XINJE

# XL Series PLC Expansion Module

# User Manual

Wuxi Xinje Electric Co., Ltd.

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XINJE Xinje Electric

XL Series PLC Expansion Module User Manual

Catalog


Module Information Overview 1

Digital Expansion Module 2

Analog Input Module 3

Analog Output Module 4

Analog Input/Output Module 5

Temperature Control Module 6

Pressure Measurement Module 7

Manual Update Log

## Basic Information

- Thank you for purchasing the Xinje XL series industrial intelligent controllers.
- This manual primarily introduces the hardware specifications and other relevant information for the XL series industrial intelligent controllers.
- Before using the product, please read this manual carefully and proceed with wiring only after you have fully understood its contents.
- For information on software and programming, please refer to the relevant manuals.
- Please deliver this manual to the end user.

## User Guide

- Only operators with a certain level of electrical knowledge may perform tasks such as wiring the product; if you have any questions regarding the use of this product, please consult our technical personnel.
- The examples listed in this manual or other technical documentation are for user understanding and reference only; they do not guarantee that the described actions will always be performed correctly.
- When using this product in combination with other products, please verify that it complies with the relevant specifications, principles, and other requirements.
- When using this product, please verify independently whether it meets the requirements and is safe to use.
- Please configure the backup and safety functions yourself to prevent any machine malfunctions or losses that may arise due to a failure of this product.

## Disclaimer

- Although the content in this manual has been carefully verified, errors are inevitable; we cannot guarantee absolute accuracy.
- We regularly review the content of this manual and will make corrections in future versions; we welcome your valuable feedback.
- Should any changes be made to the information contained in this manual, we apologize for any inconvenience and will not provide additional notice.

## Contact way

If you have any questions regarding the use of this product, please contact the distributor or office where you purchased the product, or you may contact Xinje Company directly.


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March 2019

# Catalog

**BASIC INFORMATION** ..... **3**

**CATALOG** ..... **I**

**1 MODULE INFORMATION OVERVIEW** ..... **1**

1.1 MODULE MODEL AND CONFIGURATION ..... 1

*1.1.1 Module Model and Functions* ..... *1*

*1.1.2 Module Configuration* ..... *2*

1.2 MODULE STRUCTURE DESCRIPTION ..... 2

1.3 MODULE POWER AND OPERATING CONDITIONS ..... 3

1.4 MODULE INSTALLATION ..... 5

*1.4.1 Installation Environment* ..... *5*

*1.4.2 Installation Requirements* ..... *5*

*1.4.3 Installation Steps* ..... *6*

*1.4.4 Cabling Requirements* ..... *7*

1.5 TERMINAL RESISTANCE MODULE XL-ETR ..... 7

1.6 XL COMPATIBLE POWER SUPPLY – XL-P50-E ..... 8

**2 DIGITAL EXPANSION MODULE** ..... **11**

2.1 MODULE OVERVIEW ..... 11

*2.1.1 Naming Rule* ..... *11*

*2.1.2 Model List* ..... *11*

*2.1.3 General Requirements* ..... *12*

2.2 TERMINAL ARRANGEMENT ..... 12

*2.2.1 Digital Input Module Terminal Arrangement* ..... *12*

*2.2.2 Digital Output Module Terminal Arrangement* ..... *13*

*2.2.3 Digital I/O Module Terminal Arrangement* ..... *13*

2.3 INPUT SPECIFICATIONS AND WIRING ..... 14

*2.3.1 NPN Input Specifications and Wiring* ..... *14*

*2.3.2 PNP Input Specifications and Wiring* ..... *15*

*2.3.3 NPN & PNP Bipolar Input Specifications and Wiring* ..... *16*

2.4 OUTPUT SPECIFICATIONS AND WIRING ..... 18

*2.4.1 Output Specifications* ..... *18*

*2.4.2 Output Connection* ..... *19*

2.5 WIRING TERMINAL SPECIFICATIONS ..... 20

2.6 EXTERNAL TERMINAL BLOCK ..... 20

2.7 INPUT/OUTPUT DEFINITION NUMBER ALLOCATION ..... 21

*2.7.1 Input Terminal Address Definition* ..... *21*

*2.7.2 Output Terminal Address Definition* ..... *22*

2.8 WORK MODE SETTINGS ..... 23

2.9 EXTERNAL DIMENSIONS DIAGRAM ..... 27

2.10 APPLICATION EXAMPLE ..... 29

**3 ANALOG INPUT MODULE ..... 32**

3.1 ANALOG INPUT MODULE OVERVIEW ..... 32
*3.1.1 Naming Rule ..... 32*
*3.1.2 Model List ..... 32*
*3.1.3 General Requirements ..... 32*
3.2 14-BIT ANALOG CURRENT AND VOLTAGE INPUT MODULE XL-E4AD ..... 33
*3.2.1 Module Features and Specifications ..... 33*
*3.2.2 Terminal Specifications ..... 34*
*3.2.3 External Connection ..... 34*
*3.2.4 Input Definition Number Allocation ..... 35*
*3.2.5 Work Mode Settings ..... 38*
*3.2.6 Analog-to-Digital Conversion Diagram ..... 41*
*3.2.7 External dimensions diagram ..... 42*
*3.2.8 Programming Example ..... 43*
3.3 14-BIT ANALOG CURRENT INPUT MODULE XL-E8AD-A ..... 44
*3.3.1 Module Features and Specifications ..... 44*
*3.3.2 Terminal Specifications ..... 44*
*3.3.3 External Connection ..... 45*
*3.3.4 Input Definition Number Allocation ..... 46*
*3.3.5 Work Mode Settings ..... 51*
*3.3.6 Analog-to-Digital Conversion Diagram ..... 55*
*3.3.7 External dimensions diagram ..... 55*
*3.3.8 Programming Example ..... 56*
3.4 14-BIT ANALOG VOLTAGE INPUT MODULE XL-E8AD-V ..... 57
*3.4.1 Module Features and Specifications ..... 57*
*3.4.2 Terminal Specifications ..... 57*
*3.4.3 External Connection ..... 58*
*3.4.4 Input/Output Definition Number Allocation ..... 58*
*3.4.5 Work Mode Settings ..... 63*
*3.4.6 Analog-to-Digital Conversion Diagram ..... 67*
*3.4.7 External dimensions diagram ..... 68*
*3.4.8 Programming Example ..... 68*
3.5 16-BIT ANALOG CURRENT INPUT MODULE XL-E8AD-A-S ..... 70
*3.5.1 Module Features and Specifications ..... 70*
*3.5.2 Terminal Specifications ..... 70*
*3.5.3 External Connection ..... 71*
*3.5.4 Input Definition Number Allocation ..... 72*
*3.5.5 Work Mode Settings ..... 77*
*3.5.6 Analog-to-Digital Conversion Diagram ..... 81*
*3.5.7 External dimensions diagram ..... 81*
*3.5.8 Programming Example ..... 82*
3.6 16-BIT ANALOG VOLTAGE INPUT MODULE XL-E8AD-V-S ..... 83
*3.6.1 Module Features and Specifications ..... 83*
*3.6.2 Terminal Specifications ..... 83*
*3.6.3 External Connection ..... 84*
*3.6.4 Input Definition Number Allocation ..... 84*

*3.6.5 Work Mode Settings* ..... *89*
*3.6.6 Analog-to-Digital Conversion Diagram* ..... *93*
*3.6.7 External Dimensions Diagram* ..... *93*
*3.6.8 Programming Example* ..... *94*

**4 ANALOG OUTPUT MODULE** ..... **95**

4.1 ANALOG OUTPUT MODULE OVERVIEW ..... 95
*4.1.1 Naming Rule* ..... *95*
*4.1.2 Model List* ..... *95*
4.2 12-BIT ANALOG OUTPUT MODULE XL-E4DA ..... 96
*4.2.1 Module Features and Specifications* ..... *96*
*4.2.2 Terminal Specifications* ..... *96*
*4.2.3 External Connection* ..... *97*
*4.2.4 Input/Output Definition Number Allocation* ..... *98*
*4.2.5 Work Mode Settings* ..... *101*
*4.2.6 Analog-to-Digital Conversion Diagram* ..... *104*
*4.2.7 External Dimensions Diagram* ..... *105*
*4.2.8 Programming Example* ..... *106*

**5 ANALOG INPUT/OUTPUT MODULE** ..... **107**

5.1 ANALOG INPUT/OUTPUT MODULE OVERVIEW ..... 107
*5.1.1 Naming Rule* ..... *107*
*5.1.2 Model List* ..... *107*
*5.1.3 General Requirements* ..... *107*
5.2 ANALOG INPUT/OUTPUT MODULE XL-E4AD2DA ..... 108
*5.2.1 Module Features and Specifications* ..... *108*
*5.2.2 Terminal Specifications* ..... *109*
*5.2.3 External Connection* ..... *109*
*5.2.4 Input/Output Definition Number Allocation* ..... *111*
*5.2.5 Work Mode Settings* ..... *115*
*5.2.6 Analog-to-Digital Conversion Diagram* ..... *119*
*5.2.7 External Dimensions Diagram* ..... *121*
*5.2.8 Programming Example* ..... *121*

**6 TEMPERATURE CONTROL MODULE** ..... **124**

6.1 TEMPERATURE CONTROL MODULE OVERVIEW ..... 124
*6.1.1 Naming Rule* ..... *124*
*6.1.2 Model List* ..... *124*
*6.1.3 General Requirements* ..... *124*
6.2 THERMOCOUPLE TEMPERATURE CONTROL MODULE XL-E4TC-P ..... 125
*6.2.1 Module Features and Specifications* ..... *125*
*6.2.2 Terminal Specifications* ..... *126*
*6.2.3 Input/Output Wiring Example* ..... *128*
*6.2.4 IO address allocation and read/write operations* ..... *129*
*6.2.5 Work Mode Settings* ..... *134*
*6.2.6 External Dimensions Diagram* ..... *139*
*6.2.7 Programming Example* ..... *139*

6.3 RTD TEMPERATURE CONTROL MODULE XL-E4PT3-P ..... 142
*6.3.1 Module Features and Specifications* ..... *142*
*6.3.2 Terminal Specifications* ..... *143*
*6.3.3 Input/Output Wiring Example* ..... *144*
*6.3.4 IO Address Allocation And Read/Write Operations* ..... *145*
*6.3.5 Work Mode Settings* ..... *150*
*6.3.6 External dimensions diagram* ..... *154*
*6.3.7 Programming Example* ..... *154*
6.4 THERMISTOR TEMPERATURE CONTROL MODULE (ISOLATED TYPE) XL-E4PT3-P-H ..... 157
*6.4.1 Module Features and Specifications* ..... *157*
*6.4.2 Terminal Specifications* ..... *158*
*6.4.3 Input/Output Wiring Example* ..... *159*
*6.4.4 IO Address Allocation and Read/Write Operations* ..... *160*
*6.4.5 Work Mode Settings* ..... *166*
*6.4.6 External Dimensions Diagram* ..... *169*
*6.4.7 Programming Example* ..... *169*

**7 PRESSURE MEASUREMENT MODULE ..... 172**

7.1 PRESSURE MEASUREMENT MODULE OVERVIEW ..... 172
*7.1.1 Naming Rule* ..... *172*
*7.1.2 Model List* ..... *172*
*7.1.3 General Requirements* ..... *172*
7.2 N-CHANNEL PRESSURE MEASUREMENT MODULE XL-ENWT-D ..... 173
*7.1.4 Module Features and Specifications* ..... *173*
*7.1.5 Terminal Specifications* ..... *174*
*7.1.6 External Connection* ..... *176*
*7.1.7 Weighing System Composition* ..... *177*
*7.1.8 Module Function Description* ..... *177*
*7.1.9 IO address allocation and read/write operations* ..... *179*
*7.1.10 Work Mode Setup* ..... *186*
*7.1.11 Module Error Message* ..... *188*
*7.1.12 External dimensions diagram* ..... *189*
*7.1.13 Programming Example* ..... *189*

**MANUAL UPDATE LOG ..... 192**

# 1 Module Information Overview

## 1.1 Module Model and Configuration

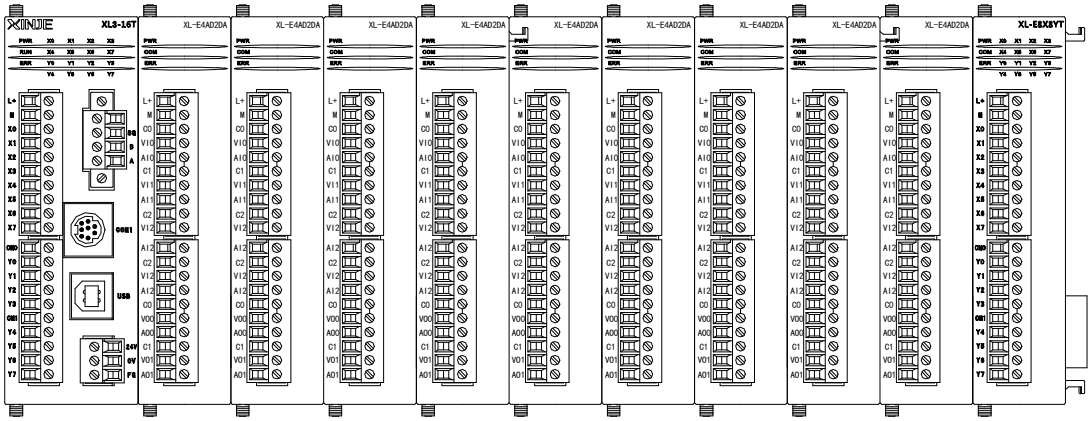
The XL series PLCs not only feature powerful logic processing, data computation, and high-speed processing capabilities, but also include A/D and D/A conversion functions. By utilizing input/output expansion modules, analog input/output modules, and other accessories, the XL series PLCs have found widespread application in process control systems such as temperature, flow rate, and liquid level monitoring systems.

### 1.1.1 Module Model and Functions

| Module Type | Product Model | Function |
|---|---|---|
| Digital Input Expansion | XL-EnXmY | n-input, m-output; NPN/PNP/Bipolar input types; Relay/Transistor output |
| Analog Signal Expansion | XL-E4AD | 4-channel analog input (14-bit), current and voltage bipolar input |
| | XL-E8AD-A | 8-channel analog input module (14-bit); bipolar current input |
| | XL-E8AD-V | 8-channel analog input module (14-bit); bipolar voltage input |
| | XL-E8AD-A-S | 8-channel analog input module (16-bit); current bipolar input |
| | XL-E8AD-V-S | 8-channel analog input module (16-bit); bipolar voltage input |
| | XL-E4DA | 4-channel analog output module (12-bit); current and voltage output options available |
| | XL-E4AD2DA | 4-channel analog input (14-bit) and 2-channel analog output (12-bit) module;<br>Input and output voltage and current can be optionally selected. |
| Temperature Control | XL-E4TC-P | 4-channel thermocouple temperature measurement module with PID regulation |
| | XL-E4PT3-P | 4-channel PT100/PT1000 temperature measurement modules with PID regulation |
| | XL-E4PT3-P-H | Four-channel PT100 and PT1000 temperature measurement modules; each channel is individually isolated, features PID control, and supports automatic tuning functionality. |
| Pressure Measurement | XL-EnWT-D | N-channel pressure sensor input (23-bit), detection range: DC – 20 to 20 mV |

### 1.1.2 Module Configuration

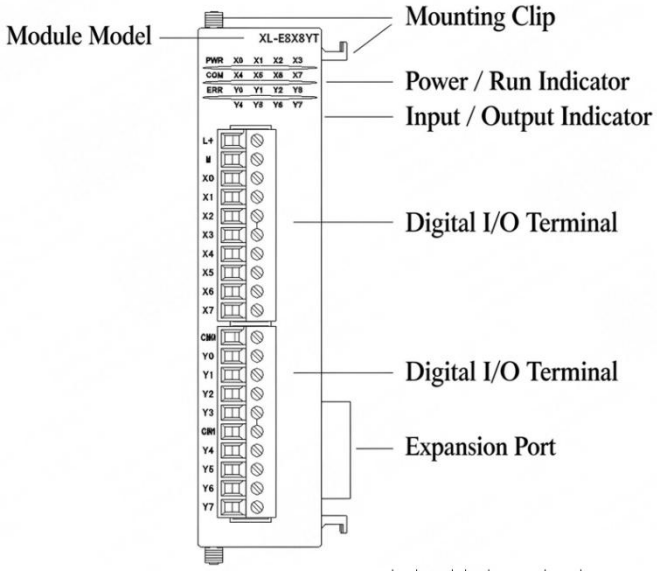
XL Series expansion modules can be installed on the right side of the main unit or the expansion modules of XL Series PLCs:



- The input/output digital signal sequence number is an octal number.
- The input/output analog value sequence number is a decimal number.
- The XL3/XL3E series supports up to 10 expansion modules; the XL5/XL5E/XL5N/XL5H/XLME/ XLH/XSLH series supports up to 16 expansion modules; the XL1 does not support expansion modules. The device is compatible with a wide range of modules – whether for digital input/output switching, analog signals, temperature control modules, or other applications.

When the number of right-side expansion modules connected to an XL series PLC is ≥5, a terminal resistor module XL-ETR must be connected to the right side of the last module (the hardware version of the XL series right-side expansion modules must be H3.1 or later).

## 1.2 Module Structure Description



| Name | | Function |
|---|---|---|
| Mounting Clip | | Used to secure the PLC unit to its expansion modules. |
| Module Model | | Model of this Special Function Module. |
| Expansion Port | | Connect other expansion modules. |
| Input/Output Terminal Block | | Removable terminals for connecting digital/analog inputs, outputs, and external devices. |
| Power Operation Indicator Light | PWR | When the module CPU board is powered, this indicator light will illuminate (green). |
| | COM | When the module's communication port is functioning normally, this indicator light remains constantly illuminated (green);<br>When the module is waiting for the PLC unit to establish communication, this indicator light will flash. |
| | ERR | When a module error occurs, this indicator light will remain constantly on or flash (green);<br>When the ERR indicator remains constantly lit, it indicates a severe application error has occurred, rendering the module unusable; the operating mode must be adjusted, and the PLC unit should be switched to the STOP state;<br>When the ERR indicator flashes, it indicates that the module has encountered an application error, is operating abnormally, or contains abnormal data, yet the PLC unit is still running (RUN). |
| Input/Output Indicator Light | | I/O conductivity indicator light. |

## 1.3 Module Power and Operating Conditions

The XL series right-side expansion module can only be used normally when the difference between the PLC's internal and external power consumption and the module's internal and external power consumption is greater than or equal to zero; if the PLC is configured with an ED module, its internal and external power consumption must also be subtracted; if the right-side expansion module and the ED module are powered by an external power supply, no external power consumption needs to be subtracted for the PLC.

1) Module Power List

| Extended Module Model | Internal Power (Extended Cable) | External Power (Power Supply 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 |

| Extended Module Model | Internal Power (Extended Cable) | External Power (Power Supply Terminal) |
|---|---|---|
| XL-E16YT | 1.7W | 0 |
| XL-E16PYT | 0.6W | 0.6W |
| 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 Consumption Table

| PLC Model | Internal Power | External Power |
|---|---|---|
| 16-point PLC | 1.2~1.8W | 1.6W |
| 24-point PLC | 2.2~3.9W | 2.3W |
| 30-point PLC | 4.6W | 1.9W |
| 32-point PLC | 1.4~2.6W | 3.1~4.4W |
| 64-point PLC | 2.1~2.4W | 3.3~3.6W |

3) Other

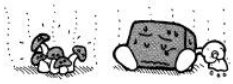
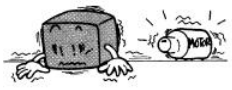
| Model | Internal Power | External Power |
|---|---|---|
| XL-2AD2PT-V-ED and other analog ED devices | Very small , negligible | 0.2~2.2W |
| XL-NES-ED | 0.6W | - |

| Model | Internal Power | External Power |
|---|---|---|
| BOX class ED | Very small , negligible | 0.5~2.5W |

# 1.4 Module Installation

## 1.4.1 Installation Environment

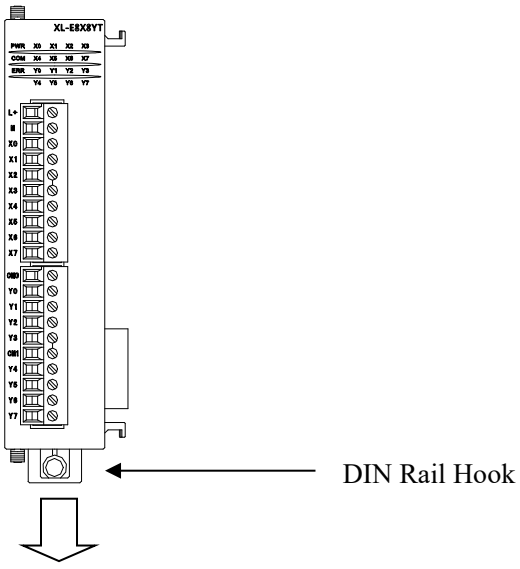
Before installing the module, please verify whether the installation site for the special function module is suitable. Note that the module should not be installed in the following environments:

| Direct Sunlight | Environmental Temperature Exceeds 0–50°C | Environmental Temperature Exceeds 35–85% Rh |
|---|---|---|
|  |  |  |
| Condensation Occurs Due To Sudden Temperature Changes. | Corrosive Gases And Combustible Gases | High Levels Of Dust, Salt, Iron Filings, And Cooking Fumes |
|  |  |  |
| Exposed To Direct Vibration And Impact | Spraying Of Oil, Chemicals, Etc. | Generates Strong Magnetic And Electric Fields |
|  |  |  |

## 1.4.2 Installation Requirements

The XL Series expansion modules can be installed on the right side of the main unit or the expansion modules of XL Series PLCs. They can be mounted using a DIN46277 rail (35 mm wide).

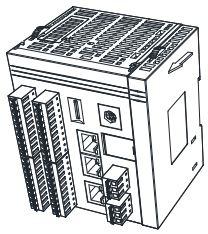
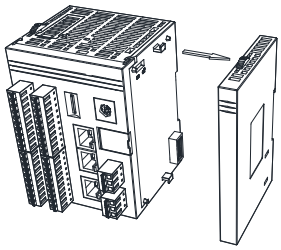
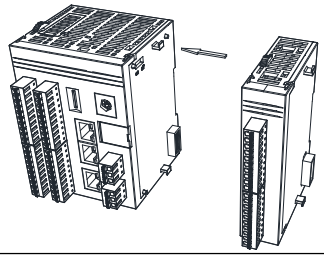
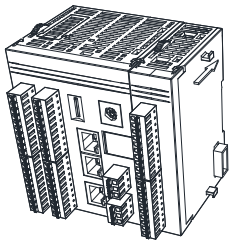
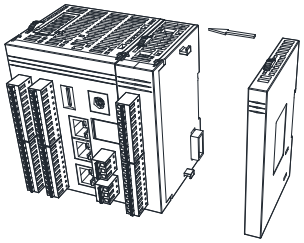
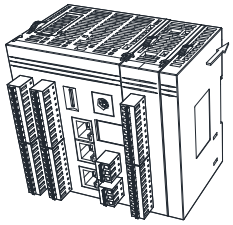
Install using DIN46277 rail



The basic unit and the expansion module are installed on a DIN46277 rail (35 mm wide). To remove the unit, simply pull down the assembly pull tab on the DIN rail and then take the product out.

### 1.4.3 Installation Steps

The following illustrates the installation steps using the First Expansion Module as an example:

| | |
|---|---|
|  | 1. Locate the rear cover on the right side of the PLC; push the rear cover up or down in the direction indicated by the arrow on the diagram to engage the securing latch; |
|  | 2. Remove the rear cover; |
|  | 3. After completing Step 2, an expansion port will be exposed on the right side of the PLC; align this port with the connection port on the left side of the module to be installed and proceed with the installation; |
|  | 4. Push the module's upper and lower fixing clips in the direction indicated by the arrow on the diagram to secure the module; |
|  | 5. Install the rear cover removed in Step 2 onto the right side of the expansion module; |
|  | 6. Push the upper and lower fixing clips on the rear cover in the direction indicated by the arrow on the diagram to secure the rear cover in place. |

- After installation is complete, please check whether the module's mounting clip are securely engaged and whether the module is loose.
- When installing multiple modules, please mount the rear cover on the right side of the last module.

### 1.4.4 Cabling Requirements

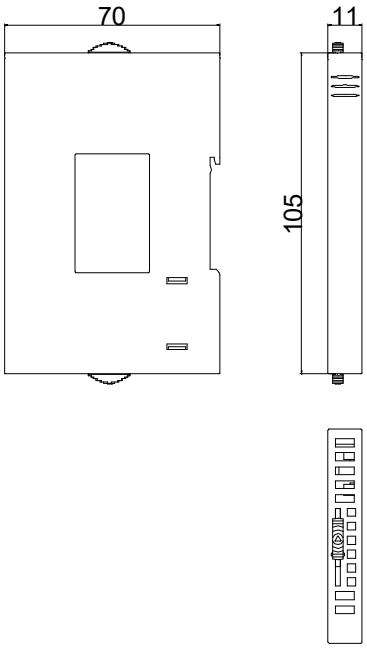
Except for the XL-E16YT-A and the 32-point expansion modules of the XL series, which require an external terminal block for wiring, all other modules can be connected simply by inserting the cables into their respective wiring terminals.

- Please confirm the specifications and select the appropriate module.
- During screw hole machining or wiring operations, ensure that neither chips nor wire debris fall into the module.
- Before connecting, please double-check the specifications of both the module and the connected device to ensure there are no issues.
- When connecting cables, ensure that the connection is secure; a loose connection can cause issues such as incorrect data transmission or short circuits.
- Installation, wiring, and other similar operations must be performed only after all power supplies have been disconnected.

## 1.5 Terminal Resistance Module XL-ETR

When the number of external right-hand expansion modules for the XL series PLC is ≥5, the XL-ETR terminal resistor module must be used in conjunction.
XL-ETR is only compatible with right-side expansion modules from the XL series running hardware version H3.1 or later.

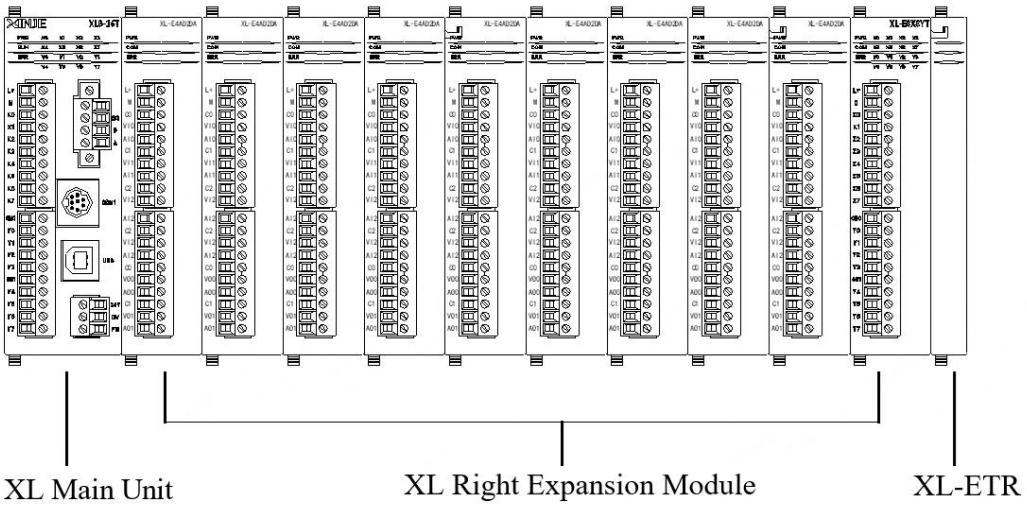
1) External Dimensions




(Unit: mm)

2) Installation Location

When installing the XL-ETR, place it on the right side of the last expansion module and connect it by aligning it with the module interface slot, as shown in the figure below:




## 1.6 XL Compatible Power Supply – XL-P50-E

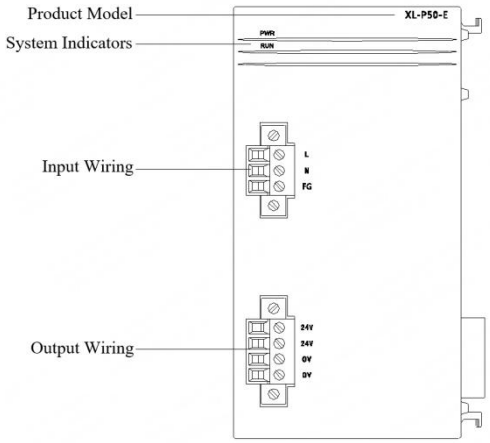
The power supply for XL-series PLCs can be an external switching power supply or the dedicated XL-P50-E power module.

1) Basic Specifications

| Project | Specifications |
|---|---|
| Power Supply Voltage | AC100-240V |
| Output Voltage | DC24V |

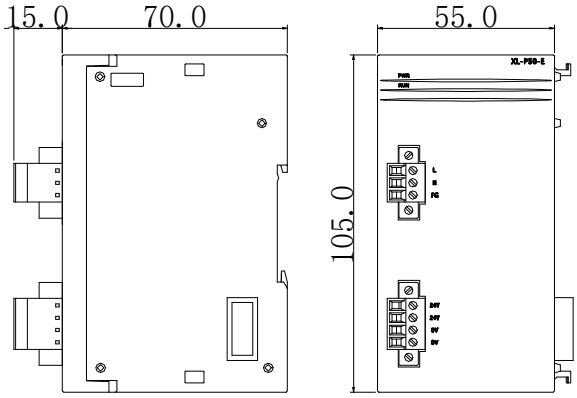
| | |
|---|---|
| Output | 2A |
| Air | Non-corrosive, flammable gases |
| Ambient Temperature | 0℃~60℃ |
| Ambient Humidity | 5% RH–95% RH (no condensation) |
| Install | Directly installed on the guide rail |
| Ground | Third type of grounding (Must not share common grounding with high-voltage systems.) |

2) Structural Description




| Name | Function Declaration |
|---|---|
| Product Model | Specific product model |
| System Indicator Light | PWR: Power indicator light – turns red and stays on when the power module is powered.<br>RUN: Operation indicator light – stays green and constantly lit when the power module is operating normally. |
| Input Wiring | L, N: External power supply input terminals for the power supply module<br>FG: Ground Terminal |
| Output Connection | Provides an external output of one 24V/0V power supply, primarily used to power the XL device itself. |

3) External dimensions (Unit: mm)


15.0
70.0
55.0
105.0
XL-PS0-E
PWR
RUN

# 2 Digital Expansion Module

## 2.1 Module Overview

The XL-EnXmY expansion module features digital input, digital output, and digital I/O capabilities. As an expansion module for the main unit, it provides additional input and output points, meeting the practical production requirements.

### 2.1.1 Naming Rule

XL－E ○ □ ○ □－□
① ② ③ ④ ⑤ ⑥ ⑦

| | | |
|---|---|---|
| ① | Series Name | XL: XL Series Expansion Modules |
| ② | Expansion Module | E: Indicates Expansion Module |
| ③ | Input point count | 8, 16, or 32 |
| ④ | Input Point Type | X: Indicates that the input point is of NPN type.<br>PX: Indicates that the input point is a PNP-type input.<br>NPX: Indicates that the input points are of NPN or PNP type. |
| ⑤ | Output points | 8, 16, or 32 |
| ⑥ | Output form | YT: Transistor output<br>YR: Relay output<br>PYT: PNP transistor output |
| ⑦ | Interface type | None: European terminal interface<br>A: Bull horn terminal interface – requires an external terminal block. |

### 2.1.2 Model List

| Model | | Function Declaration |
|---|---|---|
| NPN Input Type | PNP Input Type | |
| XL-E8X8YR | XL-E8PX8YR | 8-channel digital input, 8-channel Relay output |
| XL-E8NPX8YR | | 8-channel bipolar digital input; 8-channel Relay output |
| XL-E8X8YT | XL-E8PX8YT | 8-channel digital input, 8-channel transistor output |
| XL-E8NPX8YT | | 8-channel bipolar digital input, 8-channel transistor output |
| XL-E16X | XL-E16PX | 16-channel discrete input |
| XL-E16YR | - | 16-channel Relay output |
| XL-E16YT | - | 16-channel transistor output |
| XL-E16PYT | - | 16-channel PNP transistor output |
| XL-E16YT-A | - | 16-channel transistor output (horn connector terminal) |
| XL-E16X16YT | XL-E16PX16YT | 16-channel digital input, 16-channel transistor output |
| - | XL-E16PX16PYT | 16-channel PNP digital input; 16-channel PNP transistor output |
| XL-E16X16YT-A | XL-E16PX16YT-A | 16-channel digital input; 16-channel transistor output (horn-type terminal block) |

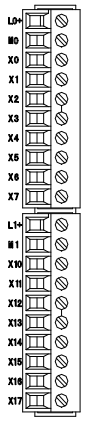
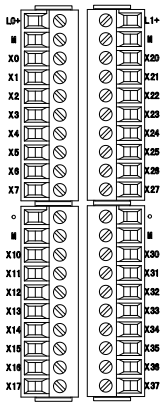
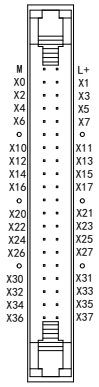
| Model | | Function Declaration |
|---|---|---|
| NPN Input Type | PNP Input Type | |
| XL-E32X | XL-E32PX | 32-channel discrete input |
| XL-E32X-A | XL-E32PX-A | 32-channel discrete input (horn-type terminal block) |
| XL-E32YT | - | 32-bit transistor output |
| XL-E32YT-A | - | 32-pin transistor output (horn connector) |

### 2.1.3 General Requirements

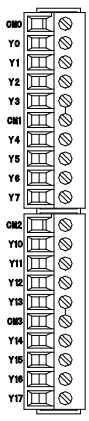
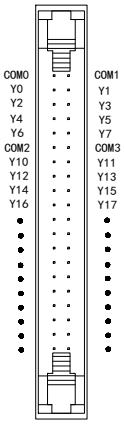
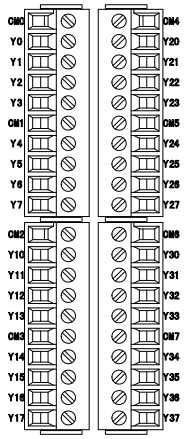
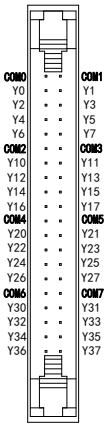
| Project | Specifications |
|---|---|
| Input Power Supply Voltage | DC24V±10% |
| Service Environment | Non-corrosive gases |
| Ambient Temperature | 0℃~55℃ |
| Ambient Humidity | 5~95% |
| Install | Directly installed on a DIN46277 guide rail (35 mm width) |

## 2.2 Terminal Arrangement

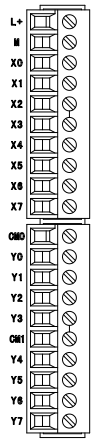
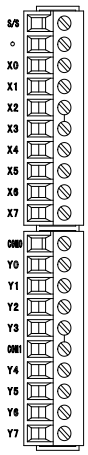
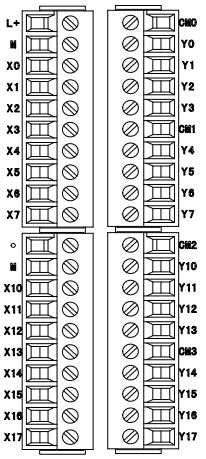
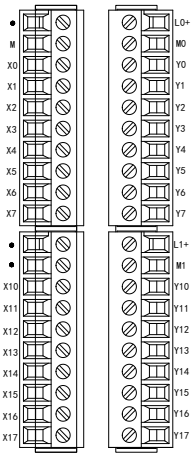
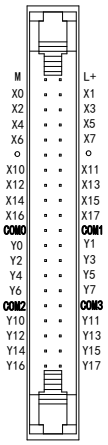
### 2.2.1 Digital Input Module Terminal Arrangement

| XL-E16X | XL-E32X | XL-E32X-A |
|---|---|---|
|  |  |  |

## 2.2.2 Digital Output Module Terminal Arrangement

| XL-E16YR,<br>XL-E16YT,<br>XL-E16PYT | XL-E16YT-A | XL-E32YT | XL-E32YT-A |
|---|---|---|---|
|  |  |  |  |

## 2.2.3 Digital I/O Module Terminal Arrangement

| XL-E8X8YR<br>XL-E8X8YT | XL-E8NPX8YT<br>XL-E8NPX8YR | XL-E16X16YT | XL-E16PX16PYT | XL-E16X16YT-A |
|---|---|---|---|---|
|  |  |  |  |  |

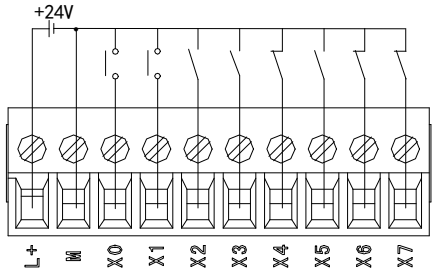
# 2.3 Input Specifications and Wiring

## 2.3.1 NPN Input Specifications and Wiring

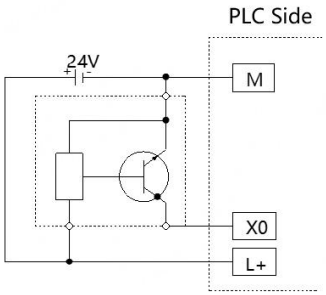
1) NPN Input Specifications

| Project | Explain |
|---|---|
| Input Signal Voltage | DC24V±10% |
| Input Signal Current | 7mA/DC24V |
| On Current Input | Above 4.5mA |
| Input Off Current | Below 1.5 mA |
| Input Response Time | Approx. 10ms |
| Input Signal Format | Contact input or NPN open-collector transistor |
| Circuit Insulation | Optoelectronic coupling insulation |
| Input Action Display | The LED light turns on when the ON switch is activated. |

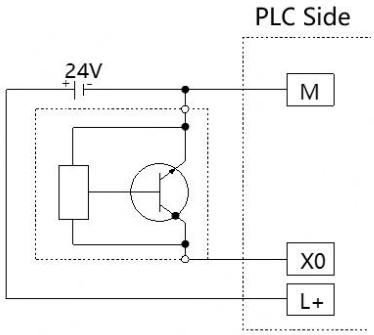
2) NPN Input Wiring




Switch Button Wiring Diagram Example




Three-wire (NPN-type) proximity switch wiring diagram example




Two-wire (normally open or normally closed) proximity switch wiring diagram example

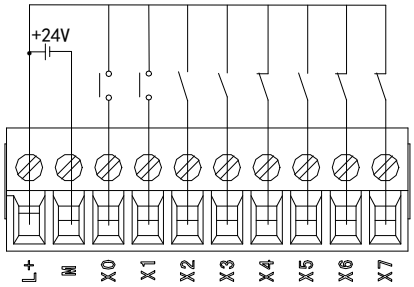
## 2.3.2 PNP Input Specifications and Wiring

1) PNP Input Specifications

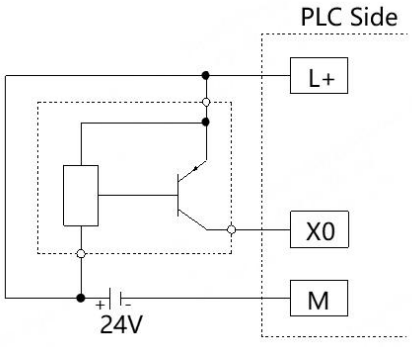
| Project | Explain |
|---|---|
| Input Signal Voltage | DC24V±10% |
| Input Signal Current | 7mA/DC24V |
| On Current Input | Above 4.5mA |
| Input Off Current | Below 1.5 mA |
| Input Response Time | Approx. 10ms |
| Input Signal Format | Contact input or PNP open-collector transistor |
| Circuit Insulation | Optoelectronic coupling insulation |
| Input Action Display | The LED light turns on when the ON switch is activated. |

2) PNP Input Wiring Example

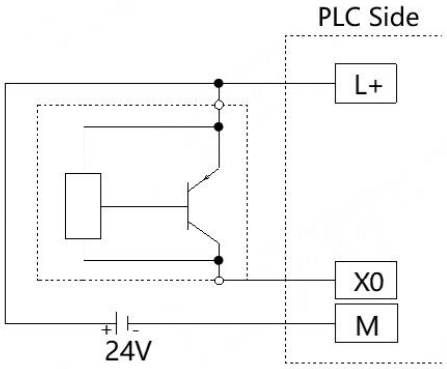
- General Module




Switch Button Wiring Diagram Example

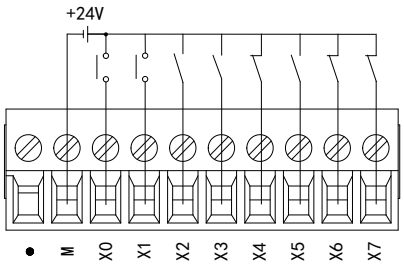



Three-wire (PNP-type) proximity switch wiring diagram example;

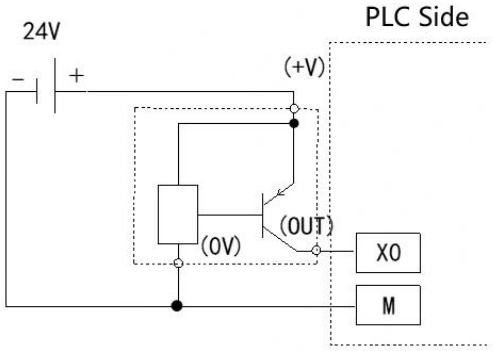



Two-wire (normally open or normally closed) proximity switch wiring diagram example

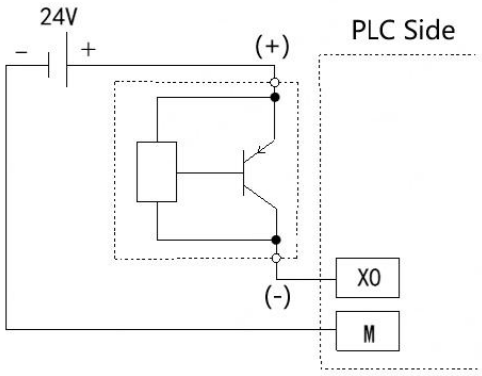
- XL-E16PX16PYT




Switch Button Wiring Diagram Example




Three-wire proximity switch wiring diagram example




Two-wire proximity switch wiring diagram example

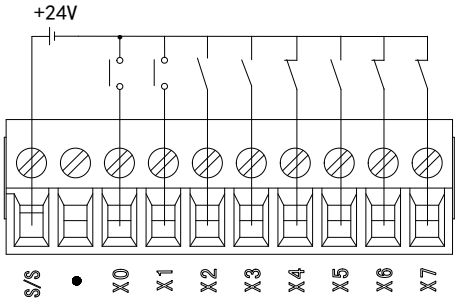
## 2.3.3 NPN & PNP Bipolar Input Specifications and Wiring

1) Input Specifications

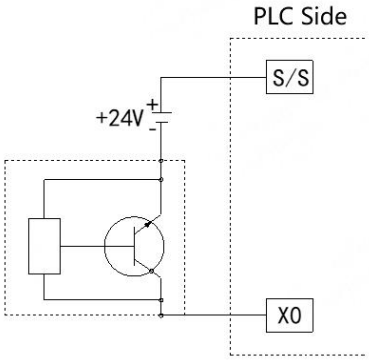
| Project | Explain |
|---|---|
| Input Signal Voltage | DC24V±10% |
| Input Signal Current | 7mA/DC24V |
| On Current Input | Above 4.5mA |
| Input Off Current | Below 1.5 mA |
| Input Response Time | Approx. 10 ms |
| Input Signal Format | NPN or PNP compatible input – open-collector transistor |
| Circuit Insulation | Optoelectronic coupling insulation |
| Input Action Display | The LED light turns on when the ON switch is activated. |

2) Wiring Example

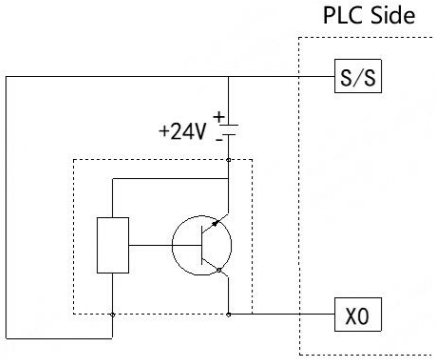
- NPN Pattern




Switch Button Wiring Diagram Example

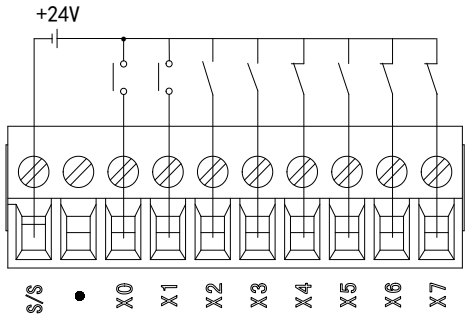



Example wiring diagram for a two-wire (normally open or normally closed) proximity switch

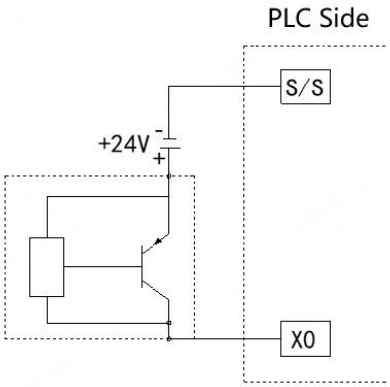



Example wiring diagram for a three-wire (NPN-type) proximity switch

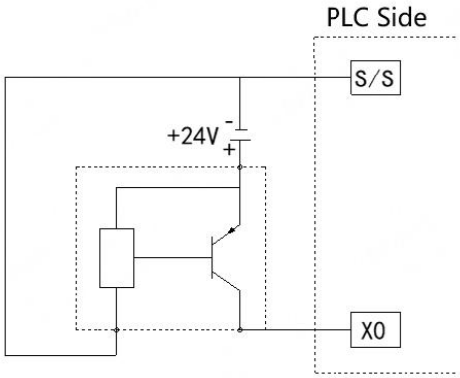
- PNP Pattern




Switch Button Wiring Diagram Example




Example wiring diagram for a two-wire (normally open or normally closed) proximity switch



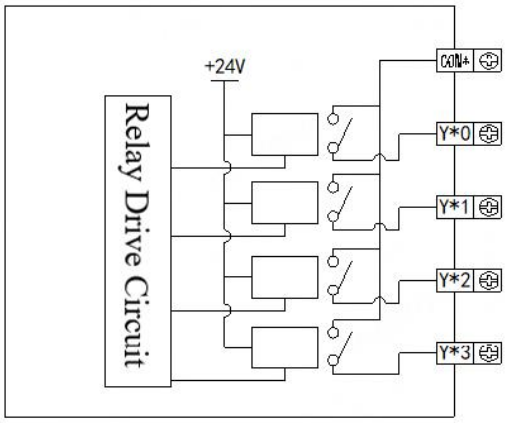

Example wiring diagram for a three-wire (PNP-type) proximity switch

# 2.4 Output Specifications and Wiring

## 2.4.1 Output Specifications

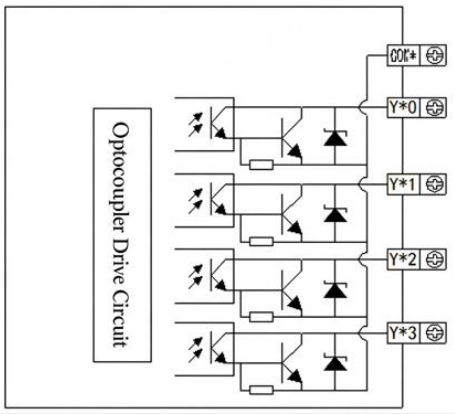
1) Relay output

| Project | | Explain |
|---|---|---|
| External Power Source | | AC 250V or below, DC 30V or below |
| Circuit Insulation | | Mechanical insulation |
| Action Instruction | | LED pilot lamp |
| Maximum Load | Resistive Load | 3A |
| | Inductive Load | 80VA |
| | Light Load | 100W |
| Minimum Load | | DC5V 2mA |
| Respond Time | OFF→ON | 10ms |
| | ON→OFF | 10ms |



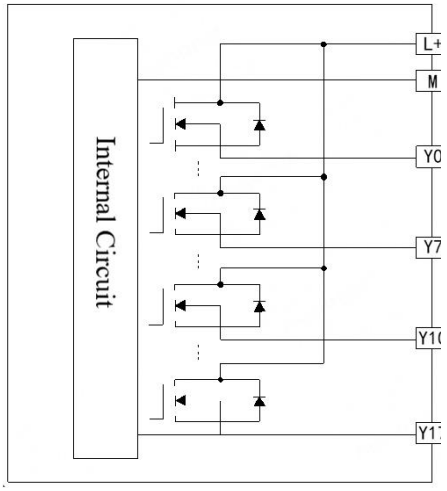

2) Standard Transistor Output (NPN Type)

| Project | | Explain |
|---|---|---|
| External Power Source | | DC 5~30 V or below |
| Circuit Insulation | | Optical coupling insulation |
| Action Instruction | | LEDpilot lamp |
| Maximum Load | Resistive Load | 0.3A |
| | Inductive Load | 7.2W/DC24V |
| | Light Load | 1.5W/DC24V |
| Minimum Load | | DC5V 2mA |
| Open-Circuit Leakage Current | | Below 0.1 mA |
| Respond Time | OFF→ON | Less than 0.2 ms |
| | ON→OFF | Less than 0.2 ms |




3) Standard Transistor Output (PNP type)

| Project | | Explain |
|---|---|---|
| External Power Source | | DC5~30V (-15%~+20%) |
| Circuit Insulation | | Optical coupling insulation |
| Action Instruction | | LEDpilot lamp |
| Maximum Load | Resistive Load | 0.3 A per point; 4 A per module |
| Minimum Load | | DC5V 2mA |
| Open-Circuit Leakage Current | | Below 0.1 mA |
| Respond Time | OFF→ON | Less than 0.2 ms |
| | ON→OFF | DC24V (-15%~+20%) |

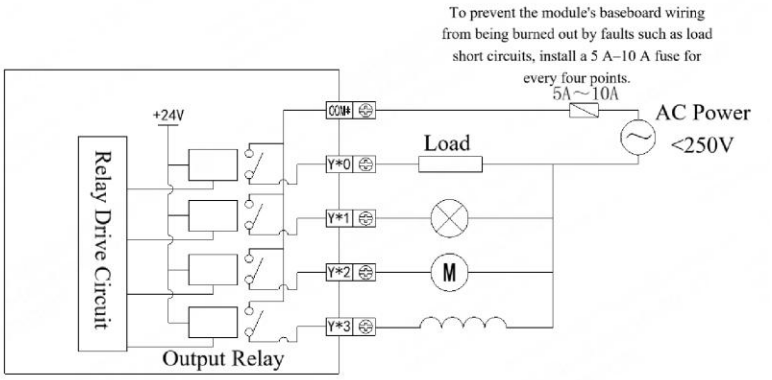



Output Current

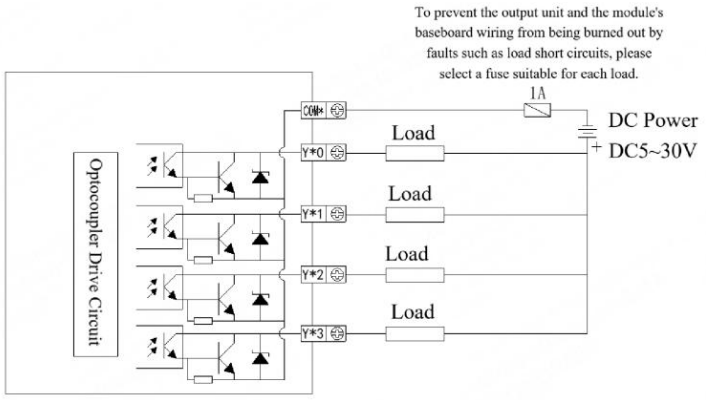
The current per output point is 0.3 A. However, due to temperature rise limitations, the total current for four output points amounts to 0.5 A.

## 2.4.2 Output Connection

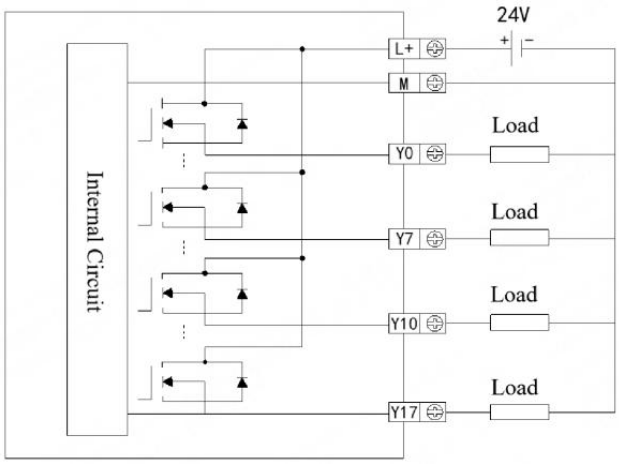
1) Relay-type Output Wiring




2) Transistor-type (NPN) Output Wiring




3) Transistor-type (PNP) Output Wiring



## 2.5 Wiring Terminal Specifications

When wiring the XL-E8X8YR, XL-E8PX8YR, XL-E8X8YT, XL-E8PX8YT, XL-E8NPX8YT, XL-E8NPX8YR, XL-E16X, XL-E16PX, XL-E16YR, XL-E16YT, or XL-E16PYT modules, the terminals must comply with the following requirements:

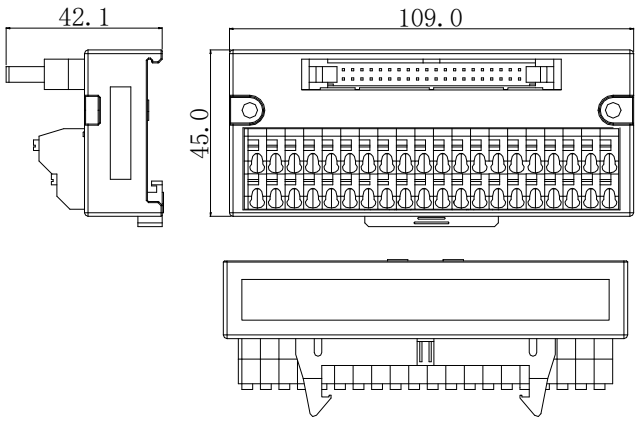
- Wire stripping length: 9 mm;
- Flexible conductor with tubular bare ends, cross-sectional area 0.25–1.5 mm²;
- Flexible conductor with tubular pre-insulated ends, cross-sectional area: 0.25–0.5 mm².

## 2.6 External Terminal Block

The XL–A type module features horn-type terminals and requires the use of an external terminal block; Xinje provides the appropriate terminal blocks and connection cables needed for these modules for customers to select from. List of module models, compatible terminal blocks, and connection cables:

| Module Model | Terminal Block Model | Compatible Connecting Cable |
|---|---|---|
| XL-E16YT-A | JT-E16YT-A | JC-TE32-NN05 (0.5m)<br>JC-TE32-NN10 (1.0m)<br>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 | |

1) Terminal block external dimensions (Unit: mm)



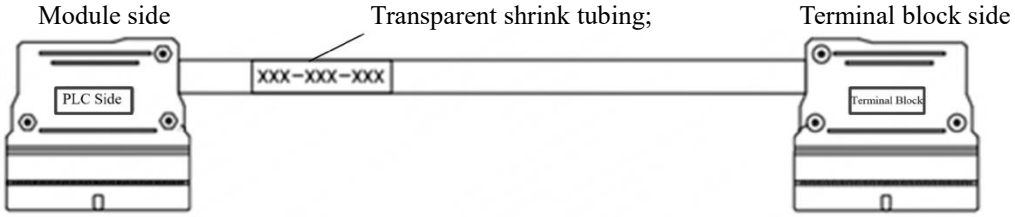

2) Wiring Method

During wiring, press the spring switch with a small straight-acting tool to insert the wire into the corresponding socket, then release the spring switch. For this terminal block, the length of the wire after stripping the outer insulation should be 1.5 cm.

3) Connect Cables

When using an external terminal block, appropriate connecting cables must be used. Xinje offers three types of cables with different lengths – JC-TE32-NN05, JC-TE32-NN10, and JC-TE32-NN15 – for customers to select from. During connection, please note: connect the end of the cable that is wrapped by the transparent

heat-shrink tubing (which bears the model number) to the module, and connect the other end to the terminal block; do not connect the ends in reverse Program!!! The connection diagram is shown below:




# 2.7 Input/Output Definition Number Allocation

The terminal definitions and addresses for NPN-type and PNP-type modules are identical.

## 2.7.1 Input Terminal Address Definition

Definition of Input Terminals X0–X37 for Extended Modules (No.1–16)

| | #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 |

## 2.7.2 Output Terminal Address Definition

Definition of Output Terminals Y0–Y37 for Extended Modules #1–#16

| | #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 |

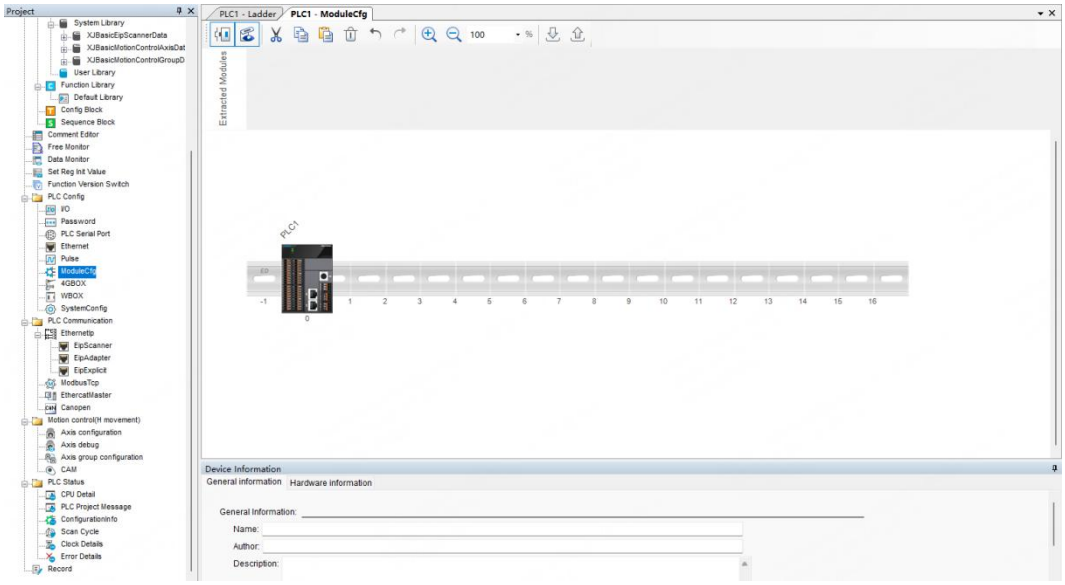
## 2.8 Work Mode Settings

There are two methods for configuring the operating mode (The effects of these two methods are equivalent.).

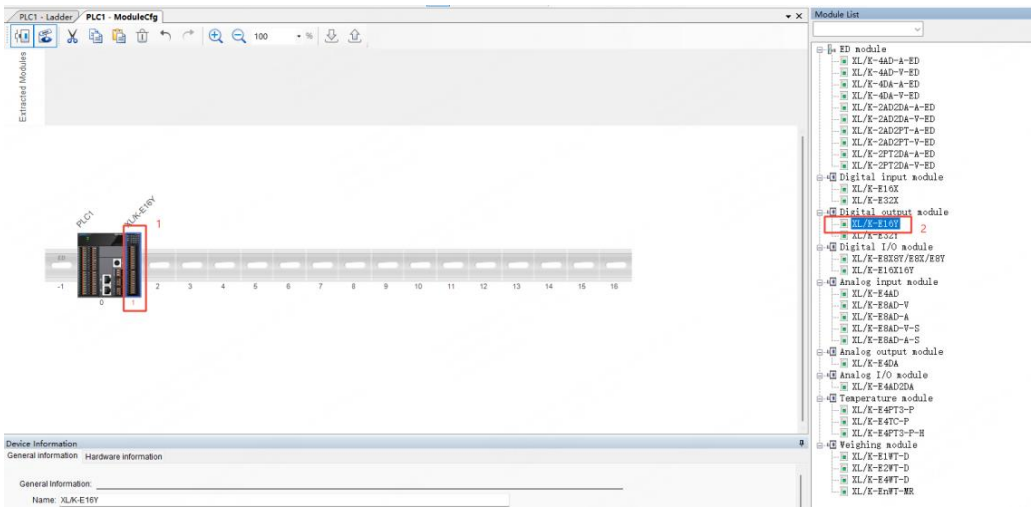
- Configure via the Control Panel;
- Set via Flash registers.

### 1) Configuration Panel Configuration

1. Use the Xinje PLC Programming Tool Software version 3.8.0a or later to configure the module; click [PLC Configuration] – [Module Configuration] in the left-side Engineering Bar to open the Expansion Module Settings window. For versions of the Xinje PLC Programming Tool Software prior to 3.8.0a, click [PLC Configuration] – [Expansion Module] in the left-side Engineering Bar to perform the configuration.

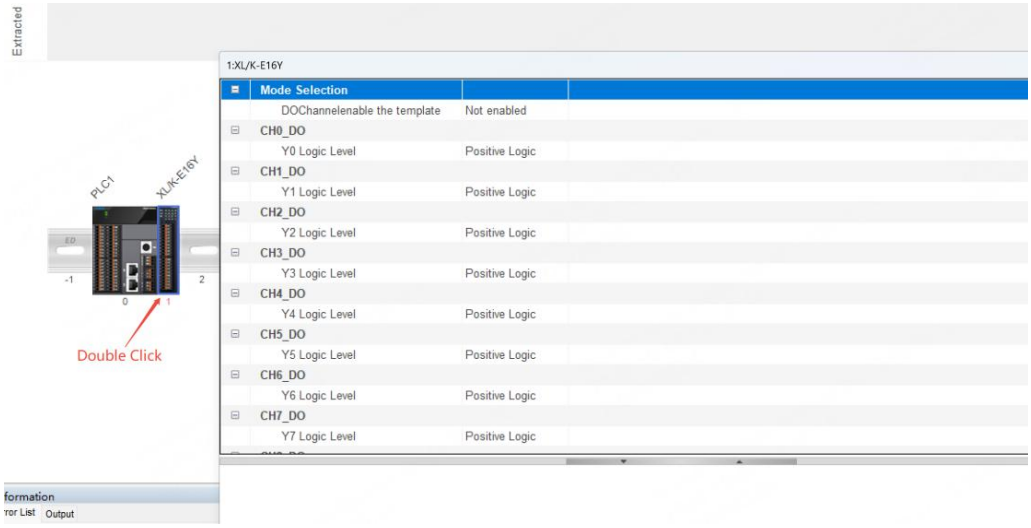



2. Select a module from the right-hand module list and drag it to the desired position; alternatively, double-click a module in the right-hand module list to select it:



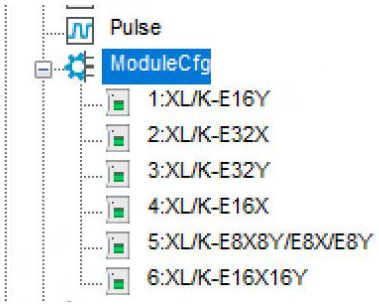

3. Double-click the corresponding module icon to access the module configuration interface and configure module parameters. Positive and negative logic can be adjusted, and the filtering

time can be set.




4. Click " " to retrieve the default configuration parameters for the extended module.

5. After completing the parameter configuration for the expansion module, click " " to write the set values into the PLC; the changes will take effect only after the PLC is powered off and then powered on again. Under the Module Configuration Node, mount the configured module, then double-click it to enter the module parameter configuration interface.




## 2) Flash Register Configuration

Configuration Information Address:

| Module ID | Configuration Information Address | Module ID | Configuration Information 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 specific allocation of the first 20 bytes of the COMMAND information is as follows:

- XL-E8X8Y

| | Byte0 | Byte1 | Byte2 | Byte3 | Byte4 | Byte5 | Byte6~ Byte19 |
|---|---|---|---|---|---|---|---|
| Bit7 | X0–X3 Filtering Time set up | X4–X7 Filtering Time set up | - | - | - | - | - |
| 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 | - |
| Explain | Filtering time (unit: ms): When configurable, the available values are 1~5, 10, 15, 20, 25, 30, 35, 40, 45, 50; the default value is 10 if not configured. | | Note: 0 represents positive logic; 1 represents negative logic. | | | | - |

- XL-E16X

| | Byte0 | Byte1 | Byte2 | Byte3 | Byte4 | Byte5 | Byte6 | Byte7 | Byte8~ Byte19 |
|---|---|---|---|---|---|---|---|---|---|
| Bit7 | X0~X3 Filtering Time Settings | X4~X7 Filtering Time Settings | X10~X13 During filtering Intermittent settings | X14~X17 During filtering Intermittent settings | - | - | - | - | - |
| 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 | - |
| Explain | Filtering time (unit: ms): When configurable, the available values are 1~5, 10, 15, 20, 25, 30, 35, 40, 45, 50; the default value is 10 if not configured. | | | | Note: 0 represents positive logic; 1 represents negative logic | | | | - |

- XL-E16X16Y

| | Bit0 | Bit1 | Bit2 | Bit3 | Bit4 | Bit5 | Bit6 | Bit7 | Explain |
|---|---|---|---|---|---|---|---|---|---|
| Byte0 | X0–X3 filtering time setting | | | | | | | | Filtering time (unit: ms): When configurable, the available values are 1–5, 10, 15, 20, 25, 30, 35, 40, 45, 50; the default value is 10 if not configured. |
| Byte1 | X4–X7 filtering time setting | | | | | | | | |
| Byte2 | X10–X13 filtering time setting | | | | | | | | |
| Byte3 | X14–X17 filtering time setting | | | | | | | | |
| Byte4 | X0 logic | - | X1 logic | - | X2 logic | - | X3 logic | - | 0 represents positive logic; 1 |

| | Bit0 | Bit1 | Bit2 | Bit3 | Bit4 | Bit5 | Bit6 | Bit7 | Explain |
|---|---|---|---|---|---|---|---|---|---|
| Byte5 | X4 logic | - | X5 logic | - | X6 logic | - | X7 logic | - | represents negative 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 | Explain |
|---|---|---|---|---|---|---|---|---|---|
| Byte0 | Y0 Logic | - | Y1 Logic | - | Y2 Logic | - | Y3 Logic | - | 0 represents positive logic; 1 represents 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 Logic | - | Y35 Logic | - | Y36 Logic | - | Y37 Logic | - | |
| Byte 8~19 | - | - | - | - | - | - | - | - | |

- XL-E32X

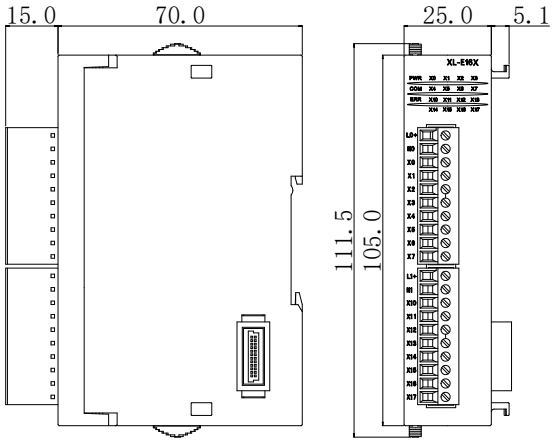
| | Bit0 | Bit1 | Bit2 | Bit3 | Bit4 | Bit5 | Bit6 | Bit7 | Explain |
|---|---|---|---|---|---|---|---|---|---|
| Byte0 | X0–X3 filtering time setting | | | | | | | | Filtering Time (Unit: ms): When configurable, the available values are 1~5, 10, 15, 20, 25, 30, 35, 40, 45, 50; the default value is 10 if not configured |
| Byte1 | X4–X7 filtering time setting | | | | | | | | |
| Byte2 | X10–X13 filtering time setting | | | | | | | | |
| Byte3 | X14–X17 filtering time setting | | | | | | | | |
| Byte4 | X20–X23 filter time setting | | | | | | | | |
| Byte5 | X24–X27 filtering time setting | | | | | | | | |
| Byte6 | X30–X33 filter time setting | | | | | | | | |
| Byte7 | X34–X37 filtering time setting | | | | | | | | |
| Byte8 | X0 Logic | - | X1 Logic | - | X2 Logic | - | X3 Logic | - | 0 represents positive logic; 1 |

| | Bit0 | Bit1 | Bit2 | Bit3 | Bit4 | Bit5 | Bit6 | Bit7 | Explain |
|---|---|---|---|---|---|---|---|---|---|
| Byte9 | X4 Logic | - | X5 Logic | - | X6 Logic | - | X7 Logic | - | represents negative 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 | - | - | - | - | - | - | - | - | |

Positive logic: When input terminal X is conducting, the signal at terminal X is ON; when input terminal X is open, the signal at terminal X is OFF.
Negative logic: When input terminal X is conducting, the signal at terminal X is OFF; when input terminal X is open, the signal at terminal X is ON.
Positive logic is set by default and generally does not require modification.

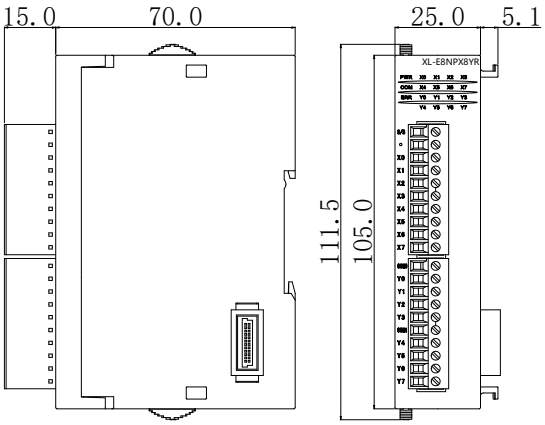
## 2.9 External Dimensions Diagram

Unit: mm



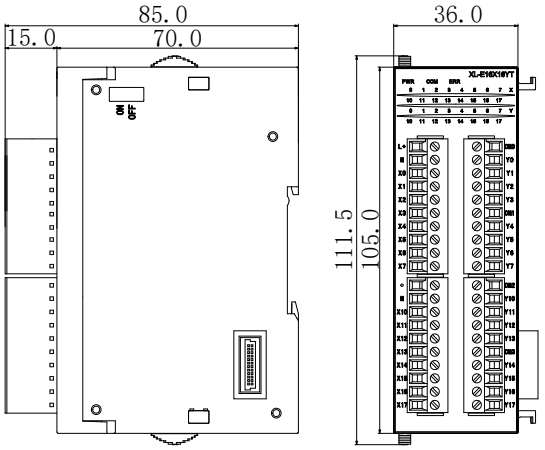

Applicable Modules

| Input | IO | Output |
|---|---|---|
| XL-E16X | XL-E8X8YR | XL-E16YR |
| XL-E16PX | XL-E8PX8YR | XL-E16YT |
| | XL-E8X8YT | XL-E16PYT |
| | XL-E8PX8YT | |



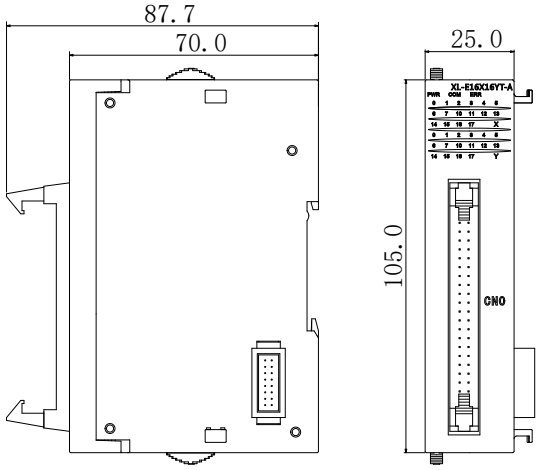

Applicable Modules

| Input | IO | Output |
|---|---|---|
| - | XL-E8NPX8YR<br>XL-E8NPX8YT | - |




Applicable Modules

| Input | IO | Output |
|---|---|---|
| XL-E32X | XL-E16X16YT<br>XL-E16PX16PYT | XL-E32YT |

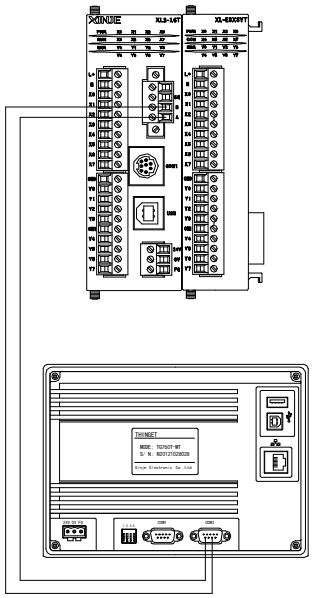



Applicable Modules

| Input | IO | Output |
|---|---|---|
| XL-E32X-A | XL-E16X16YT-A | XL-E16YT-A<br>XL-E32YT-A |

## 2.10 Application Example

Example: The Xinje XL3-16R serves as a slave device equipped with an XL-E8X8YR expansion module, enabling communication with the Xinje TG765 Human-Machine Interface (HMI).



In this example, the touchscreen serves as the communication master station; it reads the input point status of the expansion module and writes it to the local coil status of the touchscreen, while writing the internal coil status of the touchscreen to the output point of the expansion module. The operating procedure is as follows:

1) Hardware Connection

Connect the XL-E8X8YR module to the XL3-16R; then connect the RS485 communication terminals AB of the XL3-16R to the PLC port terminals AB of the TG765, respectively.
Communication parameter configuration: Select the following communication parameters – baud rate: 19,200 bps; 8 data bits; 1 stop bit; Even parity; PLC's Modbus station ID: 1. After setting the station ID, please power on the PLC again.
For the TG765 touchscreen: Select the PLC type as "Modbus RTU (Display as Master)" and set the communication parameters to a baud rate of 19,200 bps, 8 data bits, 1 stop bit, and Even parity.

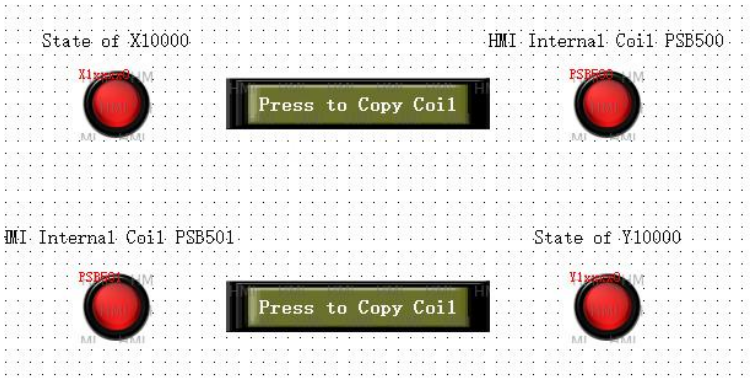
2) Program Application

The correspondence between module I/O point addresses and local coil addresses is as follows:

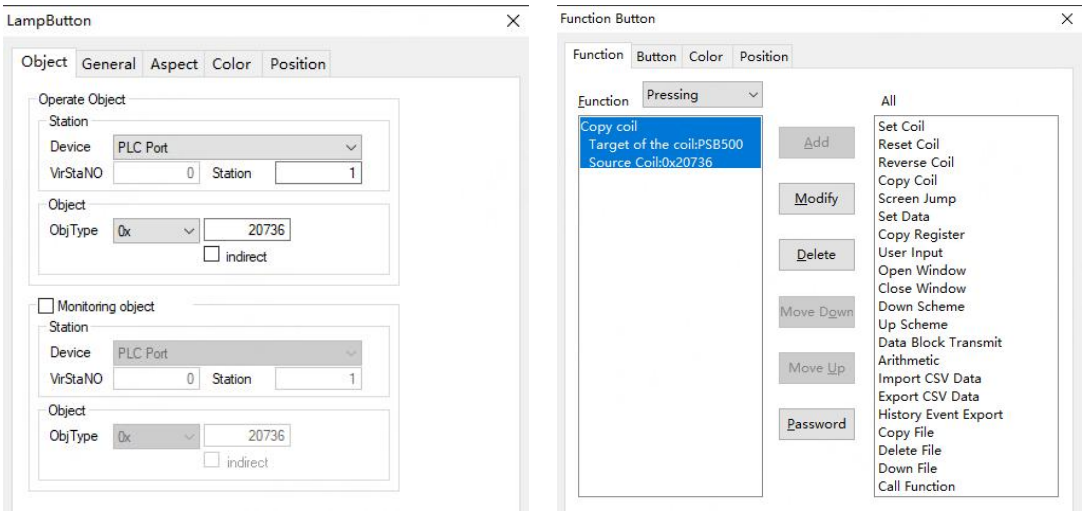
| Local Coil Address | | Model I/O Point | Modbus Address |
|---|---|---|---|
| PSB500 | ◄——► | X10000 | K20736 |
| PSB501 | ◄——► | Y10000 | K24832 |

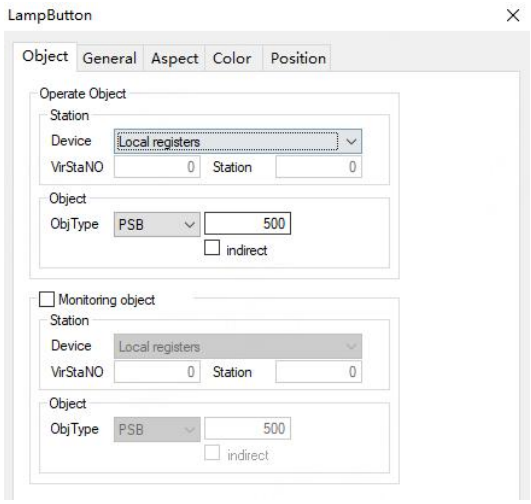
3) Image Editing

The touchscreen display is as follows:

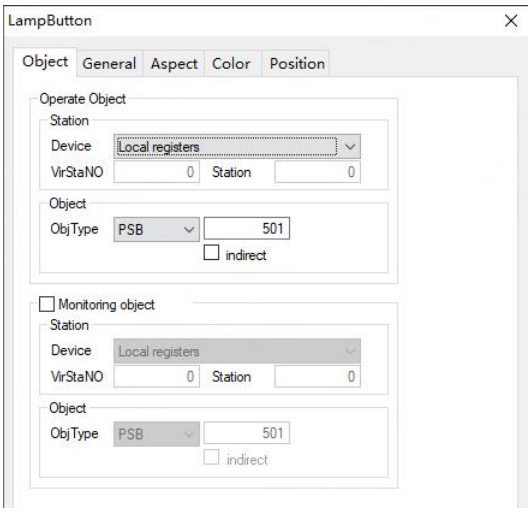


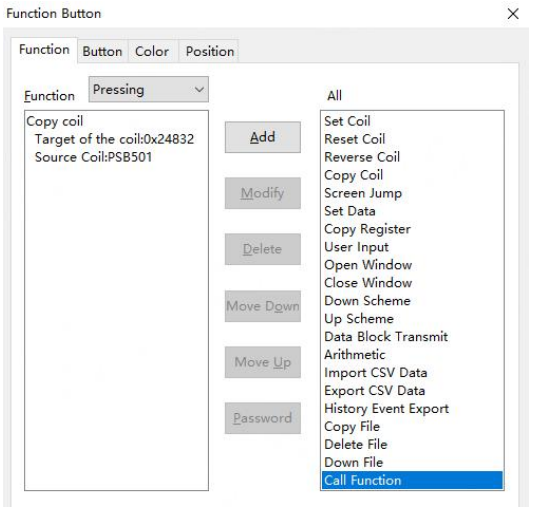

Perform status configuration for the X10000 expansion module by adding an indicator light; set the indicator light's object type to 0X, which corresponds to Modbus address coil 20736; select the function key button; set its function to copy the X10000 coil status to the PSB500 internal touchscreen coil upon pressing; configure the PSB500 internal touchscreen indicator light by selecting the indicator light object type as "PSB" and specifying coil number 500.

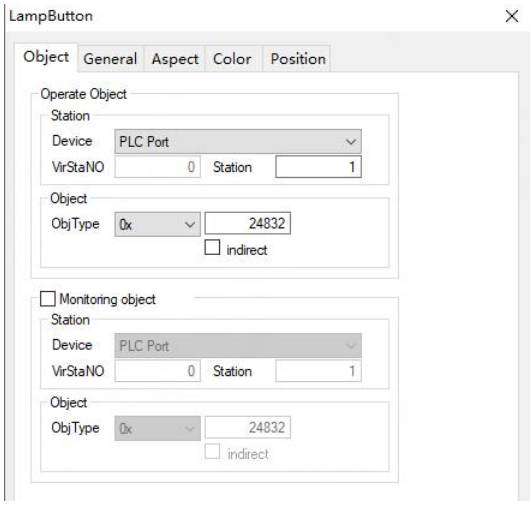



Similarly, edit the internal PSB501 coil status on the touchscreen by selecting the Indicator Light Button (object type: PSB; coil number: 501); then select the Function Key Button, which, when pressed, copies the coil status of PSB501 to the coil of the Y10000 expansion module; finally, edit the status of the Y10000 expansion module by selecting the Indicator Light Button (object type: 0X; corresponding Modbus coil address: 24832).




Once the video has been edited, download it to the touchscreen and then initiate communication.

# 3 Analog Input Module

## 3.1 Analog Input Module Overview

XL Series Analog Input Module – supports 4–8 current-or voltage-type input channels.

### 3.1.1 Naming Rule

XL－E○AD－□－□
① ② ③ ④ ⑤ ⑥

| | | |
|---|---|---|
| ① | Series name | XL: XL Series Expansion Modules |
| ② | Reference expansion module | E: Indicates Expansion Module |
| ③ | Number of input channels | 4 or 8 |
| ④ | Read analogue input | AD: Indicates analog voltage or current input. |
| ⑤ | Analog signal type | A: Represents current-mode<br>V: denotes a voltage-type converter |
| ⑥ | Resolution ratio | S: Indicates a resolution of 1/65,536 (16-bit).<br>None: Indicates a resolution of 1/16,383 (14-bit). |

### 3.1.2 Model List

| Model | | Description |
|---|---|---|
| Analog Input | XL-E4AD | 4-channel analog input, supporting both current and voltage measurement modes, 14-bit resolution |
| | XL-E8AD-A | 8-channel analog input with current-mode support and 14-bit resolution |
| | XL-E8AD-V | 8-channel analog input; supports voltage mode; 14-bit resolution |
| | XL-E8AD-A-S | 8-channel analog input; supports current mode; 16-bit resolution |
| | XL-E8AD-V-S | 8-channel analog input, supports voltage mode, 16-bit |

### 3.1.3 General Requirements

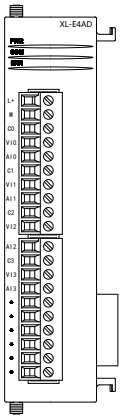
| Project | Specifications |
|---|---|
| Input Power Supply Voltage | DC24V±10% |

| | |
|---|---|
| Service Environment | Non-corrosive gases |
| Ambient Temperature | 0℃~60℃ |
| Ambient Humidity | 5~95% |
| Install | Directly installed on a DIN46277 guide rail (35 mm width) |

## 3.2 14-Bit Analog Current and Voltage Input Module XL-E4AD

This section primarily introduces the specifications of the XL-E4AD module, terminal descriptions, assignment of input definition codes, operating mode configuration, external connections, analog-to-digital conversion diagram, and external dimensions diagram.

### 3.2.1 Module Features and Specifications



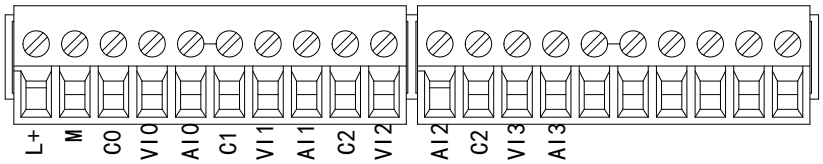

The XL-E4AD analog input module converts four analog input signals into digital values and transmits them to the PLC main unit, enabling real-time data exchange with the PLC main unit.

- 4-channel analog input: supports both voltage and current input modes.
- 14-bit high-precision analog input.
- As a specialized functional module for the XL series, the XL3/XL3E can connect up to 10 modules; the XL5/XL5E/XL5N/XL5H/XLME/ XLH/XSLH can support up to 16 modules; however, the XL1 does not support the addition of any modules.

Module Specifications

| Project | Voltage Input (V) | Current Input(mA) |
|---|---|---|
| Analog Input Range | 0~5V、0~10V、-5~5V、-10~10V | 0~20 mA、4~20 mA、-20~20mA |
| Maximum Input Range | DC±15V | -40~40mA |
| Analog Output Range | - | |
| Digital Input Range | - | |
| Digital Output Range | 0–16383 or -8192–8191 | |
| Resolution Ratio | 1/16383 (14Bit) | |
| Overall Accuracy | ±1% | |
| Conversion Rate | 2ms/1 channel | |
| Module Power Supply | DC24V±10%，150mA | |

## 3.2.2 Terminal Specifications




| Name | | Function |
|---|---|---|
| Terminal Block | L+ | External power supply: +24V positive terminal for the module |
| | M | External power supply: 24V negative terminal for the module |
| | C0 | VI0, AI0 Input Port |
| | VI0 | Route 1 AD analog voltage input terminal |
| | AI0 | Route 1 AD analog current input terminal |
| | C1 | VI1, AI1 Input Port |
| | VI1 | AD Analog Voltage Input Terminal (Channel 2) |
| | AI1 | Route 2 AD analog current input terminal |
| | C2 | VI2, AI2 Input Port |
| | VI2 | Route 3 AD analog voltage input terminal |
| | AI2 | Route 3 AD analog current input terminal |
| | C3 | VI3, AI3 Input Port |
| | VI3 | Channel 4 AD analog voltage input terminal |
| | AI3 | Channel 4 AD analog current input terminal |

### Wiring Terminal Specifications

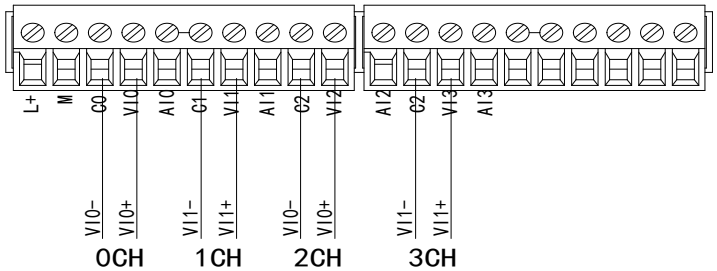
When wiring a module, its terminals must comply with the following requirements:

- Wire stripping length: 9 mm;
- Flexible conductor with tubular bare ends, cross-sectional area 0.25–1.5 mm²;
- Flexible conductor with tubular pre-insulated ends, cross-sectional area: 0.25–0.5 mm².

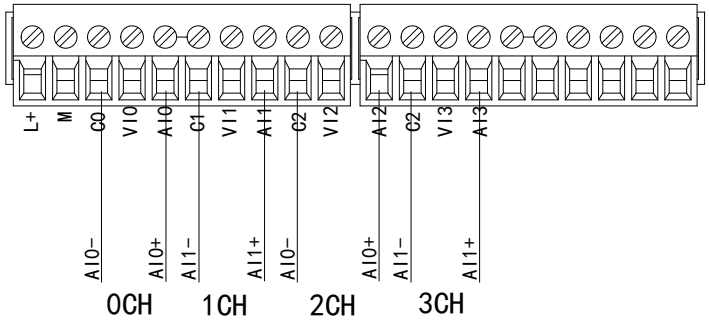
## 3.2.3 External Connection

When connecting externally, to avoid interference, please use a shielded cable and perform single-point grounding of the shield.

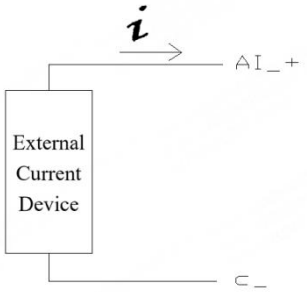
1) Single-ended voltage input



2) Single-ended current input




The XL-E4AD's current input-side wiring is shown in the figure below:




No DC24V power supply required for current output!

## 3.2.4 Input Definition Number Allocation

The XL series analog input modules do not occupy any I/O units; the converted values are directly written into the PLC registers. The definition numbers for the PLC registers corresponding to each channel are as follows:

First Expansion Module Register Definition Number

| Channel | AD signal | Channel Enable Switch | Channel Alarm Flag Bit |
|---|---|---|---|
| 0CH | ID10000 | Y10000 | X10000 |
| 1CH | ID10001 | Y10001 | X10001 |
| 2CH | ID10002 | Y10002 | X10002 |
| 3CH | ID10003 | Y10003 | X10003 |

Second Expansion Module Register Definition Number

| Channel | AD Signal | Channel Enable Switch | Channel Alarm Flag Bit |
|---|---|---|---|
| 0CH | ID10100 | Y10100 | X10100 |
| 1CH | ID10101 | Y10101 | X10101 |
| 2CH | ID10102 | Y10102 | X10102 |
| 3CH | ID10103 | Y10103 | X10103 |

Third Expansion Module Register Definition Code

| Channel | AD Signal | Channel Enable Switch | Channel Alarm Flag Bit |
|---|---|---|---|
| 0CH | ID10200 | Y10200 | X10200 |

| | | | |
|---|---|---|---|
| 1CH | ID10201 | Y10201 | X10201 |
| 2CH | ID10202 | Y10202 | X10202 |
| 3CH | ID10203 | Y10203 | X10203 |

Fourth Expansion Module Register Definition Number

| Channel | AD Signal | Channel Enable Switch | Channel Alarm Flag Bit |
|---|---|---|---|
| 0CH | ID10300 | Y10300 | X10300 |
| 1CH | ID10301 | Y10301 | X10301 |
| 2CH | ID10302 | Y10302 | X10302 |
| 3CH | ID10303 | Y10303 | X10303 |

Fifth expansion module register definition number

| Channel | AD Signal | Channel Enable Switch | Channel Alarm Flag Bit |
|---|---|---|---|
| 0CH | ID10400 | Y10400 | X10400 |
| 1CH | ID10401 | Y10401 | X10401 |
| 2CH | ID10402 | Y10402 | X10402 |
| 3CH | ID10403 | Y10403 | X10403 |

Sixth expansion module register definition number

| Channel | AD Signal | Channel Enable Switch | Channel Alarm Flag Bit |
|---|---|---|---|
| 0CH | ID10500 | Y10500 | X10500 |
| 1CH | ID10501 | Y10501 | X10501 |
| 2CH | ID10502 | Y10502 | X10502 |
| 3CH | ID10503 | Y10503 | X10503 |

Seventh expansion module register definition number

| Channel | AD Signal | Channel Enable Switch | Channel Alarm Flag Bit |
|---|---|---|---|
| 0CH | ID10600 | Y10600 | X10600 |
| 1CH | ID10601 | Y10601 | X10601 |
| 2CH | ID10602 | Y10602 | X10602 |
| 3CH | ID10603 | Y10603 | X10603 |

Eighth expansion module register definition number

| Channel | AD Signal | Channel Enable Switch | Channel Alarm Flag Bit |
|---|---|---|---|
| 0CH | ID10700 | Y10700 | X10700 |
| 1CH | ID10701 | Y10701 | X10701 |
| 2CH | ID10702 | Y10702 | X10702 |
| 3CH | ID10703 | Y10703 | X10703 |

Ninth Extended Module Register Definition Number

| Channel | AD Signal | Channel Enable Switch | Channel Alarm Flag Bit |
|---|---|---|---|
| 0CH | ID10800 | Y11000 | X11000 |
| 1CH | ID10801 | Y11001 | X11001 |
| 2CH | ID10802 | Y11002 | X11002 |
| 3CH | ID10803 | Y11003 | X11003 |

Tenth Extended Module Register Definition Number

| Channel | AD Signal | Channel Enable Switch | Channel Alarm Flag Bit |
|---|---|---|---|
| 0CH | ID10900 | Y11100 | X11100 |
| 1CH | ID10901 | Y11101 | X11101 |
| 2CH | ID10902 | Y11102 | X11102 |
| 3CH | ID10903 | Y11103 | X11103 |

Eleventh Expansion Module Register Definition Number

| Channel | AD Signal | Channel Enable Switch | Channel Alarm Flag Bit |
|---|---|---|---|
| 0CH | ID11000 | Y11200 | X11200 |
| 1CH | ID11001 | Y11201 | X11201 |
| 2CH | ID11002 | Y11202 | X11202 |
| 3CH | ID11003 | Y11203 | X11203 |

Twelfth Expansion Module Register Definition Number

| Channel | AD Signal | Channel Enable Switch | Channel Alarm Flag Bit |
|---|---|---|---|
| 0CH | ID11100 | Y11300 | X11300 |
| 1CH | ID11101 | Y11301 | X11301 |
| 2CH | ID11102 | Y11302 | X11302 |
| 3CH | ID11103 | Y11303 | X11303 |

Thirteenth Extended Module Register Definition Code

| Channel | AD Signal | Channel Enable Switch | Channel Alarm Flag Bit |
|---|---|---|---|
| 0CH | ID11200 | Y11400 | X11400 |
| 1CH | ID11201 | Y11401 | X11401 |
| 2CH | ID11202 | Y11402 | X11402 |
| 3CH | ID11203 | Y11403 | X11403 |

Fourteenth Extended Module Register Definition Code

| Channel | AD Signal | Channel Enable Switch | Channel Alarm Flag Bit |
|---|---|---|---|
| 0CH | ID11300 | Y11500 | X11500 |
| 1CH | ID11301 | Y11501 | X11501 |
| 2CH | ID11302 | Y11502 | X11502 |
| 3CH | ID11303 | Y11503 | X11503 |

Fifteenth Extended Module Register Definition Code.

| Channel | ADsignal | Channel Enable Switch | Channel Alarm Flag Bit |
|---|---|---|---|
| 0CH | ID11400 | Y11600 | X11600 |
| 1CH | ID11401 | Y11601 | X11601 |
| 2CH | ID11402 | Y11602 | X11602 |
| 3CH | ID11403 | Y11603 | X11603 |

Sixteenth Extended Module Register Definition Code

| Channel | ADsignal | Channel Enable Switch | Channel Alarm Flag Bit |
|---|---|---|---|
| 0CH | ID11500 | Y11700 | X11700 |
| 1CH | ID11501 | Y11701 | X11701 |
| 2CH | ID11502 | Y11702 | X11702 |

| | | | |
|---|---|---|---|
| 3CH | ID11503 | Y11703 | X11703 |

- Disabling unused channels can increase the input/output scanning speed.
- When the input enable switch is turned off during operation, the corresponding input channel will not capture any data (the data value will be displayed as 0).

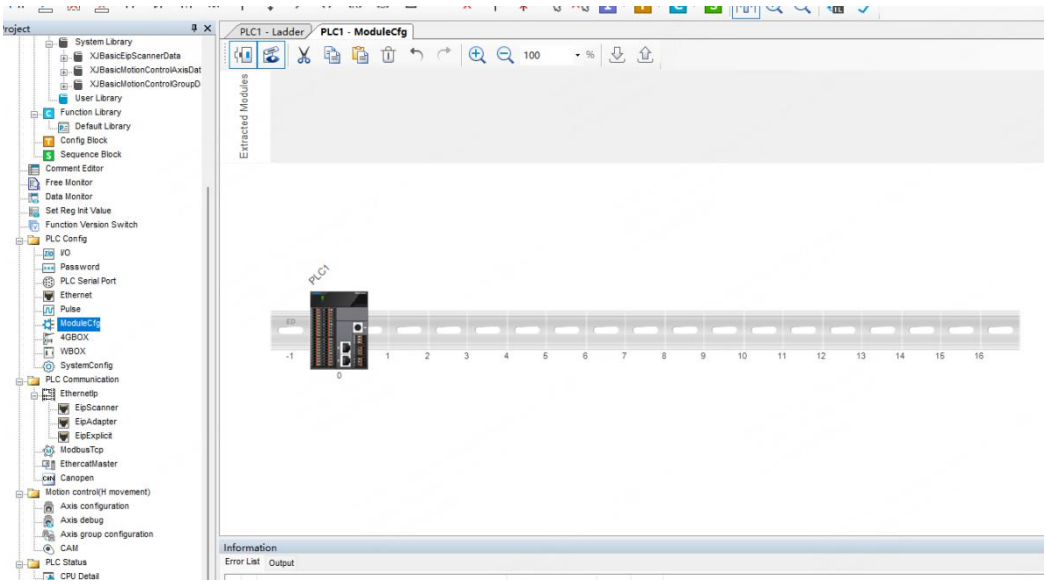
### 3.2.5 Work Mode Settings

There are two methods for configuring the operating mode (The effects of these two methods are equivalent.).

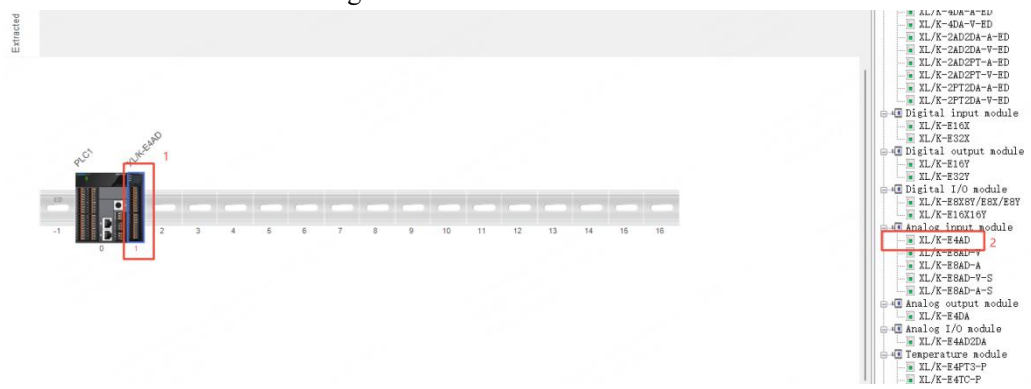
- Configure via the Control Panel;
- Set via Flash registers.

#### 1) Configuration Panel Configuration

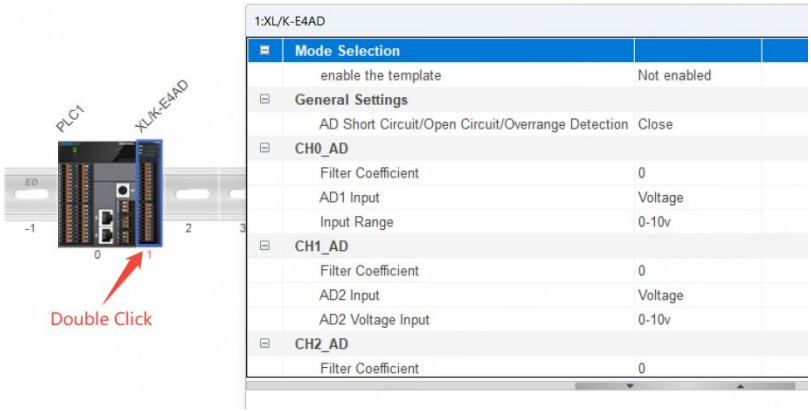
1. Use the Xinje PLC Programming Tool Software version 3.8.0a or later to configure the module; click [PLC Configuration] – [Module Configuration] in the left-side Engineering Bar to open the Expansion Module Settings window. For versions of the Xinje PLC Programming Tool Software prior to 3.8.0a, click [PLC Configuration] – [Expansion Module] in the left-side Engineering Bar to perform the configuration.




2. Select a module from the right-hand module list and drag it to the desired position; alternatively, double-click a module in the right-hand module list to select it:

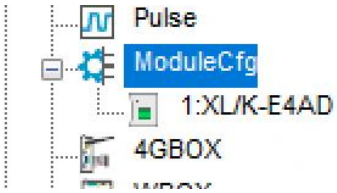


3. Double-click the corresponding module icon to access the module configuration interface, where you can select the AD filter coefficient and the voltage/current input mode for the AD channel.




4. Click " " to retrieve the default configuration parameters for the extended module.

5. After completing the parameter configuration for the expansion module, click " " to write the set values into the PLC; the changes will take effect only after the PLC is powered off and then powered on again. Under the Module Configuration Node, mount the configured module, then double-click it to enter the module parameter configuration interface.




The first-Program low-pass filtering method calculates the effective filtered value by weighting the current sample value against the previous filtered output value; the filtering coefficient is set by the user between 0 and 254 – a smaller value results in more stable data but may introduce data lag; therefore, when the coefficient is set to 1, the filtering effect is strongest and the data is most stable; when the coefficient is set to 254, the filtering effect is weakest; the default value is 0 (no filtering).

## 2) Flash Register Configuration

The expansion module's input and output channels support two selectable modes: voltage and current. The current range options include 0–20 mA, 4–20 mA, and –20–20 mA; the voltage range options include 0–5 V, 0–10 V, –5–5 V, and –10–10 V. These settings are configured using the SFD (Special FLASH Data Register) within the PLC. See below:

| Module ID | Configuration Information Address | Module ID | Configuration Information Address |
|---|---|---|---|
| #1 | SFD350~SFD359 | #9 | SFD430~SFD439 |
| #2 | SFD360~SFD369 | #10 | SFD440~SFD449 |

| Module ID | Configuration Information Address | Module ID | Configuration Information Address |
|---|---|---|---|
| #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 |



As shown above, each register is configured to set the mode for four channels; each register consists of 16 bits, and the modes for the four channels are configured sequentially in groups of four bits, from the lowest to the highest bit position.

### 3) SFD Bit Definition

Using the First Module as an example to illustrate the setup 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><th>Explain</th></tr>
<tr><td rowspan="2">SFD350</td><td>Byte0</td><td colspan="8">AD Channel 1, Channel 2 Filter Coefficient</td><td rowspan="2">AD filtering coefficient</td></tr>
<tr><td>Byte1</td><td colspan="8">AD Channel 3, Channel 4 filtering coefficient</td></tr>
<tr><td rowspan="6">SFD351</td><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="6">Used to specify the input range for the AD module: the lower 4 bits of Byte2 represent the configuration bits for AD Channel 1, while the upper 4 bits represent the configuration bits for AD Channel 2; the lower 4 bits of Byte3 represent the configuration bits for AD Channel 3, while the upper 4 bits represent the configuration</td></tr>
<tr><td colspan="4">AD2</td><td colspan="4">AD1</td></tr>
<tr><td>Reserved</td><td colspan="3">000：0~10V<br>001：0~5V<br>100：-10~10V<br>101：-5~5V<br>010：0~20mA<br>011：4~20mA<br>110：-20~20mA</td><td>Reserved</td><td colspan="3">000：0~10V<br>001：0~5V<br>100：-10~10V<br>101：-5~5V<br>010：0~20mA<br>011：4~20mA<br>110：-20~20mA</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>Reserved</td><td colspan="3">000：0~10V<br>001：0~5V<br>100：-10~10V<br>101：-5~5V</td><td>Reserved</td><td colspan="3">000：0~10V<br>001：0~5V<br>100：-10~10V<br>101：-5~5V</td></tr>
</table>

| Register | | Bit7 | Bit6 | Bit5 | Bit4 | Bit3 | Bit2 | Bit1 | Bit0 | Explain |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | 010：0~20mA<br>011：4~20mA<br>110：-20~20mA | | | | 010：0~20mA<br>011：4~20mA<br>110：-20~20mA | | | bits for AD Channel 4. |
| SFD352 | Byte4 | AD channel short-circuit/open-circuit/overshoot detection switch | | | | | | | | |
| | Byte5 | Reserved | | | | | | | | |
| SFD353~SFD359 | | Reserved | | | | | | | | |

Example: Set the operating modes for Channels 3, 2, 1, and 0 of the first module to 0–20 mA, 4–20 mA, 0–10 V, and 0–5 V, respectively; set the filtering coefficients for Channels 1 and 2 to 254, and set the filtering coefficients for Channels 3 and 4 to 100.

Method 1:

It can be configured directly from the configuration panel; the configuration method is shown in the figure above.

Method 2:

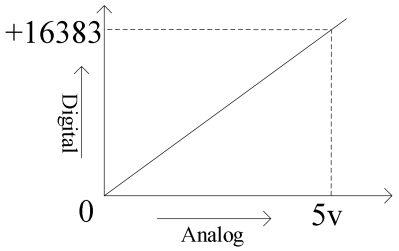
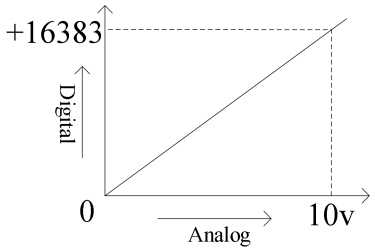
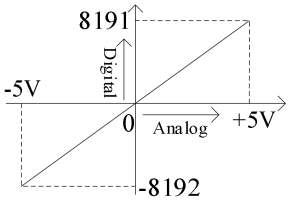
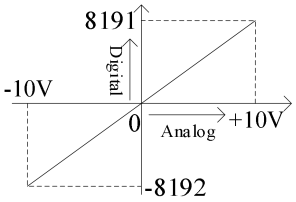
Set the SFD special register directly to the following value:

SFD350=64FEH SFD351=2301H SFD352=0000H SFD353=0000H

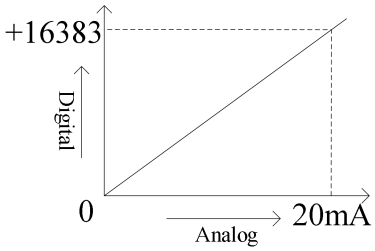
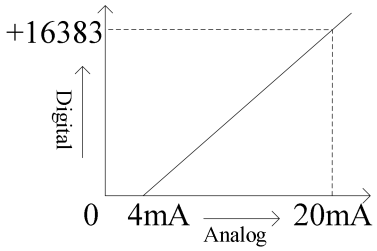
## 3.2.6 Analog-to-Digital Conversion Diagram

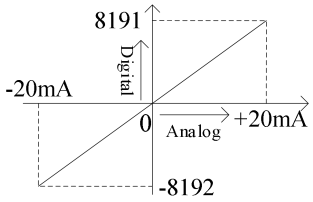
The relationship between the input analog signal and the converted digital signal is shown in the table below:

- Analog Voltage-to-Digital Conversion Diagram

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

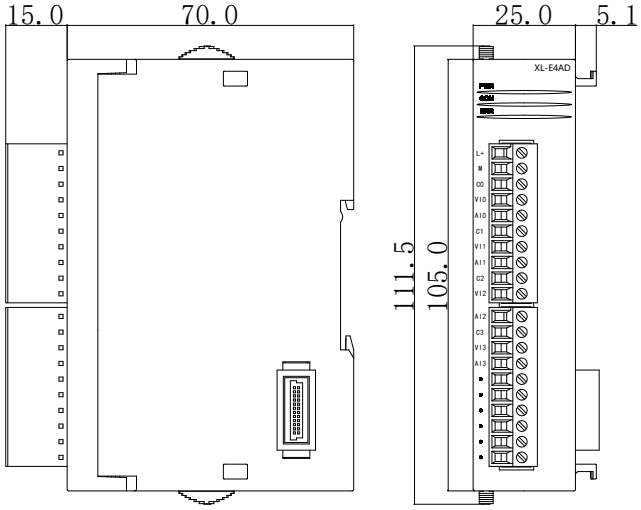
- Analog current-to-digital converter diagram

| 0–20 mA analog input | 4–20 mA analog input |
|---|---|
|  |  |

| -20~20 mA analog input | |
|---|---|
|  | |

When the channel enable switch is turned on and the AD voltage input is open-circuit, the corresponding ID register displays the value 16383; when the AD current input is open-circuit, the corresponding ID register displays the value 0. When the channel enable switch is turned off, the ID register corresponding to the AD voltage/current input displays the value 0.

## 3.2.7 External dimensions diagram




(unit:mm)

## 3.2.8 Programming Example

Example:

A pressure sensor output signal needs to be acquired (Pressure sensor performance parameters: detection pressure range 0 MPa–10 MPa; output analog signal: 4–20 mA).

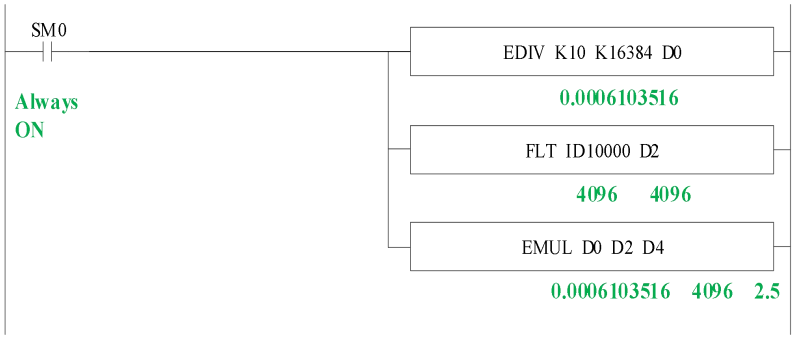
Analyse:

Since the pressure sensor's measurement range is 0 MPa–10 MPa, corresponding to an analog output of 4–20 mA, and the digital output range converted by the expansion module via analog-to-digital conversion is 0–16383, we can bypass the intermediate analog conversion step (4–20 mA) and directly map the pressure measurement range (0 MPa–10 MPa) to the digital output range (0–16383). The value 10 MPa / 16384 = 0.0006103515 represents the pressure value corresponding to each digital unit captured by the expansion module; therefore, by multiplying the real-time digital value read from the expansion module's ID register by 0.0006103515, the current pressure measured by the sensor can be calculated. For example, if the digital value read from the ID register is 4096, the corresponding pressure is 2.5 MPa.



- First, set the enable bit corresponding to the first channel – namely Y10000 – to ON.
- Please use floating-point arithmetic for calculations; otherwise, the calculation accuracy may be affected, or the calculation may even fail!

Program:



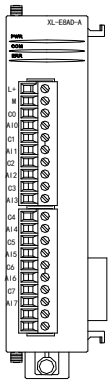

Explain:

The SM0 is a normally ON coil that remains in the ON state throughout the PLC's operation. When the PLC starts running, the analog signal acquisition first calculates the pressure value corresponding to each digital value of 1 acquired by the expansion module; then, it converts the digital value (integer type) read from the ID10000 register into a floating-point number. Therefore, the current real-time pressure value can be determined by multiplying the real-time value read from the ID10000 register of the expansion module by the pressure value corresponding to each digital value of 1 acquired by the expansion module.

# 3.3 14-bit Analog Current Input Module XL-E8AD-A

This section primarily describes the specifications of the XL-E8AD-A module, terminal pinouts, assignment of input definition codes, operating mode configuration, external connections, analog-to-digital conversion diagram, and external dimensions diagram.

## 3.3.1 Module Features and Specifications



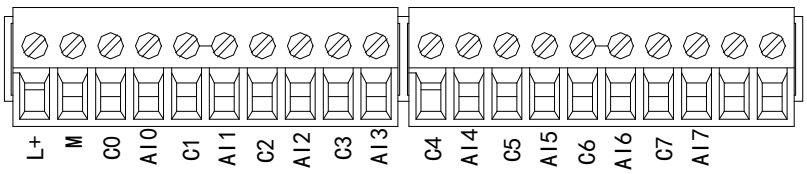
The XL-E8AD-A analog input module converts eight analog current input signals into digital values and transmits them to the PLC main unit, enabling real-time data exchange with the PLC main unit.

- 8-channel analog input: Current input.
- 14-bit high-precision analog input.
- As a specialized functional module for the XL series, the XL3/XL3E can connect up to 10 modules; the XL5/XL5E/XL5N/XL5H/XLME/ XLH/XSLH can support up to 16 modules; however, the XL1 does not support the addition of any modules.

Module Specifications

| Project | Analog Current Input |
|---|---|
| Analog Input Range | 0~20mA, 4~20mA, -20~20mA |
| Maximum Input Range | -40~40mA |
| Digital Output Range | 14-bit binary number (0–16383 or-8192–8191) |
| Resolution Ratio | 1/16383(14Bit) |
| Overall Accuracy | 1% |
| Conversion Rate | 2ms/1 channel |
| Module Power Supply | DC24V±10%, 150mA |

## 3.3.2 Terminal Specifications




| Name | | Function |
|---|---|---|
| Terminal Block | L+ | External power supply: +24V positive terminal for the module |
| | M | External power supply: 24V negative terminal for the module |
| | C0 | AI0 Output Port |
| | AI0 | Route 1 AD analog current input terminal |
| | C1 | AI1 Output Port |

| Name | | Function |
|---|---|---|
| | AI1 | Route 2 AD analog current input terminal |
| | C2 | AI2 Output Port |
| | AI2 | Route 3 AD analog current input terminal |
| | C3 | AI3 Output Port |
| | AI3 | Channel 4 AD analog current input terminal |
| | C4 | AI4 Output Port |
| | AI4 | Route 5 AD analog current input terminal |
| | C5 | AI5 Output Port |
| | AI5 | Route 6 AD analog current input terminal |
| | C6 | AI6 Output Port |
| | AI6 | Route 7 AD analog current input terminal |
| | C7 | AI7 Output Terminal |
| | AI7 | Route 8 AD analog current input terminal |

### Wiring terminal specifications

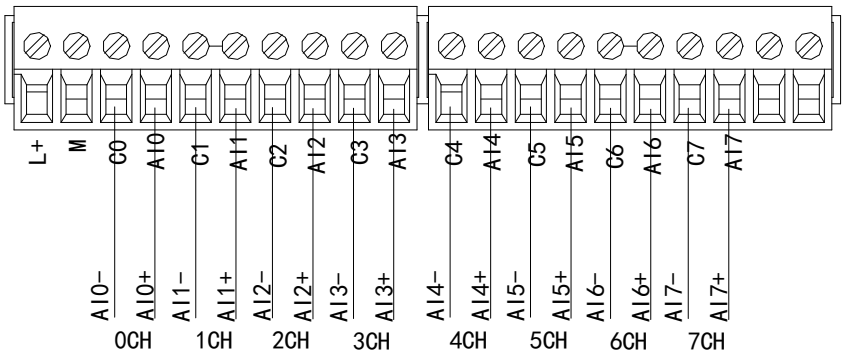
When wiring a module, its terminals must comply with the following requirements:

- Wire stripping length: 9 mm;
- Flexible conductor with tubular bare ends, cross-sectional area 0.25–1.5 mm²;
- Flexible conductor with tubular pre-insulated ends, cross-sectional area: 0.25–0.5 mm².

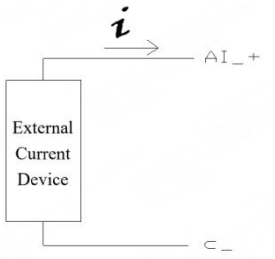
## 3.3.3 External Connection

When connecting externally, to avoid interference, please use a shielded cable and perform single-point grounding of the shield.

### Current single-ended input




The current input-side wiring for the XL-E8AD-A is shown in the figure below:



## 3.3.4 Input Definition Number Allocation

The XL series analog input modules do not occupy any I/O units; the converted values are directly written into the PLC registers. The definition numbers for the PLC registers corresponding to each channel are as follows:

First Expansion Module Register Definition Number

| Channel | AD Signal | Channel Enable Switch (Each channel can only be used when the enable bit is set to 1) | Channel Alarm Flag Bit |
|---|---|---|---|
| 0CH | ID10000 | Y10000 | X10000 |
| 1CH | ID10001 | Y10001 | X10001 |
| 2CH | ID10002 | Y10002 | X10002 |
| 3CH | ID10003 | Y10003 | X10003 |
| 4CH | ID10004 | Y10004 | X10004 |
| 5CH | ID10005 | Y10005 | X10005 |
| 6CH | ID10006 | Y10006 | X10006 |
| 7CH | ID10007 | Y10007 | X10007 |

Second Expansion Module Register Definition Number

| Channel | AD Signal | Channel Enable Switch (Each channel can only be used when the enable bit is set to 1) | Channel Alarm Flag Bit |
|---|---|---|---|
| 0CH | ID10100 | Y10100 | X10100 |
| 1CH | ID10101 | Y10101 | X10101 |
| 2CH | ID10102 | Y10102 | X10102 |
| 3CH | ID10103 | Y10103 | X10103 |
| 4CH | ID10104 | Y10104 | X10104 |
| 5CH | ID10105 | Y10105 | X10105 |
| 6CH | ID10106 | Y10106 | X10106 |
| 7CH | ID10107 | Y10107 | X10107 |

Third Expansion Module Register Definition Code

| Channel | AD Signal | Channel Enable Switch (Each channel can only be used when the enable bit is set to 1) | Channel Alarm Flag Bit |
|---|---|---|---|
| 0CH | ID10200 | Y10200 | X10200 |
| 1CH | ID10201 | Y10201 | X10201 |
| 2CH | ID10202 | Y10202 | X10202 |
| 3CH | ID10203 | Y10203 | X10203 |
| 4CH | ID10204 | Y10204 | X10204 |
| 5CH | ID10205 | Y10205 | X10205 |
| 6CH | ID10206 | Y10206 | X10206 |
| 7CH | ID10207 | Y10207 | X10207 |

Fourth Expansion Module Register Definition Number

| Channel | AD Signal | Channel Enable Switch (Each channel can only be used when the enable bit is set to 1) | Channel Alarm Flag Bit |
|---|---|---|---|
| 0CH | ID10300 | Y10300 | X10300 |
| 1CH | ID10301 | Y10301 | X10301 |
| 2CH | ID10302 | Y10302 | X10302 |
| 3CH | ID10303 | Y10303 | X10303 |
| 4CH | ID10304 | Y10304 | X10304 |
| 5CH | ID10305 | Y10305 | X10305 |
| 6CH | ID10306 | Y10306 | X10306 |
| 7CH | ID10307 | Y10307 | X10307 |

Fifth expansion module register definition number

| Channel | AD Signal | Channel Enable Switch (Each channel can only be used when the enable bit is set to 1) | Channel Alarm Flag Bit |
|---|---|---|---|
| 0CH | ID10400 | Y10400 | X10400 |
| 1CH | ID10401 | Y10401 | X10401 |
| 2CH | ID10402 | Y10402 | X10402 |
| 3CH | ID10403 | Y10403 | X10403 |
| 4CH | ID10404 | Y10404 | X10404 |
| 5CH | ID10405 | Y10405 | X10405 |
| 6CH | ID10406 | Y10406 | X10406 |
| 7CH | ID10407 | Y10407 | X10407 |

Sixth expansion module register definition number

| Channel | AD Signal | Channel Enable Switch (Each channel can only be used when the enable bit is set to 1) | Channel Alarm Flag Bit |
|---|---|---|---|
| 0CH | ID10500 | Y10500 | X10500 |
| 1CH | ID10501 | Y10501 | X10501 |
| 2CH | ID10502 | Y10502 | X10502 |
| 3CH | ID10503 | Y10503 | X10503 |
| 4CH | ID10504 | Y10504 | X10504 |
| 5CH | ID10505 | Y10505 | X10505 |
| 6CH | ID10506 | Y10506 | X10506 |
| 7CH | ID10507 | Y10507 | X10507 |

Seventh expansion module register definition number

| Channel | AD Signal | Channel Enable Switch (Each channel can only be used when the enable bit is set to 1) | Channel Alarm Flag Bit |
|---|---|---|---|
| 0CH | ID10600 | Y10600 | X10600 |
| 1CH | ID10601 | Y10601 | X10601 |
| 2CH | ID10602 | Y10602 | X10602 |
| 3CH | ID10603 | Y10603 | X10603 |
| 4CH | ID10604 | Y10604 | X10604 |
| 5CH | ID10605 | Y10605 | X10605 |

| Channel | AD Signal | Channel Enable Switch (Each channel can only be used when the enable bit is set to 1) | Channel Alarm Flag Bit |
|---|---|---|---|
| 6CH | ID10606 | Y10606 | X10606 |
| 7CH | ID10607 | Y10607 | X10607 |

Eighth expansion module register definition number

| Channel | AD Signal | Channel Enable Switch (Each channel can only be used when the enable bit is set to 1) | Channel Alarm Flag Bit |
|---|---|---|---|
| 0CH | ID10700 | Y10700 | X10700 |
| 1CH | ID10701 | Y10701 | X10701 |
| 2CH | ID10702 | Y10702 | X10702 |
| 3CH | ID10703 | Y10703 | X10703 |
| 4CH | ID10704 | Y10704 | X10704 |
| 5CH | ID10705 | Y10705 | X10705 |
| 6CH | ID10706 | Y10706 | X10706 |
| 7CH | ID10707 | Y10707 | X10707 |

Ninth Extended Module Register Definition Number

| Channel | AD Signal | Channel Enable Switch (Each channel can only be used when the enable bit is set to 1) | Channel Alarm Flag Bit |
|---|---|---|---|
| 0CH | ID10800 | Y11000 | X11000 |
| 1CH | ID10801 | Y11001 | X11001 |
| 2CH | ID10802 | Y11002 | X11002 |
| 3CH | ID10803 | Y11003 | X11003 |
| 4CH | ID10804 | Y11004 | X11004 |
| 5CH | ID10805 | Y11005 | X11005 |
| 6CH | ID10806 | Y11006 | X11006 |
| 7CH | ID10807 | Y11007 | X11007 |

Tenth Extended Module Register Definition Number

| Channel | AD Signal | Channel Enable Switch (Each channel can only be used when the enable bit is set to 1) | Channel Alarm Flag Bit |
|---|---|---|---|
| 0CH | ID10900 | Y11100 | X11100 |
| 1CH | ID10901 | Y11101 | X11101 |
| 2CH | ID10902 | Y11102 | X11102 |
| 3CH | ID10903 | Y11103 | X11103 |
| 4CH | ID10904 | Y11104 | X11104 |
| 5CH | ID10905 | Y11105 | X11105 |
| 6CH | ID10906 | Y11106 | X11106 |
| 7CH | ID10907 | Y11107 | X11107 |

Eleventh Expansion Module Register Definition Number

| Channel | AD Signal | Channel Enable Switch (Each channel can only be used when the enable bit is set to 1) | Channel Alarm Flag Bit |
|---|---|---|---|

| | | | |
|---|---|---|---|
| 0CH | ID11000 | Y11200 | X11200 |
| 1CH | ID11001 | Y11201 | X11201 |
| 2CH | ID11002 | Y11202 | X11202 |
| 3CH | ID11003 | Y11203 | X11203 |
| 4CH | ID11004 | Y11204 | X11204 |
| 5CH | ID11005 | Y11205 | X11205 |
| 6CH | ID11006 | Y11206 | X11206 |
| 7CH | ID11007 | Y11207 | X11207 |

Twelfth Expansion Module Register Definition Number

| Channel | AD Signal | Channel Enable Switch (Each channel can only be used when the enable bit is set to 1) | Channel Alarm Flag Bit |
|---|---|---|---|
| 0CH | ID11100 | Y11300 | X11300 |
| 1CH | ID11101 | Y11301 | X11301 |
| 2CH | ID11102 | Y11302 | X11302 |
| 3CH | ID11103 | Y11303 | X11303 |
| 4CH | ID11104 | Y11304 | X11304 |
| 5CH | ID11105 | Y11305 | X11305 |
| 6CH | ID11106 | Y11306 | X11306 |
| 7CH | ID11107 | Y11307 | X11307 |

Thirteenth Extended Module Register Definition Code

| Channel | AD Signal | Channel Enable Switch (Each channel can only be used when the enable bit is set to 1) | Channel Alarm Flag Bit |
|---|---|---|---|
| 0CH | ID11200 | Y11400 | X11400 |
| 1CH | ID11201 | Y11401 | X11401 |
| 2CH | ID11202 | Y11402 | X11402 |
| 3CH | ID11203 | Y11403 | X11403 |
| 4CH | ID11204 | Y11404 | X11404 |
| 5CH | ID11205 | Y11405 | X11405 |
| 6CH | ID11206 | Y11406 | X11406 |
| 7CH | ID11207 | Y11407 | X11407 |

Fourteenth Extended Module Register Definition Code

| Channel | AD Signal | Channel Enable Switch (Each channel can only be used when the enable bit is set to 1) | Channel Alarm Flag Bit |
|---|---|---|---|
| 0CH | ID11300 | Y11500 | X11500 |
| 1CH | ID11301 | Y11501 | X11501 |
| 2CH | ID11302 | Y11502 | X11502 |
| 3CH | ID11303 | Y11503 | X11503 |
| 4CH | ID11304 | Y11504 | X11504 |
| 5CH | ID11305 | Y11505 | X11505 |
| 6CH | ID11306 | Y11506 | X11506 |
| 7CH | ID11307 | Y11507 | X11507 |

Fifteenth Extended Module Register Definition Code

| Channel | AD Signal | Channel Enable Switch (Each channel can only be used when the enable bit is set to 1) | Channel Alarm Flag Bit |
|---|---|---|---|
| 0CH | ID11400 | Y11600 | X11600 |
| 1CH | ID11401 | Y11601 | X11601 |
| 2CH | ID11402 | Y11602 | X11602 |
| 3CH | ID11403 | Y11603 | X11603 |
| 4CH | ID11404 | Y11604 | X11604 |
| 5CH | ID11405 | Y11605 | X11605 |
| 6CH | ID11406 | Y11606 | X11606 |
| 7CH | ID11407 | Y11607 | X11607 |

Sixteenth Extended Module Register Definition Code

| Channel | AD Signal | Channel Enable Switch (Each channel can only be used when the enable bit is set to 1) | Channel Alarm Flag Bit |
|---|---|---|---|
| 0CH | ID11500 | Y11700 | X11700 |
| 1CH | ID11501 | Y11701 | X11701 |
| 2CH | ID11502 | Y11702 | X11702 |
| 3CH | ID11503 | Y11703 | X11703 |
| 4CH | ID11504 | Y11704 | X11704 |
| 5CH | ID11505 | Y11705 | X11705 |
| 6CH | ID11506 | Y11706 | X11706 |
| 7CH | ID11507 | Y11707 | X11707 |



- Disabling unused channels can increase the input/output scanning speed.
- When the input enable switch is turned off during operation, the corresponding input channel will not capture any data (the data value will be displayed as 0).

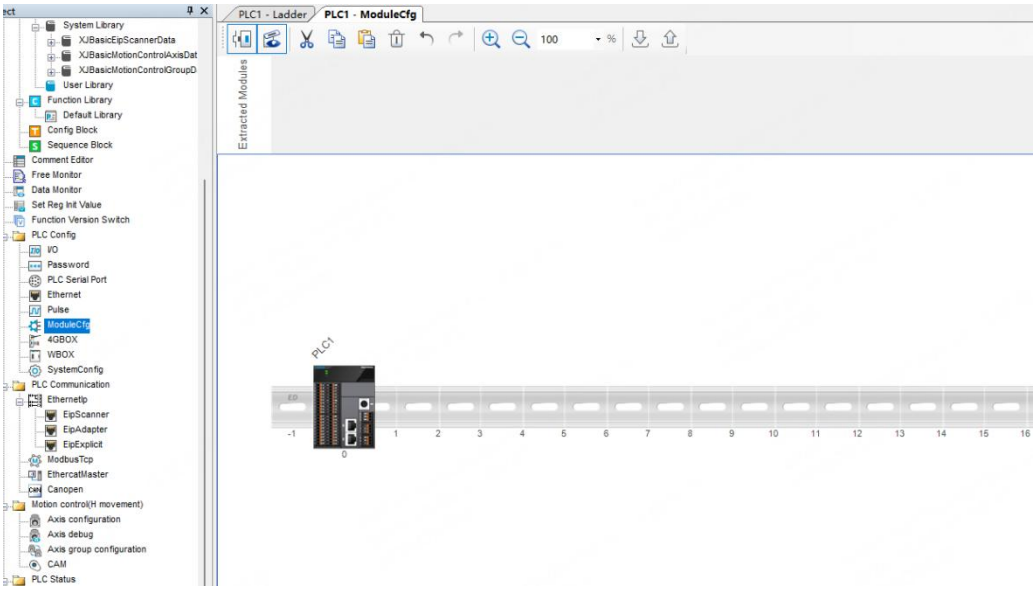
## 3.3.5 Work Mode Settings

There are two methods for configuring the operating mode (The effects of these two methods are equivalent.).

- Through Control Panel configuration
- Set via Flash registers

1) Configuration Panel Configuration

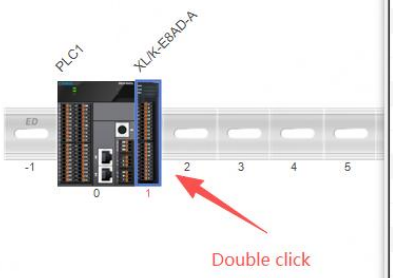
1. Use the Xinje PLC Programming Tool Software version 3.8.0a or later to configure the module; click [PLC Configuration] – [Module Configuration] in the left-side Engineering Bar to open the Expansion Module Settings window. For versions of the Xinje PLC Programming Tool Software prior to 3.8.0a, click [PLC Configuration] – [Expansion Module] in the left-side Engineering Bar to perform the configuration.




2. Select a module from the right-hand module list and drag it to the desired position; alternatively, double-click a module in the right-hand module list to select it:



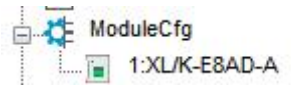
3. Double-click the corresponding module icon to access the module configuration interface, where you can select the AD filter coefficient and the voltage input mode for the AD channel.




| Mode Selection | |
|---|---|
| enable the template | Not enabled |
| **General Settings** | |
| AD Short Circuit/Open Circuit/Overrange Detection | Close |
| **CH0_AD** | |
| Filter Coefficient | 0 |
| Input Range | 0-20ma |
| **CH1_AD** | |
| Filter Coefficient | 0 |
| Input Range | 0-20ma |
| **CH2_AD** | |
| Filter Coefficient | 0 |
| Input Range | 0-20ma |
| **CH3_AD** | |
| Filter Coefficient | 0 |
| Input Range | 0-20ma |
| **CH4_AD** | |
| Filter Coefficient | 0 |
| Input Range | 0-20ma |

4. Click "" to  retrieve the default configuration parameters for the extended module.

5. After completing the parameter configuration  for the expansion module, click "" to write the set values into the PLC; the changes will take effect only after the PLC is powered off and then powered on again. Under the Module Configuration Node, mount the configured module, then double-click it to enter the module parameter configuration interface.






The first-order low-pass filtering method calculates the effective filtered value by weighting the current sample value against the previous filtered output value. The filtering coefficient can be set by the user to a range of 0–254: a lower value results in greater data stability but may introduce data lag; setting it to 1 provides the strongest filtering effect and the highest data stability; setting it to 254 yields the weakest filtering effect; the default setting is 0 (no filtering).

## 2) Flash Register Configuration

The expansion module's input channels operate in current-mode, with selectable ranges of 0–20 mA, 4–20 mA, or-20–20 mA; these settings are configured via the internal PLC's special FLASH data register, SFD. As shown below:

| Module ID | Configuration Information Address | Module ID | Configuration Information 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 |

| Module ID | Configuration Information Address | Module ID | Configuration Information Address |
|---|---|---|---|
| #8 | SFD420~SFD429 | #16 | SFD500~SFD509 |



As shown above, each register is configured to set the mode for four channels; each register consists of 16 bits, and the modes for the four channels are configured sequentially in groups of four bits, from the lowest to the highest bit position.

### 3) SFD Bit Definition

| | Bit7 | Bit6 | Bit5 | Bit4 | Bit3 | Bit2 | Bit1 | Bit0 | Explain |
|---|---|---|---|---|---|---|---|---|---|
| Byte0 | AD Channel 2; Channel 1 filtering coefficient | | | | | | | | AD filtering coefficient |
| Byte1 | AD Channel 4; Channel 3 filtering coefficient | | | | | | | | |
| Byte2 | AD Channel 6; Channel 5 filtering coefficient | | | | | | | | |
| Byte3 | AD Channel 8; Channel 7 filtering coefficient | | | | | | | | |
| Byte4 | Bit7 | Bit6 | Bit5 | Bit4 | Bit3 | Bit2 | Bit1 | Bit0 | Used to specify the input range of the AD module; the lower 4 bits of Byte4 represent the configuration bits for AD Channel 1, while the upper 4 bits represent the configuration bits for AD Channel 2;<br>The lower 4 bits of Byte5 represent the configuration bits for AD Channel 3; the upper 4 bits represent the |
| | AD2 | | | | AD1 | | | | |
| | 1000: Current 0–20 mA<br>1001: Current 4–20 mA<br>1010: Current – 20–20 mA | | | | 1000: Current 0–20 mA<br>1001: Current 4–20 mA<br>1010: Current – 20–20 mA | | | | |
| Byte5 | Bit7 | Bit6 | Bit5 | Bit4 | Bit3 | Bit2 | Bit1 | Bit0 | |
| | AD4 | | | | AD3 | | | | |
| | 1000: Current 0–20 mA<br>1001: Current 4–20 mA<br>1010: Current – 20–20 mA | | | | 1000: Current 0–20 mA<br>1001: Current 4–20 mA<br>1010: Current – 20–20 mA | | | | |
| Byte6 | Bit7 | Bit6 | Bit5 | Bit4 | Bit3 | Bit2 | Bit1 | Bit0 | |
| | AD6 | | | | AD5 | | | | |
| | 1000: Current 0–20 mA<br>1001: Current 4–20 mA<br>1010: Current – 20–20 mA | | | | 1000: Current 0–20 mA<br>1001: Current 4–20 mA<br>1010: Current – 20–20 mA | | | | |
| Byte7 | Bit7 | Bit6 | Bit5 | Bit4 | Bit3 | Bit2 | Bit1 | Bit0 | |
| | AD8 | | | | AD7 | | | | |
| | 1000: Current 0–20 mA<br>1001: Current 4–20 mA<br>1010: Current – 20–20 mA | | | | 1000: Current 0–20 mA<br>1001: Current 4–20 mA<br>1010: Current – 20–20 mA | | | | |

| | | |
|---|---|---|
| Byte8~ Byte19 | Reserved | configuration bits for AD Channel 4; the lower 4 bits of Byte6 represent the configuration bits for AD Channel 5; the upper 4 bits represent the configuration bits for AD Channel 6;<br>The lower 4 bits of Byte7 represent the configuration bits for AD Channel 7; the upper 4 bits represent the configuration bits for AD Channel 8. |

Example: Set the operating mode for input channels 1 and 0 of the first module to 0–20 mA; set the operating mode for input channels 3 and 2 to 4–20 mA; set the operating mode for input channels 5 and 4 to 0–20 mA; set the operating mode for input channels 7 and 6 to-20–20 mA; set the filtering coefficient for channels 0, 1, 2, and 3 to 254; set the filtering coefficient for channels 4, 5, 6, and 7 to 100.

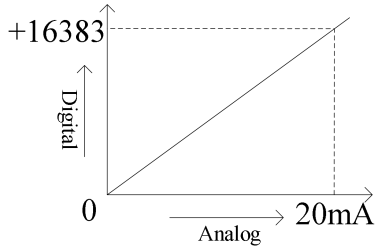
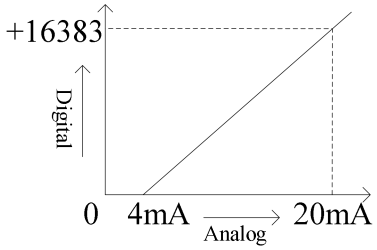
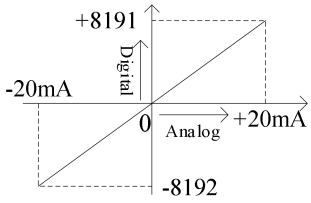
Method 1: You can configure this directly from the Configuration Panel; the configuration procedure is described in Section 3-3-5-1.

Method 2: Directly set the SFD special register to the following value:

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

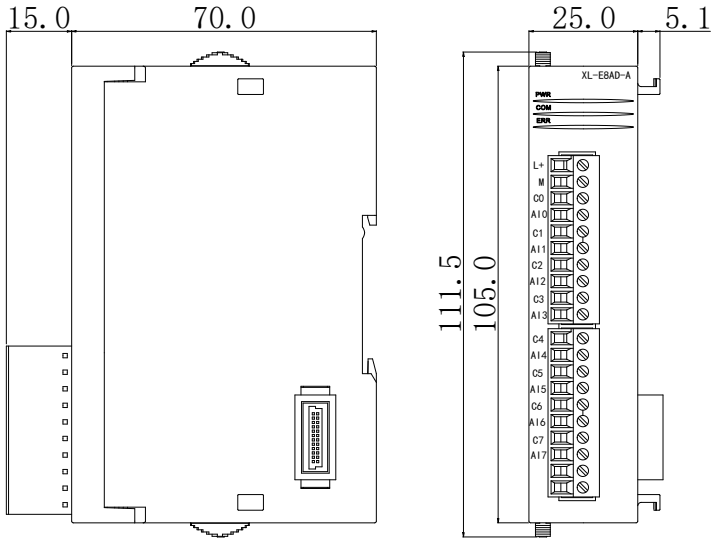
## 3.3.6 Analog-to-Digital Conversion Diagram

The relationship between the input analog signal and the converted digital signal is shown in the table below:

<table>
<tr><th>0–20 mA analog input</th><th>4–20 mA analog input</th></tr>
<tr><td>
</td><td>
</td></tr>
<tr><th>-20~20 mA analog input</th><th></th></tr>
<tr><td>
</td><td></td></tr>
</table>

When the channel enable switch is turned on and the AD current input is open-circuit, the ID register corresponding to the AD current input displays 0. When the channel enable switch is turned off, the ID register corresponding to the AD current input also displays 0.

## 3.3.7 External dimensions diagram



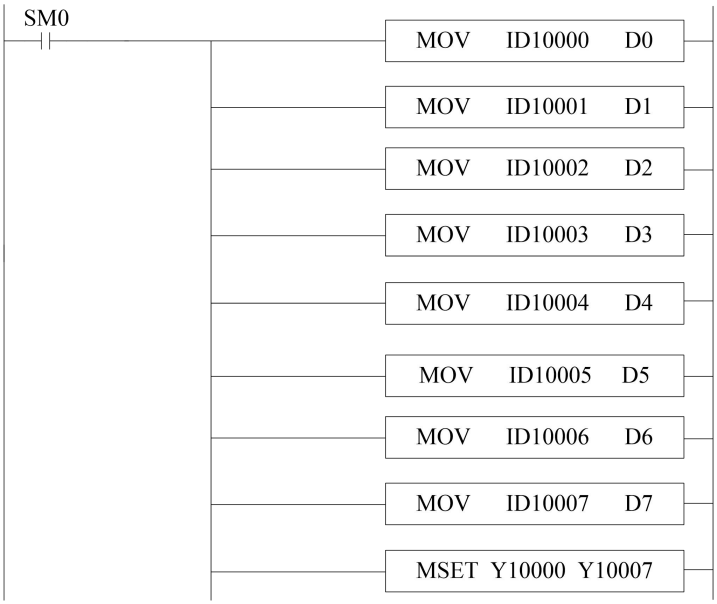

(Unit: mm)

## 3.3.8 Programming Example

Example:

Read real-time data from eight channels (taking Module 1 as an example).

Program:




Explain:

SM0 is a normally ON coil that remains in the ON state throughout the PLC operation.
The PLC starts operating and continuously writes the data from Channel 0 of Module #1 into the data register D0;

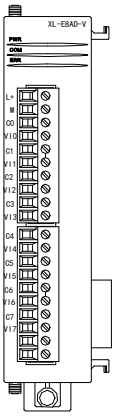
Data from Channel 1 is written into the Data Register D1;
Data from Channel 2 is written into Data Register D2;
Write data from Channel 3 into Data Register D3;
Data from Channel 4 is written into Data Register D4;
Data from Channel 5 is written into Data Register D5;
Write data from Channel 6 into Data Register D6;
Write data from Channel 7 to Data Register D7;

Since all channels are in use, enable all channel enable bits.

# 3.4 14-bit Analog Voltage Input Module XL-E8AD-V

This chapter primarily introduces the specifications of the XL-E8AD-V module, terminal descriptions, assignment of input definition codes, operating mode configuration, external connections, analog-to-digital conversion diagram, and external dimensions diagram.

## 3.4.1 Module Features and Specifications



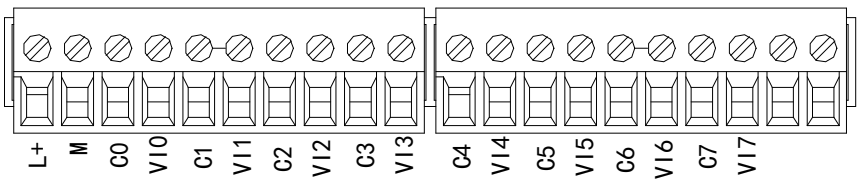
The XL-E8AD-V analog voltage input module converts eight analog input signals into digital values and transmits them to the PLC main unit, enabling real-time data exchange with the PLC main unit.

- 8-channel analog input: Voltage input.
- 14-bit high-precision analog input.
- As a specialized functional module for the XL series, the XL3/XL3E can connect up to 10 modules; the XL5/XL5E/XL5N/XL5H/XLME/ XLH/XSLH can support up to 16 modules; however, the XL1 does not support the addition of any modules.

Module Specifications

| Project | Analog Voltage Input |
|---|---|
| Analog Input Range | 0~5V、0~10V、-5~5V、-10~10V |
| Maximum Input Range | DC±15V |
| Digital Output Range | 14-bit binary number (0–16383 or-8192–8191) |
| Resolution Ratio | 1/16383 (14Bit) |
| Overall Accuracy | 1% |
| Conversion Rate | 2ms/1 channel |
| Module Power Supply | DC24V±10%，150mA |

## 3.4.2 Terminal Specifications




| Name | | Function |
|---|---|---|
| Terminal Block | L+ | External power supply: +24V positive terminal for the module |
| | M | External power supply: 24V negative terminal for the module |
| | C0 | VI0 Output Terminal |
| | VI0 | Route 1 AD analog voltage input terminal |

| Name | | Function |
|---|---|---|
| | C1 | VI1 Output Terminal |
| | VI1 | AD Analog Voltage Input Terminal (Channel 2) |
| | C2 | VI2 Output Terminal |
| | VI2 | Route 3 AD analog voltage input terminal |
| | C3 | VI3 Output Terminal |
| | VI3 | Channel 4 AD analog voltage input terminal |
| | C4 | VI4 Output Terminal |
| | VI4 | Route 5 AD analog voltage input terminal |
| | C5 | VI5 Output Terminal |
| | VI5 | Route 6 AD analog voltage input terminal |
| | C6 | VI6 Output Terminal |
| | VI6 | Route 7 AD analog voltage input terminal |
| | C7 | VI7 Output Terminal |
| | VI7 | Route 8 AD analog voltage input terminal |

Wiring terminal specifications

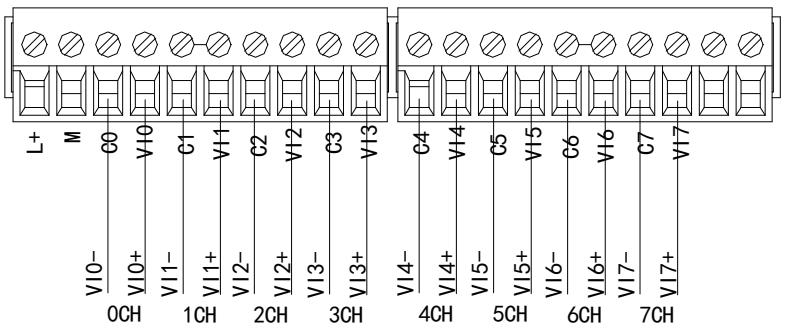
When wiring a module, its terminals must comply with the following requirements:

- Wire stripping length: 9 mm;
- Flexible conductor with tubular bare ends, cross-sectional area 0.25–1.5 mm²;
- Flexible conductor with tubular pre-insulated ends, cross-sectional area: 0.25–0.5 mm².

## 3.4.3 External Connection

When connecting externally, to avoid interference, please use a shielded cable and perform single-point grounding of the shield.

Single-ended voltage input




## 3.4.4 Input/Output Definition Number Allocation

The XL series analog input modules do not occupy any I/O units; the converted values are directly written into the PLC registers. The definition numbers for the PLC registers corresponding to each channel are as follows:

First Expansion Module Register Definition Number

| Channel | AD Signal | Channel Enable Switch (Each channel can only be used when the enable bit is set to 1) | Channel Alarm Flag Bit |
|---|---|---|---|
| 0CH | ID10000 | Y10000 | X10000 |
| 1CH | ID10001 | Y10001 | X10001 |
| 2CH | ID10002 | Y10002 | X10002 |
| 3CH | ID10003 | Y10003 | X10003 |
| 4CH | ID10004 | Y10004 | X10004 |
| 5CH | ID10005 | Y10005 | X10005 |
| 6CH | ID10006 | Y10006 | X10006 |
| 7CH | ID10007 | Y10007 | X10007 |

Second Expansion Module Register Definition Number

| Channel | AD Signal | Channel Enable Switch (Each channel can only be used when the enable bit is set to 1) | Channel Alarm Flag Bit |
|---|---|---|---|
| 0CH | ID10100 | Y10100 | X10100 |
| 1CH | ID10101 | Y10101 | X10101 |
| 2CH | ID10102 | Y10102 | X10102 |
| 3CH | ID10103 | Y10103 | X10103 |
| 4CH | ID10104 | Y10104 | X10104 |
| 5CH | ID10105 | Y10105 | X10105 |
| 6CH | ID10106 | Y10106 | X10106 |
| 7CH | ID10107 | Y10107 | X10107 |

Third Expansion Module Register Definition Code

| Channel | AD Signal | Channel Enable Switch (Each channel can only be used when the enable bit is set to 1) | Channel Alarm Flag Bit |
|---|---|---|---|
| 0CH | ID10200 | Y10200 | X10200 |
| 1CH | ID10201 | Y10201 | X10201 |
| 2CH | ID10202 | Y10202 | X10202 |
| 3CH | ID10203 | Y10203 | X10203 |
| 4CH | ID10204 | Y10204 | X10204 |
| 5CH | ID10205 | Y10205 | X10205 |
| 6CH | ID10206 | Y10206 | X10206 |
| 7CH | ID10207 | Y10207 | X10207 |

Fourth Expansion Module Register Definition Number

| Channel | AD Signal | Channel Enable Switch (Each channel can only be used when the enable bit is set to 1) | Channel Alarm Flag Bit |
|---|---|---|---|
| 0CH | ID10300 | Y10300 | X10300 |
| 1CH | ID10301 | Y10301 | X10301 |
| 2CH | ID10302 | Y10302 | X10302 |
| 3CH | ID10303 | Y10303 | X10303 |
| 4CH | ID10304 | Y10304 | X10304 |

| Channel | AD Signal | Channel Enable Switch (Each channel can only be used when the enable bit is set to 1) | Channel Alarm Flag Bit |
|---|---|---|---|
| 5CH | ID10305 | Y10305 | X10305 |
| 6CH | ID10306 | Y10306 | X10306 |
| 7CH | ID10307 | Y10307 | X10307 |

Fifth expansion module register definition number

| Channel | AD Signal | Channel Enable Switch (Each channel can only be used when the enable bit is set to 1) | Channel Alarm Flag Bit |
|---|---|---|---|
| 0CH | ID10400 | Y10400 | X10400 |
| 1CH | ID10401 | Y10401 | X10401 |
| 2CH | ID10402 | Y10402 | X10402 |
| 3CH | ID10403 | Y10403 | X10403 |
| 4CH | ID10404 | Y10404 | X10404 |
| 5CH | ID10405 | Y10405 | X10405 |
| 6CH | ID10406 | Y10406 | X10406 |
| 7CH | ID10407 | Y10407 | X10407 |

Sixth expansion module register definition number

| Channel | AD Signal | Channel Enable Switch (Each channel can only be used when the enable bit is set to 1) | Channel Alarm Flag Bit |
|---|---|---|---|
| 0CH | ID10500 | Y10500 | X10500 |
| 1CH | ID10501 | Y10501 | X10501 |
| 2CH | ID10502 | Y10502 | X10502 |
| 3CH | ID10503 | Y10503 | X10503 |
| 4CH | ID10504 | Y10504 | X10504 |
| 5CH | ID10505 | Y10505 | X10505 |
| 6CH | ID10506 | Y10506 | X10506 |
| 7CH | ID10507 | Y10507 | X10507 |

Seventh expansion module register definition number

| Channel | AD Signal | Channel Enable Switch (Each channel can only be used when the enable bit is set to 1) | Channel Alarm Flag Bit |
|---|---|---|---|
| 0CH | ID10600 | Y10600 | X10600 |
| 1CH | ID10601 | Y10601 | X10601 |
| 2CH | ID10602 | Y10602 | X10602 |
| 3CH | ID10603 | Y10603 | X10603 |
| 4CH | ID10604 | Y10604 | X10604 |
| 5CH | ID10605 | Y10605 | X10605 |
| 6CH | ID10606 | Y10606 | X10606 |
| 7CH | ID10607 | Y10607 | X10607 |

Eighth expansion module register definition number

| Channel | AD Signal | Channel Enable Switch (Each channel can only be used when the enable bit is set to 1) | Channel Alarm Flag Bit |
|---|---|---|---|
| 0CH | ID10700 | Y10700 | X10700 |
| 1CH | ID10701 | Y10701 | X10701 |
| 2CH | ID10702 | Y10702 | X10702 |
| 3CH | ID10703 | Y10703 | X10703 |
| 4CH | ID10704 | Y10704 | X10704 |
| 5CH | ID10705 | Y10705 | X10705 |
| 6CH | ID10706 | Y10706 | X10706 |
| 7CH | ID10707 | Y10707 | X10707 |

Ninth Extended Module Register Definition Number

| Channel | AD Signal | Channel Enable Switch (Each channel can only be used when the enable bit is set to 1) | Channel Alarm Flag Bit |
|---|---|---|---|
| 0CH | ID10800 | Y11000 | X11000 |
| 1CH | ID10801 | Y11001 | X11001 |
| 2CH | ID10802 | Y11002 | X11002 |
| 3CH | ID10803 | Y11003 | X11003 |
| 4CH | ID10804 | Y11004 | X11004 |
| 5CH | ID10805 | Y11005 | X11005 |
| 6CH | ID10806 | Y11006 | X11006 |
| 7CH | ID10807 | Y11007 | X11007 |

Tenth Extended Module Register Definition Number

| Channel | AD Signal | Channel Enable Switch (Each channel can only be used when the enable bit is set to 1) | Channel Alarm Flag Bit |
|---|---|---|---|
| 0CH | ID10900 | Y11100 | X11100 |
| 1CH | ID10901 | Y11101 | X11101 |
| 2CH | ID10902 | Y11102 | X11102 |
| 3CH | ID10903 | Y11103 | X11103 |
| 4CH | ID10904 | Y11104 | X11104 |
| 5CH | ID10905 | Y11105 | X11105 |
| 6CH | ID10906 | Y11106 | X11106 |
| 7CH | ID10907 | Y11107 | X11107 |

Eleventh Expansion Module Register Definition Number

| Channel | AD Signal | Channel Enable Switch (Each channel can only be used when the enable bit is set to 1) | Channel Alarm Flag Bit |
|---|---|---|---|
| 0CH | ID11000 | Y11200 | X11200 |
| 1CH | ID11001 | Y11201 | X11201 |
| 2CH | ID11002 | Y11202 | X11202 |
| 3CH | ID11003 | Y11203 | X11203 |
| 4CH | ID11004 | Y11204 | X11204 |
| 5CH | ID11005 | Y11205 | X11205 |

| Channel | AD Signal | Channel Enable Switch (Each channel can only be used when the enable bit is set to 1) | Channel Alarm Flag Bit |
|---|---|---|---|
| 6CH | ID11006 | Y11206 | X11206 |
| 7CH | ID11007 | Y11207 | X11207 |

Twelfth Expansion Module Register Definition Number

| Channel | AD Signal | Channel Enable Switch (Each channel can only be used when the enable bit is set to 1) | Channel Alarm Flag Bit |
|---|---|---|---|
| 0CH | ID11100 | Y11300 | X11300 |
| 1CH | ID11101 | Y11301 | X11301 |
| 2CH | ID11102 | Y11302 | X11302 |
| 3CH | ID11103 | Y11303 | X11303 |
| 4CH | ID11104 | Y11304 | X11304 |
| 5CH | ID11105 | Y11305 | X11305 |
| 6CH | ID11106 | Y11306 | X11306 |
| 7CH | ID11107 | Y11307 | X11307 |

Thirteenth Extended Module Register Definition Code

| Channel | AD Signal | Channel Enable Switch (Each channel can only be used when the enable bit is set to 1) | Channel Alarm Flag Bit |
|---|---|---|---|
| 0CH | ID11200 | Y11400 | X11400 |
| 1CH | ID11201 | Y11401 | X11401 |
| 2CH | ID11202 | Y11402 | X11402 |
| 3CH | ID11203 | Y11403 | X11403 |
| 4CH | ID11204 | Y11404 | X11404 |
| 5CH | ID11205 | Y11405 | X11405 |
| 6CH | ID11206 | Y11406 | X11406 |
| 7CH | ID11207 | Y11407 | X11407 |

Fourteenth Extended Module Register Definition Code

| Channel | AD Signal | Channel Enable Switch (Each channel can only be used when the enable bit is set to 1) | Channel Alarm Flag Bit |
|---|---|---|---|
| 0CH | ID11300 | Y11500 | X11500 |
| 1CH | ID11301 | Y11501 | X11501 |
| 2CH | ID11302 | Y11502 | X11502 |
| 3CH | ID11303 | Y11503 | X11503 |
| 4CH | ID11304 | Y11504 | X11504 |
| 5CH | ID11305 | Y11505 | X11505 |
| 6CH | ID11306 | Y11506 | X11506 |
| 7CH | ID11307 | Y11507 | X11507 |

Fifteenth Extended Module Register Definition Code

| Channel | AD Signal | Channel Enable Switch (Each channel can only be used when the enable bit is set to 1) | Channel Alarm Flag Bit |
|---|---|---|---|
| 0CH | ID11400 | Y11600 | X11600 |
| 1CH | ID11401 | Y11601 | X11601 |
| 2CH | ID11402 | Y11602 | X11602 |
| 3CH | ID11403 | Y11603 | X11603 |
| 4CH | ID11404 | Y11604 | X11604 |
| 5CH | ID11405 | Y11605 | X11605 |
| 6CH | ID11406 | Y11606 | X11606 |
| 7CH | ID11407 | Y11607 | X11607 |

Sixteenth Extended Module Register Definition Code

| Channel | AD Signal | Channel Enable Switch (Each channel can only be used when the enable bit is set to 1) | Channel Alarm Flag Bit |
|---|---|---|---|
| 0CH | ID11500 | Y11700 | X11700 |
| 1CH | ID11501 | Y11701 | X11701 |
| 2CH | ID11502 | Y11702 | X11702 |
| 3CH | ID11503 | Y11703 | X11703 |
| 4CH | ID11504 | Y11704 | X11704 |
| 5CH | ID11505 | Y11705 | X11705 |
| 6CH | ID11506 | Y11706 | X11706 |
| 7CH | ID11507 | Y11707 | X11707 |



- Disabling unused channels can increase the input/output scanning speed.
- When the input enable switch is turned off during operation, the corresponding input channel will not capture any data (the data value will be displayed as 0).

## 3.4.5 Work Mode Settings

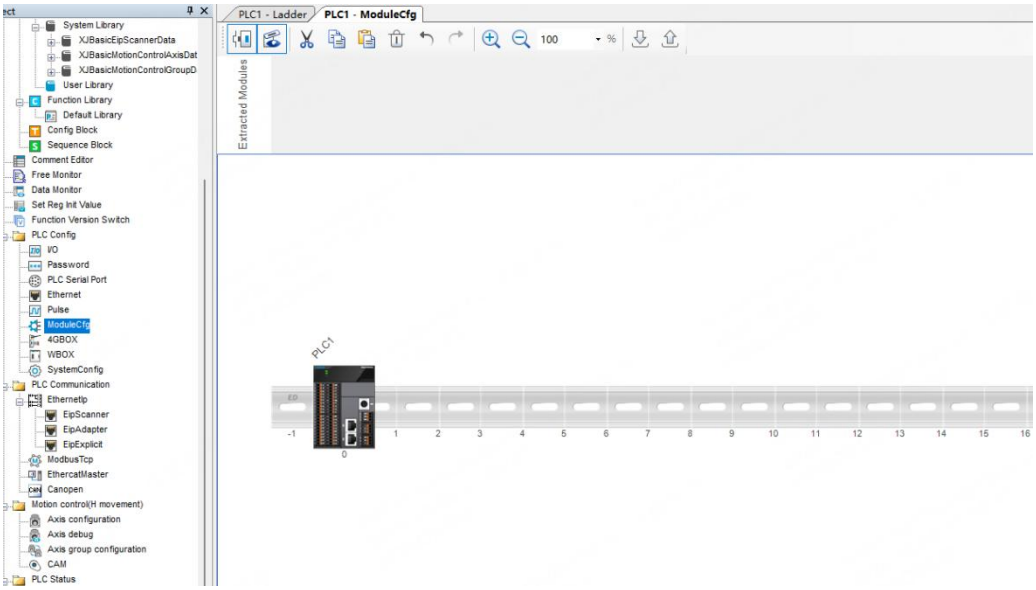
There are two methods for configuring the operating mode (The effects of these two methods are equivalent.).

- Through Control Panel configuration
- Set via Flash registers

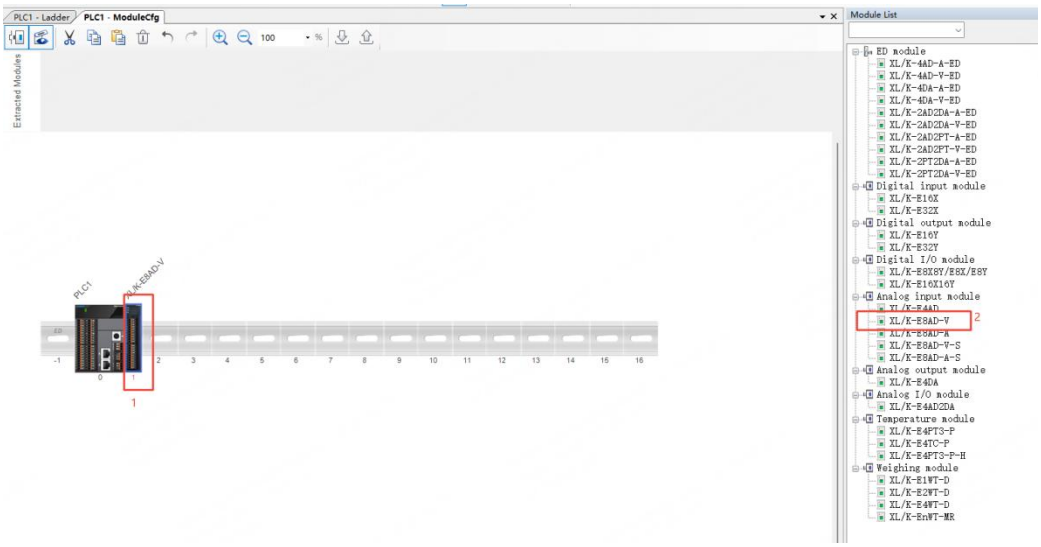
1) Configuration Panel Configuration

1. Use the Xinje PLC Programming Tool Software version 3.8.0a or later to configure the module; click [PLC Configuration] – [Module Configuration] in the left-side Engineering Bar to open the Expansion Module Settings window. For versions of the Xinje PLC Programming Tool Software prior to 3.8.0a, click [PLC Configuration] – [Expansion Module] in the left-side Engineering Bar to

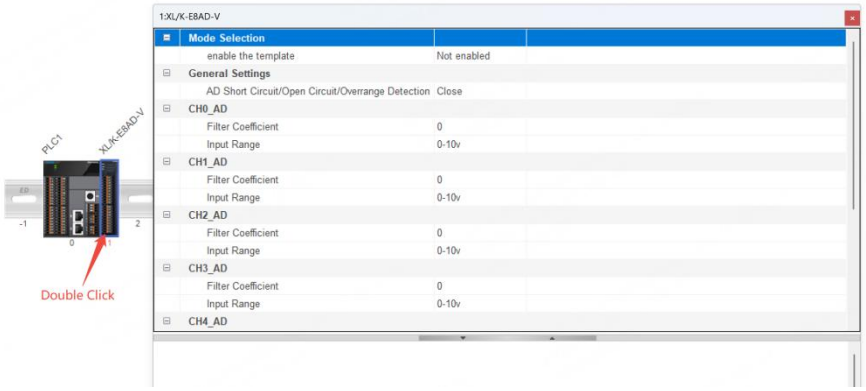
perform the configuration.




2. Select a module from the right-hand module list and drag it to the desired position; alternatively, double-click a module in the right-hand module list to select it:

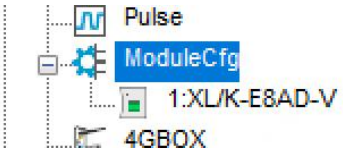



3. Double-click the corresponding module icon to access the module configuration interface, where you can select the AD filter coefficient and the voltage input mode for the AD channel.




4. Click "" to  retrieve the default configuration parameters for the extended module.

5. After completing the parameter configuration  for the expansion module, click "" to write the set values into the PLC; the changes will take effect only after the PLC is powered off and then powered on again. Under the Module Configuration Node, mount the configured module, then double-click it to enter the module parameter configuration interface.




The first-Program low-pass filtering method calculates the effective filtered value by weighting the current sample value against the previous filtered output value. The filtering coefficient can be set by the user to a range of 0–254: a lower value results in greater data stability but may introduce data lag; setting it to 1 provides the strongest filtering effect and the highest data stability; setting it to 254 yields the weakest filtering effect; the default setting is 0 (no filtering).

### 2) Flash Register Configuration

The input and output channels of the expansion module operate in voltage mode, with selectable ranges of 0–5 V, 0–10 V, –5–5 V, and –10–10 V; these settings are configured via the dedicated FLASH data register SFD within the PLC, as shown below.

| Module ID | Configuration Information Address | Module ID | Configuration Information 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 |

As shown above, each register is configured to set the mode for four channels; each register consists of 16 bits, and the modes for the four channels are configured sequentially in groups of four bits, from the lowest to the highest bit position.

### 3) SFD Bit Definition

| | Bit7 | Bit6 | Bit5 | Bit4 | Bit3 | Bit2 | Bit1 | Bit0 | Explain |
|---|---|---|---|---|---|---|---|---|---|
| Byte0 | AD Channel 2; Channel 1 filtering coefficient | | | | | | | | AD filtering coefficient |
| Byte1 | AD Channel 4; Channel 3 filtering coefficient | | | | | | | | |
| Byte2 | AD Channel 6; Channel 5 filtering coefficient | | | | | | | | |
| Byte3 | AD Channel 8; Channel 7 filtering coefficient | | | | | | | | |

<table>
<tr><td rowspan="5">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="20">Used to specify the input range of the AD module; the lower 4 bits of Byte4 represent the configuration bits for AD Channel 1, while the upper 4 bits represent the configuration bits for AD Channel 2;<br>The lower 4 bits of Byte5 represent the configuration bits for AD Channel 3; the upper 4 bits represent the configuration bits for AD Channel 4; the lower 4 bits of Byte6 represent the configuration bits for AD Channel 5; the upper 4 bits represent the configuration bits for AD Channel 6;<br>The lower 4 bits of Byte7 represent the configuration bits for AD Channel 7; the upper 4 bits represent the configuration bits for AD Channel 8.</td></tr>
<tr><td colspan="4">AD2</td><td colspan="4">AD1</td></tr>
<tr><td colspan="4">0000: Voltage 0–10 V<br>0001: Voltage 0–5 V<br>0010: Voltage – 10–10 V<br>0011: Voltage – 5–5 V</td><td colspan="4">0000: Voltage 0–10 V<br>0001: Voltage 0–5 V<br>0010: Voltage – 10–10 V<br>0011: Voltage – 5–5 V</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">0000: Voltage 0–10 V<br>0001: Voltage 0–5 V<br>0010: Voltage – 10–10 V<br>0011: Voltage – 5–5 V</td><td colspan="4">0000: Voltage 0–10 V<br>0001: Voltage 0–5 V<br>0010: Voltage – 10–10 V<br>0011: Voltage – 5–5 V</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">0000: Voltage 0–10 V<br>0001: Voltage 0–5 V<br>0010: Voltage – 10–10 V<br>0011: Voltage – 5–5 V</td><td colspan="4">0000: Voltage 0–10 V<br>0001: Voltage 0–5 V<br>0010: Voltage – 10–10 V<br>0011: Voltage – 5–5 V</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">0000: Voltage 0–10 V<br>0001: Voltage 0–5 V<br>0010: Voltage – 10–10 V<br>0011: Voltage – 5–5 V</td><td colspan="4">0000: Voltage 0–10 V<br>0001: Voltage 0–5 V<br>0010: Voltage – 10–10 V<br>0011: Voltage – 5–5 V</td></tr>
<tr><td>Byte8~<br>Byte19</td><td colspan="8">Reserved</td></tr>
</table>

Example: Set the operating mode for Input Channels 1 and 0 of the first module to 0–10 V; set the operating mode for Input Channels 3 and 2 to 0–5 V; set the operating mode for Input Channels 5 and 4 to 0–10 V; set the operating mode for Input Channels 7 and 6 to 0–5 V; set the filtering coefficient for Channels 0, 1, 2, and 3 to 254; set the filtering coefficient for Channels 4, 5, 6, and 7 to 100.

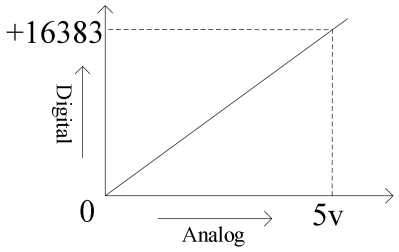
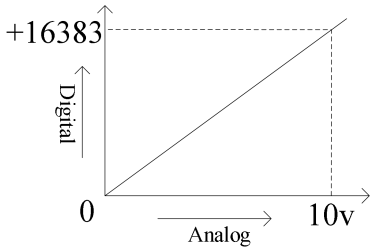
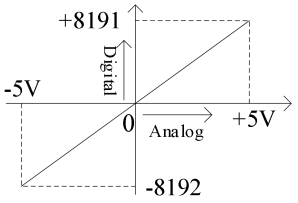
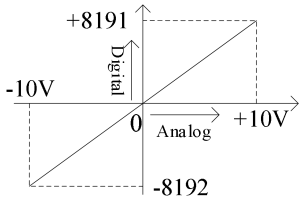
Method 1: You can configure this directly from the Configuration Panel; the configuration procedure is described in Sections 3-4-5-1.

Method 2: Directly set the SFD special register to the following value:

SFD350=FEFEH SFD351=6464H SFD352=1100H SFD353=1100H

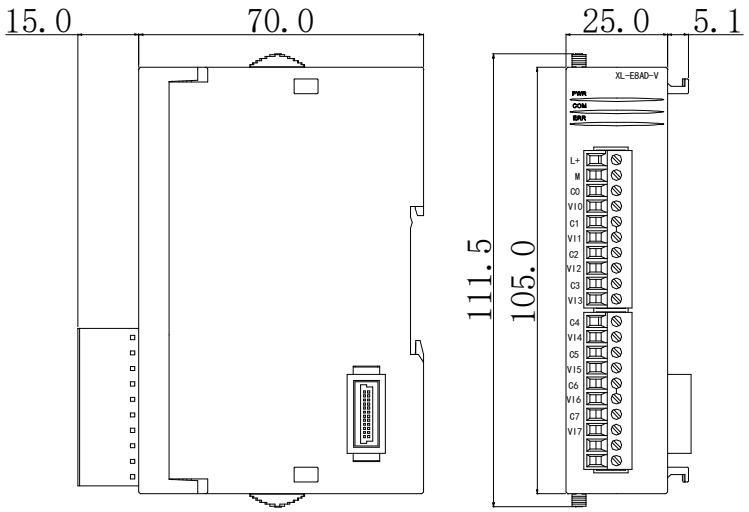
## 3.4.6 Analog-to-Digital Conversion Diagram

The relationship between the input analog signal and the converted digital signal is shown in the table below:

<table>
<tr><th>0–5 V analog input</th><th>0–10 V analog input</th></tr>
<tr><td>
</td><td>
</td></tr>
<tr><th>-5~5V analog input</th><th>-10~10 V analog input</th></tr>
<tr><td>
</td><td>
</td></tr>
</table>

When the channel enable switch is turned on and the AD voltage input is open-circuit, the corresponding ID register displays the value 16383; when the channel enable switch is turned off, the ID register corresponding to the AD voltage input displays the value 0.

## 3.4.7 External dimensions diagram



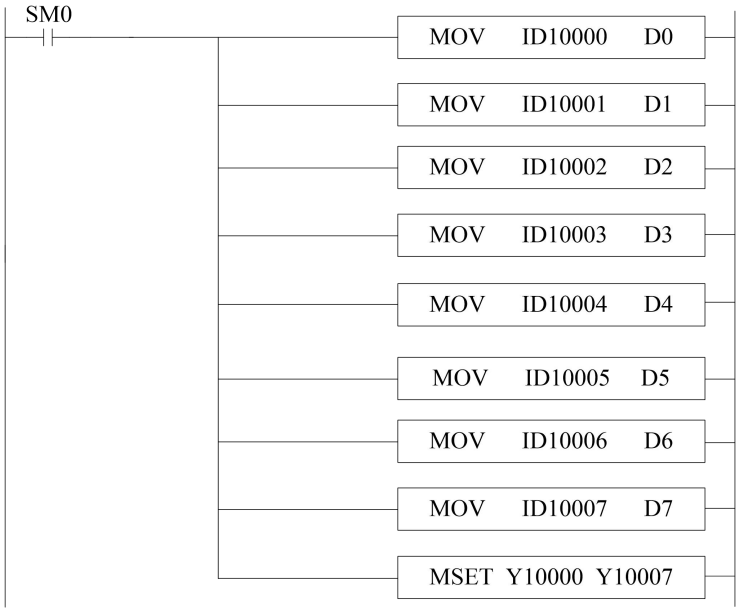

(Unit: mm)

## 3.4.8 Programming Example

Example:

Read real-time data from eight channels (taking Module 1 as an example)

Program:




Explain:

SM0 is a normally ON coil that remains in the ON state throughout the PLC operation.

The PLC starts operating and continuously writes the data from Channel 0 of Module #1 into the data register D0;

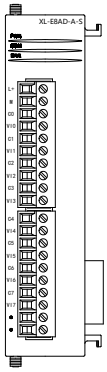
Data from Channel 1 is written into the Data Register D1;
Data from Channel 2 is written into Data Register D2;
Write data from Channel 3 into Data Register D3;
Data from Channel 4 is written into Data Register D4;
Data from Channel 5 is written into Data Register D5;
Write data from Channel 6 into Data Register D6;
Write data from Channel 7 to Data Register D7;

Since all channels are in use, enable all channel enable bits.

# 3.5 16-bit analog current input module XL-E8AD-A-S

This section primarily introduces the specifications, terminal descriptions, assignment of input definition codes, operating mode configuration, external connections, analog-to-digital conversion diagram, and external dimensions diagram for the XL-E8AD-A-S module.

## 3.5.1 Module Features and Specifications



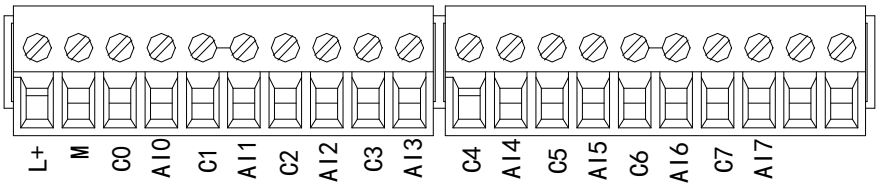
The XL-E8AD-A-S analog input module converts eight analog current input values into digital values and transmits them to the PLC main unit, enabling real-time data exchange with the PLC main unit.

- 8-channel analog input: Current input.
- 16-bit high-precision analog input.
- As a specialized functional module for the XL series, the XL3/XL3E can connect up to 10 modules; the XL5/XL5E/XL5N/XL5H/XLME/ XLH/XSLH can support up to 16 modules; however, the XL1 does not support the addition of any modules.

Module Specifications

| Project | Analog Current Input |
|---|---|
| Analog Input Range | 0~20mA，4~20mA，-20～20mA |
| Maximum Input Range | -40~40mA |
| Digital Output Range | 16-bit binary number (0–65535 or-32768–32767) |
| Resolution Ratio | 1/65535 (16Bit) |
| Overall Accuracy | ±1% |
| Conversion Rate | 2ms/1 channel |
| Module Power Supply | DC24V±10%，150mA |

## 3.5.2 Terminal Specifications




| Name | | Function |
|---|---|---|
| Terminal Block | L+ | External power supply: +24V positive terminal for the module |
| | M | External power supply: 24V negative terminal for the module |
| | C0 | AI0 Output Port |
| | AI0 | Route 1 AD analog current input terminal |
| | C1 | AI1 Output Port |
| | AI1 | Route 2 AD analog current input terminal |
| | C2 | AI2 Output Port |

| Name | | Function |
|---|---|---|
| | AI2 | Route 3 AD analog current input terminal |
| | C3 | AI3 Output Port |
| | AI3 | Channel 4 AD analog current input terminal |
| | C4 | AI4 Output Port |
| | AI4 | Route 5 AD analog current input terminal |
| | C5 | AI5 Output Port |
| | AI5 | Route 6 AD analog current input terminal |
| | C6 | AI6 Output Port |
| | AI6 | Route 7 AD analog current input terminal |
| | C7 | AI7 Output Terminal |
| | AI7 | Route 8 AD analog current input terminal |

### Wiring terminal specifications

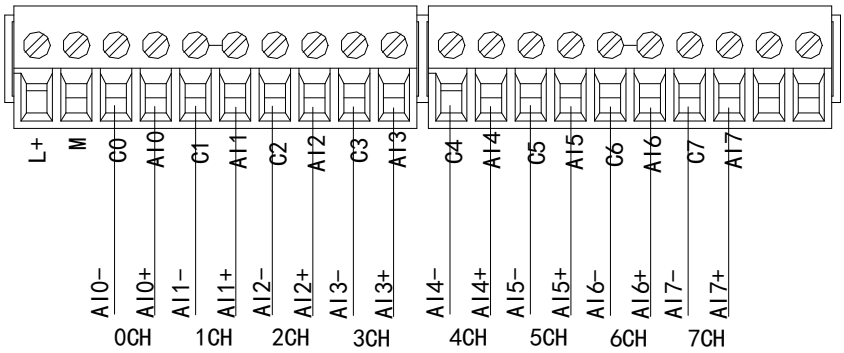
When wiring a module, its terminals must comply with the following requirements:

- Wire stripping length: 9 mm;
- Flexible conductor with tubular bare ends, cross-sectional area 0.25–1.5 mm²;
- Flexible conductor with tubular pre-insulated ends, cross-sectional area: 0.25–0.5 mm².

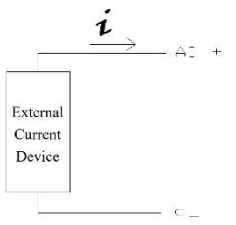
## 3.5.3 External Connection

When connecting externally, to avoid interference, please use a shielded cable and perform single-point grounding of the shield.

### Current single-ended input




The current input-side wiring for the XL-E8AD-A-S is shown in the figure below:



### 3.5.4 Input Definition Number Allocation

The XL series analog input modules do not occupy any I/O units; the converted values are directly written into the PLC registers. The definition numbers for the PLC registers corresponding to each channel are as follows:

First Expansion Module Register Definition Number

| Channel | AD Signal | Channel Enable Switch (Each channel can only be used when the enable bit is set to 1) | 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 |

Second Expansion Module Register Definition Number

| Channel | AD Signal | Channel Enable Switch (Each channel can only be used when the enable bit is set to 1) | 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 | ID10114 | Y10107 | X10107 |

Third Expansion Module Register Definition Code

| Channel | AD Signal | Channel Enable Switch (Each channel can only be used when the enable bit is set to 1) | 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 |

Fourth Expansion Module Register Definition Number

| Channel | AD Signal | Channel Enable Switch (Each channel can only be used when the enable bit is set to 1) | 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 |

Fifth expansion module register definition number

| Channel | AD Signal | Channel Enable Switch (Each channel can only be used when the enable bit is set to 1) | 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 |

Sixth expansion module register definition number

| Channel | AD Signal | Channel Enable Switch (Each channel can only be used when the enable bit is set to 1) | 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 |

Seventh expansion module register definition number

| Channel | AD Signal | Channel Enable Switch (Each channel can only be used when the enable bit is set to 1) | 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 |

| Channel | AD Signal | Channel Enable Switch (Each channel can only be used when the enable bit is set to 1) | Channel Alarm Flag Bit |
|---|---|---|---|
| 6CH | ID10612 | Y10606 | X10606 |
| 7CH | ID10614 | Y10607 | X10607 |

Eighth expansion module register definition number

| Channel | AD Signal | Channel Enable Switch (Each channel can only be used when the enable bit is set to 1) | 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 |

Ninth Extended Module Register Definition Number

| Channel | AD Signal | Channel Enable Switch (Each channel can only be used when the enable bit is set to 1) | 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 |

Tenth Extended Module Register Definition Number

| Channel | AD Signal | Channel Enable Switch (Each channel can only be used when the enable bit is set to 1) | 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 |

Eleventh Expansion Module Register Definition Number

| Channel | AD Signal | Channel Enable Switch (Each channel can only be used when the enable bit is set to 1) | 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 |

Twelfth Expansion Module Register Definition Number

| Channel | AD Signal | Channel Enable Switch (Each channel can only be used when the enable bit is set to 1) | 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 |

Thirteenth Extended Module Register Definition Code

| Channel | AD Signal | Channel Enable Switch (Each channel can only be used when the enable bit is set to 1) | 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 |

Fourteenth Extended Module Register Definition Code

| Channel | AD Signal | Channel Enable Switch (Each channel can only be used when the enable bit is set to 1) | 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 |

| Channel | AD Signal | Channel Enable Switch (Each channel can only be used when the enable bit is set to 1) | Channel Alarm Flag Bit |
|---|---|---|---|
| 6CH | ID11312 | Y11506 | X11506 |
| 7CH | ID11314 | Y11507 | X11507 |

Fifteenth Extended Module Register Definition Code

| Channel | AD Signal | Channel Enable Switch (Each channel can only be used when the enable bit is set to 1) | 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 |

Sixteenth Extended Module Register Definition Code

| Channel | AD Signal | Channel Enable Switch (Each channel can only be used when the enable bit is set to 1) | 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 |



- Disabling unused channels can increase the input/output scanning speed.
- When the input enable switch is turned off during operation, the corresponding input channel will not capture any data (the data value will be displayed as 0).

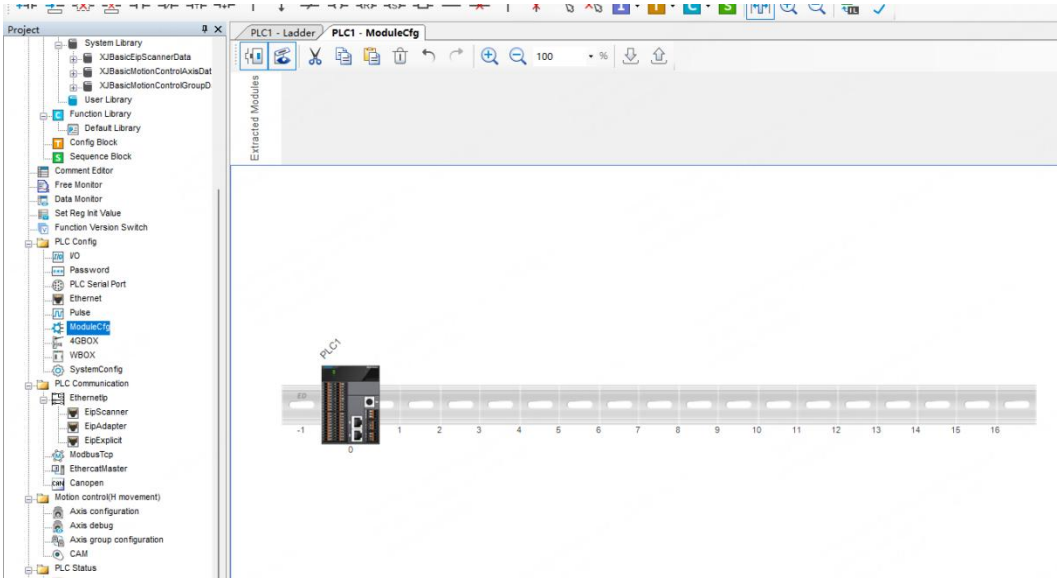
## 3.5.5 Work Mode Settings

There are two methods for configuring the operating mode (The effects of these two methods are equivalent.).

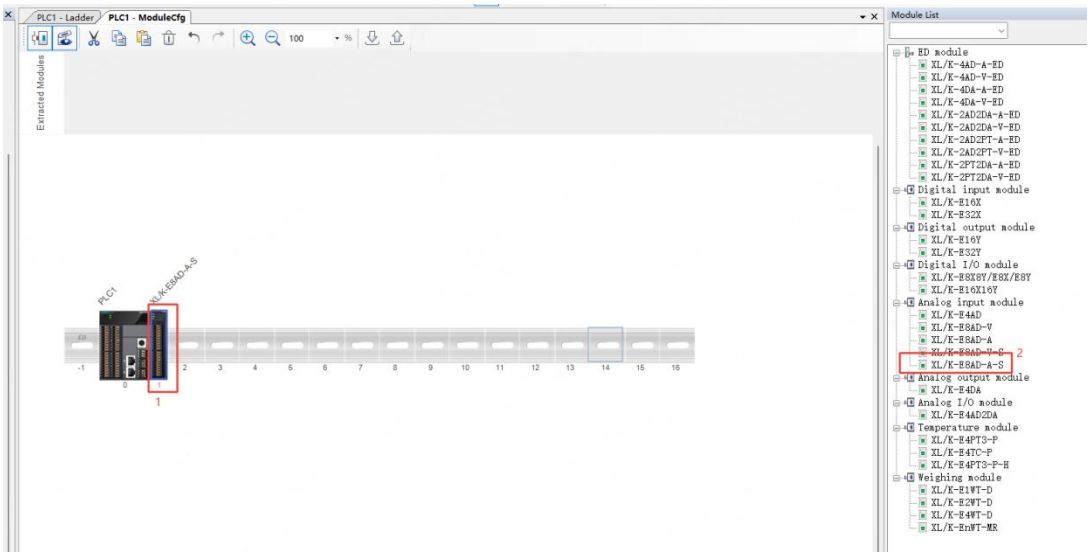
- Through Control Panel configuration
- Set via Flash registers

### 1) Configuration Panel Configuration

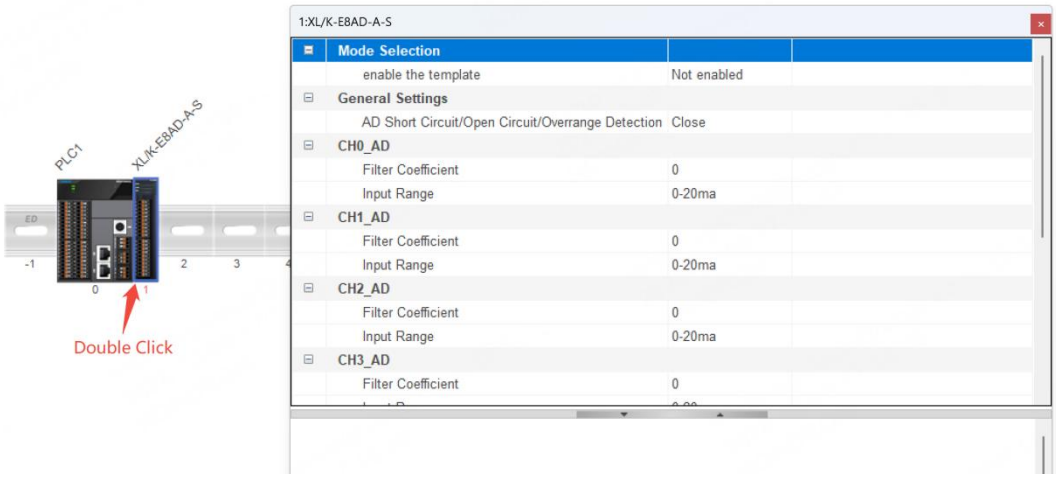
1. Use the Xinje PLC Programming Tool Software version 3.8.0a or later to configure the module; click [PLC Configuration] – [Module Configuration] in the left-side Engineering Bar to open the Expansion Module Settings window. For versions of the Xinje PLC Programming Tool Software prior to 3.8.0a, click [PLC Configuration] – [Expansion Module] in the left-side Engineering Bar to perform the configuration.




2. Select a module from the right-hand module list and drag it to the desired position; alternatively, double-click a module in the right-hand module list to select it:

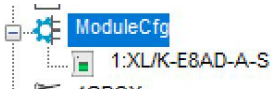


3. Double-click the corresponding module icon to access the module configuration interface, where you can select the AD filter coefficient and the current input mode corresponding to the AD channel.




4. Click " " to retrieve the default configuration parameters for the extended module.

5. After completing the parameter configuration for the expansion module, click " " to write the set values into the PLC; the changes will take effect only after the PLC is powered off and then powered on again. Under the Module Configuration Node, mount the configured module, then double-click it to enter the module parameter configuration interface.




The first-Program low-pass filtering method calculates the effective filtered value by weighting the current sample value against the previous filtered output value; the filtering coefficient is set by the user between 0 and 254 – a smaller value results in more stable data but may introduce data lag; therefore, when the coefficient is set to 1, the filtering effect is strongest and the data is most stable; when the coefficient is set to 254, the filtering effect is weakest; the default value is 0 (no filtering).

## 2) Flash Register Configuration

The expansion module's input channels operate in current-mode, with selectable ranges of 0–20 mA, 4–20 mA, or-20–20 mA; these settings are configured via the internal PLC's special FLASH data register, SFD. As shown below:

| Module ID | Configuration Information Address | Module ID | Configuration Information 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 |

| Module ID | Configuration Information Address | Module ID | Configuration Information Address |
|---|---|---|---|
| #7 | SFD410~SFD419 | #15 | SFD490~SFD499 |
| #8 | SFD420~SFD429 | #16 | SFD500~SFD509 |

As shown above, each register is configured to set the mode for four channels; each register consists of 16 bits, and the modes for the four channels are configured sequentially in groups of four bits, from the lowest to the highest bit position.

3) SFD Bit Definition

| | Bit7 | Bit6 | Bit5 | Bit4 | Bit3 | Bit2 | Bit1 | Bit0 | Explain |
|---|---|---|---|---|---|---|---|---|---|
| Byte0 | AD Channel 2; Channel 1 filtering coefficient | | | | | | | | AD filtering coefficient |
| Byte1 | AD Channel 4; Channel 3 filtering coefficient | | | | | | | | |
| Byte2 | AD Channel 6; Channel 5 filtering coefficient | | | | | | | | |
| Byte3 | AD Channel 8; Channel 7 filtering coefficient | | | | | | | | |
| Byte4 | Bit7 | Bit6 | Bit5 | Bit4 | Bit3 | Bit2 | Bit1 | Bit0 | Used to specify the input range of the AD module; the lower 4 bits of Byte4 represent the configuration bits for AD Channel 1, while the upper 4 bits represent the configuration bits for AD Channel 2; The lower 4 bits of Byte5 represent the configuration bits for AD Channel 3; the upper 4 bits represent the |
| | AD2 | | | | AD1 | | | | |
| | 1000: Current 0–20 mA<br>1001: Current 4–20 mA<br>1010: Current – 20–20 mA | | | | 1000: Current 0–20 mA<br>1001: Current 4–20 mA<br>1010: Current – 20–20 mA | | | | |
| Byte5 | Bit7 | Bit6 | Bit5 | Bit4 | Bit3 | Bit2 | Bit1 | Bit0 | |
| | AD4 | | | | AD3 | | | | |
| | 1000: Current 0–20 mA<br>1001: Current 4–20 mA<br>1010: Current – 20–20 mA | | | | 1000: Current 0–20 mA<br>1001: Current 4–20 mA<br>1010: Current – 20–20 mA | | | | |
| Byte6 | Bit7 | Bit6 | Bit5 | Bit4 | Bit3 | Bit2 | Bit1 | Bit0 | |
| | AD6 | | | | AD5 | | | | |
| | 1000: Current 0–20 mA<br>1001: Current 4–20 mA<br>1010: Current – 20–20 mA | | | | 1000: Current 0–20 mA<br>1001: Current 4–20 mA<br>1010: Current – 20–20 mA | | | | |
| Byte7 | Bit7 | Bit6 | Bit5 | Bit4 | Bit3 | Bit2 | Bit1 | Bit0 | |
| | AD8 | | | | AD7 | | | | |
| | 1000: Current 0–20 mA<br>1001: Current 4–20 mA<br>1010: Current – 20–20 mA | | | | 1000: Current 0–20 mA<br>1001: Current 4–20 mA<br>1010: Current – 20–20 mA | | | | |

| | | |
|---|---|---|
| Byte8~ Byte19 | Reserved | configuration bits for AD Channel 4; the lower 4 bits of Byte6 represent the configuration bits for AD Channel 5; the upper 4 bits represent the configuration bits for AD Channel 6;<br>The lower 4 bits of Byte7 represent the configuration bits for AD Channel 7; the upper 4 bits represent the configuration bits for AD Channel 8. |

Example: Set the operating mode for input channels 1 and 0 of the first module to 0–20 mA; set the operating mode for input channels 3 and 2 to 4–20 mA; set the operating mode for input channels 5 and 4 to 0–20 mA; set the operating mode for input channels 7 and 6 to-20–20 mA; set the filtering coefficient for channels 0, 1, 2, and 3 to 254; set the filtering coefficient for channels 4, 5, 6, and 7 to 100.

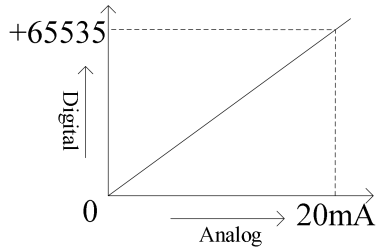
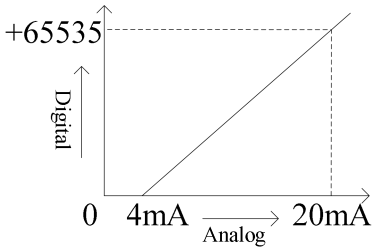
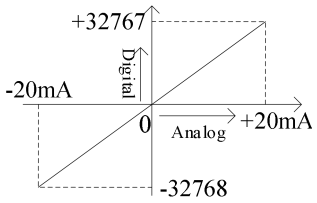
Method 1: You can configure this directly from the Configuration Panel; the configuration procedure is described in Section 3-5-5-1.

Method 2: Directly set the SFD special register to the following value:

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

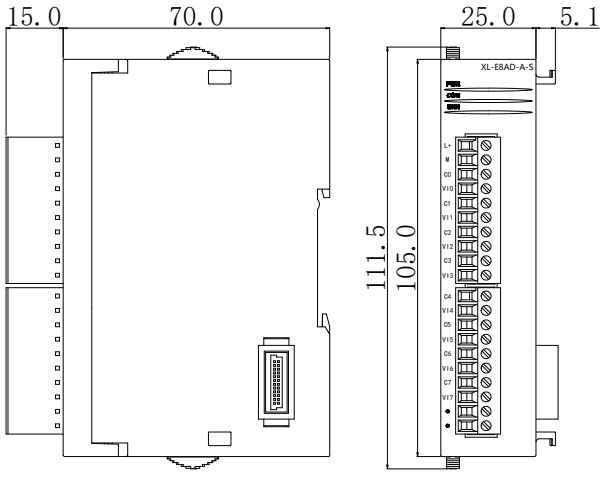
## 3.5.6 Analog-to-Digital Conversion Diagram

The relationship between the input analog signal and the converted digital signal is shown in the table below:

<table>
<tr><td>0–20 mA analog input</td><td>4–20 mA analog input</td></tr>
<tr><td>
</td><td>
</td></tr>
<tr><td>-20~20 mA analog input</td><td></td></tr>
<tr><td>
</td><td></td></tr>
</table>

When the channel enable switch is turned on and the AD current input is open-circuit, the ID register corresponding to the AD current input displays 0. When the channel enable switch is turned off, the ID register corresponding to the AD current input also displays 0.

## 3.5.7 External dimensions diagram



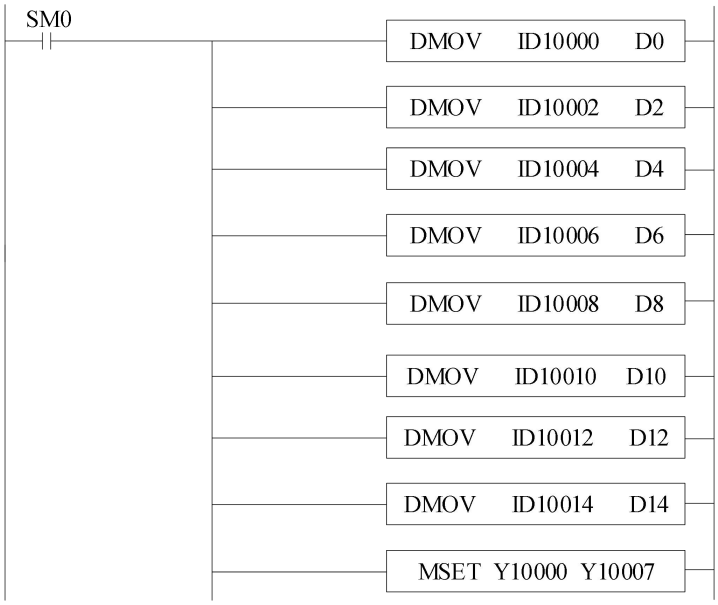

(Unit: mm)

## 3.5.8 Programming Example

Example:

Read real-time data from eight channels (taking Module 1 as an example)

Program:




Explain:

SM0 is a normally ON coil that remains in the ON state throughout the PLC operation.

The PLC starts operating and continuously writes the data from Channel 0 of Module #1 into the data register D0;

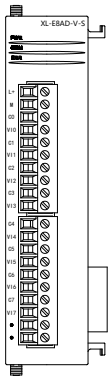
Data from Channel 1 is written into Data Register D2;
Data from Channel 2 is written into Data Register D4;
Data from Channel 3 is written into Data Register D6;
Data from Channel 4 is written into Data Register D8;
Data from Channel 5 is written into Data Register D10;
Data from Channel 6 is written into Data Register D12;
Data from Channel 7 is written into Data Register D14;

Since all channels are in use, enable all channel enable bits.

# 3.6 16-bit analog voltage input module XL-E8AD-V-S

This section primarily introduces the specifications, terminal descriptions, assignment of input definition codes, operating mode configuration, external connections, analog-to-digital conversion diagram, and external dimensions diagram for the XL-E8AD-V-S high-precision module.

## 3.6.1 Module Features and Specifications



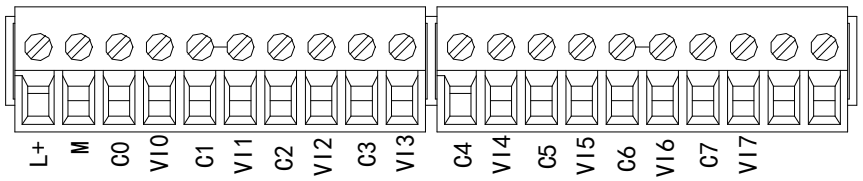
The XL-E8AD-V-S high-precision analog input module converts eight analog input signals into digital values and transmits them to the PLC main unit, enabling real-time data exchange with the PLC main unit.

- 8-channel analog input: Voltage input.
- 16-bit high-precision analog input.
- As a specialized functional module for the XL series, the XL3/XL3E can connect up to 10 modules; the XL5/XL5E/XL5N/XL5H/XLME/ XLH/XSLH can support up to 16 modules; however, the XL1 does not support the addition of any modules.

Module Specifications

| Project | Analog Voltage Input |
|---|---|
| Analog Input Range | 0~5V、0~10V、-5~5V、-10~10V |
| Maximum Input Range | DC±15V |
| Digital Output Range | 16-bit binary number (0–65535 or-32768–32767) |
| Resolution Ratio | 1/65535 (16Bit) |
| Overall Accuracy | ±1% |
| Conversion Rate | 2ms/1 channel |
| Module Power Supply | DC24V±10%，150mA |

## 3.6.2 Terminal Specifications




| Name | | Function |
|---|---|---|
| Terminal Block | L+ | External power supply: +24V positive terminal for the module |
| | M | External power supply: 24V negative terminal for the module |
| | C0 | VI0 Output Terminal |
| | VI0 | Route 1 AD analog voltage input terminal |
| | C1 | VI1 Output Terminal |

| Name | | Function |
|---|---|---|
| | VI1 | AD Analog Voltage Input Terminal (Channel 2) |
| | C2 | VI2 Output Terminal |
| | VI2 | Route 3 AD analog voltage input terminal |
| | C3 | VI3 Output Terminal |
| | VI3 | Channel 4 AD analog voltage input terminal |
| | C4 | VI4 Output Terminal |
| | VI4 | Route 5 AD analog voltage input terminal |
| | C5 | VI5 Output Terminal |
| | VI5 | Route 6 AD analog voltage input terminal |
| | C6 | VI6 Output Terminal |
| | VI6 | Route 7 AD analog voltage input terminal |
| | C7 | VI7 Output Terminal |
| | VI7 | Route 8 AD analog voltage input terminal |

Wiring terminal specifications

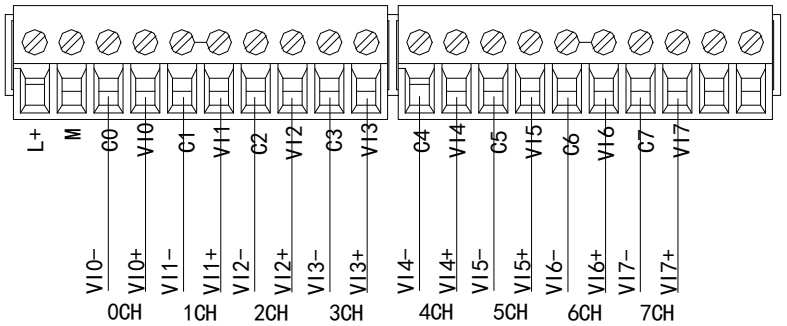
When wiring a module, its terminals must comply with the following requirements:

- Wire stripping length: 9 mm;
- Flexible conductor with tubular bare ends, cross-sectional area 0.25–1.5 mm²;
- Flexible conductor with tubular pre-insulated ends, cross-sectional area: 0.25–0.5 mm².

## 3.6.3 External Connection

When connecting externally, to avoid interference, please use a shielded cable and perform single-point grounding of the shield.

Single-ended voltage input




## 3.6.4 Input Definition Number Allocation

The XL series analog input modules do not occupy any I/O units; the converted values are directly written into the PLC registers. The definition numbers for the PLC registers corresponding to each channel are as follows:

First Expansion Module Register Definition Number

| Channel | AD Signal | Channel Enable Switch (Each channel can only be used when the enable bit is set to 1) | 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 |

Second Expansion Module Register Definition Number

| Channel | AD Signal | Channel Enable Switch (Each channel can only be used when the enable bit is set to 1) | 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 | ID10114 | Y10107 | X10107 |

Third Expansion Module Register Definition Code

| Channel | AD Signal | Channel Enable Switch (Each channel can only be used when the enable bit is set to 1) | 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 |

Fourth Expansion Module Register Definition Number

| Channel | AD Signal | Channel Enable Switch (Each channel can only be used when the enable bit is set to 1) | 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 |

| Channel | AD Signal | Channel Enable Switch (Each channel can only be used when the enable bit is set to 1) | Channel Alarm Flag Bit |
|---|---|---|---|
| 6CH | ID10312 | Y10306 | X10306 |
| 7CH | ID10314 | Y10307 | X10307 |

Fifth expansion module register definition number

| Channel | AD Signal | Channel Enable Switch (Each channel can only be used when the enable bit is set to 1) | 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 |

Sixth expansion module register definition number

| channel | AD Signal | Channel Enable Switch (Each channel can only be used when the enable bit is set to 1) | 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 |

Seventh expansion module register definition number

| Channel | AD Signal | Channel Enable Switch (Each channel can only be used when the enable bit is set to 1) | 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 |

Eighth expansion module register definition number

| Channel | AD Signal | Channel Enable Switch (Each channel can only be used when the enable bit is set to 1) | 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 |

Ninth Extended Module Register Definition Number

| Channel | AD Signal | Channel Enable Switch (Each channel can only be used when the enable bit is set to 1) | 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 |

Tenth Extended Module Register Definition Number

| Channel | AD Signal | Channel Enable Switch (Each channel can only be used when the enable bit is set to 1) | 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 |

Eleventh Expansion Module Register Definition Number

| Channel | AD Signal | Channel Enable Switch (Each channel can only be used when the enable bit is set to 1) | 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 |

| Channel | AD Signal | Channel Enable Switch (Each channel can only be used when the enable bit is set to 1) | Channel Alarm Flag Bit |
|---|---|---|---|
| 6CH | ID11012 | Y11206 | X11206 |
| 7CH | ID11014 | Y11207 | X11207 |

Twelfth Expansion Module Register Definition Number

| Channel | AD Signal | Channel Enable Switch (Each channel can only be used when the enable bit is set to 1) | 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 |

Thirteenth Extended Module Register Definition Code

| Channel | AD Signal | Channel Enable Switch (Each channel can only be used when the enable bit is set to 1) | 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 |

Fourteenth Extended Module Register Definition Code

| Channel | AD Signal | Channel Enable Switch (Each channel can only be used when the enable bit is set to 1) | 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 |

Fifteenth Extended Module Register Definition Code

| Channel | AD Signal | Channel Enable Switch (Each channel can only be used when the enable bit is set to 1) | 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 |

Sixteenth Extended Module Register Definition Code

| Channel | AD Signal | Channel Enable Switch (Each channel can only be used when the enable bit is set to 1) | 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 |



- Disabling unused channels can increase the input/output scanning speed.
- When the input enable switch is turned off during operation, the corresponding input channel will not capture any data (the data value will be displayed as 0).

## 3.6.5 Work Mode Settings

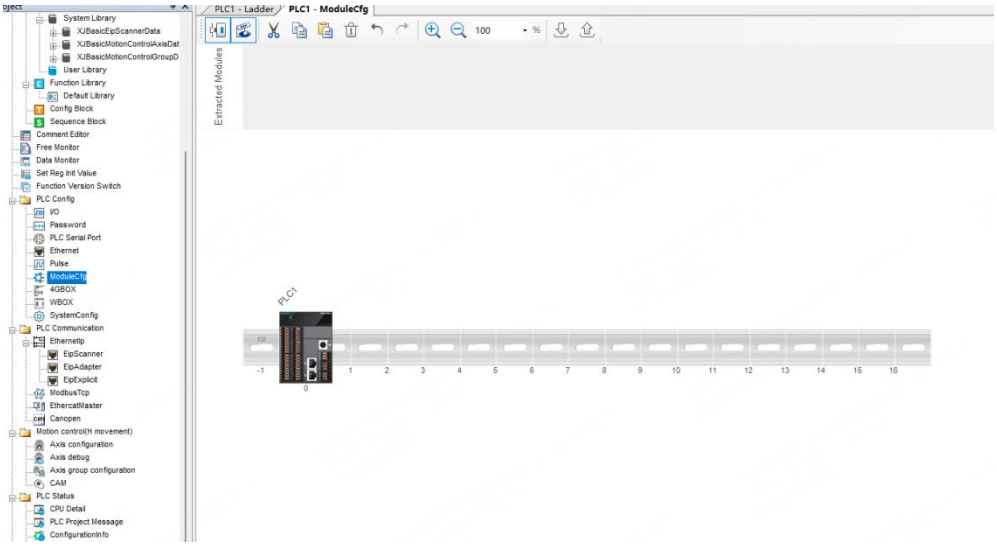
There are two methods for configuring the operating mode (The effects of these two methods are equivalent.).

- Through Control Panel configuration
- Set via Flash registers

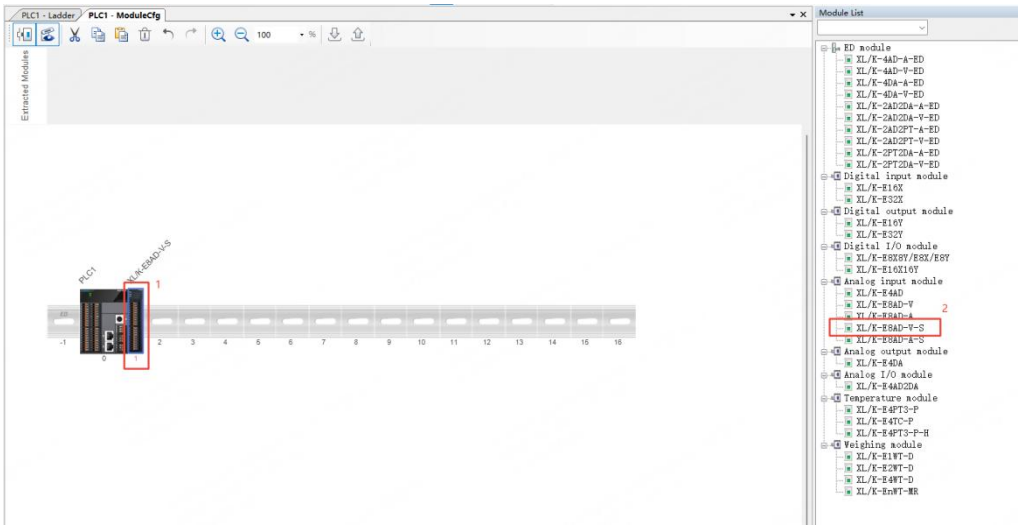
### 1) Configuration Panel Configuration

1. Use the Xinje PLC Programming Tool Software version 3.8.0a or later to configure the module; click [PLC Configuration] – [Module Configuration] in the left-side Engineering Bar to open the Expansion Module Settings window. For versions of the Xinje PLC Programming Tool Software prior to 3.8.0a, click [PLC Configuration] – [Expansion Module] in the left-side Engineering Bar to

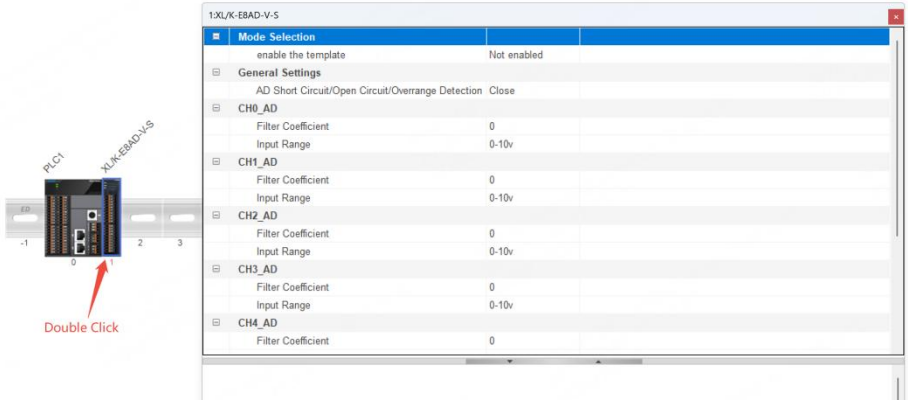
perform the configuration.



2. Select a module from the right-hand module list and drag it to the desired position; alternatively, double-click a module in the right-hand module list to select it:

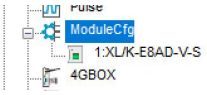


3. Double-click the corresponding module icon to access the module configuration interface, where you can select the AD filter coefficient and the voltage input mode for the AD channel.




4. Click "  " to retrieve the default configuration parameters for the extended module.

5. After completing the parameter configuration for the expansion module, click "  " to write the set values into the PLC; the changes will take effect only after the PLC is powered off and then powered on again. Under the Module Configuration Node, mount the configured module, then double-click it to enter the module parameter configuration interface.




The first-Program low-pass filtering method calculates the effective filtered value by weighting the current sample value against the previous filtered output value. The filtering coefficient can be set by the user to a range of 0–254: a lower value results in greater data stability but may introduce data lag; setting it to 1 provides the strongest filtering effect and the highest data stability; setting it to 254 yields the weakest filtering effect; the default setting is 0 (no filtering).

## 2) Flash Register Configuration

The expansion module's input and output channels operate in voltage mode, with selectable ranges of 0–5 V, 0–10 V, -5–5 V, or-10–10 V; these settings are configured via the internal PLC FLASH data register SFD. As shown below:

| Module ID | Configuration Information Address | Module ID | Configuration Information 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 |

As shown above, each register is configured to set the mode for four channels; each register consists of 16 bits, and the modes for the four channels are configured sequentially in groups of four bits, from the lowest to the highest bit position.

## 3) SFD Bit Definition

| | Bit7 | Bit6 | Bit5 | Bit4 | Bit3 | Bit2 | Bit1 | Bit0 | Explain |
|---|---|---|---|---|---|---|---|---|---|
| Byte0 | AD Channel 2; Channel 1 filtering coefficient | | | | | | | | AD filtering coefficient |
| Byte1 | AD Channel 4; Channel 3 filtering coefficient | | | | | | | | |
| Byte2 | AD Channel 6; Channel 5 filtering coefficient | | | | | | | | |
| Byte3 | AD Channel 8; Channel 7 filtering coefficient | | | | | | | | |
| Byte4 | Bit7 | Bit6 | Bit5 | Bit4 | Bit3 | Bit2 | Bit1 | Bit0 | Used to specify |

<table>
<tr><td rowspan="2"></td><td colspan="4">AD2</td><td colspan="4">AD1</td><td rowspan="10">the input range of the AD module; the lower 4 bits of Byte4 represent the configuration bits for AD Channel 1, while the upper 4 bits represent the configuration bits for AD Channel 2;<br>The lower 4 bits of Byte5 represent the configuration bits for AD Channel 3; the upper 4 bits represent the configuration bits for AD Channel 4; the lower 4 bits of Byte6 represent the configuration bits for AD Channel 5; the upper 4 bits represent the configuration bits for AD Channel 6;<br>The lower 4 bits of Byte7 represent the configuration bits for AD Channel 7; the upper 4 bits represent the configuration bits for AD Channel 8.</td></tr>
<tr><td colspan="4">0000: Voltage 0–10 V<br>0001: Voltage 0–5 V<br>0010: Voltage – 10–10 V<br>0011: Voltage – 5–5 V</td><td colspan="4">0000: Voltage 0–10 V<br>0001: Voltage 0–5 V<br>0010: Voltage – 10–10 V<br>0011: Voltage – 5–5 V</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: Voltage 0–10 V<br>0001: Voltage 0–5 V<br>0010: Voltage – 10–10 V<br>0011: Voltage – 5–5 V</td><td colspan="4">0000: Voltage 0–10 V<br>0001: Voltage 0–5 V<br>0010: Voltage – 10–10 V<br>0011: Voltage – 5–5 V</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: Voltage 0–10 V<br>0001: Voltage 0–5 V<br>0010: Voltage – 10–10 V<br>0011: Voltage – 5–5 V</td><td colspan="4">0000: Voltage 0–10 V<br>0001: Voltage 0–5 V<br>0010: Voltage – 10–10 V<br>0011: Voltage – 5–5 V</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: Voltage 0–10 V<br>0001: Voltage 0–5 V<br>0010: Voltage – 10–10 V<br>0011: Voltage – 5–5 V</td><td colspan="4">0000: Voltage 0–10 V<br>0001: Voltage 0–5 V<br>0010: Voltage – 10–10 V<br>0011: Voltage – 5–5 V</td></tr>
<tr><td>Byte8~<br>Byte19</td><td colspan="8">Reserved</td></tr>
</table>

Example: Set the operating mode for Input Channels 1 and 0 of the first module to 0–10 V; set the operating mode for Input Channels 3 and 2 to 0–5 V; set the operating mode for Input Channels 5 and 4 to 0–10 V; set the operating mode for Input Channels 7 and 6 to 0–5 V; set the filtering coefficient for Channels 0, 1, 2, and 3 to 254; set the filtering coefficient for Channels 4, 5, 6, and 7 to 100.

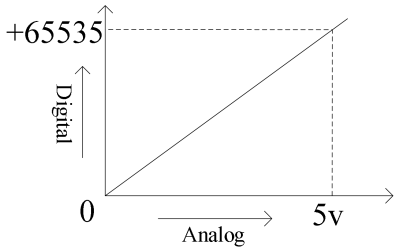
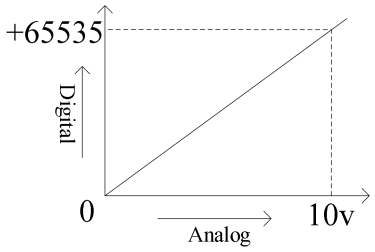
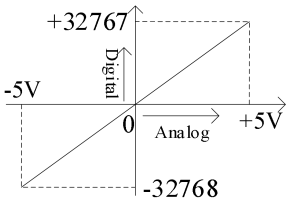
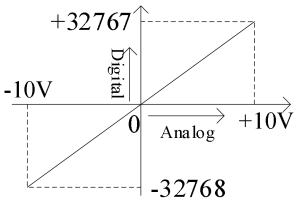
Method 1: You can configure it directly from the Configuration Panel; the configuration procedure is described in Section 3-6-5-1.

Method 2: Directly set the SFD special register to the following value:

SFD350=FEFEH SFD351=6464H SFD352=1100H SFD353=1100H

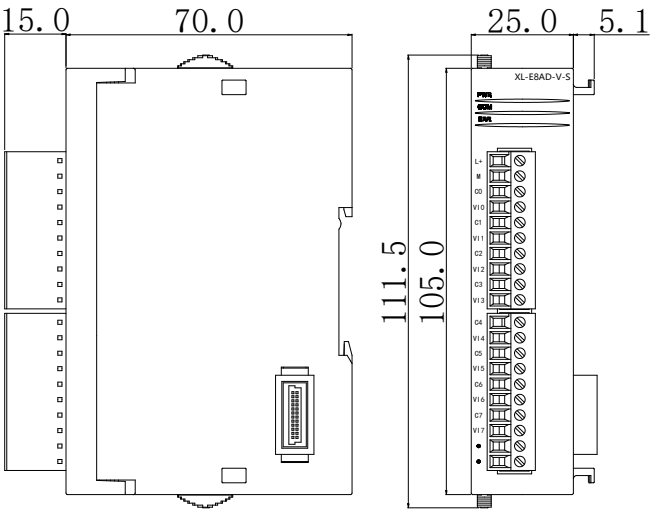
## 3.6.6 Analog-to-Digital Conversion Diagram

The relationship between the input analog signal and the converted digital signal is shown in the table below:

<table>
<tr><th>0–5 V Analog Input</th><th>0–10 V Analog Input</th></tr>
<tr><td>
</td><td>
</td></tr>
<tr><th>-5~5V Analog Input</th><th>-10~10 V Analog Input</th></tr>
<tr><td>
</td><td>
</td></tr>
</table>

When the channel enable switch is turned on and the AD current input is open-circuit, the ID register corresponding to the AD current input displays 0. When the channel enable switch is turned off, the ID register corresponding to the AD current input also displays 0.

## 3.6.7 External Dimensions Diagram



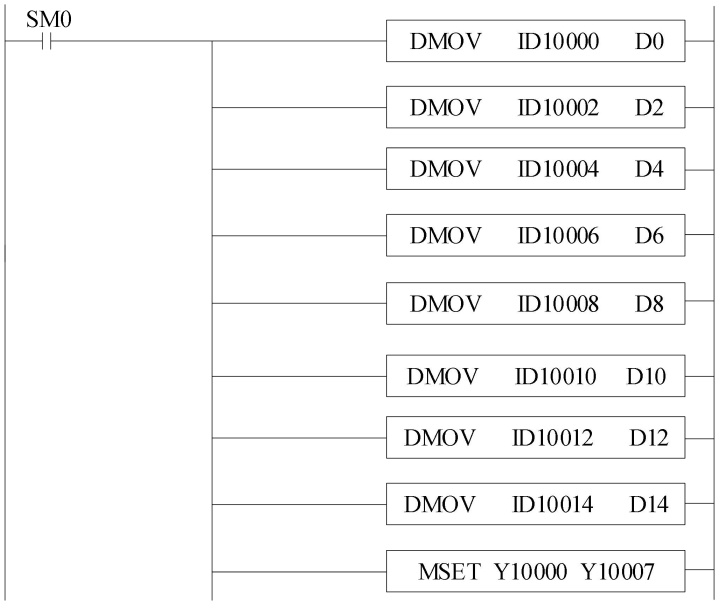

(Unit: mm)

## 3.6.8 Programming Example

Example:

Read real-time data from eight channels (taking Module 1 as an example)

Program:




Explain:

SM0 is a normally ON coil that remains in the ON state throughout the PLC operation.

The PLC starts operating and continuously writes the data from Channel 0 of Module #1 into the data register D0;

Data from Channel 1 is written into Data Register D2;
Data from Channel 2 is written into Data Register D4;
Data from Channel 3 is written into Data Register D6;
Data from Channel 4 is written into Data Register D8;
Data from Channel 5 is written into Data Register D10;
Data from Channel 6 is written into Data Register D12;
Data from Channel 7 is written into Data Register D14;

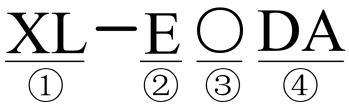
Since all channels are in use, enable all channel enable bits.

# 4 Analog Output Module

## 4.1 Analog Output Module Overview

The XL series PLCs can be connected to analog output modules; each PLC supports up to 16 modules and accommodates four types of current-or voltage-based output modules.

### 4.1.1 Naming Rule




| | | |
|---|---|---|
| ① | Series Name | XL: XL Series Expansion Modules |
| ② | Reference Expansion Module | E: Indicates Expansion Module |
| ③ | Number of output channels | 4 |
| ④ | Analog output | DA: Represents analog voltage or current output. |

### 4.1.2 Model List

| Model | | Description |
|---|---|---|
| Analog Output | XL-E4DA | 4-channel analog output, supporting both current and voltage modes |

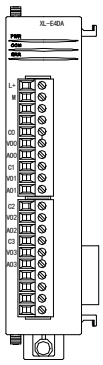
### 4.1.3 General Requirements

| Project | Specifications |
|---|---|
| Input Power Supply Voltage | DC24V±10% |
| Service Environment | Non-corrosive gases |
| Ambient Temperature | 0℃~60℃ |
| Ambient Humidity | 5~95% |
| Install | Directly installed on a DIN46277 guide rail (35 mm wide) |

# 4.2 12-bit analog output module XL-E4DA

This section primarily introduces the specifications of the XL-E4DA module, terminal descriptions, assignment of input definition codes, operating mode configuration, external connections, analog-to-digital conversion diagram, and external dimensions diagram.

## 4.2.1 Module Features and Specifications



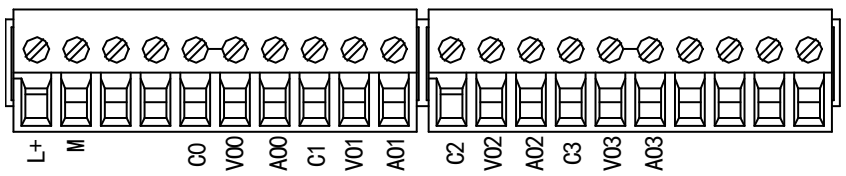
The XL-E4DA analog input/output module converts four digital signals into analog signals and transmits them to the PLC main unit, enabling real-time data exchange with the PLC main unit.

- 4-channel analog output: supports both voltage output and current output modes.
- 12-bit high-precision analog output.
- As a specialized functional module for the XL series, the XL3/XL3E can connect up to 10 modules; the XL5/XL5E/XL5N/XL5H/XLME/ XLH/XSLH can support up to 16 modules; however, the XL1 does not support the addition of any modules.

Module Specifications

| Project | Voltage Output | Current Output |
|---|---|---|
| Analog Output Range | 0~5V、0~10V、-5~5V、-10~10V<br>(External load resistor: 2 kΩ–1 MΩ) | 0~20mA、4~20mA<br>(External load resistance <500 Ω) |
| Digital Input Range | 12-bit binary number (0–4095 or-2048–2047) | |
| Resolution Ratio | 1/4095 (12Bit) | |
| Overall Accuracy | 1% | |
| Conversion Rate | 2ms/1 channel | 2ms/1 channel |
| Module Power Supply | DC24V±10%，150mA | |

## 4.2.2 Terminal Specifications




| Name | | Function |
|---|---|---|
| Terminal | L+ | External power supply: +24V positive terminal for the module |

| Name | | Function |
|---|---|---|
| Block | M | External power supply: 24V negative terminal for the module |
| | C0 | VO0, AO0 Output Ports |
| | VO0 | Route 1 DA analog voltage output terminal |
| | AO0 | Route 1 DA analog current output terminal |
| | C1 | VO1, AO1 Output Terminal |
| | VO1 | Route 2 DA analog voltage output terminal |
| | AO1 | Route 2 DA analog current output terminal |
| | C2 | $VO_2$, $AO_2$ output port |
| | VO2 | Route 3 DA analog voltage output terminal |
| | AO2 | Route 3 DA analog current output terminal |
| | C3 | VO3, AO3 Output Port |
| | VO3 | Route 4 DA analog voltage output terminal |
| | AO3 | Route 4 DA analog current output terminal |

Wiring terminal specifications

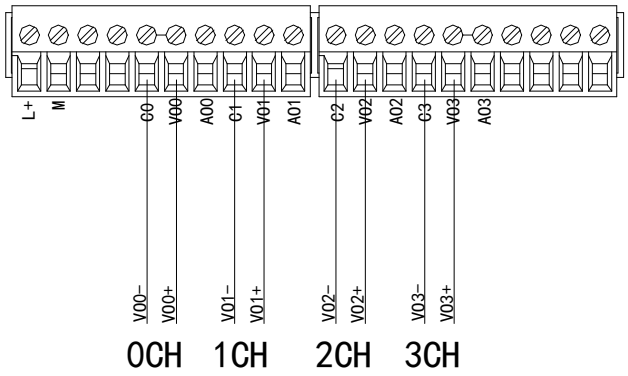
When wiring a module, its terminals must comply with the following requirements:

- Wire stripping length: 9 mm;
- Flexible conductor with tubular bare ends, cross-sectional area 0.25–1.5 mm²;
- Flexible conductor with tubular pre-insulated ends, cross-sectional area: 0.25–0.5 mm².

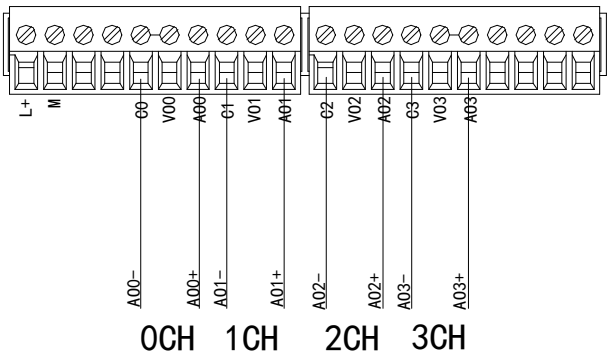
## 4.2.3 External Connection

When connecting externally, to avoid interference, please use a shielded cable and perform single-point grounding of the shield.

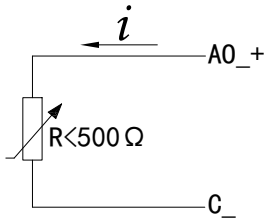
1) Single-ended voltage output




2) Single-ended current output




The XL-E4DA's current output-side wiring is shown in the figure below:




No DC24V power supply required for current output!

## 4.2.4 Input/Output Definition Number Allocation

The XL series analog input modules do not occupy any I/O units; the converted values are directly written into the PLC registers. The definition numbers for the PLC registers corresponding to each channel are as follows:

First Expansion Module Register Definition Number

| Channel | DA Signal | Channel Enable Switch (Each channel can only be used when the enable bit is set to 1) |
|---|---|---|
| 0CH | QD10000 | Y10000 |
| 1CH | QD10001 | Y10001 |
| 2CH | QD10002 | Y10002 |
| 3CH | QD10003 | Y10003 |

Second Expansion Module Register Definition Number

| Channel | DA Signal | Channel Enable Switch (Each channel can only be used when the enable bit is set to 1) |
|---|---|---|
| 0CH | QD10100 | Y10100 |
| 1CH | QD10101 | Y10101 |
| 2CH | QD10102 | Y10102 |
| 3CH | QD10103 | Y10103 |

Third Expansion Module Register Definition Code

| Channel | DA Signal | Channel Enable Switch (Each channel can only be used when the enable bit is set to 1) |
|---|---|---|
| 0CH | QD10200 | Y10200 |
| 1CH | QD10201 | Y10201 |
| 2CH | QD10202 | Y10202 |
| 3CH | QD10203 | Y10203 |

Fourth Expansion Module Register Definition Number

| Channel | DA Signal | Channel Enable Switch (Each channel can only be used when the enable bit is set to 1) |
|---|---|---|
| 0CH | QD10300 | Y10300 |
| 1CH | QD10301 | Y10301 |
| 2CH | QD10302 | Y10302 |
| 3CH | QD10303 | Y10303 |

Fifth expansion module register definition number

| Channel | DA Signal | Channel Enable Switch (Each channel can only be used when the enable bit is set to 1) |
|---|---|---|
| 0CH | QD10400 | Y10400 |
| 1CH | QD10401 | Y10401 |
| 2CH | QD10402 | Y10402 |
| 3CH | QD10403 | Y10403 |

Sixth expansion module register definition number

| Channel | DA Signal | Channel Enable Switch (Each channel can only be used when the enable bit is set to 1) |
|---|---|---|
| 0CH | QD10500 | Y10500 |
| 1CH | QD10501 | Y10501 |
| 2CH | QD10502 | Y10502 |
| 3CH | QD10503 | Y10503 |

Seventh expansion module register definition number

| Channel | DA Signal | Channel Enable Switch (Each channel can only be used when the enable bit is set to 1) |
|---|---|---|
| 0CH | QD10600 | Y10600 |
| 1CH | QD10601 | Y10601 |
| 2CH | QD10602 | Y10602 |
| 3CH | QD10603 | Y10603 |

Eighth expansion module register definition number

| Channel | DA Signal | Channel Enable Switch |
|---|---|---|

| | | (Each channel can only be used when the enable bit is set to 1) |
|---|---|---|
| 0CH | QD10700 | Y10700 |
| 1CH | QD10701 | Y10701 |
| 2CH | QD10702 | Y10702 |
| 3CH | QD10703 | Y10703 |

Ninth Extended Module Register Definition Number

| Channel | DA Signal | Channel Enable Switch (Each channel can only be used when the enable bit is set to 1) |
|---|---|---|
| 0CH | QD10800 | Y11000 |
| 1CH | QD10801 | Y11001 |
| 2CH | QD10802 | Y11002 |
| 3CH | QD10803 | Y11003 |

Tenth Extended Module Register Definition Number

| Channel | DA Signal | Channel Enable Switch (Each channel can only be used when the enable bit is set to 1) |
|---|---|---|
| 0CH | QD10900 | Y11100 |
| 1CH | QD10901 | Y11101 |
| 2CH | QD10902 | Y11102 |
| 3CH | QD10903 | Y11103 |

Eleventh Expansion Module Register Definition Number

| Channel | DA Signal | Channel Enable Switch (Each channel can only be used when the enable bit is set to 1) |
|---|---|---|
| 0CH | QD11000 | Y11200 |
| 1CH | QD11001 | Y11201 |
| 2CH | QD11002 | Y11202 |
| 3CH | QD11003 | Y11203 |

Twelfth Extension Module Register Definition Number

| Channel | DA Signal | Channel Enable Switch (Each channel can only be used when the enable bit is set to 1) |
|---|---|---|
| 0CH | QD11100 | Y11300 |
| 1CH | QD11101 | Y11301 |
| 2CH | QD11102 | Y11302 |
| 3CH | QD11103 | Y11303 |

Thirteenth Extended Module Register Definition Code

| Channel | DA Signal | Channel Enable Switch |
|---|---|---|

| | | (Each channel can only be used when the enable bit is set to 1) |
|---|---|---|
| 0CH | QD11200 | Y11400 |
| 1CH | QD11201 | Y11401 |
| 2CH | QD11202 | Y11402 |
| 3CH | QD11203 | Y11403 |

Fourteenth Extended Module Register Definition Code

| Channel | DA Signal | Channel Enable Switch (Each channel can only be used when the enable bit is set to 1) |
|---|---|---|
| 0CH | QD11300 | Y11500 |
| 1CH | QD11301 | Y11501 |
| 2CH | QD11302 | Y11502 |
| 3CH | QD11303 | Y11503 |

Fifteenth Extended Module Register Definition Code

| Channel | DA Signal | Channel Enable Switch (Each channel can only be used when the enable bit is set to 1) |
|---|---|---|
| 0CH | QD11400 | Y11600 |
| 1CH | QD11401 | Y11601 |
| 2CH | QD11402 | Y11602 |
| 3CH | QD11403 | Y11603 |

Sixteenth Extended Module Register Definition Code

| Channel | DA Signal | Channel Enable Switch (Each channel can only be used when the enable bit is set to 1) |
|---|---|---|
| 0CH | QD11500 | Y11700 |
| 1CH | QD11501 | Y11701 |
| 2CH | QD11502 | Y11702 |
| 3CH | QD11503 | Y11703 |



- Disabling unused channels can increase the input/output scanning speed.
- When the input enable switch is turned off during operation, the corresponding input channel will not capture any data (the data value will be displayed as 0).

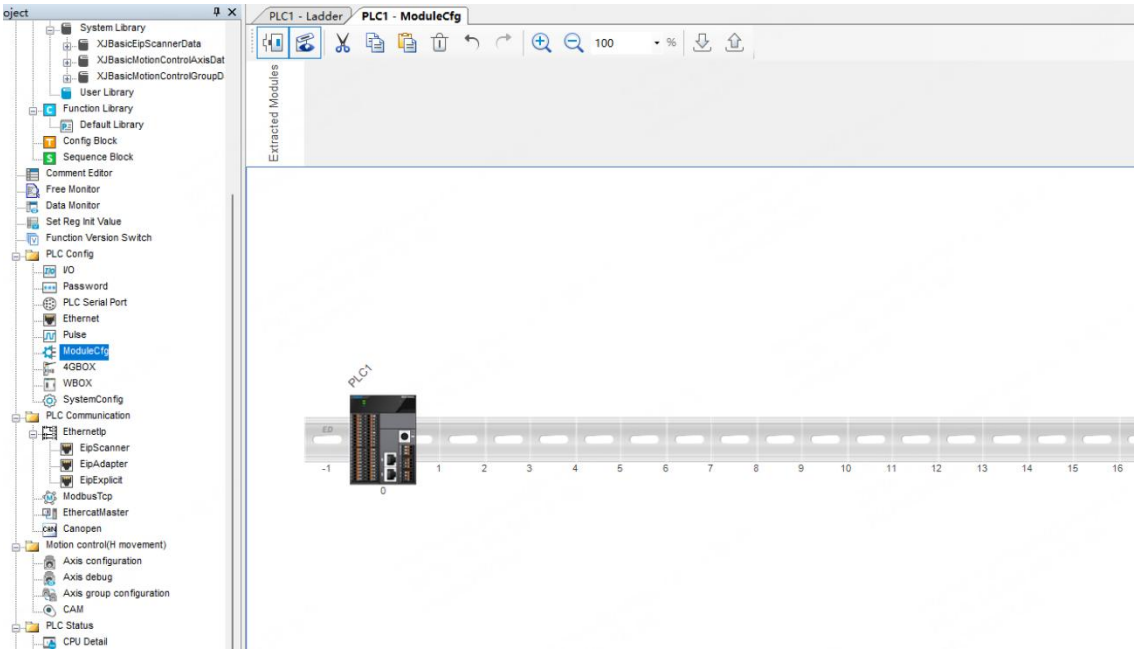
### 4.2.5 Work Mode Settings

There are two methods for configuring the operating mode (The effects of these two methods are equivalent.).

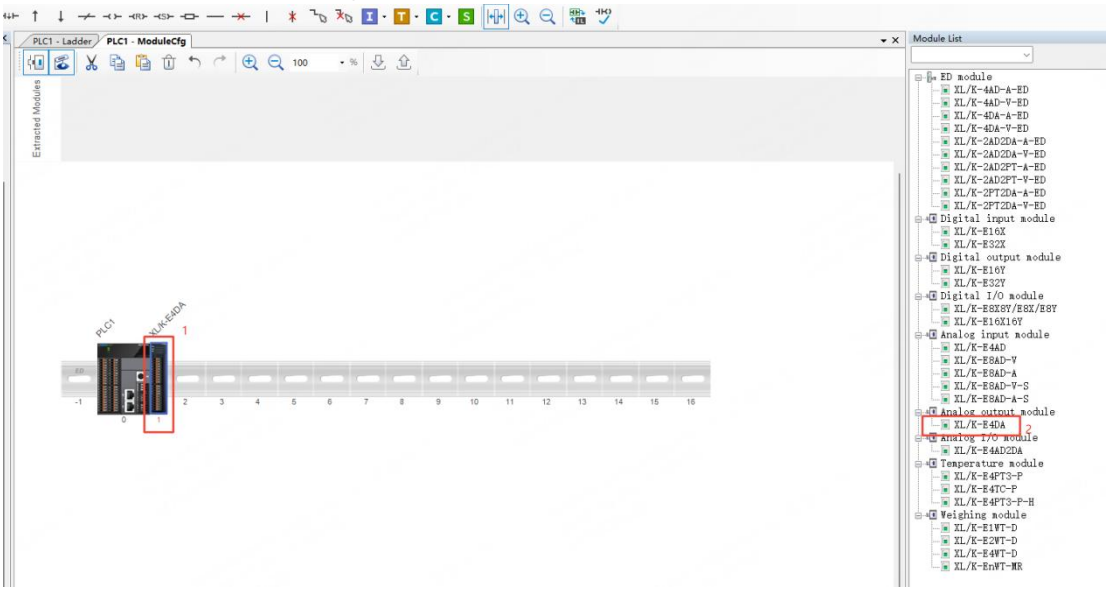
- Through Control Panel configuration
- Set via Flash registers

## 1) Configuration Panel Configuration

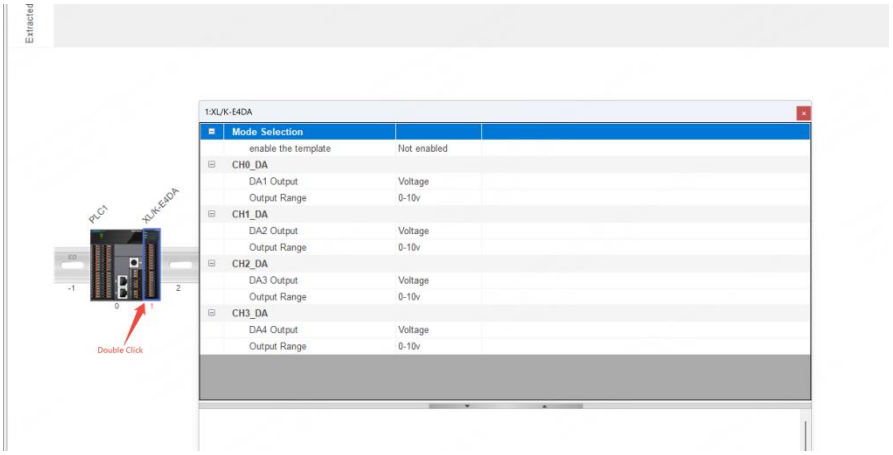
1. Use the Xinje PLC Programming Tool Software version 3.8.0a or later to configure the module; click [PLC Configuration] – [Module Configuration] in the left-side Engineering Bar to open the Expansion Module Settings window. For versions of the Xinje PLC Programming Tool Software prior to 3.8.0a, click [PLC Configuration] – [Expansion Module] in the left-side Engineering Bar to perform the configuration.




2. Select a module from the right-hand module list and drag it to the desired position; alternatively, double-click a module in the right-hand module list to select it:

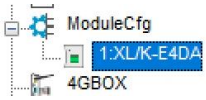


3. Double-click the corresponding module icon to access the module configuration interface and select the voltage or current output mode for the DA channel.




4. Click "  " to retrieve the default configuration parameters for the extended module.

5. After completing the parameter configuration for the expansion module, click "  " to write the set values into the PLC; the changes will take effect only after the PLC is powered off and then powered on again. Under the Module Configuration Node, mount the configured module, then double-click it to enter the module parameter configuration interface.




## 2) Flash Register Configuration

The expansion module's output channels support two operating modes: voltage and current. The current mode offers two options – 0–20 mA or 4–20 mA – while the voltage mode includes four options: 0–5 V, 0–10 V, -5–5 V, or-10–10 V. These settings can be configured using the SFD (Special FLASH Data Register) within the PLC. See below for details:

| Module ID | Configuration Information Address | Module ID | Configuration Information 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 |

## 3) SFD Bit Definition

Using the First Module as an example to illustrate the setup method.

<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>Explain</td></tr>
<tr><td rowspan="2">Byte0</td><td colspan="4">DA2</td><td colspan="4">DA1</td><td rowspan="6"></td></tr>
<tr><td>Reserved</td><td colspan="3">Voltage, Current<br>000：0~10V 010：0~20mA<br>001：0~5V 011：4~20mA<br>100：-10~10V<br>101：-5~5V</td><td>Reserved</td><td colspan="3">Voltage, Current<br>000：0~10V 010：0~20mA<br>001：0~5V 011：4~20mA<br>100：-10~10V<br>101：-5~5V</td></tr>
<tr><td rowspan="2">Byte1</td><td colspan="4">DA4</td><td colspan="4">DA3</td></tr>
<tr><td>Reserved</td><td colspan="3">Voltage, Current<br>000：0~10V 010：0~20mA<br>001：0~5V 011：4~20mA<br>100：-10~10V<br>101：-5~5V</td><td>Reserved</td><td colspan="3">Voltage, Current<br>000：0~10V 010：0~20mA<br>001：0~5V 011：4~20mA<br>100：-10~10V<br>101：-5~5V</td></tr>
<tr><td>Byte2~ Byte19</td><td colspan="8">Reserved</td></tr>
</table>

Example: Set the operating modes for Channels 3, 2, 1, and 0 to 0–10 V, 0–10 V, 0–20 mA, and 0–20 mA, respectively.

Method 1: You can configure it directly from the Configuration Panel; the configuration procedure is described in Section 4-2-5-1 above.

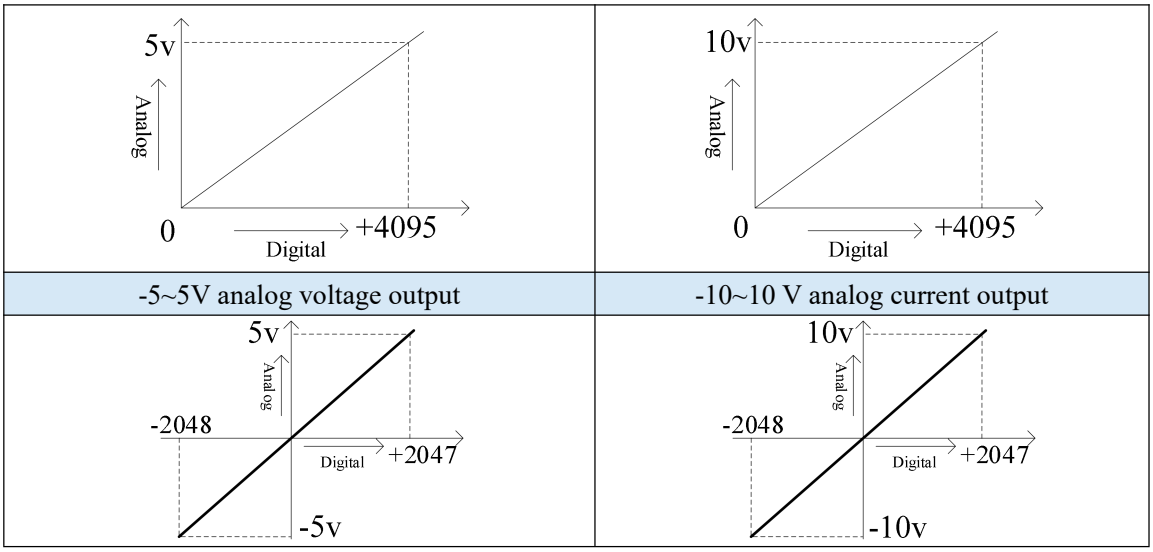
Method 2: Directly set the SFD special register to the following value: SFD350 = 0022H

## 4.2.6 Analog-to-Digital Conversion Diagram

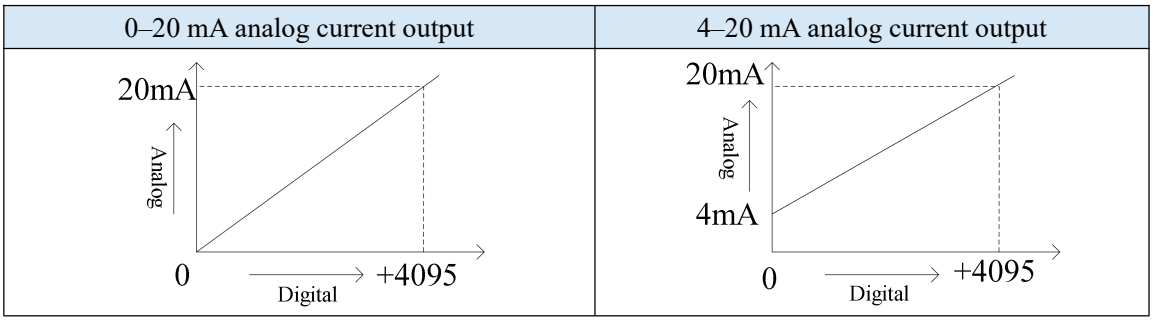
The relationship between the output digital signal and its corresponding analog signal data is shown in the table below:

1) Analog-to-Digital Voltage Conversion Diagram

| 0–5 V analog voltage output | 0–10 V analog voltage output |
|---|---|

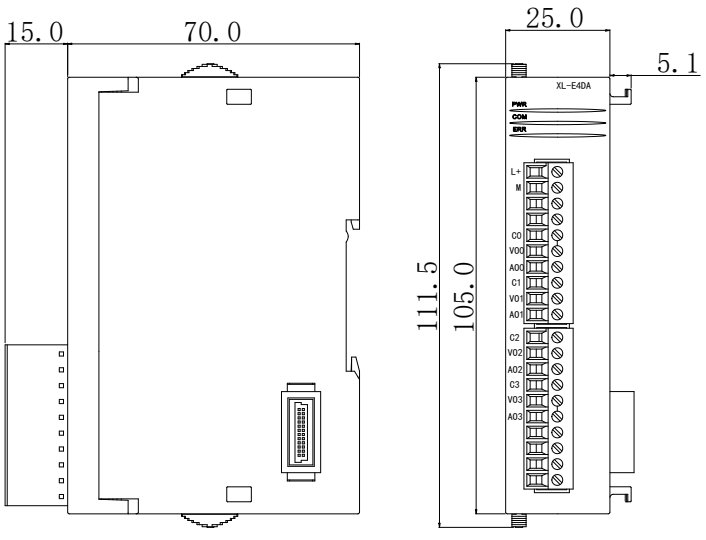



2) Analog-to-Digital Current Conversion Diagram




When the input data exceeds K4095, the output analog data from the D/A converter remains constant at 5 V, 10 V, or 20 mA.

## 4.2.7 External Dimensions Diagram



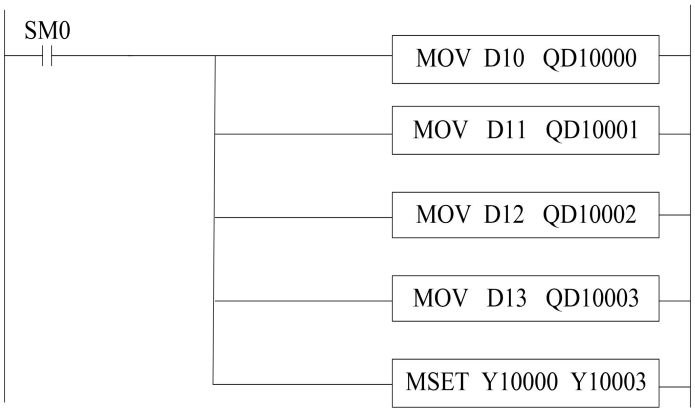

(Unit:mm)

## 4.2.8 Programming Example

Example:

Real-time writing of data to four channels (taking the first module as an example).

Program:




Explain:

SM0 is a normally ON coil that remains in the ON state throughout the PLC operation.
Write data from data register D10 to output channel 0;
Write data from data register D11 to Output Channel 1;
Write data from data register D12 to Output Channel 2;
Write data from data register D13 to Output Channel 3.
Since all channels are in use, enable bits for all channels should be set to high.

# 5 Analog Input/Output Module

## 5.1 Analog Input/Output Module Overview

The XL series PLCs can be connected to analog input/output modules; each PLC supports up to 16 modules and accommodates 4 analog input and 2 analog output modules.

### 5.1.1 Naming Rule

XL－E○AD○DA
① ② ③ ④ ⑤ ⑥

| | | |
|---|---|---|
| ① | Series Name | XL: XL Series Expansion Modules |
| ② | Reference Expansion Module | E: Indicates Expansion Module |
| ③ | Number of input channels | 4 |
| ④ | Analog signal type | AD: Represents Analog Input |
| ⑤ | Number of output channels | 2 |
| ⑥ | Analog signal type | DA: Represents analog output |

### 5.1.2 Model List

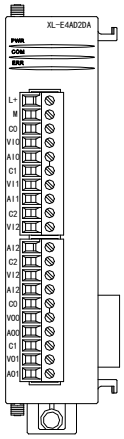
| Model | | Description |
|---|---|---|
| Analog Input/Output | XL-E4AD2DA | 4-channel analog input and 2-channel analog output; supports both current and voltage measurement modes. |

### 5.1.3 General Requirements

| Project | Specifications |
|---|---|
| Input Power Supply Voltage | DC24V±10% |
| Service Environment | Non-corrosive gases |
| Ambient Temperature | 0℃~60℃ |
| Ambient Humidity | 5~95% |
| Install | Directly installed on a DIN46277 guide rail (35 mm wide) |

# 5.2 Analog Input/Output Module XL-E4AD2DA

## 5.2.1 Module Features and Specifications



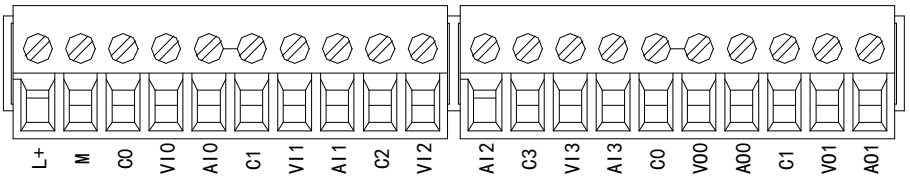

The XL-E4AD2DA analog input/output module converts four analog input signals into digital values and two digital signals into analog signals, then transmits these signals to the PLC main unit and enables real-time data exchange with the PLC main unit.

- 4-channel analog input: supports both voltage and current input modes.
- 14-bit high-precision analog input channels.
- 2-channel, 12-bit analog output.
- As an expansion module for the XL series, the XL3/XL3E can connect up to 10 modules; the XL5/XL5E/XL5N/XL5H/XLME/XLH can support up to 16 modules; however, the XL1 does not support expansion modules.

Module Specifications

| Project | Read Analogue Input | | Analog Output | |
|---|---|---|---|---|
| | Voltage Input | Current Input | Voltage Output | Current Output |
| Analog Input Range | 0~5V、0~10V<br>-5~5V、-10~10V | 0~20mA、<br>4~20mA、<br>-20~20mA | - | |
| Maximum Input Range | DC±15V | -40~40mA | - | |
| Analog Output Range | - | | 0~5V、0~10V<br>-5~5V、-10~10V<br>(External load resistor: 2 kΩ–1 MΩ) | 0~20mA、<br>4~20mA<br>(External load resistance <500 Ω) |
| Digital Input Range | - | | 0–4095 or-2048–2047 | |
| Digital Output Range | 0–16383 or-8192–8191 | | - | |
| Resolution Ratio | 1/16383 (14Bit) | | 1/4095 (12Bit) | |
| Overall Accuracy | ±1% | | | |
| Conversion Rate | 2ms/1 channel | | 2ms/1 channel | |
| Module Power Supply | DC24V±10%，150mA | | | |

## 5.2.2 Terminal Specifications




| Name | | Function |
|---|---|---|
| Terminal Block | L+ | External power supply: +24V positive terminal for the module |
| | M | External power supply: 24V negative terminal for the module |
| | C0 | VI0, AI0 Input Port |
| | VI0 | Route 1 AD analog voltage input terminal |
| | AI0 | Route 1 AD analog current input terminal |
| | C1 | VI1, AI1 Input Port |
| | VI1 | AD Analog Voltage Input Terminal (Channel 2) |
| | AI1 | Route 2 AD analog current input terminal |
| | C2 | VI2, AI2 Input Port |
| | VI2 | Route 3 AD analog voltage input terminal |
| | AI2 | Route 3 AD analog current input terminal |
| | C3 | VI3, AI3 Input Port |
| | VI3 | Channel 4 AD analog voltage input terminal |
| | AI3 | Channel 4 AD analog current input terminal |
| | C0 | VO0, AO0 Output Ports |
| | VO0 | Route 1 DA analog voltage output terminal |
| | AO0 | Route 1 DA analog current output terminal |
| | C1 | VO1, AO1 Output Terminal |
| | VO1 | Route 2 DA analog voltage output terminal |
| | AO1 | Route 2 DA analog current output terminal |

### Wiring terminal specifications

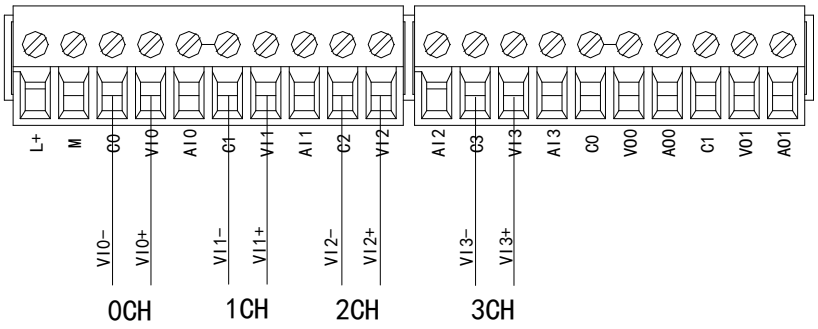
When wiring a module, its terminals must comply with the following requirements:

- Wire stripping length: 9 mm;
- Flexible conductor with tubular bare ends, cross-sectional area 0.25–1.5 mm²;
- Flexible conductor with tubular pre-insulated ends, cross-sectional area: 0.25–0.5 mm².

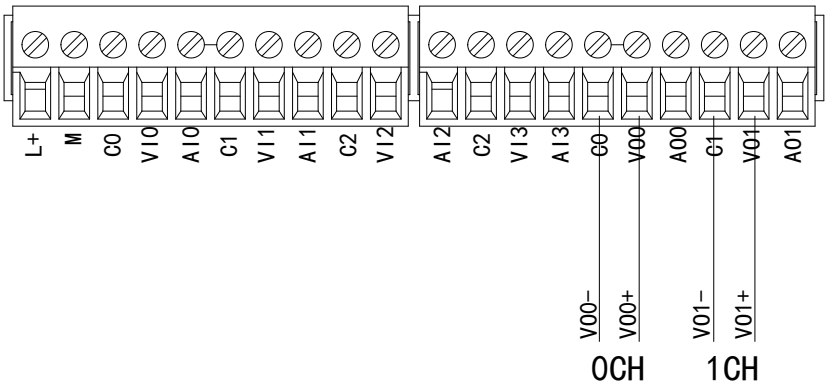
## 5.2.3 External Connection

When connecting externally, to avoid interference, please use a shielded cable and perform single-point grounding of the shield.

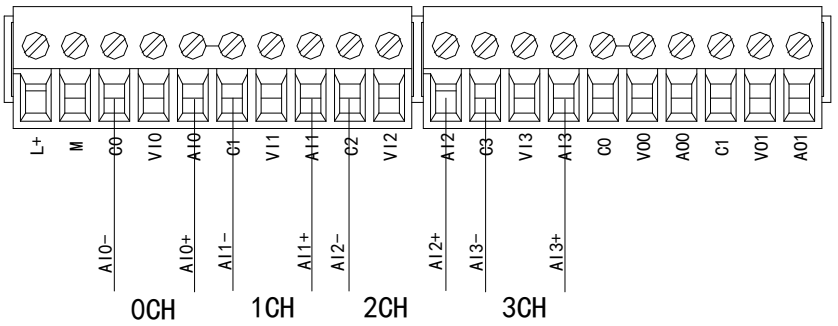
1) Single-ended voltage input



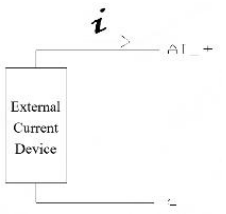

2) Single-ended voltage output



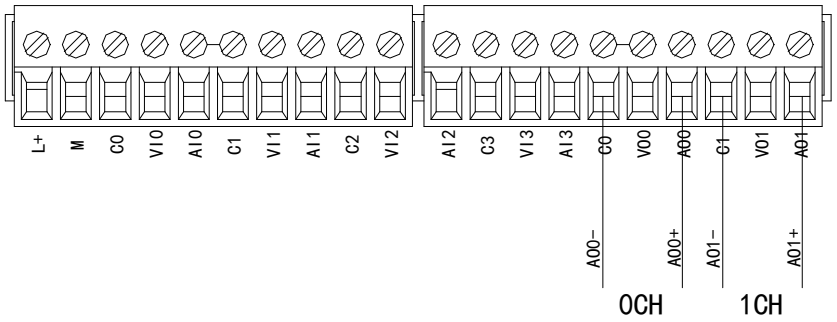

3) Single-ended current input




The current input-side wiring for the XL-E4AD2DA is shown in the figure below:




4) Single-ended current output




No DC24V power supply required for current output!

## 5.2.4 Input/Output Definition Number Allocation

The XL series analog input modules do not occupy any I/O units; the converted values are directly written into the PLC registers. The definition numbers for the PLC registers corresponding to each channel are as follows:

First Expansion Module Register Definition Number

| Signal | Channel | Register Address | Channel Enable Switch (Each channel can only be used when the enable bit is set to 1) | Channel Alarm Flag Bit |
|---|---|---|---|---|
| AD Signal | 0CH | ID10000 | Y10000 | X10000 |
| | 1CH | ID10001 | Y10001 | X10001 |
| | 2CH | ID10002 | Y10002 | X10002 |
| | 3CH | ID10003 | Y10003 | X10003 |
| DA Signal | 0CH | QD10000 | Y10004 | — |
| | 1CH | QD10001 | Y10005 | — |

Second Expansion Module Register Definition Number

| Signal | Channel | Register Address | Channel Enable Switch (Each channel can only be used when the enable bit is set to 1) | Channel Alarm Flag Bit |
|---|---|---|---|---|
| AD Signal | 0CH | ID10100 | Y10100 | X10100 |
| | 1CH | ID10101 | Y10101 | X10101 |
| | 2CH | ID10102 | Y10102 | X10102 |
| | 3CH | ID10103 | Y10103 | X10103 |
| DA Signal | 0CH | QD10100 | Y10104 | — |
| | 1CH | QD10101 | Y10105 | — |

Third Expansion Module Register Definition Code

| Signal | Channel | Register Address | Channel Enable Switch (Each channel can only be used when the enable bit is set to 1) | Channel Alarm Flag Bit |
|---|---|---|---|---|
| AD Signal | 0CH | ID10200 | Y10200 | X10200 |
| | 1CH | ID10201 | Y10201 | X10201 |

| | | | | |
|---|---|---|---|---|
| | 2CH | ID10202 | Y10202 | X10202 |
| | 3CH | ID10203 | Y10203 | X10203 |
| DA Signal | 0CH | QD10200 | Y10204 | — |
| | 1CH | QD10201 | Y10205 | — |

Fourth Expansion Module Register Definition Number

| Signal | Channel | Register Address | Channel Enable Switch (Each channel can only be used when the enable bit is set to 1) | Channel Alarm Flag Bit |
|---|---|---|---|---|
| AD Signal | 0CH | ID10300 | Y10300 | X10300 |
| | 1CH | ID10301 | Y10301 | X10301 |
| | 2CH | ID10302 | Y10302 | X10302 |
| | 3CH | ID10303 | Y10303 | X10303 |
| DA Signal | 0CH | QD10300 | Y10304 | — |
| | 1CH | QD10301 | Y10305 | — |

Fifth expansion module register definition number

| Signal | Channel | Register Address | Channel Enable Switch (Each channel can only be used when the enable bit is set to 1) | Channel Alarm Flag Bit |
|---|---|---|---|---|
| AD Signal | 0CH | ID10400 | Y10400 | X10400 |
| | 1CH | ID10401 | Y10401 | X10401 |
| | 2CH | ID10402 | Y10402 | X10402 |
| | 3CH | ID10403 | Y10403 | X10403 |
| DA Signal | 0CH | QD10400 | Y10404 | — |
| | 1CH | QD10401 | Y10405 | — |

Sixth expansion module register definition number

| Signal | Channel | Register Address | Channel Enable Switch (Each channel can only be used when the enable bit is set to 1) | Channel Alarm Flag Bit |
|---|---|---|---|---|
| AD Signal | 0CH | ID10500 | Y10500 | X10500 |
| | 1CH | ID10501 | Y10501 | X10501 |
| | 2CH | ID10502 | Y10502 | X10502 |
| | 3CH | ID10503 | Y10503 | X10503 |
| DA Signal | 0CH | QD10500 | Y10504 | — |
| | 1CH | QD10501 | Y10505 | — |

Seventh expansion module register definition number

| Signal | Channel | Register Address | Channel Enable Switch (Each channel can only be used when the enable bit is set to 1) | Channel Alarm Flag Bit |
|---|---|---|---|---|
| AD Signal | 0CH | ID10600 | Y10600 | X10600 |
| | 1CH | ID10601 | Y10601 | X10601 |
| | 2CH | ID10602 | Y10602 | X10602 |
| | 3CH | ID10603 | Y10603 | X10603 |

| | | | | |
|---|---|---|---|---|
| DA Signal | 0CH | QD10600 | Y10604 | — |
| | 1CH | QD10601 | Y10605 | — |

Eighth expansion module register definition number

| Signal | Channel | Register Address | Channel Enable Switch (Each channel can only be used when the enable bit is set to 1) | Channel Alarm Flag Bit |
|---|---|---|---|---|
| AD Signal | 0CH | ID10700 | Y10700 | X10700 |
| | 1CH | ID10701 | Y10701 | X10701 |
| | 2CH | ID10702 | Y10702 | X10702 |
| | 3CH | ID10703 | Y10703 | X10703 |
| DA Signal | 0CH | QD10700 | Y10704 | — |
| | 1CH | QD10701 | Y10705 | — |

Ninth Extended Module Register Definition Number

| Signal | Channel | Register Address | Channel Enable Switch (Each channel can only be used when the enable bit is set to 1) | Channel Alarm Flag Bit |
|---|---|---|---|---|
| AD Signal | 0CH | ID10800 | Y11000 | X11000 |
| | 1CH | ID10801 | Y11001 | X11001 |
| | 2CH | ID10802 | Y11002 | X11002 |
| | 3CH | ID10803 | Y11003 | X11003 |
| DA Signal | 0CH | QD10800 | Y11004 | — |
| | 1CH | QD10801 | Y11005 | — |

Tenth Extended Module Register Definition Number

| Signal | Channel | Register Address | Channel Enable Switch (Each channel can only be used when the enable bit is set to 1) | Channel Alarm Flag Bit |
|---|---|---|---|---|
| AD Signal | 0CH | ID10900 | Y11100 | X11100 |
| | 1CH | ID10901 | Y11101 | X11101 |
| | 2CH | ID10902 | Y11102 | X11102 |
| | 3CH | ID10903 | Y11103 | X11103 |
| DA Signal | 0CH | QD10900 | Y11104 | — |
| | 1CH | QD10901 | Y11105 | — |

Eleventh Expansion Module Register Definition Number

| Signal | Channel | Register Address | Channel Enable Switch (Each channel can only be used when the enable bit is set to 1) | Channel Alarm Flag Bit |
|---|---|---|---|---|
| AD Signal | 0CH | ID11000 | Y11200 | X11200 |
| | 1CH | ID11001 | Y11201 | X11201 |
| | 2CH | ID11002 | Y11202 | X11202 |
| | 3CH | ID11003 | Y11203 | X11203 |
| DA Signal | 0CH | QD11000 | Y11204 | — |
| | 1CH | QD11001 | Y11205 | — |

Twelfth Extension Module Register Definition Number

| Signal | Channel | Register Address | Channel Enable Switch (Each channel can only be used when the enable bit is set to 1) | Channel Alarm Flag Bit |
|---|---|---|---|---|
| AD Signal | 0CH | ID11100 | Y11300 | X11300 |
| | 1CH | ID11101 | Y11301 | X11301 |
| | 2CH | ID11102 | Y11302 | X11302 |
| | 3CH | ID11103 | Y11303 | X11303 |
| DA Signal | 0CH | QD11100 | Y11304 | — |
| | 1CH | QD11101 | Y11305 | — |

Thirteenth Extended Module Register Definition Code

| Signal | Channel | Register Address | Channel Enable Switch (Each channel can only be used when the enable bit is set to 1) | Channel Alarm Flag Bit |
|---|---|---|---|---|
| AD Signal | 0CH | ID11200 | Y11400 | X11400 |
| | 1CH | ID11201 | Y11401 | X11401 |
| | 2CH | ID11202 | Y11402 | X11402 |
| | 3CH | ID11203 | Y11403 | X11403 |
| DA Signal | 0CH | QD11200 | Y11404 | — |
| | 1CH | QD11201 | Y11405 | — |

Fourteenth Extended Module Register Definition Code

| Signal | Channel | Register Address | Channel Enable Switch (Each channel can only be used when the enable bit is set to 1) | Channel Alarm Flag Bit |
|---|---|---|---|---|
| AD Signal | 0CH | ID11300 | Y11500 | X11500 |
| | 1CH | ID11301 | Y11501 | X11501 |
| | 2CH | ID11302 | Y11502 | X11502 |
| | 3CH | ID11303 | Y11503 | X11503 |
| DA Signal | 0CH | QD11300 | Y11504 | — |
| | 1CH | QD11301 | Y11505 | — |

Fifteenth Extended Module Register Definition Code

| Signal | Channel | Register Address | Channel Enable Switch (Each channel can only be used when the enable bit is set to 1) | Channel Alarm Flag Bit |
|---|---|---|---|---|
| AD Signal | 0CH | ID11400 | Y11600 | X11600 |
| | 1CH | ID11401 | Y11601 | X11601 |
| | 2CH | ID11402 | Y11602 | X11602 |
| | 3CH | ID11403 | Y11603 | X11603 |
| DA Signal | 0CH | QD11400 | Y11604 | — |
| | 1CH | QD11401 | Y11605 | — |

Sixteenth Extended Module Register Definition Code

| Signal | Channel | Register Address | Channel Enable Switch (Each channel can only be used when the enable bit is set to 1) | Channel Alarm Flag Bit |
|---|---|---|---|---|
| AD Signal | 0CH | ID11500 | Y11700 | X11700 |
| | 1CH | ID11501 | Y11701 | X11701 |
| | 2CH | ID11502 | Y11702 | X11702 |
| | 3CH | ID11503 | Y11703 | X11703 |
| DA Signal | 0CH | QD11500 | Y11704 | — |
| | 1CH | QD11501 | Y11705 | — |

- Disabling unused channels can increase the input/output scanning speed.
- When the input enable switch is turned off during operation, the corresponding input channel will not capture any data (the data value will be displayed as 0).
- When the output enable switch is turned off during operation, the corresponding output channel retains its original output state.

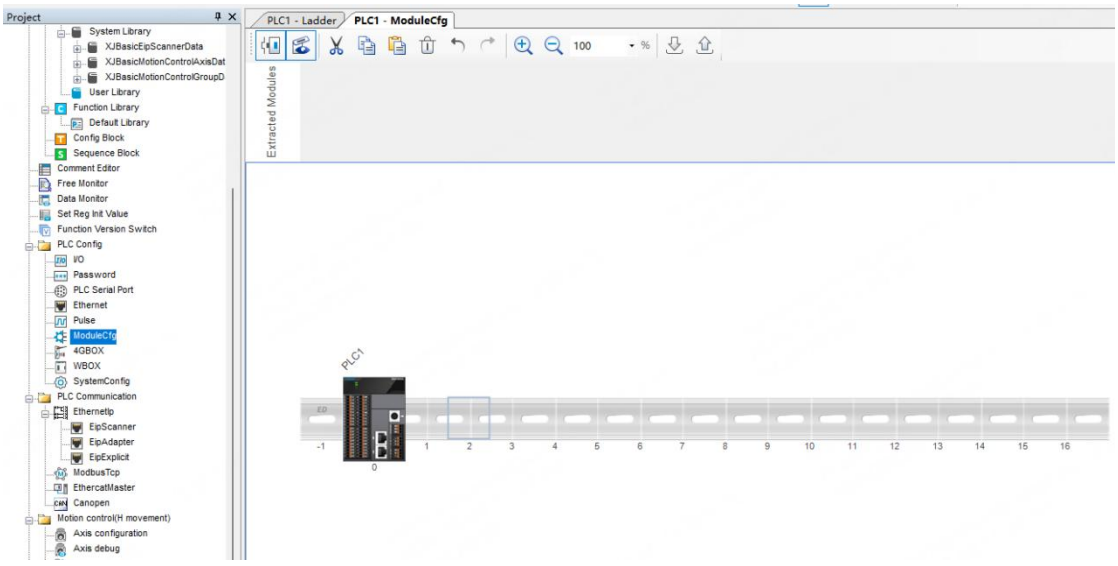
## 5.2.5 Work Mode Settings

There are two methods for configuring the operating mode (The effects of these two methods are equivalent.):

- Through Control Panel configuration
- Set via Flash registers

### 1) Configuration Panel Configuration

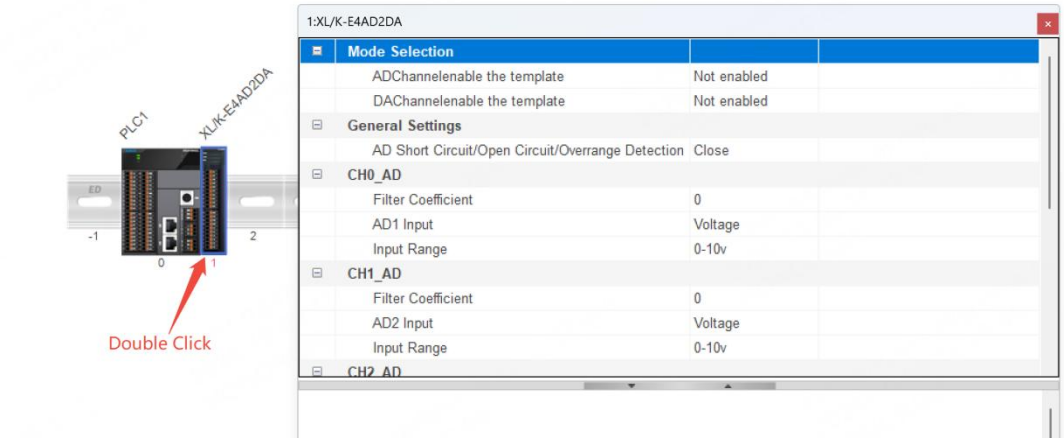
1. Use the Xinje PLC Programming Tool Software version 3.8.0a or later to configure the module; click [PLC Configuration] – [Module Configuration] in the left-side Engineering Bar to open the Expansion Module Settings window. For versions of the Xinje PLC Programming Tool Software prior to 3.8.0a, click [PLC Configuration] – [Expansion Module] in the left-side Engineering Bar to perform the configuration.



2. Select a module from the right-hand module list and drag it to the desired position; alternatively, double-click a module in the right-hand module list to select it:

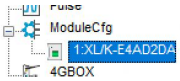



3. Double-click the corresponding module icon to access the module configuration interface, where you can select the AD filter coefficient and the voltage or current output mode for the AD/DA channel.




4. Click " " to retrieve the default configuration parameters for the extended module.

5. After completing the parameter configuration for the expansion module, click " " to write the set values into the PLC; the changes will take effect only after the PLC is powered off and then powered on again. Under the Module Configuration Node, mount the configured module, then double-click it to enter the module parameter configuration interface.




The first-Program low-pass filtering method calculates the effective filtered value by weighting the current sample value against the previous filtered output value; the filtering coefficient is set by the user between 0 and 254 – a smaller value results in more stable data but may introduce data lag; therefore, when the coefficient is set to 1, the filtering effect is strongest and the data is most stable; when the coefficient is set to 254, the filtering effect is weakest; the default value is 0 (no filtering).

### 2) Flash Register Configuration

The expansion module's input and output channels support two operating modes: voltage and current. The current range options include 0–20 mA, 4–20 mA, and –20–20 mA; the voltage range options include 0–5 V, 0–10 V, –5–5 V, and –10–10 V. These settings are configured using the SFD (Special FLASH Data Register) within the PLC. As shown below:

| Module ID | Configuration Information Address | Module ID | Configuration Information 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 |



As shown above, each register is configured to set the mode for four channels; each register consists of 16 bits, and the modes for the four channels are configured sequentially in groups of four bits, from the lowest to the highest bit position.

### 3) SFD Bit Definition

Using the First Module as an example to illustrate the setup method.

<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>Explain</th></tr>
<tr><td>Byte0</td><td colspan="8">AD Channel 1, Channel 2 Filter Coefficient</td><td rowspan="2">AD filtering coefficient</td></tr>
<tr><td>Byte1</td><td colspan="8">AD Channel 3, Channel 4 filtering coefficient</td></tr>
<tr><td rowspan="4">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="4">Used to specify AD and DA.<br>Module input range: The lower 4 bits of Byte2 represent the AD value.<br>The high 4 bits of the Channel 1 configuration bits correspond to the AD Channel 2 configuration bits.<br>The low 4 bits of Byte3 correspond to The AD Channel 3 configuration bits: the upper 4 bits</td></tr>
<tr><td colspan="4">AD2</td><td colspan="4">AD1</td></tr>
<tr><td>Reserved</td><td colspan="3">000：0~10V<br>001：0~5V<br>100：-10~10V<br>101：-5~5V<br>010：0~20mA<br>011：4~20mA<br>110：-20~20mA</td><td>Reserved</td><td colspan="3">000：0~10V<br>001：0~5V<br>100：-10~10V<br>101：-5~5V<br>010：0~20mA<br>011：4~20mA<br>110：-20~20mA</td></tr>
<tr><td>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>
</table>

<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>Explain</td></tr>
<tr><td rowspan="3"></td><td colspan="4">AD4</td><td colspan="4">AD3</td><td rowspan="15">correspond to the AD Channel 4 configuration bits; the lower 4 bits of Byte4. The upper 4 bits represent the configuration bits for DA Channel 1; the remaining bits represent the configuration bits for DA Channel 2.</td></tr>
<tr><td>Reserved</td><td colspan="3">000：0~10V<br>001：0~5V<br>100：-10~10V<br>101：-5~5V<br>010：0~20mA<br>011：4~20mA<br>110：-20~20mA</td><td>Reserved</td><td colspan="3">000：0~10V<br>001：0~5V<br>100：-10~10V<br>101：-5~5V<br>010：0~20mA<br>011：4~20mA<br>110：-20~20mA</td></tr>
<tr><td colspan="8"></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>Reserved</td><td colspan="3">000：0~10V<br>001：0~5V<br>100：-10~10V<br>101：-5~5V<br>010：0~20mA<br>011：4~20mA</td><td>Reserved</td><td colspan="3">000：0~10V<br>001：0~5V<br>100：-10~10V<br>101：-5~5V<br>010：0~20mA<br>011：4~20mA</td></tr>
<tr><td>Byte5~<br>Byte19</td><td colspan="8">Reserved</td></tr>
</table>

Example: Set the operating modes for Channels 3, 2, 1, and 0 of the first module to 0–20 mA, 4–20 mA, 0–10 V, and 0–5 V, respectively; set the filtering coefficients for Channels 1 and 2 to 254; set the filtering coefficients for Channels 3 and 4 to 100; set the operating modes for Channels 1 and 0 at the output to 0–10 V and 0–20 mA, respectively.

Method 1: You can configure it directly from the Configuration Panel; the configuration procedure is as described above.

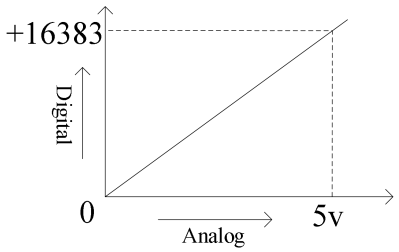
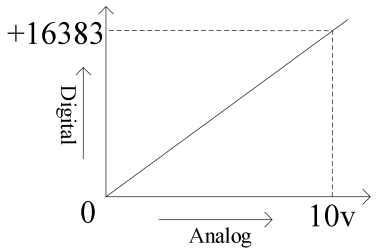
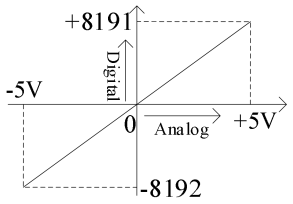
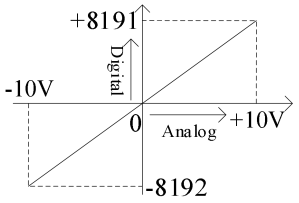
Method 2: Directly set the SFD special register to the following value:

SFD350=64FEH SFD351=2301H SFD352=0002H

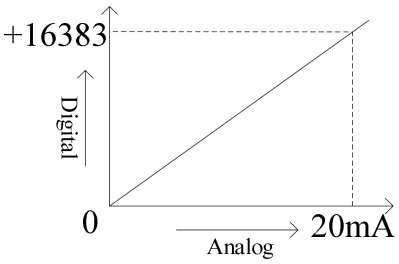
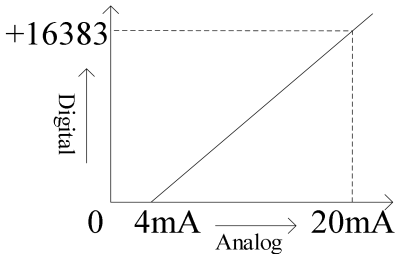
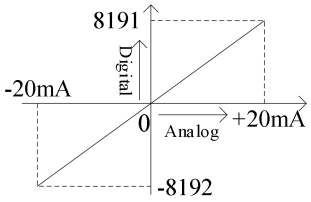
## 5.2.6 Analog-to-Digital Conversion Diagram

1) The relationship between the input analog signal and the converted digital signal

- Analog Voltage Input-to-ADC Conversion Diagram

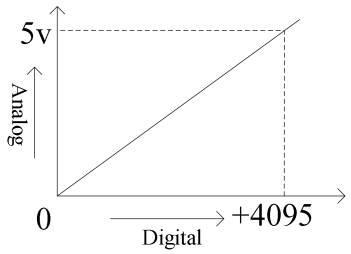
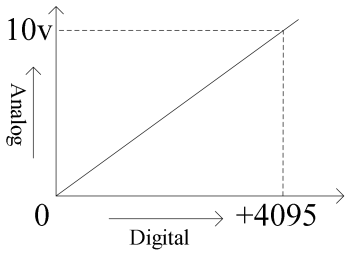
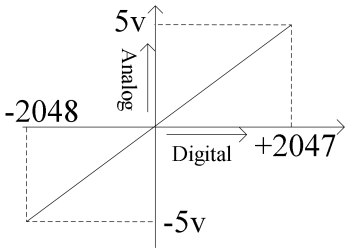
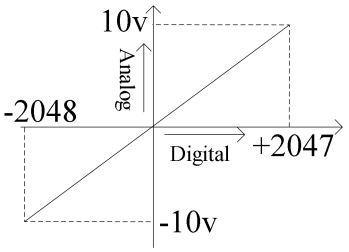
| 0–5 V Analog Input | 0–10 V Analog Input |
|---|---|
|  |  |
| **-5~5V Analog Input** | **-10~10 V Analog Input** |
|  |  |

- Analog current input-to-ADC conversion diagram

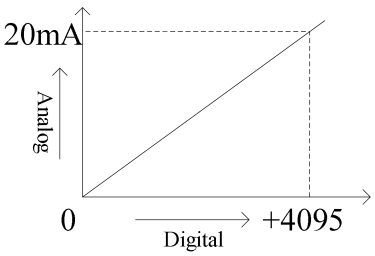
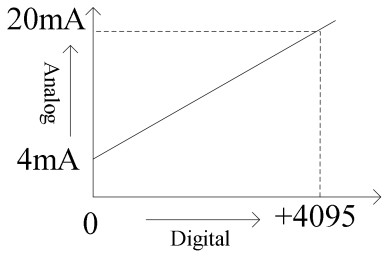
| 0–20 Ma Analog Input | 4–20 Ma Analog Input |
|---|---|
|  |  |
| **-20~20 Ma Analog Input** | |
|  | |

2) The relationship between the digital output and its corresponding analog data

- Analog Voltage Output-to-Digital Conversion Diagram

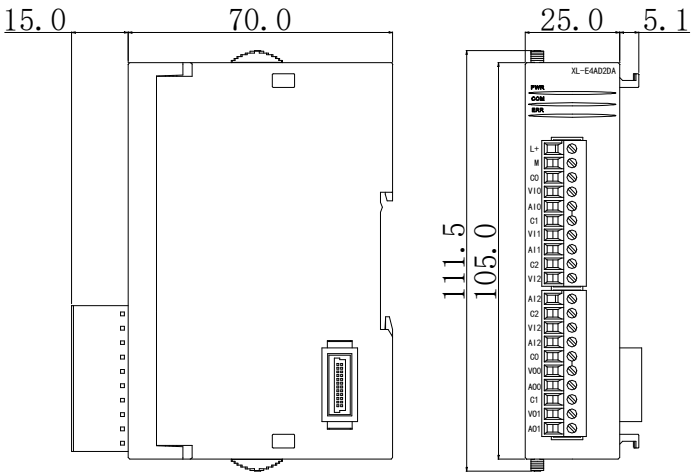
| 0–5 V Analog Output | 0–10 V Analog Output |
|---|---|
|  |  |
| **-5~5V Analog Output** | **-10~10 V Analog Output** |
|  |  |

- Analog current output-to-ADC conversion diagram

| 0–20 Ma Analog Output | 4–20 Ma Analog Output |
|---|---|
|  |  |

- When the channel enable switch is turned on and the AD voltage input is open-circuit, the corresponding ID register displays the value 16383; when the AD current input is open-circuit, the corresponding ID register displays the value 0. When the channel enable switch is turned off, the ID register corresponding to the AD voltage/current input displays the value 0.
- When the input data exceeds K4095, the analog output data from the DA conversion remains constant at 5 V, 10 V, or 20 mA.

## 5.2.7 External Dimensions Diagram




(Unit: mm)

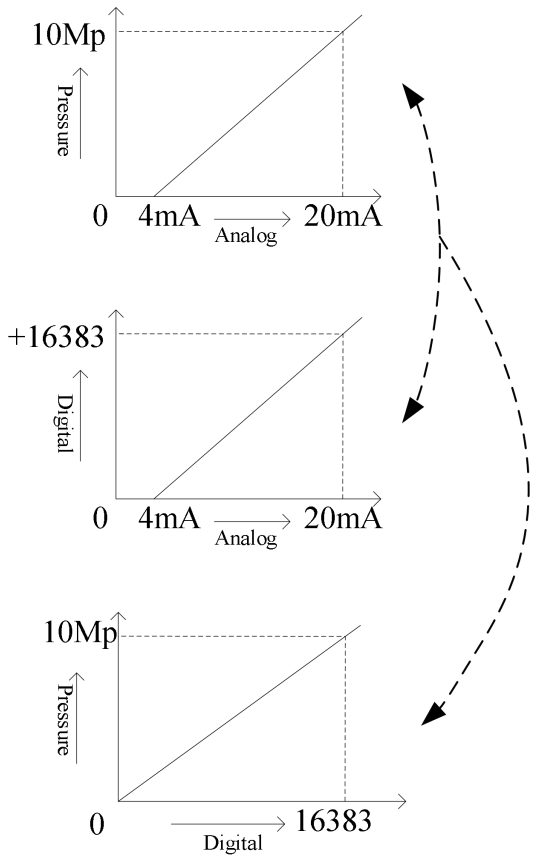
## 5.2.8 Programming Example

Example:

A pressure sensor's output signal needs to be acquired (Pressure sensor performance parameters: detection pressure range 0 MPa–10 MPa; output analog signal: 4–20 mA); simultaneously, a 0 V–10 V voltage signal must be sent to the frequency converter.

Analyse:

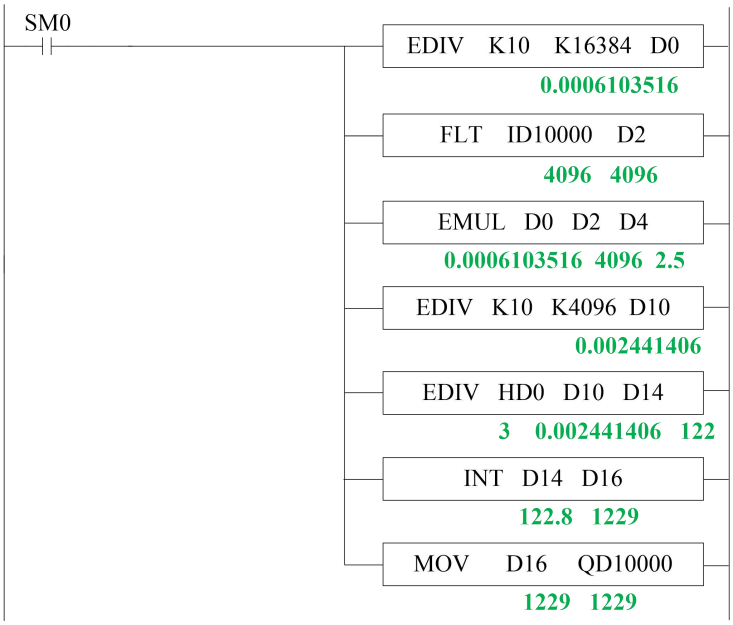
Since the pressure sensor's measurement range is 0 MPa–10 MPa, corresponding to an analog output of 4–20 mA, and the digital output range converted by the expansion module via analog-to-digital conversion is 0–16,383, we can bypass the intermediate analog conversion step (4–20 mA) and directly map the pressure measurement range of 0 MPa–10 MPa to the digital output range of 0–16,383; the corresponding relationship is shown in the figure below. The value 10 MPa / 16,384 = 0.0006103515 represents the pressure value corresponding to each digital unit captured by the expansion module; therefore, by multiplying the real-time digital value read from the expansion module's ID register by 0.0006103515, the current pressure measured by the sensor can be calculated. For example, if the digital value read from the ID register is 4,096, the corresponding pressure is 2.5 MPa.




Similarly, the digitally set range of 0–4095 in the QD expansion module register corresponds to a voltage output signal ranging from 0 V to 10 V. The value 10 V/4096 = 0.0024414 indicates the voltage value corresponding to each digitally set value in the QD expansion module register; for example, to output a voltage of 3 V, calculate 3 V / 0.0024414 = 1229, and then send this computed digital value to the corresponding QD register.

Please use floating-point arithmetic for calculations; otherwise, the calculation accuracy may be affected, or the calculation may even fail!

Program:




Explain:

- SM0 is a normally ON coil that remains in the ON state throughout the PLC operation.
- When the PLC is activated, the analog signal acquisition first calculates the pressure value corresponding to each digital value of 1 collected by the expansion module; then, the digital value (integer type) acquired from the ID10000 register is converted into a floating-point number. Therefore, the current real-time pressure value can be determined simply by multiplying the real-time value acquired from the ID10000 register of the expansion module by the pressure value corresponding to each digital value of 1 collected by that expansion module.
- Similarly, for an analog output, first calculate the voltage value corresponding to each digital value of 1 acquired by the expansion module; then, divide the set target voltage value by the voltage value corresponding to each digital value of 1 acquired by the expansion module to obtain the digital value (a floating-point number) that needs to be set. Since the QD10000 register can only store integers, the resulting floating-point digital value must be converted into an integer before being transmitted to the QD10000 register.

# 6 Temperature Control Module

## 6.1 Temperature Control Module Overview

The XL series temperature control module supports four-channel thermocouple or four-channel RTD temperature signal inputs.

### 6.1.1 Naming Rule

XL－E○□□－P－H
① ② ③ ④ ⑤ ⑥

| | | |
|---|---|---|
| ① | Series Name | XL: XL Series Expansion Modules |
| ② | Reference Expansion Module | E: Indicates Expansion Module |
| ③ | Number of temperature control circuits | 4 |
| ④ | Temperature sensor type | TC: denotes a thermo couple sensor<br>PT3: Indicates a three-wire thermal resistance sensor |
| ⑤ | PID Control | P: Indicates support for PID control |
| ⑥ | Is isolation required? | None: Non-isolated handling<br>H: Independent channel isolation for enhanced interference resistance |

### 6.1.2 Model List

| Model | | Description |
|---|---|---|
| Temperature Control | XL-E4TC-P | 4-channel thermo couple temperature control with built-in PID regulation and auto-tuning support |
| | XL-E4PT3-P | 4-channel RTD temperature control with built-in PID regulation and self-tuning capability |
| | XL-E4PT3-P-H | 4-channel RTD temperature control with built-in PID regulation, supports automatic tuning, and features a fully isolated channel design. |

### 6.1.3 General Requirements

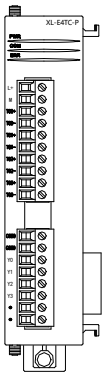
| Project | Specifications |
|---|---|

| | |
|---|---|
| Input Power Supply Voltage | DC24V±10% |
| Service Environment | Non-corrosive gases |
| Ambient Temperature | 0°C~60°C |
| Ambient Humidity | 5~95% |
| Install | Directly installed on a DIN46277 guide rail (35 mm wide) |

## 6.2 Thermocouple Temperature Control Module XL-E4TC-P

This section primarily introduces the specifications of the XL-E4TC-P module, relevant thermocouple knowledge, terminal pin outs, data address mapping, operating workflow and principles, read/write data commands, as well as relevant programming examples.

### 6.2.1 Module Features and Specifications



The XL-E4TC-P Temperature PID Control Module processes four-point thermo couple temperature signals and transmits them to the PLC main unit.

- Therm couple temperature sensor – uses analog input.
- 4-channel input, 4-channel output, 4 independent PID parameters, with auto-tuning functionality supported.
- Integrated cold-end compensation circuit.
- Resolution accuracy: 0.1°C.
- As specialized functional modules for the XL series, the XL3/XL3E series PLCs can connect up to 10 modules; the XL5/XL5E/XL5N/ XL5H/XLME/XLH series support up to 16 modules; however, the XL1 series does not support additional modules.

Module Specifications

| Project | Content | |
|---|---|---|
| Analog Input Signal | Type K, S, E, N, B, T, J, R thermocouples | |
| Temperature Measurement Range | Type K | -200.0°C ~ 1300.0°C |
| | Type S | -50.0°C ~ 1700.0°C |
| | Type E | -200.0°C ~ 1000.0°C |
| | Type N | -200.0°C ~ 1300.0°C |
| | Type B | 250.0°C ~ 1700.0°C |

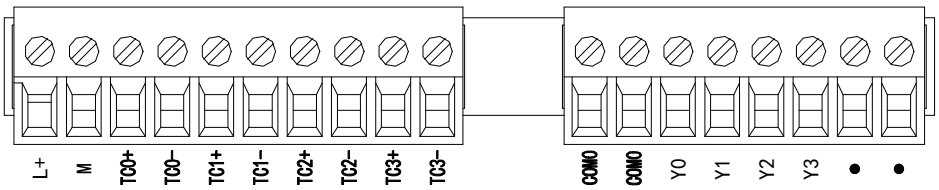
| Project | Content | |
|---|---|---|
| | Type T | -200.0℃ ~ 400.0℃ |
| | Type J | -200.0℃ ~ 1200.0℃ |
| | Type R | -50.0℃ ~ 1700.0℃ |
| Digital Output Range | 0–Maximum temperature measurement value × 10 (e.g., for Type K thermocouples, the digital output range is 0–13,000) | |
| Resolution Ratio | 0.1℃ | |
| Overall Accuracy | ±1% (relative maximum value) | |
| Conversion Rate | 420ms/4 channel | |
| Module Power Supply | DC24V±10%，50mA | |

When the module is in an abnormal state, the ID1xxxx register will display a corresponding abnormality value; even if line break detection is disabled in the module configuration, an abnormality value will still be displayed. The abnormality values for different types of alarms are as follows:

- When the 24 V power supply is disconnected, the data for all channels is-2.
- The thermo couple temperature control module: when no sensor is connected, its channel data is-1.
- When the sensor signal falls below the lower limit of the measurement range, the channel data represents the minimum value within the digital output range for the selected sensor type.
- When the sensor signal exceeds the upper limit of the measurement range, the channel data represents the maximum value within the digital output range for the selected sensor type.
- When both sensor line breakage and 24V power supply line breakage occur simultaneously, an abnormality indicator (-2) indicating a 24V power supply line breakage is displayed.

Negative temperature detection feature – supported only on temperature modules with firmware version V5 or later.

## 6.2.2 Terminal Specifications




| Terminal Block | | Function |
|---|---|---|
| Power Terminal | L+ | External power supply: +24V positive terminal for the module |
| | M | External power supply: 24V negative terminal for the module |
| CH0 | TC0+ | CH0 thermocouple positive input terminal |
| | TC0- | CH0 thermocouple negative input terminal |
| CH1 | TC1+ | CH1 thermocouple positive input terminal |

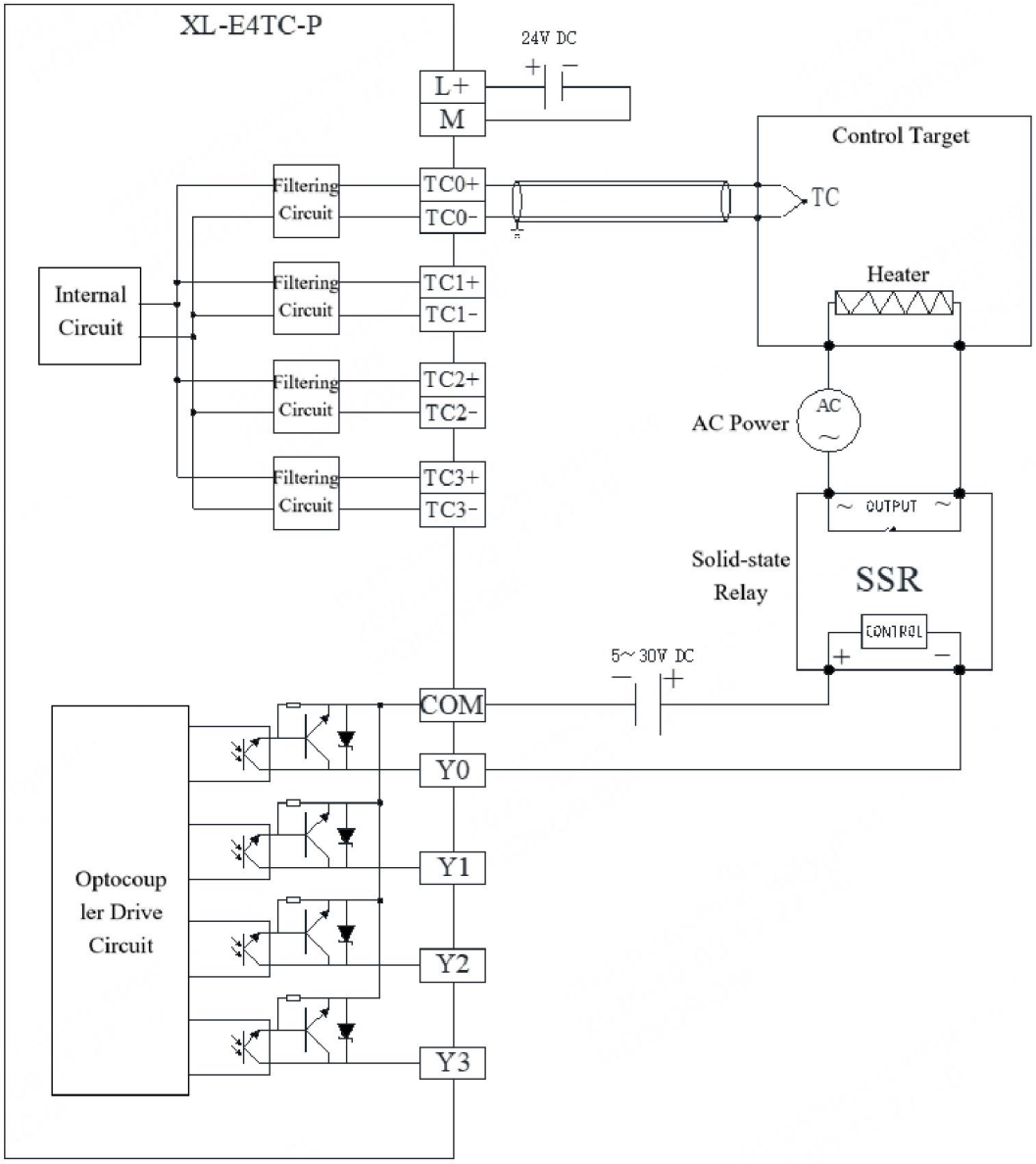
| | | |
|---|---|---|
| | TC1- | CH1 thermocouple negative input terminal |
| CH2 | TC2+ | CH2 thermocouple positive input terminal |
| | TC2- | CH2 thermocouple negative input terminal |
| CH3 | TC3+ | CH3 thermocouple – Positive input terminal |
| | TC3- | CH3 thermocouple negative input terminal |
| Output Terminal | COM0 | CH0–CH3 common output terminal |
| | Y0~Y3 | CH0–CH3 output terminal |

## Wiring terminal specifications

When wiring a module, its terminals must comply with the following requirements:

- Wire stripping length: 9 mm;
- Flexible conductor with tubular bare ends, cross-sectional area 0.25–1.5 mm²;
- Flexible conductor with tubular pre-insulated ends, cross-sectional area: 0.25–0.5 mm².

## 6.2.3 Input/Output Wiring Example




- Output terminal: Transistor-output terminal; please use a smooth DC 5V–30V power supply.
- Circuit insulation: The internal circuits of the programmable logic controller and the output transistors are optically isolated using optical couplers; additionally, each individual module is isolated from the others.
- Response time: The time from the programmable logic controller driving (or breaking) the opto coupler to the transistor turning on/off shall not exceed 0.2 ms.
- Output current: To limit temperature rise, a maximum output load of 50 mA is supported.
- Open-circuit leakage current: below 0.1 mA.

- When connecting an external 24V power supply, please use the 24V power supply built into the PLC unit to avoid interference.
- The housing of the device where the temperature sensor is installed must be grounded.
- To prevent interference, the temperature sensor should be connected using a shielded cable with the shield grounded at a single point.
- When the "Cold-End Compensation Method Selection" is set to "Internal Compensation," the thermo couple's cold end is located at a terminal block on the module; in this case, an extension cable made of the same material or a dedicated compensation cable must be used for extension; otherwise, the measurement accuracy will be affected.

## 6.2.4 IO address allocation and read/write operations

### 1) Input/Output Definition Number Allocation

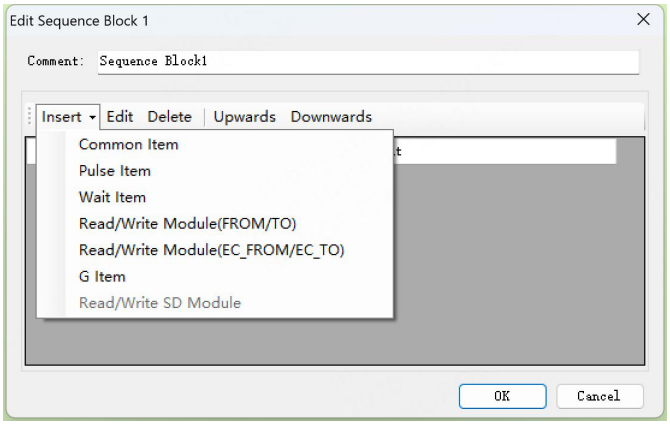
The XL series analog input modules do not occupy any I/O units; the converted values are directly written into the PLC registers. The definition numbers for the PLC registers corresponding to each channel are as follows:

| Relevant Parameter | Explain | | | | |
|---|---|---|---|---|---|
| | Module ID | CH0 | CH1 | CH2 | CH3 |
| Temperature Display (Unit: 0.1°C) | Module 1 | ID10000 | ID10001 | ID10002 | ID10003 |
| | Module 2 | ID10100 | ID10101 | ID10102 | ID10103 |
| | ..... | ID1xx00 | ID1xx01 | ID1xx02 | ID1xx03 |
| | Module 16 | ID11500 | ID11501 | ID11502 | ID11503 |
| PID Enable Signal (0: Disabled; 1: Enabled) | Module 1 | Y10000 | Y10001 | Y10002 | Y10003 |
| | Module 2 | Y10100 | Y10101 | Y10102 | Y10103 |
| | ..... | Y1xx00 | Y1xx01 | Y1xx02 | Y1xx03 |
| | Module 16 | Y11700 | Y11701 | Y11702 | Y11703 |
| | When the "Y Function Selection" is set to "Immediate Output," Y0–Y3 serve as standard digital output terminals; the Y10000–Y10003 (using Module #1 as an example) can be used to directly control the Y0–Y3 outputs of the module;<br>When the "Y Function Selection" is set to "Channel Enable," Y0–Y3 serve as PID output terminals; the channels corresponding to these can be enabled using Y10000–Y10003 (for example, using Module #1) to activate the PID control for those channels; the Y0–Y3 outputs of the module are then controlled by automatic PID calculations. | | | | |
| PID Contact Output (X Input Returning To The Main Unit) | Module 1 | X10000 | X10001 | X10002 | X10003 |
| | Module 2 | X10100 | X10101 | X10102 | X10103 |
| | ..... | X1xx00 | X1xx01 | X1xx02 | X1xx03 |
| | Module 16 | X11700 | X11701 | X11702 | X11703 |
| | When the "Y Function Selection" is set to "Channel Enable," Y10000–Y10003 (taking Module #1 as an example) represent the PID enable bits; the PID duty cycle output should be monitored using X10000–X10003 (taking Module #1 as an example). | | | | |
| Channel: Wire | Module 1 | X10010 | X10011 | X10012 | X10013 |

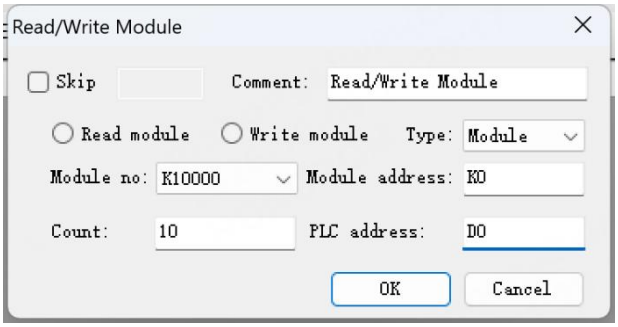
| Relevant Parameter | Explain | | | | |
|---|---|---|---|---|---|
| | Module ID | CH0 | CH1 | CH2 | CH3 |
| Fault/Power Supply Detection (0: Wired; 1: Wire Fault) | Module 2 | X10110 | X10111 | X10112 | X10113 |
| | ..... | X1xx10 | X1xx11 | X1xx12 | X1xx13 |
| | Module 16 | X11710 | X11711 | X11712 | X11713 |
| PID Automatic Tuning Error (0: Normal; 1: Automatic Tuning Parameter Error) | Module 1 | X10020 | X10021 | X10022 | X10023 |
| | Module 2 | X10120 | X10121 | X10122 | X10123 |
| | ..... | X1xx20 | X1xx21 | X1xx22 | X1xx23 |
| | Module 16 | X11720 | X11721 | X11722 | X11723 |

## 2) From/To Command Usage Instructions

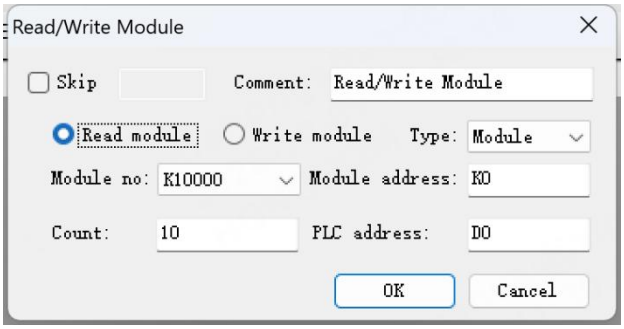
Reading and writing to the thermocouple temperature control module shall be implemented via FROM/TO instructions in the sequential function block BLOCK, as shown below:



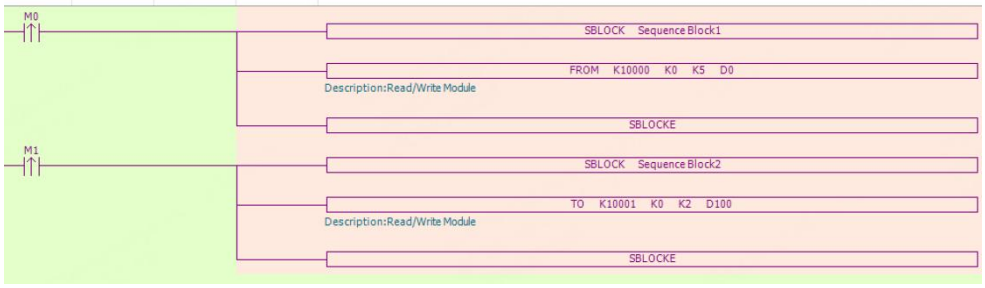

**(a) Insert "Read/Write Module (FROM/TO)"**




**(b) Writing Module**




**(c)read through model**

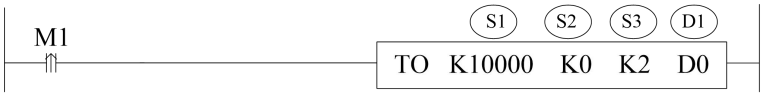



**(d) Convert to a ladder diagram**

Instruction Parse:

- Write Module Instruction: T0

Write the specified register data into the designated module address, using a byte as the operation unit.




| Operand | Function | Available Operands |
|---|---|---|
| S1 | Target Module Number. | K、TD，CD，D，HD，FD |
| S2 | Write the starting address of the module. | K、TD，CD，D，HD，FD |
| S3 | Number of registers to write to (number of words). | K、TD，CD，D，HD，FD |
| D1 | The starting address of the register where written data is stored within the device. | TD，CD，D，HD，FD |

- Read Module Instruction: FROM

Read data from the specified module address into the designated register of the device, using a word as the operation unit.




| Operand | Function | Available Operands |
|---|---|---|
| S1 | Target Module Number. | K、TD，CD，D，HD，FD |
| S2 | Read the starting address of the module. | K、TD，CD，D，HD，FD |
| S3 | Number of registers to read (number of words). | K、TD，CD，D，HD，FD |
| D1 | The body receives the starting address of the register. | TD，CD，D，HD，FD |

- The FROM/TO instruction can only be written within a BLOCK sequential function block; for XL series PLCs with firmware version V3.4.5 or later, a maximum of 100 BLOCKs can be written in the program, but only up to 8 can be executed simultaneously;
- The module starting number begins at K10000; Module #1 is K10000, Module #2 is K10001, and so on – Module #16 is K10015.

### 3) Related Address Definition

During the use of this module, operations involving the reading and writing of relevant parameters are performed; the following provides an explanation of the address arrangement:

| From_To Data | | Initial Value | CH0 | CH1 | CH2 | CH3 | R/W |
|---|---|---|---|---|---|---|---|
| Auto-tuning Enable | | 0 | K0 | K0 | K0 | K0 | RW |
| Pid Output Value (0–4095) | | - | K1 | K2 | K3 | K4 | R |
| Temperature Setpoint (Unit: 0.1°C) | | 0 | K5 | K6 | K7 | K8 | RW |
| PID Parameter | Kp | 40 | K9 | K13 | K17 | K21 | RW |
| | Ki | 240 | K10 | K14 | K18 | K22 | RW |
| | Kd | 60 | K11 | K15 | K19 | K23 | RW |
| | ΔT (Unit: 0.1°C) | 1000 | K12 | K16 | K20 | K24 | RW |
| Temperature Control Cycle (Unit: 0.1 s) | | 20 | K25 | K26 | K27 | K28 | RW |
| Output Amplitude (Range: 0–100) | | 100 | K29 | K30 | K31 | K32 | RW |
| Temperature Deviation Value δ (Unit: 0.1°C) | | 0 | K33 | K34 | K35 | K36 | RW |
| Calibrate Ambient Temperature Value (Unit: 0.1°C) | | - | K37 | K38 | K39 | K40 | W |
| From/To Data Initialization | | - | K41 | K41 | K41 | K41 | W |

| Relevant Parameter | Explain |
|---|---|
| Auto-tuning Enable | Self-tuning enable signal: when set to 1, the system enters the self-tuning phase. Upon completion of the self-tuning process, the PID parameter values and the temperature control cycle value are updated, and the enable bit is automatically cleared to 0.<br>The user can also read the status; a value of 1 indicates that the system is currently in the self-tuning process, while a value of 0 indicates that self-tuning has not yet been performed or that the self-tuning process has been completed.<br>The self-tuning method employs the critical oscillation technique. |
| PID Output Value (0 ~ 4095) | When the PID output is used for analog control (e.g., steam valve opening degree or thyristor conduction angle), this value can be transmitted to an analog output module to fulfill the control requirements. |
| Temperature setpoint | The target temperature value for the control system. The setpoint range corresponds to the digital value corresponding to the upper and lower |

| Relevant Parameter | Explain |
|---|---|
| (Unit: 0.1°C) | temperature limits of the selected sensor scale. |
| PID Parameter<br>(P、I、D) | The optimal parameter values can be determined using PID self-tuning.<br>If the current PID control does not adequately meet the control requirements, the user may directly enter empirical PID parameters; the module will then perform PID control based on these user-defined PID parameters. |
| PID Control Range<br>(Diff)<br>(Unit: 0.1°C) | Let: the operating range be Tdiff, the setpoint temperature be Tset, and the displayed temperature be T.<br>When Tset–Tdiff ≤ T ≤ Tset+Tdiff, the output is controlled by PID calculation.<br>When T ≤ T_set – T_diff, the output is set to its maximum value.<br>When Tset + Tdiff ≤ T, the output is 0. |
| Temperature Control Cycle<br>(Unit: 0.1 s) | The control cycle adjustment range is 0.1s to 200s, with a minimum accuracy of 0.1s.<br>The write value is the actual temperature control cycle value multiplied by 10; for example, writing 5 corresponds to an actual temperature control cycle of 0.5s. |
| Output Amplitude | The output amplitude calculated by the PID controller is expressed in%; a value of 100 corresponds to 100% of the full-scale output, while a value of 80 corresponds to 80% of the full-scale output.<br>Note: When set to 0, the PID controller will not produce any output. |
| Temperature Deviation Value δ<br>(Unit: 0.1°C) | Temperature display value = (Sampling temperature value + Temperature deviation value δ) / 10. This parameter is a signed integer with a unit of 0.1°C; it represents the power-off hold value, and the default value is 0. |
| Calibrate Ambient Temperature Value<br>(Unit: 0.1°C) | When the user determines that the ambient temperature value does not match the temperature value displayed on the module's channel, they can write the known ambient temperature value into this parameter. At the moment of writing, the module calculates the temperature deviation value δ and stores it.<br>Calculate the temperature deviation value δ = calibrated ambient temperature value – sampling temperature value. Unit: 0.1°C.<br>For example: Under thermal equilibrium conditions, the user measures the ambient temperature using a mercury thermometer and obtains a reading of 60.0°C; however, the displayed temperature at that moment is 55.0°C (corresponding to a sampled temperature of 55.0°C), resulting in a temperature deviation δ = 0. At this point, the user writes the value 600 into this parameter; the temperature deviation δ is then recalculated as 50 (5°C). Consequently, the displayed temperature is calculated as: (Sampled Temperature Value + Temperature Deviation δ) / 10 = 60°C.<br>Note: When entering the calibration temperature value, ensure that it matches the ambient temperature. This data is critical; any incorrect entry could lead to a significant calculation error in the temperature deviation value (δ), which in turn would affect the displayed temperature. |
| From/To Data Initialise | This function resets the parameters in the above table to their factory settings; when using this function, set K41 to 1 – setting it to any other value will have no effect. The Automatic Tuning Enable feature cannot be initialized; it will |

| Relevant Parameter | Explain |
|---|---|
| | revert to its default value only after the tuning process is completed or after the device is powered on again. |

- The "From/To Data Initialization" feature requires the module firmware version to be V3 or later.
- When the "Y Function Selection" is set to "Immediate Output", only the 'Temperature Deviation Value δ' and 'Calibrated Ambient Temperature Value' among the above parameters are valid; all other parameters are inactive.
- The module can automatically save the set temperature value, PID parameters, temperature control cycle, output amplitude, temperature deviation, and temperature calibration parameters. When writing these parameters, use rising-edge-triggered writing; avoid performing continuous writes. It is recommended to write only the parameters that are actually needed; for programming convenience, it is not advisable to write data to the entire chip, as setting certain addresses to zero may prevent the system from operating correctly.
- Self-tuning enable address K0: The K0 address occupies a contiguous 8-bit address space; the 4-channel module enable bit corresponds to the first 4 bits of this address space, while the remaining 4 bits remain unused (but cannot be repurposed). When the read/write enable bit is active, K0 may refer to a coil or a register; if it refers to a coil, that coil serves as the starting address for occupying a contiguous 8-bit segment; if it refers to a register, the entire register is occupied. For example, to set the first and third channels of the module to self-tuning mode and the remaining two channels to manual PID mode, when the command is "To K10000 K0 K1 M10," set M10 and M12 to ON and set M11 and M13 to OFF; when the command is "To K10000 K0 K1 D100," assign the value 5 to D100.

### 6.2.5 Work Mode Settings

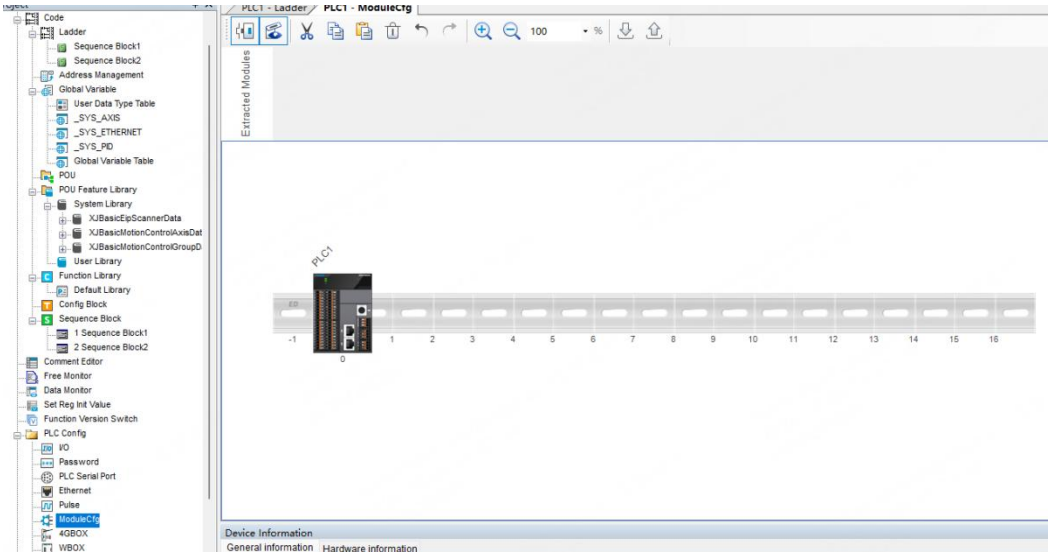
There are two methods available for configuring the operating mode (The effects of these two methods are equivalent.):

- Configure via the Settings Panel
- Set via Flash register (SFD)

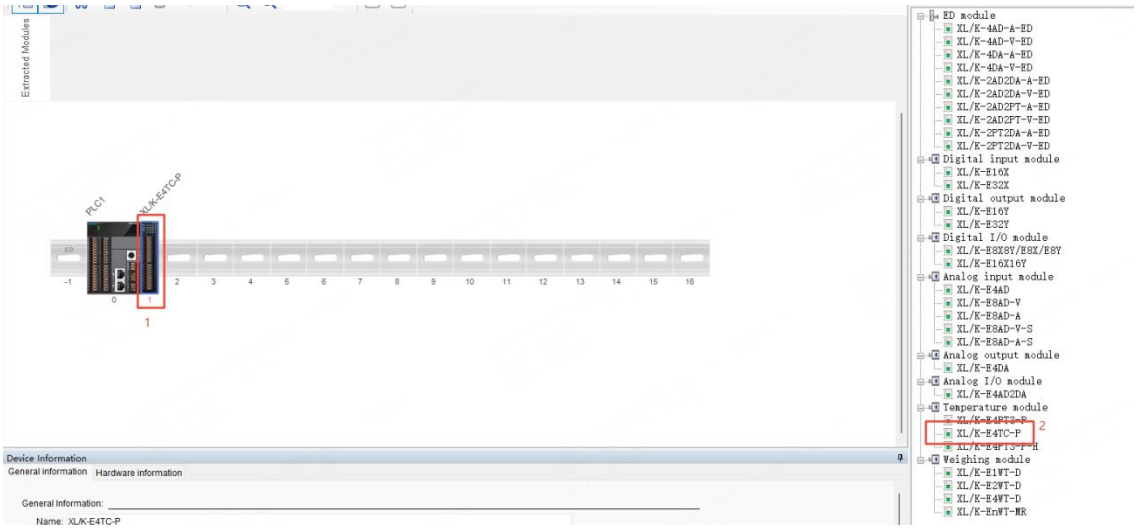
#### 1) Configuration Panel Configuration

1. Use the Xinje PLC Programming Tool Software version 3.8.0a or later to configure the module; click [PLC Configuration] – [Module Configuration] in the left-side Engineering Bar to open the Expansion Module Settings window. For versions of the Xinje PLC Programming Tool Software prior to 3.8.0a, click [PLC Configuration] – [Expansion Module] in the left-side Engineering Bar to

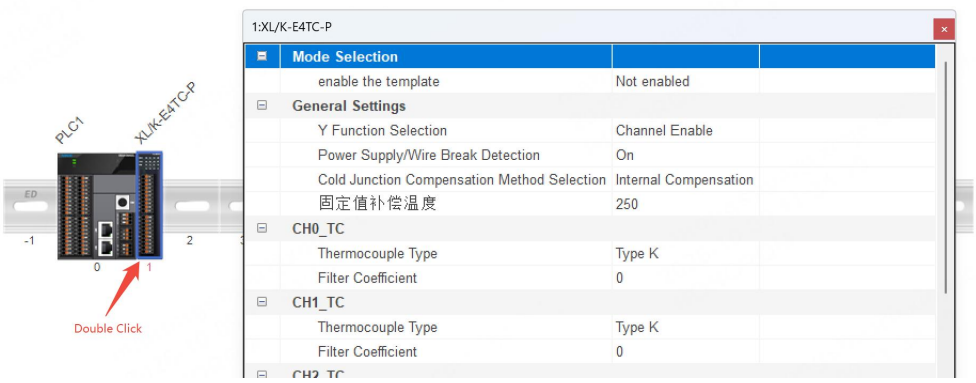
perform the configuration.



2. Select a module from the right-hand module list and drag it to the desired position; alternatively, double-click a module in the right-hand module list to select it:

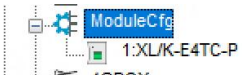


3. Double-click the corresponding module icon to access the module configuration interface, where you can select the appropriate thermo couple model (supports 8 thermo couple types), wire break detection switch, Y-function selection, fixed-value compensation method, and fixed-value compensation temperature.

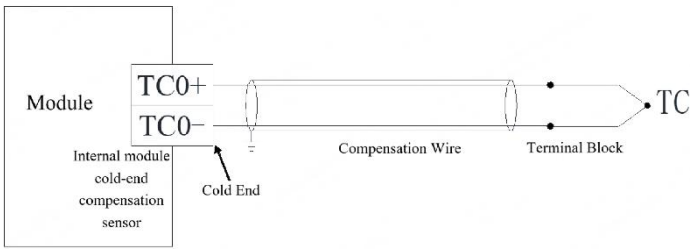


4. Click " " to retrieve the default configuration parameters for the extended module.

5. After completing the parameter configuration for the expansion module, click " " to write the set values into the PLC; the changes will take effect only after the PLC is powered off and then powered on again. Under the Module Configuration Node, mount the configured module, then double-click it to enter the module parameter configuration interface.




- The "Y Function Selection" setting is used to specify the function for modules Y10000–Y10003 (e.g., Module #1); by default, this setting is set to "Channel Enable," which supports the module's built-in self-tuning and PID control functions. The output points Y0–Y3 on the module switch on or off based on the PID output value; when this setting is configured as "Immediate Output," the output points Y0–Y3 on the module function as standard digital output points – setting Y10000–Y10003 will activate Y0–Y3, while the module retains only its temperature acquisition functionality; if temperature control functionality is required, please use the PID instruction on the PLC main unit to implement it.
- A thermo couple consists of two conductive wires made of different metals or metal alloys; the ends of these wires are welded together, and this welded junction is known as the temperature measurement point. The other ends of the two wires remain open; these ends are referred to as the cold junction.




The module supports two cold-end compensation methods: "Internal Compensation" and "Fixed Value Compensation." The "Cold-End Compensation Method Selection" menu allows you to switch between these two modes; by default, the module uses "Internal Compensation," in which case the cold-end temperature is measured by the module's built-in cold-end sensor. When set to "Fixed Value Compensation," the cold-end temperature is determined by a predefined "Fixed Value Compensation Temperature." The default value for this parameter is 250 (25.0°C), and the adjustable range is from-1000 to 1000. However, it is important to ensure that the set "Fixed Value Compensation Temperature" matches the actual temperature at the location where the cold end is situated.

- The "Y Function Selection" feature is supported only on temperature modules with firmware version V3 or later.
- The "Fixed Value Compensation" feature is supported only on temperature modules with firmware version V5 or later.

## 2) Flash Register Configuration

The CH0–CH3 expansion module channels allow the selection of thermo couple type, which can be configured using the SFD (Special FLASH Data Register) within the PLC.

| Module ID | Configuration Information Address | Module ID | Configuration Information 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 |

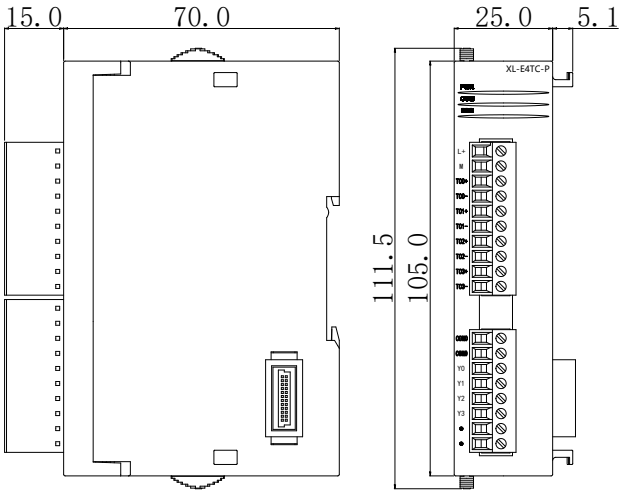
### 3) SFD Bit Definition

Using the First Module as an example to illustrate the setup method:

| Register | | Bit7 | Bit6 | Bit5 | Bit4 | Bit3 | Bit2 | Bit1 | Bit0 |
|---|---|---|---|---|---|---|---|---|---|
| SFD350 | Byte0 | TC2 Sensor Type | | | | TC1 Sensor Type | | | |
| | | 0000：K<br>0001：S<br>0010：E<br>0011：N<br>0100：J<br>0101：T<br>0110：R<br>0111：B | | | | 0000：K<br>0001：S<br>0010：E<br>0011：N<br>0100：J<br>0101：T<br>0110：R<br>0111：B | | | |
| | Byte1 | TC4 Sensor Type | | | | TC3 Sensor Type | | | |
| | | 0000：K<br>0001：S<br>0010：E<br>0011：N<br>0100：J | | | | 0000：K<br>0001：S<br>0010：E<br>0011：N<br>0100：J | | | |

| Register | | Bit7 | Bit6 | Bit5 | Bit4 | Bit3 | Bit2 | Bit1 | Bit0 |
|---|---|---|---|---|---|---|---|---|---|
| | | 0101：T<br>0110：R<br>0111：B | | | | 0101：T<br>0110：R<br>0111：B | | | |
| SFD351 | Byte2 | - | | | | | | | |
| | Byte3 | - | | | | | | | |
| SFD352 | Byte4 | - | | Cold-end compensation method selection:<br>00: Internal Compensation<br>01: Fixed Value Compensation | | TC Channel Disconnection/ Power Supply Detection Switch<br>00:00 – Start<br>01: Turn Off | | YFS<br>00: Channel Enable<br>01: Output Immediately | |
| | Byte5 | - | | | | | | | |
| SFD353 | Byte6 | Fixed-value compensation temperature (unit: 0.1°C; setpoint range: -1000 to 1000; default: 250) | | | | | | | |
| | Byte7 | | | | | | | | |
| SFD354 | Byte8 | TC1 filtering coefficient (0 – no filtering; 1–254 – filtering intensity decreases sequentially; default: 0) | | | | | | | |
| | Byte9 | TC2 filtering coefficient (0 – no filtering; 1–254 – filtering intensity decreases sequentially; default: 0) | | | | | | | |
| SFD355 | Byte10 | TC3 filtering coefficient (0 – no filtering; 1–254 – filtering intensity decreases sequentially; default: 0) | | | | | | | |
| | Byte11 | TC4 filtering coefficient (0 – no filtering; 1–254 – filtering intensity decreases sequentially; default: 0) | | | | | | | |
| SFD356 | Byte12 | - | | | | | | | |
| | Byte13 | - | | | | | | | |
| SFD357 | Byte12 | - | | | | | | | |
| | Byte13 | - | | | | | | | |
| SFD358~SFD359 | | Reserved | | | | | | | |

## 6.2.6 External Dimensions Diagram




(Unit:mm)

## 6.2.7 Programming Example

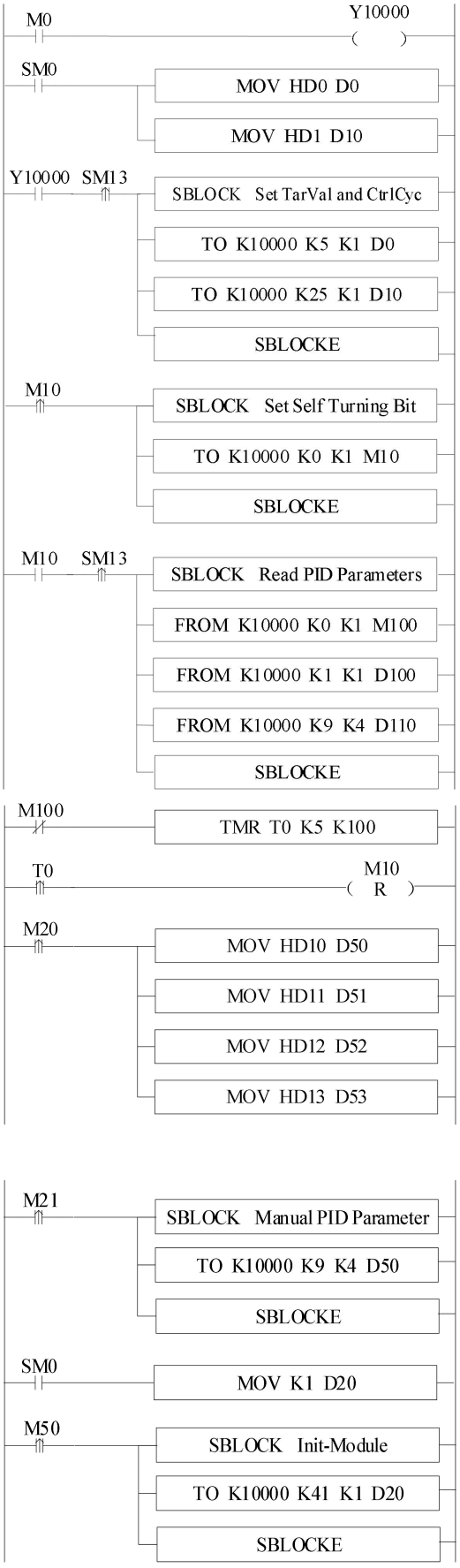
When temperature control is required, two programming methods are available:

- To implement temperature control using the PID function on the PLC unit, switch the Y function selection to 'Immediate Output'. For a detailed programming example, refer to Chapter 7, 'PID Control Function', in the *XD/XL Series Programmable Logic Controller User Manual [Basic Instructions Section]*.
- Use the built-in PID controller for temperature regulation; in this case, switch the Y function selection to 'Channel Enable'. The programming example is shown below.

Example:

Taking Module #1 as an example, apply PID control to its CH0.

Program:


M0
Y10000
SM0
MOV HD0 D0
MOV HD1 D10
Y10000 SM13
SBLOCK Set TarVal and CtrlCyc
TO K10000 K5 K1 D0
TO K10000 K25 K1 D10
SBLOCKE
M10
SBLOCK Set Self Turning Bit
TO K10000 K0 K1 M10
SBLOCKE
M10 SM13
SBLOCK Read PID Parameters
FROM K10000 K0 K1 M100
FROM K10000 K1 K1 D100
FROM K10000 K9 K4 D110
SBLOCKE
M100
TMR T0 K5 K100
T0
M10
R
M20
MOV HD10 D50
MOV HD11 D51
MOV HD12 D52
MOV HD13 D53
M21
SBLOCK Manual PID Parameter
TO K10000 K9 K4 D50
SBLOCKE
SM0
MOV K1 D20
M50
SBLOCK Init-Module
TO K10000 K41 K1 D20
SBLOCKE

Explain:

- When the Auto-Tuning Enable bit is activated, this command immediately occupies eight bits (M10–M17); specifically, M10–M13 correspond to the Auto-Tuning Enable bits for each channel respectively. To enable tuning for a particular channel, simply set the corresponding coil to ON. The bits M14–M17 currently have no function and should remain unset.
- If the output is a solid-state relay, the recommended temperature control cycle is 1–3s; if the output is a traditional relay, the recommended temperature control cycle is 3–15s.
- Due to differing unit systems, the PID parameters for the main unit and the module PID parameters cannot be directly used interchangeably. The main unit's PID parameters are denoted in uppercase letters, while the module's PID parameters are denoted in lowercase letters. The specific conversion relationships are as follows: p = P/100; i = I/10; d = D/100.

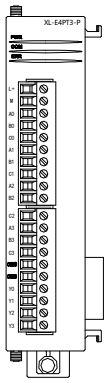
Soft components function:

| | |
|---|---|
| M0 | Enable PID control |
| SM0 | Set target values and temperature control cycle |
| M1 | Write target value, temperature control cycle |
| M3 | Set manual P, I, and D parameters |
| M4 | Enter the P, I, and D parameters manually. |
| M10 | Reads the setpoint, PID parameters, and PID output value. |
| M50 | Initialization Module |
| Y10000 | Channel 0 PID enable bit |
| D0 | Set target value |
| D10 | Temperature Control Cycle |
| D80 | P |
| D81 | I |
| D82 | D |
| D83 | DIFF |

# 6.3 RTD Temperature Control Module XL-E4PT3-P

This section primarily introduces the specifications of the XL-E4PT3-P module, terminal descriptions, assignment of input definition codes, operating mode configuration, external connections, analog-to-digital conversion diagram, external dimensions diagram, and relevant programming examples.

## 6.3.1 Module Features and Specifications



The XL-E4PT3-P Temperature PID Control Module processes four RTD temperature signals and transmits them to the PLC main unit.

- Three-wire platinum resistance thermometer input; calibration scales: Pt100 and Pt1000.
- 4-channel input, 4-channel output, 4 independent PID parameters, with auto-tuning functionality supported.
- 1 mA constant-current output, unaffected by external environmental changes.
- Resolution accuracy: 0.1°C.
- As specialized functional modules for the XL series, the XL3/XL3E series PLCs can connect up to 10 modules; the XL5/XL5E/XL5N/ XL5H, XLME, XLH, and XLH series can support up to 16 modules; however, the XL1 series does not support the addition of expansion modules.

Module Specifications

| Project | Content |
|---|---|
| Analog Input Signal | Pt100, Pt1000 platinum resistance temperature detectors |
| Temperature Measurement Range | -100.0℃ ~ 500.0℃ |
| Digital Output Range | -1000～5000 |
| Resolution Ratio | 0.1℃ |
| Overall Accuracy | ±0.5% (relative maximum value) |
| Conversion Rate | 450ms/4 channel |
| Module Power Supply | DC24V±10%，50mA |

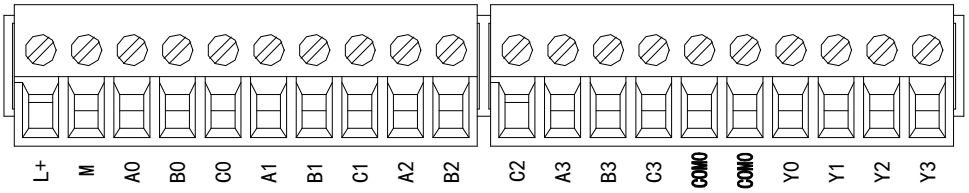
When the module is in an abnormal state, the ID1xxxx register will display a corresponding abnormality value; even if line break detection is disabled in the module configuration, an abnormality value will still be displayed. The abnormality values for different types of alarms are as follows:

- When the 24 V power supply is disconnected, the data for all channels is-2.
- The RTD temperature control module: when no sensor is connected, its channel data corresponds to the maximum value of the digital output range (5000).
- When the sensor signal falls below the lower limit of the measurement range, the channel data corresponds to the minimum value of the digital output range (-1000).

- When the sensor signal exceeds the upper limit of the measurement range, the channel data corresponds to the maximum value in the digital output range (5000).
- When both sensor line breakage and 24V power supply line breakage occur simultaneously, an abnormality indicator (-2) indicating a 24V power supply line breakage is displayed.

Pt1000 sensor type: Temperature modules with firmware version V3 or later are compatible with configuration using XDPPro software version V3.7.16 or later.

## 6.3.2 Terminal Specifications



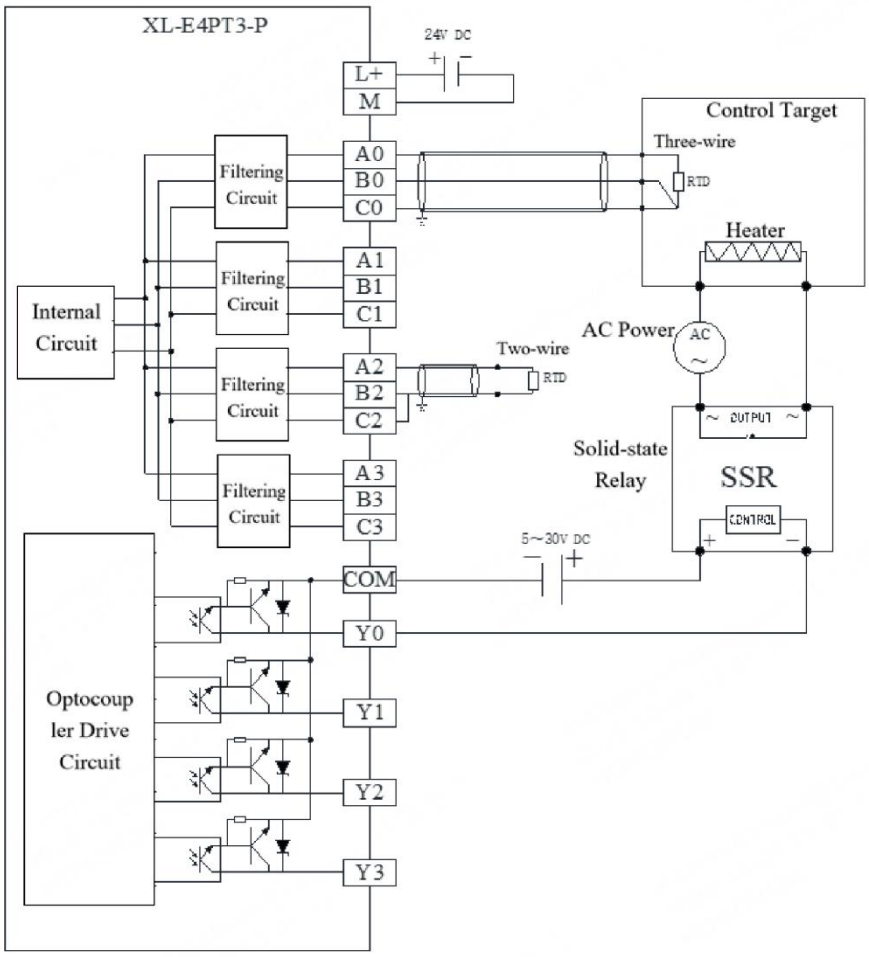

| Terminal Block | | Function |
|---|---|---|
| Power Terminal | L+ | External power supply: +24V positive terminal for the module |
| | M | External power supply: 24V negative terminal for the module |
| CH0 | A0 | CH0 RTD input terminal |
| | B0 | CH0 RTD input common terminal |
| | C0 | CH0 RTD input common terminal |
| CH1 | A1 | CH1 RTD input terminal |
| | B1 | CH1 RTD input common terminal |
| | C1 | CH1 RTD input common terminal |
| CH2 | A2 | CH2 RTD input terminal |
| | B2 | CH2 RTD input common terminal |
| | C2 | CH2 RTD input common terminal |
| CH3 | A3 | CH3 RTD input terminal |
| | B3 | CH3 RTD input common terminal |
| | C3 | CH3 RTD input common terminal |
| Output Terminal | COM0 | CH0–CH3 common output terminal |
| | Y0~Y3 | CH0–CH3 output terminal |

### Wiring terminal specifications

When wiring a module, its terminals must comply with the following requirements:

- Wire stripping length: 9 mm;
- Flexible conductor with tubular bare ends, cross-sectional area 0.25–1.5 mm²;
- Flexible conductor with tubular pre-insulated ends, cross-sectional area: 0.25–0.5 mm².

## 6.3.3 Input/Output Wiring Example




- For a secondary heating resistance sensor, connect one end of the sensor to Terminal A and the other end to Terminal C; then short-circuit Terminals B and C using a wire.
- For a three-wire thermal resistance sensor, connect the two wires of the same color to terminals B and C, respectively; connect the remaining wire to terminal A.
- Output terminal: Transistor-output terminal; please use a smooth DC 5V–30V power supply.
- Circuit insulation: The internal circuits of the programmable logic controller and the output transistors are optically isolated using optical couplers; additionally, each individual module is isolated from the others.
- Response time: The time from the programmable logic controller driving (or breaking) the opto coupler to the transistor turning on/off shall not exceed 0.2 ms.
- Output current: To limit temperature rise, a maximum output load of 50 mA is supported.
- Open-circuit leakage current: below 0.1 mA.



- When connecting an external 24V power supply, please use the 24V power supply built into the PLC unit to avoid interference.
- The housing of the device where the temperature sensor is installed must be grounded.
- To prevent interference, the temperature sensor should be connected using a shielded cable with the shield grounded at a single point.

## 6.3.4 IO Address Allocation And Read/Write Operations

### 1) Input/Output Definition Number Allocation

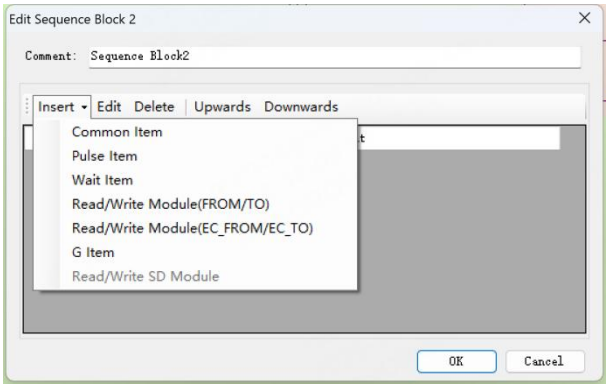
The XL series analog input modules do not occupy any I/O units; the converted values are directly written into the PLC registers. The definition numbers for the PLC registers corresponding to each channel are as follows:

| Relevant Parameter | Explain | | | | |
|---|---|---|---|---|---|
| | Module ID | CH0 | CH1 | CH2 | CH3 |
| Temperature Display (Unit: 0.1°C) | Module 1 | ID10000 | ID10001 | ID10002 | ID10003 |
| | Module 2 | ID10100 | ID10101 | ID10102 | ID10103 |
| | … | ID1xx00 | ID1xx01 | ID1xx02 | ID1xx03 |
| | Module 16 | ID11500 | ID11501 | ID11502 | ID11503 |
| PID Enable Signal (0: Disabled; 1: Enabled) | Module 1 | Y10000 | Y10001 | Y10002 | Y10003 |
| | Module 2 | Y10100 | Y10101 | Y10102 | Y10103 |
| | … | Y1xx00 | Y1xx01 | Y1xx02 | Y1xx03 |
| | Module 16 | Y11700 | Y11701 | Y11702 | Y11703 |
| | When the "Y Function Selection" is set to "Immediate Output," Y0–Y3 serve as standard digital output terminals; the Y10000–Y10003 (using Module #1 as an example) can be used to directly control the Y0–Y3 outputs of the module;<br>When the "Y Function Selection" is set to "Channel Enable," Y0–Y3 serve as PID output terminals; the channels corresponding to these can be enabled using Y10000–Y10003 (for example, using Module #1) to activate the PID control for those channels; the Y0–Y3 outputs of the module are then controlled by automatic PID calculations. | | | | |
| PID Contact Output (X Input Returning To The Main Unit) | Module 1 | X10000 | X10001 | X10002 | X10003 |
| | Module 2 | X10100 | X10101 | X10102 | X10103 |
| | … | X1xx00 | X1xx01 | X1xx02 | X1xx03 |
| | Module 16 | X11700 | X11701 | X11702 | X11703 |
| | When the "Y Function Selection" is set to "Channel Enable," Y10000–Y10003 (taking Module #1 as an example) represent the PID enable bits; the PID duty cycle output should be monitored using X10000–X10003 (taking Module #1 as an example). | | | | |
| Channel Fault/Power Supply Detection (0: Connected; 1: Broken connection) | Module 1 | X10010 | X10011 | X10012 | X10013 |
| | Module 2 | X10110 | X10111 | X10112 | X10113 |
| | … | X1xx10 | X1xx11 | X1xx12 | X1xx13 |
| | Module 16 | X11710 | X11711 | X11712 | X11713 |
| PID Automatic Tuning Error (0: Normal; 1: Automatic Tuning | Module 1 | X10020 | X10021 | X10022 | X10023 |
| | Module 2 | X10120 | X10121 | X10122 | X10123 |
| | … | X1xx20 | X1xx21 | X1xx22 | X1xx23 |
| | Module 16 | X11720 | X11721 | X11722 | X11723 |

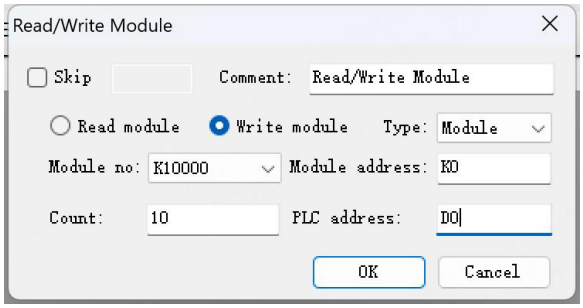
| | | | | | |
|---|---|---|---|---|---|
| Parameter Error) | | | | | |

2) From/To Command Usage Instructions

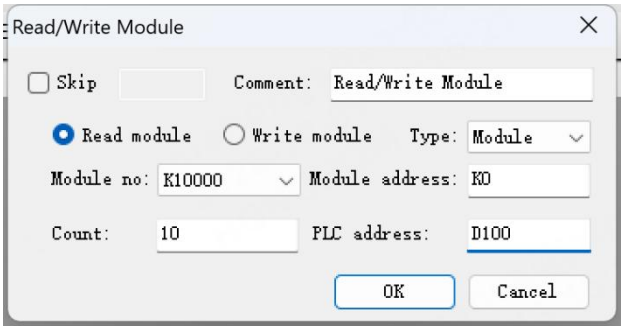
Reading and writing operations for the RTD temperature control module must be performed using the FROM/TO instruction within the BLOCK Sequential Function Block, as shown in the figure below:



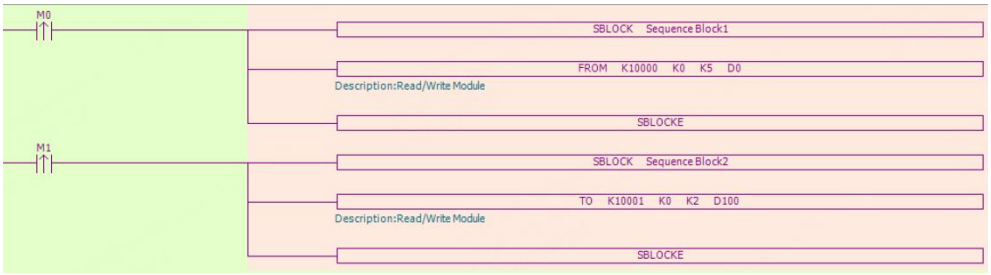

**(a) Insert "Read/Write Module (FROM/TO)"**




**(b) Writing Module**




**(c)read through model**

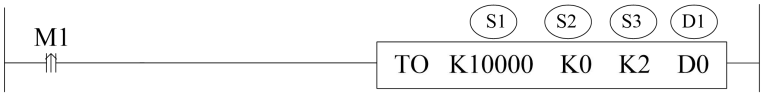



**(d) Convert to a ladder diagram**

Instruction parse:

- Write Module Instruction: TO

Write the specified register data into the designated module address, using a byte as the operation unit.




| Operand | Function | Available Operands |
|---|---|---|
| S1 | Target Module Number. | K、TD，CD，D，HD，FD |
| S2 | Write the starting address of the module. | K、TD，CD，D，HD，FD |
| S3 | Number of registers to write to (number of words). | K、TD，CD，D，HD，FD |
| D1 | The starting address of the register where written data is stored within the device. | TD，CD，D，HD，FD |

- Read module instruction: FROM

Read data from the specified module address into the designated register of the device, using a word as the operation unit.




| Operand | Function | Available Operands |
|---|---|---|
| S1 | Target Module Number. | K、TD，CD，D，HD，FD |
| S2 | Read the starting address of the module. | K、TD，CD，D，HD，FD |
| S3 | Number of registers to read (number of words). | K、TD，CD，D，HD，FD |
| D1 | The body receives the starting address of the register. | TD，CD，D，HD，FD |

- The FROM/TO instruction can only be written within a BLOCK sequential function block; for XL series PLCs with firmware version V3.4.5 or later, a maximum of 100 BLOCKs can be written in the program, but only up to 8 can be executed simultaneously;
- The module starting number begins at K10000; Module #1 is K10000, Module #2 is K10001, and so on – Module #16 is K10015.

### 3) Related Address Definition

During the use of this module, operations involving the reading and writing of relevant parameters are performed; the following provides an explanation of the address arrangement:

| From_To Data | | Initial Value | CH0 | CH1 | CH2 | CH3 | R/W |
|---|---|---|---|---|---|---|---|
| Auto-tuning Enable | | 0 | K0 | K0 | K0 | K0 | RW |
| Pid Output Value (0–4095) | | - | K1 | K2 | K3 | K4 | R |
| Temperature Setpoint (Unit: 0.1°C) | | 0 | K5 | K6 | K7 | K8 | RW |
| PID parameter | Kp | 40 | K9 | K13 | K17 | K21 | RW |

| From_To Data | | Initial Value | CH0 | CH1 | CH2 | CH3 | R/W |
|---|---|---|---|---|---|---|---|
| | Ki | 240 | K10 | K14 | K18 | K22 | RW |
| | Kd | 60 | K11 | K15 | K19 | K23 | RW |
| | ΔT (Unit: 0.1°C) | 1000 | K12 | K16 | K20 | K24 | RW |
| Temperature Control Cycle (Unit: 0.1 s) | | 20 | K25 | K26 | K27 | K28 | RW |
| Output Amplitude (Range: 0–100) | | 100 | K29 | K30 | K31 | K32 | RW |
| Temperature Deviation Value δ (Unit: 0.1°C) | | 0 | K33 | K34 | K35 | K36 | RW |
| Calibrate Ambient Temperature Value (Unit: 0.1°C) | | - | K37 | K38 | K39 | K40 | W |
| From/To Data Initialization | | - | K41 | K41 | K41 | K41 | W |

| Relevant Parameter | Explain |
|---|---|
| Auto-tuning Enable | Self-tuning enable signal: when set to 1, the system enters the self-tuning phase.<br>Upon completion of the self-tuning process, the PID parameter values and the temperature control cycle value are updated, and the enable bit is automatically cleared to 0.<br>The user can also read the status; a value of 1 indicates that the system is currently in the self-tuning process, while a value of 0 indicates that self-tuning has not yet been performed or that the self-tuning process has been completed.<br>The self-tuning method employs the critical oscillation technique. |
| PID Output Value<br>(0 ~ 4095) | When the PID output is used for analog control (e.g., steam valve opening degree or thyristor conduction angle), this value can be transmitted to an analog output module to fulfill the control requirements. |
| Temperature Setpoint<br>(Unit: 0.1°C) | The target temperature value for the control system. The setpoint range is-1000 to 5000, i.e., -100.0 to 500.0°C. |
| PID parameter<br>(P、I、D) | The optimal parameter values can be determined using PID self-tuning.<br>If the current PID control does not adequately meet the control requirements, the user may directly enter empirical PID parameters; the module will then perform PID control based on these user-defined PID parameters. |
| PID Control Range (Diff)<br>(Unit: 0.1°C) | Let: the operating range be Tdiff, the setpoint temperature be Tset, and the displayed temperature be T.<br>When Tset–Tdiff ≤ T ≤ Tset+Tdiff, the output is controlled by PID calculation.<br>When T ≤ T_set – T_diff, the output is set to its maximum value.<br>When Tset + Tdiff ≤ T, the output is 0. |
| Temperature Control Cycle<br>(Unit: 0.1 s) | The control cycle adjustment range is 0.1s to 200s, with a minimum accuracy of 0.1s.<br>The write value is the actual temperature control cycle value multiplied by 10; for example, writing 5 corresponds to an actual temperature control cycle of 0.5s. |
| Output Amplitude | The output amplitude calculated by the PID controller is expressed in%; a value of 100 corresponds to 100% of the full-scale output, while a value of 80 corresponds to 80% of the full-scale output. |

| Relevant Parameter | Explain |
|---|---|
| | Note: When set to 0, the PID controller will not produce any output. |
| Temperature Deviation Value δ (Unit: 0.1°C) | Temperature display value = (Sampling temperature value + Temperature deviation value δ) / 10. This parameter is a signed integer with a unit of 0.1°C; it represents the power-off maintenance range, and the default value is 0. The setpoint range is-40.0°C to 40.0°C. |
| Calibrate Ambient Temperature Value (Unit: 0.1°C) | When the user determines that the ambient temperature value does not match the temperature value displayed on the module's channel, they can write the known ambient temperature value into this parameter. At the moment of writing, the module calculates the temperature deviation value δ and stores it.<br>Calculate the temperature deviation value δ = calibrated ambient temperature value – sampling temperature value. Unit: 0.1°C.<br>For example: Under thermal equilibrium conditions, the user measures the ambient temperature using a mercury thermometer and obtains a reading of 60.0°C; however, the displayed temperature at that moment is 55.0°C (corresponding to a sampling temperature of 55.0°C), resulting in a temperature deviation δ = 0. At this point, the user writes the value 600 into this parameter; the temperature deviation δ is then recalculated as 50 (5°C). Consequently, the displayed temperature = (sampling temperature value + temperature deviation δ) / 10 = 60°C.<br>Note: When entering the calibration temperature value, ensure that it matches the ambient temperature. This data is critical; any incorrect entry could lead to a significant calculation error in the temperature deviation value (δ), which in turn would affect the displayed temperature. |
| From/To Data Initialization | This function resets the parameters in the above table to their factory settings; when using this function, set K41 to 1 – setting it to any other value will have no effect. The Automatic Tuning Enable feature cannot be initialized; it will revert to its default value only after the tuning process is completed or after the device is powered on again. |



- The "From/To Data Initialization" feature requires the module firmware version to be V3 or later.
- When the "Y Function Selection" is set to "Immediate Output", only the 'Temperature Deviation Value δ' and 'Calibrated Ambient Temperature Value' among the above parameters are valid; all other parameters are inactive.
- The module can automatically save the set temperature value, PID parameters, temperature control cycle, output amplitude, temperature deviation, and temperature calibration parameters – all of which are retained even after a power failure. When writing these parameters, use rising-edge-triggered writing; avoid continuous writing operations. It is recommended to write only the parameters that are actually in use; for programming convenience, writing data to the entire chip is not advisable, as setting certain addresses to zero may prevent the system from operating correctly.
- Self-tuning enable address K0: The K0 address occupies a contiguous 8-bit address space; the 4-channel module enable bit corresponds to the first 4 bits of this address space, while the remaining 4 bits remain unused (but cannot be repurposed). When the read/write enable bit is active, K0 may refer to a coil or a register; if it refers to a

coil, that coil serves as the starting address for occupying a contiguous 8-bit segment; if it refers to a register, the entire register is occupied. For example, to set the first and third channels of the module to self-tuning mode and the remaining two channels to manual PID mode, when the command is "To K10000 K0 K1 M10," set M10 and M12 to ON and set M11 and M13 to OFF; when the command is "To K10000 K0 K1 D100," assign the value 5 to D100.

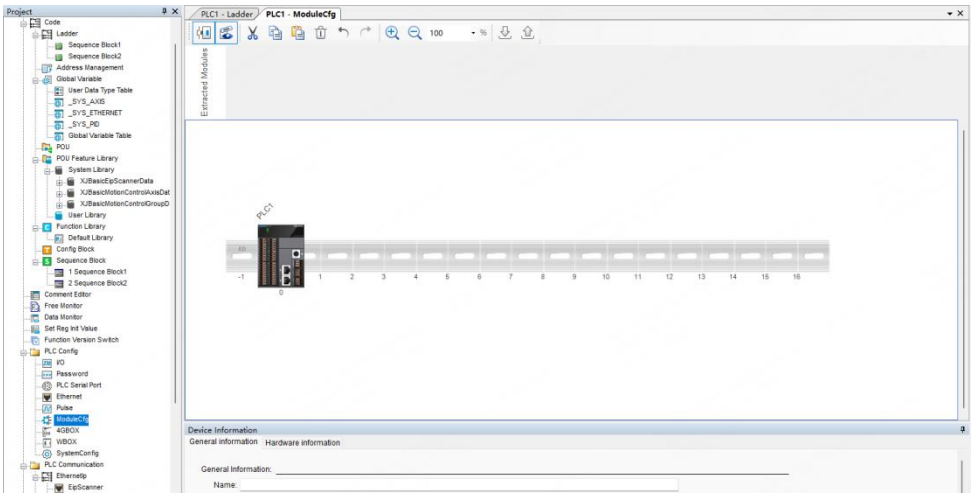
## 6.3.5 Work Mode Settings

There are two methods available for configuring the operating mode (The effects of these two methods are equivalent.):

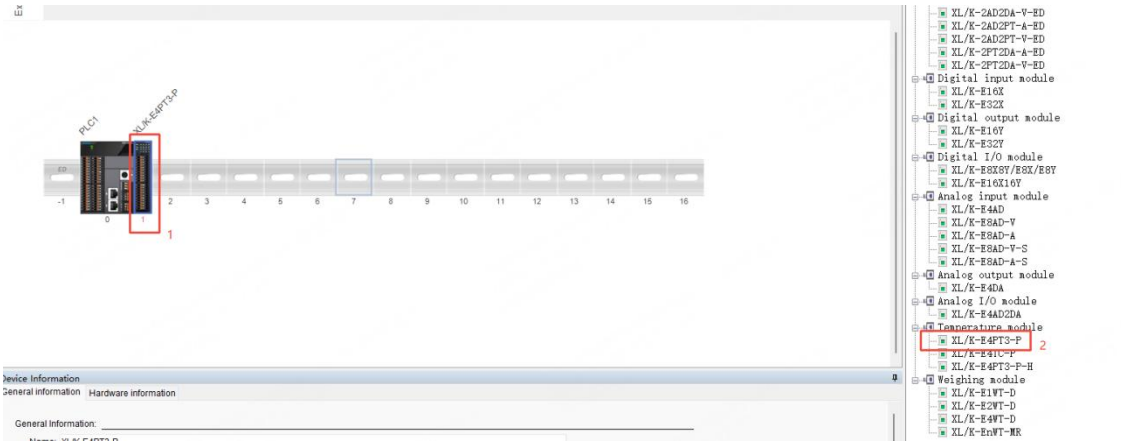
- Configure via the Settings Panel
- Set via Flash register (SFD)

### 1) Configuration Panel Configuration

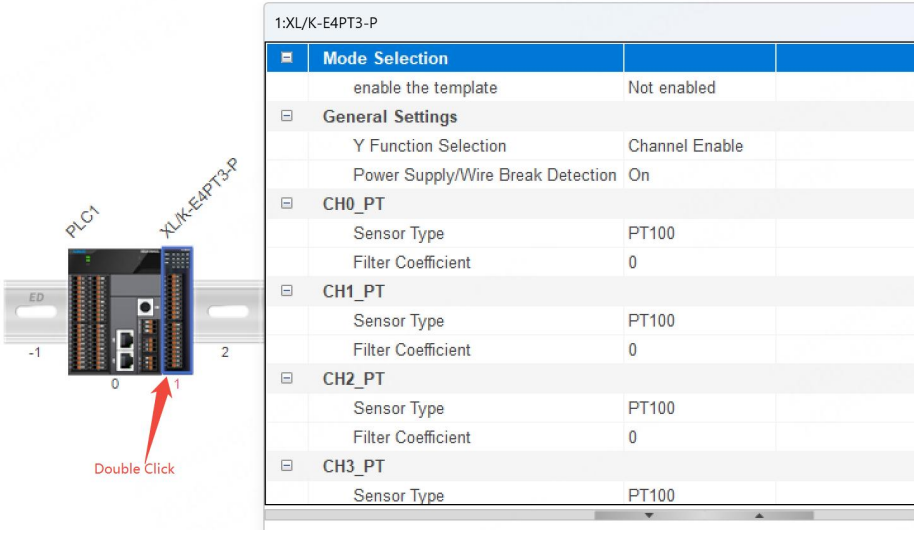
1. Use the Xinje PLC Programming Tool Software version 3.8.0a or later to configure the module; click [PLC Configuration] – [Module Configuration] in the left-side Engineering Bar to open the Expansion Module Settings window. For versions of the Xinje PLC Programming Tool Software prior to 3.8.0a, click [PLC Configuration] – [Expansion Module] in the left-side Engineering Bar to perform the configuration.



2. Select a module from the right-hand module list and drag it to the desired position; alternatively, double-click a module in the right-hand module list to select it:

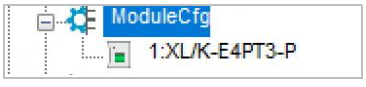



3. Double-click the corresponding module icon to access the module configuration interface, where you can select the sensor type, filtering coefficient, line-break detection switch, and Y-function selection for the respective channel.




4. Click "  " to retrieve the default configuration parameters for the extended module.

5. After completing the parameter configuration for the expansion module, click "  " to write the set values into the PLC; the changes will take effect only after the PLC is powered off and then powered on again. Under the Module Configuration Node, mount the configured module, then double-click it to enter the module parameter configuration interface.



- The temperature input channel employs a first-Program low-pass filtering method, where the current sample value is weighted against the previous filtered output value to obtain the effective filtered value. The filtering coefficient can be set by the user between 0 and 254; a smaller value results in more stable data but may introduce data lag; a setting of 1 provides the strongest filtering effect, while a setting of 254 provides the weakest filtering effect; the default value is 0 (no filtering).
- The "Y Function Selection" setting is used to specify the function for modules Y10000–Y10003 (e.g., Module #1); by default, this setting is set to "Channel Enable," which supports the module's built-in self-tuning and PID control functions. The output points Y0–Y3 on the module switch on or off based on the PID output value; when this setting is configured as "Immediate Output," the output points Y0–Y3 on the module function as standard digital output points – setting Y10000–Y10003 will activate Y0–Y3; in this case, the module retains only its temperature acquisition functionality; for temperature control, please use the PID instruction built into the PLC unit.
- The "Y Function Selection" feature requires support from firmware version V3 or later;
- PT1000 sensor type – supported only by temperature modules with firmware version V3 or later; must be used in conjunction with XDPPro software version V3.7.16 or later for configuration.
- Module 24V power supply detection function – supported only on temperature modules with firmware version V4 or later.

### 2) Flash Register Configuration

The CH0–CH3 expansion module channels allow the configuration of sensor type, filtering coefficient, and Y function selection; these settings are made using the SFD (Special FLASH Data Register) within the PLC.

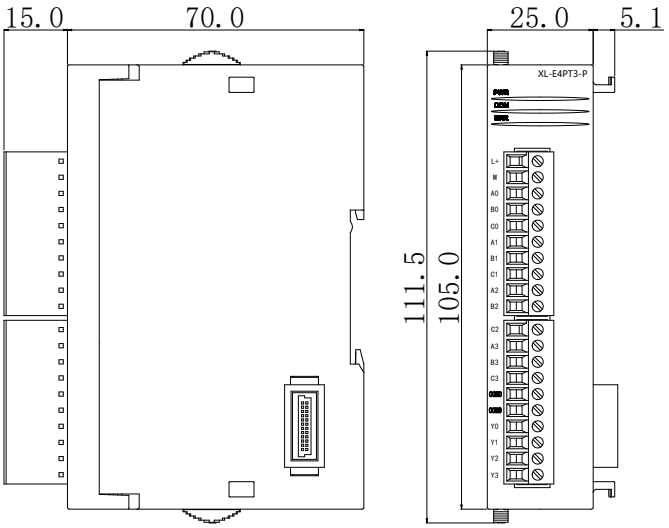
| Module ID | Configuration Information Address | Module ID | Configuration Information Address |
|---|---|---|---|
| #1 | SFD350~SFD359 | #9 | SFD430~SFD439 |
| #2 | SFD360~SFD369 | #10 | SFD440~SFD449 |
| #3 | SFD370~SFD379 | #11 | SFD450~SFD459 |
| #4 | SFD380~SFD389 | #12 | SFD460~SFD469 |
| #5 |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

### 3) SFD Bit Definition

Using the First Module as an example to illustrate the setup 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="2">SFD350</td><td>Byte0</td><td colspan="8">PT1 filtering coefficient (0 – no filtering; 1–254 – filtering intensity decreases sequentially; default: 0)</td></tr>
<tr><td>Byte1</td><td colspan="8">PT2 filtering coefficient (0 – no filtering; 1–254 – filtering intensity decreases sequentially; default: 0)</td></tr>
<tr><td rowspan="2">SFD351</td><td>Byte2</td><td colspan="8">PT3 filtering coefficient (0 – no filtering; 1–254 – filtering intensity decreases sequentially; default: 0)</td></tr>
<tr><td>Byte3</td><td colspan="8">PT4 filtering coefficient (0 – no filtering; 1–254 – filtering intensity decreases sequentially; default: 0)</td></tr>
<tr><td rowspan="2">SFD352</td><td>Byte4</td><td colspan="8">Reserved</td></tr>
<tr><td>Byte5</td><td colspan="8">Reserved</td></tr>
<tr><td rowspan="2">SFD353</td><td>Byte6</td><td colspan="8">Reserved</td></tr>
<tr><td>Byte7</td><td colspan="8">Reserved</td></tr>
<tr><td rowspan="2">SFD354</td><td>Byte8</td><td colspan="4">-</td><td colspan="2">PT Channel Fault/Power Supply Detection Switch<br>00:00 – Start<br>01: Turn Off</td><td colspan="2">YFS<br>00: Channel Enable<br>01: Output Immediately</td></tr>
<tr><td>Byte9</td><td colspan="4">-</td><td colspan="4">-</td></tr>
<tr><td rowspan="4">SFD355</td><td rowspan="2">Byte10</td><td colspan="4">PT2 Sensor Type</td><td colspan="4">PT1 Sensor Type</td></tr>
<tr><td colspan="4">0000：PT100<br>0001：PT1000</td><td colspan="4">0000：PT100<br>0001：PT1000</td></tr>
<tr><td rowspan="2">Byte11</td><td colspan="4">PT4 Sensor Type</td><td colspan="4">PT3 Sensor Type</td></tr>
<tr><td colspan="4">0000：PT100<br>0001：PT1000</td><td colspan="4">0000：PT100<br>0001：PT1000</td></tr>
<tr><td rowspan="2">SFD356</td><td>Byte12</td><td colspan="4">-</td><td colspan="4">-</td></tr>
<tr><td>Byte13</td><td colspan="4">-</td><td colspan="4">-</td></tr>
<tr><td colspan="2">SFD357~SFD359</td><td colspan="8">Reserved</td></tr>
</table>

## 6.3.6 External dimensions diagram




(Unit:mm)

## 6.3.7 Programming Example

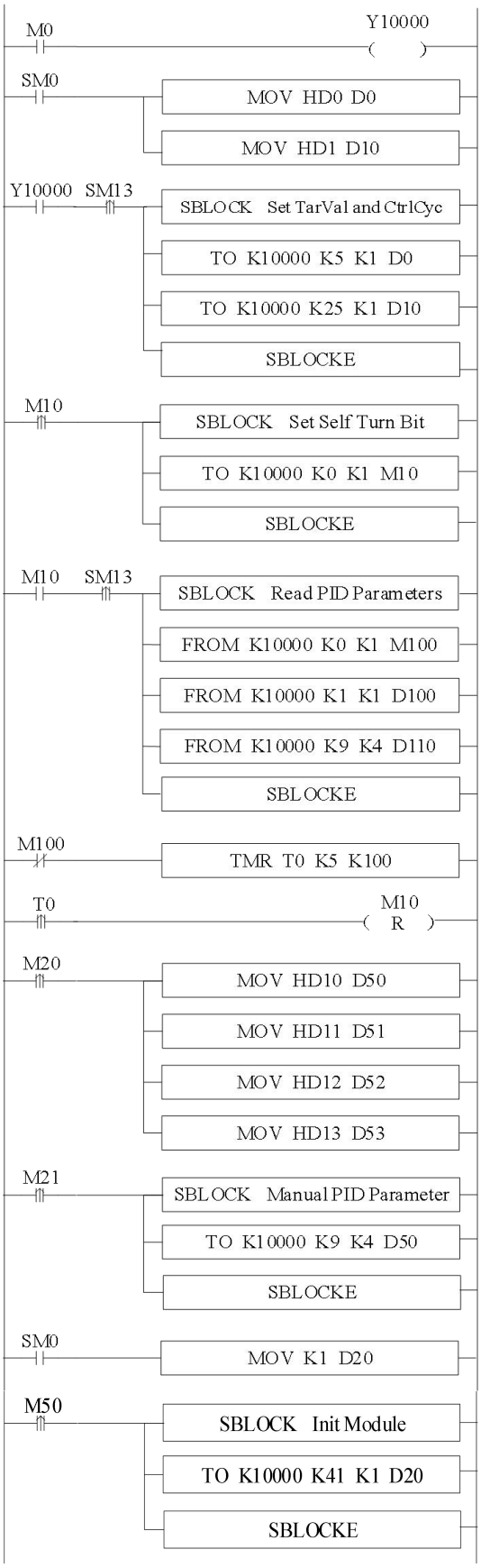
When temperature control is required, two programming methods are available:

- To implement temperature control using the PID function on the PLC unit, switch the Y function selection to 'Immediate Output'. For a detailed programming example, refer to Chapter 7, 'PID Control Function', in the *XD/XL Series Programmable Logic Controller User Manual [Basic Instructions Section]*.
- Use the built-in PID controller for temperature regulation; in this case, switch the Y function selection to 'Channel Enable'. The programming example is shown below.

Example:

Taking Module #1 as an example, apply PID control to its CH0.

Program:




Explain:

- When the Auto-Tuning Enable bit is activated, this command immediately occupies 8 bits (M10–M17); specifically, M10–M13 correspond to the Auto-Tuning Enable bits for each channel

respectively. To enable tuning for a particular channel, simply set the corresponding coil to ON. M14–M17 currently have no function and should remain unset.

- If the output is a solid-state relay, the recommended temperature control cycle is 1–3s; if the output is a traditional relay, the recommended temperature control cycle is 3–15s.
- Due to differing unit systems, the PID parameters for the main unit and the module PID parameters cannot be directly used interchangeably. The main unit's PID parameters are denoted in uppercase letters, while the module's PID parameters are denoted in lowercase letters. The specific conversion relationships are as follows: p = P/100; i = I/10; d = D/100.

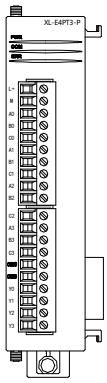
Soft components function:

| | |
|---|---|
| M0 | Enable PID control |
| SM0 | Set target values and temperature control cycle |
| M1 | Write target value, temperature control cycle |
| M3 | Set manual P, I, and D parameters |
| M4 | Enter the P, I, and D parameters manually. |
| M10 | Reads the setpoint, PID parameters, and PID output value. |
| M50 | Initialization Module |
| Y10000 | Channel 0 PID enable bit |
| D0 | Set target value |
| D10 | Temperature Control Cycle |
| D80 | P |
| D81 | I |
| D82 | D |
| D83 | DIFF |

# 6.4 Thermistor Temperature Control Module (Isolated Type) XL-E4PT3-P-H

This section primarily introduces the specifications, terminal description, assignment of input definition codes, operating mode configuration, external connections, analog-to-digital conversion diagram, external dimensions diagram, and relevant programming examples for the XL-E4PT3-P-H module.

## 6.4.1 Module Features and Specifications



The XL-E4PT3-P-H temperature control module processes four RTD temperature signals and transmits them to the PLC main unit.
Compared to the XL-E4PT3-P, the XL-E4PT3-P-H features a fully isolated design, offering superior anti-interference performance, a wider temperature measurement range, higher resolution and accuracy, and support for a greater variety of sensor types.

- The three-wire temperature sensor utilizes an analog input interface and supports PT100, PT1000, Cu50, and Cu100 type thermal resistors.
- 4-channel fully isolated input and 4-channel output; 4 sets of independent PID parameters; supports automatic tuning function.
- 1 mA constant-current output, unaffected by external environmental changes.
- Resolution accuracy: 0.1°C, 0.01°C.
- As specialized functional modules for the XL series, the XL3/XL3E series can connect up to 10 devices; the XL5/XL5E/XL5H/XL5N/ XLME/XLH/XSLH series can connect up to 16 devices; the XL1 series does not support expansion modules.

Module Specifications

| Project | Content | | |
|---|---|---|---|
| Analog Input Signal | Pt100, Pt1000, Cu50, Cu100 thermal resistance sensors | | |
| Temperature Measurement Range | Sensor Type | Display Resolution | Temperature Measurement 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 (depending on the sensor type) | | |
| Resolution Ratio | 0.1°C, 0.01°C (optional) | | |
| Overall Accuracy | ±0.2% (relative maximum value) | | |
| Repeatability | ±0.05%FS | | |
| Conversion Rate | 50 ms/All Channels | | |
| Module Power Supply | DC24V±10%，50mA | | |

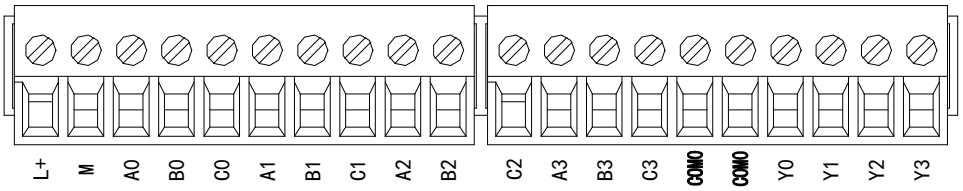
When the module is in an abnormal state, the ID1xxxx register will display a corresponding abnormality value; even if line break detection is disabled in the module configuration, an abnormality value will still be displayed. The abnormality values for different types of alarms are as follows:

- When the 24 V power supply is disconnected, the data for all channels is-2.
- When no sensor is connected, the channel data for the RTD temperature control module represents the maximum value within the digital output range corresponding to the selected sensor type.
- When the sensor signal falls below the lower limit of the measurement range, the channel data represents the minimum value within the digital output range for the selected sensor type.
- When the sensor signal exceeds the upper limit of the measurement range, the channel data represents the maximum value within the digital output range for the selected sensor type.
- When both sensor line breakage and 24V power supply line breakage occur simultaneously, an abnormality indicator (-2) indicating a 24V power supply line breakage is displayed.



- Unlike the XL-E4PT3-P, the XL-E4PT3-P-H supports a wider range of sensor types.
- Unlike the XL-E4PT3-P, the XL-E4PT3-P-H features isolated processing for each channel, enabling simultaneous sampling across multiple channels and a faster sampling rate.
- This module must be configured and used in conjunction with the Xinje PLC Programming Tool software version 3.7.17 or later.

## 6.4.2 Terminal Specifications




| Terminal Block | | Function |
|---|---|---|
| Power Terminal | L+ | External power supply: +24V positive terminal for the module |
| | M | External power supply: 24V negative terminal for the module |
| CH0 | A0 | CH0 RTD input terminal |
| | B0 | CH0 RTD input common terminal |
| | C0 | CH0 RTD input common terminal |
| CH1 | A1 | CH1 RTD input terminal |

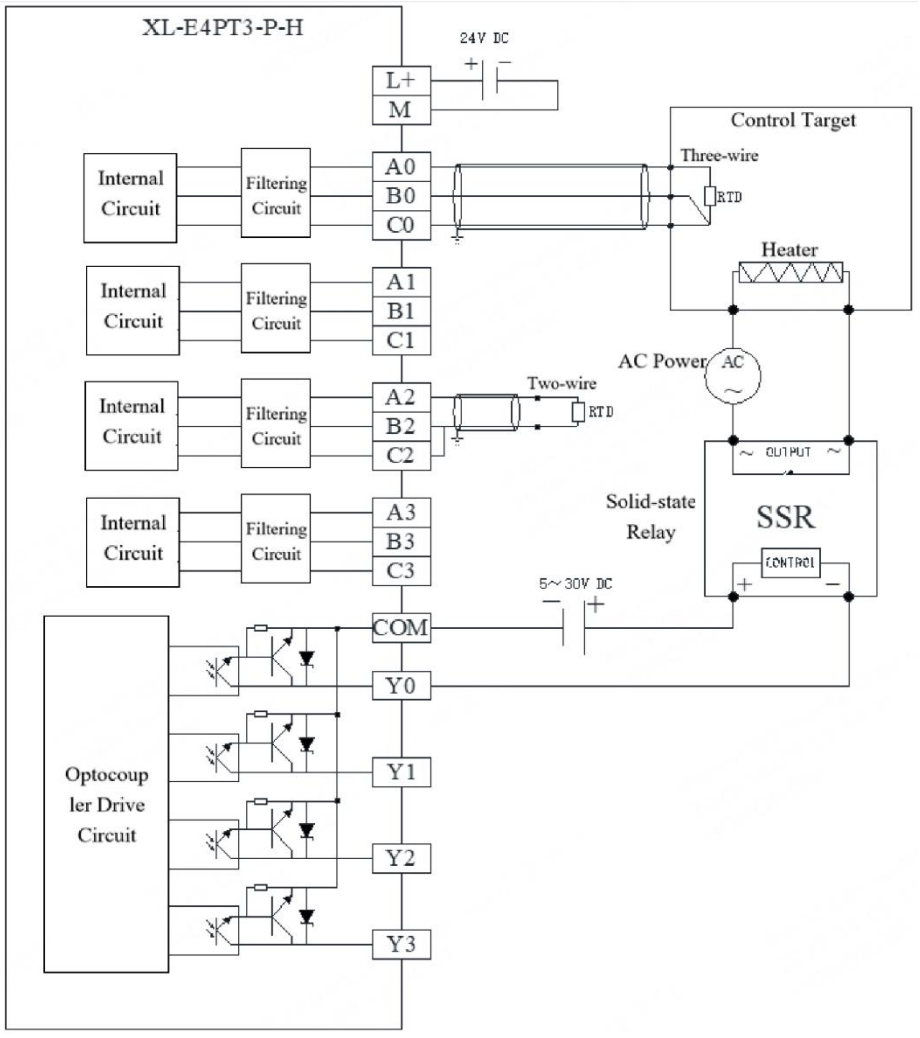
| | | |
|---|---|---|
| | B1 | CH1 RTD input common terminal |
| | C1 | CH1 RTD input common terminal |
| CH2 | A2 | CH2 RTD input terminal |
| | B2 | CH2 RTD input common terminal |
| | C2 | CH2 RTD input common terminal |
| CH3 | A3 | CH3 RTD input terminal |
| | B3 | CH3 RTD input common terminal |
| | C3 | CH3 RTD input common terminal |
| Output Terminal | COM0 | CH0–CH3 common output terminal |
| | Y0~Y3 | CH0–CH3 output terminal |

Wiring terminal specifications

When wiring a module, its terminals must comply with the following requirements:

- Wire stripping length: 9 mm;
- Flexible conductor with tubular bare ends, cross-sectional area 0.25–1.5 mm²;
- Flexible conductor with tubular pre-insulated ends, cross-sectional area: 0.25–0.5 mm².

## 6.4.3 Input/Output Wiring Example



- For a secondary heating resistance sensor, connect one end of the sensor to Terminal A and the other end to Terminal C; then short-circuit Terminals B and C using a wire.
- For a three-wire thermal resistance sensor, connect the two wires of the same color to terminals B and C, respectively; connect the remaining wire to terminal A.
- Output terminal: Transistor-output terminal; please use a smooth DC 5V–30V power supply.
- Circuit insulation: The internal circuits of the programmable logic controller and the output transistors are optically isolated using optical couplers; additionally, each individual module is isolated from the others.
- Response time: The time from the programmable logic controller driving (or breaking) the opto coupler to the transistor turning on/off shall not exceed 0.2 ms.
- Output current: To limit temperature rise, a maximum output load of 50 mA is supported.
- Open-circuit leakage current: below 0.1 mA.



- When connecting an external 24V power supply, please use the 24V power supply built into the PLC unit to avoid interference.
- The housing of the device where the temperature sensor is installed must be grounded.
- To prevent interference, the temperature sensor should be connected using a shielded cable with the shield grounded at a single point.

## 6.4.4 IO Address Allocation and Read/Write Operations

### 1) Input/Output Definition Number Allocation

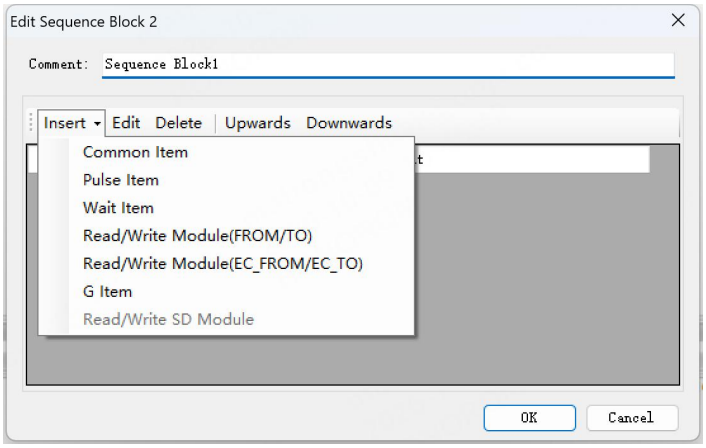
The XL series analog input modules do not occupy any I/O units; the converted values are directly written into the PLC registers. The definition numbers for the PLC registers corresponding to each channel are as follows:

| Relevant Parameter | Explain | | | | |
|---|---|---|---|---|---|
| | Module ID | CH0 | CH1 | CH2 | CH3 |
| Temperature display (0.1°C/0.01°C) *1 | Module 1 | ID10000 | ID10001 | ID10002 | ID10003 |
| | Module 2 | ID10100 | ID10101 | ID10102 | ID10103 |
| | … | ID1xx00 | ID1xx01 | ID1xx02 | ID1xx03 |
| | Module 16 | ID11500 | ID11501 | ID11502 | ID11503 |
| PID Enable Signal (0: Disabled; 1: Enabled) | Module 1 | Y10000 | Y10001 | Y10002 | Y10003 |
| | Module 2 | Y10100 | Y10101 | Y10102 | Y10103 |
| | … | Y1xx00 | Y1xx01 | Y1xx02 | Y1xx03 |
| | Module 16 | Y11700 | Y11701 | Y11702 | Y11703 |
| | When the "Y Function Selection" is set to "Immediate Output," Y0–Y3 serve as standard digital output terminals; the Y10000–Y10003 (using Module #1 as an example) can be used to directly control the Y0–Y3 outputs of the module;<br>When the "Y Function Selection" is set to "Channel Enable," Y0–Y3 serve as PID output terminals; the channels corresponding to these can be enabled using Y10000–Y10003 (for example, using Module #1) to activate the PID control for those channels; the Y0–Y3 outputs of the module are then controlled by automatic PID calculations. | | | | |

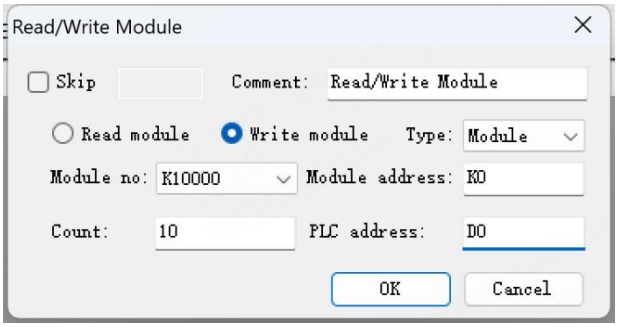
| | | | | | |
|---|---|---|---|---|---|
| PID Contact Output (X Input Returning To The Main Unit) | Module 1 | X10000 | X10001 | X10002 | X10003 |
| | Module 2 | X10100 | X10101 | X10102 | X10103 |
| | … | X1xx00 | X1xx01 | X1xx02 | X1xx03 |
| | Module 16 | X11700 | X11701 | X11702 | X11703 |
| | When the "Y Function Selection" is set to "Channel Enable," Y10000–Y10003 (taking Module #1 as an example) represent the PID enable bits; the PID duty cycle output should be monitored using X10000–X10003 (taking Module #1 as an example). | | | | |
| Channel Fault/Power Supply Detection (0: Connected; 1: Broken connection) | Module 1 | X10010 | X10011 | X10012 | X10013 |
| | Module 2 | X10110 | X10111 | X10112 | X10113 |
| | … | X1xx10 | X1xx11 | X1xx12 | X1xx13 |
| | Module 16 | X11710 | X11711 | X11712 | X11713 |
| PID Automatic Tuning Error (0: Normal; 1: Automatic Tuning Parameter Error) | Module 1 | X10020 | X10021 | X10022 | X10023 |
| | Module 2 | X10120 | X10121 | X10122 | X10123 |
| | … | X1xx20 | X1xx21 | X1xx22 | X1xx23 |
| | Module 16 | X11720 | X11721 | X11722 | X11723 |

## 2) From/To Command Usage Instructions

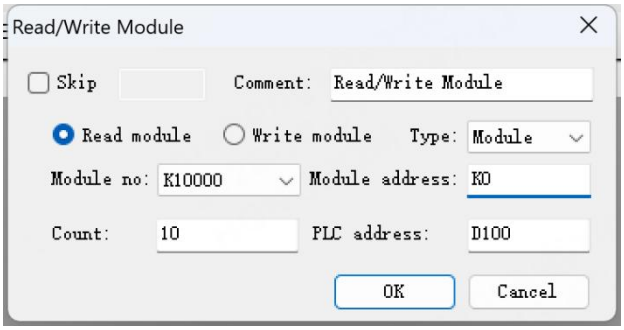
Reading and writing operations for the RTD temperature control module must be performed using the FROM/TO instruction within the BLOCK Sequential Function Block, as shown in the figure below:



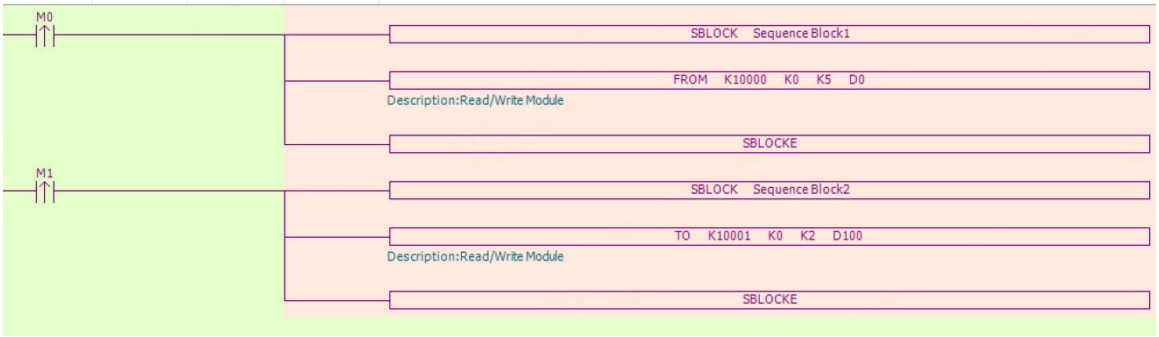

**(a) Insert "Read/Write Module (FROM/TO)"**




**(b) Writing Module**




**(c)read through model**

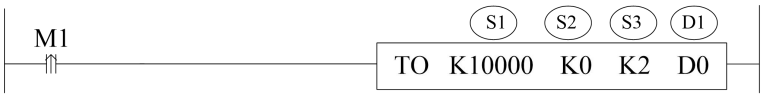



**(d) Convert to a ladder diagram**

Instruction parse:

- Write Module Instruction: T0

Write the specified register data into the designated module address, using a byte as the operation unit.




| Operand | function | Available operands |
|---|---|---|
| S1 | Target Module Number. | K、TD，CD，D，HD，FD |
| S2 | Write the starting address of the module. | K、TD，CD，D，HD，FD |
| S3 | Number of registers to write to (number of words). | K、TD，CD，D，HD，FD |
| D1 | The starting address of the register where written data is stored within the device. | TD，CD，D，HD，FD |

- Read module instruction: FROM

Read data from the specified module address into the designated register of the device, using a word as the operation unit.




| Operand | Function | Available Operands |
|---|---|---|
| S1 | Target Module Number. | K、TD，CD，D，HD，FD |
| S2 | Read the starting address of the module. | K、TD，CD，D，HD，FD |
| S3 | Number of registers to read (number of words). | K、TD，CD，D，HD，FD |
| D1 | The body receives the starting address of the register. | TD，CD，D，HD，FD |

- The FROM/TO instruction can only be written within a BLOCK sequential function block; for XL series PLCs with firmware version V3.4.5 or later, a maximum of 100 BLOCKs can be written in the program, but only up to 8 can be executed simultaneously;
- The module starting number begins at K10000; Module #1 is K10000, Module #2 is K10001, and so on – Module #16 is K10015.

### 3) Related Address Definition

During the use of this module, operations Involving the reading and writing of relevant parameters are performed; the following provides an explanation of the address arrangement:

| From_To Data | | Initial Value | CH0 | CH1 | CH2 | CH3 | R (Read)/W (Write) |
|---|---|---|---|---|---|---|---|
| Auto-tuning Enable | | 0 | K0 | K0 | K0 | K0 | RW |
| Pid Output Value (0–4095) | | - | K1 | K2 | K3 | K4 | R |
| Temperature Setpoint (Unit: 0.1°C/0.01°C) | | 0 | K5 | K6 | K7 | K8 | RW |
| PIDparameter | Kp | 40 | K9 | K13 | K17 | K21 | RW |
| | Ki | 240 | K10 | K14 | K18 | K22 | RW |
| | Kd | 60 | K11 | K15 | K19 | K23 | RW |
| | Diff (Unit: 0.1°C/0.01°C) | 1000 (0.1°C) 10000 (0.01°C) | K12 | K16 | K20 | K24 | RW |
| Temperature Control Cycle (Unit: 0.1 s) | | 20 | K25 | K26 | K27 | K28 | RW |
| Output Amplitude (Range: 0–100) | | 100 | K29 | K30 | K31 | K32 | RW |
| Temperature Deviation Value δ (Unit: 0.1°C/0.01°C) | | 0 | K33 | K34 | K35 | K36 | RW |
| Calibrate Ambient Temperature value (Unit: 0.1°C/0.01°C) | | - | K37 | K38 | K39 | K40 | W |
| From/To Data Initialization | | - | K41 | K41 | K41 | K41 | W |

| Relevant Parameter | Explain |
|---|---|
| Auto-tuning Enable | Self-tuning enable signal: when set to 1, the system enters the self-tuning phase.<br>Upon completion of the self-tuning process, the PID parameter values and the temperature control cycle value are updated, and the enable bit is automatically cleared to 0.<br>The user can also read the status; a value of 1 indicates that the system is currently in the self-tuning process, while a value of 0 indicates that self-tuning has not yet been performed or that the self-tuning process has been completed.<br>The self-tuning method employs the critical oscillation technique. |
| PID Output Value (0–4095) | When the PID output is used for analog control (e.g., steam valve opening degree or thyristor conduction angle), this value can be transmitted to an analog output module to fulfill the control requirements. |
| Temperature Setpoint (Unit: 0.1°C/0.01°C) | The target temperature value for the control system. The setpoint range corresponds to the digital value corresponding to the upper and lower temperature limits of the selected sensor scale. |
| PID Parameters (P, I, D) | The optimal parameter values can be determined using PID self-tuning.<br>If the current PID control does not adequately meet the control requirements, the user may directly enter empirical PID parameters; the module will then perform PID control based on these user-defined PID parameters. |
| PID Calculation Range (Diff)<br>(Unit: 0.1°C/0.01°C) | Let: the operating range be Tdiff, the setpoint temperature be Tset, and the displayed temperature be T.<br>When Tset–Tdiff ≤ T ≤ Tset+Tdiff, the output is controlled by PID calculation.<br>When T ≤ T_set – T_diff, the output is set to its maximum value.<br>When Tset + Tdiff ≤ T, the output is 0. |
| Temperature Control cycle (unit: 0.1 s) | The control cycle adjustment range is 0.1s to 200s, with a minimum accuracy of 0.1s.<br>The write value is the actual temperature control cycle value multiplied by 10; for example, writing 5 corresponds to an actual temperature control cycle of 0.5s. |
| Output Amplitude | The PID calculation output amplitude is expressed in%; a value of 100 corresponds to 100% of the full-scale output, while a value of 80 corresponds to 80% of the full-scale output.<br>Note: When set to 0, the PID controller will not produce any output. |
| Temperature Deviation Value δ<br>(Unit: 0.1°C/0.01°C) | This parameter represents a signed integer; it specifies the power outage duration, with a default value of 0.<br>0.1°C: Actual temperature display = (Sampling temperature value + Temperature deviation value δ) / 10;<br>0.01°C: Actual temperature display = (Sampling temperature value + Temperature deviation value δ) / 100;<br>When the user detects a discrepancy between the measured temperature and the actual temperature, they can adjust this value to correct the temperature.<br>The operating range is-40.0°C to 40.0°C. |

| Relevant Parameter | Explain |
|---|---|
| Calibrate ambient temperature value (Unit: 0.1°C/0.01°C) | When the user determines that the ambient temperature value does not match the temperature value displayed on the module's channel, they can write the known ambient temperature value into this parameter. At the moment of writing, the module calculates the temperature deviation value δ and stores it.<br>Temperature deviation value δ = calibrated ambient temperature value – sampling temperature value.<br>Note: When entering the calibration temperature value, ensure that it matches the ambient temperature. This data is critical; any incorrect entry could lead to a significant calculation error in the temperature deviation value (δ), which in turn would affect the displayed temperature. |
| From/To Data Initialization | This function resets the parameters in the above table to their factory settings; when using this function, set K41 to 1 – setting it to any other value will have no effect. The Automatic Tuning Enable feature cannot be initialized; it will revert to its default value only after the tuning process is completed or after the device is powered on again. |

- When the "Y Function Selection" is set to "Immediate Output", only the 'Temperature Deviation Value δ' and 'Calibrated Ambient Temperature Value' among the above parameters are valid; all other parameters are inactive.
- The module can automatically save the set temperature value, PID parameters, temperature control cycle, output amplitude, temperature deviation, and temperature calibration parameters, with data retention even during power outages. When writing these parameters, use rising-edge-triggered writing; avoid continuous writing operations. It is recommended to write only the parameters that are actually in use; for programming convenience, writing data to the entire chip is not advisable, as setting certain addresses to zero may prevent the system from operating correctly.
- Self-tuning enable address K0: The K0 address occupies a contiguous 8-bit address space; the 4-channel module enable bit corresponds to the first 4 bits of this address space, while the remaining 4 bits remain unused (but cannot be repurposed). When the read/write enable bit is active, K0 may refer to a coil or a register; if it refers to a coil, that coil serves as the starting address for occupying a contiguous 8-bit segment; if it refers to a register, the entire register is occupied. For example, to set the first and third channels of the module to self-tuning mode and the remaining two channels to manual PID mode, when the command is "To K10000 K0 K1 M10," set M10 and M12 to ON and set M11 and M13 to OFF; when the command is "To K10000 K0 K1 D100," assign the value 5 to D100.
- When switching the "Resolution" setting, the "Temperature Setpoint", "PID Parameters", "PID Calculation Range", "Temperature Deviation Value δ", and "Calibration Ambient Temperature Value" must be reconfigured; the unit of measurement for these parameters should match the resolution.
- When switching the "Resolution" setting, all From/To parameters (except Auto-Tuning Enable) will revert to their default values.

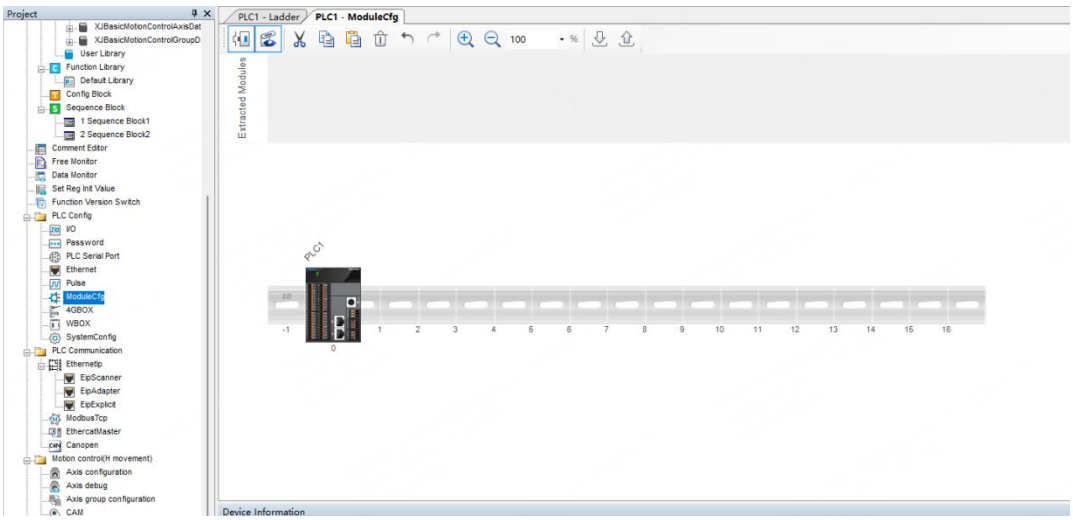
## 6.4.5 Work Mode Settings

There are two methods available for configuring the operating mode (The effects of these two methods are equivalent.):

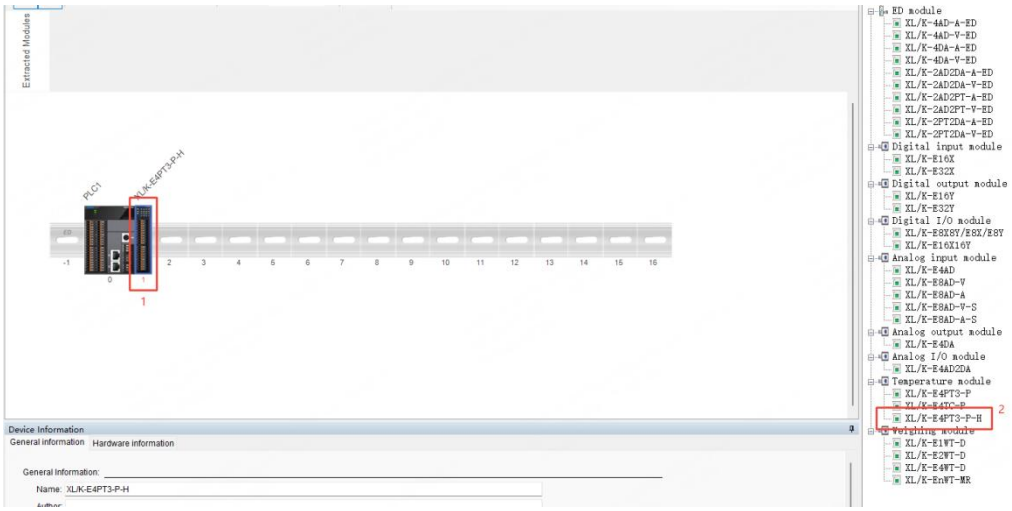
- Configure via the Settings Panel
- Set via Flash register (SFD)

### 1) Configuration Panel Configuration

1. Use the Xinje PLC Programming Tool Software version 3.8.0a or later to configure the module; click [PLC Configuration] – [Module Configuration] in the left-side Engineering Bar to open the Expansion Module Settings window. For versions of the Xinje PLC Programming Tool Software prior to 3.8.0a, click [PLC Configuration] – [Expansion Module] in the left-side Engineering Bar to perform the configuration.

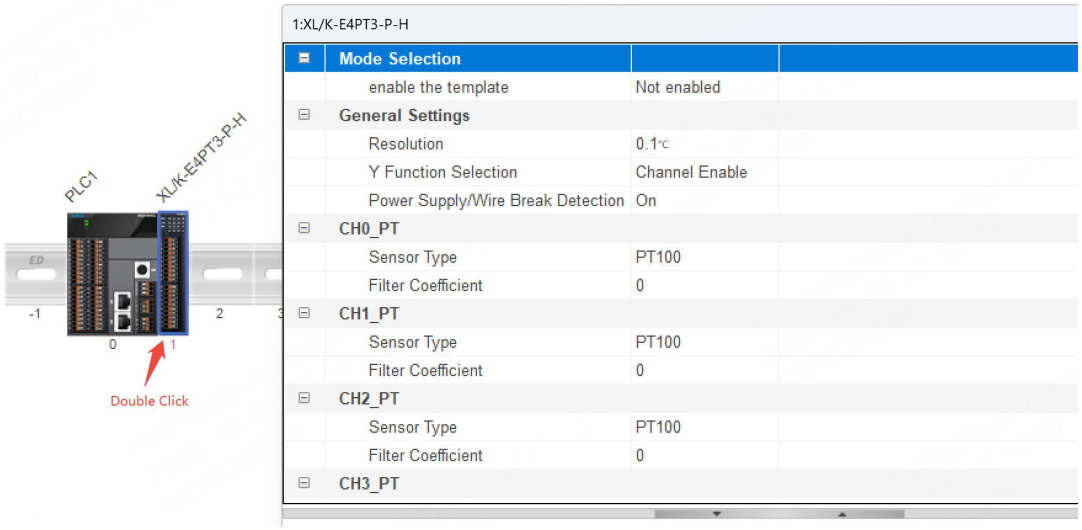



2. Select a module from the right-hand module list and drag it to the desired position; alternatively, double-click a module in the right-hand module list to select it:



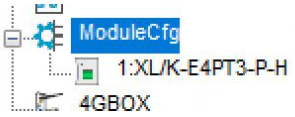

3. Double-click the corresponding module icon to access the module configuration interface, where you can select the sensor type, filtering coefficient, line-break detection switch, and Y-function

selection for the respective channel.




4. Click "  " to retrieve the default configuration parameters for the extended module.

5. After completing the parameter configuration for the expansion module, click "  " to write the set values into the PLC; the changes will take effect only after the PLC is powered off and then powered on again. Under the Module Configuration Node, mount the configured module, then double-click it to enter the module parameter configuration interface.




- The temperature input channel employs a first-Program low-pass filtering method, where the current sample value is weighted against the previous filtered output value to obtain the effective filtered value. The filtering coefficient can be set by the user between 0 and 254; a smaller value results in more stable data but may introduce data lag; a setting of 1 provides the strongest filtering effect, while a setting of 254 provides the weakest filtering effect; the default value is 0 (no filtering).
- The "Y Function Selection" setting is used to specify the function for modules Y10000–Y10003 (e.g., Module #1); by default, this setting is set to "Channel Enable," which supports the module's built-in self-tuning and PID control functions. The output points Y0–Y3 on the module switch on or off based on the PID output value; when this setting is configured as "Immediate Output," the output points Y0–Y3 on the module act as standard digital output points – setting Y10000–Y10003 will activate Y0–Y3, while the module retains only its temperature acquisition functionality; for temperature control, please use the PID instruction built into the PLC unit.

## 2) Flash Register Configuration

The CH0–CH3 expansion module channels allow the configuration of sensor type, filtering coefficient, and Y function selection; these settings are made using the SFD (Special FLASH Data Register) within the PLC. As shown below:

| Module ID | Configuration Information Address | Module ID | Configuration Information 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 |

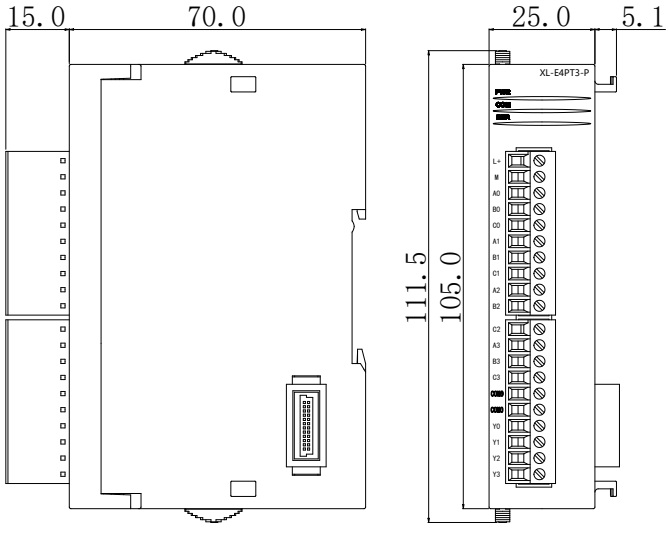
### 3) SFD Bit Definition

Using the First Module as an example to illustrate the setup 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="2">SFD350</td><td>Byte0</td><td colspan="8">PT1 filtering coefficient (0 – no filtering; 1–254 – filtering intensity decreases sequentially; default: 0)</td></tr>
<tr><td>Byte1</td><td colspan="8">PT2 filtering coefficient (0 – no filtering; 1–254 – filtering intensity decreases sequentially; default: 0)</td></tr>
<tr><td rowspan="2">SFD351</td><td>Byte2</td><td colspan="8">PT3 filtering coefficient (0 – no filtering; 1–254 – filtering intensity decreases sequentially; default: 0)</td></tr>
<tr><td>Byte3</td><td colspan="8">PT4 filtering coefficient (0 – no filtering; 1–254 – filtering intensity decreases sequentially; default: 0)</td></tr>
<tr><td rowspan="2">SFD352</td><td>Byte4</td><td colspan="8">Reserved</td></tr>
<tr><td>Byte5</td><td colspan="8">Reserved</td></tr>
<tr><td rowspan="2">SFD353</td><td>Byte6</td><td colspan="8">Reserved</td></tr>
<tr><td>Byte7</td><td colspan="8">Reserved</td></tr>
<tr><td rowspan="2">SFD354</td><td>Byte8</td><td colspan="2">-</td><td colspan="2">resolution ratio<br>00：0.1℃<br>01：0.01℃</td><td colspan="2">PT Channel Fault/Power Supply Detection Switch<br>00:00 – Start<br>01: Turn Off</td><td colspan="2">YFS<br>00: Channel Enable<br>01: Output Immediately</td></tr>
<tr><td>Byte9</td><td colspan="4">-</td><td colspan="4">-</td></tr>
<tr><td>SFD355</td><td>Byte10</td><td colspan="4">PT2 Sensor Type</td><td colspan="4">PT1 Sensor Type</td></tr>
</table>

| Register | | Bit7 | Bit6 | Bit5 | Bit4 | Bit3 | Bit2 | Bit1 | Bit0 |
|---|---|---|---|---|---|---|---|---|---|
| | | 0000：PT 100<br>0001：PT 1000<br>0010：Cu 50<br>0011：Cu 100 | | | | 0000：PT 100<br>0001：PT 1000<br>0010：Cu 50<br>0011：Cu 100 | | | |
| | Byte11 | PT4 Sensor Type | | | | PT3 Sensor Type | | | |
| | | 0000：PT 100<br>0001：PT 1000<br>0010：Cu 50<br>0011：Cu 100 | | | | 0000：PT 100<br>0001：PT 1000<br>0010：Cu 50<br>0011：Cu 100 | | | |
| SFD356 | Byte12 | - | | | | - | | | |
| | Byte13 | - | | | | - | | | |
| SFD357~SFD359 | | Reserved | | | | | | | |

## 6.4.6 External Dimensions Diagram




(unit:mm)

## 6.4.7 Programming Example

When temperature control is required, two programming methods are available:

- Use the PID function on the PLC unit for temperature control; in this case, switch the Y function selection to "Immediate Output." For a detailed programming example, refer to Chapter 7, "PID

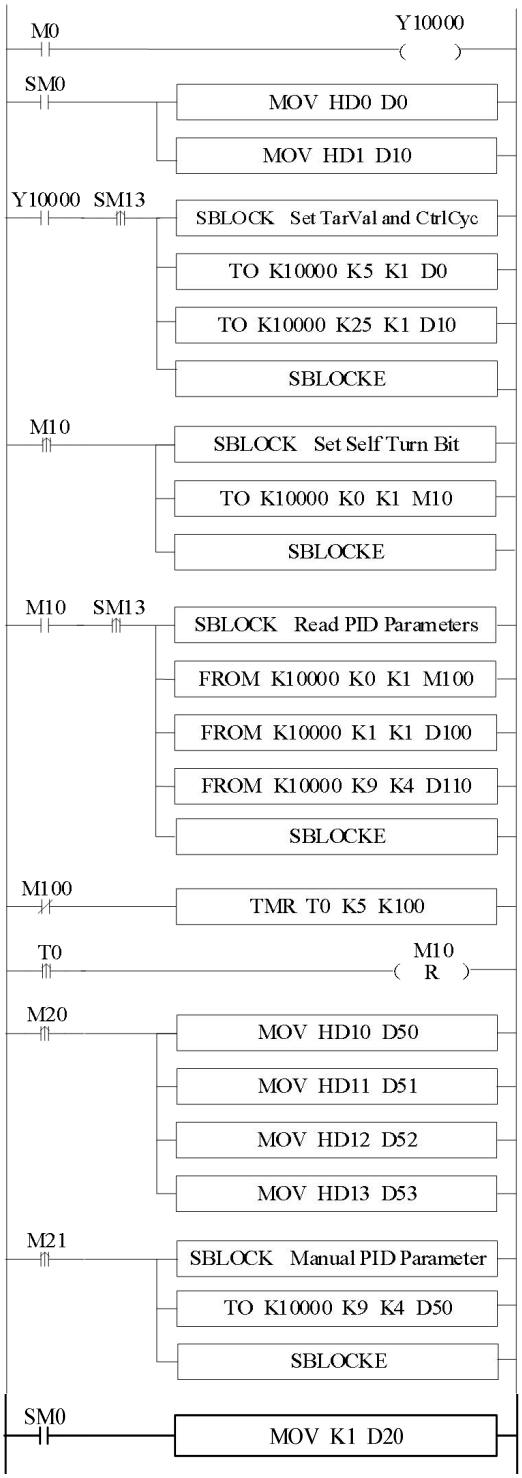
Control Function," in the "XD/XL Series Programmable Logic Controller User Manual [Basic Instructions Section]".

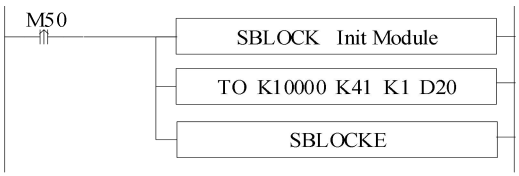
- Use the built-in PID controller for temperature regulation; in this case, switch the Y function selection to "Channel Enable". An example programming scenario is shown below.

Example:

Taking Module #1 as an example, apply PID control to its CH0.

Program:






Explain:

- When the Auto-Tuning Enable bit is activated, this command immediately occupies 8 bits (M10–M17); specifically, M10–M13 correspond to the Auto-Tuning Enable bits for each channel respectively. To enable tuning for a particular channel, simply set the corresponding coil to ON. The bits M14–M17 currently have no function and should remain unset.
- If the output is a solid-state relay, the recommended temperature control cycle is 1–3s; if the output is a traditional relay, the recommended temperature control cycle is 3–15s.
- Due to differing unit systems, the PID parameters for the main unit and the module PID parameters cannot be directly used interchangeably. The main unit's PID parameters are denoted in uppercase letters, while the module's PID parameters are denoted in lowercase letters. The specific conversion relationships are as follows: p = P/100; i = I/10; d = D/100.

Soft components function:

| | |
|---|---|
| M0 | Enable PID control |
| SM0 | Set target values and temperature control cycle |
| M1 | Write target value, temperature control cycle |
| M3 | Set manual P, I, and D parameters |
| M4 | Enter the P, I, and D parameters manually. |
| M10 | Reads the setpoint, PID parameters, and PID output value. |
| M50 | Initialization Module |
| Y10000 | Channel 0 PID enable bit |
| D0 | Set target value |
| D10 | Temperature Control Cycle |
| D80 | P |
| D81 | I |
| D82 | D |
| D83 | DIFF |

# 7 Pressure Measurement Module

## 7.1 Pressure Measurement Module Overview

The XL series PLCs can be connected to pressure measurement modules; each PLC supports up to 16 modules and accommodates 1~4 pressure signal inputs.

### 7.1.1 Naming Rule

XL－E○WT－D
① ② ③ ④ ⑤

| | | |
|---|---|---|
| ① | Series Name | XL: XL Series Expansion Modules |
| ② | Reference Expansion Module | E: Indicates Expansion Module |
| ③ | Measure route count | 1, 2, or 4 |
| ④ | Module Type | WT: Represents the Pressure Measurement Module |
| ⑤ | Module Version | D |

### 7.1.2 Model List

| Model | | Description |
|---|---|---|
| Pressure Measurement | XL-E1WT-D | Single-channel pressure measurement, -20–20 mV range, 23-bit conversion accuracy |
| | XL-E2WT-D | Two-channel pressure measurement (–20–20 mV), 23-bit conversion accuracy |
| | XL-E4WT-D | 4-channel pressure measurement, -20–20 mV range, 23-bit conversion accuracy |

### 7.1.3 General Requirements

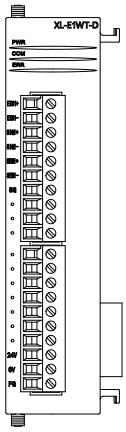
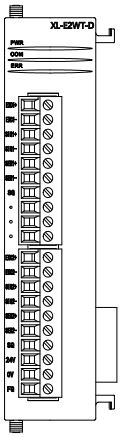
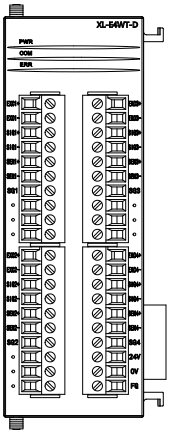
| Project | Specifications |
|---|---|
| Input Power Supply Voltage | DC24V±10% |
| Service Environment | Non-corrosive gases |
| Ambient Temperature | -10℃~50℃ |
| Maintain Ambient Temperature | -20~70℃ |
| Ambient Humidity | 5–95% RH (non-condensing) |
| Maintain Ambient Humidity | 5~95%RH |
| Install | Directly installed on a DIN46277 guide rail (35 mm wide) |

# 7.2 n-channel pressure measurement module XL-EnWT-D

This section primarily introduces the specifications of the XL-EnWT-D module, terminal descriptions, assignment of input definition codes, operating mode configuration, external connections, analog-to-digital conversion diagram, external dimensions diagram, and relevant programming examples.

## 7.1.4 Module Features and Specifications

The XL-EnWT Pressure Measurement Module can be used to detect 1/2/4-channel voltage signals ranging from –20 to +20 mV, or to acquire voltage signals from pressure sensors; it then converts these analog voltage values into digital values via an A/D converter and performs further processing on them.

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

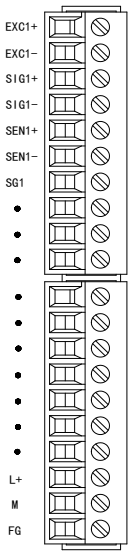
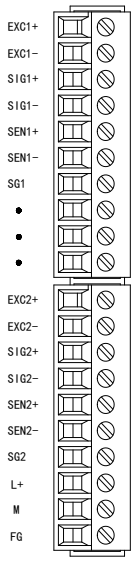
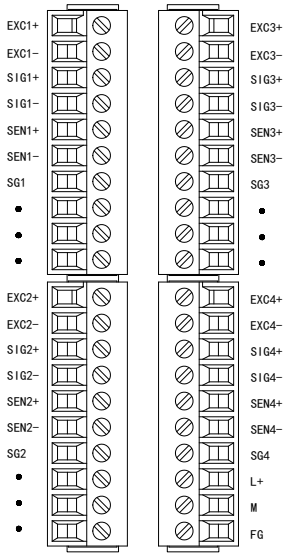
Module Features

- 1/2/4-channel pressure measurement: capable of detecting voltage signals ranging from-20 to 20 mV.
- 23-bit high-precision A/D conversion.
- As a specialized functional module for the XL series, the XL3/XL3E can connect up to 10 modules; the XL5/XL5E/XL5N/XL5H/XLME/XLH/XSLH can support up to 16 modules; however, the XL1 does not support the addition of any modules.

Module Specifications

| Project | Specifications |
|---|---|
| Analog Input Range | DC-20～20mV |
| A/D Practical Resolving Power | 1/8388607 (23Bit) |
| Maximum Display Resolution | 1/500000 |
| Nolinear | 0.01%F.S |
| Conversion Rate | Available options: 150 Hz, 300 Hz, or 450 Hz |
| Source | DC24V±10% |
| Sensor Excitation Power Supply | 5 VDC / 120 mA – allows for the parallel connection of up to four 350 Ω load cells. |
| Software Release | V3.7.4b or later |

## 7.1.5 Terminal Specifications

| XL-E1WT-D Terminal Arrangement | XL-E2WT-D Terminal Arrangement | XL-E4WT-D Terminal Arrangement |
|---|---|---|
|  |  |  |

| Terminal Block | | Function | |
|---|---|---|---|
| CH1 | EXC1+ | Positive incentive | Power supply input terminal of the sensor |
| | EXC1- | Negative incentive | |
| | SIG1+ | Signal: Positive | Sensor signal output terminal |
| | SIG1- | Negative signal | |
| | SEN1+ | Positive feedback | Sensor feedback voltage output terminal |
| | SEN1- | Negative feedback | |
| | SG | Signal Ground | Sensor signal cable ground wire |
| CH2 | EXC2+ | Positive incentive | Power supply input terminal of the sensor |
| | EXC2- | Negative incentive | |
| | SIG2+ | Signal: Positive | Sensor signal output terminal |
| | SIG2- | Negative signal | |
| | SEN2+ | Positive feedback | Sensor feedback voltage output terminal |
| | SEN2- | Negative feedback | |

| Terminal Block | | Function | |
|---|---|---|---|
| | SG | Signal Ground | Sensor signal cable ground wire |
| CH3 | EXC3+ | Positive incentive | Power supply input terminal of the sensor |
| | EXC3- | Negative incentive | |
| | SIG3+ | Signal: Positive | Sensor signal output terminal |
| | SIG3- | Negative signal | |
| | SEN3+ | Positive feedback | Sensor feedback voltage output terminal |
| | SEN3- | Negative feedback | |
| | SG | Signal Ground | Sensor signal cable ground wire |
| CH4 | EXC4+ | Positive incentive | Power supply input terminal of the sensor |
| | EXC4- | Negative incentive | |
| | SIG4+ | Signal: Positive | Sensor signal output terminal |
| | SIG4- | Negative signal | |
| | SEN4+ | Positive feedback | Sensor feedback voltage output terminal |
| | SEN4- | Negative feedback | |
| | SG | Signal Ground | Sensor signal cable ground wire |
| - | L+，M | Power terminal | Power supply for the module: DC 24V ±10% |
| | FG | Power Ground | Power supply grounding terminal |

The XL-E1WT-D model does not have a CH2–CH4 channel; the XL-E2WT-D model does not have a CH3–CH4 channel.

## Wiring terminal specifications

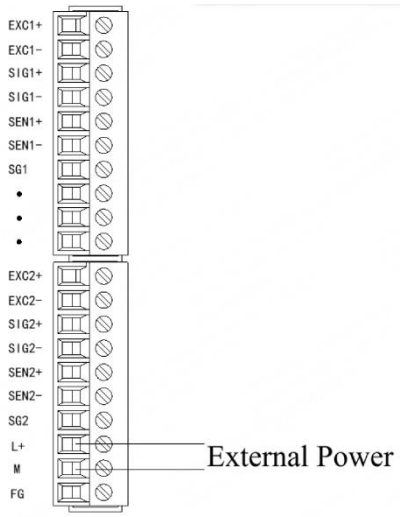
When wiring a module, its terminals must comply with the following requirements:

- Wire stripping length: 9 mm;
- Flexible conductor with tubular bare ends, cross-sectional area 0.25–1.5 mm²;
- Flexible conductor with tubular pre-insulated ends, cross-sectional area: 0.25–0.5 mm².

### 7.1.6 External Connection

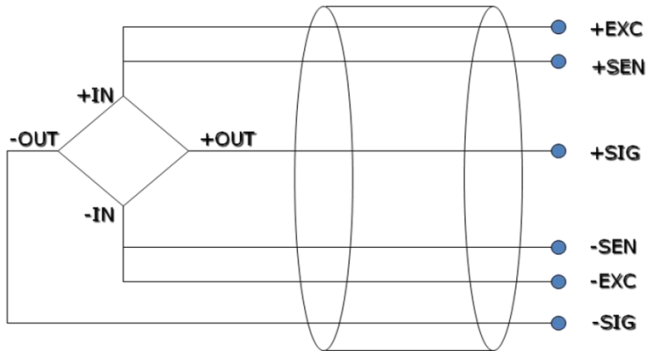
When connecting externally, to avoid interference, please use a shielded cable and perform single-point grounding of the shield.

1) Power supply wiring

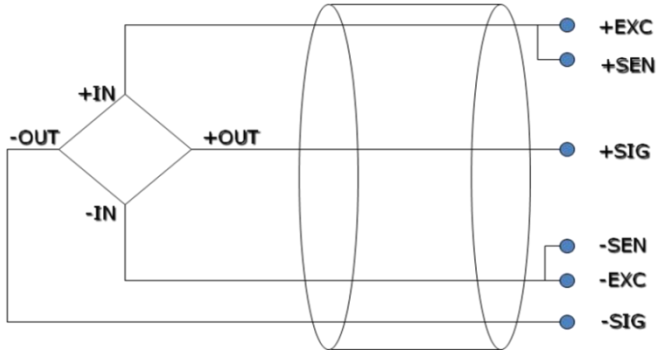



2) Connect to sensor

- Six-wire connection method



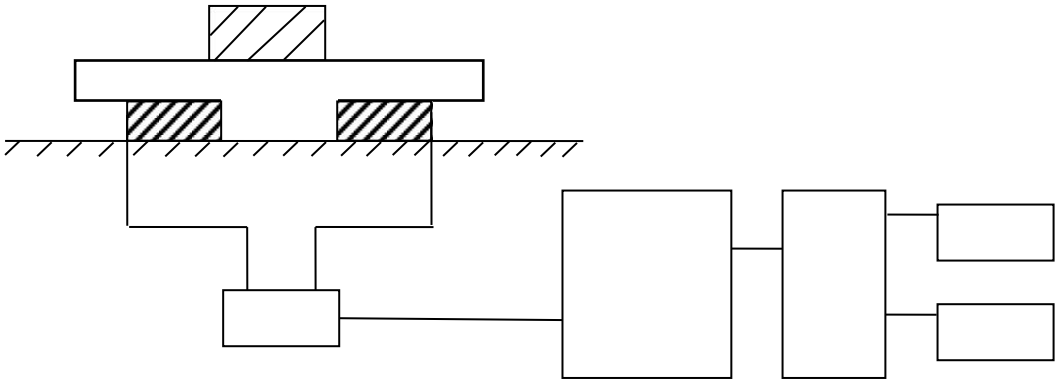

- Four-wire connection method



If the sensor is a four-wire system, short-circuit EXC-to SEN-and EXC+ to SEN+.

### 7.1.7 Weighing System Composition

A complete industrial weighing system (scale) primarily consists of the following components:



The figure above shows the setup of a weighing system equipped with an XL-EnWT-D module.

| Name | Explain |
|---|---|
| Load-bearing Component | Load-bearing components are used to support the load to be weighed; these include platforms, hoppers, aerial handling vehicles, containers, and so on. |
| Pressure Sensor | A pressure sensor is a measuring device that converts a physical quantity (i.e., weight) into a proportional electrical signal. |
| Assembling Components | Assembly components ensure the proper operation of the weighing sensor; assembly and guiding components prevent overloading, as overloading can lead to measurement errors or damage the weighing sensor. Overloading is caused by a force (lateral force) acting in a direction not intended by the design of the weighing sensor's spring. |
| Connecting Box | The junction box (JB) is used to combine the signal lines from multiple parallelly connected load cells. |
| XL-EnWT-D | The XL-EnWT-D module can be used as an electronic evaluation device that captures signals from a pressure senso<br>r and performs further analysis. |

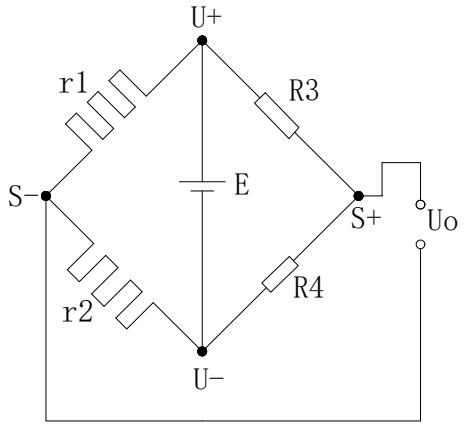
### 7.1.8 Module Function Description

The XL-EnWT-D multi-channel pressure measurement module offers the following functions:

- Pressure sensor calibration
- Pressure sensor signal acquisition
- Weight value calculation
- -20 to 20 mV voltage signal detection

#### Pressure Sensor Introduction

The pressure sensor operates on the principle of the resistive strain effect. Its schematic diagram is shown below:




- R1 and R2 are strain resistors that, together with the two fixed resistors R3 and R4, form a bridge circuit. When the resistance values of R1 and R2 change, the bridge becomes unbalanced, thereby generating an unbalanced voltage Uo as the sensor's output signal.
- U+ and U-represent the positive and negative terminals of the sensor power supply, respectively; the power supply can be either the 5 V supply provided by this module or an external power source.
- S+ and S-represent the positive and negative terminals of the sensor's output signal, respectively; connecting this millivolt voltage output signal to this module enables the measurement of pressure magnitude.

### 7.1.9 IO address allocation and read/write operations

1) Input/Output Definition Number Allocation

First Expansion Module Register Definition Number

| Soft Components | Channel | Address | Explain | Remarks |
|---|---|---|---|---|
| Output Winding | CH1 | Y10000 | Filter Level Switching | |
| | | Y10001 | Reset | |
| | | Y10002 | Zero-point calibration | |
| | | Y10003 | Gain calibration | |
| | CH2 | Y10004 | Filter Level Switching | |
| | | Y10005 | Reset | |
| | | Y10006 | Zero-point calibration | |
| | | Y10007 | Gain calibration | |
| | CH3 | Y10010 | Filter Level Switching | |
| | | Y10011 | Reset | |
| | | Y10012 | Zero-point calibration | |
| | | Y10013 | Gain calibration | |
| | CH4 | Y10014 | Filter Level Switching | |
| | | Y10015 | Reset | |
| | | Y10016 | Zero-point calibration | |
| | | Y10017 | Gain calibration | |
| | ALL | Y10020 | Restore to factory settings | |
| Input Coil | CH1 | X10000 | Stability Indicator | |
| | | X10001 | Overflow flag | |
| | | X10002 | Calibration Successful Indicator | |
| | | X10003 | Calibration Failure Flag | |
| | | X10020 | AD Update Flag | |
| | CH2 | X10004 | Stability Indicator | |
| | | X10005 | Overflow flag | |
| | | X10006 | Calibration Successful Indicator | |
| | | X10007 | Calibration Failure Flag | |
| | | X10021 | AD Update Flag | |
| | CH3 | X10010 | Stability Indicator | |
| | | X10011 | Overflow flag | |
| | | X10012 | Calibration Successful Indicator | |
| | | X10013 | Calibration Failure Flag | |
| | | X10022 | AD Update Flag | |
| | CH4 | X10014 | Stability Indicator | |
| | | X10015 | Overflow flag | |
| | | X10016 | Calibration Successful Indicator | |
| | | X10017 | Calibration Failure Flag | |
| | | X10023 | AD Update Flag | |

| Soft Components | Channel | Address | Explain | Remarks |
|---|---|---|---|---|
| Incoming Register | CH1 | ID10000 | Current weight | DWord |
| | | ID10002 | Current digital value / Current input voltage | DWord |
| | CH2 | ID10004 | Current weight | DWord |
| | | ID10006 | Current digital value / Current input voltage | DWord |
| | CH3 | ID10008 | Current weight | DWord |
| | | ID10010 | Current digital value / Current input voltage | DWord |
| | CH4 | ID10012 | Current weight | DWord |
| | | ID10014 | Current digital value / Current input voltage | DWord |

Second Expansion Module Register Definition Number

| Soft Components | Channel | Address | Explain | Remarks |
|---|---|---|---|---|
| Output Winding | CH1 | Y10100 | Filter Level Switching | |
| | | Y10101 | Reset | |
| | | Y10102 | Zero-point calibration | |
| | | Y10103 | Gain calibration | |
| | CH2 | Y10104 | Filter Level Switching | |
| | | Y10105 | Reset | |
| | | Y10106 | Zero-point calibration | |
| | | Y10107 | Gain calibration | |
| | CH3 | Y10110 | Filter Level Switching | |
| | | Y10111 | Reset | |
| | | Y10112 | Zero-point calibration | |
| | | Y10113 | Gain calibration | |
| | CH4 | Y10114 | Filter Level Switching | |
| | | Y10115 | Reset | |
| | | Y10116 | Zero-point calibration | |
| | | Y10117 | Gain calibration | |
| | ALL | Y10120 | Restore to factory settings | |
| Input Coil | CH1 | X10100 | Stability Indicator | |
| | | X10101 | Overflow flag | |
| | | X10102 | Calibration Successful Indicator | |
| | | X10103 | Calibration Failure Flag | |
| | | X10120 | AD Update Flag | |
| | CH2 | X10104 | Stability Indicator | |
| | | X10105 | Overflow flag | |
| | | X10106 | Calibration Successful Indicator | |
| | | X10107 | Calibration Failure Flag | |
| | | X10121 | AD Update Flag | |

| Soft Components | Channel | Address | Explain | Remarks |
|---|---|---|---|---|
| | CH3 | X10110 | Stability Indicator | |
| | | X10111 | Overflow flag | |
| | | X10112 | Calibration Successful Indicator | |
| | | X10113 | Calibration Failure Flag | |
| | | X10122 | AD Update Flag | |
| | CH4 | X10114 | Stability Indicator | |
| | | X10115 | Overflow flag | |
| | | X10116 | Calibration Successful Indicator | |
| | | X10117 | Calibration Failure Flag | |
| | | X10123 | AD Update Flag | |
| Incoming Register | CH1 | ID10100 | Current weight | DWord |
| | | ID10102 | Current digital value / Current input voltage | DWord |
| | CH2 | ID10104 | Current weight | DWord |
| | | ID10106 | Current digital value / Current input voltage | DWord |
| | CH3 | ID10108 | Current weight | DWord |
| | | ID10110 | Current digital value / Current input voltage | DWord |
| | CH4 | ID10112 | Current weight | DWord |
| | | ID10114 | Current digital value / Current input voltage | DWord |

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Sixteenth Extended Module Register Definition Code

| Soft Components | Channel | Address | Explain | Remarks |
|---|---|---|---|---|
| Output Winding | CH1 | Y11700 | Filter Level Switching | |
| | | Y11701 | Reset | |
| | | Y11702 | Zero-point calibration | |
| | | Y11703 | Gain calibration | |
| | CH2 | Y11704 | Filter Level Switching | |
| | | Y11705 | Reset | |
| | | Y11706 | Zero-point calibration | |
| | | Y11707 | Gain calibration | |
| | CH3 | Y11710 | Filter Level Switching | |
| | | Y11711 | Reset | |
| | | Y11712 | Zero-point calibration | |
| | | Y11713 | Gain calibration | |
| | CH4 | Y11714 | Filter Level Switching | |
| | | Y11715 | Reset | |
| | | Y11716 | Zero-point calibration | |

| Soft Components | Channel | Address | Explain | Remarks |
|---|---|---|---|---|
| | | Y11717 | Gain calibration | |
| | ALL | Y11720 | Restore to factory settings | |
| Input Coil | CH1 | X11700 | Stability Indicator | |
| | | X11701 | Overflow flag | |
| | | X11702 | Calibration Successful Indicator | |
| | | X11703 | Calibration Failure Flag | |
| | | X11720 | AD Update Flag | |
| | CH2 | X11704 | Stability Indicator | |
| | | X11705 | Overflow flag | |
| | | X11706 | Calibration Successful Indicator | |
| | | X11707 | Calibration Failure Flag | |
| | | X11721 | AD Update Flag | |
| | CH3 | X11710 | Stability Indicator | |
| | | X11711 | Overflow flag | |
| | | X11712 | Calibration Successful Indicator | |
| | | X11713 | Calibration Failure Flag | |
| | | X11722 | AD Update Flag | |
| | CH4 | X11714 | Stability Indicator | |
| | | X11715 | Overflow flag | |
| | | X11716 | Calibration Successful Indicator | |
| | | X11717 | Calibration Failure Flag | |
| | | X11723 | AD Update Flag | |
| Incoming Register | CH1 | ID11500 | Current weight | DWord |
| | | ID11502 | Current digital value / Current input voltage | DWord |
| | CH2 | ID11504 | Current weight | DWord |
| | | ID11506 | Current digital value / Current input voltage | DWord |
| | CH3 | ID11508 | Current weight | DWord |
| | | ID11510 | Current digital value / Current input voltage | DWord |
| | CH4 | ID11512 | Current weight | DWord |
| | | ID11514 | Current digital value / Current input voltage | DWord |



The XL-E1WT-D does not contain CH2–CH4; the XL-E2WT-D does not contain CH3 or CH4.

Address Information

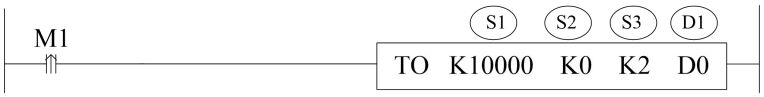
| Parameter Name | Function Declaration |
|---|---|
| 1: Filter Level Switching | ON: Filter Level A; OFF: Filter Level B; |
| 2: Reset | Resetting within the allowed range is valid; the zero point is not saved. |

| Parameter Name | Function Declaration |
|---|---|
| 3: Zero Calibration | Used for system zero-point calibration; |
| 4: Gain Calibration | For system linearity correction; |
| 5: Stability Indicator | When the stability determination range and stability determination time conditions are satisfied, this signal output becomes valid; |
| 6: Overflow flag | When the signal voltage exceeds the set range, this signal output becomes valid; |
| 7: Calibration Successful Indicator | When zero-point calibration and gain calibration are successful, this signal output becomes valid; |
| 8: Calibration Failure Flag | When zero-point calibration or gain calibration fails, this signal output becomes valid;<br>(For specific reasons, please refer to the module application error message.) |
| 9: AD Update Flag | Each AD value acquisition triggers a bit set; |
| 10: Current digital value / Current input voltage | The setting can be configured via the host computer; when switched to the current input voltage mode, the unit is millivolt (mV) with four decimal places. |

## 2) EC_FROM/EC_To Instruction Manual

- Parameter Write Instruction: TO

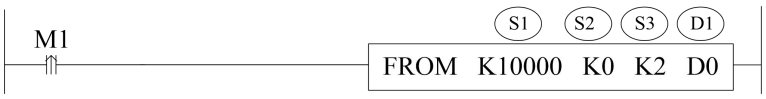
Write the specified register data into the designated module address, using a byte as the operation unit.




| Operand | Function | Available Operands |
|---|---|---|
| S1 | Target Module Number – Range: 10000–10015. | K、TD，CD，D，HD，FD |
| S2 | Write the starting address of the module. | K、TD，CD，D，HD，FD |
| S3 | Number of registers to write to (number of words). | K、TD，CD，D，HD，FD |
| D1 | The starting address of the register where written data is stored within the device. | TD，CD，D，HD，FD |

- Parameter Read Instruction: FROM

Read data from the specified module address into the designated register of the device, using a word as the operation unit.




| Operand | Function | Available Operands |
|---|---|---|
| S1 | Target Module Number – Range: 10000–10015. | K、TD，CD，D，HD，FD |
| S2 | Read the starting address of the module. | K、TD，CD，D，HD，FD |
| S3 | Number of registers to read (number of words). | K、TD，CD，D，HD，FD |

| | | |
|---|---|---|
| D1 | The body receives the starting address of the register. | TD，CD，D，HD，FD |



The FROM/TO instruction can only be written within a Sequential Function Block; a single project may contain a maximum of 8 Sequential Function Blocks.

3) Related Address Definition

| Address | Content | Explain | | Attribute |
|---|---|---|---|---|
| K0 | Zero Point Tracking Range | Range: 0–99; Initial value: 5 | All Channels | Word R/W |
| K1 | Zero-point tracking time | Range: 10–5000 (ms) Initial value: 2000 | | Word R/W |
| K2 | Zeroing Range | Range: 1–99 (%) Initial value: 50 | | Word R/W |
| K3 | Stability Range | Range: 1–99; Initial value: 3 | | Word R/W |
| K4 | Steady-state 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 | Filtering Level B | Range: 0–34; Initial value: 5 | | Word R/W |
| K8 | Steady-state filtering coefficient | Range: 0–34; Initial value: 0 | | Word R/W |
| K9 | | | | |
| K10 | Gain calibration relative digital return value | Gain calibration digital quantity – Zero calibration digital quantity | CH1 | Dword R |
| K12 | Gain calibration weight value | Gain calibration weight value | | Dword R/W |
| K14 | CH1 Minimum Division | Range: 1, 2, 5, 10,20,50 | | Word R/W |
| K15 | CH1 Maximum Range | Range: ≤ Division × 500,000 | | Dword R/W |
| K17 | Reserved | | | |
| K20 | Gain calibration relative digital return value | Gain calibration digital quantity – Zero calibration digital quantity | CH2 | Dword R |
| K22 | Gain calibration weight value | Gain calibration weight value | | Dword R/W |
| K24 | CH2 minimum scale division | Range: 1, 2, 5, 10,20,50 | | Word R/W |
| K25 | CH2 Maximum Range | Range: ≤ Division × 500,000 | | Dword R/W |

| Address | Content | Explain | | Attribute |
|---|---|---|---|---|
| K27 | Reserved | | | |
| K30 | Gain calibration relative digital return value | Gain calibration digital quantity – Zero calibration digital quantity | CH3 | Dword R |
| K32 | Gain calibration weight value | Gain calibration weight value | | Dword R/W |
| K34 | CH3 minimum scale division | Range: 1, 2, 5, 10,20,50 | | Word R/W |
| K35 | CH3 maximum range | Range: ≤ Division × 500,000 | | Dword R/W |
| K37 | | | | |
| K40 | Gain calibration relative digital return value | Gain calibration digital quantity – Zero calibration digital quantity | CH4 | Dword R |
| K42 | Gain calibration weight value | Gain calibration weight value | | Dword R/W |
| K44 | CH4 minimum scale division | Range: 1, 2, 5, 10,20,50 | | Word R/W |
| K45 | CH4 maximum range | Range: ≤ Division × 500,000 | | Dword R/W |
| K47 | | | | |

- Weighing unit setting

In the PLC program, the weight of the object is written using the `To` instruction. For example, if the weight of the object is 1 kg and the unit precision is set to kilograms, the value to be written is 1; if the unit precision is set to grams, the value to be written is 1000; and if the unit precision is set to 0.1 grams, the value to be written is 10000. This follows the formula: Resolution = 1 kg / Value Written.

- Demarcate

Whenever the sensor is replaced, the pressure sensor must be recalibrated. For example, take Module 1, Channel 1:

| Step | Explain |
|---|---|
| ***1*** | Verify whether the module and sensor are functioning correctly;<br>Judgment Method:<br>First, check whether the Overflow flag X10001 is in the OFF state; if it is ON, this indicates that the sensor is not properly connected or is damaged;<br>Next, use the host computer software to monitor whether the ID10002's measured value fluctuates upward or downward according to the sensor's output (the magnitude of the fluctuation depends on the sensor's range); if the measured value increases as the load pressure increases, or decreases as the load pressure increases, this indicates:<br>① The sensor is installed incorrectly – adjust the sensor's position or swap the positive and negative terminals of the sensor's output signal;<br>② The input voltage signal has exceeded its allowable range – appropriately reduce the load. |

| Step | Explain |
|---|---|
| ***2*** | Set the pressure sensor to no-load condition; when the stability indicator X10000 is set to ON, initiate the zero-point calibration function Y10002. If X10002 is set to OFF, it indicates a successful zero-point calibration; if, after waiting for a few seconds, X10003 is set to ON, it indicates a failed zero-point calibration. |
| ***3*** | Place a load of known weight on the scale body, and write the corresponding weight value of the weights via the TO instruction. When the stability flag X10000 turns ON, enable gain calibration Y10003. When X10002 is ON, it indicates successful calibration; turn off Y10003. If X10003 turns ON after waiting for several seconds, the zero point calibration fails. |
| ***4*** | The calibration is now complete. During weighing, the module automatically calculates the necessary adjustment based on the collected no-load and calibration values, and finally displays the correct weighing result. |

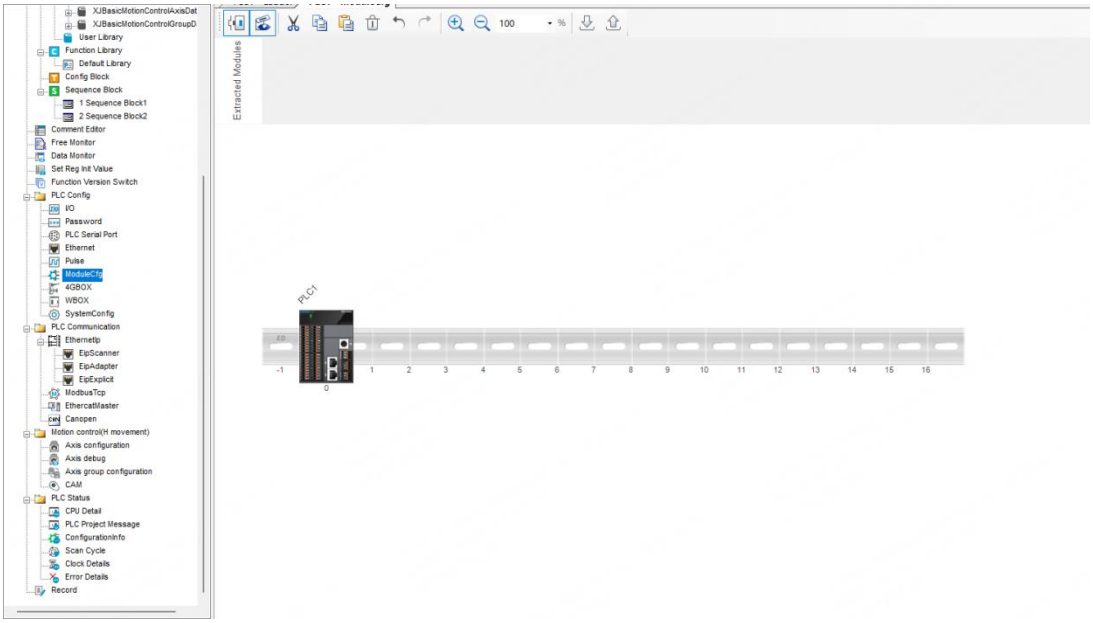
### 7.1.10 Work Mode Setup

There are two methods for configuring the operating mode (The effects of these two methods are equivalent.).

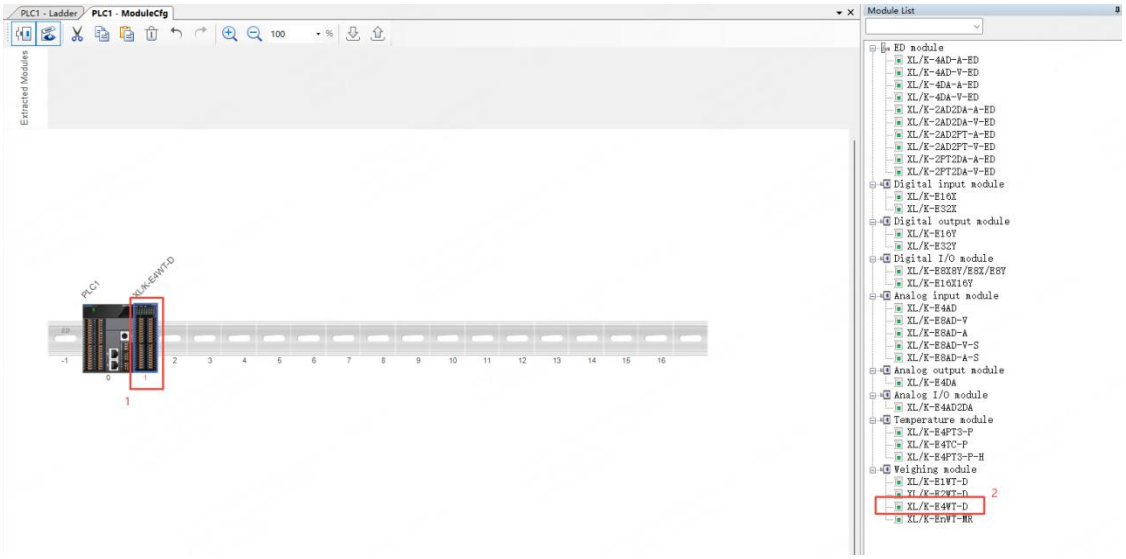
- Through Control Panel configuration
- Set via Flash registers

#### 1) Configuration Panel Configuration

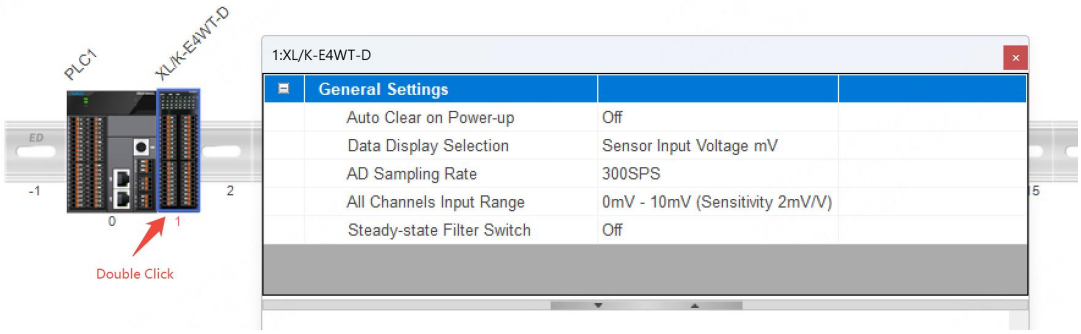
1. Use the Xinje PLC Programming Tool Software version 3.8.0a or later to configure the module; click [PLC Configuration] – [Module Configuration] in the left-side Engineering Bar to open the Expansion Module Settings window. For versions prior to 3.8.0a of the Xinje PLC Programming Tool Software, click [PLC Configuration] – [Expansion Module] in the left-side Engineering Bar to perform the configuration.



2. Select a module from the right-hand module list and drag it to the desired position; alternatively, double-click a module in the right-hand module list to select it:

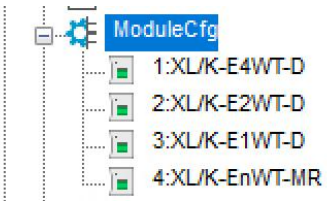


3. Double-click the corresponding module icon to access the module configuration interface and select the weighing module configuration parameters.




4. Click "  " to retrieve the default configuration parameters for the extended module.

5. After completing the parameter configuration for the expansion module, click "  " to write the set values into the PLC; the changes will take effect only after the PLC is powered off and then powered on again. Under the Module Configuration Node, mount the configured module, then double-click to enter the Module Parameter Configuration screen.




## 2) Flash Register Configuration

The expansion module allows users to configure gear positions and customize the fast sampling frequency; these settings are made using the SFD (Special FLASH Data Register) within the PLC. As shown below:

| Module ID | Configuration Information Address | Module ID | Configuration Information 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 |

3) SFD Bit Definition

Using the First Module as an example to illustrate the setup method.

| Register | | Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit3 | Bit 2 | Bit1 | Bit0 | Explain |
|---|---|---|---|---|---|---|---|---|---|---|
| SFD350 | Byte0 | AD sampling rate<br>Range: 0–2<br>Initial value: 1<br>0: 150 times/second<br>1,300 times/second<br>2: 450 times/second | | | | Steady-state filter initial value: 0<br>0: Off \| 1: On | | Sampling data mode initial value: 0<br>0: Sensor input voltage (mV)<br>1: AD sampling digital value | Automatic reset upon power-on<br>Initial value: 0<br>0: Off<br>1: On | All Channels |
| | Byte1 | Reserved | | | | | | | | |
| SFD351~SFD359 | | Reserved | | | | | | | | |

## 7.1.11 Module Error Message

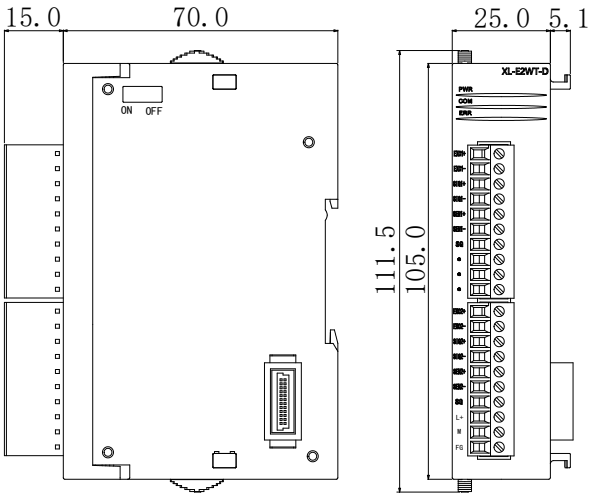
Severe application error (corresponds to the high 8 bits of the Body Register Address SD503)

| Error Code | | | Meaning |
|---|---|---|---|
| Binary | Hexadecimal | Decimal | |
| 0000 0001 | 0x01 | 1 | Unconnected 24V supply |
| 0000 0010 | 0x02 | 2 | Configuration not completed within 5 seconds |
| 0000 0011 | 0x03 | 3 | Inconsistent module models |
| 0000 0011 | 0x04 | 4 | Communication anomaly with the PLC unit |

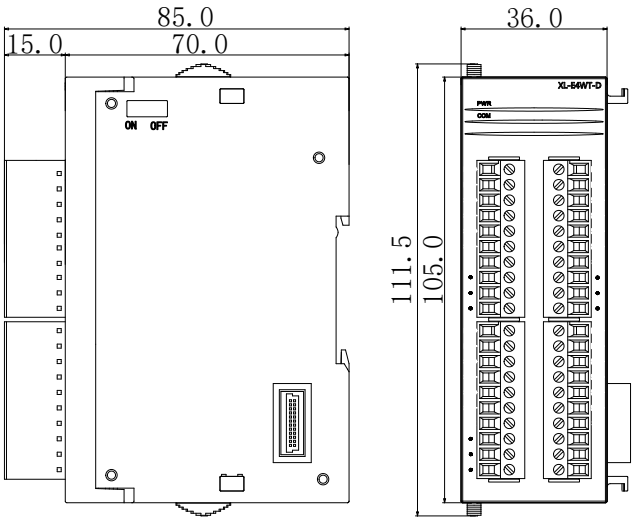
Usage of this error code: Write the module number to SD500. To view the error code of the first module, write 10000.

## 7.1.12 External dimensions diagram

Unit: mm




| Applicable Modules |
| --- |
| Pressure Measurement Module |
| XL-E1WT-D |
| XL-E2WT-D |



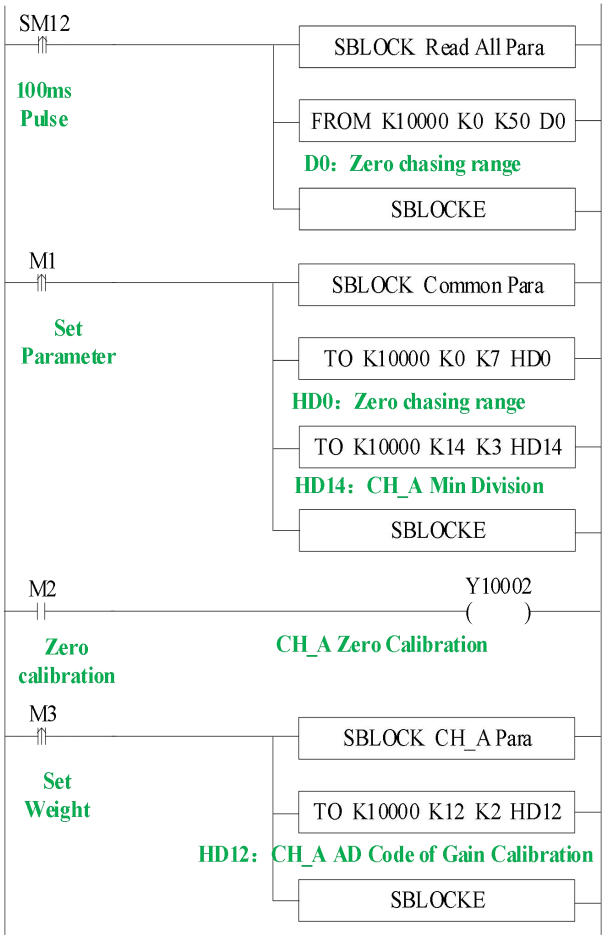

| Applicable Modules |
| --- |
| Pressure Measurement Module |
| XL-E4WT-D |

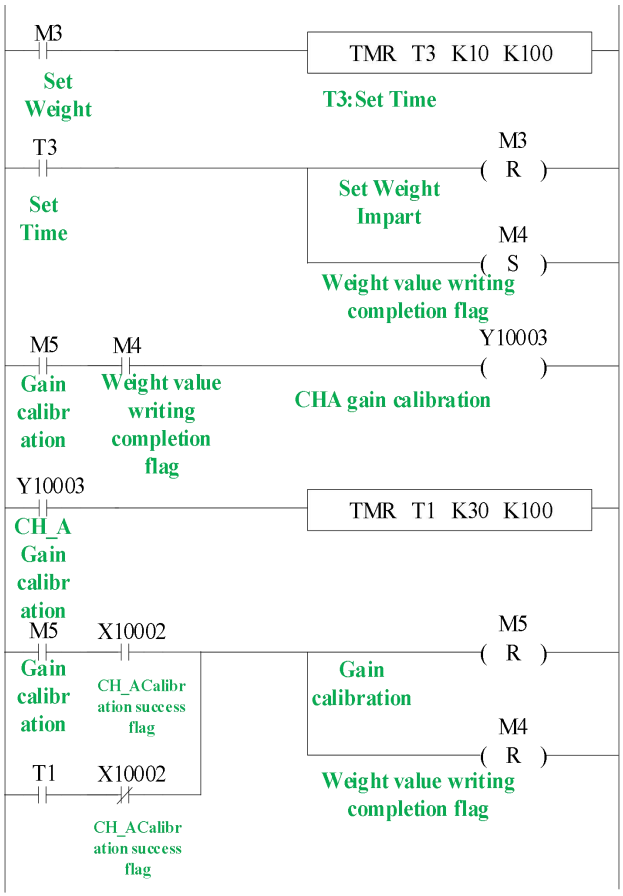
## 7.1.13 Programming Example

Example:

Take Module 1, Channel 1 as an example:

Program:


SM12
SBLOCK Read All Para
100ms
Pulse
FROM K10000 K0 K50 D0
D0: Zero chasing range
SBLOCKE
M1
SBLOCK Common Para
Set
Parameter
TO K10000 K0 K7 HD0
HD0: Zero chasing range
TO K10000 K14 K3 HD14
HD14: CH_A Min Division
SBLOCKE
M2
Y10002
Zero
calibration
CH_A Zero Calibration
M3
SBLOCK CH_A Para
Set
Weight
TO K10000 K12 K2 HD12
HD12: CH_A AD Code of Gain Calibration
SBLOCKE


M3
TMR T3 K10 K100
Set
Weight
T3:Set Time
T3
M3
R
Set
Time
Set Weight
Impart
M4
S
Weight value writing
completion flag
M5
M4
Y10003
Gain
calibr
ation
Weight value
writing
completion
flag
CHA gain calibration
Y10003
TMR T1 K30 K100
CH_A
Gain
calibr
ation
M5
X10002
M5
R
Gain
calibr
ation
CH_ACalibr
ation success
flag
Gain
calibration
M4
R
T1
X10002
Weight value writing
completion flag
CH_ACalibr
ation success
flag

Explain:

- Read all parameters and write general operating parameters using the FORM/TO command;
- Set M1 to write all parameters to Channel 1;
- Zero-point calibration: Set M2 and perform zero-point calibration; if the calibration is successful, set X10002 to ON;
- Gain calibration: Before performing gain calibration, first enter the weight value, set M3, and input the HD12 weight value into the module. Once the write operation is successful, turn on the completion flag M4 before proceeding with the gain calibration; then set M5 to initiate the gain calibration process. Set the preset stabilization time to 3 seconds and wait for the weighing platform to stabilize. If the gain calibration is successful, turn on X10002 or wait until calibration time T1 expires; then reset M4 and M5 – the gain calibration is now complete.

# Manual Update Log

The document reference number for this manual is printed in the lower right corner of the cover. Information regarding this manual's revision is summarized below:

| No. | Document Reference Number | Chapter | Update Content |
|---|---|---|---|
| 1 | PL04 20220225 1.0 | - | 1. New XL-E4AD, XL-E1WT-D, XL-E2WT-D, and XL-E4WT-D modules have been added. |
| 2 | PL04 20230329 1.1 | - | 1. Correct the description of the PWR and ERR indicator lights;<br>2. Precautions for modifying the analog-to-digital conversion diagram;<br>3. New XL-E8AD-A-S and XL-E8AD-V-S module specifications. |
| 3 | PL04 20230427 1.1.1 | - | 1. Update the documentation for the IO module's horn terminals. |
| 4 | PL04 20230504 1.1.2 | - | 1. Update the instructions for the Temperature Module section in the User Manual. |
| 5 | PL04 20231101 1.2 | - | 1. New XL-E16PX16PYT and XL-E4PT3-P-H module documentation;<br>2. Manual structure adjustment. |
| 6 | PL04 20240224 1.3 | - | 1. New XL-E8NPX8YT and XL-E8NPX8YR modules have been added. |
| 7 | PL04 20240426 1.4 | - | 1. Update the instructions for the Temperature Module;<br>2. Other modifications to the manual. |
| 8 | PL04 20240823 1.5 | - | 1. Add a new Chapter 1.3 module covering power rating and operating conditions;<br>2. Revised List of Analog Input Module Model Specifications;<br>3. Update the bit definition description for the SFD in XL-E4AD2DA. |
| 9 | PL04 20250409 1.5.1 | - | 1. Added new content to Chapter 1.6. |
| 10 | PL04 20250714 1.6 | - | 1. Instructions for the new XL-E16PYT module;<br>2. Modify the work mode settings. |
| 11 | PL04 20260116 1.6.1 | - | 1. Instructions for increasing the number of compatible modules for XL3E models;<br>2. The Chapter 7.2.6 now includes an address specification for Channels 3 and 4 of the XL-EnWT-D module. |
| 12 | PL04 20260116 1.6.2 | | 1. Add description of the number of matching modules for XL3E model. |

| | | | |
|---|---|---|---|
| | | | 2. Add address description for Channel 3 and Channel 4 of XL-EnWT-D module in Section 7.2.6. |

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