T3D Series
General Purpose Servo Drives
instruction manual

(v2.3 full version)

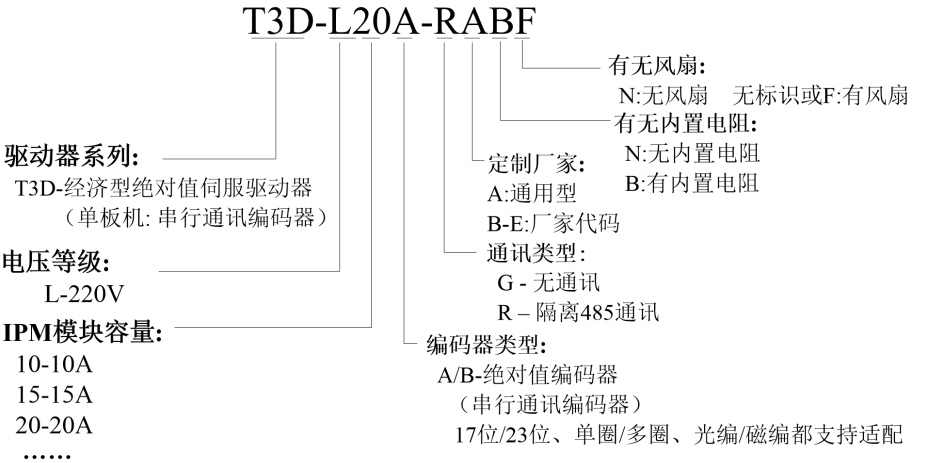
➢ Products

T3D series general-purpose servo drive adopts advanced fully digital control and AC motor vector control theory, adapted with serial communication absolute encoder, system performance is excellent, high reliability, widely used in all kinds of general automation equipment.

➢ Product Features

- ➢ Adopts high-performance multi-platform DSP/ARM processor chip with excellent control performance
- ➢ **Adapted to 17-bit/23-bit, single-turn/multi-turn serial communication encoders with high positioning accuracy and good servo axis rigidity.**
- ➢ Fully sealed design, good protection, strong anti-interference ability
- ➢ Compact veneer design saves installation space
- ➢ Selection of the latest industrial-grade IPM module, strong overload drive capability
- ➢ Integration of position control, speed control and torque control
- ➢ Can drive various types of permanent magnet synchronous servo motors
- ➢ Complete fault protection and status monitoring functions

● Model specification description



Safety Precautions

Before storing, installing, wiring, operating, inspecting or servicing the product, the user must familiarize himself with and observe the following important matters to ensure safe and proper use of the product.

⚠危险	Incorrect operation may cause danger and result in personal injury or death.
⚠注意	Incorrect operation can be hazardous, resulting in personal injury and possible damage to the equipment.
⃠禁止	Behavior is strictly prohibited and may result in damage to the equipment or render it inoperable.

1. Occasions for use

⚠危险
● It is prohibited to use the product exposed to moisture, corrosive gas, or flammable gas. Otherwise, it will lead to electric shock or fire. ● It is prohibited to use the product in places with direct sunlight, dust, salt and metal powder. ● It is prohibited to use the product in places where water, oil and medicines are dripping.

2. Wiring

⚠危险
● Please ground the ground terminal reliably; poor grounding may cause electric shock or fire. ● Do not connect the 220V drive power supply to the 380V power supply, as this may cause equipment damage and electric shock or fire. ● Do not connect the U, V, and W motor output terminals to a three-phase power supply, as this may cause injury or fire. ● The U, V, W motor output terminals and the driver terminals U, V, W must be connected

one-to-one, otherwise the motor may overspeed and fly causing equipment damage and casualties.

- Tighten the power supply and motor output terminals, otherwise a fire may result.
- For wiring, please refer to the wire selection wiring, otherwise it may cause fire.

3. Operations

⚠注意

- When the mechanical equipment starts to operate, it is necessary to match the appropriate parameter setting value. Failure to adjust to the appropriate setting values may result in loss of control or malfunction of the machinery and equipment.
- Before starting operation, check that the emergency switch can be activated at any time to stop the machine.
- Please test the servo motor for normal operation without load first, and then connect the load afterwards to avoid unnecessary loss.
- Do not turn the power on and off too often, as this may cause the drive to overheat internally.

4. Operation

⃠禁止

- When the motor is running, it is forbidden to touch any of the rotating parts, as this may cause injury or death.
- Do not touch the drive and motor while the unit is running, as this may cause electric shock or burns.
- It is prohibited to move the connecting cables while the unit is in operation, as this could result in injury or damage to the unit.

5. Maintenance and inspection

⃠禁止

- It is prohibited to touch the drive and the inside of its motor as this may cause electric shock.
- It is prohibited to remove the drive panel when the power is activated, as this may result in electric shock.
- Do not touch the terminals within 5 minutes of the power being turned off, otherwise residual high voltage may cause electric shock.

- It is prohibited to change the wiring while the power is on, as this may cause electric shock.
- It is prohibited to disassemble the servo motor as this may cause electric shock.

6. Scope of use

⚠注意

The products covered in this manual are for general industrial use and should not be used in devices that may directly jeopardize personal safety, such as nuclear energy devices, aerospace and aviation equipment, life-support and life-supporting equipment, and various safety equipment. Please contact the manufacturer's customer service if any of the above uses are required.

Content

note

Chapter 1 Product Inspection and Installation

1.1 Product inspection

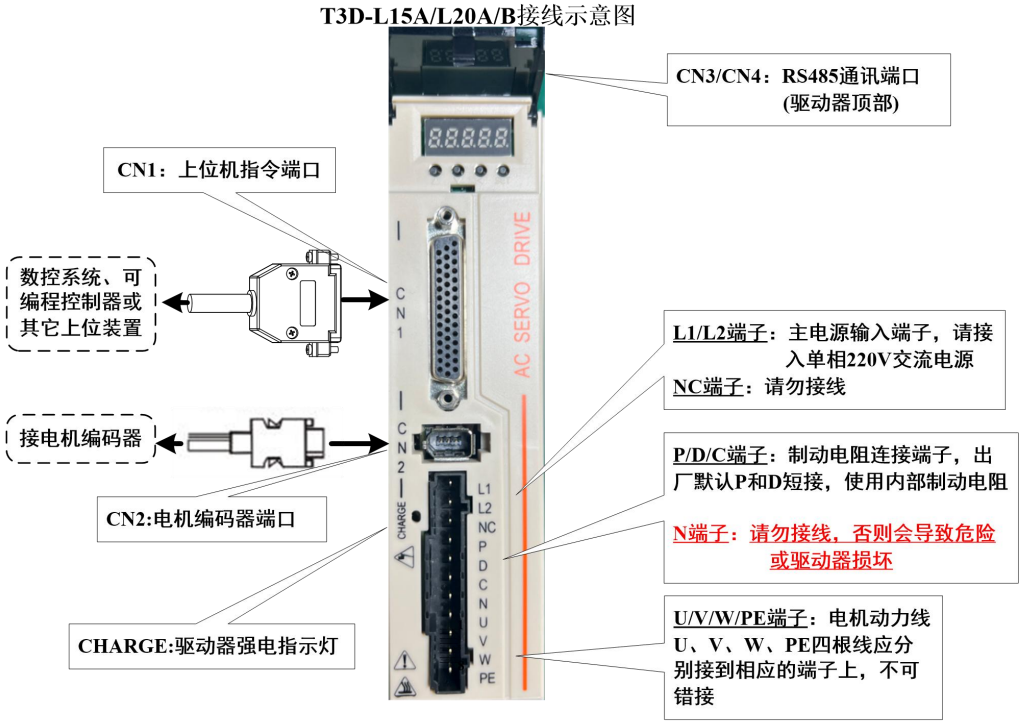
This product has been tested for complete functionality before leaving the factory. In order to prevent the product from being shipped out of order due to negligence, please check the following matters in detail after unpacking the product:

- Check that the servo driver and servo motor models are the same as the model ordered.
- Check the appearance of the servo drive and servo motor for damage and scratches. Do not connect the wires for power supply if the damage is caused during transportation.
- Check the servo driver and servo motor for loose components. Check if there are loose screws, or if the screws are not locked or have fallen off.
- Check that the servo motor rotor shaft can rotate smoothly by hand. Motors with brakes cannot be rotated directly.

  If any of the above malfunctions or irregularities occur, contact your dealer immediately.

1.2 Product front panel

T3D-L15A/L20A/B接线示意图



T3D-L30A接线示意图

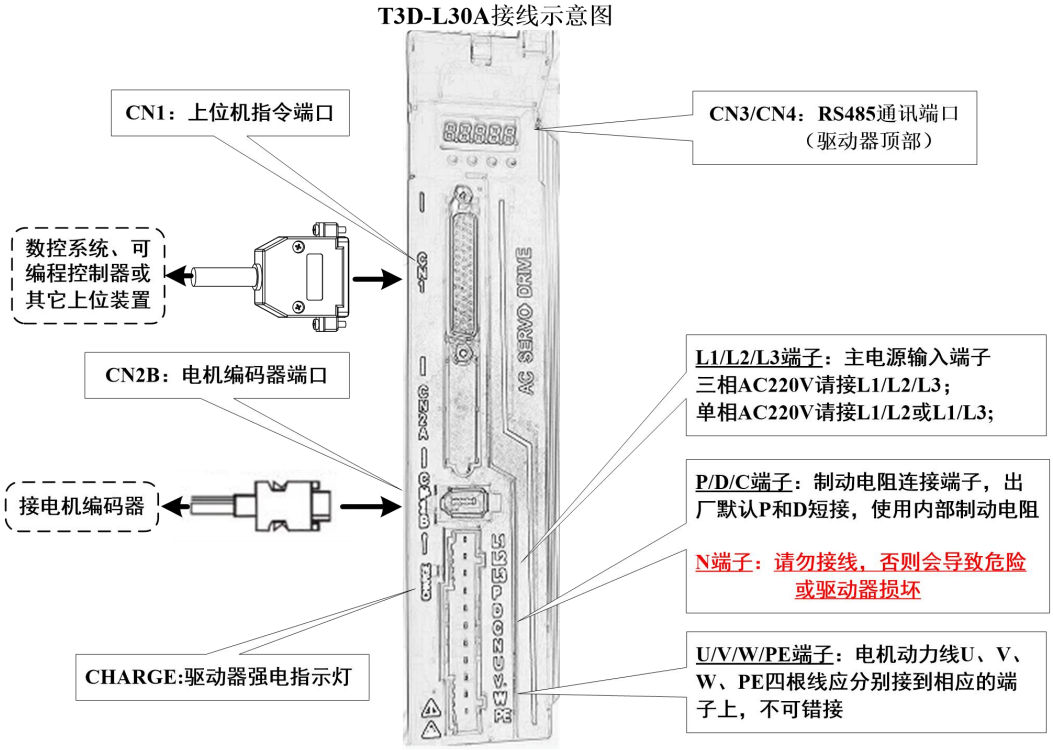


Figure 1.1 Front Panel Schematic

1.3 Servo Drive Installation

1.3.1 Environmental conditions for installation

The environment in which the servo drive is installed has a direct impact on the normal functioning of the drive and its service life, so the installation environment of the drive must comply with the following conditions:

- Operating ambient temperature: 0℃～℃40; Operating ambient humidity: 40%～80% below (no condensation).
- Storage ambient temperature: -40℃ ～ ℃50; Storage ambient humidity: below 93% (no condensation).
- Vibration: 0.5G or less.
- Protect from dripping rain or wet conditions.
- Avoid direct sunlight.
- Prevents oil mist and salt erosion.
- Protect against corrosive liquids, gas erosion.
- Prevents intrusion of dust, lint and fine metal shavings.
- Keep away from radioactive materials and combustible materials.
- When installing several drives in the control cabinet, please note that the placement should leave enough space for air flow to help dissipate heat. Please add a cooling fan to reduce the temperature around the servo driver. The long-term safe operating temperature is 40°C or less.
- If there is a source of vibration nearby (e.g., a punch press), use a vibration absorber or install anti-vibration rubber gaskets if it cannot be avoided.
- When there is interference equipment nearby, it interferes with the power and control lines of the servo driver and may cause the driver to malfunction. Noise filters and other anti-interference measures can be added to ensure the normal operation of the drive. However, the noise filter will increase the leakage current, so it is necessary to install an isolation transformer on the power input of the drive.

1.3.2 Installation methods

- The normal mounting orientation of the servo drive is vertical upright orientation with the top facing up for heat dissipation.
- When mounting, tighten the M5 set screw on the rear of the servo drive.

- Refer to the diagram on the following page for the mounting spacing distances between Servo Drives and with other equipment. To ensure the performance and life of the Drive, leave sufficient mounting spacing as much as possible.
- A cooling fan must be installed in the electrical control cabinet to ensure that there is vertically oriented air to dissipate heat from the servo drive's heat sink.
- When installing the electrical control cabinet, prevent dust or iron filings from getting inside the Servo Drive.

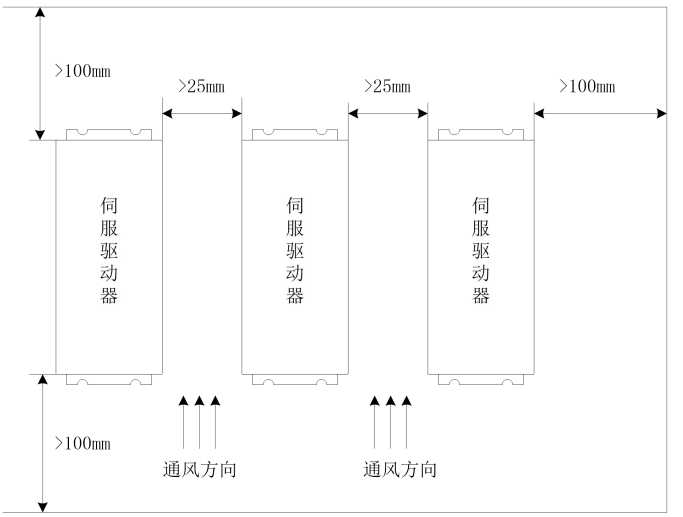


Figure 1.2 Servo Drive Installation Diagram

1.4 Servo motor mounting

1.4.1 Environmental conditions for installation

- Operating ambient temperature: 0 ～ 40℃; Operating ambient humidity: below 80% (no condensation).
- Storage ambient temperature: -40℃ ～ ℃05; Storage ambient humidity: below 80% (no condensation).
- Vibration: G0.5 or less.
- A well-ventilated place with little moisture and dust.
- No corrosive, ignition gas, oil and gas, cutting fluid, cutting powder, iron powder and other environments.
- A place free from water vapor and direct sunlight.

1.4.2 Installation methods

- Horizontal installation: To avoid water, oil and other liquids from flowing into the motor from the motor outlet end, please place the cable outlet below.
- Vertical mounting: If the motor is mounted with the motor shaft facing upwards and a gearhead is attached, care must be taken to prevent oil from the gearhead from seeping into the motor via the motor shaft.
- The extension of the motor shaft must be sufficient, if the extension is insufficient, it will be easy to cause vibration when the motor moves.
- When mounting and dismounting the motor, do not hit the motor with a hammer as this may cause damage to the motor shaft and encoder.

1.5 Definition of motor rotation direction

This manual describes the definition of the direction of motor rotation: facing the motor shaft extension, counterclockwise rotation of the rotating shaft (CCW) is positive rotation, and clockwise rotation of the rotating shaft (CW) is reverse rotation.

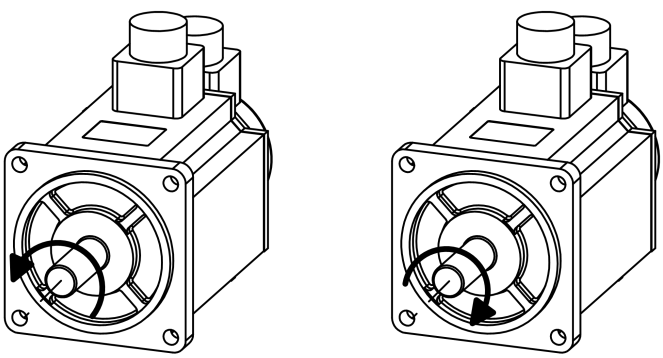


Figure 1.3 Definition of servo motor rotation direction

Chapter 2 Wiring

2.1 System Composition and Wiring

2.1.1 Wiring instructions

Wiring Notes:

- The wiring material is used according to the wire specifications.
- Cable length, within 3m for command cable and 20m for encoder cable.
- Check if the power supply and wiring of L1/L2/L3 are correct, **220V servo should not be connected to 380V power supply**.
- Motor output U, V, W terminal phase sequence, must and drive the corresponding terminal one-to-one correspondence, connect the wrong motor may not turn or fly. Can not be used to swap the three-phase terminals to make the motor reverse, which is completely different from the asynchronous motor.
- It must be reliably grounded and single-point grounded.
- Relays mounted to output signals with diodes for absorption should be connected in the correct direction, otherwise the fault will result in failure to output signals.
- To prevent false operation caused by noise, install an insulating transformer and a noise filter on the power supply.
- Wiring should be done with power lines (power lines, motor lines, etc.) and signal lines more than 30cm apart, and should not be placed in the same wiring duct.
- Install a non-fused circuit breaker to disconnect the external power supply in case of drive failure.

2.1.2 Wire specifications

Connection Terminal	notation	Wire specification
Main circuit power supply	L1, L2, L3	1.5 to 2.5mm^2
Motor Connection Terminal	U, V, W	1.5 to 4mm^2
ground terminal	⏚	1.5 to 4mm^2
Control Signal Terminal	CN1	≥0.14mm^2 (AWG26), incl. shielded cable
Encoder Signal Terminal	CN2	≥0.14mm^2 (AWG26), incl. shielded cable
Brake Resistor Terminal	P, D, C	1.5 to 2.5mm^2

The encoder cable must be twisted. If the encoder cable is too long (>20m), it will result in

insufficient power supply to the encoder, whose power and ground can be connected by multiple wires or by using thick wires.

2.1.3 Description of strong electrical terminals

name (of a thing)	Terminal Symbols	particular
Main circuit power supply	L1, L2, L3	Connect the external AC power supply: L15/L20 connects to single-phase 220V AC power supply. L30 connects to three-phase or single-phase 220V AC power supply -15% to +10% 50/60Hz
Braking Resistors terminals	P, D, C	When an external braking resistor is connected, it is used in parallel with the internal braking resistor. Please take care to select the resistance value and power to avoid burning out the driver.
Motor Connection Terminal	U	Output to motor U-phase power supply
	V	Output to motor V-phase power supply
	W	Output to motor W-phase power supply
ground terminal	PE /⏚	Motor housing grounding terminal
	PE /⏚	Driver Ground Terminal

2.2 CN1 control signal terminal

The CN1 control signal terminal provides the signals required for connection to the upper controller, and the signal types include:

- 4 programmable inputs , 4 programmable outputs;
- Pulse command input (position command, speed command);
- Analog command input (speed command, torque command)
- Encoder signal output.

2.2.1 CN1 terminal signal description

Special note: DI1~DI4 are programmable input ports, whose functions are configured by parameter P-100~P-103; DO1~DO4 are programmable output ports, whose functions are configured by parameter P-108~P-111; for parameter configuration, please refer to section 5.4.2 of Chapter 5, and for specific function descriptions, please refer to section 5.5~5.6 of Chapter 5, and the following table shows the factory default configuration.

terminal number	Signal Name	markings	functionality
	Power supply positive terminal of input terminal	COM +	The positive terminal of the power supply of the input terminal is used to drive the photocoupler of the input terminal, DC12～24V, current ≥100mA.
	DI1 Servo Enable	SON	Servo enable input terminal. SON ON: Allows the drive to work; SON OFF: The drive is enabled off and the motor is free. Note 1: The motor must be stationary before hitting from OFF to ON. Note 2: After hitting SON ON, wait at least 50ms before entering the command.
	DI2 Alarm Clearance	ACLR	Alarm clear input terminal. ACLR ON: Clears system alarms; ACLR OFF: Holds the system alarm. Note 1: Some hardware fault alarm numbers, which cannot be cleared by this method, need to be powered off for repair and then powered on again.

	DI3 CCW Driver Disable	CCWL	CCW (counterclockwise) drives the prohibited input terminals. CCWL ON: CCW drive is allowed and the motor can rotate counterclockwise; CCWL OFF: CCW drive is disabled and the motor is prohibited from rotating counterclockwise. Note 1: For mechanical overrun, when the switch is OFF, the torque in the CCW direction remains 0. Note 2: This function can be blocked by setting parameter P-097, and the user does not have to connect this terminal to make the CCW driver allow.
	DI4 CW Driver Disable	CWL	CW (clockwise) drives the prohibited input terminals. CWL ON: CW drive is allowed and the motor can be rotated clockwise; CWL OFF: CW drive is disabled and the motor is prohibited from rotating clockwise. Note 1: For mechanical overrun, when switch OFF, CW Directional torque is held at 0. Note 2: This function can be blocked by setting parameter P-097, and the user does not have to connect this terminal to make the CW driver allow.

terminal number	Signal Name	markings	functionality
	DO1 Servo ready output	RDY +	Servo ready output terminals. RDY ON: The main power supply is normal, the drive has no alarms, and the servo ready output is ON (output on); RDY OFF: The main power supply is not closed or the drive has an alarm, and the servo ready output is OFF (output cutoff).
		RDY-	
	DO2 Servo Alarm Output	ALM +	Servo alarm output terminal. ALM ON: servo drive no alarm, servo alarm output ON (output on); ALM OFF: Servo drive has an alarm, servo alarm output OFF (output cutoff).
		ALM-	

	DO3 Positioning completion output; (in position control mode)	COIN +	Position the completion output terminals. COIN ON: When the position deviation counter value is in the set positioning range, the positioning completion output is ON (output on), otherwise the output is OFF (output off).
		COIN-	
	DO4 Mechanical brake release (holding brake output)	BRK +	This port can be used to control the brake when the motor has a mechanical brake (power loss keeper). BRK ON: The brake is energized, the brake is not effective, and the motor can run; BRK OFF: Brake cutoff, brake is active, motor is locked and cannot run. Note: The BRK function is controlled internally by the drive.
		BRK-	
	Command pulse PLUS input	PULS+	External command pulse input terminal. Note 1: The pulse input method is set by parameter P-035. ● P-035 = 0, command pulse + symbol mode (default state); ● P-035=1, CCW/CW command pulse mode; ● P-035=2, orthogonal pulse mode.
		PULS-	
	Command pulse SIGN input	SIGN +	
		SIGN-	

terminal number	Signal Name	markings	functionality
	Analog speed command input	AS +	External analog speed command input terminal, differential mode, input impedance 10kΩ, input range 0V to +10V.
		AGND	
	analogically	AGND	Ground for analog input.
	Analog torque command input	AS +	External analog torque command input terminal, differential mode, input impedance 10kΩ, input range 0V to +10V.
		AGND	
	analogically	AGND	Ground for analog input.

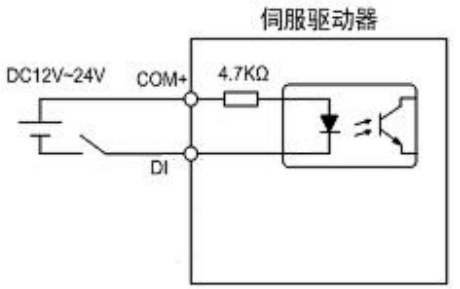
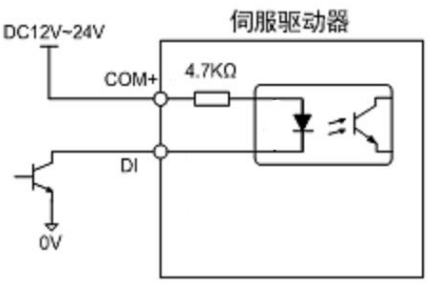
	Encoder Z-phase open collector outputs	CZ	● The encoder Z-phase signal is output from the open collector. When the encoder Z-phase signal is present, the output is ON (output conductive), otherwise the output is OFF (output cutoff); ● Non-isolated outputs (non-insulated) ● In the upper computer, the Z-phase signal pulse is usually very narrow, so please use a high-speed photocoupler to receive it.
	Encoder common ground	GND	Encoder common ground.
	Shielded ground	FG	Shielded ground terminal.

2.2.2 CN1 terminal interface type

The following section describes each of the CN1 interface circuits and how they are wired to the upper control unit.

1. Digital input connector (C1)

The digital input interface circuit can be controlled by switches, relays, open collector transistors, and opto-couplers. Relays need to be selected as low current relays to avoid poor contact. External voltage range DC12V to 24V.

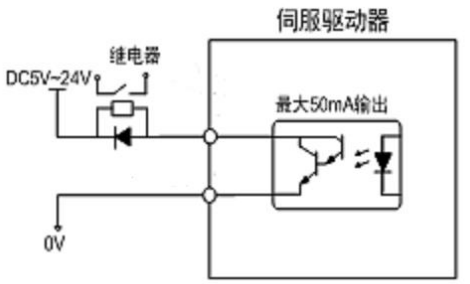
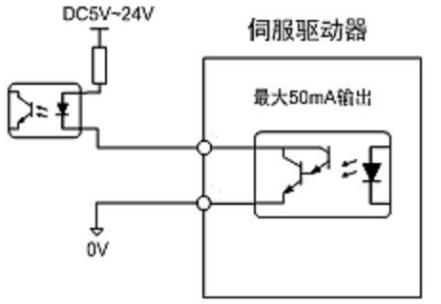
C1-1: Switch input	C1-2:Open collector triode
	

2. Digital output interface (C2)

The output circuit uses a Darlington photocoupler, which can be connected to relays, photocouplers, and notes:

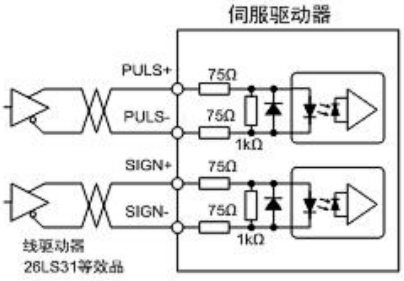
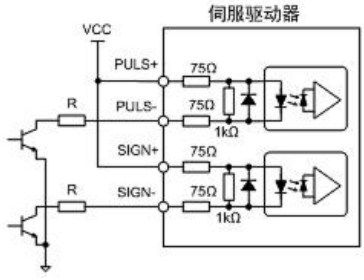
- The power supply is supplied by the user and can cause damage to the drive if the power supply is reversed.
- Maximum external power supply is 24V, maximum output current is 50mA, and the sum of 3-way current does not exceed 100mA.

- When inductive loads such as relays are used, diodes need to be added in parallel with the inductive loads, and if the diodes have opposite polarity, the driver will be damaged.
- When it conducts, there is about 1V voltage drop, which does not meet the TTL low level requirement, so it cannot be directly connected to the TTL circuit.

C2-1: Relay	C2-2: Optocoupler
	
● A renewal diode must be added externally.	

3. Position pulse command interface (C3)

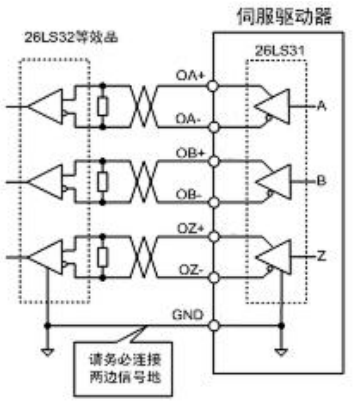
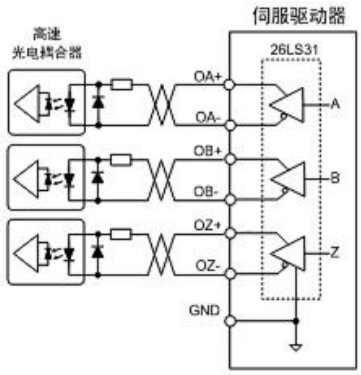
There are two types of connection methods, differential drive and single-ended drive, and differential drive connection method is recommended. The wiring should be twisted pair. Driving current is 8~15mA, and the working mode is set by parameter P-035: pulse + symbol, forward/reverse pulse, orthogonal pulse.

C3-1: Differential drive	C3-2: Single-Ended Driver
	
● Maximum pulse frequency 500kHz (kpps); ● This connection is recommended as interference is not desirable.	● Maximum pulse frequency 200kHz (kpps); ● Recommended resistance value of resistor R:

VCC	R
5V	82Ω~120Ω
12V	510Ω~820Ω
24V	1.5kΩ~2kΩ

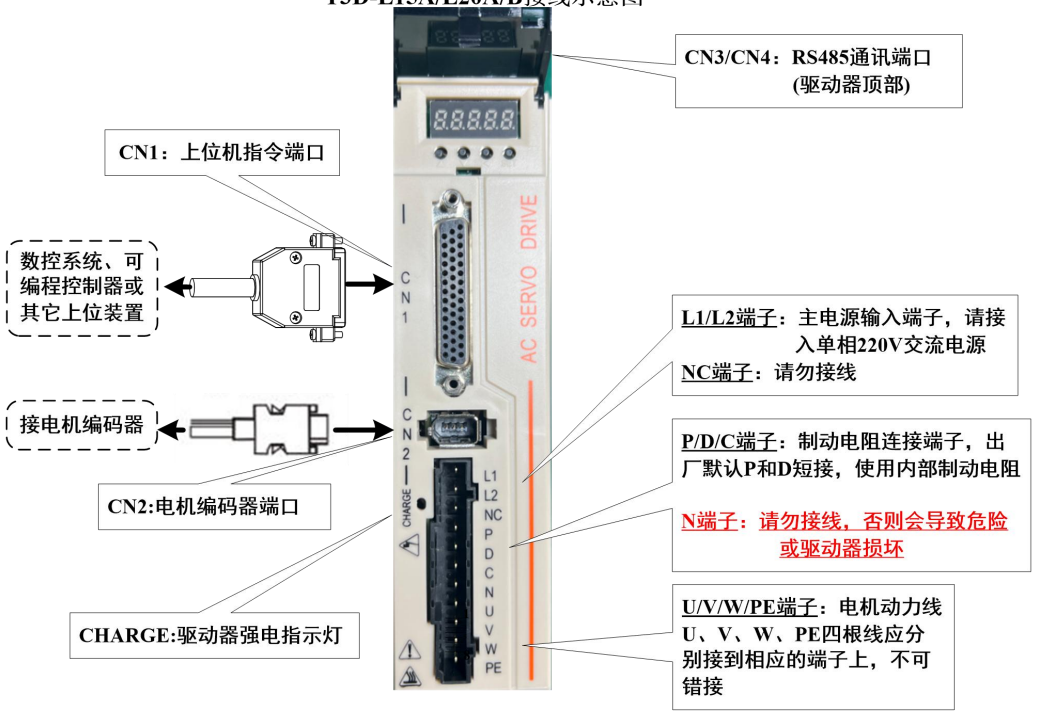
4. Encoder signal line drive output (C5)

The encoder signals are divided into frequencies and output to the host controller via a line driver.

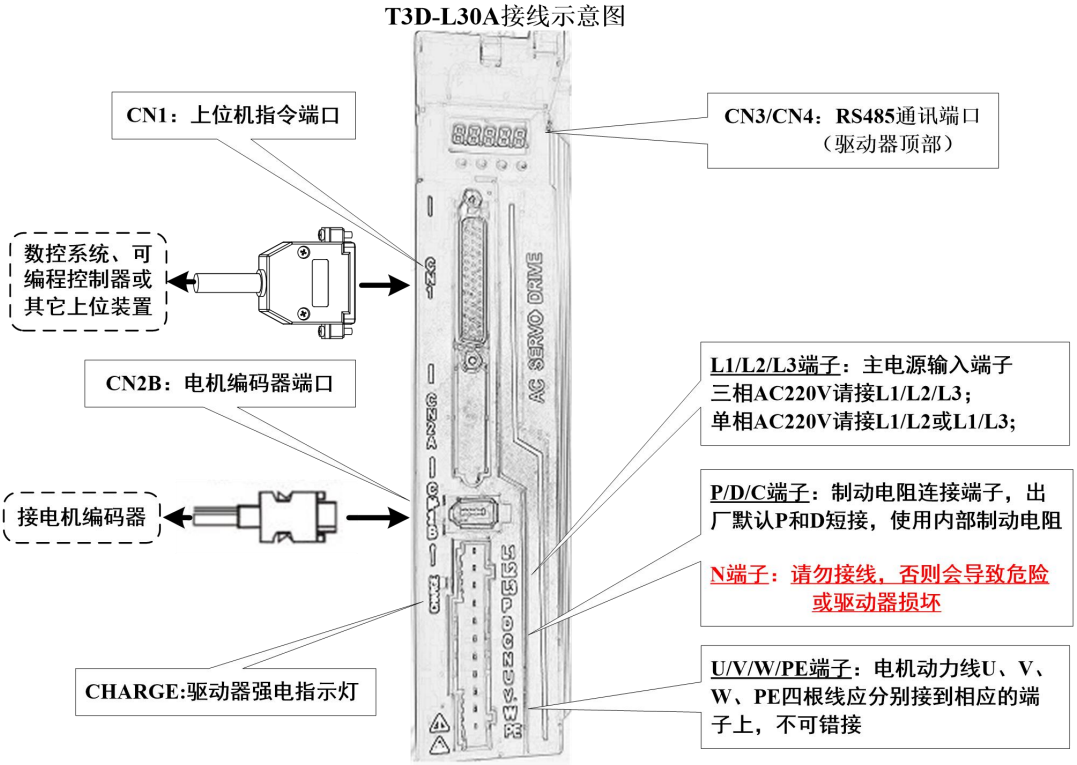
C5-1: Long line receiver reception	C5-2: Optocoupler reception
	
● The upper controller uses the AM26LS32 equivalent as the receiver, and must be connected to a terminating resistor with a resistance value of 220Ω to 470Ω; ● The drive encoder signal ground (GND) must be connected to the upper controller signal ground.	● The upper controller uses a high-speed opto-coupler (e.g. 6N137) with a current-limiting resistor resistance of about 220Ω.

2.3 Front Panel Terminal Wiring Schematic

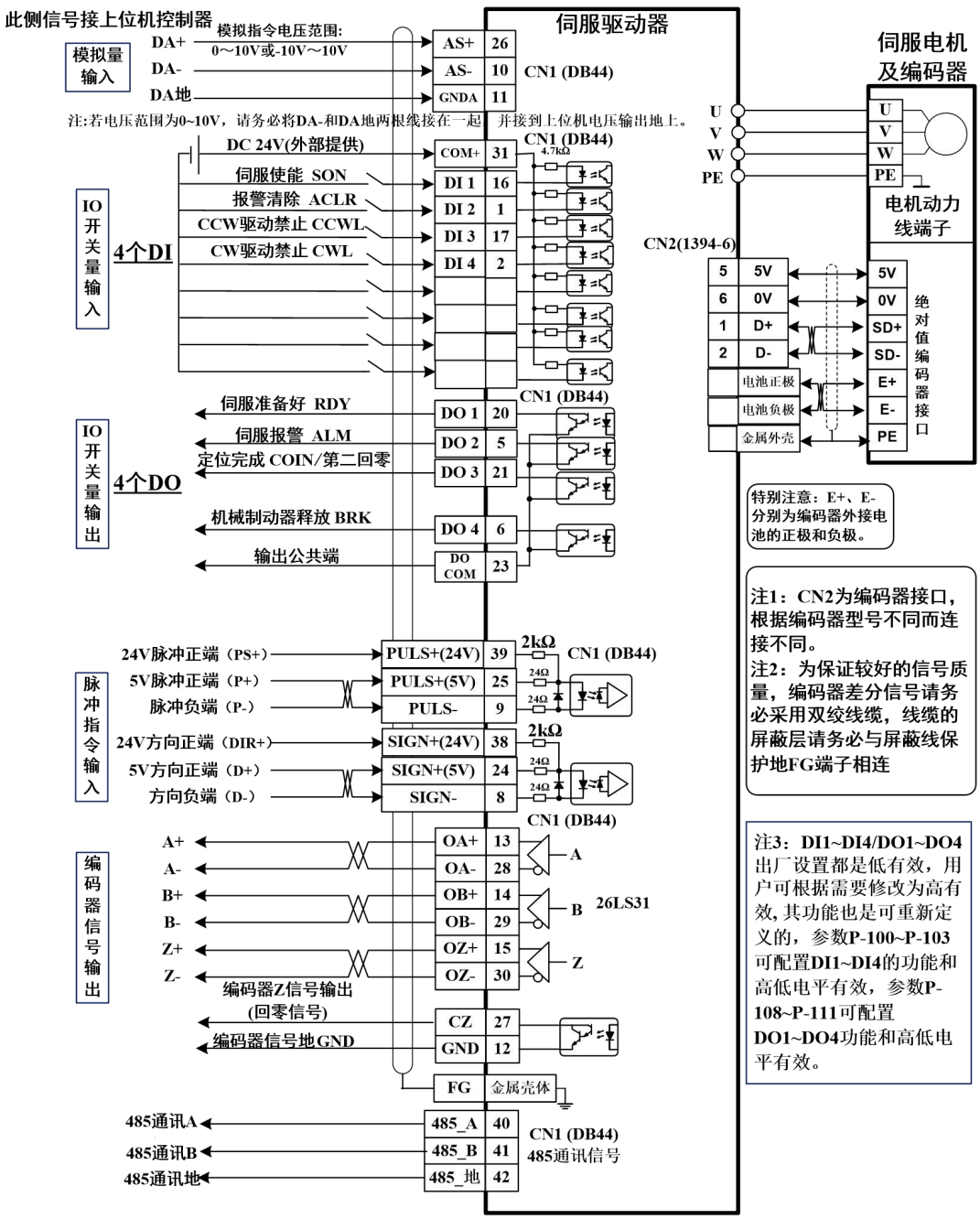
T3D-L15A/L20A/B接线示意图



T3D-L30A接线示意图



2.4 Control Port CN1 and Encoder Port CN2 Definition Map



Special attention:

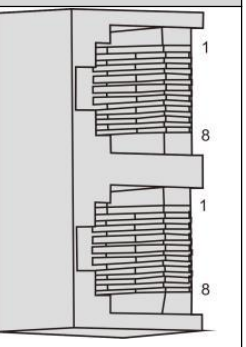
If the pulse command signal is a 24V supply, PULS+ must be connected to CN1 pin 39 and SIGN+ must be connected to CN1 pin 38, otherwise there is a risk of damaging the pulse command port;

If the pulse command signal is a 5V power supply, PULS+ must be connected to

CN1 pin 25 and SIGN+ must be connected to CN1 pin 24, otherwise there is a possibility that the pulse reception is not normal.

2.5 Connection diagram of communication port CN3/CN4

The communication connection between the drive and the upper computer such as CNC, PC, PLC and the drive can be realized through the 485 communication ports CN3 and CN4 on the drive, where the port pins of CN3 and CN4 are defined as follows:

pin number	CN3	name (of a thing)	CN4	name (of a thing)	icon
1					
2					
3					
4	485_B	RS485 communication connector	485_B	RS485 communication connector	
5	485_A		485_A		
6					
7	485_Ground	485 signal ground	485_Ground	485 signal ground	
8					

Special note: The RS485 communication port can also be connected via CN1's 40/41/42, see section 1.3 for graphical description.

◆ It can be connected to a PC or host computer controller via a special serial cable, and is not allowed to be plugged or unplugged with electricity.

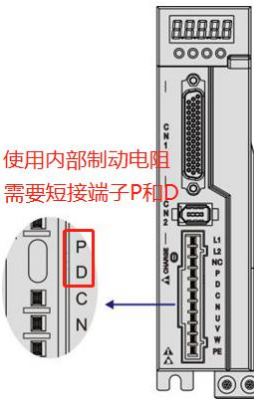
◆ It is recommended to use twisted pair or shielded cable with a length of less than 5 meters.

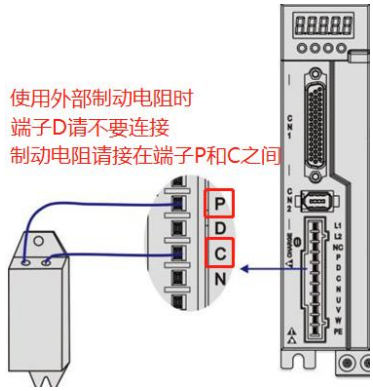
◆ When multiple machines are connected in series, CN3 is connected to CN4 of the previous drive and CN4 is connected to CN3 of the next drive.

◆ When using RS485 bus communication, when the 485 signal ground of the host computer is connected to the earth (PE), please connect the PE terminal of the host computer to the driver terminal by reasonable grounding; in this case, it is prohibited to connect the 485 signal ground of the host computer to the 485 signal ground (GND) of the driver, otherwise the driver may be damaged.

2.6 Braking resistor connection and operating instructions

If internal braking resistor is used, it is necessary to short connect terminals P and D, i.e., it can be used normally according to the factory status, as shown in the left figure below. If external braking resistor is used, the shorting metal piece between P and D must be removed first, and then the external braking resistor will be connected across terminals P and C, as shown in the right figure below (the drive models shown in the figure are L15A, L20A/B, and the braking resistor connection and use schematic is also applicable to the L30A drive):





Special Notes:

◆ Do not connect the external braking resistor to the positive and negative terminals P and N of the busbar, otherwise it will blow up the machine and cause a fire;

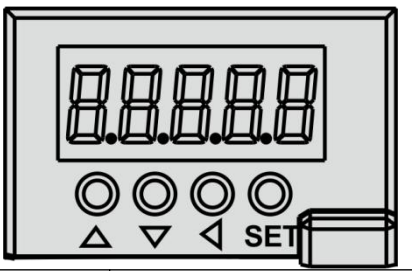
◆ Do not connect an external braking resistor smaller than the minimum allowable resistance value of 25Ω, otherwise it will cause the drive to alarm or damage the drive.

Chapter 3 Panel Operation

3.1 Driver Panel Description

The T3D series panel consists of 5 LED digital tube displays, 4 buttons ▲, ▼, ◄, **SET**, which are used to display various system statuses as well as setup parameters.

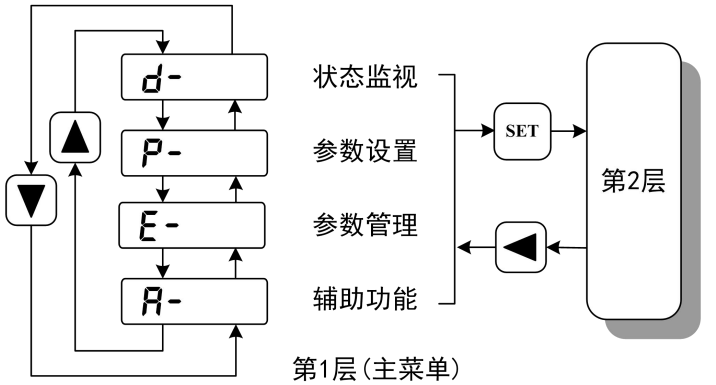
The operations are all hierarchical, expanding layer by layer from the main menu, and the operation panel is shown below:



notation	name (of a thing)	functionality
POW	Power light (none)	**The second digit from the left is lit to indicate servo undervoltage.**
RUN	Run light (none)	**The first digit from the left is lit to indicate servo enable.**
▲	Add key	Add serial number or value; long press has repeat effect.
▼	minus key	Reduce the serial number or value; long press has a repeat effect.
◄	exit button	Menu exit; operation canceled.
SET	confirmation key	Menu entry; parameter modification confirmation or operation confirmation.

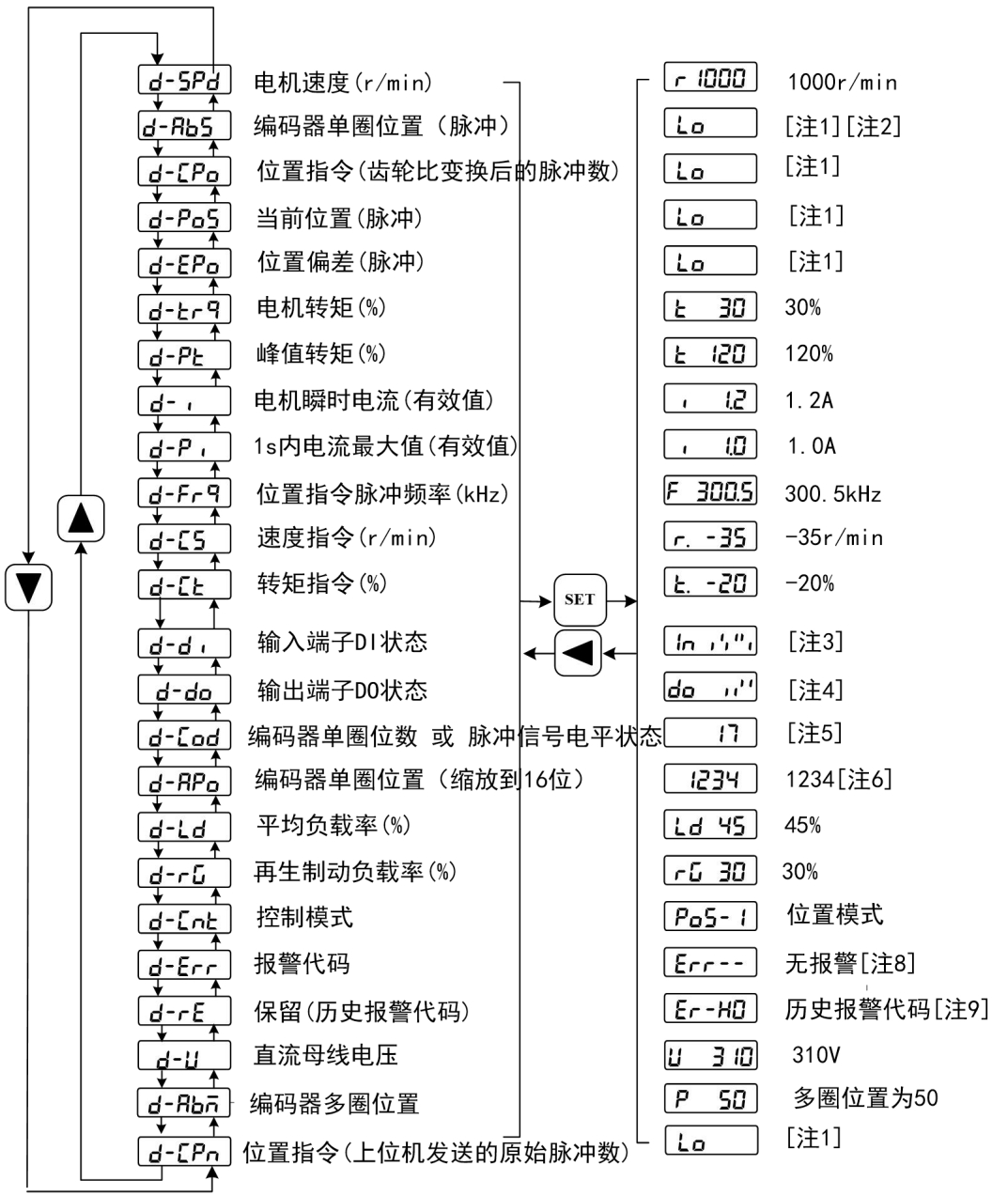
3.2 Main Menu

Level 1 is the main menu with 4 operation modes, use ▲ and ▼ keys to change the mode, press **SET** to enter level 2 to perform specific operations, and press ◄ to return to the main menu from level 2.



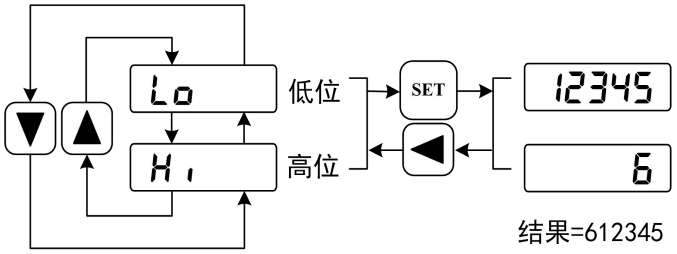
3.3 Status monitoring

Under the main menu, select status monitoring "d-" and press **SET** key to enter the monitoring mode. There are many kinds of monitoring items, users use ▲, ▼ key to select the desired display item, and then press **SET** key to enter the specific display status. The specific meanings of the status monitoring display items are as follows:



1. 32-bit binary numeric display [Note 1]

The 32-bit binary numbers range from -2147483648 to 2147483647 and are represented using a combination of low and high bits, which are selected through the menu to synthesize the complete value using the formula in the figure.



32位数值=高位数值×100000+低位数值

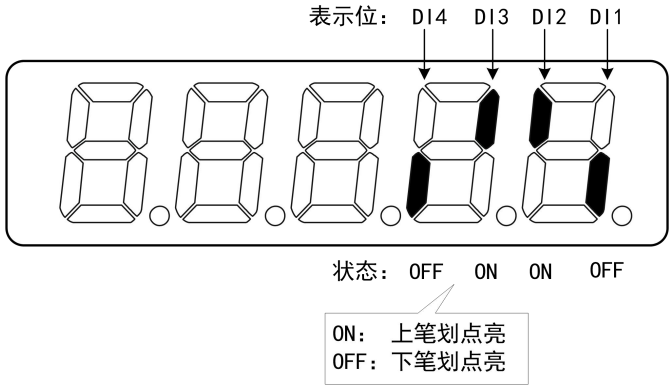
2. Pulse units [Note 2]

The pulses for raw position commands are the number of pulses entered, not electronically geared. The pulse unit for other items is the encoder pulse unit. Take the example of using a 2500 line encoder:

$$\begin{aligned} \text{编码器脉冲单位} &= \text{编码器分辨率} \\ &= 4 \times \text{编码器线数} \\ &= 4 \times 2500(pulse/rev) \\ &= 10000(pulse/rev) \end{aligned}$$

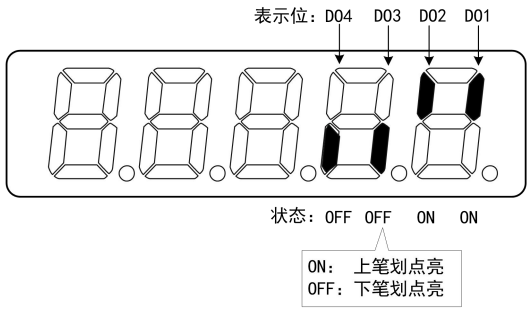
3. Input terminal DI [Note 3]

The vertical line of the digital tube indicates the state of one bit, the upper stroke of the vertical line is lit to indicate ON, and the lower stroke is lit to indicate OFF.



4. Output terminal DO [Note 4]

The vertical line of the digital tube indicates the state of one bit, the upper stroke of the vertical line is lit to indicate ON, and the lower stroke is lit to indicate OFF.



5. Encoder input signal [Note 5]

The vertical line of the digital tube indicates the status of one bit, the upper stroke of the vertical line is lighted to indicate a high level, and the lower stroke is lighted to indicate a low level. **(Note: For absolute position encoder, the number of encoder resolution digits is displayed, e.g., display 17-indicates that the encoder has 17 digits in a single turn)**

6. Rotor lap position [Note 6]

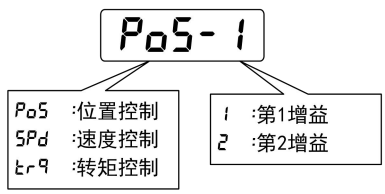
Indicates the position of the rotor relative to the stator in one revolution, with one revolution as a cycle, the minimum resolution of the encoder as a unit, and the encoder Z pulse as the origin.

2500-wire encoder: Its range is 0 to 9999 (decimal), and the value is 0 when the Z pulse appears.

Absolute position encoder: Its range is 0 to 65535 (decimal), divided into high and low bit representation.

7. Control modalities [Note 7]

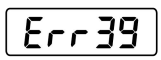
The display characters represent the current control mode of the servo drive.



8. Alarm codes [Note 8]

No alarm displays two minus signs. With alarm displays the alarm number and blinks. When the alarm appears, the monitor will automatically enter the state monitoring and display the alarm number, but you can use the keyboard to perform other operations, when it is not in the monitoring state, then the decimal point of the rightmost digital tube flashes to indicate that an alarm exists. Specific examples are as follows:

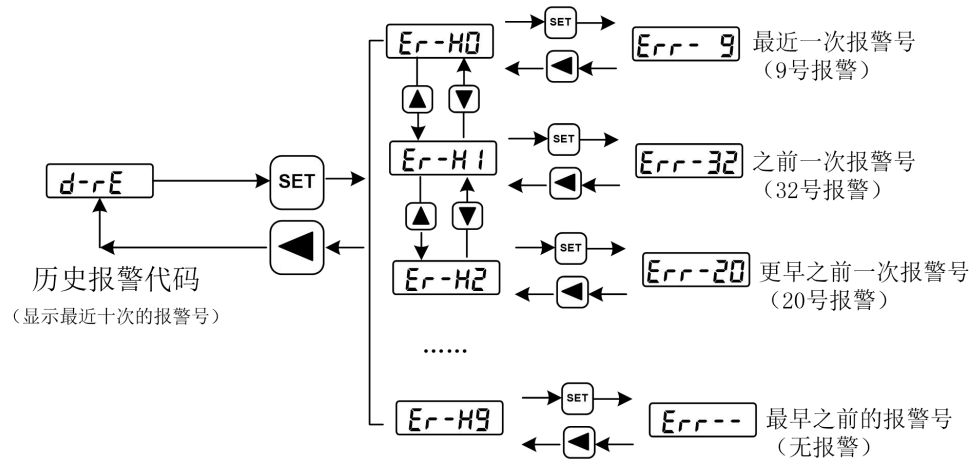
无报警



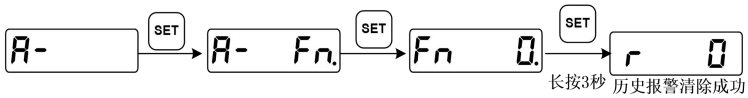
闪烁　39号报警

9. Historical alarm codes [Note 9]

The Historical Alarm Code displays the contents of the drive's last 10 alarms, with no alarms displaying the two minus sign, and with alarms displaying the alarm number. When an alarm occurs, the drive will automatically update and store the alarm number. The history alarm code view operation and specific display contents are described below:



The method of clearing the history alarm code is as follows: In the case of no alarm, set parameter P-119 to 4 first, and then follow the steps below to clear all the history alarm codes.



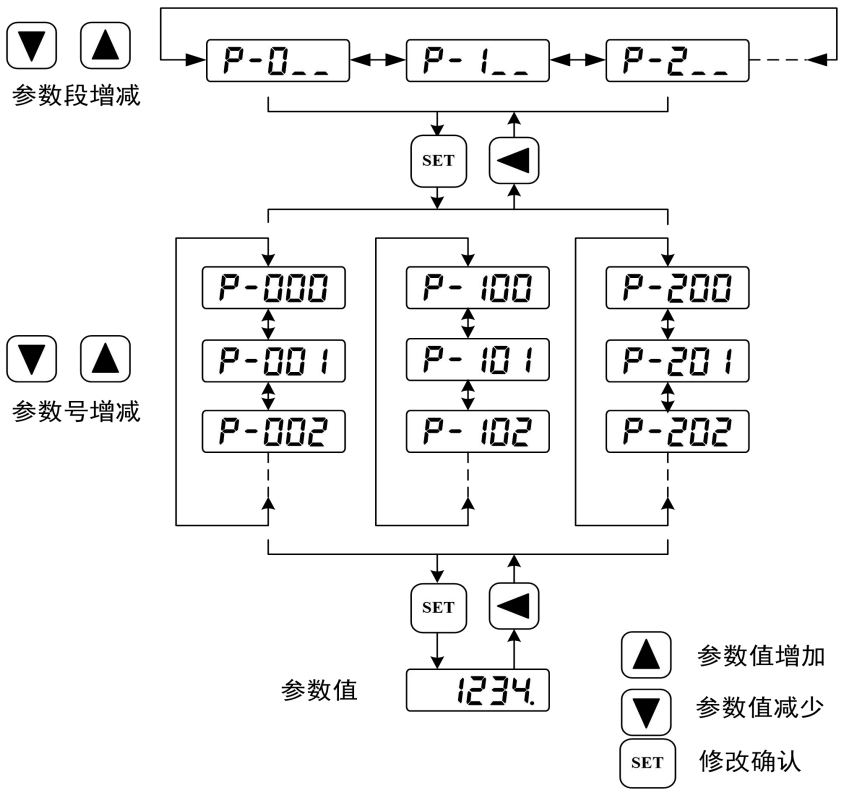
3.4 Parameterization

The parameter is expressed as parameter segment + parameter number, the hundreds digit is the segment number, and the tens digit and individual digit are the parameter number. For example, the parameter P-105, the segment number is "1", the parameter number is "05", the digital tube displays "P- 105".

Select parameter setting "P-" under the main menu, press **SET** key to enter the parameter setting mode. Firstly use ▲, ▼ key to select the parameter segment, after selected, press **SET** key to enter the segment parameter number selection. Secondly use ▲, ▼ key to select the parameter number again, after selected, press **SET** key to display the parameter value.

The parameter value can be modified with ▲ and ▼ keys, press ▲ or ▼ key once, the parameter increases or decreases by 1, press and keep ▲ or ▼ key, the parameter can increase or decrease continuously. When the parameter value is modified, the decimal point of the rightmost LED digital tube will light up, press **SET** key to make sure the modified value is valid, at this time, the decimal point of the right LED digital tube will go out, and the modified value will be reflected in the control immediately (some parameters need to be saved and re-powered to work).

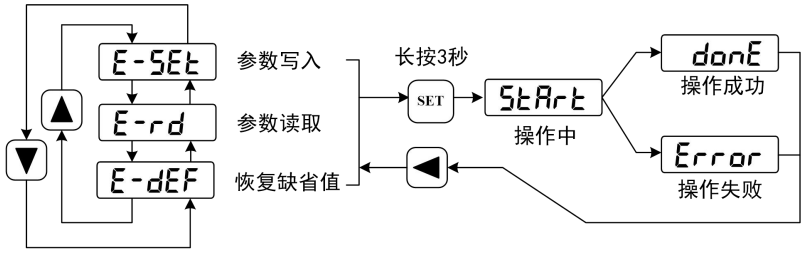
You can continue to modify the parameter thereafter, and when you are finished, press ◄ to return to the parameter number selection state. If you are not satisfied with the value being modified, do not press **SET** to confirm, but press ◄ to cancel and the parameter will return to its original value. The modified parameters are not saved to EEPROM, if you need to save them permanently, please use the parameter write operation in the parameter management.



3.5 Parameter management

Parameter management mainly deals with the operation between parameter table and EEPROM, select parameter management "E-" under the main menu and press **SET** to enter the parameter management mode.

Select the operation mode, there are 3 modes, use ▲, ▼ keys to select. After selecting the operation, press the **SET** key and hold it for more than 3 seconds to activate the operation. When finished then you can press the ◄ key to return to the operation mode selection state.



- Parameter writing

Indicates that the parameters in the parameter table will be written to EEPROM. the user modifies the parameters, only the parameter value in the parameter table is changed, and

the next power up will be restored to the original value. If you want to change the parameter value permanently, you need to perform the parameter write operation to write the parameter in the parameter table to EEPROM, and the modified parameter will be used in the future power-up.

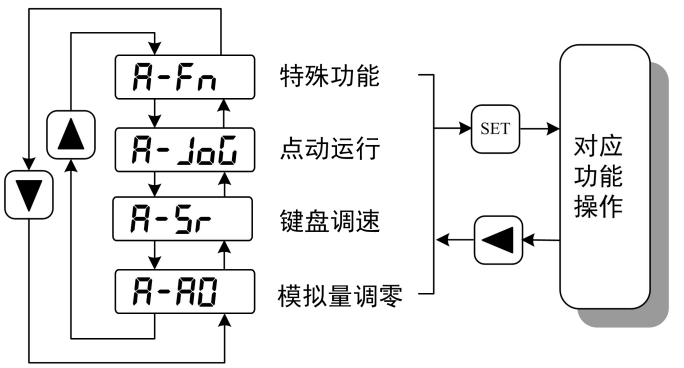
- Restore default values

Indicates that the default values (factory values) of all parameters will be read into the parameter table and written into the EEPROM, and the default parameters will be used for the next power-up. When the user messes up the parameters and can not work normally, use this operation to restore all parameters to the factory state. Because different drive models and motor models correspond to different parameter default values, when using to restore the default parameters, you must first ensure the correctness of the motor code (parameter P-002).

3.6 Accessibility

3.6.1 Brief description of functions

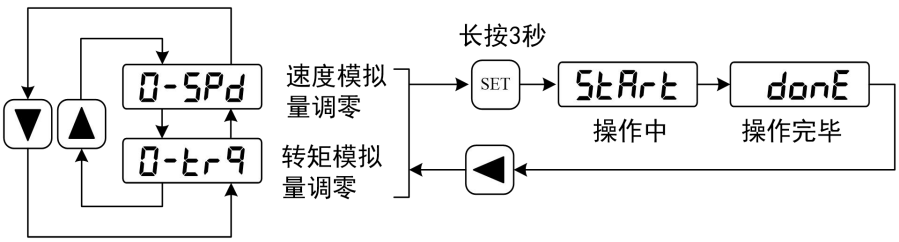
Select the auxiliary function "A-" under the main menu and press SET to enter the auxiliary function mode. Use ▲, ▼ keys to select operation mode. After selecting the operation, press the SET key to enter the corresponding function, and when finished, press the ◄ key to return to the operation mode selection state.



3.6.2 Analog Zeroing

When this operation is used, the driver automatically detects the analog zero bias and writes the zero bias value to parameter P-047 (or P-054). This operation already saves the zero bias parameter to the EEPROM, so there is no need to perform the parameter write operation again.

The operation method is as follows: (1) the host computer first outputs 0V analog to enable the servo drive, and then selects analog zero "A-A" 0, press SET to enter; (2) if the drive control mode is analog speed mode, select speed analog zero "0-SPd" through the menu; (3) if the drive control mode is analog torque mode, select torque analog zero "0-TRQ" through the menu; (4) after selecting the operation, press SET; (5) if the drive control mode is analog torque mode, select torque analog zero "0-TRQ" through the menu. SPd"; if the drive control mode is analog torque mode, select torque analog zeroing "0-trq" through the menu; (3) After selecting the operation, press the SET key and hold it for more than 3 seconds to activate the operation. When finished, press ◄ key to return to the menu selection state, the specific display is as follows:



3.6.3 Pointing (JOG) operation

Energize the drive first, after confirming that there is no alarm or any abnormal condition, the servo enable (SON) ON, RUN indicator lights up, then the motor excitation, in the state of zero speed.

In the auxiliary function, select the pointing operation "A-JoG", and press the SET key to enter the pointing (JOG) operation mode. The prompt for JOG is "J", the unit of value is r/min, and the speed command is provided by the key. Press ▲ key and keep it, the motor will run at JOG speed forward (CCW), release the key, the motor will stop and keep zero speed; press ▼ key and keep it, the motor will run at JOG speed reverse (CW), release the key, the motor will stop and keep zero speed.

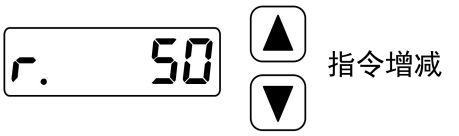
Note: JOG speed is set by parameter P-076 (unit is r/min), and servo enable is controlled by external switching or by parameter P-098 (set to 1 the drive is internally forced to enable, set to 0 does not enable).

3.6.4 Keypad speed control

Power up the drive first, after confirming that there is no alarm or any abnormal condition, the servo enable (SON) ON, RUN indicator lights up, at this time, the motor excitation, in the state of zero speed.

In the auxiliary function, select the keyboard speed control "A-Sr" and press SET to enter the keyboard speed control mode. The keyboard speed control prompt is "r.", the value unit is r/min, and the speed command is provided by the key. Change the speed command with ▲ and ▼ keys, the motor runs at the given speed. A positive number indicates positive rotation (CCW),

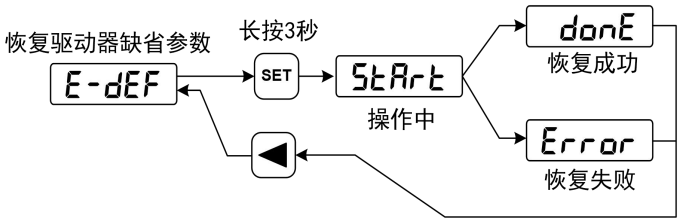
a negative number indicates reverse rotation (CW), and the minimum given speed is 0.1r/min.



Note: Keyboard speed control requires the control mode to be set to speed control mode, i.e., set parameter P-004 to 1 (power off and restart effective); servo enable is controlled by external switching or by parameter P-098 (set to 1 drive internal forced enable, set to 0 does not enable).

3.7 Parameter Default Value Recovery

1, **check the motor series P-099 and model code P-002, restore the default parameters of the drive:** set P-000 for 385 or 316, enter the parameter management mode "E-", switch to "E-DEF", hold down the SET key for 3 seconds. After switching to "E-DEF", press and hold the SET key for 3 seconds, and "Done" will be displayed to indicate that the restoration of default values is completed, and the operation process is shown in the figure below:



注意：此操作要求在驱动器处于非使能状态进行！

<Be sure to complete this step as required before driver debugging, otherwise operation abnormality may occur>!

Special Note: For servo motors with absolute encoder, the driver will automatically recognize the motor series (P-099) and motor model code (P-002), eliminating the need to manually set the motor series and model code. However, when using the servo motor for the first time, it is important to check whether the motor specification parameters are correctly recognized (P-099 displays the motor series, and P-002 displays the motor model code; see Section 7.2 for details of the motor specification parameters). (P-099 displays the motor series, P-002 displays the motor model code, for details of the motor specifications, see Section 7.2).

Parameter number	Physical meaning of the parameter
P-201	**Number of motor pole pairs** 4:4 pole pairs 5:5 pole pairs
P-204	**Motor rated line current** unit (A) 2.5: indicates 2.5A
P-207	**Motor rated speed** unit (r/min) 3000: indicates 3000r/min

After confirming that there is no error, turn off the power and power up again to work.

note

Chapter 4 Operation

4.1 No-load commissioning

The purpose of the trial run is to confirm that the following matters are correct:

- Drive power wiring;
- Servo motor power line wiring;
- Encoder wiring;
- Servo motor running direction and speed.

Special Note: This series of servo drive adopts the integrated design of control power supply and strong power supply, in order to use the drive smoothly, please read the working sequence diagram in section 4.8 carefully, and the upper computer controller should strictly follow the requirements of this sequence diagram.

4.1.1 Wiring and inspection

Confirm the following before energizing:

- The motor is unloaded, do not put a load on the motor shaft, and disconnect the connector even if it is already mounted on the machinery;
- The motor must be secured due to the shock of acceleration and deceleration of the motor;
- Is the wiring correct, especially whether the driver U, V, W and motor U, V, W wiring one-to-one correspondence, driver L1, L2 wiring is correct;
- Does the input voltage meet the requirements indicated on the nameplate;
- The encoder cable is connected correctly.

4.1.2 Restoring Default Parameters and Setting Drive Parameters

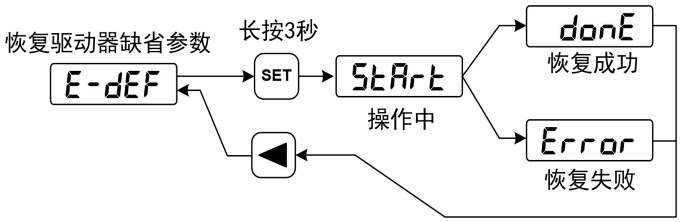
Without connecting the command line and communication line of the upper computer, **after connecting the motor power line and encoder cable, turn on the power of the main circuit**, the display panel of the drive lights up, and if there is an alarm, please check the connecting line.

(If the configuration of multi-turn absolute encoder, drive the first power-up will appear alarm number Err40, is a normal phenomenon, suggesting that the multi-turn encoder once had a power loss state, the host computer needs to set the mechanical zero operation, this alarm number clearing method is as follows: set P-008 to 2, save the parameters, and then restart the power-off, Err40 lifted, if the alarm is still not lifted, power-off and restart again can be, it must be reset the

mechanical zero point.)

Set the drive parameters as described below:

1、 check the motor series P-099 and model code P-002, restore the default parameters of the drive: set P-000 for 385 or 316, enter the parameter management mode "E-", switch to "E-dEF" and hold down the **SET** key for 3 seconds. After switching to "E-DEF", press and hold the SET key for 3 seconds, the display will show "donE" indicating that the restoration of default values is completed, the operation process is shown in the following figure:



注意：此操作要求在驱动器处于非使能状态进行！

<Be sure to complete this step as required before driver debugging, otherwise operation abnormality may occur>!

Special Note: For servo motors with absolute encoder, the driver will **automatically recognize the** motor series (P-099) and motor model code (P-002), eliminating the need to manually set the motor series and model code. However, **when using the** servo motor **for the first time, it is important to** check whether the motor specification parameters are correctly recognized (P-099 displays the motor series, and P-002 displays the motor model code; see Section 7.2 for details of the motor specification parameters). (P-099 displays the motor series, P-002 displays the motor model code, for details of the motor specifications, see Section 7.2).

Parameter number	Physical meaning of the parameter
P-201	**Number of motor pole pairs** 4:4 pole pairs 5:5 pole pairs
P-204	**Motor rated line current** Unit (A) 2.5: indicates 2.5A
P-207	**Motor rated speed** Unit (r/min) 3000: indicates 3000r/min

2、 If you need to communicate with the driver through RS485 interface, **please set the communication parameters** as follows:

P-181	Drive communication ID number	realm	default value	unit (of measure)
		-1 to 32	1	

When using RS-485 communication, the upper controller is the host and the servo drive is the slave. The communication address of the servo drive needs to be set to a different communication station number by this parameter. The setting range of the station number address is from -1 to 32, **-1 means that the communication function is closed, and the setting value is greater than 0 means that the communication function is open.** Before using the communication function, this parameter must be set to the required station number, this station number represents the absolute address of this drive in the communication network, a group of servo drives can only be set to one station number, if the station number is set repeatedly, it will lead to the failure of normal communication.

P-182	MODBUS communication baud rate	realm	default value	unit (of measure)
		0 to 5	2	

Select the baud rate of RS-485 communication through this parameter, different values correspond to different baud rates, the selected communication baud rate should be the same as the communication baud rate of the upper controller, the specific set values are as follows:

Parameter significance: 0: Baud rate is 4800bps 1: Baud rate is 9600bps

2: Baud rate of 19200bps 3: Baud rate of 38400bps

4: Baud rate of 57600bps 5: Baud rate of 115200bps

P-183	MODBUS communication data mode selection (Only RTU data format is supported for the time being)	realm	default value	unit (of measure)
		0 to 5	1	

Select the data mode of RS-485 communication through this parameter, and the selected data mode should be consistent with the communication protocol of the upper controller, and the meaning of the specific parameter value is as follows:

0: Data bit - 8 bits Checksum bit - none Stop bit - 1 bit

1: Data bits-8 bits Checksum bits-even check (Even) Stop bits-1 bit

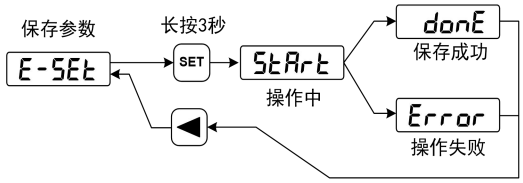
2: Data bits-8 bits Checksum-odd (Odd) Stop bits-1 bit

3: Data bits - 8 bits Checksum - none Stop bits - 2 bits

4: Data bits-8 bits Checksum bits-even check (Even) Stop bits-2 bits

5: Data bits-8 bits Checksum-odd (Odd) Stop bits-2 bits

3、 **enter section 4.2 to set the function parameters and performance parameters,** set the drive parameters must press **SET** to confirm, and then perform the parameter save operation E-SEt as shown below:



4、After the parameters are saved successfully, the drive will be powered off and restarted, and the trial operation can be carried out: **keyboard speed trial operation (Fn -20);or JOG spotting trial run.**

4.1.3 Keypad speed trial run (Fn -20)

Turn on the power to the drive and after confirming that there are no alarms or any abnormalities, perform the following operations according to the figure below:

The keypad speed prompt is "r.", the numerical unit is r/min, and the speed command is provided by the keys. Change the speed command with ▲ and ▼ keys, the motor runs at the given speed. A positive number indicates positive rotation (CCW), a negative number indicates reverse rotation (CW), and the minimum given speed is 0.1r/min.

After the keyboard speed control trial run without any abnormality, you can connect the mechanical load and carry out the next step of debugging under the control instructions of the upper computer controller.

4.1.4 JOG spotting trial run

Turn on the main circuit power, the display panel lights up, if there is an alarm appears, please check the connecting wire.

After confirming that there are no alarms or any abnormal conditions, set P-098 to 1. The servo enable (SON) is ON and the RUN indicator lights up, at which time the motor is excited and is in the zero speed state.

In the auxiliary function, select the pointing operation "A-JoG" and press the **SET** key to enter the pointing (JOG) operation mode. The prompt for jog is "J", the unit of value is r/min, and the speed command is provided by the key:

Press ▲ key and hold it, the motor runs at JOG speed forward (CCW), release the key, the motor stops and keeps zero speed; press ▼ key and hold it, the motor runs at JOG speed reverse (CW), release the key, the motor stops and keeps zero speed.

The JOG speed is set by parameter P-076, and the default speed is 100 r/min. **If the motor operates normally, you can proceed to the next operation (intermodulation with the upper computer controller).**

The meanings of the parameters related to the trial run are as follows:

Table 4.1 Key parameters for commissioning

param eters	name (of a thing)	set value	default value	Parameter description
P-060	Speed command acceleration time	Appropriate values	100	Unit: ms 0-1000r/min acceleration time, increase the parameter can reduce the acceleration shock
P-061	Speed command deceleration time	Appropriate values	100	Unit: ms 1000r/min-0 deceleration time, increase this parameter can reduce the deceleration shock
P-069	Trial run torque limit	100~200	100	Unit: Rated torque*1%
P-075	Maximum speed limit	Set up as needed	3000	Unit: r/min Setting this parameter can play a role in over-speed safety protection.
P-076	JOG running speed	Appropriate values	100	Unit: r/min Pointing (JOG) Speed
P-098	force	1 or 0	0	Forced Enable: set to 0 if externally enabled; set to 1 if externally enabled is not used for motor excitation.

Note: When the keypad speed control trial operation or JOG pointing trial operation, if the motor vibration, noise and other abnormalities, it is necessary to appropriately reduce the value of parameter P-005.

4.2 Interfacing with the host computer controller

Servo drives can operate in three modes: position mode, speed mode and torque mode.

(1) The position control mode is used in systems requiring precision positioning, such as **CNC machine tools and textile machinery**. The source of position instruction is pulse instruction, which is input by PULS+, PULS- and SIGN+, SIGN- input pulses from the input terminals;

(2) Speed control is used in applications requiring precise speed control, such as knitting **machines, drilling machines, and CNC processing machines**. It can also be used to form a closed-loop position control by working in conjunction with the upper position device;

(3) Torque control is used in **printing machines, winding machines, injection molding machines**, etc. The motor output torque is proportional to the input command.

4.2.1 Control parameter setting

After confirming that the command port CN1 of the upper computer is wired correctly, keep all input signals OFF, put in the power supply, and then set the necessary parameters as follows:

(1) The position control mode sets the relevant control parameters according to the following table:

Table 4.2 Key parameter settings for position control mode

parameters	name (of a thing)	set value	Parameter description
P-004	control method	0 (default)	Set to position control mode
P-028	Position Command Electronic Gear Molecule (High 4 digits)	0 (default)	Electronic gear molecules = p-028*10000 + p-029
P-029	Position Command Electronic Gear Molecule (lower 4 bits)	1 (default)	
P-030	Position Command Electronic Gear Denominator	1 (default)	Electronic Gear Denominator
P-035	Pulse Input Method	0 (default value)	**0: Pulse + direction** 1: Forward/reverse pulse 2: A/B orthogonal pulses
P-036	Pulse input	0 (default	0: Normal direction 1:

	direction	value)	Reverse direction
P-005	Velocity Loop Gain	50 (default)	To improve the servo rigidity, the parameter value should be increased, but too large easily caused by vibration and noise, each time the amount of adjustment for 10
P-006	Velocity loop integration time	20 (default)	The larger the load inertia, the value of this parameter should be increased appropriately, but too large to reduce the speed response rigidity, each time the adjustment amount of 5
P-009	Position Loop Gain	40 (default)	To improve the servo rigidity and reduce the following error, the value of this parameter should be increased, but too large easily caused by vibration and noise, each time the amount of adjustment is 10
P-007	Torque Filtering Time Constant	25 (default)	To eliminate vibration and noise when the motor is running, the value of these two parameters should be increased appropriately, in the absence of obvious vibration and noise, the smaller the parameter value, the better, each time the amount of adjustment is 10; **priority should be given to adjusting the P-019, in the case of noise and vibration can not be eliminated, and then consider adjusting the P-007**
P-019	Speed detection filter time constant	40 (default)	
P-021	Position loop feed-forward gain	0 (default value)	Range: 0~128
P-022	Position loop	10 (default)	Unit: 1ms Range: 2~1000

	feed-forward filtering time		
P-040	Position command smoothing filter time	0 (default value)	Unit: 1ms Range: 0~1000
P-080	Position overshoot detection range	600 (default)	Unit: 0.01 turns

Set the **absolute encoder application parameters according to** the following table according to the actual application needs:

parameters	name (of a thing)	set value	Parameter description
P-172	Encoder Equivalent Pulse Lines	0~8000 (default 2500)	**2500:** indicates that the motor shaft rotates once, the equivalent number of pulses is 2500*4=10000, i.e.: **when the position pulse command gear ratio is 1/1, the host controller sends out 10000 pulses to the servo drive, corresponding to the motor rotates once.**
P-179	Pulse division output signal selection	0~1	This parameter is used to select the type of pulse division output signal: 0: Encoder feedback pulse signal 1: Position command synchronization pulse signal
P-184	23-bit encoder resolution selection	17~23	Set to 17 to be used as a 17-bit encoder. If the encoder is 17-bit, the P-184 parameter is invalid.(The drive display item d-cod can view the current encoder bits)

Special Note: To increase the servo rigidity and improve the dynamic performance, P-005 and P-009 should be set to a larger value as much as possible, and the amount of adjustment each time is 10. In general, the greater the rigidity of the mechanical axis, the greater the adjustable values of P-005 and P-009. Can let the servo axis in the zero-speed feed hold state, gradually

increase the two parameters, observe the display item d-EPo (position following the error) of low Lo (Press Enter to display the value), the value of the normal range should be in plus or minus 10 within the jump, if the amplitude of the jump is significantly larger than that of the servo axis of the rigidity of the adjustments is too strong, can be appropriate to reduce P-005 and P-009 a little bit, then the gain of the parameter value is ideal. parameter value is more ideal. If there is obvious vibration or noise in the process of adjusting P-005 and P-009, you can increase P-007 appropriately, the value of each increase of 5, observe whether the noise is reduced, the parameter value should not be too large (generally less than 40).

(2) The speed control mode sets the relevant control parameters according to the following table:

Table 4.3 Speed control mode key parameter settings

parameters	name (of a thing)	set value	Parameter description
P-004	control method	1	Set to speed control mode
P-025	Speed command source	0 (default value)	0: Analog input, analog voltage input from ports AS+ and GNDA; 1: Internal Multi-Segment Speed <8 selectable P-137~P-144 > 2: Analog + internal multispeed

			3: Pulse speed
P-046	Analog Speed Command Gain	300 (default) Setup on demand	Rotational speed corresponding to 1V analog voltage (unit: r/min/V)
P-047	Analog Speed Command Zero Offset Compensation	0 (default value) Setup on demand	Unit: 0.1mv
P-048	Speed command direction	0 (default value) Setup on demand	0: Normal direction 1: Reverse direction
P-051	Analog speed command deadband 1 (positive)	0 (default value) Setup on demand	Sets the forward voltage deadband: 0 to 13000 units mv
P-052	Analog speed command deadband 2 (negative)	0 (default value) Setup on demand	Setting negative voltage deadband: -13000 ～ 0 unit mv
P-060	Speed command acceleration time	100 (default value) Setup on demand	Acceleration time from 0 to 1000r/min (unit: ms)
P-061	Speed command deceleration time	100 (default value) Setup on demand	Deceleration time from 1000 to 0r/min (unit: ms)
P-005	Velocity loop proportional gain	50 (default)	To improve the rigidity, you can adjust P-005 appropriately, each time the amount of adjustment is 10
P-006	Velocity loop integration time constant	20 (default)	If the load inertia is large, you can appropriately adjust P-006, each time the amount of adjustment for 10
P-007	Torque Filtering Time Constant	25 (default)	When the motor operation generates vibration or

P-019	Speed detection filter time constant	40 (default)	noise, it can be adjusted appropriately, and the amount of adjustment is 10 percent each time.

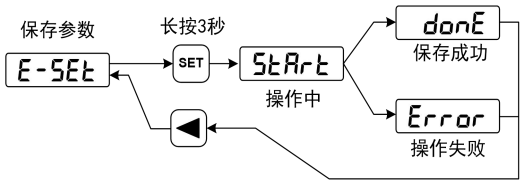
(3) Torque control mode Set the relevant control parameters according to the table below:

Table 4.4 Torque control mode key parameter settings

parameters	name (of a thing)	set value	Parameter description
P-004	control method	2	Set to torque control mode
P-026	Torque command source	0 (default value)	0: Analog torque 1: Internal multi-segment torque < 4 selectable P-145~P-148 settings>
P-053	Analog Torque Command Gain	30 (default) Setup on demand	Percentage of rated motor torque corresponding to 1V analog voltage (unit: 1%/V)
P-054	Analog Torque Command Zero Bias Compensation	0 (default value) Setup on demand	Unit: 0.1mv
P-055	Analog Torque Command Direction	0 (default value) Setup on demand	0: Normal direction 1: Reverse direction
P-075	Maximum speed limit	Setup on demand	Setting the overspeed protection value (Unit: r/min)
P-078	Speed limitation during torque control	Setup on demand Default value (1000)	Torque mode motor running speed is limited within this parameter: 0~8000 (Unit: r/min)

After the completion of the above parameter settings, be sure to perform the parameter save operation E-SEt as shown in the following figure, showing that the operation is successful after

turning off the power, to be drive panel display goes out and then powered on again, you can carry out the next step of the function debugging.



4.2.2 Functional debugging

1、According to the actual need, after the above necessary parameters are set, perform the parameter writing operation (refer to the E-SEt operation instructions in section 3.5 Parameter Management), and after the parameters are saved, restart the servo drive with power off.

2, speed control mode: given a small analog voltage command, and make the servo enable input signal SON for ON, the motor should follow the instruction to run up, at this time on the panel, "enable" indication decimal point will be lit, by monitoring the following variables can determine whether the motor is running normally:

(1) Observe the magnitude of the motor current (unit: A) by monitoring d-1. During normal steady speed operation, the displayed current value will not exceed the rated current of the motor;

(2) Observe the analog command (expressed in rotational speed in r/min) by monitoring d-CS. When normal, the displayed value is equal to the rotational speed displayed by d-SPd.

(3) By monitoring rE-10 under the D-rE menu, observe the original analog instruction (expressed by voltage, unit: mv), and normally display a value equal to the given command voltage value of the upper computer.(Note: rE-9 is the command after zero bias compensation, and the display value is only displayed after enabling it, the unit is mv.)

3、After confirming the normal, slowly increase the analog voltage command, gradually increase the speed of motor operation, while monitoring the motor operation whether there is vibration, noise, speed is smooth, whether the motor current will exceed the rated value.

4, when the motor from zero speed to positive maximum speed, or from zero speed to negative maximum speed are running normally, the user can carry out other functions debugging.

Common abnormalities during analog command speed mode operation and their

treatment are as follows:

serial number	Frequently encountered anomalies in the commissioning operation	deal with
1	When an analog command is given, the data displayed in monitor window rE-3 does not correspond to the commanded voltage.	Check the command system of the upper computer and the command cable connection for correctness.
2	After enabling, the monitoring window rE-10 has the corresponding commanded voltage value, while d-cS has no corresponding command speed, that is, there is a voltage command and the motor does not run	1. Check the setting of "necessary parameters"; 2. Check the input I/O signal line, it will be convenient to carry out I/O checking by observing the contents of the d-di display (refer to the description of input terminal DI in section 2.3).
3	The positive direction of motor rotation is not consistent with the requirements of the host computer.	Modify parameter P-048 to set whether the speed instruction is inverted or not: set it to 0 for no inversion, set it to 1 for inversion (immediate effect)
4	Abnormal conditions such as vibration and noise occur in the motor;	1. Check that the shielded wires are properly wired; 2. Refer to Chapter 4, Performance Optimization Tuning.
5	The motor will still move slightly if you give it a 0V command.	Perform the analog auto zero function, or manually adjust parameter P-047.

6. Position control mode: make the servo enable input signal SON to ON, give a lower frequency position pulse command, the motor should run up:

(1) Observe the size of the motor current (unit: A) by monitoring d-i. During normal no-load steady speed operation, the current value displayed should be a very small current value close to zero;

(2) By monitoring d-Fr9, the frequency of instruction pulse can be displayed in real time. If the pulse is inaccurate, the pulse filter coefficient P-038 can be set accordingly.

(3) By monitoring d-cod, press **SET** key to display encoder bits, and then press ▲ or ▼ key to display real-time level status of input pulse signal;

(4) After the driver unit executes an instruction, the number of pulses sent from the upper computer can be read out by monitoring d-CPn;

7、 slowly increase the speed of the position command, gradually increase the speed of the motor operation, and at the same time monitor the motor operation for vibration, noise, smooth speed, and whether the motor current will exceed the rated value.

8、When the motor can follow the instruction within the rated speed, and the position following error displayed by d-EPo is 0 when it stops, the user can carry out other function debugging.

Common abnormalities during position control mode operation and their treatment are as follows:

serial number	Frequently encountered anomalies in the commissioning operation	deal with
1	Position pulse command is given after enabling, d-cPn display does not change, motor does not run	Check the command system of the upper computer and the command cable connection for correctness.
2	d-cPn display changes, motor does not run	1. Check the setting of "necessary parameters"; 2. Check the input I/O signal line, it will be convenient to carry out I/O checking by observing the contents of the d-d display (refer to the description of input terminal DI in section 2.3).
3	The positive direction of motor rotation is not consistent with the requirements of the host computer.	Modify parameter P-036 to set whether the position instruction is inverted or not: set to 0 for no inversion, set to 1 for inversion (immediate effect)
4	Abnormal conditions such as vibration and noise occur in the motor.	1. Check that the shielded wires are properly wired; 2. Refer to Chapter 4, Performance Optimization Tuning.
5	Motor can only run in one direction	1. Pay attention to the mode of detecting the command source and check the setting of P-035/P-037; 2. Check if the position command input cable is connected properly.
6	d-cPn The number of position command pulses displayed by Pn does not match the number of pulses in the command source of the host computer	1. Check the shielding treatment of the command signal line; 2. Keep away from strong sources of interference.

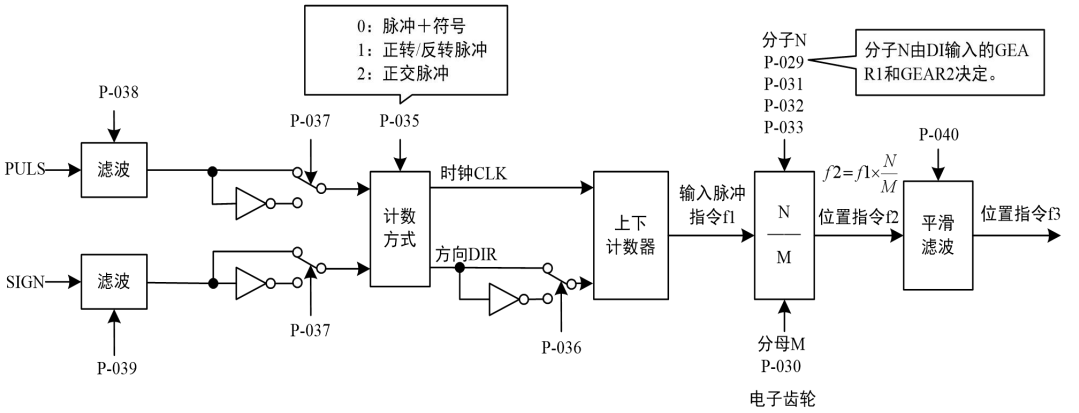
4.3 Position control parameters in detail

4.3.1 Position commands

1. Parameters related to position instructions

parameters	name (of a thing)	Parameter range	default value	unit (of measure)	be applicable
P-028	Position Command Electronic Gear Molecule (High 4 digits)	0 to 32000	0	Electronic gear molecules = p-028*10000 + p-029	
P-029	Position Command Electronic Gear Molecule (lower 4 bits)	0 to 9999	1		
P-030	Position Command Pulse Electronic Gear Denominator	1 to 32767	1		P
P-035	Position command pulse input method	0 to 2	0		P
P-036	Position command pulse input direction	0 to 1	0		P
P-037	Position command pulse input signal logic	0 to 12	0		P
P-038	Position command pulse signal filter coefficients	0 to 21	2		P
P-039	Position Command Direction Signal Filter Coefficients	0 to 15	0		P
P-040	Position command exponential smoothing filter time	0 to 5000	0	ms	P

2. Command pulse transmission path



3. Command pulse input method

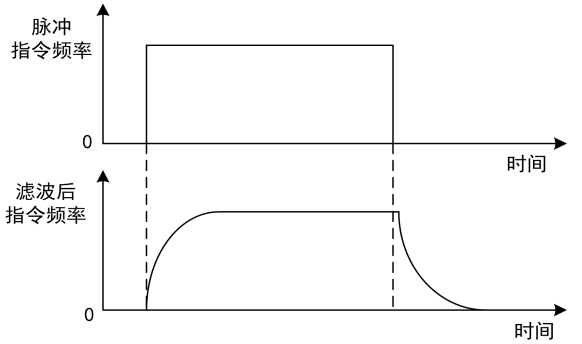
The input method is determined by parameter P-035; the phase of the input signals PULS and SIGN can be set by parameter P-037 and is used to adjust the counting edge; parameter P-036 is used to change the counting direction, and the setting of 1 is used to reverse the counting value.

脉冲指令形式	正转(CCW)	反转(CW)	**参数P-035**
脉冲+方向	PULS SIGN		0
正转/反转脉冲	PULS SIGN		1
正交脉冲	PULS SIGN		2

Note: The arrow indicates the counting edge and when P-036=0 and P-037=0

4. Smooth filtering

As shown below, parameter P-040 is a smoothing filter for command pulses with an exponential form of acceleration and deceleration. The filter does not lose the input pulse, but there is a command delay. When set to 0, the filter does not work. The parameter value indicates the time to rise from a frequency of 0 to the 63.2% position command frequency.



The filter smoothes the input pulse frequency. This filter is used when: the upper controller has no acceleration or deceleration function, the electronic gear ratio is large, and the command frequency is low.

4.3.2 Input electronic gears

(1) Basic description of electronic gear ratios

The Electronic Gear allows you to define a unit pulse command input to the unit to move the drive an arbitrary distance. The pulse command generated by the host controller does not take into account the gear ratio, reduction ratio or number of motor encoder lines of the drive system. The following table describes the electronic gear variables:

variant	Description of variables	Value of this device
C	Number of encoder lines/digits	2500 line
P_t	The number of pulses (pulse/rev) required to rotate the encoder one revolution by default (electronic gear ratio 1:1).	= 4 x *C* = 4 x 2500 = 10000 (pulse/rev)
R	reduction ratio	*R = B/A*, where *A*: Number of motor rotations; *B*: Number of rotations of the load axis
ΔP	One Command Pulse Shift	
P_c	Number of command pulses for one revolution of the load axis	
Pitch	Ball screw pitch(mm)	
D	Roller Diameter(mm)	

Calculation formula:

$$\text{电子齿轮比}(\frac{N}{M}) = \frac{\text{编码器一转分辨率}(P_t)}{\text{负载轴一转的指令脉冲数}(P_c) \times \text{减速比}(R)}$$

Among them.

$$\text{负载轴一转的指令脉冲数}(P_c) = \frac{\text{负载轴一转的移动量}}{\text{一个指令脉冲移动量}(\Delta P)}$$

Approximate the result of the above calculation and write an integer value to the parameter such that both the numerator and denominator are less than or equal to 32767.

(2) Electronic gear ratio dynamic switching function

The drive provides 4 sets of electronic gear numerator N, which can be changed online and is determined by the DI input GEAR1, GEAR2. The denominator M (parameter P-030) are all the same.

Parameter **P-034** can be used to set the dynamic electronic gear application mode as described below:

P-034 is set to 0: Dynamic electronic gear ratio switching is prohibited, and the command pulse electronic gear molecule is set by P-028 and P-029;

P-034 is set to 1: Dynamic electronic gear ratio switching is allowed and the command pulse electronic gear molecule is determined by GEAR1 on the DI input;

DI signal [Note] GEAR1	Command Pulse Electronic Gear Molecule N
0	1st molecule (parameter P-029)
1	2nd molecule (parameter P-031)

Note: 0 means OFF, 1 means ON.

P-034 is set to 2: Dynamic electronic gear ratio switching is allowed and the command pulse electronic gear molecule is determined by the DI input GEAR1, GEAR2.

DI signal [Note]		Command Pulse Electronic Gear Molecule N
GEAR2	GEAR1	
0	0	1st molecule (parameter P-029)
0	1	2nd molecule (parameter P-031)
1	0	3rd molecule (parameter P-032)
1	1	4th molecule (parameter P-033)

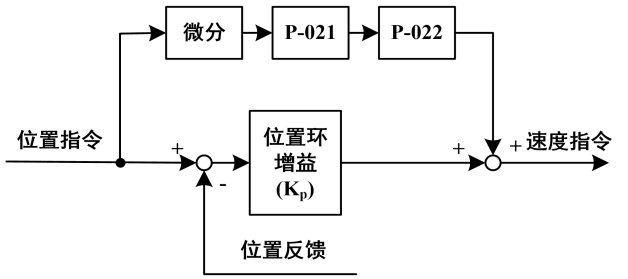
Note: 0 means OFF, 1 means ON.

4.3.3 Position control related gains

parameters	name (of a thing)	Parameter range	default value	unit (of measure)	be applicable
P-009	Position ring proportional gain	1 to 1000	40	1/s	P
P-021	Position loop feed-forward gain	0 to 128	0	%	P
P-022	Position loop feed-forward filtering time	2 to 1000	10	ms	P

Since the position loop includes the speed loop, the load inertia ratio is set first, then the speed loop gain and speed loop integration time constant are adjusted, and finally the position loop gain is adjusted according to the order of the inner loop followed by the outer loop.

The following are the position controllers for the system. Increasing the position loop gain K_p increases the position loop bandwidth, but is limited by the speed loop bandwidth. To increase the position loop gain, the velocity loop bandwidth must first be increased.



Feedforward reduces the phase lag of the position loop control, which reduces the position tracking error during position control as well as shorter positioning time. Increasing the amount of feedforward reduces the position control tracking error, but too much can make the system unstable and overshoot. If the electronic gear ratio is greater than 10 is also easy to generate noise. General application can be set P-021 as 0%, need high response, low tracking error, can be increased appropriately, should not exceed 80%, and may need to adjust the position loop feed-forward filtering time constant (parameter P-022).

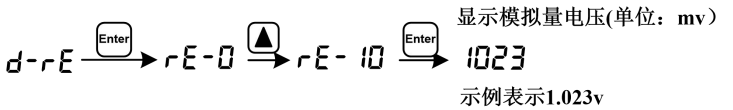
4.4 Speed Control Parameter Details

4.4.1 Parameters related to the speed command

The parameters related to the speed command are as follows:

param eters	name (of a thing)	Parameter range	default value	unit (of measure)	be appli cable
P-025	Speed command source	0 to 3	0		S
P-046	Analog Speed Command Gain	10-3000	300	r/min/V	S
P-047	Analog Speed Command Zero Offset Compensation	-30,000 to 30,000	0	0.1mv	S
P-048	Analog Speed Command Direction	0 to 1	0		S
P-049	Analog Speed Command Filter Time Constant	2 to 500	20	0.1ms	S
P-050	Analog Speed Command Polarity	0 to 2	0		S
P-051	Analog Speed Command Deadband 1	0 to 30000	0	mv	S
P-052	Analog Speed Command Deadband 2	-30000～0	0	mv	S

The analog zeroing operation is described in detail in section 3.6.2. The zero offset value can also be adjusted by manually setting parameter P-047 according to the input analog quantity. The analog voltage value received by the drive can be viewed through the following menu items:



4.4.2 Velocity command sources

There are several different sources of speed commands, set by parameter P-025, as described below:

P-025	clarification	account for
0	Analog Speed Command	Port AS+ and GNDA input analog voltage
1	Internal Multi-Segment Speed Command < 8 optional P-137~P-144 >	Determined by SP1, SP2, and SP3 of the DI input [Note 1].
2	Analog Speed Command + Internal Multi-Segment Speed Command	When SP1, SP2, and SP3 are OFF is an analog command, and the rest is determined by SP1, SP2, and SP3 [Note 2].

Note 1: Internal speed command:

DI signal			speed command
SP3	SP2	SP1	
0	0	0	Internal speed 1 (parameter P-137)
0	0	1	Internal speed 2 (parameter P-138)
0	1	0	Internal speed 3 (parameter P-139)
0	1	1	Internal speed 4 (parameter P-140)
1	0	0	Internal speed 5 (parameter P-141)
1	0	1	Internal speed 6 (parameter P-142)
1	1	0	Internal speed 7 (parameter P-143)
1	1	1	Internal speed 8 (parameter P-144)

Note 2: Analog speed command + internal speed command:

DI signal			speed command
SP3	SP2	SP1	
0	0	0	Analog Speed Command
0	0	1	Internal speed 2 (parameter P-138)
0	1	0	Internal speed 3 (parameter P-139)
0	1	1	Internal speed 4 (parameter P-140)
1	0	0	Internal speed 5 (parameter P-141)
1	0	1	Internal speed 6 (parameter P-142)
1	1	0	Internal speed 7 (parameter P-143)
1	1	1	Internal speed 8 (parameter P-144)

Above 0 means OFF, 1 means ON. There are two DI inputs to provide special functions: CZERO (zero command), CINV (command inversion), when CZERO is ON, the speed command

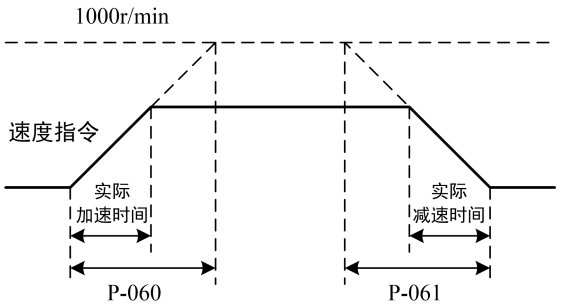
is forced to zero; when CINV is ON, the speed command is inverted.

4.4.3 Acceleration and deceleration control (valid for speed mode only)

Acceleration and deceleration control is related to the following parameters:

parameters	name (of a thing)	Parameter range	default value	unit (of measure)	be applicable
P-060	Speed command acceleration time	0 to 30000	100	ms	S
P-061	Speed command deceleration time	0 to 30000	100	ms	S

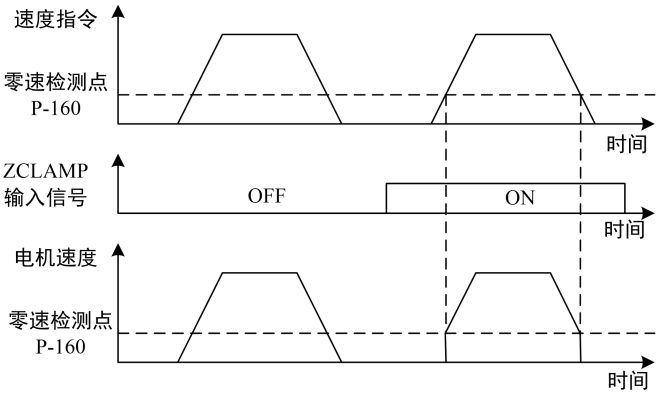
Acceleration and deceleration control slows down sudden changes in speed and makes the motor run smoothly. As shown in the figure below, parameter P-060 sets the acceleration time of the motor from zero speed to 1000r/min, and P-061 sets the deceleration time of the motor from 1000r/min to zero speed. This parameter should be set to 0 if the drive constitutes position control with the upper unit.



4.4.4 Zero-speed clamping

The parameters related to the zero-speed clamping are as follows:

parameters	name (of a thing)	Parameter range	default value	unit (of measure)	be applicable
P-160	Zero Speed Detection Point	0 to 3000	10	r/min	ALL
P-161	Zero Speed Detection Return	0 to 1000	5	r/min	ALL
P-162	Zero-speed clamping mode	0 to 1	0		S



When speed control is performed, even if the motor is at zero speed, external forces may cause rotation resulting in position changes. In case of analog speed command input, absolute zero speed command is also not easy to realize. In order to solve these two problems, the zero speed clamping function can be considered. The zero-speed clamping function is turned on when the following conditions are met:

Condition 1: Speed control mode;

Condition 2: ZCLAMP (zero speed clamp) in DI is ON;

Condition 3: The speed command is below parameter P-160.

When either of the above conditions is not satisfied, normal speed control is executed. There are two modes of zero speed clamping as follows:

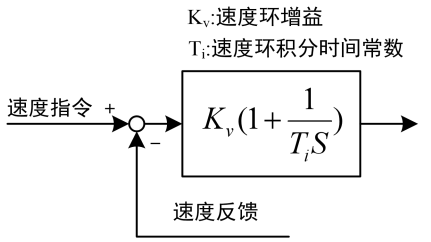
P-162	clarification
0	The motor position is fixed at the moment the function is turned on. At this time, the position control is internally accessed, and even if rotation occurs due to an external force, it will return to the zero fixed point.
1	Speed command is forced to zero speed when function is on. Internally it remains speed controlled and may rotate due to external forces.

4.4.5 Speed control related gains

parameters	name (of a thing)	Parameter range	default value	unit (of measure)	be applicable
P-005	1st velocity loop gain	1 to 3000	50	Hz	P,S
P-006	1st velocity loop integration time constant	1 to 1000	20	ms	P,S
P-018	Velocity loop PDFF control coefficients	0 to 100	100	%	P,S

The following is the speed controller of the system. Increasing the speed loop gain K_v

improves the response bandwidth of the speed, and decreasing the speed loop integration time constant T_i , increases the system rigidity and reduces the steady state error.



P-018 selectable speed controller structure, 0 for IP regulator, 100 for PI regulator, 1 to 99 for PDFF regulator. large value of P-018 parameter is high frequency response, small value of parameter is high stiffness (resistance to deviation), and the medium value balances frequency response and stiffness.

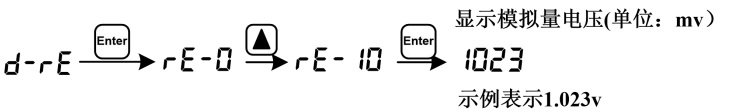
4.5 Torque Control Parameter Details

4.5.1 Parameters related to the torque command

The parameters related to the torque command are shown in the table below:

param eters	name (of a thing)	Parameter range	default value	unit (of measur e)	be appli cable
P-026	Torque command source	0 to 2	0		T
P-053	Analog Torque Command Gain	1 to 300	30	%/V	T
P-054	Analog Torque Command Zero Bias Compensation	-30,000 to 30,000	0	mv	T
P-055	Analog Torque Command Direction	0 to 1	0		T
P-056	Analog Torque Command Filter Time Constant	2 to 500	20	0.1ms	T
P-057	Analog Torque Command Polarity	0 to 2	0		T
P-075	Maximum speed limit	0 to 32000	3500	r/min	ALL

The analog zeroing operation is described in Section 3.6.2. The zero offset value can also be adjusted by manually setting parameter P-054 according to the input analog quantity. The analog voltage value received by the drive can be viewed through the following menu items:



4.5.2 Torque Command Sources

There are several different sources of torque commands, set by parameter P-026 as follows:

P-026	clarification	account for
0	Analog torque command	Port AS+ and GNDA input analog voltage
1	Internal Torque Command	Determined by TRQ1 and TRQ2 of the DI input [Note 1].
2	Analog torque command + internal torque command	When both TRQ1 and TRQ2 are OFF it is an analog command, and the rest is determined by TRQ1 and TRQ2 [Note 2].

Note 1: Internal torque command:

DI signal		Torque command
TRQ2	TRQ1	
0	0	Internal torque 1 (parameter P-145)
0	1	Internal torque 2 (parameter P-146)
1	0	Internal torque 3 (parameter P-147)
1	1	Internal torque 4 (parameter P-148)

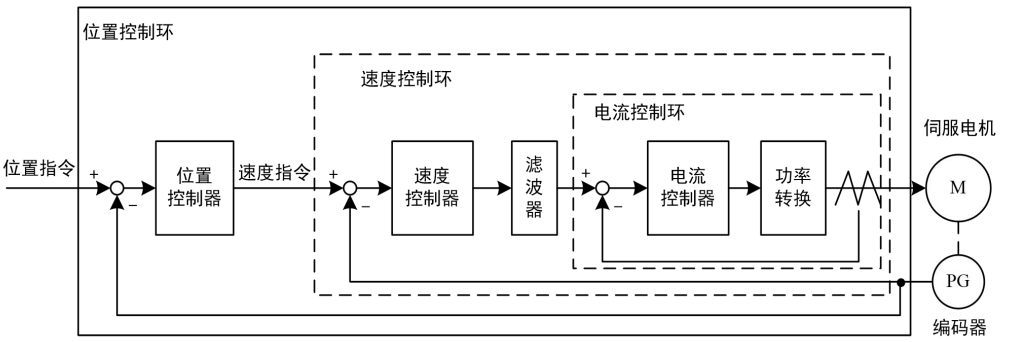
Note 2: Analog torque command + internal torque command:

DI signal		Torque command
TRQ2	TRQ1	
0	0	Analog torque command
0	1	Internal torque 2 (parameter P-146)
1	0	Internal torque 3 (parameter P-147)
1	1	Internal torque 4 (parameter P-148)

Above 0 means OFF, 1 means ON. there are two DI inputs CZERO (zero command), CINV (command inverse) can provide special function, when CZERO is ON, the torque is forced to zero; when CINV is ON, the torque command is inverted.

4.6 Gain Adjustment

The drive includes three control loops: current control loop, speed control loop and position control loop. The control block diagram is as follows:



Theoretically, the control loop bandwidth of the inner layer must be higher than that of the outer layer, otherwise the whole control system will be unstable and cause vibration or poor response, so the relationship between the bandwidths of the three control loops is as follows:

Current loop bandwidth > Velocity loop bandwidth > Position loop bandwidth

Since the drive has already adjusted the current control loop to be optimal, the user only needs to adjust the speed control loop and position control loop parameters.

4.6.1 Gain parameters

The parameters related to the control gain are shown below:

parameters	name (of a thing)	Parameter range	default value	unit (of measure)	be applicable
P-005	Velocity Loop Gain	1 to 3000	50	Hz	P,S
P-006	Velocity loop integration time constant	1 to 1000	20	ms	P,S
P-009	Position Loop Gain	1 to 1000	40	1/s	P
P-007	Torque Filtering Time Constant	1 to 500	25	0.1ms	ALL
P-019	Speed detection filter time constant	5 to 500	45	0.1ms	P,S

The symbols are defined below:

K_v : Speed loop gain;

T_i : Speed loop integration time constant;

K_p : Position loop gain;

G: Load moment of inertia ratio (P-017);

J_L : The inertia of the load converted to the motor shaft;

J_M : Motor rotor moment of inertia.

1. Velocity loop gain K_v

The speed loop gain, K_v , directly determines the response bandwidth of the speed loop. As long as the mechanical system does not generate vibration or noise, increasing the speed loop gain value will speed up the speed response and improve the followability of speed commands. However, too large a setting may cause mechanical resonance. The speed loop bandwidth is expressed as follows:

$$速度环频宽(Hz) = \frac{1+G}{1+J_L/J_M} \times K_v(Hz)$$

If the load moment of inertia ratio G is set correctly ($G=J_L/J_M$), the speed loop bandwidth is

equal to the speed loop gain K_v .

2. Velocity loop integration time constant T_i

Velocity loop integration effectively eliminates velocity steady-state errors and responds quickly to subtle velocity changes. On the premise that the mechanical system does not generate vibration or noise, reduce the speed loop integration time constant T_i to increase the system rigidity and reduce the steady state error. If the load inertia ratio is very large or there is a resonance factor in the mechanical system, make sure that the speed loop integration time constant is large enough, otherwise the mechanical system is prone to resonance. If the load inertia ratio G is set correctly ($G = J_L / J_M$), use the following formula to get the velocity loop integration time constant T_i : $T_i(ms) \geq \frac{4000}{2\pi \times K_V(Hz)}$

3. Position loop gain K_p

The position loop gain directly determines the response speed of the position loop. On the premise that the mechanical system does not generate vibration or noise, increase the position loop gain to speed up the response, reduce the position tracking error, and shorten the positioning time. However, too large a setting may cause mechanical system jitter or positioning overshoot. The position loop bandwidth should not be higher than the speed loop bandwidth.

$$\text{位置环频宽}(Hz) \leq \frac{\text{速度环频宽(Hz)}}{4}$$

If the load inertia ratio G is set correctly ($G=J_L / J_M$), the position loop gain K_p is calculated as follows.

$$K_p(1/s) \leq 2\pi \times \frac{K_v(Hz)}{4}$$

4.6.2 Gain Adjustment Procedure

① Gain Parameter Adjustment Procedure Gain parameter adjustment procedure.

The selection of position and speed bandwidths must be determined by the rigidity of the machinery and the application. Conveying machinery connected by belts has low rigidity and can be set to lower bandwidths (P-009:10~40); gearboxes driven by gearboxes with medium mechanical rigidity can be set to medium bandwidths (P-009:30~50); direct-drive screws have high rigidity and can be set to high bandwidths (P-009:> 50). If the mechanical characteristics are unknown, the gain can be gradually increased to raise the frequency bandwidth until resonance,

and then the gain can be adjusted down again.

In servo gain, if you change one parameter, the other parameters need to be readjusted. Please do not make large changes to only one parameter. Regarding the procedure for changing servo parameters, generally please observe the following principles.

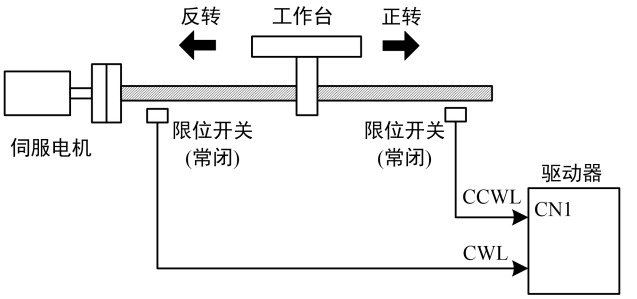
Improved response	Reduces response, suppresses vibration and overshoot
1. Increase the speed loop gain K_v (P-005) by 10 per adjustment; 2. Decrease the speed loop integration time constant T_i (P-006) by 5 per adjustment; 3. Increase the position loop gain K_p (P-009) by 10 per adjustment.	1. Decrease the position loop gain K_p (P-009, 10 per adjustment.); 2. Increase the speed loop integration time constant T_i (P-006) by 5 per adjustment; 3. Decrease the speed loop gain K_v (P-005) by 10 per adjustment.

② Noise and resonance suppression methods.

If the gain cannot be adjusted up due to resonance in the mechanical system, etc., and the desired responsiveness cannot be obtained, the speed detection filtering time can be increased appropriately first (P-019 is adjusted by 10 per adjustment), and if there is no obvious effect, the torque low-pass filtering time (P-007 is adjusted by 10 per adjustment) can be increased appropriately in order to suppress the resonance.

4.7 Over-travel protection

The over-travel protection function is a safety function that causes the motor to stop forcibly when the moving part of the machine exceeds the designed safe moving range and the limit switch operates. The over-travel protection schematic is shown below:



The limit switches are recommended to be used with normally closed contacts, which are closed within the safety range and disconnected for overtravel. Connection to the forward drive prohibition (CCWL) and reverse drive prohibition (CWL) can also be set to use vs. ignore via the single digit of parameter P-097. Set to use, the limit signal must be accessed; set to ignore, the

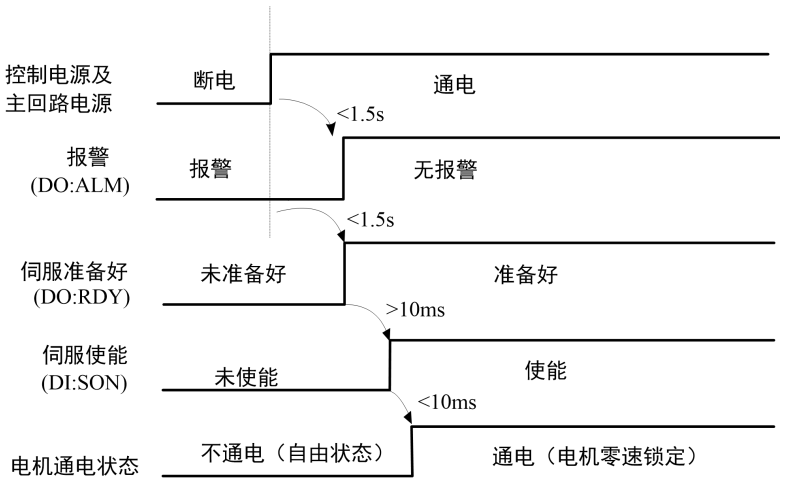
signal is not required. The default value of the parameter is that both CCWL and CWL are ignored; if use is required, the number of digits of parameter P-097 must be modified. It is still permitted to exit the overtravel state by entering a reverse command, even when in overtravel.

P-097 single-digit character	Reverse Drive Lockout (CWL)	Positive Rotation Drive Lockout (CCWL)
0	utilization	utilization
1	utilization	neglect
2	neglect	utilization
3 (default)	neglect	neglect

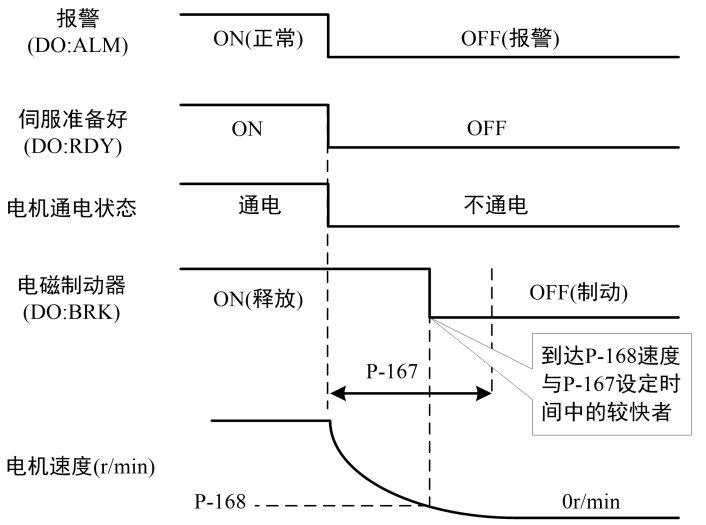
4.8 Work Timing

4.8.1 Power On Timing

- After the main power supply is turned on, about 1.5 seconds delay, servo ready signal (RDY) ON, at this time can accept servo enable (SON) signal, detected servo enable is valid, the power circuit is turned on, the motor excitation, in the running state. Detected servo enable is invalid or there is an alarm, the power circuit is turned off and the motor is in free state.

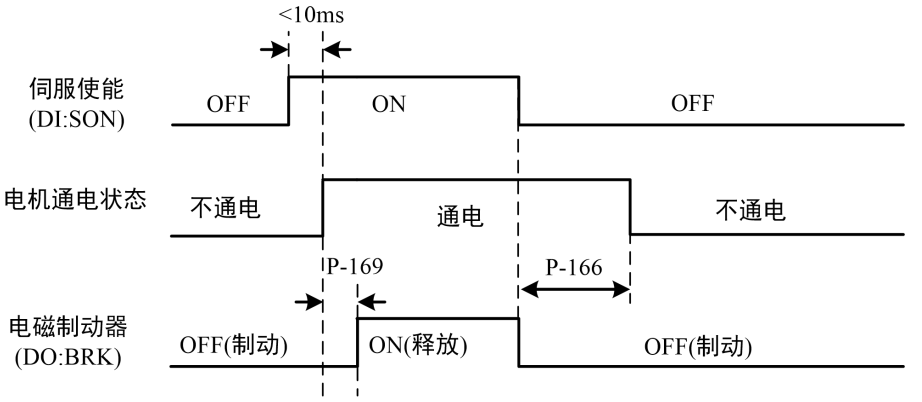


4.8.2 Servo-ON Alarm Timing



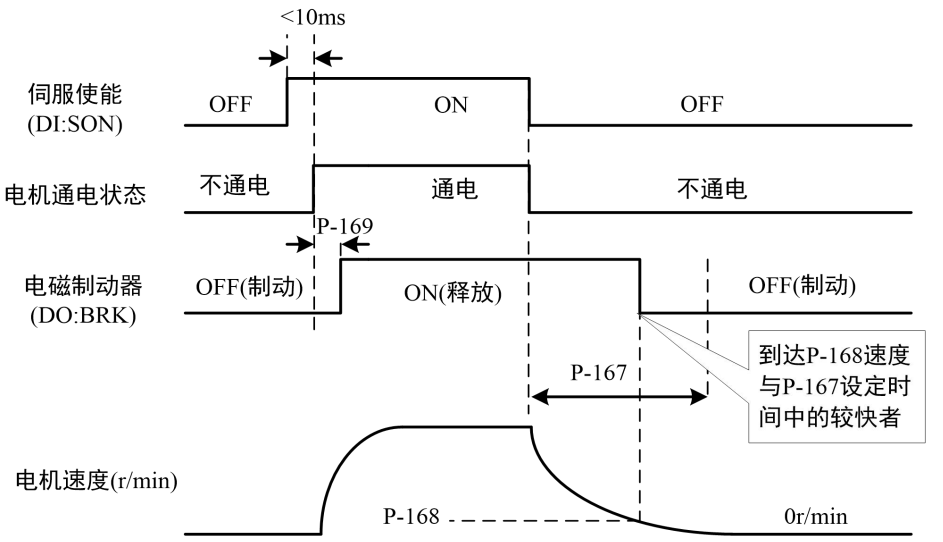
4.8.3 Timing of electromagnetic brake operation when the motor is stationary

Timing of electromagnetic brake operation when the motor speed is lower than parameter P-165:



4.8.4 Timing of electromagnetic brake operation during motor operation

Timing of electromagnetic brake operation when the motor speed is higher than parameter P-165:



4.9 Electromagnetic brake (mechanical holding brake)

An electromagnetic brake (holding brake, power loss brake) is used to lock the vertical or inclined table connected to the motor to prevent the table from falling when the servo power is lost. To realize this function, a motor with a brake is required. The brake should only be used to hold the table, never to decelerate or stop machine movement.

4.9.1 Electromagnetic brake parameters

Parameters related to electromagnetic brakes:

param eters	name (of a thing)	Parameter range	default value	unit (of measure)	be applica ble
P-165	Motor standstill speed detection point	0 to 3000	5	r/min	ALL
P-166	Electromagnetic brake delay time when the motor is stationary	0 to 30000	300	ms	ALL
P-167	Waiting time for electromagnetic brake during motor operation	0 to 10000	500	ms	ALL
P-168	Electromagnetic brake operating speed during motor operation	0 to 3000	100	r/min	ALL
P-169	Delay time for electromagnetic brake release	0 to 10000	300	ms	ALL

4.9.2 Electromagnetic brake use

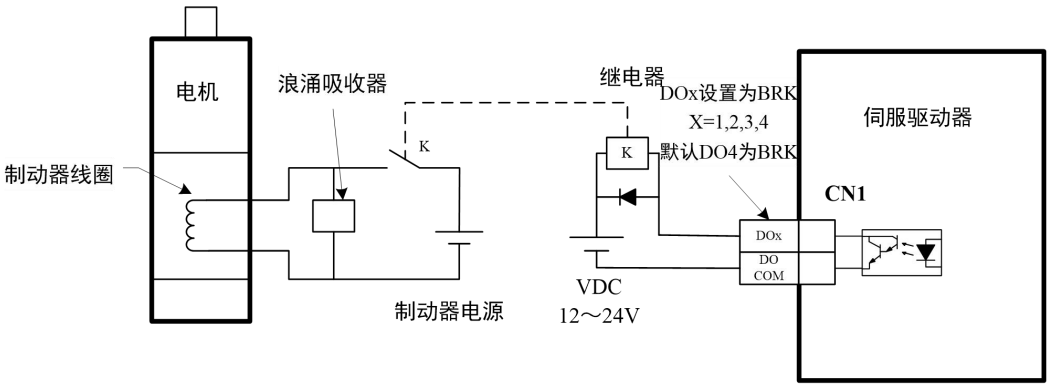
The following figure shows the brake wiring diagram. The brake release signal BRK from the driver is connected to the relay coil, and the relay contacts are connected to the brake power supply. The brake power supply is provided by the user and has sufficient capacity. It is recommended to install a surge absorber to suppress the surge voltage caused by the on/off operation of the relay. A diode can also be used as a surge absorber, bearing in mind that it will cause a slight brake delay.

After the motor stops and comes to a standstill (speed less than P-165) servo OFF, at which time the motor continues to be energized to maintain position, the brake is stabilized for a period of time (time determined by parameter P-166) from release, and the motor power supply is withdrawn.

The motor is running (speed greater than P-165) servo OFF, which cuts off the motor current, the brake continues to be released, and the brake is applied after a time delay. This is to decelerate

the motor from a high-speed rotating state to a low speed, and then make the mechanical brake action to avoid damage to the brake. The delay time is the time required for parameter P-167 or the motor speed to decelerate to the speed of parameter P-168, taking the smallest value of the two.

P-169: Defines the delay time from motor current turn-on to electromagnetic brake release (DO output terminal BRK ON) when the system changes from an inactive state to an enabled state.

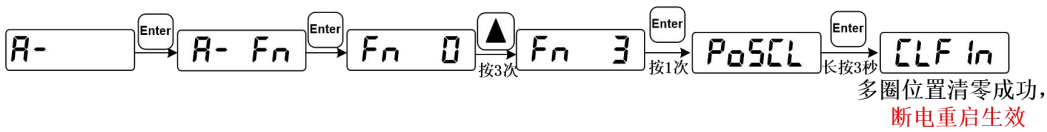


4.10 Absolute encoder operation

4.10.1 Encoder multi-turn position clearing function

This operation is used when the current multi-turn position needs to be zeroed to avoid large 32-bit data in the uploaded absolute position. This operation needs to be performed in the non-enable state of the driver, and the operation method is as follows:

First set the operation password P-000 to 510, then switch the operation menu to A-Fn and perform the Fn3 operation as shown below:



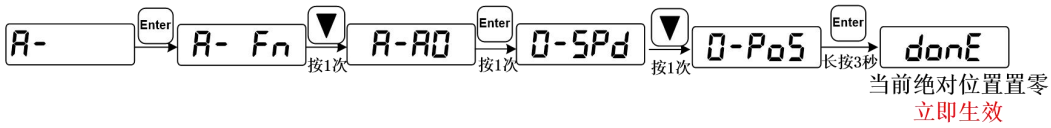
Power off and restart are required to take effect after successful operation. (Multi-turn position can be viewed through the display item: d-Abn)

Special note: The alarm (Err40) related to the multi-turn position of the encoder can also be cleared by the above operation.

4.10.2 Zeroing function for uploading absolute position

This operation is used when it is necessary to set the current motor position to the

mechanical zero point. It is recommended that this operation be performed in the non-enable state of the driver, and the operation method is as follows:



Special note: The motor's motion direction parameters and feedback position gear ratio parameters must be determined through commissioning before performing the absolute position zero setting operation described above. This procedure must be followed, otherwise, the zero point is not set correctly! **Specific instructions are as follows:**

The T3D communication absolute driver is described below:

It must be set first according to the actual need P-036 (whether the position instruction direction is reversed or not, the default value is 0, if it is set to 1 then the position instruction is reversed), P-024 (set to 1 to upload the absolute position direction is reversed) and P-170/P-171 (to upload the absolute position electronic gear ratio, the default gear ratio is 1:1), save the parameter and then restart the drive after power off, move the motor position to the desired mechanical zero position, then execute **0-Pos** to set the current position as absolute zero.

The above steps must be followed, otherwise the zero point is not set correctly!!!!

4.10.3 Uploading Absolute Position Reversal and Gear Ratio Arithmetic Functions

This function is used when the original 32-bit absolute position read by the driver needs to be uploaded to the host computer after processing, including **direction reversal**, **gear ratio operation** or **resolution bit scaling**.

The pulse command type absolute driver is described below:

P-024: whether the uploaded absolute position is reversed, the default value is 0, set to 1 to upload the absolute position direction is reversed;

P-170/P-171: Upload the electronic gear ratio operation parameter for absolute position feedback (P-170 is the numerator/P-171 is the denominator), the default gear ratio is 1/1;

The above parameters set the absolute position inversion and gear ratio operation (effective after power failure and restart), and the drive will internally process the absolute position direction inversion and gear ratio operation according to the above settings.

Examples are given below:

Requirements for sending position commands from the host computer: drive the motor one revolution when the servo receives 10,000 pulses.

Motor encoder type is single-turn 17-bit/multi-turn 16-bit absolute encoder

Then the change in servo feedback position for one revolution of the motor is 131072

If it is required that the change in servo feedback position for one revolution of the motor is 10000, the following parameters can be set to realize it:

P-170/P-171 = 10000/131072 = (625*16)/(8192*16) = 625/8192

That is, P-170 is set to 625 and P-171 is set to 8192.

Different setting values of parameter P-250 can be used with the display item to view the absolute position related information, as described below:

P-250 bit0 is set to 1:

D-ABM displays multi-turn data (-32768~32767) corresponding to the absolute motor position after operation.

d-Ab5 displays the absolute motor position (32-bit signed number) after arithmetic operation and subtraction of the zero offset

P-250 bit0 is set to 0 (default):

D-ABM displays raw motor absolute position corresponding to multi-turn data (-32768~32767)

d-Ab5 displays the raw absolute motor position corresponding to the single-turn data (17-bit encoder: 0~131071 23-bit encoder: 0~8388607)

In addition, for 23-bit absolute encoders, the number of resolution bits can be scaled as described below:

P-184: 23-bit absolute encoder resolution digit setting Default: 23 Range: 17~23

This parameter is used to set the number of encoder bits and is only valid for 23-bit encoders.

Used to scale the number of absolute data digits, after setting the number of digits both the single-turn and upload absolute positions are automatically scaled.

For example, if P-184 is set to 17 (power failure and restart take effect), the range of change of the single-turn position value will be: 0~131071, and the uploaded absolute position will be uploaded according to the single-turn 17-bit operation.

note

Chapter 5 Parameters

5.1 List of parameters

Applicable column indicates the applicable control mode, P is position control, S is speed control, T is torque control, All is applicable to position, speed and torque control. The parameter value "*" indicates that the factory default value may be different.

5.1.1 0-segment parameters

parameters	name (of a thing)	Parameter range	default value	unit (of measure)	be applicable
P-000	operating password	0 to 9999	315		ALL
P-001	Drive Model Code	*	*		ALL
P-002	Motor Code	*	*		ALL
P-003	software version	*	*		ALL
P-004	control method	0 to 8	0		ALL
P-005	1st velocity loop gain	1 to 3000	50	Hz	P,S
P-006	1st velocity loop integration time constant	1 to 1000	20	ms	P,S
P-007	1st torque filtering time constant	1 to 500	25	0.1ms	ALL
P-009	1st position ring gain	1 to 1000	40	1/s	P
P-019	Speed detection filter time constant	5 to 500	60	0.1ms	P,S
P-021	Position loop feed-forward gain	0 to 100	0	%	P
P-022	Position loop feed-forward filtering time constant	2 to 1000	10	ms	P
P-025	Speed command source	0 to 3	0		S
P-026	Torque command source	0 to 2	0		T
P-028	Position command pulse electronic gear 1st molecule H	0 to 32000	0		P
P-029	Position command pulse electronic gear 1st molecule L	0 to 9999	1		P
P-030	Position Command Pulse Electronic Gear Denominator	1 to 32767	1		P

parameters	name (of a thing)	Parameter range	default value	unit (of measure)	be applicable
P-031	Command pulse electronic gear 2nd molecule	1 to 32767	1		P
P-032	Command pulse electronic gear 3rd molecule	1 to 32767	1		P
P-033	Command pulse electronic gear 4th molecule	1 to 32767	1		P
P-034	Position command control word (electronic gear ratio switching)	0~11111	0		P
P-035	Position command pulse input method	0 to 2	0		P
P-036	Position command pulse input direction	0 to 1	0		P
P-037	Position command pulse input signal logic	0 to 12	0		P
P-038	Position command pulse signal filter coefficients	0 to 21	2		P
P-039	Position Command Direction Signal Filter Coefficients	0 to 15	0		P
P-040	Position command exponential smoothing filter time	0 to 5000	0	ms	P
P-046	Analog Speed Command Gain	1 to 3000	300	r/min/V	S
P-047	Analog Speed Command Zero Offset Compensation	-30,000 to 30,000	0	0.1mv	S
P-048	Analog Speed Command Direction	0 to 1	0		S
P-049	Analog Speed Command Filter Time Constant	2 to 500	20	0.1ms	S
P-050	Analog Speed Command Polarity	0 to 2	0		S
P-051	Analog Speed Command Deadband 1	0 to 30000	0	mv	S
P-052	Analog Speed Command Deadband 2	-30000～0	0	mv	S
P-053	Analog Torque Command Gain	1 to 300	30	%/V	T
P-054	Analog Torque Command Zero	-30,000 to	0	mv	T

parameters	name (of a thing)	Parameter range	default value	unit (of measure)	be applicable
	Bias Compensation	30,000			
P-055	Analog Torque Command Direction	0 to 1	0		T
P-056	Analog Torque Command Filter Time Constant	2 to 500	20	0.1ms	T
P-057	Analog Torque Command Polarity	0 to 2	0		T
P-060	Speed command acceleration time	0 to 30000	100	ms	S
P-061	Speed command deceleration time	0 to 30000	100	ms	S
P-063	EMG (emergency stop)/ALM deceleration time	0 to 5000	100	ms	ALL
P-064	Torque Limit Selection	0 to 2	0		ALL
P-065	Internal positive rotation (CCW) torque limiting	0 to 500	250	%	ALL
P-066	Internal counter-rotating (CW) torque limitation	-500 to 0	-250	%	ALL
P-067	External positive rotation (CCW) torque limitation	0 to 300	100	%	ALL
P-068	External reversing (CW) torque limitation	-300 to 0	-100	%	ALL
P-069	Trial run torque limit	0 to 500	100	%	ALL
P-070	Positive (CCW) torque overload alarm level	1 to 300	150	%	ALL
P-071	Reverse (CW) torque overload alarm level	-300 to -1	-150	%	ALL
P-072	Torque overload alarm detection time	1 to 32,000	10000	ms	ALL
P-075	Maximum speed limit	0 to 32000	3500	r/min	ALL
P-076	JOG running speed	0 to 32000	100	r/min	S
P-077	Speed Limit Selection	0 to 2	0		T
P-078	Speed limitation during torque control	-8000 to 8000	1000	r/min	T
P-079	Speed limiting error during torque control	1 to 5000	100	r/min	T

parameters	name (of a thing)	Parameter range	default value	unit (of measure)	be applicable
P-080	Position overshoot detection	0 to 32767	600	0.01 turns	P
P-081	First encoder type selection	0~4	4		ALL
P-082	Number of first encoder lines	1~32767	2500	impulse	ALL
P-083	First encoder zero offset angle	-360.0 to 360.0	-23.0	degree (angles, temperature etc)	ALL
P-084	First encoder control parameters	-32768 to 32767	0		ALL
P-097	Positive and negative limit use mode / forward and reverse control	0 to 33	33		ALL
P-098	force	0~1	0		ALL
P-099	Motor Series Code	3~6	5		ALL

5.1.2 1-paragraph parameters

parameters	name (of a thing)	Parameter range	default value	unit (of measure)	be applicable
P-100	Digital Input DI1 Function	-25 to 25	1		ALL
P-101	Digital Input DI2 Function	-25 to 25	2		ALL
P-102	Digital Input DI3 Function	-25 to 25	3		ALL
P-103	Digital Input DI4 Function	-25 to 25	4		ALL
P-104	Digital Input DI5 Function	-25 to 25	20		ALL
P-105	Digital Input DI6 Function	-25 to 25	21		ALL
P-108	Digital output DO1 function	-16 to 16	2		ALL
P-109	Digital output DO2 function	-16 to 16	3		ALL
P-110	Digital output DO3 function	-20 to 20	5		ALL
P-111	Digital output DO4 function	-16 to 16	8		ALL
P-120	Digital input DI forced active 1	-32768 to 32767	0		ALL
P-121	Digital input DI forced active 2	-32768 to 32767	0		ALL
P-122	Digital input DI forced valid 3	-32768 to 32767	0		ALL

param eters	name (of a thing)	Parameter range	default value	unit (of measu re)	be applic able
P-123	Digital input DI forced active 4	-32768 to 32767	0		ALL
P-124	Digital input DI forced active 5	-32768 to 32767	0		ALL
P-125	Digital Input DIx Filtering	1 to 1000	5	ms	ALL
P-136	Enable OFF or shutdown mode when an alarm occurs	0 to 1	0		ALL
P-137	Internal speed 1	-8000 to 8000	0	r/min	S
P-138	Internal speed 2	-8000 to 8000	0	r/min	S
P-139	Internal speed 3	-8000 to 8000	0	r/min	S
P-140	Internal speed 4	-8000 to 8000	0	r/min	S
P-141	Internal speed 5	-8000 to 8000	0	r/min	S
P-142	Internal speed 6	-8000 to 8000	0	r/min	S
P-143	Internal speed 7	-8000 to 8000	0	r/min	S
P-144	Internal speed 8	-8000 to 8000	0	r/min	S
P-145	Internal torque1	-300 to 300	0	%	T
P-146	Internal torque2	-300 to 300	0	%	T
P-147	Internal torque3	-300 to 300	0	%	T
P-148	Internal torque4	-300 to 300	0	%	T
P-150	Locate the scope of completion	0 to 32767	10	impuls e	P
P-151	Positioning Completion Return Difference	0 to 32767	5	impuls e	P
P-152	Positioning proximity range	0 to 32767	500	impuls e	P
P-153	Positioning Approach Differential	0 to 32767	50	impuls e	P
P-154	speed of arrival	-8000 to 8000	500	r/min	ALL
P-155	Arrival velocity return difference	0 to 5000	30	r/min	ALL
P-156	Arrival velocity polarity	0 to 1	0		ALL
P-157	Arrival torque	-300 to 300	100	%	ALL
P-158	Arrival torque return	0 to 300	5	%	ALL
P-159	Arrival torque polarity	0 to 1	0		ALL
P-160	Zero Speed Detection Point	1 to 3000	10	r/min	ALL
P-161	Zero Speed Detection Return	0 to 1000	5	r/min	ALL
P-162	Zero-speed clamping mode	0 to 1	0		S

parameters	name (of a thing)	Parameter range	default value	unit (of measure)	be applicable
P-164	Methods of Emergency Shutdown	0 to 1	0		P
P-165	Motor standstill speed detection point	0 to 3000	5	r/min	ALL
P-166	Electromagnetic brake delay time when the motor is stationary	0 to 30000	300	ms	ALL
P-167	Waiting time for electromagnetic brake during motor operation	0 to 10000	300	ms	ALL
P-168	Electromagnetic brake operating speed during motor operation	0 to 3000	100	r/min	ALL
P-169	Delay time for opening the electromagnetic brake	0 to 10000	300	ms	ALL
P-170	Encoder absolute position upload gear ratio numerator	1~32767	1		ALL
P-171	Encoder Absolute Position Upload Gear Score	1~32767	1		ALL
P-172	Number of encoder equivalent pulse lines / number of crossover output lines	0~30000	2500		ALL
P-173	Encoder pulse split output polarity (A/B pulse phase)	0 to 1	0		ALL
P-174	Encoder pulse division output Z signal phase	0 to 1	0		ALL
P-175	Encoder pulse division output Z signal width	0~100	0		ALL
P-179	Pulse division output signal selection	0~1	0		
P-181	485 communication ID number	-1~32	1		ALL
P-182	485 Communication Baud Rate	0~3	2		ALL
P-183	485 communication data mode selection	0~5	1		ALL
P-184	23-bit encoder resolution selection	17~23	23		ALL

5.1.3 2-paragraph parameters (partial)

parameters	name (of a thing)	Parameter range	default value	unit (of measure)	be applicable

P-201	Motor pole pair number	1 to 50	5		ALL
P-204	Motor rated current	1 to 4000	60	0.1A	ALL
P-207	Rated motor speed	1 to 30000	2500	r/min	ALL

5.2 List of DI functions

serial number	notation	DI Functions	serial number	notation	DI Functions
0	NULL	functionless	14	TRQ2	Internal torque selection2
1	SON	Servo Enable	15	EMG	emergency stop
2	ACLR	Alarm Clearance	16	CMODE	Control mode switching
3	CCWL	Positive Rotation Drive Disable	17	GAIN	Gain switching
4	CWL	Reverse drive prohibition	18	GEAR1	Electronic Gear Selection 1
5	TCCW	Positive torque limit	19	GEAR2	Electronic Gear Options 2
6	TCW	Reverse torque limit	20	CLE	Position deviation removal
7	ZCLAMP	Zero-speed clamping	21	INH	Pulse Input Inhibit
8	CZERO	zero instruction			
9	CINV	command inversion	23	CCW	Positive operation (startup)
10	SP1	Internal speed selection 1	24	CW	invert the operation
11	SP2	Internal speed selection 2	25	ORN	return to zero
12	SP3	Internal speed selection 3			
13	TRQ1	Internal torque selection1			

5.3 List of DO functions

serial number	notation	DO Function	serial number	notation	DO Function
0	OFF	It's never worked.	8	BRK	Electromagnetic brake

					output control
1	ON	Always works.	9	RUN	Servo in operation
2	RDY	Servo ready.	10	NEAR	localization
3	ALM	give a warning	11	TRQL	In torque limitation
4	ZSP	zero speed	12	SPL	Speed limit in progress
5	COIN	Positioning complete.	14	PtoS	Position/speed mode switching complete
6	ASP	speed	15	PtoT	Position/torque mode switching complete
7	ATRQ	Torque Arrival	16	StoT	Speed/torque mode switching complete
			20	DO3_ZOUT	Zero return Z signal output (only DO3 supports this function)

5.4 Parameter details

5.4.1 0-segment parameters

P-000	operating password	realm	default value	unit (of measure)	be applicable
		0 to 9999	315		ALL

- Hierarchical management of parameters ensures that parameters are not modified by mistake.
- Some special operations require appropriate passwords.
- P-001 drive code, P-002 motor code, P-099 motor series code, modification needs to set P-000 to 385 (or 316), otherwise the modification is invalid

P-001	Drive Codes	realm	default value	unit (of measure)	be applicable
		*	*		ALL

- The drive model currently in use. Factory set and cannot be changed by the user.

P-002	Motor Code	realm	default value	unit (of measure)	be applicable
		*	*		ALL

- LA-1A (220V, 0.4kW) LA-2A (220V, 0.75kW) LA-3A (220V, 1.5kW)

- The motor model code currently used, if it is a serial communication type absolute encoder, the driver can automatically recognize the motor model, if it is a pulse encoder, please set it according to the actual motor model used.
- For the meaning of the parameters see the motor adaptation table in section 7.2.
- This parameter needs to be modified when changing to a different type of motor, please refer to section 3.7 for details.

P-003	software version	realm	default value	unit (of measure)	be applicable
		*	*		ALL

- Software version number, which cannot be modified.

P-004	control method	realm	default value	unit (of measure)	be applicable
		0 to 8	0		ALL

- Parameter Meaning:

0: Position control mode; 1: Speed control mode; 2: Torque control mode;
3: Position/velocity mode; 4: Position/torque mode; 5: Velocity/torque mode;

- When set to 3, 4, or 5, the specific control method is determined by the CMODE of the DI input:

P-004	CMODE [Note]	control method
3	0	position control
	1	speed control
4	0	position control
	1	torque control
5	0	speed control
	1	torque control

Note: 0 means OFF, 1 means ON.

P-005	1st velocity loop gain	realm	default value	unit (of measure)	be applicable
		1 to 3000	50	Hz	P,S

- The proportional gain of the speed regulator, increasing the value of the parameter, can make the speed response faster, too large easily cause vibration and noise.

P-006	1st velocity loop integration time constant	realm	default value	unit (of measure)	be applicable
		1 to 1000	20	ms	P,S

- Integration time constant of the speed regulator, reduce the value of the parameter, can reduce the speed control error, increase the rigidity, too small easily cause vibration and noise.
- This parameter should be increased appropriately when the motor load inertia is large.

P-007	1st torque filtering time constant	realm	default value	unit (of measure)	be applicable
		1 to 500	25	0.1ms	ALL

- Low-pass filter for torque, which suppresses mechanical vibrations.
- The larger the value, the better the effect of vibration suppression, too large will cause the response to become slower and may cause oscillation; the smaller the value, the response becomes faster, but subject to mechanical conditions.
- Smaller values can be set when the load inertia is small, and larger values can be set when the load inertia is large.

P-009	1st position ring gain	realm	default value	unit (of measure)	be applicable
		1 to 1000	40	1/s	P

- Proportional gain of the position regulator; increasing the value of the parameter reduces the position tracking error and improves the response, too much may lead to overshooting or oscillation.

P-019	Speed detection filter time constant	realm	default value	unit (of measure)	be applicable
		5 to 500	60	0.1ms	P,S

- The larger the value of the parameter, the smoother the detection, the smaller the value of the parameter, the faster the detection response, too small may lead to noise generation; too large may lead to oscillation.

P-021	Position loop feed-forward gain	realm	default value	unit (of measure)	be applicable
		0 to 100	0	%	P

- Feedforward reduces the position tracking error during position control, and with a setting of 100, the position tracking error is always 0 at any frequency of command pulse.
- Increasing the parameter value improves the position control response, while too large a value makes the system unstable and prone to oscillation.

P-022	Position loop feed-forward filtering time constant	realm	default value	unit (of measure)	be applicable
		2 to 1000	10	ms	P

- Filtering of the position loop feedforward quantity serves to increase the stability of the feedforward control.

P-025	Speed command source	realm	default value	unit (of measure)	be applicable
		0 to 3	0		S

- For speed control, set the source of the speed command.
- Parameter Meaning:

0: Analog speed 1: Internal multi-segment speed < 8 selectable P-137 ~ P-144 >

2: Analog + internal multi-segment speed 3: Pulse speed

The specific meanings are as follows:

0: Analog speed command, input from analog port AS+, GNDA.

1: Internal speed command, determined by SP1, SP2, and SP3 of DI input:

DI signal [Note]			speed command
SP3	SP2	SP1	
0	0	0	Internal speed 1 (parameter P-137)

0	0	1	Internal speed 2 (parameter P-138)
0	1	0	Internal speed 3 (parameter P-139)
0	1	1	Internal speed 4 (parameter P-140)
1	0	0	Internal speed 5 (parameter P-141)
1	0	1	Internal speed 6 (parameter P-142)
1	1	0	Internal speed 7 (parameter P-143)
1	1	1	Internal speed 8 (parameter P-144)

Note: 0 means OFF, 1 means ON.

2: Analog speed command + internal speed command:

DI signal [Note]			speed command
SP3	SP2	SP1	
0	0	0	Analog Speed Command
0	0	1	Internal speed 2 (parameter P-138)
0	1	0	Internal speed 3 (parameter P-139)
0	1	1	Internal speed 4 (parameter P-140)
1	0	0	Internal speed 5 (parameter P-141)
1	0	1	Internal speed 6 (parameter P-142)
1	1	0	Internal speed 7 (parameter P-143)
1	1	1	Internal speed 8 (parameter P-144)

Note: 0 means OFF, 1 means ON.

P-026	Torque command source	realm	default value	unit (of measure)	be applicable
		0 to 2	0		T

- For torque control, set the source of the torque command.
- Parameter Meaning:

  0: Analog torque command, input from analog port AS+, GNDA.

  1: Internal torque command, determined by TRQ1 and TRQ2 of DI input:

DI signal [Note]		Torque command
TRQ2	TRQ1	
0	0	Internal torque 1 (parameter P-145)
0	1	Internal torque 2 (parameter P-146)
1	0	Internal torque 3 (parameter P-147)
1	1	Internal torque 4 (parameter P-148)

Note: 0 means OFF, 1 means ON.

2: Analog torque command + internal torque command;

DI signal [Note]		Torque command
TRQ2	TRQ1	
0	0	Analog torque command
0	1	Internal torque 2 (parameter P-146)
1	0	Internal torque 3 (parameter P-147)
1	1	Internal torque 4 (parameter P-148)

Note: 0 means OFF, 1 means ON.

P-028	Position command pulse electronic gear 1st molecule H	realm	default value	unit (of measure)	be applicable
		0 to 32000	0		P
P-029	Position command pulse electronic gear 1st molecule L	realm	default value	unit (of measure)	be applicable
		0 to 9999	1		P

P-030	Position Command Pulse Electronic Gear Denominator	realm	default value	unit (of measure)	be applicable
		1 to 32767	1		P

- Used to divide or multiply the input pulse, it can be easily matched to various pulse sources to achieve the pulse resolution required by the user.
- The command pulse electronic gear numerator N is set by parameters P-028 and P-029, and the denominator M is set by parameter P-030.
- **Electronic Gear Numerator N = P-028*10000 + P-029 and Electronic Gear Denominator M = P-030.**
- The input pulse command is changed by N/M to get the position command.

P-031	Position command pulse electronic gear 2nd molecule	realm	default value	unit (of measure)	be applicable
		1 to 32767	1		P

- Refer to the description of parameters P-029 and P-030.

P-032	Position command pulse electronic gear 3rd molecule	realm	default value	unit (of measure)	be applicable
		1 to 32767	1		P

- Refer to the description of parameters P-029 and P-030.

P-033	Position command pulse electronic gear 4th molecule	realm	default value	unit (of measure)	be applicable
		1 to 32767	1		P

- Refer to the description of parameters P-029 and P-030.

P-034	Position command control word	realm	default value	unit (of measure)	be applicable
		0 to 11111	0		S

- For position control, set the source of position commands, and the dynamic electronic gear application mode.
- Parameter Meaning:

  Single digit: Setting of the dynamic electronic gear application mode (see description in section 4.3.2 for details)

0: Dynamic electronic gear ratio switching disabled, command pulse electronic gear molecule set by P-028/P-029

1: Dynamic electronic gear ratio switching is permitted and the command pulse electronic gear numerator is determined by GEAR1 at the DI input

2: Allows the use of dynamic electronic gear ratio switching, and the command pulse electronic gear molecule is determined by the DI input GEAR1, GEAR2

P-035	Position command pulse input method	realm	default value	unit (of measure)	be applicable
		0 to 2	0		P

- Sets the command pulse input method and the meaning of the parameter:

  0: Pulse + direction

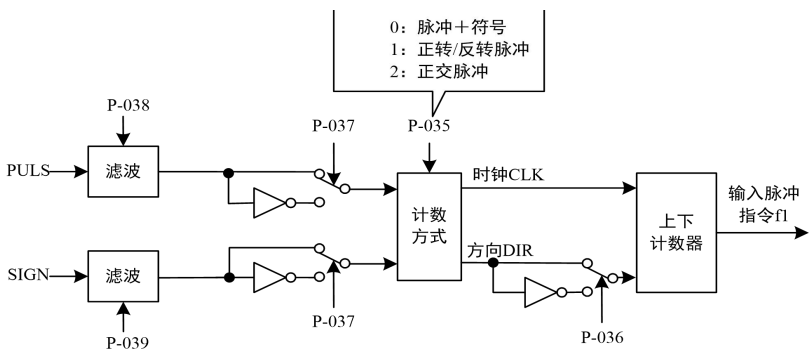
  1: Positive/reverse pulse (positive and negative pulse)

  2: Orthogonal pulses (A/B pulses)

脉冲指令形式	正转(CCW)	反转(CW)	参数P-035
脉冲+方向	PULS SIGN		0
正转/反转脉冲	PULS SIGN		1
正交脉冲	PULS SIGN		2

Note: The arrow indicates the counting edge and when the parameter is set to P-036=0 and P-037=0.

- Command Pulse Input Block Diagram



- After parameter modification, it must be saved and re-powered to be valid.

P-036	Position command pulse input direction	realm	default value	unit (of measure)	be applicable
		0 to 1	0		P

- Parameter Meaning:
  0: Normal direction 1: Reverse direction

P-037	Position command pulse input signal logic	realm	default value	unit (of measure)	be applicable
		0 to 12	0		P

- **Ten digits:** Set the counting edge of pulse input signal PULS: **P-037 is set to 0 to count the rising edge of pulse signal, and P-037 is set to 10 to count the falling edge of pulse signal;**
- After parameter modification, it must be saved and re-powered to be valid.

P-038	Position command **pulse** signal filter coefficients	realm	default value	unit (of measure)	be applicable
		0 to 21	2		P

- The pulse input signal PULS is digitally filtered, the larger the value, the larger the filter time constant.
- **By default, the maximum pulse input frequency is 500kHz** (kpps), the larger the value the maximum pulse input frequency will be reduced accordingly.
- It is used to filter out the noise on the signal line to avoid counting error. If the phenomenon of inaccurate walking due to inaccurate counting occurs, the value of the parameter can be increased appropriately:
  P-038 set to 7: Maximum pulse input frequency is 100 kHz
  P-038 set to 15: Maximum pulse input frequency is 20 kHz
  P-038 set to 21: Maximum pulse input frequency is 6 kHz
- Adjustments can be made for pulse and direction signal timing overruns or lags.
- After parameter modification, it must be saved and re-powered to be valid.

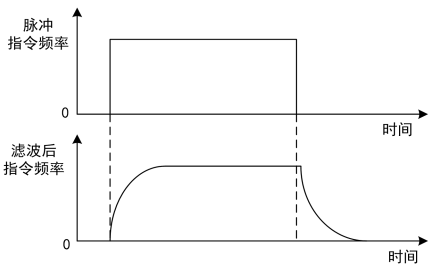
P-039	Position Command **Direction** Signal Filter Coefficients	realm	default value	unit (of measure)	be applicable
		0 to 15	0		P

- The pulse direction signal SIGN is digitally filtered, the larger the value, the larger the filter time constant.

- After parameter modification, it must be saved and re-powered to be valid.
- Adjustments can be made for pulse and direction signal timing overruns or lags.
- After parameter modification, it must be saved and re-powered to be valid.

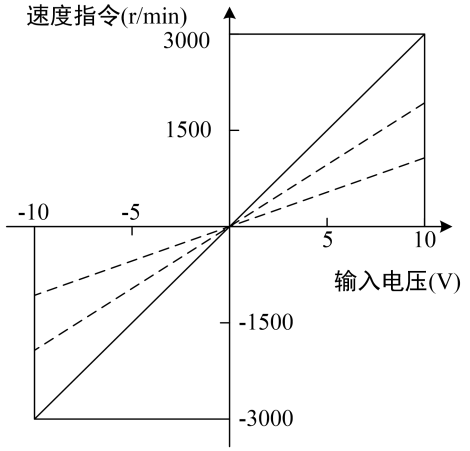
P-040	Position command exponential smoothing filter time	realm	default value	unit (of measure)	be applicable
		0 to 5000	0	ms	P

- Smooth filtering of command pulses with an exponential form of acceleration and deceleration. The filter does not lose the input pulse, but there is a command delay, and when set to 0, the filter does not work.
- This filter is used for:
  1. The upper controller has no acceleration or deceleration function;
  2. The electronic gearing is relatively large (N/M > 10);
  3. Lower frequency of instructions;
  4. Stepping jumps and unevenness in motor operation.



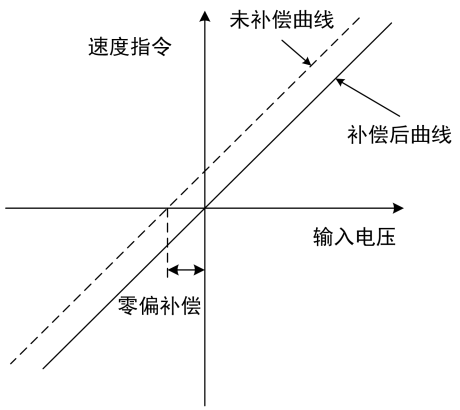
P-046	Analog Speed Command Gain	realm	default value	unit (of measure)	be applicable
		1 to 3000	300	r/min/V	S

- Sets the proportionality between the analog speed input voltage and the actual motor running speed.
- The analog input range is 0~10V.



P-047	Analog Speed Command Zero Offset Compensation	realm	default value	unit (of measure)	be applicable
		-30,000 to 30,000	0	0.1mv	S

- Zero offset compensation amount for analog speed input, actual speed command is input analog minus this parameter value.
- It is possible to use the analog auto-zero function, this parameter is set automatically, refer to section 23.6.



P-048	Analog Speed Command Direction	realm	default value	unit (of measure)	be applicable
		0 to 1	0		S

- Meaning of parameter: 0: Normal direction 1: Reverse direction of speed command

P-049	Analog Speed Command Filter Time Constant	realm	default value	unit (of measure)	be applicable
		2 to 500	20	0.1ms	S

- Low-pass filter for analog speed input.
- The larger the setting, the slower the response speed of the input analog quantity, which is conducive to reducing high-frequency noise interference; the smaller the setting, the faster the response speed, but the high-frequency noise interference is large.

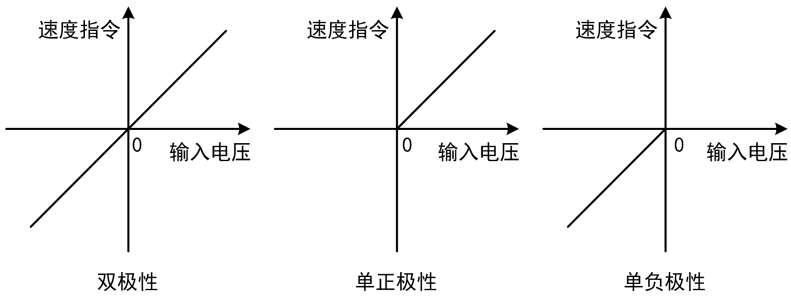
P-050	Analog Speed Command Polarity	realm	default value	unit (of measure)	be applicable
		0 to 2	0		S

- Parameter Meaning:

0: Bipolar.

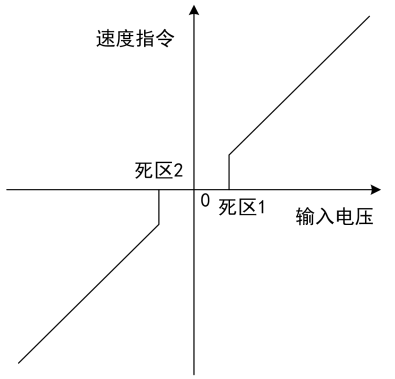
1: Single positive polarity. Input is valid for positive polarity and forced to 0 for negative polarity.

2: Single negative polarity. Input is valid for negative polarity and forced to 0 for positive polarity.



P-051	Analog Speed Command Deadband 1	realm	default value	unit (of measure)	be applicable
		0 to 30000	0	mv	S

- The instruction is forced to 0 when the input voltage is between deadband 2 (parameter P-052) and deadband 1 (parameter P-051).

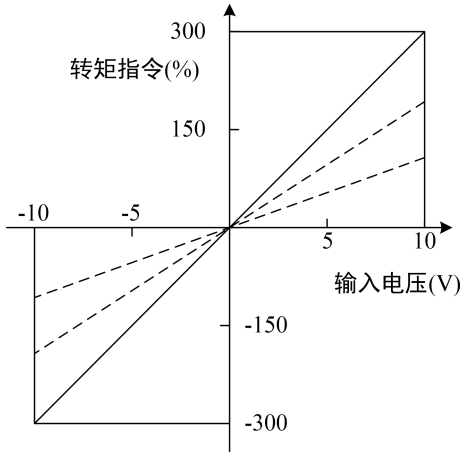


P-052	Analog Speed Command Deadband 2	realm	default value	unit (of measure)	be applicable
		-30000～0	0	mv	S

- Refer to the description of parameter P-051.

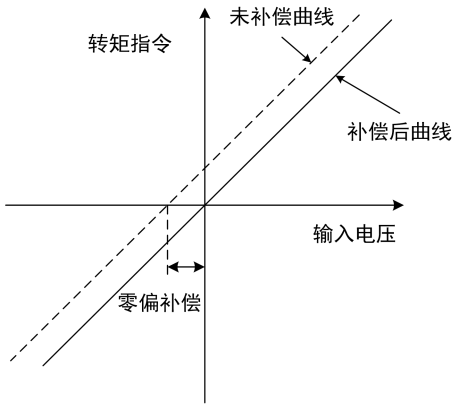
P-053	Analog Torque Command Gain	realm	default value	unit (of measure)	be applicable
		1 to 300	30	%/V	T

- Sets the proportionality between the analog torque input voltage and the actual operating torque of the motor, and the unit of the setting value is 1%/V of the rated torque;
- The analog input range is 0~10V.



P-054	Analog Torque Command Zero Bias Compensation	realm	default value	unit (of measure)	be applicable
		-30,000 to 30,000	0	mv	T

- Zero bias compensation amount for analog torque input, the actual torque command is the input analog minus the value of this parameter.
- It is possible to use the analog auto zero function, this parameter is set automatically, refer to section 3.6.2.



P-055	Analog Torque Command Direction	realm	default value	unit (of measure)	be applicable
		0 to 1	0		T

- Meaning of parameter: 0: Normal direction 1: Torque command direction reversed.

P-056	Analog Torque Command Filter Time Constant	realm	default value	unit (of measure)	be applicable
		2 to 500	20	0.1ms	T

- Low-pass filtering factor for analog torque input.
- The larger the setting, the slower the response speed of the input analog quantity, which is conducive to reducing high-frequency noise interference; the smaller the setting, the faster the response speed, but the high-frequency noise interference is large.

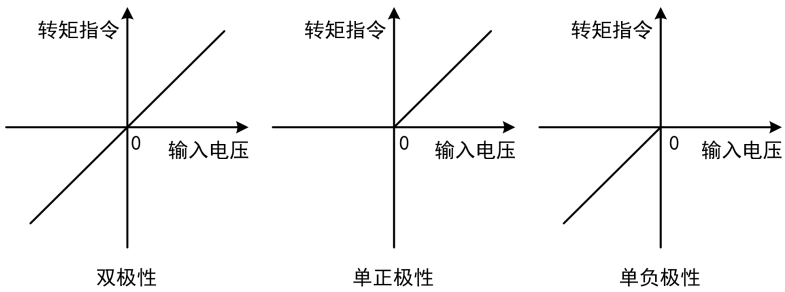
P-057	Analog Torque Command Polarity	realm	default value	unit (of measure)	be applicable
		0 to 2	0		T

- Parameter Meaning:

0: Bipolar.

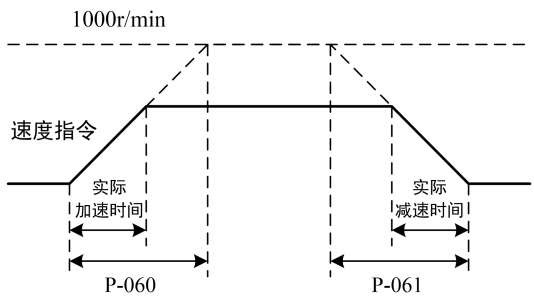
1: Single positive polarity. Input is valid for positive polarity and forced to 0 for negative polarity.

2: Single negative polarity. Input is valid for negative polarity and forced to 0 for positive polarity.



P-060	Speed command acceleration time	realm	default value	unit (of measure)	be applicable
		0 to 30000	100	ms	S

- Set the acceleration time of the motor from zero speed to 1000r/min.
- Used only for speed control mode, not valid for position control mode.
- This parameter should be set to 0 if it is used in the speed control mode and in closed loop position control with the upper mechanism.



P-061	Speed command deceleration time	realm	default value	unit (of measure)	be applicable
		0 to 30000	100	ms	S

- Set the deceleration time of the motor from 1000r/min to zero speed.
- Used only for speed control mode, not valid for position control mode.
- This parameter should be set to 0 if it is used in the speed control mode and in closed loop position control with the upper mechanism.

P-063	EMG (emergency stop)/ALM deceleration time	realm	default value	unit (of measure)	be applicable
		0 to 5000	100	ms	ALL

- Functions when the EMG (emergency stop) method is deceleration stop (P-164 set to 1).
- Functions when the alarm occurs when the stopping method is deceleration stop (P-136 is set to 1).
- Set the deceleration time of the motor from 1000r/min to zero speed when EMG (emergency stop) or alarm occurs, and the deceleration curve is linear.

P-065	Internal positive rotation (CCW) torque limiting	realm	default value	unit (of measure)	be applicable
		0 to 500	250	%	ALL

- Sets the internal torque limit value in the CCW direction of the motor.
- At all times, this restriction is in effect.
- If the set value exceeds the maximum allowable overload capacity of the drive, the actual limit is the maximum overload capacity.

P-066	Internal counter-rotating (CW) torque limitation	realm	default value	unit (of measure)	be applicable
		-500 to 0	-250	%	ALL

- Sets the internal torque limit value for the CW direction of the motor.
- At all times, this restriction is in effect.
- If the set value exceeds the maximum overload capacity allowed for the drive, the actual limit is the maximum overload capacity allowed for the system.

P-067	External positive rotation (CCW) torque limitation	realm	default value	unit (of measure)	be applicable
		0 to 300	100	%	ALL

- Sets the external torque limit value in the CCW direction of the servomotor.
- This limitation is effective only when TCCW (positive torque limit) is ON for DI input.
- When the limit is in effect, the actual torque limit is the minimum of the drive's maximum allowable overload capacity, the internal positive torque limit, and the external positive torque limit.

P-068	External reversing (CW) torque limitation	realm	default value	unit (of measure)	be applicable
		-300 to 0	-100	%	ALL

- Set the external torque limit value for the CW direction of the servomotor.
- This limitation is effective only when TCW (reverse torque limit) is ON for DI input.
- When the limit is in effect, the actual torque limit is the absolute minimum of the drive's maximum allowable overload capacity, the internal reversing torque limit, and the external reversing torque limit.

P-069	Trial run torque limit	realm	default value	unit (of measure)	be applicable
		0 to 500	100	%	ALL

- Set the torque limit value in the trial operation mode (speed JOG operation, keypad speed control, demo mode).
- Independent of the direction of rotation, forward and reverse rotation are limited.
- Internal and external torque limitations remain in effect.

P-070	Torque overload alarm level	realm	default value	unit (of measure)	be applicable
		1 to 300	150	%	ALL

- Set the torque overload value, which is a percentage of the rated torque.
- When the absolute value of motor torque exceeds P-070 for a duration greater than P-072, the drive alarms Err29 and the motor stops.

P-072	Torque overload alarm detection time	realm	default value	unit (of measure)	be applicable
		1 to 32,000	10000	ms	ALL

- Refer to the description of parameter P-070.

P-075	Maximum speed limit	realm	default value	unit (of measure)	be applicable
		0 to 32000	3500	r/min	ALL

- Sets the maximum permissible speed limit (absolute) for the servomotor.
- Independent of the direction of rotation.
- If the motor runs at more than 120% of the set value, the drive will alarm Err1 (overspeed).

P-076	JOG running speed	realm	default value	unit (of measure)	be applicable
		0 to 32000	100	r/min	S

- Sets the running speed of the JOG operation.

P-077	Speed Limit Selection	realm	default value	unit (of measure)	be applicable
		0 to 2	0		T

- Sets the speed limit mode for torque control, and the speed limit is direction-independent.

P-077	clarification	account for
0	fundamental limitation	Restricted by parameter P-078.

P-078	Speed limitation during torque control	realm	default value	unit (of measure)	be applicable
		-8000 to 8000	1000	r/min	T

- During torque control, the motor operating speed is limited to this parameter.
- It prevents over speeding with light loads.
- When overspeed occurs, negative speed feedback is accessed to reduce the actual torque, and the motor speed will run at the set value.

P-080	Position overshoot detection	realm	default value	unit (of measure)	be applicable
		0 to 32767	600	0.01 turns	P

- Set the range of position out-of-position alarm detection.
- In the position control mode, when the count value of the position deviation counter exceeds the pulse corresponding to the value of this parameter, the servo driver gives a position overrun alarm (Err 4).
- The unit is the revolution, multiplied by the encoder resolution per revolution to get the number of pulses. If a 2500 line encoder is used, the encoder resolution per revolution is 10000, and a parameter value of 600 corresponds to 60000 encoder pulses.

P-081	First encoder type selection	realm	default value	unit (of measure)	be applicable
		0 to 4	4		ALL

- Sets the type of motor encoder;
- Parameter meaning: 0: non-wire-saving photoelectric encoder; 1: wire-saving photoelectric encoder; 4: serial communication encoder

P-082	Number of first encoder lines	realm	default value	unit (of measure)	be applicable
		1~32767	2500	impulse	ALL

- Sets the number of wires in the motor encoder, the default setting is 2500 wires optical encoder;
- In case of incremental pulse encoder, ppr = number of lines of the motor encoder * 4 per revolution;
- This parameter is invalid if the encoder is a serial communication absolute value encoder;

P-084	First encoder control parameters	realm	default value	unit (of measure)	be applicable
		0 to 11111	0		ALL

- Setting the polarity of the incremental pulse encoder A/B signal: 0: A/B not inverted 1: A/B inverted
- This parameter is invalid if the encoder is a serial communication absolute value encoder;

P-097	**Positive and negative limit use mode / forward and reverse control**	realm	default value	unit (of measure)	be applicable
		0 to 33	33		ALL

- The forward drive prohibition (CCWL) and reverse drive prohibition (CWL) in the DI inputs are used for limit travel protection, and are normally closed switches, so that the motor can only be operated in that direction when the input is ON, and cannot be operated in that direction when it is OFF. If limit travel protection is not used, this parameter can be ignored so that the motor can be operated without accessing the drive prohibition signal.
- The default value is ignore driver disable, if you need to use the driver disable function, please modify this value first.
- **Significance of single-digit parameters:**

P-097 single-digit character	Reverse Drive Lockout (CWL)	Positive Rotation Drive Lockout (CCWL)

0	utilization	utilization
1	utilization	neglect
2	neglect	utilization
3	neglect	neglect

Use: When the input signal is ON, the motor can run in that direction; when OFF, the motor cannot run in that direction.

Ignore: The motor can run in that direction, the drive prohibit signal has no effect, the signal can not be accessed.

- **Meaning of 10-digit parameter: Used with analog speed command in speed control mode.**

P-097 ten-digit number	Forward signal use mode (analog speed command)	Inversion Signal Usage Mode (analog speed command)
0	utilization	utilization
1	utilization	non-use
2	non-use	utilization
3	non-use	non-use

Usage: The speed command size is given by 0~10V analog, and the direction is determined by the forward and reverse input points.

Not used: speed command size and direction are given by -10V~10V analog, forward and reverse input points do not work.

P-098	force	realm	default value	unit (of measure)	be applicable
		0~1	0		ALL

- meaning of a parameter

  0: The internal enable of the driver is invalid, the enable signal is controlled by the SON of the DI input;

  1: The driver is internally forced to enable.

P-099	Motor Series Code	realm	default value	unit (of measure)	be applicable
		3~6	5		ALL

- Setting the motor series, the power line UVW phase sequence may be different for different series of motors, and the encoder AB signal polarity, and encoder mounting offset angle may also be different;

- Incorrect settings can lead to motor blocking or flying! Therefore, it is important for the user to ensure that this parameter is correct before using the drive!
- For motors equipped with absolute encoders with serial communication, the drive automatically recognizes the motor family.
- meaning of a parameter
  See Chapter 7 Motor Adaptation Table for specific setting instructions.

5.4.2 1-paragraph parameters

P-100	Digital Input DI1 Function	realm	default value	unit (of measure)	be applicable
		-24 to 24	1		ALL

- Digital input DI1 function planning, parameter absolute value indicates function, symbol indicates logic, please refer to section 5.5 for function.
- Symbol indicates input logic, positive number indicates positive logic, negative number indicates negative logic, ON is valid, OFF is invalid:

parameter value	DI input signal	DI results
positive number	open up a path	OFF
	conduction	ON
negative number	open up a path	ON
	conduction	OFF

- When multiple input channel function selections are the same, the function result is a logical or relationship. For example, if both P-100 and P-101 are set to 1 (SON function), SON is valid when either DI1 or DI2 is ON.
- Input functions that are not selected by parameters P-100 to P-105, i.e., functions that are not planned, result in OFF (invalid). There are exceptions, however, and setting parameters P-120 to P-124 can force an input function ON (valid), regardless of whether the function is planned or not.

P-101	Digital Input DI2 Function	realm	default value	unit (of measure)	be applicable
		-24 to 24	2		ALL

- Digital input DI2 function planning, refer to the description of parameter P-100.

P-102	Digital Input DI3 Function	realm	default value	unit (of measure)	be applicable
		-24 to 24	3		ALL

- Digital input DI3 function planning, refer to the description of parameter P-100.

P-103	Digital Input DI4 Function	realm	default value	unit (of measure)	be applicable
		-24 to 24	4		ALL

- Digital input DI4 function planning, refer to the description of parameter P-100.

P-104	Digital Input DI5 Function	realm	default value	unit (of measure)	be applicable
		-24 to 24	20		ALL

- Digital input DI5 function planning, refer to the description of parameter P-100.

P-105	Digital Input DI6 Function	realm	default value	unit (of measure)	be applicable
		-24 to 24	21		ALL

- Digital input DI6 function planning, refer to the description of parameter P-100.

P-108	Digital output DO1 function	realm	default value	unit (of measure)	be applicable
		-16 to 16	2		ALL

- Digital output DO1 function planning, parameter absolute value indicates function, symbol indicates logic, for function please refer to section 5.6.
- 0 is forced OFF and 1 is forced ON.
- The symbols represent the output logic, with positive numbers indicating positive logic and negative numbers indicating negative logic:

parameter value	corresponding function	DO Output Signal
positive number	ON	conduction
	OFF	stopping point
negative number	ON	stopping point
	OFF	conduction

P-109	Digital output DO2 function	realm	default value	unit (of measure)	be applicable

P-109	Digital output DO2 function	realm	default value	unit (of measure)	be applicable
		-16 to 16	3		ALL

- For planning of the digital output DO2 function, refer to the description of parameter P-108.

P-110	Digital output DO3 function	realm	default value	unit (of measure)	be applicable
		-20 to 20	5		ALL

- For planning of the digital output DO3 function, refer to the description of parameter P-108.

P-111	Digital output DO4 function	realm	default value	unit (of measure)	be applicable
		-16 to 16	8		ALL

- For planning of the digital output DO4 function, refer to the description in parameter P-108.

P-120	Digital input DI forced active 1	realm	default value	unit (of measure)	be applicable
		-32768 to 32767	0		ALL

- The corresponding function is represented by 5 decimal digits:

digitally	the ten thousands place (or column) in the decimal system	the thousands place (or column) in the decimal system	the hundreds place (or column) in the decimal system	the tens place (or column) in the decimal system	the units place (or column) in the decimal system
corresponding function	reservations	TCW	TCCW	ACLR	SON

- The function used to force the DI input to be valid. If the corresponding function bit is set to 1, the function is forced ON (valid).
- Refer to section 5.5 for the meaning of the DI symbol.

- Parameter Meaning:

A bit in this parameter	Corresponding functions[note]	Functional results
0	unplanned	OFF
	planned	Determined by input signal
1	Not planned or planned	ON

Note: Planned is a function that has been selected by parameters P-100 to P-105. Unplanned is a function that has not been selected by parameters P-100 to P-105.

P-121	Digital input DI forced active 2	realm	default value	unit (of measure)	be applicable
		-32768 to 32767	0		ALL

- The corresponding function is represented by 5 decimal digits:

digitally	the ten thousands place (or column) in the decimal system	the thousands place (or column) in the decimal system	the hundreds place (or column) in the decimal system	the tens place (or column) in the decimal system	the units place (or column) in the decimal system
corresponding function	ZCLAMP	SPD3	SPD2	SPD1	CMODE

- Refer to the description of parameter P-120 for other references.

P-122	Digital input DI forced valid 3	realm	default value	unit (of measure)	be applicable
		-32768 to 32767	0		ALL

- The corresponding function is represented by 5 decimal digits

digitally	the ten	the	the	the tens	the

	thousands place (or column) in the decimal system	thousands place (or column) in the decimal system	hundreds place (or column) in the decimal system	place (or column) in the decimal system	units place (or column) in the decimal system
corresponding function	TRQ2	TRQ1	CINV	CZERO	CCW

- Refer to the description of parameter P-120 for other references.

P-123	Digital input DI forced active 4	realm	default value	unit (of measure)	be applicable
		-32768 to 32767	0		ALL

- The corresponding function is represented by 5 decimal digits:

digitally	the ten thousands place (or column) in the decimal system	the thousands place (or column) in the decimal system	the hundreds place (or column) in the decimal system	the tens place (or column) in the decimal system	the units place (or column) in the decimal system
corresponding function	GEAR2	GEAR1	EMG	PC	CW

- Refer to the description of parameter P-120 for other references.

P-124	Digital input DI forced active 5	realm	default value	unit (of measure)	be applicable
		-32768 to 32767	0		ALL

- The corresponding function is represented by 5 decimal digits:

digitally	Dec5	Dec4	Dec3	Dec2	Dec1
correspond	GAIN	CWL	CCWL	CLE	INH

ing function					

- Refer to the description of parameter P-120 for other references.

P-125	Digital Input DIx Filtering (DI1~DI6 share this filter parameter)	realm	default value	unit (of measure)	be applicable
		1 to 1000	5	ms	ALL

- Digital filtering time constant for DI input.
- The smaller the value of the parameter, the faster the signal response; the larger the value of the parameter, the slower the signal response, but the stronger the ability to filter out noise.

P-136	Enable OFF or shutdown mode when an alarm occurs	realm	default value	unit (of measure)	be applicable
		0 to 1	0		P

- This parameter is used to set the way of stopping when the drive is enabled OFF or when an alarm occurs.
- The meaning of the parameter is:

  0: The driver cuts off the motor current directly and the motor stops freely.

  1: The driver maintains the first enable state, controls the motor to decelerate and stop with the deceleration time defined in P-063, and then turns off the enable to cut off the motor current.

P-137	Internal speed 1	realm	default value	unit (of measure)	be applicable
		-8000 to 8000	0	r/min	S

- Internal speed 1, refer to the description of parameter P-025.

P-138	Internal speed 2	realm	default value	unit (of measure)	be applicable
		-8000 to 8000	0	r/min	S

- Internal speed 2, refer to the description of parameter P-025.

P-139	Internal speed 3	realm	default value	unit (of measure)	be applicable

P-139	Internal speed 3	realm	default value	unit (of measure)	be applicable
		-8000 to 8000	0	r/min	S

- Internal speed 3, refer to the description of parameter P-025.

P-140	Internal speed 4	realm	default value	unit (of measure)	be applicable
		-8000 to 8000	0	r/min	S

- Internal speed 4, refer to the description of parameter P-025.

P-141	Internal speed 5	realm	default value	unit (of measure)	be applicable
		-8000 to 8000	0	r/min	S

- Internal speed 5, refer to the description of parameter P-025.

P-142	Internal speed 6	realm	default value	unit (of measure)	be applicable
		-8000 to 8000	0	r/min	S

- Internal speed 6, refer to the description of parameter P-025.

P-143	Internal speed 7	realm	default value	unit (of measure)	be applicable
		-8000 to 8000	0	r/min	S

- Internal speed 7, refer to the description of parameter P-025.

P-144	Internal speed 8	realm	default value	unit (of measure)	be applicable
		-8000 to 8000	0	r/min	S

- Internal speed 8, refer to the description of parameter P-025.

P-145	Internal torque1	realm	default value	unit (of measure)	be applicable
		-300 to 300	0	%	T

- Internal torque 1, refer to the description of parameter P-026.

P-146	Internal torque2	realm	default value	unit (of measure)	be applicable
		-300 to 300	0	%	T

- Internal torque 2, refer to the description of parameter P-026.

P-147	Internal torque3	realm	default value	unit (of measure)	be applicable
		-300 to 300	0	%	T

- Internal torque 3, refer to the description of parameter P-026.

P-148	Internal torque4	realm	default value	unit (of measure)	be applicable
		-300 to 300	0	%	T

- Internal torque 4, refer to the description of parameter P-026.

P-150	Locate the scope of completion	realm	default value	unit (of measure)	be applicable
		0 to 32767	10	impulse	P

- Sets the range of positioning completion pulses under position control.
- When the number of remaining pulses in the position deviation counter is less than or equal to the setting value of this parameter, COIN (positioning completion) of the digital output DO is ON, otherwise OFF.
- The comparator has a return differential function, set by parameter P-151.

P-151	Positioning Completion Return Difference	realm	default value	unit (of measure)	be applicable
		0 to 32767	5	impulse	P

- Refer to the description of parameter P-150.

P-152	Positioning proximity range	realm	default value	unit (of measure)	be applicable
		0 to 32767	500	impulse	P

- Sets the range of positioning proximity pulses under position control.

- When the number of remaining pulses in the position deviation counter is less than or equal to the setting value of this parameter, NEAR (near positioning) of the digital output DO is ON, otherwise OFF.
- The comparator has a return differential function, set by parameter P-153.
- It is used when the positioning is about to be completed, the host computer receives the NEAR signal to prepare for the next step. Generally the parameter value is greater than P-150.

P-153	Positioning Approach Differential	realm	default value	unit (of measure)	be applicable
		0 to 32767	50	impulse	P

- Refer to the description of parameter P-152.

P-154	speed of arrival	realm	default value	unit (of measure)	be applicable
		-8000 to 8000	500	r/min	ALL

- When the motor speed exceeds this parameter, the ASP (speed arrival) of the digital output DO is ON, otherwise OFF.
- The comparator has a return differential function, set by parameter P-155.
- With polarity setting function, controlled by parameter P-156:

P-156	P-154	comparator
0	>0	velocity regardless of direction
1	>0	Only forward speed is detected
	<0	Detects only reversal speed

P-155	Arrival velocity return difference	realm	default value	unit (of measure)	be applicable
		0 to 5000	30	r/min	ALL

- Refer to the description of parameter P-154.

P-156	Arrival velocity polarity	realm	default value	unit (of measure)	be applicable
		0 to 1	0		ALL

- Refer to the description of parameter P-154.

P-157	Arrival torque	realm	default value	unit (of measure)	be applicable
		-300 to 300	100	%	ALL

- When the motor torque exceeds this parameter, ATRQ (torque reached) is ON for the digital output DO, otherwise OFF.
- The comparator has a return difference function, set by parameter P-158.
- With polarity setting function, controlled by parameter P-159:

P-159	P-157	comparator
0	>0	Torque regardless of direction
1	>0	Positive torque

		detection only
	<0	Reverse torque detection only

P-158	Arrival torque return	realm	default value	unit (of measure)	be applicable
		0 to 300	5	%	ALL

- Refer to the description of parameter P-157.

P-159	Arrival torque polarity	realm	default value	unit (of measure)	be applicable
		0 to 1	0		ALL

- Refer to the description of parameter P-157.

P-160	Zero Speed Detection Point	realm	default value	unit (of measure)	be applicable
		0 to 3000	10	r/min	ALL

- When the motor speed is lower than this parameter, ZSP (zero speed) of the digital output DO is ON, otherwise OFF.
- The comparator has a return differential function, set by parameter P-161.

P-161	Zero Speed Detection Return	realm	default value	unit (of measure)	be applicable
		0 to 1000	5	r/min	ALL

- Refer to the description of parameter P-160.

P-162	Zero-speed clamping mode	realm	default value	unit (of measure)	be applicable
		0 to 1	0		S

- The zero-speed clamping function turns on when the following conditions are met:

  Condition 1: Speed control mode

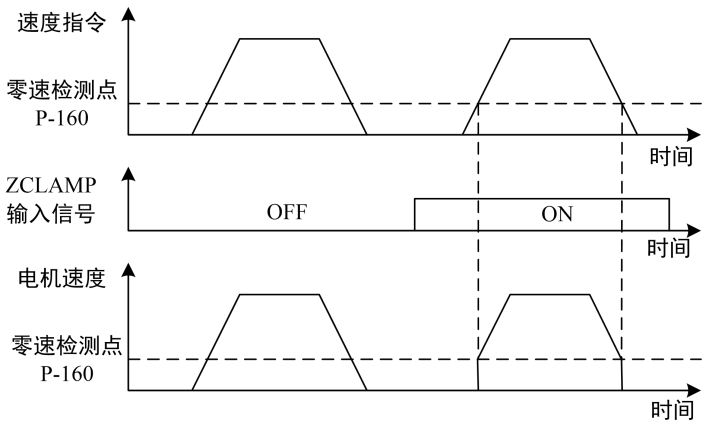
  Condition 2: ZCLAMP (Zero Speed Clamp) ON in DI

  Condition 3: Speed command below parameter P-160

- If any of the above conditions are not satisfied, normal speed control is executed.
- The meaning of this parameter is when the zero-speed clamping function is on:

0: The motor position is fixed at the moment the function is turned on. At this time, the position control is internally accessed, and even if rotation occurs due to an external force, it will return to the zero fixed point.

1: Speed command is forced to zero speed when function is on. Internally it is still speed controlled and may rotate due to external forces.



P-164	Methods of Emergency Shutdown	realm	default value	unit (of measure)	be applicable
		0 to 1	0		P

- This parameter is used to set the method of stopping when EMG (Emergency Stop) is ON in the drive DI.
- The meaning of the parameter is:

  0: The driver cuts off the motor current directly and the motor stops freely;

  1: The drive remains enabled and controls the motor to decelerate and stop with the acceleration and deceleration time defined in P-063.

P-165	Motor standstill speed detection point	realm	default value	unit (of measure)	be applicable
		0 to 1000	5	r/min	ALL

- Motor standstill detection, the motor speed is lower than the parameter value to consider the motor standstill.
- **Used only for electromagnetic brake timing judgment.**

P-166	Electromagnetic brake delay time when the motor is stationary	realm	default value	unit (of measure)	be applicable
		0 to 30000	300	ms	ALL

- Defines the delay time from electromagnetic brake braking (DO output terminal BRK OFF) to motor current cutoff during motor standstill when the system changes from an enabled state to an unenabled state or when an alarm occurs.
- **This parameter is to enable the brake to brake reliably before cutting off the current, avoiding small displacements of the motor or dropping of the workpiece**. The parameter should not be less than the delay time of the mechanical brake.
- **See section 4.8.3 for the corresponding timing.**

P-167	Waiting time for electromagnetic brake during motor operation	realm	default value	unit (of measure)	be applicable
		0 to 10000	300	ms	ALL

- Defines the delay time from motor current cutoff to electromagnetic brake braking (DO

output terminal BRK OFF) during motor operation when the system changes from an enabled state to an unenabled state or when an alarm occurs.

- **This parameter is to decelerate the motor from a high speed rotating state to a low speed before allowing the brake to brake to avoid damaging the brake**;
- The actual action time is the time required to decelerate the motor to the value of P-167 or P-168, whichever is the smallest.
- **See section 4.8.4 for the corresponding timing.**

P-168	Electromagnetic brake operating speed during motor operation	realm	default value	unit (of measure)	be applicable
		0 to 3000	100	r/min	ALL

- Refer to the description of parameter P-167.

P-169	Delay time for opening the electromagnetic brake	realm	default value	unit (of measure)	be applicable
		0 to 5000	500	r/min	ALL

- When the driver changes from the disable state to the enable state, it defines the delay time between the motor current turning on and the electromagnetic brake releasing (DO output terminal BRK ON).
- **See section 4.8.3 for the corresponding timing.**

P-170	Encoder absolute position upload gear ratio numerator	realm	default value	unit (of measure)	be applicable
		1 to 32767	1		ALL

P-171	Encoder Absolute Position Upload Gear Score	realm	default value	unit (of measure)	be applicable
		1 to 32767	1		ALL

- (Used for uploading the feedback absolute position of serial communication encoder to the host computer after gear ratio operation: the driver reads the single-turn and multi-turn data of the encoder, completes the splicing of the absolute position to get the **original multi-turn absolute position**, and then obtains **the multi-turn absolute position that** needs to be **uploaded after the** electronic gear ratio operation of the above two parameters, and the host computer reads the feedback absolute position in the way of communication).
- The numerator N of the electronic gear ratio for the feedback position is set by parameter

P-170 and the denominator M by parameter P-171.

- Uploaded multi-turn absolute position when using absolute encoders =原始多圈绝对位置×$\frac{P\text{-}170}{P\text{-}171}$

P-172	Encoder Equivalent Pulse Lines /Number of crossover output lines	realm	default value	unit (of measure)	be applicable
		0 to 30000	2500		ALL

- meaning of a parameter

  When an absolute encoder is selected, set this parameter to determine the number of lines of output pulses from the driver and the number of turns per position pulse command received.

- The default value is 2500, which means that for each revolution of the motor shaft, 2500 x 4 = 10000 pulses are output, i.e., **when the gear ratio of the position command is 1/1, the host computer controller sends out 10000 pulses to the servo drive, corresponding to 1 revolution of the motor.**

P-173	Encoder pulse split output polarity (A/B pulse phase)	realm	default value	unit (of measure)	be applicable
		0 to 1	0		ALL

- This parameter adjusts the phase relationship between the B and A phase signals: 0: normal phase 1: phase inversion

P-174	Encoder pulse division output Z signal phase	realm	default value	unit (of measure)	be applicable
		0 to 1	0		ALL

- This parameter adjusts the phase of the Z phase signal: 0: normal phase 1: phase inversion

P-175	Encoder pulse division output Z signal width	realm	default value	unit (of measure)	be applicable
		0 to 100	0		ALL

- This parameter can adjust the width of Z signal: 0: default width (4 pulses) 1~100: the number of pulses for width expansion, for example, set to 5, it means that 5 pulses are expanded on the basis of the default width, and the total pulse width of Z signal is 9 pulses.

P-179	Pulse division output signal selection	realm	default value	unit (of measure)	be applicable

P-179	Pulse division output signal selection	realm	default value	unit (of measure)	be applicable
		0 to 1	0		ALL

- This parameter is used to select the type of pulse division output signal:
  0: Encoder feedback pulse signal 1: Position command synchronization pulse signal

P-181	485 communication ID number	realm	default value	unit (of measure)	be applicable
		-1 to 32	1		ALL

- When using RS-485 communication, the upper controller is the host and the servo drive is the slave. The communication address of the servo drive needs to be set to a different communication station number by this parameter. The setting range of the station number address is from -1 to 32, and a setting value of -1 means that the communication function is closed, and a setting value greater than 0 means that the communication function is open. Before using the communication function, this parameter must be set to the required station number, this station number represents the absolute address of this drive in the communication network, a group of servo drives can only be set to one station number, and if the station number is set repeatedly, it will lead to the inability of normal communication.

P-182	485 Communication Baud Rate	realm	default value	unit (of measure)	be applicable
		0 to 3	2		ALL

- Select the baud rate of RS-485 communication through this parameter, different values correspond to different baud rates, the selected communication baud rate should be the same as the communication baud rate of the upper controller, the specific set values are as follows:
- Parameter Meaning:
  0: Baud rate is 4800bps 1: Baud rate is 9600bps
  2: Baud rate of 19200bps 3: Baud rate of 38400bps
  4: Baud rate of 57600bps 5: Baud rate of 115200bps

P-183	MODBUS communication data mode selection (Only RTU data format is supported for the time being)	realm	default value	unit (of measure)	be applicable
		0 to 5	1		ALL

- Select the data mode of RS-485 communication through this parameter, and the selected data

mode should be consistent with the communication protocol of the upper controller, and the meaning of the specific parameter value is as follows:

0: Data bit - 8 bits Checksum bit - none Stop bit - 1 bit

1: Data bits-8 bits Checksum bits-even check (Even) Stop bits-1 bit

2: Data bits-8 bits Checksum-odd (Odd) Stop bits-1 bit

3: Data bits - 8 bits Checksum - none Stop bits - 2 bits

4: Data bits-8 bits Checksum bits-even check (Even) Stop bits-2 bits

5: Data bits-8 bits Checksum-odd (Odd) Stop bits-2 bits

P-184	23-bit encoder resolution selection	realm	default value	unit (of measure)	be applicable
		17-23	23		ALL

- This parameter allows you to set the resolution that is actually used for the 23-bit encoder, e.g. if it is set to 17 it is used as a 17-bit encoder. If the encoder is 17 bit, the P-184 parameter is invalid.

5.5 DI Functions in Detail

Special note: DI1~DI4 are programmable input ports, whose functions are configured by parameters P-100~P-103; DO1~DO4 are programmable output ports, whose functions are configured by parameters P-108~P-111; for details of parameter configurations, please refer to Section 5.4.2 of Chapter 5, and the specific functions are described below:

<table>
<tr><th>serial number</th><th>notation</th><th>functionality</th><th>functional explanation</th></tr>
<tr><td>0</td><td>NULL</td><td>functionless</td><td>The input state has no effect on the system.</td></tr>
<tr><td>1</td><td>SON</td><td>Servo Enable</td><td>OFF: The servo driver is not enabled and the motor does not pass current;
ON : The servo driver is enabled and the motor is energized.</td></tr>
<tr><td>2</td><td>ACLR</td><td>Alarm Clearance</td><td>When there is an alarm, the input rising edge (OFF to ON moment) clears the alarm if that alarm allows clearing. Note that only some alarms are allowed to be cleared.</td></tr>
<tr><td>3</td><td>CCWL</td><td>Positive Rotation Drive Disable</td><td>OFF: Forward (CCW) rotation is disabled;
ON : Allows positive (CCW) rotation.
Used for mechanical limit travel protection, function controlled by parameter P-097. Note that the default value of P-097 is to ignore this function, if you need to use this function, you need to modify P-097.
<table>
<tr><th>P-097 single-digit character</th><th>clarification</th></tr>
<tr><td>0</td><td rowspan="2">To use the positive rotation drive inhibit function, the normally closed contact of the travel switch must be connected.</td></tr>
<tr><td>2</td></tr>
<tr><td>1</td><td rowspan="2">Ignore the positive rotation drive prohibit function, the motor can run in the positive direction, this signal has no effect, no need to access.</td></tr>
<tr><td>3 (default)</td></tr>
</table>
</td></tr>
</table>

<table>
<tr><th>serial number</th><th>notation</th><th>functionality</th><th>functional explanation</th></tr>
<tr><td>4</td><td>CWL</td><td>Reverse drive prohibition</td><td>OFF: Prohibits reverse (CW) rotation;
ON : Allows reverse (CW) rotation.
Used for mechanical limit travel protection, function controlled by parameter P-097. Note that the default value of P-097 is to ignore this function, if you need to use this function, you need to modify P-097.
<table>
<tr><th>P-097 single-digit character</th><th>clarification</th></tr>
<tr><td>0</td><td rowspan="2">To use the reverse drive prohibition function, the normally closed contacts of the travel switch must be connected.</td></tr>
<tr><td>1</td></tr>
<tr><td>2</td><td rowspan="2">Ignore the reverse drive prohibit function, the motor can run in the opposite direction, this signal has no effect, no need to access.</td></tr>
<tr><td>3 (default)</td></tr>
</table></td></tr>
<tr><td>5</td><td>TCCW</td><td>Positive torque limit</td><td>OFF: CCW direction torque is not limited by the P-067 parameter;
ON : CCW direction torque is limited by the P-067 parameter.
Note that the CCW directional torque is also limited by parameter P-065, regardless of whether TCCW is active or inactive.</td></tr>
<tr><td>6</td><td>TCW</td><td>Reverse torque limit</td><td>OFF: CW direction torque is not limited by the P-068 parameter;
ON : CW direction torque is limited by parameter P-068.
Note that the CW directional torque is also limited by parameter P-066, regardless of whether TCW is active or inactive.</td></tr>
<tr><td>7</td><td>ZCLAMP</td><td>Zero-speed clamping</td><td>The zero-speed clamping function turns on when the following conditions are met:
Condition 1: Speed control mode;
Condition 2: ZCLAMP ON;
Condition 3: The speed command is below parameter P-160.
When any of the above conditions are not satisfied, normal speed control is executed. Refer to parameter P-162 for specific application description.</td></tr>
<tr><td>8</td><td>CZERO</td><td>zero instruction</td><td>speed or torque command under speed or torque control, respectively:
OFF: Normal command;
ON : Zero command.</td></tr>
</table>

<table>
<tr><th>serial number</th><th>notation</th><th>functionality</th><th>functional explanation</th></tr>
<tr><td>9</td><td>CINV</td><td>command inversion</td><td>speed or torque command under speed or torque control, respectively:
OFF: Normal command;
ON : The instruction is reversed.</td></tr>
<tr><td>10</td><td>SP1</td><td>Internal speed selection 1</td><td rowspan="3">For speed control and speed limitation, the combination of SP1, SP2 and SP3 selects internal speeds 1 to 8:
<table>
<tr><th colspan="3">DI signal [Note]</th><th rowspan="2">speed command</th></tr>
<tr><th>SP3</th><th>SP2</th><th>SP1</th></tr>
<tr><td>0</td><td>0</td><td>0</td><td>Internal speed 1 (parameter P-137)</td></tr>
<tr><td>0</td><td>0</td><td>1</td><td>Internal speed 2 (parameter P-138)</td></tr>
<tr><td>0</td><td>1</td><td>0</td><td>Internal speed 3 (parameter P-139)</td></tr>
<tr><td>0</td><td>1</td><td>1</td><td>Internal speed 4 (parameter P-140)</td></tr>
<tr><td>1</td><td>0</td><td>0</td><td>Internal speed 5 (parameter P-141)</td></tr>
<tr><td>1</td><td>0</td><td>1</td><td>Internal speed 6 (parameter P-142)</td></tr>
<tr><td>1</td><td>1</td><td>0</td><td>Internal speed 7 (parameter P-143)</td></tr>
<tr><td>1</td><td>1</td><td>1</td><td>Internal speed 8 (parameter P-144)</td></tr>
</table>
Note: 0 means OFF, 1 means ON.</td></tr>
<tr><td>11</td><td>SP2</td><td>Internal speed selection 2</td></tr>
<tr><td>12</td><td>SP3</td><td>Internal speed selection 3</td></tr>
<tr><td>13</td><td>TRQ1</td><td>Internal torque selection1</td><td>For torque control and torque limiting, the combination of TRQ1 and TRQ2 selects internal torque 1~4:
<table>
<tr><th>DI signal [Note]</th><th>Torque command</th></tr>
</table></td></tr>
</table>

<table>
<tr><th>serial number</th><th>notation</th><th>functionality</th><th>functional explanation</th></tr>
<tr><td>14</td><td>TRQ2</td><td>Internal torque selection2</td><td>
<table>
<tr><th>TRQ2</th><th>TRQ1</th><th></th></tr>
<tr><td>0</td><td>0</td><td>Internal torque 1 (parameter P-145)</td></tr>
<tr><td>0</td><td>1</td><td>Internal torque 2 (parameter P-146)</td></tr>
<tr><td>1</td><td>0</td><td>Internal torque 3 (parameter P-147)</td></tr>
<tr><td>1</td><td>1</td><td>Internal torque 4 (parameter P-148)</td></tr>
</table>
Note: 0 means OFF, 1 means ON.
</td></tr>
<tr><td>15</td><td>EMG</td><td>emergency stop</td><td>OFF: Allows the servo drive to operate;
ON: The motor is stopped in the manner set in parameter P-164.</td></tr>
<tr><td>16</td><td>CMODE</td><td>Control mode switching</td><td>When parameter P-004 is set to 3, 4 or 5, the control mode can be switched:
<table>
<tr><th>P-004</th><th>CMODE</th><th>control method</th></tr>
<tr><td>3</td><td>0</td><td>placement</td></tr>
<tr><td></td><td>1</td><td>tempo</td></tr>
<tr><td>4</td><td>0</td><td>placement</td></tr>
<tr><td></td><td>1</td><td>torque</td></tr>
<tr><td>5</td><td>0</td><td>tempo</td></tr>
<tr><td></td><td>1</td><td>torque</td></tr>
</table>
Note: 0 means OFF, 1 means ON.
</td></tr>
<tr><td>17</td><td>GAIN</td><td>Gain switching</td><td>When parameter P-176 = 2, the gain combination is switched via GAIN:
OFF: 1st gain;
ON: 2nd gain.</td></tr>
<tr><td>18</td><td>GEAR1</td><td>Electronic Gear Selection 1</td><td rowspan="2">Parameter P-034 is used to configure the dynamic electronic gear application mode, as specified in section 4.2.3.</td></tr>
<tr><td>19</td><td>GEAR2</td><td>Electronic Gear Options 2</td></tr>
</table>

serial number	notation	functionality	functional explanation
20	CLE	Position deviation removal	Clears the position deviation counter, the clearing mode is selected by parameter P-163, and position deviation clearing occurs: P-163 = 0: CLE ON level; P-163=1: CLE upper edge (OFF to ON instant).
21	INH	Pulse Input Inhibit	OFF: The position command pulse is allowed to pass; ON : The position command pulse is disabled.
23	CCW	Positive operation (startup)	When the P-097 ten-digit setting value is not 3, this signal is used as the forward rotation allow function. OFF: Positive rotation prohibited; ON: Positive rotation is allowed.
24	CW	invert the operation	P-097 This signal is used as a reverse allow function when the set value of the ten digits is not 3. OFF: Reversal is disabled; ON: Reversal is allowed.
25	ORN	return to zero (math.)	When P-127 is set to 1 and P-128 is set to 2, it is used as a return-to-zero trigger source. OFF: Zero return switch is invalid; ON: Zero return switch is active.

5.6 DO Functions in Detail

serial number	notation	functionality	functional explanation
0	OFF	It's never worked.	Force the output OFF.
1	ON	Always works.	Forces the output ON.
2	SRDY	Servo ready.	OFF: The servo main power is not closed or there is an alarm; ON : Servo main power is normal, no alarm.
3	ALM	give a warning	OFF: There is an alarm; ON : No alarm.
4	ZSP	zero speed	OFF: Motor speed higher than parameter P-160 (regardless of direction); ON : Motor speed below parameter P-160 (regardless of direction).
5	COIN	Positioning complete.	For position control OFF: Position deviation greater than parameter P-150; ON : Position deviation is less than parameter P-150.
6	ASP	speed	OFF: The motor speed is lower than parameter P-154; ON : Motor speed is higher than parameter P-154. With polarity setting function, refer to parameter P-154 for description.
7	ATRQ	Torque Arrival	OFF: Motor torque is lower than parameter P-157; ON: The motor torque is higher than parameter P-157. With polarity setting function, refer to parameter P-157 for description.
8	BRK	electromagnetic brake	OFF: Electromagnetic brake braking; ON : The electromagnetic brake is released.
9	RUN	Servo in operation	OFF: The servo motor is not energized for operation; ON : The servo motor is in power-on operation.
10	NEAR	localization	For position control OFF: Position deviation greater than parameter P-152; ON : Position deviation is less than parameter P-152.
11	TRQL	In torque limitation	OFF: Motor torque has not reached the limit value; ON : Motor torque reaches the limit value. The torque limiting method is set with parameter P-064.

serial number	notation	functionality	functional explanation
12	SPL	Speed limit in progress	For torque control OFF: The motor speed has not reached the limit value; ON : Motor speed reaches the limit value. The speed limit method is set via parameter P-077.
20	DO3_ZOUT	Zero return Z signal output (only DO3 supports this function)	OFF: Z signal outputs high level; ON : Z signal outputs low level.

Chapter 6 Troubleshooting and Diagnostics

6.1 List of alarms

Special Note: The following alarms can be turned off by setting the function parameters, only Err 3 is turned off by default, if users need to turn on the "power main circuit undervoltage alarm", they need to change the parameter P-116 from the default value of 8 to 0 and save the parameter.

Alarm Code	Alarm Name	Alarm contents and handling methods	Alarm Clearance
Err--	no alarm	proper functioning	
Err 1	speeding	Motor speed exceeds limit value, check P-075 setting/check for correct motor wiring	may
Err 2	Power main circuit overvoltage	**If an internal braking resistor is used, check that terminals P and D are reliably connected together; if an external resistor is used, check that a resistor is connected between P and C.**	clog ged
Err 3	Power main circuit undervoltage	The main circuit power supply voltage is lower than the specified value (check the display item D-v: DC bus voltage, the normal value is around 300V)	may
Err 4	Position overshoot (following error too large)	The value of the position deviation counter exceeds the number of revolutions set in parameter P-080 (unit: 0.01 revolutions).	may
Err 5	Position commands are too frequent	Error in sending commands from the host computer or wrong resolution setting	may
Err 6	motor stalling	Wrong connection or poor contact of motor power cable, wrong motor code setting, overloading	may
Err 7	Driver Disable Exception	CCWL, CWL drive travel limit switch signal active (i.e. limit position reached)	may
Err11	IPM module failure	Failure of the IPM inverter module in the power main circuit	clog ged

Err12	overcurrent	Excessive servo drive transient current	may
Err13	overloaded	Motor average load current is too high	may
Err14	Braking peak power overload	Braking short time instantaneous load is too large/check that terminals P and C are reliably connected/braking resistor is not damaged.	may
Err20	EEPROM error	Error during EEPROM read/write, power failure during parameter saving	clogged
Err21	Logic chip error	Processor peripheral logic circuit failure	clogged
Err23	AD conversion reference voltage error	AD Sampling Circuit Voltage References are not standardized	clogged
Err24	AD conversion channel asymmetry or large zero drift	AD sample amplification conditioning circuit abnormality	clogged
Err25	Motor code error	Motor code adaptation error inside the drive	clogged
Err29	User torque overload alarm	Motor load exceeds user-set value P-070 and duration P-072	may
Err35	Absolute encoder multi-turn count error	Verify that the encoder battery is properly connected/not damaged, restart the drive and reset the mechanical zero point	clogged
Err38	Absolute encoder zero error	The motor has not been subjected to an encoder zero calibration operation	clogged
Err39	**Absolute encoder communication disconnection**	**Loose or disconnected encoder cable, electromagnetic interference, encoder damage, encoder baud rate deviation is too large, etc.**	clogged
Err40	**Absolute encoder battery loss**	**If the alarm occurs when the drive is first used or the motor encoder plug has been removed, the alarm is a normal phenomenon, follow the instructions in section 5.2 to clear the alarm and reset the mechanical zero point; if it occurs after a period of time, it means that the batteries have been disconnected or the voltage is low, so it is necessary to replace the batteries, and it is necessary to reset the mechanical zero point.**	clogged

Err41	Absolute encoder count error	Loose or disconnected encoder cable, electromagnetic interference, check cable, restart drive	
Err42	Motor matching error	Non-standard motor, encoder zero point is wrong, need to use the driver to write motor parameters and zero calibration operation	clogged
Err43	Absolute encoder zero error	Illegal removal of a single turn position	clogged
Err44	Low battery voltage Warning	After replacing the battery, press and hold the Enter key with Fn 0 for 3 seconds, Err44 is lifted	
Err45	Absolute encoder temperature too high	Motor temperature too high, need to reduce load	clogged

6.2 Alarm Clearing Method

① Err40/Err41/Err35 Clearing method

Special Note: Err40/Err35 indicates that the absolute encoder battery has been de-energized or the motor encoder cable has been disconnected. In the alarm state, the encoder multi-turn position will be lost (cleared to zero), and the absolute position of the mechanical coordinates will be incorrect. When the Err40 alarm occurs, make sure to perform all of the following checks and operations:

- Check whether the battery voltage is sufficient (battery voltage is normally stabilized at 3.6V), if the voltage is low, please replace the battery;
- Check that the encoder cable is reliably connected;
- Verify that the encoder cable plug has not been removed from the motor end, if so the mechanical zero must be recalibrated;
- Clear the alarms and reset the mechanical zero point for each axis;
- The first time the drive is connected to the encoder, Err40 is normal (not a fault) and an alarm clearing operation needs to be performed;

To clear Err40/Err41/Err35, proceed as follows:

Method 1: Set the operation password P-000 to 510, then switch the operation menu to A-Fn and execute the Fn 0 operation (as shown in the following figure, press and hold the Enter key for 3 seconds), and after the alarm is cleared successfully, reset the mechanical zero point.

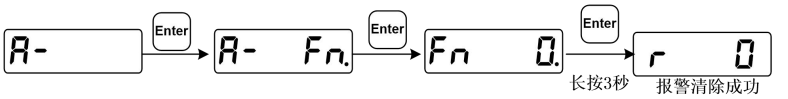
Method 2: After eliminating the cause of the alarm, set P-008 to 2, save the

parameter, and then power off and restart, the alarm will be lifted, if the alarm is still not lifted, just power off and restart again, and then reset the mechanical zero point.

Note: Both of the above methods can be used to achieve clearing of the encoder multi-turn alarm. If Err40 cannot be cleared, check the battery power supply to see if it is normal or perform an alarm clear and restart the drive power supply more than twice.

② Other alarm clearing methods

When a fault alarm occurs in the servo drive, after eliminating the cause of the fault, the alarm can be cleared through the drive operation panel without power supply, as follows:



Note: Some hardware failure alarms cannot be cleared, contact customer service for details.

6.3 Absolute encoder battery replacement method

Recommended lithium battery specification: ER36V (battery voltage normally stabilized at 3.6V)

Battery Replacement Procedure.

1. Replace the battery when the servo driver power supply is ON and the POW lamp is on but not enabled (RUN lamp is off).

2, after replacing the battery, power off and restart the servo drive power, if there is no abnormal alarm, indicating that the battery replacement is successful.

Special Note: If the battery connection is removed or the encoder cable is removed from the servomotor while the servo drive power supply is OFF, the multi-turn data in the absolute encoder will be lost and the **mechanical zero point must be reset.**

6.4 Common problems and countermeasures

① No display at power-on **No display at power-on**

a. Use a multimeter to test whether the power input is normal;

b. Exclude whether the cable connection inside the drive is loose;

c. Restart the servo drive with multiple power failures;

d. After the above causes are eliminated, it can be determined that the drive is damaged.

② **Err35/Err38/Err39/Err40/Err43" fault alarm appears.**

Note: The optical encoder at the end of the servo motor is typically a fragile and vulnerable

component and requires special attention to protect !

a. The above alarms indicate a problem with the encoder or encoder connection cable;

b, Err40 indicates that the encoder external power supply battery voltage is low and needs to be replaced;

c. Check whether the shield is well grounded at both ends and whether the plug has water or impurities;

d. Whether the connection cable is too long for the encoder power supply 5V caused by attenuation;

e. Confirm whether it is an interference problem, whether there are strong magnetic and electric lines next to it, and if so, isolate them as far as possible.

③ **Noise or vibration during servo motor operation (high frequency)**

a. Adjust the filter coefficients P-007 and P-019 appropriately by an amount of 10 per adjustment;

b. If the effect of adjusting the filter coefficient is not obvious, it is necessary to reduce the proportional gain of the speed ring and the proportional gain of the position ring, i.e., adjusting P-005 and P-009, each time the adjustment amount is 10;

c. If there is no significant improvement in any of the above measures, check whether there is any interference in the encoder connecting line, and check whether the shield is well grounded at both ends.

④ **Jitter (low frequency) in servo motor operation**

a. Determine whether the load and inertia carried by the servo motor are within the permissible range of the motor. If the load and inertia exceed the motor's rated multiples by too much (load torque greater than 3 times, inertia greater than 5 times), please re-select a larger specification of the motor;

b. Adjust the speed ring proportional gain P-005 appropriately by 10 per adjustment;

c. If the effect of adjusting P-005 is not obvious, the filter coefficient P-007/P-019 can be adjusted appropriately, and the amount of each adjustment is 10;

d. If the effect of adjusting the filter coefficients is not obvious, the position loop gain P-009 can be adjusted appropriately, and the amount of each adjustment is 10;

e. If there is no significant improvement in any of the above measures, check the encoder connection line and the command connection line for interference and check that the shield is well grounded at both ends.

⑤ 、**The driver displays Err2/Err11**

Determine whether the drive alarms on power-up or during frequent acceleration and deceleration of large inertia:

a. If the power on the alarm can be identified as a drive hardware circuit failure;

b. If the alarm is caused by frequent acceleration and deceleration of large inertia, first check the monitoring menu d-1 and d-P1, and observe whether the instantaneous value and maximum value of the current are beyond the permissible range of the driver and the motor, and if they are beyond the range, reduce the acceleration of inertia accordingly (Speed Mode: increase the acceleration time P-060 and the deceleration time P-061; Position Mode: increase the acceleration and deceleration time of the upper controller), so as to make the current control within the permissible range of the driver and the motor, and check whether the fault disappears. drive and motor within the allowable range, check whether the fault disappears.

⑥ **The driver displays "Err5/Err12" when the servo motor is started.**

a. The appearance of "Err5" indicates that the upper computer sends pulse command frequency is too fast, beyond the response ability of the servo motor, it is recommended to adjust the upper computer acceleration and deceleration time, or appropriately adjust the position command smoothing time P-040, each time to adjust the amount of 10;

b. If the above measures are ineffective or the upper computer cannot be modified, please set P-116 to 32 to block "Err5" alarm (power failure and restart are required to take effect);

c. If "Err12" overcurrent alarm appears in the drive when starting, it means that the load is too large when the motor starts, please check whether the drive selection is too small or whether the drive is damaged.

(7) **The "Err-4" message appears on the driver during servo motor operation.**

a. If low-speed operation is normal, but "Err4" appears in high-speed operation, please first check whether the maximum speed limit of P-075 is low, and then adjust the position ring gain of P-009 appropriately (the amount of adjustment is 5 each time), or adjust the position overrun detection range of P-080 appropriately;

b. If "Err4" appears as soon as the motor is running no matter what speed is given as long as the position command is given, please make sure whether the motor is blocked or damaged, and whether the strong electric circuit of the driver is damaged;

c. If "Err4" appears when accelerating faster during operation, please confirm whether the driver and motor selection is too small;

d. If "Err4" appears occasionally during operation, please check whether there is any interference between the encoder connection line and the command connection line, and whether the shield is well grounded at both ends.

⑧ **The drive is running normally, and the upper computer shows "excessive position following error".**

a. Determine the detection threshold of the upper computer position tracking error overrun, set the drive position overrun detection range P-080 to a value less than the threshold, and observe whether "Err4" appears in the drive during operation;

b. If "Err4" appears in the drive, it means that it is the response problem of the drive and the motor, please make sure the integrity of the drive and the motor first, and then adjust the position loop and speed loop gain P-009/P-005;

c. If the above measures do not have a significant effect, consider selecting a larger specification drive and motor.

6.5 Alarm causes and handling

Err 1 (overspeed)

rationale	probe	deal with
Motor wiring U, V, W phase sequence error	Check U, V, W wiring	Correctly connect the U, V, and W wires to correspond with the U, V, and W markings on the drive plugs.
Motor speed overshoot	Check the running status and view the parameters	Adjust servo gain to minimize overshoot; increase acceleration and deceleration times for speed control
Encoder wiring error	Check encoder wiring	Correct Wiring

Err 2 (Main circuit overvoltage)

rationale	probe	deal with
Input AC power too high	Check power supply voltage	Bringing the voltage in line with product specifications
regenerative brake failure	Regenerative braking resistor, brake pipe for failure or wiring disconnection	protect and maintain
Excessive regenerative braking	View Brake Load Ratio	Reduced start/stop frequency

energy		Increase in acceleration and deceleration time Reducing the torque limit value Reduced load inertia Replacement of higher power drives and motors Replacement of larger braking resistor

Err 3 (Main circuit undervoltage)

rationale	probe	deal with
Input AC power too low	Check power supply voltage	Bringing the voltage in line with product specifications

Err 4 (position overrun)

rationale	probe	deal with
Motor wiring U, V, W phase sequence error	Check U, V, W wiring	Correctly connect the motor U, V, W wiring to correspond with the U, V, W labeling of the drive plug.
Encoder zero change	Checking the encoder zero point	Reinstall and zero the encoder
Encoder wiring error	Check encoder wiring	Correct Wiring
Motor jammed	Check the motor and mechanical connections	protect and maintain
Command pulse frequency too high	Check input frequency, pulse division frequency parameters	Reduced input frequency Adjustment of pulse division frequency parameters
Position loop gain too small	Check Parameters P-009, P-013	Increase Position Ring Gain
The overshoot detection range is too small	Check parameter P-080	Increase the value of parameter P-080
Insufficient torque	View Torque	Increase the torque limit value Increase position command smoothing filter time load reduction Replacement of higher power drives and motors

Err 5 (positional command overclocking)

rationale	probe	deal with
Command pulse frequency too	Check that the input frequency	Reduced input frequency

high	and electronic gear ratio settings are correct	Correct setting of P-029, P-030
Too short an interval between motor enable and command pulse issuance	The host computer adds a delay of at least 500ms between giving an enable and sending a pulse (waiting for the motor to be fully excited).	Modify the upper computer timing
No acceleration/deceleration processing or too short acceleration/deceleration time in the upper computer command.	Whether the acceleration and deceleration times of the position commands sent by the host computer are set reasonably.	Increase the acceleration and deceleration times for commands sent from the host computer. Adjust the position command smoothing filter coefficient P-040 appropriately.

Err 6 (Motor blocked)

rationale	probe	deal with
Motor jammed	Check the motor and mechanical connections	examine and fix (a motor)
Motor wiring U, V, W phase sequence error	Check U, V, W wiring	Correctly connect the motor U, V, W wiring to correspond with the U, V, W labeling of the drive plug.
Encoder wiring error	Check encoder wiring	Correct Wiring
Motor overloading	Check  load current 	load reduction Increase torque limit P-065, P-065 Replacement of higher power drives

Err 7 (Driver disablement exception)

rationale	probe	deal with
CCWL and CWL drive inhibit inputs are invalid when servo is enabled.	Check CCWL, CWL wiring	Correct input of CCWL, CWL signals If CCWL and CWL signals are not used, parameter P-097 can be set to block the

Err 9 (Encoder AB signal failure)

rationale	probe	deal with
Encoder wiring error	Check encoder wiring	Correct Wiring
Bad encoder cable and connector	Check cables and connectors	Replacement of cables and connectors
Motor model not set correctly	Check the motor model	Reset the motor model
Damaged encoder	Checking the encoder	Replacement of encoder

Err11 (power module failure)

rationale	probe	deal with
Short circuit between motor wiring U, V, W	Check U, V, W wiring	Correct connection of U, V and W wiring
Damage to motor winding insulation	Check the motor	Replacement of motor
Drive damage	Check the drive	No problem with the motor, power on again or alarm, may be the drive is damaged, replace the drive
poor grounding	Check the ground wire	Proper Grounding
suffer interference	Checking for sources of interference	Increase line filters away from sources of interference

Err12 (overcurrent)

rationale	probe	deal with
Short circuit between motor wiring U, V, W	Check U, V, W wiring	Correct connection of U, V and W wiring
Damage to motor winding insulation	Check the motor	Replacement of motor
Drive damage	Check the drive	No problem with the motor, power on again or alarm, may be the drive is damaged, replace the drive

Err13 (overload)

rationale	probe	deal with
Continuous operation over rated load	View Load Ratio	Reduce the load or switch to a higher power drive
System instability	Check motor operation for oscillation	Reduced system gain
Accelerating and decelerating too fast.	Check for smooth motor operation	Increase the acceleration and deceleration time
Encoder zero change	Checking the encoder zero point	Reinstall and zero the encoder

Err14 (braking peak power overload)

rationale	probe	deal with
Input AC power supply is high	Check power supply voltage	Bringing the voltage in line with product specifications

regenerative brake failure	Regenerative braking resistor, brake pipe for failure or wiring disconnection	protect and maintain
Excessive regenerative braking energy	View Brake Load Ratio	Reduced start/stop frequency Increase in acceleration and deceleration time Replacement of higher power drives and motors Replacement of larger braking resistor
Encoder Issues	Wrong number of lines and poles. Encoder Z signal error Damaged encoder	Replacement of encoder

Err20 (EEPROM error)

rationale	probe	deal with
EEPROM chip damage	Re-power up and check	Failure does not disappear, replace the drive

Err21 (Logic circuit error)

rationale	probe	deal with
Control circuit failure	Re-power up and check	Failure does not disappear, replace the drive

Err23 (AD conversion reference voltage error)

rationale	probe	deal with
Current Sensor and Connector Problems	Look at the main circuit for loose flexible connections	Replacement of drives
AD converter and analog amplifier circuit problems	Check the control circuit	Replacement of drives

Err24 (AD conversion channel asymmetry or zero drift value is too large)

rationale	probe	deal with
AD converter and analog amplifier circuit problems	Check the control circuit	Replacement of drives

Err29 (user torque overload alarm)

rationale	probe	deal with

Unexpectedly large loads occur	Checking the load	Adjustment of the load
Parameters P-070, P-071 and P-072 are not set properly.	Checking parameters	Adjustment parameters

Err30 (Loss of encoder Z signal)

rationale	probe	deal with
Encoder Issues	View Encoder Z Signal	Replacement of encoder
Encoder cable and connector issues	Check cables and connectors	Replacement of cables and connectors
Drive Interface Circuit Failure	Check the control circuit	Replacement of drives

Err31 (Encoder Z signal detection abnormality)

rationale	probe	deal with
Encoder Issues	View Encoder Z Signal	Replacement of encoder
Interference in the encoder cable	Check cables and connectors	Replacement of cables and connectors
Drive Interface Circuit Failure	Check the control circuit	Replacement of drives

Err32 (illegal encoding of encoder UVW signal)

rationale	probe	deal with
Encoder Issues	Check encoder UVW signal	Replacement of encoder
Incorrect encoder wiring, broken wires	Check encoder wiring	Correct wiring, including shielded wires

Err33 (wire-saving encoder signal error)

rationale	probe	deal with
Encoder Issues	Checking the encoder signal	Replacement of encoder
Motor model not set correctly	Check the motor model and make sure the motor is equipped with a wire-saving encoder.	Reset the motor model

Chapter 7 Specifications and Adapted Motors

7.1 Drive specifications and mounting dimensions

- **Model naming rules**

T3D-L20A-RABF

驱动器系列:
T3D-经济型绝对值伺服驱动器
（单板机: 串行通讯编码器）

电压等级:
L-220V

IPM模块容量:
10-10A
15-15A
20-20A
……

编码器类型:
A/B-绝对值编码器
（串行通讯编码器）
17位/23位、单圈/多圈、光编/磁编都支持适配

通讯类型:
G - 无通讯
R – 隔离485通讯

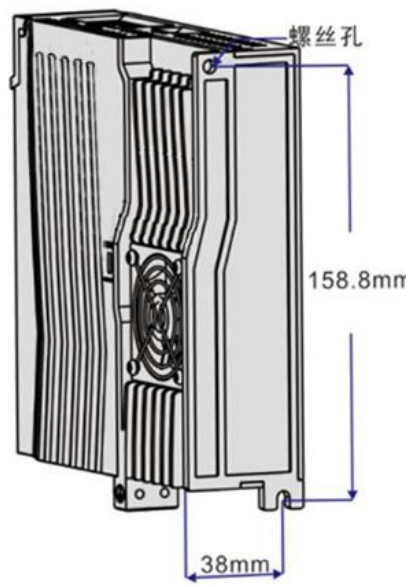
定制厂家:
A:通用型
B-E:厂家代码

有无内置电阻:
N:无内置电阻
B:有内置电阻

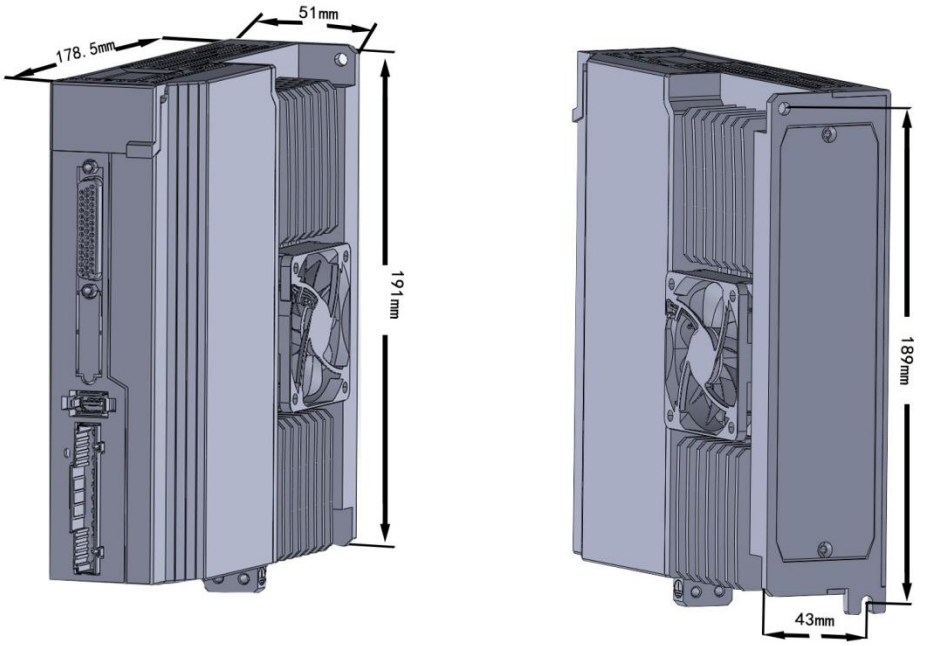
有无风扇:
N:无风扇　F:有风扇

- **Drive Mounting Dimension Drawing**

T3D-L15A/T3D-L20A/B have the same mounting dimensions as shown below:



The T3D-L30A installation dimensions are shown below:



Model specification and function introduction

Table 7.1 Driver Model Specifications and Functions

model number			L15	L20	L30				
importation power supply	main power	Single phase 220VAC -15%+10% 50/60Hz							
classifier for scores in archery etc boundary	temp	Work: ℃0～℃40 Storage: ℃-40～℃50							
	humidity level	Operating: 40% to 80% (no condensation) Storage: 93% or less (no condensation)							
	atmospheric pressure	86kPa～106 kPa							
protection class		IP20							
control mode		Position, speed, torque, position/speed, speed/torque, position/torque							
digital input		4 programmable input terminals (opto-isolated)							
digital output		4 programmable output terminals (opto-isolated)							
impulse freque	Signal Type	A, B, Z differential outputs Z signal open collector output RS485 communication to read the position of the feedback encoder							

ncy sharing signal exports		**Encoder feedback pulse signal output / Position command synchronization pulse signal output**
classifier for honorific people install	Input frequency	T3D: Differential input: ≤500kHz (kpps); Single-ended input: ≤200kHz (kpps)
	Instruction Mode	T3D: Pulse + Symbol; Forward/Reverse Pulse; Quadrature Pulse
	Electronic Gear Ratios	1 to 32767/1 to 32767
velocity degree (angles, temperature etc)	analog command importation	0~10VDC, input impedance 10kΩ
	directive plus decelerations	Parameter setting P-060/P-061
	Source of instructions	Analog, internal speed command
classifier for repeated actions carpenter's square	analog command importation	0～+10V, input impedance 10kΩ
	Torque Limit	Parameter setting P-065/P-066
	Source of instructions	Analog, internal torque command
monitoring function		Speed, current position, position deviation, motor torque, motor current, command pulse frequency, etc.
protective function		Over-speed, over-voltage, over-current, over-load, abnormal braking, abnormal encoder, over-position, over-frequency command, etc.
distinguished suffix forming noun from adjective, corresponding-ness or -ity	speed frequency responsive	≥1.6kHz
	velocity volatility	<±0.03% (load 0～100%); <±0.02% (power supply -15% ～ +10%)

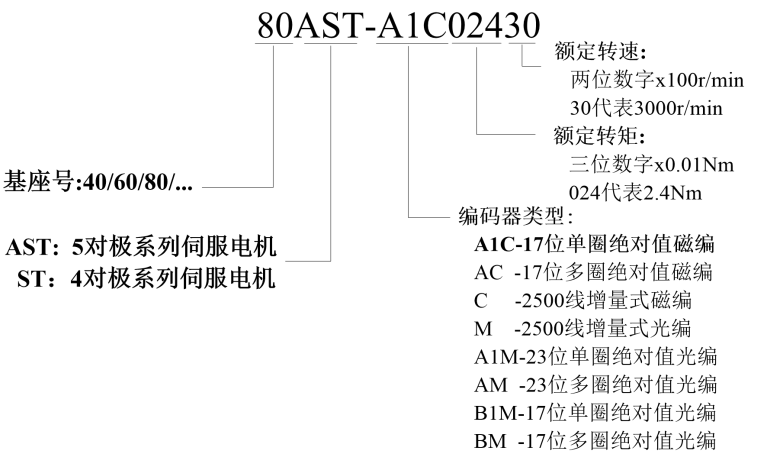
7.2 Motor adaptation table as standard (5-pole motor, 17-digit absolute magnetic coding)

Table 7.2 Adaptation list of 5-pole motor with T3D driver

(Motor series code P-099:) 5-nA5

Motor model code (P-002) automatic recognition	Adaptor Drive Model Specification (AC 220V)	Servo motor model (220V)	rated power (output) (kW)	rated amps (A)	rated Torque (Nm)	overloaded factor
0	L15	40AST-A1C00330	0.1	1.1	0.32	3
1	L15	60AST-A1C00630	0.2	1.1	0.64	3
2	**L15**	**60AST-A1C01330**	**0.4**	**2.8**	**1.27**	**2.8**
	L15	**60AST-A1C01930**	0.6	3.6	1.9	2
3	L15	80AST-A1C01330	0.4	2.8	1.27	2.5
4	**L20**	**80AST-A1C02430**	**0.75**	**4.5**	**2.39**	**2.5**
	L20	**80AST-A1C03230**	1.0	4.8	3.2	2.5
5	L20	80AST-A1C03220	0.67	5.6	3.2	2
	L20	**80AST-A1C04025**	1.0	4.5	3.8	2.5
6	L20/L30	110AST-A1C04220	0.88	4.5	4.2	2.2/3
7	L20/L30	110AST-A1C05420	1.1	5.5	5.4	2/2.7
8	L30	110AST-A1C06420	1.3	6.5	6.4	2.5
9	L30	110AST-A1C07520	1.6	8.0	7.5	2
10	L30	110AST-A1C04230	1.3	6.5	4.2	2.5
11	L30	110AST-A1C05430	1.7	8.2	5.4	2
12	L30	110AST-A1C06425	1.7	9.5	6.4	1.7
	L30	110AST-A1C06430	2.0	9.5	6.4	1.7
13	L30	130AST-A1C05415	0.85	6.5	5.4	2.5
14	L30	130AST-A1C06415	1.0	8.0	6.4	2
15	L30	130AST-A1C07515	1.2	9.0	7.5	1.7
16	L30	130AST-A1C08415	1.3	9.5	8.4	1.7
17	L30	130AST-A1C09615	1.5	10.0	9.6	1.5

电机型号命名规则


80AST-A1C02430
额定转速：
两位数字x100r/min
30代表3000r/min
额定转矩：
三位数字x0.01Nm
024代表2.4Nm
编码器类型：
A1C-17位单圈绝对值磁编
AC -17位多圈绝对值磁编
C -2500线增量式磁编
M -2500线增量式光编
A1M-23位单圈绝对值光编
AM -23位多圈绝对值光编
B1M-17位单圈绝对值光编
BM -17位多圈绝对值光编
基座号:40/60/80/...
AST：5对极系列伺服电机
ST：4对极系列伺服电机

note