HBS86H
Hybrid Stepper Servo Drive
Manual

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1. Overview

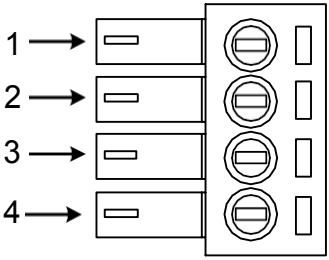
The HBS86H hybrid stepper servo drive system integrates the servo control technology into the digital stepper drive perfectly. And this product adopts an optical encoder with high speed position sampling feedback of 50 μ s, once the position deviation appears, it will be fixed immediately. This product is compatible the advantages of the stepper drive and the servo drive, such as lower heat, less vibration, fast acceleration, and so on. This kind of servo drive also has an excellent costperformance.

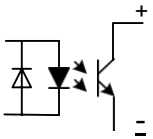
2. Features

- Without losing step, High accuracy inpositioning
- 100% rated outputtorque
- Variable current control technology, High currentefficiency
- Small vibration, Smooth and reliable moving at lowspeed
- Accelerate and decelerate control inside, Great improvement in smoothness of starting or stopping themotor
- User-defined microsteps
- Compatible with 1000 and 2500 linesencoder
- No adjustment in generalapplications
- Over current, over voltage and over position errorprotection
- Green light means running while red light means protection or offline

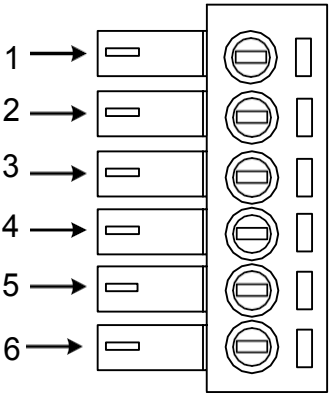
3. Ports Introduction

3.1 ALM and PEND signal outputports



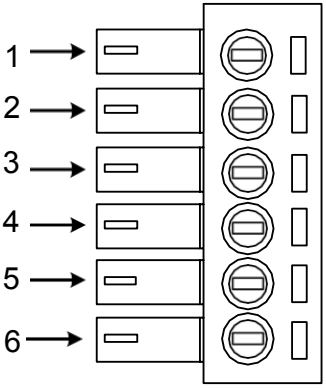
Port	Symbol	Name	Remark
1	PEND+	In position signal output +	
2	PEND-	In position signal output -	
3	ALM+	Alarm output +	
4	ALM-	Alarm output -	

3.2 Control Signal InputPorts



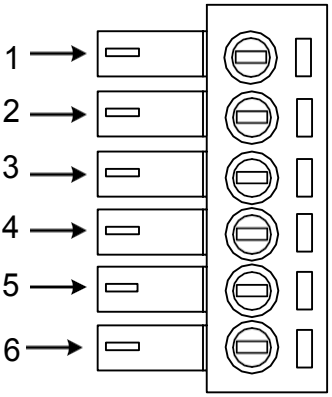
Port	Symbol	Name	Remark
1	PLS+	Pulse signal +	Compatible with 5V or 24V
2	PLS-	Pulse signal -	
3	DIR+	Direction signal+	Compatible with 5V or 24V
4	DIR-	Direction signal-	
5	ENA+	Enable signal +	Compatible with 5V or 24V
6	ENA-	Enable signal -	

3.3 Encoder Feedback Signal InputPorts



Port	Symbol	Name	Wiring color
1	PB+	Encoder phase B +	Blue
2	PB-	Encoder phase B -	White
3	PA+	Encoder phase A +	Yellow
4	PA-	Encoder phase A -	Green
5	VCC	Input power	Red
6	GND	Input power ground	Black

3.4 Power InterfacePorts



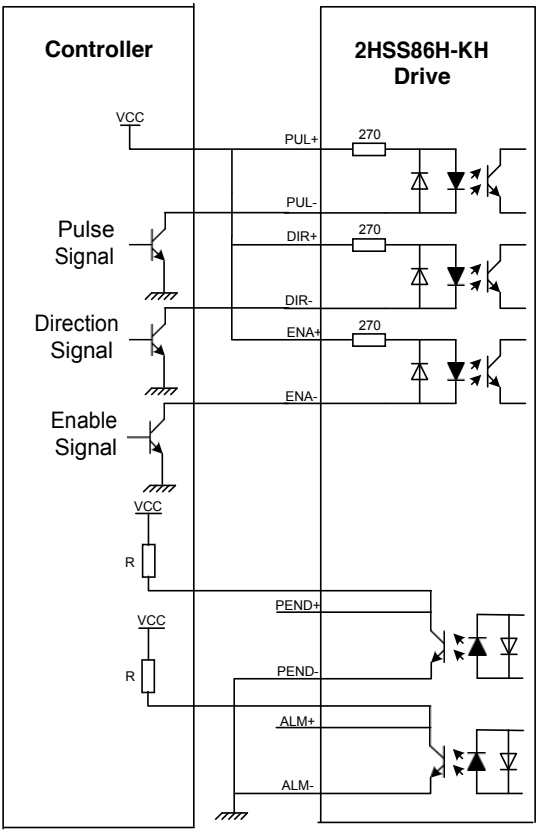
Port	Identification	Symbol	Name	Remark
1	Motor Phase Wire InputPorts	A+	Phase A+（Red）	Motor Phase A
2		A-	Phase A- (Blue）	
3		B+	Phase B+（Green）	Motor Phase B
4		B-	Phase B-（Black）	
5	Power Input Ports	VCC	Input Power +	AC24V-70V DC30V-100V
6		GND	Input Power-	

4. Technological Index

Input Voltage		24~70VAC or 30~100VDC
Output Current		6A 20KHz PWM
Pulse Frequency max		200K
Communication rate		57.6Kbps
Protection		● Over current peak value12A±10% ● Over voltage value130V ● The over position error range can be set through theHISU
Overall Dimensions（mm）		150×97.5×53
Weight		Approximate 580g
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

5. Connections to ControlSignal

5.1 Connections to CommonAnode

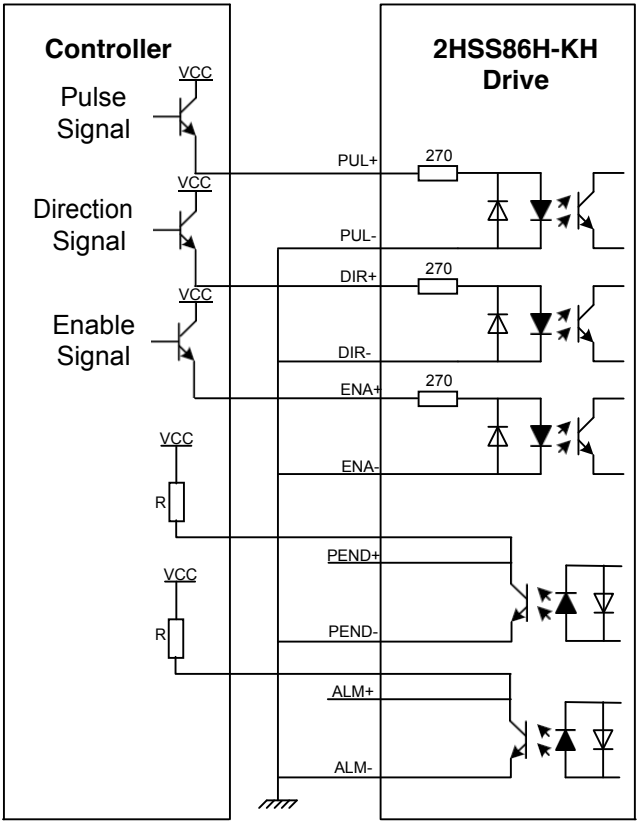


Remark:

VCC is compatible with 5V or 24V;

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

5.2 Connections to CommonCathode

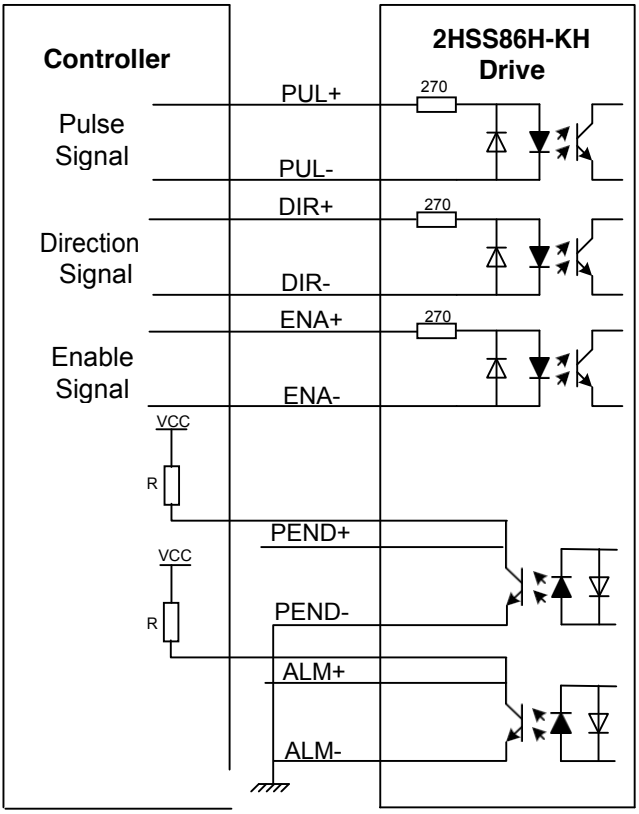


Remark:

VCC is compatible with 5V or 24V;

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

5.3 Connections to DifferentialSignal

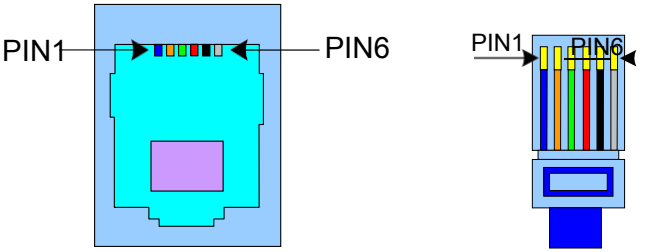


Remark:

VCC is compatible with 5V or 24V;

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

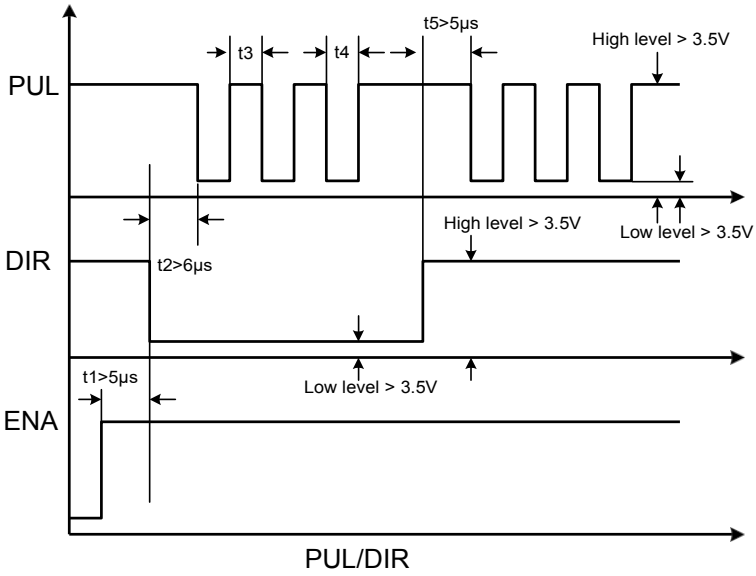
5.4 Connections to 232 Serial CommunicationInterface



Crystal Head foot	Definition	Remark
1	TXD	Transmit Data
2	RXD	Receive Data
4	+5V	Power Supply to HISU
6	GND	Power Ground

5.5 Sequence Chart of ControlSignals

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



Remark:

a. t1: ENA must be ahead of DIR by at least 5μ s. Usually, ENA+ and ENA- are NC (notconnected).

b. t2: DIR must be ahead of PUL active edge by 6μ s to ensure correct direction;

c. t3: Pulse width not less than 2.5μs;

d. t4: Low level width not less than 2.5μs.

6. DIP SwitchSetting

6.1 Activate EdgeSetting

SW1 is used for setting the activate edge of the input signal, “off” means the activate edge is the rising edge, while “on” is the falling edge.

6.2 Running DirectionSetting

SW2 is used for setting the running direction, “off” means CCW, while “on” means CW.

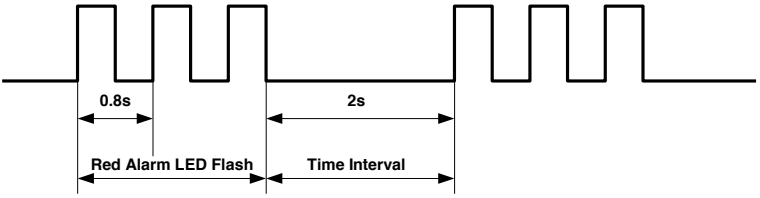
6.3 Micro stepsSetting

The micro steps setting is in thefollowingtable, whileSW3、SW4、SW5、SW6 are all on, the internal default micro steps inside is activate，this ratio can be setting through the HISU.

Dial switch / Micro steps	SW3	SW4	SW5	SW6
Default	on	on	on	on
800	off	on	on	on
1600	on	off	on	on
3200	off	off	on	on
6400	on	on	off	on
12800	off	on	off	on
25600	on	off	off	on
51200	off	off	off	on
1000	on	on	on	off
2000	off	on	on	off
4000	on	off	on	off
5000	off	off	on	off

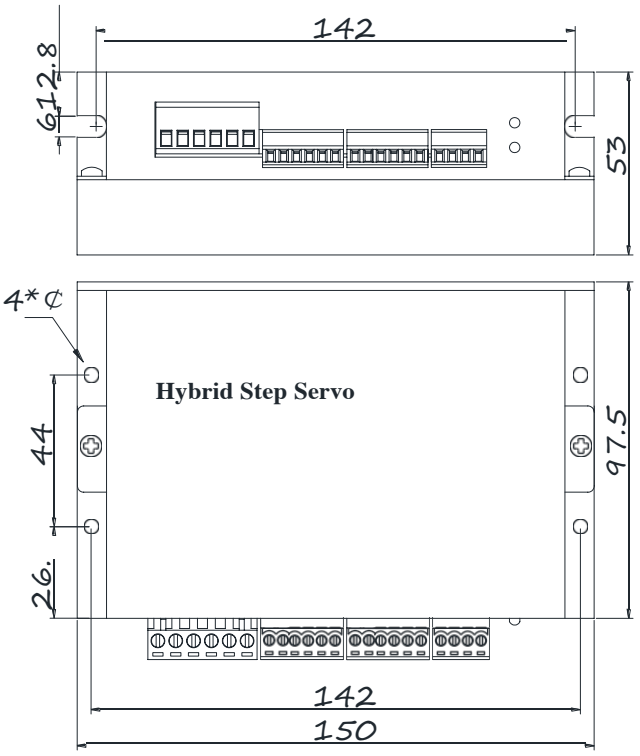
8000	on	on	off	off
10000	off	on	off	off
20000	on	off	off	off
40000	off	off	off	off

7. Faults alarm and LED flickerfrequency



Flicker Frequency	Description to the Faults
1	Error occurs when the motor coil current exceeds the drive's current limit.
2	Voltage reference error in the drive
3	Parameters upload error in the drive
4	Error occurs when the input voltage exceeds the drive's voltage limit.
5	Error occurs when the actual position following error exceeds the limit which is set by **the position error limit**.

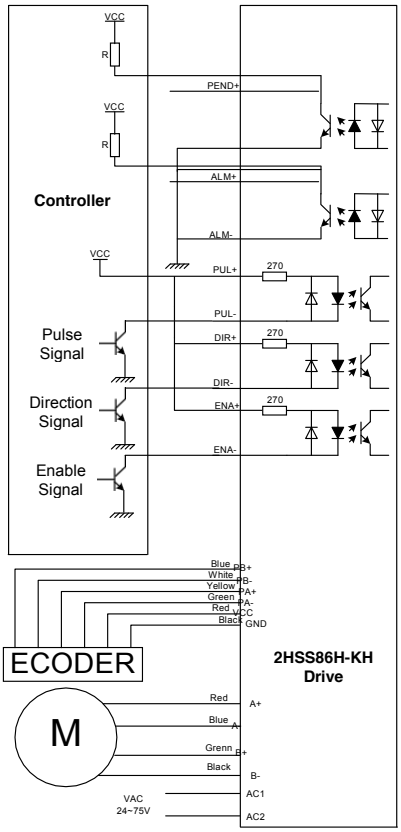
8. Appearance and InstallationDimensions



9. Typical Connection

This drive can provide the encoder with a power supply of +5v, maximum current 80mA. It adopts a quadruplicated-frequency counting method, and the resolution ratio of the encoder multiply 4 are the pulses per rotate of the servo motor. Here is the typical connection of

2HSS86H-KH.



10. ParameterSetting

The parameter setting method of 2HSS86H-KH drive is to use a HISU adjuster through the 232 serial communication ports, only in this way can we setting the parameters we want. There are a set of best defaultparameterstothecorrespondingmotorwhicharecarefully

adjusted by our engineers, users only need refer to the following table, specific condition and set the correct parameters.

Actual value = Set value × the corresponding dimension

Mode	Definition	Range	Dime-nsion	Drive Restart	Default Value
P1	Current loop Kp	0—4000	1	N	1000
P2	Current loop Ki	0—1000	1	N	100
P3	Damping coefficient	0—1000	1	N	100
P4	Position loop Kp	0—4000	1	N	1300
P5	Position loop Ki	0—1000	1	N	250
P6	Speed loop Kp	0—3000	1	N	50
P7	Position loop Ki	0—1000	1	N	10
P8	Open loop current	0—60	0.1	N	45
P9	Close loop current	0—40	0.1	N	20
P10	Alarm level	0—1	1	N	0
P11	Reserved				
P12	Stop lock enable	0—1	1	N	0
P13	Enable signal level	0—1	1	N	0
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	1000
P17	Reserved				
P18	Motor type	0—5	0	Y	4
P19	Speed smoothness	0—10	1	N	0
P20	User-defined p/r	4-1000	50	Y	8

There are total 20 parameter configurations, use the HISU to download the configured parameters to the drive, the detail descriptions to every parameter configuration are asfollows:

Item	Description
Current loop Kp	Increase Kp to make current rise fast. Proportional Gain determines the response of the drive to setting command. Low Proportional Gain provides a stable system (doesn't oscillate), has low stiffness, and the current error, causing poor performances in tracking current setting command in each step. Too large proportional gain values will cause oscillations and unstable system.
Current loop Ki	Adjust Ki to reduce the steady error. Integral Gain helps the drive to overcome static current errors. A low or zero value for Integral Gain may have current errors at rest. Increasing the integral gain can reduce the error. If the Integral Gain is too large, the system may "hunt" (oscillate) around the desired position.
Damping coefficient	This parameter is used to change the damping coefficient in case of the desired operating state is under resonance frequency.
Position loop Kp **Position loop Ki**	The PI parameters of the position loop. The default values are suitable for most of the application, you don't need to change them. Contact us if you have any question.

Speed loop Kp **Speed loop Ki**	The PI parameters of the speed loop. The default values are suitable for most of the application, you don't need to change them. Contact us if you have any question.
Open loop current	This parameter affects the static torque of the motor.
Close loop current	This parameter affects the dynamic torque of the motor. (The actual current = open loop current + close loop current)
Alarm Control	This parameter is set to control the Alarm optocoupler output transistor. 0 means the transistor is cut off when the system is in normal working, but when it comes to fault of the drive, the transistor becomes conductive. 1 means opposite to 0.
Stop lock enable	This parameter is set to enable the stop clock of the drive. 1 means enable this function while 0 means disable it.
Enable Control	This parameter is set to control the Enable input signal level, 0 means low, while 1 means high.
Arrival Control	This parameter is set to control the Arrival optocoupler output transistor. 0 means the transistor is cut off when the drive satisfies thearrival

command, but when it comes to not, the transistor becomes conductive. 1 means opposite to 0.

Encoder resolution

This drive provides two choices of the number of lines of the encoder. 0 means 1000 lines, while 1 means 2500 lines.

Position error limit

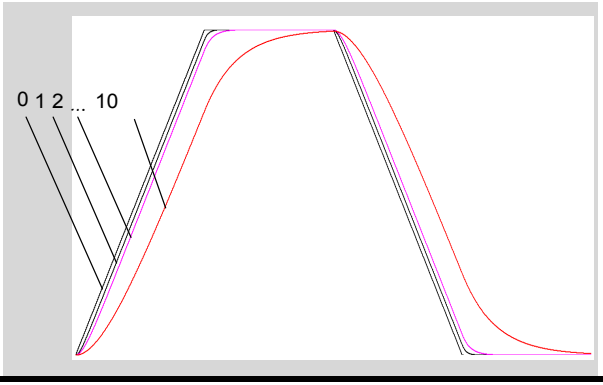
The limit of the position following error. When the actual position error exceeds this value, the drive willgointoerrormodeandthefaultoutputwillbe activated. (The actual value = the set value× 10)

Motor typeselection

Parameter	1	2	3	4	5
Type	86J18 65EC	86J18 80EC	86J18 95EC	86J18 118EC	86J18 156EC

Speed smoothness

This parameter is set to control the smoothness of the speed of the motor while acceleration or deceleration, the larger the value, the smoother the speed in acceleration ordeceleration.



User-defined p/r	This parameter is set of user-defined pulse per revolution,theinternaldefaultmicrostepsinsideis activatewhileSW3、SW4、SW5、SW6areallon, users can also set the micro steps by the outer DIP switches.(Theactualmicrosteps= the setvalue × 50)

11. Processing Methods to Common Problems and Faults

11.1 Power on power lightoff

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

11.2 Power on red alarm lighton

- Please check the motor feedback signal and if the motor is connected with thedrive.
- The stepper servo drive is over voltage or under voltage. Please lower or increase the inputvoltage.

11.3 Red alarm light on after the motor running asmall angle

- Please check the motor phase wires if they are connected correctly，if not， please refer to the 3.4 Power Ports.

- 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 themcorrectly.
- 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 positionerror.

11.4 After input pulse signal but the motor notrunning

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