

ZMC316 Hardware Manual

Version 1.5

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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 to add error handling procedures in software. Zmotion has no obligation or responsibility for the loss.

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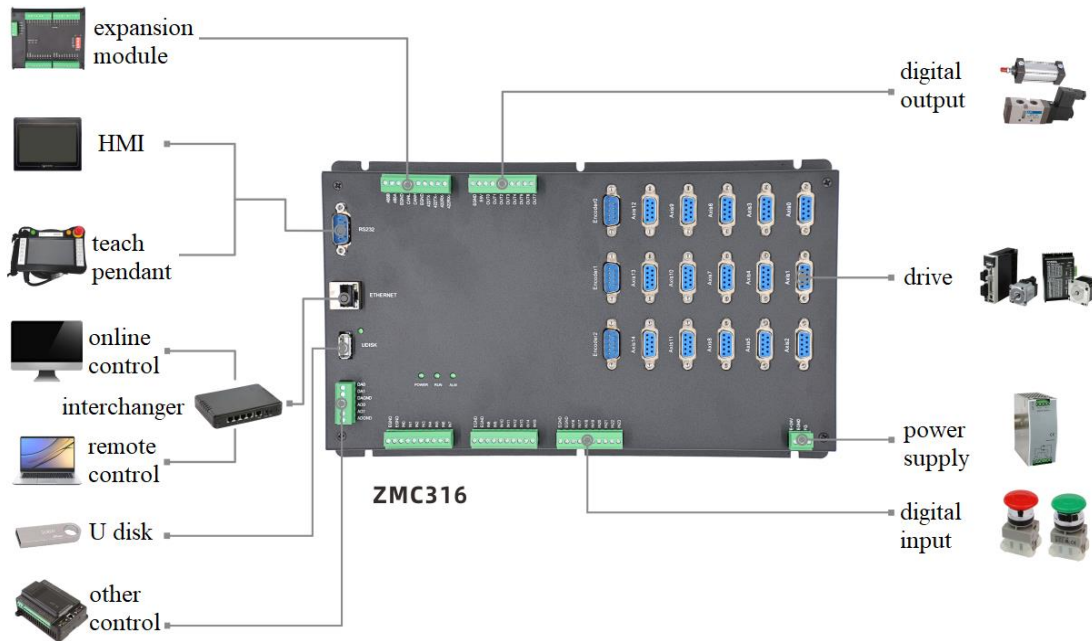
Chapter I Controllers Introduction

ZMC is the abbreviation of network motion controller published by ZMOTION.

ZMC316 series controllers support linear interpolation of up to 24 axes, interpolation of random, spherical or helical, electronic cam, electronic gear, synchronous follow, virtual axis, etc. Real-time motion control can be realized by using optimized network communication protocol.

One computer can link with up to 256 ZMC controllers.

1.1 Connection Configuration

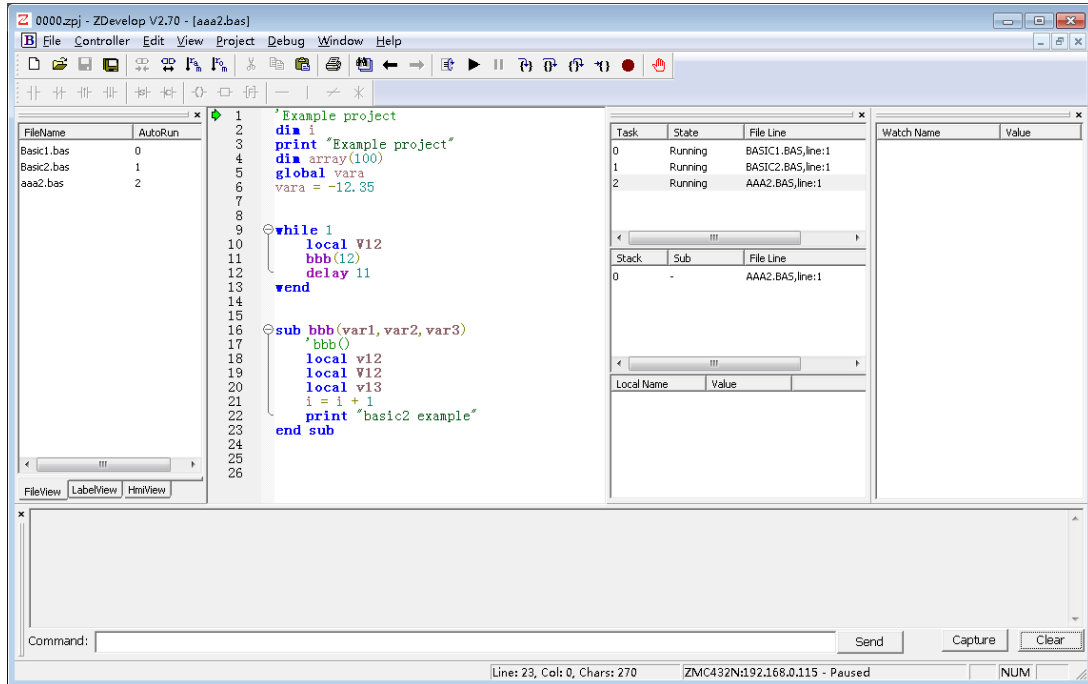


Typical Connection Configuration

ZMC motion controller supports Ethernet, USB, CAN, 485 and other communication interfaces, each expansion module can be connected through CAN bus to extend the inputs and outputs or axes of motion (Resistance of 120Ω is required between CANH and CANL).

ZMC controller supports data saving or reading through USB Drive. (Except for ZMC00X series).

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. Link 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, Zvelop software can be connected with controller simultaneously, but needs a dynamic library when the procedure is running: zmotion.dll.

1.3 Features

- Motion control of up to 24 axes.
- Pulse output mode: Directional / pulse or double mode.
- Encoder position measurement is supported and can be configured as hand wheel input mode.
- Maximum output pulse frequency of each axis is 8MHZ.
- Isolation inputs or outputs can reach 512 through CAN bus.
- The positive or negative position limit signal / origin signal of axis can be configured to any inputs.
- The output current can reach 300mA, which can directly drive some kinds of solenoid valves.
- Interfaces: USB Drive, RS485, RS422 and Ethernet.
- Linear interpolation of up to 24 axes, interpolation of random circular, spherical and helical.
- Electronic cam, electronic gear, position latch, synchronous follow and virtual axis, etc.
- Pulse closed loop, pitch compensation and other functions.
- Multi-file and multi-task programming in ZBasic.
- A variety of program encryption methods to protect the intellectual property rights of customers.
- Power failure detection and power failure storage.

Chapter II Hardware Description

2.1 ZMC316 Series Controller

	ZMC316
Axes	16
Maximum extended axes	24
Type of basic axes	Pulse output, 3 axes with encoders
Internal IO	24+15 inputs, 8+15 outputs
Maximum extended IO	Up to 512 inputs and 512 outputs
PWM	2(occupy output, output frequency is 1M)
Internal ADDA	2 ADs, 2 DAs (0-10V).
Maximum extended AD/DA	520 ADs, 520 DAs
Pulse bits	32
Encoder bits	32
Speed/Acceleration bits	32
Max pulse frequency	10MHZ
Axis motion buffer	128
Array space	160000
Procedure space	2Mbyte
Flash space	128MByte
Power input	24V DC input (since consumption is within 10W, fan cooling is not needed), IO consumption is not included.
Communication	RS232, RS485, RS422, Ethernet, U disk, CAN
Dimension	302*180mm

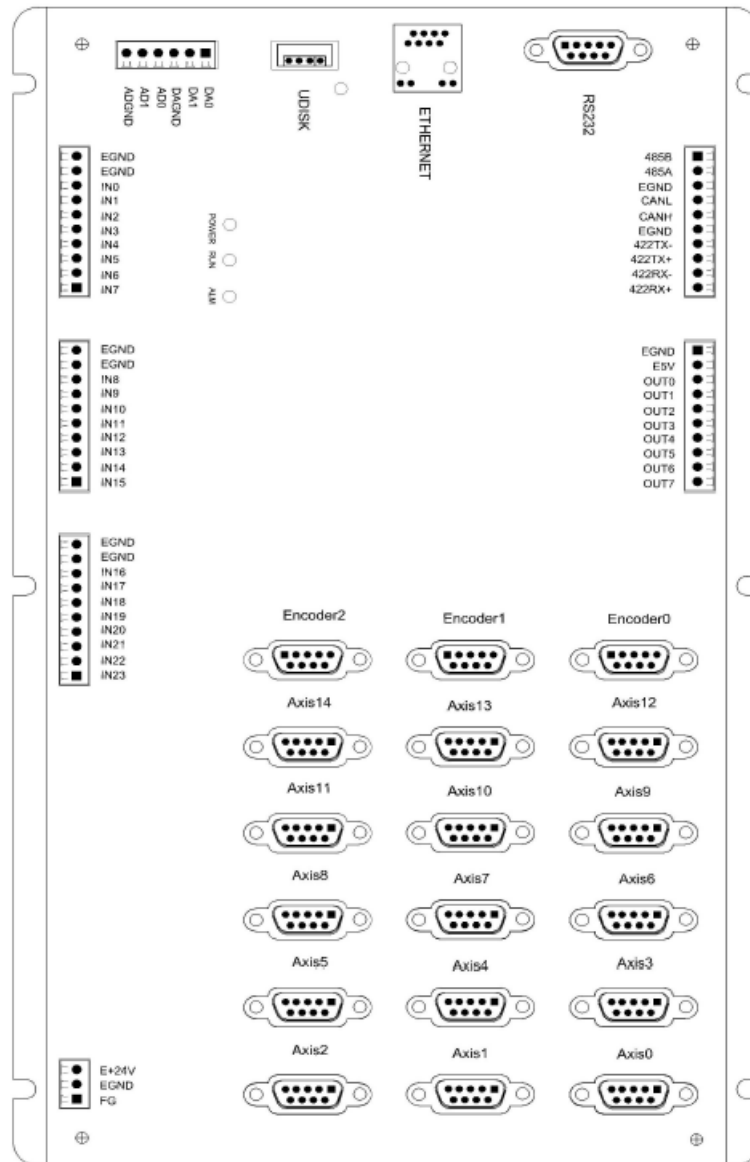


The last axis is controlled by PWM.

2.1.1 Order Information

Model	Specification
ZMC316	16 axes, point to point, interpolation of linear, circular, electronic cam, continuous interpolation, robotics instruction.
ZMC316-1	16 axes, point to point, electronic cam.
ZMC316-2	16 axes, point to point, interpolation of linear, electronic cam.
ZMC316-6	16 axes, point to point, interpolation of linear, circular, electronic cam.

2.2 Wiring Reference

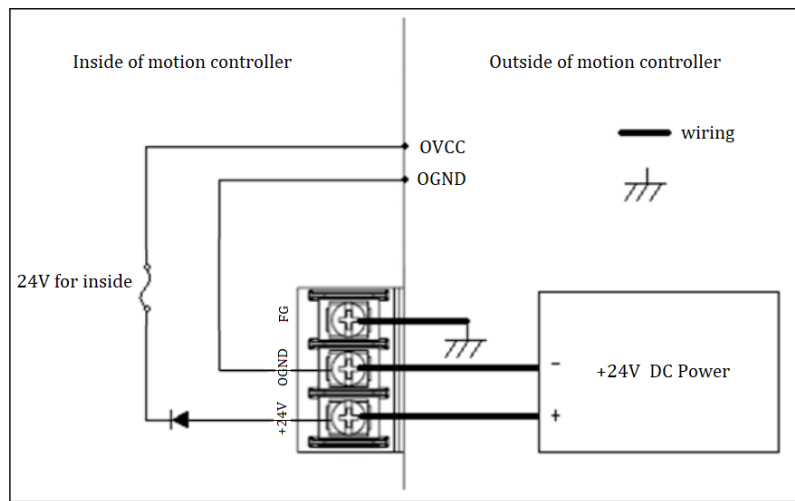


There are 16 basic axes in ZMC316, and up to 24 virtual axes. Axes can be extended through expansion modules.


There are 24+15 general inputs and 8+15 general output in ZMC316 (the first 15 axes with another 1 input and 2 outputs), 2 ADs(0-10V) and 2 DAs(0-10V), and with interfaces, 1 RS232, 1 RS485, 1RS422, 1 Ethernet and 1 USB drive embedded.

1 CAN bus, which is used to link expansion modules through ZCAN communication protocol.

2.2.1 Power Interface





PIN	Name	Description
1	+24V	Power 24V input
2	EGND	Power ground
3	FG/EARTH	Shield layer


 ZMC316 series uses signal power, ZMC0-2 series and ZIO expansion card use double power.

2.2.2 Communication Interface

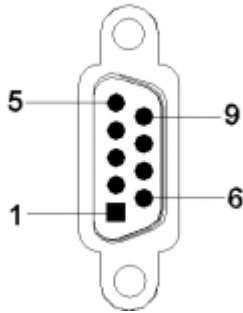
PIN	Name	Description
1	485B	485-
2	485A	485+
3	EGND	Power ground
4	CANL	CAN differential data+
5	CANH	CAN differential data -
6	EGND	Power ground
7	422TX-	422 Send -
8	422TX+	422 Send +
9	422RX-	422 Receive -
10	422RX+	422 Receive +

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

 Communication interfaces on ZMC3 series controllers usually use external 24V power. Be careful when linking with other controllers or touch screen.

 For CAN bus communication, when using different powers, GND of controller and GND of expansion module should be connected together. When ZMC316 controller and expansion module use different powers, controller power EGND should be linked with expansion module power GND, otherwise, CAN will be burned.

2.2.3 RS232 Interface

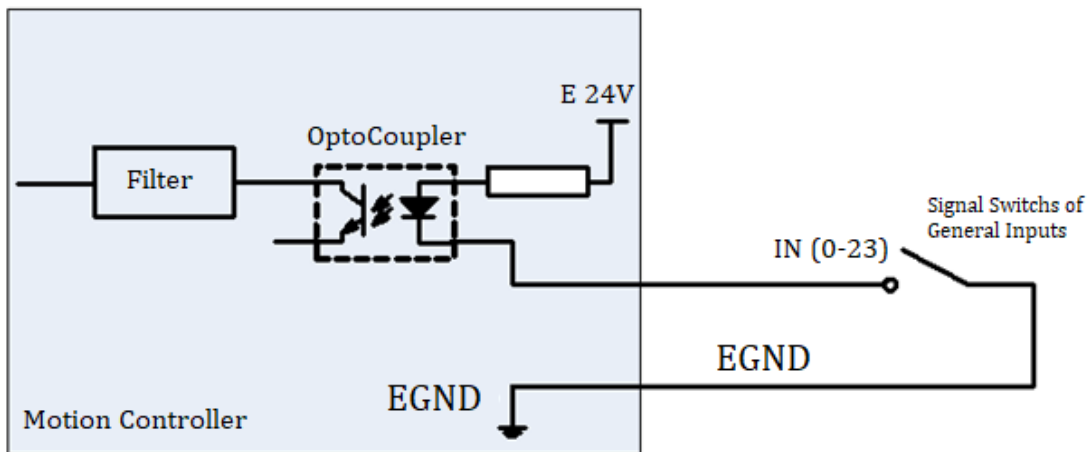


Pin definition of RS232 as follows:

PIN	Name	Description
2	RXD	Receive data PIN
3	TXD	Send data PIN
5	EGND	External power ground
9	E5V	External 5V output, it supplies text screen.

! 2.3 crossover cable with two female head is needed when try to link to computer.

2.2.4 General Input signal




digital input wiring reference

! Each axis signal has another 1 general input, please see axis interface description.

2.2.4.1 Input 0-7

PIN	Name	Description	Default
1	EGND	External power ground	
2	EGND	External power ground	
3	IN0	High speed input 0	Latch A, EA3
4	IN1	High speed input 1	Latch B, EB3
5	IN2	Input 2	EZ3
6	IN3	Input 3	
7	IN4	Input 4	
8	IN5	Input 5	
9	IN6	Input 6	
10	IN7	Input 7	

 Input0 and input1 support simultaneously latch A and latch B.

 Encoder 3 is reserved as 24V encoder, it also supports 24V handwheel input.

2.2.4.2 Input 8-15

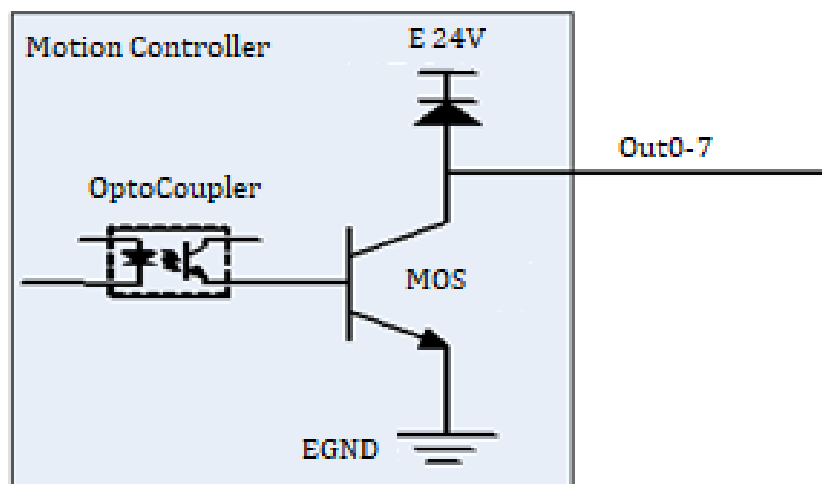
PIN	Name	Description	Default
1	EGND	External power ground	
2	EGND	External power ground	
3	IN8	Input 8	
4	IN9	Input 9	
5	IN10	Input 10	
6	IN11	Input 11	
7	IN12	Input 12	
8	IN13	Input 13	
9	IN14	Input 14	

10	IN15	Input 15	
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2.2.4.3 Input 16-23

PIN	Name	Description	Default
1	EGND	External power ground	
2	EGND	External power ground	
3	IN16	Input 16	
4	IN17	Input 17	
5	IN18	Input 18	
6	IN19	Input 19	
7	IN20	Input 20	
8	IN21	Input 21	
9	IN22	Input 22	
10	IN23	Input 23	

2.2.5 General Output





Output wiring reference



Each axis signal has another 1 general output that has no current amplification.

PIN	Name	Description
1	EGND	External power ground
2	E5V	Generated 5V power outside, output
3	OUT0	Output 0, PWM 0
4	OUT1	Output 1, PWM 1
5	OUT2	Output 2, PUL15
6	OUT3	Output 3, DIR15
7	OUT4	Output 4
8	OUT5	Output 5
9	OUT6	Output 6
10	OUT7	Output 7

 **OUT0, OUT1 support PWM function, they are general outputs when PWM functions are shut down.**

 **OUT2/3 are regarded as axis 15 single-ended type using common anode 5V supply), they are general output when ATYPE is not configured.**

2.2.6 ADDA Signal

PIN	Name	Description
1	AOUT0	Channel 0 outputs, 0-10V, 12 bits resolution
2	AOUT1	Channel 1 outputs, 0-10V, 12 bits resolution
3	DAGND	Analog reference ground
4	AIN0	Channel 0 outputs, 0-10V, 12 bits resolution
5	AIN1	Channel 1 outputs, 0-10V, 12 bits resolution
6	ADGND	Analog reference ground

 **ZMC316 inner ADDA uses internal power.**

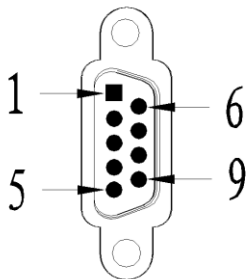
2.2.7 USB Drive

PIN	Name	Description
1	V	Internal +5V power
2	D-	Differential data D-
3	D+	Differential data D+
4	GND	Internal power ground

2.2.8 Axis Interface

- ◆ It provides 0V and + 5V output, which also can provide 5V power for the encoder.
- ◆ Do set its parameter ATYPE before use axis.

2.2.8.1 Axis 0-14

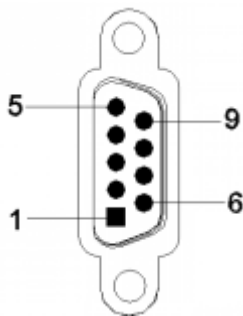


Alarm input and axis enable output can be used as general input or output, no current amplification in enable output.

PIN	Name	Description
1	PUL+	Pulse differential+
2	PUL-	Pulse differential-
3	DIR+	Directional differential+
4	DIR-	Directional differential -

5	GND	Internal 0V
6	ALM(IN24-38)	Alarm in (can be configured as general input)
7	SERVON (OUT8-22)	Axis enable (can be used as general output, no current amplification)
8	5V	Internal 5V
9	EGND	External ground

2.2.8.2 Encoder 0-2



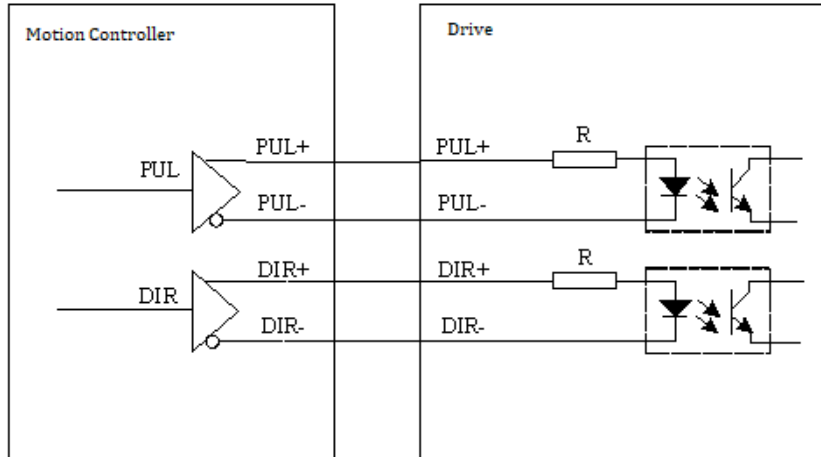
! The encoder can be accessed through axis 16-18.

! Encoder uses DB9 male head, pay attention to the pin's position.

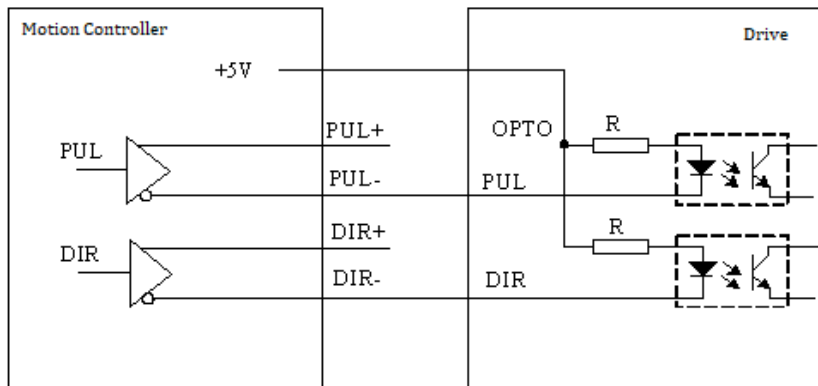
PIN	Encoder mode name	Description
1	EA+	
2	EA-	
3	EB+	
4	EB-	
5	GND	Internal 0V
6	EZ+	
7	EZ-	
8	5V	Internal 5V
9		

2.2.9 Axis Wiring Reference

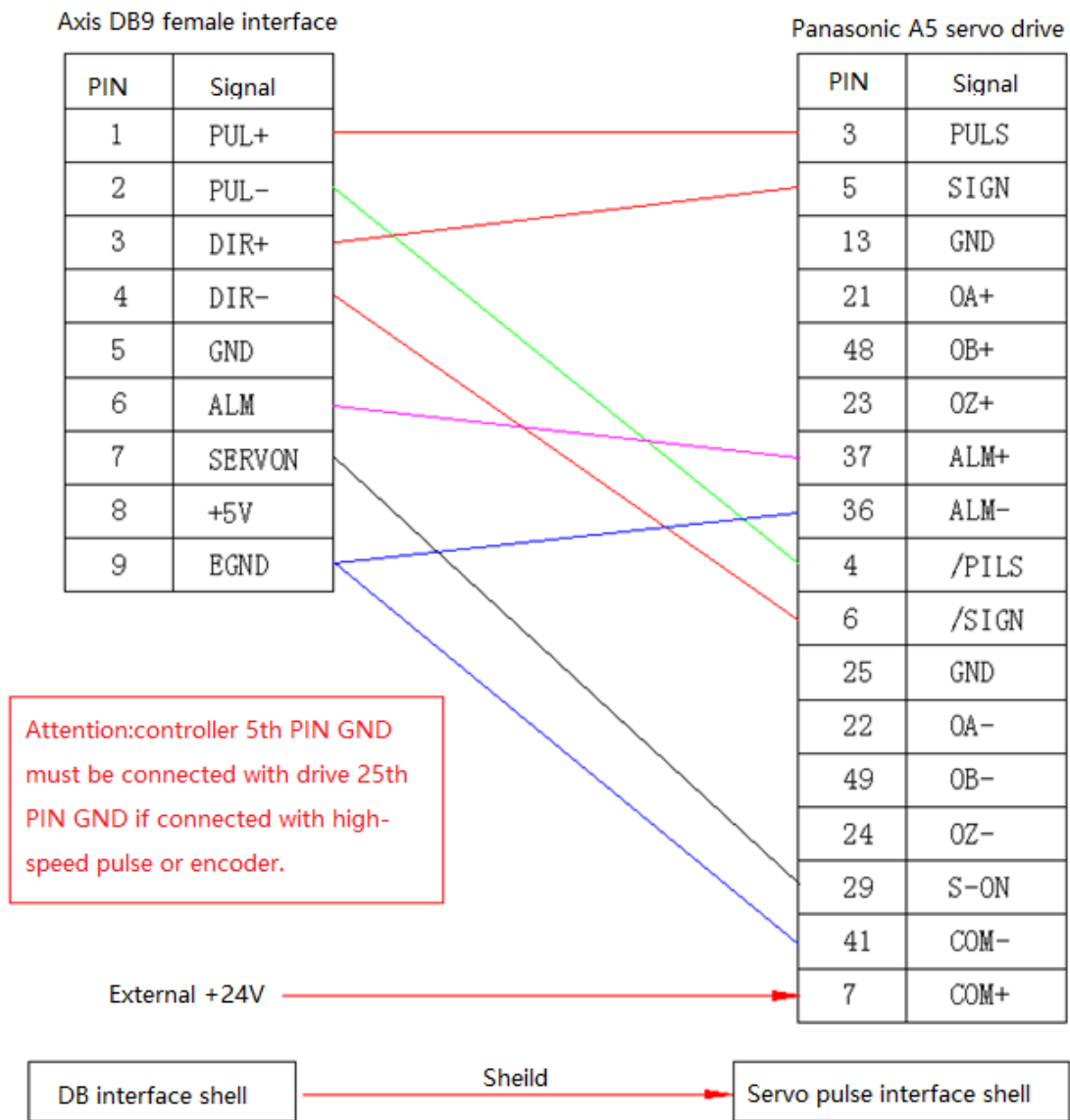
2.2.9.1 Wiring Reference for Low-speed Differential Pulse



Differential Connection



Single-ended Connection

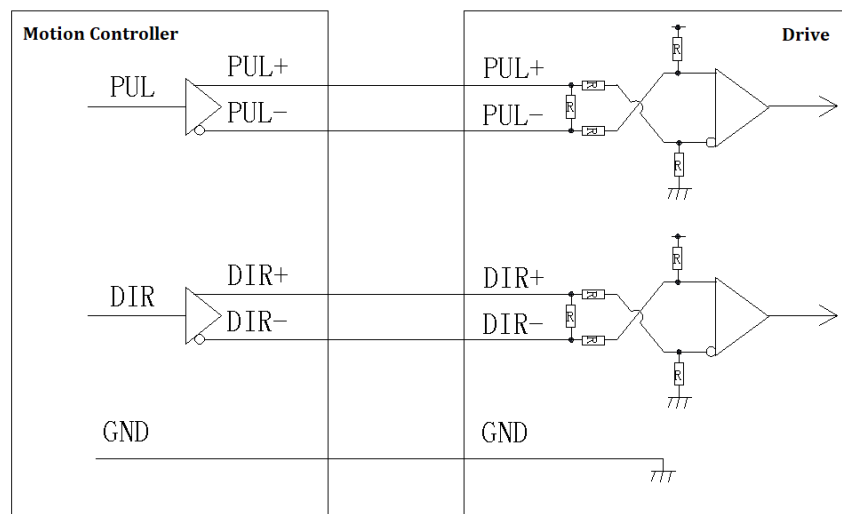


wiring reference of Panasonic drive low-speed pulse and ZMC316

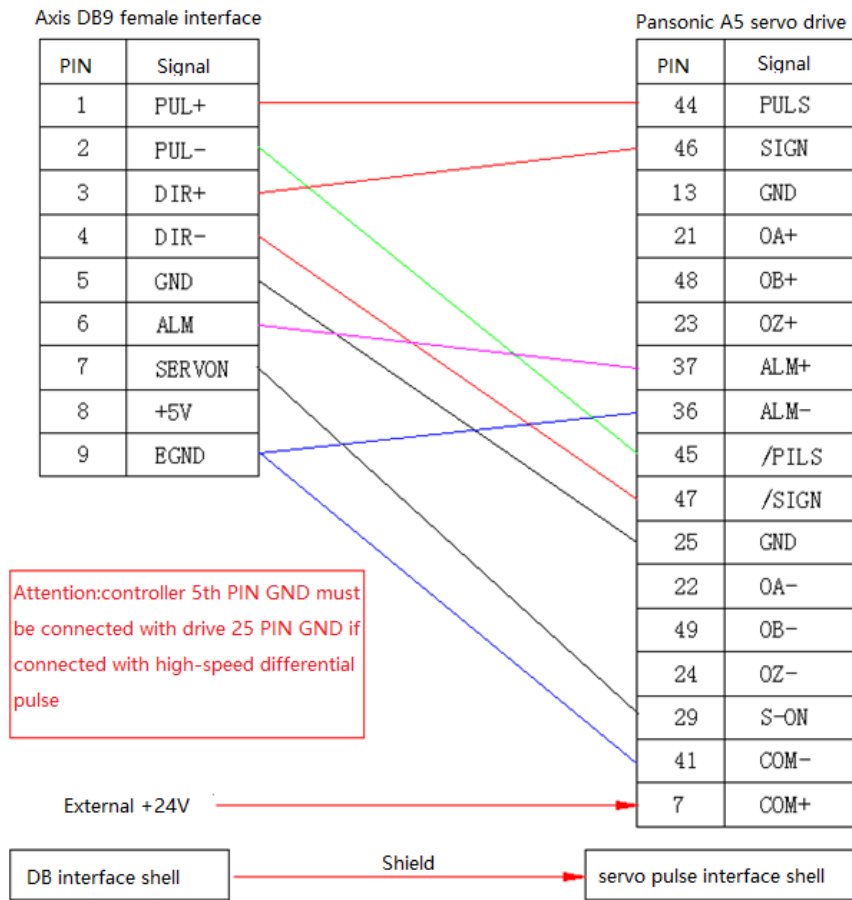
! If a high-speed differential pulse or encoder is connected, 5 PIN (GND) of controller and 25 PIN(GND) of drive should be connected together.

2.2.9.2 Wiring reference for High-speed Differential Pulse

! If the low-speed differential pulse meets speed requirement, use low-speed differential pulse preferentially. Or if need to use high-speed differential pulse, do connect internal digital GND of controller with GND of high-speed pulse interface of drive.

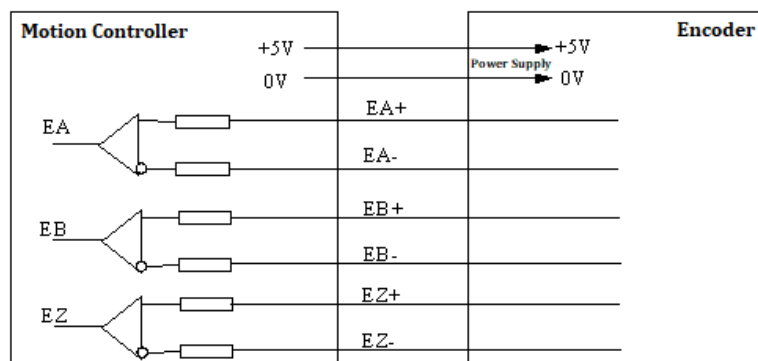


High-speed Differential Pulse Connection

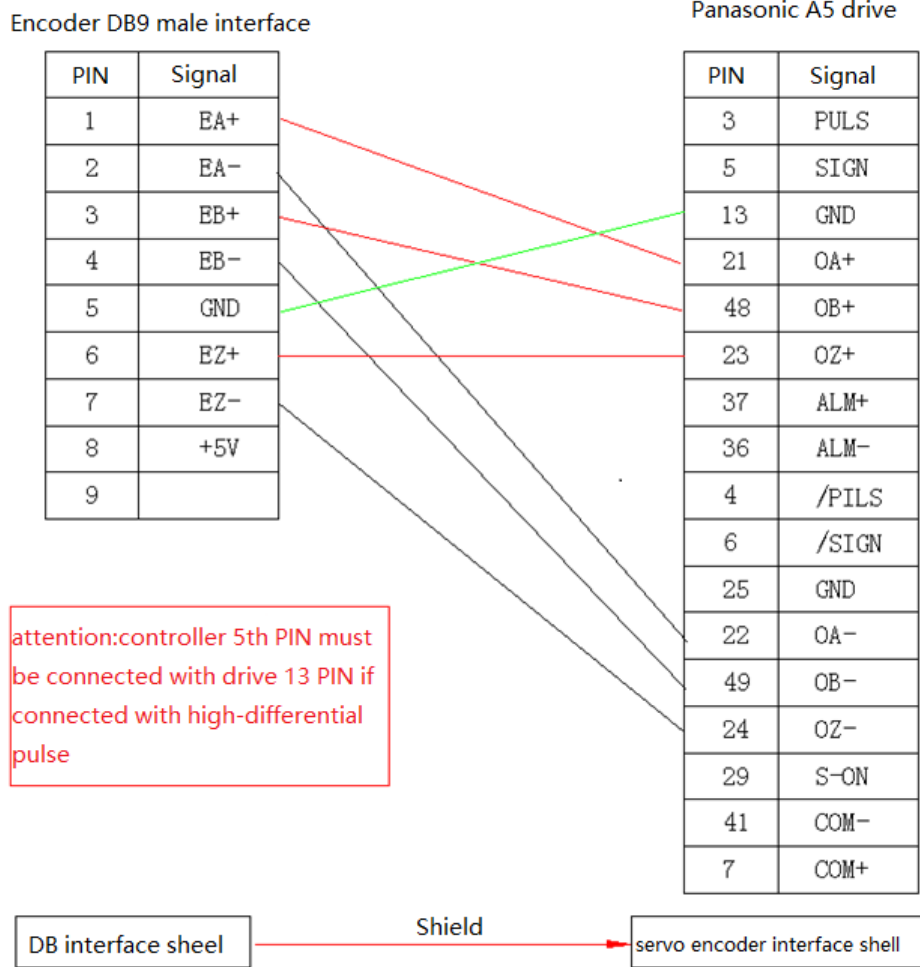


Wiring reference of ZMC316 and Panasonic high-speed pulse

2.2.9.3 Wiring Reference for Encoder



Encoder Connection



Wiring reference of ZMC316 Panasonic A5 servo drive

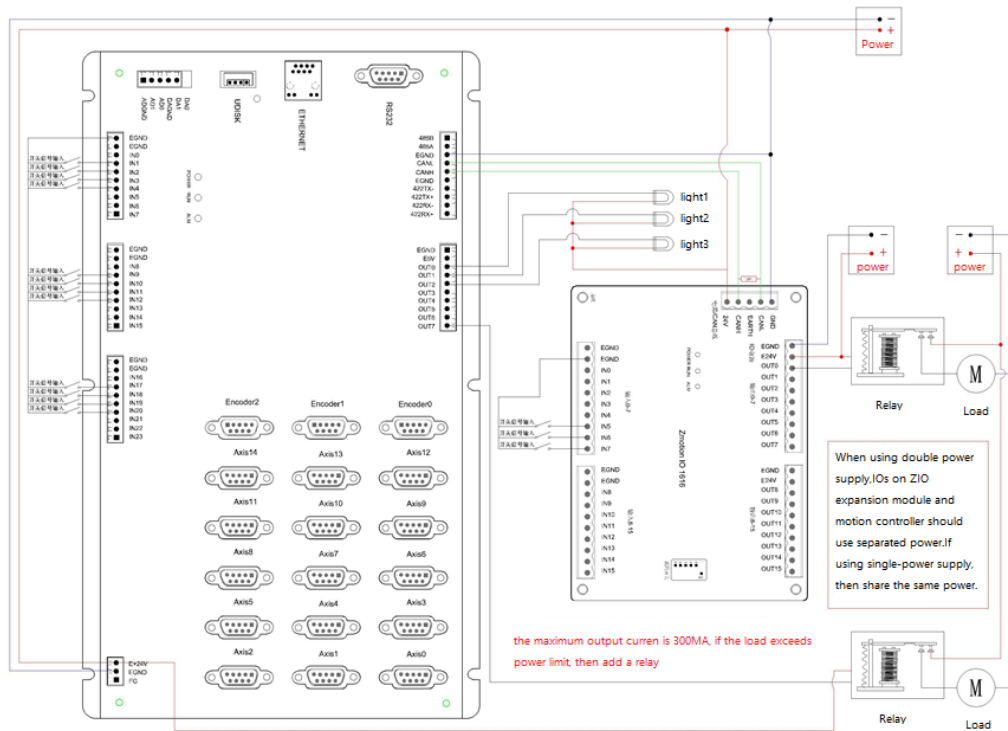
Chapter III Expansion Module

See *ZIO expansion card hardware manual* for reference.

3.1 Wiring Reference For CAN, Input, Output and Power

! 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.

! ZMC3 series 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 the controller and expansion module use different powers, the EGND of controller must be connected to the GND of expansion modules, otherwise CAN bus may be burned out.



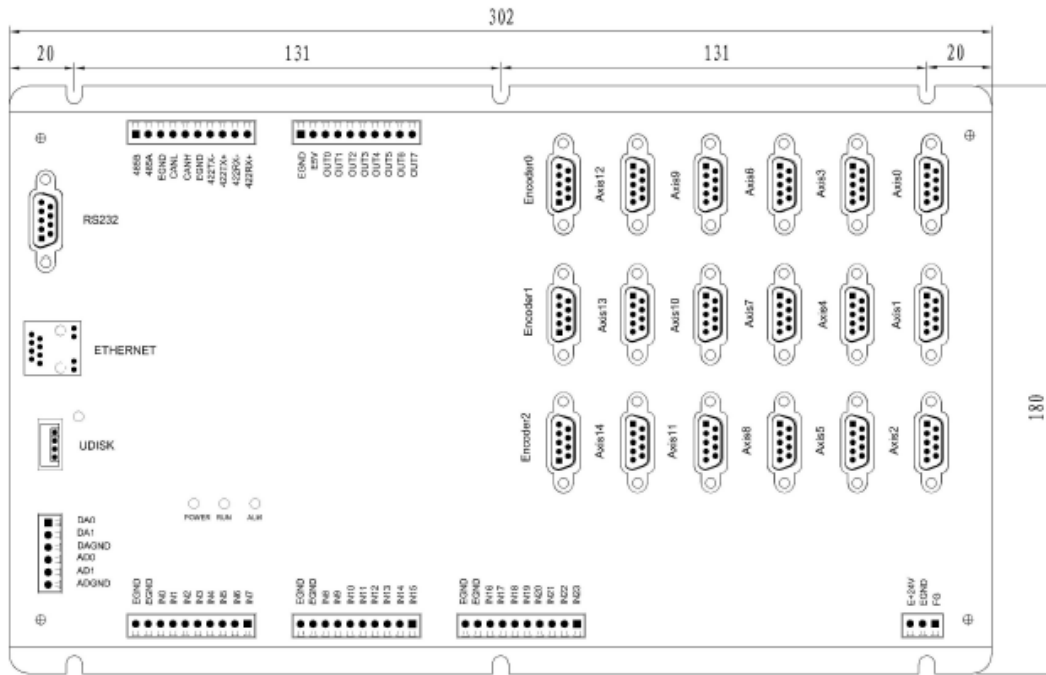
Chapter IV Common Problems

Problems	Suggestions
Motor does not rotate.	<p>Check whether the ATYPE of the controller is correct;</p> <p>Check whether the pulse send mode matches 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 works 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 correct.</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 works normally;</p> <p>Check whether the signal of the limit sensor is disturbed;</p>
The expansion module cannot 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</p>

	<p>input channel.</p> <p>Check whether the input number matches the ID of the IO board.</p>
The output does not work.	<p>Check whether the IO is supplied normally;</p> <p>The IO also needs supply.</p> <p>Check whether the output number matches the ID of the IO board.</p>
The Ethernet cannot be connected.	<p>Check whether the Ethernet light is on?</p> <p>Whether direct connection was built between controller and computer, but computer does not support automatic crossing?</p> <p>Check whether the controller IP address has been modified?</p> <p>Check whether the IP address segment of computer is same as that of controller?</p>
Serial port on controller cannot be connected.	<p>Check whether the serial port parameters have been modified by the running program, you can check all the current serial port configurations through instruction: ? * SETCOM</p>
POWER light is ON, RUN is OFF	<p>Check power of power supplier is enough, now it is best to supply power for controller separately, and restart the controller after modification.</p>
RUN light is ON, ALM is ON also.	<p>Program running errors, please check ZDevelop error code list, and check application program.</p>

Chapter V Hardware Installation

5.1 ZMC316 Installation



Unit: mm

mounting hole diameter 4.5mm