Digital Hybrid Servo Drive
User's Manual

【Please read this manual carefully before use】

CONTENS

Digital Hybrid Servo Drive

Introduction

1. Profile

This product is a low-voltage hybrid servo product developed by our company based on years of experience in low-voltage servo systems. The product adopts the latest DSP digital processing chip and advanced variable current and frequency conversion control algorithm technology, providing manufacturers with a cost-effective hybrid servo drive solution. The driver is compact in structure, small in size, space-saving, and reduces the Electromagnetic Interference(EMI) between wires; It adopts better vibration technology and low heat generation technology, which effectively solves the problems of heat, vibration and noise of the motor and driver, also green Environmental protection.

2. Feature

- Operating voltage: DC input voltage 24VDC to 80VDC, recommended operating voltage 36V/48V.
- Continuous output current maximum 8.0A, maximum peak current 13A (advanced hybrid servo overload capability).
- Differential and single-ended pulse/direction commands are accepted, with three control modes, position/speed/torque.
- FOC magnetic field positioning control technology and spatial vector pulse width modulation (SVPWM) closed-loop control technology are adopted.
- The use of advanced variable current technology and variable frequency technology, which can reduce the heat of motors and drivers effectively.
- The number of pulses per lap can be set by debugging software or dial switch (subdivision)
- It has protection functions such as overvoltage, undervoltage, overcurrent and over-tolerance.
- Single/dual pulse mode, pulse effective edge optional (selected via serial port)
- The maximum pulse frequency of the control instruction is 500KHz (factory default is 200KHz)
- Pulse, direction and enable signal input interface levels are 4.5-28V compatible.
- With serial RS232 debugging function, but the company’s dedicated serial port debugging cable is required
- Performance: smooth speed, smaller overshoot, small tracking error, low heating of motors and drivers.

3. Application

Suitable for a variety of small and medium-sized automation equipment and instruments, such as: screw lock machine, stripping machine, winding machine, terminal machine, laser machine, inkjet printing machine, small and medium engraving machine, electronic processing equipment, automatic grasping equipment, special CNC machine tools, packaging machine and robots, etc. Application is especially effective in devices that users expect to be low noise and high speed.

Electrical, mechanical and environmental indicators

1. Electrical indicators

Parameters				
	Min.	Typ.	Max.	Unit
Output current	0.5	-	13	A
Power Supply	24	36/48	80	Vdc
Input current	6	10	16	mA
Input voltage	4.5	5	28	Vdc
Pulse frequency	0	200	500	kHz
Pulse high level width	1.5	-	-	uS
Position error accuracy	-	±1	-	Pulse
Speed accuracy	-	±2	-	rpm
Maximum acceleration (No load)	-	100	-	rpm /ms
Overvolted protection voltage	90	92	94	Vdc
Insulation resistance	100	-	-	MΩ

2. Environment Indicators

Heat Sinking Method	Natural cooling or fan-forced cooling
Occation	Do not place next to heating equipment, avoid dust, oil mist, and corrosive gases. In places with high humidity and strong vibration, flammable gas and conductive dust are prohibited;
Temperature	-5℃ ～ +45℃
Humidity	40 ～ 90%RH
Vibration	10 ～ 55Hz / 0.15mm
Storage Temperature	-20℃ ～ +65℃
Operating Altitude	≤1000m
Weight	≈ 1.4KG

1. Dimension(Unit:mm)

The driver can match any type of two-phase hybrid servo motors of nema17, nema23, nema24 and nema34. Our company mainly recommends 0.3 NM, 0.4 NM, 0.6 NM, 0.8 NM, 1.0NM, 2.4NM , 3.0NM, 3.6NM, 4.5NM and 8.5NM hybrid servo motors. It can also be matched with other manufacturers' hybrid servo motors that encoder line number is 250~5000 lines, but you need to contact us to provide you motor parameters. According to different motor matching related programs. If the customer has higher requirements for low-speed vibration or high-speed performance, it is recommended to contact us. We will write the algorithm to match the motor and it will show perfect performance.

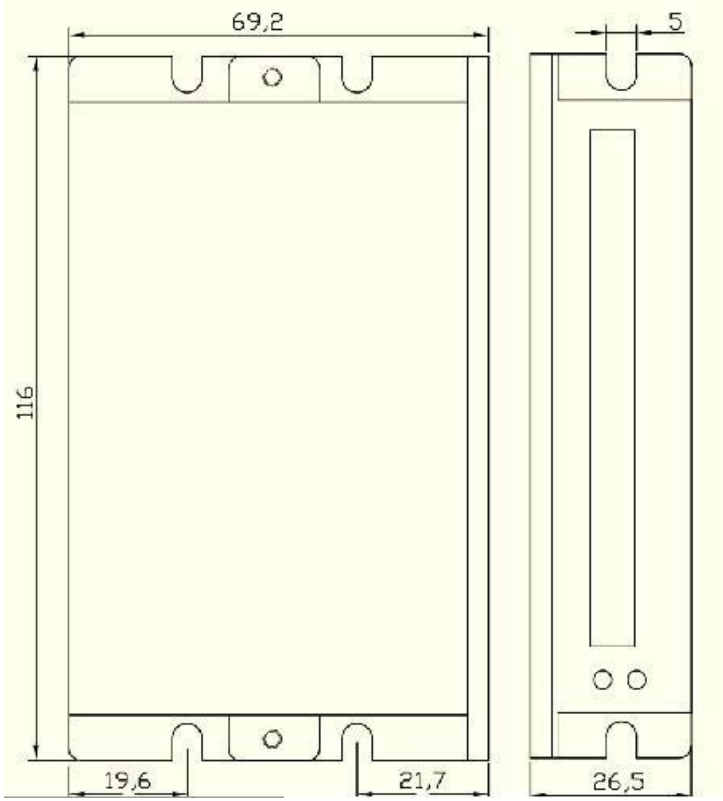


Figure 1 structure size

4. Attention

The reliable working environment temperature of the drive is usually within -5°C ~ 45°C, the temperature of the drive is within 65°C, and the temperature of the motor is within 70°C. If necessary, install a fan near the drive to force cooling to ensure that the drive is working reliably.

Ⅲ、Connector and wiring

1. Connector

1.1 Control signal connector

3.81mm spacing terminal with green 8Pin

Pin	Signal	Function	说明
1	PUL+	Pulse input+	Compatible with 4.5V~28V level signal
2	PUL-	Pulse input-	
3	DIR+	Direction signal input+	
4	DIR-	Direction signal input-	
5	ENA+	Enable signal input+	
6	ENA-	Enable signal input-	
7	ALM+	Alarm signal output+	Open collector OC output, MAX pull-up level 24V, MAX output current 100mA
8	ALM-	Alarm signal output-	

1.2 Power supply connector

Green 3Pin 3.81mm spaced screw terminals

(Noted: Do not connect the positive and negative poles reversely!)

PIN	Signal	Function
1	+VDC	Power supply+, input 24~80VDC
2	GND	Power supply-
3	NC	No signal

1.3 Port signal

Green 3Pin 3.81mm spaced screw terminals

(Noted: Do not connect the positive and negative poles reversely!)

PIN	Signal	Function
1	EB+	Encoder signal input B+
2	EB-	Encoder signal input B-
3	EA+	Encoder signal input A+
4	EA-	Encoder signal input A-
5	VCC	Driver +5V output
6	EGND	Driver GND output

1.4 Serial RS232 connector

The PC can be connected via a serial transfer device (equipped separately) and a dedicated serial port cable (plugging or unplugging is prohibited). The function and parameter settings of the drive can be set via PC software, such as the subdivision and current value, effective edge, and the elimination of resonance point can also be adjusted.

PIN	Name	Function	Noted
1	+5V	Power supply 5V+	Only for external STU
2	TXD	RS232 sender	
3	RXD	RS232 receiver	
4	GND	5V power ground	0V

Note：The drive serial cable must be a dedicated cable, which is attached depending on the user's situation, please confirm before use to avoid damage.

1.5 LED status indication

The green LED is a power LED that LED lights up when the drive is plugged in and goes out when the driver is powered off. The red LED is a fault indicator that flashes in a 5-second cycle when a fault occurs, and the red LED goes out when the fault is cleared by the user. The flashing frequency of the red LED is 2Hz, where the LED is on for 200ms and off for 300ms. The number of flashes of the red LED within 5 seconds represents different fault information, as shown in the table below:

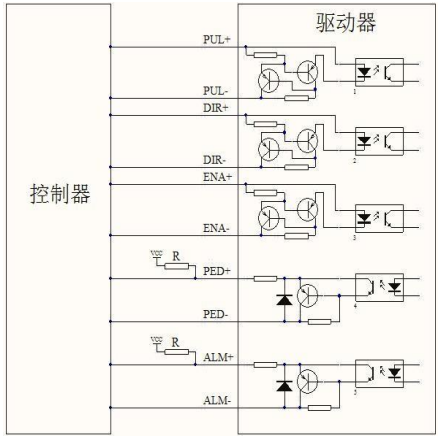
NO.	times	Waveform of red LED	malfunction
1	1		Over current（I_{peak}≥25A）
2	2		Over voltage（Vdc≥90V）
3	5		Tracking error out of tolerance

When fails, the drive shuts down and the fault code is prompted. The fault can only be cleared when the user needs to power off and on again. The drive will wait in a queue to save the latest failure in the drive's EEPROM

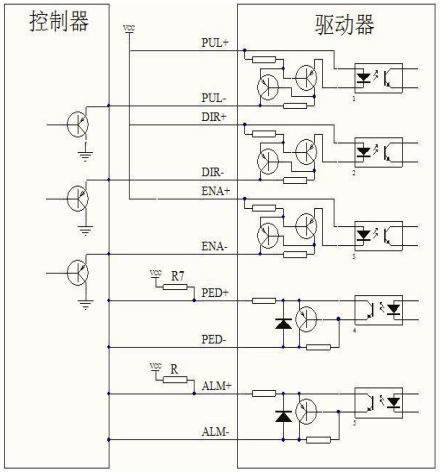
and the drive holds up to 10 of the most recent historical failures. The fault code can be read from the PC and text display

2. Control signal input

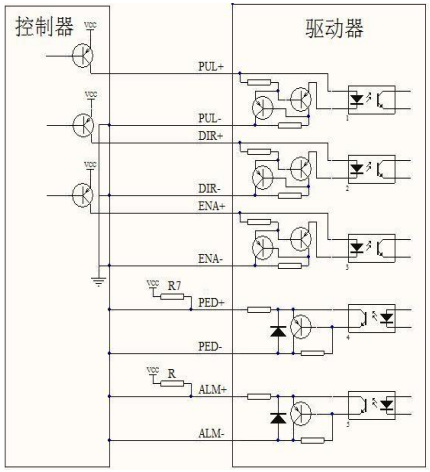
The drive signal input can be Co-anode single-ended input, co-cathode signal single-ended input, built-in high-speed photoelectric isolation coupler; Output is triode open collector OC output, and the interface is connected as follows:



FigureⅡ Input signal differential connection



FigureⅢ Input signal single-end co-anode connection

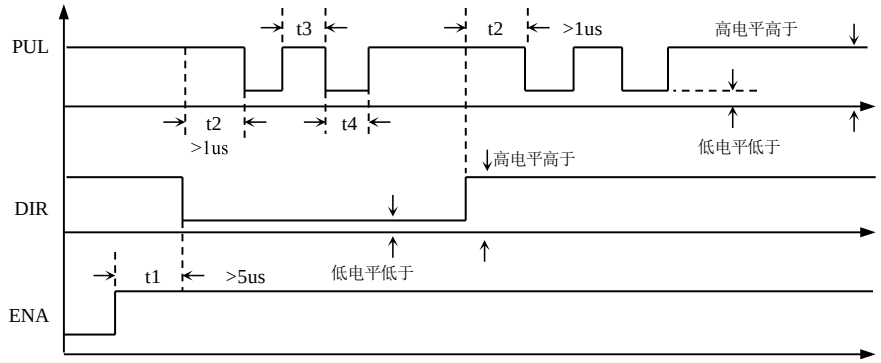


FigureⅣ Input signal single-ended co-cathode connection

Note: The voltage range of the signal input interface is 4.5~28Vdc, whether it's single-ended or differential,， series current limiting resistor is not required. For the output, the maximum external pull-up voltage is 28Vdc, and the maximum output current is 100mA. According to the external pull-up voltage to choose a suitable pull-up resistor, basic parameter value. If the external pull-up voltage is 24Vdc, pull-up resistance is 2K. If the pull-up voltage is 12Vdc, pull-up resistance is1K. If it is the driving relay or motor brake coil, please consult our engineer.

3. Sequence Diagram

To avoid some misoperations and deviations, PUL-, DIR-, and ENA-should meet certain requirements, as shown in the figure below：



FigureⅤ control signal sequence diagram

Note：

1) t1：ENA should be determined to be high in advance with a DIR of at least 5μs. In general, It is recommended to hover.
2) t2：DIR at least advances the PUL drop along 1μs to determine whether its status is high or low；
3) t3：The pulse width at least 1.5μs；
4) t4：The low-level width at least 1.5μs。

4.Mode Setting

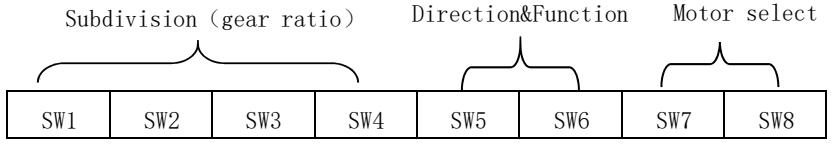
Pulse trigger edge：Set the rising or falling edge of the pulse via PC software.
Sigle and double pulse：Set single or double pulse via PC software.
Direction：Set the initial running direction via PC software. ON

5.Wiring Requirement

1) It is recommended that the control signal use shielded cable, and the shield layer and ground short to prevent interference. Except for special requirements, control the shield cable single-end ground: The upper end of the shield is grounded and the driver end is suspended. The same machine only can ground in on point, if not the real ground wire, may cause serious interference. At this time, the shield is not connected. If conditions permit, the use of thermal grounding technology is most effective shielding.
2) Pulse and direction signal wires and motor lines are not allowed to be wrapped side by side. It's better to separate at least 10cm, otherwise the motor noise will easily interfere with the pulse direction signal and cause faults such as inaccurate positioning and system instability
3) If one power supply is available for multiple drives, they should be in parallel, and chain connection to one to another is not allowed.
4) It is forbidden to plug in the driver terminal when the power on. When the charged motor stops, a large current flowing through the coil. Unplugging the terminal will cause a huge instantaneous inductive electric potential to burn out the drive.
5) It is forbidden to connect the wire head to the terminal after tinning, as this may overheat and damage the terminal due to the large contact resistance.
The wire head must not be exposed to the terminals in case the driver is damaged by short. Noise can easily interferes with pulse direction signals causing faults such as faulty motor positioning and unstable system

Ⅳ、DIP Switches Setting

This digital all-in-one low-voltage servo drive adopts 8-bit DIP switches to set the subdivision (gear ratio), initial direction rotation, self-test and function mode selection. The detailed description is as follows:



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
500	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
3600	ON	OFF	OFF	OFF
7200	OFF	OFF	OFF	OFF

Subdivision accuracy (gear ratio): S1, S2, S3, S4 ON, the drive's internal micro-step subdivision is default, the internal default subdivision value is 400Pulse/rev. You can also be set by debugging software. SW5 sets the motor direction, SW5 ON: CCW; SW5 OFF: CW. SW6 function mode selection, when it is OFF, the drive is in space vector control (FOC) When it is ON, the drive point motion (PM), which is better. The HS808E driver factory-matched hybrid servo motor.

Motor	SW7	SW8
TC42	ON	ON
TC57	OFF	ON
TC60	ON	OFF
Default【TC86】	OFF	OFF

Note: The hybrid servo motors of other manufacturers can be matched, such as nema11, nema14, etc. can be matched, but need to contact us!

Ⅴ、Protective Function

1) **Overvoltage protection**

The driver stops working when the input voltage is higher than 90Vdc. The fault must be drained and re-powered to reset.

2) **Undervoltage protection**

The driver stops working when the input voltage is below 15Vdc. The fault must be drained and re-powered to reset.

3) **Overflow protection**

The drive stops working when there is an overflow. The fault must be drained and re-powered to reset.

4) **Tracking error is out of tolerance**

The drive stops working when a tracking error is out of tolerance. The fault must be drained and re-powered to reset.

△ **Attention:** Since the driver does not have power positive and negative reverse protection, please make sure that the positive-negative wiring connects correctly before powering on. Reverse will cause the fuse to burn out!

Ⅵ、FAQ

1.Trouble shooting

2.

Situation	Possible cause	Suggestion
Motor disable	Power light off	Check whether the circuit is powered
	电机轴有力	Pulse signal is weak, signal current increases to 7-16mA
	Subdivision too small	Select suitable subdivision
	Driver protected	Power up again
	Low enable signal	Pull up ENA or disconnected
	No respond to the control signal	Power is off
	Open circuit	Check and connect correctly
	Overvoltage/Undervoltage	Check the power supply
	Motor or drive is damaged	Change another one
Inaccurate location	Signal is interfered	Eliminate interference
	Shielding ground is not connected	Connect the shielding ground
	Open circuit	Check and connect correctly
	Subdivision error	Set a right value
Block the motor as it accelerates	Acceleration time too short	Length up acceleration time
	Rated Torque is low	Setlect a suitable motor
	Voltage value is low	Set the voltage higher

Drive FAQ

1) What are the advantage of Subdivision Servo Drive?

- The step uniformity is improved by reducing the step angle of each step, so the control accuracy can be improved.
- It can greatly reduce motor vibration. Low-frequency oscillation is an inherent characteristic of stepper motors. Subdivision is the best way to eliminate it.
- It can effectively reduce torque ripple and increase output torque.

The above advantages are generally recognized by users and bring them benefits, so it is recommended that you choose subdivision drives.

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

- The direction signal may be too weak, or the wiring polarity is wrong, or the signal voltage is too high and it burns the direction current-limiting resistor.
- The pulse mode does not match, the signal is PUL/DIR, and the driver must be set to this mode.
- If there are other problems, please contact our engineer

Ⅶ、ICAN Product Warranty

1 Warranty Period

Dongguan ICAN Technology provides warranty for 1 years from the date of shipping.

2 Not Cover By Warranty

- Inappropriate wiring, such as reverse connection of the positive and negative poles of the power supply, and charged unplugging.
- Change the internal components without permission.
- Use beyond electrical and environmental requirements.
- Poor heat dissipation in the environment

3 Return Process

Please contact the agent or our salesman.

4 Warranty limitations

- The warranty scope of our products is limited to product's components and processes (i.e. consistency).
- Our company does not guarantee that this product can be suitable for the specific purpose of the customer, because the suitability is also related to the technical index requirements, conditions and environment.