AC SERIES SERVO DRIVE

MANUAL

(THIRD VERSION)

DRIVE SD3L06B SD3L08B SD3L10B SD3L20B SD3L30B

SD3L40B SD3L50B

SHENZHEN XINSTART TECHNOLOGY CO.,LTD

NOTICE

- The power supply of servo driver is three-phase or single phase AC 220V, it is suggested to use three-phase isolation transformer. The driver could not connect to the AC380v directly, otherwise, it will be damaged;
- The U、V、W terminals must match the motor's U、V、W connection;
- The content of this manual is suitable for software edition V1.54 of the driver.

CATALOG

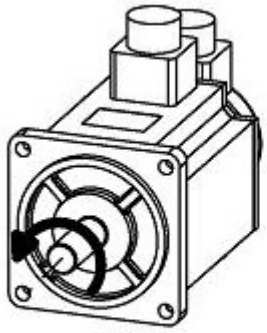
CHAPTER 1 SPECIFICATION

1.1 The specification of servo driver

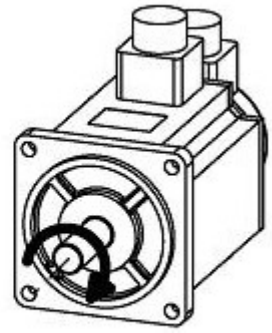
Input power supply		Single-phase or three-phases AC220V -15~+10% 50/60Hz	three-phases AC220V -15~+10% 50/60Hz
Ambience	Temperature	operation：0~40°C Storage：-40°C~50°	
	Humidity	40%~80%(non-condensing)	
	Atmospheric pressure	86~106kPa	
Control method		①Position control ②Speed control ③Torque control ④JOG operation	
Regenerative braking		Internal connection External connection	
Characteristic	Speed frequency response	200Hz or higher	
	Perturbation of speed rate	<±0.03 (Load 0~100%); <±0.02 (Power -15 ~ +10%) (value corresponds to nominal speed)	
	Speed modulation ratio	1:5000	
	Pulse frequency	≤500kHz	
Control input		①Servo enable ②Alarm Clear ③CCW driver forbid ④CW driver forbid ⑤Deviation counter reset/ / speed select 1 / zero-speed clamp ⑥command pulse forbid/ speed select 2 ⑦CCW torque limit ⑧CW torque limit	
Control output		①Servo ready output ②Servo alarm output ③Positioning complete output / speed reach output	
Position control		Input mode	① Pulse + symbol ② CCW pulse / CW pulse ③ Two-phases A / B orthogonal pulse
		Electronicic gear	1~32767/1~32767

	Feedback pulse	2500 C/T
Speed control	Four kinds of internal speed	
Acceleration and deceleration function	Data establishment 1~10000mS / 1000r/min	
Monitoring function	Rotational speed, current position, command pulse accumulation, position deviation, motor torque, motor current, linear speed, rotor absolute location, command pulse frequency, running status, input / output terminal signal and so on	
Protection function	Overspeed, the main power supply over-voltage and under-voltage, over current, overload, brake exceptionally, encoder exceptionally, control power supply exceptionally, position ultra and inferior and so on	
Applicable load inertia	Less than five times of motor inertia	

1.2 Motor deriection definition



Counterclockwise(CCW)



Clockwise(CW)

CHAPTER 2 INSTALLATION AND CONNECTION

2.1 Installation and connection

2.1.1 Installation occasions

1) The inner installation of electrical control cabinet.
   Driver's cooling and control cabinet inner configuration, guarantee servo drives in the ambient temperature below 55°C, relative humidity below 90 percent. Long-term security operating temperature is below 45°C.
2) There is vibrating equipment nearby servo drives.
   Take an antivibration measure to guarantee that the servo driver is free from vibration impact, and guarantee reducing vibration under 0.5G (4.9m/s^2).
3) The servo drives used in the harsh ambience.
   When servo drives used in the harsh environment and contact caustic gas, moist, metal dust, water as well as processing liquid, the driver will break down. Therefore, itt must guarantee driver's working ambience while installation.
4) There is interferential equipment nearby servo drives.
   When there is interferential equipment nearby servo drives, there is great disturbing effect to the servo driver's power line as well as the control line, and causes the driver to have the misoperation. It could add the noise filter and other antijamming measure to guarantee driver's normal work..It is noticeable that the leakage current will increase after adding the noise filters, in order to avoid this problem, you can use isolation transformers.

2.2 Installation method

1) Installation direction
   The normal Installation direction of servo driver is the vertical direction.
2) Installs fixedly
   Impacting the four M5 fixed screws behind servo driver when installs.
3) Installation interval
   The installation interval distance between servo driver and other equipments, please refer to Figure 2, and notice that marked on the map is the smallest size, In order to guarantee that driver's openominal performance and the life, please as far as possible leave the full installation interval.
4) Dispel radiation
   The servo driver selects the natural cooling method, and that must install the radiation ventilator in the electrical control cabinet to guarantee that there is the vertical direction wind blowing to the servo driver's radiator for radiation.
5) Advertent proceeding of Installation
   When installs the electrical control cabinet, prevents the dust or the iron filings entering in the servo driver.

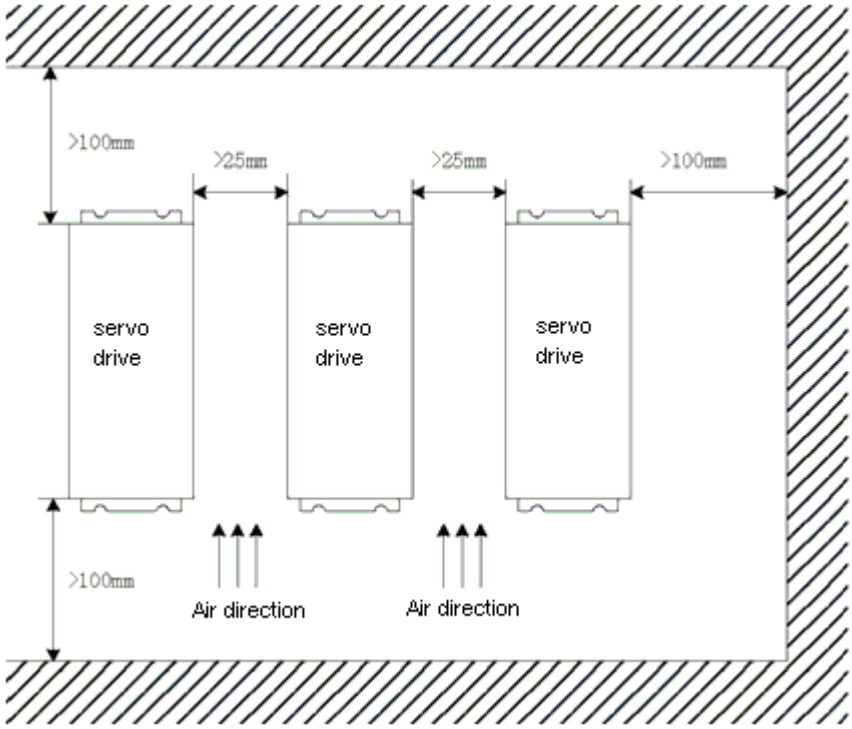


Figure 2 Servo driver installation diagram (unit: mm)

2.3 Standard connection

2.3.1 Position control mode

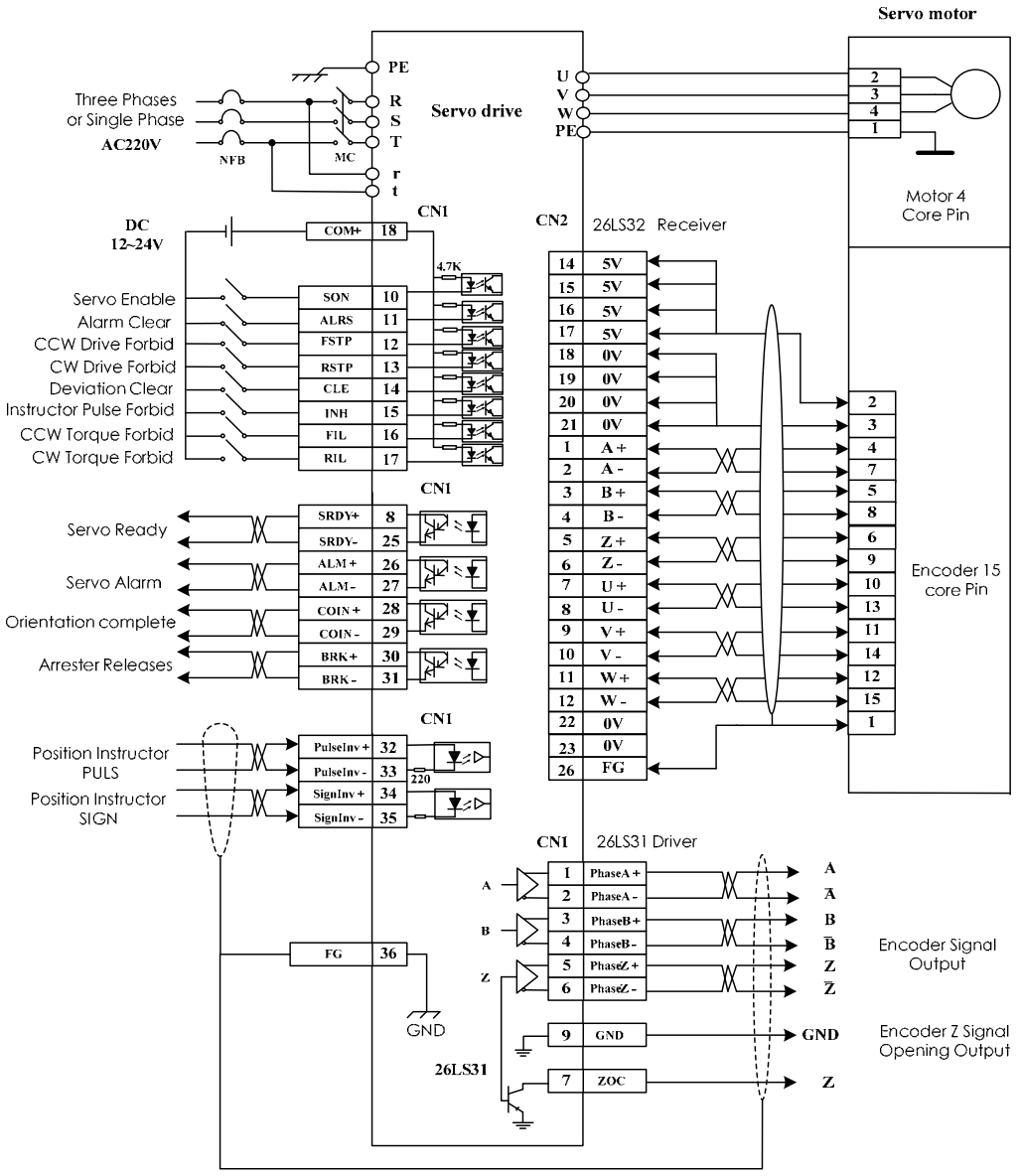


Figure 3 The standard connection of position control mode

2.3.2 Speed control mode

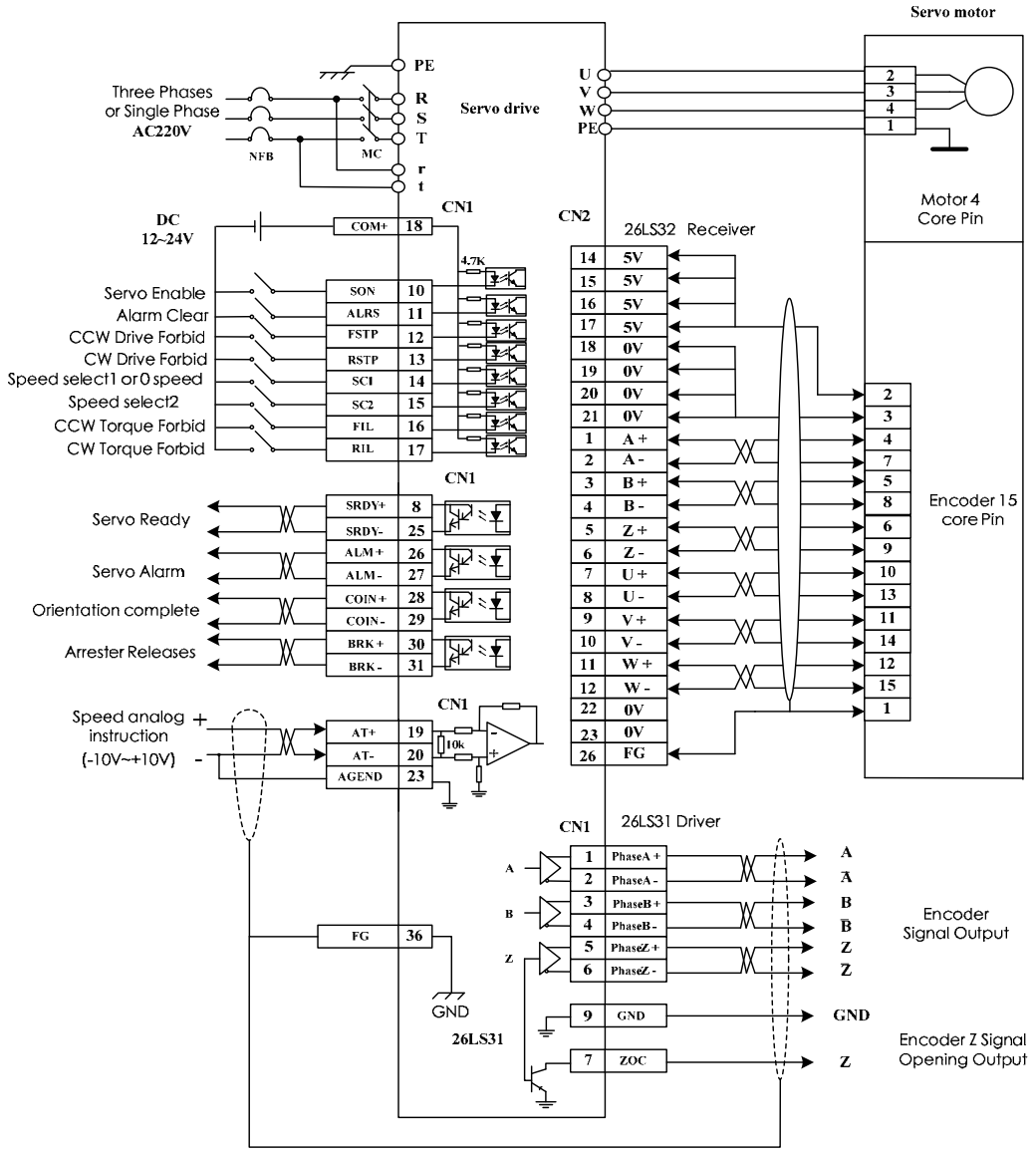


Figure 4 The standard connection of speed control mode

2.3.3 Torque control mode

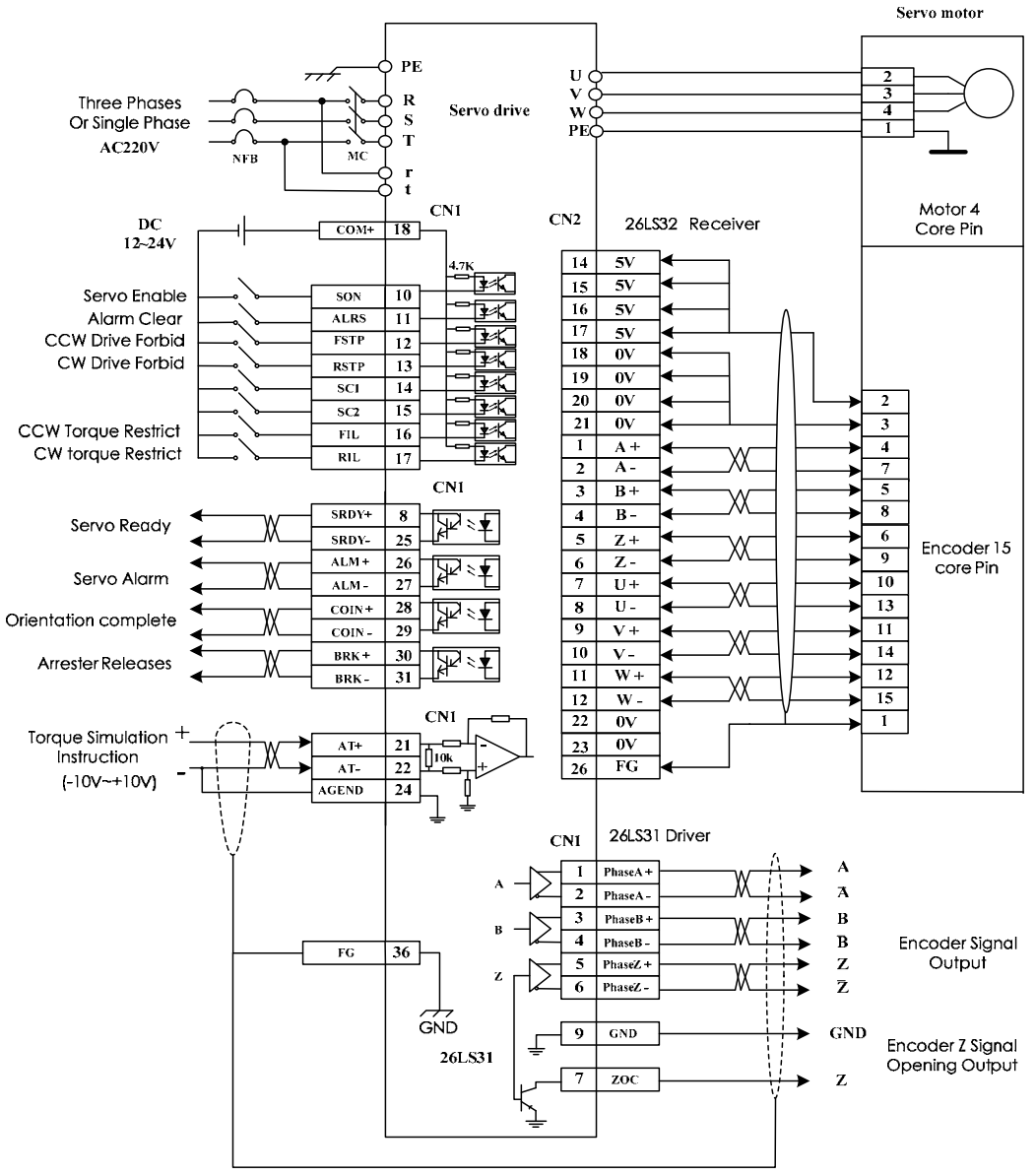


Figure 5 The standard connection of torque control mode

2.4 Wiring specification

1) Power terminals TB

- Wire size: R、S、T、PE、U、V、Wterminal wire size=>1.5mm^2 (AWG 14 16), r、t terminal wire size=>1.0 mm^2 (AWG 16 18).
- Pre-insulated terminal is used for connecting wire terminals and make sure that the connections are fast.

- Proposed three-phase isolation transformer power supply.

2.5 Wiring method

1) Please use the recommended electric cable or similar shielded wire for the input and output signal lines and encoder signal line, the length of cable is: The length of input and output signal lines is 3 meters or less.the length of encoder signal line is 20 meters or less. The length of lines is shorter as possible, and the main circuit wiring and the signal line must separate.
2) The wire size for grounding is as bigger as possible. The PE terminals of the servo driver and servo moto
3) Rare connected to the ground in one point.
4) To prevent the interference causing malfunction, it is suggested to install the noise filter, and pays attention to:
   - The installation distance of noise filters, servo drives and the superior controller is as closer as possible.
   - That must install surge suppressor in the winding of relay 、electromagnetic contactor、arrester and so on.
   - The main circuit wiring and the signal line do not pass in the identical pipeline, and do not tie together.
5) If there is an intense interference (such as welding machine) right round, it is able to use Isolation transformer to prevent the misoperation.
6) Please install a non-melt type breaker (NFB) to switch off power supply quickly while the servo driver arises malfunction.
7) Please connect cable shielding layer rightly.

2.6 Advertent proceeding

1) The wires connections (U, V, W) of the servo driver must match with U, V, W terminals of the servo motor, and notice that it cannot exchange direction of the three-phase terminals to cause the servo motor reverse, this point is completely different from the asynchronous motor.
2) Because the high-frequency switching current flows is through the servo motor, so the leakage current is relative big. The PE terminals of the servo driver and servo motor are connected to the ground in one point.
3) Because there is the large capacity electrolytic capacitor in the servo drives, so even cut off the power supply, there is still high voltage in the internal circuits. After cuting off the power supply and waiting for more than five minutes, it can contact the servo driver and the servo motor.
4) After switching on the power supply, the operator should keep certain distance with the servo driver and the servo motor.
5) If it is long-playing that the servo driver does not be used, please cut off the power supply.
6) The definition of direction of rotation: facing to the servo motor's shaft extension, the counterclockwise rotation of axis of rotation is the CCW direction, and the clockwise rotation of axis of rotation is the CW direction. Generally, it is said that CCW is the direction, CW is the negative direction.

CHAPTER 3 INTERFACE

3.1 Power terminals TB1, TB2, TB3 of servo driver

TB1

Terminals symbol	Name of signal	Function
R	Main power supply one phase or three phases	Main power input terminal,~220V, 50Hz Note: never connect R, S, T to U, V, W terminals of servo motor.
S		
T		
B	External brake resistance terminal	1. When that does not use the external brake resistance, please and leave the B and P port free. 2. When use the external brake resistance, please connect the external brake resistance between B and P(this is suit for big power drive)
P	Brake resistance	

Remark: The detailed explanation of B,P please refer to 3.6

TB2

Terminals symbol	Name of signal	Function
U	Servo driver three-phases output	Servo driver output terminals must match with U, V, W terminals of the servo motor.
V		
W		
PE	System ground Single-phase	Grounding terminal, connect with ground of servo motor.

TB3

Terminals symbol	Name of signal	Function
r	Control input of power supply	Control loop circuit power supply input terminal AC220V, 50Hz
t		

3.2 Control signal input/output terminals CN1

Abbreviation of control mode: P stands for position control mode;
S stands for speed control mode;
T stands for torque control mode.

Table 1 Control signal input/output terminals CN1

Terminals number	Name of signal	Terminals Symbol			Function
		Symbol	I/O	Mode	
18	The power supply anode of input	VCCCOM	Type1		The power supply anode of input terminal is used to driver the electro-optical coupler of

	terminal				input terminal DC12-24V, current≥100Ma.
10	Servo enable	ServoEn	Type1		Input terminal of servo enable. ServoEn ON: permit servo diver to run; ServoEn OFF: driver off, stop working, motor is in a free mode; Remark l: make sure that servo motor is quiescent before turn "ServoEn OFF" to "ServoEn ON" Remark 2: input any command after 50 ms turning to "ServoEn ON".
11	Alarm clear	AlarmClr	Type1		Alarm clear terminal input AlarmClr ON: clear system's alarm; AlarmClr OFF: keep system's alarm; Remark 1: if the warning is that the failure code is smaller than 12, it can not use this method to eliminate, needs to cut off the power supply and overhaul, and then electrifies once more.
12	CCW drive forbid	CCWDis	Type1		CCW (counter-clockwise) servo driver forbid input terminal. CCWDis ON: CCW driver forbid CCWDis OFF:CCW driver permit Notel: Remark 1: used in mechanical out of limit, CCW direction is zero torque when switch is off. Remark 2: setting "PA20=1" could achieve the same result.
13	CW drive forbid	CW Dis	Type1		CW (clockwise) servo drive forbids input terminal. CWDis ON:CW servo driver forbid CWDis OFF:CW servo driver permit Remark 1: used in mechanical out of limit, CW direction is

					zero torque when switch is off. Remark 2: setting "PA20=1" could achieve the same result.
14	Deviation counter clear	CLE	Type1	P	In the position control mode, input terminal of position deviation counter clear (data PA4=0) CLE ON: clear deviation counter in position control mode.
	Speed choose1	SC1	Type1	S	In the speed control mode (data PA4=1), while choosing inner speed (data PA22=0), speed choose 1 input terminal. In the speed control mode, use the combination of SC1 and SC2 to choose different inner speed. SC1 OFF, SC2 OFF: inner speed choose1 SC1 ON,SC2 OFF: inner speed choose2 SC1 OFF, SC2 ON: inner speed choose3 SC1 ON, SC2 ON: inner speed choose4 Renark: inner speed 1~4 can modify by data
	Zero speed clamp	ZEROSPD	Type1	S	In the speed control mode (data PA4=1), while choosing outer stimulant speed (data PA22=1); ZEROSPD ON: no matter what the simulative value is, force speed to zero ZEROSPD OFF: the value of speed dictate is simulative value.
15	Command pulse forbid	INH	Type1	P	In the position control mode, input terminal of command pulse(data PA4=0), INH ON: command pulse input forbid INH OFF: command pulse input efficient
	Speed choose 2	SC2	Type1	S	In the speed control mode (data PA4=1),while choosing inner

					speed (data PA22=0), speed choose 2 input terminal. In the speed control mode, use the combination of SC1 and SC2 to choose different inner speed. SC1 OFF, SC2 OFF: inner speed choose1 SC1 ON, SC2 OFF: inner speed choose2 SC1 OFF, SC2 ON: inner speed choose3 SC1 ON, SC2 ON: inner speed choose4.
16	CCW torque limit	FIL	Type1		CCW (counter-clockwise)torque limit input terminal CCWTLtd ON:CCW external torque limit in Scope data PA36 CCWTLtd OFF: CCW torque is not limited by data PA36. Remark1:whether CCWTLtd is valid or not, CCW torque is limited by data PA34, generally speaking, data PA34> data PA36.
17	CW torque limit	RIL	Type1		CW (clockwise) torque limit input terminal. CWTLtd ON:CW torque limit in Scope data PA37 CWTLtd OFF:CW torque is not limited by data PA37; Remark1: whether CWTLtd is valid or not, CW torque is limited by data PA35, generally speaking, data PA35> data PA37.
8	Servo ready output	SRDY＋	Type2		Output terminal of servo ready. SRDY ON: control power supply and main power supply is in the course of nature, there is no alarm from servo driver, servo ready output is ON; SRDY OFF: main power supply is detached or there is generant alarm from driver, servo ready
25		SRDY–	Type2		

					output is off.
26 27	Servo alarm output	ALM＋ ALM–	Type2		Output terminal of servo alarm. ALM ON: there is no alarm from servo driver, servo alarm output is ON ALM OFF: there is alarm from servo driver, servo alarm output is OFF.
28 29	Positioning complete output (position control mode); speed reach output (speed control mode)	COIN＋ COIN–	Type2	P S P S	Output terminal of positioning complete COIN ON: positioning complete output is ON while the value of position deviation counter is in enactment positioning range, otherwise, output is OFF (output close). COIN ON: when the speed is equal or over hypothesis speed, speed reach output is ON, otherwise, output is OFF (output close).
30 31	Mechanical brake release	BRK＋ BRK–	Type2		When the motor has mechanical brake, the port can use to control the brake. BRK ON:brake electrify, brake is not valid, the motor can operate; BRK OFF: break close, break is valid, the motor can not operate. Reamrk: the function of BRK is controlled by driver.
32 33	Command pulse PLUS input	PulseInv + PulseInv –	Type3	P	Input terminal of external command pulse. Remark : enactment mode of the pulse input by data PA14; ① PA14=0, command pulse+ signal mode(default state); ②PA14=1, CCW/CW command pulse mode; ③PA14=2, 2phases command pulse mode.
34 35	Command pulse SIGN input	SignInv + SignInv –	Type3	P	
19 20	Analog speed command input	ASPEED+ ASPEED–	Type4	S	Input terminal of external simulative speed command, difference way, input Impedance is 10kΩ, input scope is -10V~+10V.

23	Analog grounding	AGND			The grounding line of analog input.
21 22	Analog torque command input	ATORQUE+ ATORQUE–	Type4	T	Input terminal of external analog torque command, difference way, input impedance is 10kΩ, input scope is -10V~+10V.
24	Analog grounding	AGND			The grounding line of analog input.
1 2	Encoder phase A signal	PhaseA ＋ PhaseA –	Type5		1. Encoder A B Z signal difference servo output(26LS31 output, correspond to RS422) 2. Non-isolative output (non-insulative).
3 4	Encoder phase B signal	PhaseB＋ PhaseB–	Type5		
5 6	Encoder phase Z signal	PhaseZ＋ PhaseZ–	Type5		
7	Encoder phase Z collector opening output	ZOC	Type6		1. Encoder phase Z signal output from collector opening, when encoder phase Z signal appearants, output is ON, otherwise, output is OFF; 2. Non-isolative output (non-insulative). 3. In the superior machine, the phase Z signal pulse is very narrow, so please use the high speed electro-optical coupler to receive
9	Encoder public grounding line	GND			Encoder public grounding line
36	Shield grounding line	FG			The terminal of shield grounding line.

3.3 Encoder signal input terminals CN2

Table 2 Encoder signal input terminals CN2

Terminal Number	Signal Name	Function		
		sign	I/O	Description
14 15 16 17	Power supply 5V	+5V		The servo motor electro-optic encoder uses the +5V power suppply and public grounding; If the cable length is long, it should use multiple wires to be parallel, and reduce the line drop.

18 19 20 21 22 23	Public grounding	0V		
1	Encoder A+ input	A＋	Type7	Connect to electro-optic encoder A+
2	Encoder A- input	A–		Connect to electro-optic encoder A-
3	Encoder B+ input	B＋	Type7	Connect to electro-optic encoder B+
4	Encoder B- input	B–		Connect to electro-optic encoder B-
5	Encoder Z+ input	Z＋	Type7	Connect to electro-optic encoder Z+
6	Encoder Z- input	Z–		Connect to electro-optic encoder Z-
7	Encoder U+ input	U＋	Type7	Connect to electro-optic encoder U+
8	Encoder U- input	U–		Connect to electro-optic encoder U-
9	Encoder V+ input	V＋	Type7	Connect to electro-optic encoder V+
10	Encoder V- input	V–		Connect to electro-optic encoder V-
11	Encoder W+ input	W＋	Type7	Connect to electro-optic encoder W+
12	Encoder W- input	W–		Connect to electro-optic encoder W-
26	Shield grounding line	FG		Shield grounding line terminals

3.4 Interface terminal configure

Figure 6 The configuration figure of servo driver interface terminal CN1. CN1 is 36 cores connector.

Figure 7 The configuration figure of servo driver interface terminal CN2. CN2 is 26 cores connector.

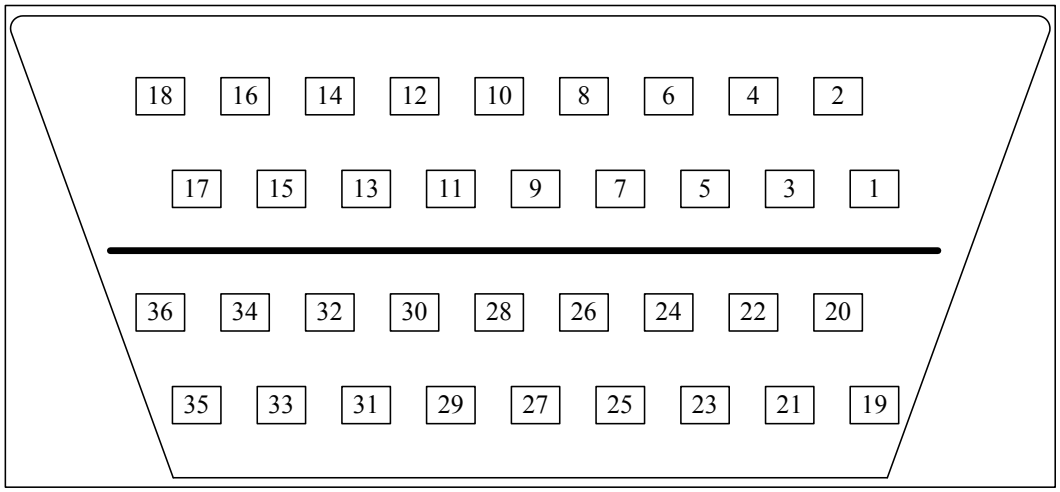


Figure 6 Plug-welding of drivers CN1 plug (CONTROL)(look face to plug-welding)

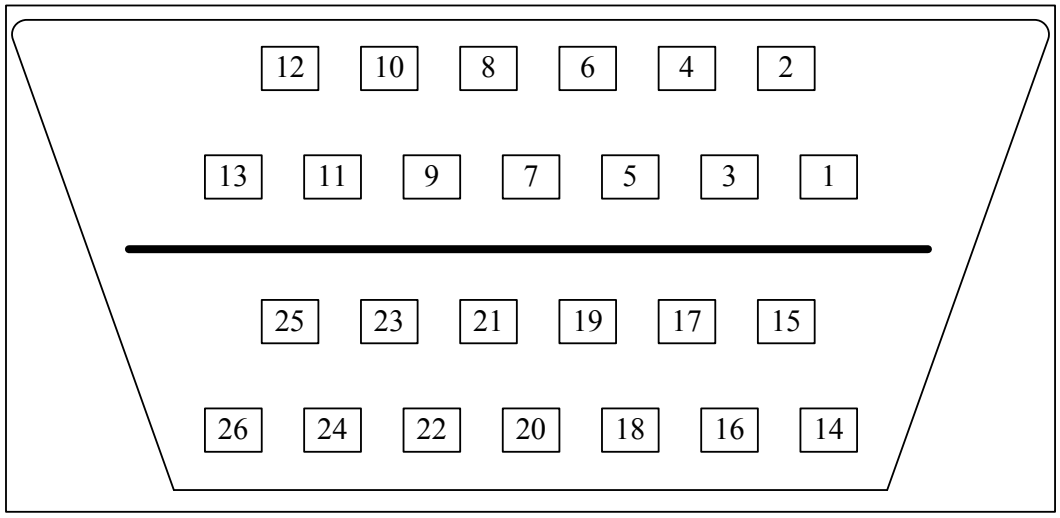


Figure 7 Plug-welding of drivers CN2 plugs (encoder FEEDBACK) (look face to plug-welding)

3.5 Input / output interface types

3.5.1 Switching signal input interface

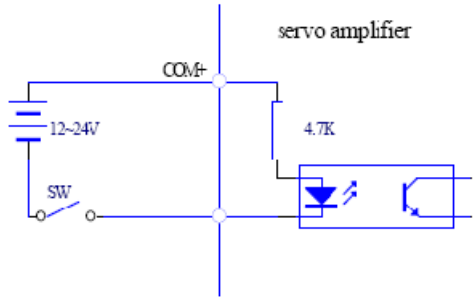
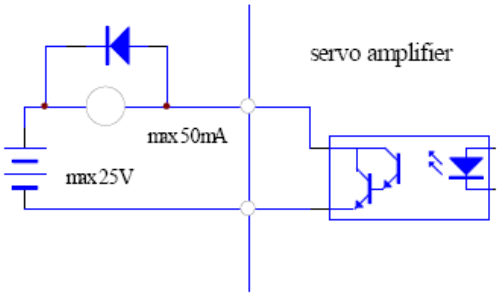


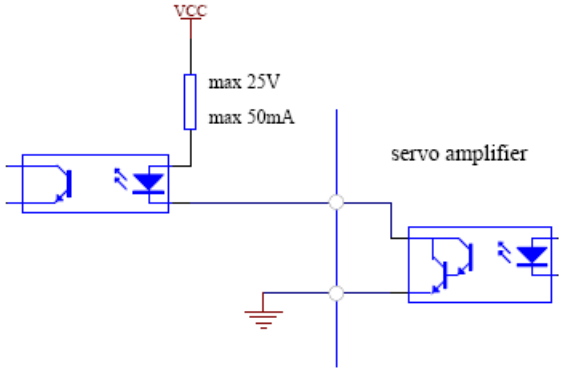
Figure 8 (type1) switching signal input interface

(1) The customer should provide an external power supply. DC 12—24V, current≧100mA;
(2) It should be noted that if the polarity of the external power supply is reversal, the servo drive could not work.

3.5.2 Switching signal output interface



a. Relay connection



b. Electro-optical coupler connection

Figure 9 (type2) Switching signal output interface

(1) The output is Darlington transistor, and it connects with relay or electro-optical coupler.
(2) The customer provides the external power supply. Be careful, if the polarity of the external power supply is reversal, the servo driver may be be damagedd.
(3) The output circuit is an open collector, its maximum sink current is limited to 50mA and the external maximum voltage is 25 volts. Therefore, the load of switching output signal must settle for the above limitative request. If it is overload or short circuit, the servo driver will be be damagedd.
(4) If the output loads are inductive loads such as relay, it is necessary to connect an antiparallel continued current diode at both sides of the load. Be careful; if the continued

current diode is reversal, the servo driver will be be damagedd

(5) The output transistor is Darlington transistor, while it is open, the line drop Vce between collector and emitter is about 1V, and can not meet the requirements of low TTL, so, it can not directly connected to TTL integnominal circuits.

3.5.3 Pulse signal input interface

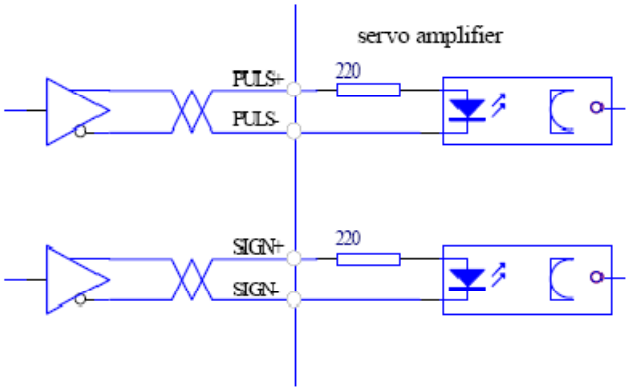


Figure10 (type3) the difference drive mode of pulse input interface

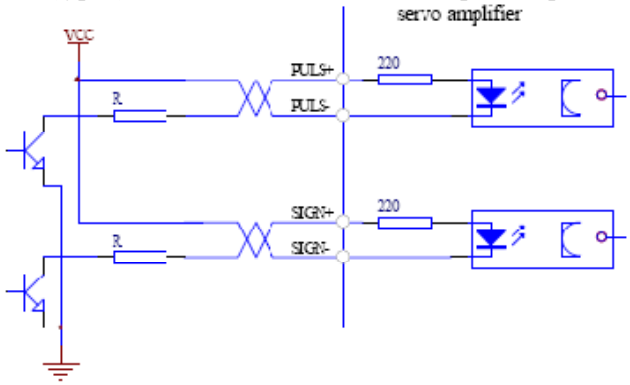


Figure11 (type3) the single end drive mode of pulse input interface

(1) To transmit the pulse signal data correctly, it is suggested to use the difference drive mode;

(2) In the difference drive mode, the IC AM26LS31, MC3487 or the similar RS422 line driver will be adopted.

(3) When using the single end drive mode, the action frequency will be down. According to the pulse input circuit, the driving current is 10-15mA and the external maximum voltage is limited to 25 volts, so it can ascertain the value of resistance R. The experience dataes are following:

VCC=24V， R=1.3~2k；VCC=12V， R＝510 820Ω；VCC=5V， R=82~120Ω。

(4) When using the single end drive mode, the customer should provide the external power supply. Be careful, if the polarity of the external power supply is reversal, the servo driver may be damaged.

(5) The command pulse input style is shown in table 3, in which the arrow stands for pulse counting edge. The pulse input timing and its dataes are shown in table 4.When two-phase pulses are used; its 4 frequency multiplication pulse frequency should be less than 500 KHz.

Table 3 Pulse input style

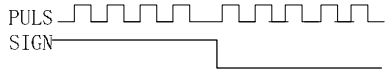
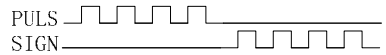
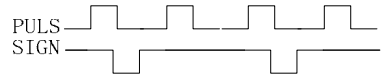
Command pulse style	CCW CW	Data enactment
Pulse train sign		0 Command pulse + sign
CCW pulse train CW pulse train		1 CCW pulse/CW pulse
A phase pulse train B phase pulse train		2 Two phases command pulse

Table 4 the pulse input timing dataes

Data	Difference drive input	Single end drive input
t_{ck}	>2μS	>5μS
t_h	>1μS	>2.5μS
t_l	>1μS	>2.5μS
t_{rh}	<0.2μS	<0.3μS
t_{rl}	<0.2μS	<0.3μS
t_s	>1μS	>2.5μS
t_{qck}	>8μS	>10μS
t_{qh}	>4μS	>5μS
t_{ql}	>4μS	>5μS
t_{qrh}	<0.2μS	<0.3μS
t_{qrl}	<0.2μS	<0.3μS
t_{qs}	>1μS	>2.5μS

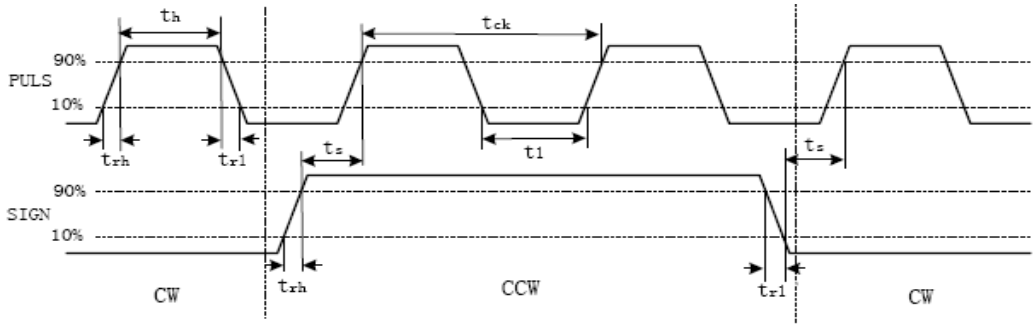


Figure 12 Pulse + timing chart of sign input interface (maximum pulse frequency500KHz)

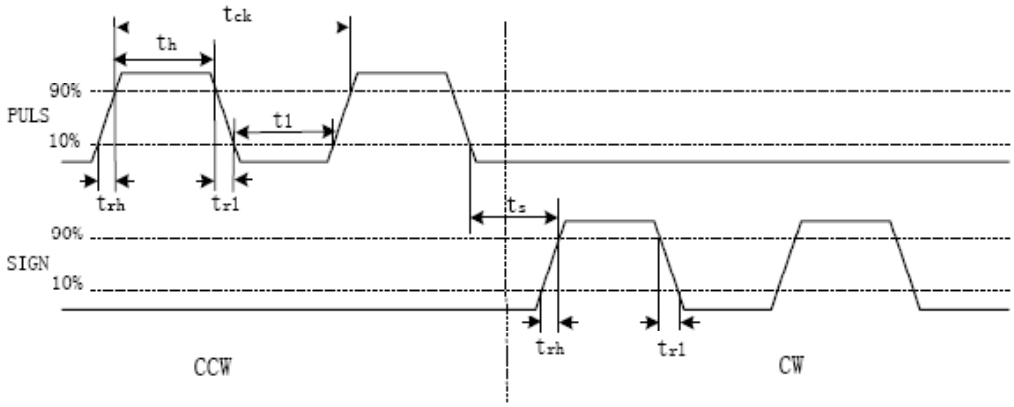


Figure 13 CCW pulse/CW pulse timing chart of sign input interface (maximum pulse frequency500KHz)

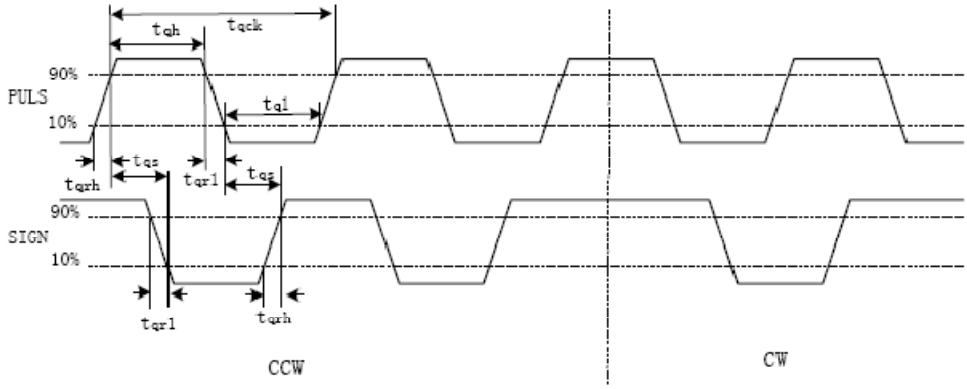


Figure 14 Two phases command pulse timing chart of sign input I nterface (maximum pulse frequency≧125KHz)

3.5.4 Analog input interface

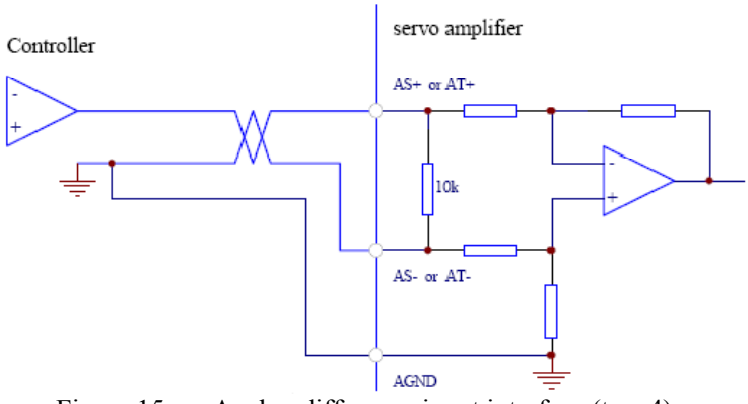
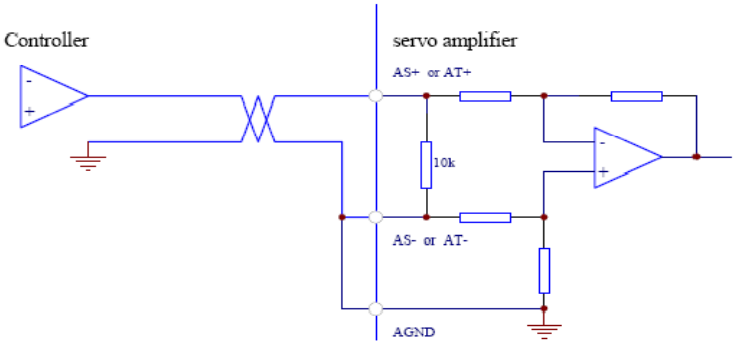
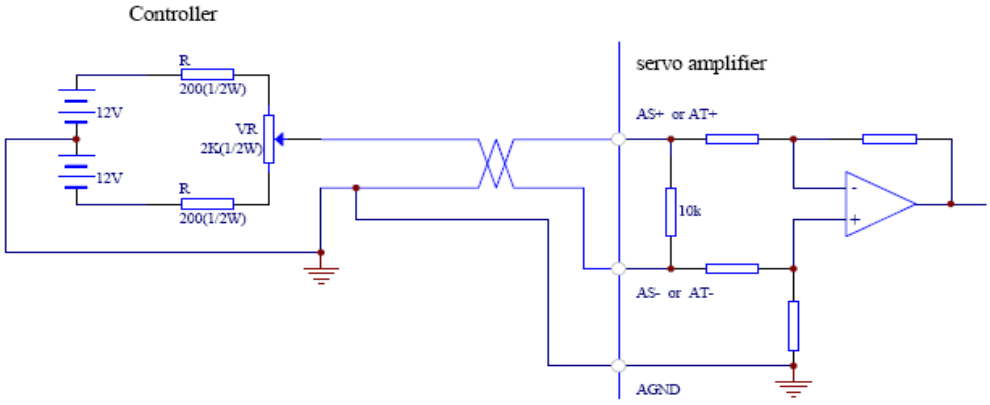


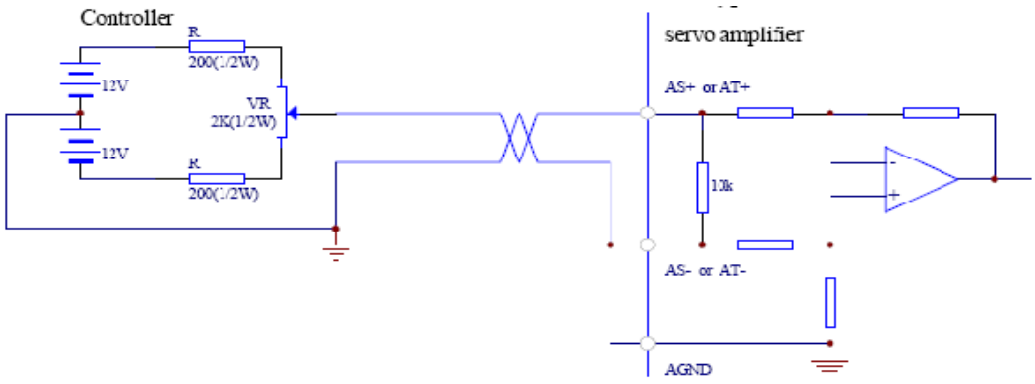
Figure 15 a Analog difference input interface (type4)



b. Single end analog input interface (type4)



c. Input interface of analog difference potentiometer (type4)



d. Input interface of analog single end potentiometer (type4)

(1) The analog input interface is difference mode, according to different connections, which can be accessed as two modes: difference and single end , the input impedance is 10kΩ, the input voltage range is -10V~+10V;

(2) In the difference mode, analog ground line connect with negative input terminal by controller side, it needs three lines to connect the controllers and driver;

(3) In the single end mode, analog ground line connect with negative input terminal by controller side, it needs two lines to connect the controllers and driver;

(4) The performance of difference mode is more excellent than single end, it can inhibit common-mode interference;
(5) Input voltage range can not exceed -10V~+10V, or else the driver may be damaged;
(6) It suggests to connect shielded cable to reduce noise interference,
(7) It is normal that analog input interface exists zero-bias, and you can adjust data ***PA45*** to compensate the zero-bias;
(8) Analog interface is non-isolated (non-insulation).

3.5.5 Encoder signal output interface

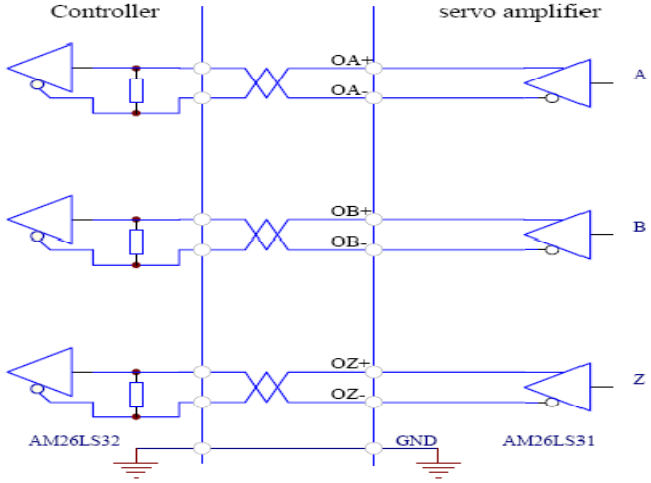
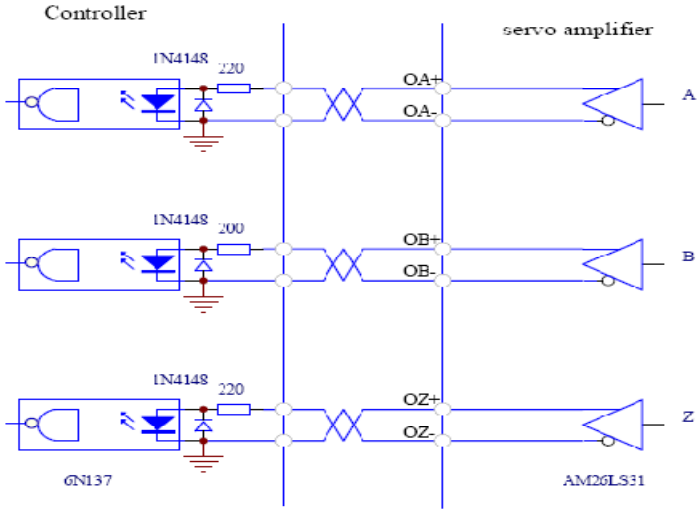


Figure 16 a Photoelectric encoder output interface(Type 5)



b Photoelectric encoder output interface(Type 5)

(1) The encoder signal outputs through the difference driver;
(2) The controller input terminal may use the AM26LS32 receiver, it must connect the terminal resistance, which is approximate 330Ω ;
(3) The controller grounding line and the driver grounding line must connect reliably;
(4) Non-isolated output;

(5) The controller input terminal may use the electro-optical coupler to accept, but it must use the high speed electro-optical coupler.

3.5.6 Encoder Z signal collector opening output interface

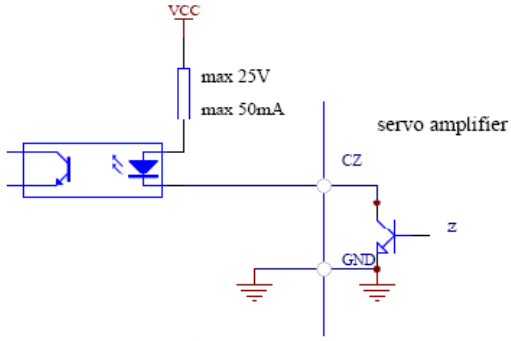


Figure 17 Electro-optical encoder output interface (Type6)

(1) The encoder Z signal outputs through the collector opening, when the encoder Z signal appears, output is ON (output open), otherwise output is OFF (output closure);
(2) Non-isolated output (non-insulation);
(3) In the superior machine, the Z signal pulse is usually very narrow; therefore please use the high speed electro-optical coupler to receive.

3.5.7 Servo motor photoelectric encoder input interface

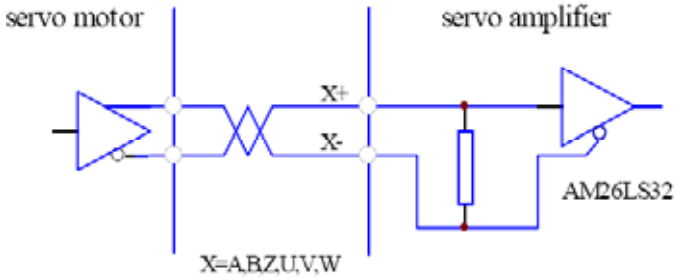
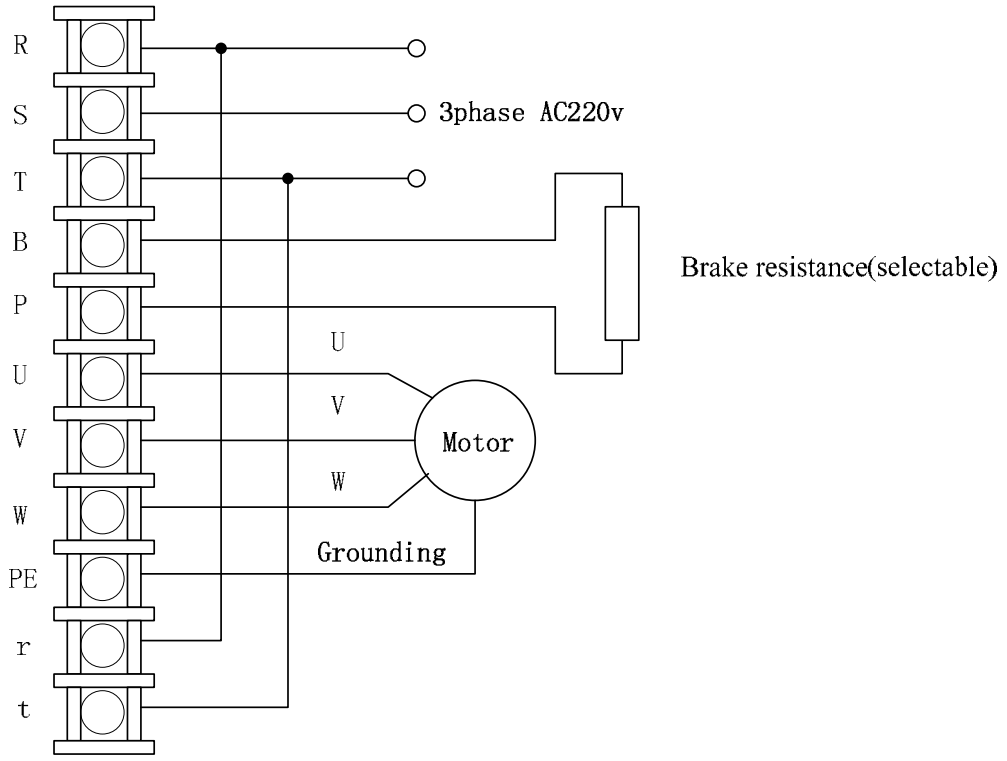


Figure 18 Servo motor photoelectric encoder input interface

3.6 Brake resistance terminals TB



Drive terminals TB

Generally, it doesn't need external resistance. While it appears regenerative energy oversized because of deceleration, the internal brake resistance can not absorb completely, and causes to appear the Err3 over votage alarm or Err-14 brake alarm, it could increase the deceleration time properly, if it also appears alarm, then should connect the B, P terminals to the brake resistance through external connection, which use to enhance brake effect. The value of external connection brake resistance is about 40~200Ω, the value of power is about 100~50W, the resistance value is smaller, the break current is bigger, the needful brake resistance power to be bigger, the brake energy to be bigger, but, if the value of resistance is too small, the driver may be damaged, the testing method is that adjusting the value of resistance from big to small until the driver no longer appears alarm. The external connection brake resistance and the internal brake resistance (approximately 40Ω) are the parallel connection. For the external connection brake resistance, it must wait for five minutes after the driver power supply is off, and after the internal high voltage releases completely, and then it could be openominal.

Because B, P terminals connect with internal high voltage circuit , so it can not touch B, P terminals within five minutes after the driver power supply is off and ON, prevent from geting an electric shock, PC, P terminals can not touch with other terminals, prevent from short circuit, and damaging the driver.

CHAPTER 4 DATAES

NOTICE

- Any person who will adjust dataes should be fully familiar with the meaning of dataes. Any error of the data adjustment may cause to damage the equipment and/or operators.
- It is strongly recommended that first time you adjust the data should make it run in no save mode, so as to avoid the misuse adjustment.

4.1 Data list

Dataes as shown in the following table are factory values.

Table5 Data list

NO.	Data Name	Suitable Mode	Data Range	Factory Values	Unit
PA0	Password	P, S, T	0-9999	315	
PA1	Model code	P, S, T	0-51	30	
PA2	Software edition（read only）	P, S, T	*	*	
PA3	Screen Display mode	P, S, T	0-21	0	
PA4	Motor control mode	P, S, T	0-6	0	
PA5	Speed loop proportional gain	P, S	5-2000	150	Hz
PA6	Speed loop integral gain	P, S	1-1000	20	ms
PA7	Low-pass filter bandwidth of torque command	P, S, T	20-500	100	%
PA8	Low pass bandwidth of speed ring	P, S	20-500	100	%
PA9	Position loop proportional gain	P	1-1000	40	1/S
PA10	Position Feedforward gain	P	0-100	0	%
PA11	The cut-off frequency of position feedback forward filter	P	0-1200	300	Hz
PA12	First position command pulse frequency division numerator	P	1~32767	1	
PA13	Denominator of position gear case	P	1~32767	1	
PA14	Position command pulse input mode	P	0~2	0	
PA15	Position command pulse reverse	P	0~1	0	
PA16	Orientation complete range	P	0~30000	20	pulse
PA17	Detection range of position exceed or miss	P	0~30000	400	*100pulse
PA18	Position exceeding or missing error is invalid	P	0~1	0	
PA19	Position command smooth filter	P	0-30000	0	0.1ms

PA20	Drive inhabit input invalid	P,S,T	0-1	0	
PA21	Speed set in JOG mode	S	-3000-3000	120	rpm
PA22	Internal or external speed command select	S	0 2	1	
PA23	Maximum speed limit set	P,S,T	0-4000	3600	rpm
PA24	Internal speed 1	S	-3000~3000	0	rpm
PA25	Internal speed 2	S	-3000~3000	100	rpm
PA26	Internal speed 3	S	-3000~3000	300	rpm
PA27	Internal speed 4	S	-3000~3000	-100	rpm
PA28	Reached speed	S	0 3000	500	rpm
PA29	Analog torque command input gain	T	10 100	30	0.1V/100 %
PA30	User torque overload alarm value	P,S,T	1-300	300	%
PA31	User torque overload alarm check time	P,S,T	0-32767	0	ms
PA32	Control mode switch allow	P,S,T	0-1	0	
PA33	Reverse enable of analog torque input	T	0~1	0	
PA34	Internal CCW torque limit	P,S,T	0 ~ 300	300	%
PA35	Internal CW torque limit	P,S,T	-300 ~ 0	-300	%
PA36	External CCW torque limit	P,S,T	0 ~ 300	100	%
PA37	External CW torque limit	P,S,T	-300 ~ 0	-100	%
PA38	Torque limit in JOG mode	S	0-300	100	%
PA39	Analog torque input bias compensation	T	-2000 2000	0	
PA40	The time-constant of speed linear accelerate	S	1~10000	0	MS
PA41	The time-constant of speed linear decelerate	S	1~10000	0	MS
PA42	S model acc and dec time	S	1-1000	0	MS
PA43	Analog speed command input gain	S	10 3000	300	RMP/V
PA44	Reverse enable of analog speed input	S	0~1	0	
PA45	Analog speed command zero bias compensation	S	-5000 5000	0	
PA46	Low pass bandwidth of analog speed input	S	0~1000	300	Hz
PA47	The mechanical brake action set when the motor stop	P,S,T	0 200	0	*10ms
PA48	The mechanical brake action set when the motor operate	P,S,T	0 200	50	*10ms
PA49	The mechanical brake speed set when the motor operate	P,S,T	0 3000	100	rpm
PA50	Speed limit in torque mode	T	0-5000	3600	RMP

PA51	Dynamic electronicic gear is effective	P	0~1	0	
PA52	Second position command pulse frequency division numerator	P	1~32767	1	
PA53	Compel ON on the low4 bit of the superior machine input terminals	P,S,T	0000-1111	0000	binary
PA54	Compel ON on the high 4 bit of the superior machine input terminals	P,S,T	0000-1111	0000	binary
PA55	Rightabout control on the low 4 bit of the superior machine input terminals	P,S,T	0000-1111	0000	binary
PA56	Rightabout control on the high 4 bit of the superior machine input terminals	P,S,T	0000-1111	0000	binary
PA57	Rightabout control of the superior machine output terminals	P,S,T	0000-1111	0000	binary
PA58	input terminals anti-vibration time	P,S,T	1-1000	16	0.1ms
PA59	Demo mode	P,S	0-1	0	

4.2 The contents of dataes

NO.	Data Name	Data Description	Range
PA0	User data protectio n code	1. In order to prevent from modify incorrectly. Generally, if the data need to be setted, first, you should set the data as proper password, and then set data. After completing the debugging, that should set this data as 0 to make sure the data will not be modified incorrectly. 2. Passward has different class according to the user parameter,system parameter and all the parameter. 3. modify the driver type parameter (PA1).you must use the driver type password.other password can not od that 4.user password is **315.** 5.driver type password is **385**	0 9999
PA1	Driver type	1. it is modified according the motor and drive. 2.different motors and drives are different default value.when using restore function.you need adjust this parameter to meet the motor. 3.when eeprom alarm is**20**.after recover, you also need	0－51

		reset this papameter to meet the motor, or the driver work abnormally or is easily damaged. 4.modify this parameter.you need firstly set PA0 to **385** 5.the details please refer to chapter 7.14.1 and chapter8	
PA2	Software edition	It is able to examine software edition Numer., but the users can't modify it.	—
PA3	Display mode	Select LED display status after servo drive input current 0: Display motor's current speed; 1: Display low 5 bit of current position; 2: Display high 5 bit of current position; 3: Display low 5 bit of position command(command pulse accumulated value); 4: Display high 5 bit of position command(command pulse accumulated value); 5: Display low 5 bit of position deviation; 6: Display high 5 bit of position deviation; 7: Display motor's current torque; 8: Display motor's current; 9: Display linear speed; 10: Display control mode; 11: Display postion command pulse frequency 12: Display speed command; 13: Display torque command; 14: Display rotor's absoluteness position; 15: Display input terminals' state; 16: Display output terminals' state; 17: Display photoelectric encoder input terminals state 18: Display run state; 19: Display alarm code; 20: Reserve 21: Reserve	0 20
PA4	Motor control mode	(1) Setting control mode of servo driver through this dat 0: Position control mode 1: Speed control mode 2: trial operation mode 3: JOG control mode 4: encoder automatic adjust zero mode 5: open loop run mode(used for test motor a encoder) 6: Torque control mode (2) In position control mode, position command input from pulse input interface; (3) In speed control mode, speed command input from input terminals or analog input, which is decided by data (***PA22***). When using internal speed mode,	0 6

		SC1and SC2 compound to choose the differ 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; (4) trial operation mode,speed command is fr keyboard, it is used to test the drive and motor. **(5)** In JOG control mode, press Up and hold ,the motor run as JOG speed, release the key, the motor stop and keep zero-speed; press Down and hold, the motor run reverse, then release the key, the motor stop and keep zero-speed; (6)In encoder automatic adjust zero mode, it is used to adjust zero-point compensation.	
PA5	Speed loop proporti onal gain	(1) Setting the speed loop proportional gain; (2) The larger the setted value is, the higher the gain and the greater the stiffness will be. The value is is determined by the type and the load of the servo driver. general, the larger the load is, the larger the setted value is; (3) If there is no oscillation, the higher the better.	5~2000Hz
PA6	Speed loop integral gain	(1) Setting integral gain of the seed loop adjuster; (2) The smaller the setted value is, the faster the integral speed will be. It is Is easy to bring an over modulation if the value is too large, and it will make the response slow down if the value is too small; (3) The value is determined by the type and the load of servo driver. In general, the larger the load inertia is, the smaller the setted value will be.	1~1000ms
PA7	Low-pas s filter bandwid th of torque comman d	(1) Setting the command bandwidth which output to torque loop; (2) The smaller the value is, the lower the cut off frequency is, the smaller the noise from motor. If the load inertia is very large, it could appropriately reduce setted value. If the value is too small, that will make the response slow down, and may cause oscillation; (3) The larger the value is, the higher the cut off frequency is, the faster the feedback response of the speed will be. If you need a higher response rate, you could increase setted value appropriately.	20-500%
PA8	Low-pas s bandwid th of	(1) Setting characteristics of speed detection filter; (2) The smaller the value is, the lower the cut off frequency is, the smaller the noise from motor. If the load inertia is very large, it could appropriately reduce	20-500%

	speed	setted value. If the value is too small, that will make the response slow down, and may cause oscillation; (3) The larger the value is, the higher the cut off frequency is, the faster the feedback response of the speed will be. If you need a higher response rate, you could increase setted value appropriately.	
PA9	Position loop proporti onal gain	(1) Set the proportional gain of position loop adjuste (2) The larger the setted value is, the higher the gain the greater the stiffness will be, and the smaller t hysteresis is when with the same frequency comma pulse. But the value is too large, it may cause over modulation oscillation; (3) The value is determined by the type and the load of servo driver.	1 1000/S
PA10	position feedback gain	(1)set the position feedback gain (2)when set 100%,it means that in any condition,positi Lag is 0. (3)when the gain is bigger,the control system responsir Speed increases.but it will make the system not stabl is Easy to make vibration.	0-100%
PA11	The cut-off frequenc y of position feedback forward filter	(1) It is used to set the low-pass filter's cut-off frequency of position feedback forward; position feed forward loop. the unit is Hz; (2) This filter is used to increase stability of compound position control.	1 1200Hz
PA12	First position comman d pulse sub-freq uency numerat or	(1) Used to set the frequency multiplication for command pulse (electric gear); (2) In the position control mode, it is convenient to match every pulse source bysetting dataes PA12 and PA13, to meet the required resolution (angle/pulse); (3) P×G=N×C×4 P: Input command pulse number; G: sub-frequency molecule / sub-frequency denominator; N: The revolving circle of the motor; C: The photoelectric encoder's resolving ability, this system is C=2500; (6) (For example) When the input command pulse is 6000, the motor runs one circle; $G = \frac{N \times C \times 4}{P} = \frac{1 \times 2500 \times 4}{6000} = \frac{5}{3}$	1~32767

		So please set ***PA12***=5, ***PA13***=3 (5) Recommendatory range of electronicic gear ratio 1/50≤G≤50	
PA13	Denominator of frequency multiplication for position command pulse	Refer to PA12	1~32767
PA14	Position command pulse input mode	(1) Set the input form of position command pulse; (2) Set one of three input ways by dataes; 0: Pulse + symbol; 1: CCW pulse / CW pulse; 2: Two-phases orthogonal input pulses; (3) CCW, CW direction refer to Chapter1.3	0~2
PA15	The direction of position command pulse reverses	It is setted as: 0: Normal; 1: The direction of position command pulse reverses.	0~1
PA16	Positioning complete range	(1) Set positioning complete range in position control mode; (2) This data provides a gist that the driver determines whether the positioning completes in position control mode. When the remaining pulse number of position deviation counter isn't more than this setted data value, the drive considers that positioning has been completed, the positioning complete signal COIN is ON, otherwise COIN is OFF; (3) In position control mode, the positioning complete output signal COIN, in other control mode, the output speed reach SCMP.	0~30000 pulse
PA17	The detection range of position exceeding and deficiency	(1) Set the detection range of position exceeding and deficiency; (2) In position control mode, the counter value of position deviation counter exceed this data value, servo drives will alarm.	0~30000*100 pulse

PA18	The error of position exceeding and deficiency is invalid	It is setted as: (1) 0: The alarm detection of position exceeding and deficiency is valid; (2) 1: The alarm detection of position exceeding and deficiency is invalid, stop to detecte the error of position exceeding and deficiency.	0~1
PA19	Position command filter constant	(1) Command pulse smoothly filter exponential accelerate and decelerate, the value shows time constant and the unit is Ms; (2) Filter cannot lose input pulse, but it may lead to command delay; (3) This filter is used for: 1. Upper controller doesn't have the function; of acceleration and deceleration; 2. The frequency multiplication of electric gear too big. (＞10); 3. Command frequency is lower; 4. It appears stepper jump and imbalance when the motor is running; (4) Filter is ineffective while setting data as 0.	0-30000*0.1 ms
PA20	Drive inhabit input invalid	As set 0:CCW,CW input inhabit valid.when CCW input is on.CCW direction can run.if CCW input is off. CCW direction keeps 0torque. CW is same.when both CCW, CW are off.this will have a erro alarm 1:CCW,CW input inhabit invalid.whether CCW,CW input are on or off. CCW and CW direction can run.both CCW and CW is off. There is no alarm.	
PA21	Set speed in JOG mode	It is use to set JOG operating speed.	-3000-3000r mp
PA22	Internal or external speed command selection	(1) Set 0, speed command gets from internal speed; (2) Set1, speed command gets from external analog input. (3) Set2, speed command gets from external analog input.single input 0-10v,speed direction is decided by input terminal FIL(ccw torque limit),RIL(cw torque limit).FIL is on.turn CCW direction.RIL is on.turn CW direction. Both FIL and RIL are on or off.speed is 0.in this condition.the external torque limit is invalid.	0 1
PA23	The maximum speed	(1) Setting the maximum speed limit of the servo motor; (2) It is irrespective of the direction of rotation;	0 3000rmp

	limit	(3) If the setted value is large than nominal speed, the actual maximum speed limit is the nominal speed.	
PA24	Internal speed 1	(1) Setting the internal speed 1; (2) In speed control mode, please choose the internal speed 1 as the speed command when SC1 is OFF, SC2 is OFF.	-3000~3000rmp
PA25	Internal speed 2	(1) Setting the internal speed 2; (2) In speed control mode, please choose the internal speed 2 as the speed command when SC1 is ON, SC2 is OFF.	-3000~3000rmp
PA26	Internal speed 3	(1) Setting the internal speed 3; (2) In speed control mode, please choose the internal speed 3 as the speed command when SC1 is OFF, SC2 is ON.	-3000~3000rmp
PA27	Internal speed 4	(1) Setting the internal speed 4; (2) In speed control mode, please choose the internal speed 4 as the speed command when SC1 is ON, SC2 is ON.	-3000~3000rmp
PA28	Reached speed	(1) Setting the reached speed, the unit is rpm; (2) In non-position control mode, if the motor is faster than the setted value, SCMP is ON, otherwise SCMP is OFF; (3) In the position control mode, it doesn't use this data; (4) It is irrespective of the direction of rotation; (5) Comparators have hysteretic characteristics.	0 3000rmp
PA29	The input gain of analog torque command	(1) Setting proportional relation between analog torque input voltage and the motor's actual operating torque; (2) The unit of setted value is 100% / 0.1V; (3) The default value is 30, and it corresponds 100% / 3V, that means generating 100% nominal torque when input 3V voltage.	10 100(0.1V/100%)
PA30	User torque overload alarm value	(1)it is used to set user torque limit.this value is percentage and no direction(both limit CCW and CW direction). (2)when PA31>0,and motor torque >PA30,the continue time >PA31,the drive will be alarm.it is ERR-29.motor stop.only restarting can extinguish the alarm	1-300
PA31	User torque overload alarm check time	User torque overload alarm check time.unit is MS. Set 0:PA30 is invalid. Generally it is set to0	1-32767
PA32	Control	Set 0: don't allow to switch.	0- 1

	mode switch allow	Set 1:allow to swith.Use ALRS to switch.the alarm release fuction is invalid. PA4 ALRS Control Mode 0 OFF Postion ON Speed 1 OFF Speed ON Torque 6 OFF Torque ON Position	
PA33	Reverse enable of analog torque input	(1) Polar of analog torque input reverses; (2) While setting 0 and the analog torque command is pros, the direction of torque is CW; (3) While setting 1 and the analog torque command is pros, the direction of torque is CCW.	0~1
PA34	Internal CCW torque limit	(1) Setting the CCW internal torque limit of the motor. (2) This value is the percentage of nominal torque. example, if the torque limit is double nominal torque, th setted value is 200; (3) The toque limit is always valid at any time; (4) If the value is higher than the allowable maximum overload, the actual toque limit is the allowable maximum overload.	0-300%
PA35	Internal CW torque limit	(1) Setting CCW internal torque limit of the motor; (2) This value is the percentage of nominal torque. example, if the torque limit is double nominal torque, th setted value is 200; (3) The toque limit is always valid at any time; (4) If the value is higher than the allowable maximum overload, the actual toque limit is the allowable maximum overload.	-300-0%
PA36	External CCW torque limit	(1) Setting the CCW external torque limit of the motor. (2) Setted value is the percentage of nominal torque, for example, setting 1 time of the nominal torque, the setted value is 100. (3) The toque limit is valid just while the CW torque limit input terminal (CWTLtd) is ON. (4) When the CW external torque limit is valid, the actual torque limit is the minimum value of the absolute value among the allowable maximum overload, the CW internal torque limit and the CW external torque limit.	0-300%
PA37	External CW torque	(1) Setting CW external torque limit of the motor. (2) Setted value is the percentage of nominal torque, for example, setting 1 time of the nominal	-300-0%

	limit	torque, the setted value is 100. (3) The toque limit is valid just while the CCW torque limit input terminal (CCWTLtd) is ON. (4) When the CW external torque limit is valid, the actual torque limit is the minimum value of the absolute value among the allowable maximum overload, the CCW internal torque limit and the CCW external torque limit.	
PA38	Torque limit in JOG mode	(1)set torque limit in jog mode (2)no limit in direction (3)the set value is percentage.if set twice of rated torque.plese set to 200 (2)inner torque is valid.	0-300%
PA39	The Bias compensation of analog torque	(1) The zero bias compensation of the analog torque input; (2) The unit of setted value is mv.	-2000 2000
PA40	Time constant of speed linear acceleration	(1) Setted value is the time that the motor accelerates from 0 to 1000 r / min (2) Characteristics of acceleration and deceleration are linear; (3) It is only for speed control mode, position control mode is void; (4) If the driver operates in the position control mode, or it uses as combining with the outside position loop, this data should be 0.	1~10000ms
PA41	Time constant of speed linear deceleration	(1) Setted value is the time that the motor decelerates from 1000 r / min to 0 (2) Characteristics of acceleration and deceleration are linear; (3) It is only for speed control mode, position control mode is void; (4) If the driver operates in the position control mode, or it uses as combining with the outside position loop, this data should be 0.	1~10000ms
PA42	S model acc and dec time	Make motor start and stop.set S model acc and dec time	1-1000ms
PA43	The input gain of analog speed command	(1) Setting proportional relation between analog speed input voltage and the motor's actual operating speed;	10 3000RMP/V
PA44	Reverse	(1) Polar of analog speed input reverses;	0~1

	enable of analog speed input	(2) While setting 0 and the analog speed command is pros, the direction of speed is CCW; (3) While setting 1 and the analog speed command is pros, the direction of speed is CW.	
PA45	Analog speed command zero bias compensation	Analog speed command zero bias compensat	-5000-5000
PA46	Low-pass bandwidth of analog speed input	(1) The low-pass filter of analog speed input; (2) The larger the setting, the faster the response speed of speed analog input ,the bigger the noise impact of signal ; the smaller the setting, the slower the response speed of speed analog input ,the smaller the noise impact of signal.	1~1000 Hz
PA47	Action setting of the mechanical brake while the motor stop	(1) Defining the delay time from mechanical brake running to shuting off the motor current (output terminal BRK turns ON to OFF) while the motor stop; (2) In order to avoid minuteness displacement or workpiece depreciation of the motor, this data should be not less than the delay time of mechanical brake.	0-200 *10ms
PA48	Action setting of the mechanical brake while the motor run	(1) Defining the delay time from shuting off the motor current to mechanical brake running (output terminal BRK turns ON to OFF) while the motor run; (2) This data is used to make mechanical brake run after the motor decelerating from the high speed revolving stste to low speed, avoids damaging the brake; (3) The actual operating time is ***PA48***or the time that the motor decelerates to ***PA49***, and then takes the minimum value from the both times.	0-200 *10ms
PA49	Action speed of the mechanical brake while the motor run	(1) Defining the value of speed from shuting off the motor current to mechanical brake running (output terminal BRK turns ON to OFF) while the motor run; (2) The actual operating time is ***PA48*** or the time that the motor decelerates to ***PA49,*** and then takes the minimum value from the both times.	0 3000rmp
PA50	Speed limit in torque	(1)in torque mode ,speed is limit in this value (2) Avoid over speed in low load.	0-5000rmp

<table>
<tr><td></td><td>mode</td><td></td><td></td></tr>
<tr><td>PA51</td><td>Dynamic electronicic gear is effective</td><td>(1) When setting 0, dynamic electronicic gear is invalid, input terminal INH’s function is forbidding command pulse;
(2) When set 1, the dynamic electronicic gear is valid, the input terminal INH’s function is switching electronicic gear. When INH terminal is OFF, the input electronicic gear is PA12/PA13 when INH terminal is ON, the input electronicic gear is PA54/PA13 the electronicic gear ratio could be changed by controlling INH terminal.
(3) Attention to that the first and second electronicic gear sub-frequency denominator is the same.</td><td>0~1</td></tr>
<tr><td>PA52</td><td>The second position command pulse sub-frequency numerator</td><td>(1) Set up the second position command pulse sub-frequency (electronicic gear);
(2) While using the dynamic electronicic gear,it must set dataes PA51 =1, then the function of input terminal INH (command pulse forbid) translates into control terminal of electronicic gear switching input;
(3)when INH is off. Input electronicic gear is PA12/PA13 .when INH is on Input electronicic gear is PA54/PA53.</td><td>1~32767</td></tr>
<tr><td>PA53</td><td>The low 4bit of the superior machine input terminals compel ON</td><td>(1) That must use external connection to control ON / OFF, the terminal that compeled ON doesn’t need external connections. the interior of driver will set ON automatically;
(2) Denoteing with six bit binary. If this bit is 0, that denotes the input terminal doesn’t compel ON, if this bit is 1, that denotes the input terminal compels ON. The input terminals denoted by binary are as below:
<table><tr><td>3</td><td>2</td><td>1</td><td>0</td></tr><tr><td>RSTP</td><td>FSTP</td><td>ALRS</td><td>SON</td></tr></table>SON: Servo enable;
ALRS: Alarm clear;
FSTP: CCWservo driver forbid;
RSTP: CW servo driver forbid;</td><td>0000-1111</td></tr>
<tr><td>PA54</td><td>The high 4 bit of the superior machine input terminals compel ON</td><td>(1) That must use external connection to control ON / OFF, the terminal that compeled ON doesn’t need external connections. the interior of driver will set ON automatically;
(2) Denoteing with four bit binary. If this bit is 0, that denotes the input terminal doesn’t compel ON, if this bit is 1, that denotes the input terminal compels ON. The input terminals denoted by binary are as below:</td><td>0000-1111</td></tr>
</table>

<table>
<tr><td></td><td></td><td>
<table>
<tr><td>3</td><td>2</td><td>1</td><td>0</td></tr>
<tr><td>RIL</td><td>FIL</td><td>INH/SC2</td><td>CLE/SC1/ZEROSI</td></tr>
</table>
CLE/SC1/ZEROSPD: Deviation counter clear / Speed choose 1 / Zero speed clamp;
INH/SC2: Command pulse forbid /Speed choose 2;
FIL: CCW torque limit
RIL: CW torque limit
</td><td></td></tr>
<tr><td>PA55</td><td>Rightabout controlment on the low 4 bit of the superior machine input terminals</td><td>(1) The input terminal is rightabout. The terminal that isn’t rightabout is effective while the switch close, and it is not effective while the switch disconnect; the terminal that is rightabout is not effective while the switch close, and it is effective while the switch disconnect;
(2) Denoteing with six bit binary. If this bit is 0, that denotes the input terminal is not rightabout, if this bit is 1, that denotes the input terminal is rightabout. The input terminals denoted by binary are as below:
<table>
<tr><td>3</td><td>2</td><td>1</td><td>0</td></tr>
<tr><td>RSTP</td><td>FSTP</td><td>ALRS</td><td>SON</td></tr>
</table>
SON: Servo enable;
ALRS: Alarm clear;
FSTP: CCWservo driver forbid;
RSTP: CW servo driver forbid;</td><td>0000-1111</td></tr>
<tr><td>PA56</td><td>Rightabout controlment on the high 4 bit of the superior machine input terminals</td><td>(1) The input terminal is rightabout. The terminal that isn’t rightabout is effective while the switch close, and it is not effective while the switch disconnect; the terminal that is rightabout is not effective while the switch close, and it is effective while the switch disconnect ;
(2) Denoteing with four bit binary. If this bit is 0, that denotes the input terminal is not rightabout, if this bit is 1, that denotes the input terminal is rightabout. The input terminals denoted by binary are as below:
<table>
<tr><td>3</td><td>2</td><td>1</td><td>0</td></tr>
<tr><td>RIL</td><td>FIL</td><td>INH/SC2</td><td>CLE/SC1/ZEROSPD</td></tr>
</table>
CLE/SC1/ZEROSPD: Deviation counter clear / Speed choose 1 / Zero speed clamp;
INH/SC2: Command pulse forbid /Speed choose 2;
SignInv: Position command pulse symbol bit;
PulseInv: Position command pulse bit;</td><td>000-1111</td></tr>
<tr><td>PA57</td><td>Rightabout controlment on</td><td>(1) The ouput terminal is rightabout. For the terminal that is rightabout, its definition of opening and closure is contrary to normal definition;
(2) Denoteing with four bit binary. If this bit is 0,</td><td>0000-1111</td></tr>
</table>

<table>
<tr><td></td><td>the high 4 bit of the superior machine output terminals</td><td>that denotes the output terminal is not rightabout, if this bit is 1, that denotes the output terminal is rightabout. The input terminals denoted by binary are as below:
<table><tr><td>3</td><td>2</td><td>1</td><td>0</td></tr><tr><td>BRK</td><td>COIN</td><td>ALM</td><td>SRDY</td></tr></table>SRDY: Servo ready output;
ALM: Servo alarm;
COIN: Position complete / speed reach;
BRK: Mechanical brake release.</td><td></td></tr>
<tr><td>PA58</td><td>input terminals anti-vibration time</td><td>(1)input signal anti-vibrate time
(2)the small it is .the faster the response is
(3)the value is big.the anti vibtate is good .but the reponse is slow.</td><td>1-1000*0.1ms</td></tr>
<tr><td>PA59</td><td>Demo mode</td><td>Special test</td><td>0-1</td></tr>
</table>

CHAPTER 5 PROTECTION FUNCTION

5.1 Alarm list

Table 5.1 Alarm list

Alarm Code	Alarm name
-	Nnatural
ERR- 1	Overspeed warning
ERR-2	Main power supply over-voltage
ERR-3	Main power supply under-voltage
ERR-4	Position command overflow warning
ERR-5	Motor overheat
ERR-6	Speed Amplifiers erro
ERR-7	Both of CCW and CW driving prohibit
ERR-8	Position deviation counter's absolute value more than 2^30
ERR-9	Encoder signal error
ERR-10	Control power Voltage is low
ERR-11	IPM module error
ERR-12	Current overshoot in U, V or W wire
ERR-13	Over load
ERR-14	Brake circuit error
ERR-15	Encoder counter error
ERR-16	Motor overheart(over the set value)
ERR-17	Speed reponse erro
ERR-19	Heat recover
ERR-20	EEPROM fails
ERR-21	U4 erro
ERR-22	reserve
ERR-23	U6erro
ERR-29	User torque limit alarm
ERR-30	Encoder Z pulse lose
ERR-31	Encoder UVW signal erro
ERR-32	Enconder UVW signal is illegal

5.2 Method to solve alarm

Table 5.2 Alarm and solving ways

Alarm code	Alarm name	Running mode	Cause	Solving ways
1	**OVSPEED**	Occurs when connects to control power supplier	① Control electro-circuit board error ② Encoder error	①Change servo driver ② Change servo motor
		Occurs during motor running	① Too big inputting dictate pulse frequency	① Setting correct inputting pulse
			① Time constant of accelerate and decelerate is too small, causing too big speed over modification	① Increase time constant of accelerate and decelerate
			① The inputting electronic gear rate is too big	① Correct setting dataes
			①Encoder error	① Change motor
		Occurs when motor start	Load is too big	Reduce the load Chang big motor
			Encoder z point erro	Change the servo drive Require the manufacture to adjust it
			Motor UVW wire connect erro Encoder wire connect erro	Connect wire right
2	OV	Occurs when connects to control power supplier	① Electro-circuit board error	①Change Servo Driver
		Occurs when connects to main power supplier	① power supplier's voltage too high ② power supplier's wave error	①check the power supplier
		Occurs during motor running	①Brake resistance disconnect	①Reconnect the circuitry
			① Brake transistor broken Inside brake resistance	①Change Servo Driver

			broken	
3	LV	Occurs When connected to a main power	① ivePCB Fault ② Power insurance damage ③ Soft-start circuitry Fault	① Change Servo drive
			Power voltage is low Short power off is over20ms	② Chenk the power
		Occurs during motor running	Capacity is not enough Short power off is over20ms	①check circuitry
			Radiator is hot	Check the load
4	OVPOSITION	Occurs when connects to control power supplier	①PCB fault	①change servo driver
		Connected to main power supplier and control line, inputting dictate pulse, and motor zero speed	① Wrong connect among U, V, W in the motor ②Leading lines of encoder error	①Correct connection
		To occur in the course of motor operation	① Small position overshoot range	① Increase position overshoot range
			① Scale plus is too small in Position	①Increase plus
			①Torque shortage	①Check torque limit valve ② Decrease load capacity. ③Change Bigger Power servo motor and servo drive
			③ ①frequency of Instructions pulse is too high	①Reduced frequency

5	OH	Occurs When connected to a main power	①PCB Fault	①Change servo driver
			Wire is broken Motor inner fuse is damage	Check the wire Check the motor
		Occurs in the course of motor operation	Motor over load	Reduce load Reduce the start and stop frequency Reduce the torque limit value Reduce the related gain Change to big motor
			Motor inner erro	Chang the motor
6	SS	Occurs in the course of motor operation	Motor is mechanical block	Check load
			Load too big	Reduce the load Change the big motor
7	DRIPROH		①CCW,CW driving prohibiti input ports all disconnect	①check circuitry, input ports
8	Position bias overflow		Motor is mechanical block Input command abnormal	Check load Chenk command pulse Check motor run by the command
9	Enconder erro		encoder damaged encoder lines error encoder disk damaged long line low voltage in enco	Check the wire Change the motor Cheng the wire
10	Control power low voltage		Iuput power low voltage	Check the power
			Drive inner plug bad Switch power abnormal Chip is damaged	Chage the drive Check the plug Check the switch power
11	IPM	Occurs When connected to a main power	①PCB Fault	①change servo driver
		Occurs in the course of motor operation	① voltage supply is too low ② overheat	① check servo driver ② repower ③ change servo driver
			①Short circuit among U,V,W	①check circuitry
			①grounding abnormal	①grounding correctly
			①Motor insulation damaged	①change motor

			①Get disturbed	① increase circuitry filte far from the disturb sourc
12	Over current		Short UVW of drive	Check wire
			Grounding is not good	Grouding correctly
			Motor insulation damagede	Change the motor
			Drive is damaged	Cheng the drive
13	OVload	Occurs when connects to control power supplier	Pcn fault	Change servo driver
		Occurs during motor running	Run in over torque	Reduce load Reduce the start and stop frequency Reduce the torque limit value Reduce the related gain Change to big motor
			Break is not free	Check the break
			Motor vibrate	Adjust the gain Increase acc and dec time Reduce the load
			Uvw one phase is broken Encoder wire erro	Check the wire
14	BRAKE	Occurs When connected to a main power	①PCB Fault	①Change servo driver
		Occurs in the course of motor operation	①Brake resistance disconnect	①reconnect the brake resistance
			①Brake transistor is broken ②Inner brake resistance is broken	①Change servo driver
			Shortage of brake capacity	1 Increase time constan of accelerate and decelerate 2 Reduce torque

				limitation 3 Reduce loading inerti 4 Replace with larger power servo driver and servo motor
			①power supplier's voltage too high	①check the power supplier
15	ENCCOUN		① encoder damaged ② encoder lines error ③ encoder disk damaged ④ fake Z signal existed	①change encoder
			①encoder connect error	①check circuitry
			①grounding abnormal	① grounding correctly ② check shield grounding lines
16	OV heat load	Occurs when connects to control power supplier	Pcb fault	Change servo driver
			Paremeter set erro	Set the parameter right
		Occurs during motor running	Run in over torque long time	Reduce load Reduce the start and stop frequency Reduce the torque limit value Reduce the related gain Change to big motor
			Mechanical transmition is not good	Check mechanical parts
19	Heat recover		Input power is not stable	Check the power
			Under interference	Add the filter Keep away the Interferer source
20	EEPROM		①Chip or electro circuit erro	① Change Servo Drive ② After repaired, set driver type and then recov default dataes.
21	U4 erro		Chip is damaged	Change the drive
22	reserve			

22	U6erro		Chip is damaged	Change the drive
29	User torque limit alarm		PA30.PA31 set not reasonable Sudden big load	Modify the parameter Check the mechanical part.
30	ZPUL		① Z pulse is not existence, encoder is damaged ② cable is in bad situation ③ shield grounding lines connect abnormally ④ encoder interface circuitry fault	① change encoder ② check the encoder interface circuitry
31	UVW erro		① encoder UVW signal is damaged Z pulse is not existence, encoder is damaged ② cable is in bad situation ③ shield grounding lines connect abnormally ④ encoder interface circuitry fault	② change encoder ② check the encoder interface circuitry
32	UVW wrong code		1.encoder UVW signal is damaged 2.cable is in bad situation 3.shield grounding lines connect abnormally 4.encoder interface circuitry fault	change encoder check the encoder interface circuitry

CHAPTER 6 DISPLAY AND KEY OPERATION

The panel is composed by 6 LED nixietube monitors and 4 key-presses of Up Down, Cancel, which is used to display each condition and data of system, and so on. The operation is the level operation, Cancel and Enter key express backlash and advance, the Enter key means entering and confirming, the Cancel key has the significance of the drawalling and cancelling; Up and Down key indicate that increase or reduce serial number or the value. If pressing Down or Up key and maintaining, then there is repeated effect, and the time is longer, the redundant speed is higher.

If 6 nixietubes or the decimal point of the nixietube on most right side twinkle, it indicates that there is warning. If the CHARGE indicating lamp lightens, it expresses that the main power on, if the RUN indicating lamp lightens,it expresses the motor is revolving.

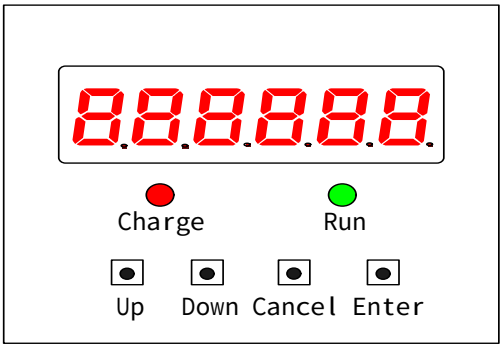


Figure 19 Panel

6.1 First layer

In 1st layer,it is used for the selecting operation, altogether it has 7 ways. Using Up, Down key to shift gears, pressing the Enter key to enter 2nd layer, pressing the Cancel key to return 1st layer from 2ndl layer.

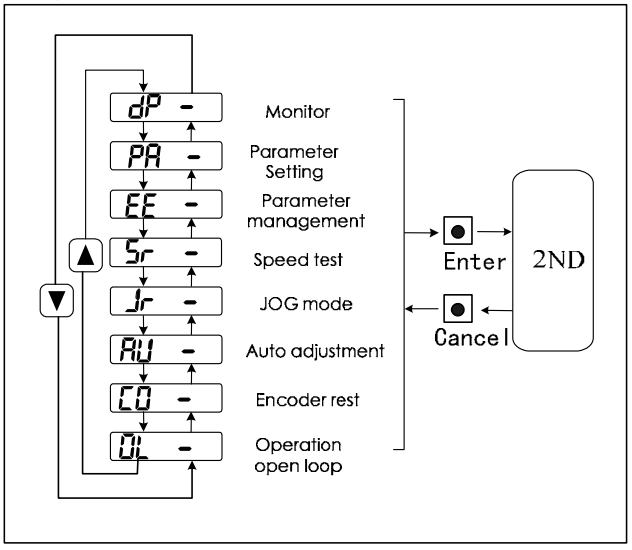


Figure 6.1 Block diagram for selecting operation mode

6.2 Second layer

6.2.1 Monitor mode

In 1st layer, choosing "dP-", and pressing the Enter key to enter the Monitor mode. Altogether it has 19 kinds of display statuses, the user chooses needed display mode by Up, Down key, if you press the Enter key again, then you could enter the concrete display status.

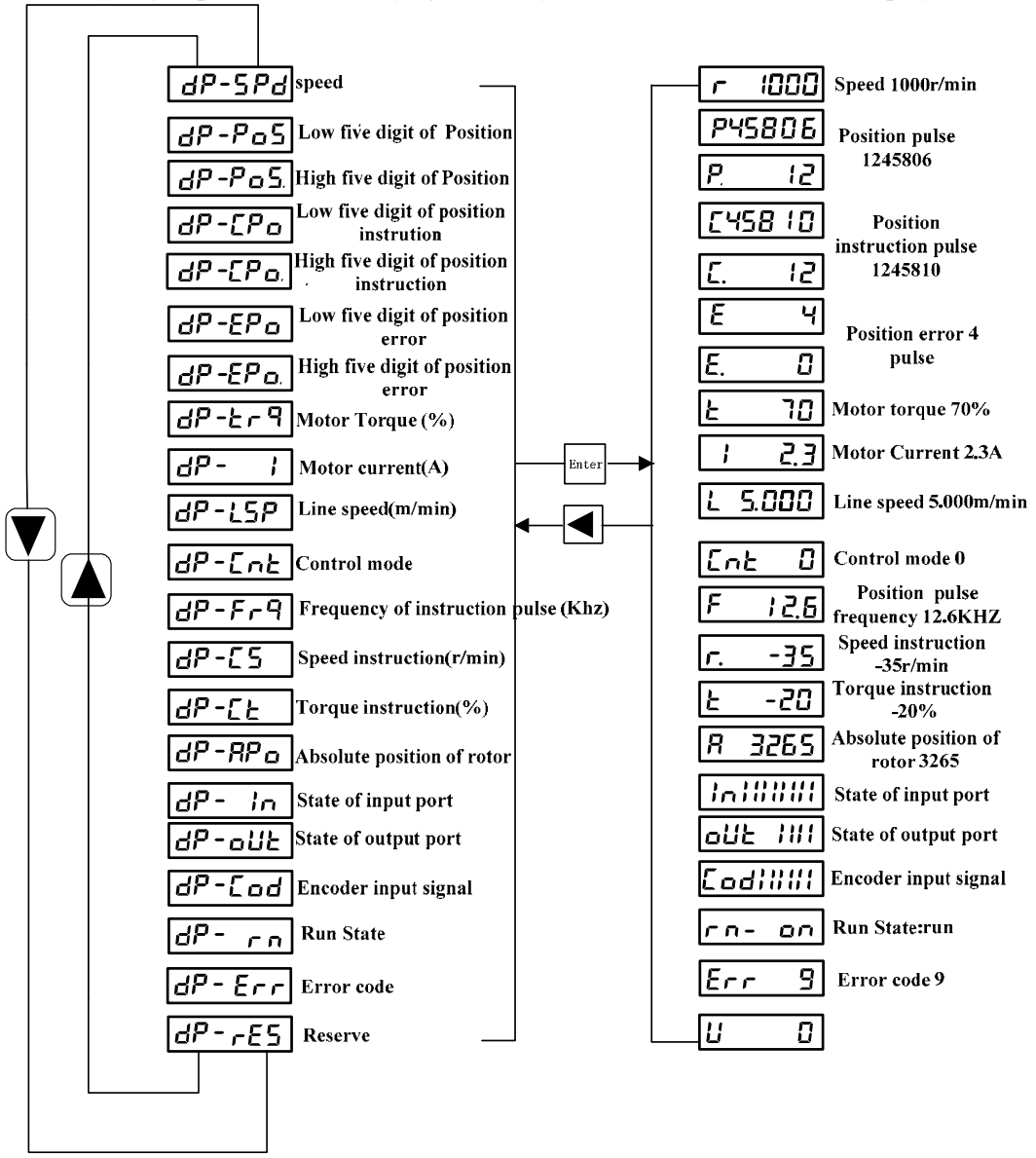


Figure 6.2 Block diagram of operation for monitor mode

[Note1] The input pulse quantity is enlarged by the input electronic gear .
[Note2] The pulse quantity unit is the system interior pulse Unit, in this system 10000 pulse/r. The pulse quantity indicated with high 5 + low 5

The computational method is:

Pulse quantity = high 5 figure value ×100000+ low 5 figure value

[Note3] The control mode:

0-Torque controls;

1- Speed control;

2- Position control;

3-JOG movement; the

4- Speed tries to move;

5- Automatic correction parametric mode.

6- Demonstration pattern (support torque, speed and position control pattern, point-to-point pattern)

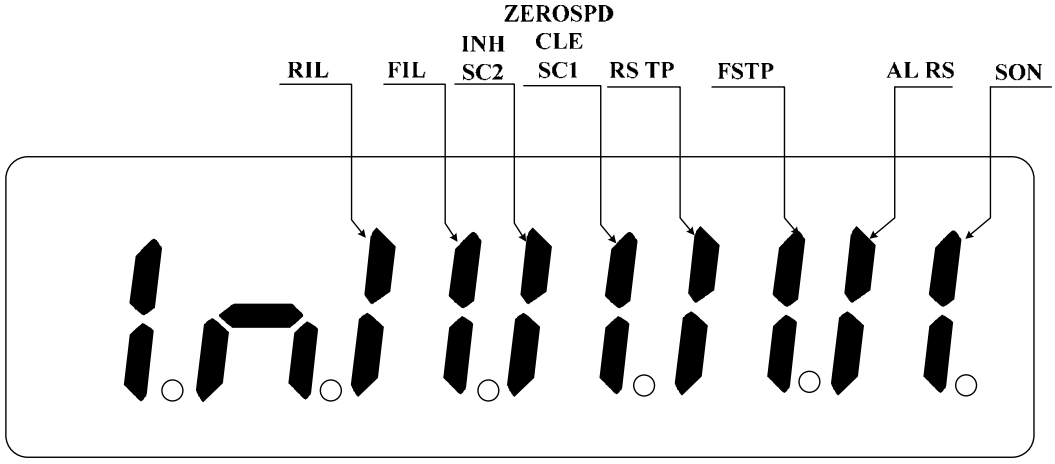
[Note 4] If the demonstration digit achieves 6 (for example demonstration - 12345), then no longer demonstrates the prompting character.

[Note 5] The position command pulse frequency is actual pulse frequency before the input electronic gear, smallest unit 0.1kHz, clockwise direction demonstrates positive number, reverse direction demonstrates negative number.

[Note 6] The motor current computational method is

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

[Note 7] Rotor absolute location in a expresses that the rotor in the position against stator locates, one revolution as one cycle, the scope is 0~9999, this value has nothing to do with the electronicic gear ratio.



Iutput display

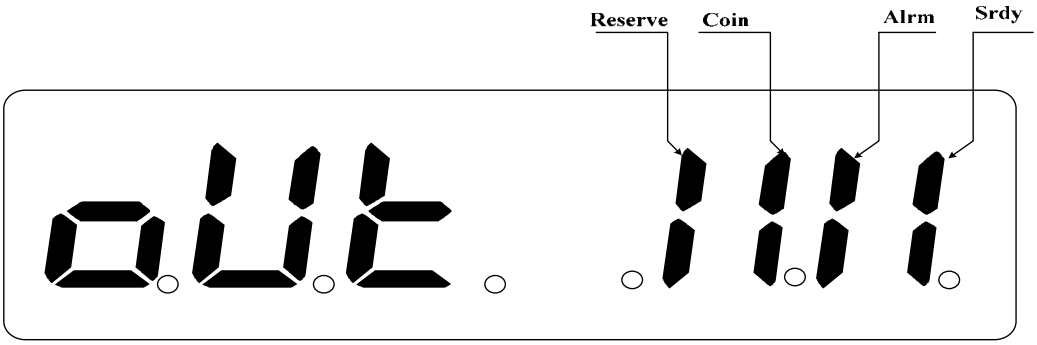


Figure22 Output display

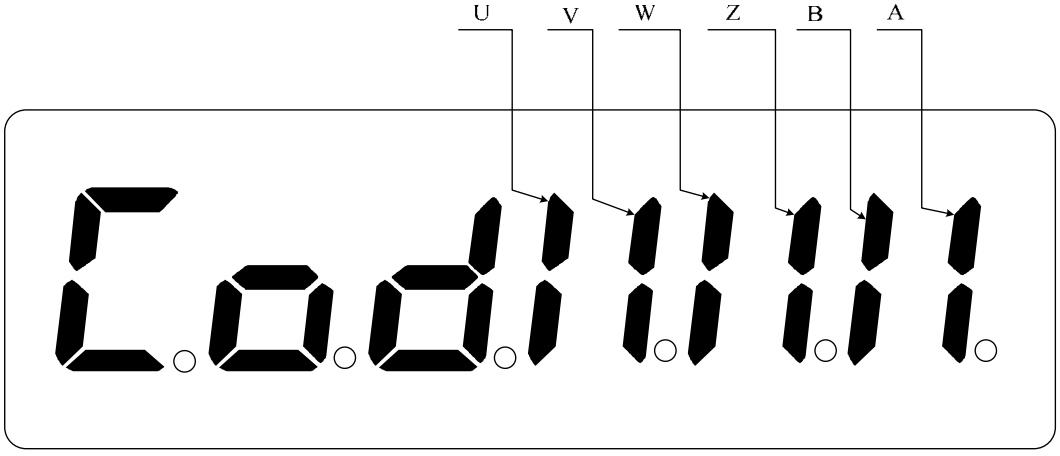


Figure 23 encoder signal display

[Note 8] The running status expression is:

"cn-oFF": The main circuit has not charged, the server system has not run;

"cn-cH": The main circuit has charged, the server system has not run (servo enable does not exist or has a warming);

"cn-on": The main circuit has charged, the server system is running.

[Note 9] Alarm demonstrates "Err --" the expression is normal, alarm is free.

6.2.2 Data setting

In 1st layer, choosing "PA -", and pressing Enter key to enter the data establishment mode. Using Up, Down key to select data number, pressing enter key to confirm the data value, and pressing the Up or Down key to change the data value.Pressing Up or Down key one time, the data increases or reduces 1, pressing and maintaining Down or Up, the data can increase or reduce continuously. If the data value is revised, the right side LED nixietube decimal point lightens. Pressing Enter key to confirm revision value to be effective, the decimal point of LED nixietube on right side extinguishes, then the revision value immediately reflects in the control, and you could revise the data by pressing Up or Down key after that, and the revision is finished. Pressing Cancel key to return to data choice condition. If the revising value is unsatisfied, do not press the Enter key to determine, press Cancel key

to cancel, the data recovers to original value, and returns to the data choice condition.

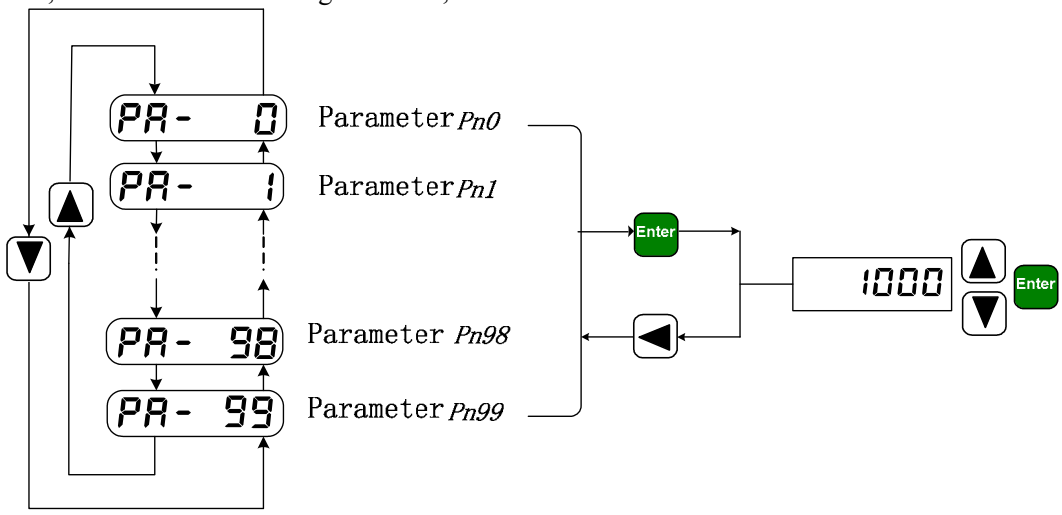


Figure 6.6 block diagram for data setting.

6.2.3 Data Management

The data management process between main memory and EEPROM. in 1st layer chooses "EE-", and presses Enter key to enter the data administration mode. First needs the selecting operation pattern, altogether it has 5 kind of patterns, with Up, Down key to choose. "the data writes" as the example, choice "EE-Set", then presses and maintains Down Enter key above 3 seconds, the monitor demonstrates "Start", indicates the data is writing in EEPROM, waits for 1~2 second time, if writes operates successfully, the monitor demonstrates "FInISH", if is defeated, then demonstrates "Error". Press ← key again to return to the operator schema choice condition.

- The EE- SEt data writes, expresses writing the data list in EEPROM data area. The user revised the data, only caused data value in data list to change, on the next time power on will restore to original value. If you want to change permanent value abidingly, needs to carry out the data write operation, writes data in the data area to EEPROM, next time power revised data will be used
- The EE- rd data reads, expresses to reads the EEPROM data area's data to the data list. This process will carry out automatically one time when power is on, at the beginning, the data between data list and data in EEPROM area are the same. But the user revised the data, will change data value in the data list, when the user unsatisfies revising the data or the data is adjusted to be chaotic, carries out the data read operation, can read the data once more from the EEPROM data area to the data list, restored to power on data.
- The EE- bA data backup, expresses write the data in data list to the EEPROM backup area. Entire EEPROM is divided into the data area and the backup area, which can save two sets of dataes. Power is on, the data read and write is used the data area of EEPROM, but the data backup and restores to use the backup area of EEPROM. In data establishment process, if the user is quite satisfied to group of dataes, but also wants to continue to revise, may carry out the data backup operation firstly. Preserves the memory

data to the EEPROM backup area, and then revises the data again, if the effect is worse, may use to resume the backup operation, reads backup area's data in the EEPROM to the data list, then might revise or the conclusion once more. Moreover, when the user establishes the data, may carry out the data to write and the data backup two operations. causes the data area and the backup area data is completely same, prevents the data to revise carelessly, may also begin using resumes the backup operation, reads backup area's data to the data list, uses the data write operation again, writes data in the data list to the data area of EEPROM.

- EE- rS restores the backup, expressed that reads in the data list the EEPROM backup area's data. Pays attention to this operation not to carry out the data write operation, on when next time electricity the EEPROM data area's data reads in the memory. If the user wants to cause permanent to use EEPROM the backup area data, but also needs to carry out a data write operation.
- EE-dEF restores the default value, expressed that will possess the data the default value (leaving the plant value) to read in the memory, and reads in EEPROM in the data area, the next time electricity will use the default data. When the user adjusts chaotically the data, when is unable the normal work, uses this operation, may possess the data to restore the leaving the plant condition.

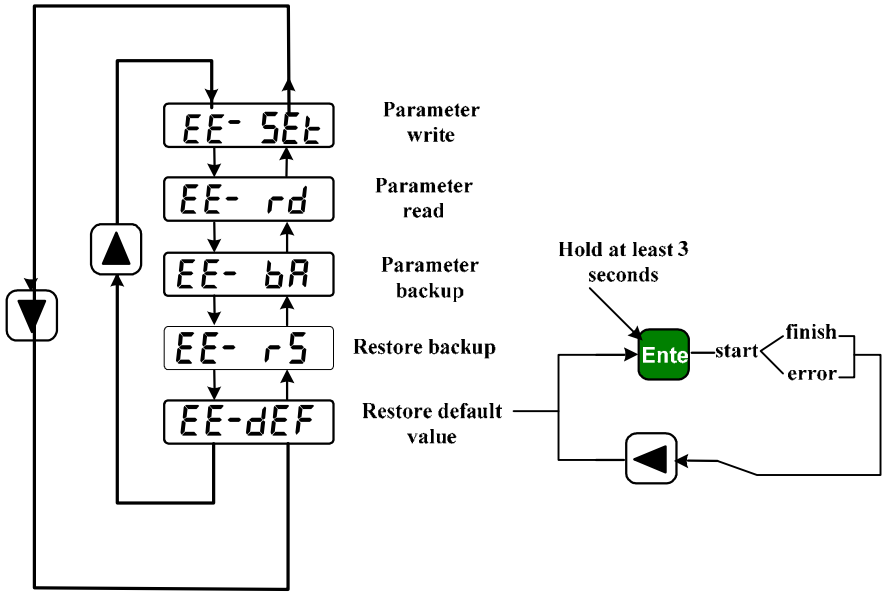


Figure 6.7 diagram for data management

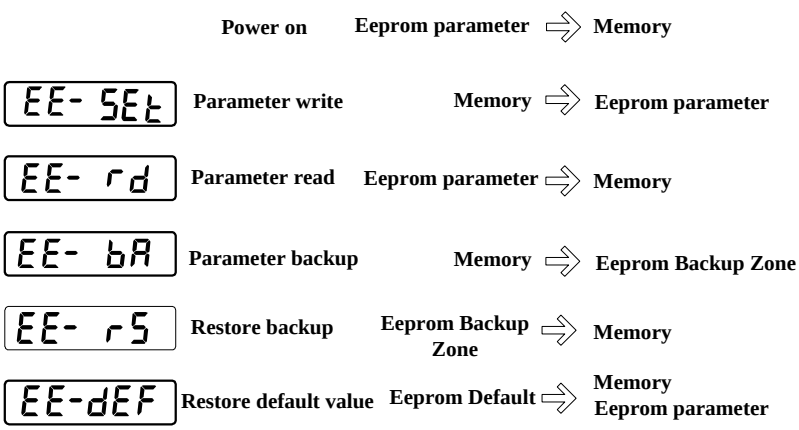


Figure 6.8 the meaning of data management

6.2.4 Speed Testing

In 1st layer Chooses "SP -", and presses Enter key to enter tries to move mode. prompt symbol of the speed tries to move is "S", the value unit is r/min, the system is in control mode, the speed instruction is provided by the pressed key. With Up, Down key to change the speed instruction, the motor runs in the assigned speed.

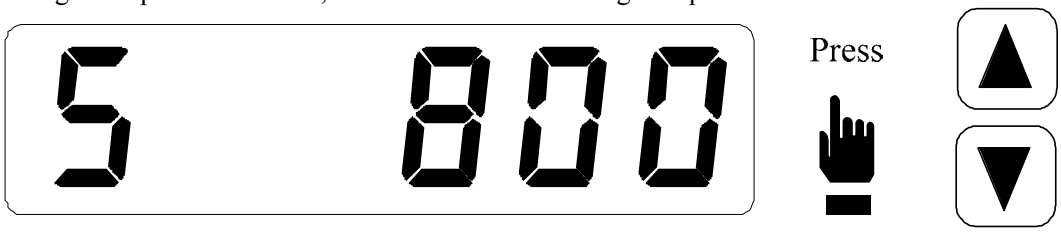


Figure 6.9 diagram for speed test operation

6.2.5 JOG Operation

In 1st layer Chooses "JP -", and presses Enter key to enter to JOG mode. The s prompt symbol is "J", the value unit is r/min, the system is in the speed control mode, the speed instruction is provided by the pressed key. After entering the JOG operation, presses and maintains Up key, the motor run in the JOG speed. loosens the pressed key, the motor stops and keeps zero speed; Presses and maintains Down key, the motor reverse in the JOG speed .loosens the pressed key, the motor stops and keep zero speed. The JOG speed is established by data PA21.

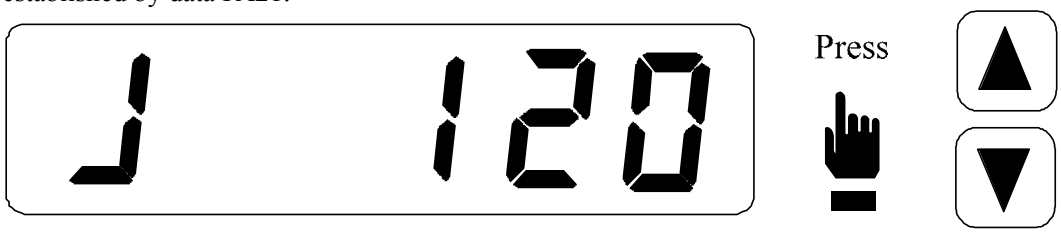


Figure 6.10 JOG operation diagram

6.2.6 Analog automatic zero set

After using this operation, driver detects speed analog zero-bias automatically (or torque analog zero-bias),

Writes the zero-bias value in PA45 t(or PA39), and preserves it in EEPROM. in 1st layer Chooses "AU-", and presses Enter key to enter the zero alignment operating..After automatic zero setting, the user can continue to carry on the manual zero alignment.

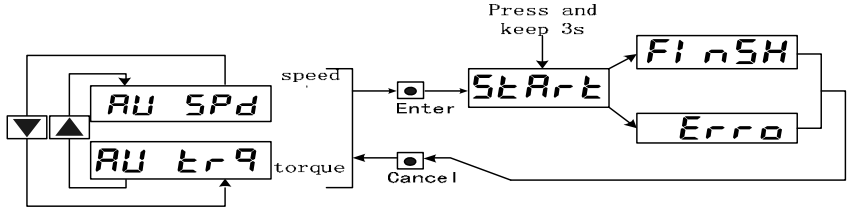


Figure 29 Analog automatic zero set

CHAPTER 7 OPERATION

7.1 Grounding

The servo driver and the servo motor should be reliably grounding, in order to avoid undergoing an electric shock, the grounding terminals of servo driver and control box must put through all the time. Servo driver adapts power tube under the PWM technology as power supplier, so the driver and the connection possibly receive the influence from switch noise. In order to conform to the EMC standard, connections are as thickness as possible, grounding resistance is as small as possible.

7.2 Step of working

7.2.1 Power Supplier Connection

1) Connecting power supplier with main circuit power input terminal through electromagnetism contactor, (Three phases connect R, S, T; and single phase connect R, S).
2) Connecting power supplier of control circuit before the main circuit. if just putting though the main electronic-circuit. Servo ready (SRDY) is OFF.
3) After putting through the main electronic-circuit, servo read (SRDY) will be ON in 1.5 seconds, and then it can accept servo enable (ServoEn) signal. If it checks the servo enable effective, will be opening, motor is prompting with running condition. If it checks the servo enable ineffective or any alarm, is cut off and motor is in free condition.
4) Servo enable and power supplier put through at the same time. Base electrode circuit puts through in 1.5 seconds.

   Higher frequency on-off power supplier could break soft start circuit and energy-cost brake circuit. The on-off power frequency should be max 5 times per hour and less than 30 times per day. If circuit cuts off and dues to higher temperature of driver or motor, make sure cooling the equipment more than 30 minutes and then restart power supplier.

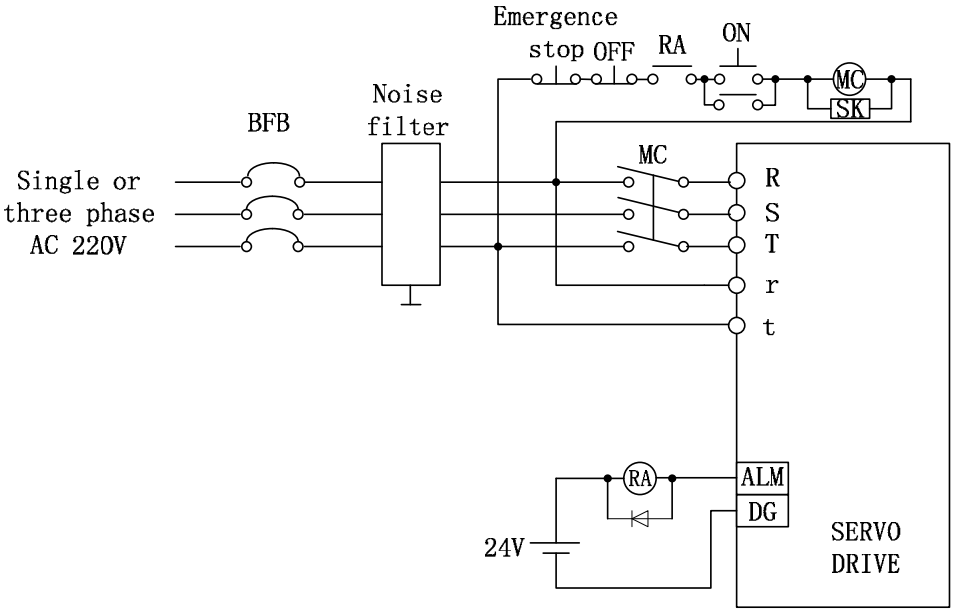


Figure 7.1 Power wiring diagram

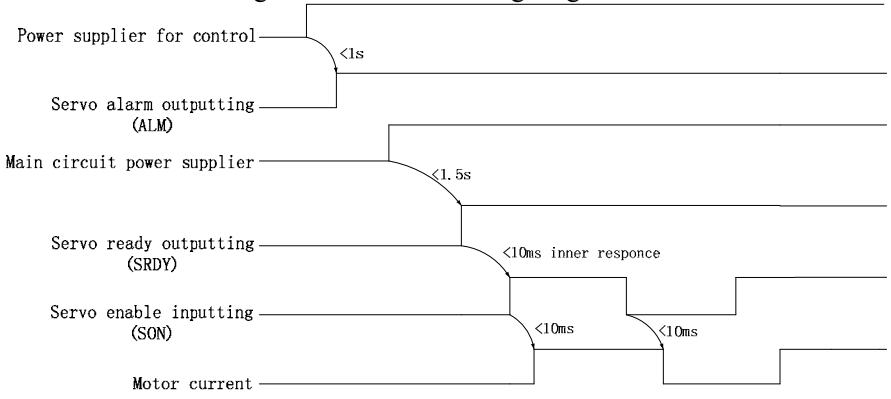


Figure 7.2 Power connected timing sequence Diagram

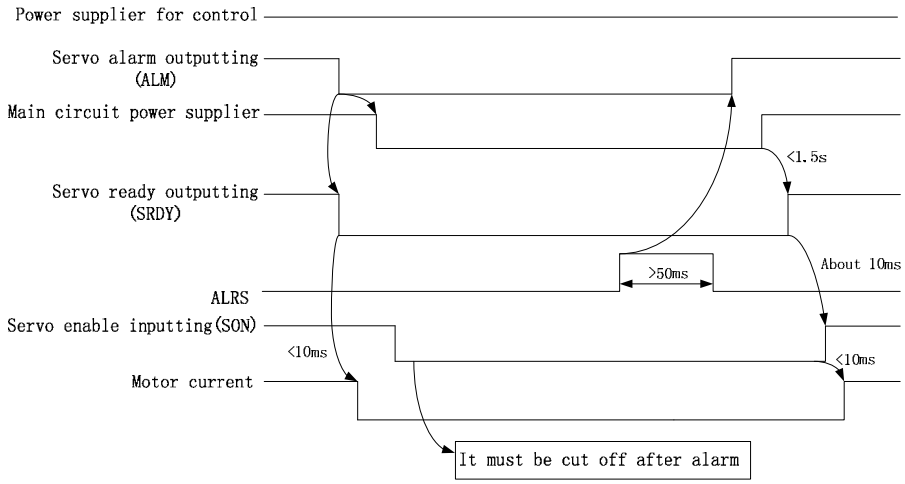


Figure 7.3 alarm timing sequence Diagram

7.3 Use of mechanical brake

Mechanical brake（brake）uses to lock in the vertical or slantwise work table which is connected with the servo motor, and to avoid the work table dropping when the power is cut off. To carry out this function, we must select and purchase servo motor which has Mechanical brake. The arrester is only used for Maintaining stopping work table. it cannot be used to decelerate and break.

Figure 7.4 is the wiring diagram of arrester, signal BRK which comes from servo driver controls the arrester. Pay attention to power supply, it must be enough capability and provided by user. Suggest installing surge absorber to control the surge voltage which is from the movement of relay pass/break. Also the diode can be used as surge absorber, but it will make brake lag.

Figure 7.5 is the sequence of mechanical brake when servo motor stops on normal condition, then servo motor hold position by power supply continuing and the arrester acts from releasing to braking. After stable period (refer to data ***PA47***) remove the power supply.

Figure 7.6 is the motor operation, the speed is higher than 30r/min, now cut off the power supply; the arrester continues to keep the release condition, after delaying a period of time, the arrester works again. This is for avoiding the damage of arrester after the servo motor from high speed to low speed. The delay time is minimum value between the data ***PA48***and time which the servo motor speed decelerates to the data ***PA49***needs.

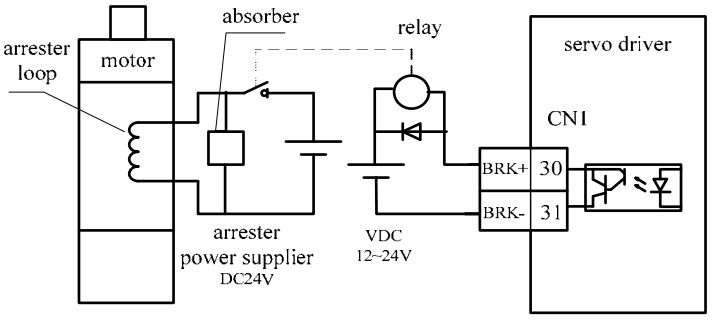


Figure 7.4 wiring diagram of Mechanical brake

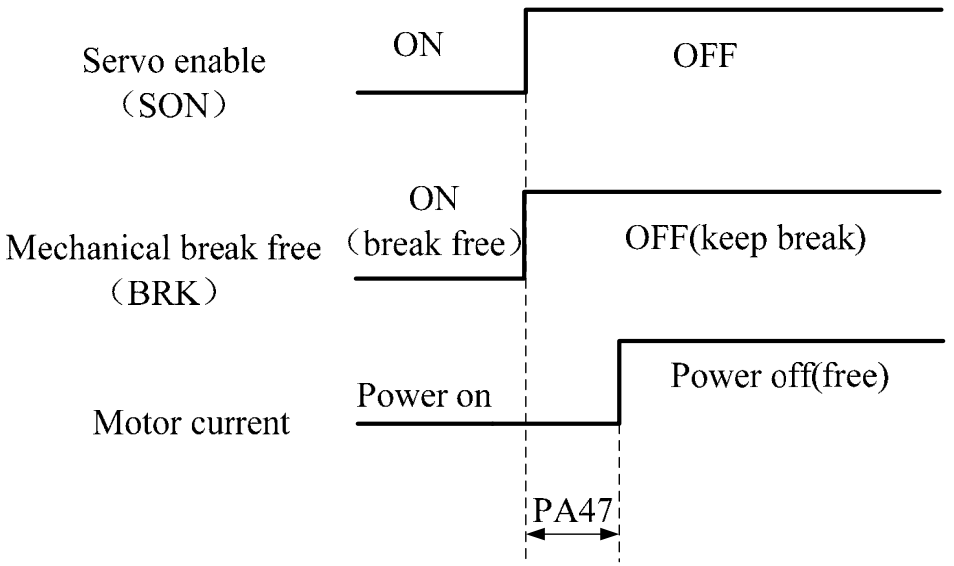


Figure 7.5 order of Mechanical brake when stop (speed < 30r/min)

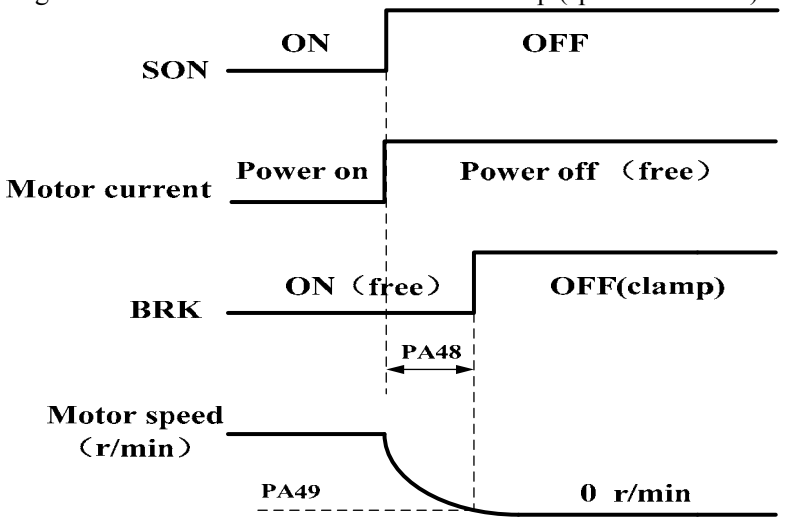


Figure 7.6 order of Mechanical brake when operation

7.4 Attention

(1) The start and stop frequency is restricted by servo driver and motor; it needs to satisfy two conditions at the same time.

1) Allowable frequency for servo driver

Making sure that the permitted frequency is in the range when it is used in higher frequency start & stop application fields. The permitted frequency range is different according to motor style, capability, loading inertia and motor speed. First set the period of time to avoid generating the huge regeneration power (the position control, set ***PA19*** the speed control, set ***PA40* & *PA41)***. Under the condition of m times motor inertia, the permitted start & stop frequency and recommended acceleration & deceleration time showed as

following:

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

If it can not satisfy the requirement, user can reduce internal torque limitation (data ***PA34, PA35***) and reduce the motor highest rotational speed (data ***PA23***) to solve the problem.

- The maximum allowable start/stop rate and acceleration/deceleration time depend on the type of servo motor and the load conditions, running time, environmental temperature, etc
- 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.
- 1) Reduce the interior torque limit (data ***PA34, PA35)*** ;
- 2) Reduce the maximum speed of the servo motor (data ***PA23***);
- 3) Install external regeneration brake equipment, that is connect external resistance, the wire connecting refers to chapter 3
- In the servo driver it is loaded with the encoder electric power supply, in order to guarantee the encoder normal work, it must keep the output voltage 5V±5%. When user uses very long electric cable, possibly make the voltage loss, in this case, please use the multi-cores cable for the encoder to reduce the electric cable pressure drop.

7.5 Test operations

7.5.1 Check before operation

After being installed and connected, please check the following items before power-on:

- Check connections correct or not？especially the R,S,T and U,V,W, Check the servo driver and servo motor are firmly installed
- Check the inputting voltage
- Check power and motor wiring are not shorted or grounded
- Check encoder connections correct or not
- Check the power terminal TB and inputting voltage.

7.5.2 Test operation with power-on

1. Before power-on
- No load within motor;
- Due to strike from motor accelerate and decelerate, must fix up the motor.

2. Connection Figure 7.7
- Main circuit end , three-phase AC 220V， connect to R, S, T, single-phase AC 220V， connect to terminal R, S;
- Control pressure terminal r , t connect to single-phase AC 220V;
- Connecting to CN2, encoder signal and servo motor;
- Connecting to CN1, inputting control signals as per figure.

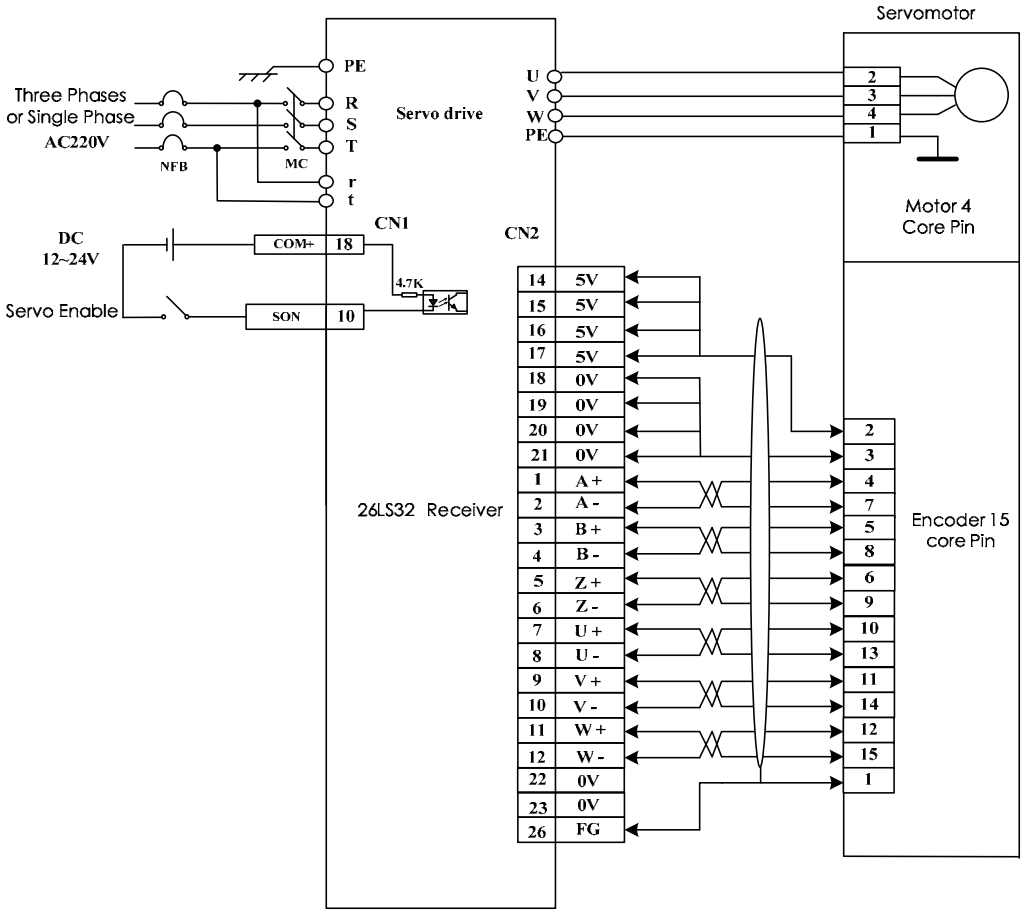


Figure 7.7 Test operation Figure

JOG Operate

1) Putting through the control circuit power (main circuit power does not meet temporarily), displayer on servo driver is bright. Please check the connection if alarm appeared.
2) Putting through main circuit power, ***CHARGE*** lamp is on;
3) Set data as following:

NO.	meaning	data	default
PA4	choose of control fashion	3	0
PA20	Drive inhabit input invalid	1	0

4) Make sure none of alarm or other abnormal cases, servo enable (ServoEn) ON, RUN lamp is on. Motor is prompting in zero speed condition.
5) Getting into JOG operation mode by key operation. Prompt of JOG mode is "J 0"---unit is r/min. system is in speed control mode, seed dictates are send by keys. Pressing and maintaining key Up, motor runs in JOG speed. Losing press, motor stops and keeps speed 0.Pressing and maintains key Down motor reverses in JOG speed.Losing press, motor stops and keeps speed 0. JOG speed is set through ***PA21***, default is 120r/min.
6) If the external control servo enables (ServoEn) is not convenient, may set data ***PA53***as

0001, forces the servo to enable (ServoEn) ON, does not need exterior wire to control ServoEn.

4. Manual Speed operation

1) Putting through the control circuit power (main circuit power does not meet temporarily), displayer on servo driver is bright. Please check the connection if alarm appeared;

2) Putting through main circuit power, ***CHARGE*** lamp is on;

3) Set data as following:

NO.	meaning	data	default
PA4	choose of control fashion	2	0
PA20	Drive inhabit input invalid	1	0

4) Make sure none of alarm or other abnormal cases, servo enable (ServoEn) ON, motor is prompting in zero speed condition.

5) Getting into speed test operation mode by key operation. Prompt of speed test run is "S 0"-unit is r/min. system is in speed control mode. The speed dictates are supplied by keys Up and Down. Motor runs at the given speed.

6) If the external control servo enables (ServoEn) not to be convenient, may set data ***PA53*** as 0001, forces the servo to enable (ServoEn) ON, does not need exterior wireto control SON.

7.6 Simple connection operation in position control mode

1. Connection Figure 7.8,

- Main circuit terminals , three-phase AC 220V，connect to R、S、T，single-phase AC 220V，connect to terminal R、S；
- Control pressure terminal r , t connect to single-phase AC 220V;
- Connecting to CN2, encoder signal and servo motor；
- Connecting to CN1, inputting control signals as per figure；

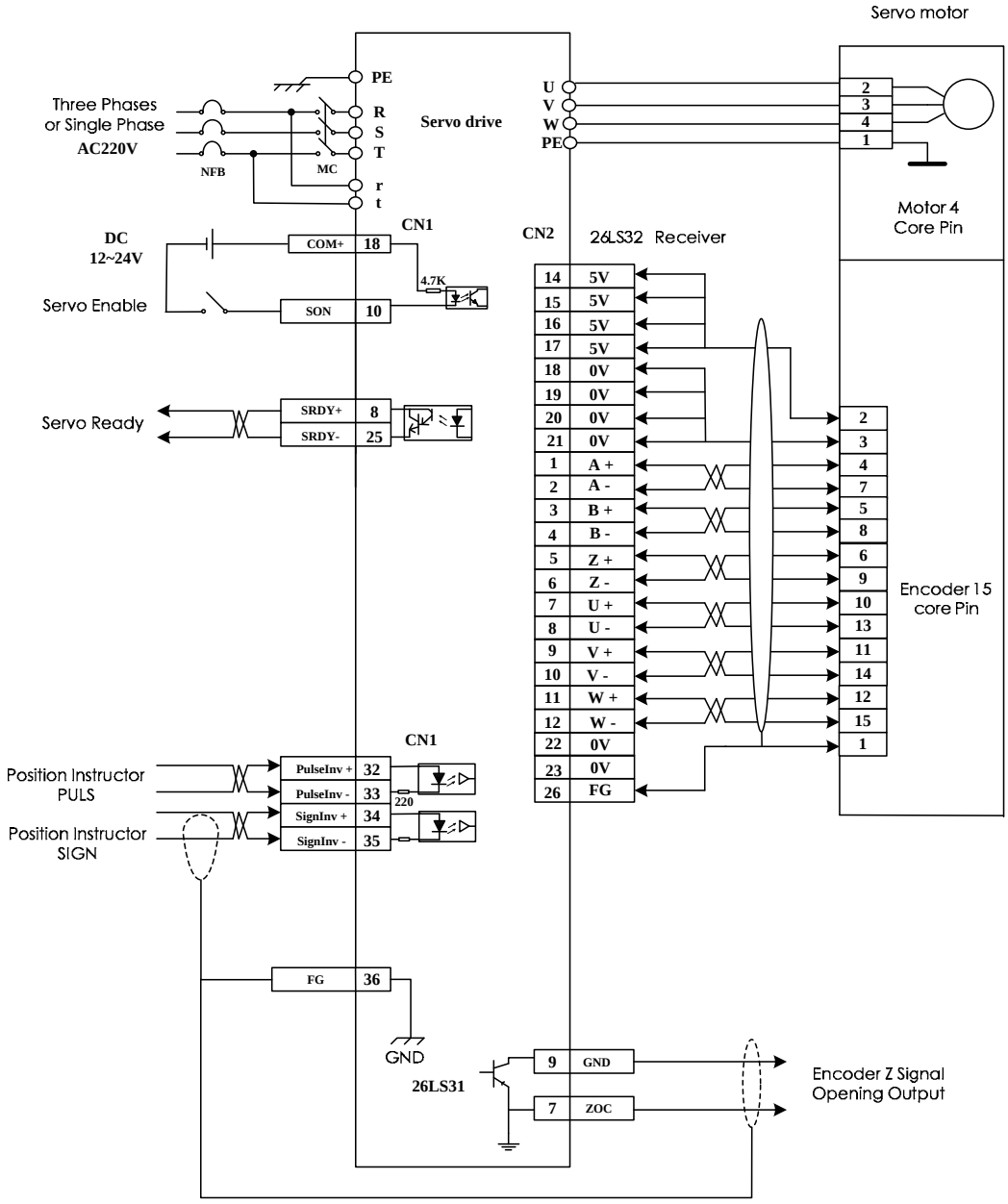


Figure7.8 connection drawing of position control

2．Operation

1）Putting through the main circuit power, displayer on servo driver is bright ***CHARGE*** lamp is on. Please check the connection if alarm appeared.

2）set the data to EEPROM as follow:

NO.	Meaning	Data	Default
PA4	choose of control fashion	0	0
PA12	electric gears denominator	User setting	1

PA13	electric gears numerator	User setting	1
PA20	Drive inhabit input invalid	1	0

3)No alarm and abnormity, make (ServoEn) ON, "RUN"is bright；

4) Director sends the low frequency pulse to drive, motor runs in low speed.

3. Electronic gear setting

The servo drive's encoder is 10000 pulse/turn, by setting electric gears data ***PA12,PA13***it would get discretional pulse.

Note：

1. User can sets random value to molecule and denominator hypothesis to obtain any ratio, but it is better not to surpass 1/50~50.

2. If dynamic electric gear is used, ***PA51*** is set to 1. Now INH terminal is changed into electric gear shift input control terminal.

3. When INH terminal is OFF, the importation of electronicic gear is PA12/PA13 .When INH terminal is ON, the importation of electronicic gear is PA52/PA13; by controlling INH terminal, the electronicic gear ratio changes values.

7.7 Simple connection operation in speed control mode

1. Connection Figure 7.9

- Main circuit end , three-phase AC 220V, connect to R、S、T, single-phase AC 220V, connect to terminal R、S；
- Control pressure terminal r , t connect to single-phase AC 220V;
- Connecting to CN2 encoder signal and servo motor；
- Connecting to CN1, inputting control signals as per figure；
- If only makes the velocity modulation control, need not to connect the encoder output signal; If exterior director is the positional, needs to connect the encoder output signal.

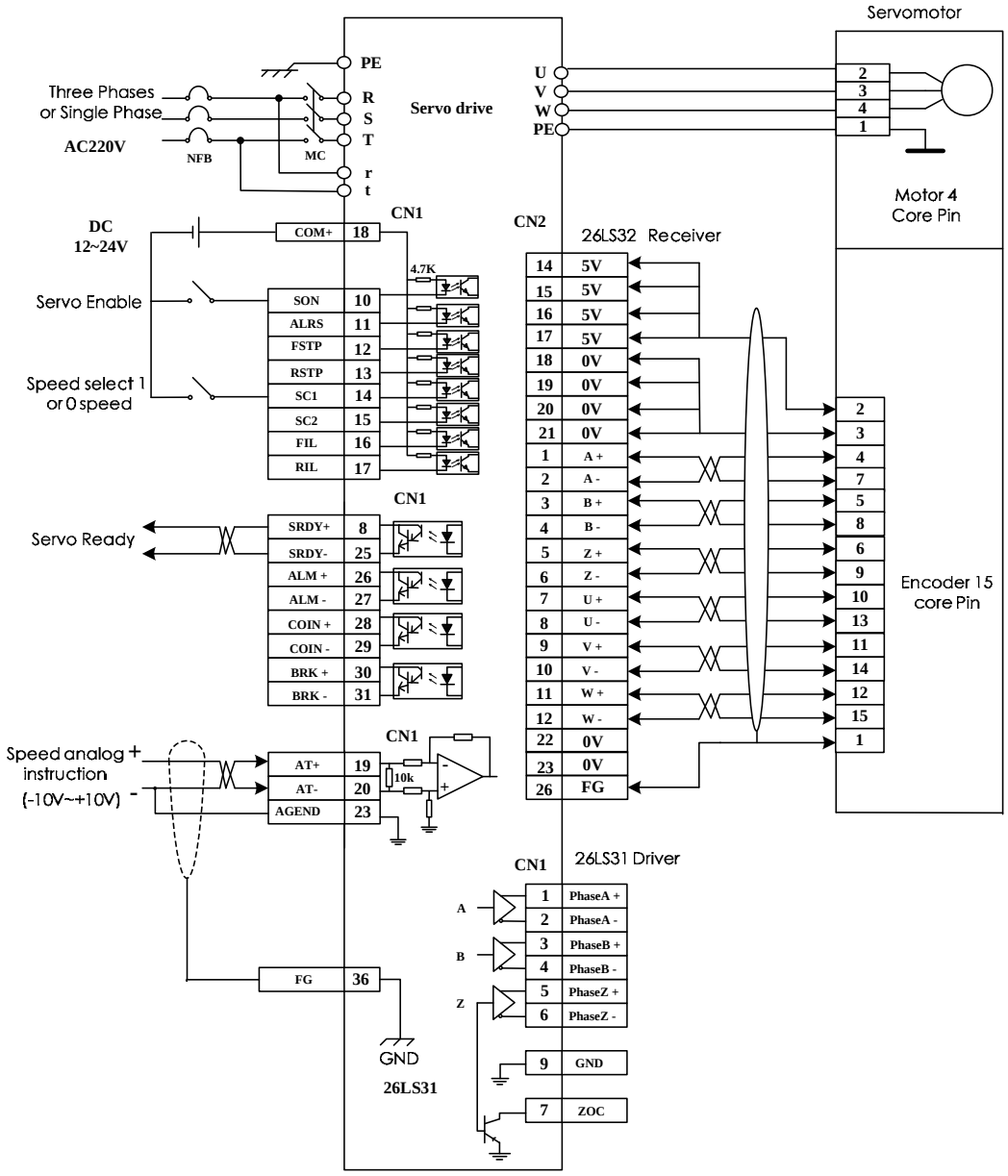


Figure 7.9 the simple wiring diagram of speed control mode

2. Operation

1）Putting through the main circuit power, displayer on servo driver is bright ***CHARGE*** lamp is on. Please check the connection if alarm appeared.

2) Setting the data to EEPROM as follow:

Data number	Significance	Data value	Factory Default
PA4	Control Options	1	0
PA20	Drive inhabit input invalid	1	0

PA22	Internal and external directives to choose speed	1	0
PA40	Speed up time constant	0	0
PA41	decelerating time constant	0	0
PA43	directive Gain of simulation speed	settings As required	300 (r/min) / V
PA19	Position command smooth filter	0	0

3) No alarm and abnormity, make (ServoEn) ON, "RUN" bright；
4) Adds an adjustable DC voltage to the simulation speed input port, increase this voltage from 0 gradually, guarantees the electrical machinery rotational speed to correspond to change along with the instruction; Adds the negative voltage, the electrical motor should reverse.
5) Close the ZEROSPD switch, motor should stop and keep stopping
6) If simulation instruction voltage is zero voltage (0V), because upper controller and driver have zero-bias voltage, the servo motor possibly turns. adjusting data ***PA45*** to compensate zero-bias and make the servo motor stop;
7) Adjust data ***PA43, PA44*** to change input gain and direction.

7.8 Simple connection operation in torque control mode

1. Connection Figure 7.10：
   - Main circuit end , three-phase AC 220V, connect to R、S、T, single-phase AC 220V, connect to terminal R、S；
   - Control pressure terminal r , t connect to single-phase AC 220V;
   - Connecting to CN2, encoder signal and servo motor；
   - Connecting to CN1, inputting control signals as per figure；

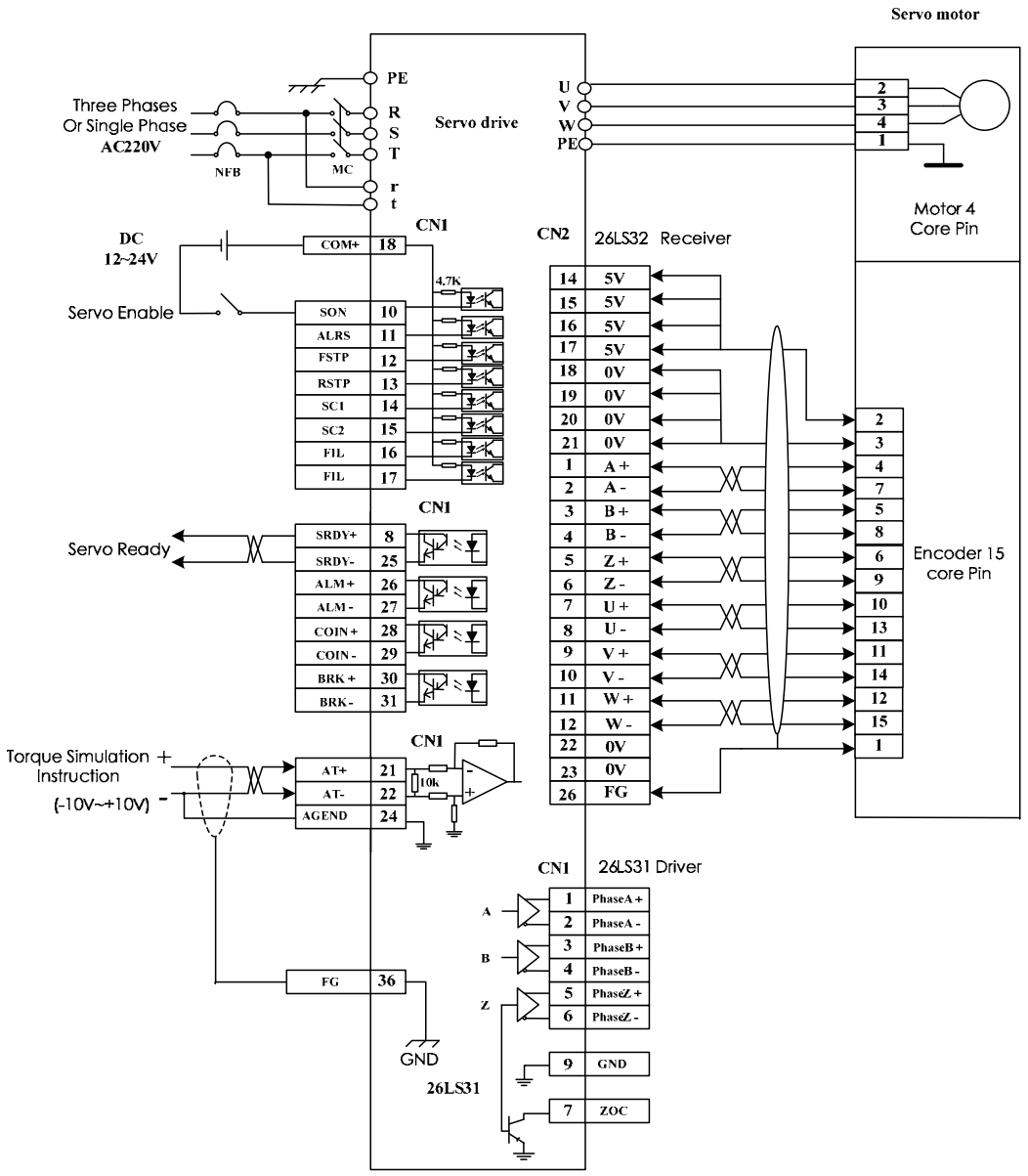


Figure 7.10 Simple wiring diagram Control Torque mode

2. Operation

1）Putting through the main circuit power, displayer on servo driver is bright ***CHARGE*** lamp is on. Please check the connection if alarm appeared.

2) Setting the data to EEPROM as follow:

Data number	Significance	Data value	Factory Default
PA4	Control Options	6	0
PA20	Drive inhabit input invalid	1	0

PA29	directive Gain of simulation torque	settings As required	30
PA33	Simulation torque command direction take the anti -direction	0	0
PA39	Partial instructions compensation of Simulation torque	0	0
PA50	Torque control speed limits	settings As required	Rated speed

3) appropriate load on motor shaft;
4) No alarm and abnormity，make (ServoEn) ON，"RUN"is bright；
5) Adds an adjustable DC voltage to the simulation torque input port, from 0 starts to increase this voltage gradually, the motor outputs the corresponding torque; Adds the negative voltage, the servo motor outputs the reverse torque;
6) If the simulation instruction voltage is 0, the servo motor has the torque output, may adjust data***PA39***, make it zero torque;
7) Adjust data ***PA29, PA33*** to change input plus and direction.
8) Please specially pay attention, when the load is small, it's easy to fast. Data ***PA50***may carry on the regulating to the servo motor, prevents over speed when under light loading;
9) Surpasses rating torque when it is at the overload condition, only continue a short time, its characteristic refers to system overload characteristic

7.9 The dynamic electronicic gear function

Is to change electronic gear ratio dynamically by input control signal in driver system running situation. This function is: maximum output pulse frequency is low on the upper control, when the electronic gear ratio is small, the position resolution is high, but the maximum speed is low; When the electronic gear ratio is big, the position is low, but the maximum speed is high. In order to obtain the high position resolution and the high maximum speed, we set two electronic gear ratios. Control signal from upper controller controls shifting in dynamic.

For example, in the numerical control machine, set the first electronic gear ratio to be small, the second electronic gear ratio bigger, when machining, the speed is not very high generally, upper controller output control signal chooses the first electronic gear ratio, may obtain the high position resolution; When rapid traverse, upper controller output control signal chooses the second electronic gear ratio, may obtain the high traveling speed.

7.9.1 Brief connection

Figure 7.12

- Main circuit terminal , three-phase AC 220V，connect to R、S、T，single-phase AC 220V，connect to R、S；
- Control pressure terminal r , t connect to single-phase AC 220V;
- Connecting to CN2, encoder signal and servo motor；
- Connecting to CN1, inputting control signals as per figure；

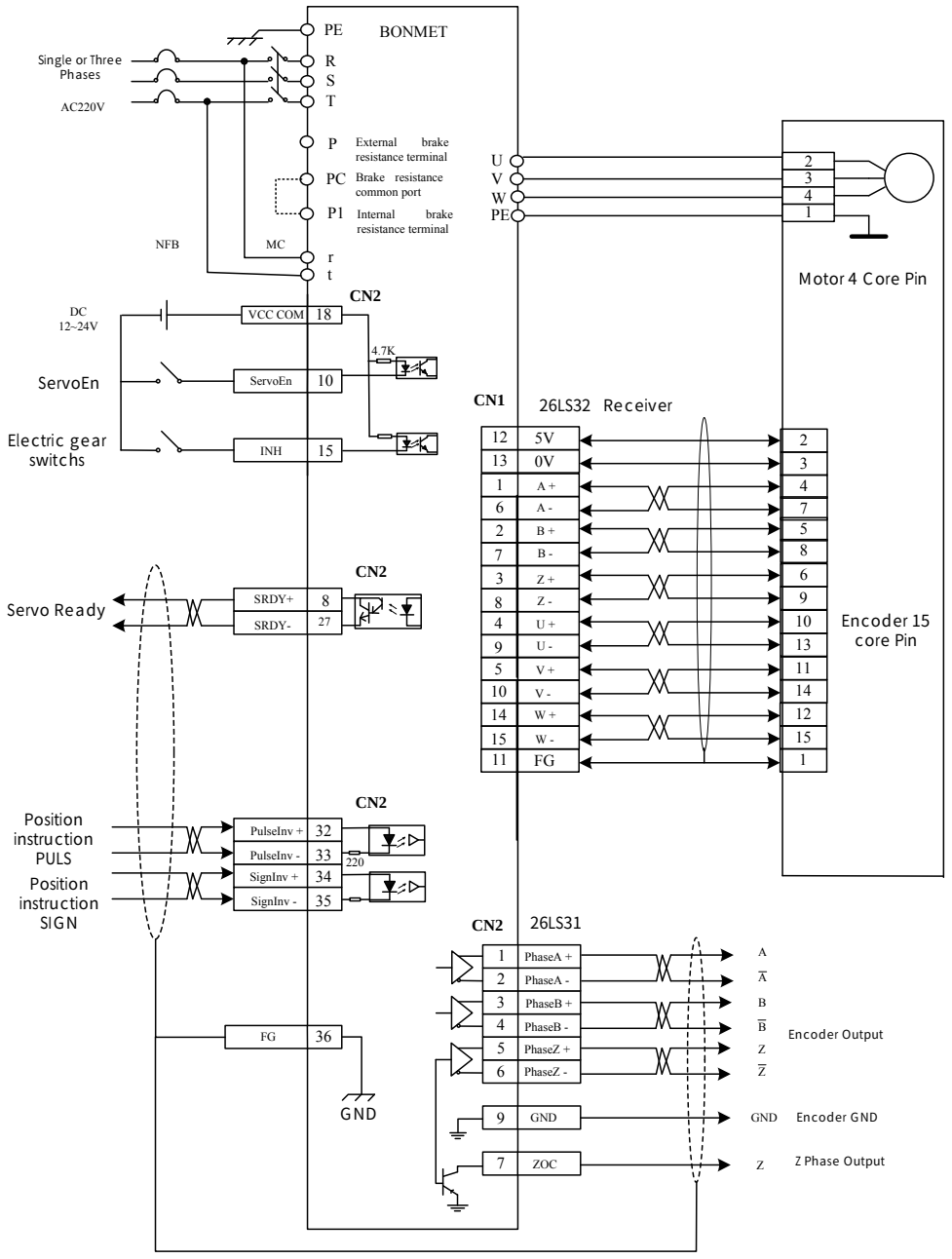


Figure 7.11 Using wiring diagram of dynamic electronicic gear

7.9.2 Operation

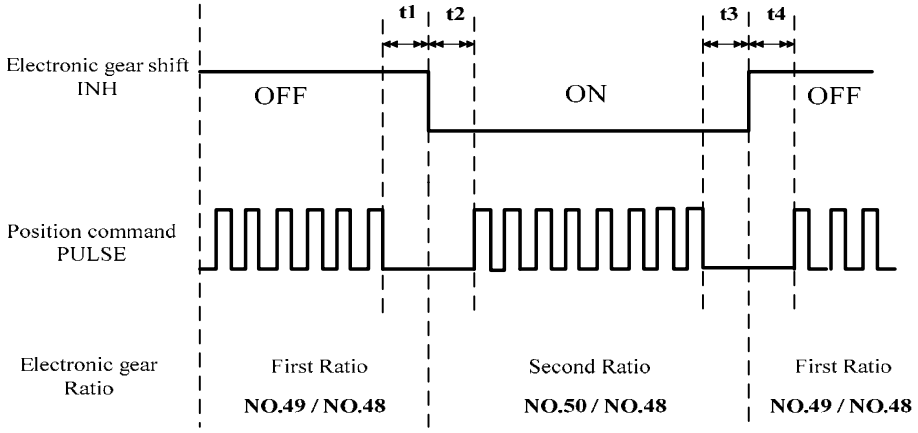
1）Set the data to EEPROM as follow:

Data number	Significance	Data values	Factory Default

PA4	Control Options	0	0
PA20	Drive inhabit input invalid	1	0
PA12	electric gears denominator	User setting	1
PA13	electric gears numerator	User setting	1
PA19	Position command smooth filter	0	0
PA51	Dynamic electronicic gear is effective	1	0
PA52	Second position command pulse frequency division numerator	User settings	1

2) Through control input port, INH shifts electronic gear switch. When INH port is OFF, the input electronic gear is ***PA12/PA13***; When INH port is ON, the input electronic gear is ***PA52/PA13***;

3) Note :when the electronics witch shifts, it must satisfy Figure7.11, INH changes within 10ms, does not send the pulse.



t1, t2, t3, t4>10mS

Figure 7.12 Timing sequence of dynamic electronicic gear

7.10 Single analog speed control

Set the value according to the follow table.

Data number	Significance	Data values	Factory Default
PA4	Control Options	1	0
PA20	Drive inhabit input invalid	1	0
PA22	Internal or external speed command select	2	1
PA43	Analog speed command input gain	User setting	300
PA44	Reverse enable of analog speed input	User setting	0
PA45	Analog speed command zero bias compensation	User setting	0
PA46	Low pass bandwidth of analog speed	User settings	300

Input analog range0-10V,SON is on,speed and direction is decided by follow table.

PA44	*FIL(CCW torque limit)*	*RIL(CW torque limit)*	*Run direction*
0	ON	OFF	CCW
	OFF	ON	CW
	ON	ON	0
	OFF	OFF	0
1	ON	OFF	CW
	OFF	ON	CWW
	ON	ON	0
	OFF	OFF	0

7.11 Input terminal switch control model

Input terminal switch control model function is that using a input terminal ON/OFF to switch two control model.it can be switched bwtween positon/speed or speed/torque or torque/position.

PA32(switch control model allowe) decides it.whenPA32=0.you cant switch through external terminal.control model is decided by PA4.ALRS is used to alarm release.when PA32=1.you can switch through external terminal.now the fuction ofALRS is external switch terminal.

Position model,the command instruction is from external input pulse.speed model, the command instruction have two ways.one is PA22=0 it is interior speed.another is PA22=1(default),it is external analog input.torquei model, the command instruction is from external torque analog input.

PA32	*PA4*	*ALRS*	*Control model*
0(default)	0(default)	Alarm release	Positon
	1	Alarm release	Speed
	6	Alarm release	Torque
1	0	OFF	Positon
		ON	Speed
	1	OFF	Speed
		ON	Torque
	6	OFF	Torque
		ON	Position

7.12 User torque overload alarm function

In order to prevent that the accident occurs in certain situations and the motor load elevates unmorally, it possibly destroys certain mechanisms, so we design user torque overload alarm function. When this function is effective, drive system examines motor torque, when the torque is higher than the data value set, after period of time, the driver alarms, alarm signal is ***Err-29***, the motor stops.

When the user uses torque overload alarm function, it is needed to establish ***PA31> 0***, and establish ***PA30, PA31*** reasonably, enables it to alarm quickly when the event occurs .and don't alarm in normal condition.

7.13 Adjustment

7.13.1 Basic plus adjustment

- Speed control loop
  1) 【 Speed proportional gain 】 (Data ***PA5***) setting, make it as big as possible if there is no vibration. Usually, load inertia is bigger and the 【Speed proportional gain 】is bigger accordingly.
  2) 【 Speed integral time constant 】 (Data ***PA6***) 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. If 【 Speed integral time constant 】 is too big, when load is changing, speed will change a lot. Usually, bigger load leads to bigger 【 Speed integral time constant 】.
- Position Control loop
  1) Setting suitable 【 Speed proportional gain 】 and 【 Speed integral time constant 】 according to the upper description.
  2)【Position back gain 】(Data ***PA10***) set it to 0%.
  3)【Position proportional gain 】 (Data ***PA9)*** can be as bigger as possible in stable range. If 【 Position proportional gain 】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.

【 Note1 】When system is not stable, increasing 【 Position forward plus 】 could get higher acceleration and deceleration time constant.

Setting 【position proportional gain】according to the following table.

Stiffness	【position proportional gain】
Lower stiffness	10～20/S
Middle stiffness	30～50/S
Higher stiffness	50～70/S

7.13.2 Basic data adjustment

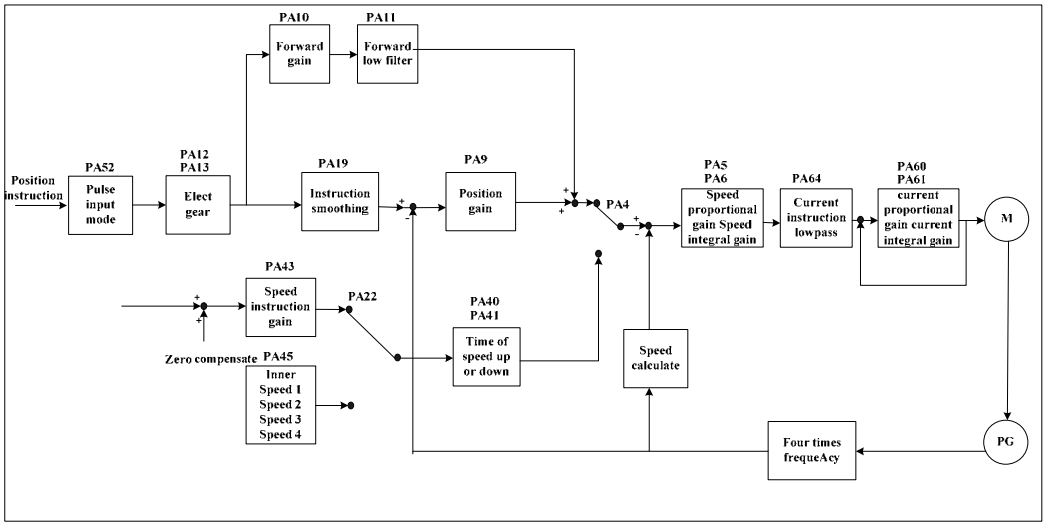


Figure 7.13 Basic data adjustment

7.14 Frequently asked questions

7.14.1 Restores default data

The following situations occur, please restore default data function：

- The data is adjusted chaotically, the system is unable to work normally；
- When saving data, the system exactly falls the electricity, causing the system self-recovery to default data, but the model code(***PA1***) and this driver and motor do not match;
- The driver needs to replace motor, new trade is different from the original one

Restores default data as follows：

1) Check if the model of driver and motor matches. Or else the driver is easy to be damaged;the model code refer to chanpter8.0.
2) Revises password data ***PA0*** is 385；
3) Write default data values into the EEPROM. In layer 1 select “EE”, press Enter key to enter dataes management mode. First choosing operation mode, which has a total of five kinds of patterns, using Up, Down key to select. Select “EE-DEF”, and press Enter and keep more than three seconds, the display reads “Start”, dataes are being written into the EEPROM, for about 1 to 2 seconds, if successfully writed, display reads “FINISH “;If it fails, it shows ”ERROR” .
4) Successful operating above step, shut off drive power, and then re-power, operation is finished.

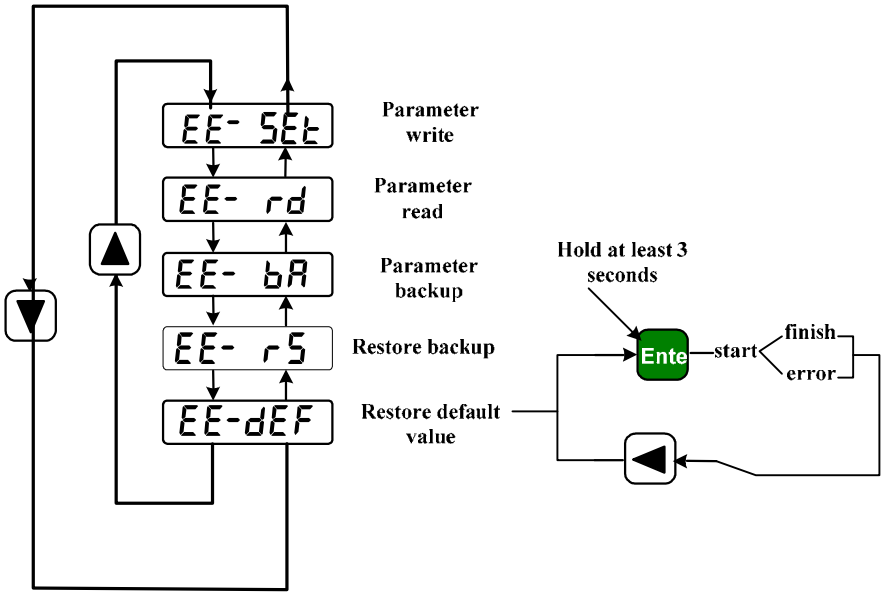


Figure 7.14 resume defaulting data

7.14.2 Frequent display Err-15, Err-30, Err-31,Err-32

These alarm shows that photoelectric encoder and its connecting cable have problems, first to solve in the following aspects:

- connecting cables and plugs whether there is a connection is bad;

- whether shielded pot of cable is good;
- whether the grounding PE terminal of drive is good;
- whether motor grounding terminal and drive grounding terminal connect well;
- If the cable is longer, it may result in the power voltage dropping too much, please use the multiple-core line to connect the encoder 0 V and 5 V power supply;
- Don't put strong power and weak power cables together, try to change the cable alignment;
- If the above measures do not work, please contact sales.

7.14.3 ***POWER*** lights can not be on:

Driver control Power and main Power are normal conditions, the driver has display, no alarm is there, and the main power lamp on panel is off, the driver can not run. Such a situation, it is because the internal drive circuit brakes failure, forcing driver into the protection state, please contact sales.

7.15 Related knowledge

7.15.1 Position resolution and electronicic gear's establishment

The position resolution (an impulse stroke △l) is decided by of traveling schedule △S of servo motor running each revolution and feedback pulse Pt of encoder each revolution.

Use the equation below to express: $\triangle l = \triangle S/Pt$

In the formula, △l: Impulse stroke (mm);

△S: Servo motor each revolution of traveling schedule (mm/extension);

Pt: Encoder each extension feedback pulse number (pulse/extension).

Because in the system it has four doubling circuits, therefore Pt=4C, C is encoder each crossover number. In this system, C=2500 line/extension, therefore Pt=10000 pulse/extension.

The dictate pulse multiplies the electronicic gear ratio G transform to position control pulse, therefore a dictate pulse traveling schedule △l* is expressed: $\triangle l^* = (\triangle S/Pt) * G$

In the formula,

G= dictate pulse frequency division member/command pulse frequency division denominator.

7.15.2 Position control pulse lag

With pulse training to control servo motor, between the dictate pulse and the feedback pulse, it has a differential value, called the lag pulse. This value accumulates in the position deviation counter, the dictate pulse frequency, the electronicic gear ratio, and the position proportional gain have following relates

$\varepsilon = (f^* * G)/Kp$

In the formula,

ε: Lag pulse (pulse);

f*: dictate pulse frequency (Hz);

Kp: Position proportional gain (1/S);

G: Electronicic gear ratio.

[Note 1] the above relations are obtained in under 0% [position Forward feed gain] conditions, if [position forward feed gain] >0%, then the lag pulse will be smaller than the predicted value above equation.

CHAPTER 8 Model code and motor

The set of PA1(Model code) must match the servo motor.the comparing table refer to following list.if they don't match.the performance may be down.all the medel code have a default parameter set.and the drive has been set to match the motor after packaging.

If it refes to chapter7.14.1.please refer to the following table to set.

Model code	*Servo motor*	*Torque(N.M)*	*Rated speedrmp*	*Power(kw)*
25	ASM 80-013-30 LFB	1.3Nm	3000rpm	0.4Kw
28	ASM 80-024-30 LFB	2.4Nm	3000rpm	0.75Kw
29	ASM 80-033-30 LFB	3.3Nm	3000rpm	1.0Kw
34	ASM 110-020-30 LFB	2 Nm	3000 rpm	0.6 Kw
35	ASM 110-040-30 LFB	4 Nm	3000 rpm	1.2 Kw
36	ASM 110-050-30 LFB	5 Nm	3000 rpm	1.5 Kw
37	ASM 110-060-20 LFB	6 Nm	2000 rpm	1.2 Kw
38	ASM 110-060-30 LFB	6 Nm	3000 rpm	1.6 Kw
44	ASM 130-040-25 LFB	4 Nm	2500 rpm	1.0 Kw
45	ASM 130-050-25 LFB	5 Nm	2500 rpm	1.3 Kw
46	ASM 130-060-25 LFB	6 Nm	2500 rpm	1.5 Kw
47	ASM 130-077-20 LFB	7.7 Nm	2000 rpm	1.6 Kw
48	ASM 130-077-30 LFB	7.7 Nm	3000 rpm	2.4 Kw
49	ASM 130-100-15 LFB	10 Nm	1500 rpm	1.5 Kw
50	ASM 130-100-25 LFB	10 Nm	2500 rpm	2.6 Kw
51	ASM 130-150-15 LFB	15 Nm	1500 rpm	2.3 Kw
52	ASM 130-150-25 LFB	15 Nm	2500 rpm	3.8 Kw
7	ASM 150-150-25 LFB	15 Nm	2500 rpm	3.8 Kw
8	ASM 150-180-20 LFB	18 Nm	2000 rpm	3.6 Kw
9	ASM 150-230-20 LFB	23 Nm	2000 rpm	4.7 Kw
10	ASM 150-270-20 LFB	27 Nm	2000 rpm	5.5 Kw

Hongkong Xinstart technology Co.,Limited

ADD:ROOM 1701, 17/F., HENAN BUILDING, NO. 90
JAFFE ROAD,WANCHAI,HONG KONG

TEL: 852—3752 2533

FAX: 852-3019 5857

Shenzhen xinstart technology Co.,Limited

ADD:BUILDING2 LANEWAY4 EAST VILLAGE SHANGSHA
FUTIAN DISTRICT SHENZHEN CHINA

TEL:86-755-82557084

FAX:86-755-82557084

Zip Code:518048

E-mail:admin@xinstart.com

Website:www.xinstart.com

2008.11