杰美康机电
JUST MOTION CONTROL

2HCS868H
Digital Step Servo Drive
Manual

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Thanks for selecting JMC stepper motor driver. We hope that the superior performance, outstanding quality, excellent cost performance of our product can help you accomplish your motion control project.

The content in this manual has been carefully prepared and is believed to be accurate, but no responsibility is assumed for inaccuracies.

Shenzhen Just Motion Control

Electro-mechanics Co., Ltd

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1.Product introduction

1.1 Overview

2HCS868H is a new simple stepper servo driver perfectly integrated into servo technology. The stepper servo driver adopts the latest 32-bit DSP and integrates advanced vector control and power angle closed-loop control algorithms. Compared with traditional stepper drivers, it can minimize the problem of stepper motor lost steps and significantly reduce motor vibration. , which greatly enhances the high-speed performance of the motor. The cost of the driver is 50% of that of the AC servo system, and the size of the adapted motor is compatible with the traditional stepper motor, which is convenient for customers to replace and upgrade. In short, this stepping servo driver integrates the advantages of no lost steps, low temperature rise, high speed, high torque, and low cost, and is a very cost-effective motion control product.

1.2 Features

- Without losing step, High accuracy in positioning
- 100% rated output torque
- Variable current control technology, High current efficiency
- Small vibration, Smooth and reliable moving at low speed
- Accelerate and decelerate control inside, Great improvement in smoothness of starting or stopping the motor
- User-defined micro steps
- Compatible with 1000 and 2500 lines encoder
- No adjustment in general applications
- Phase loss, Over current, over voltage and over position error protection
- Four-digit digital tube display, easy to set parameters and monitor the running status of the motor

1.3 Application

Suitable for all kinds of automation equipment and instruments with large torque requirements, such as engraving machines, wire stripping machines, marking machines, cutting machines, laser imagesetters, plotters, CNC machine tools, automatic assembly equipment, etc. It is particularly effective in devices where users expect low noise and high speed.

2. Technological Index

2.1 Electrical and Environment Specifications

Input Voltage		24~90VAC
Output Current		6.0A
Pulse Frequency max		Can be set by internal parameters
Signal Input Current		7~20mA（10mA Typical）
Communication rate		57.6Kbps
Protection		Over current peak value 16A±10% Over voltage value 200VDC The over position error range can be set through the front panel of the drive
Environment Specifications	Environment	Avoid dust, oil fog and corrosive gases
	Operating Temperature	70℃ MAX
	Storage Temperature	-20℃~+65℃
	Humidity	40~90%RH
	Cooling method	Natural cooling or forced air cooling

2.2 Mechanical Specifications

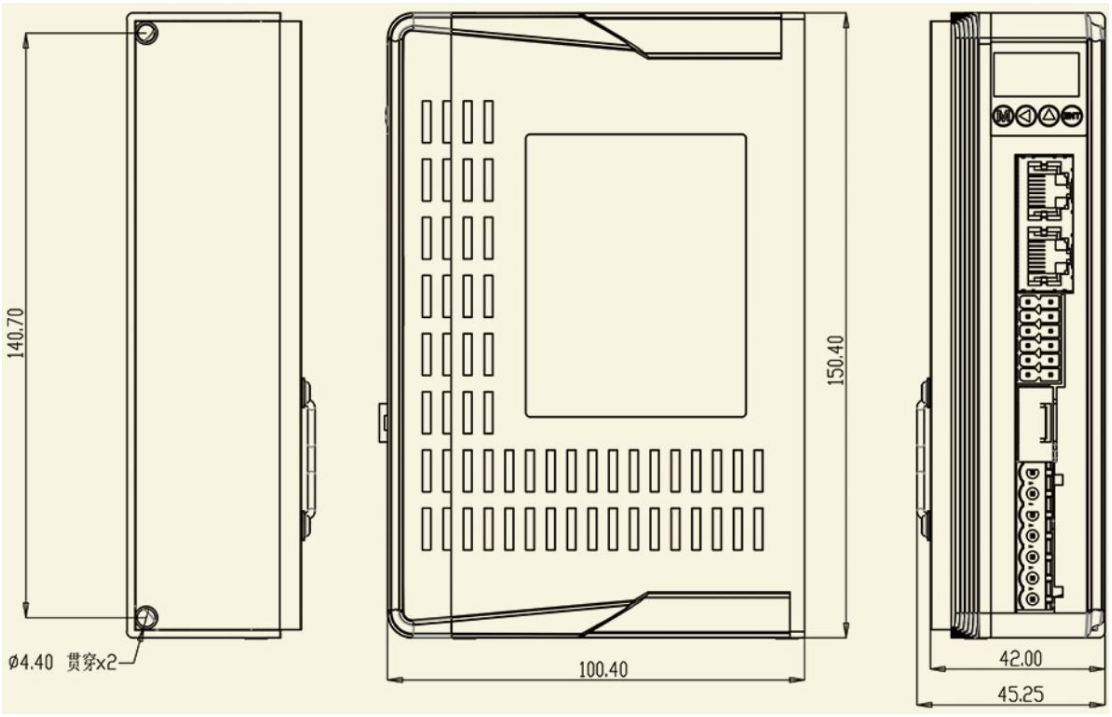


Fig. 1 Mechanical installation size (unit: mm)

Notice: Please take the terminal size and ventilation cooling while design the installation size.

2.3 Elimination of Heat

Drive's reliable working temperature should be <60℃, and motor working temperature should be <90℃;

It is recommended to mount the drive vertically to maximize heat sink area. Use forced cooling method to cool the system if necessary.

3. Fault Data Display

Data display	Fault cause
	Over current in the motor
	Current sensor alarm
	Parameters upload alarm
	Over voltage in power supply
	Over position error alarm
	Missing phase alarm
	Drive off -line

0Err alarm:

1. Alarm when powered on: first check the wiring to make sure that the motor transfer wiring and the motor wiring are not short-circuited. Otherwise try to replace the drive or motor.
2. Alarm during operation: a. Check the wiring to confirm that there is no short circuit between the motor adapter and the motor cable; b. Check whether there is electromagnetic interference outside; c. Reduce the speed and lengthen the acceleration and deceleration time.

1Err, 2Err alarm:

Re-power on, if alarm, replace the driver

3Err alarm:

1. Alarm when power on: first confirm whether the power supply voltage is too high, exceeding AC 114V and DC 160V. Confirm the voltage is ok, try to replace the drive.

2. Alarm during operation: a. Check whether there is electromagnetic interference in the outside world; b. Reduce the speed and lengthen the acceleration and deceleration time.

4Err alarm:

Reason 1: Check the wiring, motor wire and encoder wire, whether there is a wrong connection or poor contact;
Treatment method: ensure that the wiring is in good contact and correctly defined;
Reason 2: Check the speed and acceleration time, if the speed is too fast and the acceleration time is too short, it may
raise an alarm;
Treatment method: appropriately reduce the speed and prolong the acceleration time;
Reason 3: Check the structure and load, whether the structure is stuck, whether the load is too heavy, which may cause an alarm;
Treatment method: adjust the structure to ensure smooth travel, reduce drive load test;
Reason 4: The above is no problem, replace the motor or driver.
Treatment method: replace the product of the same model and do the exclusion test.

5Err alarm:

1. Check whether the motor power line is not connected properly or has poor contact.
2. Modify P30 to 0 and power on again.

EnOF alarm:

Check whether the ENA signal is connected.

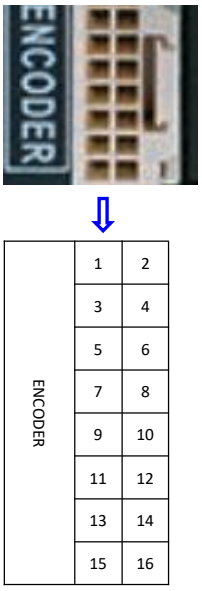
4. Ports and Connections Introduction

4.1 Ports Definition

1）Power Interface Ports

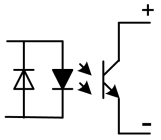
Symbol	Definition	Remark
AC1	Alternating current	20~75VAC
AC2	Alternating current	
A+	Motor connection port A+	Motor wire color red：A+ Motor wire color blue：A- Motor wire color green：B+ Motor wire color black：B-
A-	Motor connection port A-	
B+	Motor connection port B+	
B-	Motor connection port B-	

2） Connections to Encoder



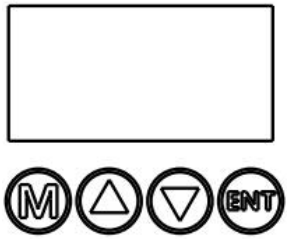
DB Port	Description	DB Port	Description
1	Encoder Chanel **A** Input +	2	Encoder Chanel **A** Input -
3	Encoder Chanel **B** Input +	4	Encoder Chanel **B** Input -
5	Encoder Chanel **Z** Input +	6	Encoder Chanel **Z** Input -
7	Encoder Voltage Input **+5V**	8	Encoder **GND** Input
9	Encoder Voltage Input **+5V**	8	Encoder **GND** Input
11	Encoder Chanel **A** Input +	12	Encoder Chanel **A** Input -
13	Encoder Chanel **B** Input +	14	Encoder Chanel **B** Input -
15	Encoder Chanel **Z** Input +	16	Encoder Chanel **Z** Input -

3）Control Signal Interface Ports

Symbol	Definition	Symbol	Definition	Remark
ENA+	Enable signal input +	ENA-	Enable signal input -	Compatible with 5V and 24V
PUL+	Pulse signal input +	PUL-	Pulse signal input -	
DIR+	Direction signal input +	DIR-	Direction signal input -	
BRK+	Brake signal input +	BRK-	Brake signal input -	 Open collector output
ALM+	Alarm signal output +	ALM-	Alarm signal output -	
PEND+	Position signal output +	PEND-	Position signal output -	

4）Status Indicator

Control panel (including 4 buttons and 4 LED digital tube displays)



2HCS868H uses LED to indicate the power supply and four-digit digital tube display status, long press the button "M" to select the display mode, and use the up and down buttons to select and monitor the running status of the motor.

The key operation is as follows:：

▲key	Adjust parameters and add functions
▼key	Parameter adjustment and function reduction
Ent key (short press)	Shift function
Ent key (long press)	Confirm and save functions
M key	Undo exit, function switching

The meaning of nixie tube display is as follows：

LED Display	Definition
0-Sr	Reference Speed
1-SF	Speed Feedback
2-Er	Position Error
3-Pr	Position Reference
4-PF	Position Feedback
5-u.	Bus voltage
6-Ld	Given current
EnOF	Drive offline
0Err	Motor overcurrent alarm
1Err	Sampling reference Alarm
2Err	Parameter upload alarm
3Err	Power overvoltage alarm
4Err	Position out of tolerance alarm
5Err	Motor phase loss alarm

Remark: switch to this function through 'M'; that is, the parameter display function; long press the 'ENT' key to view the parameter value (the power-on display is the parameter value you finally checked), press the '▼' key or press '▲' key to switch

functions; to exit this function and go to the next function press the 'M' key.

4.2 Connections to Control Signal

The connections to the input and output control signals are as follows:

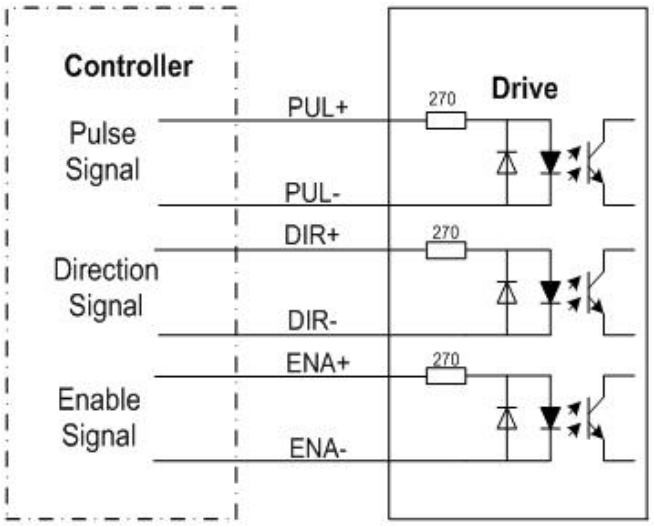


Fig.2 Differential signal connection

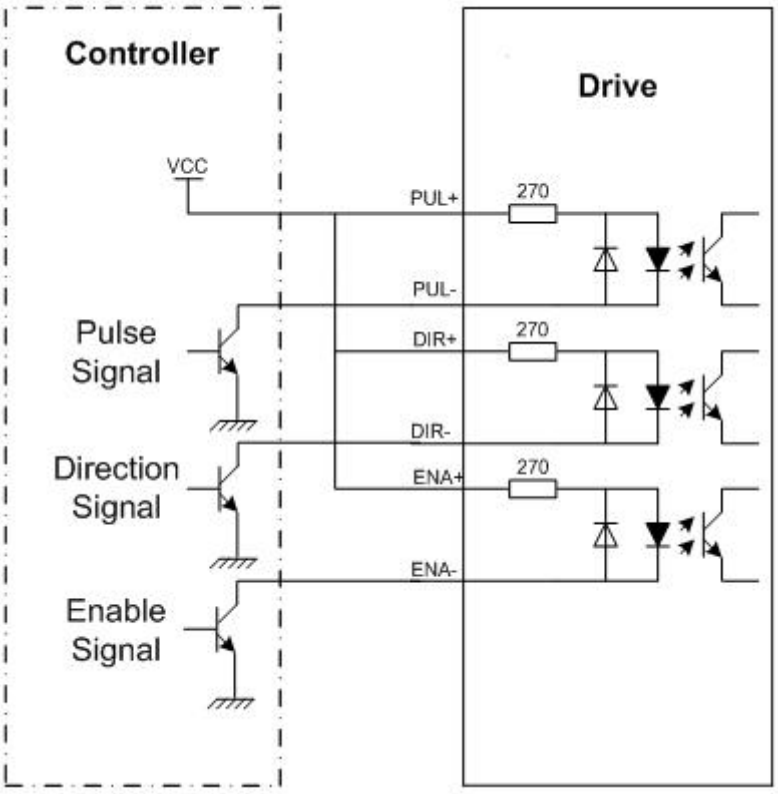


Fig.3 Common anode connection method

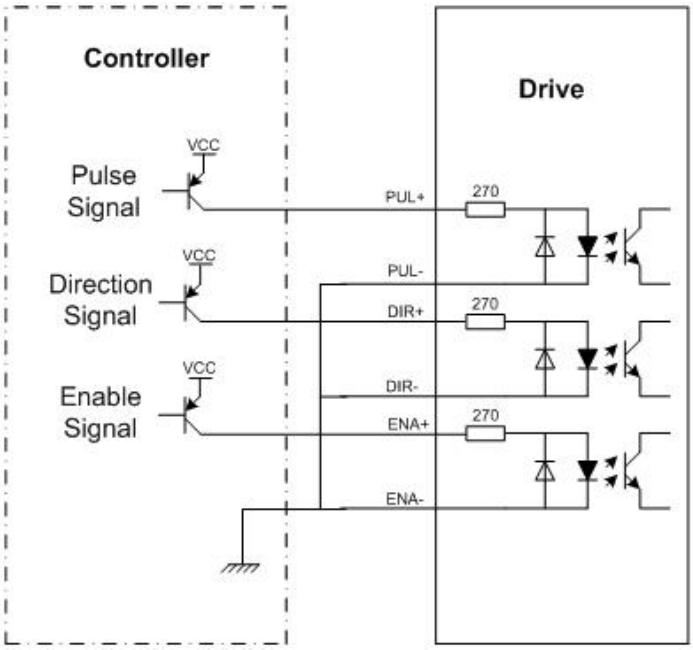


Fig. 4 Common cathode connection method

Attention: The control signal can be compatible with 5V and 24V.

4.3 Sequence Chart of Control Signal

In order to avoid some fault operations and deviations, PUL, DIR and ENA should abide by some rules, shown as following diagram:

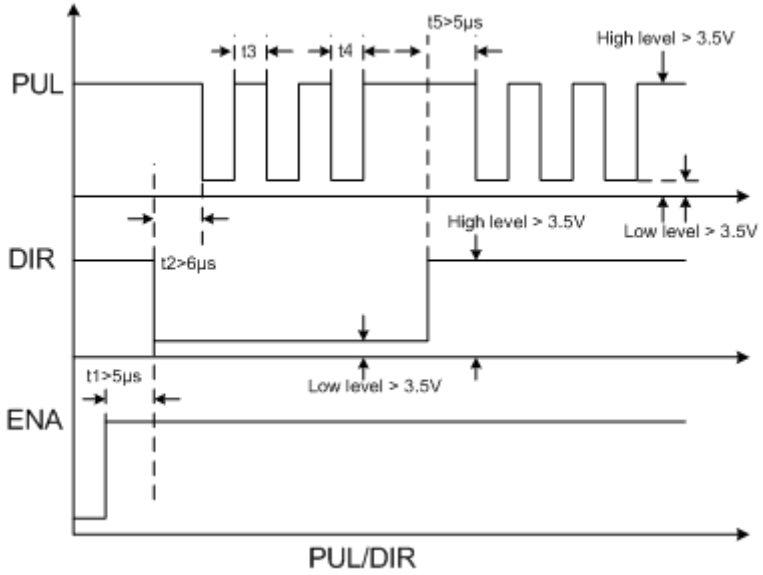


Fig. 5 Timing diagram of Control signal

Remark:

(1) t1: ENA (enable signal) should advance DIR at least 6μs and be

determined to be high. In general, it is recommended that ENA+ and ENA- be left floating.

(2) t2: DIR determines its state high or low at least 5μs ahead of the falling edge of PUL.

(3) t3: The pulse width is at least not less than 2.5μs.

(4) t4: The width of the low level is not less than 2.5μs.

(5) t5: DIR maintains its state high or low at least 5 μs behind the rising edge of PUL.

4.4 Control signal mode setting

Pulse trigger edge selection: set parameter p12 through the front panel of the driver to select whether the pulse rising edge or falling edge trigger is effective.

Single and double pulse selection: set parameter P18 through the front panel of the driver to select single pulse mode or double pulse mode.

5.Drive' Parameters Configure

Parameter setting method of 2HCS868H driver: parameters can be set through the front panel of the driver. There is a set of default factory configuration parameters corresponding to the best motor in the driver. The user only needs to adjust the internal subdivision of the driver according to the specific use situation. The specific parameters and functions are shown in the table below:

Actual value = Set value ×the corresponding dimension

Mode	Definition	Range	Dimension	Restart Drive	Default Value
P1	**Current loop Kp**	**0—9000**	**0.0001**	**Y**	**1000**
P2	**Current loop Ki**	**0—2000**	**0.0001**	**N**	**100**
P3	**Damping coefficient**	**0—1000**	**0.0001**	**N**	**30**
P4	**Position loop Kp**	**0—3000**	**0.001**	**N**	**2000**
P5	**Position loop Ki**	**0—1000**	**0.01**	**N**	**200**
P6	**Speed loop Kp**	**0—5000**	**0.00001**	**N**	**300**
P7	**Speed loop Ki**	**0—5000**	**0.00001**	**N**	**1000**
P8	**Open-loop current**	**0—60**	**0.1**	**N**	**40**
P9	**Close-loop current**	**0—40**	**0.1**	**N**	**20**
P10	**Alarm level**	**0—1**	**1**	**Y**	**1**
P11	**Direction level**	**0—1**	**1**	**N**	**1**
P12	**Drive edge selection**	**0—1**	**1**	**Y**	**0**
P13	**Enable level**	**0—1**	**1**	**N**	**1**
P14	**Arrival level**	**0—1**	**1**	**N**	**1**
P15	**Encoder line number**	**0—1**	**1**	**Y**	**0**
P16	**Position error limit**	**0—3000**	**10**	**N**	**400**
P17	**Subdivision Selection**	**0—15**	**The breakdown values are shown in the table below**	**Y**	**2**

	Para	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**
	Pulses/Rev	customize	800	1600	3200	6400	12800	25600	51200
	Para	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
	Pulses/Rev	1000	2000	4000	5000	8000	10000	20000	40000
P18	**single and double pulse**					**0—1**	**1**	**Y**	**0**
P19	**Drive command smoothing**					**0—10**	**0**	**N**	**2**
P20	**User-defined Micro Steps**					**4—1000**	**50**	**Y**	**8**
P21	**Power on display**					**0—4**	**1**	**N**	**0**
P22	**Driver pulse filtering**					**0—100**	**4**	**Y**	**3**
P23	**Driver enable lock**					**0—1**	**1**	**Y**	**0**
P24	**Open loop angle compensation**					**0-10000**	**0.0001**	**N**	**350**
P25	**Open and closed loop ratio**					**0—100**	**1**	**N**	**20**
P26	**In place output threshold**					**0—1000**	**1**	**N**	**10**
P27	**Open and closed loop selection**					**0—1**	**1**	**Y**	**1**
P28	**Inductance identification value**					**Read only**			
P29	**Resistance identification value**					**Read only**			
P30	**Close motor to detect the lack of Phase**					**0—1**	**1**	**Y**	**1**
P31	**Back EMF compensation coefficient**					**0—9000**	**0.01**	**N**	**100**
P32	**scale factor**					**0—1000**	**0.01**	**N**	**100**
P33	**Reserve**					**Reserve**	**Reserve**	**Reserve**	**Reserve**
P34	**Half flow slope reduction**					**0—10000**	**0.00001**	**N**	**30**
P35	**Half flow downtime**					**0—1500**	**10**	**N**	**1000**
P36	**Half flow out of tolerance threshold**					**0—4000**	**1**	**N**	**100**
P37	**Shutdown current setting**					**0—60**	**0.1**	**N**	**20**
P38	**Shutdown current enable**					**0—1**	**1**	**N**	**1**
P39	**Forced tooth alignment enable**					**0—1**	**1**	**Y**	**1**
P40	**Current change threshold**					**0—4000**	**1**	**N**	**10**
P41	**Current variation limit**					**0—4000**	**1**	**N**	**50**

There are 41 parameters in total, the following parameters can be

modified through the front panel of the drive, or downloaded to the drive through HISU. The settings of each parameter are described below. Parameters P1, P2, P3, P4, P5, P6, P7 are used to set the parameters of current loop, system damping, position loop and speed loop respectively.

Parameters P8 and P9 are used to set open-loop current and closed-loop control current respectively. (actual current = open loop current + closed loop current)

Parameter P10 is used to select the alarm output level. Parameter 1 means that the optocoupler output transistor is turned off in normal operation; the optocoupler output transistor is turned on when the driver alarms. vice versa.

Parameter P11 is used for the direction level selection. By setting this parameter, the control direction of the control terminal level can be changed.

Parameter P12 is used to select the trigger edge of the pulse, 1 means falling edge trigger, 0 means rising edge trigger.

Parameter P13 is used to select the level of the enable signal. Generally, 0 is selected, and the low level is enabled, that is, no external enable input signal is required. vice versa.

Parameter P14, select the in-position output level, 1 means that the driver meets the in-position condition and the photo-coupled output transistor is turned off; if the in-position condition is not met, the

photo-coupled output triode is turned on. vice versa.

Parameter P15, selection of encoder lines, 0 means 1000 lines, 1 means 2500 lines.

Parameter P16, sets the threshold value of the position error. (actual value = set value × 10)

Parameter P17, subdivision setting of the drive

Para	0	1	2	3	4	5	6	7
Pulses/Rev	User defined	800	1600	3200	6400	12800	25600	51200
Para	8	9	10	11	12	13	14	15
Pulses/Rev	1000	2000	4000	5000	8000	10000	20000	40000

Tip: In addition, the driver also provides users with any subdivision that can be set freely,and the specific parameters are set through mode P20.

Parameter P18, single and double pulse setting of the drive, 1 is pulse+ direction, 0 is double pulse mode.

Parameter P19, command smoothing Coefficient

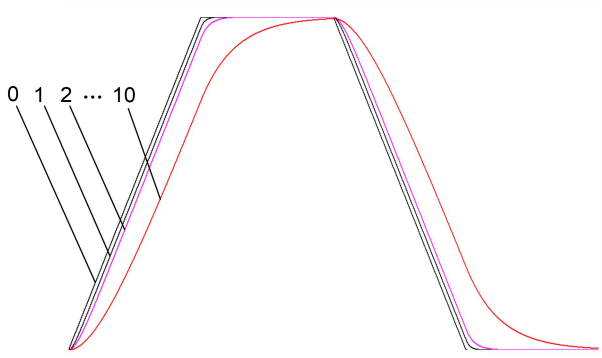


Fig.7 command smoothing coefficient

The parameter P20 is used for the user-defined subdivision number. The user-defined subdivision value is P20*50. For example, if the user needs to set the subdivision to 6100, it is necessary to set P17=0 first, and then set P20=122.

Parameter P21, it is displayed when the drive is powered on.

Parameter	0	1	2	3	4
Data display	Speed reference	Speed feedback	Position Tracking error	Position reference	Position feedback

Parameter P22, drive pulse filter, as the value increases, the pass frequency of the drive pulse gradually decreases, which is used to suppress the electronic interference generated by the use environment.

Parameter P23, the drive is enabled to lock, when this parameter is 0, after the enable signal is given, the motor does not lock the axis, and the drive does not count external pulses. When this parameter is 1, after the enable signal is given, the motor locks the axis, and the drive does not count external pulses.

Parameter P30, drive phase loss detection, 1 means open, 0 means close. Limited to factory maintenance.

6.Parameter adjustment method

6.1 Button Panel Operation

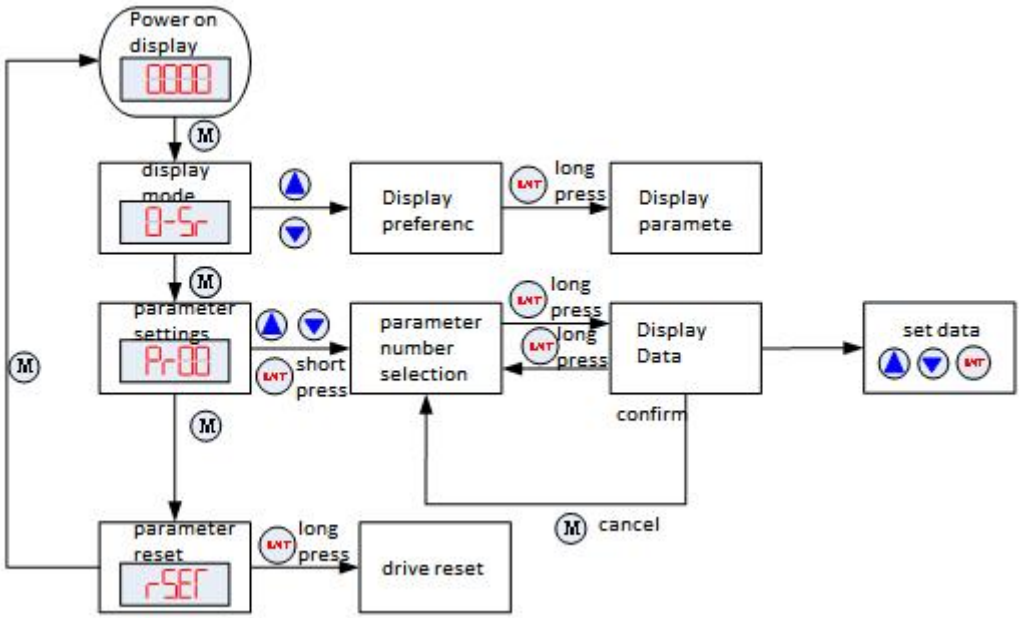


Fig. 8 Button operation flow diagram

6.2 Operation example

【1】Mode Configure Operation Example

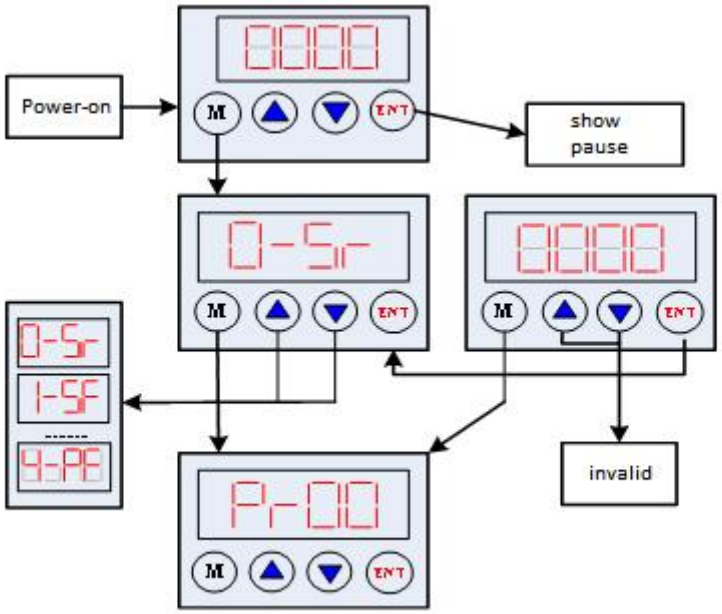


Fig. 9 Display operation flow diagram

【2】Parameter Configure Operation Example

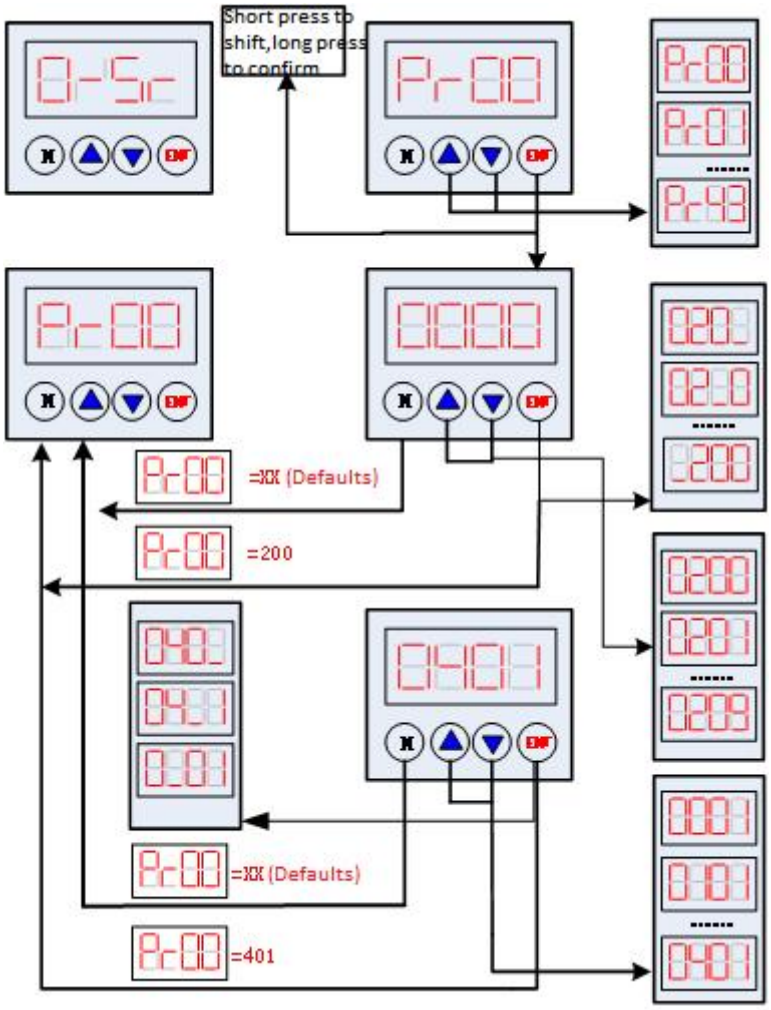


Fig. 10 Parameter configure flow diagram

Attention: The default parameters of current loop, position loop and speed loop are almost the best, user no need to change them, but to configure the parameter Pulses/revolution according to the necessity of the control system.

7.Typical Connections to 2HCS868H

The typical connections to 2HCS868H are shown in figure 11. The power source grade AC24V ~ AC90V selection is based on the matching motor.

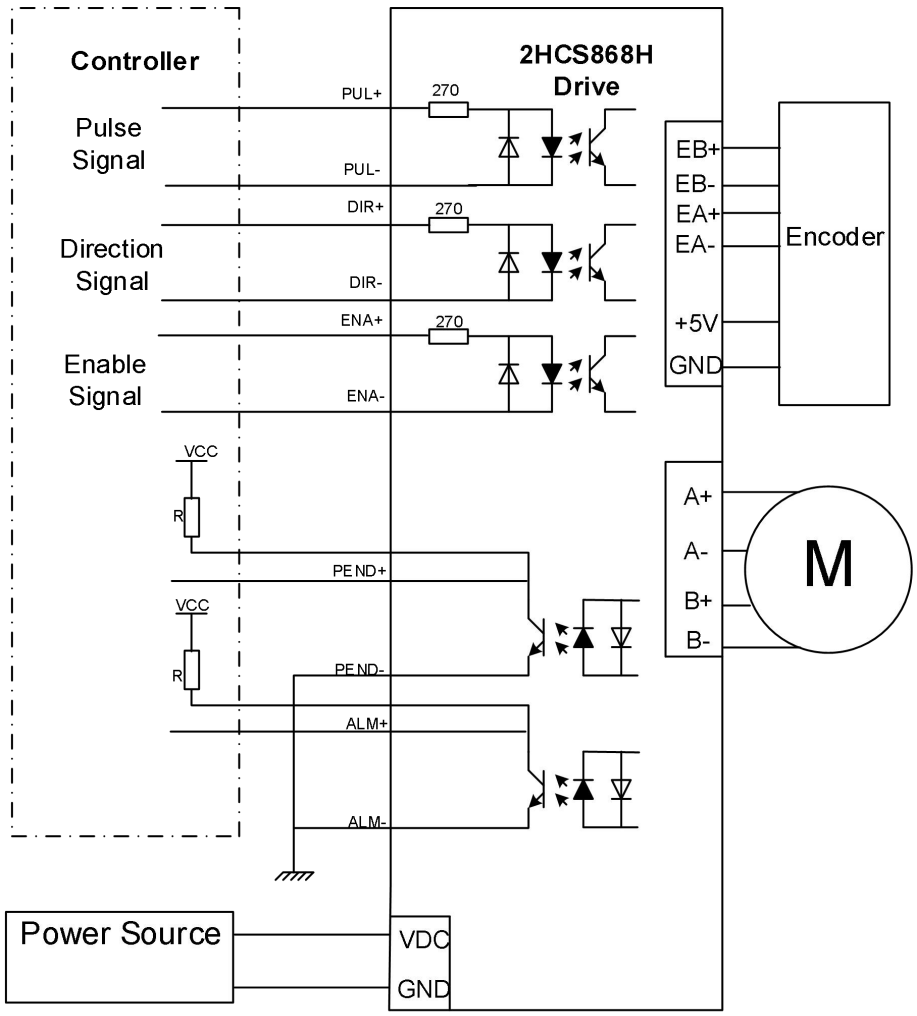


Fig. 11 Typical connections to 2HCS868H

Attention ： R (3~5K) must be connected to control signal terminal.

8.Processing Methods to Common Problems and Faults

8.1 Power on but no digital tube display

- No power input, please check the power supply circuit. The voltage is too low.

8.2 Power on or after the motor running a small angle and fault data display

- Please check the motor feedback signal and if the motor is connected with the drive.
- The stepper servo drive is over voltage or under voltage. Please lower or increase the input voltage.
- Please check the motor phase wires if they are connected correctly.Please refer to the motor identification and the corresponding phase sequence connection of the driver
- Please check the parameter in the drive if the poles of the motor and the encoder lines are corresponding with the real parameters, if not, set them correctly.
- Please check if the frequency of the pulse signal is too fast, thus the motor may be out of it rated speed, and lead to position error.

8.3 After input pulse signal but the motor not running

- Please check the input pulse signal wires are connected in reliable way.
- Please make sure the input pulse mode is corresponding with the real input mode.

■ Whether the motor enable undo.

8.4 Motor does not rotate after pulse input

0Err alarm:

1. Alarm when powered on: first check the wiring to make sure that the motor transfer wiring and the motor wiring are not short-circuited. Otherwise try to replace the drive or motor.
2. Alarm during operation: a. Check the wiring to confirm that there is no short circuit between the motor adapter and the motor cable; b. Check whether there is electromagnetic interference outside; c. Reduce the speed and lengthen the acceleration and deceleration time.

1Err, 2Err alarm:

Re-power on, if alarm, replace the driver

3Err alarm:

1. Alarm when power on: first confirm whether the power supply voltage is too high, exceeding AC 114V and DC 160V. Confirm the voltage is ok, try to replace the drive.
2. Alarm during operation: a. Check whether there is electromagnetic interference in the outside world; b. Reduce the speed and lengthen the acceleration and deceleration time.

4Err alarm:

Reason 1: Check the wiring, motor wire and encoder wire, whether there is a wrong connection or poor contact;
Treatment method: ensure that the wiring is in good contact and correctly defined;
Reason 2: Check the speed and acceleration time, if the speed is too fast and the acceleration time is too short, it may
raise an alarm;
Treatment method: appropriately reduce the speed and prolong the acceleration time;
Reason 3: Check the structure and load, whether the structure is stuck, whether the load is too heavy, which may cause an alarm;
Treatment method: adjust the structure to ensure smooth travel, reduce drive load test;
Reason 4: The above is no problem, replace the motor or driver.
Treatment method: replace the product of the same model and do the exclusion test.

5Err alarm:

1. Check whether the motor power line is not connected properly or has poor contact.
2. Modify P30 to 0 and power on again.

EnOF alarm:

Check whether the ENA signal is connected.