DINGS
Precision Motion Specialist

VER 1.2

Technical Manual

DS-OLS4-FPD Digital Stepping Driver

DINGS
Precision Motion Specialist

Table of Contents

1. Introduction

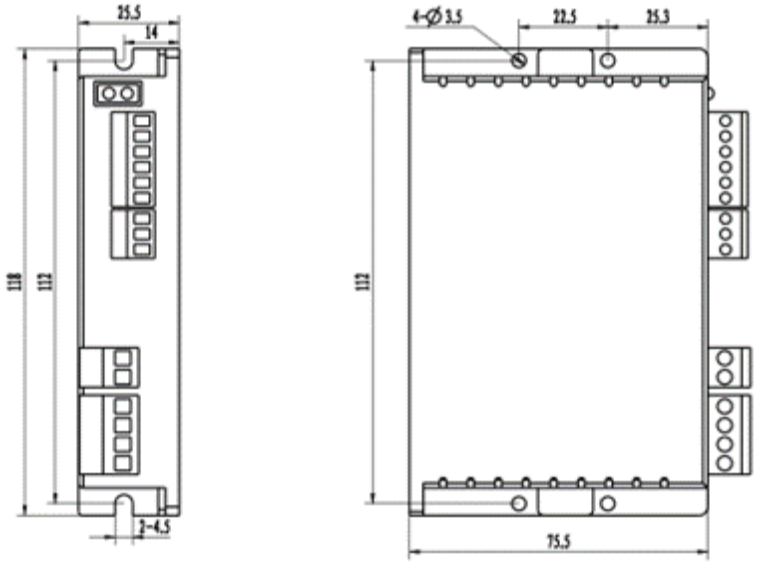
1.1 Features

- Input power supply : DC 24V~48V
- 8 speed current selection
- 16 levels of subdivision selection
- Single / Double pulse selection, phase-locked current selection, filtering selection, self tuning selection, alarm output logic selection
- Pulse triggering edge selection, enabling control selection
- PWM constant current bipolar subdivision drive
- Photoelectric isolation input function
- Motor short circuit protection function
- Exquisite design, low noise, and low vibration

1.2 Technical Parameters

Drive model			**DS-OLS4-FPD**
Adapter motor			Adapted to two-phase hybrid stepping motor, DS-OLS4-FPD Maximum adaptation 4.2A
Power supply			24 - 48V DC
Output current			DS-OLS4-FPD：1.0A-4.2A/ phase (peak)
Drive mode			Full-bridge bipolar PWM driver
Input signal	Pulse signal Direction signal	Dial to select 24V signal	Optocoupler input voltage H = 18-28V, L = 0 - 0.8V On current 6-15mA
		Dial to select 5V signal	Optocoupler input voltage H = 3.5-5V, L = 0 - 0.8V On current 6-15mA
	Offline signal		Optocoupler input voltage H = 3.5-26V, L = 0 - 0.8V On current 6-15mA
Output signal	Alarm signal		Optically isolated output, highest withstand voltage 30VDC， Maximum saturation current 100mA
	Brake		
Size (excluding terminals)			118 × 21 × 55mm
Weight (excluding terminals)			About 240 g
Use surroundings	Use occasion		Avoid dust, oil mist and corrosive gases
	Humidity		< 85 % RH, No condensation
	Temperature		0°C - +40°C
	Heat dissipation		Installed in a ventilated environment

1.3 Dimensional Drawing (mm)



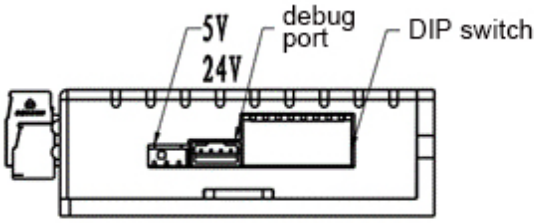
Drive installation

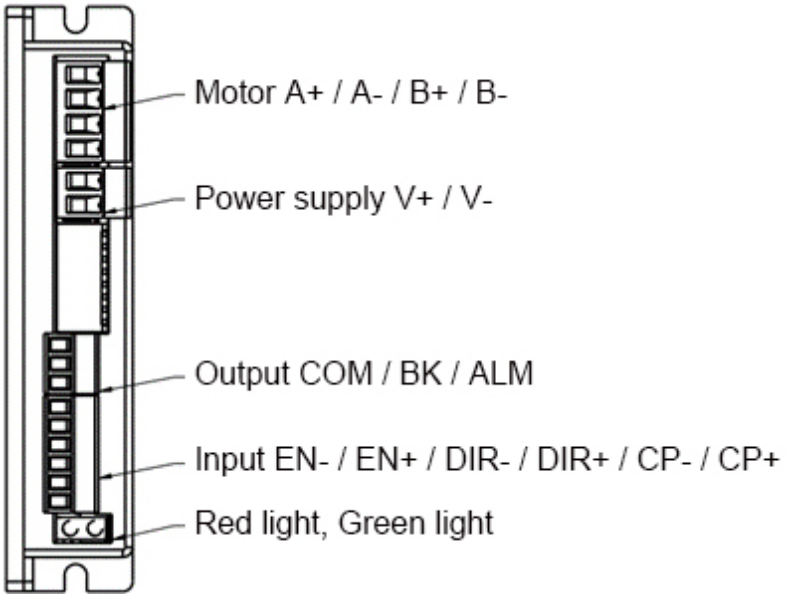
Install with narrow edges and M4 screws through the holes on both sides. The power device of the driver will generate heat. If it operates continuously under high input voltage and high power conditions, the effective heat dissipation area should be expanded or forced cooling should be applied.

Do not use in areas where the air is not circulating or where the ambient temperature exceeds 40 ℃

Do not install the drive in damp or metal shavings.

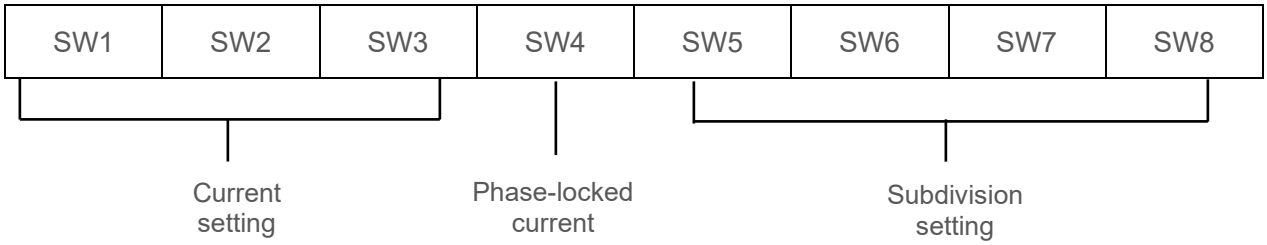
2. Schematic Diagram and Interface Definition



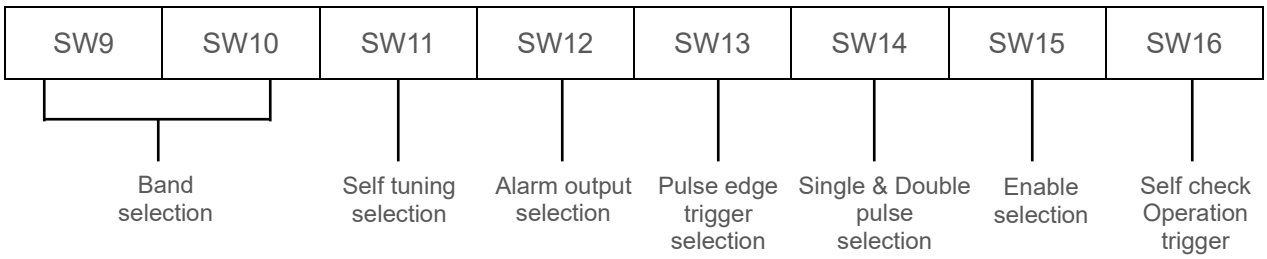


3. Set Switch

Front Dial



Side Dial



3.1 Subdivision Setting

DIP switch				Pulse count / Revolution
SW5	SW6	SW7	SW8	
ON	ON	ON	ON	200
OFF	ON	ON	ON	400
ON	OFF	ON	ON	800
OFF	OFF	ON	ON	1600
ON	ON	OFF	ON	3200
OFF	ON	OFF	ON	6400
ON	OFF	OFF	ON	12800
OFF	OFF	OFF	ON	25600
ON	ON	ON	OFF	1000
OFF	ON	ON	OFF	2000
ON	OFF	ON	OFF	4000
OFF	OFF	ON	OFF	5000
ON	ON	OFF	OFF	8000
OFF	ON	OFF	OFF	10000
ON	OFF	OFF	OFF	20000
OFF	OFF	OFF	OFF	25000

3.2 Current Setting

DIP switch			Phase current (peak)
SW1	SW2	SW3	
ON	ON	ON	1.0A
OFF	ON	ON	1.5A
ON	OFF	ON	1.9A
OFF	OFF	ON	2.4A
ON	ON	OFF	2.8A
OFF	ON	OFF	3.3A
ON	OFF	OFF	3.8A
OFF	OFF	OFF	4.2A

3.3 Filter Setting

SW9	SW10	Filter setting
ON	ON	Default
OFF	ON	6ms
ON	OFF	12ms
OFF	OFF	25ms (can be set through communication)

3.4 Phase Locked Current Setting

SW4=off : (factory default) After the driver stops receiving pulses for about 0.4 seconds, the output current is 50% of the peak value

(set to half current, which can reduce the heating of the driver and motor in some applications)

SW4=on : The output current of the driver is 90% of the peak value when the motor is stationary.

3.5 Self Tuning Setting

SW11=off : Motor power on self setting (factory default)

SW11=on : The motor does not self adjust when powered on, and default parameters are used.

3.6 Alarm Output Setting

SW12=off : Under normal working conditions, the alarm output is in a low resistance state (conduction state) (factory default).

When the driver alarms, the alarm output is in a high resistance state (non conduction state)

SW12=on : Under normal working conditions, the alarm output is in a high resistance state (non conductive state).
When the driver alarms, the alarm output is in a low resistance state (conductive state).

3.7 Pulse Trigger Edge Setting

SW13=off : The rising edge of the pulse is valid (factory default)
SW13=on : The pulse falling edge is effective.

3.8 Single and Double Pulse Selection Setting

SW14=off : set to single pulse mode (factory default)
SW14=on : Set to dual pulse mode.

3.9 Enable Selection Setting

SW15=off : When the driver is not enabled, it does not respond to pulses, no current output, and the motor does not lock (factory default)
SW15=on : When the driver is not enabled, it does not respond to pulses, there is current output, and the motor is locked.

SW16=off : Turn off self detection (factory default)
SW16=on : The motor rotates clockwise and counterclockwise at a speed of 1 RPS, continuously cycling.

3.10 Indicator Light Function

This product has two LED indicators in red and green to display the status:
The green light is the power indicator light

Fault indication:

Alarm function	Light Flashing	Explain
Motor overcurrent	1 green+1 red	Motor phase current overcurrent or driver failure
Overvoltage	1 green+2 red	Power input greater than 60V
Undervoltage	1 green+3 red	Power input less than 15V
Motor phase loss	1 green+4 red	The motor is not connected

3.11 Debugging Interface

485 debugging interface for parameter settings.

4. Power Supply

4.1 Voltage

The chopper driver continuously changes the magnitude and direction of the motor winding terminal voltage during operation, while detecting the current to obtain accurate phase current. If both high efficiency and low noise are to be ensured, the driver supply voltage should be at least 5 times the rated phase voltage of the motor (the rated phase current of the motor × Phase resistance).

If you need the motor to achieve better high-speed performance, you need to increase the driver supply voltage. If using a regulated power supply, it is required that the power supply voltage should not exceed 48V. If using a non regulated power supply, the voltage must not exceed 34V.

Because the rated current of non regulated power supply is full load current. When the load is very light, such as when the motor is not running, the actual voltage can reach 1.4 times the rated voltage of the power supply. If you want the motor to run smoothly and quietly, choose low voltage.

4.2 Current

The maximum power supply current should be the sum of the two phase currents. Usually, the current you need depends on the motor model, voltage, speed, and load conditions. The actual power supply current value is significantly lower than this maximum current value because the driver uses a switching amplifier to convert high voltage and low current into low voltage and high current. The more the power supply voltage exceeds the motor voltage, the less power supply current is required.

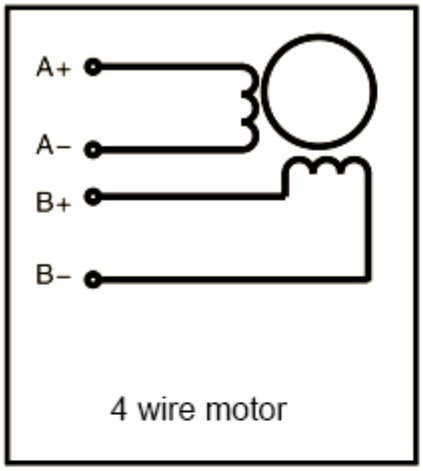
4.3 Regenerative Discharge

When the motor slows down, it converts the kinetic energy of the load into electrical energy like a generator. Some energy will be consumed by the driver and motor. If your application has a large load running at high speed, a considerable amount of kinetic energy will be converted into electrical energy. It is easy to cause driver alarms (overvoltage) and may even cause damage to the driver.

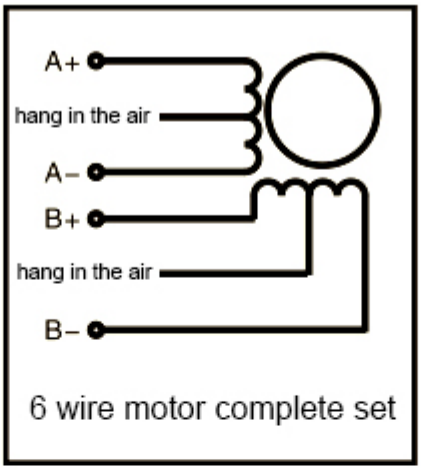
5. Motor Connection

Caution

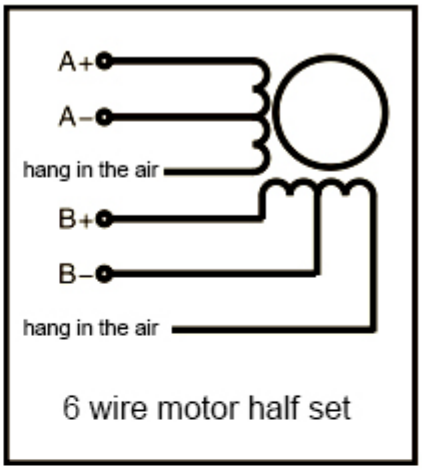
When connecting the motor to the drive, please confirm that the power supply to the drive is turned off first. Confirm that the unused motor leads are not shorted to other objects. During the power on period of the driver, the motor cannot be disconnected. Do not connect the motor leads to the ground or power supply.



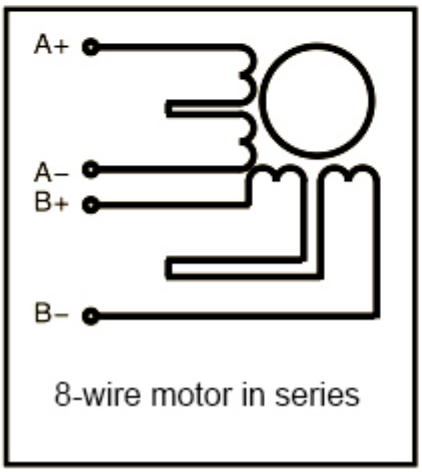
4 wire motor



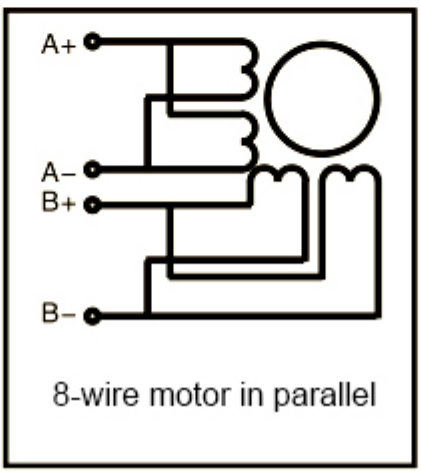
6 wire motor complete set



6 wire motor half set



8-wire motor in series



8-wire motor in parallel

1) Four-wire motors can only be connected in one way.

2) Six-wire motors can be connected in two ways: full group and half group. In the full group mode, the motor has greater torque at low speeds, but it cannot run as fast as in the half group. When the whole group is running, the motor needs to run at less than 30% of the half-group current to avoid overheating.

3) Eight-wire motors can be connected in two ways: series and parallel. The series mode has greater torque at low speeds and less torque at high speeds. When running in series, the motor needs to run at 50% of the current in parallel to avoid overheating.

Notes

1) **The corresponding colors of different motors are different. When using the motors, the specifications of the motors shall prevail.**
2) **The windings of different phases of the motor cannot be connected to the terminals of the same phase of the driver (A+, A - represents one phase, B+, B - represents another phase). If the motor's rotation direction is different from the expected rotation direction, only exchange the positions of A+, A -.**
3) **This driver can only drive two-phase hybrid stepping motors, not three-phase and five-phase stepping motors.**

6. Signal Input

6.1 Pulse Signal : PUL

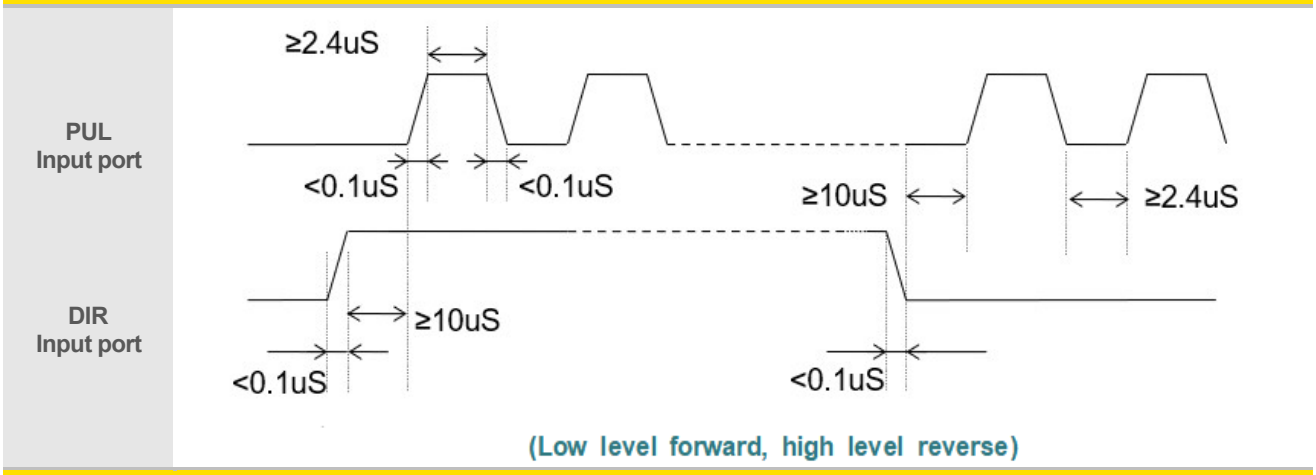
The dialing selection can accept 5VDC or 24VDC single ended or differential signals. The change from off to on is understood as receiving an effective pulse along the instruction. For the common anode, the low level is effective (for the common cathode, the high level is effective), and at this time, the driver will drive the motor to run one step according to the corresponding timing. For the normal operation of the driver, the duty cycle of the effective level signal should be below 50%. To ensure the reliable response of the pulse signal, the duration of the pulse effective level of the subdivided driver should not be less than 2.5us. The signal response frequency of the subdivision driver is 200KHz, and an excessively high input frequency may result in incorrect response.

6.2 Direction Signal : DIR

The dialing selection can accept 5VDC or 24VDC single ended or differential signals. The on-off of the internal optocoupler at this end is explained as two directions of motor operation, and a change in direction signal will cause a change in the direction of motor operation. The suspension at this end is equivalent to an input high level. It should be noted that the subdivision driver should ensure that the direction signal is established at least 10us ahead of the pulse signal input to avoid incorrect response of the driver to the pulse signal. When reversing the motor, it is necessary to slow down the motor to the starting frequency before reversing. The commutation signal must change after the end of the last PUL pulse of the previous direction signal and before the first PUL pulse of the next direction signal. When there is no need to change direction, the direction signal end can be suspended.

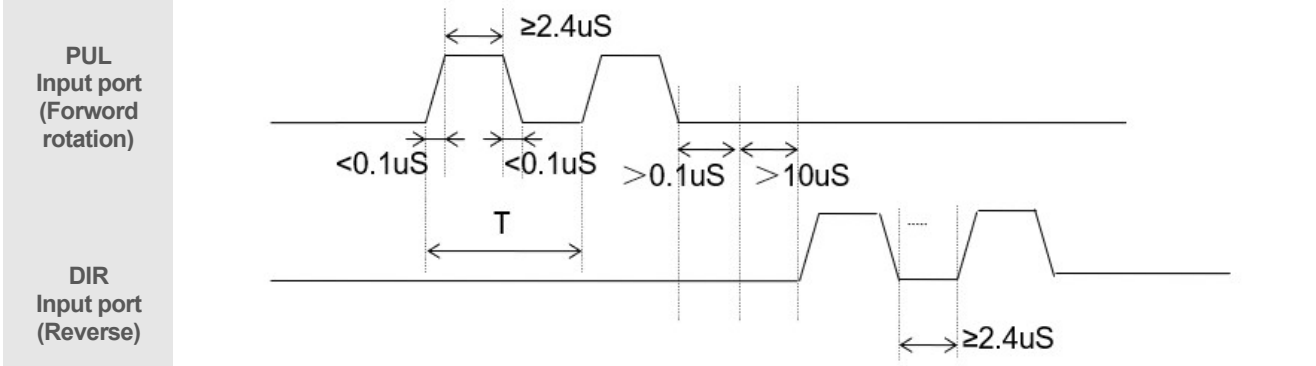
6.3 Pulse / Direction Input Timing Diagram

Input signal waveform and timing (single pulse method)



(Low level forward, high level reverse)

Input signal waveform and timing (double pulse method)

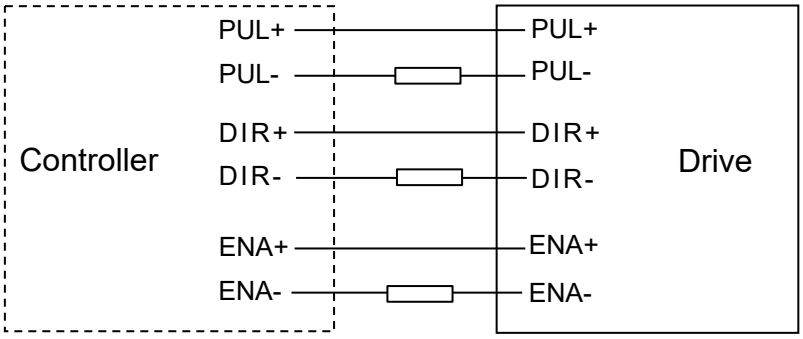


6.4 Offline Signal : ENA

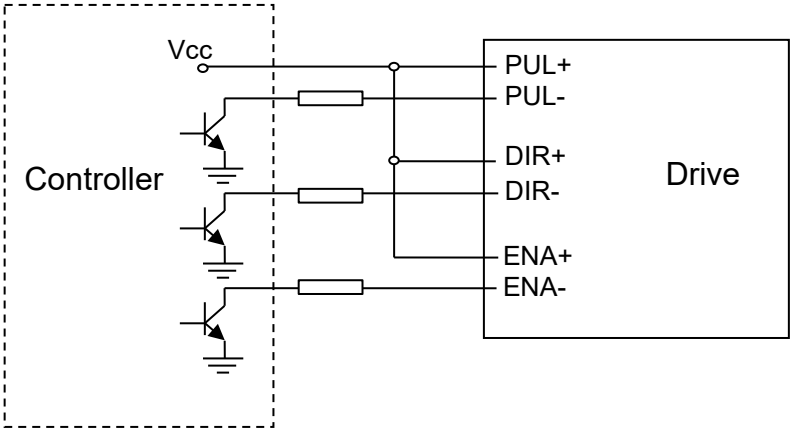
It can accept 5-24VDC single ended or differential signals. When the built-in optocoupler is turned on, the motor phase current is cut off and the rotor is in a free state (offline state). When this function is not needed, the offline signal end can be suspended.

7. Typical Signal Connection Method

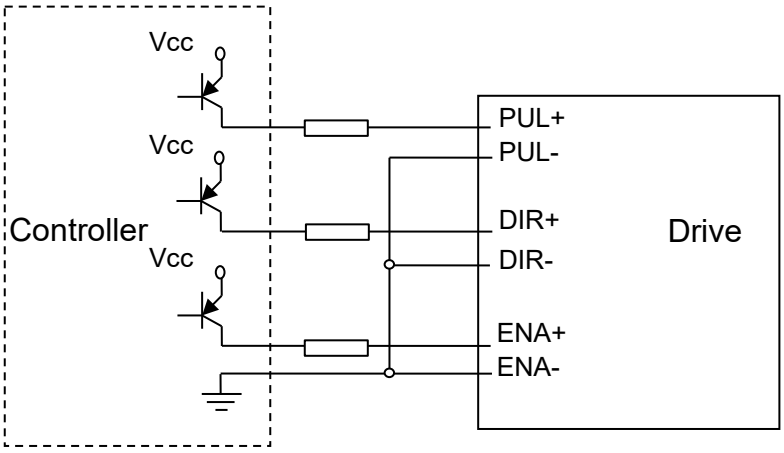
7.1 Differential Connection Method



7.2 Co Positive Connection Method



7.3 Co Negative Connection Method

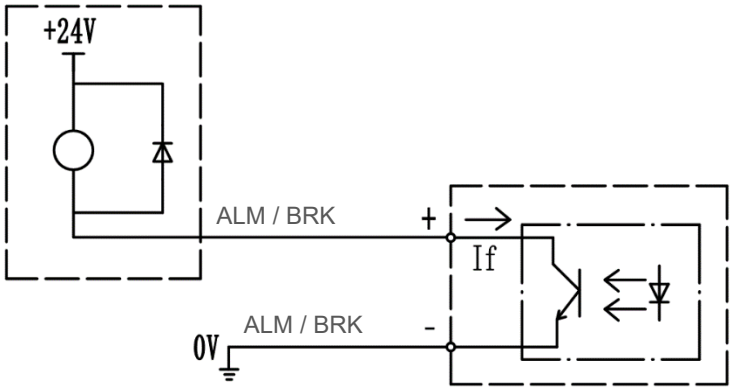


Notes

VCC 3.5-5 VDC R=0 Ω VCC 12VDC R=1K Ω
VCC 24VDC R=2.2K Ω Dial to select 24V signal: VCC 24VDC R=0K Ω

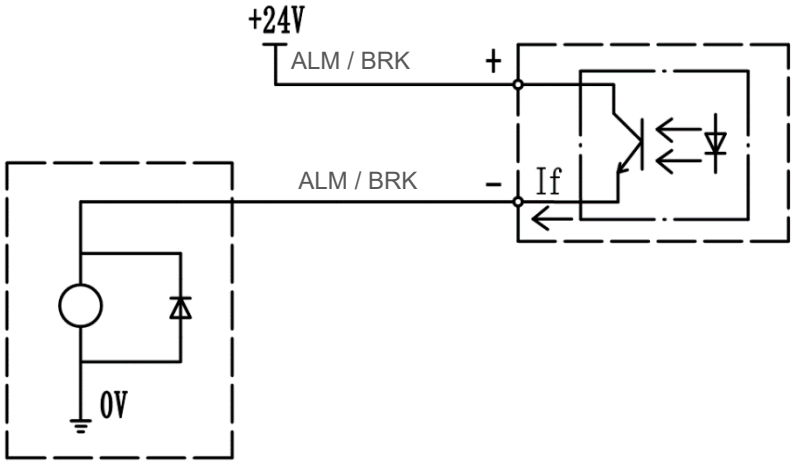
Typical Connection Method for Signal Output

Relay Connection



Notes **When the relay is connected, it is required to connect diodes at both ends of the relay (such as IN4000 series)**

Optocoupler Connection



The output is photoelectric isolation, with a maximum withstand voltage of 30VDC and a maximum saturation current of 100mA.

8. Wiring Requirements

1) In order to prevent the driver from being disturbed, it is recommended to use shielded cable for the control signal, and the shield layer should be shorted to the ground. Except for special requirements, the shielded wire of the control signal cable is grounded at one end: the upper end of the shielded cable is grounded The driver end of the wire is left floating. Grounding can only be performed at the same point in the same machine. If it is not a real ground wire, the interference may be serious, and the shielding layer is not connected at this time.
2) Pulse and direction signal lines and motor lines are not allowed to be bundled side by side, preferably at least 10cm apart, otherwise motor noise may easily interfere with pulse direction signals, causing inaccurate positioning of the motor, system instability and other faults.
3) If one power supply is used for multiple drives, a parallel connection should be adopted at the power supply. It is not allowed to connect one to the other in a chain.
4) It is strictly forbidden to plug and unplug the driver's strong current (motor and power) terminals. When the charged motor is stopped, a large current still flows through the coil. Plugging and unplugging the strong current (motor and power) terminals will cause a huge momentary induced electromotive force to burn out driver.
5) It is strictly forbidden to add lead to the terminal after adding tin, otherwise the terminal may be damaged due to overheating due to the increased contact resistance.
6) The wiring head must not be exposed outside the terminal to prevent the driver from being accidentally shorted.

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