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HPD 970
Two-phase stepping drive operating instruction

[Read this manual carefully before use to avoid damage to the drive]

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I. Product brief introduction

◆ summary

HPD 970 Two-phase stepping motor driver is a cost-effective subdivided drive designed based on PI flow control algorithm, with superior performance, high speed large torque output, low noise, low vibration, low heat.

HPD 970 The drive can select the operating current and subdivision through the dial switch, there are 16 kinds of subdivision, 16 kinds of current for selection, with overvoltage, undervoltage, phase current and total overcurrent protection, its input and output control signals are photoelectric isolation.

◆ characteristic

Pi control algorithm, low wooyin, low vibration, low heat;
Signal input: single end, pulse + direction and double pulse;
Built-in micro; power supply: up to DC90V;
The current setting is convenient, 16 gear optional, the output current peak up to 7A; open 1S current halved factory the default maximum subdivision 128,16 gear adjustable;
Optical isolation of differential signal input, input maximum pulse frequency of 300 KHz;
It has the functions of overvoltage and undervoltage alarm, phase current overcurrent protection, motor phase open circuit detection; pulse, direction and enabling terminals have constant current input function, so it can be connected directly to the input signals without adding series resistance step-down current limiting protection.
Spontaneous pulse: built-in oscillator, dial-up or switch signal control motor start and stop, 16 gear speed switch;

2. Introduction of interface and wiring

◆ signal input end

PUL+ PUL-	The default pulse drop edge is valid; to reliably respond to the pulse signal, the pulse width should be greater than 1.2us. Input voltage range: 3.3~24V.

DIR+ DIR -	Direction input signal, high / low level signal, to ensure the reliable redirection of the motor, the direction signal should be established before the pulse signal of at least 5u s. The initial running direction of the motor is related to the motor winding wiring. Changing any phase winding (e. g. A +, A- exchange) can change the initial running direction of the motor.
ENA + ENA -	Ability input signal (offline signal) to enable or prohibit drive output. When enabling, the driver will cut the current of the motor to make the motor in a free state and does not respond to the step pulse. When this function is not required, the enabling signal terminal can be suspended.

◆ Motor winding connection

A +,A -	Motor A-phase winding.
B +, B -	Motor B-phase winding.

◆ Power supply voltage connection

V CC	The DC power supply is positive. Power supply is DC 20V ~90V;
G ND	The DC power supply is negative.

◆ status indication

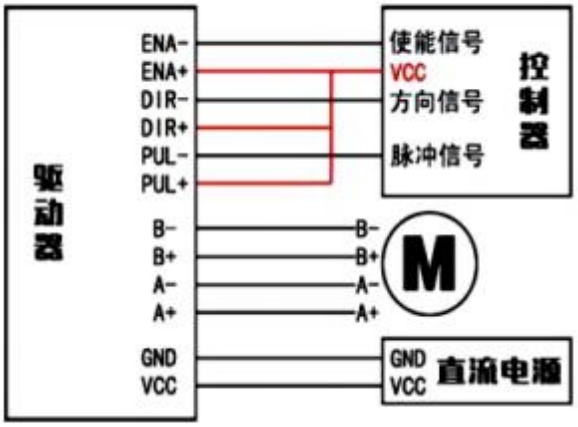
green	Power supply indicator light, when the driver is powered on, the LED is always on; The LED is turned off when the drive is powered off. If the lamp is not on, please check whether the power wiring or use voltage is within the use range.

red	The fault indicator light is on when faulty; the red LED goes out when the fault is cleared by the user. Cause: ① Overcurrent protection (short to ground; short to VM; short between outputs (Wrong phase)): Power off to check whether the wiring is correct; ② Over-temperature protection: cooling for a period of time after the driver temperature drops, or install a cooling fan.
	If the indicator light is completely out, the drive or has been damaged during use, please contact the manufacturer for repair.

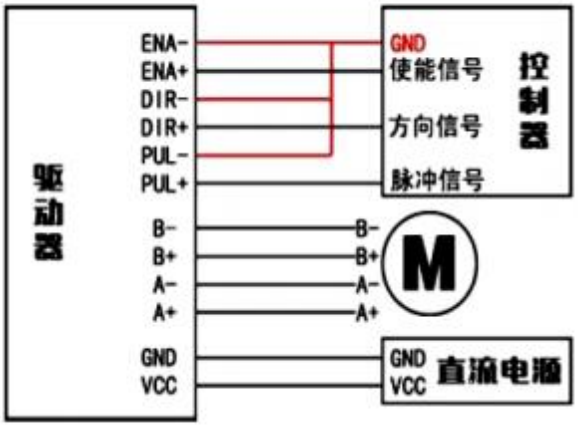
◆ mode of connection

There are two connection methods for the input signal interface, and users can use the co-anode connection method or co-cathode connection method as needed.

共阳极接法（低电平有效）



共阴极接法（高电平有效）



pay attention to:

1. Do not share the VCC and GND of the controller and the drive in the picture.
2. The ENA terminal is not connected. When the ENA is valid, the motor rotor is in a free state (offline state), so you can manually turn the motor rotating shaft to make the adjustment suitable for you. After the manual adjustment, set ENA to invalid to continue automatic control.

quirements

(1) In order to prevent the drive from being disturbed, it is recommended to use the shielding cable for the control signal, and the shielding layer is short connected to the ground line at the same point in the same machine. If the grounding signal is not the real grounding line, the interference may be serious, and the shielding layer is not connected.

(2) Pulse and direction signal line and motor line and power line are not allowed to be wrapped side by side, it is best to separate at least 10cm, otherwise the motor noise is easy to interfere with the pulse direction signal to cause inaccurate motor positioning, system instability and other faults.

(3) If one power supply is supplied to multiple drives, a parallel connection should be adopted at the power supply, and it is not allowed to connect to one power supply first and then to another in a chain type.

(4) It is strictly prohibited to unplug the power terminal of the drive. When the live motor stops, there is still a large current to flow through the coil. Unplug the power terminal will lead to a huge instantaneous induced electric motive force that will burn out the drive.

(5) It is strictly prohibited to tin the wire head to the terminal, otherwise the terminal may be damaged due to the large contact resistance.

(6) The wiring head should not be exposed outside the terminal, in case of accidental short circuit and damage to the drive.

Three, subdivision, current dial code switch setting

The eight-bit dial switch is used to set the subdivision, running current and static half current. Detailed descriptions are as follows:

(Lock electromechanical flow can be set by internal jumper full flow, the default is 50%)

<table>
<tr><td colspan="2">SW 1/SW 2/SW 3/SW 4</td><td>Drive current setting</td></tr>
<tr><td colspan="2">SW 5/SW 6/SW 7/SW 8</td><td>Subdivision precision setting</td></tr>
<tr><td>Sw 9 single and double pulse</td><td>The Sw 10 is self-run</td><td>Continuous self-running</td></tr>
</table>

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rating current setting

Current (peak value)	Current (valid value)	Sw 1	Sw 2	Sw 3	Sw 4
2.8A	2.0A	OFF	OFF	OFF	OFF
3.0A	2.1A	ON	OFF	OFF	OFF
3.2A	2.3A	OFF	ON	OFF	OFF
3.5A	2.5A	ON	ON	OFF	OFF
3.8A	2.7A	OFF	OFF	ON	OFF
4.0A	2.8A	ON	OFF	ON	OFF
4.2A	3.0A	OFF	ON	ON	OFF
4.5A	3.2A	ON	ON	ON	OFF
4.8A	3.4A	OFF	OFF	OFF	ON
5.0A	3.5A	ON	OFF	OFF	ON
5.2A	3.7A	OFF	ON	OFF	ON
5.5A	3.9A	ON	ON	OFF	ON
5.8A	4.1A	OFF	OFF	ON	ON
6.2A	4.4A	ON	OFF	ON	ON
6.5A	4.6A	OFF	ON	ON	ON
7.0A	5.0A	ON	ON	ON	ON

◆ subdivision setting

Step number / turn	Sw 5	Sw 6	Sw 7	Sw 8	Turn / points
200	ON	ON	ON	ON	5
400	OFF	ON	ON	ON	10
800	ON	OFF	ON	ON	15
1600	OFF	OFF	ON	ON	30
3200	ON	ON	OFF	ON	60
6400	OFF	ON	OFF	ON	90
12800	ON	OFF	OFF	ON	120
25600	OFF	OFF	OFF	ON	150
1000	ON	ON	ON	OFF	180
2000	OFF	ON	ON	OFF	210
4000	ON	OFF	ON	OFF	240
5000	OFF	OFF	ON	OFF	300
8000	ON	ON	OFF	OFF	400

10000	0 FF	0N	0 FF	0 FF	500
20000	0N	0 FF	0 FF	0 FF	650
25000	0 FF	0 FF	0 FF	0 FF	800

◆ continues to run itself

running mode	Sw 9	Sw 10
Single Pulse (default)	0 FF	0 FF
dipulse	0N	0 FF
Controlled self-running	0 FF	0N
Continuous self-running	0N	0N

V. Mechanical and environmental indicators

◆ Use of the environment and the parameters

cooling-down method		Natural cooling or forced air cooling
service environment	occasion	Can not be placed next to other heating equipment, to avoid dust, oil, corrosive gas, humidity and strong earthquake places, prohibit combustible gas and conductive dust
	temperature	0 ~+50X
	humidity	40~90%RH
	vibrate	10~55Hz /0 15mm
Save the temperature		-20℃~65℃
weight		350 grams

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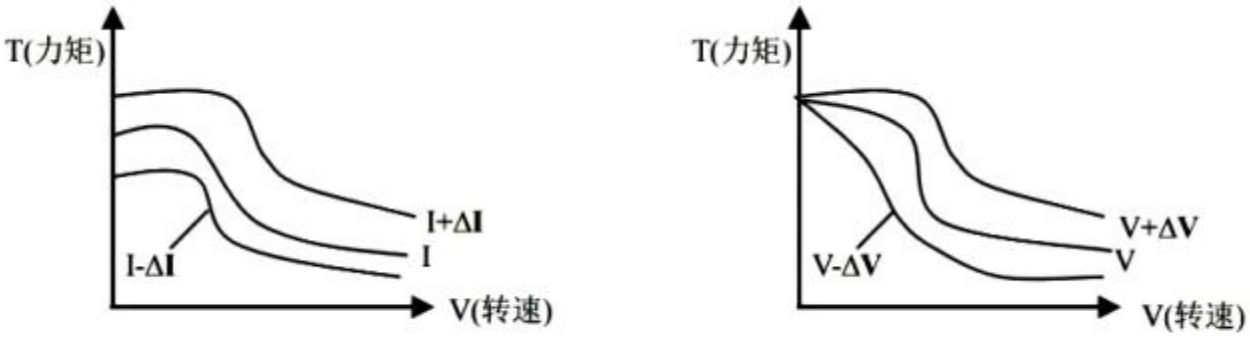
◆ Electrical Indicators

explain	HPD 970			
	least value	representative value	crest value	unit
Output current (peak value)	2.8	-	7	A
service voltage	20	48	90	VDC
Control the signal current	6	10	16	mA
Step-forward pulse frequency	0	-	300	K hz
Step pulse width	2	-	-	us
Direction-wise signal width	100	-	-	us
Underpressure protection point	-	7.5	-	VDC
Overpressure protection point	-	100	-	VDC
Drive initialization time	2	-	-	s
insulation resistance	500	-	-	M Ω

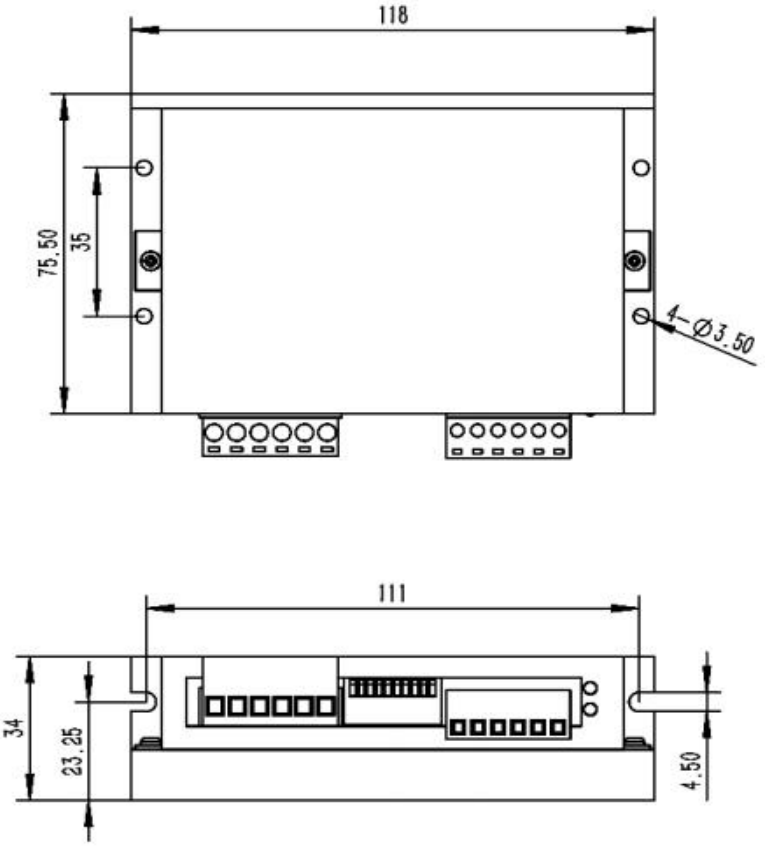
◆ mechanical installation diagram



矩频特性图

◆ motor wiring

Two-phase 4,6,8 wire motor wiring, as shown in the figure below



Five, the motor matching

HPD 970 The drive can be used to drive a 4,6,8-line two-phase step motor of 57,60, with step angles of 1.8 degrees and 0.9 degrees are applicable. The motor selection is mainly determined by the torque and rated current of the motor. The torque size is mainly determined by the motor size. Large size motor torque is larger; and the current size is mainly related to the inductance, small inductor motor high speed performance, but the current is larger.

◆ motor optional

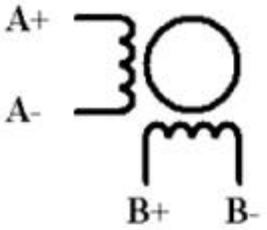
(1) Determine the load torque, transmission ratio working speed range

T motor =C (J ε + T load)

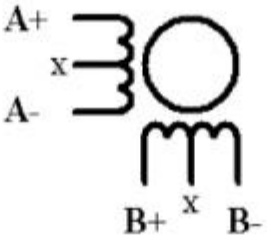
J: moment of inertia of load ε: maximum angular acceleration of load C: safety factor, recommended value 1.2-1.4 T Load: maximum load torque, including active load, friction, transmission efficiency and other resistance torque (2) Which factors determine the output torque of the motor

For a given stepping motor and coil connection method, the output torque has the following characteristics:

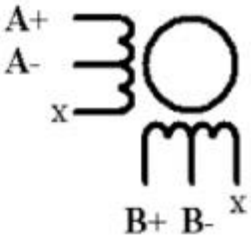
- The greater the actual current of the motor, the greater the output torque, but the more the motor copper loss (P=I2R), the more the motor;
- The higher the power supply voltage of the driver, the greater the high-speed torque of the motor;
- According to the characteristics of the moment and frequency of the stepping motor, the high speed is smaller than the medium and low speed torque.



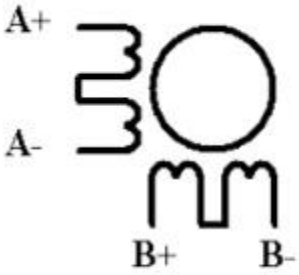
四线电机接线方法



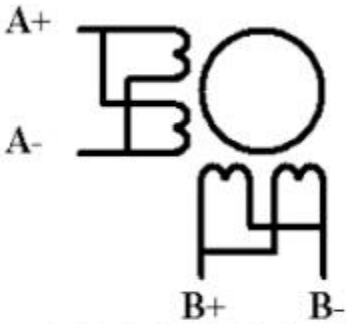
六线电机接线方法
高力矩输出



六线电机接线方法
高速度输出



八线电机接线方法
高力矩输出



八线电机接线方法
高速度输出

◆ Selection of power supply voltage and output current

(1) Setting of the power supply voltage

Generally speaking, the higher the power supply voltage, the greater the torque when the motor is at high speed. The more you can avoid the loss caused by insufficient torque at high speed. But on the other hand, too high voltage will lead to overvoltage protection, the motor heat more, and may even damage the drive. When working at a high voltage, the vibration of the low-speed movement of the motor will be greater.

(2) Set value of the output current

For the same motor, the greater the current setting value, the greater the output torque of the motor, but the heat of the motor and the driver is also more serious when the current is large. The specific amount of heat is not only related to the current setting value, but also related to the type of movement and residence time. The following setting method adopts the rated current value of the stepping motor as a reference, but the optimal value in the actual application should be adjusted on this basis. In principle, if the temperature is very low (<40℃), the current setting value may be appropriately increased to increase the output power of the motor (torque and high speed response).

● Four-wire motor: the output current is set to be equal to or slightly greater than the rated current value of the motor;

● Six-wire motor high torque mode: the output current is set at 50% of the rated current of the motor unipolar connection method;

● Six-wire motor high-speed mode: the output current is set to 100% of the rated current of the motor unipolar connection method;

● Eight-wire motor series connection method: the output current can be set into 70% of the rated current of the motor unipolar connection method;

● Eight-wire motor parallel connection method: the output current can be set into 140% of the rated current of the motor unipolar connection method.

△ Note: After the current is set, please run the motor for 15-30 minutes. If the temperature rise of the motor is too high (> 70℃), the current setting value should be reduced. Therefore, the general situation is to set the current into the motor long-term work when the warm but not hot value.

Vi. Product warranty terms

◆ One Year Warranty

We provide one year warranty from delivery date for raw materials and process defects. During the warranty period, our company provides free maintenance service for the defective products.

◆ Does not included in the warranty

● Inappropriate wiring, such as positive and negative power supply connection and power unplug

● Change the internal devices without permission

- Use beyond the electrical and environmental requirements
- Environmental heat dissipation is too poor
- Running with two motors at the same time

7. Common problems

◆ Common problems and handling methods in applications

phenomenon	Possible problem	countermeasure
The motor does not turn	The power lamp is not on	Normal-range power supply
	Current setting is too small	Select the appropriate current gear according to the rated current of the motor
	The drive is protected	After troubleshooting, re-again
	The enable signal is low	This signal is raised or disconnected
	Control of the signal problem	2. Check whether the amplitude and width of the control signal meet the requirements. 2. The motor starts at high speed, and the controller signal should be accelerated and reduced. 3
Motor steering error	The motor wire is connected wrong	Two wires of the same phase of any switching motor (e. g. A +, A-switching wiring position)
	The motor line has an open circuit	Check and get it right
Alarm indicator light is on	The motor wire is connected wrong	Check the wiring
	Over-high or overheated voltage	Check the supply voltage; place for temperature drop before use
	Damaged motor or driver	Replace the motor or driver
Location is not allowed	The signal is disturbed	1. Eliminate interference 2. Do shield line processing
	The ded ground is not connected or not connected	Reliable grounding

	Subdivision error	Set the right subdivision
	Current is small	Increase current appropriately
	Control of the signal problem	Check that the control signal meets the timing requirements
The motor accelerates the blocking and rotation	The acceleration time is too short	Increase the acceleration time appropriately
	Motor torque is too small	Select the large-torque motor
	Low voltage or too little current	Raise the voltage appropriately or set a larger current