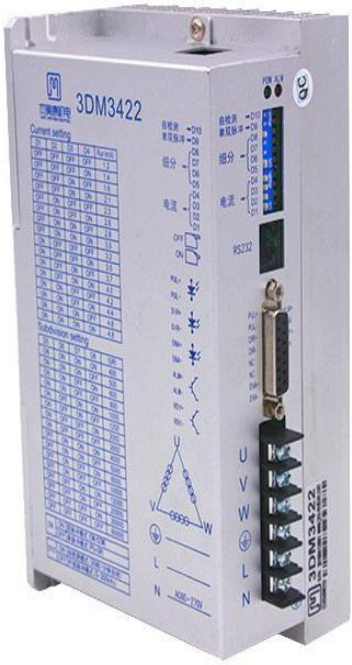
杰美康机电
JUST MOTION CONTROL

3DM3422

Digital stepper driver

User manual



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Preface

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Version	Writer	Approved
V1.10	R&D	R&D

Directory

一、overview

3DM3422 is a digital two-phase stepper drive that uses the latest 32-bit technology DSP for control. This digital driver peripheral is subdivided and current dialed, allowing users to Free to set according to needs, internal DSP is used to write advanced drive control algorithms, which can ensure The stepper motor operates accurately and stably in various speed ranges, with built-in subdivision calculation The method can make the motor run smoothly at low speeds; Medium to high speed torque compensation algorithm, Can maximize the torque of the motor at high and medium speeds; Parameter self-tuning calculation Method: Able to adapt to various motors and maximize motor performance; Built in smoothing Algorithms can greatly improve the acceleration and deceleration performance of motors. In short, this digital drive can Satisfied for most applications, it is a highly cost-effective motion control product.

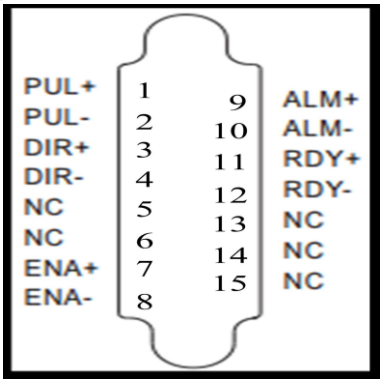
二、characteristic

- ◆ Parameter self-tuning and motor adaptation;
- ◆ Built in high precision, low vibration, low heat generation, and smooth low-speed operation;
- ◆ Medium and high speed torque compensation;
- ◆ Current vector control, high current efficiency;
- ◆ Built in acceleration and deceleration control to improve smoothness of start stop;
- ◆ Single and double pulse control modes can be selected;
- ◆ Memory of motor operating position;

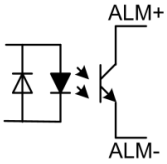
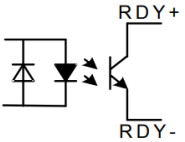
- ◆ Input signal differential optocoupler isolation, compatible with 5V~24V;
- ◆ Users can customize segmentation;
- ◆ Overcurrent protection, overvoltage protection;
- ◆ Automatic detection, flexible selection of pulse edge counting method;
- ◆ Green light indicates operation, red light indicates protection or offline;

三、Port Description

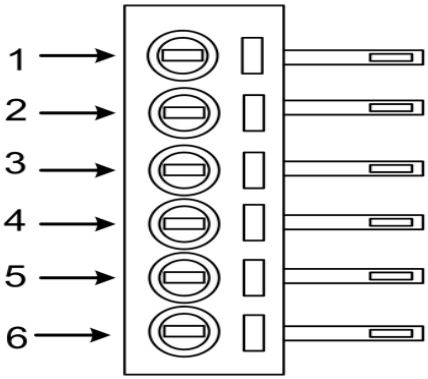
3.1 Control signal input port



Pin number	grade	Name	illustrate
1	PUL+	Pulse input +	Compatible with 5V~24V levels
2	PUL-	Pulse input -	
3	DIR+	Direction input +	Compatible with 5V~24V levels
4	DIR-	Direction input -	
7	ENA+	Offline signal +	Compatible with 5V~24V levels
8	ENA-	Offline signal -	

9	ALM+	Alarm output +	
10	ALM-	Alarm output -	
11	RDY+	Prepare signal output	
12	RDY-	Prepare signal output	（RDY signal output description The internal initialization of the drive has been completed Complete）

3.2 Power port



Attention: Electromagnetic induction of the motor can induce a certain amount of charge on the motor casing. To suppress the impact of motor leakage, please make sure to connect the protective wire of the motor casing to the grounding terminal on the driver with a wire, and try to connect it to the ground as much as possible.

Pin number	identifying	grade	Name	illustrate
1	Motor phase line	U	Motor U-end	motor winding
2		V	Motor V-end	
3		W	Motor W-end	
4	NC	NC	None	
5	Power input terminal	AC1	AC40V-270V	
6		AC2		

四、TECHNICAL INDEX

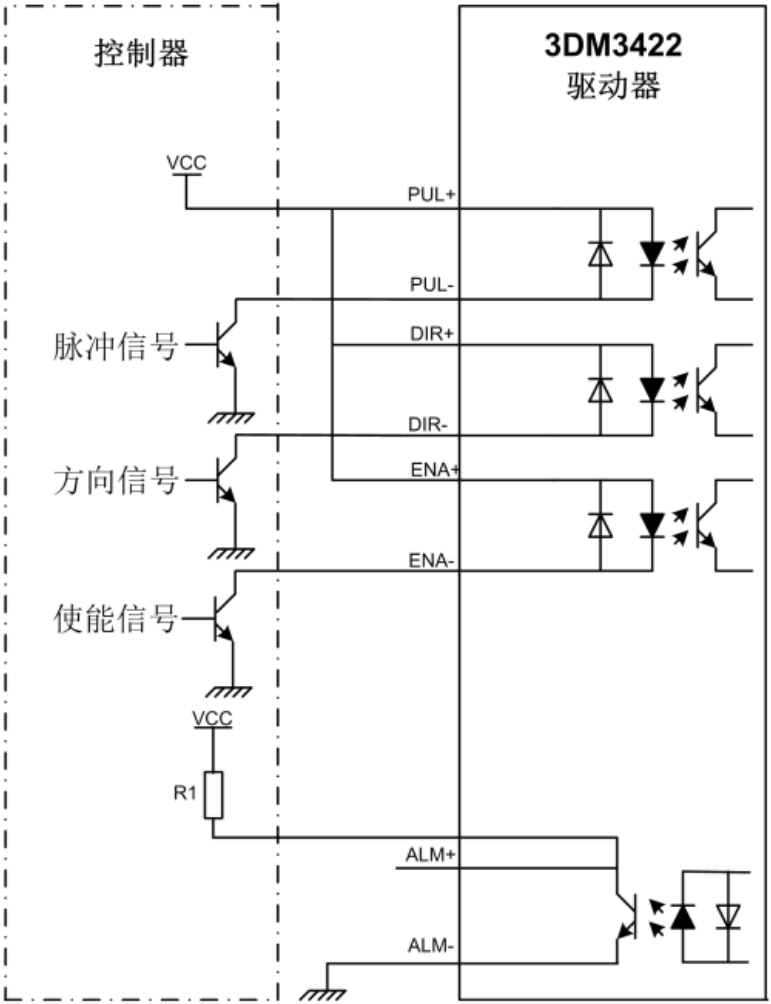
INPUT VOLTAGE		AC40V~240V
continuing current		4.8A
Maximum pulse frequency		200K
Default communication rate		57.6Kbps
protect		☞Peak overcurrent action value 15A ± 10% ☞Overvoltage voltage action value 400VDC ☞Undervoltage voltage action value 40VDC
External dimensions （mm）		178×108×68
weight		Approximately 1500g
使用环境	occasion	Try to avoid dust, oil mist, and corrosive gases as much as possible
	operation temperature	0~70℃
	storage temperature	-20℃~+80℃
	humidity	40~90%RH

	Cooling method	Natural cooling or forced cold air

五、Control signal wiring

Attention: In order to prevent signal interference, users should pay attention to separating the power line (motor phase line, power line) from the weak signal line when wiring to avoid interference with the control signal. In cases where it is inconvenient to separate wiring or there are strong interference sources (such as frequency converters and solenoid valves), it is best to use shielded cables for signal control lines; Or use higher-level control signals; Or change the edge of the internal pulse collection in the driver.

5.1 Control signal single ended common anode wiring

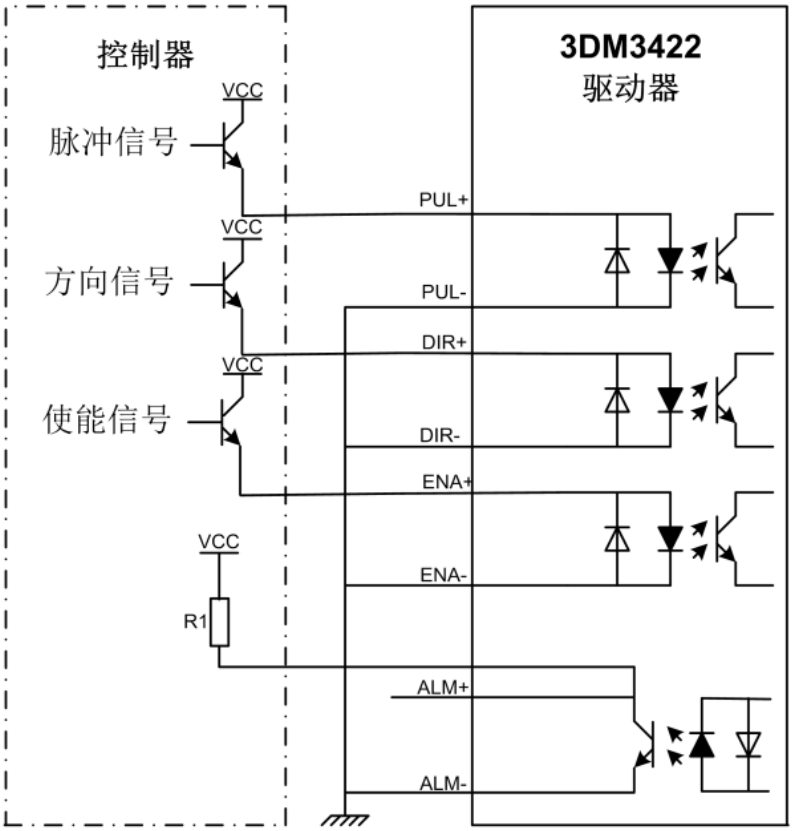


notice：

VCC is compatible with 5V~24V.

Resistance R1 is connected to the control signal terminal, with a resistance value of 3-5 K.

5.2 Control signal single ended common cathode wiring

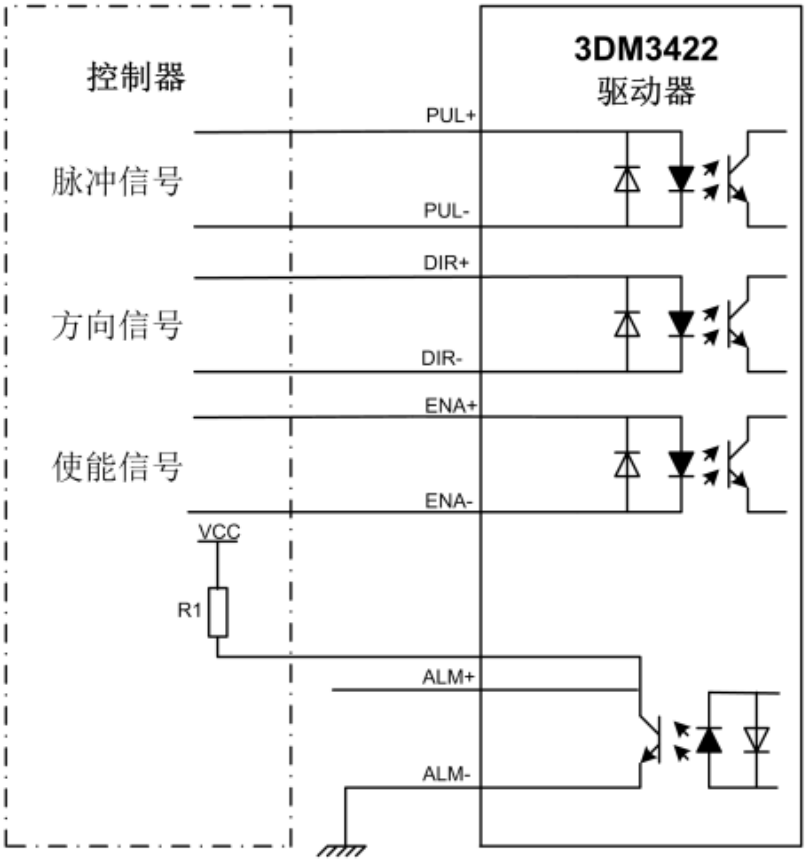


notice：

VCC is compatible with 5V~24V.

Resistance R1 is connected to the control signal terminal, with a resistance value of 3-5 K.

5.3 Differential wiring method for control signals

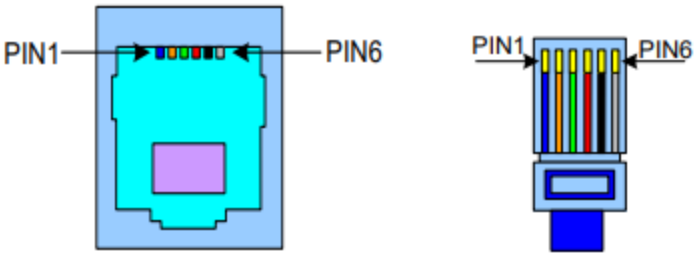


notice:

VCC is compatible with 5V~24V.

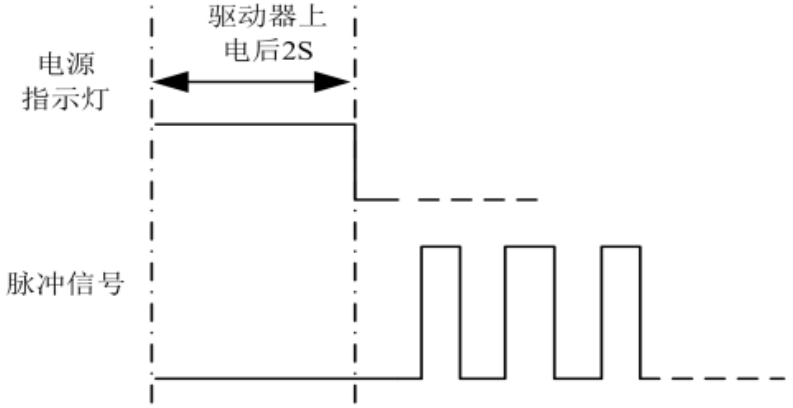
Resistance R1 is connected to the control signal terminal, with a resistance value of 3-5 K.

5.4 232 serial communication wiring diagram



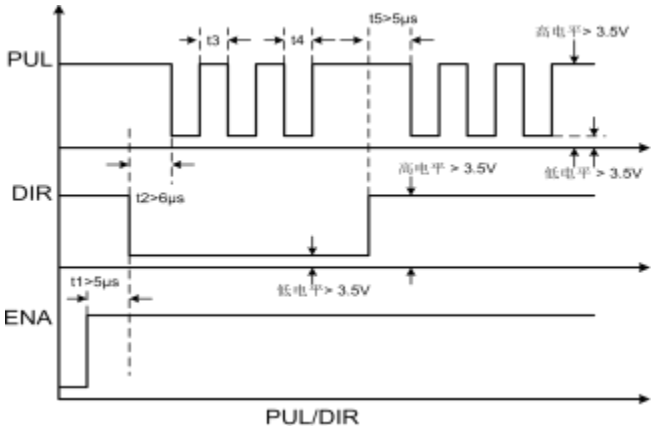
Crystal Head and Foot Position	define	illustrate
1	TXD	Sender
2	RXD	receiving end
4	+5V	For external HISU only
6c	GND	Power supply ground

5.5 Power on Sequence



5.6 Control signal timing diagram

To avoid some misoperations and deviations, PUL, DIR, and ENA should meet the requirements of one Set r equirements, as shown in the following figure:



explantion:

(1) T1: ENA (enable signal) should have a minimu m advance DIR of 5 μ s. Confirm

For high. In general, it is recommended to u se ENA+and ENA - for Hanging connection met hod.

(2) T2: At least advance PUL counting edge 6 for DIR μ Determine its status High or low.

(3) T3: Pulse width not less than 2.5 μ S.

(4) T4: Low level width not less than 2.5 μ S.

六、DIP switch setting

6.1 SW DIP Switch Description

For the same motor, in order to achieve greater output torque, it is generally necessary to set a larger current, but when the current is high, the heating of the motor and driver is also more severe. In principle, if the temperature is very low (less than 40 ℃) but the torque is not enough, the current setting value can be appropriately increased as needed. After setting the current, please run the motor for 15-30 minutes. If the temperature rise of the motor is too high (greater than 80 ℃), the current setting value should be reduced.

The DP-1 current dial settings are shown in the table below.

DIP / current Valid value	D1	D2	D3	D4
1.2A	0	0	0	0
1.4A	0	0	0	1
1.6A	0	0	1	0
2.1A	0	0	1	1
2.3A	0	1	0	0
2.6A	0	1	0	1
2.8A	0	1	1	0
3.0A	0	1	1	1

3.2A	1	0	0	0
3.5A	1	0	0	1
3.7A	1	0	1	0
4.0A	1	0	1	1
4.2A	1	1	0	0
4.4A	1	1	0	1
4.6A	1	1	1	0
4.8A	1	1	1	1

6.2 DP-2 Subdivision Dialing Settings

The subdivision of the drive is set by the DP-2 DIP switch, as shown in the table below. In addition, when the subdivision code table cannot meet the user's needs, users can customize subdivision through the debugging board. When using custom subdivision, the subdivision code needs to be set to the "1111" gear (other gears are still indicated by the silk screen). If parameter P14 is set to 4-1000, the driver subdivision will be 4 * 50~1000 * 50. When setting the debugging board parameter P14 to 0, the user-defined subdivision function fails, and the subdivision is set by the toggle switch.6.3 Subdivision **dialing settings**

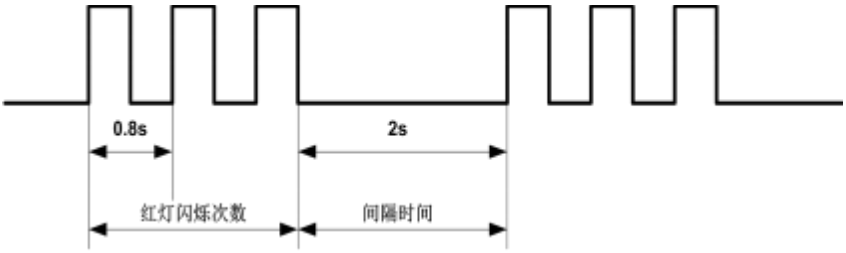
DIP / subdivision	D1	D2	D3	D4
400	1	1	1	1
500	1	1	1	0
800	1	1	0	1
1000	1	0	1	1

1200	1	0	1	0
2000	1	0	0	0
3000	0	1	1	1
4000	0	1	1	1
5000	0	1	1	0
6000	0	1	0	1
10000	0	1	0	0
12000	0	0	1	1
20000	0	0	1	0
30000	0	0	0	1
60000	0	0	0	0

6. 3DP-2 function dialing settings

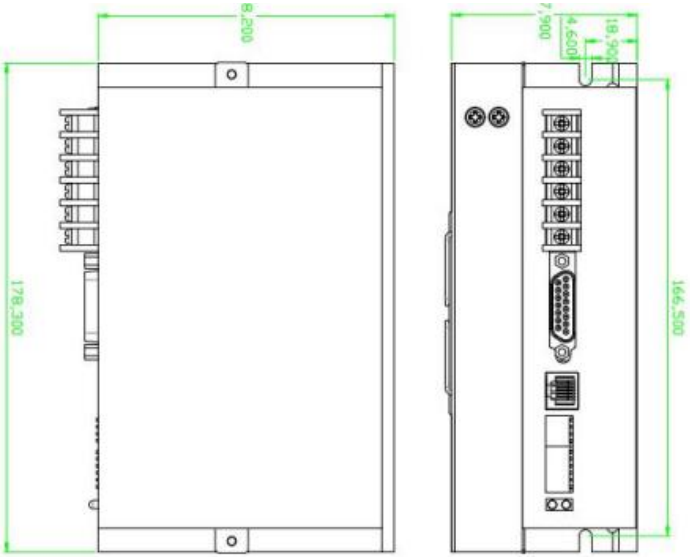
D5 (Single and double pulse selection)	ON	Dual pulse mode (CW/CCW)
	OFF	Single pulse mode (PUL+DIR)
D6 (Self check mode selection)	ON	The motor runs automatically at 30 rpm
	OFF	Receive external pulse signals to operate the motor

七、Error alarm and LED flashing frequency



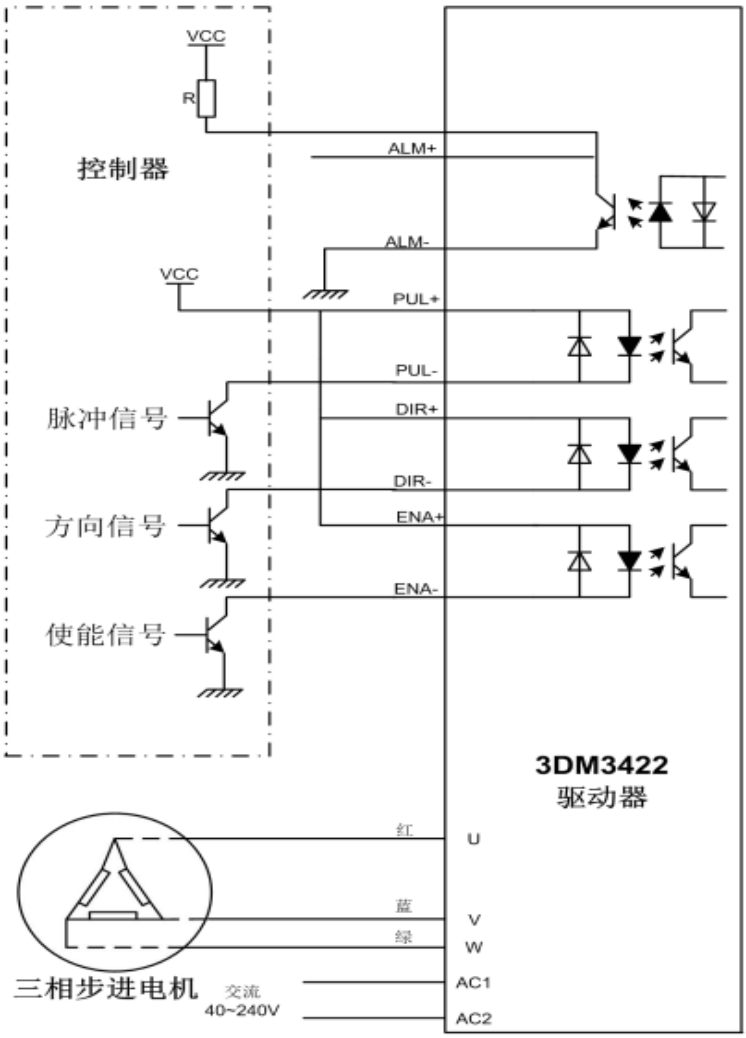
Number of red light flashes	Alarm Description
1	Drive overcurrent
2	Internal voltage reference error in the driver
3	Driver parameter upload error
4	The power supply voltage of the driver exceeds the maximum value
5	Motor phase loss alarm
6	Drive overheat alarm (over 80℃)

八、Installation dimensions



九、Wiring diagram

The reference for 3DM3422 shown in the figure：



十、Parameter settings

Parameter setting method for 2DM3422 driver: Through the RS232 serial communication port of the HISU debugger, a dedicated debugging board is used to complete the parameter setting. There is a set of default factory configuration parameters corresponding to the best motor inside the driver, and users only need to adjust the internal parameters of the driver according to the specific usage situation, specific parameters and functions
As shown in the table below:

The actual value of the parameter=set value *corresponding dimension

Serial Number	name	range	dimension	Restart driver	default parameter
P1	Current loop ratio	**0-4000**	**0.02**	Yes	**500**
P2	Current loop integration	**0-1000**	**0.001**	Yes	**100**
P3	System damping coefficient	**0-500**	**0.0001**	No	**200**
P4	View estimated inductance		**1**	No	**read only**
P5	Reserved	**0-100**	**1**	No	**0**
P6	Second resonance point amplitude	**0-1000**	**0.001**	No	**10**
P7	Phase of the second resonance point	**0-1000**	**0.001**	No	**150**
P8	View the set proportion		**1**	No	**30**

P9	View the set points		1	**No**	**read only**
P10	Enable signal level	**0-1**	**1**	No	**0**
P11	Reserved	**0-1**	**1**	No	**1**
P12	Reserved	**0-1**	**1**	No	0
P13	Reserved		1	**Yes**	**0**
P14	User defined subdivision	**4-1000**	**50**	Yes	**0**
P15	Stop Half Flow Time	**0-4000**	**0.5 ms**	**Yes**	**1000**
P16	Stop current percentage	**0-100**	**1**	Yes	**50**

P17	Instruction smoothing coefficient	**0-10**	**1**	Yes	**5**
P18	Position memory enable	**0-1**	**1**	Yes	**1**
P19	User defined motor inductance	**0-100**	**mh**	No	**0**
P20	User defined motor resistance	**0-100**	**0.1Ω**	No	**0**
P21	Location memory results	**0-10**	**1**	**Yes**	**0**
P22	IO port filtering	0-10	**1**	**Yes**	**3**
P23	Lack of phase enabling	0-1	1	**Yes**	0
P24	Initial current limit amplitude	0-10	0.1A	**NO**	2
P25	Erase program			**No**	

This driver has a total of 25 parameters that can be adjusted:

Parameters P1 and P2 are used to set the proportional and integral parameters of the current loop at the moment of power on. The proportional and integral parameters of the current loop during motor operation are automatically obtained by the self-tuning algorithm. When the parameter is 500, the driver adopts self-tuning parameters. When the parameter is not equal to 500, the driver adopts set parameters.

Parameter P3 is used to adjust the system damping coefficient to enhance the torque of the motor at medium and high speeds (above 300 rpm), while also suppressing vibration.

Parameter P4, used to view the estimated inductance.

Parameter P5, reserved.

Parameters P6 and P7 are used to eliminate vibration points of the motor at medium and high speeds (above 300 rpm), improve torque performance, and generally do not require modification.

Parameters P8 and P9 are used to view the set proportion and integration parameters, respectively.

Parameter P10, used for enabling level selection. 0 indicates that the enabling signal is high and the motor is in offline state. 1 indicates that the enabling signal is low and the motor is in offline state.

Parameter P11, reserved.

Parameter P12c, reserved.

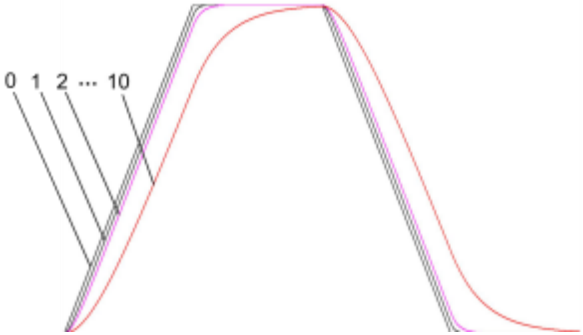
Parameter P13, reserved.

Parameter P14, used for user-defined segmentation. When using custom subdivision, the subdivision dial needs to be set to the "1111" gear (other gears are still indicated by the silk screen), and if parameter P14 is set to 4-1000, the driver subdivision will be set to 4 * 50~1000 * 50. For example, if P14 is set to 80, the driver subdivision is set to 80 * 50=4000 subdivision. At this time, the dial switch must be set to "1111" gear to achieve 4000 subdivision (other gears are still indicated by the silk screen). When parameter P14 is set to 0, the user-defined subdivision function fails, and the subdivision is set by the toggle switch.

Parameter P15, used to set how long the pulse stops before the current starts to decrease. If set to 0, there is no half flow function.

Parameter P16, used to set the percentage of current reduction.

Parameter P17, Instruction smoothing coefficient.



Parameter P18, used to enable position memory function. 0 indicates that the position memory function is not enabled, and 1 indicates that the position memory function is enabled.

Parameter P19, used for users to set their own motor inductance. 0 indicates enabling self identification algorithm to automatically identify motor inductance and resistance, while other values indicate not enabling identification algorithm and using user set inductance and resistance parameters.

Parameter P20, used for users to set their own motor resistance. 0 indicates enabling self identification algorithm to automatically identify motor inductance and resistance, while other values indicate not enabling identification algorithm and using user set inductance and resistance parameters.

Parameter P21, used to view position memory results.

Parameter P22 is used to filter out interference from the pulse port signal. The default filtering degree is 3. The larger the parameter value, the higher the filtering degree, but it will only allow the pulse port to pass in a lower frequency.

Parameter P23, used to enable the phase loss alarm function, 0 is to turn off the phase loss alarm, and 1 is to turn on the phase loss alarm.

Parameter P24 is used to set the limit amplitude of the initial current, which generally does not need to be modified.

Parameter P25, used to erase the program. Note that when P25 is set to 25, the DSP will automatically erase the internal program.

十一、Common problems and troubleshooting

11.1 Accumulated error in position

■ Separate the power line (motor phase line, power line) from the weak signal line to avoid interference with the control signal; Alternatively, it is best to use shielded cables for signal control lines; Or use higher-level control signals; Or change the pulse acquisition edge of the driver.

11.2 Motor temperature overheating

■ The maximum allowable temperature on the surface of the motor should depend on the demagnetization point of different motor magnetic materials; Generally speaking, the demagnetization point of magnetic materials is above 130 degrees Celsius, and some even reach as high as 200 degrees Celsius. Therefore, the surface temperature of stepper motors is completely normal at 80-90 degrees Celsius. After setting the current, please run the motor for 15-30 minutes. If the temperature rise of the motor is too high (>80 °C), the current setting value should be reduced or the motor cooling device should be added.

11.3 Does not rotate after pulse input

■ Electromagnetic induction of the motor can induce a certain amount of charge on the motor casing. To suppress the impact of motor leakage, please make sure to connect the protective wire of the motor casing to the grounding terminal on the driver with a wire, and try to connect it to the ground as much as possible.

11.4 Power light not on

■ Input power failure, please check the power circuit. Is the voltage too low.

11.5 Power on Red Light Alarm

■ Is the phase line of the motor power connected.

■ Is the input power voltage of the driver too high or too low.

11.6 Does not rotate after pulse input

■ Is the wiring of the pulse input terminal of the driver reliable.

■ Is the input method in the drive system configuration related to pulse input.

■ Is the motor able to be released.