

# **XPLC516E Vision Motion Controller Hardware Manual**

Version 1.2

## Copyright statement

# Zmotion®

This manual is copyrighted by Shenzhen Technology Co., Ltd., without the written permission of the Zmotion Technology, no person shall reproduce, translate and copy any content in this manual.

ZMC controller software involved in details as well as the introduction and routines of each instruction, please refer to ZBASIC software manual.

Information contained in this manual is only for reference. Due to improvements in design and functions and other aspects, Zmotion Technology reserves the final interpretation! Subject to change without notice!



**Pay attention to safety when debug the machine! Be sure to design effective safety devices in the machine, and add error handling procedures in software. Zmotion has no obligation or responsibility for the loss.**

# Content

|         |  |           |
|---------|--|-----------|
| 1       | Chapter One Briefy Introduction .....  | 4         |
| 1.1     | Connection Configuration.....  | 4         |
| 1.2     | Installation and programming .....   | 5         |
| 1.3     | Features .....   | 6         |
| 2       | Chapter two Hardware Description .....   | 7         |
| 2.1     | XPLC516E Series Model Specification.....   | 7         |
| 2.2     | XPLC516E Wiring.....   | 8         |
|         | .....  | 8         |
| 2.2.1   | Power and CAN interface .....  | 9         |
| 2.2.2   | 232/485 Communication Interface COM .....  | 9         |
| 2.2.3   | General input/output signal.....   | 10        |
| 2.2.3.1 | General input interface example .....  | 12        |
| 2.2.3.2 | General output interface example .....   | 12        |
| 2.2.4   | Handwheel interface .....  | 12        |
| 3       | Chapter 3 Expansion Module.....  | 15        |
| 3.1     | Expansion Module, CAN bus, input and output, power supply wiring<br>reference..... | 15        |
| 4       | Chapter Four common problem .....  | 错误!未定义书签。 |
| 5       | Chapter Five Hardware Installation .....   | 17        |
| 5.1     | XPLC516E Installation .....  | 17        |

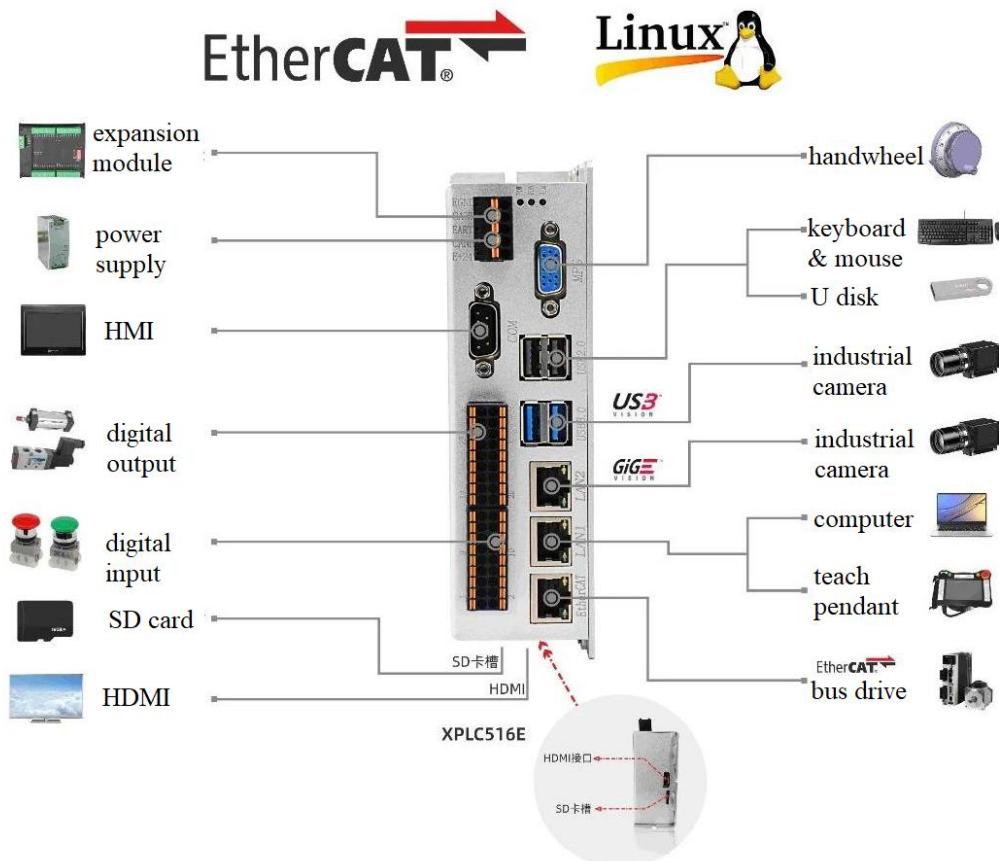
# Chapter I Briefy Introduction

XPLC is referred to fieldbus motion controller developed by ZMOTION.

XPLC516E vision motion controller integrates 1000M Ethernet, USB3.0 interface and USB2.0 interfaces (supports industrial cameras of various brands). It supports EtherCAT bus, CAN, 232, 485, encoder handwheel interface, and it has 16 inputs, 16 outputs, which means it has 32 local digital IO.

Motion control of XPLC516E up to 16 axes, it supports interpolation of linear, random, circular, space arc and helical, electronic cam, electronic gear, synchronous follow, virtual axis, etc. Real-time motion control can be achieved through optimized net communication protocol.

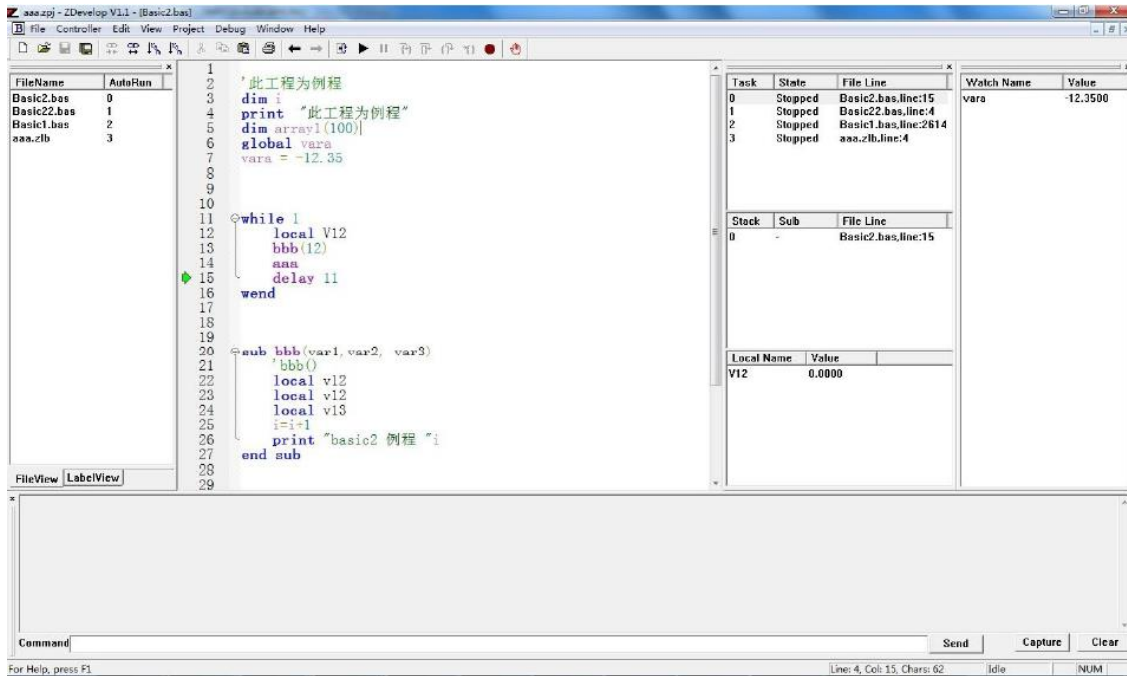
## 1.1 Connection Configuration



XPLC516E supports various communication interfaces, like, EtherCAT, Ethernet, USB, CAN, 485, 232, etc. Each expansion module can be linked through CAN and

EtherCAT, then to expand the numbers of digital, analog and motion-axis (there needs to connect a 120ohm resistance between two terminals of CAN bus).

## 1.2 Installation and programming



ZDevelop development environment

ZMC controller is programmed and debugged by ZDevelop software. ZDevelop, the software is easy to program, compile and debug. Likn ZDevelop and controller through serial, 485, USB or Ethernet.

Application procedures can be programmed by VC, VB, VS, C ++ Builder, C # and other software development. When debugs, Zevelop software can be connected with controller simultaneously, but needs a dynamic library when the procedure is running: zmotion.dll.

XPLC516E controller supports Linux system, and it provides Qt software (version 5.5.1), and supports embedded Qt development.

## 1.3 Features

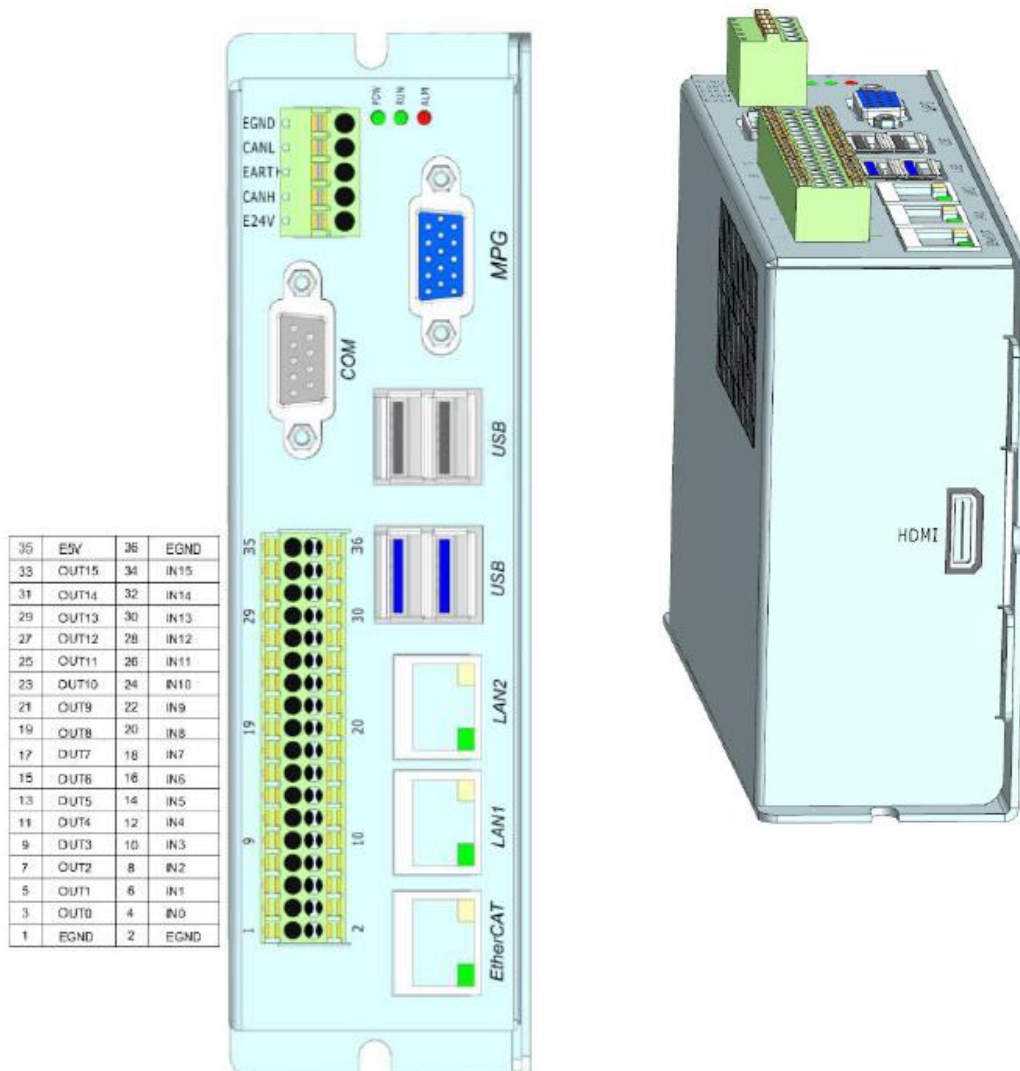
- Up to 32 axes EtherCAT bus motion control (EtherCAT, Encoder, Virtual).
- Encoder interface supports encoder position measurement, which can be configured as handwheel input mode.
- 16 NPN general outputs. 12 channels are high-speed output, 4 channels are low-speed output, the max output current can reach 300mA, which can drive some solenoid valves directly.
- 16 PNP general inputs. 2 channels are high-speed input, 12 channels are low-speed input. High-speed input can be configured to latch signals.
- Isolation inputs and outputs can be extended to 4096 through EtherCAT.
- 4 USB (2 USB3.0 interfaces) 1 RS485, 1 RS232, two 1000M Ethernet interfaces and one 100M EtherCAT interface.
- Support max 16 axes interpolation of linear, random, circular, arc, helical and spline.
- Support electronic cam, electronic gear, position latch, synchronous follow, virtual axis, etc.
- Support hardware comparison output (HW\_PSWITCH2), hardware timer, precision output in motion.
- Support pulse closed loop, pitch compensation and other functions.
- Support multi-task and multi-file program in ZBasic.
- A variety of program encryption to protect intellectual property rights of customers.
- Power failure storage and power failure detection.

## Chapter II Hardware Description

### 2.1 XPLC516E Series Model Specification

|                                 | XPLC516E   |
|---------------------------------|--|
| <b>Basic axes</b>               | 16   |
| <b>Max extended axes</b>        | 32   |
| <b>Basic axes type</b>          | EtherCAT, 4 pulse axes, 1 single-ended encoder axis, 1 handwheel encoder axis. |
| <b>Inner IOs</b>                | 16 inputs and 16 outputs (with over current protection)                        |
| <b>Max IOs</b>                  | 4096   |
| <b>PWM</b>                      | 2  |
| <b>Max AD/DA</b>                | 128/64   |
| <b>Pulse bit</b>                | 64   |
| <b>Encoder bit</b>              | 64   |
| <b>Speed (acceleartion) bit</b> | 64   |
| <b>Max pulse speed</b>          | 500k   |
| <b>Motion axis buffer</b>       | 4096   |
| <b>Array space</b>              | 1280000  |
| <b>Procedure space</b>          | 64MB   |
| <b>Flash space</b>              | 512MB  |
| <b>Power input</b>              | 24V DC input (power is within 20W), IO load is not included.                   |
| <b>Communication interface</b>  | RS232, RS485, Ethernet, USB, CAN, EtherCAT                                     |
| <b>Size</b>                     | 162*47*119MM   |

## 2.2 XPLC516E Wiring



XPLC516E has 16 axes, virtual axis can reach 32, and axis can be extended through expansion module.

XPLC516E has 4 single port pulse axes, one handwheel interface, and with one single port encoder.

XPLC516E board has 16 general inputs and 16 general outputs.

XPLC516E has 1 RS485, 1 RS232, 2 1000M Ethernet interfaces and 1 EtherCAT.

XPLC516E has 1 CAN interface and supports link to expansion module through ZCAN protocol.

XPLC516E has 2 USB3.0 and 2 USB2.0 interfaces.

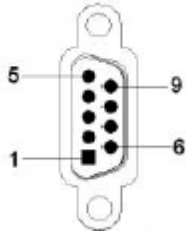
XPLC516E has 1 HDMI interface, which is used to connect with display screen.



## 2.2.1 Power and CAN interface

| Pin NO. | Signal | Description               |
|---------|--------|---------------------------|
| 1       | E24V   | External power 24V input  |
| 2       | CANH   | CAN differential signal + |
| 3       | EARTH  | Safety/Shield layer       |
| 4       | CANL   | CAN differential signal - |
| 5       | EGND   | External power ground     |

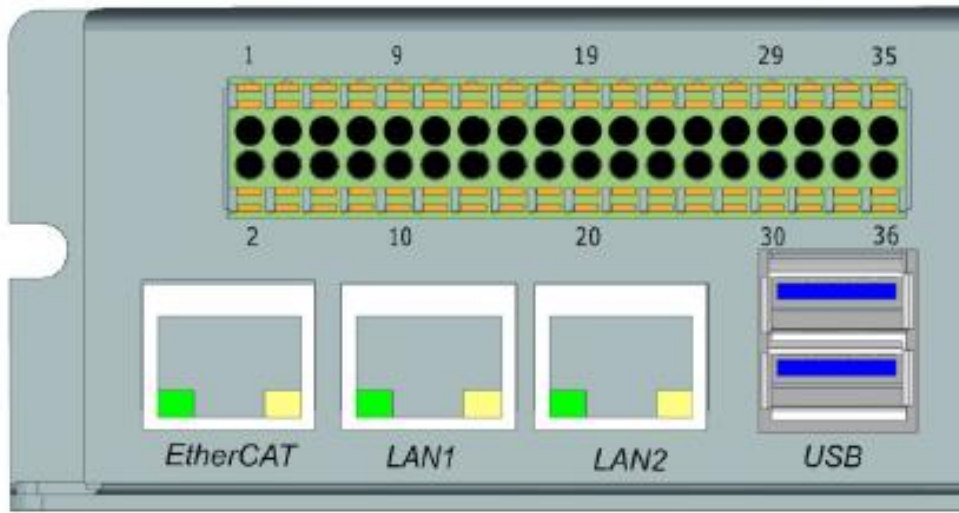
## 2.2.2 232/485 Communication Interface COM



| Pin NO. | Signal | Description                           |
|---------|--------|---------------------------------------|
| 1       | NC     |                                       |
| 2       | RXD    | 232 Serial receive signal             |
| 3       | TXD    | 232 Serial send signal                |
| 4       | 485A   | 485 signal A+                         |
| 5       | EGND   | Communication signal reference ground |
| 6       | NC     |                                       |
| 7       | 485B   | 485 signal B-                         |
| 8       | NC     |                                       |
| 9       | NC     |                                       |

- ⚠ Use double head 2.3 crossover cable to connect with the computer.
- ⚠ RS232 is port 0, RS458 is port 1.
- ⚠ When CAN bus connects with multi controllers, there needs with a 120ohm resistance between CANL and CANH of controller.

### 2.2.3 General input/output signal



| Pin NO. | Signal | Description           | Pin NO. | Signal | Description           |
|---------|--------|-----------------------|---------|--------|-----------------------|
| 1       | EGND   | External power ground | 2       | EGND   | External power ground |
| 3       | OUT0   | Output 0, PWM 0       | 4       | IN0    | Input 0, latch A      |
| 5       | OUT1   | Output 1, PWM 1       | 6       | IN1    | Input 1, latch B      |
| 7       | OUT2   | Output 2              | 8       | IN2    | Input 2               |
| 9       | OUT3   | Output 3              | 10      | IN3    | Input 3               |
| 11      | OUT4   | Output 4              | 12      | IN4    | Input 4               |
| 13      | OUT5   | Output 5              | 14      | IN5    | Input 5               |

|    |       |   |    |      |                       |
|----|-------|---|----|------|-----------------------|
| 15 | OUT6  | Output 6  | 16 | IN6  | Input 6               |
| 17 | OUT7  | Output 7  | 18 | IN7  | Input 7               |
| 19 | OUT8  | Output 8, DIR3                                      | 20 | IN8  | Input 8               |
| 21 | OUT9  | Output 9, PUL3                                      | 22 | IN9  | Input 9               |
| 23 | OUT10 | Output 10, DIR2                                     | 24 | IN10 | Input 10              |
| 25 | OUT11 | Output 11, PUL2                                     | 26 | IN11 | Input 11              |
| 27 | OUT12 | Output 12, DIR1                                     | 28 | IN12 | Input 12              |
| 29 | OUT13 | Output 13, PUL1                                     | 30 | IN13 | Input 13              |
| 31 | OUT14 | Output 14, DIR0                                     | 32 | IN14 | Input 14              |
| 33 | OUT15 | Output 15, PUL0                                     | 34 | IN15 | Input 15              |
| 35 | E5V   | External 5V power output generated from 24V, <300mA | 36 | EGND | External power ground |



Input 0 and input 1 both has EA1, EB1 and EZ1 encoder input function simultaneously.

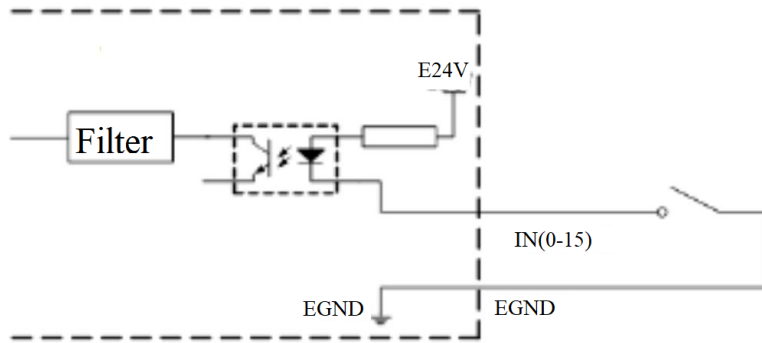


Pulse port can use E5V commonanode output or E24V commonanode output.

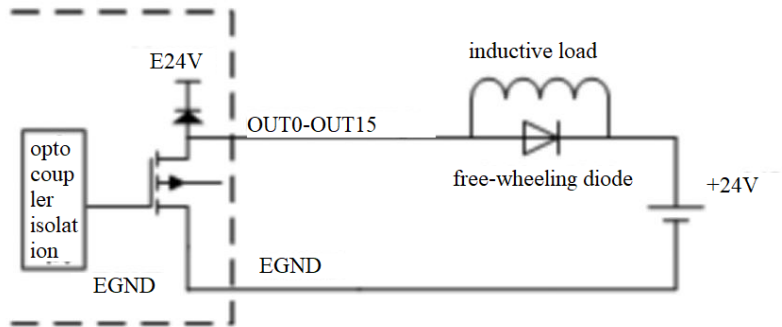


When virtual axis is relatively configured (atype=0), it is common output port, or it is axis signal.

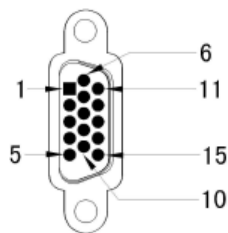
### 2.2.3.1 General input interface example



### 2.2.3.2 General output interface example



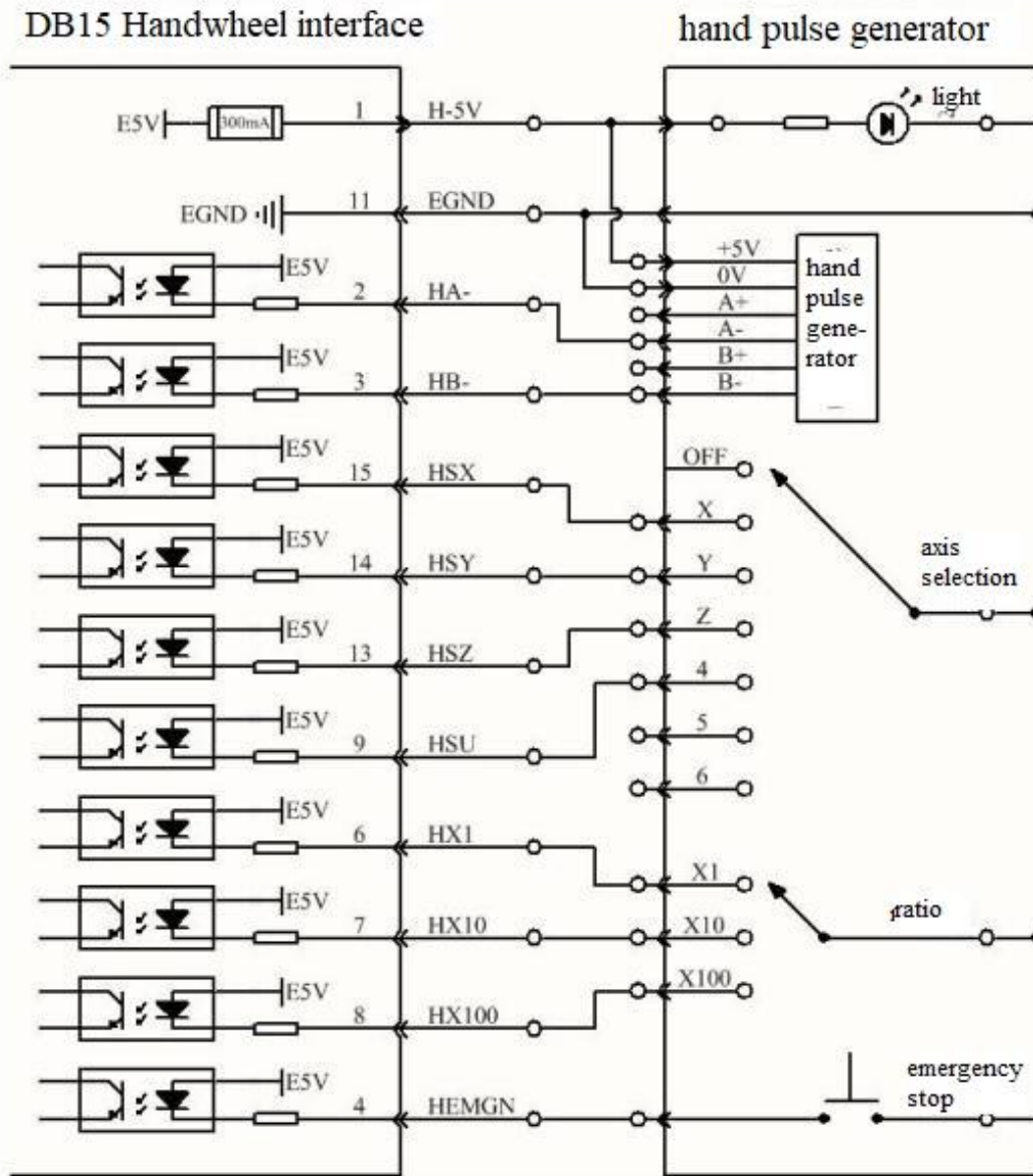
### 2.2.4 Handwheel interface



◆ The encoder physical axis number of handwheel is 0.

| Pin NO. | Signal | Description                        |
|---------|--------|------------------------------------|
| 1       | H-5V   | 5V output, offer power for encoder |

|    |       |                               |
|----|-------|-------------------------------|
| 2  | HA-   | Encoder A phase signal (IN16) |
| 3  | HB-   | Encoder B phase signal (IN17) |
| 4  | HEMGN | Emergency stop signal         |
| 5  | NC    |                               |
| 6  | HX1   | Ratio X1 (IN18)               |
| 7  | HX10  | Ratio X10 (IN19)              |
| 8  | HX100 | Ratio X100 (IN20)             |
| 9  | HS3   | Select axis 3 (IN24)          |
| 10 | HS4   | Select axis 4 (IN25)          |
| 11 | EGND  | Signal reference ground       |
| 12 | HS5   | Select axis 5 (IN26)          |
| 13 | HS2   | Select axis 2 (IN23)          |
| 14 | HS1   | Select axis 1 (IN22)          |
| 15 | HS0   | Select axis 0 (IN21)          |



hanwheel wiring circuit schematic

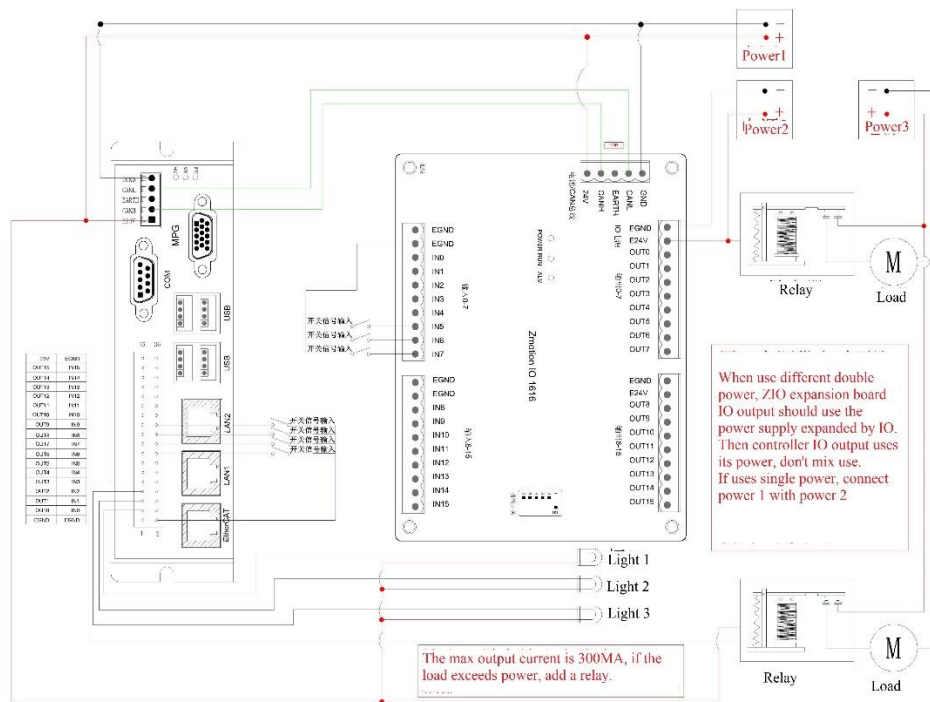
# Chapter III Expansion Module

See "ZIO Expansion Card Hardware Manual"

**!** XPLC516E controller uses single power. ZIO expansion module uses double power to supply, in actual application, ZIO power channels on expansion modules can share the same power supply. When controller and ZIO module uses different powers, the EGND of controller must be connected to the GND of expansion modules, otherwise CAN bus may be burned out.

**!** When multi expansion modules are linked on CAN bus, it is necessary to connect 120Ω resistor between CANL and the CANH on the last IO expansion module.

## 3.1 Expansion Module, CAN bus, input and output, power supply wiring reference



## Chapter IV Common Problems

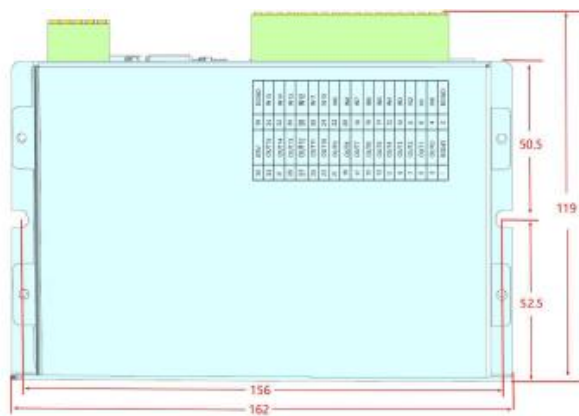
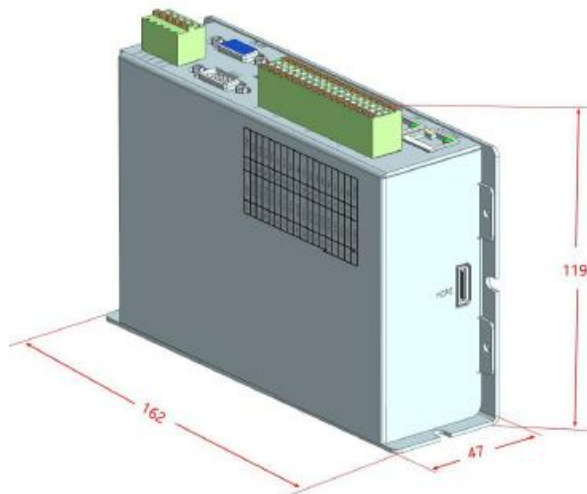
| Problems  | Suggestions   |
|---|---|
| Motor does not rotate.  | <p>Check whether the ATYPE of the controller is correct;</p> <p>Check whether the pulse input mode is matched with the input pulse mode of the drive;</p> <p>Check whether the motor already reached hardware or software position limit, resulting in ALM signal comes.</p> <p>Check whether pulse count is normal in ZDEVELOP.</p>  |
| The controller worked normally, pulses is sent out normally, motor still does not rotate. | <p>Check whether connection between drive and motor is correct and whether connection between the drive and the controller is in good contact;</p> <p>Check whether the drive works properly and there is no alarm.</p>   |
| Motor can rotate, but it doesn't work normally.   | <p>Check whether deceleration and speed exceed the device limit;</p> <p>Check whether pulse frequency output exceed the receiving limit of the drive;</p> <p>Check whether connection between controller and drive are correct and whether anti-interference measures are well done;</p> <p>Check whether current limiting resistance used in the photoelectric isolation circuit of pulse and direction signal output is too large and the working current is too small.</p> |
| Motor is under control, but it may oscillate or overturn sometimes.                       | <p>Check whether the drive parameters setting is correct.</p> <p>Check whether acceleration or deceleration period and motion speed were set properly in software.</p>  |
| Motor is under control, but homing position is inaccurate.                                | <p>Check whether the origin signal switch works normally;</p> <p>Check whether the origin signal is disturbed.</p>  |
| The position limit signal is invalid.   | <p>Check whether the position limit sensor is not working normally;</p> <p>Check whether the signal of the limit sensor is disturbed;</p>   |
| The expansion module can't be connected, and alarm light of the expansion module is on.   | <p>Check whether there is a 120Ω resistor at both ends;</p> <p>Check whether multi expansion modules use the same ID.</p>   |
| No signal comes to the input.   | <p>Check whether the IO is supplied normally;</p>   |

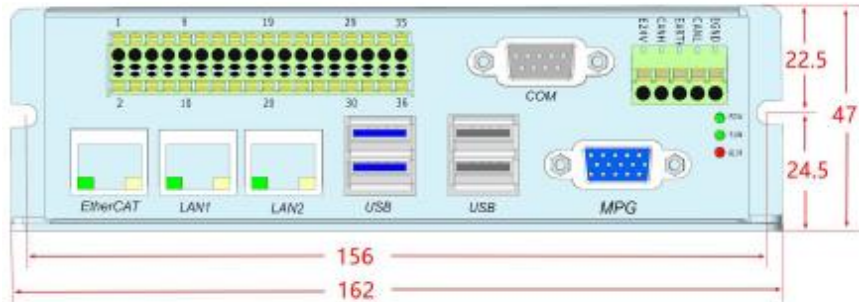


|  |  |
|--|--|
|  | <p>Check whether the input signal level matches the input channel.</p> <p>Check whether the input number matches the ID of the IO board.</p>           |
| <p>The output does not work.</p>                         | <p>Check whether the IO is supplied normally;<br/>The IO also needs supply.</p> <p>Check whether the output number matches the ID of the IO board.</p> |
| <p>The motor will move around suddenly after a while</p> | <p>Check drive introduction if there needs to connect with GND.</p>  |

## Chapter V Hardware Installation

### 5.1 XPLC516E Installation





Unit: mm

Install hole diameter: 4.5mm

## Chapter VI Appendix

### 6.1 Electronic Technology Parameter

#### 6.1.1 Power demand

| Item                        | Parameter                               |
|-----------------------------|---|
| Power voltage               | Recommendation for DC24V, up to 18V-36V |
| Initial current (when open) | 0.7A (DC24V)                            |
| Working current             | 0.5A (DC24V)                            |

#### 6.1.2 Working environment

| Item                | Parameter             |
|---------------------|-----------------------|
| Working temperature | 0-60°C (32°F-140°F)   |
| Relative humidity   | 5%-90% non-condensing |