



B2 Series Servo

Manual

Shenzhen Xinlichuan Electric Co.,Ltd.

<http://servo.xlichuan.com>

Catalog

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Chapter I Installation



Notices

- The storage and installation of the product shall meet the required environmental conditions,
- Damaged products or products with incomplete parts shall not be installed.
- Fire-proof materials shall be employed in the product installation. The product shall not be installed on or near the inflammables to avoid fire.
- Servo drive unit shall be installed inside the electric cabinet to prevent the entry of dust, corrosive gas, conductive objects, liquid and inflammables.
- Servo drive unit and servo motor shall avoid vibration and shall not bear any impact.
- Do not drag the servo motor wiring and encoder line.

1.1 Installation of Servo Drive Unit



Notices

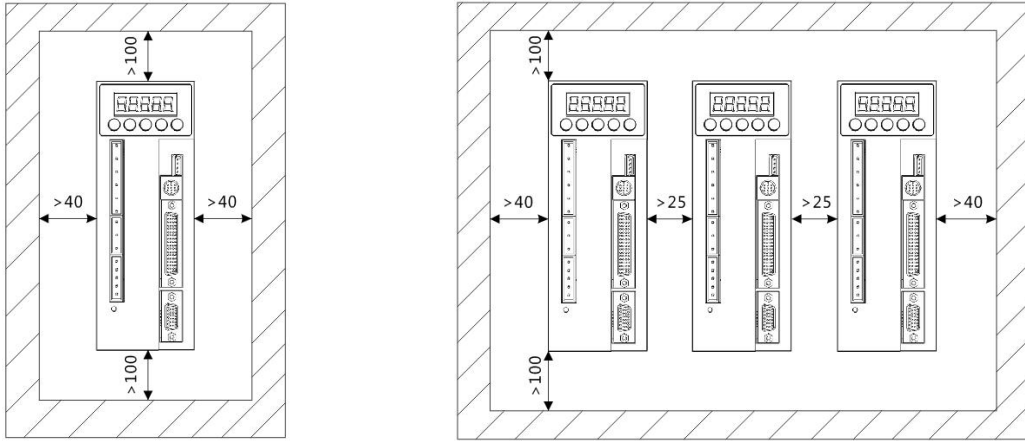
- Servo drive unit shall be installed inside the well-preserved electric cabinet.
- Servo drive unit shall be installed as per the specified direction and interval, and good heat dissipation conditions shall be ensured.
- Do not install the servo drive unit on or above the inflammables in case of fire.

1.1.1 Installation Environment

- (1) **Operating temperature/humidity:** 0~55°C (no white dew), below 90%RH(no condensation).
- (2) **Storage temperature/humidity:** -20~65°C (no white dew), below 90%RH(no condensation).
- (3) **Atmospheric environment:** Inside the control cabinet with no corrosive or inflammable gas, oil mist and dust etc.
- (4) **Elevation:** below 1000 m.
- (5) **Vibration:** below 0.5G (4.9m/s²), 10~60 Hz (discontinuous operation).
- (6) **Protection:** Servo drive is not self-protective. Therefore it shall be installed inside the well-preserved electric cabinet to prevent the entry of corrosive or inflammable gas, conductive objects, metal dust, oil mist and liquid.

1.1.2 Installation Method

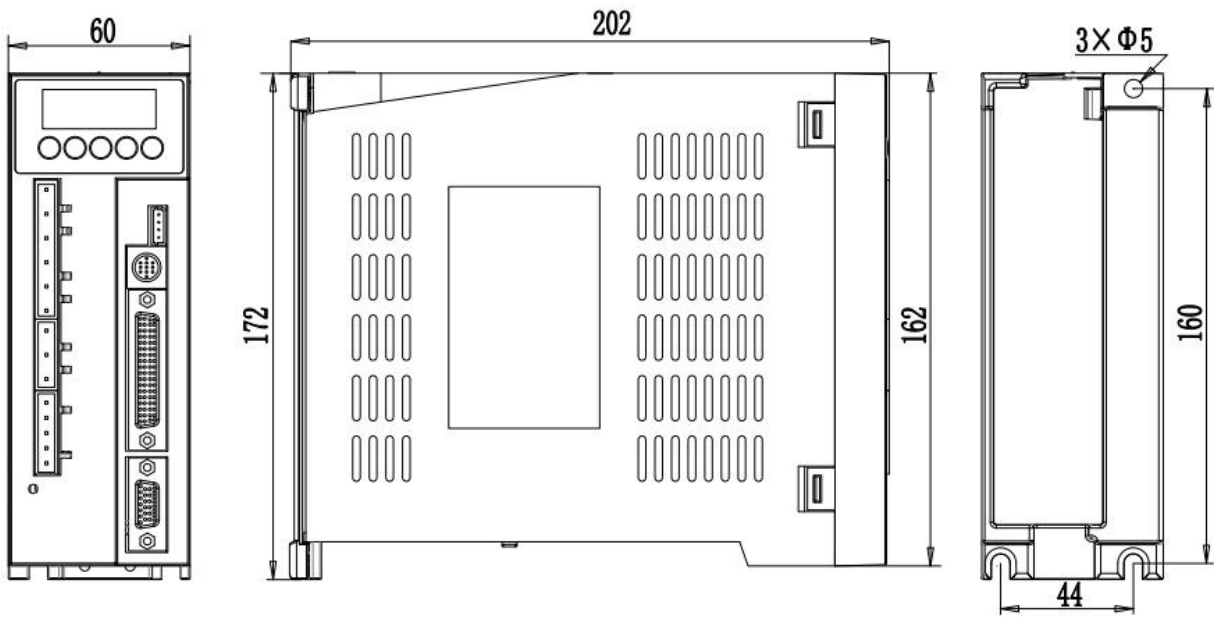
- (1) **Installation direction:** Servo drive provided by the company is of vertical structure, so please install vertically. The installation direction shall be perpendicular to the installation surface upward.
- (2) **Installation interval:**



Dwg1.1 Installation intervals of single servo drive unit

Dwg1.2 Installation intervals of more servo drive units

1.1.3 Installation Dimension of Servo Unit



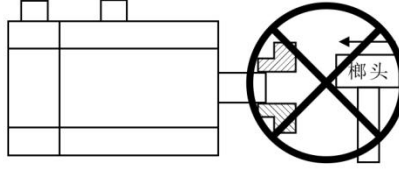
Dwg 1.3 Installation dimension of servo unit

1.2 Installation of Servo motor



Warnings

Do not knock the shaft end of the motor, or the motor encoder may be damaged.



1.2.1 Installation Environment

- (1) **Operating temperature/humidity:** 5~40°C (no white dew), below 90%RH(no condensation).
- (2) **Storage temperature/humidity:** -20~55°C (no white dew), below 80%RH(no condensation).
- (3) **Atmospheric environment:** Indoor (no exposure to sun) with no corrosive or inflammable gas, oil mist and dust etc.
- (4) **Elevation:** below 1000 m.
- (5) **Vibration:** below 0.5G (4.9m/s²), 10~60 Hz (discontinuous operation).
- (6) **Protection grade:** IP54

1.2.2 Installation Method

- (1) **Installation direction:** To prevent the entry of liquid, like water and oil, into the motor from its wire-end, please make the cable outlet installed downward. If the motor shaft is installed upward and attached with reducer, the oil stain in the reducer shall be prevented to permeate into the motor from the motor axis.
- (2) **Concentric:** When connected to the machine, please employ the coupling and keep the axis of servo motor and that of the machine in alignment.
- (3) **Cable:** Do not curve the cable or load tension to it, so when wiring (using) it, do not stretch the cable too much.

Chapter II Wiring



Warnings

- This series of drive is equipped with the three-phase 220V power supply, therefore the power for the drive shall be checked when wiring.
- Customers shall take safety protection into consideration during the layout and installation of the product in order to avoid accidents due to false operation.
- The drive terminals U, V, W shall separately correspond to those of the motor U, V, W.
- The drive and the motor shall be well-grounded.
- The electricity shall be turned off at least 5 minutes before dismantling the drive.
- Do not frequently turn on/ off the power supply. Should the power supply have to be turned on/ off repeatedly, please ensure that it is performed with an interval of more than 1 minute.
- When using the internal brake resistance, the short-circuit wire shall be connected between the terminal C and DC+. Do not connect the wire strap directly between the terminal C and DC+.

2.1 The Main Circuit Wiring

2.1.1 The Name of the Main Circuit Terminal

Identifier	Name	Explanation
R、S、T	The main circuit power input terminal	Connect the single-phase/three-phase AC power (based on the product model, select appropriate voltage specification, connect single-phase 220V to only R and S)
r、s	Test power input terminal	Turn on the power when testing. Need not turn on the power during normal use.
DC+、D、C	Retrogradation resistance terminal	When using the internal retrogradation resistance, connect the short-circuit wire between terminal C and DC+ (connected before delivery); when using the external retrogradation resistance, disconnect the short-circuit wire between terminal C and DC+ and connect brake resistance between terminal D and DC+. The external retrogradation resistance shall be purchased separately.
U、V、W	Motor cable	Connected to the motor.
PE	Protective earth terminal (two places)	Ground connection: Connected to the grounding terminal of the power and that of the motor.

2.1.2 Application Method of Main Circuit Power Terminal (spring-loaded)

(1) **Wire size:** single line $\phi 0.5 \sim \phi 1.6\text{mm}$.

(2) **Connection method:**

1. Dismantle the terminal from the servo drive before wiring, or the servo drive may be damaged.

2. Strip the wire to expose 8~9mm bare copper wire.

3. Open the wiring insertion slot inside the terminal, insert the wiring into the terminal, then the terminal will close when loosening the control lever or the screwdriver. The method is shown below

- Lever the slot with the matched control level for servo drive (shown in Fig. A).

- Insert the straight screwdriver into the terminal opening (the end width 3.0~3.5mm), then press

firmly to open the slot (shown in Fig. B).

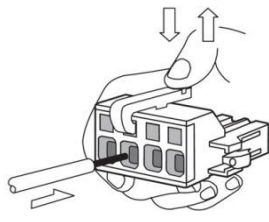


图 A Fig. A

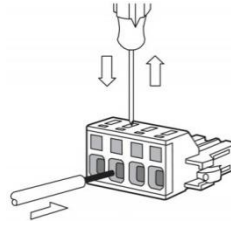
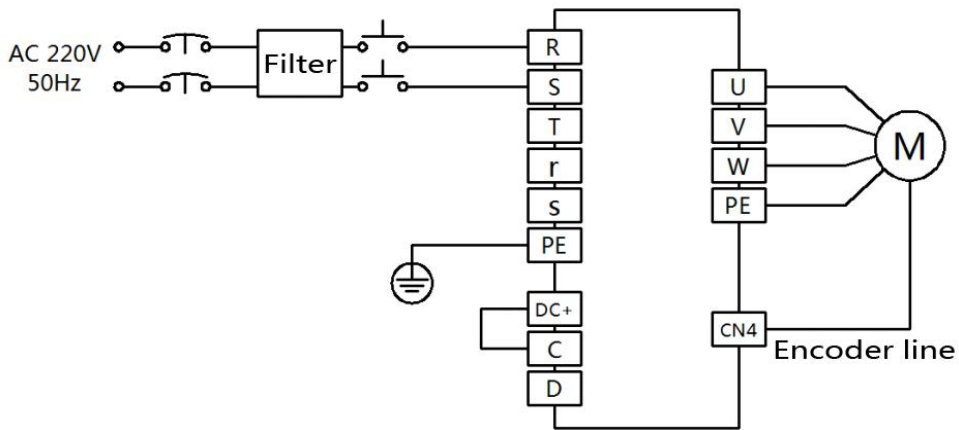


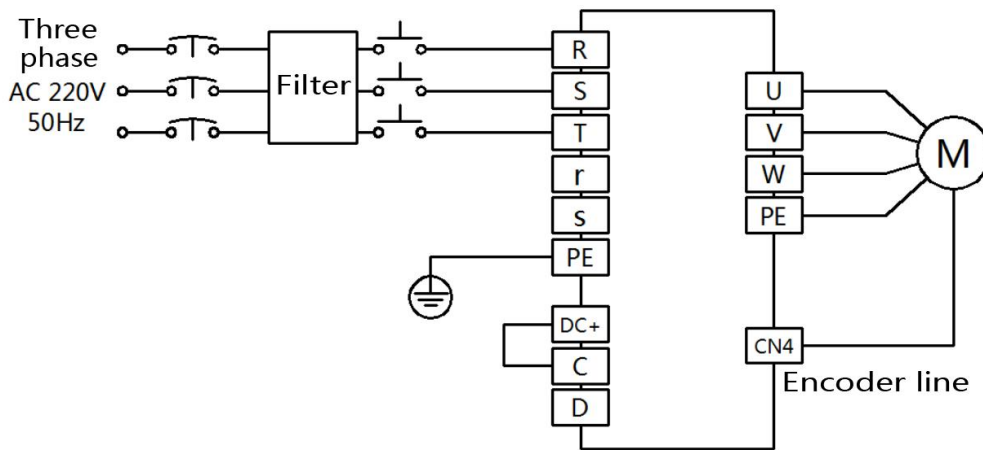
图 B Fig. B

2.1.3 Main Circuit Wiring

1、Single-phase power wiring



2、Three-phase power wiring

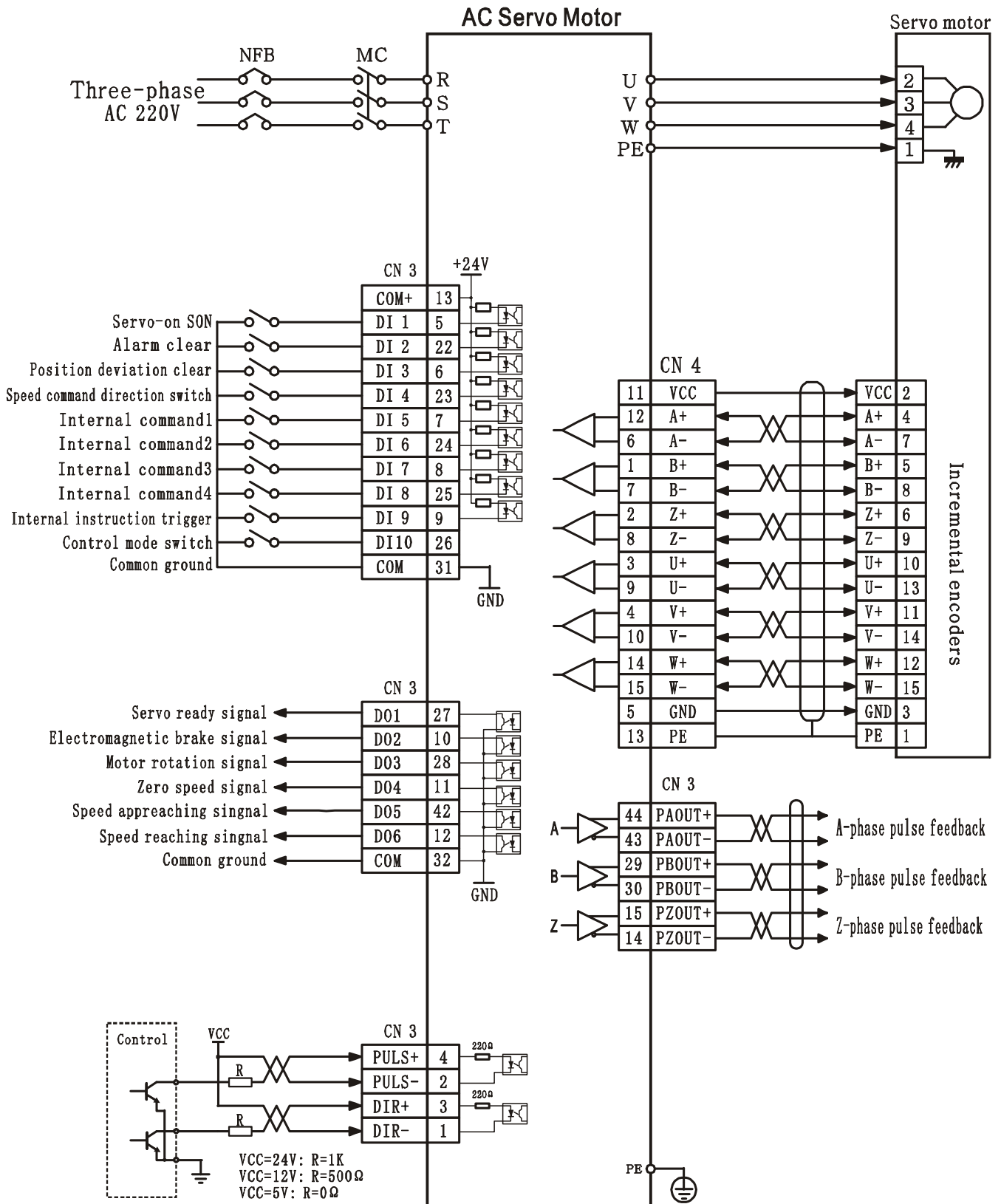


Note:

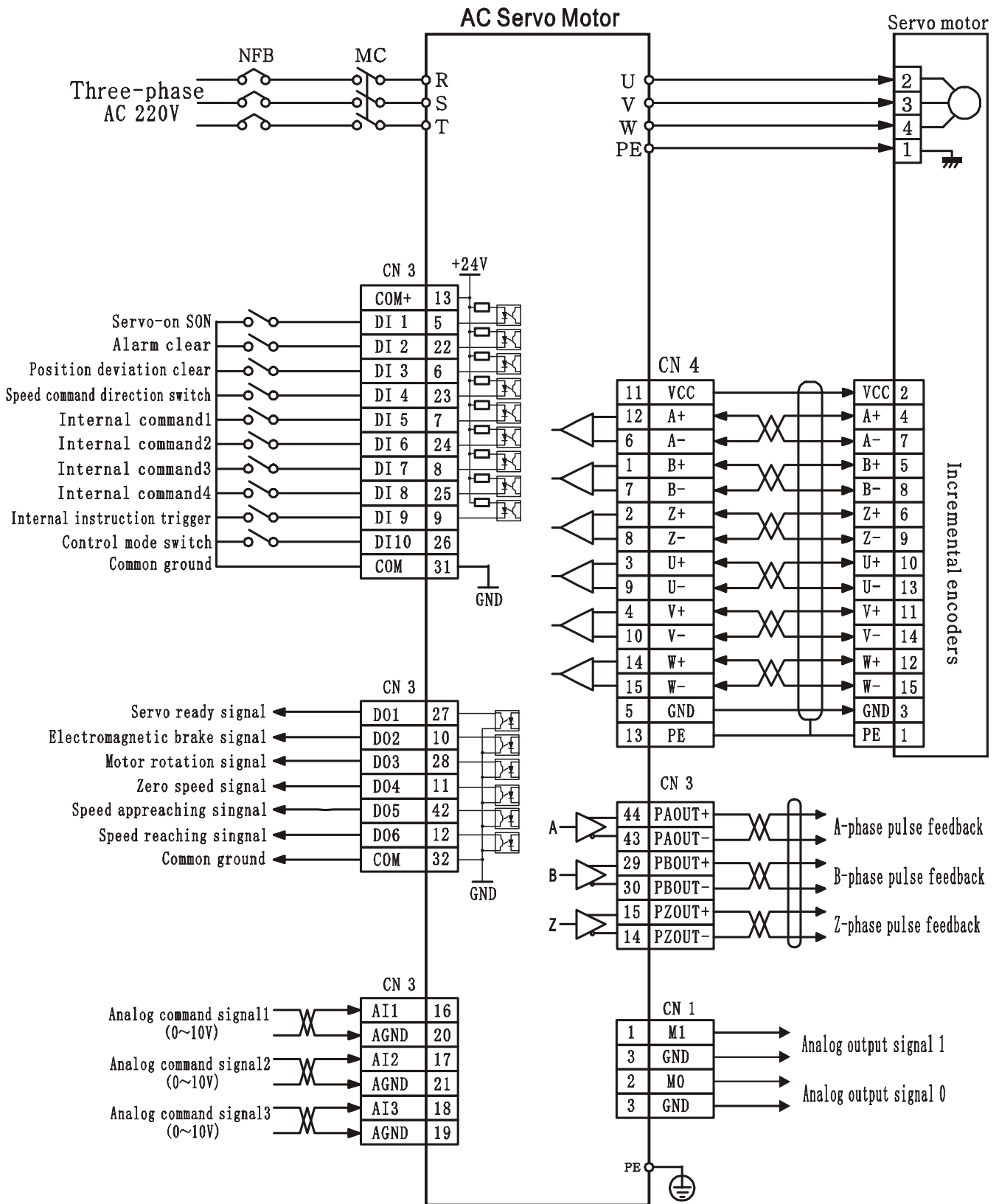
1. When using the internal brake resistance, connect the short-circuit wire between terminal C and DC+ (connected before delivery); when using the external brake resistance, disconnect the short-circuit wire between terminal C and DC+ and connect brake resistance between terminal D and DC+.
2. Terminal r and s are testing terminals. Need not turn on the power when operating.

2.2 CN3 Control Terminal Wiring

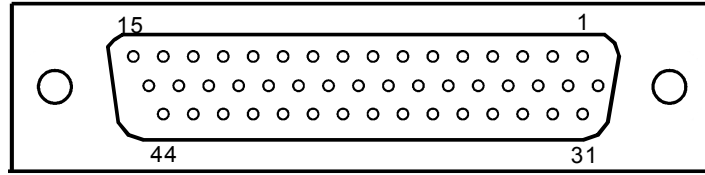
2.2.1 Standard Wiring of The Position Mode



2.2.2 Standard Wiring of The Speed/Torque Mode



2.2.3 CN3 Terminal Definition



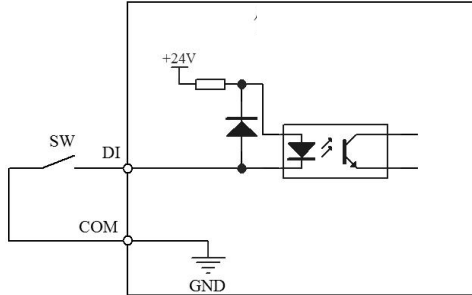
Terminal welding surface

The signal name		Pin no.	The default function	Function
Digital value input port	DI1	5	1	Servo-on
	DI2	22	2	Alarm reset signal
	DI3	6	3	Position control impulse deviation counter clear
	DI4	23	4	Speed instruction direction selection
	DI5	7	5	Internal instructions CMD0
	DI6	24	6	Internal instructions CMD 1
	DI7	8	7	Internal instructions CMD 2
	DI8	25	8	Internal instructions CMD 3
	DI9	9	9	Internal instructions Level triggered
	DI10	26	10	control mode switch
Digital value output port	DO1	27	1	Servo ready
	DO2	10	2	Brake output signal
	DO3	28	3	Motor rotation output signal
	DO4	11	4	Zero speed signal
	DO5	42	5	Speed approaching
	DO6	12	6	Speed reaching
Position instruction	PULSE	4	Input pulse instruction: differential drive/ open collector Input mode: pulse+direction/Phase A and B orthogonal pulse	
	/PULSE	2		
	SIGN	3		
	/SIGN	1		
Analog quantity input port	AI1	16	Analog quantity input signal, input range 0~10V	
	AI2	17	Analog quantity input signal, input range 0~10V	
	AI3	18	Analog quantity input signal, input range 0~10V	
	GNDA	19、20、21	Analog quantity input ground	
Encoder output signal	PA+	44	Encoder phase A output signal (differential)	
	PA-	43		
	PB+	29	Encoder phase B output signal (differential)	
	PB-	30		
	PZ+	15	Encoder phase Z output signal (differential)	
	PZ-	14		
Power	+24V	13	Internal 24V power, for external use (with COM)	
	COM	31、32		

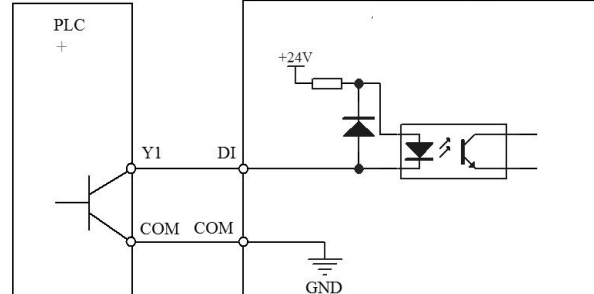
2.2.4 CN3 interface circuit

1、 Digital Input Circuit

The series of servo drive provides ten routes of DI terminal altogether for customers. The function of each DI port can be planned. The schematic diagram is shown below.



Control wiring diagram of external terminal

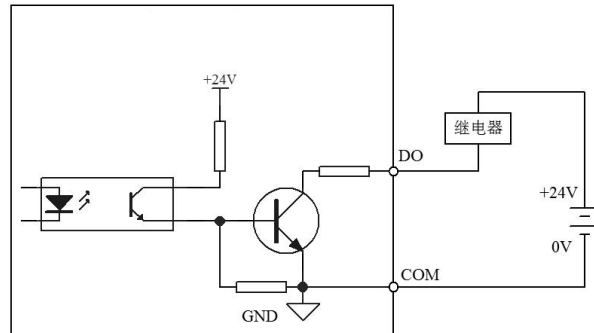


PLC control wiring diagram

2、 Digital Output Circuit

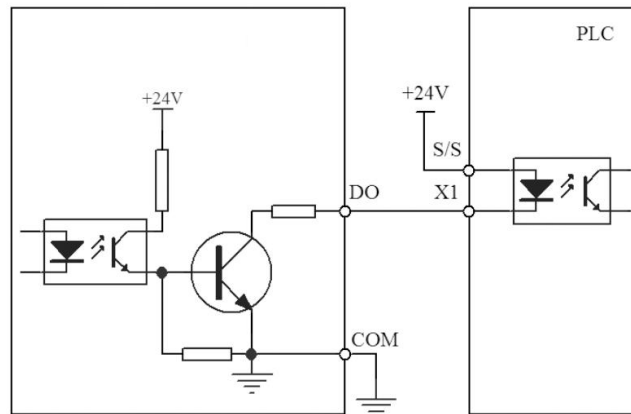
The series of servo drive provides six routes of DO terminal altogether for customers. The function of each DO port can be planned. The schematic diagram is shown below.

(1) Wiring diagram when upper computer displays relay input:



when upper computer displays relay input

(2) Wiring diagram when upper computer displays optocoupler input:



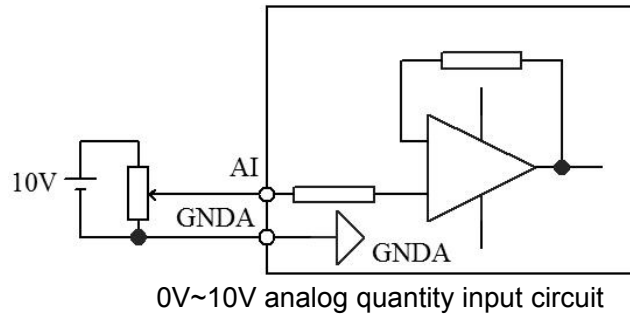
when upper computer displays optocoupler input

Note: When the external power is at 24V, pull-up resistor R=10K; when the external power is at 5V, pull-up resistor R=2K.

3、 Analog quantity output circuit

The series of servo drive provides two kind of analog quantity output circuit, namely, unipolar and bipolar. Input voltage range of unipolar analog quantity: 0~10V; Channel for AI1 and AI2 are unipolar, The schematic diagram is shown below.

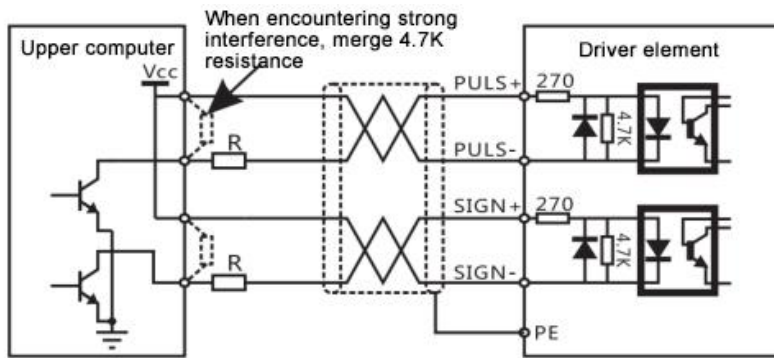
(1) Unipolar analog quantity input circuit (AI1~AI3)



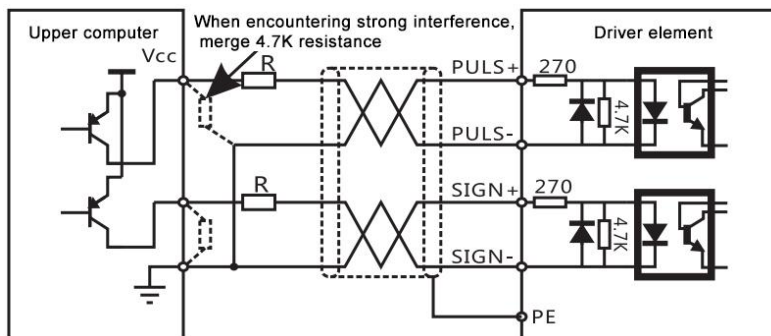
4. Position instruction input circuit

The series of servo drive has pulse instruction input terminal and it can receive signal from both the differential drive output from the upper level device and open-collector output. Specific wiring is shown below.

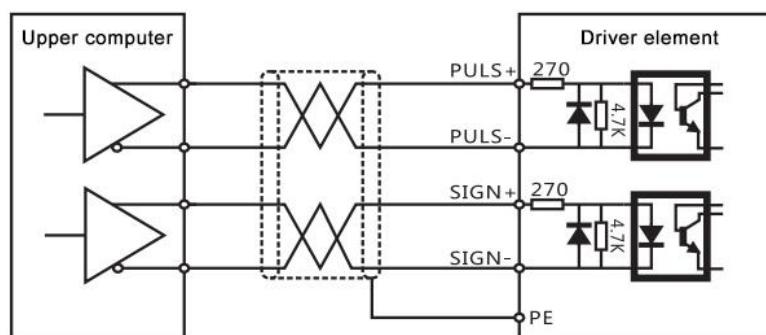
(1) NPN type open-collector wiring mode



(2) PNP type open-collector wiring mode

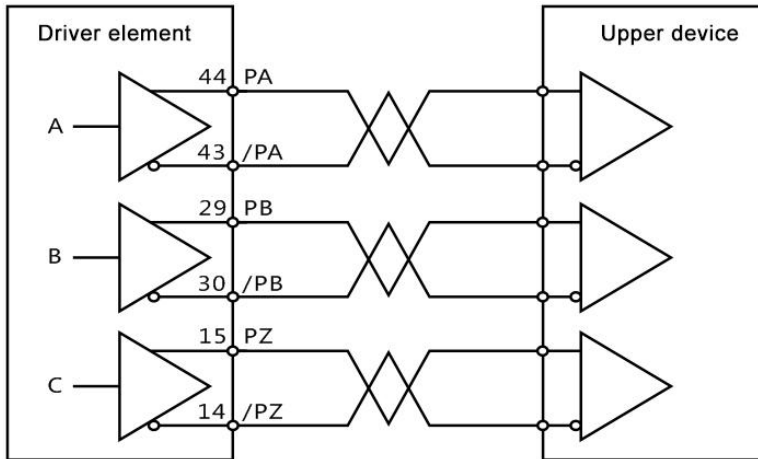


(3) Differential drive output wiring mode

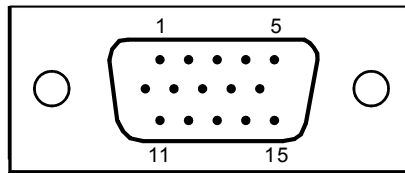


5. Encoder signal output circuit

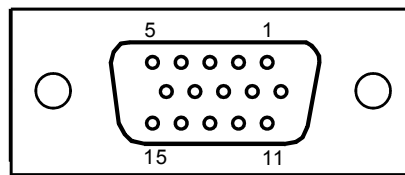
The series of servo drive can output the feedback signal of encoder to differential signal through differential drive, provide feedback signal for upper computer, thus forming position closed-loop control. Upper computer shall use differential for circuit reception. The schematic diagram is shown below.



2.2.5 CN4 encoder signal terminal



Encoder wiring terminal front

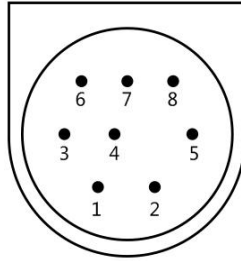


Encoder wiring terminal back

Pin	Identifier	Content	Pin	Identifier	Content
12	PGA+	A	4	PGV+	V
6	PGA-	/A	10	PGV-	/V
1	PGB+	B	14	PGW+	W
7	PGB -	/B	15	PGW-	/W
2	PGZ+	Z	11	+5V	DC5V
8	PGZ-	/Z	5	GND	0V
3	PGU+	U	13	PE	大地
9	PGU -	/U			

2.2.6 CN2 communication port terminal

CN2 communication port terminal of the series of servo drive provides two sets of port --RS232 and RS485, but they can not work simultaneously. Customers can modify or monitor the parameters in the servo drive through touch screen, PLC or PC. The pin figure is shown below.

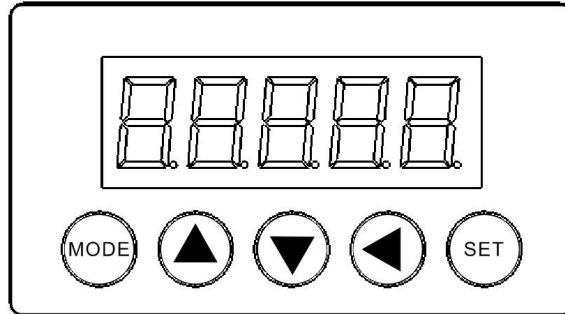





Pin	Definition	Pin	Definition
1	RXD	2	GND
4	TXD	3	
5	485+	6	
8	485-	7	

The front pin figure of the terminal

Chapter III Manifestation and Operation

3.1 Name of the Panel Parts

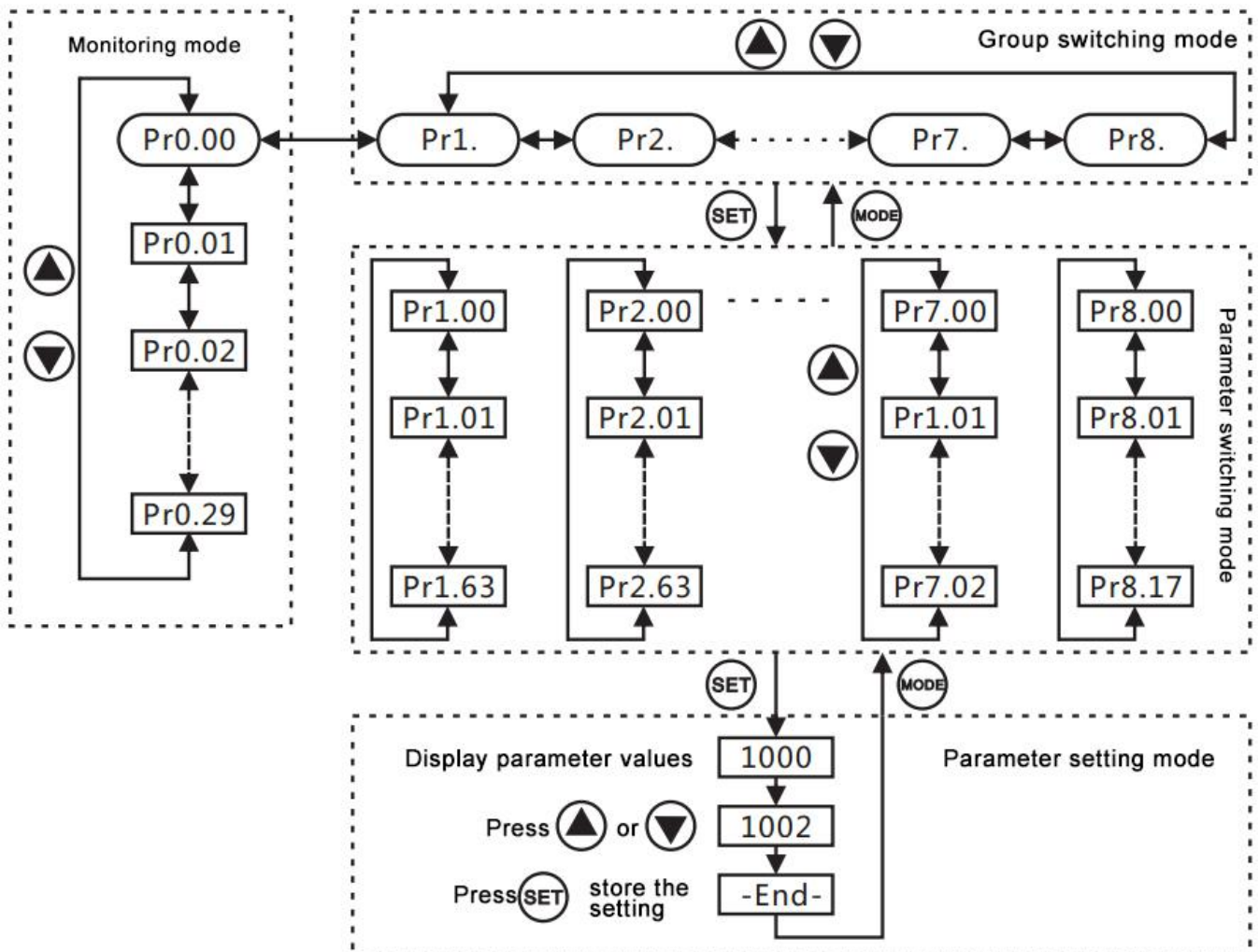


Part	Part name	Function
Digital display tube	Display	Five sets of LED Nixie tube are to display the monitoring values, parameter values and set values.
MODE	MODE button	Enter modes between groups or withdraw modes between/within groups and set parameter modes.
	SHIFT button	Under set modes, shifting blinking characters to the left can modify the higher set character values. If the parameter displayed is 5-digit greater than that of the LED Nixie tube, high and low bytes switching will be displayed.
	UP button	Modify monitoring code, group number, parameter code and set value.
	DOWN button	Modify monitoring code, group number, parameter code and set value.
SET	SET button	Display and store the entry of set value, modes between groups and parameter set mode.

3.2 Parameter setting procedure

- (1) Turn on the drive power, and the panel will display the default control codes of the drive for one second and then automatically enter the monitoring display mode.
- (2) Under the monitoring mode, when pressing the UP or DOWN button, you can switch the monitoring parameter codes, and at this moment press set button to enter the monitoring display of the parameter code. If no button is pressed, the system will automatically enter the monitoring display of the parameter code one minute later.
- (3) Under the monitoring mode, when control parameter is at 32 (bit number) or the displayed value is above 5 digits (binary number), press the SHIFT button to switch between the high and low digits. When it is switched to the high digit, the point of the highest digit LED will be on.
- (4) Under the monitoring mode, press the MODE button to enter the parameter modes between groups, then press the UP/DOWN button to switch group codes and press the MODE button to withdraw parameter codes between groups and to go back to the control mode.

- (5) Under the parameter codes between groups, press the SET button to enter the parameter codes within group; press the MODE button to withdraw the parameter codes within group and to go back to codes between groups. Press the SHIFT button, the blinking character will shift to the left and then the group number and the high digit within the group can be modified to select the required parameter.
- (6) Under the parameter codes within group, press SET button to enter the parameter setting mode to display the setting value of the parameter; press the UP or DOWN button to the last two values of the parameter code.
- (7) Under the setting mode, press the SHIFT button, and the blinking character will shift to the left, then press the UP/DOWN button to set the higher digit parameter character.
- (8) After modifying the setting value, press the SET button, the storage or execution of of the parameter value can be done.
- (9) After setting the parameter, the display will show the corresponding prompt code, like "-End-" and then automatically go back to the parameter modes within group.
- (10) Under the setting mode, it means not to modify the parameter setting value and to go back to the parameter codes within group when pressing the MODE button or no button is pressed within one minute. Under other modes, it will also go back to the monitoring mode when no button is pressed within one minute. The specific flow diagram is shown below.



3.2 Storage status display

Press the SET button to display the status of the parameter setting mode.

Displayed symbol	Content description
-End-	The storage finishes when the setting values are correct.
Po_on	The parameter will be effective after turning on the power.
SrvOn	Parameters are unable to be set when the servo is on.
Err-r	Read-only parameter, non-modifiable.
rESvd	The parameter is retention value, non-modifiable.

3.3 Fault and alarm display

Display example	Content description
Er.0xx	When the drive fails, the panel will report fault and display its symbol "Er.0" and its number "xx", whose range is 01~FFH. At this moment, other images will be seen if the operation buttons are pressed, but the point of the rightmost LED Nixie tube will continue to flash until the fault is cleared. The panel will show "Er.---" if there is no fault or warning.
Er.Exx	When the drive alarm sounds, the panel will report warning and display its symbol "Er.E" and its number "xx". At this moment, other images will be seen if any operation button is pressed, but the lowest digit Nixie tube will continue to flash until the alarm is cleared.

Chapter IV Parameter Description

4.1 Parameter Definition

Parameters are divided into 9 groups. The first parameter of its start code is the group number and the following two parameters are internal group numbers. The communication address is composed of group number and internal group numbers. The parameter group is defined as follows.

Pr0.xx group 0: Control parameter

Pr1.xx group1: Basic parameter

Pr1.xx group2: Internal position control parameter

Pr3.xx group3: Internal speed control parameter

Pr4.xx group4: Torque control parameter

Pr5.xx group5: Tuning parameter

Pr6.xx group6: Input/ output setting parameter

Pr7.xx group7: Communication parameter

Pr8.xx group8: Auxiliary function parameter

Description of parameter setting

- - Set at any time and be effective immediately.
 - - Set at any time and be effective after turning on the power again.
 - - Halt On and be effective immediately.
 - - Halt On and be effective immediately turning on the power again.
 - ▲ - Read-only parameter, description of the control mode that can not be set.
- P - Position control mode
S - Speed control mode
T - Torque control mode

4.2 Parameter Description

4.2.1 Monitoring Parameter

Parameter no.	Function code explanation	Factory default	Setting range	Unit	Attribute	The operation mode
Pr0.00	Current revolving speed	/	/	rpm	▲	P S T
Pr0.01	External pulse frequency, collected external pulse count within position dispatching cycle.	/	/	Hz	▲	P S T
Pr0.02	4 digits lower at current position (pulse)	/	/	puls	▲	P S T
Pr0.04	4 digits higher at current position (pulse ×10000)	/	/	puls	▲	P S T
Pr0.06	Position instruction when its 4 digits lower (pulse)	/	/	puls	▲	P S T
Pr0.08	Position instruction when its 4 digits lower (pulse ×10000)	/	/	puls	▲	P S T
Pr0.10	Effective current value	/	/	A	▲	P S T
Pr0.12	Incremental encoder UVW sector number	/	/	/	▲	P S T
Pr0.13	Current electrical angle	/	/	/	▲	P S T
Pr0.14	Load rate	/	/	%	▲	P S T
Pr0.16	Effective current value of the motor	/	/	A	▲	P S T
Pr0.18	Instantaneous current value of Phase U	/	/	A	▲	P S T
Pr0.19	Instantaneous current value of Phase W	/	/	A	▲	P S T
Pr0.20	Busbar voltage	/	/	V	▲	P S T
Pr0.21	Ratio of inertias of current load	/	/	%	▲	P S T
Pr0.22	Current total inertia	/	/	%	▲	P S T
Pr0.23	DI input status	/	/	/	▲	P S T
Pr0.24	DO output status	/	/	/	▲	P S T
Pr0.25	Display the fault code P1-60 selects	/	/	rpm	▲	P S T
Pr0.26	Revolving speed when P1-60 fault occurs	/	/	rpm	▲	P S T
Pr0.27	Busbar voltage when P1-60 fault occurs	/	/	V	▲	P S T
Pr0.28	Effectiv current value when P1-60 fault occurs	/	/	A	▲	P S T
Pr0.29	Running time when fault occurs	/	/	min	▲	P S T
Pr0.30	Drive module temperature	/	/	°C	▲	P S T

4.2.2 Basic parameter

Parameter no.	Function code explanation	Factory default	Setting range	Unit	Attribute	The operation mode
Pr1.00	control mode selection: 0: Speed control mode; 1: Position control mode; 2: Torque control mode; 3: Switching mode between speed and position; 4: Switching mode between torque and speed; 5: Switching mode between position and torque;	1	0~5	/	<input type="checkbox"/>	P S T
Pr1.01	Input form of external pulse: 0: Direction + pulse, logic is positive 1: Direction + pulse, logic is negative 2: AB is orthogonal, logic is positive 3: AB is orthogonal, logic is negative	0	0~3	/	<input checked="" type="checkbox"/>	P
Pr1.02	Electronic gear numerator 1	1	1~32767	/	<input type="checkbox"/>	P
Pr1.04	Electronic gear denominator	1	1~32767	/	<input type="checkbox"/>	P
Pr1.06	Electronic gear numerator2	1	1~32767	/	<input type="checkbox"/>	P
Pr1.08	Electronic gear numerator3	1	1~32767	/	<input type="checkbox"/>	P
Pr1.10	Electronic gear numerator4	1	1~32767	/	<input type="checkbox"/>	P
Pr1.12	Positioning approaching width: Under the position control mode, when position deviation pulse value is lower than what is set, output the position approaching signal.	20	1~65535	Puls	<input type="checkbox"/>	P
Pr1.13	Position completion width: Under the position control mode, when position deviation pulse value is lower than what is set, output the position completion signal.	10	0~65535	Puls	<input type="checkbox"/>	P
Pr1.14	Position following error warning value	65535	10-65535	Puls	<input type="checkbox"/>	P
Pr1.16	Position following error fault value	65535	1-65535	Puls	<input type="checkbox"/>	P
Pr1.18	IF the position feedback deviation is too large, fault will shield switch: 0: Not block; 1: Deviation warning at the shielded position.	0	0~1	/	<input type="checkbox"/>	P
Pr1.19	Auto clear of positional deviation: 0: Clear the deviation automatically under the fault; 1: Clear the deviation automatically when the fault and servo are OFF; 2: Apply Pr1.20 to clear the deviation instead of auto clear.	1	0~2	/	<input type="checkbox"/>	P
Pr1.20	External DI signal deviation clear selection 0: Clear through CLR rising edge; 1: Clear through CLR low level; 2: Clear through CLR high level;	0	0~3	/	<input type="checkbox"/>	P

Parameter no.	Function code explanation	Factory default	Setting range	Unit	Attribute	The operation mode
	3: Clear through CLR falling edge.					
Pr1.21	Halt mode: 0: Free deceleration 1: Halt at zero speed	0	0~1	/	<input type="checkbox"/>	P S T
Pr1.22	Position instruction source: 0: External pulse instruction 1: Internal register setting	0	0~1	/	<input type="checkbox"/>	P
Pr1.24	Run mode selection of internal multiple segment position: 0: Run from Pr1 to Pr16, and circulate; 1: Run from Pr1 to Pr16, and not circulate.	0	0~2	/	<input type="checkbox"/>	P
Pr1.25	Delay time between the servo is on and the electromagnetic brake signal is on (withdraw the brake)	500	0~500	ms	<input type="checkbox"/>	P S T
Pr1.26	Delay time between servo is off and the electromagnetic brake signal is off (start the brake)	500	0~500	ms	<input type="checkbox"/>	P S T
Pr1.27	Speed instruction when the electromagnetic brake is effective	100	1~1000	rpm	<input type="checkbox"/>	P S T
Pr1.28	Speed instruction source: 0: Internal register setting; 1: Analog quantity 1(AI1) setting; 2: Analog quantity 2(AI2) setting; 3: Analog quantity 3(AI3) setting; 4: Internal speed instruction switch; 5: Inching (When external DI JOG is on);	0	0~5	/	<input type="checkbox"/>	S
Pr1.29	Run mode selection of multi-speed 0: Switch between multi-speed automatically, and circulate; 1: Switch between multi-speed automatically, and not circulate; 2: External DI switch of multi-speed	0	0~2	/	<input type="checkbox"/>	S
Pr1.30	Motor overspeed alarm setting value	5000	0~5000	rpm	<input type="checkbox"/>	P S T
Pr1.31	Threshold detection of zero speed output	10	0~100	rpm	<input type="checkbox"/>	P S T
Pr1.32	Speed threshold value of rotation signal output	10	0~1000	rpm	<input type="checkbox"/>	P S T
Pr1.33	Speed approaching threshold value	100	10~3000	rpm	<input type="checkbox"/>	S
Pr1.34	Speed reaching threshold value	20	1~3000	rpm	<input type="checkbox"/>	S
Pr1.35	Fixed value of zero speed of analog speed instruction When the analog input signal is below the setting value, motor will be locked ± 1 pulse within the effective range of zero fixed value.	10	0~300	rpm	<input type="checkbox"/>	S
Pr1.36	Analog speed instruction gain: The corresponding speed when the analog input is 10V.	5000	0~5000	rpm	<input type="checkbox"/>	S

Parameter no.	Function code explanation	Factory default	Setting range	Unit	Attribute	The operation mode
Pr1.37	Anti-interference intensity of external pulse input	3	0~7	/	<input type="checkbox"/>	P
Pr1.38	Time constant of external pulse input smoothing filtering	0	0~500	ms	<input type="checkbox"/>	P
Pr1.39	Acceleration and deceleration time constant of position S pattern smoothing natural rotation instruction	100	1~10000	ms	<input type="checkbox"/>	P
Pr1.40	Acceleration and deceleration time constant of position S pattern smoothing inversion instruction	100	1~10000	ms	<input type="checkbox"/>	P
Pr1.41	Acceleration and deceleration time constant within position S pattern smooth curve	10	0~1000	ms	<input type="checkbox"/>	P
Pr1.42	Time constant of speed feedback filtering and micro vibration restrain	500	0~30000	us	<input type="checkbox"/>	S
Pr1.43	Acceleration time constant of position S pattern smoothing instruction	100	1~10000	ms	<input type="checkbox"/>	S
Pr1.44	Deceleration time constant of position S pattern smoothing instruction	100	1~10000	ms	<input type="checkbox"/>	S
Pr1.45	Acceleration and deceleration time constant within speed S pattern smooth curve	10	0~1000	ms	<input type="checkbox"/>	S
Pr1.46	Smoothing time of speed instruction lowpass filtering	0.0	0.0~1000.0	ms	<input type="checkbox"/>	S
Pr1.47	Current feedback filtering time constant	100	0~10000	us	<input type="checkbox"/>	P S T
Pr1.48	Time constant of the given torque current and resonance restrain filtering	100	0~10000	us	<input type="checkbox"/>	T
Pr1.49	Torque notch frequency of the first group	1000	50~1000	/	<input type="checkbox"/>	T
Pr1.50	Torque notch depth of the first group	0	0~32	/	<input type="checkbox"/>	T
Pr1.51	Torque notch frequency of the second group	1000	50~1000	/	<input type="checkbox"/>	T
Pr1.52	Torque notch depth of the second group	0	0~32	/	<input type="checkbox"/>	T
Pr1.53	Torque notch frequency of the third group	1000	50~1000	/	<input type="checkbox"/>	T
Pr1.54	Torque notch depth of the third group	0	0~32	/	<input type="checkbox"/>	T
Pr1.60	Fault display selection: 0: The last fault; 1: The former fault before the last fault; 2: The former two faults before the last fault; 3: The former three faults before the last fault;	0	0~3	/	<input type="checkbox"/>	P S T
Pr1.61	System parameter initialization: 0: No-operation; 1: Fault clearance record; 65535: Restore factory defaults (power on again, automatic reset)	0	0~65535	/	<input checked="" type="checkbox"/>	P S T
Pr1.63	Open password of F group function	0	0~1	/	<input type="checkbox"/>	P S T

Parameter no.	Function code explanation	Factory default	Setting range	Unit	Attribute	The operation mode
	code					

4.2.3 Internal position control parameter

Parameter no.	Function code explanation	Factory default	Setting range	Unit	Attribute	The operation mode
Pr2.00	the Number of turns of Internal position instruction1	0	30000-+3000	rev	<input type="checkbox"/>	P
Pr2.01	the Pulse number of Internal position instruction1	0	-9999-+9999	Puls	<input type="checkbox"/>	P
Pr2.02	the Movement speed of Internal position instruction1	1000	1-3000	rpm	<input type="checkbox"/>	P
Pr2.03	Waiting time between the completion of Pr1 and the entry of Pr2	1.0	0.0-3000.0	s	<input type="checkbox"/>	P
Pr2.04	the Number of turns of Internal position instruction2	0	30000-+3000	rev	<input type="checkbox"/>	P
Pr2.05	the Pulse number of Internal position instruction2	0	-9999-+9999	Puls	<input type="checkbox"/>	P
Pr2.06	the Movement speed of Internal position instruction2	1000	1-3000	rpm	<input type="checkbox"/>	P
Pr2.07	Waiting time between the completion of Pr2 and the entry of Pr3	1.0	0.0-3000.0	s	<input type="checkbox"/>	P
Pr2.08	the Number of turns of Internal position instruction3	0	30000-+3000	rev	<input type="checkbox"/>	P
Pr2.09	the Pulse number of Internal position instruction3	0	-9999-+9999	Puls	<input type="checkbox"/>	P
Pr2.10	the Movement speed of Internal position instruction3	1000	1-3000	rpm	<input type="checkbox"/>	P
Pr2.11	Waiting time between the completion of Pr3 and the entry of Pr4	1.0	0.0-3000.0	s	<input type="checkbox"/>	P
Pr2.12	the Number of turns of Internal position instruction4	0	30000-+3000	rev	<input type="checkbox"/>	P
Pr2.13	the Pulse number of Internal position instruction4	0	-9999-+9999	Puls	<input type="checkbox"/>	P
Pr2.14	the Movement speed of Internal position instruction4	1000	1-3000	rpm	<input type="checkbox"/>	P
Pr2.15	Waiting time between the completion of Pr4 and the entry of Pr5	1.0	0.0-3000.0	s	<input type="checkbox"/>	P
Pr2.16	the Number of turns of Internal position instruction5	0	30000-+3000	rev	<input type="checkbox"/>	P
Pr2.17	the Pulse number of Internal position instruction5	0	-9999-+9999	Puls	<input type="checkbox"/>	P
Pr2.18	the Movement speed of Internal position instruction5	1000	1-3000	rpm	<input type="checkbox"/>	P
Pr2.19	Waiting time between the completion of Pr5 and the entry of Pr6	1.0	0.0-3000.0	s	<input type="checkbox"/>	P
Pr2.20	the Number of turns of Internal position instruction6	0	30000-+3000	rev	<input type="checkbox"/>	P
Pr2.21	the Pulse number of Internal position	0	-9999-+9999	Puls	<input type="checkbox"/>	P

Parameter no.	Function code explanation	Factory default	Setting range	Unit	Attribute	The operation mode
	instruction6					
Pr2.22	the Movement speed of Internal position instruction6	1000	1-3000	rpm	<input type="checkbox"/>	P
Pr2.23	Waiting time between the completion of Pr6 and the entry of Pr7	1.0	0.0-3000.0	s	<input type="checkbox"/>	P
Pr2.24	the Number of turns of Internal position instruction7	0	30000-+3000	rev	<input type="checkbox"/>	P
Pr2.25	the Pulse number of Internal position instruction7	0	-9999-+9999	Puls	<input type="checkbox"/>	P
Pr2.26	the Movement speed of Internal position instruction7	1000	1-3000	rpm	<input type="checkbox"/>	P
Pr2.27	Waiting time between the completion of Pr7 and the entry of Pr8	1.0	0.0-3000.0	s	<input type="checkbox"/>	P
Pr2.28	the Number of turns of Internal position instruction8	0	30000-+3000	rev	<input type="checkbox"/>	P
Pr2.29	the Pulse number of Internal position instruction8	0	-9999-+9999	Puls	<input type="checkbox"/>	P
Pr2.30	the Movement speed of Internal position instruction8	1000	1-3000	rpm	<input type="checkbox"/>	P
Pr2.31	Waiting time between the completion of Pr8 and the entry of Pr9	1.0	0.0-3000.0	s	<input type="checkbox"/>	P
Pr2.32	the Number of turns of Internal position instruction9	0	30000-+3000	rev	<input type="checkbox"/>	P
Pr2.33	the Pulse number of Internal position instruction9	0	-9999-+9999	Puls	<input type="checkbox"/>	P
Pr2.34	the Movement speed of Internal position instruction9	1000	1-3000	rpm	<input type="checkbox"/>	P
Pr2.35	Waiting time between the completion of Pr9 and the entry of Pr10	1.0	0.0-3000.0	s	<input type="checkbox"/>	P
Pr2.36	the Number of turns of Internal position instruction10	0	30000-+3000	rev	<input type="checkbox"/>	P
Pr2.37	the Pulse number of Internal position instruction10	0	-9999-+9999	Puls	<input type="checkbox"/>	P
Pr2.38	the Movement speed of Internal position instruction10	1000	1-3000	rpm	<input type="checkbox"/>	P
Pr2.39	Waiting time between the completion of Pr10 and the entry of Pr11	1.0	0.0-3000.0	s	<input type="checkbox"/>	P
Pr2.40	the Number of turns of Internal position instruction11	0	30000-+3000	rev	<input type="checkbox"/>	P
Pr2.41	the Pulse number of Internal position instruction11	0	-9999-+9999	Puls	<input type="checkbox"/>	P
Pr2.42	the Movement speed of Internal position instruction11	1000	1-3000	rpm	<input type="checkbox"/>	P
Pr2.43	Waiting time between the completion of Pr11 and the entry of Pr12	1.0	0.0-3000.0	s	<input type="checkbox"/>	P
Pr2.44	the Number of turns of Internal position instruction12	0	30000-+3000	rev	<input type="checkbox"/>	P
Pr2.45	the Pulse number of Internal position	0	-9999-+9999	Puls	<input type="checkbox"/>	P

Parameter no.	Function code explanation	Factory default	Setting range	Unit	Attribute	The operation mode
	instruction12					
Pr2.46	the Movement speed of Internal position instruction12	1000	1-3000	rpm	<input type="checkbox"/>	P
Pr2.47	Waiting time between the completion of Pr12 and the entry of Pr13	1.0	0.0-3000.0	s	<input type="checkbox"/>	P
Pr2.48	the Number of turns of Internal position instruction13	0	30000-+3000	rev	<input type="checkbox"/>	P
Pr2.49	the Pulse number of Internal position instruction13	0	-9999-+9999	Puls	<input type="checkbox"/>	P
Pr2.50	the Movement speed of Internal position instruction13	1000	1-3000	rpm	<input type="checkbox"/>	P
Pr2.51	Waiting time between the completion of Pr13 and the entry of Pr14	1.0	0.0-3000.0	s	<input type="checkbox"/>	P
Pr2.52	the Number of turns of Internal position instruction14	0	30000-+3000	rev	<input type="checkbox"/>	P
Pr2.53	the Pulse number of Internal position instruction14	0	-9999-+9999	Puls	<input type="checkbox"/>	P
Pr2.54	the Movement speed of Internal position instruction14	1000	1-3000	rpm	<input type="checkbox"/>	P
Pr2.55	Waiting time between the completion of Pr14 and the entry of Pr15	1.0	0.0-3000.0	s	<input type="checkbox"/>	P
Pr2.56	the Number of turns of Internal position instruction15	0	30000-+3000	rev	<input type="checkbox"/>	P
Pr2.57	the Pulse number of Internal position instruction15	0	-9999-+9999	Puls	<input type="checkbox"/>	P
Pr2.58	the Movement speed of Internal position instruction15	1000	1-3000	rpm	<input type="checkbox"/>	P
Pr2.59	Waiting time between the completion of Pr15 and the entry of Pr16	1.0	0.0-3000.0	s	<input type="checkbox"/>	P
Pr2.60	the Number of turns of Internal position instruction16	0	30000-+3000	rev	<input type="checkbox"/>	P
Pr2.61	the Pulse number of Internal position instruction16	0	-9999-+9999	Puls	<input type="checkbox"/>	P
Pr2.62	the Movement speed of Internal position instruction16	1000	1-3000	rpm	<input type="checkbox"/>	P
Pr2.63	Waiting time between the completion of Pr16 and the entry of Pr1	1.0	0.0-3000.0	s	<input type="checkbox"/>	P

4.2.4 Internal speed control parameter

Parameter no.	Function code explanation	Factory default	Setting range	Unit	Attribute	The operation mode
Pr3.00	Internal speed instructionregister 1	400	-3000~+3000	rpm	<input type="radio"/>	S
Pr3.01	Internal instructions 1 Run time setting	1.0	0.1-6535.5	s	<input type="checkbox"/>	S
Pr3.02	Internal speed instructionregister2	0	-3000~+3000	rpm	<input type="radio"/>	S
Pr3.03	Internal instructions2 Run time setting	1.0	0.1-6535.5	s	<input type="checkbox"/>	S
Pr3.04	Internal speed instructionregister3	-400	-3000~+3000	rpm	<input type="radio"/>	S
Pr3.05	Internal instructions3 Run time setting	1.0	0.1-6535.5	s	<input type="checkbox"/>	S

Parameter no.	Function code explanation	Factory default	Setting range	Unit	Attribute	The operation mode
Pr3.06	Internal speed instructionregister4	0	-3000~+3000	rpm	○	S
Pr3.07	Internal instructions4 Run time setting	1.0	0.1-6535.5	s	□	S
Pr3.08	Internal speed instructionregister5	800	-3000~+3000	rpm	○	S
Pr3.09	Internal instructions5 Run time setting	1.0	0.1-6535.5	s	□	S
Pr3.10	Internal speed instructionregister6	0	-3000~+3000	rpm	○	S
Pr3.11	Internal instructions6 Run time setting	1.0	0.1-6535.5	s	□	S
Pr3.12	Internal speed instructionregister7	-800	-3000~+3000	rpm	○	S
Pr3.13	Internal instructions7 Run time setting	1.0	0.1-6535.5	s	□	S
Pr3.14	Internal speed instructionregister8	0	-3000~+3000	rpm	○	S
Pr3.15	Internal instructions8 Run time setting	1.0	0.1-6535.5	s	□	S
Pr3.16	Internal speed instructionregister9	1200	-3000~+3000	rpm	○	S
Pr3.17	Internal instructions9 Run time setting	1.0	0.1-6535.5	s	□	S
Pr3.18	Internal speed instructionregister10	0	-3000~+3000	rpm	○	S
Pr3.19	Internal instructions10 Run time setting	1.0	0.1-6535.5	s	□	S
Pr3.20	Internal speed instructionregister11	-1200	-3000~+3000	rpm	○	S
Pr3.21	Internal instructions11 Run time setting	1.0	0.1-6535.5	s	□	S
Pr3.22	Internal speed instructionregister12	0	-3000~+3000	rpm	○	S
Pr3.23	Internal instructions12 Run time setting	1.0	0.1-6535.5	s	□	S
Pr3.24	Internal speed instructionregister13	1500	-3000~+3000	rpm	○	S
Pr3.25	Internal instructions13 Run time setting	1.0	0.1-6535.5	s	□	S
Pr3.26	Internal speed instructionregister14	0	-3000~+3000	rpm	○	S
Pr3.27	Internal instructions14 Run time setting	1.0	0.1-6535.5	s	□	S
Pr3.28	Internal speed instructionregister15	-1500	-3000~+3000	rpm	○	S
Pr3.29	Internal instructions15 Run time setting	1.0	0.1-6535.5	s	□	S
Pr3.30	Internal speed instructionregister16	0	-3000~+3000	rpm	○	S
Pr3.31	Internal instructions16 Run time setting	1.0	0.1-6535.5	s	□	S

4.2.5 Torque control parameter

Parameter no.	Function code explanation	Factory default	Setting range	Unit	Attribute	The operation mode
Pr4.00	Torque instruction source: 0: Inter number for a given (Pr4.05 given); 1: Analog quantity 1(AI1) given; 2: Analog quantity 2(AI2) given; 3: Analog quantity 3(AI3) given;	0	0~3	/	□	T
Pr4.01	The corresponding torque instruction for analog input (10V)	100	0~300	%	□	T
Pr4.02	Torque speed control instruction source:	0	0~3	/	□	T

Parameter no.	Function code explanation	Factory default	Setting range	Unit	Attribute	The operation mode
	0: Internal register given(Pr4.06 given); 1: Analog quantity 1 given; 2: Analog quantity 2 given; 3: Analog quantity 3 given;					
Pr4.03	Torque speed control instruction gain	1000	0~3000	rpm	<input type="checkbox"/>	T
Pr4.04	Number of turns of torque limitation	0	0~20	/	<input type="checkbox"/>	T
Pr4.05	Internal digital torque instruction setting	100.0	-300.0~300.0	%	<input type="radio"/>	T
Pr4.06	The internal speed control setting under torque control	100	0~3000	rpm	<input type="checkbox"/>	T
Pr4.09	Torque control source selection: 0: Internal control (Pr4.11、Pr4.12) ; 1: Analog quantity1(AI1) given; 2: Analog quantity2(AI2) given; 3: Analog quantity3(AI3) given; (Note: Analog quantity given and subject to Pr4.11、Pr4.12);	0	0~3	/	<input type="checkbox"/>	T
Pr4.10	Torque reaching threshold value	0.0	0~10.0	%	<input type="checkbox"/>	T
Pr4.11	Natural rotation torque control	300.0	0~300.0	%	<input type="checkbox"/>	T
Pr4.12	Inversion torque control	300.0	0~300.0	%	<input type="checkbox"/>	T
Pr4.13	Torque instruction compensation	0.0	0.0~10.0	%	<input type="checkbox"/>	T

4.2.6 Tuning parameter

Parameter no.	Function code explanation	Factory default	Setting range	Unit	Attribute	The operation mode
Pr5.00	Gain tuning mode selection: 0: Manual mode. 1: Semi-automatic mode (discontinuous adjustment). 2: Automatic mode (continuous adjustment).	0	0~2	/	<input type="radio"/>	P S T
Pr5.01	Speed loop response frequency setting: 1~50Hz: low stiffness, low response 51~250Hz: middle stiffness, middle stiffness 251~550Hz: high stiffness, high stiffness	60	0~1000	Hz	<input type="radio"/>	P S T
Pr5.02	Position control gain: The increase of the gain value of position control can promote position response speed and narrow the amountof position control deviation. But if this value is set too high, vibration and noise will be easily caused.	25	0~6553.5	Hz	<input type="radio"/>	P
Pr5.03	Position gain change rate	50	0~500	%	<input type="radio"/>	P
Pr5.04	Position control feedforward gain:	0.0	0.0~100.0	%	<input type="radio"/>	P

Parameter no.	Function code explanation	Factory default	Setting range	Unit	Attribute	The operation mode
	When position control instruction changes smoothly, the increase of gain value can improve the amount of position following error. If position control instruction does not change smoothly, the decrease of gain value can reduce the running vibration of the mechanism.					
Pr5.05	Smoothing constant of position control feedforward gain When position control instruction changes smoothly, the decrease of smoothing constant value can improve the amount of position following error. If position control instruction does not change smoothly, the increase of smoothing constant value can reduce the running vibration of the mechanism.	5	0~100	ms	○	P
Pr5.06	Speed control gain: The increase of the gain value of speed control can promote speed response performance. But if the value is set too high, vibration and noise will be easily caused.	355.0	0~6553.5	Hz	○	S
Pr5.07	Speed integral time constant: The decrease of the speed integral time constant can promote speed response performance and narrow the amount of speed control deviation. But if the value is set too high, vibration and noise will be easily caused.	12.3	0~6553.5	ms	○	S
Pr5.08	Speed gain change rate	50	0~500	%	○	P S
Pr5.09	Selection of gain switch conditions:	0	0~18	/	□	P S T
Pr5.10	Gain switch time constant: Switch time constant applies to the switch of smoothing gain.	5	0~3000	ms	□	P S T
Pr5.11	Gain delay time	5	0~3000	ms	□	P S T
Pr5.12	Gain switch threshold value: The setting of the switching condition value (pulse error, Kpps, r/min), shall conform to the selection term of the switching conditions (Pr5.09).	100	0~32767	/	□	P S T
Pr5.17	Off-line inertia identification switch	0	0~1	/	○	P S T
Pr5.18	Load inertia ratio	0.01	0~655.35	%	□	P S T
Pr5.19	Off-line inertia identification rotating cycles	4	1~5	r	□	P S T
Pr5.20	Reserve					
Pr5.21	Speed PDFF regulator control	100	0~100	%	□	P S T

Parameter no.	Function code explanation	Factory default	Setting range	Unit	Attribute	The operation mode
	coefficient: Apply the IP controller, speed wave will be flat without overshoot, but its response will be slow. Applying the PDF controller between the IP one and the PI one can attain the required small speed overshoot and quick speed response.					
Pr5.22	LF stiffness: Under speed mode, reduce the speed overshoot	1.0	0.5~4.0	/	□	P S T
Pr5.23	Control loop coefficient: Under automatic gain, the relation of position loop gain and speed gain	17	1~100	%	□	P S T

4.2.7 Communication parameter

Parameter no.	Function code explanation	Factory default	Setting range	Unit	Attribute	The operation mode
Pr7.00	Station number setting	1	1~254	/	○	P S T
Pr7.01	Communication transmission rate: 0: 4800; 1: 9600; 2: 19200; 3: 38400; 4: 57600;	1	0~4	/	○	P S T
Pr7.02	Communication data format: 0: no check 1+8+N+1; 1: odd check 1+8+O+1; 2: even check 1+8+E+1; 3: no check 1+8+N+2; 4: odd check 1+8+O+2; 5: even check 1+8+E+2;	0	0~5	/	○	P S T

4.2.8 Auxiliary parameters

Parameter no.	Function code explanation	Factory default	Setting range	Unit	Attribute	The operation mode
Pr8.00	Internal SON instruction: automatic clearance after the power is applied again. Pr6.01 can set servo ON , and will not be lost. 0: Internal servo off. 1: Internal servo on.	0	0~1	/	○	P S T
Pr8.01	Fault resetting: 0: No-operation; 1: Fault restting, performing once, automatic clearance;	0	0~1	/	○	P S T
Pr8.02	Inching function (trial running), enter the function code, press the UP button to rotate naturally with Pr8.03 setting value; release the button and the natural rotation stops; press the DOWN button, the motor will run reversely with P803 setting value, release the button and the inversion stops; press the MODE button to exit this function, and the inching becomes invalid.	/	/	/	○	P S T
Pr8.03	Inching speed setting	100	0~3000	rpm	○	P S T
Pr8.05	Software resetting: 0: No-operation; 1: Software restting, performing once, automatic clearance;	0	/	/	○	P S T
Pr8.08	Drive overheat warning value	70	0~ Pr8.09	℃	○	P S T
Pr8.09	Drive overheat fault value	80	0~150	℃	○	P S T
Pr8.11	Fan control selection: 0: Fan runs when servo is on or servo fault warns. 1: Fun runs once the power is turned on.	0	0~1	/	○	P S T
Pr8.12	Drive warning setting	60	20~100	%	○	P S T
Pr8.13	Motor overload warning setting	60	20~100	%	○	P S T
Pr8.14	Son condition selection of each halting mode 0: Free halting, start Son as per Pr8.15 condition; 1: Free halting and zero speed halting are both selected;	0	0~1	/	□	P S T
Pr8.15	Son conditions: 0: After pressing Soff, start Son as per time (Pr8.16) condition 1: Start as per speed (Pr8.17) condition; 2: Start as per time and speed conditions; 3: Instant-on;	3	0~3	/	□	P S T

Parameter no.	Function code explanation	Factory default	Setting range	Unit	Attribute	The operation mode
Pr8.16	The interval between pressing the Soff and Son becoming effective	5.00	0.001~300.0	s	<input type="checkbox"/>	P S T
Pr8.17	Speed setting to ensure Son's effectiveness	20	0~3000	rpm	<input type="checkbox"/>	P S T

4.2.9 Input/output setting parameter

Parameter no.	Function code explanation	Factory default	Setting range	Unit	Attribute	The operation mode
Pr6.00	DI filtering setting	2	0~20	ms	<input type="checkbox"/>	P S T
Pr6.01	DI level logic [1] There are ten bits corresponding to 10 DI ports respectively. If the corresponding bit is set to 1, the corresponding DI port will take effect The example sets the parameter to "00001", which indicates that the servo SON is valid	0	0~3FFH	/	<input checked="" type="checkbox"/>	P S T
Pr6.02	DI1 Function No.	1	0~99	/	<input checked="" type="checkbox"/>	P S T
Pr6.03	DI2 Function No.	2	0~99	/	<input checked="" type="checkbox"/>	P S T
Pr6.04	DI3 Function No.	3	0~99	/	<input checked="" type="checkbox"/>	P S T
Pr6.05	DI4 Function No.	4	0~99	/	<input checked="" type="checkbox"/>	P S T
Pr6.06	DI5 Function No.	5	0~99	/	<input checked="" type="checkbox"/>	P S T
Pr6.07	DI6 Function No.	6	0~99	/	<input checked="" type="checkbox"/>	P S T
Pr6.08	DI7 Function No.	7	0~99	/	<input checked="" type="checkbox"/>	P S T
Pr6.09	DI8 Function No.	8	0~99	/	<input checked="" type="checkbox"/>	P S T
Pr6.10	DI9 Function No.	9	0~99	/	<input checked="" type="checkbox"/>	P S T
Pr6.11	DI10 Function No.	10	0~99	/	<input checked="" type="checkbox"/>	P S T
Pr6.12	DO level logic [2]	0	0~99	/	<input checked="" type="checkbox"/>	P S T
Pr6.13	DO1 Function No.	1	0~99	/	<input checked="" type="checkbox"/>	P S T
Pr6.14	DO2 Function No.	2	0~99	/	<input checked="" type="checkbox"/>	P S T
Pr6.15	DO3 Function No.	3	0~99	/	<input checked="" type="checkbox"/>	P S T
Pr6.16	DO4 Function No.	4	0~99	/	<input checked="" type="checkbox"/>	P S T
Pr6.17	DO5 Function No.	5	0~99	/	<input checked="" type="checkbox"/>	P S T
Pr6.18	DO6 Function No.	6	0~99	/	<input checked="" type="checkbox"/>	P S T
Pr6.19	AI1 Bias adjustment	0	-1000~1000	mV	<input type="checkbox"/>	P S T
Pr6.20	AI2 Bias adjustment	0	-1000~1000	mV	<input type="checkbox"/>	P S T
Pr6.21	AI3 Bias adjustment	0	-1000~1000	mV	<input type="checkbox"/>	P S T
Pr6.22	AI1 filtering time	2	0~10000	ms	<input type="checkbox"/>	P S T
Pr6.23	AI2 filtering time	2	0~10000	ms	<input type="checkbox"/>	P S T
Pr6.24	AI3 filtering time	2	0~10000	ms	<input type="checkbox"/>	P S T

4.2.10 Digital input (DI) function definition list

Setting value	Name	Function Name	Description	Trigger method	The operation mode
1	/S-ON	Servo-on	OFF-Disable the servo motor; ON-Enable the servo motor power;	Level triggered	P、S、T
2	/ALM-RST	Alarm reset signal	OFF- disable servo drive-on; ON-enable servo drive power; Faults are designed into resettable and non-resettable, which aims to reset fault after it's cleared.	Edge triggered	P、S、T
3	/P-CLR	Position control pulse deviation counter clearance	Level triggered mode, see Pr1.20 definition	Edge/Level triggered	P
4	/DIR-SEL	Speed direction instruction selection	OFF-default instruction direction ON- instruction the opposite direction	Level triggered	S
5	CMD0	Internal instructions bit0	Under position control mode, the signal functions as position multistage switch. Under speed control mode, the signal functions as speed multistage switching.	Level triggered	P、S
6	CMD1	Internal instructions bit1		Level triggered	P、S
7	CMD2	Internal instructions bit2		Level triggered	P、S
8	CMD3	Internal instructions bit3		Level triggered	P
9	CTRG	Internal instructionsLevel triggered	Level triggered condition of multistage position	Edge triggered	P
10	MSEL	control mode switch	For mixed control mode switching	Level triggered	P、S、T
12	/INHIBIT	Pulse inhibit	ON- Disable instruction pulse input OFF- Enable instruction pulse input	Level triggered	P
13	P-OT	Disable natural rotation drive	When the machine runs beyond the movable range, it will enter the over travel prevention. ON-enable natural rotation OFF-disable natural rotation ON ON-	Level triggered	P、S、T

Setting value	Name	Function Name	Description	Trigger method	The operation mode									
14	N-OT	Disable inversion drive	When the machine runs beyond the movable range, it will enter the over travel prevention function. ON-enable inversion OFF-disable inversion	Level triggered	P、S、T									
17	/JOGCMD+	Positive direction inching	ON-input as per the given instruction OFF-run the instruction and stop inputting	Level triggered	S									
18	/JOGCMD-	Inversion inching	ON- inverted input as per the given instruction OFF- run the instruction and stop inputting	Level triggered	S									
19	/TDIR-SEL	Torque instruction direction selection	OFF-default direction ON-instructing the opposite direction	Level triggered	T									
20	GNUM0	Electronic gear ratio molecule selection 0	<table border="1"> <thead> <tr> <th>GNUM1</th> <th>GNUM0</th> <th>Gear ratio</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>0</td> <td>P1-27</td> </tr> <tr> <td>0</td> <td>1</td> <td>P1-29</td> </tr> </tbody> </table>	GNUM1	GNUM0	Gear ratio	0	0	P1-27	0	1	P1-29	Level triggered	P
GNUM1	GNUM0	Gear ratio												
0	0	P1-27												
0	1	P1-29												
21	GNUM1	Electronic gear ratio molecule selection 1	<table border="1"> <tbody> <tr> <td>1</td> <td>0</td> <td>P1-30</td> </tr> <tr> <td>1</td> <td>1</td> <td>P1-31</td> </tr> </tbody> </table>	1	0	P1-30	1	1	P1-31	Level triggered	P			
1	0	P1-30												
1	1	P1-31												

4.2.11 Digital output (DO) function definition list

Setting value	Name	Function Name	Description	The operation mode
1	/S-RDY	Servo ready	When servo is OK, it can receive S-ON signal: effective- servo is ready; ineffective- servo is not ready.	P、S、T
2	/BK	Brake output signal	Brake output signal: effective – close, withdraw the brake; ineffective- start the brake.	P、S、T
3	/TGON	Motor rotation output signal	Output the signal when servo motor rotates: effective- motor rotation signal is valid; ineffective- motor rotation signal is invalid.	P、S、T

Setting value	Name	Function Name	Description	The operation mode
4	/ZERO	Zero speed signal	Output the signal when servo motor stops rotating: effective- motor speed is zero; ineffective- motor speed is not zero.	P、S、
5	/V-CLS	Speed approaching	Under speed control, it is effective when the absolute value of the difference between servo motor speed and speed instruction is lower than the setting value Pr1.33 of speed deviation.	S
6	/V-CMP	Speed reaching	Under speed control, it is effective when the absolute value of the difference between servo motor speed and speed instruction is lower than the setting value Pr1.34 of speed deviation.	S
7	/PNEAR	Position approaching	Under speed control, it is effective when the position deviation pulse reaches within the setting value of the positioning approaching width Pr1.12.	P
8	/COIN+-	Position reaching	Under position control mode, it is effective when the position deviation pulse reaches within the setting value of the positioning completion width Pr1.13.	P
9	/C-LT+-	Torque control signal	The confirming signal of torque limitation: effective- motor torque is limited; ineffective- motor torque is not limited.	P、S
10	/V-LT+-	Speed control signal	Under torque control, confirm the signal of torque limitation: effective- motor speed is limited; ineffective- motor speed is not limited.	T
11	/WARN	Warning output signal	Warning output signal connectivity	P、S、T
12	/ALM	Fault output signal	The status signal is effective when detecting the fault	P、S、T
13	/Tcmp	Torque reaching output signal	Output the corresponding signal under the torque reaching setting	T
14	/PNEAR	Position approaching	Under position control mode, position deviation pulse reaching	P

Chapter V Operation with Power on

5.1 Trial Run



Warnings

- Check and confirm that the wiring is correct before turning on the power.
- An emergency stop circuit shall be placed in to ensure that the power can be immediately stopped if any fault occurs.
- After the fault alarm of the drive unit sounds, confirm that the fault is cleared and SON signal is ineffective before restarting.
- The drive unit and the motor shall not be touched within at least 5 minutes in case of electric shock.
- The drive unit and the motor may encounter a high temperature rise after running for some period of time. Be careful not to get burned.
- The drive unit and the motor must be grounded firmly and PE terminal must be connected tightly to the ground terminal of the equipment.
- It's suggested that the drive unit power be supplied through the isolation transformer and the power filter to ensure its security and anti-interference capability.

5.1.1 Inspection before the trial run

Before turning on the power, the following inspections must be done.

1. Status of the servo motor

Inspect the servo motor to make sure there are no external damages.

Inspect the servo motor shaft to make sure it rotates smoothly by hand (it is normal that the shaft of the servo motor with oil seal).

2. Wiring

Inspect the power terminals (R、S、T) of the servo drive to make sure their wirings are correct and firm;

Inspect wheter the input voltage of the servo drive meets the requirements;

Inspect whether the phase of the output terminals (U、V、W)of the servo drive is consistent with that of the servo drive cables and whether they are connected firmly.

Inspect whether the connector of the servo motor encoder is correctly and firmly connected to the servo drive.

Inspect whether the servo drive and the servo motor are well grounded.

3. Enviroment

Inspect whether the running environment of the servo drive meets the related requirements, and make sure that no strange objects like wire ends, metal filings, will cause short circuit for the conductor and the power line.

Note: turn on the power only after inspecting all the above items.

4. Inching trial run

Steps	Item	Operation
1	Set the inching running speed	Enter the function parameter Pr8.03, set the inching speed by ▲、▼ and <<. The initial default value is 100 rpm.

Steps	Item	Operation
2	Enter the inching running	Enter the function parameter Pr8.02, press the Set button, and the keyboard image displays JOGEn, then it is under the inching running mode.
3	Inching — natural rotation	Press the ▲ button, and servo motor rotates positively as per the Pr8.03 set speed; release the button, and the motor will stop.
	Inching—inversion	Press the ▼ button, and servo motor rotates reversely as per the Pr8.03 set speed; release the button, and the motor will stop.
4	Exit the inching running	Press the Mode button to withdraw the inching JoGEn running mode.

5.2 Position control mode


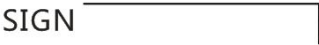






5.2.1 External position mode

1. Apply the drive power, and inspect whether the drive displays warnings or alarms. If it does, inspect whether the wiring is normal.
2. Set the control method to the position control mode (set Pr1.00 to 1), and then the input format (Pr1.01) of the position instruction, its source (set Pr1.22 to 0) and then set the electronic gear ratio (Pr1.02、Pr1.04).
3. The controller inputs servo-on signal (servo-on signal connected to servo CN3-5), to excite the motor.
4. After the upper controller sends pulse instruction to serve (pulse signal connected to servo CN3-1、CN3-2、CN3-3、CN3-4), and then it can control the servo motor running, monitor the pulse count received by servo unit through Pr0.02 and feedbacked by servo motor through Pr0.04.
5. The relevant parameters of the external position mode are shown below.

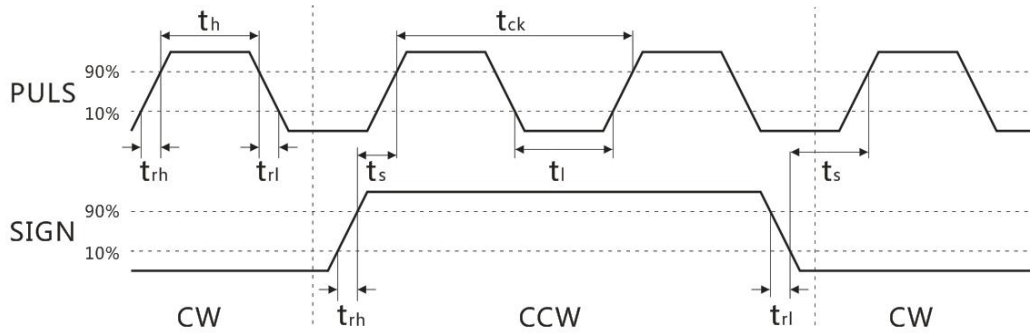
Parameter no.	Function code explanation	Factory default value	Setting range	Unit
Pr1.00	Control method selection	1	0~5	/
Pr1.01	Pulse form selection	0	0~3	/
Pr1.02	Electronic gear numerator1	1	1~32767	/
Pr1.04	Electronic gear denominator	1	1~32767	/
Pr1.22	Position instruction source selection	0	0~1	/
Pr1.39	Acceleration and deceleration time constant of position S pattern smoothing natural rotation instruction	100	1~10000	ms
Pr1.40	Acceleration and deceleration time constant of position S pattern smoothing inversion instruction	100	1~10000	ms
Pr1.41	Acceleration and deceleration time constant within position S pattern smooth curve	10	0~1000	ms

6.Pulse input form

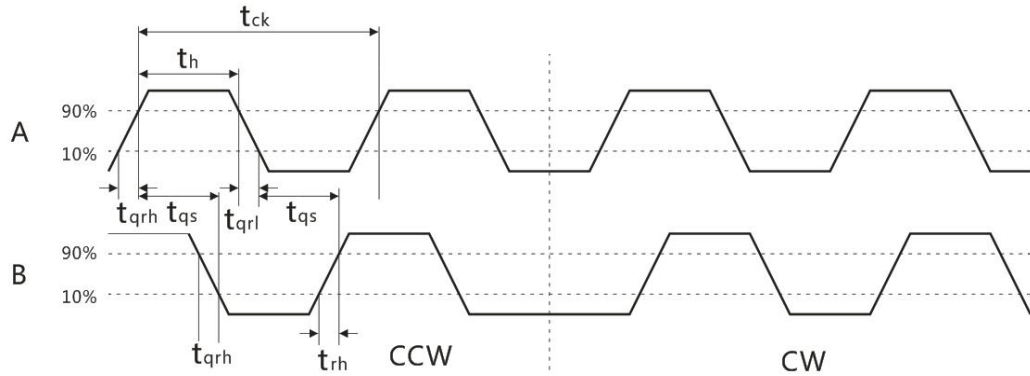
The series of servo supports two kinds of pulse input forms: pulse puls direction and orthogonal pulse of phase A and B. It can be set by parameter“Pr1.01”. The relevant theory of pulse form is shown below.

Pulse form	CCW	CW
Pulse direction	PULS  SIGN 	 
Phase A pulse	A 	
Phase B pulse	B 	

a. The sequence diagram of pulse + direction

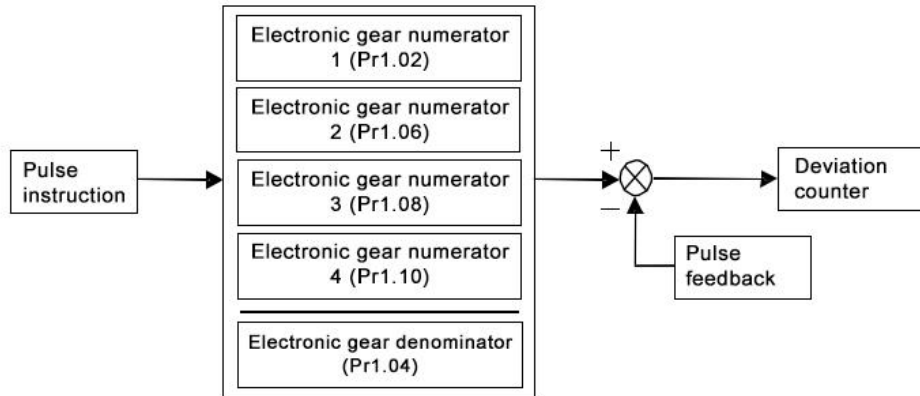


b. The sequence diagram of phase A and B pulse



7.Electronic gear ratio

The amount of motor movement of the instruction pulse per unit can be set by the electronic gear ratio; or when the highest pulse frequency output by the upper device is not enough and can not meet the required motor speed, the motor speed can be increased by modifying the gear ratio. The theory is shown below.



The calculation formula is shown below.

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

P: Number of pulses of the input instruction

G: Electronic gear ratio

$$G = \frac{\text{Electronic gear numerator}}{\text{Electronic gear denominator}}$$

N: Motor rotating cycles

C: Resolution ratio of optical encoder (For the series of servo C=2500)

For instance: the lead of the ball screw is 5mm. when the amount of motor movement of the instruction pulse per unit is 0.001mm, then:

$$\text{Number of pulses per turn} = \frac{5}{0.001} = 5000$$

$$\text{Electronic gear ratio } G = \frac{N \times C \times 4}{P} = \frac{1 \times 2500 \times 4}{5000} = \frac{2}{1}$$

So set Pr1.02 to 2, Pr1.04 to 1.

5.2.2 Internal multiple segment position function

Internal multistage position function refers that there are 16 groups of the relevant position control parameters inside servo drive and that up to 16 position segments of different direction, speed, rotation number and waiting time between segments can be set through these parameters. It can achieve automatic multiple segment running with fixed length or select the needed position segment from the input signals by the external digital input terminal and run as per the selected segment speed, rotation number and waiting time between segments. The specific procedures are as follows.

1. Apply the drive power to inspect whether the drive displays warnings or alarms. If it does, inspect whether the wiring is normal.
2. Set the control method to the position control mode (set Pr1.00 to 1), and select the position instruction

source (set Pr1.22 to 1), and select the Internal position control mode (set Pr1.24 to 2), then set the electronic gear ratio (Pr1.02, Pr1.04).

- Plan the function of DI port and connect the corresponding DI terminal to the controller. The corresponding list of DI port and position segment is shown below.

Pr instruction	CMD3	CMD2	CMD1	CMD0	CTRG	Corresponding parameter	Explanation	Speed setting
Pr1	0	0	0	0	↑	Pr2.00 Pr2.01	Number of turns (0-±30000) Pulse number (0-±9999)	Pr2.02
Pr2	0	0	0	1	↑	Pr2.04 Pr2.05	Number of turns (0-±30000) Pulse number (0-±9999)	Pr2.06
Pr3	0	0	1	0	↑	Pr2.08 Pr2.09	Number of turns (0-±30000) Pulse number (0-±9999)	Pr2.10
Pr4	0	0	1	1	↑	Pr2.12 Pr2.13	Number of turns (0-±30000) Pulse number (0-±9999)	Pr2.14
Pr5	0	1	0	0	↑	F2-16 F2-17	Number of turns (0-±30000) Pulse number (0-±9999)	Pr2.18
Pr6	0	1	0	1	↑	Pr2.20 Pr2.21	Number of turns (0-±30000) Pulse number (0-±9999)	Pr2.22
Pr7	0	1	1	0	↑	Pr2.24 Pr2.25	Number of turns (0-±30000) Pulse number (0-±9999)	Pr2.26
Pr8	0	1	1	1	↑	Pr2.28 Pr2.29	Number of turns (0-±30000) Pulse number (0-±9999)	Pr2.30
Pr9	1	0	0	0	↑	Pr2.32 Pr2.33	Number of turns (0-±30000) Pulse number (0-±9999)	Pr2.34
Pr10	1	0	0	1	↑	Pr2.36 Pr2.37	Number of turns (0-±30000) Pulse number (0-±9999)	Pr2.38
Pr11	1	0	1	0	↑	Pr2.40 Pr2.41	Number of turns (0-±30000) Pulse number (0-±9999)	Pr2.42
Pr12	1	0	1	1	↑	Pr2.44 Pr2.45	Number of turns (0-±30000) Pulse number (0-±9999)	Pr2.46
Pr13	1	1	0	0	↑	Pr2.48 Pr2.49	Number of turns (0-±30000) Pulse number (0-±9999)	Pr2.50
Pr14	1	1	0	1	↑	Pr2.52 Pr2.53	Number of turns (0-±30000) Pulse number (0-±9999)	Pr2.54
Pr15	1	1	1	0	↑	Pr2.56 Pr2.57	Number of turns (0-±30000) Pulse number (0-±9999)	Pr2.58
Pr16	1	1	1	1	↑	Pr2.60 Pr2.61	Number of turns (0-±30000) Pulse number (0-±9999)	Pr2.62

- The controller inputs servo-on signal (servo-on signal connected to servo CN3-5), to excite the motor.

- Adjust the relevant parameter of internal position

Parameter no.	Function code explanation	Factory default value	Setting range	Unit
Pr1.00	Control method selection	1	0~5	/
Pr1.02	Electronic gear numerator ¹	1	1~32767	/
Pr1.04	Electronic gear denominator	1	1~32767	/
Pr1.39	Acceleration and deceleration time constant of	100	1~10000	ms

Parameter no.	Function code explanation	Factory default value	Setting range	Unit
	position S pattern smoothing natural rotation instruction			
Pr1.40	Acceleration and deceleration time constant of position S pattern smoothing inversion instruction	100	1~10000	ms
Pr1.41	Acceleration and deceleration time constant within position S pattern smooth curve	10	0~1000	ms
Pr1.22	Position instruction source selection	1	0~1	/
Pr6.00	DI filtering setting	2	0~20	ms
Pr6.01	DI level logic [1]	0	0~3FFH	/
Pr6.02	DI1 Function No.	1	0~99	/
Pr6.03	DI2 Function No.	2	0~99	/
Pr6.04	DI3 Function No.	3	0~99	/
Pr6.05	DI4 Function No.	4	0~99	/
Pr6.06	DI5 Function No.	5	0~99	/
Pr6.07	DI6 Function No.	6	0~99	/
Pr6.08	DI7 Function No.	7	0~99	/
Pr6.09	DI8 Function No.	8	0~99	/
Pr6.10	DI9 Function No.	9	0~99	/
Pr6.11	DI10 Function No.	10	0~99	/
Pr2.00~Pr2.63				

5.3 Speed control mode

5.3.1 External speed mode

1. Apply the drive power, and inspect whether the drive displays warnings or alarms. If it does, inspect whether the wiring is normal.
2. Set the control method to the speed control mode (set Pr1.00 to 0), and select the speed instruction source (Pr1.28) .
3. Connect the external analog voltage output terminal to the servo analog input terminal (CN3-16, CN3-17, CN3-18, CN3-19, CN3-20).
4. The controller inputs servo-on signal (servo-on signal connected to servo CN3-5), to excite the motor.
5. Set the external analog voltage to 0V, and set the motor speed to zero through AI Bias adjustment (parameter Pr6.19, Pr6.20, Pr6.21) .
6. The correlation parameters of the external speed mode are shown below.

Parameter no.	Function code explanation	Factory default value	Setting range	Unit
Pr1.00	Control method selection	1	0~5	/
Pr1.28	Speed instruction source	0	0~5	/
Pr1.36	The corresponding maximum speed for analog $\pm 10V$	5000	0~5000	rpm
Pr1.43	Acceleration time constant of position S pattern smoothing instruction	100	1~10000	ms
Pr1.44	Deceleration time constant of position S pattern smoothing instruction	100	1~10000	ms

Pr1.45	Acceleration and deceleration time constant within speed S pattern smooth curve	10	0~1000	ms
Pr6.19	AI1 Bias adjustment	0	-1000~1000	ms
Pr6.20	AI2 Bias adjustment	0	-1000~1000	ms
Pr6.21	AI3 Bias adjustment	0	-1000~1000	ms

5.3.2 Internal multi-speed function

Internal multi-speed function refers that there are 16 groups of the relevant speed control parameters inside servo drive and that up to 16 kinds of motor speed control can be achieved easily through DI input terminal.

1. Apply the drive power, and inspect whether the drive displays warnings or alarms. If it does, inspect whether the wiring is normal.
2. Set the control method to the speed control mode (set Pr1.00 to 0), and select the speed instruction source (set Pr1.28 to 4) .
3. Plan the function of DI port and connect the corresponding DI terminal to the controller. The corresponding list of DI port and internal speed is shown below.

Internal speed instruction	CMD3	CMD2	CMD1	CMD0	Corresponding parameter	Explanation
Spd1	0	0	0	0	Pr3.00	Setting speed 1 (0±The motor rated speed)
Spd2	0	0	0	1	Pr3.02	Setting speed2 (0±The motor rated speed)
Spd3	0	0	1	0	Pr3.04	Setting speed3 (0±The motor rated speed)
Spd4	0	0	1	1	Pr3.06	Setting speed4 (0±The motor rated speed)
Spd5	0	1	0	0	Pr3.08	Setting speed5 (0±The motor rated speed)
Spd6	0	1	0	1	Pr3.10	Setting speed6 (0±The motor rated speed)
Spd7	0	1	1	0	Pr3.12	Setting speed7 (0±The motor rated speed)
Spd8	0	1	1	1	Pr3.14	Setting speed8 (0±The motor rated speed)
Spd9	1	0	0	0	Pr3.16	Setting speed9 (0±The motor rated speed)
Spd10	1	0	0	1	Pr3.18	Setting speed10 (0±The motor rated speed)
Spd11	1	0	1	0	Pr3.20	Setting speed11 (0±The motor rated speed)

Internal speed instruction	CMD3	CMD2	CMD1	CMD0	Corresponding parameter	Explanation
Spd12	1	0	1	1	Pr3.22	Setting speed12 (0±The motor rated speed)
Spd13	1	1	0	0	Pr3.24	Setting speed13 (0±The motor rated speed)
Spd14	1	1	0	1	Pr3.26	Setting speed14 (0±The motor rated speed)
Spd15	1	1	1	0	Pr3.28	Setting speed15 (0±The motor rated speed)
Spd16	1	1	1	1	Pr3.30	Setting speed16 (0±The motor rated speed)

4. The controller inputs servo-on signal (servo-on signal connected to servo CN3-5), to excite the motor.
5. Set the motor speed to zero through AI Bias adjustment (parameter Pr6.19, Pr6.20, Pr6.21) .
6. The relevant parameters of the internal speed mode are shown below.

Parameter no.	Function code explanation	Factory default value	Setting range	Unit
Pr1.00	Control method selection	1	0~5	/
Pr1.28	Speed instruction source	4	0~5	/
Pr1.36	The corresponding maximum speed for analog ±10V	5000	0~5000	rpm
Pr1.43	Acceleration time constant of position S pattern smoothing instruction	100	1~10000	ms
Pr1.44	Deceleration time constant of position S pattern smoothing instruction	100	1~10000	ms
Pr1.45	Acceleration and deceleration time constant within speed S pattern smooth curve	10	0~1000	ms
Pr6.19	AI1 Bias adjustment	0	-1000~1000	ms
Pr6.20	AI2 Bias adjustment	0	-1000~1000	ms
Pr6.21	AI3 Bias adjustment	0	-1000~1000	ms
Pr3.00~ Pr3.31				

5.4 Torque control mode

The torque mode refers that the torque force of the servo motor has two torque control instruction functions: input by external analog or set by internal register. Under this mode, when the motor torque exceeds the torque force limited by torque instruction, the motor stops. This mode applies to conditions that need to control the motor torque force, like rolling and digging screws.

1. Apply the drive power, and inspect whether the drive displays warnings or alarms. If it does, inspect whether the wiring is normal.
2. Set the control method to the torque control mode (set Pr1.00 to 2), and select the torque instruction

source (Pr4.00) .

3. Select the torque limitation source (Pr4.09) and the torque speed limitation instruction source (Pr4.02).
4. When selecting the external analog quantity as the torque instruction source, connect the external analog voltage output terminal to servo analog input terminal (CN3-16, CN3-17, CN3-18, CN3-19, CN3-20) .
5. Set the external analog voltage to 0V, and set the motor to zero speed and zero torque through AI Bias adjustment (parameter Pr6.19, Pr6.20, Pr6.21) .
6. When selecting the register setting as the torque instruction source, the motor torque force and speed can be controlled by setting Pr4.05, Pr4.06, Pr4.11, Pr4.12.
7. The controller inputs servo-on signal (servo-on signal connected to servo CN3-5), to excite the motor.
8. The current motor torque force can be known by monitoring the load rate (Pr0.09) and the motor speed (Pr0.00) .
9. The relevant parameters of the torque control mode are shown below.

Parameter no.	Function code explanation	Factory default value	Setting range	Unit
Pr1.00	Control method selection	0	0~3	/
Pr4.00	Torque instruction source	100	0~300	%
Pr4.01	The corresponding torque instruction for analog maximum input (10V)	0	0~3	/
Pr4.02	Torque speed limitation instruction source	1000	0~3000	rpm
Pr4.03	Torque speed limitation instruction gain	0	0~20	/
Pr4.04	Torque limitation cycles	100.0	-300.0~300.0	%
Pr4.05	Internal digital torque instruction setting	100	0~3000	rpm
Pr4.06	Speed limit value under the torque control	0	0~3	/
Pr4.09	Torque limitation source selection	0.0	0~10.0	%
Pr4.10	Torque reaching threshold value	300.0	0~300.0	%
Pr4.11	Natural rotation torque limitation	300.0	0~300.0	%
Pr4.12	Inversion torque limitation	0	0~3	/
Pr6.19	AI1 Bias adjustment	0	-1000~1000	ms
Pr6.20	AI2 Bias adjustment	0	-1000~1000	ms
Pr6.21	AI3 Bias adjustment	0	-1000~1000	ms

5.5 Mixed control mode

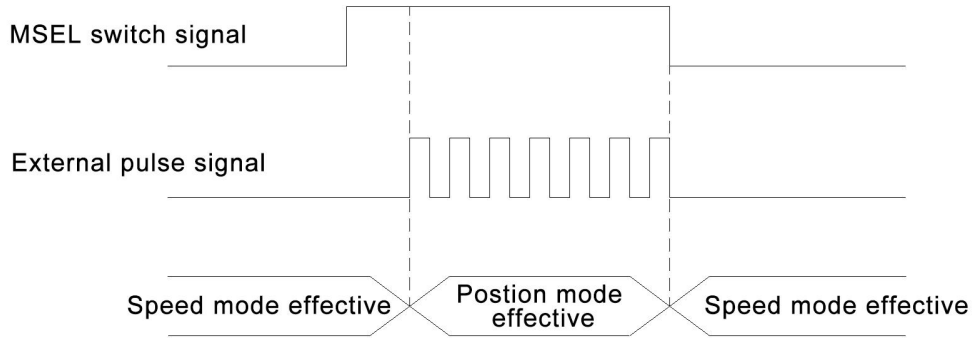
Besides the single running mode, the series of servo drive also provides mixed control mode, which includes three types.

1. Speed/position switch control mode(S-P);
2. Torque/speed switch control mode(T-S);
3. Position/torque switch control mode(P-T).

Note: To avoid the mixed control mode occupying too much DI input point, it's suggested speed/ torque control mode adopts the external analog voltage signal as instruction to reduce the usage of DI terminals.

5.5.1 Speed/Position switch mode

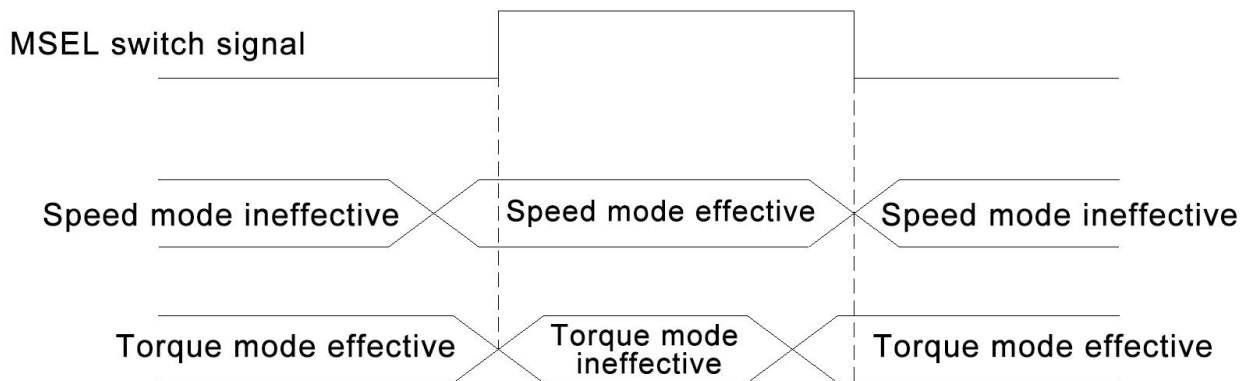
The position instruction is set by the external input pulse signal; the speed instruction can be the external analog voltage or the data of the internal register parameter. The switch between the speed/position mode is controlled by MSEL switching the signal. The sequence diagram is shown below.



Under the speed control mode (MSEL is off), the speed instruction selects its instruction by CMD3~CMD0, and at this moment, the external pulse signal is ineffective; when it's switched to position control mode (MSEL is on, and the switch must be done when the motor speed is zero), the motor runs as per the pulse instruction when the drive receives the external pulse signal; when MSEL is off again, it returns to the torque mode immediately.

5.5.2 Torque/Speed switch mode

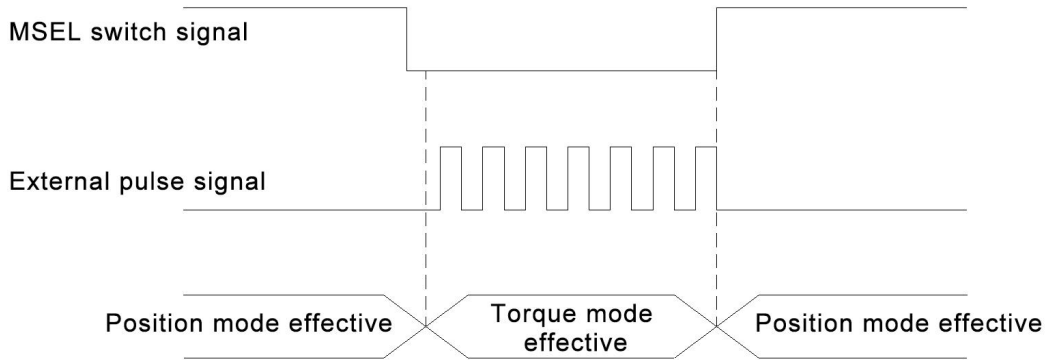
The torque instruction of the speed control mode can both be the external analog voltage or the data of the internal register parameter. The switch between the torque/speed mode is controlled by MSEL switching the signal. The sequence diagram is shown below.



Under the torque control mode (MSEL is off), the torque instruction can come from the external analog quantity voltage or be set by the internal register. When it's switched to speed control mode (MSEL is on), the speed instruction can come from the external analog quantity voltage or be set by the internal register. The motor rotates immediately as per the speed set by the speed instruction; when MSEL is off again, it returns to the torque mode immediately.

5.5.3 Position/Torque switch mode

The position instruction of the position control mode origins from the pulse of external input; torque instruction of the torque control mode is set by the external analog voltage or by the internal register parameter. Position/torque switch mode is controlled by MSEL signal. The sequence diagram is shown below.

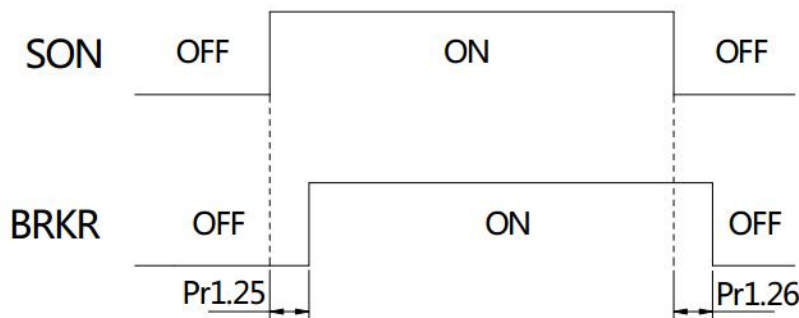


Under the torque control mode (MSEL is on), the torque instruction is input by analog quantity or set by the internal register. When it's switched to position mode (MSEL is off), the motor runs as per the external pulse instruction; when MSEL is on again, it returns to the torque mode immediately.

5.6 Other devices

5.6.1 Application of electromagnetic brake

When BRKR is set to OFF, the electromagnetic brake do not work, and the motor is locked; When BRKR is set to ON, the electromagnetic brake releases and the motor is unrestrained. The electromagnetic brake can achieve automatic on/off signals by setting Pr1.25 【 the delay time after servo is on and the signal of electromagnetic brake shows on (withdraw the brake)】 and Pr1.26 【 the delay time after servo is off and the signal of electromagnetic brake shows off (start the brake)】 in order to avoid the damaged caused to the motor and the mechanical structure due to untimely brake opening or closing during the users operates it. The sequence diagram of the electromagnetic brake is shown below.



Chapter VI Parameter Tuning

6.1 Position loop gain tuning

Before setting the parameters of the position loop control unit, the user must set the parameters of the speed loop control unit (Pr5.06 、 Pr5.07) first, for the inner loop of the position includes the speed loop. Afterwards, set the proportional gain (Pr5.02) , feedforward gain (Pr5.04) of the position loop and the smoothing constant of the position control feedforward gain (Pr5.05) .

1、 Proportional gain of the position loop Pr5.02

The increase of the value of the position control gain (KPP) can promote the position response performance and narrow the amount of the position control deviation. But if this value is set too high, vibration and noise will be easily caused.

The parameter determines the response performance of the position loop. The higher KPP is set, the more frequently the position loop will respond; the better it executes the position instruction, the smaller the value of the position deviation is; and the shorter the positioning setting time is. Yet, if the value is set too high, the machine vibration or the positioning overshoot will occur. The response frequency of the position loop is calculated below.

$$\text{The response frequency of the position loop(HZ)} = \frac{\text{KPP}}{2\pi}$$

2、 Pr5.04 Position control feedforward gain Pr5.04

When the position control instruction changes smoothly, the increase of the value of the position control feedforward gain can improve the amount of the position following error. When the position control instruction does not change smoothly, the decrease of the value of the position control feedforward gain can reduce the running vibration of the mechanism.

3、 Smoothing constant of the position control feedforward gain Pr5.05

When the position control instruction changes smoothly, the decrease of the smoothing constant of the position control feedforward gain can improve the amount of the position following error. When the position control instruction does not change smoothly, the increase of the smoothing constant of the position control feedforward gain can reduce the running vibration of the mechanism.

6.2 Speed loop gain tuning

1、 Speed control gain (KVP) Pr5.06

The increase of the value of the speed control gain (KVP) can promote the speed response performance. But if the value is set too high, vibration and noise will be easily caused.

The parameter determines the response performance of the speed loop. The higher KPP is set, the more frequently the speed loop will respond; the better it executes the speed instruction. Yet, if the value is set too high, the mechanical resonance will be easily caused. The response frequency of the speed loop must be 4-6

times higher than that of the position loop. If the response frequency of the position loop is higher than that of the speed loop, the machine vibration or the positioning overshoot will occur. The response frequency of the speed loop is calculated below.

When the estimated or set Pr5.18 equals to the real JL/JM : $f_v = \left(\frac{KVP}{2\pi} \right) \times \left[\frac{(1+Pr5.18)}{1+JL/JM} \right] Hz$

JL : Load inertia, JM : Motor inertia

2、 Speed integration time constant Pr5.07

Parameter function: The decrease of the speed integration time constant can promote the speed response performance and narrow the amount of the speed control deviation. But if the value is set too high, vibration and noise will be easily caused.

Chapter VII Abnormality Diagnosis and Processing

7.1 Fault warning list

Fault code	The fault name	Fault action content	The fault type
Fault			
Er.001	Short-circuit fault	Short-circuit protection of power devie is detected	Can not be reset
Er.002	Hardware overcurrent	Overcurrent protection of power devie is detected	Can not be reset
Er.003	Software overcurrent	The output electricity of servo drive exceeds the permissible range	Can not be reset
Er.004	Undervoltage fault	When the power is 220V, the busbar voltage is lower than 200V	Can not be reset
Er.005	Overvoltage fault	When the power is 220V, the busbar voltage is higher than 400V	Can not be reset
Er.006	Wrong phase sequence	Wrong wiring sequence of the motor U, V, W	Can not be reset
Er.007	Default phase	The wire of the motor U, V, W breaks or contact poorly	Can not be reset
Er.008	AD initialization fault	AD module initial calibration fault	Can not be reset
Er.009	AD module adoption fault	AD conversion fault (large deviation or overtime conversion)	Can not be reset
Er.00A	Motor overload fault	The motor load exceeds 120% of the rated for over a certain time	Can be reset
Er.00b	Drive overload fault	The drive load exceeds 120% of the rated for over a certain time for over a certain time	Can be reset
Er.00C	Motor overheat fault	Motor overheat	Can not be reset
Er.00d	Drive overheat fault	Drive overheat	Can be reset
Er.00E	Parameter storage abnormality	Abnormal or frequent Eeprom storage	Can be reset
Er.00F	Fan abnormality	Fan abnormality	Can be reset
Er.010	Motor overspeed fault	The motor speed exceeds its maximam	Can be reset
Er.011	Encoder wire break	The encoder wire break	Can be reset
Er.012	Encoder ABZ interference	Runtime abnormality	
Er.013			
Er.014	Large position deviation fault	The detained pulse in the position deviation counter will exceed the permissible range.	
Warning			
Er.E01	Motor overheat warning	Fault occurs when the motor's temperature is too high	
Er.E02	Drive overheat warning	Fault occurs when the major loop of the drive is overheat	
Er.E03	Motor overload warning	Inverse-time curve when the motor is overloaded	
Er.E04	Drive overload warning	Inverse-time curve when the drive is overloaded	
Er.E05	Large position deviation warning	The detained pulse in the position deviation counter will exceed the permissible range.	

7.2 Fault causes and the processing measures

Fault code	Alarm name	Abnormal checking	Treatment measure
Er.001 Er.002 Er.003	Short-circuit fault Hardware overcurrent Software overcurrent	Inspect the wiring of the motor and the drive or whether the conductor is short-circuit	Exclude short-circuit condition, and avoid exposing the metallic conductor
		Inspect the wiring sequence between the motor and the drive	Rewire as per the wiring sequence in the specification
		Inspect whether the setting value is much too higher than the default value	Reset to the default value and modify if by the quantity
		Inspect whether the control input instruction changes too much	Modify the frequency of input instruction change or start the filtering
Er.004	Undervoltage fault	Inspect the input voltage wiring of the major loop is normal	Reconfirm the voltage wiring
		Use the voltmeter to measure whether the voltage of the major loop is normal	Reconfirm the power switch
		Use the voltmeter to measure whether the power system confirms to the defined specifications	Use the correct voltage source or series transformer
Er.005	Overvoltage fault	Use the voltmeter to measure whether the input voltage of the major loop is within the rated acceptable voltage	Use the correct voltage source or series voltage regulator
		Use the voltmeter to measure whether the power system confirms to the defined specifications	Use the correct voltage source or series transformer
		The error still occurs when the input voltage of the major loop measured by the voltmeter is within the rated acceptable voltage	Please return it to the manufacturer for testing and repair
Er.006	Wrong phase sequence	Inspect whether the motor U, V, W are correctly wired.	Wire U, V, W correctly as per the handbook and perform ground connection
Er.007	Default phase	Inspect whether the wiring of the motor U, V, W breaks or looses	Reconnect them (U, V, W)
Er.008	AD initialization fault	Initialize parameters and apply power again	Please return it to the manufacturer for testing and repair if it's abnormal after repeated resetting.
Er.009	AD sampling module fault		
Er.00A Er.00B	Motor overload fault Drive overload fault	Continue to use even when the servo drive exceeds the rated load.	Monitor parameters Pr0.09 and Pr0.10 to confirm whether the motor is overloaded.
		Inspect whether the motor and the encoder are wrongly wired.	Reconfirm the wiring
		Inspect whether the motor rotation is blocked	Exclude the motor block
		Overload	Enhance the motor capacity or reduce its load.
		Wrong setting of the motor overload point	Check whether Pr8.13 is set too low.
		Confirm the overload characteristic and running instruction of the motor or servo drive	Modify the loading condition, running condition and motor capacity.
Er.00C Er.00D	Motor overheat fault Drive overheat	Inspect whether the temperature of the working environment is too high	Measure the environment temperature and improve the working environment according to it.

Fault code	Alarm name	Abnormal checking	Treatment measure
	fault	Inspect whether the installation direction of servo drive and its connection to other devices are proper	Inspect whether servo drive is installed as is required.
Er.00E	Parameter storage abnormality	Inspect whether the upper device frequently modifies the function parameters of servo drive	改变 parameter 写入方法并重新写入 Change the writing method and rewrite
		Modify any one of the parameters, apply power again and check whether the parameter is saved.	Rewrite it and check whether it's saved. Please return it to the manufacturer for testing and repair if it's not saved after repeated writing.
Er.00F	Fan abnormality	Inspect whether the fan wire breaks or it's blocked	Clean the fan or change it
Er.010	Motor overspeed fault	Wrong sequence of Phase U, V, W of servo motor	Inspect the motor wiring to confirm if it's free of problems.
		Wrong sequence of Phase U, V, W of servo motor	Inspect the input of the speed instruction, and reduce the value or gain of the instruction.
		Motor speed overshoot	Inspect the speed waveform of the motor, and lower the gain of the regulator.
		Whether the zero electric angle of the function (PrE.18) and the encoder deviation angle (PrE.19) are correctly set	Inspect whether the two functions display the set value by the manufacturer. If not, set them to the value by the manufacturer.
Er.011	Encoder wire break	Inspect whether the wiring of U, V, W, A, B and Z of the encoder is correct; Inspect whether the wiring joints of the encoder is firm; Inspect whether the coherent signals of the encoder are welded correctly.	Reconfirm the wiring and apply power again. Please return it to the manufacturer for testing and repair if the alarm sounds after repeated confirmation.
Er.012	Encoder ABZ interference	Inspect whether the encoder wiring is firm; Inspect whether the encoder is shielded.	
Er.013		Inspect whether the encoder routes along with AC power line.	
Er.014	Fault Large position deviation fault	Confirm whether the gain setting value is appropriate	Modify the gain value correctly
		Confirm whether the torque limitation value is too low	Modify the torque limitation value correctly
		Inspect whether the external load is too large or the rotation is blocked	Reduce the external load or reassess the motor capacity

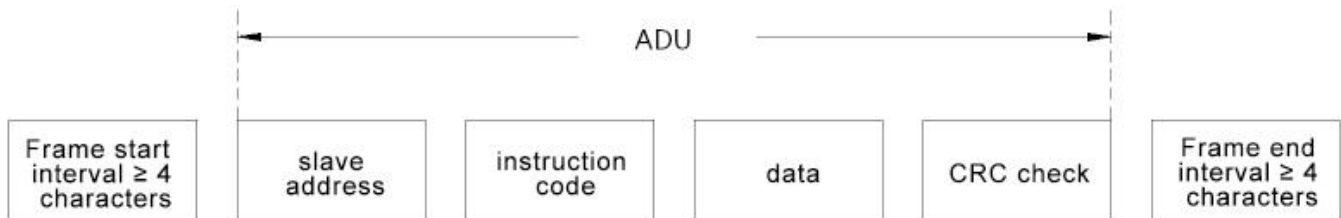
Chapter VIII Communication Description

8.1 Scope of application

The series of servo drive supports the ModBus protocol, RTU format, uses RS232 or RS485 communication (can not be used simultaneously), and is equipped with “single host multiple slaves” communication network of RS485 bus. Before using the communication function, set its parameters (station number Pr7.00, Baud rate Pr7.01, data format Pr7.02) of each drive.

Modify directly the parameters inside the drive from the upper computer by the communication function, and thus control the drive to run in internal speed or in internal position easily.

8.2 Protocol format



high and low bytes by the CRC16 checksum of the first three parts of ADU. In the protocol format, the low bytes of CRC check are before the high bytes.

1. Read the function code parameters or status word of servo drive (instruction code 0x03)

ADU part content	The number of bytes	Range
Request to send from the host:		
Slave address	1	0-0FEH
Instruction code	1	0x0003
Initial address of register	2	0x0000-0x0FFFF
Amountof registers	2	0x0000-0x0008
CRC check (low bytes are in the front)	2	
Slave response:		
Slave address	1	Local address
Instruction code	1	0x03
Read byte number	1	2* amountof registers
Register content	2* amountof registers	
CRC check	2	

Example: Read motor speed to send data to 01 03 00 00 00 01 84 0A

2. Write the single function code or control parameters of servo drive (instruction code 0x06)

ADU part content	The number of bytes	Range
Request to send from the host		
Slave address	1	0-0FEH
Instruction code	1	0x06
Register address	2	0x0000-0x0FFFF
Register content	2	0x0000-0x0FFFF
CRC check	2	
Slave response		
Slave address	1	Local address
Instruction code	1	0x06
Register address	2	0x0000-0x0FFFF
Register content	2	0x0000-0x0FFFF
CRC check	2	

Example: Control servo enable Pr6.01 is set to 1, sending data is 01 06 26 01 00 01 12 82

3. Rewrite the multiple function code or control parameters of servo drive (instruction code 0x10)

ADU part content	The number of bytes	Range
Request to send from the host		
Slave address	1	0-0FEH
Instruction code	1	0x10
Initial address of register	2	0x0000-0x0FFFF
Amountof registers	2	0x0000-0x0008
Byte number of register content	1	2* amountof registers
Register content	2* amountof registers	
CRC check	2	
Slave response:		
Slave address	1	Local address
Instruction code	1	0x10
Initial address of register	2	0x0000-0x0FFFF
Amountof registers	2	0x0000-0x0008
CRC validation	2	

4. Communication line diagnosis and setting

ADU part content	The number of bytes	Range
Request to send from the host		
Slave address	1	0-0FEH
Instruction code	1	0x08
Subfunction code	2	0x0000-0x0FFFF
Data	2	
CRC check	2	
Slave response:		
Slave address	1	Local address
Instruction code	1	0x08
Subfunction code	2	0x0000-0x0FFFF
Data	2	
CRC check	2	

Note: Instruction code 0x08 only functions to verify that the communications line is connected.

8.3 The protocol format description

1. **Station number:** The setting range of servo drive slave address is 1-247.

2. Function code

Function code	Function
03H	Read the function code parameter or status word of servo drive
06H	Write the single function code or the control parameter of servo drive
10H	Write the multiple function codes or the control parameter of servo drive
08H	Communication line diagnosis and setting

3. Register address distribution

Name	Address space	Explanation
Function code	0000H~ 08xxH	The high bytes are the group numbers of function code; the high types of Pr0-Pr8's corresponding address are separately 00H-08H. The low bytes are the code numbers of the functions within the group. For instance: the corresponding address of Pr1.07 is 0107H.
	2000H~ 28xxH	The address of the function code +2000H is needed to save the modified parameters (the modified EEPROM content). For instance, the corresponding address of Pr1.07 is 2107H.

4. CRC check

The transmitting equipment calculates CRC value first and attaches it to the sent message. The receiving equipment will recalculate the CRC value after receiving it and compare the recalculated value to the received CRC value. If the two values are not equal, it means error occurs in transit.

Calculating process of CRC check

- (1) Define a CRC register and assign the initial value FFFFH to it.
- (2) Make XOR calculation to the first byte of the sent message and the value of CRC register, and store the result in the CRC register. No calculation will be made from the address code, the start bit and the stop bit.
- (3) Extract and check LSB (the least significant digit of CRC register)
- (4) Move each digit of CRC register one position to the right, and complement the most significant digit with 0.
- (5) If LSB is 1, make XOR calculation to the value of CRC register and A001H and store the result in CRC register.
- (6) Repeat the steps 3, 4, 5 until 8 shifts are completed.
- (7) Repeat the steps 2, 3, 4, 5, 6, and handle the next byte of the sent message. Repeat the steps as needed until all bytes of the sent message are handled.
- (8) After completing the calculation, the content in the CRC register is the value of CRC check.
- (9) Send the low byte of the CRC check value first and then the high byte.

5. Abnormal response

When the host sends wrong data or servo receives wrong data due to external interference, an abnormal response message will be sent. The data structure of the abnormal response:

ADU part content	The number of bytes	Explanation
Address code	1	Slave address
Function code	1	Equals to the sent function code +0x80
Abnormality code	1	See abnormality code list
CRC check (L)	2	CRC16
CRC check (H)		CRC16

Abnormality code list

Abnormality code	meaning
01	CRC check error
02	Incorrect function code
04	Incorrect data length
08	Register address error
10	Register digital error
20	Register modification error
40	EEPROM busy

Note: If the function code is wrong, abnormality code 0x02 will display.