



# **XC series PLC expansion module**

**User Manual**

WUXI XINJE ELECTRIC CO., LTD.

This manual includes some basic precautions which you should follow to keep you safe and protect the products. These precautions are underlined with warning triangles in the manual. About other manuals that we do not mention please follow basic electric operating rules.

**Precautions**



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Please follow the precautions. If not, it may lead the control system incorrect or abnormal, even cause fortune lose.

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**Correct Application**



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The models could only be used according to the manual, and an only be used along with the peripheral equipments recognized or recommended by Xinje Company. They could only work normally in the condition of be transported, kept and installed correctly, also please operate and maintain them according to the recommendation.

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Without exact paper file allowance, copy, translate or using the manual is not allowed. Disobey this, people should take the responsibility of loss. We reserve all the right of expansions and their design patent.

**Duty Declare**

We have checked the manual; its content fits the hardware and software of the products. As mistakes are unavoidable, we couldn't promise all correct. However, we would check the data in the manual frequently, and in the next edition, we will correct the necessary information. Your recommendation would be highly appreciated

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# 1. Modules introduction

## 1-1. Module type and configuration

XC series PLCs not only have strong functions of logic operation, data operation, high speed processing etc. but also A/D, D/A conversion, PID function. With the expansions of analog input module, analog output module, temperature control module etc, XC series PLCs are widely used in the control system of temperature, flow, liquid level, pressure.

### Module type and names

The detailed information is:

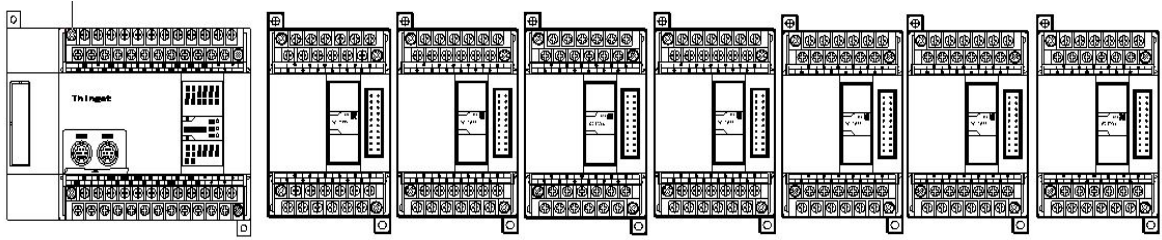
Model	Function
XC-E8AD (-H)	8 channels analog input (14bits); 4 channels current input, 4 channels voltage input
XC-E4AD2DA (-H)	4 channels analog input (14bits); 2 channels analog output (12bits); current/voltage selectable
XC-E4AD2DA-B-H	4 channels analog input (14bits); 2 channels analog output (12bits); current/voltage selectable
XC-4AD (-H)	4 channels analog input (14 bits), current/voltage selectable
XC-4DA (-H)	4 channels analog output (14 bits), current/voltage selectable
XC-E4DA-B-H	4 channels analog output (14 bits), voltage output
XC-2DA (-H)	2 channels analog output (12 bits), current/voltage selectable
XC-E2AD-H	2 channels analog input (12 bits), current/voltage selectable
XC-E6PT(-P)(-H)	-100°C~350°C, 6 channels Pt100 temperature signal sampling, 0.1 degree precision, built-in PID function
XC-E2PT-H	-100°C~327°C, 2 channels K type thermocouple temperature sampling module, 0.1 degree precision, include PID operation
XC-E6TCA-P	0°C~1000°C or 0°C~1300°C , 6 channels thermocouple temperature sampling module, 0.1 degree precision, include PID operation
XC-3AD4PT2DA(-H)	3 channels current input (14 bits), 4 channels PT100 temperature input and 2 channels voltage output (10 bits)
XC-E2AD2PT2DA	2 channels current input (16 bits), 2 channels PT100 temperature input and 2 channels voltage output (10 bits)
XC-EnXmY	n points digital input, m points digital output

**Note:**XC-E8AD-B is analog input module with control bit

### Module configuration

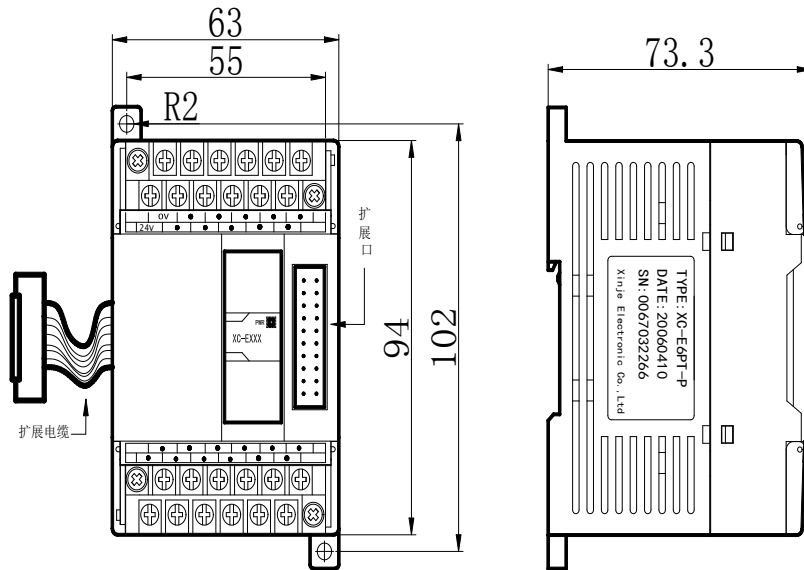
XC series expansion modules can be connected to the right side of PLC:

- Digital input, output terminal no. is octal number.
- Analog input, output terminal no. is decimal number.
- Up to 7 expansion modules and 1 BD board can be connected to the PLC.do not have kind limitation .

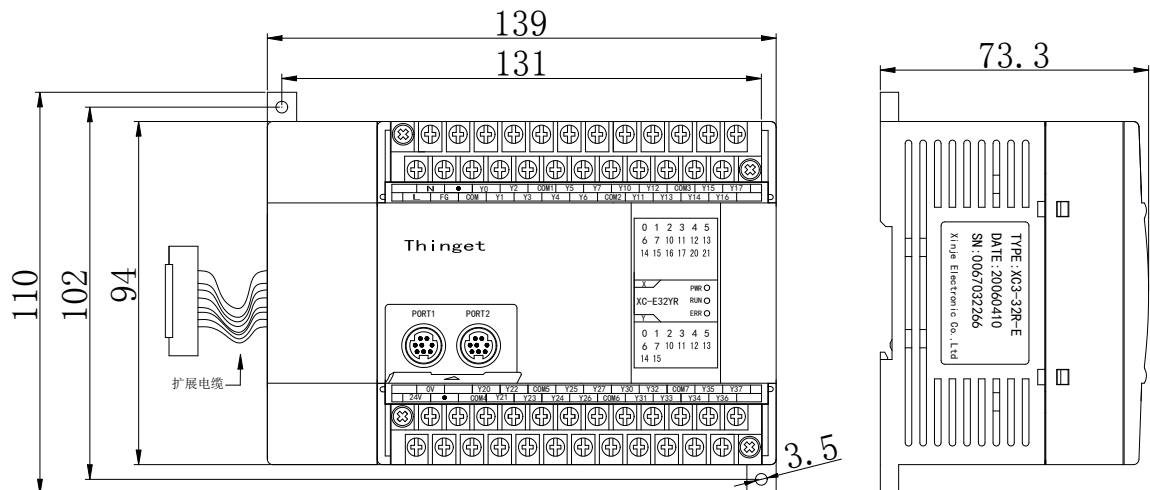


## 1-2. Dimensions

Analog, temperature, pressure modules, 8/16 points I/O modules: (dimension: mm)

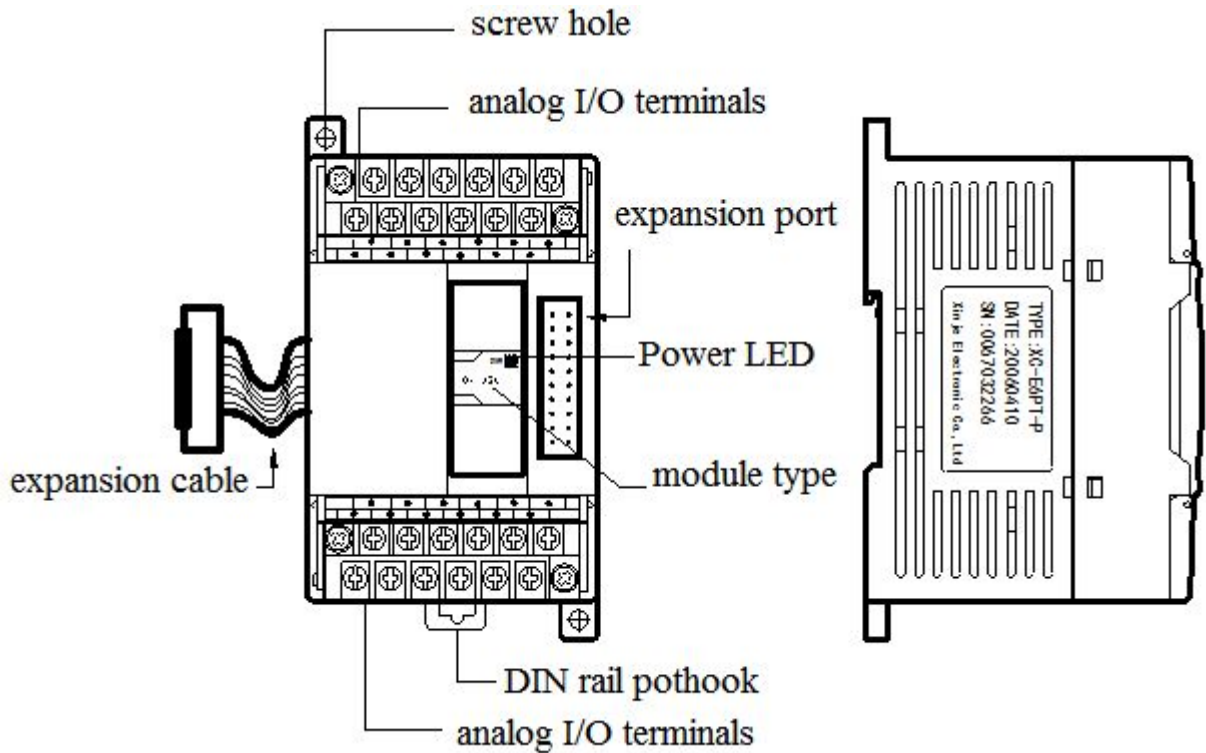


32 points I/O modules: (dimension: mm)





### 1-3. Module part name and function



Name	Function
Power LED	The LED lights when the power supply is on
Module type	The type of expansion module
Expansion port	To connect the expansion module
Analog I/O terminals	To connect to analog input and output, the terminals are knock-down
DIN rail pothook	To mount the module, pull down the pothook to take away the module
Screw hole	Use M3 screw
Expansion cable	To connect the expansion module

### 1-4. General specifications

Operating Environment	No corrosive gas
Ambient Temperature	0°C~60°C
Store Temperature	-20~70°C
Ambient Humidity	5~95%
Store Humidity	5~95%
Installation	Can be fixed with M3 screw or directly installed on DIN46277 rail (width: 35mm)

**Label notes:**

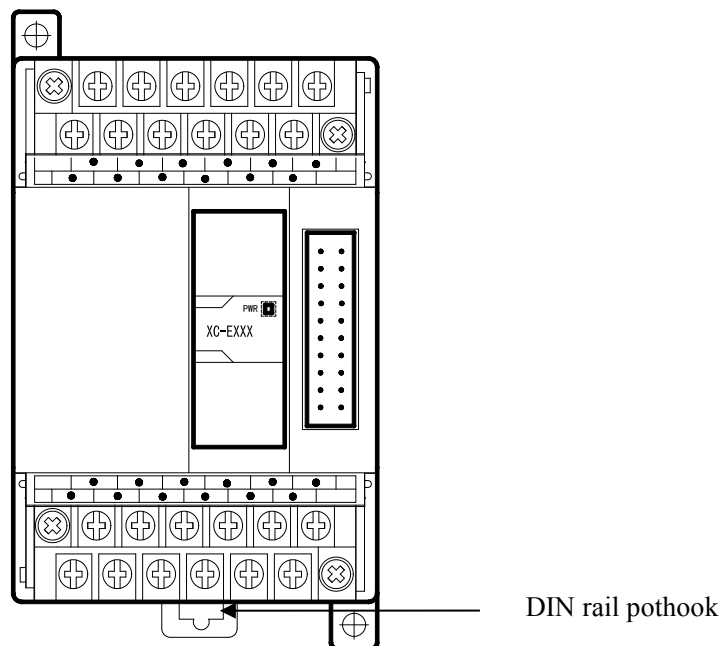
TYPE:XC-E6PT-P  
DATE:20060410  
SN:0067032266  
Xinje Electronic Co.,Ltd

TYPE: module type  
DATE: out of factory date  
SN: serial number  
Manufacturer: Xinje Electronic Co., Ltd.

**1-5. Installation**

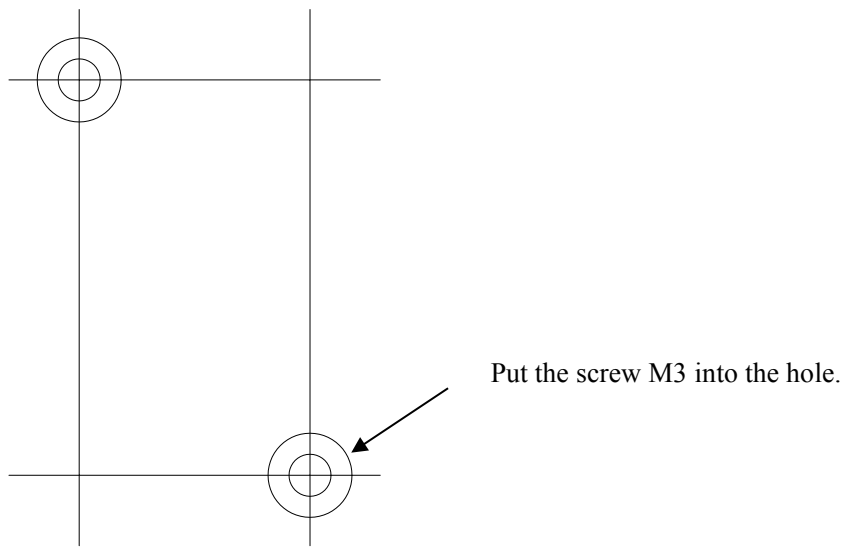
XC series expansion module can be connected to the right side of PLC. Fix the module on the DIN46277 rail or with screw M3.

DIN46277 rail:



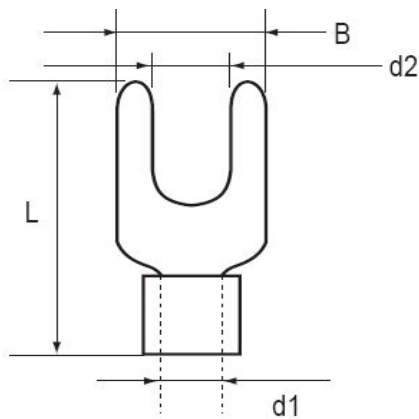
The module can be mounted on the DIN46277 rail (width 35mm). Pull down the DIN rail pothook to uninstall the module.

Direct installation: put the screw (M3) to fix the module.



**Terminal wiring:**

■ Y terminal



Y terminal dimension

B: Y outer dimension

d1: Outer diameter connecting to the wire

d2: Internal diameter (press the screw)

L: Whole length

Suitable dimension:

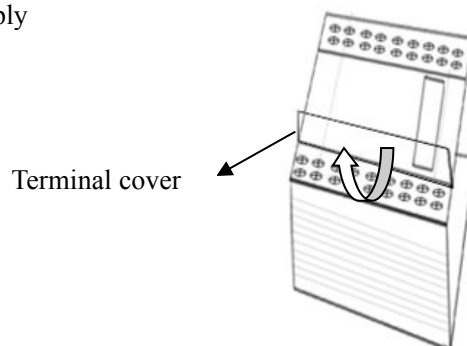
B: below 6mm    L: below 13mm

d2: below 3.2mm

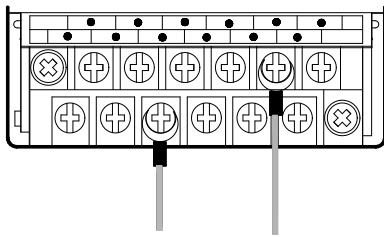
■ Wiring method

A. Cut off the power supply

B. Open the front cover



C. Put the terminal of signal wire on the I/O terminal tightens the screw.



D. Close the I/O terminal cover

Notes:

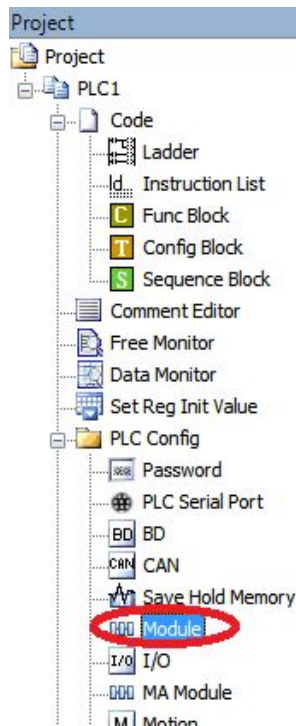
1. Confirm the specification of the module
2. The scraps can not fall into the module when wiring
3. Before wiring, confirm the specifications of module and device again
4. Make sure the wire connection is firm, otherwise data incorrectness and circuit shorting will happen
5. Cut the power before Installation and wiring

## 1-6. Set the module

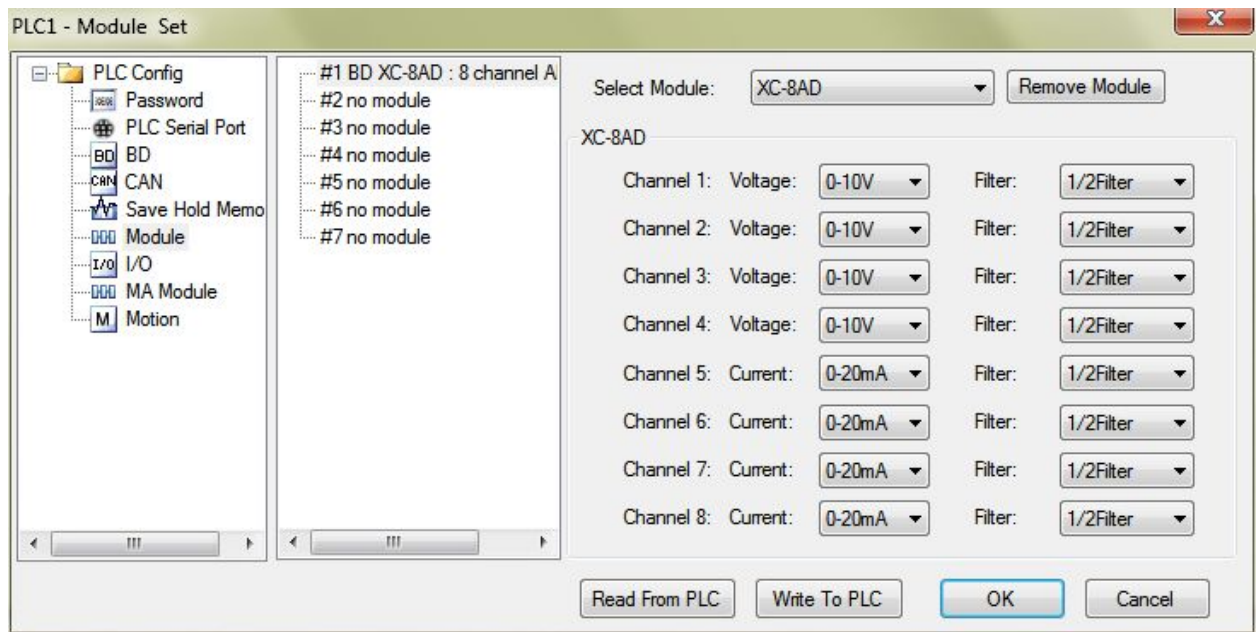
Before using the expansion module, please configure the module in XCPpro software.

Next we will introduce the configuration steps. Take XC-E8AD as an example.

A. Open the XCPpro software, click module in the project menu:



B. Choose the module type and channel parameters in the following window:



## 1-7. PID Function

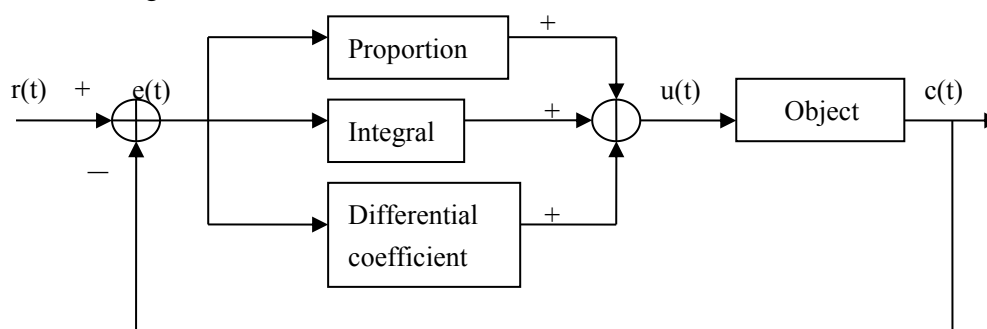
XC series PLC has two PID modes:

1. The PID control is inside expansion module. The PLC program writes the PID parameters to the module, controls the ON/OFF of PID start/stop bit. The control period is 2s. This mode is suitable for the object which has delay time such as temperature.
2. The PID control is inside PLC. The PLC program will control the PID auto-tune and get the best PID parameters. This mode is more flexible and suitable for various objects such as temperature, pressure, flow, liquid level...

### Brief introduction of PID function

Among XC series PLC special modules, digital input module (A/D module) and temperature control module have PID control function which is widely used. There are only four parameters ( $K_p$ ,  $K_i$ ,  $K_d$  and Diff) should be set.

PID control diagram:



**PID control system diagram**

$$e(t) = r(t) - c(t) \quad (1-1)$$

$$u(t) = K_p [ e(t) + 1/T_i \int e(t) dt + T_D de(t)/dt ] \quad (1-2)$$

$e(t)$  is offset,  $r(t)$  is setting value,  $c(t)$  is analog value,  $u(t)$  is control value;  
 $K_p$  is proportion coefficient,  $T_i$  is integral coefficient,  $T_D$  is differential coefficient.

### PID Parameters

$K_p$  — P is proportion parameter, to control the offset of the system once it happens.

$K_i$  — I is integral parameter, to eliminate the static error, improve the no error degree of the system.

$K_d$  — D is differential parameter, to control the signal changing trend, decrease the system vibration.

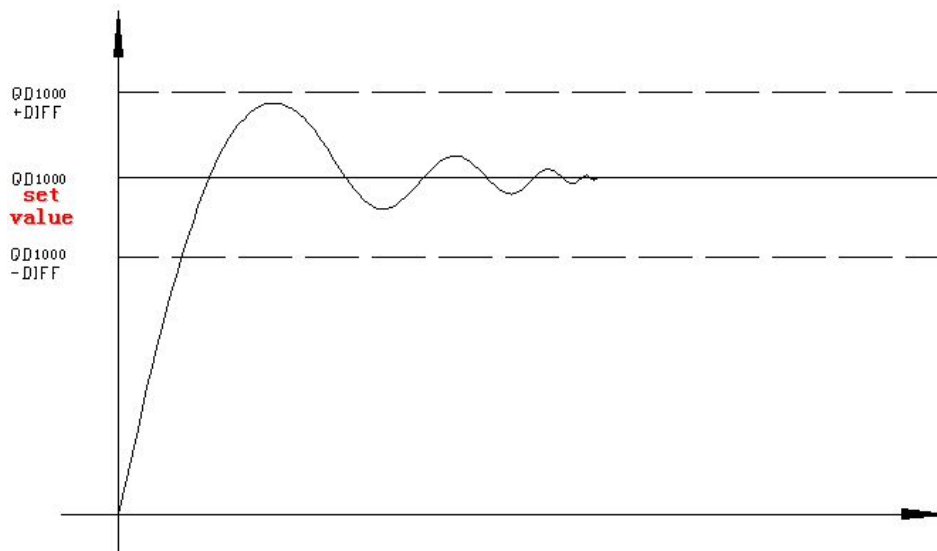
Diff — Control range, to do PID control in the defined range.

Death — Death area, compare the current PID output to the former one, if the difference is less than the death area value, the module will abandon the current PID value, send the last value to the PLC.

### Control characteristics

When the testing value is low than  $QD-Diff$ , controller output range is full scale; when the testing value is larger than  $QD+Diff$ , the controller stops outputting; in the range of  $QD-Diff$  to  $QD+Diff$ , PID control works.

The control curve of PID:



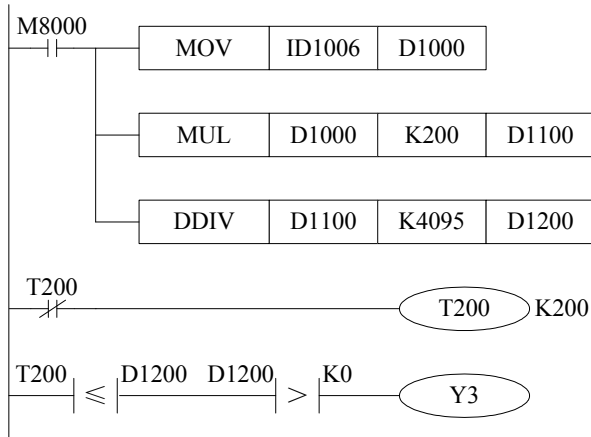
Each parameter's reference value:  $K_p=20\sim100$ ,  $K_i=5\sim20$ ,  $K_d=200\sim700$ ,  $DIFF=100\sim200$ .

### PID auto-tune methods:

(1) Digital output. Control the duty ratio of transistor output. Such as XC-E6PT-P and

XC-E6TC-P.

- (2) Analog input. Each analog input channel has setting value and PID parameters. It transforms the PID output to analog output. Such as XC-4AD, XC-8AD, XC-4AD/2DA.
- (3) Analog value transforms to digital output. Analog expansion module has PID output, but not has digital output. The controlling object needs digital output. It needs to transform the PID value to PLC duty ratio output. User has to set the PID parameters and make the control program in this method. Next is an example.



ID1006 is PID output.

The module output PID value every 2s. The duty ratio = PID output value/4095. PID output value is X ( $0 \leq X \leq 4095$ ). The PLC controls the object through the duty ratio in 2s. PLC outputs at  $2X/4095$ s, PLC doesn't output at  $(2-2X/4095)$ .

**Notes:**

For analog modules XC-E8AD, XC-E4AD, XC-E4AD2D,

1. PID control period is 2s, which is not suitable to fast changing object. Such as pressure, liquid level, flow.
2. PID parameters should be set manually.

For analog modules XC-E6PT-P, XC-E6TC-P,

1. PID output value is duty ratio mode. It only controls the ON/OFF of solid state relay. It cannot output analog signal. If the controlling object is valve opening or silicon control angle, the PID cannot control them.
2. PID parameters need to be set manually.

**Introduction of PLC PID instruction**

For the following situations, the PID function of expansion module cannot meet the requirements. The PID function of PLC (hardware version v3.1d and higher) is required.

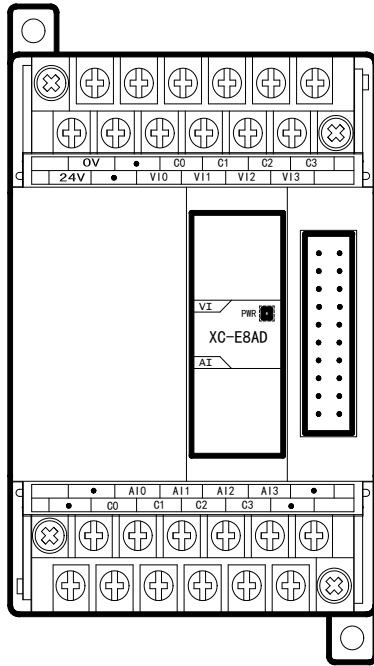
1. The object which has fast changing speed, such as pressure, liquid level, flow and so on, PID control period is less than 2s.
2. The temperature control needs high precision. It needs PID auto-tune to get the best PID parameters.
3. The PID output needs analog signal such as valve opening, silicon angle.

Please refer to XC series PLC instruction manual for the details of PID instruction.

## 2. Analog input module XC-E8AD(-H)

### 2-1. Specification

XC-E8AD and XC-E8AD-H transform the analog value (current or voltage input) to digital value and send to PLC registers.



- 14 bits high precision analog input
- 8 channels analog input: The first four channels are voltage input (0~5V, 0~10V); The last 4 channels are current input (0~20, 4~20mA)
- As special function module of XC, up to 7 models can be connected.
- PID function
- XC-E8AD-H: the power of analog and digital has isolation circuit

Items	Current input (0CH~3CH)	Voltage input (4CH~7CH)
Analog input range	0~5V, 0~10V	0~20mA, 4~20mA
Max input range	± 15V	0~40mA
Digital output range	14 bits binary data	
PID control value	0~4095	
Resolution	1/16383(14Bit)	
Integrate Precision	1%	
Conversion speed	20ms per channel	
Analog power supply	DC24V±10%,100mA	
Installation	Can be fixed with screw M3 or directly installed on orbit of DIN46277 (width: 35mm)	
Dimension	63mm×102mm×73.3mm	



## 2-2. Terminals

	0V		C0	C1	C2	C3	
24V	.	V10	V11	V12	V13		

		A10	A11	A12	A13		
	C0	C1	C2	C3			

Channel	Terminal name	Signal name
CH0	V10	VI0+ voltage input
	C0	VI0- voltage input
CH1	V11	VI1+ voltage input
	C1	VI1- voltage input
CH2	V12	VI2+ voltage input
	C2	VI2- voltage input
CH3	V13	VI3+ voltage input
	C3	VI3- voltage input
CH4	A10	AI0+current input
	C0	AI0- current input
CH5	A11	AI1+ current input
	C1	AI1- current input
CH6	A12	AI2+ current input
	C2	AI2- current input
CH7	A13	AI3+ current input
	C3	AI3- current input
-	24V	+24Vpower supply
	0V	Common terminal of power supply

## 2-3. I/O distribution

XC series analog expansion modules don't occupy I/O unit, the converted data is directly transferred to PLC register. Each channel address:

### I/O address list

Register address of expansion module 1:

Channel	AD signal	PID output value	PID start/stop control bit	Preset value	PID Parameters: Kp, Ki, Kd, control range Diff, dead range "Death"
0CH	ID100	ID108	Y100	QD100	Kp: QD108 Ki: QD109 Kd: QD110 Diff: QD111 Death: QD112
1CH	ID101	ID109	Y101	QD101	
2CH	ID102	ID110	Y102	QD102	
3CH	ID103	ID111	Y103	QD103	
4CH	ID104	ID112	Y104	QD104	
5CH	ID105	ID113	Y105	QD105	
6CH	ID106	ID114	Y106	QD106	
7CH	ID107	ID115	Y107	QD107	

Register address of expansion module 2:

Channel	AD signal	PID output value	PID start/stop control bit	Preset value	PID parameters: Kp, Ki, Kd, control range Diff, dead range "Death"
0CH	ID200	ID208	Y200	QD200	Kp: QD208 Ki: QD209 Kd: QD210 Diff: QD211 Death: QD212
1CH	ID201	ID209	Y201	QD201	
2CH	ID202	ID210	Y202	QD202	
3CH	ID203	ID211	Y203	QD203	
4CH	ID204	ID212	Y204	QD204	
5CH	ID205	ID213	Y205	QD205	
6CH	ID206	ID214	Y206	QD206	
7CH	ID207	ID215	Y207	QD207	

Register address of expansion module 3:

Channel	AD signal	PID output value	PID start/stop control bit	Preset value	PID parameters: Kp, Ki, Kd, control range Diff, dead range "Death"
0CH	ID300	ID308	Y300	QD300	Kp: QD308 Ki: QD309 Kd: QD310 Diff: QD311 Death: QD312
1CH	ID301	ID309	Y301	QD301	
2CH	ID302	ID310	Y302	QD302	
3CH	ID303	ID311	Y303	QD303	
4CH	ID304	ID312	Y304	QD304	
5CH	ID305	ID313	Y305	QD305	
6CH	ID306	ID314	Y306	QD306	
7CH	ID307	ID315	Y307	QD307	

Register address of expansion module 4:

Channel	AD signal	PID output value	PID start/stop control bit	Preset value	PID parameters: Kp, Ki, Kd, control range Diff, dead range "Death"
0CH	ID400	ID408	Y400	QD400	Kp: QD408 Ki: QD409 Kd: QD410 Diff: QD411 Death: QD412
1CH	ID401	ID409	Y401	QD401	
2CH	ID402	ID410	Y402	QD402	
3CH	ID403	ID411	Y403	QD403	
4CH	ID404	ID412	Y404	QD404	
5CH	ID405	ID413	Y405	QD405	
6CH	ID406	ID414	Y406	QD406	
7CH	ID407	ID415	Y407	QD407	

Register address of expansion module 5:

Channel	AD signal	PID output value	PID start/stop control bit	Preset value	PID parameters: Kp, Ki, Kd, control range Diff, dead range "Death"
0CH	ID500	ID508	Y500	QD500	Kp: QD508 Ki: QD509 Kd: QD510 Diff: QD511 Death: QD512
1CH	ID501	ID509	Y501	QD501	
2CH	ID502	ID510	Y502	QD502	
3CH	ID503	ID511	Y503	QD503	
4CH	ID504	ID512	Y504	QD504	
5CH	ID505	ID513	Y505	QD505	
6CH	ID506	ID514	Y506	QD506	
7CH	ID507	ID515	Y507	QD507	

Register address of expansion module 6:

Channel	AD signal	PID output value	PID start/stop control bit	Preset value	PID parameters: Kp, Ki, Kd, control range Diff, dead range "Death"
0CH	ID600	ID608	Y600	QD600	Kp: QD608 Ki: QD609 Kd: QD510 Diff: QD611 Death: QD512
1CH	ID601	ID609	Y601	QD601	
2CH	ID602	ID610	Y602	QD602	
3CH	ID603	ID611	Y603	QD603	
4CH	ID604	ID612	Y604	QD604	
5CH	ID605	ID613	Y605	QD605	
6CH	ID606	ID614	Y606	QD606	
7CH	ID607	ID615	Y607	QD607	

Register address of expansion module 7:

Channel	AD signal	PID output value	PID start/stop control bit	Preset value	PID parameters: Kp, Ki, Kd, control range Diff, dead range "Death"
0CH	ID700	ID708	Y700	QD700	Kp: QD708 Ki: QD709 Kd: QD710 Diff: QD711 Death: QD712
1CH	ID701	ID709	Y701	QD701	
2CH	ID702	ID710	Y702	QD702	
3CH	ID703	ID711	Y703	QD703	
4CH	ID704	ID712	Y704	QD704	
5CH	ID705	ID713	Y705	QD705	
6CH	ID706	ID714	Y706	QD706	
7CH	ID707	ID715	Y707	QD707	

Start signal (Y): when Y is 0, close PID control, when Y is 1, start PID control.

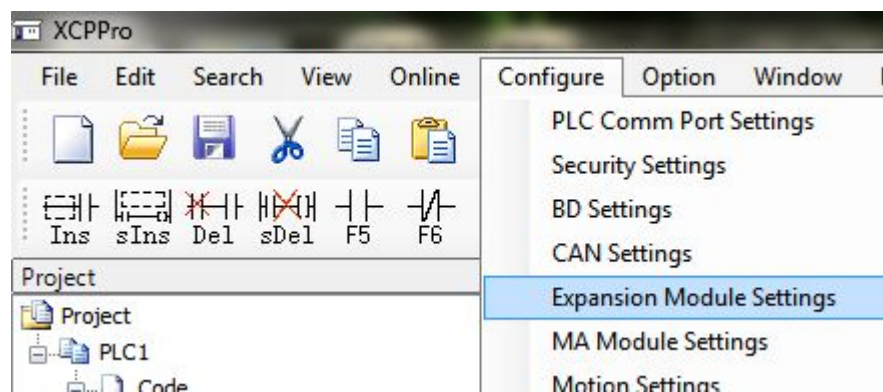
## 2-4. Working mode

There are two ways to set the working mode:

1. XCPpro software
2. FD registers of PLC

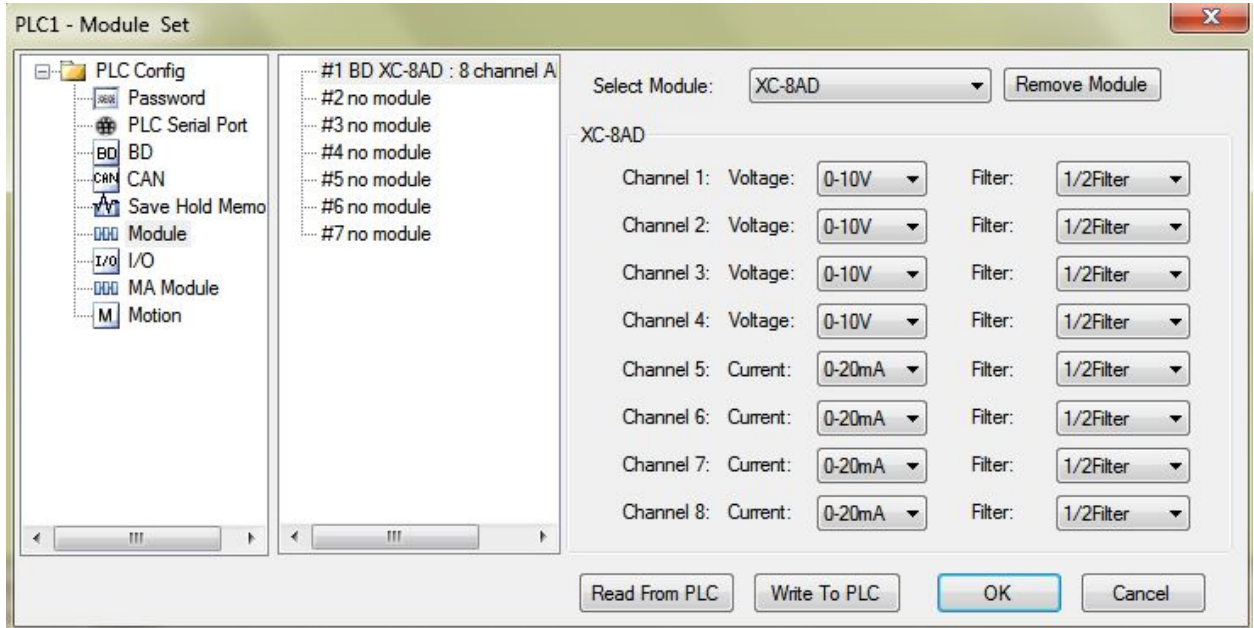
### XCPpro software:

Open the XCPpro software, click configure/expansion module settings:



Set the model and channel parameters in the following window. Then click write to PLC/ok.

For software version lower than v3.3, please restart the PLC after setting.

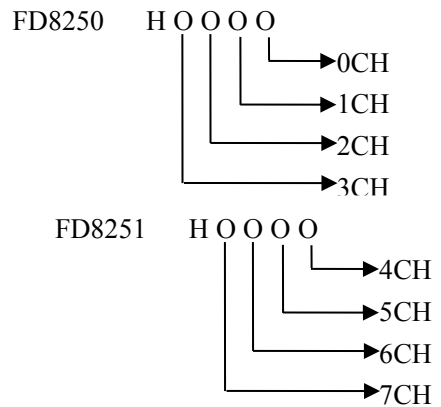


**FD registers:**

0CH~3CH channels have two modes to select: voltage 0~5V or 0~10V, 4CH~7CH channels have two modes to select, current 0~20mA or 4~20mA. Set the modes through FD registers of PLC. See the following table:

Module	Channel ID	
	0CH~3CH	4CH~7CH
1# module	FD8250	FD8251
2# module	FD8258	FD8259
3# module	FD8266	FD8267
4# module	FD8274	FD8275
5# module	FD8282	FD8283
6# module	FD8290	FD8291
7# module	FD8298	FD8299

Take 1# module as an example:



Note: As showed in the preceding table, each register set 4 channels mode, each register has 16 bits. From low bit to high bit, every 4 bits can set 1 channels mode.

Each bit definition is showed in the following table:

Register FD8250: (Module 1)

Channel 1				Channel 0			
Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
00: 1/2 filter		-	0: 0~10V 1: 0~5V	00: 1/2 filter		-	0: 0~10V 1: 0~5V
01: not filter				01: not filter			
10: 1/3 filter		-		10: 1/3 filter		-	
11: 1/4 filter				11: 1/4 filter			
Channel 3				Channel 2			
Bit15	Bit14	Bit13	Bit12	Bit11	Bit10	Bit9	Bit8
00: 1/2 filter		-	0: 0~10V 1: 0~5V	00: 1/2 filter		-	0:0~10V 1:0~5V
01: not filter				01: not filter			
10: 1/3 filter		-		10: 1/3 filter		-	
11: 1/4 filter				11: 1/4 filter			

Register FD8251:

Channel 5				Channel 4			
Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
00: 1/2 filter		-	0: 0~20mA	00: 1/2 filter		-	0: 0~20mA 1: 4~20mA
01: not filter				01: not filter			
10: 1/3 filter		-	1: 4~20mA	10: 1/3 filter		-	
11: 1/4 filter				11: 1/4 filter			
Channel 7				Channel 6			
Bit15	Bit14	Bit13	Bit12	Bit11	Bit10	Bit9	Bit8
00: 1/2 filter		-	0: 0~20mA	00: 1/2 filter		-	0: 0~20mA 1: 4~20mA
01: not filter				01: not filter			
10: 1/3 filter		-	1: 4~20mA	10: 1/3 filter		-	
11: 1/4 filter				11: 1/4 filter			

Example:

Set module 1 Channel No. 3, No.2, No.1, No.0 working mode to 0~10V, 0~5V, 0~10V, 0~5V, all the four channels are not filter, data in FD8250 is 4545H

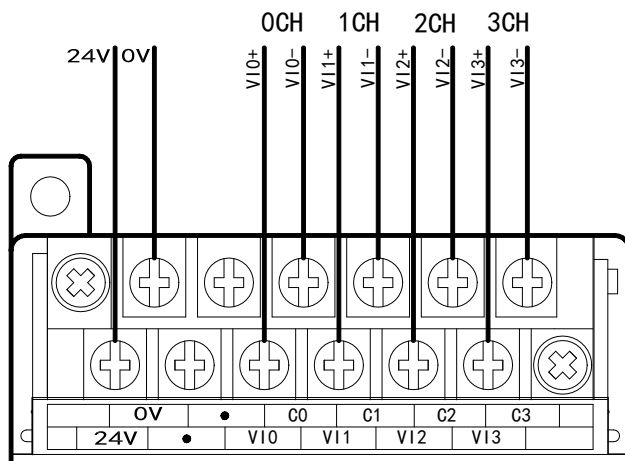
Set module 1 Channel No. 7, No.6, No.5, No.4 working mode to 0~20mA, 4~20mA, 0~20mA, 4~20mA, all the four channels are 1/2 filter, data in FD8251 is 0101H

## 2-5. Exterior connection

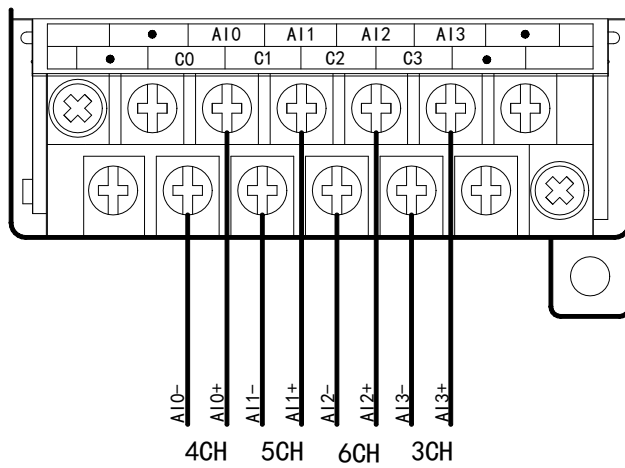
Notes:

- When connect external +24V power, please use the 24V power of PLC to avoid interference.
- To avoid interference, please use shield cable and single point ground for the shield layer.

**Voltage input:**



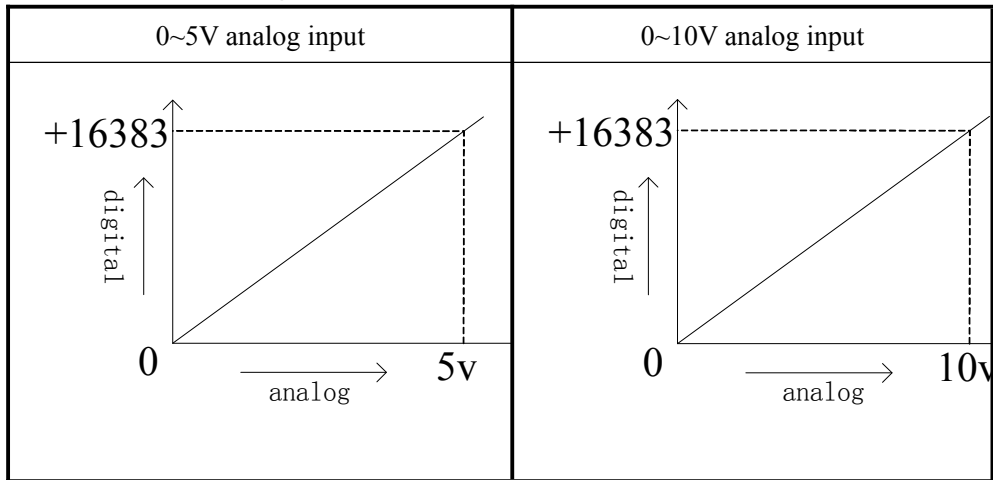
**Current input:**



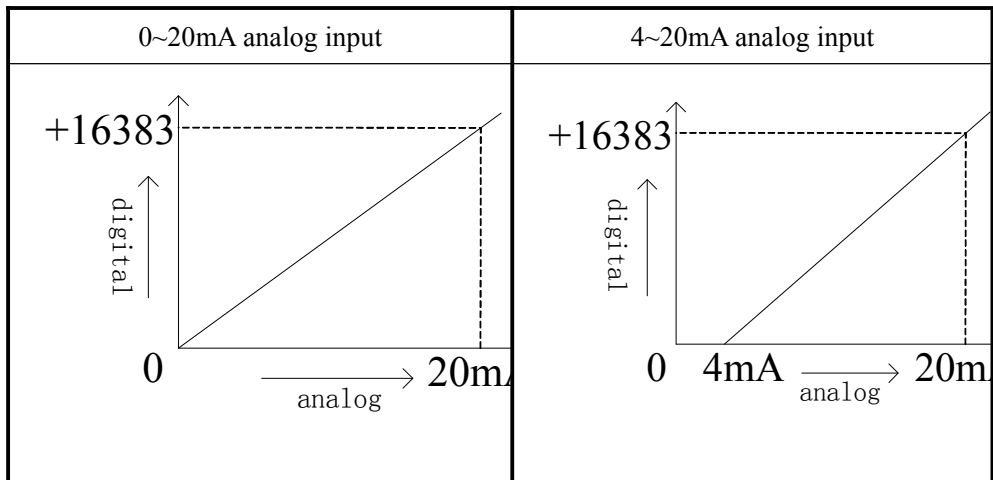
## 2-6. AD conversion diagram

The relationship between analog value and digital value is shown as the following diagram:

### Channel 0 ~ Channel 3 voltage mode:



### Channel 4 ~ Channel 7 current mode:

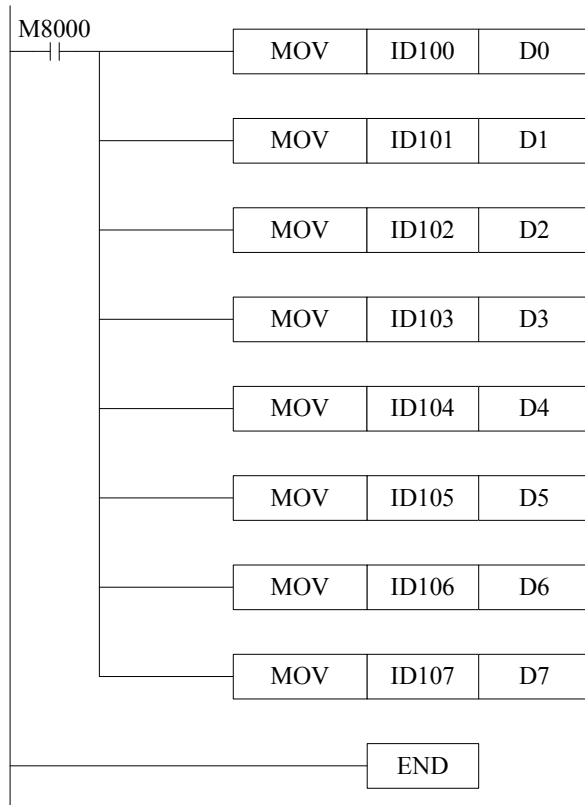




## 2-7. Programming

Example 1:

Real-time read the data of the 8 channels (module 1)



M8000 is always ON coil, it is ON when PLC is running.

Send the data from channel 0~7 to PLC register D0~D7.

Then the data in D0~D7 is the AD conversion value of the 8 channels.

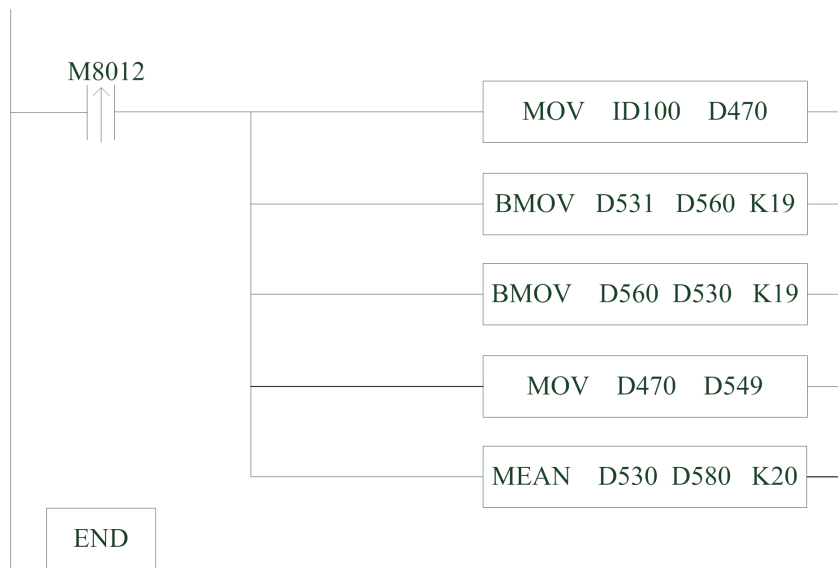
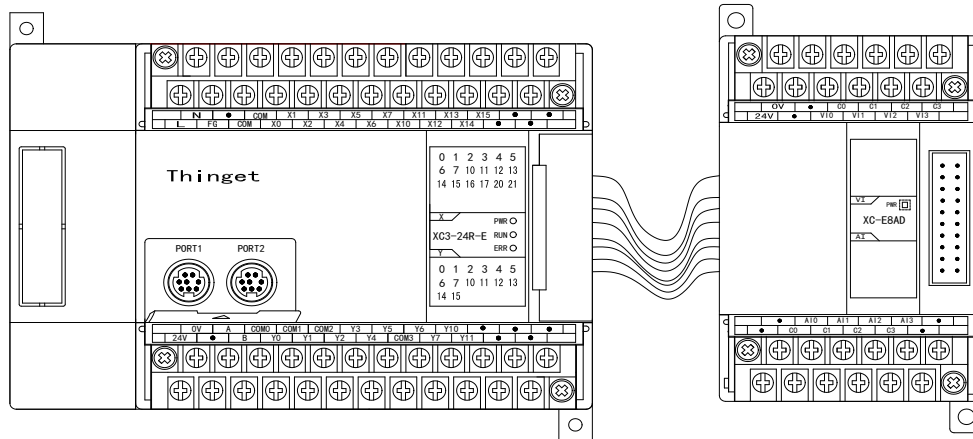
Example 2:

PLC gets the analog input value every 100ms, get the average value of the 20 analog input values, abandon the earliest value, then the result is the filter value.

Hardware connection:

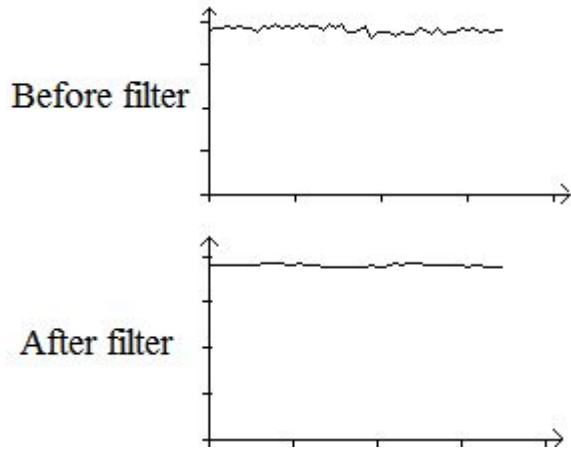
PLC

XC-E8AD module 1



- M8012 is ON every 100ms. It can meet the requirements of getting the value every 100ms.
- Get the analog input value of channel 0.
- The latest analog input value is saved in D470, get 20 analog values and saved in D530~D549.
- Get the average value of the 20 values, save the result in D580. D580 is filter value.

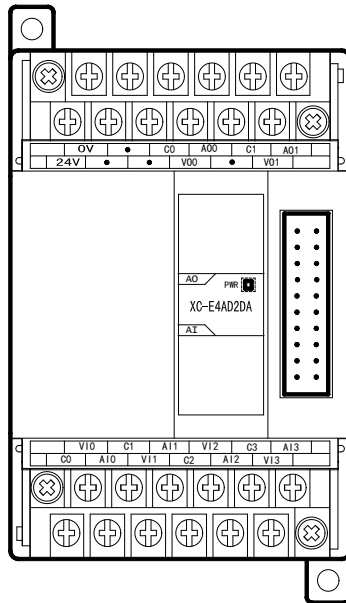
Filter effect:



### 3. Analog input/output module XC-E4AD2DA(-H)

#### 3-1. Specification

XC-E4AD2DA, XC-E4AD2DA-H transform the 4 channels analog value to digital value, 2 channels digital value to analog value, and send them to PLC.



- 4 channels 14 bits analog input and 2 channels 12 bits analog output
- 4 channels selectable voltage 0~5V, 0~10V, current 0~20mA, 4~20mA input and 2 channels selectable voltage 0~5V, 0~10V, current 0~20mA, 4~20mA output.
- Up to 7 expansion modules can be connected to the PLC
- 4 AD channels have PID function
- XC-E4AD2DA-H: the power of analog and digital has isolation circuit. Current output is draw-off current.

Items	Analog input (AD)		Analog output (DA)	
	Voltage input	Current input	Voltage output	Current output
Analog input bound	0~5V, 0~10V	0~20mA, 4~20mA	-	
Max input bound	DC ±15V	0~40mA	-	
Analog output bound	-		0~5V, 0~10V (Exterior load resistance 2KΩ~1MΩ)	0~20mA, 4~20mA (Exterior load resistance is less than 500Ω)
Digital input bound	-		12 bits binary data (0~4095)	
Digital output bound	14 bits binary data (0~16383)		-	
Distinguish ratio	1/16383(14Bit); the converted data is stored into PLC in the format of HEX (14Bit)		1/4095(12Bit); the converted data is stored into PLC with the format of HEX. (12Bit)	
PID control value	0~4095		-	
Integrate precision	1%			
Convert speed	20ms per channel		3ms per channel	
Power used by analog	DC24V±10%,100mA			

Install format	Fixed with M3 screws or directly installed on orbit of DIN46277 (Width: 35mm)
Exterior size	63mm×102mm×73.3mm

### 3-2. Terminals

	0V		C0	A00	C1	A01	
	24V	.	.	V00	.	V01	

	VI0	C1	A11	VI2	C3	A13	
	C0	A10	VI1	C2	A12	VI3	

Channel	Terminal name	Signal name
CH0	AI0	Current input
	VI0	Voltage input
	C0	CH0 common terminal of analog input
CH1	AI1	Current input
	VI1	Voltage input
	C1	CH1 common terminal of analog input
CH2	AI2	Current input
	VI2	Voltage input
	C2	CH2 common terminal of analog input
CH3	AI3	Current input
	VI3	Voltage input
	C3	CH3 common terminal of analog input
CH0	AO0	Current input
	VO0	Voltage input
	C0	CH0 common terminal of analog input
CH1	AO1	Current input
	VO1	Voltage input
	C1	CH1 common terminal of analog input
-	24V	+24V power supply
	0V	Common terminal of power supply

### 3-3. The assignment of I/O address

XC series analog modules do not occupy I/O units; the converted data is directly transferred into PLC register,

Address of module 1:

Channel	AD signal	PID output value	PID start/stop control bit	The set value	PID parameter: Kp, Ki, Kd, control range Diff, dead area Death
0CH	ID100	ID104	Y100	QD102	Kp: QD106 Ki: QD107 Kd: QD108 Diff: QD109 Death: QD110
1CH	ID101	ID105	Y101	QD103	
2CH	ID102	ID106	Y102	QD104	
3CH	ID103	ID107	Y103	QD105	
Channel	DA signal	-	-	-	-
0CH	QD100	-	-	-	
1CH	QD101	-	-	-	

Address of module 2:

Channel	AD	PID output value	PID start/stop control bit	The set value	PID parameter: Kp, Ki, Kd, control range Diff, dead area Death
0CH	ID200	ID204	Y200	QD202	Kp: QD206 Ki: QD207 Kd: QD208 Diff: QD209 Death: QD210
1CH	ID201	ID205	Y201	QD203	
2CH	ID202	ID206	Y202	QD204	
3CH	ID203	ID207	Y203	QD205	
Channel	DA signal	-	-	-	-
0CH	QD200	-	-	-	
1CH	QD201	-	-	-	

Address of module 3:

Channel	AD signal	PID output value	PID start/stop control bit	The set value	PID parameter: Kp, Ki, Kd, control range Diff, dead area Death
0CH	ID300	ID304	Y300	QD302	Kp: QD306 Ki: QD307 Kd: QD308 Diff: QD309 Death: QD310
1CH	ID301	ID305	Y301	QD303	
2CH	ID302	ID306	Y302	QD304	
3CH	ID303	ID307	Y303	QD305	
Channel	DA signal	-	-	-	-
0CH	QD300	-	-	-	
1CH	QD301	-	-	-	

Address of module 4:

Channel	AD signal	PID output value	PID start/stop control bit	The set value	PID parameter: Kp, Ki, Kd, control range Diff, dead area Death
0CH	ID400	ID404	Y400	QD402	Kp: QD406 Ki: QD407 Kd: QD408 Diff: QD409 Death: QD410
1CH	ID401	ID405	Y401	QD403	
2CH	ID402	ID406	Y402	QD404	
3CH	ID403	ID407	Y403	QD405	
Channel	DA signal	-	-	-	-
0CH	QD400	-	-	-	
1CH	QD401	-	-	-	

Address of module 5:

Channel	AD signal	PID output value	PID start/stop control bit	The set value	PID parameter: Kp, Ki, Kd, control range Diff, dead area Death
0CH	ID500	ID504	Y500	QD502	Kp: QD506 Ki: QD507 Kd: QD508 Diff: QD509 Death: QD510
1CH	ID501	ID505	Y501	QD503	
2CH	ID502	ID506	Y502	QD504	
3CH	ID503	ID507	Y503	QD505	
Channel	DA signal	-	-	-	-
0CH	QD500	-	-	-	
1CH	QD501	-	-	-	

Address of module 6:

Channel	AD signal	PID output value	PID start/stop control bit	The set value	PID parameter: Kp, Ki, Kd, control range Diff, dead area Death
0CH	ID600	ID604	Y600	QD602	Kp: QD606 Ki: QD607 Kd: QD608 Diff: QD609 Death: QD610
1CH	ID601	ID605	Y601	QD603	
2CH	ID602	ID606	Y602	QD604	
3CH	ID603	ID607	Y603	QD605	
Channel	DA signal	-	-	-	-
0CH	QD600	-	-	-	
1CH	QD601	-	-	-	

Address of module 7:

Channel	AD signal	PID output value	PID start/stop control bit	The set value	PID parameter: Kp, Ki, Kd, control range Diff, dead area Death
0CH	ID700	ID704	Y700	QD702	Kp: QD706 Ki: QD707 Kd: QD708 Diff: QD709 Death: QD710
1CH	ID701	ID705	Y701	QD703	
2CH	ID702	ID706	Y702	QD704	
3CH	ID703	ID707	Y703	QD705	
Channel	DA signal	-	-	-	-
0CH	QD700	-	-	-	
1CH	QD701	-	-	-	

**Description:**

Start signal (Y): When Y is 0, close PID control; when Y is 1, start PID control.

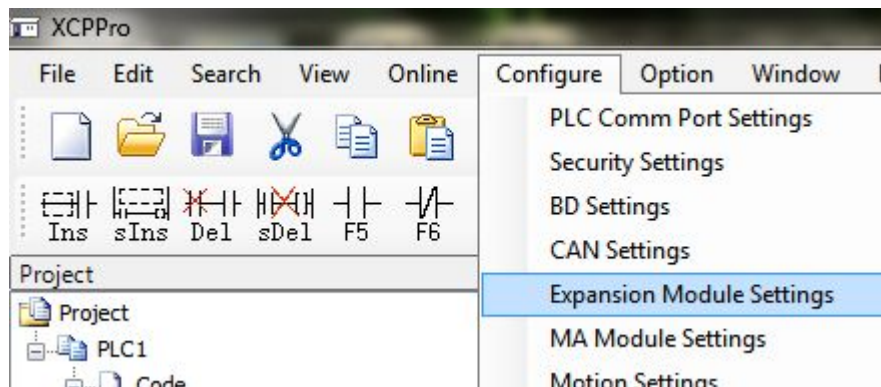
**3-4. Working mode**

There are two ways to set the working mode:

1. XCPpro software
2. FD registers of PLC

**XCPpro software:**

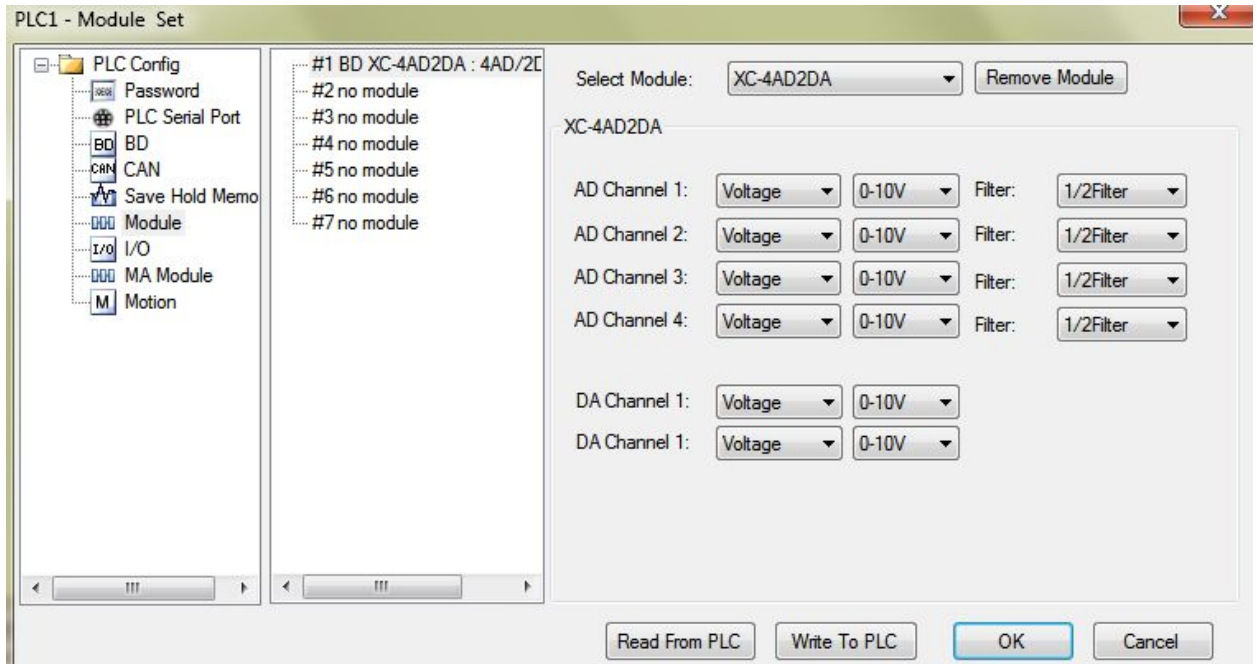
Open the XCPpro software, click configure/expansion module settings:



Set the model and channel parameters in the following window. Then click write to PLC/ok.

For software version lower than v3.3, please restart the PLC after setting.



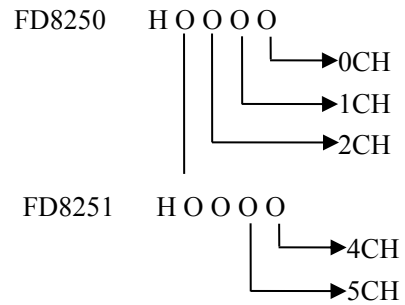


**FD registers:**

The module has current and voltage mode. Current has choices of 0~20mA, 4~20mA; voltage has choices of 0~5V, 0~10V. 0CH~3CH are analog input channels, 4CH~5CH are analog output channels. These parameters can be set through PLC FD registers.

Module	Channel	
	0CH~3CH	4CH~5CH
Module 1	FD8250	FD8251 low byte
Module 2	FD8258	FD8259 low byte
Module 3	FD8266	FD8267 low byte
Module 4	FD8274	FD8275 low byte
Module 5	FD8282	FD8283 low byte
Module 6	FD8290	FD8291 low byte
Module 7	FD8298	FD8299 low byte

Take module 1 as an example:



Note: As shown in the preceding table, every register set 4 channels mode, each register has 16 bits, from low to high, every 4 bits set 1 channel mode.

The setting method: (module 1)

Register FD8250:

Channel 1				Channel 0			
Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
00: 1/2 filter		0: voltage input	0:0~10V	00: 1/2 filter		0: voltage input	0:0~10V
01: not filter			1:0~5V	01: not filter			1:0~5V
10: 1/3 filter		1: current input	0:0~20mA	10: 1/3 filter		1: current input	0:0~20mA
11: 1/4 filter			1:4~20mA	11: 1/4 filter			1:4~20mA
Channel 3				Channel 2			
Bit15	Bit14	Bit13	Bit12	Bit11	Bit10	Bit9	Bit8
00: 1/2 filter		0: voltage input	0:0~10V	00: 1/2 filter		0: voltage input	0:0~10V
01: not filter			1:0~5V	01: not filter			1:0~5V
10: 1/3 filter		1: current input	0:0~20mA	10: 1/3 filter		1: current input	0:0~20mA
11: 1/4 filter			1:4~20mA	11: 1/4 filter			1:4~20mA

Register FD8251 low byte:

Channel 5				Channel 4			
Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
00: 1/2 filter		0: voltage input	0:0~10V	00: 1/2 filter		0: voltage input	0:0~10V
01: not filter			1:0~5V	01: not filter			1:0~5V
10: 1/3 filter		1: current input	0:0~20mA	10: 1/3 filter		1: current input	0:0~20mA
11: 1/4 filter			1:4~20mA	11: 1/4 filter			1:4~20mA

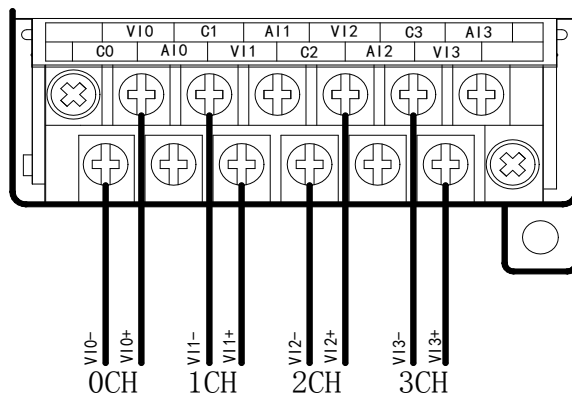
**Example:** If set the working mode of module 1 channel 3, channel 2, channel 1, channel 0 to 0~20mA, 4~20mA, 0~10V, 0~5V, filters are all 1/2 filter, value in FD8250 is 2301H.

### 3-5. Exterior connection

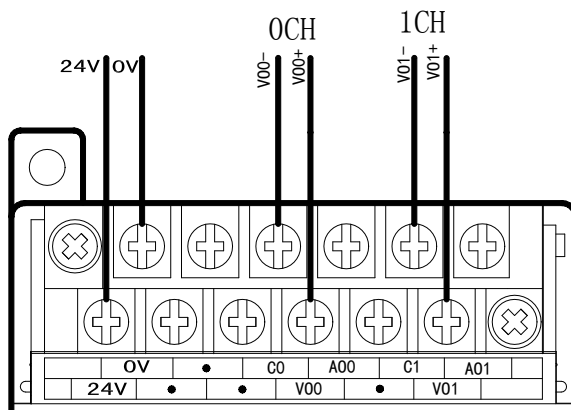
When make exterior connection, please read the following items:

- When connect +24V power, please choose 24V power of PLC to avoid interference.
- To avoid interference, please use shield cable and single point ground for the shield layer.
- XC-E4AD2DA: 0~20mA or 4~20mA current output need external 24V power supply, the module control the current according to the value of QD. The module cannot produce current by itself.
- XC-E4AD2DA-H: 0~20mA or 4~20mA current output do not need external 24V power supply, the module control the current according to the value of QD. The module current output is draw-off current.

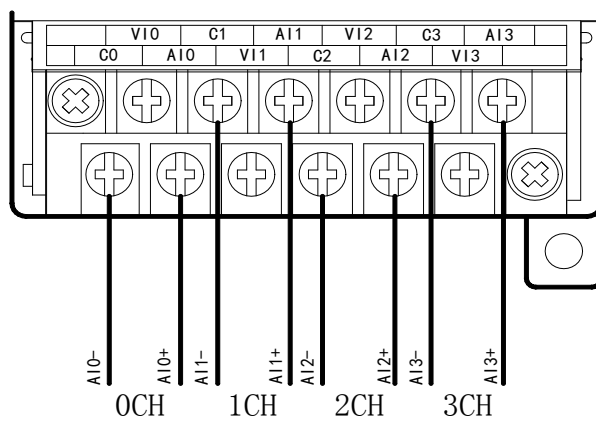
### Voltage input



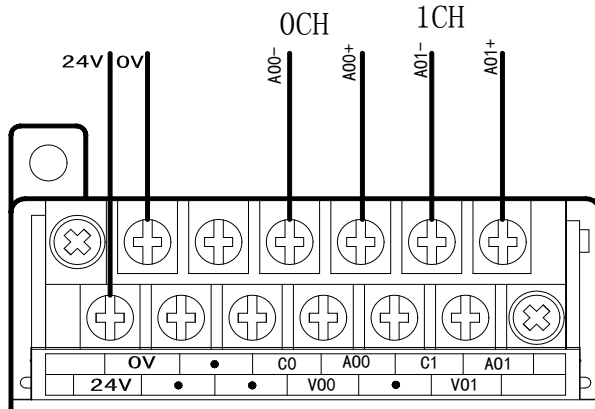
### Voltage output



### Current input

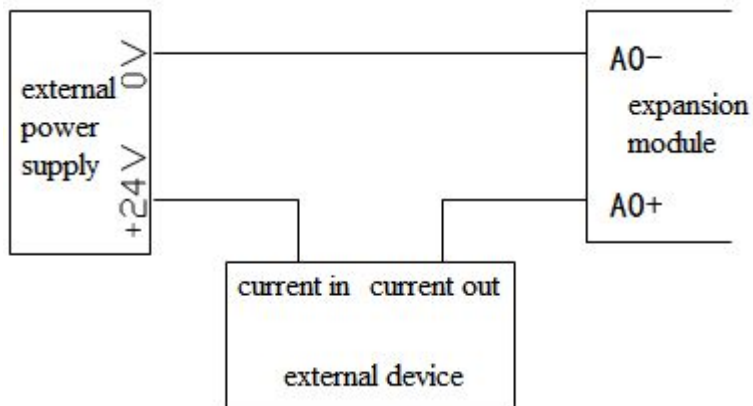


## Current output

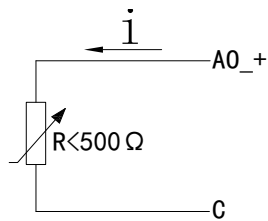


### Note:

1. XC-E4AD2DA current output needs external 24V power supply.

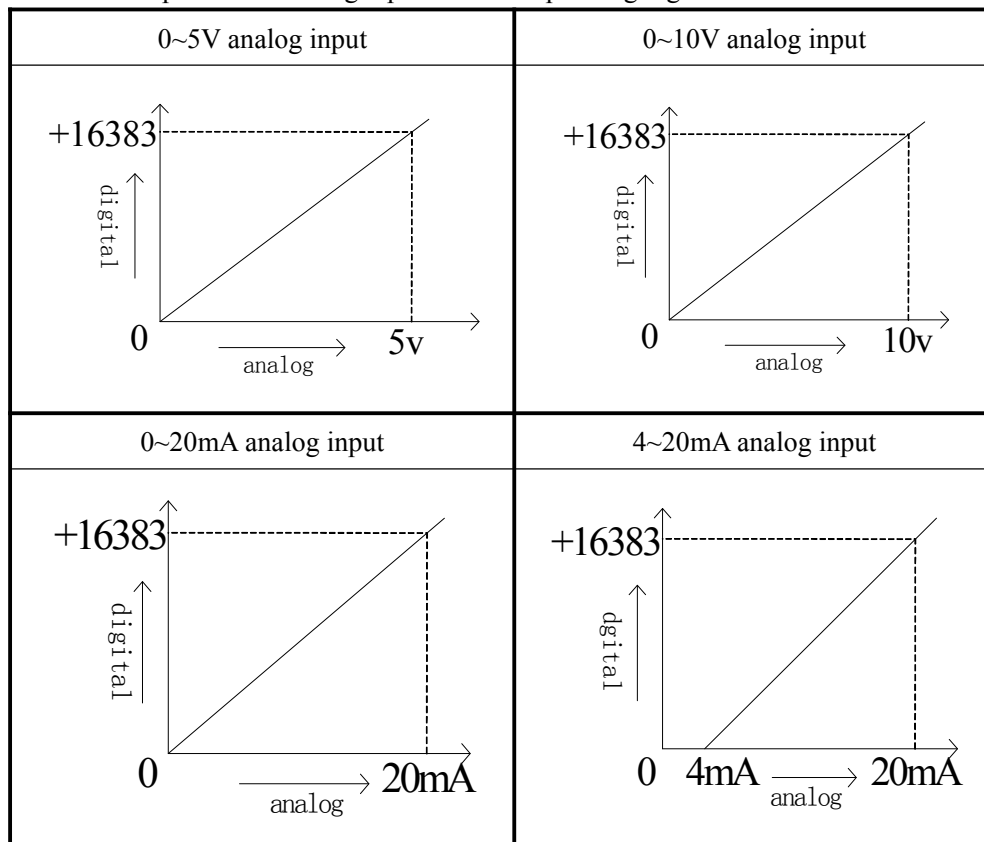


2. XC-E4AD2DA-H current output wiring:

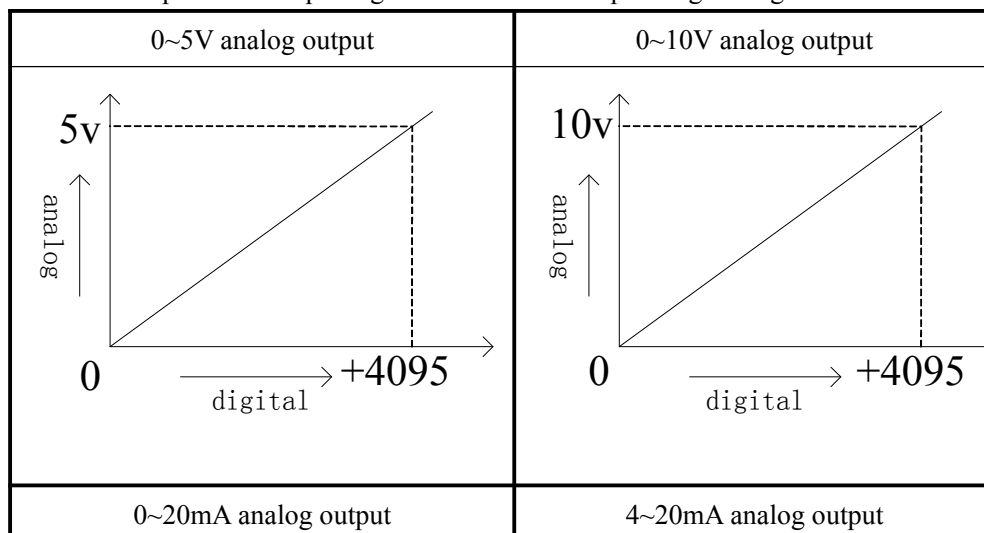


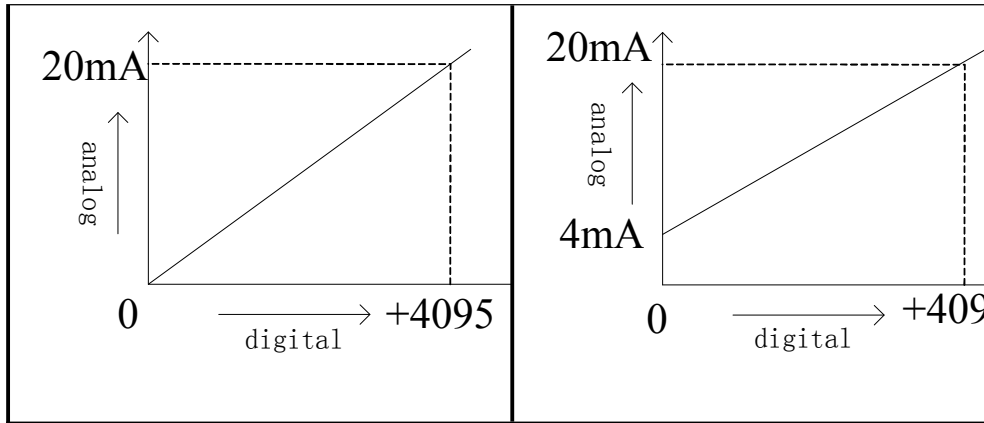
### 3-6. AD conversion diagram

The relationship between analog input and corresponding digital value:



The relationship between input digital value and corresponding analog value:

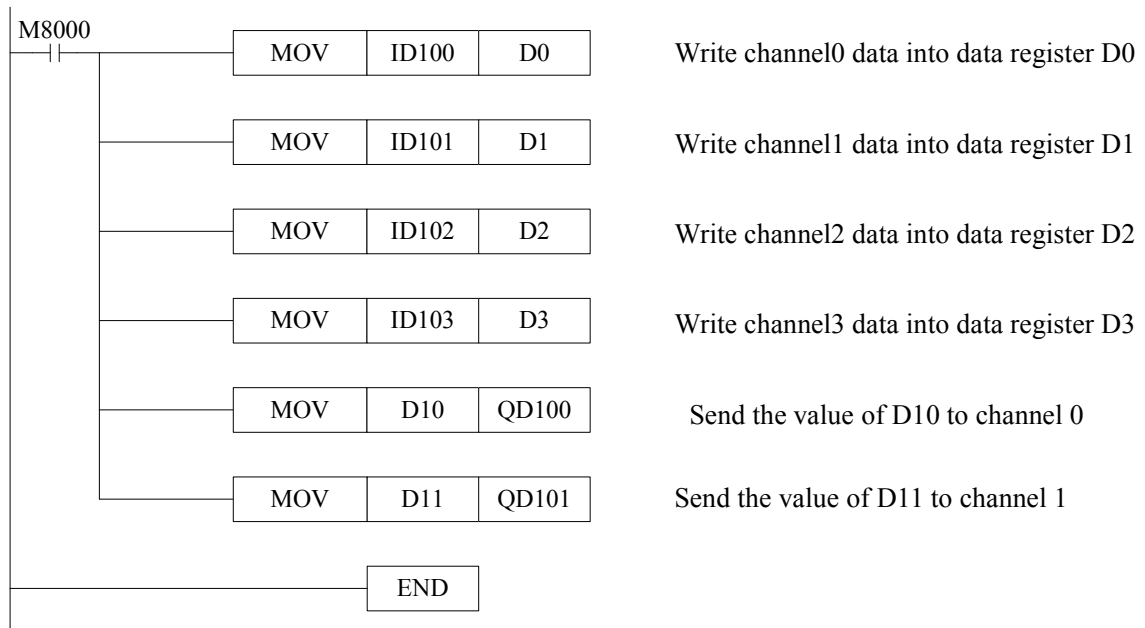




Note: When input data exceeds 4095, analog output will stay at the max value of 5V, 10V or 20mA.

### 3-7. Programming

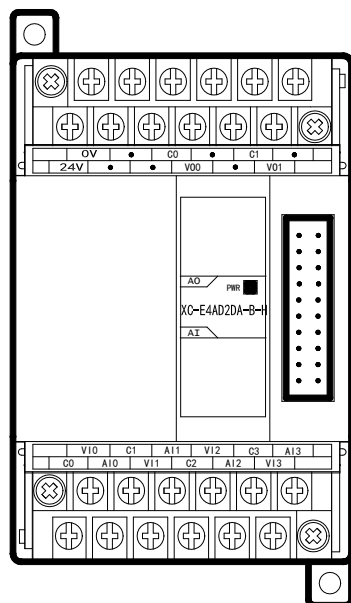
**Example** Real time read 4 channels data, write 2 channels data (take expansion 1 as an example)



## 4. Analog Input Module XC-E4AD2DA-B-H

### 4-1. Specifications

XC-E4AD2DA-B-H transform the 4 channels analog value to digital value, 2 channels digital value to analog value, and send them to PLC.



- 4 channels analog input
- 4 channels selectable voltage 0~5V, 0~10V
- 14 bits high precision analog input
- Up to 7 expansion modules can be connected to the PLC
- 4 AD channels have PID function
- XC-E4AD2DA-B-H: the power of analog and digital has isolation circuit. Current output is draw-off current.

Items	Analog input (AD)		Analog output(DA)	
	Voltage input	Current input	Voltage output	Current output
Analog input bound	0~5V, 0~10V	0~20mA, 4~20mA	-	
Max input bound	DC ±15V	0~40mA	-	
Analog output bound	-		0~5V, 0~10V (Exterior load resistance 2KΩ~1MΩ)	
Digital input bound	-		12 bits binary data (0~4095)	
Digital output bound	14 bits binary data (0~16383)		-	
Distinguish ratio	1/16383(14Bit); the converted data is stored into PLC in the format of HEX (14Bit)		1/4095(12Bit); the converted data is stored into PLC with the format of HEX. (12Bit)	
PID control value	0~K4095		-	
Integrate precision	1%			
Convert speed	20ms per channel		3ms per channel	
Power used by analog	DC24V±10%,100mA			
Install format	Fixed with M3 screws or directly installed on orbit of DIN46277 (Width: 35mm)			

## 4-2. Terminals

	OV	•	C0	•	C1	•	
	24V	•	•	V00	•	V01	

	V10	C1	A11	V12	C3	A13	
	C0	A10	V11	C2	A12	V13	

Channe	Terminal	Signal
CH0	AI0	Current input
	VI0	Voltage input
	C0	CH0 common terminal of analog input
CH1	AI1	Current input
	VI1	Voltage input
	C1	CH1 common terminal of analog input
CH2	AI2	Current input
	VI2	Voltage input
	C2	CH2 common terminal of analog input
CH3	AI3	Current input
	VI3	Voltage input
	C3	CH3 common terminal of analog input
CH0	VO0	Current input
	C0	CH0 common terminal of analog input
CH1	VO1	Voltage input
	C1	CH1 common terminal of analog input
-	24V	+24V power supply
	0V	Common terminal of power supply

## 4-3. I/O address assignment

XC series expansions do not occupy I/O units; the converted value is sent to PLC register directly.

Expansion module 1 address



Channel	AD signal	PID output value	PID start/stop control bit	The set value	PID parameter: Kp, Ki, Kd, control range Diff, dead area Death
0CH	ID100	ID104	Y100	QD102	Kp-----QD106 Ki-----QD107 Kd-----QD108 Diff---QD109 Death--QD110
1CH	ID101	ID105	Y101	QD103	
2CH	ID102	ID106	Y102	QD104	
3CH	ID103	ID107	Y103	QD105	
Channel	DA signal	-	-	-	-
0CH	QD100	-	-	-	
1CH	QD101	-	-	-	

Expansion module 2 address

Channel	AD signal	PID output value	PID start/stop control bit	The set value	PID parameter: Kp, Ki, Kd, control range Diff, dead area Death
0CH	ID200	ID204	Y200	QD202	Kp-----QD206 Ki-----QD207 Kd-----QD208 Diff---QD209 Death--QD210
1CH	ID201	ID205	Y201	QD203	
2CH	ID202	ID206	Y202	QD204	
3CH	ID203	ID207	Y203	QD205	
Channel	DA signal	-	-	-	-
0CH	QD200	-	-	-	
1CH	QD201	-	-	-	

Expansion module 3 address

Channel	AD signal	PID output value	PID start/stop control bit	The set value	PID parameter: Kp, Ki, Kd, control range Diff, dead area Death
0CH	ID300	ID304	Y300	QD302	Kp-----QD306 Ki-----QD307 Kd-----QD308 Diff---QD309 Death--QD310
1CH	ID301	ID305	Y301	QD303	
2CH	ID302	ID306	Y302	QD304	
3CH	ID303	ID307	Y303	QD305	
Channel	DA signal	-	-	-	-
0CH	QD300	-	-	-	
1CH	QD301	-	-	-	

Expansion module 4 address

Channel	AD signal	PID output value	PID start/stop control bit	The set value	PID parameter: Kp, Ki, Kd, control range Diff, dead area Death
0CH	ID400	ID404	Y400	QD402	Kp-----QD406 Ki-----QD407 Kd-----QD408 Diff---QD409 Death--QD410
1CH	ID401	ID405	Y401	QD403	
2CH	ID402	ID406	Y402	QD404	
3CH	ID403	ID407	Y403	QD405	
Channel	DA signal	-	-	-	-
0CH	QD400	-	-	-	
1CH	QD401	-	-	-	

Expansion module 5 address

Channel	AD Signal	PID Output Value	PID Start/Stop Control Bit	Preset Value	PID Parameters: Kp, Ki, Kd, Control Range Diff, Dead Range "Death"
0CH	ID500	ID504	Y500	QD502	Kp----- QD506 Ki----- QD507 Kd----- QD508 Diff----- QD509 Death---- QD510
1CH	ID501	ID505	Y501	QD503	
2CH	ID502	ID506	Y502	QD504	
3CH	ID503	ID507	Y503	QD505	
Channel	DA signal	-	-	-	-
0CH	QD500	-	-	-	
1CH	QD501	-	-	-	

Expansion module 6 address

Channel	AD Signal	PID Output Value	PID Start/Stop Control Bit	Preset Value	PID Parameters: Kp, Ki, Kd, Control Range Diff, Dead Range "Death"
0CH	ID600	ID604	Y600	QD602	Kp----- QD606 Ki----- QD607 Kd----- QD608 Diff----- QD609 Death----QD610
1CH	ID601	ID605	Y601	QD603	
2CH	ID602	ID606	Y602	QD604	
3CH	ID603	ID607	Y603	QD605	
Channel	DA Signal	-	-	-	-
0CH	QD600	-	-	-	

1CH	QD601	-	-	-	-
-----	-------	---	---	---	---

Expansion module 7 address

Channel	AD Signal	PID Output Value	PID Start/Stop Control Bit	Preset Value	PID Parameters: Kp, Ki, Kd, Control Range Diff, Dead Range "Death"
0CH	ID700	ID704	Y700	QD702	Kp----- QD706 Ki----- QD707 Kd----- QD708 Diff----- QD709 Death---- QD710
1CH	ID701	ID705	Y701	QD703	
2CH	ID702	ID706	Y702	QD704	
3CH	ID703	ID707	Y703	QD705	
Channel	DA signal				
0CH	QD700				
1CH	QD701				

**Description:**

Start signal (Y): when Y is 0, close PID control, when Y is 1, start PID control

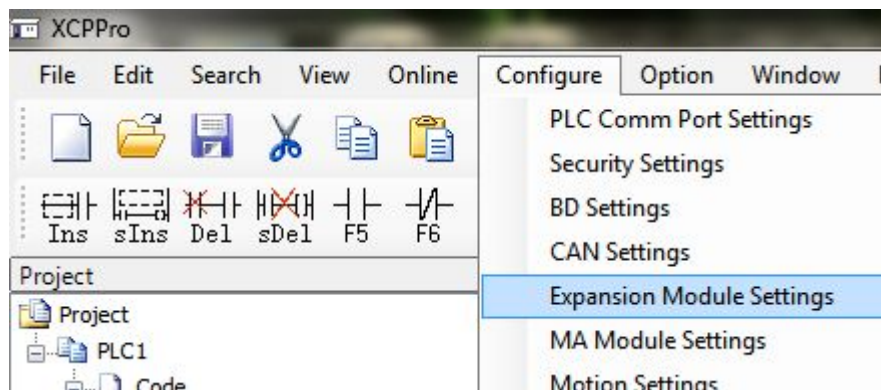
**4-4. Working mode**

There are two ways to set the working mode:

1. XCPpro software
2. FD registers of PLC

**XCPpro software:**

Open the XCPpro software, click configure/expansion module settings:



Set the model and channel parameters in the following window. Then click write to PLC/ok.

For software version lower than v3.3, please restart the PLC after setting.

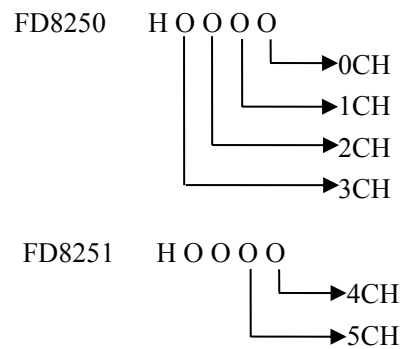


**FD registers:**

The working mode can be voltage 0~5V, 0~10V or current 0~20mA, 4~20mA, set through FD registers of PLC: N

Module	Channel	
	0CH~3CH	4CH~5CH
Module 1	FD8250	FD8251 low byte
Module 2	FD8258	FD8259 low byte
Module 3	FD8266	FD8267 low byte
Module 4	FD8274	FD8275 low byte
Module 5	FD8282	FD8283 low byte
Module 6	FD8290	FD8291 low byte
Module 7	FD8298	FD8299 low byte

Take module 1 as an example:



Note: As shown in the preceding table, every register set 4 channels mode, each register has 16 bits, from low to high, and every 4 bits set 1 channel mode.

We take module 1 as an example to show how to set:

Register FD8250:

Channel 1				Channel 0			
Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
00: 1/2 filter		0: voltage input	0:0~10V	00: 1/2 filter		0: voltage input	0:0~10V
01: no filter			1:0~5V	01: no filter			1:0~5V
10: 1/3 filter		1: current input	0:0~20mA	10: 1/3 filter		1: current input	0:0~20mA
11: 1/4 filter			1:4~20mA	11: 1/4 filter			1:4~20mA
Channel 3				Channel 2			
Bit15	Bit14	Bit13	Bit12	Bit11	Bit10	Bit9	Bit8
00: 1/2 filter		0: voltage input	0:0~10V	00: 1/2 filter		0: voltage input	0:0~10V
01: no filter			1:0~5V	01: no filter			1:0~5V
10: 1/3 filter		1: current input	0:0~20mA	10: 1/3 filter		1: current input	0:0~20mA
11: 1/4 filter			1:4~20mA	11: 1/4 filter			1:4~20mA

Register FD8251 low byte:

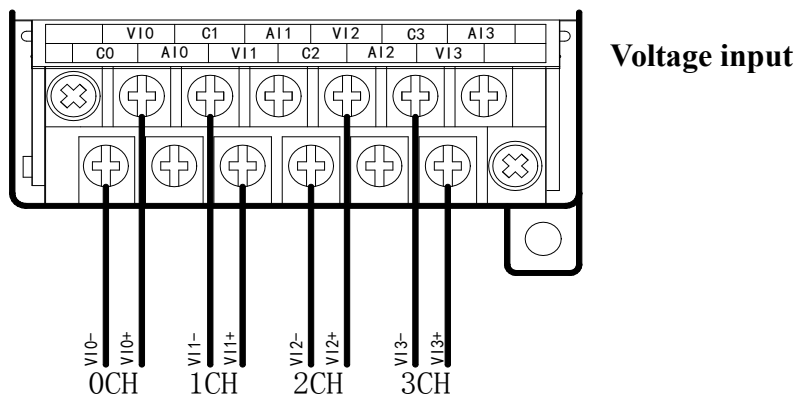
Channel 5				Channel 4			
Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
00: 1/2 filter		-	0: -10~10V	00: 1/2 filter		-	0: -10~10V
01: no filter			1: -5~5V	01: no filter			1: -5~5V
10: 1/3 filter				10: 1/3 filter			
11: 1/4 filter				11: 1/4 filter			

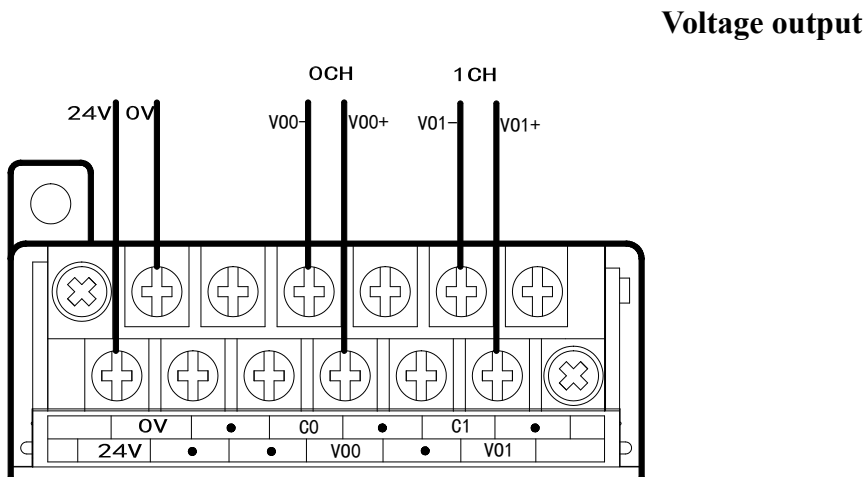
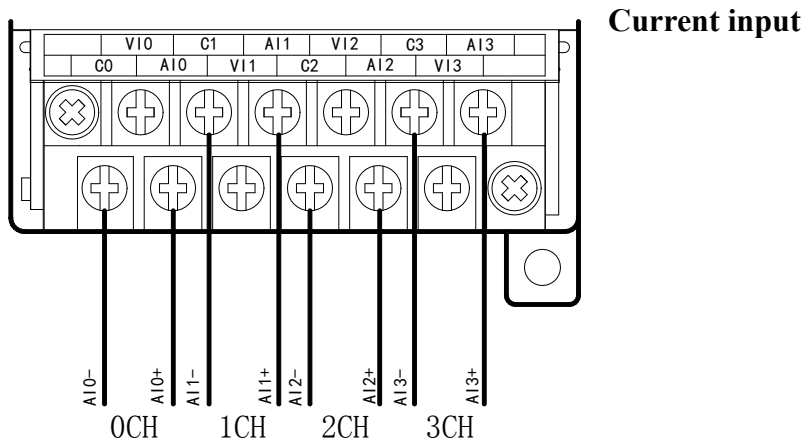
**Example:** If set working mode to 0~20mA, 4~20mA, 0~10V, 0~5V of module 1 channel 3, channel 2, channel 1, channel 0, filters are all 1/2 filter, the value in FD8250 is 2301H.

#### 4-5. Exterior connection

When make external connection, please note the following items:

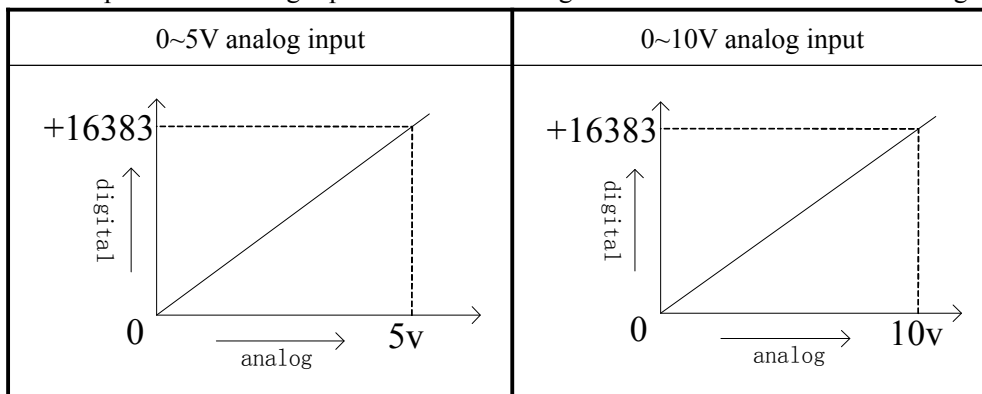
- When connect external 24V power, please choose 24V power of PLC to avoid interference.
- To avoid interference, please use shield cable and single-point ground with the shield layer.

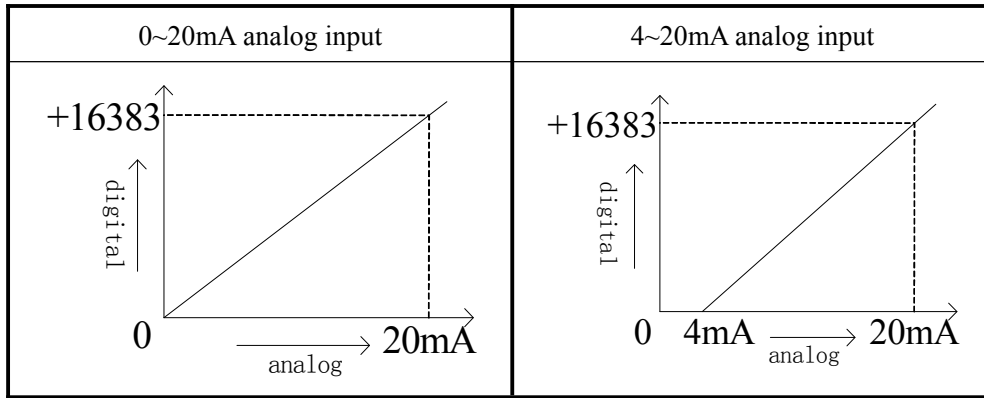




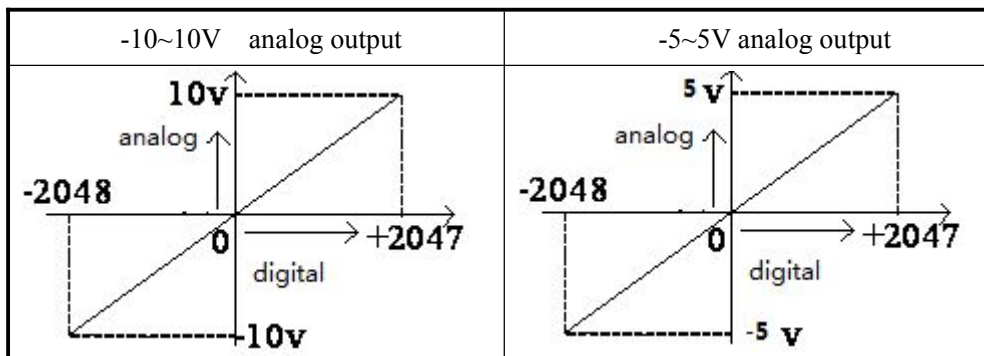
#### 4-6. AD conversion diagram

The relationship between analog input and converted digital value is shown in the following chart:





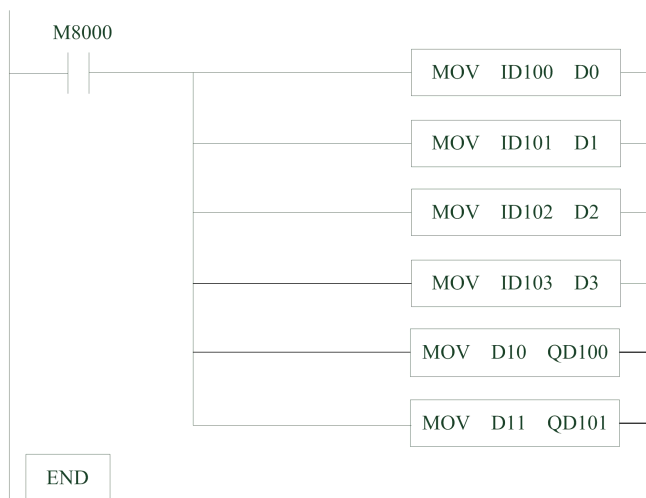
The relationship between analog output and converted digital value is shown in the following chart:



**Note:** When input data more than K2047, D/A convert analog data keep as 10V

#### 4-7. Programming

Example Real-time read the 4 channels data ,write 2 channels data(take module 1 as an example)



Explanation:

M8000 is always ON coil, it is ON when PLC is running.

Send channel 0 data to PLC register D0,

Send channel 1 data to PLC register D1,

Send channel 2 data to PLC register D2,

Send channel 3 data to PLC register D3.

Register D10 send data to channel 0 ;

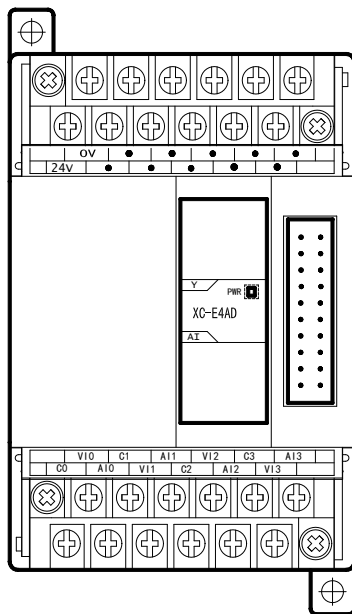
Register D11 send data to channel 1.



## 5. Analog Input Module XC-E4AD(-H)

### 5-1. Specifications

XC-E4AD, XC-E4AD-H transform the analog input (current or voltage) to digital value and send to PLC register.



- 4 channels 14 bits analog input: voltage (0~5V, 0~10V), current (0~20mA, 4~20mA) for choice
- As expansion of XC series PLC, up to 7 modules can be connected to the PLC
- 4 channels A/D input have PID function
- XC-E4AD-H has isolation for the power of analog and digital part

ITEMS	Analog Input (AD)	
	Voltage Input	Current Input
Analog Input Range	DC 0~5V, 0~10V	DC 0~20mA, 4~20mA
Maximum Input Range	DC ±18V	DC 0~40mA
Digital Output Range	14 bits binary (0~16383)	
Resolution	1/16383(14Bit); the convert data is stored in PLC in the form of Hex. (14Bit)	
PID Output Value	0~K4095	
Synthesis Precision	0.8%	
Conversion Speed	20ms per channel	
Power Supply	DC24V±10%,100mA	
Installation	Fix with M3 screw or install on DIN46277 guilder (Width: 35mm) directly	
Dimension	63mm×102mm×73.3mm	

## 5-2. Terminals

	0V						
	24V						
	VI0	C1	A11	VI2	C3	A13	
	C0	A10	VI1	C2	A12	VI3	

### Module signal :

Channel	Terminal name	Signal name
CH0	A10	Current input
	VI0	Voltage input
	C0	CH0 common terminal
CH1	A11	Current input
	VI1	Voltage input
	C1	CH1 common terminal
CH2	A12	Current input
	VI2	Voltage input
	C2	CH2 common terminal
CH3	A13	Current input
	VI3	Voltage input
	C3	CH3 common terminal
-	24V	+24V power supply
	0V	Common terminal of power supply

## 5-3. I/O address assignment

XC series expansions do not occupy I/O units; the converted value is sent to PLC register directly.

Expansion module 1 address

Channel	AD Signal	PID Output Value	PID Start/Stop Control Bit	Preset Value	PID Parameters: Kp, Ki, Kd, Control Range Diff, Dead Range "Death"
0CH	ID100	ID104	Y100	QD102	Kp----- QD106
1CH	ID101	ID105	Y101	QD103	Ki----- QD107
2CH	ID102	ID106	Y102	QD104	Kd----- QD108
3CH	ID103	ID107	Y103	QD105	Diff----- QD109
					Death---- QD110

Expansion module 2 address

Channel	AD Signal	PID Output Value	PID Start/Stop Control Bit	Preset Value	PID Parameters: Kp, Ki, Kd, Control Range Diff, Dead Range "Death"
0CH	ID200	ID204	Y200	QD202	Kp----- QD206
1CH	ID201	ID205	Y201	QD203	Ki----- QD207
2CH	ID202	ID206	Y202	QD204	Kd----- QD208
3CH	ID203	ID207	Y203	QD205	Diff----- QD209
					Death----QD210

Expansion module 3 address

Channel	AD Signal	PID Output Value	PID Start/Stop Control Bit	Preset Value	PID Parameters: Kp, Ki, Kd, Control Range Diff, Dead Range "Death"
0CH	ID300	ID304	Y300	QD302	Kp----- QD306
1CH	ID301	ID305	Y301	QD303	Ki----- QD307
2CH	ID302	ID306	Y302	QD304	Kd----- QD308
3CH	ID303	ID307	Y303	QD305	Diff----- QD309
					Death----QD310

Expansion module 4 address

Channel	AD Signal	PID Output Value	PID Start/Stop Control Bit	Preset Value	PID Parameters: Kp, Ki, Kd, Control Range Diff, Dead Range "Death"
0CH	ID400	ID404	Y400	QD402	Kp----- QD406
1CH	ID401	ID405	Y401	QD403	Ki----- QD407
2CH	ID402	ID406	Y402	QD404	Kd----- QD408
3CH	ID403	ID407	Y403	QD405	Diff----- QD409
					Death----QD410

Expansion module 5 address

Channel	AD Signal	PID Output Value	PID Start/Stop Control Bit	Preset Value	PID Parameters: Kp, Ki, Kd, Control Range Diff, Dead Range "Death"
0CH	ID500	ID504	Y500	QD502	Kp----- QD506
1CH	ID501	ID505	Y501	QD503	Ki----- QD507
2CH	ID502	ID506	Y502	QD504	Kd----- QD508
3CH	ID503	ID507	Y503	QD505	Diff----- QD509
					Death----QD510

Expansion module 6 address

Channel	AD Signal	PID Output Value	PID Start/Stop Control Bit	Preset Value	PID Parameters: Kp, Ki, Kd, Control Range Diff, Dead Range "Death"
0CH	ID600	ID604	Y600	QD602	Kp----- QD606
1CH	ID601	ID605	Y601	QD603	Ki----- QD607
2CH	ID602	ID606	Y602	QD604	Kd----- QD608
3CH	ID603	ID607	Y603	QD605	Diff----- QD609
					Death---- QD610

Expansion module 7 address

Channel	AD Signal	PID Output Value	PID Start/Stop Control Bit	Preset Value	PID Parameters: Kp, Ki, Kd, Control Range Diff, Dead Range "Death"
0CH	ID700	ID704	Y700	QD702	Kp----- QD706
1CH	ID701	ID705	Y701	QD703	Ki----- QD707
2CH	ID702	ID706	Y702	QD704	Kd----- QD708
3CH	ID703	ID707	Y703	QD705	Diff----- QD709
					Death---- QD710

**Description:**

Start signal (Y): when Y is 0, close PID control, when Y is 1, start PID control

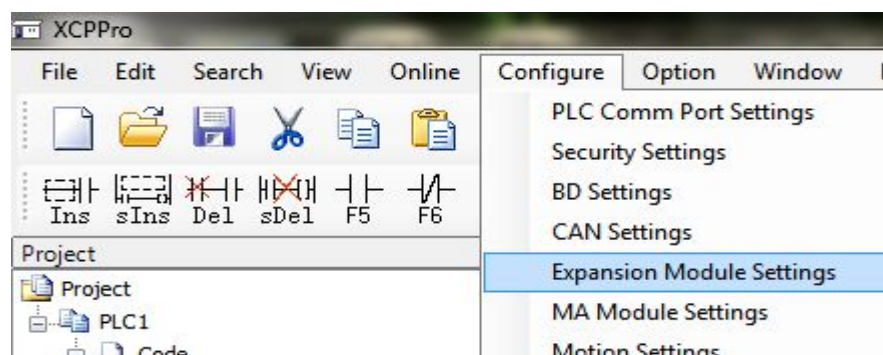
**5-4. Working mode**

There are two ways to set the working mode:

3. XCPpro software
4. FD registers of PLC

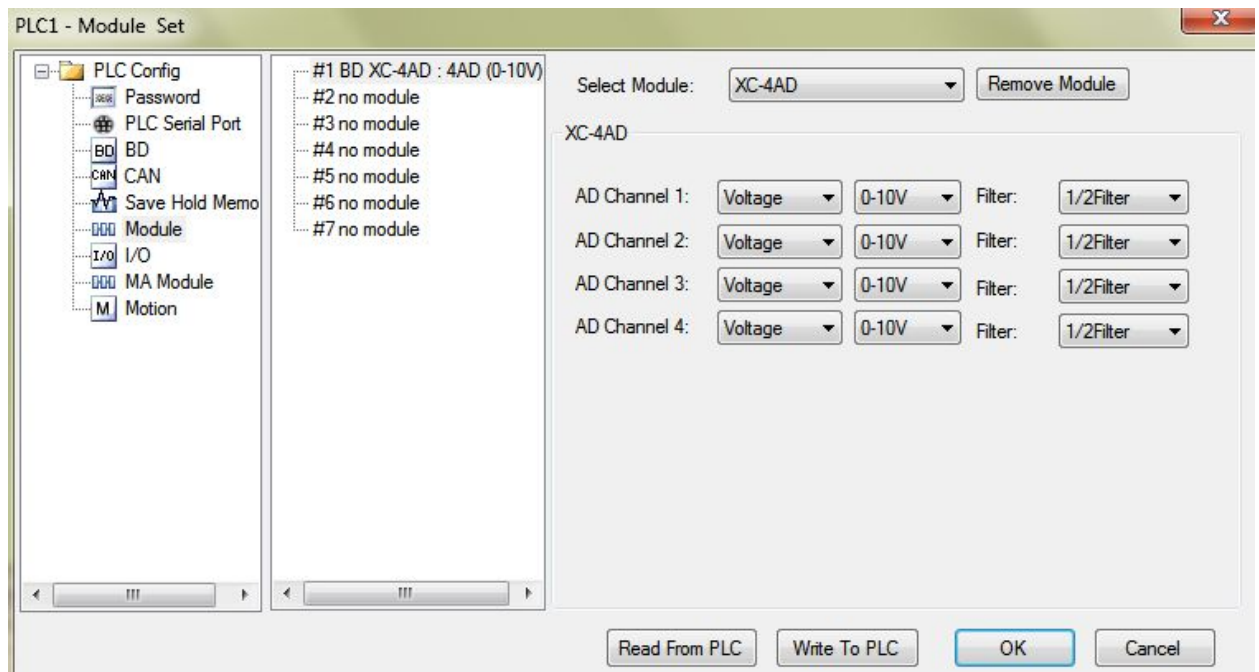
**XCPpro software:**

Open the XCPpro software, click configure/expansion module settings:



Set the model and channel parameters in the following window. Then click write to PLC/ok.

For software version lower than v3.3, please restart the PLC after setting.

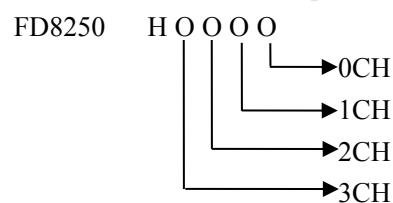


### FD registers:

The working mode can be voltage 0~5V, 0~10V or current 0~20mA, 4~20mA, set through FD registers of PLC:

Module	Channel's address
	0CH~3CH
Module 1	FD8250
Module 2	FD8258
Module 3	FD8266
Module 4	FD8274
Module 5	FD8282
Module 6	FD8290
Module 7	FD8298

Take module 1 as an example:



Note: As shown in the preceding table, every register set 4 channels mode, each register has 16 bits, from low to high, and every 4 bits set 1 channel mode.

We take module 1 as an example to show how to set:

Register FD8250:

Channel 1				Channel 0			
Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
00: 1/2 filter		0: voltage input	0:0~10V	00: 1/2 filter		0: voltage input	0:0~10V
01: no filter			1:0~5V	01: no filter			1:0~5V
10: 1/3 filter		1: current input	0:0~20mA	10: 1/3 filter		1: current input	0:0~20mA
11: 1/4 filter			1:4~20mA	11: 1/4 filter			1:4~20mA
Channel 3				Channel 2			
Bit15	Bit14	Bit13	Bit12	Bit11	Bit10	Bit9	Bit8
00: 1/2 filter		0: voltage input	0:0~10V	00: 1/2 filter		0: voltage input	0:0~10V
01: no filter			1:0~5V	01: no filter			1:0~5V
10: 1/3 filter		1: current input	0:0~20mA	10: 1/3 filter		1: current input	0:0~20mA
11: 1/4 filter			1:4~20mA	11: 1/4 filter			1:4~20mA

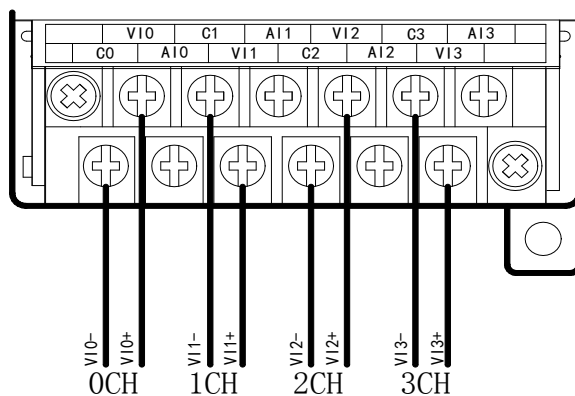
**Example:** If set working mode to 0~20mA, 4~20mA, 0~10V, 0~5V of module 1 channel 3, channel 2, channel 1, channel 0, filters are all 1/2 filter, the value in FD8250 is 2301H.

## 5-5. Exterior connection

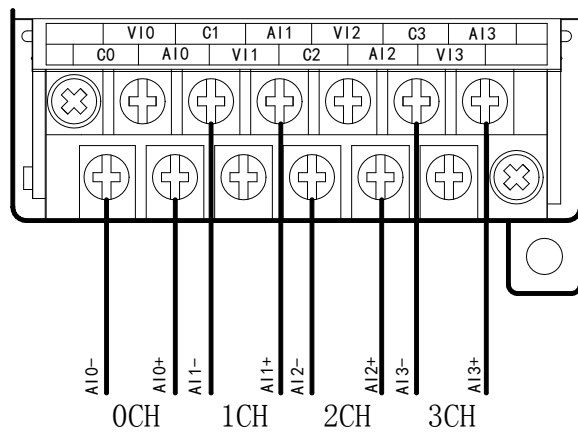
When make external connection, please note the following items:

- When connect external 24V power, please choose 24V power of PLC to avoid interference.
- To avoid interference, please use shield cable and single-point ground with the shield layer.

## Voltage input

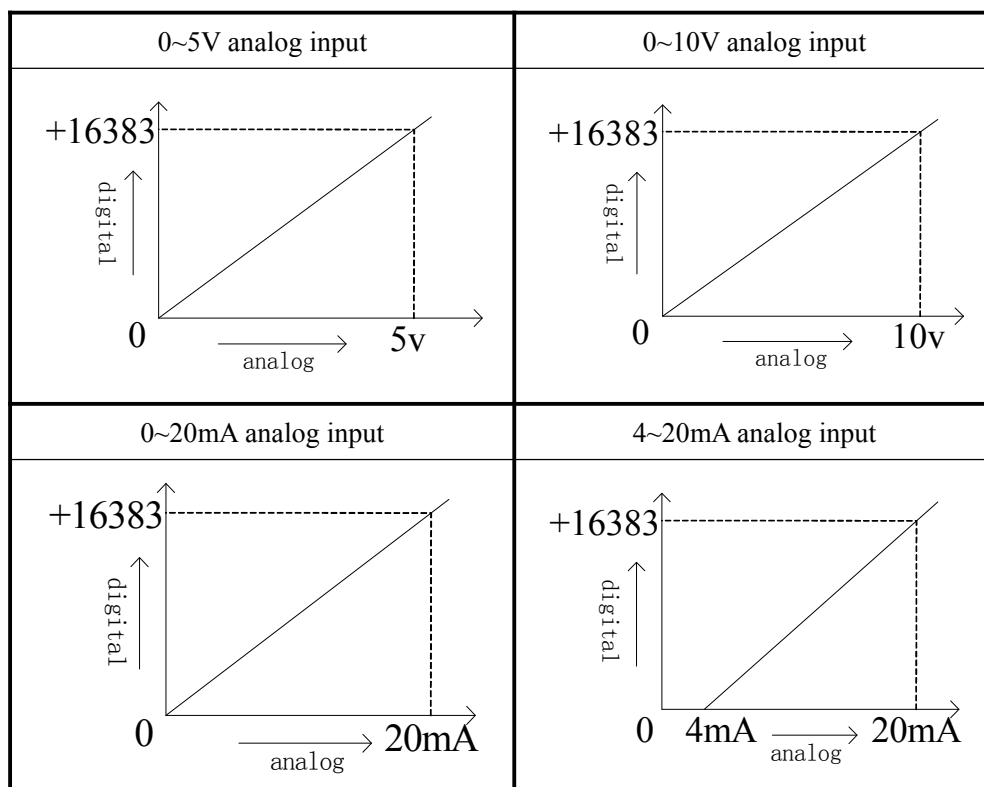


## Current input



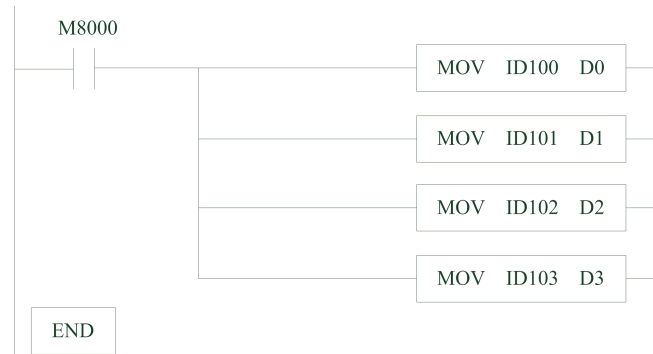
## 5-6. AD conversion diagram

The relationship between analog input and converted digital value is shown in the following chart:



## 5-7. Programming

Example Real-time read the 4 channels data (take expansion 1 as an example)



Explanation:

M8000 is always ON coil, it is ON when PLC is running.

Send channel 0 data to PLC register D0,

Send channel 1 data to PLC register D1,

Send channel 2 data to PLC register D2,

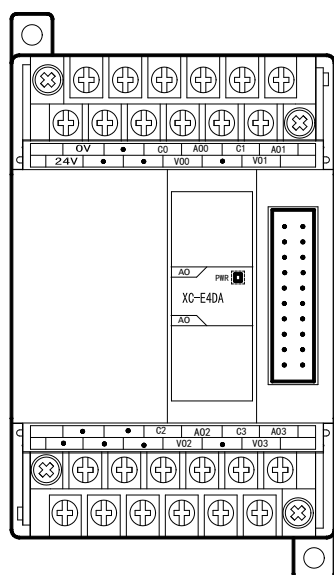
Send channel 3 data to PLC register D3.



## 6. Analog output module XC-E4DA(-H)

### 6-1. Specification

XC-E4DA and XC-E4DA-H transform 12 bits digital value to current or voltage output.



- 12 bits high precision analog output
- 4 channels analog output: voltage 0~5V, 0~10V; current 0~20mA, 4~20mA
- As special function module of XC, 7 modules could be connected to PLC.
- XC-E4DA-H: the power of analog and digital part is isolation. Current output is draw-off current.

Items	Voltage output	Current output
Analog output range	DC0~5V, 0~10V (external load resistor is 2KΩ~1MΩ)	DC0~20mA, 4~20mA (external load resistor is less than 500 Ω)
Digital input range	12 bits binary data	
Distinguish Ratio	1/4096(12Bit); the converted data is stored into PLC with the format of HEX	
Integrate precision	0.8%	
Convert speed	3ms per channel	
Power for analog using	DC 24V±10%, 100mA	
Install format	Can be fixed with M3 screws or directly installed on orbit of DIN46277 (width: 35mm)	
Exterior size	63mm×102mm×73.3mm	

## 6-2. Terminals

	0V		C0	A00	C1	A01	
	24V			V00		V01	

			C2	A02	C3	A03	
				V02		V03	

Channel	Terminal name	Signal name
CH0	A00	Current output
	V00	Voltage output
	C0	CH0 common terminal
CH1	A01	Current output
	V01	Voltage output
	C1	CH1 common terminal
CH2	A02	Current output
	V02	Voltage output
	C2	CH2 common terminal
CH3	A03	Current output
	V03	Voltage output
	C3	CH3 common terminal
-	24V	+24V power supply
	0V	Common terminal of power supply

## 6-3. I/O address assignment

XC series analog module does not occupy I/O space; the converted data is directly transferred into PLC register. The PLC register corresponding to the channels are shown as the following:

Channel	Module 1	Module 2	Module 3	Module 4	Module 5	Module 6	Module 7
0CH	QD100	QD200	QD300	QD400	QD500	QD600	QD700
1CH	QD101	QD201	QD301	QD401	QD501	QD601	QD701
2CH	QD102	QD202	QD302	QD402	QD502	QD602	QD702
3CH	QD103	QD203	QD303	QD403	QD503	QD603	QD703

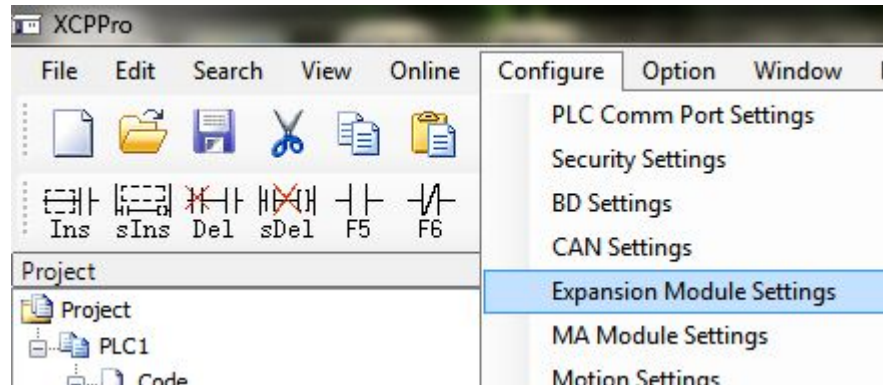
## 6-4. Working mode

There are two ways to set the working mode:

1. XCPpro software
2. FD registers of PLC

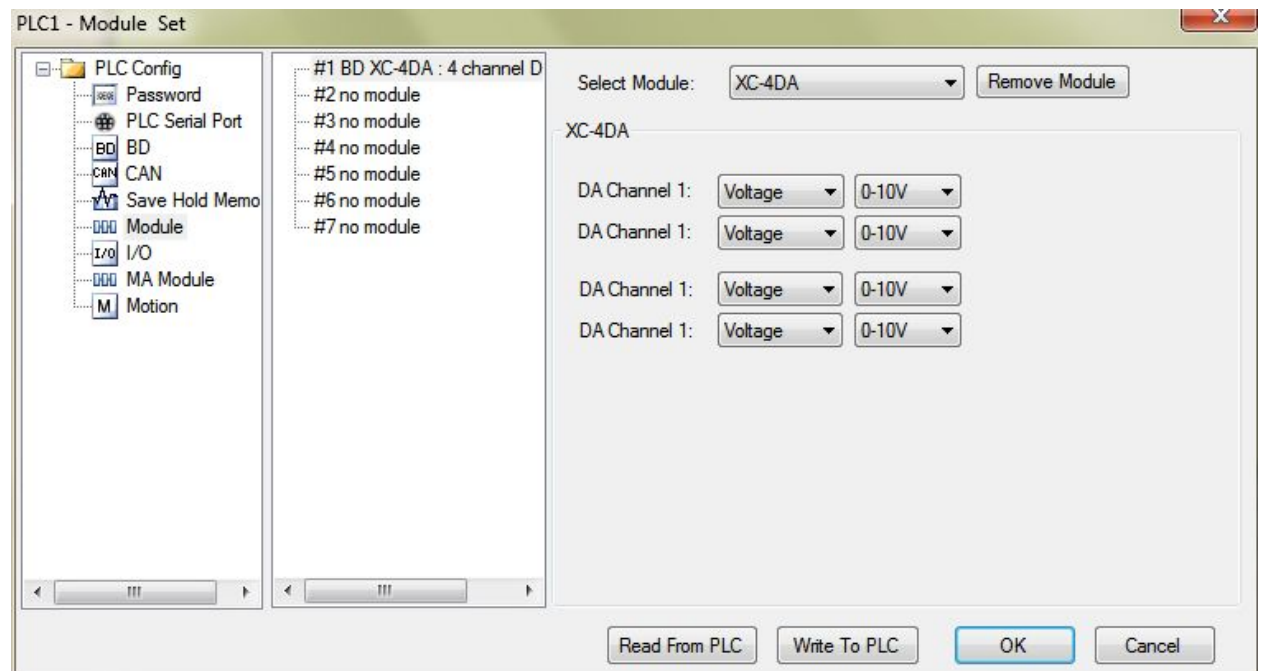
### XCPpro software:

Open the XCPpro software, click configure/expansion module settings:



Set the model and channel parameters in the following window. Then click write to PLC/ok.

For software version lower than v3.3, please restart the PLC after setting.

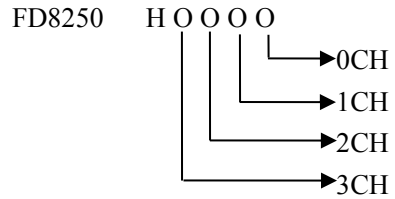


### FD register

The module has two modes for choice: voltage 0~5V, 0~10V, current 0~20mA, 4~20mA. The modes can be set through FD register of PLC.

Module	Channel address
Module 1	D8250
Module 2	D8258
Module 3	D8266
Module 4	D8274
Module 5	D8282
Module 6	D8290
Module 7	D8298

Take expansion 1 as an example:



Every 4 bits of the register define the working mode of one channel. Every register set 4 channels modes.

Take module 1 as an example:

Register FD8250:

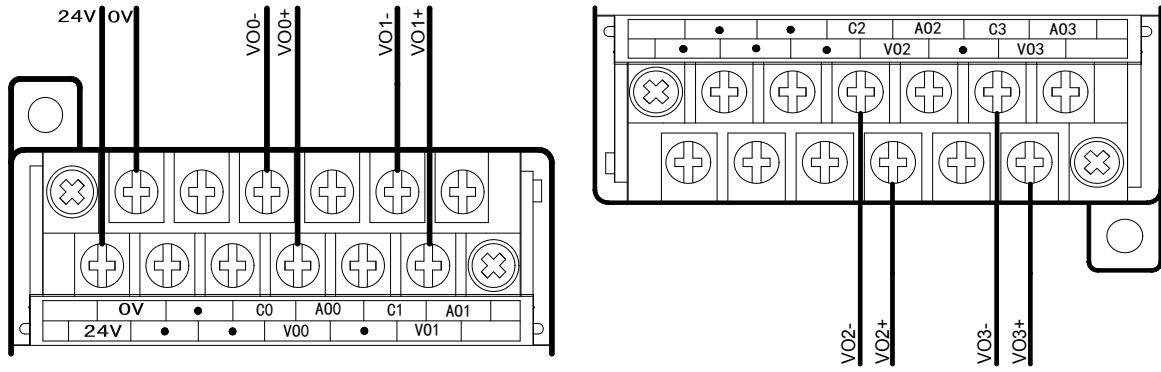
Channel 1				Channel 0			
Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
-		0: Voltage output	0:0~10V 1:0~5V	-		0: Voltage output	0:0~10V 1:0~5V
		1: current output	0:0~20mA 1:4~20mA			1: Current output	0:0~20mA 1:4~20mA
Channel 3				Channel 2			
Bit15	Bit14	Bit13	Bit12	Bit11	Bit10	Bit9	Bit8
-		0: Voltage output	0:0~10V 1:0~5V	-		0: Voltage output	0:0~10V 1:0~5V
		1: current output	0:0~20mA 1:4~20mA			1: current output	0:0~20mA 1:4~20mA

### 6-5. Exterior connection

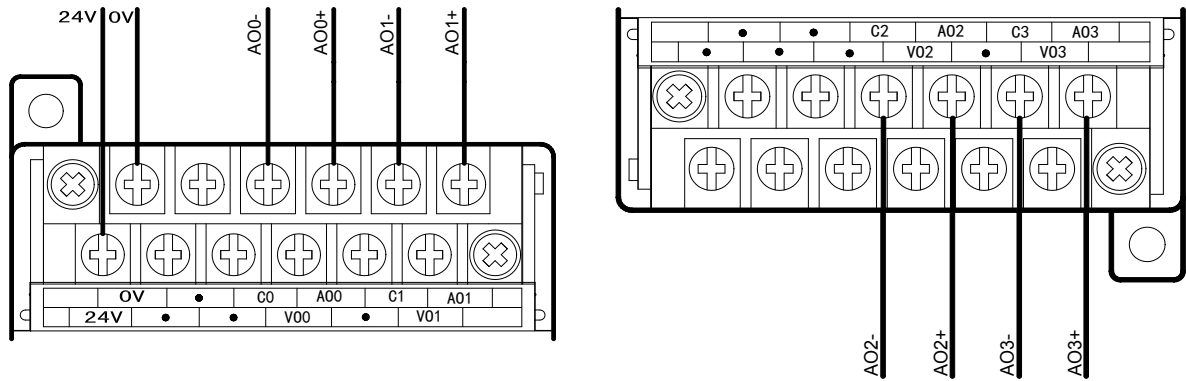
When make exterior connection, please see the following items:

- When XC-E4DA connects external +24V power, please use the 24V power of PLC to avoid interference.
- The current output of XC-E4DA needs 24V power supply, the module control the circuit current according to QD value, the module cannot produce current by itself.
- The current output of XC-E4DA-H doesn't need 24V power supply, the module control the circuit current according to QD value, the output current is draw-off mode.
- To avoid interference, please use shield cable and single point ground with the shield layer.

### Voltage output

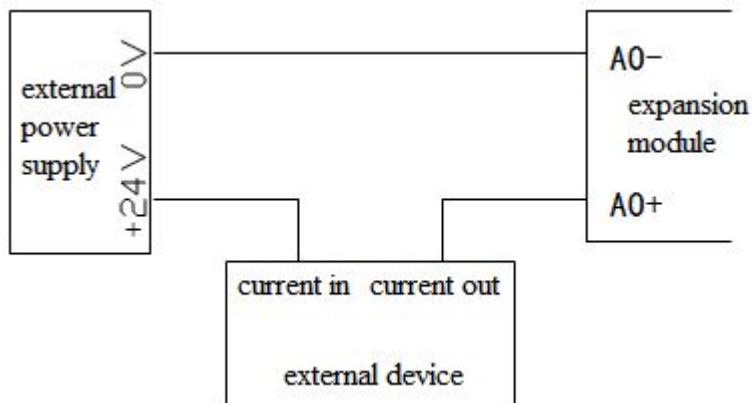


### Current output

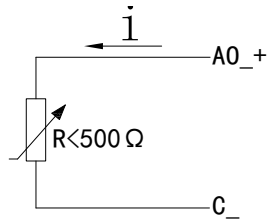


### Note:

- XC-E4DA current output needs external 24V power supply.

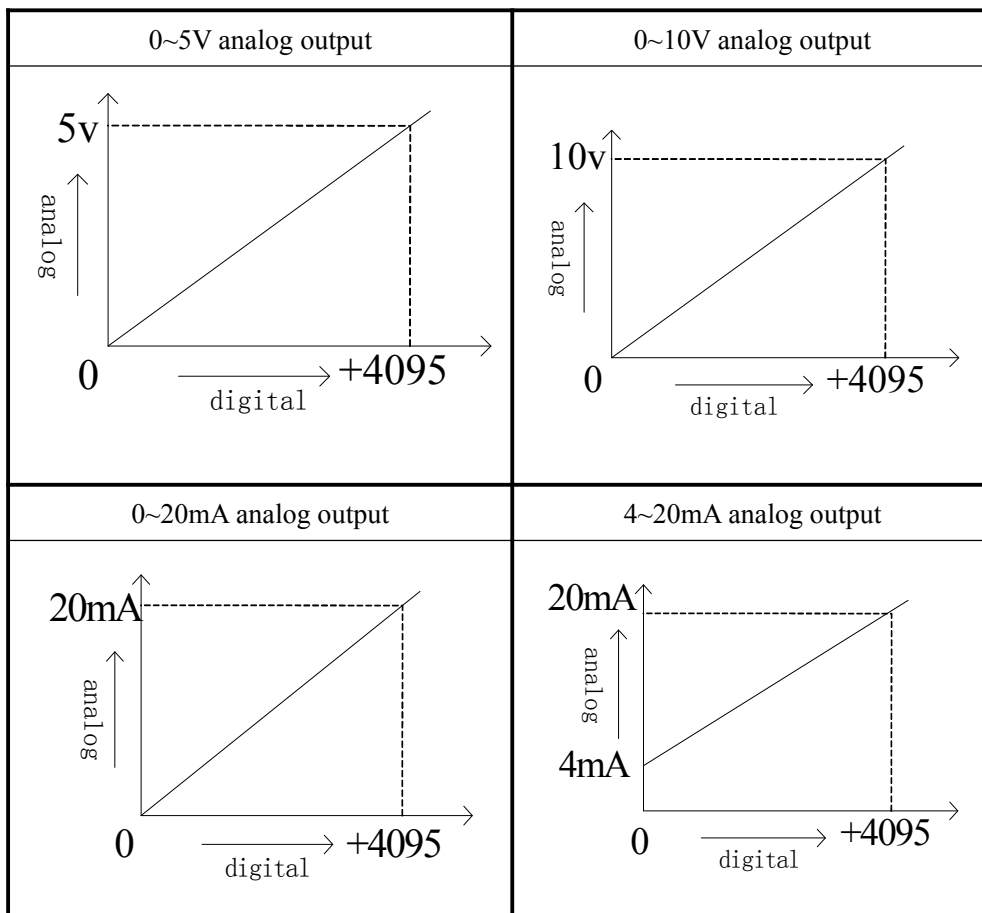


2. XC-E4DA-H current output wiring:



**6-6. DA convert chart**

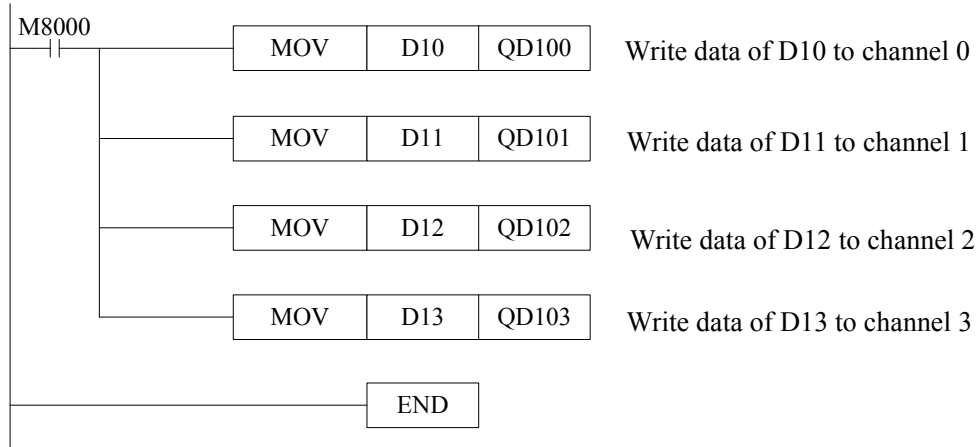
The relationship between digital input and corresponding analog output is showed in the following chart:



When the digital data exceed 4095, D/A analog output data will keep 5V, 10V or 20mA.

## 6-7. Programming

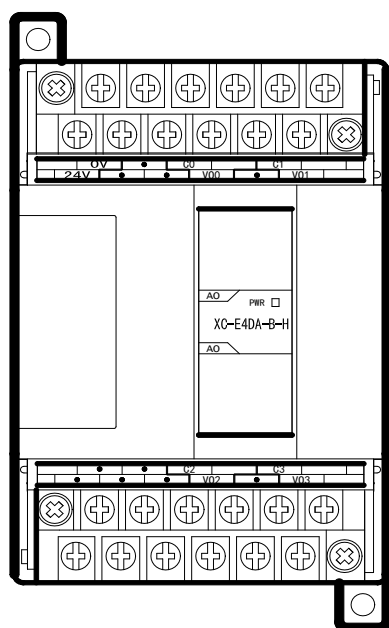
**Example** Real-time write data into 4 channels.



## 7. Analog output module XC-E4DA-B-H

### 7-1. Specification

XC-E4DA-B-H transform 12 bits digital value to voltage output.



- 12 bits high precision analog output
- 4 channels analog output: voltage 0~5V, 0~10V
- As special function module of XC, 7 modules could be connected to PLC.
- XC-E4DA-B-H: the power of analog and digital part is isolation

Items	Voltage output
Analog output range	DC0~5V, 0~10V (external load resistor is 2KΩ~1MΩ)
Digital input range	12 bits binary data
Distinguish Ratio	1/4096(12Bit); the converted data is stored into PLC with the format of HEX
Integrate precision	1%
Convert speed	3ms per channel
Power for analog using	DC 24V±10%, 100mA
Install format	Can be fixed with M3 screws or directly installed on orbit of DIN46277 (width: 35mm)
Exterior size	63mm×102mm×73.3mm



## 7-2. Terminals

	0V		C0		C1		
24V	.	.	V00	.	V01		

			C2		C3		
			V02		V03		

Channel	Terminal name	Signal name
0CH	VO0	Voltage output
	C0	CH0 common terminal
1CH	VO1	Voltage output
	C1	CH1 common terminal
2CH	VO2	Voltage output
	C2	CH2 common terminal
3CH	VO3	Voltage output
	C3	CH3 common terminal
-	24V	+24V power supply
	0V	Common terminal of power supply

### 7-3. I/O address assignment

XC series analog module does not occupy I/O space; the converted data is directly transferred into PLC register. The PLC register corresponding to the channels are shown as the following:

Channel	Module 1	Module 2	Module 3	Module 4	Module 5	Module 6	Module 7
0CH	QD100	QD200	QD300	QD400	QD500	QD600	QD700
1CH	QD101	QD201	QD301	QD401	QD501	QD601	QD701
2CH	QD102	QD202	QD302	QD402	QD502	QD602	QD702
3CH	QD103	QD203	QD303	QD403	QD503	QD603	QD703

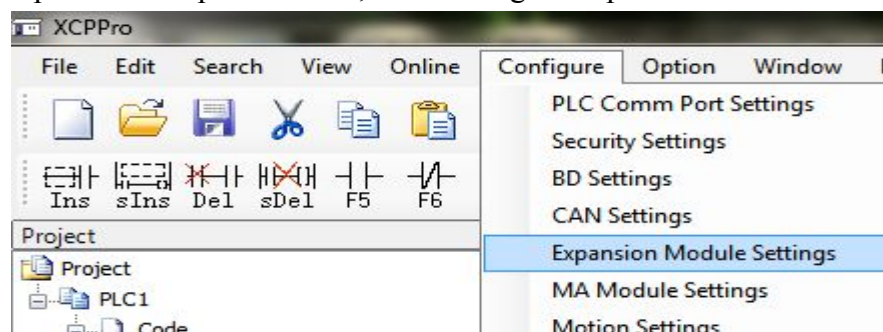
### 7-4. Working mode

There are two ways to set the working mode:

- 1.XCPpro software
- 2.FD registers of PLC

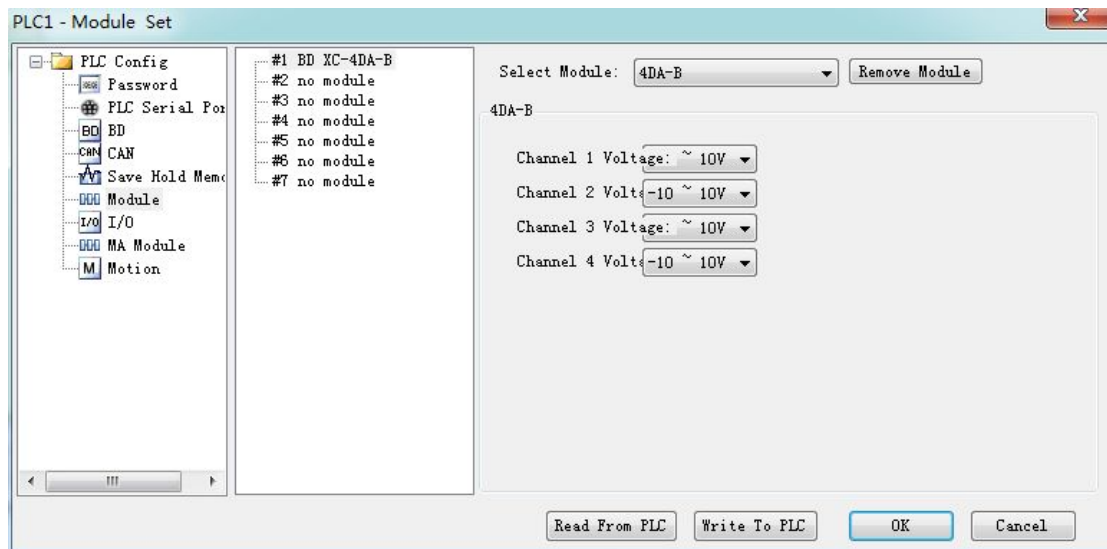
#### XCPpro software:

Open the XCPpro software, click configure/expansion module settings:



Set the model and channel parameters in the following window. Then click write to PLC/ok.

For software version lower than v3.3, please restart the PLC after setting.

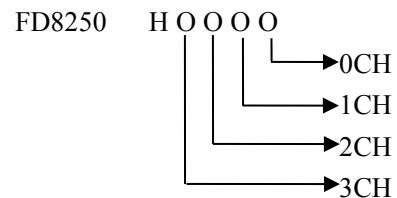


### FD register

The module has two modes for choice: voltage -5V~5V, -10V~10V. The modes can be set through FD register of PLC.

Module	Channel address
	0CH~3CH
Module 1	D8250
Module 2	D8258
Module 3	D8266
Module 4	D8274
Module 5	D8282
Module 6	D8290
Module 7	D8298

Take expansion 1 as an example:



Channel 0 and channel 1 choose -10~10 V voltage output, Channel 2 and channel 3 choose -5~5V voltage output,

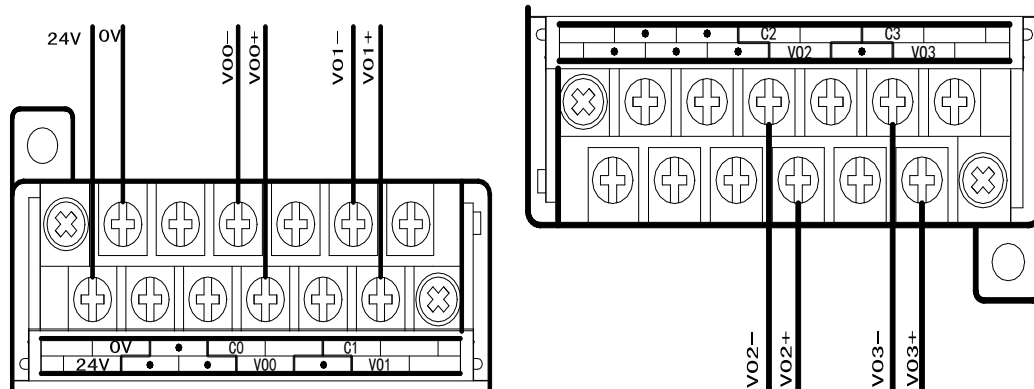
Channel 1				Channel 0			
Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
-	-	-	0: -10~10V 1: -5~5V	-	-	-	0: -10~10V 1: -5~5V
Channel 3				Channel 2			
Bit15	Bit14	Bit13	Bit12	Bit11	Bit10	Bit9	Bit8
-	-	-	0: -10~10V 1: -5~5V	-	-	-	0: -10~10V 1: -5~5V

## 7-5. Exterior connection

When make external connection, please note the following items:

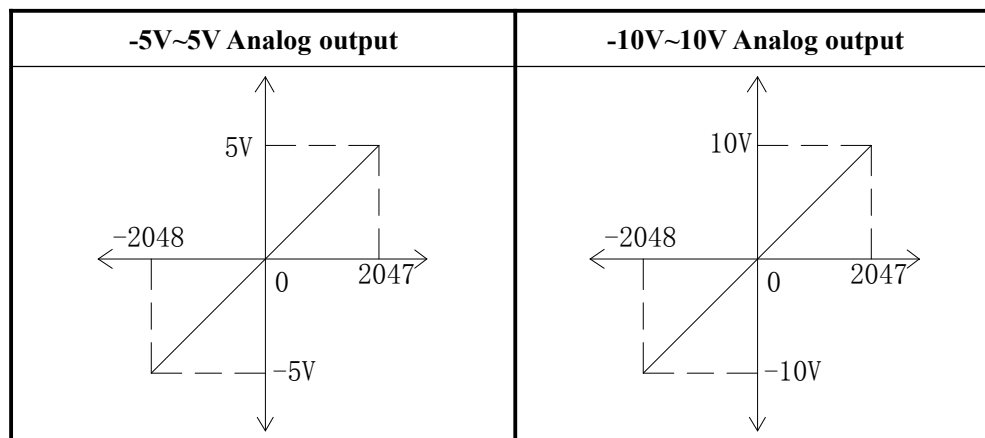
- When connect external 24V power, please choose 24V power of PLC to avoid interference. To avoid interference, please use shield cable and single-point ground with the shield layer.

### Voltage Output



## 7-6. AD conversion diagram

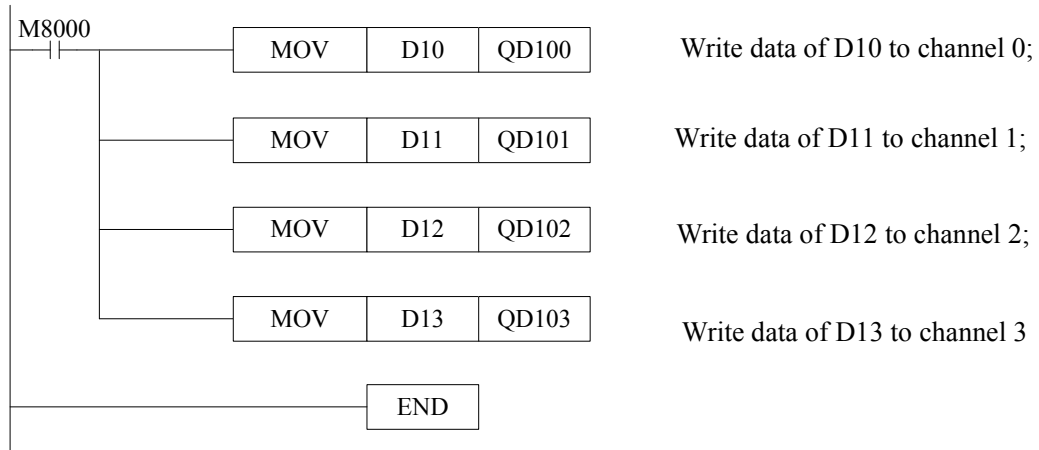
The relationship between analog output and converted digital value is shown in the following chart:



**Note:** When input data more than K-2048~K2047, D/A convert analog data keep 5V or 10 V

## 7-7. Programming

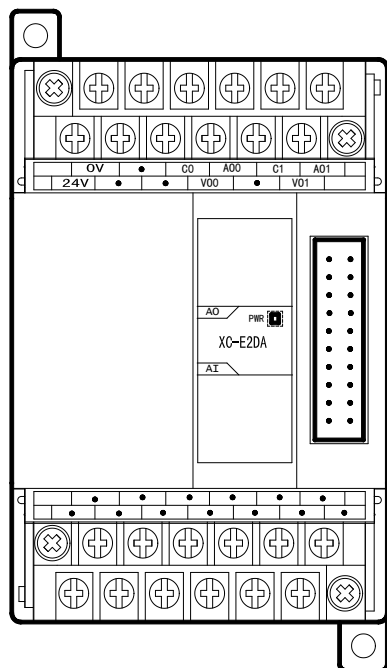
Example Real-time write data into 4 channels (take expansion 1 as an example)



## 8. Analog output module XC-E2DA(-H)

### 8-1. Specifications

XC-E2DA and XC-E2DA-H transform 12 bits digital value to current or voltage output.



- 12 bits high precision analog output
- 2 channels voltage (0~5V/0~10V), current (0~20mA/4~20 mA) output for choice.
- As special function module of XC series, up to 7 modules can be connected to the PLC.
- XC-E2DA-H: the power of digital and analog part has isolation. The current output is draw-off current.

Items	Voltage output	Current output
Analog output	DC 0 to 5V, 0 to 10V (external load resistor 2K $\Omega$ ~1M $\Omega$ )	DC0 to 20mA, 4 to 20mA (external load resistor is less than 500 $\Omega$ )
Digital input	12 bits	
Resolution	1/4095(12 bit); the cover data is stored into PLC in the form of Hex	
General precision	1%	
Conversion speed	3ms per channel	
Isolation	DC/AC convert, optical-coupling isolate	
Power supply for analog using	DC24V $\pm$ 10%,100mA	
Installation	Fix with M3 screws or install on DIN46277 (width: 35) leader directly	
Dimension	63mm $\times$ 102mm $\times$ 73.3mm	

## 8-2. Terminals

	0V		C0	A00	C1	A01	
	24V			V00		V01	


Channel	Terminal name	Signal name
CH0	A00	Current output
	V00	Voltage output
	C0	CH0 common terminal
CH1	A01	Current output
	V01	Voltage output
	C1	CH1 common terminal
-	24V	+24V power supply
	0V	Common terminal of power supply

## 8-3. I/O address assignment

XC series analog modules don't occupy I/O units, the converted value is sent to PLC register directly.

The PLC registers are shown as the following:

Channel	Module 1	Module 2	Module 3	Module 4	Module 5	Module 6	Module 7
0CH	QD100	QD200	QD300	QD400	QD500	QD600	QD700
1CH	QD101	QD201	QD301	QD401	QD501	QD601	QD701

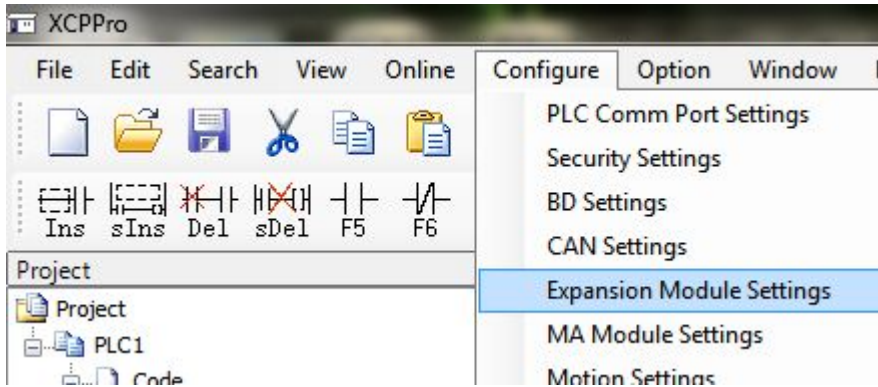
## 8-4. Working mode

There are two ways to set the working mode:

1. XCPpro software
2. FD registers of PLC

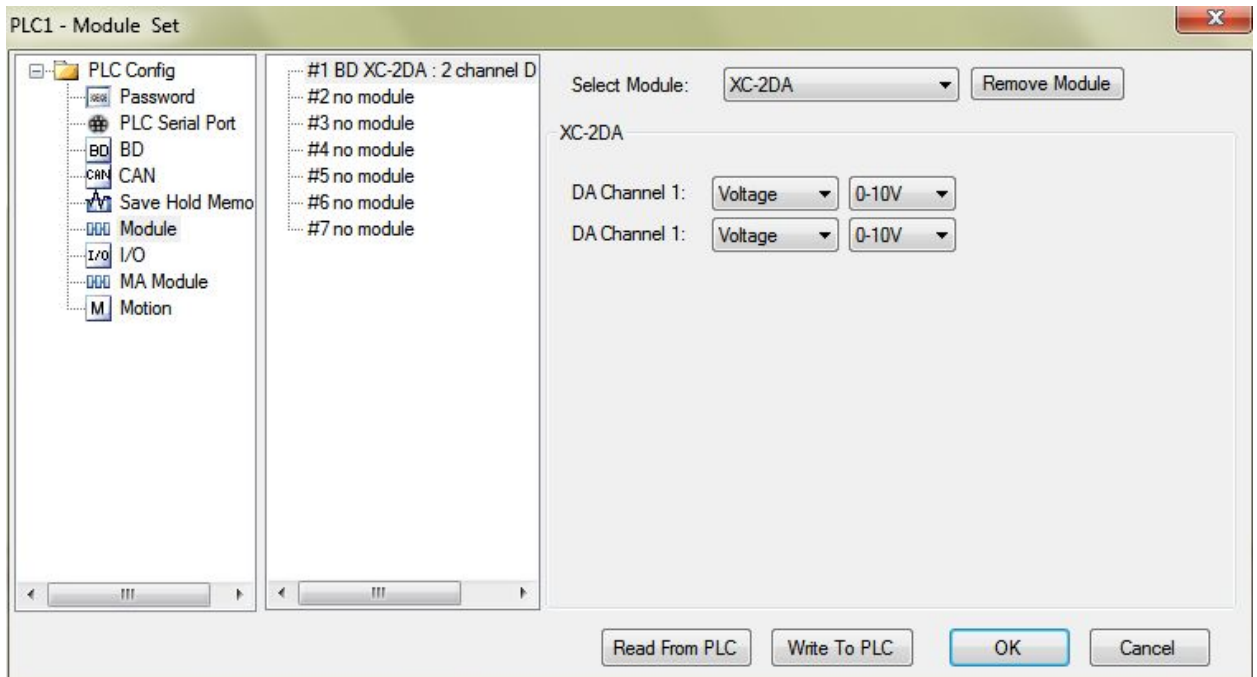
### XCPpro software:

Open the XCPpro software, click configure/expansion module settings:



Set the model and channel parameters in the following window. Then click write to PLC/ok.

For software version lower than v3.3, please restart the PLC after setting.

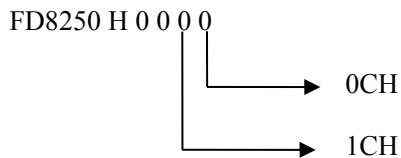


**FD registers:**

The module output has voltage 0 ~ 5V, 0 ~ 10V, current 0 ~ 20mA, 4 ~ 20mA, set the modes through the PLC internal special FLASH registers FD.

Module	Channels No.
	0CH to 1CH
Module 1	D8250
Module 2	D8254
Module 3	D8258
Module 4	D8262
Module 5	D8264
Module 6	D8268
Module 7	D8272

Take module 1 as an example:



Note: As shown in the preceding table, each register set 2 channels mode, each register has 16 bits,



from low bit to high bit, every 4 bits set 1 channel mode.

Take the first module as an example:

Register FD8250:

Channel 1				Channel 0			
Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
-		0:voltage output	0:0 ~10V 1:0 ~ 5V	-		0:voltage output	0:0 ~10V 1:0 ~ 5V
		1:current output	0:0~20mA 1:4~20mA			1:current output	0:0~20mA 1:4~20mA

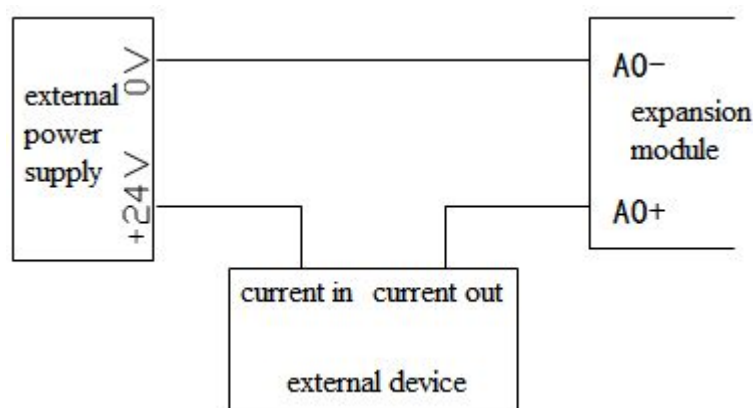
## 8-5. External connection

When make external connection, please note the following items:

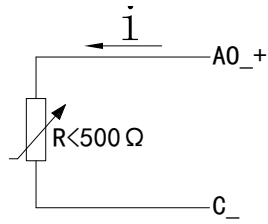
- When connect to external +24V power supply, please use 24V power supply of PLC to avoid interference.
- To avoid interference, please use shield cable, and single-point ground with the shield layer.
- For XC-E2DA, the 0 ~20 mA /4 ~ 20mA current output need external 24V power supply. The module doesn't generate current but adjust the circuit current according to the QD value.
- For XC-E2DA-H, the 0 ~20 mA /4 ~ 20mA current output doesn't need external 24V power supply. The module adjusts the circuit current according to the QD value. The output current is draw-off current.

Note:

1. XC-E2DA current output is sink current, it needs external 24V power supply. The wiring diagram:

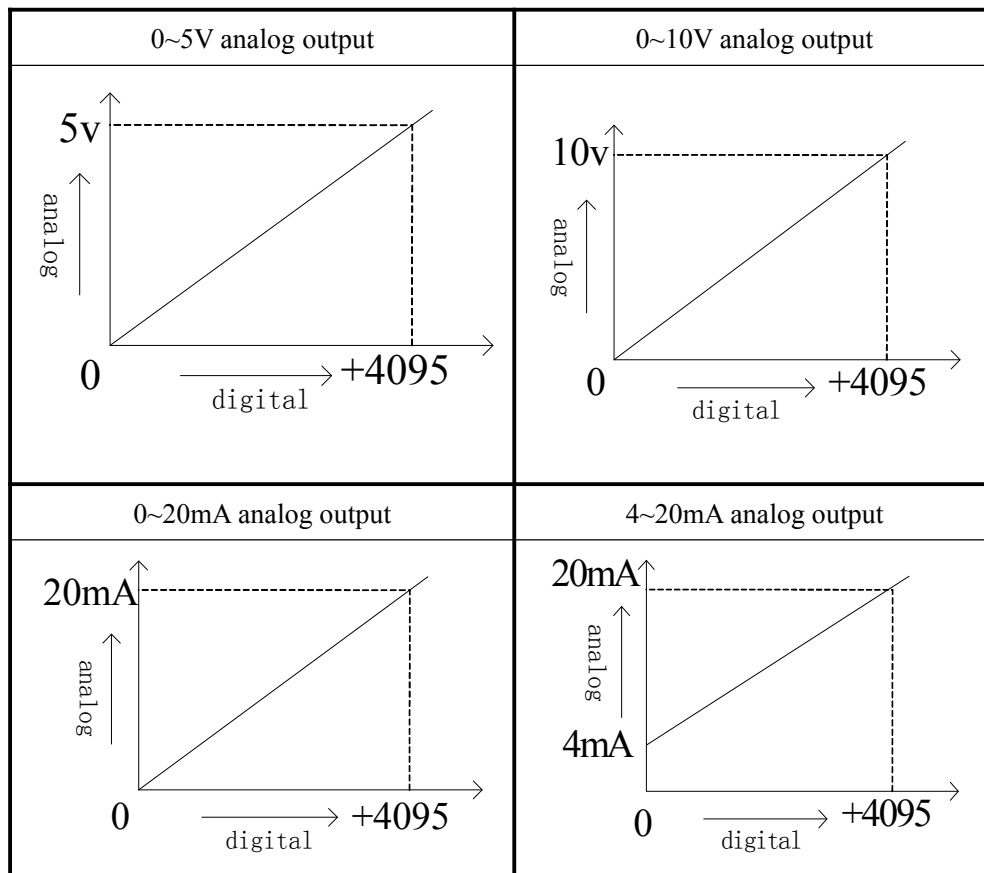


2. XC-E2DA-H current output is draw-off current, it doesn't need external 24V power supply. The wiring diagram:



### 8-6.DA conversion diagram

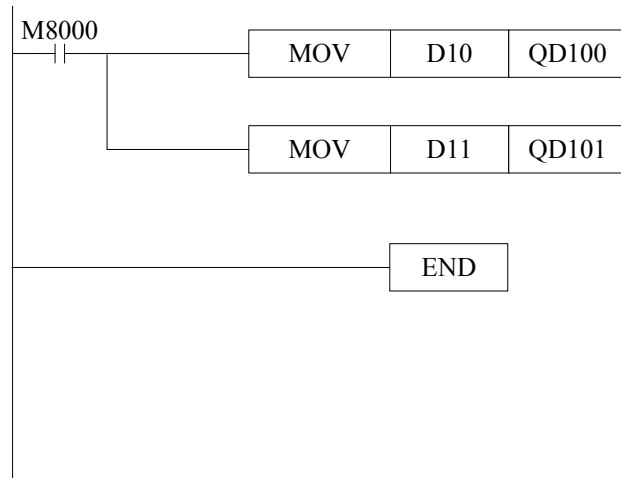
The relationship between digital input value and analog output value is shown as below:  
 When the input value is larger than 4095, D/A converted analog value will remain 5V, 10V or 20mA.



**Note:** when input data more than 4095, D/A convert analog data keep 5V,10V or 20 mA

## 8-7.Programming

Real-time write data to 2 channels

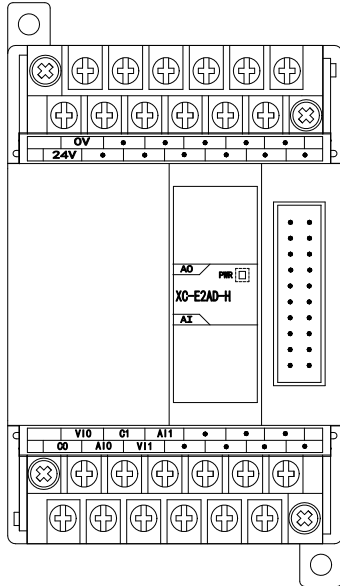


Write the value of D10 to channel 0

Write the value of D11 to channel 1

## 9. Analog Input Module XC-E2AD-H

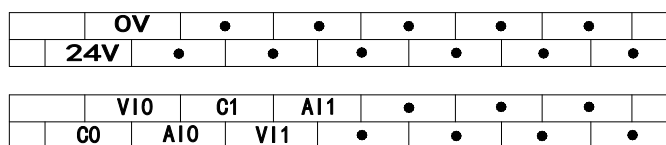
### 9-1. Specifications



- 2 channels analog input : can choose voltage input and current input ,voltage input has 0~5V、0~10V, current input has 0~20mA、4~20mA
- 14 bits high precision analog input
- As special function module of XC, up to 7 models can be connected.
- 2 channels A/D have PID function;
- XC-E2AD-H:the power of analog and digital has isolation circuit

Items	Voltage input	Current input
Analog input range	0~5V, 0~10V	0~20mA, 4~20mA
Max input range	± 15V	DC 0~40mA
Digital output range	14 bits binary data	
PID control value	0~4095	
Resolution	1/16383(14Bit);the converted data is stored into PLC in the format of HEX (14Bit)	
Integrate Precision	0.8%	
Conversion speed	20ms per channel	
Analog power supply	DC24V±10%,100mA	
Installation	Can be fixed with screw M3 or directly installed on orbit of DIN46277 (width: 35mm)	
Dimension	63mm×102mm×73.3mm	

### 9-2. Terminals



Channel	Terminal name	Signal name
CH0	AI0	Current input
	VI0	Voltage input
	C0	CH0 common terminal of analog input
CH1	AI1	Current input
	VI1	Voltage input
	C1	CH1 common terminal of analog input
-	24V	+24V power supply
	0V	Common terminal of power supply

### Assignment of I/O Address

XC series analog modules do not occupy I/O units; the converted data is directly transferred into PLC register

Address of module 1:

Channel	AD signal	PID output value	PID start/stop control bit	The set value	PID parameter: Kp, Ki, Kd, control range Diff, dead area Death
0CH	ID100	ID102	Y100	QD100	Kp----QD102 Ki----QD103 Kd----QD104 Diff---QD105 Death--QD106
1CH	ID101	ID103	Y101	QD101	

Address of module 2:

Channel	AD signal	PID output value	PID start/stop control bit	The set value	PID parameter: Kp, Ki, Kd, control range Diff, dead area Death
0CH	ID200	ID202	Y200	QD2100	Kp----QD202 Ki----QD203 Kd----QD204 Diff---QD205 Death--QD206
1CH	ID201	ID203	Y201	QD201	

Address of module 3:

Channel	AD signal	PID output value	PID start/stop control bit	The set value	PID parameter: Kp, Ki, Kd, control range Diff, dead area Death
0CH	ID300	ID302	Y300	QD300	Kp----QD302 Ki----QD303 Kd----QD304 Diff---QD305 Death--QD306
1CH	ID301	ID303	Y301	QD301	

Address of module 4:

Channel	AD signal	PID output value	PID start/stop control bit	The set value	PID parameter: Kp, Ki, Kd, control range Diff, dead area Death
0CH	ID400	ID402	Y400	QD400	Kp-----QD402 Ki-----QD403 Kd-----QD404 Diff---QD405 Death--QD406
1CH	ID401	ID403	Y401	QD401	

Address of module 5:

Channel	AD signal	PID output value	PID start/stop control bit	The set value	PID parameter: Kp, Ki, Kd, control range Diff, dead area
0CH	ID500	ID502	Y500	QD500	Kp-----QD502 Ki-----QD503 Kd-----QD504 Diff---QD505 Death--QD506
1CH	ID501	ID503	Y501	QD501	

Address of module 6:

Channel	AD signal	PID output	PID start/stop control bit	The set value	PID parameter: Kp, Ki, Kd, control range Diff, dead area
0CH	ID600	ID602	Y600	QD600	Kp-----QD602 Ki-----QD603 Kd-----QD604 Diff---QD605 Death--QD606
1CH	ID601	ID603	Y601	QD601	

Address of module 7:

Channel	AD signal	PID output value	PID start/stop control bit	The set value	PID parameter: Kp, Ki, Kd, control range Diff, dead area
0CH	ID700	ID702	Y700	QD700	Kp-----QD702 Ki-----QD703 Kd-----QD704 Diff---QD705 Death--QD706
1CH	ID701	ID703	Y701	QD701	

**Description:**

Start signal (Y): When Y is 0, close PID control; when Y is 1, start PID control.

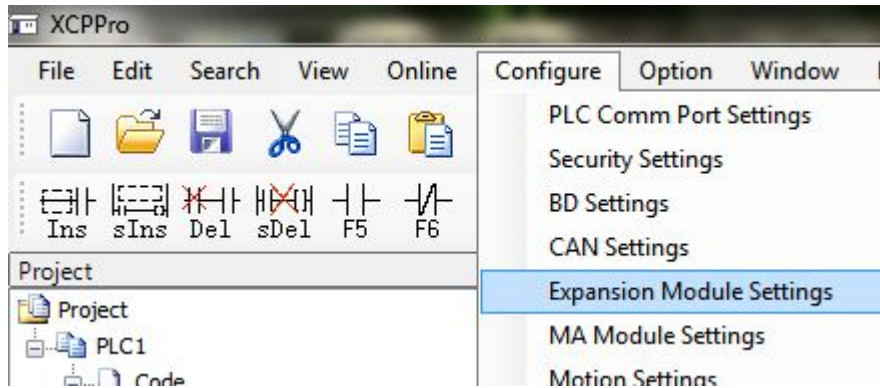
**9-4. Working mode**

There are two ways to set the working mode:

3. XCPpro software
4. FD registers of PLC

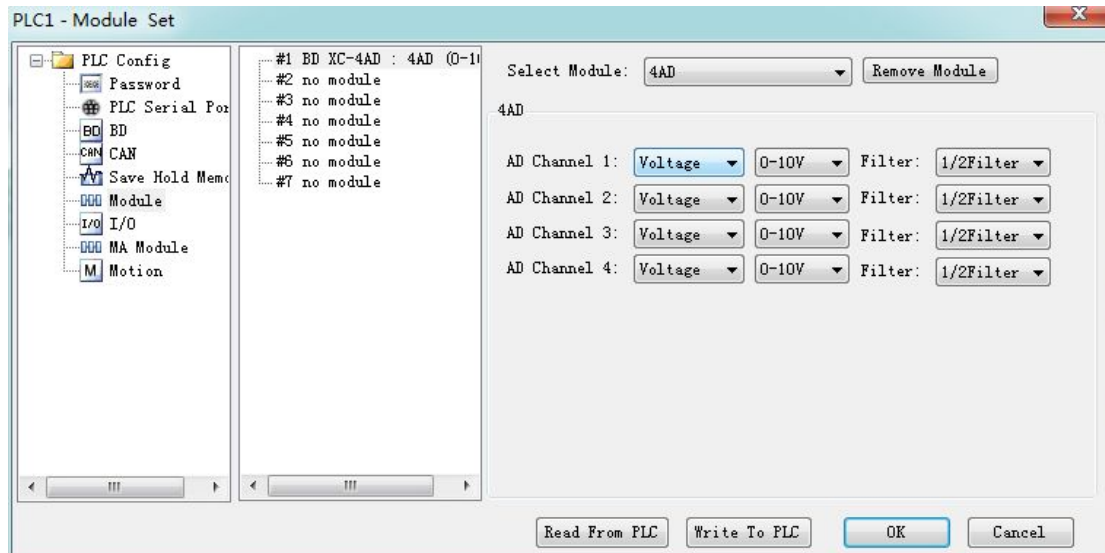
## XCPpro software:

Open the XCPpro software, click configure/expansion module settings:



Set the model and channel parameters in the following window. Then click write to PLC/ok.

For software version lower than v3.3, please restart the PLC after setting.



FD registers:

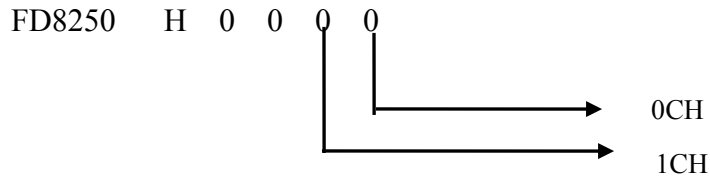
The module has current and voltage mode. Current has choices of 0~20mA, 4~20mA; voltage has choices of 0~5V, 0~10V.

Module	Channel
	0CH~1CH
1#	FD8250
2#	FD8258
3#	FD8266
4#	FD8274
5#	FD8282
6#	FD8290
7#	FD8298

Note: As shown in the preceding table, every register set 4 channels mode, each register has 16 bits, from low to high, every 4 bits set 2 channel's mode.

The setting method: (module 1)

Register FD8250:



Channel 1				Channel 0			
Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
00: 1/2 filter		0 : voltage input	0: 0~10V	00: 1/2 filter		0 : voltage input	0: 0~10V
01: not filter			1: 0~5V	01: not filter			1: 0~5V
10: 1/3 filter		1 : current input	0: 0~20mA	10: 1/3 filter		1 : current input	0: 0~20mA
11: 1/4 filter			1: 4~20mA	11: 1/4 filter			1: 4~20mA

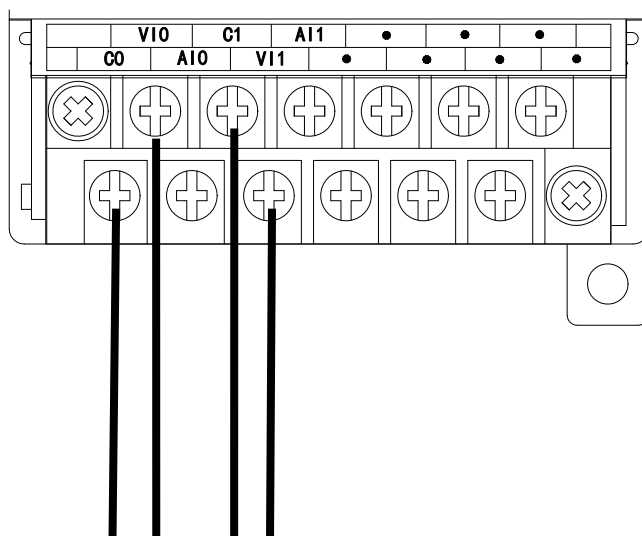
**Example:** If set the working mode of module 1 channel 1, channel 0 to 4~20mA, 0~10V, filters are all 1/2 filter, value in FD8250 is 0300H.

### 9-5. Exterior connection

When make exterior connection, please read the following items:

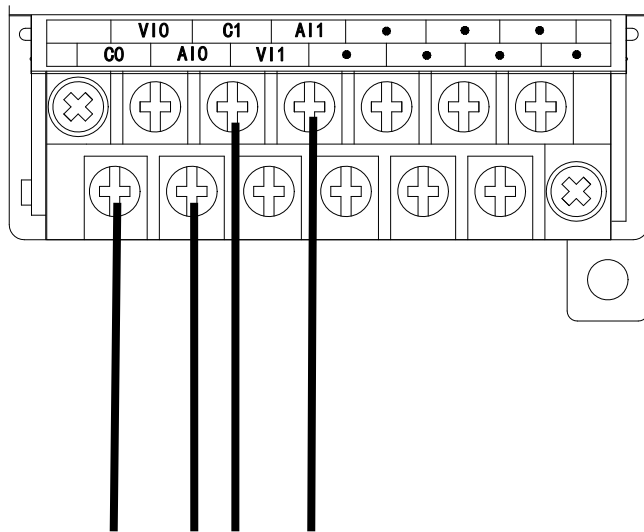
- When connect +24V power, please choose 24V power of PLC to avoid interference.
- To avoid interference, please use shield cable and single point ground for the shield layer.

#### Voltage input



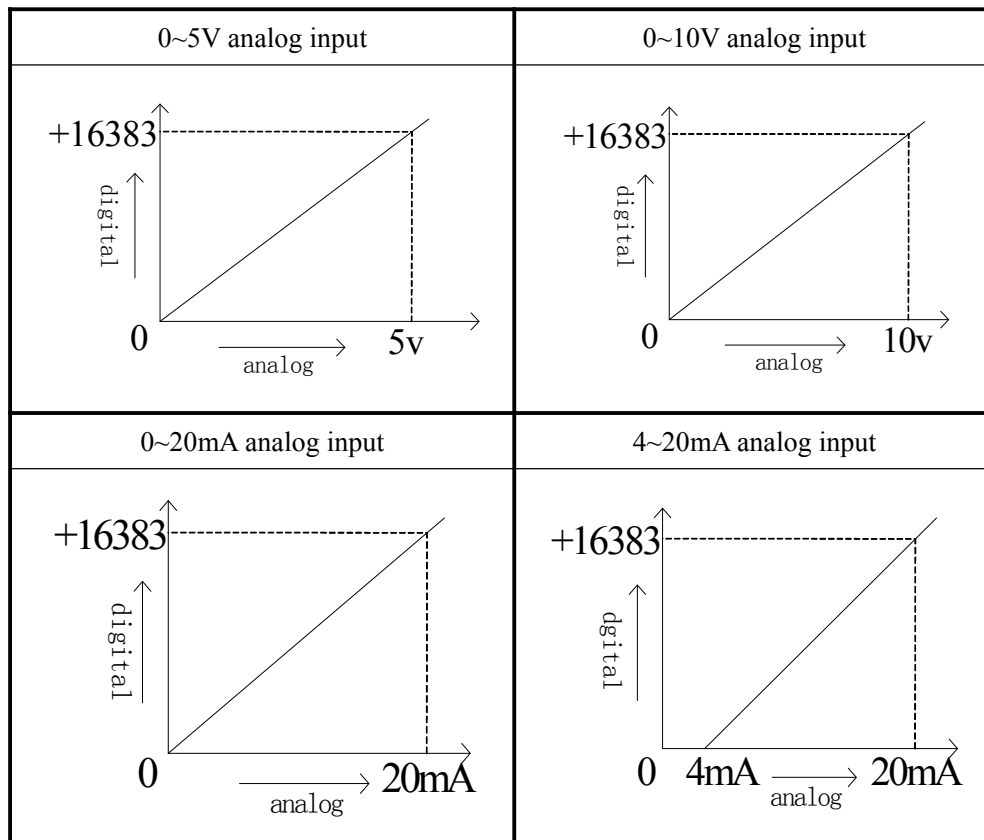


## Current input



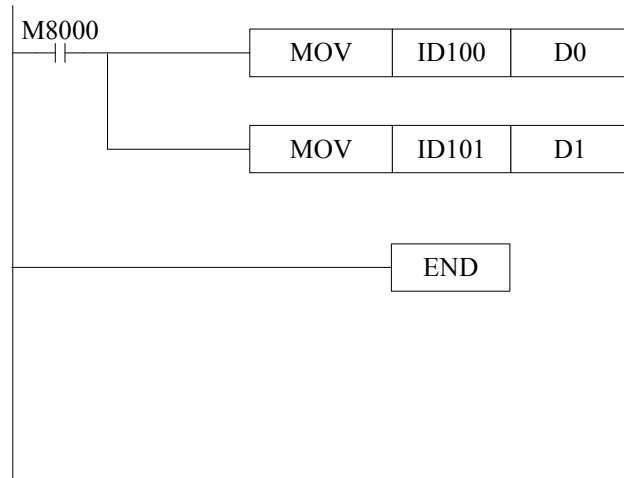
## 9-6. AD conversion diagram

The relationship between analog input and corresponding digital value:



## 9-7. Programming

**Example** Real time read 2 channels data,(take expansion 1 as an example)



Explanation:

M8000 is always ON coil, it is ON when PLC is running.

Send channel 0 data to PLC register D0,

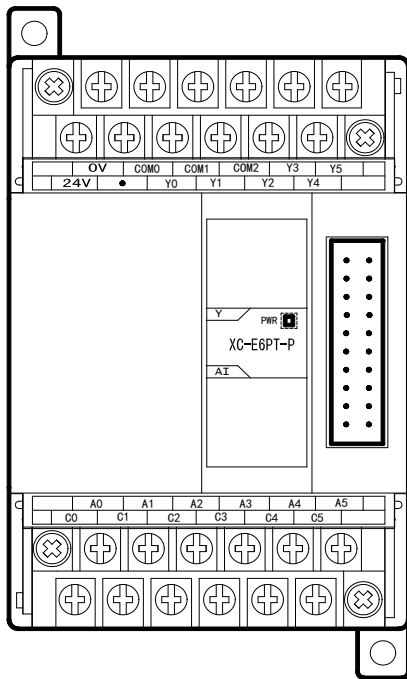
Send channel 1 data to PLC register D1,

## 10 Temperature Control Module XC-E6PT(-P)(-H)

### 10-1. Specification

XC-E6PT、XC-E6PT-H、can collect the temperature signal from PT100 sensor. It doesn't have PID function.

XC-E6PT-P、XC-E6PT-P-H temperature PID function, do process to 6 points signal PT100 ,and send to PLC main unit



- Platinum thermal resistance input, Pt100
- 6 channels input, 6 channels output  
2 groups PID parameters (every 3 channels use one group of PID parameters)
- 1mA constant current output, will not be affected by the exterior environment
- Resolution is 0.1°C
- As the special function module of XC, 7 modules can be connected to the PLC.
- XC-E6PT-H、XC-E6PT-P-H the power of analog and digital part is isolation

Item	Content
Analog input signal	Pt100 platinum thermal-resistance
Temperature measurement range	-100°C~500°C
Digital output bound	-1000~3500, 16 bits with sign bit, binary
Control precision	±0.5°C
Resolution	0.1°C
Integrate precision	1% (relative max value)
Conversion speed	20ms per channels
Analog power	DC24V±10%, 50mA
Installation format	Fixed with M3 screws or directly installed on orbit of DIN46277 (Width: 35mm)

Dimension	63mm×102mm×73.3mm
-----------	-------------------

**Note:**

1. Without signal input, the channel data will be 3500
2. Connect to Pt100 platinum thermal resistance according to actual requirements

**10-2. Terminals**

	OV	COM0	COM1	COM2	Y3	Y5	
	24V	.	.Y0	Y1	Y2	Y4	

	A0	A1	A2	A3	A4	A5	
	C0	C1	C2	C3	C4	C5	

Channel	Terminal name	Signal name
CH0	A0	0CH PT100 input
	C0	0CH common terminal of PT100 input
CH1	A1	1CH PT100 input
	C1	1CH common terminal of PT100 input
CH2	A2	2CH PT100 input
	C2	2CH common terminal of PT100 input
CH3	A3	3CH PT100 input
	C3	3CH common terminal of PT100 input
CH4	A4	4CH PT100 input
	C4	4CH common terminal of PT100 input
CH5	A5	5CH PT100 input
	C5	5CH common terminal of PT100 input
-	Y0	Channel 0 output
	Y1	Channel 1 output
	Y2	Channel 2 output
	Y3	Channel 3 output
	Y4	Channel 4 output
	Y5	Channel 5 output
	COM0	Common terminal of output
	COM1	Common terminal of output
-	24V	+24V power supply
	0V	Common terminal of power supply

### 10-3. I/O Address Assignment

XC series analog modules don't occupy I/O units; the converted data is directly transferred into PLC register.

The PLC registers are shown as the following:

Module 1 address:

Channel	Real-time temperature	Set temperature	PID start/stop bit	PID of first 3 channels	PID of last 3 channels
0CH	ID100	QD100	Y100	Kp----QD106 Ki----QD107 Kd----QD108 Diff---QD109	Kp----QD110 Ki----QD111 Kd----QD112 Diff---QD113
1CH	ID101	QD101	Y101		
2CH	ID102	QD102	Y102		
3CH	ID103	QD103	Y103		
4CH	ID104	QD104	Y104		
5CH	ID105	QD105	Y105		

Module 2 address:

Channel	Real-time temperature	Set temperature	PID start/stop bit	PID of first 3 channels	PID of last 3 channels
0CH	ID200	QD200	Y200	Kp----QD206 Ki----QD207 Kd----QD208 Diff---QD209	Kp----QD210 Ki----QD211 Kd----QD212 Diff---QD213
1CH	ID201	QD201	Y201		
2CH	ID202	QD202	Y202		
3CH	ID203	QD203	Y203		
4CH	ID204	QD204	Y204		
5CH	ID205	QD205	Y205		

Module 3 address:

Channel	Real-time temperature	Set temperature	PID start/stop bit	PID of first 3 channels	PID of last 3 channels
0CH	ID300	QD300	Y300	Kp----QD306 Ki----QD307 Kd----QD308 Diff---QD309	Kp----QD310 Ki----QD311 Kd----QD312 Diff---QD313
1CH	ID301	QD301	Y301		
2CH	ID302	QD302	Y302		
3CH	ID303	QD303	Y303		
4CH	ID304	QD304	Y304		
5CH	ID305	QD305	Y305		

Module 4 address:

Channel	Real-time temperature	Set temperature	PID start/stop bit	PID of first 3 channels	PID of last 3 channels
0CH	ID400	QD400	Y400	Kp----QD406 Ki----QD407 Kd----QD408 Diff---QD409	Kp----QD410 Ki----QD411 Kd----QD412 Diff---QD413
1CH	ID401	QD401	Y401		
2CH	ID402	QD402	Y402		
3CH	ID403	QD403	Y403		
4CH	ID404	QD404	Y404		
5CH	ID405	QD405	Y405		

Module 5 address:

Channel	Real-time temperature	Set temperature	PID start/stop bit	PID of the first 3 channels	PID of the last 3 channels
0CH	ID500	QD500	Y500	Kp----QD506 Ki----QD507 Kd----QD508 Diff---QD509	Kp----QD510 Ki----QD511 Kd----QD512 Diff---QD513
1CH	ID501	QD501	Y501		
2CH	ID502	QD502	Y502		
3CH	ID503	QD503	Y503		
4CH	ID504	QD504	Y504		
5CH	ID505	QD505	Y505		

Module 6 address:

Channel	Real-time temperature	Set temperature	PID start/stop bit	PID of the first 3 channels	PID of the last 3 channels
0CH	ID600	QD600	Y600	Kp----QD606 Ki----QD607 Kd----QD608 Diff---QD609	Kp----QD610 Ki----QD611 Kd----QD612 Diff---QD613
1CH	ID601	QD601	Y601		
2CH	ID602	QD602	Y602		
3CH	ID603	QD603	Y603		
4CH	ID604	QD604	Y604		
5CH	ID605	QD605	Y605		

Module 7 address:

Channel	Real-time temperature	Set temperature	PID start/stop bit	PID of the first 3 channels	PID of the last 3 channels
0CH	ID700	QD700	Y700	Kp----QD706 Ki----QD707 Kd----QD708 Diff---QD709	Kp----QD710 Ki----QD711 Kd----QD712 Diff---QD713
1CH	ID701	QD701	Y701		
2CH	ID702	QD702	Y702		
3CH	ID703	QD703	Y703		
4CH	ID704	QD704	Y704		

5CH	ID705	QD705	Y705		
-----	-------	-------	------	--	--

Start signal (Y): When Y is 0, close PID control; when Y is 1, start PID control

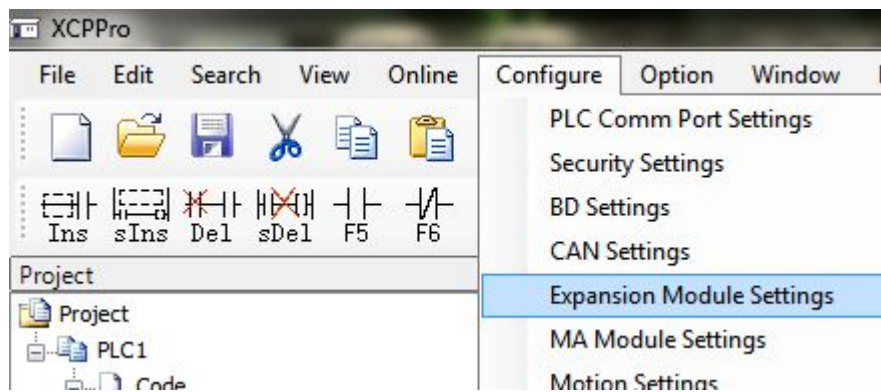
#### 10-4. Working mode

There are two ways to set the working mode:

1. XCPpro software
2. FD registers of PLC

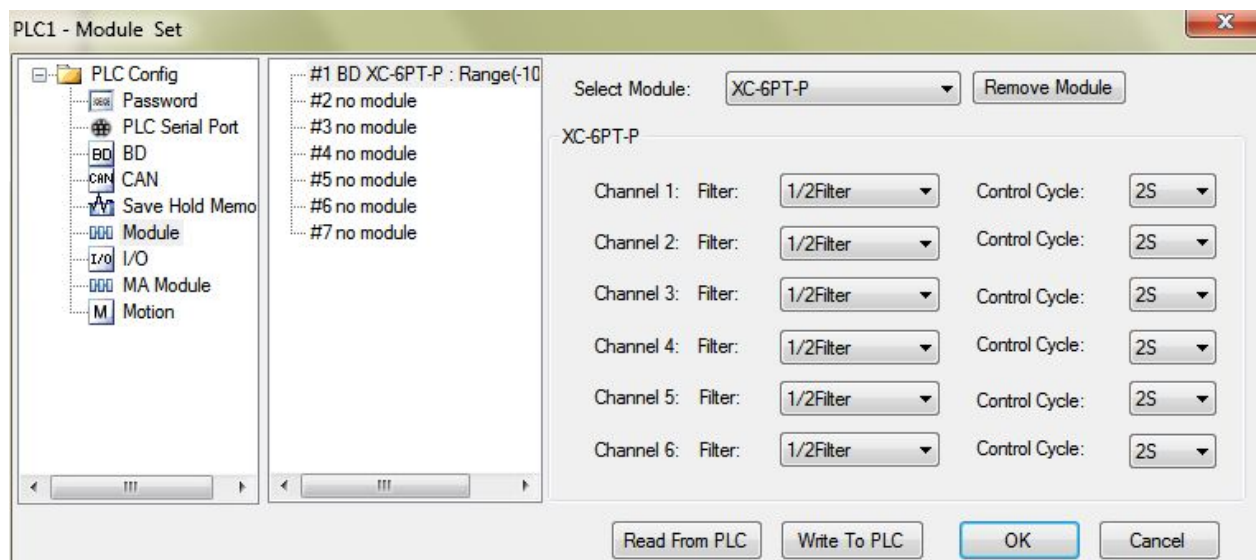
#### XCPpro software:

Open the XCPpro software, click configure/expansion module settings:



Set the model and channel parameters in the following window. Then click write to PLC/ok.

For software version lower than v3.3, please restart the PLC after setting.

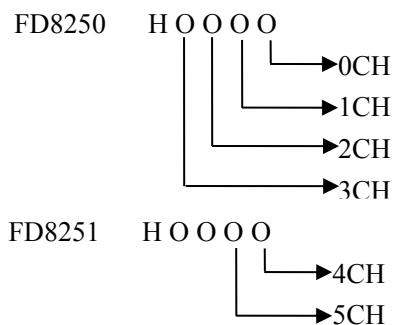


#### FD registers:

Set the filter and control cycle through FD registers of PLC.

Module	channel address	
	0CH~3CH	4CH~5CH
Module 1	FD8250	FD8251 low byte
Module 2	FD8258	FD8259 low byte
Module 3	FD8266	FD8267 low byte
Module 4	FD8274	FD8275 low byte
Module 5	FD8282	FD8283 low byte
Module 6	FD8290	FD8291 low byte
Module 7	FD8298	FD8299 low byte

Take module 1 as an example:



Each FD register can set 4 channels parameters. Every 4 bits of the FD register can set one channel parameters.

Take module 1 as an example:

Register FD8250:

Channel 2				Channel 1			
Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
00: 1/2 filter		-	0: 2s	00: 1/2 filter		-	0: 2s
01: no filter			1: 20s	01: no filter			1: 20s
10: 1/3 filter		-	0: 2s	10: 1/3 filter		-	0: 2s
11: 1/4 filter			1: 20s	11: 1/4 filter			1: 20s
Channel 4				Channel 3			
Bit15	Bit14	Bit13	Bit12	Bit11	Bit10	Bit9	Bit8
00: 1/2 filter		-	0: 2s	00: 1/2 filter		-	0: 2s
01: no filter			1: 20s	01: no filter			1: 20s
10: 1/3 filter		-	0: 2s	10: 1/3 filter		-	0: 2s
11: 1/4 filter			1: 20s	11: 1/4 filter			1: 20s

Register FD8251:

Channel 5				Channel 4			
Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
00: 1/2 filter		-	0: 2s	00: 1/2 filter		-	0: 2s
01: no filter			1: 20s	01: no filter			1: 20s
10: 1/3 filter		-	0: 2s	10: 1/3 filter		-	0: 2s
11: 1/4 filter			1: 20s	11: 1/4 filter			1: 20s

Note:



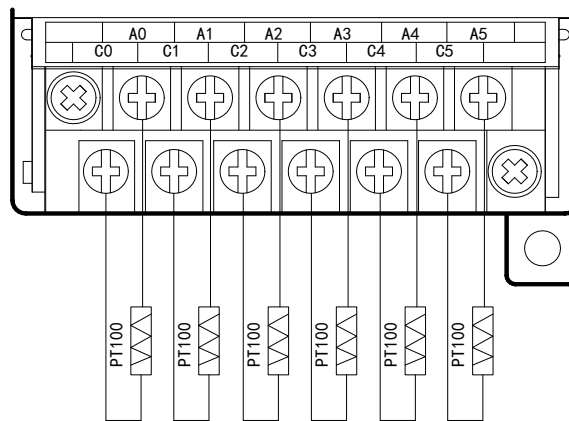
1. When the product is out of factory, the default value is 0, the filter format is 1/2 filter.
2. Each channel parameters include filter mode and control cycle.
3. Control cycle: in the control cycle, PID function controls the temperature according to the duty ratio which calculates through PID output value.

## 10-5. Exterior connection

About the external wiring, please see the following items:

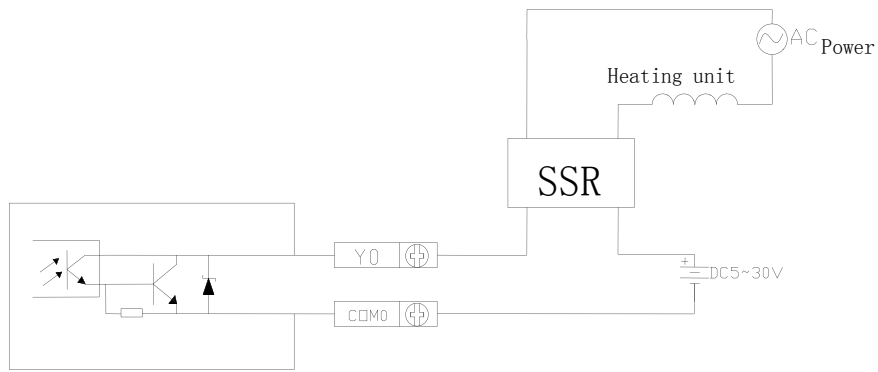
- When connect +24V power, please use 24V power on PLC main unit to avoid interference.
- To avoid interference, please use shield cable to ground.

### Input connection:

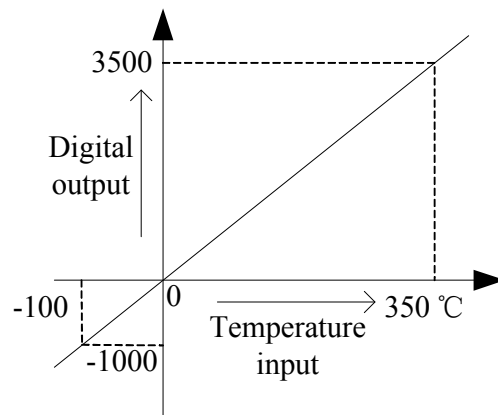


### Output connection:

- Output terminals: transistor output terminal please choose DC 5V~30V power supply.
- Circuit insulation  
PLC interior circuit and output transistor is optical insulation. Each public module is also separated.
- Response time  
The time is less than 0.2ms from PLC driving (or cut) optical coupling device to transistor ON/OFF.
- Output current  
Each point current is 0.15A to avoid over-heat.
- Open circuit leakage current  
Below 0.1mA

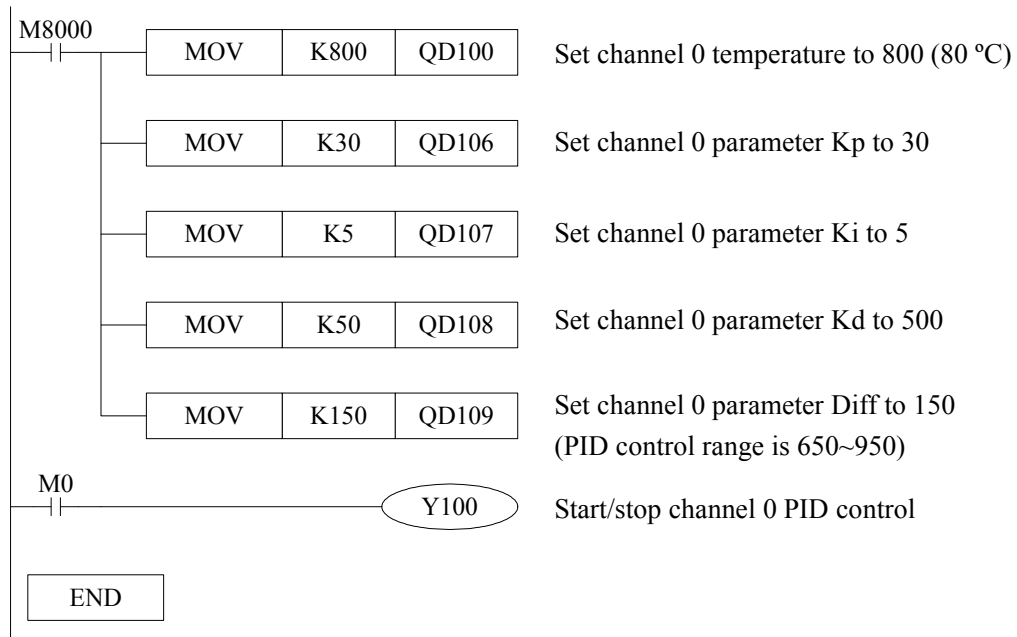


**PT100 input features:**

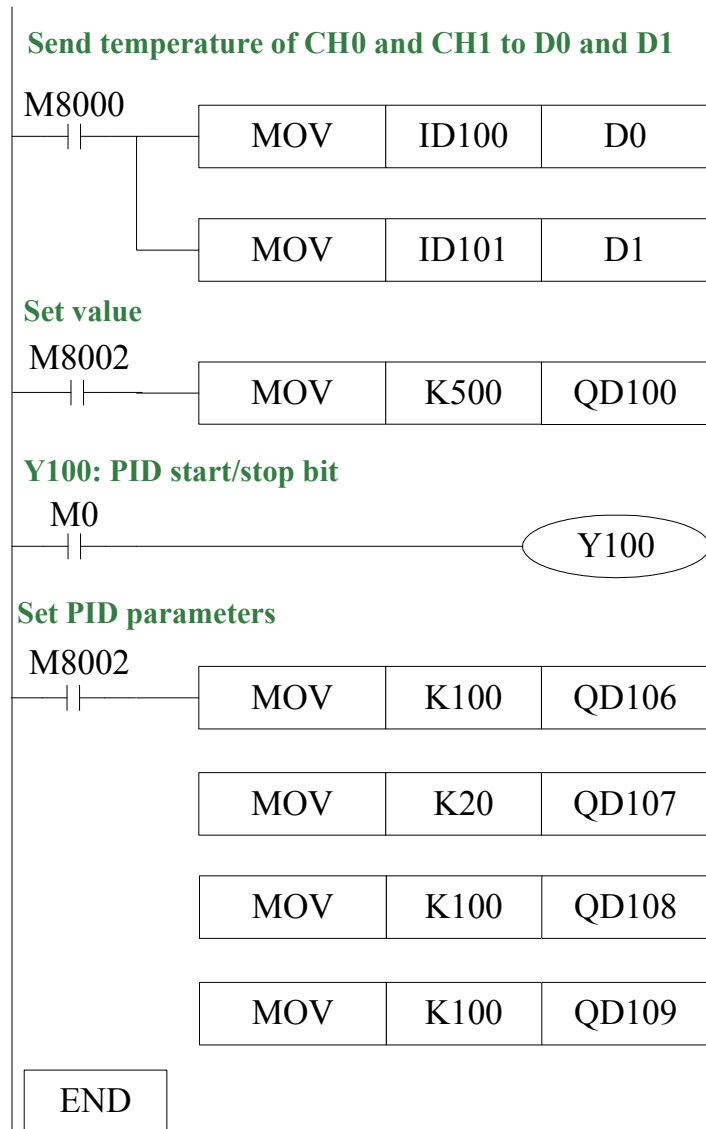


## 10-6. Programming

Example 1: Module 1, PID control for CH0

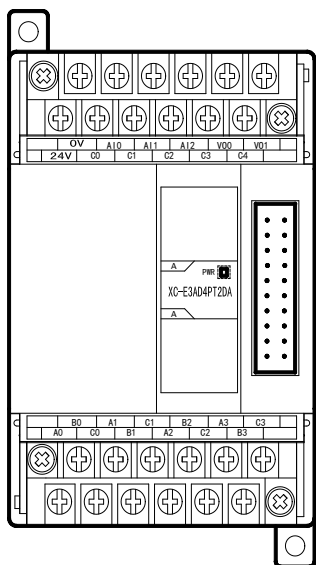


Example 2: XC-E6PT-P module 1, read the temperature of CH0 and CH1 then send to PLC register D0 and D1, PID control for CH0.



## 11. Pt100 temperature control module XC-E2PT-H

### 11-1. Specification



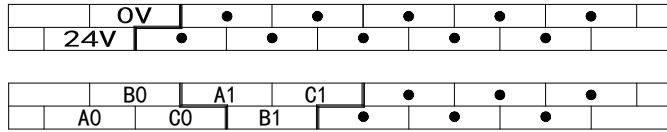
- 2 channels PT100 temperature input
- DC-DC isolate power supply ,enhance the anti-jamming ability of the system
- Resolution is 0.01℃.
- As the special function module of XC, 7 modules can be connected to the PLC.

Item	Content
Analog input signal	Pt100 platinum thermal-resistance
Temperature measurement range	-100℃~327℃
Digital output bound	-1000~3500, 16 bits with sign bit, binary
Control precision	±0.5℃
Resolution	0.1℃
Integrate precision	1% (relative max value)
Conversion speed	20ms per channels
Analog power	DC24V±10%, 50mA
Installation format	Fixed with M3 screws or directly installed on orbit of DIN46277 (Width: 35mm)
Dimension	63mm×102mm×73.3mm

**Note:**

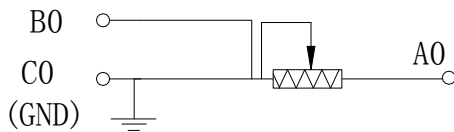
1. Without signal input, the channel data will be 3500
2. Connect to Pt100 platinum thermal resistance according to actual requirements

## 11-2. Terminals



Channel	Terminal	Signal
CH0	A0	0CH resistor input
	B0	
	C0	Common terminal of 0CH
CH1	A1	1CH resistor input
	B1	
	C1	Common terminal of 1CH

Three-wired Pt100 platinum thermal-resistance input connection :



To common Pt100 platinum three-wired thermal-resistance , two same color cables can connect to B0 and C0 terminal, the third one connect to A0

## 11-3. I/O address assignment

XC series analog modules don't occupy I/O units; the converted data is directly transferred into PLC register.

Module 1 address:

Channel	Current temperature
0CH	ID100
1CH	ID101

Module 2 address:

Channel	Current temperature
0CH	ID200
1CH	ID201

Module 3 address:

Channel	Current temperature
0CH	ID300
1CH	ID301

Module 4 address :

Channel	Current temperature
0CH	ID400
1CH	ID401

Module 5 address :

Channel	Current temperature
0CH	ID500
1CH	ID501

Module 6 address:

Channel	Current temperature
0CH	ID600
1CH	ID601

Module 7 address:

Channel	Current temperature
0CH	ID700
1CH	ID701

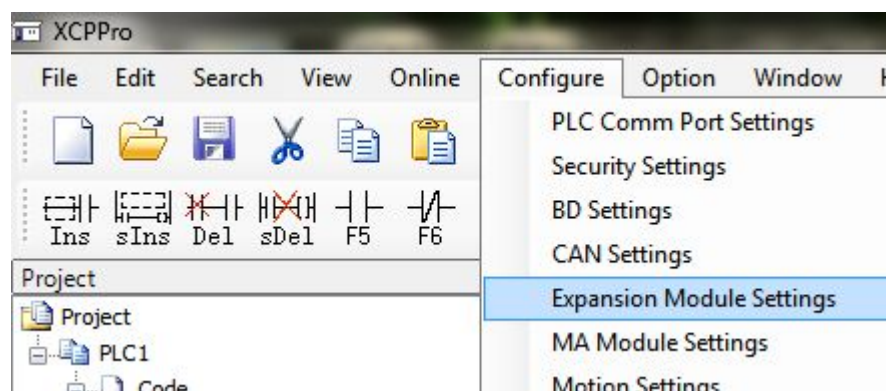
#### 11-4. Working mode

There are two ways to set the working mode:

3. XCPpro software
4. FD registers of PLC

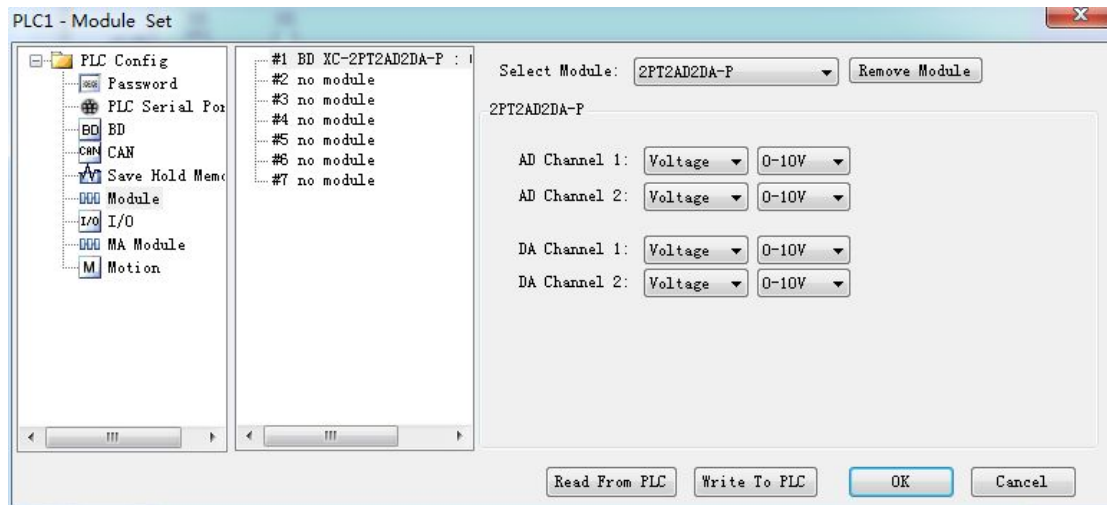
##### **XCPpro software:**

Open the XCPpro software, click configure/expansion module settings

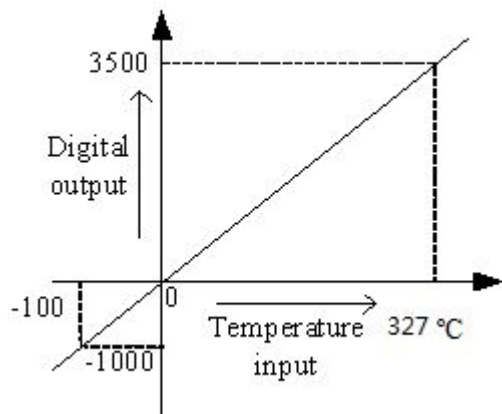


Set the model and channel parameters in the following window. Then click write to PLC/ok.

For software version lower than v3.3, please restart the PLC after setting.



### PT100 input features:



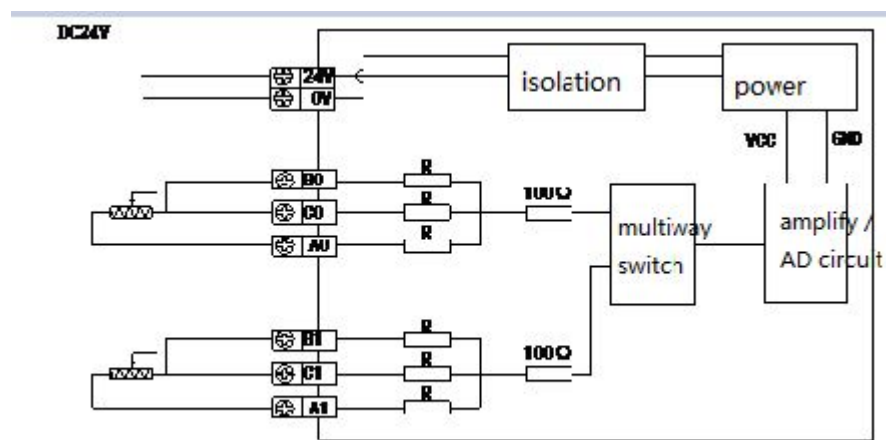


## 11-5. Exterior connection

About the external wiring, please see the following items:

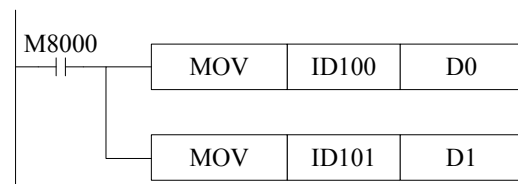
- When connect +24V power, please use 24V power on PLC main unit to avoid interference.
- To avoid interference, please use shield cable to ground.

Connection :



## 11-6. Programming

Example 1: Module 1, read 2 channels temperature value

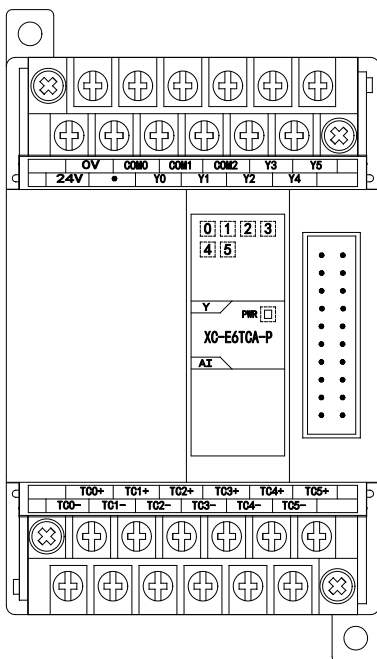


0 channel ,1 channel temperature value send to register D0 ,D1

## 12. Analoge expansion XC-E2TCA-P/XC-E6TC(-P)

### 12-1. Specification

XC-E6TCA-P (V4) and higher version has better noise immunity ability. XC-E6TCA-P is temperature control module. XC-E2TCA-P/XC-E6TCA-P as the expansion module of PLC, it has 2/6 channels temperature signal input and support various types thermocouple. Each channel can auto-tune PID parameters and communicate with PLC. So based on this module, you can build your temperature control system with PLC, LCD screen and computer.



- Support various types of thermocouple: K, J, S, E, N, T, R.
- DC-DC power supply isolated design, enhance the anti-jamming ability of the system.
- Temperature display precision 0.1℃.
- Each channel has independent PID parameters.
- PID self-study under cooling, heating, transforming status.
- FROM and TO instructions to communicate with PLC, enlarge the data storage space.
- As special function module of XC , up to 7 modules can be connected to PLC

Items	Content
Analog input signal	K type: 0℃～1300℃ ( : Version below V6 is 0℃～1000℃ ) S: 0℃～1700℃ E: 0℃～600℃ N: 0℃～1200℃ B: 0℃～1800℃ T: 0℃～400℃ J: 0℃～800℃ R: 0℃～1700℃
Input channel number	6 channel (XC-E2TCA-P is 2 channel)

Resolution	0.1°C
Integrate precision	0.1°C
Environment temperature	0°C~60°C
Conservation temperature	-20~70°C
Environment humidity	5~95%
Conservation humidity	5~95%
Conversion speed	20ms per channel
Install format	Fixed with M3 screws or directly installed on orbit of DIN46277 (Width: 35mm)
Dimension	63mm×102mm×73.3mm

**Using requirements:**

- PLC: hardware version 3.1e and above
- XCPpro software: version 3.1b and above
- Temperature sensor type: thermocouple K, S, E, N, J, T, R

**12-2. Terminals**

	OV	COM0	COM1	COM2	Y3	Y5	
	24V	.Y0	Y1	Y2	Y4		

	TC0+	TC1+	TC2+	TC3+	TC4+	TC5+	
	TC0-	TC1-	TC2-	TC3-	TC4-	TC5-	

Name	Content		
Input (TC0+,TC0-,...,TC5+,TC5-)	6 channels	Analog input range: K :0°C ~1300°C S :0°C ~1700°C E:0°C ~600°C N:0°C ~1200°C B:0°C ~1800°C T:0°C ~400°C J:0°C ~800°C R:0°C ~1700°C	
Output (Y0~Y5)	6 channels	Analog output	In digital format, range: 0~4095
		Switch output	In duty cycle format, Y output when put through

**Note: XC-E2TCA-P input and output terminal only have 2 channel**

XC-E6TCA-P, XC-E2TCA-P can connect many types of thermocouples. In order to set the mode, each type will have an index no.

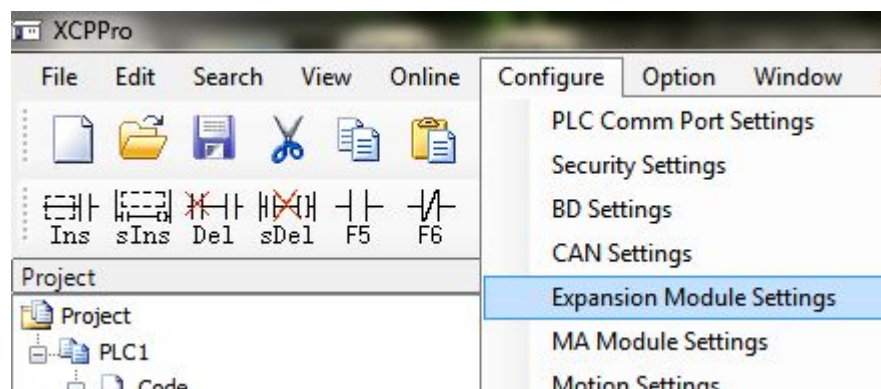
Index No.	0	1	2	3	4	5	6
Sensor type	K	S	E	N	J	T	R

There are two ways to set the working mode:

1. XCPpro software
2. FD registers of PLC

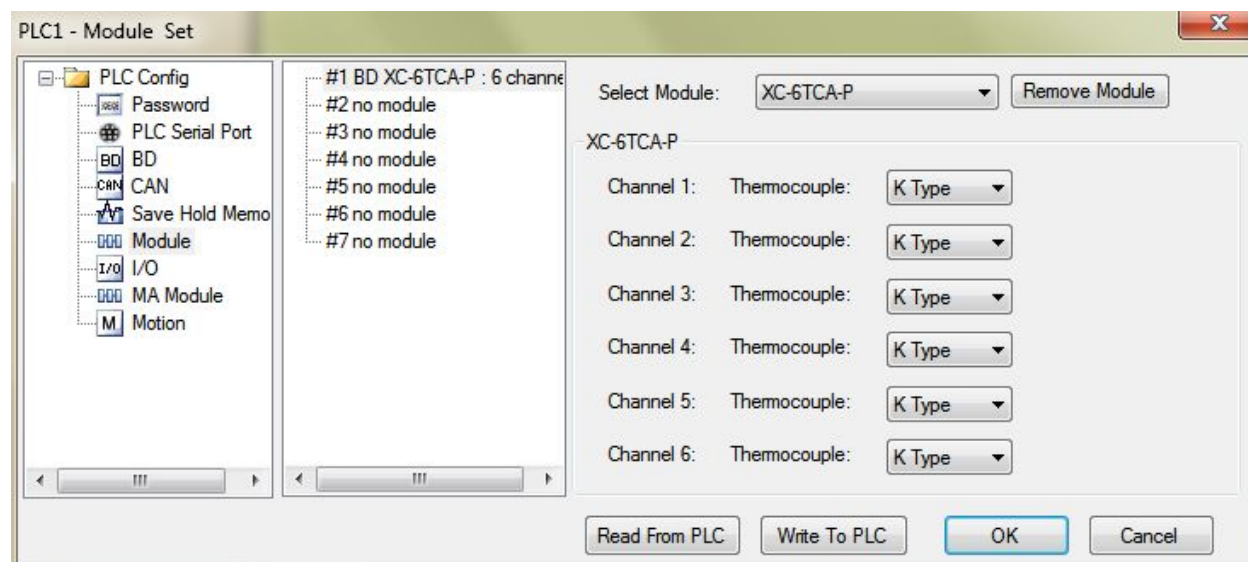
### XCPpro software:

Open the XCPpro software, click configure/expansion module settings:



Set the model and channel parameters in the following window. Then click write to PLC/ok.

For software version lower than v3.3, please restart the PLC after setting



### FD registers:

To choose the thermocouple type for each channel, you should set the data in FD8250 and FD8251 of PLC.

FD8250:

channel 1				channel 0			
Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
Write the index NO.				Write the index NO.			
channel 3				channel 2			
Bit15	Bit14	Bit13	Bit12	Bit11	Bit10	Bit9	Bit8
Write the index NO.				Write the index NO.			

FD8251:

channel 5				channel 4			
Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
Write the index NO.				Write the index NO.			
/				/			
Bit15	Bit14	Bit13	Bit12	Bit11	Bit10	Bit9	Bit8

For example: channel 0 is type S, channel 1 is type N, channel 5 is type E, so FD8250=31H, FD8251=20H.

### 12-3. I/O address assignment

Parameters	Explanation				
	Channel	Ch0	Ch1	.....	Ch5
Display temperature Unit: 0.1 °C	Module 1	ID100	ID101	ID10×	ID105
	Module 2	ID200	ID201	ID20×	ID205
	.....	ID×00	ID×01	ID×0×	ID×05
	Module 7	ID700	ID701	ID70×	ID705
PID output ( return to the X input of PLC )	Module 1	X100	X101	X10×	X105
	Module 2	X200	X201	X20×	X205
	.....	X×00	X×01	X×0×	X×05
	Module 7	X700	X701	X70×	X705
Connection state of thermocouple(0 is connection, 1 is disconnection)	Module 1	X110	X111	X11×	X115
	Module 2	X210	X211	X21×	X215
	.....	X×10	X×11	X×1×	X×15
	Module 7	X710	X711	X71×	X715
Enable signal	Module 1	Y100	Y101	Y10×	Y105
	Module 2	Y200	Y201	Y20×	Y205
	.....	Y×00	Y×01	Y×0×	Y×05
	Module 7	Y700	Y701	Y70×	Y705

PID auto-tune error signal bit(0 is normal, 1 is error)	Module 1	X120	X121	X12x	X125
	Module 2	X220	X221	X22x	X225
	.....	Xx20	Xx21	Xx2x	Xx25
	Module 7	X720	X721	X72x	X725
PID control bit	<p>Auto-tune triggered signal, start to auto-tune mode when set to 1</p> <p>After auto-tune, PID parameters and temperature control period value are refreshed, the bit value is cleared to be 0. The user can read the bit to know the state. 1 means auto-tune is ongoing. 0 means auto-tune has finished.</p>				
PID output (The result)	<p>Digital quantity output range is 0~4095.</p> <p>When the PID output is analog quantity (such as steam valve open degree or silicon-controlled conduction angle), the value can be transmitted to the analog quantity output module in order to realize the control demand.</p>				
PID parameters (P, I, D)	<p>The best PID parameters got from the PID auto-tune.</p> <p>If the current PID parameters cannot meet the control requirements, users can set the experience PID parameters to make the module work according to the user setting value.</p>				
PID calculation range (Diff) Unit: 0.1℃	<p>PID arithmetic is effective in the range of T (setting temperature) ±Diff. In real temperature control environment, when the temperature is lower than T- Diff, the PID output is the maximum value; when the temperature is higher than T+Diff, the PID output is the minimum value.</p>				
Temperature difference value δ Unit: 0.1℃	<p>( sampling temperature value + temperature difference value δ ) / 10 = display temperature. At the time the display temperature is the most close to the real temperature. This parameter is a sign value with the unit of 0.1℃, the value is retained when th power is cut off, the defaulted value is 0.</p>				
Set temperature Unit: 0.1℃	<p>The target temperature of the control system. Range from 0~1000℃, precision degree is 0.1℃.</p>				
Temperature control period Unit: 0.1s	<p>The temperature control period range from 0.5 to 200 seconds, the minimum precision is 0.1 second. The set value = real value × 10. For example: if the real temperature control period is 0.5 seconds, user should set 5 seconds in the module.</p>				
Adjusting environment temperature Unit: 0.1℃	<p>If user realizes that the environment temperature is different from display temperature, they can write the correct environment temperature into the module. Then the module will calculate the temperature difference δ and save it.</p> <p>Temperature difference δ = adjusting environment temperature — sampling temperature. Unit: 0.1℃. For example, under the caloric balance condition, users measured the environment temperature is 60℃ with mercury thermometer, but the display temperature is 55℃ ( sampling temperature is 550 ), temperature difference δ is 0. At this time, users can set the parameter to be 600, then the temperature difference δ is 50 ( 5℃ ).</p> <p>Display temperature = ( 550 + 50 ) / 10 = 60℃.</p> <p>**Attention: when setting the adjusting environment temperature, make sure it is the same as environment temperature. It is very important because the incorrect parameter will result in mistake of calculating temperature difference δ and affect the display temperature.</p>				
auto-tune output range	<p>The auto-tune output unit is percent. 100 means the duty ratio is 100% of the full-scale output, 80 means the duty ratio is 80% of the full-scale output.</p>				

## 12-4. Read and write address

When using the module, it needs to write and read the parameters; the parameter addresses are shown as below:

### 1. The address of read instruction (FROM)

Address	Description	
K0	PID control bit	
K1	Ch0	PID output (the result)
K2		PID output (the result)
:	:	:
K6	Ch5	PID output (the result)
K7		PID parameter P
K8	Ch0	PID parameter I
K9		PID parameter D
K10		PID parameter Diff
K11		PID parameter P
K12	Ch1	PID parameter I
K13		PID parameter D
K14		PID parameter Diff
:		:
K27	Ch5	PID parameter P
K28		PID parameter I
K29		PID parameter D
K30		PID parameter Diff
K31	<u>Ch0</u>	Temperature difference value $\delta$
K32	Ch1	Temperature difference value $\delta$
:	:	:
K36	Ch5	Temperature difference value $\delta$

### 2. The address of write instruction (TO)

Address	Description
K0	PID control bit

K1	Ch0	Setting temperature
K2	Ch1	Setting temperature
:	:	:
K6	Ch5	Setting temperature
K7	Ch0	PID parameter P
K8		PID parameter I
K9		PID parameter D
K10		PID parameter Diff
K11	Ch1	PID parameter P
K12		PID parameter I
K13		PID parameter D
K14		PID parameter Diff
:	:	:
K27	Ch5	PID parameter P
K28		PID parameter I
K29		PID parameter D
K30		PID parameter Diff
K31	Ch0	Temperature control period
K32	Ch1	Temperature control period
:	:	:
K36	Ch5	Temperature control period
K37	Ch0	Adjusting environment temperature
K38	Ch1	Adjusting environment temperature
:	:	:
K42	Ch5	Adjusting environment temperature
K43	Ch0	Auto-tune output range
K44	Ch1	Auto-tune output range
:	:	:
K48	Ch5	Auto-tune output range
K49	Ch0	Temperature difference value $\delta$
K50	Ch1	Temperature difference value $\delta$
:	:	
K54	Ch5	Temperature difference value $\delta$



The module can save set temperature, PID parameters (P, I, D, Diff...), temperature difference value, temperature control period, auto-tune output range, etc. The module will save the parameters after auto-tune finished or user modify them.

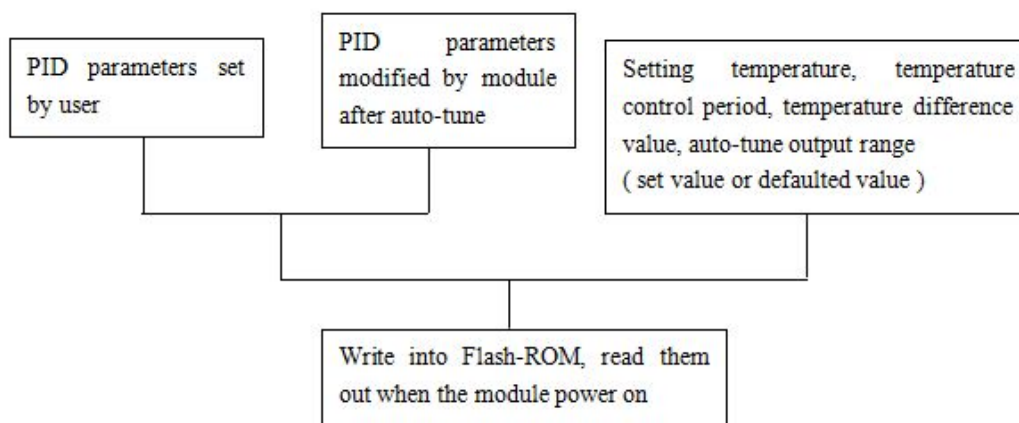
The defaulted value of the parameters:

Parameter		Defaulted value					
Setting temperature ( 0.1°C )		CH0	CH1	CH2	CH3	CH4	CH5
		0	0	0	0	0	0
PID parameters	P	40	40	40	40	40	40
	I	1200	1200	1200	1200	1200	1200
	D	300	300	300	300	300	300
	Diff	10	10	10	10	10	10
Temperature control period ( unit: 0.1s )		20	20	20	20	20	20
Temperature difference ( Sign value )		0	0	0	0	0	0
Auto-tune output range		100	100	100	100	100	100

## 12-5. Working process and principle

The module work process is shown as below:

When the module power on, it reads the PID parameters, target temperature, temperature control period, auto-tune output range. Even the module powers off and power on again, these parameters are still there.



After power on and read all the parameters, the module starts to collect the temperature. Then write the target temperature, temperature control period, auto-tune output range into the module. The module judges the enable signal of each channel, if the signal is ON, it starts the PID control for the object.

Meanwhile, the module will judge if there is auto-tune trigger signal.

If the trigger signal is ON, when the rise edge coming, the auto-tune process will begin and the state bit will be set ON; when the auto-tune process is completed, state bit and trigger signal will

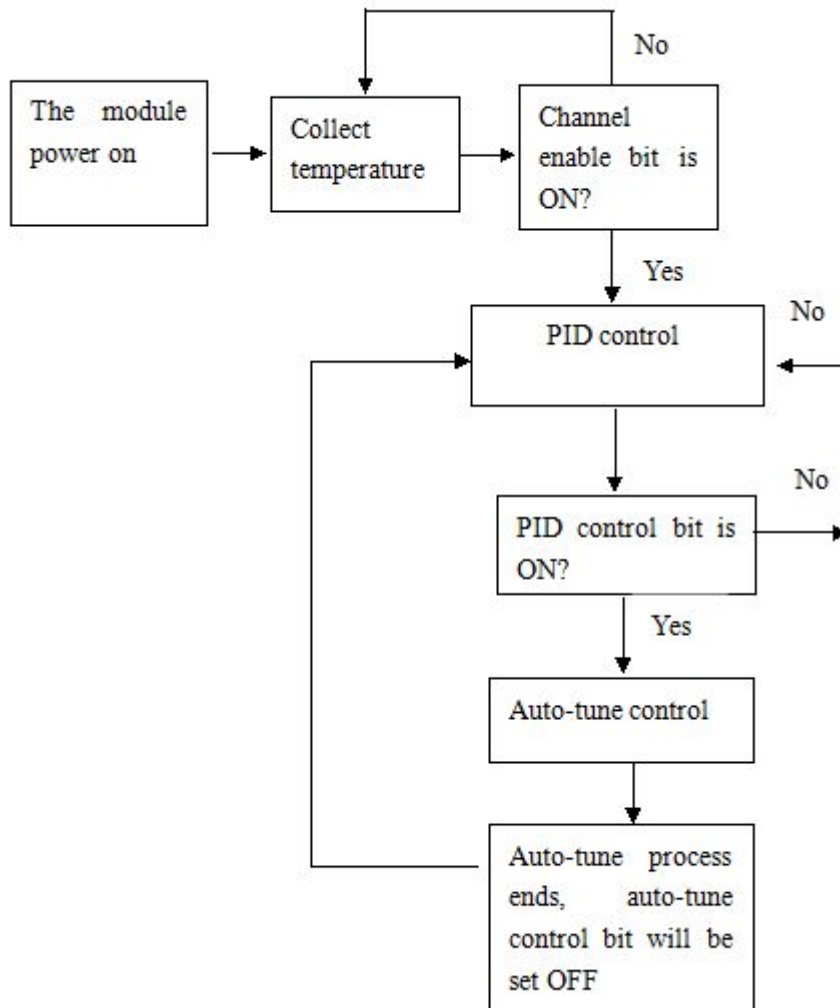
be set OFF; then the module enter into PID control.

If the auto-tune trigger signal is not ON, the module will keep doing PID control.

**Notes:**

The module does PID control process according to PID parameters, target temperature, temperature control period. If the temperature control period is 0, this channel will not output and only collect temperature.

The control process chart is as below:



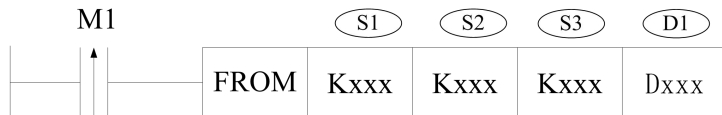
The first module no. is K0.

## 12-6. FROM and TO instruction

### 1. Read instruction: FROM

This instruction can read the data from the module. It can divide into bit and word operation.

#### (1) word operation



Function: read the data of the module and save them in PLC register, object operand unit is word.

Operand explanation:

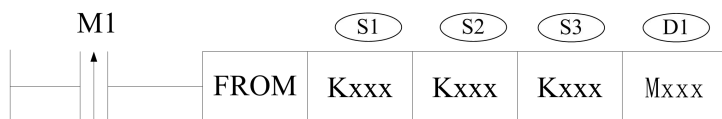
S1: target module number. Operand: K, TD, CD, D, FD.

S2: the data head address of the module. Operand: K, TD, CD, D, FD.

S3: the register quantity (how many words). Operand: K, TD, CD, D, FD.

D1: the register head address of the PLC.

(1) bit operation



Function: read the data of the module and save them in PLC coil, object operand unit is bit.

Operand explanation:

S1: target module number. Operand: K, TD, CD, D, FD.

S2: the data head address of the module. Operand: K, TD, CD, D, FD.

S3: the data quantity (how many bits). Operand: K, TD, CD, D, FD.

D1: the coil head address of the PLC. Operand: M, Dn.m.

2. Write instruction: **TO**

This instruction can write the data to the module. It can divide into bit and word operation.

(1) word operation



Function: write the data of PLC register to the module, object operand unit is word.

Operand explanation:

D1: target module number. Operand: K, TD, CD, D, FD.

D2: the head address of the module. Operand: K, TD, CD, D, FD.

D3: the register quantity (how many words ). Operand: K, TD, CD, D, FD.

S1: the register head address of the PLC.

(2) bit operation



Function: write the data of PLC coil to the module, object operand unit is bit.

Operand explanation:

D1: target module number. Operand: K, TD, CD, D, FD.

D2: the head address of the module. Operand: K, TD, CD, D, FD.

D3: the data quantity (how many bits ). Operand: K, TD, CD, D, FD.

S1: the coil head address of the PLC. Operand: M, Dn.m.

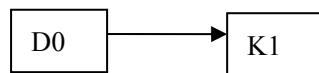
### Application of the instruction

#### 1. Set the target temperature



Explanation:

PLC register      module address



First save target temperature in D0, when set on M1, the data of D0 will write to module address K1( channel 0 set temperature ).

D0=200 means the target temperature is 200 °C.

Operand meaning:

TO: write instruction

K0: the module number is 0

K1: the data address in the module

K1: write word quantity is 1 word

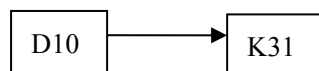
D0: the PLC register saved the data

#### 2. Set the temperature control period



Explanation:

PLC register      module address



Write the temperature control period ( D10 ) to module channel 0 ( K31 ) when M1 is set on.  
 D10 = 25 means the temperature control period is 2.5 seconds.

Operand meaning:

TO: write instruction

K0: module number is 0

K31: the data address in the module

K1: word quantity is 1 word

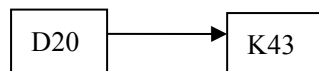
D10: the PLC register saved the data

### 3. Auto-tune output range



Explanation:

PLC register      module address



Write the auto-tune output range ( D20 ) to module channel 0 ( K43 ) when M1 is set on.  
 D20 = 80 means the auto-tune output range is 80% of the full-scale.

Operand meaning:

TO: write instruction

K0: module number is 0

K43: the data address in the module

K1: write word quantity is 1 word

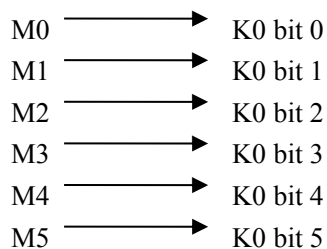
D20: the PLC register saved the data

### 4. Set on the PID control bit



Explanation:

PLC coil      module address



Write M0~M5 to the module address K0 when M100 is set on. If M0 = 1, start the auto-tune process of channel 0. If M1 = 1, start the auto-tune process of channel 1.....

Operand meaning:

TO: write instruction

K0: module number is 0

K0: the data address in the module

K6: the write bit quantity is 6 bits

M0: the head address of the data in the PLC.

### 5. Read the auto-tune state bit



Explanation:

PLC coil                      module address

M10	←	K0 bit 0
M11		K0 bit 1
M12		K0 bit 2
M13		K0 bit 3
M14		K0 bit 4
M15		K0 bit 5

Read PID control bit of every channel and save them in M10~M15. If M10 is ON, then channel 0 is doing auto-tune; if M10 is OFF, the auto-tune process is completed or never begins. If M11 is ON, the channel 1 is doing auto-tune.....

Operand meaning:

FROM: read instruction

K0: the module number is 0

K0: the data address in the module

K6: read bit quantity is 6 bits

M10: the head address of the data saved in the PLC

### 6. Read PID parameters



Explanation:

PLC register	module address
D30	← K7
D31	← K8
D32	← K9
D33	K10

read the PID parameters (channel 0) and save them in D30~D33 of the PLC.

D30 = P, D31 = I, D32 = D, D33 = Diff parameter.

Operand meaning:

FROM: read instruction

K0: the module number is 0

K7: the data address of the module

K4: read word quantity is 4 words

D30: the head address of the data saved in the PLC

#### 7. Write the PID parameters



Explanation:

PLC register	module address
D40	→ K27
D41	→ K28
D42	→ K29
D43	→ K30

Users can save the PID parameters in D40~D43 then write them to the module channel 5.

Operand meaning:

TO: write instruction

K0: the module number is 0

K27: the data address in the module

K4: write word quantity is 4 words

D40: the head address of the data saved in the PLC

#### 8. Open the enable bit

Explanation:

For module number one, channel 0~5 are corresponding to Y100~Y105; for module number two,

channel 0~5 are corresponding to Y200~Y205..... So set on the corresponding enable bit to start the PID control for the channel.

## 9. Read PID output



During PID control process, users can read PID output of every channel and save them in D50~D55.

Operand meaning:

FROM: read instruction

K0: the module number is 0

K1: data address in the module

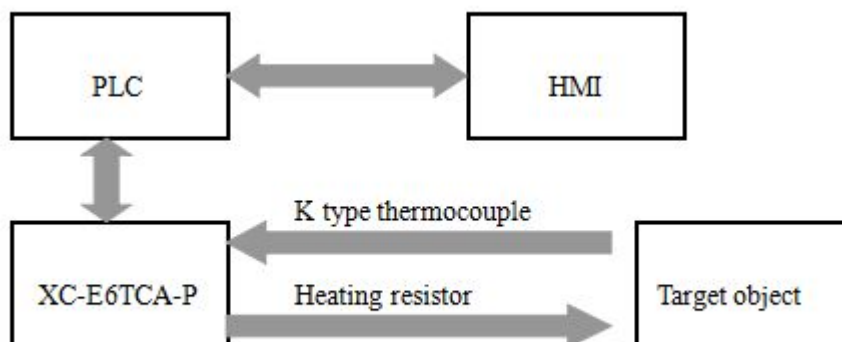
K6: read word quantity is 6 words

D50: the head address of data in the PLC

## 12-7. Programming

For this example, we will control 5 channels temperature by using XC-6TCA-P.

The whole control system includes TP series HMI, XC series PLC, XC-6TCA-P, K type thermocouple, heating resistor and other devices. The system chart is shown as following:



The control processes are as the following:

1. Power on the XC-6TCA-P to read the current temperature, display them on the HMI.
2. Write the target temperature, turn on “write target temperature” button on the HMI, the value will be written into XC-6TCA-P.
3. If user wants to modify the default PID parameters, input the PID value and turn on “PID enable bit” button on the HMI, XC-6TCA-P will enter PID control process.
4. If XC-6TCA-P needs to auto-tune, turn on the “auto-tune state bit” then turn on “auto-tune control bit” on the HMI to start the auto-tune process.
5. To monitor the “auto-tune state bit”, you can see if the auto-tune process is over.



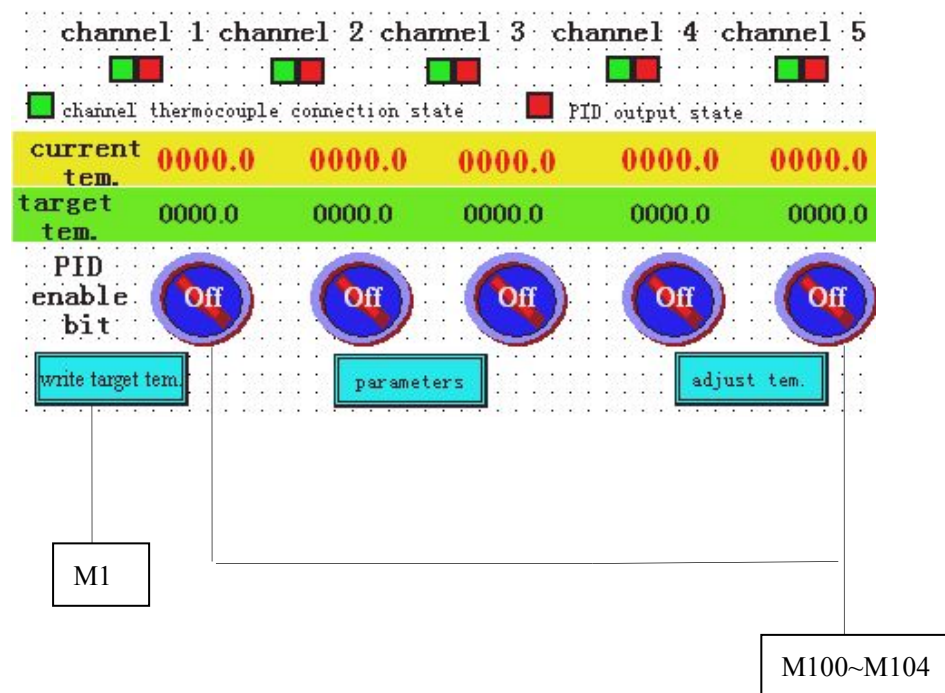
6. Turn on “read PID parameters” to read the PID parameters of each channel.
7. If you want to adjust the ambient temperature, push the “adjust ambient temperature” button to enter the adjustment screen.

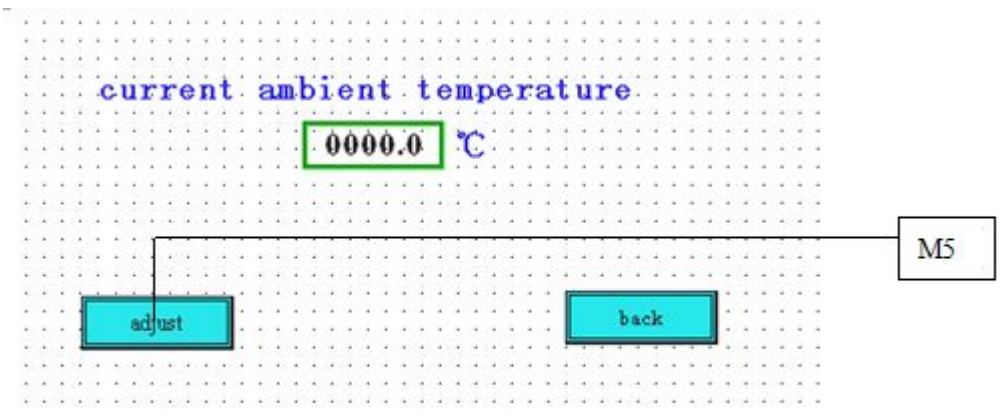
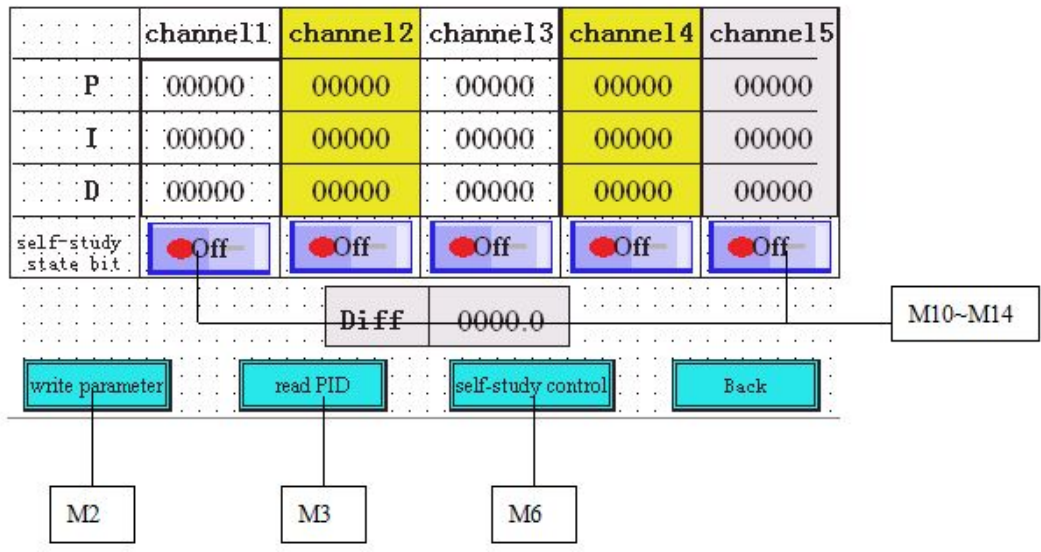
First of all, set the thermocouple types in the XCPpro software. As the 0~4 channels are K type thermocouple, set FD8250 to 1111H, FD8251 to 01H.

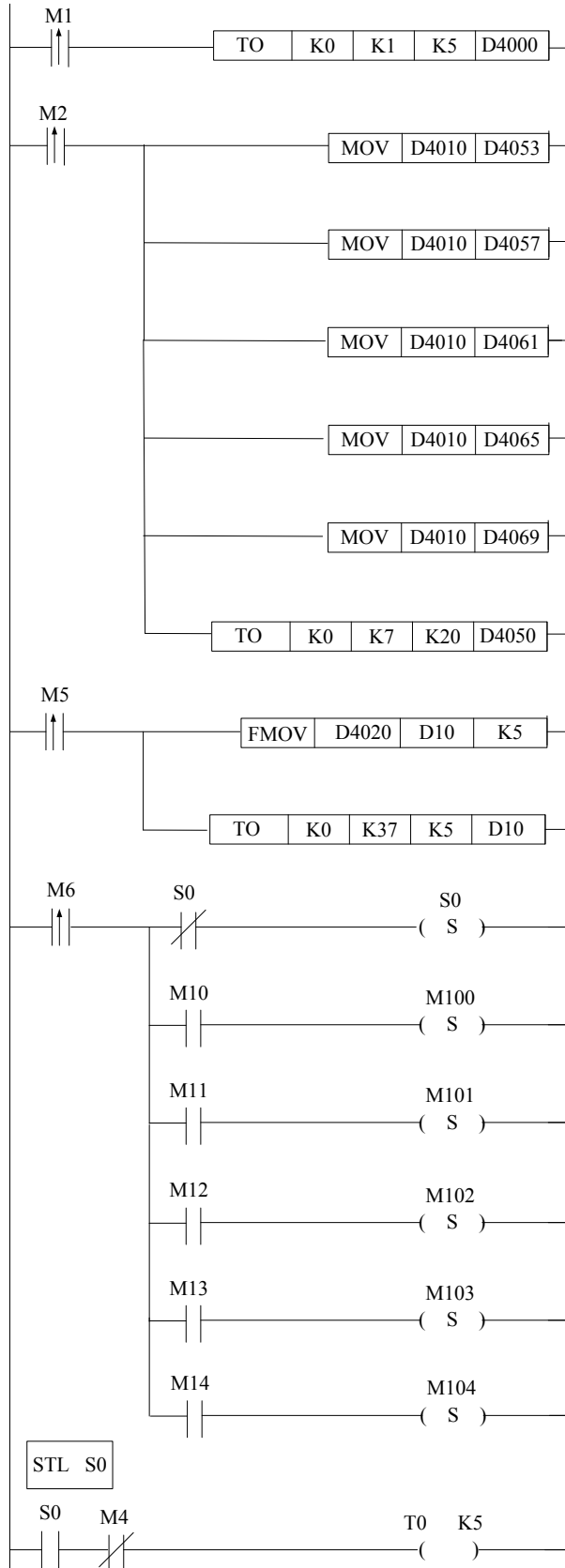
Next, please see the corresponding address of PLC and XC-6TCA-P.

PLC	XC-6TCA-P	Remark
M10-M14	K0	Self-study enable bit
M100-M104	Y100-Y104	0~4 channel PID enable bit
D4000-D4004	K1-K5	0~4 channel target temperature
D4050-D4069	K7-K26	0~4 channel P,I,D,DIFF values
D10-D14	K37-K40	0~4 channel adjustment temperature

The HMI screens are as the following:







Write channel 0~4 target temperature into XC-6TCA-P address K1~K5

Move the value of D4010 to D4053, (channel 0 DIFF value)

Move the value of D4010 to D4057, (channel 1 DIFF value)

Move the value of D4010 to D4061, (channel 2 DIFF value)

Move the value of D4010 to D4065, (channel 3 DIFF value)

Move the value of D4010 to D4069, (channel 4 DIFF value)

Write the value of D4050-D4069 into K7-K26,(channel 0~4 P,I,D,DIFF value)

Write the value of D4020 to D10-D14, (ambient temperature)

Write the value of D10-D14 to K37-K41, (channel 0~4 adjust ambient temperature)

Set on M6 to enter process S0;

Set on M100 when M10 is on

Set on M101 when M11 is on

Set on M102 when M12 is on

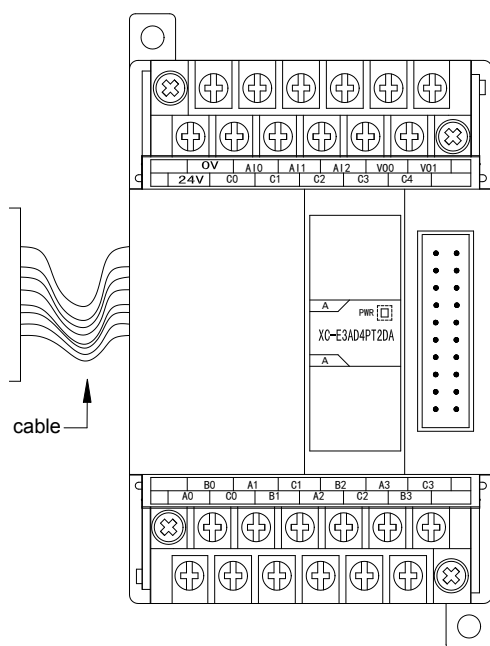
Set on M103 when M13 is on

Set on M104 when M14 is on

Process S0 is on, delay 5ms

## 13. XC-E3AD4PT2DA

### 13-1. Specifications



- 3 channels 14 bits current input, 4 channels PT100 temperature input and 2 channels 10 bits voltage output
- 3 channels current 0~20mA, 4~20mA input (selectable) and 2 channels voltage 0~5V, 0~10V output (selectable), set via the software
- Pt resistor signal input (PT100)
- 3 channels AD and 4 channels PT input, have PID function
- Up to 7 modules can be connected to the PLC

ITEMS	Analog Current Input (AD)	Temperature Input (PT)	Analog Voltage Output (DA)
Analog Input	DC0~20mA、4~20mA	PT100	-
Temperature range	-	-100~350℃	-
Maximum Output range	DC0~40mA	-	-
Analog Output range	-	-	DC0~5V、0~10V External load resistor (2KΩ~1MΩ)
Digital Input range	-	-	10 bits binary (0~1023)
Digital Output range	14 bits binary (0~16383)	-1000~3500	-
Resolution	1/16383(14Bits); the converted data is saved into the PLC (14Bits) in the form of Hex.	0.1℃	1/1023(10Bits); the converted data is saved into the PLC (10Bits) in the form of Hex.
PID Output Value	0~4095		-
General Precision	1%	±0.5℃	1%
Conversion Speed	20ms per channel		3ms per channel
Power Supply for	DC24V±10%,100mA		

Analog Using	
Installation	Fix with M3 screws or install on DIN46277 (Width: 35mm) leader directly
Dimension	63mm×102mm×73.3mm

### 13-2. Terminals

	0V	A10	A11	A12	V00	V01	
24V	C0	C1	C2	C3	C4		

	B0	A1	C1	B2	A3	C3	
A0	C0	B1	A2	C2	B3		

Channel	Terminal name	Signal name
0CH	A10	0CH current input
	C0	0CH common terminal of current input
1CH	A11	1CH current input
	C1	1CH common terminal of current input
2CH	A12	2CH current input
	C2	2CH common terminal of current input
0CH	A0	0CH temperature signal input
	B0	-
	C0	0CH input common terminal
1CH	A1	1CH temperature signal input
	B1	-
	C1	1CH input common terminal
2CH	A2	2CH temperature signal input
	B2	-
	C2	2CH input common terminal
3CH	A3	3CH temperature signal input
	B3	-
	C3	3CH input common terminal
0CH	V00	0CH voltage output
	C3	0CH common terminal of voltage output
1CH	V01	1CH voltage output
	C4	1CH common terminal of voltage output
-	24V	+24V power supply
	0V	Common terminal of power supply

### 13-3. I/O address assignment

XC series analog modules do not occupy I/O units, the converted value is sent to PLC register directly.

The PLC register addresses are shown as the following:

Module 1 addresses:

Channel	AD Signal	PID Output Value	PID start/stop bit	Preset Value	PID parameter: Kp, Ki, Kd, Diff, Death	
0CH	ID100	ID107	Y100	QD102	Kp----- QD109 Ki----- QD110 Kd----- QD111 Diff----- QD112 Death----QD113	
1CH	ID101	ID108	Y101	QD103		
2CH	ID102	ID109	Y102	QD104		
Channel	PT100 Signal	PID Output Value	PID start/stop bit	Preset Value		
3CH	ID103	ID110	Y103	QD105		
4CH	ID104	ID111	Y104	QD106		
5CH	ID105	ID112	Y105	QD107		
6CH	ID106	ID113	Y106	QD108		
Channel	DA Signal	-	-	-		-
0CH	QD100	-	-	-		
1CH	QD101	-	-	-		

Module 2 addresses:

Channel	AD Signal	PID Output Value	PID start/stop bit	Preset Value	PID parameter: Kp, Ki, Kd, Diff, Death	
0CH	ID200	ID207	Y200	QD202	Kp----- QD209 Ki----- QD210 Kd----- QD211 Diff----- QD212 Death----QD213	
1CH	ID201	ID208	Y201	QD203		
2CH	ID202	ID209	Y202	QD204		
Channel	PT Signal	PID Output Value	PID start/stop bit	Preset Value		
3CH	ID203	ID210	Y203	QD205		
4CH	ID204	ID211	Y204	QD206		
5CH	ID205	ID212	Y205	QD207		
6CH	ID206	ID213	Y206	QD208		
Channel	DA Signal	-	-	-		-
0CH	QD200	-	-	-		

1CH	QD201	-	-	-	
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Module 3 addresses:

Channel	AD Signal	PID Output Value	PID start/stop bit	Preset Value	PID parameter: Kp, Ki, Kd, Diff, Death
0CH	ID300	ID307	Y300	QD302	
1CH	ID301	ID308	Y301	QD303	
2CH	ID302	ID309	Y302	QD304	
Channel	PT Signal	PID Output Value	PID start/stop bit	Preset Value	
3CH	ID303	ID310	Y303	QD305	
4CH	ID304	ID311	Y304	QD306	
5CH	ID305	ID312	Y305	QD307	
6CH	ID306	ID313	Y306	QD308	
Channel	DA Signal	-	-	-	-
0CH	QD300	-	-	-	
1CH	QD301	-	-	-	

Module 4 addresses:

Channel	AD Signal	PID Output Value	PID start/stop bit	Preset Value	PID parameter: Kp, Ki, Kd, Diff, Death
0CH	ID400	ID407	Y400	QD402	
1CH	ID401	ID408	Y401	QD403	
2CH	ID402	ID409	Y402	QD404	
Channel	PT Signal	PID Output Value	PID start/stop bit	Preset Value	
3CH	ID403	ID410	Y403	QD405	
4CH	ID404	ID411	Y404	QD406	
5CH	ID405	ID412	Y405	QD407	
6CH	ID406	ID413	Y406	QD408	
Channel	DA Signal	-	-	-	-
0CH	QD400	-	-	-	
1CH	QD401	-	-	-	

Module 5 addresses:

Channel	AD Signal	PID Output Value	PID start/stop bit	Preset Value	PID parameter: Kp, Ki, Kd, Diff, Death	
0CH	ID500	ID507	Y500	QD502	Kp----- QD509 Ki----- QD510 Kd----- QD511 Diff-----QD512 Death----QD513	
1CH	ID501	ID508	Y501	QD503		
2CH	ID502	ID509	Y502	QD504		
Channel	PT Signal	PID Output Value	PID start/stop bit	Preset Value		
3CH	ID503	ID510	Y503	QD505		
4CH	ID504	ID511	Y504	QD506		
5CH	ID505	ID512	Y505	QD507		
6CH	ID506	ID513	Y506	QD508		
Channel	DA Signal	-	-	-		-
0CH	QD500	-	-	-		
1CH	QD501	-	-	-		

Module 6 addresses:

Channel	AD Signal	PID Output Value	PID start/stop bit	Preset Value	PID parameter: Kp, Ki, Kd, Diff, Death	
0CH	ID600	ID607	Y600	QD602	Kp----- QD609 Ki----- QD610 Kd----- QD611 Diff-----QD612 Death----QD613	
1CH	ID601	ID608	Y601	QD603		
2CH	ID602	ID609	Y602	QD604		
Channel	PT Signal	PID Output Value	PID start/stop bit	Preset Value		
3CH	ID603	ID610	Y603	QD605		
4CH	ID604	ID611	Y604	QD606		
5CH	ID605	ID612	Y605	QD607		
6CH	ID606	ID613	Y606	QD608		
Channel	DA Signal	-	-	-		-
0CH	QD600	-	-	-		
1CH	QD601	-	-	-		

Module 7 addresses:

Channel	AD Signal	PID Output Value	PID start/stop bit	Preset Value	PID parameter: Kp, Ki, Kd, Diff, Death
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0CH	ID700	ID707	Y700	QD702	Kp----- QD709 Ki----- QD710 Kd----- QD711 Diff----- QD712 Death---- QD713
1CH	ID701	ID708	Y701	QD703	
2CH	ID702	ID709	Y702	QD704	
Channel	PT Signal	PID Output Value	PID start/stop bit	Preset Value	
3CH	ID703	ID710	Y703	QD705	
4CH	ID704	ID711	Y704	QD706	
5CH	ID705	ID712	Y705	QD707	
6CH	ID706	ID713	Y706	QD708	
Channel	DA Signal	-	-	-	-
0CH	QD700	-	-	-	
1CH	QD701	-	-	-	

**Description:**

Start signal (Y): when Y is 0, close PID control, when Y is 1, start PID control

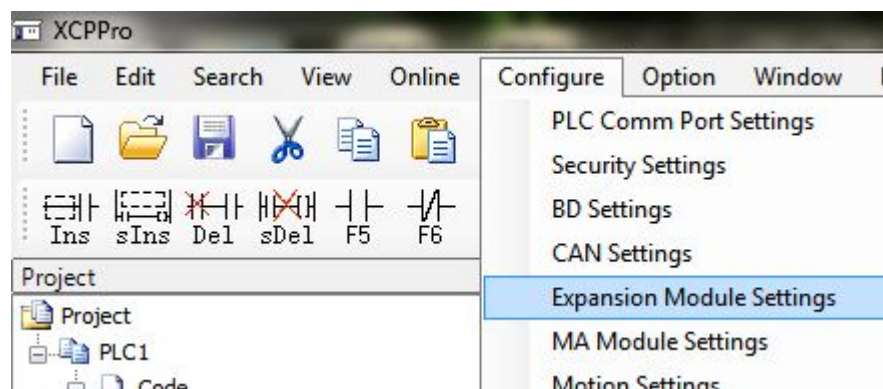
**13-4. Working mode**

There are two ways to set the working mode:

1. XCPpro software
2. FD registers of PLC

**XCPpro software:**

Open the XCPpro software, click configure/expansion module settings:



Set the model and channel parameters in the following window. Then click write to PLC/ok.

For software version lower than v3.3, please restart the PLC after setting.



Register FD8250:

Input CH 1 (AD)				Input CH 0 (AD)			
Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
00: 1/2 filter 01: no filter 10: 1/3 filter 11: 1/4 filter		-	0:0~20mA 1:4~20mA	00: 1/2 filter 01: no filter 10: 1/3 filter 11: 1/4 filter		-	0:0~20mA 1:4~20mA
Input CH 3 (PT)				Input CH 2 (AD)			
Bit15	Bit14	Bit13	Bit12	Bit11	Bit10	Bit9	Bit8
00: 1/2 filter 01: no filter 10: 1/3 filter 11: 1/4 filter		-		00: 1/2 filter 01: no filter 10: 1/3 filter 11: 1/4 filter		-	0:0~20mA 1:4~20mA

Low byte of register FD8251:

Input CH 5 (PT)				Input CH 4 (PT)			
Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
00: 1/2 filter 01: no filter 10: 1/3 filter 11: 1/4 filter		-		00: 1/2 filter 01: no filter 10: 1/3 filter 11: 1/4 filter		-	
Output CH 0 (DA)				Input CH 6 (PT)			
Bit15	Bit14	Bit13	Bit12	Bit11	Bit10	Bit9	Bit8
		-	0 :0~10V 1 :0~5V	00: 1/2 filter 01: no filter 10: 1/3 filter 11: 1/4 filter		-	

Low byte of register FD8252:

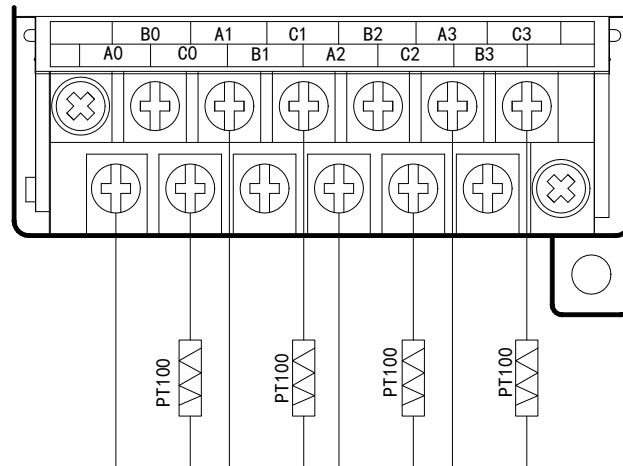
-				Output CH 1 (PT)			
Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
-	-	-	-	-	-	-	0 :0~10V 1 :0~5V

### 13-5. External Connection

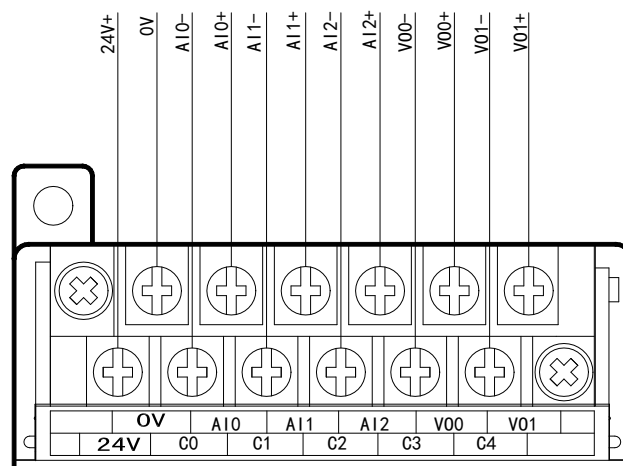
Please note the following items:

- When connect external +24V power supply, please use the 24V power supply of PLC to avoid interference.
- To avoid interference, please use shield cable, and single-point ground with the shield layer.

#### Temperature signal input:

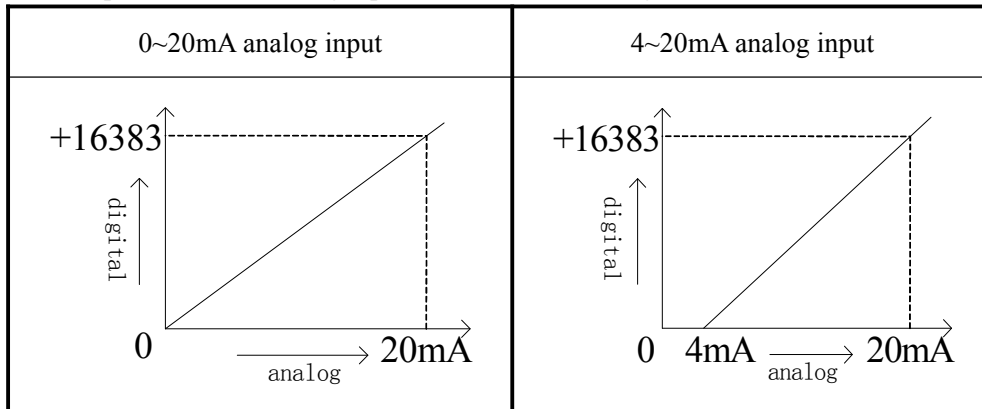


#### Analog wiring:

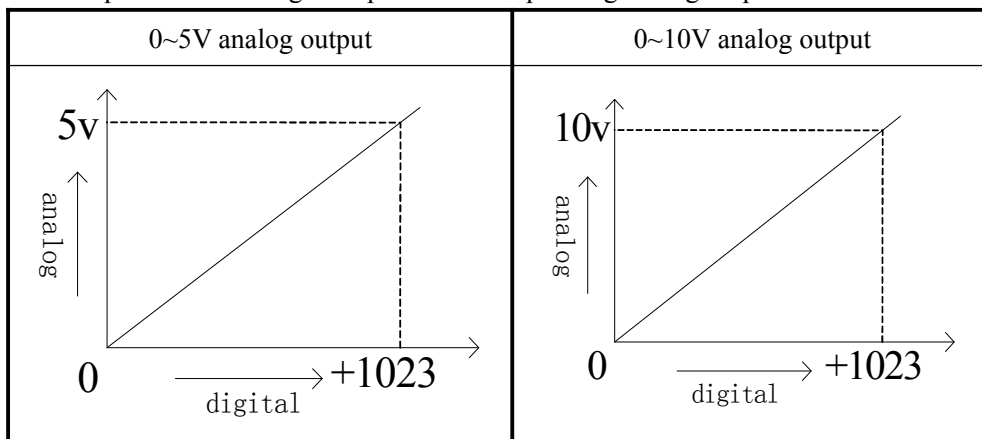


### 13-6. AD conversion Diagram

The relationship between the analog input and the converted digital value is shown as below:

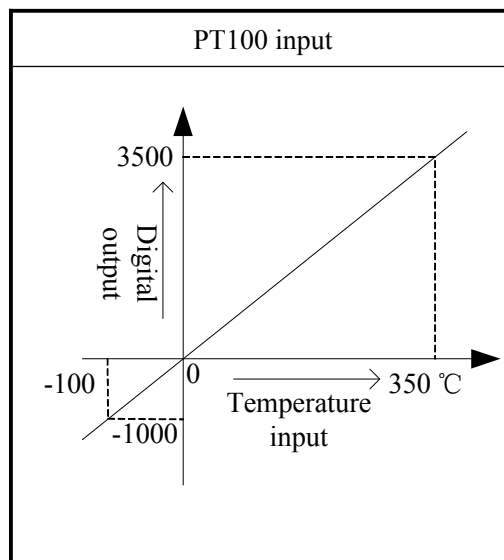


The relationship between the digital input and corresponding analog output is shown as below:



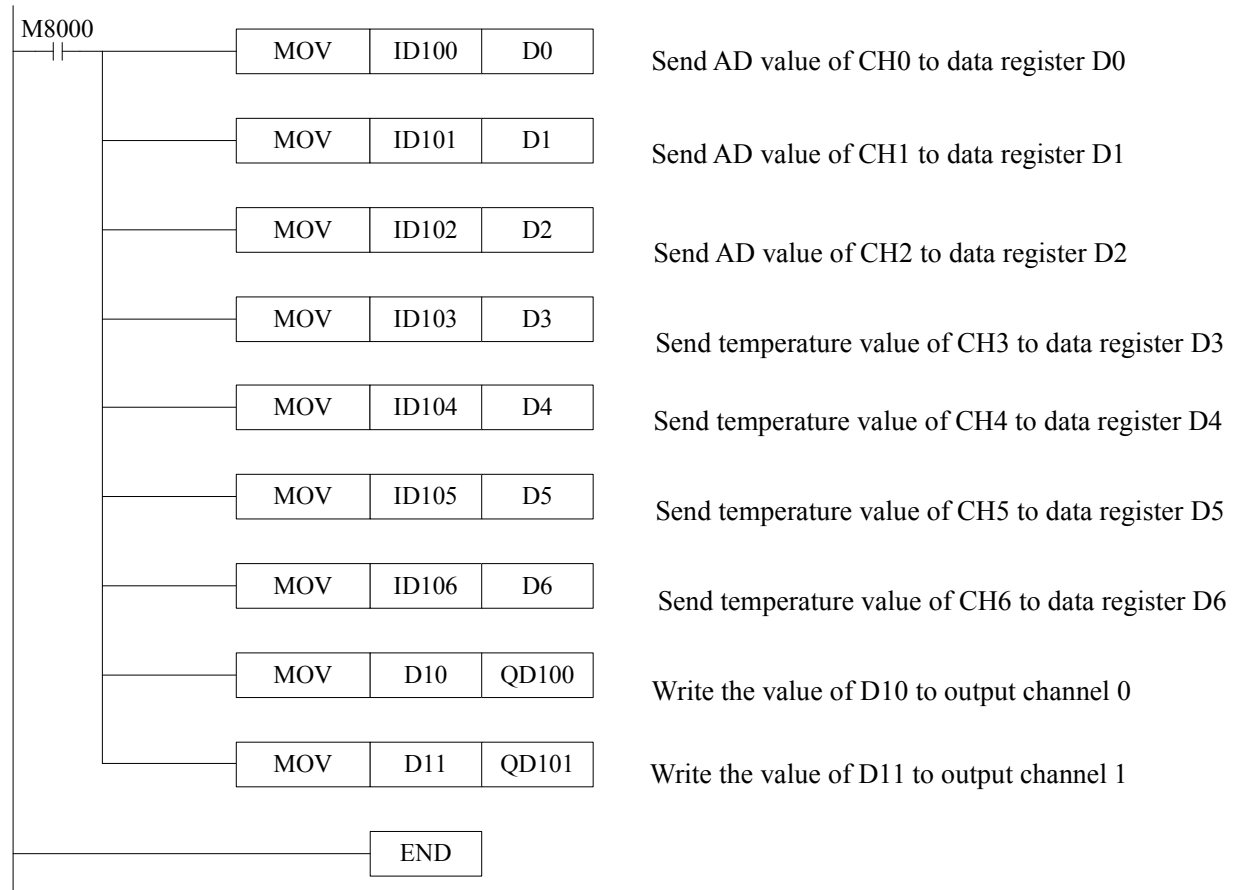
Note: When the output value is larger than 1023, D/A converted analog value will remain 5V or 10V

PT100 input features:



### 13-7. Programming

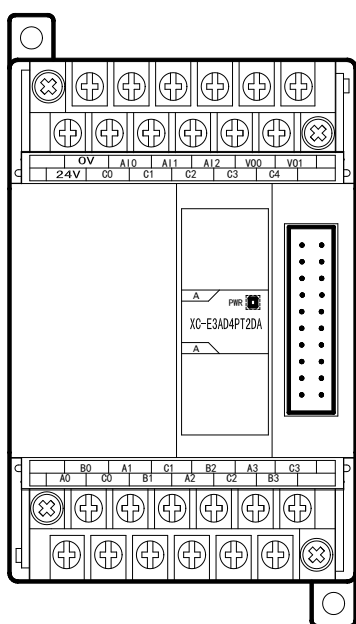
Example: Real-time read the data of 7 channels, write data to 2 channels (take module 1 as an example)



## 14. Analog and temperature module XC-E2AD2PT2DA

### 14-1. Specifications

XC-E2AD2PT2DA as the PID temperature control module, support 2-channel and 16-bit precise analog input, 2-channel PT100 temperature input, and 2-channel 10-bit precise analog output. This module integrates 2-channel of temperature input, has the function of PID auto-tune, independent PID parameters setting, communication with PLC and so on. Based on this module, user can build a distributed temperature control system with PLC, HMI and computer.



- 2-channel and 16-bit precise analog input, 2-channel PT100 temperature input, and 2-channel 10-bit precise analog output.
- 2-channel current(0~20mA,4~20mA) and voltage(0~5V,0~10V) can be selected, set through XCPpro software.
- 2-channel AD and 2-channel PT input, PID function.
- DC-DC power separating, enhance the anti-interference ability of system.
- Temperature precision is 0.01℃.
- Set the PID parameters of each temperature channel independently, has separate register address space.
- Support PID real-time auto-tune. Allow the device auto-tune in different conditions (Cold status, heating status, transition status etc), then get the suitable PID parameters.
- Exchanging data based on PLC communication instructions: “FROM” and “TO”.
- As the special function module of XC series, 7 modules can be connected at most.

Items	Analog input (AD)		Temperature input (PT)	Analog voltage output (DA)	
	Analog input	Current		0~20mA 4~20mA	PT100
Voltage		0~5V 0~10V			
Temperature range	-		-100~327℃	-	
Maximum input range	0~40mA		-	-	
Analog output range	-		-	Voltage	0~10V、0~5V

			Current	0~20mA、4~20mA
Digital input range	-	-	10 bits binary data (0~1023)	
Digital output range	16 bits binary data (0~65535)	-10000~32767		-
Resolution	1/65535 (16Bit)	0.01℃		1/1023(10Bit)
PID output value	0~4095			-
General precision	0.8%	±0.01℃		0.8%
Conversion speed	2ms/1 channel			2ms/1 channel
Power supply for analog using	DC24V±10%, 100mA			
Installation	Fixed with M3 screws or directly installed on orbit of DIN46277 (Width: 35mm)			

### Application environment

- PLC: V3.1f and higher versions (Hardware version).
- Programming software: XCPPro V3.1b and higher versions.
- Temperature sensor: Platinum resistance PT100.

### 14-2. Terminals

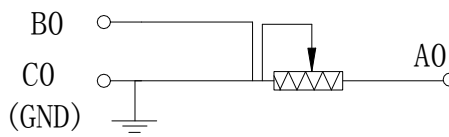
	OV	•	•	V00	V01	C01	
	24V	•	•	A00	C00	A01	

	B0	A1	C1	A10	V11	C11	
	A0	C0	B1	V10	C10	A11	

Name	Terminals definition	Descriptions		
Input terminals	B0, B1	Temperature input channels	Analog input, PT100 temperature sensor (-100℃~327℃)	
	VI0, VI1	Analog input channels	Voltage	0~10V or 0~5V
	AI0, AI1		Current	0~20mA or 4~20mA
Output terminals	VO0, VO1	Analog output channels	Voltage	Digital value, range: 0-1023
	AO0, AO1		Current	Digital value, range: 0-1023



The input wiring diagram of PT100 (Three-line):



The wiring method of regular PT100 resistor (Three-line) can be distinguished according to the wire color, two of the three wires with the same color should be connected to B0 and C0, and the remaining terminal should be connected to A0.

### 14-3. Data address description

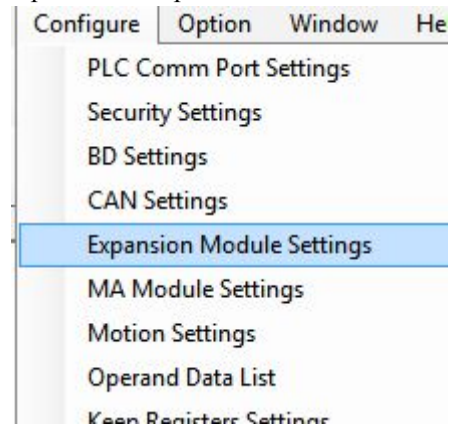
#### 14-3-1. Working mode definition

There are two ways to set the working mode (The results of the two ways are the same):

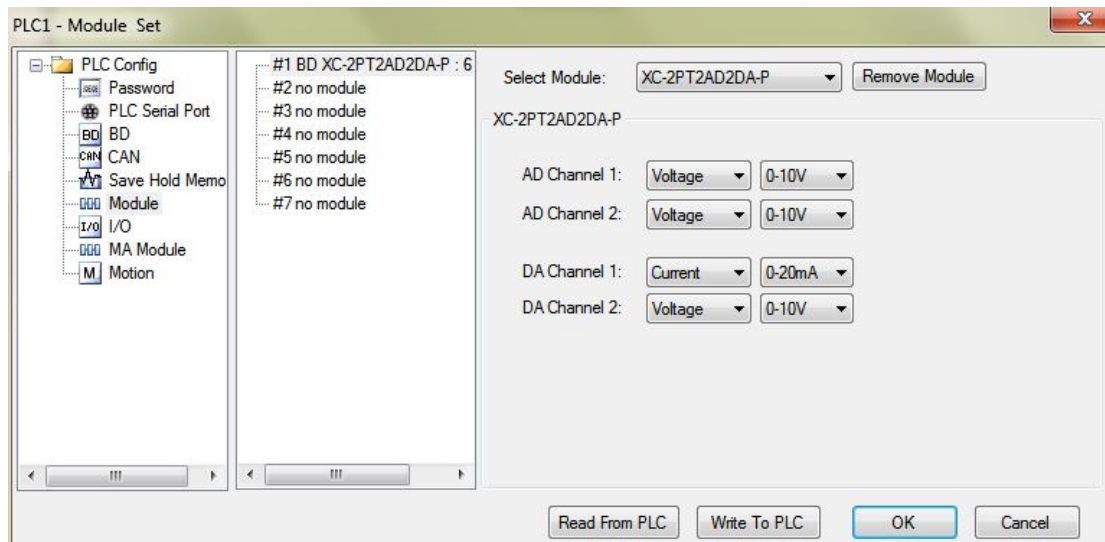
- 1: Set through the XCPpro software
- 2: Set through Flash register

#### XCPpro software:

Open the XCPpro software, click configure/expansion module settings:



Then select corresponding module and configuration information:



Choose the correct module and channel parameters.

After finishing configuration, please click “write to plc”, then click “OK”. The configurations will take effect after downloading and running the program.

#### FD registers:

For XC-E2AD2PT2DA module, user can set the parameters through Flash register FD (special data register of PLC):

Module	Register address	
Module 1	FD8250	FD8251
Module 2	FD8258	FD8259
Module 3	FD8266	FD8267
Module 4	FD8274	FD8275
Module 5	FD8282	FD8283
Module 6	FD8290	FD8291
Module 7	FD8298	FD8299

Next we take module 1 as an example to show how to set the parameters:

Register FD8250:

PT CH 1				PT CH 0			
Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
-----				-----			
AD CH 1				AD CH 0			
Bit15	Bit14	Bit13	Bit12	Bit11	Bit10	Bit9	Bit8
		0: Voltage	0: 0~10V 1: 0~5V			0: Voltage	0: 0~10V 1: 0~5V
		1: Current	0: 0~20mA 1: 4~20mA			1: Current	0: 0~20mA 1: 4~20mA

Register FD8251:

DA CH 1				DA CH 0			
Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
		0: Voltage	0: 0~10V 1: 0~5V			0:Voltage	0: 0~10V 1: 0~5V
		1: Current	0: 0~20mA 1: 4~20mA			1:Current	0: 0~20mA 1: 4~20mA
Remaining register bits							
Bit15	Bit14	Bit13	Bit12	Bit11	Bit10	Bit9	Bit8
-----				-----			

For example: If XC-E2AD2PT2DA is module 2, and AD Channel 0 is voltage, range is 0~5V, AD Channel 1 is default, DA Channel 0 is current, range is 4~20mA,CH 1 is default. Then, the value of register FD8250 and FD8251 are shown as below:

FD8250	Bit value															
	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0

The value of FD8250 is 512.

FD8251	Bit value															
	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1

The value of FD8251 is 3.

### 14-3-2. Data address of module

The parameters of 2-channel temperature input and 2-channel analog input are shown as below:

Related parameters	Descriptions				
	Channel	PT0 (0.01℃)	PT1 (0.01℃)	AD0	AD1
Current value	Module1	ID100	ID101	ID102	ID103
	Module2	ID200	ID201	ID202	ID203
	.....	ID×00	ID×01	ID×02	ID×03
	Module7	ID700	ID701	ID702	ID703
PID output	Module1	X100	X101	X102	X103
	Module2	X200	X201	X202	X203
	.....	X×00	X×01	X×02	X×03
	Module7	X700	X701	X702	X703
Channel	Module1	X110	X111	X112	X113

connection /open circuit testing ( 0 is connected, 1 is open circuit )	Module2	X210	X211	X212	X213
	.....	X×10	X×11	X×12	X×13
	Module7	X710	X711	X712	X713
PID auto-tune error bit (0 is OK, 1 is error )	Module1	X120	X121	X122	X123
	Module2	X220	X221	X222	X223
	.....	X×20	X×21	X×22	X×23
	Module7	X720	X721	X722	X723
Enable signal	Module1	Y100	Y101	Y102	Y103
	Module2	Y200	Y201	Y202	Y203
	.....	Y×00	Y×01	Y×02	Y×03
	Module7	Y700	Y701	Y702	Y703
auto-tune PID control bit	Auto-tune trigger signal, start auto-tune when set to 1. After auto-tune, PID parameters and period value are refreshed, and clear the auto-tune PID control bit automatically. User also could read the status,"1" means in the process of auto-tune,"0" means no auto-tune or auto-tune is finished				
PID output value (operation result)	Digital value output range: 0~4095 When the PID output value is analog control (Such as steam valve opening or silicon controlled conduction angles), user can send the value to analog output module to meet the control requests.				
PID parameters value (P、I、D)	Get the best parameters through PID auto-tune. If current PID parameters can't meet control requests, user can use experienced PID parameters directly.				
PID operation range (Diff)	PID algorithm works in the range of $\pm$ Diff. For actual applications, if current value is lower than $T_{Setting} - T_{Diff}$ , PID output is the maximum value; If current value is higher than $T_{Setting} + T_{Diff}$ , PID output is the minimum value. (The units is different according to channel type and setting range)				
Offset value $\delta$	(Sampling value+Offset value $\delta$ )/10 = Display value. Then the sampling value will equal or close to actual value. This parameter is signed number, retentive after power-off, default value is 0.(The units is different according to channel type and setting range)				
Temperature value setting	Target value of control system. The adjustment range of temperature control is 0~1000℃, resolution is 0.01℃.				
Temperature control period (unit: 0.1 second)	The adjustment range of control period is 0.5s~200s, minimum precision is 0.1 second. Set value = actual temperature control period × 10. For example, set to 5 if the temperature control period is 0.5 seconds.				
Actual value	If the actual value is different from the display value, user could write the actual value into this parameter. After then, module will calculate the offset value $\delta$ and				

	<p>save it.</p> <p>Offset value <math>\delta = \text{actual value} - \text{current sampling value}</math>. (The units are different according to channel type and setting range).</p> <p>For example, user tests the ambient temperature is 60°C, the module display temperature is 55°C. User set this parameter to 600, <math>\delta</math> will be 50, then the display temperature = <math>(\text{sampling value} + \delta)/10 = 60</math> °C.</p> <p><b>**Caution:</b> Please make sure the input actual value is correct, otherwise that will affect the offset value, and then affect the display value.</p>
Auto-tune output amplitude	Output value of auto-tune, the units is %, 80 means 80% output of the full scale.

The units of temperature acquisition and analog channels are different according to the channel style and range configuration.

Channel	Units		
Temperature acquisition channel	0.01 °C		
Analog channel	Voltage input	0~10V	$1.5 \times 10^{-4} \text{V}$
		0~5V	$7.6 \times 10^{-5} \text{V}$
	Current input	0~20mA	$3.1 \times 10^{-4} \text{mA}$
		4~20mA	$2.4 \times 10^{-4} \text{mA}$

The parameters of 2-channel analog output:

Parameters	Description		
	Channel	DA0	DA1
Analog output value	Module 1	QD100	QD101
	Module 2	QD200	QD201
	.....	QD×00	QD ×01
	Module 7	QD700	QD701

### 14-3-3. Address definition

The read/write parameters address:

#### 1. Parameters address of FROM instruction (read parameters):

Address	Description
K0	Auto-tune PID control bit
K1	PID output value of channel PT0
K2	PID output value of channel PT1
K3	PID output value of channel AD0

K4	PID output value of channel AD1
K5	Channel PT0 PID parameter value (P)
K6	Channel PT0 PID parameter value (I)
K7	Channel PT0 PID parameter value (D)
K8	Channel PT0 PID parameter value (Diff)
K9	Channel PT1 PID parameter value (P)
K10	Channel PT1 PID parameter value (I)
K11	Channel PT1 PID parameter value (D)
K12	Channel PT1 PID parameter value (Diff)
K13	Channel AD0 PID parameter value (P)
K14	Channel AD0 PID parameter value (I)
K15	Channel AD0 PID parameter value (D)
K16	Channel AD0 PID parameter value (Diff)
K17	Channel AD1 PID parameter value (P)
K18	Channel AD1 PID parameter value (I)
K19	Channel AD1 PID parameter value (D)
K20	Channel AD1 PID parameter value (Diff)
K21	Channel PT0 temperature offset value
K22	Channel PT1 temperature offset value
K23	Channel AD0 offset value
K24	Channel AD1 offset value

**2. Parameters address of TO instruction (write parameters):**

<b>Address</b>	<b>Description</b>
K0	Auto-tune PID control bit
K1	Heating/cooling choice bit
K2	Channel PT0 setting temperature value
K3	Channel PT1 setting temperature value
K4	Channel AD0 setting value
K5	Channel AD1 setting value
K6	Channel PT0 PID parameter value (P)
K7	Channel PT0 PID parameter value (I)
K8	Channel PT0 PID parameter value (D)
K9	Channel PT0 PID parameter value (Diff)
K10	Channel PT1 PID parameter value (P)
K11	Channel PT1 PID parameter value (I)
K12	Channel PT1 PID parameter value (D)
K13	Channel PT1 PID parameter value (Diff)
K14	Channel AD0 PID parameter value (P)
K15	Channel AD0 PID parameter value (I)
K16	Channel AD0 PID parameter value (D)

K17	Channel AD0 PID parameter value (Diff)
K18	Channel AD1 PID parameter value (P)
K19	Channel AD1 PID parameter value (I)
K20	Channel AD1 PID parameter value (D)
K21	Channel AD1 PID parameter value (Diff)
K22	Channel PT0 temperature control period
K23	Channel PT1 temperature control period
K24	Channel AD0 temperature control period
K25	Channel AD1 temperature control period
K26	Channel PT0 actual temperature value
K27	Channel PT1 actual temperature value
K28	Channel AD0 actual value
K29	Channel AD1 actual value
K30	Channel PT0 auto-tune output amplitude
K31	Channel PT1 auto-tune output amplitude
K32	Channel AD0 auto-tune output amplitude
K33	Channel AD1 auto-tune output amplitude
K34	Channel PT0 temperature offset value
K35	Channel PT1 temperature offset value
K36	Channel AD0 offset value
K37	Channel AD1 offset value

In addition, the module can save setting temperature, PID parameters (P, I, D, Diff), temperature offset value, temperature control period, auto-tune output amplitude and other parameters. When the auto-tune end or user change the parameters, the parameters will be saved; the module will take out the parameters and operate after restart. The default values of parameters are shown as below:

Parameters name		Default value			
Setting value		PT0	PT1	CH2	CH3
		0	0	0	0
PID parameters	P	40	40	40	40
	I	1200	1200	1200	1200
	D	300	300	300	300
	Diff	10	10	10	10
Temperature control period (units 0.1s)		20	20	20	20
Offset value (signed number)		0	0	0	0
Auto-tune output amplitude		100	100	100	100

## 14-4. Read and Write instructions

### 14-4-1. Instructions description

PLC can read and write the parameters of XC-E2AD2PT2DA through FROM and TO instruction.

Caution: The module number of first module is K0.

#### 1. Read instruction FROM

##### (1) Word operation



Function: read the module parameters to PLC register, the operate unit is word.

Operand description:

S1: Target module number. Available operand: K,TD,CD,D,FD.

S2: Head address of the module. Available operand: K,TD,CD,D,FD.

S3: Read register quantity (Word quantity). Available operand: K,TD,CD,D,FD.

D1: The head address of PLC registers.

##### (2) Bit operation



Function: read the module data to PLC address, the operate unit is bit.

Operand description:

S1: Target module number. Available operand: K,TD,CD,D,FD.

S2: Read the first address of the module. Available operand: K,TD,CD,D,FD.

S3: Read data quantity (Bit quantity). Available operand: K,TD,CD,D,FD.

D1: The first address of PLC coil to receive the module data. Available operand: M,Dn,m.

#### 2. Write instruction TO

##### (1) Word operation



Function: Write the data of PLC register to the module address, the units is word.

Operand description:

D1: Target module number. Available operand: K,TD,CD,D,FD.

D2: The first address of the module. Available operand: K,TD,CD,D,FD.

D3: Write in register quantity (Word quantity). Available operand: K,TD,CD,D,FD.

S1: The PLC registers first address.



(2) Bit operation



Function: Write PLC data to the module address, the operation unit is bit.

Operand description:

D1: Target module number. Available operand: K,TD,CD,D,FD.

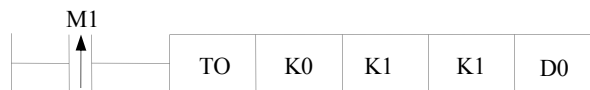
D2: The first address of the module. Available operand: K,TD,CD,D,FD.

D3: Write in data quantity (Bit quantity). Available operand: K,TD,CD,D,FD.

S1: The PLC coil first address. Available operand: M,Dn,m.

### 14-4-2. Instruction applications

1. Set temperature

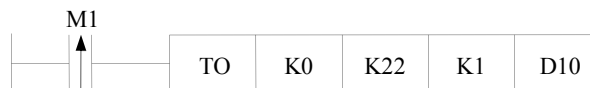


Description: Input the temperature value to D0, write the D0 data to module address K1 (PT0 setting temperature). For instance, D0=2000, means the setting temperature is 20.00°C.

Operand definition:

- (1) TO Write instruction
- (2) K0 Module number: 0
- (3) K1 Module address: 1
- (4) K1 Word quantity to write in: 1
- (5) D0 The PLC register: D0

2. Set temperature control period



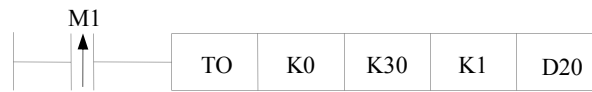
Description: Input temperature control period to D10, write D10 data to module address K22 (temperature control period of CH0). For instance, D10=25 means the temperature control period is 2.5s.

Operand definition:

- (1) TO Write instruction
- (2) K0 Module number: 0
- (3) K22 Module address: 22
- (4) K1 Write in word quantity: 1

(5) D10 PLC register address: D10

### 3. Auto-tune output amplitude



Description: Input auto-tune output amplitude to D20, write the D20 data to module address K30 (auto-tune output amplitude of CH0). For instance, D20=80, means the output value of auto-tune is the 80% of maximum output value.

Operand definition:

- (1) TO Write instruction
- (2) K0 Module number: 0
- (3) K30 Module address: 30
- (4) K1 Word quantity to write in: 1
- (5) D20 The PLC register address: D20

### 4. Auto-tune PID control bit



Description: Set on coil M0~M3 before auto-tune, then start auto-tune after write the data into module address. If in the process of auto-tune, set on the coil M0~M3 and write into module, the module will quit auto-tune and start PID control according to PID parameters which set before.

For instance, Set M0 ON means Channel 0 will start to auto-tune.

Operand definition:

- (1) TO Write instruction
- (2) K0 Module number: 0
- (3) K0 Module address: 0
- (4) K4 Bit quantity to write in: 4
- (5) M0 The coil address of PLC: M0~M5.

### 5. Read auto-tune PID control bit



Description: User can read the auto-tune status bit of module, and send back to M10~M13 of PLC. If one coil is ON, means the corresponding channel is in the process of auto-tune, OFF means the auto-tune hasn't started or already ended.

Operand definition:

- (1) FROM Read instruction
- (2) K0 Module number: 0
- (3) K0 Module address: 0
- (4) K4 Bit quantity to read: 4
- (5) M10 PLC coil address: M10~M13

## 6. Read PID parameters



Description: User can read the PID parameters of module (PID parameters of CH0), send back to D30~D33 of PLC. D30 is parameter P, D31 is parameter I, D32 is parameter D, D33 is parameter Diff.

Operand definition:

- (1) FROM Read instruction
- (2) K0 Module number: 0
- (3) K5 Module internal address: 5
- (4) K4 Word quantity to read: 4
- (5) D30 PLC register address: D30~D33

## 7. Write PID parameters



Description: User can revise the PID parameters of module (PID parameters of CH5), set on the coil M100 after input the data to D40~D43 of PLC, the new PID parameters will be used by the module.

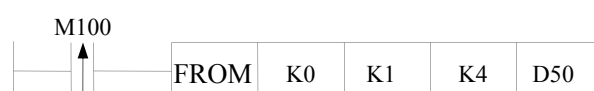
Operand definition:

- (1) TO Write instruction
- (2) K0 Module number: 0
- (3) K6 Module address: 6
- (4) K4 Word quantity to write in: 4
- (5) D40 PLC register address: D40~D43

## 8. Open enable channel bit

Description: Module 0: the corresponding enable bits of CH0~3 are Y100~Y103; Module 1: the corresponding enable bits of CH0~3 are Y200~Y203; the rest can be done in the same manner. Therefore, if set on one enable bit, the corresponding channel will start to PID control.

## 9. Read PID output value



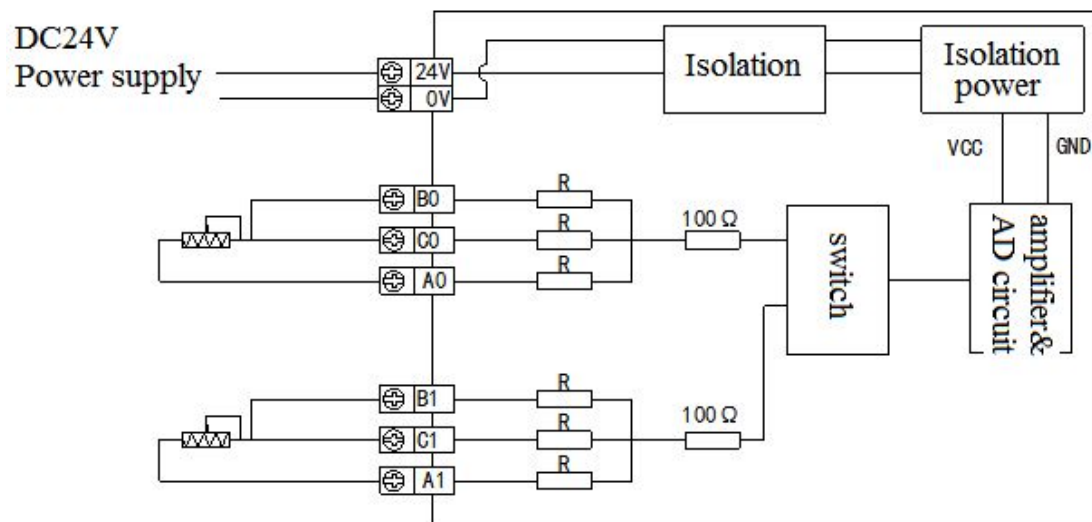
Description: When module is in process of PID control, user can read PID output value to PLC registers D50~D53.

Operand definition:

- (1) FROM Read instruction
- (2) K0 Module number: 0
- (3) K1 Module address: 1
- (4) K4 Byte quantity to read: 4
- (5) D50 PLC register address: D50~ D55

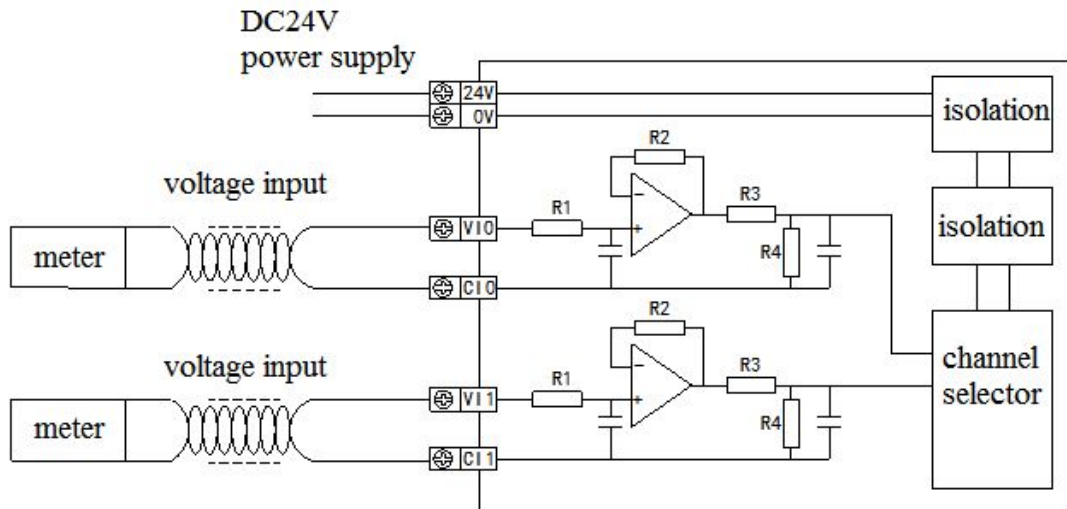
### 14-5. External connection

(1) The wiring diagram of 2-Channel temperature input:

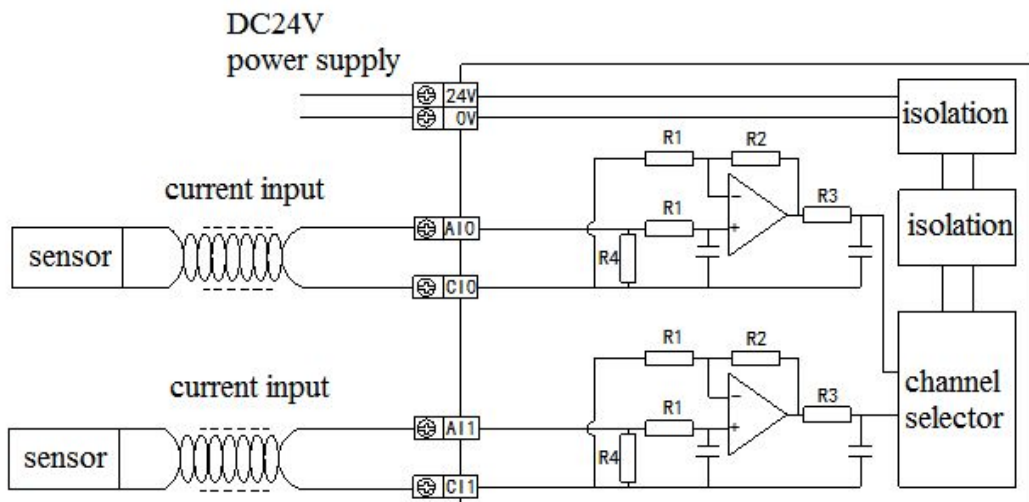


(2) 2-Channel analog input, the connection mode of input terminal as below shows:

Voltage input mode as below shows:

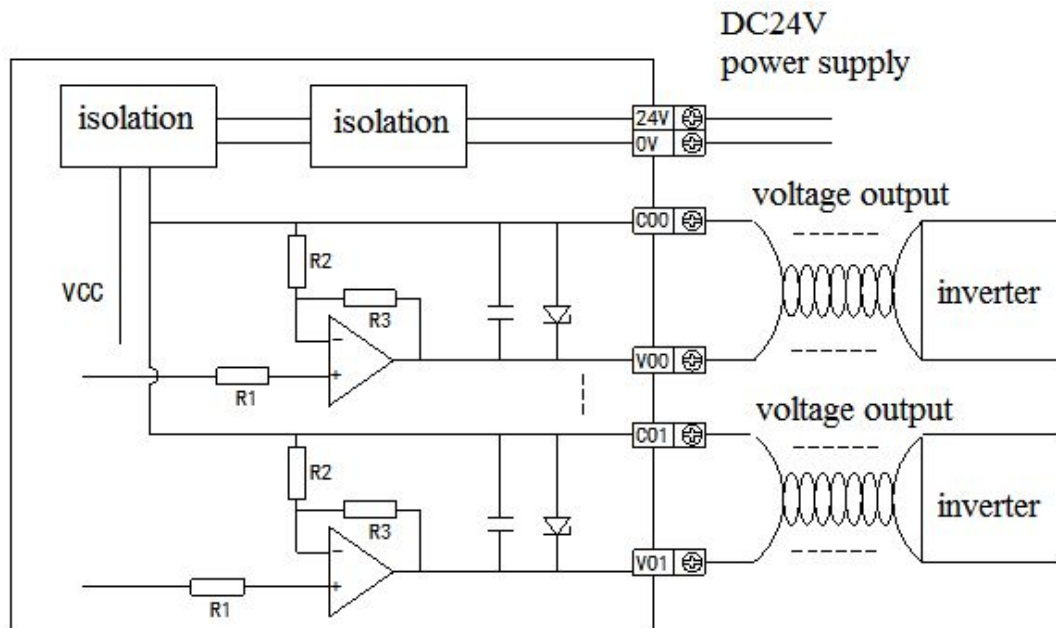


Current input wiring:

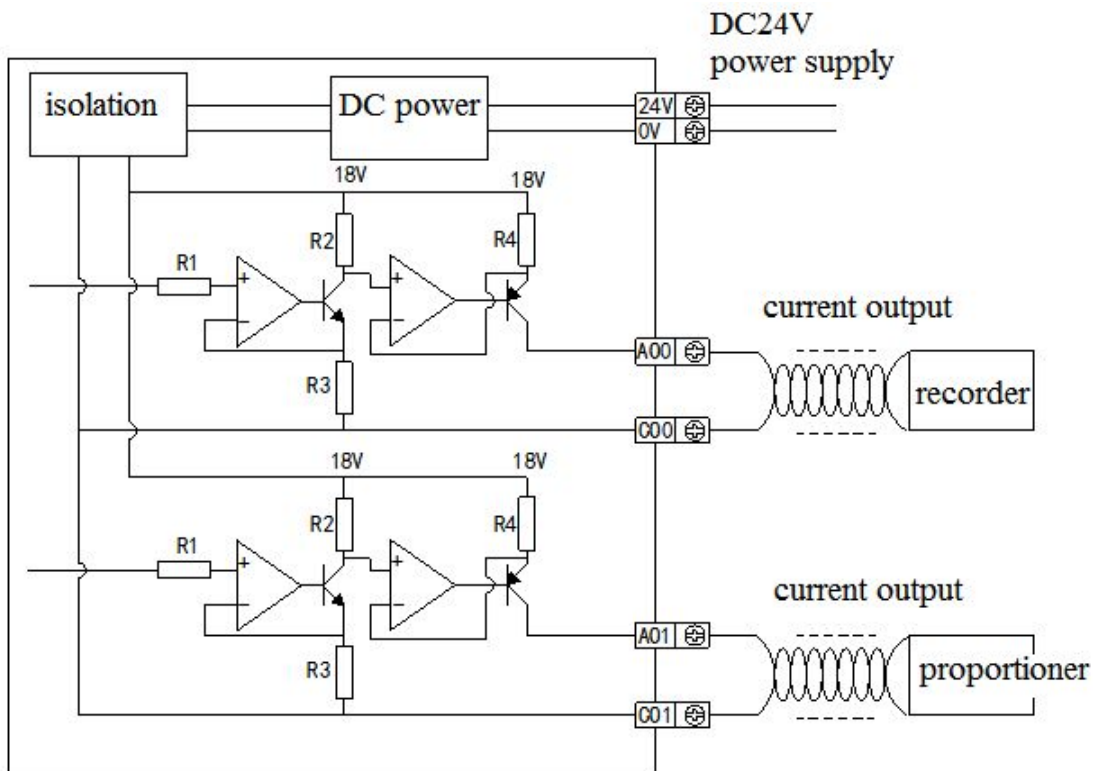


(3) 2-Channel analog output wiring:

Voltage output mode:

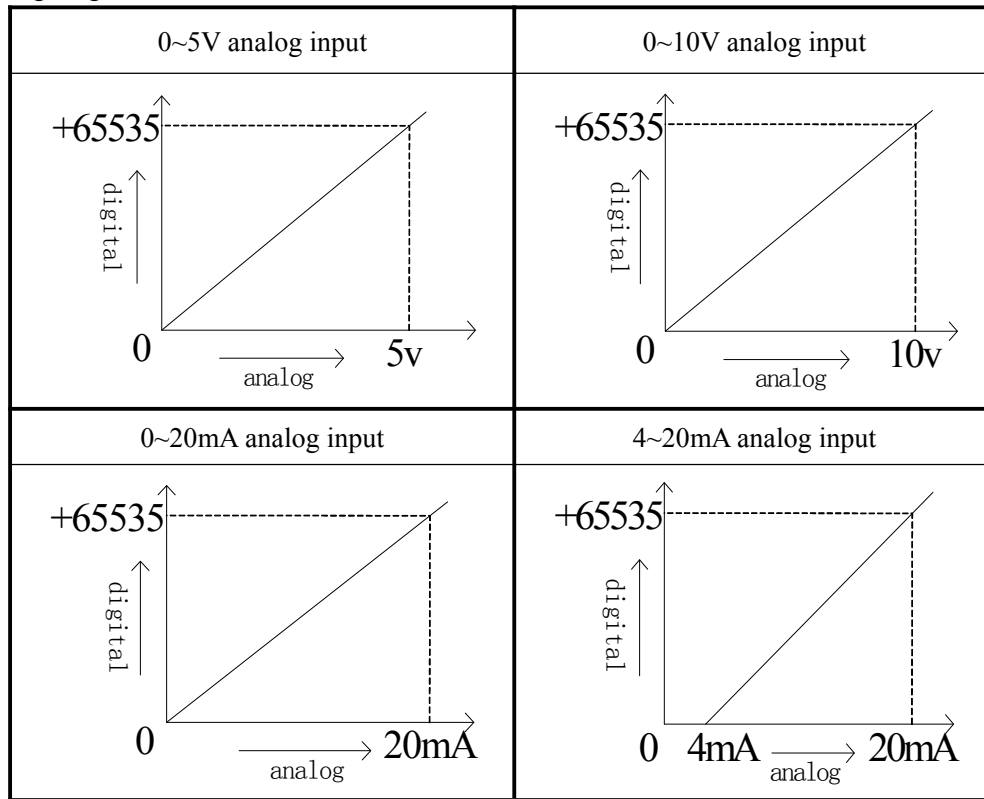


Current output mode as below shows:

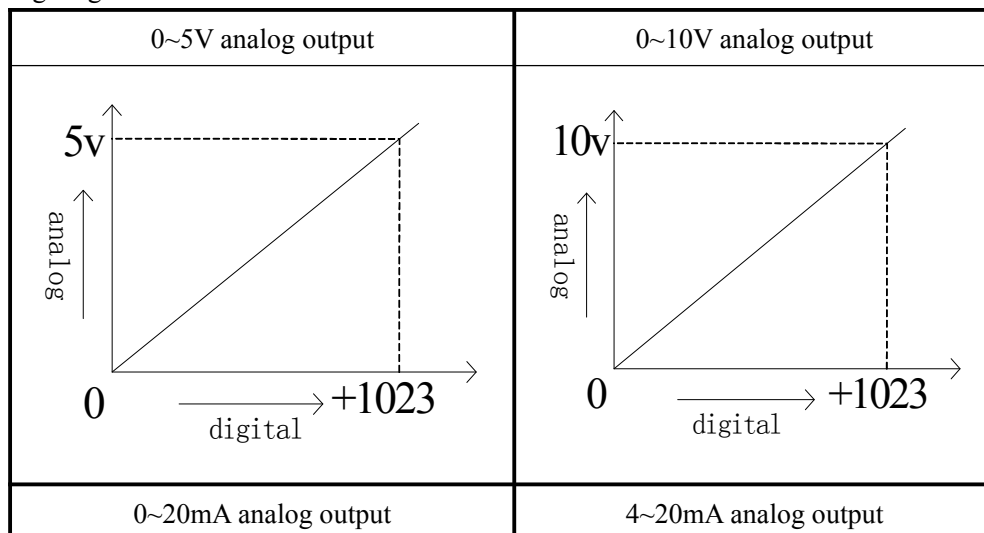


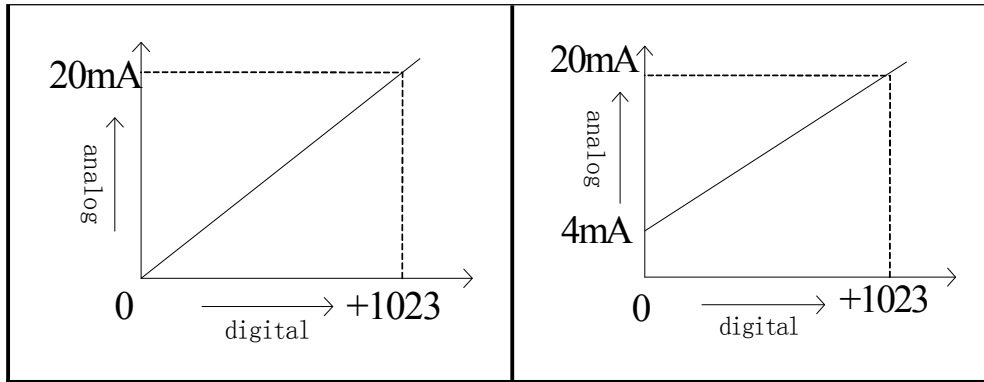
## 14-6. Analog/Digital conversion Diagram

2-Channel analog input, the relationship between analog value and digital value are shown as the following diagram:



The relationship between the digital input and corresponding analog output are shown as the following diagram:

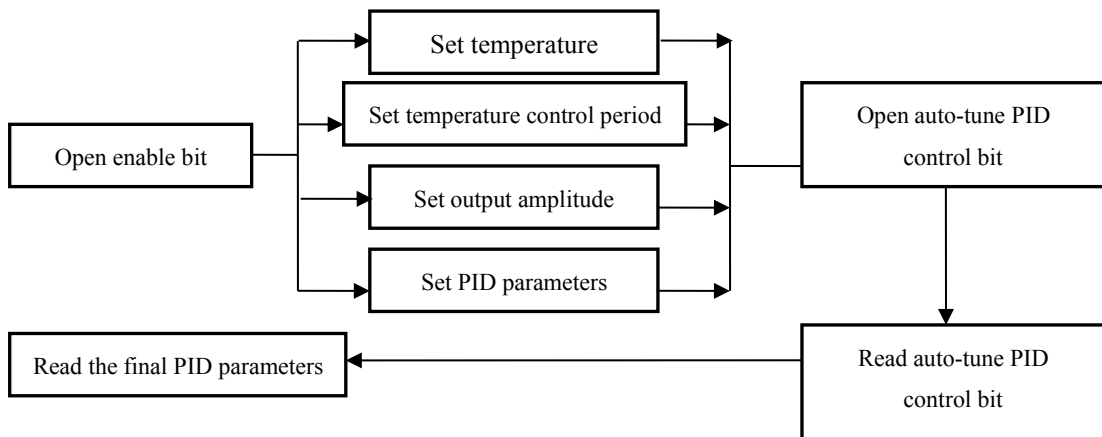




### 14-7. Programming

The following is the example of XC-E2AD2PT2DA:

The control process diagram is shown as the following (channel 0):



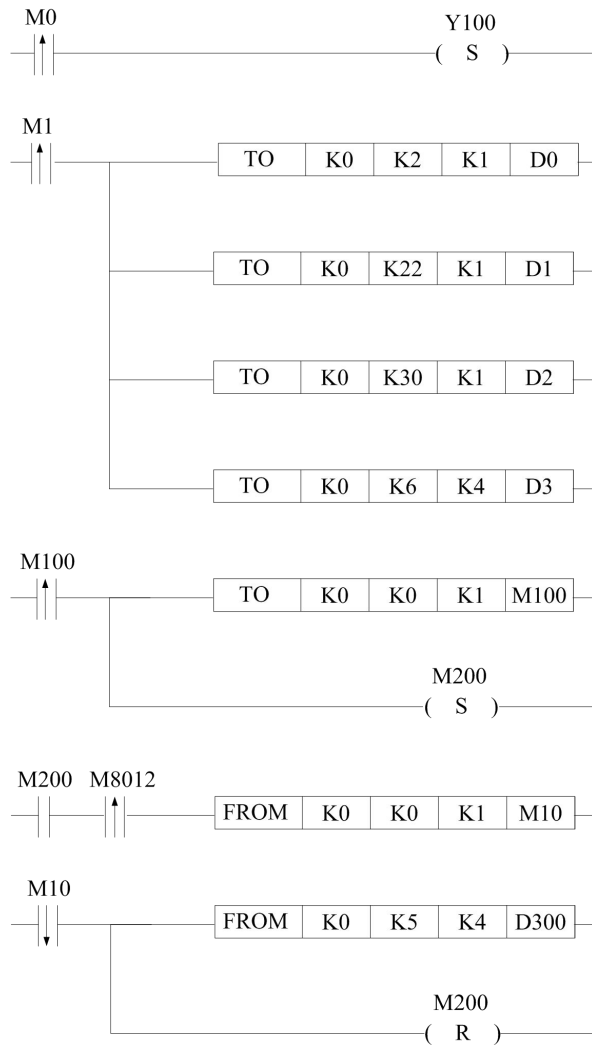
This example controls the temperature through HMI.

1. Set on enable bit of Channel 0;
2. Write the parameters into the module including setting temperature, temperature control period, auto-tune output amplitude. Then, module starts to PID control.
3. Set on the auto-tune PID control bit, the module starts to PID auto-tune.
4. After auto-tune, the module starts to PID control; send the PID parameters to PLC registers.

Of course, the parameters can be set through HMI.



The address of PLC coil and register		Module address	Description
D0	←→	K2	Channel 0 set temperature
D1	←→	K22	Channel 0 temperature control period
D2	←→	K30	Channel 0 output amplitude
D3	←→	K6	Channel 0 set parameter P
D4	←→	K7	Channel 0 set parameter I
D5	←→	K8	Channel 0 set parameter D
D6	←→	K9	Channel 0 set parameter Diff
D300	←→	K5	Channel 0 read parameter P
D301	←→	K6	Channel 0 read parameter I
D302	←→	K7	Channel 0 read parameter D
D303	←→	K8	Channel 0 read parameter Diff
M100	←→	K0	Channel 0 auto-tune PID control bit



Open the enable bit of channel 0

Write the data of D0 to K2 (channel 0 setting temperature);

Write the data of D1 to K22, (channel 0 temperature control period)

Write the data of D2 to K30 (channel 0 output amplitude)

Write the data of D3,D4,D5,D6 to module address K6,K7,K8,K9 (channel 0 output amplitude)

Write the data of M100 to K0 (open the auto-tune enable bit of channel 0)

Set on M200

Read K0 status to PLC coil M10 every 100ms (channel 0 auto-tune state bit)

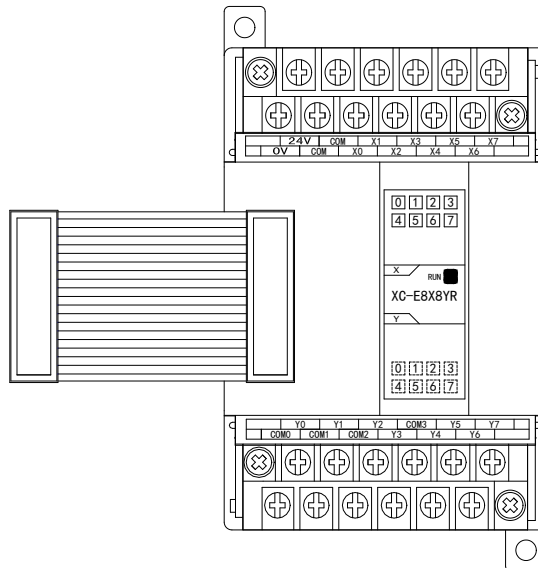
Read module data K5,K6,K7,K8 to PLC registers D300,D301,D302,D303 (channel 0 PID parameters).

Reset M200.

## 15. I/O expansion module XC-EnXmY

### 15-1. Specifications

XC-EnXmY is the extension module of XC series, up to 7 XC-EnXmY modules can be connected to PLC. This module has rich types, small size, and more I/O points which can meet more requirements.



#### Module types

Model		Function description
NPN input	PNP input	
XC-E8X	XC-E8PX	8-channel digital input
XC-E8YR	XC-E8YR	8-channel relay output
XC-E8YT	XC-E8YT	8-channel transistor output
XC-E8X8YR	XC-E8PX8YR	8-channel digital input, 8-channel relay output
XC-E8X8YT	XC-E8PX8YT	8-channel digital input, 8-channel transistor output
XC-E16X	XC-E16PX	16-channel digital input
XC-E16YR	XC-E16YR	16-channel relay output
XC-E16YT	XC-E16YT	16-channel transistor output
XC-E16X16YR	XC-E16PX16YR	16-channel digital input, 16-channel relay output
XC-E32X	XC-E32PX	32-channel digital input
XC-E32YR	XC-E32YR	32-channel relay output

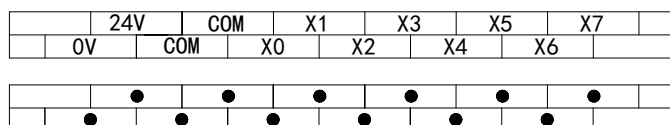
## Module Specifications

Items	Specifications
Input voltage (Power supply)	DC24V ± 10% (32 points I/O module is AC220V ± 10%)
Application environment	No corrosive gas
Environment temperature	0°C~60°C
Environment humidity	5~95%
Installation	Fixed with M3 screws or directly installed on DIN46277 rail (Width: 35mm)
Dimension	63mm × 102mm × 73.3mm (16 points, 8 points)
	139mm × 102mm × 73.3mm (32 points)

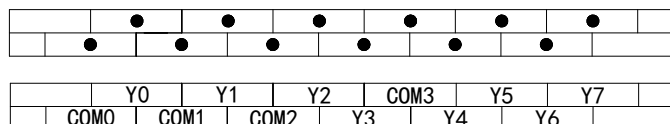
## 15-2. Terminals

The terminals distributions of NPN and PNP input are the same.

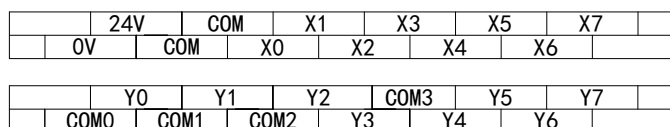
(1) XC-E8X module:



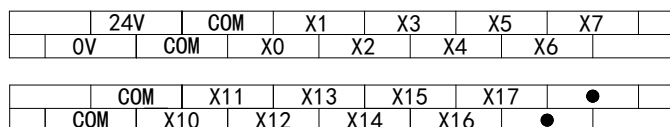
(2) XC-E8YR, XC-E8YT module:



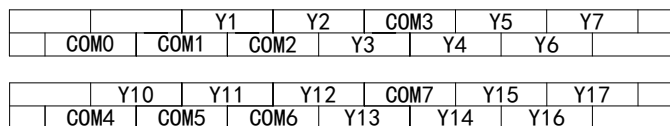
(3) XC-8X8YR, XC-8X8YT module:



(4) XC-16X module:



(5) XC-16YR, XC-16YT module:



(6) XC-16X16YR module:

	N	●	COM	X1	X3	X5	X7	X11	X13	X15	X17	●	
	L	FG	COM	X0	X2	X4	X6	X10	X12	X14	X16	●	

	0V	●	Y0	Y2	COM1	Y5	Y7	Y10	Y12	COM3	Y15	Y17	
	24V	●	COM0	Y1	Y3	Y4	Y6	COM2	Y11	Y13	Y14	Y16	

(7) XC-32X module:

	N	●	COM	X1	X3	X5	X7	X11	X13	X15	X17	●	
	L	FG	COM	X0	X2	X4	X6	X10	X12	X14	X16	●	

	0V	●	COM	X21	X23	X25	X27	X31	X33	X35	X37	●	
	24V	●	COM	X20	X22	X24	X26	X30	X32	X34	X36	●	

(8) XC-32YR module:

	N	●	Y0	Y2	COM1	Y5	Y7	Y10	Y12	COM3	Y15	Y17	
	L	FG	COM0	Y1	Y3	Y4	Y6	COM2	Y11	Y13	Y14	Y16	

	0V	●	Y20	Y22	COM5	Y25	Y27	Y30	Y32	COM7	Y35	Y37	
	24V	●	COM4	Y21	Y23	Y24	Y26	COM6	Y31	Y33	Y34	Y36	

**Caution: Maybe the common terminal of each module is different from above pictures; please see the label of actual objects.**

### 15-3. I/O address assignment

XC series can expand 7 modules, the address of I/O terminals are shown as below:

(Caution: Take NPN type as an example, the terminals definition, address, suitable module of PNP are the same as NPN)

**The definition of input terminals (Extension module 1):**

Terminals number	Address	Suitable modules
X0	X100	XC-E8X、XC-E8X8YR/T、XC-E16X、XC-E16X16YR、XC-E32X
X1	X101	XC-E8X、XC-E8X8YR/T、XC-E16X、XC-E16X16YR、XC-E32X
X2	X102	XC-E8X、XC-E8X8YR/T、XC-E16X、XC-E16X16YR、XC-E32X
X3	X103	XC-E8X、XC-E8X8YR/T、XC-E16X、XC-E16X16YR、XC-E32X
X4	X104	XC-E8X、XC-E8X8YR/T、XC-E16X、XC-E16X16YR、XC-E32X
X5	X105	XC-E8X、XC-E8X8YR/T、XC-E16X、XC-E16X16YR、XC-E32X
X6	X106	XC-E8X、XC-E8X8YR/T、XC-E16X、XC-E16X16YR、XC-E32X
X7	X107	XC-E8X、XC-E8X8YR/T、XC-E16X、XC-E16X16YR、XC-E32X
X10	X110	XC-E16X、XC-E16X16YR、XC-E32X
X11	X111	XC-E16X、XC-E16X16YR、XC-E32X
X12	X112	XC-E16X、XC-E16X16YR、XC-E32X
X13	X113	XC-E16X、XC-E16X16YR、XC-E32X
X14	X114	XC-E16X、XC-E16X16YR、XC-E32X
X15	X115	XC-E16X、XC-E16X16YR、XC-E32X
X16	X116	XC-E16X、XC-E16X16YR、XC-E32X
X17	X117	XC-E16X、XC-E16X16YR、XC-E32X
X20	X120	XC-E32X
X21	X121	XC-E32X
X22	X122	XC-E32X

X23	X123	XC-E32X
X24	X124	XC-E32X
X25	X125	XC-E32X
X26	X126	XC-E32X
X27	X127	XC-E32X
X30	X130	XC-E32X
X31	X131	XC-E32X
X32	X132	XC-E32X
X33	X133	XC-E32X
X34	X134	XC-E32X
X35	X135	XC-E32X
X36	X136	XC-E32X
X37	X137	XC-E32X

**The definition of output terminals (Extension module 1):**

Terminals number	Address	Suitable modules
Y0	Y100	XC-E8YR/T, XC-E8X8YR/T, XC-E16YR/T, XC-E16X16YR , XC-E32YR
Y1	Y101	XC-E8YR/T, XC-E8X8YR/T, XC-E16YR/T, XC-E16X16YR , XC-E32YR
Y2	Y102	XC-E8YR/T, XC-E8X8YR/T, XC-E16YR/T, XC-E16X16YR , XC-E32YR
Y3	Y103	XC-E8YR/T, XC-E8X8YR/T, XC-E16YR/T, XC-E16X16YR , XC-E32YR
Y4	Y104	XC-E8YR/T, XC-E8X8YR/T, XC-E16YR/T, XC-E16X16YR , XC-E32YR
Y5	Y105	XC-E8YR/T, XC-E8X8YR/T, XC-E16YR/T, XC-E16X16YR , XC-E32YR
Y6	Y106	XC-E8YR/T, XC-E8X8YR/T, XC-E16YR/T, XC-E16X16YR , XC-E32YR
Y7	Y107	XC-E8YR/T, XC-E8X8YR/T, XC-E16YR/T, XC-E16X16YR , XC-E32YR
Y10	Y110	XC-E16YR/T, XC-E16X16YR, XC-E32YR
Y11	Y111	XC-E16YR/T, XC-E16X16YR, XC-E32YR
Y12	Y112	XC-E16YR/T, XC-E16X16YR, XC-E32YR
Y13	Y113	XC-E16YR/T, XC-E16X16YR, XC-E32YR
Y14	Y114	XC-E16YR/T, XC-E16X16YR, XC-E32YR
Y15	Y115	XC-E16YR/T, XC-E16X16YR, XC-E32YR
Y16	Y116	XC-E16YR/T, XC-E16X16YR, XC-E32YR
Y17	Y117	XC-E16YR/T, XC-E16X16YR, XC-E32YR
Y20	Y120	XC-E32YR
Y21	Y121	XC-E32YR
Y22	Y122	XC-E32YR
Y23	Y123	XC-E32YR
X24	Y124	XC-E32YR
X25	Y125	XC-E32YR
Y26	Y126	XC-E32YR
Y27	Y127	XC-E32YR

Y30	Y130	XC-E32YR
Y31	Y131	XC-E32YR
Y32	Y132	XC-E32YR
Y33	Y133	XC-E32YR
Y34	Y134	XC-E32YR
Y35	Y135	XC-E32YR
Y36	Y136	XC-E32YR
Y37	Y137	XC-E32YR

**The definition of input terminals (Extension module 2):**

Terminals number	Address	Suitable modules
X0	X200	XC-E8X, XC-E8X8YR /T, XC-E16X, XC-E16X16YR , XC-E32X
X1	X201	XC-E8X, XC-E8X8YR /T, XC-E16X, XC-E16X16YR , XC-E32X
X2	X202	XC-E8X, XC-E8X8YR /T, XC-E16X, XC-E16X16YR , XC-E32X
X3	X203	XC-E8X, XC-E8X8YR /T, XC-E16X, XC-E16X16YR , XC-E32X
X4	X204	XC-E8X, XC-E8X8YR /T, XC-E16X, XC-E16X16YR , XC-E32X
X5	X205	XC-E8X, XC-E8X8YR /T, XC-E16X, XC-E16X16YR , XC-E32X
X6	X206	XC-E8X, XC-E8X8YR /T, XC-E16X, XC-E16X16YR , XC-E32X
X7	X207	XC-E8X, XC-E8X8YR /T, XC-E16X, XC-E16X16YR , XC-E32X
X10	X210	XC-E16X, XC-E16X16YR, XC-E32X
X11	X211	XC-E16X, XC-E16X16YR, XC-E32X
X12	X212	XC-E16X, XC-E16X16YR, XC-E32X
X13	X213	XC-E16X, XC-E16X16YR, XC-E32X
X14	X214	XC-E16X, XC-E16X16YR, XC-E32X
X15	X215	XC-E16X, XC-E16X16YR, XC-E32X
X16	X216	XC-E16X, XC-E16X16YR, XC-E32X
X17	X217	XC-E16X, XC-E16X16YR, XC-E32X
X20	X220	XC-E32X
X21	X221	XC-E32X
X22	X222	XC-E32X
X23	X223	XC-E32X
X24	X224	XC-E32X
X25	X225	XC-E32X
X26	X226	XC-E32X
X27	X227	XC-E32X
X30	X230	XC-E32X
X31	X231	XC-E32X
X32	X232	XC-E32X
X33	X233	XC-E32X
X34	X234	XC-E32X
X35	X235	XC-E32X
X36	X236	XC-E32X

X37	X237	XC-E32X
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**The definition of output terminals (Extension module 2):**

Terminals number	Address	Suitable modules
Y0	Y200	XC-E8YR/T、XC-E8X8YR/T、XC-E16YR/T、XC-E16X16YR、XC-E32YR
Y1	Y201	XC-E8YR/T、XC-E8X8YR/T、XC-E16YR/T、XC-E16X16YR、XC-E32YR
Y2	Y202	XC-E8YR/T、XC-E8X8YR/T、XC-E16YR/T、XC-E16X16YR、XC-E32YR
Y3	Y203	XC-E8YR/T、XC-E8X8YR/T、XC-E16YR/T、XC-E16X16YR、XC-E32YR
Y4	Y204	XC-E8YR/T、XC-E8X8YR/T、XC-E16YR/T、XC-E16X16YR、XC-E32YR
Y5	Y205	XC-E8YR/T、XC-E8X8YR/T、XC-E16YR/T、XC-E16X16YR、XC-E32YR
Y6	Y206	XC-E8YR/T、XC-E8X8YR/T、XC-E16YR/T、XC-E16X16YR、XC-E32YR
Y7	Y207	XC-E8YR/T、XC-E8X8YR/T、XC-E16YR/T、XC-E16X16YR、XC-E32YR
Y10	Y210	XC-E16YR/T、XC-E16X16YR、XC-E32YR
Y11	Y211	XC-E16YR/T、XC-E16X16YR、XC-E32YR
Y12	Y212	XC-E16YR/T、XC-E16X16YR、XC-E32YR
Y13	Y213	XC-E16YR/T、XC-E16X16YR、XC-E32YR
Y14	Y214	XC-E16YR/T、XC-E16X16YR、XC-E32YR
Y15	Y215	XC-E16YR/T、XC-E16X16YR、XC-E32YR
Y16	Y216	XC-E16YR/T、XC-E16X16YR、XC-E32YR
Y17	Y217	XC-E16YR/T、XC-E16X16YR、XC-E32YR
Y20	Y220	XC-E32YR
Y21	Y221	XC-E32YR
Y22	Y222	XC-E32YR
Y23	Y223	XC-E32YR
X24	Y224	XC-E32YR
X25	Y225	XC-E32YR
Y26	Y226	XC-E32YR
Y27	Y227	XC-E32YR
Y30	Y230	XC-E32YR
Y31	Y231	XC-E32YR
Y32	Y232	XC-E32YR
Y33	Y233	XC-E32YR
Y34	Y234	XC-E32YR
Y35	Y235	XC-E32YR
Y36	Y236	XC-E32YR
Y37	Y237	XC-E32YR

••••••••The input and output are 8-32 points, there are two output modes: Relay output and Transistor output. The addresses of module N begin with Xn00 and Yn00.



**The definition of input terminals (Extension module 7):**

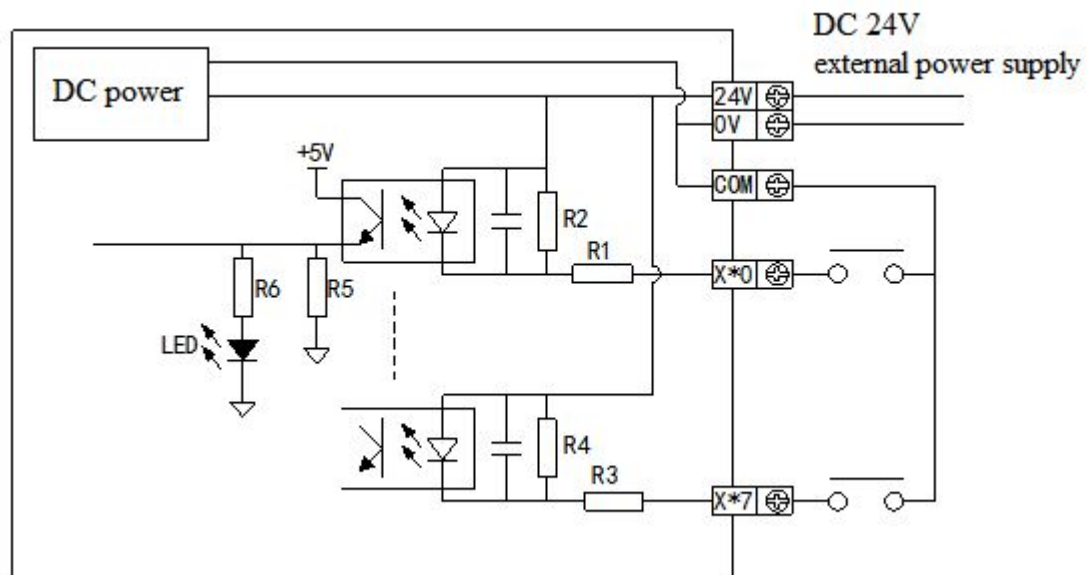
Terminals number	Address	Suitable modules
X0	X700	XC-E8X、XC-E8X8YR/T、XC-E16X、XC-E16X16YR、XC-E32X
X1	X701	XC-E8X、XC-E8X8YR/T、XC-E16X、XC-E16X16YR、XC-E32X
X2	X702	XC-E8X、XC-E8X8YR/T、XC-E16X、XC-E16X16YR、XC-E32X
X3	X703	XC-E8X、XC-E8X8YR/T、XC-E16X、XC-E16X16YR、XC-E32X
X4	X704	XC-E8X、XC-E8X8YR/T、XC-E16X、XC-E16X16YR、XC-E32X
X5	X705	XC-E8X、XC-E8X8YR/T、XC-E16X、XC-E16X16YR、XC-E32X
X6	X706	XC-E8X、XC-E8X8YR/T、XC-E16X、XC-E16X16YR、XC-E32X
X7	X707	XC-E8X、XC-E8X8YR/T、XC-E16X、XC-E16X16YR、XC-E32X
X10	X710	XC-E16X、XC-E16X16YR、XC-E32X
X11	X711	XC-E16X、XC-E16X16YR、XC-E32X
X12	X712	XC-E16X、XC-E16X16YR、XC-E32X
X13	X713	XC-E16X、XC-E16X16YR、XC-E32X
X14	X714	XC-E16X、XC-E16X16YR、XC-E32X
X15	X715	XC-E16X、XC-E16X16YR、XC-E32X
X16	X716	XC-E16X、XC-E16X16YR、XC-E32X
X17	X717	XC-E16X、XC-E16X16YR、XC-E32X
X20	X720	XC-E32X
X21	X721	XC-E32X
X22	X722	XC-E32X
X23	X723	XC-E32X
X24	X724	XC-E32X
X25	X725	XC-E32X
X26	X726	XC-E32X
X27	X727	XC-E32X
X30	X730	XC-E32X
X31	X731	XC-E32X
X32	X732	XC-E32X
X33	X733	XC-E32X
X34	X734	XC-E32X
X35	X735	XC-E32X
X36	X736	XC-E32X
X37	X737	XC-E32X

**The definition of output terminals (Extension module 7):**

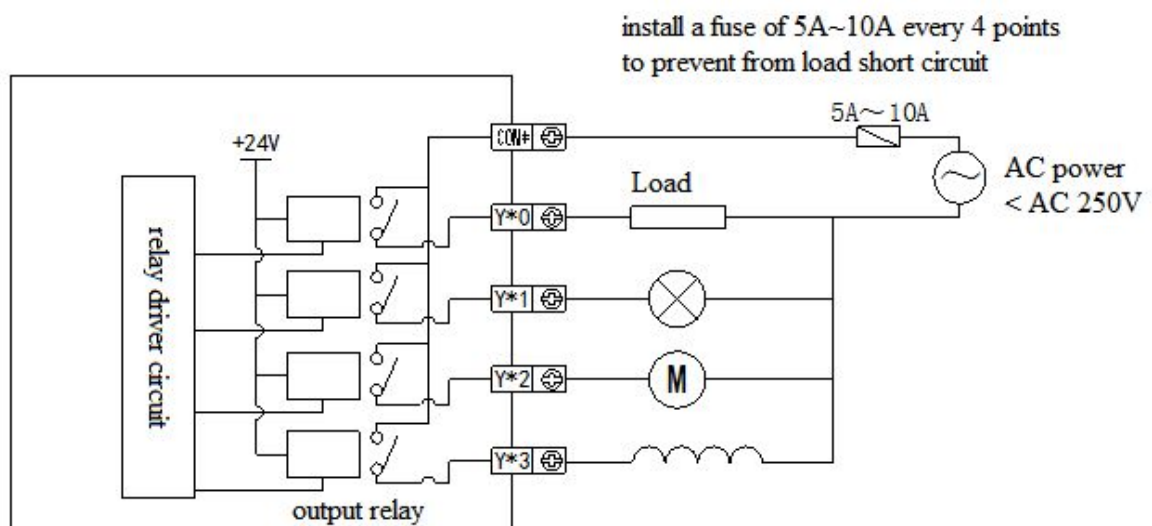
Terminals number	Address	Suitable modules
Y0	Y700	XC-E8YR/T、XC-E8X8YR/T、XC-E16YR/T、XC-E16X16YR、XC-E32YR
Y1	Y701	XC-E8YR/T、XC-E8X8YR/T、XC-E16YR/T、XC-E16X16YR、XC-E32YR
Y2	Y702	XC-E8YR/T、XC-E8X8YR/T、XC-E16YR/T、XC-E16X16YR、XC-E32YR
Y3	Y703	XC-E8YR/T、XC-E8X8YR/T、XC-E16YR/T、XC-E16X16YR、XC-E32YR
Y4	Y704	XC-E8YR/T、XC-E8X8YR/T、XC-E16YR/T、XC-E16X16YR、XC-E32YR
Y5	Y705	XC-E8YR/T、XC-E8X8YR/T、XC-E16YR/T、XC-E16X16YR、XC-E32YR
Y6	Y706	XC-E8YR/T、XC-E8X8YR/T、XC-E16YR/T、XC-E16X16YR、XC-E32YR
Y7	Y707	XC-E8YR/T、XC-E8X8YR/T、XC-E16YR/T、XC-E16X16YR、XC-E32YR
Y10	Y710	XC-E16YR/T、XC-E16X16YR、XC-E32YR
Y11	Y711	XC-E16YR/T、XC-E16X16YR、XC-E32YR
Y12	Y712	XC-E16YR/T、XC-E16X16YR、XC-E32YR
Y13	Y713	XC-E16YR/T、XC-E16X16YR、XC-E32YR
Y14	Y714	XC-E16YR/T、XC-E16X16YR、XC-E32YR
Y15	Y715	XC-E16YR/T、XC-E16X16YR、XC-E32YR
Y16	Y716	XC-E16YR/T、XC-E16X16YR、XC-E32YR
Y17	Y717	XC-E16YR/T、XC-E16X16YR、XC-E32YR
Y20	Y720	XC-E32YR
Y21	Y721	XC-E32YR
Y22	Y722	XC-E32YR
Y23	Y723	XC-E32YR
X24	Y724	XC-E32YR
X25	Y725	XC-E32YR
Y26	Y726	XC-E32YR
Y27	Y727	XC-E32YR
Y30	Y730	XC-E32YR
Y31	Y731	XC-E32YR
Y32	Y732	XC-E32YR
Y33	Y733	XC-E32YR
Y34	Y734	XC-E32YR
Y35	Y735	XC-E32YR
Y36	Y736	XC-E32YR
Y37	Y737	XC-E32YR

## 15-4. External connection

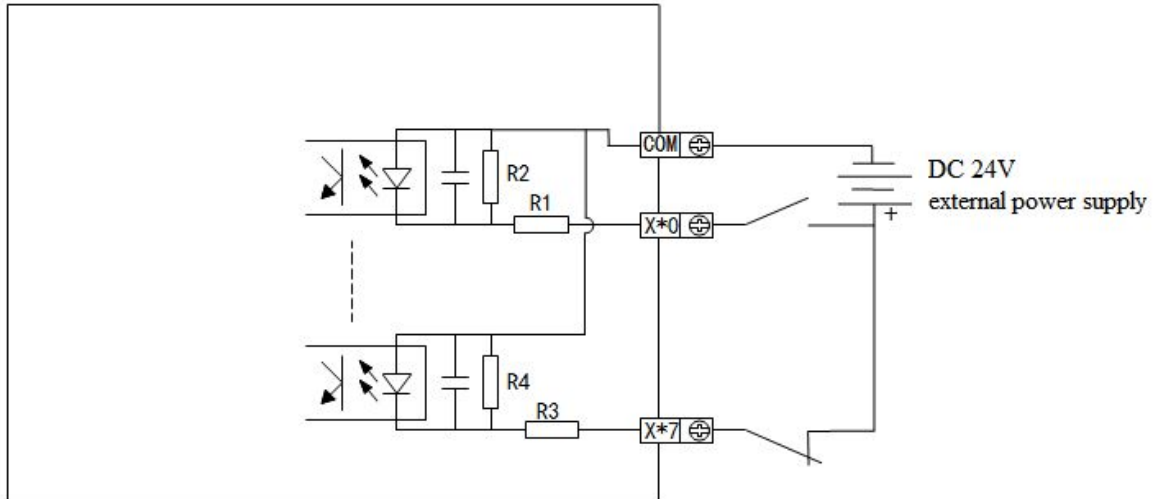
(1) The input terminal connection diagram of XC-E8X8YR:



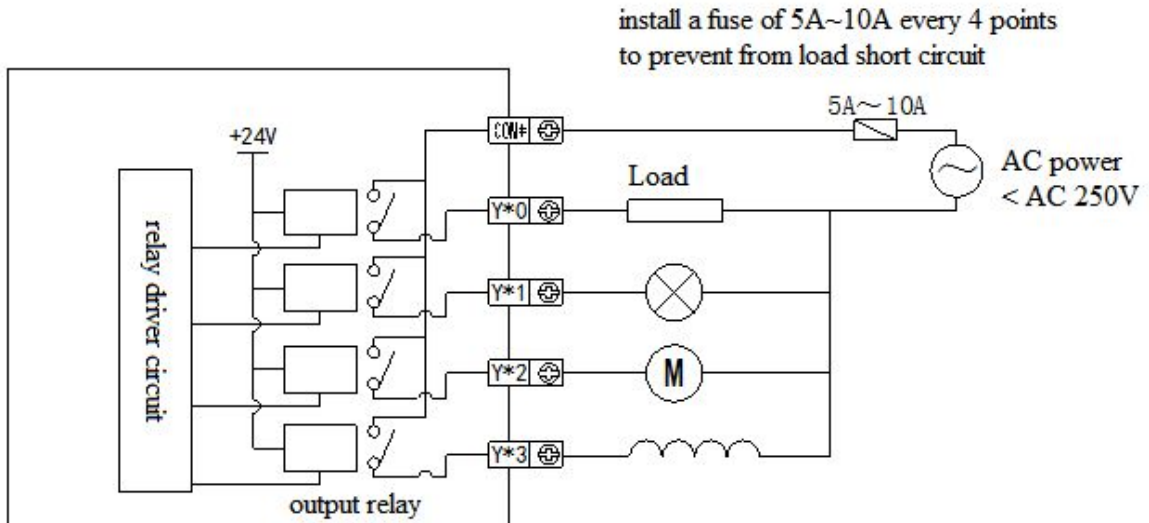
The output terminal connection diagram:



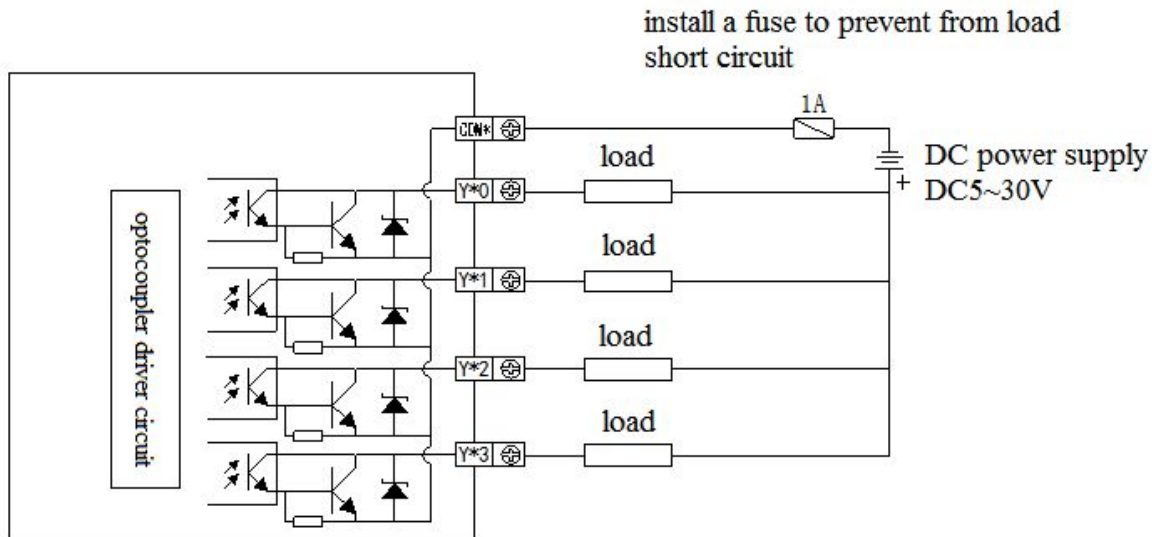
(2) The input terminal connection diagram of XC-E16PX:



(3) The output terminal connection diagram of XC-E16YR module:



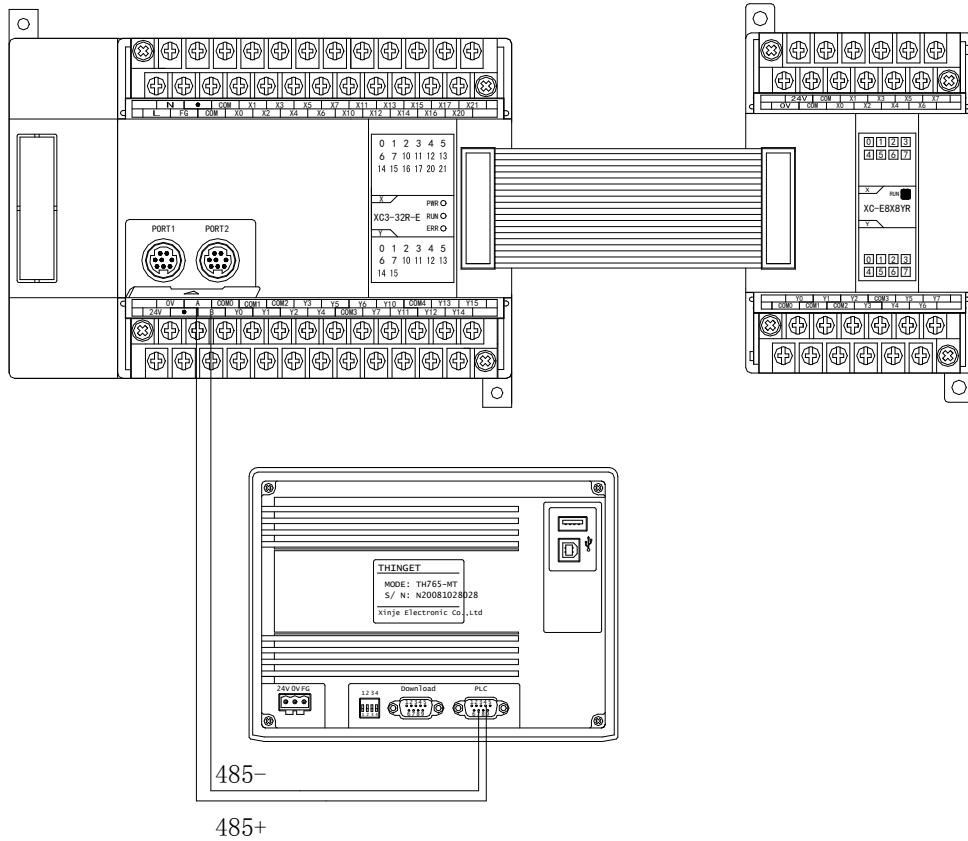
The output terminal connection diagram of XC-E16YT module:



## 15-5. Applications

The application example includes three devices: Xinje XC series PLC (slave station), expansion module XC-E8X8YR and HMI TH765-MT.

The communication between XC-E8X8YR and TH765-MT (Xinje HMI):



In this example, the HMI is the master station, read the input status of extension module to the HMI, writes the coil status of HMI to the extension module.

(1) Hardware connection: Connect XC-E8X8YR with XC3-32R-E, connect AB terminals of XC3-32R-E to AB terminals (PLC port) of TH765-MT.

Communication parameters setting of PLC:

Baud rate: 19200bps, Data bits: 8bits, Stop bits: 1bit, Parity: even, Modbus number: 1, restart the PLC after setting.

Touchwin software settings for TH765-MT:

PLC port device: “Modbus RTU (Panel is master)”, Baud rate: 19200bps, Databits: 8bits, Stopbits: 1bit, Parity: even.

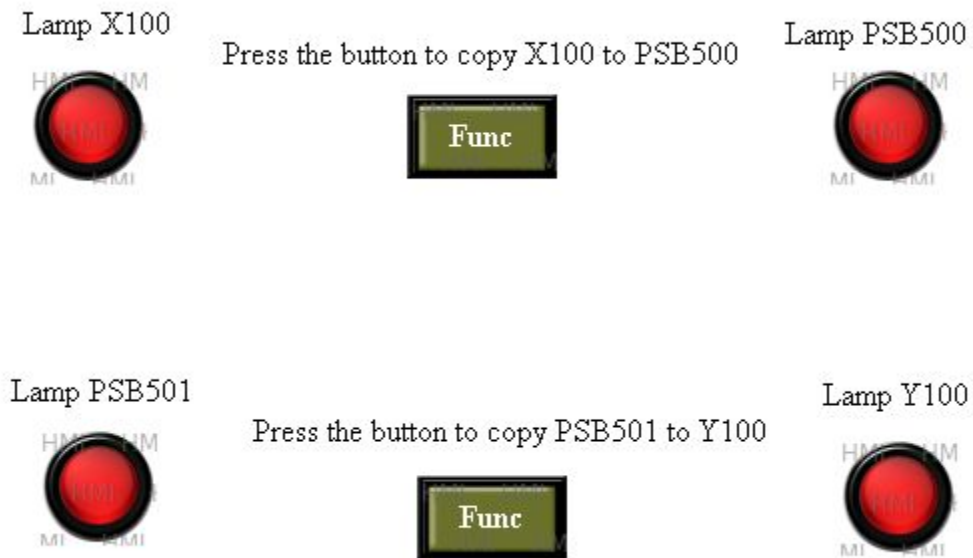
(2) Program application:

The corresponding relationship between expansion module address and HMI address:

HMI address	Expansion module	Related MODBUS address
PSB500	X100	K16448
PSB501	Y100	K18496

(3) HMI screen editing:

The screen of HMI:



Edit the status of X100:

Lamp X100: the Modbus address of expansion module coil X100 is 0x16448 (diagram A).

Function Button: copy the coil status of X100 to PSB500 when the button is pressed (diagram B).

Lamp PSB500: HMI internal coil address is PSB500. (diagram C)

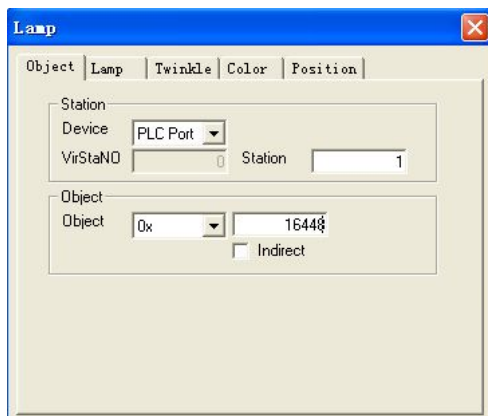


Diagram A

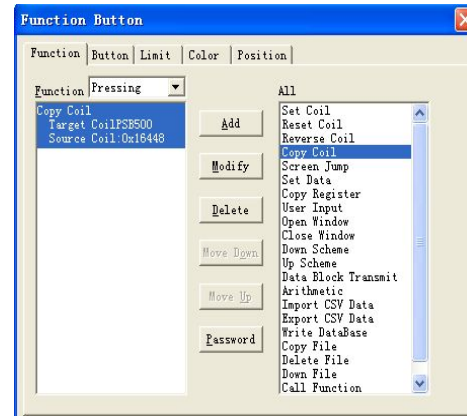


Diagram B

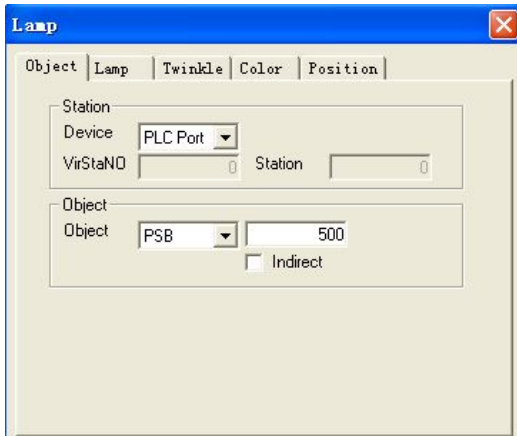


Diagram C

Edit the status of PSB501:

Lamp PSB501: the HMI internal coil address is PSB501 (diagram D);

Function Button: copy the coil status of PSB501 to Y100 when the button is pressed (diagram E);

Lamp Y100: the Modbus address of expansion module coil Y100 is 0x18496 (diagram F).

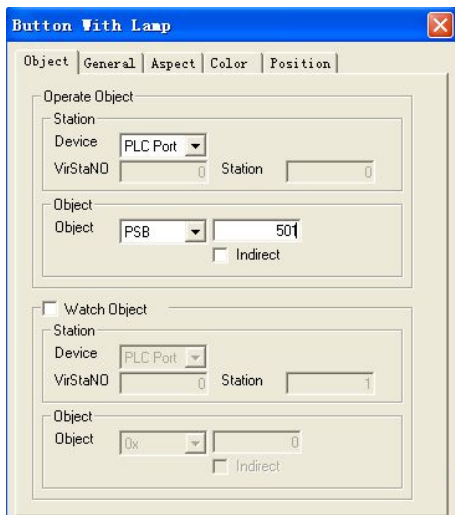


Diagram D

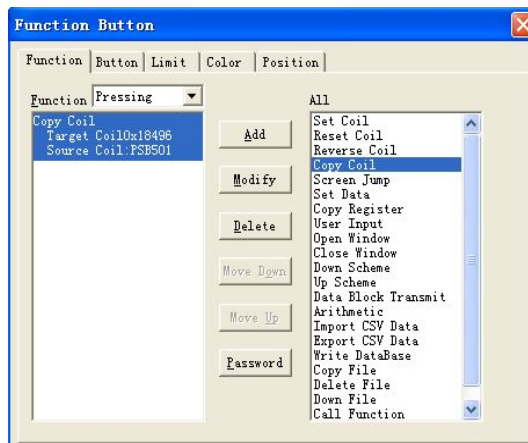


Diagram E

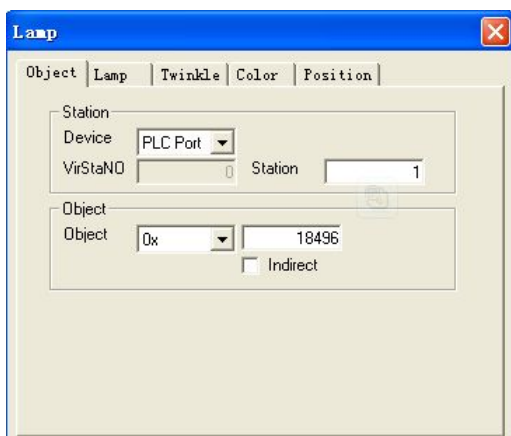


Diagram F

After editing the HMI screen, download it to the HMI and start to work.



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