SUMTOR

HSC86A

Digital hybrid servo driver

user's Guide

table of Contents

一、Product Brief

1.Overview

HSC86A is a new type of low-voltage hybrid servo product developed by our company based on many years of experience in low-voltage servo systems. This product uses the latest DSP digital processing chip and advanced variable current and variable frequency control algorithm technology to provide a high level for equipment manufacturers. Cost-effective hybrid servo drive solution. HSC86A has a compact structure, small size, saves space, and reduces electromagnetic interference between lines; it adopts better vibration technology and low heat generation technology, which effectively solves the problems of heat, vibration and noise of motors and drivers. Environmental protection.

2.Features

● Working voltage: AC and DC universal, AC input voltage 24 ～ 80VAC, recommended working voltage 60VAC

● Maximum continuous output current 8.0A (advanced stepping servo overload capability)

● Accepts differential and single-ended pulse / direction commands, and has three control modes of position / speed / torque

● Adopt FOC magnetic field positioning control technology and space vector pulse width modulation (SVPWM) closed-loop control technology

● Adopt advanced variable current technology and frequency conversion technology, effectively reduce the heat of motor and driver

● The number of pulses per revolution can be set by debugging software or code extraction (subdivision)

● With over-voltage, under-voltage, over-current and over-tolerance protection functions

● Single / double pulse mode, optional pulse effective edge

● The maximum pulse frequency of the control command is 500KHz (the factory default is 200KHz)

● Pulse, direction and enable signal input interface level is compatible with 4.5-28V

● With serial port RS232 debugging function, but need to use the company's special serial debugging cable

● Performance: stable speed, small overshoot, small tracking error, low heating of motor and driver

3. Application field

Suitable for all kinds of small and medium-sized automation equipment and instruments, such as: laser machines, inkjet machines, small and medium-sized engraving machines, electronic processing equipment, automatic grasping equipment, special CNC machine tools, packaging equipment and robots. It is especially effective in devices where users expect low noise and high speed.

二、Electrical, mechanical and environmental indicators

1. Electrical indicators

| parameter	HSC86A			
	Minimum value	Typical value	Maximum	unit
Continuous output current	0.5	-	13	A
Power supply voltage (AC / DC)	24	60	80	VAC
Logic input current	6	10	16	mA
Logic input voltage	4.5	5	28	Vdc
Pulse frequency	0	200	500	kHz
Pulse high width	1.5	-	-	uS
Position error control accuracy	-	±1	-	Pulse
Speed control accuracy	-	±2	-	rpm
Maximum acceleration (no load)	-	100	-	rpm/ms
Overvoltage protection voltage	90			VAC
Insulation resistance	100	-	-	MΩ

Note: If the power input is DC, the input range is 24 ~ 110Vdc!!!

2.Use environment and parameters

cooling method	Natural cooling or forced air cooling
Use environment	occasion	It cannot be placed beside other heat-generating equipment. Avoid dust, oil mist, corrosive gas, excessive humidity and strong vibration. Combustible gas and conductive dust are prohibited
	temperature	-5℃～+45℃
	humidity	40～90%RH
	vibration	10～55Hz／0.15mm
Storage temperature	-20℃～+65℃
Use altitude	≤1000m
weight	约 0.6KG

3.Mechanical structure size chart

The structure of HSC86A driver can match any type of two-phase hybrid motors of

Figure 1 Mechanical installation dimension drawing (unit: mm)
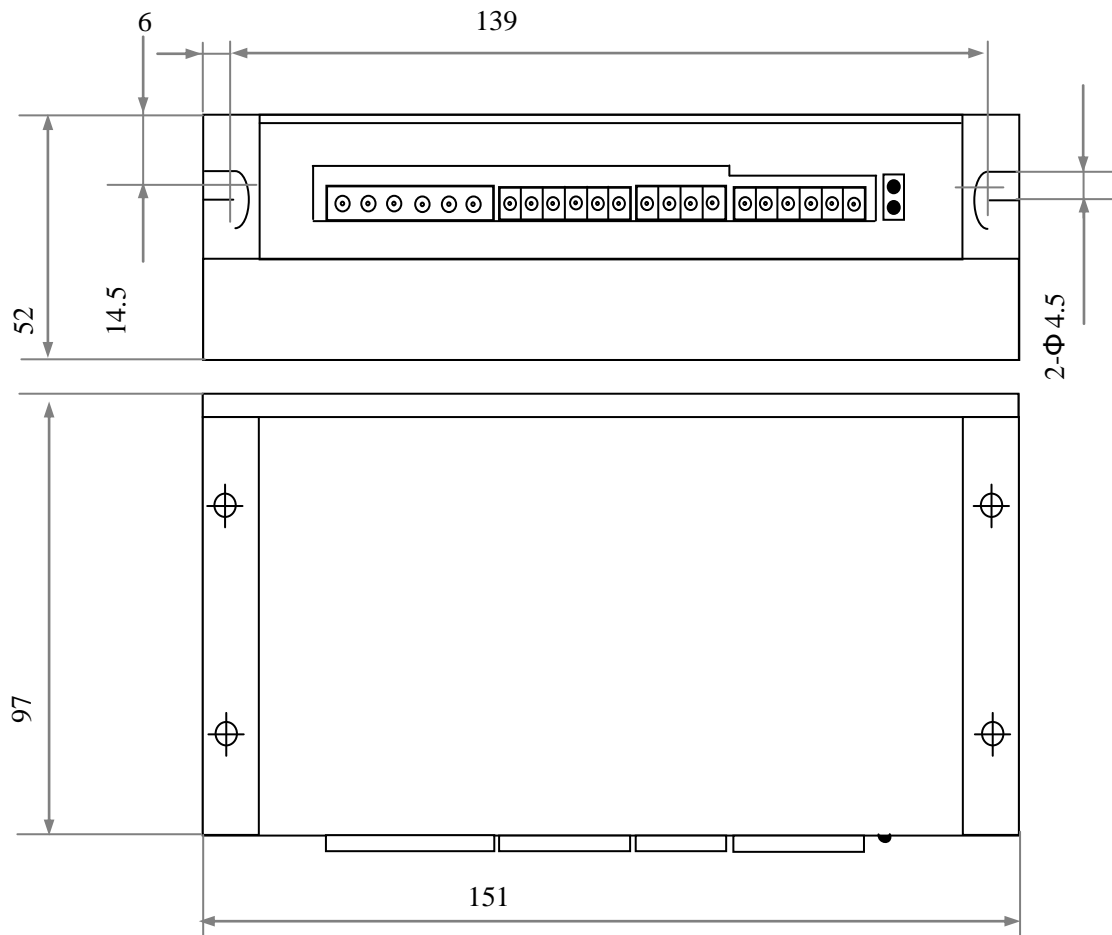
60 and 86 bases. The company mainly recommends hybrid servo motors of 3.0NM, 4.5NM, 8.5NM and 12NM, and can also match the hybrid servo motors of other manufacturers. The number of encoder lines can be 250 to 5000 lines, but you need to contact our company to provide motor parameters and match related programs according to different motors. If the customer has higher requirements for low-speed vibration or high-speed performance, it is recommended to contact our company. Our company will write an algorithm for matching the motor according to the motor parameters, and the motor will show perfect performance.

4. Thermal considerations

The reliable working environment temperature of the driver is usually within -5 ℃ ~ 45 ℃, when the driver is working, the temperature is within 65 ℃, and when the motor is working, the temperature is within 70 ℃. If necessary, install a fan near the driver to force heat dissipation to ensure that the driver works reliably Work within the temperature range.

三、Driver interface and wiring introduction

1. Interface description

1.1 Control port

Use green 6 + 4Pin 3.81mm spaced terminals

Pin number	signal	Features	Explanation
1	PUL+	Pulse positive input	
2	PUL-	Pulse negative input	
3	DIR+	Positive direction input	Compatible with 4.5V ~ 28V level signals
4	DIR-	Direction negative input	
5	ENA+	Enable positive input	

6	ENA-	Enable negative input	
7	ALM+	Alarm signal positive output	Open collector OC output, maximum pull-up level 24V, maximum output current 100mA
8	ALM-	Alarm signal negative output	
9	PEND+	In-position signal positive output	Open collector OC output, maximum pull-up level 24V, maximum output current 100mA
10	PEND-	In-position signal negative output	

1.2 Motor and power input ports

Use green 6Pin 5.0mm spaced screw terminals

Terminal number	symbol	Name	Explanation
1	A＋	A-phase motor winding ＋	
2	A－	A-phase motor winding－	
3	B＋	B-phase motor winding ＋	
4	B－	B-phase motor winding－	
5	AC	AC input	24V~ 80Vac
6	AC	AC input	24V~ 80Vac

1.3 Encoder port

Use green 6Pin 3.81mm interval with screw terminals (note the positive and negative poles of the power supply, do not reverse the positive and negative poles !!!)

Pin number	signal	Function Description
1	EB+	Encoder signal B + input
2	EB-	Encoder signal B-input
3	EA+	Encoder signal A + input
4	EA-	Encoder signal A-input
5	VCC	Driver + 5V output, power supply for encoder
6	EGND	Driver GND output, power supply for encoder

1.4 Serial RS232 / RS485 communication interface

It can be connected to the PC through a serial port adapter device (serial adapter device is optional) and a dedicated serial cable (prohibited live plugging and unplugging). The function and parameter settings of the driver can be set through the PC software, such as the subdivision and current value and effective edge required by the customer, and the resonance point can be eliminated and adjusted.

Terminal number	Symbol	Name	Explanation
1	+5V	5V positive terminal	External STU only
2	TXD	RS232 transmitter	
3	RXD	RS232 receiver	
4	GND	5V power ground	0V

⚠ Note: The HSC86A serial cable must be a special cable of our company, depending on the user's condition, please confirm before use to avoid damage.

1.5 LED status indicator

The green LED is the power indicator. When the drive is powered on, the LED is always on; when the drive is turned off, the LED is off. The red LED is a fault indicator. When a fault occurs, the indicator flashes in cycles of 5 seconds; when the fault is cleared by the user, the red LED is often off. The red LED flashes at a frequency of 2 Hz, with the LED on for 200 ms and off for 300 ms. The number of red LED flashes within 5 seconds represents different fault information, the specific relationship is shown in the following table:

Serial number	Number of flashes	Red indicator flashing waveform	Fault description
1	1	⎍_____⎍	Overcurrent fault (I peak ≥25A)
2	2	⎍⎍_____⎍	Overvoltage fault (Vac≥90V)

3	5	⊓⊔⊓⊔⊓⊔⊓⊔⊓_⊓	Tracking error out of tolerance fault

When the drive fails, the drive will stop and prompt the corresponding fault code. The fault can only be cleared when the user needs to power off and re-power on. When the drive fails, the drive will save the latest fault in the drive's EEPROM in the form of a queue, and the drive will save up to 10 latest historical faults. The user can read the corresponding fault code through the PC and the text display.

2.Control signal interface circuit

HSC86A driver signal input interface can be differential signal input, common anode signal
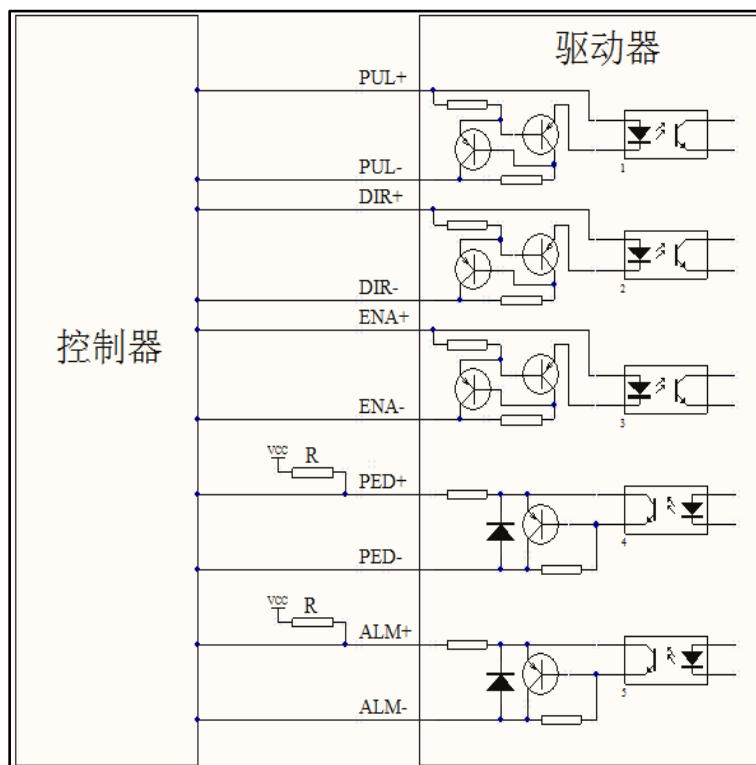
single-ended input and common cathode signal single-ended input, built-in high-speed photoelectric isolation coupler; output is triode open collector OC output, interface connection method is as follows:-

Figure 2 Input signal differential connection

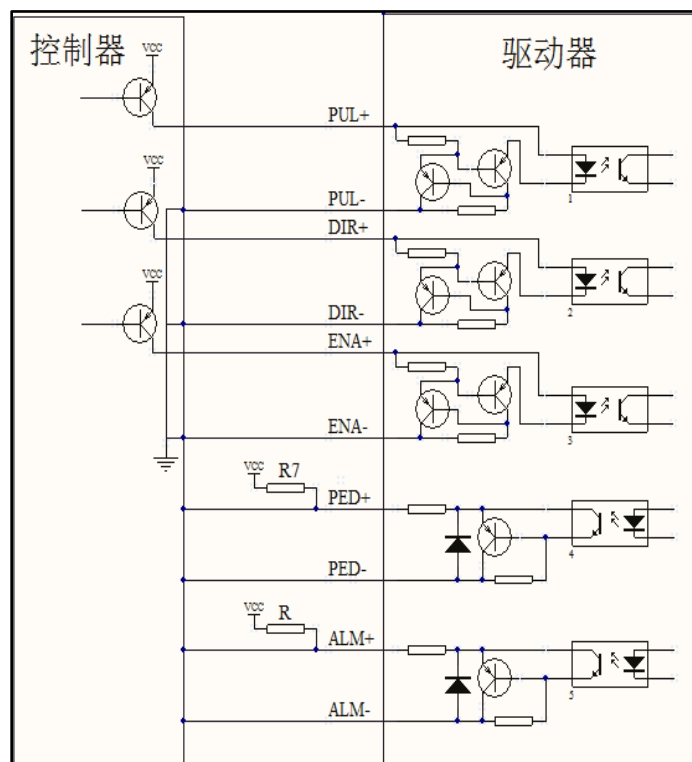Figure 3 Input signal single-ended common anode connection

Figure 4 Input signal single-ended common cathode connection

Note: The voltage range of the signal input interface in the figure is 4.5 ~ 28Vdc. No matter whether it is single-ended connection or differential connection, no series current limiting resistor is required. For the external pull-up voltage of the output interface, the maximum is 28Vdc, and the maximum output current is 100mA. According to the external pull-up voltage, select the appropriate pull-up resistor. If the external pull-up voltage is 24Vdc, the pull-up resistor is 2K. If The external pull-up voltage is 12Vdc, and the pull-up resistor is 1K. If it is a drive relay or motor holding brake coil, please consult our application engineers.

3. Control signal timing diagram

In order to avoid some misoperations and deviations, PUL-, DIR- and ENA- should meet certain requirements, as shown in the following figure:
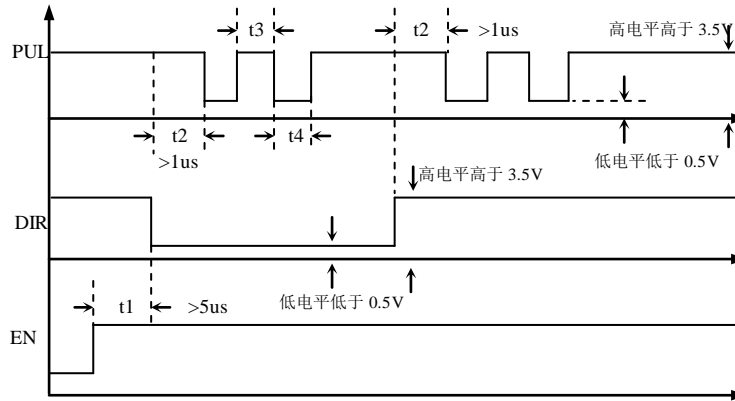
Figure 5 Control signal timing diagram

Comment：

1) t1: ENA (enable signal) should be at least 5μs in advance DIR, determined to be high. Under normal circumstances, it is recommended to hang in the air;

2) t2: DIR determines the state of high or low at least 1μs in advance of the falling edge of PUL;

3) t3: pulse width is at least 1.5μs;

4) t4: Low level width is not less than 1.5μs.

4.Control signal mode setting

Pulse trigger edge selection: PC pulse software sets the pulse rising edge or falling edge trigger is valid.

Single and double pulse selection: Single pulse or double pulse is set by PC software.

Direction selection: Set the initial running direction of the motor through the PC software.

5.Wiring requirements

1) In order to prevent the driver from being disturbed, it is recommended to use shielded cable for the control signal, and the shielding layer is short-circuited with the ground wire. Except for special

requirements, the shielded wire of the control signal cable is grounded at one end: the upper end of the shielded wire is grounded and the shielded wire End of the drive is floating. The same machine is only allowed to be grounded at the same point. If it is not a real ground wire, the interference may be serious. At this time, the shielding layer is not connected. If the conditions permit, thermal grounding technology is most effective for shielding.

2) The pulse and direction signal lines and the motor line are not allowed to be bundled side by side, preferably separated by at least 10cm or more, otherwise the motor noise will easily interfere with the pulse direction signal and cause motor positioning inaccuracy, system instability and other faults.

3) If one power supply is used for multiple drives, parallel connection should be adopted at the power supply, and it is not allowed to go to one first and then to another chain connection.

4) It is strictly forbidden to plug and unplug the driver terminal with electricity. When the live motor stops, a large current still flows through the coil. Pulling and plugging the terminal will cause a huge instantaneous induced electromotive force to burn the driver.

5) It is strictly forbidden to insert the wire head into the terminal after tin, otherwise the terminal may be damaged due to overheating of the contact resistance.

6) The wiring head should not be exposed outside the terminal to prevent accidental short circuit and damage to the driver.

四、DIP switch setting

HSC86A digital integrated low-voltage servo driver adopts 8-bit dial switch to set the subdivision accuracy (electronic gear ratio), the initial direction of motor rotation, self-test and function mode selection. The detailed description is as follows:

Subdivision accuracy (electronic gear ratio)   rection and function mode settings   Motor selection

SW1	SW2	SW3	SW4	SW5	SW6	SW7	SW8

Pulse/rev	S1	S2	S3	S4
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

Subdivision accuracy (electronic gear ratio): When S1, S2, S3, S4 are all on, the driver microstep subdivision adopts the internal default microstep subdivision number of the driver. The electronic gear ratio can also be set through the debugging software. SW5 sets the motor direction, when it is ON, the motor rotates clockwise (CW), when it is OFF, the motor rotates counterclockwise (CCW); SW6 function mode selection, when it is OFF, the drive is space vector control mode (FOC) , When it is on, the driver moves in point mode (PM), which has better start-stop effect.

Motor	SW7	SW8	说明
60-30	ON	ON	Adapt to our 60 series 3NM closed loop motor
86-45	OFF	ON	Adapt to our 86 series 4.5NM closed loop motor
86-85	ON	OFF	Adapt to our 86 series 8.5NM closed loop motor

86-120	OFF	OFF	Adapt to our 86 series 12NM closed loop motor

五、Protective function

1）Overvoltage protection

When the input voltage of HSC86A is higher than 90VAC, the driver will stop working. At this time, the fault must be eliminated and reset after power on again.

2）Undervoltage protection

When the input voltage of HSC86A is lower than 15VAC, the driver will stop working. At this time, the fault must be eliminated and reset after power on again.

3）Overcurrent protection

When overcurrent occurs in HSC86A, the driver will stop working. At this time, the fault must be eliminated and reset after power on again.

4）Tracking error

When the tracking error exceeds the tolerance of HSC86A, the driver stops working. At this time, the fault must be eliminated and reset after power on again.

六、common problem

1.Common problems and solutions in the application

phenomenon	Possible problem	solution
The motor does not rotate	Power light is off	Check the power supply circuit, normal power supply
	Powerful motor shaft	The pulse signal is weak, the signal current is increased to 7-16mA
	Subdivision is too small	Select the right segment
	Drive is protected	Power cycle
	Enable signal is low	This signal is pulled high or not connected
	Does not respond to control signals	Not powered
	Motor wire is broken	Check and connect
	The voltage is too high or too low	Check the power supply
	Damaged motor or driver	Replace the motor or drive
Inaccurate location	Signal is disturbed	Eliminate interference
	Shielding ground is not connected or not connected	Reliable ground
	Motor wire is broken	Check and connect
	Segmentation error	Set subdivision
Stall when the motor accelerates	The acceleration time is too short	Increased acceleration time
	Motor torque is too small	Choose high torque motor
	Low voltage	Appropriately increase the voltage

2.Frequently asked questions about drives

1）What are the advantages of subdividing servo drives?

●Since the step angle of each step is reduced, the step uniformity is improved, so the control accuracy can be improved.

●It can greatly reduce the vibration of the motor. Low-frequency oscillation is an inherent characteristic of the stepper motor. Subdivision is the best way to eliminate it.

●It can effectively reduce torque ripple and increase output torque.

●These advantages are generally recognized by users and bring them benefits, so it is recommended that you choose a subdivision driver.

2）Why does my motor only run in one direction?

●It is possible that the direction signal is too weak, or the polarity of the wiring is wrong, or the signal voltage is too high, and the direction current limiting resistor is burned out.

●The pulse mode does not match, the signal is pulse / direction, the drive must be set to this mode.

Our company product warranty terms

1 One year warranty

Our company provides a one-year warranty for defects in raw materials and workmanship of its products from the date of shipment. During the warranty period, our company provides free repair services for defective products.

2 Not covered by warranty

●Inappropriate wiring, such as reverse connection of positive and negative power supply and live plugging

●Unauthorized changes to internal devices

●Use beyond electrical and environmental requirements

●Environmental heat dissipation is poor

3 Repair process

Please contact the relevant agent or the company's salesperson

4 Warranty restrictions

●The warranty scope of our company's products is limited to the product's devices and processes (ie consistency).

●Our company does not guarantee that its products can be adapted to the customer's specific use, because the suitability is also related to the technical index requirements, use conditions and environment of the use.