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## Manual of QW-D Series Servo Driver (Version 5.0)



- ◆ Please read this manual carefully before using the product to ensure correct use
- ◆ This manual must be followed
- ◆ Please keep this manual for reference at any time

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# Chapter one safety Precautions

## Safety Precautions

### Security statement

- 1) During the installation, operation and maintenance of the product, please read and comply with the safety precautions.
  - 2) In order to ensure the safety of persons and equipment, please follow all the safety precautions specified in the product labels and manuals when installing, operating and maintaining the products.
  - 3) The "Notice", "warning" and "dangerous" items in the manual do not represent all the safety matters that should be followed and are only for the purpose of the manual
- Additional safety precautions.
- 4) The product shall be used in an environment conforming to the design specifications; otherwise, it may cause faults. Functional abnormalities or component damage caused by non-compliance with relevant regulations are not within the scope of product quality assurance.
  - 5) Our company will not bear any legal liability for personal safety accidents and property losses caused by illegal operation of products.

### Definition of security level

**Danger** "danger" means that failure to do so will result in death or serious bodily injury.

**Warning** "Warning" means that failure to do so can result in death or serious bodily injury.

**Note Attention** If not followed, this may result in minor bodily injury or damage to the equipment.

### Safety Precautions

#### Out of the acceptance

##### Pay attention to

Before unpacking the case, please check whether the outer packing of the product is in good condition, whether it is damaged, wet, damp, out of shape, etc.

Please open the package according to the order of level, do not knock violently!

Please check whether the surface of the product and its accessories is damaged, rusted or bruised when unpacking.

After unpacking, please carefully check the packing list to see if the quantity and data of the products and their accessories are complete

##### Warning

When unpacking, the products and accessories are found to be damaged, rusted, used signs and other problems, please do not install!

Do not install if water, parts are missing or parts are damaged when opening the box.

Please carefully check the packing list. If the packing list does not match the product name, please do not install it.

#### Storage and transportation

##### Pay attention to

Please store and transport the products according to the storage and transportation conditions. The storage temperature and humidity meet the requirements.

Avoid storage and transportation in places such as water splashing, direct sunlight, strong electric field, strong magnetic field and strong vibration.

Avoid product storage time more than 3 months, too long storage time, please carry out more stringent protection and necessary inspection.

Please pack the products strictly before vehicle transportation. The closed box must be used for long-distance transportation.

It is strictly prohibited to transport the product together with equipment or articles that may affect or damage the product.

##### Warning

Please be sure to use professional loading and unloading equipment to handle large or heavy equipment and products!

When handling the product by hand, please be sure to hold the shell of the product to avoid the parts falling off, otherwise there will be the risk of injury!  
When handling the product, please be sure to lift it gently and pay attention to the objects under your feet at all times to prevent tripping or falling, otherwise there will be the risk of injury or damage to the product!  
When the equipment is lifted by lifting tools, personnel under the equipment shall not stand or stay.

## **When installation,**

### **Warning**

Please read the product instructions and safety precautions carefully before installation!

Refitting this product is strictly prohibited!

Do not screw the fixed bolts of the parts and components and the bolts marked red!

Do not install this product in places with strong electric field or electromagnetic interference.

When the product is installed in the cabinet or terminal equipment, the secret or terminal equipment shall provide the corresponding fire protection shell, electrical protection shell, mechanical protection shell and other protective devices, the protection level shall meet the relevant IEC standards and local laws and regulations requirements.

### **Dangerous**

It is strictly prohibited for non-professionals to install, connect, maintain, inspect or replace the parts.

The installation, wiring, maintenance, inspection or component replacement of this product can only be carried out by professionals with sufficient electrical knowledge who have been tested and ordered by electrical equipment.

Installation personnel must be familiar with product installation requirements and related technical information.

In the need to install transformers and other strong electromagnetic interference equipment, please install the shield protection device, to avoid the wrong action of this product!

## **When the connection**

### **Dangerous**

It is strictly prohibited for non-professional personnel to install, wire, maintain, inspect or replace the parts.

Do not connect the wires when the power is on, otherwise there will be the risk of electric shock.

Please cut off the power supply of all equipment before wiring. After the power is cut off, there is residual voltage in the capacitance of the equipment. Please wait for at least 10 minutes before wiring and other operations.

Please make sure that the equipment and products are well grounded, otherwise there will be the risk of electric shock.

Please follow the steps specified in ESD and wear ESD bracelets for wiring and other operations to avoid damage to the equipment or electrical circuits within the product.

### **Warning**

It is strictly prohibited to connect the input power to the output end of the equipment or products, otherwise it will cause equipment damage or even fire.

When the drive device is connected with the motor, make sure that the phase sequence of the driver and the motor terminal is accurate and consistent, so as to avoid reverse rotation of the motor.

The cable used during wiring must meet the requirements of the corresponding wire diameter and shielding, etc. The shielding layer of the shielded cable needs a single end reliable grounding!

After wiring is complete, make sure there are no fallen screws or exposed cables inside the equipment and products.

## **When the electricity**

### **Dangerous**

Before power on, please make sure that the equipment and products are installed in good condition, the wiring is firm, and the motor device is allowed to restart.

Before power on, please confirm that the power supply meets the requirements of the equipment to avoid damage or fire!

When power on, the mechanical device of the equipment or product may move suddenly. Please take care to remove the mechanical device.

After power on, do not open the cabinet door or the protective cover of the product, otherwise there will be general electric shock risk!

Do not touch any terminal of the equipment when it is energized, otherwise there will be electric shock danger!

It is strictly prohibited to disassemble any device or part of the equipment and products under the condition of electrification, otherwise there will be electric shock danger!

## The runtime

### Dangerous

Do not touch any terminal of the equipment in the running state, otherwise there will be electric shock danger!

It is strictly prohibited to disassemble any device or part of the equipment and products in operation, otherwise there will be electric shock danger!

Do not touch the equipment shell, fan or resistance to test the degree, or it may cause damage!

It is strictly prohibited for non-professional technicians to detect signals in operation, otherwise it may cause personal injury or equipment damage!

### Warning

During operation, avoid other items or metal objects falling into the equipment, otherwise the equipment will be damaged!

Please use the contactor on/off method to control the device to stop printing, otherwise the device will be damaged!

## When the maintenance

### Dangerous

It is strictly prohibited for non-professional personnel to install, wire, maintain, inspect or replace the parts.

It is strictly prohibited to maintain the equipment under the condition of electrification, or thieves may get electric shock!

After cutting off the power supply of all equipment, please wait at least 10 minutes before performing equipment maintenance and other operations.

### Warning

Please conduct daily and regular inspection and maintenance of the equipment and products in accordance with the equipment maintenance and maintenance requirements, and make maintenance records

## When the maintenance

It is strictly prohibited for non-professional personnel to install, wire, maintain, inspect or replace the parts.

It is strictly prohibited to repair the equipment when the power is on, or the thief may get an electric shock!

After cutting off the power to all equipment, please wait at least 10 minutes before carrying out equipment inspection, maintenance and other operations.

### Warning

Please guarantee the equipment in accordance with the product warranty agreement

In case of equipment failure or damage, professional personnel shall troubleshoot and repair the equipment and products according to the maintenance instructions, and make maintenance records.

Please replace the worn parts according to the replacement instruction.

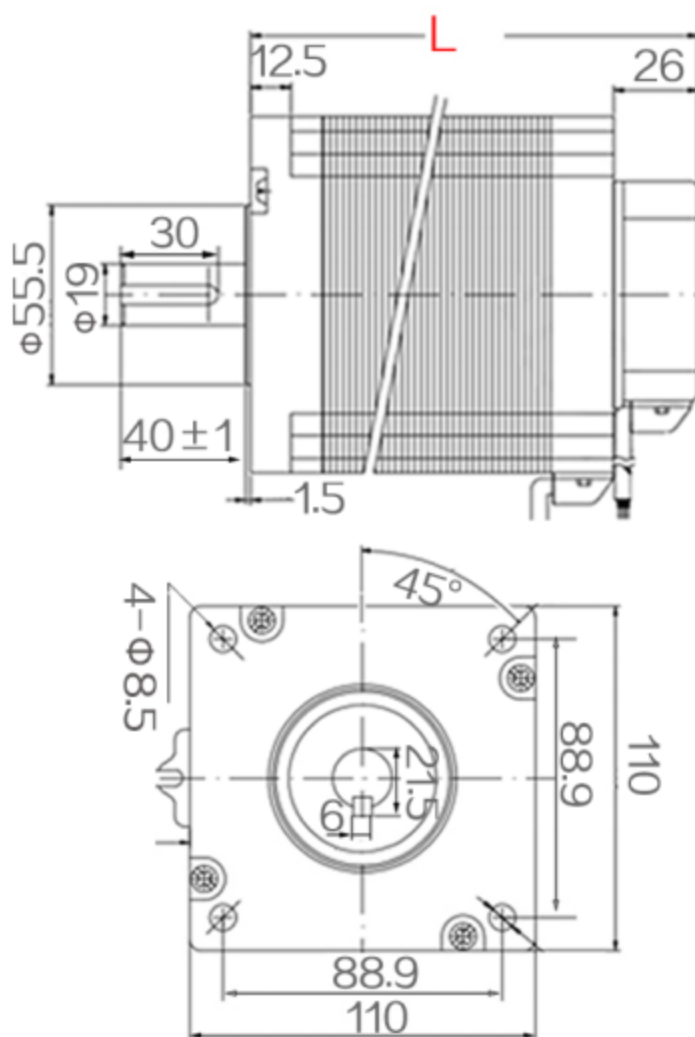
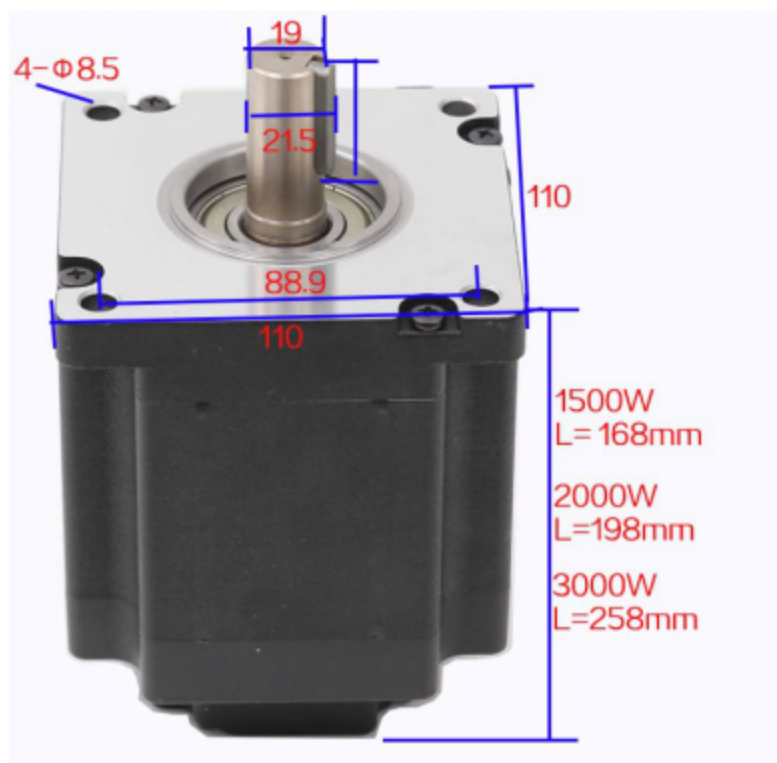
## Chapter Two Specification

### Wiring And Installation

#### 2.1 Installation environment requirements

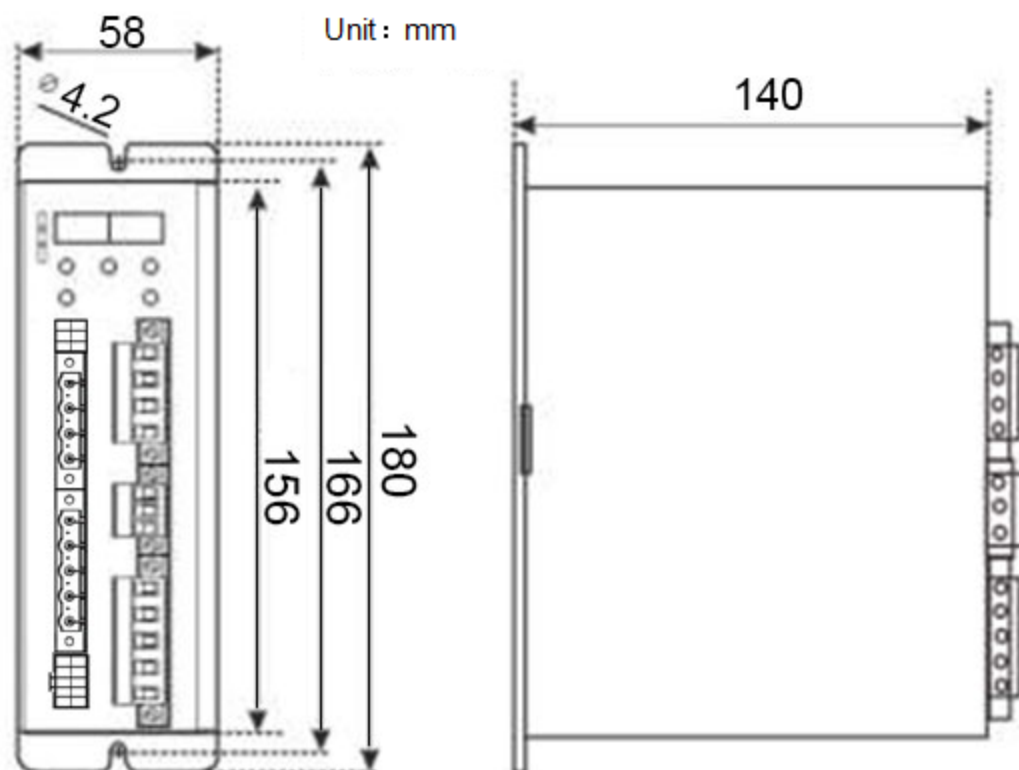
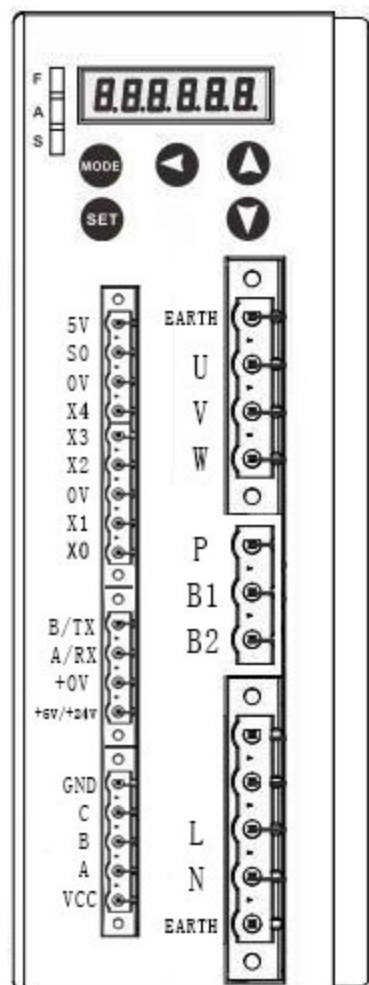
Main circuit power supply	QW-D 0.45KW-- 0.75KW	single-phase AC220V $\pm 10\%$ 50/60Hz
working condition	temperature	Working temperature: 0 ~ 50 °C ; Storage temperature : - 10 ~ 60°C
	humidity	$\leq 90\%RH$ , Non frosting state
	Altitude	$\leq 1000M$
	Vibration	$\leq 0.5G$
operation panel	6-digit digital tube display, 5-digit key, 3-digit LED status indication	
Encoder support	Encoder support	
Control I / O quantity	7-point input : X0 ~ X6 , IO input	

## 2.2 Size of Motor and Driver



### 110 MOTOR

1500W	L=168mm
2000W	L=198mm
3000W	L=258mm



## NOTE:

- ◆ When conducting electrical wiring or maintenance work, the main power switch must be disconnected and carried out after the power is cut off for 5 minutes, otherwise there is a risk of electric shock!
- ◆ All cables shall be free from vibration, friction and strength stress!
- ◆ The driver shall be installed in the indoor well protected electric cabinet and prevent corrosive substances, flammable gases, metal dust and iron chips from entering the drive.
- ◆ Must be vertical and reliable installation, not easy to loose off, do not bear heavy pressure, and ensure good heat dissipation and ventilation
- ◆ The driver shall be installed to avoid impact and vibration.
- ◆ The installation cabinet and the drive shell are reliably grounded

## Chapter Three Interface Definition

### 3.1 Definition Diagram of Hall

Serial number	Name	Content introduction
1	GND(black)	Negative pole of Hall sensor power supply
2	C(green)	Hall sensor C phase
3	B(blue)	Hall sensor B phase
4	A(white)	Hall sensor A phase
5	VCC(red)	Positive pole of Hall sensor power supply

### 3.2 definition of control interface function

Serial number	Name	Content introduction
1	5v	+5V Power output
2	S0	0-5V Voltage input
3	0V	0V
4	X4	
5	X3	
6	X2	
7	0V	
8	X1	Forward /reverse control
9	X0	Start/stop

### 3.3 Definition Of Motor Interface

Serial number	Name	Content introduction
1	EARTH(green)	Ground wire
2	U (black)	Brushless motor Winding U phase (A)
3	V (red)	Brushless motor Winding V phase (B)
4	W (white)	Brushless motor Winding W phase (C)

### 3.4 Definition Of Power Input Interface

Serial number	Name	Content introduction
1	L	AC 220
2	N	AC 220
3	EARTH	Ground wire

### 3.5 Alarm Output

Serial number	Name	Content introduction
1	B/TX	Signal input
2	A/RX	Signal input1

### 3.6 Brake Resistor Interface






Serial number	Name	Content introduction
1	P	External brake resistor signal interface
2	B1	Public
3	B2	Built-in resistance signal interface



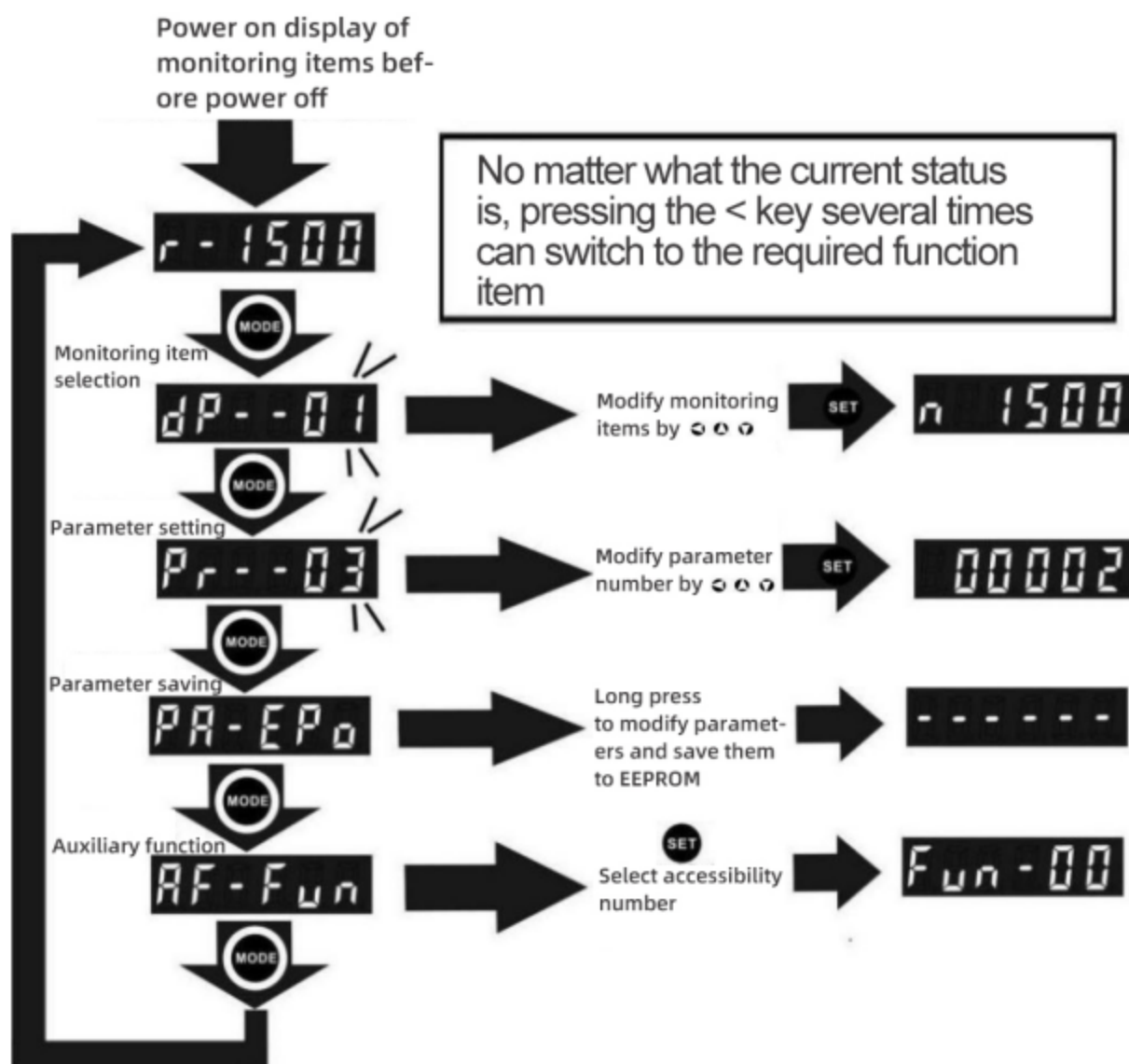
## Chapter Four Display And Keyboard Operation

### 4.1 Drive display panel



project	definition	Introduction
indicator light project indicator light	F	Function indicator can be set by parameters
	A	Driver alarm indication, servo alarm flashing indication.
	S	Servo on indication, always on when servo is enabled
project		Mode key for panel function switching
		Set key for function confirmation
		Shift key, used to modify and select the required number of digits
		Add key to add the selected bit
		Minus key, to select the minus operation

## 4.2 Functional operation flow



## 4.3 Monitoring item

### 4.3.1 Monitoring item list and description

Monitoring parameter function code	Monitoring content	Display format	Unit	Introduction	MODBUS _postal address	Variable type
dp-01	Fault alarm status	E- 0001	1	Display current fault status	1000H	read
dp-02	Motor speed	r- 3000	rpm	Real time motor speed, - 3000rpm	1001H	read
dp-03	Command speed	N- 3000	rpm	Real time instruction speed, - 3000rpm	1002H	read
dp-04	Main circuit bus current	i- 23	0.1A	Main circuit bus current, 2.3A	1003H	read
dp-05	Main circuit power supply voltage	U- 3105	0.1V	Main circuit power supply voltage, 310.5v	1004H	read
dp-06	Analog speed command voltage value	A- 150	0.01V	Used to monitor analog speed command, 1.50v	1005H	read
dp-07	Drive temperature	t- 55		Drive temperature, 55 degrees	1006H	read
dp-08	Hall position	H- 6		Current Hall position status, 6	1007H	read
dp-09	peak current	y- 120	0.1A	The maximum peak current in operation is 12.0a	1008H	read

### 4.3.2 Select monitoring item operation

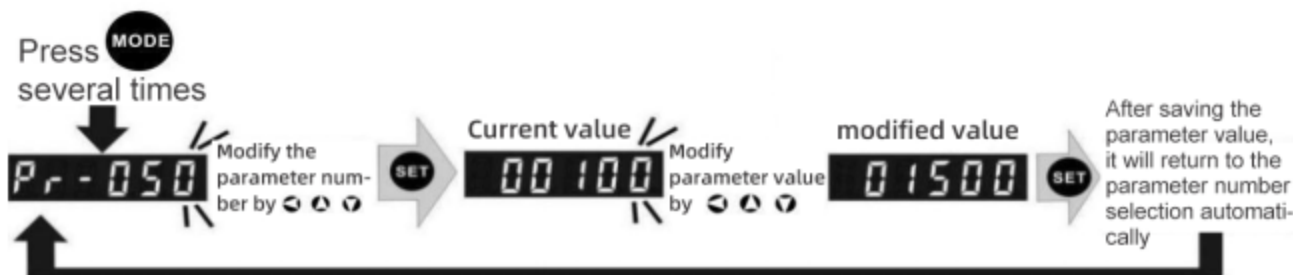
Select the monitoring item (take DP as an example, the current motor speed is - 1200rpm)



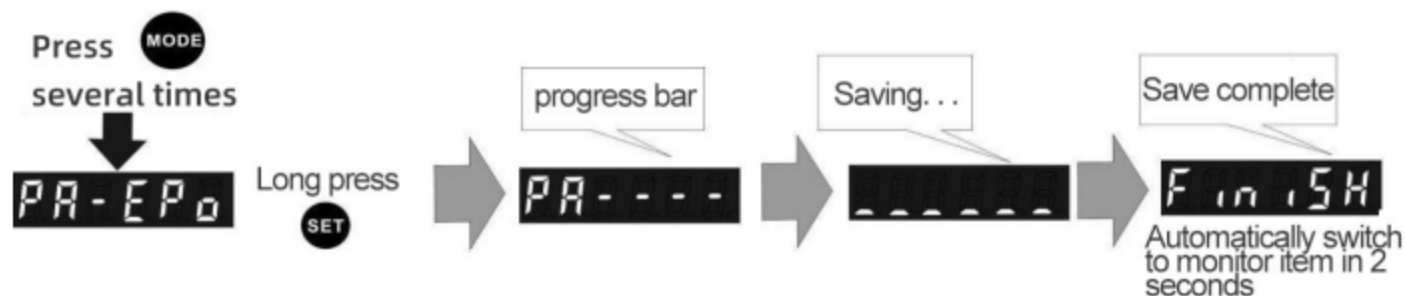
## 4.4 Parameter setting operation

Parameter setting

(if pR50 is set as an example, the original 100 parameter value is changed to 1500)



## 4.5 Parameter save operation



Description: A separate save operation is required after each parameter modification

## 4.6 Description of parameter modification

basic parameter Function code	name	set up Range	Min unit	Ex factory Setting value	Min value	Max value	MODBUS postal address	variable type
Pr01	control mode	0: panel start stop; 1: external terminal control start stop; 2: standby; 3: standby; 4: standby; 5: 485 / 232 communication port control start stop	1	0	0	5	0000H	Read / write
Pr02	Speed setting mode	0: panel keyboard digital setting; 1: external analog potentiometer; 2: standby; 3: standby; 4: digital setting of 485 / 232 communication port;	1	0	0	4	0001H	Read / write
Pr03	Stop mode	0: free stop; 1: deceleration stop; 2: deceleration stop with energy consumption braking;	1	0	0	2	0002H	Read / write
Pr04	Motor steering	0: forward rotation; 1: reverse rotation	1	0	0	1	0003H	Read / write
Pr05	Speed observer switch	0: the running interface displays the real-time speed 1: the running interface does not display the real-time speed	1	0	0	1	0004H	Read / write
Pr06	Set the minimum speed	100-Pr06	1RPM	100	100	Pr06	0005H	Read / write
Pr07	Set the	65000	1RPM	3000	Pr05	6500	0006H	Read /

	maximum speed					0		write
Pr08	Set operating speed	Pr05-Pr06	1RPM	3000	Pr05	Pr06	0007H	Read / write
Pr09	Acceleration time	1-65000	0.1S	1	1	65000	0008H	Read / write
Pr10	Deceleration time	1-65000	0.1S	1	1	65000	0009H	Read / write
Pr11	Panel keyboard set speed step value	1-1000	1	100	1	1000	000AH	Read / write
Pr12	Given speed step value of external potentiometer	10-1000	10	100	10	1000	000BH	Read / write
Pr13	Potentiometer (0-5V) minimum setting	0.0-Pr13	0.01V	0	0	Pr13	000CH	Read / write
Pr14	Maximum setting of potentiometer (0-5V)	0.0-5.00V	0.01V	499	Pr12	500	000DH	Read / write
Pr15	Motor pole pairs	1-255	1	3	1	255	000EH	Read / write
Pr16	Hall angle	0: 120 degrees; 1: 60 degrees;	1	0	0	1	000FH	Read / write
Pr17	Baud rate setting of communication port	0: 9600	0	0	0	0	0010H	read
Pr18	Local address	1-127	1	1	1	127	0011H	read
Pr19	Motor non zero speed start switch	0: it is forbidden to start the motor at non-zero speed; 1: The motor is allowed to start at non-zero speed;	1	0	0	1	0012H	Read / write
Pr20	Multi function selection of x0 and x1	0: X1 (long drive) forward rotation start stop, X2 (long drive) reverse start stop; 1: X1 (inching) forward rotation start stop, X2 (inching) reverse start stop; 2: X1 (long drive) control start stop, X2 control forward and reverse (fast switch); 3: standby; 4: standby; 5: standby	1	0	0	5	0013H	Read / write

Pr21	X2 multi function selection	0: brake emergency stop; 1: standby locking;	1	0	0	1	0014H	Read / write
Pr22	X3, X4 multi function selection	0: X3 forward rotation limit stop, X4 reverse limit stop; 1: standby; 2: standby; 3 standby	0	0	0	1	0015H	Read / write
Pr23	Locking torque	Description: 1 min; 10 max;	1	1	1	10	0016H	Read / write

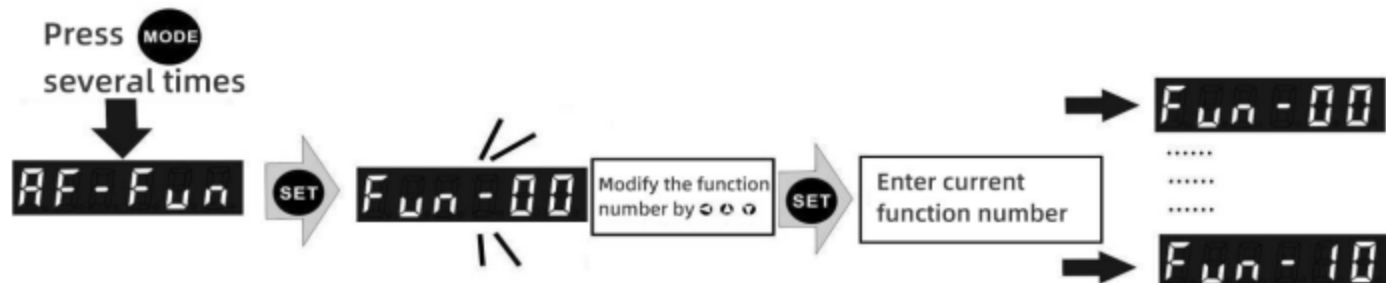
Note: the main parameter to be modified is pr01 pr02 pr05 PR7

## 4.7 Accessibility operation

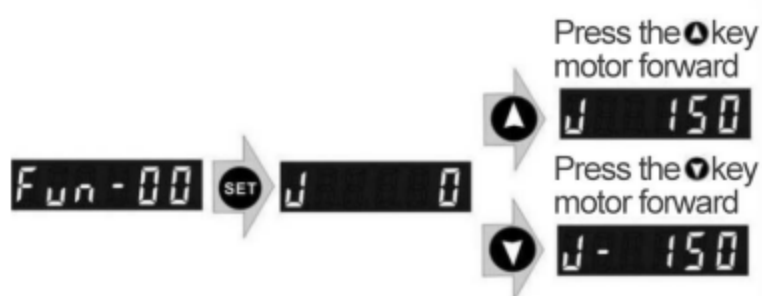
### 4.7.1 Accessibility table

Auxiliary menu	
Auxiliary function number	Function description
FUN-00	test run
FUN-01	View IO status
FUN-02	View product serial number
FUN-03	All parameters are restored to factory values
FUN-04	Back up the working parameters to the factory values
FUN-05	retain
FUN-06	retain
FUN-07	retain

### 4.7.2 Enter the accessibility interface



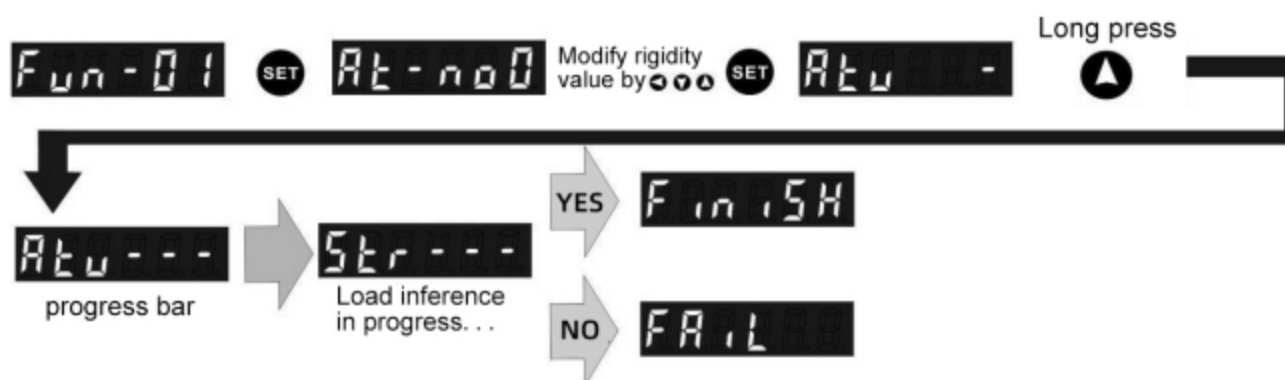
### 4.7.3 Trial operation (FUN-00)



1. JOG mode is only used to detect whether the electrical connection of driver and motor is normal.

2. The servo must be OFF before adjustment. Press the key to automatically servo ON and run at the set JOG speed. Release the button to automatically set the servo OFF state and the motor stops running.

#### 4.7.4 Automatic gain tuning



Note:

1. Before performing adjustment, make sure that the input command is 0 (for example, it is in a stopped state in position mode).
2. It must be in the servo ON state before adjustment.
3. Wrong load estimation may occur and cause oscillation. Please pay attention and increase precautions.

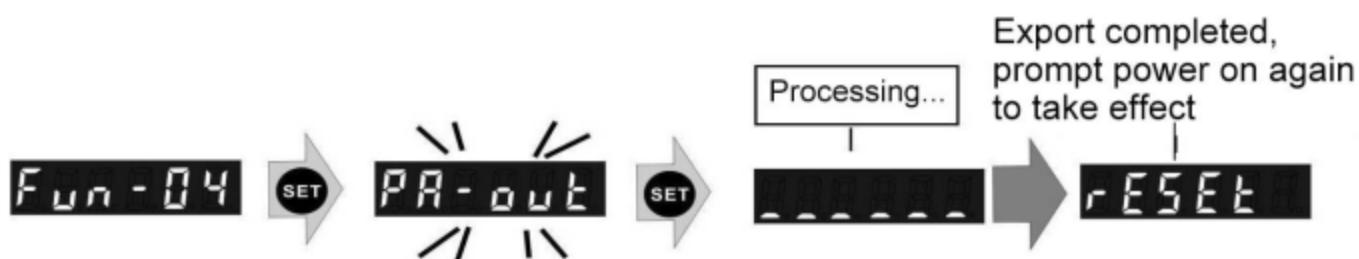
#### 4.7.5 View I/O status



When the status of the corresponding terminal is on, it will be displayed as 1; when the status is off, it will be displayed as 0. The meaning of the prefix is as follows:

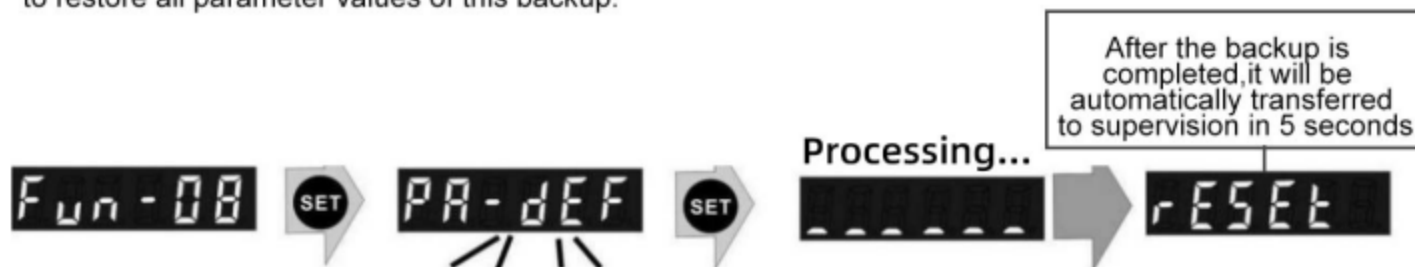
- A** Real time monitoring of x0-x4 input status
- b** Real time monitoring of x0-x4 input status
- C** Real time monitoring of y0-y3 output status

#### 4.7.6 Restore all parameters to factory values

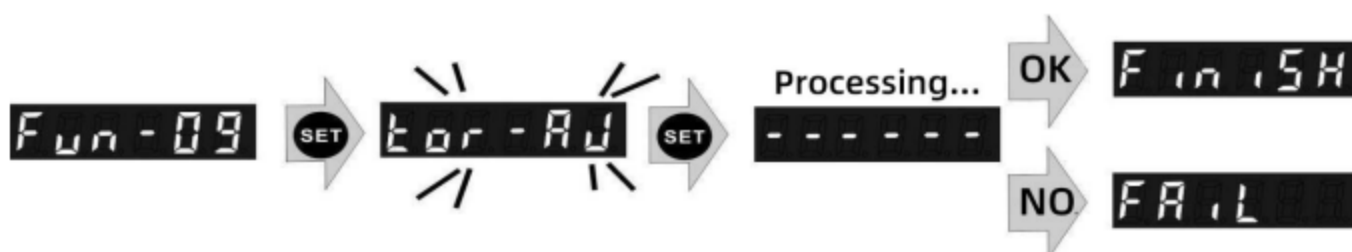


#### 4.7.7 Back up working parameters to factory value

After the drive adjustment is completed, all the current parameters can be saved as initial values to backup the subsequent parameter adjustment. If the later parameter adjustment is wrong, you can execute fun-04 to restore all parameter values of this backup.

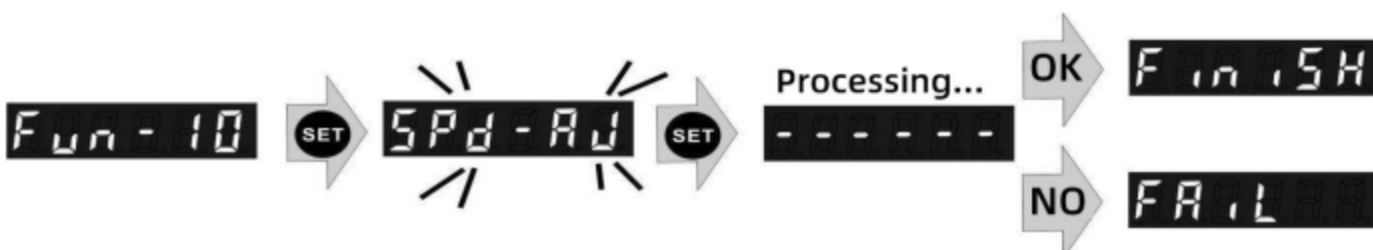


#### 4.7.8 Analog torque command automatic zero adjustment



Note: Before executing the analog torque command zero point adjustment, make sure that the TourAg input command voltage is 0V or short-circuit TourAg with AGND

#### 4.7.9 Analog speed command automatic zero adjustment



Note: Before executing the analog speed command zero point adjustment, make sure that the SpdAg input command voltage is 0V or short-circuit SpdAg with AGND

## Chapter Five Fault Alarm Description

Fault code	fault type
Err001	Drive self check over current
Err002	Driver current detection fault
Err003	Accelerated overcurrent
Err004	Operation over current
Err005	IPM protection
Err006	Phase loss of motor phase line
Err007	Hall fault
Err008	Driver drive circuit fault
Err009	Operation overvoltage
Err010	Deceleration brake overpressure
Err011	Driver voltage detection fault
Err012	Motor stalling
Err013	Drive overheating
Err014	Communication failure between driver and panel
Err015	485 communication failure
Err016	Drive temperature detection failure
Err017	spare
Err018	spare
Err019	spare
Err020	spare