XL series PLC extension module

User manual

Wuxi XINJE Electric Co., Ltd.

Data No. PL04 20240823EN 1.5

Basic Description

- Thank you for purchasing the Xinje XL series products.
- This manual mainly introduces the product characteristics, specifications, and usage of XL series PLC expansion modules.
- Before using the product, please read this manual carefully and connect the wires with a full understanding of the manual content.
- Please deliver this manual to the end user.

User Notice

- Only operators with certain electrical knowledge can perform wiring and other operations on the product. If there are any unclear areas of use, please consult our technical personnel.
- The examples listed in manuals and other technical materials are for user understanding and reference only, and do not guarantee certain actions.
- When combining this product with other products, please confirm whether it complies with relevant specifications, principles, etc.
- When using this product, please confirm for yourself whether it meets the requirements and is safe.
- Please set up backup and safety functions on your own to avoid machine malfunctions or losses that may occur due to product failures.

Responsibility Statement

- Although the content in the manual has been carefully checked, errors are inevitable, and we cannot guarantee complete consistency.
- We will regularly review the content of the manual and make corrections in subsequent versions. We welcome valuable feedback.
- The content described in the manual is subject to change without prior notice.

Contact Us

If you have any questions about the use of this product, please contact the agent or office where you purchased the product, or you can directly contact Xinje Company.

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Catalog

1. Module information summary

1-1. Module model and configuration

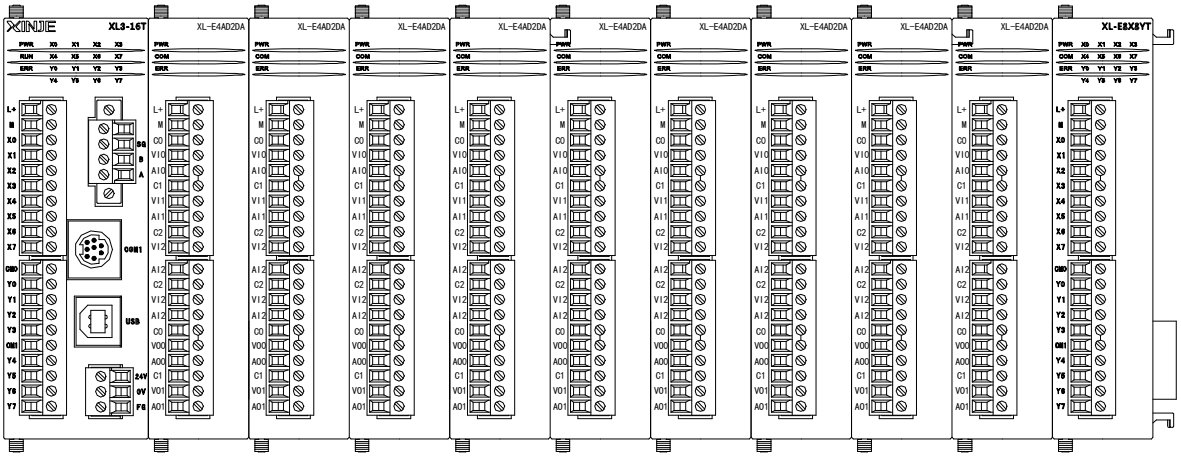
XL series PLC not only has powerful functions of logic processing, data operation and high-speed processing, but also has functions of A/D and D/A conversion. By using input-output expansion module and analog module, XL series PLC has been widely used in process control systems such as temperature, flow and liquid level.

Model and function

Module type	Model	Function
Digital expansion	XL-EnXmY	N inputs, m outputs, NPN input, relay/transistor output
Analog expansion	XL-E4AD	4-channel analog input (14 bits), current and voltage bipolar input
	XL-E4AD2DA	4 channels analog input (14 bits), 2 channels analog output (12 bits). Input output is voltage/current optional
	XL-E8AD-A	8 channels analog input (14 bits), current bipolar input
	XL-E8AD-V	8 channels analog input (14 bits), voltage bipolar input
	XL-E8AD-A-S	8 channels analog input (16 bits), current bipolar input
	XL-E8AD-V-S	8 channels analog input (16 bits), voltage bipolar input
	XL-E4DA	4 channels analog output (12 bits), current/voltage optional
Temperature control	XL-E4PT3-P	4 channels PT100, PT1000 temperature measurement, with PID function
	XL-E4PT3-P-H	4 channels PT100, PT1000 temperature measurement, with PID function
	XL-E4TC-P	4 channels thermocouple temperature measurement, with PID function
Pressure measurement	XL-EnWT-D	N-channel pressure sensor input (23bit), detection range DC-20mV~20mV

Module configuration

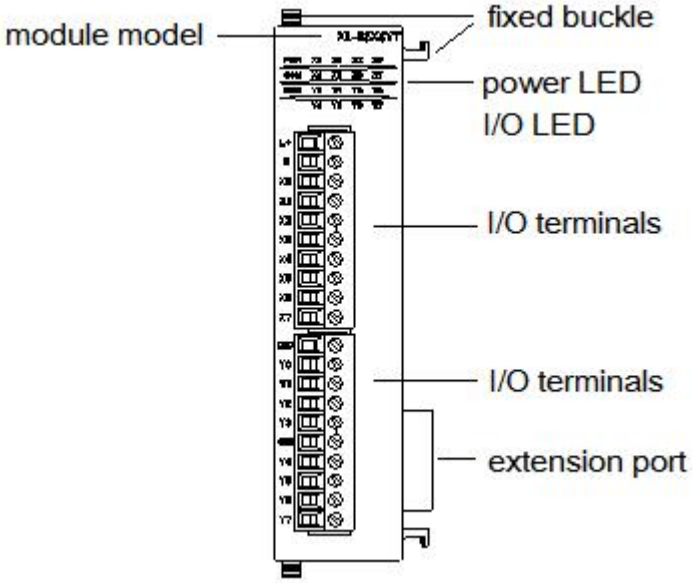
XL series expansion module can be installed on the right side of the main unit and expansion module of XL series PLC.



- The number of digital input and output is octal.
- The number of analog input and output is decimal.
- The XL3 series can connect up to 10 expansion modules, while the XL5/XL5E/XL5N/XL5H/XLME/XLH/XSLH series can connect up to 16 expansion modules. XL1 does not support expansion modules. There are no restrictions on the types, which can be input/output switch quantities, analog quantities, temperature control modules, etc.

Note: When the number of right extension modules connected by XL series PLC is more than 5, it is necessary to connect a terminal resistance module XL-ETR to the right of the last module (requiring the hardware version of XL series right extension module to be H3.1 or more).

1-2. Part name and function



Name	Function	
Fixed buckle	fix the PLC unit and extension module	
Module model	The extension module model	
Extension port	To connect other modules	
I/O terminal	Connect analog input and output, external devices, removable	
Power LED	PWR	The LED lights up when the module has power supply.
	COM	When the module communication port communicates normally, the LED lights on.
	ERR	When there is an error in the module, the LED is always on or flickering (red). When the ERR LED is always on, it indicates that the module has serious application errors and can not be used. It is necessary to adjust the mode of use and switch the PLC to STOP state. When the ERR LED flickers, there are application errors, abnormal work and abnormal data in the module, but the PLC is still RUN.
I/O LED	Input output ON indicator	

1-3. Module power and usage conditions

The XL series right expansion module can only be used normally when the internal and external power of the PLC minus the internal and external power of the module is greater than or equal to 0; If the PLC is configured with an ED module, the internal and external power consumption also needs to be subtracted; If the right expansion module and ED module use external power supply, there is no need to subtract their external power at the PLC.

(1) Module power list

Expansion module model	Internal power (extended cable)	External power (power terminal)
XL-E8X8YR	1.8W	1.5W
XL-E8PX8YR	1.5W	1.3W
XL-E8NPX8YR	1.3W	1.7W
XL-E8X8YT	1.3W	1.5W
XL-E8PX8YT	1W	1.3W
XL-E8NPX8YT	1W	1.7W
XL-E16X	1.1W	2.9W
XL-E16PX	0.9W	2.6W
XL-E16YR	2.7W	0
XL-E16YT	1.7W	0

Expansion module model	Internal power (extended cable)	External power (power terminal)
XL-E16YT-A	1.1W	0
XL-E16X16YT	1.7W	2.9W
XL-E16PX16YT	1.5W	2.7W
XL-E16X16YT-A	1.3W	2.7W
XL-E16PX16YT-A	1.4W	2.6W
XL-E16PX16PYT	1.2W	2.7W
XL-E32X	1.1W	5.5W
XL-E32PX	0.9W	5.2W
XL-E32X-A	1W	5.3W
XL-E32PX-A	0.9W	5.2W
XL-E32YT	2.3W	0
XL-E32YT-A	1.7W	0
XL-E4AD2DA	0.9W	2.5W
XL-E4AD	0.9W	1.1W
XL-E8AD-A	0.8W	1W
XL-E8AD-A-S	0.9W	0.5W
XL-E8AD-V	0.9W	1W
XL-E8AD-V-S	0.9W	0.4W
XL-E4TC-P	1.2W	0.4W
XL-E4PT3-P	1.4W	0.5W
XL-E4PT3-P-H	1.1W	0.4W
XL-E1WT-D	0.7W	0.6W
XL-E2WT-D	0.9W	0.8W
XL-E4WT-D	0.9W	1.6W

(2) PLC power list

PLC model	Internal power	External power
16 points PLC	1.2~1.8W	1.6W
24 points PLC	2.2~3.9W	2.3W
30 points PLC	4.6W	1.9W
32 points PLC	1.4~2.6W	3.1~4.4W
64 points PLC	2.1~2.4W	3.3~3.6W

(3) Others

Model	Internal power	External power
XL-2AD2PT-V-ED and other analog ED module	Very small, negligible	0.2~2.2W
XL-NES-ED	0.6W	None
BOX type ED module	Very small, negligible	0.5~2.5W

1-4. Module installation

Installation environment

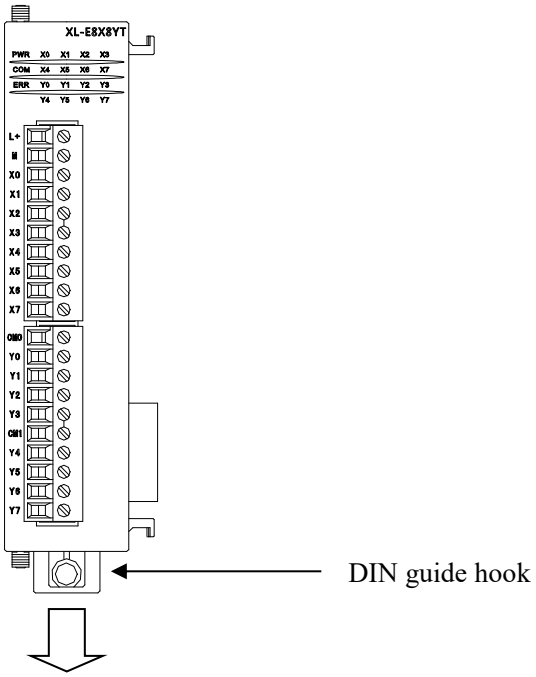
Do not install in the following environments:

- Places in direct sunlight
- Environment temperature exceeded 0-50 centigrade
- Environment humidity exceeded 35-85%
- Where dew occurs because of dramatic changes in temperature
- Places with corrosive and flammable gases
- Dust, iron scraps, salt, smoky places
- Places directly affected by vibration and shock
- Places for spraying water, oil and medicine
- A place where a strong magnetic field or electric field is produced

Installation

XL series analog input and output, temperature control module can be installed on the right side of the main unit and expansion module of XL series PLC. The installation can use DIN46277 guideway (35 mm wide).

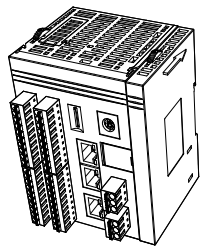
- Use DIN46277 guideway



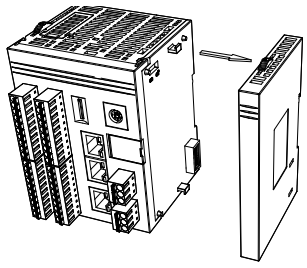
The basic unit and expansion module are installed on the DIN46277 guideway (35 mm wide). To dismantle, just pull down the assembly hook of DIN guide rail and take off the product.

- Installation process

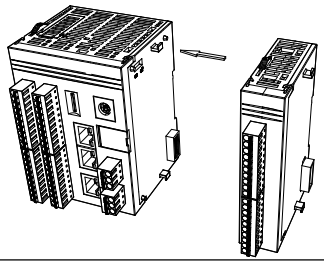
Taking the first expansion module as an example, explain the installation steps below:



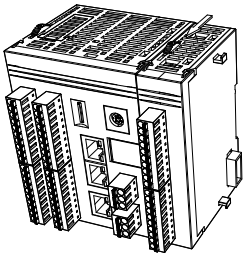
1. Find the back cover on the right side of the PLC, and push the back cover in the direction of the arrow shown in the diagram;



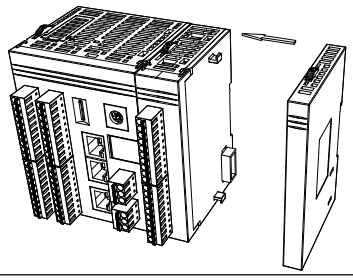
2. Take off the back cover



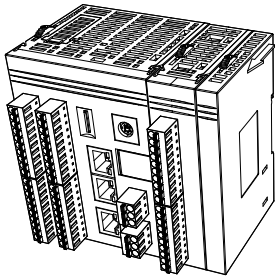
3. There is a expansion port on the right side of the PLC. Align it with the access port on the left side of the module to be installed and install it



4. Push the fixing clip of the module in the direction of the arrow shown in the diagram to fix the module.



5. Install the back cover removed in step 2 on the right side of the expansion module.



6. Push the upper and lower fixing clips of the back cover in the direction of the arrow shown in the diagram to fix the back cover.

Wiring requirement

Apart from the XL series 32-point extension module and XL-E16YT-A, which needs to use an external terminal for wiring, other modules can directly insert the cable into the corresponding wiring hole.

Cautions:

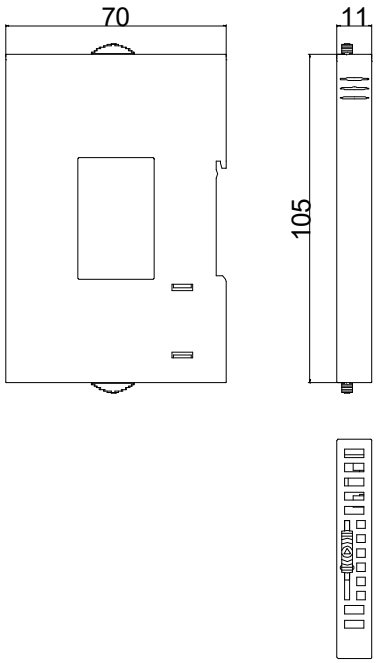
1. Please confirm the specifications and select the appropriate modules.
2. When processing screw holes and wiring, do not let chips and wire chips fall into the module.
3. Before connecting, please reconfirm the specifications of modules and connecting equipment to ensure that there is no problem.
4. When connecting, please pay attention to whether the connection is firm or not. If the connection falls off, it will cause data incorrect, short circuit and other faults.
5. Installation, wiring and other operations must be carried out after cutting off all the power supply.

1-5. Terminal resistance module XL-ETR

When the number of right extension modules of XL series PLC is more than 5, the terminal resistance module XL-ETR must be used together.
XL-ETR is only applicable to XL series right extension modules of hardware version H3.1 and above.

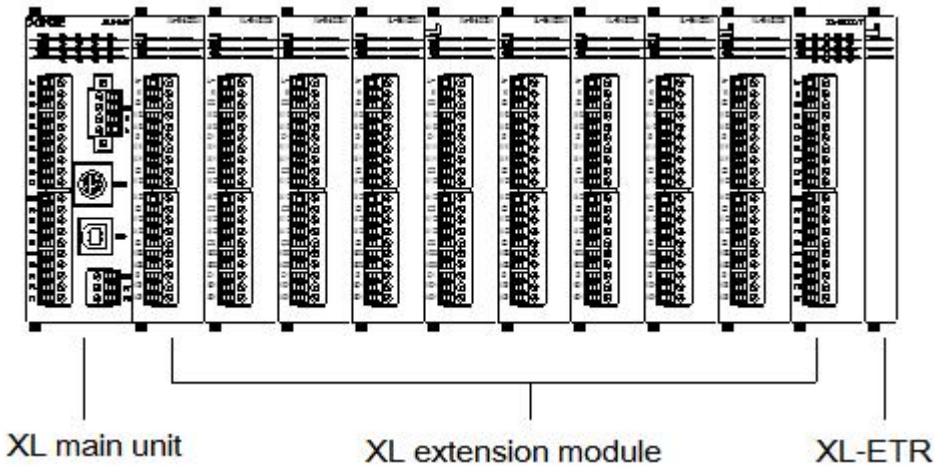
Dimension

Unit: mm



Installation

When using, please install XL-ETR on the right side of the last extension module and connect the interface slot of the module as shown in the following figure:


XL main unit
XL extension module
XL-ETR

2. I/O extension module XL-EnXmY

2-1. Module features and specifications

XL series PLC can expand XL-EnXmY digital input and output module externally. Each XL3 series PLC can expand 10 modules, XL5/XL5E can expand 16 modules, XL1 does not support expansion module. The module is rich in types and compact in shape, which makes it possible for more input and output points and meets the actual production needs.

Naming rule

XL－E ○ □ ○ □－□

① ② ③ ④ ⑤ ⑥ ⑦

①	Series name	XL: XL series expansion module
②	Expansion module	E: expansion module
③	Input points	8/16/32
④	Input type	X: NPN type input PX: PNP type input
⑤	Output points	8/16/32
⑥	Output type	YT: Transistor output YR: Relay output
⑦	Interface type	No: European terminal A: Horn terminal, requires external terminal block

Models

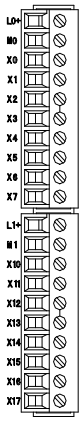
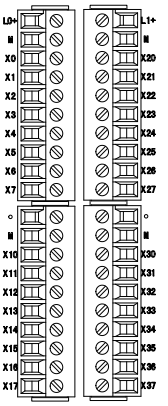
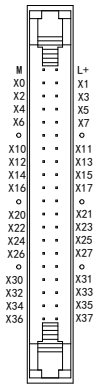
Model		Function
NPN input	PNP input	
XL-E8X8YR	XL-E8PX8YR	8 channels digital input, 8 channels relay output
XL-E8NPX8YR		8 channels digital bipolar input, 8 channels relay output
XL-E8X8YT	XL-E8PX8YT	8 channels digital input, 8 channels transistor output
XL-E8NPX8YT		8 channels digital bipolar input, 8 channels

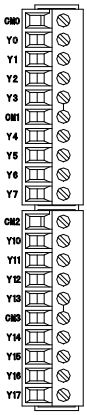
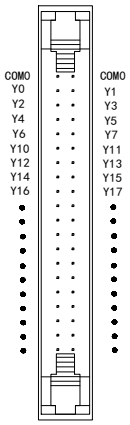
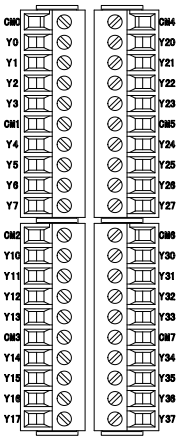
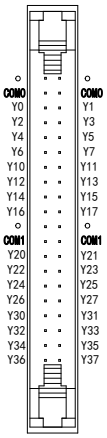
		transistor output
XL-E16X	XL-E16PX	16 channels digital input
XL-E16YR	-	16 channels relay output
XL-E16YT	-	16 channels transistor output
XL-E16YT-A	-	16 channels transistor output (horn terminals)
XL-E16X16YT	XL-E16PX16YT	16 channels digital input, 16 channels transistor output
-	XL-E16PX16PYT	16 channels PNP digital input, 16 channels PNP transistor output
XL-E16X16YT-A	XL-E16PX16YT-A	16 channels digital input, 16 channels transistor output (horn terminal)
XL-E32X	XL-E32PX	32 channels digital input
XL-E32X-A	XL-E32PX-A	32 channels digital input (horn terminals)
XL-E32YT	-	32 channels transistor output
XL-E32YT-A	-	32 channels transistor output (horn terminals)

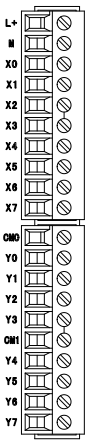
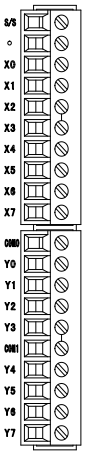
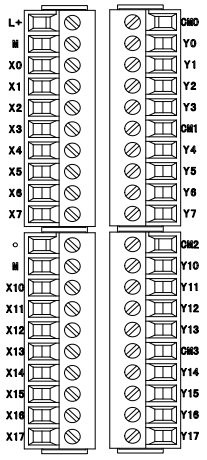
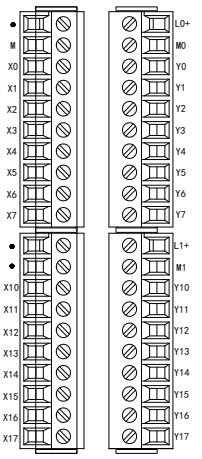
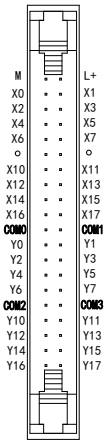
Module specification

Item	Specification
Power supply	DC24V±10%
Environment	Non-corrosive gas
Temperature	0℃~55℃
Humidity	5~95%
Installation	Direct mounting on DIN46277 (35 mm wide) rail

2-2. Terminal arrangement

XL-E16X	XL-E32X	XL-E32X-A
		

XL-E16YR, XL-E16YT	XL-E16YT-A	XL-E32YT	XL-E32YT-A
			

XL-E8X8YR XL-E8X8YT	XL-E8NPX8YT XL-E8NPX8YR	XL-E16X16YT	XL-E16PX16PYT	XL-E16X16YT-A
				

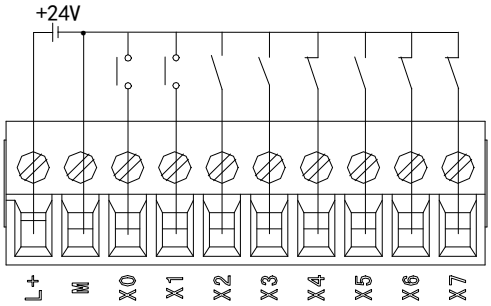
2-3. Input wiring and specification

2-3-1. NPN input specification and wiring

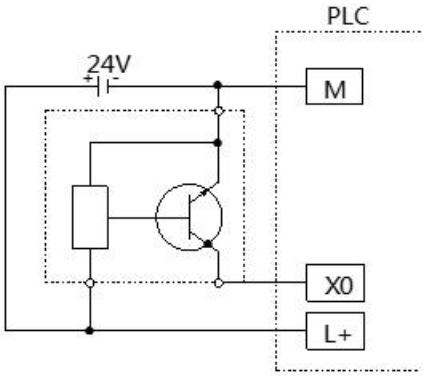
NPN input specification:

Input signal voltage	DC24V±10%
Input signal current	7mA/DC24V
Input ON current	Below 4.5mA
Input OFF current	Below 1.5mA
Input response time	About 10ms
Input signal form	Contact input or NPN open collector transistor
Circuit insulation	Optoelectronic coupling insulation
Input action display	LED lights up when input is ON

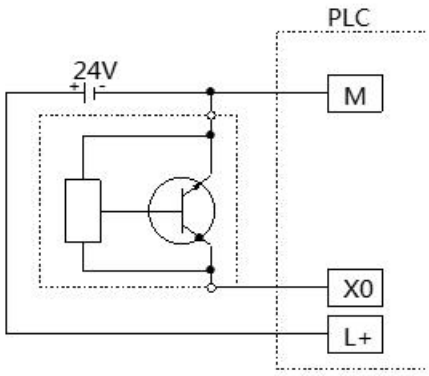
NPN input terminal wiring method:



Button wiring example



3-wire (NPN) proximity switch wiring



2-wire (NO/NC) proximity switch wiring

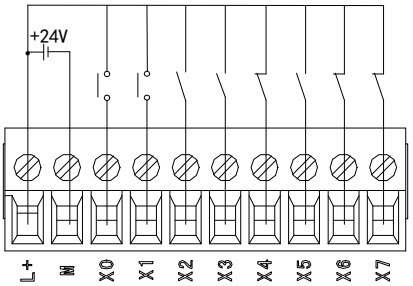
2-3-2. PNP input specification and wiring

PNP input specification:

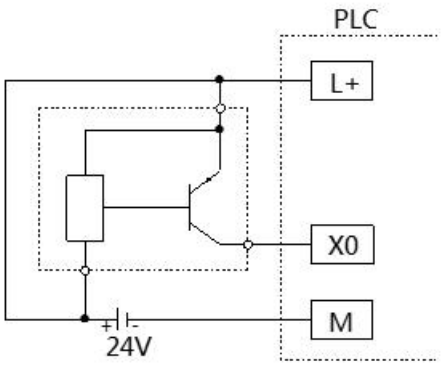
Input signal voltage	DC24V±10%
Input signal current	7mA/DC24V
Input ON current	Below 4.5mA
Input OFF current	Below 1.5mA
Input response time	About 10ms
Input signal form	Contact input PNP open collector transistor
Circuit insulation	Optoelectronic coupling insulation
Input action display	LED lights up when input is ON

PNP input terminal wiring method:

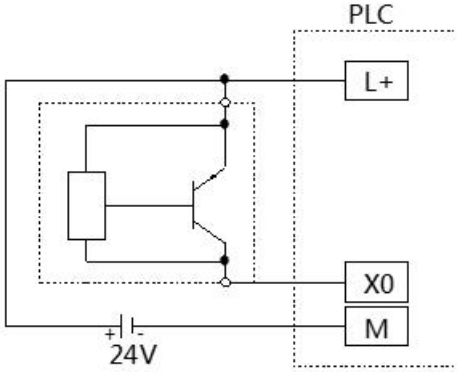
Gereral models:



Button wiring example

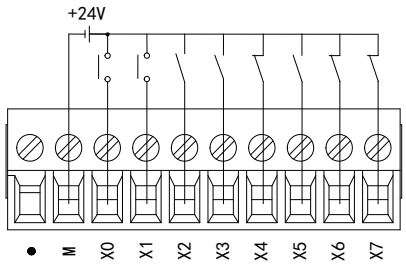


3-wire (PNP) proximity switch wiring

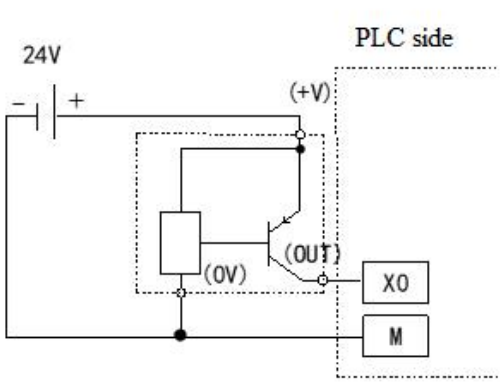


2-wire (NO/NC) proximity switch wiring

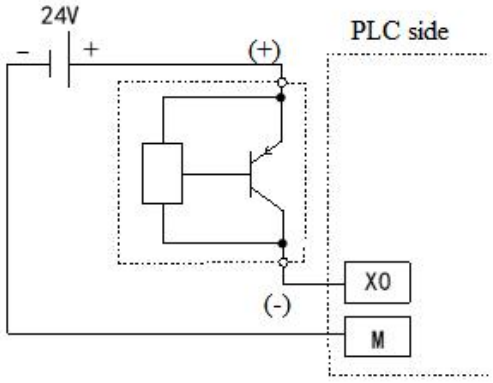
XL-E16PX16PYT:



Button wiring example



3-wire proximity switch wiring



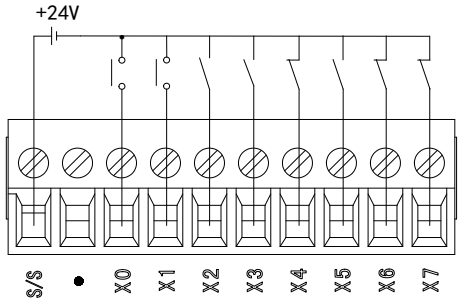
2-wire proximity switch wiring

2-3-3. NPN&PNP bipolar input specification and wiring

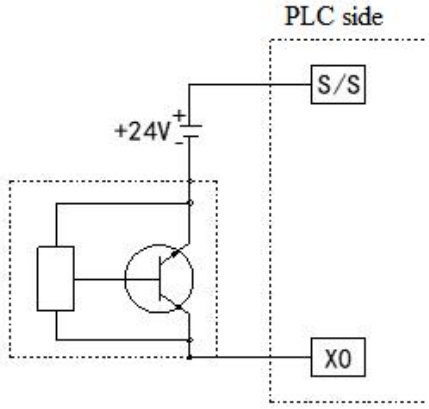
Input specification:

Input signal voltage	DC24V±10%
Input signal current	7mA/DC24V
Input ON current	Below 4.5mA
Input OFF current	Below 1.5mA
Input response time	About 10ms
Input signal form	Contact input NPN or PNP open collector transistor
Circuit insulation	Optoelectronic coupling insulation
Input action display	LED lights up when input is ON

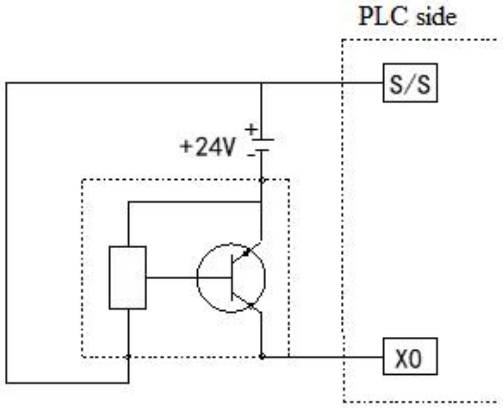
NPN mode wiring example:



Button wiring example

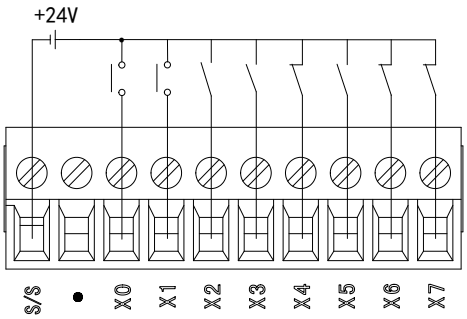


2-wire (NO or NC) proximity switch wiring

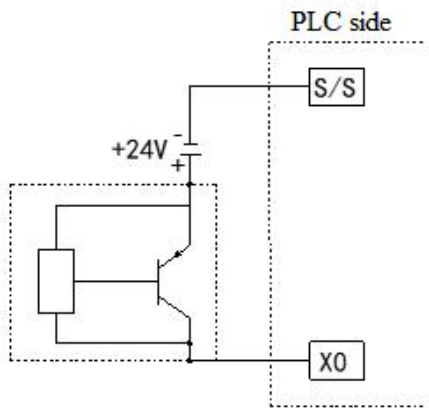


3-wire (NPN) proximity switch wiring

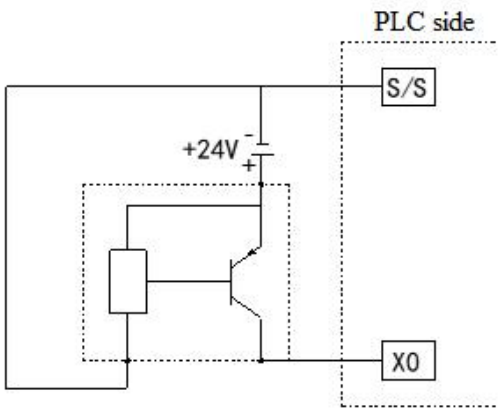
PNP mode wiring example:



Button wiring example



2-wire (NO or NC) proximity switch wiring



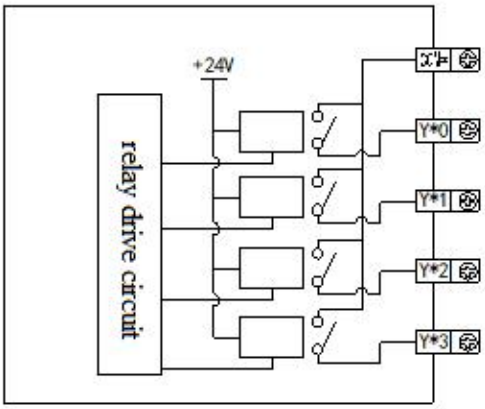
3-wire (PNP) proximity switch wiring

2-4. Output wiring and specification

Output specification:

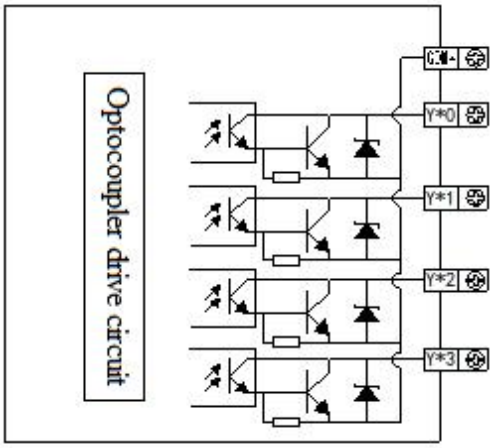
(1) Relay output

External power supply		Below AC250V, DC30V
Circuit insulation		Mechanical insulation
Action display		LED light
Max load	Resistive	3A
	Inductive	80VA
	Light	100W
Min load		DC5V 2mA
Response time	OFF→ON	10ms
	ON→OFF	10ms



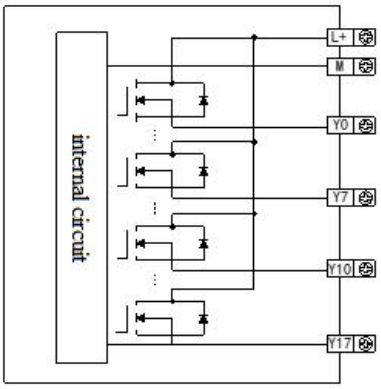
(2) General transistor output (NPN)

External power supply		Below DC5~30V
Circuit insulation		Optocoupler insulation
Action display		LED light
Max load	Resistive	0.3A
	Inductive	7.2W/DC24V
	Light	1.5W/DC24V
Min load		DC5V 2mA
Open circuit leakage current		Below 0.1mA
Response time	OFF→ON	Below 0.2ms
	ON→OFF	Below 0.2ms



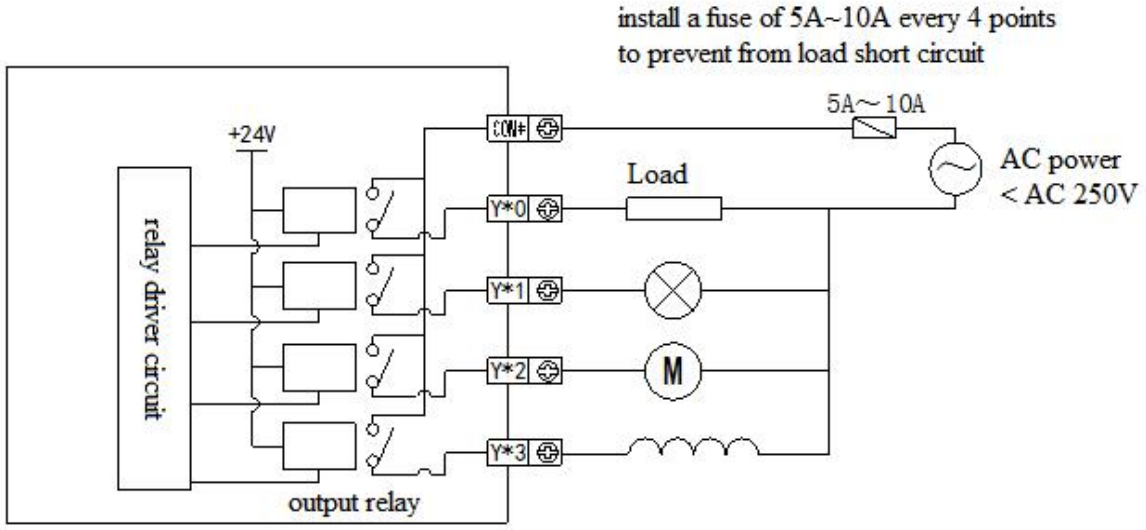
(3) General transistor output (PNP)

External power supply		Below DC5~30V
Circuit insulation		Optocoupler insulation
Action display		LED light
Max load	Resistive	0.3A
Min load		DC5V 2mA
Open circuit leakage current		Below 0.1mA
Response time	OFF→ON	Below 0.2ms
	ON→OFF	Below 0.2ms

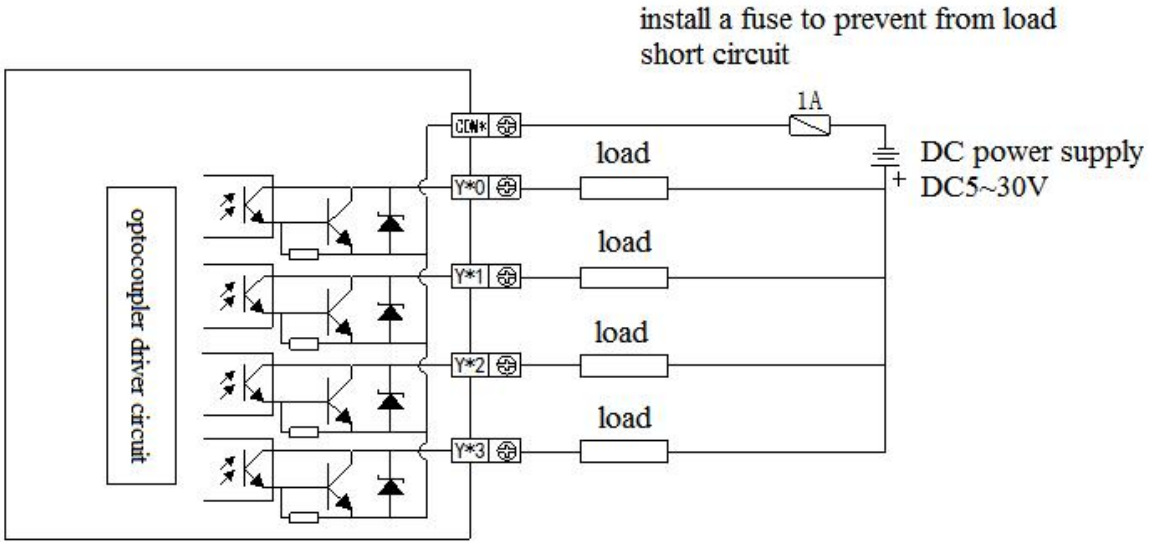


Output wiring method:

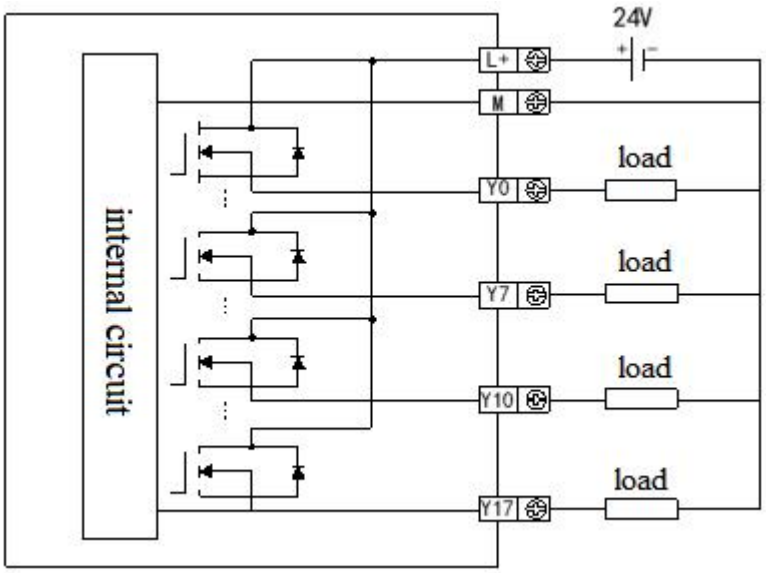
Relay type



Transistor type (NPN)



Transistor type (PNP)



2.5 Wiring head specifications

The wiring must be consistent with the following requirements in connection with the XL-E8X8YR, XL-E8PX8YR, XL-E8X8YT, XL-E8PX8YT, XL-E8NPX8YT, XL-E8NPX8YR, XL-E16X, XL-E16PX, XL-E16YR, XL-E16YT modules:

(1) The stripping length is 9 mm;

(2) Flexible conductors with bare tubular ends are 0.25-1.5 square meter.

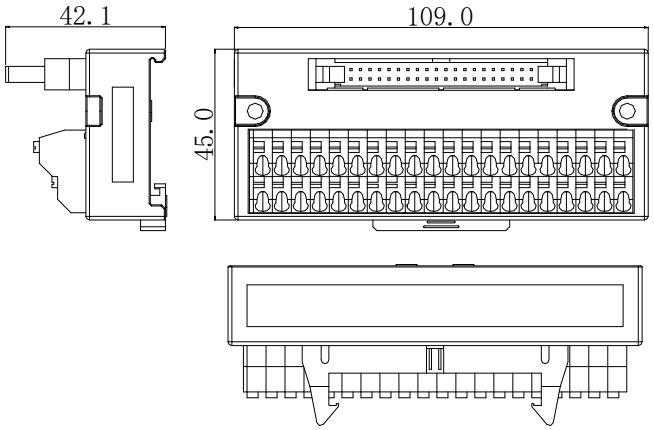
(3) Flexible conductor with tubular pre-insulated end is 0.25-0.5 square meter.

2-6. External terminal block

XL-A modules have horn terminals, which need external terminals. Xinje provides adapter terminals and connection cables for users to choose from. A list of module models and adapter terminals and connecting cables:

Module	Terminal	Cable
XL-E16YT-A	JT-E16YT-A	JC-TE32-NN05 (0.5m) JC-TE32-NN10 (1.0m) JC-TE32-NN15 (1.5m)
XL-E16X16YT-A	JT-E16X16YT	
XL-E16PX16YT-A		
XL-E32X-A	JT-E32X	
XL-E32PX-A		
XL-E32YT-A	JT-E32YT	

- **Terminal appearance** **(Unit: mm)**



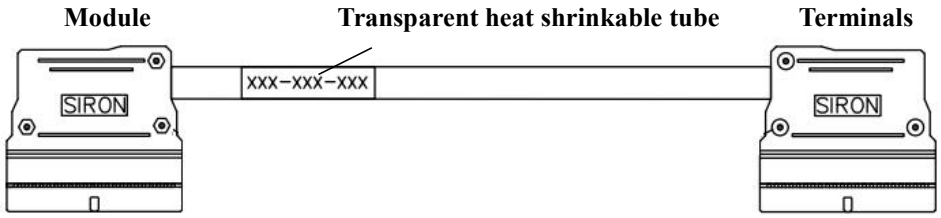
- **Wiring method**

When wiring, press the spring switch with the slotted screwdriver, insert the wire into the corresponding holes, and loosen the spring switch. The length of the cable skin stripping is 1.5 cm.

- **Connection cable**

External terminals need to cooperate with the use of connecting cables, Xinje provides JC-TE32-NNN05, JC-TE32-NN10, JC-TE32-NN15 three different length of cables for users to choose and purchase. When connecting, please note that the end closing to the transparent heat shrinkable tube connects the module, the other end connects to the terminals, can not be reversed!!!

Wiring diagram:



2-7. I/O definition number

The addresses of the input and output terminals of the XL Series I/O Extension Module are as follows:

Note: The terminal definitions and addresses of NPN and PNP type modules are the same.

- **#1~#16 extension module input terminal X0~X37 definition:**

	#1	#2	#3	#4	#5	#6	#7	#8
X0	X10000	X10100	X10200	X10300	X10400	X10500	X10600	X10700
X1	X10001	X10101	X10201	X10301	X10401	X10501	X10601	X10701

…	…	…	…	…	…	…	…	…
X7	X10007	X10107	X10207	X10307	X10407	X10507	X10607	X10707
X10	X10010	X10110	X10210	X10310	X10410	X10510	X10610	X10710
…	…	…	…	…	…	…	…	…
X17	X10017	X10117	X10217	X10317	X10417	X10517	X10617	X10717
X20	X10020	X10120	X10220	X10320	X10420	X10520	X10620	X10720
…	…	…	…	…	…	…	…	…
X27	X10027	X10127	X10227	X10327	X10427	X10527	X10627	X10727
X30	X10030	X10130	X10230	X10330	X10430	X10530	X10630	X10730
…	…	…	…	…	…	…	…	…
X36	X10036	X10136	X10236	X10336	X10436	X10536	X10636	X10736
X37	X10037	X10137	X10237	X10337	X10437	X10537	X10637	X10737
	#9	#10	#11	#12	#13	#14	#15	#16
X0	X11000	X11100	X11200	X11300	X11400	X11500	X11600	X11700
X1	X11001	X11101	X11201	X11301	X11401	X11501	X11601	X11701
…	…	…	…	…	…	…	…	…
X7	X11007	X11107	X11207	X11307	X11407	X11507	X11607	X11707
X10	X11010	X11110	X11210	X11310	X11410	X11510	X11610	X11710
…	…	…	…	…	…	…	…	…
X17	X11017	X11117	X11217	X11317	X11417	X11517	X11617	X11717
X20	X11020	X11120	X11220	X11320	X11420	X11520	X11620	X11720
…	…	…	…	…	…	…	…	…
X27	X11027	X11127	X11227	X11327	X11427	X11527	X11627	X11727
X30	X11030	X11130	X11230	X11330	X11430	X11530	X11630	X11730
…	…	…	…	…	…	…	…	…
X36	X11036	X11136	X11236	X11336	X11436	X11536	X11636	X11736
X37	X11037	X11137	X11237	X11337	X11437	X11537	X11637	X11737

- **#1~#16 extension module output terminal Y0~Y37 definition:**

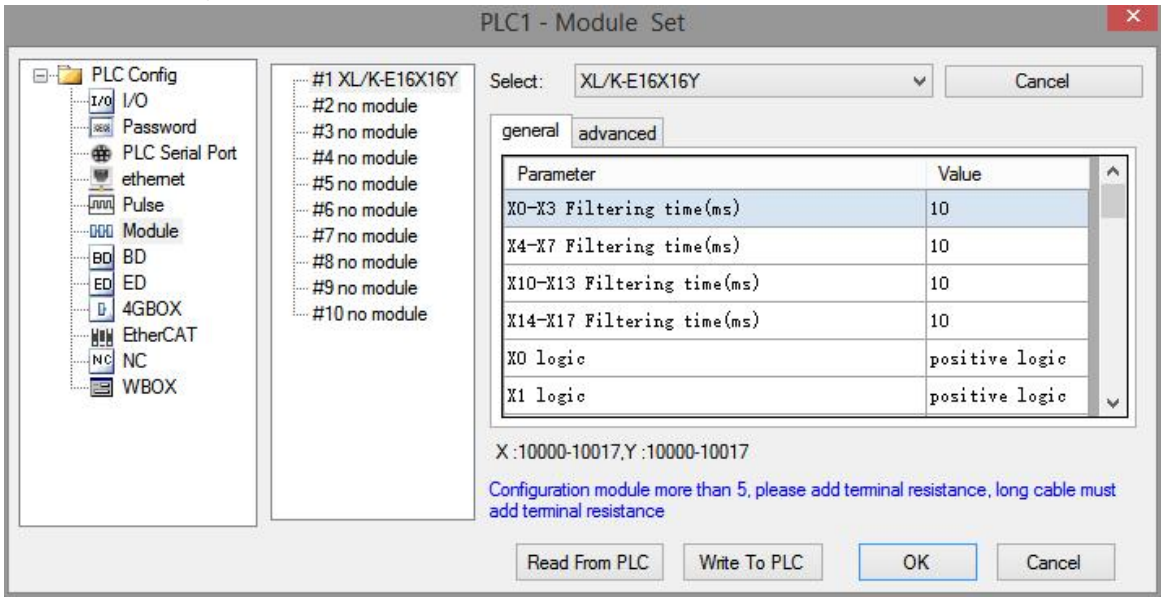
	#1	#2	#3	#4	#5	#6	#7	#8
Y0	Y10000	Y10100	Y10200	Y10300	Y10400	Y10500	Y10600	Y10700
Y1	Y10001	Y10101	Y10201	Y10301	Y10401	Y10501	Y10601	Y10701
…	…	…	…	…	…	…	…	…
Y7	Y10007	Y10107	Y10207	Y10307	Y10407	Y10507	Y10607	Y10707
Y10	Y10010	Y10110	Y10210	Y10310	Y10410	Y10510	Y10610	Y10710
…	…	…	…	…	…	…	…	…
Y17	Y10017	Y10117	Y10217	Y10317	Y10417	Y10517	Y10617	Y10717
Y20	Y10020	Y10120	Y10220	Y10320	Y10420	Y10520	Y10620	Y10720
…	…	…	…	…	…	…	…	…
Y27	Y10027	Y10127	Y10227	Y10327	Y10427	Y10527	Y10627	Y10727

Y30	Y10030	Y10130	Y10230	Y10330	Y10430	Y10530	Y10630	Y10730
…	…	…	…	…	…	…	…	…
Y36	Y10036	Y10136	Y10236	Y10336	Y10436	Y10536	Y10636	Y10736
Y37	Y10037	Y10137	Y10237	Y10337	Y10437	Y10537	Y10637	Y10737
	#9	#10	#11	#12	#13	#14	#15	#16
Y0	Y11000	Y11100	Y11200	Y11300	Y11400	Y11500	Y11600	Y11700
Y1	Y11001	Y11101	Y11201	Y11301	Y11401	Y11501	Y11601	Y11701
…	…	…	…	…	…	…	…	…
Y7	Y11007	Y11107	Y11207	Y11307	Y11407	Y11507	Y11607	Y11707
Y10	Y11010	Y11110	Y11210	Y11310	Y11410	Y11510	Y11610	Y11710
…	…	…	…	…	…	…	…	…
Y17	Y11017	X11117	X11217	X11317	X11417	X11517	X11617	X11717
Y20	Y11020	Y11120	Y11220	Y11320	Y11420	Y11520	Y11620	Y11720
…	…	…	…	…	…	…	…	…
Y27	Y11027	Y11127	Y11227	Y11327	Y11427	Y11527	Y11627	Y11727
Y30	Y11030	Y11130	Y11230	Y11330	Y11430	Y11530	Y11630	Y11730
…	…	…	…	…	…	…	…	…
Y36	Y11036	Y11136	Y11236	Y11336	Y11436	Y11536	Y11636	Y11736
Y37	Y11037	Y11137	Y11237	Y11337	Y11437	Y11537	Y11637	Y11737

2-8. Module parameters

Positive and negative logic can be adjusted and filtering time can be adjusted. There are two configuration modes:

A. Set through the software



B. Set through SFD register

Module number	SFD address	Module number	SFD address
#1	SFD350~SFD359	#9	SFD430~SFD439
#2	SFD360~SFD369	#10	SFD440~SFD449
#3	SFD370~SFD379	#11	SFD450~SFD459
#4	SFD380~SFD389	#12	SFD460~SFD469
#5	SFD390~SFD399	#13	SFD470~SFD479
#6	SFD400~SFD409	#14	SFD480~SFD489
#7	SFD410~SFD419	#15	SFD490~SFD499
#8	SFD420~SFD429	#16	SFD500~SFD509

The first 20 bytes of OMMAND information are allocated as follows:

- **XL-E8X8Y**

	Byte0	Byte1	Byte2	Byte3	Byte4	Byte5	Byte6~Byte19
Bit7	X0~X3 filtering time	X4~X7 filtering time	-	-	-	-	-
Bit6			X3 logic	X7 logic	Y3 logic	Y7 logic	-
Bit5			-	-	-	-	-
Bit4			X2 logic	X6 logic	Y2 logic	Y6 logic	-
Bit3			-	-	-	-	-
Bit2			X1 logic	X5 logic	Y1 logic	Y5 logic	-
Bit1			-	-	-	-	-
Bit0			X0 logic	X4 logic	Y0 logic	Y4 logic	-
Notes	Filtering time (unit: ms): 1~5, 10(default), 15, 20, 25, 30, 35, 40, 45, 50		Note: 0 is positive logic, 1 is negative logic				-

- **XL-E16X**

	Byte0	Byte1	Byte2	Byte3	Byte 4	Byte 5	Byte 6	Byte 7	Byte8~Byte19
Bit7	X0~X3 filtering time	X4~X7 filtering time	X10~X13 filtering time	X14~X17 filtering time	-	-	-	-	-
Bit6					X3 logic	X7 logic	X13 logic	X17 logic	-
Bit5					-	-	-	-	-
Bit4					X2 logic	X6 logic	X12 logic	X16 logic	-
Bit3					-	-	-	-	-
Bit2					X1 logic	X5 logic	X11 logic	X15 logic	-
Bit1					-	-	-	-	-
Bit0					X0 logic	X4 logic	X10 logic	X14 logic	-

Notes	Filtering time (unit: ms): 1~5, 10(default), 15, 20, 25, 30, 35, 40, 45, 50	Note: 0 is positive logic, 1 is negative logic	-

- **XL-E16X16Y**

	Bit0	Bit1	Bit2	Bit3	Bit4	Bit5	Bit6	Bit7	Explanation
Byte0	X0~X3 filtering time								Filtering time (unit: ms): 1~5, 10(default), 15, 20, 25, 30, 35, 40, 45, 50
Byte1	X4~X7 filtering time								
Byte2	X10~X13 filtering time								
Byte3	X14~X17 filtering time								
Byte4	X0 logic	-	X1 logic	-	X2 logic	-	X3 logic	-	Note: 0 is positive logic, 1 is negative logic
Byte5	X4 logic	-	X5 logic	-	X6 logic	-	X7 logic	-	
Byte6	X10 logic	-	X11 logic	-	X12 logic	-	X13 logic	-	
Byte7	X14 logic	-	X15 logic	-	X16 logic	-	X17 logic	-	
Byte8	Y0 logic	-	Y1 logic	-	Y2 logic	-	Y3 logic	-	
Byte9	Y4 logic	-	Y5 logic	-	Y6 logic	-	Y7 logic	-	
Byte10	Y10 logic	-	Y11 logic	-	Y12 logic	-	Y13 logic	-	
Byte11	Y14 logic	-	Y15 logic	-	Y16 logic	-	Y17 logic	-	
Byte 12~19	-	-	-	-	-	-	-	-	

- **XL-E16Y/XL-E32Y**

	Bit0	Bit1	Bit2	Bit3	Bit4	Bit5	Bit6	Bit7	Explanation
Byte0	Y0 logic	-	Y1logic	-	Y2 logic	-	Y3 logic	-	Note: 0 is positive logic, 1 is negative logic
Byte1	Y4 logic	-	Y5 logic	-	Y6 logic	-	Y7 logic	-	
Byte2	Y10 logic	-	Y11 logic	-	Y12 logic	-	Y13 logic	-	
Byte3	Y14 logic	-	Y15 logic	-	Y16 logic	-	Y17 logic	-	
Byte4	Y20 logic	-	Y21 logic	-	Y22 logic	-	Y23 logic	-	
Byte5	Y24 logic	-	Y25 logic	-	Y26 logic	-	Y27 logic	-	
Byte6	Y30 logic	-	Y31 logic	-	Y32 logic	-	Y33 logic	-	
Byte7	Y34	-	Y35	-	Y36	-	Y37	-	

	logic		logic		logic		logic		
Byte8~19	-	-	-	-	-	-	-	-	

- **XL-E32X**

	Bit0	Bit1	Bit2	Bit3	Bit4	Bit5	Bit6	Bit7	Explanation
Byte0	X0~X3 filtering time								Filtering time (unit: ms): 1~5, 10(default), 15, 20, 25, 30, 35, 40, 45, 50
Byte1	X4~X7 filtering time								
Byte2	X10~X13 filtering time								
Byte3	X14~X17 filtering time								
Byte4	X20~X23 filtering time								
Byte5	X24~X27 filtering time								
Byte6	X30~X33 filtering time								
Byte7	X34~X37 filtering time								
Byte8	X0 logic	-	X1 logic	-	X2 logic	-	X3 logic	-	Note: 0 is positive logic, 1 is negative logic
Byte9	X4 logic	-	X5 logic	-	X6 logic	-	X7 logic	-	
Byte10	X10 logic	-	X11 logic	-	X12 logic	-	X13 logic	-	
Byte11	X14 logic	-	X15 logic	-	X16 logic	-	X17 logic	-	
Byte12	X20 logic	-	X21 logic	-	X22 logic	-	X23 logic	-	
Byte13	X24 logic	-	X25 logic	-	X26 logic	-	X27 logic	-	
Byte14	X30 logic	-	X31 logic	-	X32 logic	-	X33 logic	-	
Byte15	X34 logic	-	X35 logic	-	X36 logic	-	X37 logic	-	
Byte 16~19	-	-	-	-	-	-	-	-	

Note:

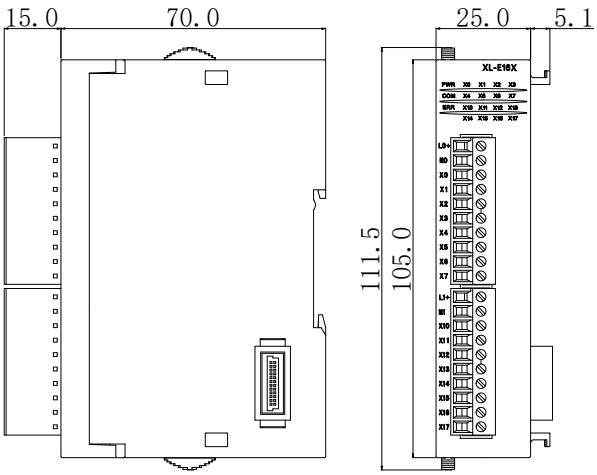
In positive logic, X terminal is ON, X-terminal signal is ON, X terminal is OFF and X-terminal signal is OFF.

In negative logic, X terminal is ON, X terminal signal is OFF, X terminal is OFF, X-terminal signal is ON.

Default is positive logic, usually without modification.

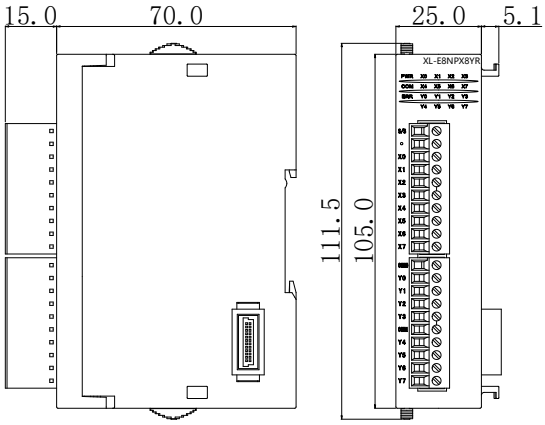
2-9. Dimension

Unit: mm



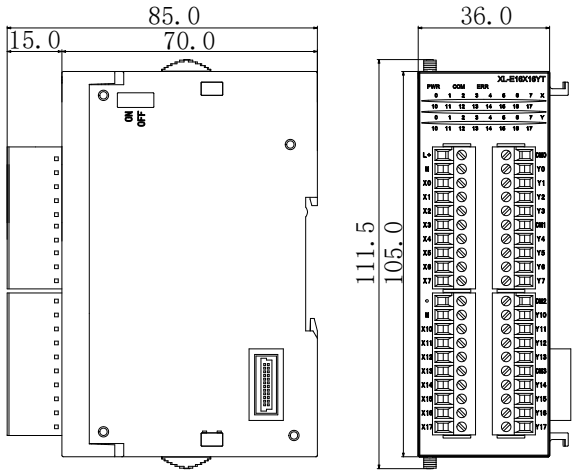
Suitable modules

Input	Output	Input/output
XL-E16X	XL-E8X8YR	XL-E16YR
XL-E16PX	XL-E8PX8YR	XL-E16YT
	XL-E8X8YT	
	XL-E8PX8YT	



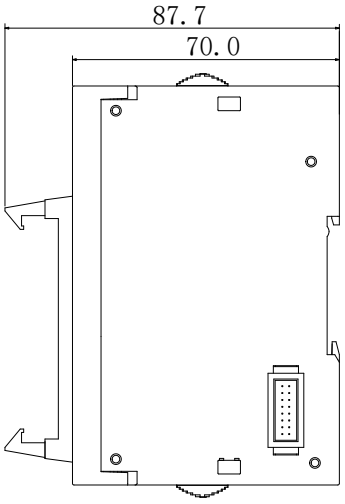
Suitable modules

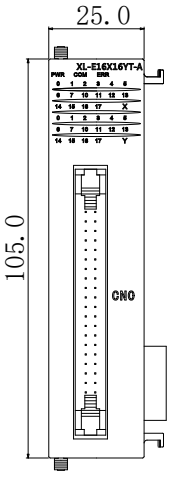
Input	Output	Input/output
-	XL-E8NPX8YR	-
	XL-E8NPX8YT	



Suitable modules

Input	Output	Input/output
XL-E32X	XL-E16X16YT	XL-E32YT
	XL-E16PX16PYT	



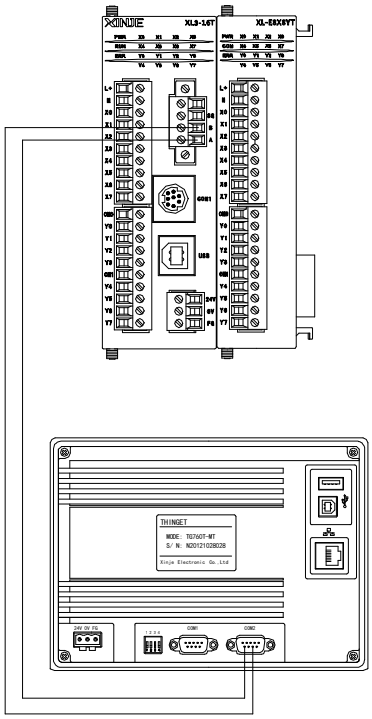


Suitable modules

Input	Output	Input/output
XL-E32X-A	XL-E16X16YT-A	XL-E16YT-A XL-E32YT-A

2-10. Application

In this chapter, the application of this module will be exemplified. XL3-16R is slave station with an extended XL-E8X8YR to communicate with XINJE HMI.
Communication between Extended Module XL-E8X8YR and Xinje TG765 HMI.



In this example, as the main communication station, the HMI reads the input point state of the extended module to the local coil state of the HMI, and writes the coil state of the internal HMI to the output point of the extended module. The corresponding relationship is as follows:

Hardware connection:

The module XL-E8X8YR is attached to XL3-16R, and the RS485 communication terminal AB of XL3-16R is connected to the AB terminal of the PLC port of TG765 respectively.

Communication parameter settings: the baud rate is 19200 bps, 8 data bits, 1 stop bit, even parity, PLC Modbus station number is 1, then cut the power supply and power on again.

For TG765 HMI: please set the PLC type to Modbus RTU (panel is master). The baud rate is 19200 bps, 8 data bits, 1 stop bit, even parity.

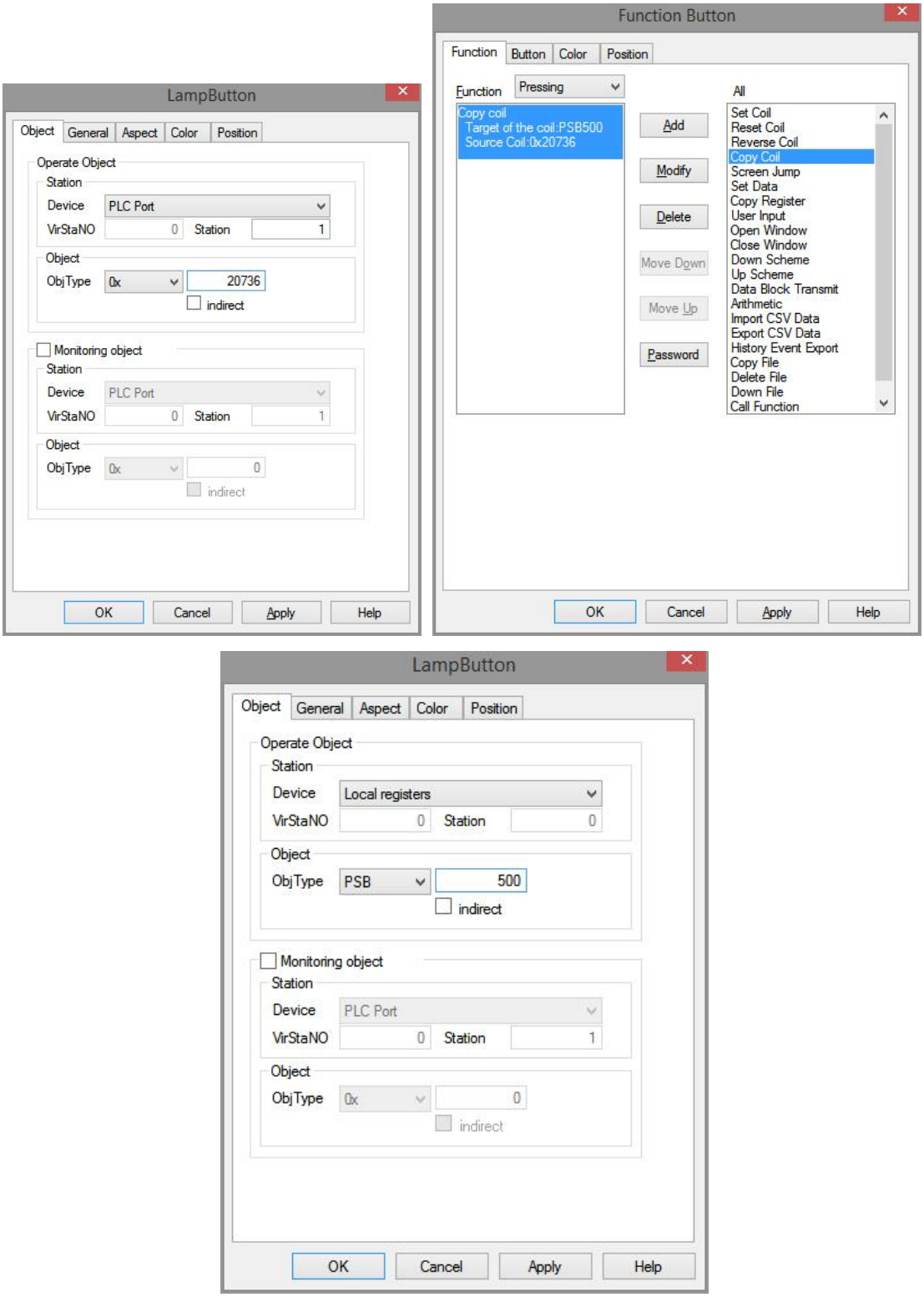
Program application:

The corresponding relationship between the module input and output address and the local coil address is as follows:

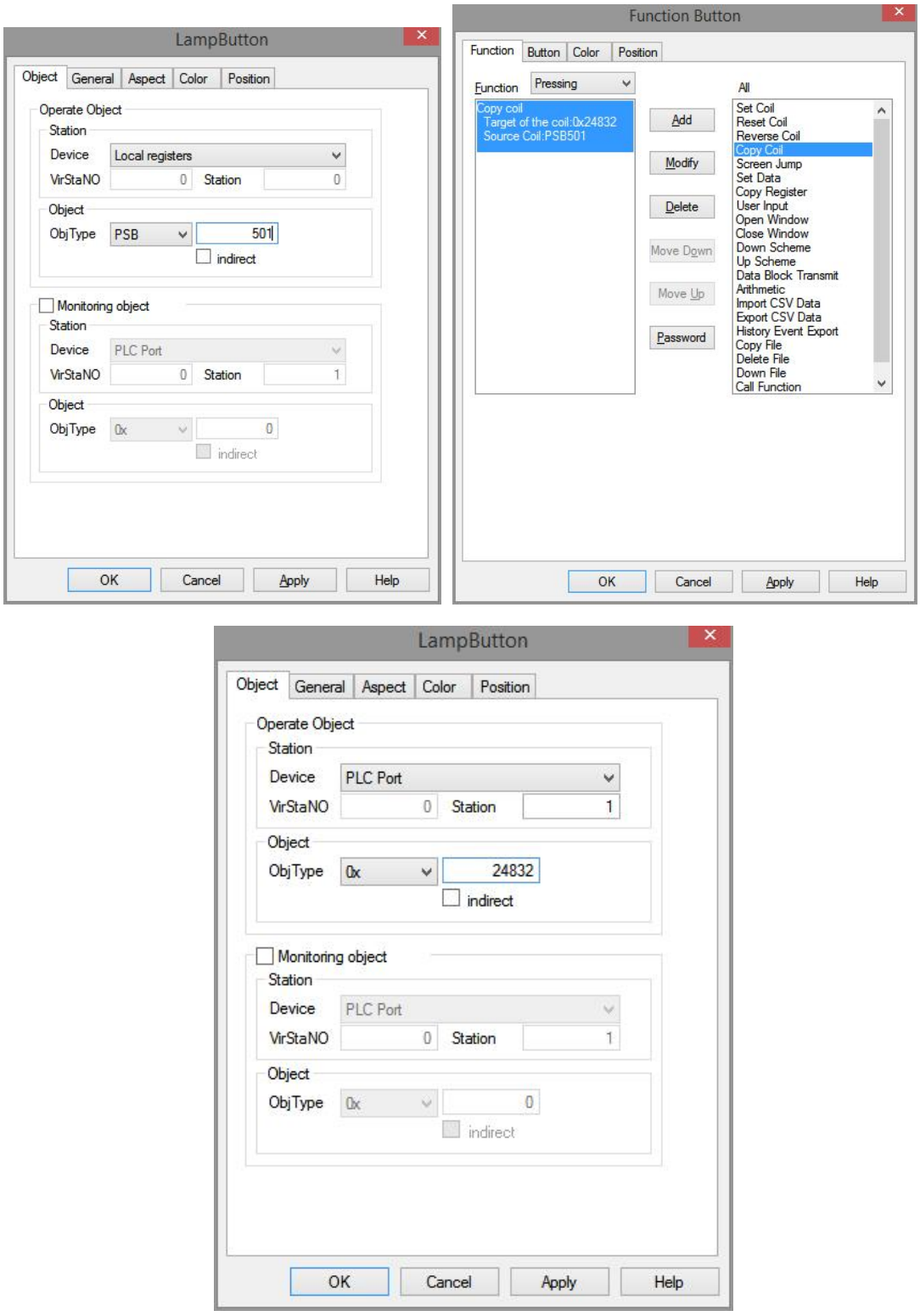
Local coil address		Module I/O	Related modbus address
PSB500	↔	X10000	K20736
PSB501	↔	Y10000	K24832

HMI screen:

Edit the status of extension module X10000, place a lamp, the object type of lamp is 0X, corresponding Modbus address coil is 20736; select function button, button function is to copy the coil status of X10000 to PSB500 when pressing the button; edit PSB500 lamp, the lamp object type is PSB, the coil number is 500.



Edit the PSB501 status, place a lamp, the lamp object type is PSB, the coil number is 501. When the function button is pressed, copy the status of PSB501 to extension module Y10000. Edit the status of extension module Y10000, the lamp object type is 0x, the modbus address is 24832.



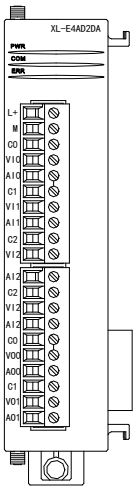
Download the program into the HMI. Then make them to communicate.

3. Analog I/O module XL-E4AD2DA

This chapter mainly introduces XL-E4AD2DA module specifications, terminal, input definition number allocation, working mode settings, external connections, analog-to-digital conversion diagrams, appearance size diagrams and related programming examples.

3-1. Module features and specifications

XL-E4AD2DA analog input and output module converts four channels of analog input values into digital values, two channels of digital values into analog values, and transmits them to the main unit of PLC, and real-time data interaction with the main unit of PLC.



Module features

- Four-channel analog input: Voltage input and current input can be selected.
- 14-bit high-precision analog input.
- 2-channel 12-bit analog output.
- As an expansion module of the XL series, XL3 can connect up to 10 modules, XL5/XL5E/XL5N/XL5H/XLME/XLH/XSLH can expand 16 modules, and XL1 does not support.expansion modules.

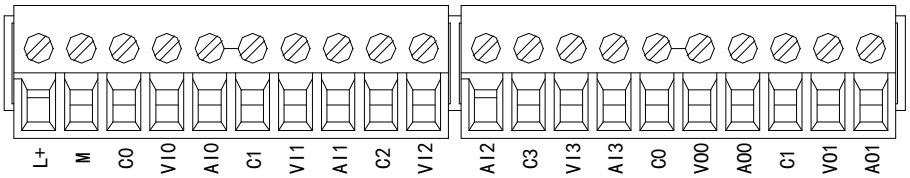
Module specification

Items	Analog input (AD)		Analog output (DA)	
	Voltage input	Current input	Voltage output	Current output
Analog input range	0~5V, 0~10V, -5~5V, -10~10V	0~20mA, 4~20mA, -20~20mA	-	
Max input range	DC ±15V	-40~40mA	-	
Analog output range	-		0~5V, 0~10V, -5~5V, -10~10V (Exterior load resistance 2KΩ~1MΩ)	0~20mA, 4~20mA (Exterior load resistance is less than 500Ω)

Digital input range	-	12 bits binary data (0~4095 or -2048~2047)
Digital output range	14 bits binary data (0~16383 or -8192~8191)	-
Resolution	1/16383(14Bit)	1/4095(12Bit)
Integrated precision	±1%	
Conversion speed	2ms per channel	2ms per channel
Module power supply	DC24V±10%,150mA	
Installation	Fixed with M3 screws or directly installed on orbit of DIN46277 (Width: 35mm)	

3-2. Terminal description

Terminal arrangement



Terminal signal

Name		Function
Indicator light	PWR	The indicator lights up when the module has a power supply.
	COM	When the module port communicates normally, the indicator lights on.
	ERR	When there is an error in the module, the indicator is always on or flickering (red). When the ERR LED is always on, it indicates that the module has serious application errors and can not be used. It is necessary to adjust the mode of use and switch the PLC to STOP state. When the ERR LED flickers, there are application errors, abnormal work and abnormal data in the module, but the PLC is still RUN.
Terminal	L+	Module 24V power supply input +
	M	Module 24V power supply input -
	C0	VI0, AI0 input ground
	VI0	Channel 1 AD voltage input
	AI0	Channel 1 AD current input

	C1	VI1, AI1 input ground
	VI1	Channel 2 AD voltage input
	AI1	Channel 2 AD current input
	C2	VI2, AI2 input ground
	VI2	Channel 3 AD voltage input
	AI2	Channel 3 AD current input
	C3	VI3, AI3 input ground
	VI3	Channel 4 AD voltage input
	AI3	Channel 4 AD current input
	C0	VO0, AO0 output ground
	VO0	Channel 1 DA voltage output
	AO0	Channel 1 DA current output
	C1	VO1, AO1 output ground
	VO1	Channel 2 DA voltage output
	AO1	Channel 2 DA current output

Wiring head specification

When wiring the module, its wiring head should meet the following requirements:

(1) The stripping length is 9 mm;

(2) Flexible wires with bare tubular ends are 0.25-1.5 square.

(3) Flexible wires with tubular pre-insulated end is 0.25-0.5 square.

3-3. I/O address

XL series analog module does not occupy I/O unit, the converted value is directly sent to the PLC register, the corresponding channel definition number of the PLC register is as follows:

Module 1 register address:

Channel	AD signal	Channel enable switch (please turn on the swich to use this channel)
0CH	ID10000	Y10000
1CH	ID10001	Y10001
2CH	ID10002	Y10002
3CH	ID10003	Y10003
Channel	DA signal	
0CH	QD10000	Y10004
1CH	QD10001	Y10005

Module 2 register address:

Channel	AD signal	Channel enable switch (please turn on the swich to use this channel)
0CH	ID10100	Y10100
1CH	ID10101	Y10101
2CH	ID10102	Y10102
3CH	ID10103	Y10103
Channel	DA signal	
0CH	QD10100	Y10104
1CH	QD10101	Y10105

Module 3 register address:

Channel	AD signal	Channel enable switch (please turn on the swich to use this channel)
0CH	ID10200	Y10200
1CH	ID10201	Y10201
2CH	ID10202	Y10202
3CH	ID10203	Y10203
Channel	DA signal	
0CH	QD10200	Y10204
1CH	QD10201	Y10205

Module 4 register address:

Channel	AD signal	Channel enable switch (please turn on the swich to use this channel)
0CH	ID10300	Y10300
1CH	ID10301	Y10301
2CH	ID10302	Y10302
3CH	ID10303	Y10303
Channel	DA signal	
0CH	QD10300	Y10304
1CH	QD10301	Y10305

Module 5 register address:

Channel	AD signal	Channel enable switch (please turn on the swich to use this channel)
0CH	ID10400	Y10400
1CH	ID10401	Y10401

2CH	ID10402	Y10402
3CH	ID10403	Y10403
Channel	DA signal	
0CH	QD10400	Y10404
1CH	QD10401	Y10405

Module 6 register address:

Channel	AD signal	Channel enable switch (please turn on the swich to use this channel)
0CH	ID10500	Y10500
1CH	ID10501	Y10501
2CH	ID10502	Y10502
3CH	ID10503	Y10503
Channel	DA signal	
0CH	QD10500	Y10504
1CH	QD10501	Y10505

Module 7 register address:

Channel	AD signal	Channel enable switch (please turn on the swich to use this channel)
0CH	ID10600	Y10600
1CH	ID10601	Y10601
2CH	ID10602	Y10602
3CH	ID10603	Y10603
Channel	DA signal	
0CH	QD10600	Y10604
1CH	QD10601	Y10605

Module 8 register address:

Channel	AD signal	Channel enable switch (please turn on the swich to use this channel)
0CH	ID10700	Y10700
1CH	ID10701	Y10701
2CH	ID10702	Y10702
3CH	ID10703	Y10703
Channel	DA signal	
0CH	QD10700	Y10704
1CH	QD10701	Y10705

Module 9 register address:

Channel	AD signal	Channel enable switch (please turn on the swich to use this channel)
0CH	ID10800	Y11000
1CH	ID10801	Y11001
2CH	ID10802	Y11002
3CH	ID10803	Y11003
Channel	DA signal	
0CH	QD10800	Y11004
1CH	QD10801	Y11005

Module 10 register address:

Channel	AD signal	Channel enable switch (please turn on the swich to use this channel)
0CH	ID10900	Y11100
1CH	ID10901	Y11101
2CH	ID10902	Y11102
3CH	ID10903	Y11103
Channel	DA signal	
0CH	QD10900	Y11104
1CH	QD10901	Y11105

Module 11 register address:

Channel	AD signal	Channel enable switch (please turn on the swich to use this channel)
0CH	ID11000	Y11200
1CH	ID11001	Y11201
2CH	ID11002	Y11202
3CH	ID11003	Y11203
Channel	DA signal	
0CH	QD11000	Y11204
1CH	QD11001	Y11205

Module 12 register address:

Channel	AD signal	Channel enable switch (please turn on the swich to use this channel)
0CH	ID11100	Y11300
1CH	ID11101	Y11301

2CH	ID11102	Y11302
3CH	ID11103	Y11303
Channel	DA signal	
0CH	QD11100	Y11304
1CH	QD11101	Y11305

Module 13 register address:

Channel	AD signal	Channel enable switch (please turn on the swich to use this channel)
0CH	ID11200	Y11400
1CH	ID11201	Y11401
2CH	ID11202	Y11402
3CH	ID11203	Y11403
Channel	DA signal	
0CH	QD11200	Y11404
1CH	QD11201	Y11405

Module 14 register address:

Channel	AD signal	Channel enable switch (please turn on the swich to use this channel)
0CH	ID11300	Y11500
1CH	ID11301	Y11501
2CH	ID11302	Y11502
3CH	ID11303	Y11503
Channel	DA signal	
0CH	QD11300	Y11504
1CH	QD11301	Y11505

Module 15 register address:

Channel	AD signal	Channel enable switch (please turn on the swich to use this channel)
0CH	ID11400	Y11600
1CH	ID11401	Y11601
2CH	ID11402	Y11602
3CH	ID11403	Y11603
Channel	DA signal	
0CH	QD11400	Y11604
1CH	QD11401	Y11605

Module 16 register address:

Channel	AD signal	Channel enable switch (please turn on the swich to use this channel)
0CH	ID11500	Y11700
1CH	ID11501	Y11701
2CH	ID11502	Y11702
3CH	ID11503	Y11703
Channel	DA signal	
0CH	QD11500	Y11704
1CH	QD11501	Y11705

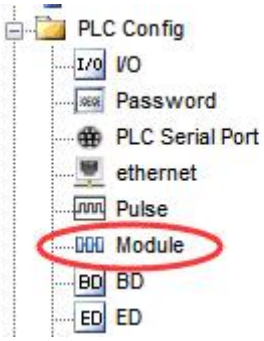
Note:
(1) Banning unused channels can improve the scanning speed of input/output.
(2) When the input enable switch is turned off during operation, the corresponding input channel will not collect data. (Data display is 0)
(3) When the enable switch of output is turned off during operation, the corresponding output channel keeps the original data unchanged.

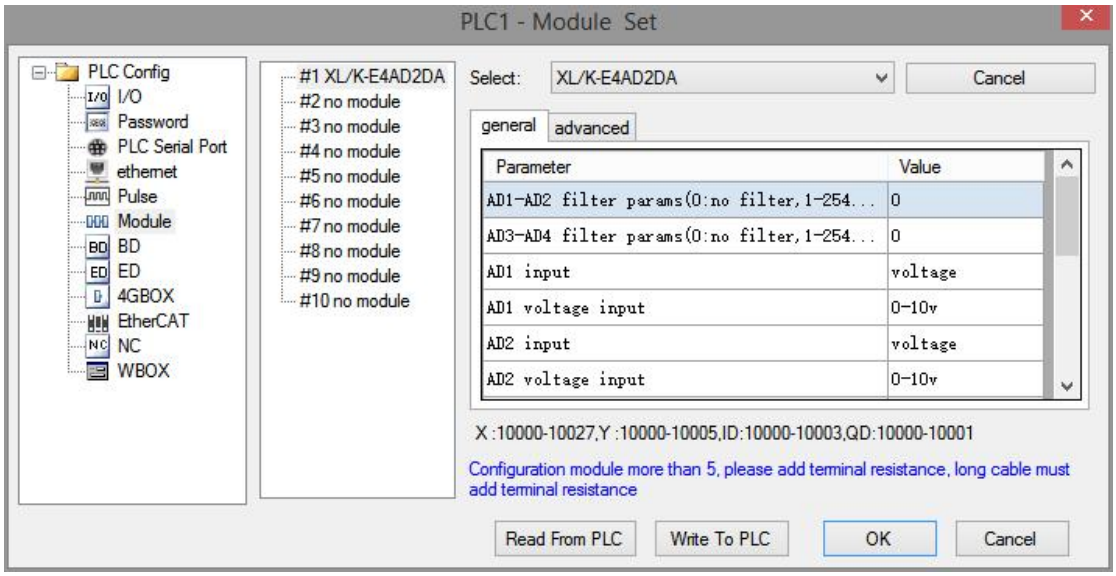
3-4. Working mode settings

There are two ways to set the working mode (the effect of these two ways is equivalent):
(1) Configuration through the software
(2) Setting up by Flash Register

Set through the software

Please use XDPpro v3.5.1 or higher version software to configure the module.
Open the software, click module in the left menu,





Choose the module type, and set each channel's parameters in the above window. Then click write to PLC, cut the power supply and power on again to make the settings effective.

Note: The first-order low-pass filtering method weighs this time sampling value and the output value of the last filtering to get the effective filtering value; the filter coefficient is set by the user to 0-254, the smaller the value, the more stable the data, but may lead to data lag; therefore, when set to 1, the filtering effect is strongest and the data is the most stable; when set to 254, the filtering effect is the weakest; default is 0 (no filtering).

Set by Flash register

The input and output channels of the expansion module can be selected in two modes: voltage and current. Current is 0-20mA, 4-20mA, and -20-20mA. Voltage is 0-5V, 0-10V, -5-5V and -10-10V. It is set by special FLASH data register SFD in PLC. As follows:

Module no.	SFD register	Module no.	SFD register
#1	SFD350~SFD359	#9	SFD430~SFD439
#2	SFD360~SFD369	#10	SFD440~SFD449
#3	SFD370~SFD379	#11	SFD450~SFD459
#4	SFD380~SFD389	#12	SFD460~SFD469
#5	SFD390~SFD399	#13	SFD470~SFD479
#6	SFD400~SFD409	#14	SFD480~SFD489
#7	SFD410~SFD419	#15	SFD490~SFD499
#8	SFD420~SFD429	#16	SFD500~SFD509

Note: As shown above, each register sets four-channel modes. Each register has 16 bits. From low to high, each four bit will set four-channel modes in turn.

SFD bit definition

Take the first module as an example to illustrate how to set it up.

<table>
<tr><td></td><td>Bit7</td><td>Bit6</td><td>Bit5</td><td>Bit4</td><td>Bit3</td><td>Bit2</td><td>Bit1</td><td>Bit0</td><td>NOTE</td></tr>
<tr><td>Byte0</td><td colspan="8">AD channel 1, channel 2 filtering parameter</td><td rowspan="2">AD filtering parameter</td></tr>
<tr><td>Byte1</td><td colspan="8">AD channel 3, channel 4 filtering parameter</td></tr>
<tr><td rowspan="3">Byte2</td><td>Bit7</td><td>Bit6</td><td>Bit5</td><td>Bit4</td><td>Bit3</td><td>Bit2</td><td>Bit1</td><td>Bit0</td><td rowspan="9">Set the AD and DA module input range, Byte2 low 4-bit set AD channel 1, high 4-bit set AD channel 2. Byte3 low 4-bit set AD channel 3, high 4-bit set AD channel 4. Byte4 low 4-bit set DA channel 1, High 4-bit set DA channel 2.</td></tr>
<tr><td colspan="4">AD2</td><td colspan="4">AD1</td></tr>
<tr><td>-</td><td colspan="3">000：0~10V 010：0~20mA
001：0~5V 011：4~20mA
100：-10~10V 110：-20~20mA
101：-5~5V</td><td>-</td><td colspan="3">000：0~10V 010：0~20mA
001：0~5V 011：4~20mA
100：-10~10V 110：-20~20mA
101：-5~5V</td></tr>
<tr><td rowspan="3">Byte3</td><td>Bit7</td><td>Bit6</td><td>Bit5</td><td>Bit4</td><td>Bit3</td><td>Bit2</td><td>Bit1</td><td>Bit0</td></tr>
<tr><td colspan="4">AD4</td><td colspan="4">AD3</td></tr>
<tr><td>-</td><td colspan="3">000：0~10V 010：0~20mA
001：0~5V 011：4~20mA
100：-10~10V 110：-20~20mA
101：-5~5V</td><td>-</td><td colspan="3">000：0~10V 010：0~20mA
001：0~5V 011：4~20mA
100：-10~10V 110：-20~20mA
101：-5~5V</td></tr>
<tr><td rowspan="3">Byte4</td><td>Bit7</td><td>Bit6</td><td>Bit5</td><td>Bit4</td><td>Bit3</td><td>Bit2</td><td>Bit1</td><td>Bit0</td></tr>
<tr><td colspan="4">DA2</td><td colspan="4">DA1</td></tr>
<tr><td>-</td><td colspan="3">000：0~10V 010：0~20mA
001：0~5V 011：4~20mA
100：-10~10V
101：-5~5V</td><td>-</td><td colspan="3">000：0~10V 010：0~20mA
001：0~5V 011：4~20mA
100：-10~10V
101：-5~5V</td></tr>
<tr><td>Byte5
~
Byte19</td><td colspan="8">-</td></tr>
</table>

Example: the input channels of the first module are 0-20mA, 4-20mA, 0-10V and 0-5V respectively, the filter coefficients of the first and second channels are 254, the filter coefficients of the third and fourth channels are 100, and the output channels of the first and the zero channels are 0-10V and 0-20mA respectively.

Method 1:

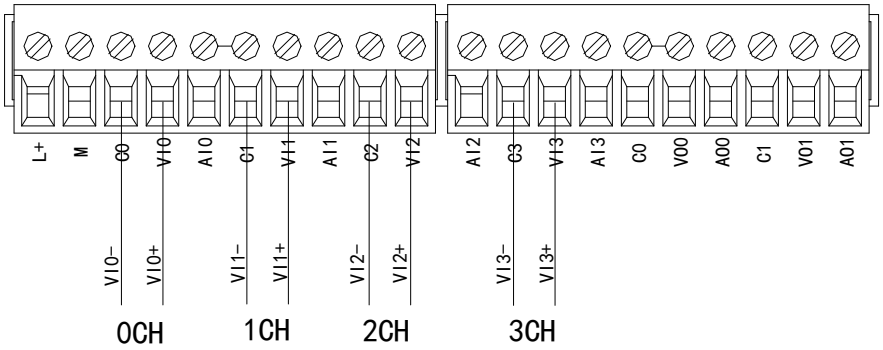
You can configure it directly in the PLC software, as shown above.

Method 2:
Set the SFD as follows:
SFD350=64FEH SFD351=2301H SFD352=0002H

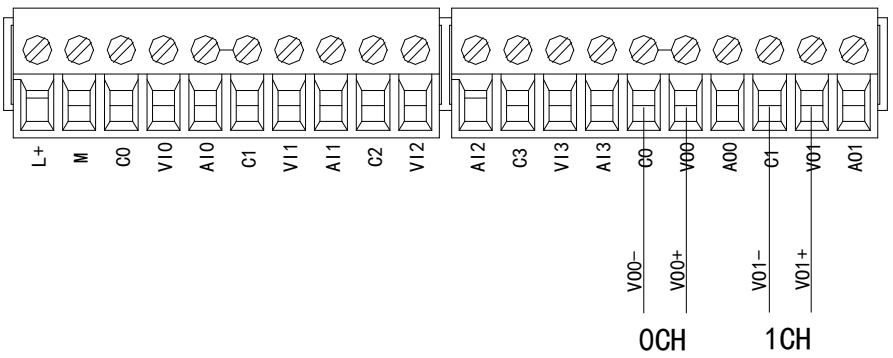
3-5. External wiring

For external connection, to avoid interference, use shielding wire and connect the ground to the single point of shielding layer.

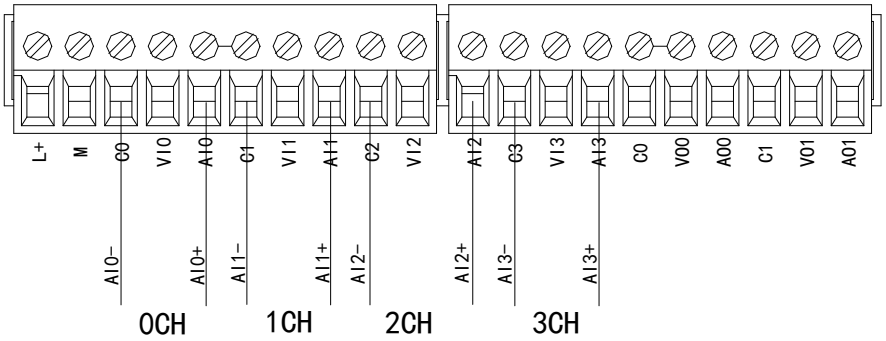
Voltage input



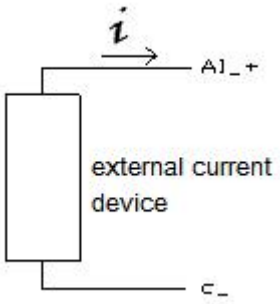
Voltage output



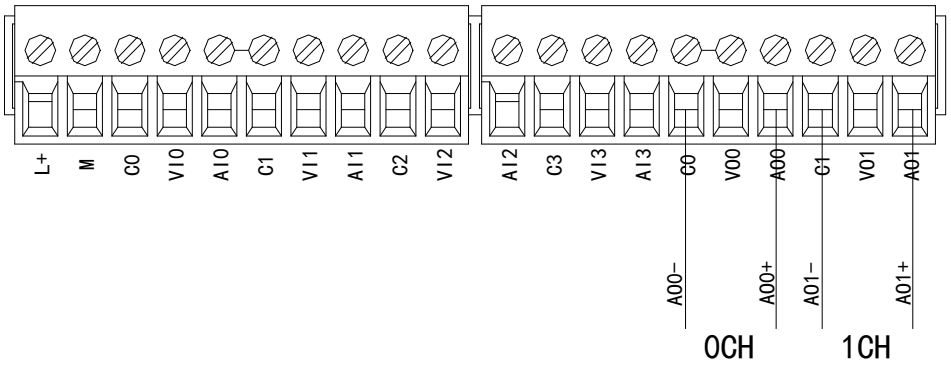
Current input



XL-E4AD2DA current input wiring:



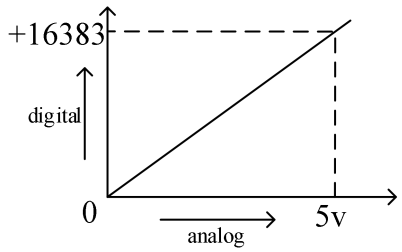
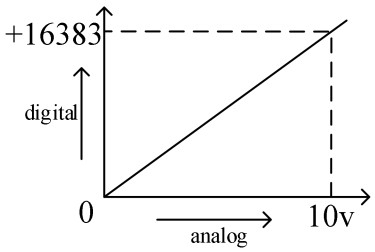
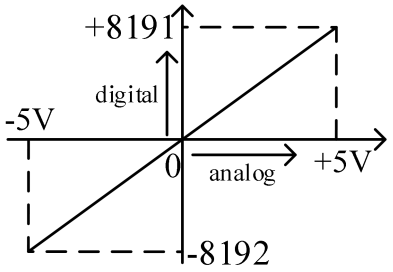
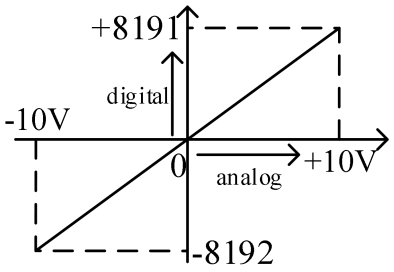
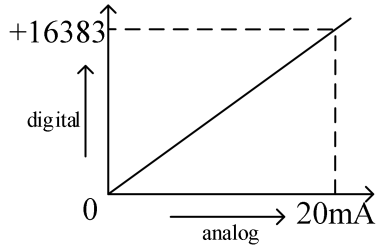
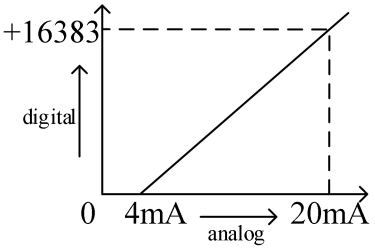
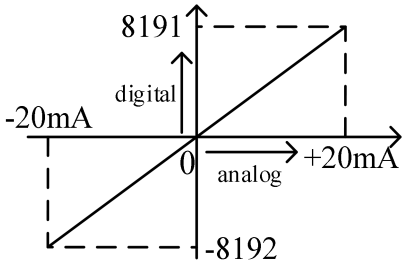
Current output



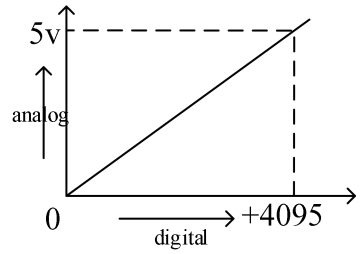
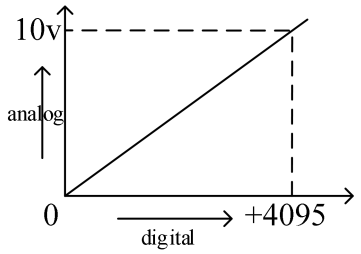
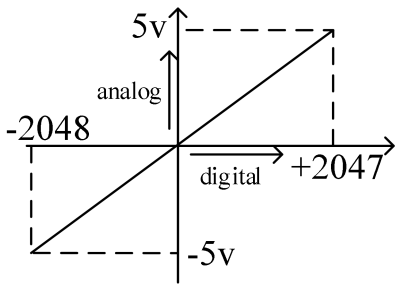
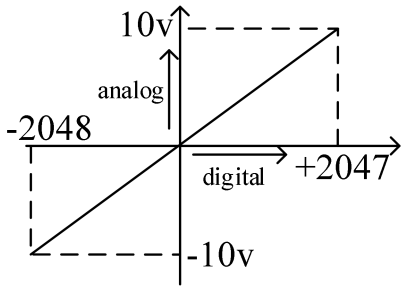
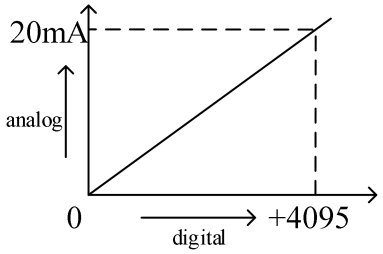
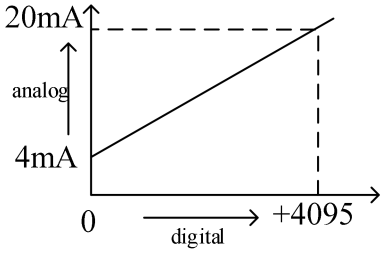
Note: current output no need DC24V power supply.

3-6. Analog digital conversion diagram

The relationship between input analog quantities and converted digital quantities is shown in the following table:

0~5V analog input	0~10V analog input
	
-5~5V analog input	-10~10V analog input
	
0~20mA analog input	4~20mA analog input
	
-20~20mA analog input	
	

The relationship between the output digital quantity and its corresponding analog data is shown in the following table:

0~5V analog output	0~10V analog output
	
-5~5V analog output	**-10~10V analog output**
	
0~20mA analog output	**4~20mA analog output**
	

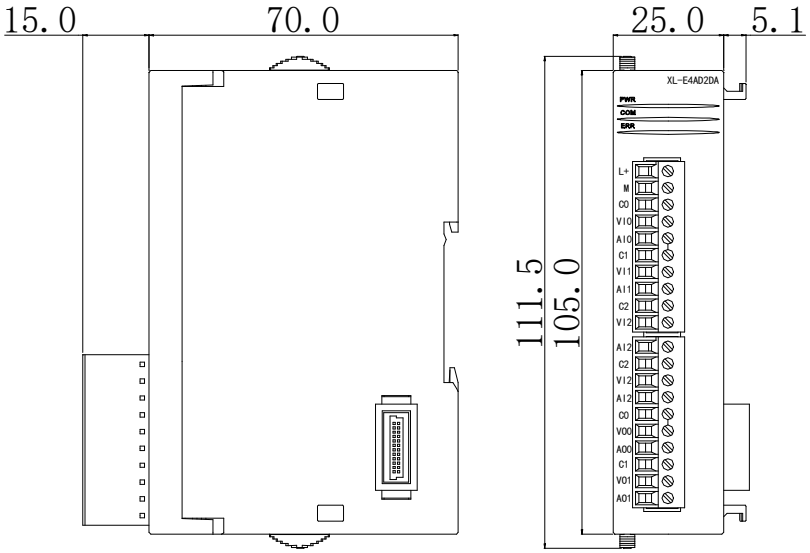
Note:

(1) When the AD voltage input is suspended, the corresponding ID register is 16383; when the AD current input is suspended, the corresponding ID register is 0.

(2) When the input data exceeds K4095, the analog data of DA conversion remains unchanged at 5V, 10V or 20mA.

3-7. Dimension

(Unit: mm)



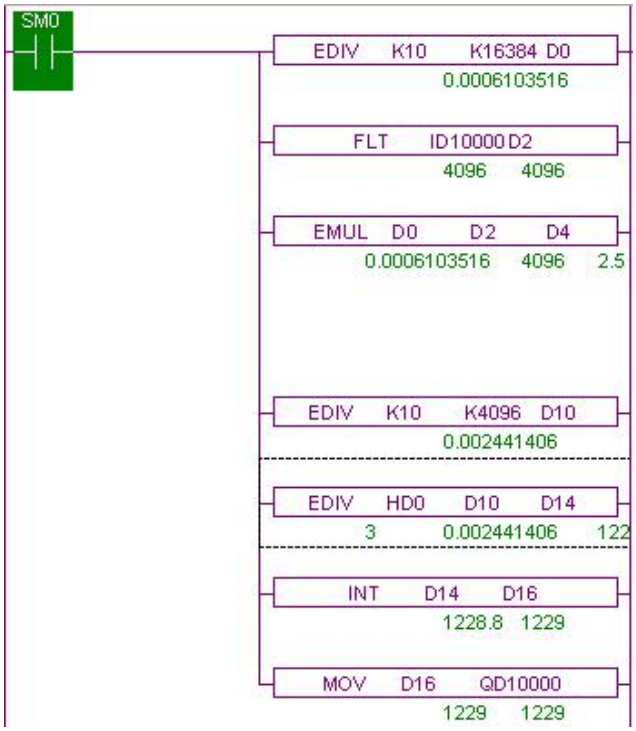
3-8. Application

Example: The output signal of one-channel pressure sensor needs to be collected (pressure sensor performance parameters: detection pressure range 0Mp~10Mp, output analog signal 4~20mA), and output one-channel 0V~10V voltage signal to frequency converter.

Analysis: As the pressure detection range of pressure sensor is 0Mp~10Mp, the analog output is 4~20mA, and the digital conversion range of expansion module is 0~16383, we can skip the analog amount of 4~20mA in the intermediate conversion process, which directly means that the pressure detection range is 0~16383 in the corresponding digital range of 0Mp~10Mp; 10Mp/16384=0.0006103515 is pressure corresponding to each digital number 1. The real-time pressure of the current pressure sensor can be calculated by multiplying the real-time value collected in the ID register of the expansion module by 0.0006103515. For example, the ID register is 4096, and the corresponding pressure is 2.5Mp.

Similarly, the range of the set number in the extended module register QD is 0-4095 corresponding to the output voltage signal 0V-10V, 10V/4096=0.0024414, which indicates the corresponding output voltage value for each set number in the extended module register QD; for example, it is now necessary to output 3V voltage value, 3V/0.0024414=1229, and send the calculated value to the extended module register QD.

Note: Please use floating-point number to calculate, otherwise it will affect the accuracy of calculation and even can not be calculated!



Explanation:

SM0 is a constant ON coil and has been in ON state during the operation of PLC.

The PLC starts to run. The analog acquisition first calculates the pressure value corresponding to each digit 1 collected by the expansion module, and then converts the digital quantity (integer) collected in the ID10000 register into floating-point numbers. So as long as the real-time value collected in the expansion module ID10000 register is multiplied by the pressure value corresponding to each digit 1 collected by the expansion module, the real-time pressure values are calculated.

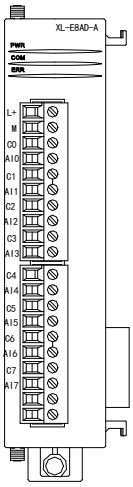
Similarly, the analog output first calculates the voltage value corresponding to each digit 1 collected by the expansion module, divides the set target voltage value by the voltage value corresponding to each digit 1 collected by the expansion module, and then obtains the required number (floating point number). As the QD10000 register can only store integers, it is necessary to convert the floating point number to integer and transmit to QD10000.

4. Analog input module XL-E8AD-A

This chapter mainly introduces XL-E8AD-A module specifications, terminal instructions, input definition number allocation, working mode settings, external connections, analog-to-digital conversion diagrams, appearance size diagrams and related programming examples.

4-1. Module features and specifications

XL-E8AD-A analog input module converts 8 analog current input values into digital values, and transmits them to the main unit of PLC, and interacts with the main unit of PLC in real time.



Module features

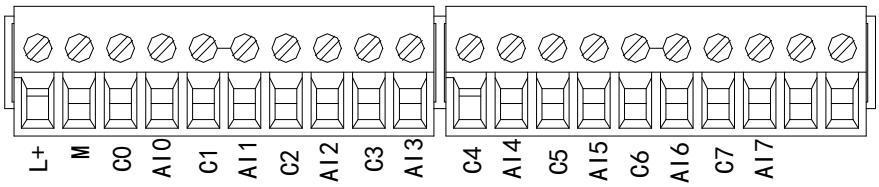
- 8-channel analog input: current input.
- 14-bit high-precision analog input.
- As an expansion module of the XL series, XL3 can connect up to 10 modules, XL5/XL5E/XL5N/XL5H/XLME/XLH/XSLH can expand 16 modules, and XL1 does not support expansion modules.

Module specification

Item	Analog input
	Current input
Analog input range	0~20mA, 4~20mA, -20～20mA
Max input range	-40~40mA
Digital output range	14 bits binary data (0~16383 or -8192~8191)
Resolution	1/16383 (14Bit)
Integrated precision	1%
Conversion speed	2ms/1 channel
Module power supply	DC24V±10%, 150mA
Installation	Fixed with M3 screws or directly installed on rail of DIN46277 (Width: 35mm)

4-2. Terminal descriptions

Terminal arrangment



Terminal signal

Name		Function
Indicator light	PWR	The indicator lights up when the module has a power supply.
	COM	When the module port communicates normally, the indicator lights on.
	ERR	When there is an error in the module, the indicator is always on or flickering (red). When the ERR LED is always on, it indicates that the module has serious application errors and can not be used. It is necessary to adjust the mode of use and switch the PLC to STOP state. When the ERR LED flickers, there are application errors, abnormal work and abnormal data in the module, but the PLC is still RUN.
Terminal	L+	Module 24V power supply input +
	M	Module 24V power supply input -
	C0	AI0 output ground
	AI0	Channel 1 AD current input
	C1	AI1 output ground
	AI1	Channel 2 AD current input
	C2	AI2 output ground
	AI2	Channel 3 AD current input
	C3	AI3 output ground
	AI3	Channel 4 AD current input
	C4	AI4 output ground
	AI4	Channel 5 AD current input
	C5	AI5 output ground
	AI5	Channel 6 AD current input

	C6	AI6 output ground
	AI6	Channel 7 AD current input
	C7	AI7 output ground
	AI7	Channel 8 AD current input

Wiring head specification

When wiring the module, its wiring head should meet the following requirements:
(1) The stripping length is 9 mm;
(2) Flexible wires with bare tubular ends are 0.25-1.5 square.
(3) Flexible wires with tubular pre-insulated end is 0.25-0.5 square.

4-3. I/O address

XL series analog module does not occupy I/O unit, the converted value is directly sent to the PLC register, the corresponding channel definition number of the PLC register is as follows:

Module 1 register address:

Channel	AD signal	Channel enable switch (please turn on the swich to use this channel)
0CH	ID10000	Y10000
1CH	ID10001	Y10001
2CH	ID10002	Y10002
3CH	ID10003	Y10003
4CH	ID10004	Y10004
5CH	ID10005	Y10005
6CH	ID10006	Y10006
7CH	ID10007	Y10007

Module 2 register address:

Channel	AD signal	Channel enable switch (please turn on the swich to use this channel)
0CH	ID10100	Y10100
1CH	ID10101	Y10101
2CH	ID10102	Y10102
3CH	ID10103	Y10103
4CH	ID10104	Y10104
5CH	ID10105	Y10105

6CH	ID10106	Y10106
7CH	ID10107	Y10107

Module 3 register address:

Channel	AD signal	Channel enable switch (please turn on the swich to use this channel)
0CH	ID10200	Y10200
1CH	ID10201	Y10201
2CH	ID10202	Y10202
3CH	ID10203	Y10203
4CH	ID10204	Y10204
5CH	ID10205	Y10205
6CH	ID10206	Y10206
7CH	ID10207	Y10207

Module 4 register address:

Channel	AD signal	Channel enable switch (please turn on the swich to use this channel)
0CH	ID10300	Y10300
1CH	ID10301	Y10301
2CH	ID10302	Y10302
3CH	ID10303	Y10303
4CH	ID10304	Y10304
5CH	ID10305	Y10305
6CH	ID10306	Y10306
7CH	ID10307	Y10307

Module 5 register address:

Channel	AD signal	Channel enable switch (please turn on the swich to use this channel)
0CH	ID10400	Y10400
1CH	ID10401	Y10401
2CH	ID10402	Y10402
3CH	ID10403	Y10403
4CH	ID10404	Y10404
5CH	ID10405	Y10405
6CH	ID10406	Y10406
7CH	ID10407	Y10407

Module 6 register address:

Channel	AD signal	Channel enable switch (please turn on the swich to use this channel)
0CH	ID10500	Y10500
1CH	ID10501	Y10501
2CH	ID10502	Y10502
3CH	ID10503	Y10503
4CH	ID10504	Y10504
5CH	ID10505	Y10505
6CH	ID10506	Y10506
7CH	ID10507	Y10507

Module 7 register address:

Channel	AD signal	Channel enable switch (please turn on the swich to use this channel)
0CH	ID10600	Y10600
1CH	ID10601	Y10601
2CH	ID10602	Y10602
3CH	ID10603	Y10603
4CH	ID10604	Y10604
5CH	ID10605	Y10605
6CH	ID10606	Y10606
7CH	ID10607	Y10607

Module 8 register address:

Channel	AD signal	Channel enable switch (please turn on the swich to use this channel)
0CH	ID10700	Y10700
1CH	ID10701	Y10701
2CH	ID10702	Y10702
3CH	ID10703	Y10703
4CH	ID10704	Y10704
5CH	ID10705	Y10705
6CH	ID10706	Y10706
7CH	ID10707	Y10707

Module 9 register address:

Channel	AD signal	Channel enable switch (please turn on the swich to use this channel)
0CH	ID10800	Y11000
1CH	ID10801	Y11001
2CH	ID10802	Y11002
3CH	ID10803	Y11003
4CH	ID10804	Y11004
5CH	ID10805	Y11005
6CH	ID10806	Y11006
7CH	ID10807	Y11007

Module 10 register address:

Channel	AD signal	Channel enable switch (please turn on the swich to use this channel)
0CH	ID10900	Y11100
1CH	ID10901	Y11101
2CH	ID10902	Y11102
3CH	ID10903	Y11103
4CH	ID10904	Y11104
5CH	ID10905	Y11105
6CH	ID10906	Y11106
7CH	ID10907	Y11107

Module 11 register address:

Channel	AD signal	Channel enable switch (please turn on the swich to use this channel)
0CH	ID11000	Y11200
1CH	ID11001	Y11201
2CH	ID11002	Y11202
3CH	ID11003	Y11203
4CH	ID11004	Y11204
5CH	ID11005	Y11205
6CH	ID11006	Y11206
7CH	ID11007	Y11207

Module 12 register address:

Channel	AD signal	Channel enable switch (please turn on the swich to use this channel)
0CH	ID11100	Y11300
1CH	ID11101	Y11301
2CH	ID11102	Y11302
3CH	ID11103	Y11303
4CH	ID11104	Y11304
5CH	ID11105	Y11305
6CH	ID11106	Y11306
7CH	ID11107	Y11307

Module 13 register address:

Channel	AD signal	Channel enable switch (please turn on the swich to use this channel)
0CH	ID11200	Y11400
1CH	ID11201	Y11401
2CH	ID11202	Y11402
3CH	ID11203	Y11403
4CH	ID11204	Y11404
5CH	ID11205	Y11405
6CH	ID11206	Y11406
7CH	ID11207	Y11407

Module 14 register address:

Channel	AD signal	Channel enable switch (please turn on the swich to use this channel)
0CH	ID11300	Y11500
1CH	ID11301	Y11501
2CH	ID11302	Y11502
3CH	ID11303	Y11503
4CH	ID11304	Y11504
5CH	ID11305	Y11505
6CH	ID11306	Y11506
7CH	ID11307	Y11507

Module 15 register address:

Channel	AD signal	Channel enable switch (please turn on the swich to use this channel)
0CH	ID11400	Y11600
1CH	ID11401	Y11601
2CH	ID11402	Y11602
3CH	ID11403	Y11603
4CH	ID11404	Y11604
5CH	ID11405	Y11605
6CH	ID11406	Y11606
7CH	ID11407	Y11607

Module 16 register address:

Channel	AD signal	Channel enable switch (please turn on the swich to use this channel)
0CH	ID11500	Y11700
1CH	ID11501	Y11701
2CH	ID11502	Y11702
3CH	ID11503	Y11703
4CH	ID11504	Y11704
5CH	ID11505	Y11705
6CH	ID11506	Y11706
7CH	ID11507	Y11707

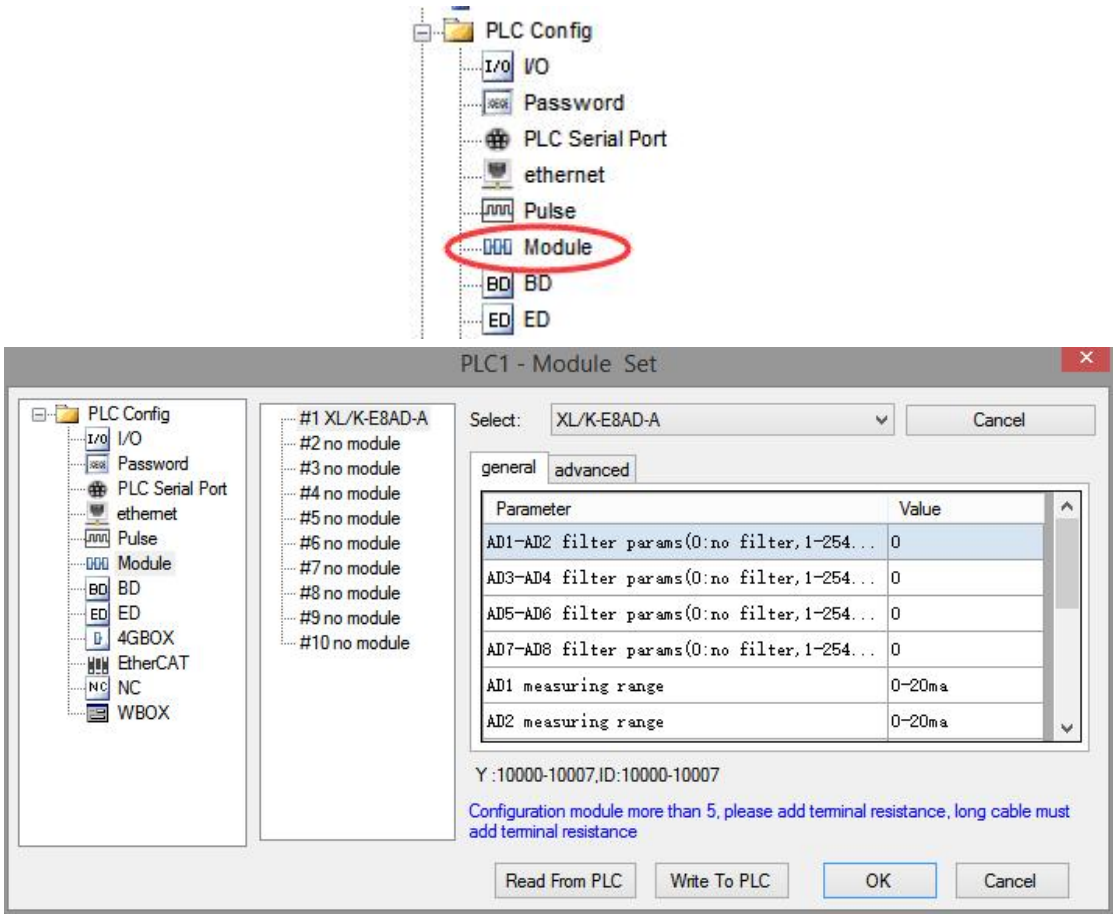
Note:
(1) Banning unused channels can improve the scanning speed of input/output.
(2) When the input enabling switch is turned off during operation, the corresponding input channel will not collect data. (Data display is 0)

4-4. Working mode settings

There are two ways to set the working mode (the effect of these two ways is equivalent):
(1) Configuration through the software
(2) Setting up by Flash Register

Set through the software

Please use XDPpro v3.5.1 or higher version software to configure the module.
Open the software, click module in the left menu,



Choose the module type, and set each channel's parameters in the above window. Then click write to PLC, cut the power supply and power on again to make the settings effective.

Note: The first-order low-pass filtering method weighs this time sampling value and the output value of the last filtering to get the effective filtering value; the filter coefficient is set by the user to 0-254, the smaller the value, the more stable the data, but may lead to data lag; therefore, when set to 1, the filtering effect is strongest and the data is the most stable; when set to 254, the filtering effect is the weakest; default is 0 (no filtering).

Set by Flash register

The input channel of the extended module is current mode, with 0-20mA, 4-20mA and -20-20mA optional. It is set by special FLASH data register SFD in PLC. As follows:

Module no.	SFD register	Module no.	SFD register
#1	SFD350~SFD359	#9	SFD430~SFD439
#2	SFD360~SFD369	#10	SFD440~SFD449
#3	SFD370~SFD379	#11	SFD450~SFD459
#4	SFD380~SFD389	#12	SFD460~SFD469
#5	SFD390~SFD399	#13	SFD470~SFD479
#6	SFD400~SFD409	#14	SFD480~SFD489
#7	SFD410~SFD419	#15	SFD490~SFD499

#8	SFD420~SFD429	#16	SFD500~SFD509

Note: As shown above, each register sets four-channel modes. Each register has 16 bits. From low to high, each four bit will set four-channel modes in turn.

SFD bit definition

	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0	NOTE
Byte0	AD channel 2, channel 1 filtering parameter								AD filtering parameter
Byte1	AD channel 4, channel 3 filtering parameter								
Byte2	AD channel 6, channel 5 filtering parameter								
Byte3	AD channel 8, channel 7 filtering parameter								
Byte4	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0	Set the AD module input range, Byte4 low 4-bit set AD channel1, high 4-bit set AD channel2. Byte5 low 4-bit set AD channel3, high 4-bit set AD channel4, Byte6 low 4-bit set AD channel5, high 4-bit set AD channel6, Byte7 low 4-bit set AD channel7, high 4-bit set AD channel8.
	AD2				AD1				
	1000：0~20mA 1001：4~20mA 1010：-20~20mA				1000：0~20mA 1001：4~20mA 1010：-20~20mA				
Byte5	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0	
	AD4				AD3				
	1000：0~20mA 1001：4~20mA 1010：-20~20mA				1000：0~20mA 1001：4~20mA 1010：-20~20mA				
Byte6	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0	
	AD6				AD5				
	1000：0~20mA 1001：4~20mA 1010：-20~20mA				1000：0~20mA 1001：4~20mA 1010：-20~20mA				
Byte7	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0	
	AD8				AD7				
	1000：0~20mA 1001：4~20mA 1010：-20~20mA				1000：0~20mA 1001：4~20mA 1010：-20~20mA				
Byte8~ Byte19	-								

Take the first module as an example to illustrate how to set it up.

Example: To set the working modes of input channels 1 and 0 of the first module to be 0-20 mA, input channels 3 and 2 to be 4-20 mA, input channels 5 and 4 to be 0-20 mA, input channels 7 and 6 to be -20-20 mA, filter coefficients of channels 0, 1, 2 and 3 to be 254, filter coefficients of channels 4, 5, 6 and 7 to be 100.

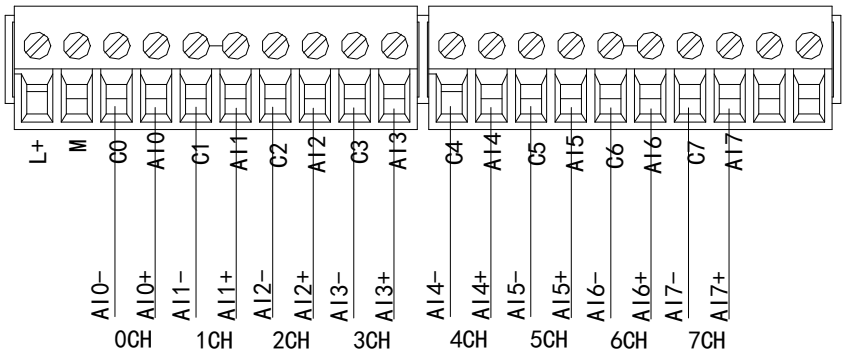
Method 1:
You can configure it directly in the PLC software, as shown above.

Method 2:
Set the SFD as follows:
SFD350=FEFEH SFD351=6464H SFD352=9988H SFD353=AA88H

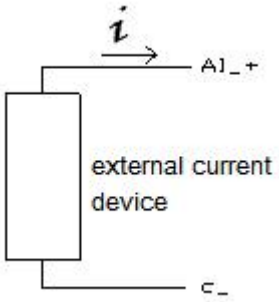
4-5. External wiring

For external connection, to avoid interference, use shielding wire and connect the ground to the single point of shielding layer.

Current input

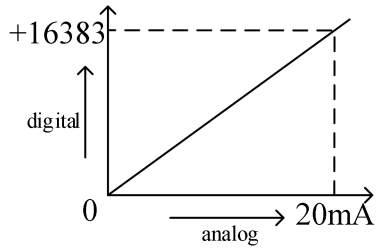
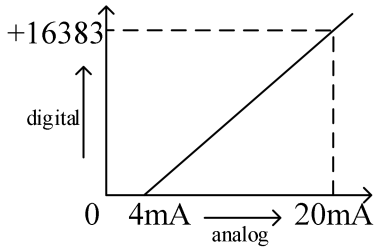
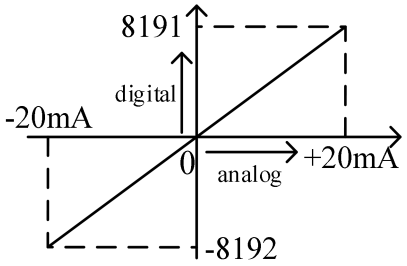


XL-E8AD-A current input wiring:



4-6. Analog digital conversion diagram

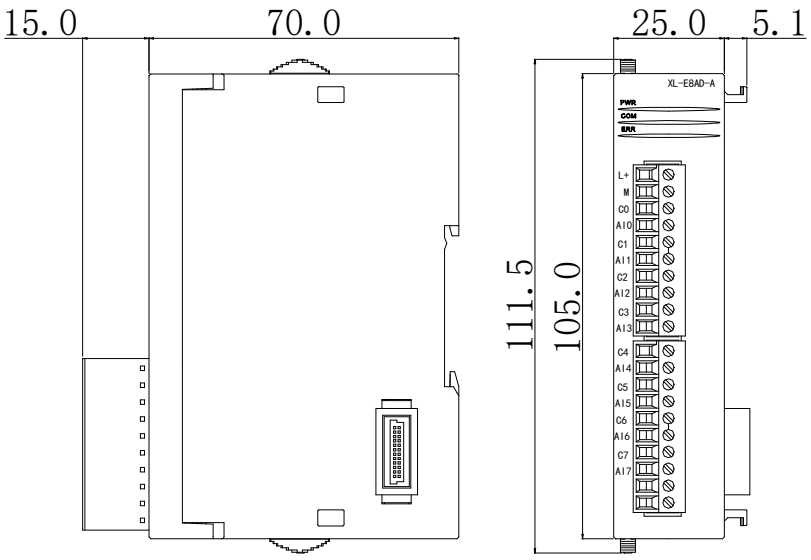
The relationship between input analog quantities and converted digital quantities is shown in the following table:

0~20mA analog input	4~20mA analog input
	
-20~20mA analog input	
	

Note: When the channel enable switch is turned on and the AD current input is suspended, the ID register corresponding to the AD current input is displayed as 0. When the channel enable switch is turned off, the ID register corresponding to the AD current input is displayed as 0.

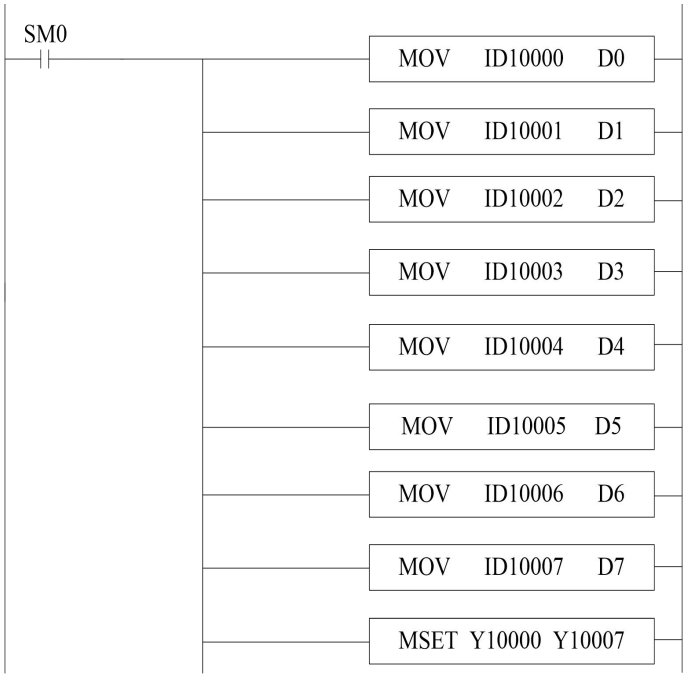
4-7. Dimension

(Unit: mm)



4-8. Application

Examples of real-time reading 8 channels of data (take Module 1 as an example)



Explain:

SM0 is a constant ON coil and has been in ON state during the operation of PLC.

The PLC starts to run, and continuously writes the data of channel 0 of the module 1 into the data register D0.

Data in channel 1 is written to data register D1;

Data in channel 2 is written to data register D2.

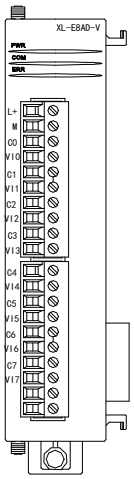
Data in channel 3 is written to data register D3.
Data in channel 4 is written to data register D4.
The data of channel 5 is written to the data register D5.
The data of channel 6 is written to the data register D6.
The data of channel 7 is written to the data register D7.
Since all channels are used, all the channel enablers are opened.

5. Analog input module XL-E8AD-V

This chapter mainly introduces XL-E8AD-V module specifications, terminal instructions, input definition number allocation, working mode settings, external connections, analog-to-digital conversion diagrams, appearance size diagrams and related programming examples.

5-1. Module features and specifications

XL-E8AD-V analog input module converts 8 analog current input values into digital values, and transmits them to the main unit of PLC, and interacts with the main unit of PLC in real time.



Module features

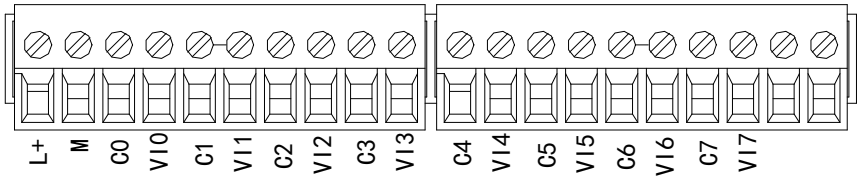
- 8-channel analog input: voltage input.
- 14-bit high-precision analog input.
- As a special functional module of the XL series, XL3 can connect up to 10 modules, XL5/XL5E/XL5N/XL5H/XLME/XLH/XSLH can expand 16 modules, and XL1 does not support expansion modules.

Module specification

Item	Analog input
	Voltage input
Analog input range	0~5V, 0~10V, -5~5V, -10~10V
Max input range	DC±15V
Digital output range	14 bits binary data (0~16383 or -8192~8191)
Resolution	1/16383 (14Bit)
Integrated precision	1%
Conversion speed	2ms/1 channel
Module power supply	DC24V±10%, 150mA
Installation	Fixed with M3 screws or directly installed on rail of DIN46277 (Width: 35mm)

5-2. Terminal descriptions

Terminal arrangment



Terminal signal

Name		Function
Indicator light	PWR	The indicator lights up when the module has a power supply.
	COM	When the module port communicates normally, the indicator lights on.
	ERR	When there is an error in the module, the indicator is always on or flickering (red). When the ERR LED is always on, it indicates that the module has serious application errors and can not be used. It is necessary to adjust the mode of use and switch the PLC to STOP

		state. When the ERR LED flickers, there are application errors, abnormal work and abnormal data in the module, but the PLC is still RUN.
Terminal	L+	Module 24V power supply input +
	M	Module 24V power supply input -
	C0	VI0 output ground
	VI0	Channel 1 AD voltage input
	C1	VI1 output ground
	VI1	Channel 2 AD voltage input
	C2	VI2 output ground
	VI2	Channel 3 AD voltage input
	C3	VI3 output ground
	VI3	Channel 4 AD voltage input
	C4	VI4 output ground
	VI4	Channel 5 AD voltage input
	C5	VI5 output ground
	VI5	Channel 6 AD voltage input
	C6	VI6 output ground
	VI6	Channel 7 AD voltage input
	C7	VI7 output ground
	VI7	Channel 8 AD voltage input

Wiring head specification

When wiring the module, its wiring head should meet the following requirements:
(1) The stripping length is 9 mm;
(2) Flexible wires with bare tubular ends are 0.25-1.5 square.
(3) Flexible wires with tubular pre-insulated end is 0.25-0.5 square.

5-3. I/O address

XL series analog module does not occupy I/O unit, the converted value is directly sent to the PLC register, the corresponding channel definition number of the PLC register is as follows:

Module 1 register address:

Channel	AD signal	Channel enable switch (please turn on the swich to use this channel)
0CH	ID10000	Y10000

1CH	ID10001	Y10001
2CH	ID10002	Y10002
3CH	ID10003	Y10003
4CH	ID10004	Y10004
5CH	ID10005	Y10005
6CH	ID10006	Y10006
7CH	ID10007	Y10007

Module 2 register address:

Channel	AD signal	Channel enable switch (please turn on the swich to use this channel)
0CH	ID10100	Y10100
1CH	ID10101	Y10101
2CH	ID10102	Y10102
3CH	ID10103	Y10103
4CH	ID10104	Y10104
5CH	ID10105	Y10105
6CH	ID10106	Y10106
7CH	ID10107	Y10107

Module 3 register address:

Channel	AD signal	Channel enable switch (please turn on the swich to use this channel)
0CH	ID10200	Y10200
1CH	ID10201	Y10201
2CH	ID10202	Y10202
3CH	ID10203	Y10203
4CH	ID10204	Y10204
5CH	ID10205	Y10205
6CH	ID10206	Y10206
7CH	ID10207	Y10207

Module 4 register address:

Channel	AD signal	Channel enable switch (please turn on the swich to use this channel)
0CH	ID10300	Y10300
1CH	ID10301	Y10301
2CH	ID10302	Y10302
3CH	ID10303	Y10303
4CH	ID10304	Y10304
5CH	ID10305	Y10305

6CH	ID10306	Y10306
7CH	ID10307	Y10307

Module 5 register address:

Channel	AD signal	Channel enable switch (please turn on the swich to use this channel)
0CH	ID10400	Y10400
1CH	ID10401	Y10401
2CH	ID10402	Y10402
3CH	ID10403	Y10403
4CH	ID10404	Y10404
5CH	ID10405	Y10405
6CH	ID10406	Y10406
7CH	ID10407	Y10407

Module 6 register address:

Channel	AD signal	Channel enable switch (please turn on the swich to use this channel)
0CH	ID10500	Y10500
1CH	ID10501	Y10501
2CH	ID10502	Y10502
3CH	ID10503	Y10503
4CH	ID10504	Y10504
5CH	ID10505	Y10505
6CH	ID10506	Y10506
7CH	ID10507	Y10507

Module 7 register address:

Channel	AD signal	Channel enable switch (please turn on the swich to use this channel)
0CH	ID10600	Y10600
1CH	ID10601	Y10601
2CH	ID10602	Y10602
3CH	ID10603	Y10603
4CH	ID10604	Y10604
5CH	ID10605	Y10605
6CH	ID10606	Y10606
7CH	ID10607	Y10607

Module 8 register address:

Channel	AD signal	Channel enable switch (please turn on the swich to use this channel)
0CH	ID10700	Y10700
1CH	ID10701	Y10701
2CH	ID10702	Y10702
3CH	ID10703	Y10703
4CH	ID10704	Y10704
5CH	ID10705	Y10705
6CH	ID10706	Y10706
7CH	ID10707	Y10707

Module 9 register address:

Channel	AD signal	Channel enable switch (please turn on the swich to use this channel)
0CH	ID10800	Y11000
1CH	ID10801	Y11001
2CH	ID10802	Y11002
3CH	ID10803	Y11003
4CH	ID10804	Y11004
5CH	ID10805	Y11005
6CH	ID10806	Y11006
7CH	ID10807	Y11007

Module 10 register address:

Channel	AD signal	Channel enable switch (please turn on the swich to use this channel)
0CH	ID10900	Y11100
1CH	ID10901	Y11101
2CH	ID10902	Y11102
3CH	ID10903	Y11103
4CH	ID10904	Y11104
5CH	ID10905	Y11105
6CH	ID10906	Y11106
7CH	ID10907	Y11107

Module 11 register address:

Channel	AD signal	Channel enable switch (please turn on the swich to use this channel)
0CH	ID11000	Y11200

1CH	ID11001	Y11201
2CH	ID11002	Y11202
3CH	ID11003	Y11203
4CH	ID11004	Y11204
5CH	ID11005	Y11205
6CH	ID11006	Y11206
7CH	ID11007	Y11207

Module 12 register address:

Channel	AD signal	Channel enable switch (please turn on the swich to use this channel)
0CH	ID11100	Y11300
1CH	ID11101	Y11301
2CH	ID11102	Y11302
3CH	ID11103	Y11303
4CH	ID11104	Y11304
5CH	ID11105	Y11305
6CH	ID11106	Y11306
7CH	ID11107	Y11307

Module 13 register address:

Channel	AD signal	Channel enable switch (please turn on the swich to use this channel)
0CH	ID11200	Y11400
1CH	ID11201	Y11401
2CH	ID11202	Y11402
3CH	ID11203	Y11403
4CH	ID11204	Y11404
5CH	ID11205	Y11405
6CH	ID11206	Y11406
7CH	ID11207	Y11407

Module 14 register address:

Channel	AD signal	Channel enable switch (please turn on the swich to use this channel)
0CH	ID11300	Y11500
1CH	ID11301	Y11501
2CH	ID11302	Y11502
3CH	ID11303	Y11503
4CH	ID11304	Y11504
5CH	ID11305	Y11505

6CH	ID11306	Y11506
7CH	ID11307	Y11507

Module 15 register address:

Channel	AD signal	Channel enable switch (please turn on the swich to use this channel)
0CH	ID11400	Y11600
1CH	ID11401	Y11601
2CH	ID11402	Y11602
3CH	ID11403	Y11603
4CH	ID11404	Y11604
5CH	ID11405	Y11605
6CH	ID11406	Y11606
7CH	ID11407	Y11607

Module 16 register address:

Channel	AD signal	Channel enable switch (please turn on the swich to use this channel)
0CH	ID11500	Y11700
1CH	ID11501	Y11701
2CH	ID11502	Y11702
3CH	ID11503	Y11703
4CH	ID11504	Y11704
5CH	ID11505	Y11705
6CH	ID11506	Y11706
7CH	ID11507	Y11707

Note:

(1) Banning unused channels can improve the scanning speed of input/output.

(2) When the input enabling switch is turned off during operation, the corresponding input channel will not collect data. (Data display is 0)

5-4. Working mode settings

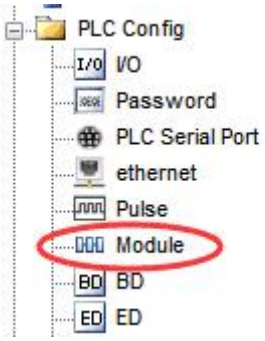
There are two ways to set the working mode (the effect of these two ways is equivalent):

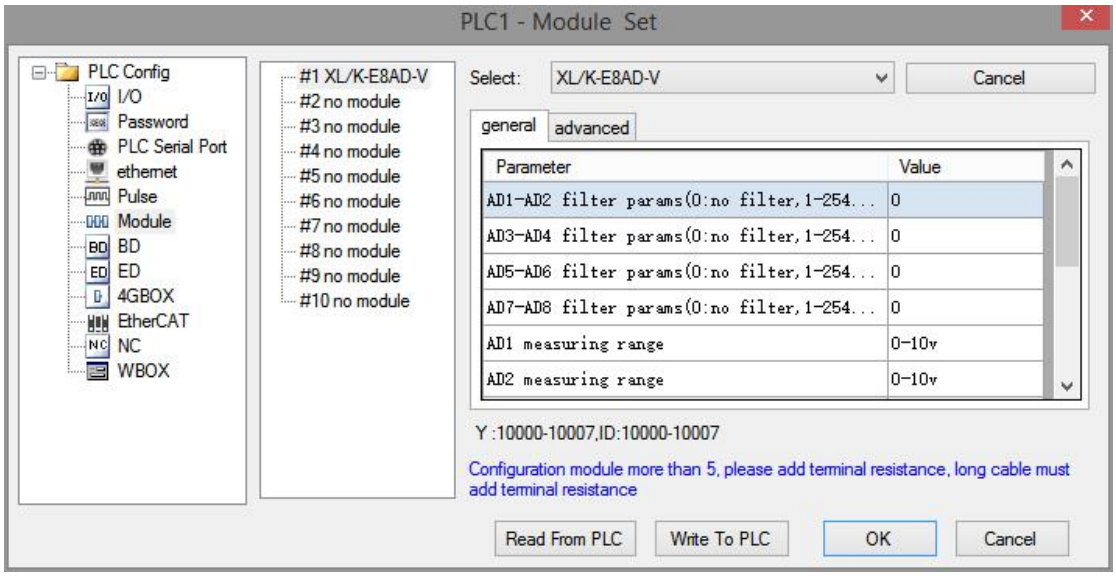
(1) Configuration through the software

(2) Setting up by Flash Register

Set through the software

Please use XDPpro v3.5.1 or higher version software to configure the module.
Open the software, click module in the left menu,





Choose the module type, and set each channel's parameters in the above window. Then click write to PLC, cut the power supply and power on again to make the settings effective.

Note: The first-order low-pass filtering method weighs this time sampling value and the output value of the last filtering to get the effective filtering value; the filter coefficient is set by the user to 0-254, the smaller the value, the more stable the data, but may lead to data lag; therefore, when set to 1, the filtering effect is strongest and the data is the most stable; when set to 254, the filtering effect is the weakest; default is 0 (no filtering).

Set by Flash register

The input channel of the extended module is voltage mode, with 0~5V, 0~10V, -5~5V, -10~10V optional. It is set by special FLASH data register SFD in PLC. As follows:

Module no.	SFD register	Module no.	SFD register
#1	SFD350~SFD359	#9	SFD430~SFD439
#2	SFD360~SFD369	#10	SFD440~SFD449
#3	SFD370~SFD379	#11	SFD450~SFD459
#4	SFD380~SFD389	#12	SFD460~SFD469
#5	SFD390~SFD399	#13	SFD470~SFD479
#6	SFD400~SFD409	#14	SFD480~SFD489

#7	SFD410~SFD419	#15	SFD490~SFD499
#8	SFD420~SFD429	#16	SFD500~SFD509

Note: As shown above, each register sets four-channel modes. Each register has 16 bits. From low to high, each four bit will set four-channel modes in turn.

SFD bit definition

<table>
<tr><th></th><th>Bit7</th><th>Bit6</th><th>Bit5</th><th>Bit4</th><th>Bit3</th><th>Bit2</th><th>Bit1</th><th>Bit0</th><th>NOTE</th></tr>
<tr><td>Byte0</td><td colspan="8">AD channel 2, channel 1 filtering parameter</td><td rowspan="4">AD filtering parameter</td></tr>
<tr><td>Byte1</td><td colspan="8">AD channel 4, channel 3 filtering parameter</td></tr>
<tr><td>Byte2</td><td colspan="8">AD channel 6, channel 5 filtering parameter</td></tr>
<tr><td>Byte3</td><td colspan="8">AD channel 8, channel 7 filtering parameter</td></tr>
<tr><td rowspan="4">Byte4</td><td>Bit7</td><td>Bit6</td><td>Bit5</td><td>Bit4</td><td>Bit3</td><td>Bit2</td><td>Bit1</td><td>Bit0</td><td rowspan="8">Set the AD module input range, Byte4 low 4-bit set AD channel1, high 4-bit set AD channel2. Byte5 low 4-bit set AD channel3, high 4-bit set AD channel4, Byte6 low 4-bit set AD channel5, high 4-bit set AD channel6,
Byte7 low 4-bit set AD channel7, high 4-bit set AD channel8.</td></tr>
<tr><td colspan="4">AD2</td><td colspan="4">AD1</td></tr>
<tr><td colspan="4">0000：0~10V
0001：0~5V
0010：-10~10V
0011：-5~5V</td><td colspan="4">0000：0~10V
0001：0~5V
0010：-10~10V
0011：-5~5V</td></tr>
<tr><td colspan="8"></td></tr>
<tr><td rowspan="4">Byte5</td><td>Bit7</td><td>Bit6</td><td>Bit5</td><td>Bit4</td><td>Bit3</td><td>Bit2</td><td>Bit1</td><td>Bit0</td></tr>
<tr><td colspan="4">AD4</td><td colspan="4">AD3</td></tr>
<tr><td colspan="4">0000：0~10V
0001：0~5V
0010：-10~10V
0011：-5~5V</td><td colspan="4">0000：0~10V
0001：0~5V
0010：-10~10V
0011：-5~5V</td></tr>
<tr><td colspan="8"></td></tr>
<tr><td rowspan="4">Byte6</td><td>Bit7</td><td>Bit6</td><td>Bit5</td><td>Bit4</td><td>Bit3</td><td>Bit2</td><td>Bit1</td><td>Bit0</td></tr>
<tr><td colspan="4">AD6</td><td colspan="4">AD5</td></tr>
<tr><td colspan="4">0000：0~10V
0001：0~5V
0010：-10~10V
0011：-5~5V</td><td colspan="4">0000：0~10V
0001：0~5V
0010：-10~10V
0011：-5~5V</td></tr>
<tr><td colspan="8"></td></tr>
<tr><td rowspan="4">Byte7</td><td>Bit7</td><td>Bit6</td><td>Bit5</td><td>Bit4</td><td>Bit3</td><td>Bit2</td><td>Bit1</td><td>Bit0</td></tr>
<tr><td colspan="4">AD8</td><td colspan="4">AD7</td></tr>
<tr><td colspan="4">0000：0~10V
0001：0~5V
0010：-10~10V
0011：-5~5V</td><td colspan="4">0000：0~10V
0001：0~5V
0010：-10~10V
0011：-5~5V</td></tr>
<tr><td colspan="8"></td></tr>
<tr><td>Byte8~
Byte19</td><td colspan="8">-</td></tr>
</table>

Take the first module as an example to illustrate how to set it up.

Example: To set the first module's input channels 1and 0 to 0~10V, input channels 3 and 2 to 0~5V, input channels 5 and 4 to 0~10V, input channels 7 and 6 to 0~5V, filter coefficients of channels 0, 1, 2 and 3 to 254, filter coefficients of channels 4, 5, 6 and 7 to 100.

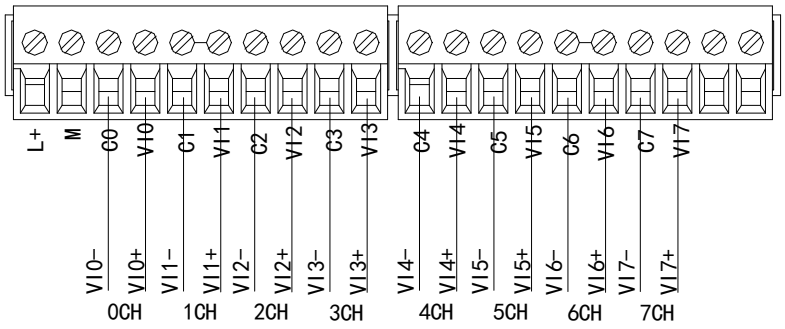
Method 1:
You can configure it directly in the PLC software, as shown above.

Method 2:
Set the SFD as follows:
SFD350=FEFEH SFD351=6464H SFD352=1100H SFD353=1100H

5-5. External wiring

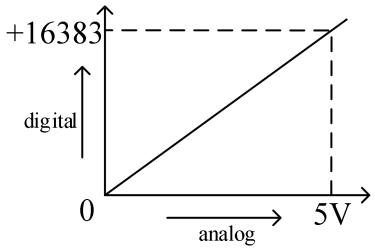
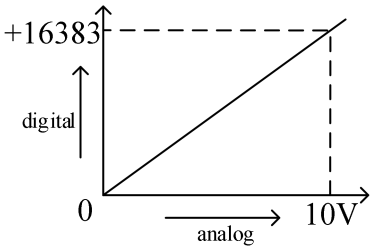
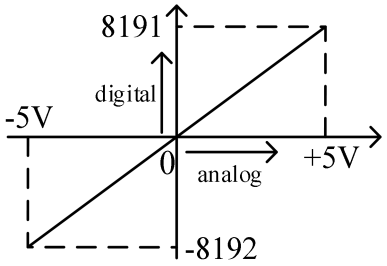
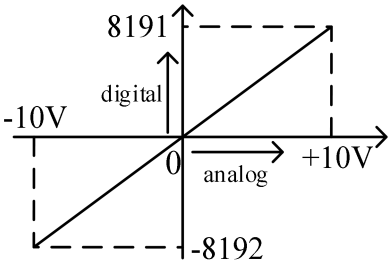
For external connection, to avoid interference, use shielding wire and connect the ground to the single point of shielding layer.

Voltage input



5-6. Analog digital conversion diagram

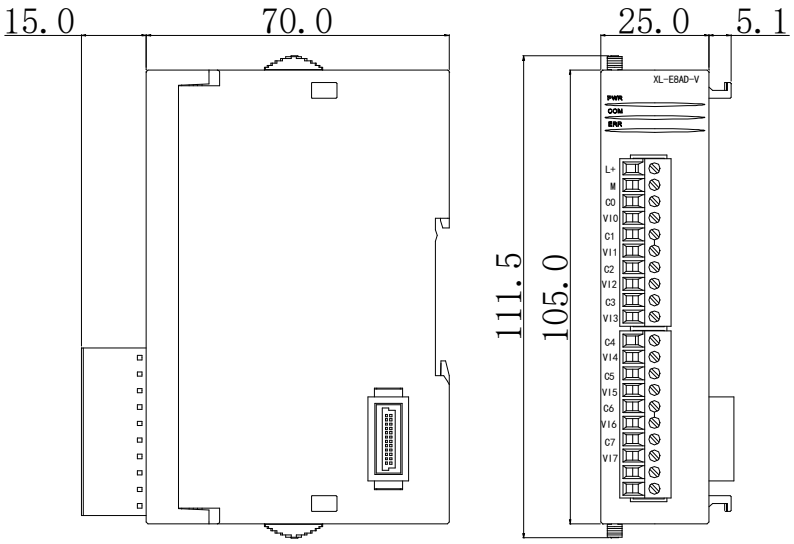
The relationship between input analog quantities and converted digital quantities is shown in the following table:

0~5V analog input	0~10V analog input
	
-5~5V analog input	**-10~10V analog input**
	

Note: When the channel enable switch is turned on and the AD voltage input is suspended, the corresponding ID register is displayed as 16383; When the channel enable switch is turned off, the ID register corresponding to the AD voltage input is displayed as 0.

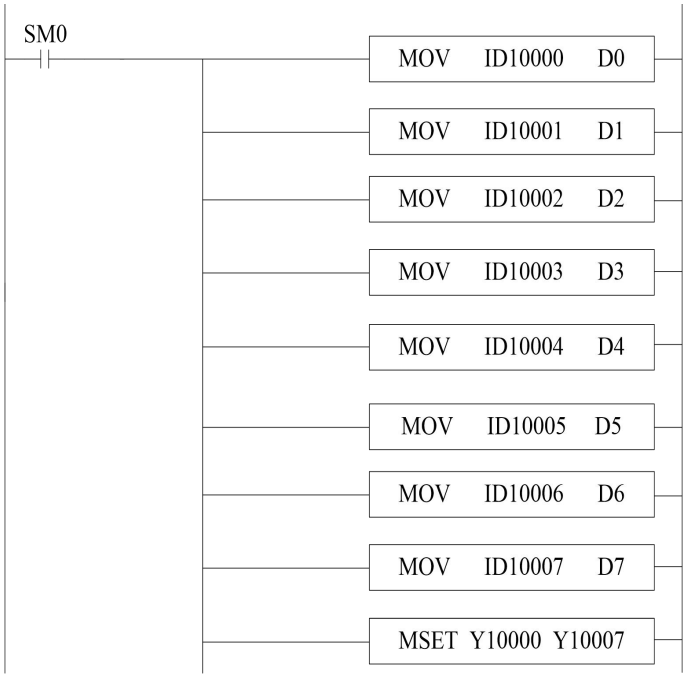
5-7. Dimension

(Unit: mm)



5-8. Application

Examples of real-time reading 8 channels of data (take Module 1 as an example)



Explain:

SM0 is a constant ON coil and has been in ON state during the operation of PLC.

The PLC starts to run, and continuously writes the data of channel 0 of the module 1 into the data register D0.

Data in channel 1 is written to data register D1;

Data in channel 2 is written to data register D2.

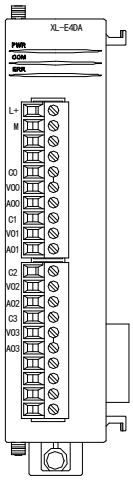
Data in channel 3 is written to data register D3.
Data in channel 4 is written to data register D4.
The data of channel 5 is written to the data register D5.
The data of channel 6 is written to the data register D6.
The data of channel 7 is written to the data register D7.
Since all channels are used, all the channel enablers are opened.

6. Analog output module XL-E4DA

This chapter mainly introduces XL-E4DA module specifications, terminal, input definition number allocation, working mode settings, external connections, analog-to-digital conversion diagrams, appearance size diagrams and related programming examples.

6-1. Module features and specifications

XL-E4DA analog output module converts four digital quantities into analog quantities, and transmits them to the main unit of PLC, and interacts with the main unit of PLC in real time.



Module features

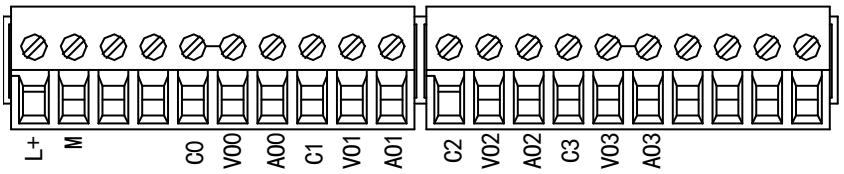
- Four-channel analog output: Voltage and current mode can be selected.
- 12-bit high-precision analog output.
- As a special functional module of the XL series, XL3 can connect up to 10 modules, XL5/XL5E/XL5N/XL5H/XLME/XLH/XSLH can expand 16 modules, and XL1 does not support expansion modules.

Module specification

Item	Voltage output	Current output
Analog output range	0~5V, 0~10V, -5~5V, -10~10V (Exterior load resistance 2KΩ~1MΩ)	0~20mA, 4~20mA (Exterior load resistance is less than 500Ω)
Digital input range	12 bits binary data (0~4095 or -2048~2047)	
Resolution	1/4095 (12Bit)	
Integrate precision	1%	
Conversion speed	2ms/1 channel	2ms/1 channel
Module power supply	DC24V±10%, 150mA	
Installation	Fixed with M3 screws or directly installed on orbit of DIN46277 (Width: 35mm)	

6-2. Terminal description

Terminal arrangement



Terminal signal

Name		Function
Indicator light	PWR	The indicator lights up when the module has a power supply.
	COM	When the module port communicates normally, the indicator lights on.
	ERR	When there is an error in the module, the indicator is always on or flickering (red). When the ERR LED is always on, it indicates that the module has serious application errors and can not be used. It is necessary to adjust the mode of use and switch the PLC to STOP state. When the ERR LED flickers, there are application errors, abnormal work and abnormal data in the module, but the PLC is still RUN.
Terminal	L+	Module 24V power supply input +

	M	Module 24V power supply input -
	C0	VO0, AO0 output ground
	VO0	Channel 1 DA voltage output
	AO0	Channel 1 DA current output
	C1	VO1, AO1 output ground
	VO1	Channel 2 DA voltage output
	AO1	Channel 2 DA current output
	C2	VO2, AO2 output ground
	VO2	Channel 3 DA voltage output
	AO2	Channel 3 DA current output
	C3	VO3, AO3 output ground
	VO3	Channel 4 DA voltage output
	AO3	Channel 4 DA current output

Wiring head specification

When wiring the module, its wiring head should meet the following requirements:
(1) The stripping length is 9 mm;
(2) Flexible wires with bare tubular ends are 0.25-1.5 square.
(3) Flexible wires with tubular pre-insulated end is 0.25-0.5 square.

6-3. I/O address

XL series analog module does not occupy I/O unit, the converted value is directly sent to the PLC register, the corresponding channel definition number of the PLC register is as follows:

Module 1 register address:

Channel	DA signal	Channel enable switch (please turn on the swich to use this channel)
0CH	QD10000	Y10000
1CH	QD10001	Y10001
2CH	QD10002	Y10002
3CH	QD10003	Y10003

Module 2 register address:

Channel	DA signal	Channel enable switch (please turn on the swich to use this channel)
0CH	QD10100	Y10100
1CH	QD10101	Y10101
2CH	QD10102	Y10102
3CH	QD10103	Y10103

Module 3 register address:

Channel	DA signal	Channel enable switch (please turn on the swich to use this channel)
0CH	QD10200	Y10200
1CH	QD10201	Y10201
2CH	QD10202	Y10202
3CH	QD10203	Y10203

Module 4 register address:

Channel	DA signal	Channel enable switch (please turn on the swich to use this channel)
0CH	QD10300	Y10300
1CH	QD10301	Y10301
2CH	QD10302	Y10302
3CH	QD10303	Y10303

Module 5 register address:

Channel	DA signal	Channel enable switch (please turn on the swich to use this channel)
0CH	QD10400	Y10400
1CH	QD10401	Y10401
2CH	QD10402	Y10402
3CH	QD10403	Y10403

Module 6 register address:

Channel	DA signal	Channel enable switch (please turn on the swich to use this channel)
0CH	QD10500	Y10500
1CH	QD10501	Y10501
2CH	QD10502	Y10502

3CH	QD10503	Y10503

Module 7 register address:

Channel	DA signal	Channel enable switch (please turn on the swich to use this channel)
0CH	QD10600	Y10600
1CH	QD10601	Y10601
2CH	QD10602	Y10602
3CH	QD10603	Y10603

Module 8 register address:

Channel	DA signal	Channel enable switch (please turn on the swich to use this channel)
0CH	QD10700	Y10700
1CH	QD10701	Y10701
2CH	QD10702	Y10702
3CH	QD10703	Y10703

Module 9 register address:

Channel	DA signal	Channel enable switch (please turn on the swich to use this channel)
0CH	QD10800	Y11000
1CH	QD10801	Y11001
2CH	QD10802	Y11002
3CH	QD10803	Y11003

Module 10 register address:

Channel	DA signal	Channel enable switch (please turn on the swich to use this channel)
0CH	QD10900	Y11100
1CH	QD10901	Y11101
2CH	QD10902	Y11102
3CH	QD10903	Y11103

Module 11 register address:

Channel	DA signal	Channel enable switch (please turn on the swich to use this channel)
0CH	QD11000	Y11200

1CH	QD11001	Y11201
2CH	QD11002	Y11202
3CH	QD11003	Y11203

Module 12 register address:

Channel	DA signal	Channel enable switch (please turn on the swich to use this channel)
0CH	QD11100	Y11300
1CH	QD11101	Y11301
2CH	QD11102	Y11302
3CH	QD11103	Y11303

Module 13 register address:

Channel	DA signal	Channel enable switch (please turn on the swich to use this channel)
0CH	QD11200	Y11400
1CH	QD11201	Y11401
2CH	QD11202	Y11402
3CH	QD11203	Y11403

Module 14 register address:

Channel	DA signal	Channel enable switch (please turn on the swich to use this channel)
0CH	QD11300	Y11500
1CH	QD11301	Y11501
2CH	QD11302	Y11502
3CH	QD11303	Y11503

Module 15 register address:

Channel	DA signal	Channel enable switch (please turn on the swich to use this channel)
0CH	QD11400	Y11600
1CH	QD11401	Y11601
2CH	QD11402	Y11602
3CH	QD11403	Y11603

Module 16 register address:

Channel	DA signal	Channel enable switch (please turn on the swich to use this channel)
0CH	QD11500	Y11700
1CH	QD11501	Y11701
2CH	QD11502	Y11702
3CH	QD11503	Y11703

Note:

1) Banning unused channels can improve the scanning speed of input/output.

2) When the enabling switch of output is turned off during operation, the corresponding output channel keeps the original data unchanged.

6-4. Working mode settings

There are two ways to set the working mode (the effect of these two ways is equivalent):

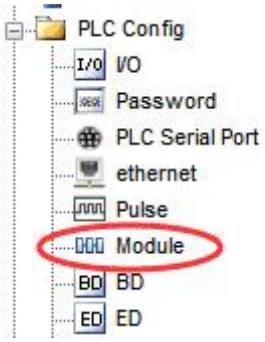
(1) Configuration through the software

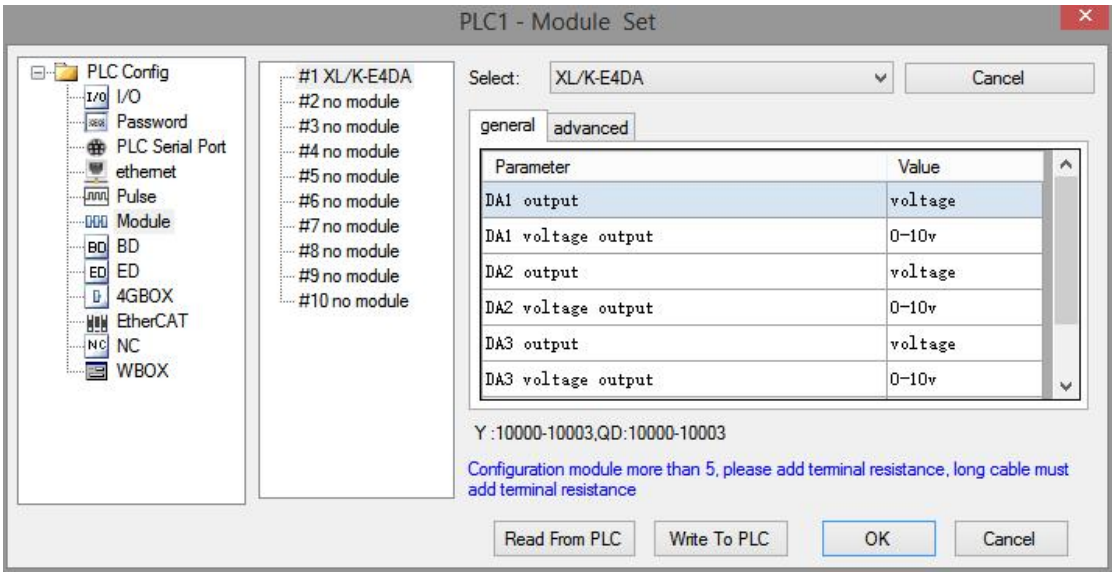
(2) Setting up by Flash Register

Set through the software

Please use XDPpro v3.5.1 or higher version software to configure the module.

Open the software, click module in the left menu,





Choose the module type, and set each channel's parameters in the above window. Then click write to PLC, cut the power supply and power on again to make the settings effective.

Set by Flash register

The output channels of the expansion module can be selected in two modes: voltage and current. Current is 0-20mA, 4-20mA. Voltage is 0-5V, 0-10V, -5-5V and -10-10V. It is set by special FLASH data register SFD in PLC. As follows:

Module no.	SFD register	Module no.	SFD register
#1	SFD350~SFD359	#9	SFD430~SFD439
#2	SFD360~SFD369	#10	SFD440~SFD449
#3	SFD370~SFD379	#11	SFD450~SFD459
#4	SFD380~SFD389	#12	SFD460~SFD469
#5	SFD390~SFD399	#13	SFD470~SFD479
#6	SFD400~SFD409	#14	SFD480~SFD489
#7	SFD410~SFD419	#15	SFD490~SFD499
#8	SFD420~SFD429	#16	SFD500~SFD509

SFD bit definition

Take the first module as an example to illustrate how to set it up.

	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
	DA2				DA1			
Byte0	-	voltage current 000：0~10V 010：0~20mA 001：0~5V 011：4~20mA 100：-10~10V 101：-5~5V			-	voltage current 000：0~10V 010：0~20mA 001：0~5V 011：4~20mA 100：-10~10V 101：-5~5V		
	DA4				DA3			
Byte1	-	voltage current 000：0~10V 010：0~20mA 001：0~5V 011：4~20mA 100：-10~10V 101：-5~5V			-	voltage current 000：0~10V 010：0~20mA 001：0~5V 011：4~20mA 100：-10~10V 101：-5~5V		
Byte2~ Byte19	-							

Example: The working modes of output channel 3, channel 2, channel 1 and channel 0 are 0-10V, 0-10V, 0-20mA and 0-20mA, respectively.

Method 1:

You can configure it directly in the PLC software, the configuration method please refer to chapter 6-4.

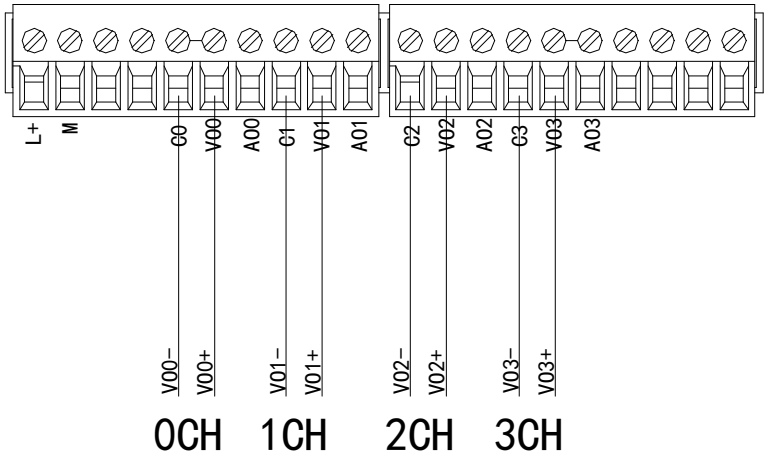
Method 2:

Set the SFD as follows: SFD350=0022H

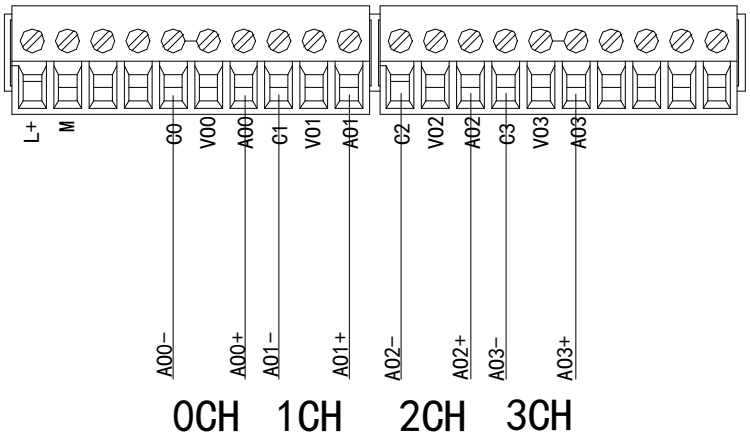
6-5. External wiring

For external connection, to avoid interference, use shielding wire and connect the ground to the single point of shielding layer.

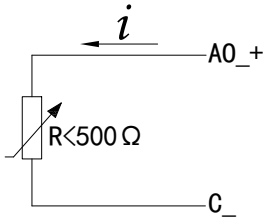
Voltage output



Current output



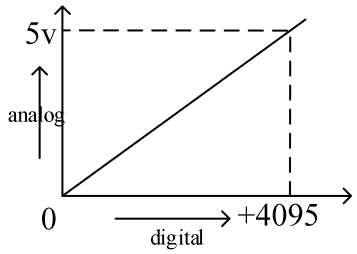
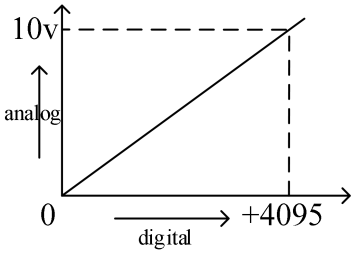
XL-E4DA current output wiring:

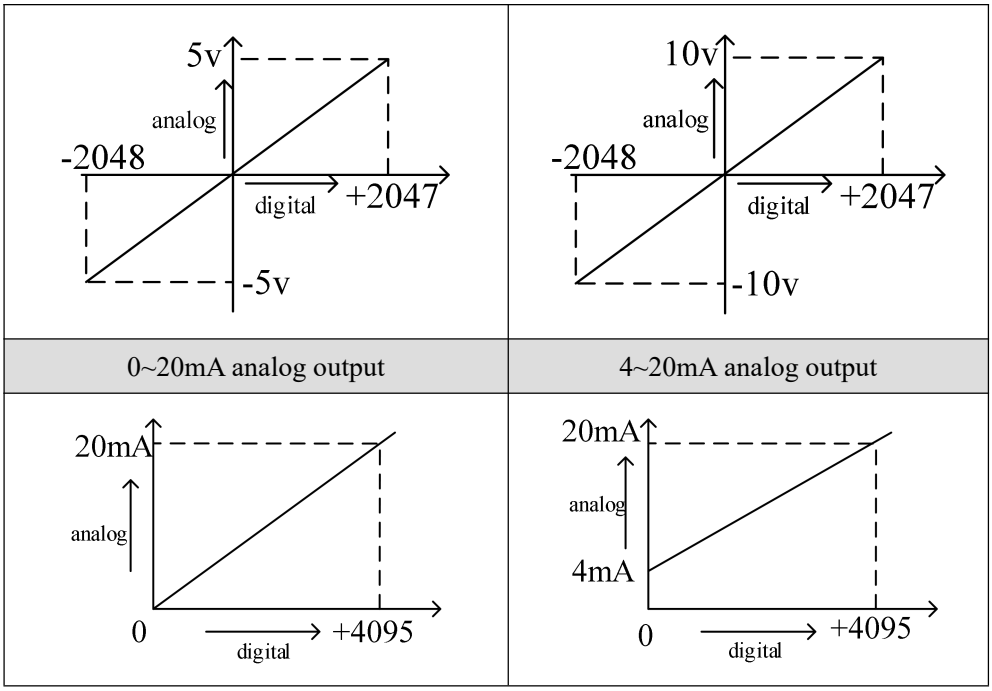


Note: current output no needs to connect DC24V power supply.

6-6. Analog digital conversion diagram

The relationship between the output digital quantity and its corresponding analog data is shown in the following table:

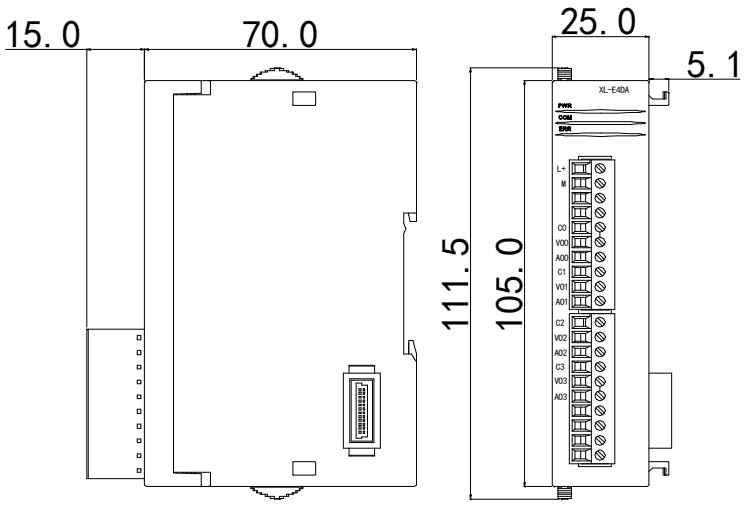
0~5V analog output	0~10V analog output
	
-5~5V analog output	-10~10V analog output



Note: When the input data exceeds K4095, the analog data of DA conversion remains unchanged at 5V, 10V or 20mA.

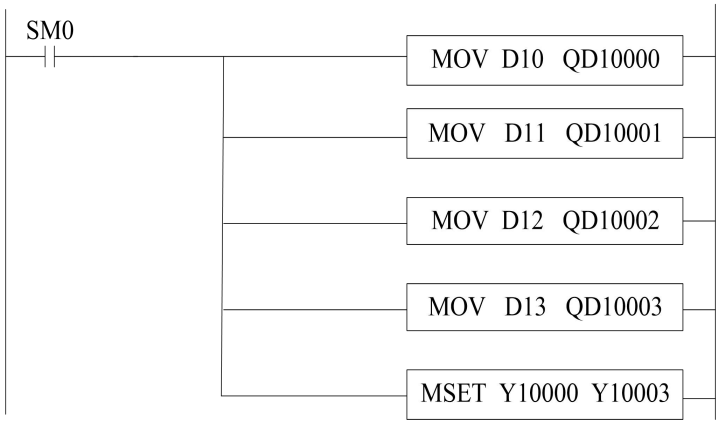
6-7. Dimension

(Unit: mm)



6-8. Application

Example: real-time write 4 channels data(take module 1 as an example)



Explain:

SM0 is a constant ON coil and has been in ON state during the operation of PLC.

Write the data register D10 to output channel 0.

Write the data register D11 to output channel 1.

Write the data register D12 to output channel 2.

Write the data register D13 to output channel 3.

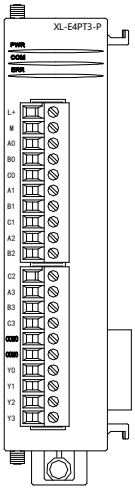
Since all channels are used, all the enabled bits of all channels are opened.

7. PT100 temperature module XL-E4PT3-P

This chapter mainly introduces XL-E4PT3-P module specifications, terminal instructions, input definition number allocation, working mode settings, external connections, analog-to-digital conversion diagrams, appearance size diagrams and related programming examples.

7-1. Module features and specifications

XL-E4PT3-P temperature PID control module processes 4-channel thermal resistance temperature signals and transmits them to the main unit of PLC.



Features

- Platinum thermal resistance input, indexing number Pt100, Pt1000
- 4 channels input, 4 channels output
- 4 groups PID parameters, auto-tune function
- The constant current output of 1mA is not affected by the change of external environment.
- Resolution is 0.1℃
- As a special functional module of the XL series, the XL3 series PLC can connect up to 10 modules, XL5/XL5E/XL5N/XL5H/XLME/XLH/XSLH can expand 16 modules, and XL1 does not support expansion modules.

Module specifications

Item	Contents
Analog input signal	Pt100, Pt1000 platinum thermistors
Temperature measurement range	-100℃~500℃
Digital output range	-1000~5000
Resolution	0.1℃
Integrate precision	±0.5% (relative max value)
Conversion speed	450ms/4 channels
Module power supply	DC24V±10%, 50mA
Install format	Fixed with M3 screws or directly installed on orbit of

	DIN46277 (Width: 35mm)

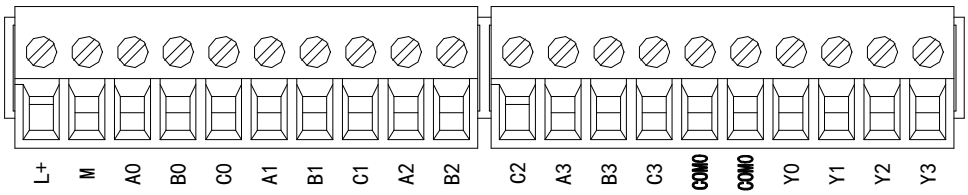
Note:
When the module is in an abnormal state, the ID1xxxx register will display corresponding abnormal values, even if the disconnection detection is disabled in the module configuration. The abnormal values for different types of alarms are as follows:

(1) When the 24V power supply of the module is disconnected, all channel data is -2.
(2) When the thermistor temperature control module is not connected to a sensor, its channel data is the maximum value of the digital output range (5000).
(3) When the sensor signal is below the lower limit of the measurement range, its channel data is the minimum value of the digital output range (-1000).
(4) When the sensor signal is higher than the upper limit of the measurement range, its channel data is the maximum value of the digital output range (5000).
(5) When both sensor disconnection and 24V power supply disconnection occur, display the abnormal value (-2).

Pt1000 sensor type is only supported by firmware version V3 and above temperature modules, aslo V3.7.16 and above XDPPro software is required.

7-2. Terminals

Terminal arrangement



Module signal

Name		Function
LED light	PWR	The indicator lights up when the module has a power supply
	COM	When the module communication port communicates normally, the indicator lights on
	ERR	When there is an error in the module, the indicator is always on or flickering (red)

		When the ERR lamp is always on, there are serious application errors in the module that can not be used, so the mode of use must be adjusted, and the PLC body is switched to STOP state. When the ERR lamp flickers, there are application errors, abnormal work and abnormal data in the module, but the PLC body is still RUN.
terminal	L+	External power supply 24V +
	M	External power supply 24V -
	A0	CH0 temperature input
	B0	CH0 input common terminal
	C0	CH0 input common terminal
	A1	CH1 temperature input
	B1	CH1 input common terminal
	C1	CH1 input common terminal
	A2	CH2 temperature input
	B2	CH2 input common terminal
	C2	CH2 input common terminal
	A3	CH3 temperature input
	B3	CH3 input common terminal
	C3	CH3 input common terminal
	COM0	PID output common terminal
	Y0~Y3	PID output terminals corresponding to CH0~CH3

Wiring head specifications

When wiring the module, its wiring head should meet the following requirements:

(1) The stripping length is 9 mm;

(2) Flexible conductors with bare tubular ends are 0.25-1.5 square.

(3) Flexible conductor with tubular pre-insulated end is 0.25-0.5 square.

7-3. I/O address

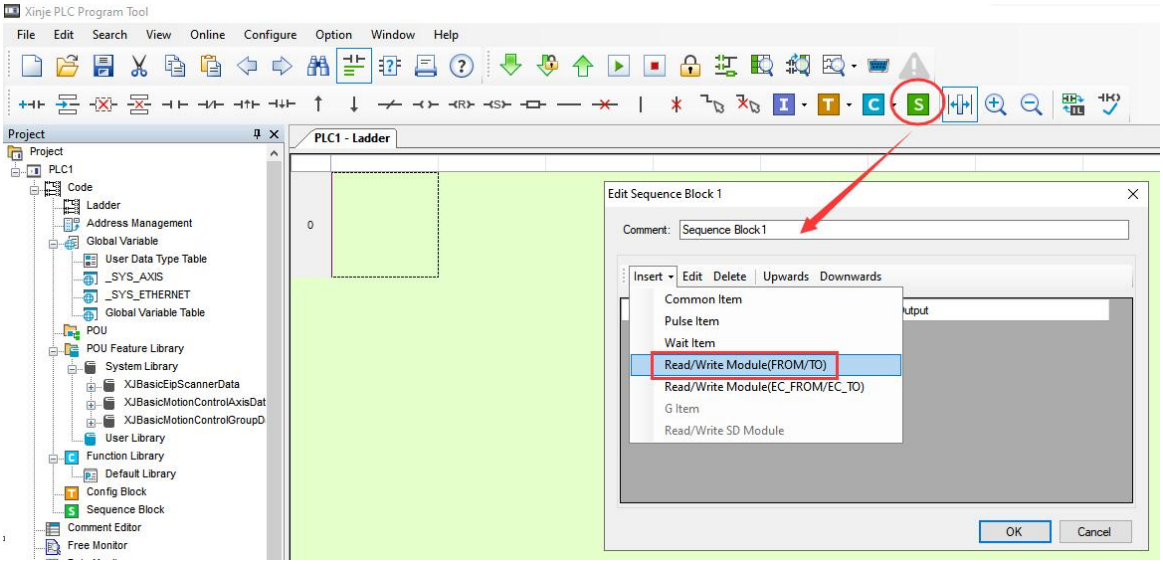
XL series analog module will not occupy I/O unit, the conversion value will be sent to PLC register. Each channel related PLC register address are shown as below:

Parameter	Address				
Channel		CH0	CH1	CH2	CH3
Display temperature (unit: 0.1℃)	Module 1	ID10000	ID10001	ID10002	ID10003
	Module 2	ID10100	ID10101	ID10102	ID10103
	·····	ID10x00	ID10x01	ID10x02	ID10x03
	Module 16	ID11500	ID11501	ID11502	ID11503

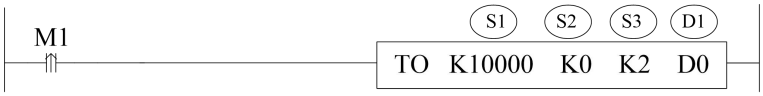
PID enable bit (0: OFF, 1: ON)	Module 1	Y10000	Y10001	Y10002	Y10003
	Module 2	Y10100	Y10101	Y10102	Y10103
	·····	Y10x00	Y10x01	Y10x02	Y10x03
	Module 16	Y11700	Y11701	Y11702	Y11703
	When the "Y function selection" is set to "immediate output", Y0~Y3 are ordinary switch output terminals, and Y10000~Y10003 (taking module # 1 as an example) can be used to directly control the Y0~Y3 output of the module. When "Y Function Selection" is set to "Channel Enable", Y0~Y3 are PID output terminals, and Y10000~Y10003 (taking module # 1 as an example) can be used to enable PID control of the corresponding channel. The Y0~Y3 output of the module is automatically calculated and controlled by PID.				
PID contact output (X input returning to the main body)	Module 1	X10000	X10001	X10002	X10003
	Module 2	X10100	X10101	X10102	X10103
	·····	X10x00	X10x01	X10x02	X10x03
	Module 16	X11700	X11701	X11702	X11703
	When the "Y function selection" is set to "channel enable", Y10000~Y10003 (taking module # 1 as an example) are PID enable bits, and the PID duty cycle output needs to be monitored through X10000~X10003 (taking module # 1 as an example).				
Open circuit detection (0: normal, 1: disconnected)	Module 1	X10010	X10011	X10012	X10013
	Module 2	X10110	X10111	X10112	X10113
	·····	X10x10	X10x11	X10x12	X10x13
	Module 16	X11710	X11711	X11712	X11713
Auto-tuning error	Module 1	X10020	X10021	X10022	X10023
	Module 2	X10120	X10121	X10122	X10123
	·····	X10x20	X10x21	X10x22	X10x23
	Module 16	X11720	X11721	X11722	X11723

From/To instruction

The reading and writing of the temperature control module for the thermal resistor needs to be completed in the sequence block through the FROM/TO command, as shown in the following figure:



Parameter write insruction TO



Function: write the PLC register data to module address, the operate unit is word.

Operand:

S1: target module number, range: 10000~10015. Operand: K, TD, CD, D, HD, FD

S2: first address of module. Operand: K, TD, CD, D, HD, FD

S3: write in register numbers. Operand: K, TD, CD, D, HD, FD

D1: first address of PLC. Operand: TD, CD, D, HD, FD

Parameter read instruction FROM

Function: read the module data to the PLC regsiter, the operate unit is word.

S1: target module number, range: 10000~10015. Operand: K, TD, CD, D, HD, FD

S2: first address of module. Operand: K, TD, CD, D, HD, FD

S3: read register numbers. Operand: K, TD, CD, D, HD, FD

D1: first address of PLC. Operand: TD, CD, D, HD, FD

Note:

(1) The FROM/TO instruction can only be written in the sequence function block. For XL series PLCs with firmware version V3.4.5 and above, a maximum of 100 BLOCKs can be written in the program, but a maximum of 8 can be run simultaneously.

(2) The starting number of the module starts from K10000, with module # 1 being K10000, module # 2 being K10001... and so on, module # 16 being K10015.

Related address definition:

The address of the read/write parameters:

From_To data	Address				Read/write	Default value
Channel	CH0	CH1	CH2	CH3		
Auto-tune bit	K0	K0	K0	K0	R/W	0
PID output (0~4095)	K1	K2	K3	K4	R	-
Target temperature (unit: 0.1℃)	K5	K6	K7	K8	R/W	0
Kp	K9	K13	K17	K21	R/W	40
Ki	K10	K14	K18	K22	R/W	240
Kd	K11	K15	K19	K23	R/W	60
Diff (unit: 0.1℃)	K12	K16	K20	K24	R/W	1000
Control period (unit: 0.1s)	K25	K26	K27	K28	R/W	20
Output range (range: 0~100)	K29	K30	K31	K32	R/W	100
Temperature difference δ (unit: 0.1℃)	K33	K34	K35	K36	R/W	0
Calibrate ambient temperature values (unit: 0.1℃)	K37	K38	K39	K40	W	-
From/To data initialization	K41	K41	K41	K41	W	-

Auto-tune PID control bit	Auto-tune triggered signal, start to auto-tune mode when set to 1 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.
PID output value (0~4095)	When the PID output is for analog control (such as steam valve opening or thyristor conduction angle), this value can be transmitted to the analog output module to achieve control requirements.
PID parameters (P, I, D)	The best PID parameters got from the PID auto-tune. 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.
PID calculation	This function can set the temperature range of the PID operation, such as setting the relevant parameter Tdiff, the target temperature is Target, then the operation range of

range (Diff) Unit: 0.1℃	the PID is Target-Tdiff < T < Target + Tdiff, when T < Target-Tdiff, the output is the max value, when T > Target + Tdiff, the output is 0.
Temperature difference value δ Unit: 0.1℃	The actual temperature display = (sampling temperature value + temperature deviation value δ)/10. When the user thinks the measured temperature is different from the actual temperature, this value can be modified to correct the temperature.
Set temperature Unit: 0.1℃	The target temperature of the control system. Range from -1000~5000, which is -100~500℃, precision degree is 0.1℃.
Temperature control period Unit: 0.1s	The adjusting range of temperature control period is 0.1s~200s, and the minimum precision range is 0.1s. For example, when writing 5, the actual temperature control period is 0.5s.
Adjusting Environment temperature Unit: 0.1℃	When the user believes that the ambient temperature value is inconsistent with the temperature value displayed on the module channel, the known ambient temperature value can be written into this parameter. At the moment the module is written, the temperature deviation value is set to δ and save. Calculate temperature deviation value δ = adjusting ambient temperature value - sampling temperature value. Unit: 0.1 ℃. For example, in the thermal equilibrium state, the user measured the ambient temperature as 60.0 ℃ using a mercury thermometer, and the displayed temperature was 55.0 ℃ (corresponding to the sampling temperature of 550), with a temperature deviation value δ = 0. At this point, the user writes 600 and the temperature deviation value δ Recalculated to 50 (5 ℃), the displayed temperature is (sampling temperature value+temperature deviation value δ) / 10=60 ℃. Attention: When the user inputs the adjusting temperature value, confirm that it is consistent with the ambient temperature. This data is very important, and once entered incorrectly, it can lead to calculating temperature deviation values δ Serious error, which in turn affects the display temperature.
Auto-tune output range	The output amplitude calculated by PID is in %, where 100 represents the duty cycle as 100% of the full scale output and 80 represents 80% of the full scale output. Note: When set to 0, PID control will have no output.
From/To data initialization	This function can restore the parameters in the above table to their factory settings. When using it, K41 needs to be set to 1, setting to other values are invalid.

Note:

(1) The "From/To data initialization" function requires the module firmware version to be V3 or higher.

(2) When the "Y function selection" is set to "immediate output", only the “temperature deviation value” and “adjusting ambient temperature value” is valid, and other parameters are not effective.

(3) The module can automatically save the set temperature value, PID parameters, temperature control cycle, output amplitude, temperature deviation, and temperature calibration parameters. When writing the above parameters, it is necessary to use the rising edge to trigger the writing. Do not keep writing. It is recommended to only write the parameters used.

It is not recommended to write the entire piece of data for programming convenience, as writing 0 to some addresses may cause the system to malfunction.

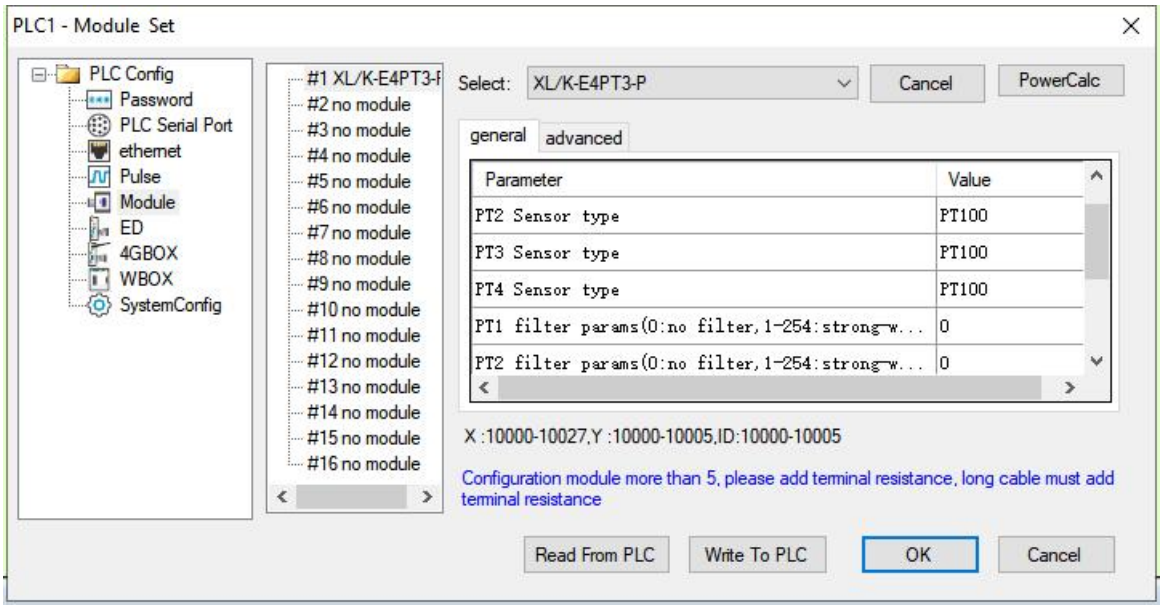
(4) The self-tuning enable address K0: K0 will occupy a continuous 8-bit address space. The 4-channel module enable bits correspond to the first 4 bits address space, while the last 4 bits addresses are idle (but cannot be used for other purposes). When the read/write enable bit is enabled, K0 can be a coil or register. When it is a coil, it occupies 8 consecutive bits starting from the coil address; When it is a register, it occupies that register. For example, to set the first and third channels of the module to self-tuning mode, and the other two channels to manual PID mode, with the command To K10000 K0 K1 M10, M10 and M12 should be set to ON, and M11, M13, M14, and M15 should be set to OFF; When the instruction is To K10000 K0 K1 D100, D100 should be assigned a value of 5.

7-4. Working mode

There are two ways to set the working mode (the effect of these two ways is equivalent):
1: Through the XDPpro software
2: Through Flash Register (FD) Settings

Set through the software

Open the software, click configure/expansion module setting, then select the module type in the following window:



Steps	Explanation
1	Select the module model
2	Select the sensor type, filtering coefficient, wire breakage detection switch, and Y function selection for the corresponding channel
3	After configuration is complete, click "Write to PLC" and then click "OK". After downloading the user program and running it, this configuration will take effect.

Note:

(1) The first-order low-pass filtering method weighted this sampling value and the output value of the last filtering to get the effective filtering value; the filter coefficient is set by the user to 0-254, the smaller the value, the more stable the data, but it may lead to data lag; therefore, when set to 1, the filtering effect is strongest and the data is the most stable; when set to 254, the filtering effect is the weakest; default is 0 (no filtering).

(2) The "Y function selection" function needs to be supported by module firmware versions of V3 or above.

(3) "Y Function Selection" is used to specify the functions of Y10000~Y10003 (# 1 module as an example). The default factory setting is "Channel Enable", which supports the module's own self-tuning and PID control functions. The output points Y0~Y3 on the module are affected by the PID output value, resulting in on/off effects; When set to "immediate output", the output points Y0~Y3 on the module are ordinary switch output points. Setting On Y10000~Y10003 can conduct Y0~Y3, while the module only retains the temperature acquisition function. If temperature control is required, please use the PID command of the PLC body to achieve it.

(4) The "PT channel disconnection detection" function requires firmware version V3 or above.

(5) PT1000 sensor type is only supported by firmware version V3 and above temperature module, and used in conjunction with V3.7.16 and above XDPPro software.

(6) Module 24V power supply detection function is only supported by firmware version V4 and above temperature modules.

Set through flash register

Extension module CH0~CH3 channel can set filter coefficients through special FLASH data register FD inside PLC. As follows:

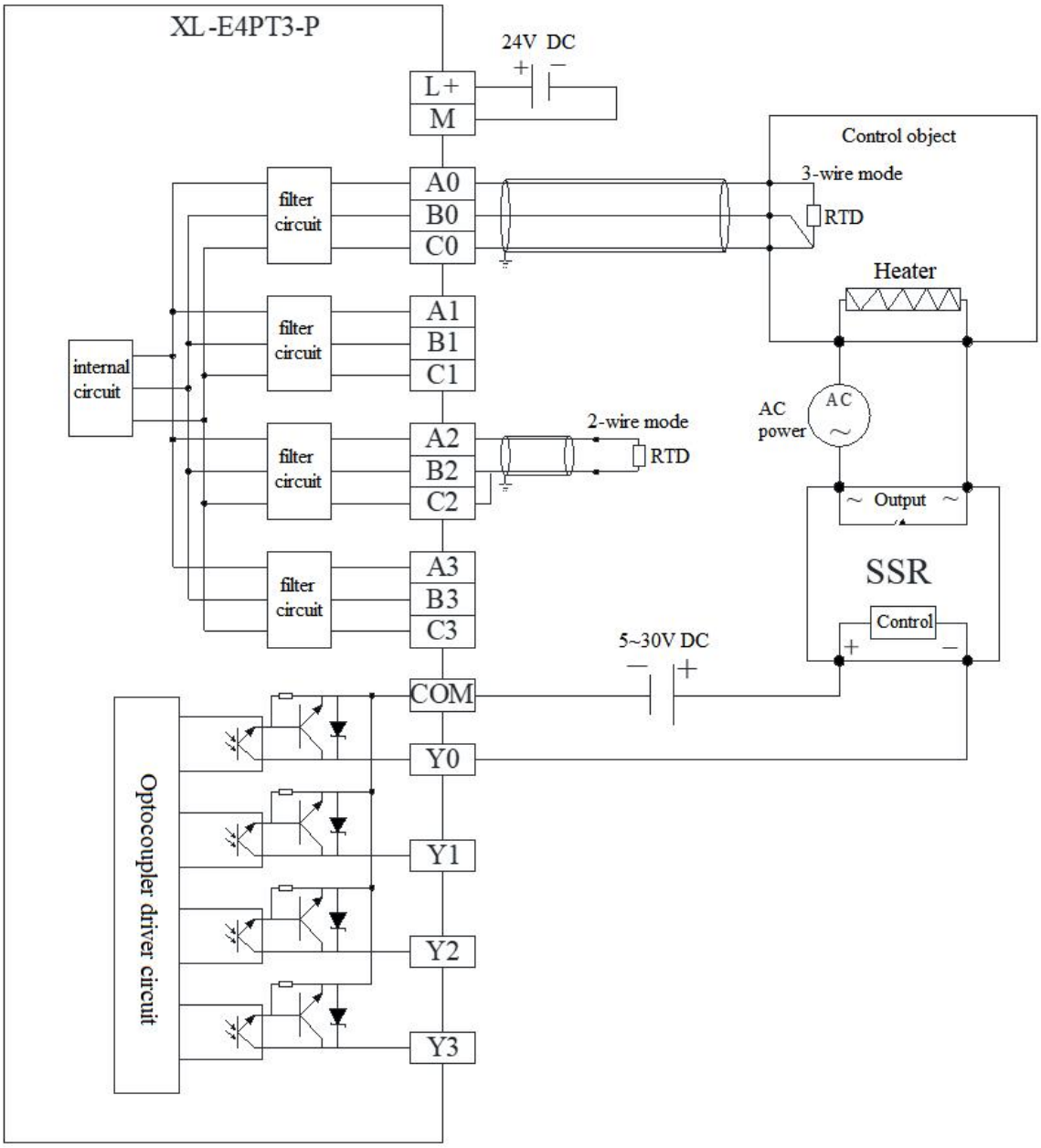
Module ID	SFD address	Module ID	SFD address
#1	SFD350~SFD359	#9	SFD430~SFD439
#2	SFD360~SFD369	#10	SFD440~SFD449
#3	SFD370~SFD379	#11	SFD450~SFD459
#4	SFD380~SFD389	#12	SFD460~SFD469
#5	SFD390~SFD399	#13	SFD470~SFD479
#6	SFD400~SFD409	#14	SFD480~SFD489
#7	SFD410~SFD419	#15	SFD490~SFD499
#8	SFD420~SFD429	#16	SFD500~SFD509

SFD bit definition

Take module 1 as an example to explain the setting method:

Register		Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
SFD350	Byte0	PT channel 1 filtering coefficient (0 not filtered, 1-254 filtering intensity decreases sequentially)							
	Byte1	PT channel 2 filtering coefficient (0 not filtered, 1-254 filtering intensity decreases sequentially)							
SFD351	Byte2	PT channel 3 filtering coefficient (0 not filtered, 1-254 filtering intensity decreases sequentially)							
	Byte3	PT channel 4 filtering coefficient (0 not filtered, 1-254 filtering intensity decreases sequentially)							
SFD352	Byte4	-							
	Byte5	-							
SFD353	Byte6	-							
	Byte7	-							
SFD354	Byte8	-				PT channel disconnection detection 00: On 01: Off		Y function selection 00: Channel Enable 01: Immediate output	
	Byte9	-				-			
SFD355	Byte10	PT2 sensor type				PT1 sensor type			
		0000: PT100 0001: PT1000				0000: PT100 0001: PT1000			
	Byte11	PT4 sensor type				PT3 sensor type			
		0000: PT100 0001: PT1000				0000: PT100 0001: PT1000			
SFD356	Byte12	-				-			
	Byte13	-				-			
SFD357~SFD359		-							

7-5. External wiring



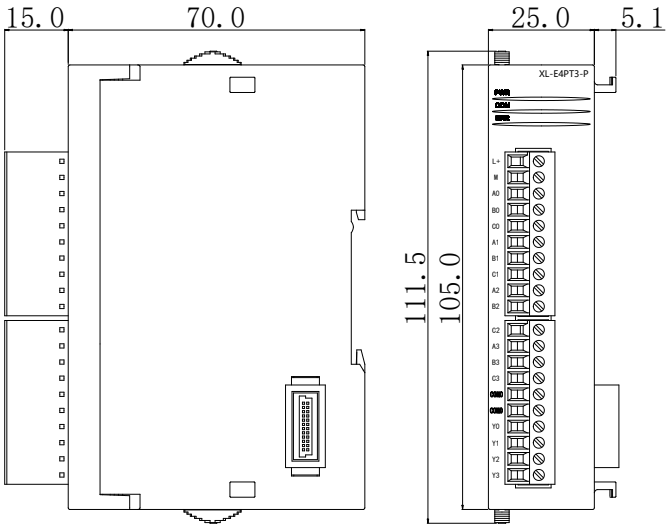
- For a two-wire thermal resistance, one end of the sensor should be connected to terminal A and the other end to terminal C, and a wire should be used to short-circuit terminals B and C.
- For a three wire thermal resistance, two wires of the same color of the sensor should be connected to terminal B and terminal C respectively, and the other wire should be connected to terminal A.
- Output terminal: transistor output terminal, please choose a smooth power supply with DC5V~30V.
- Circuit insulation: Optocouplers are used for optical insulation between the internal circuits and output transistors of programmable controllers, and each common module is also separated from each other.
- Response time: The time from the programmable controller driving (or disconnecting) the optocoupler to the transistor ON/OFF shall not exceed 0.2ms.

- Output current: To limit temperature rise, it supports a maximum output load of 50mA.
- Open circuit leakage current: below 0.1mA.

- When connecting an external 24V power supply, please use the 24V power supply on the PLC body to avoid interference.
- The casing of the equipment where the temperature sensor is installed must be grounded.
- To avoid interference, temperature sensors should use shielded wires and be grounded at a single point for the shielding layer.

7-6. Dimension

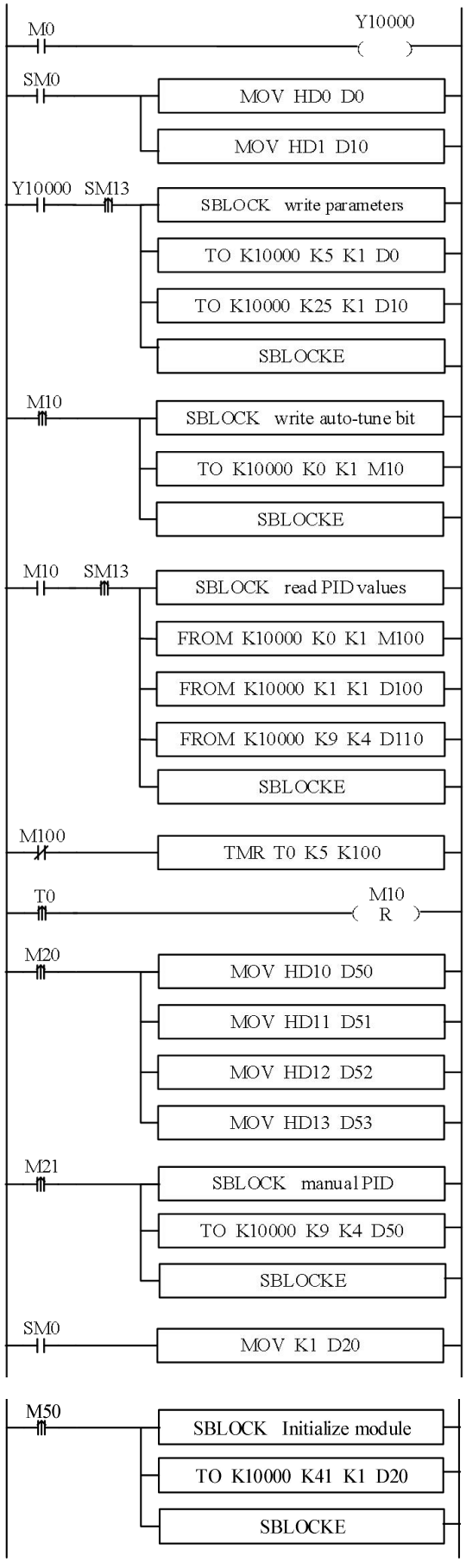
Unit: mm



7-7. Application

When temperature control is required, there are two programming options:
1. use the PID of the PLC body for temperature control, at this time, you need to switch the Y function selection to 'immediate output', the programming case details please refer to "XDXL PLC instruction manual" chapter 7 PID control functions.
2. use the built-in PID of the module for temperature control, at this time, you need to switch the Y function selection to "channel enable", programming cases such as shown in following example 1.

Example 1: take module 1 as an example, do PID control for channel 0.



// open PID enable bit

// set target value

// set temperature control period

// write in the target value, temperature control period

//write in the auto-tune flag bit

// turn on auto-tune function

//read auto-tune bit and PID parameters

//read auto-tune bit

//read PID output value

//set P, I, D values

//after reset auto-tune for 0.5s, reset auto-tune start flag

//set P value

//set I value

//set D value

//set Diff value

//perform manual PID control, write in P, I, D, Diff values

// Initialize module parameters

Explanation:

After enabling the self-tuning, this command will immediately occupy a total of 8 bits in M10-M17. M10-M13 corresponds to the self-tuning enable of each channel. To set which channel needs to be tuned, set the corresponding coil to ON. M14~M17 have no meaning at the moment and need to be left blank.

If the output is a solid-state relay, it is recommended to set the temperature control cycle to 1-3 seconds; If the output is a relay, it is recommended to set the temperature control cycle to 3-15s.

Due to inconsistent units, the PID parameters of the main body and module cannot be used interchangeably. The main body PID parameters are in uppercase, and the module PID parameters are in lowercase. The specific conversion relationship is as follows: p=P/100; i=I/10; d=D/100.

M0 turn on PID enable
SM0 set the target value, temperature control period
M1 write in target value, temperature control period
M3 set the manual P, I, D parameters
M4 write in manual P, I, D parameters
M10 read the auto-tuning bit, PID parameters and PID output value
M50 initialize the module
Y10000 PID enable bit of channel 0

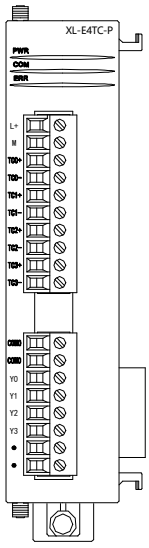
D0 target value
D10 temperature control period
D80 P
D81 I
D82 D
D83 DIFF

8. Thermocouple temperature module XL-E4TC-P

This chapter mainly introduces XL-E4TC-P module specifications, terminal instructions, input definition number allocation, working mode settings, external connections, analog-to-digital conversion diagrams, appearance size diagrams and related programming examples.

8-1. Specifications

XL-E4TC-P can process 4-channel of thermocouple signal and send the data to the PLC.



Features

- thermocouple sensor signal input
- 4 channels input, 4 channels output
- 4 groups PID parameters, auto-tune function
- Built-in cold-terminal compensation circuit
- Resolution is 0.1℃
- As a special functional module of the XL series, the XL3 series PLC can connect up to 10 modules, XL5/XL5E/XL5N/XL5H/XLME/XLH/XSLH can expand 16 modules, and XL1 does not support expansion modules.

Specification

Item	Contents	
Analog input signal	K, S, E, N, B, T, J, R type thermocouple	
Temperature measurement range	K	0.0℃~1300.0℃
	S	0.0℃~1700.0℃
	E	0.0℃~600.0℃
	N	0.0℃~1200.0℃
	B	250.0℃~1800.0℃ (display 0 below 250.0℃)
	T	0.0℃~400.0℃
	J	0.0℃~800.0℃

	R	0.0℃~1700.0℃
Digital output range	0~max measuring temperature×10 (Taking K-type as an example, the digital output range is 0~13000)	
Resolution	0.1℃	
Integrate precision	±1% (relative max value)	
Conversion speed	420ms 4 channels	
Module power supply	DC24V±10%, 50mA	
Installation	Fixed with M3 screws or directly installed on orbit of DIN46277 (Width: 35mm)	

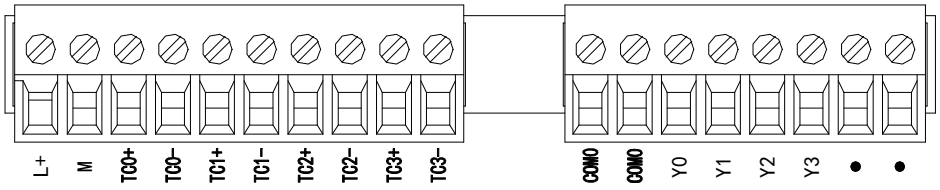
When the module is in an abnormal state, the ID1xxxx register will display corresponding abnormal values, even if the disconnection detection is disabled in the module configuration. The abnormal values for different types of alarms are as follows:

- When the 24V power supply of the module is disconnected, all channel data is -2.
- When the thermocouple temperature control module is not connected to a sensor, its channel data is -1.
- When the sensor signal is below the lower limit of the measurement range, its channel data is the minimum value of the digital output range of the selected sensor type.
- When the sensor signal is higher than the upper limit of the measurement range, its channel data is the maximum value of the digital output range of the selected sensor type.
- When both sensor disconnection and 24V power supply disconnection occur, display the abnormal value (-2) of 24V power supply disconnection.

Negative temperature detection function is only supported by firmware version V5 and above temperature modules.

8-2. Terminals

Arrangment



Signal

Name		Function
Indicator light	PWR	The indicator lights up when the module has a power supply
	COM	When the module communication port communicates normally, the indicator lights on
	ERR	When there is an error in the module, the indicator is always on or flickering (red) When the ERR lamp is always on, there are serious application errors in the module that can not be used, so the mode of use must be adjusted, and the PLC body is switched to STOP state. When the ERR lamp flickers, there are application errors, abnormal work and abnormal data in the module, but the PLC body is still RUN.
Wiring terminal	L+	External power supply 24V +
	M	External power supply 24V -
	TC0+	CH0 thermocouple input +
	TC0-	CH0 thermocouple input -
	TC1+	CH1 thermocouple input +
	TC1-	CH1 thermocouple input -
	TC2+	CH2 thermocouple input +
	TC2-	CH2 thermocouple input -
	TC3+	CH3 thermocouple input +
	TC3-	CH3 thermocouple input -
	COM0	PID output common terminal
	Y0~Y3	PID output terminals corresponding to CH0~CH3

Wiring specification

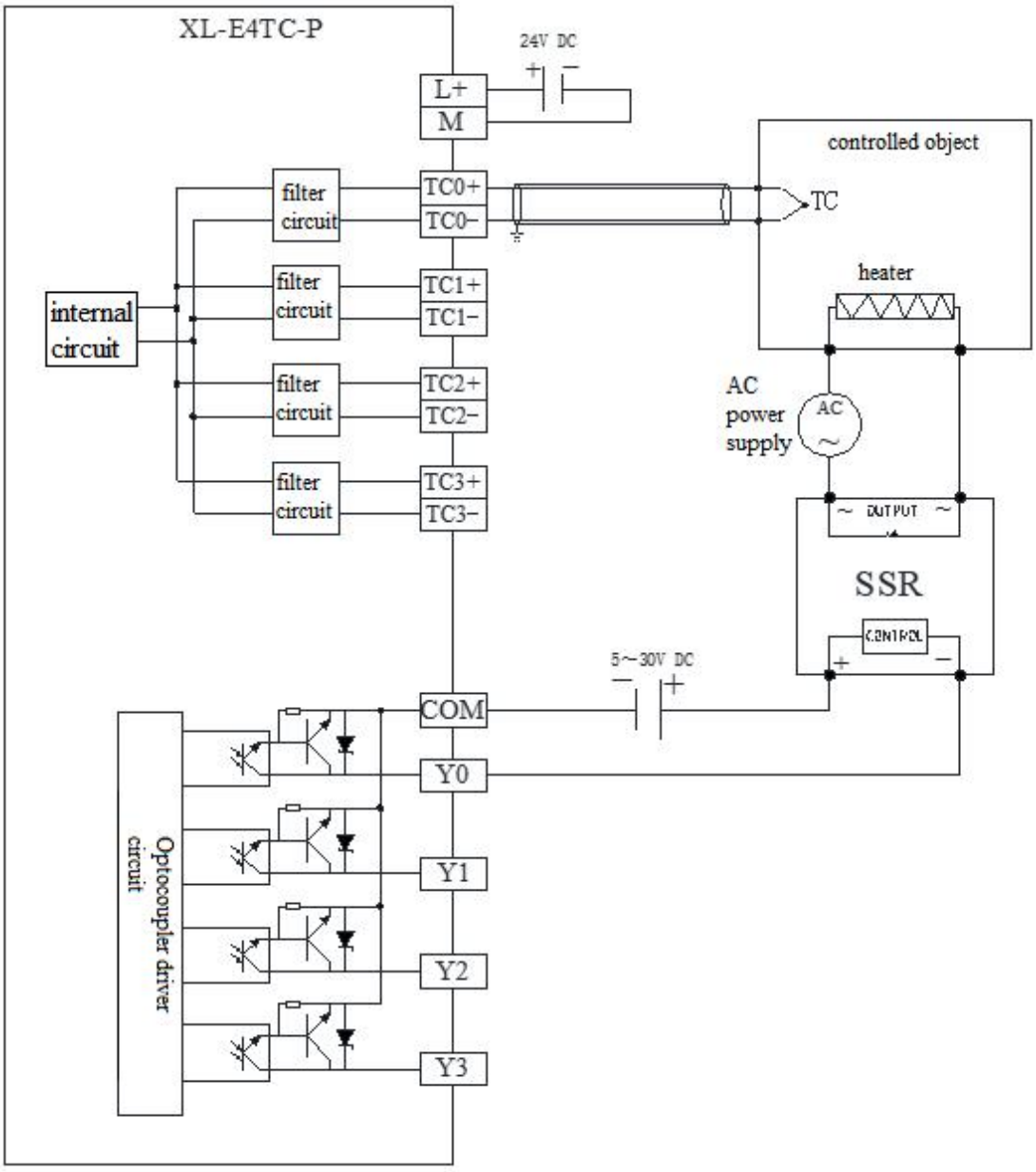
When wiring the module, its wiring head should meet the following requirements:

(1) The stripping length is 9 mm;

(2) Flexible conductors with bare tubular ends are 0.25-1.5 square.

(3) Flexible conductor with tubular pre-insulated end is 0.25-0.5 square.

8-3. I/O wiring example



- Output terminal: transistor output terminal, please choose a smooth power supply of DC5V~30V.
- Circuit insulation: optocouplers are used for optical insulation between the internal circuits and output transistors of programmable controllers, and each common module is also separated from each other.
- Response time: the time from the programmable controller driving (or disconnecting) the optocoupler to the transistor ON/OFF shall not exceed 0.2ms.
- Output current: to limit temperature rise, it supports a maximum output load of 50mA.
- Open circuit leakage current: below 0.1mA.

- When connecting an external 24V power supply, please use the 24V power supply on the PLC body to avoid interference.
- The casing of the equipment where the temperature sensor is installed must be grounded.
- To avoid interference, temperature sensors should use shielded wires and be grounded at a single point for the shielding layer.
- When the "cold end compensation method selection" is "internal compensation", the thermocouple cold end is the wiring terminal on the module and needs to be extended with extension wires of the same material or special compensation wires, otherwise it will affect the measurement accuracy.

8-3. I/O address assignment

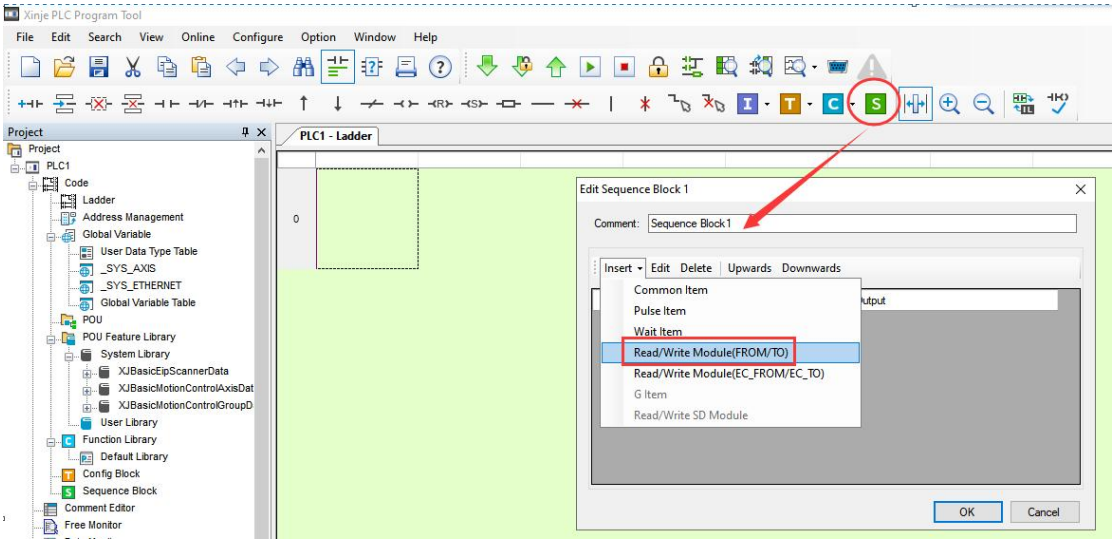
XL series analog module will not occupy I/O unit, the conversion value will be sent to PLC register. Each channel related PLC register address are shown as below:

Parameters	Notes				
	Channel	Ch0	Ch1	Ch2	Ch3
Display temperature Unit: 0.1 ℃	Module 1	ID10000	ID10001	ID10002	ID10003
	Module 2	ID10100	ID10101	ID10102	ID10103
	·····	ID10×00	ID10×01	ID10×02	ID10×03
	Module 16	ID11500	ID11501	ID11502	ID11503
PID output (return to the X input of PLC)	Module 1	X10000	X10001	X10002	X10003
	Module 2	X10100	X10101	X10102	X10103
	·····	X10×00	X10×01	X10×02	X10×03
	Module 16	X11700	X11701	X11702	X11703
	When the "Y function selection" is set to "channel enable", Y10000~Y10003 (taking module # 1 as an example) are PID enable bits, and the PID duty cycle output needs to be monitored for X10000~X10003 (taking module # 1 as an example).				
Connection state of thermocouple(0 is connection, 1 is disconnection)	Module 1	X10010	X10011	X10012	X10013
	Module 2	X10110	X10111	X10112	X10113
	·····	X10×10	X10×11	X10×12	X10×13
	Module 16	X11710	X11711	X11712	X11713
PID auto-tune error signal bit(0 is normal, 1 is error)	Module 1	X10020	X10021	X10022	X10023
	Module 2	X10120	X10121	X10122	X10123
	·····	X10×20	X10×21	X10×22	X10×23
	Module 16	X11720	X11721	X11722	X11723
Channel PID enable signal (0: Off, 1: On)	Module 1	Y10000	Y10001	Y10002	Y10003
	Module 2	Y10100	Y10101	Y10102	Y10103
	·····	Y10×00	Y10×01	Y10×02	Y10×03
	Module 16	Y11700	Y11701	Y11702	Y11703

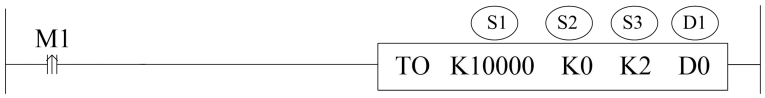
	When the "Y function selection" is set to "immediate output", Y0~Y3 are ordinary switch output terminals, and Y10000~Y10003 (taking module # 1 as an example) can be used to directly control the Y0~Y3 output of the module. When "Y Function Selection" is set to "Channel Enable", Y0~Y3 are PID output terminals, and Y10000~Y10003 (taking module # 1 as an example) can be used to enable PID control of the corresponding channel. The Y0~Y3 output of the module is automatically calculated and controlled by PID.

From/To instruction

The reading and writing of the thermocouple temperature control module needs to be completed in the sequence block through the FROM/TO command, as shown in the following figure:



Parameter write insruction TO



Function: write the PLC register data to module address, the operate unit is word.
Operand:
S1: target module number, range: 10000~10015. Operand: K, TD, CD, D, HD, FD
S2: first address of module. Operand: K, TD, CD, D, HD, FD
S3: write in register numbers. Operand: K, TD, CD, D, HD, FD
D1: first address of PLC. Operand: TD, CD, D, HD, FD

Parameter read instruction FROM

Function: read the module data to the PLC regsiter, the operate unit is word.

S1: target module number, range: 10000~10015. Operand: K, TD, CD, D, HD, FD
S2: first address of module. Operand: K, TD, CD, D, HD, FD
S3: read register numbers. Operand: K, TD, CD, D, HD, FD
D1: first address of PLC. Operand: TD, CD, D, HD, FD

Note:

(1) The FROM/TO instruction can only be written in the sequence block. For XL series PLCs with firmware version V3.4.5 and above, a maximum of 100 BLOCKs can be written in the program, but a maximum of 8 can be run simultaneously.
(2) The starting number of the module starts from K10000, with module # 1 being K10000, module # 2 being K10001... and so on, module # 16 being K10015.

Related address definition:

The address of the read/write parameters:

From_To data	Note				Read /write	Default value
Channel	CH0	CH1	CH2	CH3		
PID auto-tune enable bit	K0	K0	K0	K0	R/W	0
PID output (0~4095)	K1	K2	K3	K4	R	-
Target temperature (unit: 0.1℃)	K5	K6	K7	K8	R/W	0
Kp	K9	K13	K17	K21	R/W	40
Ki	K10	K14	K18	K22	R/W	240
Kd	K11	K15	K19	K23	R/W	60
Diff (unit: 0.1℃)	K12	K16	K20	K24	R/W	1000
Control period (unit: 0.1s)	K25	K26	K27	K28	R/W	20
Output range (range: 0~100)	K29	K30	K31	K32	R/W	100
Temperature difference δ (unit: 0.1℃)	K33	K34	K35	K36	R/W	0
Calibrate ambient temperature values	K37	K38	K39	K40	W	-
From/To data initialization	K41	K41	K41	K41	W	-

Auto-tune PID control bit	Auto-tune triggered signal, start to auto-tune mode when set to 1 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.
PID output value	When the PID output is for analog control (such as steam valve opening or thyristor conduction angle), this value can be transmitted to the analog output module to

(0~4095)	achieve control requirements.
PID parameters (P, I, D)	The best PID parameters got from the PID auto-tune. 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.
PID calculation range (Diff) Unit: 0.1℃	This function can set the temperature range of the PID operation, such as setting the relevant parameter Tdiff, the target temperature is Target, then the operation range of the PID is Target-Tdiff < T < Target + Tdiff, when T < Target-Tdiff, the output is the max value, when T > Target + Tdiff, the output is 0.
Temperature difference value δ Unit: 0.1℃	The actual temperature display = (sampling temperature value + temperature deviation value δ)/10. When the user thinks the measured temperature is different from the actual temperature, this value can be modified to correct the temperature.
Set temperature Unit: 0.1℃	The target temperature of the control system. Range from -1000~5000, which is -100~500℃, precision degree is 0.1℃.
Temperature control period Unit: 0.1s	The adjusting range of temperature control period is 0.1s~200s, and the minimum precision range is 0.1s. For example, when writing 5, the actual temperature control period is 0.5s.
Adjusting Environment temperature Unit: 0.1℃	When the user believes that the ambient temperature value is inconsistent with the temperature value displayed on the module channel, the known ambient temperature value can be written into this parameter. At the moment the module is written, the temperature deviation value is set to δ and save. Calculate temperature deviation value δ = adjusting ambient temperature value - sampling temperature value. Unit: 0.1 ℃. For example, in the thermal equilibrium state, the user measured the ambient temperature as 60.0 ℃ using a mercury thermometer, and the displayed temperature was 55.0 ℃ (corresponding to the sampling temperature of 550), with a temperature deviation value δ = 0. At this point, the user writes 600 and the temperature deviation value δ Recalculated to 50 (5 ℃), the displayed temperature is (sampling temperature value+temperature deviation value δ) / 10=60 ℃. Attention: When the user inputs the adjusting temperature value, confirm that it is consistent with the ambient temperature. This data is very important, and once entered incorrectly, it can lead to calculating temperature deviation values δ Serious error, which in turn affects the display temperature.
Auto-tune output range	The output amplitude calculated by PID is in %, where 100 represents the duty cycle as 100% of the full scale output and 80 represents 80% of the full scale output. Note: When set to 0, PID control will have no output.
From/To data initialization	This function can restore the parameters in the above table to their factory settings. When using it, K41 needs to be set to 1, setting to other values are invalid.

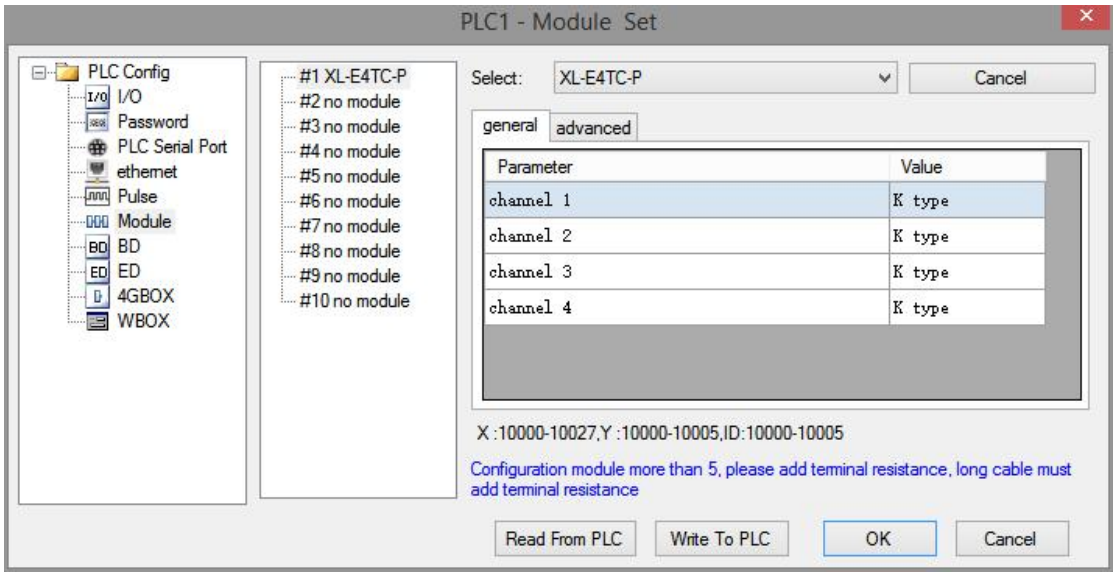
Note:

(1) The "From/To data initialization" function requires the module firmware version to be V3 or higher.
(2) When the "Y function selection" is set to "immediate output", only the “temperature deviation value” and “adjusting ambient temperature value” is valid, and other parameters are not effective.
(3) The module can automatically save the set temperature value, PID parameters, temperature control cycle, output amplitude, temperature deviation, and temperature calibration parameters. When writing the above parameters, it is necessary to use the rising edge to trigger the writing. Do not keep writing. It is recommended to only write the parameters used. It is not recommended to write the entire piece of data for programming convenience, as writing 0 to some addresses may cause the system to malfunction.
(4) The self-tuning enable address K0: K0 will occupy a continuous 8-bit address space. The 4-channel module enable bits correspond to the first 4 bits address space, while the last 4 bits addresses are idle (but cannot be used for other purposes). When the read/write enable bit is enabled, K0 can be a coil or register. When it is a coil, it occupies 8 consecutive bits starting from the coil address; When it is a register, it occupies that register. For example, to set the first and third channels of the module to self-tuning mode, and the other two channels to manual PID mode, with the command To K10000 K0 K1 M10, M10 and M12 should be set to ON, and M11, M13, M14, and M15 should be set to OFF; When the instruction is To K10000 K0 K1 D100, D100 should be assigned a value of 5.

8-4. Working mode

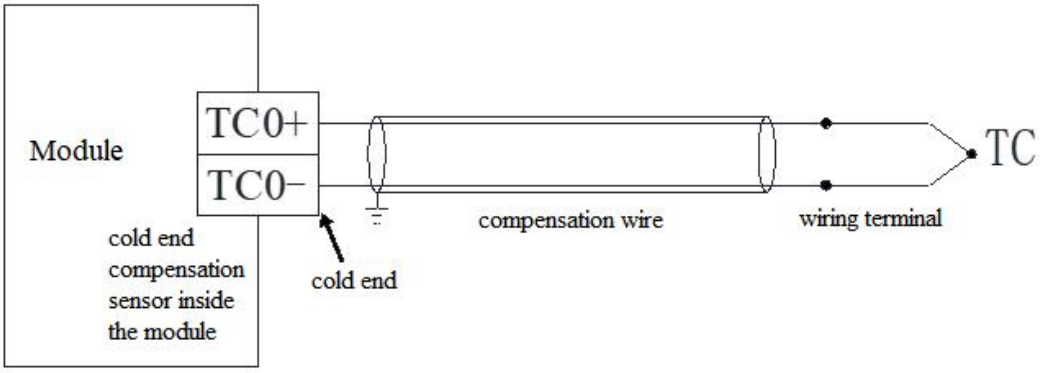
Set via software

Open the software, click configure/expansion module setting, then select the module type in the following window:



Step	Explanation
1	Select the module model
2	Select the corresponding thermocouple model (supporting 8 types of thermocouples), disconnect detection switch, Y function selection, fixed value compensation method, and fixed value compensation temperature.
3	After configuration is complete, click "Write to PLC" and then click "OK". After downloading the user program and running it, this configuration will take effect.

- The "Y Function Selection" is used to specify the functions of Y10000~Y10003 (taking module # 1 as an example). It defaults to "Channel Enable" and supports the module's own self-tuning and PID control functions. The output points Y0~Y3 on the module are affected by the PID output value and produce on/off effects. When set to "immediate output", the output points Y0~Y3 on the module will be used as ordinary switch output points. Setting Y10000~Y10003 will turn on Y0~Y3, while the module only retains temperature acquisition function. If temperature control function is required, please use the PID command of the PLC body to implement it.
- A thermocouple consists of two wires made of different metals or metal alloys. The ends of the two wires are welded together, and the welding point is called the temperature measurement point. The other end of the two wires is open, and this end is called the cold end.



The module provides two cold end compensation methods: "internal compensation" and "fixed value compensation". "Cold end compensation method selection" is used to switch the cold end compensation method. The default is "internal compensation", and the cold end temperature is collected by the module's built-in cold end sensor. When set to "fixed value compensation", the cold end temperature adopts the set "fixed value compensation temperature", which defaults to 250 (25.0℃) and has a setting range of -1000~1000. However, it should be noted that the set "fixed value compensation temperature" must be consistent with the actual temperature at the location of the cold end.

- The 'Y Function Selection' function is only supported by firmware version V3 and above temperature modules.
- The "fixed value compensation" function is only supported by firmware version V5 and above temperature modules.

Set via Flash register

The expansion module 0CH~3CH channel can set the type of thermocouple, and it can be set through the special FLASH data register FD inside the PLC. As follows:

Module ID	SFD address	Module ID	SFD address
#1	SFD350~SFD359	#9	SFD430~SFD439
#2	SFD360~SFD369	#10	SFD440~SFD449
#3	SFD370~SFD379	#11	SFD450~SFD459
#4	SFD380~SFD389	#12	SFD460~SFD469
#5	SFD390~SFD399	#13	SFD470~SFD479
#6	SFD400~SFD409	#14	SFD480~SFD489
#7	SFD410~SFD419	#15	SFD490~SFD499
#8	SFD420~SFD429	#16	SFD500~SFD509

SFD bit definition

Take module 1 as an example to explain the setting method:

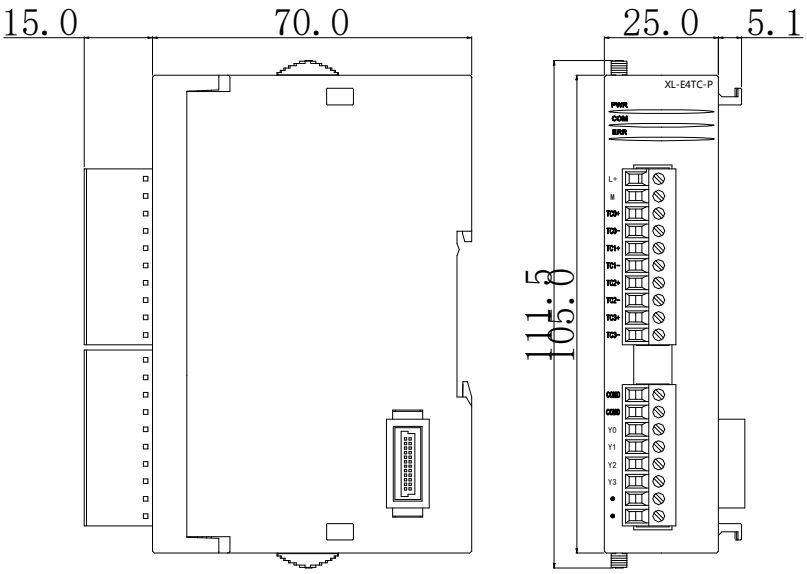
<table>
<tr><th colspan="2">Register</th><th>Bit7</th><th>Bit6</th><th>Bit5</th><th>Bit4</th><th>Bit3</th><th>Bit2</th><th>Bit1</th><th>Bit0</th></tr>
<tr><td rowspan="4">SFD350</td><td rowspan="2">Byte0</td><td colspan="4">TC1 channel</td><td colspan="4">TC0 channel</td></tr>
<tr><td colspan="4">K：0000
S：0001
E：0010
N：0011
J：0100
T：0101
R：0110
B：0111</td><td colspan="4">K：0000
S：0001
E：0010
N：0011
J：0100
T：0101
R：0110
B：0111</td></tr>
<tr><td rowspan="2">Byte1</td><td colspan="4">TC3 channel</td><td colspan="4">TC2 channel</td></tr>
<tr><td colspan="4">K：0000
S：0001
E：0010
N：0011
J：0100
T：0101
R：0110
B：0111</td><td colspan="4">K：0000
S：0001
E：0010
N：0011
J：0100
T：0101
R：0110
B：0111</td></tr>
<tr><td rowspan="2">SFD351</td><td>Byte2</td><td colspan="8">-</td></tr>
<tr><td>Byte3</td><td colspan="8">-</td></tr>
<tr><td rowspan="2">SFD352</td><td>Byte4</td><td colspan="2"></td><td colspan="2">Cold end compensation method selection:
00: Internal compensation
01: Fixed value compensation</td><td colspan="2">TC channel disconnection detection
00: On
01: Off</td><td colspan="2">Y function selection
00: Channel Enable
01: Immediate output</td></tr>
<tr><td>Byte5</td><td colspan="8">-</td></tr>
<tr><td rowspan="2">SFD353</td><td>Byte6</td><td colspan="8" rowspan="2">Fixed value compensation temperature (unit: 0.1 ℃, set range: -1000~1000, default: 250)</td></tr>
<tr><td>Byte7</td></tr>
<tr><td rowspan="2">SFD354</td><td>Byte8</td><td colspan="8">TC1 filtering coefficient (0 no filtering, 1-254 filtering intensity gradually decreases, default 0)</td></tr>
<tr><td>Byte9</td><td colspan="8">TC2 filtering coefficient (0 no filtering, 1-254 filtering intensity gradually decreases, default 0)</td></tr>
<tr><td>SFD355</td><td>Byte10</td><td colspan="8">TC3 filtering coefficient (0 no filtering, 1-254 filtering intensity gradually decreases, default 0)</td></tr>
</table>

Register		Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
	Byte11	TC4 filtering coefficient (0 no filtering, 1-254 filtering intensity gradually decreases, default 0)							
SFD356	Byte12	-							
	Byte13	-							
SFD357	Byte12	-							
	Byte13	-							
SFD358~SFD359		Reserved							

8-6. Dimension

The outline and dimension:

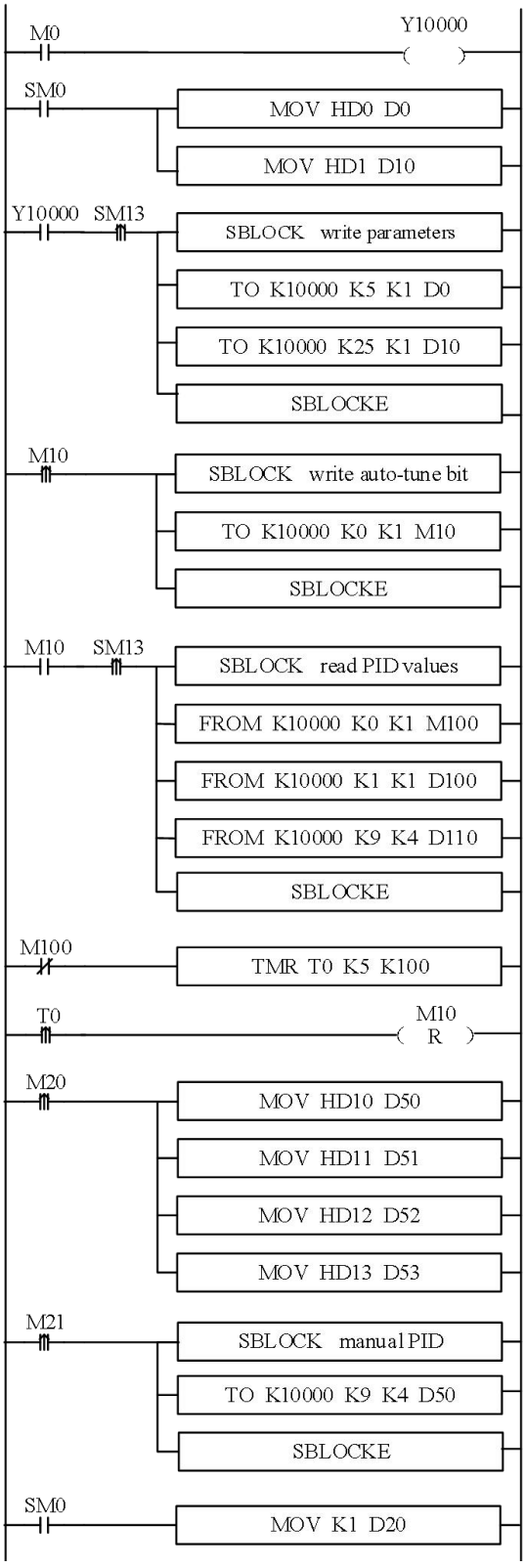
(unit: mm)



8-7. Programming example

When temperature control is required, there are two programming options:
1. use the PID of the PLC body for temperature control, at this time, you need to switch the Y function selection to 'immediate output', the programming case details please refer to "XDXL PLC instruction manual" chapter 7 PID control functions.
2. use the built-in PID of the module for temperature control, at this time, you need to switch the Y function selection to "channel enable", programming cases such as shown in following example 1.

Example 1: Do PID control for CH0 of module 1.



// open PID enable bit

// set target value

// set temperature control period

// write in the target value, temperature control period

//write in the auto-tune flag bit

// turn on auto-tune function

//read auto-tune bit and PID parameters

//read auto-tune bit

//read PID output value

//set P, I, D values

//after reset auto-tune for 0.5s, reset auto-tune start flag

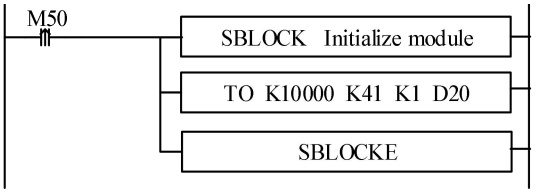
//set P value

//set I value

//set D value

//set Diff value

//perform manual PID control, write in P, I, D, Diff values



// Initialize module parameters

Explanation:

After enabling the self-tuning, this command will immediately occupy a total of 8 bits in M10-M17. M10-M13 corresponds to the self-tuning enable of each channel. To set which channel needs to be tuned, set the corresponding coil to ON. M14~M17 have no meaning at the moment and need to be left blank.

If the output is a solid-state relay, it is recommended to set the temperature control cycle to 1-3 seconds; If the output is a relay, it is recommended to set the temperature control cycle to 3-15s.

Due to inconsistent units, the PID parameters of the main body and module cannot be used interchangeably. The main body PID parameters are in uppercase, and the module PID parameters are in lowercase. The specific conversion relationship is as follows: p=P/100; i=I/10; d=D/100.

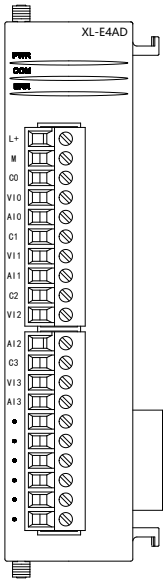
M0 turn on PID enable
SM0 set the target value, temperature control period
M1 write in target value, temperature control period
M3 set the manual P, I, D parameters
M4 write in manual P, I, D parameters
M10 read the auto-tuning bit, PID parameters and PID output value
M50 initialize the module
Y10000 PID enable bit of channel 0

D0 target value
D10 temperature control period
D80 P
D81 I
D82 D
D83 DIFF

9. Analog input module XL-E4AD

9-1. Specifications

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



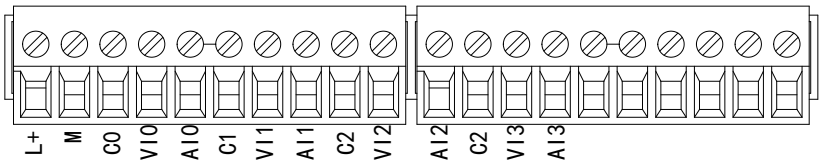
Features:

- 4-channel analog input: two modes of voltage input and current input can be selected.
- 14-bit high precision analog input.
- As a special functional module of the XL series, the XL3 series PLC can connect up to 10 modules, XL5/XL5E/XL5N/XL5H/XLME/XLH/XSLH can expand 16 modules, and XL1 does not support expansion modules.

Specifications:

ITEMS	Analog Input (AD)	
	Voltage Input	Current Input
Analog Input Range	0~5V, 0~10V, -5~5V, -10~10V	0~20mA, 4~20mA, -20~20mA
Max input range	DC±15V	-40~40mA
Digital Output Range	14 bits binary (0~16383 or -8192~8191)	
Resolution	1/16383(14Bit)	
Synthesis Precision	±1%	
Conversion Speed	2ms per channel	
Power Supply	DC24V±10%, 150mA	
Installation	Fix with M3 screw or install on DIN46277 guilder (Width: 35mm) directly	

9-2. Terminals



Name		Function
Wiring terminals	L+	External power supply for the module DC24V+
	M	External power supply for the module DC24V-
	C0	VI0, AI0 input ground
	VI0	Channel 1 AD voltage input terminal
	AI0	Channel 1 AD current input terminal
	C1	VI1, AI1 input ground
	VI1	Channel 2 AD voltage input terminal
	AI1	Channel 2 AD current input terminal
	C2	VI2, AI2 input ground
	VI2	Channel 3 AD voltage input terminal
	AI2	Channel 3 AD current input terminal
	C3	VI3, AI3 input ground
	VI3	Channel 4 AD voltage input terminal
	AI3	Channel 4 AD current input terminal

Note:

When wiring the module, its connector shall meet the following requirements:

(1) Stripping length: 9mm.

(2) Flexible cable with tubular bare end 0.25-1.5mm^2.

(3) Flexible cable with tubular pre-insulated end is 0.25-0.5mm^2.

9-3. I/O address assignment

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

Note: each channel can work after turning on the channel enable bit.

Expansion module 1 address

Channel	AD signal	Channel enable bit (set ON the enable bit to use this channel)	Channel alarm bit
0CH	ID10000	Y10000	X10000
1CH	ID10001	Y10001	X10001

2CH	ID10002	Y10002	X10002
3CH	ID10003	Y10003	X10003

Expansion module 2 address

Channel	AD signal	Channel enable bit (set ON the enable bit to use this channel)	Channel alarm bit
0CH	ID10100	Y10100	X10100
1CH	ID10101	Y10101	X10101
2CH	ID10102	Y10102	X10102
3CH	ID10103	Y10103	X10103

Expansion module 3 address

Channel	AD signal	Channel enable bit (set ON the enable bit to use this channel)	Channel alarm bit
0CH	ID10200	Y10200	X10200
1CH	ID10201	Y10201	X10201
2CH	ID10202	Y10202	X10202
3CH	ID10203	Y10203	X10203

Expansion module 4 address

Channel	AD signal	Channel enable bit (set ON the enable bit to use this channel)	Channel alarm bit
0CH	ID10300	Y10300	X10300
1CH	ID10301	Y10301	X10301
2CH	ID10302	Y10302	X10302
3CH	ID10303	Y10303	X10303

Expansion module 5 address

Channel	AD signal	Channel enable bit (set ON the enable bit to use this channel)	Channel alarm bit
0CH	ID10400	Y10400	X10400
1CH	ID10401	Y10401	X10401
2CH	ID10402	Y10402	X10402
3CH	ID10403	Y10403	X10403

Expansion module 6 address

Channel	AD signal	Channel enable bit (set ON the enable bit to use this channel)	Channel alarm bit
0CH	ID10500	Y10500	X10500
1CH	ID10501	Y10501	X10501
2CH	ID10502	Y10502	X10502
3CH	ID10503	Y10503	X10503

Expansion module 7 address

Channel	AD signal	Channel enable bit (set ON the enable bit to use this channel)	Channel alarm bit
0CH	ID10600	Y10600	X10600
1CH	ID10601	Y10601	X10601
2CH	ID10602	Y10602	X10602
3CH	ID10603	Y10603	X10603

Expansion module 8 address

Channel	AD signal	Channel enable bit (set ON the enable bit to use this channel)	Channel alarm bit
0CH	ID10700	Y10700	X10700
1CH	ID10701	Y10701	X10701
2CH	ID10702	Y10702	X10702
3CH	ID10703	Y10703	X10703

Expansion module 9 address

Channel	AD signal	Channel enable bit (set ON the enable bit to use this channel)	Channel alarm bit
0CH	ID10800	Y11000	X11000
1CH	ID10801	Y11001	X11001
2CH	ID10802	Y11002	X11002
3CH	ID10803	Y11003	X11003

Expansion module 10 address

Channel	AD signal	Channel enable bit (set ON the enable bit to use this channel)	Channel alarm bit
0CH	ID10900	Y11100	X11100
1CH	ID10901	Y11101	X11101
2CH	ID10902	Y11102	X11102
3CH	ID10903	Y11103	X11103

Expansion module 11 address

Channel	AD signal	Channel enable bit (set ON the enable bit to use this channel)	Channel alarm bit
0CH	ID11000	Y11200	X11200
1CH	ID11001	Y11201	X11201
2CH	ID11002	Y11202	X11202
3CH	ID11003	Y11203	X11203

Expansion module 12 address

Channel	AD signal	Channel enable bit (set ON the enable bit to use this channel)	Channel alarm bit
0CH	ID11100	Y11300	X11300
1CH	ID11101	Y11301	X11301
2CH	ID11102	Y11302	X11302
3CH	ID11103	Y11303	X11303

Expansion module 13 address

Channel	AD signal	Channel enable bit (set ON the enable bit to use this channel)	Channel alarm bit
0CH	ID11200	Y11400	X11400
1CH	ID11201	Y11401	X11401
2CH	ID11202	Y11402	X11402
3CH	ID11203	Y11403	X11403

Expansion module 14 address

Channel	AD signal	Channel enable bit (set ON the enable bit to use this channel)	Channel alarm bit
0CH	ID11300	Y11500	X11500
1CH	ID11301	Y11501	X11501
2CH	ID11302	Y11502	X11502
3CH	ID11303	Y11503	X11503

Expansion module 15 address

Channel	AD signal	Channel enable bit (set ON the enable bit to use this channel)	Channel alarm bit
0CH	ID11400	Y11600	X11600
1CH	ID11401	Y11601	X11601
2CH	ID11402	Y11602	X11602
3CH	ID11403	Y11603	X11603

Expansion module 16 address

Channel	AD signal	Channel enable bit (set ON the enable bit to use this channel)	Channel alarm bit
0CH	ID11500	Y11700	X11700
1CH	ID11501	Y11701	X11701
2CH	ID11502	Y11702	X11702
3CH	ID11503	Y11703	X11703

Note:

1. Forbid the unused channel to improve the I/O scanning speed.
2. If set off the enable bit of the input channel, this channel will not accept the data. (the data display is 0).

9-4. Working mode

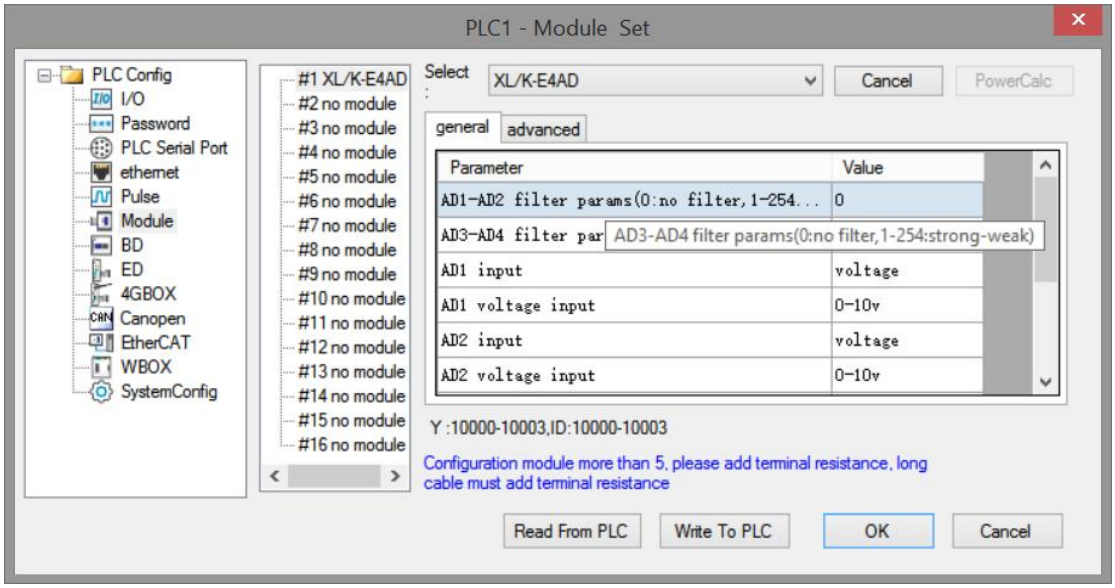
There are two ways to set the working mode:

1. XDPpro software
2. Flash registers of PLC

XDPpro software:

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

Set the model and channel parameters in the following window. Then click write to PLC.
Please restart the PLC after setting.



Note:

1. The first-order low-pass filtering method uses this sampling value and the last filtering output value for weighting to get the effective filtering value.
2. The filter coefficient is set to 0 ~ 254 by the user, the smaller the value is, the more stable the data is, but it may cause data lag; when it is set to 1, the filtering effect is the strongest, and when it is set to 254, the filtering effect is the weakest, and the default value is 0 (no filtering).

Flash registers:

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

Module no.	SFD address	Module no.	SFD address
#1	SFD350~SFD359	#9	SFD430~SFD439
#2	SFD360~SFD369	#10	SFD440~SFD449
#3	SFD370~SFD379	#11	SFD450~SFD459
#4	SFD380~SFD389	#12	SFD460~SFD469
#5	SFD390~SFD399	#13	SFD470~SFD479
#6	SFD400~SFD409	#14	SFD480~SFD489
#7	SFD410~SFD419	#15	SFD490~SFD499
#8	SFD420~SFD429	#16	SFD500~SFD509

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:

<table>
<tr><td colspan="2">Register</td><td>Bit7</td><td>Bit6</td><td>Bit5</td><td>Bit4</td><td>Bit3</td><td>Bit2</td><td>Bit1</td><td>Bit0</td><td>Note</td></tr>
<tr><td rowspan="2">SFD350</td><td>Byte0</td><td colspan="8">AD channel 1, 2 filtering coefficient</td><td rowspan="2">AD filtering coefficient</td></tr>
<tr><td>Byte1</td><td colspan="8">AD channel 3, 4 filtering coefficient</td></tr>
<tr><td rowspan="4">SFD351</td><td rowspan="2">Byte2</td><td>Bit7</td><td>Bit6</td><td>Bit5</td><td>Bit4</td><td>Bit3</td><td>Bit2</td><td>Bit1</td><td>Bit0</td><td rowspan="8">To set the input range of AD module. Byte2 low 4-bit is to set AD channel 1, high 4-bit is to set AD channel 2. Byte3 Low 4-bit is to set AD channel 3, high 4-bit is to set AD channel 4.</td></tr>
<tr><td colspan="4">AD2</td><td colspan="4">AD1</td></tr>
<tr><td>-</td><td colspan="3">000：0~10V
001：0~5V
100：-10~10V
101：-5~5V
010：0~20mA
011：4~20mA
110：-20~20mA</td><td>-</td><td colspan="3">000：0~10V
001：0~5V
100：-10~10V
101：-5~5V
010：0~20mA
011：4~20mA
110：-20~20mA</td></tr>
<tr><td rowspan="2">Byte3</td><td>Bit7</td><td>Bit6</td><td>Bit5</td><td>Bit4</td><td>Bit3</td><td>Bit2</td><td>Bit1</td><td>Bit0</td></tr>
<tr><td colspan="4">AD4</td><td colspan="4">AD3</td></tr>
<tr><td>-</td><td colspan="3">000：0~10V
001：0~5V
100：-10~10V
101：-5~5V
010：0~20mA
011：4~20mA
110：-20~20mA</td><td>-</td><td colspan="3">000：0~10V
001：0~5V
100：-10~10V
101：-5~5V
010：0~20mA
011：4~20mA
110：-20~20mA</td></tr>
<tr><td rowspan="2">SFD352</td><td>Byte4</td><td colspan="8">AD channel short circuit/open circuit/over range detection switch</td></tr>
<tr><td>Byte5</td><td colspan="8">-</td></tr>
<tr><td colspan="2">SFD353~SFD359</td><td colspan="8">-</td></tr>
</table>

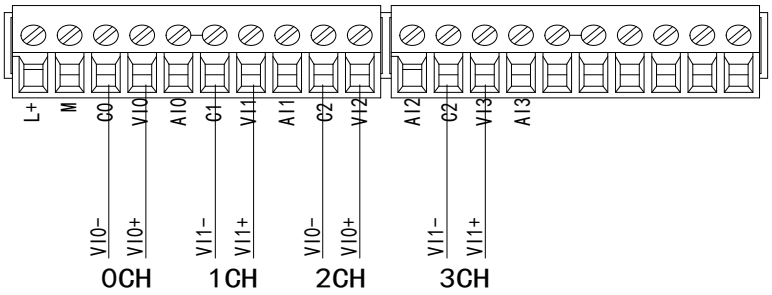
For example:
Set module no. 1 channel 3, 2, 1, 0 working mode to 0~20mA, 4~20mA, 0~10V, 0~5V. Set channel 1 and channel 2 filter factor to 254, set channel 3 and channel 4 filter factor to 100.
So the SFD values are:
SFD350=64FEH SFD351=2301H SFD352=0000H SFD353=0000H

9-5. Exterior connection

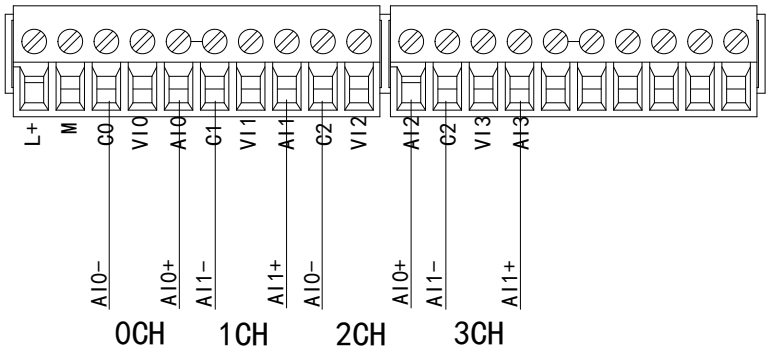
When make external connection, please note the following items:

- To avoid interference, please use shield cable and single-point ground with the shield layer.

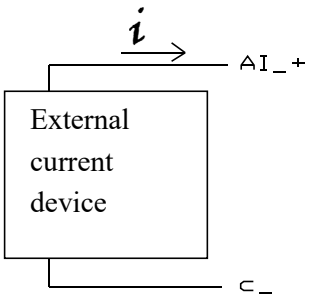
Voltage input



Current input



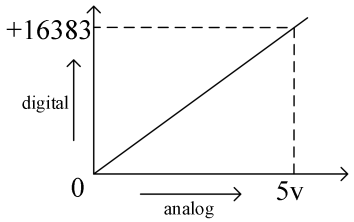
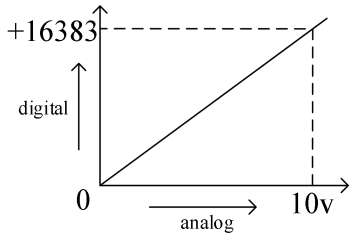
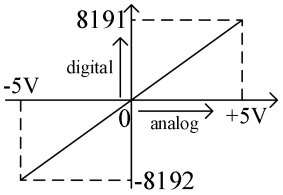
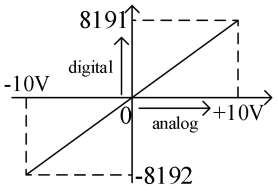
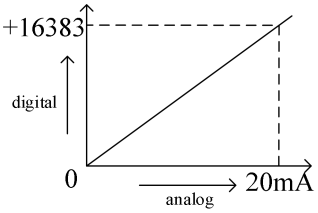
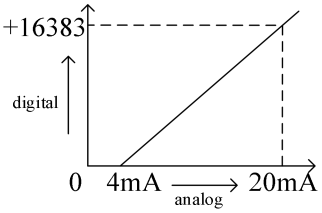
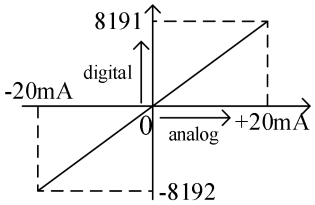
XL-E4AD current input wiring:



Note: it no needs to connect DC24V power supply for current output.

9-6. AD conversion diagram

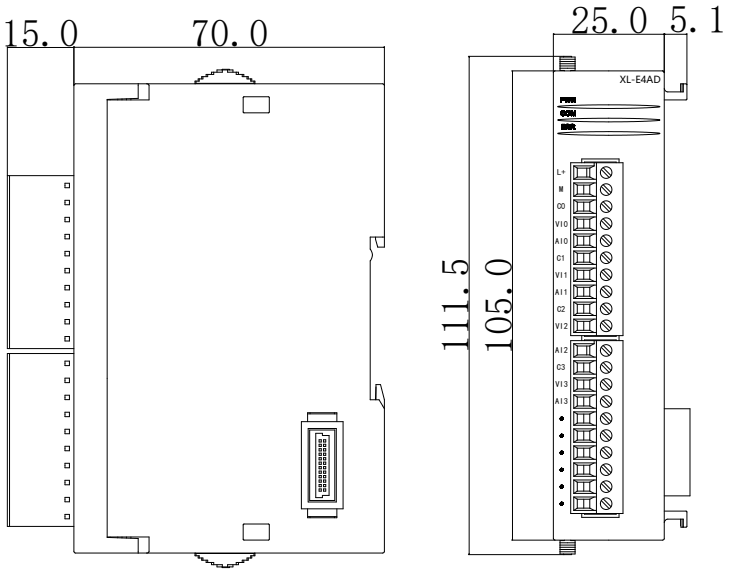
The relationship between analog input and converted digital value is shown in the following chart:

0~5V analog input	0~10V analog input
	
-5~5V analog input	-10~10V analog input
	
0~20mA analog input	4~20mA analog input
	
-20~20mA analog input	
	

Note: When the channel enable switch is turned on and the AD voltage input is suspended, the corresponding ID register is displayed as 16383; When the AD current input is suspended, the corresponding ID register is displayed as 0. When the channel enable switch is turned off, the ID register corresponding to the AD voltage/current input is displayed as 0.

9-7. Dimension

(Unit: mm)



9-8. Programming

For example, the output signal of the existing pressure sensor needs to be collected (performance parameters of the pressure sensor: the detection pressure range is 0Mp~10Mpa, and the output analog signal is 4~20mA).

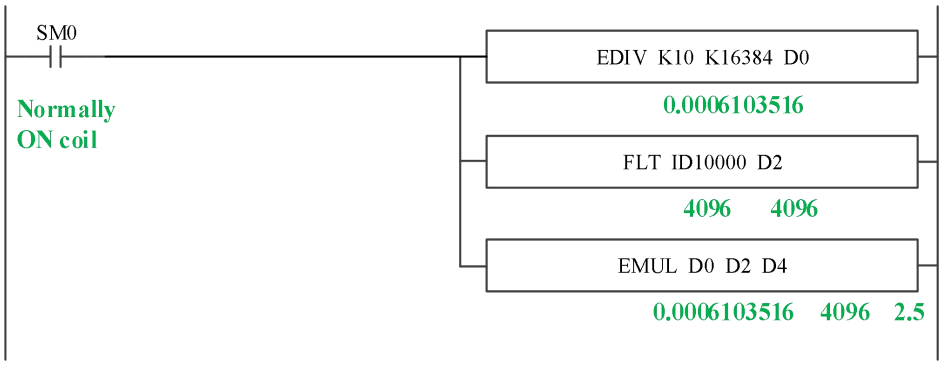
Analysis: because the pressure detection range of the pressure sensor is 0Mp~10Mpa, the corresponding output analog quantity is 4~20mA, and the digital quantity range of the expansion module converted by analog-to-digital conversion is 0~16383. So we can skip the analog quantity 4~20mA of the intermediate conversion link, which is directly the digital quantity range 0~16383 corresponding to the pressure detection range of 0Mp~10mp. 10Mp/16384=0.0006103515 is the pressure value corresponding to each digit 1 of the digital quantity collected by the expansion module, so the real-time pressure of the current pressure sensor can be calculated by multiplying the real-time value collected in the expansion module ID register by 0.0006103515. For example, if the digital quantity collected in the ID register is 4096, the corresponding pressure is 2.5Mp.

Note:

(1) First, set the enable bit corresponding to the first channel, namely Y10000, to ON.

(2) Please use floating-point operation for calculation, otherwise the calculation accuracy will be affected or even cannot be calculated!

The program is as follows:



Explanation:

SM0 is normally ON coil, which is always ON during PLC operation.

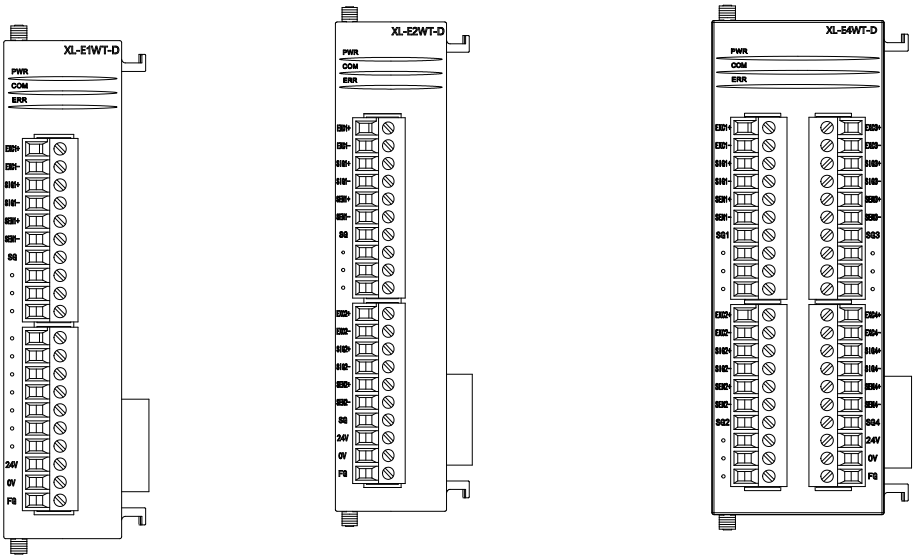
The PLC starts to run, and the analog quantity acquisition first calculates the pressure value corresponding to each digit 1 of the digital quantity collected by the expansion module, and then converts the digital quantity (integer) collected in the ID10000 register into a floating point number. Therefore, the current real-time pressure value can be calculated by multiplying the real-time value collected in the ID10000 register of the expansion module by the pressure value corresponding to each digit 1 of the digital quantity collected by the expansion module.

10. N channel pressure measurement module XL-EnWT-D

10-1. Features

XL-EnWT pressure measurement module can be used to detect 1/2/4 channels -20~20mV voltage signal or collect voltage signal of pressure sensor, and convert analog voltage value into digital value through A/D and perform operation.

XL-E1WT-D **XL-E2WT-D** **XL-E4WT-D**



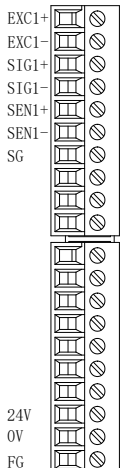
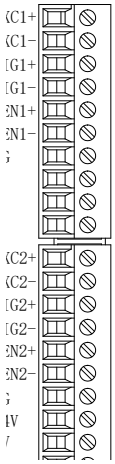
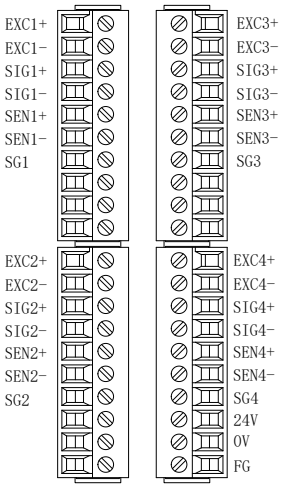
Features:

- The analog voltage signal of 1 / 2 / 4 channel pressure sensor can be collected.
- It can detect the voltage signal of -20~20mV.
- 23-bit high precision A / D conversion.
- As a special functional module of the XL series, XL3 can connect up to 10 modules, XL5/XL5E/XL5N/XL5H/XLME/XLH/XSLH can expand 16 modules, and XL1 does not support expansion modules.

Specifications:

Input range	DC -20~20mV
AD real resolution	1/8388607 (23Bit)
Max display resolution	1/500000
Non-linear	0.01%F.S
Transformation speed	150/300/450 times/second (optional)
Power supply	DC24V±10%
Sensor power supply	5VDC/120mA, can parallel 4 pieces of 350Ω pressure sensor
Installation	Mount on DIN46277 rail (width 35mm) or fix with screw M3
Software version	V3.7.4b and higher version
Working environment	No corrosive gas
Ambient temperature	-10℃~50℃
Humidity	5~95%RH (no condensation)

10-2. Terminals

XL-E1WT-D	XL-E2WT-D	XL-E4WT-D
		

XL-E1WT-D, XL-E2WT-D, XL-E4WT-D:

	Name		Function	
LED	PWR		This indicator is on when the module has power supply	
	COM		This indicator is on when the module communication port communicates normally	
	ERR		When there is an error in the module, the indicator is always on or flashing. When the ERR light is always on, it means that the module cannot be used due to serious application errors, and the use mode must be adjusted, and the PLC body is switched to the STOP state. When the ERR light flashes, it indicates that the module has application error, abnormal operation and abnormal data, but the PLC body is still running.	
Wiring terminal	CH1	EXC1+	Excitation +	Connected to the power input terminal of the sensor
		EXC1-	Excitation -	
		SIG1+	Signal +	Connected to sensor signal output terminal
		SIG1-	Signal -	
		SEN1+	Feedback +	Connected to sensor feedback voltage output terminal
		SEN1-	Feedback -	
		SG	Signal ground	Connected to sensor signal cable ground wire
	CH2	EXC2+	Excitation +	Connected to the power input terminal of the sensor
		EXC2-	Excitation -	
		SIG2+	Signal +	Connected to sensor signal output terminal
		SIG2-	Signal -	
		SEN2+	Feedback +	Connected to sensor feedback voltage output terminal
		SEN2-	Feedback -	
		SG	Signal ground	Connected to sensor signal cable ground wire
Wiring terminal	CH3	EXC3+	Excitation +	Connected to the power input terminal of the sensor
		EXC3-	Excitation -	
		SIG3+	Signal +	Connected to sensor signal output terminal
		SIG3-	Signal -	
		SEN3+	Feedback +	Connected to sensor feedback voltage output terminal
		SEN3-	Feedback -	
		SG	Signal ground	Connected to sensor signal cable ground wire
	CH4	EXC4+	Excitation +	Connected to the power input terminal of the sensor
		EXC4-	Excitation -	
		SIG4+	Signal +	Connected to sensor signal output terminal
		SIG4-	Signal -	
		SEN4+	Feedback +	Connected to sensor feedback voltage output terminal
		SEN4-	Feedback -	
		SG	Signal ground	Connected to sensor signal cable ground wire
	-	L+，M	Power supply	Give the power supply for the module, DC24V±10%

		FG	Power supply ground	Power supply grounding terminal

Note: XL-E1WT-D has no CH2~CH4 channel, and XL-E2WT-D has no CH3~CH4 channel.

When wiring the module, its connector shall meet the following requirements:

(1) Stripping length: 9mm.

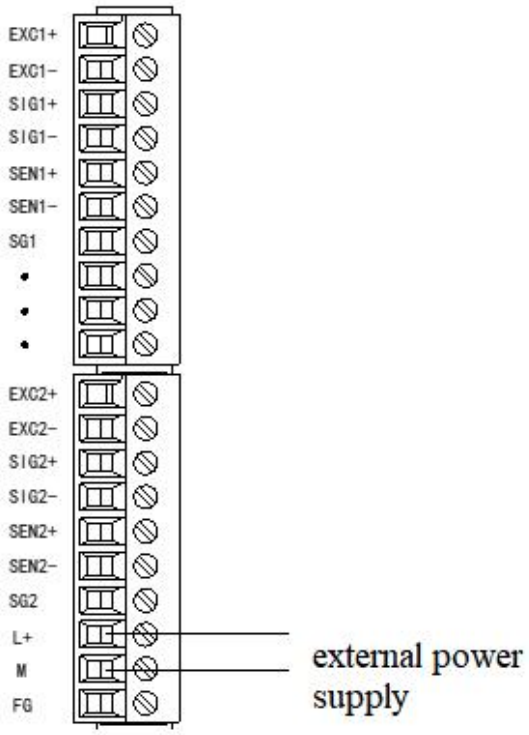
(2) Flexible cable with tubular bare end 0.25-1.5mm^2.

(3) Flexible cable with tubular pre-insulated end is 0.25-0.5mm^2.

10-3. External connection

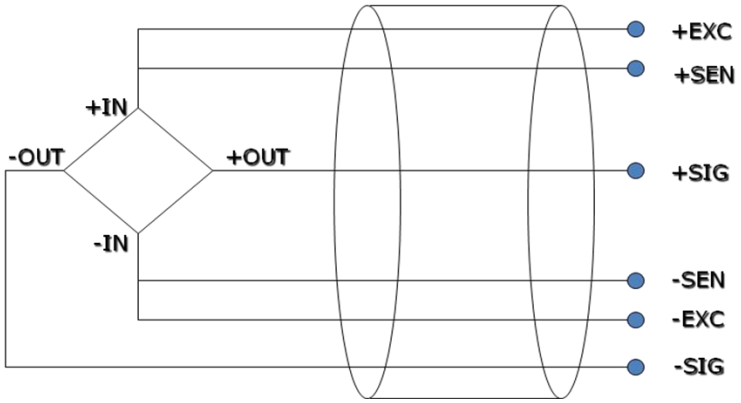
Please use shield cable and single-point connect to the ground for shield layer.

Power supply wiring

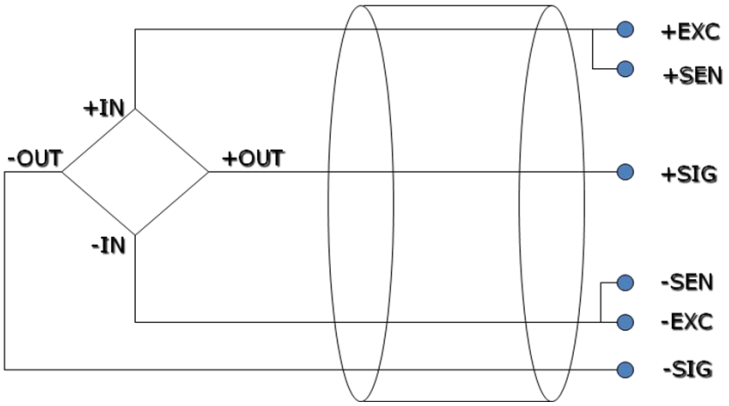


Connect to sensor

6 wires mode:



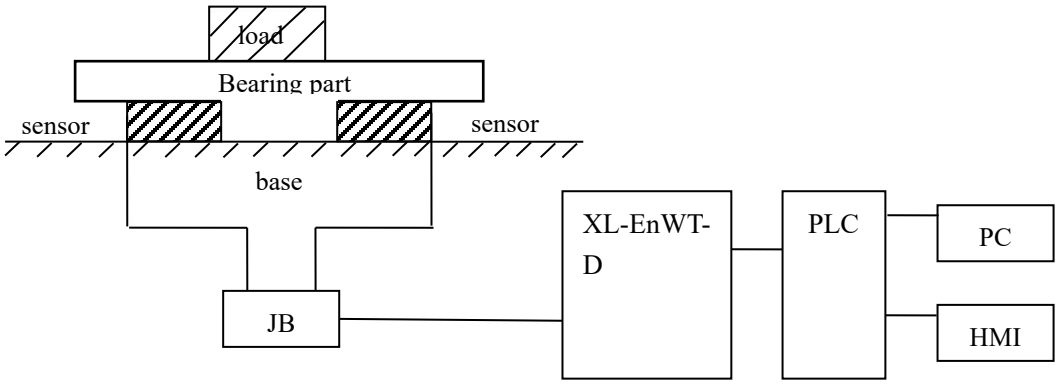
4 wires mode:



Note: short connect EXC1- and SEN1-, short connect EXC1+ and SEN1+ for 4 wires mode sensor.

10-4. Weighing system

A typical weighing system:



Loading bearing part: to support the load. Such as flat, hopper, container, air transport car…
Pressure sensor: transform the weight to voltage signal.
Assembly part: make sure the pressure sensor can work correctly, assembly part and direct part can avoid overload. Overload will cause measurement error and sensor damage.
Connection box (JB): to collect several sensor signals.
XL-EnWT-D: can be used as an electronic assessment device, it gets the pressure sensor signal and makes further assessment.

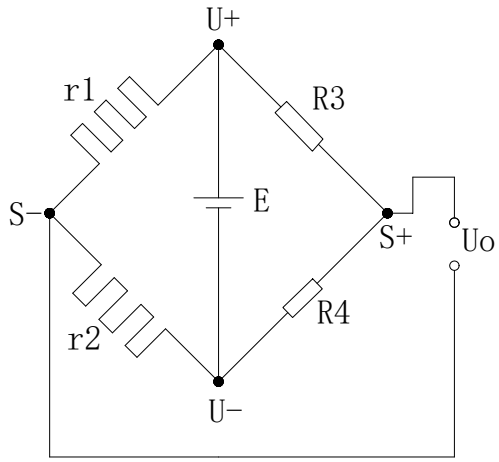
10-5. Module functions

XL-EnWT-D has the follow functions:

- Adjust the pressure sensor
- Collect the pressure sensor signal
- Calculate the weight value
- -20~20mV voltage signal test

10-5-1. Pressure sensor

The pressure sensor is based on resistance strain effect, see the following diagram:



R1 and R2 is strain resistor which make bridge circuit with R3 and R4. With the change of R1 and R2, the bridge circuit will lose the balance, unbalance voltage Uo will be produced as the output of sensor.

U+ and U- are positive and negative point of the sensor power supply. Please select the 5V power of the module or from outside.

S+ and S- are positive and negative point of the sensor output. Connect the output to the module to test the weight.

10-6. I/O address

The I/O address of module 1:

Soft component		Address	Explanation	Note
Output coil	CH1	Y10000	Filter level	
		Y10001	Reset	
		Y10002	Zero point calibration	
		Y10003	Gain calibration	
	CH2	Y10004	Filter level	
		Y10005	Reset	
		Y10006	Zero point calibration	
		Y10007	Gain calibration	
	CH3	Y10010	Filter level	
		Y10011	Reset	
		Y10012	Zero point calibration	
		Y10013	Gain calibration	
	CH4	Y10014	Filter level	
		Y10015	Reset	
		Y10016	Zero point calibration	
		Y10017	Gain calibration	

	ALL	Y10020	Back to out of factory value	
Input coil	CH1	X10000	Stable flag	
		X10001	Overflow flag	
		X10002	Calibration success flag	
		X10003	Calibration failure flag	
		X10020	AD update flag	
	CH2	X10004	Stable flag	
		X10005	Overflow flag	
		X10006	Calibration success flag	
		X10007	Calibration failure flag	
		X10021	AD update flag	
	CH3	X10010	Stable flag	
		X10011	Overflow flag	
		X10012	Calibration success flag	
		X10013	Calibration failure flag	
		X10022	AD update flag	
	CH4	X10014	Stable flag	
		X10015	Overflow flag	
		X10016	Calibration success flag	
		X10017	Calibration failure flag	
		X10023	AD update flag	
Input register	CH1	ID10000	Present weight	Double words
		ID10002	Present digital value/present input voltage	Double words
	CH2	ID10004	Present weight	Double words
		ID10006	Present digital value/present input voltage	Double words
	CH3	ID10008	Present weight	Double words
		ID10010	Present digital value/present input voltage	Double words
	CH4	ID10012	Present weight	Double words
		ID10014	Present digital value/present input voltage	Double words

The I/O address of module 2:

Soft component		Address	Explanation	Note
Output coil	CH1	Y10100	Filter level	
		Y10101	Reset	
		Y10102	Zero point calibration	
		Y10103	Gain calibration	
	CH2	Y10104	Filter level	
		Y10105	Reset	
		Y10106	Zero point calibration	
		Y10107	Gain calibration	
	CH3	Y10110	Filter level	
		Y10111	Reset	
		Y10112	Zero point calibration	
		Y10113	Gain calibration	
	CH4	Y10114	Filter level	
		Y10115	Reset	
		Y10116	Zero point calibration	
		Y10117	Gain calibration	
	ALL	Y10120	Back to out of factory value	
Input coil	CH1	X10100	Stable flag	
		X10101	Overflow flag	
		X10102	Calibration success flag	
		X10103	Calibration failure flag	
		X10120	AD update flag	
	CH2	X10104	Stable flag	
		X10105	Overflow flag	
		X10106	Calibration success flag	
		X10107	Calibration failure flag	
		X10121	AD update flag	
	CH3	X10110	Stable flag	
		X10111	Overflow flag	
		X10112	Calibration success flag	
		X10113	Calibration failure flag	
		X10122	AD update flag	
	CH4	X10114	Stable flag	
		X10115	Overflow flag	
		X10116	Calibration success flag	
		X10117	Calibration failure flag	
		X10123	AD update flag	
	CH1	ID10100	Present weight	Double words

Input register		ID10102	Present digital value/present input voltage	Double words
	CH2	ID10104	Present weight	Double words
		ID10106	Present digital value/present input voltage	Double words
	CH3	ID10108	Present weight	Double words
		ID10110	Present digital value/present input voltage	Double words
	CH4	ID10112	Present weight	Double words
		ID10114	Present digital value/present input voltage	Double words

……..

The I/O address of module 16:

Soft component		Address	Explanation	Note
Output coil	CH1	Y11500	Filter level	
		Y11501	Reset	
		Y11502	Zero point calibration	
		Y11503	Gain calibration	
	CH2	Y11504	Filter level	
		Y11505	Reset	
		Y11506	Zero point calibration	
		Y11507	Gain calibration	
	CH3	Y11510	Filter level	
		Y11511	Reset	
		Y11512	Zero point calibration	
		Y11513	Gain calibration	
	CH4	Y11514	Filter level	
		Y11515	Reset	
		Y11516	Zero point calibration	
		Y11517	Gain calibration	
	ALL	Y10020	Back to out of factory value	
Input coil	CH1	X11500	Stable flag	
		X11501	Overflow flag	
		X11502	Calibration success flag	
		X11503	Calibration failure flag	
		X11520	AD update flag	
	CH2	X11504	Stable flag	

		X11505	Overflow flag	
		X11506	Calibration success flag	
		X11507	Calibration failure flag	
		X11521	AD update flag	
	CH3	X11510	Stable flag	
		X11511	Overflow flag	
		X11512	Calibration success flag	
		X11513	Calibration failure flag	
		X11522	AD update flag	
	CH4	X11514	Stable flag	
		X11515	Overflow flag	
		X11516	Calibration success flag	
		X11517	Calibration failure flag	
		X11523	AD update flag	
Input register	CH1	ID11500	Present weight	Double words
		ID11502	Present digital value/present input voltage	Double words
	CH2	ID11504	Present weight	Double words
		ID11506	Present digital value/present input voltage	Double words
	CH3	ID11508	Present weight	Double words
		ID11510	Present digital value/present input voltage	Double words
	CH4	ID11512	Present weight	Double words
		ID11514	Present digital value/present input voltage	Double words

Note: XL-E1WT-D has no CH2~CH4, XL-E2WT-D has no CH3~CH4.

Address explanation:

filter level	ON: filter level A, OFF: filter level B
Reset	The reset is valid in the reset range, not save zero point
zero point calibration	To calibrate the system zero point
gain calibration	To calibrate system linear
Stable flag	The signal output is effective when meeting the stable range and time
Overflow flag	When the signal voltage larger than 10mv, this signal output is effective
Calibration success flag	This signal output is effective when zero point calibration and gain calibration succeeded
Calibration failure	This signal output is effective when zero point calibration and gain

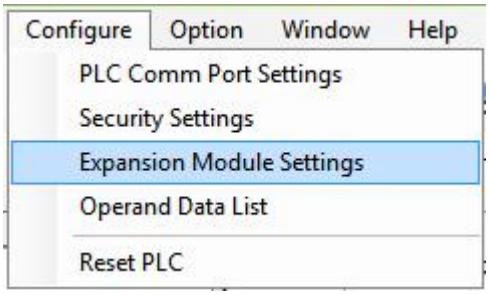
flag	calibration failed (the detailed reasons please check module applicatoin error info)
AD update flag bit	AD value acquisition and setting ON once
Present digital value/present input voltage	Switch through upper device, when it is switched to present input voltage, the unit is mv, the decimal place is 4 bits

10-7. Working mode

There are two methods to set the working mode:

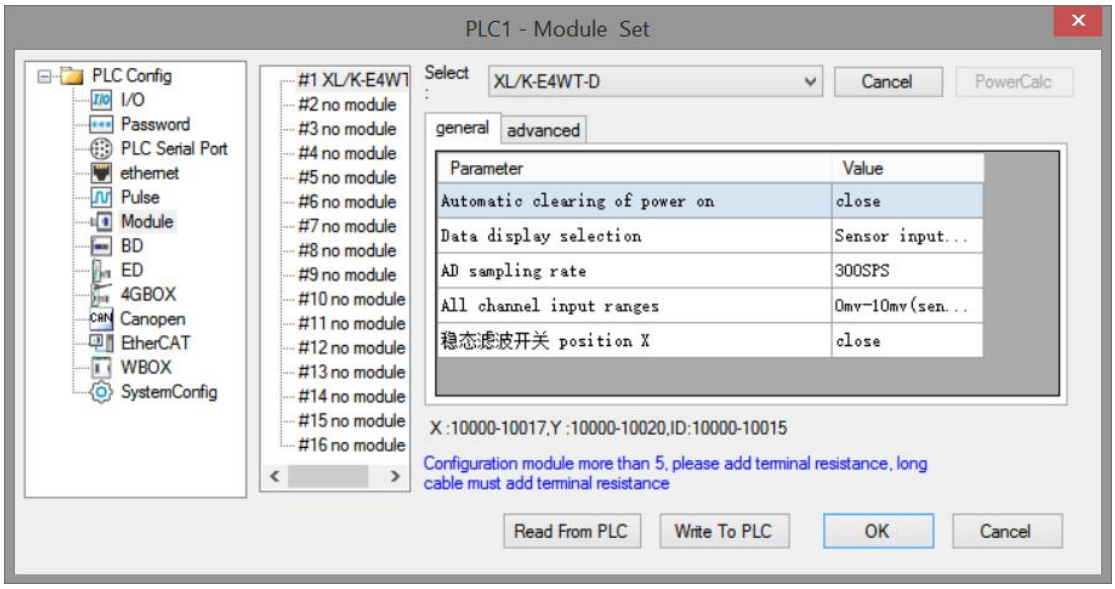
1. set through the control panel
2. set through Flash register

Open the XDPpro PLC software, click the menu configure/expansion module setting.



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

Please restart the PLC after setting.



Parameter	Function
Automatic clearing of power on	After opening, the module will be reset automatically every time it is powered on.
Data display selection	Configuration switching can be performed. When switching to the current input voltage, the unit is mV and the decimal point is 4 digits;

AD sampling rate	Select AD sampling speed
All channel input ranges	Support -20~20mV voltage signal detection, can choose the range according to the demand
Steady state filter switch	Steady state filter switch, when set to off, the steady-state filter coefficient can be written, but it is invalid. When set to on, it is valid in steady state.

Flash register setting:

The expansion module can set the gear and user-defined fast sampling frequency through PLC flash register SFD.

Module no.	SFD address	Module no.	SFD address
#1	SFD350~SFD359	#9	SFD430~SFD439
#2	SFD360~SFD369	#10	SFD440~SFD449
#3	SFD370~SFD379	#11	SFD450~SFD459
#4	SFD380~SFD389	#12	SFD460~SFD469
#5	SFD390~SFD399	#13	SFD470~SFD479
#6	SFD400~SFD409	#14	SFD480~SFD489
#7	SFD410~SFD419	#15	SFD490~SFD499
#8	SFD420~SFD429	#16	SFD500~SFD509

SFD350~SFD359 register explanation:

SFD		Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0	NOTE
SFD350	Byte0	AD sampling speed Range 0~2 Initial value: 1 0: 150 time/second 1: 300 time/second 2: 450 time/second				Steady state filtering 0: OFF 1: ON		Sampling data mode Initial value: 0 0: sensor input voltage (mv) 1: AD sampling digital value	Automatical reset when power on Intial value: 0 0: OFF 1: ON	All the channels
	Byte1	-								

10-8. Module setting

Module parameter list:

Address	Contents	Explanation		Features
K0	Zero point tracking range	Range: 0~9 Initial value: 5	All the channels	Word R/W
K1	Zero point tracking time	Range: 10~5000 (ms) Initial value: 2000		Word R/W
K2	Reset range	Range: 1~99 (%) Initial value: 50		Word R/W
K3	Stable range	Range: 1~99 Initial value: 3		Word R/W
K4	Stable time	Range: 10~5000 (ms) Initial value: 100		Word R/W
K5	Filter level A	Range: 0~34 Initial value: 3		Word R/W
K6	Filter level B	Range: 0~34 Initial value: 5		Word R/W
K8	Steady state filter coefficient	Range: 0~34 Initial value: 0		Word R/W
K9	-			
K10	Return value of relative digital quantity in gain calibration	Gain calibration digital vlaue-zero-point Calibration digital value	CH1	Dword R
K12	Gain calibration weight value	Gain calibration weight value		Dword R/W
K14	CH1 min scale division	Range: 1,2,5,10,20,50		Word R/W
K15	CH1 max range	Range: <= scale division×500000		Dword R/W
K20	Return value of relative digital quantity in gain calibration	Gain calibration digital vlaue-zero-point Calibration digital value	CH2	Dword R
K22	Gain calibration weight value	Gain calibration weight value		Dword R/W
K24	CH2 min scale division	Range: 1,2,5,10,20,50		Word R/W
K25	CH2 max range	Range: <= scale division×500000		Dword R/W
K27	Reserved			
K30	Return value of	Gain calibration digital vlaue-		Dword R

	relative digital quantity in gain calibration	zero-point Calibration digital value		
K32	Gain calibration weight value	Gain calibration weight value	CH3	Dword R/W
K34	CH3 min scale division	Range: 1,2,5,10,20,50		Word R/W
K35	CH3 max range	Range: <= scale division×500000		Dword R/W
K40	Return value of relative digital quantity in gain calibration	Gain calibration digital vlaue-zero-point Calibration digital value	CH4	Dword R
K42	Gain calibration weight value	Gain calibration weight value		Dword R/W
K44	CH4 min scale division	Range: 1,2,5,10,20,50		Word R/W
K45	CH4 max range	Range: <= scale division×500000		Dword R/W
K47	Reserved			

Parameter notes:

1. Zero-point tracking range and time: If the weight value fluctuates in the range of K0 of zero point and the fluctuation lasts for K1 time, it is considered that the fluctuation value in this range is not recorded, and the weight value is displayed as 0.
2. Reset range: It is allowed to perform the reset action within the proportion range of the parameter maximum range.
3. Stable range and time: When the difference between the last weight value and the previous weight value is in K3 range and maintains K4 time, it is considered that the weight value at this time has been stable.

Take module no.1 as an example:

Weight unit setting:

Write in weight through instruction TO. For example, the object weight is 1kg, write in 1 means the unit is kg, write in 1000 means the unit is g, write in 10000 means the unit is 0.1g. resolution=1kg/write in digital value.

Calibration:

Please calibrate the pressure sensor for the first time using.

Take module channel 1 as an example:

Step 1:

Confirm whether the module and sensor work properly.

Judgment method:

First, monitor whether the overflow flag X10001 is OFF state. If it is ON, the sensor is not connected or the sensor is damaged.
Second, using the software to monitor whether ID10002 value fluctuates following sensor (fluctuation range is related to sensor range), and pressure value increased when increasing the load, if there are value but increase the load stress value decreases, that means (1) sensor installed opposite, please adjust the sensor position or exchange +/- of sensor output signal; (2) The incoming voltage signal has been overflow, reducing the load appropriately.

Step 2:

Make the sensor no load, after the stable flag X10000 is ON, set ON zero-point calibration Y10002. X10002 ON means the zero-point calibration is successful. If after few seconds, X10003 is ON, that means zero-point calibration is failed.

Step 3:

Put the load whose weight is known on the scale, write the weight through TO instruction, after stable flag X10000 is ON, set ON gain calibration Y10003, X10002 ON means calibration is successful, shut off Y10003. If after few seconds, X10003 is ON, that means zero-point calibration is failed.

Step 4:

Hereto, the calibration finished. The module will automatic adjust the result according to the idle load value and calibration value when weighing, and finally get the correct weight.

10-9. Module error info

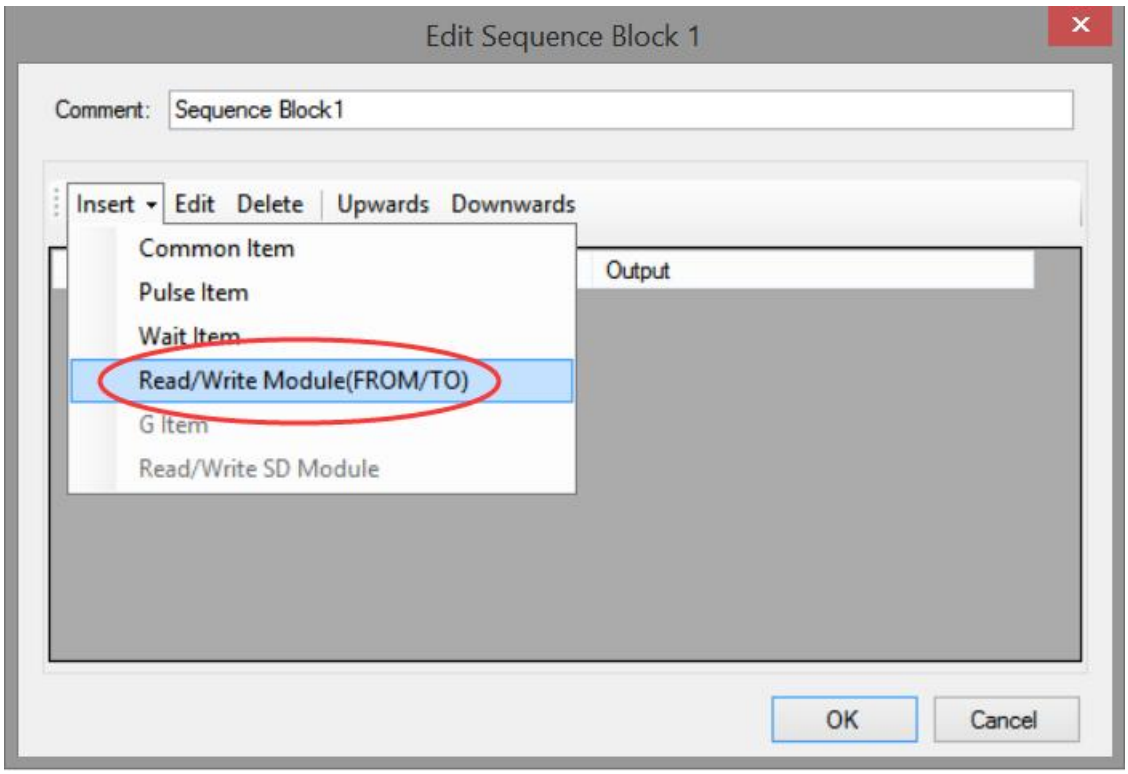
Serious application error (related to main unit register address SD503 high 8 bits)

Error code			Meaning
Binary	Hex	Decimal	
0000 0001	0x01	1	Not connect 24V
0000 0010	0x02	2	Not finish the setting in 5s
0000 0011	0x03	3	Module model is different
0000 0011	0x04	4	Communicate with PLC error

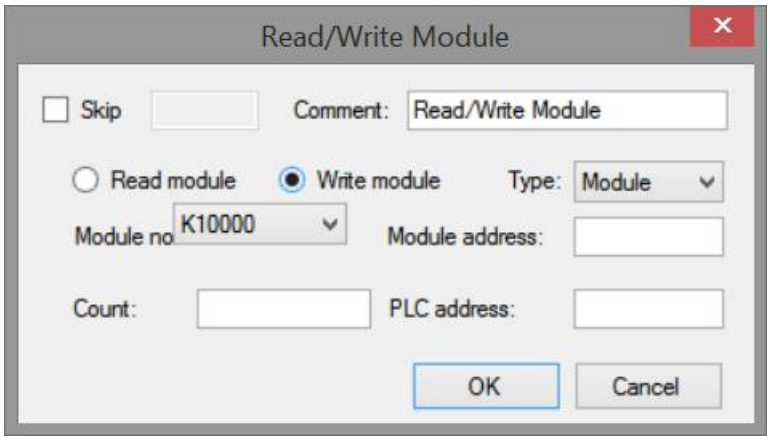
The error code using method: write in module no. in SD500, if it needs to check module no.1 error code, please write in 10000.

10-10. Instruction FROM and TO

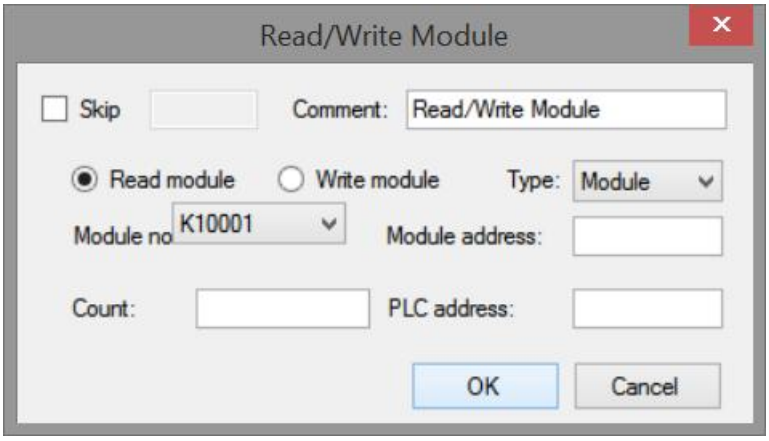
The reading and writing of XD-EnWT-D module needs to be completed through the FROM/TO instruction in the sequential function block, as shown in the figure below:



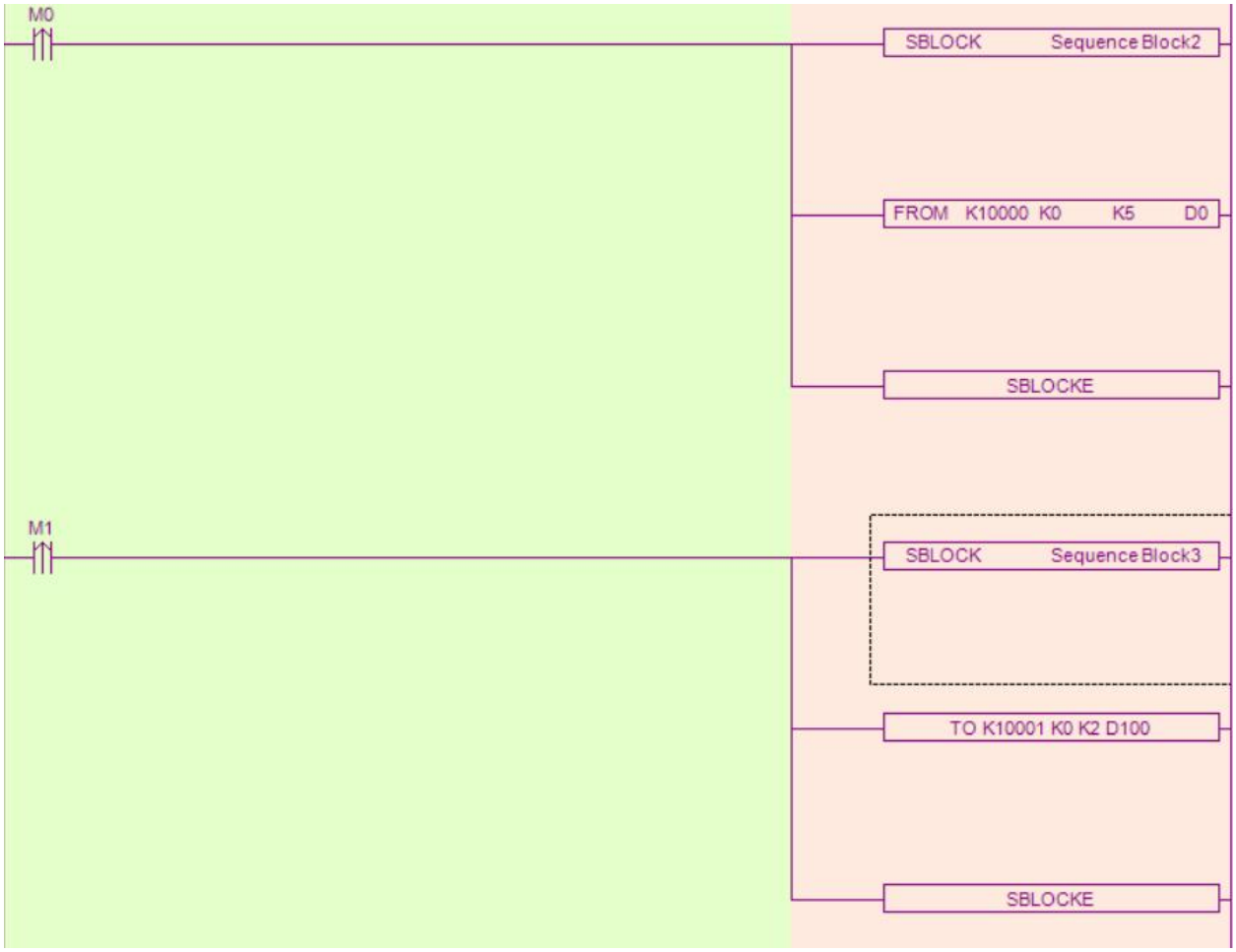
(a) Insert FROM/TO module



(b) Write instruction

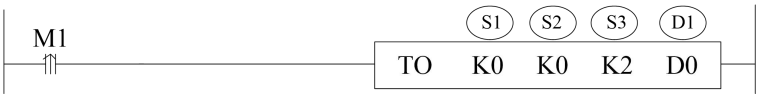


(c) Read instruction



(d) Ladder chart

Write instruction TO



Function: write the PLC register data to module specified address, the unit is word.

Operand:

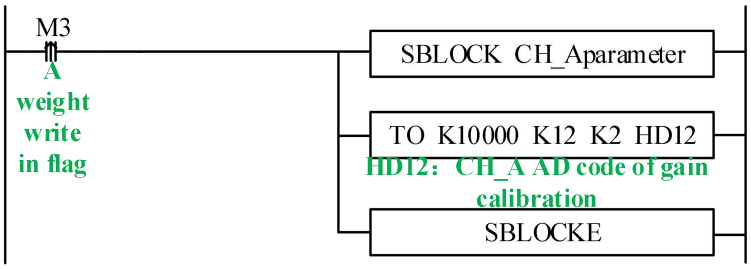
S1: target module number. Operand: K, TD, CD, D, HD, FD.

S2: module first address. Operand: K, TD, CD, D, HD, FD.

S3: write in register quantity. Operand: K, TD, CD, D, HD, FD.

D1: write in data register first address in PLC. Operand: TD, CD, D, HD, FD.

Example: write the weight value to module no.1 channel 1



Read instruction FROM

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

Operand:

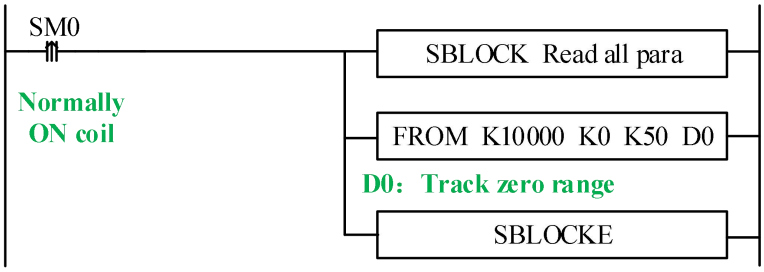
S1: target module number. Operand: K, TD, CD, D, HD, FD.

S2: module first address. Operand: K, TD, CD, D, HD, FD.

S3: read register quantity. Operand: K, TD, CD, D, HD, FD.

D1: PLC register first address. Operand: TD, CD, D, HD, FD.

For example: read all the parameters of module no.1

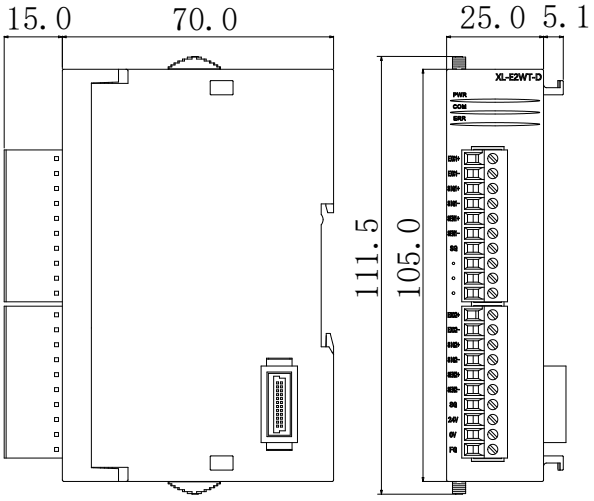


Note:

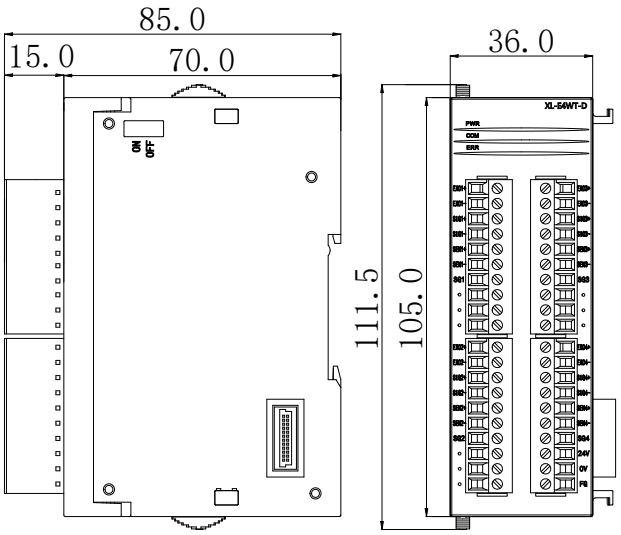
1. From/TO instruction can only be written in sequence function block, XL series PLC with firmware version v3.4.5 and above can write up to 100 blocks in the program, but can only run up to 8 blocks at the same time.
2. The starting number of module starts from k10000, k10000 is module 1 and k10001 is module 2. By analogy, module 16 is K10015.

10-11. Dimension

XL-E1WT-D, XL-E2WT-D (Unit: mm)

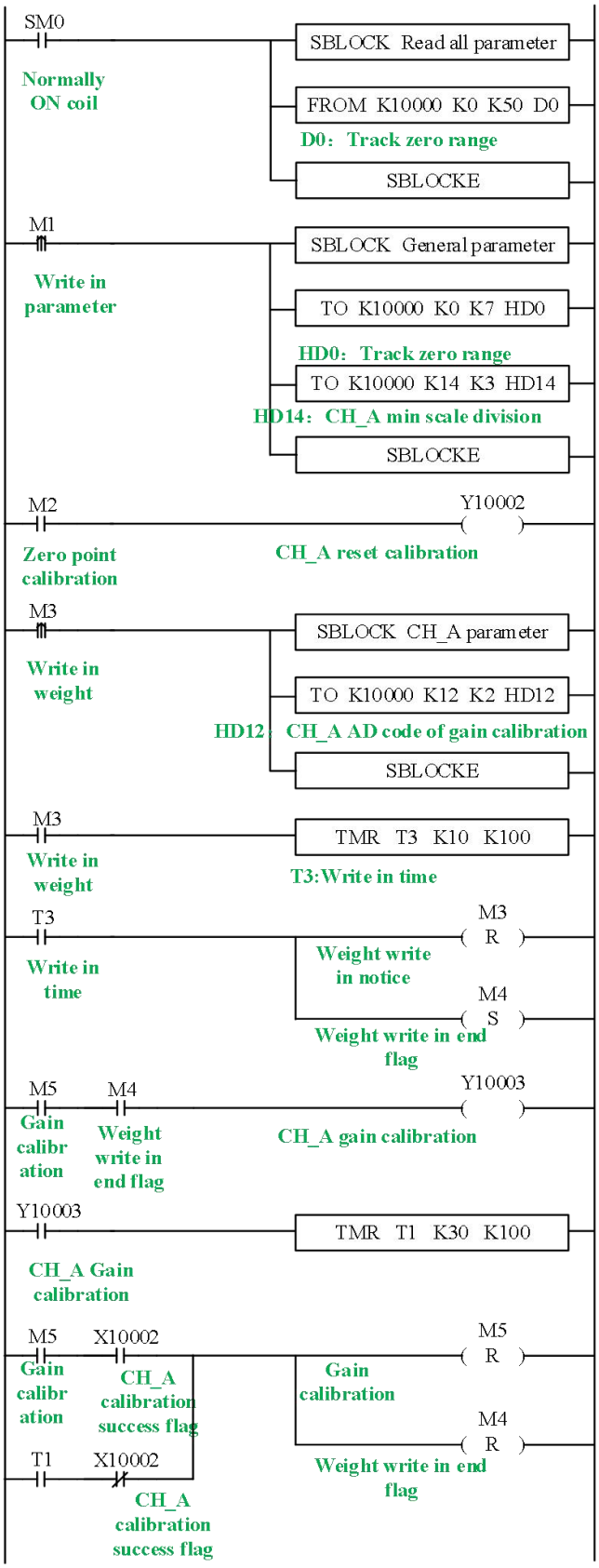


XL-E4WT-D (Unit: mm)



10-12. Application program

Take module 1 as an example:



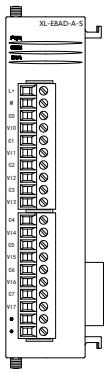
Explanation:
Read all the parameters and write in general parameters through FROM/TO instruction.
Set ON M1, write in all the parameters of channel 1.
Zero-point calibration: set ON M2, if zero-point calibration is successful, X10002 is set ON.
Gain calibration: first set ON M3, write the weight value HD12 to the module. After write in success flag M4 is ON, it starts to calibrate gain. Set ON M5 to start the calibration, the preset stable time is 3s. after the scale is stable, gain calibration success flag X10002 is ON or calibration time T1 reached, reset M4, M5, gain calibration is finished.

11. Analog input module XL-E8AD-A-S

This chapter mainly introduces XL-E8AD-A-S module specifications, terminal instructions, input definition number allocation, working mode settings, external connections, analog-to-digital conversion diagrams, appearance size diagrams and related programming examples.

11-1. Module features and specifications

XL-E8AD-A-S analog input module converts 8 analog current input values into digital values, and transmits them to the main unit of PLC, and interacts with the main unit of PLC in real time.



Module features

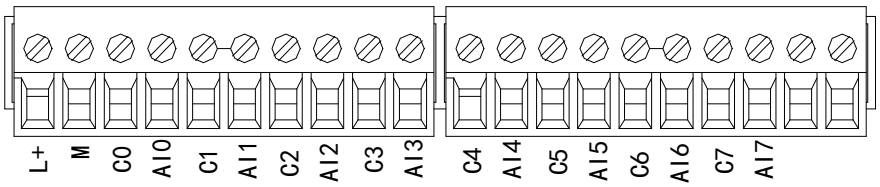
- 8-channel analog input: current input.
- 16-bit high-precision analog input.
- As a special functional module of the XL series, XL3 can connect up to 10 modules, XL5/XL5E/XL5N/XL5H/XLME/XLH/XSLH can expand 16 modules, and XL1 does not support expansion modules.

Module specification

Item	Analog input
	Current input
Analog input range	0~20mA, 4~20mA, -20~20mA
Max input range	-40~40mA
Digital output range	16 bits binary data (0~65535 or -32768~32767)
Resolution	1/65535 (16Bit)
Integrated precision	±1%
Conversion speed	2ms/1 channel
Module power supply	DC24V±10%, 150mA

11-2. Terminal descriptions

Terminal arrangment



Terminal signal

Name		Function
Indicator light	PWR	The indicator lights up when the module has a power supply.
	COM	When the module port communicates normally, the indicator lights on.
	ERR	When there is an error in the module, the indicator is always on or flickering (red).

		When the ERR LED is always on, it indicates that the module has serious application errors and can not be used. It is necessary to adjust the mode of use and switch the PLC to STOP state. When the ERR LED flickers, there are application errors, abnormal work and abnormal data in the module, but the PLC is still RUN.
Terminal	L+	Module 24V power supply input +
	M	Module 24V power supply input -
	C0	AI0 output ground
	AI0	Channel 1 AD current input
	C1	AI1 output ground
	AI1	Channel 2 AD current input
	C2	AI2 output ground
	AI2	Channel 3 AD current input
	C3	AI3 output ground
	AI3	Channel 4 AD current input
	C4	AI4 output ground
	AI4	Channel 5 AD current input
	C5	AI5 output ground
	AI5	Channel 6 AD current input
	C6	AI6 output ground
	AI6	Channel 7 AD current input
	C7	AI7 output ground
	AI7	Channel 8 AD current input

Wiring head specification

When wiring the module, its wiring head should meet the following requirements:
(1) The stripping length is 9 mm;
(2) Flexible wires with bare tubular ends are 0.25-1.5 square.
(3) Flexible wires with tubular pre-insulated end is 0.25-0.5 square.

11-3. I/O address

XL series analog module does not occupy I/O unit, the converted value is directly sent to the PLC register, the corresponding channel definition number of the PLC register is as follows:

Module 1 register address:

Channel	AD signal	Channel enable switch (please turn on the swich to use this channel)	Channel alarm flag bit
0CH	ID10000	Y10000	X10000
1CH	ID10002	Y10001	X10001
2CH	ID10004	Y10002	X10002
3CH	ID10006	Y10003	X10003
4CH	ID10008	Y10004	X10004
5CH	ID10010	Y10005	X10005
6CH	ID10012	Y10006	X10006
7CH	ID10014	Y10007	X10007

Module 2 register address:

Channel	AD signal	Channel enable switch (please turn on the swich to use this channel)	Channel alarm flag bit
0CH	ID10100	Y10100	X10100
1CH	ID10102	Y10101	X10101
2CH	ID10104	Y10102	X10102
3CH	ID10106	Y10103	X10103
4CH	ID10108	Y10104	X10104
5CH	ID10110	Y10105	X10105
6CH	ID10112	Y10106	X10106
7CH	ID101014	Y10107	X10107

Module 3 register address:

Channel	AD signal	Channel enable switch (please turn on the swich to use this channel)	Channel alarm flag bit
0CH	ID10200	Y10200	X10200
1CH	ID10202	Y10201	X10201
2CH	ID10204	Y10202	X10202
3CH	ID10206	Y10203	X10203
4CH	ID10208	Y10204	X10204
5CH	ID10210	Y10205	X10205
6CH	ID10212	Y10206	X10206
7CH	ID10214	Y10207	X10207

Module 4 register address:

Channel	AD signal	Channel enable switch (please turn on the swich to use this channel)	Channel alarm flag bit
0CH	ID10300	Y10300	X10300
1CH	ID10302	Y10301	X10301
2CH	ID10304	Y10302	X10302
3CH	ID10306	Y10303	X10303
4CH	ID10308	Y10304	X10304
5CH	ID10310	Y10305	X10305
6CH	ID10312	Y10306	X10306
7CH	ID10314	Y10307	X10307

Module 5 register address:

Channel	AD signal	Channel enable switch (please turn on the swich to use this channel)	Channel alarm flag bit
0CH	ID10400	Y10400	X10400
1CH	ID10402	Y10401	X10401
2CH	ID10404	Y10402	X10402
3CH	ID10406	Y10403	X10403
4CH	ID10408	Y10404	X10404
5CH	ID10410	Y10405	X10405
6CH	ID10412	Y10406	X10406
7CH	ID10414	Y10407	X10407

Module 6 register address:

Channel	AD signal	Channel enable switch (please turn on the swich to use this channel)	Channel alarm flag bit
0CH	ID10500	Y10500	X10500
1CH	ID10502	Y10501	X10501
2CH	ID10504	Y10502	X10502
3CH	ID10506	Y10503	X10503
4CH	ID10508	Y10504	X10504
5CH	ID10510	Y10505	X10505
6CH	ID10512	Y10506	X10506
7CH	ID10514	Y10507	X10507

Module 7 register address:

Channel	AD signal	Channel enable switch (please turn on the swich to use this channel)	Channel alarm flag bit
0CH	ID10600	Y10600	X10600
1CH	ID10602	Y10601	X10601
2CH	ID10604	Y10602	X10602
3CH	ID10606	Y10603	X10603
4CH	ID10608	Y10604	X10604
5CH	ID10610	Y10605	X10605
6CH	ID10612	Y10606	X10606
7CH	ID10614	Y10607	X10607

Module 8 register address:

Channel	AD signal	Channel enable switch (please turn on the swich to use this channel)	Channel alarm flag bit
0CH	ID10700	Y10700	X10700
1CH	ID10702	Y10701	X10701
2CH	ID10704	Y10702	X10702
3CH	ID10706	Y10703	X10703
4CH	ID10708	Y10704	X10704
5CH	ID10710	Y10705	X10705
6CH	ID10712	Y10706	X10706
7CH	ID10714	Y10707	X10707

Module 9 register address:

Channel	AD signal	Channel enable switch (please turn on the swich to use this channel)	Channel alarm flag bit
0CH	ID10800	Y11000	X11000
1CH	ID10802	Y11001	X11001
2CH	ID10804	Y11002	X11002
3CH	ID10806	Y11003	X11003
4CH	ID10808	Y11004	X11004
5CH	ID10810	Y11005	X11005
6CH	ID10812	Y11006	X11006
7CH	ID10814	Y11007	X11007

Module 10 register address:

Channel	AD signal	Channel enable switch (please turn on the swich to use this channel)	Channel alarm flag bit
0CH	ID10900	Y11100	X11100
1CH	ID10902	Y11101	X11101
2CH	ID10904	Y11102	X11102
3CH	ID10906	Y11103	X11103
4CH	ID10908	Y11104	X11104
5CH	ID10910	Y11105	X11105
6CH	ID10912	Y11106	X11106
7CH	ID10914	Y11107	X11107

Module 11 register address:

Channel	AD signal	Channel enable switch (please turn on the swich to use this channel)	Channel alarm flag bit
0CH	ID11000	Y11200	X11200
1CH	ID11002	Y11201	X11201
2CH	ID11004	Y11202	X11202
3CH	ID11006	Y11203	X11203
4CH	ID11008	Y11204	X11204
5CH	ID11010	Y11205	X11205
6CH	ID11012	Y11206	X11206
7CH	ID11014	Y11207	X11207

Module 12 register address:

Channel	AD signal	Channel enable switch (please turn on the swich to use this channel)	Channel alarm flag bit
0CH	ID11100	Y11300	X11300
1CH	ID11102	Y11301	X11301
2CH	ID11104	Y11302	X11302
3CH	ID11106	Y11303	X11303
4CH	ID11108	Y11304	X11304
5CH	ID11110	Y11305	X11305
6CH	ID11112	Y11306	X11306
7CH	ID11114	Y11307	X11307

Module 13 register address:

Channel	AD signal	Channel enable switch (please turn on the swich to use this channel)	Channel alarm flag bit
0CH	ID11200	Y11400	X11400
1CH	ID11202	Y11401	X11401
2CH	ID11204	Y11402	X11402
3CH	ID11206	Y11403	X11403
4CH	ID11208	Y11404	X11404
5CH	ID11210	Y11405	X11405
6CH	ID11212	Y11406	X11406
7CH	ID11214	Y11407	X11407

Module 14 register address:

Channel	AD signal	Channel enable switch (please turn on the swich to use this channel)	Channel alarm flag bit
0CH	ID11300	Y11500	X11500
1CH	ID11302	Y11501	X11501
2CH	ID11304	Y11502	X11502
3CH	ID11306	Y11503	X11503
4CH	ID11308	Y11504	X11504
5CH	ID11310	Y11505	X11505
6CH	ID11312	Y11506	X11506
7CH	ID11314	Y11507	X11507

Module 15 register address:

Channel	AD signal	Channel enable switch (please turn on the swich to use this channel)	Channel alarm flag bit
0CH	ID11400	Y11600	X11600
1CH	ID11402	Y11601	X11601
2CH	ID11404	Y11602	X11602
3CH	ID11406	Y11603	X11603
4CH	ID11408	Y11604	X11604
5CH	ID11410	Y11605	X11605
6CH	ID11412	Y11606	X11606
7CH	ID11414	Y11607	X11607

Module 16 register address:

Channel	AD signal	Channel enable switch (please turn on the swich to use this channel)	Channel alarm flag bit
0CH	ID11500	Y11700	X11700
1CH	ID11502	Y11701	X11701
2CH	ID11504	Y11702	X11702
3CH	ID11506	Y11703	X11703
4CH	ID11508	Y11704	X11704
5CH	ID11510	Y11705	X11705
6CH	ID11512	Y11706	X11706
7CH	ID11514	Y11707	X11707

Note:

(1) Banning unused channels can improve the scanning speed of input/output.

(2) When the input enabling switch is turned off during operation, the corresponding input channel will not collect data. (Data display is 0)

11-4. Working mode settings

There are two ways to set the working mode (the effect of these two ways is equivalent):

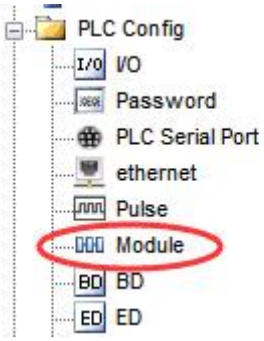
(1) Configuration through the software

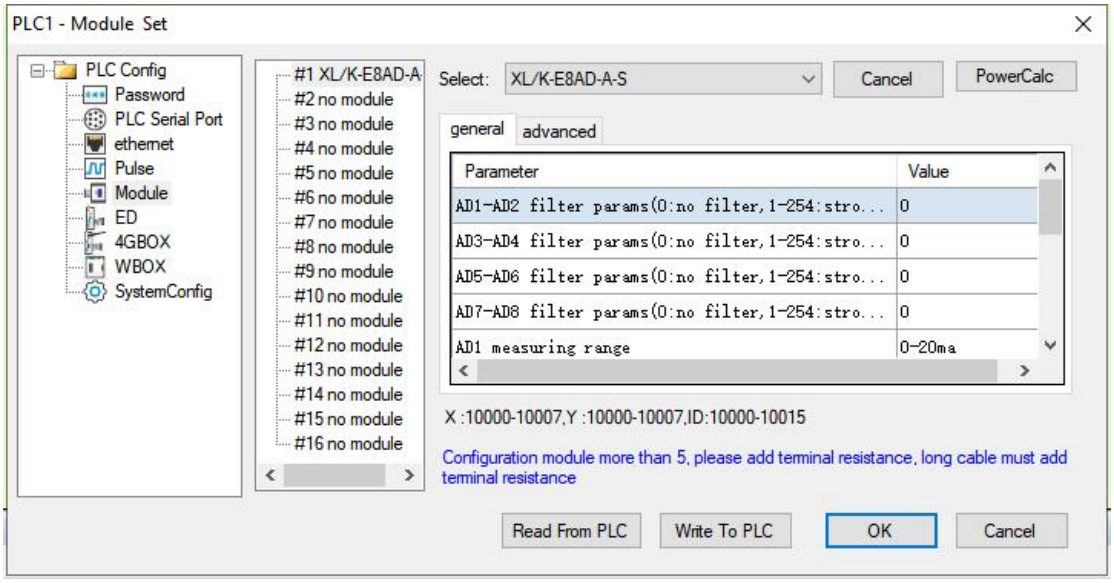
(2) Setting up by Flash Register

Set through the software

Please use XDPpro v3.5.1 or higher version software to configure the module.

Open the software, click module in the left menu,





Choose the module type, and set each channel's parameters in the above window. Then click write to PLC, cut the power supply and power on again to make the settings effective.

Note: The first-order low-pass filtering method weighs this time sampling value and the output value of the last filtering to get the effective filtering value; the filter coefficient is set by the user to 0-254, the smaller the value, the more stable the data, but may lead to data lag; therefore, when set to 1, the filtering effect is strongest and the data is the most stable; when set to 254, the filtering effect is the weakest; default is 0 (no filtering).

Set by Flash register

The input channel of the extended module is current mode, with 0-20mA, 4-20mA and -20-20mA optional. It is set by special FLASH data register SFD in PLC. As follows:

Module no.	SFD register	Module no.	SFD register
#1	SFD350~SFD359	#9	SFD430~SFD439
#2	SFD360~SFD369	#10	SFD440~SFD449
#3	SFD370~SFD379	#11	SFD450~SFD459
#4	SFD380~SFD389	#12	SFD460~SFD469
#5	SFD390~SFD399	#13	SFD470~SFD479
#6	SFD400~SFD409	#14	SFD480~SFD489
#7	SFD410~SFD419	#15	SFD490~SFD499
#8	SFD420~SFD429	#16	SFD500~SFD509

Note: As shown above, each register sets four-channel modes. Each register has 16 bits. From low to high, each four bit will set four-channel modes in turn.

SFD bit definition

<table>
<tr><td></td><td>Bit7</td><td>Bit6</td><td>Bit5</td><td>Bit4</td><td>Bit3</td><td>Bit2</td><td>Bit1</td><td>Bit0</td><td>NOTE</td></tr>
<tr><td>Byte0</td><td colspan="8">AD channel 2, channel 1 filtering parameter</td><td rowspan="4">AD filtering parameter</td></tr>
<tr><td>Byte1</td><td colspan="8">AD channel 4, channel 3 filtering parameter</td></tr>
<tr><td>Byte2</td><td colspan="8">AD channel 6, channel 5 filtering parameter</td></tr>
<tr><td>Byte3</td><td colspan="8">AD channel 8, channel 7 filtering parameter</td></tr>
<tr><td rowspan="3">Byte4</td><td>Bit7</td><td>Bit6</td><td>Bit5</td><td>Bit4</td><td>Bit3</td><td>Bit2</td><td>Bit1</td><td>Bit0</td><td rowspan="13">Set the AD module input range, Byte4 low 4-bit set AD channel1, high 4-bit set AD channel2. Byte5 low 4-bit set AD channel3, high 4-bit set AD channel4, Byte6 low 4-bit set AD channel5, high 4-bit set AD channel6, Byte7 low 4-bit set AD channel7, high 4-bit set AD channel8.</td></tr>
<tr><td colspan="4">AD2</td><td colspan="4">AD1</td></tr>
<tr><td colspan="4">1000：0~20mA
1001：4~20mA
1010：-20~20mA</td><td colspan="4">1000：0~20mA
1001：4~20mA
1010：-20~20mA</td></tr>
<tr><td rowspan="3">Byte5</td><td>Bit7</td><td>Bit6</td><td>Bit5</td><td>Bit4</td><td>Bit3</td><td>Bit2</td><td>Bit1</td><td>Bit0</td></tr>
<tr><td colspan="4">AD4</td><td colspan="4">AD3</td></tr>
<tr><td colspan="4">1000：0~20mA
1001：4~20mA
1010：-20~20mA</td><td colspan="4">1000：0~20mA
1001：4~20mA
1010：-20~20mA</td></tr>
<tr><td rowspan="3">Byte6</td><td>Bit7</td><td>Bit6</td><td>Bit5</td><td>Bit4</td><td>Bit3</td><td>Bit2</td><td>Bit1</td><td>Bit0</td></tr>
<tr><td colspan="4">AD6</td><td colspan="4">AD5</td></tr>
<tr><td colspan="4">1000：0~20mA
1001：4~20mA
1010：-20~20mA</td><td colspan="4">1000：0~20mA
1001：4~20mA
1010：-20~20mA</td></tr>
<tr><td rowspan="3">Byte7</td><td>Bit7</td><td>Bit6</td><td>Bit5</td><td>Bit4</td><td>Bit3</td><td>Bit2</td><td>Bit1</td><td>Bit0</td></tr>
<tr><td colspan="4">AD8</td><td colspan="4">AD7</td></tr>
<tr><td colspan="4">1000：0~20mA
1001：4~20mA
1010：-20~20mA</td><td colspan="4">1000：0~20mA
1001：4~20mA
1010：-20~20mA</td></tr>
<tr><td>Byte8~
Byte19</td><td colspan="8">-</td></tr>
</table>

Take the first module as an example to illustrate how to set it up.

Example: To set the working modes of input channels 1 and 0 of the first module to be 0-20 mA, input channels 3 and 2 to be 4-20 mA, input channels 5 and 4 to be 0-20 mA, input channels 7 and 6 to be - 20-20 mA, filter coefficients of channels 0, 1, 2 and 3 to be 254, filter coefficients of channels 4, 5, 6 and 7 to be 100.

Method 1:
You can configure it directly in the PLC software, as shown above.

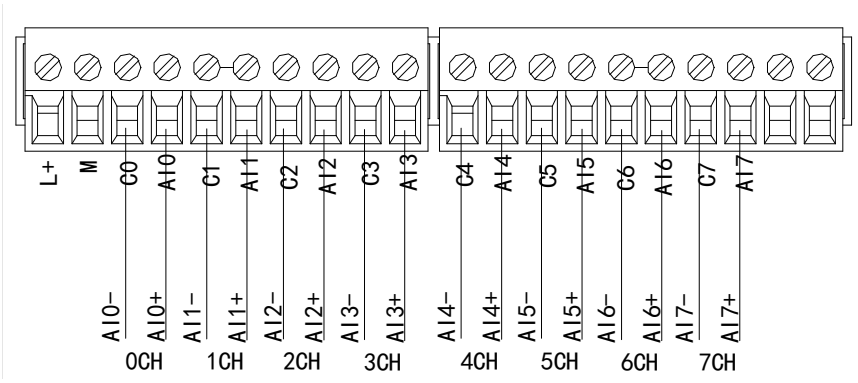
Method 2:
Set the SFD as follows:

SFD350=FEFEH SFD351=6464H SFD352=9988H SFD353=AA88H

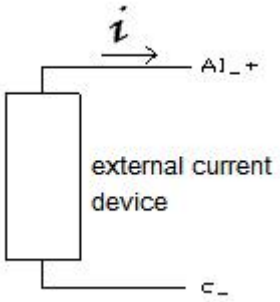
11-5. External wiring

For external connection, to avoid interference, use shielding wire and connect the ground to the single point of shielding layer.

Current input

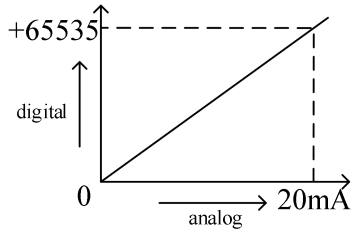
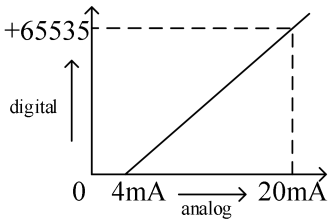
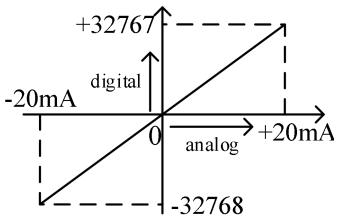


XL-E8AD-A-S current input wiring:



11-6. Analog digital conversion diagram

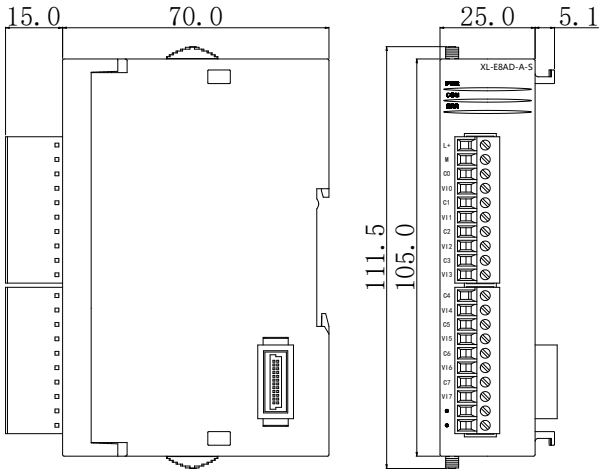
The relationship between input analog quantities and converted digital quantities is shown in the following table:

0~20mA analog input	4~20mA analog input
	
-20~20mA analog input	
	

Note: When the channel enable switch is turned on and the AD current input is suspended, the ID register corresponding to the AD current input is displayed as 0. When the channel enable switch is turned off, the ID register corresponding to the AD current input is displayed as 0.

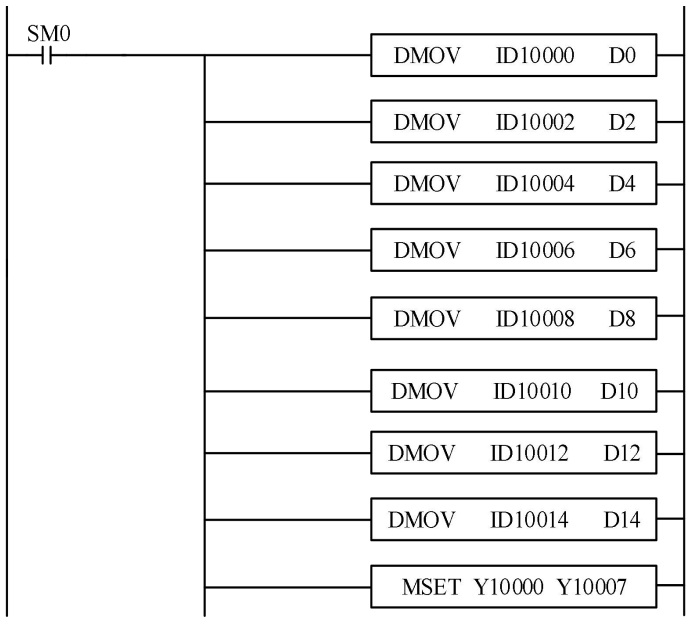
11-7. Dimension

(Unit: mm)



11-8. Application

Examples of real-time reading 8 channels of data (take Module 1 as an example)



Explain:

SM0 is a constant ON coil and has been in ON state during the operation of PLC.

The PLC starts to run, and continuously writes the data of channel 0 of the module 1 into the data register D0.

Data in channel 1 is written to data register D1, D0.

Data in channel 2 is written to data register D3, D2.

Data in channel 3 is written to data register D5, D4.

Data in channel 4 is written to data register D7, D6.
Data in channel 5 is written to data register D9, D8.
Data in channel 6 is written to data register D11, D10.
Data in channel 7 is written to data register D13, D12.
Data in channel 8 is written to data register D15, D14.

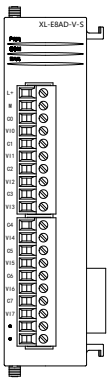
Since all channels are used, all the channel enablers are opened.

12. Analog input module XL-E8AD-V-S

This chapter mainly introduces XL-E8AD-V-S module specifications, terminal instructions, input definition number allocation, working mode settings, external connections, analog-to-digital conversion diagrams, appearance size diagrams and related programming examples.

12-1. Module features and specifications

XL-E8AD-V-S analog input module converts 8 analog current input values into digital values, and transmits them to the main unit of PLC, and interacts with the main unit of PLC in real time.



Module features

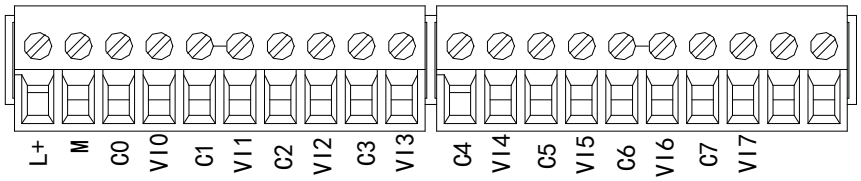
- 8-channel analog input: voltage input.
- 16-bit high-precision analog input.
- As a special functional module of the XL series, XL3 can connect up to 10 modules, XL5/XL5E/XL5N/XL5H/XLME/XLH/XSLH can expand 16 modules, and XL1 does not support expansion modules.

Module specification

Item	Analog input
	Voltage input
Analog input range	0~5V, 0~10V, -5~5V, -10~10V
Max input range	DC±15V
Digital output range	16 bits binary data (0~65535 or -32768~32767)
Resolution	1/65535 (16Bit)
Integrated precision	±1%
Conversion speed	2ms/1 channel
Module power supply	DC24V±10%, 150mA
Installation	Fixed with M3 screws or directly installed on rail of DIN46277 (Width: 35mm)

12-2. Terminal descriptions

Terminal arrangment



Terminal signal

Name		Function
Indicator light	PWR	The indicator lights up when the module has a power supply.
	COM	When the module port communicates normally, the indicator lights on.
	ERR	When there is an error in the module, the indicator is always on

		or flickering (red). When the ERR LED is always on, it indicates that the module has serious application errors and can not be used. It is necessary to adjust the mode of use and switch the PLC to STOP state. When the ERR LED flickers, there are application errors, abnormal work and abnormal data in the module, but the PLC is still RUN.
Terminal	L+	Module 24V power supply input +
	M	Module 24V power supply input -
	C0	VI0 output ground
	VI0	Channel 1 AD voltage input
	C1	VI1 output ground
	VI1	Channel 2 AD voltage input
	C2	VI2 output ground
	VI2	Channel 3 AD voltage input
	C3	VI3 output ground
	VI3	Channel 4 AD voltage input
	C4	VI4 output ground
	VI4	Channel 5 AD voltage input
	C5	VI5 output ground
	VI5	Channel 6 AD voltage input
	C6	VI6 output ground
	VI6	Channel 7 AD voltage input
	C7	VI7 output ground
	VI7	Channel 8 AD voltage input

Wiring head specification

When wiring the module, its wiring head should meet the following requirements:

(1) The stripping length is 9 mm;

(2) Flexible wires with bare tubular ends are 0.25-1.5 square.

(3) Flexible wires with tubular pre-insulated end is 0.25-0.5 square.

12-3. I/O address

XL series analog module does not occupy I/O unit, the converted value is directly sent to the PLC register, the corresponding channel definition number of the PLC register is as follows:

Module 1 register address:

Channel	AD signal	Channel enable switch (please turn on the swich to use this channel)	Channel alarm flag bit
0CH	ID10000	Y10000	X10000
1CH	ID10002	Y10001	X10001
2CH	ID10004	Y10002	X10002
3CH	ID10006	Y10003	X10003
4CH	ID10008	Y10004	X10004
5CH	ID10010	Y10005	X10005
6CH	ID10012	Y10006	X10006
7CH	ID10014	Y10007	X10007

Module 2 register address:

Channel	AD signal	Channel enable switch (please turn on the swich to use this channel)	Channel alarm flag bit
0CH	ID10100	Y10100	X10100
1CH	ID10102	Y10101	X10101
2CH	ID10104	Y10102	X10102
3CH	ID10106	Y10103	X10103
4CH	ID10108	Y10104	X10104
5CH	ID10110	Y10105	X10105
6CH	ID10112	Y10106	X10106
7CH	ID101014	Y10107	X10107

Module 3 register address:

Channel	AD signal	Channel enable switch (please turn on the swich to use this channel)	Channel alarm flag bit
0CH	ID10200	Y10200	X10200
1CH	ID10202	Y10201	X10201
2CH	ID10204	Y10202	X10202
3CH	ID10206	Y10203	X10203
4CH	ID10208	Y10204	X10204
5CH	ID10210	Y10205	X10205
6CH	ID10212	Y10206	X10206
7CH	ID10214	Y10207	X10207

Module 4 register address:

Channel	AD signal	Channel enable switch (please turn on the swich to use this channel)	Channel alarm flag bit
0CH	ID10300	Y10300	X10300
1CH	ID10302	Y10301	X10301
2CH	ID10304	Y10302	X10302
3CH	ID10306	Y10303	X10303
4CH	ID10308	Y10304	X10304
5CH	ID10310	Y10305	X10305
6CH	ID10312	Y10306	X10306
7CH	ID10314	Y10307	X10307

Module 5 register address:

Channel	AD signal	Channel enable switch (please turn on the swich to use this channel)	Channel alarm flag bit
0CH	ID10400	Y10400	X10400
1CH	ID10402	Y10401	X10401
2CH	ID10404	Y10402	X10402
3CH	ID10406	Y10403	X10403
4CH	ID10408	Y10404	X10404
5CH	ID10410	Y10405	X10405
6CH	ID10412	Y10406	X10406
7CH	ID10414	Y10407	X10407

Module 6 register address:

Channel	AD signal	Channel enable switch (please turn on the swich to use this channel)	Channel alarm flag bit
0CH	ID10500	Y10500	X10500
1CH	ID10502	Y10501	X10501
2CH	ID10504	Y10502	X10502
3CH	ID10506	Y10503	X10503
4CH	ID10508	Y10504	X10504
5CH	ID10510	Y10505	X10505
6CH	ID10512	Y10506	X10506
7CH	ID10514	Y10507	X10507

Module 7 register address:

Channel	AD signal	Channel enable switch (please turn on the swich to use this channel)	Channel alarm flag bit
0CH	ID10600	Y10600	X10600
1CH	ID10602	Y10601	X10601
2CH	ID10604	Y10602	X10602
3CH	ID10606	Y10603	X10603
4CH	ID10608	Y10604	X10604
5CH	ID10610	Y10605	X10605
6CH	ID10612	Y10606	X10606
7CH	ID10614	Y10607	X10607

Module 8 register address:

Channel	AD signal	Channel enable switch (please turn on the swich to use this channel)	Channel alarm flag bit
0CH	ID10700	Y10700	X10700
1CH	ID10702	Y10701	X10701
2CH	ID10704	Y10702	X10702
3CH	ID10706	Y10703	X10703
4CH	ID10708	Y10704	X10704
5CH	ID10710	Y10705	X10705
6CH	ID10712	Y10706	X10706
7CH	ID10714	Y10707	X10707

Module 9 register address:

Channel	AD signal	Channel enable switch (please turn on the swich to use this channel)	Channel alarm flag bit
0CH	ID10800	Y11000	X11000
1CH	ID10802	Y11001	X11001
2CH	ID10804	Y11002	X11002
3CH	ID10806	Y11003	X11003
4CH	ID10808	Y11004	X11004
5CH	ID10810	Y11005	X11005
6CH	ID10812	Y11006	X11006
7CH	ID10814	Y11007	X11007

Module 10 register address:

Channel	AD signal	Channel enable switch (please turn on the swich to use this channel)	Channel alarm flag bit
0CH	ID10900	Y11100	X11100
1CH	ID10902	Y11101	X11101
2CH	ID10904	Y11102	X11102
3CH	ID10906	Y11103	X11103
4CH	ID10908	Y11104	X11104
5CH	ID10910	Y11105	X11105
6CH	ID10912	Y11106	X11106
7CH	ID10914	Y11107	X11107

Module 11 register address:

Channel	AD signal	Channel enable switch (please turn on the swich to use this channel)	Channel alarm flag bit
0CH	ID11000	Y11200	X11200
1CH	ID11002	Y11201	X11201
2CH	ID11004	Y11202	X11202
3CH	ID11006	Y11203	X11203
4CH	ID11008	Y11204	X11204
5CH	ID11010	Y11205	X11205
6CH	ID11012	Y11206	X11206
7CH	ID11014	Y11207	X11207

Module 12 register address:

Channel	AD signal	Channel enable switch (please turn on the swich to use this channel)	Channel alarm flag bit
0CH	ID11100	Y11300	X11300
1CH	ID11102	Y11301	X11301
2CH	ID11104	Y11302	X11302
3CH	ID11106	Y11303	X11303
4CH	ID11108	Y11304	X11304
5CH	ID11110	Y11305	X11305
6CH	ID11112	Y11306	X11306
7CH	ID11114	Y11307	X11307

Module 13 register address:

Channel	AD signal	Channel enable switch (please turn on the swich to use this channel)	Channel alarm flag bit
0CH	ID11200	Y11400	X11400
1CH	ID11202	Y11401	X11401
2CH	ID11204	Y11402	X11402
3CH	ID11206	Y11403	X11403
4CH	ID11208	Y11404	X11404
5CH	ID11210	Y11405	X11405
6CH	ID11212	Y11406	X11406
7CH	ID11214	Y11407	X11407

Module 14 register address:

Channel	AD signal	Channel enable switch (please turn on the swich to use this channel)	Channel alarm flag bit
0CH	ID11300	Y11500	X11500
1CH	ID11302	Y11501	X11501
2CH	ID11304	Y11502	X11502
3CH	ID11306	Y11503	X11503
4CH	ID11308	Y11504	X11504
5CH	ID11310	Y11505	X11505
6CH	ID11312	Y11506	X11506
7CH	ID11314	Y11507	X11507

Module 15 register address:

Channel	AD signal	Channel enable switch (please turn on the swich to use this channel)	Channel alarm flag bit
0CH	ID11400	Y11600	X11600
1CH	ID11402	Y11601	X11601
2CH	ID11404	Y11602	X11602
3CH	ID11406	Y11603	X11603
4CH	ID11408	Y11604	X11604
5CH	ID11410	Y11605	X11605
6CH	ID11412	Y11606	X11606
7CH	ID11414	Y11607	X11607

Module 16 register address:

Channel	AD signal	Channel enable switch (please turn on the swich to use this channel)	Channel alarm flag bit
0CH	ID11500	Y11700	X11700
1CH	ID11502	Y11701	X11701
2CH	ID11504	Y11702	X11702
3CH	ID11506	Y11703	X11703
4CH	ID11508	Y11704	X11704
5CH	ID11510	Y11705	X11705
6CH	ID11512	Y11706	X11706
7CH	ID11514	Y11707	X11707

Note:

(1) Banning unused channels can improve the scanning speed of input/output.

(2) When the input enabling switch is turned off during operation, the corresponding input channel will not collect data. (Data display is 0)

12-4. Working mode settings

There are two ways to set the working mode (the effect of these two ways is equivalent):

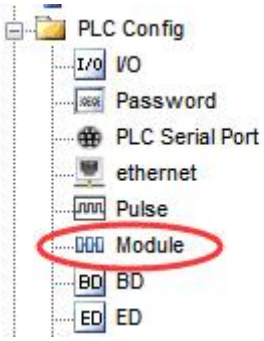
(1) Configuration through the software

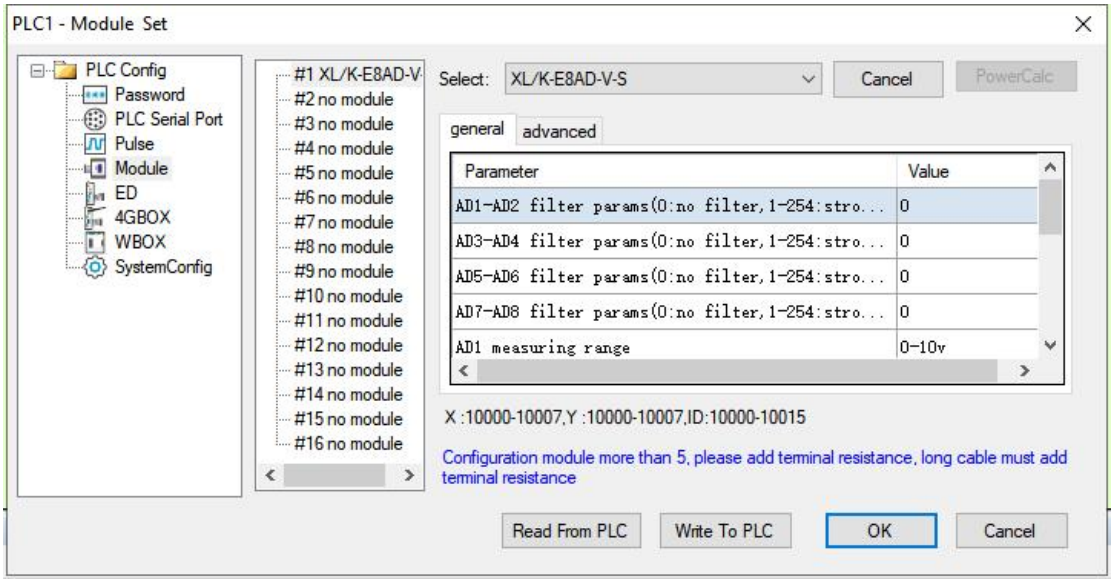
(2) Setting up by Flash Register

Set through the software

Please use XDPpro v3.5.1 or higher version software to configure the module.

Open the software, click module in the left menu,





Choose the module type, and set each channel's parameters in the above window. Then click write to PLC, cut the power supply and power on again to make the settings effective.

Note: The first-order low-pass filtering method weighs this time sampling value and the output value of the last filtering to get the effective filtering value; the filter coefficient is set by the user to 0-254, the smaller the value, the more stable the data, but may lead to data lag; therefore, when set to 1, the filtering effect is strongest and the data is the most stable; when set to 254, the filtering effect is the weakest; default is 0 (no filtering).

Set by Flash register

The input channel of the extended module is voltage mode, with 0~5V, 0~10V, -5~5V, -10~10V optional. It is set by special FLASH data register SFD in PLC. As follows:

Module no.	SFD register	Module no.	SFD register
#1	SFD350~SFD359	#9	SFD430~SFD439
#2	SFD360~SFD369	#10	SFD440~SFD449
#3	SFD370~SFD379	#11	SFD450~SFD459
#4	SFD380~SFD389	#12	SFD460~SFD469
#5	SFD390~SFD399	#13	SFD470~SFD479
#6	SFD400~SFD409	#14	SFD480~SFD489
#7	SFD410~SFD419	#15	SFD490~SFD499
#8	SFD420~SFD429	#16	SFD500~SFD509

Note: As shown above, each register sets four-channel modes. Each register has 16 bits. From low to high, each four bit will set four-channel modes in turn.

SFD bit definition

<table>
<tr><th></th><th>Bit7</th><th>Bit6</th><th>Bit5</th><th>Bit4</th><th>Bit3</th><th>Bit2</th><th>Bit1</th><th>Bit0</th><th>NOTE</th></tr>
<tr><td>Byte0</td><td colspan="8">AD channel 2, channel 1 filtering parameter</td><td rowspan="4">AD filtering parameter</td></tr>
<tr><td>Byte1</td><td colspan="8">AD channel 4, channel 3 filtering parameter</td></tr>
<tr><td>Byte2</td><td colspan="8">AD channel 6, channel 5 filtering parameter</td></tr>
<tr><td>Byte3</td><td colspan="8">AD channel 8, channel 7 filtering parameter</td></tr>
<tr><td rowspan="4">Byte4</td><td>Bit7</td><td>Bit6</td><td>Bit5</td><td>Bit4</td><td>Bit3</td><td>Bit2</td><td>Bit1</td><td>Bit0</td><td rowspan="16">Set the AD module input range, Byte4 low 4-bit set AD channel1, high 4-bit set AD channel2. Byte5 low 4-bit set AD channel3, high 4-bit set AD channel4, Byte6 low 4-bit set AD channel5, high 4-bit set AD channel6, Byte7 low 4-bit set AD channel7, high 4-bit set AD channel8.</td></tr>
<tr><td colspan="4">AD2</td><td colspan="4">AD1</td></tr>
<tr><td colspan="4">0000：0~10V
0001：0~5V
0010：-10~10V
0011：-5~5V</td><td colspan="4">0000：0~10V
0001：0~5V
0010：-10~10V
0011：-5~5V</td></tr>
<tr><td rowspan="3">Byte5</td></tr>
<tr><td>Bit7</td><td>Bit6</td><td>Bit5</td><td>Bit4</td><td>Bit3</td><td>Bit2</td><td>Bit1</td><td>Bit0</td></tr>
<tr><td colspan="4">AD4</td><td colspan="4">AD3</td></tr>
<tr><td colspan="4">0000：0~10V
0001：0~5V
0010：-10~10V
0011：-5~5V</td><td colspan="4">0000：0~10V
0001：0~5V
0010：-10~10V
0011：-5~5V</td></tr>
<tr><td rowspan="3">Byte6</td></tr>
<tr><td>Bit7</td><td>Bit6</td><td>Bit5</td><td>Bit4</td><td>Bit3</td><td>Bit2</td><td>Bit1</td><td>Bit0</td></tr>
<tr><td colspan="4">AD6</td><td colspan="4">AD5</td></tr>
<tr><td colspan="4">0000：0~10V
0001：0~5V
0010：-10~10V
0011：-5~5V</td><td colspan="4">0000：0~10V
0001：0~5V
0010：-10~10V
0011：-5~5V</td></tr>
<tr><td rowspan="3">Byte7</td></tr>
<tr><td>Bit7</td><td>Bit6</td><td>Bit5</td><td>Bit4</td><td>Bit3</td><td>Bit2</td><td>Bit1</td><td>Bit0</td></tr>
<tr><td colspan="4">AD8</td><td colspan="4">AD7</td></tr>
<tr><td colspan="4">0000：0~10V
0001：0~5V
0010：-10~10V
0011：-5~5V</td><td colspan="4">0000：0~10V
0001：0~5V
0010：-10~10V
0011：-5~5V</td></tr>
<tr><td>Byte8~
Byte19</td><td colspan="8">-</td></tr>
</table>

Take the first module as an example to illustrate how to set it up.

Example: To set the first module's input channels 1and 0 to 0~10V, input channels 3 and 2 to 0~5V, input channels 5 and 4 to 0~10V, input channels 7 and 6 to 0~5V, filter coefficients of channels 0, 1, 2 and 3 to 254, filter coefficients of channels 4, 5, 6 and 7 to 100.

Method 1:

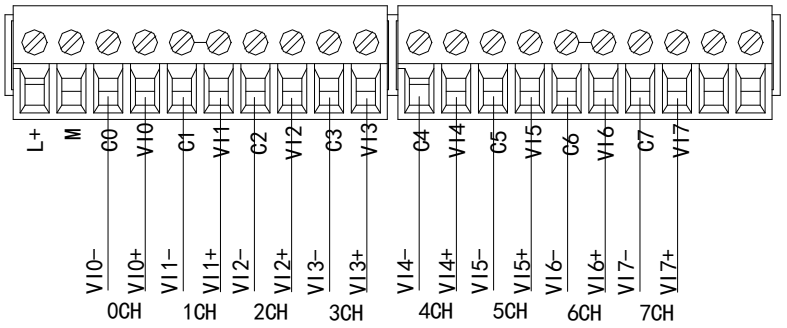
You can configure it directly in the PLC software, as shown above.

Method 2:
Set the SFD as follows:
SFD350=FEFEH SFD351=6464H SFD352=1100H SFD353=1100H

12-5. External wiring

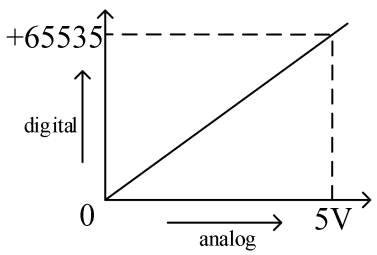
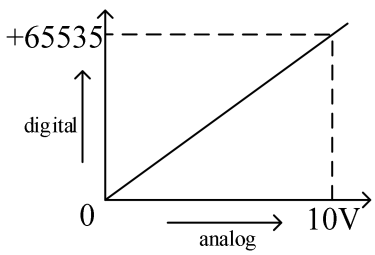
For external connection, to avoid interference, use shielding wire and connect the ground to the single point of shielding layer.

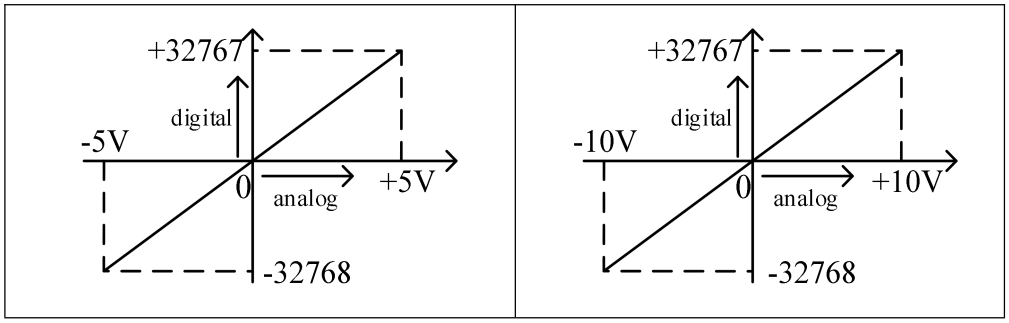
Voltage input



12-6. Analog digital conversion diagram

The relationship between input analog quantities and converted digital quantities is shown in the following table:

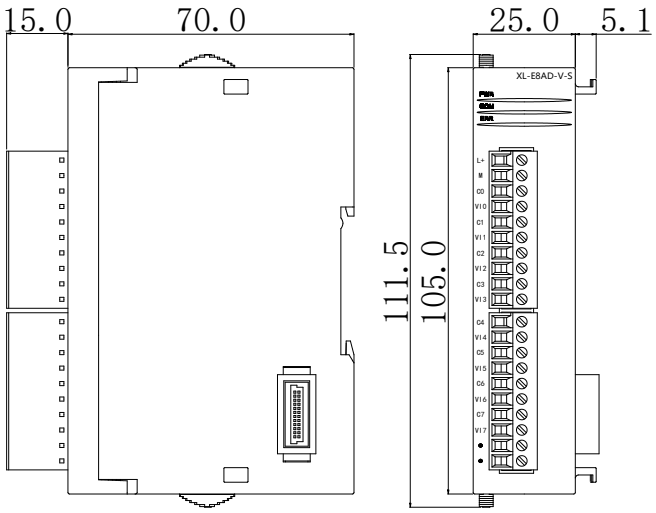
0~5V analog input	0~10V analog input
	
-5~5V analog input	-10~10V analog input



Note: When the channel enable switch is turned on and the AD current input is suspended, the ID register corresponding to the AD current input is displayed as 0. When the channel enable switch is turned off, the ID register corresponding to the AD current input is displayed as 0.

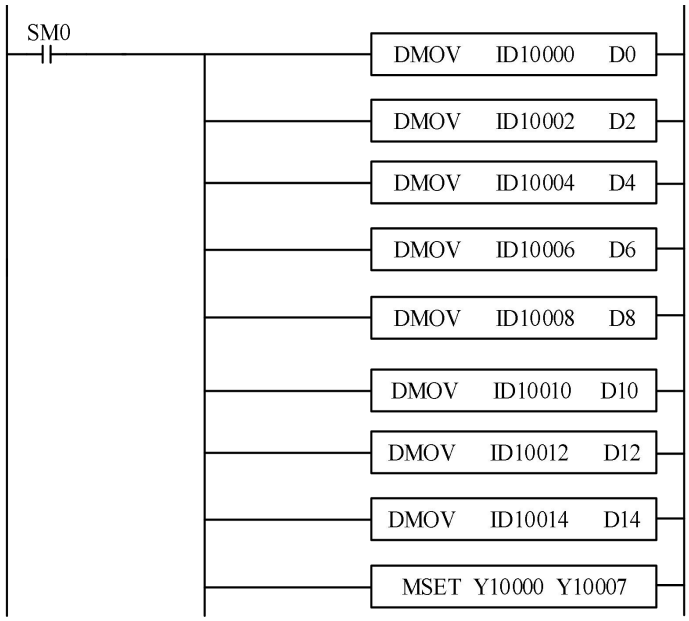
12-7. Dimension

(Unit: mm)



12-8. Application

Examples of real-time reading 8 channels of data (take Module 1 as an example)



Explain:

SM0 is a constant ON coil and has been in ON state during the operation of PLC.

The PLC starts to run, and continuously writes the data of channel 0 of the module 1 into the data register D0.

Data in channel 1 is written to data register D1, D0.

Data in channel 2 is written to data register D3, D2.

Data in channel 3 is written to data register D5, D4.

Data in channel 4 is written to data register D7, D6.

Data in channel 5 is written to data register D9, D8.

Data in channel 6 is written to data register D11, D10.

Data in channel 7 is written to data register D13, D12.

Data in channel 8 is written to data register D15, D14.

Since all channels are used, all the channel enablers are opened.

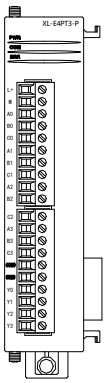
13. PT100 temperature module

XL-E4PT3-P-H

This chapter mainly introduces XL-E4PT3-P-H module specifications, terminal instructions, input definition number allocation, working mode settings, external connections, analog-to-digital conversion diagrams, appearance size diagrams and related programming examples.

13-1. Module features and specifications

XL-E4PT3-P-H temperature PID control module processes 4-channel thermal resistance temperature signals and transmits them to the main unit of PLC. Compared with XL-E4PT3-P, XL-E4PT3-P-H adopts a fully isolated scheme, which has better anti-interference performance, wider temperature measurement range, higher resolution and accuracy, and supports a variety of sensor types.



Features

- Three wires temperature sensors analog inputs and support Pt100, Pt1000, Cu50, and Cu100 thermistors.
- 4 channels of fully isolated input, 4 channels of output, 4 sets of independent PID parameters, supporting self-tuning function.
- 1mA constant current output, unaffected by external environmental changes.
- The resolution accuracy is 0.1 ℃ and 0.01 ℃.
- As a special functional module of the XL series, the XL3 series can connect up to 10 units, the XL5/XL5E/XL5H/XL5N/XLME/XLH/XSLH series can connect up to 16 units, and the XL1 series does not support expansion modules.

Module specifications

Item	Contents		
Analog input signal	Pt100, Pt1000, Cu50, and Cu100 thermistors		
Temperature measurement range	Sensor type	Display resolution	Temperature range
	Pt100	(0.1℃)	-200.0℃~850.0℃
		(0.01℃)	-200.00℃~300.00℃
	Pt1000	(0.1℃)	-200.0℃~850.0℃
		(0.01℃)	-200.00℃~300.00℃
	Cu50	(0.1℃, 0.01℃)	-50.00℃~150.00℃
	Cu100	(0.1℃, 0.01℃)	-50.00℃~150.00℃
Digital output range	-20000 to 30000 (specific differentiation based on sensor type)		
Resolution	0.1℃, 0.01℃		
Integrate precision	±0.2% (relative max value)		
Repeatability	±0.05%FS		
Conversion speed	50ms/all the channels		
Module power supply	DC24V±10%, 50mA		
Install format	Fixed with M3 screws or directly installed on orbit of DIN46277 (Width: 35mm)		

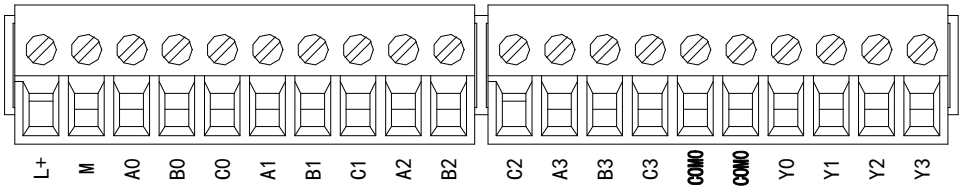
When the module is in an abnormal state, the ID1xxxx register will display corresponding abnormal values, even if the disconnection detection is disabled in the module configuration. The abnormal values for different types of alarms are as follows:

(1) When the 24V power supply of the module is disconnected, all channel data is -2.
(2) When the thermistor temperature control module is not connected to a sensor, its channel data is the maximum digital output range of the selected sensor type.
(3) When the sensor signal is below the lower limit of the measurement range, its channel data is the minimum value of the digital output range of the selected sensor type.
(4) When the sensor signal is higher than the upper limit of the measurement range, its channel data is the maximum value of the digital output range of the selected sensor type.
(5) When both sensor disconnection and 24V power supply disconnection occur, display the abnormal value -2.

- Unlike XL-E4PT3-P, XL-E4PT3-P-H supports more sensor types.
- Unlike XL-E4PT3-P, XL-E4PT3-P-H has isolated processing for each channel, allowing multiple channels to sample simultaneously, resulting in a faster sampling rate.
- The module needs to be configured and used in conjunction with the V3.7.17 and above versions of the Xinje PLC programming software.

13-2. Terminals

Terminal arrangement



Module signal

Name		Function
LED light	PWR	The indicator lights up when the module has a power supply
	COM	When the module communication port communicates normally, the indicator lights on
	ERR	When there is an error in the module, the indicator is always on or flickering (red) When the ERR lamp is always on, there are serious application errors in the module that can not be used, so the mode of use must be adjusted, and the PLC body is switched to STOP state. When the ERR lamp flickers, there are application errors, abnormal work and abnormal data in the module, but the PLC body is still RUN.
terminal	L+	External power supply 24V +
	M	External power supply 24V -
	A0	CH0 temperature input
	B0	CH0 input common terminal
	C0	CH0 input common terminal
	A1	CH1 temperature input
	B1	CH1 input common terminal
	C1	CH1 input common terminal
	A2	CH2 temperature input
	B2	CH2 input common terminal
	C2	CH2 input common terminal
	A3	CH3 temperature input
	B3	CH3 input common terminal
	C3	CH3 input common terminal
	COM0	PID output common terminal
	Y0~Y3	PID output terminals corresponding to CH0~CH3

Wiring head specifications

When wiring the module, its wiring head should meet the following requirements:

(1) The stripping length is 9 mm;

(2) Flexible conductors with bare tubular ends are 0.25-1.5 square.

(3) Flexible conductor with tubular pre-insulated end is 0.25-0.5 square.

13-3. I/O address

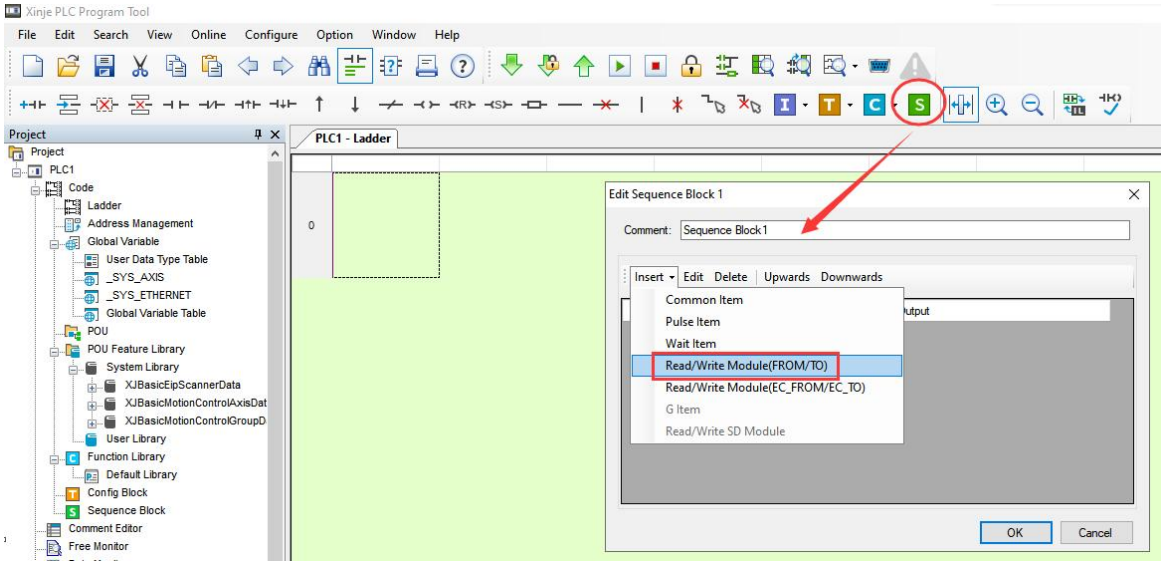
XL series analog module will not occupy I/O unit, the conversion value will be sent to PLC register. Each channel related PLC register address are shown as below:

Parameter	Address				
Channel		CH0	CH1	CH2	CH3
Display temperature (unit: 0.1℃)	Module 1	ID10000	ID10001	ID10002	ID10003
	Module 2	ID10100	ID10101	ID10102	ID10103
	……	ID10x00	ID10x01	ID10x02	ID10x03
	Module 16	ID11500	ID11501	ID11502	ID11503
PID enable bit (0: OFF, 1: ON)	Module 1	Y10000	Y10001	Y10002	Y10003
	Module 2	Y10100	Y10101	Y10102	Y10103
	……	Y10x00	Y10x01	Y10x02	Y10x03
	Module 16	Y11700	Y11701	Y11702	Y11703
	When the "Y function selection" is set to "immediate output", Y0~Y3 are ordinary switch output terminals, and Y10000~Y10003 (taking module # 1 as an example) can be used to directly control the Y0~Y3 output of the module. When "Y Function Selection" is set to "Channel Enable", Y0~Y3 are PID output terminals, and Y10000~Y10003 (taking module # 1 as an example) can be used to enable PID control of the corresponding channel. The Y0~Y3 output of the module is automatically calculated and controlled by PID.				
PID contact output (X input returning to the main body)	Module 1	X10000	X10001	X10002	X10003
	Module 2	X10100	X10101	X10102	X10103
	……	X10x00	X10x01	X10x02	X10x03
	Module 16	X11700	X11701	X11702	X11703
	When the "Y function selection" is set to "channel enable", Y10000~Y10003 (taking module # 1 as an example) are PID enable bits, and the PID duty cycle output needs to be monitored through X10000~X10003 (taking module # 1 as an example).				
Open circuit detection (0: normal, 1:	Module 1	X10010	X10011	X10012	X10013
	Module 2	X10110	X10111	X10112	X10113
	……	X10x10	X10x11	X10x12	X10x13

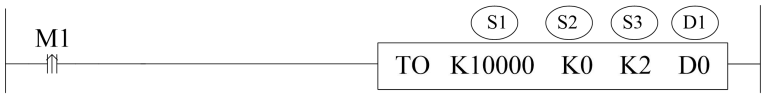
disconnected)	Module 16	X11710	X11711	X11712	X11713
Auto-tuning error	Module 1	X10020	X10021	X10022	X10023
	Module 2	X10120	X10121	X10122	X10123
	·····	X10x20	X10x21	X10x22	X10x23
	Module 16	X11720	X11721	X11722	X11723

From/To instruction

The reading and writing of the temperature control module for the thermal resistor needs to be completed in the sequence block through the FROM/TO command, as shown in the following figure:



Parameter write insruction TO



Function: write the PLC register data to module address, the operate unit is word.
Operand:
S1: target module number, range: 10000~10015. Operand: K, TD, CD, D, HD, FD
S2: first address of module. Operand: K, TD, CD, D, HD, FD
S3: write in register numbers. Operand: K, TD, CD, D, HD, FD
D1: first address of PLC. Operand: TD, CD, D, HD, FD

Parameter read instruction FROM

Function: read the module data to the PLC regsiter, the operate unit is word.

S1: target module number, range: 10000~10015. Operand: K, TD, CD, D, HD, FD
S2: first address of module. Operand: K, TD, CD, D, HD, FD
S3: read register numbers. Operand: K, TD, CD, D, HD, FD
D1: first address of PLC. Operand: TD, CD, D, HD, FD

Note:

(1) The FROM/TO instruction can only be written in the sequence function block. For XL series PLCs with firmware version V3.4.5 and above, a maximum of 100 BLOCKs can be written in the program, but a maximum of 8 can be run simultaneously.
(2) The starting number of the module starts from K10000, with module # 1 being K10000, module # 2 being K10001... and so on, module # 16 being K10015.

Related address definition:

The address of the read/write parameters:

From_To data	Address				Read/write	Default value
Channel	CH0	CH1	CH2	CH3		
Auto-tune bit	K0	K0	K0	K0	R/W	0
PID output (0~4095)	K1	K2	K3	K4	R	-
Target temperature (unit: 0.1℃/0.01℃)	K5	K6	K7	K8	R/W	0
Kp	K9	K13	K17	K21	R/W	40
Ki	K10	K14	K18	K22	R/W	240
Kd	K11	K15	K19	K23	R/W	60
Diff (unit: 0.1℃/0.01℃)	K12	K16	K20	K24	R/W	1000
Control period (unit: 0.1s)	K25	K26	K27	K28	R/W	20
Output range (range: 0~100)	K29	K30	K31	K32	R/W	100
Temperature difference δ (unit: 0.1℃/0.01℃))	K33	K34	K35	K36	R/W	0
Calibrate ambient temperature values (unit: 0.1℃/0.01℃))	K37	K38	K39	K40	W	-
From/To data initialization	K41	K41	K41	K41	W	-

Auto-tune PID control bit	Auto-tune triggered signal, start to auto-tune mode when set to 1 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.

PID output value (0~4095)	When the PID output is for analog control (such as steam valve opening or thyristor conduction angle), this value can be transmitted to the analog output module to achieve control requirements.
PID parameters (P, I, D)	The best PID parameters got from the PID auto-tune. 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.
PID calculation range (Diff) Unit: 0.1℃/0.01℃	This function can set the temperature range of the PID operation, such as setting the relevant parameter Tdiff, the target temperature is Target, then the operation range of the PID is Target-Tdiff < T < Target + Tdiff, when T < Target-Tdiff, the output is the max value, when T > Target + Tdiff, the output is 0.
Temperature difference value δ Unit: 0.1℃/0.01℃	This parameter is a signed number, with power outage duration of 0 by default. 0.1℃: actual temperature display = (sampling temperature value + temperature deviation value δ)/10. 0.01℃: actual temperature display = (sampling temperature value + temperature deviation value δ)/100. When the user thinks the measured temperature is different from the actual temperature, this value can be modified to correct the temperature.
Set temperature Unit: 0.1℃/0.01℃	The target temperature value of the control system. Set the range to the numerical value corresponding to the temperature upper and lower limits of the selected sensor scale.
Temperature control period Unit: 0.1s	The adjusting range of temperature control period is 0.1s~200s, and the minimum precision range is 0.1s. For example, when writing 5, the actual temperature control period is 0.5s.
Adjusting Environment temperature Unit: 0.1℃/0.01℃	When the user believes that the ambient temperature value is inconsistent with the temperature value displayed on the module channel, the known ambient temperature value can be written into this parameter. At the moment the module is written, the temperature deviation value is set to δ and save. Temperature deviation value δ= adjusting environment temperature value - sampling temperature value. Attention: When the user inputs the adjusting temperature value, confirm that it is consistent with the ambient temperature. This data is very important, and once entered incorrectly, it can lead to calculating temperature deviation values δ Serious error, which in turn affects the display temperature.
Auto-tune output range	The output amplitude calculated by PID is in %, where 100 represents the duty cycle as 100% of the full scale output and 80 represents 80% of the full scale output. Note: When set to 0, PID control will have no output.
From/To data initialization	This function can restore the parameters in the above table to their factory settings. When using it, K41 needs to be set to 1, setting to other values are invalid.

Note:

(1) When the "Y function selection" is set to "immediate output", only the “temperature deviation δ” and “adjusting ambient temperature value” is valid, and other parameters are not effective.

(2) The module can automatically save the set temperature value, PID parameters, temperature control cycle, output amplitude, temperature deviation, and temperature calibration parameters. When writing the above parameters, it is necessary to use the rising edge to trigger the writing. Do not keep writing. It is recommended to only write the parameters used. It is not recommended to write the entire piece of data for programming convenience, as writing 0 to some addresses may cause the system to malfunction.

(3) The self-tuning enable address K0: K0 will occupy a continuous 8-bit address space. The 4-channel module enable bits correspond to the first 4 bits address space, while the last 4 bits addresses are idle (but cannot be used for other purposes). When the read/write enable bit is enabled, K0 can be a coil or register. When it is a coil, it occupies 8 consecutive bits starting from the coil address; When it is a register, it occupies that register. For example, to set the first and third channels of the module to self-tuning mode, and the other two channels to manual PID mode, with the command To K10000 K0 K1 M10, M10 and M12 should be set to ON, and M11, M13, M14, and M15 should be set to OFF; When the instruction is To K10000 K0 K1 D100, D100 should be assigned a value of 5.

(4) When switching the "resolution", "temperature setting value", "PID parameter", "PID operation range", "temperature deviation δ", "adjusting environment temperature value" needs to be set again, and the parameter units should be consistent with the resolution.

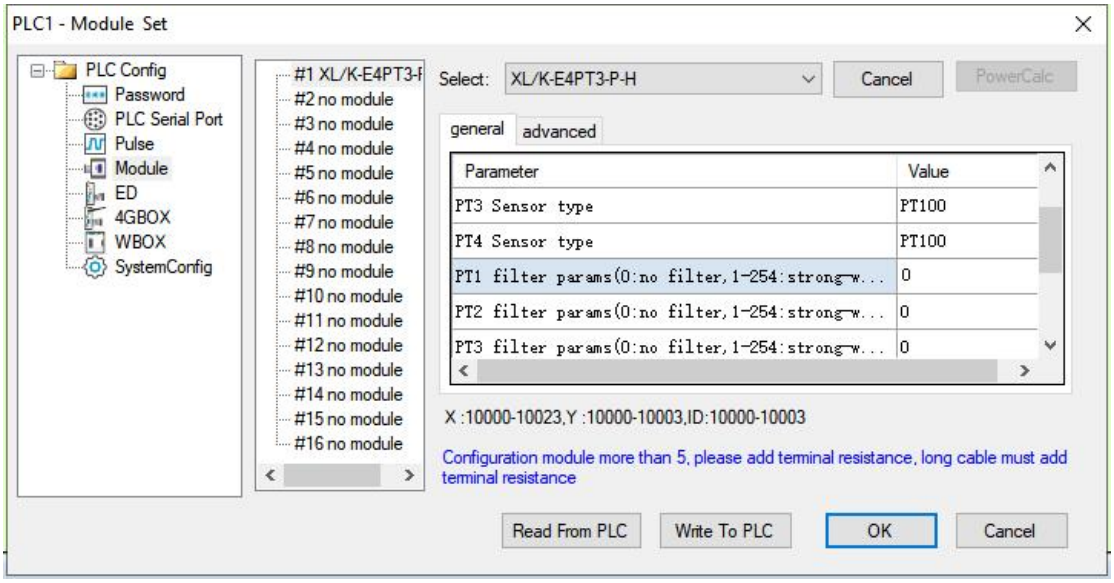
(5) When switching "resolution", all From/To parameters (except for self-tuning enable) will return to their default values.

13-4. Working mode

There are two ways to set the working mode (the effect of these two ways is equivalent):
1: Through the XDPpro software
2: Through Flash Register (FD) Settings

Set through the software

Open the software, click configure/expansion module setting, then select the module type in the following window:



Steps	Explanation
1	Select the module model
2	Select the sensor type, filtering coefficient, resolution, wire breakage detection switch, and Y function selection for the corresponding channel
3	After configuration is complete, click "Write to PLC" and then click "OK". After downloading the user program and running it, this configuration will take effect.

Note:

(1) The first-order low-pass filtering method weighted this sampling value and the output value of the last filtering to get the effective filtering value; the filter coefficient is set by the user to 0-254, the smaller the value, the more stable the data, but it may lead to data lag; therefore, when set to 1, the filtering effect is strongest and the data is the most stable; when set to 254, the filtering effect is the weakest; default is 0 (no filtering).

(2) "Y Function Selection" is used to specify the functions of Y10000~Y10003 (# 1 module as an example). The default factory setting is "Channel Enable", which supports the module's own self-tuning and PID control functions. The output points Y0~Y3 on the module are affected by the PID output value, resulting in on/off effects; When set to "immediate output", the output points Y0~Y3 on the module are ordinary switch output points. Setting On Y10000~Y10003 can conduct Y0~Y3, while the module only retains the temperature acquisition function. If temperature control is required, please use the PID command of the PLC main body to achieve it.

Set through flash register

The CH0~CH3 channels of the expansion module can be set with sensor type, filtering coefficient, and Y function selection, which can be set through the special FLASH data register SFD inside the PLC. As shown below:

Module ID	SFD address	Module ID	SFD address
#1	SFD350~SFD359	#9	SFD430~SFD439
#2	SFD360~SFD369	#10	SFD440~SFD449
#3	SFD370~SFD379	#11	SFD450~SFD459
#4	SFD380~SFD389	#12	SFD460~SFD469
#5	SFD390~SFD399	#13	SFD470~SFD479
#6	SFD400~SFD409	#14	SFD480~SFD489
#7	SFD410~SFD419	#15	SFD490~SFD499
#8	SFD420~SFD429	#16	SFD500~SFD509

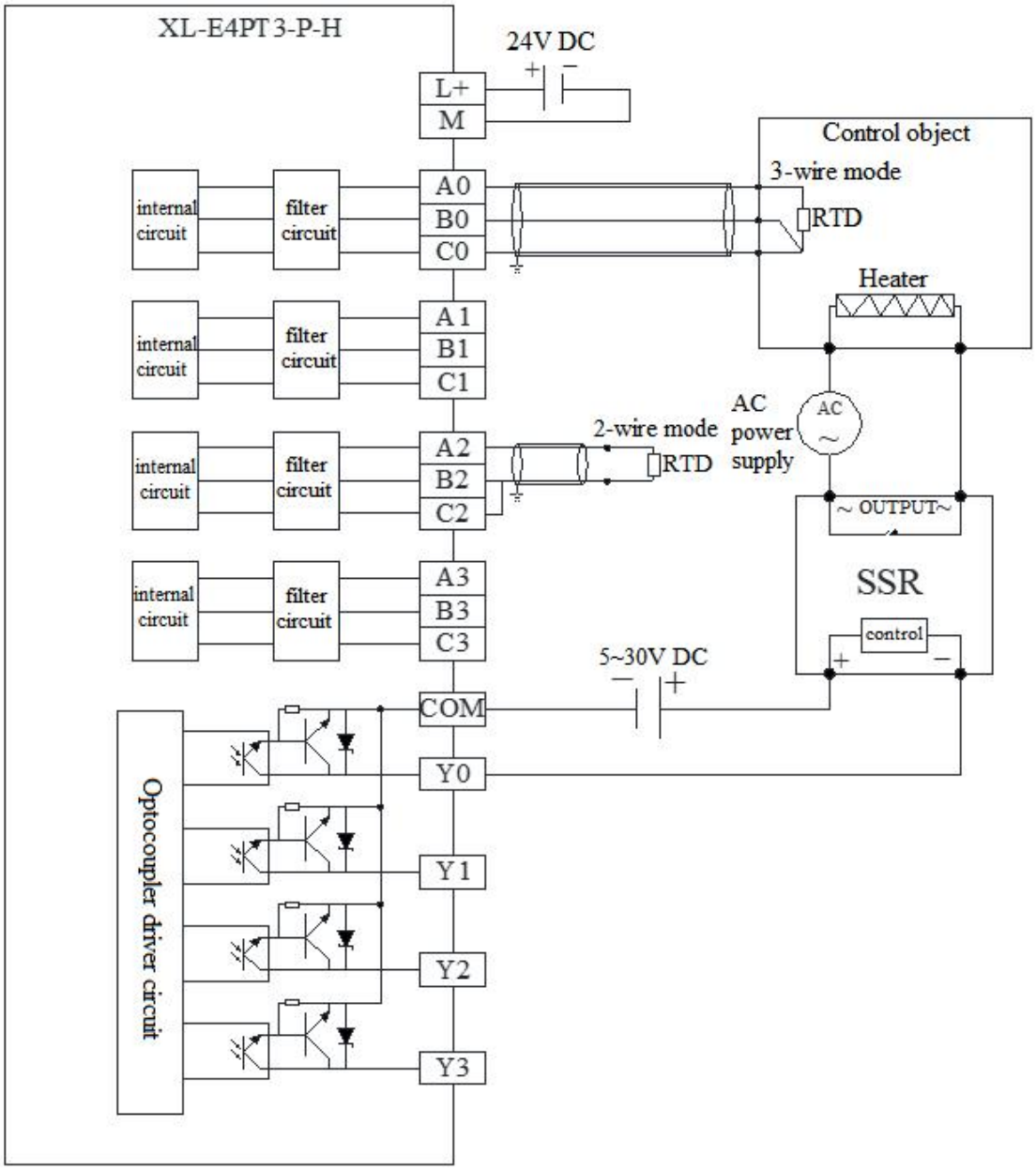
SFD bit definition

Take module 1 as an example to explain the setting method:

Register		Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
SFD350	Byte0	PT channel 1 filtering coefficient (0 not filtered, 1-254 filtering intensity decreases sequentially)							
	Byte1	PT channel 2 filtering coefficient (0 not filtered, 1-254 filtering intensity decreases sequentially)							
SFD351	Byte2	PT channel 3 filtering coefficient (0 not filtered, 1-254 filtering intensity decreases sequentially)							
	Byte3	PT channel 4 filtering coefficient (0 not filtered, 1-254 filtering intensity decreases sequentially)							
SFD352	Byte4	-							
	Byte5	-							
SFD353	Byte6	-							
	Byte7	-							
SFD354	Byte8	-		Resolution 00: 0.1℃ 01: 0.01℃		PT channel disconnection detection 00: On 01: Off		Y function selection 00: Channel Enable 01: Immediate output	
	Byte9	-				-			
SFD355	Byte10	PT2 sensor type				PT1 sensor type			
		0000: PT100 0001: PT1000 0010: Cu50 0011: Cu100				0000: PT100 0001: PT1000 0010: Cu50 0011: Cu100			
	Byte11	PT4 sensor type				PT3 sensor type			

		0000: PT100 0001: PT1000 0010: Cu50 0011: Cu100	0000: PT100 0001: PT1000 0010: Cu50 0011: Cu100
SFD356	Byte12	-	-
	Byte13	-	-
SFD357~SFD359		-	

13-5. External wiring

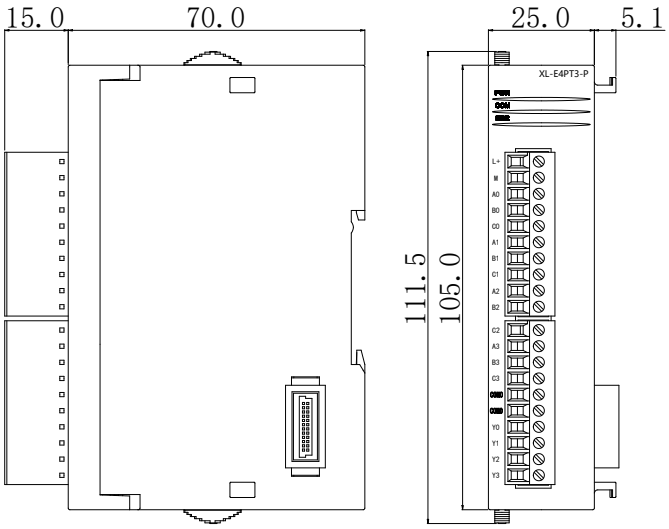


- For a two-wire thermal resistance, one end of the sensor should be connected to terminal A and the other end to terminal C, and a wire should be used to short-circuit terminals B and C.
- For a three wire thermal resistance, two wires of the same color of the sensor should be connected to terminal B and terminal C respectively, and the other wire should be connected to terminal A.
- Output terminal: transistor output terminal, please choose a smooth power supply with DC5V~30V.
- Circuit insulation: optocouplers are used for optical insulation between the internal circuits and output transistors of programmable controllers, and each common module is also separated from each other.
- Response time: the time from the programmable controller driving (or disconnecting) the optocoupler to the transistor ON/OFF shall not exceed 0.2ms.
- Output current: to limit temperature rise, it supports a maximum output load of 50mA.
- Open circuit leakage current: below 0.1mA.

- When connecting an external 24V power supply, please use the 24V power supply on the PLC body to avoid interference.
- The casing of the equipment where the temperature sensor is installed must be grounded.
- To avoid interference, temperature sensors should use shielded wires and be grounded at a single point for the shielding layer.

13-6. Dimension

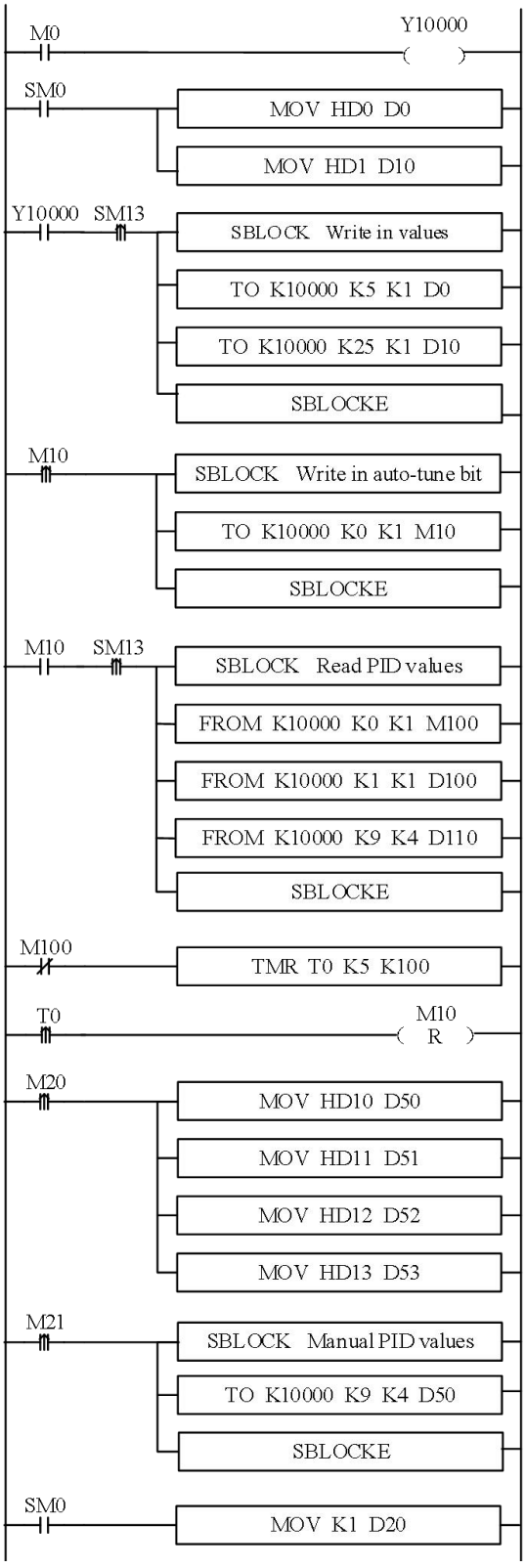
Unit: mm



13-7. Application

When temperature control is required, there are two programming options:
1. use the PID of the PLC body for temperature control, at this time, you need to switch the Y function selection to 'immediate output', the programming case details please refer to "XDXL PLC instruction manual" chapter 7 PID control functions.
2. use the built-in PID of the module for temperature control, at this time, you need to switch the Y function selection to "channel enable", programming cases such as shown in following example 1.

Example 1: take module 1 as an example, do PID control for channel 0.



// open PID enable bit

// set target value

// set temperature control period

// write in the target value, temperature control period

//write in the auto-tune flag bit

// turn on auto-tune function

//read auto-tune bit and PID parameters

//read auto-tune bit

//read PID output value

//set P, I, D values

//after reset auto-tune for 0.5s, reset auto-tune start flag

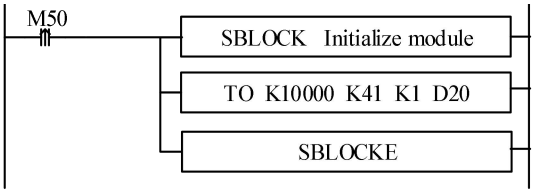
//set P value

//set I value

//set D value

//set Diff value

//perform manual PID control, write in P, I, D, Diff values



// Initialize module parameters

Explanation:

After enabling the self-tuning, this command will immediately occupy a total of 8 bits in M10-M17. M10-M13 corresponds to the self-tuning enable of each channel. To set which channel needs to be tuned, set the corresponding coil to ON. M14~M17 have no meaning at the moment and need to be left blank.

If the output is a solid-state relay, it is recommended to set the temperature control cycle to 1-3 seconds; If the output is a relay, it is recommended to set the temperature control cycle to 3-15s.

Due to inconsistent units, the PID parameters of the main body and module cannot be used interchangeably. The main body PID parameters are in uppercase, and the module PID parameters are in lowercase. The specific conversion relationship is as follows: p=P/100; i=I/10; d=D/100.

M0 turn on PID enable
SM0 set the target value, temperature control period
M1 write in target value, temperature control period
M3 set the manual P, I, D parameters
M4 write in manual P, I, D parameters
M10 read the auto-tuning bit, PID parameters and PID output value
M50 initialize the module
Y10000 PID enable bit of channel 0

D0 target value
D10 temperature control period
D80 P
D81 I
D82 D
D83 DIFF

XINJE

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