



# **DP-708/DP-5022 Stepper Driver**

**User's Manual**



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## 1. Summary

DP-708/DP-5022 subdivision stepper driver with 80VDC/220VAC input 7.0A /5.0A output current is used for all the 2-phase/3-phase hybrid stepper motor whose rated current is below 7.0A/5.0A. Based on the digital control technology and pure sine wave current control technology, this series product have a good performance in smoothly running with low noise ,meets the high resolution requirement of the numerical control equipments, such as laser marking machine, CNC machine etc.

### 1-1. Characteristic

- Strong anti-interference ability and digital control technology
- Low running noise of motor
- Power supply reaches 80VDC/220VAC
- Effective value of current up to 7.0A/5.0A
- Dynamic select the subdivision, can up to 300
- The DP-708 driver can match with all the 4/6/8 wires motors whose current is below 7.0 A
- Photo isolation signal input
- Easy to set current, any level selectable
- Over-voltage and over-current protection

### 1-2. Application

It is suitable for small and medium automation devices and instruments, such as aerodynamic marking machine, labeling machine, cutting machine, laser marking machine, small carving tool, CNC machine etc., especially having a perfect performance for the devices need low noise and vibration, high precision and speed.

### 1-3. Electric characters

Item		Min. value	Typical value	Max. value
Power supply	DP-708(VDC)	20	80	80
	DP-5022(VA)	200	220	240
Virtual value of current output	DP-708 (A)	0	—	7
	DP-5022 (A)	0	—	5
Logic current input (mA)		4	7	16
Frequency of stepping pulse (KHz)		0	—	200
Insulation resistance (MΩ)		500	—	—
Environment temperature		0°C~50°C		
Max working temperature		70°C		
Humidity		40%~90% RH (no condensation)		
Vibration		5.9m/s <sup>2</sup> Max		
Storage temperature		-20°C~65°C		

## 2. Operation Guide

Please read the following suggestions carefully before you install the driver.

### 2-1. Safety

- The driver is authorized to be installed and operated by the professional staff.
- Don't turn on the power before connecting to the motor.
- Make sure that the input signals meet the technical requirements.
- Don't make the setting or measure operations on the motor and driver during power on.
- Please do the wiring, installation and parameter setting after power is off for more than 3 minutes.
- Ensure the connection operation is absolutely correct and fixable before you turn on the power, including the power wire, motor cable and signal cable.
- Avoid electromagnetic interference.

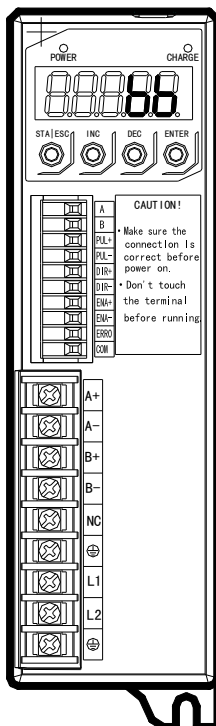
### 2-2. Attention

- Please use shield cable for signal input, and leave each other for distance. The further the distance, the better the interference is avoided.
- Please connect the motor cover to the GND terminal.
- Don't operate on the output terminal when power on, or else the driver will be damaged.

### 2-3. Installation

- Don't install the driver next to the heating devices.
- Don't exposure the driver to the dusty, corrosive gas, high humidity, and strong vibration environment.
- For perfect conducting, the ground cable of PC, driver and motor should contact with the ground for large area.

### 3. Common Terminals



#### 3-1. Control signal terminals

##### 3-1-1. Description of Control signal terminals

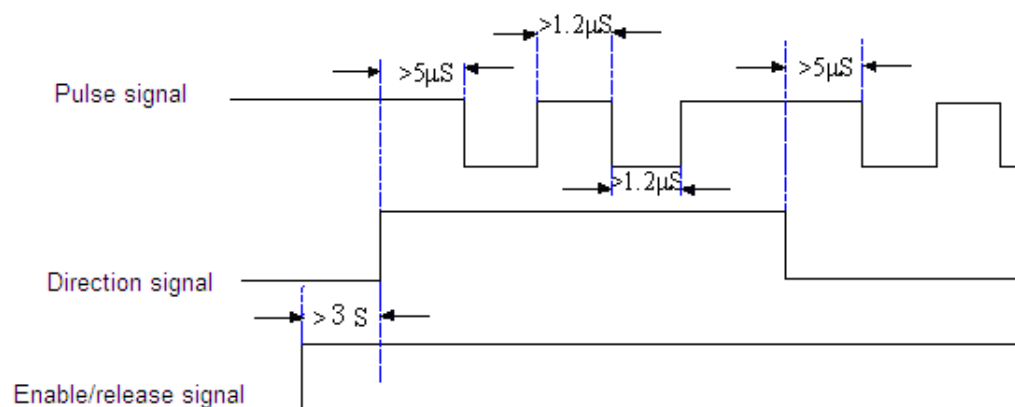
Signal	Function	Description
A	Communication terminal	RS485 communication
B		
PUL+	Pulse control signal	The rising edge is effective; motor moves one step at the rising edge of pulse. PUL high voltage is 24V, low voltage is 0~0.5V.
PUL-		
DIR+	Direction control signal	High voltage 24V and low voltage 0~0.5V correspond to two directions of the motor. Exchanging the signal can change the motor direction. The original direction of the motor depends on the wiring. Exchange any phase wiring can change the motor turning direction.
DIR-		
ENA+	Enable signal	To release the motor. When ENA+ connects to 24V, ENA- connects to low voltage, the driver will cut all phase current of the motor, and the stepper pulse will not be responded. Please let the terminal be vacant if out of use.
ENA-		
ERRO	Error signal output	Output the error signal when the driver is under-voltage or over-voltage.
COM		

### 3-1-2. Sequential chart of control signals

In order to ensure the reliability of the system response, please take the following advices.

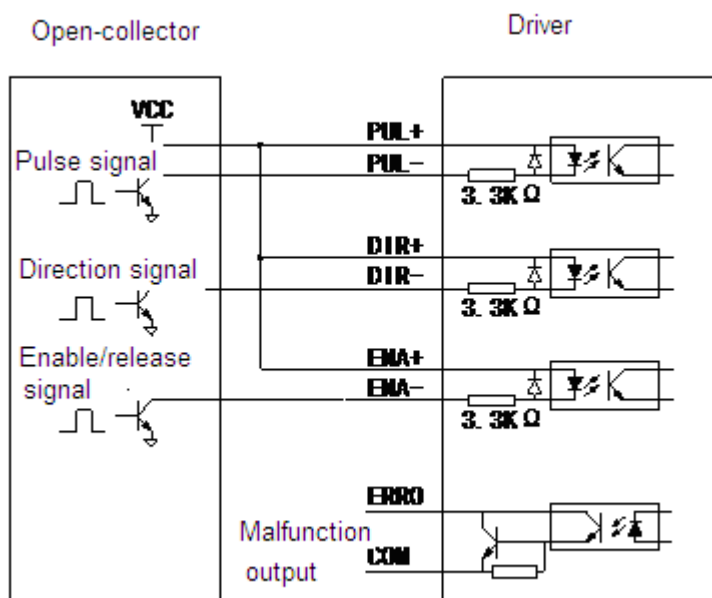
- The signal high voltage is 24V; low voltage is less than 0.5V.
- The ENA (enable) signal should turn to high-level at least 3s before DIR (direction) signal.
- Ensure the falling edge of the DIR (direction) signal is built at least 5 $\mu$ s before PUL (pulse) signal.
- The width of pulse should be more than 1.2 $\mu$ s
- The duration of the pulse low-voltage should be more than 1.2 $\mu$ s

The sequential chart is shown as below:



### 3-1-3. Input circuit

The common positive connection of input circuit is shown as below:



**Note:**

- All the input signals go through the photoelectric isolation. To ensure the well conducting of inside high-speed optical coupler, keep the control signal current



above 8mA.

- Optical coupler current limiting resistor is built in stepper driver. It is common to supply all the control signals with +24V.



### 3-2. Power Terminals

#### 3-2-1. Description of Heavy-current terminal

- DP-708

Terminal	Function	Description
A+, A-	Phase A of motor	Exchanging A+ and A- can change the motor running direction
B+, B-	Phase B of motor	Exchanging B+ and B- can change the motor running direction
NC	-	Vacant
	Ground terminal	Ground of the power supply
L1	Power supply	20VDC ~ 80VDC
L2		
	Ground terminal	Ground of the power supply

- DP-5022

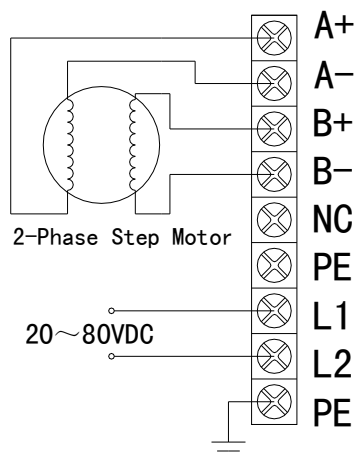
Terminal	Function	Description
NC	-	Vacant
NC	-	Vacant
U	Phase U of motor	Phase U input
V	Phase V of motor	Phase V input
W	Phase W of motor	Phase W input
	Ground terminal	Ground of the power supply
L	Power supply	200 VAC ~ 240VAC
N		
	Ground terminal	Ground of the power supply

#### 3-2-2. Requirement of power supply

- To keep the normal working of drive, please ensure the power supply in this range: DP-708: 20~80VDC; DP-5022: 200~240VAC.
- For DP-708, it is advised to use non-regulated DC power supply, and make sure the current output of power is 60% higher than setting current of driver.
- For DP-708, if use regulated DC power supply, the current of power supply is higher than motor working current.

#### 3-2-3. Wiring

- DP-708

**Note:**

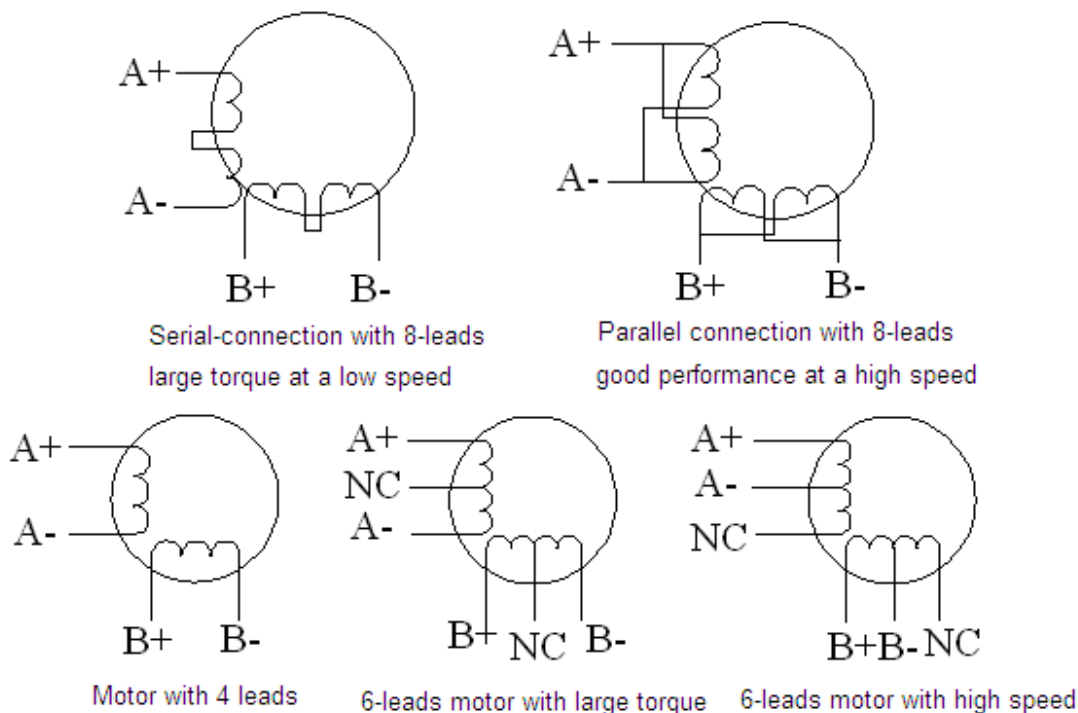
The motor performance depends on the connection between driver and motor. Generally, the high-speed performance of motor depends on the power supply voltage (the higher the power voltage, the higher the high-speed torque, can avoid the step missing), and the output torque depends on the setting current (the greater the setting current, the higher the output torque of motor).

However, please pay attention that the motor is getting hot when the power voltage is higher, and the vibration is obviously big when the motor is running at a low speed.

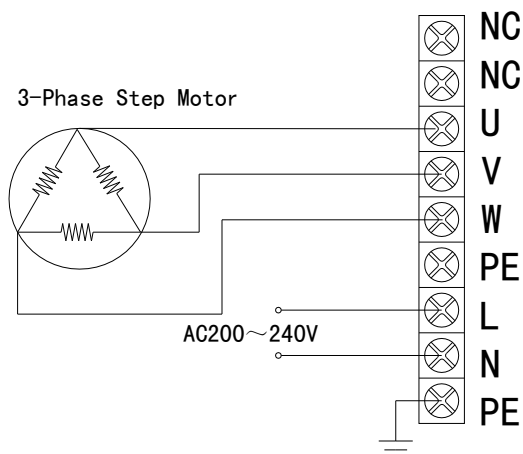
Above all, please do the connection according to the actual requirements.

There are some typical connections for your reference:

- 8-wire parallel connection mode: the setting current is 1.4 times of rated motor current.
- 8-wire serial connection mode: the setting current value is 70% of rated motor current.
- 4/6-wire high-speed mode: the setting current value should be lower than the motor rated current.
- 6-wire high-torque mode: the setting current value should be 70% of the motor rated current.



■ DP-5022



**Notes:**

Generally, the motor high-speed performance depends on the driver power voltage (the bigger the power voltage, the higher the high-speed torque, step loss is avoided effectively), motor output torque depends on the setting current (the larger the setting current, the higher the motor output torque).

However, if the power voltage is large, low-speed running vibration is serious; if the setting current is large, the heating of driver and motor is serious.

**3-3. Function Setting**

The subdivision precision and current can be set through the parameter by the driver panel. For more details please refer to chapter 4-2.

### 3-3-1. Current Setting

Set the current in the range of 0~0.7A/5.0A through the parameter P0-00. Set the half-current or full-current mode through the parameter P0-01.

### 3-3-2. Subdivision Setting

The subdivision precision can be set through the parameter P0-02, for more details please refer to chapter 4-2.

## 4. Digital panel

This chapter describes the basic operation of the digital panel. The digital panel can be used to set parameters and run the motor. Operate the digital panel when you read this chapter.

### 4-1. Basic operation

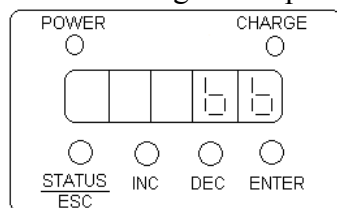
This section provides information on the basic operation of the digital panel for setting operating conditions.

#### 4-1-1. Functions of digital panel

The digital panel can be used to set parameters, display the command and state.

- 5-bit digital tube: display the driver parameter, alarm and status.
- Power LED: it lights when power on.
- Charge LED: it lights when the main circuit is powered on. When power is off, electric charges still stays in the capacitor, and at this time DO NOT touch the stepper driver cables.

The following will explain the button functions of the original digital panel.



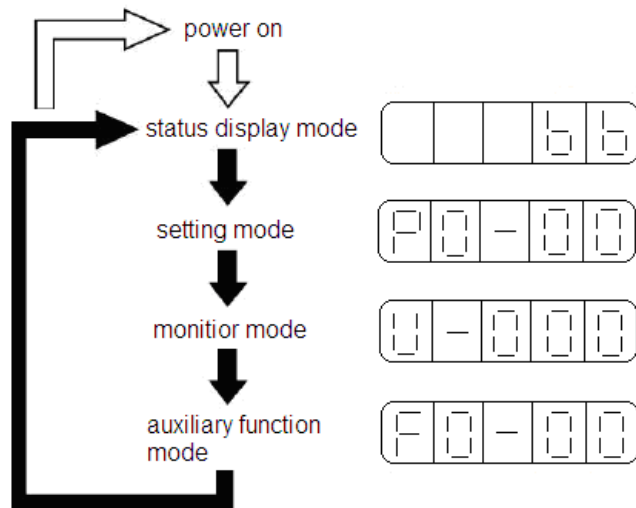
Button	Name	Function
	STATUS/ESC	Press: status switch, status return
	INC	Press: increase the value, Press and hold: Increase the value continuously.
	DEC	Press: Decrease the value; Press and hold: Decrease the value continuously.
	ENTER	Press: Shift; Press and hold: Enter setting and read data mode



### 4-1-2. Basic state switching

Display the running state, set the parameters and run the command through digital panel state switching.

The basic states include running state, monitor state, auxiliary function state, parameter setting state, alarm state (visible when error). The states will change as the following chart after touching the STATUS/ESC button.



Display mode:

- Parameter setting PX—XX: the first X means group No., the last two X means the No. in this group.
- Monitor mode U—XXX: XXX means the monitor parameter NO.
- Auxiliary function mode FX—XX: the first X means group No., the last two X means the No. in this group.
- Alarm mode E—XXX: XXX means the alarm code.

Running state:

	Driver is OFF Driver is in enable off state (panel force enable)
	Running Driver is in enable on state.

### 4-2. Parameter setting

Select the function via parameter setting, the parameters are shown as below:

Modbus address: 0x000~0x005

Table 1 driver parameters

P0-	Name	Unit	Default setting	Setting range	Reference
00	Phase-current (virtual value)	0.1A	10	0~70	
01	Half-current enable		0	0~1	0: Half-current 1: Full-current
02	Pulse number per circle		1600	200~65535	
03	Modbus station NO.		1	1~255	
04	Parameters of serial port		2206	0~2209	Refer to table 2
05	Internal / External Pulse Selection		0	0~1	0: External Pulses 1: Internal pulses

Table 2 Serial port parameters

	Function	Default Setting	Setting Range
P0-04.0	Baud Rate	6	0~9 0: 300 1: 600 2: 1200 3: 2400 4: 4800 5: 9600 6: 19200 7: 38400 8: 57600 9: 115200
P0-04.1	Data Bit	0	0: 8
P0-04.2	Stop Bit	2	0: 2 Bit 2: 1Bit
P0-04.3	Parity Bit	2	0~2 0: None 1: Odd 2: Even

The steps to change the parameters:

The parameter setting is used to change the parameters. Check the permitted range of the parameters in the above table before changing the data.

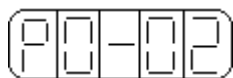
This example shows how to change parameter P0-02 from 8 to 16.

1. Press the STATUS/ESC key to enter parameters setting mode and then press the ENTER key to enter.



2. At this time, the left second LED is blinking, and press ENTER key to confirm, the right two LEDs are blinking, press INC key, DEC key or ENTER key to select NO. 2

press ENTER key and hold to confirm.



3. At this time, the panel displays the value in parameter P0-02, and the “0” at the lowest bit is blinking, press ENTER key to left shift the blinking bit. Press INC, DEC or ENTER key to modify the value to 3200, and press and hold ENTER key to confirm.



Thus, the value in P0-02 is changed from 1600 to 3200.

Please repeat the steps 2 to 3 if need changing the parameter again.

4. Press STATUS/ESC key to return to other group or status.

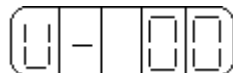
### 4-3. Monitor mode

Monitor the driver state and input command. The monitor state can be changed even when the motor is running.

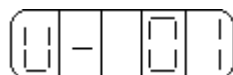
#### ■ Use the Monitor Mode

Display monitor number U-01 state.

1. Press the STATUS/ESC key to enter monitor mode.



2. Press the INC or DEC key to select the monitor number U-01, and then press and hold ENTER to enter.



3. At this time, it displays the value of U-001, the temperature of the module.

4. Press the INC or DEC key to select the monitor number.

5. Press STATUS/ESC key to return to the monitor number display.

#### ■ Contents of Monitor Mode Display

Number	Monitor Display	Unit
U-000	Motor speed	rpm
U-001	Module temperature	0.1°
U-002	Bus voltage	V
U-003	Coil current	0.1A

### 4-4. Auxiliary Function

In auxiliary function state, use the digital panel to do the operations.

Group No.	Description
F0-**	Check system information,display system No.and data
F1-**	Check the alarm information,display the alarm code and the status of the motor
F2-00	Return to default value for all the parameters

F3-00	External communication monitoring
F4-00	Forced enable

#### 4-4-1. Check System Information

Press the STATUS/ESC key to select the auxiliary function mode. Set the group No. to 0 to check system information. Press INC or DEC key to select different No., and press and hold ENTER key to check current information. Press STATUS/ESC key to return.

Information No.:

Code	Description	Code	Description
F0-00	Driver Serial No.	F0-01	Type
F0-02	Date: Year	F0-03	Date: Month
F0-04	Date: Day	F0-05	Software Version
F0-06	Hardware Version		

#### 4-4-2. Check Alarm Information

Set group No. to 1 in auxiliary function and enter alarm information state.

The following steps show how to check alarm information.

1. Press STATUS/ESC key to select Auxiliary Function.
2. Press INC or DEC key to set group No. to 1, and press ENTER key.
3. Press INC, DEC or ENTER key to modify the No.
4. Press ENTER key, display corresponding alarm information.

Code	Description	Unit	Modbus address
F1-00	Current alarm code ※1		0x0305
F1-01	Current warn code ※2		0x0306
F1-02	Alarm/warn code 1 when alarm		0x0307
F1-03	U phase current when alarm	A	0x0308
F1-04	V phase current when alarm	A	0x0309
F1-05	Effective current values when alarm	A	0x030A
F1-06	Bus voltage when alarm	V	0x030B
F1-07	Module temperature when alarm	°C	0x030C
F1-08	Motor speed when alarm	rpm	0x030D
F1-09	Alarm/warn code 2 when alarm		0x030E
F1-10	Alarm/warn code 3 when alarm		0x030F
F1-11	Alarm/warn code 4 when alarm		0x0310
F1-12	Alarm/warn code 5 when alarm		0x0311
F1-13	Alarm/warn code 6 when alarm		0x0312
F1-14	Alarm/warn code 7 when alarm		0x0313

※1: When F1-00=0, indicates that there is no alarm.

※2: When F1-01=0, indicates that there is no warn.

### 4-4-3. Reset Parameters to Default

The following steps show how to reset parameters to default values.

1. Press STATUS/ESC key to select Auxiliary Function.
2. Press INC or DEC key to set group No. to 2, and press ENTER key to confirm.
3. Press and hold ENTER key and 0 is blinking on the digital panel.
4. Set the value to 1. Press and hold ENTER key to confirm.
5. Restart the driver and the parameters are all reset to default values.

### 4-4-4. External communication monitoring

Select F3-00 in auxiliary mode, it displays C-OUT which means external monitor state, serial port 1 (COM1) is available, panel monitor is unavailable. You can debug the driver via PC. Press STATUS/ESC to return and quit C-OUT.

### 4-4-5. Forced enable

Select F4-00 in auxiliary function, then press ENTER and hold to enter the parameter setting status. Press INC and DEC to modify the parameter, press ENTER key and hold to confirm.

- 0: Cancel forced enable
- 1: forced enable

### 4-5. Alarm

The driver will show alarm state when there is error; the alarm state is invisible if no error. E-XXX means system error. EEEEE means digital panel communication error. Press ENTER to reset part of the alarm information.

Please note that clear the error then clear the alarm.

Alarm information is shown as below:

Alarm code	Description	Causes	Solution	Note
E-001	Program Damage	Program self-test failure	Re-download the program or contact Xinje or an authorized distributor	●
E-002	Parameter Damaged	Parameter self-test failure	Restart the driver to reset the parameters to default values. If it happens for many times contact Xinje or an authorized distributor	●
E-003	Bus over-voltage	Power voltage is too high	Check the power voltage	△
E-004	Bus under voltage	Power voltage is too low	Check the power voltage	△
E-005	Module temperature is too high	Driver is working under big current for long time; Ambient	Reduce the current, and enhance the cooling system, or check if the fan is working; decrease the	△

		temperature is higher than normal.	ambient temperature.	
E-006	Over Current	Driver output to motor error or motor error	Change the damaged motor and check motor wiring	●
E-007	System initialize failure	System IC is damaged.	Contact Xinje or an authorized distributor.	●

● Can not clear the alarm information through digital panel, need re-power.

△ Can clear the alarm information through digital panel after remove the error, no need to re-power.

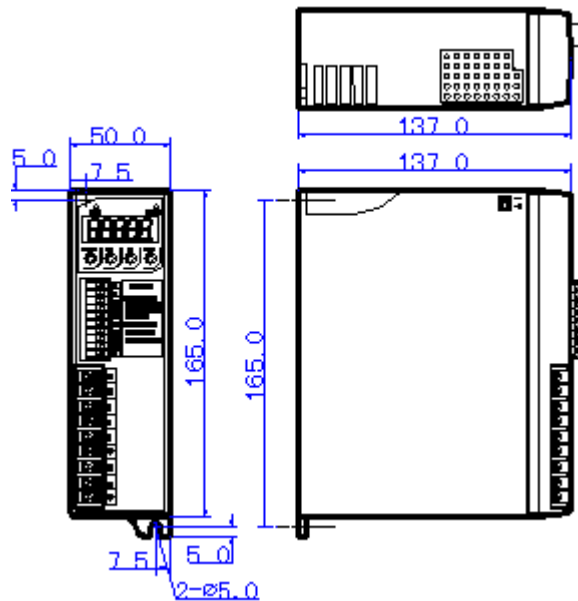
Warning information is shown as below:

Warning code	Description	Note
1	Bus voltage is too high	
2	Bus voltage is too low	
3	Module temperature is too high	
4	Temperature detection is abnormal	
5	Bus voltage detection is abnormal	

## 5. Dimension installation and wiring

### 5-1. Dimension

Unit: mm

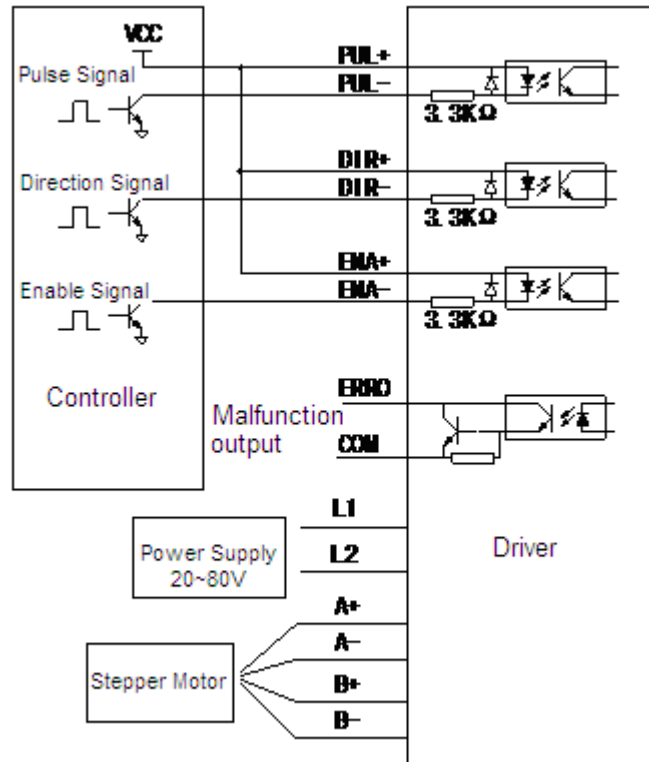


### 5-2. Installation

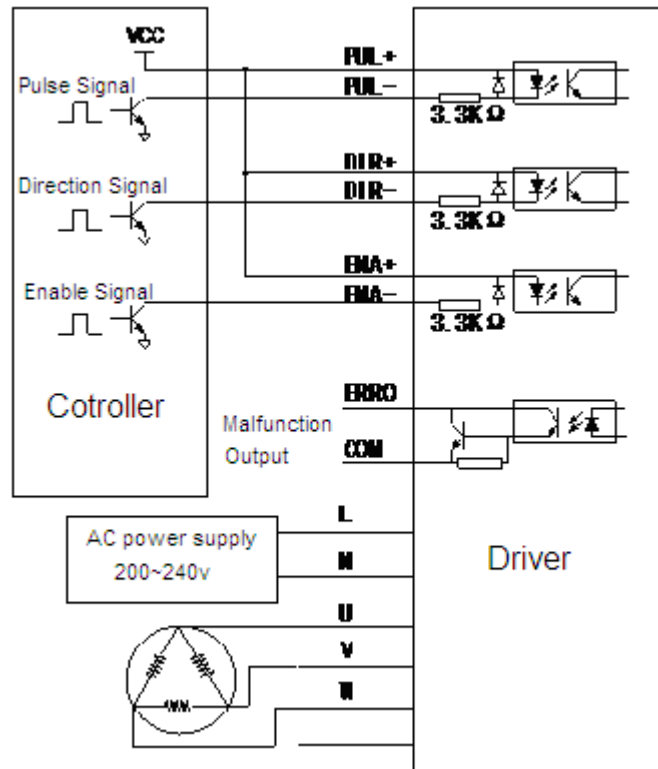
Install the driver in the well-ventilated and protected electric cabinet, check the fan regularly. To ensure the driver heat dissipation is well, keep at least 10cm space when installing. To avoid dust and scrap fall into the driver.

### 5-3. Typical Wiring

#### ■ DP-708



■ DP-5022



**Note:** please separate the power cables (power supply cable and motor phase cable) and the weak electricity cable in order to avoid interference.



## 6. Malfunction Diagnoses and Solution

Malfunction	Causation	Solution
The power light doesn't work	Something wrong with the power supply	Check the power supply
	The power voltage is too low	Increase the power voltage
The motor doesn't work	Setting current is too low	Reset the current
	Subdivision is too small	Reset the Subdivision
	Protection circuit is working	Re-power the driver
	The release signal is low	Do not connect the signal
	Power off	Re-power
	Motor wiring is error	Check the wiring
	No pulse input	Adjust the pulse width and signal voltage
The direction of motor is incorrect	Inverse of phase-sequence	Exchange the phase-sequence
	Disconnection	Check the wiring
Alarm indicator lights	Motor wiring is wrong	Re-wiring
	The voltage is too low or high	Adjust the power voltage
	Motor or drive is damaged	Check the driver and motor
Motor torque is too small	Acceleration is too high	Reduce the acceleration value
	Driver doesn't match with the motor	Change the driver

## **7. Motor Selection**

The DP-708 series driver matches with 4/6/8 wires 2-phase hybrid stepper motor. Please select the suitable motor and driver.

The DP-5022 series driver matches with 3/6 wires 3-phase hybrid stepper motor. Please select the suitable motor and driver.

Please pay attention to the torque and rated current when choosing a motor. The torque depends on the motor dimension, the bigger the dimension, and the greater the torque. And the current depends on the resistor, the smaller the resistor, the greater the current, and the motor will have good performance at high speed.

But for certain connection motor, the bigger the working current, the greater the torque, the motor heating is serious; the higher the driver power voltage, the bigger the motor high-speed torque. The high-speed torque of motor is smaller than low-speed torque.

