

HIGH-PERFORMANCE

SUPER-SMALL DIMENSION

SN2000

FULL DIGITIZE AC SERVO DRIVER (AMPLIFIER)

INSTALLATION AND OPERATION MANUAL



NANJING SUQIANG NUMERICAL CONTROL M&E CO., LTD
2005-7-1




Preface

Thank you for choosing this SN2000 AC servo system. This user guide gives comprehensible information and precaution for using the servo driver.

Incorrect handling may cause an unexpected accident. Before using the servo driver, please read this manual carefully.

- ★ Due to improvement of the product the contents of this manual may be change at any time without further notice.
- ★ Our factory does not assume any responsibility for any reform of the products by customer. If so, the product guarantee form is not valid any more.

When read this manual, please pay more attention to the following warning symbols:

 WARNING	Indicates that incorrect handling may cause dangerous consequences resulting in death or severe injury
 CAUTION	Indicates that incorrect handling may cause injury to the operator and may cause equipment damage.
 NOTICE	Indicates that incorrect handling may cause the servo amplifier and other equipment to be faulty or damage.

SAFETY INSTRUCTIONS

! WARNING

- ★ The design and manufacture of the servo amplifier are not applied to such a mechanical system in which there are some serious influences on human life.
- ★ To prevent accident due to abnormal operation safety and protection measures should be considered for the mechanical equipment and systems in design and build stage.

CONFIRMATION OF PRODUCT RECEPTION

! CAUTION

- ★ Do not put into operation if there is any damage or failure of the product.

TRANSPORTATION

! CAUTION

- ★ Store or transport the products correctly according to the required environmental conditions.
- ★ Do not pile the products to prevent them falling down.
- ★ Ensure the packing is in good condition during transportation.
- ★ During transportation, do not catch cables, motor shaft or encoder to pull the servomotor.
- ★ Do not shock the servo driver and servo motor.

INSTALLATION

! CAUTION

Servo driver and servo motor

- ★ Do not install the servo driver and servo motor on or near combustibles. Otherwise a fire may cause.
- ★ Avoid vibration. Isolate the servo driver from all impact loads.
- ★ Do not install the servo driver and servo motor damaged or having any part missing.

Servo driver

- ★ Install the servo driver into a control box with sufficient protection.

- ★ Leave specified clearances between the servo driver and other equipment.
- ★ Ensure a good cooling condition to be provided.
- ★ To prevent dust, corrosive gas, conductive matter, liquid, combustible and explosive matter, etc. entering the servo driver.

Servo motor

- ★ Installation should be very firm to prevent loosening by vibration.
- ★ Prevent any kind of liquid entering the servo motor and encoder.
- ★ Do not give shock to the servo motor and motor shaft since it is provided with an encoder or they may break.
- ★ Do not subject the servo motor shaft to more than the permissible load.

WIRING

! WARNING

- ★ Any person who is involved in wiring and inspection should be fully competent to do the work.
- ★ Before wiring or inspection, switch the power off and wait for more than five minutes, then can make it.
- ★ The servo driver and servo motor must be grounded securely.
- ★ Incorrect voltage and polarity may cause explosion or get out of order.
- ★ Before wiring, install the servo driver and servo motor properly.

! CAUTION

- ★ Wire the servo driver correctly and securely. Otherwise, the servo motor may run incorrectly and the equipment may cause trouble by contact failure
- ★ Contact U, V and W terminals of servo motor correctly. Do not connect AC power directly to the servo motor
- ★ Directly connect the servo driver with servo motor, do not insert any capacitors, inductor, or filter between the servo driver and the servo motor.
- ★ Prevent any kind of conductive matter such as metal piece, wire bar, etc. entering the servo driver.
- ★ Do not put any wire and other material, which is not ovenproof on the heat sink of the servo driver or servo motor.
- ★ The flying-wheel diode connected to DC relay must be wired in the specified direction.

TEST RUNNING

! CAUTION

- ★ Before operation, make sure that the servo driver and servomotor have been installed securely and the voltage of power supply, the connection of wiring are correct.
- ★ Make sure that the parameter settings are correct. In order to prevent any mistake operation causing some mechanical or equipment trouble the test running is firstly operated under no-load condition and then under load condition

USAGE

! CAUTION

- ★ Provide an external emergency stop circuit to ensure that operation can be stopped and the power switched off immediately when an accident occurs.
- ★ Before resetting an alarm, make sure that the servo enable signal is off. Otherwise a sudden restart is made if an alarm is reset while the servo enable signal is on.
- ★ Use the servo driver with the specified servo motor.
- ★ Use a noise filter, an isolated transformer, etc. to minimize the influence of electromagnetic interference nearby.
- ★ Do not frequently switch on and off the power supply to prevent the servo amplifier to be damaged.
- ★ During operation or soon after power off, do not touch the heat sink of the servo driver or servo motor, for they may be at high temperature after long term running.
- ★ Do not reform the servo motor.

TROUBLE HANDLING

! WARNING

- ★ Do not touch or unwire the terminals to prevent electronic shock. Even though the power is off, but a high voltage still exist in the servo driver for about five minutes of time.
- ★ Any person who involved in disassemble and inspection of the servo driver should have specialized knowledge and be fully competent to do the work.

! CAUTION

- ★ When any alarm occurred, remove its cause, ensure safety, and then reset the alarm before restart operation.
- ★ After an instantaneous power failure, keep away from the machine because the machine may be restarted suddenly when the power is restored. (Design the machine so that it is occurred against danger if it is restarted).

SYSTEM CONFIGURATION**! NOTICE**

- ★ The required rated torque of the servo motor must be greater than the effective continuous load torque.
- ★ The ratio of the load inertia to the servo motor inertia should be less than the recommend value.
- ★ The servo driver is matched to the servo motor

COUTENTS

CHAPTER 1 INTERODUCTION

- 1.1 Products brief introduction
- 1.2 Inspection at delivery

CHAPTER 2 INSTALLATION

- 2.1 Environmental conditions
- 2.2 Installation of servo driver

CHAPTER 3 WIRING

- 3.1 Standard wiring
- 3.2 Terminal function
- 3.3 Input / output interface circuit

CHAPTER 4 PARAMETERS

- 4.1 Parameter list
- 4.2 The function of parameters

CHAPTER 5 ALARMS AND HANDLE

- 5.1 Alarm list
- 5.2 Alarm and trouble shooting

CHAPTER 6 DISPLAY AND OPERATON

- 6.1 Keyboard operation
- 6.2 Monitor mode
- 6.3 Parameters setting
- 6.4 Parameter management
- 6.5 Speed test operation
- 6.6 JOG operation
- 6.7 Others

CHAPTER 7 OPERATION

- 7.1 Power supply connection
- 7.2 Test operations
- 7.3 Adjustment

CHAPTER 8 SPECIFICATIONS

- 8.1 Specifications of servo driver
- 8.2 Specifications of servo motor

CHAPTER 9 Specification of SQ serials Brushless AC servo motor

CHAPTER 1 INTRODUCTION

1.1 PRODUCTS BRIEF INTRODUCTION

AC servo technique has been developed since 1980 and has reached a high level of drivers. The features of the AC servo are continuously increasing. Their products have been widely use din the area of automation such as, numerical control machine tools, printing machines, packing machines, textile machines, auto-production-line, etc.

SN2000 serials of AC servo driver is a fully digitized AC servo system, and also is first-generation product of China-made. The futures of the SN2000 servo driver have reached the level of external products of the same class. It has small volume, fully protection, good reliability, and high integration by employing international newly digital signal processor (DSP), large-scale programmable gate array and MITSUBISHI intelligent power module (IPM), and by using the optional PID algorithm to achieve PWM control.

In comparison with step motor driver, the SN2000 servo system has advantages as the followings:

★ Avoid out-of step phenomenon

The servo system is combined the servo driver, servo motor with encoder and open-loop position controller to form a semi-closed loop control system. The position feedback signal is fed to the servo driver to ensure no out-of-step phenomenon.

★ Constant torque in a wide range of speed

The servo system has a constant torque from low to high speed in which the speed range is about 1:10000.

★ High speed, high accuracy

The maximum speed of servo motor reaches to 6000rpm. The in-position error is within 1/10000r.

Note: The maximum speed of servo motor may be different form different type of servo motor.

★ Simple control and flexibility

To meet different requirement, the servo driver can operate in a required operation mode and required characteristic by setting their parameters properly.

1.2 INSPECTION AT DELIVERY

1) Check the following item after receiving the product

- (1) Check the package of the product to confirm the product is free from any damage or scratches by transportation.
- (2) After unpacking, check the nameplate to make sure that the servo amplifier and / or servo motor are the same as the order one by the customer.
- (3) Check the packing list to see accessories are correct.

2) Accessories

1.3 PRODUCT OUTLIJNE DRAWINGS

- 1) The outline drawing of the servo driver



- 2) The outline drawing of the servo motor



CHAPTER 2 INSTALLATION

! NOTICE

- ★ Store and install of the products must meet requirements of environmental conditions
- ★ Do not pile the products too much to prevent damage from pressing or falling
- ★ Original product package must be used when transportation is again needed
- ★ Use fireproofing material for installation and keep away from flammable matter in case to prevent on fire
- ★ The servo driver must be installed inside a cabinet to keep free from dust, corrupt gas, liquid, conductance and easy burning matter
- ★ The servo driver and servo motor must keep away from vibration source and isolate from all impact
- ★ Do not carry the servo motor by drawing the motor shaft, cables of motor or encoder

2.1 ENVIROMENTAL CONDITIONS

Item	SN2000 servo driver	SQ Series servo motor
Ambient temperature	0~55℃ (non-freezing)	0~40℃ (non-freezing)
Ambient humidity	90% RH or less (non-condensing)	90% RH or less (non-condensing)
Storage temperature	-20~80℃	-25~70℃
Storage humidity	90% RH (non-condensing)	<80% RH (non-condensing)
Ambience	Free from corrosive gas, flammable gas, oil mist, dust and dirt etc.	Free from corrosive gas, flammable gas, oil mist, dust and dirt etc
Altitude	1000m or less (above sea level)	2500m or less (above sea level)
Vibration	<0.5G (4.9m/s ²) 10~60HZ (non continuous operation)	
Protection class	IP00 (non-protection)	IP 55

2.2 INSTALLATION OF SERVO DRIVER

! NOTICE

- ★ The servo driver must be installed in control cabinet with good protection condition.
- ★ The servo driver must be installed in the specified direction and kept enough space between the driver unit and control box wall or other equipment to guarantee the condition of heat transmission.
- ★ Do not install the driver unit on or nearby flammable matters to prevent causing fire.

1) Environmental conditions for installation

(1) Protections

The servo driver must be installed in a control cabinet with good protection condition due to the driver unit has non-protection and kept free from corrosive gas, flammable gas, oil mist, metal dust, liquid and conductance matters etc.

(2) Temperature

Ambient temperature 0~50°C and under 45°C for continuous operation with guarantee the condition of heat transmission.

(3) Vibration and impact

Installation must ensure no harm vibration otherwise reduce vibration means must be taken for reducing vibration under 0.5G (4.5m/s²). Do not put heavy objects on the servo driver and avoid impact.

2) Installation method

(1) Installation manner

There are two manners of installation can be used, the first one is the rear plate mounting and the second is the front-panel plate mounting. The installation direction is perpendicular to the mounted plate. Figure 2.1 shows the rear plate mounting. Figure 2.2 shows the front-panel plate mounting.

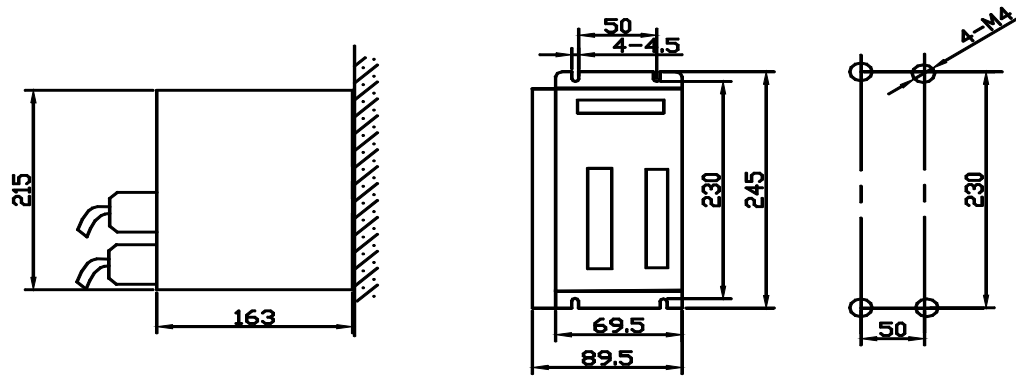


Figure 2.1 Servo driver rear plate mounting

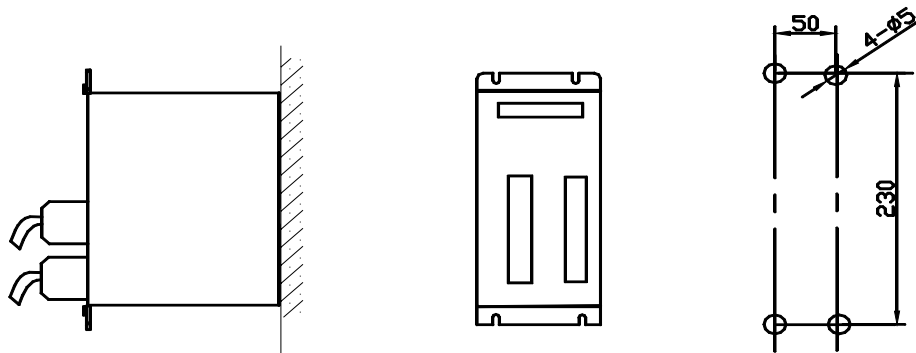


Figure 2.2 Servo driver front-panel plate mounting

(2) Installation clearances

Figure 2.3 shows the installation clearances for a single servo driver, Figure 2.4 shows the installation clearances for multiple servo drivers. In practice, to ensure a good cooling condition, provide installation clearances around the servo driver as large as possible

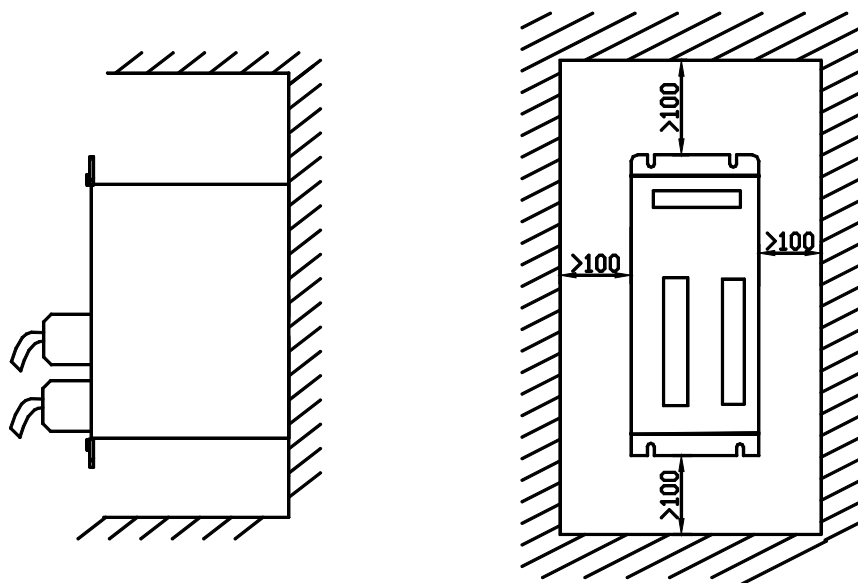


Figure 2.3 The installation clearances for a single servo driver

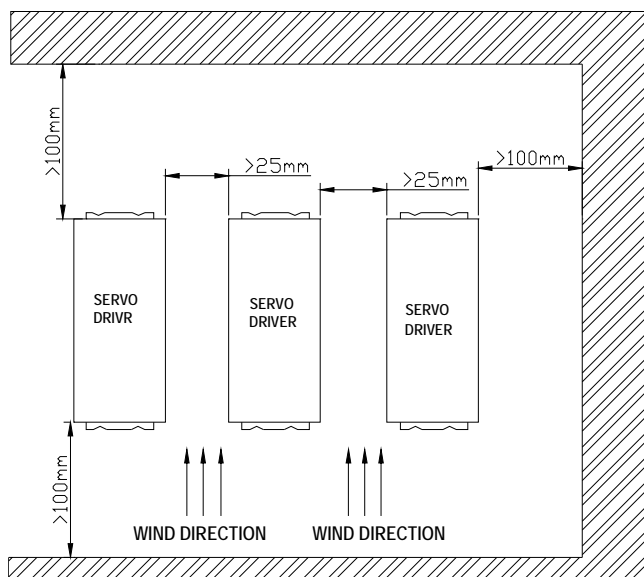


Figure 2.4 The installation clearances for multiple servo drivers

2.3 SERVO MOTOR INSTALLATION

! NOTICE

- ★ Do not give shocks to the servo motor and encoder, or they may break.
- ★ During transportation, do not catch cables, motor shaft or encoder to pull the servo motor.
- ★ Do not subject the servomotor shaft to more than the permissible load, or servo motor may damage.
- ★ Installation should be very firm to prevent loosening by vibration.

Note: Please know more from attached servo motor manual.

CHAPTER3 WIRING

! WARNING

- ★ Any person who is involved in wiring or checking should be fully competent to do the work.
- ★ Before wiring or checking, make sure that the voltage is safe at least 5 minutes after power-off. Otherwise you may get an electric shock.

! CAUTION

- ★ Connect cables to correct terminals according to voltage level and polarity to prevent equipment damage or person injury.
- ★ The protective earth terminals (PE, FG) should be connected to ground.

3.1 STANDARD WIRING

Connections of the servo driver are related to the control mode as following:

1) Position control mode

The standard wiring for position control mode is shown in FIG.3.1

2) Velocity control mode

The standard wiring for velocity control mode is shown in FIG.3.2

3) Wiring

(1) Power terminals TB

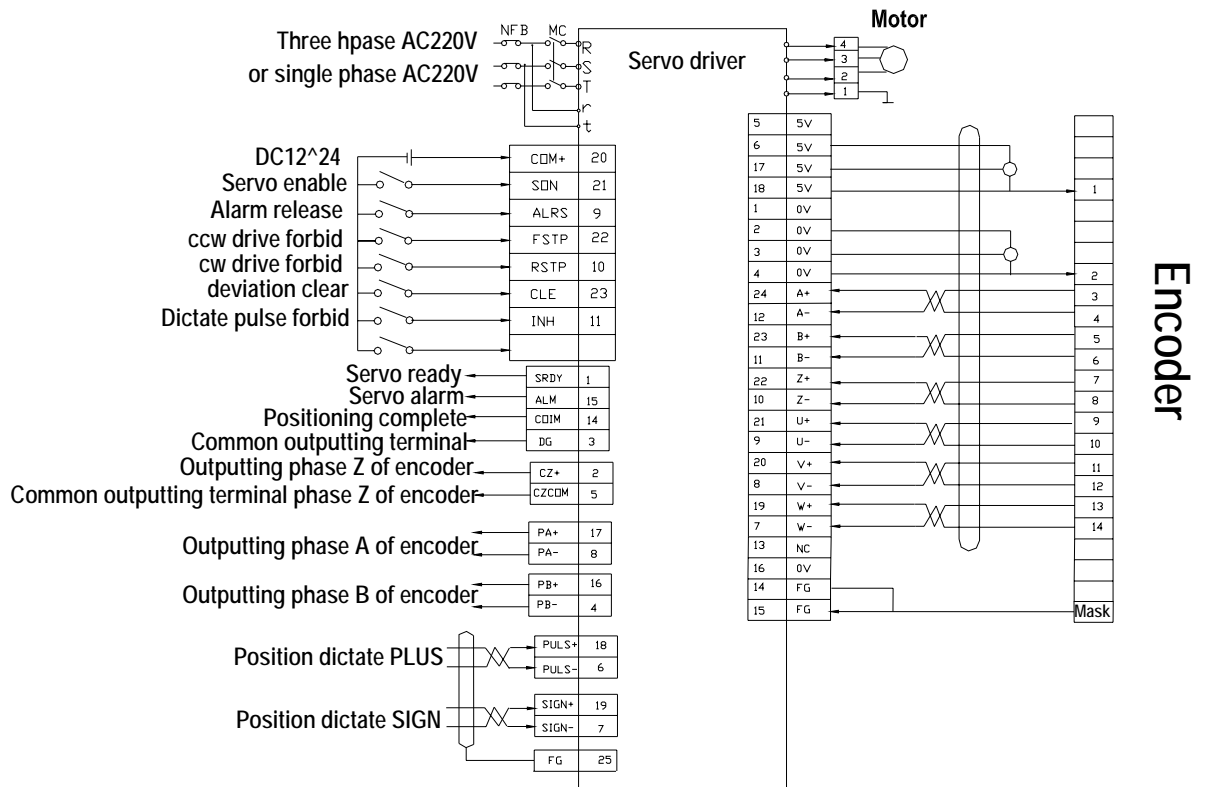
- Wire size: R, S, T, PE, U, V, W terminal wire size $\geq 1.5\text{mm}^2$ (AGW 14~16), r, t terminal wire size $\geq 1.0\text{mm}^2$ (AGW 16~18)
- Grounding: The wire size for grounding is as bigger as possible. The PE terminals of the servo driver and servomotor are connected to the ground in one point. The grounding resistant should be less than 1000MS.
- JUT-1.5-4 pre-insulated terminal is used for connecting wire terminals and make sure that the connections are fast.
- A phase isolated transformer for power supply is recommended to reducing possibility of electric shock.
- A noise filter in series with power supply is recommended to enhance the ability of anti-interference. Please install a non-melt type breaker (NFB) to switch off power supply quickly in case of the servo driver failure.

(2) Control signals CN1, Encoder signals CN2

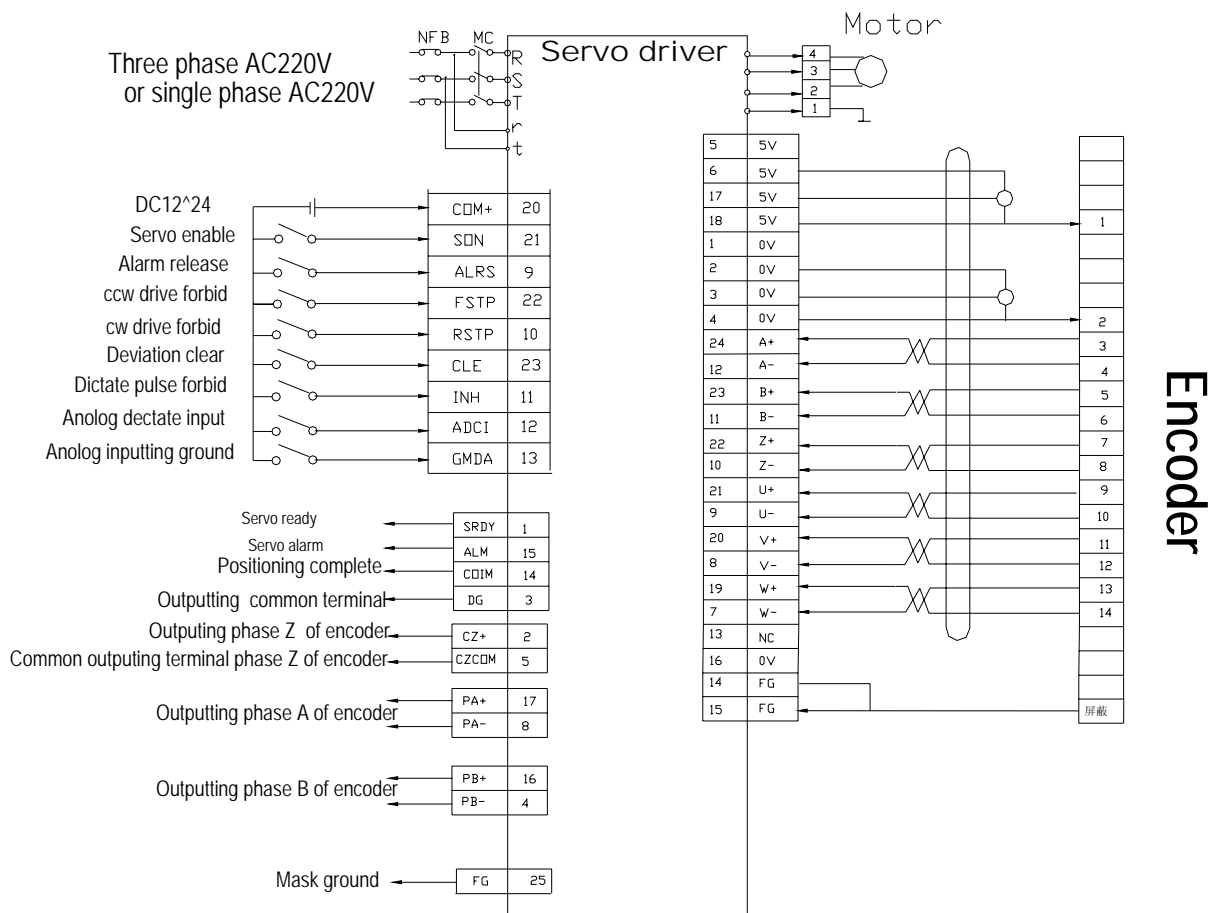
- Wire size: Use a screened cable (screened twisted pair type is best), wire size $\geq 0.12\text{mm}^2$ (AWG24-26). The screening wire must be connected to PE(FG) terminal.
- Cable length: The length of cable is shorter as possible. The length of control cable CN1 is three meters or less. The length of encoder cable is 20 meters or less.
- Wire distribution: The cable wiring must be kept away from power wiring to prevent the influence of electromagnetic interference.
- Please provide a surge voltage snubber component to each inductance (coil) in related circuit. A direct current coil is connected with an anti-parallel flywheel diode and an AC coil is connected with a RC snubber circuit.

! NOTICE

- ★ Connect the wires to the correct phase terminals (U, V, W) of the servo driver and servo motor. Otherwise the servo motor will not operate.
- ★ The cables and wires must be fixed securely and are not closed to the heat sink of the servo driver and servomotor to prevent their insulation feature getting worse from heat.
- ★ Do not touch the servo driver and servomotor during operation or even though the power is switched because in the servo driver there is an electrolytic capacitor is which a high voltage will be kept for about five minutes after power off.



Drawing3.1 Standard Connection for Position Control Mode



Drawing3.2 Standard Connection for Speed Control Mode

3.2 TERMINAL FUNCTIONS

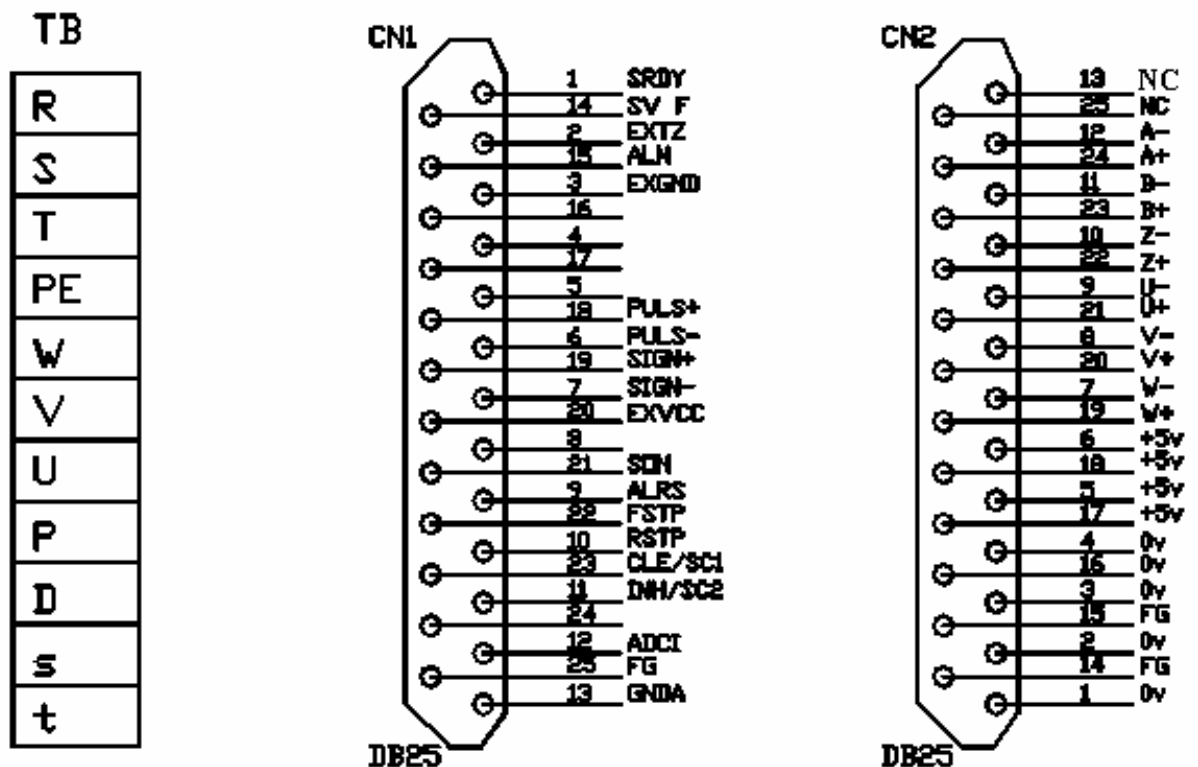
1) Arrangement of connection terminals

Figure 3.3 is arrangement of connection terminal for the servo driver where TB is the terminal block.

TB is the terminal block.

CN1 is DB25 connector. The socket is male and the plug is female.

CN2 is DB 25 connector. The socket is female and the plug is male.



2) Power terminal block

Table 3.1 Power terminal block

Terminal number	Symbol	Name of signal	Function
TB-1	R	Main power supply One phase or three phases	Main power input terminals. -220V, 50Hz. Note: Never connect R, S, T to U, V, W terminals of the servo motor
TB-2	S		
TB-3	T		
TB-4	PE	System ground	Grounding terminal Grounding resistance < 100 Ω Connect with input power ground to form a common point
TB-5	W	Servo driver	Servo driver output terminals.

TB-6	V	outputs	Connections must match with U, V, W terminals of the servo motor
TB-7	U		
TB-8	P	Reserved	
TB-9	D	Reserved	
TB-10	r	Control power supply Single phase	Control circuit power supply terminals -220V, 50Hz
TB-11	T		

3) Control signal terminals CN1

Abbreviation of contrl mode: P stands for position control mode

S stands for speed control mode

Table 3.2 Control signal input/output terminals CN1

Terminal number.	Name of signal	symbol	I/O	Mode	Function
CN1-20	The anode of input terminal	COM+	Type1		The anode of input terminal is used to drive the isolator of input terminal DC12-24V, current $\geq 100\text{mA}$
CN1-21	Servo enable	SON	Type1		Input terminal of servo enable SON ON: permit diver run SON OFF: driver off, motor is in free mode Note1: make sure servo motor is quiescent before turn “SON OFF” TO “SON ON” Note2: Input any command after 50 ms turning to SON ON
CN1-9	Alarm clear	ALRS	Type1		Alarm clear terminal input ALRS ON: Clear system's alarm ALRS OFF: Keep system's alarm Note1: Need check and test cutting

					current off to solve the alarm NO. bigger than 8
CN1-22	CCW servo forbid	FSTP	Type1		CCW (anticlockwise) Servo forbid input terminal FSTP ON: CCW Driver permit FSTP OFF: CCW Drive forbid Note1 : used in mechanical out of limit , CCW direction is zero torque when switch is off. Note2: Setting parameter of No20 can shield this function or make switch on.
CN1-10	CW servo forbid	RSTP	Type1		CW (Deasil) Input terminal of drive forbid RSTP ON: CW drive permit RSTP OFF: CW drive forbid Note1 : used in mechanical out of limit, CW direction is zero torque when switch is off. Note2: Setting parameter of No20 can shield this function or make switch on.
CN1-23	Deviation Clear	CLE	Type1	P	Input terminal of Deviation clear CLE ON : clear deviation during position control.
CN1-11	Command pulse forbid	INH	Type1	P	Input terminal of command pulse INH ON: Command pulse input forbid INH OFF : Command pulse input efficient

CN1-12	Analog input	ADCI	Type2	S	Analog input terminal
CN1-13	Analog input	GMDA	Type2	S	Analog input public terminal
CN1-24	The second gear ratio	SEGR	Type2	P	The second gear ratio input terminal
CN1-1	Servo ready input	SRDY	Type2		Input terminal of servo ready SRDY ON: Correct control power source and main power source; no alarm from servo driver; servo ready input is ON. SRDY OFF: Main power source is detached or exist alarm from driver, servo ready input is off.
CN1-15	Servo alarm output	ALM	Type2		Output terminal of servo alarm ALM ON: No alarm from servo driver; servo alarm output is ON ALM OFF: Exist alarm from servo driver; servo alarm output is OFF
CN1-14	Positioning complete output	COIN	Type2	P	Output terminal of positioning complete COIN ON : Positioning complete output is On when deviation clear in the range of positioning range preset
	Speed arrival output	SCMP	Type2	S	Output terminal of Speed arrival. SCMP ON: Speed arrival output is ON when speed arrive or out of preset speed.
CN1-16		PB+	Type2	S	Encoder phase B+ output

CN1-4		PB-	Type2	S	Encoder phase B- output
CN1-17		PA+	Type2	S	Encoder phase A+ output
CN1-8		PA-	Type2	S	Encoder phase A- output
CN1-3	Output common terminal	DG			Common terminal of output terminal (except CZ terminal) for control signal
CN1-18	Command pulse PLUS input	PLUS+	Type3	P	Input terminal of outside command pulse Note 1: Set parameter PA14 to achieve pulse input type 1) Command pulse + signal type 2) CCW/CW command pulse type 3) 2 phases command pulse type
CN1-6		PLUS-			
CN1-19	Plus command SIGN input	SIGN+	Type3	P	
CN1-7		SIGN-			
CN1-2	Phase Z output	CZ			Encoder's Z phase output signal
CNI-5	Phase Z common terminal	CZCO M			Z phase common output terminal
CN1-25	Screen ground	FG			Screen ground terminal

4) Encoder signal terminals CN2

Table 3.3 Input/output terminals of encoder signals

Terminal number	Name of signal	Terminal symbol			Color	Function
		Sign	I/O	Type		
CN2-5 CN2-6 CN2-17 CN2-18	Power supply output +	+5V				+5V is used for the optical encoder of servo motor. If the encoder cable is longer than two meters it is necessary to use multiple wires in parallel.
CN2-1 CN2-2 CN2-3 CN2-4 CN2-16	Power supply output-	0V				
CN2-24	Encoder A + input	A+	Type4			Connect to A+ of encoder
CN2-12	Encoder A- input	A-				Connect to A- of encoder
CN2-23	Encoder B+ input	B+	Type4			Connect to B+ of encoder
CN2-11	Encoder B- input	B-				Connect to B- of encoder
CN2-22	Encoder Z+ input	Z+	Type4			Connect to Z+ of encoder
CN2-10	Encoder Z- input	Z-				Connect to Z- of encoder
CN2-21	Encoder U+ input	U+	Type4			Connect to U+ of encoder
CN2-9	Encoder U- input	U-				Connect to U- of encoder
CN2-20	Encoder V+ input	V+	Type4			Connect to V+ of encoder
CN2-8	Encoder V- input	V-				Connect to V- of encoder
CN2-19	Encoder W+ input	W+	Type4			Connect to W+ of encoder
CN2-7	Encoder W- input	W-				Connect to W- of encoder

3.3 INPUT / OUTPUT INTERFACE CIRCUIT

1) Switching signal input interface (Type1)

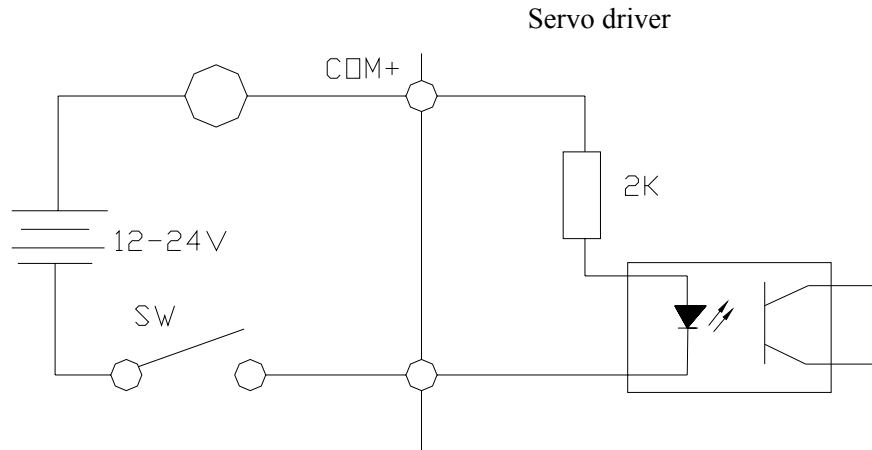


Figure 3.4 Type1 of switching signal input interface

- (1) The customer should provide an external power supply. DC 12~24V, current $\geq 100\text{mA}$
 - (2) It should be noted that if the polarity of the external power supply is reversal the servo drive is not to work.
- 3) Switching signal output interface (Type2)

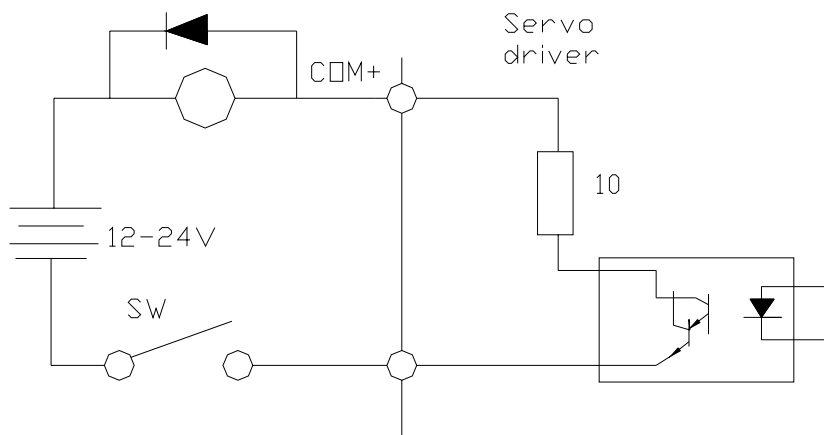


Figure 3.5 Type2 of switching signal output interface

- (1) The customer provides the external power supply. Be careful, the polarity of power supply must be correct. Otherwise, the output circuit of the servo driver may damage.
- (2) The output circuit is an open collector form. Its maximum, sink current is limited to 50mA and the external maximum voltage is a 25 volts. Therefore do not exceed the

above limitations for all digital output terminals. Otherwise, overloaded or short-circuited will damage the servo driver.

- (3) If the output load is an inductance load such as relay, it is necessary to connect a flying-wheel diode to the relay coil in opposite direction against DC positive pole. Be careful; if such a diode is in wrong direction the output circuit will blow down.

4) Pulse signal input interface (type3)

- (1) TO transmit the data pulse signal correctly it is recommended to use the differential line drive circuit as shown in Figure3.6.
- (2) When used the differential driver circuit the IC AM26LS31, MC3487, the same kind of RS422 line drive will be adopted.
- (3) When used the single-end drive circuit as shown in Figure3.7, the transmission rate will slow down. The driving to current is 10-15mA and the external maximum voltage is limited to 25 volts. According to the above condition the series resistor can be determined. The experience data are as the following: VCC=24V, R=1.3~2k;

VCC=12V, R=510 Ω ~820 Ω ;

VCC=5V, R=80 Ω -120 Ω

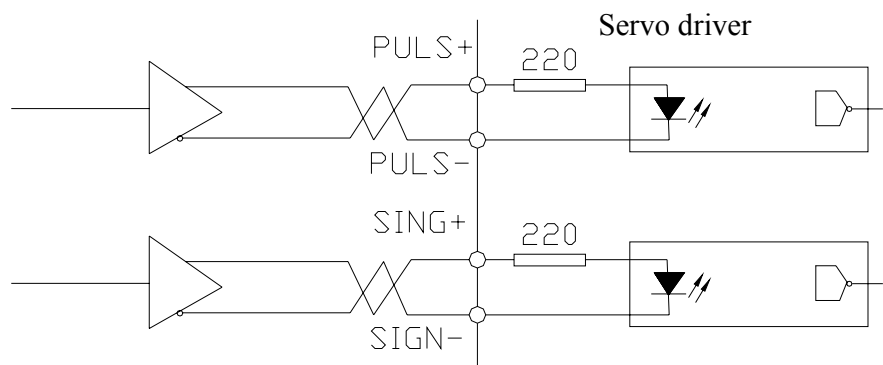
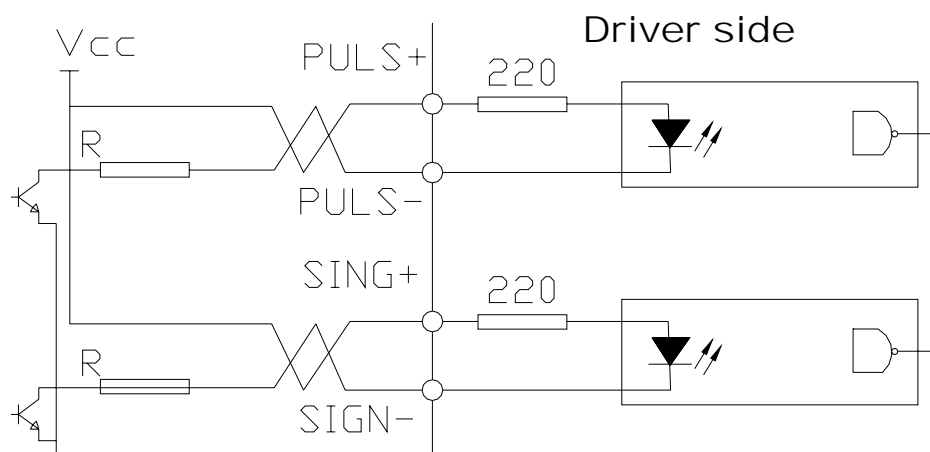


Figure3.6 Type3 of the differential drive mode of pulse input interface

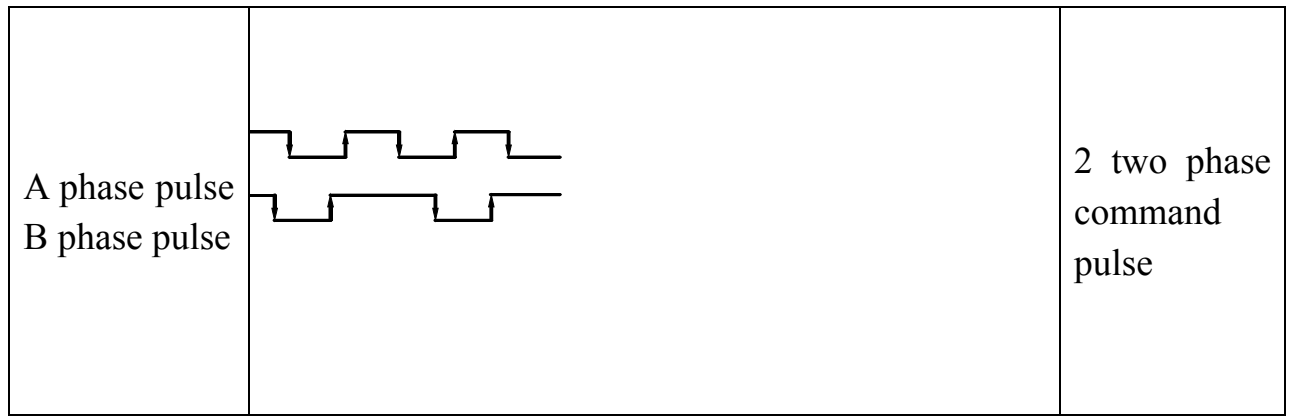


Picture3.7 Type3 of the single-end drive mode of pulse input interface

- (4) To drive the single-end circuit the customer will provide an external power supply. Please pay attention to the polarity of the power supply, or the servo driver may cause failure.
- (5) The command pulse mode is shown in table 3.4, in which the arrow stands for pulse counting edge. The pulse timing and its parameter are shown in Table3.5.

Table3.4 pulse input mode

Command pulse mode	CCW	CW	Parameter value
Pulse train sign			0 pulse + signal
CCW pulse train / CW pulse train			1 CCW pulse / CW pulse



(6) When two-phase pulses is used rate should be less than 125kHz

Table3.5 Timing chart parameters of the input pulse

Parameters	Line drive	Driving from single end inputting
t_{ck}	$>2 \mu S$	$>5 \mu S$
t_h	$>1 \mu S$	$>2.5 \mu S$
t_l	$>1 \mu S$	$>2.5 \mu S$
t_{rh}	$<0.2 \mu S$	$<0.3 \mu S$
t_{rl}	$<0.2 \mu S$	$<0.3 \mu S$
t_s	$>1 \mu S$	$>2.5 \mu S$
t_{qck}	$>8 \mu S$	$>10 \mu S$
t_{qh}	$>4 \mu S$	$>5 \mu S$
t_{ql}	$>4 \mu S$	$>5 \mu S$
t_{qrh}	$<0.2 \mu S$	$<0.3 \mu S$
t_{qrl}	$<0.2 \mu S$	$<0.3 \mu S$
t_{qs}	$>1 \mu S$	$>2.5 \mu S$

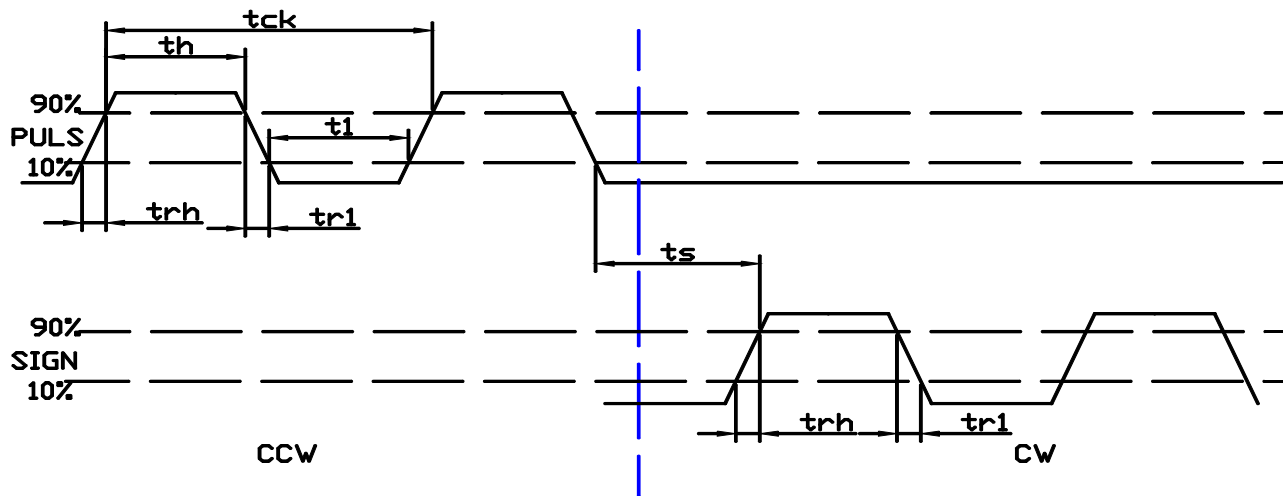


Figure 3.8 Timing chart of Pulse + sign input interface (maximum pulse rate $\leq 500\text{kHz}$)

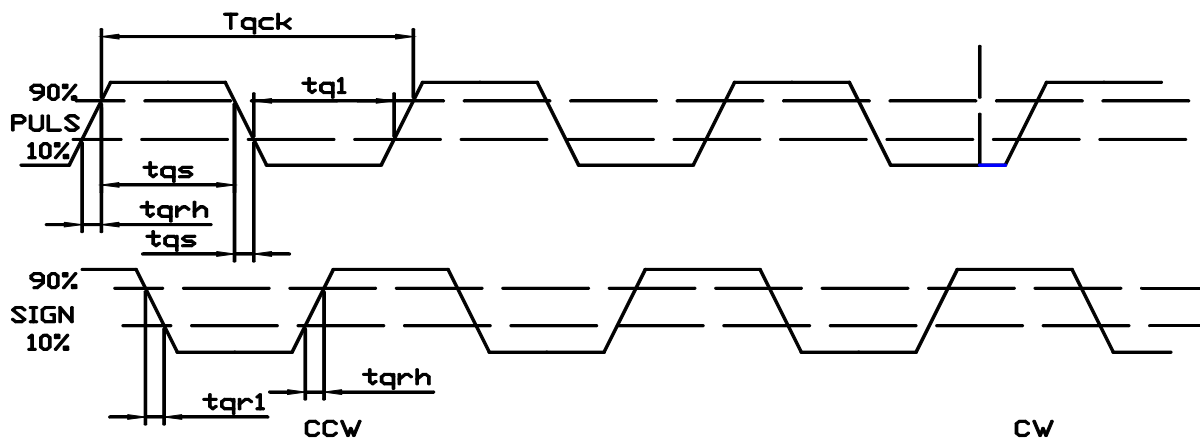


Figure3.9 timing chart of CCW/CW pulse input interface (maximum pulse rate $\leq 500\text{kHz}$)

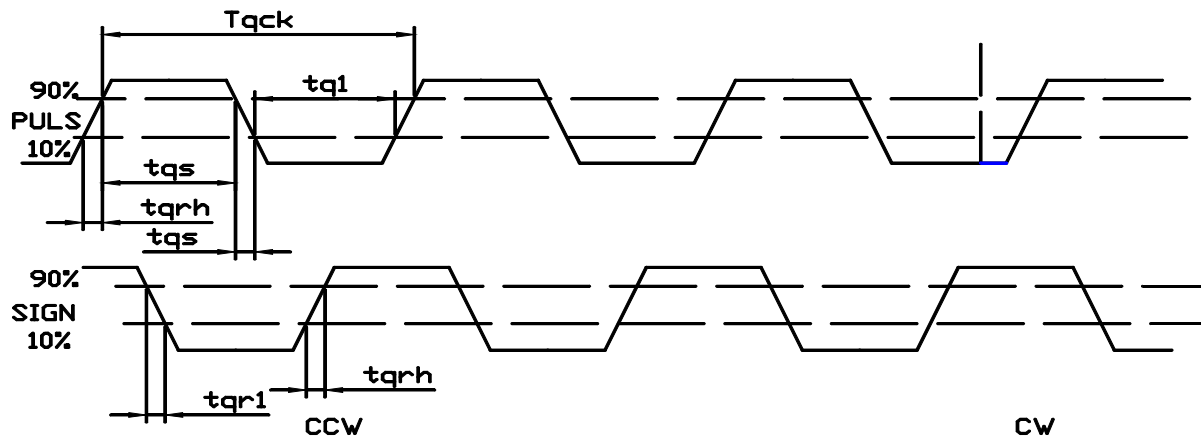
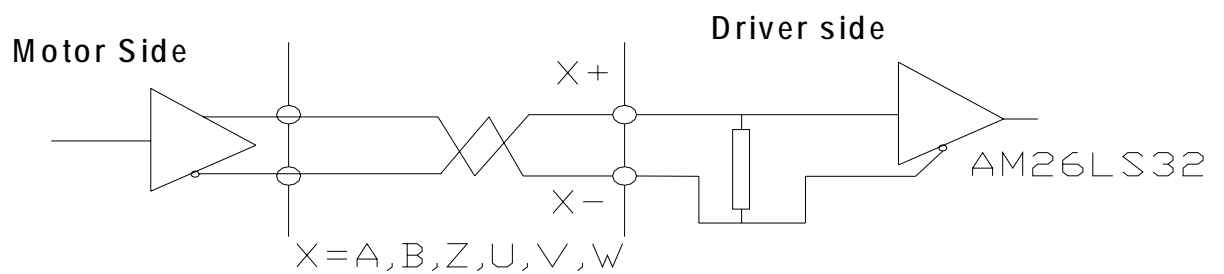


Figure3.10 Timing chart of two phase pulse input interface (maximum pulse rate $\leq 125\text{kHz}$)

5) Input interface of servo driver with optical encoder of servo motor (type4)

The interface is shown in Figure 3.1.



Picture3.11 Input interface of servo motor's encoder

CHAPTER 4 PARAMETERS

NOTICE

- Any person who involved in parameter adjustment should be fully familiar with the meaning of parameters. Any error of the parameter setting may cause equipment damaged and / or person injured.
- It is recommended that the parameter adjustment be firstly made under no-load operation condition.

4.1 PARAMETER LIST

- Parameters presetting in the following table is matching Suqiang SQA serials servo motor.

Different motor with different parameters.

Short form of control type: **P** is position control type.

S is speed control type.

T is torque control type.

Table 4.1 Parameter list

No	Name	Suitable type	Parameter range	Presetting	Unit
0	Passwords	P, S, T	0-9999	315	
1	Type code	P, S, T	0-51	30*	
2	Soft version	P, S, T	*	*	
3	Initial display state	P, S, T	0-21	0	
4	Control mode selection	P, S, T	0-5	0	
5	Speed scale plus	P, S, T	5-2000	600*	Hz
6	Speed integral time constant	P, S, T	1-1000	20*	mS
7	Torque command filter	P, S, T	1-500	100	%
8	Speed testing low-pass filter	P, S, T	1-500	100	%
9	Position scale plus	P	1-1000	500	1/S
10	Position feed forward plus	P	0-100	10	%
11	Cut-off frequency of position	P	1-1200	300	Hz

	feed forward low pass filter				
12	Pre-scale numerator for position command pulse train	P	1-32767	5	
13	Pre-scale denominator for position command pulse train	P	1-32767	3	
14	Input mode of the position command pulse train.	P	0-2	0	
15	Inverse the direction of position command pulse train.	P	0-1	0	
16	In-position range	P	0-30000	1000	pulse
17	The range of droop pulse of the deviation counter.	P	0-30000	4000	× 100pulse
18	Fault of excessive position deviation counter is invalid	P	0-1	1	
19	Reserved	P	0-30000	0	0.1mS
20	Input signal for servo drive lock is invalid	P, S	0-1	1	
21	Internal speed command selection	S	0-1	0	
22	JOG running speed	S	-3000-3000	120	r/min
23	Maximum speed limit	P, S	0-4000	3000	r/min
24	Internal speed 1	S	-3000-3000	0	r/min
25	Internal speed 2	S	-3000-3000	100	r/min
26	Internal speed 3	S	-3000-3000	300	r/min
27	Internal speed 4	S	-3000-3000	-100	r/min
28	Reached speed	S	0-3000	500	r/min
29	Accelerate decelerate time constant	S		1000	
30	Line speed conversion molecular	P, S	1-32767	10	

31	Line speed conversion denominator	P, S	1-32767	1	
32	Line speed decimal position	P, S	0-5	3	
33	Reservation				
34	Internal CCW torque limit	P, S	0-300	120*	%
35	Internal CW torque limit	P, S	-300-0	-120*	%
36	Internal CCW torque limit	P, S	0-300	100	%
37	Internal CW torque limit	P, S	-300-0	-100	%
38	Speed running-in, JOG running torque limit	S	0-3000	100	%
39	Software over current limit	P, S, T		200	0.1A
40	Permitted over current time limit	S	1-10000	800	mS
41	Malfunction clearance time limit	P		5	
42	The second electron gear wheel ratio numerator	P	1-32767	50	
43	The second electron gear wheel ratio denominator	P	1-32767	3	
44	Analog inputting sensitivity compensate value	S		000	0.01V
45	Analog inputting	S		010	0.01V
46	Speed overshoot checking range	P, S, T		20	%
47	Speed overshoot judgment forbid	P, S, T		1	
48	Speed overshoot permitting time	P, S, T		5000	ms
49	Torque mode speed over the maximum limit permitting time	T		5000	ms

50	Torque mode speed over the maximum limit treating mode	T		0	
51	Analog input plus	S		100	%
52	Torque accelerate and decelerate time	T		1000	ms
53	Speed accelerate and decelerate time	S		1000	ms
54	Torque scale plus	T		400	Hz
55	Torque integral time constant	T		10	0.1ms
56	Rating speed	P, S, T		2000	r / min
57	Rating current	P, S, T		58	0.1A
58	Rating torque	P, S, T		6	N.m
59	Encoder coefficient	P, S, T		2500	
60	Number of poles pair	P, S, T		2	
61	3.3V maximum current	P, S, T		220	0.1A
62	Encoder checking mode	P, S, T		0	1

4.2 THE FUNCTION OF PARAMETERS

Table4.2 the function of parameters

Number	Name	Function	Parameters range
0	Password	<ul style="list-style-type: none"> To escape from parameters modified incorrectly. Commonly, when setting parameters, set the parameters as demanding password firstly, then setting parameters. When parameter setting finished, setting the parameter as 0, to ensure the parameters cannot modify by mistakes in the future Password grades , homologous user's 	0-9999

		<p>parameters, entire parameters</p> <ul style="list-style-type: none"> ● Modifying type code's parameters (PA1) must use type code's password, other password cannot modify these parameters ● User's password is 315 	
1	Type code	<ul style="list-style-type: none"> ● Homologous same serials but different power grade of servo motor and servo driver ● Different type code homologous parameters have different default data, When using the resetting default parameters function, must confirm correct parameters. ● EEPROM alarm occurred (code: 20), after modified, need reset these parameters again. Then, get default parameters, or-else servo driver will not work or broken ● Parameters' explanation can be found in this chapter. 	0-51
2	Software edition	<ul style="list-style-type: none"> ● Could examine software edition, but can't modify. 	*
3	Initial display state	<ul style="list-style-type: none"> ● Select display condition on servo driver after inputting current. <p>0: Display motor's speed</p> <p>1: Display current position low for 5 digit</p> <p>2: Display current position high for 5 digit</p> <p>3: Display position command (command pulse accumulate value) low for 5 digit</p> <p>4: Display position command (command pulse accumulate) high 5 digit</p> <p>5: Display position deviation low for 5 digit</p>	0-21

		6: Display position deviation for high 5 digit 7: Display motor's torque 8: Display motor's current 9: Display line speed 10: Display control mode 11 : Display position command pulse frequency. 12: Display speed command 13: Display torque command 14: Display absoluteness position in one revolution 15: Display inputting terminals' condition 16 : Display outputting terminals' condition 17: Display encoder's inputting signals 18: Display operation condition 19: Display alarm code 20: Reservation 21: Reservation	
4	Control mode selection	<ul style="list-style-type: none"> ● Modify this parameter to select control mode of servo driver 0: Position control mode 1: Speed control mode 2: Test run control mode 3: JOG control mode ● Position control mode, position command inputting from pulse input interface ● Speed control mode, speed command inputting from input terminals or analog 	0-5

		<p>value , determined by parameters (internal and outside speed command select) (PA42) . Select different internal speed by combination of SC1 and SC2, when using internal speed.</p> <p>SC1 OFF, SC2 OFF: Internal speed1</p> <p>SC1 ON, SC2 OFF: Internal speed2</p> <p>SC1 OFF, SC2 ON: Internal speed3</p> <p>SC1 ON, SC2 ON: Internal speed4</p> <ul style="list-style-type: none"> ● Test run control mode, speed command inputted by keyboard, to check servo motor and servo driver ● JOG control mode---JOG run mode, turning into JOG, press and keep ↑ , motor run in JOG speed mode. Loosen key ↑ , motor stop and remains 0 speed. Press and keep ↓ , motor run inversed in JOG speed mode, loosen the key ↓ , motor stop and remains 0 speed. 	
5	Speed proportional plus	<ul style="list-style-type: none"> ● Used for setting the speed loop proportional plus ● The higher the plus setting, the greater the stiffness will be. The value is determined according to the type of servo driver and the load. In general, the larger load in ● Under no oscillation condition the higher plus the better 	5-2000Hz
6	Speed integral time constant	<ul style="list-style-type: none"> ● Used for setting the speed loop integration time constant ● The smaller the time constant, the greater the stiffness and the faster the integration. The value is determined according to the type of servo driver and the load. In 	1-1000mS

		<p>general, the larger load inertia the higher the setting value will be.</p> <ul style="list-style-type: none"> ● Under no oscillation condition the smaller the time constant the better. 	
7	Torque command filter	<ul style="list-style-type: none"> ● Set up torque command filter can restrain the vibration cause by torque (acuity vibration noise from motor) ● Make this parameter smaller if exist acuity vibration noise from motor ● Small parameter can get lower cut-off frequency and lower motor noise. If loading inertia is much bigger, setup value could be reduced. But with smallest value, return will be slower and may lead to instability. ● Value is bigger, virtue frequency is higher and response is faster. If need higher mechanical stiffness, it is suitable to increase setup value. 	1-500%
8	LPF of feedback speed	<ul style="list-style-type: none"> ● Set the characteristics of LPF for feedback speed. ● The smaller the value, the lower the cut-off frequency and the motor noise. If the load inertia is larger properly reduce the setting value. If the setting value is too small the dynamic response will slow down and may cause oscillation. ● The higher the value, the greater the cut-off frequency and the faster the response is required properly increase the setting value. 	500%
9	Position proportional plus	<ul style="list-style-type: none"> ● Set the position loop proportional plus. ● The higher the plus setting, the greater the stiffness and the smaller droop pulse will be. If the value is too large it may cause overshoot or oscillation. ● The value is determined according to the 	1-1000/S

		type of servo driver and the load.	
10	Position feed forward plus	<ul style="list-style-type: none"> ● Set the feed forward plus for position loop. ● 100% setting value indicates that the droop pulse in position loop is always zero at any command pulse rate. ● The greater the feed forward plus, the higher the speed response of the control system and the worse the stable of position loop resulting in an oscillation may occur. ● This parameter is usually set zero if very fast response is not required. 	0-100%
11	The cut-off frequency of position feed forward LPF	<ul style="list-style-type: none"> ● Used to set the cut-off frequency of LPF of position feed forward loop. ● This LPF will play the role of increasing stability for compound position control. 	1-1200Hz
12	The numerator of pre-scale for position command pulse train	<ul style="list-style-type: none"> ● Used to set the multiplier for pre-scale (electric gear) ● Under the position control mode it is convenient to match every pulse source by setting NO.12 and NO.13 parameters to meet the required resolution (angle/pulse) ● $P \times G = N \times C \times 4$ P: Input command pulse value G: Electron gear ratio $G = \frac{\text{Electron gear}}{\text{Electron gear}}$ N: Motor's circumrotate C: Encoder's resolving ability. This system is C=2500 	1-32767

		<ul style="list-style-type: none"> ● (For example) when input command pulse is 6000, one motor circle $G = N \times C \times 4 / P = 1 \times 2500 \times 4 / 6000 = 5/3$ ● Recommending electron gear ratio range: $1/50 \leq G \leq 50$ 	
13	The denominator of pre-scale for position command pulse train	<ul style="list-style-type: none"> ● Refer to the parameters PA12 	1-32767
14	The input mode of position command pulse	<ul style="list-style-type: none"> ● Used to set the input mode for position command pulse. ● One of the three input mode can be selected by setting this parameter. <ol style="list-style-type: none"> 1) CCW in pulse and CW pulse; 2) Two pulses with 90 degree pause shift each other ● CCW indicates that the motor shaft rotate in counterclockwise direction defined as positive when viewing from the shaft-end. ● CW indicates the clockwise direction defined as negative. 	0-2
15	Reversal of position command pulse direction	<ul style="list-style-type: none"> ● Setting as: 0 : Natural (the rotating direction is determined according to Parameter NO.14) 1: Reversal 	0-1
16	In-position range	<ul style="list-style-type: none"> ● Used to set the range of pulse for in-position under position control mode. ● In-position control mode this parameter gives a judgment on that whether the positioning of the servo driver is completer or not. When the number of droop pulse counter is equal or less than this parameter value. It is to confirm that the positioning of the servo driver is complete and the 	0-30000 pulse

		<p>COIN is “ON”. Otherwise COIN is “OF”.</p> <ul style="list-style-type: none"> ● In position control mode NO.16 appears as in-position signal (SOIN). In other control mode NO.16 appears as reached-speeds signal (SCMP). 	
17	The range droop pulse of the deviation counter	<ul style="list-style-type: none"> ● Used to set the range of droop pulse of the deviation counter. ● In position control mode if the droop pulse value of the deviation counter exceeds the setting value of the deviation counter exceeds the setting value an alarm signal will be given by the servo driver. 	0-30000 × 100pulse
18	Fault of excessive position deviation counter is invalid	<ul style="list-style-type: none"> ● Used to set <ol style="list-style-type: none"> 0. testing and alarming the droop pulse of the deviation counter is valid. 1. testing and alarming the droop pulse of the deviation counter is invalid. 	0-1
19	Position command smooth filter	<ul style="list-style-type: none"> ● Smoothen command pulse from filter. exponential accelerate and decelerate, the value shows time constant ● Filter cannot loose input pulse, but it may lead to command delay. ● This filter is used for <ol style="list-style-type: none"> 1. Upper controller doesn't have accelerate and decelerate function 2. Electron gear ratio is too big. (>10) 3. Lower command frequency 4. Exist step jump, imbalance when running the motor. ● Filter is ineffective if setting parameter as 0 	0-30000 × 0.1mS

20	Input signal for servo driver lock is invalid	<ul style="list-style-type: none"> Used to set <p>0: CCW and CW input inhibit is valid. The CCW drive is enable if the CCW inhibit switch (FSTP) is on. The CCW drive is disable (with no torque) if the CCW inhibit switch (FSTP) is off. The CW drive enable or disable are in the same way. If the CCW and CW inhibit switch are off there is an alarm is an alarm signal appears.</p> <p>1: CCW and CW input inhibit is invalid. The CCW and CW drive are enable in spite of the on/off state of the inhibit switches and no alarm appears.</p>	0-1
21	Select internal and outside speed command	<ul style="list-style-type: none"> Setting as 0, speed command come from internal speed. Setting as 1, speed command come from outside analog value inputting. 	0-1
22	JOG running speed	<ul style="list-style-type: none"> Used to set the JOG operation speed 	-3000-3000 r/min
23	Maximum speed limit	<ul style="list-style-type: none"> Used to set the maximum speed limit. This value is independent of rotating direction. If the value is higher than rated speed the actual maximum speed limit is equal to the rated speed. 	0-3000 r/min
24	Internal speed1	<ul style="list-style-type: none"> Setting internal speed1 In speed control mode, choose speed 1 as speed command when SC1 OFF, SC2 OFF 	-3000-3000 r/min
25	Internal speed2	<ul style="list-style-type: none"> Setting internal speed2 In speed control mode, choose speed 2 as 	-3000-3000 r/min

		speed command when SC1 ON, SC2 OFF	
26	Internal speed3	<ul style="list-style-type: none"> ● Setting internal speed3 ● In speed control mode, choose speed 3 as speed command when SC1 OFF, SC2 ON 	-3000-3000 r/min
27	Internal speed4	<ul style="list-style-type: none"> ● Setting internal speed4 ● In speed control mode, choose speed 4 as speed command when SC1 ON, SC2 ON 	-3000-3000 r/min
28	Reached speed	<ul style="list-style-type: none"> ● Setting arrival speed ● Not in position control mode, if motor speed higher than this enactment value, SCMP ON, otherwise SCMP OFF ● In position control mode, don't use this parameter ● No relation with circumrotate direction. ● The action has a hysteresis feature 	0-3000 r/min
29	Accelerate and decelerate time constant	<ul style="list-style-type: none"> ● Enactment value shows demanding time of motor from 0-1000 r/min, 1000-0 r/min. ● Accelerate and decelerate characteristics are linearity. ● Effective for speed control mode only, ineffective for position control mode ● Setting this parameter as 0 if servo driver used together with outside position loop. 	
30	Numerator for linear speed conversion	<ul style="list-style-type: none"> ● Used to display speed of system linearity running. ● Linearity speed= motor speed (r/min) \times linearity speed conversion numerator/ linearity speed conversion denominator ● Decimal of linearity speed is according to the parameter- PA32 0 stand for decimal, 1 	1-32767

		<p>stand for decimal on decade and 2 stands for decimal on hundred. And the same analogy.</p> <ul style="list-style-type: none"> ● (For example) a servo motor directly drives a ball bearing screw with 10 mm screw-pitch. If the conversion numerator set by 10 and the conversion denominator set by 1 and the decimal point set by 3 the linear speed is 5,000 m/min when motor rotates in 5000 m/min when motor rotates in 500 r/min. it can be displayed on the LEDs in m/min. 	
31	Denominator for linear speed conversion	Refer to the parameter NO.30	1-32767
32	Location of decimal point for linear speed	Refer to the parameter NO.30	0-5
34	CCW internal torque limit	<ul style="list-style-type: none"> ● used to set the CCW internal torque limit. ● This value is a percentage of rated torque. For example, if the torque limit is double rated torque then the parameter is set by 200 ● The torque limit is always valid at any time. ● If the value is higher than the allowed maximum torque the actual maximum torque limit is equal to the allowed maximum torque. 	0-300%

35	CW internal torque limit	<ol style="list-style-type: none"> 1. Used to set the CCW internal torque limit. 2. This value is a percentage of rated torque. For example, if the torque limit is double rated torque then the parameter is set by -200 3. The torque limit is always valid at any time. 4. If the value is higher than the allowed maximum torque the actual maximum torque limit is equal to the allowed maximum torque. 	-300-0%
36	CCW external torque limit	<ol style="list-style-type: none"> 1. Used to set the CCW external torque limit. 2. This value is a percentage of rated torque. For example, if the torque limit is equal to rated torque then 100set the parameter. 3. Only the CCW external torque limit is valid when the CCW torque limit input terminal "FIL" is on. 4. When the CCW external torque limit is valid the actual torque limit is the minimum value among the allowed maximum torque, the CCW internal torque limit and the CCW external torque limit. 	0-300%
37	CW external torque limit	<ul style="list-style-type: none"> ● Used to set the CW external torque limit. ● This value is a percentage of rated torque. For example, if the torque limit is equal to rated torque then the parameter is set by -100. ● Only the CW external torque limit is valid when the CW torque limit input terminal "RIL" is on. ● When the CW external torque limit is valid the actual torque limit is the minimum value among the allowed maximum torque, the CW internal torque limit and the CW external torque limit. 	-300-0%

38	Torque limit for test and JOG operation	<ul style="list-style-type: none"> ● Used to set the torque limit for test and JOG operation. ● This parameter is valid for both CCW and CW directions. ● This value is a percentage of rated torque. For example, if the torque limit is equal to rated torque then 100 set the parameter. ● The internal and external torque limit is still valid. 	0-300%
39	Software over current limit	<ul style="list-style-type: none"> ● Maximum current permitted by software 	
40	Permitting time enactment of over current	<ul style="list-style-type: none"> ● Permitted time enactment of over current by software 	
41	Times of malfunction clearance	<ul style="list-style-type: none"> ● 	
42	The first electron gear ratio numerator	<ul style="list-style-type: none"> ● Same as PA12 parameters 	
43	The first electron gear ratio denominator	<ul style="list-style-type: none"> ● Same as PA13 parameters 	
44	Analog input sensitivity compensated value	<ul style="list-style-type: none"> ● Symmetry anode and cathode of voltage 	
45	Analog input value	<ul style="list-style-type: none"> ● Delicacy degrees is higher with bigger delicacy value of analog input 	
46	Speed overshoot checking range	<ul style="list-style-type: none"> ● Setting speed alarm checking range ● In the speed control mode, if the value of speed deviation counter bigger than this parameter, servo driver will send off speed overshoot alarm. 	

47	Speed overshoot judge forbid	<ul style="list-style-type: none"> ● Setting as: 0 : Speed overshoot alarm checking effective 1 : Speed overshoot alarm checking ineffective, stop checking position overshoot error 	
48	Speed overshoot permitted time	<ul style="list-style-type: none"> ● Permit the value of speed deviation counter bigger than the parameter PA64 	
49	Permitted time for over maximum speed limit in torque mode speed	<ul style="list-style-type: none"> ● 	
50	Over maximum speed limit dealing mode in torque mode	<ul style="list-style-type: none"> ● 	
51	Analog input plus	<ul style="list-style-type: none"> ● 	
52	Torque accelerate and decelerate time	<ul style="list-style-type: none"> ● 	
53	Time speed accelerate and decelerate		
54	Torque scale plus		
55	Torque integral time constant		
56	Rating speed	<ul style="list-style-type: none"> ● Motor rating speed 	
57	Rating current	<ul style="list-style-type: none"> ● Motor rating current 	

58	Rating torque	● Motor rating torque	
59	Encoder coefficient	●	
60	Pair of poles	●	
61	3.3Vmaximumcur rent	●	
62	Encoder mode	●	

CHAPTER 5 ALARMS AND HANDLE

! NOTICE

- ★ Any person who involved in inspection should be fully competent to do the work.
- ★ Before starting maintenance and / or inspection make sure that it takes more than 5 minute after power-off. Otherwise you may get an electric shock.
- ★ When any alarm has occurred always remove its cause according to the alarm code and then can put it into operation again.
- ★ Before reset an alarm it is necessary to confirm that the SON is invalid to prevent accident from that the servo motor may suddenly start by any cause.

5.1.ALARM LIST

Table5.1 Alarm list

Alarm Code	Alarm name	Content
--	Normal	
1	IPM	IPM module broken
2	OV	Main power supplier is too high
3	OCU	Over current limit
4	LV	Lower voltage of main power supplier
5	IA	No current in analog A passage
6	IB	No current in analog B passage
7	ENCODOER	Encoder error
8	OVSPEED	Overshoot speed
9	OVPOSITOIN	Over position deviation.
10	SFOTOCU	Over current limit of software

5.2 Ways to solve alarm

Table5.2 Alarm and solving ways

Alarm code	Alarm name	Running mode	Cause	Solving ways

1	Error of IPM module	Occurs when connects to control power supplier	<ul style="list-style-type: none"> ● Electro-circuit board error. 	<ul style="list-style-type: none"> ● Change servo driver
		Occurs during motor running	<ul style="list-style-type: none"> ● Lower voltage of power supplier ● Over heated 	<ul style="list-style-type: none"> ● Checking servo driver ● Turn-on current afresh ● Change the servo driver
			<ul style="list-style-type: none"> ● Short circuit among U、V、W 	<ul style="list-style-type: none"> ● Check connection
			<ul style="list-style-type: none"> ● Badness grounding 	<ul style="list-style-type: none"> ● Correct grounding
			<ul style="list-style-type: none"> ● Bad motor isolation 	<ul style="list-style-type: none"> ● Change servo motor
			<ul style="list-style-type: none"> ● Disturbs occurring 	<ul style="list-style-type: none"> ● Increase circuit filter ● Far away from disturb source.
2	Main circuit over suppress	Occurs when connects to control power supplier	<ul style="list-style-type: none"> ● Electro-circuit board error 	<ul style="list-style-type: none"> ● Change servo driver
		Occurs when connects to main power supplier	<ul style="list-style-type: none"> ● Over voltage ● Abnormal voltage wave 	<ul style="list-style-type: none"> ● Check power supplier
		Occurs during motor running	<ul style="list-style-type: none"> ● Connection of brake resistance is disconnected 	<ul style="list-style-type: none"> Connect refresh

			<ul style="list-style-type: none"> ● Brake transistor is broken ● Inner brake resistance is broken 	Change servo driver
			<ul style="list-style-type: none"> ● Shortage of brake loop capacity 	<ul style="list-style-type: none"> ● Decrease frequency of on and off. ● Increase time constant of accelerate and decelerate ● Reduce torque limit ● Reduce loading inertia ● Change larger power servo driver and servo motor
3	Over current		<ul style="list-style-type: none"> ● short circuit between U、V、W of servo motor ● Bad grounding ● Bad motor isolation ● Broken servo driver 	<ul style="list-style-type: none"> ● Check connection ● Correct grounding ● Change servo motor ● Change servo driver

Table5.2 Ways to solve alarm

Alarm code	Alarm name	Running mode	Cause	Solving ways
4	Voltage		Lower voltage of main	Change servo

	shortage		power supplier, and brake unit error	driver
5	No current in analog passage A	Occurs when connects to control power supplier	$\pm 12V$ No voltage	Change servo driver
			Analog A channel error	
			DSP A channel error	
		Occurs during motor running	Analog A channel error	Change servo driver
			DSP A channel error	
6	No current in analog B channel	Occurs when connects to control power supplier	$\pm 12V$ No voltage	Change servo driver
			Analog B channel error	
			DSP analog A channel error	
		Occurs during motor running	Analog A channel error	Change servo driver
			DSP analog A channel broken	
7	Encoder error		● Wrong encoder connection	● Check the encoder connection
			● Encoder error	● Changer motor
			● Bad encoder lines	● Change encoder line

			<ul style="list-style-type: none"> ● Too long encoder line, causing lower voltage of power supplier for encoder 	<ul style="list-style-type: none"> ● Make encoder line shorter ● Adopt multiple cores line with parallel connection
--	--	--	--	---

Table5.2 alarm and solving ways

Alarm code	Alarm name	Running mode	Cause	Solving ways
8	Overspend	Occurs when connects to control power supplier	<ul style="list-style-type: none"> ● Control electro-circuit board ● Encoder error 	<ul style="list-style-type: none"> ● Change servo driver ● Change servo motor
		Occurs during motor running	<ul style="list-style-type: none"> ● Too big inputting dictate pulse frequency 	<ul style="list-style-type: none"> ● Setting correct inputting pulse
			<ul style="list-style-type: none"> ● Time constant of accelerate and decelerate is too small, causing too big speed over modification 	<ul style="list-style-type: none"> ● Increase time constant of accelerate and decelerate
			<ul style="list-style-type: none"> ● The inputting electron gear rate is too big 	<ul style="list-style-type: none"> ● Correct setting parameters
			<ul style="list-style-type: none"> ● Encoder error 	<ul style="list-style-type: none"> ● Change motor

			<ul style="list-style-type: none"> ● Lines of encoder error 	<ul style="list-style-type: none"> ● Change the lines of encoder
			<ul style="list-style-type: none"> ● servo system unstable causing over modification 	<ul style="list-style-type: none"> ● Reinstall concerned plus ● If it could not setting suitable value, please reduce the revolving load inertia rate.
		Occurring at the moment of motor start	<ul style="list-style-type: none"> ● Too big load inertia 	<ul style="list-style-type: none"> ● Reduce the revolving load inertia. ● Change bigger power servo motor and servo drive
			<ul style="list-style-type: none"> ● Zero point of encoder error 	<ul style="list-style-type: none"> ● Change servo motor ● Let manufacturer modulate zero point of encoder
			<ul style="list-style-type: none"> ● Wrong connect among U、V、W in the motor ● Leading lines of encoder error 	<ul style="list-style-type: none"> ● Correct connection
9	Position overshoot	Occurs when connects to control power supplier	<ul style="list-style-type: none"> ● Electro-circuit board 	<ul style="list-style-type: none"> ● Change servo driver

		Connected to main power supplier and control line, inputting dictate pulse, and motor zero speed.	<ul style="list-style-type: none"> ● Wrong connect among U、V、W in the motor ● Leading lines of encoder error 	<ul style="list-style-type: none"> ● Correct connection
			<ul style="list-style-type: none"> ● Encoder error 	<ul style="list-style-type: none"> ● Change servo motor
			<ul style="list-style-type: none"> ● Small position overshoot range 	<ul style="list-style-type: none"> ● Increase position overshoot range
			<ul style="list-style-type: none"> ● Scale plus is too small in Position P 	<ul style="list-style-type: none"> ● Increase plus
			<ul style="list-style-type: none"> ● Torque shortage 	<ul style="list-style-type: none"> ● Check torque limit value ● Minish load capacity. ● Change bigger power servo motor and servo driver
10	Over current limit of software	Occurs during motor running	incorrect connection among U、V、W	<ul style="list-style-type: none"> ● Connect correctly ● Change servo driver

CHAPTER 6. DISPLAY AND OPERATION

6.1 KEYBOARD OPERATION

1) There are 6 LED 7-Segment digit display and 4 keys (\uparrow , \downarrow , \leftarrow , Enter) on the front panel of the servo amplifier. They are used for displaying status of servo drive and setting parameters. The key functions are as follows:

- “ \uparrow ” : Sequence number, value increasing, or move forward for select item.
- “ \downarrow ” : Sequence number, value increasing, or move backward for select item.
- “ \leftarrow ” : Return to upper layer menu, or cancel the operate.
- “ Enter ” : Enter next layer menu, or input confirmed.

NOTE: If “ \uparrow ” or “ \downarrow ” is pressed and held the operation will repeat as that the longer the holding, the faster the execution rate.

2) The 6 LED 7-segment digit indicates the states and data of the servo drive. All 6 digit or most right decimal point is glimmering, it indicates that alarms occur.

3) The operation executes according to multi-layer menu. The first layer is the main menu including seven operation modes. The second layer is the function menu of specific operation. The block-diagram of the main-menu shows as figure 6.1.

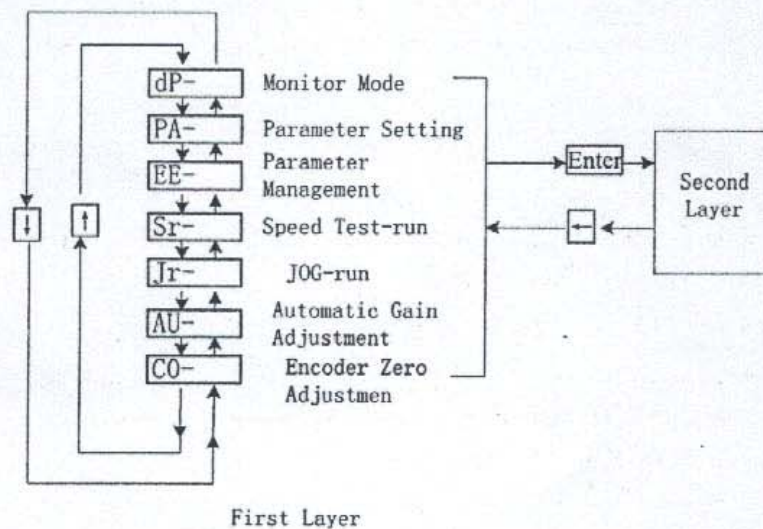


Figure 6.1 Block diagram for selecting operation mode.

6.2 MONITOR MODE

Select “dp-“ in the first layer. Press “ Enter ” key to move to monitor mode. There are Twenty-one State displayed. Using “ \uparrow ” or “ \downarrow ” key to select the display mode. Then press “ Enter ” key again to move to the specific Display State.

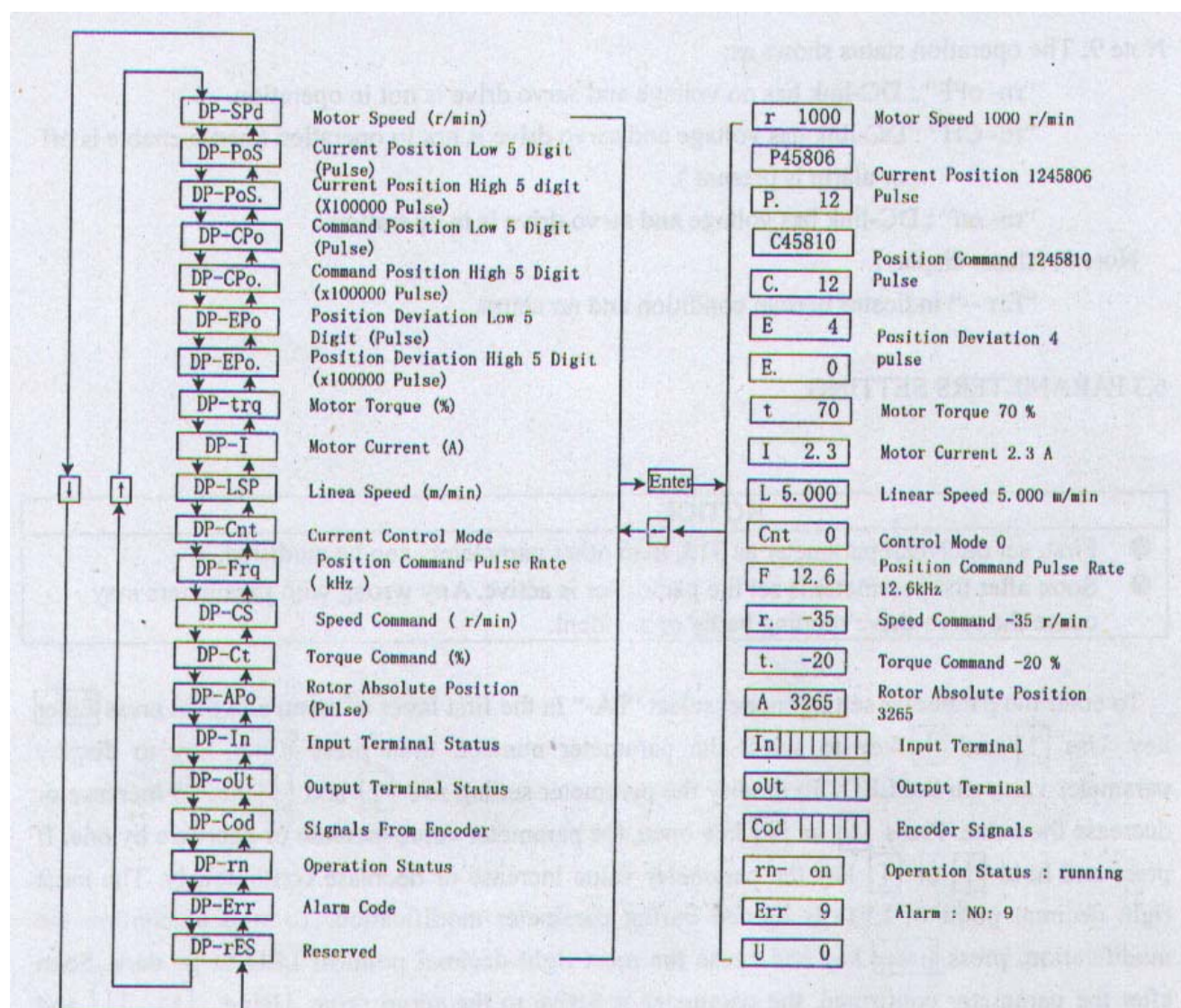


Figure 6.2 Block diagram of operation for monitor mode.

Note 1: The quantity of input pulse is the product of the number of position controller output pulse times the electric gear ratio.

Note 2: The pulse unit is equivalent to an internal pulse unit. In the servo drive 10000 pulses is corresponding to one revolution. The quantity of pulse is indicated by 5 high-digits plus 5 low-digits. The calculation will be:

$$\text{quantity of pulse} = 5 \text{ high-digit} \times 100000 + 5 \text{ low-digit}$$

Note 3: Control mode: 0--Position Control

1--Speed Control

2--Speed Test Operation

3--JOG Operation

4--Encoder Zero Adjustment

Note 4: If the displayed digit reached six digits (for example: -12345) the prompt letter will not be displayed

Note 5: The position command pulse rate is equal to the pulse output rate of position controller. The positive value stands for CCW and negative for CW in 0.1 kHz scale.

Note 9: The operation status shows as:

“rn- oFF” : DC-link has no voltage and servo drive is not in operation.

“rn- CH” : DC-link has voltage and servo drive is not in operation (servo enable is off or alarm is present).

“rn- on” : DC-link has voltage and servo drive is in operation.

Note 9: Alarm display:

“Err --” indicates normal condition and no alarm.

6.3 PARAMETERS SETTING

NOTICE

- First, set the NO.0 parameter as 315, then other parameters can be modified.
- Soon after the parameter is set the parameter is active. Any wrong with parameters may cause the servo drive running badly or accident.

To enter the parameter setting mode, select “PA-” in the first layer of menu and then press **Enter** key. Use **↑** and **↓** key to select the parameter number, then press **Enter** key to display parameter value on the LED. To modify the parameter setting use **↑** and **↓** key to increase or decrease the value. Press **↑** or **↓** key once, the parameter value increase or decrease by one. If press and hold **↑** or **↓** key the parameter value increase or decrease continuously. The most right decimal point of LED is lighted during parameter modification. To stop or confirm the modification, press **Enter** key and cause the most right decimal point of LED to go dark. Soon after the parameter confirmed, the parameter is active to the servo drive. Using **↑** , **↓** and **Enter** keys the above operation can be repeated. To return to parameter number select mode, press **←** key. To cancel a parameter modification, press **←** key (do not press the **Enter** key) to restore the old parameter value and return to parameter number select mode.

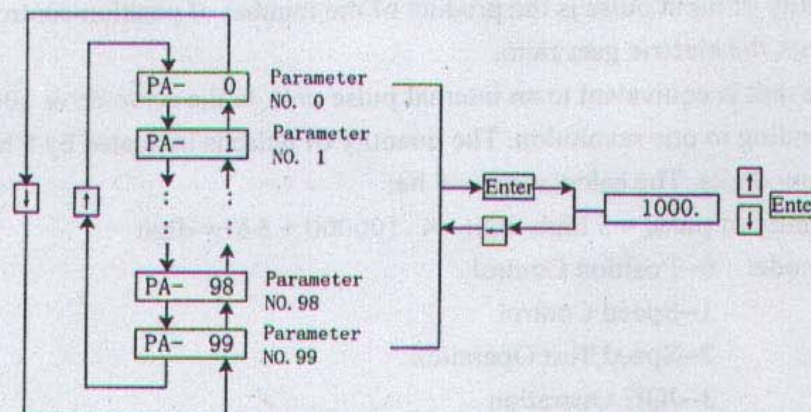


Figure 6.6 Block diagram for parameter setting.

6.4 PARAMETER MANAGEMENT

NOTICE: The modified parameters will not be saved after power-off. To save modified parameters it is necessary to carry out parameter-write operation.

The parameter management processes the data of EMS memory and EEPROM. To enter the parameter management mode, select “EE-“ in the first layer of menu and then press **[Enter]** key. There are 5 operation mode and can be selected by **[↑]** or **[↓]** key. For instant, select the “EE-set” and then press and hold the **[Enter]** key for more than 3 seconds to display “StArt” on the LED indicating that the parameters is writing to EEPROM. Waiting for about 1~2 seconds the LED displays “FInISH” if the writing is successful or “ERROR” if fail. To return to the operation mode selection, press **[←]** key.

- **EE-SEt (Parameter Write):** It means that the contents of EMS memory will be transferred to EEPROM parameter section. The modified parameters are only stored in the EMS memory and will lose after power-off. To save the modified parameters permanently it is necessary to carry out parameter-write operation to transfer the modified parameters in the EMS memory to EEPROM parameter section. The new parameters will restore from EEPROM parameter section to EMS memory when power-on again.

- **EE-rd (Parameter Read):** It means that the contents of EEPROM parameter section will be transferred to the EMS memory. The same action can be done automatically when power-on. After power is on the contents of EMS memory has the same contents as the EEPROM parameter section does. When parameter modification is carried out the contents of EMS memory will be changed. To recover the parameters just power-on, read the EEPROM parameter section to EMS memory if the parameters are not satisfied or confused.

- **EE-bA (Parameter Backup):** It means that the contents of EMS memory will be transferred to EEPROM backup section. The whole EEPROM section is divided into two sections, the one is the EEPROM parameter section and the other is the EEPROM backup section. Use the EEPROM parameter section for power-on, parameter-write and parameter-read. Use the EEPROM backup section for parameter backup and restore. In order to get a better group of parameters, modify parameters and try running, then store the satisfied parameters to the EEPROM backup section and try again. If fail to do so, recover the former parameters from EEPROM backup section and try again or stop. If got a better set of parameter, you had better to save them to EEPROM parameter section and EEPROM backup section to deal with the case that parameters might be changed by accident. If so, you can transfer data from EEPROM backup section to the EMS memory and EEPROM parameter section.

- **EE-rS (Restore Backup):** It means that the contents of EEPROM backup section will be transferred to EMS memory only, but not to the EEPROM parameter section. In order to use the backup parameters for many times; perform the parameter-write to change the contents of EEPROM parameter section. For the next power-on the contents of EEPROM parameter section will be used.

- **EE-dEF (Restore default values):** It means that the default values will be transferred to EMS memory and EEPROM parameter section. It is also used for the next power-on. If the servo drive can not run normally due to the confused parameters, use “EE-dEF” to restore the default values. For doing so, make sure that the parameter NO.1 must match with the servo amplifier type because the default values are different for the different servo amplifier type. Then use “EE-dEF” to restore correct default values.

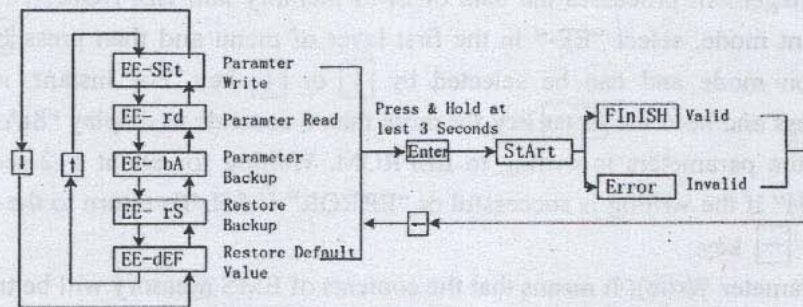


Figure 6.7 Block diagram for parameter management

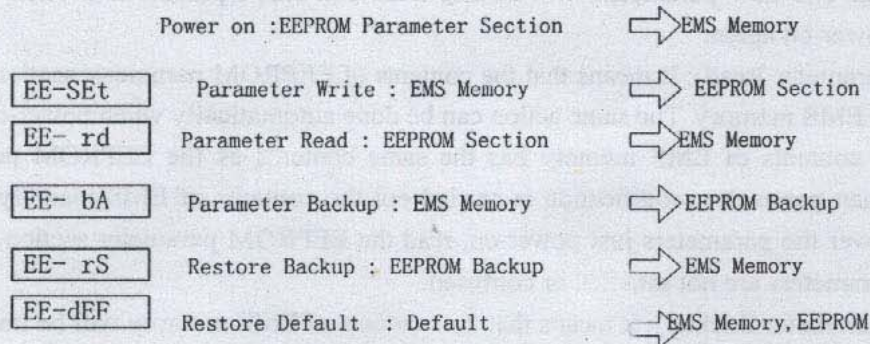


Figure 6.8 the meaning of parameter management

NOTICE	
●	To prevent equipment damaging during test-running or JOG operation, it is recommended that the speed test and JOG operation are carried out in no load condition.
●	The servo enable (SON) should be active and the CCW, CW drive inhibit should be invalid.

6.5 SPEED TEST OPERATION

To enter the speed test operation mode, select “Sr-“ in the first layer of menu and then press the **Enter** key. The prompt “S” shows the servo drive is in speed control mode and the displayed value indicates the speed in r/min. Use **↑** and **↓** key to change the speed command and the motor speed will follow the given speed. Press **↑** key to increase motor speed in CCW direction (or decrease in CW direction) or press **↓** key to decrease motor speed in CCW direction (or increase in CW direction). If the displayed value is positive the motor runs in CCW direction, if negative in CW direction.

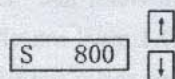


Figure 6.9 Block diagram for speed test operation

6.6 JOG OPERATION

To enter the JOG operation mode, select “Jr-“ in the first layer of menu and then press the

[Enter] key. The prompt “J” shows the servo drive is in speed control mode and the displayed value indicates the speed in r/min. Press and hold **[↑]** key the motor is running in CCW direction with the speed given by parameter NO.21. Release the **[↑]** key the motor stops and keeps zero speed. Press the **[↓]** key the motor is running in CW direction with the speed given by parameter NO.21. Release the **[↓]** key the motor stops and keeps zero speed.

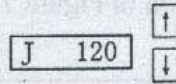


Figure 6.10 block diagram for JOG operation

6.7 OTHERS

The auto-tuning function is in process of development and is not available at the moment. Do not use the encoder adjust function because it is used only for manufacturer.

CHAPTER7 ELECTRIFYING RUNNING

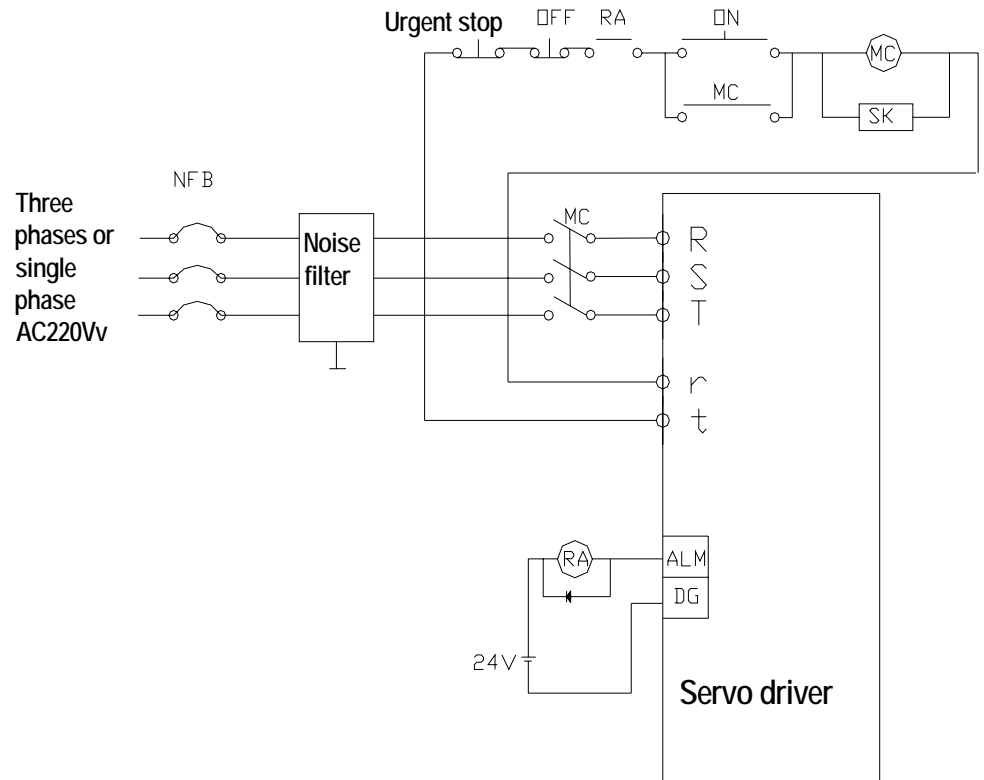
Attention

- Servo driver must ground correctly, and terminal PE should connected with grounding terminal on equipment.
- Power supplier for servo driver should be equipped with filter, in order to escape from disturbs.
- Check connection carefully before electrifying.
- Need equipped with a cut-off for urgent matters to ensure power supplier can cut off as soon as possible. (Refer to Drawing 7.1)
- After driver alarm, make sure the malfunction has disappeared and SON signal is ineffective.
- Don't touch driver and motor in five minutes after cutting off current.
- Driver and motor will be at higher temperature after running for some time.

7.1 Power Supplier Connection

Power supplier connection is according to drawing 7.1, and put though power supplier by the following order:

- 1) Connecting power supplier onto inputting power terminal in the main electro-circuit by electromagnetism contactor. (Three phase connect R, S, T; and single phase connect R, S)
- 2) Don't connect power supplier of control electron-circuit r, t later than put though the main electron-circuit. Servo ready (SRDY) is ON if just putting the main electron-circuit.
- 3) After putting through the main electron-circuit, servo read (SRDY) will be ON in 1.5 seconds, and it can accept servo enable (SON) signal. If it checks the servo enable effective, driver output effective, motor is prompting with running condition. If it checks the servo enable ineffective or any alarm, electron-circuit cuts off and motor is in free condition.
- 4) Connect servo enable and power supplier through, basic pole electron-circuit put through in 1.5 seconds.
- 5) Higher frequency on-off power supplier could break soft start circuit and energy-cost brake circuit. The on-off frequency should in the limits of 5 times per hour and less than 30 times per day. If circuit cut off due to higher temperature of driver and motor, make sure cooling the equipment more than 30 minutes and restart power supplier.



Drawing7.1 Power Supplier Connection

The power-on and alarm timing-chart are shown in Figure 7.2 and 7.3:

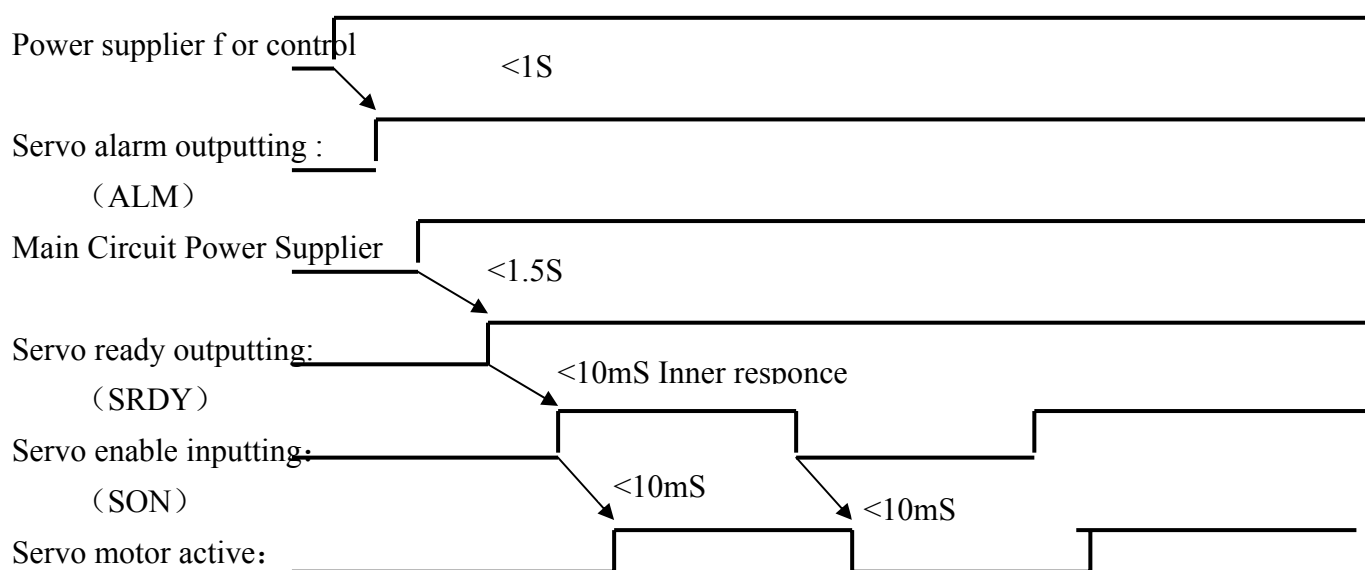


Figure7.2 Power-on timing-chart

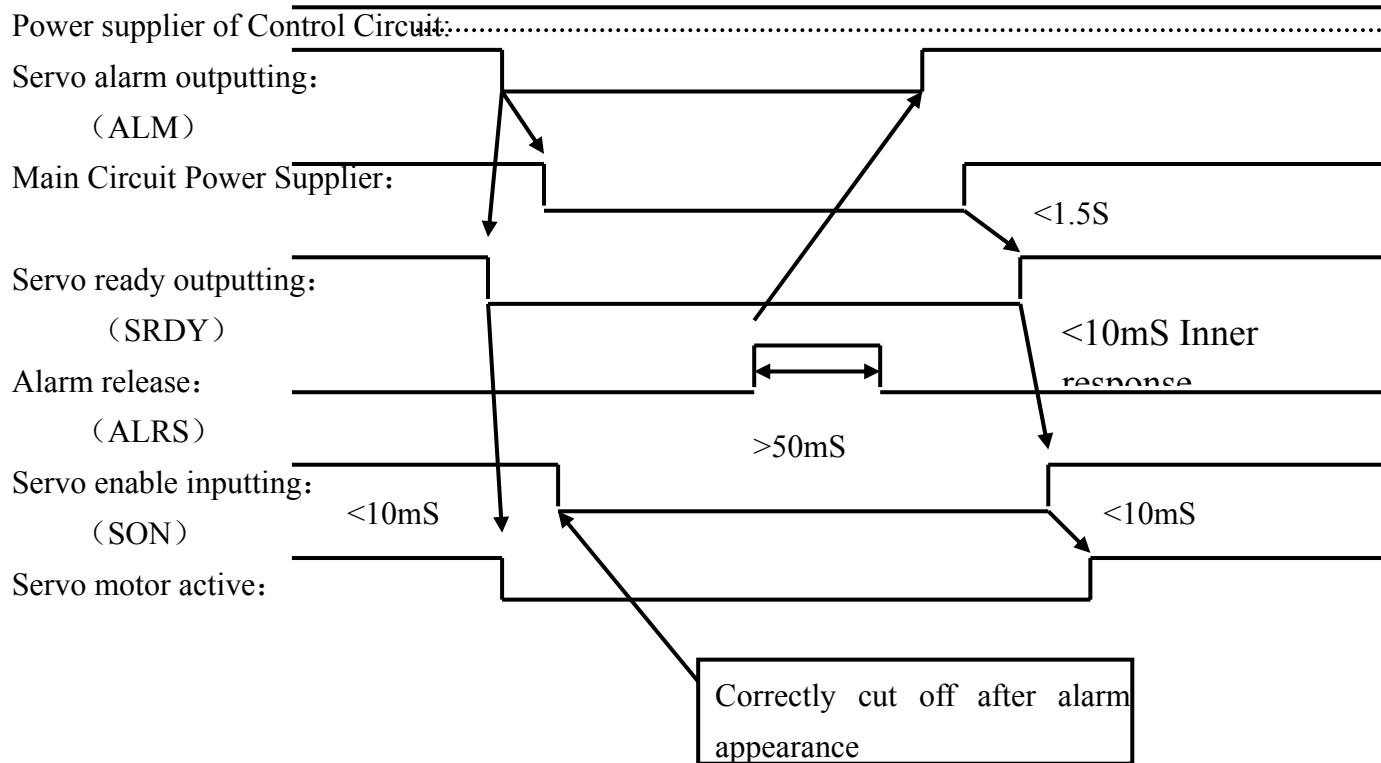


Figure 7.3 Alarm timing-chart

7.2 Test operations

1) Check before operation



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

- Check the power terminal TB and inputting voltage.
- Check power and motor wiring are not shorted or grounded.
- Check encoder connections are correct or not.
- Check the control cable connections and the value, polarity of power supply are correct or not
- Check the servo driver and servo motor are firmly installed or not.
- Check the motor shaft is not coupled with any load.



2) Test operation with power-on

A: Test operation Mode

1. Connecting to CN1, inputting control signals; Servo enable (SON) OFF, CCW drive forbid (FSTP) ON, and CW drives forbid ON.
2. Putting through control circuit power (the main circuit power keeps off), displayer on servo driver bright. Please check the connection if alarm appeared.
3. Setting speed test running mode (setting as 2) from control mode (Parameter No.4)

4. Putting through the main circuit power.
5. Make sure none of alarm or other abnormal cases, servo enable (SON) ON, motor is prompting in zero speed condition.
6. Getting speed test run by key operation. Prompt of speed test run is "S"---r/min and system in speed control mode. The speed dictate supplied by keys  and  to change speed dictate. Motor runs at the given speed.

B: JOG operation

1. Connecting to CN1, inputting control signals; servo enable(SON) OFF, CCW drive forbid (FSTP) ON, CW drive forbid ON
2. Putting through control circuit power (the main circuit power keeps off), displayer on servo driver bright. Please check the connection if alarm appeared
3. Setting JOG running mode (setting as 3) from control mode (Parameter No.4)
4. Putting through the main circuit power
5. Make sure none of alarm or other abnormal cases, servo enable (SON) ON, motor is prompting in zero speed condition
6. Getting speed test run by key operation. Prompt of JOG mode is "J"---r/min and system in speed control mode, the size and direction of speed are according to parameter No.21. Pressing the key  to get the speed and running direction caused by parameter No.21. Pressing the key  to get the inverse running at the speed and direction caused by parameter No.21.

C: Position operation Mode

1. Connecting to CN1, inputting control signals; servo enable(SON) OFF, CCW drive forbid (FSTP) ON, CW drive forbid ON
2. Putting through control circuit power (the main circuit power keeps off), displayer on servo driver bright. Please check the connection if alarm appeared
3. Setting position control mode (setting as 0) from control mode (Parameter No.4) according to outputting signal type from controller.
4. Putting through the main circuit power
5. Make sure none of alarm or other abnormal cases, servo enable (SON) ON, motor is prompting in zero speed condition
6. Transforming signals from controller to drive CN1-6\18\7\9 tootsie, motor runs according to the dictate.

D: Speed Operation Mode

1. Connecting to CN1, inputting control signals; servo enable(SON) OFF, CCW drive forbid (FSTP) ON, CW drive forbid ON

2. Putting through control circuit power (the main circuit power keeps off), displayer on servo driver bright. Please check the connection if alarm appeared
3. Setting speed running mode (setting as 1) from control mode (Parameter No.4) according to parameter No.24~27
4. Putting through the main circuit power
5. Make sure none of alarm or other abnormal cases, servo enable (SON) ON, motor is prompting in zero speed condition
6. Changing the value of signal SC1. SC2 to make motor run according to dictate.

7.3 ADJUSTMENT

Attention	
●	Make sure the parameters are correct before start the servo drive. Any wrong with parameters may cause the servo drive running badly or accident.
●	It is recommend that the no-load test is firstly carried and then load test.

1) Basic plus adjustment

- Speed control loop
 1. **【Speed scale plus】** (Parameter No.5) setting, make it as big as possible if there is no vibration. Usually, load inertia is bigger and the **【Speed scale plus】** is bigger.
 2. **【Speed integral time constant】** (Parameter No.26) setting, make it smaller according to presetting condition. If **【Speed integral time constant】** is too small, response time will be promoted, but will vibrate easily. Usually, bigger load inertia leads to bigger **【Speed integral time constant】**.
- Position Control loop
 1. Setting suitable **【Speed scale plus】** and **【Speed integral time constant】** according to the upper description.
 2. **【Position forward plus】** (Parameter No.10) Setting as 0%
 3. **【Position scale plus】** (Parameter No.9) can be as bigger as possible in stable range. If **【Position scale plus】** is too bigger, track characteristic of position dictate will be good, and lag error will be small, but it will vibrate easily during positioning stop.
 4. Increasing position forward plus can cause higher track characteristic of position dictate.

【Note1】: When **【Position scale plus】** is small, system will be in stable condition, but the dispatch of position track and lag will be bigger. Increasing acceleration and deceleration

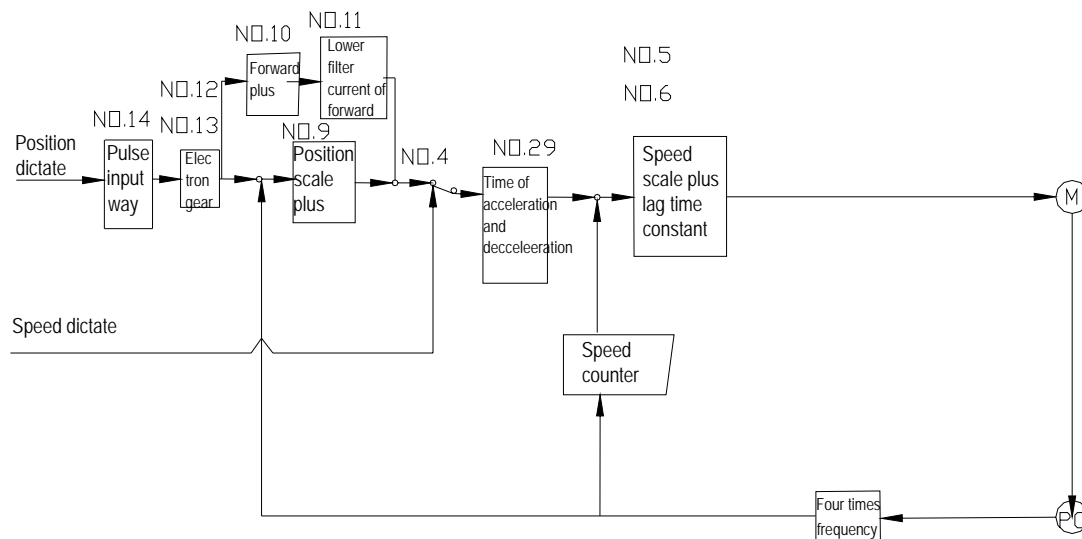
time constant (Parameter No.40, No.41) can cause higher position scale plus

【Note2】: When system is not stable, increasing 【Position forward plus】 could get higher acceleration and deceleration time constant.

【Note3】: Setting 【position scale plus】 according to the following table.

Stiffness	【Position scale plus】
Lower stiffness	10~20/S
Middle stiffness	130~50/S
Higher stiffness	50~70/S

2) The basis parameter adjustment



Drawing7.4 The Basis Parameter Modulation

3) Setting position resolving index and electron gear

Position resolving index (one electron route Δl) is according to per turn route ΔS of servo motor and feedback pulse P_t of encoder. Their relation is as following:

$$\Delta l = \Delta S / P_t$$

In the equation,

Δl : Route of per pulse (mm);

ΔS : Per turn route of servo motor (mm/turn)

P_t : Per turn feedback pulse of Encoder (pulse/turn)

Because there is four times frequency circuit in the system, per turn resolving of encoder is $P_t = 4 \times C$, C is per turn resolving of encoder. In this system, $C = 2500$ and $P_t = 10000$ pulse/turn

Dictate pulse multiply the electron gear ratio G to get the position control pulse. So one

pulse route Δl^* is as:

$$\Delta l^* = (\Delta S / P_t) \times G$$

In the equation, G is electron gear numerator of dictate pulse / electron gear denominator of dictate pulse

4) Character Adjustment of Start and Stop

Characteristic of servo system start & stop means the acceleration and deceleration time, caused by load inertia, start & stop frequency, and the performance limitation of servo motor and servo driver. High frequent start & stop, too short time for acceleration & deceleration, and too big load inertia can cause driver and motor over heated, and main circuit overpowers alarm. So user need modulate all the items correctly.

1. Loading Inertia and Start & Stop Frequency

Make sure the permitted frequency range in higher frequency start & stop application fields. The permitted frequency range is different from different motor style, capability, loading inertia and motor speed. Under the condition of m times motor inertia, the permitted start & stop frequency and recommended acceleration & deceleration time showed as following (Parameter No.41, No.42):

Multiple of loading inertia	Permitted start & stop time
$m \leq 3$	> 100 times/minutes; Less than 60mS for acceleration & deceleration
$m \leq 5$	60~1000 times/minutes; Less than 150mS for acceleration & deceleration
$m > 5$	< 60 times/minutes; More than 150mS for acceleration & deceleration

2. Factor of Servo Motor

The maximum allow bale start/stop rate and acceleration/deceleration time also depend on the type of servo motor and on the load conditions, running time, environmental temperature, etc. to avoid overheating alarm and influence on the servo motor life-time, please refer to the servo motor guide and adjust according to reality situations.

3. Method of adjustment

In general, the load inertia should be less than 5 times the inertia of the motor. If the load inertia is large than the above mentioned it may cause over voltage or brake abnormal alarm during deceleration. To deal with the above problem, use the following treatments.

- Increase acceleration/ deceleration time (parameter No.7). first, make it large, then reduce it gradually to a proper value.
- Reduce the torque limit (parameter No34, No35) and current limit;

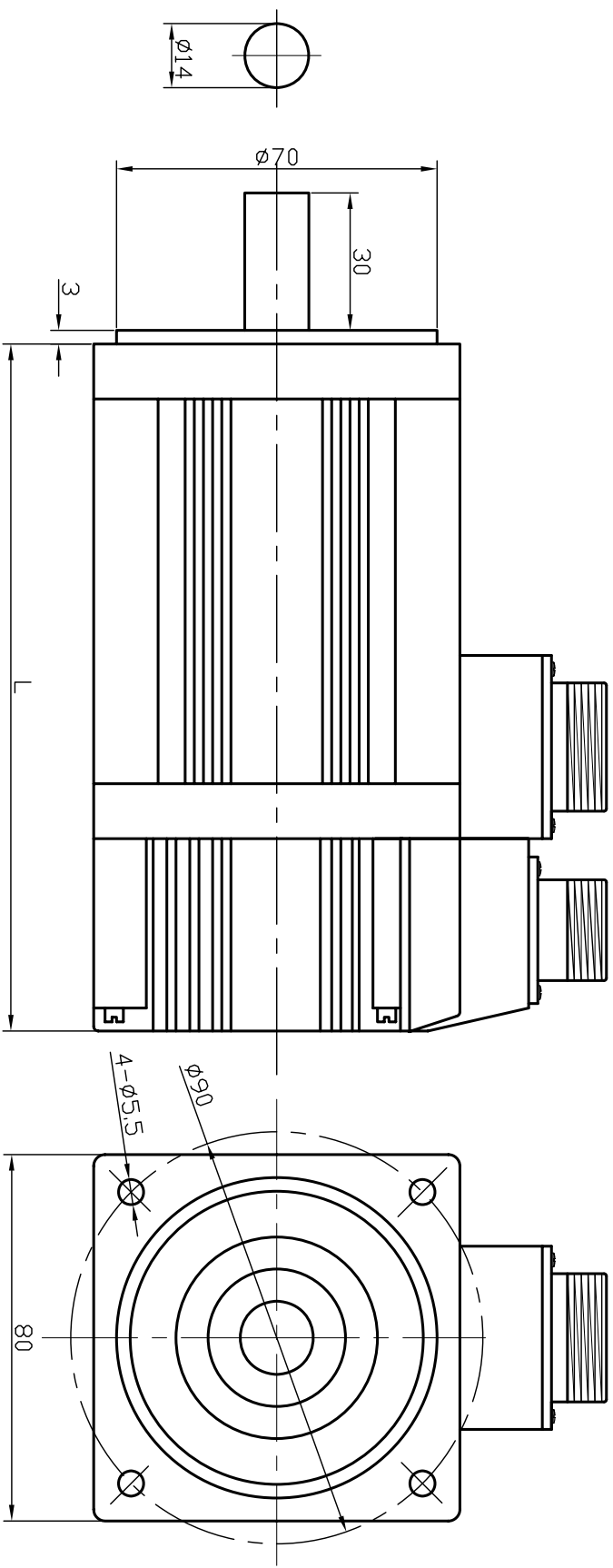
- Reduce the maximum speed of the servo motor (parameter No23);
- Install an external regeneration brake equipment;
- Replace with larger rated power and inertia of servo motor.

Chapter8 Products Specification

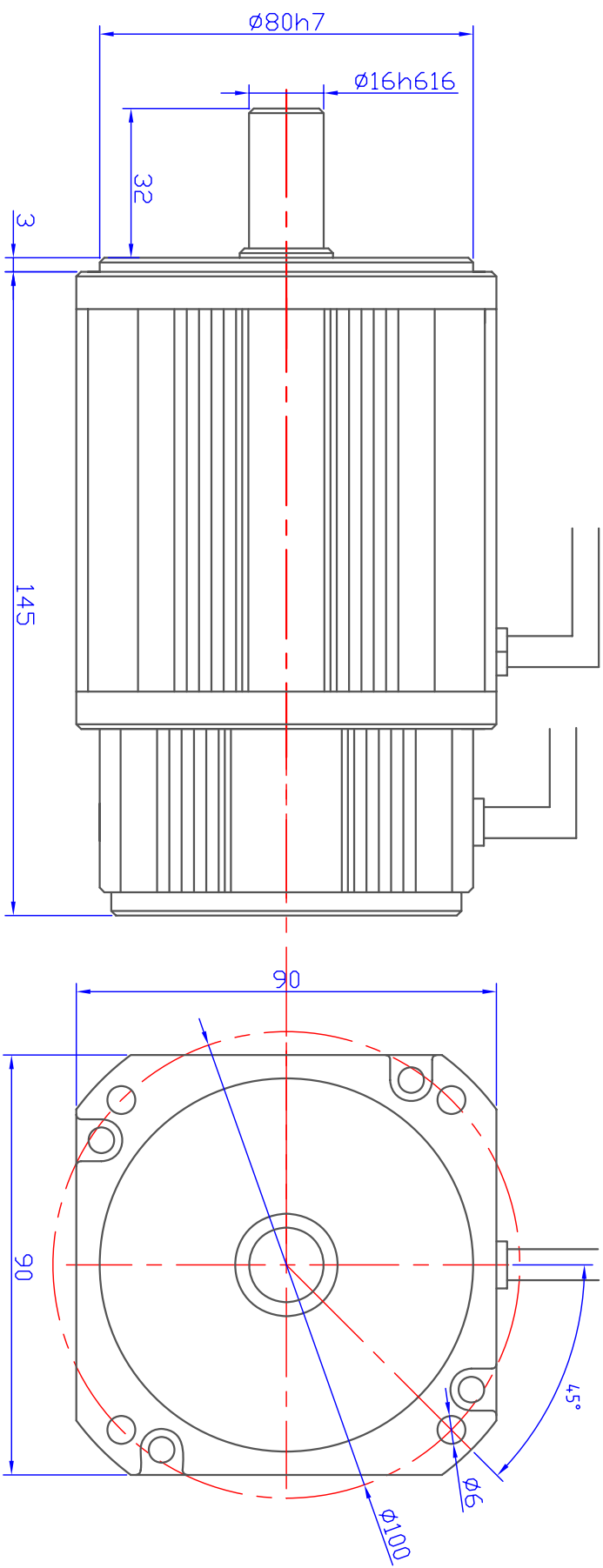
Output power		0.2~0.8	1.0~1.5	1.7~2.3
Motor's rating torque（Nm）		0.3~4	4~10	6~15
Input power supplier		Signal phase or three phases AC220V -15~+10℃ 50/60Hz		Three phase AC220V -15~+10℃ 50/60Hz
Application condition	Temperature	Run:0~55℃ Storage: -20~80℃		
	Humidness	Lower than 90%（No dew）		
	Vibration	Lower than 0.5G（4.9m/S ² ）， 10~60Hz		
Control mode		1） Position control 2） Speed control 3） Speed test run 4） JOG run 5） crawl run 6) Analog input		
Regenerative braking		Inside		
Control characteristics	Frequency response of speed: not less than 200Hz			
	Fluctuation ratio of speed: <±0.03（load 0~100%）: <±0.02（power supplier-15~+10%）（Note: the numeric correspond normal speed）			
	Speed regulation ratio: 1: 10000			
	Frequency of impulse: ≤500 kHz			
Control input		1） servo enable 2） alarm clear 3） CCW drive forbidding 4） CW drive forbidding 5） Deviation counter clear/ speed choice 1 6） command impulse forbidding		
Control output		1） Servo ready 2） Servo alarm 3） positioning complete / speed arrival		
Position control	Input mode	1） pulse + symbol 2） CCW pulse /CW pulse 3） Two-phase A/B orthogonal		
	Electron gear ratio	1~32767/1~32767		
	Feedback pulse	10000 pulse / turn		
Speed control		Four kind speed control modes		
Acceleration and deceleration function		Setting parameter of acceleration and deceleration time:1~10000mS（0 r/min←→1000 r/min）		
Monitor function		Speed, Current position, Dictate pulse accumulate, Position deviation, Motor torque, Motor current, Linear speed, Rotor absolute position, dictate pulse frequency, Running mode, Input and output terminal signals		
Protect function		Over-speed, Over-voltage/ under-voltage, Over-current, Overload, Brake abnormal, Encoder abnormal, Control power abnormal, Position overshoot etc.		
Display and operate		Four keys, six LEDs		
Suitable loading inertia		Five times than the inertia of motor		

suqiang servo specifaction

type	rating power	rating torque	rating speed
	Kw	Nm	rpm
60SQA00360E	0.2	0.3Nm	6000rpm
80SQA01030E	0.31	1.0Nm	3000rpm
80SQA01330E	0.4	1.3Nm	3000rpm
80SQA01630E	0.5	1.6Nm	3000rpm
80SQA02020E	0.4	2.0Nm	2000rpm
80SQA02030E	0.63	2.0Nm	3000rpm
80SQA02430E	0.75	2.4Nm	3000rpm
90SQA02430E	0.75	2.4Nm	3000rpm
110SQA02020E	0.4	2.0Nm	2000rpm
110SQA04020E	0.84	4.0Nm	2000rpm
110SQA04030E	1.25	4.0Nm	3000rpm
110SQA06020E	1.25	6.0Nm	2000rpm
110SQA06030E	1.84	6.0Nm	3000rpm
130SQA04020E	0.84	4.0Nm	2000rpm
130SQA05020E	1.05	5.0Nm	2000rpm
130SQA06020E	1.25	6.0Nm	2000rpm
130SQA07520E	1.57	7.5Nm	2000rpm
130SQA10015E	1.57	10.0Nm	1500rpm
130SQA10020E	2.1	10.0Nm	2000rpm
130SQA15015E	2.36	15.0Nm	1500rpm
130SQA15020E	3.14	15.0Nm	2000rpm
180SQA12815E	2.01	12.8Nm	1500rpm
180SQA14320E	3	14.3Nm	2000rpm
180SQA15030E	4.8	15.0Nm	3000rpm
180SQA19110E	2	19.1Nm	1000rpm
180SQA19115E	3	19.1Nm	1500rpm
180SQA19120E	4	19.1Nm	2000rpm
180SQA19130E	6	19.1Nm	3000rpm
180SQA23820E	5	23.8Nm	2000rpm
180SQA28610E	3	28.6Nm	1000rpm
180SQB31830E	10	31.8Nm	3000rpm
180SQB37030E	11.6	37.0Nm	3000rpm
180SQB40015E	6.3	40.0Nm	1500rpm
180SQB40020E	8.4	40.0Nm	2000rpm
180SQB40030E	12.6	40.0Nm	3000rpm
180SQB48010E	5	48.0Nm	1000rpm
180SQB48015E	7.5	48.0Nm	1500rpm
180SQB48020E	10	48.0Nm	2000rpm
180SQB50020E	10.48	50.0Nm	2000rpm
180SQB50030E	15	50.0Nm	3000rpm
230SQB70020E	14	70.0Nm	2000rpm

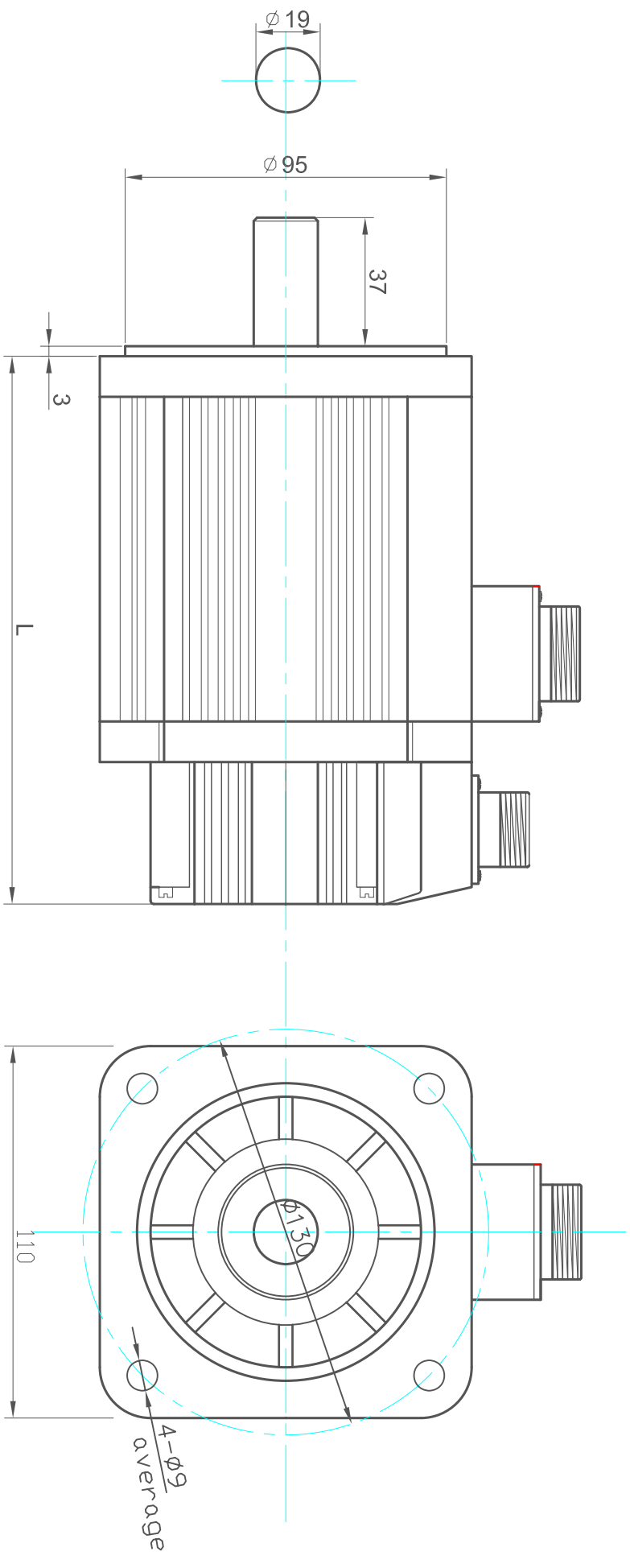


80SQA serials servo motor

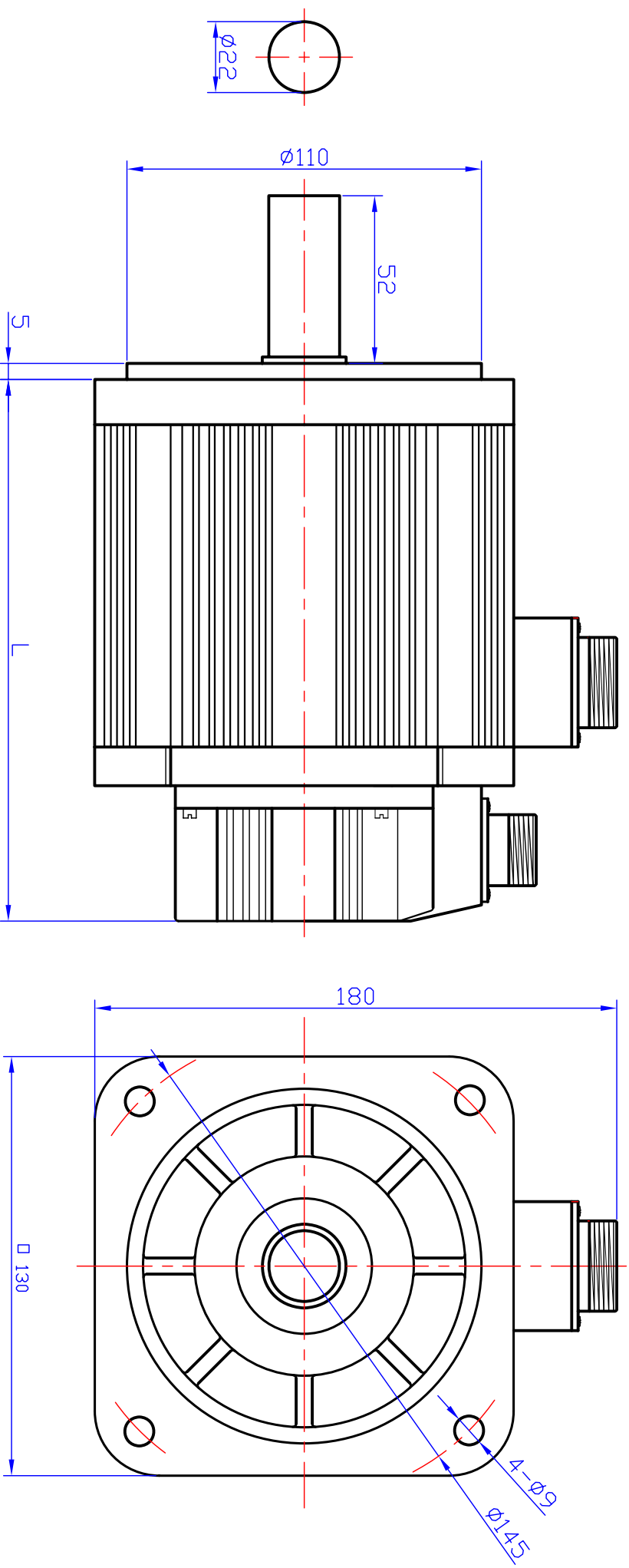


额定功率: 750W
额定转矩: 2.4N.m
额定转速: 3000rpm

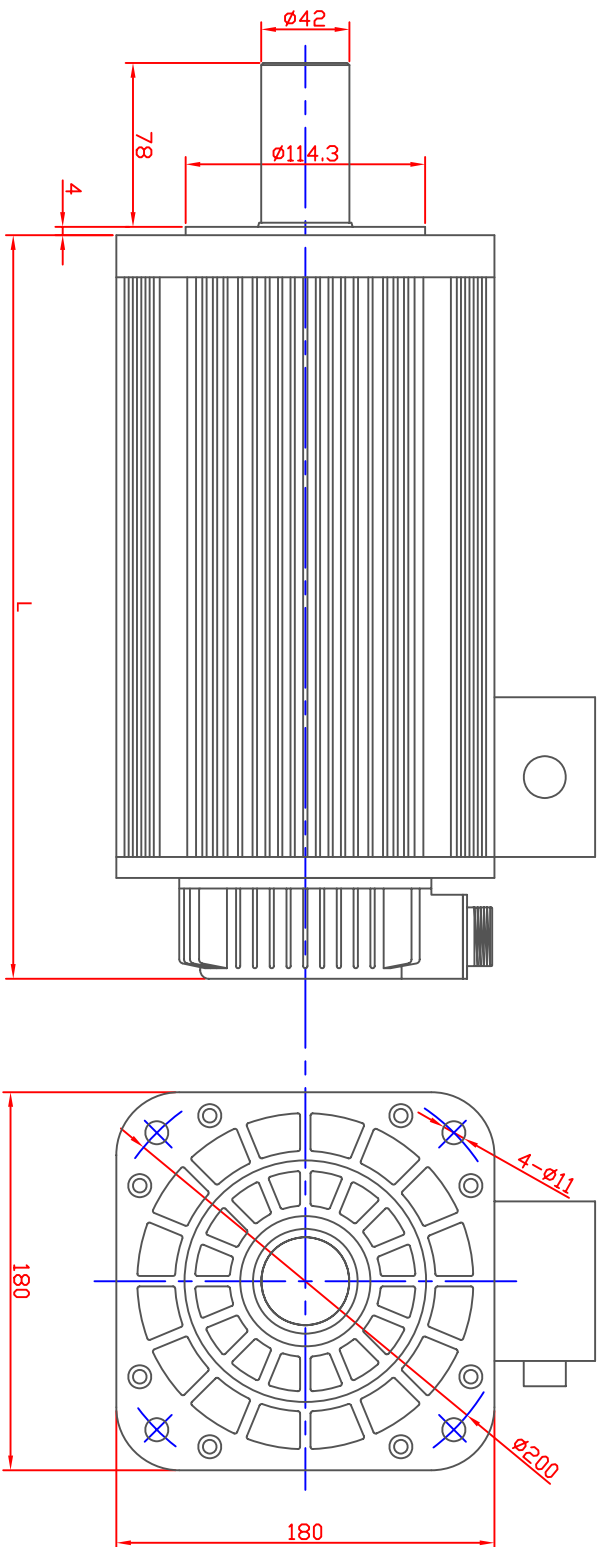
[illegible]



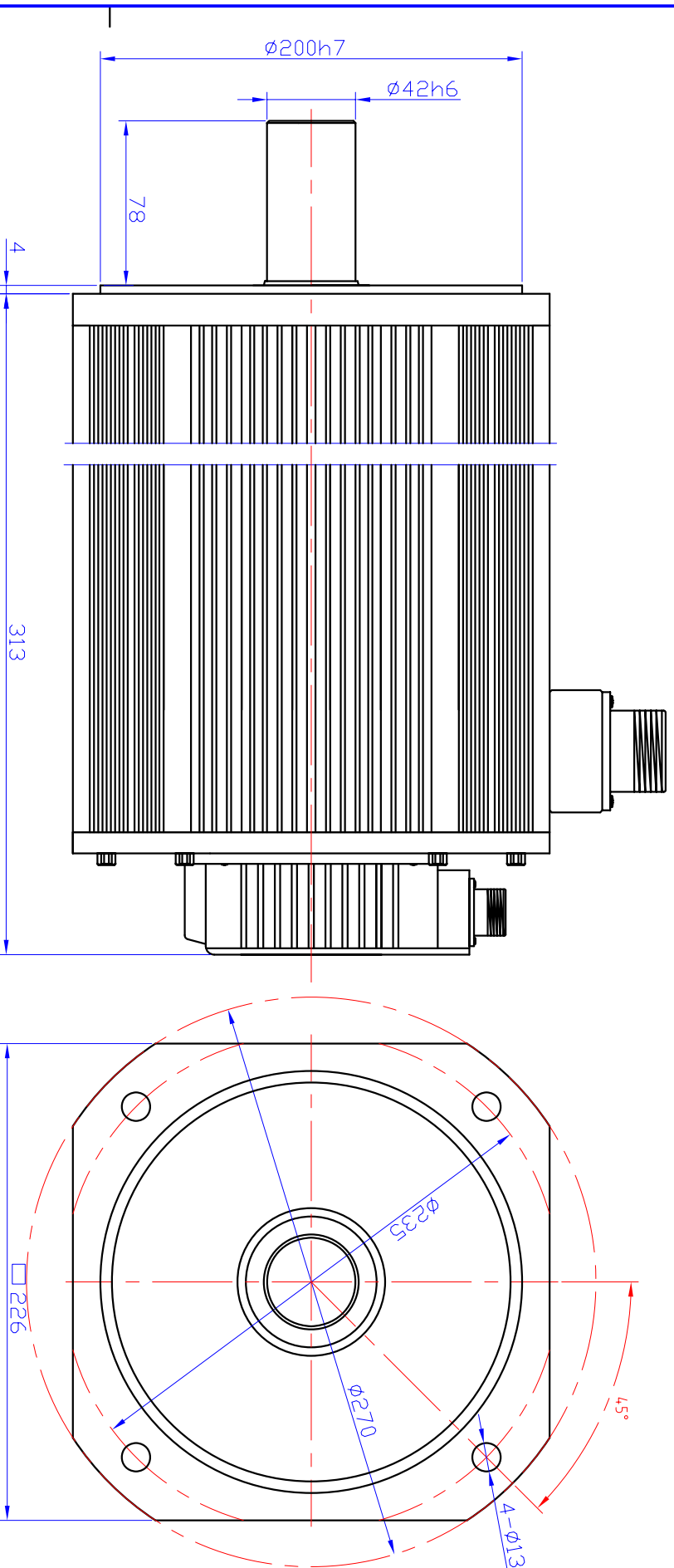
I10SQA series servo motor



130SQA series AC servo motor



180SQA/SQB series servo motor



Rated torque: 70N.m
 L-L Induction: 1.97mH
 Rated speed: 2000rpm
 L-L resistance: 0.17 Ω
 Reted current: 35A
 Torque constant: 2.1/N.m
 Rated voltage: 380VAC
 Electrical time constant: 9.3ms
 Rotor inertia: 418.4Kg.cm
 Mechanical time constant: 2.3ms

Note: 1. Dimensions of motor shaft and flange can be modified due to customer's special demands.
 2. This brushless servo motor can reach the biggest rated power of 30Kw.
 3. This brushless servo motor can mounted with resolver and encoder, due to customer's demands.

sugiangservo@hotmail.com
 roylio@hotmail.com



SGS-CSTC Standards
Technical Services Co.,
Ltd.



1/F., Building No. 1, Agriculture Machinery
Materials Co., Wushan Road, Shipai,
Tianhe District, Guangzhou, China

Telephone: +86 (0) 20 3848 1001

Fax: +86 (0) 20 3848 1006

Kent_Hsu@sgs.com

Report No.: 04.03.0620EE

Page 1 of 28

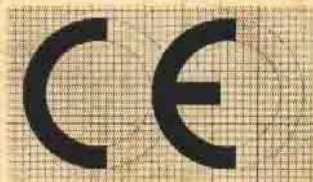
EMC TEST REPORT

Application No.: 04.03.0620E
Applicant: Nanjing Liyuan Power Magnetic Co.,LTD
Equipment Under Test (EUT):
EUT Name: Full Digital A.C. Servo Driver
Item No.: SN2000
Serial No.: Not supplied by client
Standards: EN 61000-6-4 : 2001
EN 61000-6-2 : 2001
Date of Receipt: 30 March 2004
Date of Test: 31 March to 05 April 2004
Date of Issue: 06 April 2004

Test Result :	PASS*
----------------------	--------------

* In the configuration tested, the EUT complied with the standards specified above.

The CE mark as shown below can be used, under the responsibility of the manufacturer, after completion of an EC Declaration of Conformity and compliance with all relevant EC Directives.



Kent Hsu
Laboratory Manager

This report refers to the General Conditions for Inspection and Testing Services, printed overleaf.

This report details the results of the testing carried out on one sample. The results contained in this test report do not relate to other samples of the same product and does not permit the use of the SGS PRODUCT CERTIFICATION MARK. The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in this report.

This report may only be reproduced and distributed in full. If the product in this report is used in any configuration other than that detailed in the report, the manufacturer must ensure the new system complies with all relevant standards. Any mention of SGS International Electrical Approvals or testing done by SGS International Electrical Approvals in connection with, distribution or use of the product described in this report must be approved by SGS International Electrical Approvals in writing.



SGS-CSTC Standards
Technical Services Co.,
Ltd.



1/F., Building No. 1, Agriculture Machinery
Materials Co., Wushan Road, Shipai,
Tianhe District, Guangzhou, China
Telephone: +86 (0) 20 3848 1001
Fax: +86 (0) 20 3848 1006
Kent_Hsu@sgs.com

Report No.: 04.03.0621EE
Page 1 of 26

EMC TEST REPORT

Application No.: 04.03.0621E

Applicant: Nanjing Liyuan Power Magnetic Co.,LTD

Equipment Under Test (EUT):

EUT Name: Permanent Magnetic Brushless Servo Motor

Item No.: 110 (110SNMA6, 110SNMA2, 110SNMA4),
130 (130SNMA5, 130SNMA6, 130SNMA7.5, 130SNMA10, 130SNMA15)

♣

Serial No.: Not supplied by client

♣

Please refer to section 2 of this report for details.

Standards: EN 61000-6-4 : 2001
EN 61000-6-2 : 2001

Date of Receipt: 30 March 2004

Date of Test: 31 March to 05 April 2004

Date of Issue: 06 April 2004

Test Result :	PASS*
----------------------	--------------

* In the configuration tested, the EUT complied with the standards specified above.

The CE mark as shown below can be used, under the responsibility of the manufacturer, after completion of an EC Declaration of Conformity and compliance with all relevant EC Directives.

Kent Hsu
Laboratory Manager



This report refers to the General Conditions for Inspection and Testing Services, printed overleaf.

This report details the results of the testing carried out on one sample. The results contained in this test report do not relate to other samples of the same product and does not permit the use of the SGS PRODUCT CERTIFICATION MARK. The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in this report.

This report may only be reproduced and distributed in full. If the product in this report is used in any configuration other than that detailed in the report, the manufacturer must ensure the new system complies with all relevant standards. Any mention of SGS International Electrical Approvals or testing done by SGS International Electrical Approvals in connection with, distribution or use of the product described in this report must be approved by SGS International Electrical Approvals in writing.