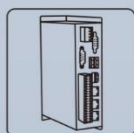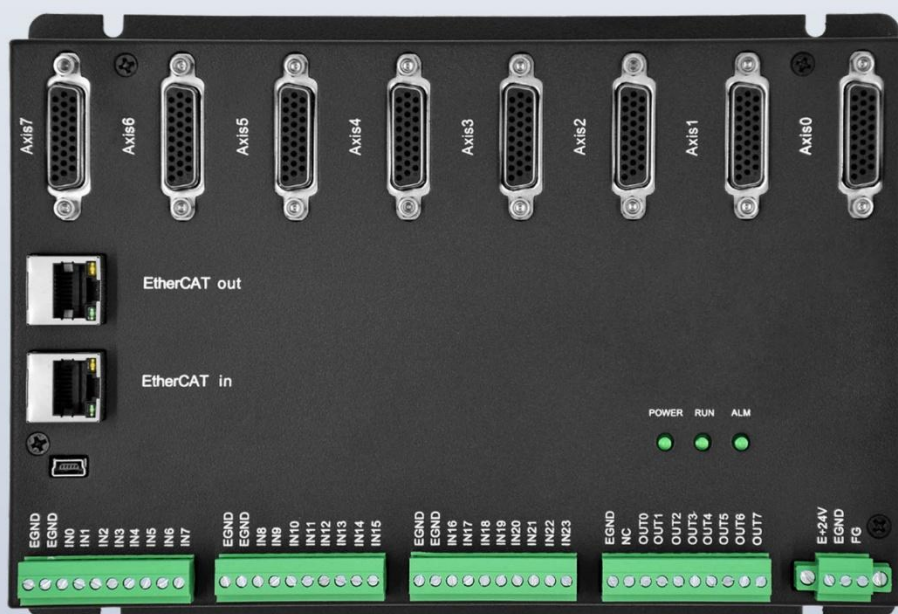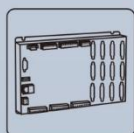# EtherCAT IO & Pulse Axis Module
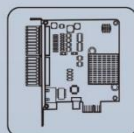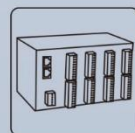
# EIO24088-V2



Vision Motion Controller | Motion Controller | Motion Control Card | IO Expansion Module | HMI

## Statement

Thank you for choosing our Zmotion products. Please be sure to read this manual carefully before use so that you can use this product correctly and safely. Zmotion is not responsible for any direct or indirect losses caused by the use of this product.

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## ➢ Notes

In order to prevent possible harm and damage caused by incorrect use of this product, the following instructions are given on matters that must be observed.

### ■ Danger

| | |
|---|---|
| Do not use it in places with water, corrosive or flammable gases, or near flammable substances. | May cause electric shock, fire, damage, etc. |
| When installing or disassembling, make sure the product is powered off. | |
| Cables should be connected securely, and exposed parts that are energized must be insulated by insulators. | |
| Wiring work must be performed by professionals. | |

### ■ Notes

| | |
|---|---|
| It should be installed within the specified environmental range. | May cause damage, mis-operation, etc. |
| Make sure there are no foreign objects on the product hardware circuit board. | |
| After installation, the product and the mounting bracket should be tight and firm. | |
| After installation, at least 2-3cm should be left between the product and surrounding components for ventilation and replacement. | |
| Never disassemble, modify, or repair it by yourself. | |

# Content

# Chapter I Production Information

## 1.1. Product Information

EIO24088-V2 expansion module is used for EtherCAT controller, when IO, AIO, or pulse axis are not enough, an expansion module is needed. What's more, several EtherCAT expansion modules can be connected synchronously to the controller through EtherCAT. And IO and axis resources of EIO24088 can be accessed directly by mapping Number.

## 1.2. Functional Features

◆ Axis expansion: 8-axis pulse-axis expansion.

◆ Digital expansion: there are 24 inputs and 8 outputs, each pulse axis has one additional input and one additional output that can be configured.

◆ Pulse output mode: pulse / direction or dual pulses.

◆ Maximum pulse output frequency of each axis is 10MHz.

◆ The maximum output current of outputs (except pulse-axis) can reach 300mA, which can directly drive some kinds of solenoid valves.

## 1.3. System Frame
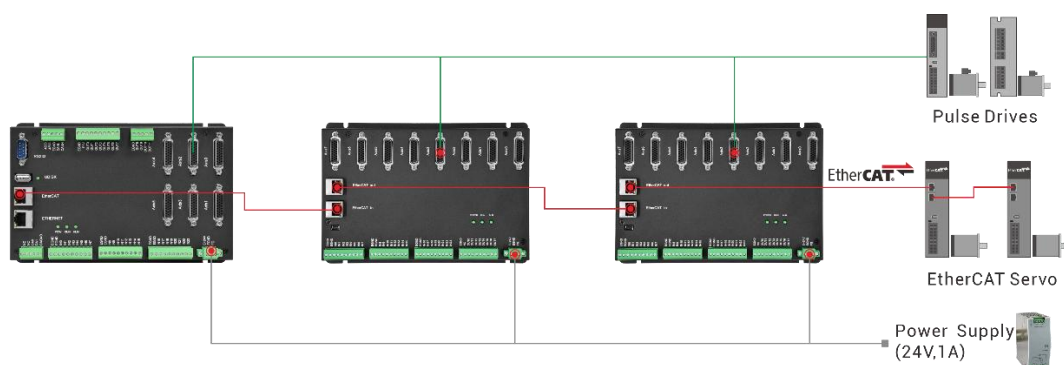
## 1.4. Hardware Installment

EIO24088-V2 expansion module is installed horizontally with screws, and each controller should be fastened with 4 screws.
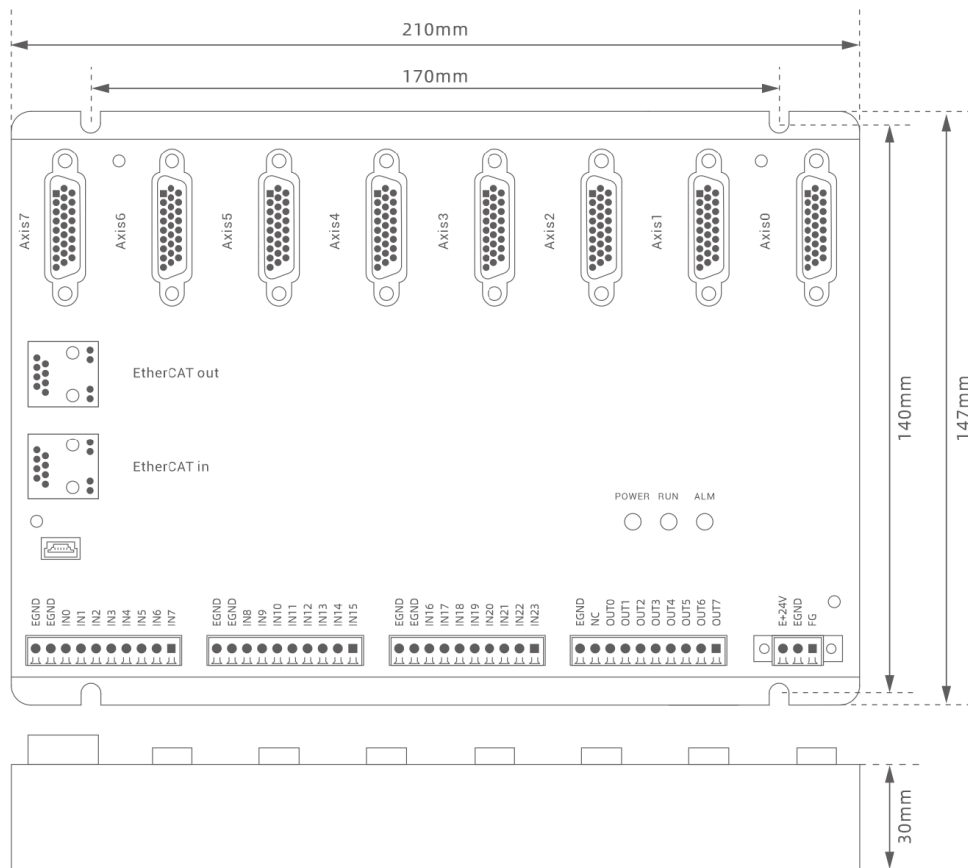


→ Unit: mm                    → Mounting Hole Diameter 4.5mm

| | |
|---|---|
| ⚠️  **Installation attention** | • Non-professionals are strictly prohibited to operate. Specifically, professionals who had been trained related electrical equipment, or who master electrical knowledge.<br>• Please be sure to read the product instruction manual and safety precautions carefully before installation.<br>• Before installation, please ensure that the product is powered off.<br>• Do not disassemble the module, otherwise the machine may be damaged.<br>• Avoid direct sunlight installation. |

|  | <ul><li>In order to facilitate ventilation and controller replacement, 2-3cm should be left between the upper and lower parts of the controller and the installation environment and surrounding components.</li><li>Considering the convenient operation and maintenance of the controller, please <span style="color:red">do not</span> install the controller in the following places:<br>  a)  places where the surrounding ambient temperature exceeds the range of -10°C-55°C<br>  b)  places where the ambient humidity exceeds the range of 10%-95% (non-condensing)<br>  c)  places with corrosive gases and flammable gases<br>  d)  places with many conductive powders such as dust and iron powder, oil mist, salt, and organic solvents</li></ul> |

# Chapter II Product Specification

## 2.1. Interface Definition
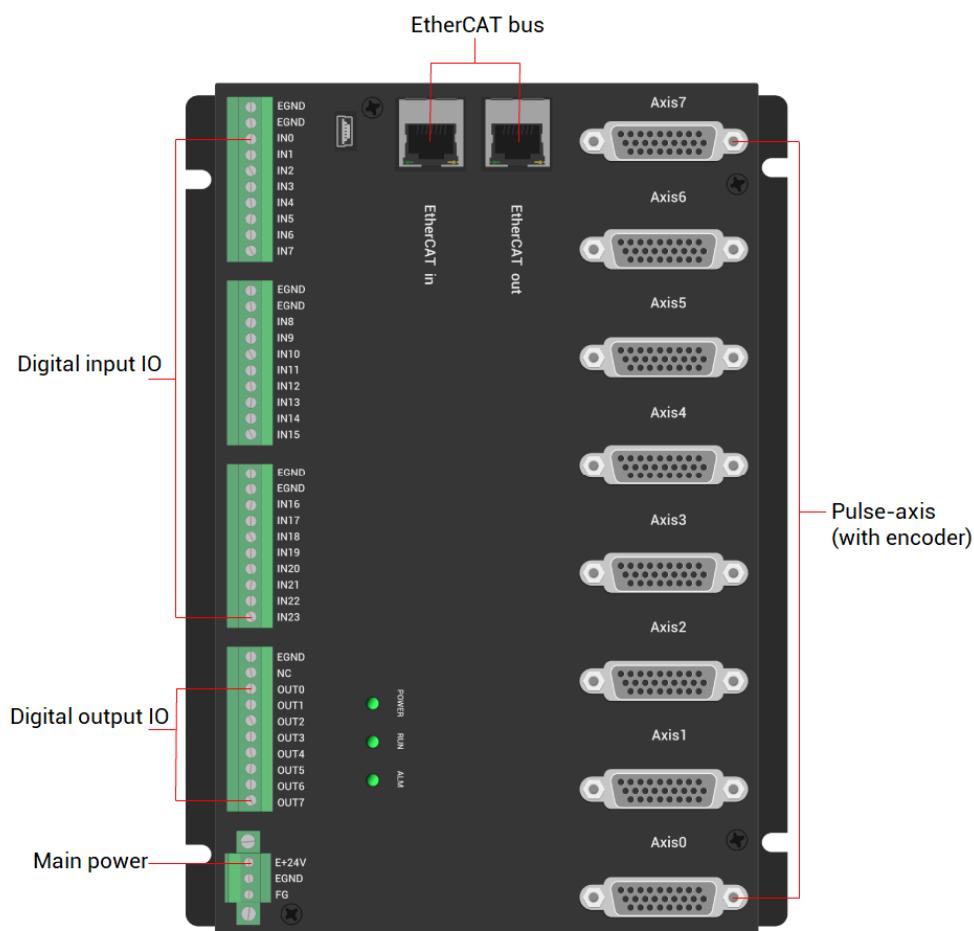


| Mark | Interface | Number | Description |
|---|---|---|---|
| POW | The led that indicates the current state. | 1 | Power state: it lights when power is conducted. |
| RUN | | 1 | Run state: it lights when runs normally |
| ALM | | 1 | Error state: it lights when runs incorrectly |
| EtherCAT IN | EtherCAT bus interface | 1 | Connect to main controller or former level expansion module. |
| EtherCAT OUT | | 1 | Connect to drive equipment or behind level expansion module. |
| Digital input | | 24 | NPN type, main power 24V. |
| Digital output | | 8 | NP leakage type, main power 24V. |

| | | |
|---|---|---|
| Main power | 1 | 24V DC power supplies for main control area of expansion module. |
| Pulse axis | 8 | Each axis can be configured as differential pulse output and differential encoder input. |

## 2.2. Order Information

| Model | Axes | Encoder | Inner IN | Inner OUT | ECAT IN / EACT OUT | Functions |
|---|---|---|---|---|---|---|
| EIO1616 | - | - | 16 | 16 | 1/1 | Module: EIO1616M<br>Module + Cover: EIO1616MT |
| EIO16084 | 4 | 4 | 16 | 8 | 1/1 | 4-axis expansion |
| EIO24088 -V2 | 8 | 8 | 24 | 8 | 1/1 | 8-axis expansion |

## 2.3. Work Environment

| Item | | Parameters |
|---|---|---|
| Work Temperature | | -10℃-55℃ |
| Work relative Humidity | | 10%-95% non-condensing |
| Storage Temperature | | -40℃ ~ 80℃ (not frozen) |
| Storage Humidity | | Below 90%RH (no frost) |
| vibration | Frequency | 5-150Hz |
| | Displacement | 3.5mm(directly install)(<9Hz) |
| | Acceleration | 1g(directly install)(>9Hz) |
| | Direction | 3 axial direction |
| Shock (collide) | | 15g, 11ms, half sinusoid, 3 axial direction |
| Degree of Protection | | IP20 |
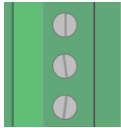
# Chapter III Wiring & Communicatio

## 3.1. Power Input

The power supply input adopts a 3Pin (there are all 3 terminals) screw-type pluggable wiring terminal. And it is 24V DC power.

### → Terminal Definition:

| Terminal | Name | Type | Function |
|---|---|---|---|
| E+24V<br>EGND<br>FG | E+24V | Input | Positive (+) of DC power input (connect power + to positive of controller) |
|  | EGND | Input | Negative (-) of power input |
|  | FG | Earthing (Grounding) | Protect |
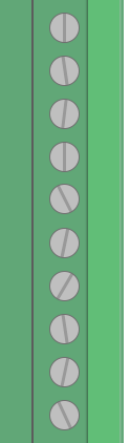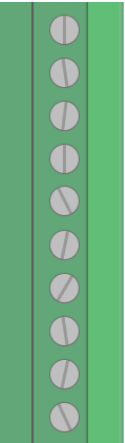
## 3.2. Power Specification

### → Specification

| Item | Description |
|---|---|
| Voltage | DC24V (-5%~5%) |
| The current to open | ≤0.5A |
| The current to work | ≤0.4A |
| Anti-reverse connection | Yes |
| Overcurrent Protection | Yes |

## 3.3. IN Digital Input

### → Terminal Definition

| Terminal | Name | Type | Function 1 |
|---|---|---|---|
| EGND | EGND | / | IO Public End |
| EGND | EGND | / | IO Public End |
| IN0 | IN0 | | Input 0 |
| IN1 | IN1 | | Input 1 |
| IN2 | IN2 | | Input 2 |
| IN3 | IN3 | NPN type, | Input 3 |
| IN4 | IN4 | digital inputs | Input 4 |
| IN5 | IN5 | | Input 5 |
| IN6 | IN6 | | Input 6 |
| IN7 | IN7 | | Input 7 |
| EGND | EGND | / | IO Public End |
| EGND | EGND | / | IO Public End |
| IN8 | IN8 | | Input 8 |
| IN9 | IN9 | | Input 9 |
| IN10 | IN10 | | Input 10 |
| IN11 | IN11 | NPN type, | Input 11 |
| IN12 | IN12 | digital inputs | Input 12 |
| IN13 | IN13 | | Input 13 |
| IN14 | IN14 | | Input 14 |
| IN15 | IN15 | | Input 15 |
| EGND | EGND | / | IO Public End |
| EGND | EGND | / | IO Public End |
| IN16 | IN16 | | Input 16 |
| IN17 | IN17 | | Input 17 |
| IN18 | IN18 | | Input 18 |
| IN19 | IN19 | NPN type, | Input 19 |
| IN20 | IN20 | digital inputs | Input 20 |
| IN21 | IN21 | | Input 21 |
| IN22 | IN22 | | Input 22 |
| IN23 | IN23 | | Input 23 |

## 3.3.1. Digital Input Specification

| Item | Digital input (IN0-23) |
|---|---|
| Input mode | NPN type, input is triggered when in low-electric level |
| Frequency | <5kHz |
| Impedance | 4.7KΩ |
| Voltage level | DC24V |
| The voltage to open | <14.5V |
| The voltage to close | >14.7V |
| Minimal current | -1.8mA (negative) |
| Max current | -6mA (negative) |
| Isolation mode | optoelectronic isolation |
| Note: the above parameters are standard values when the voltage of expansion module power supply (E+24V port) is 24V. | |

## 3.3.2. Digital Input Wiring
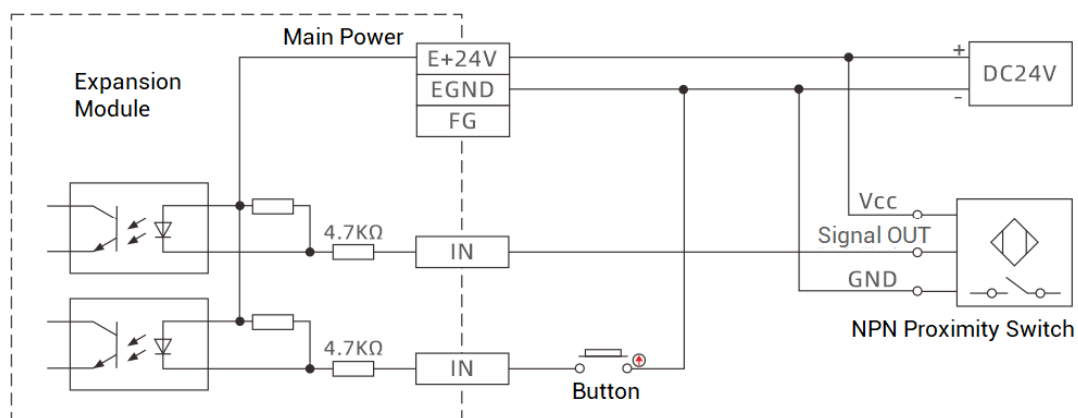


### → Wiring Note:

● The wiring principle of digital inputs IN (0-23) is shown in the figure above. The external signal source can be an optocoupler, a key switch or a sensor, etc., all can be connected as long as the requirements on output of electric level can be achieved.

● For the public end, please connect "EGND" of power supply to "COM" of external input device. If the signal area power supply of external device and the power supply of expansion module are in same power supply system, this also can be omitted.

## 3.4. OUT Digital Output

→ **Terminal Definition**

| Terminal | Name | Type | Function |
|---|---|---|---|
| EGND<br>NC<br>OUT0<br>OUT1<br>OUT2<br>OUT3<br>OUT4<br>OUT5<br>OUT6<br>OUT7 | EGND | / | IO Public End |
| | NC | / | Spare |
| | OUT0 | NPN, digital outputs | Output 0 |
| | OUT1 | | Output 1 |
| | OUT2 | | Output 2 |
| | OUT3 | | Output 3 |
| | OUT4 | | Output 4 |
| | OUT5 | | Output 5 |
| | OUT6 | | Output 6 |
| | OUT7 | | Output 7 |

## 3.4.1. Digital Output Specification

| Item | Digital Output (OUT0-7) |
|---|---|
| Output mode | NPN type, it is 0V when outputs |
| Frequency | <8kHz |
| Voltage level | DC24V |
| Max output current | +300mA |
| Max leakage current when off | 25μA |
| Respond time to conduct | 12μs |
| Respond time to close | 80μs |
| Overcurrent protection | Support |
| Isolation method | optoelectronic isolation |

**Note:**

✧ The times in the form are typical based on the resistive load, and may change when the load circuit changes.

✧ Due to the leak-type output, the shutdown of the output will be obviously affected by the external load circuit, and the output frequency should not be set too high in the application.
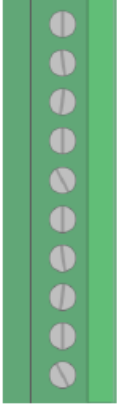
## 3.4.2. Digital Output Wiring
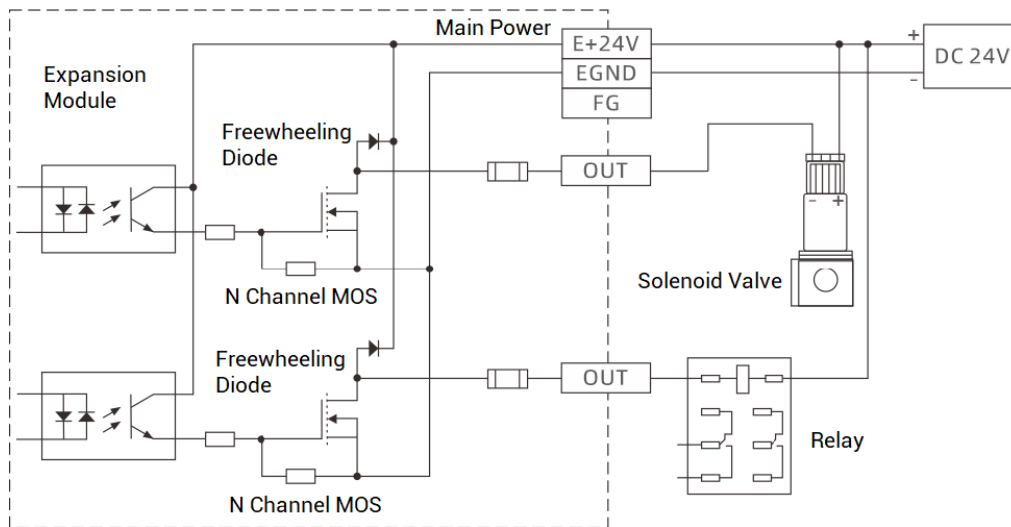


## → Wiring Note:

- The wiring principle of digital outputs OUT (0-7) is shown in the figure above. The external signal receiving end can be an optocoupler or a relay or solenoid valve, all can be connected as long as the input current does not exceed 300mA.

- For the connection of the public end, please connect the "EGND" port on the power supply to the negative pole of the DC power supply of the external input device. If the DC power supply of the external device and the expansion module power supply are in the same power supply system, this connection can also be omitted.

## 3.5. EtherCAT Bus Interface

EIO24088 expansion module has 2 100M EtherCAT communication interfaces (EtherCAT protocol). ECAT IN is connected to main controller or former level expansion module, ECAT OUT is connected to drive or next level module, they can't be mixed.

| PIN | Signal | Description |
|-----|--------|-------------|
| 1 | TX+ | Send signal (+) |
| 2 | TX- | Send signal (-) |
| 3 | RX+ | Receive signal (+) |
| 4 | NC | Reserved |
| 5 | NC | Reserved |
| 6 | RX- | Receive signal (-) |
| 7 | NC | Reserved |
| 8 | NC | Reserved |
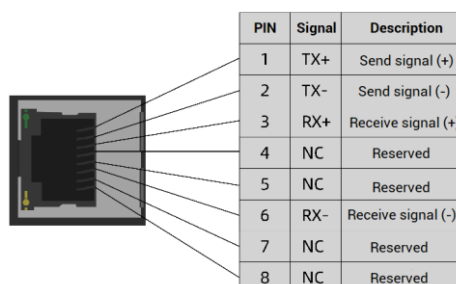
## → Specification

| Item | Specification |
|---|---|
| Communication protocol | EtherCAT protocol |
| Valid service | CoE(PDO, SDO), FoE |
| Synchronization method | IO adopts input and output synchronization / DC-distributed clock |
| Physical level | 100BASE-TX |
| Duplex mode | Full duplex |
| Topology | linear topology |
| Transfer media | Cable |
| Transfer distance | It is less than 100M between 2 nodes |
| Process data | Maximum 1486 bytes of one single frame |
| Synchronization shaking of two slave stations | <1us |
| Refresh | For 1000 digital inputs and outputs, about 30us |

## → Communication Cable Requirements

EtherCAT communication interface adopts standard Ethernet RJ45 interface.

The network cable adopts Category 5e STP, and the crystal head has a metal shell to reduce interference and to prevent information from being eavesdropped. As shown below:
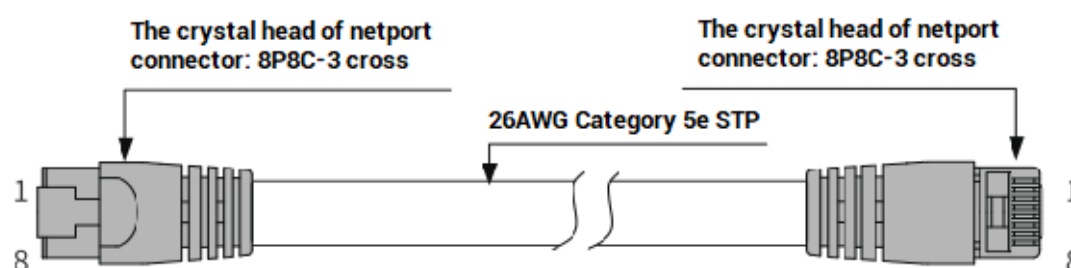


| Item | Specification |
|---|---|
| Cable type | Flexible crossover cable, Category 5e |
| traverse | twisted pair |
| Line pairs | 4 |
| Isolation | cross skeleton |
| Connector | Crystal head with iron shell |

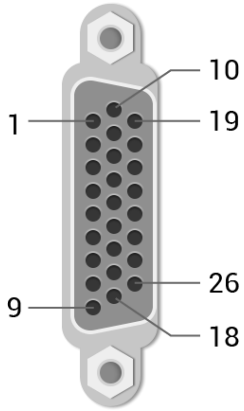| Cable material | PVC |
|---|---|
| Cable length | Less than 100m |

**Use RJ45 network cable connection method:**

● When installing, hold the crystal head that is with the cable and insert it into the RJ45 interface until it makes a "click" sound (kada).

● In order to ensure the stability of communication, please fix the cables with cable ties.

● When disassembling, press the tail mechanism of the crystal head, and pull out the connector and the module in a horizontal direction.

Please use tube-type pre-insulated terminals and cables with appropriate wire diameters to connect the user terminals.

# 3.6. AXIS Differential Pulse Axis Interface

This product provides 8 local differential pulse axis interfaces, each interface is a standard DB26 female socket.

## → Interface Definition

| Interface | Pin | Signal | Description |
|---|---|---|---|
| | 1 | EGND | Negative pole of IO 24V power |
| | 2 | IN24-31/ALM | General input (recommended as driver alarm) |
| | 3 | OUT8-15/ENABLE | General output (recommended as driver enable) |
| | 4 | EA- | Encoder differential input signal A- |
| | 5 | EB- | Encoder differential input signal B- |
| | 6 | EZ- | Encoder differential input signal Z- |
| | 7 | +5V | Positive pole of 5V power of pulse/encoder signal |
| | 8 | Reserved | Reserved |
| | 9 | DIR+ | Servo or step direction output + (differential signal) |

| | | |
|---|---|---|
| 10 | GND | Negative pole of 5V power of pulse/encoder signal |
| 11 | PUL- | Servo or step pulse output − (differential signal) |
| 12 | Reserved | Reserved |
| 13 | GND | Negative pole of 5V power of pulse/encoder signal |
| 14 | OVCC | Positive pole of IO 24V power |
| 15 | Reserved | Reserved |
| 16 | Reserved | Reserved |
| 17 | EA+ | Encoder differential input signal A+ |
| 18 | EB+ | Encoder differential input signal B+ |
| 19 | EZ+ | Encoder differential input signal Z+ |
| 20 | GND | Negative pole of 5V power of pulse/encoder signal |
| 21 | GND | |
| 22 | DIR- | Servo or step direction output - (differential signal) |
| 23 | PUL+ | Servo or step pulse output + (differential signal) |
| 24 | GND | Negative pole of 5V power of pulse/encoder signal |
| 25 | Reserved | Reserved |
| 26 | Reserved | Reserved |

**Note:**

✧ ALM, ENABLE, CLR and INP are recommended to be used as axis IO, because the drive capacity is small.

✧ OVCC, +5V are only used for communication between the controller and the servo driver, please do not use it as power supply for other places.

## →Pulse Axis PIN & IO PIN

| Pulse Axis No. | IN (PIN 2) | OUT (PIN 3) |
|---|---|---|
| AXIS0 | IN24 | OUT8 |
| AXIS1 | IN25 | OUT9 |

| AXIS2 | IN26 | OUT10 |
|-------|------|-------|
| AXIS3 | IN27 | OUT11 |
| AXIS4 | IN28 | OUT12 |
| AXIS5 | IN29 | OUT13 |
| AXIS6 | IN30 | OUT14 |
| AXIS7 | IN31 | OUT15 |

## 3.6.1. AXIS Interface Signal Specification & Wiring

### → Specification:

| Signal | Item | Description |
|--------|------|-------------|
| PUL/DIR | Signal type | Differential output signal |
| | Voltage range | 0-5V |
| | Maximum frequency | 10MHz |
| EA/EB/EZ | Signal type | Differential input signal |
| | Voltage range | 0-5V |
| | Maximum frequency | 5MHz |
| IN24-31 | Input method | NPN type, it is triggered when low electric level is input. |
| | Frequency | <5kHz |
| | Impedance | 6.8KΩ |
| | Voltage level | DC24V |
| | The voltage to open | <10.5V |
| | The voltage to close | >10.7V |
| | Minimal current | -1.8mA (negative) |
| | Maximum current | -4mA (negative) |
| | Isolation | optoelectronic isolation |
| OUT8-15 | Output method | NPN leak type, it is 0V when outputs |
| | Frequency | <8kHz |
| | Voltage level | DC24V |
| | Maximum current | +50mA |
| | Overcurrent protection | No |

| | Isolation | optoelectronic isolation |
|---|---|---|
| +5V, GND | Maximum output current for 5V | 50mA |
| OVCC, EGND | Maximum output current for 24V | 50mA |

## → **Wiring Reference:**

➢ Reference example of wiring with Panasonic A5/A6 servo driver:
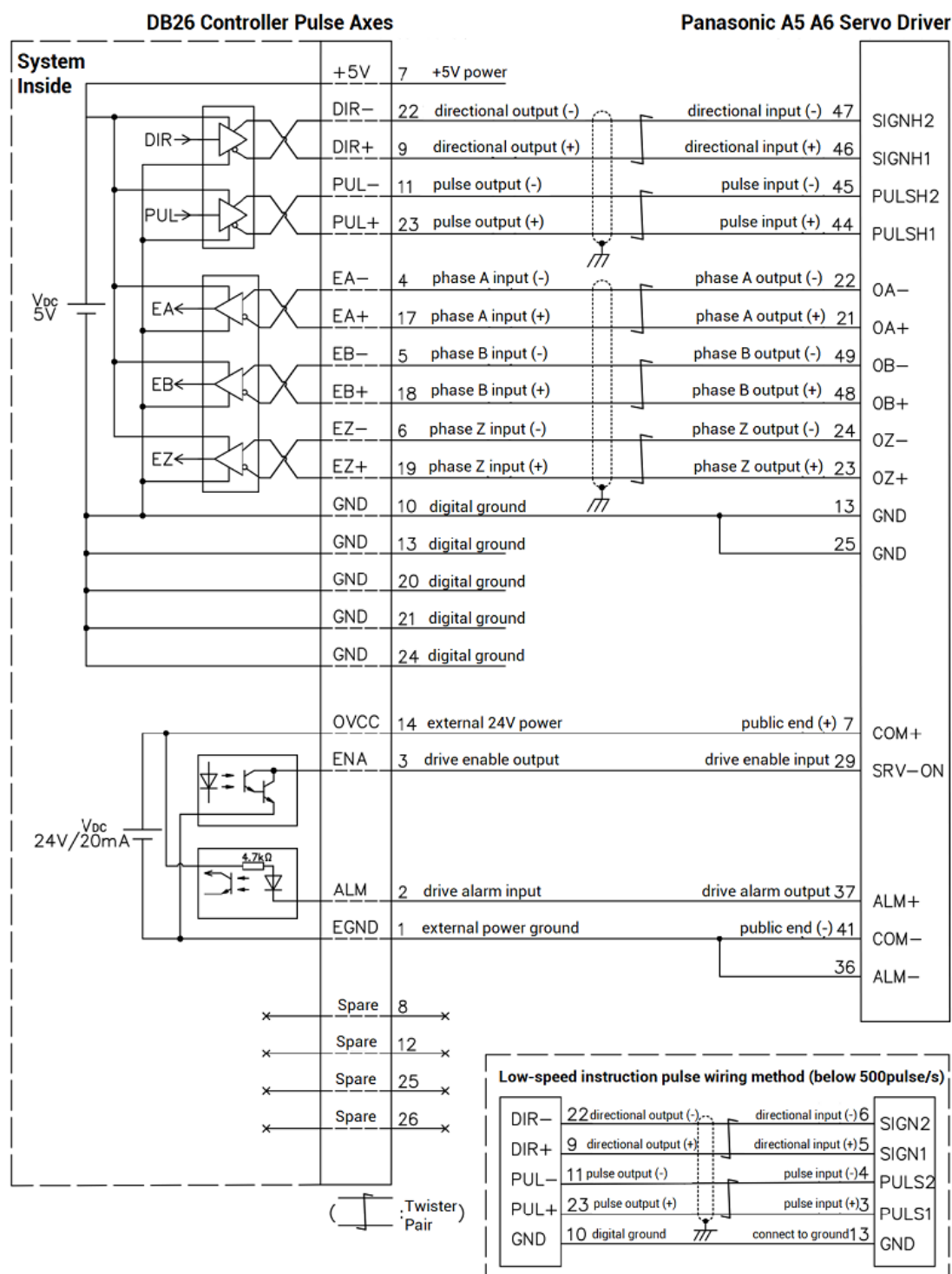
➢ PUL/DIR Common Anode Wiring:

| +5V | 7 | +5V Power | | Drive |
|---|---|---|---|---|
| DIR− | 22 | Directional Out (−) | DIR− | |
| DIR+ | 9 | Directional Out (+) | DIR+ | |
| PUL− | 11 | Pulse Out (−) | PUL− | |
| PUL+ | 23 | Pulse Out (+) | PUL+ | |
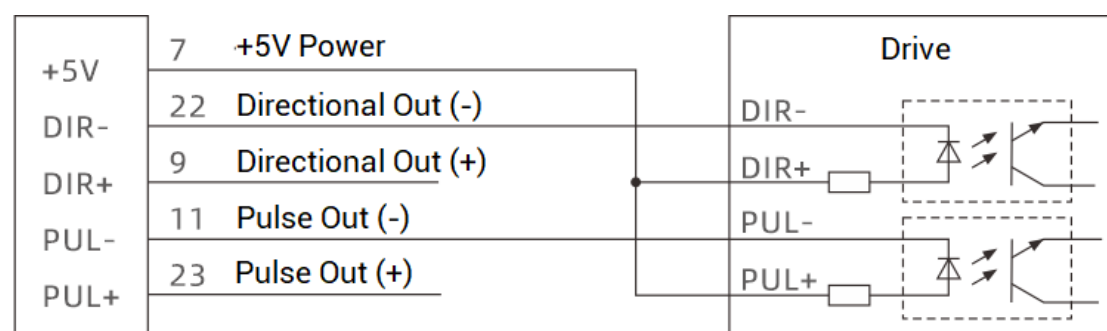
➢ EA/EB/EZ Common Anode Wiring:

| +5V | 7 | +5V Power | | 5V | |
|---|---|---|---|---|---|
| EA− | 4 | Phase A IN (−) | | | |
| EA+ | 17 | Phase A IN (+) | | A | |
| EB− | 5 | Phase B IN (−) | | | NPN Encoder |
| EB+ | 18 | Phase B IN (+) | | B | |
| EZ− | 6 | Phase Z IN (−) | | | |
| EZ+ | 19 | Phase Z IN (+) | | Z | |
| GND | 10/13/20/21/24 | | | GND | |
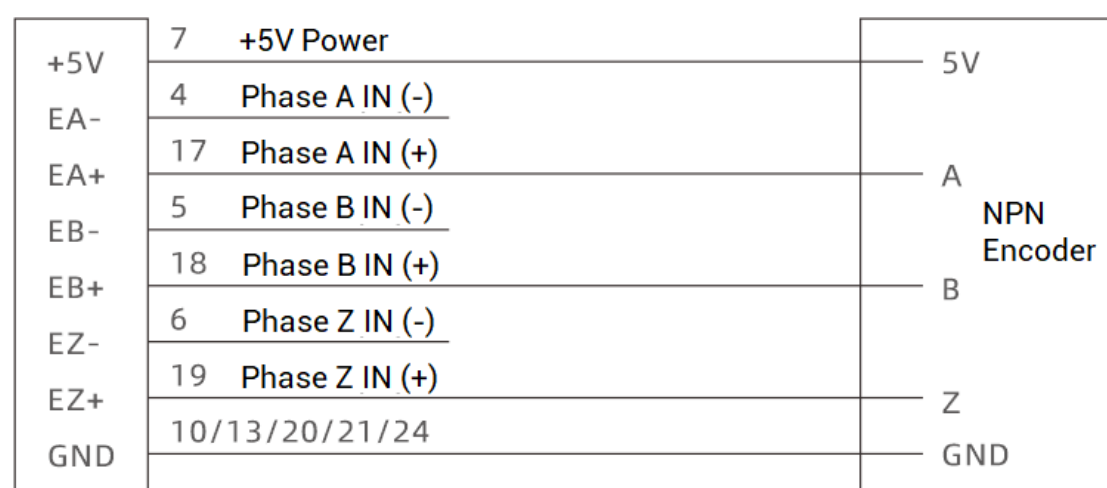
## → Wiring Note:

✧ The wiring principle of the differential pulse axis interface is shown in the figure above, and the wiring methods of different types of drivers are different, please connect carefully.

✧ Please use STP, especially in bad environments, and make sure the shielding layer is fully grounded.

# Chapter IV Expansion Module

## 4.1. EtherCAT Expansion Wiring Reference

EIO24088-V2 expansion module is powered by the single power. The main power can supply power for IO, the main power uses 24V DC power.

After the expansion wiring is completed, each EIO expansion module does not need to develop again. It only needs to manually configure the unique IO address and axis address in the EtherCAT master controller, and it can be accessed after the configuration is completed. The IO address number is set through the bus command NODE_IO, and the program on the controller can access the resources on the expansion module only through the IO number.

When wiring, pay attention that EtherCAT IN is connected to the upper-level module, and EtherCAT OUT is connected to the lower-level module. The IN and OUT ports cannot be mixed.

EIO expansion module wiring reference example:
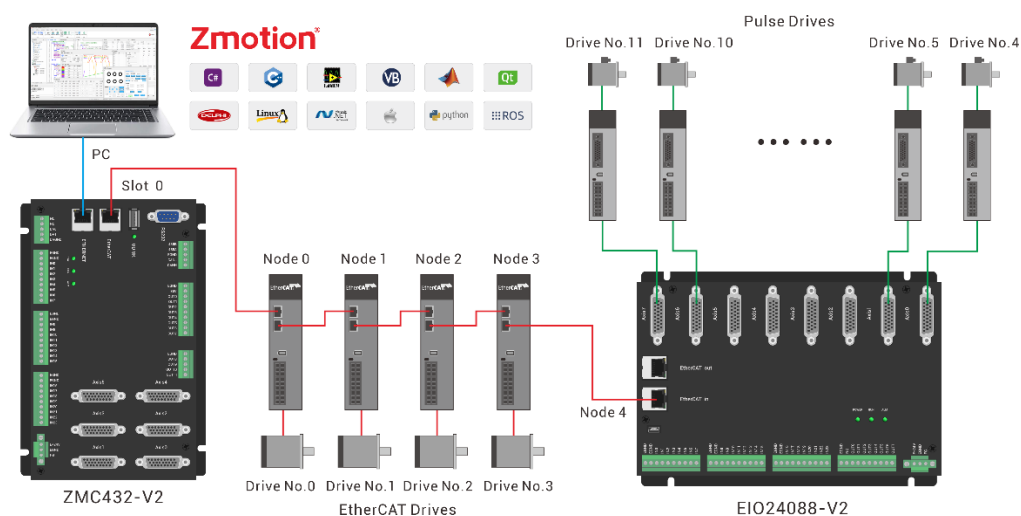


Involved number concepts in above figure are as follows: the bus-related command parameters will use the following numbers:

**Slot number (slot):**

The slot number refers to the number of the bus interface on the controller, and the slot number of the EtherCAT bus is 0.

**Device number (node):**

The device number refers to the number of all devices connected to a slot. It starts from 0 and is automatically numbered according to the connection sequence of the

devices on the bus. You can view the total number of devices connected to the bus through the NODE_COUNT(slot) command.

**Drive number:**

The controller will automatically identify the drive on the slot, and the number starts from 0, and the number is automatically numbered according to the connection sequence of the drive on the bus.

The drive number is different from the device number. Only the drive device number on the slot is assigned, and other devices are ignored. The drive number will be used when mapping the axis number.

## 4.2. EtherCAT Expansion Module Usage

1.    Please follow the above wiring instructions to correctly complete the wiring of power supply, EtherCAT bus, IO signal and other modules.

2.    After the controller is powered on, please use the ETHERNET interface and RS232 serial port to connect to RTSys.

3.    The EIO24088-V2 expansion module can only be used after bus initialization.

①  Execute the bus initialization program, identify the device number of the EIO expansion module and the connected drive number during the initialization process, operate the axis mapping according to the drive number, and use the AXIS_ADDRESS command to map the axis, also operate the IO mapping of the expansion module according to the device number, and use the NODE_IO command to map the IO, set DRIVE_PROFILE and ATYPE;

②  After successful initialization, enable the driver on the expansion module.

③  Enable and set the basic motion parameters ATYPE, UNITS, SPEED, ACCEL, FWD_IN, REV_IN and other axis parameters, and then send the motion command to drive the motor.

4.    After the setting is completed, the communication can be established. If the communication is successful, "controller status" - "slot 0 node" will display the information of the expansion module.
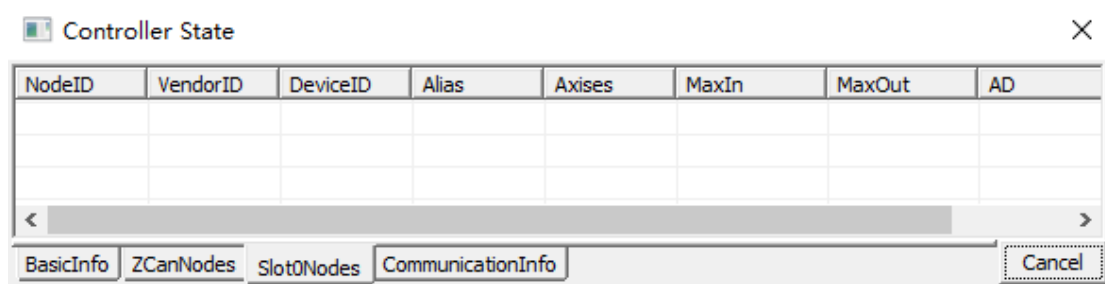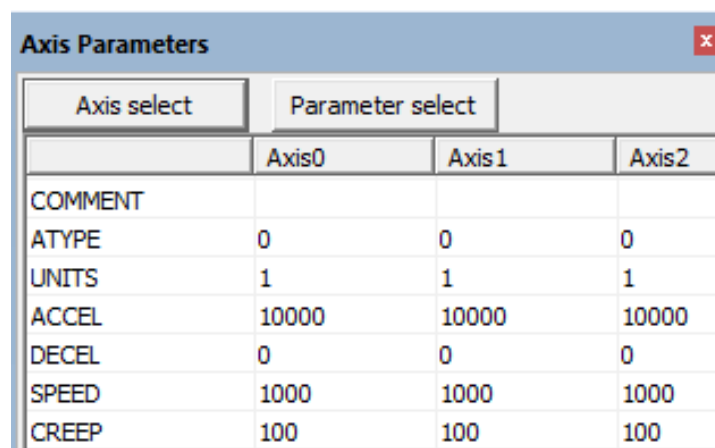
5.   Corresponding input state values can be directly read through "IN" command, or through "RTSys/Tool/IN". Please refer to ZBasic Programming Manual.
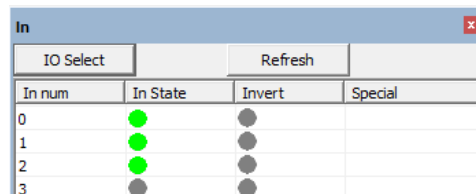


6.   Open or close outputs through "OP" command, or through "RTSys/Tool/OP". Please refer to ZBasic Programming Manual.
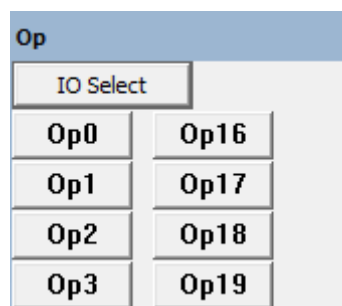


7.   There are many parameters related to pulse-axis, and they can be set through relative commands, please refer to RTBasic Programming Manual, or through "RTSys/View/Axis Parameter".

| | Axis0 | Axis1 | Axis2 |
|---|---|---|---|
| COMMENT | | | |
| ATYPE | 0 | 0 | 0 |
| UNITS | 1 | 1 | 1 |
| ACCEL | 10000 | 10000 | 10000 |
| DECEL | 0 | 0 | 0 |
| SPEED | 1000 | 1000 | 1000 |
| CREEP | 100 | 100 | 100 |

8. Through RTSys/Tool/Manual to operate relative motions.



## → **Notes:**

● Regardless of whether the IO on the expansion module is used or not, the NODE IO command needs to be used to map the input and output numbers of the EIO24088-V2. The DRIVE_PROFILE of the expansion module is set to 0, and the ATYPE is set to 65, but the actual axis type is not 65 because it is a pulse type drive. The configuration of the real axis type uses the SDO command to configure the data dictionary 6011h settings.

● If a hard limit alarm occurs during the initialization process, you can point the mapping number of the hard limit FWD_IN and REV_IN to -1 in the axis parameter window, which means no mapping, and then modify FWD_IN and REV_IN when the limit switch needs to be connected.

## 4.3. EtherCAT Bus Expansion Resource Mapping

### → IO Mapping:

The program on the controller can access the resources on the expansion module only through the IO number. The IO number of the EtherCAT bus expansion module is set through the bus command NODE_IO, and the input and output are configured at the same time.

When IO mapping, first check the maximum IO number of the controller itself (including the external IO interface and the interface in the pulse axis), and then use the command to set.

If the extended IO coincides with the IO number of the controller itself, the two will work at the same time, so the mapped number of the IO mapping must not be repeated in

the entire control system.

**IO mapping syntax:**

NODE_ IO( slot, node ) = iobase

slot: slot number, 0-default

node: device number, starting from 0

iobase : mapping the IO start number, the setting result will only be a multiple of 8

**Example:**

NODE_IO(0,0)=32         'set the IO start number of slot 0 interface device 0 to 32

If device 0 is EIO24088, after configuration according to the above syntax, the IO numbers corresponding to input IN0-23 are 32-55 in turn, the general input port numbers in the axis interface are 56-63, and the drive alarm inputs of axes AXIS 0-3 are 56-59 respectively. The IO numbers corresponding to the output OUT0-7 are 32-39 in sequence, the general output port numbers in the axis interface are 40-47, and the drive enable outputs of the axes AXIS 0-3 are 40-43 respectively.

| 0 | 41bh | 1ab0h | 0 | 8 | 32(32-63) | 16(32-47) | 0 |
|---|------|-------|---|---|-----------|-----------|---|

## → AXIS Mapping:

Before using the axis of the expansion module, you need to use the AXIS_ADDRESS command to map the axis number, and the axis mapping also needs to pay attention to the axis number of the entire system cannot be repeated. The mapping syntax of the EIO series extended axis is the same as that of the bus driver.

**Axis mapping syntax:**

AXIS_ADDRESS( axis number )=(slot number<<16)+driver number+1

**Example:**

AXIS_ADDRESS(0)=(0<<16)+0+1

        'the first drive on the EtherCAT bus, drive number 0, bound as axis 0

AXIS_ADDRESS(1)=(0<<16)+1+1

        'the second drive on the EtherCAT bus, drive number 1, bound as axis 1

If the first node is EIO24088, and EIO24088 is connected to drive, then driver 0 here is the first pulse driver connected to EIO24088, otherwise it is the EtherCAT driver.

# Chapter V Data Dictionary

**SDO command configures drive parameters:**

For example: the real axis type setting of the extended pulse axis is set through the data dictionary 6011h, (refer to the parameters in the table below, set in order according to the axis number, the first drive sets the data dictionary 6011h+0*800h, and the second drive sets 6011h+ 1*800h, and so on, add 800h for each drive, and the same for other parameters).

## 5.1. Input & Output

| Number | Description | Type | Read/write | Others |
|--------|-------------|------|------------|--------|
| 6000h | Input | ARRAY U8 | RO | 1-close |
| 6200h | Output | ARRAY U8 | RW | 1-open |
| 6206h | Abnormal output mode | ARRAY U8 | RW | 1-use abnormal output |
| 6207h | Abnormal output usage status | ARRAY U8 | RW | |

## 5.2. The First Drive on The First Expansion Module

| Number | Description | Type | Read/write | Others |
|--------|-------------|------|------------|--------|
| 6011h | Atype | UNSIGNED8 | RW | Axis type of expansion board:<br>● 0: virtual axis<br>● 1: step or servo of pulse directional<br>● 2: servo of analog signal control<br>● 3: orthogonal encoder<br>● 4: step + encoder |

|  |  |  |  |  |
|---|---|---|---|---|
|  |  |  |  | ● 5: step + pulse directional encoder<br>● 6: pulse directional encoder<br>● 7: pulse directional step/servo + EZ signal input |
| 6012h | Invert_Step | UNSIGNED16 | RW | See controller introduction Invert_Step |
| 6013h | Iolevel | UNSIGNED32 | RW | B0-origin electrical level<br>B1-limit position level<br>B8-automatic use enable signal<br>B9-use ALM signal to alarm<br>B11-B15: origin signal selection |
| 6014h | Axisstatus | UNSIGNED32 | RO | See controller introduction AXISSTATUS |
| 6040h | Controlword | UNSIGNED16 | RW | Relative master controller DRIVE_CONTROLWORD:<br><br>B0- Switch on<br>B1- Enable voltage<br>B3- Enable operation<br>B7- Fault reset |
| 6041h | Statusword | UNSIGNED16 | RO | Relative master controller DRIVE_STATUS:<br><br>B0 Ready to switch on<br>B1 Switch on |

| | | | | B2 Operation enabled |
| | | | | B3 Fault |
| | | | | B4 Voltage enabled |
| | | | | B5 Quick stop |
| | | | | B7 Warning |
| | | | | B8 EZ status |
| | | | | B9 Remote |
| | | | | B10 Target reached |
| | | | | B11 Internal limit active |
| | | | | B12-13 Operation mode specific |
| | | | | B14 EA status |
| | | | | B15 EB status |
| 6060h | Modes of operation | INTEGER 8 | RW | 6: homing<br>8: positioning in cycle |
| 607Eh | Polarity | INTEGER 8 | RW | 1- opposite direction<br>0- normal direction |
| 60fDh | Drive input compatibility | UNSIGNED 32 | RW | |

# Chapter VI Run and Maintain

The correct operation and maintenance of the device can not only guarantee and extend the life cycle of the equipment itself, but also take technical management measures according to the pre-specified plan or the corresponding technical conditions to prevent equipment performance degradation or reduce the probability of equipment failure.

## 6.1. Regular Inspection and Maintenance

The working environment has an impact on the device. Therefore, it is usually inspected regularly based on the inspection cycle of 6 months to 1 year. The inspection cycle of the device can be appropriately adjusted according to the surrounding environment to make it work within the specified standard environment.

| Check item | Check content | Inspection standards |
|---|---|---|
| power supply | Check whether the voltage is rated | DC 24 V ( -5%~5%) |
| surroundings | Whether the ambient temperature is within the specified range (when installed in the cabinet, the temperature inside the cabinet is the ambient temperature) | -10°C - 55°C |
| | Whether the ambient humidity is within the specified range (when installed in the cabinet, the humidity in the cabinet is the ambient humidity) | 10%-95% non-condensing |
| | Is there direct sunlight | No |
| | With or without droplets of water, oil, chemicals, etc. | No |
| | Whether there is dust, salt, iron filings, dirt | No |
| | Whether there is corrosive gas | No |
| | Whether there are flammable and explosive gases or articles | No |

| | Whether the device is subjected to vibration or shock | Should be within the range of vibration resistance and impact resistance |
|---|---|---|
| | Is the heat dissipation good | Keep good ventilation and heat dissipation |
| Installation and Wiring Status | Whether the basic unit and the expansion unit are installed firmly | The mounting screws should be tightened without loosening |
| | Whether the connecting cables of the basic unit and the expansion unit are fully inserted | The connection cable cannot be loosened |
| | Are the screws of the external wiring loose | Screws should be tightened without loosening |
| | Whether the cable is damaged, aged, cracked | The cable must not have any abnormal appearance |

## 6.2. Common Problems

| Problems | Suggestions |
|---|---|
| Controller can't communicate with EIO expansion module. | 1. Check whether controller or expansion module is powered on.<br>2. Check the wiring, whether the problem is cable, please try to change one cable. And please check EtherCAT IN and EtherCAT OUT wiring.<br>3. Check EtherCAT interface of expansion module and controller, they should be in good quality.<br>4. Check whether bus initialization program is correct.<br>5. Check whether expansion module addresses conflict, and IO mapping and axis mapping setting.<br>6. Check controller and expansion module firmware, try to update.<br>7. Check whether the controller supports expansion module, if not, please add XML file. |
| No signal comes to the | 1. Check whether IO power is needed. |

| input. | 2. Check whether the limit sensor is working normally, and whether the "IN" view can watch the signal change of the limit sensor. |
| | 3. Check whether the mapping of the limit switch is correct. |
| | 4. Check whether the limit sensor is connected to the common terminal of the controller. |
| The output does not work. | 1. Check whether IO power is needed. |
| | 2. Check whether the output No. is consistent with the No. that is operated. |
| No voltage and current signals on input channel | 1. Check whether IO power is needed. |
| | 2. Check whether the output No. is consistent with the No. that is operated. |
| POWER led is ON, RUN led is OFF. | 1. Check whether the power of the power supply is sufficient. At this time, it is best to supply power to the controller alone, and restart the controller after adjustment. |
| | 2. Check whether the ALM light flickers regularly (hardware problem). |
| RUN led is ON, ALM led is ON. | 1. Program running error, please check RTSys error code, and check application program. |