



XC series expansions with special functions
Operate Manual

Xinje Electronic Co., Ltd.

Catalog

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1. Modules information

1. Basic Characteristics

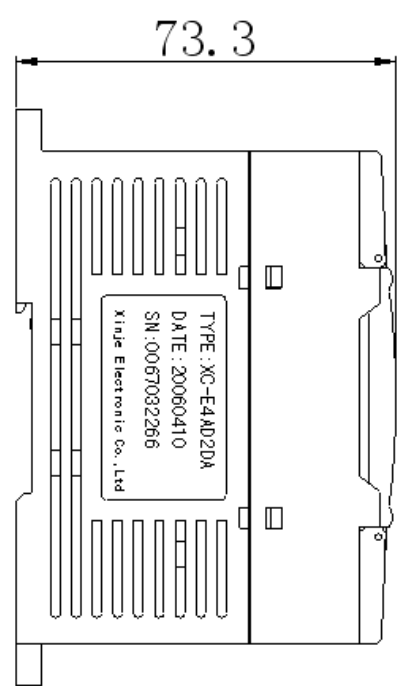
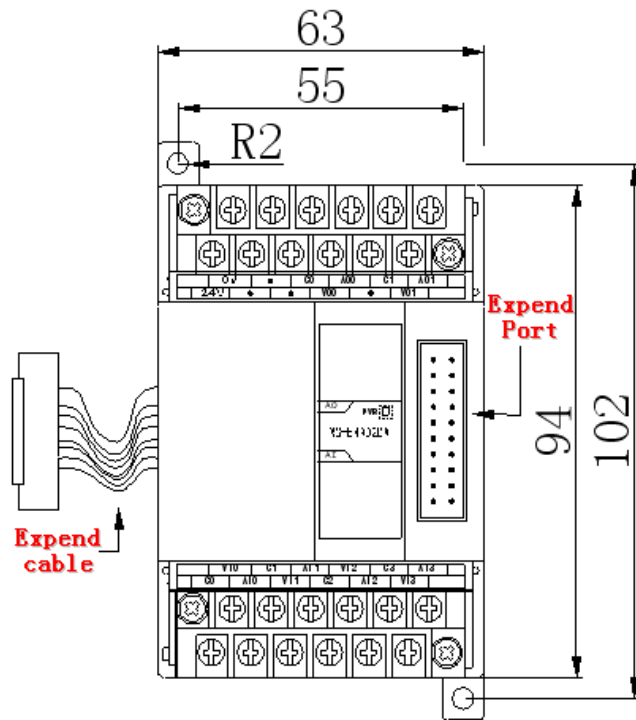
XC series PLCs not only have strong functions of logic operation, data operation, high speed processing etc. but also functions of A/D, D/A conversion, PID adjustment. With the expansions of analog input module, analog output module, temperature control module etc, XC series PLCs are widely used in the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

2. Module Names

The detailed information is:

| Model | Function |
|--------------|---|
| XC-E8AD | 8 channels analog input (14bits); there into 4 channels current input, 4 channels voltage input |
| XC-E4AD2DA | 4 channels analog input (14bits); 2 channels analog output (12bits); current / voltage selectable |
| XC-E4DA | 4 channels analog output (12bits); current / voltage selectable |
| XC-E6PT-P | -150°C~350°C, 6 channels Pt100 temperature signal sampling, 0.1 degree precision, built-in PID function |
| XC-E6TC-P | 0°C~1000°C, 6 channels K type thermocouple temperature sampling module, 0.1 degree precision, include PID operation |
| XC-3AD4PT2DA | 3 channels current input(14 bits), 4 channels PT100 temperature input and 2 channels voltage output (12 bits) |
| XC-4AD | 4 channels analog input (14 bits), current / voltage selectable |
| XC-2DA | 2 channels analog output (12 bits), current/voltage selectable |

3. Dimension: (mm)



4. General Specification

| | |
|-----------------------|---|
| Operating Environment | No corrosive gas |
| Ambient Temperature | 0°C~60°C |
| Store Temperature | -20~70°C |
| Ambient Humidity | 5~95% |
| Store Humidity | 5~95% |
| Installation | Can be fixed with M3 screw or directly installed on orbit of DIN46277 (width: 35mm) |
| Size | 63mm×102mm×73.3mm |

5. Notes

- Please confirm the specifications, choose the right module
- When wiring the module, please prevent the scraps falling into the modules
- Before connecting, please confirm again the module specifications and connected device
- When connecting, please check if the connection is firm, cable broken will cause data incorrect, short circuit and other errors! Installation, layout should only be carried on after cutting the power.

2. PID Function

1. Brief introduction of PID function

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

2. PID Parameters

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

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

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

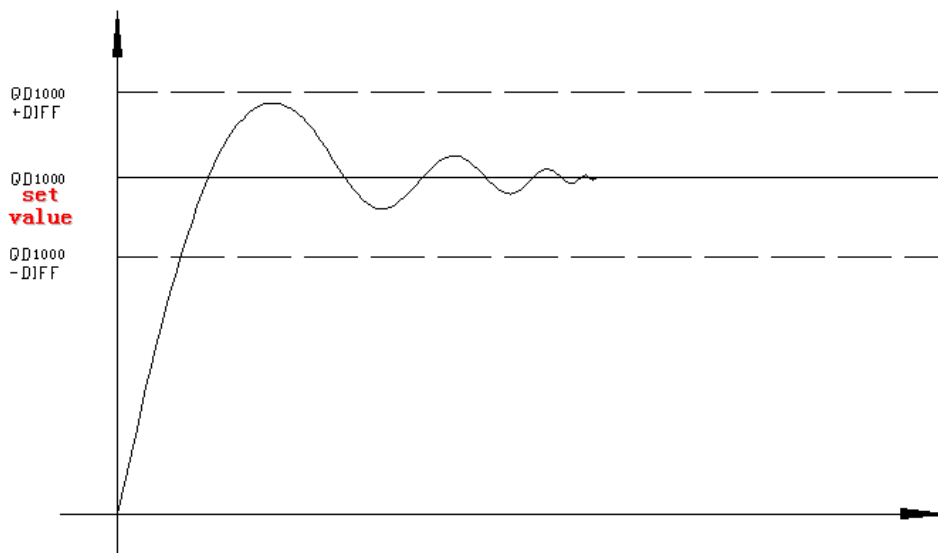
Diff — Control range, to do PID control in the defined range.

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

3. Control characteristics

The range of PID adjustment is, when the testing value is low than $QD-Diff$, controller outputs with the full scale; when the testing value is larger than $QD+Diff$, the controller stops outputting; in the range of $QD-Diff$ to $QD+Diff$, carry on PID adjustment.

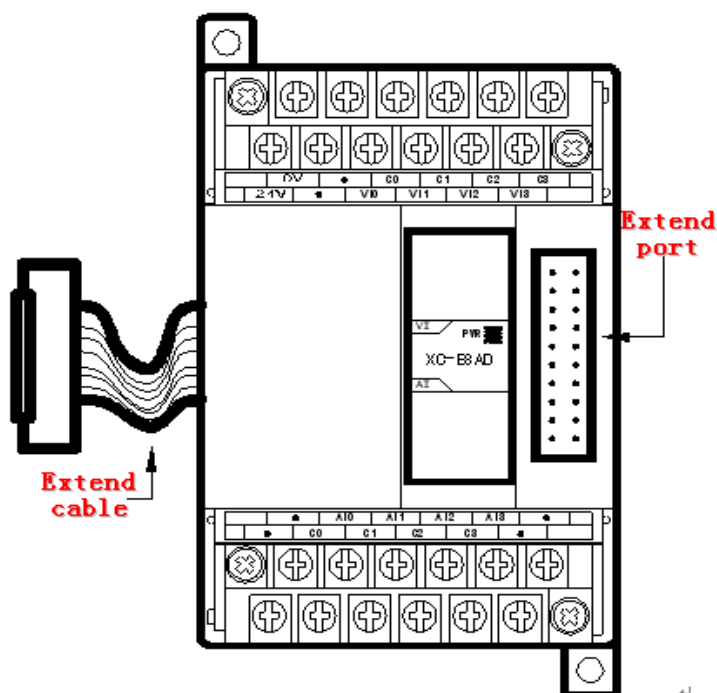
The control curve of PID:



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

3. Analog input module XC-E8AD

1. Specification



- 14 bits high precision analog input
- 8 channels analog input: The first four channels are current input (0~20mA, 4~20 mA); The left 4 channels are voltage input (0~5V, 0~10V)
- As special function module of XC, up to 7 models can be connected.
- PID adjustment function

| Items | Current input (0CH~3CH) | Voltage input (4CH~7CH) |
|----------------------|---|-------------------------|
| Analog input range | DC0~20mA、4~20mA | DC0~5V、0~10V |
| Max input range | 0~40mA | ±18V |
| Digital output range | 14 bits binary data | |
| PID control value | 0~4095 | |
| Resolution | 1/16383(14Bit) | |
| Integrate Precision | 0.8% | |
| Conversion speed | 15ms per channel | |
| Analog power supply | DC24V±10%,100mA | |
| Installation | Can be fixed with screw M3 or directly installed on orbit of DIN46277 (width: 35mm) | |
| Dimension | 63mm×102mm×73.3mm | |

2. Input address

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

I/O address list

Register address of expansion module 1:

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

Register address of expansion module 2:

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

Register address of expansion module 3:

| Channel | AD signal | PID output value | PID start/stop control bit | Preset value | PID parameters: Kp, Ki, Kd, control range Diff, dead range "Death" |
|---------|-----------|------------------|----------------------------|--------------|--|
| 0CH | ID300 | ID308 | Y300 | QD300 | Kp: QD308 Ki: QD309 Kd: QD310 Diff: QD311 Death: QD312 |
| 1CH | ID301 | ID309 | Y301 | QD301 | |
| 2CH | ID302 | ID310 | Y302 | QD302 | |
| 3CH | ID303 | ID311 | Y303 | QD303 | |
| 4CH | ID304 | ID312 | Y304 | QD304 | |

| | | | | | |
|-----|-------|-------|------|-------|--|
| 5CH | ID305 | ID313 | Y305 | QD305 | |
| 6CH | ID306 | ID314 | Y306 | QD306 | |
| 7CH | ID307 | ID315 | Y307 | QD307 | |

Register address of expansion module 4:

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

Register address of expansion module 5:

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

Register address of expansion module 6:

| Channel | AD signal | PID output value | PID start/stop control bit | Preset value | PID parameters: Kp, Ki, Kd, control range Diff, dead range "Death" |
|---------|-----------|------------------|----------------------------|--------------|--|
| 0CH | ID600 | ID608 | Y600 | QD600 | Kp: QD608 Ki: QD609 Kd: QD510 Diff: QD611 Death: QD512 |
| 1CH | ID601 | ID609 | Y601 | QD601 | |
| 2CH | ID602 | ID610 | Y602 | QD602 | |
| 3CH | ID603 | ID611 | Y603 | QD603 | |
| 4CH | ID604 | ID612 | Y604 | QD604 | |

| | | | | | |
|-----|-------|-------|------|-------|--|
| 5CH | ID605 | ID613 | Y605 | QD605 | |
| 6CH | ID606 | ID614 | Y606 | QD606 | |
| 7CH | ID607 | ID615 | Y607 | QD607 | |

Register address of expansion module 7:

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

Description:

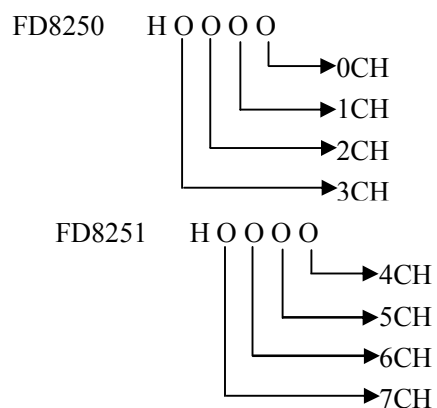
Start signal (Y): when Y is 0, close PID control, when Y is 1, start PID control.

3. Setting of working mode

1) Expansion's 0CH~3CH channels have two modes to select: current 0~20mA、4~20mA , 4CH~7CH channels have two modes to select, voltage 0~5V, 0~10V. Set via special FLASH data register FC inside PLC. See the following table:

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

Take 1# module as example:



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

Each bit's definition is showed in the following table:

The following, we take module 1 as example to describe the setting format:

Register FD8250:

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

Register FD8251:

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

E.g. 1) Set module 1 No. 3, No.2, No.1, No.0 channel's working mode separately to 0~20mA, 4~20mA, 0~20mA, 4~20mA, all the four channels are 1/2 filter, data in FD8250 is 0101H

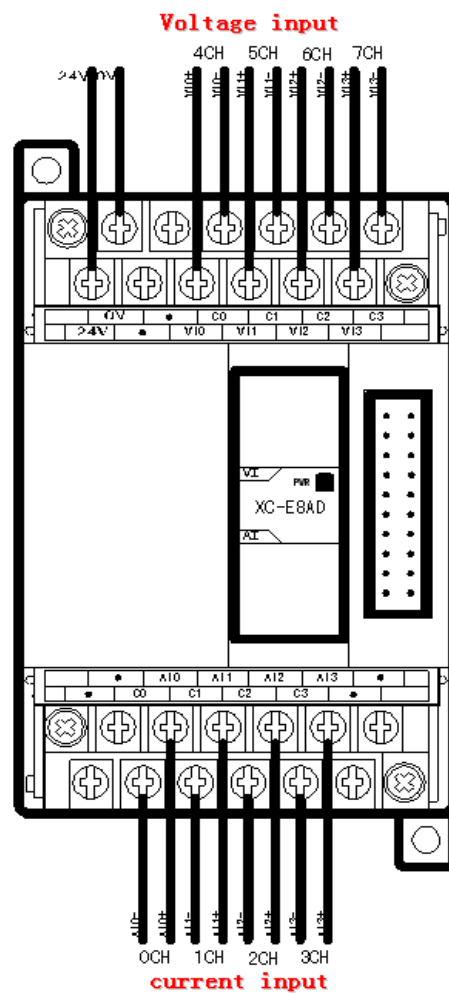
2) Set module 1 No. 7, No.6, No.5, No.4 channel's working mode separately to 0~10V, 0~5V, 0~10V, 0~5V, all the four channels don't filter, data in FD8251 is 4545H

4. Exterior connection

About exterior connection, you should note the below two items:

- When connect +24V power outside, please use the 24V power on PLC main unit to avoid interference.
- To avoid interference, please use the shield cable and single point ground with the shield layer.

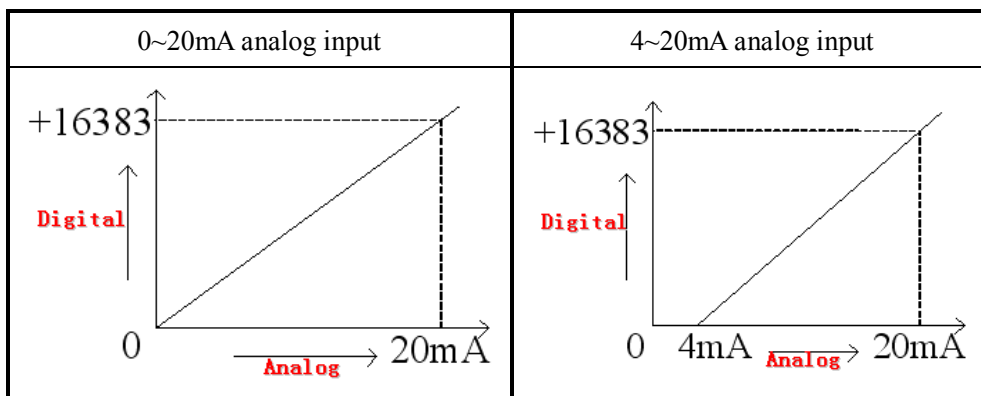
Layout diagram:



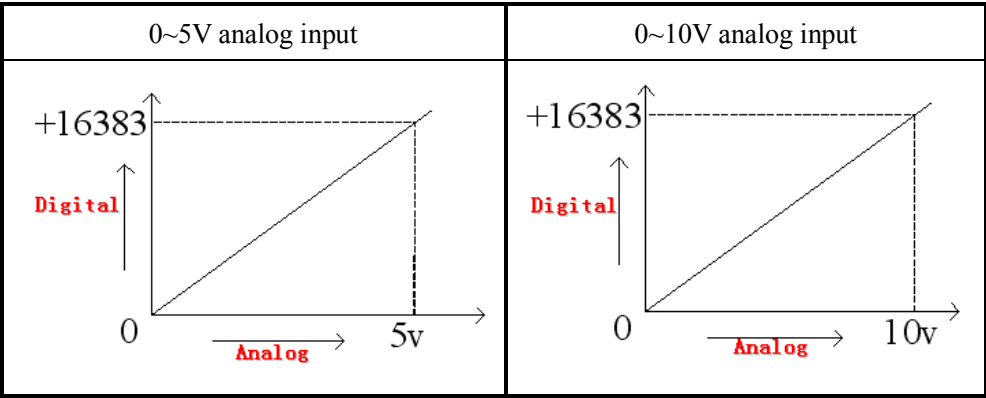
5. Analog/digital convert chart

The relationship between input analog and converted digital quantity is showed in the following chart:

Current mode of Channel 0~Channel 3:

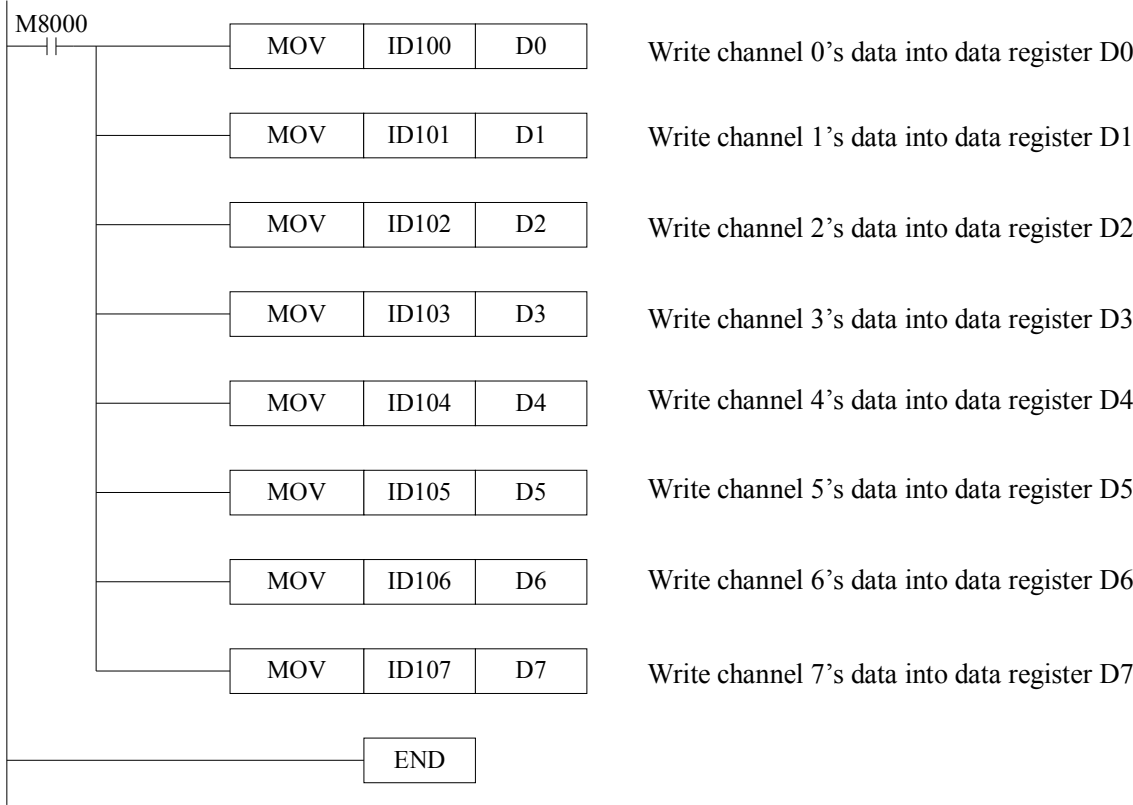


Voltage mode of Channel 4 ~ Channel 7:



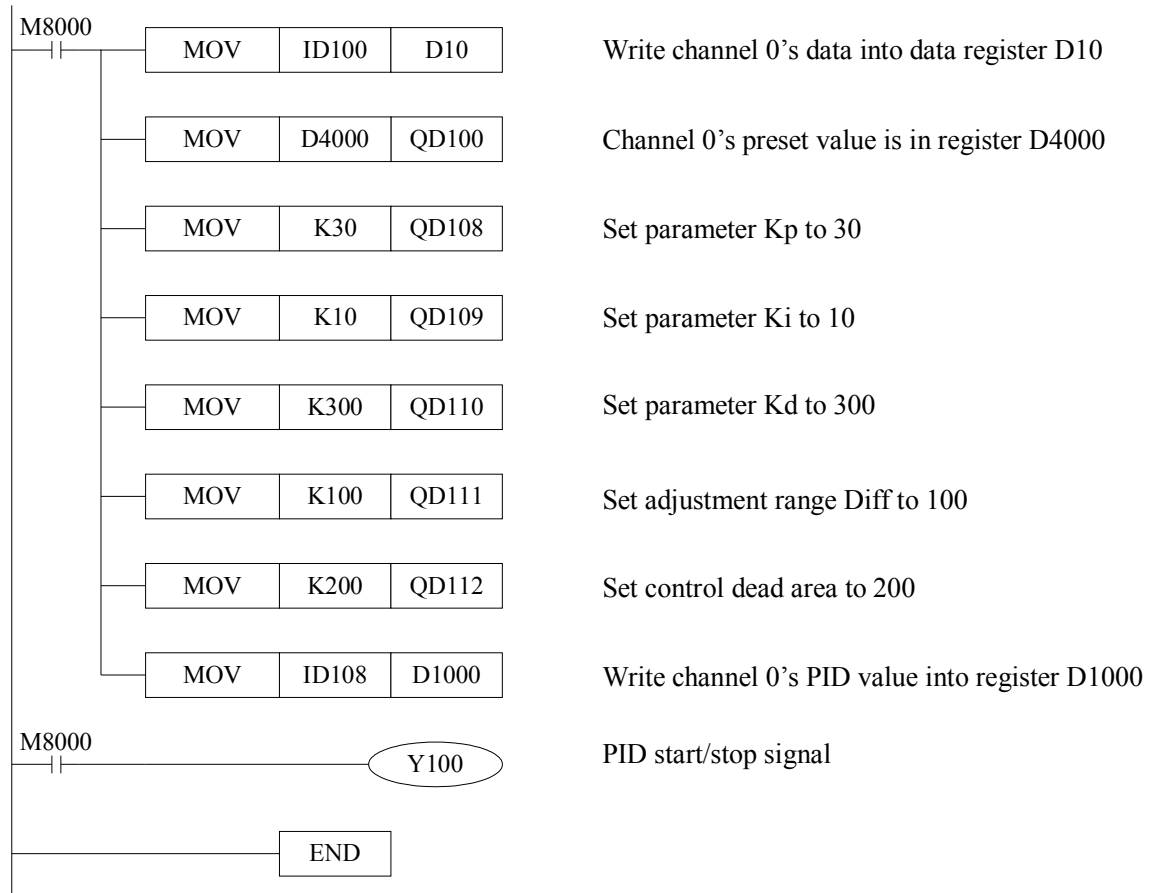
6. Programming

E.g. 1) Real time read unit 1 XC-E8AD 8 channels' data



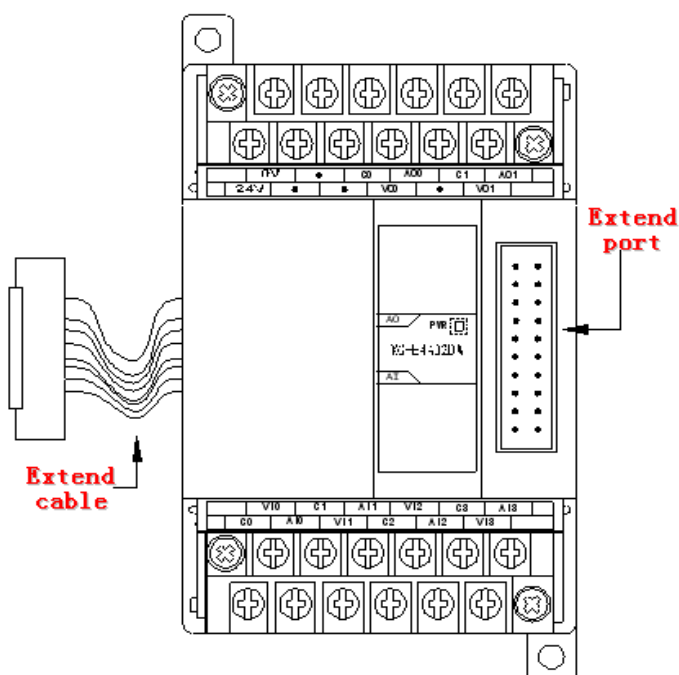
E.g.2) Application of PID control in AD modules

The following, we take XC-E8AD channel 0 as an example:



4. Analog input/output module XC-E4AD2DA

1. Specification



- 4 channels 14 bits analog input and 2 channels 12 bits analog output
- 4 channels selectable voltage 0~5V, 0~10V, current 0~20mA, 4~20mA input and 2 channels selectable voltage 0~5V, 0~10V, current 0~20mA, 4~20mA output. Set via host machine.
- As special function module of XC, up to 7 modules can be connected together
- 4 channels A/D have PID adjustment function

| Items | Analog input (AD) | | Analog output (DA) | |
|----------------------|---|-----------------|--|--|
| | Voltage input | Current input | Voltage output | Current output |
| Analog input bound | DC0~5V、0~10V | DC0~20mA、4~20mA | - | |
| Max input bound | DC±18V | DC0~40mA | - | |
| Analog output bound | - | | DC0~5V、0~10V (Exterior load resistance 2KΩ~1MΩ) | DC0~20mA、4~20mA (Exterior load resistance is less than 500Ω) |
| Digital input bound | - | | 12 bits binary data (0~4095) | |
| Digital output bound | 14 bits binary data (0~16383) | | - | |
| Distinguish ratio | 1/16383(14Bit); the converted data is stored into PLC in the format of HEX format (14Bit) | | 1/4095(12Bit); the converted data is stored into PLC with the format of HEX. (12Bit) | |
| PID control value | 0~4095 | | - | |
| Integrate precision | 0.8% | | | |
| Convert speed | 15ms per channel | | 2ms per channel | |
| Power used by analog | DC24V±10%,100mA | | | |
| Install format | Fixed with M3 screws or directly installed on orbit of DIN46277 (Width: 35mm) | | | |
| Exterior size | 63mm×102mm×73.3mm | | | |

[Extend cable]: Realize data transfer via the connection of extend cable and PLC extend port

[Extend port]: Connect with other expansions

2. The assignment of I/O address

XC series analog modules do not occupy I/O units, the converted data is directly transferred into PLC register, analog output is also directly offered by PLC register.

Register's address of expansion 1:

| Channel | AD signal | PID output value | PID start/stop control bit | The set value | PID parameter: Kp, Ki, Kd, control range Diff, dead area Death |
|---------|-----------|------------------|----------------------------|---------------|--|
| 0CH | ID100 | ID104 | Y100 | QD102 | Kp: QD106 Ki: QD107 Kd: QD108 Diff: QD109 Death: QD110 |
| 1CH | ID101 | ID105 | Y101 | QD103 | |
| 2CH | ID102 | ID106 | Y102 | QD104 | |
| 3CH | ID103 | ID107 | Y103 | QD105 | |
| Channel | DA signal | - | - | - | - |
| 4CH | QD100 | - | - | - | |
| 5CH | QD101 | - | - | - | |

Register's address of expansion 2:

| Channel | AD | PID output value | PID start/stop control bit | The set value | PID parameter: Kp, Ki, Kd, control range Diff, dead area Death |
|---------|-----------|------------------|----------------------------|---------------|--|
| 0CH | ID200 | ID204 | Y200 | QD202 | Kp: QD206 Ki: QD207 Kd: QD208 Diff: QD209 Death: QD210 |
| 1CH | ID201 | ID205 | Y201 | QD203 | |
| 2CH | ID202 | ID206 | Y202 | QD204 | |
| 3CH | ID203 | ID207 | Y203 | QD205 | |
| Channel | DA signal | - | - | - | - |
| 4CH | QD200 | - | - | - | |
| 5CH | QD201 | - | - | - | |

Register's address of expansion 3:

| Channel | AD signal | PID output value | PID start/stop control bit | The set value | PID parameter: Kp, Ki, Kd, control range Diff, dead area Death |
|---------|-----------|------------------|----------------------------|---------------|--|
| 0CH | ID300 | ID304 | Y300 | QD302 | Kp: QD306 Ki: QD307 Kd: QD308 Diff: QD309 Death: QD310 |
| 1CH | ID301 | ID305 | Y301 | QD303 | |
| 2CH | ID302 | ID306 | Y302 | QD304 | |
| 3CH | ID303 | ID307 | Y303 | QD305 | |
| Channel | DA signal | - | - | - | - |
| 4CH | QD300 | - | - | - | |
| 5CH | QD301 | - | - | - | |

Register's address of expansion 4:

| Channel | AD signal | PID output value | PID start/stop control bit | The set value | PID parameter: Kp, Ki, Kd, control range Diff, dead area Death |
|---------|-----------|------------------|----------------------------|---------------|--|
| 0CH | ID400 | ID404 | Y400 | QD402 | Kp: QD406 Ki: QD407 Kd: QD408 Diff: QD409 Death: QD410 |
| 1CH | ID401 | ID405 | Y401 | QD403 | |
| 2CH | ID402 | ID406 | Y402 | QD404 | |
| 3CH | ID403 | ID407 | Y403 | QD405 | |
| Channel | DA signal | - | - | - | - |
| 4CH | QD400 | - | - | - | |
| 5CH | QD401 | - | - | - | |

Register's address of expansion 5:

| Channel | AD signal | PID output value | PID start/stop control bit | The set value | PID parameter: Kp, Ki, Kd, control range Diff, dead area Death |
|---------|-----------|------------------|----------------------------|---------------|--|
| 0CH | ID500 | ID504 | Y500 | QD502 | Kp: QD506 Ki: QD507 Kd: QD508 Diff: QD509 Death: QD510 |
| 1CH | ID501 | ID505 | Y501 | QD503 | |
| 2CH | ID502 | ID506 | Y502 | QD504 | |
| 3CH | ID503 | ID507 | Y503 | QD505 | |
| Channel | DA signal | - | - | - | - |
| 4CH | QD500 | - | - | - | |
| 5CH | QD501 | - | - | - | |

Register's address of expansion 6:

| Channel | AD signal | PID output value | PID start/stop control bit | The set value | PID parameter: Kp, Ki, Kd, control range Diff, dead area Death |
|---------|-----------|------------------|----------------------------|---------------|--|
| 0CH | ID600 | ID604 | Y600 | QD602 | Kp: QD606 Ki: QD607 Kd: QD608 Diff: QD609 Death: QD610 |
| 1CH | ID601 | ID605 | Y601 | QD603 | |
| 2CH | ID602 | ID606 | Y602 | QD604 | |
| 3CH | ID603 | ID607 | Y603 | QD605 | |
| Channel | DA signal | - | - | - | - |
| 4CH | QD600 | - | - | - | |
| 5CH | QD601 | - | - | - | |

Register's address of expansion 7:

| Channel | AD signal | PID output value | PID start/stop control bit | The set value | PID parameter: Kp, Ki, Kd, control range Diff, dead area Death |
|---------|-----------|------------------|----------------------------|---------------|--|
| 0CH | ID700 | ID704 | Y700 | QD702 | Kp: QD706 Ki: QD707 Kd: QD708 Diff: QD709 Death: QD710 |
| 1CH | ID701 | ID705 | Y701 | QD703 | |
| 2CH | ID702 | ID706 | Y702 | QD704 | |
| 3CH | ID703 | ID707 | Y703 | QD705 | |
| Channel | DA signal | - | - | - | |
| 4CH | QD700 | - | - | - | - |
| 5CH | QD701 | - | - | - | - |

Description:

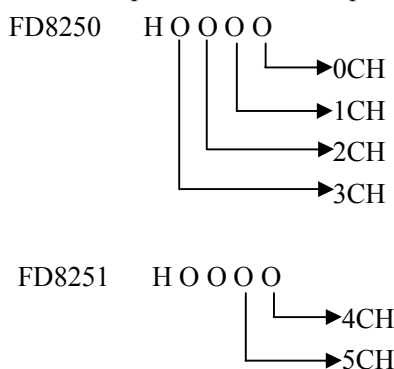
Start signal (Y): When Y is 0, close PID control; when Y is 1, start PID control.

3. Setting of working mode

1) Expansion's I/O have options of voltage mode 0~5V/0~10V, current mode 0~20mA/4~20mA. Via setting of special FLASH data register FD in PLC. See the following table:

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

Take 1# expansion as an example:



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

Each channel's working mode is assigned by correspond register's 4 bits. Each bit definition is showed in the following table:

The following, we take module 1 as an example to show how to set:

Register FD8250:

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

Register FD8251 low byte:

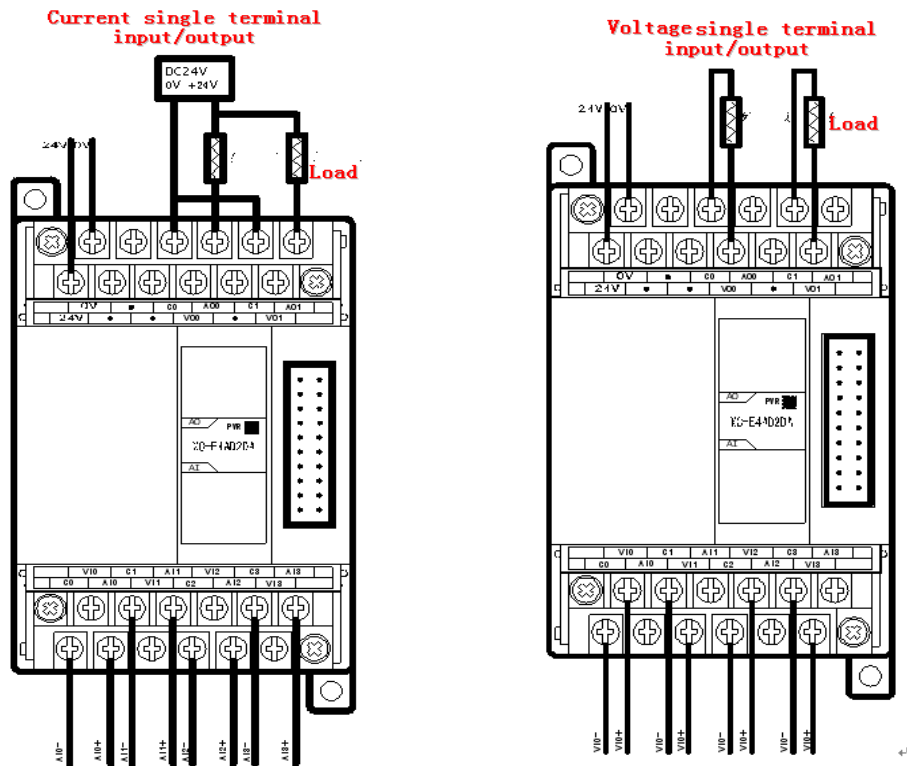
| Channel 5 | | | | Channel 4 | | | |
|----------------|------|---------------------|----------|----------------|------|---------------------|----------|
| Bit7 | Bit6 | Bit5 | Bit4 | Bit3 | Bit2 | Bit1 | Bit0 |
| 00: 1/2 filter | | 0: voltage input | 0:0~10V | 00: 1/2 filter | | 0: voltage input | 0:0~10V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

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

4. Exterior connection

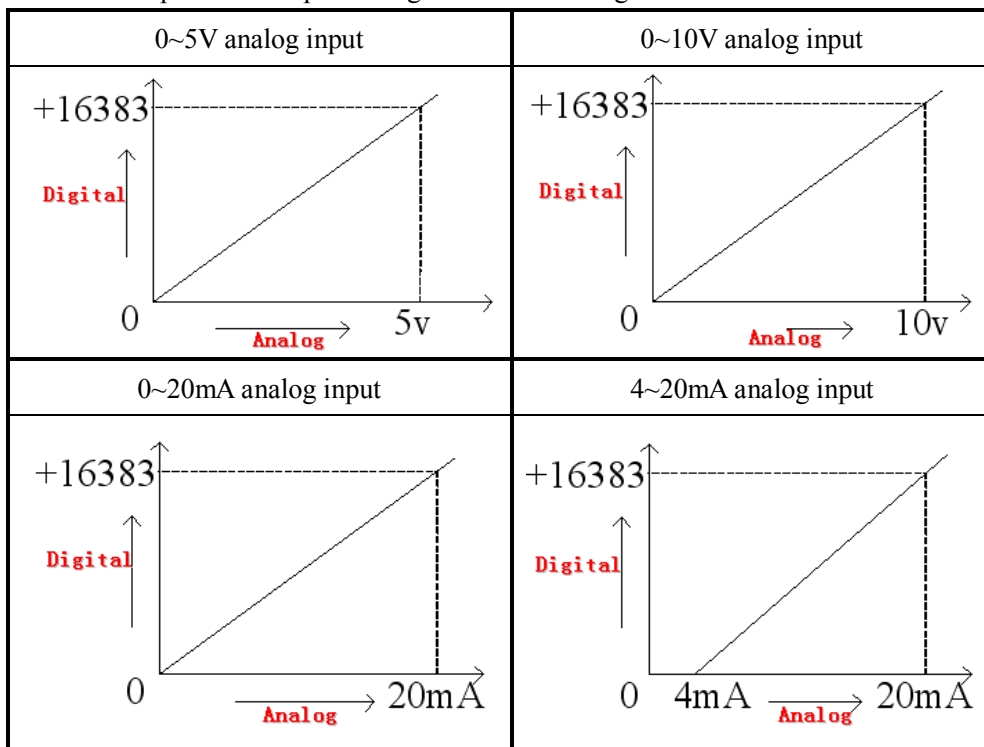
When make exterior connection, please read the following items:

- When connect +24V power outside, please choose 24V power on PLC main unit to avoid interference.
- To avoid interference, please use shield cable and single point ground with the shield layer.
- The 0~20mA or 4~20mA output of the modules need external power supply DC 24V, according to the analog output register QD, the module adjusts the loop circuit's current, but the module itself doesn't produce current.

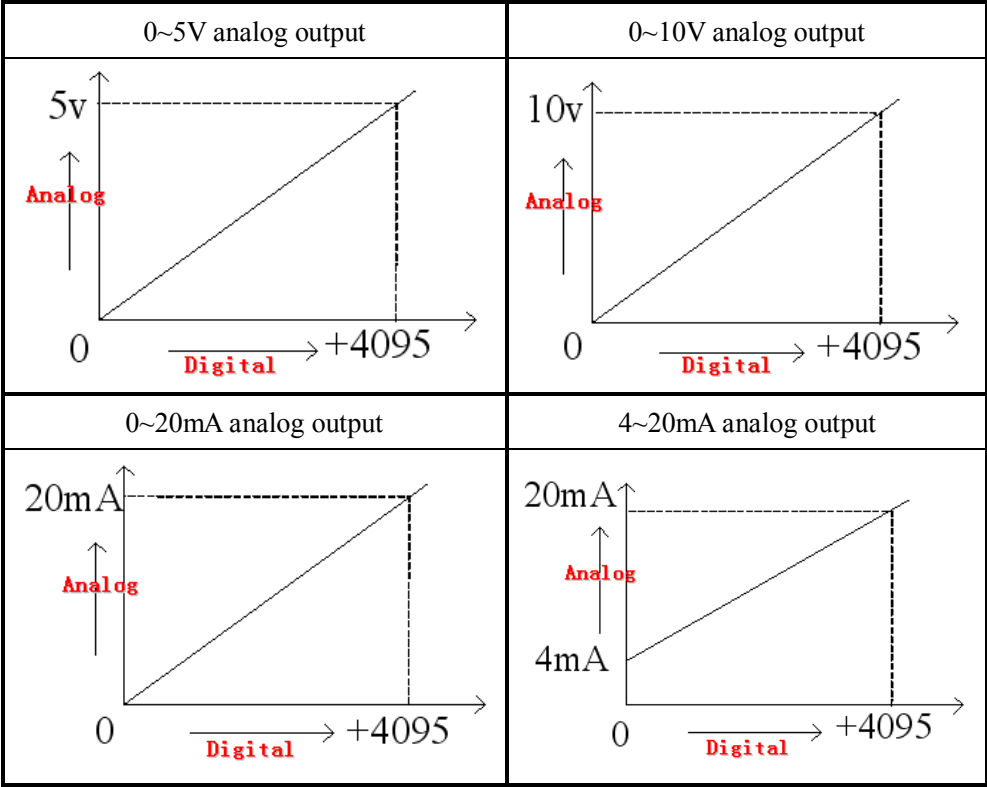


5. Analog digital conversion chart

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



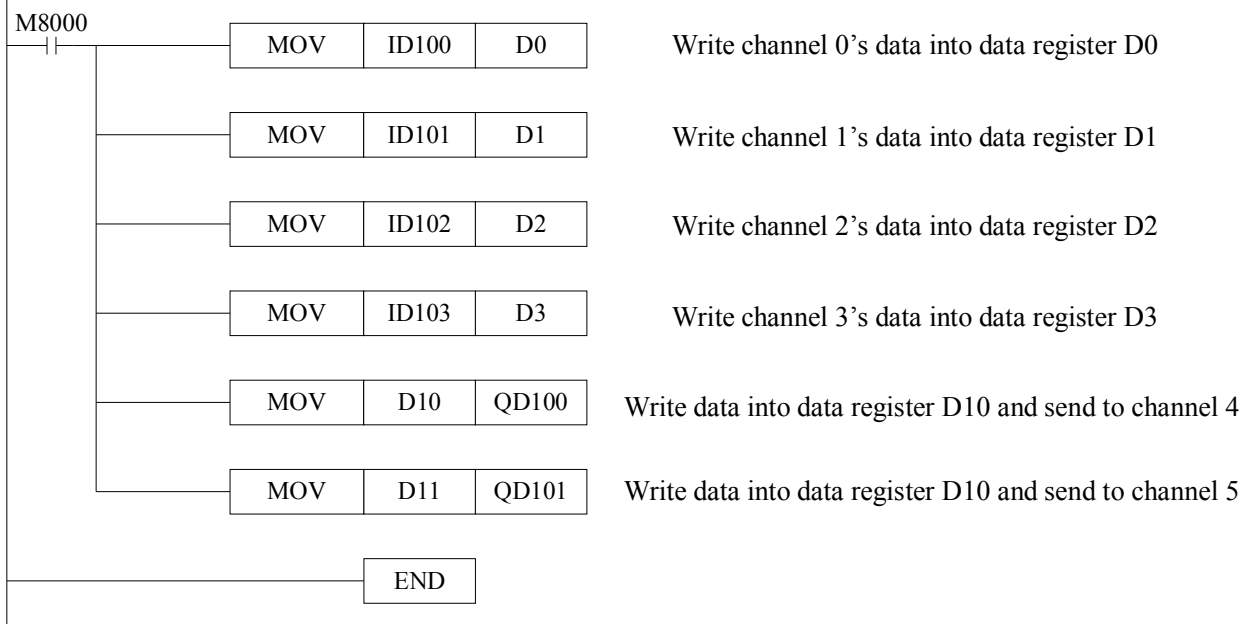
The relationship between output digital value and its corresponding analog data is showed in the following chart:



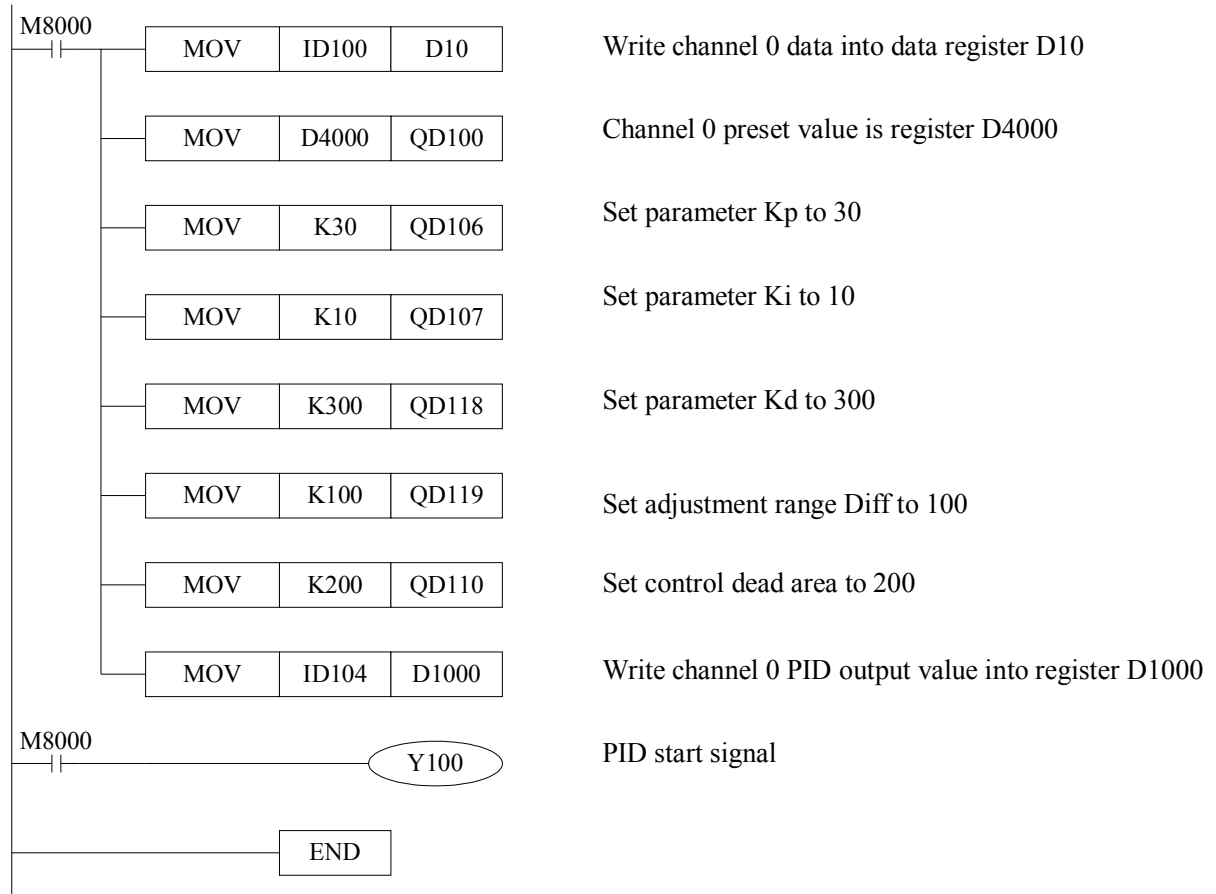
When input data exceeds K4095, analog output will keep the max value of 5V, 10V or 20mA.

6. Programming

E.g.1) Real time read 4 channels data, write 2 channels data (take expansion 1 as an example)

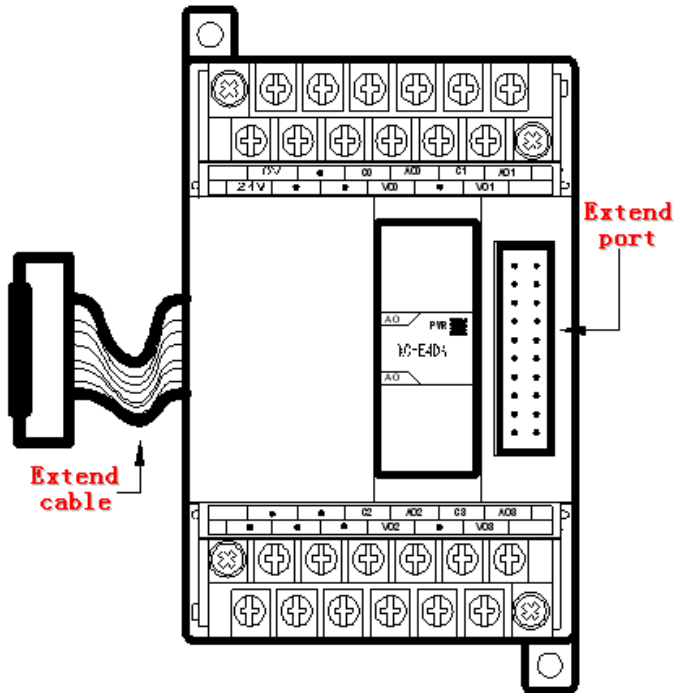


E.g.2) Applied method of PID (take expansion 1's channel 0 as example)



5. Analog output module XC-E4DA

1. Specification



- 12 bits high precision analog output
- 4 channels selectable voltage 0~5V, 0~10V, current 0~20mA, 4~20mA output
- As special function module of XC, 7 modules could be connected

| Items | Voltage output | Current output |
|------------------------|--|------------------|
| Analog output bound | DC0~5V, 0~10V | DC0~20mA, 4~20mA |
| Digital output bound | 12 bits binary data | |
| Distinguish Ratio | 1/4096(12Bit); the converted data is stored into PLC with the format of HEX | |
| Integrate precision | 0.8% | |
| Convert speed | 2ms per channel | |
| Insulate format | DC/DC convert, optical coupling insulation | |
| Power for analog using | DC 24V±10%, 100mA | |
| Install format | Can be fixed with M3 screws or directly installed on orbit of DIN46277 (width: 35mm) | |
| Exterior size | 63mm×102mm×73.3mm | |

[Extend cable]: Realize data transfer via connecting of extend cable and PLC extend port

[Extend port]: Connect with other expansions

2. Assignment of Output address

XC series analog module does not occupy I/O units, the converted data is directly transferred into PLC register. The output channels corresponding PLC register address is:

Output address list

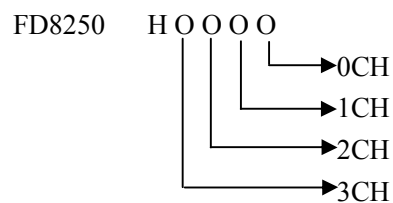
| Channel | No.1 unit | No.2 unit | No.3 unit | No.4 unit | No.5 unit | No.6 unit | No.7 unit |
|---------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| 0CH | QD100 | QD200 | QD300 | QD400 | QD500 | QD600 | QD700 |
| 1CH | QD101 | QD201 | QD301 | QD401 | QD501 | QD601 | QD701 |
| 2CH | QD102 | QD202 | QD302 | QD402 | QD502 | QD602 | QD702 |
| 3CH | QD103 | QD203 | QD303 | QD403 | QD503 | QD603 | QD703 |

3. Setting of working mode

1) The I/O of the module has selectable modes of voltage 0~5V, 0~10V, current 0~20mA, 4~20mA. Via the setting of special FLASH data register FD inside PLC, see the following table:

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

Take expansion 1 as an example:



Every 4 bits of the register define the working mode of one channel. Each bit definition is listed in the following table:

Take module 1 as an example:

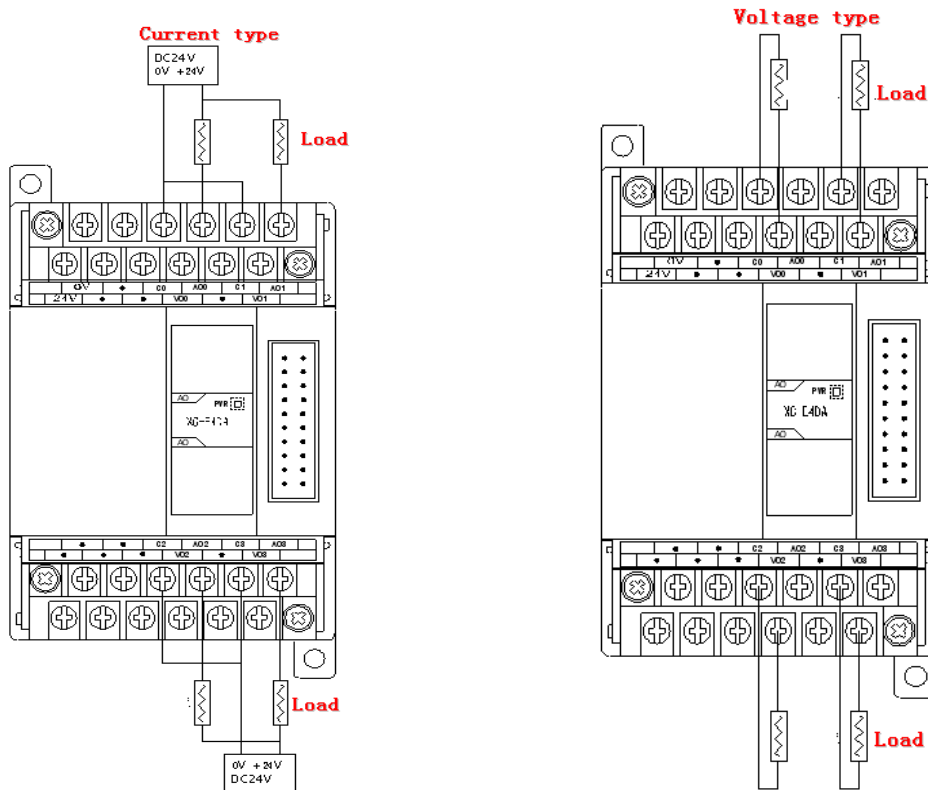
Register FD8250:

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

4. Exterior connection

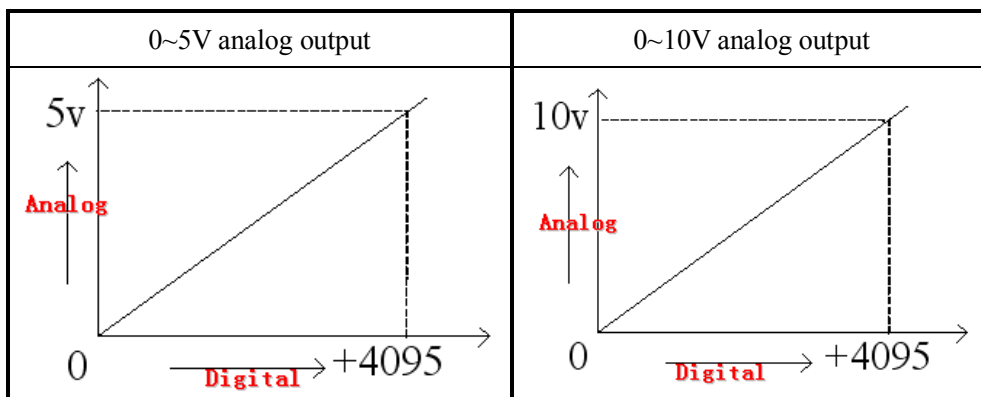
When make exterior connection, please see the following items:

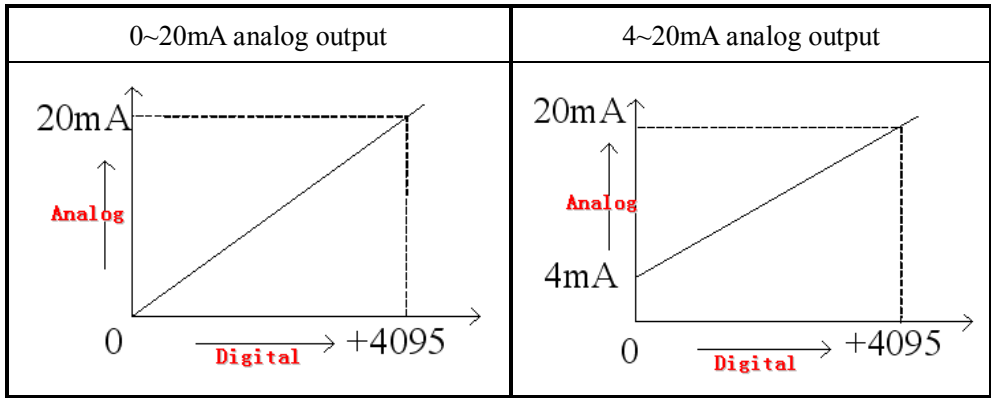
- When connect external +24V power, please use the 24V power on PLC main unit to avoid interference.
- To avoid interference, please use shield cable and single point ground with the shield layer.
- The 0~20mA or 4~20mA output need external 24V power. The module adjusts the circuit current according to the analog output register QD, but the module doesn't produce current itself.



5. Analog digital convert chart

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

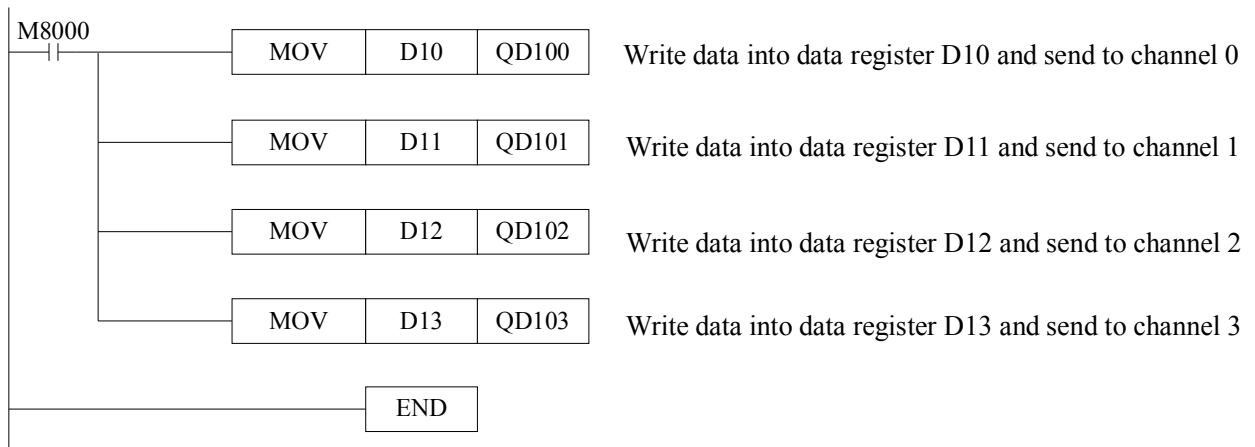




When the digital data exceed K4095, D/A analog output data will keep 5V, 10V or 20mA.

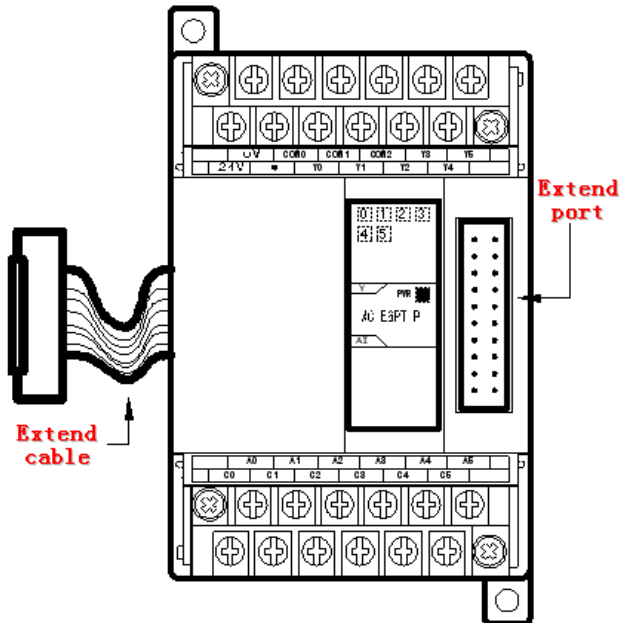
6. Programming

Real-time write data into 4 channels



6. Pt100 temperature PID control module XC-E6PT-P

1. Specification



- Platinum thermal resistance input, Pt100
- 6 channels input, 6 channels output
- 2 groups PID parameters (every 3 channels have one group of PID parameters)
- 1mA constant current output, will not be affected by the exterior environment
- Resolution is 0.1°C
- As the special function module of XC, 7 modules can be connected together

| Item | Content |
|-------------------------------|---|
| Analog input signal | Pt100 platinum thermo-resistance |
| Temperature measurement range | -100°C~350°C |
| Digital output bound | -1000~3500, 16 bits with sign bit, binary |
| Control precision | ±0.5°C |
| Resolution | 0.1°C |
| Integrate precision | ±0.8% (relative to the max value) |
| Conversion speed | 100ms×6 channels |
| Analog power | DC24V±10%, 50mA |
| Installation format | Fixed with M3 screws or directly installed on orbit of DIN46277 (Width: 35mm) |
| Dimension | 63mm×102mm×73.3mm |

[Extend cable]: transfer data through the extend cable and PLC extend port.

[Extend port]: Connect with other expansions

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

2. Assignment of input address

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

Table of input definition address:

| Channel | 1#module | 2#module | 3#module | 4#module | 5#module | 6#module | 7#module |
|---------|----------|----------|----------|----------|----------|----------|----------|
| 0CH | ID100 | ID200 | ID300 | ID400 | ID500 | ID600 | ID700 |
| 1CH | ID101 | ID201 | ID301 | ID401 | ID501 | ID601 | ID701 |
| 2CH | ID102 | ID202 | ID302 | ID402 | ID502 | ID602 | ID702 |
| 3CH | ID103 | ID203 | ID303 | ID403 | ID503 | ID603 | ID703 |
| 4CH | ID104 | ID204 | ID304 | ID404 | ID504 | ID604 | ID704 |
| 5CH | ID105 | ID205 | ID305 | ID405 | ID505 | ID605 | ID705 |

Table of output definition address:

| Channel | 1#module | 2#module | 3#module | 4#module | 5#module | 6#module | 7#module |
|--|----------|----------|----------|----------|----------|----------|----------|
| 0CH preset temperature | QD100 | QD200 | QD300 | QD400 | QD500 | QD600 | QD700 |
| 1CH preset temperature | QD101 | QD201 | QD301 | QD401 | QD501 | QD601 | QD701 |
| 2CH preset temperature | QD102 | QD202 | QD302 | QD402 | QD502 | QD602 | QD702 |
| 3CH preset temperature | QD103 | QD203 | QD303 | QD403 | QD503 | QD603 | QD703 |
| 4CH preset temperature | QD104 | QD204 | QD304 | QD404 | QD504 | QD604 | QD704 |
| 5CH preset temperature | QD105 | QD205 | QD305 | QD405 | QD505 | QD605 | QD705 |
| First 3 channels parameter P | QD106 | QD206 | QD306 | QD406 | QD506 | QD606 | QD706 |
| First 3 channels parameter I | QD107 | QD207 | QD307 | QD407 | QD507 | QD607 | QD707 |
| First 3 channels parameter D | QD108 | QD208 | QD308 | QD408 | QD508 | QD608 | QD708 |
| First 3 channels temperature control range | QD109 | QD209 | QD309 | QD409 | QD509 | QD609 | QD709 |
| Last 3 channels parameter P | QD110 | QD210 | QD310 | QD410 | QD510 | QD610 | QD710 |
| Last 3 channels parameter I | QD111 | QD211 | QD311 | QD411 | QD511 | QD611 | QD711 |
| Last 3 channels parameter D | QD112 | QD212 | QD312 | QD412 | QD512 | QD612 | QD712 |
| Last 3 channels temperature control range | QD113 | QD213 | QD313 | QD413 | QD513 | QD613 | QD713 |

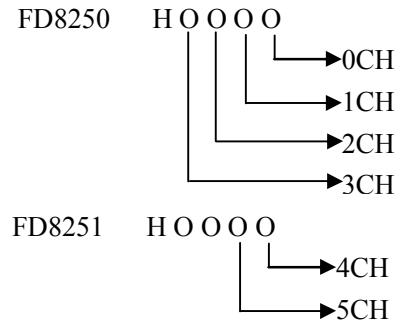
Start signal (Y): When Y is 0, close PID control; when Y is 1, start PID control

3. Setting of input filter

1) Every input of expansion has filter options, set via special FLASH data register FD in PLC. See the following chart:

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

Take 1# module as an example:



Each bit definition is shown in the following table:

Take module 1 as an example:

Register FD8250:

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

Register FD8251:

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

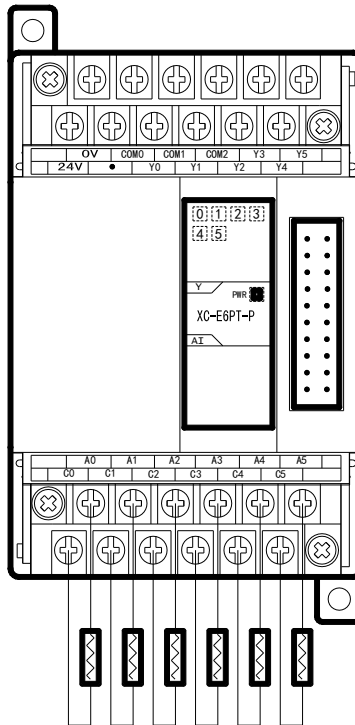
When the product is out of factory, the default value is 0, the filter format is 1/2 filter.

4. Exterior connection

About the external wiring, please see the following items:

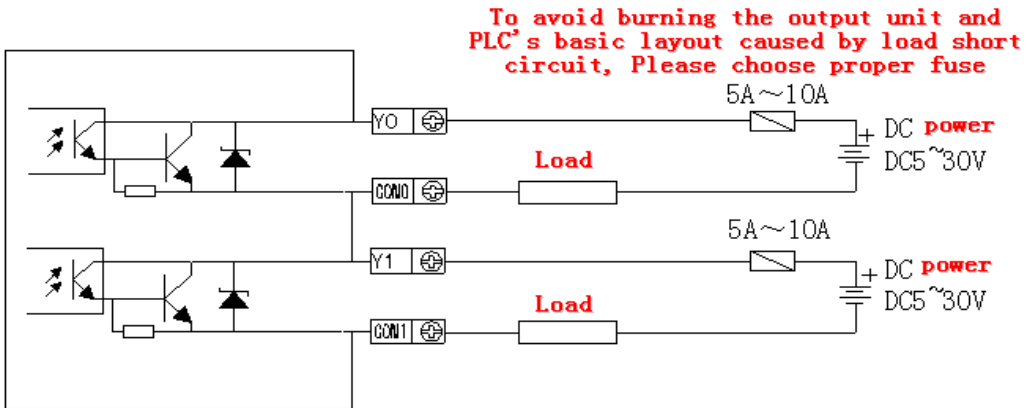
- When connect +24V power, please use 24V power on PLC main unit to avoid interference.
- To avoid interference, please use shield cable to ground.

Input connection:



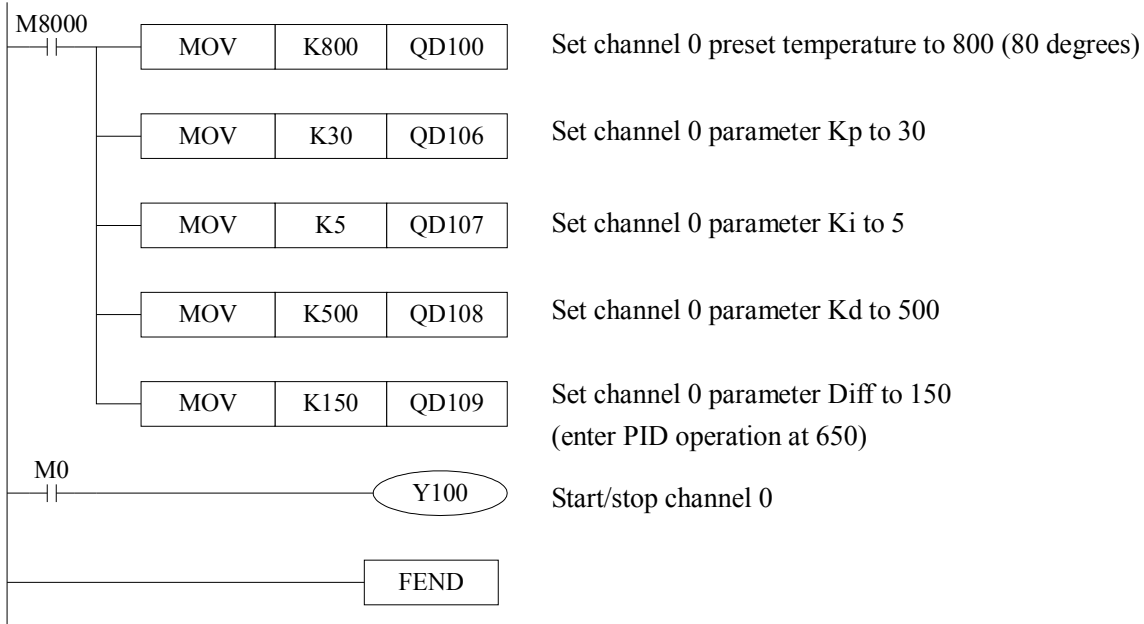
- Output terminals
Transistor output terminals, please choose DC 5V~30V.
- Circuit insulation
Between PLC's interior circuit and output transistor is optical insulation. Each public module is also separate.
- Response time
The time is less than 0.2ms from PLC driving (or cut) optical coupling device to transistor ON/OFF.
- Output current
Each point current is 0.8A, but to prevent temperature rising, please use as 1.2A every 4 points or 2.0A every 8 points.
- Open circuit leakage current
Below 0.1mA

The output circuit is as the following:
 Take channel 0 and channel 1 as an example:



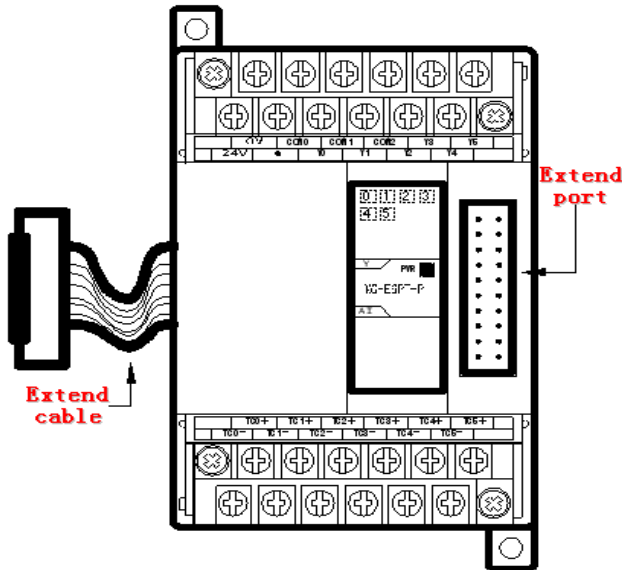
6. Programming

Program with the first channel



7. K type thermocouple temperature PID control module XC-E6TC-P

1. Specification



- K type thermocouple sensor signal input
- 6 channels input, 6 channels output
- 2 groups PID parameters (every 3 channels have one group PID parameters)
- Built-in cold-terminal compensation circuit
- Resolution is 0.1°C
- As special function module of XC , up to 7 modules can be connected

| Items | Content |
|-------------------------------|---|
| Analog input signal | K type thermocouple |
| Temperature measurement range | 0°C~1000°C |
| Digital output range | 0~10000, 16 bits with sign bit, binary |
| Control precision | ±0.5°C |
| Resolution | 0.1°C |
| Integrate precision | ±0.8% (compare with the max value) |
| Conversion speed | 100ms×6 channels |
| Analog power | DC24V±10%, 50mA |
| Install format | Fixed with M3 screws or directly installed on orbit of DIN46277 (Width: 35mm) |
| Dimension | 63mm×102mm×73.3mm |

[Extend cable]: transfer data via the extend cable and PLC extend port

[Extend port]: Connect with other expansions

Note: 1. If no signal input, the channel data is 0

2. According to the actual requirement, connect to K type thermocouple

2. Assignment of input address

XC series analog modules don't occupy I/O units, the converted data is directly transferred into PLC register, and channels corresponding register address are:

Input address list

| Channel | 1# Expansion | 2# Expansion | 3# Expansion | 4# Expansion | 5# Expansion | 6# Expansion | 7# Expansion |
|---------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|
| 0CH | ID100 | ID200 | ID300 | ID400 | ID500 | ID600 | ID700 |
| 1CH | ID101 | ID201 | ID301 | ID401 | ID501 | ID601 | ID701 |
| 2CH | ID102 | ID202 | ID302 | ID402 | ID502 | ID602 | ID702 |
| 3CH | ID103 | ID203 | ID303 | ID403 | ID503 | ID603 | ID703 |
| 4CH | ID104 | ID204 | ID304 | ID404 | ID504 | ID604 | ID704 |
| 5CH | ID105 | ID205 | ID305 | ID405 | ID505 | ID605 | ID705 |

Output address list

| Channel parameter | 1# Expansion | 2# Expansion | 3# Expansion | 4# Expansion | 5# Expansion | 6# Expansion | 7# Expansion |
|--|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|
| 0CH preset temperature | QD100 | QD200 | QD300 | QD400 | QD500 | QD600 | QD700 |
| 1CH preset temperature | QD101 | QD201 | QD301 | QD401 | QD501 | QD601 | QD701 |
| 2CH preset temperature | QD102 | QD202 | QD302 | QD402 | QD502 | QD602 | QD702 |
| 3CH preset temperature | QD103 | QD203 | QD303 | QD403 | QD503 | QD603 | QD703 |
| 4CH preset temperature | QD104 | QD204 | QD304 | QD404 | QD504 | QD604 | QD704 |
| 5CH preset temperature | QD105 | QD205 | QD305 | QD405 | QD505 | QD605 | QD705 |
| First 3 channels parameter P | QD106 | QD206 | QD306 | QD406 | QD506 | QD606 | QD706 |
| First 3 channels parameter I | QD107 | QD207 | QD307 | QD407 | QD507 | QD607 | QD707 |
| First 3 channels parameter D | QD108 | QD208 | QD308 | QD408 | QD508 | QD608 | QD708 |
| First 3 channels temperature control range | QD109 | QD209 | QD309 | QD409 | QD509 | QD609 | QD709 |
| Last 3 channels parameter P | QD110 | QD210 | QD310 | QD410 | QD510 | QD610 | QD710 |

| | | | | | | | |
|---|-------|-------|-------|-------|-------|-------|-------|
| Last 3 channels parameter I | QD111 | QD211 | QD311 | QD411 | QD511 | QD611 | QD711 |
| Last 3 channels parameter D | QD112 | QD212 | QD312 | QD412 | QD512 | QD612 | QD712 |
| Last 3 channels temperature control range | QD113 | QD213 | QD313 | QD413 | QD513 | QD613 | QD713 |

*** Note: For new XC-6TC-P produced after August, 2008, please use new manual *XC-6TCA-P Manual*. The address and using method are totally different.**

Description:

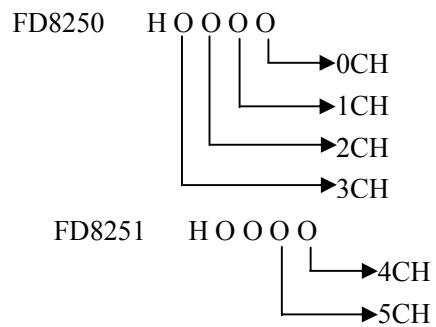
Start signal (Y): When Y is 0, close PID control; when Y is 1, start PID control

3. Input filter setting

Every input of expansion has filter options, set through special FLASH data register FD inside PLC. See the following chart:

| Module | Channel's address | |
|-----------|-------------------|-----------------|
| | 0CH~3CH | 4CH~5CH |
| 1# module | FD8250 | FD8251 Low byte |
| 2# module | FD8258 | FD8259 Low byte |
| 3# module | FD8266 | FD8267 Low byte |
| 4# module | FD8274 | FD8275 Low byte |
| 5# module | FD8282 | FD8283 Low byte |
| 6# module | FD8290 | FD8291 Low byte |
| 7# module | FD8298 | FD8299 Low byte |

Take 1# module as an example:



Every 4 bits of the register define one channel working mode. Each bit definition is shown in the following table:

Take module 1 as an example

Register FD8250:

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

Register FD8251:

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

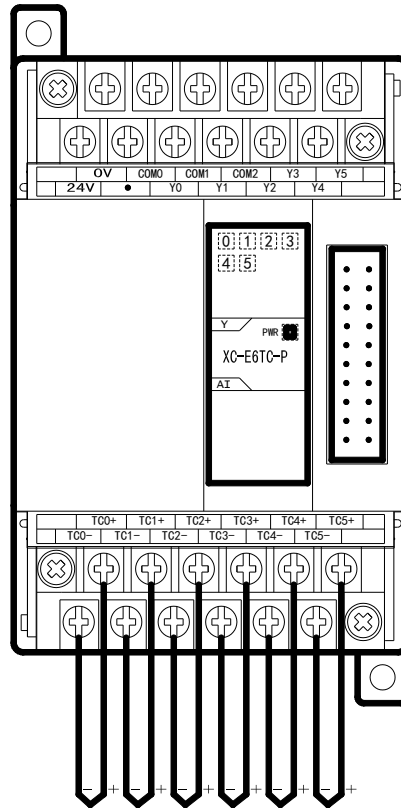
When the products are out of factory, the default value is 0, the initial filter format is 1/4 filter.

4. Exterior connection

About the exterior connection, please pay attention to the following items:

- When connect to +24V power, please use the 24V power supply on PLC main unit to avoid interference.
- To avoid interference, shielding measure is necessary for signal cables.

Input method:

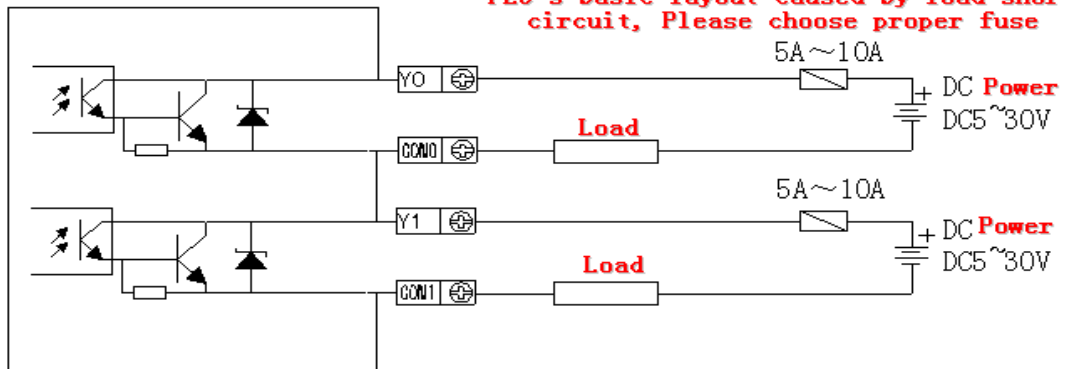


- Output terminal
For transistor output terminals, please use DC5V~30V power supply.
- Circuit insulation
PLC internal circuit and output transistor is optical insulation with optical coupling device. Each public module is separate.
- Response time
The time is less than 0.2ms from PLC driving (or cut) optical coupling circuit to transistor ON/OFF.
- Output circuit
Each point current is 0.8A. Prevent temperature increasing, please use as 1.2A every 4 points or 2.0A every 8 points.
- Open circuit leak current
Below 0.1mA.

The output circuit is as the following:

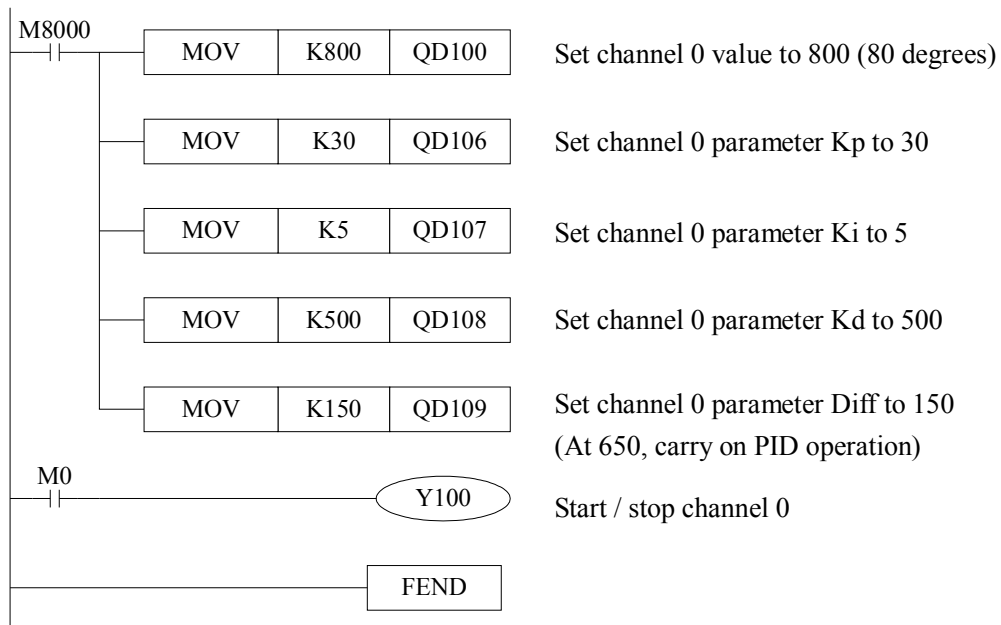
Take channel 0 and channel 1 as an example:

To avoid burning the output unit and PLC's basic layout caused by load short circuit, Please choose proper fuse



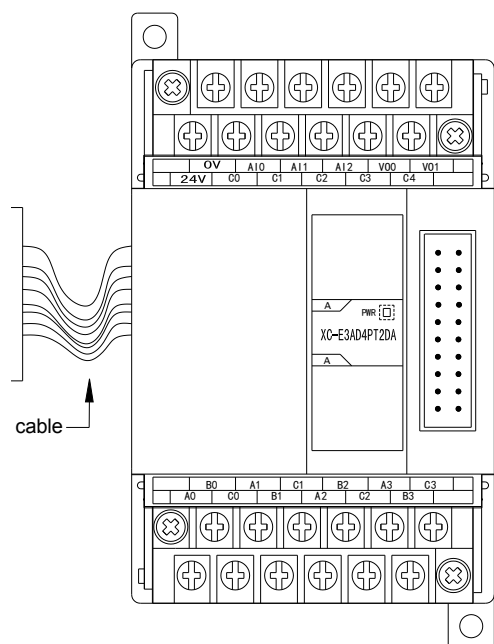
6. Program

Program with the first channel



8. XC-E3AD4PT2DA

1. Specifications



- 3 channels 14 bits current input, 4 channels PT100 temperature input and 2 channels 10 bits voltage output
- 3 channels current 0~20mA, 4~20mA input (selectable) and 2 channels voltage 0~5V, 0~10V output (selectable), set via the software
- Pt resistor signal input (PT100)
- 3 channels A/D and 4 channels PT input, with PID control function

| ITEMS | Analog Current Input (AD) | Temperature Input (PT) | Analog Voltage Output (DA) |
|-------------------------------|--|------------------------|---|
| Analog Input | DC0~20mA、4~20mA | PT100 | - |
| Temperature range | - | -100~350℃ | - |
| Maximum Output range | DC0~40mA | - | - |
| Analog Output range | - | - | DC0~5V、0~10V External load resistor (2KΩ~1MΩ) |
| Digital Input range | - | - | 10 bits binary (0~1023) |
| Digital Output range | 14 bits binary (0~16383) | -1000~3500 | - |
| Resolution | 1/16383(14Bits); the converted data is saved into the PLC (14Bits) in the form of Hex. | 0.1℃ | 1/1023(10Bits); the converted data is saved into the PLC (10Bits) in the form of Hex. |
| PID Output Value | 0~K4095 | | - |
| General Precision | 0.8% | ±0.5℃ | 0.8% |
| Conversion Speed | 20ms per channel | | 3ms per channel |
| Power Supply for Analog Using | DC24V±10%,100mA | | |
| Installation | Fix with M3 screws or install on DIN46277 (Width: 35mm) leader directly | | |
| Dimension | 63mm×102mm×73.3mm | | |

[Extend Cable]: transfer data through the connection of the extend cable and PLC's extend port

[Extend Port]: Connect to other expansions

2. I/O address

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

The first expansion registers address:

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

The second expansion registers address:

| Channel | AD Signal | PID Output Value | PID start/stop bit | Preset Value | PID parameter: Kp, Ki, Kd, Diff, Death | |
|---------|-----------|------------------|--------------------|--------------|---|---|
| 0CH | ID200 | ID207 | Y200 | QD202 | Kp----- QD209 Ki----- QD210 Kd----- QD211 Diff-----QD212 Death----QD213 | |
| 1CH | ID201 | ID208 | Y201 | QD203 | | |
| 2CH | ID202 | ID209 | Y202 | QD204 | | |
| Channel | PT Signal | PID Output Value | PID start/stop bit | Preset Value | | |
| 3CH | ID203 | ID210 | Y203 | QD205 | | |
| 4CH | ID204 | ID211 | Y204 | QD206 | | |
| 5CH | ID205 | ID212 | Y205 | QD207 | | |
| 6CH | ID206 | ID213 | Y206 | QD208 | | |
| Channel | DA Signal | - | - | - | | - |
| 0CH | QD200 | - | - | - | | |
| 1CH | QD201 | - | - | - | | |

The third expansion registers address:

| Channel | AD Signal | PID Output Value | PID start/stop bit | Preset Value | PID parameter: Kp, Ki, Kd, Diff, Death | |
|---------|-----------|------------------|--------------------|--------------|---|---|
| 0CH | ID300 | ID307 | Y300 | QD302 | Kp----- QD309 Ki----- QD310 Kd----- QD311 Diff-----QD312 Death----QD313 | |
| 1CH | ID301 | ID308 | Y301 | QD303 | | |
| 2CH | ID302 | ID309 | Y302 | QD304 | | |
| Channel | PT Signal | PID Output Value | PID start/stop bit | Preset Value | | |
| 3CH | ID303 | ID310 | Y303 | QD305 | | |
| 4CH | ID304 | ID311 | Y304 | QD306 | | |
| 5CH | ID305 | ID312 | Y305 | QD307 | | |
| 6CH | ID306 | ID313 | Y306 | QD308 | | |
| Channel | DA Signal | - | - | - | | - |
| 0CH | QD300 | - | - | - | | |
| 1CH | QD301 | - | - | - | | |

The fourth expansion registers address:

| Channel | AD Signal | PID Output Value | PID start/stop bit | Preset Value | PID parameter: Kp, Ki, Kd, Diff, Death | |
|---------|-----------|------------------|--------------------|--------------|---|---|
| 0CH | ID400 | ID407 | Y400 | QD402 | Kp----- QD409 Ki----- QD410 Kd----- QD411 Diff-----QD412 Death----QD413 | |
| 1CH | ID401 | ID408 | Y401 | QD403 | | |
| 2CH | ID402 | ID409 | Y402 | QD404 | | |
| Channel | PT Signal | PID Output Value | PID start/stop bit | Preset Value | | |
| 3CH | ID403 | ID410 | Y403 | QD405 | | |
| 4CH | ID404 | ID411 | Y404 | QD406 | | |
| 5CH | ID405 | ID412 | Y405 | QD407 | | |
| 6CH | ID406 | ID413 | Y406 | QD408 | | |
| Channel | DA Signal | - | - | - | | - |
| 0CH | QD400 | - | - | - | | |
| 1CH | QD401 | - | - | - | | |

The fifth expansion registers address:

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

The sixth expansion registers address:

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

The seventh expansion registers address:

| Channel | AD Signal | PID Output Value | PID start/stop bit | Preset Value | PID parameter: Kp, Ki, Kd, Diff, Death |
|---------|-----------|------------------|--------------------|--------------|--|
| 0CH | ID700 | ID707 | Y700 | QD702 | Kp----- QD709 |
| 1CH | ID701 | ID708 | Y701 | QD703 | Ki----- QD710 |
| 2CH | ID702 | ID709 | Y702 | QD704 | Kd----- QD711 |

| | | | | | |
|---------|-----------|------------------|--------------------|--------------|----------------------------------|
| Channel | PT Signal | PID Output Value | PID start/stop bit | Preset Value | Diff-----QD712 Death----QD713 |
| 3CH | ID703 | ID710 | Y703 | QD705 | |
| 4CH | ID704 | ID711 | Y704 | QD706 | |
| 5CH | ID705 | ID712 | Y705 | QD707 | |
| 6CH | ID706 | ID713 | Y706 | QD708 | |
| Channel | DA Signal | - | - | - | - |
| 0CH | QD700 | - | - | - | |
| 1CH | QD701 | - | - | - | |

Description:

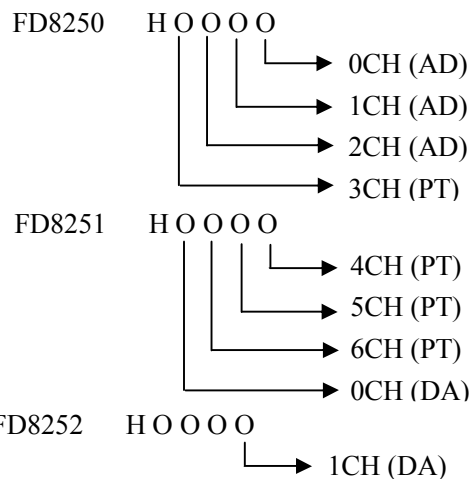
Start signal (Y): when Y is 0, close PID control, when Y is 1, start PID control

3. Working Mode Setting

1) The working mode can be set through special FLASH data register FD of PLC.

| Module | Register address |
|-----------|-------------------------|
| 1# Module | FD8250 , FD8251, FD8252 |
| 2# Module | FD8258, FD8259, FD8260 |
| 3# Module | FD8266, FD8267, FD8268 |
| 4# Module | FD8274, FD8275, FD8276 |
| 5# Module | FD8282, FD8283, FD8284 |
| 6# Module | FD8290, FD8291, FD8292 |
| 7# Module | FD8298, FD8299, FD8270 |

Take 1# module as an example:



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

Each bit definition is shown in the following table:

Take module 1 as an example:

Register FD8250:

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

Low byte of register FD8251:

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

Low byte of register FD8252:

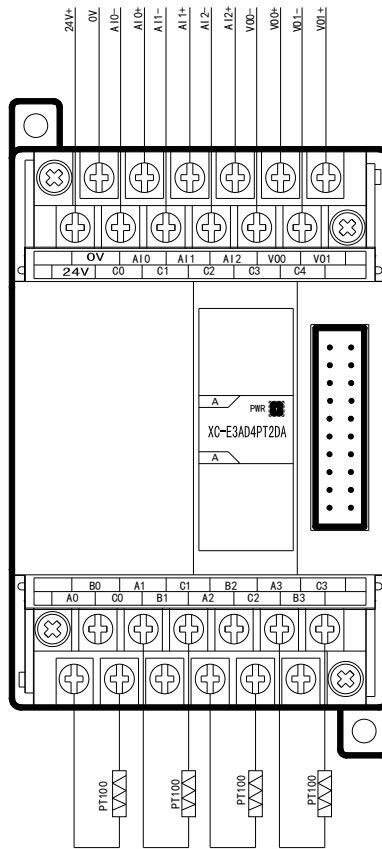
| - | | | | Output CH 1 (PT) | | | |
|------|------|------|------|------------------|------|------|---------------------|
| Bit7 | Bit6 | Bit5 | Bit4 | Bit3 | Bit2 | Bit1 | Bit0 |
| - | - | - | - | - | - | - | 0 :0~10V 1 :0~5V |

4. External Connection

Please note the following items:

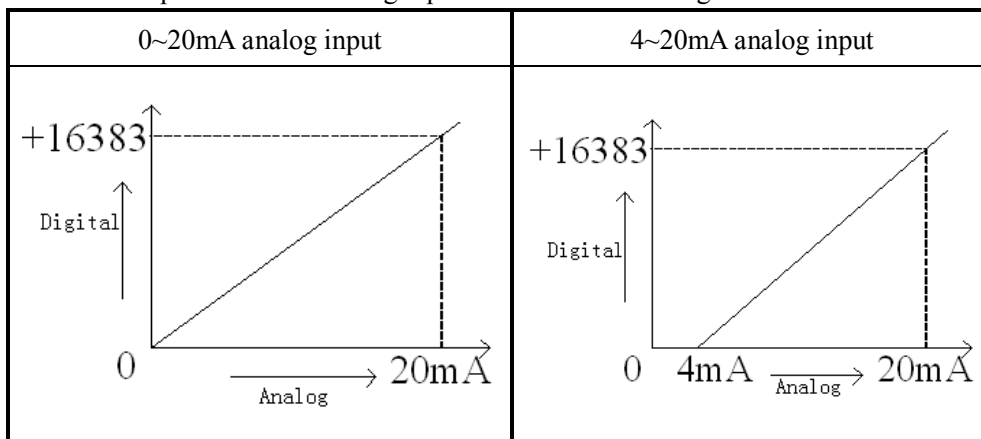
- When connect to external +24V power supply, please use the 24V power supply on PLC main unit to avoid interference.
- To avoid interference, please use shield cable, and single-point ground with the shield layer.

- The 0~20mA or 4~20mA output of the module need connect to external 24V power supply. The module adjusts the circuit current according to the QD value. The module doesn't produce current itself.

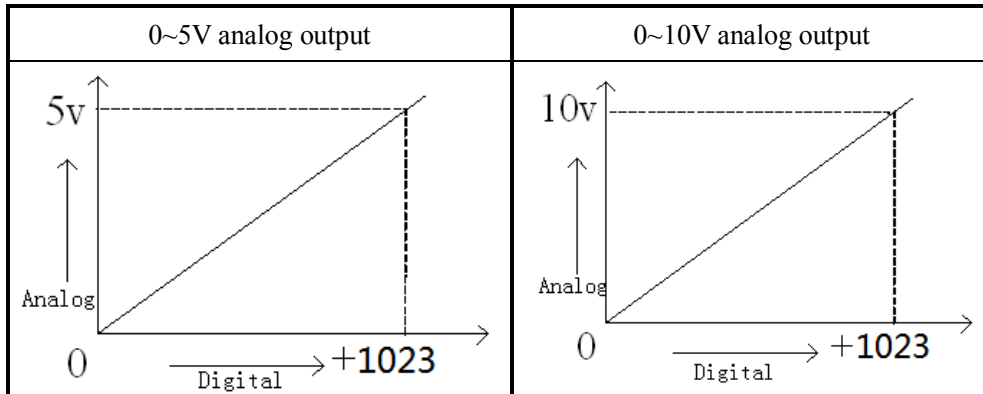


5. Analog/Digital conversion Diagram

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

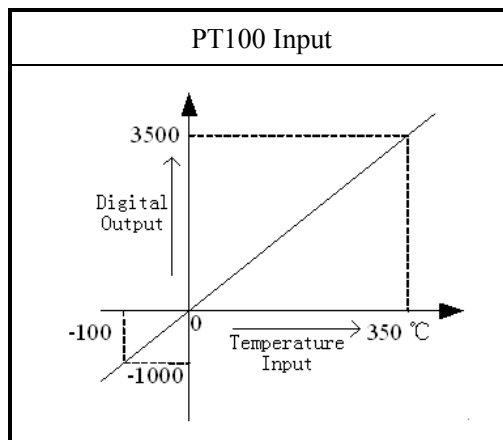


The relationship between the digital input and corresponding analog output is shown as below:



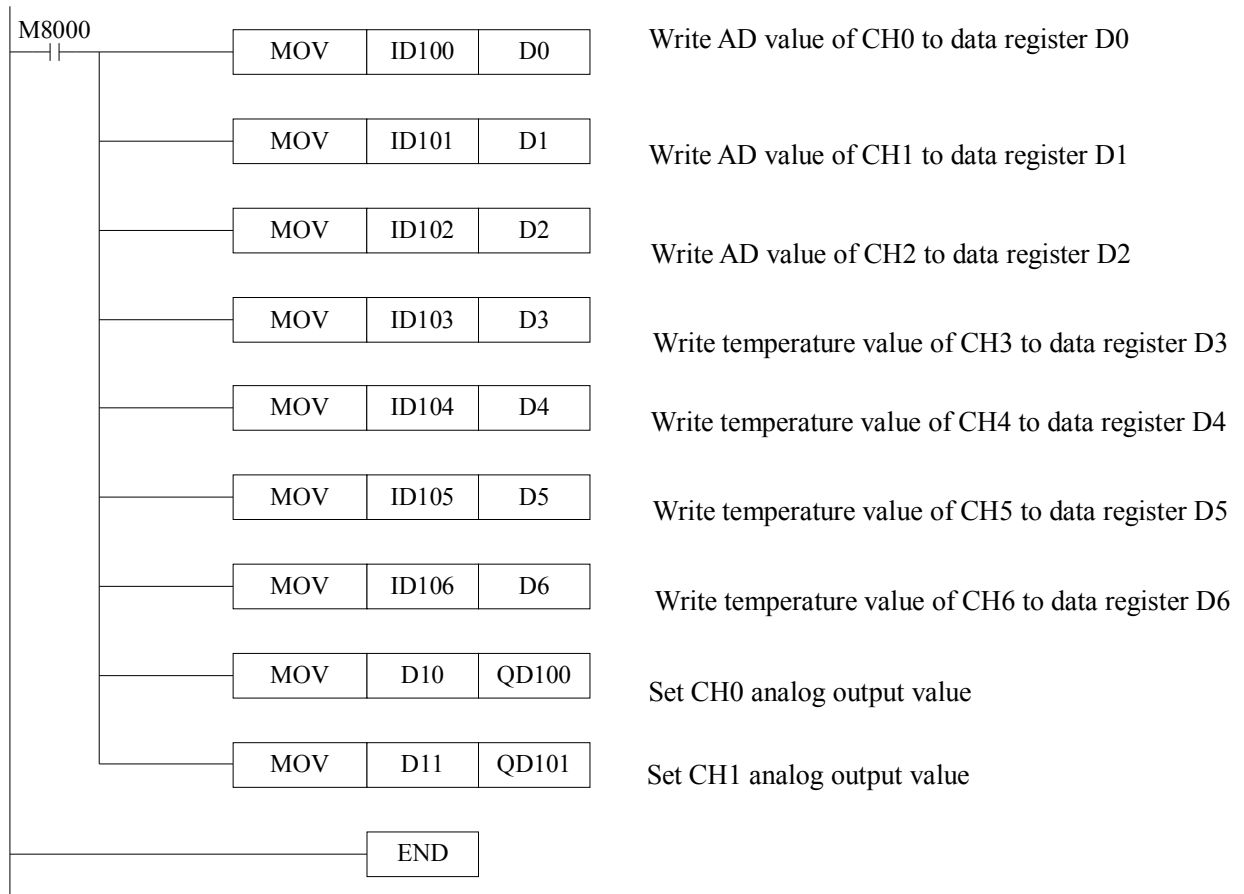
When the output value is larger than K1023, D/A converted analog value will remain 5V or 10V.

The output value of PT100 is shown as below:

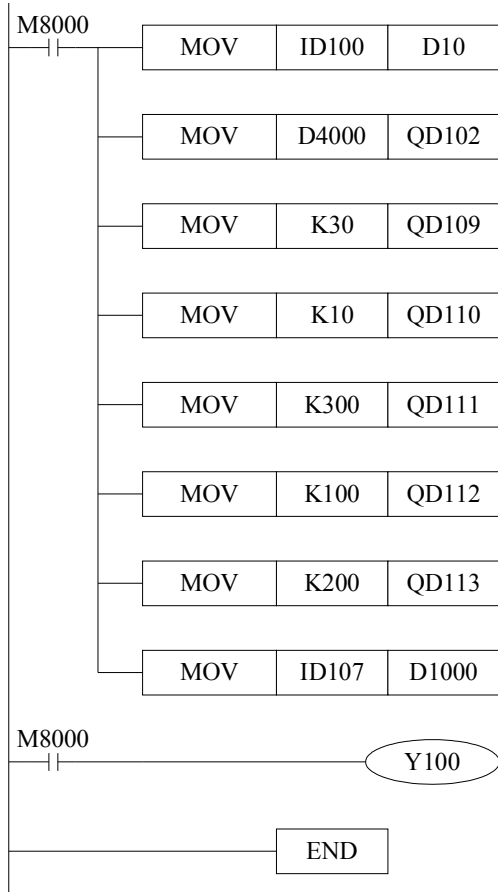


6. Program

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



E.g.2) Application of PID function (Take CH0 of module 1 as an example)



Write AD value from CH0 to data register D10

Write the AD value from CH0 to register D4000

Set parameter K_p to 30

Set parameter K_i to 10

Set parameter K_d to 300

Set parameter Diff to 100

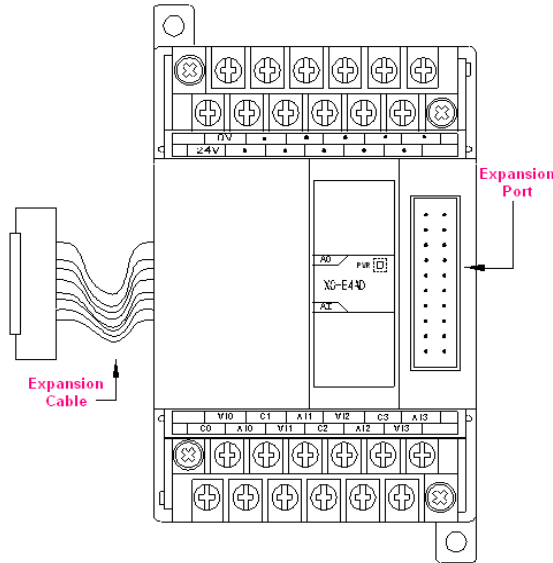
Set control dead area Death to 200

Write CH0 PID value to register D1000

PID start/stop signal

9. Analog Input Module XC-E4AD

1. Specifications



- 4 channels 14 bits analog input
- 4 channels voltage (0~5V, 0~10V), current (0~20mA, 4~20mA) input options, set in the software.
- As expansion of XC series PLC, the PLC CPU unit can connect up to 7 modules
- 4 channels of A/D input have PID adjustment function

| ITEMS | Analog Input (AD) | |
|----------------------|---|------------------|
| | Voltage Input | Current Input |
| Analog Input Range | DC0~5V, 0~10V | DC0~20mA, 4~20mA |
| Maximum Input Range | DC±18V | DC 0~40mA |
| Analog Output Range | - | - |
| Digital Input Range | - | - |
| Digital Output Range | 14 bits binary (0~16383) | |
| Resolution | 1/16383(14Bit); the convert data is stored in PLC in the form of Hex. (14Bit) | |
| PID Output Value | 0~K4095 | |
| Synthesis Precision | 0.8% | |
| Conversion Speed | 20ms per channel | |
| Power Supply | DC24V±10%,100mA | |
| Installation | Fix with M3 screw or install on DIN46277 guilder (Width: 35mm) directly | |
| Dimension | 63mm×102mm×73.3mm | |

[Expansion Cable]: Transfer data through the connection of expansion cable and PLC expansion port.

[Expansion Port]: Connect to other expansion modules

2. Assignment of I/O address

XC series expansions do not occupy I/O units; the converted value is transferred to PLC register directly. Analog input is also offered by PLC register.

Register address of expansion 1:

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

Register address of expansion 2:

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

Register address of expansion 3:

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

Register address of expansion 4:

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

Register address of expansion 5:

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

Register address of expansion 6:

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

Register address of expansion 7:

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

Description:

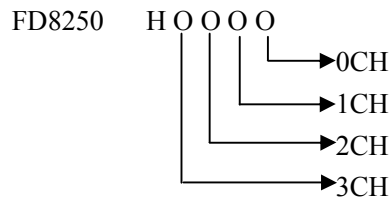
Start signal (Y): when Y is 0, close PID control, when Y is 1, start PID control

3. Setting of working mode

1) The working mode can be voltage 0~5V, 0~10V or current 0~20mA, 4~20mA, set via special FLASH data register FD inside PLC. See the following table:

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

Take 1# expansion as example:



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

Each channel working mode is defined by corresponding FD register. Each bit definition is shown in the following table:

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

Register FD8250:

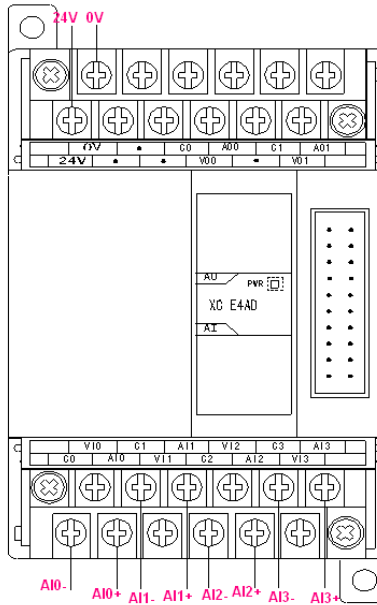
| Channel 1 | | | | Channel 0 | | | |
|----------------|-------|------------------|----------|----------------|-------|------------------|----------|
| Bit7 | Bit6 | Bit5 | Bit4 | Bit3 | Bit2 | Bit1 | Bit0 |
| 00: 1/2 filter | | 0: voltage input | 0:0~10V | 00: 1/2 filter | | 0: voltage input | 0:0~10V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

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

4. Exterior connection

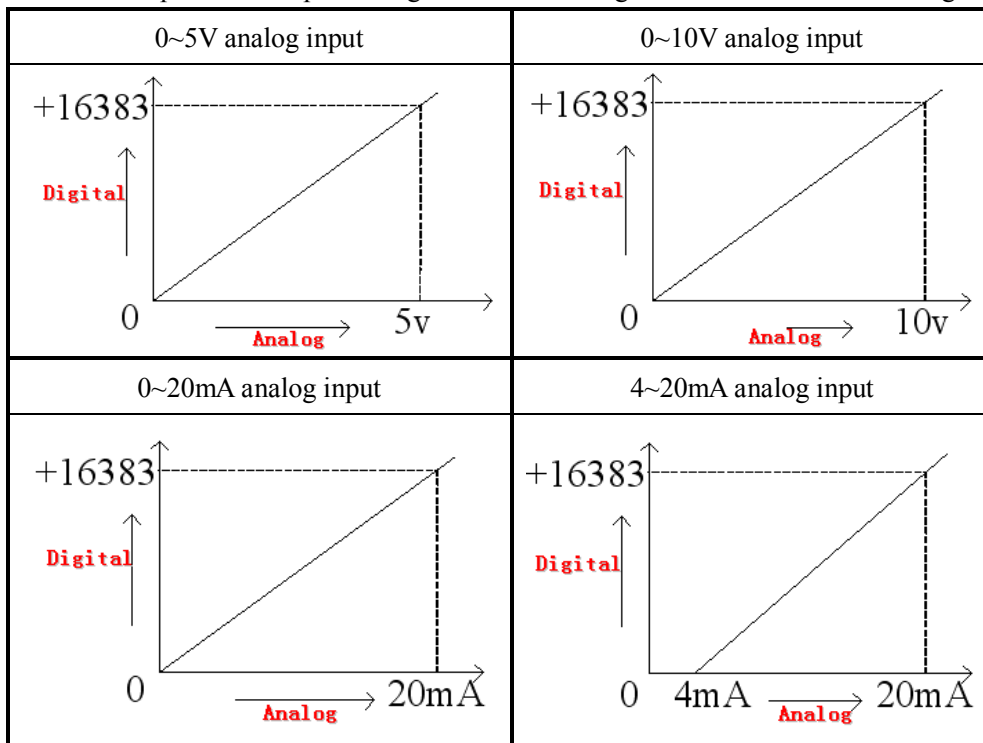
When make external connection, please note the following items:

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



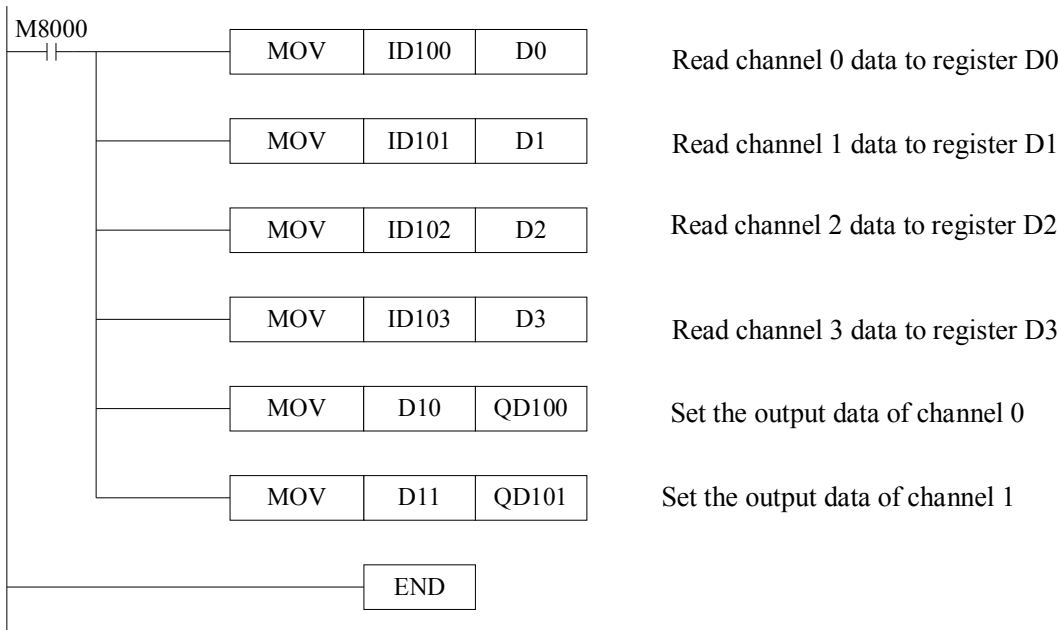
5. Analog digital conversion diagram

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

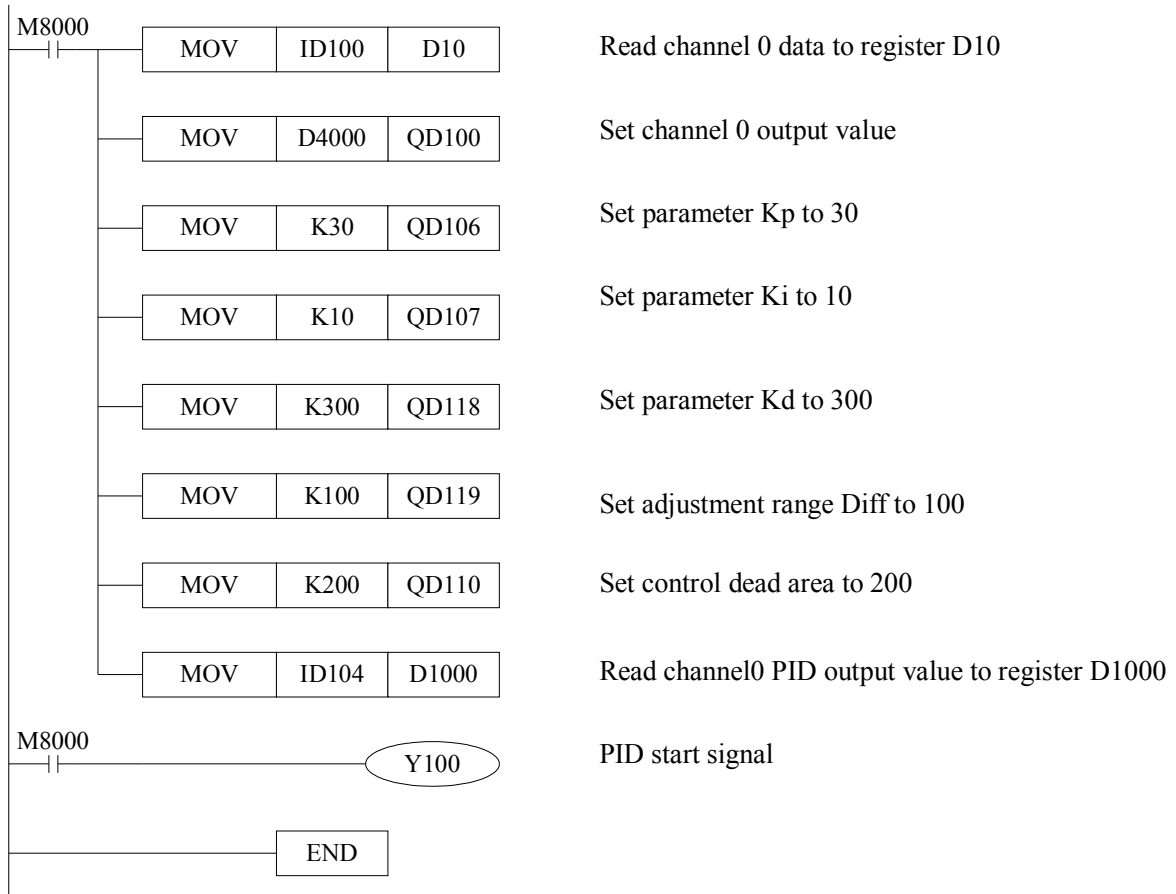


6. Programming

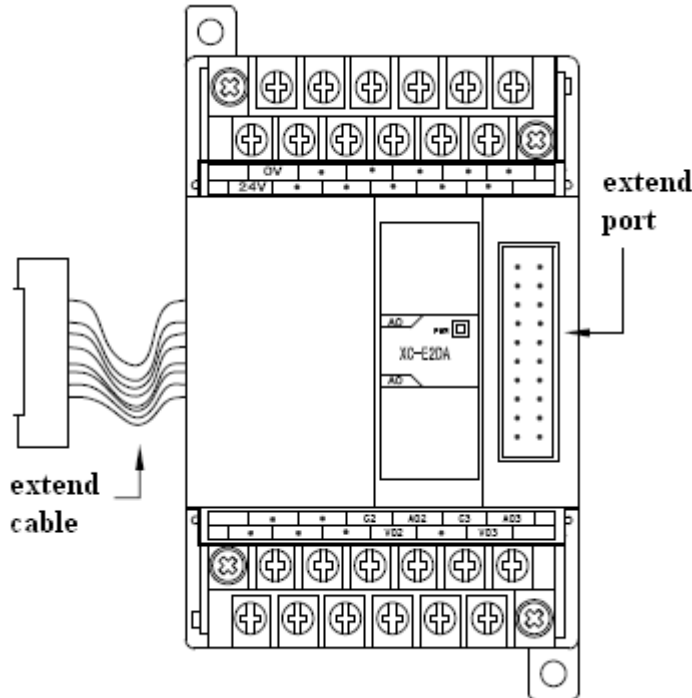
E.g.1 Real-time read the 4 channels data, write 2 channels data (take expansion 1 as an example)



E.g.2 Applied method of PID (take expansion 1 channel 0 as an example)



1. Specifications



- 12 bits high precision analog input.
- 2 channels voltage (0~5V/0~10V), currents (0~20mA/4~20 mA) output options.
- As special function module of XC series, up to 7 modules can be connected.

| Items | Voltage output | Current output |
|-------------------------------|---|------------------------|
| Analog input | DC 0 to 5V, 0 to 10V | DC0 to 20mA, 4 to 20mA |
| Digital output | 12 bits | |
| Resolution | 1/4096(12 bit); the cover data is stored into PLC in the form of Hex | |
| General precision | 0.8% | |
| Conversion speed | 3ms per channel | |
| Isolation | DC/AC convert, optical-coupling isolate | |
| Power supply for analog using | DC24V±10%,100mA | |
| Installation | Fix with M3 screws or install on DIN46277 (width: 35) leader directly | |
| Dimension | 63mm×102mm×73.3mm | |

[Extend cable]: transfer data through the connection of the extend cable and PLC's extend port

[Extend port]: connect to other expansions.

2. The assignment of I/O address

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

Register address of expansion 1~7:

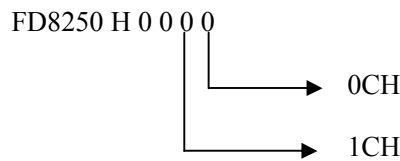
| Channel | 1 unit | 2 unit | 3 unit | 4 unit | 5 unit | 6 unit | 7 unit |
|---------|--------|--------|--------|--------|--------|--------|--------|
| 0CH | QD100 | QD200 | QD300 | QD400 | QD500 | QD600 | QD700 |
| 1CH | QD101 | QD201 | QD301 | QD401 | QD501 | QD601 | QD701 |

3. Working mode setting

1) Expansion I/O has voltage 0 ~ 5V, 0 ~ 10V, current 0 ~ 20mA, 4 ~ 20mA for selection, set the modes through the PLC internal special FLASH registers FD. Such as:

| Modules | Channels No. |
|-----------|--------------|
| | 0CH to 1CH |
| 1#modules | D8250 |
| 2#modules | D8254 |
| 3#modules | D8258 |
| 4#modules | D8262 |
| 5#modules | D8264 |
| 6#modules | D8268 |
| 7#modules | D8272 |

Take 1# module as an example:



Note: As shown in the preceding table, each register set 2 channels mode, each register has 16 bits, from low bit to high bit, every 4 bits set 1 channels mode.

Take the first module as an example:

Register FD8250:

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

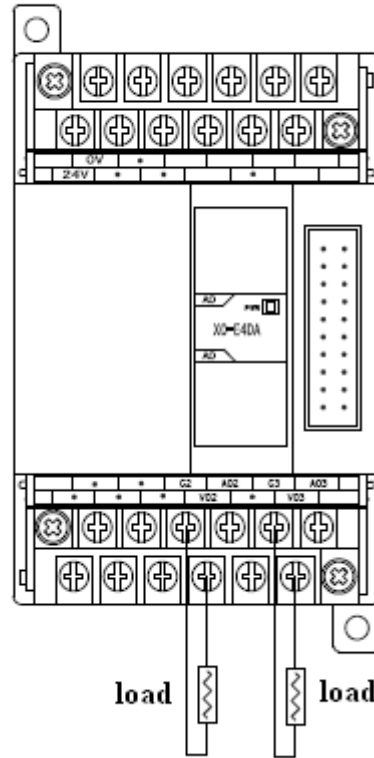
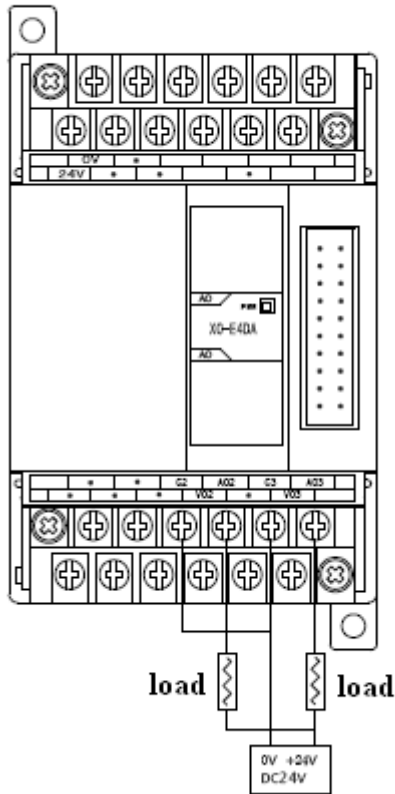
3. External connection

When make external connection, please note the following items:

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

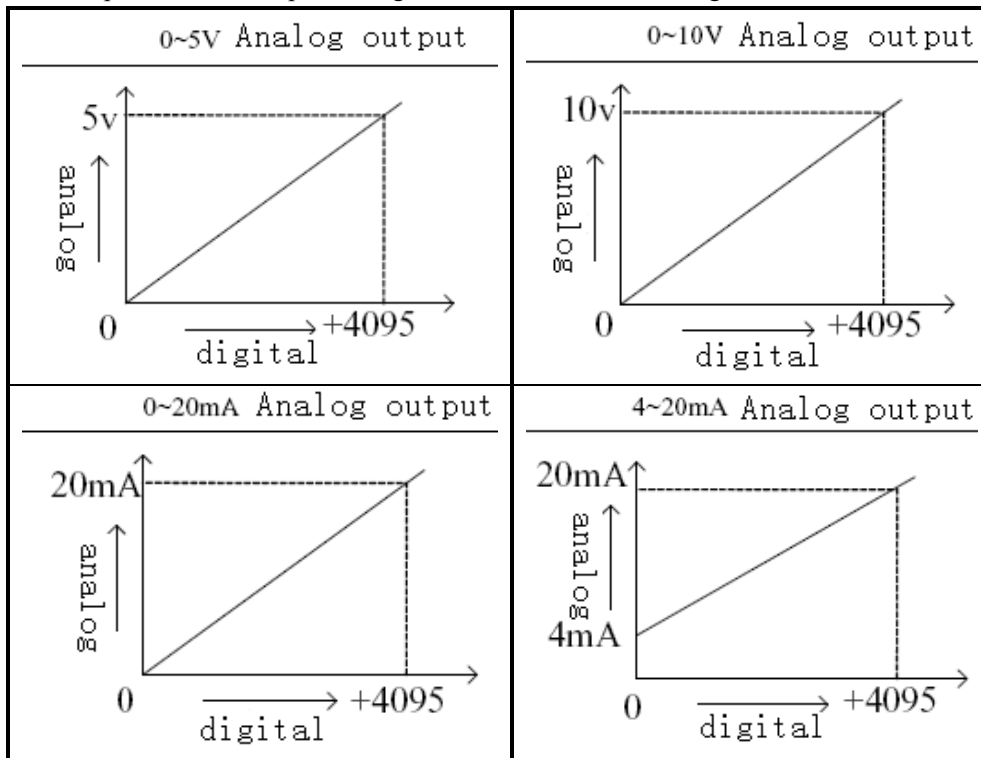
current

voltage



4. Analog/Digital conversion diagram

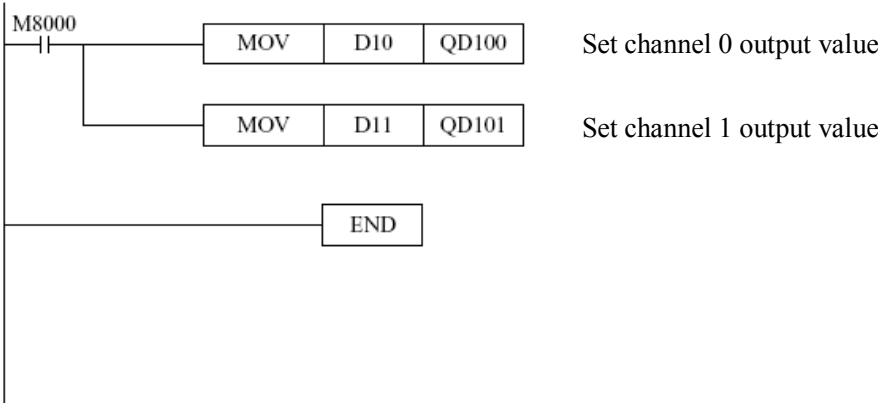
The relationship between the input analog value and the converted digital value is shown as below:



When the output value is larger than K4095, D/A converted analog value will remain 5V, 10V or 20mA.

6. Program

eg.1) Real-time write data to 2 channels





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