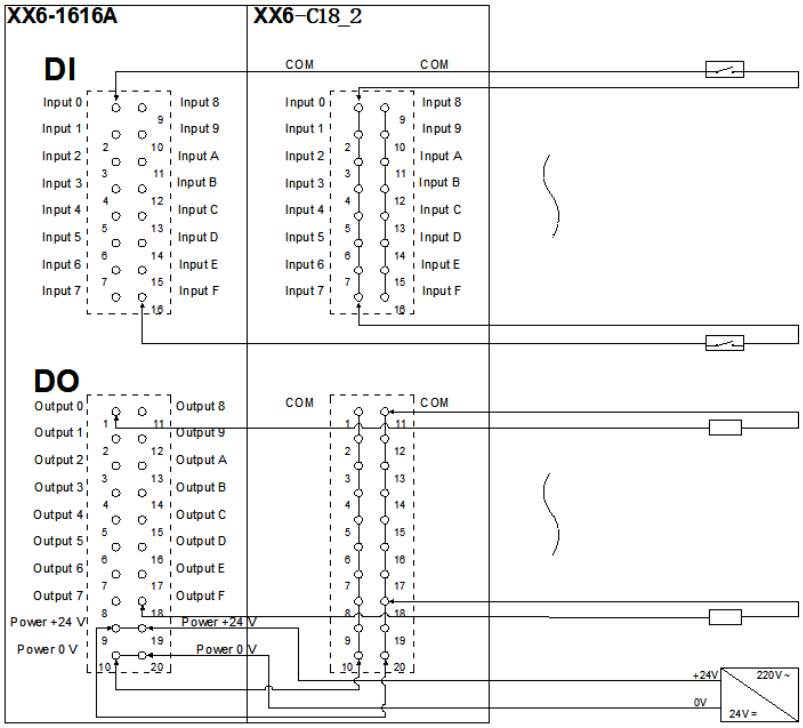


Note: The screen printing of module XB6-A04I is XB6-A04I.

6.4 Common terminal expansion module wiring diagrams

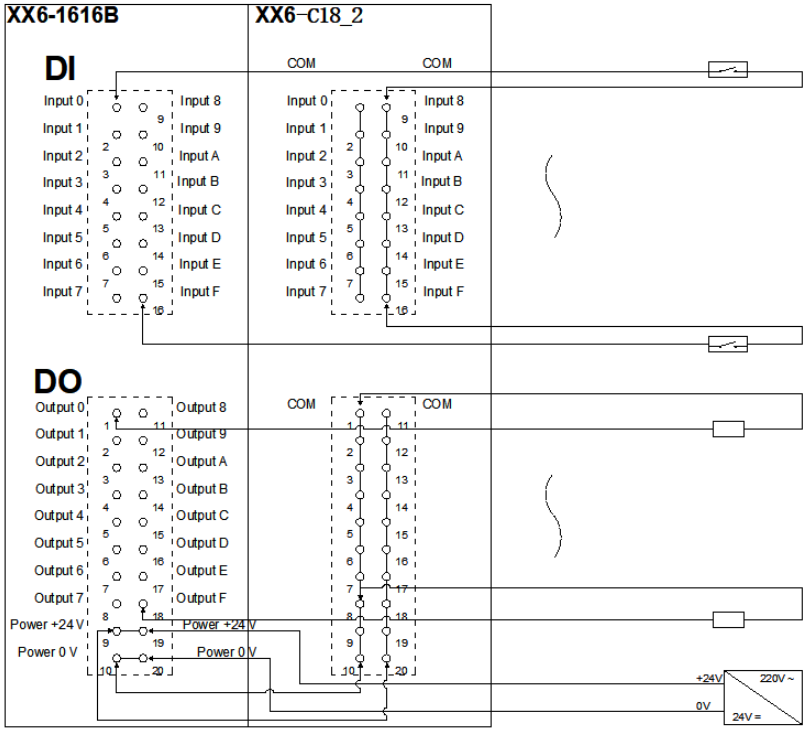
The wiring method of two-wire and three-wire sensors is described in this section, taking the two modules of XX6-1616A/B as examples.

Wiring method of two-wire sensor (NPN type)

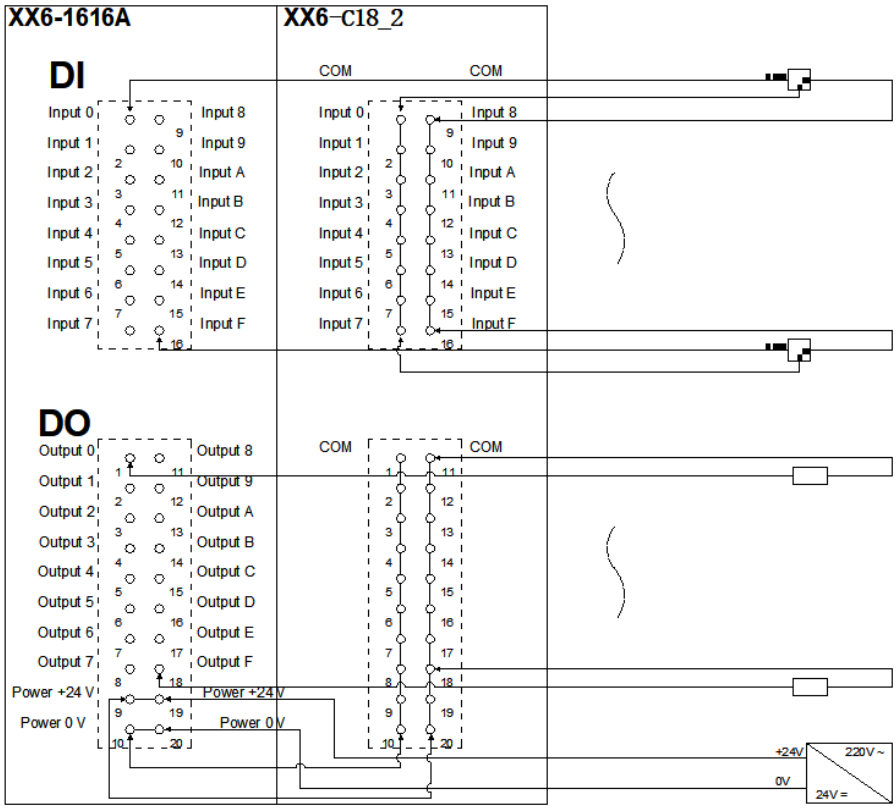


Copyright © 2018 Nanjing Solidot Electronic Technology Co., Ltd.

Wiring method of two-wire sensor (PNP type)

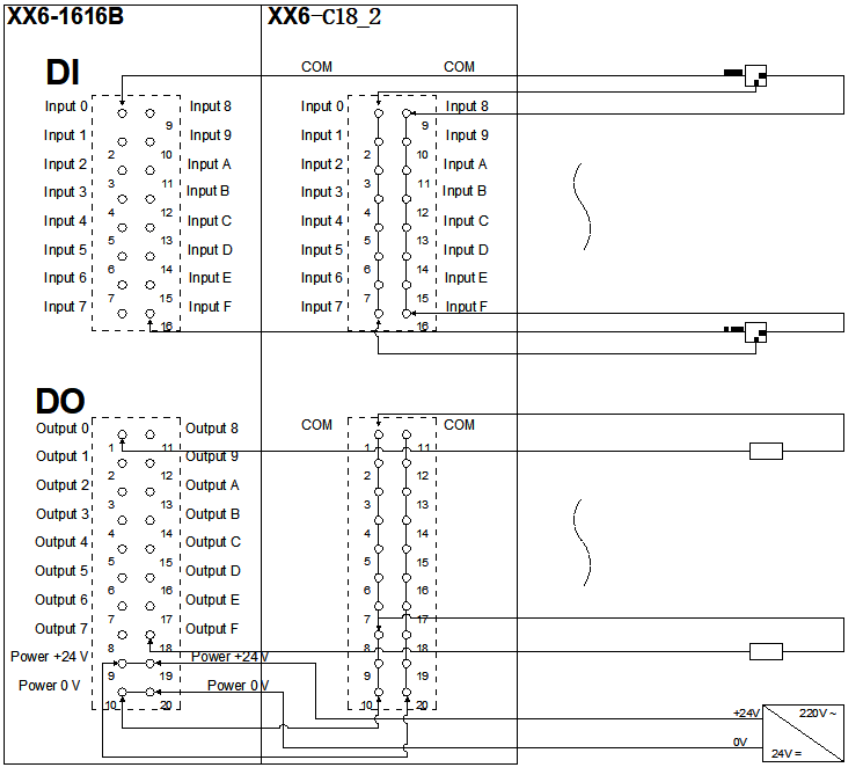


Wiring method of three-wire sensor (NPN type)



Wiring method of three-wire sensor (PNP type)

Copyright © 2018 Nanjing Solidot Electronic Technology Co., Ltd.



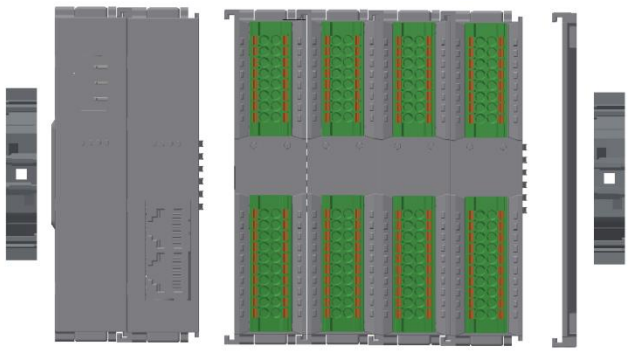
Copyright © 2018 Nanjing Solidot Electronic Technology Co., Ltd.

7 Operation

7.1 Module application

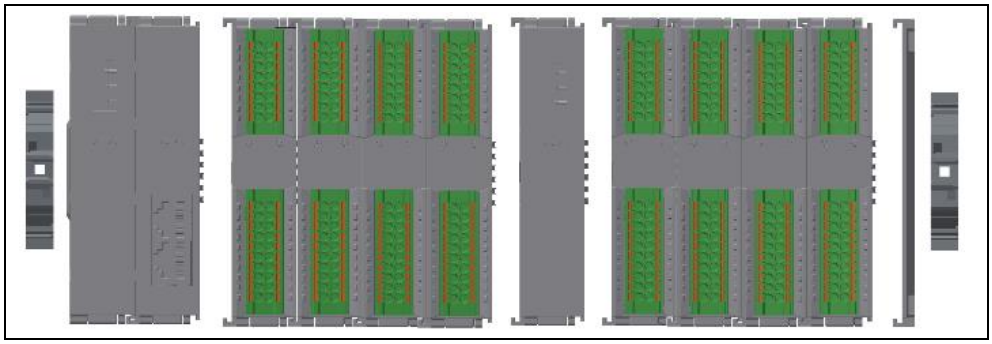
7.1.1 Application modes

Two combinations are available for the product as shown below, each containing a coupler, I/O modules and an end cover.

First product combination (coupler, I/O modules, end cover)		
Coupler	I/O modules	End cover
		

Second product combination (coupler, I/O modules, power module, I/O modules, end cover)				
Coupler	I/O modules	Power module	I/O modules	End cover

Copyright © 2018 Nanjing Solidot Electronic Technology Co., Ltd.



The following principles should be adhered to when determining the number of I/O modules:

- The model and number of I/O modules in the system must be configured in such a way that the maximum power consumption is lower than the load current provided by the power module.
- The number of IO modules that can be supported by a coupler is not higher than 32.
- The number of analog modules should not exceed 12, and the number of 8-channel analog inputs should not exceed 8.
- One power supply supports up to 10 I/O devices. If there are more than 10 devices, additional power supplies will be required.

7.1.2 Number of power modules configured and power consumption calculation

Power module configuration principle

The model and number of I/O modules in the system must be configured in such a way that the maximum power consumption is lower than the load current provided by the power module.

After the model and number of I/O modules are determined, calculation can be made by referring to our "**Solidot XB6 Series I/O Power Consumption Calculation Table**", so as to reasonably configure the number of couplers and power modules.

Website of**"Solidot XB6 Series I/O Power Consumption Calculation Table"**:

https://www.solidotech.com/documents/tools

An example of configuration of couplers and power modules

Models and number of I/O modules required by the system and corresponding power consumption:

Type	Model	Number	Power consumption
IO module	XB6-3200A	1	55 mA
	XB6-1600A	1	50 mA
	XB6-0032A	4	180 mA
	XB6-0016A	1	110 mA
	XB6-1616A	5	120 mA
	XB6-A80V	1	230 mA
Total power consumption			1685 mA

Conclusion:

Because the total power consumption of all modules is 1685 mA, which is greater than the 1600 mA current provided by a coupler for I/O modules, it is necessary to add a power supply module.

7.2 Coupler functional description

In this chapter, TwinCAT3 software platform is taken as an example to introduce coupler functions.

Topological configuration

Copyright © 2018 Nanjing Solidot Electronic Technology Co., Ltd.

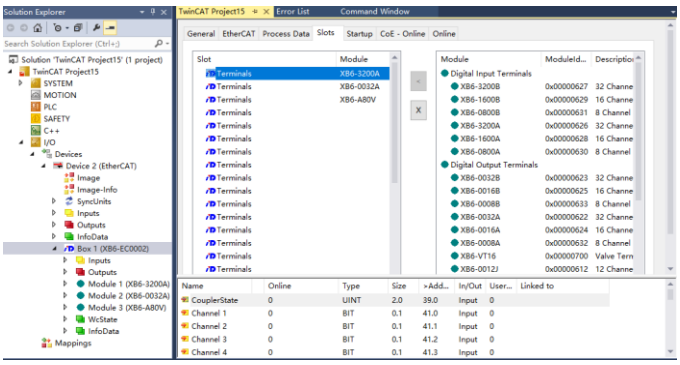
The system supports both automatic scan configuration and manual configuration

- **Manual configuration:**

  Select a target module in **SLOT**. The specific location varies with the master station.

  After adding a coupler, enter **Slots** page and click < and X for topological configuration, as shown in the figure below. For details, please refer to:

  7.4.1 Application in TwinCAT3 software environment.



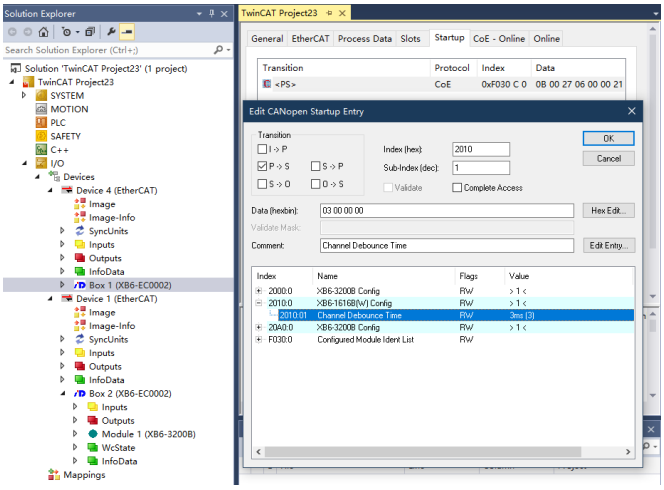
- **Automatic scan configuration:**

  For details, please refer to: 7.4.1 Application in TwinCAT3 software environment.

Parameter configuration

Enable P > S setting to activate parameters.

After adding a coupler, enter“Startup”page and right click to select “Insert” for parameter configuration, as shown in the figure below.

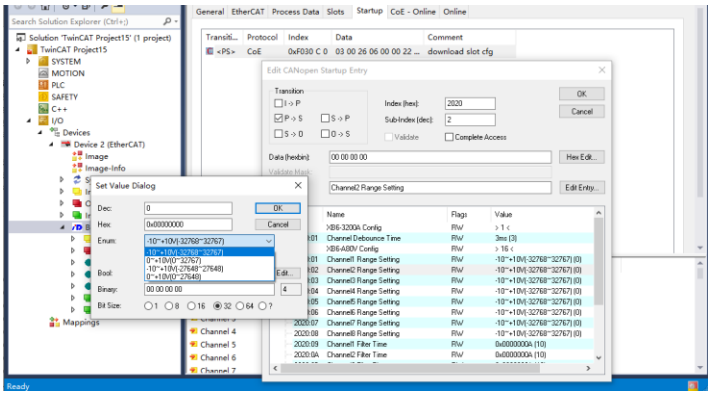


- In the master station, activate the parameter configuration function to configure IO module parameters when creating a project.
- In the master station, use SDO to modify parameters. Upon completion of the operation, the module will be automatically saved and take effect immediately. The parameters will always be kept before the topology is changed.

  Note: If the equipment is in OP state, when an output module is modified, the output signal will be cleared and new parameters will be used for operation immediately.

  Recommendation: Configure the IO modules using the parameter activation mode. After configuration, power off the system and then power it on again, so as to confirm whether the parameters have been correctly applied.

Copyright © 2018 Nanjing Solidot Electronic Technology Co., Ltd.



Coupler control word/status word

XB6-EC0002 supports two-byte control word (”CouplerState”) and two-byte status word (”CouplerState”), as shown in the table below:

CouplerState	**15**	**14**	**13**	**12**	**11**	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
						Reserved							X-bus error code display area			
[15-4]						Reserved										
[3-0]						X-bus operation status, "0”indicating normal status.										
CouplerCtrl	**15**	**14**	**13**	**12**	**11**	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
By writing bit 0 of control word CouplerCtrl, output modules can maintain continuous channel output under abnormal conditions.						Reserved										Clear/hold
[15-1]						Reserved										
[0]						**0:** default value, clearing control. **1**: holding control, default value:“0**”.** A change takes effect immediately.										

Copyright © 2018 Nanjing Solidot Electronic Technology Co., Ltd.

7.3 Module parameter configuration function

In this chapter, TwinCAT3 software platform is taken as an example to introduce module parameters, functions, and configuration methods.

7.3.1 Filtering time of digital inputs

Digital input filtering can prevent unexpected rapid changes in program response input signals. Such changes may result from jumping of switch contact or electrical noise. The duration of digital input filtering is currently fixed at 3 ms, and all clutters within 3 ms can be filtered out. Separate channel configuration is not allowed.

The 3 ms input filtering time means that a single signal changing from 0 to 1 or from 1 to 0 can only be detected after 3 ms has lapsed following such change, while a single high pulse or low pulse shorter than 3 ms will not be detected.

7.3.2 Analog filtering configuration function

Analog input filtering function

The analog input filtering function can average the data internally after A/D conversion to reduce the fluctuation effect on input signals due to noise.

Analog inputs are subject to moving average processing based on the specified A/D conversion times.

Filtering function configuration

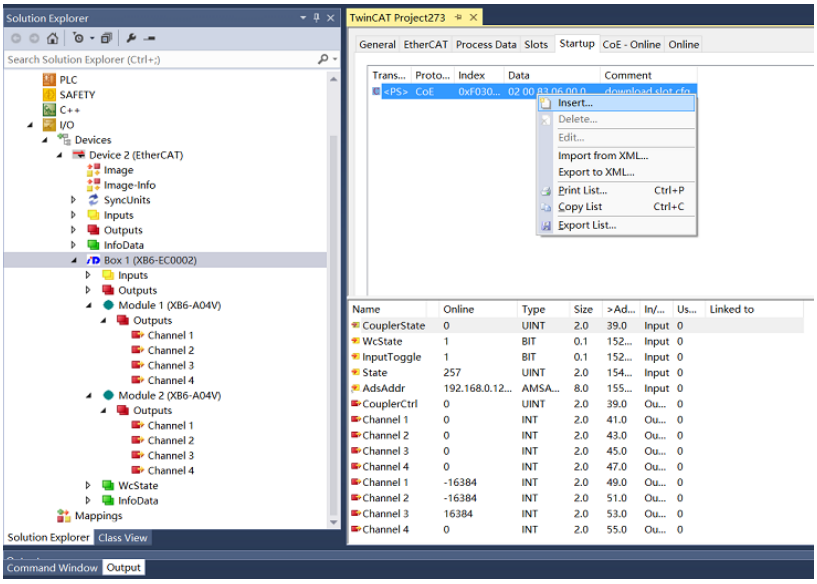
Each channel can be configured separately. Configuration range: **1~200**, default: **10**.

Sampling rate of 8-channel module: 1.25 KHZ/8 channels (800 us/8 channels)

Sampling rate of 4-channel module: 2.5 KHZ/4 channels (400 us/4 channels)

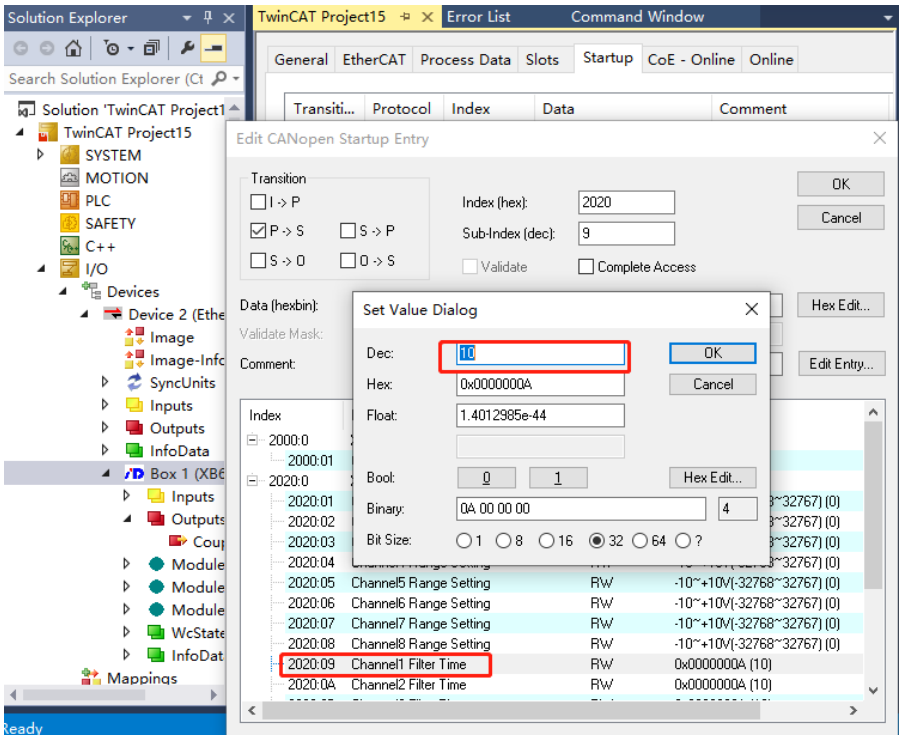
Restart is recommended after completion of configuration.

1. Single click“TwinCAT Project > I/O > Devices > Device (EtherCAT) > Box 1(XB6-EC002)” to enter the configuration interface, and switch to“Startup”page.
2. Right click“Insert”, as shown in the figure below.



Copyright © 2018 Nanjing Solidot Electronic Technology Co., Ltd.

3. Double click to select a module of an existing model (**XB6-A80V** in this example), and select the corresponding channel for filtering parameter configuration, as shown in the figure below.



7.3.2 Output clearing and holding function

Output holding: When the communication is disconnected, the module output channel will maintain its output.

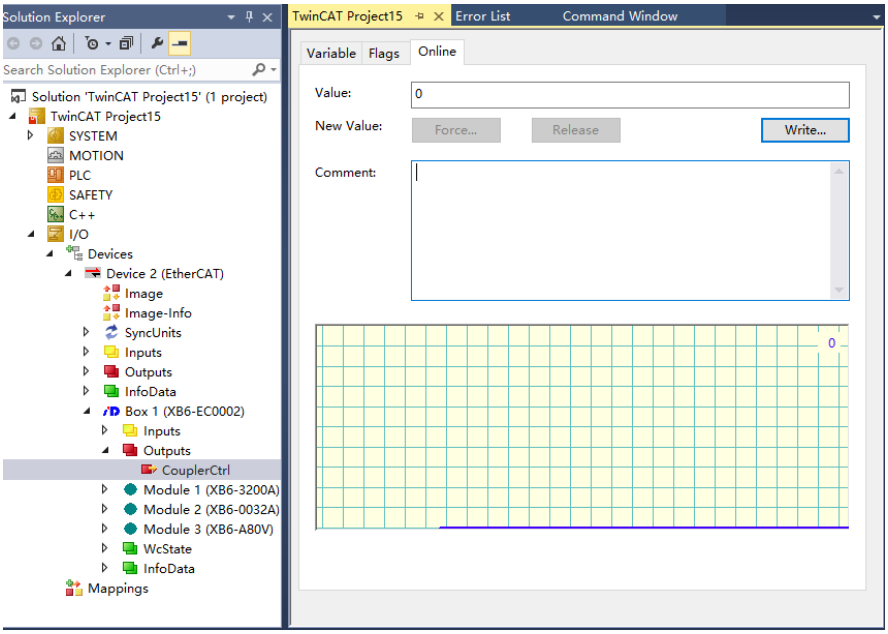
Output clearing: When the communication is disconnected, the module output channel will clear its output.

Configuration of output emptying and holding function

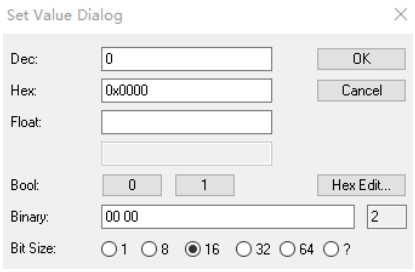
TwinCAT3 software platform is taken as an example here to explain how to configure output holding and clearing function.

1. In the tree directory, double click “CouplerCtrl”.
2. Switch to “Online” page, as shown below.

Copyright © 2018 Nanjing Solidot Electronic Technology Co., Ltd.



3. Single click “Write”, and modify the value of “CouplerCtrl”.



Set Dec to “0”: clear output.

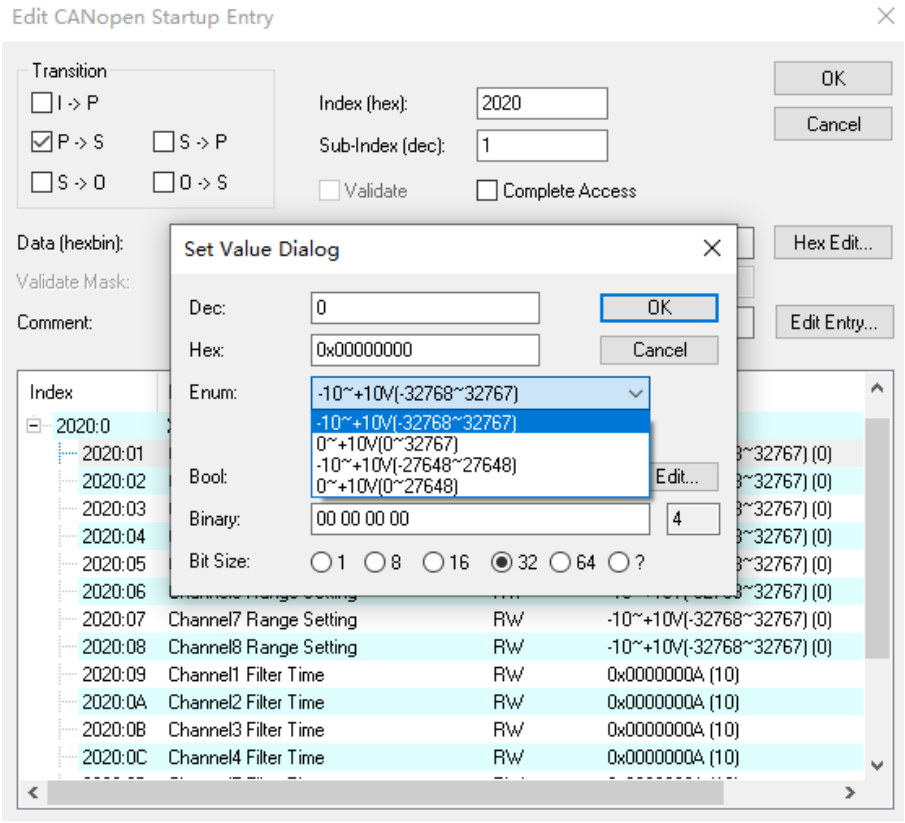
Set Dec to “1”: hold output.

Copyright © 2018 Nanjing Solidot Electronic Technology Co., Ltd.

7.3.4 Analog range selection

Range selection function is supported for analog modules. See 3.5 Analog parameters for details. TwinCAT3 software is taken as an example in this manual to explain how to configure the range of analog modules.

1. In the left navigation tree of the configuration page, select “Box 1(XB6-EC0002)”.
2. Select an analog module, right click “Insert” and enter “Edit CANopen Startup Entry” page.
2. Double click to modify the module channel. A “Set Value Dialog” box will pop up, as shown below. Set the range as needed. After modification, the module should be restarted.



Copyright © 2018 Nanjing Solidot Electronic Technology Co., Ltd.

7.4 Bus module configuration description

7.4.1 Application in TwinCAT3 software environment

1. **Preparation**

Hardware environment

A computer installed with TwinCAT3 software

Dedicated EtherCAT shielded cable

A switching power supply

Module installation guide rail and fasteners

The module model and type are shown in the table below:

Type	Model	Quantity
coupler	XB6-EC2002ST	1
IO module	XB6-3200A	1
	XB6-0032A	4
	XB60032B	1
	XB6-A40V	1
End cover	XB6-CVR00	1

Device configuration files

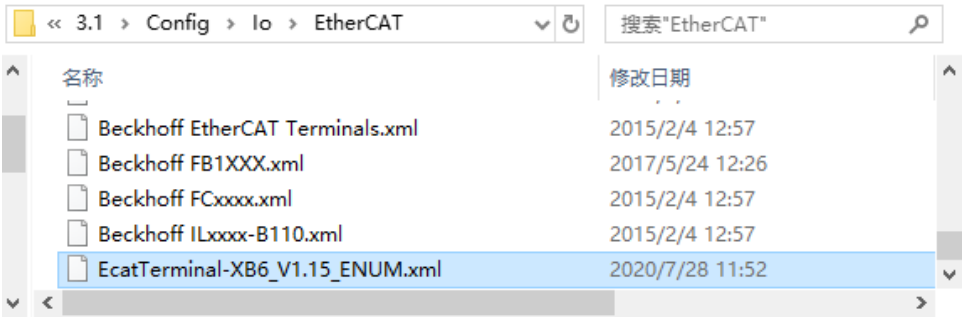
Website of configuration files: https://www.solidotech.com/documents/configfile

Hardware configuration and wiring

Please operate according to "5 Installation and Disassembly and 6 Wiring.

2. **Add a device configuration file**

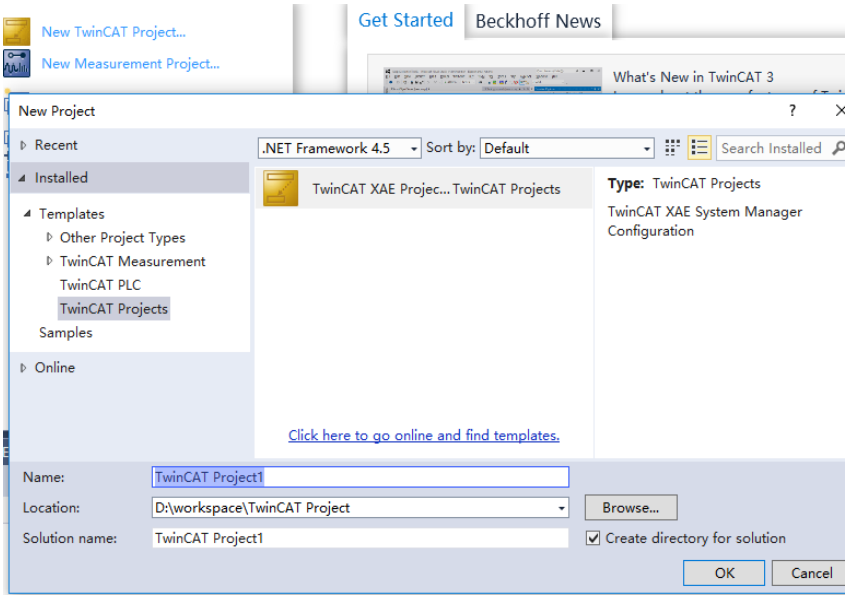
Place an **ESI** configuration file (e.g. "EcatTerminal-XB6_VX.XX_ENUM.xml") in the installation directory of **TwinCAT**: "C:\TwinCAT\3.1\Config\Io\EtherCAT", as shown below.



3. **Add a device**

1. Start **TwinCAT** software.
2. Single click "New TwinCAT Project" to create a new project, as shown below.

Copyright © 2018 Nanjing Solidot Electronic Technology Co., Ltd.

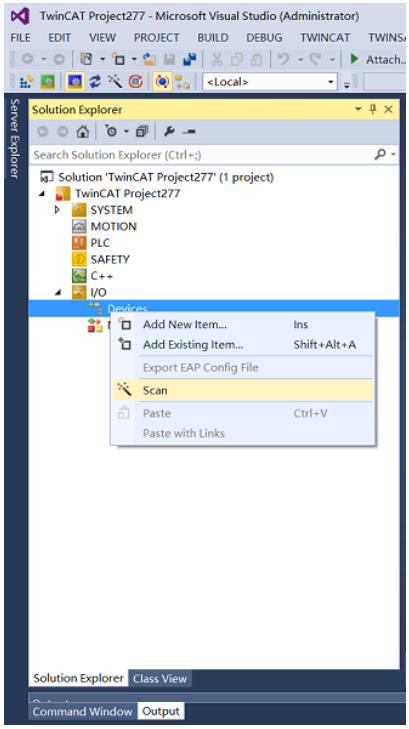


3. Single click “OK”.
4. Add a device.

   The module supports two device configuration modes: "automatic scan" and "manual addition".

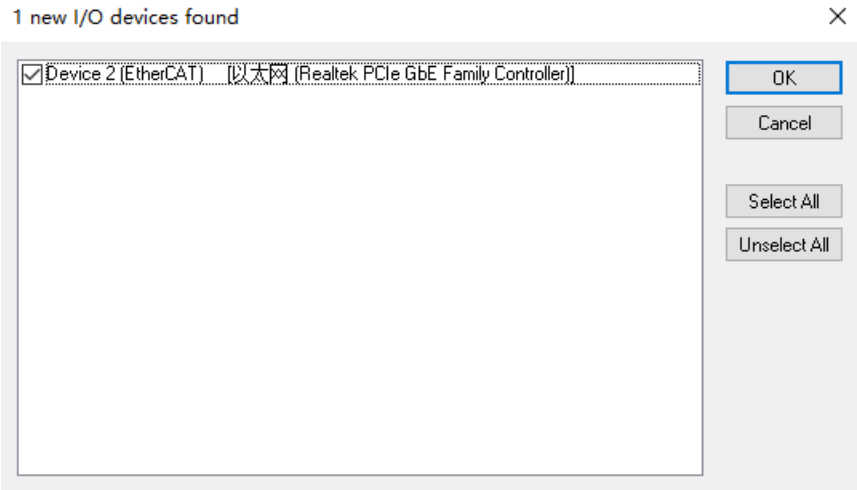
   - **Automatic scan configuration**

     1. Single click “I/O > Devices”, and right click “Scan” to scan slave station devices.



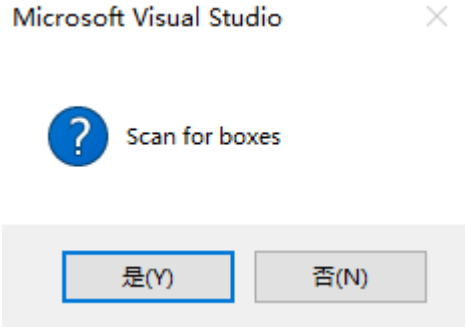
     2. Check “Local Connection” network card.

Copyright © 2018 Nanjing Solidot Electronic Technology Co., Ltd.

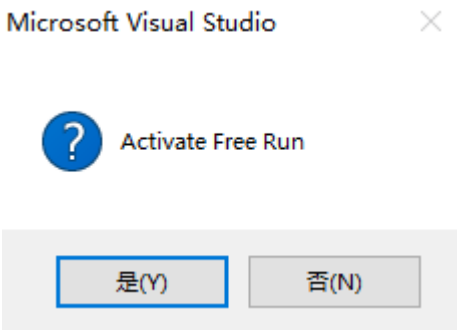


3. Single click “OK”.

4. In the pop-up “Scan for boxes” box, select “Yes”, as shown below.



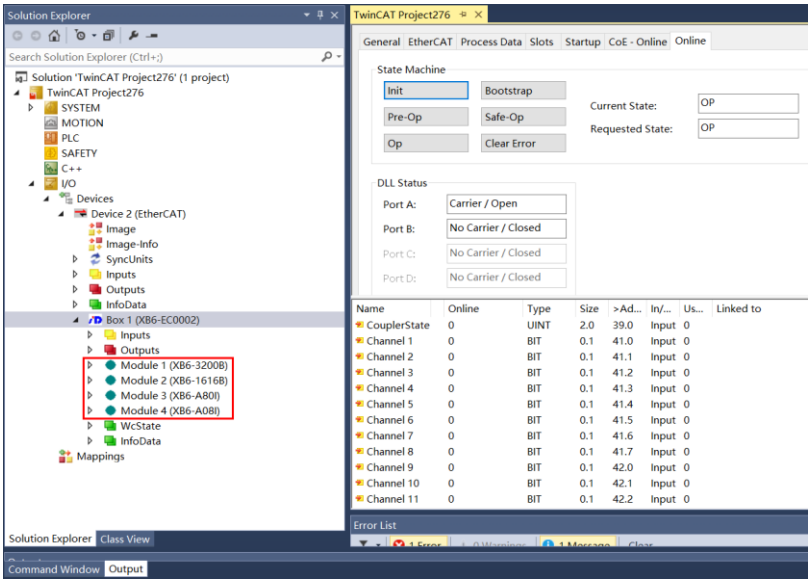
5. In the pop-up “Activate Free Run” box, select “Yes”, as shown below.



Example: The scanned “Box 1(XB6-EC0002)” is a coupler.

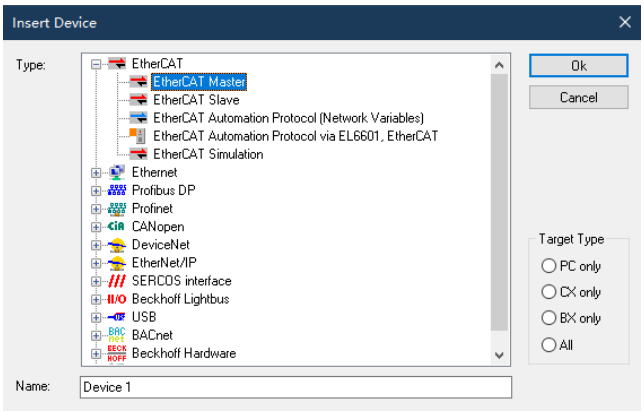
View modules connected to Box1. There are currently four modules connected to it, as shown below.

Copyright © 2018 Nanjing Solidot Electronic Technology Co., Ltd.



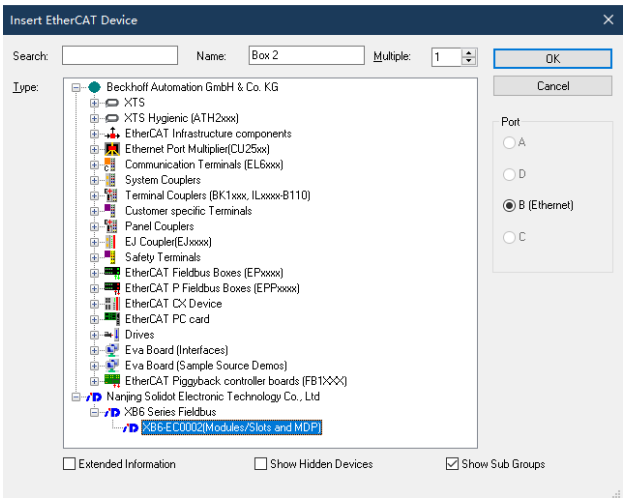
- **Add a device manually**

1. Single click “I/O > Devices”, and right click “Add New Item”. The following window will pop up.



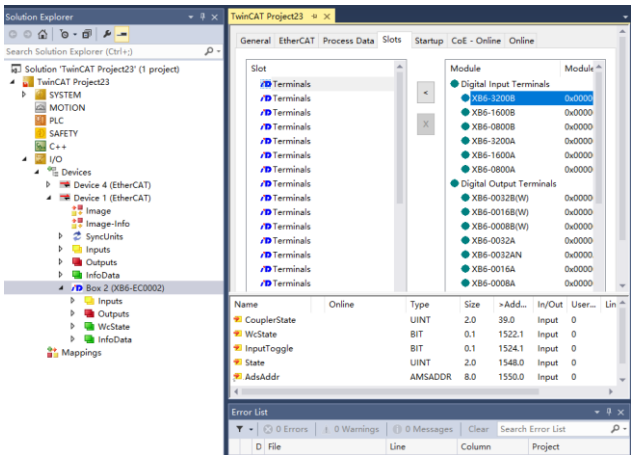
2. Select “EtherCAT > EtherCAT Master”, and single click “OK”.
3. Select “Ethernet” in the pop-up window.
4. Single click “I/O > Devices”, and right click “Add New Item”. The following window will pop up.

   Select a coupler.



Copyright © 2018 Nanjing Solidot Electronic Technology Co., Ltd.

5. Add a device.

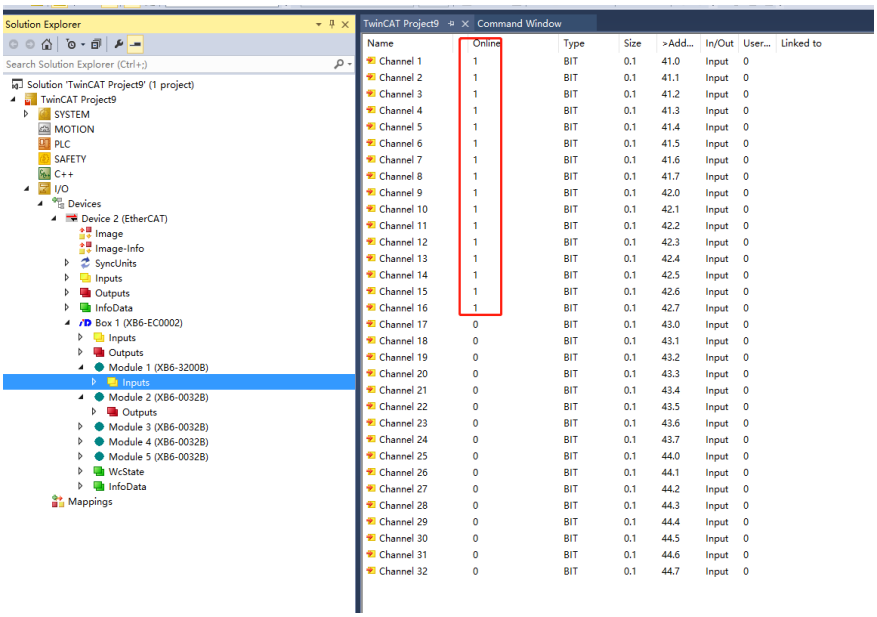


In “Slots” tab, add a device.

4. Data interaction

Digital input:

Taking **XB6-3200B** module as an example, the input signal can be monitored in “Inputs” of the module, as shown below:

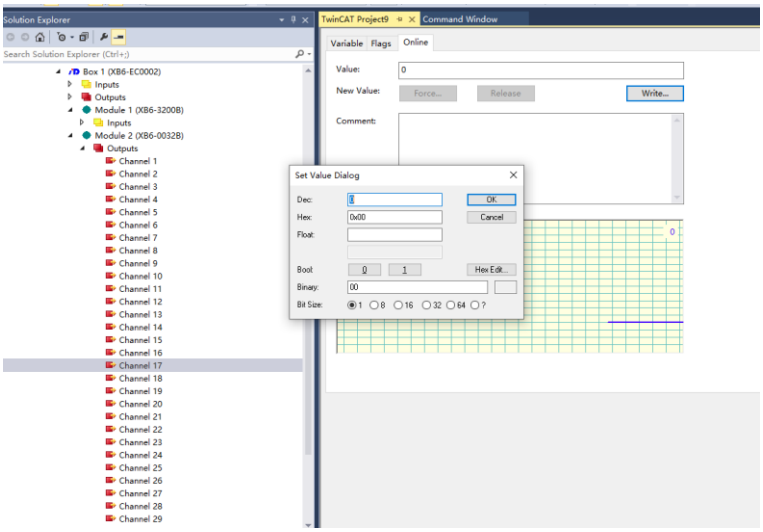


Digital output:

Taking **XB6-0032B** as an example, in order to enable output of channel **17** of the module, the following operation steps are required:

1. Select “TwinCAT Project > I/O > Box 1(XB6-EC002) > Module 2(XB6-3200B) > Outputs > Channel 17”.
2. Switch to “Online”.
3. Single click “Write” to set “Dec” as “1”.

Copyright © 2018 Nanjing Solidot Electronic Technology Co., Ltd.



4. Single click “OK”, and the channel indicator corresponding to the module will light up.

7.4.2 Application in Sysmac Studio software environment

1. Preparation

Hardware environment

A computer installed with Sysmac Studio software

Omron PLC: NX1P2 9024DT

Dedicated EtherCAT shielded cable

A switching power supply

Module installation guide rail and fasteners

The module model and type are show in the table below:

Type	Model	Quantity
coupler	XB6-EC2002ST	1
IO module	XB6-3200A	1
	XB6-0032A	4
	XB60032B	1
	XB6-A40V	1
End cover	XB6-CVR00	1

Device configuration files

Website of configuration files: https://www.solidotech.com/documents/configfile

Hardware configuration and wiring

Please operate according to 5 Installation and Disassembly and 6 Wiring.

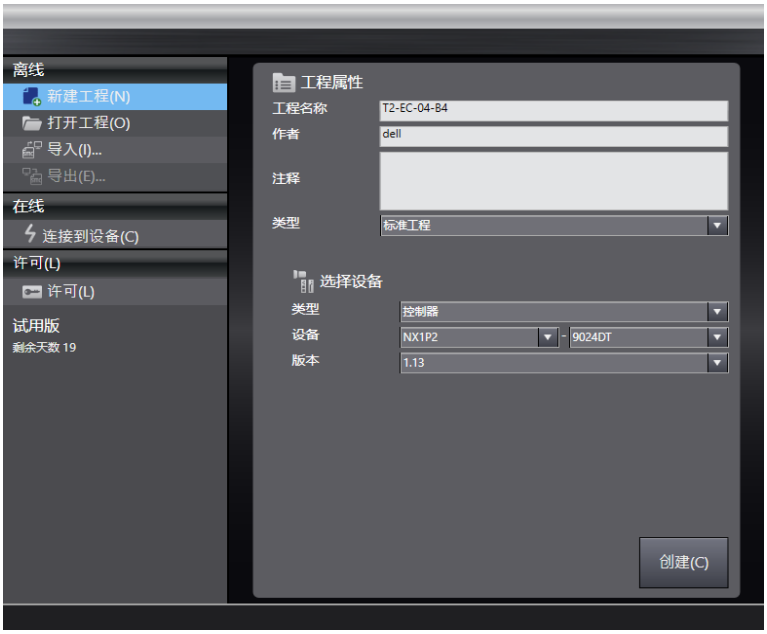
Computer IP requirement

Set the IP address of the computer and that of the PLC to ensure they are in the same network segment.

2. Add a device description file

1. Log into **Sysmac Studio**.
2. Single click “Create a New Project” button**.**

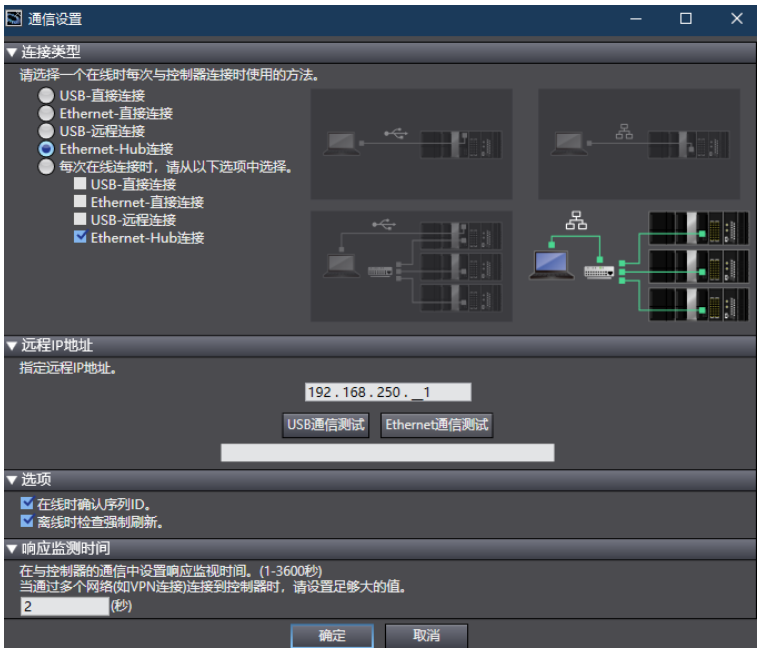
Copyright © 2018 Nanjing Solidot Electronic Technology Co., Ltd.



In the drop-down list of “Device” and “Version”, select “Device”, “Model”, and “Version”.

3. Select “Controller > Communication Configuration”.

   1. Select a method for connecting the controller online, and enter a “remote IP address”, as shown below.

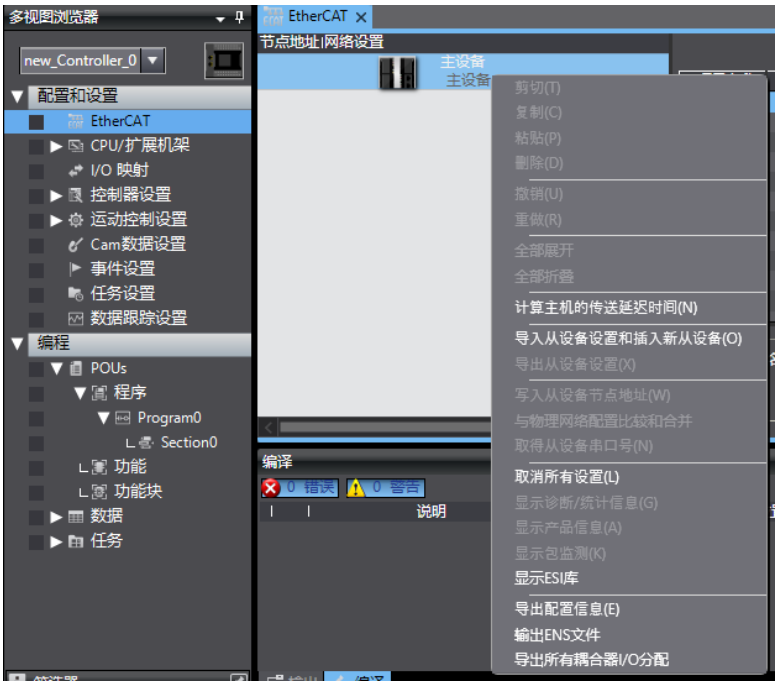


   2. Single click “Ethernet Communication Test”, and the system will show a successful test message.

3. Add an XML file

1. Unfold “Configuration and Setting” in the left navigation tree, and double click “EtherCAT”.
2. Right click “Main Device”, and select “Display ESI Library”, as shown below.

Copyright © 2018 Nanjing Solidot Electronic Technology Co., Ltd.

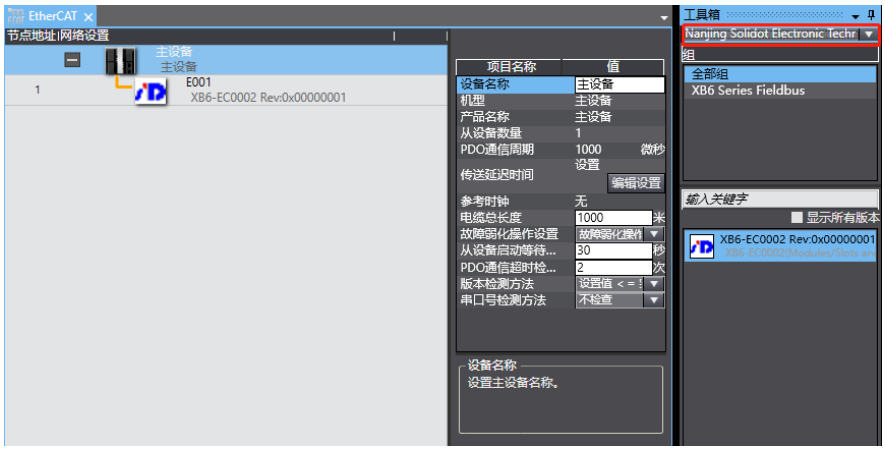


3. In the pop-up “ESI Library” window, single click “Install (File)” button, and select a XML file path.

4. Add a device

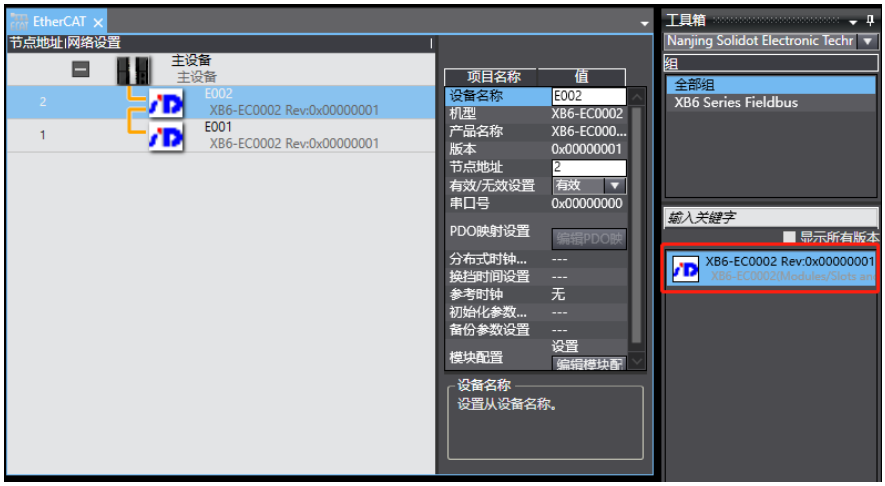
Add a coupler

1. Unfold “Configuration and Setting” in the left navigation tree, and double click “EtherCAT” to show “Node Setting | Network Setting” page.
2. In the drop-down list of “All Suppliers” in the right navigation bar, select “Nanjing Solidot Electronic Technology Co., Ltd”, as shown below.



3. Double click **XB6-EC0002** to add a coupler module, as shown below.

Copyright © 2018 Nanjing Solidot Electronic Technology Co., Ltd.

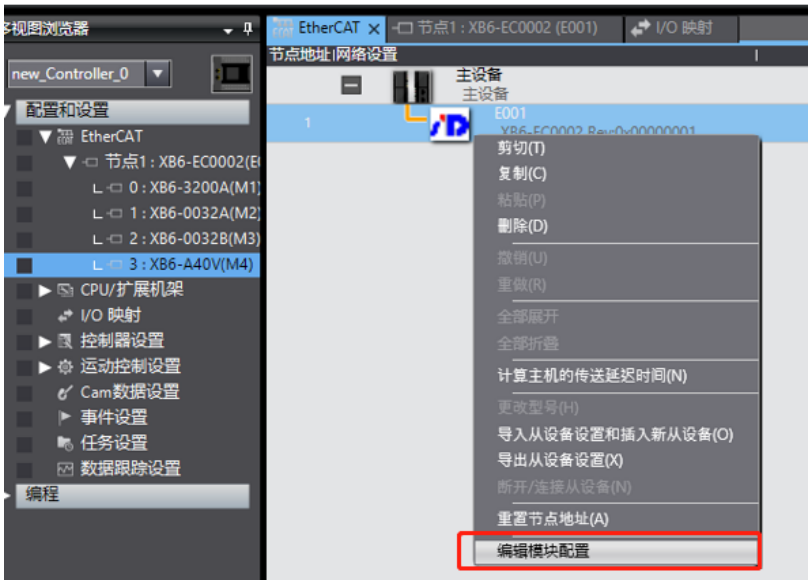


Copyright © 2018 Nanjing Solidot Electronic Technology Co., Ltd.

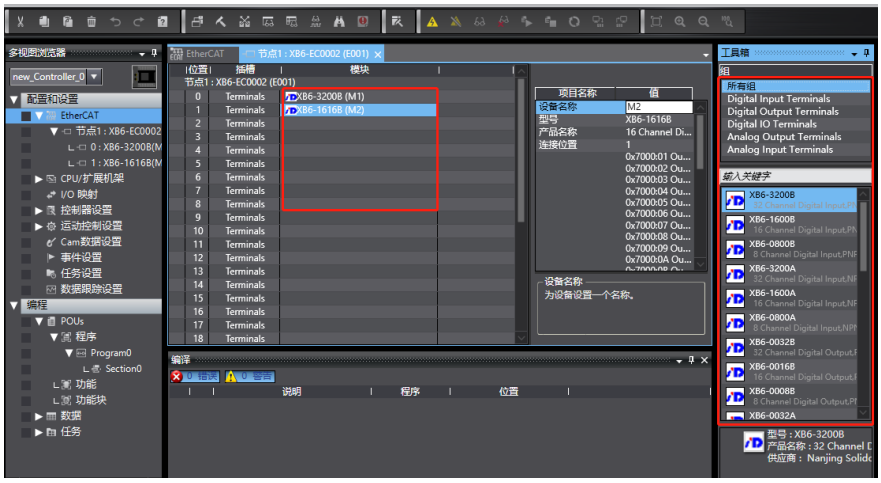
- **Add an I/O module**

Single device connection:

1. Select the added coupler module, and right click it to show the menu. Select “Edit Module Setting”, as shown below.



2. Place the cursor on “Module”, and single click the module in the right list. Add I/O modules one by one according to I/O configuration sequence.



Multi-device cascading:

1. Selected the added coupler module, and right click it to show the menu. Select “Edit Module Setting”.
2. Single click the top menu bar “Controller > Online”.
3. Right click the “Main Device” icon, and select “Write Slave Device Node Address”, as shown below. Enter a “Setting” different from the “Current Value”.

Copyright © 2018 Nanjing Solidot Electronic Technology Co., Ltd.

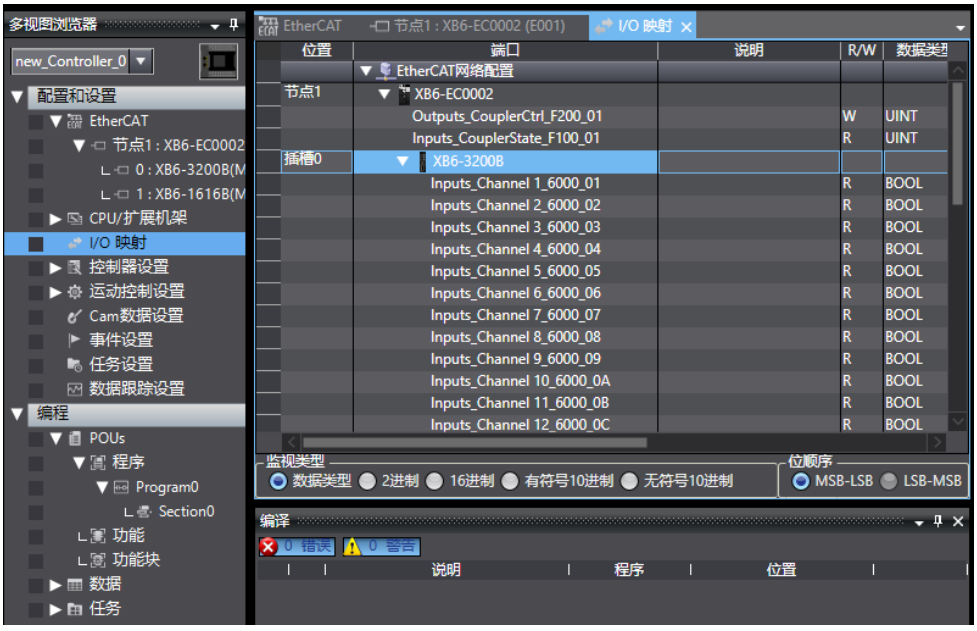
4. Restart PLC and the device simultaneously.
5. Right click “Main Device” icon, and select “Compare with Physical Network Configuration and Merge”.

5. Configuration download

Single click “Controller > In Transmission > Transmit to Controller” to send the online data to the controller.

6. Channel test

In the left navigation tree, double click “I/O Mapping”, and select a corresponding I/O module to view and operate channel data.

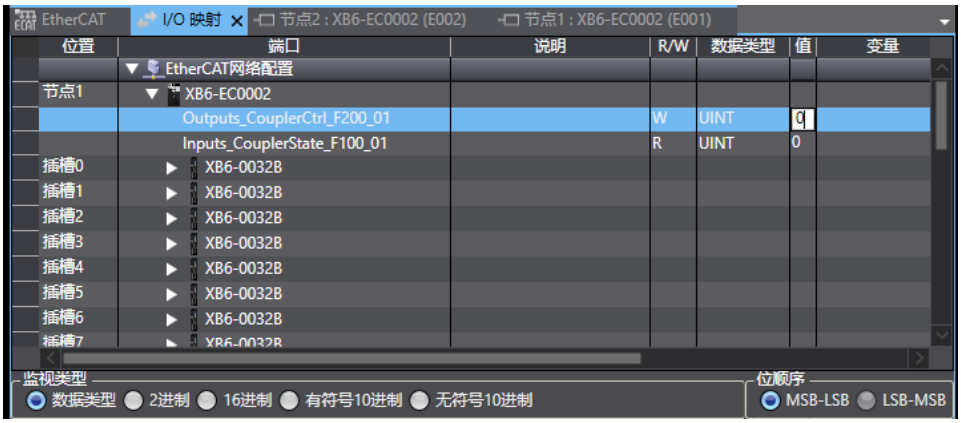


7. Module parameter configuration

Output emptying/holding function

1. Double click “I/O Mapping” in the left navigation tree to show “I/O Mapping” window.
2. Unfold the node. In the system operation state, Write “01” into “Outputs_CouplerCtrl_F200_01” to complete configuration of clearing/holding function.

Copyright © 2018 Nanjing Solidot Electronic Technology Co., Ltd.

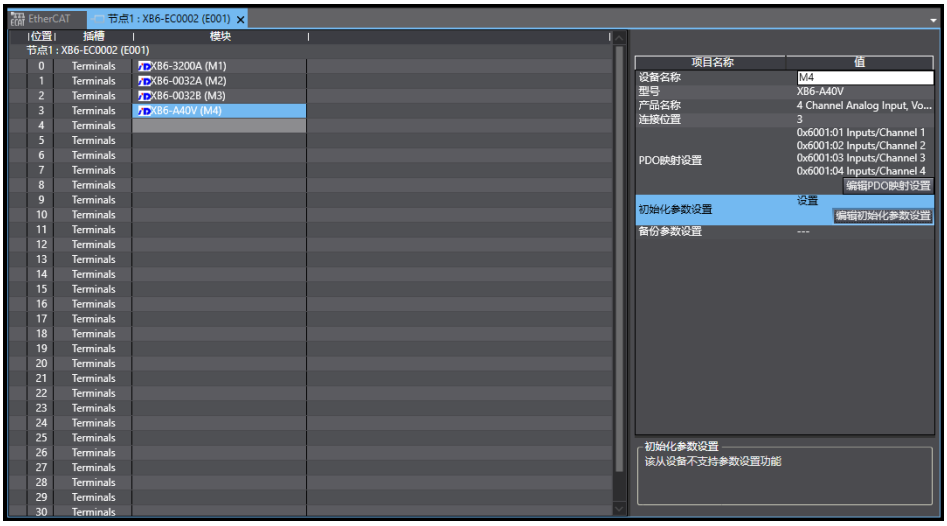


0: clear the output

1: hold the output

Analog range selection and filtering configuration

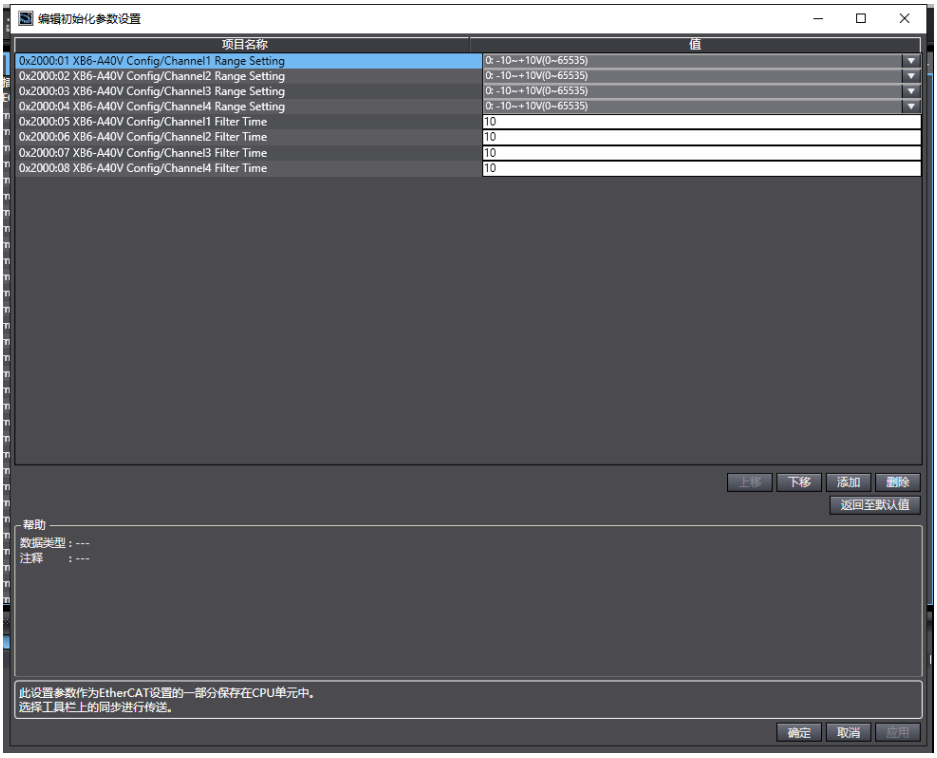
1. Double click a node in the left navigation tree and select a corresponding input module.
2. After the system goes offline, single click “Edit Initialization Parameter Setting” button.



3. **Range selection and filtering configuration**

   It is possible to select a range and set filtering parameters in “Edit Initialization Parameter Setting” page. For specific parameters, please refer to 7.3 Module parameter configuration function.

Copyright © 2018 Nanjing Solidot Electronic Technology Co., Ltd.



Copyright © 2018 Nanjing Solidot Electronic Technology Co., Ltd.

7.4.3 Application in CODESYS V3.5 software environment

1. Preparation

Hardware environment

A computer installed with **CODESYS V3.5** software

Dedicated EtherCAT shielded cable

A switching power supply

Module installation guide rail and fasteners

The module model and type are shown in the table below:

Type	Model	Quantity
coupler	XB6-EC0002	1
IO module	XB6-3200A	1
	XB6-0032A	4
	XB60032B	1
	XB6-A40V	1
End cover	XB6-CVR00	1

Device configuration files

Website of configuration files: https://www.solidotech.com/documents/configfile

Hardware configuration and wiring

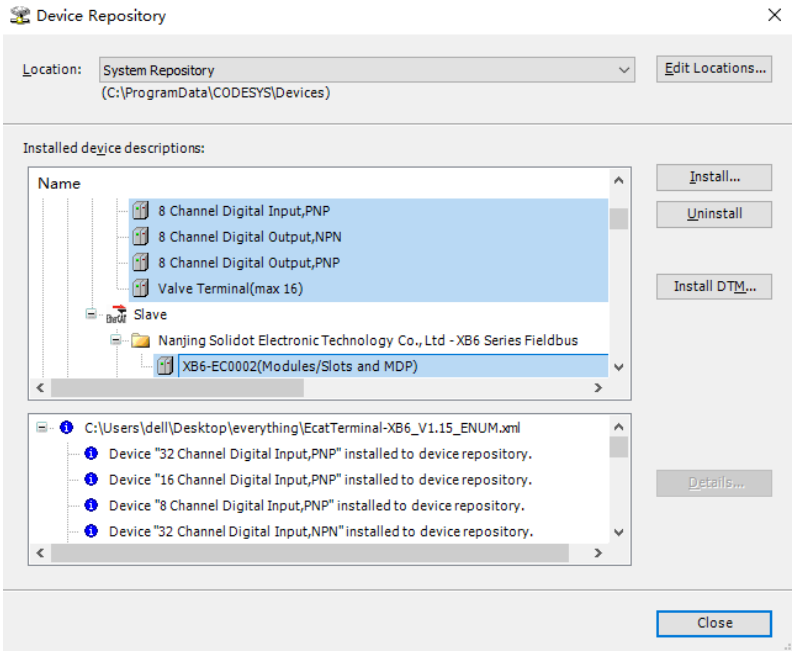
Please operate according to 5 Installation and Disassembly and 6 Wiring.

2. Install device configuration file

1. Install **EhterCAT XML** device description file **(**“EcatTerminal-XB6_VX.XX_ENUM.xml”)

1. Log into **CODESYS.**
2. Select “Tools > Device Repository”.
3. Single click “Install”, and select relevant XML file for installation.

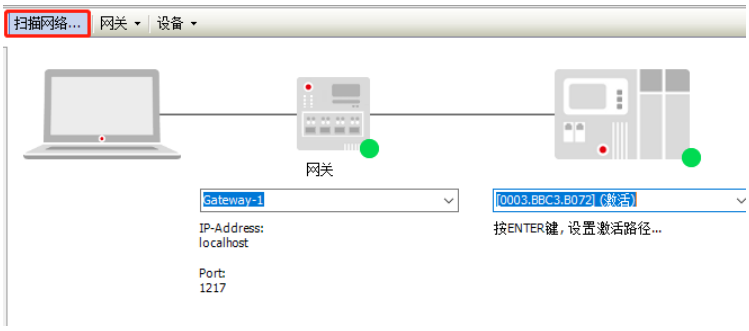
After successful installation, “Device xxxx installed to device repository” will be displayed.



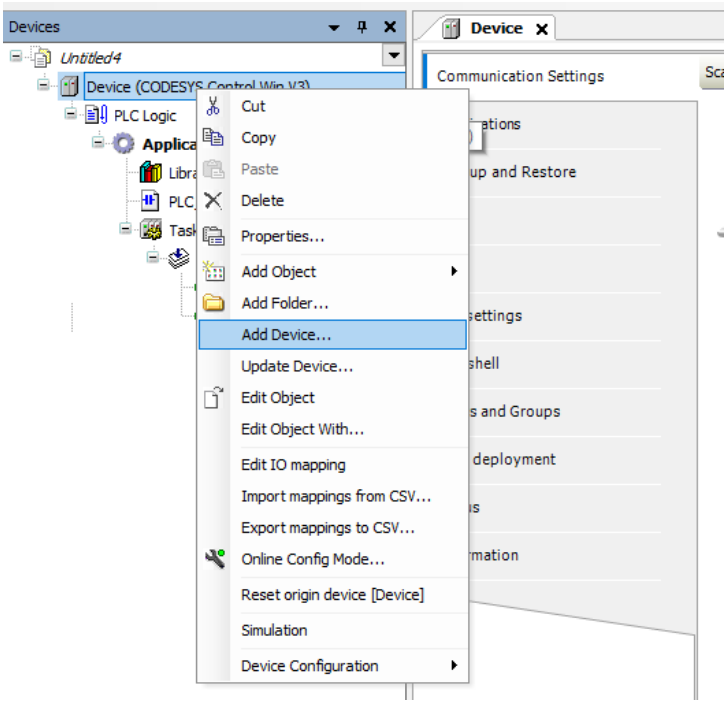
2. Add **EtherCAT Master**

Copyright © 2018 Nanjing Solidot Electronic Technology Co., Ltd.

1. Double click “Device(CODESYS Control Win V3 X84)” in the left navigation tree, and single click “Scan Network”.
2. Select a device for network scan, e.g.:

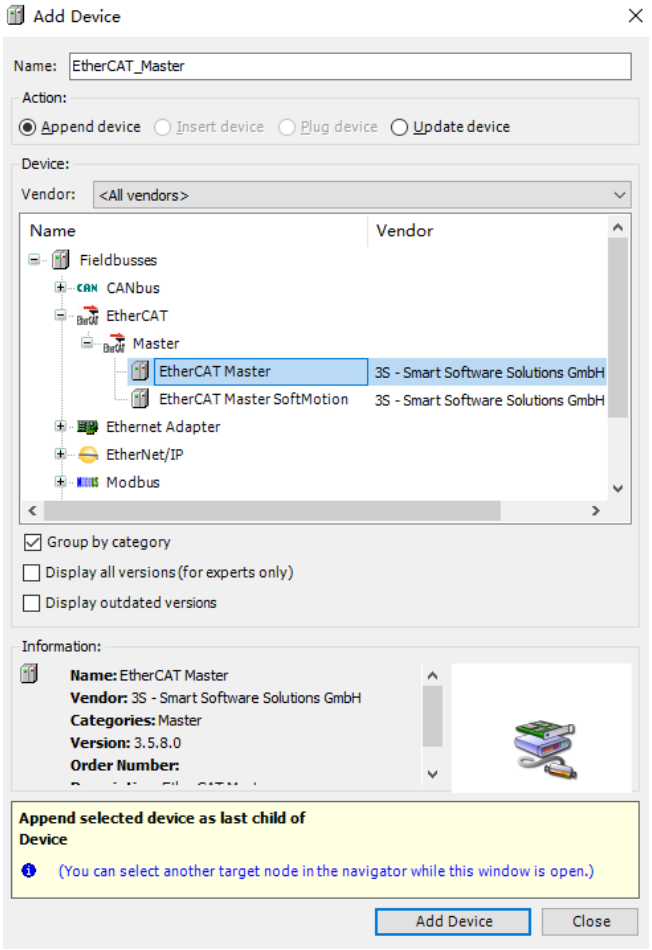


3. Select “Device(CODESYS Control Win V3 X84)” in the left navigation tree, and right click to select “Add Device”, as shown below.



4. Select “EtherCAT Master”, as shown below.

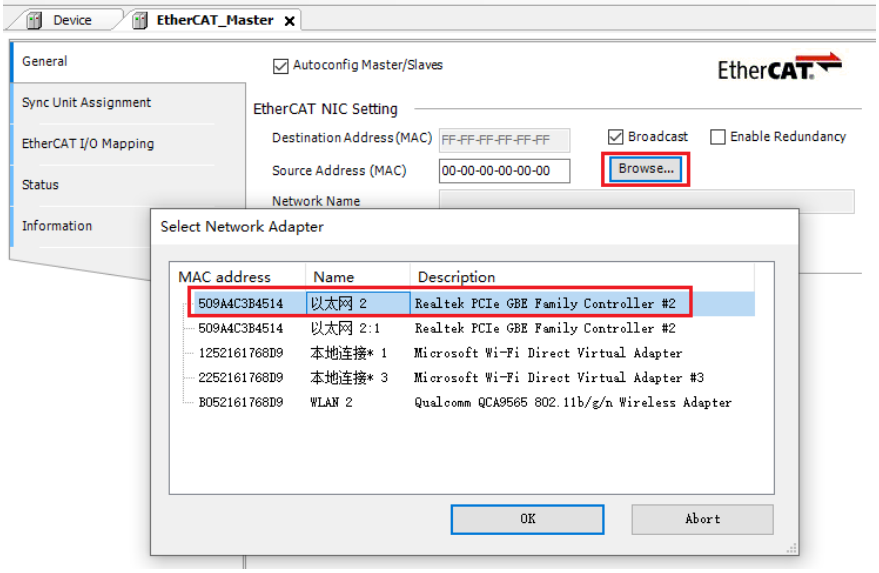
Copyright © 2018 Nanjing Solidot Electronic Technology Co., Ltd.



5. Single click “Add Device”, and press Enter in the Device List box to activate the device.

3. Configure “EtherCAT Master”.

1. Double click “EtherCAT Master(EtherCAT_Master)”.
2. Single click “Browse”, and select “Ethernet” in the pop-up box, e.g.:



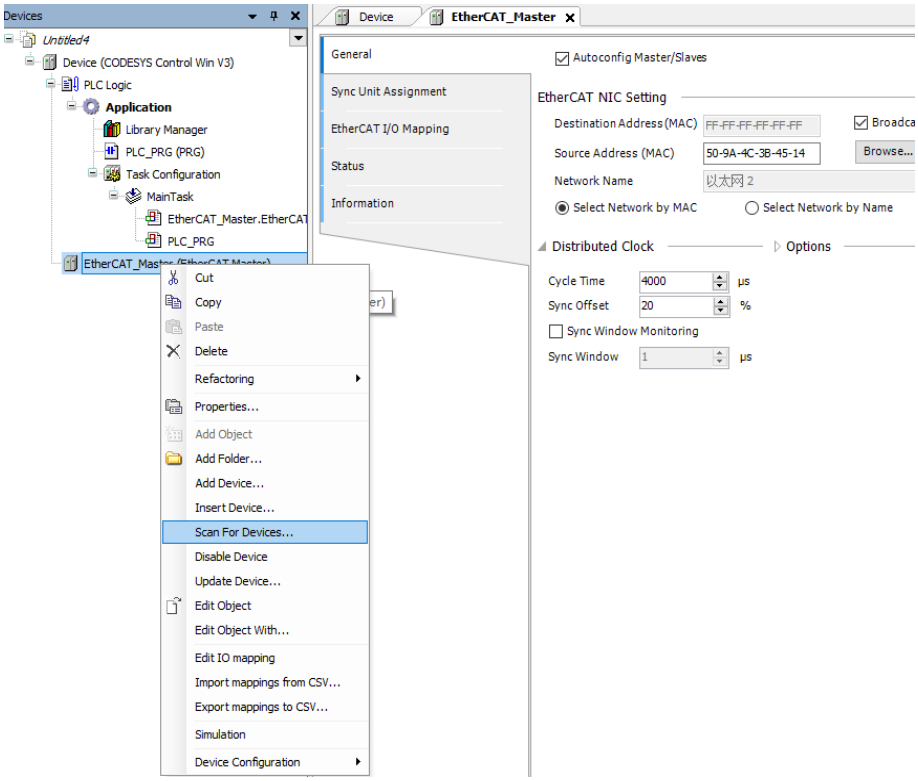
4. Configure a device

The module supports two device configuration modes: "**automatic scan**" and "**manual addition**".

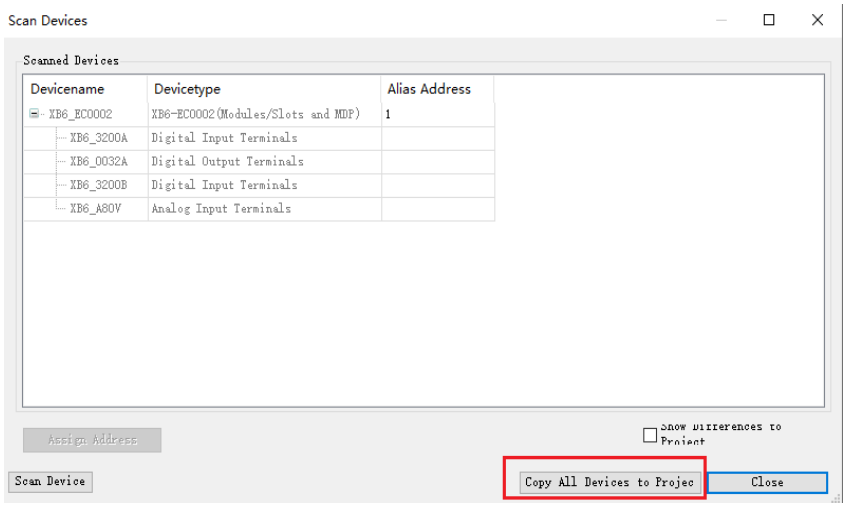
- **Automatic device scan**

Copyright © 2018 Nanjing Solidot Electronic Technology Co., Ltd.

1. Select “EtherCAT_Master (EtherCAT Master)”, and single click “Scan For Devices”, as shown below.

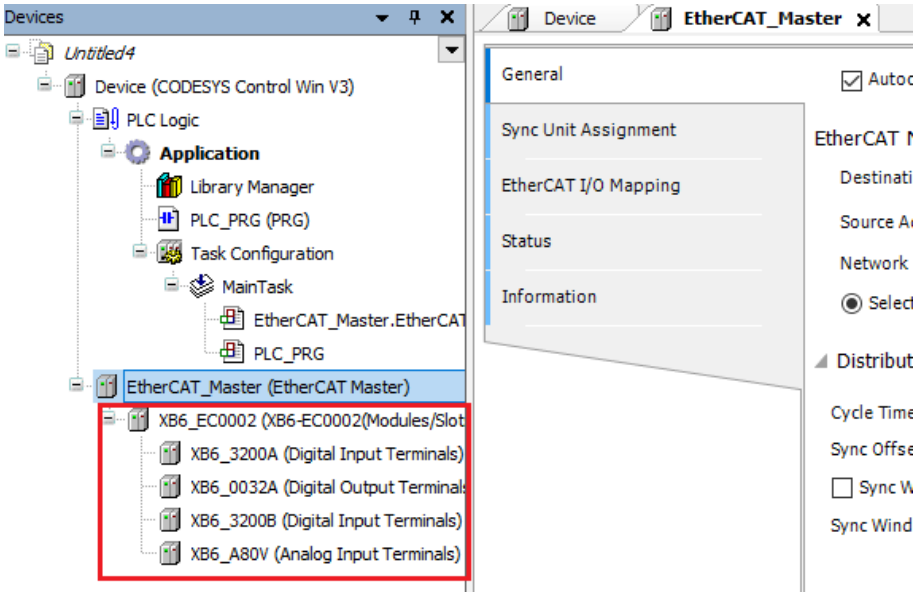


2. Select “XB6_EC0002”, and single click “Copy All Devices to Project”, as shown below.



The device has been added, as shown below.

Copyright © 2018 Nanjing Solidot Electronic Technology Co., Ltd.

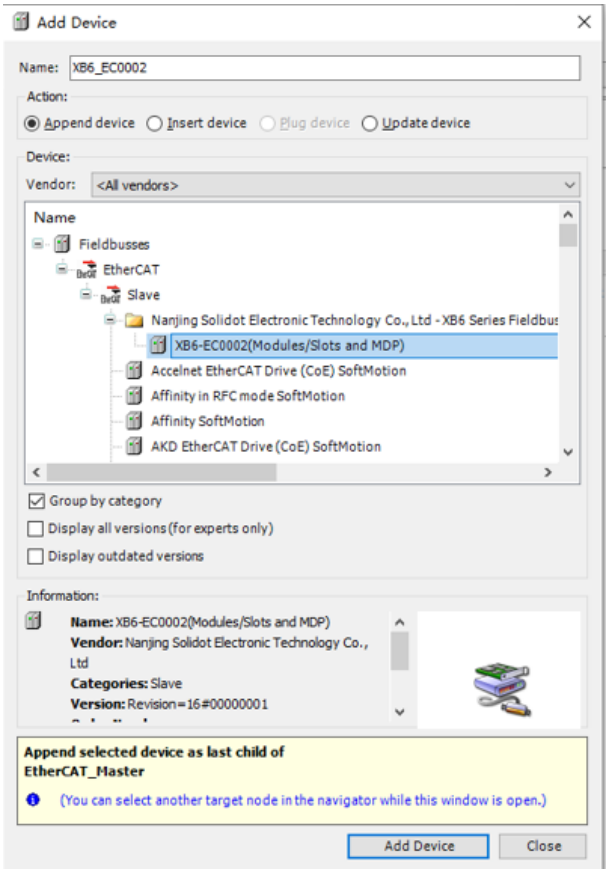


1. Single click “Online > Multiple”, and select “Always Execute Full Download”.
2. Single click “Online > Login” in the menu bar.

- **Add a device manually**

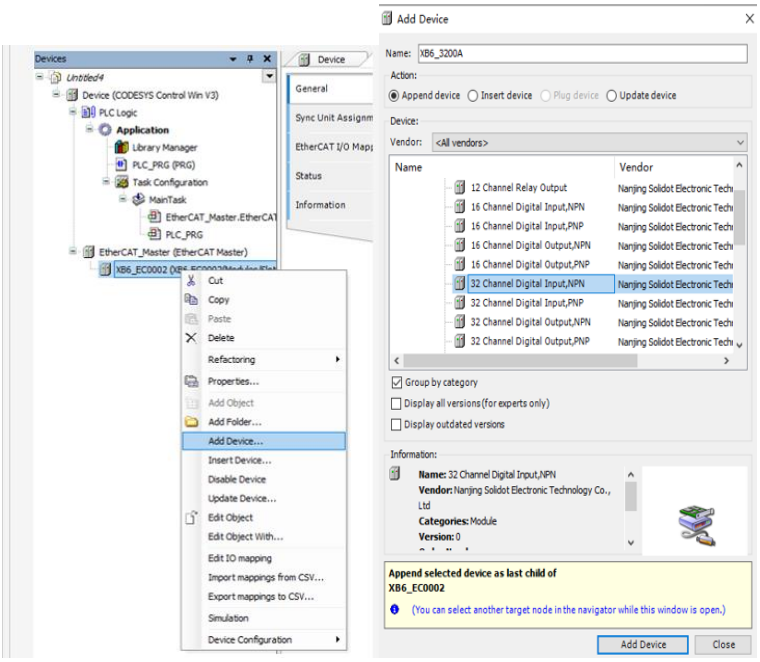
  Add the modules one by one in their installation order. In the case of wrong order, the system will not run normally.

  1. Select “EtherCAT_Master (EtherCAT Master)”.
  2. Right click “Add Device” to show “Add Device” page. Select a coupler, as shown below.



  3. Select a coupler and single click “Add Device” to add an I/O module, as shown below.

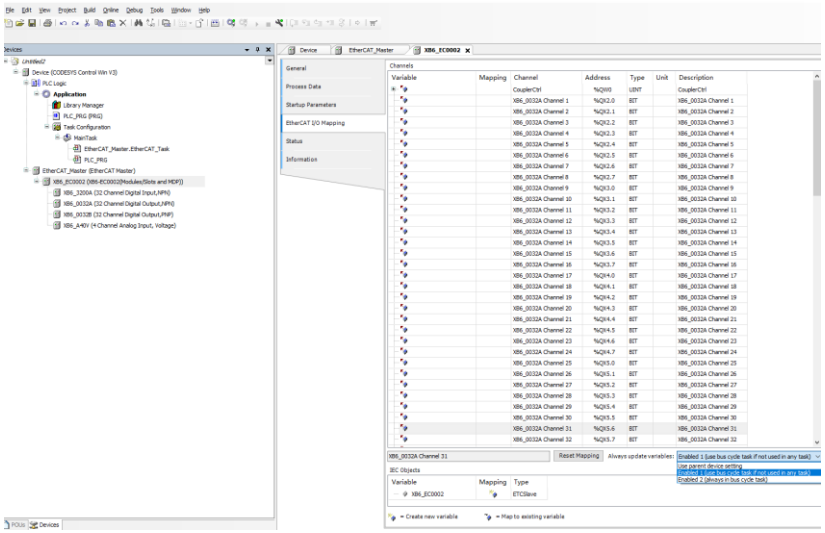
Copyright © 2018 Nanjing Solidot Electronic Technology Co., Ltd.



5. Test an IO module

- Configure IO module bus mode

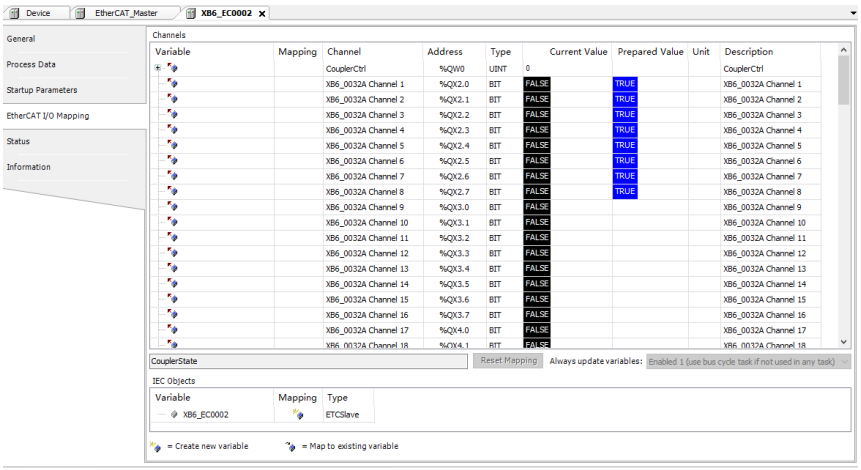
1. Single click “Logout” button to exit from PLC.
2. Double click a coupler to switch to “EhterCAT I/O Mapping” tab.
3. In the “Always update variables” drop-down list in the bottom right corner, select “Enabled1” mode, as shown below.



4. Execute download and single click “Online Multiple”.
5. Test input and output.

1. Single click “Log Into” button to log in again.
2. Double click the coupler, and click “Prepared Value” cell.
3. In the top menu bar, click “Debug > Write Value”.

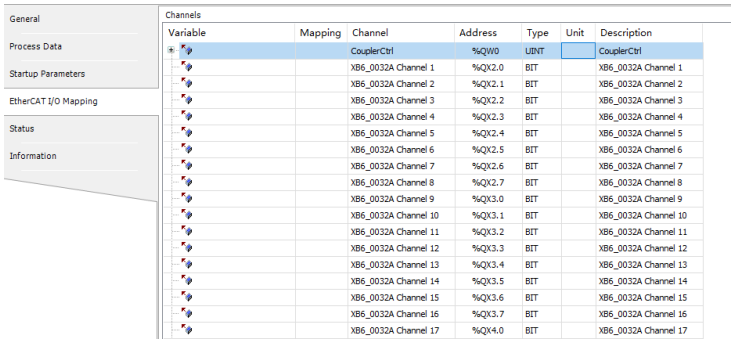
Copyright © 2018 Nanjing Solidot Electronic Technology Co., Ltd.



6. Module parameter configuration

Output clearing/holding configuration

1. In the left navigation bar, double click coupler **XB6-EC0002**. In its “Property” tab, select “EtherCAT I/O Mapping” page.



2. In the system operation state, enter “Preset Value”, click “Debug > Write Value”, and modify the value of “CouperCtrl”.

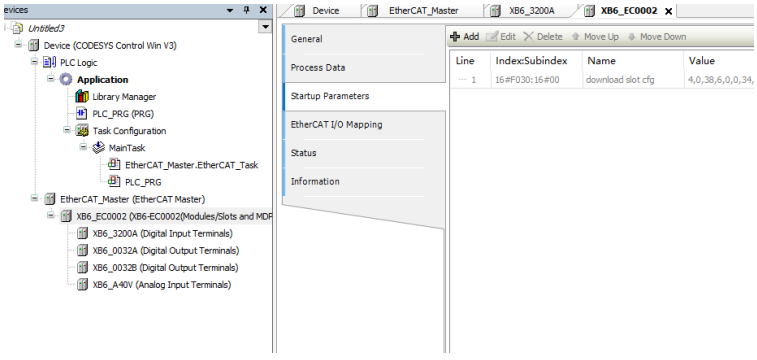
   0: clear the output

   1: hold the output

Analog range and filtering configuration

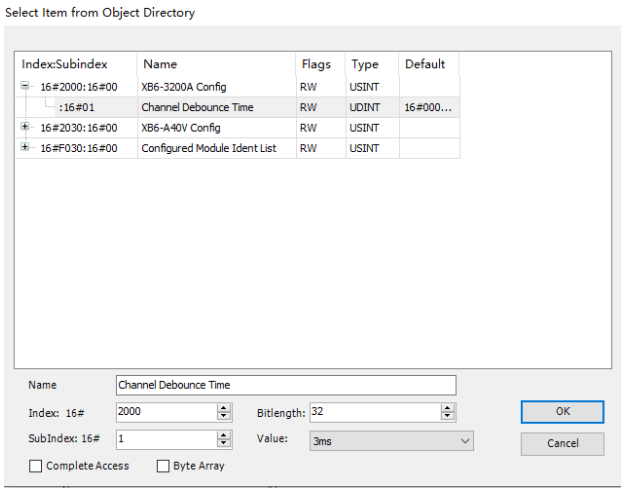
1. Enable expert configuration

   Log out. In the left navigation bar, double click coupler **XB6-EC0002**, and select “Startup Parameters” page in its “Property” tab.

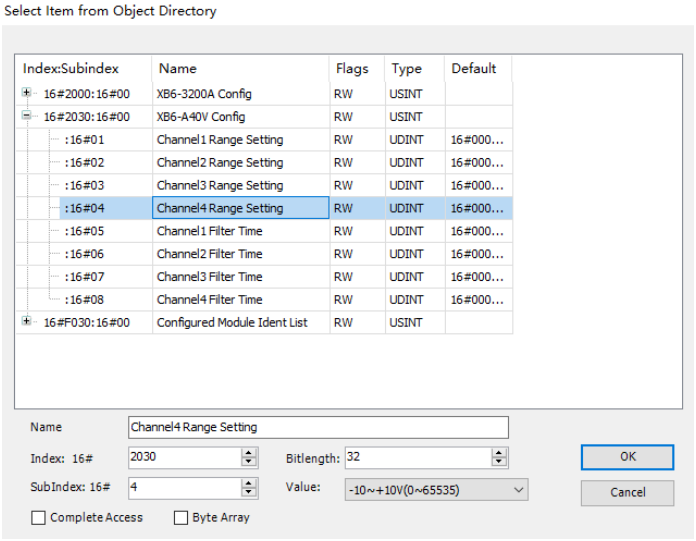


2. Single click “Add” button to show “Select Item from Object Directory” page.

Copyright © 2018 Nanjing Solidot Electronic Technology Co., Ltd.



It is possible to set the range and filtering parameters in “Select Item from Object Directory” page.



Copyright © 2018 Nanjing Solidot Electronic Technology Co., Ltd.