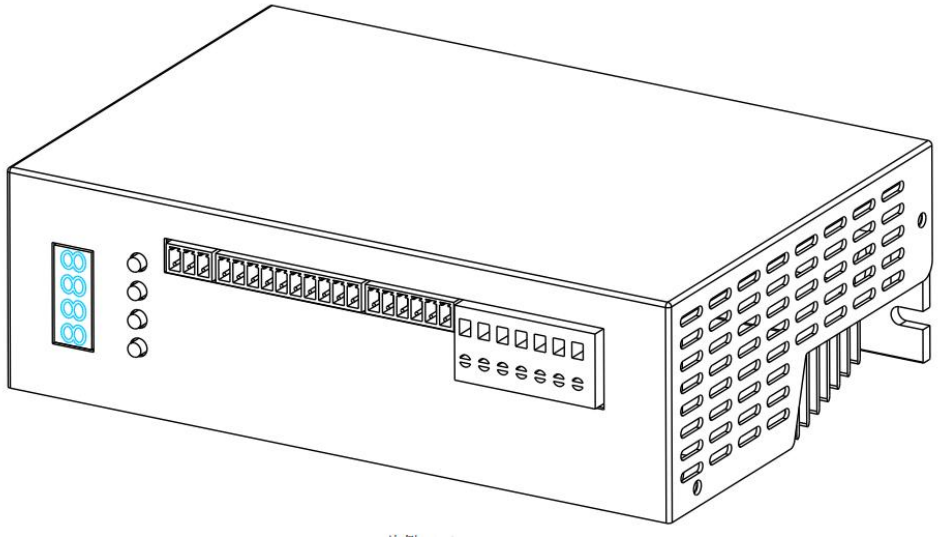
User Manual for Two-Phase High Voltage Stepping Driver DL2822 H

[Please read this manual carefully before use to prevent damage to the drive]



Focus Stepping, Servo and Motion Control

catalogue

I. Introduction

The DL2822H is an ARM-based high-performance two-phase hybrid stepper motor driver operating on AC 110V-240V. Designed for motors with effective currents below 8.0A and outer diameters ranging from 86mm to 130mm, it delivers smooth operation with minimal vibration and noise, while providing high output power and precise positioning accuracy.

This driver features a digital display with parameter-setting buttons, allowing customizable subdivision settings and real-time adjustment of rigidity. It is ideal for small to medium-sized automated equipment and instruments such as woodworking cutoff machines, harness processing machines, laser cutters, high-speed plotters, CNC machine tools, and automated assembly systems. Particularly effective in applications requiring low noise levels, smooth operation, and rapid response times.

technical feature

- Using 32-bit motor dedicated control chip;
- Adopt advanced vector closed-loop control technology;
- LED digital tube display, convenient for parameter setting, monitoring running parameters;
- In open-loop mode, 8 levels of optional operating current are provided (range 2.5-8.0A);
- Can be adapted to drive 86,110,130 series two-phase hybrid stepper motor;
- Photoelectric isolation signal input/output;
- Provides 224V pulse signals and direction signals;
- Pulse response frequency 200KHz;
- Provides 16 general subdivision options, up to 256 subdivisions (51200 pulses/rev);
- Provide electronic gears (any subdivision value) that match various pulse sources;
- Overcurrent, overheating, overpressure and other protection;
- The driver is integrated with closed-loop function and the default control mode is open-loop;
- The closed-loop mode can be adapted to 1000,2000 and 2500 line encoders.

II. Electrical, Mechanical and Environmental Indicators

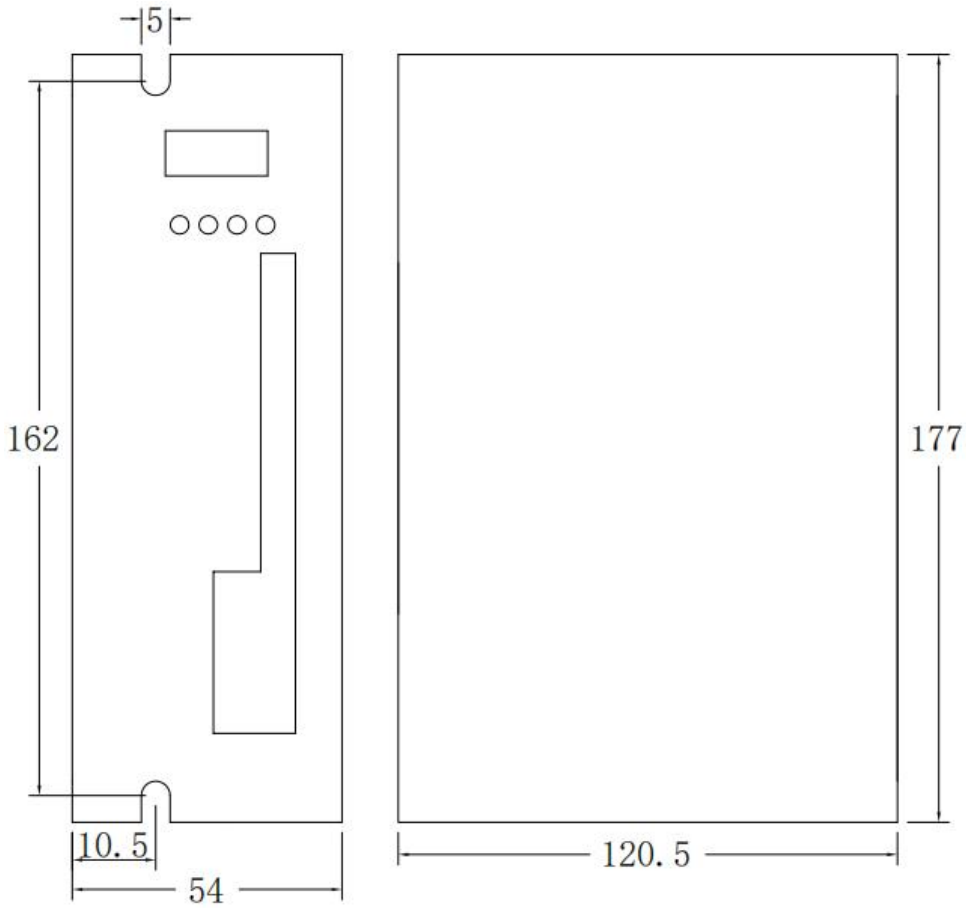
2.1 Electrical Indicators

parameter	least value	representative value	crest value	unit
Continuous output current	0.4	-	8	A
Input power voltage (AC)	80	220	265	AC
Logic input current	7	10	20	mA
impulse frequency	0	-	200	kHz
insulation resistance	500			MΩ
Provide encoder current			50	mA

2.2 Usage Environment and Parameters

cooling-down method	Built-in cooling fan cooling (when the radiator temperature exceeds 40℃, the fan starts to work)	
service environment	Where it is used	Avoid dust, oil mist and corrosive gas
	temperature	-10℃～50℃
	humidity	40～90%RH
	shake	5.9 m/s^2 Max
Storage temperature	-20℃～+70℃	
weight	1450 grams	

2.3 Mechanical Installation Dimensions (unit Mm)



Note: Keep the drive well cooled

(1) The reliable working temperature of the driver is usually within 60℃, and the working temperature of the motor is within 80 ℃;

(2) When installing the driver, try to install it vertically and sideways, away from heat sources and do not block the air duct of the fan. If necessary, install cooling and ventilation fans on the electrical cabinet where the driver is installed to ensure that the air inside and outside the electrical cabinet flows, so as to ensure that the driver works within the reliable working temperature range.

III. Introduction of Driver Port and Wiring

3.1 Port Definition, Lead Color Description

3.1.1 Motor and Power Input Port

Port number	symbol	name	Lead color description
1	A+	A phase winding +	black
2	A-	A phase winding -	green
3	B+	B phase winding +	red
4	B-	B phase winding -	blue
5	PE	Motor ground wire	Kelly
6	PE	Size of chassis	Kelly
7	L	power input	AC80~ 265V
8	N	power input	

3.1.2 Encoder Signal Input Port (this Port Is Enabled in Closed-Loop Mode)

Port number	symbol	name	Lead color description
1	EB+	Motor encoder B phase positive input	blue
2	EB-	Motor encoder B phase negative input	Blue and black
3	EA+	Motor encoder A phase positive input	green
4	EA-	Motor encoder A phase negative input	Greenish black
5	VCC	Encoder power + 5V input	red
6	EGND	Encoder power ground	black

3.1.3 Control Signal Port

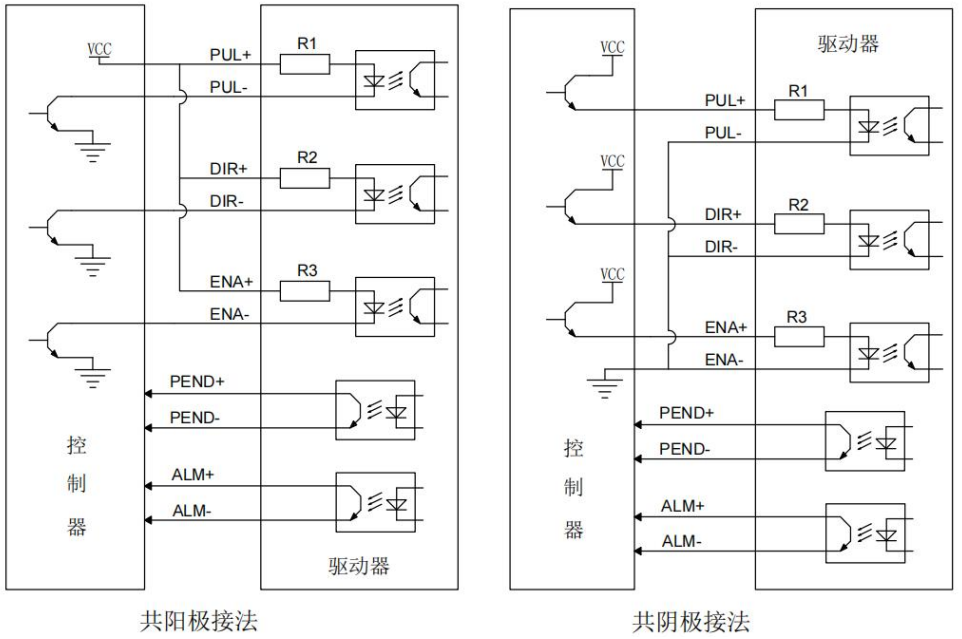
Port number	symbol	name	explain
1	5PUL+	Pulse is positive input	5V～24V compatible
2	PUL-	Pulse negative input	
3	5DIR+	The direction is set to positive	5V～24V compatible
4	DIR-	Negative directional input	
5	ENA+	Motor enables positive input	When this signal is effective, the motor is in free state and not locked
6	ENA-	Motor enables negative input	
7	Pend+	The in-phase signal is output	After the motor is in place, the driver outputs a signal to the host computer (this port function only works in closed-loop mode)
8	Pend-	Positive output of the in-position signal	
9	ALM+	The alarm signal is being output	After the driver fault protection, the output signal is sent to the host computer
10	ALM-	Alarm signal negative output	

Note: When the driver is faulty, the ENA signal is valid and the driver will clear all faults.

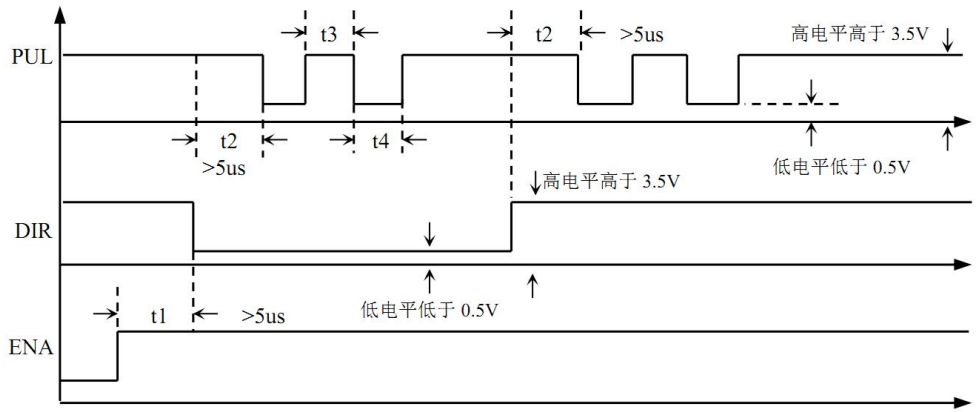
3.1.4 24V Signal Port

Port number	symbol	name
1	24PUL+	24V Stepping Pulse Positive Input
2	24DIR+	24V directional signal positive input

3.2 Control Signal Interface Circuit Diagram



3.3 Input Signal Waveform Timing Diagram



IV. Parameter Setting

The driver's operation panel consists of four LED digital displays and four keys↩、↓、↑、↵ Composition, used to display various system states, parameter Settings, etc.

Key function description table

key	function declaration
↩	Exit, cancel operation; used to return to the previous page and end parameter input status
↓	When the page is turned down and the value is changed, the data size of the current bit is adjusted
↑	Page up, a shift operation used for data bits when the value is changed
↵	Enter parameter modification mode, parameter modification confirmation, long press for 3 seconds

When powered on, the drive displays its current version number. Three seconds later, it shows the device's status (0 for standby operation, with fault codes displayed during malfunctions). In normal operation mode, real-time motor speed (revolutions per minute) is displayed. When reversing direction, the leftmost digit (highest position) of the display blinks. During multiple fault alarms, corresponding error codes are displayed in alternating flashing patterns.

4.1 Description of Parameter Functions

The driver provides two parameter groups for user operation. The P0 group is used to set several conventional parameter values of the driver (such as subdivision, lock current, motor type, etc.), and the P1 group is used to set performance parameter index values of the driver. See the following table for details. In open-loop mode, the green highlighted parameter group is valid.

4.1.1 Parameter Function Table

parameter	name	Scope of parameters	explain
P000	controlling parameter	～	Set a specific value to correspond to a specific function. See 4.2.2 P000 Settings for details
P001	Sub-division options	SEt ，2～256	16 Category general subdivision, 1 category arbitrary subdivision
P002	Motor running direction selection	0、1	Motor forward and reverse setting
P003	Motor type selection	8、10、12、16、20、50	Select the motor according to the motor torque
P004	Positioning error limit value	1～9999	System default 4000
P005	Percentage of lockout current	0～100%	System default 50%
P006	Gear gear frequency molecules		This value cannot be set to 0 and is by default 1
P007	Electronic gear frequency division denominator		This value cannot be set to 0 and is set to 1 by default
P020	Low input pulse count 4 bits	～	Used to display the total number of external input pulses, and separate the high and low bits.
P021	Input pulse count high 4 bits	～	
P100	Percentage of operating current	10～120%	*
P101	Current loop ratio coefficient	1～1000	**Factory Settings, do not modify**
P102	Integral coefficient of current	1～1000	**Factory Settings, do not modify**
P103	Current loop damping coefficient	1～1000	**Factory Settings, do not modify**
P104	Speed ring ratio coefficient	1～1000	*
P105	Speed ring integral coefficient	1～1000	*
P106	Positional ring ratio coefficient	1～1000	*
P107	Speed loop feedforward coefficient	1～100	*
P108	Driver internal enable	0、1	*
P109	Speed ring damping coefficient	1～100	*
P110	Input and output level Settings	Corresponding bit 0/1	See 4.2.3 P110 Settings for details

P111	positioning accuracy	1～50	By default, it is 1 and the positioning error is ±1 pulse
P112	Resonance factor	1～12	The default value is 6
P200	Operation mode selection	Default value 3	See 4.4 Driver Mode Description for details
P201	Speed Settings	Default 60	Speed mode, RPM setting, RPM
P202	Acceleration time	100ms	Speed mode, acceleration and deceleration time, ms
P203	Delayed release of brakes	Default 0	See 4.2.4 P203 Settings for details
P204	Control mode after alarm	0、1、2	See 4.2.5 P204 Settings for details
P300	Current value in open loop mode	5.2A	P200 is valid in open loop mode 3
P301	After power on, return to the initial position	0	Set to 1, and the motor returns to its initial position after power on.
P304	Encoder type selection	1000	1000,2000,2500
P305	Overload time	160	Set 0 to cancel the overload alarm (unit: seconds)

Note: The default current loop parameters, speed loop parameters and position loop parameters of the driver are the best parameters of the matching motor, and customers generally do not need to modify them. If customers have special application environment, they can modify the parameters with * under the guidance of professionals to achieve the best use effect.

4.1.2 Internal Subdivision Table of the Driver (values in P001)

Fraction	SEt,2,4,5,8,10,16,20,25,32,40,50,64,100,128,200,256

pay attention to：

1、 When calculating the pulse equivalent, the host computer should use the fraction in Table 4.1.2 ×200 to obtain the subdivision value in the unit of pulse/revolution.

2、 The closed-loop drive system can not simply change the operation direction of the motor by replacing the motor wire. If the operation direction of the motor is inconsistent with the given direction, change the value in parameter **P002** to change the direction.

3、 When the subdivision value selected in P001 is SEt, the driver subdivision is defined using an electronic gear variable. This mechanism allows the unit pulse command input to the driver to move the transmission system over any distance. The pulse commands generated by the upper-level controller do not require consideration of the transmission system's gear ratios, reduction ratios, or motor encoder wire count. It can be easily matched with various pulse sources to achieve the user's desired control resolution (angle/pulse).

Calculation formula: **P×G= N×C×4**

P: Number of pulses for input command

G: Electronic gear ratio:

$$G=\frac{\text{Frequency Division Molecules}}{\text{Denominator of the Fraction}}$$

N: the number of motor rotations, C: the number of photoelectric encoder lines per revolution. In this system, C = 1000. For example, when the upper controller outputs 6000 command pulses, the motor rotates 1 revolution

$$G=\frac{N*C*4}{P}=\frac{1*1000*4}{6000}=\frac{2}{3}$$

Then parameter P006 is set to 2 and P007 to 3. The above results are calculated by mathematical reduction, trying to take the least common divisor. The recommended range of electronic gear ratio is:

$$\frac{1}{20}\le G\le 20$$

4.2 Parameter Setting

4.2.1 Setting of User Parameter Value Group P0

In standby mode, hold down the"↵"Press key for 3 seconds to enter the P parameter setting mode, and display the first parameter **P001** (subdivision selection). Press"↓"、"↑"Enter the page to select the type of P parameter you want to change. For example, if you need to change the fraction value, under the P001 status, press again the"↵"Enter, the digital tube displays the current subdivision value, long press"↵"Press the key for 3 seconds to enter the modification state, at which time the current subdivision value flashes. Through"↓"、"↑"Press the key to flip the page to select the desired subdivision value. Hold down the"↵"Press the button for 3 seconds to confirm that the value stops flashing and the subdivision change is complete. Press"⮌"Key returns.

P001 subdivision parameters, **P002** motor direction selection and **P003** motor type selection are three types of parameters that the driver has already prepared the corresponding values for. You only need to pass through"↓"、"↑"Use the page-turning keys to select the desired values. The **P004** and **P005** parameters can be set to any value according to the equipment's requirements. When entering the corresponding configuration interface, press the"↑"The key selects the number of digits (ones, tens, hundreds, and thousands) to be changed, and then presses"↓Adjust the data size of the position (changing from 0 to 9). All other P parameters are set through the"↓"、"↑"Press the key to flip the page to select.

Note: After parameter modification, the display interface jumps back to the current P parameter sequence number.

4.2.2 P000 Parameter Description

P000 is the control parameter. Setting a specific value will correspond to a specific function. The power-on parameter of the driver is set to "0000" by default. The following table lists the functions corresponding to the specific values.

P000 parameter setting value	function declaration
“1111”	The driver restores factory default parameters
“0100”	The software turns on the drive fan
“0101”	Display the real-time speed of the motor (default when the driver is powered on)
“0102”	Real-time display of the internal DC bus voltage of the drive
“0103”	Real-time display of internal temperature value of the drive
“0104”	Real-time display position error
“0105”	Query the drive production date
“0106”	View the drive historical failures. 1 is the latest failure
“0200”	The driver enters self-test mode

Note: Set P000 to "0200" and the driver enters self-test mode. The motor rotates at a default speed of 60 RPM.↓”、“↑"The key can reduce and increase the speed, the speed range-300 ~ +300 rpm, the digital tube real-time display of motor speed,"⮌"Key to disable test mode.

4.2.3 P110 Parameter Description

P110 is the input/output I/O port level setting. The default parameter value is "0020". The description is as follows:

highest order	ENA enable level	0: External low-level enable; 1: External high-level enable
Next high	PUL level selection	0: Pulse + direction mode, triggered by the falling edge; 1: Pulse + direction mode, rising edge trigger; 2: Dual-pulse mode, triggered by the falling edge; 3: Dual-pulse mode, triggered by rising edge.
Next low	Pend to position level	Default value: 2, **control brake** (normally closed output); 0: Run high resistance, **low resistance when in position**; 1: Run low resistance, **high resistance when in position**
lowest order	ALM fault level	0: Normal high resistance, fault low resistance; 1: Normal low resistance, fault high resistance. When set to 1, ALM can also be used to control the brake.

4.2.4 P203 Parameter Description

When the motor is connected to the brake, the brake signal is controlled by the Pend output pin by default. P203 controls the brake

Vehicle release delay time, unit ms.

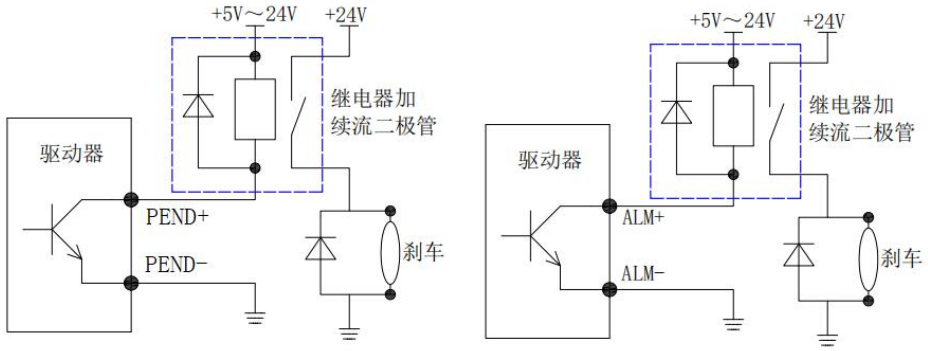
parameter	parameter values	parameter declaration
P203	0	The driver PWM wave output is normal and the brake is released after the motor is fully excited. It responds to external pulse signals and encoder feedback.
	200	After the driver PWM wave output is normal and the motor is fully excited, the brake is released after a delay time, and the external pulse and encoder feedback are responded to.

Brake motor wiring method:

When the brake coil operates, it generates significant inrush current. Directly connecting the coil to the driver's output port could damage the optocoupler, making relay-based control essential. Since both the brake coil and relay coil are inductive loads, it's recommended to install diodes (such as standard rectifier diodes like IN4007) with proper polarity. Note: Diode polarity must be correctly connected to ensure safe operation.

It is recommended that customers use solid state relay, no need to add diode, solid state relay advantages: fast response speed, no need to add diode, no sound when switching on and off:

The relay wiring is shown in the following figure:



If alarm output multiplexing is used to control the brake, the alarm output bit needs to be changed to **normally closed** state.

4.2.5 P204 Parameter Description

P204 Control mode setting after driver alarm, the default value is 0, as follows:

parameter	parameter values	parameter declaration
P204	0	By default, after the alarm, the driver turns off the PWM output and does not operate the motor

		control 。
	1	After the driver alarm, the motor is controlled by PWM with constant current output. After 3 seconds, the current starts to decrease gradually and the PWM output stops. To prevent the risk of workpiece hitting the equipment due to inertia during the alarm.
	2	After the driver alarm, the motor is controlled by PWM with constant current output. After 3S, the system clears the fault and restarts. If there is still a fault after clearing twice, it will not restart.

Note: When the overcurrent alarm is set, no PWM output is generated for any value.

When P204 is set to 1, the system has a non-01 alarm and the driver does not immediately release the motor, which can prevent the risk of inertia impact on the workpiece.

4.3 Driver Alarm Code

When the driver fails, the corresponding fault code will be displayed in a flash. If there are multiple alarms, they will be displayed in rotation.

4.3 List of Alarm Codes

Alarm code	Alarm Name	Alert content
Er 01	excess current	The motor current is too large (driver internal short circuit or motor wire short circuit)
Er 02	exceed the speed limit	Motor speed exceeds maximum limit (maximum 3000 rpm)
Er 03	Location is off the mark	The position deviation value exceeds the P004 set value. Possible situation: 1、 The phase of encoder wire and power wire is wrong; 2、 The acceleration time is too short, the speed is too fast to cause the motor response can not be met; 3、 The motor torque is small and can not drive the load (stall).
Er 04	Driver overheating	The driver temperature exceeds the set value (maximum 80℃)
Er 05	DC overvoltage	The input voltage of the main circuit exceeds the set value
Er 06	EPROM wrong	EPROM read/write error
Er 07	Overload alarm	Motor blockage (not reaching the set position for a long time)
Er 08	Motor connection fault	Motor wiring error or motor wire break (missing phase)

When the driver is running in open-loop mode, the alarm codes generated are Er01, Er04, Er05, Er06 and Er08

4.4 Driver Operation Mode Settings

P200 parameter, the driver can set 4 operating modes, as follows:

parameter	parameter values	parameter declaration
P200	0	Full closed mode (position mode)
	1	Speed mode (I/O mode)
	2	Closed-loop mode of the merit corner (position mode)
	3	In the open-loop step mode, the current value is set through P300 parameter

After the parameters are set, the driver needs to be re-powered for the Settings to take effect.

4.4.1 Full Closed Mode: When P200=0, the Driver Rigid Parameter Adjustment Is as Follows:

parameter	parameter name	parameter declaration
P104	Speed ring ratio coefficient	The larger the set value, the higher the gain and the greater the rigidity.
P105	Speed ring integral coefficient	The smaller the set value, the faster the integration speed, the stronger the system resistance to deviation, and the greater the rigidity. Too small is easy to produce overshoot.
P106	Positional ring ratio coefficient	The smaller the set value, the higher the gain, the greater the rigidity, and the faster the position tracking. However, too small a value may cause motor oscillation or overshoot.
P107	Speed loop feedforward coefficient	The larger the set value, the faster the corresponding external speed is tracked, and the greater the rigidity, with a maximum value of 100.

4.4.2 Under the Closed-Loop Mode and Open-Loop Mode of the Working Angle, the Driver Rigid Parameter Is Adjusted as Follows:

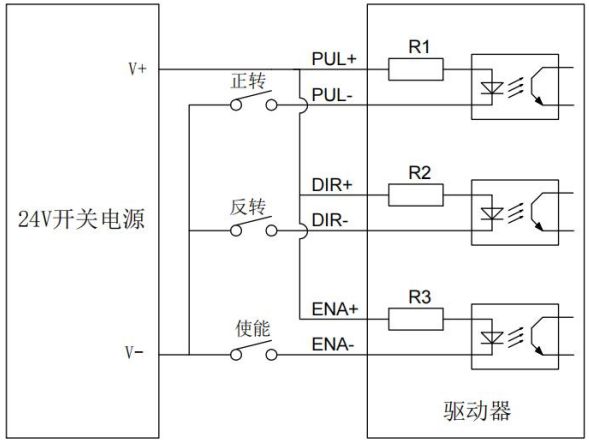
parameter	parameter name	parameter declaration
P104	Speed ring ratio coefficient	The default value is 10. The larger the value, the slower the response speed and the weaker the rigidity
P106	Positional ring ratio coefficient	The default value is 25. The larger the value, the slower the response speed and the weaker the rigidity

4.4.3 Speed Mode (I/O Mode)

When P200 is set to "1", the driver operates in speed mode. P201 and P202 are valid in mode mode. P201 sets the motor's rotational speed in revolutions per minute. P202 sets acceleration and deceleration times in milliseconds. The control methods are as follows:

impulse /PUL	direction /DIR	explain
0	0	Motor stopped running
0	1	The motor runs at the speed set by P201, and the forward and reverse rotation can be changed through PU/ DR (the direction can be changed by P002)
1	0	
1	1	Motor stopped running

The wiring diagram in I/O speed mode is as follows:



4.4.4 Open Loop Current Setting

When the P200 is set to 3, in open-loop mode, the driver provides 8 current settings (unit 0.1 A), which can be selected by turning the page through the upper and lower keys during setting, and the default value is 5.2A. As shown in the following table:

current value	0025	0035	0045	0052	0059	0066	0073	0080