

# 3DM2080

3 PHASE DIGITAL STEPPER MOTOR DRIVER

260V<sub>AC</sub> 8.2A

The 3DM2080 is a three 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 3DM2080 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



## Control Signal Input Ports

<i>DIR-</i>	<i>DIR+</i>	Direction signal, Compatible 5V..24V
<i>PLS-</i>	<i>PLS+</i>	Pulse signal, Compatible 5V..24V
<i>ENA-</i>	<i>ENA+</i>	Enable signal, Compatible 5V..24V
<i>ALM-</i>	<i>ALM+</i>	Alarm output, “+”collector, “-”emitter

## Power Interface Ports

<i>A-</i>	<i>A+</i>	Motor phase A
<i>B-</i>	<i>B+</i>	Motor phase B
<i>AC1</i>	<i>AC2</i>	Power 80..260V <sub>ac</sub>

## Technological Index

Input Voltage 80 ~ 260V<sub>AC</sub>

Output Current 8A

Pulse Frequency max 200K

Communication rate 57.6Kbps

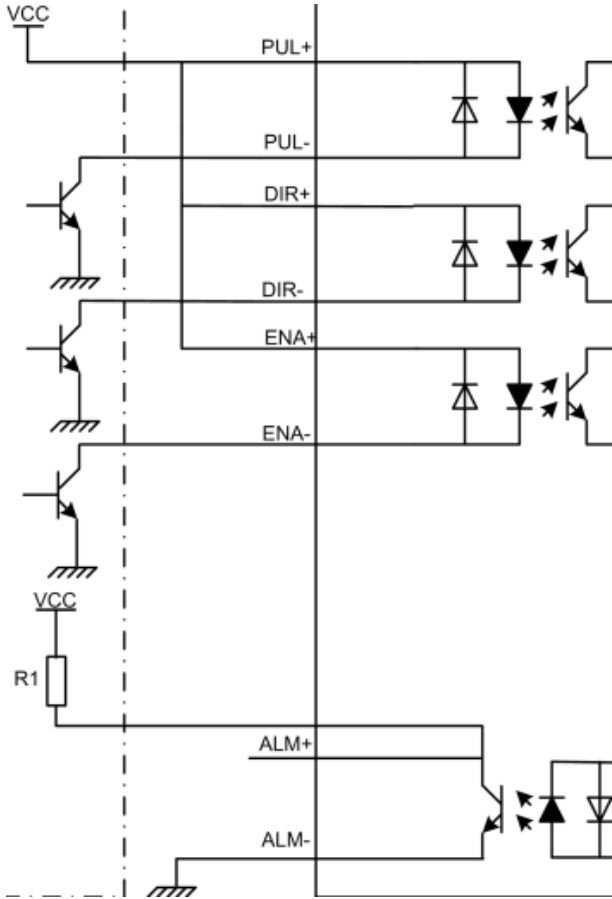
### Protection:

- Over current peak value 15A ± 10%
- Over voltage value 350V
- The over position error range can be set with the *HISU*

Overall Dimensions (mm) 192 × 127 × 85

Weight Approximate 1500g

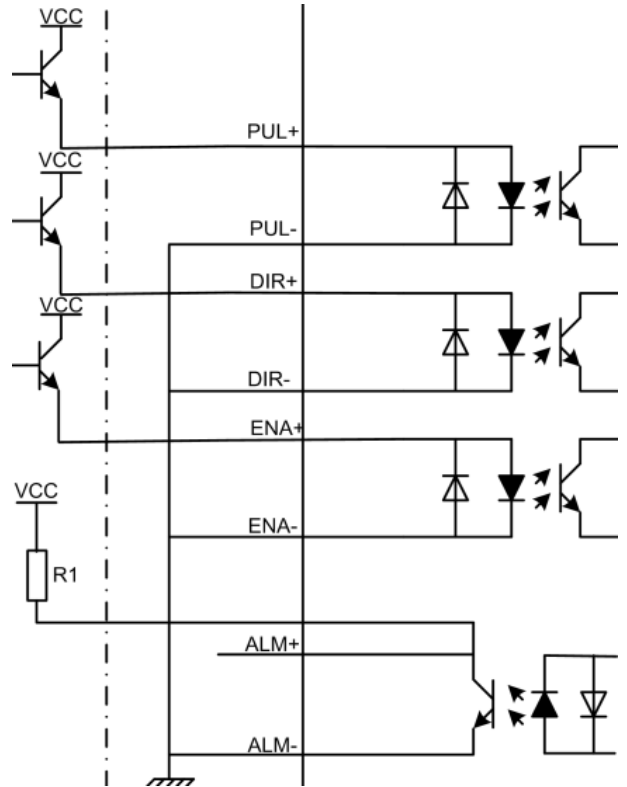
### Connections to Common Anode



**Remark:**

$V_{CC}$  is compatible with 5V or 24V;  
 $R1(3 \dots 5K)$  must be connected to control signal terminal.

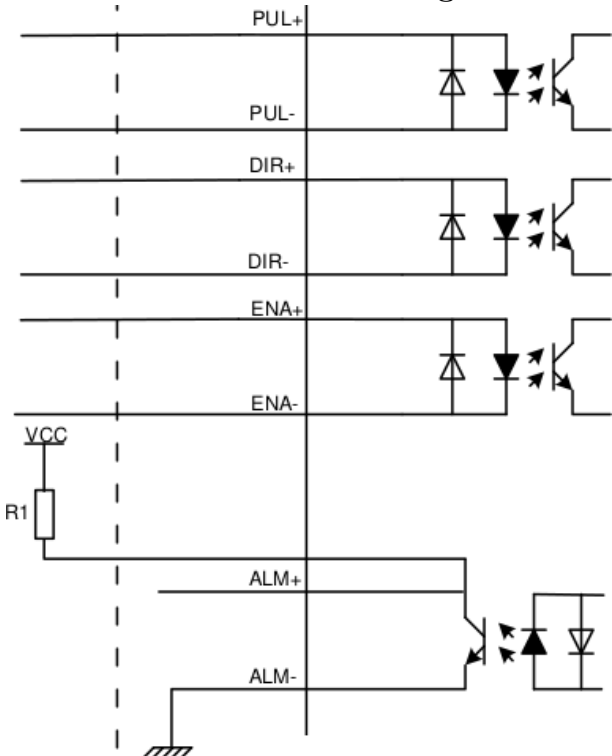
### Connections to Common Cathode



**Remark:**

$V_{CC}$  is compatible with 5V or 24V;  
 $R1(3 \dots 5K)$  must be connected to control signal terminal.

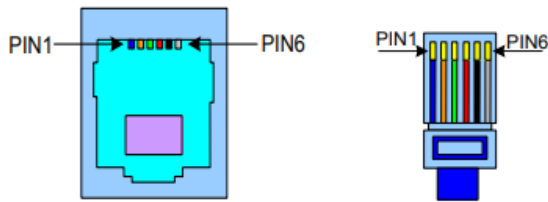
### Connections to Differential Signal



**Remark:**

$V_{CC}$  is compatible with 5V or 24V;  
 $R1(3 \dots 5K)$  must be connected to control signal terminal.

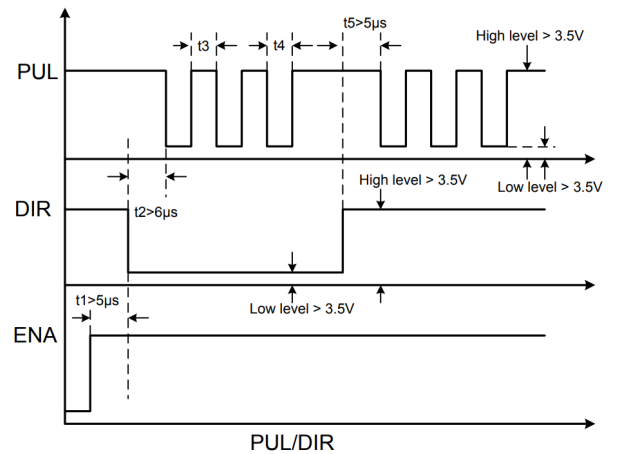
## Connections to 232 Serial Communication Interface



Crystal Head foot	Definition	Remark
1	TXD	Transmit Data
2	RXD	Receive Data
4	+5V	Power Supply to HISU
6	GND	Power Ground

## Sequence Chart of Control Signals

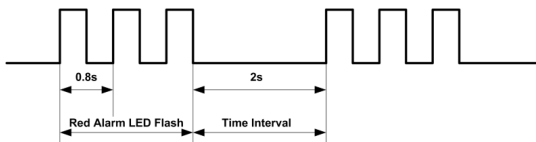
In order to avoid some fault operations and deviations, PUL, DIR and ENA should abide by some rules, shown as following diagram:



### Remark:

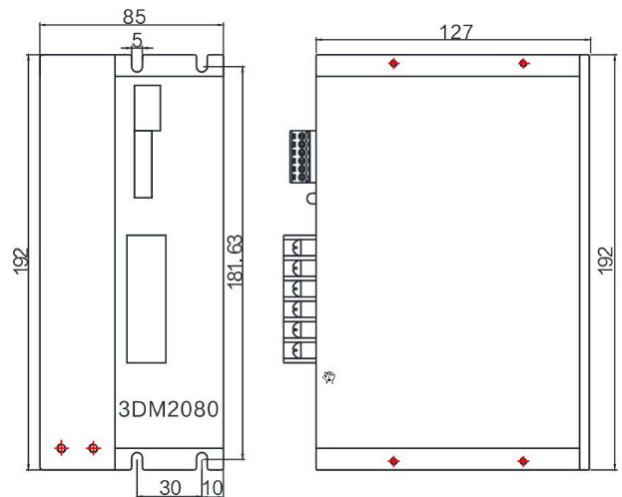
- $t_1$ : ENA must be ahead of DIR by at least  $5\mu s$ . Usually, ENA+ and ENA- are NC (not connected).
- $t_2$ : DIR must be ahead of PUL active edge by  $6\mu s$  to ensure correct direction;
- $t_3$ : Pulse width not less than  $2.5\mu s$ ;
- $t_4$ : Low level width not less than  $2.5\mu s$ .

## Faults alarm and LED flicker frequency



Flicker Frequency	Description to the Faults
1	Error occurs when the motor coil current exceeds the drive's current limit.
2	Voltage reference error in the drive
3	Parameters upload error in the drive
4	Error occurs when the input voltage exceeds the drive's voltage limit.
5	Wrong wiring of motor.

## Appearance and Installation Dimensions



## Current Setting

Dial switch Current	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

## Standstill current Setting

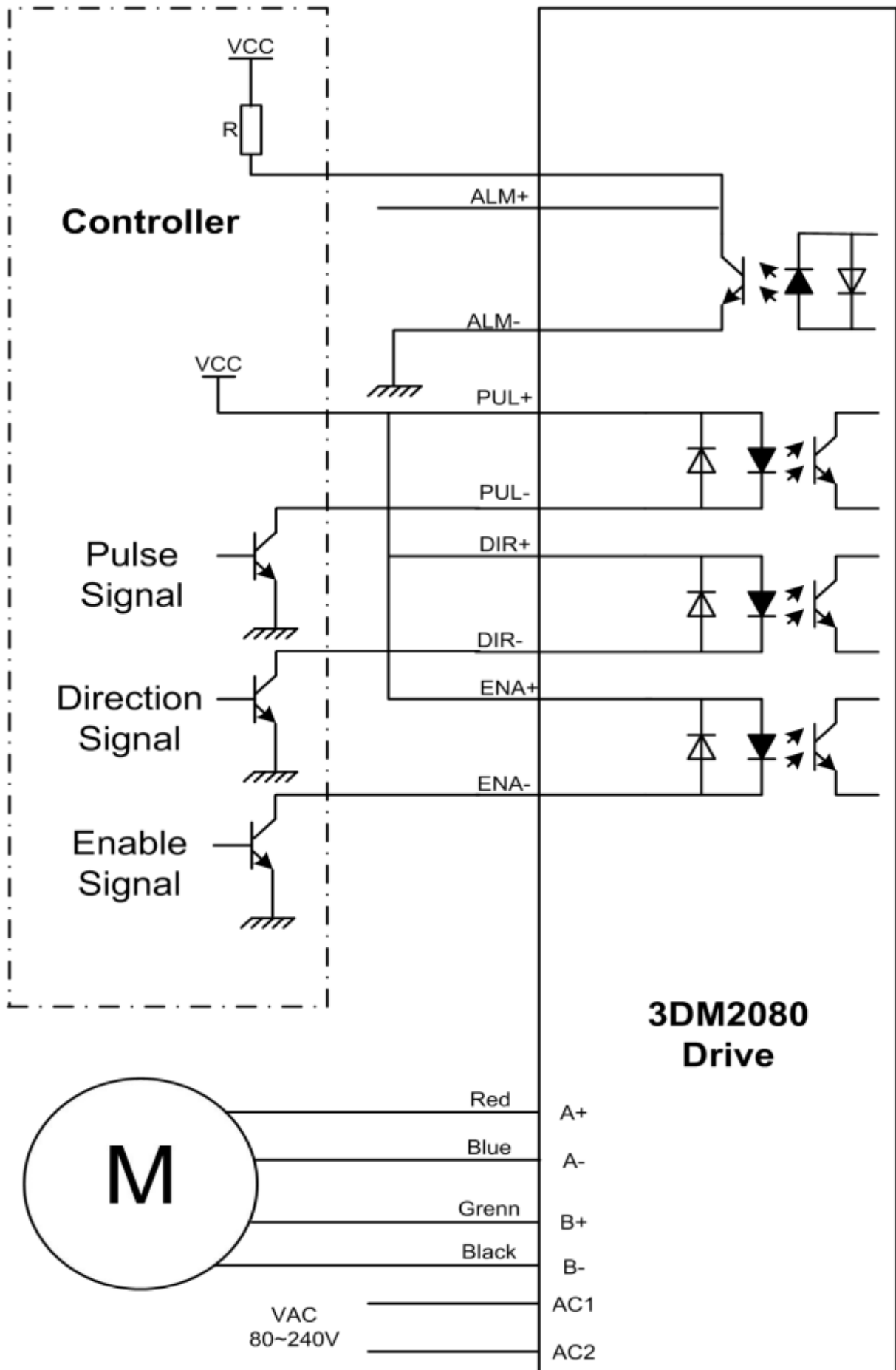
SW4 is used for setting the standstill current , “off” means the standstill current is set to be half of the selected dynamic current or other current, which can be set by the HISU, the details can be seen in the tenth sections. while “on” means the standstill current is set to be the same as the selected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

## Micro steps Setting

Dial switch Micro steps	SW5	SW6	SW7	SW8
400	0	0	0	1
500	0	0	0	1
600	1	0	0	1
800	1	0	0	0
1000	0	1	0	1
1600	0	1	0	0
2000	1	1	0	0
3200	0	0	1	0
4000	1	0	1	0
5000	1	1	0	1
6000	0	0	1	1
6400	0	1	1	0
7500	1	0	1	1
8000	1	1	1	0
10000	0	1	1	1
30000	1	1	1	1

## Typical Connection

Here is the typical connection of 3DM2080.



## Parameter Setting

The parameter setting method of 3DM2080 drive is to use a *HISU* adjuster through the *RS232* 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.

Mode	Definition	Range	Dimension	Drive Restart	Default Value
<b>P1</b>	Current loop $K_p$	0 – 4000	1	Y	4000
<b>P2</b>	Current loop $K_i$	0 – 1000	1	Y	100
<b>P3</b>	Damping coefficient	0 – 500	1	N	100
<b>P4</b>	See the inductance of motor by motor self-test		0.1mh		
<b>P5</b>	Reserved				
<b>P6</b>	Amplitude of resonance point	0 – 1000	0,001	N	10
<b>P7</b>	Phase of resonance point	0 – 1000	0,001	N	50
<b>P8</b>	Reserved				
<b>P9</b>	Reserved				
<b>P10</b>	Enable signal level	0 – 1	1	N	1
<b>P11</b>	Reserved				
<b>P12</b>	Alarm out level	0 – 1	1	Y	1
<b>P13</b>	Command Type	0 – 1	1	Y	0
<b>P14</b>	User-defined micro steps	4 – 1000	50	Y	0
<b>P15</b>	Time of standstill current	0 – 4000	1ms	Y	1000
<b>P16</b>	Percentage of standstill current	0 – 100	1	Y	50
<b>P17</b>	Speed smoothness	0 – 10	1	Y	0
<b>P18</b>	Enable of position memory	0 – 1	1	Y	1
<b>P19</b>	User-defined inductance of motor	0 – 100	mh	Y	0
<b>P20</b>	User-defined resistance of motor	0 – 100	0.1Ohm	Y	0
<b>P21</b>	Result of position memory	0 – 128	1		0
<b>P22</b>	PUL filter	0 – 10	1	Y	3
<b>P23</b>	Lack phase detect enable	0 – 1	1	Y	0
<b>P24</b>	Initial current saturation	0 – 10	0,1A	N	2
<b>P25</b>	Erase DSP				

There are total 25 parameter configurations, use the *HISU* to download the configured parameters to the drive, the 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  $K_p$  at the moment of power-on. If you set the  $K_p$  is 500, the  $K_p$  and  $K_i$  is got by the Self-tuning algorithm. But when you set the  $K_p$  is not 500, the  $K_p$  and  $K_i$  is the values which you set.

#### 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 & Phase (P6,P7)

3DM2080 Driver provides robust anti-resonance control to stop the vibrations and maintain equilibrium. Amplitude and Phase is adjustment for resonance, and compensate torque in high speed.

## Enable signal level (P10)

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

## Alarm out level (P12)

This parameter is set to control the Alarm output signal level. 0 means the transistor is cut off when the drive is alarm, but when it comes to not, the transistor becomes conductive. 1 means opposite to 0.

## Command Type (P13)

This parameter is set to choice the PUL/DIR mode or CW/CCW mode. 0 means *PUL/DIR* mode, while 1 means *CW/CCW* mode.

## User-defined micro steps (P14)

This parameter is set of user-defined micro steps. The actual micro steps = the set value  $\times 50$ . For example, if the parameter is  $P14 = 4$ , the micro steps is  $4 \times 50 = 800$ . But  $P14 = 0$  means micro steps is set by the outer DIP switches.

## Time of standstill current (P15)

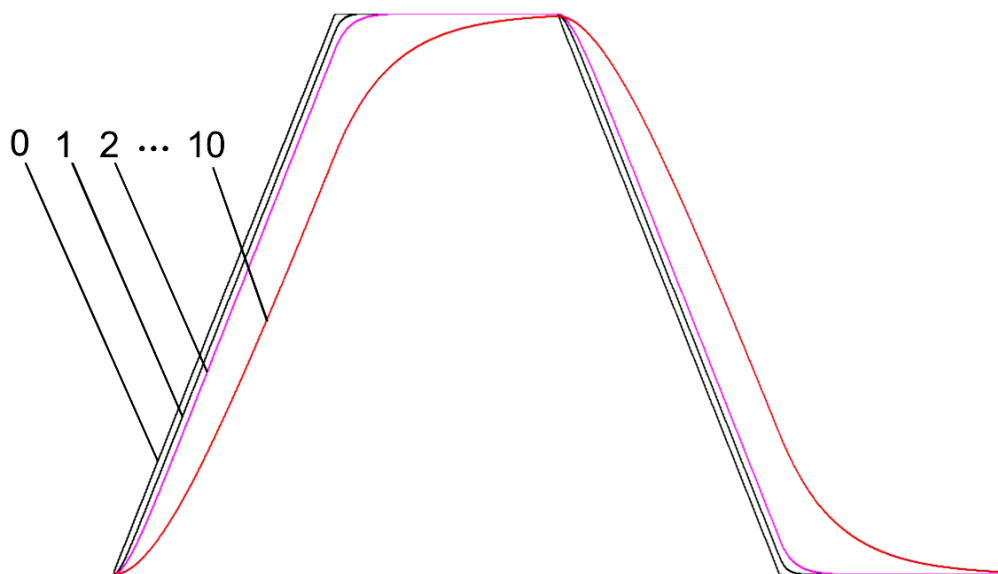
This parameter is set the time when the standstill current is set to be half of the selected dynamic current or other current.

## 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.  $P18 = 0$  means disable, while  $P18 = 1$  means enable. If set 1, the 3DM2080 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.  $P19 = 0$  means 3DM2080 gets the inductance by control algorithm of Parameter auto-setup, while  $P19 > 0$  means 3DM2080 gets the inductance through user sets.

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

This parameter is set the resistance of motor.  $P20 = 0$  means 3DM2080 gets the resistance by control algorithm of Parameter auto-setup, while  $P20 > 0$  mean 3DM2080 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.

### **PUL filter (P22)**

This parameter is set the filter coefficient of PUL.

### **Lack phase detect enable (P23)**

This parameter is to enable the function of lack phase test. 0 means enable, 1 meas disable.

### **Initial current saturation (P24)**

This parameter is to set the Initial current saturation.

### **Erasure DSP (P25) !!!**

*If this parameter is 25, The DSP will be erased.*

---

## **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.