

# 2DM2280

## Digital Step Driver

8A 240V<sub>AC</sub> 2 phase Digital Stepper Drive

The 2DM2280 is a two phase digital stepper driver based on DSP. Its Micro step resolutions and output current are programmable. And it has advanced control algorithm, which can bring a unique level of system smoothness, provides optimum torque and mid-range instability. The control algorithm of Multi-Stepping can make stepper motor has smooth system performance. The control algorithm of torque compensation can improve the torque of motor in the high speed. The control algorithm of motor self-test and parameter auto-setup technology offers optimum responses with different motors and easy-to-use. The control algorithm of smoothness can enhance the acceleration and deceleration of motor. Its unique features make the 2DM2280 to be an ideal solution for applications.

### Features

- Parameter auto-setup and motor self-test
- Multi-Stepping inside
- Small noise, low heating, smooth movement
- Torque compensation in high speed
- Variable current control technology, High current efficiency
- Accelerate and decelerate control inside, Great improvement in smoothness of starting or stopping the motor
- Support PUL/DIR and CW/CCW modes
- Storage the position of motor
- Optically isolated input and compatible with 5V or 24V
- User-defined micro steps (via RS232)
- Microstep resolutions and Output current programmable
- Over current, over voltage and low voltage protection
- Green light means running while red light means protection or off line

### Parameters

Input Voltage 80~240VAC

Output Current 8A

Pulse Frequency max 200K

Communication rate 57.6Kbps

Protection:

- Over current peak value  $15A \pm 10\%$
- Over voltage value 350V
- The over position error range can be
- set through the HISU

Overall Dimensions (mm) 192×127×85

Weight Approximate 1500g

### Control Signal Input Ports

DIR- / DIR+ Direction signal, Compatible with 5V...24V

PLS- / DIR+ Pulse signal, Compatible with 5V...24V

ENA- / ENA+ Enable (Free) signal, Compatible with 5V...24V

ALM- / ALM+ Alarm output, “+”collector, “-”emitter

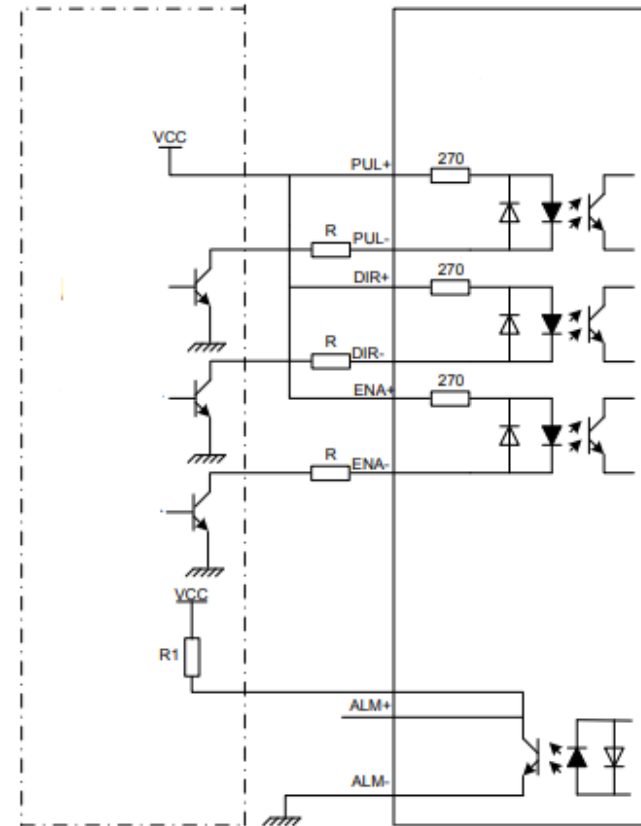
### Power Interface Ports

A+ / A- Motor phase A

B+ / B- Motor phase B

AC1 / AC2 Power input AC80V-240V

### Connections to Control Signal



VCC is compatible with 5V or 24V;

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

Current Setting

Standstill current Setting

SW4 is used for setting the standstill current , “off” means the standstill current is set to be half of the selected dynamic current or other current, which can be set by the HISU, the details can be seen in the tenth sections. while “on” means the standstill current is set to be the same as the selected dynamic current

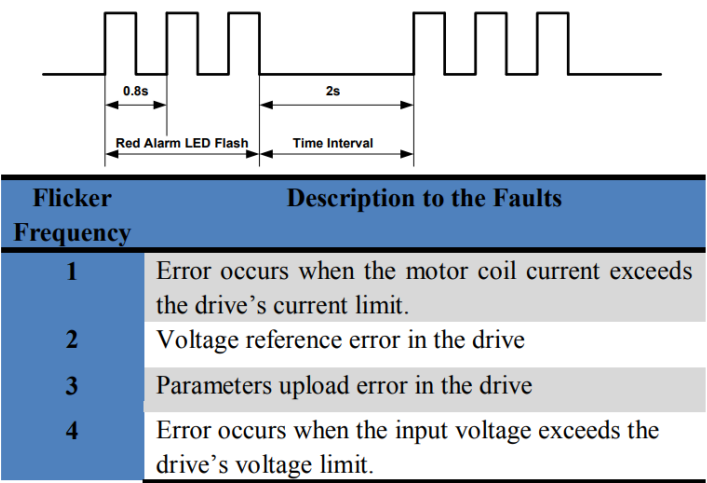
| <div>Dial switch</div> <div>Current</div> | SW1 | SW2 | SW3 |
|---|-----|-----|-----|
| Default                                   | 0   | 0   | 0   |
| 2. 2A                                     | 1   | 0   | 0   |
| 3. 2A                                     | 0   | 1   | 0   |
| 4. 5A                                     | 1   | 1   | 0   |
| 5. 2A                                     | 0   | 0   | 1   |
| 6. 3A                                     | 1   | 0   | 1   |
| 7. 2A                                     | 0   | 1   | 1   |
| 8. 2A                                     | 1   | 1   | 1   |

Micro steps Setting

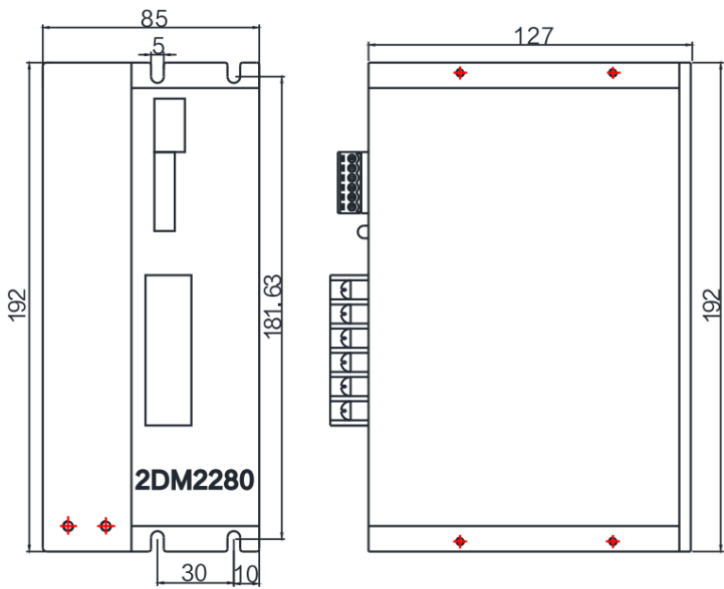
The subdivision of the drive is set by the DIP switch, and the specific settings are shown in the table below. In addition, when the subdivision dial table cannot meet the needs of the user, the user can customize the subdivision through the debug board (HISU), and set the parameter *P14* to 4...1000, then the drive subdivision is 4 \* 50...1000 \* 50, when setting the debug board When *P14* is 0, the user-defined subdivision function is invalid, and the subdivision is set by the DIP switch.

| <div>Dial switch</div> <div>Micro steps</div> | SW5 | SW6 | SW7 | SW8 |
|---|-----|-----|-----|-----|
| Default                                       | 1   | 1   | 1   | 1   |
| 400   | 0   | 1   | 1   | 1   |
| 800   | 1   | 0   | 1   | 1   |
| 1600  | 0   | 0   | 1   | 1   |
| 3200  | 1   | 1   | 0   | 1   |
| 6400  | 0   | 1   | 0   | 1   |
| 12800   | 1   | 0   | 0   | 1   |
| 25600   | 0   | 0   | 0   | 1   |
| 1000  | 1   | 1   | 1   | 0   |
| 2000  | 0   | 1   | 1   | 0   |
| 4000  | 1   | 0   | 1   | 0   |
| 5000  | 0   | 0   | 1   | 0   |
| 8000  | 1   | 1   | 0   | 0   |
| 10000   | 0   | 1   | 0   | 0   |
| 20000   | 1   | 0   | 0   | 0   |
| 25000   | 0   | 0   | 0   | 0   |

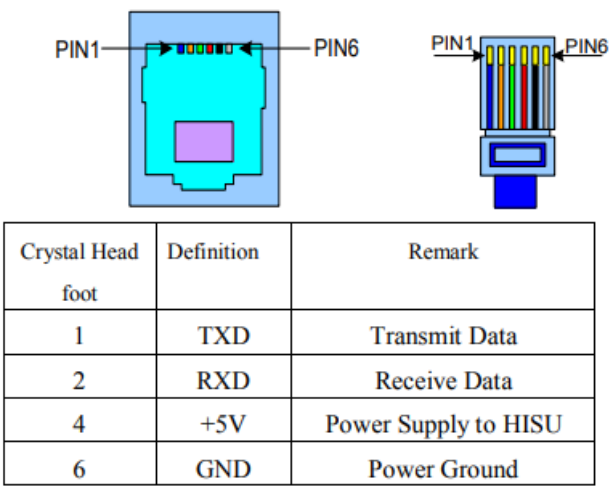
Faults alarm and LED flicker frequency



Appearance and Installation Dimensions

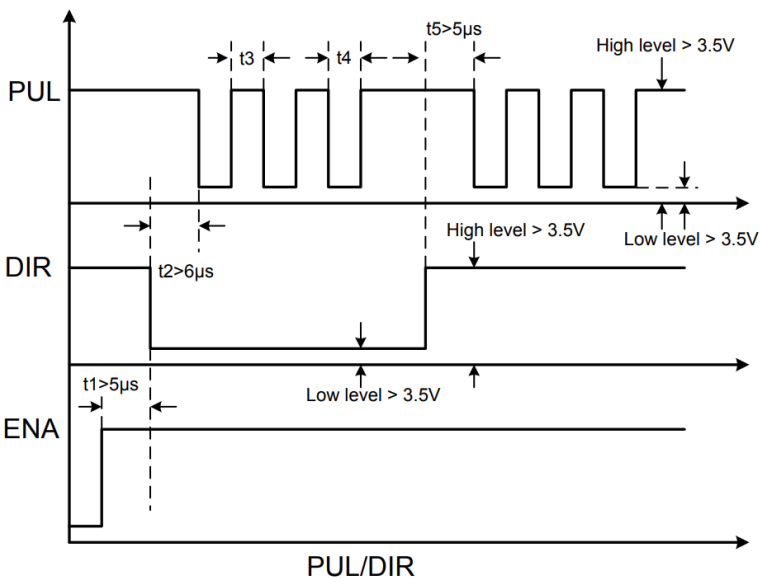


Connections to 232 Serial Communication Interface



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:

- t1: ENA must be ahead of DIR by at least 5μs. Usually, ENA+ and ENA- are NC (not connected).
- t2: DIR must be ahead of PUL active edge by 6μs to ensure correct direction.
- t3: Pulse width not less than 2.5μs.
- t4: Low level width not less than 2.5μs.

Parameter setting

The parameter setting method of 2DM2280 drive is to use a HISU adjuster through the 232 serial communication ports, only in this way we can set the parameters we want. There are a set of best default parameters to the corresponding motor which are carefully adjusted by our engineers, users only need refer to the following table, specific condition and set the correct parameters.

Actual value = Set value × the corresponding dimension

| Mode | Definition                       | Range    | Dimension | Drive Restart | Default Value |
|------|----------------------------------|----------|-----------|---------------|---------------|
| P1   | Current loop $K_p$               | 0 – 4000 | 1         | N             | 1000          |
| P2   | Current loop $K_i$               | 0 – 1000 | 1         | Y             | 50            |
| P3   | Damping coefficient              | 0 – 500  | 1         | N             | 200           |
| P4   | Amplitude of 1– resonance point  | 0 – 100  | 1         | N             | 0             |
| P5   | Phase of 1– resonance point      | 0 – 100  | 1         | N             | 0             |
| P6   | Amplitude of 2– resonance point  | 0 – 100  | 1         | N             | 0             |
| P7   | Phase of 2– resonance point      | 0 – 100  | 1         | N             | 0             |
| P8   | Anti-resonance coefficient       | 0 – 1000 | 1         | N             | 0             |
| P9   | Reserved                         |          |           |               |               |
| P10  | Enable signal level              | 0 – 1    | 1         | N             | 0             |
| P11  | Initial direction selection      | 0 – 1    | 1         | N             | 0             |
| P12  | Reserved                         |          |           |               |               |
| P13  | Command Type                     | 0 – 1    | 1         | Y             | 0             |
| P14  | User-defined micro steps         | 4 – 1000 | 50        | Y             | 0             |
| P15  | Time of standstill current       | 0 – 4000 | 1ms       | N             | 1000          |
| P16  | Percentage of standstill current | 0 – 100  | 1         | Y             | 50            |
| P17  | Speed smoothness                 | 0 – 10   | 1         | Y             | 50            |
| P18  | Enable of position memory        | 0 – 1    | 1         | Y             | 0             |
| P19  | User-defined resistance of motor | 0 – 100  | mh        | Y             | 0             |
| P20  | User-defined inductance of motor | 0 – 100  | 0.1Ohm    | Y             | 0             |
| P21  | Result of position memory        | 0-128    | 1         |               | 0             |
| P22  | Reserved                         |          |           |               |               |

There are total 22 parameter configurations, use the HISU to download the configured parameters to the drive, he detail descriptions to every parameter configuration are as follows:

Current loop  $K_p$  (P1) & Current loop  $K_i$  (P2)

The P1 and P2 is used to set  $K_p$  and  $K_i$  of Current loop at the moment of power-on. When the motor is turning, the  $K_p$  and  $K_i$  is got by the Self-tuning algorithm.

Current loop  $K_p$

Increase  $K_p$  to make current rise fast. Proportional Gain determines the response of the drive to setting command. Low Proportional Gain provides a stable system (doesn’t oscillate), has low stiffness, and the current error, causing poor performances in tracking current setting command in each step. Too large proportional gain values will cause oscillations and unstable system.

Current loop  $K_i$

Adjust  $K_i$  to reduce the steady error. Integral Gain helps the drive to overcome static current errors. A low or zero value for Integral Gain may have current errors at rest. Increasing the integral gain can reduce the error. If the Integral Gain is too large, the system may “hunt” (oscillate) around the desired position.

Damping coefficient (P3)

This parameter is used to change the damping coefficient in case of the desired operating state is under resonance frequency.This parameter is useful in high speed.

Amp 1 – 2 & Phase 1 – 2 (P4,P5,P6,P7)

2DM2280Driver provides robust anti-resonance control to stop the vibrations and maintain equilibrium.

Amp1 and Phase1 is Phase adjustment for 1st and Amplitude adjustment for 1st resonance area respectively. Usually between 0.6rps and 1.2rps.

Amp2 and Phase2 is Phase adjustment for 2nd and Amplitude adjustment for 2nd resonance area respectively. Usually between 1.2rps and 2.4rps.

Anti-resonance coefficient (P8)

This parameter is used for reducing resonance. Usually between 3rps and 4rps.

Enable signal level (P10)

This parameter is set to control the Enable Input signal level. 0 means high, while 1 means low.

Initial direction selection (P11)

For the initial direction selection, 1 indicates that the initial direction is the counter clockwise, and the 0 indicates the initial direction is clockwise.

User-defined micro steps (P14)

This parameter is set of user-defined micro steps. The actual micro steps = the set value ×50. For example, if the parameter is 4, the micro steps is 4 × 50 = 800. But If this parameter is 0, which means micro steps is set by the outer DIP switches.

Time of standstill current (P15)

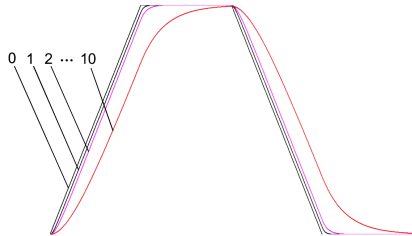
This parameter is set the time when the standstill current is set to be half of the selected dynamic current or other current.

Percentage of standstill current (P16)

This parameter is set the percentage of standstill current.

Speed smoothness (P17)

This parameter is set to control the smoothness of the speed of the motor while acceleration or deceleration, the larger the value, the smoother the speed in acceleration or deceleration.



**Enable of position memory (P18)**

This parameter is set to enable the function of position memory. 0 means disable, while 1 means enable. If set 1, the 2DM2280 can remember the position of motor in the next time of power on.

**User-defined inductance of motor (P19)**

This parameter is set the inductance of motor. 0 means 2DM2280 gets the inductance by control algorithm of Parameter auto-setup, while 1 means 2DM2280 gets the inductance through user sets.

**User-defined resistance of motor (P20)**

This parameter is set the resistance of motor. 0 means 2DM2280 gets the resistance by control algorithm of Parameter auto-setup, while 1 mean 2DM2280 gets the resistance through user sets.

**Result of position memory (P21)**

This parameter is set to control the smoothness of Display the result of position memory

**Processing Methods to Common Problems and Faults**

**Power on power light off**

No power input, please check the power supply circuit. The voltage is too low.

**Power on red alarm light on**

- Please check the motor is connected with the drive.
- The stepper digital drive is over voltage or under voltage. Please lower or increase the input voltage.

**After input pulse signal but the motor not running**

- Please check the input pulse signal wires are connected in reliable way.
- Please make sure the input pulse mode is corresponding with the real input mode.
- The Driver is disabled.

