mindman

DRIVER



CM10 series

User Manual

Open Loop Stepper Motor Driver

Ver. 2309

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1. Safety Precautions

Please observe the ratings and use this product in the environment stated in this book.

The purpose of designing and manufacturing the company's products is not to enable this product to be used in life-related situations or environments. Therefore, if you purchase this product for a special purpose, please inform our sales staff, discuss and confirm it.

The company is constantly pursuing higher quality and better customer trust. However, when using our products, please be sure to consider safety designs such as multiple backup design, fire countermeasure design, and malfunction prevention design to avoid personal accidents, fires and other social damages caused by system design failures. The company is constantly pursuing higher quality and better customer trust. However, when using our products, please be sure to consider safety designs such as multiple backup design, fire countermeasure design, and malfunction prevention design to avoid personal accidents, fires and other social damages caused by system design failures.

In order to allow all users to use this drive safely, safety precautions are listed in the following table in this book. Precautions are described here.

Danger	Indicates that if a mistake occurs, there is a possibility that a dangerous situation will occur and cause death or serious injury.
Warning	Indicates that if a mistake occurs, there will be a dangerous situation that will cause the person to be moderately injured or slightly injured. There may also be material losses.
Prohibit	Must not be violated.
Compulsory	Must be executed.

Danger	● Do not touch the terminal part and its interior with your hands when the power is on. Otherwise, electric shock accidents may occur. ● Do not pull or twist the cable, or place heavy objects on the cable. Otherwise, electric shock or fire accidents may occur. ● Do not touch the movable parts of the module with your hands. Otherwise, it may be caught in the rotating shaft and cause injury. ● Do not touch the internal parts of the driver with your hands. Otherwise, electric shock accidents may occur. ● Be sure to ground the terminals of the driver and motor. Otherwise, electric shock accidents may occur. ● Movement, wiring, maintenance, inspection, etc., should be performed after confirming that the power is off and the display LED on the panel is completely off. Otherwise, electric shock accidents may occur. ● Do not touch the rotating part of the motor during operation. Otherwise, it may be cause injury.

Warning	● Do not use this product in places where it may be contaminated with water, oil, drug droplets, corrosive, or flammable gases. ● Please use the specified voltage. Otherwise, a fire may occur. ● The temperature of the driver, motor, and peripheral devices will rise, so please do not touch them. Otherwise, there may be a risk of burns. ● Please connect the wiring correctly. ● Please use the motor and driver in accordance with the specified combination. Otherwise, a fire may occur. ● When the power is turned on or after the power is shortly turned off, the heat sink and motor of the drive may still be in high temperature. Therefore, please do not touch it, otherwise there may be a risk of burns. ● Do not apply excessive pressure to the edge of the case. Otherwise, it may be cause injury.
Prohibit	● Do not use or store this product in a place exposed to direct sunlight. ● Do not use or store this product in places where the surrounding temperature and humidity exceed the specified range. ● Do not use or store this product in places with a lot of dust. ● Do not use or store this product in places subject to direct vibration or impact. ● Do not repair or modify the internal and external structure of this product by yourself.
Compulsory	● Please install an external emergency stop circuit that can stop the motion immediately

2. Technical Specifications

2.1 Driver Specifications

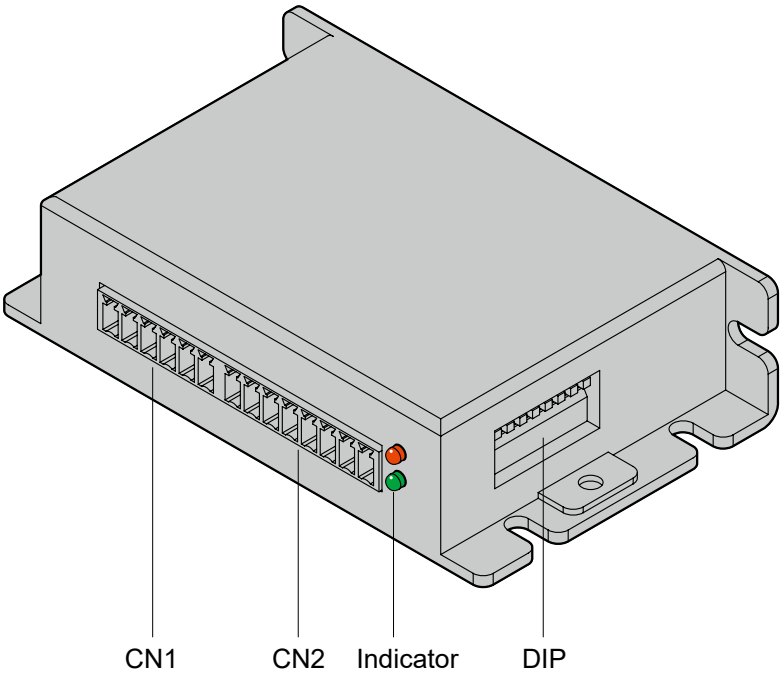
Model		CM10
Input voltage (driver)		20VDC ~ 30VDC (Recommend 24VDC)
Operating current		0.4A, 0.8A, 1.2A, 1.6A, 2.0A, 2.4A, 2.8A, 3.2A (by DIP setting)
Applicable motor		Two-phase hybrid stepping motor (Without encoder)
Control method		Single / Double pulse input
I/O signal	Pulse signal	Optocoupler input voltage : H = 3.5 ~ 26V, L = 0 ~ 0.8V Current consumption : 6 ~ 15mA 5V and 24V signal compatible
	Free signal	
	Direction signal	
Resolution [p/r]		400 800 1,000 1,600 2,000 3,200 4,000 5,000 ,6,400 8,000 10,000 12,800 25,600 40,000 100,000 102,400 (by DIP setting)
Protection		short circuit protection, over current protection, over voltage protection
Operating temperature/ humidity		0 ~ 50°C, <85%RH (no condensation)
Storage temperature/ humidity		-200 ~ 70°C, <85%RH (no condensation)
Environment		Avoid dust, oil mist and corrosive gas
Weight		180 g

2.2 Motor Specifications

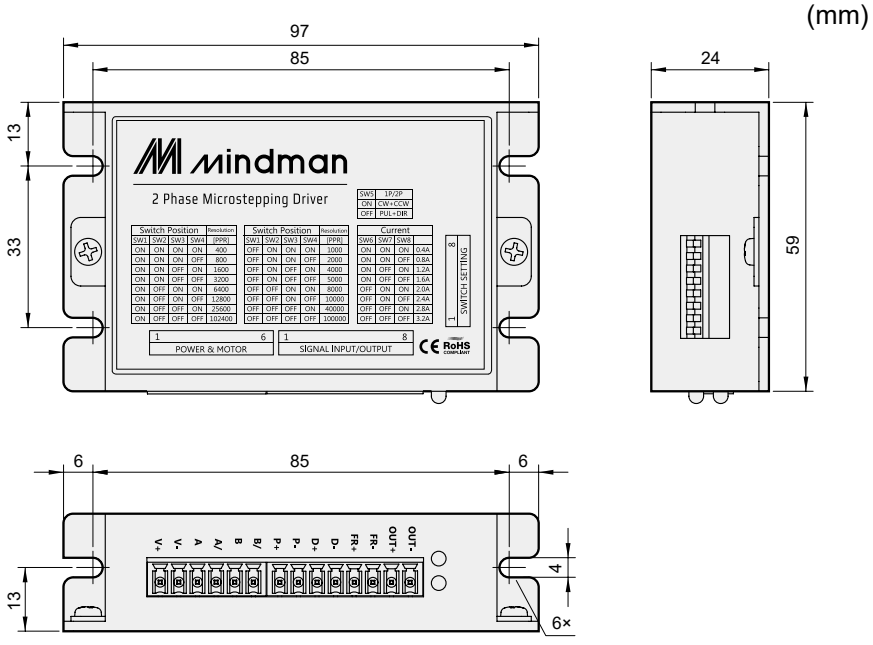
Motor		OBM		
Size		□ 20	□ 25	□ 28
Drive method		Bi-polar		
Phase		2 Phase		
Phase current	A	0.8	1.2	1.2
Holding torque	N·m	0.036	0.09	0.09
Rotor inertia	$g \cdot cm^2$	2.9	8	8
Weight	g	70	110	110
Insulation resistance	Mohm	100 MIN. (at 500VAC)		
Operation temperature	°C	0~50		

* If the operating current of the driver is higher than the rated current of the motor, longterm operation may cause damage to the motor.

2.3 Dimensions



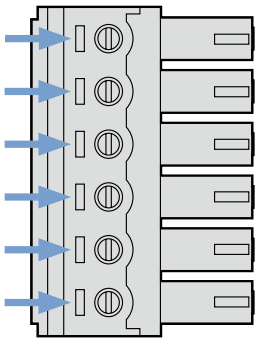
(mm)



3. System Configuration

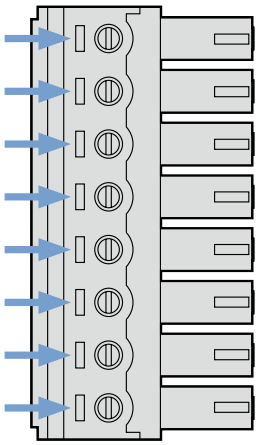
3.1 CN1 (Power & Motor)

Pin	Name	Function
1	V+	Drive power : DC24V
2	V-	Drive power : 0V
3	A	Motor wire OUT PUT : A
4	A/	Motor wire OUT PUT : A/
5	B	Motor wire OUT PUT : B
6	B/	Motor wire OUT PUT : B/



3.2 CN2 (Signal Input/Outout)

Pin	Name	Function
1	P+	DC24V / CCW+
2	P-	Pulse INPUT / CCW-
3	D+	DC24V / CW+
4	D-	DIR. INPUT / CW-
5	FR+	DC24V
6	FR-	Motor free INPUT
7	OUT+	Motor ready signal OUT PUT
8	OUT-	0V



3.3 DIP Setting

SW1	SW2	SW3	SW4	SW5	SW6	SW7	SW8
Resolution				Mode	Current		

3.3.1 Resolution

DIP switch				P/R
SW1	SW2	SW3	SW4	
ON	ON	ON	ON	400
ON	ON	ON	OFF	800
ON	ON	OFF	ON	1,600
ON	ON	OFF	OFF	3,200
ON	OFF	ON	ON	6,400
ON	OFF	ON	OFF	12,800
ON	OFF	OFF	ON	25,600
ON	OFF	OFF	OFF	102,400
OFF	ON	ON	ON	1,000
OFF	ON	ON	OFF	2,000
OFF	ON	OFF	ON	4,000
OFF	ON	OFF	OFF	5,000
OFF	OFF	ON	ON	8,000
OFF	OFF	ON	OFF	10,000
OFF	OFF	OFF	ON	40,000
OFF	OFF	OFF	OFF	100,000

3.3.2 Current

DIP switch			Phase current
SW6	SW7	SW8	
ON	ON	ON	0.4 A
ON	ON	OFF	0.8 A
ON	OFF	ON	1.2 A
ON	OFF	OFF	1.6 A
OFF	ON	ON	2.0 A
OFF	ON	OFF	2.4 A
OFF	OFF	ON	2.8 A
OFF	OFF	OFF	3.2 A

* When the driver has no pulse input for 500 milliseconds, the current will automatically drop to 50% of the set current, which is the factory default value to reduce motor heating. When pulse input is effective, the current returns to the set value. When the customer requires the driver to keep 10%~90% of the stop current when there is no pulse input (the motor gene rates more heat), please contact our company.

3.3.3 Mode

- **Pulse and DIR.**: The pulse input terminal is onnected to the external pulse signal output. When the direction input end optocoupler is turned on, the motor rotates forward, and when the direction input optocoupler is turned off, the motor reverses.
- **Double Pulse**: When the pulse input terminal is connected to the external pulse signal output, the motor rotates forward; when th e direction input terminal is connected to the external pulse signal output, the motor rotates in the reverse direction.

DIP switch	Control method
SW5	
ON	Double pulse
OFF	Pulse and DIR.

3.3.4 Indicator Light

Function	Status	Instruction
Motor stop	Flashing green	No pulse input or drive free state
Motor run	Steady green	With pulse input, the motor is running
Over current	One red and one green flashing	Motor overcurrent or drive failure
Motor disconnected	One red and two green flashing	Motor is not connected
Overvoltage	One red and three green flashing	Power input is more than 50V
Undervoltage	One red and four green flashing	Power input is less than 18V
Others	One red and five green flashing	Other alarm

* If the indicator light appears other than what is listed in the above table, please contact us as soon as possible.

4. Regenerative Discharge

When the motor decelerates, it will convert the kinetic energy of the load into electrical energy like a generator. Part of the energy will be consumed by the drive and motor. If your application has a large load running at high speed, considerable kinetic energy will be converted into electrical energy. It is easy to cause over voltage alarm of the drive, an d may even cause damage to the drive. Because this driver has a power supply reverse connection protection, it can prevent damage to the driver caused by power supply reverse connection. Due to the shortcomings brought by this function, the power supply cu rrent of this driver only flows in and does not flow out, and the external absorption resistors or capacitors is invalid.

* When your application has a large load running at high speed, please contact the company in advance to remove the anti-reverse conne ction function and connect an external absorption resistor or capacitor. When there is no anti-reverse connection function, please pay attention to the positive and negative polars of the power not to be reversed. There is no warranty service for the damag e of the driver caused by the reverse connection of the power.

5. Motor Connection

When the motor is connected to the driver, please make sure that the power is turned off. Make sure that the unused wires are not short circuited with other objects. The motor cannot be disconnected while the driver is energized. Do not connect the motor leads to the ground or power supply.

Caution	● Different motors use different colors of wires, so please refer to the motor data when you use them. For example. ● The phases are relative, but the windings of different phases cannot be connected to the termina ls of the same phase of the driver (A+, A- are one phase, B+, B- are an other phase), if the rotation of the motor is not as expected, just exchange A+ and A-. ● The correct way to judge whether the stepping motor is in series or in parallel: rotate the motor shaft by hand, without connecting the driver. If it can be rotate d easily and evenly, the wiring is correct. If the resistance is large, uneven, and there is a certain noise, it means that the wiring is wrong.

6. Input Signal

6.1 **Pulse**: P+ / P-

The driver port has a internal optocoupler, which can receive 5~24VDC single or differential signals, and the maximum voltage can reach 26V. The change from off to on is understood as receiving a valid pulse edge command. For NPN, low potential is valid (PNP is high potential), and the driver will drive the motor for one step according to the corresponding timing. For the normal operation of the driver, the duty cycle of the effective potential signal should be below 50%. In order to ensure a reliable response to the pulse signal, the duration of the pulse effective potential of the driver should not be less than 1 μs. The signal response frequency of the driver is 500kHz, and an excessively high input frequency may get an incorrect response.

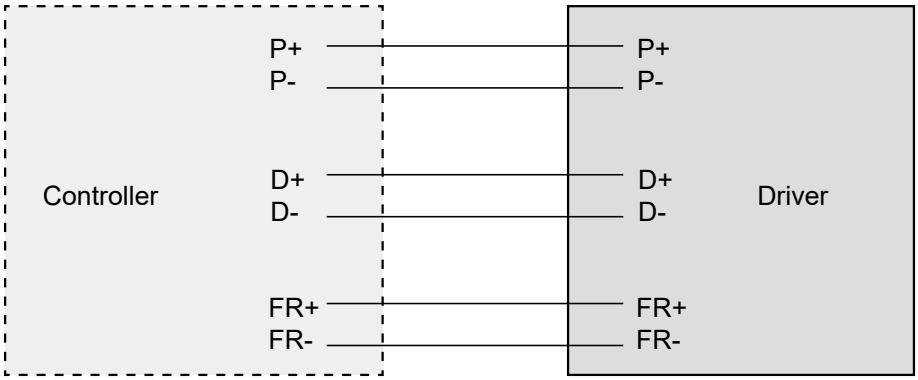
6.2 **Direction**: D+ / D-

It can receive 5~24VDC single or differential signal, the highest voltage can reach 26V. The turn-on and turn-off of the internal optocoupler are interpreted as the two directions of motor rotation. The direction signal will change the direction of motor operation. This terminal floating is equivalent to the input of the high potential signal. It should be noted that it is necessary to ensure that the direction signal input of the driver is at least 10 μs ahead of the pulse signal input, so as to avoid the wrong response of the driver to the pulse signal. When the motor switches the direction of rotation, it must be switched after the motor stops. The switching direction signal must be changed between the last pulse of the current direction signal ends and the first pulse of the next direction. When there is no need to switch the direction, the “Direction” signal can be left floating.

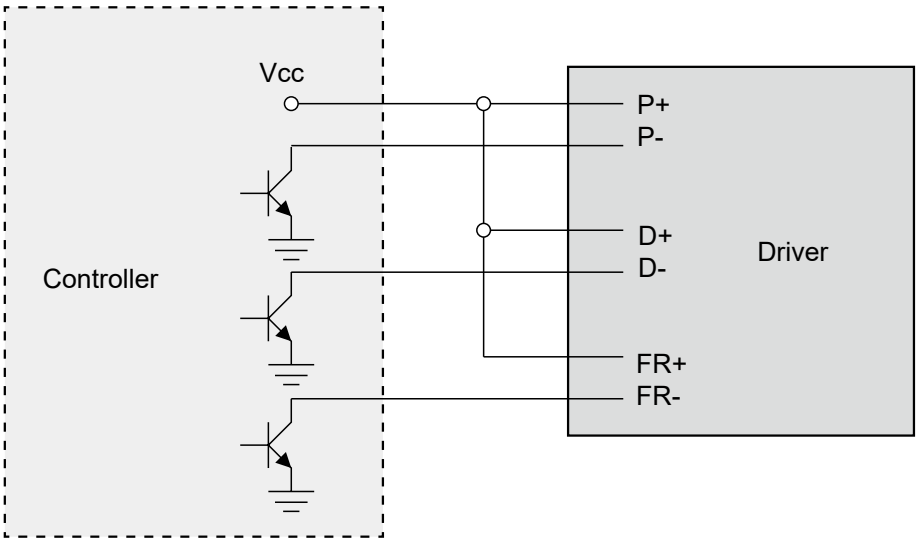
6.3 **Motor Free**: FR+ / FR-

It can receive 5~24VDC single or differential signal, the highest voltage can reach 26V. When the internal optocoupler is turned on, the motor phase current is cut off and the rotor is in a free state (de-excitation). When this function is not needed, the “Motor Free” signal can be left floating.

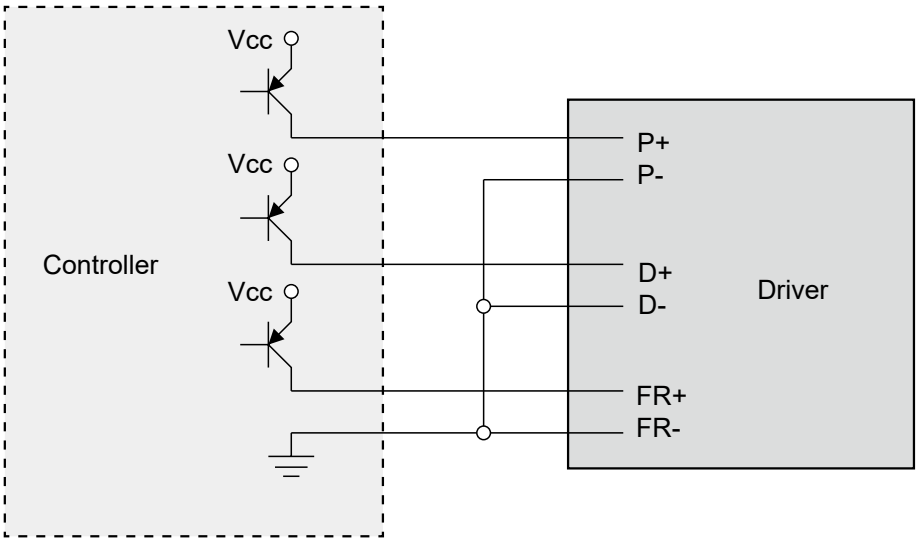
6.4 Typical Signal Connection



NPN type



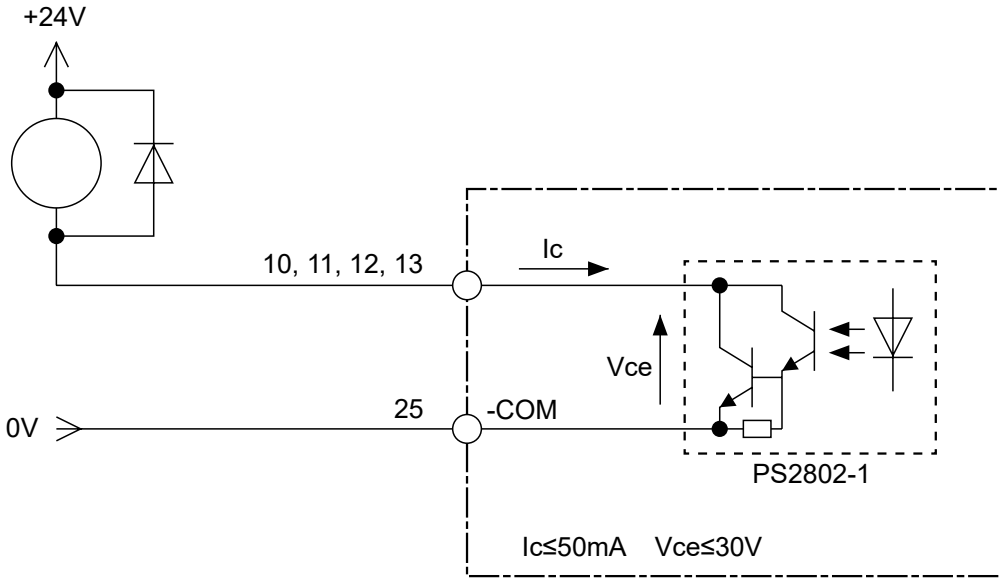
PNP type



* The P, D and FR terminals have current limiting functions, which can be directly connected to the input signal without the external series resistor step down current limiting protection. The Vcc value is 3.5~26V.

7. Output Signal

7.1 Digital Output Circuit (Relay Connection)



Caution

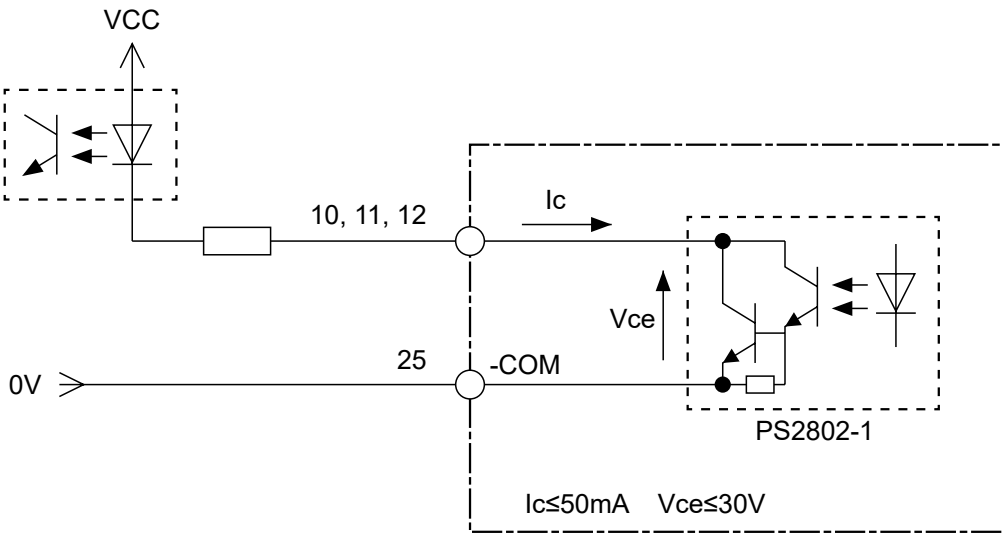
- Caution: When the relay is connected, both terminals of the relay must be connected to a diode. For example, 1N4001.

7.2 Digital Output Circuit (Optocoupler Connection)

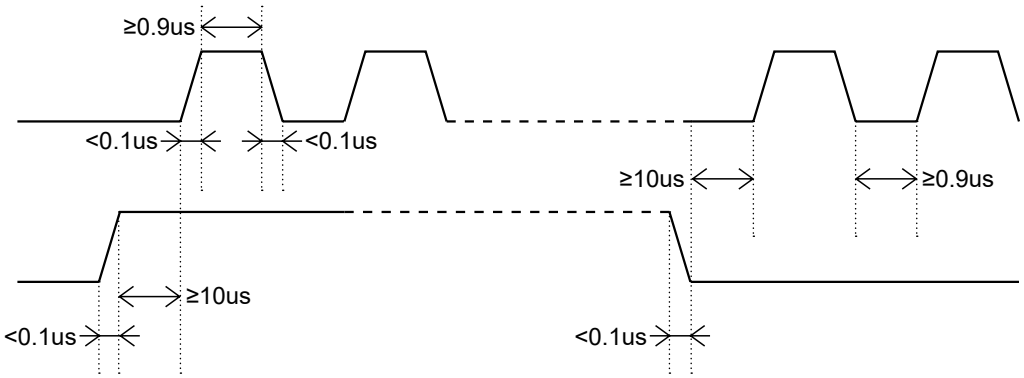
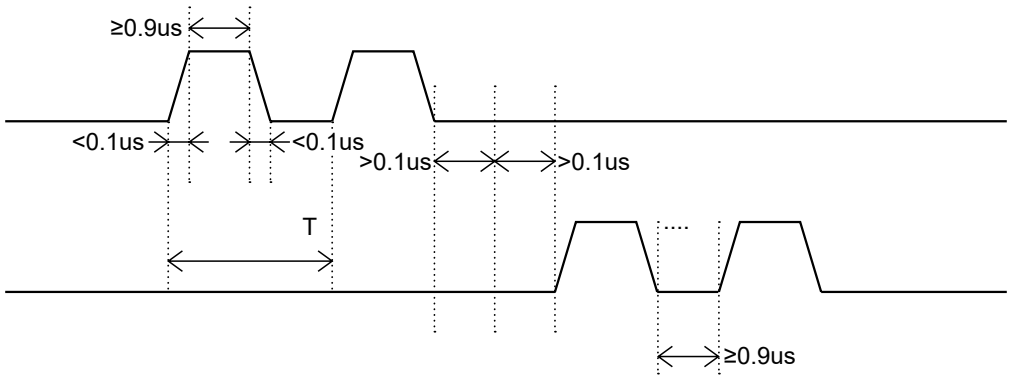
The alarm output is photoelectrically isolated, with a maximum withstand voltage of 30VDC and a maximum saturation current of 50mA.

When the driver is working normally, the output terminal is short circuited with the low potential.

When the driver alarms, the output terminal is floating.



8. Pulse / Direction Input Timing Chart

	Single pulse input
Pulse input DIR input	
	Differential (Double pulse) input
Pulse input DIR input	

9. Wiring Requirements

1. In order to prevent the driver from being interfered, it is recommended that the control signal use an anti-interference cable and the shield layer is grounded. Except for special requirements, the shield line of the control signal line should be grounded at a single side. The host controller side of the shield line should be grounded, and the driver side should be floating. In the same machine it must be grounded at the same point. If it is not a real ground wire, there may be serious interference, and the shield layer do not be connected in this situation
2. Pulse and direction signal wires and motor wires are not allowed to be wrapped side by side. It is better to separate them by at least 10cm, otherwise motor noise will easily interfe re with pulse and direction signals and cause inaccurate motor positioning and system instability.
3. If a power supply is used for multiple drives, parallel connection is required for the drives.
   A chain connection from one to the other is not allowed.
4. It is strictly prohibited to plug and unplug the driver's strong current terminals (motor and power terminals) in the power on state. When the charged motor is stopped, a large current still flows through the coil. Plugging and unplugging the strong current terminals will cause instantaneous huge induced electromotive force to damage the driver.
5. It is strictly prohibited to connect the wire to the terminal after soldering, otherwise the terminal may be damaged by overheating due to the increase of the contact re sistance.
6. The wiring head should not be exposed outside the terminal to prevent accidental short circuit and damage to the driver.

Driver Installation

Install on the narrow side, use M3/M4 screws to tighten through the holes on both sides.

The power device of the driver will generate heat. If it is continuously working under the condition of high input voltage and high power, the effective heat dissipation area should be enlarged or forced cooling.

- Do not use it in a place without air circulation or where the surrounding temperature exceeds 40°C.
- Do not install the drive in a wet place or a place with metal shavings.