**Dealer**

ADD: 23555 Golden Springs DR. K-1, Diamond Bar, CA
91765 USA
TEL: +1 800-585-1519
WEB: https://www.ato.com/
E-mail: sales@ato.com

All specifications and designs are subject to change without notice.

# User Manual

## AC servo driver

**Model: SG–□□A**
**0.2~5.5KW**

Please send the manual to the end user, and properly kept

SG-30A Series
POW
RUN

# Forword

Thank you for purchasing and using SG series servo driver which R&D and produced by Wenling Yuhai electromechanical CO.,LTD.SG series servo driver has high quality, multi-function and low noise ,and can control the servo motor’s position, speed acceleration and output torque very easily. The successful development of SG series servo driver has brought the infinite vitality to transmission control field .

SG series servo driver core using 32 bit CPU. realize the motor full digital control, and is the most competitive electrical driver products for mechanical manufacturing industry.

SG series universal servo driver, is developed based on the requirement of automation fields, including the control of position, speed and torque. It’s the preferred product of motion control field, such as CNC lathe, textile machinery, plastic machine, Paper-making industry and all kinds of automated assembly line.

Please read this manual carefully before using SG series servo drivers in order to use it correctly.Misuse may cause the driver run abnormally, malfunction or reduce the service life, and even personal injury accidents. So Reading this manual repeatedly, before using it and follow the instruction carefully, his manual is sent out along with the machine, please make sure it’s well kept, in order to use it in the future when the driver needs to repair and maintain.

# Safety information

Before the product storage, installation, wiring, running, inspection or maintenance, The user must be familiar with and comply with the following important items, to ensure to use this product safely.

**Warning :If operation is incorrect, a dangerous situation may occur, resulting in death or serious injuries.**

**Caution: If operation is incorrect, a dangerous situation may occur, resulting in injuries to personnel or damage to equipment.**

**Forbid: If operation is incorrect, damage to system or equipment may occur.**

## 1.Using occasions

**Danger**

- Forbid to use products in the place which is exposed to moisture, corrosive gas, combustible gas. Or it will cause electric shock or fire.
- Forbid to use products in the place of direct sunlight, dust, salt and more metal powder.
- Forbid to use products in the place with the dripping of water, oil and drug .

## 2.Wiring

**Danger**

- Please connect the ground terminal reliable grounding, or it may result in electric shock or fire.
- Do not connect the 220v driver to 380v power supply, otherwise it may cause equipment damage and electric shock or fire.
- Do not connect the U,V,W motor output terminal to three phase power supply, otherwise it will cause casualties or fire.
- Ensure U, V, W motor output terminal and motor wiring terminal U, V, W one-to-one correspondence connection, Otherwise motor may cause equipment damage and casualties by racing. Please tighten power and motor output terminal, otherwise may cause fire.
- Refer to the wire selection when wiring. otherwise may cause fire.

## 3.Operation

**Attention**

- Please set the parameters to proper value before running the mechanical equipment. Inappropriate value may cause the mechanical equipment out of control or malfunction.
- Before running the machine, please confirm that the emergency switch is available at any time to stop the machine.
- To avoid unnecessary loss, please check whether the servo motor is in a normal operation under no-load condition first, and make it loaded after that.
- Please do not turn the power on and off too frequently, otherwise it will cause the driver overheating inside.

# 4. Running

**Prohibition**

- Forbid to touch any rotating parts while the motor is running, otherwise may cause casualties.
- Forbid to touch drive and motor when running, otherwise may cause electric shock or burn.
- Forbid to move the connection cable while the motor is running , otherwise may cause personal injury or equipment damage.

# 5.Maintenance and repair

**Prohibition**

- Prohibit to touch the drive and motor internal, otherwise may cause electric shock
- Prohibit to open the drive panel when the power is on, otherwise it will cause electric shock.
- Do not touch the terminal within 5 minutes after the power is cut off, otherwise may cause electric shock by residual high voltage
- Prohibit to change the wiring when the power is on, otherwise may cause electric shock
- Prohibit to dismantle the servo motor, otherwise may cause electric shock

# 6.Range of application

**Attention**

The products referred in this manual are for general industrial use, do not use it in the device which may directly endanger the personal safety , such as nuclear-energy equipment, aerospace equipment, life support and maintenance equipment and various of safety devices. If you have needs as mentioned, please contact us.

# Catalog

**Chapter 1 Product inspection and installation** ........ 1

1.1 Product inspection ........ 1

1.2 Installation and wiring ........ 1

1.3 Installation ........ 2

1.4 Servo motor installation ........ 3

1.4.1 Ambient conditions of installation ........ 3

1.4.2 Installation method ........ 3

1.5 Definition of motor rotation direction ........ 4

**Chapter 2 Wiring** ........ 5

2.1 Wiring specification ........ 5

2.2 Wiring method ........ 5

2.3 Precautions ........ 6

2.4 Standard connection ........ 7

**Chapter3 Interface** ........ 8

3.1 Power terminal TB of servo driver ........ 8

3.2 Control signal input/output terminal CN1 ........ 9

3.3 The encoder signal input terminal CN2 ........ 15

3.4 Interface terminal configuration ........ 17

3.5 Input/output interface of switching volume ........ 17

3.5.1 Input interface of switching volume ........ 17

3.5.2 Output interface of switching volume ........ 18

3.5.3 Pulse volume input interface ........ 19

3.5.4 Analog input interface ........ 22

3.5.5 The encoder signal output interface ........ 23

3.5.6 Encoder Z phase signal open-collector output interface ........ 24

3.5.7 Servo motor photoelectric encoder input interface ........ 24

Chapter 4 Parameter ········ 25
4.1 Parameter list ········ 25
4.2 Parameter function ········ 28
Chapter 5 protection function ········ 45
5.1 Alarm list ········ 45
5.2 Alarm troubleshootings ········ 46
6.1 Keyboard operation ········ 54
6.1 Keyboard operation ········ 54
6.1.2 the first layer ········ 54
6.2 The sencond layer ········ 55
6.2.1 Monitoring mode ········ 55
6.2.2 Parameter setting ········ 57
6.2.3 Parameter management ········ 58
6.2.4 Trial speed run ········ 60
6.2.5 JOG run ········ 60
6.2.6 Analog automatic zero ········ 60
Charpert 7 Running ········ 61
7.1 Grounding ········ 61
7.2 Operation time sequence ········ 61
7.2.1 Power supply connection ········ 61
7.2.2 Time sequence of power on and alarm ········ 62
7.3 Mechanical brakes ········ 63
7.4 Precautions ········ 64
7.5 Trial run ········ 65
7.5.1 Check before running ········ 65
7.5.2 Trial run after power on ········ 65
7.6 User torque overload alarm function ········ 68
7.7 Adjustment ········ 68
7.8 FAQ ········ 69
7.8.1 Restore default parameters ········ 69
7.8.2 Frequent alarm Err-15, Err-30, Err-31, Err-32 ········ 71
7.8.3 POWER light can't light up ········ 71

Chapert 8 Specifications ········ 72
8.1 AC servo drive unit specifications diagram ········ 72
8.2AC servo drive unit installation size diagram ········ 72
8.3 AC servo drive unit specifications ········ 73
8.4 The comparison table of servo code parameters and motors ········ 74
8.5 Servo motor model ········ 76
8.6 Servo motor wiring ········ 76
8.6.1.1 Winding wiring(Aviation plug wire) ········ 76
8.6.1.2 Winding wiring( Plastic plug wire) ········ 76
8.6.2 Brake wiring ········ 76
8.6.3.1 Standard encoder(Aviation plug wire) ········ 77
8.6.3.2 Standard encoder(Plastic plug wire) ········ 77
8.6.4 Economic incremental encoder wiring ········ 78
8.7 Servo motor parameters ········ 78
8.7.1 60-S series servo motor parameters ········ 78
8.7.2 80-S series servo motor parameters ········ 79
8.7.3 80 series servo motor parameters ········ 79
8.7.4 90 series servo motor parameters ········ 80
8.7.5 110 series servo motor parameters ········ 80
8.7.6 130 series servo motor parameters ········ 81
8.7.7 180 series servo motor parameters ········ 81

**Appendix**

1.YUHAI CNC system connection ········ 82
2.KND CNC system connection ········ 83
3.GSK CNC system connection ········ 84
4.SIEMENS CNC system connection ········ 85

# Chapter 1 Product inspection and installation

## 1.1 Product inspection

Product has been taken a complete functional test before leaving the factory, In order to prevent products abnormal caused by negligence in the process of transporting, please check the following items in detail after opening it:

- Check whether the models of servo driver and servo motor are both the same models as ordered.
- Check whether the servo driver and servo motor have any damage and scratches in appearance, If any damage is found during transport, please do not wiring electrify.
- Check whether the servo driver and servo motor has loose phenomenon of parts. Whether it has a loose screw, or the screw is not strengthened or fallen off.
- Check whether the servo motor rotor shaft can manually be rotated,Motor with brake would not be rotated directly.

If any malfunction or abnormal phenomenon happened as mentioned above, please contact the dealer immediately.

## 1.2 Installation and wiring

- The installation of electrical control cabinet :

Considering the heating of electrical equipment in the electrical control cabinet, and the cooling condition of control cabinet. The surrounding temperature of servo motor will be rising. so considering the cooling of the drive and configuration of control cabinet long-term security working temperature should be below 40ºC.

- heat generating equipment near servo driver:

Working in high temperature conditions will cause the servo driver’s life cycle get reduced significantly, and may cause fault. So please make sure that the surrounding temperature is below 40ºC, while the servo motor is under the conditions of thermal convection and thermal radiation.

- Vibration equipment near servo driver:

  Please use a variety of vibration control measures to ensure that the servo driver is not affected by vibration, ensure that vibration is under 0.5G (4.9m/s2).

- servo driver used in bad environment:

  Severe environment, such as corrosive gas, damp, metal dust, water and processing liquid, makes the driver malfunction. So when installing the motor, please make sure that the driver is under good environment.

- Jamming equipment near servo driver:

  Jamming equipment near servo driver has great influence on the power line and the control line of the servo drive, which may cause the driver malfunction. Add noise filters and other various anti-interference measures, to ensure the driver is in normal condition, Note that adding noise filter will increase leakage current, in order to avoid this problem, you can use isolation transformers. Specially pay attention to that the driver control signal lines are susceptible to interference, there should be reasonable line and shielding measures.

## 1.3 Installation

- Installation direction:

  The normal installation direction is vertical upright direction

- Fixing installation :

  Please tighten up the two M5 screw behind the servo driver when in installation.

- Installation interval:

  The installation distance between servo drivers and other devices, please refer to figure 1.1, note that it's the minimum size that marked in the figure, in order to ensure the performance and the service life of the driver, please make sure there are enough interval space among devices.

- Cooling:

  Servo driver uses the natural cooling mode. Cooling fans must be installed in the electric control cabinet, and ensure that direction of wind is perpendicular to the direction of the radiator for servo drive.

- Installation caution:

  Prevent dust or iron scrap from entering into servo drive when installing the electrical control cabinet,

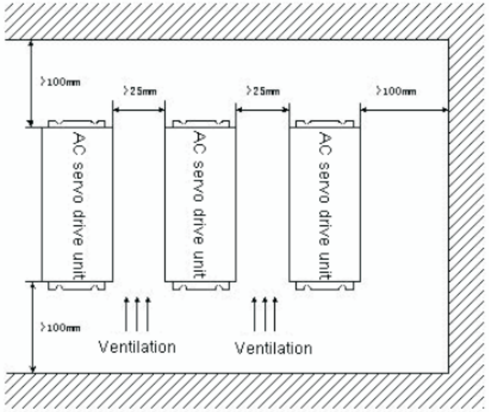


Diagram 1.1 servo driver installation

## 1.4 Servo motor installation

### 1.4.1 Ambient conditions of installation

- Ambient temperature: 0~40º C; Ambient humidity: below 80%( no frost )
- Storage temperature: -40~50º C; storage humidity: below 80% ( no frost )
- Vibration: < 0.5G (4.9m/s2)
- Place keep well ventilated、few moisture and few dust
- Environment with no corrosive, flammable gas, oil gas, cutting fluid, cutting powder, iron powder and so on.
- Place with no water vapor or direct sunlight

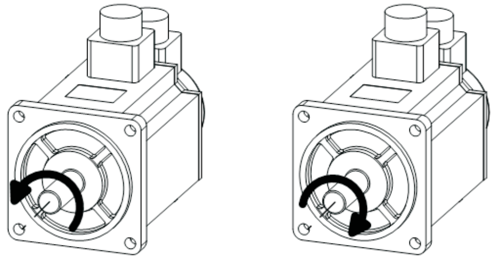
### 1.4.2 Installation method

- Horizontal installation: To avoid water, oil and other liquids into the interior from the motor wire end, please put cable outlet at the bottom.

- Vertical installation: If the motor shaft is installed upwards, and there has reducer, please pay attention to prevent the reducer's oil running through the motor shaft and getting into the internal of the motor.
- The motor should be long enough to stretch out, if not, the motor will be easy to get vibrated when it's in operation.
- When Installing and uninstalling the motor, please do not use hammer to knock the motor, otherwise it will be easy to cause the motor shaft and the encoder damaged.

## 1.5 Definition of motor rotation direction

Definition of motor rotation direction described in this manual: When facing the motor shaft extension, if the rotation of the axis is counter-clockwise(CCW), then it's called forward, if it's clockwise, then we call it reversal.



forword
Counterclockwise（CCW）

reverse
Clockwise（CW）

Diagram1.2 The definition of motor rotation direction

# Chapter 2 Wiring

## 2.1 Wiring specification

- Wire diameter: wire diameter of PE,R,S,T,U,V,W terminal : ≥1.5mm$^2$ （AWG14-16）， wire diameter of r、t terminal ≥0.75mm2（AWG18）
- The terminal is pre-insulated cold pressed terminal, be sure to connect it firmly.
- Recommended to use three-phase isolation transformer to supply power.

## 2.2 Wiring method

- Input/output signal wire and encoder signal wire: please use the recommended cable or similar shielded wire, the wiring length: Input/output signal wire below 3m,encoder signal wire below 20m. wiring should be in accordance with the shortest connection distance when wiring, the shorter the better, main circuit wiring and signal wire should be separated.
- Grounding wire must be thick grounds as one point servo motor grounding terminal and servo driver grounding terminal PE must be connected.
- To avoid misoperation caused by interference, it's recommended to install a noise filter, and notes:
  1)Noise filter, servo drive and upper controller should be installed as close as possible.
  2)Be sure to install surge suppressor in the coils of electromagnetic contactor, relay, brake, etc.
  3)Main circuit and signal wire shouldn't pass through in the same pipe and shouldn't be tied together.
- When strong interference sources is nearby(such as electric welding machine, EDM machine, etc.), please use isolation transformer on the input power supply to prevent misoperation caused by the interference.
- Please install the No Fuse Breaker (NFB),which can cut off the external power supply in time when the driver breaks down.
- Connect cable shielding layer correctly.

## 2.3 Cautions

- Drive U, V, W terminals must be connected to motor terminals U, V, W one-to-one correspondence, Please note that do not change the three-phase terminal to make motor reversal, as it’s totally different from asynchronous motor.
- Because the high frequency switching current flows through the servo motor ,so the leakage current is relatively large. The motor grounding terminal and servo driver grounding terminal PE must be connected together and grounded well.
- Because servo drive internal has a large capacity electrolytic capacitor, even if the power supply is cut off, there is still a high voltage in the internal circuit. So wait for at least 5 minutes to touch the drives and motors after the power is cut off.
- After the power is switched on ,the operator should keep a certain distance with the drive and motor.
- Please cut-off the power supply, if it’s not used for a long time.

## 2.4 Standard connection

### 2.4.1 Wiring of position/speed control mode

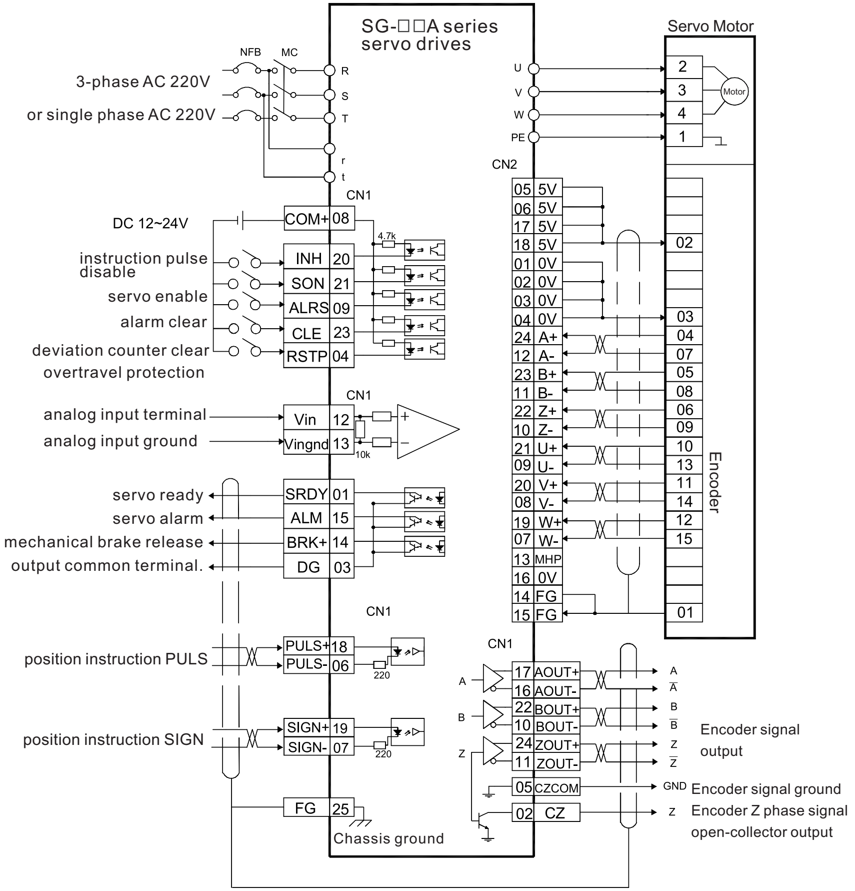

SG-□□A series
servo drives
Servo Motor
NFB
MC
3-phase AC 220V
or single phase AC 220V
R
S
T
r
t
U
V
W
PE
2
3
4
1
Motor
CN1
CN2
DC 12~24V
COM+ 08
4.7k
instruction pulse disable
servo enable
alarm clear
deviation counter clear
overtravel protection
INH 20
SON 21
ALRS 09
CLE 23
RSTP 04
analog input terminal
analog input ground
Vin 12
Vingnd 13
10k
servo ready
servo alarm
mechanical brake release
output common terminal.
SRDY 01
ALM 15
BRK+ 14
DG 03
position instruction PULS
PULS+ 18
PULS- 06
220
position instruction SIGN
SIGN+ 19
SIGN- 07
FG 25
Chassis ground
05 5V
06 5V
17 5V
18 5V
01 0V
02 0V
03 0V
04 0V
24 A+
12 A-
23 B+
11 B-
22 Z+
10 Z-
21 U+
09 U-
20 V+
08 V-
19 W+
07 W-
13 MHP
16 0V
14 FG
15 FG
02
03
04
07
05
08
06
09
10
13
11
14
12
15
01
Encoder
A
B
Z
17 AOUT+
16 AOUT-
22 BOUT+
10 BOUT-
24 ZOUT+
11 ZOUT-
05 CZCOM
02 CZ
A
$\overline{A}$
B
$\overline{B}$
Z
$\overline{Z}$
Encoder signal output
GND Encoder signal ground
Z Encoder Z phase signal open-collector output

Diagram 2.1 Wiring of position/speed control mode

# Chapter3 Interface

## 3.1 Power terminal TB of servo driver

| Terminal NO. | Terminal single | Signal name | Function |
|---|---|---|---|
| TB-1 | PE | System grounding | Ground terminal |
| TB-2 | R | Main circuit power input 3-phase AC220V | Main circuit power input terminal AC220V 50HZ<br>Attention: not connect with the output terminal UVW of the motor |
| TB-3 | S | | |
| TB-4 | T | | |
| TB-5 | U | Servo motor power output | The output power of the servo motor must be one-to-one correspondence connected with U, V, W terminal. |
| TB-6 | V | | |
| TB-7 | W | | |
| TB-8 | r | Control power input singal phase AC220 | Control input terminal of circuit power AC220V 50Hz |
| TB-9 | t | | |

Chat 3.1 Power terminal TB

## 3.2 Control signal input/output terminal CN1

Control mode abbreviate: P represents position control mode
S represents speed control mode

Table 3.2 Control signal input/output terminal CN1

| Terminal No. | Signal name | Mark | I/0 | Mode | Function |
|---|---|---|---|---|---|
| CN1-08 | Power supply Positive of input terminals | COM+ | Type1 | | Power supply positive of input terminals,used to drive the photoelectric coupler of the inputterminal .DC12-24v. current>100mA |
| CN1-21 | SRV-ON | SON | Type1 | P.S | Input terminal of servo enable.<br>SON ON:AC servo drive unit enable<br>SON OFF :AC servo drive unit off and disabled and the motor is in free state.<br>Note 1: The motor must be resting before it is switched from SON OFF to SON ON;<br>Note 2: Wait for at least 50ms before inputting new command after it is switched to SON ON.<br>Note 3:If open internal enabled, the SON signal don’t inspect. |
| CN1-09 | Alarm clear | ALRS | Type1 | P.S | Alarm clear input terminal<br>ALRS ON: alarm clear<br>ALRS OFF: alarm<br>Note :For the alarm whose code is more than 8 it can’t be cleared by this means. It needs to cut off the power for reparation and then repower. |

| Terminal No. | Signal name | Mark | I/0 | Mode | Function |
|---|---|---|---|---|---|
| CN1-23 | Deviator clear | CLE | Type1 | P | In the position control mode , parameter PA4=0. The function of this input terminal is position deviator clear.<br>CLE ON:position deviator clear in position control |
| | Speed selection 1 | SCI | Type1 | S | In the speed control mode parameter PA4=1,when select internal speed parameter PA22=0. The default value of input terminal is speed selection 1<br>The combination of SC1 and SC2 is used for selecting different internal speed in speed control mode<br>SC1 OFF,SC2 OFF: internal speed 1<br>SC1 ON,SC2 OFF: internal speed 2<br>SC1 OFF,SC2 ON:internal speed 3<br>SC1 ON,SC2 ON: internal speed 4<br>Note The values of internal speed 1～4can be modified by parameters. |
| | Zero speed | ZERO SPD | Type1 | S | In the speed control mode. parameter PA4=1,When select external analog speed parameter PA22=1, the default value.<br>ZEROSPD ON: No matter how much is the analog input, forced speed instruction is zero.<br>ZEROSPD OFF:Speed instruction is analog input values. |

| Terminal No. | Signal name | Mark | I/0 | Mode | Function |
|---|---|---|---|---|---|
| CN1-20 | Instruction pulse disable | INH | Type1 | P | In the position control mode, parameter PA4=0, Input terminal of position instruction pulse disable.<br>INH ON: input disable of instruction pulse<br>INH OFF: instruction pulse input valid |
| | Speed selection 2 | SC2 | Type1 | S | In the speed control mode, parameter PA4=1, when select internal speed parameter PA22=0. The default value of input terminal is speed selection 2<br>The combination of SC1 and SC2 is used for selecting different internal speed in speed control mode.<br>SC1 OFF,SC2 OFF: internal speed 1<br>SC1 ON,SC2 OFF: internal speed 2<br>SC1 OFF,SC2 ON: internal speed 3<br>SC1 ON,SC2 ON:internal speed 4 |
| CN1-01 | Servo ready output | SRDY | Type2 | P.S | Servo ready output terminal.<br>SRDY ON: If control and main power are normal, the AC servo drive unit has no alarm, the servo ready is set for ON;<br>If main power is not making, or the AC servo drive unit has an alarm, the servo ready is set for OFF. |

| Terminal No. | Signal name | Mark | I/O | Mode | Function |
|---|---|---|---|---|---|
| CN1-04 | Overtravel-protection | RSTP | Type1 | P.S | External joint overtravel protection signal. |
| CN1-15 | Servo alarm output | ALM | Type2 | P.S | Output terminal of servo alarm<br>ALM ON:If AC servo drive unit has no alarm, servo alarm is set for ON.<br>ALM OFF:If AC servo drive unit has an alarm, servo alarm is set for OFF. |
| CN1-14 | Positioning completion output: (Pos ition Control mode)<br>Speed in-position output (Speed control mode) | COIN | Type2 | P.S | Output terminal of positioning completion.<br>COIN ON: When the position deviator value is within the set positioning range, the positioning completion is set for ON, otherwise output OFF (output cut-off).<br>Instruction speed reach output terminal.<br>COIN ON: When the actual speed reaches or exceeds the speed specified, speed in-position is set for ON, otherwise the output OFF<br>NOTE: The interface is shared with BRK, the factory default BRK. Board need to jump line by using COIN function , let us know when make an order. |

---

| Terminal No. | Signal name | Mark | I/O | Mode | Function |
|---|---|---|---|---|---|
| CN1-14 | Mechanical brake release | BRK | Type2 |  | When the motor has the mechanical brake (lose electric retainer), can use this terminal to control brake.<br>BRK ON: Brake is powered on, brake is invalid, the motor can run<br>BRK OFF: Brake is cut-off, brake is effective, motor was locked and can not run<br>Note 1:The BRK function is ciontrolled<br>Note2:The interface is shared with COIN, factory default is BRK. |
| CN1-18 | PLUS input of instructi | PLUS+ | Type3 | P | Input terminals of external instruction pulse<br>Note 1: The pulse input mode is set by parameter 14.<br>① PA14=0,instruction pulse +sign mode<br>② PA14=1,CCW/CW instruction pulse mode.<br>③PA14=2, 2-Phase instruction pulse mode |
| CN1-06 |  | PLUS- |  |  |  |
| CN1-19 | Instruction pulse SIGN input | SIGN+ | Type3 | P |  |
| CN1-07 |  | SIGN- |  |  |  |
| CN1-12 | Analog input | VIN | Type4 | S | Extern alanalog speed instruction input terminal, the input impedance of 10 KΩ,-10V+10V of input range.Differences mode,input range:-10v +10v |
| CN1-13 | Analog input grounding | VINGND |  |  | Analog input ground lead |

| Terminal No. | Signal name | Mark | I/O | Mode | Function |
|---|---|---|---|---|---|
| CN1-17 | A phase signal of encoder | AOUT+ | Type5 | | EncoderABZ signal differential drive output (26LS31 output, the same as RS422 ).<br>● Non-isolatedoutput ( noninsulated ) |
| CN1-16 | | AOUT- | | | |
| CN1-22 | B phase signal of encoder | BOUT+ | Type5 | | |
| CN1-10 | | BOUT- | | | |
| CN1-24 | Z phase signal of encoder | ZOUT+ | Type5 | | |
| CN1-11 | | ZOUT- | | | |
| CN1-02 | encoder z-phase signal open collector output | CZ | Type6 | | Encoder z signal occurs, output ON, otherwise output OFF<br>●Non-isolatedoutput ( noninsulated )<br>●In the upper machine, Z signal pulse is very narrow, so please use high-speed photoelectric coupler to receive |
| CN1-05 | Common terminal of encoder Z-phase output | CZCOM | | | Common terminal of encoder Z phase |

| Terminal No. | Signal name | Mark | I/O | Mode | Function |
|---|---|---|---|---|---|
| CN1-25 | Shieding ground | FG | | | Shied the ground terminal |

## 3.3 The encoder signal input terminal CN2

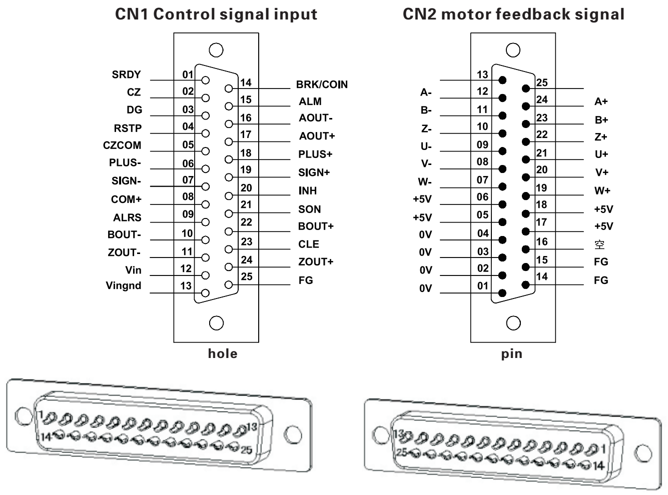
Table 3.3 The encoder signal input terminalCN2

| Terminal No. | Signal name | Function | | |
|---|---|---|---|---|
| | | Mark | I/O | Description |
| CN2-05<br>CN2-06<br>CN2-17<br>CN2-18 | Power supply output (+) | +5V | | The servo motor photoelectric encoder is employed with +5V power supply; multi-core cable in parallel are used as the length of cable is too long. |
| CN2-01<br>CN2-02<br>CN2-03<br>CN2-04 | Power supply output (-) | OV | | |
| CN2-24 | Encoder A+ input | A+ | Type7 | Connecting with servo motor photoelectric encoderA+ |
| CN2-12 | Encoder A- input | A- | | Connecting with servo motor photoelectric encode A- |
| CN2-23 | Encoder B+ input | B+ | Type7 | Connecting with servo motor photoelectric encodeB+ |
| CN2-11 | Encoder B- input | B- | | Connecting with servo motor photoelectric encode B- |
| CN2-22 | Encoder Z+ input | Z+ | Type7 | Connecting with servo motor photoelectric encode Z+ |
| CN2-10 | Encoder Z- input | Z- | | Connecting with servo motor photoelectric encode Z- |

| Terminal No. | Signal name | Function | | |
|---|---|---|---|---|
| | | Mark | I/O | Description |
| CN2-21 | Encoder U+ input | U+ | Type7 | Connecting with servo motor photoelectric encodeU+ |
| CN2-09 | Encoder U- input | U- | | Connecting with servo motor photoelectric encode U- |
| CN2-20 | Encoder V+ input | V+ | Type7 | Connecting with servo motor photoelectric encodeV+ |
| CN2-08 | Encoder V- input | V- | | Connecting with servo motor photoelectric encode V- |
| CN2-19 | Encoder W+ input | W+ | Type7 | Connecting with servo motor photoelectric encode W+ |
| CN2-07 | Encoder W- input | W- | | Connecting with servo motor photoelectric encodeW- |
| CN2-15<br>CN2-14 | Shielding ground | FG | Type7 | Shield the ground terminal |
| CN2-13 | Full | | | |
| CN2-16 | Full | | | |
| CN2-25 | Full | | | |

## 3.4 Interface terminal configuration

Diagram 3.1 is servo driver interface terminal configuration diagram. Among them,CN2 is DB25 connector, socket is hole type, plug is pin type; CN1 is also for DB25 connector, but socket is pin type, plug is hole type.


CN1 Control signal input
SRDY 01
CZ 02
DG 03
RSTP 04
CZCOM 05
PLUS- 06
SIGN- 07
COM+ 08
ALRS 09
BOUT- 10
ZOUT- 11
Vin 12
Vingnd 13
14 BRK/COIN
15 ALM
16 AOUT-
17 AOUT+
18 PLUS+
19 SIGN+
20 INH
21 SON
22 BOUT+
23 CLE
24 ZOUT+
25 FG
hole
CN2 motor feedback signal
13
A- 12
B- 11
Z- 10
U- 09
V- 08
W- 07
+5V 06
+5V 05
0V 04
0V 03
0V 02
0V 01
25
24 A+
23 B+
22 Z+
21 U+
20 V+
19 W+
18 +5V
17 +5V
16 空
15 FG
14 FG
pin
1
13
14
25
13
1
25
14

CN1 solder pin distribution

CN2 solder pin distribution

Diagram 3.1 servo driver interface terminal

## 3.5 Input/output interface of switching volume

### 3.5.1 Input interface of switching volume

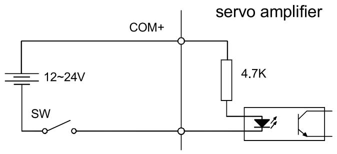
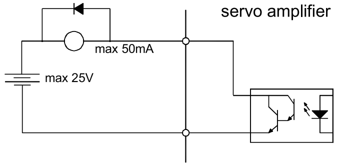

servo amplifier
COM+
12~24V
4.7K
SW

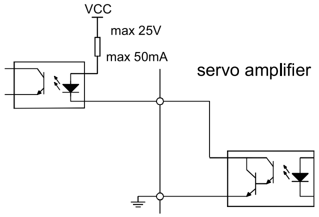
Diagram 3.2 Input interface of switching volume

- Power supply is provided by user, DC12～24V, current≥100mA;
- Note: If current polarity reversed, the servo drive unit will not run.

## 3.5.2 Output interface of switching volume



A relay connection



B Photoelectric coupler connection

Diagram 3.3 Output interface of switching volume

- Output Bit darlington tube should be connect with a relay or photovoltaic coupler.
- External power supply is provided by user; if its polarity reversed, the drive unit will be damaged.
- The output mode is the open collector form, and its max. current is 50mA, external max.power supply voltage is 25V. So the load of switching volume output signal must conform to these restrictions. If the load exceeds them or the output is connected directly with power supply, the servo drive unit may be damaged.
- If the load is an inductive one such as relay, the both terminals of load must be connected with freewheeling diode in parallel reversely. If the freewheeling diode isconnected reversely, the servo drive unit may also be damaged.
- The output transistor is darlington tube ,when conducting, voltage drop Vce between the collector and the emitter is about 1v, which can not meet the requirement of the TTL low level. So it can't connect directly with TTL integrated circuits.

---

## 3.5.3 Pulse volume input interface

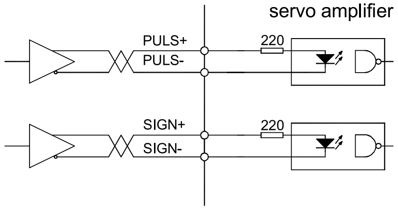


Diagram 3.4 Type3 Differential drive mode of pulse volume input interface

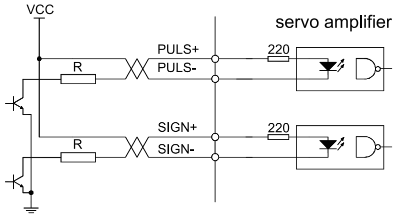


Diagram 3.5 Type3 Single terminal drive mode of pulse volume input interface

- Differential drive mode is recommended to be used to transmit pulse data.
- AM26LS31, MC3487 or the similar RS422 linear driver are employed in the differential drivemode.
- Action frequency will be reduced in single terminal drive mode. Decide the value of resistance R according to the pulse input circuit, the 10～15mA drive current and the max.25V voltage of the external power. Practical data: VCC=24V, R=1.3K～2K; VCC=12V, R=510～820Ω; VCC=5V, R=82～120Ω.
- In single terminal drive mode, the external power supply is provided by user. And if its polarity is connected reversely, the servo drive unit may be damaged.
- Refer to diagram 3.4 about pulse input form, arrowhead represents counting edge, and pulse input time sequence and parameter are shown in Diagram 3.5. When using 2-phase input form, the 4 -times frequency pulse frequency ≤500kHz.

Diagram 3.4 Pulse input form

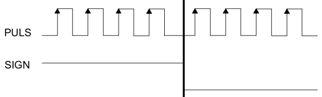
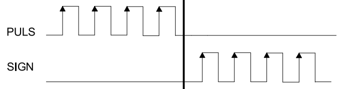
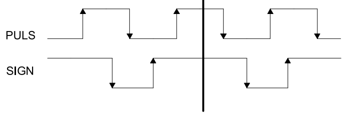
| Pulse instruction form | CCW | CW | Parameter setting values |
|---|---|---|---|
| Pulse string<br>Sign string |  |  | 0<br>Instruction pulse +signal |
| CCW pulse string<br>CW pulse string |  |  | 1<br>CCW pulse /<br>CW pulse |
| A-phase pulse train<br>B-phase pulse train |  |  | 2<br>2-phase instruction pulse |

Diagram 3.5 Time sequence parameter of pulse input

| parameters | difference drive input | single-ended drive input |
|---|---|---|
| $t_{ck}$ | >2μS | >5μS |
| $t_h$ | >1μS | >2.5μS |
| $t_l$ | >1μS | >2.5μS |
| $t_{rh}$ | <0.2μS | <0.3μS |
| $t_{rl}$ | <0.2μS | <0.3μS |
| $t_s$ | >1μS | >2.5μS |
| $t_{qck}$ | >8μS | >10μS |
| $t_{qh}$ | >4μS | >5μS |
| $t_{ql}$ | >4μS | >5μS |
| $t_{qrh}$ | <0.2μS | <0.3μS |
| $t_{qrl}$ | <0.2μS | <0.3μS |
| $t_{qs}$ | >1μS | >2.5μS |

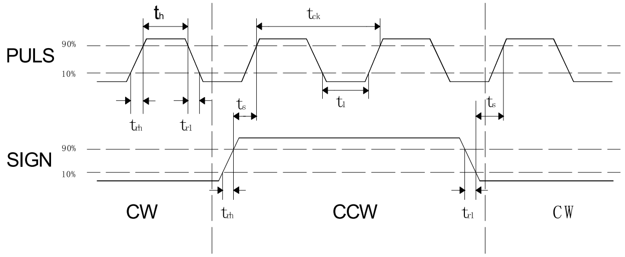

th
tck
PULS
90%
10%
trh
trl
ts
tl
ts
SIGN
90%
10%
CW
trh
CCW
trl
CW

chart 3.6 Time sequence of pulse +sign input interface (max. pulse frequency 500kHz)

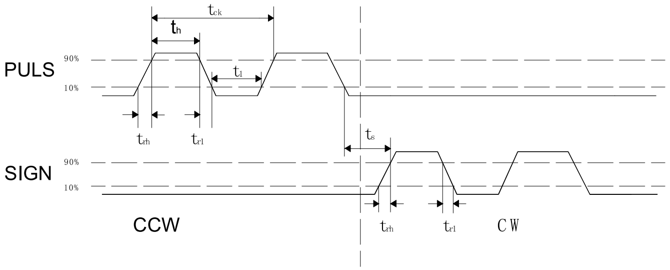

tck
th
PULS
90%
10%
tl
trh
trl
ts
SIGN
90%
10%
CCW
trh
trl
CW

chart 3.7 Time sequence of CCW/CW pulse input interface (max. pulse frequency 500kHz)

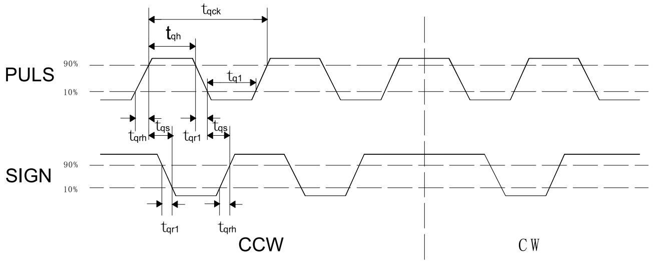

tqck
tqh
PULS
90%
10%
tq1
tqrh
tqs
tqr1
tqs
SIGN
90%
10%
tqr1
tqrh
CCW
CW

chart3.8 Time sequence of 2 phase instruction pulse pulse input interface (max. pulse frequency 125kHz)

## 3.5.4 Analog input interface

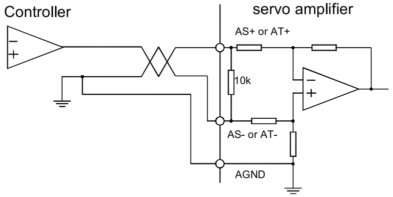

Controller
servo amplifier
AS+ or AT+
10k
AS- or AT-
AGND

Diagram 3.9a Differential analog input interface(type4)

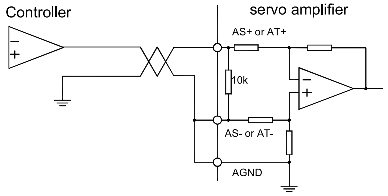

Controller
servo amplifier
AS+ or AT+
10k
AS- or AT-
AGND

Diagram 3.9b Single-ended analog input interface(type4)

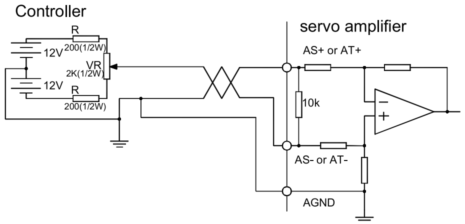

Controller
R
12V
200(1/2W)
VR
2K(1/2W)
12V
R
200(1/2W)
servo amplifier
AS+ or AT+
10k
AS- or AT-
AGND

Diagram 3.9c Analog differential potentiometer input interface(type4)

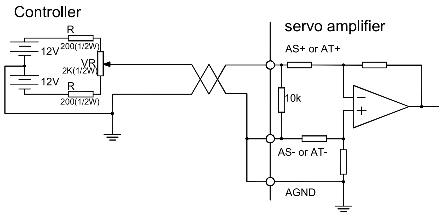

Controller
R
12V
200(1/2W)
VR
2K(1/2W)
12V
R
200(1/2W)
servo amplifier
AS+ or AT+
10k
AS- or AT-
AGND

Diagram 3.9d Analog Single-ended potentiometer input interface(type4)

- Analog input interface is the differential mode, according to the different connection, can be connected into two forms: the input impedance is10KΩ. The input voltage range is -10V~+10V。
- In differential mode, analog ground and input end are connected near the controller, between the controller and the drive needs three wiring to connect.
- In the single-ended mode, analog ground and input end are connected near the driver, between the controller and the drive needs two wiring to connect.
- The performance of differential connection is more excellence than the performance of single end connection, It can restrain common mode interference.
- The input voltage range can not be out of -10V~+10V, otherwise it might damage the driver.
- Recommend to connect by shielded cable to reduce noise interference.
- It is normal that the analog input interface has a zero bias, compensate for the zero bias by adjusting the parameters of Pa45.
- Analog interface is not isolated (noninsulated)

## 3.5.5 The encoder signal output interface

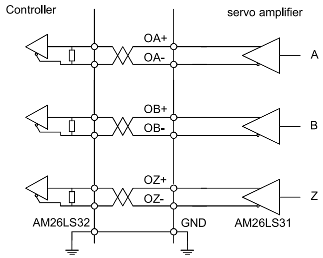

Controller
servo amplifier
OA+
OA-
A
OB+
OB-
B
OZ+
OZ-
Z
AM26LS32
GND
AM26LS31

Diagram 3.10a Photoelectric encoder output interface（Type5）

- The encoder signal output through the differential driver (AM26LS31) .
- The input terminal of the controller can use AM26LS32 receiver, must connect the terminal resistance, about 330Ω.
- The ground controller and GND must be reliable connection .
- Non isolated output.
- The input terminal of the controller can also use photoelectric coupler to receive, it must be high speed photoelectric coupler .(such as 6N137） .

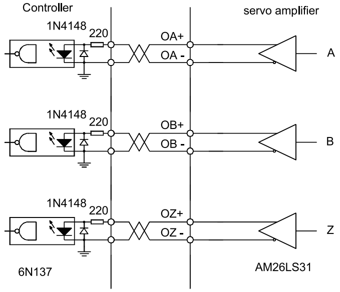

Controller
servo amplifier
1N4148
220
OA+
OA -
A
1N4148
220
OB+
OB -
B
1N4148
220
OZ+
OZ -
Z
6N137
AM26LS31

Diagram 3.10 b Photoelectric encoder output interface（Type5）

## 3.5.6 Encoder Z phase signal open-collector output interface

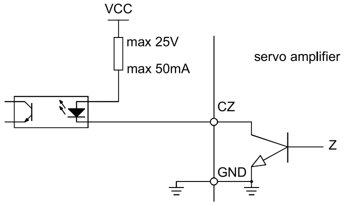

VCC
max 25V
max 50mA
servo amplifier
CZ
Z
GND

Diagram 3.11 Photoelectric encoder output interface（Type6）

- Encoder Z phase signal output with the open-collector ,when Z phase signal occurs , output ON , otherwise output OFF
- Non-isolated output (noninsulated).
- In the upper machine, Z phase signal pulse is usually very narrow, so please use the photoelectric coupler to receive (such as 6N137).

## 3.5.7 Servo motor photoelectric encoder input interface

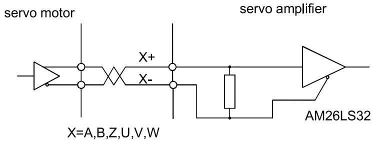

servo motor
servo amplifier
X+
X-
AM26LS32
X=A,B,Z,U,V,W

Diagram 3.12 Servo motor photoelectric encoder input interface

# Chapter 4 Parameter

## 4.1 Parameter list

Values set by factory in Diagram 4.1 are applicable for the AC servo drive unit matching YUHAI 110SY-M04030 motor. The parameters for different motors are not identical.

Diagram 4.1 User parameter list

| No. | Name | Applicable mode | Range | Value set by factory | Units |
|---|---|---|---|---|---|
| 0 | Password | P，S， | 0~9999 | 315 | |
| 1 | Model code | P，S， | 0~51 | 30* | |
| 2 | Software version (read-only) | P，S， | * | * | |
| 3 | Initial display state | P，S， | 0~21 | 0 | |
| 4 | Control mode selection | P，S， | 0~6 | 0 | |
| 5 | Speed proportional gain | P， S | 5~2000 | 150* | Hz |
| 6 | Speed integration time constant | P， S | 1~1000 | 20* | ms |
| 7 | Torque instruction filter | P，S， | 20~500 | 100 | % |
| 8 | Speed detecting Lowpass filter | P， S | 20~500 | 100 | % |
| 9 | Position proportional gain | P | 1~1000 | 40 | 1/s |
| 10 | Position feedforward gain | P | 0~100 | 0 | % |
| 11 | Lowpass filter cutoff frequency of Position feedforward | P | 1~1200 | 300 | Hz |
| 12 | Frequency division numerator of position instruction pulse | P | 1~32767 | 1 | |
| 13 | frequency division denominator of position instruction pulse | P | 1~32767 | 1 | |
| 14 | Position instruction pulse input mode | P | 0~2 | 0 | |

| No. | Name | Applicable mode | Parameters range | Factory value | Units |
|---|---|---|---|---|---|
| 15 | position instruction pulse reverse direction | P | 0~1 | 0 | |
| 16 | Positioning completion range | P | 0~30000 | 20 | pulse |
| 17 | Position out-of-tolerance detection range | P | 0~30000 | 400 | ×100 pulse |
| 18 | Position out-of-tolerance invalid | P | 0~1 | 0 | |
| 19 | Position instruction smooth filter | P | 0~30000 | 0 | 0.1ms |
| 20 | Driving stop input invalid | P，S， | 0~1 | 0 | |
| 21 | JOG running speed | S | -3000~3000 | 120 | r/min |
| 22 | Inside /outside speed instruction selection | S | 0~2 | 1 | |
| 23 | Maximum speed limit | P，S， | 0~4000 | 3600 | r/min |
| 24 | internal speed 1 | S | -3000~3000 | 0 | r/min |
| 25 | internal speed 2 | S | -3000~3000 | 100 | r/min |
| 26 | internal speed 3 | S | -3000~3000 | 300 | r/min |
| 27 | internal speed 4 | S | -3000~3000 | -100 | r/min |
| 28 | In-position speed | S | 0~3000 | 500 | r/min |
| 29 | Analog torque instruction input gain | T | 10~100 | 30 | 0.1V/100% |
| 30 | User torque overload alarm value | P，S， | 1~300 | 300 | % |
| 31 | User torque overload alarm detection time | P，S， | 0~32767 | 0 | ms |
| 32 | Control mode switch allows | P，S， | 0~1 | 0 | |
| 33 | Analog input torque instructions reverse direction | T | 0~1 | 0 | |
| 34 | Internal CCW torque limit | P，S， | 0~300 | 300* | % |

| No. | Name | Applicable mode | Parameters range | Factory value | Units |
|---|---|---|---|---|---|
| 35 | Internal CW torque limit | P，S， | -300~0 | -300* | % |
| 36 | External CCW torque limit | P，S， | 0~300 | 100 | % |
| 37 | External CW torque limit | P，S， | -300~0 | -100 | % |
| 38 | Trial Speed 、JOG torque limit | S | 0~300 | 100 | % |
| 40 | Acceleration time constant | S | 1~10000 | 0 | ms |
| 41 | Deceleration time constant | S | 1~10000 | 0 | ms |
| 42 | S mode acceleration/ deceleration time constant | S | 1~1000 | 0 | ms |
| 43 | Analog speed instruction gain | S | 10~3000 | 300 | (r/min)/V |
| 44 | Analog speed reverse direction | S | 0~1 | 0 | |
| 45 | Analog speed instruction Zero deviation compensation | S | -5000~5000 | 0 | |
| 46 | Analog speed instruction filter | S | 0~1000 | 300 | Hz |
| 47 | Mechanical brake action setting when motor stops | P，S， | 0~200 | 0 | ×10ms |
| 48 | Mechanical brake action setting as motor running | P，S， | 0~200 | 50 | ×10ms |
| 49 | Mechanical brake action setting as motor running | P，S， | 0~3000 | 100 | r/min |
| 51 | Dynamic electric gear effective | P | 0~1 | 0 | |
| 52 | The second position Instruction pulse frequency division molecular | P | 1~32767 | 1 | |
| 53 | The lower 4 bits input terminal forced ON control word | P，S， | 0000~1111 | 0000 | binary system |
| 54 | High 4 input terminal forced ON control word | P，S， | 0000~1111 | 0000 | binary system |

| No. | Name | Applicable mode | Parameter range | Factory value | Units |
|---|---|---|---|---|---|
| 55 | The lower 4 bits input terminal inverted control word | P，S， | 0000~1111 | 0000 | binary system |
| 56 | High 4 input terminal reverted control word | P，S， | 0000~1111 | 0000 | binary system |
| 57 | Output terminal reverted control word | P，S， | 0000~1111 | 0000 | binary system |
| 58 | Input terminal clear away jitter time constant | P，S， | 1~1000 | 16 | 0.1ms |
| 59 | Demo running | P，S | 0~1 | 0 | |

## 4.2 Parameter function

Diagram 4.2 Parameter function.

| No. | Name | Function | Parameter range |
|---|---|---|---|
| 0 | password | ● It is used to prevent the parameter to be modified by mistake. Usually set this parameter for a required password and then set the parameter to be modified. After debugging, set this parameter for 0 to ensure it not to be modified by mistake later.<br>● The password is classified into several levels which correspond to user parameter, system parameter and all the other parameters.<br>● Use the model password to modify model parameter (Pa1)and the model parameter can't be modified by other password.<br>● The user password is 315.<br>● The drive unit model password is 385. | 0~9999 |
| 1 | Model code | ● It corresponds to the AC servo driver unit and motor withdifferent power level in the same series.<br>● Different models correspond to different parameter default value. Ensure the parameter is right when using default parameter recovery function.<br>● This parameter should be set again after reparation for EEPROM alarm (No.20), then recover the default. | 0~51 |

| No. | Name | Function | Parameter range |
|---|---|---|---|
| | | parameter. Or else the drive unit may act abnormally or bedamaged.<br>● First set the password(parameter PA0) for 385, then modify this parameter.<br>●Refer to chapter 8.4 for the parameters significance.<br>●Refer to chapter 7.13.1 for the operation of recover the factory default parameter | |
| 2 | Software version (read-only) | Software version can be viewed but cannot be modified. | |
| 3 | Initial display state | Select display state after the AC servo driver unit is powered on.<br>0:Motor speed display;<br>1:Current position lower 5-bit display;<br>2:Current position higher 5-bit display;<br>3:Position instruction (instruction pulse accumulation ) lower<br>5-bit display;<br>4:Position instruction (instruction pulse accumulation ) higher<br>5-bit display;<br>5:Position error lower 5-bit display;<br>6:Position error higher 5-bit display;<br>7:Motor torque display;<br>8:Motor current display;<br>9:Linear speed display;<br>10:Control mode display;<br>11:Position instruction pulse frequency display;<br>12:Speed instruction display;<br>13:Torque instruction display;<br>14:Rotor absolute position display in one revolution;<br>15:Input terminal state display;<br>16:Output terminal state display;<br>17:Encoder input signal display;<br>18:Running state display;<br>19:Alarm code display;<br>20:Reserved. | 0~20 |
| 4 | Control mode selection | Set control mode of drive unit by this parameter:<br>0: Position control mode;<br>1: Speed control mode<br>2: Trial run control mode;<br>3: JOG control mode; | 0~6 |

| No. | Name | Function | Parameter range |
|---|---|---|---|
| | | 4：Encoder zeroing mode;<br>5：Open loop mode(for motor and encoder test)<br>6: Torque control mode;<br>● Position control mode Position instruction is input from the pulse input interface.<br>● Speed control mode Speed instruction is input from the input terminal or analog input, determined by the parameters PA22. The internal speed is selected by the combination of SC1 and Sc2.<br>SC1 OFF，SC2 OFF：internal speed 1<br>SC1 ON，SC2 OFF：internal speed 2<br>SC1 OFF，SC2 ON：internal speed 3<br>SC1 ON，SC2 ON：internal speed 4<br>● Trial run control mode Speed instruction is input from the keyboard, which is used for drive unit and servo motor test.<br>● JOG control mode In this mode, pressing down ↑ key andholding it on, the motor runs by JOG speed, releasing the key, the motor stops and keeps zero speed; pressing down ↓ key and holding it on, the motor runs reversely by JOG speed; releasing the key, the motor stops and keeps zero speed.<br>● Encoder zeroing mode It is used for encoder factory zeroing adjustment of motor. | |
| 5 | Speed proportional gain | ●Set the proportional gain of speed loop regulator.<br>●The bigger the setting value is, and the higher the gain is, the bigger the rigidity is. The parameter value is defined by specific AC servo driver unit model and load. Generally, the bigger the load inertia， the bigger the setting value is.<br>● Set the bigger value if there is no oscillation in system. | 5~2000Hz |

| No. | Name | Function | Parameter range |
|---|---|---|---|
| 6 | Speed integral time constant | ●Set integral time constant of speed loop regulator.<br>● The smaller the setting value is, the faster the integral speed is, The stronger the system resistance deviation is, the bigger the rigidity is, but too small will be produce overshoot. | 1~1000ms |
| 7 | Torque filter | ● Set the torque instruction filter characteristic.<br>●It can suppress the resonance resulted by torque (piercing noise from motor).<br>● The smaller the value is and the lower the cut-off frequency is, the smaller the noise from the motor is. If the load inertia is too large, reduce the setting value properly. If the value is too small, the response will be slow which may cause instability.<br>● The larger the value is and the higher the cut-off frequency is, the faster the response is. If a higher mechanic rigidity is needed, increase the setting value properly. | 20~500% |
| 8 | Speed detection lowpass filter | ● Set speed detecting lowpass filter characteristics.<br>●The smaller the setting value is, the lower the cut-off Frequency is, the smaller the motor noise is. Properly reduce setting value if the load inertia is too large. If the value is too small, the response will be slow which may causeoscillation.<br>● The larger the value is and the higher the cut-off frequency is, the faster the speed feedback response is. Properly increase setting value if faster speed response is needed. | 20~500% |

| No. | Name | Function | Parameter range |
|---|---|---|---|
| 9 | Position the proportional gain | ● Set proportional gain of position loop regulator.<br>● The larger the setting value is, the higher the gain is, and the larger the rigidity is in the same frequency instruction pulse, the smaller the position lag is. If the value is too large, the oscillation or overshooting may occur.<br>● The parameter value is defined by specific servo driver unit model and load. | 1~1000/s |
| 10 | Position feedforward gain | ● Set the feedforward gain of the position loop.<br>● If it is set for 100%, it means the position lag is always 0 in any instruction pulse frequency.<br>● If the feedforward gain of the position loop increases, the quick response characteristic of the control system will be enhanced. But it will make the system position loop unstable and oscillation may occur.<br>● Unless the high response characteristic is needed, the feed forward gain of the position loop is usually 0. | 0~100% |
| 11 | Lowpass filter cut-off frequency of position feedforward | ● set the cut-off frequency of lowpass filter of position loop feedforward.<br>●The filter is used for enhancing the stability of complex position control | 1~1200Hz |

| No. | Name | Function | Parameter range |
|---|---|---|---|
| 12 | Frequency division numerator of position instruction pulse | ●Set frequency division/multiplication (electronic gear) of position instruction pulse.<br>● In position control mode, various pulse resource can be conveniently matched by parameter PA12,PA13 setting to get a desirable control resolution( i.e. angle/pulse) by user.<br>●$P \times G = N \times C \times 4$<br>P: pulse amount of input instruction;<br>G: electronic gear ratio; G= frequency division numerator / frequency division denominator<br>N： motor rotating circles;<br>C： photoelectric encoder pulses/rev, this system C=2500<br>●For example: If the input instruction pulse is 6000, and servo motor revolution is 1:<br>$G = N \times C \times 4 / P = 1 \times 2500 \times 4 / 6000 = 5/3$ then parameter PA12 is set for 5 and PA13 is set for 3.<br>●Electronic gear ratio for the recommended range : $1/50 \leqslant G \leqslant 50$ | 1~32767 |
| 13 | Frequency division denominator of position instruction pulse | Refer to parameter PA12 | 1~32767 |

| No. | Name | Function | Parameter range |
|---|---|---|---|
| 14 | Position instruction pulse input mode | ● Set the input mode of position instruction pulse.<br>● 3 input modes by parameter setting:<br>0: pulse + sign<br>1: CCW pulse/CW pulse<br>2: 2 phase positive and negative pulse input.<br>● Viewed from the servo motor shaft axially, the counterclockwise rotation is defined as negative.<br>● Viewed from the servo motor shaft axially, the clockwiserotation is defined as negative. | 0~2 |
| 15 | Position instruction pulse reverse direction | Set for:<br>0: normal<br>1: position instruction pulse reverse direction | 0~1 |
| 16 | Positioning completion range | ● Set positioning completion pulse range in position control mode.<br>●This parameter provides factors for the drive unit judging whether the positioning is completed in position control. When the remaining pulses in position deviator is less than or equal to the setting value by this parameter, the drive unit defaults that the positioning is completed and the signal for it is COIN ON, otherwise, it is COIN OFF.<br>● It outputs positioning completion signal COIN in position control mode, and speed in-position signal SCMP in other control mode. | 0~30000pulse |
| 17 | Position out-of-tolerance detection range | ● Set the range of position out-of-tolerance alarm detection.<br>● In position control mode, the drive unit gives position out-of-tolerance alarm when the counting value of position deviator exceeds this parameter setting value. | 0~30000 × 100 pulse |

| No. | Name | Function | Parameter range |
|---|---|---|---|
| 18 | Position out-of-tolerance error invalid | Set for:<br>0：The detection of position out-of-tolerance alarm is valid.<br>1： The detection of position out-of-tolerance alarm is invalid,<br>and stop detecting the position out-of-tolerance fault. | 0~1 |
| 19 | Position instruction smooth filter | ● It filters the instruction pulse smoothly, which has an exponential acceleration/deceleration. Its value represents the time constant.<br>● The filter doesn't lose input pulse, but the instruction lag may occur.<br>● The filter is used for:<br>1.Super ordination controller has no acceleration/deceleration function;<br>2.The frequency division/multiplication of the electronic gear is large(>10)<br>3.The instruction frequency is low;<br>4.Motor step leap or unstability may occur in the running.<br>●If it is set for 0, the filter doesn't act. | 0~30000 × 0.1ms |
| 20 | Drive stop input invalid | Set for<br>0:For CCW, CW input disable valid. As the CCW drive switch(FSTP)is ON, CCW drive is enabled; as the CCW drive switch (FSTP) is OFF, the reverse torque in CCW direction is held for 0; vice versa for CW. If CCW, CW drive switch are both OFF, the drive input fault alarm will be issued.<br>1:For CCW, CW input disable cancel. No matter the CCW, CW drive switches are in any mode, the CCW, CW drive are both allowed. If the CCW, CW drive switches are both OFF, no drive input fault alarm is issued. | 0~1 |

| No. | Name | Function | Parameter range |
|---|---|---|---|
| 21 | JOG running Speed | Set the JOG running speed | -3000~3000<br>r/min |
| 22 | Internal and external speed instruction selection | Set for :<br>0:speed instruction selected from internal speed.<br>1:speed instruction selected from external analog input.<br>2:speed instruction selected from external analog input. Single polarity 0-10v,speed direction controlled by the input terminals FIL(CCW torque limit), RIL(CW torque limit) FIL valid forward. RIL valid reverse. All valid or invalid is zero speed. In this mode, External torque limit does not work. | 0~2 |
| 23 | Max. speed limit . | ● Set the max. speed of servo motor.<br>● It is irrelevant to rotary direction.<br>● If the setting value exceeds the rated speed, the actual max. speed is the rated speed. | 0~3000r/min |
| 24 | Internal speed 1 | ● Set the internal speed 1.<br>● In speed control mode, if SC1, SC2 are both OFF, theinternal speed 1 is regarded as speed instruction. | -3000~3000<br>r/min |
| 25 | Internal speed 2 | ● Set the internal speed 2.<br>● In speed control mode, if SC1 is ON, SC2 is OFF, the internal speed 2 is regarded as speed instruction. | -3000~3000<br>r/min |
| 26 | Internal speed 3 | ● Set the internal speed 3.<br>● In speed control mode, if SC1 is OFF, SC2 is ON, the internal speed 3 is regarded as speed instruction. | -3000~3000<br>r/min |

| No. | Name | Function | Parameter range |
|---|---|---|---|
| 27 | Internal speed 4 | ● Set the internal speed 4.<br>● In speed control mode, if SC1 is ON, SC2 is ON, the internal speed 4 is regarded as speed instruction. | -3000~3000<br>r/min |
| 28 | In-position speed | ● Set in-position speed.<br>● In non-position control mode, if the motor speed exceeds this setting value, SCMP is set for On，or else SCMP is set for OFF.<br>● This parameter is not used in position control mode.<br>● It is irrelevant to rotary direction.<br>● The comparator has a retardation characteristic. | 0~3000<br>r/min |
| 30 | User torque overload alarm value | ●Set user overload torque value, the value is the percentage of the rated torque, torque limit is regardless of the direction, forward and reverse are to be protected.<br>●In the case of PA31>0,when motor torque >Pa30 and holding time >PA31,the drive alarm, alarm No is Err-29, motor stops. If cause alarm, the drive must be energizing to remove the alarm. | 1~300 |
| 31 | User torque overload alarm detection time | ●User torque overload alarm detection time ,unit ms.<br>●When Set to 0 ,User torque overload alarm function is forbidden<br>●Generally ,This parameter is set for 0. | 0~32767 |

<table>
<tr><th>No.</th><th>Name</th><th>Function</th><th>Parameter range</th></tr>
<tr><td>32</td><td>Control mode switch allows</td><td>0:not allowed to switch<br>1:allow to switch. adopt ALRS (alarm clear)input to switch, the original alarm function failure.<table>
<tr><th>PA4</th><th>ALRS</th><th>CONTROL MODE</th></tr>
<tr><td rowspan="2">0</td><td>OFF</td><td>position</td></tr>
<tr><td>ON</td><td>Speed</td></tr>
<tr><td rowspan="2">1</td><td>OFF</td><td>Speed</td></tr>
<tr><td>ON</td><td>torque</td></tr>
<tr><td rowspan="2">6</td><td>OFF</td><td>torque</td></tr>
<tr><td>ON</td><td>position</td></tr>
</table></td><td>0~1</td></tr>
<tr><td>33</td><td>Analog input torque instructions reverse direction</td><td>● Polarity of analog input torque is reverse<br>● Set to 0, when analog torque instruction is forward , torque direction is CCW; set to 1, analog speed instruction s forward, torque direction is CW.</td><td>0~1</td></tr>
<tr><td>34</td><td>nternal CCW torque limit</td><td>● Set the CCW internal torque limit of servo motor.<br>● The setting value is the percentage of the rated torque. E.g. if it is set for the double of the rated torque, the setting value is 200.<br>● The limit is valid in any conditions.<br>● If the setting value exceeds the allowable max. overload of the system, the actual torque limit is the allowable max. overload ofthe system.</td><td>0~300%</td></tr>
<tr><td>35</td><td>Internal CW torque limit</td><td>● Set the CW internal torque limit of the servo motor.<br>● The setting value is the percentage of the rated torque. e.g. if it is set for the double of the rated torque, the setting value is -200.<br>●The limit is valid in any conditions.<br>●If the setting value exceeds the allowable max. overload of the system, the actual torque limit is the allowable max. overload of the system.</td><td>-300~0%</td></tr>
</table>

| No. | Name | Function | Parameter range |
|---|---|---|---|
| 36 | External CCW torque limit | ● Set the CCW external torque limit of the servo motor.<br>● The setting value is the percentage of the rated torque. e.g. if it is set for the rated torque, the setting value is 100.<br>● The limit is only valid when the input terminal (FIL) of CCW torque limit is set for ON.<br>● When the limit is valid, the actual torque limit is the minimum of the allowable max. overload, internal CCW torque limit, external CCW torque limit of the system. | 0~300% |
| 37 | External CW torque limit | ● Set the CW external torque limit of the servo motor.<br>● The setting value is the percentage of the rated torque. e.g. if it is set for the rated torque, the setting value is -100.<br>● The limit is only valid when the input terminal (RIL) of CW torque limit is set for ON.<br>● When the limit is valid, the actual torque limit is the minimum of the allowable max. overload, internal CW torque limit, external CW torque limit of the system. | -300~0% |
| 38 | Trial speed, JOG torque limit | ● Set the torque limits in trial speed, JOG mode.<br>● It is valid for bi-direction and irrelevant to the rotary direction.<br>●The setting value is the percentage of the rated torque. e.g. if it is set for the rated torque, the setting value is 100.<br>● Internal and external torque limits are still valid. | 0~300% |

| No. | Name | Function | Parameter range |
|---|---|---|---|
| 40 | Acceleration time constant | ● The setting value represents the motor acceleration time from 0r/min~1000r/min<br>● The acceleration/deceleration characteristic is linear.<br>●It is only used in speed control mode, but not in position control mode.<br>●If the AC servo driver unit is combined with external position loop, this parameter is set for 0. | 1~1000ms |
| 41 | Deceleration time constan | ●The setting value represents the motor deceleration time from 1000r/min~0r/min.<br>●The acceleration/deceleration characteristic is linear.<br>●It is only used in speed control mode, but not in position control mode.<br>●If the AC servo driver unit is combined with external position loop, this parameter is set for 0. | 1~1000ms |
| 42 | S mode acceleration/ deceleration time constant | Make motor start and stop smoothly, Set S mode curve part of acceleration and deceleration time. | 1~1000ms |
| 43 | Analog speed instruction input gain | Set the proportional relationship between input voltage of the analog speed and the motor actual running speed . | 10~3000 r/min/V |
| 44 | Analog speed instruction reverse direction | ●Set analog speed input polarity reverse<br>●Set to 0, when analog speed instruction is forward, speed direction is CCW.<br>●Set to 1, when analog speed instruction is forward, speed direction is CW. | 0~1 |
| 45 | Analog speed instruction Zero deviation compensation | Zero compensation amount for analog input speed. | -5000~5000 |

| No. | Name | Function | Parameter range |
|---|---|---|---|
| 46 | Analog speed instruction filter | ●The low- pass filter for the analog speed input<br>●The larger the setting value is, the faster the analog input response speed is, and the greater the influence of signal noise is; The smaller the setting value is, the slower the analog input response speed is, and the smaller the influence of signal noise is. | 0~1000Hz |
| 47 | Mechanical brake action setting when motor stops | ●Define motor stalling period is the delay time which is from the mechanical brake action setting(output terminal BRK from ON to OFF) to the motor current cut off.<br>●This parameters should not be less than the delay time (Tb)of mechanical brake action, To avoid the tiny displacement of the motor or the workpiece dropped<br>●Refer to diagram 7.5 for Corresponding sequence. | 0~200×10ms |
| 48 | Mechanical brake action setting while motor running | ●Define motor running period is the delay time which is from motor current cut-off to mechanical brake action(output terminal BRK from ON to OFF) .<br>●This parameter is to make mechanical brake restart to act after motor deceleration from high speed to low speed .that is in order to avoid to damage the brake.<br>●the actual action time is PA48 or the time needed for motor decelerate to PA49, and select the minimum of these two values.<br>●Refer to diagram 7.6 for Corresponding sequence. | 0~200×10ms |
| 49 | Mechanical brake action speed while motor running | ●Define motor running period is the speed value from motor current cut-off To mechanical brake action(output terminal BRK from ON to OFF) .<br>●the actual action time is PA48 or the time needed for motor decelerate to PA49, and select the minimum of these two values.<br>●Refer to diagram 7.5 for Corresponding sequence. | 0~3000r/min |
| 51 | Dynamic electric gear effective | ●set to 0,Dynamic electric gear is invalid.<br>The function of the input terminal INH is instruction pulse prohibited | 0~1 |

<table>
<tr><th>No.</th><th>Name</th><th>Function</th><th>Parameter range</th></tr>
<tr><td></td><td></td><td>●Set to 1 ,Dynamic electric gear is valid .The function of the input terminal INH is Electronic gear switched. .when INH terminal is off, the input gear is PA12/PA13; .when INH terminal is on ,the input gear is PA54/PA13; to change the electronic gear ratio value by controlling INH terminal</td><td></td></tr>
<tr><td>52</td><td>The second position instruction pulse frequency division molecular</td><td>●Set the second position instruction pulse frequency doubling (electric gear)<br>●When using the dynamic electric gear, must set the PA51=1 first. At this time, input terminal INH(instruction pulse prohibited) function has changed into Electronic gear switch input control terminal.<br>●When INH is off, input electric gear is PA12/PA13.; when INH is on ,input electric gear is PA52/PA13. to change the electronic gear ratio value by controlling INH terminal.<br>●Notice: the first and the second electric gear frequency division denominator is the same.</td><td>1~32767</td></tr>
<tr><td>53</td><td>The lower 4 bits input terminal forced ON control word</td><td>●Set input terminal internal forced ON valid, the terminal without forced ON needs connection control ON/OFF in the external, the terminal with forced ON needn't connection control ON/OFF in the external,, the drive internal set ON automatically.<br>●Expressed by the 4 binary, if the bit is 0,it represents input terminal without forced ON; if the bit is 1,it represents input terminal forced ON.<br>Binary value represents the input terminal as flowing:<br><table><tr><td>3</td><td>2</td><td>1</td><td>0</td></tr><tr><td>RSTP</td><td>FSTP</td><td>ALRS</td><td>SON</td></tr></table>SON: servo enable<br>ALRS: alarm clear<br>FSTP:CCW drive prohibited<br>RSTP:CW drive prohibited</td><td>0000~1111</td></tr>
</table>

<table>
<tr><th>No.</th><th>Name</th><th>Function</th><th>Parameter range</th></tr>
<tr><td>55</td><td>The lower 4 bits input terminal inverted control word</td><td>●Set input terminal inverted. without inverted terminal is valid when switch on, and invalid when switch off.. Inverted terminal is invalid when switch off, and valid when switch on.<br>●Expressed by the 4 binary, if the bit is 0,it represents terminal without inverted, if the bit is 1, it represents terminal inverted<br>Binary value represents the input terminal as flowing:<br><table><tr><td>3</td><td>2</td><td>1</td><td>0</td></tr><tr><td>RSTP</td><td>FSTP</td><td>ALRS</td><td>SON</td></tr></table>SON: servo enable<br>ALRS: alarm clear<br>FSTP:CCW drive prohibited.<br>RSTP:CW drive prohibited.</td><td>0000~1111</td></tr>
<tr><td>56</td><td>High 4 input terminal reverted control word</td><td>●Set input terminal inverted. without inverted terminal is valid when switch on, and invalid when switch off.. Inverted terminal is invalid when switch off, and valid when switch on.<br>●Expressed by the 4 binary, if the bit is 0,it represents terminal without inverted, if the bit is 1, it represents terminal inverted<br>Binary value represents the input terminal asflowing:<br><table><tr><td>3</td><td>2</td><td>1</td><td>0</td></tr><tr><td>RIL</td><td>FIL</td><td>INH/SC2</td><td>CLE/SC1 /ZEROS PD</td></tr></table>CLE/SC1/ZEROSPD:deviation counter reset/ speed selection1/zero speed.<br>INH/SC2:Instruction pulse prohibited/speed select2;<br>FIL:CCW torque limit;<br>RIL:CW torque limit.</td><td>0000~1111</td></tr>
</table>

<table>
<tr><th>No.</th><th>Name</th><th>Function</th><th>Parameter range</th></tr>
<tr><td>57</td><td>Output terminal reverted control word</td><td>●Set output terminal inverted .the inverted terminal, the definition of turn-on and cut-off is opposite to the standard definition.<br>Expressed by the 4 binary, if the bit is 0,it represents terminal without inverted, if the bit is 1, it represents terminal inverted<br>Binary value represents the input terminal as flowing:
<table>
<tr><td>3</td><td>2</td><td>1</td><td>0</td></tr>
<tr><td>BRK</td><td>COIN</td><td>ALM</td><td>SRDY</td></tr>
</table>
SRDY: servo ready;<br>ALM: servo alarm;<br>COIN: Positioning completed/speed arrived<br>BRK: mechanical brake release</td><td>0000~1111</td></tr>
<tr><td>58</td><td>Io Input terminal clear away jitter time constant</td><td>●Input terminal clear away jitter time<br>●The Smaller the value is, the faster the response of input terminal is.<br>●The bigger the value is, the better the anti-jamming performance of input terminal is. but response becomes slower.</td><td>1~1000×0.1ms</td></tr>
<tr><td>59</td><td>Demo running</td><td>Special for test</td><td>0~1</td></tr>
</table>

---

# Chapter 5 protection function

## 5.1 Alarm list

Table 5.1 Alarm list

| Alarm code | Alarm name | Content |
|---|---|---|
| -- | Normal | |
| 1 | Overspeed | The servo motor speed exceeds its settingvalue. |
| 2 | Main circuit overvoltage | Power voltage of main circuit is too high. |
| 3 | Main circuit undervoltage | Power voltage of main circuit is too low. |
| 4 | position out-of -tolerance | The value of position deviator exceeds its setting value. |
| 5 | Motor overheated | Motor temperature is too high. |
| 6 | Saturation failure of Speed amplifier | Speed amplifier saturation is too long |
| 7 | Drive stop abnormal | Both CCW, CW drive stop inputs are OFF. |
| 8 | The position deviator overflow | Absolute value of position deviator exceeds $2^{30}$ |
| 9 | Encoder fault | Encoder signal has errors. |
| 10 | Control power supply undervoltage | Control power voltage is on the low side |
| 11 | IPM module fault | IPM intelligent module is at fault. |
| 12 | Overcurrent | Motor current is too large |
| 13 | Over load | The AC servo drive unit and motor are overloaded (instantaneous overheating). |
| 14 | Brake fault | Braking circuit is at fault |
| 15 | Encoder countering errror | Encoder counter is abnormal |
| 16 | Motor heat overloading | The electrothermal value of the motor exceeds the setting value (I 2 t detection). |
| 17 | Speed response fault | Velocity fault is too large for a long time |
| 19 | Thermal Reset | Systems is thermally reset |
| 20 | EEPROM fault | EEPROM error |
| 21 | U4 error | U4 error |

| Alarm code | Alarm name | Content |
|---|---|---|
| 22 | Reservations | |
| 23 | U6 chip error | U6 chip or current sensor errors |
| 29 | User torque overload alarm | The load of the motor exceeds the setting value and duration |
| 30 | Z encoder pulse missing | Z encoder pulse is at fault |
| 31 | UVW signal of encoder pulse missing | UVW signal of encoder is error or encoder does not match. |
| 32 | UVW signal of encoder Illegal codes | UVW signal are all in high level or in low level |

5.2 Alarm troubleshootings

Table 5.2 Alarm processing method

| Alarm code | Alarm name | Running status | Cause | Troubleshootings |
|---|---|---|---|---|
| 1 | Over spead | Occurring as control power supply is powered on | ● Control circuit board fault<br>● Encoder fault | ● Change the AC servo drive unit.<br>• Change the servo motor. |
| | | Occurring as motor is running | The pulse frequency of input instruction is too high. | Correctly set the input instruction pulse. |
| | | | Acceleration/deceleration time constant is too small to make the speed overshooting too large. | Increase acceleration/ deceleration time constant. |
| | | | The input electronic gear ratio is too large. | Set it correctly |
| | | | Encoder fault | Change servo motor. |
| | | | Encoder cable is inferior. | Change the encoder cable. |

| Alarm code | Alarm name | Status | Cause | Troubleshootings |
|---|---|---|---|---|
| | | | Servo system is not stable that causes overshooting. | ● Set the related gain again.<br>● If the gain can not be set to a proper value, reduce the moment inertia ratio of load. |
| | | Occurring as motor is started | The load inertia is too large. | ● Reduce the load inertia.<br>● Change the drive unit and motor by larger power ones. |
| | | | Encoder Zero error | ●Change the servo motor.<br>● Adjust the encoder zero by the manufacturer. |
| | | | ● Motor U, V, W lead wires are wrongly connected.<br>●Lead wire of encoder cable is wrongly connected. | Connect the wire correctly. |
| 2 | Main circuit over voltage | Occurring as control power supply is powered on | The circuit board fault | Change the AC servo drive unit. |
| | | Occurring as main power supply is powered on | ● Power voltage is too high.<br>● Power voltage wave is abnormal. | Check the power supply. |
| | | Occurring as motor is running | Braking resistor wiring is broken off. | Connect it again. |
| | | | ●Brake transistor is damaged.<br>●Internal brake resistance is damaged. | Change the AC servo drive unit. |
| | | | Capacity of brake circuit is not enough. | ● Reduce on-off frequency.<br>● Increase acceleration /deceleration time constant.<br>● Reduce the torque limit.<br>● Reduce load inertia.<br>● Change the drive unit and motor with larger power ones. |

| Alarm code | Alarm name | Status | Cause | Troubleshootings |
|---|---|---|---|---|
| 3 | Main circuit under voltage | Occurring as main power supply is powered on | ● Circuit board fault<br>●Fuse of power supply is damaged.<br>●Soft starting circuit fault<br>●Rectifier is damaged. | Change the AC servo drive unit. |
| | | | ●Power voltage is low.<br>●Temporary power off is more than 20ms. | Check power supply. |
| | | Occurring as motor is running | ●Power capacity is not enough.<br>●Instantaneous power down | Check power supply. |
| | | | Radiator is overheated. | Check loading |
| 4 | Position out-of-tolerance | Occurring as control power supply is powered on | Circuit board fault. | Change the AC servo drive unit. |
| | | Motor doesn't run or reversed after the main power supply and control circuit are connected and instruction pulse is input | ● Motor U, V, W lead wires are wrongly connected.<br>●Lead wires of encoder cable are wrongly connected. | Connect the wires correctly. |
| | | | ●encoder zero changed<br>●.Encoder fault | Readjust encoder zero<br>Change the servo motor |
| | | Occurring as motor is running | The positionout-of-tolerance detecting range is too small. | Increase the detecting range. |
| | | | The position proportional gain is too small. | Increase the gain |
| | | | Torque is not enough . | ● Check the torque limit.<br>● Reduce the load capacity.<br>● Change the drive unit and motor with larger power ones. |
| | | | Instruction pulse frequency is too high. | Reduce the frequency. |
| | | | The encoder zero changed | Readjust the encoder zero |

| Alarm code | Alarm name | Status | Cause | Troubleshootings |
|---|---|---|---|---|
| 5 | Motor overheated | Occurring as control power supply is powered on | Circuit board fault | Change the AC servo drive unit. |
| | | | ●Cable is broken off.<br>●Internal temperature relay of motor is damaged. | ●Check the cable<br>●Check the motor |
| | | Occurring as motor is running | Motor is overloaded | ● Reduce the load.<br>● Reduce the on-off frequency.<br>● Reduce the torque limit.<br>● Reduce the related gain.<br>●Change the drive unit and motor with larger power ones. |
| | | | Motor internal fault | Change the servo motor. |
| 6 | Saturation fault of speed amplifier | Occurring as motor is running | Motor is mechanically locked. | Check the loading mechanical part. |
| | | | Load is too large | ● Reduce the load.<br>● Change the drive unit and motor with larger powerones. |
| 7 | Drive stop abnormal | | Input terminals of CCW, CW drive stop are both broken off. | Check the connection and the power supply of the input terminals. |
| 8 | The position deviator overflow | | ● Motor is mechanically locked.<br>● Input instruction pulse is abnormal | ● Check mechanical part of the load.<br>●Check the instruction pulse.<br>●Check whether the motor runs by instruction pulse. |
| 9 | Encoder fault | | Encoder connection is wrong | check the connection |
| | | | Enceder is dameged | Change the motor |
| | | | Encoder cable is inferior. | Change the cable |
| | | | Encoder cable is too long to cause the encoder voltage too low | Shorten the cable.<br>Use multi-core parallel power supply. |
| 10 | Control power supply under voltage | | The input control power supply is on the low side | Check the control power supply |

| Alarm code | Alarm name | Running status | Cause | Troubleshootings |
|---|---|---|---|---|
| | | | ● Internal connector assembly of drive unit is inferior.<br>● Switch power supply is abnormal.<br>● Chip is damaged. | ●Change the AC servo drive unit.<br>●Check the connector assembly<br>●Check the switch power supply |
| 11 | IPM module fault | Occurring as control power supply is powered on | Circuit board is at fault | Change the AC servo drive unit. |
| | | Occurring as motor is running | ● Power voltage is low.<br>● Overheated. | ●Check the AC servo drive unit<br>●Power on again.<br>●Change the AC servo drive unit. |
| | | | U, V, W of drive unit are short circuit. | Check the connection |
| | | | Grounding is not good. | Be grounded correctly. |
| | | | Motor insulation is damaged. | Change the motor. |
| | | | It is interfered. | ●Increase the circuit filter.<br>●Be far away from the interferencesource. |
| 12 | Over current | | U, V, W of drive unit are short circuit. | Check the connection |
| | | | Grounding is not good | Be grounded correctly. |
| | | | Motor insulation is damaged | Change the motor. |
| | | | AC servo drive unit is damaged | Change the AC servo drive unit. |
| 13 | Over load | Occurring as control power supply is powered on | Circuit board is at fault. | Change the AC servo drive unit. |
| | | Occurring as motor is running | Running exceeds the rated torque. | ●Check the load.<br>●Reduce the on-off frequency.<br>●Reduce the torque limit.<br>●Change the drive unit and motor with larger power ones. |
| | | | Hold brake is not open. | Check the hold brake. |
| | | | Motor vibrates unstably. | ●Regulate the gain.<br>●Increase the acceleration/ deceleration time.<br>●Reduce the load inertia. |

| Alarm code | Alarm name | Running status | Cause | Troubleshootings |
|---|---|---|---|---|
| | | | ● One of the drive unit U, V, W is broken off.<br>● The encoder connection is wrong. | Check the connection. |
| 14 | Brake fault | Occurring as control power supply is powered on | Circuit board fault | Change the AC servo drive unit. |
| | | Occurring as motor is running | Brake resistor connection is broken-off | Connect the wire again. |
| | | | ● Brake transistor is damaged.<br>● Internal brake resistance is damaged. | Change the AC servo drive unit. |
| | | | Brake loop capacity is not enough. | ●Reduce the on-off frequency.<br>●Increase the acceleration/ deceleraltion time constant.<br>●Reduce the torque limit.<br>●Reduce the load inertia.<br>●Change the drive unit and motor with larger power ones. |
| | | | Main circuit power voltage is too high. | Check the main power supply. |
| 15 | Encoder Counting error | | Encoder is damaged<br>The encoder line number is wrong<br>The encoder disc injuryed<br>Encoder has fake Z singal (there are more Z pulse in 1 rev) | Change the encoder |
| | | | Encoder connection is wrong | check the connection |
| | | | Ground connection is not good | ●Do right grounding.<br>●Check whether the shielding ground wire is connected |

| Alarm code | Alarm name | Running status | Cause | Troubleshootings |
|---|---|---|---|---|
| 16 | Motor heat over loading | Occurring ascontrol power supply is powered on | Circuit board fault | Change the AC servo drive unit. |
| | | | Parameter setting error. | Correctly set the parameters. |
| | | Occurring as motor is running | Long running exceeding the rated torque. | ●Check the load .<br>●Reduce the on -off frequency<br>●Reduce the torque limit.<br>●Change the drive unit and motor with larger power ones. |
| | | | mechanical transmission is not good | Check the mechanical part. |
| 19 | Thermal reset | | The control power of input is unsteady. | Check the control power. |
| | | | It is disturbed. | ●Increase the circuit filter.<br>●Be away from the interference source. |
| 20 | EEP ROM | | Chip or the circuit board is dameged | ●Change the AC servo drive unit.<br>●After restoring, the model of the AC servo drive unit should be set again, (parameter PA1), then recover the default parameters. |
| 21 | U4 error | | Chip or the circuit board is damaged | Change the AC servo drive unit. |
| 23 | U6 chip error | | Chip or the circuit board is dameged .<br>The power sensor is dameged | Change the AC servo drive unit. |
| 29 | User torque overload alarm | | PA30,PA31 are not reasonable<br>Unexpectedly large load happens | Modify the parameter<br>Check the machine |

| Alarm code | Alarm name | Running status | Cause | Troubleshootings |
|---|---|---|---|---|
| 30 | Encoder Z pulse missing | | Z pulse does not exist ,<br>Encoder is damaged<br>Cable is not good<br>Cable Shield is not good<br>Shielding ground wire is not connected well.<br>Encoder interface circuit fault | Change the encoder<br>Check the encoder interface circuit |
| 31 | Encoder UVW pulse error | | Encoder UVW signal is dameged<br>Encoder Z signal is dameged<br>Cable is not good<br>Cable Shield is not good.<br>Shielding ground wire is not connected well.<br>Encoder interface circuit fault | Change the encoder<br>Check the encoder interface circuit |
| 32 | Encoder UVW pulse Illegal encoding | | Encoder UVW signal is dameged<br>Cable is not good<br>Cable Shield is not good .<br>Shielding ground wire is not connected well.<br>Encoder interface circuit fault | Change the encoder<br>Check the encoder interface circuit |

# Chapt 6 Display and keyboard operation

## 6.1 Keyboard operation

The drive unit panel is comprised by 6 LED nixie tube displayer and 4 keys of ↑, ↓, ←, Enter, which is used for displaying system modes and parameters setting etc. And the functions for keys are as followings:

↑ : Sequence number, numerical number increment or forward item
↓ : Sequence number, numerical number reduction or backward item
← : Back to upper menu or cancellation of operation
Enter :Enter into next menu or confirmation of input

[Note] Holding ↑ or ↓ key down, the operation is executed repetitively, the longer the holding time is, and the faster the repetitive speed is.

The 6-digit LED nixie tube can display mode and data of system, flashing of all nixie tubes or the decimal point of rightmost nixie tube means alarm.The POWER indicator light lit means the main POWER supply has electricity, the RUN light lit means motor is running.

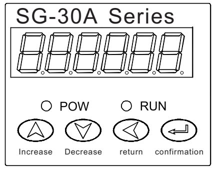

SG-30A Series
POW
RUN
Increase
Decrease
return
confirmation

Diagram 6.0 Panel

### 6.1.2 the first layer

The first layer is used for selecting the operation mode, there are 7 kinds of modes, the key ↑ ↓ are used to change the mode, press the key enter to enter into the second layer of the selected mode .punch key ← to retreat from the second layer to the first layer. Take the SG-30A for example.

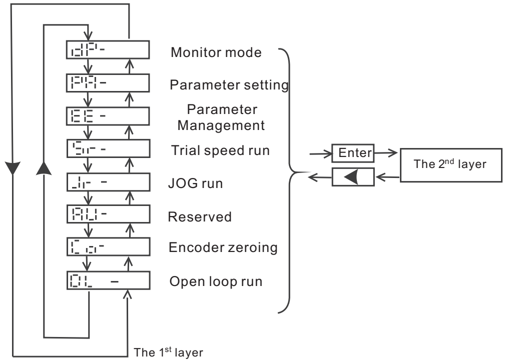

dP-
PR-
EE-
Sr-
Jr-
RU-
CO-
OL-
Monitor mode
Parameter setting
Parameter Management
Trial speed run
JOG run
Reserved
Encoder zeroing
Open loop run
Enter
The 2nd layer
The 1st layer

**Fig. 6.1 Operation block diagram of mode selection**

**Note:** The key code of different models of servo driver is different as the following table:

| Operation mode | SG-20A/30A/50A | SG-15A |
|---|---|---|
| Monitor setting | dp- | d- |
| Parameter setting | PR- | P- |
| Parameter management | EE- | E- |
| Trial speed run | Sr- | S- |
| JOG run | Jr- | J- |
| Reserved | RU- | R- |
| Encoder zeroing | CO- | C- |
| Open loop run | OL- | O- |

## 6.2 The sencond layer

### 6.2.1 Monitoring mode

Select “dP-”(in SG-15A is “d-”) in the first layer and press Enter to enter monitoring mode which includes 21 kinds of display modes. Select the desired display mode by ↑, ↓ key, then press Enter to enter into the display mode.Take the SG-30A for example.

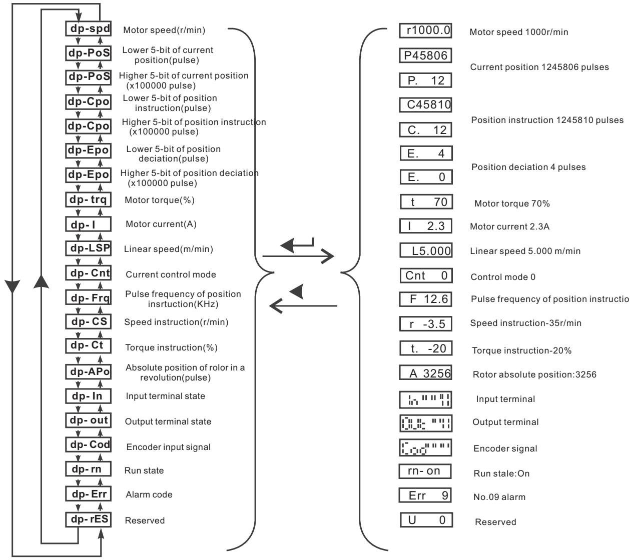

dp-spd
Motor speed(r/min)
dp-PoS
Lower 5-bit of current position(pulse)
dp-PoS
Higher 5-bit of current position (x100000 pulse)
dp-Cpo
Lower 5-bit of position instruction(pulse)
dp-Cpo
Higher 5-bit of position instruction (x100000 pulse)
dp-Epo
Lower 5-bit of position deciation(pulse)
dp-Epo
Higher 5-bit of position deciation (x100000 pulse)
dp- trq
Motor torque(%)
dp- I
Motor current(A)
dp-LSP
Linear speed(m/min)
dp- Cnt
Current control mode
dp- Frq
Pulse frequency of position insrtuction(KHz)
dp- CS
Speed instruction(r/min)
dp- Ct
Torque instruction(%)
dp-APo
Absolute position of rolor in a revolution(pulse)
dp- In
Input terminal state
dp- out
Output terminal state
dp- Cod
Encoder input signal
dp- rn
Run state
dp- Err
Alarm code
dp- rES
Reserved
r1000.0
Motor speed 1000r/min
P45806
P. 12
Current position 1245806 pulses
C45810
C. 12
Position instruction 1245810 pulses
E. 4
E. 0
Position deciation 4 pulses
t 70
Motor torque 70%
I 2.3
Motor current 2.3A
L5.000
Linear speed 5.000 m/min
Cnt 0
Control mode 0
F 12.6
Pulse frequency of position instruction:12.6KHz
r -3.5
Speed instruction-35r/min
t. -20
Torque instruction-20%
A 3256
Rotor absolute position:3256
Input terminal
Output terminal
Encoder signal
rn- on
Run stale:On
Err 9
No.09 alarm
U 0
Reserved

**Fig. 6.2 Operation block diagram of monitoring mode**

[Note 1] Position pulse and instruction pulse value are the magnified ones via the electronic gear.

[Note 2] Pulses unit is the internal pulse unit that is 10,000 pulses/rev in this system. And it is expressed by high 5-bit plus low 5-bit and its caculation method is as follows:Pulses =high 5-bit numerical value×100,000+low 5-bit numerical value

[Note 3] Control mode：0-position control；1- speed control；2- trial speed run; 3- JOG mode; 4- encoder zeroing; 5- open loop run.

[Note 4] If the numerical value displayed has 6 digits (e.g. -12345), the prompt character will not be displayed.

[Note 5] Before magnified by the electronic gear, pulse frequency of position instruction is theactual frequency with positive number for positive direction and negative number for negative direction and its min. unit is 0.1kHz.

[Note 6] Calculation of motor current I is as follows:

$$I=\sqrt{\tfrac{1}{3}\left(Iu^2+Iv^2+Iw^2\right)}$$

[Note 7] The absolute position of rotor in a rev means a position the rotor relative to the stator, one rev is one period, and its range is 0~9999.

[Note 8] Input terminals are shown as Fig.6.3, output terminals as Fig.6.4, and encoder signal display as Fig.6.5

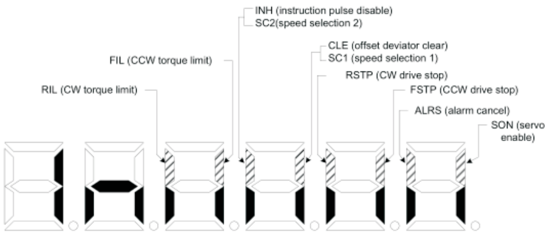

INH (instruction pulse disable)
SC2(speed selection 2)
FIL (CCW torque limit)
CLE (offset deviator clear)
SC1 (speed selection 1)
RIL (CW torque limit)
RSTP (CW drive stop)
FSTP (CCW drive stop)
ALRS (alarm cancel)
SON (servo enable)

Fig. 6.3 Input terminals display (lighting part for ON and poor light part for OFF)

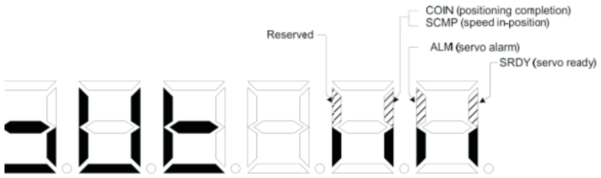

COIN (positioning completion)
SCMP (speed in-position)
Reserved
ALM (servo alarm)
SRDY (servo ready)

Fig. 6.4 Output terminal display(lighting part for ON and poor light part for OFF)

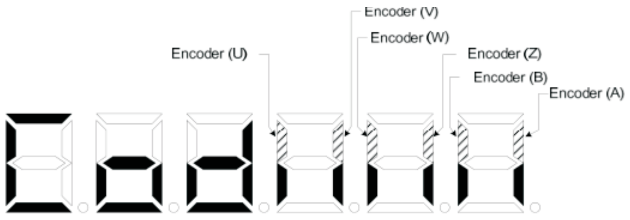

Encoder (V)
Encoder (W)
Encoder (U)
Encoder (Z)
Encoder (B)
Encoder (A)

Fig. 6.5 Encoder signal displaying (light is ON and poor light is OFF)

[Note 9] Run state:

"cn- oFF":The main circuit is not charged and the servo system does not run;

"cn- CH"：The main circuit is charged and the servo system does not run(the servo is disabled and an alarm is issued.);

"cn- on"：The main circuit is charged and the servo system is running;

[Note 10] The alarm "Err --" displayed means the system is normal and no alarm is issued.

## 6.2.2 Parameter setting

Select "PR-"(in SG-15A is" P-")in the first level and press Enter to enter into parameter setting mode. Select parameter number by key ↑,key ↓,then press Enter,the parameter value display , the value can be modified by ↑,↓. Press ↑or ↓key for once to increase or decrease 1 for the parameter value,press and hold on ↑or ↓key to increase or decrease the value continuously. When the parameter value is being modified, the decimal point of rightmost LED nixie tube lights up, press Enter key to confirm the modification, and at the same time, the decimal point of rightmost LED nixie tube put out. And the modified value will immediately take effect in the control, then press ↑,↓to go on modifing the parameters, At last, press ⟸to go back to parameter selection mode after modification. Do not pressEnterkey to confirm the modification if the parameter value modified is not appropriate. Press key⟸ to cancel the modified value to recover its original value and back to the parameter selection mode.

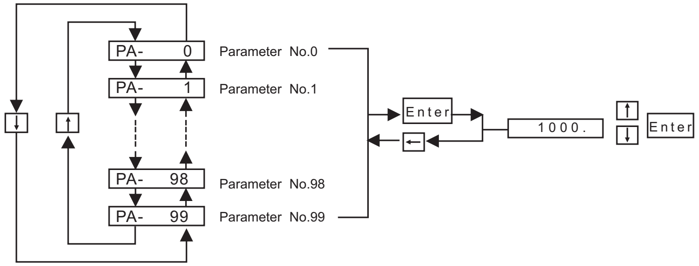

PA- 0
PA- 1
PA- 98
PA- 99
Parameter No.0
Parameter No.1
Parameter No.98
Parameter No.99
↓
↑
Enter
←
1000.
↑
↓
Enter

Fig.6.6 Operation block diagram of parameter setting

### 6.2.3 Parameter management

The parameters management mainly processes memory and EEPROM operation. Select “EE-”(in SG-15A is “E”) in the first layer and press Enter to enter into parameter management mode. Firstly ,need to select the operation modes by ⇧ ⇩ key ,there are 5 kinds of modes . For example, for “ parameter write ” , select “EE-Set”, then press Enter key and hold it on for over 3 seconds, the monitor displays “StArt” that means the parameters are being writen into EEPROM. After another 1~2 seconds, the monitor displays “FInISH” if the writing is successful, otherwise“Error” is displayed. Press ⇐ again to return to operation selection mode.

- **EE－Set**: parameter write It means to write the parameters in the memory into EEPROM parameter area. The parameter modification by user only changes the parameter values in the memory and they will be recovered to their original values when power on again. If the parameter values are desired to be changed permanently, parameter write operation is needed. Write the parameters in the memory into the EEPROM parameter area, then the modified parameter values will be valid after power on again.

- **Ee－rd:** parameter read It means to read the data in EEPROM parameter area into the memory. The process will be executed automatically when power on. At the beginning, the parameters in the memory are the same as that of EEPROM parameter area. If the parameters are modified by user, the parameter values in the memory will be changed. If the user is not sat is fied with the modified parameter values or the parameters are disordered, the data in EEPROM parameter area can be read again into the memory by parameter read operation to restore the original parameters at power-on.

- **EE－bR:** parameter backup It means to write the parameters in the memory into EEPROM backup area. The EEPROM area consists of parameter area and backup area that can store two sets of parameters. EEPROM parameter area is used for power on, parameter writing and reading operation, and EEPROM backup area for parameter backup and parameter backup recovery. If user is satisfied with one set of parameters and requires further modification, he can save the memory parameters into the EEPROM backup area by performing the parameter backup operation in advance, then modify the parameters. If the modification is not satisfied, the parameters which are saved in EEPROM backup area last time can be read into the memory for further modification or completion. Besides, after the parameters are set, the parameter write and backup operation can be performed to make the data in EEPROM parameter and backup area same to avoid parameters to be modified by mistake later. And parameter backup recovery operation can also be performed to read the data in EEPROM backup area into the memory and write the data in the memory into EEPROM parameter area by parameter write operation.

- **EE－RS**：backup recovery It means to read the data in EEPROM backup area into the DA98A AC Servo Drive Unit User Manual memory. In this operation parameter writing is not executed and the data in EEPROM parameter area will be read into the memory again when power on. If user want to permanently use the parameters in EEPROM backup area, another parameter write operation is needed.
- **EE －dEF:** default recovery It means to read all default values (factory set values) of parameters into memory and write them into EEPROM parameter area to be used when power on again. Perform this operation to restore all parameters to their factory set values if these parameters are disordered by user causing the system abnormal running. Because the different AC servo drive unit model corresponds to different parameter default values, ensure that the AC servo drive unit model is right (parameter No.1) when performing this default recovery operation.

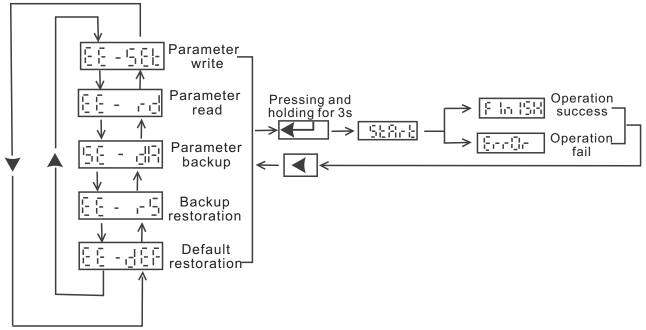


Fig. 6.7 Operation block diagram of parameter management

| | | | |
|---|---|---|---|
| | Power on:EEPROM parameter area | ⇨ | memory |
| EE-SEt | Parameter write: memory | ⇨ | EEPROM parameter area |
| EE-rd | Parameter read:EEPROM parameter area | ⇨ | memory |
| EE-bA | Parameter backup: memory | ⇨ | EEPROM backup area |
| EE-rS | Backup restoration: EEPROM backup area | ⇨ | memory |
| EE-dEF | Default restoration: Parameter default value | ⇨ | memory.EEPROM parameter area |

Fig. 6.8 Meaning of parameter management

### 6.2.4 Trial speed run

Select “Sr-” in the first level and press Enter key to enter the trial run mode. The trial speed run prompt is “S” and the unit is r/min. The system is in speed control mode and speed instructions are input by keys, which can be changed by ↑ , ↑ key, and the motor runs by the specified speed.

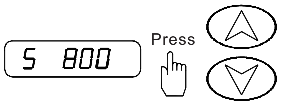


Fig. 6.9 Operation block Fig frame of trial speed run

### 6.2.5 JOG run

Select “Jr-” in the first level and press Enter key to enter JOG run. The prompt for JOG run is “J” and the unit is r/min. The system is in speed control mode and its speed instructions are input by keys. After entering JOG mode, press ↑ key and hold it on, the motor runs in a JOG speed, release the key, motor stops with zero speed; press ↓key and hold it on, the motor runs reversely in a JOG speed, and release the key, the motor stops with zero speed. The JOG speed is set by parameter PA21.

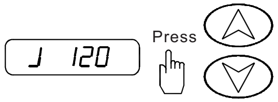


Fig. 6.10 Operation block Fig for JOG run

### 6.2.6 Analog automatic zero

After using the operation, the drive detect speed automatically analog zero bias(or torque analog zero bias), the zero bias value is written to PA45(or PA39), and stored in the EEPROM. Select "AU-" in the first layer, and enter into zero operating mode by pressing the Enter key.

After automatic zero adjustment, the user can also continue to modify the PA45 (or PA39),and manual zero。

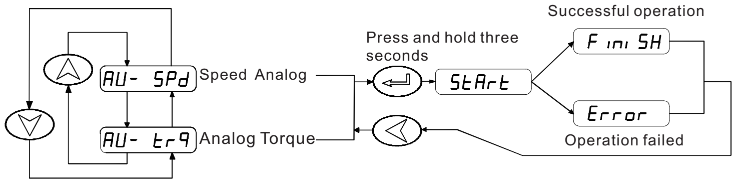


Fig 6.11 Operation block Fig for Analog automatic zero

# Charpert 7 Running

## 7.1 Grounding

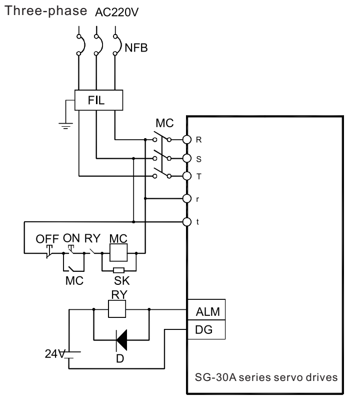
The drive unit and the motor must be well grounded, and the PE terminal of drive unit must be well connected with the device grounding part. Because the PWM technology of servo motor supply power through the power tube, Drive and cables may be affected by switching noise, In order to comply with EMC standards, thus grounding line as thick as possible and grounding resistance as small as possible.

## 7.2 Operation time sequence

### 7.2.1 Power supply connection

1. Connect the power supply with the power input terminals of the main circuit via electromagnetism contactor.
2. The control circuit power supply r, t and the main power supply are switched on simultaneously or the former is prior to the latter. If power supply of control circuit is switched on singly, the servo ready signal (SRDY) is set for OFF.
3. After the main power supply is switched on and 1.5s delay, and the servo ready signal (SRDY) is set for ON for receiving the servo enable (SON)signal and if the SON signal is detected to be valid, the AC servo drive unit output is valid and the motor is excited for running. When the SON signal is detected to be invalid or alarm is issued with the PWM circuit off, the motor is in a free state.
4. The PWM circuit is put on in about 1.5s when the SON and power supply are through.

If the power supply is switched on or off frequently, the soft start circuit and the energy brake circuit may be damaged. The on-off frequency should be less than 5 times in one hour and 30 times less each day. Owing to the overheating of the drive unit and the motor, the power supply can be switched on only after the fault is resolved and 30-minute.


Three-phase AC220V
NFB
FIL
MC
R
S
T
r
t
OFF ON RY MC
MC SK
RY
ALM
DG
24V
D
SG-30A series servo drives

NFB:Fuse
FIL: Noise Filter
RY: Small relay
MC: Contactor
SK: Surge absorber
D: Freewheeling diode

Diagram 7.1 Power supply wiring diagram

### 7.2.2 Time sequence of power on and alarm:

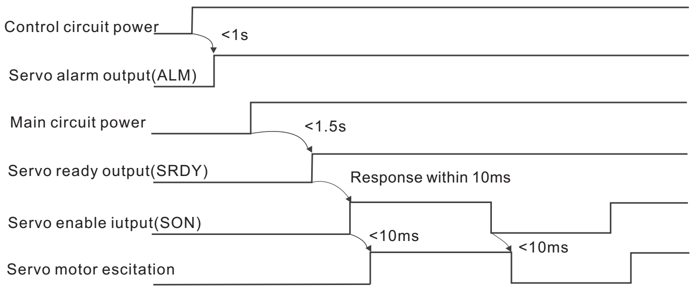

Control circuit power
<1s
Servo alarm output(ALM)
Main circuit power
<1.5s
Servo ready output(SRDY)
Response within 10ms
Servo enable iutput(SON)
<10ms
<10ms
Servo motor escitation

Diagram 7.2 Time sequence at power on

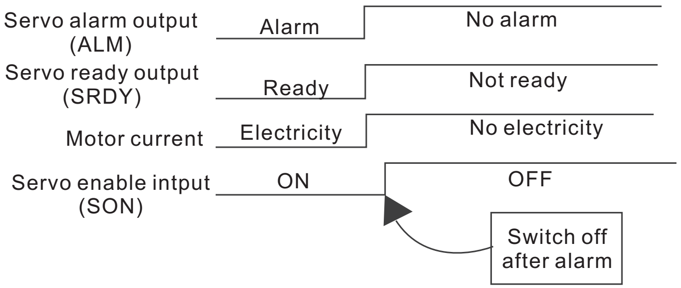

Servo alarm output (ALM)
Alarm
No alarm
Servo ready output (SRDY)
Ready
Not ready
Motor current
Electricity
No electricity
Servo enable intput (SON)
ON
OFF
Switch off after alarm

Diagram 7.3 Time sequence of alarm

## 7.3 Mechanical brake used

Mechanical brake is used to lock in a vertical or inclined workbench which connected to the motor, to prevent the working plate to drop when the servo power is lost. In order to realize this function, the user should choose and purchase the motor with brake. The brake only can be used to keep the workbench, must not be used to decelerate or stop the machine movement.

Diagram 7.4 is the mechanical brake wiring diagram. Using mechanical brake signal BRK which released from the drive to control brake. Note: the brake power supply shall be provided by the user, and have enough capacity. Recommend installing surge absorber to control surge voltage caused by the relay on/off action. Also can use diode as surge absorber, but it may cause a little brake time delay.

Diagram 7.5 is the mechanical brake action sequence when motor stops under normal circumstances, at this time ,the motor continues to electricity in order to maintain position, brake has stabilised for a period of time (the time is set by the parameter PA47) from release to brake, and then withdrawn from the motor power supply.

Diagram 7.6 is in the motor running and speed exceeds 30 r/min, at this time the current of motor is cut of. the brake continue to be in release status, and brake elay after a period of time. It is to make the mechanical brake reaction from high rotation speed to slow down to low speed, to avoid to damage the brake. delay time is the minimum value between the time set by parameter PA48 and the time needed which motor speed reaches the speed set by parameter PA49.

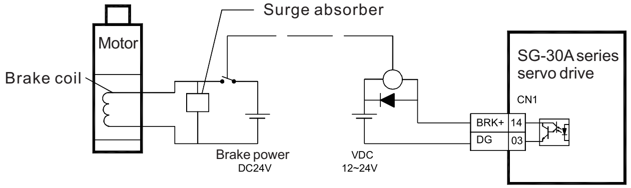

Surge absorber
Motor
Brake coil
SG-30A series servo drive
CN1
BRK+ 14
DG 03
Brake power DC24V
VDC 12~24V

Diagram 7.4 Mechanical brake wiring diagram

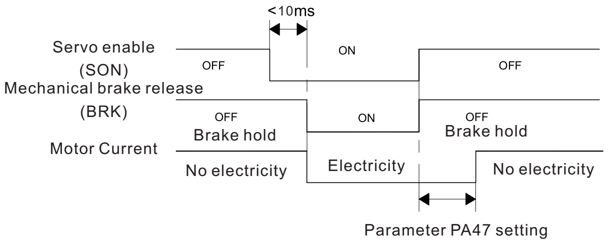

<10ms
Servo enable (SON)
OFF
ON
OFF
Mechanical brake release (BRK)
OFF
Brake hold
ON
OFF
Brake hold
Motor Current
No electricity
Electricity
No electricity
Parameter PA47 setting

Diagram 7.5 Mechanical brake action sequence when motor stops (motor speed<30r/min)

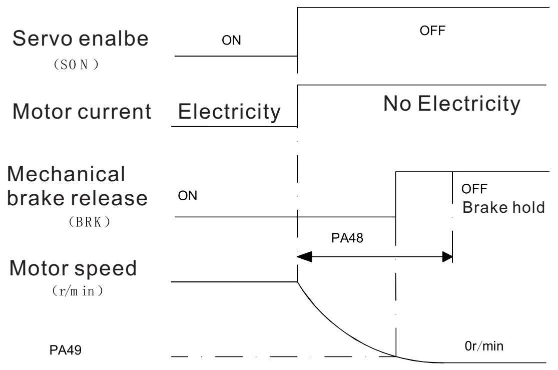


Diagram 7.6 Mechanical brake action sequence when motor running

## 7.4 Precautions

In a high frequency situation, first make sure whether they are within the allowable frequency range. The allowable frequency range varies with the motor type, capacity, load inertia and motor speed. First set the time of acceleration and deceleration to prevent excessive regeneration device (in position control mode, set the acceleration and deceleration time of the upper controller output pulse or set the parameter PA19 of the drive; In the speed control mode, set the parameters PA40 and PA41 of the drive). If the load inertia is m folds of the motor inertia, the allowable on-off frequency and the recommended acceleration and deceleration time for the servo motor are as following table:

| load inertia multiple | Allowable on-off frequency |
|---|---|
| m≦3 | >100 times/min: acceleration/deceleration time 60ms or less |
| m≦5 | 60 ～ 100 times/min: acceleration/decelerationtime 150ms or less |
| m>5 | <60 times/min: acceleration/deceleration time 150ms above |

If it still can't meet the requirements, may adopt the method of reducing the internal torque limit (parameter PA34 PA35) to reduce the max. speed of the motor(parameter PA23).

The allowable frequency on-off of the motor varies with the different of the load condition, running time. Usually the load inertia should be within five folds of the motor rotor inertia. If it is used in large load inertia, main circuit overvoltage or brake abnormality in deceleration may occur frequently, and it can be resolved by follows:

1.Reduce the internal torque limit (parameter PA34, PA35);
2.Reduce the max. motor speed (parameter PA23);
3. Fix an additional regenerative brake device.

Power supply of the encoder is installed in servo driver, in order to guarantee the normal work of the encoder, must maintain the output voltage of 5V + 5%. When the user uses a long cable, it may cause the loss of voltage, in this case, please use the multi-core cables to supply power for encoder, to reduce the voltage drop on cable.

## 7.5 Trial run

### 7.5.1 Check before running

After installation and wiring, check the following items before power on:

●Whether the connection is right, especially R, S, T and U, V, W, whether there is loose phenomenon.

●Whether input power is reliable and right.

●Whether the power and motor wires are short circuit or grounded.

●Whether the cable connection of encoder is right.

### 7.5.2 Trial run after power on

**1. Before electrify**

●motor shaft do not load when the motor without loading..

●Due to the motor acceleration and deceleration impact, the motor must be fixed.

**2. Wiring**

●Wire according to Diagram 7.7, the main circuit terminal and three-phase AC220V should be connected with R, S, T terminals.

●The control voltage terminals r, t should be connected with the single-phase AC220V.

●The encoder signal connector CN2 should be well connected with the servo motor.

●Control signal connector CN1 should be connected according to diagram.

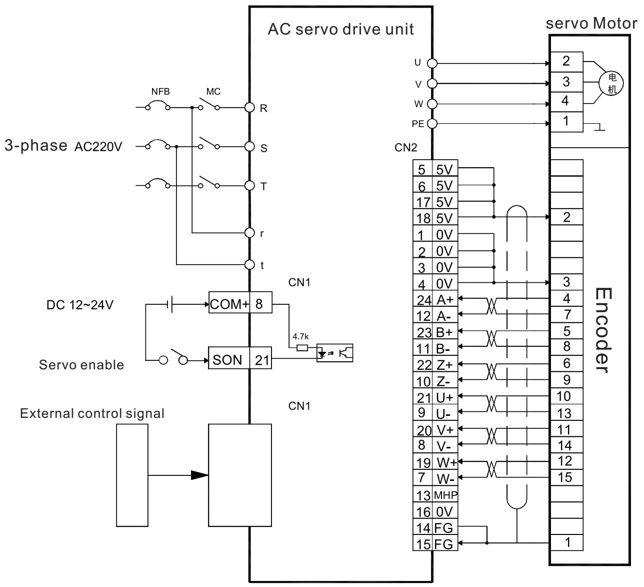


diagram 7.7 Trial run wiring diagram

### 3. JOG operation

● Switch on the control circuit power (main power is off), AC servo drive unit monitor is turned on. If an alarm is issued, check the connection.

●Switch on the main power. POWER indicator is turned on.

●Setting parameter values as the following table:

| Parameter No | Meaning | Parameter value | Factory default values |
|---|---|---|---|
| PA4 | Control mode selection | 3 | 0 |
| PA20 | Drive stops input is invalid | 1 | 0 |

●If there is no alarm or any abnormality occurring, set servo enable (SON) for ON, RUN indicator is turned on, and the motor is excited for zero speed.

●Enter JOG mode by pressing keys, the prompt of it is “J”, and the unit is r/min. When the system is in speed control mode, the Speed instruction provided by the keys, pressing and holding ↑ keys, the motor runs at JOG speed ,Loosen the keys, the motor stalling, and keep zero speed; pressing and holding ↓ keys for the reverse running at JOG speed. the keys, the motor stalling, and keep zero speed; JOG speed is set by parameter PA21,the default value is 120r/min.

●If external control servo enable (SON) is not convenient, you can set parameter PA53 for 0001, forced servo enable (SON) ON is effective, does not need external wiring control SON.

### 4. Manual speed control operation

● Switch on the control circuit power (main power is off), AC servo drive unit monitor is turned on. If an alarm is issued, check the connection.

●Switch on the main power. POWER indicator is turned on.

●Setting parameter values as the following table:

| Parameter No | Meaning | Parameter value | Factory default values |
|---|---|---|---|
| PA4 | Control mode selection | 2 | 0 |
| PA20 | Drive stops input is invalid | 1 | 0 |

●If there is no alarm or any abnormality occurring, set servo enable (SON) for ON, RUN indicator is turned on, and the motor is excited for zero speed.

●Enter Trial run mode by pressing keys, the prompt of it is “SO”, and the unit is r/min. When the system is in speed control mode, the Speed instruction provided by the keys, pressing and holding ↑, ↓ keys, the motor runs according to the given speed.

●If external control servo enable (SON) is not convenient, you can set parameter PA53 for 0001, forced servo enable (SON) ON is effective, does not need external wiring control SON.

## 7.6 User torque overload alarm function

In order to prevent accidents from Occurring in some occasions, which can cause the motor load abnormally increased, and may destroy some mechanical device. so we design the user torque overload alarm function. When the function is effective, drive system detect the motor torque, when the torque is found higher than the given parameter values and keep for a period of time, then driver alarm, alarm signal is Err-29, and the motor stops.

when need to use the user torque overload alarm function, set the PA31>0, and set PA30, PA31 reasonably, so that it can alarm as soon as possible in case that accidents occur in the application, but the false alarm will not occur in normal working conditions.

User torque overload alarm function(Err-29) is different from overload alarm function(Err-13), In the user torque overload alarm function the alarm parameters can be set by the user, but in overload alarm function it is set by the manufacturer, and the user can not modify the parameters, no matter whether the user torque overload alarm function is effective, overload alarm function is always effective. Under normal circumstances, the user torque overload alarm function is set to stop (PA31=0).

## 7.7 Adjustment

### 7.7.1 Primary gain adjustment

**Speed control**

1)［Speed proportional gain] (parameter PA5) Its setting value should be set as large as possible without oscillation occurring. Generally, the bigger the load inertia is, the larger the setting value of < speed proportional gain> is.
2)［Speed integral time constant] (parameter PA6) Its setting value should be set as small as possible without oscillation occurring.

**Position control**

1) Set proper [Speed proportional gain] and [Speed integral time constant] by the methods above.
2) Set <position feedforward gain> (parameter PA10) for 0%.
3) [Position proportional gain]（parameter PA9） Its setting value should be as large as possible in a stable range. If it is too large, the track characteristic of position instruction is good and the lag error is small, but there may be oscillation when positioning stops.
4) If high position track characteristic is required, the setting value of <position feedforward gain> may be increased. If it is too big, overshooting may occur.

［Position proportional gain] setting values are as following table:

| Rigidity | Position proportional gain |
|---|---|
| low rigidity | 10～20/S |
| medium rigidity | 30～50/S |
| high rigidity | 50～70/S |

### 7.7.2 Adjustment diagram of primary parameters

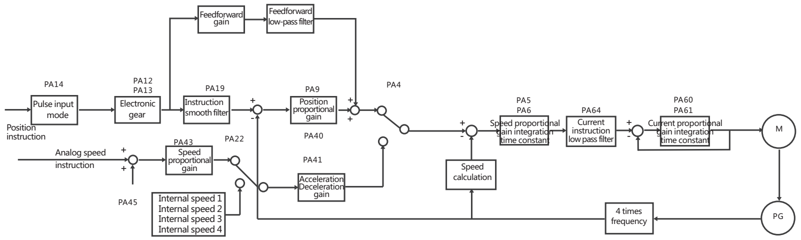

Feedforward gain
Feedforward low-pass filter
PA14
Pulse input mode
Position instruction
PA12
PA13
Electronic gear
PA19
Instruction smooth filter
PA9
Position proportional gain
PA4
PA5
PA6
Speed proportional gain integration time constant
PA64
Current instruction low pass filter
PA60
PA61
Current proportional gain integration time constant
M
Analog speed instruction
PA43
Speed proportional gain
PA22
PA40
PA41
Acceleration Deceleration gain
Speed calculation
PA45
Internal speed 1
Internal speed 2
Internal speed 3
Internal speed 4
4 times frequency
PG

Diagram 7.12 Adjustment block diagram of primary parameters

## 7.8 FAQ

### 7.8.1 Restore default parameters

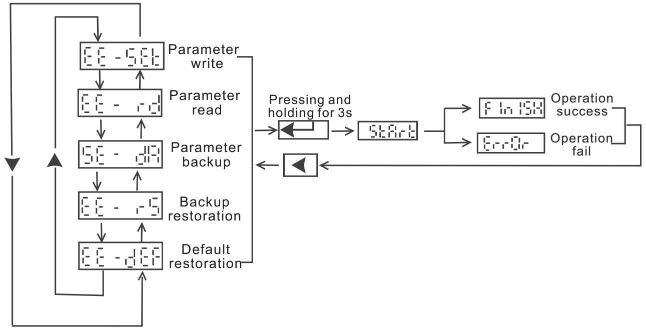

EE-SEt
Parameter write
EE- rd
Parameter read
SE- dA
Parameter backup
EE- rS
Backup restoration
EE-dEF
Default restoration
Pressing and holding for 3s
StArt
FInISH
Operation success
ErrOr
Operation fail

Diagram 7.13 Restore default parameters operation diagram

In the case of the following situations, please use the restore default parameters (factory parameters) function:

- Parameter was disorderly, the system can't work normally .
- When save the parameters, the system is just off electricity, it may cause the system restore default parameters automatically, but the model code (PA1) does not match the drive and the motor.
- The drive needs to replace the original motor, the model of the new motor is different from the model of the original motor.

**Restore default parameters as follows:**

1.Check the drive model (15A, 30A) and adaptation model of the motor, the model code will be found according to table 8.1 (for 15A drive) and table 8.2 (for 30A drive) in the 8.4 section. not to make mistake of the model of drive, otherwise it will cause drive damaged. For example: 30A drive adaptation 110SY-M06030 motor, model code is 38 by table look-up.
2.Modify the password parameter PA0 for 385;
3.Modify the code PA1 to the selected parameters code, this example is 38, the parameter values display "3R-38", "3R" is represent for 30A drive. If it is "2R" means using 20A drive;
4.Write the parameter default value into EEPROM. Select "EE-" in the first layer, press the Enter to enter into the parameter management mode. First, need to select the operation mode, there are 5 kinds of modes, use ↑, ↓, to select. Select "EE-dEF", and then press the Enter key and hold for more than 3 seconds, the displayer displays "Start", representing the parameter is being written into EEPROM, wait for another 1~2 seconds, if the write operation is successful, the displayer displays "Finish", if failure, the displayer displays "Error".
5.If the previous step is a successful operation, cut off the drive power, then energized, operation is completed.

### 7.8.2 Frequent alarm Err-15, Err-30, Err-31, Err-32

These alarms means photoelectric encoder and its connecting cable exist problems, first to solve the following several aspects:

- Whether the connection cable and plug have a bad contact phenomenon.
- Whether the shielding wire connected with the connecting cable is welded well.
- Whether the drive grounding PE terminal is grounded well.
- Whether the motor grounding terminal and the drive grounding PE terminal are connected well.

- If the cable is longer, it may cause power supply in cable voltage drop too large, pls switch to 5V or 0V power with encoder connected with multiple core wire.
- The connecting cable do not share a slot with high voltage cable , try to change the routing of the connecting cable.

If the above measures can not work, please contact the seller.

### 7.8.3 POWER light can't light up

When the control power supply of the drive and the high voltage power supply are normal, drive digital tube displays, and no alarm occurs, but the high voltage indicator in the panel does not light. If it happens, Most of the reasons are the internal drive circuit malfunction, to make the drive into protection state, pls contact the seller.

# Chapert 8 Specifications

## 8.1 AC servo drive unit specifications diagram

SG - 30A

Product series

| Mark | Output power(KW) |
|---|---|
| 15A | 0.75 |
| 20A | 1.0 |
| 30A | 1.4 |
| 50A | 2.5 |

## 8.2AC servo drive unit installation size diagram

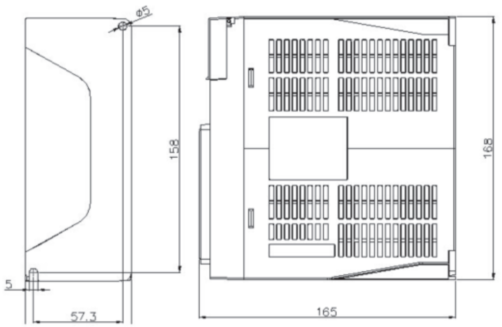


Diagram 8-1 SG-15A installation size diagram

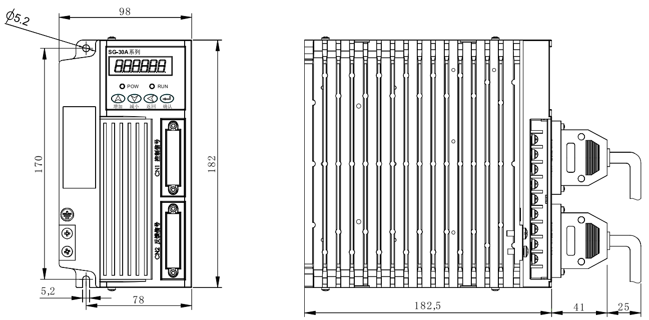


Diagram 8-2 SG-20A/30A installation size diagram

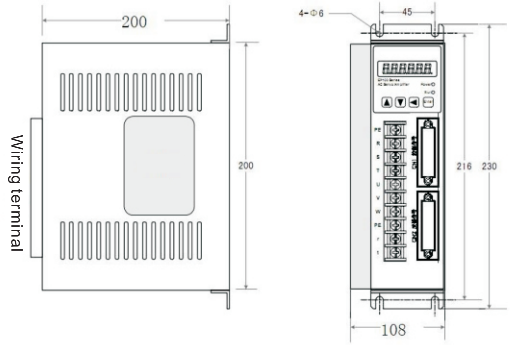


Diagram 8-3 SG-50A installation size diagram

## 8.3 AC servo drive unit specifications

| MODEL | | SG-15A | SG-20A | SG-30A | SG-50A |
|---|---|---|---|---|---|
| Output power(Kw) | | 0.2-1.0 | 0.4-1.5 | 0.8-2.4 | 1.5-5.5 |
| Motor rated torque(N.m) | | 0.6-4.0 | 2.4-6.0 | 4.0-15.0 | 10.0-35.0 |
| Input power supply | | 3-phase AC 220v , -15% +10%, 50/60HZ | | | |
| Appli-cable enviro-nment | temperature | Work:0～40 ℃, store: -40℃～50℃ | | | |
| | humidity | 40%-80%(no condensation) | | | |
| | Atmospheric pressure | 86-106kpa | | | |
| Control way | | SG series | Position control,speed control | | |
| Regeneration brake | | built-in | | | |
| Control characteristics | Speed frequency response | ≥250HZ | | | |
| | Speed fluctuation rate | <±0.03(load0 100%);<±0.02(load-15%+10%)<br>(numerical value corresponding to rated speed ) | | | |
| | Timing ratio | 1:5000 | | | |
| | Pulse frequency | ≤500kHz | | | |

| | | |
|---|---|---|
| Control input | 1.Servo enable<br>2.Alarm clear<br>3.CCW drive stops<br>4.CW drive stops.<br>5.Deviator clear / speed selection 1<br>6.Instruction pulse disable/ speed selection 2 | |
| Control output | 1.Servo ready to output<br>2.Servo alarm output<br>3.Positioning completion output /speed in position output<br>4.Mechanical brake output | |
| Position control | Input mode | 1,pulse+symbol 2.CCWpulse/CWpulse<br>3.2-phaseA/BThe orthogonal pulse |
| | Electronic gear ratio | 1~32767/1~32767 |
| | Feedback pulse | 2500 Line/turn |
| Speed control | 4 kinds of internal speed | |
| Acceleration and deceleration function | Parameter setting acceleration/deceleration time 1ms ～10,000ms（0r/min←→1000r/min） | |
| Monitoring function | Speed, current position, instruction pulse accumulation, position error, motor torque, motor current, linear speed, rotor absolute position, instruction pulse frequency, running state, input/output terminal signal etc. | |
| Protection function | Overspeed, overvoltage / undervoltage of main power, overcurrent, overload, brake abnormity, encoder abnormity, control power abnormity, position out-of-tolerance etc. | |
| Applicable load inertia | Less than 5 times of motor inertia | |

## 8.4 The comparison table of servo code parameters and motors

The parameter PA1 (model code) setting values must match with the drive and motor, the setting value of the parameters of the PA1 refer to the following table, if not matching may cause performance degradation or alarm. Each of the model code has different default parameters combination. The corresponding parameter PA1 of the device has been set when leaving the factory. And restore them into corresponding default parameters combination.If need to modify the model code or restore the factory default parameters, please refer to section 7.14.1.

Diagram 8.1 Motor adapt to SG-15A/20A drive

| Model code | Motor | P (kw) | T(N.m) | Rated speed (r/min) |
|---|---|---|---|---|
| 53 | 60SY-M00630 | 0.2 | 0.637 | 3000 |
| 54 | 60SY-M01330 | 0.4 | 1.27 | 3000 |
| 55 | 60SY-M01930 | 0.6 | 1.91 | 3000 |
| 56 | 80SY-M01330 | 0.4 | 1.3 | 3000 |
| 57 | 80SY-M02430 | 0.75 | 2.4 | 3000 |
| 59 | 80SY-M04025 | 1.0 | 4.0 | 2500 |
| 60 | 90SY-M02430 | 0.75 | 2.4 | 3000 |
| 61 | 90SY-M03520 | 0.73 | 3.5 | 2000 |
| 62 | 90SY-M04025 | 1.0 | 4.0 | 2500 |

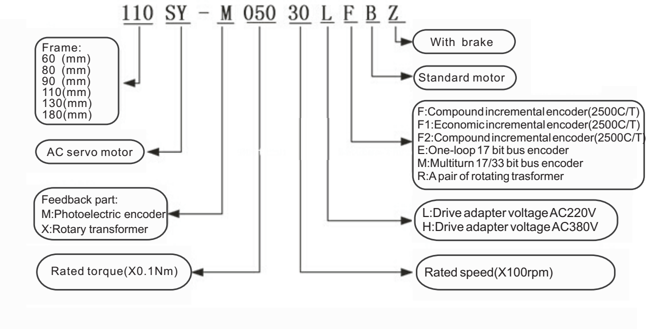
Diagram 8.2 Motor adapt to SG-30 A

| Model code | Motor | P (kw) | T(N.m) | Rated speed (r/min) |
|---|---|---|---|---|
| 34 | 110SY-M02030 | 0.6 | 2 | 3000 |
| 35 | 110SY-M04030 | 1.2 | 4 | 3000 |
| 36 | 110SY-M05030 | 1.5 | 5 | 3000 |
| 37 | 110SY-M06020 | 1.2 | 6 | 2000 |
| 38 | 110SY-M06030 | 1.8 | 6 | 3000 |
| 89 | 130SY-M04025 | 1.0 | 4 | 2500 |
| 90 | 130SY-M05025 | 1.3 | 5 | 2500 |
| 91 | 130SY-M06025 | 1.5 | 6 | 2500 |
| 92 | 130SY-M07725 | 2.0 | 7.7 | 2500 |
| 93 | 130SY-M10010 | 1.0 | 10 | 1000 |
| 94 | 130SY-M10015 | 1.5 | 10 | 1500 |
| 95 | 130SY-M10025 | 2.6 | 10 | 2500 |
| 96 | 130SY-M15015 | 2.3 | 15 | 1500 |

Diagram 8.3 Motor adapt to SG-50A drive

| Model code | Motor | P (kw) | T(N.m) | Rated speed (r/min) |
|---|---|---|---|---|
| 102 | 130SY-M10015 | 1.5 | 10 | 1500 |
| 103 | 130SY-M10025 | 2.6 | 10 | 2500 |
| 104 | 130SY-M15015 | 2.3 | 15 | 1500 |
| 105 | 130SY-M15025 | 3.8 | 15 | 2500 |
| 106 | 180SY-M17015 | 2.7 | 17 | 1500 |
| 110 | 180SY-M27015 | 4.3 | 27 | 1500 |
| 112 | 180SY-M35015 | 5.5 | 35 | 1500 |

## 8.5 Servo motor model


110 SY - M 050 30 L F B Z
Frame:
60 (mm)
80 (mm)
90 (mm)
110(mm)
130(mm)
180(mm)
AC servo motor
Feedback part:
M:Photoelectric encoder
X:Rotary transformer
Rated torque(X0.1Nm)
With brake
Standard motor
F:Compound incremental encoder(2500C/T)
F1:Economic incremental encoder(2500C/T)
F2:Compound incremental encoder(2500C/T)
E:One-loop 17 bit bus encoder
M:Multiturn 17/33 bit bus encoder
R:A pair of rotating trasformer
L:Drive adapter voltage AC220V
H:Drive adapter voltage AC380V
Rated speed(X100rpm)

## 8.6 Servo motor wiring

### 8.6.1.1 Winding wiring(Aviation plug wire)

| Terminal symbol | Terminal No. | Terminal explanation |
|---|---|---|
| U | 2 | Motor u phase power input |
| V | 3 | Motor V phase power input |
| W | 4 | Motor W phase power input |
| ⏚ | 1 | Ground terminal of motor shell |

### 8.6.1.2 Winding wiring( Plastic plug wire)

| Terminal symbol | Terminal No. | Terminal explanation |
|---|---|---|
| U | 1 | Motor u phase power input |
| V | 2 | Motor V phase power input |
| W | 3 | Motor W phase power input |
| ⏚ | 4 | Ground terminal of motor shell |

### 8.6.2 Brake wiring:

| Terminal symbol | Terminal No | Terminal explanation |
|---|---|---|
| DC+ | 2 | Brak power |
| DC- | 3 | |
| ⏚ | 4 | Ground terminal of motor shell |

### 8.6.3.1 Standard encoder(Aviation plug wire)

| Terminal symbol | Terminal No | Terminal explanation |
|---|---|---|
| 5V | 2 | Encoder input power 5v |
| 0V | 3 | |
| A+ | 4 | Encoder A phase output |
| A- | 7 | |
| B+ | 5 | Encoder B phase output |
| B- | 8 | |
| Z+ | 6 | Encoder Z phase output |
| Z- | 9 | |
| FG | 1 | Encoder shell |

### 8.6.3.2 Standard encoder(Plastic plug wire)

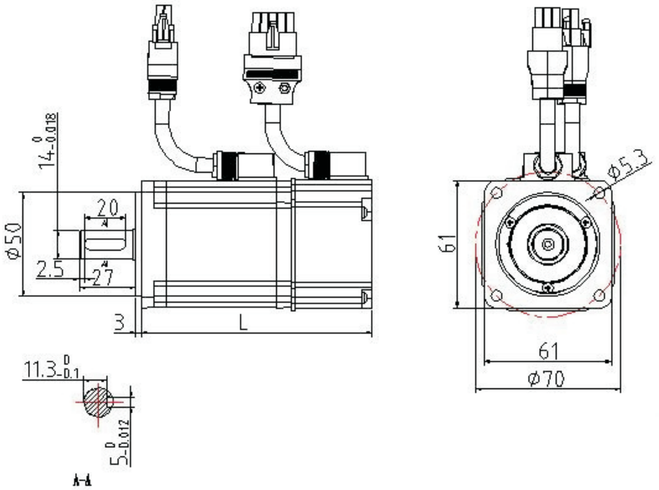
| Terminal symbol | Terminal No. | Terminal instruction |
|---|---|---|
| 5V | 2 | Encoder input power 5v |
| 0V | 3 | |
| A+ | 4 | Encoder A phase output |
| A- | 7 | |
| B+ | 5 | Encoder B phase output |
| B- | 8 | |
| Z+ | 6 | Encoder Z phase output |
| Z- | 9 | |
| U+ | 10 | Encoder U phase output |
| U- | 13 | |
| V+ | 11 | Encoder V phase output |
| V- | 14 | |
| W+ | 12 | Encoder W phase output |
| W- | 15 | |
| FG | 1 | Encoder shell |

### 8.6.4 Economic incremental encoder wiring:

| Terminal symbol | Terminal No. | Terminal instruction |
|---|---|---|
| 5V | 2 | Encoder input power 5v |
| 0V | 3 | |
| A+ | 4 | Encoder A phase output |
| A- | 7 | |
| B+ | 5 | Encoder B phase output |
| B- | 8 | |
| Z+ | 6 | Encoder Z phase output |
| Z- | 9 | |
| FG | 1 | Encoder shell |

## 8.7 Servo motor parameters:

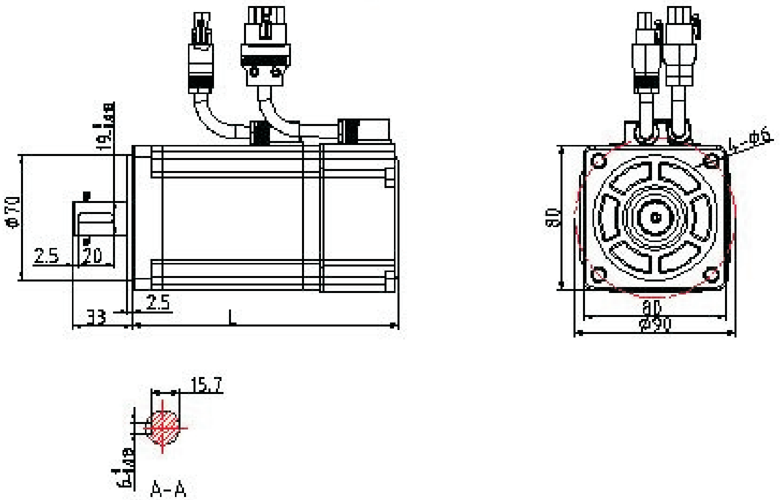
### 8.7.1 60-S series servo motor parameters:


14 0 -0.018
Ø50
20
2.5
27
3
L
Ø5.3
61
61
Ø70
11.3 0 -0.1
5 0 -0.012
A-A

| Rated torque (N•m) | 0.637 | 1.27 | 1.92 |
|---|---|---|---|
| L(mm) | 110 | 133 | 154 |
| With brake L(mm) | 148 | 171 | 192 |

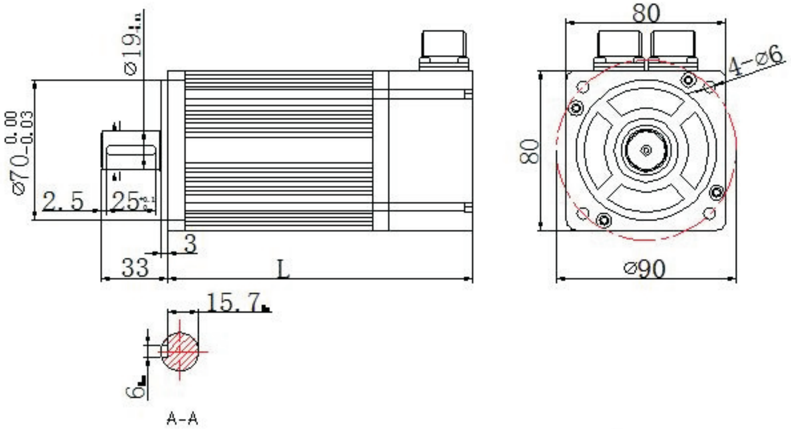
---

### 8.7.2 80-S series servo motor parameters:


19
Ø70
2.5
20
33
2.5
L
4-Ø6
80
80
Ø90
15.7
6
A-A

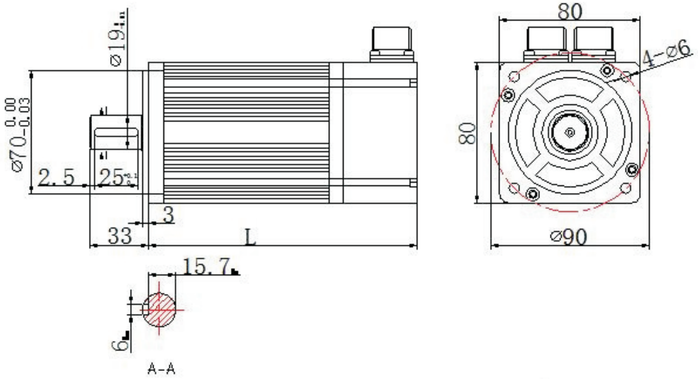
| Rated torque (N•m) | 1.6 | 2.4 | 4 |
|---|---|---|---|
| L(mm) | 132 | 150 | 178 |
| With brake L(mm) | 172 | 190 | 218 |

### 8.7.3 80 series servo motor parameters:


Ø19
Ø70 0.00 -0.03
2.5
25
3
33
L
80
4-Ø6
80
Ø90
15.7
6
A-A

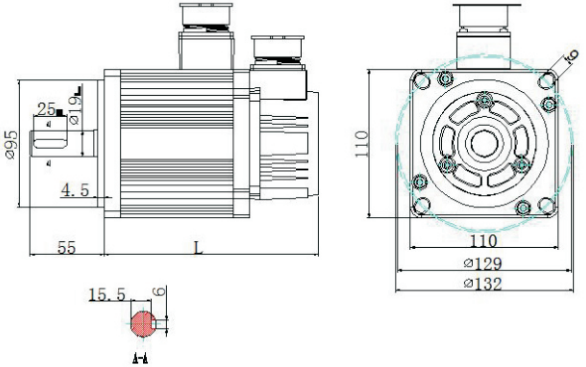
| Rated torque (N•m) | 1.3 | 2.4 | 4.0 |
|---|---|---|---|
| L(mm) | 123 | 158 | 180 |
| With brake L(mm) | 163 | 198 | 220 |

### 8.7.4 90 series servo motor parameters:


80
4-ø6
ø19
ø70
80
2.5
25
3
33
L
ø90
15.7
6
A-A

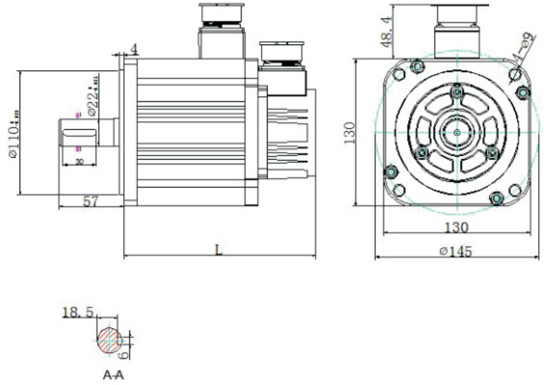
| Rated torque (N•m) | 2.4 | 3.5 | 4.0 |
|---|---|---|---|
| L(mm) | 149 | 171 | 181 |
| With brake L(mm) | 190 | 212 | 222 |

### 8.7.5 110 series servo motor parameters:


25
ø19
ø95
4.5
55
L
110
110
ø129
ø132
15.5
6
A-A

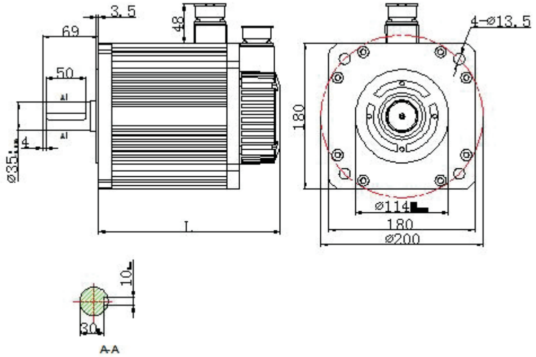
| Rated torque (N•m) | 2 | 4 | 5 |
|---|---|---|---|
| L(mm) | 157 | 187 | 202 |
| With brake L(mm) | 217 | 247 | 262 |

### 8.7.6 130 series servo motor parameters:


4
ø22
ø110
57
L
48.4
4-ø9
130
130
ø145
18.5
6
A-A

| Rated torque (N•m) | 4 | 5 | 6 | 7.7 | 10 | 15 | 20 |
|---|---|---|---|---|---|---|---|
| L(mm) | 165 | 171 | 178 | 191 | 208 | 230 | 265 |
| With brake L(mm) | 211 | 217 | 224 | 237 | 254 | 376 | 311 |

### 8.7.7 180 series servo motor parameters:


3.5
69
48
50
4
ø35
L
4-ø13.5
180
ø114
180
ø200
10
30
A-A

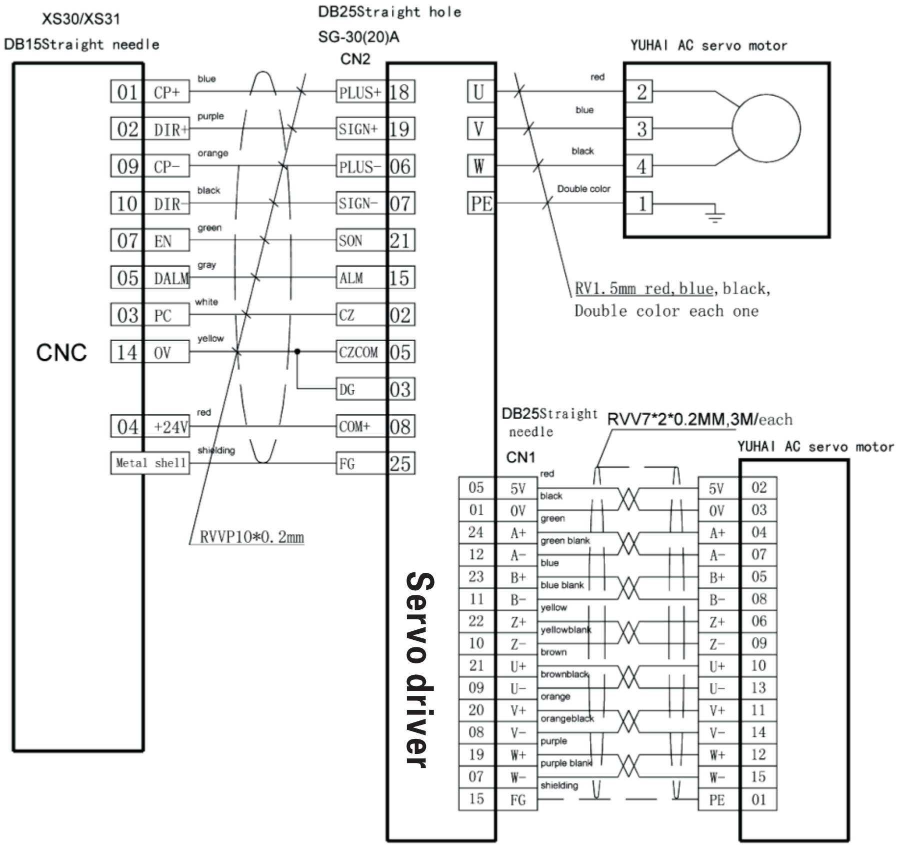
| Rated torque (N•m) | 17 | 27 | 35 |
|---|---|---|---|
| L(mm) | 226 | 262 | 292 |
| With brake L(mm) | 306 | 342 | 372 |

# Appendix

Note: the following graph is the diagram of the motor with aviation plug wire,if the motor with plastic plug wire, Please refer to 8.6.1.2 and 8.6.3.2.

## 1.YUHAI CNC system connection

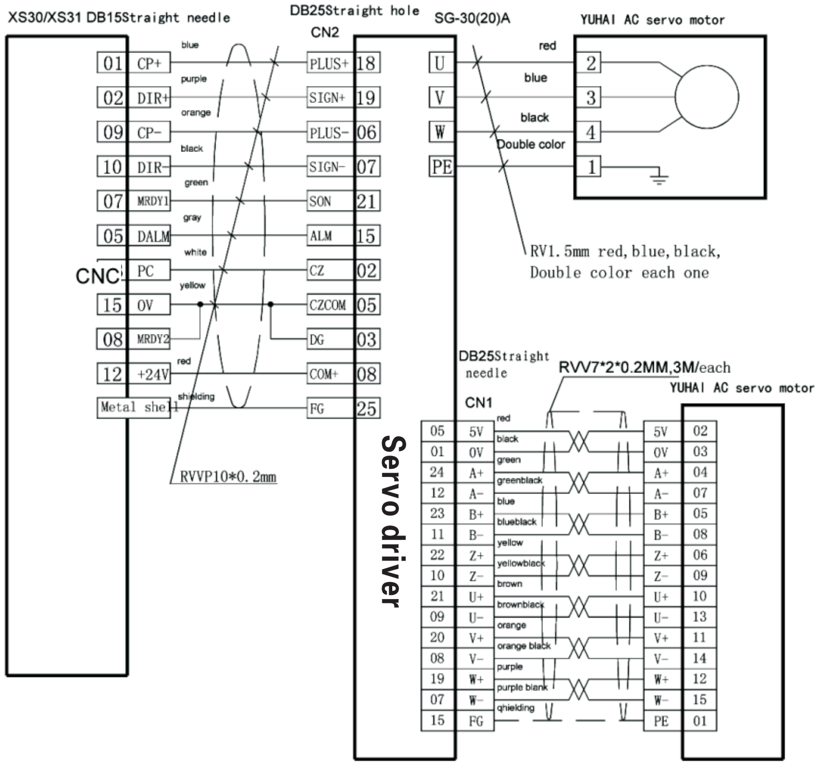
YH206/YH208/YH990 YUHAI CNC system connection


XS30/XS31
DB15Straight needle
DB25Straight hole
SG-30(20)A
CN2
YUHAI AC servo motor
CNC
01 CP+
02 DIR+
09 CP-
10 DIR-
07 EN
05 DALM
03 PC
14 0V
04 +24V
Metal shell
blue
purple
orange
black
green
gray
white
yellow
red
shielding
PLUS+ 18
SIGN+ 19
PLUS- 06
SIGN- 07
SON 21
ALM 15
CZ 02
CZCOM 05
DG 03
COM+ 08
FG 25
U
V
W
PE
red
blue
black
Double color
2
3
4
1
RV1.5mm red,blue,black,
Double color each one
RVVP10*0.2mm
DB25Straight needle
CN1
RVV7*2*0.2MM,3M/each
YUHAI AC servo motor
05 5V
01 0V
24 A+
12 A-
23 B+
11 B-
22 Z+
10 Z-
21 U+
09 U-
20 V+
08 V-
19 W+
07 W-
15 FG
red
black
green
green blank
blue
blue blank
yellow
yellowblank
brown
brownblack
orange
orangeblack
purple
purple blank
shielding
5V 02
0V 03
A+ 04
A- 07
B+ 05
B- 08
Z+ 06
Z- 09
U+ 10
U- 13
V+ 11
V- 14
W+ 12
W- 15
PE 01
Servo driver

---

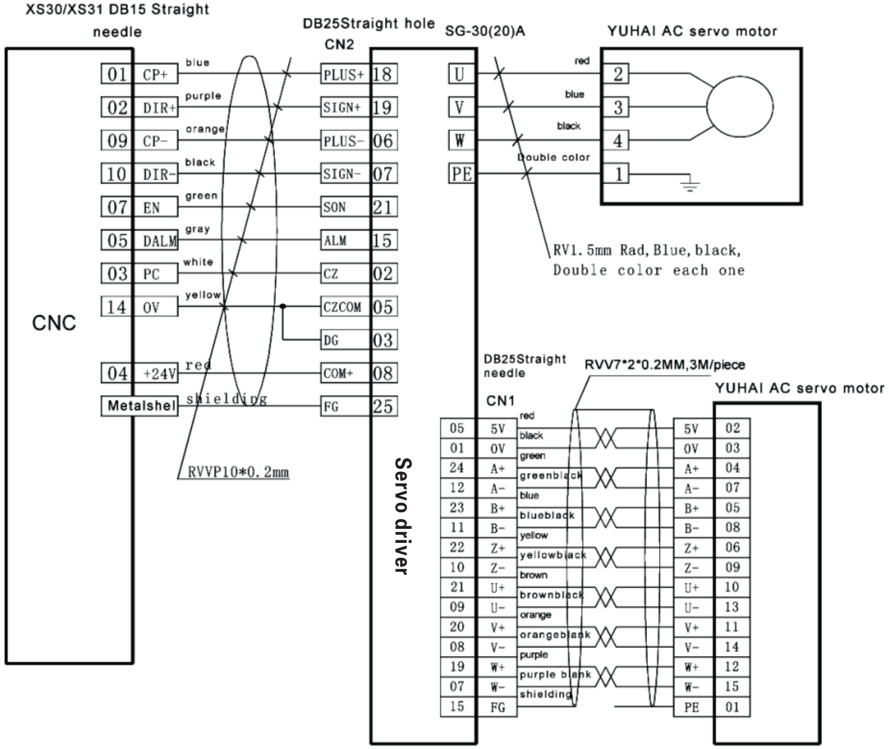
## 2.KND CNC system connection

KND-100Ti-1000M-2000M CNC system connection


XS30/XS31 DB15Straight needle
DB25Straight hole
SG-30(20)A
CN2
YUHAI AC servo motor
CNC
01 CP+
02 DIR+
09 CP-
10 DIR-
07 MRDY1
05 DALM
PC
15 0V
08 MRDY2
12 +24V
Metal shell
blue
purple
orange
black
green
gray
white
yellow
red
shielding
PLUS+ 18
SIGN+ 19
PLUS- 06
SIGN- 07
SON 21
ALM 15
CZ 02
CZCOM 05
DG 03
COM+ 08
FG 25
U
V
W
PE
red
blue
black
Double color
2
3
4
1
RV1.5mm red,blue,black,
Double color each one
RVVP10*0.2mm
DB25Straight needle
CN1
RVV7*2*0.2MM,3M/each
YUHAI AC servo motor
05 5V
01 0V
24 A+
12 A-
23 B+
11 B-
22 Z+
10 Z-
21 U+
09 U-
20 V+
08 V-
19 W+
07 W-
15 FG
red
black
green
greenblack
blue
blueblack
yellow
yellowblack
brown
brownblack
orange
orange black
purple
purple blank
qhielding
5V 02
0V 03
A+ 04
A- 07
B+ 05
B- 08
Z+ 06
Z- 09
U+ 10
U- 13
V+ 11
V- 14
W+ 12
W- 15
PE 01
Servo driver

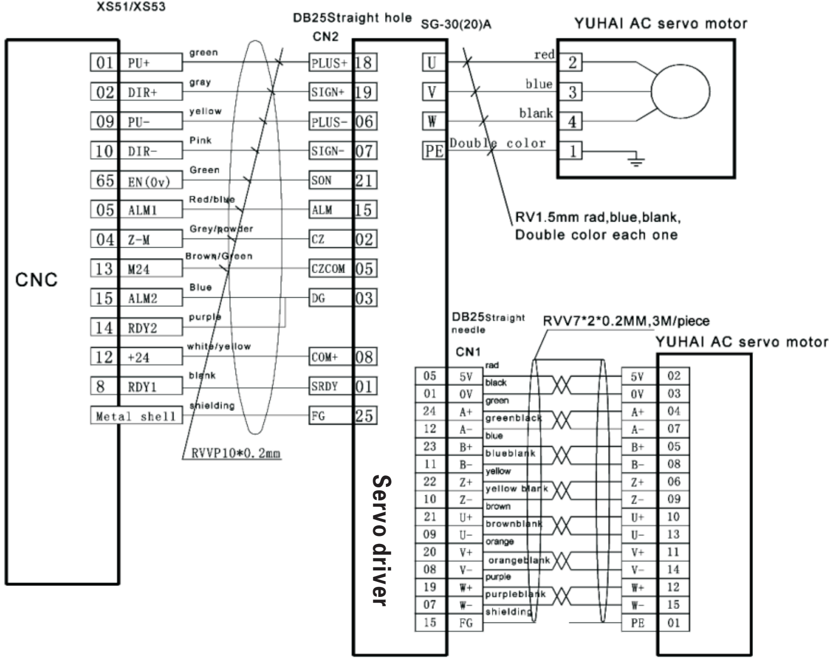
### 3.GSK CNC system connection

GSK980TA1-TA2-TB1-TB2 CNC system connection


XS30/XS31 DB15 Straight needle
DB25Straight hole CN2
SG-30(20)A
YUHAI AC servo motor
CNC
01 CP+ blue PLUS+ 18
02 DIR+ purple SIGN+ 19
09 CP- orange PLUS- 06
10 DIR- black SIGN- 07
07 EN green SON 21
05 DALM gray ALM 15
03 PC white CZ 02
14 0V yellow CZCOM 05
DG 03
04 +24V red COM+ 08
Metalshell shielding FG 25
RVVP10*0.2mm
U red 2
V blue 3
W black 4
PE Double color 1
RV1.5mm Rad,Blue,black, Double color each one
Servo driver
DB25Straight needle CN1
RVV7*2*0.2MM,3M/piece
YUHAI AC servo motor
05 5V red 5V 02
01 0V black 0V 03
24 A+ green A+ 04
12 A- greenblack A- 07
23 B+ blue B+ 05
11 B- blueblack B- 08
22 Z+ yellow Z+ 06
10 Z- yellowblack Z- 09
21 U+ brown U+ 10
09 U- brownblack U- 13
20 V+ orange V+ 11
08 V- orangeblank V- 14
19 W+ purple W+ 12
07 W- purple blank W- 15
15 FG shielding PE 01

### 4.SIEMENS CNC system connection

SIEMENS808DCNC system connection


XS51/XS53
DB25Straight hole CN2
SG-30(20)A
YUHAI AC servo motor
CNC
01 PU+ green PLUS+ 18
02 DIR+ gray SIGN+ 19
09 PU- yellow PLUS- 06
10 DIR- Pink SIGN- 07
65 EN(0v) Green SON 21
05 ALM1 Red/blue ALM 15
04 Z-M Grey/powder CZ 02
13 M24 Brown/Green CZCOM 05
15 ALM2 Blue DG 03
14 RDY2 purple
12 +24 white/yellow COM+ 08
8 RDY1 blank SRDY 01
Metal shell shielding FG 25
RVVP10*0.2mm
U red 2
V blue 3
W blank 4
PE Double color 1
RV1.5mm rad,blue,blank, Double color each one
Servo driver
DB25Straight needle CN1
RVV7*2*0.2MM,3M/piece
YUHAI AC servo motor
05 5V rad 5V 02
01 0V black 0V 03
24 A+ green A+ 04
12 A- greenblack A- 07
23 B+ blue B+ 05
11 B- blueblank B- 08
22 Z+ yellow Z+ 06
10 Z- yellow blank Z- 09
21 U+ brown U+ 10
09 U- brownblank U- 13
20 V+ orange V+ 11
08 V- orangeblank V- 14
19 W+ purple W+ 12
07 W- purpleblank W- 15
15 FG shielding PE 01

**Note: The driver which connected to the Siemens CNC control system should be customized.**