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HSS86

New generation digital display closed-loop 86 stepping driver

First, product introduction

1. summary

HSS86 is a new type of closed-loop 86 stepping driver successfully developed by our company based on more than ten years' experience in stepping and servo research and development. It adopts the latest ARM chip and vector closed-loop control algorithm, so as to completely overcome the problem of step loss of open-loop stepping motor, and at the same time, it can obviously improve the motor's high-speed performance and torque output, and reduce the motor's heating and low-speed resonance. In addition, when the motor is continuously overloaded, the driver will output an alarm signal, which has the same reliability as the AC servo system. At the same time, the installation size of the motor is completely compatible with the traditional 86 series stepping motor, the traditional stepping drive scheme is easy to upgrade, and the cost is only 30-50% of that of the traditional AC servo system.

2. performance parameter

- ◆ Built-in microcontroller function can replace PLC in most occasions, greatly reducing user cost;
- ◆ Internal inching mode is supported, and open loop/closed loop function is optional.
- ◆ Built-in smoothing filter function, external input can run normally without acceleration or deceleration;
- ◆ Adopt a new 32-bit motor control special ARM intelligent chip;
- ◆ 4-digit LED display with 4 keys for operation, which is intuitive and easy to operate;
- ◆ Advanced closed-loop control algorithm of vector current, speed and position

is adopted;

- ◆ The current can be set arbitrarily (within the range of 0-7 A);
- ◆ The motor is equipped with 1000-line high-precision photoelectric or magnetic encoder as standard;
- ◆ Optoelectronic isolation differential signal input, pulse response frequency up to 200KHZ; ;
- ◆ Arbitrary subdivision setting (200-51200) to meet all occasions;
- ◆ It has protection functions such as overcurrent, overvoltage, tracking error tolerance, etc.

3. application area

It is suitable for all kinds of small and medium-sized automation equipment and instruments, such as engraving machine, stripping machine, marking machine, cutting machine, laser phototypesetting, plotter, numerical control machine, automatic assembly equipment, etc. The application effect is particularly good when users expect low noise and high speed equipment.

II. Electrical, mechanical and environmental indicators

1. Electrical index

| join count | HSS86 | | | |
|---------------------------------------|---------------|---------------|---------|------|
| | minimum value | typical value | maximum | unit |
| Continuous output current | 1.0 | - | 7.0 | A |
| Input power supply voltage | 24 | - | 110 | VDC |
| Logic input current | 7 | 10 | 20 | mA |
| Whole machine power | | | 200 | W |
| impulse frequency | 0 | - | 200 | kHz |
| insulance | 500 | | | MΩ |
| Digital output port logic current | | | 100 | mA |
| Digital output port withstand voltage | - | - | 24 | V |

2. Use environment and parameters

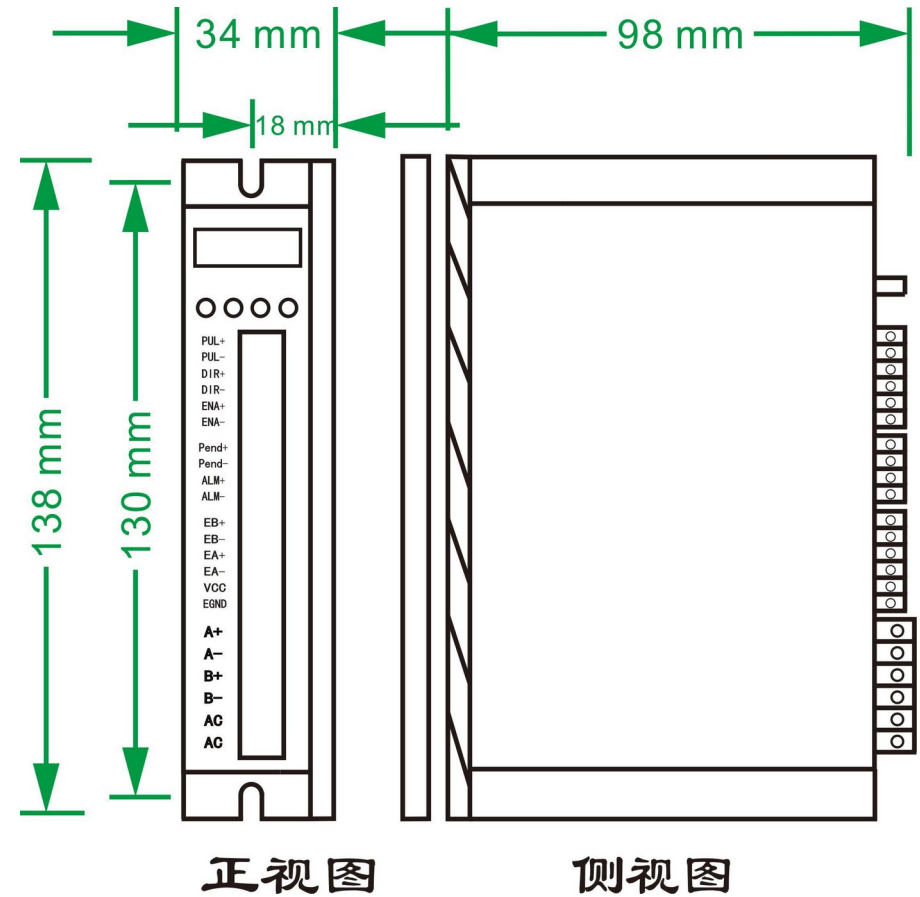
| | |
|--------------|--------------------------------------|
| Cooling mode | Natural cooling or external radiator |
|--------------|--------------------------------------|

| | | |
|--------------------------|-----------------|------------------------------------------------|
| operational environment | Usage occasion | Try to avoid dust, oil mist and corrosive gas. |
| | temperature | 0°C—50°C |
| | humidity | 40—90%RH |
| | shake | 10~55Hz/0.15mm |
| Preservation temperature | -20°C—+65°C | |
| heavy amount | About 300 grams | |

3. Mechanical dimension drawing (unit: mm)

4. Strengthen heat dissipation mode

- (1) The reliable working temperature of the driver is usually within 60°C and the working temperature of the motor is within 80°C.
- (2) The driver should be installed on the upright side to form strong air convection on the radiator surface. When necessary, install a fan close to the drive to force heat dissipation, so as to ensure that the drive works at a reliable temperature.



III. Introduction of driver interface and wiring

1. Interface definition

And a motor input port.

| Terminal number | Symbol | name | Color description of leads | |
|-----------------|--------|------------------------|--------------------------------|-------|
| 1 | A+ | A phase motor winding+ | | red |
| 2 | A- | A phase motor winding- | | blue |
| 3 | B+ | B phase motor winding+ | | green |
| 4 | B- | Phase b motor winding- | | black |
| 5 | AC1 | Input power supply | Maximum DC 110V Ac max. 80V | |
| 6 | AC2 | Input power supply | | |

Note: Closed-loop motor wiring must be strictly defined according to color, and it is not allowed to be connected at will.

Encoder: encoder signal input port

| Terminal number | Symbol | name | Color description of leads |
|-----------------|--------|--------------------------------|----------------------------|
| 1 | EB+ | Encoder b phase positive input | blue |
| 2 | EB- | Encoder b phase negative input | white |
| 3 | EA+ | Encoder a phase positive input | yellow |
| 4 | EA- | Encoder a phase negative input | green |
| 5 | VCC | Encoder+5v input | red |
| 6 | EGND | Encoder power ground | white |

Control: Control Signal port

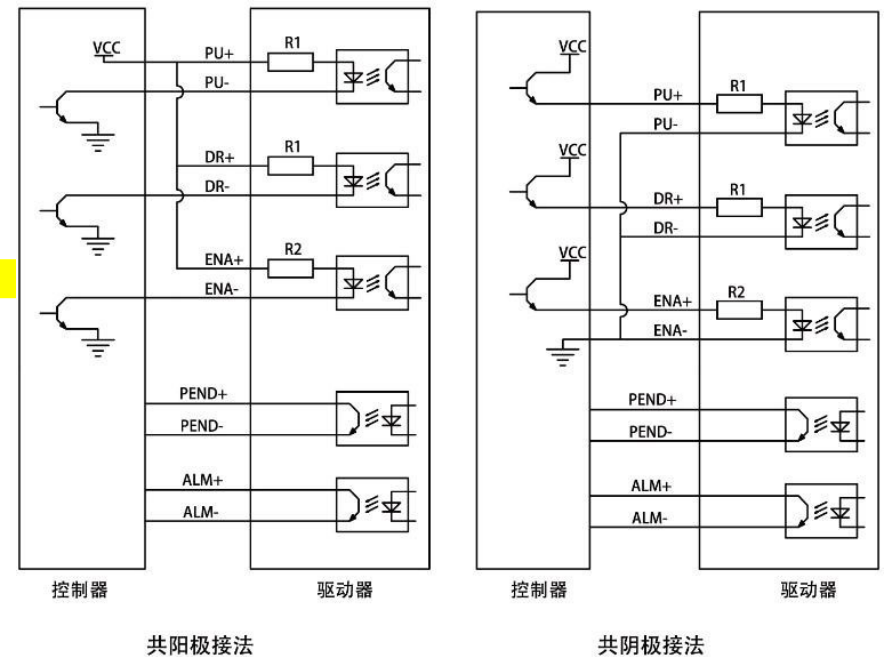
| Terminal number | Symbol | name | explain |
|-----------------|--------|----------------------|-----------------------------------------------------------------------------|
| 1 | PU+ | Pulse positive input | Signal source+5v ~ 24v pass Use, no need to connect resistors in series. |
| 2 | PU- | Pulse negative input | |

| | | | |
|---|------------|------------------------------|--|
| 7 | ALM+(BRK+) | Alarm signal positive output | |
| 8 | ALM-(BRK-) | Negative output of alarm | |

2. Circuit diagram of control signal interface

Circuit diagram of control signal input and output interface, as shown in the figure.

(1) Input connection



Special note: This driver supports 5V-24V, without series resistance!

(2) Please wire according to the following figure when inputting difference.

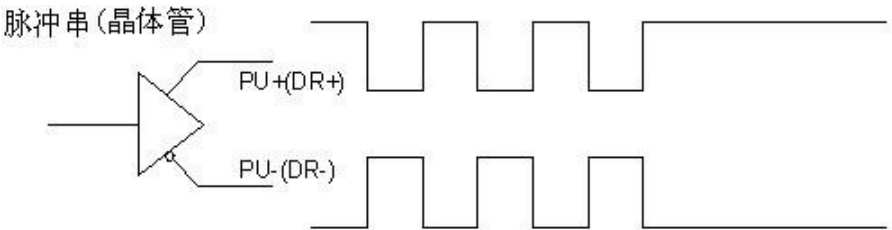
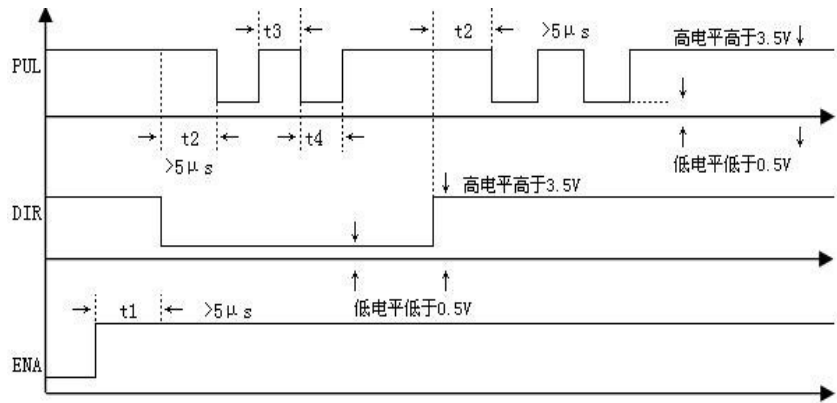


Fig. 3(a) Connection diagram of differential control signal interface

3. Control signal timing diagram

To avoid some misoperation and deviation, PUL, DIR and ENA should meet certain requirements, as shown in Figure 4 below:



IV. Introduction of driver status indication

1. Fault description

| serial number | breakdown code | Fault description | debugging |
|---------------|----------------|---------------------------|-------------------------------------------------------------------|
| 1 | Er01 | Motor overcurrent | Check whether the motor is short-circuited or reduce the current. |
| 2 | Er02 | Overvoltage of driver | Check whether the input voltage is too high. |
| 3 | Er03 | Driver undervoltage | Check whether the input voltage is too low. |
| 4 | Er04 | hardware error | The damaged drive needs to be returned to the factory for repair. |
| 5 | Er20 | Position out of tolerance | Motor overspeed, increase current and voltage appropriately. |

2. Parameter monitoring instructions

| serial number | function code | function declaration | Function introduction |
|---------------|---------------|------------------------------|------------------------------------------------------------------------------------------------------------------------------------------|
| 1 | L-00 | Motor speed: r/min | Monitor the current speed, voltage and current in real time, check whether the driver works normally, and solve any abnormality in time! |
| 2 | L-01 | Given speed: r/min | |
| 3 | L-02 | position error | |
| 4 | L-03 | Number of feedback pulses: P | |
| 5 | L-04 | Follow error | |
| 6 | L-05 | Drive fault code | |
| 7 | L-06 | Rectified bus voltage | |
| 8 | L-07 | Software version number | |

Note: L-06 shows the DC voltage inside the driver;

Fig 4 timing
diagram

Notes:

- (1) T1: ENA (enable signal) should advance DIR by at least 5μs and be determined as high. Generally, it is recommended that ENA+ and ENA- be suspended.
- (2) T2: DIR determines whether its state is high or low at least 5μs ahead of the falling edge of PUL.
- (3) T3: The pulse width is at least 2.5μs s.
- (4) T4: The width of low level is not less than 2.5μs s.

3. Description of common function codes

| serial number | Parameter setting | function code | function declaration |
|---------------|--------------------------------|---------------|--------------------------------------------|
| 1 | Subdivision pulse number | P-01 | 200-51200 arbitrary settings, factory 2000 |
| 2 | Closed-loop current percentage | P-05 | 100% max 7A |

V. Parameter setting of driver keys:

The operation panel of the driver consists of four LED digital displays and four buttons M, ▲, ▼, which are used to display various states and parameter settings of the system.

Key function description table

| butt on | function declarati on |
|---------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| M | Functions: P parameter, JOG mode, L parameter switching, system initialization selection. |
| ▲ | When the value changes: +1, press and hold to increase quickly. In jog mode: press and hold the motor forward. |
| ▼ | When the value changes: -1, press and hold to decrease quickly. In jog mode: press and hold the motor to reverse. |
| ⌚ | 1. Press and hold this key for 0.5 seconds to enter the parameter setting. 2. When setting parameters, press once to shift to the left. 3. After the setting is completed, press and hold this key for 0.5 seconds, and then return to the current function code after confirming the successful setting. 4. In case of failure, press and hold this key for 2 seconds to reset the failure. |

| P 区主功能参数 | | | | | |
|----------|---------|-----------|----|------|------------------------|
| 用户参数 | 名称 | 设定范围 | 单位 | 出厂值 | 备注 |
| P-00 | 运行模式 | 0~2 | | 0 | 3-闭环 4-开环 5-内部测试 |
| P-01 | 细分设置 | 200~51200 | | 2000 | |
| P-02 | 编码器分辨率 | 0~1 | | 0 | 0-1000 线 1-4000 线 |
| P-03 | 脉冲有效沿选择 | 0~1 | | 0 | 2-上升沿有效 3-下降沿有效 |

| | | | | | |
|------|---------------|---------|--|-------|---|
| P-05 | 闭环电流百分比 | 0~150 | | 100 | 0 |
| P-06 | 开环电流百分比 | 0~100 | | 50 | |
| P-07 | 锁机电流百分比 | 0~100 | | 40 | |
| P-08 | 锁机电流时间 | 100~500 | | 100 | |
| P-09 | 超差报警阈值 | 0~20000 | | 4000 | |
| P-12 | 报警输出信号电平选择 | 0~1 | | 0 | |
| P-13 | 使能信号电平选择 | 0~1 | | 0 | |
| P-14 | 到位信号输出阈值 | 1~4000 | | 10 | |
| P-15 | 到位信号输出电平选择 | 0~1 | | 0 | |
| P-16 | 速度平滑强度 | 1~1024 | | 5 | |
| P-17 | 位置环位置比例系数 | 1~256 | | 16 | |
| P-18 | 位置环速度比例系数 | 1~256 | | 16 | |
| P-19 | 位置环速度前馈系数 | 0~200 | | 52 | |
| P-20 | 电流环比例增益 KP | 0~30000 | | 5000 | |
| P-21 | 电流环积分增益 Ki | 0~1000 | | 48 | |
| P-24 | 编码器反馈滤波系数 | 0~1024 | | 358 | |
| P-25 | 定位完成精度 | 1~200 | | 10 | |
| P-26 | 闭环控制算法 | 0~1 | | 0 | |
| P-27 | 高速调节系数(ea 限幅) | 0~30000 | | 15360 | |
| P-28 | 力矩调节系数(ea) | 0~3000 | | 16 | |
| P-29 | 保留 | | | | |
| P-30 | 保留 | | | | |
| P-31 | 速度节点 1 | 0~1000 | | 20 | |
| P-32 | 位置比例系数 1 | 0~1000 | | 32 | |
| P-33 | 速度比例系数 1 | 0~1000 | | 320 | |
| P-34 | 速度节点 2 | 0~1000 | | 30 | |
| P-35 | 位置比例系数 2 | 0~1000 | | 33 | |
| P-36 | 速度比例系数 2 | 0~1000 | | 320 | |

Two sets of parameters are provided for users to operate, among which the P parameter is used to set several of the drives.

| | | | | | |
|-------|------------|-----------|------|-------|----------------------------------------------------------------------------------|
| P-37↵ | 速度节点 3↵ | 0~1000↵ | ↵ | 40↵ | ↵ |
| P-38↵ | 位置比例系数 3↵ | 0~1000↵ | ↵ | 35↵ | ↵ |
| P-39↵ | 速度比例系数 3↵ | 0~1000↵ | ↵ | 320↵ | ↵ |
| P-40↵ | 速度节点 4↵ | 0~1000↵ | ↵ | 60↵ | ↵ |
| P-41↵ | 位置比例系数 4↵ | 0~1000↵ | ↵ | 37↵ | ↵ |
| P-42↵ | 速度比例系数 4↵ | 00~1000↵ | ↵ | 384↵ | ↵ |
| P-43↵ | 速度节点 5↵ | 0~1000↵ | ↵ | 80↵ | ↵ |
| P-44↵ | 位置比例系数 5↵ | 0~1000↵ | ↵ | 39↵ | ↵ |
| P-45↵ | 速度比例系数 5↵ | 0~1000↵ | ↵ | 512↵ | ↵ |
| P-46↵ | 速度节点 6↵ | 0~1000↵ | ↵ | 90↵ | ↵ |
| P-47↵ | 位置比例系数 6↵ | 0~1000↵ | ↵ | 40↵ | ↵ |
| P-48↵ | 速度比例系数 1↵ | 0~1000↵ | ↵ | 640↵ | ↵ |
| P-49↵ | 静止时位置比例系数↵ | 0~1000↵ | ↵ | 32↵ | ↵ |
| P-50↵ | 静止时速度比例系数↵ | 0~1000↵ | ↵ | 320↵ | ↵ |
| P-51↵ | 保留↵ | 0~↵ | ↵ | ↵ | ↵ |
| P-52↵ | 保留↵ | 0~↵ | ↵ | ↵ | ↵ |
| P-53↵ | 启动控制↵ | 0~6↵ ↵ | ↵ | ↵ | 7-正方向位置运行↵ 8-反方向位置运行↵ 9-往复运行↵ 10-正方向速度运行↵ 11-反方向速度运行↵ 12-暂停↵ ↵ |
| P-54↵ | 起始速度↵ | 2~3600↵ | RPM↵ | 60↵ | ↵ |
| P-55↵ | 加速时间↵ | 20~2000↵ | MS↵ | 300↵ | ↵ |
| P-56↵ | 减速时间↵ | 20~2000↵ | MS↵ | 300↵ | ↵ |
| P-57↵ | 目标速度↵ | 2~3600↵ | PRM↵ | 1200↵ | ↵ |

| | | | | | |
|-------|-----------|----------|---|---|---|
| P-59↵ | 运行的单圈脉冲数↵ | 0~60000↵ | ↵ | ↵ | ↵ |
|-------|-----------|----------|---|---|---|

| | | | | | |
|-------|-------|---------|---|------|---|
| P-60↵ | 间歇时间↵ | 1~1000↵ | ↵ | 500↵ | ↵ |
| P-61↵ | 采样周期↵ | 1~1000↵ | ↵ | 2↵ | ↵ |
| P-62↵ | 重复次数↵ | 1~1000↵ | ↵ | 1↵ | ↵ |
| P-63↵ | 保留↵ | 0~↵ | ↵ | ↵ | ↵ |

VI. Precautions for Power Supply

The input voltage is DC24V~110V, and the power supply is 200W. The higher the voltage input, the larger the current setting, the greater the torque of the motor, and the better the high-speed performance, but the greater the heat generated by the motor. In principle, the smaller the current setting, the better.

Please note:

- 1) Pay attention to wiring in strict accordance with the color of the motor;
- 2) Never connect the driver to 220V; the driver is DC; pay attention to the direction;
- 3) Line power supply for encoder is provided by driver, so it is not necessary to supply power separately.
- 4) The control signal line and the motor phase line can't be intertwined, and it's better to add a shielding layer to the signal line; Seven, open loop and closed loop settings

This driver is a closed-loop 57, 60, 86 driver, and the motor must be equipped with a 1000-line encoder. Compared with the open-loop driver, the running performance of the motor is improved by more than 30%.

When an accident happens, the encoder fails or the encoder line contacts poorly, P-00 can be set to 1, and the open-loop mode can be started, so as to solve the customer's problem to the greatest extent and avoid the shutdown of the production line.

VIII. Product Warranty Terms

1. One-year warranty

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

2. Not covered by warranty.

- Improper wiring, such as wrong wiring of power supply and motor, and hot plugging.
- Changing internal devices without permission

- Use beyond electrical and environmental requirements.
- Poor environmental heat dissipation

3. Maintenance process

If the product needs to be repaired, it will be handled according to the following process:

- (1) Before delivery, you need to call the agent to obtain the repair license number;
- (2) A written explanation is attached with the goods to explain the failure of the repaired driver; The voltage at the time of failure,

And current and use environment; Information such as the name, telephone number and mailing address of the contact person.

(3) Pay the postage first and send it to the company's location or designated maintenance point. The company refuses to accept any express mail from to pay the freight.

4. limitation of warranty

The warranty scope of the product is limited to the device and process of the product (i.e. consistency).

The company does not guarantee that its products can be suitable for the specific use of customers, because the suitability is also related to the technical index requirements, use conditions and environment of the use. Our company does not recommend using this product for clinical medical use.

5. Maintenance requirements

When repairing, please fill in the Maintenance Report truthfully to facilitate maintenance analysis.