

SG-AS(EtherCAT) Series  
AC SERVO DRIVER  
USER MANUAL  
V1.0

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# Preface







This user manual is for SG-AS(EtherCAT) series AC servo driver,from safety precautions,product information,installation and connection,display and keyboard operation,running,parameter setting,alarm and so on, to introduce the driver's installation&running&testing.

This file is main for following person:

- Technical support engineer
- Machine installation engineer
- Machine maintenance engineer

## Symbol stipulations

In this file,may come out following symbols,their meaning as follows:

Symbol	Description
 Danger	If users ignore dangerous symbol may endanger personal safety,equipment safety or environment safety due to improper operation.
 Warning	If users ignore warning symbol may cause serious accidents due to improper operation,such as damaging equipment or personal injury.
 Attention	If users ignore note symbol may cause some bad consequences or fail to operate due to incorrect operation. Generally speaking, it is not too much trouble to solve the problems.
 Specification	The instructions and tips provided to the user are widely used.
 Example	The task in operation is supplemented with a brief example to enhance the user's understanding of the task.
 Knack	The author provides the users with some small functions or tips which are easy to ignore. These small functions or tips can bring convenience to the user.

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# 1 Safety Precautions

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## 1.1 Common Safety Precautions

When installing, operating, and maintaining all of our series of ac servo drivers, must observe The safety precautions described in this section.

### All Safety Precautions

When installing&operating&maintaining equipment, please follow all safety precautions specified in the equipment label and manual.to ensure personal and equipment safety.

“Note”、“Alarm”和“Danger” precautions in the manual can not represent all safety precautions,can only as a supplement to all safety matters.

### Local Laws And Regulations

When operating equipment,please according to local lows and regulations.The safety precautions only can be the supplement to local safety specification.

### Basic Installation Requirements

Users who is responsible for installation and maintenance of our products must attend professional training,understand various safety precautions.Installation&operation&maintenance only after mastering the correct operation method:

- Only qualified or trained personnel are allowed to install, operate and maintain equipment;
- Only qualified professionals are allowed to dismantle safety facilities and overhaul equipment;
- Replacement and change of equipment or components (including software) must be done by our certified or authorized personnel;
- The operator shall promptly report to the responsible person any faults or errors that may cause safety problems.

### Grounding Requirements

以 The following requirements only apply to equipment that requires grounding:

- When installing the equipment,it must be grounded first;When disassembling the equipment,removing the ground wire at last;
- Do not break the grounded conductor;
- Forbid to operate the equipment without installing grounding conductor;
- The equipment shall be permanently connect to protected area.Please check machinery electric connection to ensure reliable grounding of the equipment

before operating equipment.

## Equipment Safety

- The equipment should be fixed reliably on the electric cabinet or other solid objects,such as table or floor;
- Do not block the air vent when the system is running;
- When installing equipment,if screws need to be tightened, must operate with tools;
- Please clear the empty packaging material in the equipment area after installation.

## 1.2 Electric Safety

Introduction safety precautions of high-voltage,thunderstorm,large leakage current,power cord and fuse.

### High-voltage

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#### Danger

- High-voltage power supply power to the equipment,Contacting directly or indirectly with high-voltage power by wet objects may cause dead.
  - Irregular and incorrect high-voltage operation may cause accidents such as fire or electric shock.
- 

### Thunderstorm

This requirement only applies to outdoors equipment.

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#### Danger

- Forbit to operate outdoor high-voltage and current in thunderstorm,otherwise your life will be danger.
- 

### Large Leakage Current

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#### Warning

- The equipment must be grounded first before connecting power,otherwise personnel and equipment safety will be endangered.
- 

### Power Cord



## Danger

- Irregular and incorrect operation of high voltage power supply may cause accidents such as fire or electric shock.
  - Turn off the power switch before installing or removing the power cord.
  - The power voltage must be compatible with the driver voltage, otherwise it will endanger the safety of human and equipment
  - Before connecting the power cord, make sure that the power cord label is correct before connecting.
  - Do not touch the terminal when the power is on
  - Appropriate air switches must be connected in series between the power cord and the driver to protect personal and equipment safety.
  - After the power off, waiting for 5 minutes. After the main circuit is telex released, the maintenance operation can be carried out or the power on again. Or you could get electrocuted.
- 

## Fuse

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## Danger

- Equipment fuse must be replaced by our company's certified or authorized personnel;
  - When the fuse on the equipment is blown, replace it with a fuse of the same model and specification.
- 

## 1.3 Air Environment Safety

Introduction of equipment running environment safety precautions.

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## Danger

- The equipment shall not be placed in flammable, explosive gas or smoke environment and shall not be operated in such environment.
  - The equipment shall not be placed in an environment with corrosive gases and shall not be operated in such an environment
- 

## 1.4 Machinery Safety

Introduction of safety precautions about motor ,drilling,fan and lifting heavy.

## Motor



## Danger

- Poor electrical insulation can damage equipment and even endanger life safety.

Please use class B or above insulated motor, otherwise there will be electric shock.

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## Drill



## Attention

- Improper drilling can damage the drive cable, and metal chips from drilling into the servo drive can cause circuit board short-circuit.

Please move the cables in the cabinet before drilling the cabinet.

Prevent metal chips from falling into ac servo driver. Clean metal chips timely after drilling.

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## Fan



## Attention

- Improper operation may cause equipment damage when cooling fan runs in high speed.

Please put spare parts, screws and tools when changing parts to avoid falling into a running fan and damaging the fan or device.。

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## Transport



## Warning

- Should prepare to bear the load to avoid being hurt or sprained by heavy objects when lifting heavy.

- Please wear protective gloves when handling the driver to avoid scratching your hand.
  - When carrying heavy drives, keep your back straight and move smoothly to avoid sprain.
  - When removing the drive from the cabinet, holding the bottom edge of the drive, not the panel or the power terminal.
-



## 1.5 Others

Introduction of lashing cables and safety precautions under low temperature operation.

### Binding Cable

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#### Attention

- The signal line should be bundled separately from the strong current line or the high voltage line.
- 

### Laying Cable

When the temperature is too low, severe shock and vibration may lead to brittle cracking of the cable plastic skin. To ensure safety, the following requirements shall be followed:

- All cables shall be laid above 0°C.
- If the storage environment temperature of the cable is below 0 °C , the cable must be stored at the ambient temperature above 0 °C more than 24 hours before laying.
- Handling cables, especially at low temperatures, should be handled gently.

## 2 Product Information

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### 2.1 Introduction

SG-AS(EtherCAT) series AC servo driver a high performance, high cost performance digital ac servo drive. This series of ac servo drivers have the following characteristics:

- Low voltage servo, working under the voltage of single-phase/three-phase 220VAC, suitable for low voltage motor;
- Support position control, speed control and torque control modes;
- Provincial encoders, incremental encoders and domochuan, BISS, EnDat and nikon absolute encoders can be adapted;
- Compatible with EtherCAT industrial fieldbus interface;
- Bus products support the expansion of internal I/O of the servo driver into I/O of the system PLC;
- Supports internal speed mode and demo run mod.

## 3 Installation and Wiring

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### 3.1 Installation

The safety precautions described in this section shall be followed when installing, operating, and maintaining all our series drives.

#### 3.1.1 Installation Environment

- Working temperature: 0~45℃;
- Working humidity: less than 80% relative humidity (no condensation);
- Storage temperature: -20~65℃;
- Storage humidity: less than 80% relative humidity (no condensation);
- Vibration: below 4.9m/s<sup>2</sup>;
- Install in a well ventilated place with little moisture and dust;
- Installed in non-corrosive, ignition gas, oil and gas, cutting fluid, cutting powder, iron powder and other environments.

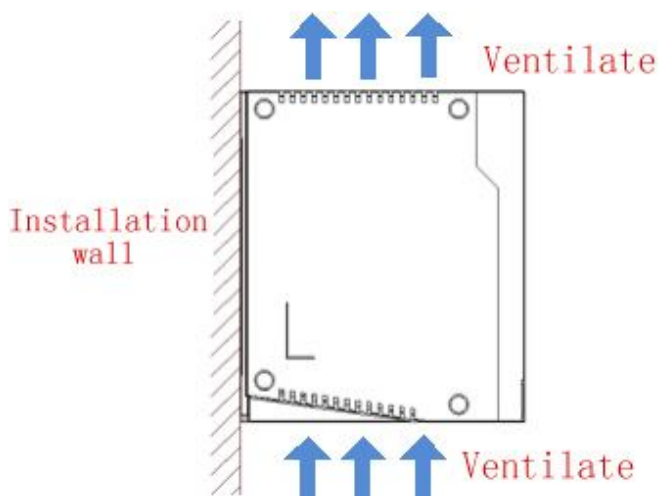


#### Attention

- When using in vibration environment, please install the anti-vibration appliance on the mounting surface of the servo driver in order to avoid vibration transmission to the servo driver;
  - When used in environments with corrosive gases, try to prevent corrosive gases from invading. Although the corrosive gas cannot cause timely damage to the servo driver, it will lead to the aging of electronic components or circuit boards and affect the service life.
- 

#### 3.1.2 Installation Direction

In the electric cabinet according to the correct direction of the servo drive can achieve good ventilation and cooling effect. Be sure to follow the installation directions shown below.



Graph 3- 6TSVB series AC servo driver installation direction

## Specification

- The installation direction should be perpendicular to the wall.
- Use natural convection or fan to cool the servo driver.

## 3.1.3 Terminal Definition

### Servo driver terminal definition

Terminal Symbols	Name	Function
L1C	Control power supply terminals	Connect to AC signal 220V;
L2C		
L1	Power supply input terminals	Single phase or three phase AC 220V; If connect single phase AC 220V, please connect between L1 and L2;
L2		
L3		
B1	Brake resistance terminals	Need short connect B2 and B3 when use internal brake resistance; Please disconnect B2 and B3 then connect resistance between B1 and B2 when use external brake resistance; Refer to “5.4 brake resistance setting” for
B2		
B3		

		external brake resistance selection and parameter setting, otherwise the driver may be damaged.
U	Motor cable terminals	The output power of the servo motor must be one-to-one correspondence connected with U,V,W,PE terminals; Note:PE is terminals on driver metal radiator.
V		
W		
PE		

Terminal No.	Name	Function
CN1	EtherCAT communication interface	CNI is communication input, CN2 is communication output
CN2		
CN3	IO interface	Input and output signal interface
CN4	Encoder interface	There are two connection: absolute and incremental
CN5	USB debugging interface	Debugging soft interface

## Specification

- Recommended to use the ac servo drive accessory cable offered by our company.
- Use the withstand voltage cable which can withstand the voltage over than AC 600V and temperature rating value over than 75°C.
- Please make sure the bending radius of the cable is more than 10 times the outside diameter.
- In the case of high ambient temperature, please choose heat-resistant cable, ordinary cable is easy to deterioration.
- Polyvinyl chloride (PVC) resin as the base of the cable skin material, in low temperature, the surface is easy to be hardened and broken, the environmental temperature below 0°C use attention to distinguish.

## Example

The relationship between wire specification and allowable current is illustrated in the following example. Please refer to it when selecting cable.

Example: choose the cable when the main circuit power supply is three-phase ac 220V, current 35A and ambient temperature is 30°C.

Step 1: choose the cable whose wire diameter is 3.5~5.5mm<sup>2</sup>

Step 2: calculate the applicable permissible current

Applicable permissible current = basic permissible current × current reduction factor × current complement factor

$$= 37 \times 0.7 \times 1.414$$

$$\approx 36.6 \text{ (A)} > 36 \text{ (A) qualified}$$

Therefore, please choose the copper stranded cable with 3 cores and a sectional area of 3.5mm<sup>2</sup>.

Step 3: if the selected cable is unqualified, please increase the selected line diameter and repeat the above steps until qualified.

Basic permissible current of copper twisted cable

Cable nominal area (mm <sup>2</sup> )	Basic permissible current (A)	Cable nominal area (mm <sup>2</sup> )	Basic permissible current (A)
2~3.5	27	14~22	88
3.5~5.5	37	22~30	115
5.5~8	49	30~38	139
8~14	61		

### 3.1.4 Encoder Terminal CN4 Definition

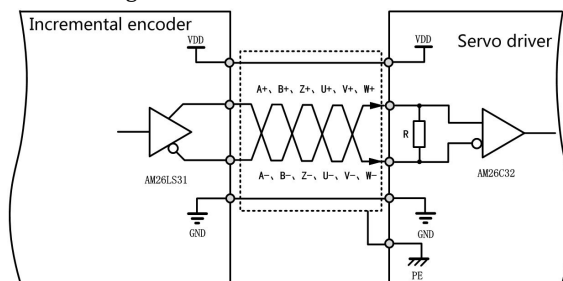
This terminal is used for inputting servo motor encoder signal. Encoder terminal pins as follows:

Definition of incremental encoder signal input terminals as followed table:

Pin No.	Signal name	Function
13	EC-5V	Encoder power output, 5V±5%
14	EC-GND	Encoder power/Grounding signal, 0V
5	A+	Encoder phase A phase signal input
10	A-	
4	B+	Encoder B phase signal input
9	B-	
3	Z+	Encoder Z phase signal input
8	Z-	

2	U+	Encoder U phase signal input
7	U-	
1	V+	Encoder V phase signal input
6	V-	
12	W+	Encoder W phase signal input
11	W-	
15	PE	Shielding ground

Incremental encoder signal reference circuit is as follows:

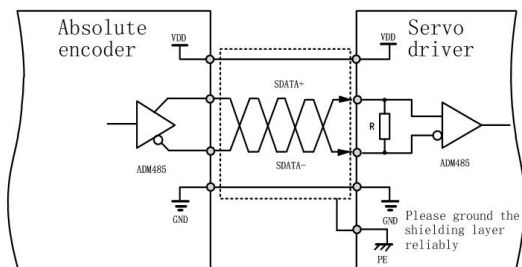


Graph 3-11 Incremental encoder input signal interface circuit

Definition of absolute encoder signal input terminal as follows:

Pin No.	Signal name	Function
13	EC-5V	Encoder power output, $5V \pm 5\%$
14	EC-GND	Encoder power/Grounding signal, 0V
12	SDATA+	Bidirectional serial data
11	SDATA-	
3	E+	Battery for absolute encoder
2	E-	
15	PE	Shielding ground, Connect the shield wire to the metal shield layer

Absolute encoder signal reference circuit is as follows:



Graph 3-12 Absolute encoder input signal interface circuit



### Warning

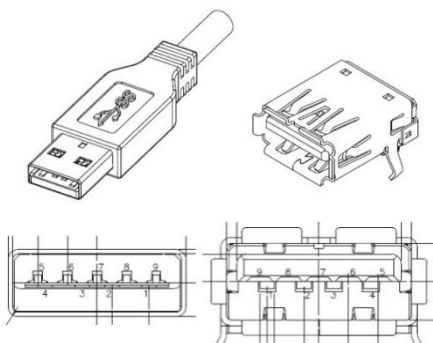
- Forbid to match the motor or encoder which do not belong to our products if without our company's permission or authorization. Otherwise, it may cause motor damage or even endanger personal safety.

## 3.1.5 USB interface CN5 Definition

This terminal is USB3.0 A type USB plug, compatible with USB2.0, but different with standard USB3.0. This port is mainly for connecting the upper computer software and MCU hardware update.

When communicate with upper computer software, using serial communication. This communication cable is option parts, just weld 5/6/7 pins when make cable.

When use for MCU hardware update, using USB communication and standard USB2.0 cable.



Graph 3-13 USB3.0 A type USB plug (left) and socket(right)

Pin definitions as follows:



Pin No.	Signal name	Functions
1	D5V	USB Positive electrode of power supply (optional)
2	USB_D-	USB data-
3	USB_D+	USB data+
4	DGND	USB signal/power supply ground
5	RS232-TX	RS232 sending
6	RS232-RX	RS232 receiving
7	DGND	RS232 signal grounding
8	D5V/D3V3	RS232 Positive electrode of power supply (optional)
9	NC	Null
Shell	FG	Floating shield grounding



### Warning

Please do not connect to the drive directly using the USB3.0 cable, which may cause damage to the drive or PC port.

## 4 Display And Keyboard Operation

### 4.1 Basic Operation

The operation panel consists of five-digit digital tubes, two indicator lights and four keys.




Graph 4- 1 Operation panel appearance

#### Five-digit digital tube

Digital tube is used for showing servo driver various statuses and parameters.

If the decimal point of the rightmost octagon flashes, the servo driver gives an alarm.

#### Value display

The numerical value adopts 5 digital tube displays, with prefixed characters before some items. If the display value is negative, the decimal point of the display value is lit up, and when the small value is higher than -10000, the highest value shows a negative sign "-". For example:  is positive number 12345;  is negative number -12345;  is negative number -2345.

#### Four keys



Up key: scroll up to display page, increase serial number or value;



Down key: scroll down to display page, reduce serial number or value;



Return key: return, cancel;



Enter key: enter, ok.

- Pressing the up and down keys, and holding, has the effect of continuously increasing the serial number (or value) and continuously decreasing the serial number (or value), and the longer the holding time, the faster the increase or decrease.



#### Example

For example, you can follow the following steps to suppose you need to modify a parameter from 0 to 3000:

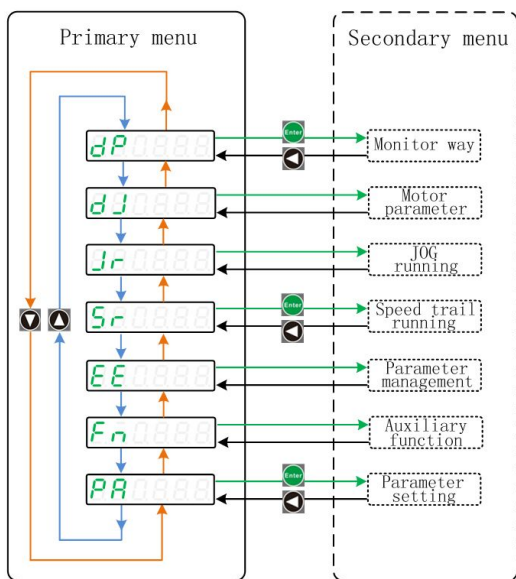
Step 1: press the up key and keep it. The value increases gradually from 0.

Step 2: increase the value gradually faster until the value increases to 3000 or so. Release the upturn key.

Step 3: press the up or down key one time and fine-tune the value until it reaches 3000.

## 4.2 First Layer

— The first level menu is used to select the operation mode. Loop through 7 modes of operation by flipping up or down. Press Enter key to enter the secondary menu, and press back key to return to the primary menu. The specific switching mode is shown in graph 4-2:




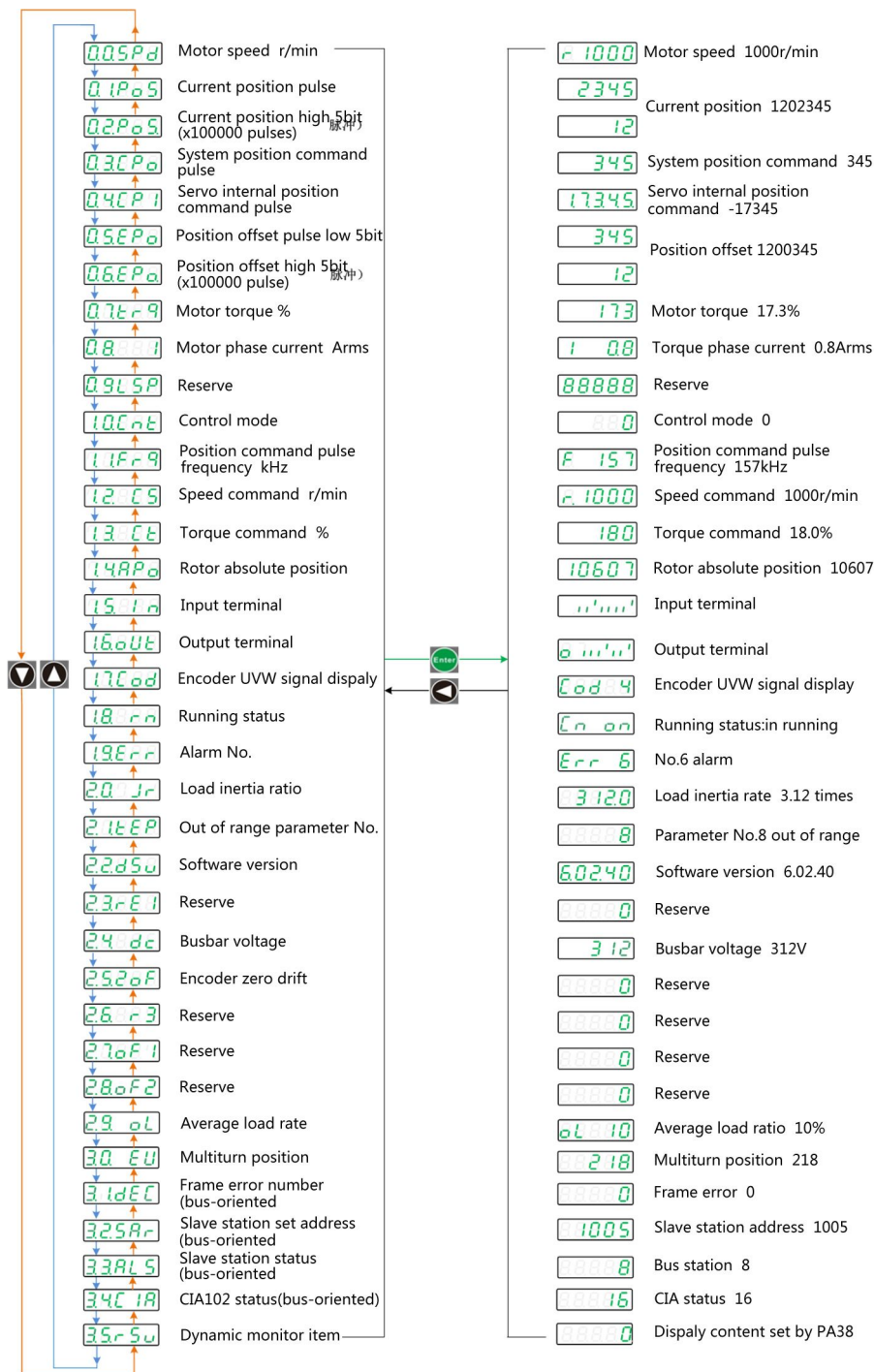
Graph 4- 2 Primary menu

## 4.3 Second Layer

Through different primary menu can enter the corresponding secondary menu. This section introduces monitoring mode, motor parameters, JOG run, speed trial run, parameter management, auxiliary functions, parameter view and setting and other secondary menu functions.

### 4.3.1 Monitoring Mode

Choose  in the primary menu, and press Enter key enter to monitoring mode. Choose parameter which need to monitor by pressing UP key or DOWN key, then press ENTER key to view parameter value; Press BACK key to back.



### Graph 4-3 Second Layer



#### Specification

- Monitor parameter only for looking-out, can not revise.
- Servo internal position command pulse number is the pulse number which input after electronic gear ratio.
- pulse number is expressed as high 5 bits + low 5 bits, and the calculation method:

$$\text{pulse number} = \text{High 5 bits value} \times 100000 + \text{low 5 bits value}$$

View control mode:

**PosPS**: position mode, pulse + direction input;

**PosCC**: position mode, CW/CCW input;

**PosAB**: position mode, A and B orthogonal pulse input;

**SPdIn**: internal speed mode;

**SPdSr**: speed trail run;

**SPdJr**: JOG mode;

**EuroL**: open loop run.

If the display number is negative, the LED corresponding decimal point will be lit.

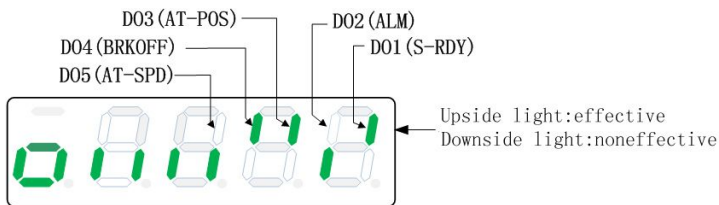
The position command pulse frequency is the actual pulse frequency before inputting electronic gear amplifies. The minimum unit is 0.1kHz. The forward rotation direction shows a positive number and the reverse direction shows a negative number.

Effective value of phase current, calculation method of current I:

$$I = \sqrt{\frac{1}{3}(I_U^2 + I_V^2 + I_W^2)}$$

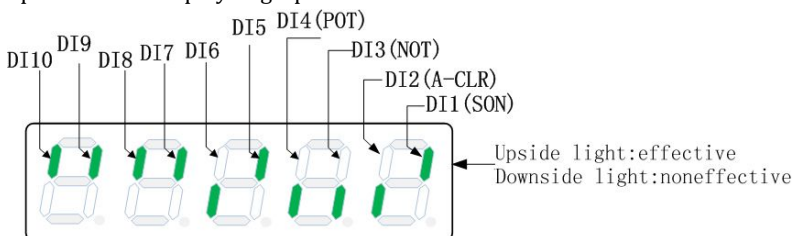
The absolute position of the rotor in a circle refers to the position of the rotor relative to the stator in a circle, with a circle as a cycle, ranging from 0 to the number of pulses per revolution of the motor, which is independent of the electronic gear ratio.

Input terminal shows as graph 4-4:



Graph 4- 4 Output terminal display

Input terminal display as graph 4.5:





Graph 4- 5 Input terminal display

Encoder UVW signal display,shows corresponding decimal number for encoder U、V、W three phase signal electric level.For example, U、V、W is binary 100,it will display corresponding decimal number 4.

Working state as:



bb: The main circuit is not charged and the servo system is not running;

run: The main circuit has been charged and the servo system is running.

Alarm state displays  express as normal,no alarm;When alarm and display , and LED blinks,the last two digits represent the alarm number,alarm significance refer to 7.1 alarm code list.

Out of range parameter number.When the servo driver has "parameter out of range (no. 22) alarm", you can check the parameter out of range under this menu.This menu can only display one parameter number which is out of range at a time. When more than one parameter is out of range at the same time, it is necessary to check the wrong parameter number several times and modify the operation of parameter value.

### 4.3.2 Parameter Setting(PA/Fn parameter)

Choose  or  in primary menu,and press ENTER key to enter into parameter setting mode.

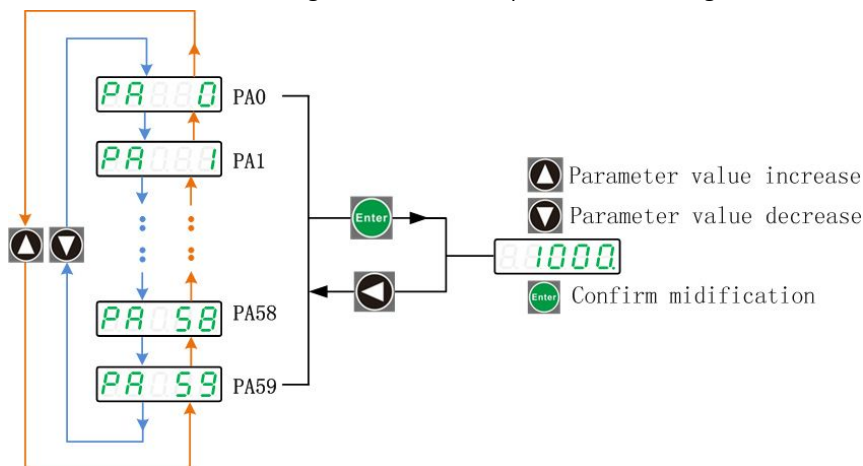
Use UP key or DOWN key to choose parameter No.,press ENTER key to display this parameter value.

Use UP key or DOWN key can revise parameter value, the value which is modified after pressing ENTER key will be reflected to control.

Press RETURN key to back.



- When the parameter value is modified, the decimal point of the rightmost digital tube will light up. Press ENTER to make the modified value valid. At this time, the digital tube decimal point on the right will be extinguished. Then press the UP key or DOWN key to continue modifying the parameters.
- If you are not satisfied with the value you are modifying, do not press ENTER key, but press RETURN key. In this case, the parameter value is not modified and the menu goes back to the parameter setting menu.



Graph 4-6 PA Parameter setting menu sample

### 4.3.3 Parameter Management

Parameter management is mainly to deal with operations between parameter list EEPROM.

Choose EE000 in the primary menu, and press ENTER key to enter into parameter management mode.

Use UP key or DOWN key to switch in these three parameter management options, press ENTER key more than 3 seconds to finish corresponding parameter management command.

Press RETURN key to back.



## Example

Sample:save the parameter

Step 1:choose E-SEt,press ENTER key.

Step 2:Press ENTER key more than 3 seconds,digit tube displays StArE ,  
expressing parameter is writing EEPROM。

Step 3:wait 1 ~ 2 seconds,if the operation is successful,displaying donE ,  
otherwise displaying Error .

Parameter management mainly includes save parameter,factory default and software reset.Every operation corresponds to one kind driver's reading and writing operation between MCU memory and EEPROM.As follows:

Syetem power on:memory  EEPROM PARAMETER AREA

Save parameter E-SEt : memory  EEPROM PARAMETER AREA

Restore defaults E-DEF : parameter default  Memory, EEPROM parameter area

System soft reset E-rSt : System reset restart,equivalent to the drive recharged

### Graph 4- 7 Parameter management menu

Saving parameter E-SEt

Represents the parameter where the parameters in the parameter table are written to EEPROM parameter area.

After the user modifies the parameter, only the parameter value in the parameter table is changed, and the original value will be restored after recharging.If you want to permanently change the parameter value, you need to perform a parameter save operation, writing the parameters from the parameter table into the parameter area of EEPROM, and the modified parameters will be used later on.

Factory default E-DEF

Represents that the factory values of all parameters are read to the parameters table and written to the parameters area of EEPROM, and the default parameters are used after recharging.

This operation can be used to reset factory default when the user sets wrong parameters and the driver cannot work properly.

Software reset E-rSt

Represents to reset drive internal MCU processor, which is equivalent to the drive being recharged after power off.After performing saving parameter,you can use this


operation to avoid disconnecting the drive power supply and recharging.




- Users need reset factory default if necessary.

### 4.3.4 Speed Trial Run


Set control mode PA4 to 2, need save and reset to take effect;

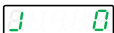
Choose  in primary menu, and press ENTER key to enter into speed trial running mode.

The speed trial running prompt is , value unit is r/min, the system is in speed control mode, speed command is offered by key, using UP key or DOWN key can change speed command, the motor will run at a given speed.

### 4.3.5 JOG run

Set control mode PA4 to 5, need save and reset to take effect;

Choose  in primary menu, and press ENTER key to enter into JOG mode, that's JOG mode.

JOG running prompt is , value unit is r/min.

The system is in speed control mode, speed command is set by parameter PA21.

Press UP key and keep, the motor runs at the speed which set by PA21, release the key and the motor stops.

Press DOWN key and keep, the motor reverses at the speed which set by PA21, release the key and the motor stops.

## 5 Running

### 5.1 Trial Run Without Loading

The purpose of the trial running is to confirm whether the following items are correct:

- Driver power supply cable;
- Servo motor cable;
- Encoder cable;
- Servo motor running direction and speed.

#### 5.1.1 Wiring And Inspection

Confirm motor before power on:

- Motor without loading and does not load the motor shaft. Please remove couplings if already installed in the machine.
- The motor must be fixed because of the motor acceleration and deceleration impact.
- Please check the following items before power on:

( 1 ) Is connection correct? In particular, do the L1/L2/L3 connection and U/V/W correspond to the motor?

( 2 ) Is the input voltage correct?

( 3 ) Is the encoder cable connection correct?

#### 5.1.2 Speed Trial Run

##### Power ON

Power on, the indicator lights on. If alarm, please check connection.

##### Parameter Setting


Set parameter according to following table, restart servo after saving parameter.


Parameter	Name	Setting value	Factory default	Parameter description
PA4	Control mode	2	0	Set to speed trial running control mode

##### Running

After confirming that there is no alarm and any abnormal conditions, the motor is

excited at zero speed.

Choose  in primary menu, and press ENTER key to enter into speed trail running mode.

Speed trail running prompt is , value unit is r/min, the system is in the speed control mode, speed command offered by key. Use UP key or DOWN key can change speed command, the motor is running at given speed.



### Specification

- If no need control (SRV-ON) by external connection, can set parameter PA53 to 00001, Forced SRV-ON (ON) is effective, no need external connection control SRV-ON.

## 5.1.3 JOG Trial Run

### Power ON

Power ON, PWR indicator lights on. If alarm, please check connection.


### Parameter Set

Set parameter as following table:

Parameter	Name	Setting value	Factory default	Parameter description
PA4	Control mode	5	0	Set to JOG control
PA21	JOG running speed	Suitable	300	JOG speed

### Running

After confirming that there is no alarm and any abnormal conditions, the motor is excited at zero speed.

Choose  in primary menu, and press ENTER key to enter into JOG running mode, this is JOG mode.

Press UP key and keep, the motor will forward rotate (CW) at JOG running speed (PA21) ;

Release the key, the motor stops, keep zero speed;

Press DOWN key and keep, the motor reverse rotates (CCW) at JOG running speed (PA21) .



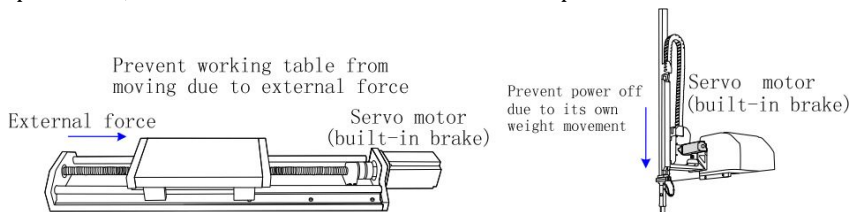
### Specification

- If it is not inconvenient to control (SRV-ON) by external connection. can set parameter PA53 to 00001, forced SRV-ON is effective, no need external connection control SRV-ON.

➤ PA21Set JOG running speed by parameter PA21,value unit is r/min.

## 5.2 Electromagnetic Brake

The electromagnetic brake is used to lock the vertical or inclined table which connect with the motor to prevent the table from falling when power OFF.To achieve this function, you need to choose a motor with brake.The brake can only be used to keep the table, and must not be used to slow down or stop the machine.

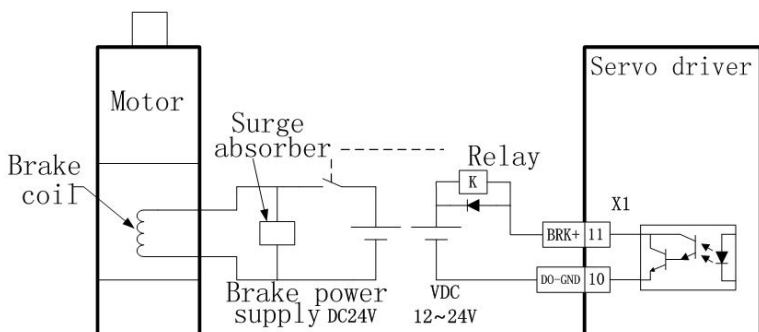


Graph 5-8 Electromagnetic brake application sample

Graph 5-9 is the brake connection diagram, the driver brake signal BRK connects to relay coils,the relay contacts connect the brake power supply.The brake power supply is offered by user,and also have enough capacity. It is recommended to install surge absorber to suppress surge voltage caused by relay on/off operation.Can also be used as a diode surge absorber, pay attention to will cause a little brake delay.

Normally, the servo is OFF after motor stops.At this time,continue to power on and keep its position. The brake from release to brake,after a period of stabilization(time is confirmed by PA47),remove the motor power supply.

When motor is running, the speed is more than 30r/min,now cut off motor current,the brake continue releasing station.Delay some times,the brake start to work.In order to make the motor from high speed rotating station to low speed rotating station,then let electromagnetic brake work to prevent brake damaging.The real delaying time is set by PA48 or motor speed deceleration time to PA49 corresponding speed time,taking the minimal value of the two vales.About brake motion detailed timing sequence refers to the graph 5-10 to 5-12.



Graph 5- 9 Wiring diagram of electromagnetic brake

Table 5- 5 Parameters related with electromagnetic brake

Parameter	Name	Setting value	Factory default	Unit
PA47	Waiting time of switch off SERVO ON when the motor is stationary	0~5000	0	ms
PA48	Waiting time of electromagnetic brake when the motor runs	0~5000	50	ms
PA49	The brake motion speed when the motor runs	0~3000	100	rpm
PA50	The brake delays to open when the motor SERVO ON	0~3000	20	ms

## 5.3 Regenerative Brake Resistor Set

When the speed of the motor is opposite to the direction of the torque, the energy is transmitted from the motor to the driver, causing the bus voltage to rise. When it reaches the braking point, the energy can only be consumed through the braking resistance. Braking energy must be consumed according to braking requirements, otherwise the servo driver will be damaged. Brake resistors can be built in or external, but cannot be used at the same time.

When the servo driver reports Err14 (braking fault) or Err16 (regenerative resistance braking ratio is too high), the acceleration and deceleration time shall be reduced appropriately through the system. If still report the error, shall connect external brake resistance. Both ends of the brake resistor are connected to B1 and B2 respectively, and remove the short connection between the terminals B2 and B3. After connect the brake resistor, should set relevant parameters correctly, otherwise maybe

cause abnormal braking.

Table 5- 7 Relevant parameter of regenerative brake resistor set

Parameter		Name	Factory default	Parameter description
PA51	Brake resistance option	0~3	0	0-inter brake resistance 1-external brake resistance
PA69	Value of external brake resistance	1~750	50	ohm ( $\Omega$ )
PA70	Power of external brake resistance	0~10000	50	watt (W)



## Attention

- Do not lower than the minimum allowable resistance value, which may cause Err38 alarm or damage the drive;
- Do not install the external brake resistor on the fuel, which may cause high temperature and fire.



## Knack

The smaller the resistance value of the brake resistance, the bigger the braking current, the bigger the power of the brake resistance, the bigger the braking energy. Never less than the minimum allowable resistance.

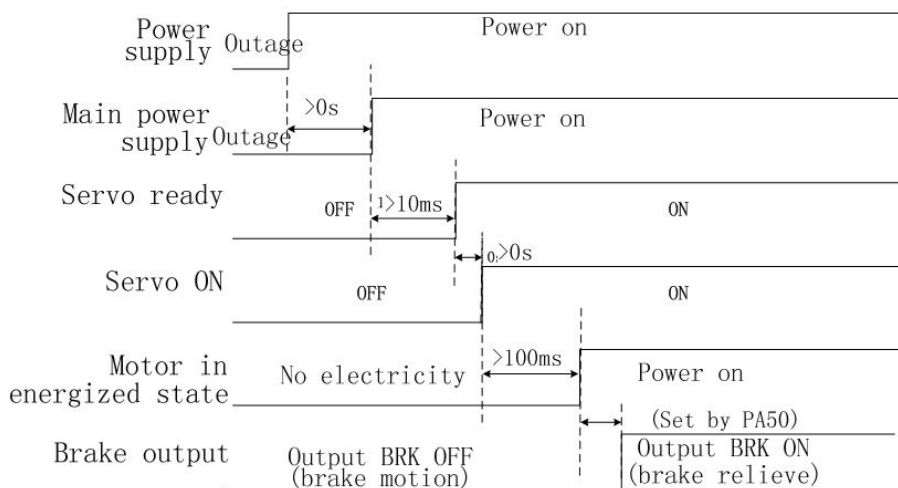
It can be determined by test method: change the resistance value from large to small until the servo driver no longer alarm. Connecting brake resistor must be at 10 minutes later, and operating after the internal high pressure releases completely.

## 5.4 Working Time Sequence

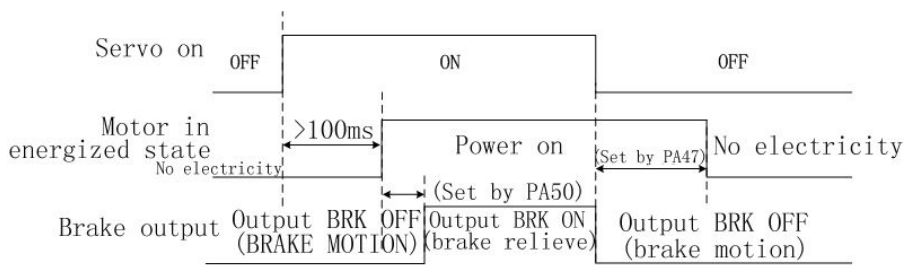
### 5.4.1 Power Supply Time Sequence

Control power L1C、L2C connects with main power. If only connect power of control circuit, servo prepares signal (S-RDY) OFF.

After connecting main power, about delaying 1.5 seconds, servo prepares signal (S-RDY) ON, at this time, can accept SRV-ON signal, detecting servo on effective, the power circuit is ON, the motor is excited to run. Detecting servo on noneffective or alarm, the power circuit is OFF, the motor is in free state.



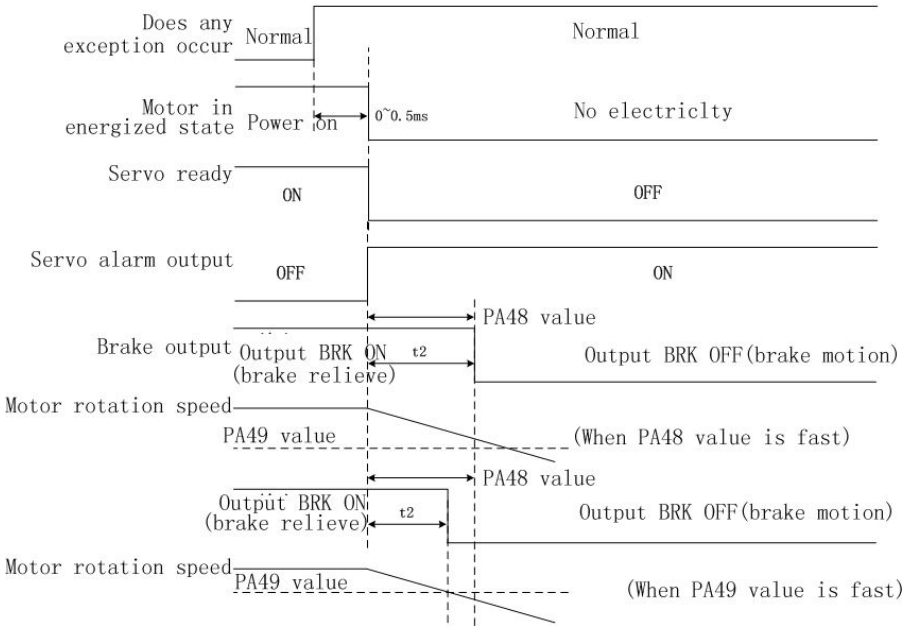
Graph 5- 10 Time sequence to receive servo start signal when power on



Graph 5- 11 Time sequence of ON/OFF when the motor stops(SVON)



## 5.4.2 Alarm Time Sequence



Graph 5- 12 Alarm Time Sequence

## 6 Parameter

### 6.1 Parameter List

#### Specification

- The applicable column represents 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 sequence with “★” represents this parameter needs save, effective after power on again. Without “★” represents it takes effect immediately after modification.
- The parameter value with “\*” represents different driver models may be different factory default value.

#### 6.1.1 PA Parameter

No.	Name	Parameter range	Factory default value	Unit	Applic ation
0	Parameter password	0~9999	315		ALL
1 ★	Motor model	1~132	1		ALL
3 ★	Initial display state	0~25	0		ALL
4 ★	Control mode	0~16	8		ALL
5	Speed ratio gain	2~2000	150*		ALL
6	Speed integral time constant	1.0~1000.0	50.0*	ms	P, S
7	Torque filter time constant	0~20.00	0.20	ms	ALL
8	Speed feedback filtering time constant	0~10.00	0.50	ms	P, S
9	Position ratio gain	1~1000	50*		P
10	Speed feedforward gain	0~200	0	%	P
11	Speed feedforward filter time constant	0~10.0	0.5	ms	P
12 ★	Frequency division numerator of position command pulse	1~32767	1		P

13 ★	Frequency division denominator of position command pulse	1~32767	1		P
14 ★	Position command pulse input method	0~4	0	0 : pulse+direction 1: CW+CCW 2 : AB orthogonality 3: bus command 4 : internal position	P
15 ★	Command direction reverse setting	00000b ~ 11111b	00000b	Bit0:position command direction reverse Bit1: speed command direction reverse Bit2: torque command direction reverse Bit3/4:rsv	ALL
16	Positioning completion range	0~30000	100	Pulse	P
17	Position out-of-tolerance detection range	0~3000	30	X0.1 circle	P
18	Absolute encoder usage mode	00000b~ 11111b	00101b	Bit0:use battery or not Bit1:ABS source Bit2:Automatic identification of motor parameters Bit3:rsv	ALL
19 ★	Position command pulse signal filter time constant	0.0~20.0	0.0	Microseconds(us)	P
20 ★	Servo control service bit switch	00000b~ 11111b	00000b	Bit1:control model switch allow Bit2:I0 JOG function allow Bit3:rsv	ALL
21	JOG running speed	0~3000	300	rpm	S
22 ★	Speed command source selection	0~2	0		S

23 ★	User sets maximal speed limit percentage	1~200	100	%	ALL
24 ★	Position command direction signal filter time constant	0.0~20.0	0.0	Microsecond s(us)	P
25	Torque command source selection	0~8	0		T
26	Speed command setting frequency	0~3000	0	Hz	S
27	Internal speed command 1	-9000 ~ 9000	0	rpm	S
28	In-position speed	0~3000	500	rpm	P, S
29	Loading rotation inertia ration	0~8000	200	%	P, S
30 ★	Alarm value of Motor torque overload	10~300	160	%	ALL
31 ★	Motor torque overload alarm detection time	0~12000	3000	ms	ALL
32	Control mode switch allows	0~1	0		ALL
33	Rigid hierarchy	0~31	0		ALL
34	Internal CCW torque limit	0~300	300*	%	ALL
35	Internal CW torque limit	-300~0	-300*	%	ALL
36	Speed command filter time constant	0~10.0	0.2	ms	S
37	Torque feedforward filter time constant	0~10.0	0.5	ms	ALL
38	DP menu dynamic display items	0~300			ALL
39	STP serial communication rate	0~15	0		T
40	Acceleration time constant	0~10000	20	ms , the time from 0rpm to max. speed	S
41	Deceleration time constant	0~10000	20	ms , the time from max. speed to 0 rpm	S
42	Incremental encoder AB signal filter time	0~1000	1	x20ns	ALL
43	Maximum permissible impact	10~5000	1700	ms	ALL

	time of brake resistance				
44 ★	Pulse command Function selection	00000b~ 11111b	00000b	bit0:high speed pulse selection bit1:access to function bu hand	P
45 ★	Single turn number of absolute encoder	0~30	0	Factory default when set to 0	ALL
46	Speed integral filter time constant	0~500	1.0	ms	P, S
47	Waiting time for taking off SERVO ON when motor is stationary	0~5000	0	ms	ALL
48	Braking waiting time of electromagnetic brake when The motor runs.	0~5000	50	ms	ALL
49	Brake motion speed when the motor runs.	0~3000	100	rpm	ALL
50	The brake delays to open when the motor servo on	0~3000	20	ms	ALL
51 ★	Brake resistance selector switch	0~1	0		ALL
52	Position command smoothing time constant	0.0~100.0	0.0	ms	P
53	Low 5 bit input terminal forced ON	00000b~ 11111b	00000b	Binary	ALL
54	High 5 bit input terminal forced ON	00000b~ 11111b	00000b	Binary	ALL
55	Low 5 bit input terminal LDI	00000b~ 11111b	00000b	Binary	ALL
56	High 5 bit input terminal LDI	00000b~ 11111b	00000b	Binary	ALL
57	Output terminal LDI	00000b~ 11111b	00000b	Binary	ALL
58	Input terminal debouncing time constant	0.1~800	1.0	ms	ALL
60	Torque command filter time constant	0~50.00	0.20	ms	ALL
62	Alarm shield setting bit	00000b~ 11111b	00000b	Bit0:Err18 Bit1:Err35 Bit2:Err41&6	ALL

				Bit3:Err25 Bit4:Err8	
63	Disturbance torque compensated gain filter cutoff frequency	0~2000	50	Hz	P, S
64	Current ratio gain	1~500	150*		ALL
65	Current integral Time constant	1~100.0	20.0*	ms	ALL
66	Torque feedforward gain	0~100	0	%	P, S
67	Gravity axis offset	-100~100	0	%	ALL
68	PDFF feedforward factor	0~100	100	%	P, S
69 ★	External brake resistance value	0~750	50	Ω	ALL
70 ★	External brake resistance power	0~10000	50	W	ALL
71	Forward friction compensation feedforward gain	0~300	0	%	P, S
72	Current loop PID limiting adjustment factor	20~100	100	%	ALL
73	Disturbance torque compensated gain	0~200	0	%	ALL
74	Internal current command	-300~300	0	%	T
75 ★	Current loop retention parameter 1	0~5	0		ALL
76	485 response frame delay time	0~1000	3	ms	ALL
77 ★	Current loop retention parameter 2	0~2	0		ALL
78 ★	Output pulses quantity of motor rotates one circle	1~32767	2500	x4 pulse	ALL
79 ★	System feedback pulse output LDI	0~1	0		ALL
80	Absolute encoder reset setting	00000b~11111b	00000b		ALL
81 ★	Command pulse number low bit when the motor rotate one circle	0~32000	0		P
82 ★	485/232 communication address setting	0~255	1		P

83 ★	485/232 communication rate setting	0~6	2		P
84 ★	Command pulse number high bit when the motor rotate one circle	0~10000	0	x10000	P
85	Vibration detection the current percentage	0~500	100	%	ALL
86	The detected value at zero speed	0~100	10	rpm	ALL
87 ★	485 communication check mode selection communication check mode selection	0~6	0	0-no checking 1-even checking 2-odd checking	
88	Negative friction compensation feedforward gain	0~300	0	%	P, S
89	Friction compensation filter time constant	0~10.0	1.0	ms	P, S
97	Alarm shield setting bit 2	00000b~ 11111b	00000b		ALL

## 6.1.2 Fn Parameter

No.	Name	Parameter range	Factory default value	Unit	Application
0	Digit input DI1 function	0~31	1		ALL
1	Digital input DI2 function	0~31	2		ALL
2	Digital input DI3 function	0~31	3		ALL
3	Digital input DI4 function	0~31	4		ALL
4	Digital input DI5 function	0~31	5		ALL
5	Digital input DI6 function	0~31	6		ALL
6	Digital input DI7 function	0~31	7		ALL
7	Digital input DI8 function	0~31	8		ALL
8	Digital input DI9 function	0~31	9		ALL
9	Digital output DI10 function	0~31	10		ALL

10	Digital output function D01	0~15	1		ALL
11	Digital output function D02	0~15	2		ALL
12	Digital output function D03	0~15	3		ALL
13	Digital output function D04	0~15	4		ALL
14	Digital output function D05	0~15	5		ALL
15	Digital output function D06	0~15	6		ALL
16	Digital output function D07	0~15	7		ALL
17	STP communication cycle parameter	0~15	10		ALL
18	Reserve	0~100	0		ALL
19	Reserve	0~15	0		ALL
20	Position command modify coefficient	1.0~10.0	1.0		P
21	485 communication protocol selection	0~4	2	0-reserve 1-Panasonic A5 2-ModbusRTU	ALL
22	Motor relative parameter setting	0000b~1111b	0000b	bit0: automatic servo bit servo on bit1: electrical degree reverse bit2: speed feedback reverse bit3: position feedback reverse	ALL
23	Secondary control policy Settings	0000b~1111b	0000b	bit0: zero bit checking bit1: dead zone compensation bit2: speed phase compensation bit3: reserve	ALL
29	Origin regression model	0~3	0		ALL
30	Origin regression first speed	1~3000	500	rpm	ALL



31	Origin regression second speed	1~3000	50	rpm	ALL
32	Origin regression acceleration and deceleration time constant	0~3000	20	ms	ALL
33	Origin regression trigger mode	0~3	0	0: close the origin regression 1: DI on the trigger 2: power on automatically	ALL
34	U phase current offset compensation	0			ALL
35	V phase current offset compensation	0			ALL
36	VF mode running frequency	0		Hz	
37	VF mode running amplitude	0			
40	Current loop bandwidth setting	0~8000		Hz	
42	Low frequency vibration suppression frequency	0~100.0	0	Hz	P
43	Low frequency vibration suppression bandwidth setting	0~20	0		P
44	Low frequency vibration suppression depth setting	0~100	0		P
45	Notching filter center frequency	0~1000	1000	Hz	ALL
46	Notching filter bandwidth	0~20	0		ALL
47	Notching filter depth	0~100	2		ALL
50	Analog AI1 filter time constant	0~600.0	2.0	ms	S, T
51	Analog AI1 null shift	-500~500	0	mV	S, T

52	Analog AI1 offset	-5000~5000	0	mV	S, T
53	Analog AI1 dead zone	0~1000	10	mV	S, T
54	Analog 10v corresponding speed value	0~6000	3000	rpm	S
55	Analog AI2 filter time constant	0~600.0	2.0	ms	S, T
56	Analog A2 null shift	-500~500	0	mV	S, T
57	Analog AI2 offset	-5000~5000	0	mV	S, T
58	Analog AI2 dead zone	0~1000	10	mV	S, T
59	Analog 10v corresponding torque value	0~800.0	100.0	%	T
60	Origin offset position low bit	0~10000	0		P
61	Origin offset position high bit	0~10000	0	x10000	P
63	Internal speed command 2	-9000~9000	0	rpm	S
64	Internal speed command 3	-9000~9000	0	rpm	S
65	Internal speed command 4	-9000~9000	0	rpm	S
66	Maximum speed of off-line inertial identification	100~3000	500	rpm	P, S
67	Acceleration and deceleration time of off-line inertial identification	20~1000	125	ms	P, S
68	Waiting time of off-line inertial identification	50~10000	800	ms	P, S
69	Inertial identification mode selection	0~3	0		P, S
70	Internal position mode target position	-1000.0~1000.0	0.0	Circle	P
71	Maximum speed of internal position mode	0~6000	100	rpm	P
72	Acceleration and deceleration time	1~3000	300	ms	P

	constant of internal position mode				
73	Waiting time of internal position mode	1~10000	500	ms	P
75	Zero lock current setting	1~200	50	%	ALL
76	Speed compensation strategy selection	0			P, S

## 6.2 PA Parameter Function

0	Parameter password	Parameter range	Factory default value	Unit	Application
		0~9999	315		ALL

Used to prevent parameters from being accidentally modified。In general, when parameters need to be set, first set this parameter as the required password, and then set the parameters.

Password classification, corresponding to user parameters, system parameters and all parameters.

When modifying the motor model (PA1), must use the motor model code password.Other password can not modify this parameter

User password is 315,the motor model code password is 385 , the extension parameter is 527.

1★	Motor model	Parameter range	Factory default	Unit	Application
		1~132	1		ALL

Corresponding to the same series of different power levels of the motor

3★	Initial display state	Parameter range	Factory default	Unit	Application
		0~35	0		ALL

After power on, choose data content displayed by LED digit tube,details refers to following table:

Setting value	Content	Setting value	Content	Setting value	Content
0	Motor rotation speed	12	Command speed	24	Busbar voltage
1	Current position low 5 bits	13	Command torque	25	Reserve
2	Current position high 5 bits	14	Absolute position of the rotor in a single	26	Maximum cycle time

			turn		
3	System command pulse number	15	Input terminal state	27	Reserve
4	Internal command pulse number	16	Output terminal state	28	Reserve
5	Position offset low 5 bits	17	Encoder input UVW	29	Average load rate
6	Position offset high 5 bits	18	Driver running state	30	Absolute encoder multiturn position
7	Motor torque	19	Alarm code	31	Bus invalid frames
8	Motor current	20	Loading rotation inertia ratio	32	The bus slave station sets the address
9	Reserve	21	Wrong parameter No.	33	Bus state machine state
10	Control mode	22	Software version	34	Bus device state machine state
11	Command pulse frequency	23	Reserve	35	Reserve
5	Speed ratio gain	Parameter range	Factory default	Unit	Applica tion
		2~2000	150*		ALL

Set ratio gain of speed loop regulator;

The bigger the setting value, the higher the gain and the bigger the rigid.The parameter value is determined according to the specific servo driver system model and loading.In general, the bigger the load inertia, the bigger the setting value.

Under the condition that the system does not oscillate, try to set a bigger value.

6	Speed integral time constant	Parameter range	Factory default	Unit	Applica tion
		1.0~1000.0	50.0*	ms	P, S

Set integral time constant of speed loop regulator;

The smaller the setting value, the faster the integration speed and the stronger the system resistance deviation, that is, the stronger the rigid, but prone to overshoot.In general, the bigger the loading inertia, the bigger the setting value.

7	Torque filter time constant	Parameter range	Factory default	Unit	Applica tion
		0~20.00	0.20	ms	ALL

Set actual torque filter time constant;

The smaller the time constant, the faster the response characteristic of the control system will be, but it will make the system unstable and easy to generate oscillation.

8	Speed feedback filter time constant	Parameter range	Factory default	Unit	Applica tion
---	-------------------------------------	-----------------	-----------------	------	--------------

		0~10.00	0.50	ms	P, S
--	--	---------	------	----	------

Set the characteristics of the speed feedback low pass filter;

The bigger the value, the lower the cut-off frequency and the lower the noise of the motor; If the load inertia is heavy, the setting value can be appropriately reduced; If the value is too big, it will slow down correspondingly, which may cause oscillation.

9	Position ratio gain	Parameter range	Factory default	Unit	Applica tion
		1~1000	50		P

Set ratio gain of position loop regulator;

The bigger the setting value, the bigger the gain and the stronger the rigid. Under the same frequency command pulse condition, the smaller the position lag, but if the value is too bigger, it may cause oscillation or overshoot.

Parameter value is according to specific servo driver model and loading.

10	Speed feedforward gain	Parameter range	Factory default	Unit	Applica tion
		0~100	0	%	P

Set feedforward of position loop;

The feedforward gain of the position loop increases, and the high speed response characteristic of the control system increases. But it will make the position loop of the system unstable and easy to produce oscillation.

The feedforward gain of the position loop is usually 0, unless very high response characteristics are required.

11	Speed feedforward filter time constant	Parameter range	Factory default	Unit	Applica tion
		0~10.0	0.5	ms	P

Set filter time constant of feedforward command;

The smaller the time constant, the faster the response characteristics of the control system will be, which will make the system unstable and easy to generate oscillation.

12 ★	Frequency division numerator of position command pulse	Parameter range	Factory default	Unit	Applica tion
		1~32767	1		P

Set position command pulse frequency multiplier(electronic gear) ;

When PA81 and PA84 are all 0, PA12 and PA13 parameter are effective, details refer to PA81;

Under the position control mode, it can be easily matched with various pulse

sources to achieve the user's ideal control resolution (i.e., Angle/pulse) by setting the parameters of PA12 and PA13.

$$P \times G = N \times C \times 4$$

P: Pulse number of input command;

G: Electronic gear ratio

$$G = \frac{\text{Molecular frequency division (PA12)}}{\text{Denominator dividing (PA13)}}$$

N: Number of motor turns;

C: Number of lines of photoelectric encoder/turn, assuming that C=2500( 2500PPR encoder) 。

### Example

When input command pulse is 6000,the servo motor rotate 1 turn

$$G = \frac{N \times C \times 4}{P} = \frac{1 \times 2500 \times 4}{6000} = \frac{5}{3}$$

Set parameter PA12 to 5,set PA13 to 3.

Recommended range of electronic gear ratio is

$$\frac{1}{50} \leq G \leq 50$$

13 ★	Frequency division denominator of position command pulse	Parameter range	Factory default	Unit	Applica tion
		1~32767	1		P

Refer parameter PA12

14 ★	Position command pulse input method	Parameter range	Factory default	Unit	Applica tion
		0~4	0		P

Set input mode of position command pulse.Set it to one of the four input modes by parameters:

- 0: Pulse + direction;
- 1: CCW pulse /CW pulse;
- 2: Two phase orthogonal pulse input;
- 3: Bus command (Only bus driver effective) ;
- 4: Internal position command.

CCW is observing from servo motor axis direction,rotating CCW direction,this is defined as forward.

CW is observing from servo motor axis direction,rotating CW direction,it is defined as reverse.

15 ★	Command direction reverse setting	Parameter range	Factory default	Unit	Applica tion
		00000b~11111b	00000b		ALL

Bit0 set position command direction: 0:Position command direction not reversed; 1:Position command direction reversed;

Bit1 set speed command direction: 0:Speed command direction not reversed; 1:Speed command direction reversed;

Bit2 set torque command direction: 0:Torque command direction not reversed;1:Torque command direction reversed;

16	Positioning completion range	Parameter range	Factory default	Unit	Applica tion
		0~30000	100	Pulse	P

Set positioning completion pulse range under position control.

This parameter provides the basis for determining whether the driver has completed the positioning under the position control mode. When the number of remaining pulses in the position deviation counter is less than or equal to the set value of this parameter, the driver is considered to have completed the positioning, and the AT-POS output of the positioning completion signal is valid.

17	Position out-of-tolerance detection range	Parameter range	Factory default	Unit	Applica tion
		0~3000	30	X0.1 turn	P

Set the alarm detection range of position out of tolerance. In the position control mode, when the value of the position deviation counter exceeds this parameter, the servo driver gives the position out-of-tolerance alarm.

When the parameter value is set to 0, the off position out-of-tolerance alarm is detected.

18 ★	Absolute encoder usage mode	Parameter range	Factory default	Unit	Applica tion
		00000b~11111b	00101b	Bit0:use battery or not Bit1:ABS source Bit3:rsv	ALL

Bit0 Set whether to test the battery:

0:The encoder battery is detected and turned off, and the encoder does not need to be connected to the external battery;

1:The encoder battery is detected and turned on. The encoder needs to be connected to the external battery. When the multi-turn position is lost, the driver will

alarm.

Bit1 set the absolute encoder feedback interface, and only EA and MA series support the second encoder interface:

0:use first encoder feedback interface;

1:use second encoder feedback interface;

19 ★	Position command pulse signal filter time constant	Parameter range	Factory default	Unit	Applica tion
		0.0~20.0	0.0	us	P

The instruction pulse signal is filtered to remove the interference noise.

In general, set to 0, and increase this parameter appropriately in the case of strong interference.

21	JOG running speed/ Max. speed of torque mode	Parameter range	Factory default	Unit	Applica tion
		0~6000	300	r/min	S

Set allowed speed of JOG operation.

Set maximum running speed of torque mode(band speed limiter)

22	Speed command source selection	Parameter range	Factory default	Unit	Applica tion
		0~2	1		S

Set speed command source under speed mode,set to

0:speed command is from bus;

1:speed command is from parameter PA27、Fn63、Fn64 or Fn65,the details is confirmed by DI input No.12/13functions;

2:speed command is from analog AI1.

23 ★	User sets maximal speed limit percentage	Parameter range	Factory default	Unit	Applica tion
		1~200	100	%	ALL

The user setting the servo motor sets the maximum speed limit and the limit speed is the product of the maximum speed of the motor and this parameter.

The maximum speed of the motor can be checked through DJ menu parameter.

It will occur over-speed alarm when motor actual speed exceeds user setting maximum speed(Err-1)



25	Torque command source selection	Parameter range	Factory default	Unit	Applica tion
		0~8	0		T

When running mode is torque mode(PA4=10),used for choosing source of torque command.Setting as followings:

- 0: Torque command comes from internal parameter PA74;
- 1: Torque command comes from analog channel AI1;
- 2: Torque command comes from analog channel AI2.

26	Speed command setting frequency	Parameter range	Factory default	Unit	Applica tion
		0~3000	0	Hz	S

27	Internal speed command 1	Parameter range	Factory default	Unit	Applica tion
		-9000~9000	0	rpm	S

Under speed control mode,set internal speed command as 1

When SPD\_SEL1 OFF, SPD\_SEL2 OFF,choosing internal speed 1 as speed command.

28	In-position speed	Parameter range	Factory default	Unit	Applica tion
		0~3000	500	rpm	P, S

Setting in-position speed

Under non-position control mode,if motor speed exceeds setting value,then AT-SPD ON,otherwise AT-SPD OFF.Nothing with the rotating direction

29	Loading rotation inertia ratio	Parameter range	Factory default	Unit	Applica tion
		0~8000	200	%	P, S

Loading inertia ratio=Total rotating inertia of machine loading/Motor rotating inertia

Loading inertia ratio is the important parameter of the servo system,correct setting will be helpful for debugging fast.

30 ★	Alarm value of motor torque overload	Parameter range	Factory default	Unit	Applica tion
		10~300	160	%	ALL

Setting user torque overload value.this value is the percentage of the rated torque,torque limited value regardless of direction,Protected both CW/CCW

Under PA31>0,when motor torque>PA30,time of duration>PA31,servo driver has

alarm,alarm number is Err-29,motor stops rotating.After appearing alarms,driver should be re-start to clear alarm.

31 ★	Motor torque overload alarm detection time	Parameter range	Factory default	Unit	Applicat ion
		0~12000	3000	ms	ALL

The unit of user torque overload detect time is MS,reference to parameter PA30  
When setting as 0,shied torque overload alarmErr29.

33	Rigid Grade	Parameter range	Factory default	Unit	Applicat ion
		0~31	0		ALL

Rigid grade parameter invalid when setting as 0,weakest rigidity when setting as 1,strongest rigidity when setting as 31.Due to the different type of load,following is the suggest for reference

Recommended rigid grade	Loading machine type
Grade 4 to Grade 8	Some big machine
Grade 8 to Grade 15	Low rigid application like belt
Grade 15 to Grade 20	High rigid application like ball screw,linear

When using PA33(Rigid grade) to set the servo gain,needs to correctly setting parameter PA29(loading rotating inertia gear),or it will occur motor shaking or performance worsen.

34	Internal CCW torque limit	Parameter range	Factory default	Unit	Applicat ion
		0~300	300*	%	ALL

Setting servo motor internal CCW torque limit

The setting value is the percentage of rated torque,E.g. setting 2 times of rated torque,the value should be 200.

This limit is always valid

If the value exceeds max overload ability of system permission,then the actual torque limit is the max overload ability of system permission.

35	Internal CW torque limit	Parameter range	Factory default	Unit	Applicat ion
		-300~0	-300*	%	ALL

Setting servo motor internal CW torque limit

The setting value is the percentage of rated torque,E.g. setting 2 times of rated torque,the value should be -200.

This limit is always valid

If the value exceeds max overload ability of system permission,then the actual torque limit is the max overload ability of system permission.

36	Speed command filter time constant	Parameter range	Factory default	Unit	Applicat ion
		0~10.0	0.2	ms	S

Setting speed command filter feature;

The lower time constant the faster of the system responding,but it may make system not stable,may cause vibration

38	DP menu dynamic display items	Parameter range	Factory default	Unit	Applicat ion
		0~51	0		ALL

After power on,choose data content of dp-rSu and STP 14,details as followings:

Value	Content	value		Value	Content
0	Position chasing error(Pulse)	12	Torque compensation percentage	24	Reserve
1	PHY connecting status	13	Bus lost frame number	25	Bus cycle compensation value
2	Position command incremental maximum value(command pulse unit)	14	Reserve	26	System position feedback status machine
3	Position feedback incremental maximum value(command pulse unit)	15	Reserve	27	Reserve
4	Recognize load inertia ratio	16	CIA status control word	28	Position adjust command
5	Position command speed	17	Setting load inertia ratio	29	Modbus valid frame number
6	STP communication status	18	ABS error register	30	Generatrix voltage value
7	Reserve	19	MCU break off executed time	31	Manual pulse quantity
8	Absolute encoder communication error frame number	20	Bus pulse incremental	32	Bus setting torque offset
9	Reserve	21	Reserve	34	U phase current offset
10	Reserve	22	Speed feedbackward quantity(rpm)	41	WatchDog error count
11	Check load torque	23	Torque feedbackward quantity(0.1%)	51	Position command accelerated speed(rad/s <sup>2</sup> )

39	STP serial communication rate	Parameter range	Factory default	Unit	Applicat ion
		0~15	5		ALL

STP port communication rate,settings as followings:

0-9600bps; 5-115200bps; 9-256000bps; 10-460800bps(bps means bit/second)

40	Acceleration time constant	Parameter range	Factory default	Unit	Applicat ion
		0~10000	20	ms	S

Timing of Motor command speed from 0 to maximum speed,when setting as 0,there is no limited on accelerated speed

41	Deceleration time constant	Parameter range	Factory default	Unit	Applicat ion
		0~10000	20	ms	S

Timing of motor command speed from maximum speed to 0,when setting as 0,there is no limited on accelerated speed

42 ★	Incremental encoder AB signal filter time	Parameter range	Factory default	Unit	Applicat ion
		0~10000	1	x20ns	P

Filter of incremental encoder AB signal feedback pulse,wiping off the noisy

Normal value is 0,but can increase it properly under strong-disturbing situation.

44 ★	Pulse command function selection	Parameter range	Factory default	Unit	Applicat ion
		00000b~11111b	00000b	bit0:high-speed pulse choice bit1:getting function by manual	P

Choosing pulsing command type

When Bit0 set as 0,input command is normal pulse,maximum input frequency is 800Khz(4 times frequency),the corresponding pulse command input pin is PULS+/-, SIGN+/-;

When Bit0 set as 1,input command pulse is high-speed pulse,maximum input frequency is 4Mhz(4 frequency doubling),the corresponding pulse command input pin is PULSH+/-, SIGNH+/-;

When Bit1 set as 1,can connect manual pulse through pin PULS+/-, SIGN+/-,only supports AB orthogonality pulse

47	Waiting time for taking off SERVO ON when motor is stationary	Parameter range	Factory default	Unit	Application
		0~5000	0	ms	ALL

When motor status changes from enabled to non-enabled,define delayed time from brake to current cut-off under motor stops.Properly change this value to avoid the displacement and workpiece drop-off which may cause by delayed time.Details please refer to picture 5-11.

48	Braking waiting time of electromagnetic brake when the motor runs.	Parameter range	Factory default	Unit	Application
		0~5000	50	ms	ALL

When power off servo under motor rotating,define delayed time from motor current cut-off to brake(output terminal BRK-OFF) open.This parameter is used for make brake working after motor speed step down from high speed to low speed,it can avoid the broken of the brake.

Actual action time is PA48 or the time of motor speed reduced to PA49,select the minimum value of this two value.Detail please refer to picture 5-12.

49	Brake motion speed when the motor runs	Parameter range	Factory default	Unit	Application
		0~5000	100	rpm	ALL

Defining motor speed value from motor current cut-off to brake active(output terminal BRK-OFF changes to ON).

Actual action time is PA48 or the time of motor speed reduced to PA49,select the minimum value of this two value.Detail please refer to picture 5-12

50	The brake delays to open when the motor servo on	Parameter range	Factory default	Unit	Application
		0~3000	20	ms	ALL

When servo changes from non-enabled to enabled status,defining delayed time from motor enabled to brake open.Properly change this time,can avoid displacement or workpiece drop-off.

51★	Brake resistance selector switch	Parameter range	Factory default	Unit	Application
		0~3	0		ALL

Select brake resistor type

When set as 0,select internal brake resistor;

When set as 1,select external brake resistor,natural cooling,set as 10% rated capacity of regenerative resistor

When set as 2,select external brake resistor,cooling fan,set as 20% rated capacity of regenerative resistor

When set as 3,select external brake resistor,Good heat dissipation ,set as 40% rated capacity of regenerative resistor

When set as external resistor,needs to correctly set PA69(Value of external resistor) and PA70(Power of external resistor)

53	Low 5 bit input terminal forced	Parameter range	Factory default	Unit	Applicat ion
	ON	00000b~11111b	00000b	Binary	ALL

Set input terminal internal force ON valid.If the terminal is not force ON valid,needs external control ON/OFF,Forced ON terminal,no need external control,driver internal set ON.

Uses 5 bits binary to display,this position is 0 stands input terminal not forced ON,1 stands input terminal forced ON.Input terminal function can be allocated by parameter Fn0~Fn9.The default function of binary input terminal showing as followings

4	3	2	1	0
DI5 (Rsv)	DI4 (POT)	DI3 (NOT)	DI2 (A-CLR)	DI1 (SRV-ON)

SRV-ON:servo enabled;A-CLR:alarm cleared;

NOT:CCW driver forbid ;POT:CW driver forbid;Rsv: Reserve.

54	High 5 bit input terminal forced	Parameter range	Factory default	Unit	Applicat ion
	ON	00000b~11111b	00000b	Binary	ALL

Set input terminal internal force ON valid.If the terminal is not force ON valid,needs external control ON/OFF,Forced ON terminal,no need external control,driver internal set ON.

Using 5 bits binary number,the position shows 0 stands input terminal not forced ON,1 stands input terminal forced ON.Input terminal function can be allocated by parameter Fn0~Fn9.The default function of binary input terminal showing as followings

55	Low 5 bit input terminal LDI	Parameter range	Factory default	Unit	Applicat ion
		00000b~11111b	00000b	Binary	ALL

Set input terminal reverse.If the terminal is not taken in reverse,it is valid when

switch is off,invalid when switch disconnected;the reversed terminal is invalid when switch is off,valid when switch is disconnected.

Using 5-bit binary number,the position shows 0 stands for input terminal is not reversed,1 stands for input terminal is reversed

56	High 5 bit input terminal LDI	Parameter range	Factory default	Unit	Application
		00000b~11111b	00000b	Binary	ALL

Set input terminal reverse.If the terminal is not taken in reverse,it is valid when switch is off,invalid when switch disconnected;the reversed terminal is invalid when switch is off,valid when switch is disconnected.

Using 5-bit binary number,the position shows 0 stands for input terminal is not reversed,1 stands for input terminal is reversed

57	Output terminal LDI	Parameter range	Factory default	Unit	Application
		00000b~11111b	00000b	Binary	ALL

Set the output terminal reverse.The definition of the reversed terminal,conduction and cut-off is exactly the opposite of the standard definition.

Using 5-bit binary,the position shows 0 stands for the output terminal not reversed,the position shows 1 stands for the output terminal reversed.The input terminal represented by binary numbers are as follows:

4	3	2	1	0
D05 (AT-SPD)	D04 (BRKOFF)	D03 (AT-POS)	D02 (ALM)	D01 (S-RDY)

S-RDY:Servo ready;ALM:Servo alarm

AT-POS:In-Position;BRKOFF: mechanical brake release;AT-SPD:In-Speed

58	Input terminal debouncing time constant	Parameter range	Factory default	Unit	Application
		0.1~800.0	1.0	ms	ALL

Set the de-jitter filtering time for the input terminal

The smaller the value,the faster the input terminal response.The larger the value,the better the input anti-interference performance,but the slower the response

60	Torque command filter time constant	Parameter range	Factory default	Unit	Application
		0~20.00	0.20	ms	ALL

Through low pass filtering,the torque command can be smoother and reduce vibration.

If the setting value of filter time constant is too large,the responsiveness will be reduced

62	Alarm shield setting bit	Parameter range	Factory default	Unit	Application
		00000b~11111b	00000b	Bit0:Err18 Bit1:Err35 Bit2:Err41&6 Bit3:Err25 Bit4:Err8	ALL

User can set this parameter to shield the relative alarm,adopt 5-bit binary,if the position shows 1,stands for shielding relative alarm,if 0,stands for not.

63	Disturbance torque compensated gain filter cutoff frequency	Parameter range	Factory default	Unit	Application
		0~2000	50	hz	P, S

Set the cutoff frequency of the disturbance observation compensation

64	Current ratio gain	Parameter range	Factory default	Unit	Application
		2~2000	150*		ALL

Setting the proportional gain of the current loop regulator,generally does not require user regulation.If the noise occurs during the motor running,reduce the parameter properly

65	Current integral Time constant	Parameter range	Factory default	Unit	Application
		1.0~100.0	50.0*	ms	ALL

Setting the integral time constant of the current loop regulator,generally does not require user regulation

66	Torque feedforward gain	Parameter range	Factory default	Unit	Application
		1~500	0	%	P, S

The use of torque feedback should set parameter PA29(load rotating inertia gear) properly

Increasing this parameter can improve the responsiveness to change speed command

Increasing this parameter can improve the position command response and reduce the position deviation at fixed speed

67	Gravity axis offset	Parameter range	Factory default	Unit	Application
		-100~100	0	%	ALL



68	PDFF feedforward factor	Parameter range	Factory default	Unit	Application
		0~100	100	%	P, S

69★	External brake resistance value	Parameter range	Factory default	Unit	Application
		0~750	50	Ω	ALL

Setting this parameter according to the actual external brake resistor value

If adopt internal brake resistor(PA51=0),then this parameter is invalid

70★	External brake resistance power	Parameter range	Factory default	Unit	Application
		0~10000	50	W	ALL

Setting this parameter according to the actual external brake resistor value

If adopt internal brake resistor(PA51=0),then this parameter is invalid

71	Forward friction compensation feedforward gain	Parameter range	Factory default	Unit	Application
		0~100	0	%	ALL

73	Disturbance torque compensated gain	Parameter range	Factory default	Unit	Application
		0~200	0	%	ALL

The disturbance torque compensation can suppress the influence of external disturbance torque on the speed.The larger this parameter is ,the stronger the compensation effect and the stronger the anti-interference ability.However,if the setting is too large,it will cause vibration and noise.

74	Internal current command	Parameter range	Factory default	Unit	Application
		0~100	0	%	T

76	485 response frame delay time	Parameter range	Factory default	Unit	Application
		0~1000	3	ms	ALL

Adjust the 485 communication response frame delay time.Under normal situation,no adjustment is needed.If the system communication response is too slow,you can increase this parameter properly.

78★	Output pulses quantity of motor rotates one circle	Parameter range	Factory default	Unit	Application
		1~32767	2500	Pulse/turn	ALL

Set the number of output pulses of OA and OB for each rotation of the motor (before 4 times the frequency)

79★	System feedback pulse output LDI	Parameter range	Factory default	Unit	Application
		0~1	0		ALL

80	Absolute encoder reset setting	Parameter range	Factory default	Unit	Application
		00000b~11111b	00000b		ALL

It is used to reset the absolute encoder error flag, single or multiple turns. At the same time, only one bit of data takes effect, and the lower priority is higher than the higher priority.

When set to xxxx1, it means to clear the encoder error flag;

When set to xxx10, it means that the encoder error flag bit and multi-turn position are cleared at the same time;

When it is set to xx100, it means that the current multi-turn position is set to the multi-turn zero point, and the current multi-turn position is stored in the parameter PA92 parameter. The parameter must be saved and restarted to take effect;

When set to x1000, it means to clear the current single lap position, only effective when PA4 is set to 13.。

81★	Command pulse number low bit when the motor rotate one circle	Parameter range	Factory default	Unit	Application
		0~32000	0	Pulse	P

Set the number of command pulses for each rotation of the motor, and work together with parameter PA84;

When PA81 and PA84 are both 0, PA12 / PA13 parameters are valid;

Command pulses per motor revolution = PA84x10000 + PA81

82★	485/232 communication address setting	Parameter range	Factory default	Unit	Application
		0~255	1		ALL

When this parameter is set to 0, the system feedback adopts Yaskawa's absolute feedback protocol, and the absolute positions of the feedback output pins OA +/-, OB +/- are fed back through the encoder;

When this parameter is set to 1 ~ 255, the meaning of the parameter is 485 communication address

83★	485/232communication rate setting	Parameter range	Factory default	Unit	Application
		0~6	2		ALL

Set 485 communicated rate,0: 2400bps; 1: 4800bps; 2: 9600bps; 3: 19200bps; 4: 38400bps; 5: 57600bps; 6: 115200bps

84★	Command pulse number high bit when the motor rotate one circle	Parameter range	Factory default	Unit	Application
		0~32000	0	Pulse	P

Set the number of command pulses for each rotation of the motor, and interact with parameter PA81;

When PA81 and PA84 are both 0, PA12 / PA13 parameters are valid;

Command pulses per motor revolution = PA84x10000 + PA81

87★	Communication check mode selection	Parameter range	Factory default	Unit	Application
	Communication check mode selection	0~6	0		ALL

Set the 485 communication check mode, 0: no check; 1: even check; 2: odd check

88	Negative friction Compensation feedforward gain	Parameter range	Factory default	Unit	Application
		0~100	0	%	ALL

## 7 Alarm List

### 7.1 Alarm Code List

Form 7-1 Alarm List

Alarm Code	Alarm Name	Content
0	Normal	
1	Over Speed	Servo motor speed exceeds a set value (PA23)
2	Main voltage over-voltage	Main circuit power supply voltage is too high
3	Vibration detection	The drive detects vibrations that exceed a set threshold
4	Out of position	The value of the position deviation counter exceeds the set value (PA17)
5	Motor average load current alarm	Motor average load current is too large
6	Speed amplifier saturation fault	Speed regulator saturates for a long time
7	Driver prohibited abnormal	CCW and CW driver prohibited inputs are both OFF
8	IPM over heat alarm	IPM temperature exceeds a set value
9A/b/c	Encoder A/B/Z phase fault	Encoder A/B/Z phase single error
10	Motor parameter fault	Motor parameter exceeds allowed range
11	IPM module fault	IPM intelligent module fault
12	Over current	Motor current too large
13	Over load	Servo driver and motor are overload(Transient overheating)
14	Brake fault	Brake circuit fault
15	Encoder count fault	Encoder count abnormal
16	Braking resistor braking rate is too high	Braking rate exceeds a reasonable value
18	Absolute encoder alarm	Encoder communication error
19	absolute encoder battery fault	Battery voltage is lower than 2.5V, multi-turn location information has been lost
20	EEPROM fault	EEPROM error
21	A phase current sampling error	A phase current sampling error

22	Parameter is out of range	Servo parameter is out of range
23	B phase current sampling error	B phase current sampling error
24	Absolute encoder parameter read and write error	Motor encoder EEPROM parameter error
25	Encoder AB feedback abnormal	Encoder AB feedback frequency is too high
26	I/O input terminal function configuration abnormal	Different I/O input terminals are configured to the same function
27	Absolute encoder battery alarm	Motor battery is lower than 3.1V, battery voltage is low
28	Absolute encoder communication timeout alarm	Absolute encoder timeout return
29	Torque overload	Motor load exceeds the value and duration set by the user
30	Encoder Z pulse lost	Encoder Z pulse lost
31	Encoder UVW signal error	Encoder UVW signal error or encoder is not matched
32	Encoder UVW signal is illegally encoded	UVW signal has all high level or all low level
33	Dynamic memory allocation error	Dynamic memory allocation error
34	Flash read CRC error	Flash read CRC error
Alarm Code	Alarm Name	Content
35	Motor adaptation error	Non-adaptive motor
36	Watchdog error	Drive internal watchdog error
37	Motor initial zero lock error	Zero lock error
38	External resistor resistance value error	External braking resistor resistance is less than the minimum allowed value
40	Bus communication error	3 consecutive frames of data error in cyclic communication
41	Bus connection interrupted	Physical network connection is down or status changes
44	Bus state machine switch abnormal	Bus state machine switches abnormally

## 7.2 Alarm Processing Method

### Alarm No. 1: Over Speed

Running Status	Cause	Solution
Appears when the control power is turned on	Control circuit board failure Encoder failure	Replace the servo driver Replace the servo motor
Appears during motor operation	Parameter PA23 is set too small	Increase the setting of parameter PA23
	Input command pulse frequency is too high	Set the input command pulse correctly
	The acceleration / deceleration data constant is too small, making the speed overshoot too large	Increase the acceleration / deceleration time constant
	The input electronic gear ratio is too large	Set correctly
	Encoder failure	Replace servo motor
	Encoder cable failure	Replace encoder cable
	Servo system is unstable	Reset the relevant gain If the gain cannot be set to a proper value, reduce the load moment of inertia ratio
Appears when the motor has just started	Excessive load inertia	Reduce load inertia Change to a more powerful drive and motor
	Encoder zero error	Change the servo motor Ask the manufacturer to adjust the encoder zero
	Motor UVW leads are incorrectly connected	Correct wiring

### Alarm No. 2: Main Circuit Over Voltage

Running Status	Cause	Solution
Appears when the control power is turned on	Circuit board failure	Replace the servo driver
Appears when the main power is	Main circuit input voltage is too high	Check whether the power supply 220V meets the following specifications: Effective value: 220V ~ 240V

turned on		Allowable deviation: -10% ~ 10% (198V ~ 264V) View generatrix voltage monitoring items under dP menu
	Power supply voltage is unstable	Measure if input power is stable
Appears during motor operation	Insufficient braking circuit capacity	Increase braking circuit capacity
	The motor is in a rapid acceleration and deceleration state, and the maximum braking energy cannot be completely absorbed.	Increase the acceleration / deceleration time if allowed
	Generatrix voltage sampling circuit failure	Check whether the displayed value under the dP menu is normal (the displayed value is 1.414 times the input voltage)
	Servo driver failure	Replace the servo driver

#### Alarm No. :Vibration Detection

Running Status	Cause	Solution
	The gain parameter is unreasonable and the rigidity is too strong	Reduce servo loop gain, reduce PA9 and PA5 appropriately, and increase PA6 parameters
	Motor model setting error	Check PA1 parameters to confirm motor model; if it is a custom motor type, check DJ menu motor parameters
	The drive model is set incorrectly	Check PA2 parameters and confirm driver model

#### Alarm No. 4: Out of Position

Running Status	Cause	Solution
Appears when the control power is turned on	Circuit board failure	Replace the servo driver
Connect the main power supply and control line, input	Motor U, V, W leads are incorrectly connected Encoder cable leads are incorrectly connected	Correct wiring
	Encoder zero point change	Encoder zero point change

the command pulse, the motor will not rotate or reverse	Encoder failure	Encoder failure
Appears during motor operation	Set position out-of-tolerance detection range is too small	Increase PA17 position tolerance detection range Off position tolerance detection
	Position proportional gain is too small	Increase gain
	Insufficient torque	Check torque limit Reduced load capacity Replace more powerful drives and motors
	Command pulse frequency is too high	Reduce frequency
	Encoder zero point change	Readjust encoder zero

#### Alarm No.5: Motor Average Load Current Alarm

Running Status	Cause	Solution
	Motor parameter setting error	Check PA1 and dJ parameters, especially dJ0 (motor manufacturer)
	Motor power line UVW phase sequence error	Check the power line wiring
	Motor model setting error	Check PA1 parameters to confirm motor model; if it is a custom motor type, check DJ menu motor parameters
	Motor overload	Check the dp8 with the motor still enabled, and confirm whether the motor current exceeds or approaches the rated current

#### Alarm No.6: Speed amplifier saturation fault

Running Status	Cause	Solution
Appears when the motor is enabled	Motor parameter setting error	Check PA1 and dJ parameters, especially dJ0 (motor manufacturer)
	Drive model code error	Driver model code error
	Motor U, V, W phase sequence is wrong	Check motor phase sequence
	Encoder zero point change	Check encoder zero
Appears	Generatrix voltage too low	Check if the displayed value under the dP



during motor operation		menu <span style="border: 1px solid black; padding: 2px;">24 dc</span> is greater than 290V
	Motor holding brake does not open	Check if the motor holding brake is open
	The motor is mechanically stuck	Check the load mechanical part
	Excessive load	Reduce load Replace more powerful drives and motors

#### Alarm No.7: Driver Prohibited Abnormal

Running Status	Cause	Solution
	CCW, CW drive prohibition input terminals are all disconnected CCW, CW mandatory prohibition is valid at the same time	Check wiring and input terminal levels Check PA53 and PA55 parameters

#### Alarm No.8: IPM Over Heat Alarm

Running Status	Cause	Solution
	IPM is overheating and exceeds set temperature	Reduce load Enhance the heat dissipation of the driver
	The servo driver is damaged	Replace the servo driver

#### Alarm 9A、9b、9c: Encoder A/B/Z Phase Fault

Running Status	Cause	Solution
	Incorrect encoder type setting	Check encoder type, check PA61 parameters
	Encoder wiring error	Check the wiring
	Encoder cable fault	Change the encoder cable
	The cable is too long, causing the encoder supply voltage to be low	Shorten cables and use multi-core parallel power supply
	Defective encoder or servo drive	Change motor or servo driver

#### Alarm 10: Motor Parameter Fault

Running Status	Cause	Solution
	Motor parameter setting is out of range	Check motor parameters (DJ menu)
	Absolute encoder EEPROM is damaged or unwritten	Turn off automatic identification of absolute motor parameters (bit 2 of PA18)

		is set to 0), and manually set motor parameters
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#### Alarm No.11:IPM Module Fault

Running Status	Cause	Solution
	Short circuit or poor contact between driver UVW	Check the wiring and measure whether the resistance between UVW is balanced
	Damaged motor insulation	Measure whether the insulation resistance between the UVW end of the driver and the PE of the ground wire is a megohm ( $M\Omega$ ) level value. Replace the motor if the insulation is poor.
	Improper gain setting, motor vibration	Making gain adjustments
	Control input command setting error	Check whether the control input command changes too drastically, modify the input command change rate or adjust the filtering parameters
	Poor grounding	Check whether the ground wire PE is connected correctly
	Driver damaged	Change the driver

#### Alarm No.12: Over Current

Running Status	Cause	Solution
	Short circuit or poor contact between driver UVW	Check the wiring and measure whether the resistance between UVW is balanced
	Damaged motor insulation	Measure whether the insulation resistance between the UVW end of the driver and the PE of the ground wire is a megohm ( $M\Omega$ ) level value. Replace the motor if the insulation is poor.
	Improper gain setting, motor vibration	Making gain adjustments
	Control input command setting error	Check whether the control input command changes too drastically, modify the input command change rate or adjust the filtering parameters
	Poor grounding	Check whether the ground wire PE is connected correctly


	Driver damaged	Change the driver
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#### Alarm No. 13: Over Load

Running Status	Cause	Solution
Appears when the control power is turned on	Circuit board failure	Replace the servo driver
Appears during motor operation	Running Exceeds rated torque	Check load Reduce start-stop frequency Reduce torque limit Replace more powerful drives and motors
	Keep the brake open	Check holding brake
	Motor unstable oscillation	Adjust the gain Increase acceleration / deceleration time Reduce load inertia
	UVW has a phase break	Check the wiring

#### Alarm No. 14: Brake Fault


Running Status	Cause	Solution
Appears when the control power is turned on	Circuit board failure	Replace the servo driver
Appears during motor operation	Braking resistor disconnected	Check if the braking resistor is connected properly
	Braking resistor parameter setting is incorrect	Check PA51, PA69 and PA70 parameters
	Insufficient braking circuit capacity	Replace the braking resistor with smaller resistance and higher power Reduce start-stop frequency Increase the acceleration / deceleration time constant Reduce load inertia Replace more powerful drives and motors
	Main circuit power is too high	Check whether the deviation of the main power supply exceeds +/- 10% and see if the displayed value under the dP menu

		 is greater than 330V
Reduced motor insulation performance		Measure the resistance of the motor power line to PE and confirm whether the insulation resistance is above $2M\Omega$
Servo driver failure		Replace the driver

#### Alarm No. 15: Encoder Count Fault

Running Status	Cause	Solution
	Defective encoder Wrong number of encoder lines Encoder platter damage The encoder has a false Z signal (multiple Z pulses in one turn)	Replace the encoder
	Encoder wiring error	Check the wiring
	Poor grounding	Check whether the shielded ground wire is connected well

#### Alarm No. 16: Braking Resistor Braking Rate Is Too High

Running Status	Cause	Solution
	Braking resistor parameters are not set correctly	Check whether the parameters of PA51 (braking resistor selection), PA69 (external braking resistor resistance) and PA70 (external braking resistor power) are consistent with the actual external resistance parameters
	Braking resistor failure	Measure whether the resistance of the braking resistor is normal and replace it with a new one
	Main circuit input voltage is too high	Check whether the power supply 220V meets the following specifications: Effective value: 220V ~ 240V Allowable deviation: -10% ~ 10% (198V ~ 264V) Check if the displayed value under the dP menu  is greater than 330V
	Reduced motor insulation performance	Measure the resistance of the motor power line to PE and confirm whether the insulation resistance is above $2M\Omega$

	The external braking resistor resistance is too large, and the maximum braking energy cannot be completely absorbed.	Appropriately reduce the external braking resistor resistance and increase the external braking resistor power Increase the acceleration / deceleration time if allowed
	Servo driver failure	Replace the driver

#### Alarm No.18: Absolute Encoder Alarm

Running Status	Cause	Solution
	Incorrect encoder type setting	Check encoder type, check PA61 parameters
	Encoder cable connection is bad	Connect the encoder cable properly
	Encoder communication is subject to electromagnetic interference	Set PA38 to 8 and check whether the value displayed in the dP menu is 0. If it is not 0, it means that the encoder communication is disturbed. At this time, you need to check whether the encoder cable shield is connected reliably and the motor PE line is connected reliably.
	Encoder failure	Replace the servo motor
	Circuit board failure	Replace the servo driver

#### Alarm No.19: Absolute Encoder Battery Fault

Running Status	Cause	Solution
	Battery connection is bad, not connected	Check whether the battery is connected correctly and perform absolute encoder reset operation (PA80 is set to 1, do not save, power on again) After the alarm is cleared, the machine origin needs to be reset.
	Encoder communication is subject to electromagnetic interference	Set PA38 to 8 and check whether the value displayed in the dP menu is 0. If it is not 0, it means that the encoder communication is disturbed. At this time, you need to check whether the encoder cable shield is

		connected reliably and the motor PE line is connected reliably.
	The battery voltage is lower than the specified value (2.5V)	Replace the battery and power on again Perform absolute encoder reset operation (PA80 is set to 1, do not save, power on again) After the alarm is cleared, the machine origin needs to be reset.

#### Alarm No. 20: EEPROM Fault

Running Status	Cause	Solution
	Chip or circuit board damage	Replace the servo driver After repairing, you must reset the drive model (parameter PA1), and then restore the default parameters

#### Alarm No. 21: A Phase Current Sampling Error

Running Status	Cause	Solution
	Chip or circuit board damage	Replace the servo driver

#### Alarm No. 22: Parameter Is Out Of Range

Running Status	Cause	Solution
	Parameter setting value is out of the specified range	Check the dP menu to find the parameter number outside the range, modify the corresponding parameter value to the range, save it to the EEPROM, and power on again If multiple parameters are out of range, the above action needs to be repeated

#### Alarm No. 23: B Phase Current Sampling Error

Running Status	Cause	Solution
	Chip or circuit board damage	Replace the servo driver

#### Alarm No. 24: Absolute Encoder Parameter Read And Write Error

Running Status	Cause	Solution
	Motor parameters are not written in the motor EEPROM	Check if the motor is a Yuhai absolute motor Turn off automatic identification of absolute motor parameters (bit 2 of PA18 is set to 0), and manually set motor parameters

#### Alarm No. 25: Encoder AB Feedback Abnormal

Running Status	Cause	Solution
	PA78 is set too large, causing the feedback frequency to be higher than the normal feedback frequency	Adjust PA78 to appropriate value, the maximum feedback frequency is 2MHz
	Encoder feedback is disturbed	Check encoder connection and strengthen shielding

#### Alarm No. 26: IO Input Terminal Function Configuration Abnormal

Running Status	Cause	Solution
	Different IO input terminals are configured to the same function	Check the Fn0 ~ Fn9 parameters to see if there are 2 or more parameters that are the same

#### Alarm No. 27: Absolute Encoder Battery Alarm

Running Status	Cause	Solution
	The battery voltage is lower than the specified value (3.1V)	Replace the battery when the drive is powered on

#### Alarm No. 28: Absolute Encoder Communication Timeout Alarm

Running Status	Cause	Solution
	Encoder cable is not connected	Connect the encoder cable properly
	Incorrect encoder type setting	Check encoder type, check PA61 parameters
	Encoder wiring error	Correct encoder wiring
	Encoder failure	Replace the servo motor

	Circuit board failure	Replace the servo driver
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#### Alarm No.29: Torque Over Load

Running Status	Cause	Solution
	PA30, PA31 parameters are unreasonable	Change parameters
	Unexpected large load	Inspection machinery
	Motor holding brake failure	Check if the motor holding brake is open normally

#### Alarm No.30: Encoder Z Pulse Lost

Running Status	Cause	Solution
	Poor cable contact or shielding	Check the encoder interface circuit
	Encoder interface circuit failure	Replace the driver
	Z pulse does not exist, encoder is damaged	Replace the encoder

#### Alarm No.31: Encoder UVW Signal Error

Running Status	Cause	Solution
	Incorrect encoder type setting	Check encoder type, check PA61 parameters
	Poor cable contact or shielding	Check the encoder interface circuit
	Encoder interface circuit failure	Replace the driver
	Defective encoder UVW signal	Replace the motor or encoder

#### Alarm No.32: Encoder UVW illegally Encoded

Running Status	Cause	Solution
	Incorrect encoder type setting	Check encoder type, check PA61 parameters
	Poor cable contact or shielding	Check the encoder interface circuit
	Encoder interface circuit failure	Replace the driver
	Defective encoder UVW signal	Replace the motor or encoder

#### Alarm No.33: Dynamic Memory Allocation Error



Running Status	Cause	Solution
	Dynamic memory allocation error	Restarting the servo driver, still unable to solve, replace the servo driver

#### Alarm No. 34: Flash Read CRC Error

Running Status	Cause	Solution
	Flash read CRC error	Perform the operation of restoring default values and power on again Replace the servo driver

#### Alarm No. 35: Motor Adaptation Error

Running Status	Cause	Solution
After performing restore parameter defaults	Motor model or parameter setting error	Check PA1 parameters and confirm motor model
	Driver model error	Check PA2 parameters and confirm driver model
	The drive is not compatible with the servo motor	Contact the manufacturer or replace the matching driver or motor

#### Alarm No. 36: Watchdog Error

Running Status	Cause	Solution
	Software watchdog error	If restarting the driver does not solve the problem, replace the driver

#### Alarm No. 38: External Resistor Resistance Value Error

Running Status	Cause	Solution
	External braking resistor resistance is less than the minimum allowed value	Check the external braking resistor resistance and set the parameter PA69 (external braking resistor resistance) correctly.