

# HYBRID STEP SERVO DRIVER SYSTEM

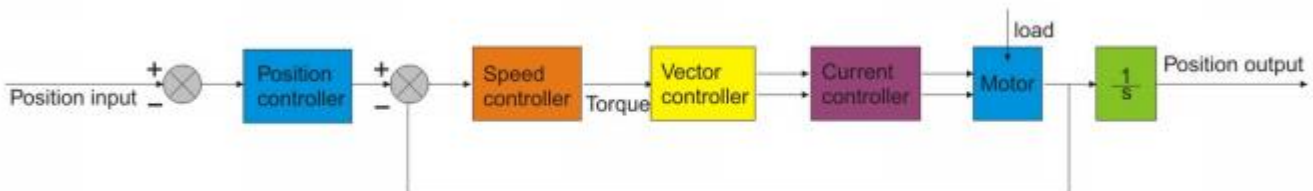
## ■ Main Features:

- Full closed loop
- High efficiency
- High torque
- High speed
- Low heat
- Smooth and accurate
- High speed response
- Six - digit nixie tube display, can set parameter easily and monitor motor running state.

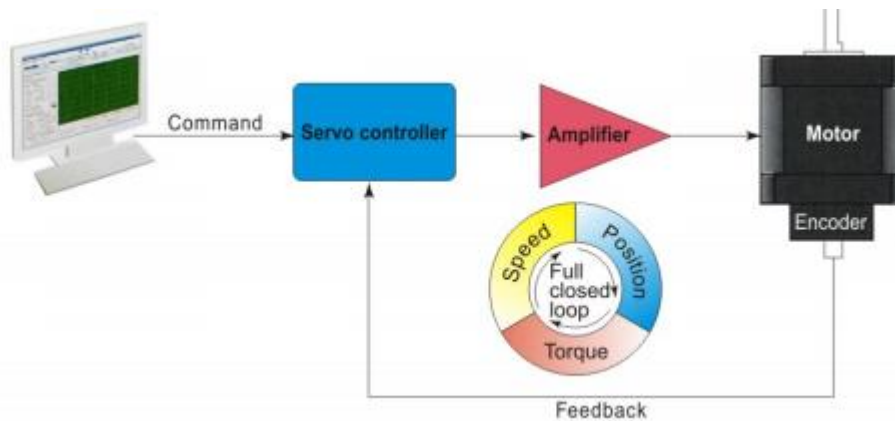


## ■ Brief introduction

2HBS hybrid stepper servo drive system integrated servo control technology into the digital step driver. It adopts typical tricyclic control method which include current loop, speed loop and position loop. This product has the advantage of both step and servo system, is a highly cost-effective motion control products.



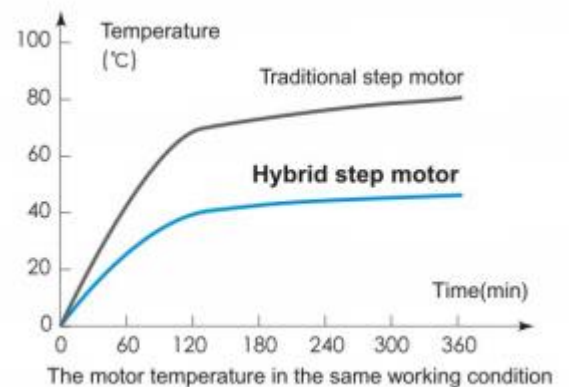
## ■ Full closed loop



1. Accurate position and speed control can achieve the most strict request of the application.
2. High robustness's servo control adapt to wide range change of inertial load and friction load.
3. The motor with 1000CPR encoder, support vector closed loop control, Compare with traditional step motor, it solved the problem of lose step.

## ■ Low heat/high efficiency

1. Adjust the current according to actual load, the heat is much lower compare with traditional step motor.
2. The current is almost 0, and without heat under stop condition.



3. It save energy and can achieve nearly 100% torque output. Working smoothly and accurately.

## ■ Smooth and accurate

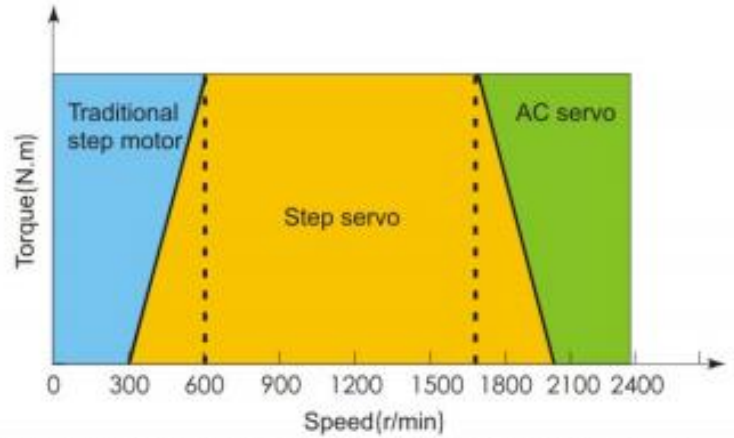
Based on the feedback encoder's space vector current control algorithm and vector smoothing filterin technique. It can resist the "low-frequency resonance" caused by the traditional step motor. The motor can still run smoothly

under low speed. This is a perfect solution to solve the problem of noise and vibration for the traditional stepper motor.

## ■ High speed response

1. Hybrid step servo system have some advantages of the traditional open-loop stepper system, position response input and output command signal are almost real-time synchronization, so very suitable for condition of short distance quickly start / stop and zero-speed stop stably.

2. In condition of point-to-point fast positioning, advanced servo control technology provides a large torque output. It makes the system has a very high dynamic response, it is far over the limit of step system.



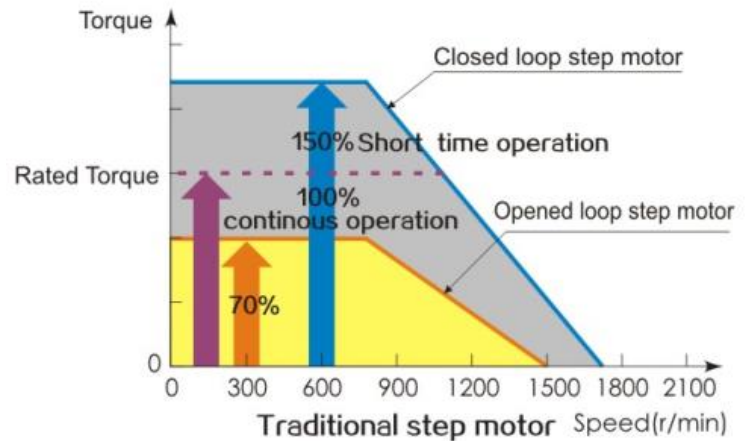
Traditional step motor: short distance, medium and low speed (300-600RPM)  
 Step servo: medium and short distance, medium and high speed (600-2000RPM)  
 AC servo: Long distance, high speed (more than 2000RPM)

## ■ High torque /high speed

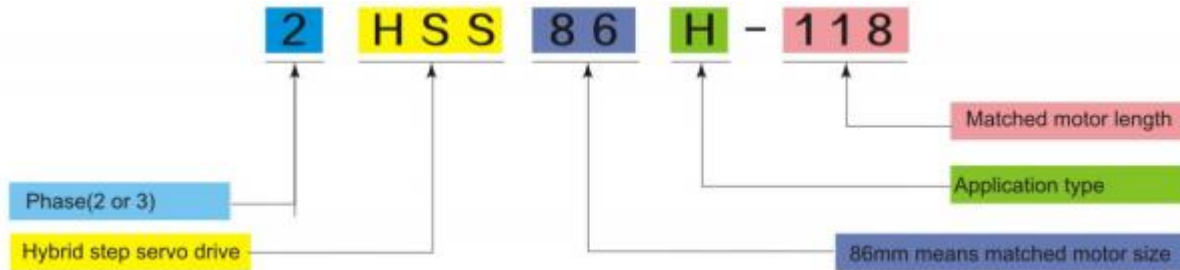
1. Hybrid servo drive system adopts the optimized current control mode, the torque of the motor can be 100% full use. There is no need to consider torque redundancy when design the machine.

2. A large torque output can simplified the complexity of the deceleration equipment in certain cases.

3. The high-speed performance of the hybrid step servo drive systems improve 30% and the effective torqued improve 70% compare with opened loop step motor. This makes the motor can maintain high-torque operation under high-speed.



■ Name rules of Hybrid step servo drive system



■ Data sheet for hybrid step servo drive

Model	current (A)	Voltage (V)	Motor	Weight (KG)	Dimension (mm)	Control signal
2HSS57	0-6A	DC (24-48V)	57, 86	0.27	118*75.5*34	differential
2HSS86H	0-7A	AC (24-70V)	57, 86	0.6	150*97.5*53	differential
2HSS858H	0-6A	AC (50-90)	57, 86	0.27	140*70*56	differential
3HSS2208H-86	0-8A	AC (180-250V)	86	0.57	140*70*56	differential
3HSS2208H-110	0-8A	AC (80-220V)	110	1.5	140*70*56	differential

## 2HSS57



### Key Features:

- Full closed loop control
- Motor with standard 1000 line encoder
- It save energy and achieve nearly 100% output torque .
- Micro step setting range is 2-256
- High speed response , High speed
- Optical isolation fault alarm output interface ALM
- Current loop bandwidth: (-3dB) 2KHz (typical value)
- Speed loop bandwidth: 500Hz (typical value)
- Position loop bandwidth: 200Hz (typical value)
- RS232 serial communication available to download or change the parameters

### Introduction

2HSS57 two-phase hybrid stepper servo drive system integrated servo control technology into the digital step driver. It adopts typical tricyclic control method which include current loop, speed loop and position loop. This product has the advantage of both step and servo system, and it's a highly cost-effective motion control products.

### Electrical Specifications

Parameters	Min	Typical	Max	Unit
Supply voltage	24V	36V	60V	VDC
Output Current (Peak)	-	-	6.0	Amps
Logic Input Current	-	10	-	mA
Pulse input frequency	-	-	200	KHz

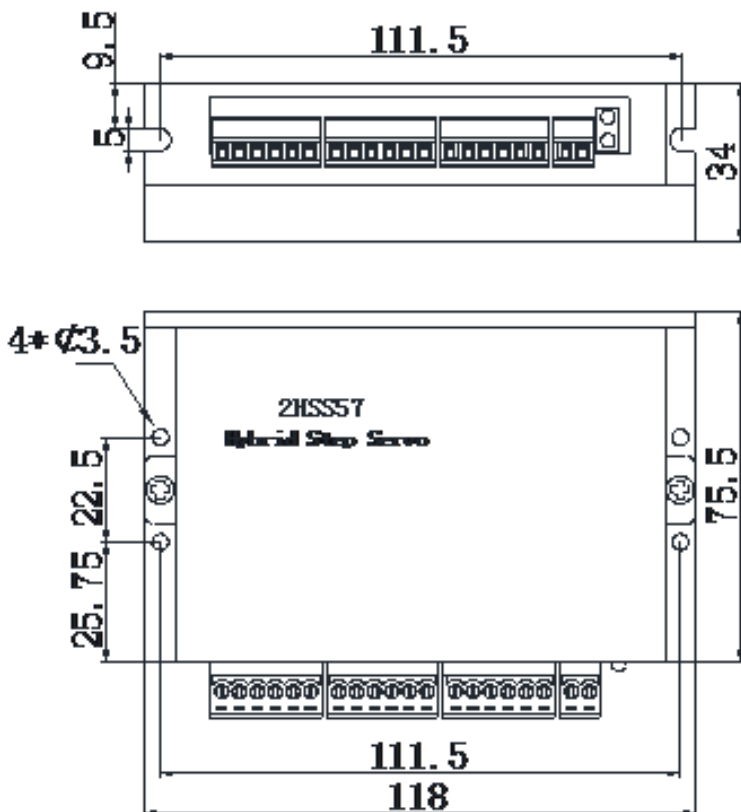
Low Level Time	2.5	-	-	μsec
----------------	-----	---	---	------

### Environment

<b>Cooling</b>	Natural Cooling or Forced Convection		
<b>Environment</b>	Storage Space	Avoid dust, oil frost and corrosive gases	
	Ambient Temperature	-20°C — +80°C	
	Humidity	<80%RH	
	Vibration	5.9m/s <sup>2</sup> Max	
<b>Storage Temp.</b>	-20°C — +80°C		
<b>Weight</b>	Approx. 300 gram		

### Dimensions

Dimensions ( Unit : mm )



## Microstep Resolution Setting

Step / Rev.	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

## Input edge settings

\* SW1: Dialing Switch checking Input edge settings.

\* OFF=Rising edge effective, ON= falling edge effective

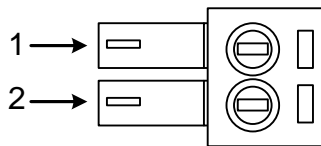
## Logical direction setting

\* SW2: When dialing switch SW2 switches ON or OFF, it can change the present running direction of motor

\* OFF=CCW, ON=CW

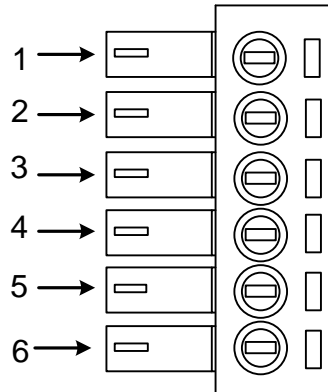
## Ports Introduction

### 1.ALM signal output ports



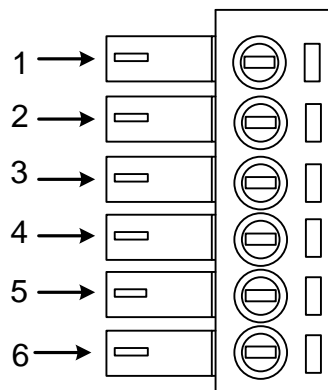
Port	Symbol	Name	Remark
1	ALM+	Alarm output +	
2	ALM-	Alarm output -	

## 2.Control signal input port



Port	Symbol	Name	Remark
1	PLS+	Pulse signal +	High level 4~5V
2	PLS-	Pulse signal -	Low level 0~0.5V
3	DIR+	Direction signal+	High level 4~5V
4	DIR-	Direction signal-	Low level 0~0.5V
5	ENA+	Enable signal +	High level 4~5V
6	ENA-	Enable signal -	Low level 0~0.5V

## 3.Power Interface Ports



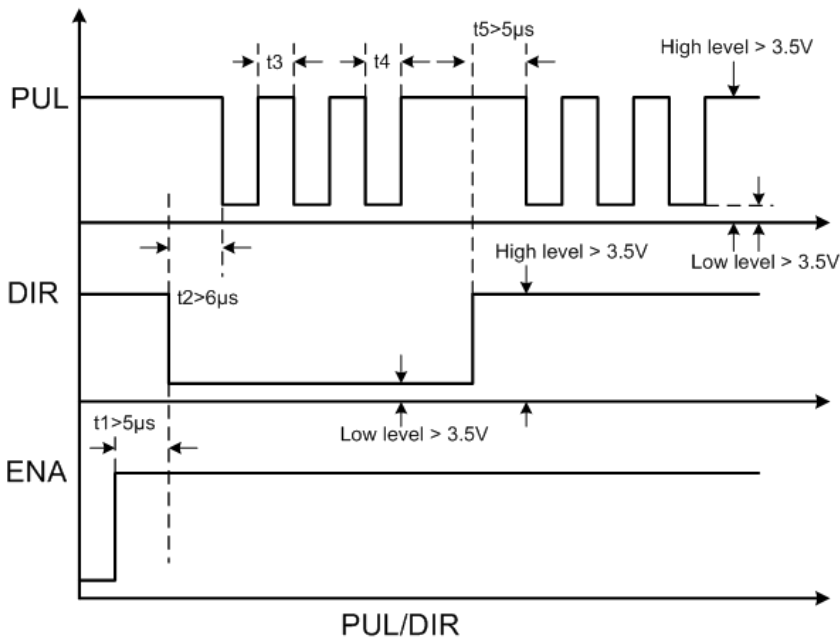
Port	Identification	Symbol	Name	Remark
1	Motor Phase Wire Input Ports	A+	Phase A+ (Red)	Motor Phase
2		A-	Phase A- (Blue)	A
3		B+	Phase B+ (Green)	Motor Phase



4		B-	Phase B- (Black)	B
5	Power Input Ports	VCC	Input Power +	24-50VDC
6		GND	Input Power-	

### Sequence Chart of Control Signals

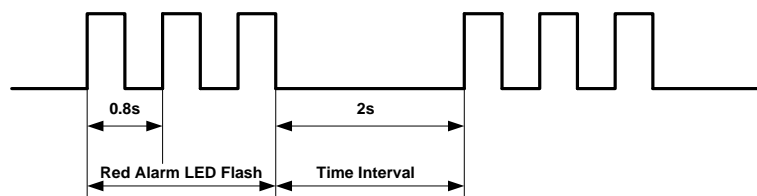
In order to avoid some fault operations and deviations, PUL, DIR and ENA should abide by some rules, shown as following diagram:



### Remark:

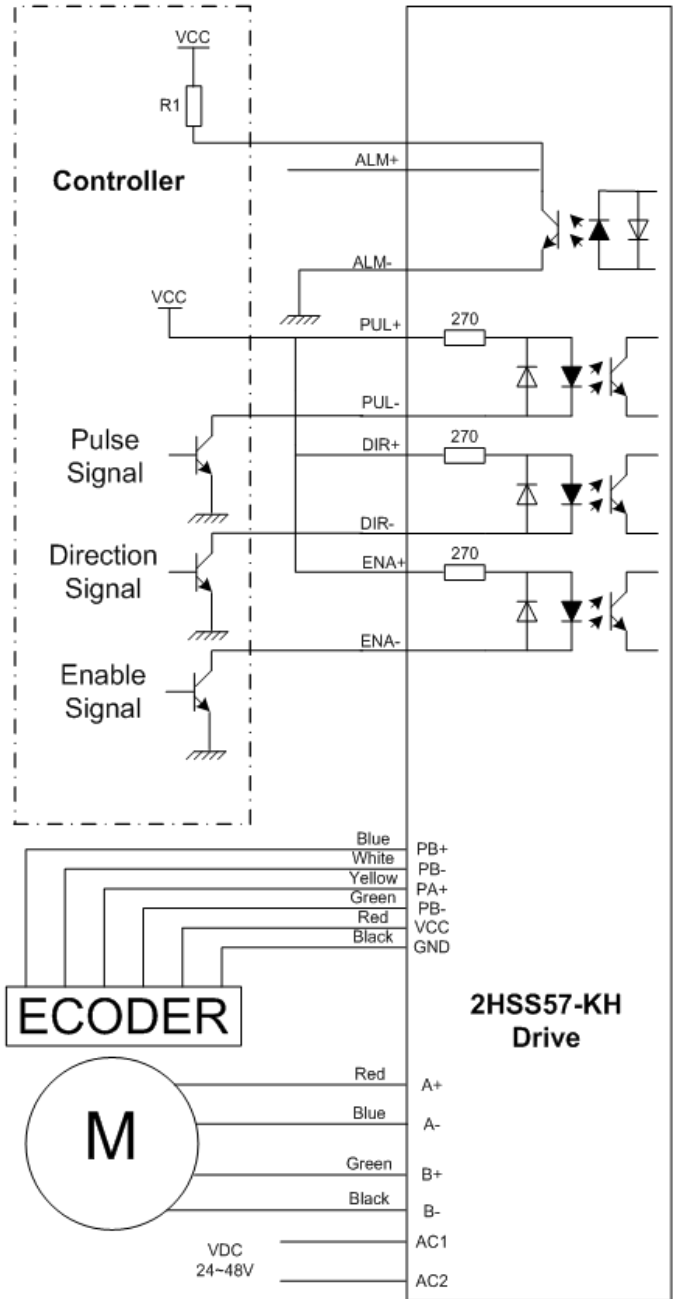
- $t_1$ : ENA must be ahead of DIR by at least  $5\mu s$ . Usually, ENA+ and ENA- are NC (not connected).
- $t_2$ : DIR must be ahead of PUL active edge by  $6\mu s$  to ensure correct direction;
- $t_3$ : Pulse width not less than  $2.5\mu s$ ;
- $t_4$ : Low level width not less than  $2.5\mu s$ .

### Faults alarm and LED flicker frequency



Flicker	Description to the Faults
Frequency	
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 <b>the position error limit</b> .

### Wiring



## 2HSS86H

### Key Features:

- Full closed loop control
- Motor with standard 1000 line encoder
- It save energy and achieve nearly 100% output torque .
- Micro step setting range is 2-256
- High speed response , High speed
- Optical isolation fault alarm output interface ALM
- Current loop bandwidth: (-3dB) 2KHz (typical value)
- Speed loop bandwidth: 500Hz (typical value)
- Position loop bandwidth: 200Hz (typical value)
- RS232 serial communication available to download or change the parameters



### Introduction

2HSS86H two-phase hybrid stepper servo drive system integrated servo control technology into the digital step driver.

It adopts typical tricyclic control method which include current loop, speed loop and position loop. This product has the advantage of both step and servo system, and it's a highly cost-effective motion control products.

### Electrical Specifications

Parameters	Min	Typical	Max	Unit
Supply voltage	30V	60V	75V	VDC

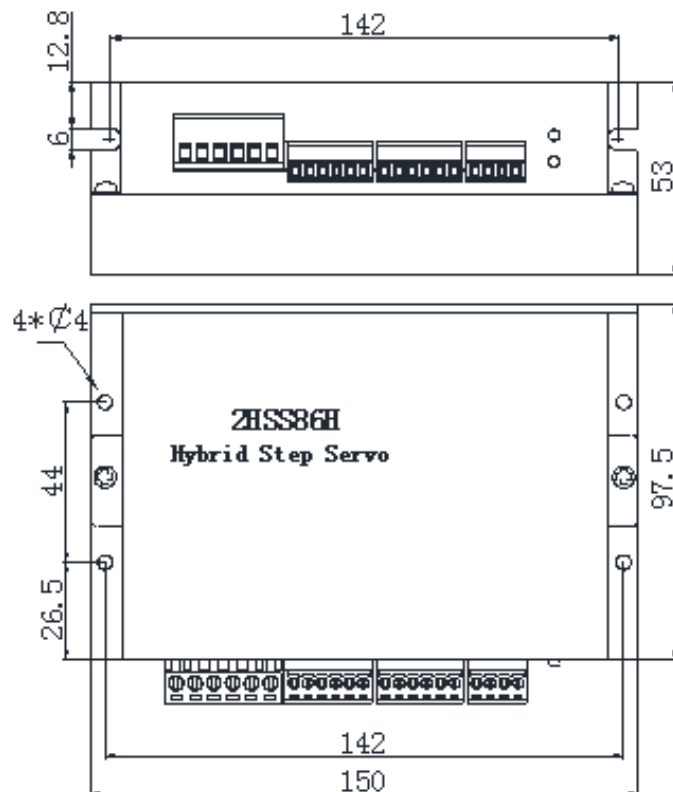
<b>Output Current (Peak)</b>	-	-	8.0	Amps
<b>Logic Input Current</b>	-	10	-	mA
<b>Pulse input frequency</b>	-	-	200	KHz
<b>Low Level Time</b>	2.5	-	-	μsec

## Environment

<b>Cooling</b>	Natural Cooling or Forced Convection	
<b>Environment</b>	Storage Space	Avoid dust, oil frost and corrosive gases
	Ambient Temperature	-20°C — +80°C
	Humidity	<80%RH
	Vibration	5.9m/s <sup>2</sup> Max
<b>Storage Temp.</b>	-20°C — +80°C	
<b>Weight</b>	Approx. 580 gram	

## Dimensions

Dimensions (Unit: mm)



## Microstep Resolution Setting

Step / Rev.	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

## Input edge settings

\* SW1: Dialing Switch checking Input edge settings.

\* OFF=Rising edge effective, ON= falling edge effective

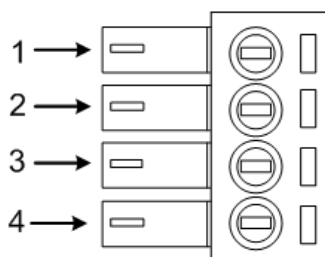
## Logical direction setting

\* SW2: When dialing switch SW2 switches ON or OFF, it can change the present running direction of motor

\* OFF=CCW, ON=CW

## Ports Introduction

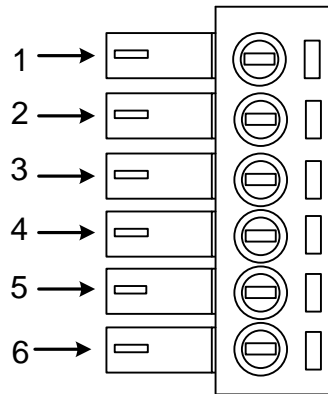
### 1.ALM and PEND signal output ports



Port	Symbol	Name	Remark
1	PEND+	In position signal	

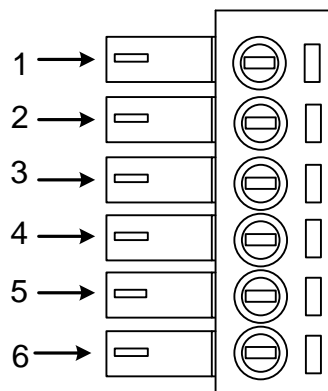
		output +	
2	PEND-	In position signal output -	
3	ALM+	Alarm output +	
4	ALM-	Alarm output -	

## 2.Control signal input port



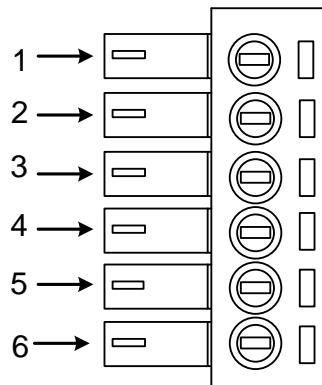
Port	Symbol	Name	Remark
1	PLS+	Pulse signal +	Compatible with 5V or 24V
2	PLS-	Pulse signal -	
3	DIR+	Direction signal+	Compatible with 5V or 24V
4	DIR-	Direction signal-	
5	ENA+	Enable signal +	Compatible with 5V or 24V
6	ENA-	Enable signal -	

## 3.Power Interface Ports



Port	Identification	Symbol	Name	Remark
1	Motor Phase Wire Input Ports	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
6		GND	Input Power-	DC30V-100V

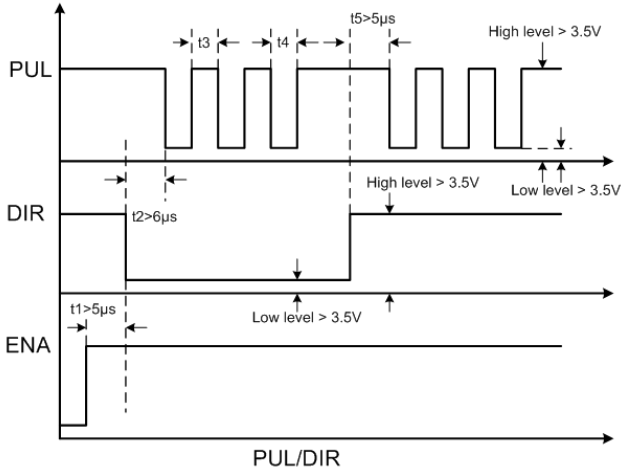
#### 4.Encoder Feedback Signal Input Ports



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

## Sequence Chart of Control Signals

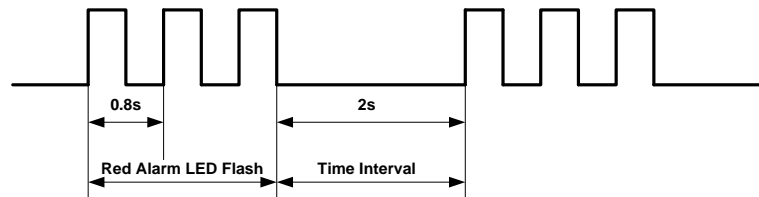
In order to avoid some fault operations and deviations, PUL, DIR and ENA should abide by some rules, shown as following diagram:



### Remark:

- $t_1$ : ENA must be ahead of DIR by at least  $5\mu s$ . Usually, ENA+ and ENA- are NC (not connected).
- $t_2$ : DIR must be ahead of PUL active edge by  $6\mu s$  to ensure correct direction;
- $t_3$ : Pulse width not less than  $2.5\mu s$ ;
- $t_4$ : Low level width not less than  $2.5\mu s$ .

## Faults alarm and LED flicker frequency

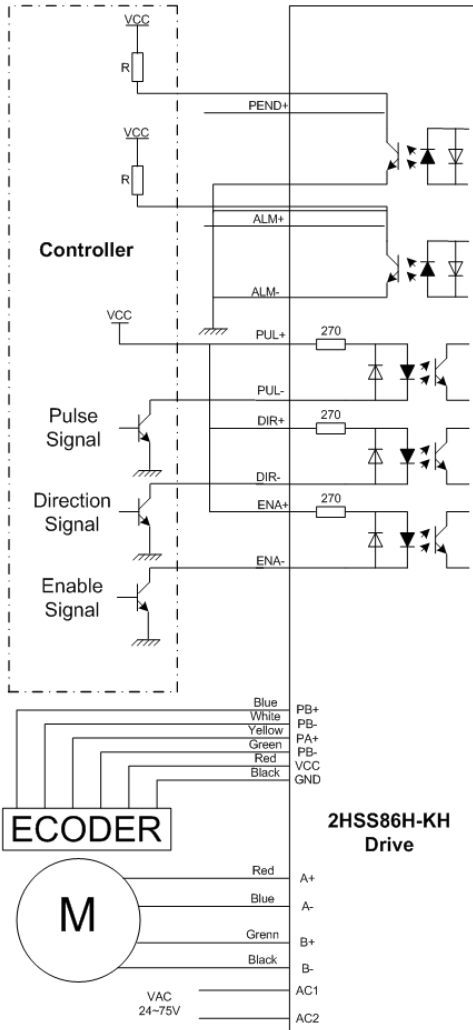


Flicker Frequency	Description to the Faults
1	Error occurs when the motor coil current exceeds the drive's current limit.
2	Voltage reference error in the drive
3	Parameters upload error in the drive
4	Error occurs when the input voltage exceeds the drive's voltage limit.
5	Error occurs when the actual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



exceeds the limit which is set by the **position error limit**.

## Wiring



# 2HSS858



## Key Features

- Without losing step, High accuracy in position
  - 100% rated output torque
  - Variable current control technology, High current efficiency
  - Little 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 application
- Lack of phase, over current, over voltage and over position protection
- Six digital tube display, easy to set parameters and monitor the motor running state

## Introduction

The 2HSS858H stepper servo drive system integrates the servo control technology into the digital stepper drive perfectly. This stepper servo driver uses the latest 32-bit DSP and combines the advanced servo algorithm to control. Compared to the traditional step drive, this step servo driver can completely avoid the stepper motor lost step problem, and effectively restrain the temperature rise of the motor, reduce the motor vibration, greatly enhance the performance of high-speed motor. The driver is half price of the AC servo system. At the same time, the size of the adapter is compatible with the traditional step motor, which is convenient for customers to upgrade and replace. In short, the stepper servo driver set the advantages of no lost step, low temperature rise, high speed, high torque, low cost and so on in one, is a cost-effective high motion control products.

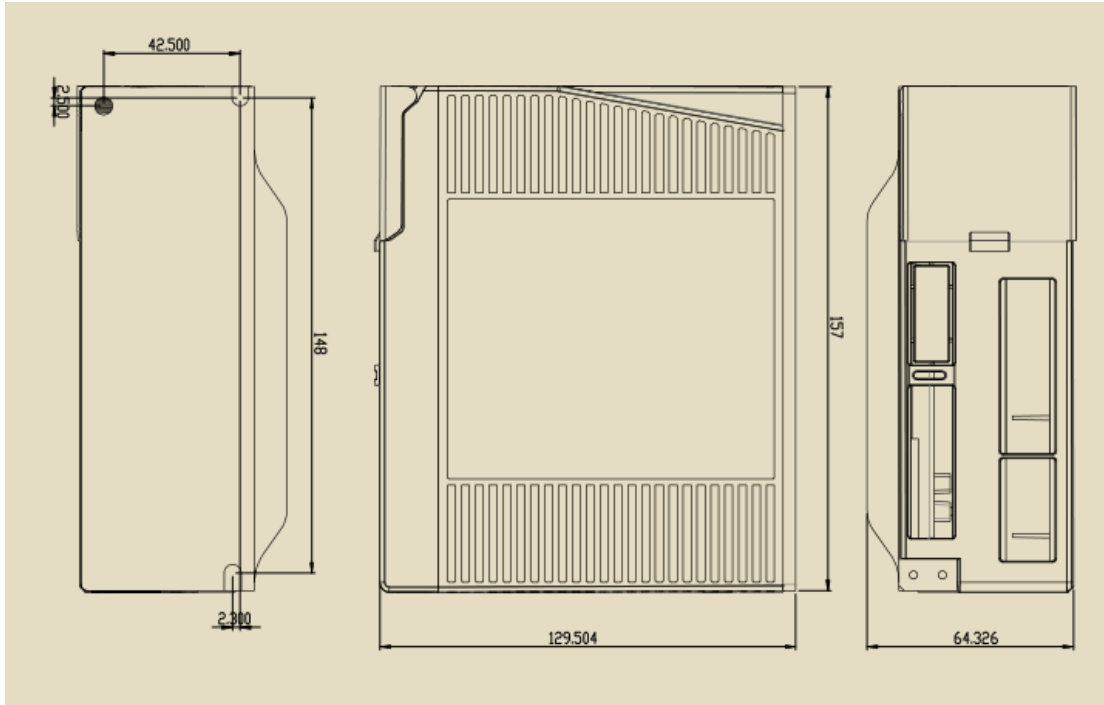
## Applications

It is suitable for the automation equipment and instrumentation which require large torque, such as: engraving machine, wire-stripping machine, marking machine, cutting machine, laser photo composing machine, plotting instrument, numerical control machine tool, automatic assembly equipment and so on. The application results are especially good in the devices with little noise and high speed.

## Electrical and Environment Specifications

Input Voltage		50~90VAC
Continuous Current Output		6.0A
Maximum Input Frequency		Can be set through the internal parameters
Signal Input Current		7~20mA (10mA Typical)
Default Communication Rate		57.6Kbps
Protections		<ul style="list-style-type: none"> <li>● Over current peak value <math>12A \pm 10\%</math></li> <li>● Over voltage value 200VDC</li> <li>● The range of over position error can be set by the front panel or HISU</li> </ul>
Overall Dimensions (mm)		140×70×56
Weight		Approximate 1500g
Environment specifications	Environment	Avoid dust, oil fog and corrosive gasses
	Operating Temperature	0~70°C
	Storage Temperature	-20°C~+65°C
	Humidity	40~90%RH
	Cooling method	Natural cooling or forced air cooling

## Mechanical Specifications



**Fig. 1 Mechanical installation size (unit: mm)**

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

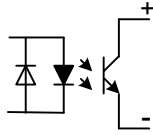
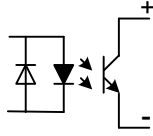
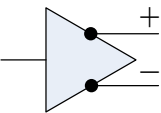
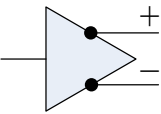
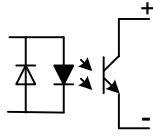
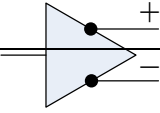
## Ports Definition

### 1.Power Interface Ports

Port	Symbol	Definition	Remark
1	AC1	Power input port L	50~90VAC between L and N
2	AC2	Power input port N	
3	A+	Motor connection port A+	
4	A-	Motor connection port A-	
5	B+	Motor connection port B+	

6	B-	Motor connection port B-	
---	----	--------------------------	--

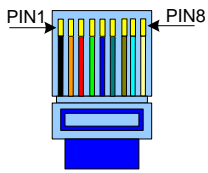
## 2.Control Signal Interface Ports (44 Pins DB)

Port	Symbol	Definition	Remark
1	IN+	Input port +	Preserved function
2	IN-	Input port -	Preserved function
3	PUL+	Pulse signal input +	Compatible with 5V and 24V
4	PUL-	Pulse signal input -	
5	DIR+	Direction signal input +	Compatible with 5V and 24V
6	DIR-	Direction signal input -	
7	ALM+	Alarm signal output +	
8	ALM-	Alarm signal output -	
9	Pend+	Position signal output +	
10	Pend-	Position signal output -	
11	ENA+	Enable signal input +	Compatible with 5V and 24V
12	ENA-	Enable signal input -	
13	OUTZ+	Encoder Z phase output +	
29	OUTZ-	Encoder Z phase output -	
14	OUTB+	Encoder B phase output +	
15	OUTB-	Encoder B phase output -	
31	<b>BRAKE+</b>	<b>Brake signal output +</b>	
32	<b>BRAKE-</b>	<b>Brake signal output -</b>	
30	OUTA-	Encoder A phase output -	

44	OUTA+	Encoder A phase output +	
----	-------	--------------------------	--

### 3.RS232 Communication Interface Ports

RS232 interface ports' arrangement and definition are as follows:

RS232	Connect to the PC or HISU adjuster with a special serial cable. <b>Never disconnect or connect it while the power source is energized.</b> It is suggested to use twisted-pair or shielded wire (less than 2m).		
Port	Symbol	Definition	Picture
1	GND	Power Ground	
2	TxD	RS232 Transmission Port	
3	5V	For external HISU	
4	RxD	RS232 Receiving Port	
5、6	NC	Not Connection	

Attention: In case of causing any damage, please confirm the connection cables between 2HSS858H and HISU before using it.

### Fault Data Display

Data display	Fault cause
00_Err	Over current in the motor
11_Err	Current sensor alarm
22_Err	Parameters upload alarm
33_Err	Over voltage in power supply
44_Err	Over position error alarm

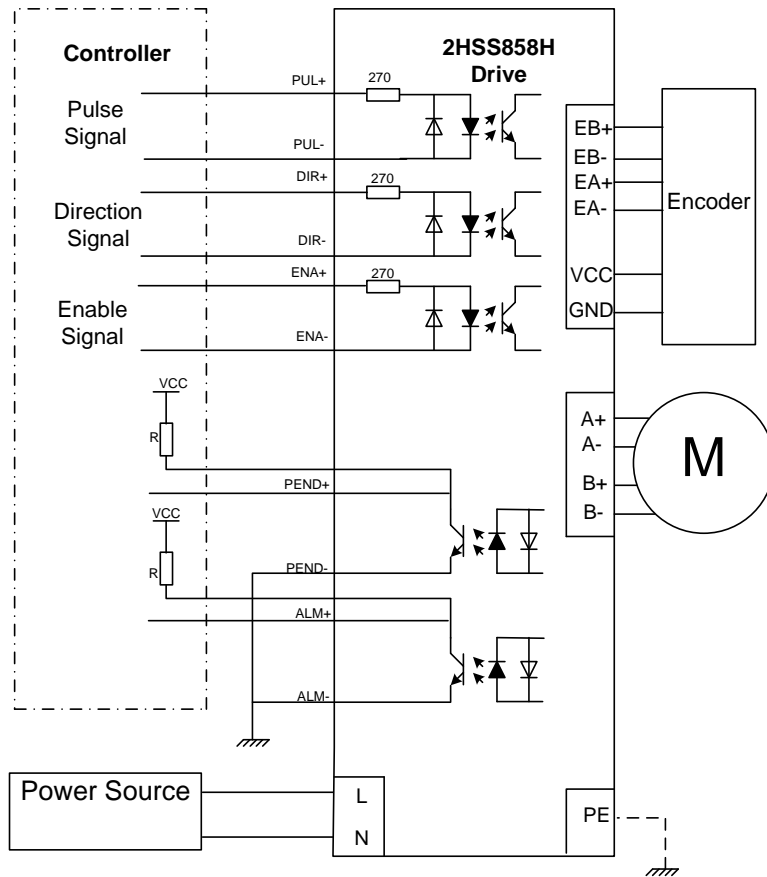
SS\_Err

Missing phase alarm

En\_OFF

Drive off -line

## Wiring



Typical connections to 2HSS858H

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

The power source grade AC50V ~ AC90V selection is based on the matching motor.

## 3HSS2208H



### Key Features:

- Without losing step, High accuracy in position
  - 100% rated output torque
  - Variable current control technology, High current efficiency
  - Little 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 application
  - Lack of phase, over current, over voltage and over position protection
- Six digital tube display, easy to set parameters and monitor the motor running state

## Introduction

The 3HSS2208H-86 stepper servo drive system integrates the servo control technology into the digital stepper drive perfectly, and fit the company 86 three-phase stepper motor. This stepper servo driver uses the latest 32-bit DSP and combines the advanced servo algorithm to control. Compared to the traditional step drive, this step servo driver can completely avoid the stepper motor lost step problem, and effectively restrain the temperature rise of the motor, reduce the motor vibration, greatly enhance the performance of high-speed motor. The driver is half price of the AC servo system. At the same time, the size of the adapter is compatible with the traditional step motor, which is convenient for customers to upgrade and replace. In short, the stepper servo driver set the advantages of no lost step, low temperature rise, high speed, high torque, low cost and so on in one, is a cost-effective high motion control products.



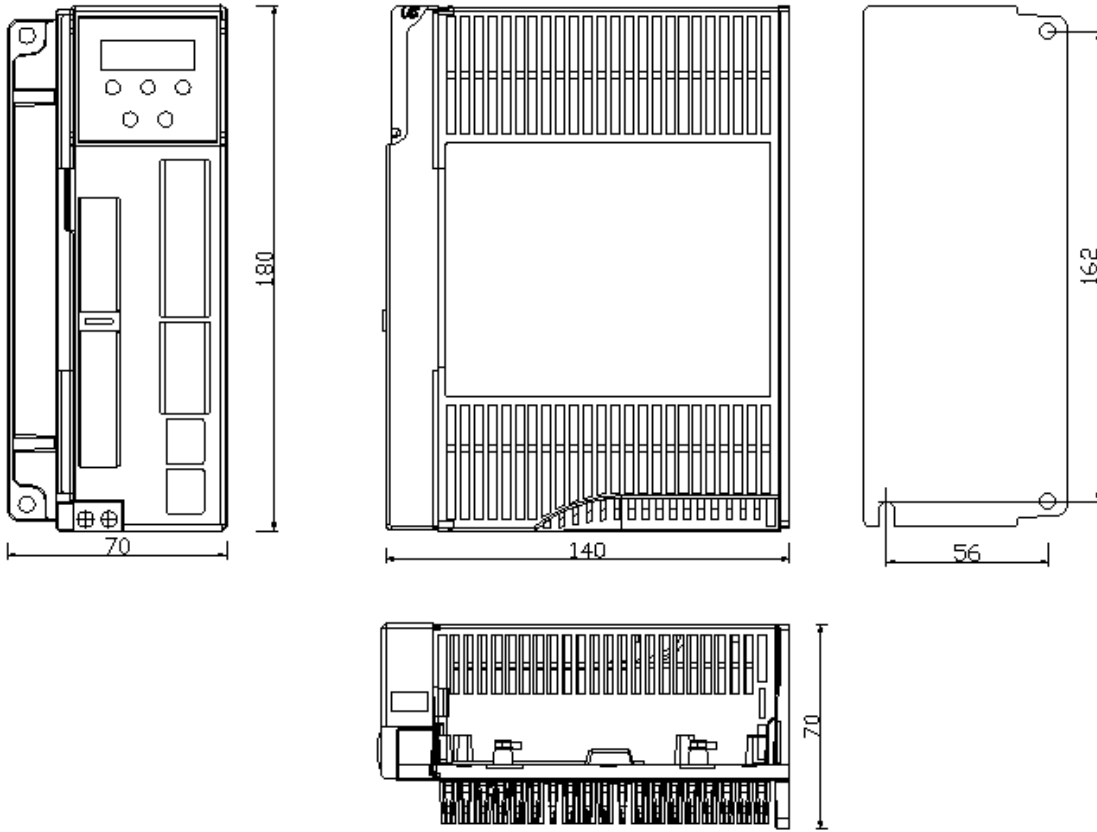
## Applications

It is suitable for the automation equipment and instrumentation which require large torque, such as: engraving machine, wire-stripping machine, marking machine, cutting machine, laser photocomposing machine, plotting instrument, numerical control machine tool, automatic assembly equipment and so on. The application results are especially good in the devices with little noise and high speed.

## Electrical and Environment Specifications

Input Voltage	180~250VAC	
Continuous Current Output	4.0A	
Maximum Input Frequency	200K	
Signal Input Current	7~20mA (10mA Typical)	
Default Communication Rate	57.6Kbps	
Protections	<ul style="list-style-type: none"><li>● Over current peak value <math>12A \pm 10\%</math></li><li>● Over voltage value 400VDC</li><li>● The range of over position error can be set by the front panel or HISU</li></ul>	
Overall Dimensions (mm)	140×70×56	
Weight	Approximate 1500g	
Environment specifications	Environment	Avoid dust, oil fog and corrosive gasses
	Operating Temperature	0~70°C
	Storage Temperature	-20°C~+65°C
	Humidity	40~90RH
	Cooling method	Natural cooling or forced air cooling

## Mechanical Specifications



**Fig. 1 Mechanical installation size (unit: mm)**

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

## Ports Definition

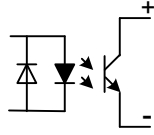
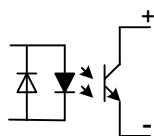
### 1.Power Interface Ports

Port	Symbol	Definition	Remark
1	L	Power input port L	180~250VAC between L and N
2	N	Power input port N	
3	PE	Ground port	
4	NC	Not Connected	
5	NC	Not Connected	

## Power Interface Ports2

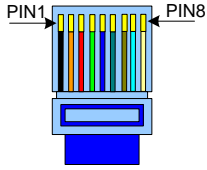
Port	Symbol	Definition	Remark
1	U	Motor connection port U	
2	V	Motor connection port V	
3	W	Motor connection port W	
4	NC	Not connected	
5	PE	Ground port	
6	NC	Not connected	

## 2.Control Signal Interface Ports (44 Pins DB)

Port	Symbol	Definition	Remark
3	PUL+	Pulse signal input +	Compatible with 5V and 24V
4	PUL-	Pulse signal input -	
5	DIR+	Direction signal input +	Compatible with 5V and 24V
6	DIR-	Direction signal input -	
7	ALM+	Alarm signal output +	
8	ALM-	Alarm signal output -	
9	Pend+	Position signal output +	
10	Pend-	Position signal output -	
11	ENA+	Enable signal input +	Compatible with 5V and 24V
12	ENA-	Enable signal input -	

## 3.RS232Communication Interface Ports

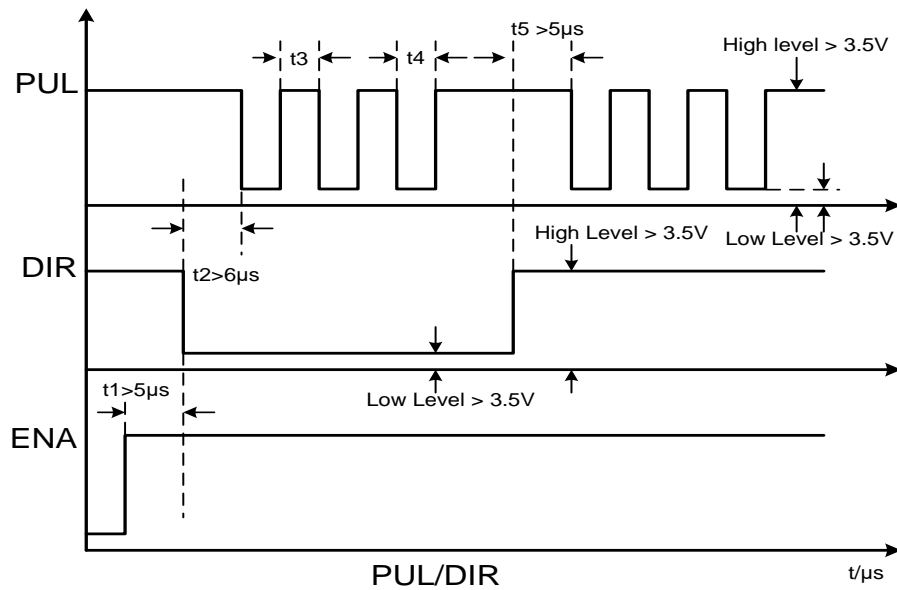
RS232 interface ports' arrangement and definition are as follows:

RS232	Connect to the PC or IHU adjuster with a special serial cable. <b>Never disconnect or connect it while the power source is energized.</b> It is suggested to use twisted-pair or shielded wire (less than 2m).		
Port	Symbol	Definition	Picture
1	GND	Power Ground	
2	TxD	RS232 Transmission Port	
3	5V	For external HISU	
4	RxD	RS232 Receiving Port	
5、6	NC	Not Connection	

**Attention:** In case of causing any damage, please confirm the connection cables between 3HSS2208H-86 and HISU before using it.

### 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)  $t_1$ : ENA must be ahead of DIR by at least  $6\mu s$ . Usually, ENA+ and ENA- are NC (not connected). See "Connector P1 Configurations" for more information.
- (2)  $t_2$ : DIR must be ahead of PUL active edge by at least  $5\mu s$  to ensure correct direction;
- (3)  $t_3$ : Pulse width not less than  $2.5\mu s$ ;
- (4)  $t_4$ : Low level width not less than  $2.5\mu s$ .

## Fault Data Display

### Data display

### Fault cause

00\_Err

Over current in the motor

11\_Err

Current sensor alarm

22\_Err

Parameters upload alarm

33\_Err

Over voltage in power supply

44\_Err

Over position error alarm

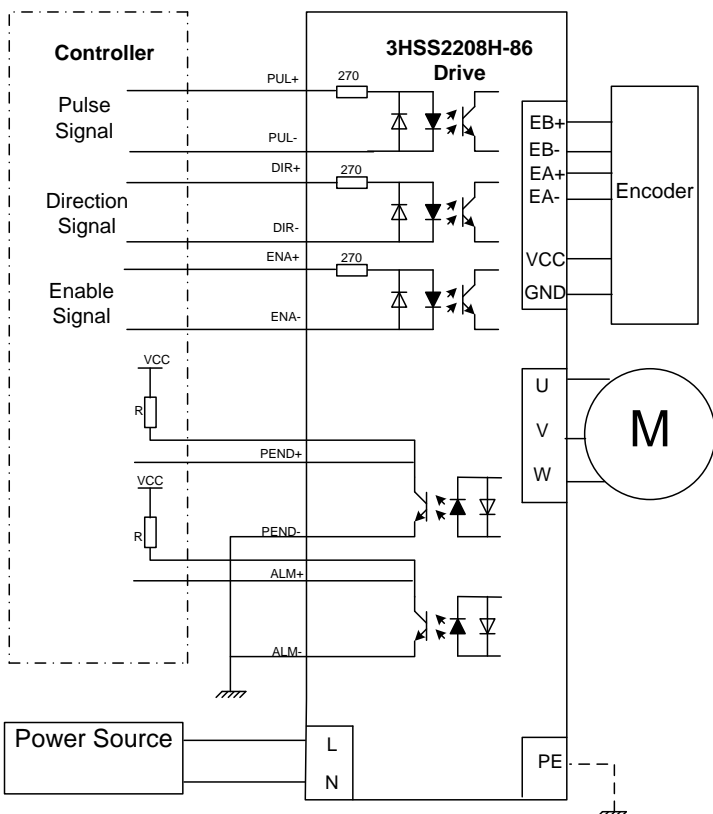
55\_Err

Missing phase alarm

En\_OFF

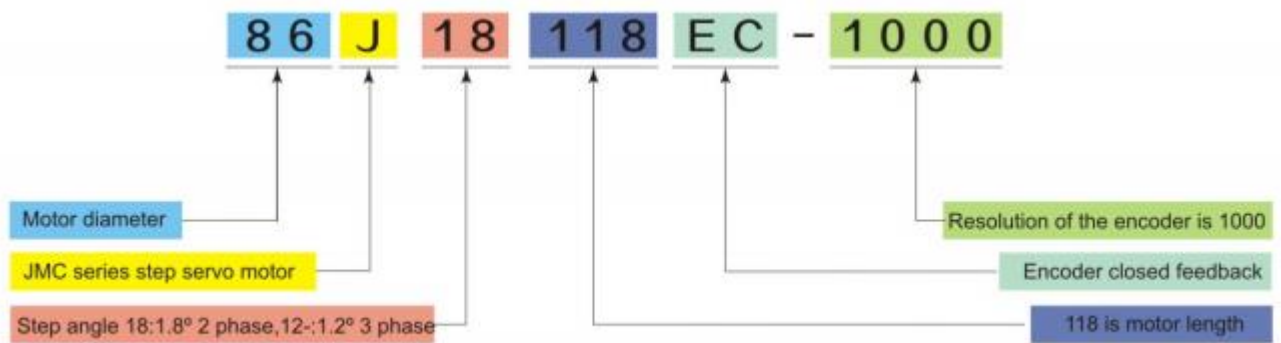
Drive off -line

## Wiring



## HYBRID STEP SERVO MOTOR

### ■ Name rules of hybrid step servo motor



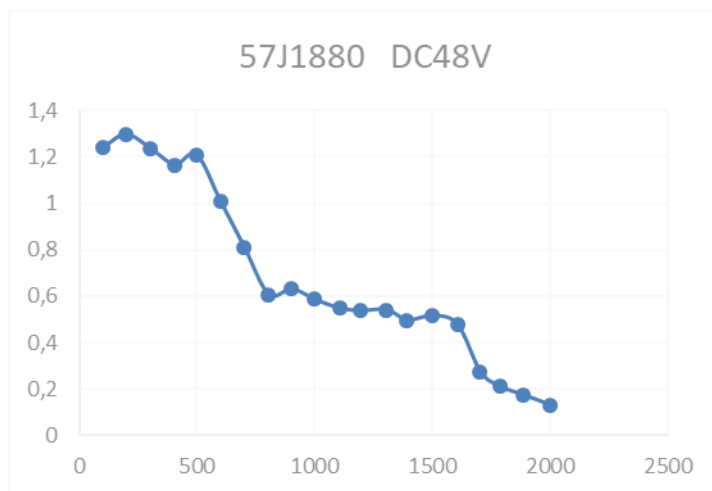
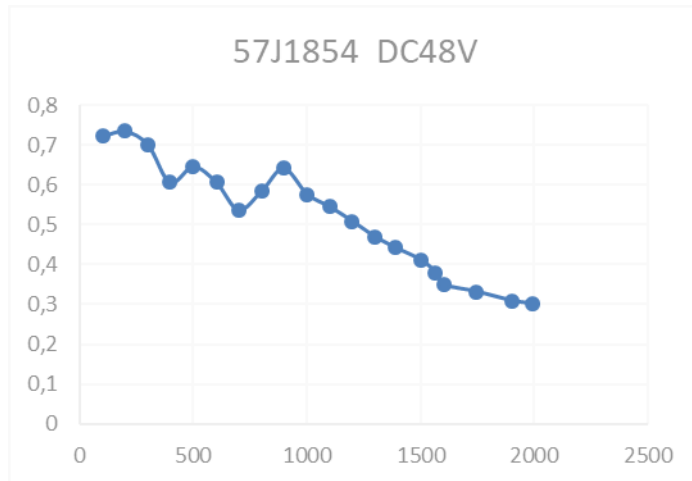
Model	Step angle (deg)	Holding torque (N.m)	Current / phase (A)	Resistance phase(ohms)	inductance / phase (mH)	Detent torque (gcm)	Rotor inertia (g-cm <sup>2</sup> )	lead wire numbers	Weight (kg)	Length (mm)
42J1848EC-1000	1.8	0.48	1.2	3.1	7.9	200	77	4	0.35	68
57J1854EC-1000	1.8	1.2	4.0	0.44	1.4	400	280	4	0.72	81
57J1880EC-1000	1.8	2	5.0	0.36	1.8	700	480	4	1.1	101
60J1887EC-1000	1.8	3	5.0	0.45	2.1	690	69-	4	1.3	110
86J1880EC-1000	1.8	4.5	6.0	0.34	2.5	1300	1800	4	2.6	109
86J18118EC-1000	1.8	8.2	6.0	0.53	4.7	2500	3600	4	4.3	146

86J18156EC-1000	1.8	12	6.0	0.75	12	4000	4000	4	5.1	183
-----------------	-----	----	-----	------	----	------	------	---	-----	-----

Model	Step angle (deg)	Holding torque (N.m)	Current/phase (A)	Resistance phase(ohms)	inductance/phase (mH)	Detent torque (gcm)	Rotor inertia (g-cm <sup>2</sup> )	lead wire numbers	Weight (kg)	Length (mm)
86J12126EC-1000	1.2	6	2.9	4.0	17	700	3000	3	4.8	161
86J12156EC-1000	1.2	7.8	2.9	4.7	24	1300	4000	3	5.3	183
110J12160EC-1000	1.2	16	6.0	1.28	19	2000	5500	3	9.0	189
110J12190EC-1000	1.2	20	6.8	1.24	22	2500	6800	3	11	223
130J12206EC-2500	1.2	28	6.8	0.8	11.3	4000	16000	3	17	257
130J12225EC-2500	1.2	35	6.8	0.92	13.8	3000	24000	3	19	277

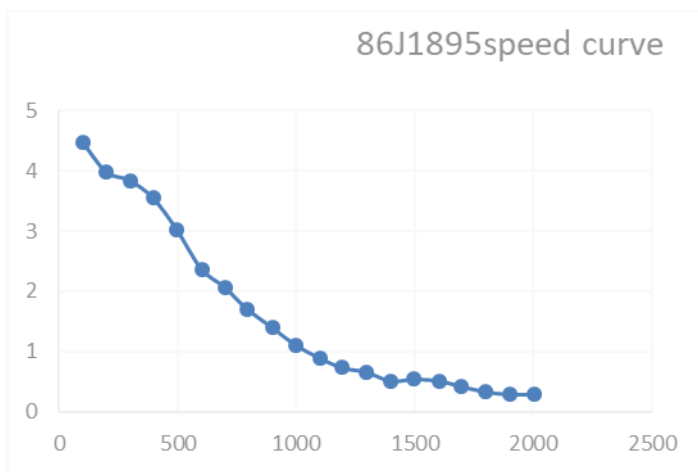
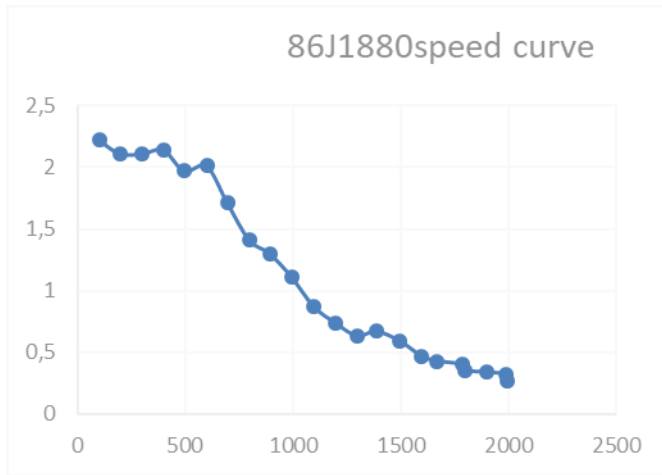
■ hybrid step motor Electrical Specification

## ■ Speed Curve

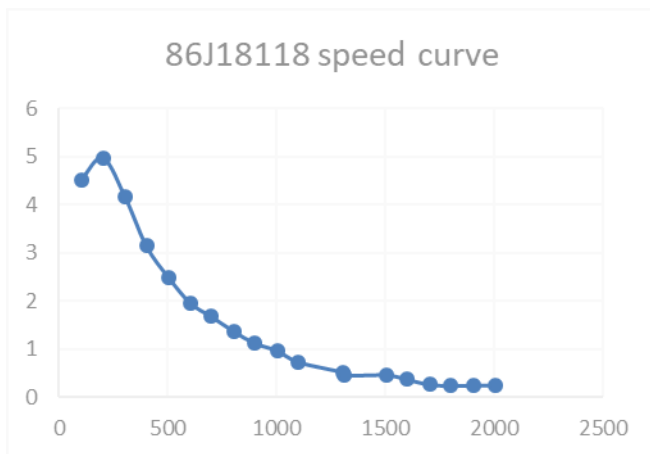


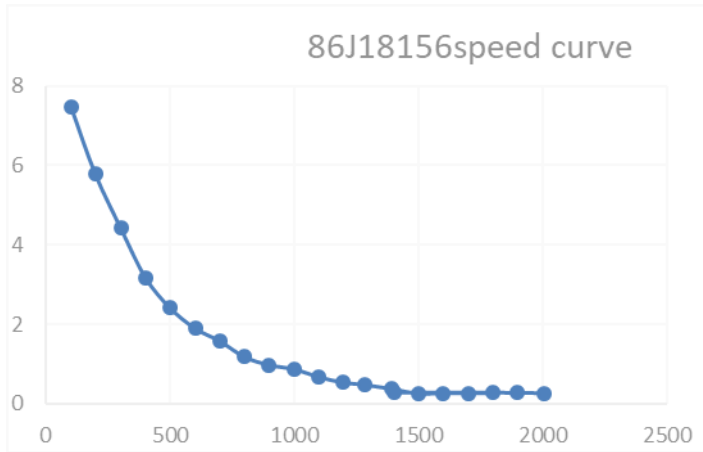
test driver: 2 HSS57 test voltage: 48VDC





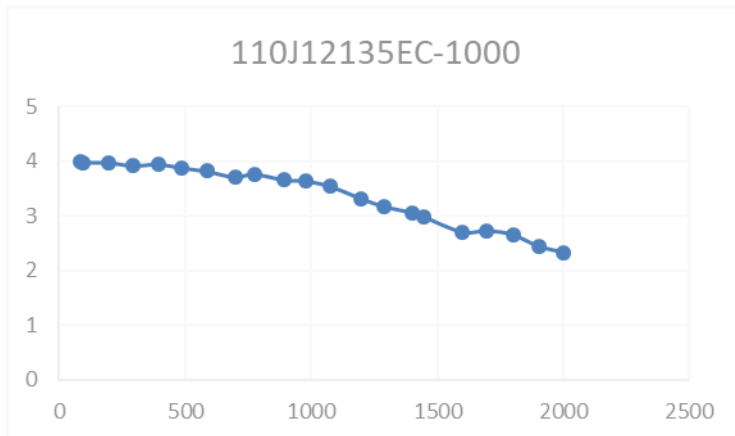
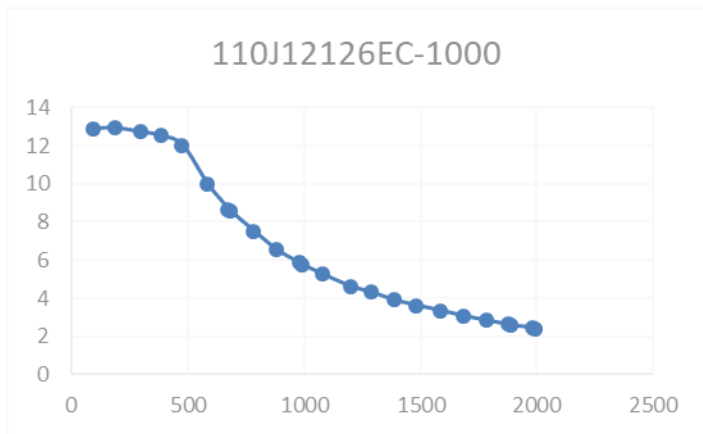
**test driver: 2 HSS86H    test voltage: 70VAC**





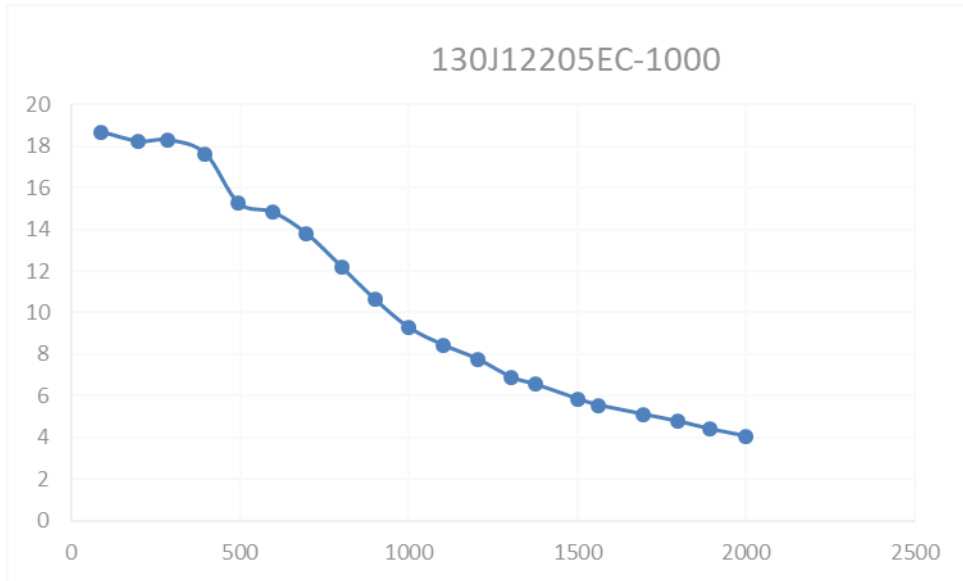
test driver: 2HSS86H

test voltage: 70VAC



test driver: 3HSS2208H

test voltage: 220VAC



**test driver: 3HSS2208H**

**test voltage: 220VAC**