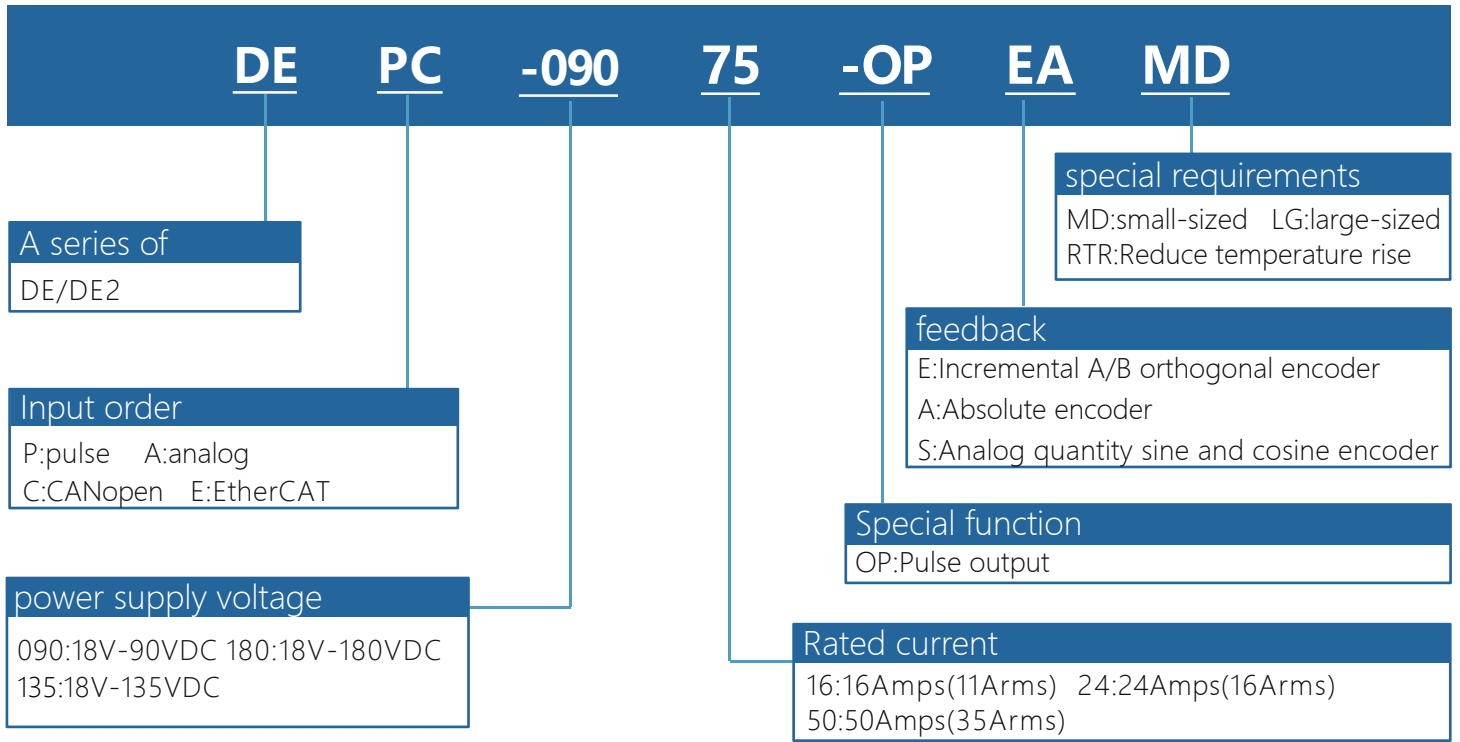


## DE series servo driver instruction manual



# DE Series servo driver model description



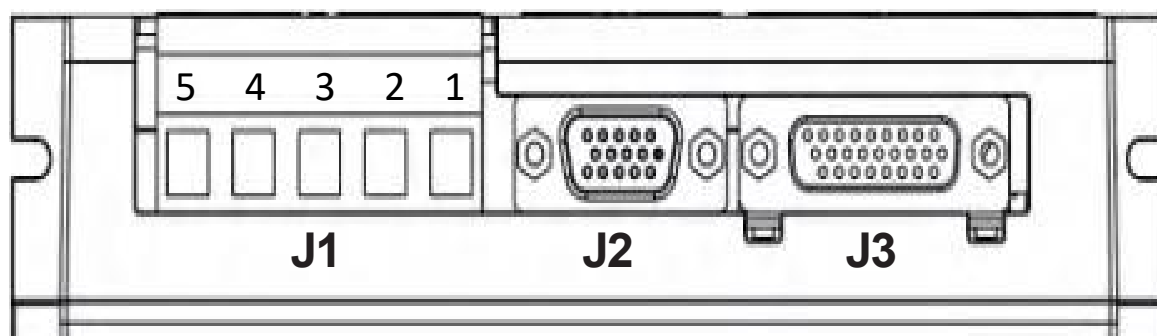
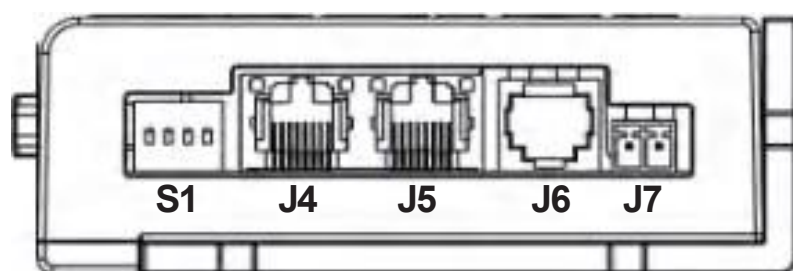
Attention to:  
1.The driver supply voltage must be greater than or equal to the rated voltage of the motor

2.The rated current of the driver must be greater than or equal to the rated current of the motor

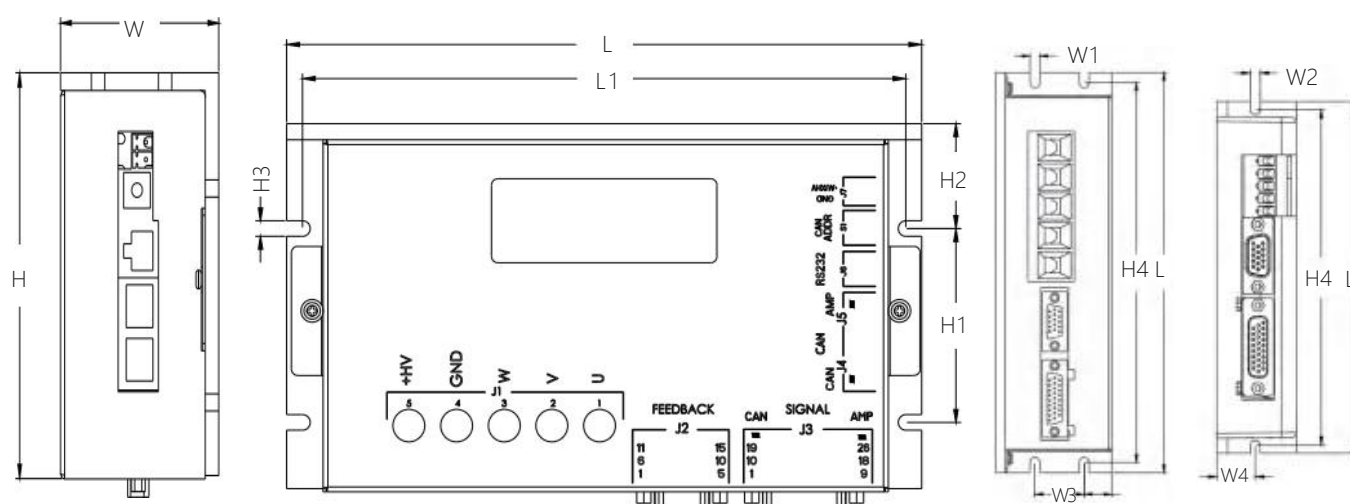
## DE Series driver specifications summary table

| Driver model        | service voltage  | Rated current Amps(Arms) | Peak current Amps(Arms)6S | Feedback type                      | Overall dimensions | weight |
|---------------------|------------------|--------------------------|---------------------------|------------------------------------|--------------------|--------|
| DEPC-09003-OPEA     | 18 ~ 90 VDC      | 3A (2.1A)                | 6A (4.2A)                 | incremental<br>I<br>absolute value | 167*100*35mm       | 0.45kg |
| DEPC-09005-OPEA     |                  | 5A (3.5A)                | 10A (7A)                  |                                    |                    |        |
| DEPC-09016-OPEA     |                  | 16A (11A)                | 48A (33A)                 |                                    |                    |        |
| DEPC-09024-OPEA     |                  | 24A (16A)                | 50A (35A)                 |                                    |                    |        |
| DEPC-09040-OPEA     |                  | 40A (28A)                | 80A (28A)                 |                                    |                    |        |
| DEPC-09050-OPEA     |                  | 50A (35A)                | 100A (70A)                |                                    |                    |        |
| DEPC-09075-OPEA     |                  | 75A (52A)                | 150A (105A)               |                                    | 200*114*59mm       | 1.10kg |
| DEPC-090100-OPEA    |                  | 100A (70A)               | 200A (140A)               |                                    | 221*140*59mm       | 1.45kg |
| DEPC-090150-OPEA    |                  | 150A (105A)              | 250A (175A)               |                                    | 221*140*85mm       | 1.8kg  |
| DEPC-090200-OPEA    |                  | 200A (140A)              | 300A (210A)               |                                    | 265*140*85mm       | 2.2kg  |
| DEPC-090300-OPEA-MD |                  | 300A (210A)              | 420A (294A)               |                                    | 167*100*35mm       | 0.45kg |
| DEPC-090300-OPEA-LG |                  | 300A (210A)              | 420A (294A)               |                                    | 200*114*59mm       | 1.10kg |
| DEPC-090350-OPEA    |                  | 350A (250A)              | 470A (330A)               |                                    | 221*140*59mm       | 1.45kg |
| DEPC-18024-OPEA     | 18 ~ 135 /180VDC | 24A (16A)                | 50A (35A)                 |                                    | 265*140*85mm       | 2.2kg  |
| DEPC-18050-OPEA     |                  | 50A (35A)                | 100A (70A)                |                                    | 221*140*59mm       | 1.45kg |
| DEPC-18075-OPEA     |                  | 75A (52A)                | 150A (105A)               |                                    | 221*140*59mm       | 1.45kg |
| DEPC-180100-OPEA    |                  | 100A (70A)               | 200A (140A)               |                                    | 221*140*59mm       | 1.45kg |
| DEPC-180150-OPEA    |                  | 150A (105A)              | 250A (175A)               |                                    | 221*140*59mm       | 1.45kg |
| DEPC-135100-OPEA    |                  | 100A (70A)               | 200A (140A)               |                                    | 221*140*85mm       | 1.8kg  |
| DEPC-135200-OPEA    |                  | 200 (140A)               | 300A (210A)               |                                    |                    |        |

## DE Serial terminal Definition



## DE Series outline dimension drawing



| model     | L   | L1  | W  | W1    | W2    | W3 | W4   | H   | H1 | H2   | H3    | H4  |
|-----------|-----|-----|----|-------|-------|----|------|-----|----|------|-------|-----|
| DE-3A~50A | 167 | 160 | 35 | /     | 2-4.5 | /  | 19.5 | 100 | 51 | 22   | 4-4.5 | 160 |
| DE-75A    | 200 | 190 | 59 | 4-5.0 | /     | 25 | /    | 114 | 60 | 32.5 | 4-4.8 | 190 |
| DE-100A   | 200 | 190 | 59 | 4-5.0 | /     | 25 | /    | 114 | 60 | 32.5 | 4-4.8 | 190 |
| DE-150A   | 221 | 211 | 59 | 5     | /     | 25 | /    | 140 | 60 | 45   | 4.8   | 211 |
| DE-200A   | 221 | 211 | 85 | 5     | /     | 25 | /    | 140 | /  | /    | /     | 211 |
| DE-300A   | 221 | 211 | 85 | 5     | /     | 25 | /    | 140 | /  | /    | /     | 211 |
| DE-350A   | 265 | 255 | 85 | 5     | /     | 25 | /    | 140 | /  | /    | /     | 255 |

# 1、 Product introduction:

## 1.1 An overview of the

DE series programmable intelligent servo drive is a general purpose, high performance, DC power supply, compact structure of all digital servo drive controller. It is mainly used for position, speed and torque control of linear (DDL), torque (DDR), voice coil, brushless and brushless servo motor. It can operate in three modes, namely, stand-alone, external or distributed network control. It supports incremental encoders, Resolver, digital Hall feedback and absolute encoders. The multimode encoder port is used as input or output depending on the basic setup of the drive. Feedback from the secondary encoder as input to create a double-loop position control system

## 1.2 Technical characteristics

- ◆•Control mode: position, speed, torque;
- ◆•Sampling frequency (time) Current loop: 16KHz(62.5us); Speed/Position Loop :4KHz(250μs)
- ◆•Bandwidth: the current loop is generally 2.5kHz, which varies with parameter adjustment and load inductance;
- ◆•Programmable protection: position error, over current, over voltage or under voltage,  $I^2t$ , output short circuit overload and other multi-directional protection functions;
- ◆•Type of driving motor: brushless motor, brush motor, linear motor, voice coil motor, etc.;
- ◆•Encoder feedback: incremental encoder, Hall, grating ruler, rotary transformer (plus conversion card); Absolute encoder, support SSI, Absolute A, BiSS(B&C) protocol;
- ◆•Pulse response frequency up to 2MHz, with digital filtering function;
- ◆•RS232 serial interface, baud rate up to 115KB;
- ◆•CAN2.0 local area bus, compatible with CANopen DS-402, baud rate up to 1MHz; Support PVT, back to zero, interpolation;
- ◆•EtherCAT Ethernet Fieldbus, used as EtherCAT slave using CANopen application protocol, supports cyclic synchronous position-speed-Torque (CSP-CSV-CST),PVT, interpolation, and zero back for DSP-402 motion control devices with EtherCAT(CoE) protocol;
- ◆•Power supply voltage: 20-90(135/180)VDC;



### 1.3 Standard specifications for servo drives

|                   |                                |                        |                                           |                                                                                                                                                                     |
|-------------------|--------------------------------|------------------------|-------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Position control  | Command control mode           |                        |                                           | Pulse, $\pm 10\text{V}$ analog input, CANopen (EtherCAT), function generator, track index, software programming                                                     |
|                   | input signal                   | Pulse instruction      | Input pulse pattern                       | The command can be direction + pulse, ORTHOGONAL pulse of A and B phases, and CW/CCW pulse.                                                                         |
|                   |                                |                        | Signal format                             | Collector open circuit                                                                                                                                              |
|                   |                                |                        | Maximum pulse frequency                   | biggest 2 MPPS                                                                                                                                                      |
|                   |                                | Simulation instruction | Voltage range                             | Input voltage range $\pm 10\text{V}$ (12-bit resolution)                                                                                                            |
|                   |                                |                        | input impedance                           | Differential input impedance =5K $\Omega$                                                                                                                           |
| Speed control     | Command control mode           |                        |                                           | PWM, $\pm 10\text{V}$ analog, function generator, software programming                                                                                              |
|                   | input signal                   | PWM                    | polarity                                  | PWM=0 ~ 100%, polarity =1/0                                                                                                                                         |
|                   |                                |                        | nonpolar                                  | PWM=50% +/-50%,                                                                                                                                                     |
|                   |                                |                        | Frequency range                           | Minimum 1 kHz, maximum 100 kHz                                                                                                                                      |
|                   |                                |                        | Minimum pulse width                       | 220ns                                                                                                                                                               |
|                   |                                | Simulation instruction | Voltage range                             | Input voltage range $\pm 10\text{V}$ (12-bit resolution)                                                                                                            |
|                   | input impedance                |                        | Differential input impedance =5K $\Omega$ |                                                                                                                                                                     |
| Current control   | Command control mode           |                        |                                           | PWM, $\pm 10\text{V}$ analog, function generator, software programming                                                                                              |
|                   | input signal                   | PWM                    | polarity                                  | PWM=0 ~ 100%, polarity =1/0                                                                                                                                         |
|                   |                                |                        | nonpolar                                  | PWM=50% +/-50%,                                                                                                                                                     |
|                   |                                |                        | Frequency range                           | Minimum 1 kHz, maximum 100 kHz                                                                                                                                      |
|                   |                                |                        | Minimum pulse width                       | 220ns                                                                                                                                                               |
|                   |                                | Simulation instruction | Voltage range                             | Input voltage range $\pm 10\text{V}$ (12-bit resolution)                                                                                                            |
|                   | input impedance                |                        | Differential input impedance =5K $\Omega$ |                                                                                                                                                                     |
| I/O signal        | Digital input IN               |                        | port number                               | 10 (IN3, IN4, IN5 and IN6 are high-speed ports)                                                                                                                     |
|                   |                                |                        | Signal format                             | NPN, PNP                                                                                                                                                            |
|                   |                                |                        | Settable function                         | Servo enable, external reset, positive/reverse limit, motor stop, high speed analog acquisition control, PWM synchronous signal input, high speed pulse input, etc. |
|                   | Digital output OUT             |                        | port number                               | three                                                                                                                                                               |
|                   |                                |                        | Signal format                             | NPN output                                                                                                                                                          |
|                   |                                |                        | Settable function                         | Fault signal, brake control, PWM sync signal, custom event, track state, position trigger, program control.                                                         |
| function          | LED indicator                  |                        |                                           | State indicator, CAN (EtherCAT) network indicator                                                                                                                   |
|                   | Communications functions       | RS-232                 | Baud rate                                 | 9600-115200                                                                                                                                                         |
|                   |                                |                        | agreement                                 | Full duplex mode, ASCII or binary format                                                                                                                            |
|                   |                                | CAN                    | Baud rate                                 | 20kbit/s-1Mbit/s                                                                                                                                                    |
|                   |                                |                        | agreement                                 | Canopen application layer DS-301 V4.02                                                                                                                              |
|                   |                                |                        | equipment                                 | Dsp-402 device driver and motion control                                                                                                                            |
|                   |                                | EtherCAT               | agreement                                 | CoE, CiA-402                                                                                                                                                        |
|                   |                                | Protection function    |                                           | Overvoltage, overcurrent, undervoltage, overload, overheating, abnormal encoder, position tracking error is too large and so on                                     |
| Using environment | installation location          |                        |                                           | Non-corrosive gas, flammable gas, etc                                                                                                                               |
|                   | altitude                       |                        |                                           | Below 1000 m                                                                                                                                                        |
|                   | temperature                    |                        |                                           | -20 $^{\circ}\text{C}$ ~+50 $^{\circ}\text{C}$                                                                                                                      |
|                   | humidity                       |                        |                                           | 5%~95%RH, no condensation of water droplets                                                                                                                         |
|                   | Resistance to vibration/impact |                        |                                           | Less than 4.9m/s <sup>2</sup> / less than 19.6m/s <sup>2</sup>                                                                                                      |

## 2、Definition of wiring port

### 2.1 Power input terminal J1

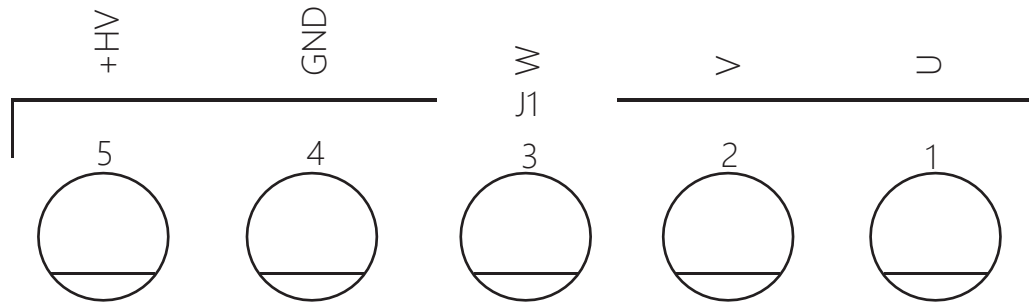


Figure 2.1 Ohm gauge terminal receptacle

| serial number | define | terminal                 | Wiring instructions                                              |
|---------------|--------|--------------------------|------------------------------------------------------------------|
| 1             | U      | Motor power line U phase | Must be connected to the motor one by one according to the label |
| 2             | V      | Motor power line V phase |                                                                  |
| 3             | W      | Motor power line W phase |                                                                  |
| 4             | GND    | Input power -            | +20~90V DC                                                       |
| 5             | +HV    | Input power +            |                                                                  |

### 2.2 Motor encoder input terminal J2

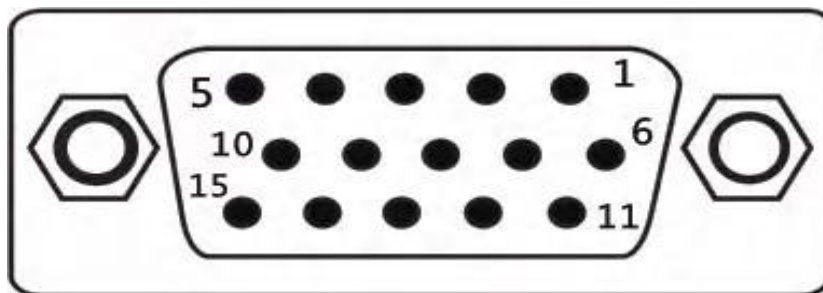


Figure 2.2 three rows of DB15 female seats

#### J2 axis encoder definition

| pin | define           | function                                            | pin | define   | function                                              |
|-----|------------------|-----------------------------------------------------|-----|----------|-------------------------------------------------------|
| 1   |                  |                                                     | 9   | W+       | Motor encoder W+ input                                |
| 2   |                  |                                                     | 10  |          |                                                       |
| 3   | U+               | Motor encoder U+ input                              | 11  | B-(DAT-) | Motor encoder B- input<br>(Absolute value coder DAT-) |
| 4   | +5V              | Motor signal line +5V                               | 12  | B+(DAT+) | Motor encoder B+ input<br>(Absolute encoder DAT+)     |
| 5   | 0V               | Motor signal cable GND                              | 13  | A-       | Motor encoder A- input                                |
| 6   | V+               | Motor encoder V+ input                              | 14  | A+       | Motor encoder A+ input                                |
| 7   | Z-<br>(CLK-/MA-) | Motor encoder Z- input<br>(Absolute value CLK-/MA-) | 15  |          |                                                       |
| 8   | Z+<br>(CL+/MA+)  | Motor encoder Z+ input<br>(Absolute value CLK-/MA-) |     |          |                                                       |

## 2.3 Control signal I/O terminal J3

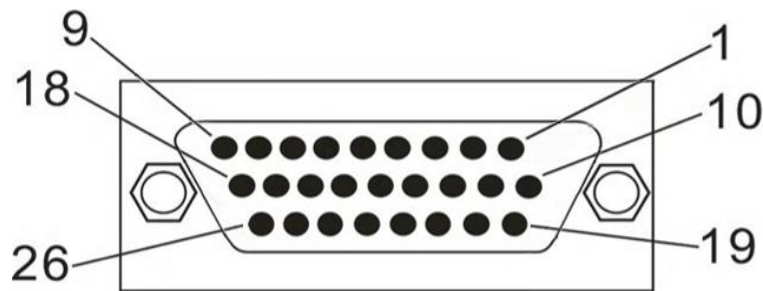


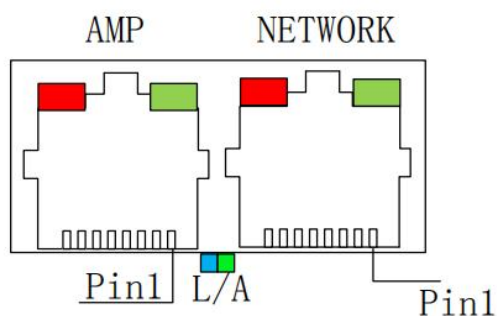
Figure 3.3 Three rows of DB26 female seats

### J3 shaft IO

| pin | define   | function                   | pin | define           | function                                                                 |
|-----|----------|----------------------------|-----|------------------|--------------------------------------------------------------------------|
| 1   | ISO_COM  | Common end of ISO terminal | 14  | OUT1             | custom                                                                   |
| 2   | Ref-     | Analog quantity - input    | 15  | OUT2             | custom                                                                   |
| 3   | Ref+     | Analog quantity + input    | 16  | OUT3             | custom                                                                   |
| 4   | IN1      | custom                     | 17  | MUL_ENC_S-       | Second absolute value encoding input                                     |
| 5   | IN2      | custom                     | 18  | MUL_ENC_S+       | Second absolute value encoding input                                     |
| 6   | IN3      | custom                     | 19  | GND              | Power grounding                                                          |
| 7   | IN4      | custom                     | 20  | +5V              | 5V power output (100mA)                                                  |
| 8   | IN5      | custom                     | 21  | EONZ- (CLK-/MA-) | Motor encoder output signal Z- (or Second absolute value encoding input) |
| 9   | IN6      | custom                     | 22  | EONZ+ (CLK+/MA+) | Motor encoder output signal Z+ (or Second absolute value encoding input) |
| 10  | ISO_IN7  | custom                     | 23  | EONB-            | Motor encoder output signal B-                                           |
| 11  | ISO_IN8  | custom                     | 24  | EONB+            | Motor encoder output signal B+                                           |
| 12  | ISO_IN9  | custom                     | 25  | EONA-            | Motor encoder output signal A-                                           |
| 13  | ISO_IN10 | custom                     | 26  | EONA+            | Motor encoder output signal A+                                           |

**Note: Orders requiring a second encoder function must specify this requirement (only one incremental encoder and one absolute encoder are permitted).**

## 2.4 CAN (EtherCAT) communication terminal J4&J5



### 2.4.1 RJ45 pin definition

CAN is defined when communicating

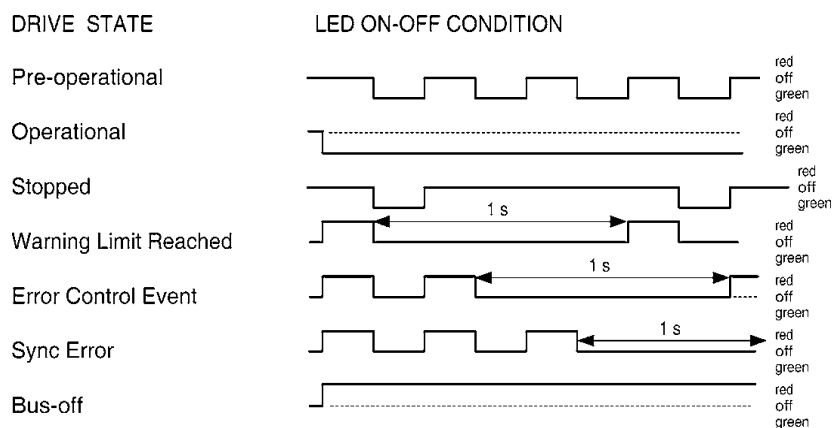
| pin | define | function                   |
|-----|--------|----------------------------|
| 1   | CAN_H  | CANH signal                |
| 2   | CAN_L  | CANL signal                |
| 3   | GND    | Communication power ground |

### EtherCAT communications

When the driver is EtherCAT, the J6 port can accept standard Ethernet cable wiring



## 2.4.2 Communication indicator (CAN)



## 2.4.3 Definition of indicator Status

### 1. Drive status indicator AMP

Red/green LED light universal color change, whether flashing, to tell us the status of the driver. There are possible cases

|                     |                                                                                                                                           |
|---------------------|-------------------------------------------------------------------------------------------------------------------------------------------|
| Green/no flash      | drive is OK and enabled                                                                                                                   |
| Green/Slow blinking | drive is OK but not enabled. After enabled, it can run                                                                                    |
| Green/Flash         | Positive limit switch or negative limit switch is effective, the motor will only move in the direction not prohibited by the limit switch |
| Red/Fixed           | Instantaneous failure, after troubleshooting amplifier restart operation                                                                  |
| Red/flashing        | Lock the fault and restart the amplifier to resume operation                                                                              |

### 2. Drive NETWORK indicator NETWORK

#### CAN communication

| Indicator light | state                                                      |
|-----------------|------------------------------------------------------------|
| green           | Off = Initialization                                       |
|                 | Blinking = Before operation                                |
|                 | Blinking once = Stopped                                    |
|                 | Steady on = Running                                        |
| red             | Off = There is no error and the communication is normal    |
|                 | Blinking = Invalid configuration                           |
|                 | One blink = number of warning arrivals                     |
|                 | Blink twice = A protection event or heartbeat event occurs |
|                 | Steady on = The CAN controller bus is off                  |
| L/A             | Off = The communication is normal                          |
|                 | Blinking = The CAN network is faulty                       |

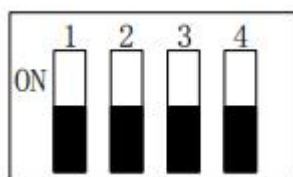
#### EtherCAT communications

| Indicator light | state                                                                    |
|-----------------|--------------------------------------------------------------------------|
| green           | Off = Initialization                                                     |
|                 | Blinking = Before operation                                              |
|                 | Single blinking = Safe operation                                         |
|                 | Steady on = Running                                                      |
| red             | Off = There is no error and the communication is normal                  |
|                 | Blinking = Invalid configuration                                         |
|                 | One flicker = local error                                                |
|                 | Two flashes =PDO or EtherCAT watchdog timed out                          |
|                 | Steady on = An error is displayed                                        |
| L/A             | Off = No connection to the physical layer                                |
|                 | Blinking = Data is being exchanged on the secondary server               |
|                 | Steady on = connection at the link layer, but no data is being exchanged |



### 2.4.3 SW Driver CAN address DIP switch

When the external DIP switch is selected for software Settings, the dip switch is effective. The switch encoding is in the BCD code sequence, and takes effect when the dip switch is switched to ON.



SW Indicates the station number of the DIP switch

| SW switch Number | Corresponding stand no |
|------------------|------------------------|
| 1                | 1                      |
| 2                | 2                      |
| 3                | 4                      |
| 4                | 8                      |

For example, if you want to set the station number to 3, switch the SW switch 1, 2 to ON and the other switch to OFF,  $1+2=3$ ; If you want to set the station number to 12, dial SW 3,4 to ON, other to ooff,  $4+8=12$

### 2.5 Serial communication terminal J6

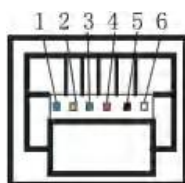
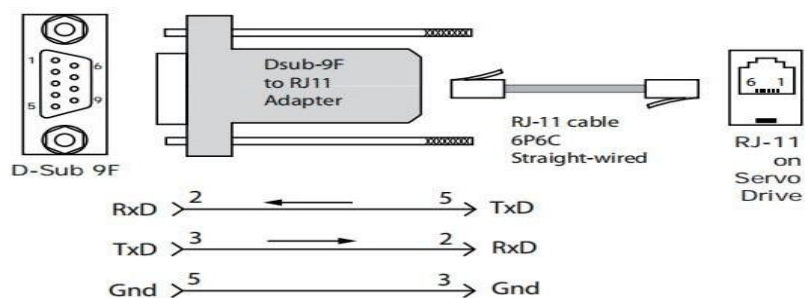


Figure 3.4 RJ11 6 pin crystal head holder

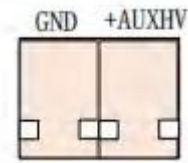
| pin | define | function                     |
|-----|--------|------------------------------|
| 2   | RXD    | RS232 communication receiver |
| 3   | GND    | Communication power ground   |
| 5   | TXD    | RS232 communication sender   |

debugging connection line is shown below



## 2.6 Auxiliary power supply J7

The driver of J7 socket is the auxiliary power supply interface, if necessary, it can be connected. If connected, +HV is disconnected from power and +AUXHV is powered on, but there is no action when issuing commands



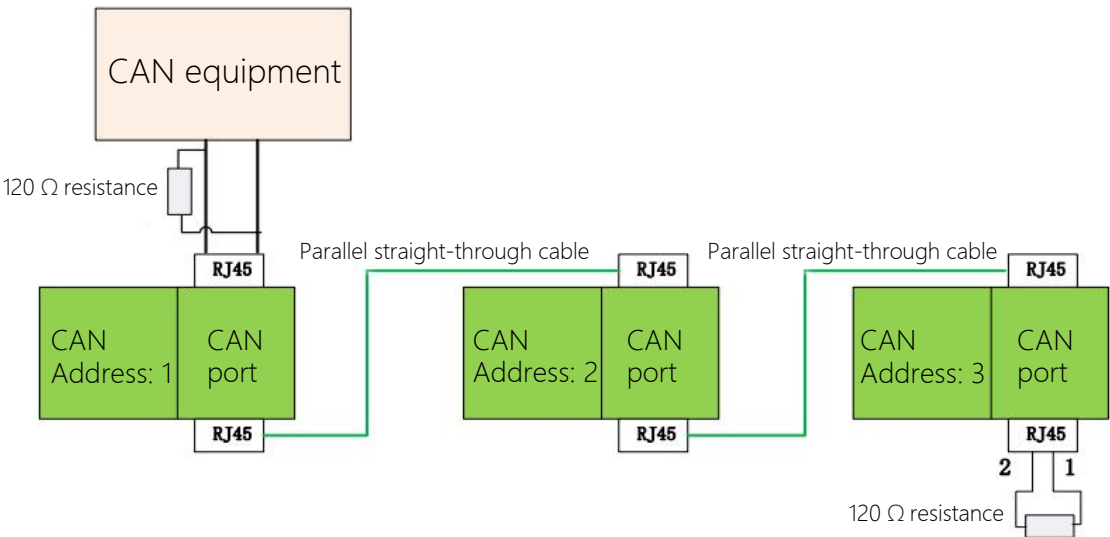
|        |                                |
|--------|--------------------------------|
| GND    | 0V                             |
| +AUXHV | +24V (or $\leq$ mains voltage) |

## 3 Hardware Wiring

### 3.1.1 CAN bus (CANH, CANL, GND)

CAN bus is based on CAN V2.0B physical layer. The signals of CAN physical layer include CANH, CANL and GND, and communicate with CANopen protocol. Electrical interface uses TJA1051 high speed transceiver. The physical address of the drive CAN communication ranges from 0 to 127. The default address is 0. You can reset or restart the drive to take effect by changing the RS-232 communication port address or external switch SW. Through the CAN communication interface, a very effective combination of high data rate and low cost multi-axis motion control system CAN be realized.

CAN network CAN be connected as shown below:



### 3.1.1 EtherCAT bus

Just connect the drive with a standard Ethernet cable.

### 3.2 Analog signal input (Ref+,Ref-)

$\pm 10\text{Vdc}$  differential analog input, maximum input voltage  $\pm 10\text{Vdc}$ , input impedance about  $5.36\text{K}$ , resolution 12 bits. The analog signal can be used for torque, speed and position control.

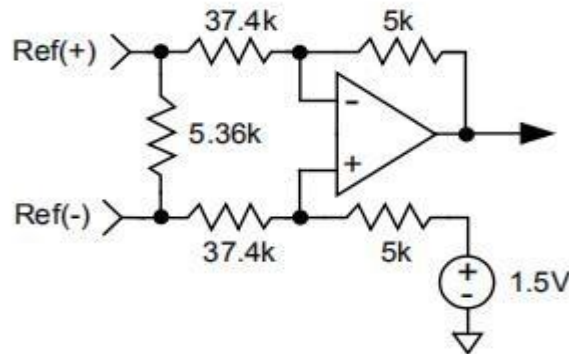


Figure 3.2.1 Analog hardware input circuit

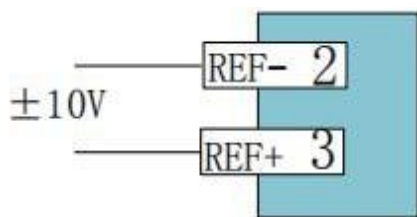


Figure 3.2.2 Analog input wiring of external power supply

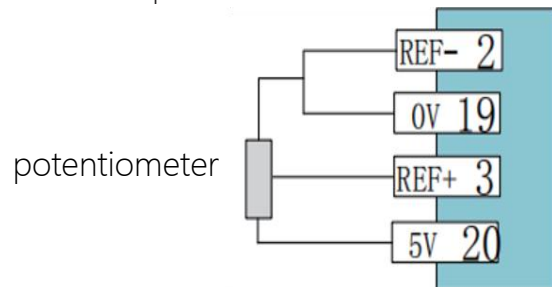


Figure 3.2.3 Analog input wiring of internal power supply

### 3.3 Digital input signal

DE series servo has 10 digital input ports, with programmable function, the drive power PWM output and safety enable fixed by IN1 control, through this port can realize the power circuit of hardware off (off enable).

According to the port function of the controller and the RC filtering time of the hardware, the input signal port can be divided into general input port and high-speed input port, and the function of each port can be changed by programming.

### 3.4 General purpose input signal terminal

IN 1, IN 2 Hardware input circuit

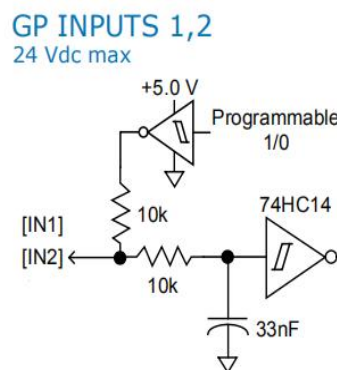


Figure 3.4.1 IN 1-in 2 Hardware input circuit

IN1 and IN 2 are universal input signal terminals. The control logic and function can be set by software. IN 1 is used for driver enablement control, which takes effect by setting high/low level by software parameter.

### 3.5 High speed input signal terminal (IN3, IN4, IN5, IN6)

IN 3, IN4, IN 5, IN 6 are high-speed input terminals, which can be used as general general terminals as well as high-speed pulse input. The pulse input port is fixed

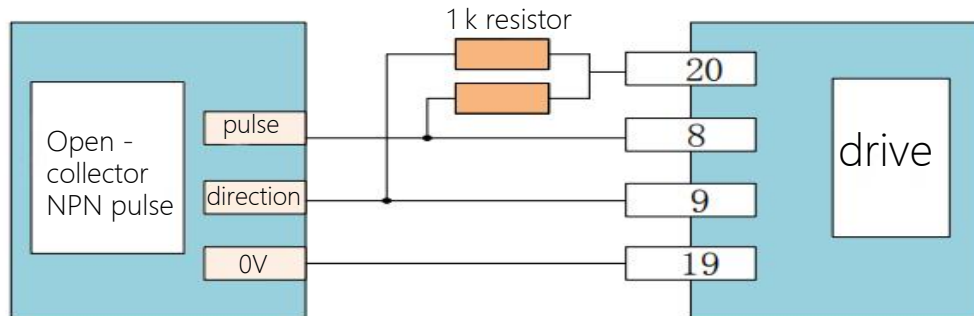


Figure 3.5.1 Open-collector NPN pulse input diagram

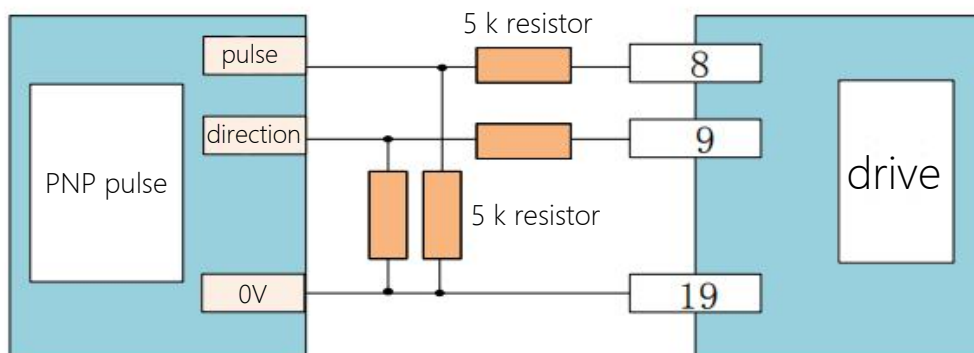


Figure 3.5.2 PNP pulse input diagram

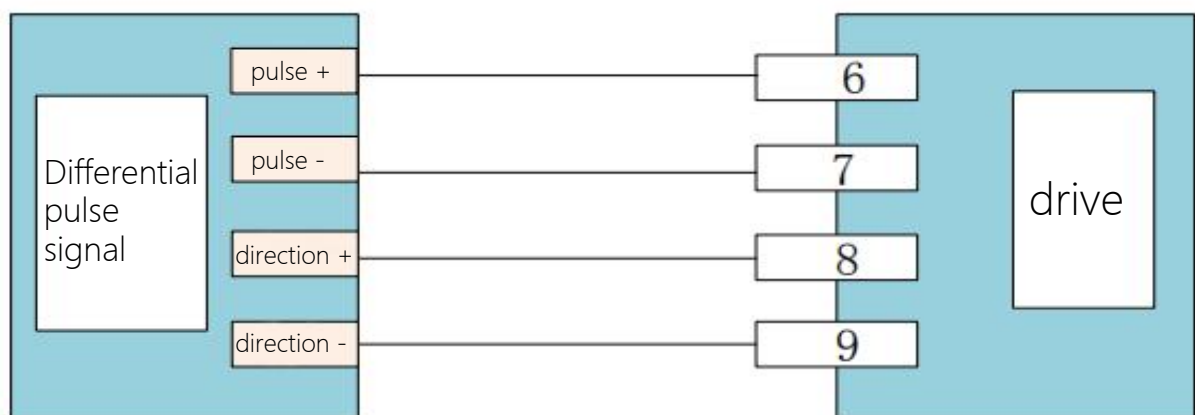


Figure 3.5.3 Differential pulse input diagram

### 3.5.1 Optical isolation digital input

There are altogether 4 inputs, which can be connected into NPN or PNP input signals according to different wiring, as shown in the following figure;

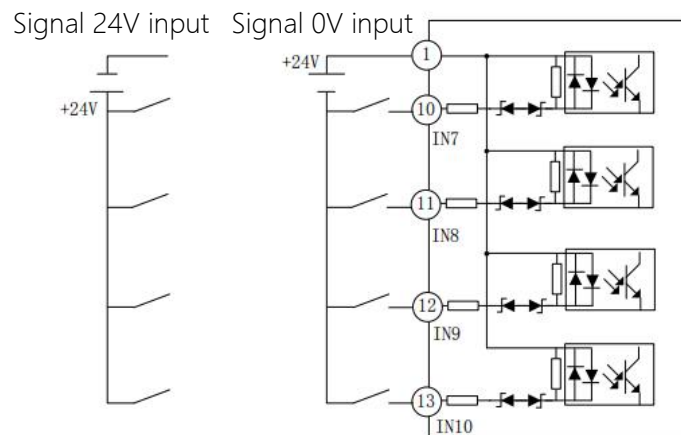


Figure 3.5.1 Optical isolation digital input

### 3.6 Digital output signal

DE series drivers have 3 digital output, digital output IO port MOSFET open output, without diode series 1K resistance in the way of pulling up to 5V, port can withstand voltage to 24Vdc, the maximum current can withstand 300mA dc, port output function can be changed according to internal programming.

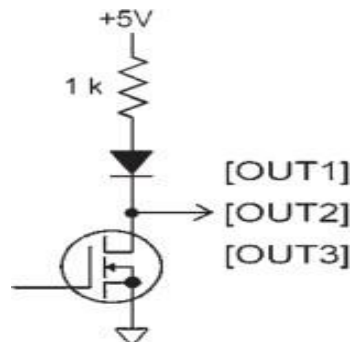


Figure 3.6.1 Digital output hardware Circuit (OUT1~3)

### 3.6.2 Motor lock output

The digital output ports OUT1, OUT2 and OUT3 can all be set as motor lock brake control. In the case of no fault and motor enabling, the brake is energized and the brake is released. In the case of any fault, the brake power is quickly disconnected to stop the motor. Because the motor brake is a perceptual device, the reverse current return diode must be paralleled.

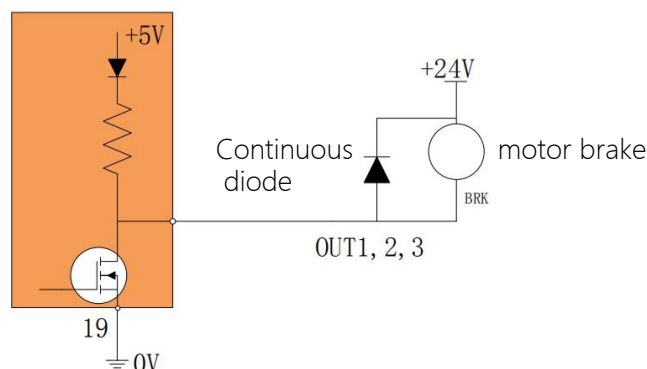


Figure 3.6.2 External circuit of motor brake

### 3.7 PWM signal input

The motor can be controlled by PWM signal for speed and torque, including single-end PWM duty ratio + direction signal and single-end PWM duty ratio  $\pm 50\%$  modulation.

#### 3.7.1 Single PWM duty cycle = 0~100% pulse control

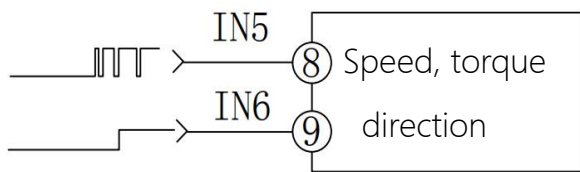


Figure 3.7.1 100% duty cycle + direction control

#### 3.7.2 Single-end PWM duty cycle = 50% $\pm$ 50% pulse control

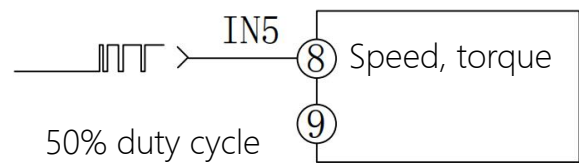


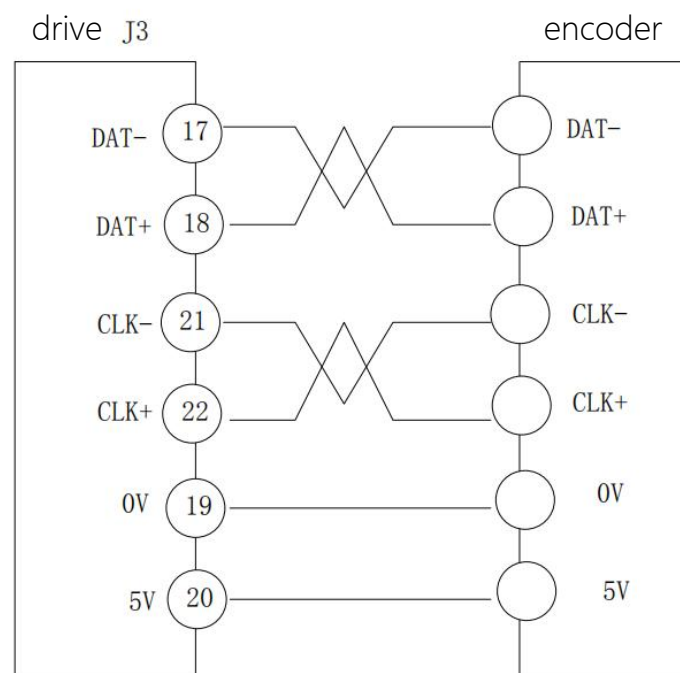
FIG. 3.7.2 50% $\pm$ 50% duty cycle control

### 3.8 Second encoder wiring

The DE driver has a second encoder input function, which can be used as a full closed-loop function, or as a motor encoder signal output, which can be configured in software.

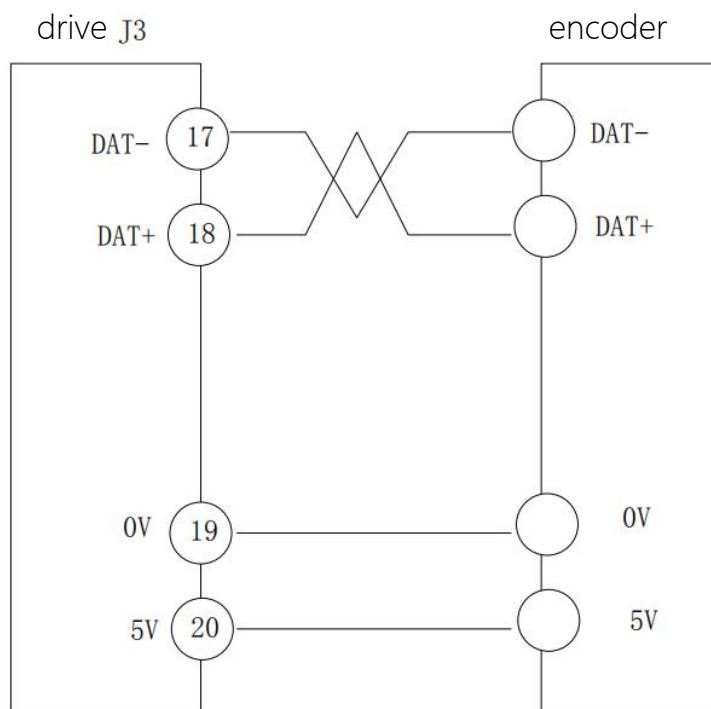
#### 3.8.1 Cables to the full-duplex absolute encoder

Supported protocols include SSI, BiSS



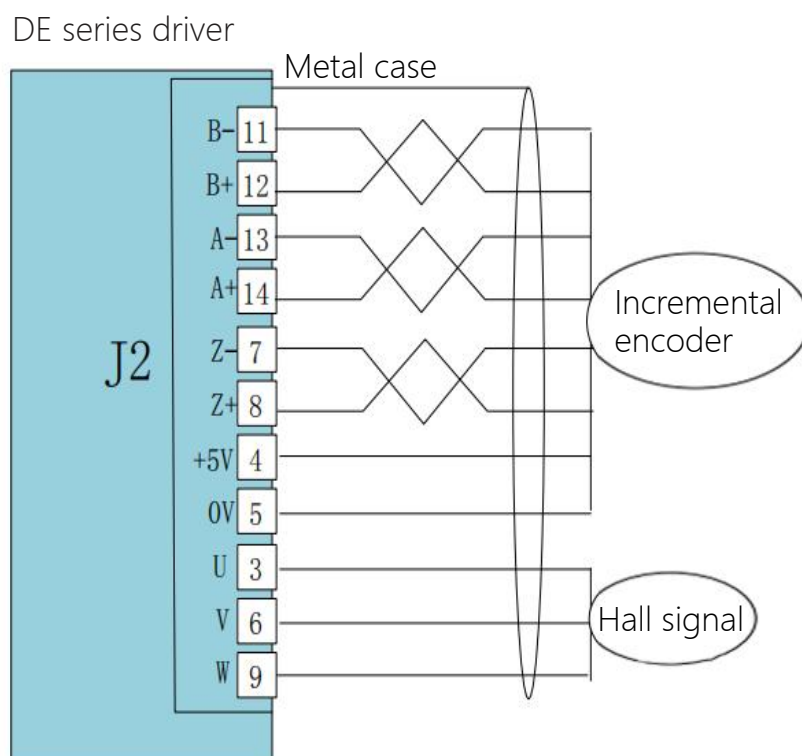
### 3.8.2 Half duplex absolute value coding cable

Supported protocols are absolute-A, Panasonic Absolute-A, Sanyo Absolute-A, and Tama Kawa Absolute-A.



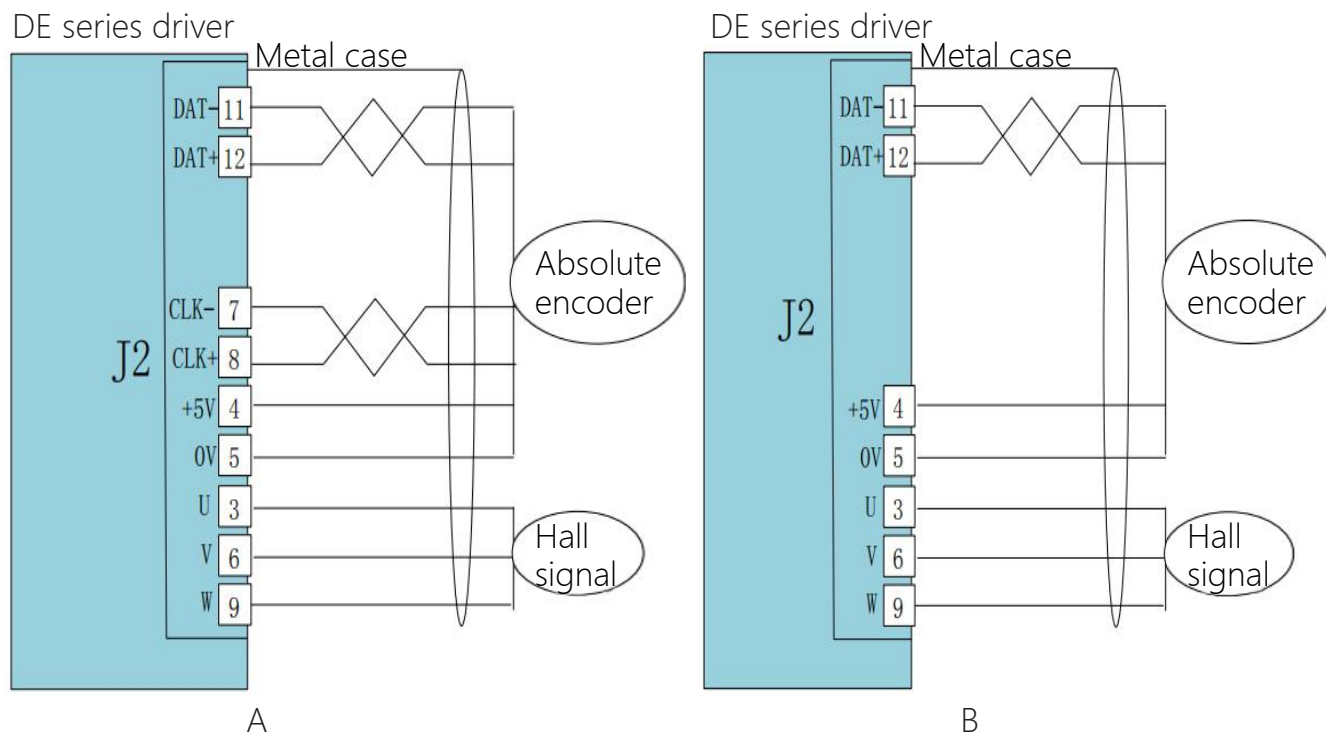
### 4 Motor connection

#### 1. Incremental encoder wiring





## 4.3 Absolute encoder wiring

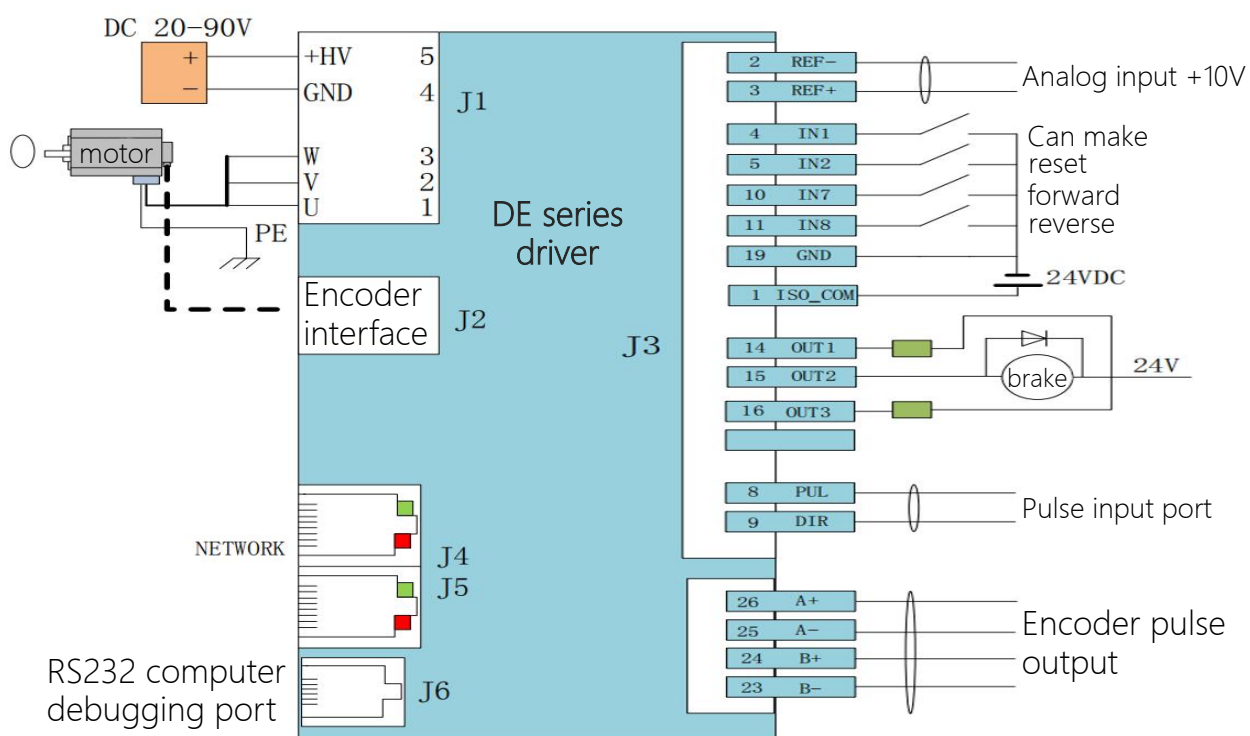


## 5 Drive parameter Setting

DE series drivers can set parameters, monitor motor status, collect data waveform and so on through RS232 serial port. Complete system debugging quickly and intuitively. For details, see the debugging software instructions.

## 6、System wiring diagram

### 6.1 Typical wiring diagram



Contact Us

Shenzhen ONKE Technology Co.

Tel: 0755-27387873 27381841

Email: onke@sz-onk.com

Address: Block 13, Huaide Cuihu Industrial Park, Fuhai Street,  
Baoan District, China

### Revision record

| Date     | Version number | Revised content |                |
|----------|----------------|-----------------|----------------|
|          |                | Modify location | Modify content |
| 20241210 | V0.1           | /               | New edition    |
|          |                |                 |                |
|          |                |                 |                |
|          |                |                 |                |