华兴数控
WASHING

SPM-3500 Full Digital AC Servo System

Installation And Operation Manual

NAN JING WASHING CNC TECHNOLOGY CO.,LTD

CONTENTS

Chapter 1　Security Warning

Thank you for choosing SPM-3500 AC servo system. This servo driver is suitable for the ordinary industrial environment, please pay attention to the following several points before using:

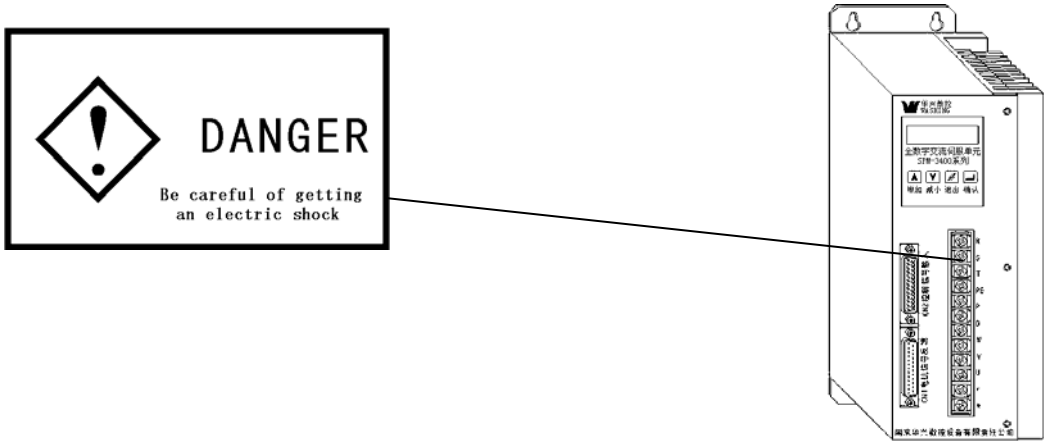
- This servo driver is not suitable for the strong vibrant environment.
- This servo driver is not suitable for the medical apparatus which influencing the life security.
- The structure of the driver is not waterproof type, unsuitable to be the environment which the drenching or sun shines directly.
- Don't do any modification to the servo driver.
- Our company keeps the right to improve this product, because the products are improved, the content of manual may be altered, forgive us for not issuing a separate notice.
- Before installing and wiring correctly, please read this service manual carefully, must understand security information, security warning and knowledge of using of this apparatus before operating.

1.1 Explanation Of Symbols Related To Security

- Incorrect handling may cause dangerous situation resulting in personal injury or death.

- Incorrect handling may cause dangerous situation resulting in personal slight or moderate casualty and damage of the apparatus.

1.2 Warning Identification Of Products



1.3 Content Of The Warning Identification

- Before installing and running, be sure to read this service manual, otherwise, have danger of getting an electric shock.
- While power-on and in five minutes after power-off, please don't open the crust.
- Please must be grounded correctly.

1.4 Safety Notes

☆ Confirm the products

- Damaged driver, please don't install.
  Otherwise, have danger of being injured.

☆ Installation

- While carrying, please hold the driver bottom. If only catch the panel, the driver may fall, have danger of being injured.
- Please install the driver on apyrous metallic flat.

Otherwise, have danger of fire.

- If more than two servo drivers are installed in the same control cabinet, please install cooling fan, and make the temperature of the entering wind keep under 45℃. Otherwise, because overheated will cause fire and other accidents.

☆ Wiring

- Before wiring, please confirm the inputting power in OFF state. Otherwise, there are dangers of electric shock and fire.
- Wiring operation should be done by electrical engineer. Otherwise, there are dangers of electric shock and fire.
- Ground terminal ⏚ must be grounded correctly. Otherwise, there are dangers of electric shock and fire.
- After finishing wiring scram circuit, please check whether movements are effective. Otherwise, have danger of being injured. (Wiring responsibility belongs to the user)
- Please don't touch the output terminal directly, the output wire of the servo driver makes sure not to be connected with crust, and not short the output wire. Otherwise, have danger of getting an electric shock and causing short circuit.

- Please confirm whether the voltage of AC major loop power and the rated voltage of servo driver are equal or not. Otherwise, there are dangers of being injured and fire.
- Please don't do high voltage test to the servo driver. Otherwise, will damage the semiconductor components.
- Please don't connect power source to the U,V,W output terminals, because the voltage is added at the output terminals, will cause the inside of the servo driver to be damaged.

- Please don't connect capacitor and LC/LR nosie filter to the U,V,W output loop. Otherwise, will cause the damage of the servo driver.
- Please don't connect electromagnetic switch or electromagnetic contactor to the U,V,W output loop. Otherwise, while driver running with load, the surge current can cause overcurrent protection for the servo driver.

☆ Trial run

Confirm the external wire of servo driver is installed correctly, please don’t dismantle the servo driver while power-on. Otherwise, there is danger of getting an electric shock.

- After resetting the servo driver, please don't be close to the mechanical equipment while trial run. (Please consider personal security in the electrical and mechanical design)
- Please provide the scram switch separately.

- The temperature of braking resistor is grown because of discharging, please don't touch. Otherwise, have danger of burning.
- Before running, please confirm again some items for using motor and machinery, such as permissible range, etc. Otherwise, have danger of being injured.
- If it is necessary to use the outer detent, please prepare separately and don't touch. Otherwise, have danger of being injured.
- Please don't check the signal during running. Otherwise, will damage equipment.

☆ Trouble Handling

- After driver power-off, a high voltage still exist in the servo driver for some time, do not dismantle wire in five minutes after power-off, do not touch the terminals. Otherwise, have danger of getting an electric shock.
- Besides designated professional personnel, please don't join, install, operate, dismantle or maintain etc.

- On the control circuit board, adopt CMOSIC integrated circuit, please don't touch directly with the finger while maintaining. Otherwise, it will damage the control circuit board by electrostatic induction.

☆ System Configuration

- The rated torque of the servo motor must be larger than the effective continuous load torque. Otherwise, it will damage the servo motor in long-term overload.
- The ratio of the load inertia to the servo motor inertia should be less than the recommend value. Otherwise, there is danger of equipment damage.
- The servo driver and servo motor should match with each other. Otherwise, will damage equipment.

☆ Others

- Please don't reform the driver by oneself. Otherwise, there are dangers of electric shock and injury.

Chapter 2 Summarization

2.1 Brief Introduction To Products

SPM-3500 serials of AC servo driver are a set of fully digital AC servo system invented independently by our company, having mainly adopted: Special motion control chip (DSP), extensive Field Programmable Gate Array (FPGA) and Intelligent Power Module (IPM), etc, nowadays the latest technology.

SPM-3500 has a series of virtues such as high integration level, small volume, fast response speed, complete protection, high reliability, simple installation, etc. It is very suitable for the field of industrial automatic control such as high-accuracy numerical control lathe, automatic product line, machine building, etc.

Comparing with past driver, the SPM-3500 AC servo system has advantages as the followings:

1、 Simple and flexible control

Through modifying the parameters of the servo driver, can choose the work mode of the servo driver system, in order to meet the requirements of different applied environment.

2、 Complete status display

SPM-3500 has a series of information for status display, helping users look over the relevant state parameters of the servo driver in the course of debugging and running; meanwhile, also offers a series of trouble diagnostic message.

3、 Wide range of speed (relate to the motor and feedback components)

SPM-3500 servo system has the maximum speed with 3000rpm and the minimum speed with 0.5rpm, the speed range is about 1:6000.

4、 Small volume, easy to install

SPM-3500 servo driver: compact structure, small volume, very easy to install and dismantle.

5、 Avoid losing step

The photoelectric encoder of servo driver sends position feedback signal into the servo driver, form the closed loop control system.

6、 Complete protection performance

Driver has many kinds of trouble measure, including: overcurrent, overvoltage, overheated, overspeed, undervoltage, position deviation, encoder measure, etc.

2.2 Brief Introduction To Operation Mode

SPM-3500 series has four kinds of control mode as follow:

☆ Position control mode: SPM-3500 series servo driver can receive two kinds of command pulse (Pulse + Direction; CCW pulse / CW pulse) by setting internal parameters.

☆ Internal speed control mode: SPM-3500 series servo driver can be in speed control mode by setting internal parameters, the speed command comes from the input port SC1 and SC2.

☆ Trial run mode: SPM-3500 series servo driver can be in trial run mode by setting internal parameters, it can be tested under “SR- ” state.

☆ JOG run mode: SPM-3500 series servo driver can be in JOG run mode by setting internal parameters, it can be tested under “JR- ” state.

Chapter 3 Order Information

3.1 Specification Of Driver

Model explanation:

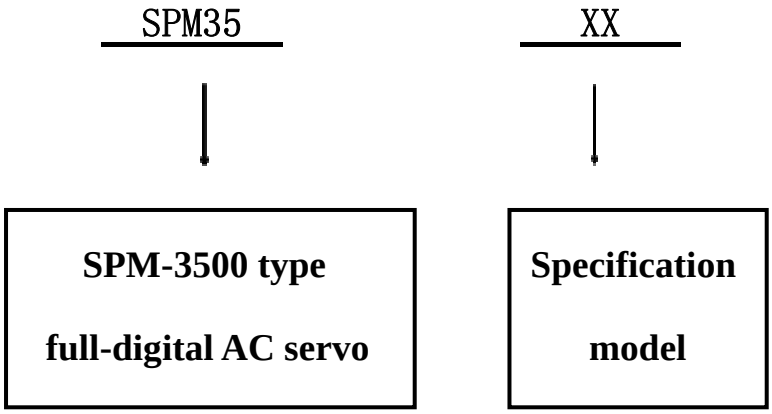


Table 3.1 Specification of driver

Specification model	Continuous current (A)	Instantaneous overload current (A)	Applicable motor
SPM-3520	5.5	15	≤1.2KW 4NM≤3000RPM 6NM≤2000RPM
SPM-3530	7.5	20	1.2KW~2.3KW 6NM≤3000RPM 7.5NM≤3000RPM 10NM≤2200RPM 15NM≤1500RPM
SPM-3540	11	30	1.2KW~3KW 6NM≤3000RPM 7.5NM≤3000RPM 10NM≤3000RPM 15NM≤2000RPM
SPM-3550	15	40	3KW~5.5KW 15NM≤3000RPM 18NM≤3000RPM 23NM≤2300RPM 27NM≤2000RPM

Note: Every type parameter of driver relates to applicable motor, see the

content of chapter 7.

Table 3.2 Specification of driver

<table>
<tr><td colspan="2">Control power supply</td><td>Single phase AC220V -50~+20% 50/60Hz</td><td>Input the strong power</td><td>Three-phase AC220V -15~+10% 50/60Hz</td></tr>
<tr><td rowspan="3">Using environment</td><td>Temperature</td><td colspan="3">Running: 0℃~55℃ Storage: -20℃~80℃</td></tr>
<tr><td>Humidity</td><td colspan="3">Small than 90%(no dew)</td></tr>
<tr><td>Vibration</td><td colspan="3">Small than 0.5G (4.9m/s²), 10~60Hz (not run continuously)</td></tr>
<tr><td colspan="2">Control method</td><td colspan="3">①Position control ②Internal speed control ③Trial run control ④JOG run control</td></tr>
<tr><td colspan="2">Regenerative braking</td><td colspan="3">Built-in\External connection</td></tr>
<tr><td rowspan="4">Characteristic</td><td>Speed frequency response</td><td colspan="3">300Hz or higher</td></tr>
<tr><td>Speed fluctuation ratio</td><td colspan="3"><±0.1(load 0～100%); <±0.02(power -15～+10%);
(The value is correspondent to the rated speed)</td></tr>
<tr><td>Regulation ratio</td><td colspan="3">1:6000</td></tr>
<tr><td>Pulse frequency</td><td colspan="3">≤500kHz</td></tr>
<tr><td colspan="2">Control input</td><td colspan="3">①Servo enable ②Alarm clear ③Deviation counter clear ④Command pulse forbid ⑤CCW drive forbid ⑥CW drive forbid</td></tr>
<tr><td colspan="2">Control output</td><td colspan="3">①Servo ready output ②Servo alarm output ③Position fixing finished output /Speed reached output</td></tr>
<tr><td colspan="2" rowspan="3">Position control</td><td>Input mode</td><td colspan="2">① Pulse + Direction
② CCW pulse / CW pulse</td></tr>
<tr><td>Electronic gear wheel</td><td colspan="2">1~32767 / 1~32767</td></tr>
<tr><td>Feedback pulse</td><td colspan="2">The pulse is 2000 pulse/rotation at most</td></tr>
<tr><td colspan="2">Acceleration and deceleration function</td><td colspan="3">Parameter set 1~10000ms (0~2000r/min or 2000~0r/min)</td></tr>
<tr><td colspan="2">Monitor function</td><td colspan="3">Rotate speed, present position, command pulse accumulation, position deviation, motor torque, motor current, rotor position, command pulse frequency, running state, input and output terminals signal, etc.</td></tr>
<tr><td colspan="2">Protect function</td><td colspan="3">Overspeed, major power supply overvoltage or undervoltage, overcurrent, overload, braking abnormity, encoder abnormity, control power supply undervoltage, overheated, position deviation, etc.</td></tr>
<tr><td colspan="2">Operation</td><td colspan="3">6 LED nixietubes, 4 keystokes</td></tr>
<tr><td colspan="2">Applicable load inertia</td><td colspan="3">Smaller than 5 times of the rotor inertia of motor</td></tr>
</table>

Installation size for the servo driver cell (unit: mm)

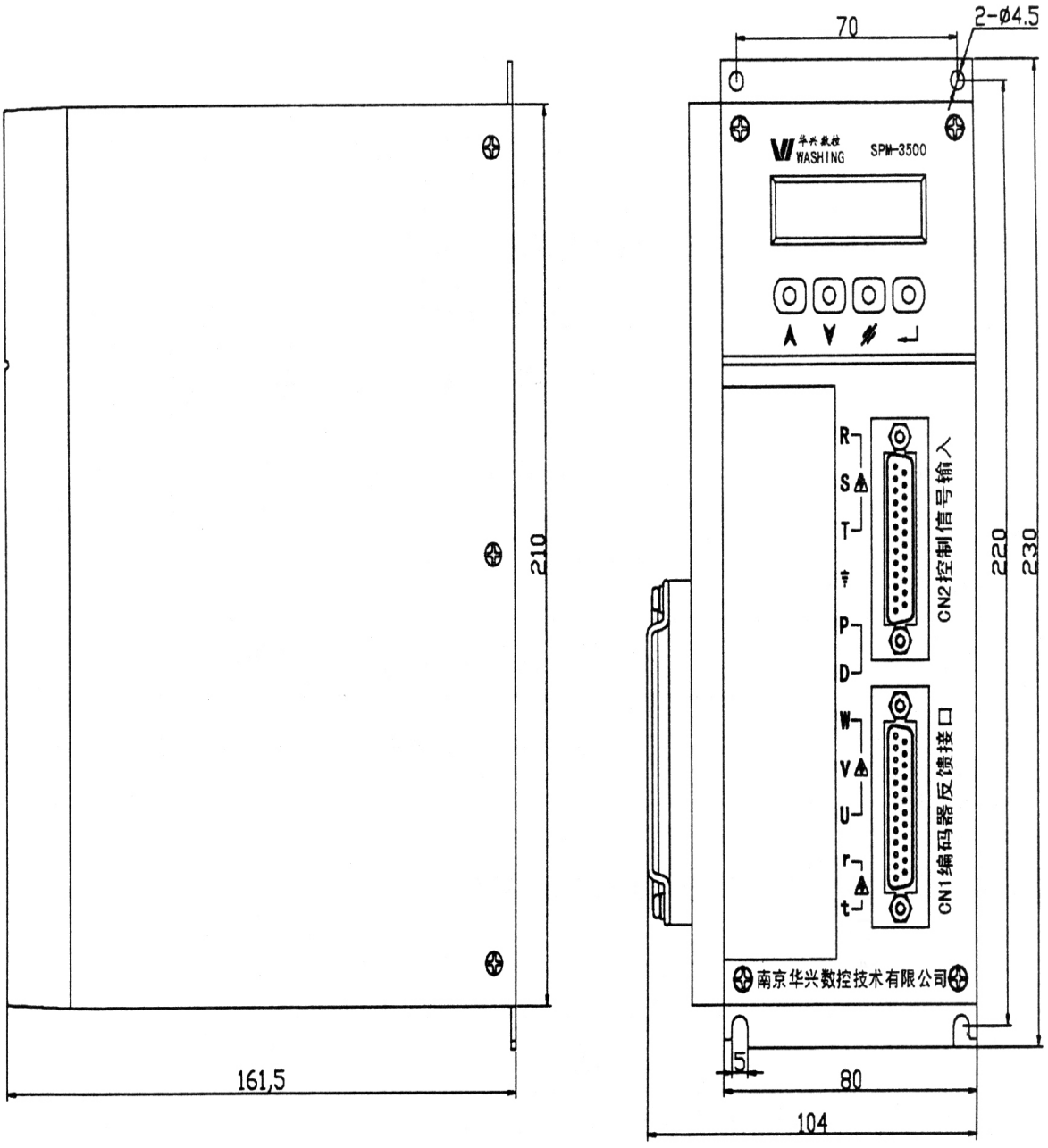


Fig 3.1 SPM-3520、SPM-3530、SPM-3540 Installation size for servo driver

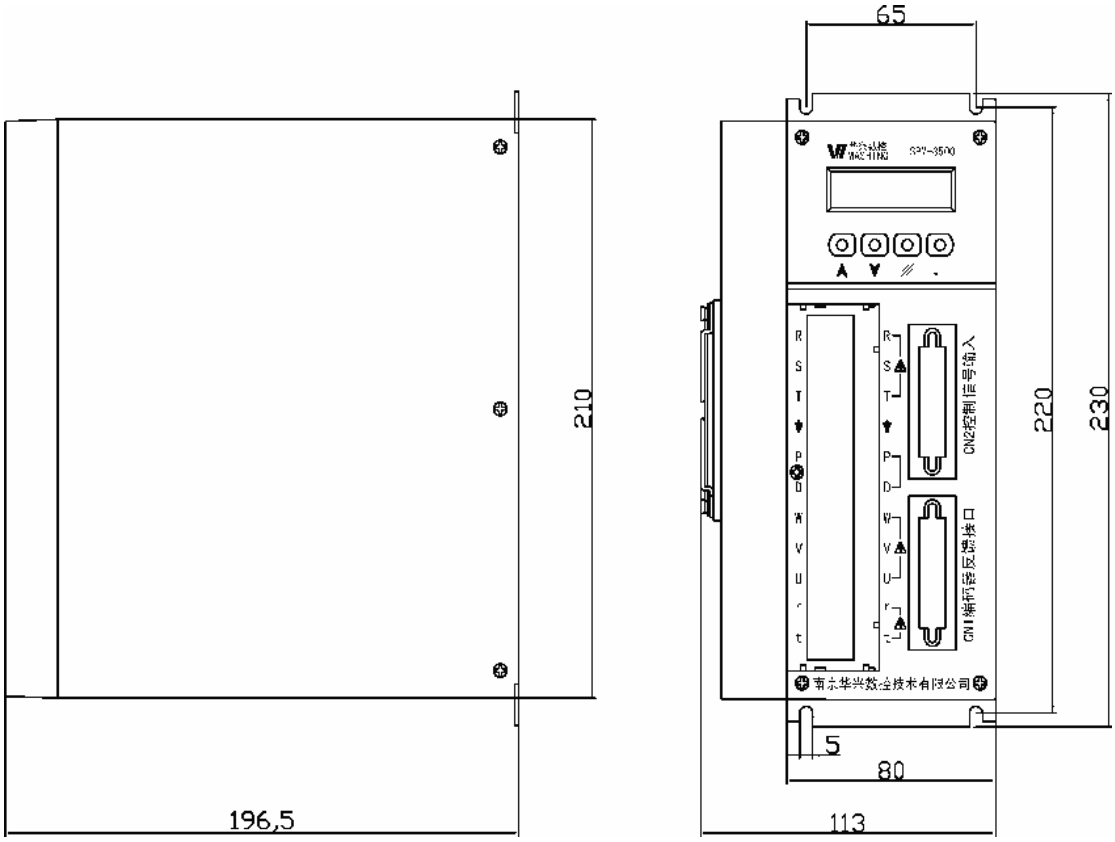


Fig 3.2 SPM-3550 Installation size for servo driver

3.2 Specification Of Isolation Transformator

SPM-3500 servo driver adopts the servo isolation transformator with 380/220V, the capacity of the isolation transformator should be determined by the capacity of the servo system, the capacity of driver that each actuating shaft select for use should be considered synthetically, it is recommended considering according to the following steps:

1. Adopt suitable motor according to the mechanical load inertia and torque of each shaft and the transmission way adopted.

2. Confirm the type of the driver according to the motor selected for use.

3. Calculate the capacity of servo isolation transformator according to the motor selected.

For example: in the system which adopts three SPM-3500 servo drivers, the power of the motor is P1, P2, P3 respectively, the power of the servo isolation transformator selected for use must meet the following formulae:

P0>(P1+P2+P3)·η (η is reduction coefficient, generally is 0.6~0.8)

4. Select the corresponding specification of the servo isolation

transformator, according to its capacity calculated.

Chapter 4 Installation

4.1 Check Goods

After receiving the product, please check for the following:

Checking item	Reference content
Have any damage	Inspect the unit to insure it was damaged during shipment
Make sure that the product is what you have ordered	Please verify the nameplate [type] of servo cell and motor
Is the attachment complete	Please check the packing list, confirm attachment type and quantity
Make sure that the servo motor shaft rotate easily	The servo motor shaft rotate easily by hands, however, the servo motor with electromagnetic brake can not be rotated

If any item is damaged or incorrect, please contact the supplier or our company directly.

NOTICE
● If the servo system is damaged or the attachment is not complete, can not install. ● The servo driver and the servo motor which matches this driver on performance should be used together.

4.2 Installation Environment

- Servo driver should be installed properly in a good electrical cabinet to prevent invasion from the dust, corrosive gas, conductor, liquid and flammables;
- Servo driver should be installed

properly according to the prescribed direction and interval, also should keep a good heat dissipation condition;

- Servo driver and motor should avoid vibration, forbid impacting;
- To avoid fire, do not set up the servo driver and motor close with flammable object.

4．2．1 Safeguard Requirement

Servo driver should be installed properly in a good electrical cabinet to prevent invasion from the corrosive and flammable gas, conductive object, metal dust, oil fog and liquid, because of having no safeguard itself.

4．2．2 Temperature Requirement

The ambient temperature range from 0℃ to 50℃, for long-term reliability should be under 45℃, also should keep a good heat dissipation condition.

4．2．3 Vibration and Impact

Avoid vibration in course of installation, control the vibration under 0.5G (4.9m/s^2) with shock absorber. The servo driver should have no stress and impact.

4.3 Install Servo Driver

NOTICE
● Servo driver should be installed properly in a good electrical cabinet. ● Servo driver should be installed properly according to the direction and interval prescribed, also keep a good heat dissipation condition. ● To avoid fire, do not mount the servo driver and motor close with flammable object.

4．3．1 Installation Direction

(1) Installation mode

Users can adopt the motherboard installation mode，the installation direction is perpendicular upward to fitting surface. Fig 4.1, fig 4.2 are sketch maps.

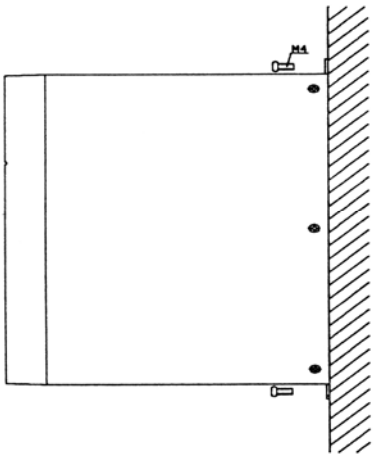


Fig 4.1 Side elevation of motherboard installation mode

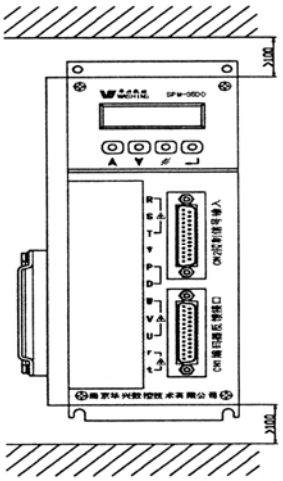


Fig 4.2 Elevation view of motherboard installation mode

(2) Installation clearances

Fig 4.3 shows the installation clearances for single driver, fig 4.4 shows the installation clearances between several drivers with side by side installation. Should reserve larger clearance for actual installation as much as possible, guarantee the good heat dissipation condition.

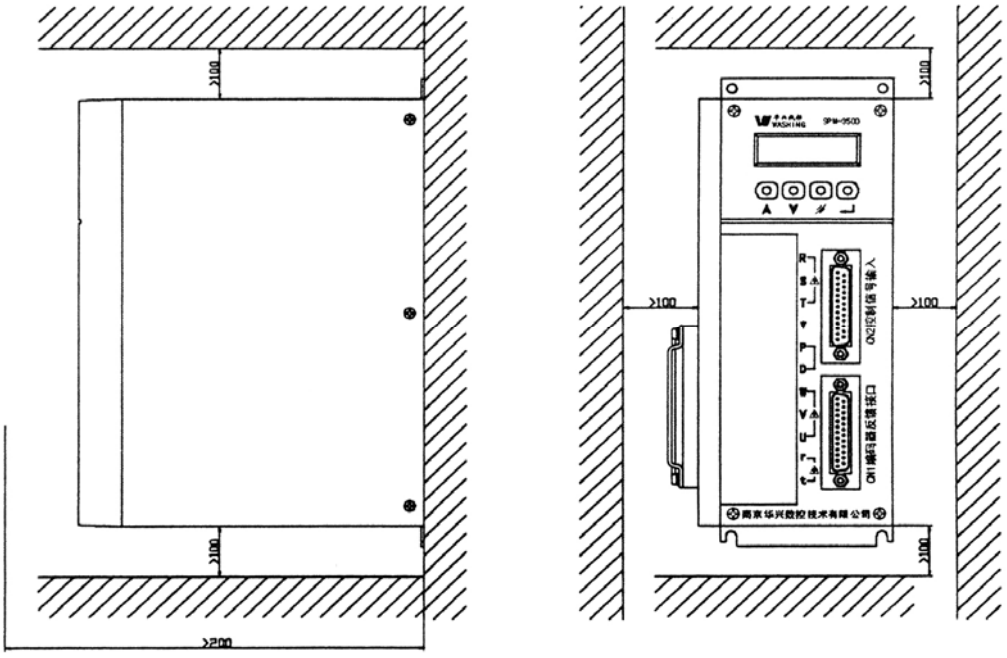


Fig 4.3 Installation clearances for single driver

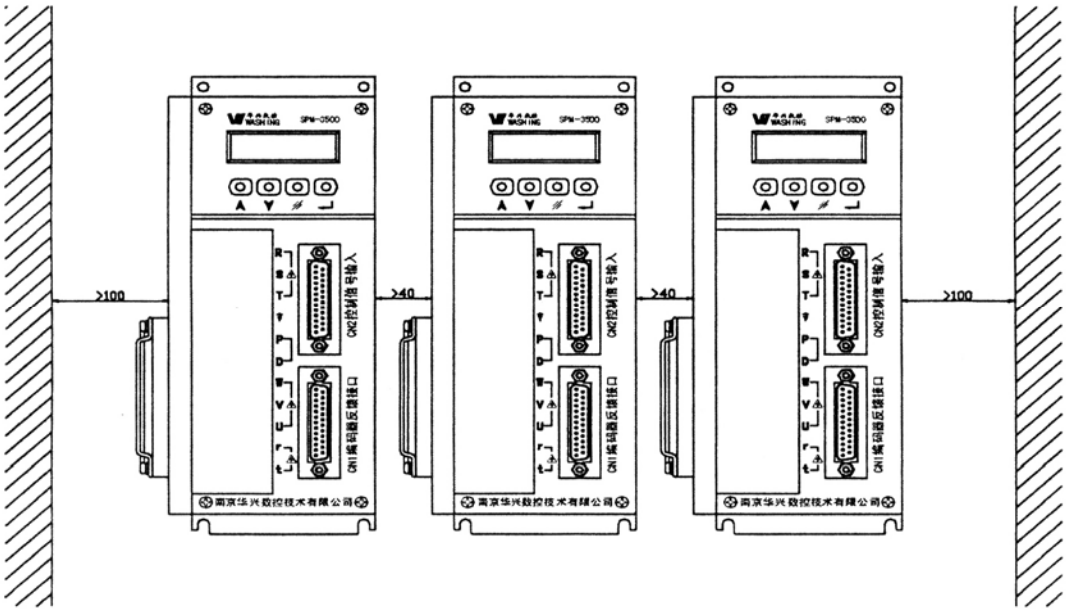


Fig 4.4 Installation clearances between several drivers with side by side installation

(3) Heat dissipation

In order to guarantee the temperature around driver dose not rise continuously, in the electrical cabinet, there should be convection wind blowing to the radiator of driver.

4.4 Install Servo Motor

NOTICE
● Forbid beating motor shaft or encoder, prevent the motor from vibration or shock. ● Can't drag the motor shaft, lead-out wire or encoder while moving the motor. ● Motor shaft can't bear overload, otherwise may damage the motor. ● It must be firm to install motor, should also have measure for loose.

4．4．1 Installation Environment

(1) Safeguard

If the servo motor is not waterproof type, must prevent liquid from

spattering on motor while installing and using, must prevent oil from entering within the motor through down-lead and motor shaft.

[Note] If user needs waterproof type servo motor, please declare while order.

(2) Temperature and humidity

The ambient temperature should keep between 0~40℃ (not form dew). The motor will become hot because of generating heat while running for a long time, little space around or have generate heat equipment nearby, should consider forcing and dispelling the heat.

The humidity should not be greater than 90% RH, can't form dew.

(3) Vibration

Servo motor should be installed in the environment without vibration, the vibration should not be greater than 0.5G (4.9m/s^2).

Chapter 5 Wiring

WARNING
● Any person who participating in wiring or checking must have enough ability to do the work. ● Before wiring or checking, make sure that the voltage is safe at least 5 minutes after power-off. Otherwise may get an electric shock.

NOTICE
● Connect cable should according to level and polarity of voltage to prevent equipment damage or personnel injury. ● The servo driver and servo motor should be grounded well. ● While installing / dismantling the mechanical interconnecting pieces which connect to the motor shaft, do not beat motor shaft with hammer directly. (Otherwise, the encoder of motor may be damaged) ● Try to make the motor shaft reach peak. (Otherwise will produce vibration, or damage the axletree)

5.1 Standard Wiring

External connections of the servo driver are related to the control mode.

1） Fig 5.1 shows: The standard wiring for position control mode between the driver and our company's 31XT/99DT/320Ti/330Ti CNC system;

2） Fig 5.2 shows: The standard wiring for position control mode between the driver and our company's 97/98 CNC system;

3） Fig 5.3 shows: The standard wiring for position control mode between the driver and HUADA/XINYUE/KANGMING/YUHAI/DONGHAO servo motor;

4） Fig 5.4 shows: The standard wiring for position control mode between the driver and DENGQI servo motor;

5） Fig 5.5 shows: The standard wiring for position control mode between the driver and SUQIANG servo motor;

6） Fig 5.6 shows: The standard wiring for position control mode between the driver and SIEMENS 801 system.

(1) Power terminals TB1

- Wire size: R、S、T、PE、U、V、W terminal wire size≥1.5mm^2, r、t terminal wire size≥1.0mm^2.
- Grounding: The wire size for grounding should be as big as possible, the PE terminals of the driver and servo motor are connected to ground in one point, the earth resistance＜100Ω.
- JUT-1.5-4 pre-insulation cold press terminal is used for connecting terminals, make sure that the connections are fast.
- Three-phase isolation transformator with power supply is recommended to reducing possibility of electric shock.
- A noise filter with power supply is recommended to enhance the ability of anti-jamming.
- Please install non-melt type breaker (NFB) to switch off power supply quickly in case of the servo driver failure.

(2) Control signals CN2, feedback signals CN1

- Wire size: Use a screened cable (screened twisted-pair cable is best), wire size≥0.12mm^2 , the shielding layer should be connected to FG terminal.
- Cable length: The length of cable is as short as possible, the length of control cable CN2 is no more than 10 meters, the length of encoder cable CN1 is no more than 40 meters.
- Wiring: Wiring must be kept away from power wire to prevent the influence of interference.
- Please provide a surge snubber component to each inductive component (coil) in related circuit: DC coil inverse parallel connect with fly-wheel diode, AC coil parallel RC snubber loop.

NOTICE
● The wires connected to the U、V、W terminals of the servo driver should be one-to-one correspondence, can't reverse connection. ● The cables and wires must be fixed securely, and are not closed to the radiator of the servo driver and motor to prevent reducing insulating property because of heat. ● Do not touch the servo driver and servo motor in 5 minutes after power off, because in the servo driver there are electrolytic capacitors keeping a high voltage, even though power-off.

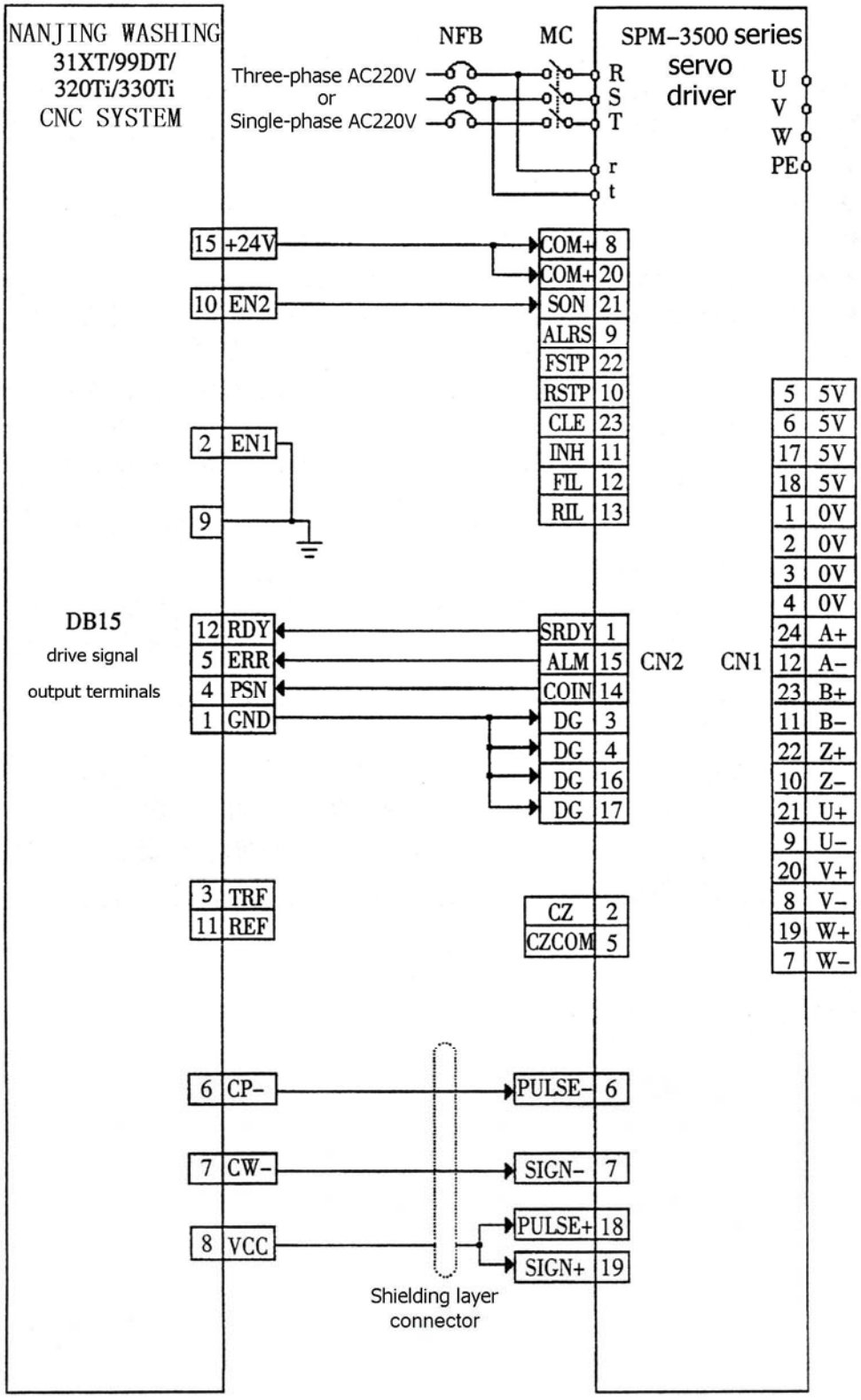


Fig5.1 Standard wiring for position control mode between the driver and our company's 31XT/99DT/320Ti/330Ti CNC system

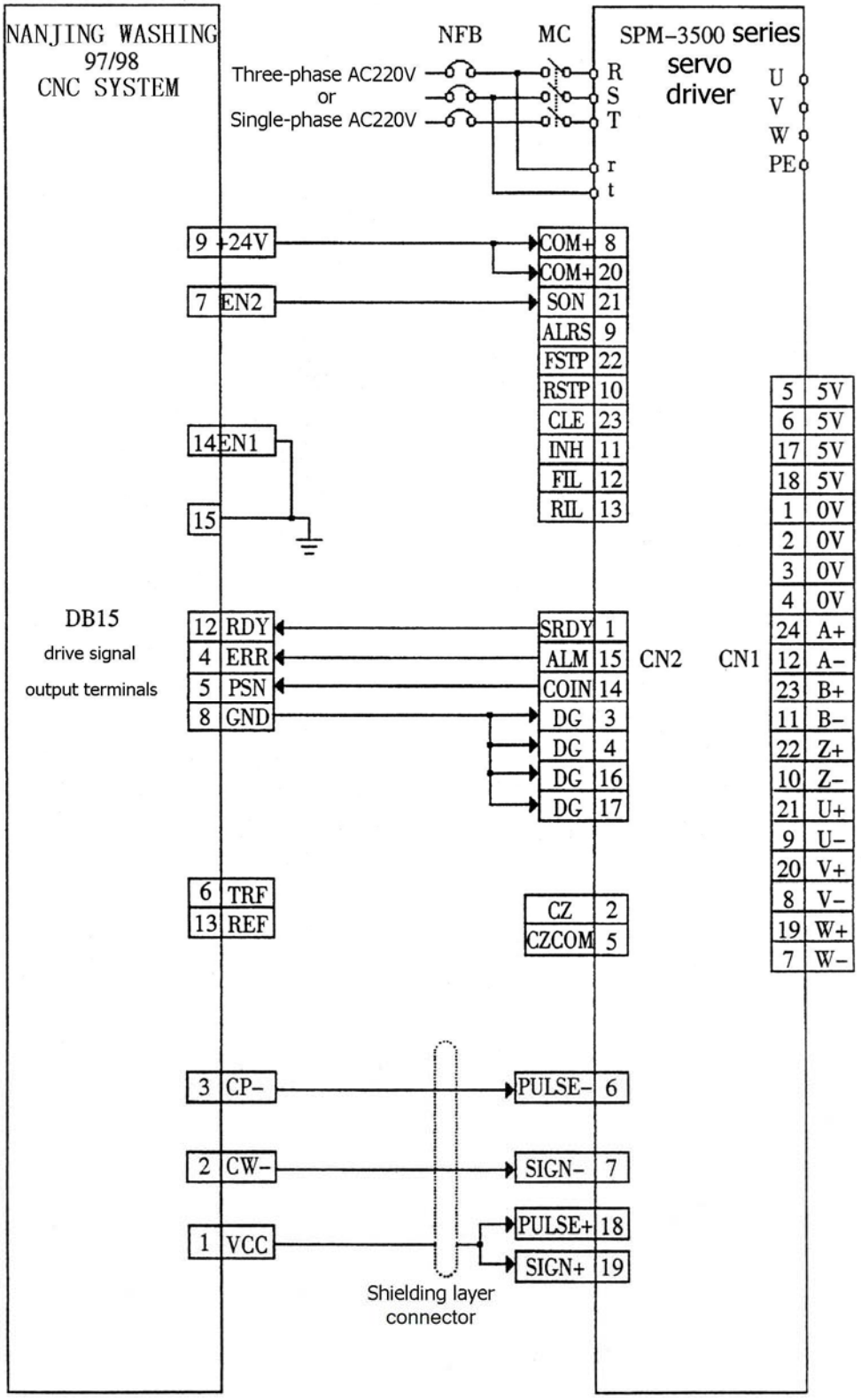


Fig 5.2 Standard wiring for position control mode between the driver and our company's 97/98 CNC system;

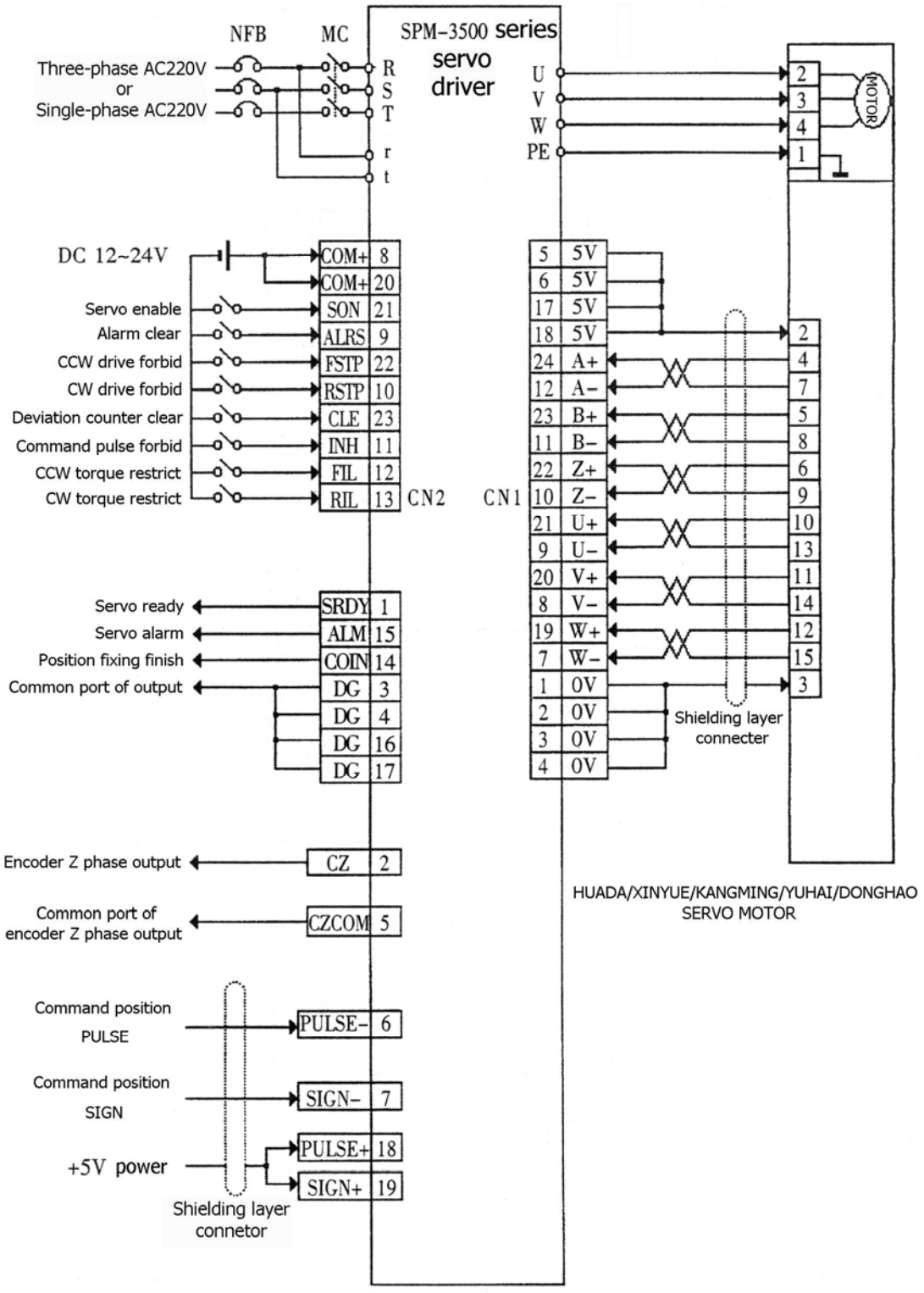


Fig 5.3 Standard wiring for position control mode between the driver and HUADA/XINYUE/KANGMING/YUHAI/DONGHAO servo motor

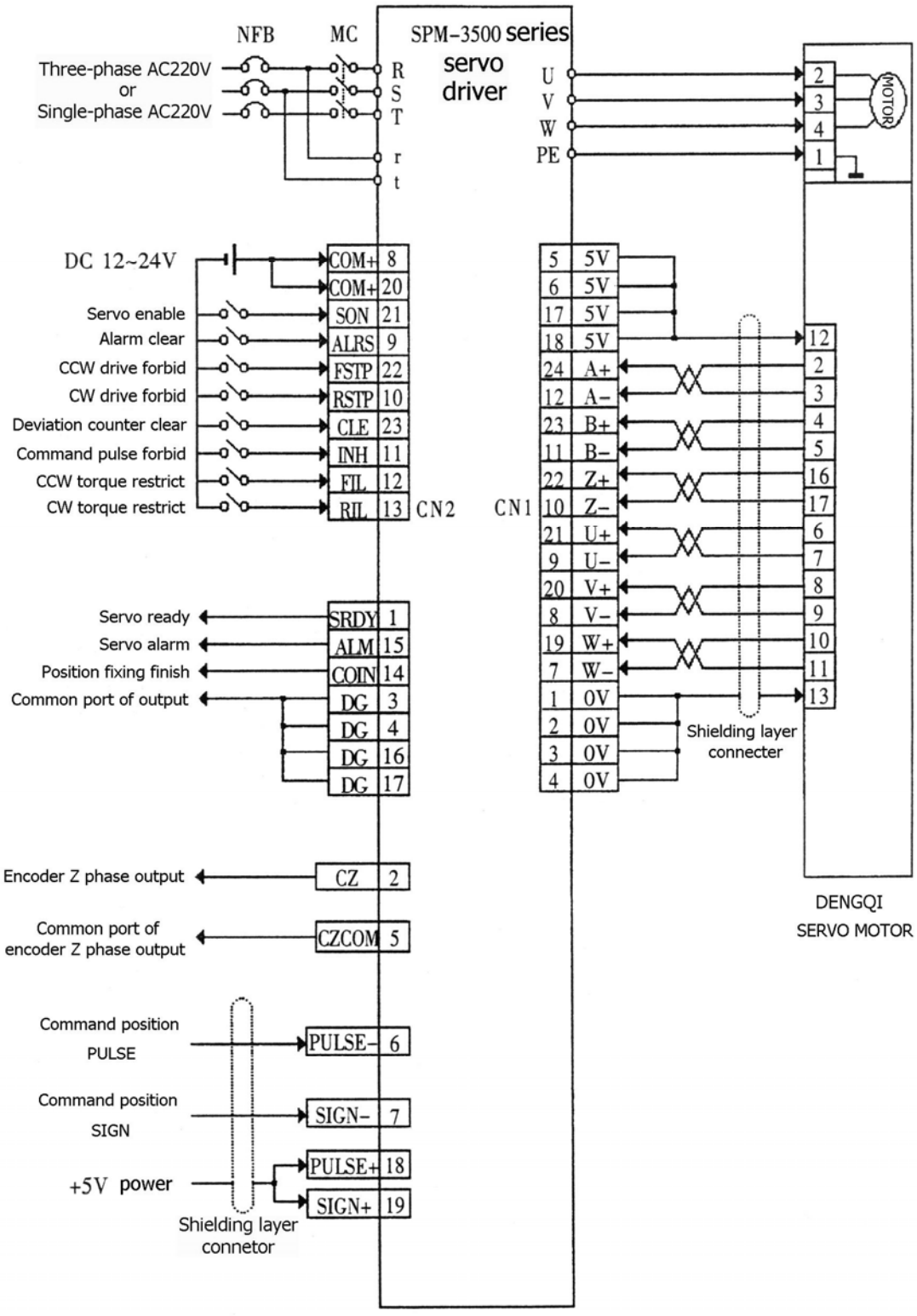


Fig 5.4 Standard wiring for position control mode between the driver and DENGQI servo motor

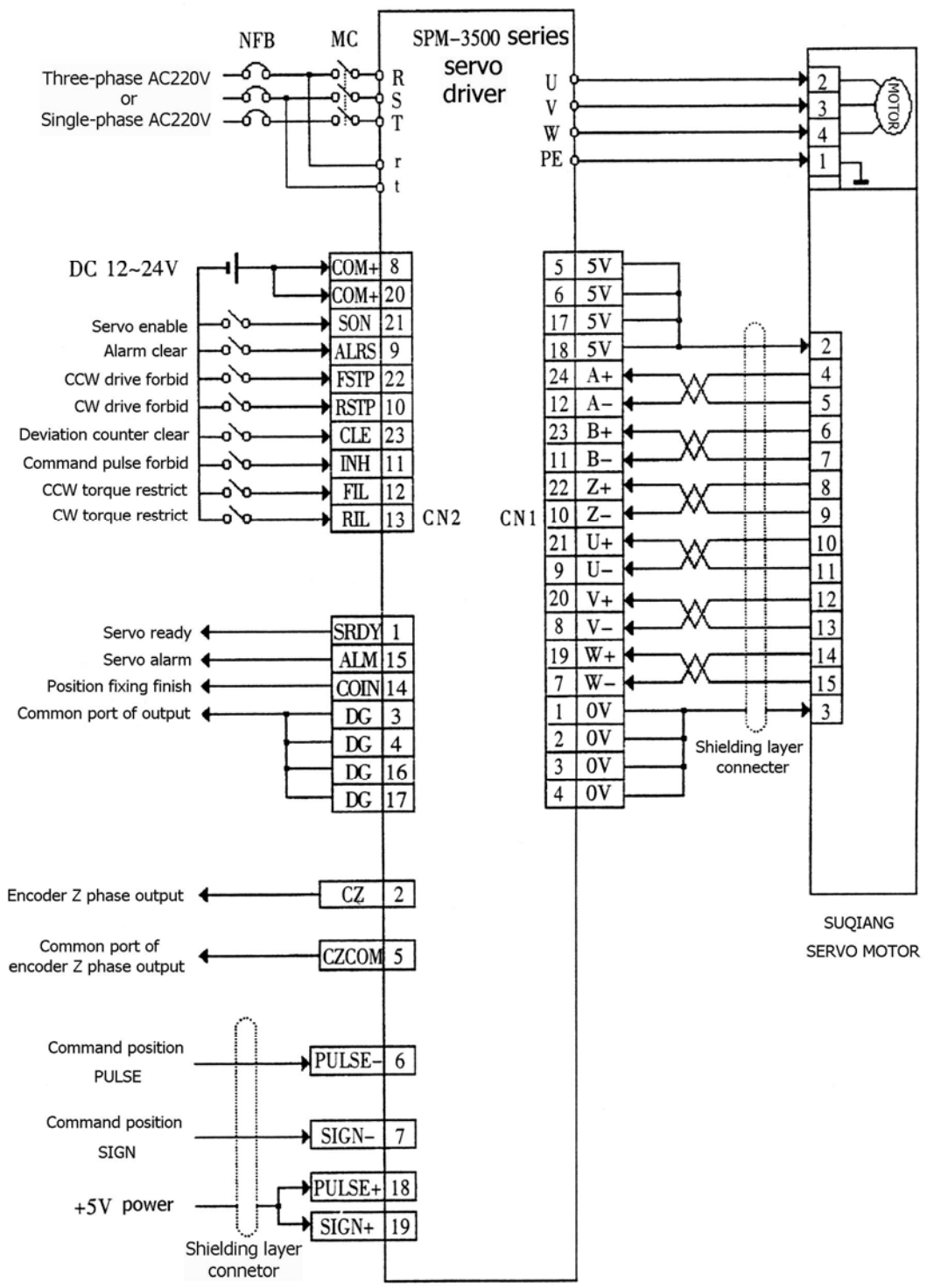


Fig 5.5 Standard wiring for position control mode between the driver and SUQIANG servo motor

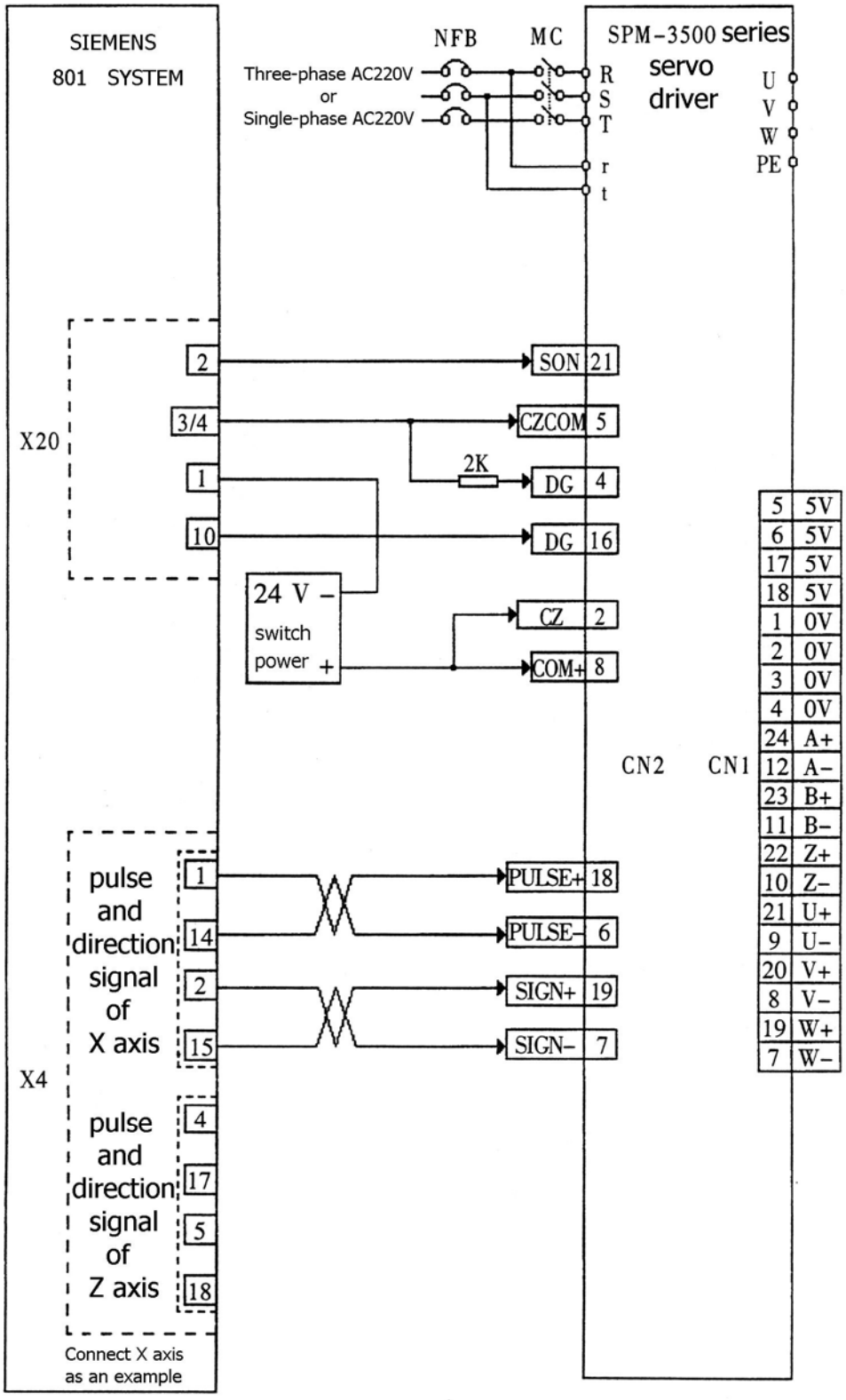


Fig 5.6 Standard wiring for position control mode between the driver and SIEMENS 801 system

5.2 Signal And Function

5.2.1 Terminal Arrangement

Fig 5.8 shows the terminal arrangement of servo driver. TB is the terminal block: CN1、CN2 are pinouts.

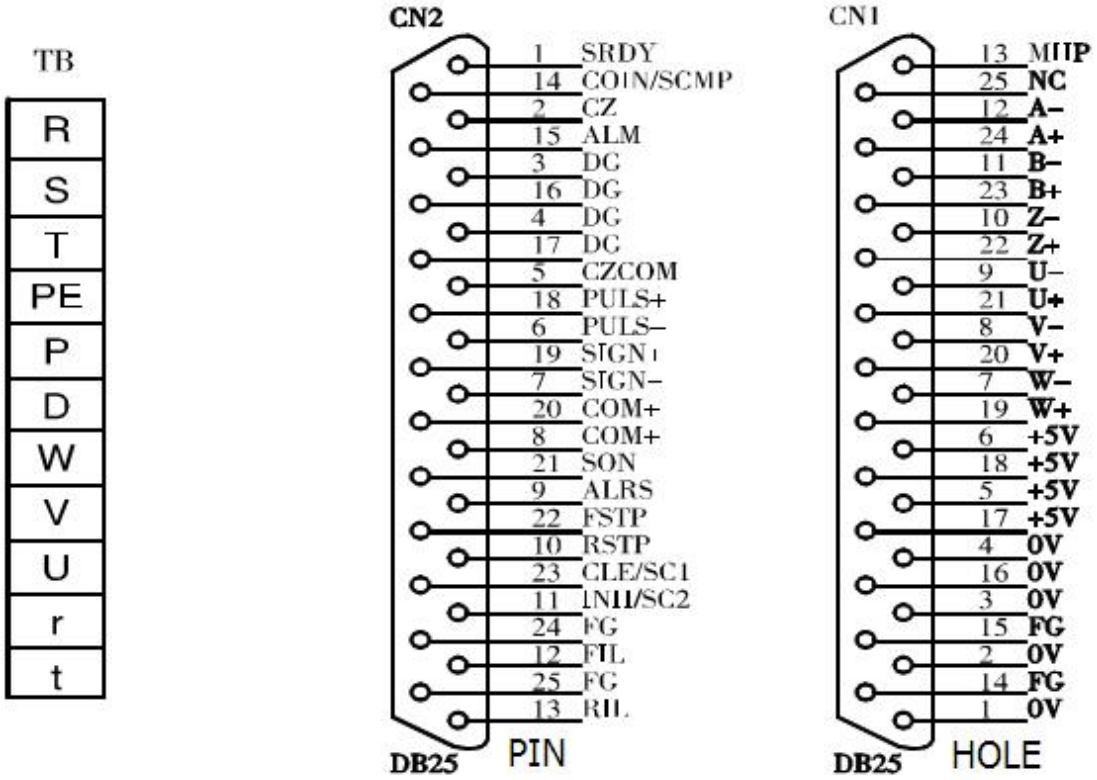


Fig 5.7 Terminal arrangement of servo driver

5.2.2 Power Terminal TB

Table 5.1 Power terminal TB

Terminal number	Terminal symbol	Name of signal	Function
1	R	Major loop power supply (single-phase or three-phase)	Major loop power supply input terminals AC220V/50Hz.
2	S		
3	T		
4	PE	System earth	Earth terminal Earth resistance<100Ω Servo motor output and power input are all grounded
5	P	External braking	If need add external braking resistor, can insert through these two points.
6	D		

Terminal number	Terminal symbol	Name of signal	Function
			If use inner braking resistor, cut off these two points. **Notice: Can't make these two points short-circuit. Otherwise, will cause the serious consequence and damage the driver!!!**
7	W	Servo driver output	Servo driver output terminals must be connected with U, V, W terminals of motor one-to-one correspondence.
8	V		
9	U		
10	r	Control power supply (Single phase)	Control loop power supply input terminals AC220V/50Hz
11	t		

5.2.3 Control signal input/output terminal CN2

Abbreviation of control mode: P stands for position control mode
S stands for speed control mode

Table 5.2 Control signal input/output terminal CN2

Terminal number	Name of signal	Symbol	I/O	Type	Function
CN2-8 CN2-20	The power positive pole of input terminal	COM+	Type1		Used for driving the optical coupler of input terminal, DC 12~24V, current ≥ 100mA
CN2-21	Servo enable	SON	Type1		SON ON: Permit driver run; SON OFF: Driver off, motor is in free state. **Note 1:** Make sure servo motor is quiescent before turn "SON OFF" to "SON ON"; **Note 2:** After turning to "SON ON", wait to input the command 50ms later at least.

Terminal number	Name of signal	Symbol	I/O	Type	Function
CN2-9	Alarm clear	ALRS	Type1		ALRS ON: Clear drive alarm; ALRS OFF: Keep drive alarm. **Note 1:** To solve the error code bigger than 8, need power-off and check, but not use this way.
CN2-22	CCW drive forbid	FSTP	Type1		FSTP ON: CCW Drive permit; FSTP OFF: CCW Drive forbid. **Note 1:** Used in mechanical overrun, CCW direction torque keeps as zero when switch OFF. **Note 2:** Can shield this function or make switch ON forever by setting PA31 parameter.
CN2-10	CW drive forbid	RSTP	Type1		RSTP ON: CW drive permit; RSTP OFF: CW drive forbid. **Note 1:** Used in mechanical overrun, CW direction torque keeps as zero when switch OFF; **Note 2:** Can shield this function or make switch ON forever by setting PA31 parameter.
CN2-23	Deviation counter clear	CLE	Type1	P	CLE ON: If in position control mode, deviation counter clear.
	Speed select 1	SC1	Type1	S	Under the speed control mode, the associations of SC1 and SC2 are used for choosing different internal speed. SC1 OFF, SC2 OFF: Internal speed 1; SC1 ON, SC2 OFF: Internal speed 2; SC1 OFF, SC2 ON: Internal speed 3; SC1 ON, SC2 ON: Internal speed 4. **Note:** The value of internal speed 1~4 can be modified by parameter.

Terminal number	Name of signal	Symbol	I/O	Type	Function
CN2-11	Command pulse forbid	INH	Type1	P	INH ON: Command pulse input is forbidden; INH OFF: Command pulse input is efficient.
	Speed select 2	SC2	Type1	S	Under the speed control mode, the associations of SC1 and SC2 are used for choosing different internal speed. SC1 OFF, SC2 OFF: Internal speed 1; SC1 ON, SC2 OFF: Internal speed 2; SC1 OFF, SC2 ON: Internal speed 3; SC1 ON, SC2 ON: Internal speed 4.
CN2-12	CCW torque restrict	FIL	Type1		FIL ON: CCW torque is restricted within the range of parameter PA34; FIL OFF: CCW torque is not restricted by parameter PA34. **Note 1:** CCW torque is restricted still by parameter PA32, whether FIL is effective or not, generally, parameter PA32 > parameter PA34.
CN2-13	CW torque restrict	RIL	Type1		RIL ON: CW torque is restricted within the range of parameter PA35; RIL OFF: CW torque is not restricted by parameter PA35. **Note 1:** CCW torque is restricted still by parameter PA33, whether RIL is effective or not, generally, parameter PA33 > parameter PA35.
CN2-1	Servo ready output	SRDY	Type2		SRDY ON: Control power supply and main power supply are all normal, no alarm from servo driver, servo ready output is ON. SRDY OFF: Main power supply is detached or exist alarm from servo

Terminal number	Name of signal	Symbol	I/O	Type	Function
					driver, servo ready output is OFF
CN2-14	Position fixing finished	COIN	Type2	P	Position fixing finished output is ON when deviation counter in the range of preset position fixing range.
	Speed reached output	SCMP	Type2	S	SCMP ON: Speed reached output is ON when speed reach or over the preset speed.
CN2-3 CN2-4 CN2-16 CN2-17	Common port of output terminals	DG			Earth common port (Except CZ).
CN2-2	Encoder Z Phase output	CZ	Type2		Servo motor photoelectric encoder Z phase pulse output CZ ON: Z phase signal appears.
CN2-5	Common port of Encoder Z Phase output	Z	CZCOM		Common port of Encoder Z Phase output terminal.
CN2-18	Command pulse PLUS input	PLUS+	Type3	P	Note 1: Set pulse input mode with parameter PA4. ①Command pulse + direction mode; ②CCW/CW command pulse mode.
CN2-6		PLUS-			
CN2-19	Command pulse SIGN input	SIGN+	Type3	P	
CN2-7		SIGN-			
CN2-24	Screen ground	FG			Screen ground terminal
CN2-25					

5.2.4 Encoder signal terminal CN1

Table 5.3 Encoder signal terminal CN1

Terminal number	Name of signal	Terminal symbol			Function
		Sign	I/O	Mode	
CN1-5	Power supply output +	+5V			+5V is used for the photoelectric encoder of servo motor. If the encoder cable is too long, it is necessary to use multiple wires in parallel connection.
CN1-6					
CN1-17					
CN1-18					
CN1-1	Power supply output -	0V			
CN1-2					
CN1-3					
CN1-4					
CN1-16					
CN1-24	Encoder A + input	A+	Type4		Connect to photoelectric encoder A+
CN1-12	Encoder A- input	A-			Connect to photoelectric encoder A-
CN1-23	Encoder B+ input	B+	Type4		Connect to photoelectric encoder B+
CN1-11	Encoder B- input	B-			Connect to photoelectric encoder B-
CN1-22	Encoder Z+ input	Z+	Type4		Connect to photoelectric encoder Z+
CN1-10	Encoder Z- input	Z-			Connect to photoelectric encoder Z-
CN1-21	Encoder U+ input	U+	Type4		Connect to photoelectric encoder U+
CN1-9	Encoder U- input	U-			Connect to photoelectric encoder U-
CN1-20	Encoder V+ input	V+	Type4		Connect to photoelectric encoder V+
CN1-8	Encoder V- input	V-			Connect to photoelectric encoder V-
CN1-19	Encoder W+ input	W+	Type4		Connect to photoelectric encoder W+
CN1-7	Encoder W- input	W-			Connect to photoelectric encoder W-

5.3 Interface Circuit

5.3.1 Switching signal input interface

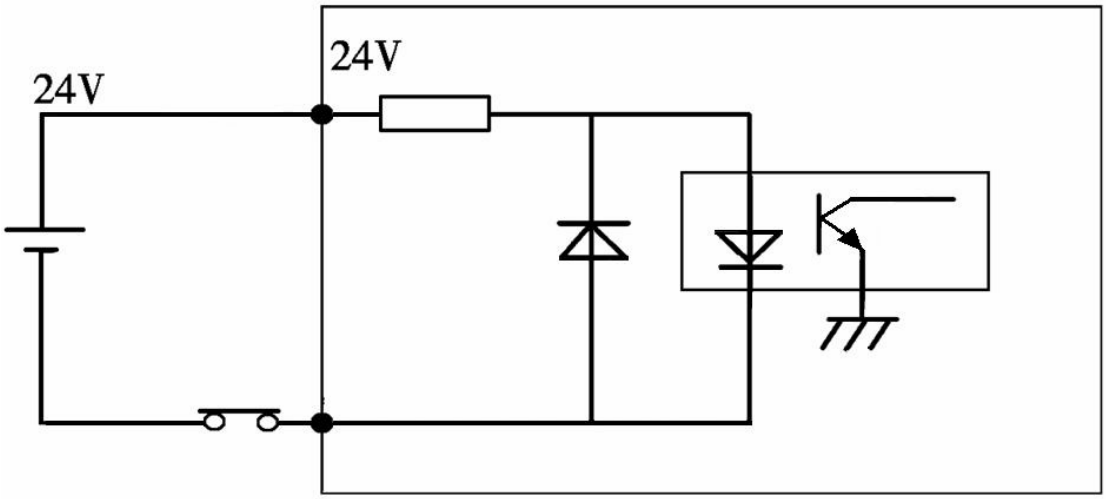


Fig 5.8 Switching signal input interface

A、 The user should provide a power supply, DC24V, current≥100mA;

B、 Notice, if the polarity of the power supply is reverse, the servo driver will be damaged.

5.3.2 Switching signal output interface

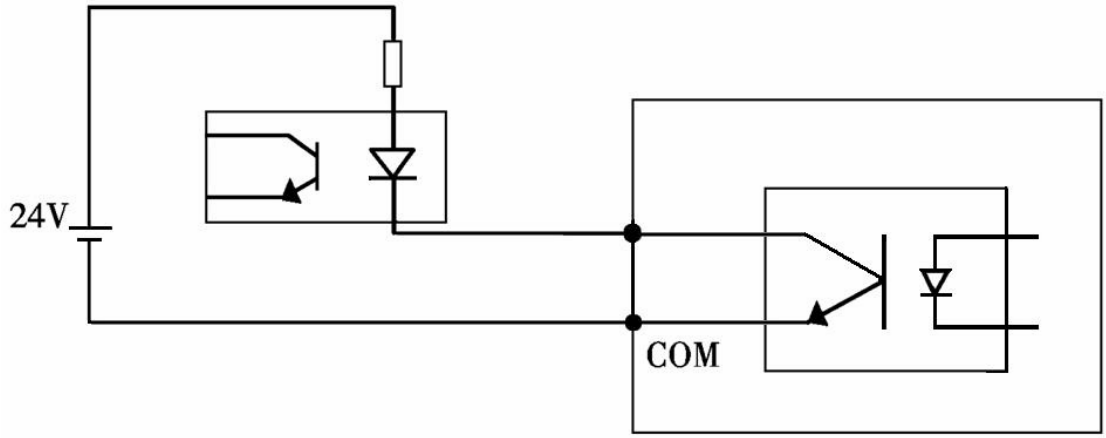


Fig 5.9 Switching signal output interface

A、The user should provide an external power supply, but be careful, if the polarity of the power supply is reverse, the servo driver will be damaged.

B、The output circuit is an open-collector form, its maximum sink current is 50mA, the external power supply voltage is 25V. Therefore, the load of the switching output signal must meet these limitations. If exceed these limitations or short between output and power supply directly, the servo driver will be damaged.

C、If the load is an inductive load such as relay, it is necessary to inverse parallel connection a fly-wheel diode to the load. If the fly-wheel diode is in a wrong direction, the servo driver will be damaged.

5.3.3 Pulse signal input interface

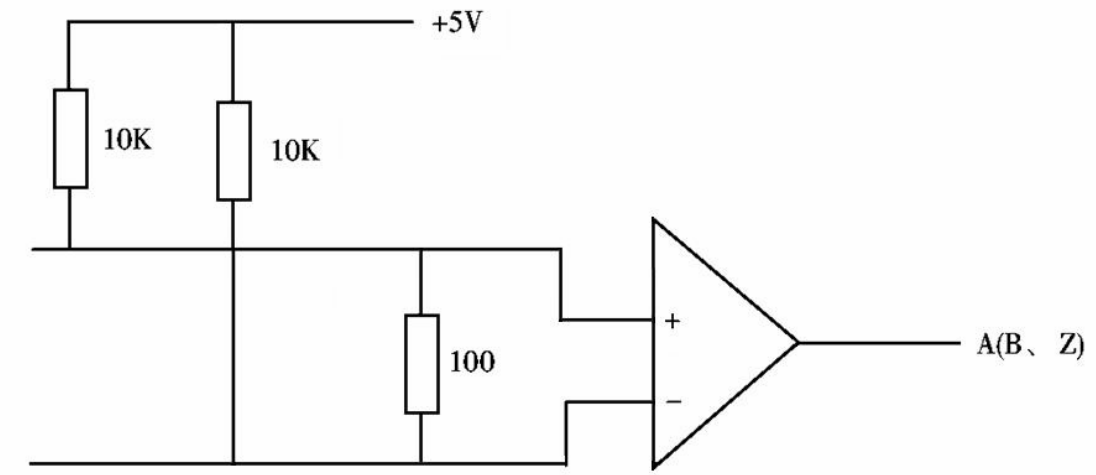


Fig 5.10 Difference drive mode for pulse signal input interface

A、To receive the pulse data correctly, it is recommended to use the difference drive mode for the pulse signal input interface of SPM-3500 servo.

B、During using, it is recommended to adopt the difference drive mode (Especially the signal cable is too long).

5.3.4 Input interface of photoelectric encoder of servo motor

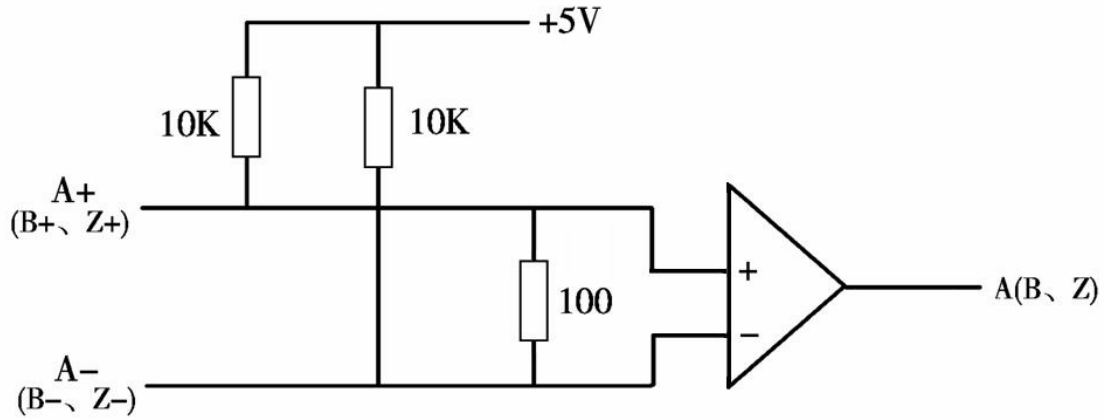


Fig 5.11 Input interface of photoelectric encoder of servo motor

Chapter 6　Operation And Display

6.1 Keyboard Operation

- The driver panel is made up of 6 LED digit displays and 4 keys、、、, they are used for displaying various states of servo system and setting parameters. The key's functions are as follows:
  ：Sequence number, value increasing, or move forward for option.
  ：Sequence number, value decreasing, or move backward for option.
  ：Return to upper layer menu, or cancel operation.
  ：Enter next layer menu, or input confirmed.

【Note】During operation, if keep 、 pressed, the operation will execute repeatedly, and the longer the pressing keeps, the faster the repeat rate is.

- The 6 LED digit displays are used for displaying various states and data of the servo system. All 6 digit displays of driver panel have displayed when putting through the control power supply of the servo driver.
- The servo system operation executes according to multilayer menu, the first layer is main menu, including 5 kinds of operation modes (As shown in fig 6.1), the second layer is function menu of each operation mode.
- After power-on each time, the system will check the present functional mode automatically, it will display corresponding alarm message when detecting any abnormality. If detection passes, system displays default monitor value set by users automatically (Please consult PA2 parameter). Users press the key each time, can retreat to the parameter monitor state, then press the key again, can enter the first layer of main menu operation mode.

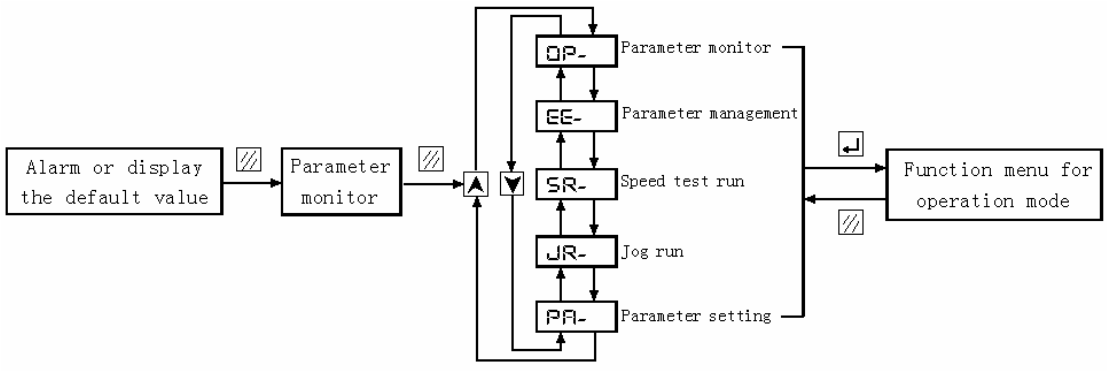


Fig 6.1 Block diagram for mode selection operation

6.2 Parameter Setting（PA- ）

NOTICE
● The setting parameter is enable immediately，any wrong setting with parameter may cause the servo driver running in error or accident. ● During adjusting parameters, advise users to do idle load test first.

Under the main menu operation mode, select “PA- ”, then press key to enter the parameter setting submenu, as shown in fig 6.2.

At this moment, the nixietube is displaying “PA- 0”, if users enter the parameter setting mode for the first time after driver power-on, should push key first, open PA0 parameter and input correct password (Detailed information please consult parameter specification chapter), finally push the key to confirm.

After entering the correct password, press and key to select the parameter number, then press key again to display parameter value. Can use and key to modify the parameter, press or key once, the parameter value increases or decreases by one, if press and hold or key, the parameter increases and decreases continuously.

After revising parameter value, user must press key to confirm, the modified value will substitute initial value and be active in control immediately, the system will return to the upper layer automatically to display the present parameter number. At this moment, users can go on choosing the parameter number with and key to do revise operation, etc.

If users are unsatisfied with the value of the parameter which is revising，do not press key, should press key to return to upper layer menu for parameter select mode, the modified parameter value will not be saved.

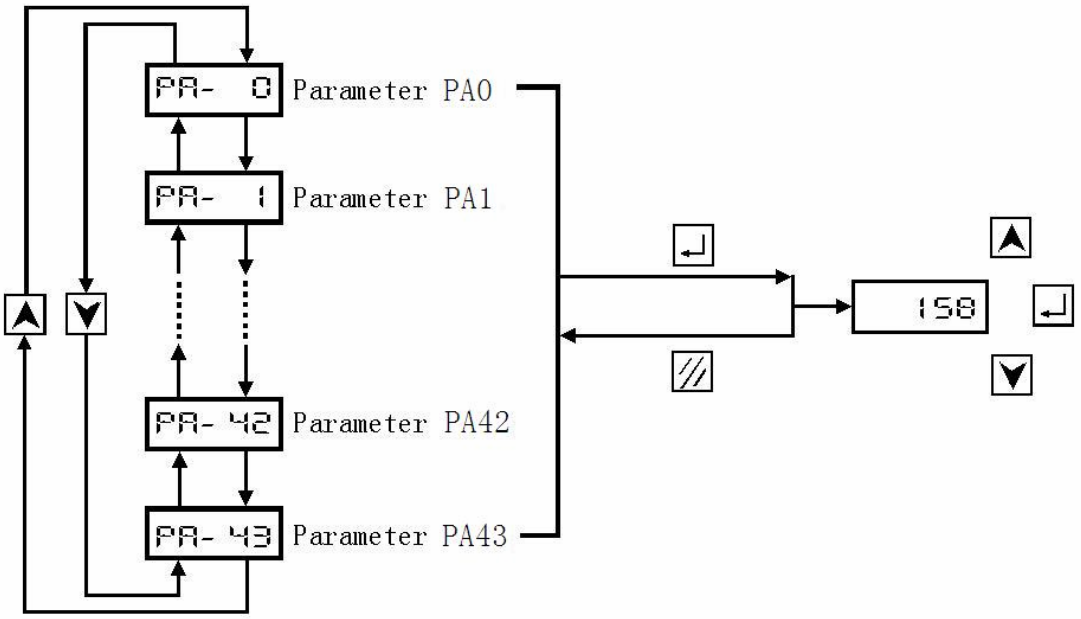


Fig 6.2 Block diagram for parameter setting operation

6.3 Parameter Monitor（DP- ）

NOTICE
● Under the parameter monitor mode, only permit user to look over every parameter of the system, but can't modify any parameter.

Under the main menu mode, please select “DP- ”, and press key to enter parameter monitor function, as shown in table 6.1. This submenu has 20 kinds of display status, users can press 、 key to select display modes needed, then press key again to enter the specific display status. If users need to withdraw from the present monitor parameter, please press key.

Table 6.1 Overview of parameter monitor

Number	Name	Function
1	DP-SPD	Present motor speed (Unit: r/min)
2	DP-POS	Present position Low Bit -99999～99999 (Unit: pulse)
3	DP-POS.	Present position High Bit
4	DP-CPO	Present command position Low Bit -99999～99999 (Unit: pulse)
5	DP-CPO.	Present command position High Bit
6	DP-EPO	Present position tracking error Low Bit -99999～99999 (Unit: pulse)
7	DP-EPO.	Present position tracking error High Bit

8	DP-TRQ	Present actual torque current
9	DP- I	Present motor current
10	DP-CNT	Present system control mode
11	DP-FRQ	Present position command pulse frequency (Unit: kHz)
12	DP-CS	Present speed command
13	DP-CT	Present torque command
14	DP-APO	Present rotor absolute position
15	DP- IN	Input control port state
16	DP-OUT	Output control port state
17	DP-COD	U、V、W state
18	DP-RN	Present motor state
19	DP-ERR	Alarm code
20	DP-RES	Reserved

6.4 Parameter Management（EE- ）

NOTICE
● If users have not executed write operation for the present modified parameter, the modified parameter will not be saved after power-off.

The parameter management mainly processes the operation between EMS memory and EEPROM, under the main menu operation mode, select “EE- ” and press ↵ key to enter the parameter management mode, as shown in fig 6.3.

This submenu has 5 kinds of operation modes, users can press ▲、 ▼ key to select.

Take “Parameter Write” as an example, select “EE-SET”, then press and hold ↵ key, the display “ START” indicates that the parameter is now writing to EEPROM, waiting for about 4 seconds, it will display “FINISH” after the parameter write operation successful. Now press % key to return to the parameter management mode. Users can use ▲、▼ key to select other operation.

Ⅰ）“EE- SET” Parameter Write: It means that the parameter in EMS memory will be written into the parameter section of EEPROM. Users revise a parameter, only change the value of this parameter in EMS memory, this modified parameter can be recovered to its original value at next time power-on. To save the modified parameter permanently, it is necessary to execute parameter write operation to write the modified parameter in EMS memory into the parameter section of EEPROM, the new parameter will be used when

power-on again.

Ⅱ）“EE- RD” Parameter Read: It means that the parameter in the parameter section of EEPROM will be read into EMS memory. This course can be done automatically when power-on, so at the beginning, the value of parameter in EMS memory is the same as the value of parameter in the parameter section of EEPROM. But if users modify the parameter, the value of parameter in EMS memory will be changed. If the modified parameter is not satisfied or confused, to restore the parameter just power-on, read the parameter in the parameter section of EEPROM into EMS memory.

Ⅲ）“EE- BA” Parameter Backup: It is used for user to save his own parameter. For example, after user adjust the motor parameter, if user is satisfied with the group of data, at this moment, can save this group of data in EEPROM forever through this operation. But this operation permits saving only one group of parameters, after executing this operation, it will cover the content automatically which saved in last time.

Ⅳ）“EE- RS” Parameter Restore: Use together with the operation “EE- BA”, used for resuming the value of parameter which modified once by users. But this operation can not do the parameter write operation automatically, if users want to use the parameter resumed at present for ever, still need to do the parameter write operation again.

Ⅴ）“EE-DEF” Restore default value: It means that all the default value (factory default value) will be read into EMS memory and written into the parameter section of EEPROM, and used for the next power-on. If the servo drive can not run normally because of the confused parameters, use this operation to restore all the default values.

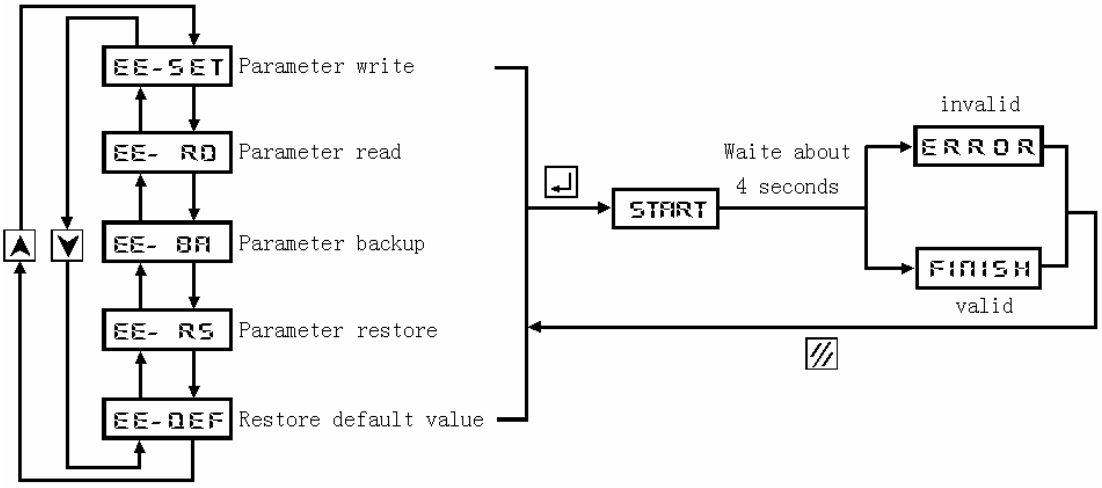


Fig 6.3 Block diagram for parameter management

6.5 Speed Trial Run（SR- ）

NOTICE
● Driver and motor must ground reliably, PE terminal must connect with the earth terminal on equipment reliably. ● Propose the driver power supply is provided through isolation transformator and power line filter, so as to ensure security and

anti-jamming ability.

- Should put through the power after checking and confirming wiring without fault.
- Must insert one braking circuit, guaranteeing that the power can cut off immediately while having any fault.
- After driver alarm, make sure the malfunction has been got rid off and SON signal is ineffective before restarting driver.
- Don't touch driver and motor in five minutes after power off, prevent shocking by electricity.
- Driver and motor will be at higher temperature after running for some time, prevent burning.

Under the main menu operation mode, select "SR- " and then press key to enter the speed trial run operation mode, initial display: **S 0.0**.

The prompt "S" shows the speed trial run, unit is r/min, use the speed command (Increase) and (Decrease) key to have the given speed. If the displayed speed value is positive, means that motor runs in positive direction; if the displayed speed value is negative, means that motor runs in reverse direction.

6.6 JOG Run（JR- ）

Under the main menu operation mode, select "JR- " and then press key to enter the JOG run operation mode, initial display: **J 150**.

The prompt "J" shows the JOG run, unit is r/min, speed command is setting by parameter PA20 (Detailed information please consult parameter specification chapter). Under the JOG run operation mode, press and hold key, motor is running in positive direction with the JOG given value, release the key the motor stops and keeps locked state; press and hold key, motor is running in reverse direction with the JOG given value, release the key the motor stops and keeps locked state.

Chapter 7 Parameters

NOTICE
● Any person who involved in parameters adjustment should be fully familiar with the meaning of parameters. Any error of the parameters setting may cause equipment damaged or person injured. ● It is recommended that the parameters adjustment be firstly made under idle load operation condition.

SPM-3500 has various parameters, can adjust or establish performance and function of the driver through these parameters. This chapter describes use and function for each parameter, understand the best use and operation for driver of these parameters are essential. User can see, establish and change these parameters with the driver panel.

7.1 Parameters Summary

SPM-3500 has offered 43 kinds of adjustable parameters to user, parameters definition consult table 7.1. In the applicable way, P is position control mode; S is speed control mode; T is torque control mode.

Table 7.1 Parameters list

Number	Name	Suitable type	Parameter range	Default	Unit
0	Operation password		0~999	158	
1	Type of driver		0~5	3	
2	Power-on display content		0~18	0	
3	Control mode selection		0~7	0	
4	Input mode for position command pulse	P	0~1	0	
5	Inverse the direction of position command pulse	P	0~1	0	
6	Position proportional gain	P	1~2000	600	1/S
7	Position feed forward gain	P	0~100	50	%
8	Position command smooth filter coefficient	P	0~100	0	0.1ms
9	Position feed forward command smooth filter coefficient	P	0~100	0	0.1ms
10	Range of position fixing	P	0~30000	50	pulse
11	Range of position deviation (0: not measure)	P	0~30000	0	×100 pulse
12	The first electronic gear wheel ratio numerator	P	0~32766	5	
13	The first electronic gear wheel ratio denominator	P	0~32766	3	
14	The second electronic gear wheel ratio numerator	P	0~32767	5	
15	The second electronic gear wheel ratio denominator	P	0~32767	3	

Number	Name	Suitable type	Parameter range	Default	Unit
16	Maximum speed limit	P，S	1~6000	2500	r/min
17	Speed proportional gain	P，S	5~2000	1000	Hz
18	Speed integral time constant	P，S	1~1000	20	ms
19	Speed measure low pass filter coefficient	P，S	0~100	99	%
20	JOG run speed	P，S	-3000~3000	120	r/min
21	Internal speed 1	S	-3000~3000	100	r/min
22	Internal speed 2	S	-3000~3000	1000	r/min
23	Internal speed 3	S	-3000~3000	500	r/min
24	Internal speed 4	S	-3000~3000	0	r/min
25	Reached speed	S	0.1~3000	100	r/min
26	Acceleration and deceleration time constant	S	0~1000	0	ms
27	Reserved				
28	Reserved				
29	Overspeed checking range	S	0~100	0	%
30	Overspeed permitting time	S	0~10000	5000	ms
31	Drive input forbid is invalid	P，S	0~1	1	
32	Internal CCW torque limit	P，S	0~300	120	%
33	Internal CW torque limit	P，S	-300~0	-120	%
34	External CCW torque limit	P，S	0~300	200	%
35	External CW torque limit	P，S	-300~0	-200	%
36	Torque limit for speed trial run and JOG run	S	0~300	100	%
37	Torque command filter coefficient	T	0~100	0	%
38	Software overcurrent limit	P，S，T	0.1~30.0	20.0	A
39	Permitted overcurrent time setting	P，S，T	0.1~100.0	100.0	ms
	40/41/42/43(Reserved)				

7.2 Parameters Function

PA0: Operation Password

(1) To avoid parameters modified incorrectly, each time after pow-on, require setting the parameters as correct password firstly，then consulting and revising other parameters. When debugging finished, suggest setting the parameter as 0 to ensure the parameters can’t be modify by mistakes.

(2) The driver’s password is: 158, support users to consult and revise 43 kinds of parameters (PA1~PA43).

PA1: Type of driver

(1) This driver can be suitable for the five major motor producer of our country rightly, they are: HUADA servo motor, DENGQI servo motor, CHANGHUA servo motor, XINYUE servo motor and SUQIANG servo motor (According to market demand, our company keep the right to add accessory motor), if users need other servo motor, please contact technology department of our company.

(2) The motors which come from different motor manufacturers and with a series of different power level, correspond to the different type code in the driver separately (Generally configure according to customer's request when dispatched from the factory), strongly advise users make sure not to change the value among them in the normal operating course.

PA2: Power-on display content

(1) This parameter is used for establishing the acquiescent display content after the driver power-on, corresponding to the order of the DP parameter monitor.

(2) During power-on, if any alarm situations appear, the driver will display the alarm code directly, but don’t display the monitor content of this parameter.

PA3: Control mode selection

Modify this parameter to select control mode for servo driver.

0: Position control mode

1: Speed control mode

2: Trial run control mode

3: JOG control mode

For position control mode, position command inputting from pulse input interface; for speed control mode, speed command inputting from input ports SC1 and SC2, choose different speed according to the states of SC1 and SC2; “SR- ” status for speed trial run control mode; “JR- ” status for JOG run control mode.

PA4: Input mode for the position command pulse

This parameter is used for setting the input mode for position loop pulse command. The modified parameter could become effective, by way of saving first and then power-on again.

0: Pulse + Direction;

1: CCW pulse / CW pulse

CCW indicates that the motor shaft rotate in counterclockwise direction defined as positive when viewing from the shaft-end; CW indicates that the motor shaft rotate in clockwise direction defined as negative when viewing from the shaft-end.

PA5: Inverse the direction of position command pulse

This parameter is used for inversing the direction of command pulse.

0: Positive direction

1: Negative direction

PA6: Position proportional gain

This parameter is determined according to the type of servo driver and the load.

The bigger the gain setting, the greater the stiffness is, and the smaller the position lag with the same frequency command pulse will be. But if the value is too large, may cause oscillation or overshoot.

PA7: Position feed forward gain

This parameter is usually set as zero, if very fast response characteristic is not required. 100% setting value indicates that the position lag is always zero at any frequency of the command pulse.

The greater the feed forward gain of the position loop is, the higher the

speed response of the control system and the worse the stabilization of position loop are, resulting in oscillation easily.

PA8: Position command smooth filter coefficient

Filter is ineffective if setting parameter as 0. Filter only smooth command pulse, will not lose input pulse, but it may lead to command delay.

This filter is mainly used for the phenomenon that: Jump or jitter when motor running; system command frequency is too low, accelerate or decelerate is too fast, etc.

PA9: Position feed forward command smooth filter coefficient

This parameter is used for increasing stability for compound position control. This parameter is usually set as zero, not use.

PA10: Range of position fixing

This parameter is used for setting the range of position fixing pulse in position control mode. This parameter gives a judgment on that whether the position fixing is finished or not. When the number of deviation counter is less than this parameter, servo driver can confirm that position fixing has already been finished and provide position reached signal.

PA11: Range of position deviation

This parameter is used for setting the range of position deviation alarm, zero setting value indicates that not deviation measure.

PA12: The first electronic gear wheel ratio numerator

This parameter is used for setting the fractional frequency / frequency doubling proportion of the position command pulse with parameter PA13. Under the position control mode, it is convenient to connect with every system by setting PA12 and PA13 parameters to meet the perfect resolution ratio.

Calculation method:

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

P：The number of input command pulse

G：Electronic gear ratio

N：Servo motor’s circumrotation

C：Optical encoder’s resolution factor, Usually, C=2500

For example: when input command pulse is 6000, the servo motor rotates one circle G=N×C×4/P=1×2500×4/6000=5/3.

So parameter PA12 is 5 and parameter PA13 is 3.

Recommending electronic gear ratio range is:

1/50≤G≤50

PA13: The first electronic gear wheel ratio denominator

Refer to the parameter PA12.

PA14: The second electronic gear wheel ratio numerator

Refer to the parameters PA12 and PA13.

PA15: The second electronic gear wheel ratio denominator

Refer to the parameters PA12 and PA13.

PA16: Maximum speed limit

Used for setting the maximum speed. this speed value is independent of rotation direction.

PA17: Speed proportional gain

Under no oscillation condition, the parameter should be set higher.

The higher the gain setting, the greater the stiffness is. The value is determined according to the type of servo driver and the load. Generally, the larger the load inertia is, the higher the setting value is.

PA18: Speed integral time constant

Under no oscillation condition, the parameter should be set smaller.

The smaller the constant setting, the faster the integral is. The value is determined according to the type of servo driver and the load. Generally, the larger the load inertia is, the higher the setting value is.

PA19: Speed measure low pass filter coefficient

The bigger the value is, the higher the cut-off frequency is, the fast the speed feedback response is. If need higher speed respond, can increase the

setting value appropriately.

The smaller the value is, the lower the cut-off frequency is, the less the motor noise is. If the load inertia is very large, can reduce value appropriately. The smaller the value is, the slower the response is, may cause oscillation.

PA20: JOG run speed

It is used for setting the JOG operation speed.

PA21: Internal speed 1

Setting internal speed 1. Choose speed 1 as the motor's speed when input terminal SC1 OFF, SC2 OFF.

PA22: Internal speed 2

Setting internal speed 2. Choose speed 2 as the motor's speed when input terminal SC1 OFF, SC2 OFF.

PA23: Internal speed 3

Setting internal speed 3. Choose speed 3 as the motor's speed when input terminal SC1 OFF, SC2 OFF.

PA24: Internal speed 4

Setting internal speed 4. Choose speed 4 as the motor's speed when input terminal SC1 OFF, SC2 OFF.

PA25: Reached speed

This parameter will be ineffective in position control mode. Under no-position control mode, if motor's speed is bigger than this setting value, SCMP ON, otherwise SCMP OFF.

PA26: Acceleration and deceleration time constant

Acceleration and deceleration characteristics are linearity. Setting value shows demanding time for motor from 0~2000 r/min, 2000~0 r/min.

PA27: Reserved

PA28: Reserved

PA29: Overspeed checking range

This parameter will be ineffective in position control mode. Under the speed control mode, if the value of speed deviation counter is bigger than this parameter, servo driver will send off overspeed alarm.

PA30: Overspeed permitting time

This parameter cooperates with PA29, i.e. the value of driver speed deviation counter exceeds the time that PA29 allows.

PA31: Drive input forbid is invalid

This parameter relates to signals CCW and CW

0: CCW and CW input forbid is valid. The CCW drive is enable if the CCW drive forbid switch (FSTP) is on; the CCW drive is disable if the CCW forbid switch (FSTP) is off, the CCW direction torque keeps as zero; CW is the same. If CCW and CW drive forbid switch are off, there is an alarm signal appears for drive forbid input error.

1: CCW and CW input forbid is invalid. The CCW and CW drive are all enable in spite of the state of forbid switches CCW and CW, also no alarm appears.

PA32: CCW internal torque limit

This parameter is used for restrianing the maximum torque while the motor rotating in anticlockwise direction under the position mode, I.e. overload coefficient.

PA33: CW internal torque limit

This parameter is used for restricting the maximum torque while the motor rotating in clockwise direction under the position mode, I.e. overload coefficient.

PA34: CCW external torque limit

This parameter is used for restricting the maximum torque while the motor rotating in anticlockwise direction under the speed mode, I.e. overload

coefficient.

PA35: CW external torque limit

This parameter is used for restricting the maximum torque while the motor rotating in clockwise direction under the speed mode, I.e. overload coefficient.

PA36: Torque limit for speed trial run and JOG run

This parameter has no relation with CCW and CW directions. The internal and external torque limit is still valid. The value of this parameter is a percentage of rated torque.

For example, if the torque limit is equal to rated torque, then set this parameter as 100.

PA37: Torque command filter coefficient

This parameter can restrain the resonance cause by torque, such as sharp noise from motor. Make this parameter smaller if there is sharp vibration noise from motor.

Big parameter value can get higher cut-off frequency and faster response. If need higher mechanical stiffness, it is suitable to increase this value.

Small parameter value can get lower cut-off frequency and lower motor noise. If load inertia is much bigger, value could be reduced. But if the value is too small, response will be slower and may lead to instability.

PA38: Software overcurrent limit

Maximum current of the driver is permitted by software.

PA39: Permitted overcurrent time setting

The permitted time after overcurrent.

7.3 Change Accessory Motor For The Driver

Now, this driver can be suitable for the major motor producer of our country rightly, they are: HUADA servo motor, DENGQI servo motor, CHANGHUA servo motor, XINYUE servo motor and SUQIANG servo motor, etc, consulting chapter 5 of the operation manual for concrete wiring way. If

users need other servo motor, please contact technology department of our company.

1) Some brief introduction for hidden parameter

The parameters from PA44 to PA62 in the driver are defined as the hidden parameter in the state that operation password is user's password, forbid users to open or revise by oneself.

According to need of debugging, debug personnel can edit or revise all hidden parameters by writing the producer's password into PA0 (operation password) parameter.

Following main introduction, debug personnel should understand the meaning of some parameters while changing the accessory motor of servo driver. Setting all standard parameters of different producers and different size motor, please consult table 7.2.

PA55: The number of pole-pairs of motor, is determined by motor manufacturer, its value corresponding to the motors from different producers is fixed.

PA56: Rated speed (RPM), is determined by performance index of motor, please consult the nameplate label of the motor.

PA57: Rated current (A), is determined by performance index of motor, please consult the nameplate label of the motor.

PA58: Rated torque (N·M), is determined by performance index of motor, please consult the nameplate label of the motor.

PA60: Checking wiring mode for encoder, is determined by motor manufacturer, its value corresponding to the motors from different producers is fixed.

2) In order to match servo motors from different producers, the parameter that must be changed is modified as follows:

Match HUADA /YUHAI/XINYUE/KANGMING/DONGHAO servo motor: PA28=1, PA55=4, PA60=2;

Match DENGQI servo motor: PA28=0, PA55=3, PA60=0;

Match SUQIANG servo motor: PA28=0, PA55=2, PA60=0.

3) Give an example for changing the accessory motor

When leaving factory, if the accessory motor of servo driver is DENGQI servo motor, change it into YUHAI 110SY-M04030 servo motor now (Rated

speed: 3000RPM; Rated current: 5A; Rated torque: 4N·M), should operate according to the following steps:

(1) Driver power-on, open parameter PA0, modify user's password 158, enter producer's password;

(2) Change parameter PA28 into 1;

(3) Change parameter PA55 into 4;

(4) Change parameter PA60 into 2;

(5) Change parameter PA56 into 3000;

(6) Change parameter PA57 into 5.0; (When revising parameter PA57, must revise the corresponding parameter PA34, PA35, PA38 by referring to table 7.3)

(7) Change parameter PA58 into 4.0;

(8) Change parameter PA6 into 1300;

(9) Change parameter PA17 into 1100;

(10) Change parameter PA18 into 20;

(11) Change parameter PA53 into 700;

(12) Change parameter PA54 into 20;

(13) Change parameter PA34 into 195;

(14) Change parameter PA35 into -195;

(15) Change parameter PA38 into 9.2;

(16) After finishing modification, save parameters, servo driver power-off;

(17)Driver power on again, can change or no change parameters appropriately according to operation result of motor, in order to meet requirements for ideal processing characteristics.

(18) After debugging the parameters each time, if operation result is perfect, must save the parameters before power-off; if the operation result is very poor, do not need to save the parameters, power-off then power-on again directly!

7.4 Parameters Debugging List Of Servo Driver

Table 7.2 Parameters debugging list

PA	HUADA/XINYU Servo motor default	KANGMING/YUHAI Servo motor default	DENGQI Servo motor default	SUQIANG Servo motor default

PA	HUADA/XINYU Servo motor default	KANGMING/YUHAI Servo motor default	DENGQI Servo motor default	SUQIANG Servo motor default
0	Debug personnel should change it to producer's password, then could open and revise 62 parameters. After finishing debugging, must change it back to customer's password 158!			
1	3	3	3	3
2	0	0	0	0
3	0	0	0	0
4	0	0	0	0
5	0	0	0	0
6	1~2NM: 1300	1~2NM: 1300	1~2NM: 1200	1~2NM: 1200
	3~4NM: 1300	3~4NM: 1300	3~4NM: 1250	3~4NM: 1250
	5~6NM: 1300	5~6NM: 1300	5~6NM: 1300	5~6NM: 1300
	7~8NM: 1300	7~8NM: 1300	7~8NM: 1350	7~8NM: 1350
	9~10NM: 1300	9~10NM: 1300	9~10NM: 1350	9~10NM: 1350
	11~12NM: 1350	11~12NM: 1350	11~12NM: 1400	11~12NM: 1400
	13~15NM: 1400	13~15NM: 1400	13~15NM: 1400	13~15NM: 1400
	16~20NM: 1400	16~20NM: 1400	16~20NM: 1400	16~20NM: 1400
	21~28NM: 1400	21~28NM: 1400	21~28NM: 1400	21~28NM: 1400
7	0	0	0	0
8	0	0	0	0
9	0	0	0	0
10	50	50	50	50
11	300	300	300	300
12	1	1	1	1
13	1	1	1	1
14	1	1	1	1
15	1	1	1	1
16	2500	2500	2500	2500
17	SPM3520、SPM3530			
	1~2NM: 1200	1~2NM: 1200	1~2NM: 1100	1~2NM: 1100
	3~4NM: 1100	3~4NM: 1100	3~4NM: 1000	3~4NM: 1000
	5~6NM: 1050	5~6NM: 1050	5~6NM: 1000	5~6NM: 1000
	7~8NM: 1000	7~8NM: 1000	7~8NM: 950	7~8NM: 950
	9~10NM: 900	9~10NM: 900	9~10NM: 900	9~10NM: 900

PA	HUADA/XINYU Servo motor default	KANGMING/YUHAI Servo motor default	DENGQI Servo motor default	SUQIANG Servo motor default
	11~12NM: 800	11~12NM: 800	11~12NM: 800	11~12NM: 800
	13~15NM: 650	13~15NM: 650	13~15NM: 700	13~15NM: 700
	SPM3540			
	5~6NM: 1300	5~6NM: 1300	5~6NM: 1150	5~6NM: 1150
	7~8NM: 1150	7~8NM: 1150	7~8NM: 1100	7~8NM: 1100
	9~10NM: 1000	9~10NM: 1000	9~10NM: 950	9~10NM: 950
	11~12NM: 900	11~12NM: 900	11~12NM: 850	11~12NM: 850
	13~15NM: 650	13~15NM: 650	13~15NM: 700	13~15NM: 700
	16~20NM: 650	16~20NM: 650	16~20NM: 700	16~20NM: 700
	21~28NM: 650	21~28NM: 650	21~28NM: 700	21~28NM: 700
	SPM3550			
	5~6NM: 1300	5~6NM: 1300	5~6NM: 1250	5~6NM: 1250
	7~8NM: 1300	7~8NM: 1300	7~8NM: 1250	7~8NM: 1250
	9~10NM: 1250	9~10NM: 1250	9~10NM: 1250	9~10NM: 1250
	11~12NM: 1150	11~12NM: 1150	11~12NM: 1150	11~12NM: 1150
	13~15NM: 1000	13~15NM: 1000	13~15NM: 1050	13~15NM: 1050
	16~20NM: 1000	16~20NM: 1000	16~20NM: 1050	16~20NM: 1050
	21~28NM: 1000	21~28NM: 1000	21~28NM: 1050	21~28NM: 1050
18	SPM3520、SPM3530			
	1~2NM: 15	1~2NM: 15	1~2NM: 22	1~2NM: 22
	3~4NM: 20	3~4NM: 20	3~4NM: 28	3~4NM: 28
	5~6NM: 30	5~6NM: 30	5~6NM: 36	5~6NM: 36
	7~8NM: 40	7~8NM: 40	7~8NM: 40	7~8NM: 40
	9~10NM: 60	9~10NM: 60	9~10NM: 60	9~10NM: 60
	11~12NM: 100	11~12NM: 80	11~12NM: 80	11~12NM: 80
	13~15NM: 160	13~15NM: 150	13~15NM: 120	13~15NM: 120
	SPM3540			
	5~6NM: 25	5~6NM: 25	5~6NM: 30	5~6NM: 30
	7~8NM: 35	7~8NM: 50	7~8NM: 35	7~8NM: 35
	9~10NM: 55	9~10NM: 70	9~10NM: 55	9~10NM: 55
	11~12NM: 90	11~12NM: 85	11~12NM: 75	11~12NM: 75
	13~15NM: 160	13~15NM: 140	13~15NM: 120	13~15NM: 120

PA	HUADA/XINYU Servo motor default	KANGMING/YUHAI Servo motor default	DENGQI Servo motor default	SUQIANG Servo motor default
	16~20NM: 160	16~20NM: 140	16~20NM: 120	16~20NM: 120
	21~28NM: 160	21~28NM: 140	21~28NM: 120	21~28NM: 120
	SPM3550			
	5~6NM: 25	5~6NM: 25	5~6NM: 30	5~6NM: 30
	7~8NM: 30	7~8NM: 45	7~8NM: 34	7~8NM: 34
	9~10NM: 45	9~10NM: 60	9~10NM: 45	9~10NM: 45
	11~12NM: 70	11~12NM: 70	11~12NM: 55	11~12NM: 55
	13~15NM: 105	13~15NM: 100	13~15NM: 80	13~15NM: 80
	16~20NM: 105	16~20NM: 100	16~20NM: 80	16~20NM: 80
	21~28NM: 105	21~28NM: 100	21~28NM: 80	21~28NM: 80
19	0	0	0	0
20	120	120	120	120
21	100	100	100	100
22	1000	1000	1000	1000
23	500	500	500	500
24	0	0	0	0
25	100	100	100	100
26	0	0	0	0
27	Reserved!			
28	1	1	0	0
29	0	0	0	0
30	5000	5000	5000	5000
31	1	1	1	1
32	120	120	120	120
33	-120	-120	-120	-120
34	When users change the accessory motor and revise parameter PA57, must check table 7.3 and establish the value of parameter PA34, PA35 and PA38 again according to the driver's type and the rated current of motor, otherwise the driver will be damaged easily!			
35				
36	100	100	100	100
37	0	0	0	0
38	20.0	20.0	20.0	20.0
39	100.0	100.0	100.0	100.0

PA	HUADA/XINYU Servo motor default	KANGMING/YUHAI Servo motor default	DENGQI Servo motor default	SUQIANG Servo motor default
40	3	3	3	3
41	0	0	0	0
42	Producer's parameter , forbid users to change!			
43	1	1	1	1
44	Parameter PA27 and PA44~PA50 are reserved, no one can be allowed to revise, debug personnel must check whether these parameter value are the same as debugging value on right! If is different, should reflect to the technology department of our company at once! If customers need to assemble other company's servo motors, please contact technology department of our company directly!			
45				
46				
47				
48				
49				
50				
51	1	1	1	1
52	0	0	0	0
53	SPM3520、SPM3530			
	1~2NM: 700	1~2NM: 700	1~2NM: 700	1~2NM: 700
	3~4NM: 750	3~4NM: 700	3~4NM: 750	3~4NM: 750
	5~6NM: 800	5~6NM: 750	5~6NM: 800	5~6NM: 800
	7~8NM: 800	7~8NM: 800	7~8NM: 850	7~8NM: 850
	9~10NM: 800	9~10NM: 750	9~10NM: 800	9~10NM: 800
	11~12NM: 750	11~12NM: 700	11~12NM: 750	11~12NM: 750
	13~15NM: 650	13~15NM: 650	13~15NM: 700	13~15NM: 700
	SPM3540			
	5~6NM: 650	5~6NM: 600	5~6NM: 700	5~6NM: 700
	7~8NM: 700	7~8NM: 650	7~8NM: 750	7~8NM: 750
	9~10NM: 700	9~10NM: 650	9~10NM: 750	9~10NM: 750
	11~12NM: 650	11~12NM: 600	11~12NM: 700	11~12NM: 700
	13~15NM: 650	13~15NM: 600	13~15NM: 700	13~15NM: 700
	16~20NM: 650	16~20NM: 600	16~20NM: 700	16~20NM: 700
	21~28NM: 650	21~28NM: 600	21~28NM: 700	21~28NM: 700
	SPM3550			
	5~6NM: 425	5~6NM: 400	5~6NM: 425	5~6NM: 425
	7~8NM: 425	7~8NM: 425	7~8NM: 450	7~8NM: 450

PA	HUADA/XINYU Servo motor default	KANGMING/YUHAI Servo motor default	DENGQI Servo motor default	SUQIANG Servo motor default
	9~10NM: 450	9~10NM: 425	9~10NM: 450	9~10NM: 450
	11~12NM: 450	11~12NM: 425	11~12NM: 450	11~12NM: 450
	13~15NM: 425	13~15NM: 425	13~15NM: 450	13~15NM: 450
	16~20NM: 425	16~20NM: 425	16~20NM: 450	16~20NM: 450
	21~28NM: 425	21~28NM: 425	21~28NM: 450	21~28NM: 450
54	SPM3520、SPM3530			
	1~2NM: 16	1~2NM: 18	1~2NM: 15	1~2NM: 15
	3~4NM: 18	3~4NM: 20	3~4NM: 18	3~4NM: 18
	5~6NM: 20	5~6NM: 25	5~6NM: 20	5~6NM: 20
	7~8NM: 30	7~8NM: 30	7~8NM: 30	7~8NM: 30
	9~10NM: 35	9~10NM: 40	9~10NM: 35	9~10NM: 35
	11~12NM: 50	11~12NM: 50	11~12NM: 50	11~12NM: 50
	13~15NM: 70	13~15NM: 60	13~15NM: 70	13~15NM: 70
	SPM3540			
	5~6NM: 40	5~6NM: 50	5~6NM: 36	5~6NM: 36
	7~8NM: 55	7~8NM: 60	7~8NM: 55	7~8NM: 55
	9~10NM: 65	9~10NM: 75	9~10NM: 60	9~10NM: 60
	11~12NM: 90	11~12NM: 90	11~12NM: 85	11~12NM: 85
	13~15NM: 110	13~15NM: 100	13~15NM: 110	13~15NM: 110
	16~20NM: 110	16~20NM: 100	16~20NM: 110	16~20NM: 110
	21~28NM: 110	21~28NM: 100	21~28NM: 110	21~28NM: 110
	SPM3550			
	5~6NM: 70	5~6NM: 85	5~6NM: 70	5~6NM: 70
	7~8NM: 105	7~8NM: 105	7~8NM: 105	7~8NM: 105
	9~10NM: 120	9~10NM: 140	9~10NM: 120	9~10NM: 120
	11~12NM: 175	11~12NM: 175	11~12NM: 175	11~12NM: 175
	13~15NM: 240	13~15NM: 210	13~15NM: 240	13~15NM: 240
	16~20NM: 240	16~20NM: 210	16~20NM: 240	16~20NM: 240
	21~28NM: 240	21~28NM: 210	21~28NM: 240	21~28NM: 240
55	4	4	3	2

PA	HUADA/XINYU Servo motor default	KANGMING/YUHAI Servo motor default	DENGQI Servo motor default	SUQIANG Servo motor default
56	Set according to the nominal value of **RPM**(Speed) on motor nameplate	Set according to the nominal value of **RPM**（Speed）on motor nameplate	Set according to the nominal value of **RPM**（Speed）on motor nameplate	Set according to the nominal value of **RPM**（Speed）on motor nameplate
57	Set according to the nominal value of **A**(Rated current) on motor nameplate	Set according to the nominal value of **A**(Rated current) on motor nameplate	Set according to the nominal value of **A**(Rated current) on motor nameplate	Set according to the nominal value of **A**(Rated current) on motor nameplate
58	Set according to the nominal value of **N.M** (Rated torque) on motor nameplate	Set according to the nominal value of **N.M** (Rated torque) on motor nameplate	Set according to the nominal value of **N.M** (Rated torque) on motor nameplate	Set according to the nominal value of **N.M** (Rated torque) on motor nameplate
59	2500	2500	2500	2500
60	2	2	0	0
61	Producer’s parameter , forbid users to change!			
62	65	65	65	65

Notice:

(1) Before the new servo driver working on machine tool or testboard for the first time, must execute parameter write operation at once after driver power-on!

(2) Before delivering each servo driver, professional must adjust the parameter of the accessory motor which the customer required, according to the default value of each motor shown in above table, then can be dispatched from the factory.

(3) Users can refer to this specification, adjust the first 44 parameters appropriately by customer's password, but forbid modifying the reserved parameter by oneself. If users need to revise some hidden parameters after PA44, consult technology department of our company.

(4) The default value listed in above table is the reference value of our

company's 35 series servo driver matching different motor from different producers. User or debug personnel can adjust them on the basis the default value according to the actual requirement on the spot.

Generally, servo driver can meet requirements, only by revising the following three-loop control parameters appropriately.

(5) Current loop (PA53&PA54)

Current loop parameters do not allow customer revise by oneself in principle, only permit company's attendants adjust at appearing following situation.

Notice: Debug personnel must record the present current loop parameters before changing, once the result is unsatisfactory after changing, can resume them to the present parameter.

① After the motor is energized or in the operation, send out sharp noise; (The value of parameter PA53 can be decreased each time, until the noise disappears)

② The handling characteristic of servo driver is unsatisfactory, and current loop parameters do not accord with its default value listed in the table.

③ After increasing the proportional gain of position loop and the proportional gain of speed loop, still appear the phenomenon that torque is not enough, such as, the motor can still rotate easily after energizing and locking, or the motor creeps obviously in running.

Regulating current loop should follow the following principles:

First of all, check the current loop parameters in servo driver and the default value in accessory motor table are identical or not.

If is not identical, please adjust the parameter to the standard parameter shown in this table;

If is identical, can adjust among a small range on the basis of initial value. It allows the range: The current-loop proportional gain (PA53) ± 20%, the current-loop integral time constant (PA54) ± 15%.

(6) Speed loop (PA17&PA18) and position loop (PA6)

Parameter PA17 (Speed proportional gain) and parameter PA6 (Position proportional gain), can regulate output torque effectively. If bigger torque cause bigger vibration, can decrease parameter; if smaller torque cause creeping, can increase parameter.

Parameter PA18 (Speed integral time constant) and Parameter PA54

(Torque integral time constant), under the condition that system without oscillation, try hard to set value smaller. The smaller the setting value is, the faster the integral action is. Generally, the larger the load inertia is, the bigger the setting value is.

(7) After the parameter is revised and debugged satisfiedly, must execute parameter saved operation before driver power-off!

Table 7.3 PA34 and PA35 overload factor

SPM3520 servo driver maximum current peak value is 16.5A			
Rated current of accessory motor (A)	SPM3520 default overload factor (%)	Default overcurrent limit value(A)	SPM3520 adjustable maximum overload factor (%)
0.85 A	PA34=200; PA35=-200	PA38=1.6	PA34=300; PA35=-300
1.5 A	PA34=200; PA35=-200	PA38=2.8	PA34=300; PA35=-300
2.0 A	PA34=200; PA35=-200	PA38=3.8	PA34=300; PA35=-300
2.5 A	PA34=200; PA35=-200	PA38=4.7	PA34=300; PA35=-300
3.0 A	PA34=200; PA35=-200	PA38=5.7	PA34=300; PA35=-300
3.8 A	PA34=200; PA35=-200	PA38=7.2	PA34=261; PA35=-261
4.0 A	PA34=200; PA35=-200	PA38=7.6	PA34=247; PA35=-247
5.0 A	PA34=195; PA35=-195	PA38=9.2	PA34=198; PA35=-198
5.5 A	PA34=180; PA35=-180	PA38=9.3	PA34=180; PA35=-180
5.6 A	PA34=175; PA35=-175	PA38=9.3	PA34=177; PA35=-177
6.0 A	PA34=165; PA35=-165	PA38=9.3	PA34=165; PA35=-165
6.2 A	PA34=155; PA35=-155	PA38=9.3	PA34=159; PA35=-159
SPM3530 servo driver maximum current peak value is 22A			
Rated current of accessory motor (A)	SPM3530 default overload factor (%)	Default overcurrent limit value (A)	SPM3530 adjustable maximum overload factor (%)
6 A	PA34=200; PA35=-200	PA38=11.4	PA34=220; PA35=-220

6.2 A	PA34=200; PA35=-200	PA38=11.7	PA34=213; PA35=-213
6.8 A	PA34=190; PA35=-190	PA38=12.2	PA34=194; PA35=-194
7 A	PA34=185; PA35=-185	PA38=12.2	PA34=188; PA35=-188
7.8 A	PA34=165; PA35=-165	PA38=12.2	PA34=169; PA35=-169
8 A	PA34=160; PA35=-160	PA38=12.2	PA34=165; PA35=-165
8.6 A	PA34=150; PA35=-150	PA38=12.2	PA34=153; PA35=-153
9 A	PA34=145; PA35=-145	PA38=12.2	PA34=146; PA35=-146
9.2 A	PA34=140; PA35=-140	PA38=12.2	PA34=143; PA35=-143
9.5 A	PA34=135; PA35=-135	PA38=12.2	PA34=139; PA35=-139
SPM3540 servo driver maximum current peak value is 33A			
Rated current of accessory motor (A)	SPM3540 factory overload factor (%)	Factory overcurrent limit value (A)	SPM3540 adjustable greatest overload factor (%)
6 A	PA34=200; PA35=-200	PA38=11.4	PA34=300; PA35=-300
7.8A	PA34=200; PA35=-200	PA38=14.8	PA34=254; PA35=-254
8 A	PA34=200; PA35=-200	PA38=15.2	PA34=247; PA35=-247
8.6 A	PA34=200; PA35=-200	PA38=16.3	PA34=230; PA35=-230
9 A	PA34=200; PA35=-200	PA38=17.1	PA34=220; PA35=-220
9.2 A	PA34=200; PA35=-200	PA38=17.4	PA34=215; PA35=-215
9.5 A	PA34=200; PA35=-200	PA38=18.0	PA34=208; PA35=-208
10 A	PA34=195; PA35=-195	PA38=18.2	PA34=198; PA35=-198
11 A	PA34=180; PA35=-180	PA38=18.2	PA34=180; PA35=-180
12 A	PA34=165; PA35=-165	PA38=18.2	PA34=165; PA35=-165
13 A	PA34=150; PA35=-150	PA38=18.2	PA34=152; PA35=-152
SPM3550 servo driver maximum current peak value is 44A			
Rated current of accessory motor (A)	SPM3550 factory overload factor (%)	Factory overcurrent limit value (A)	SPM3550 adjustable greatest overload factor (%)
11.0 A	PA34=200;PA35=-200	PA38=20.9	PA34=240;PA35=-240
13.0 A	PA34=200;PA35=-200	PA38=23.5	PA34=203;PA35=-203
14.3 A	PA34=180;PA35=-180	PA38=23.5	PA34=184;PA35=-184
15.0 A	PA34=175;PA35=-175	PA38=23.5	PA34=176;PA35=-176
16.0 A	PA34=165;PA35=-165	PA38=23.5	PA34=165;PA35=-165
16.5 A	PA34=160;PA35=-160	PA38=23.5	PA34=160;PA35=-160
17.0 A	PA34=155;PA35=-155	PA38=23.5	PA34=155;PA35=-155

18.0 A	PA34=145;PA35=-145	PA38=23.5	PA34=146;PA35=-146
19.7 A	PA34=130;PA35=-130	PA38=23.5	PA34=134;PA35=-134
20.0 A	PA34=130;PA35=-130	PA38=23.5	PA34=132;PA35=-132
20.5 A	PA34=125;PA35=-125	PA38=23.5	PA34=129;PA35=-129

1) There is overload protection function in driver, please: The parameter PA43 is set as 1; the parameter PA39 is set as 100; The parameter PA38 is set as default value in the above table, according to the type of the driver and rated current value of the accessory motor. Forbid revising the value of PA38 arbitrarily, otherwise the driver will run disorderlily.

2) If in practical operation, the type of user's motor has not been listed in this table, please telegraph the drive development department of our company!

In operation, if the torque of motor is not enough or driver easy to produce overcurrent alarm, can increase acceleration & deceleration time or the value range of parameter PA34 and PA35, but the regulated value must no bigger than the value of maximum overload factor listed in table, otherwise will damage servo driver easily.

7.5 Driver Debugging And Trouble Settlement

Servo driver while running, if alarm or unsatisfactory handling characteristic appears, user can check whether all parameters in the present driver accords with default value by consulting table 7.2, according to the type of motor.

If the present parameter is disorderly, please resume all parameters to default value, then saving, power-on to measure again.

1) Debug the parameter of driver

After the parameter of servo resuming to the default value, please check whether the wiring of driver correct by contrasting wiring diagram, if there is not any question, then can process workpiece. The output torque of servo will influence lines and smooth finish quality of the processed workpiece directly.

Step of the parameters debug:

The first step: After the lathe power-on, put dial indicator or micrometer gauge on X or Z axial of the workbench, make the meter needle point to workbench.

The second step: The system runs in the manual state at a low speed

(such as F8), the rotation of motor drives the movement of workbench, table indicator follows the movement of the workbench in step.

The third step: If meter needle has the phenomenon that the speed value is suddenly quick, suddenly slow or creeps in the course of rotating, indicates that the present mechanical load is relatively great, the output torque of the driver is relatively small.

Can increase the parameter PA6 at this moment, notice that the adjustable range should not be too big each time, generally, increases by 5% of its present value. If the value of PA6 approach the upper limit value listed in table 7.4, please resume it to its default value, then increase parameter PA17 or decrease parameter PA18, can increase the output torque of driver.

The fourth step: If meter needle has the phenomenon that high-frequency vibration in the course of rotating, indicates that the present mechanical load is relatively low, the too big output torque of the driver causes overshoot of the motor.

Can decrease the parameter PA6 at this moment, notice that the adjustable range should not be too big each time, generally, decreases by 5% of its present value. If the value of PA6 approach the lower limit value listed in table 7.4, please resume it to its default value, then decrease parameter PA17 or increase parameter PA18, can decrease the output torque of driver.

The fifth step: After changing parameter, must do saving operation, then power off.

Demand: ① While adjusting the torque, parameter value can not exceed maximum and minimum range listed in the following table.

② Base on the premise that the motor does not produce vibration, the output torque of servo should be set as big as possible.

③After the parameter PA6, PA17, PA18 finish revising, controlling will come into force immediately, does not need that revising and saving, then power on again each time.

Table 7.4 Parameters Adjustable Range List

Adjustable	Parameter PA6	Parameter PA17	Parameter PA18

Motor Range / Torque	Minimum	Maximum	Minimum	Maximum	Minimum	Maximum
1~2 NM	700	1600	900	1400	5	50
3~4 NM	700	1650	800	1400	5	50
5~6 NM	750	1650	700	1400	5	60
7~8 NM	750	1700	600	1300	10	80
9~10 NM	800	1700	500	1300	20	120
11~12 NM	800	1750	400	1200	30	180
13~15 NM	800	1750	300	1100	40	220

2) Common trouble of the driver and solution

Table 7.5 Common Trouble List

Number	Trouble phenomenon	Possible reason	Solution
1	Err-5 alarm after servo driver power-on	1)Connection of encoder is wrong	1)Change or check the line of encoder
		2)Socket connector keeps in touch badly	2)Check whether the socket is loose
		3)Water has entered the socket of the motor	3)Change servo motor
		4)Encoder of motor is damaged	
2	The motor does not run after the driver power-on, soon appear Err-1 alarm	1)Parameters are disorderly in driver	1)Resume to default value
		2)Connection of motor is wrong	2)Check connection of motor
		3)Driver or motor is damaged	3)Change driver or motor
3	Err-2 alarm after servo driver power-on	1)Input voltage is too low	1)Assemble manostat on the lathe
		2)Fluctuating range of electric network is relatively large	
		3)Driver is damaged	2)Change driver
4	After driver power-on,	1)Parameters are disorderly	1)Resume to default value

Number	Trouble phenomenon	Possible reason	Solution
	run normally at a low speed, but appear Err-9 alarm at a high speed	in driver	
		2)Socket connector keeps in touch badly	2)Check whether the socket is loose
		3)Connection of encoder is wrong	3)Change or check the line of encoder
		4)Driver or motor is damaged	4)Change driver or motor
5	After driver power-on, the motor is locked normally, but motor produces high-frequency vibration while stopping running	1)Output torque is too large	1)Decrease parameter PA6, PA17 or increase parameter PA18
		2)Driver is damaged	2)Change servo motor
6	After driver power-on, motor jumps suddenly, appear Err-1 or Err-9 alarm, then not run	1)Parameters are disorderly in driver	1)Resume to default value
		2)Connection of motor/encoder is wrong	2)Check connection of motor/encoder
		3)Driver or motor is damaged	3)Change driver or motor
7	After driver power-on, the motor is locked normally, but the motor does not run while sending pulse from system	1)Parameters are disorderly in driver	1)Resume to default value
		2)Connection between system and drive signal is wrong	2)Check signal wire and socket
		3)Lathe machinery is seized	3)Pull screw mandrel whether be seized
8	The lathe operating normally, but the lines of workpiece processed by two axles linkage (arc and bias, etc) is relatively bad	1)Driver parameter is improper	1)Please adjust the output torque of the driver according to the load of lathe
		2)Socket connector keeps in touch badly	2)Check whether the socket is loose
		3)Mechanical resistance is too large	3)Pull screw mandrel whether the resistance is large

Number	Trouble phenomenon	Possible reason	Solution
9	Operate normally after the driver power-on, but apt to alarm by mistake easily or have noise in the motor	1)The voltage of electric network fluctuates too big	1)Assemble manostat on the lathe
		2)The way of wiring is incorrect	2)Require that every electron device of the lathe concurrent connect to the earth, the driver power is introduced from transformer separately
		3)Strong disturbance source nearby	3)Keep away from disturbance source
10	Drive's output torque is relatively large, but creep at a low speed, pause at a high speed	1) The load of lathe is large, power of the servo and motor is not enough	1)Change the more powerful servo and motor
		2)Servo or motor is damaged	2)Change driver or motor
11	There is no alarm after driver power-on, but system produce No.41 alarm	1)System parameter error	1)Revise the parameter of system alarm electrical level measure
		2)Suffer from strong interference	2)Keep away from disturbance source
12	The motor is not locked after driver power-on	1)No system enable signal	1)Check signal wire of system
		2)Hasn't connected the wire of motor, or wrong connection	2)Check wire of motor
		3)Driver or motor is damage	3)Change driver or motor
13	The motor is locked after driver power-on, but the display of speed R glimmers back and forth	1)Torque parameter of the driver is improper	1)Check whether the motor shaft has little vibration
		2)Encoder of motor is running abnormally	2)Change servo motor
		3)Connection of encoder is wrong	3)Change or check the wire of encoder

3) Example for solving the trouble of driver

Trouble one: System sends the command pulse after the lathe power-on, but

the workbench does not move and the driver has not alarm.

Reason analysis:

① Is the parameter in the driver disorderly? Is the control mode changed?

Solution: User can check whether all parameters in the present driver accords with default value by consulting table 7.2, if have difference, modifying and saving, then power on to check again.

② Is the signal wire / encoder wire / motor wire kept in touch badly or connected by mistake?

Solution: Check whether each socket is loose, change or use multimeter to measure the signal wire / encoder wire / motor wire.

③ Does the system output command pulse?

Solution: Look over whether the drive pulse counter DP-CPO receives command, or change the system to test directly.

④ Is the drive or the motor damaged?

Solution: Unload the motor and put it in the space, measuring whether it could run normally. If can't run normally, change the motor or driver to test.

⑤ Is the machinery too tight? Can the motor not be driven?

Solution: After the lathe power-off, rotate the screw mandrel with the spanner, if resistance is too big, please contact machine tool plant.

⑥ If use accessory motor with internal contracting brake, Has internal contracting brake already been opened?

Solution: Lift motor line of driver off, after power-on, rotate the motor shaft with hands, if can rotate easily proving that internal contracting brake is open, otherwise please check 24V input signal of internal contracting brake.

Trouble two: The lathe working normally, but the lines of workpiece is worse or the size is inaccurate.

Reason analysis:

① Is the parameter in the driver disorderly? Is servo output torque big or small?

Solution: Firstly, user can check whether all parameters in the present driver accords with default value by consulting table 7.2, if have difference, modifying and saving, then power on to check again. Secondly, can adjust the drive output torque to a suitable value through some ways, such as setting

when at a low speed, etc.

② Have the screw mandrel gear wheel ratio and the reverse interval been set?

Solution: Check whether the system has set the gear wheel ratio and the value of reverse interval correctly, if the value is incorrect please change.

③ Is the swing of the main shaft of the lathe too big in the course of rotating?

Solution: If the swing of main shaft is too big in the course of rotating, will influence the smooth degree and lines homogenization of the workpiece directly, please contact machine tool plant directly.

④ Is the machinery resistance greater or asymmetry?

Solution: After the lathe power-off, rotate the screw mandrel with the spanner, if resistance is abnormal, please contact machine tool plant.

⑤ Is the machining method correct?

Solution: Look over whether the hardness of the workpiece is too high, whether the cutter is worn and torn, the feed pace is too fast, the rotational speed of the main shaft is too low, etc.

Trouble three: The motor is locked normally after the machine tool power-on, but appear Err-1 or Err-9 alarm after the system sending the command pulse.

Reason analysis:

① Is the parameter in the driver disorderly? Is the corresponding parameter of motor changed?

Solution: Firstly, user can check whether all parameters in the present driver accords with default value by consulting table 7.2, if have difference, modifying and saving, then power on to check again.

② Is the wire of motor connected by mistake?

Solution: Please check whether the U/V/W/PE wire of the motor corresponds to motor terminal with multimeter, if find any mistake, please correct.

③ Is the wire of encoder kept in touch badly or connected by mistake?

Solution: Look over whether the terminal of driver and the socket of motor are loose, measure whether the wire of encoder is connected by mistake or broken with multimeter, if find any problems, please revise.

④ Is the motor damaged?

Solution: Look over whether there is water in rotor shaft and socket of the

motor or noise in the encoder when rotor shaft rotating, change the motor to test directly.

⑤ Is the driver damaged?

Solution: After the driver power-off, look over whether there is unusual sound or fan works abnormally in the driver, can change the driver to test directly.

⑥ Is the gear wheel ratio of system too big or the acceleration/deceleration time of system too fast?

Solution: Retest after decreasing the electronic gear ratio of system and increasing the acceleration/deceleration time of system.

Chapter 8 Operation Adjustment

NOTICE
● Driver and motor must ground reliably, PE terminal must connect with the earth terminal of equipment reliably. ● Suggest that the driver power is provided through isolation transformator and power line filter, so as to ensure security and anti-jamming ability. ● Should put through the power after checking and confirming wiring without fault. ● Must insert one emergency stop circuit, guaranteeing that the power can cut off immediately while having any fault. ● After driver alarm, make sure the malfunction has been got rid off and SON signal is ineffective before restarting driver. ● Don’t touch driver and motor in five minutes at least after power-off, prevent shocking by electricity. ● Driver and motor will be at higher temperature after running for some

time, prevent burning.

8.1 Power Supply Connection

Power supply connection is according to fig 8.1，and put though power supply in following order:

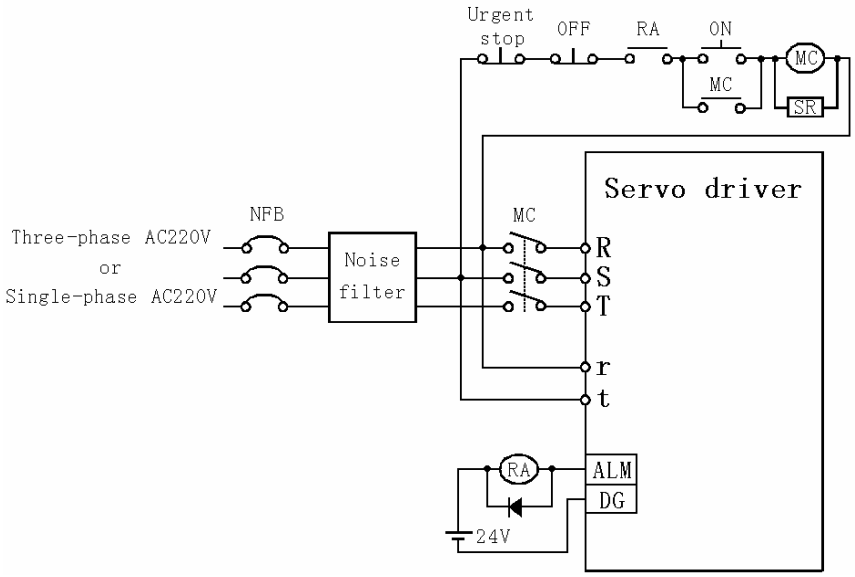


Fig 8.1 Power Supply Connection

1) Connect power supply to input power terminal of the main circuit by electromagnetic contactor (Three-phase connect to R, S, T; and single phase connect to R, S).
2) Don’t connect power supply with control circuit r, t after putting though the main circuit. Servo ready (SRDY) is OFF if just putting through the control circuit.
3) After putting through the main circuit power, servo ready (SRDY) will be ON after about 1.5 seconds, and it can accept servo enable (SON) signal. If it checks the servo enable effective, driver output effective, motor is prompting and in running state. If it checks the servo enable ineffective or any alarm, the basal pole circuit cuts off and motor is in free state.
4) When putting through servo enable and power supply together, basal pole circuit will put through after about 1.5 seconds.

5) Higher frequency on-off power supply could break soft-start circuit and dynamic braking circuit, the on-off frequency should in the limits of 5 times per hour and less than 30 times per day. If the driver or motor is overheated, need to get rid of trouble source, make sure cooling the equipment more than 30 minutes, then put through power supply again.

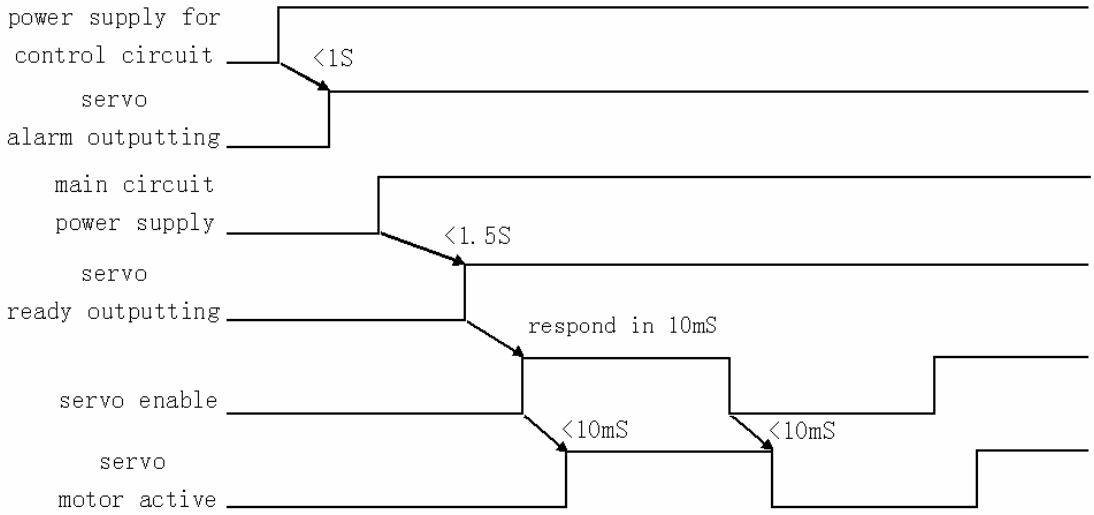


Fig 8.2 Power-on Sequence Chart

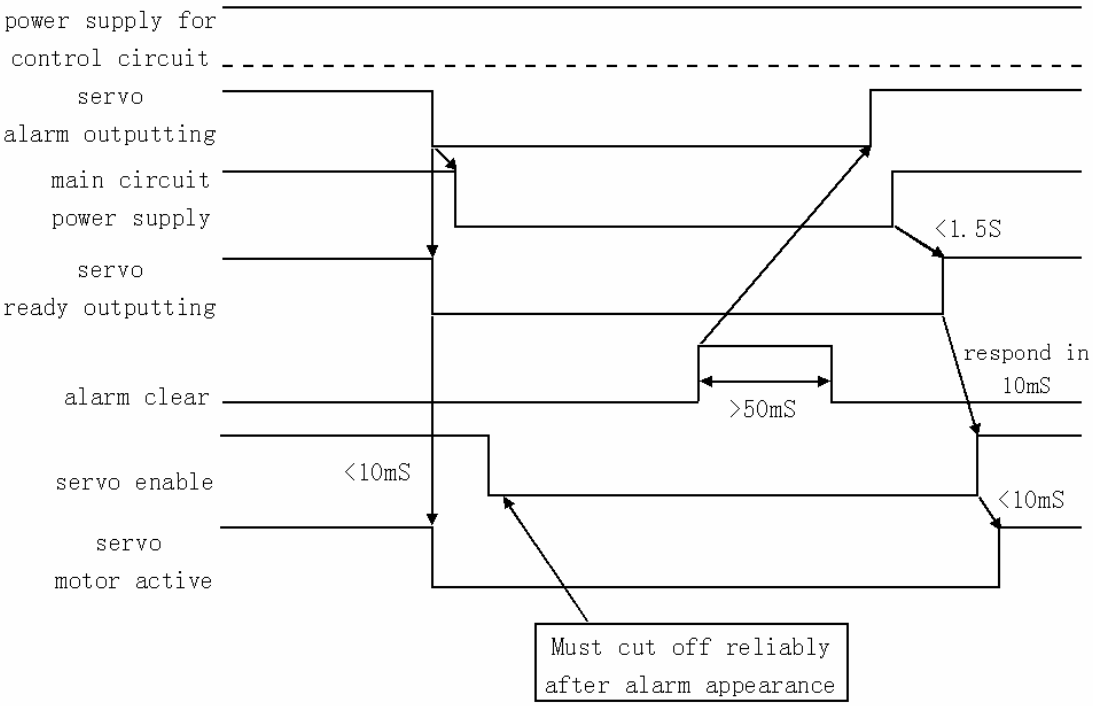


Fig 8.3 Alarm Sequence Chart

8.2 Energize Test

1) Check before operation

Installed and connected, please check the following items before power-on：

- Is the wiring of the power source terminal TB correct, reliable? Is input voltage correct?
- Are the power wire and motor wire shorted or grounded?
- Whether the control signal terminals has already joined accurately? Are the polarity and size of power supply correct?
- Have the driver and motor already been fixed?
- Has not the motor shaft connected with load?

2) Trial run with power-on

A: Trial run mode

(1) Connecting to CN2, inputting control signals; servo enable (SON) OFF, CCW drive forbid (FSTP) ON, and CW drive forbid (RSTP) ON.

(2) Putting through control circuit power (Don't connect the main circuit power temporarily), the displayer of servo driver is lighted, please check the connection if alarm appears.

(3) Setting control mode (Parameter PA3) as speed trial run mode (Setting as 2).

(4) Putting through the main circuit power.

(5) Make sure none of alarm or other abnormal cases, enable the servo (SON) ON, motor is prompting in zero speed state.

(6) Getting speed trail run mode by key operation. The DOS prompt of speed trial run is “S”, unit is r/min, and system in speed control mode. The speed command is changed by keys ▲ and ▼ . Motor runs at the given speed.

B: JOG run mode

(1) Connecting to CN2，inputting control signals; servo enable (SON) OFF, CCW drive forbid (FSTP) ON, and CW drive forbid (RSTP) ON.

(2) Putting through control circuit power (Don't connect the main

circuit power temporarily), the displayer of servo driver is lighted, please check the connection if alarm appears.

(3) Setting control mode (Parameter PA3) as JOG run mode (setting as 3).

(4) Putting through the main circuit power.

(5) Make sure none of alarm or other abnormal cases, enable the servo(SON) ON, motor is prompting in zero speed state.

(6) Getting JOG run mode by key operation. The DOS prompt of JOG run is “J”, unit is r/min, and system in speed control mode, the size and direction of speed are all determined by parameter PA20. Pressing the key ▲ to get the speed and running direction caused by parameter PA20. Pressing the key ▼ to get the inverse running at the given speed.

C: Position operation mode

(1) Connecting to CN2，inputting control signals; servo enable (SON) OFF, CCW drive forbid (FSTP) ON, and CW drive forbid (RSTP) ON.

(2) Putting through control circuit power (Don't connect the main circuit power temporarily), the displayer of servo driver is lighted, please check the connection if alarm appears.

(3) Setting control mode (Parameter PA3) as position operation mode (setting as 3), set the appropriate electronic gear wheel ratio (PA12, PA13, PA14, PA15) and corresponding parameters according to the output signal mode of the controller.

(4) Putting through the main circuit power.

(5) Make sure none of alarm or other abnormal cases, enable the servo (SON) ON, motor is prompting in zero speed state.

(6) Sending the position controller output signals to CN2-6,18,7,19 pins of the driver, it makes the motor run according to the command.

D: Internal speed operation mode

(1) Connecting to CN2，inputting control signals; servo enable (SON) OFF, speed select 1 (SC1), speed select 2 (SC2), CCW drive forbid (FSTP) ON, and CW drive forbid (RSTP) ON.

(2) Putting through control circuit power (Don't connect the main circuit power temporarily), the displayer of servo driver is lighted, please check

the connection if alarm appears.

(3) Setting control mode (Parameter PA3) as speed operation mode, establish the corresponding speed parameter according to the need.

(4) Putting through the main circuit power.

(5) Make sure none of alarm or other abnormal cases, enable the servo (SON) ON, motor is prompting in internal speed 1 state.

(6) Changing the value of signal SC1, SC2 to make motor run according to command.

8.3 Adjustment

NOTICE
● Make sure the parameters are correct before start the servo drive. Any wrong with parameters may cause equipment fault and accidentt. ● It is recommend that the idle load test firstly and then load test.

8.3.1 Basic gain

- Speed control

(1) [Speed proportional gain] (Parameter PA17), make it as big as possible if there is no vibration. Usually, load inertia is bigger, then the [Speed proportional gain] is bigger.

(2) [Speed integral time constant] (Parameter PA18), make it as small as possible according to designated condition. If [Speed integral time constant] is too small, response speed will be promoted, but will vibrate easily. So make it as small as possible if there is no vibration. If [Speed integral time constant] is too big, in the load change, the speed will be changed greatly. Generally, load inertia is bigger, then the [Speed integral time constant] is bigger.

- Position Control

(1) Setting suitable [Speed proportional gain] and [Speed integral time constant] according to the above method.

(2) [Position feed forward gain] (Parameter PA7) this parameter is bigger, response speed will be promoted, but the system position is unstable,

will vibrate easily. Usually set as 0.

(3) [Position proportional gain] (Parameter PA6) can be as big as possible in stable range. If [Position proportional gain] is too big, tracking characteristic of position command will be good, and lag error will be small, but it will vibrate easily during stop position fixing.

(4) Increasing [Position proportional gain] can cause higher position tracking characteristic, but too big will have opsition overshoot.

[Note 1] Setting [Speed proportional gain] according to the following table:

Table 8.2 Recommendation value of position proportional gain

Stiffness	[Position proportional gain]
Low stiffness	100-500 (0.01S)
Middle stiffness	500-1000 (0.01S)
High stiffness	1000-2000 (0.01S)

8.3.2 Setting electronic gear wheel

Under position control mode, can match the controller pulse conveniently through the frequency demultiplication numerator (Parameter PA12) and frequency demultiplication denominator (Parameter PA13) of position command pulse, in order to achieve user's ideal resolution ratio for position control.

Position resolution ratio (One pulse route △l) is according to per turn route of servo motor △S and per turn feedback pulse of encoder Pt, can express with the following formula:

$$\Delta l = \frac{\Delta S}{Pt}$$

In the equation，

△l: Route of per pulse (mm);

△S: Per turn route of servo motor (mm/turn);

Pt: Per turn feedback pulse of encoder (pulse/turn)

Because there is a quadruple frequency circuit in the system, so Pt = 4×C, C is encoder resolution ratio. In this system, C=2500, can be set by

parameter PA59 (Encoder resolution ratio), so Pt = 10000 pulse/turn.

Command pulse is multiplied by the electronic gear wheel ratio G to get the position control pulse, so one command pulse route is expressed as:

$$\Delta l = \frac{\Delta S}{Pt} \times G$$

In the equation，$G=\frac{\text{Electronic gear numerator of command pulse}}{\text{Electronic gear denominator of command pulse}}$

8.3.3 Start Stop Characteristic Adjustment

Start stop characteristic of servo system means the acceleration and deceleration time, determined by load inertia and start stop frequency, and also limited by the performance of servo driver and servo motor. Frequent start stop, too short time for acceleration deceleration, and too big load inertia can cause driver and motor overheated, and main circuit overvoltage alarm, so user need modulate all the items according to the practical situation.

(1) Load Inertia and Start Stop Frequency

Make sure the permitted frequency range in higher frequency start stop application fields. The permitted frequency range varys with motor type, capability, load inertia and motor speed. Under the condition of M times motor inertia, the permitted start stop frequency and recommended acceleration and deceleration time showed as following (Parameter PA26):

Table 8.3 Multiple of load inertia and Permitted start stop frequency

Multiple of loading inertia	Permitted start stop time
M≤3	>100 times/minutes: Less than 60ms for acceleration deceleration
M≤5	60~100 times/minutes: Less than 150ms for acceleration deceleration
M>5	<60 times/minutes: More than 150ms for acceleration deceleration

(2) Influence of the servo motor

The start stop frequency and acceleration deceleration for type of servo motor, depend on the load condition, running time, load occupancy ratio, environmental temperature, etc, please refer to the servo motor’s instruction

and adjust according to reality situations, to avoid overheating alarm and influence on the servo motor's life.

(3) Adjustment method

Generally, the load inertia should be less than 5 times the rotor inertia. If the load inertia is too large, it may cause main circuit overvoltage or braking abnormal during deceleration, to deal with the above problem, can use the following treatments:

- Increase acceleration deceleration time, (Parameter PA26) can be set larger first, then reduce it gradually to a proper value.
- Reduce the output torque limit value, (Parameter PA32, PA33, PA34, PA35) reduce current limit value.
- Reduce the maximum speed limit of the servo motor (Parameter PA16).
- Install an external regeneration brake.
- Replace with lager power and inertia of servo motor (Pay attention to matching driver).

Chapter 9 Fault Diagnosis

NOTICE
● Any person who participating in overhauling must have corresponding professional knowledge and ability. ● Could touch the driver and motor after servo driver and motor power off at least for 5 minutes, prevent shocking by electricity and burning. ● After the fault alarm has occurred, must fix malfunctions according to the warning code and then can put it into operation again. ● Before reset an alarm, it is necessary to confirm that the SON (Servo enable) is invalid, to prevent accident cause from which the servo motor suddenly start.

9.1 Protection Diagnosis Function

- SPM-3500 servo driver has offered 14 kinds of different protection functions and fault Diagnosis. When one kind of protection function is activated, the number showing on the operation panel represents the alarm message respectively, with alarm signal output.
- Need connect alarm output and fault chain output with the braking circuit while using the driver, when the protection function of servo driver is activated, the servo driver loop can disconnect with the main power source in time (Cut off the three-phase main power source, the control circuit continue power-on).
- After clear the malfunction source, can shut off power, then power-on serve driver again to clear alarm.

Alarm code	Alarm name	Content
—	Normal	
1	IPM module fault	IPM intelligent module fault
2	Main circuit undervoltage	Main power voltage is too low
3	Main circuit overvoltage	Main power voltage is too high
4	Overcurrent	Motor current is too large
5	Encoder fault	Encoder signal error
6	DSP fault	DSP fault
7	Watchdog fault	Software work is abnormal
8	System overspeed	Encoder error
9	Tracking error is too big	Position deviation over setting value
10	Overload	Current over setting value
11	Control parameter read error	Read EEPROM parameter fault
12	Braking fault	Braking circuit fault
13	Control power supply undervoltage	Control power supply ±15V is too low
14	Motor overheated	The temperature of motor is too high

9.2 Fault Analysis

Table 9.2 Fault analysis and solving ways

Alarm code	Alarm name	Running state	Cause	Solving ways
1	IPM module fault	Occurs when putting through control power supply	● Circuit board fault	● Change driver
		Occurs during motor running	● Lower voltage of power source ● Overheated	● Check driver ● Power-on afresh ● Change driver
			● Short among U,V,W	● Check connection
			● Bad grounding	● Correct grounding
			● Motor isolation is broken	● Change motor
			● Suffer disturbance	● Add filter on circuitry ● Far away from disturbance source.
2	Main circuit undervoltage	Occurs when putting through main power supply	● Circuit board fault ● Power fuze is damaged ● Soft start circuit fault ● Rectifier is broken	● Change driver
			● Power supply undervoltage ● Lose power more than 20ms temporarily	● Check power supply
		Occurs during motor running	● Shortage of power supply capacity ● Instantaneous power-off	● Check power supply ● Increase the acceleration deceleration time of numerical control system
			● Radiator overheated	● Check load state
3	Main circuit overvoltage	Occurs when putting through	● Circuit board fault	● Change driver

Alarm code	Alarm name	Running state	Cause	Solving ways
		control power supply		
		Occurs when putting through main power source	● Power supply overvoltage ● Abnormal voltage wave	● Check power supply
		Occurs during motor running	● External braking resistor cut off	● Check external braking circuit. reconnect
			● Braking transistor is broken ● Inner braking resistor is broken	● Change servo driver
			● Shortage of braking loop capacity	● Reduce start stop frequency ● Increase acceleration / deceleration time constant ● Reduce torque limit ● Reduce load inertia ● Change larger power servo driver and servo motor
4	Overcurrent		● Short among U,V,W	● Check connection
			● Bad grounding	● Correct grounding
			● Motor isolation is broken	● Change motor
			● Driver is broken	● Change driver
5	Encoder fault		● Wrong encoder connection	● Check connection
			● Encoder is broken	● Change motor
			● External disturbance	● Add filter on circuitry

Alarm code	Alarm name	Running state	Cause	Solving ways
				● Far away from disturbance source
			● Bad encoder cable	● Make encoder line shorter ● Adopt polycore cable with parallel connection
			● Too long encoder cable, causing lower voltage for encoder	● Make encoder line shorter ● Adopt polycore cable with parallel connection
6	DSP fault		● Input control power supply is unstable	● Check voltage of control power supply ● Check power of control power supply
			● Servo driver fault	● Change servo driver
			● Suffer disturbance	● Add filter on circuitry ● Far away from external disturbance source
7	Watchdog fault		● Input control power supply is unstable	● Check voltage of control power supply ● Check power of control power supply
			● Servo driver fault	● Change servo driver
			● Suffer disturbance	● Add filter on circuitry ● Far away from external disturbance source
8	System overspeed	Occurs when putting through control power	● Control circuit board fault ● Encoder fault	● Change servo driver ● Change servo motor

Alarm code	Alarm name	Running state	Cause	Solving ways
		supply		
		Occurs during motor running	● Input command pulse frequency is too high	● Change servo driver ● Change servo motor
			● Acceleration / deceleration time constant is too small, causing too big speed overshoot	● Increase acceleration / deceleration time constant
			● Input electronic gear wheel ratio is too big	● Set parameters correctly
			● Encoder fault	● Change servo motor
			● Bad encoder cable	● Adopt polycore cable with parallel connection
			● Servo system is unstable, causing overshoot	● Reset concerned gain ● If it could not setting suitable value, please reduce load moment of inertia rate
		Occurring at the moment of motor start	● Too big load inertia	● Reduce load inertia ● Change larger power servo motor and servo driver
			● Encoder zero point error	● Change servo motor ● Let manufacturer remodulate encoder zero point
			● Wrong connection among U,V,W ● Wrong connection of encoder cable	● Correct connection

Alarm code	Alarm name	Running state	Cause	Solving ways
9	Tracking error is too big	Occurs when putting through control power supply	● Circuit board fault	● Change servo driver
		On condition that put through main power supply and control line, then input command pulse, the motor does not rotate.	● Wrong connection among U,V,W ● Wrong connection of encoder cable	● Correct connection
			● Encoder fault	● Change servo motor
			● Position overshoot range is too small	● Expand position overshoot range
		Occurs during motor running	● Position proportional gain is too small	● Increase gain
			● Torque shortage	● Check torque limit value ● Reduce load capacity. ● Change larger power servo motor and servo driver
10	Overload		● Power shortage	● Check torque limit value (PA34,PA35) ● Look-up table 7.3, modify PA38 ● Adjust time PA39 longer
			● Servo driver fault	● Change servo driver
			● Mechanical locked-rotor	● Check mechanism
11	Control parameter read error		● Input control power supply is unstable	● Check voltage of control power supply ● Check power of control power supply
			● Servo driver fault	● Change servo driver

Alarm code	Alarm name	Running state	Cause	Solving ways
			● Suffer disturbance	● Add filter on circuitry, far away from external disturbance source
12	Braking fault	Occurs when putting through control power supply	● Circuit board fault	● Change servo driver
		Occurs during motor running	● External braking resistor cut off	● Reconnect
			● Braking transistor is broken ● Inner braking resistor is broken	● Change servo driver
			● Shortage of braking loop capacity	● Reduce start stop frequency ● Increase acceleration / deceleration time constant ● Reduce torque limit ● Change larger power servo driver and servo motor
			● Voltage of main power supply is too high	● Check main power supply
13	Control power supply undervoltage		● Short among U,V,W	● Check connection
			● Bad grounding	● Correct grounding
			● Motor isolation is broken.	● Change motor
			● Driver is broken.	● Change driver
14	Motor Overheated	Occurs when putting through control power	● Circuit board fault	● Change servo driver
			● Cable is broken ● Temperature-control	● Check cable ● Check motor

Alarm code	Alarm name	Running state	Cause	Solving ways
		source	relay in motor is broken	
		Occurs during motor running	● Motor overload	● Reduce load ● Reduce start stop frequency ● Reduce torque limit value ● Reduce concerned gain ● Change larger power servo driver and servo motor
			● Over rated torque and run for a long time	● Check load ● Decrease start stop frequency ● Reduce torque limit ● Change larger power servo driver and servo motor
			● Bad mechanical drive	● Check mechanism part
			● Fault within motor	● Change servo driver

Chapter 10 Maintain And Safeguard

The servo driver is according to the following regulation during maintenance period:
The maintenance period is: Being dispatched from the factory in 18 months, or give it to the end user in one year.

NOTICE
● The power on/off should be operated by operation staff. ● The circuit keeps the charging state under high voltage for some time after power-off. Should do check operation after powe-off, then in about 5 minutes after LED light on the panel goes out. ● Don't measure insulation resistance, will damage the driver.

10.1 Daily Inspection

Under the state of system runs normally, please confirm the following items:

1) Whether the ambient temperature, humidity are normal. Whether have dust, mote, eyewinker, etc.
2) Is the motor has unusual sound and vibration.
3) Unusually heat or have peculiar smell
4) Is the environment temperature too high
5) Is the panel clean
6) Is there any loose connection or incorrect pin position
7) Is the monitor value of output current with usual value differ greatly
8) Is the cooling fan installed under servo driver running well

10.2 Periodic Inspection

At the time of time periodic maintenance, please confirm the following items:

1) Whether the loose screw exists
2) Whether the overheated sign exists
3) Whether the burned terminal exists

10.3 Guide For Part Replace

NOTICE
● In order to check or repair, the dismantlement work for the spare part should be implemented by our company (Or sale agent).

The replacement period depend on actual operation terms and operating situation of equipment. The invalid part should be changed and repaired immediately.

Equipment	Hardware	Standard replacement period	Remarks
Driver	Filter capacitor	About 5 years	The replacement period pointed out here is only for reference, no matter how long about the standard replacement period, any hardware finds that losing efficiency should change or maintain immediately.
	Cooling fan	About 3 years	
	The aluminium electrolytic capacitor on printed plate	About 3 years	
Motor	Axletree	3-5 years	
	Oil seal	5000 hours	
	Encoder	3-5 years	

Nanjing Washing cnc technology co.,LTD

Address: Centralized Industrial Zone, DongShan Bridge, JiangNing District, NanJing City, JiangSu Province

Telephone: (025)87170996 87190997 87170998

Fax: (025)52627632

Post Code: 211100