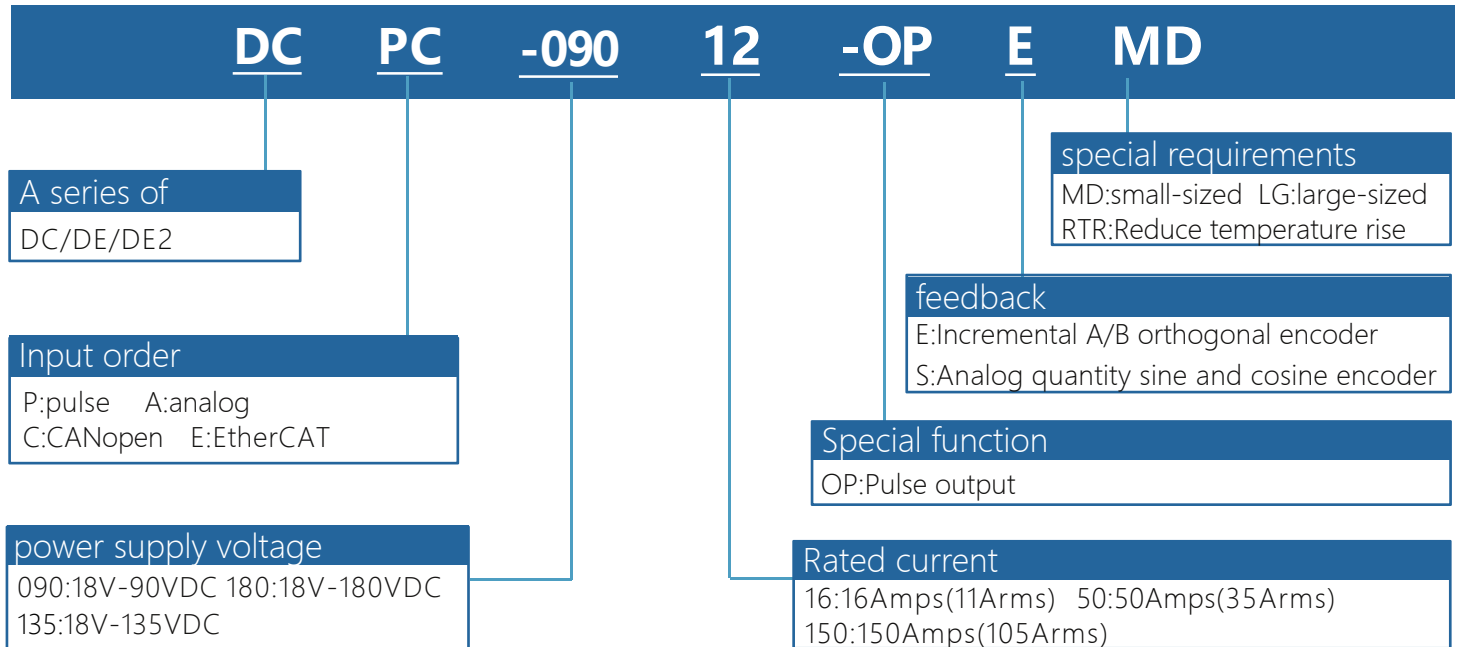


# DC series servo driver useng manual



# DC Series servo driver model description



Attention to:

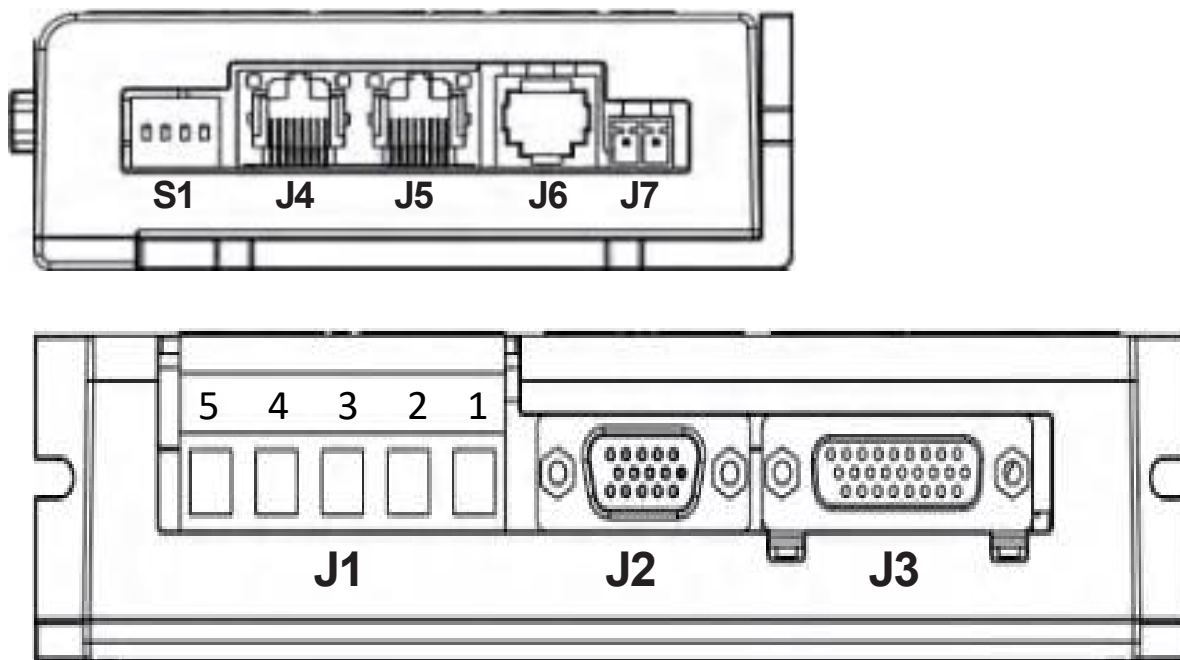
1.The driver supply voltage must be greater than or equal to the rated voltage of the motor

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

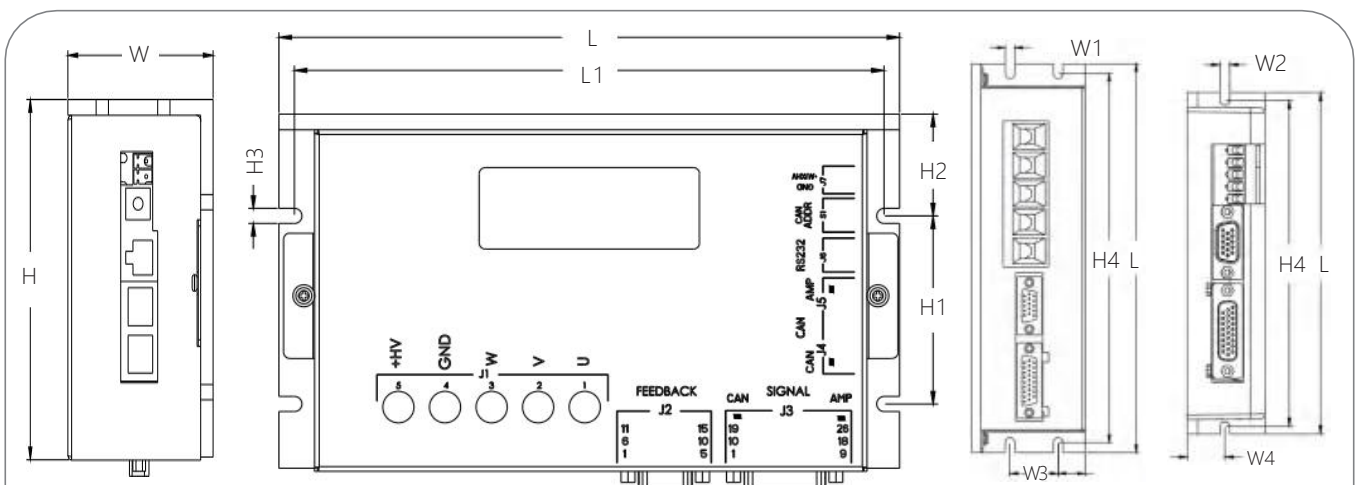
## DC Series driver specifications summary table

| Driver model       | service voltage | Rated current Amps(Arms) | Peak current Amps(Arms)6S | Feedback type | Overall dimensions | weight |
|--------------------|-----------------|--------------------------|---------------------------|---------------|--------------------|--------|
| DCPC-09002-OPE     | 18 ~ 90 VDC     | 2A (1.4A)                | 6A (4.2A)                 | incremental   | 141*90*32mm        | 0.35kg |
| DCPC-09003-OPE     |                 | 3A (2.1A)                | 9A (6.3A)                 |               |                    |        |
| DCPC-09004-OPE     |                 | 4A (2.8A)                | 8A (5.6A)                 |               |                    |        |
| DCPC-09005-OPE     |                 | 5A (3.5A)                | 10A (7A)                  |               |                    |        |
| DCPC-09008-OPE     |                 | 8A (5.6A)                | 24A (16A)                 |               |                    |        |
| DCPC-09016-OPE     |                 | 16A (11A)                | 48A (33A)                 |               |                    |        |
| DCPC-09024-OPE     |                 | 24A (16A)                | 50A (35A)                 |               | 167*100*35mm       | 0.45kg |
| DCPC-09030-OPE     |                 | 30A (21A)                | 60A (42A)                 |               |                    |        |
| DCPC-09040-OPE     |                 | 40A (28A)                | 80A (56A)                 |               |                    |        |
| DCPC-09050-OPE     |                 | 50A (35A)                | 100A (70A)                |               |                    |        |
| DCPC-09075-OPE     |                 | 75A (52A)                | 150A (105A)               |               | 200*114*59mm       | 1.10kg |
| DCPC-090100-OPE    |                 | 100A (70A)               | 200A (140A)               |               | 221*140*59mm       | 1.45kg |
| DCPC-090125-OPE    |                 | 125A(88A)                | 250A(177.5A)              |               |                    |        |
| DCPC-090150-OPE    |                 | 150A (105A)              | 250A (175A)               |               | 221*140*85mm       | 1.8kg  |
| DCPC-090200-OPE    |                 | 200A (140A)              | 300A (210A)               |               | 265*140*85mm       | 2.2kg  |
| DCPC-090300-OPE-MD | 18~135/180 VDC  | 300A (210A)              | 420A (294A)               | incremental   | 167*100*35mm       | 0.45kg |
| DCPC-090300-OPE-LG |                 | 300A (210A)              | 420A (294A)               |               |                    |        |
| DCPC-090350-OPE    |                 | 350A (250A)              | 470A (330A)               |               |                    |        |
| DCPC-18002-OPE     |                 | 2A (1.4A)                | 6A (4.2A)                 |               |                    |        |
| DCPC-18003-OPE     |                 | 3A (2.1A)                | 9A (6.3A)                 |               |                    |        |
| DCPC-18004-OPE     |                 | 4A (2.8A)                | 8A (5.6A)                 |               |                    |        |
| DCPC-18005-OPE     |                 | 5A (3.5A)                | 10A (7A)                  |               |                    |        |
| DCPC-18008-OPE     |                 | 8A (5.6A)                | 24A (16A)                 |               | 200*114*59mm       | 1.10kg |
| DCPC-18016-OPE     |                 | 16A (11A)                | 48A (33A)                 |               |                    |        |
| DCPC-18024-OPE     |                 | 24A (16A)                | 50A (35A)                 |               |                    |        |
| DCPC-18050-OPE     |                 | 50A (35A)                | 100A (70A)                |               |                    |        |
| DCPC-18075-OPE     |                 | 75A (52A)                | 150A (105A)               |               | 221*140*59mm       | 1.45kg |
| DCPC-180100-OPE    |                 | 100A (70A)               | 200A (140A)               |               | 265*140*85mm       | 2.2kg  |
| DCPC-180150-OPE    |                 | 150A (105A)              | 250A (175A)               |               | 221*140*59mm       | 1.45kg |
| DCPC-135100-OPE    |                 | 100A (70A)               | 200A (140A)               |               | 221*140*85mm       | 1.8kg  |
| DCPC-135150-OPE    |                 | 150 (105A)               | 250 (175A)                |               | 265*140*85mm       | 2.2kg  |
| DCPC-135200-OPE    |                 | 200 (140A)               | 300A (210A)               |               |                    |        |
| DCPC-125300-OPE    |                 | 300A (210A)              | 420A (294A)               |               |                    |        |

## DC Serial terminal Definition



## DC Series outline dimension drawing



| Model      | L   | L1  | W  | W1    | W2    | W3 | W4   | H   | H1 | H2   | H3    | H4  |
|------------|-----|-----|----|-------|-------|----|------|-----|----|------|-------|-----|
| DC-2A~24A  | 141 | 134 | 32 | /     | 4.5   | /  | 15.5 | 90  | 51 | 18   | 4.5   | 134 |
| DC-30A~50A | 167 | 160 | 35 | /     | 2-4.5 | /  | 19.5 | 100 | 51 | 22   | 4-4.5 | 160 |
| DC-75A100A | 200 | 190 | 59 | 4-5.0 | /     | 25 | /    | 114 | 60 | 32.5 | 4-4.8 | 190 |
| DC-100AF   | 200 | 190 | 59 | 4-5.0 | /     | 25 | /    | 114 | 60 | 32.5 | 4-4.8 | 190 |
| DC-150A    | 221 | 211 | 59 | 5     | /     | 25 | /    | 140 | 60 | 45   | 4.8   | 211 |
| DC-150AF   | 221 | 211 | 59 | 5     | /     | 25 | /    | 140 | 60 | 45   | 4.8   | 211 |
| DC-200A    | 221 | 211 | 85 | 5     | /     | 25 | /    | 140 | /  | /    | /     | 211 |
| DC-300A    | 221 | 211 | 85 | 5     | /     | 25 | /    | 140 | /  | /    | /     | 211 |
| DC-350A    | 265 | 255 | 85 | 5     | /     | 25 | /    | 140 | /  | /    | /     | 255 |

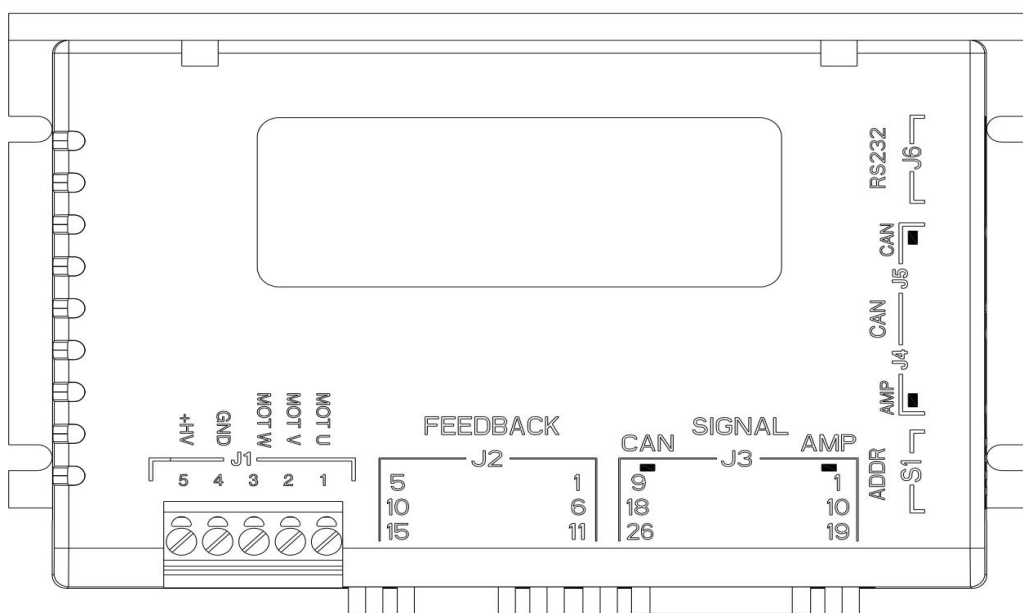
# 1、 Product introduction:

## 1.1 An overview of the

DC series programmable intelligent servo driver is a universal, high performance, DC power supply, compact structure of all digital servo driver. Mainly used in linear (DDL), torque (DDR), voice coil, brushless servo motor position, speed, torque control system. It can be operated in three modes of independently programmable control (STANDalone), external control or distributed network control, and can support incremental encoder, analog sine and cosine encoder(1.0Vp-p), rotary transformer (Resolver) and digital Hall feedback.

## 1.2 Technical characteristics

- ◆Control mode: position, speed, torque;
- ◆Sampling frequency (time) Current loop: 15KHz(66.7us); Speed/Position Loop :3KHz(330μs);
- ◆Bandwidth: the current loop is generally 2.5kHz, which varies with parameter adjustment and load inductance;
- ◆Motion mode: electronic gear, electronic CAM, proportional linkage, point to point;
- ◆Programmable protection: position error, over current, over voltage or under voltage,  $I^2t$ , output short circuit overload and other multi-directional protection;
- ◆Type of driving motor: three-phase stepping motor, brushless motor, brush motor, linear motor, voice coil motor, etc;
- ◆Position feedback: incremental encoder, Hall, grating ruler, analog sine and cosine (Sin/Cos) encoder(1.0Vp-p), rotary transformer (external conversion card);
- ◆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 ;
- ◆Power supply voltage: 18-90(135/180)VDC;



### 1.3 Electrical specifications for servo drivers

|                  |                        |                        |                                           |                                                                                                                                                                            |
|------------------|------------------------|------------------------|-------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Position control | Command control mode   |                        |                                           | Servo enable, external reset, positive/reverse limit, motor running stop, high-speed analog acquisition control, PWM synchronous signal input, high-speed pulse input, etc |
|                  | 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                             | Differential input, open collector                                                                                                                                         |
|                  |                        |                        | Maximum pulse frequency                   | Differential input :(Max. 2Mpps)<br>Open collector :(Max. 500Kpps)                                                                                                         |
|                  |                        | Simulation instruction | Voltage range                             | Input voltage range $\pm 10V$                                                                                                                                              |
|                  | impedance              |                        | Differential input impedance =5K $\Omega$ |                                                                                                                                                                            |
| Speed control    | Command control mode   |                        |                                           | PWM, $\pm 10V$ analog, function generator, software programming                                                                                                            |
|                  | input signal           | PWM                    | polarity                                  | PWM=0 $\sim$ 100%, polarity=1/0                                                                                                                                            |
|                  |                        |                        | nonpolar                                  | PWM=50% +/-50%                                                                                                                                                             |
|                  |                        |                        | Frequency range                           | Minimum 1kHz, maximum 100kHz                                                                                                                                               |
|                  |                        |                        | Minimum pulse width                       | 220ns                                                                                                                                                                      |
|                  | Simulation instruction | Voltage range          | Input voltage range $\pm 10V$             |                                                                                                                                                                            |
|                  |                        | impedance              | Differential input impedance =5K $\Omega$ |                                                                                                                                                                            |
| Current control  | Command control mode   |                        |                                           | PWM, $\pm 10V$ analog, function generator, software programming                                                                                                            |
|                  | input signal           | PWM                    | polarity                                  | PWM=0 $\sim$ 100%, polarity=1/0                                                                                                                                            |
|                  |                        |                        | nonpolar                                  | PWM=50% +/-50%                                                                                                                                                             |
|                  |                        |                        | Frequency range                           | Minimum 1kHz, maximum 100kHz                                                                                                                                               |
|                  |                        |                        | Minimum pulse width                       | 220ns                                                                                                                                                                      |
|                  | Simulation instruction | Voltage range          | Input voltage range $\pm 10V$             |                                                                                                                                                                            |
|                  |                        | impedance              | Differential input impedance =5K $\Omega$ |                                                                                                                                                                            |
| I/O signal       | Digital input IN       |                        | Number of Ports                           | 10(IN6, IN7, IN8, IN9 and IN10 are high-speed ports, IN5 is used for motor temperature protection)                                                                         |
|                  |                        |                        | Signal format                             | NPN(low active)                                                                                                                                                            |
|                  |                        |                        | Settable function                         | Servo enable, external reset, positive/reverse limit, motor running stop, high-speed analog acquisition control, PWM synchronous signal input, high-speed pulse input, etc |
|                  | Digital output OUT     |                        | Number of Ports                           | 3                                                                                                                                                                          |
|                  |                        |                        | Signal format                             | NPN(low effective), can withstand a maximum current of 300mA <sub>dc</sub> , maximum voltage of 30V <sub>dc</sub>                                                          |
|                  |                        |                        | Settable function                         | Fault signal, brake control, PWM sync signal, custom event track state, position trigger, program control                                                                  |

|                   |                                 |                     |           |                                             |
|-------------------|---------------------------------|---------------------|-----------|---------------------------------------------|
| function          | LED indicator                   |                     |           | Status indicator, CAN network indicator     |
|                   | Communi<br>cations<br>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-301V4.02       |
|                   |                                 |                     | equipment | Dsp-402 device driver and motion control    |
|                   |                                 | Protection function |           |                                             |
| Using environment | Installation location           |                     |           | Non-corrosive gas, flammable gas, etc       |
|                   | Altitude                        |                     |           | Below 1000 m                                |
|                   | Temperature                     |                     |           | 0°C~+50°C                                   |
|                   | Humidity                        |                     |           | 5%~95%RH, No condensation of water droplets |
|                   | Resistance to vibration/impact  |                     |           | Less than 4.9m/s2/ less than 19.6m/s2       |

## 2、Definition of wiring port

### 2.1 Power input terminal J1

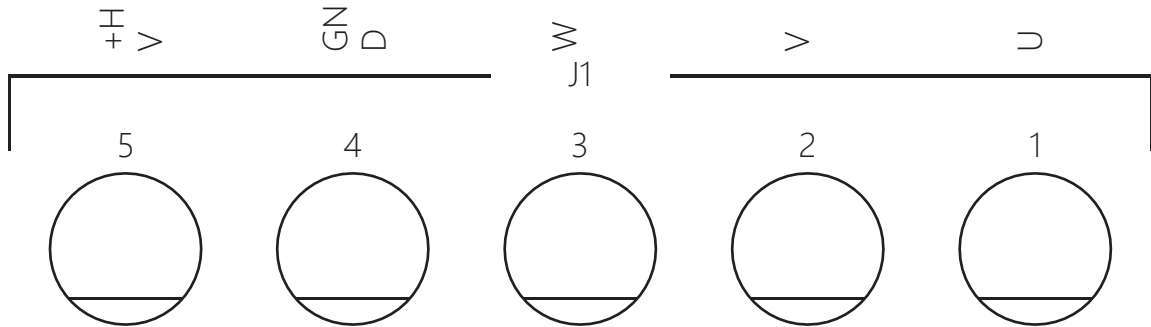


Figure 2.1 Ohm gauge terminal receptacle

| 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 -            | +18~90(135/180)VDC                                               |
| 5             | +HV    | Input power +            |                                                                  |

### 2.2 Motor encoder input terminal J2

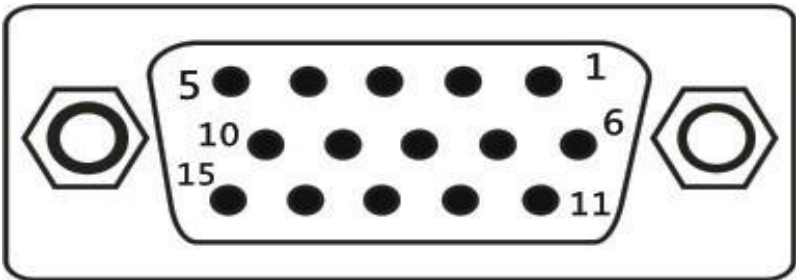


Figure 2.2 three rows of DB15 female seats

| pin | define | function               | pin | define | function               |
|-----|--------|------------------------|-----|--------|------------------------|
| 1   | SIN+   | SIN+                   | 9   | W+     | Motor encoder W+ input |
| 2   | SIN-   | SIN-                   | 10  | COS+   | COS+                   |
| 3   | U+     | Motor encoder U+ input | 11  | B-     | Motor encoder B- input |
| 4   | +5V    | Motor signal line +5V  | 12  | B+     | Motor encoder B+ input |
| 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-     | Motor encoder Z- input | 15  | COS-   | COS-                   |
| 8   | Z+     | Motor encoder Z+ input |     |        |                        |

### 2.3 Control signal I/O terminal J3

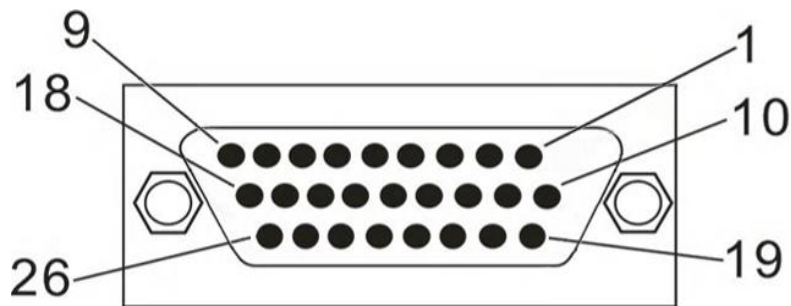


Figure 2.3 Three rows of DB26 female seats

| pin | define | function                | pin | define | function                       |
|-----|--------|-------------------------|-----|--------|--------------------------------|
| 1   | GND    | grounding               | 14  | IN10   | custom                         |
| 2   | Ref-   | Analog quantity - input | 15  | IN5    | Motor temperature              |
| 3   | Ref+   | Analog quantity + input | 16  | OUT1   | custom                         |
| 4   | IN1    | custom                  | 17  | OUT2   | custom                         |
| 5   | IN2    | custom                  | 18  | OUT3   | custom                         |
| 6   | IN3    | custom                  | 19  | GND    | power ground                   |
| 7   | IN4    | custom                  | 20  | +5V    | 5V power output (100mA)        |
| 8   | IN11   | custom                  | 21  | EONZ-  | Motor encoder output signal Z- |
| 9   | IN12   | custom                  | 22  | EONZ+  | Motor encoder output signal Z+ |
| 10  | IN6    | custom                  | 23  | EONB-  | Motor encoder output signal B- |
| 11  | IN7    | custom                  | 24  | EONB+  | Motor encoder output signal B+ |
| 12  | IN8    | custom                  | 25  | EONA-  | Motor encoder output signal A- |
| 13  | IN9    | custom                  | 26  | EONA+  | Motor encoder output signal A+ |

## 2.4 CAN communication terminal J4&J5

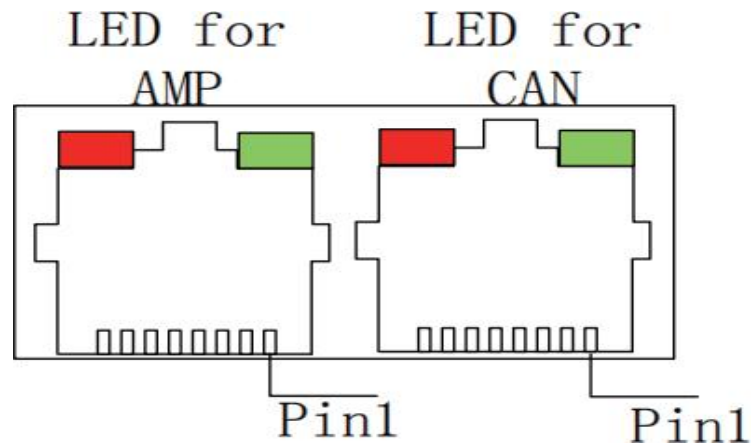


Figure 2.4. RJ45 8-pin crystal socket

| pin | definition | function                      |
|-----|------------|-------------------------------|
| 1   | CANH       | CANH signal                   |
| 2   | CANL       | CANL signal                   |
| 3/7 | GND        | Communication power grounding |

Note: The two RJ45 ports in J4/J5 are defined in the same way to facilitate bridging during communication.

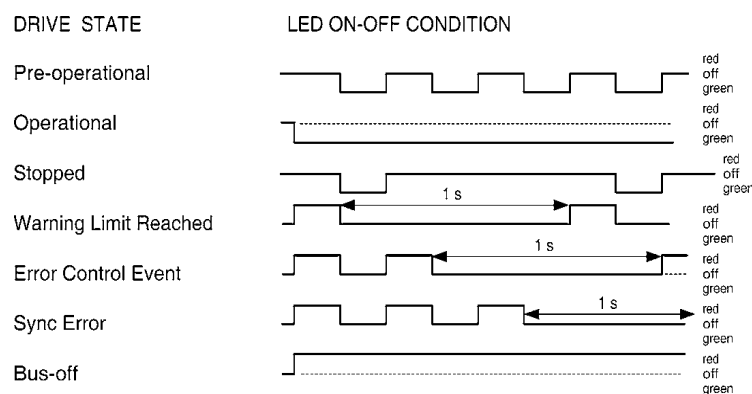
## 3. Definition of indicator Status

### 3.1 Drive status indicator (AMP)

Red/green leds tell us the status of the drive by changing color and blinking or not. Possible scenarios include:

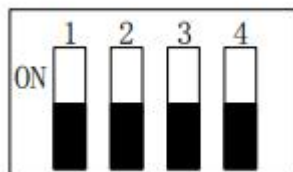
|                     |                                                                                                                                           |
|---------------------|-------------------------------------------------------------------------------------------------------------------------------------------|
| 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                                                                              |

### 3.2 CAN Communication indicator (CAN)



### 3.3 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.

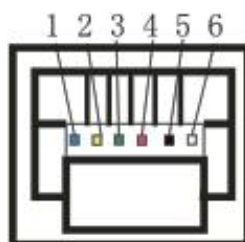


SW Indicates the station number of the DIP switch

| 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,  $4+8=12$

### 3.4 Serial communication terminal J6

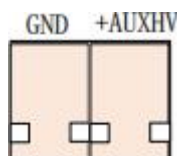


| pin | definition | function                      |
|-----|------------|-------------------------------|
| 2   | RXD        | RS232 communication receiver  |
| 3   | GND        | Communication power grounding |
| 5   | TXD        | RS232 communication sender    |

Figure 3.6 RJ11 6-pin crystal head holder

### 3.5 Auxiliary power supply J7

If there is a driver with J7 socket, this is the auxiliary power port. If necessary, you can connect it. If connected, +HV is disconnected from power and +AUXHV is powered on, but there is no action when issuing commands

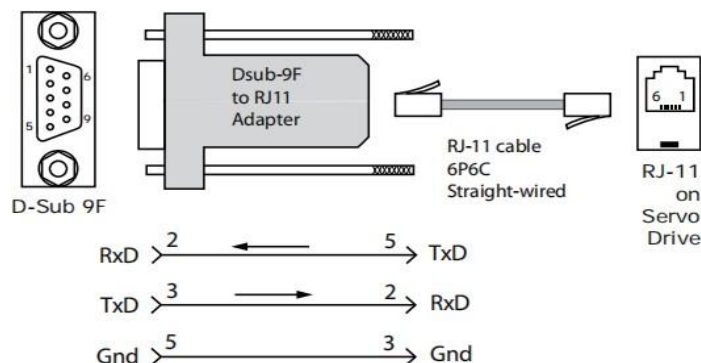


|        |                                |
|--------|--------------------------------|
| GND    | 0V                             |
| +AUXHV | +24V (or $\leq$ mains voltage) |

## 4、Control port hardware description

### 4.1 RS-232 Communications (RXD, TXD, GND)

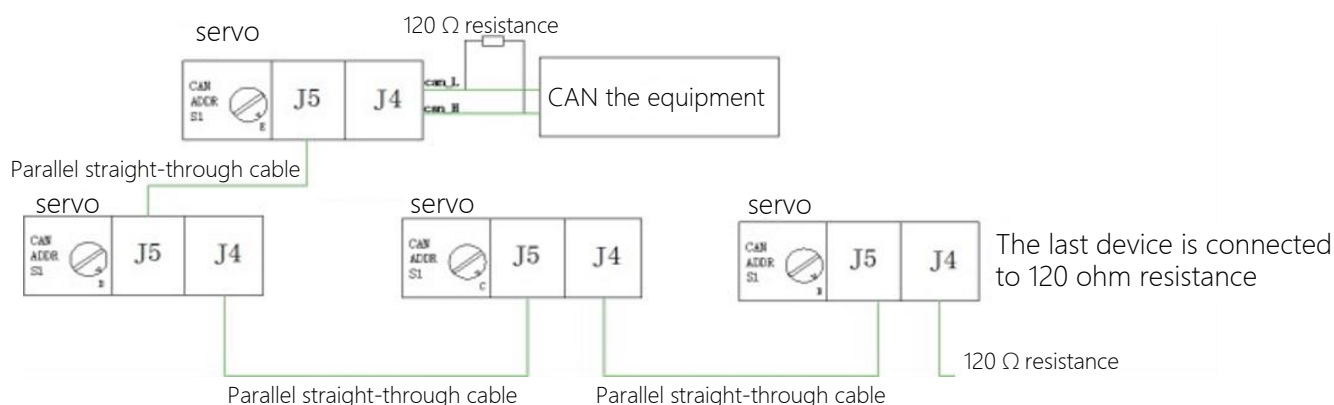
The serial ports are full-duplex and three-wire (RXD, TXD, GND)RS-232, with a baud rate from 9600 to 115200. The wiring terminal is J6 through the debugging software or serial port debugging tool. The debugging cables are shown as follows



### 4.2 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 CANope 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 change the rS-232 communication port address, reset or restart the drive to take effect. Through the CAN communication interface, a very effective combination of high data rate and low cost multi-axis motion control system CAN be realized. The wiring terminal is J4、J5.

CAN network CAN be connected as shown below:



Note: The total resistance on the CAN network is 60 ohms. If the first driver on the CAN device has a resistance, no resistance is required

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

±10Vdc differential analog input, maximum input voltage ±10Vdc, input impedance about 5.36K, resolution 12 bits. The analog signal can be used for torque, speed and position control.

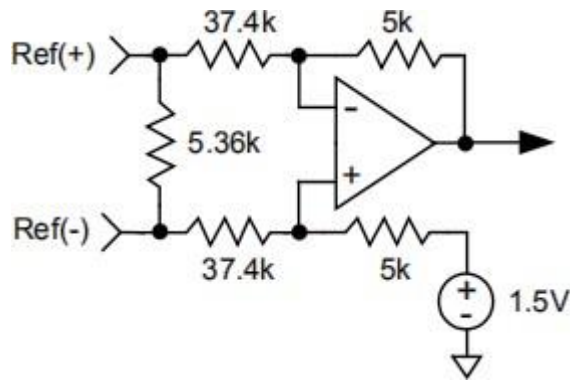


Figure 4.3.1 Analog hardware input circuit



Figure 4.3.2 Analog input wiring of external power supply

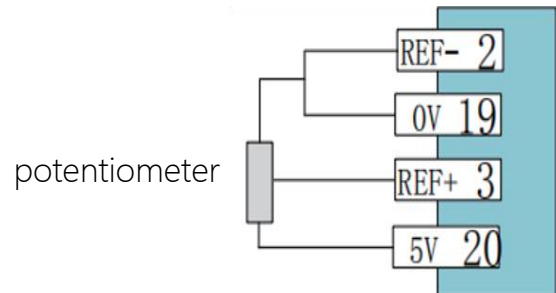


Figure 4.3.3 Analog input wiring of internal power supply

#### 4.4 Digital input signal

DC series servo has 12 digital input ports, 11 have programmable function, drive power PWM output and security enable fixed by IN1 control, through this port can achieve power circuit hardware cut off.

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

##### 4.4.1 Universal input signal terminal (IN1, IN2, IN3, IN4, IN5)

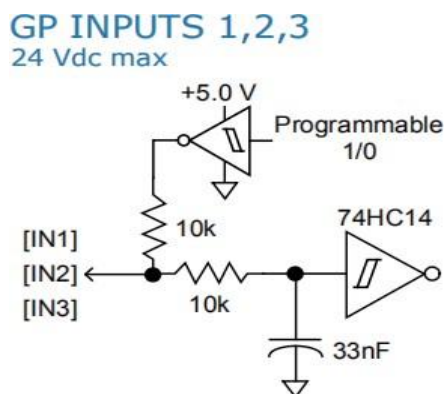


Figure 4.4.1 IN1-IN3 hardware input circuit

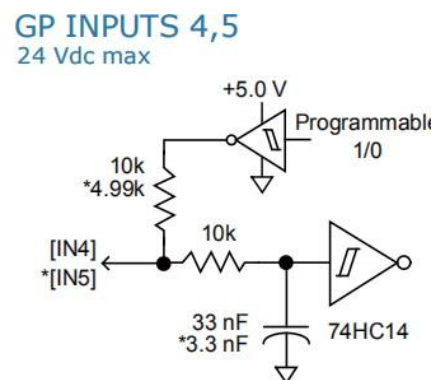


Figure 4.4.2 IN4-IN5 hardware input circuit

IN1, IN2, IN3, IN4, and IN5 are universal input signal terminals. The control logic and function can be set programmatically. IN1 is fixed for driver enable control, IN5 is mainly used for motor temperature protection input, through the software parameter setting high/low level takes effect.

#### 4.4.2 High speed input signal terminal (IN6, IN7, IN8, IN9, IN10)

IN6, IN7, IN8, IN9, IN10 are high-speed input terminals. In addition to being used as general terminals, they can also be used as high speed pulse input. The pulse input port is fixed as (IN9, IN10).

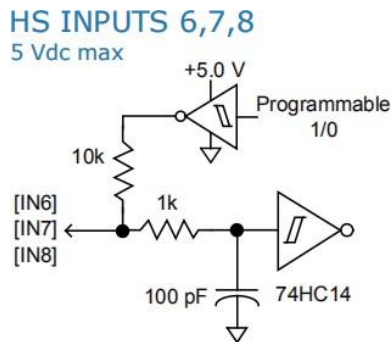


Figure 4.4.3 IN6,7,8 internal hardware diagram

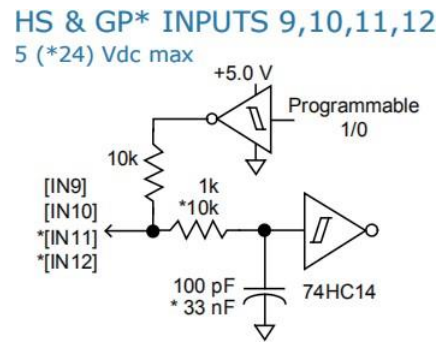


Figure 4.4.4 IN9,10,11,12 internal hardware diagram

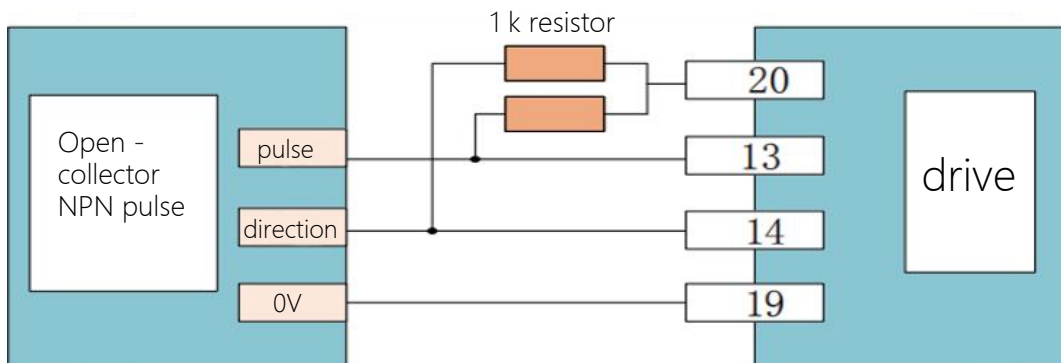


Figure 4.4.5 Open-collector NPN pulse input diagram

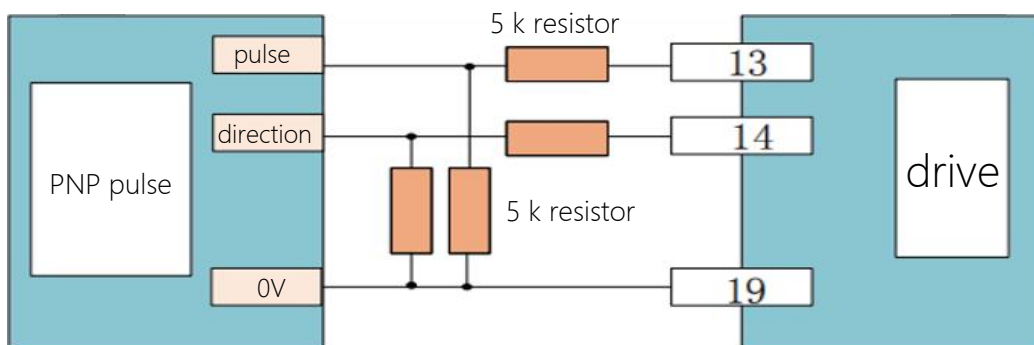


Figure 4.4.6 PNP pulse input diagram

## 4.5 Digital output signal

DC series drivers have three digital output ports, digital output IO port MOSFET open output, internal through diode series 1K resistance to pull up to 5V, the port can withstand voltage to 24Vdc, the maximum current can withstand 300mA dc. The output function of the port can be changed according to internal programming.

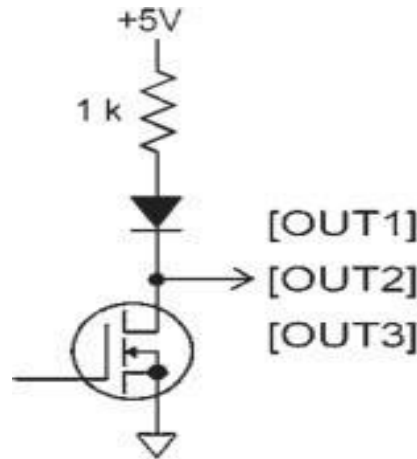


Figure 4.5 Digital output hardware circuit

### 4.5.1 motor locks the brake

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. Since the motor brake is a perceptual device, the reverse current return diode must be connected in parallel.

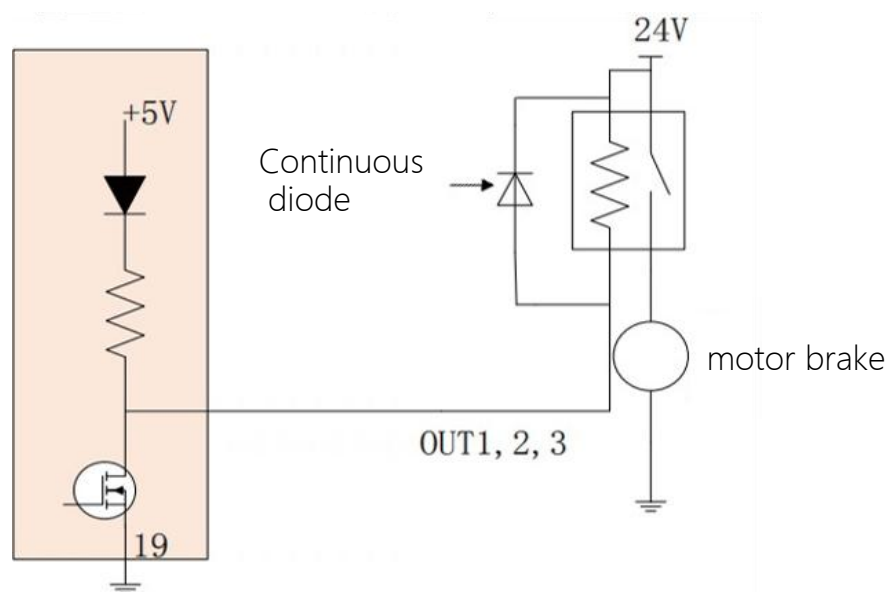


FIG. 4.5.1 External circuit of motor brake

## 4.6 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.

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

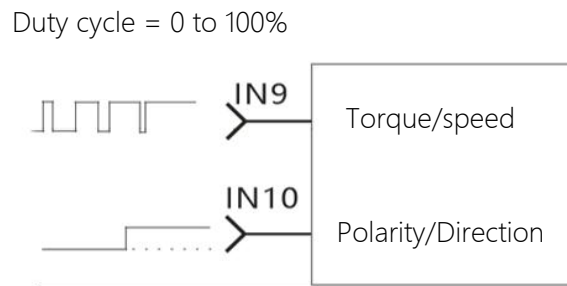


Figure 4.6.1 100% duty cycle + direction control

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

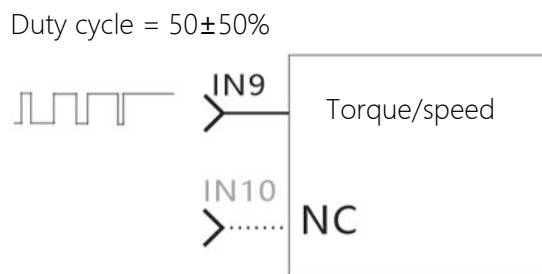


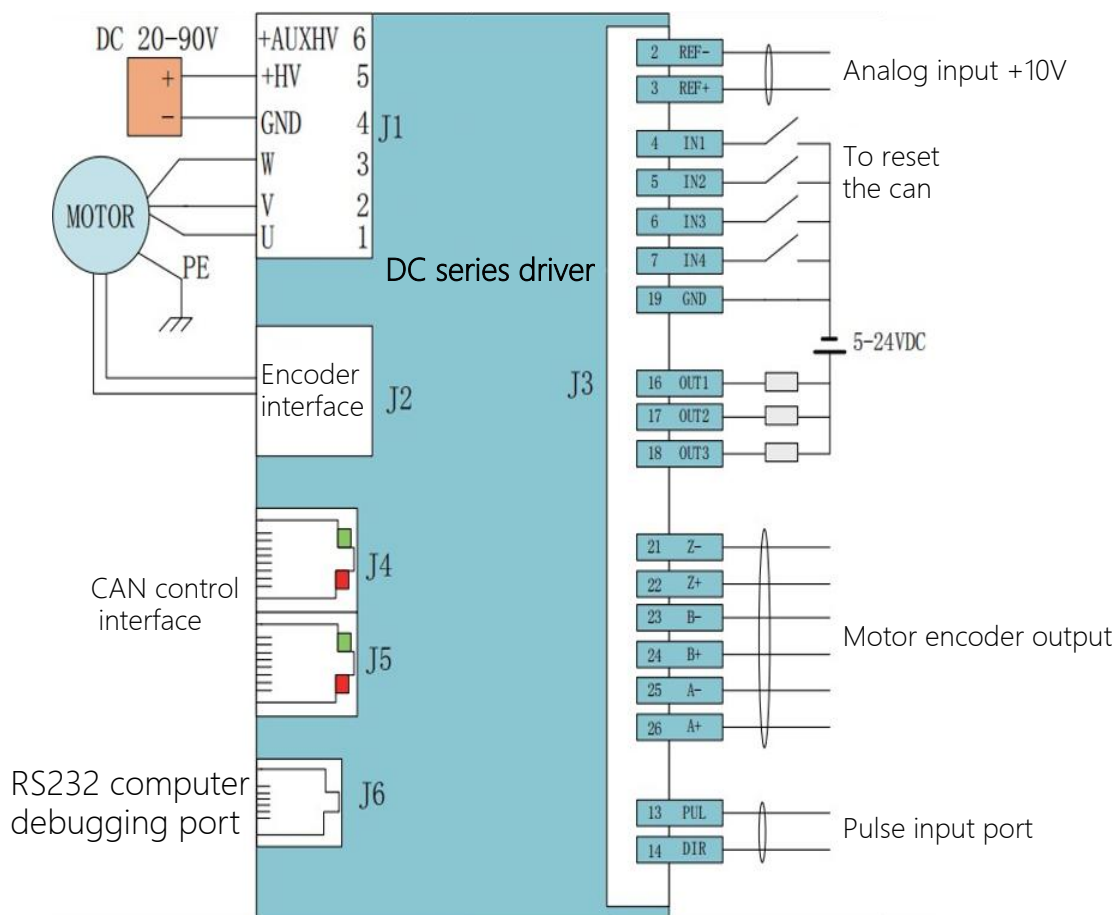
Figure 4.6.2 50% $\pm$ 50% duty cycle control

## 5、Drive parameter Setting

DC series driver can set parameters, monitor motor state, collect data wave shape and so on through RS232 serial port. Complete system debugging quickly and intuitively. For details, see the instructions for Debugging Software.

## 5.1、 System wiring diagram

### Typical wiring diagram



#### Description:

1. Input terminals IN1, IN2, IN3, IN4, IN5, IN 11, IN12 are common ports that can receive NPN and PNP signals. The maximum input voltage is 24V
2. IN6, IN7, IN8, IN9, IN10 are high-speed input ports with the highest input voltage of 5V
3. AUXHV is an auxiliary power supply, which can be connected if necessary. If connected, communication is maintained when +HV is disconnected and +AUXHV is powered on, but there is no action when issuing commands

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### Revision record

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