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**DM860H Digital two-phase stepper Driver**

1. **Product introduction**
2. **Overview**

DM860H is a two-phase digital stepper driver with serial debugging function newly launched by Gerui Internet of Things Technology Co., LTD., which adopts the latest 32-bit DSP control technology and integrates the MODBUS-RTU standard protocol specification. Users can set any subdivision and working mode within 200-40000 parameters through the PC debugging software. It greatly enriches the practical function of the product and can meet the application needs of most occasions.

DM860H driver adopts servo-like control principle, integrates vector control technology, built-in micro-segmentation technology, adaptive filtering technology, greatly optimizing the performance of the stepper motor, low, medium and high speed operation is very smooth, low noise. Accurate and smooth pure sinusoidal current vector control technology effectively reduces motor heating.

DM860H driver drive voltage range in AC20V~80V, suitable for the peak current below 7.2A, outer diameter 57~110mm two-phase hybrid stepping motor.

1. **Features**

●Serial debugging function

●Serial debugging function

●Small size, easy to install

●Can drive 4, 6, 8 wire two-phase stepper motor

●Optical isolation of differential signal input

●Built-in microparting

●Subdivision setting range 200-40000

●Pulse response frequency up to 200KHz (higher can be changed)

●The current can be set arbitrarily

●The precision current control greatly reduces the heat of the motor

●Overvoltage, undervoltage, overcurrent and other protection functions

●The current halves automatically at rest

1. **Application field**

Suitable for a variety of small and medium-sized automation equipment and instruments, such as: engraving machine, marking machine, cutting machine, plotter, CNC machine tools, automatic assembly equipment. The application effect is especially good in equipment applications where users expect low noise and high speed.

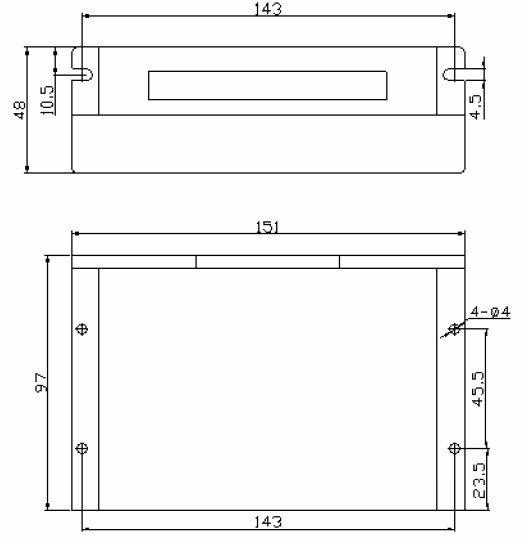
**二、Electrical, mechanical and environmental indicators**

1. **Electrical specifications**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Instructions** | **DM860H** | | | |
| **Minimum value** | **Typical value** | **Maximum value** | **Unit** |
| **Output current** | 2.4 | - | 7.2 | A |
| **Input supply voltage** | 20 | 60 | 80 | VAC |
| **Control signal input current** | 7 | 10 | 16 | mA |
| **Step pulse frequency** | 0 | - | 200 | KHz |
| **Insulation resistance** | 50 |  |  | MΩ |

1. **Use environment and parameters**

|  |  |  |
| --- | --- | --- |
| **Cooling Mode** | | Natural cooling, fan cooling |
| **Use environment** | **Environment** | Can not be placed next to other heating equipment, to avoid dust, oil mist, corrosive gases, humidity is too large and strong vibration places, flammable gases and conductive dust are prohibited |
| **Temperature** | 0——50℃ |
| **Humidness** | 40—90%RH |
| **Vibration** | 10~55Hz/0.15mm |
| **Storage temperature** | | -20℃~65℃ |

1. **Mechanical installation diagram**

Front mounting drawing Side mounting drawing

Figure 1 Installation dimensions (unit: mm)

**※It is recommended to use the side installation, the heat dissipation effect is better, the design of the installation size, pay attention to the terminal size and wiring!**

1. **Strengthen heat dissipation**
2. The reliable operating temperature of the driver is usually within 50 ° C, and the operating temperature of the motor is within 80 ° C;
3. When it is recommended to use, choose the automatic half-current mode, that is, when the motor stops, the current is automatically reduced by half to reduce the heat of the motor and the driver;
4. When installing the driver, please use the side mounting, and make the driver bottom surface to form a strong air convection; When necessary, a fan is installed near the driver in the machine to form air convection, auxiliary drive heat dissipation, and ensure that the driver works within a reliable operating temperature range.

**三、Driver interfaces and cable connections are introduced**

1. **Description of the interface**
2. **Control signal interface**

|  |  |
| --- | --- |
| **Name** | **Feature** |
| PUL+ | Pulse control signal: +5V-+24V can be driven, the rising edge is effective, whenever the pulse from high to low, the motor takes a small step. For reliable response to the pulse signal, the pulse width should be greater than 2μs. |
| PUL- |
| DIR+ | Direction control signal: +5V-+24V can be driven, high/low level signal. In order to ensure the reliable commutation of the motor, the direction signal should be established at least 5μs before the pulse signal. The initial running direction of the motor is related to the motor wiring, and exchanging any phase winding (such as A+, A- switching) can change the initial running direction of the motor. |
| DIR- |
| ENA+ | Enable control signal: +5V-+24V can be driven, high/low level signal. Used to enable or disable the operation of the motor. When ENA+ is connected to +5V and ENA- is connected to low voltage, the driver will cut off the current of each phase of the motor so that the motor is in a free state, at which time the step pulse is not responded. When this function is not required, enable the signal terminal to hang. |
| ENA- |

1. **Strong current interface**

|  |  |
| --- | --- |
| **Name** | **Feature** |
| AC+ | AC input power, AC20V-80V(DC30V-110V) |
| AC- |
| A+、A- | Motor A phase coil |
| B+、B- | Motor B phase coil |

1. **232 communication interface**

The serial port communication interface of DM860H driver adopts PH2.0-7P white terminal, which can be connected to PC through special serial cable through USB to TTL serial port conversion tool, do not plug and unplug! Through the PC side, the customer can set the required parameters, such as current, subdivision, working mode, etc., the specific can see the PC software interface.

|  |  |  |  |
| --- | --- | --- | --- |
| **Terminal number** | **Symbol** | **Name** | **Instructions** |
| 1 | NC | - | Internal use |
| 2 | NC | - | Internal use |
| 3 | GND | RS232 communication ground | 0V |
| 4 | NC | - | Internal use |
| 5 | NC | - | Internal use |
| 6 | TXD | RS232 sending end |  |
| 7 | RXD | RS232 receiving end |  |

▶**Note: The cable connecting DM860H and PC must be a special cable (depending on the user's situation) to confirm before use, so as to avoid damage.**

1. **Status indication**

The green LED is the power indicator. When the driver is powered on, the LED will be steady on. When the driver cuts off the power supply, the LED goes out.

The red LED is the fault indicator. When there is a fault, the indicator flashes at a cycle of 3 seconds. When the fault is eliminated by the user, the red LED is off. The number of times the red LED blinks within 3 seconds indicates different fault information, as shown in the following table:

|  |  |  |  |
| --- | --- | --- | --- |
| **Serial number** | **Flicker number** | **Red LED flashing waveform** | **Fault description** |
| 1 | 1 | b4b7420fd81022979949bd221bdc593 | Overcurrent, interphase short circuit or poor contact fault |
| 2 | 2 | 07aaeaeba1020372a59a448bd381b86 | Overvoltage fault (voltage >AC80V/DC110V) |
| 3 | 3 | 6ba76b7c1245b14a916aadd4c40f2f2 | Undervoltage fault (voltage <AC20V/DC30V) |
| 4 | 5 | 6f084afacbf711a593eea399b047aa1 | Open motor |

1. **Control signal interface circuit**

DM860H driver control signal end using differential interface circuit, can be used for differential signal, single-ended common negative and common positive interface, built-in high-speed optocoupler, in the harsh environment, strong anti-interference ability. The interface circuit diagram is shown in Figure 2.



Figure 2 Input interface circuit

▶**Note: DM860H is a 5V-24V universal driver, so no series resistors are required at the signal control end!**

1. **Control signal timing diagram**

In order to avoid some misactions and deviations, PLS, DIR and ENA should meet certain requirements, as shown in the following figure:



Figure. 3 Timing diagram of control signal

Notes:

1. t1: ENA (Enable signal) should be DIR in advance at least 5ms, determined as high. In general, it is recommended that ENA+ and ENA- be suspended.
2. t2: DIR at least PLS fall along 5μs in advance to determine whether its state is high or low.
3. t3: Pulse width is not less than 2.5μs.
4. t4：Low level width is not less than 2.5μs.
5. **Control signal mode setting**

Pulse trigger edge selection: can change the program setting pulse rise edge or fall edge trigger effective.

1. **Cable connection requirements**
2. In order to prevent the driver from being interfered with, it is recommended that the control signal use a shielded cable, and the shielding layer is short-connected with the ground wire. Except for special requirements, the shielded cable of the control signal cable is single-ended grounded: the upper end of the shielded cable is grounded, and the driver end of the shielded cable is suspended. The same machine is only allowed to be grounded at the same point, if it is not the real grounding line, the interference may be serious, and the shielding layer is not connected at this time.
3. The pulse and direction signal line and the motor line are not allowed to be wrapped together side by side, and it is best to separate at least 10cm or more, otherwise the motor noise is easy to interfere with the pulse direction signal and cause the motor positioning is inaccurate, the system is unstable and other failures.
4. If a power supply for multiple drivers, should be connected in parallel at the power supply, do not allow the first to a chain connection.
5. It is strictly prohibited to live plug and insert the driver's strong electric terminal. When the live motor stops, there is still a large current flowing through the coil, and the live plug and insert terminal will cause a huge instantaneous induced electromotive force to burn the driver.
6. Do not connect the wire head to the terminal after adding tin, otherwise the terminal may be damaged by overheating due to the increase in contact resistance.
7. The wiring head should not be exposed outside the terminal to prevent accidental short circuit and damage to the driver.
8. **Dip switch function setting**

DM860H driver adopts 8-bit dip switch, SW1-SW3 is used to set the current; SW4 Choose full flow or half flow lock machine; SW5-SW8 is used for subdivision Settings. Detailed description is as follows:

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **SW1** | **SW2** | **SW3** | **SW4** | **SW5** | **SW6** | **SW7** | **SW8** |
| Current setting | | | semi-flow | Subdivision setting | | | |

1. **Current setting**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Output peak current** | **Output effective current** | **SW1** | **SW2** | **SW3** | **Current self-setting** |
| 2.40 | 1.71 | on | on | on | When SW1, SW2 and SW3 are all off, the required effective current value can be set through PC software, with a maximum value of 6000mA and a resolution of 1mA. |
| 3.08 | 2.20 | off | on | on |
| 3.77 | 2.69 | on | off | on |
| 4.45 | 3.18 | off | off | on |
| 5.14 | 3.67 | on | on | off |
| 5.83 | 4.16 | off | on | off |
| 6.52 | 4.65 | on | off | off |
| 7.20 | 5.14 | off | off | off |

1. **Set static current**

The static current can be set by SW4 dip switch. off indicates that the static current is set to half of the dynamic current, and on indicates that the static current is the same as the dynamic current. In general use, SW4 should be set to off to reduce the heat of the motor and drive and improve reliability. After the pulse input is stopped, the current is automatically reduced to half (the lock current percentage can also be set by the upper computer software).

1. **Subdivide Settings**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **步数/转** | **SW5** | **SW6** | **SW7** | **SW8** | **Subdivision specification** |
| 400 | on | on | on | on | When SW5, SW6, SW7, SW8 are all off, the user can set any subdivision value of 200-40000 through the PC software, and the resolution is 1. |
| 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 |

1. **Power supply selection**

The power supply voltage can work normally within the specified range, and the DM860H driver can be powered by a transformer, and it is recommended that the AC output voltage of the transformer does not exceed its specified maximum voltage. The DM860H driver can also be powered by a non-regulated DC power supply, but it should be noted that the voltage ripple peak after rectification does not exceed its specified maximum voltage. It is recommended that users use a DC voltage lower than the maximum voltage to avoid power grid fluctuations beyond the operating voltage range of the driver.

If using a regulated switching power supply, it should be noted that the output current range of the switching power supply should be set to the maximum.

▶**Note：**

1. When wiring, pay attention to the position of the power interface, do not connect to the motor port, it is best to confirm whether the connection is correct;
2. It is best to use non-regulated power supply;
3. When using non-regulated power supply, the power supply current output capacity should be greater than 60% of the set current of the driver;
4. When the voltage regulator switching power supply is used, the output current of the power supply should be greater than or equal to the working current of the driver;
5. In order to reduce costs, two or three drivers can share a power supply, but the power supply should be ensured to be large enough.
6. **Protection function**
7. **Short circuit protection**

When an interphase short circuit occurs and the driver overcurrent occurs, the driver red light blinks once and repeatedly at a 3-second cycle. In this case, you must rectify the fault, power on it, and reset it.

1. **Overvoltage protection**

When the input voltage is higher than AC80V, the driver red light blinks twice and repeatedly at a 3-second interval. In this case, you must rectify the fault, power on it, and reset it.

1. **Undervoltage protection**

When the input voltage is lower than AC20V, the driver red light blinks three times and repeatedly at a 3-second interval. In this case, you must rectify the fault, power on it, and reset it.

1. **Lack of phase protection**

When the motor is out of phase at the beginning of power-on, the driver red light blinks 5 times, and blinks repeatedly at a 3-second cycle. In this case, you must rectify the fault, power on it, and reset it.