ESDB AC SERVO DRIVER

Servo Driver Operation Manual (V1.01)

GUANGDONG ELESY ELECTRIC CO.,LTD

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Safety Notes

The ESDB series general servo driver, which adopts DSP+FPGA system framework, has a series of virtues: it speeds up the process of data collection and processing, with high integration level and reliability; it has abundant interfaces for digital and analog input, which can match diversified upper control devices; its optimized control algorithm makes accurate full-digital control of torque, speed and position come true, which can be used in various manufacturing fields.

Before storing, installing, wiring, operating, checking and repairing, make sure to understand and obey the following important notes, so as to operate the product safely.

DANGER	Incorrect handling may cause dangerous situation resulting in personal injury or death.
WARNING	Incorrect handling may cause dangerous situation resulting in personal injury and device damage.
NOTICE	Neglect of this notice may cause undesired results or situation.
FORBIDDEN	Strictly forbidden actions, or the device may be damaged or discarded as useless.

1. Product inspection

WARNING
● AC servo drive must operate with matched servo motor. ● Products being damaged or out of order can't be used, or it may cause fire or equipment failure. ● If using your own motor, please contact our company's technicians, or normal operation of the driver can't be guaranteed.

2. Product installing

DANGER
● Don't expose the product to steam, corrosive and combustible gas, otherwise it may cause electric shock or fire. ● Don't use the product in the place with direct sunlight or lots of dust, salinity and metal powder. ● Don't use the product in the place with drippy water, oil and medicine.

3. Wiring

DANGER
● Don't join up the driver of 220V with the power supply of 380V, or there are danger of machine damage, electric shock and fire. ● Confirm the one-to-one correspondence between the U,V,W output terminals and the U,V,W binding posts, otherwise the motor may overspeed and cause damage to the machine and personal injury. ● The grounding terminal must be grounded correctly; bad ground may cause electric shock or fire.

4. Notes for operation

NOTICE
● Before power on, please make sure the servo driver and servo motor have already been installed and fixed correctly, and the power voltage and wiring is right. ● Before using the driver, confirm the machine's couplings or belts are separated, and set the driver's parameter to suitable value. Test the servo motor to confirm it is operating correctly, and then connect to the load; otherwise it may cause machine damage and breakdown. ● Before operating, please confirm the emergency switch can be turned on at any time to stop the machine.

FORBIDDEN
● Don't touch any rotating part of the motor; otherwise it may cause personal injury. ● When the equipment is running, don't move the stub cable, otherwise it may cause personal injury or machine damage. ● When the equipment is running, don't touch the drive and motor otherwise it may cause electric shock or scald. ● Don't turn on and off the power frequently. If necessary, please control the frequency is below once every minute.

5. Trouble handling

⚠NOTICE
● Except the specified professional staff, please don't connect, install, operate, dismantle and repair the machine, for there are risks of electric shock and causing damage to the equipment. ● Please don't reform the driver by oneself for there is danger of electric shock and personal injury. ● Don't touch the circuit board with hand directly, or it may destroy the board because of electrostatic induction. ● When the equipment gives an alarm signal, check it and clear the trouble. Reset the alerting signal before restarting. ● Be far away from the machine when restart it after unexpected power cut, to prevent accidents.

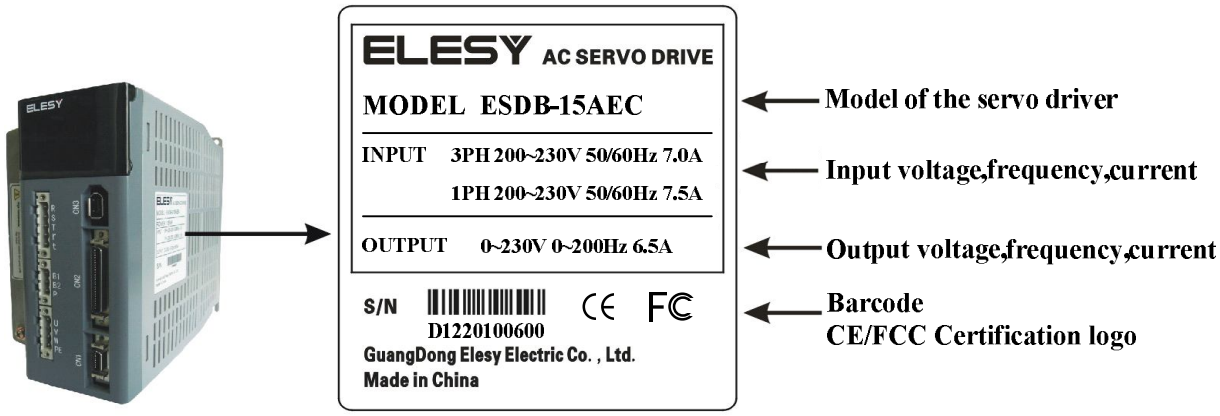
Contents

Chapter 1 Product introduction

1.1 Nameplate and model introduction

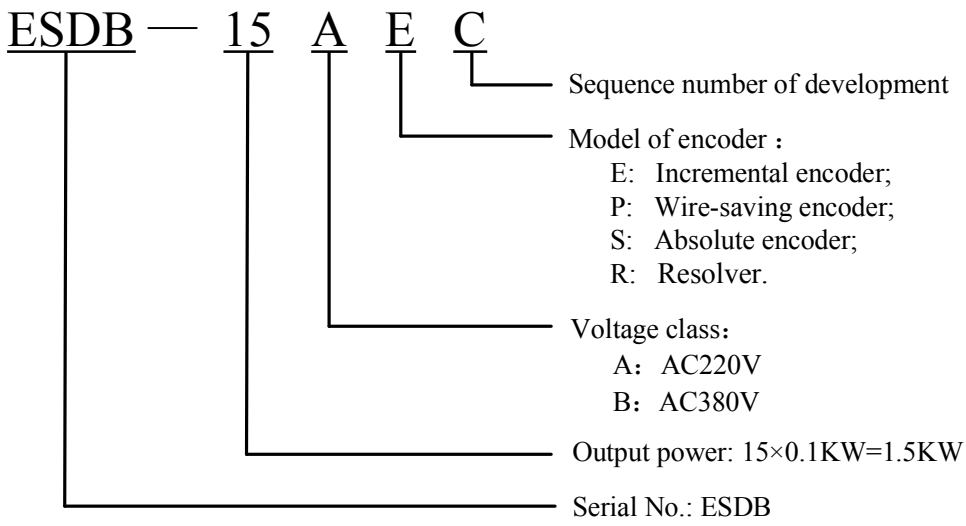
1. Nameplate

Figure 1-1 Servo driver nameplate description



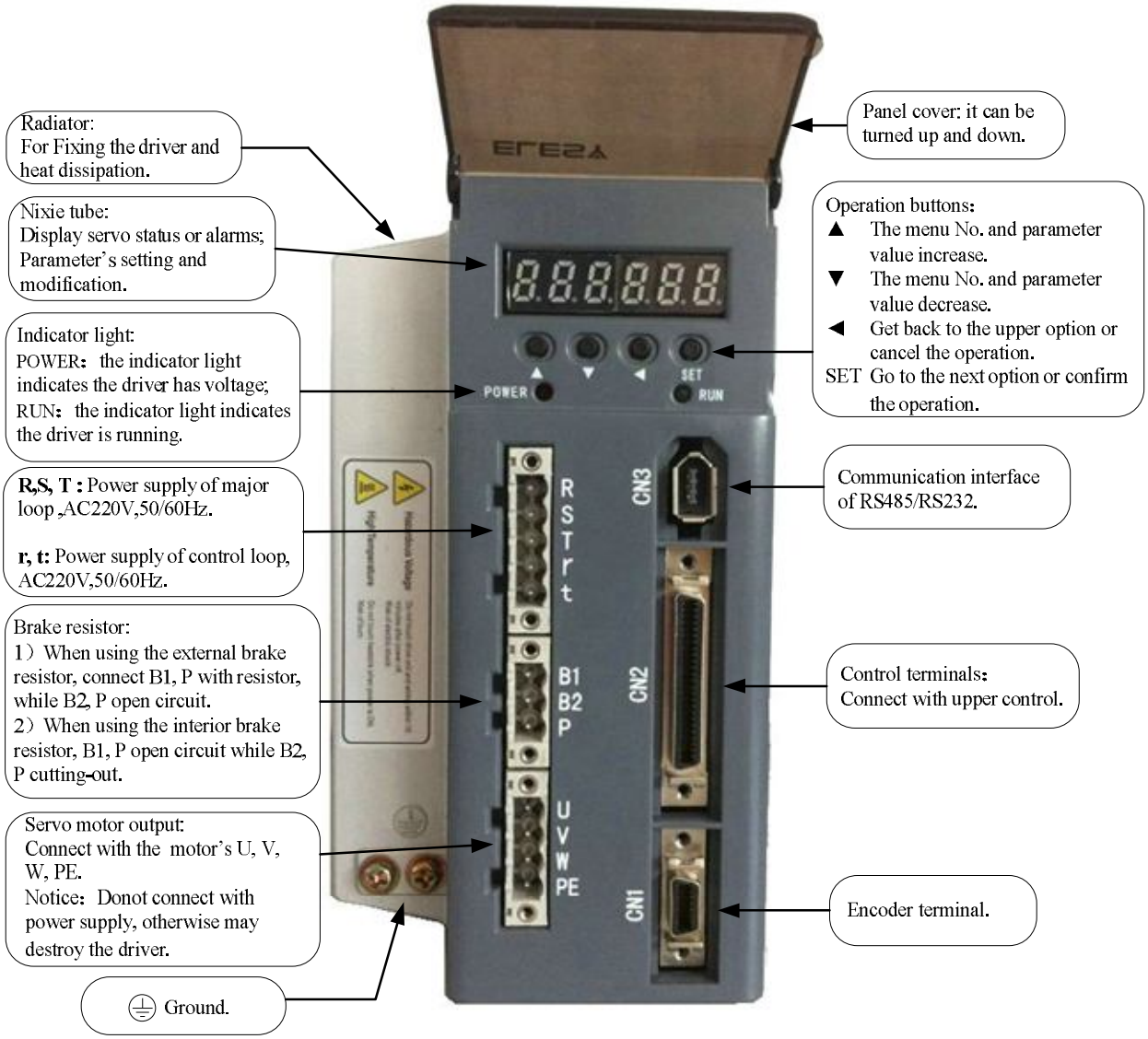
2. Model

Figure 1-2 Servo driver model description



1.2 Each part name of servo driver

Figure 1-3 Names of the servo driver's parts



1.3 Technical specification of servo driver

Power		Single-phase AC220V(-15%~+10%),50/60Hz	Three-phase AC220V (-15~+10%),50/60Hz
Environment	**Temperature**	Operation temperature: 0~40℃; Storage temperature: -40~50℃.	
	Humidity	<90% (No moisture condensation)	
	Vibration	<0.5G(4.9m/S2) 10～60Hz , operate discontinuously.	
Control mode		①Position control mode; ②Speed control mode; ③Torque control mode; ④Position/speed mode; ⑤Speed/torque mode; ⑥Torque/position mode; ⑦Open-loop operation.	
Braking resistor		Internally installed or out-connected.	

Feature	**Response**	≥400Hz
	Speed volatility	<0.03(Load: 0~100%)
	Speed control range	1:5000
	Pulse frequency	Differential Input:≤500Kpps; Open-collector input:≤200Kpps.
Control input		5 programmable DI input: 1.Servo on; 2.Alarm clear; 3. CCW drive prohibition; 4.CW drive prohibition; 5.Position deviation counter clear; 6.Pulse command input prohibition; 7.Zero speed clamp; 8.CCW forward torque limit; 9.CW reversed torque limit; 10.Control mode switching; 11.Internal position selection 1; 12.Internal position selection 2; 13.Internal position selection 3; 14.Internal speed selection 1; 15.Internal speed selection 2; 16.Internal speed selection 3; 17.Internal torque selection 1; 18.Internal torque selection 2; 19.Electronic gear ratio selection 1; 20.Electronic gear ratio selection 2; 21.Speed direction selection 1; 22.Speed direction selection 2；23. Speed command reverse; 25. Homing startup signal; 26. The homing reference point signal; 27. Inner position running start signal.
Control output		3 programmable DO output: 1.Servo ready; 2.Alarm output; 3.Positioning completion; 4.Electromagnetic brake; 5.Speed reached signal; 6.Torque reached signal; 7.Homing completion; 8.Zero speed signal.
Position control mode		Input pulse types:①Pulse+direction; ②CCW pulse/CW pulse; ③Two-phase quadrature pulse.
		Eight-optional internal position;
Speed control mode		①Eight-optional internal speed; ②External -10V~10V analog signal control.
Torque control mode		①Four-optional internal torque; ②External -10V~10V analog signal control.
Acceleration/Deceleration time		Range: 1~10000ms (0~1000rpm/1000rpm~0) .
Torque limitation		Range: -300~+300%.
Monitoring		Speed; Feedback pulse; Position command; Position deviation; Torque; Current; Pulse frequency; Control mode; I/O signal status, Etc.
Protection		Overspeed; Overvoltage; Undervoltage; Overcurrent; Overload; Encoder abnormity; Overheating; Excessive position deviation,Etc.
Operation&Display		6-bits LED nixie tube, 4 buttons, 2 indicator lights. Support shift operation.
Applicable load inertia		Less than 5 times of the inertia of motor.
Communication		RS485/RS232 CAN

Chapter 2 Installation

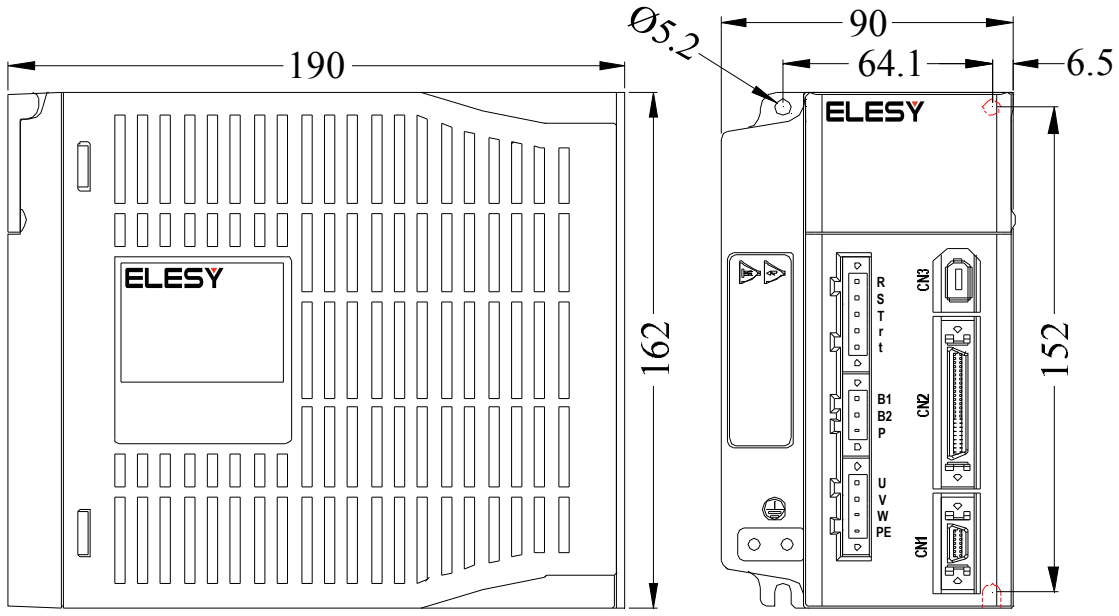
1. Installation site

Items	ESDB servo driver
Operating temperature&humidity	0~40℃(No freezing); Less than 90%RH (No moisture condensation).
Storage temperature& humidity	-40~50℃; Less than 0%RH (No moisture condensation).
Air environment	Confirm there is no corrosive gas, inflammable gas, oil mist, dust, etc. inside the cabinet.
Installation environment	Should be installed in the place where there is no high- radiation equipment, vapor, water-drop, floating metal particle, electromagnetic noise jamming.
Altitude	Elevation: 1000m below.
Vibration	Less than 0.5G(4.9m/S2) 10～60Hz,operate discontinuously.
Protection grade	IP20

2. Installation dimension

It can be installed in the way of base plate installation, and the installation direction is upwards perpendicular to fitting surface. Figure 2-1 shows the baseplate installation way.

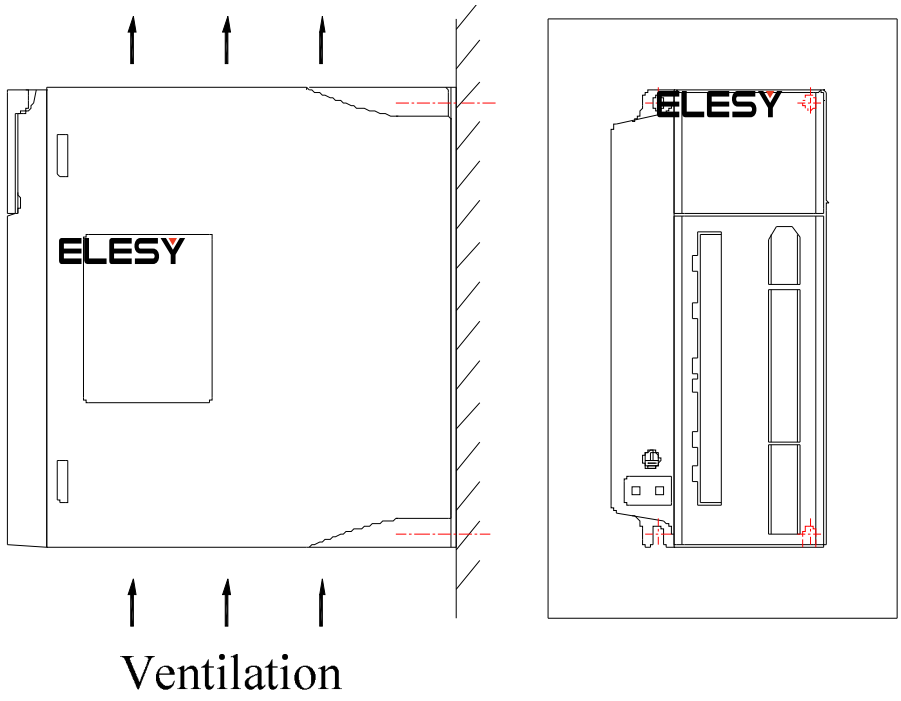
Figure 2-1 the driver's structure and installation dimension（unit: mm）



3. Installation direction

As figure 2-2 shows, the installation direction should be perpendicular to the wall's direction. Adopt mounting holes in the four corners to fix the servo driver on the wall firmly. If necessary, please install an air fan to apply forced-cooling to the servo driver.

Figure 2-2 Installation direction of the driver



4. Installation interval

The installation interval for single drive is shown in figure 2-3, and that for multi drives is shown in figure 2-4. Please leave enough space as far as possible in practical installation, so as to guarantee good heat dissipation condition.

Figure 2-3 Installation intervals for single drive

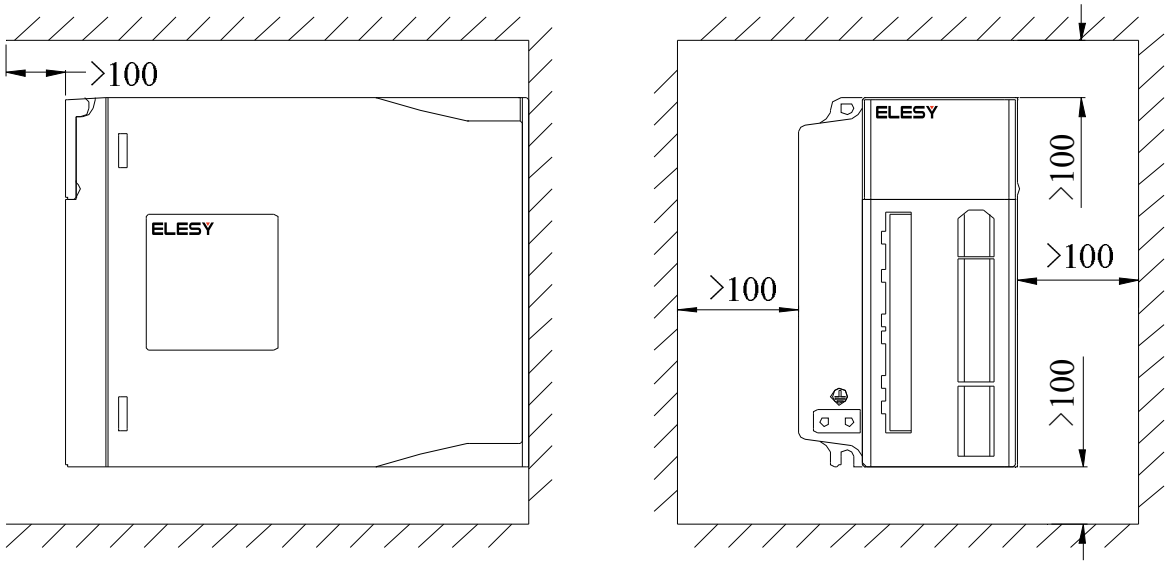
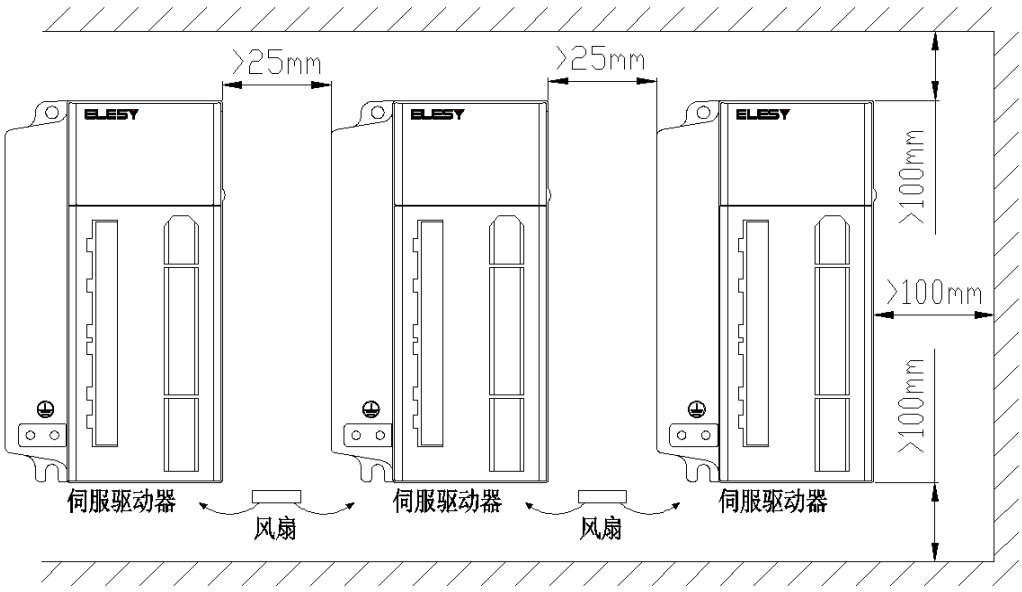


Figure 2-4 Installation intervals for multi drives



WARNING	For avoiding the environmental temperature of the servo driver rising too high, there should be convection wind blowing to radiator of driver inside the electric cabinet.

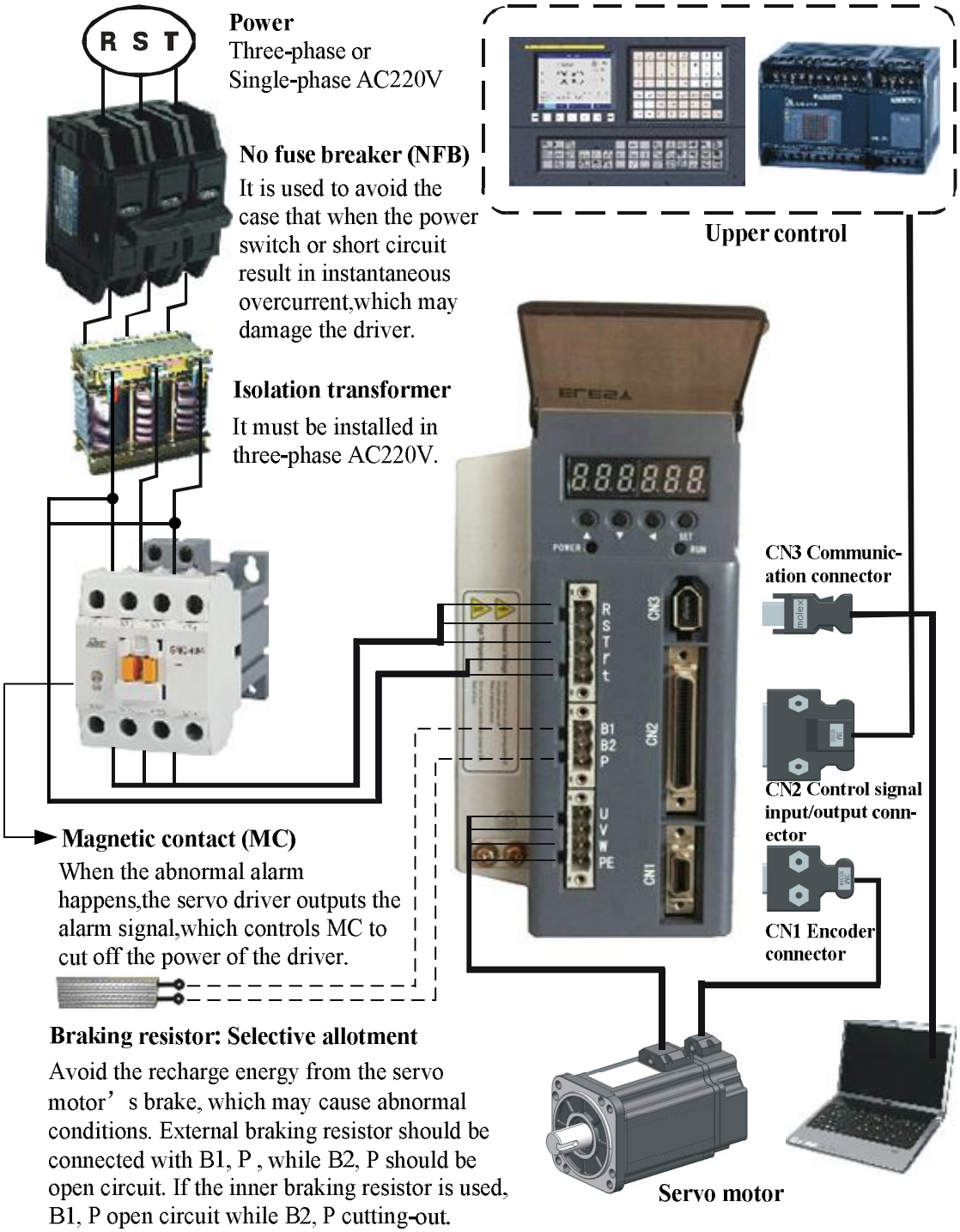
While installing multi drivers, as shown in figure 2-4, please leave room larger than 25mm in each of the two crosswise sides, and more than 100mm in each of the two vertical sides. Please keep the temperature inside the electric closet in balance, for avoiding local temperature of the servo driver rising too high. If necessary, please install forced-cooling convectional fan in the electric closet above the servo driver to pump air out.

Chapter 3 Wiring

3.1 Connection of peripheral equipments

The application of servo drive should be equipped with some peripheral equipment. Using proper peripheral equipment can guarantee the drive's stable operation; otherwise it may reduce the drive's service life, even damage the servo drive.

Figure 3-1 Connection of peripheral equipment



⚠WARNING	➢ Braking resistor should be connected in strict accordance with the manual requests. B1 and P can't be short circuit, otherwise the driver will be destroyed after power-on. ➢ Before power on, please check whether R, S, T, r, t wiring is correct. ➢ Check whether U,V,W,PE wiring is correct .Three-phase terminal sequence can't be swapped to reverse the motor ➢ Motor ground terminal must be connected with driver ground terminal PE ➢ There is large volume electrolytic capacitor in the servo driver, so high voltage will exist even after power down. Please don't touch the driver or motor in five minutes after outage .

3.2 Wiring of servo drive

3.2.1 Power supply wiring

Servo driver power line has two connections which are single-phase 220V and three-phase 220V. Single-phase connection is only used at below 1.5KW situations. In the three-phase connection, control power r and t can be connected with any two phases of the three phases.

Figure 3-2 Wiring diagram of single-phase AC220V

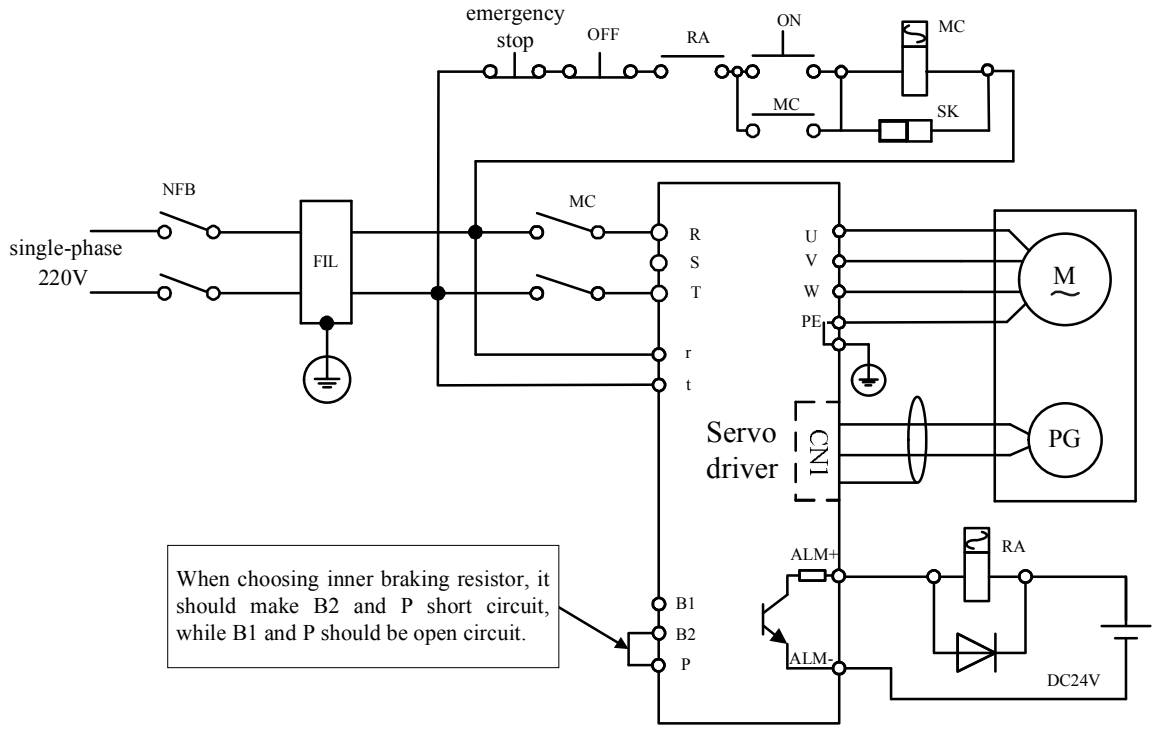
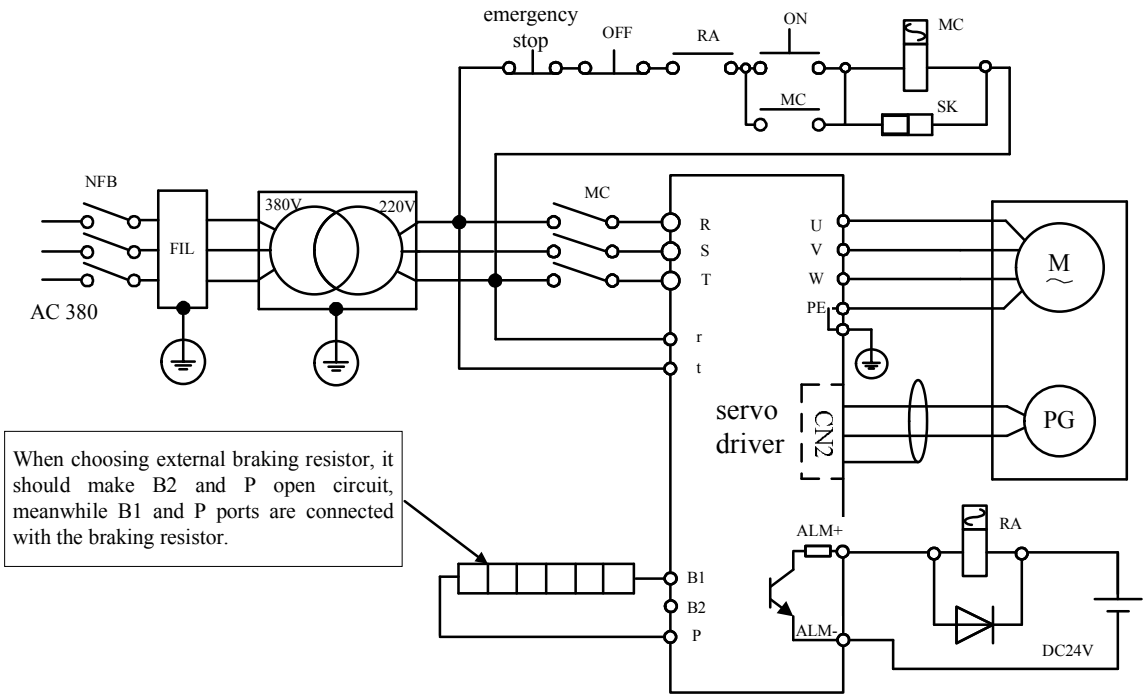
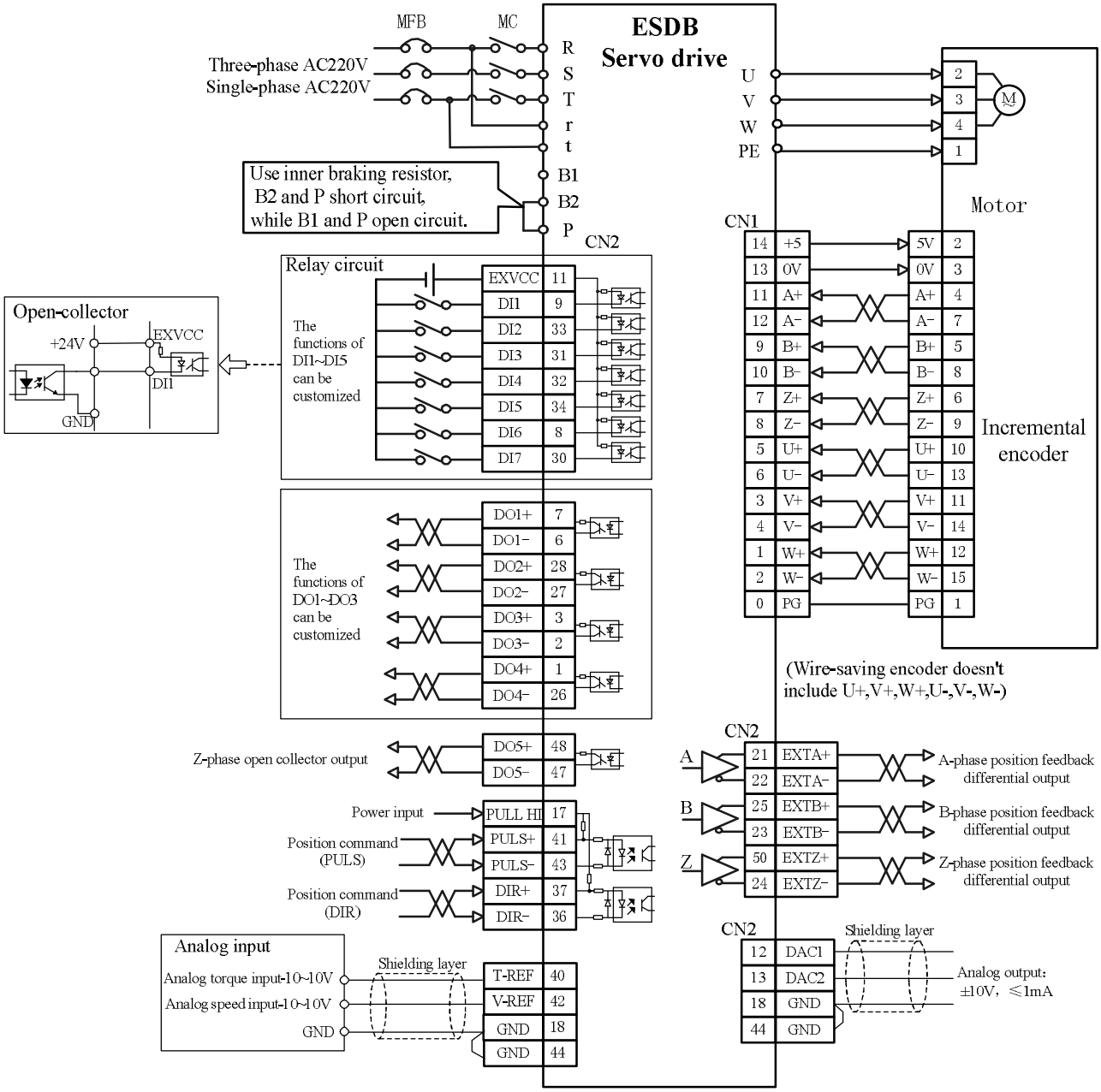


Figure 3-3 Wiring diagram of three-phase AC220V



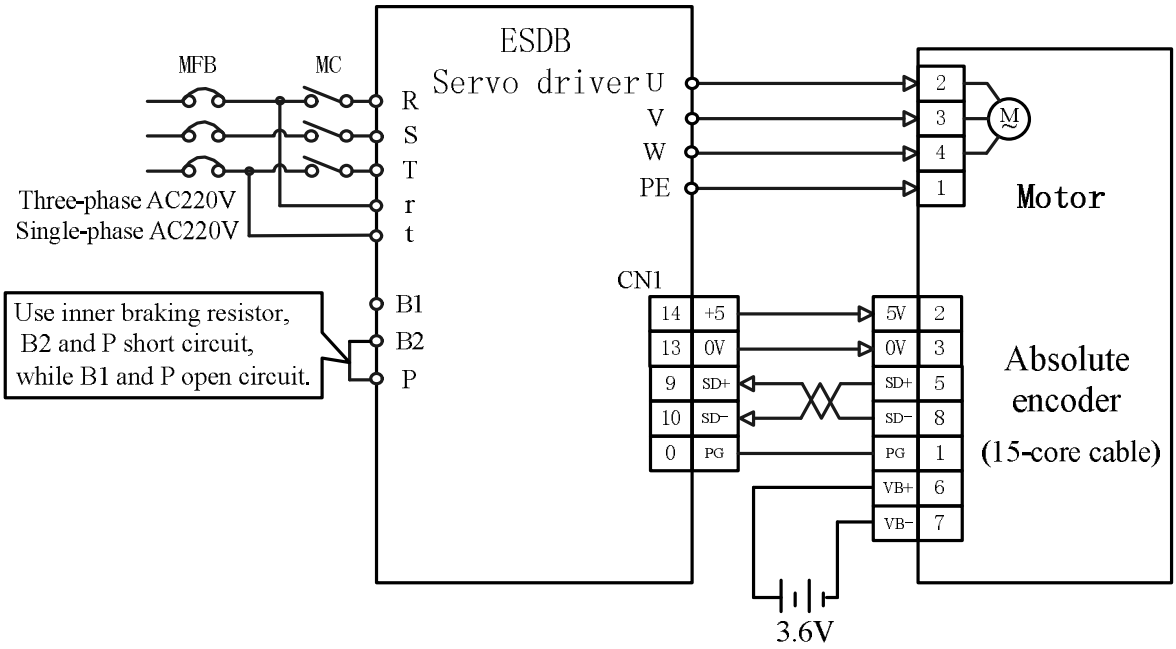
3.2.2 Standard wiring diagram of the servo drive

Figure 3-4 Wiring diagram of servo drive



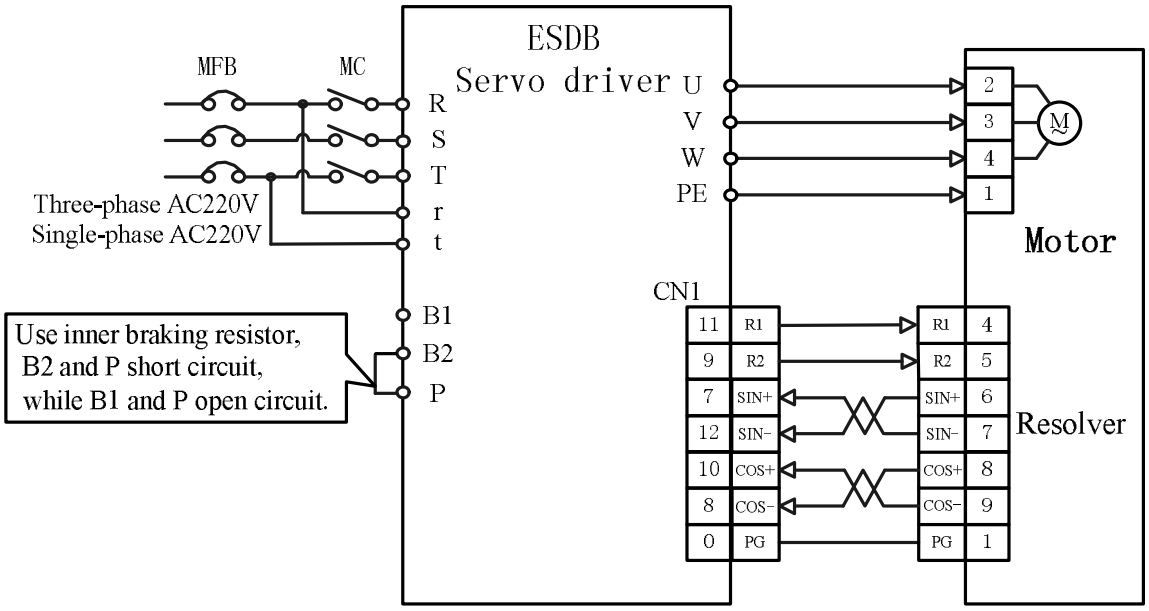
3.2.3 Absolute encoder wiring

Figure 3-5 Wiring diagram of absolute encoder



3.2.4 Resolver wiring

Figure 3-6 Wiring diagram of resolver



Chapter 4 Interface

4.1 Signal definition of power terminals

Terminal sign	Signal name	Functions	Wire diameter requirements	
			＜2.0KW	≥2.0KW
r t	Control power supply terminal	Control circuit power input terminal:AC220V，50～60Hz	1.25 mm2	
R S T	Main Circuit power	Main Circuit power input terminal: AC220V，50～60Hz	1.25 mm2	2.0 mm2
U V W PE	Motor output terminal	Connect to servo motor's U,V,W,PE .	1.25 mm^2	2.0 mm^2
B1 B2 P	Brake resistor terminal	When using inner braking resistor, the B2 and P ports are short circuit, meanwhile B1 and P ports are open circuit.	1.25 mm^2	
		When using external braking resistor, the B2 and P ports are open circuit, meanwhile B1 and P ports are connected with the external braking resistor.		
⏚	Ground terminals	Connect with motor ground.	2.0 mm2 以上	

4.2 Signal definition of encoder feedback terminals

Figure 4-1 shows connection terminals of servo driver CN1, which uses SCSI 14P connector.

Figure 4-1 CN1 plug of servo driver

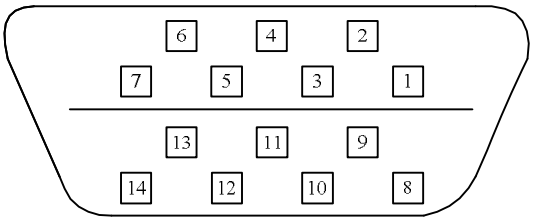


Table 4-1 Signal definition of CN1 plug

Pin	Name and sign			
	Incremental encoder	Wire-saving encoder	Absolute encoder	Resolver
CN1- 1	Encoder W+ input: W+			
CN1- 2	Encoder W- input: W-			
CN1- 3	Encoder V+ input: V+			
CN1- 4	Encoder V- input: V-			
CN1- 5	Encoder U+ input: U+			
CN1- 6	Encoder U- input: U-			
CN1- 7	Encoder Z+ input: Z+			Analog input SIN+: SIN+
CN1- 8	Encoder Z- input: Z-			Analog input COS-: COS-
CN1- 9	Encoder B+ input: B+		Encoder SD+ input: SD+	R2
CN1-10	Encoder B- input: B-		Encoder SD- input: SD-	Analog input COS+: COS+
CN1-11	Encoder A+ input: A+			R1
CN1-12	Encoder A- input: A-			Analog input SIN-: SIN-
CN1-13	Encoder power negative : 0V			
CN1-14	Encoder power positive : +5V			

4.3 Signal definition of CN2 connector

Figure 4-2 shows CN2 plug of the servo driver (in the face of soldering lug of the pin). It uses SCSI 50P connector.

Figure 4-2 CN2 plug of servo driver

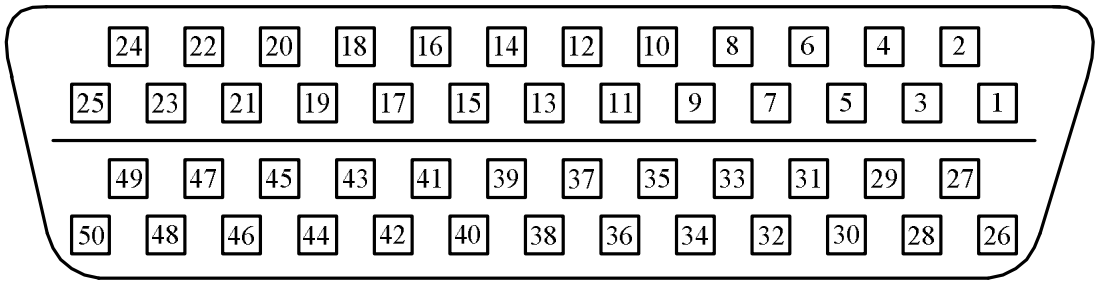


Table 4-2 Signal definition of CN2 plug

Pin	Name	Application way	Functions
CN2-11	EXVCC	P,S,T	I/O input circuit external power supply, +12V~+24V
CN2-9	DI1	P,S,T	Photoelectric isolation programmable digital input pins. Functions of DI1~DI5 can be customized by parameters P-301~P-307.
CN2-33	DI2		
CN2-31	DI3		
CN2-32	DI4		
CN2-34	DI5		
CN2-8	DI6		
CN2-30	DI7		
CN2-41	PULS+	P	External pulse command input: 1） Pulse + Direction;
CN2-43	PULS−		

CN2-37	DIR+		2） CCW Pulse /CW Pulse; 1） Two-phase quadrature pulse.
CN2-36	DIR−		
CN2-17	PULL HI	P	External DC24V power for pulse input using open collector connection.
CN2-19	VPP	P,S,T	The +24V voltage is supplied by driver.
CN2-20	COM		The ground of VPP.
CN2-12	DAC1	S,T	Analog output, −10V～+10V.
CN2-13	DAC2		
CN2-40	T-REF	S,T	Analog torque command input:-10V～+10V
CN2-42	V-REF		Analog speed command input:-10V～+10V
CN2-18	GND	S,T	Analog ground.
CN2-44	GND		
CN2-7	DO1+	P,S,T	Photoelectric isolation programmable digital output pins. Functions of DO1~DO3 can be customized by parameters P-309~P-312.
CN2-6	DO1−		
CN2-28	DO2+		
CN2-27	DO2−		
CN2-3	DO3+		
CN2-2	DO3−		
CN2-1	DO4+		
CN2-26	DO4−		
CN2-48	DO5+	P,S,T	Z-phase open collector output.
CN2-47	DO5−		
CN2-21	EXTA+	P,S,T	Position feedback pulse A phase differential output.
CN2-22	EXTA−		
CN2-25	EXTB+	P,S,T	Position feedback pulse B phase differential output.
CN2-23	EXTB−		
CN2-50	EXTZ+	P,S,T	Position feedback pulse Z phase differential output.
CN2-24	EXTZ−		

4.4 Signal definition of communication connector

Figure 4-3 Communication connector CN3 plug

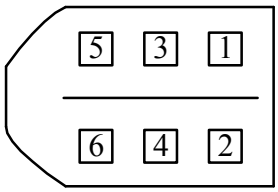


Figure 4-4 Wiring diagram of drive CN3 plug (RS232 interface) and PC

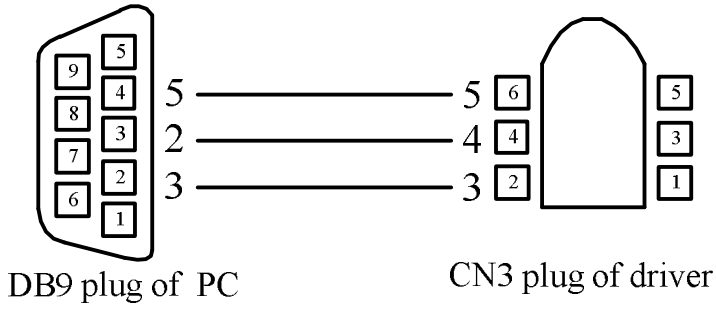
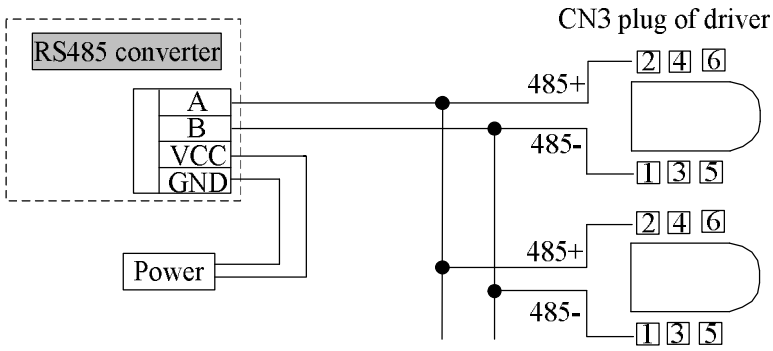


Figure 4-5 Wiring diagram of drive CN3 plug and RS485 converter



Through the RS485 interface can simultaneously achieve asynchronous serial half-duplex communication with 32 servo drivers. The cable length is related to the baud rate and the cable diameter. For example, if the baud rate is 9600bps and AWG26 cable is chosen, the maximum communication distance is 1Km.

Table 4-3 Signal definition of CN3

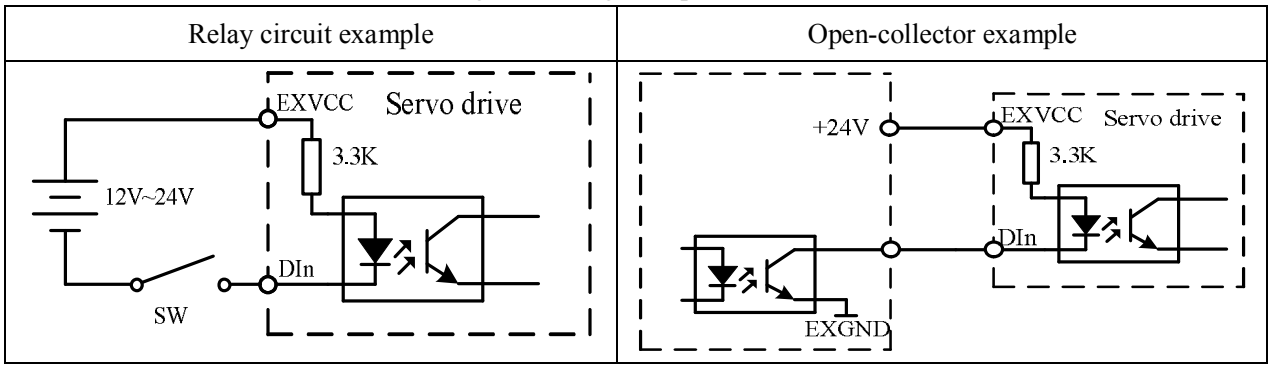
Pin	Name	Sign	Functions
CN3-1	RS485 differential signal -	RS-485-	RS-485 and CAN shared data bus. Users can choose either one by internal jumper.
	CAN differential signal -	CANL	
CN3-2	RS485 differential signal +	RS-485+	
	CAN differential signal +	CANH	
CN3-3	RS-232 data receiving	RXD232	Data receiving terminal of driver RS232 interface, connect to PC data transmitting terminal.
CN3-4	RS-232 data transmitting	TXD232	Data transmitting terminal of driver RS232 interface, connect to PC data receiving terminal.
CN3-5	Ground	GND	+5V Power supply.
CN3-6	+5V	+5V	

4.5 Digital input/output interface principle

4.5.1 Digital input interface principle

The digital input signals with two connections as follows.

Figure 4-6 Digital input interface

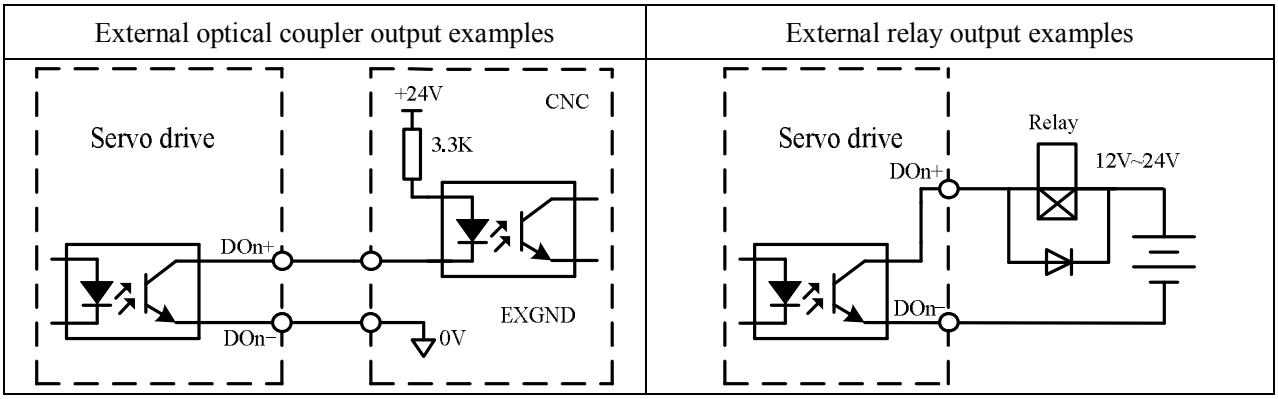


- The input power (DC12～24V) is supplied by user, the power load capacity is 100mA and above.
- If power polarity reversed, servo drive will fail to work.

4.5.2 Digital output interface principle

Servo digital outputs are all couple-terminal open-collector output. In order to guarantee reliability of signal transmission, all the output signals are valid only when the optical coupler is turned on. Wiring is showed as followings.

Figure 4-7 Digital output interface



- The power is supplied by users. Notice that the servo driver will be damaged if the power polarity is reversed.
- The maximum power supply voltage is +24V.
- The output is open-collector form, with the maximum current of 150mA.
- If the load is an inductive load such as relay, it is necessary to wire a diode parallel with the load. If the diode is in a wrong direction, the servo driver will be damaged.

4.6 Position pulse command input interface principle

1. Pulse command input interface

User can use both differential input connection and open-collector single input connection

Figure 4-8 Pulse command differential input

The maximum frequency is 500Kpps. In order to transmit pulse quantity correctly, differential driving mode is recommended.

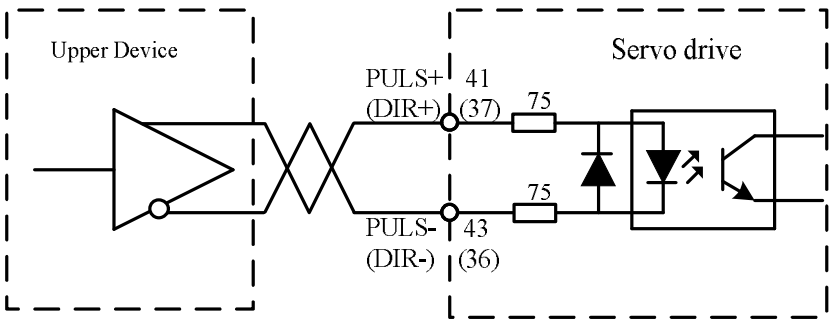


Figure 4-9 Pulse command input with internal power

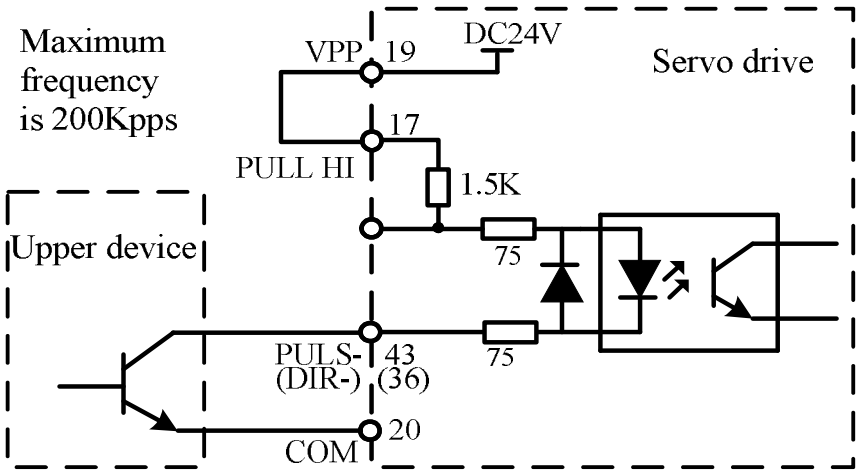
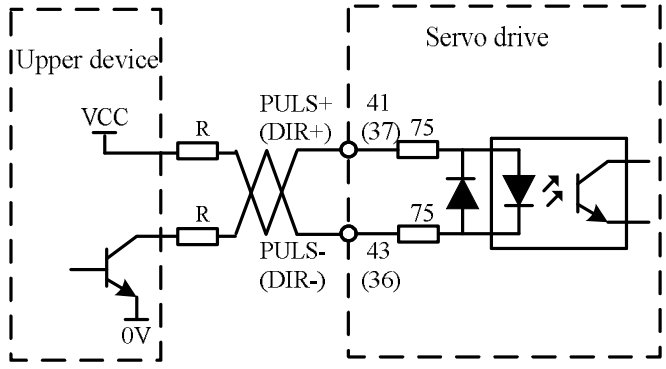


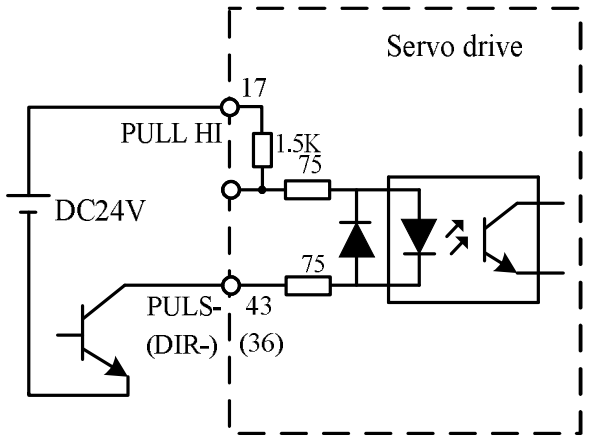
Figure 4-10 Pulse command input with external power

Circumscribed resistance R should be adjusted by VCC makes the driving current to meet 6~10mA.The maximum input pulse frequency is 200Kpps.

VCC	R
24V	1K Ω
12V	680 Ω
5V	100 Ω



Adjustment using internal resistance , the internal resistance 1.5KΩ. The maximum input pulse frequency is 200Kpps.



- Because the driver provides internal power supply, external power supply is not necessary.
- In order to improve the anti-interference ability, differential connection is recommended.
- Single-terminal mode will reduce the reception range of command pulse frequency.

2. Position pulse command types

These types command pulse can be received, which is selected by Pn-014,as follows.Pn-015 is used to change counting direction,and Pn-047 adjusts the counting edge of PULS and DIR signal.

Table 4-4 Position pulse input types(Note: Pn-015=0，Pn-047=0)

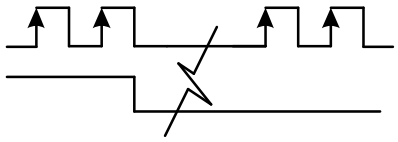
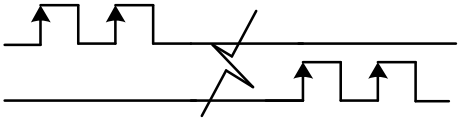
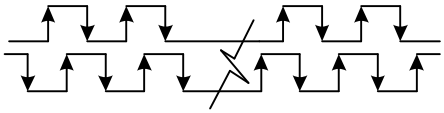
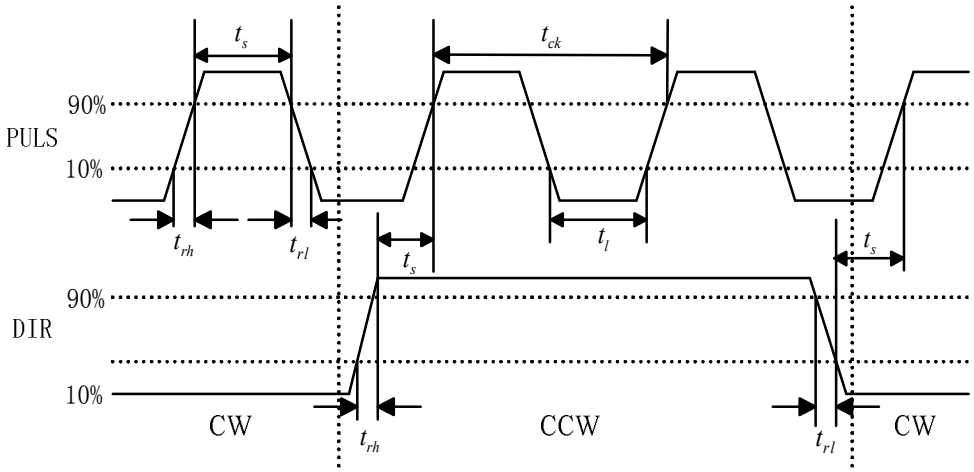
Pulse types	Run in CCW direction (Anti-clockwise)	Run in CW direction (Clockwise)
Pn-014=0, Pulse + direction		
Pn-014=1, CCW /CW pulse		
Pn-014=2, Two phase quadrature pulse		

Table 4-5 Pulse input timing parameters

Parameters	**Differential driving input**	**Single terminal driving input**
t_{ck}	>2 μ S	>5 μ S
t_h	>1 μ S	>2.5 μ S
t_l	>1 μ S	>2.5 μ S
t_{rh}	<0.2 μ S	<0.3 μ S
t_{rl}	<0.2 μ S	<0.3 μ S
t_s	>1 μ S	>2.5 μ S
t_{qck}	>8 μ S	>10 μ S
t_{qh}	>4 μ S	>5 μ S
t_{ql}	>4 μ S	>5 μ S
t_{qrh}	>0.2 μ S	<0.3 μ S
t_{qrl}	>0.2 μ S	<0.3 μ S
t_{qs}	>1 μ S	>2.5 μ S

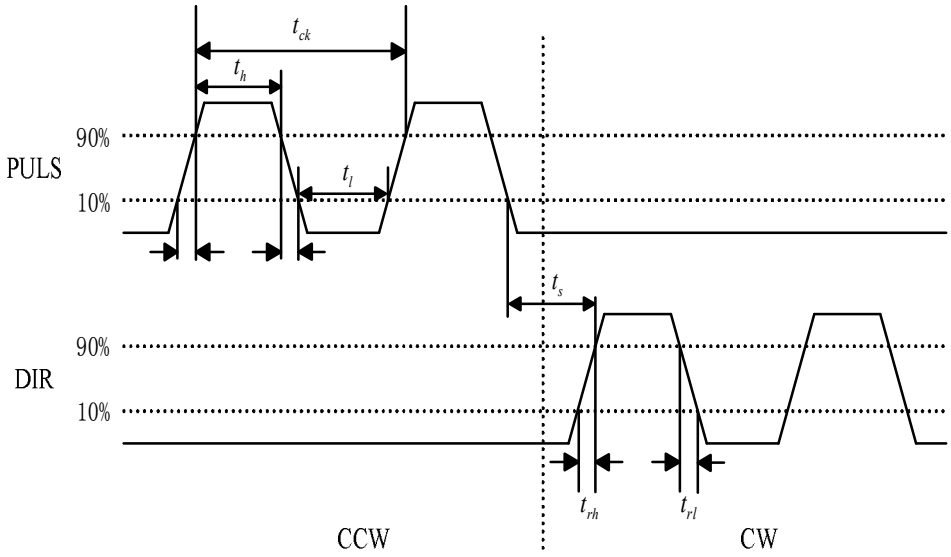
(1) Pulse + direction input timing diagram (The maximum frequency is 500KHZ)

Figure 4-11 Pulse + direction input timing diagram



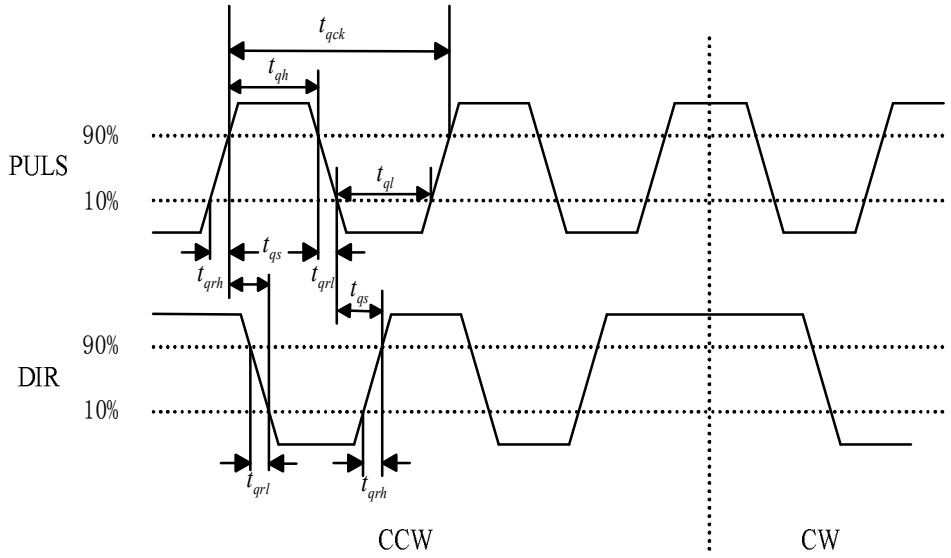
(2) CCW pulse/CW pulse input timing diagram (The maximum frequency is 500KHZ).

Figure 4-12 CCW/CW pulse input timing diagram



(3) Two phase quadrature pulse input timing diagram (The maximum frequency is 300KHZ).

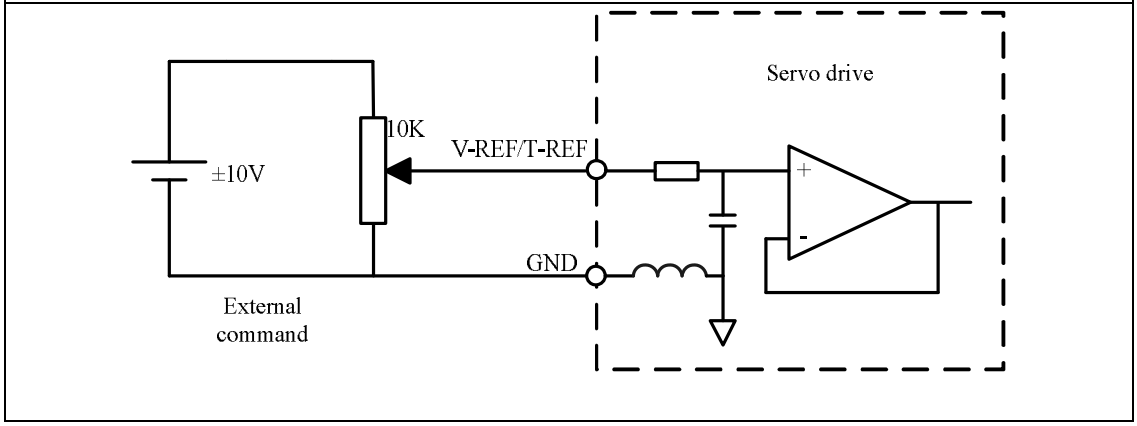
Figure 4-13 Two phase quadrature pulse input timing diagram



4.7 Analog input/output interface principle

4.7.1 Analog command input interface principle

Figure 4-14 Analog input interface

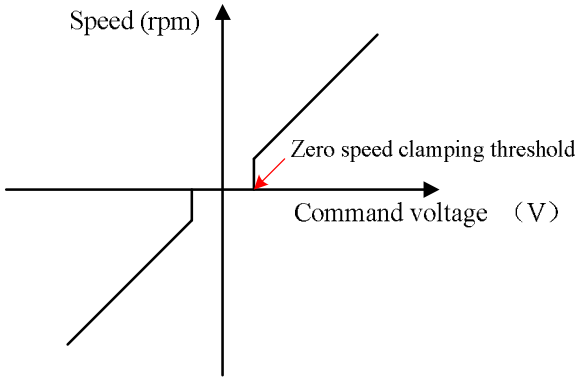


- Analog input voltage range is -10V~+10V，and the driver may be damaged if the voltage value is in excess of this range.
- The analog interface is not isolated. The analog ground line and the negative terminal of the analog input are connected in the driver side.
- Zero offset exists in the analog input. In the analog speed/torque control mode, even if the analog command voltage is 0V, sometimes motor still rotates at tiny speed, because of common ground voltage difference. It can be compensated automatically or manually by parameter setting.

  1) Auto compensation:In analog speed mode, enter into menu of ‘AU-’. Choose the submenu of ‘AU-SPd’, and press ‘SET’ key, until ‘donE’ is displayed on nixie tube, compensation value will be write to parameter ‘Pn-043’.In analog torque mode, choose the submenu of ‘AU-trq’, and press ‘SET’ key, until ‘donE’ is displayed on nixie tube, compensation value will be write to parameter ‘Pn-045’.

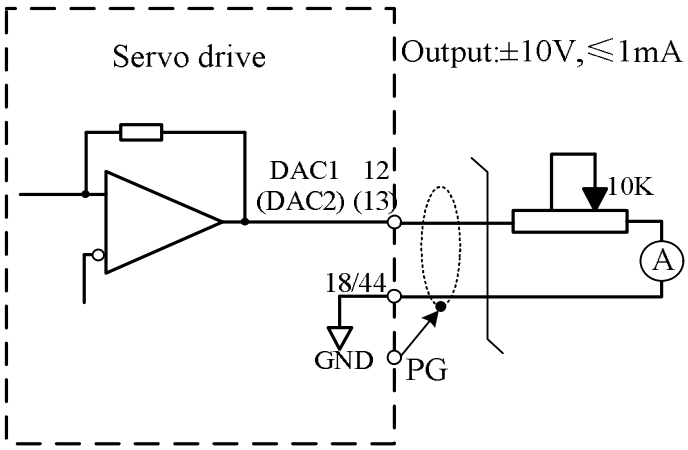
  2) Manual compensation: Enable the servo driver, the motor runs in the analog speed mode. The speed command offset can be observed by ‘dP-CS’, and then users can manually change the value of ‘Pn-043’ based on the observed offset. If the motor runs in the analog torque mode， the torque command offset can be observed by ‘dP-Ct’, and then users can manually change the value of ‘Pn-045’ based on the observed offset.

  3) When the analog input voltage is 0V, parameter Pn-044 can be used to make motor stop stably in analog speed mode. If the analog input voltage (absolute value) is smaller than the setting value, the motor will be locked. In analog torque mode, the parameter Pn-046 is used. Method of operation refers to analog speed mode.



4.7.2 Analog output interface principle

Figure 4-15 Analog output interface



Related parameters setting refer to chapter 7.

4.8 Encoder signal input/output interface principle

4.8.1 Encoder signal output interface principle

Position output signals EXTA+/EXTA-,EXTB+/EXTB-,EXTZ+/EXTZ- use differential output way. The wiring diagram is shown below.

Figure 4-16 Position feedback pulse photocoupler connection

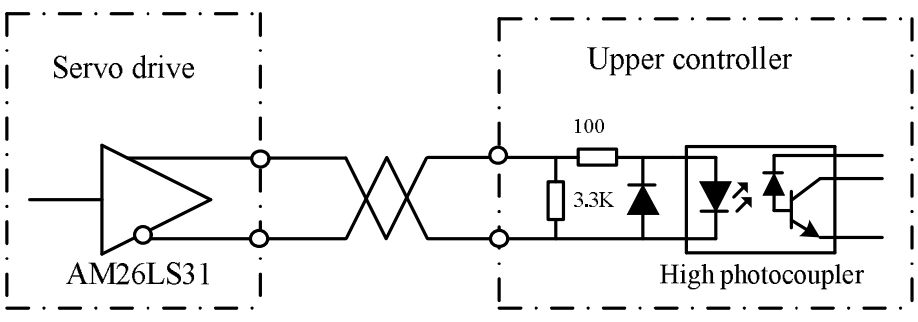
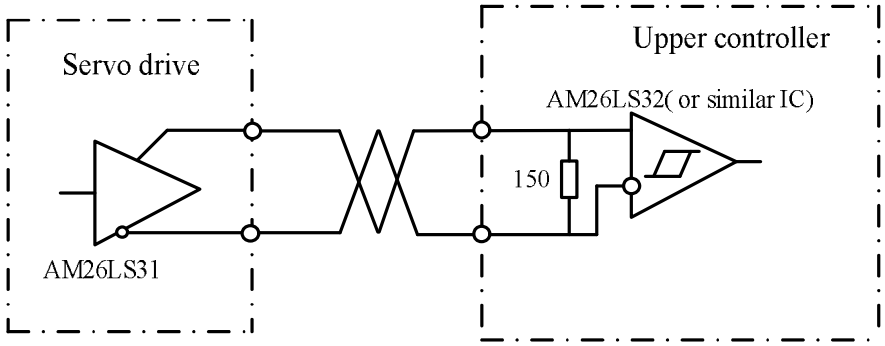
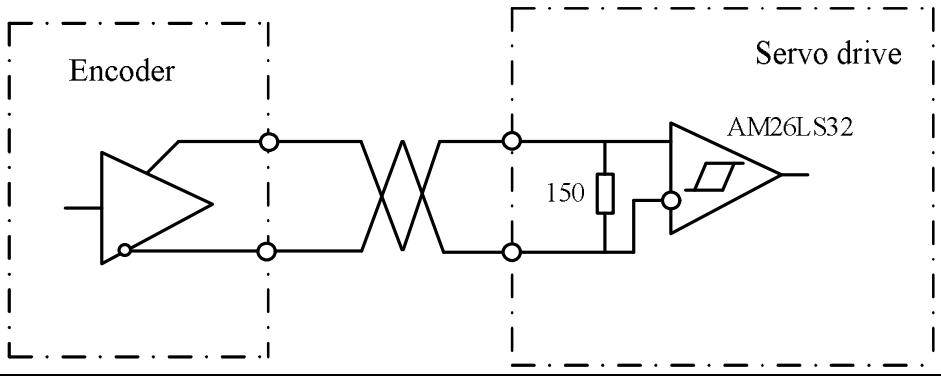


Figure 4-17 Position feedback pulse differential connection



4.8.2 Encoder signal input interface principle

Figure 4-18 Encoder signal input interface

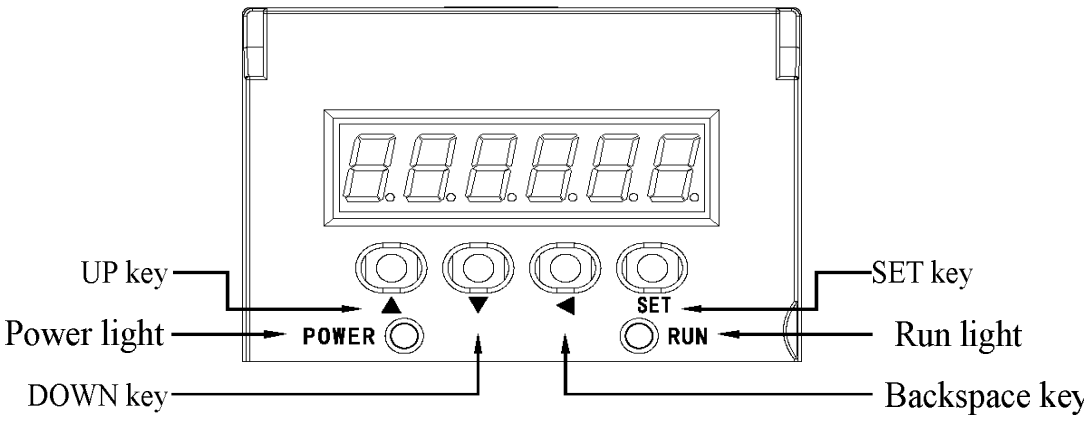


Chapter 5 Panel operation

5.1 Overview

The drive panel is made up of 6 bits 8-segment LED nixie tubes, 4 keys and 2 indicator lights. They are used for displaying various status of the driver and setting parameters.

Figure 5-1 Operation panel



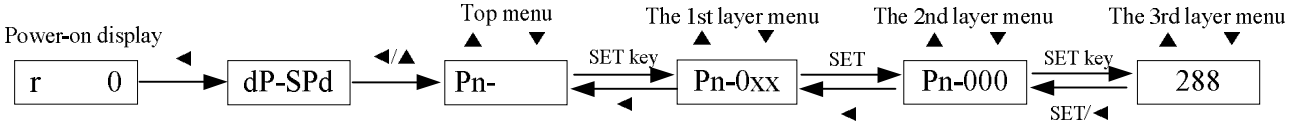
The specific function of each part is illustrated as follows:

Name	Functions
Display	The 6 bits 8-segment digital tubes are used for displaying monitoring value, setting value, parameter value and alarm information.
▲ key	Change menu, parameter number or increase the parameter values.
▼ key	Change menu, parameter number or decreases the parameter values.
◄ key	Return to upper layer menu, or cancel operation.
SET key	Enter the next layer menu,shift, or input confirmed.
POWER	The indicator light up means the drive is powered up.
RUN	The indicator light up means the drive is enabled.

5.2 Menu structure

The driver's operation adopts multilayer menu structure. Operation flow shown in Figure 5-2.

Figure 5-2 Menu operation diagram

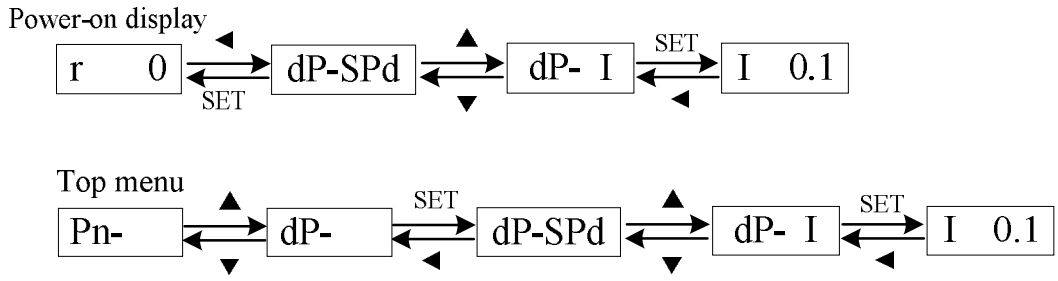


Explanation: In the third layer's menu, users can return to the second layer's menu by pressing '◄' key or 'SET' key. The difference: Press the 'SET' key to confirm the change of parameter's value, while the '◄' key cancel the change.

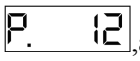
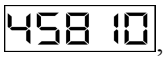
5.2.1 Monitoring menu

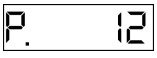
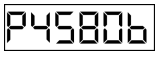
After power-on, the driver enters into monitoring mode automatically, and nixie tube displays the monitoring item which was set in advance (the power-on monitoring item was set by parameter Pn-003). In this menu there are 26 monitoring items for users' choosing by '▲' key or '▼' key, and when press 'SET' key once the driver will display specific monitoring value.

Figure 5-3 Operation chart of monitoring mode



Instructions to some items in the 'd–' menu group:

1.Current position feedback by motor encoder is composed of 'dP-PoS.' and 'dP-PoS' . For example, The value of dP-PoS. is  ,and value of dP-PoS is  , the current position pulse is calculated as following:

 × 100000 +  = 1245806 (pluse)

Position command and position deviation similar.

2. Position command pulse 'dP-Cpo' is the value of input pulse magnified by electronic gear ratio.

3. Current control mode 'dP-Cnt' displays: 0-Positional control mode; 1-Speed control mode; 2-Sr trial run mode; 3-JOG trial run mode; 5-Analog speed control mode; 6-Torque control mode; 7-Open-loop operation mode.

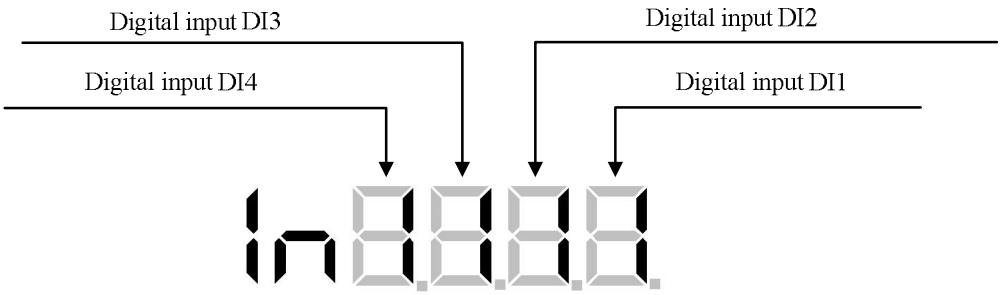
4. If display numbers go up to 6 digits (e.g. -12345), it will not display prompting character.

5. Position command pulse frequency 'dP-Frq' is the actual pulse frequency before electronic gear magnifying. The minimum value is 0.1 kHz. Positive rotation displays positive number, and reverse rotation displays negative number.

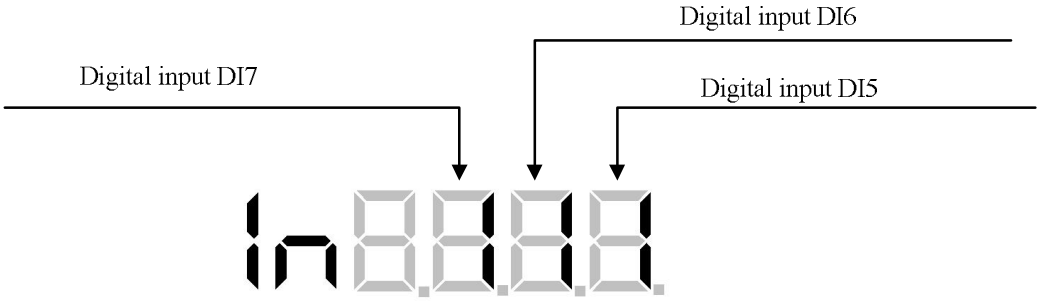
6. Alarm code displays 'dP-Err'. For the specific meaning of alarm codes, please read chapter 8.

7. Digital input port (DIn) high status 'dP-InH' and low status 'dP-InL' display as follows. Input port (DIn) functions can be customized. (1-Invalid; 0-Valid.)

Digital tube definition of ‘dP-InL’:

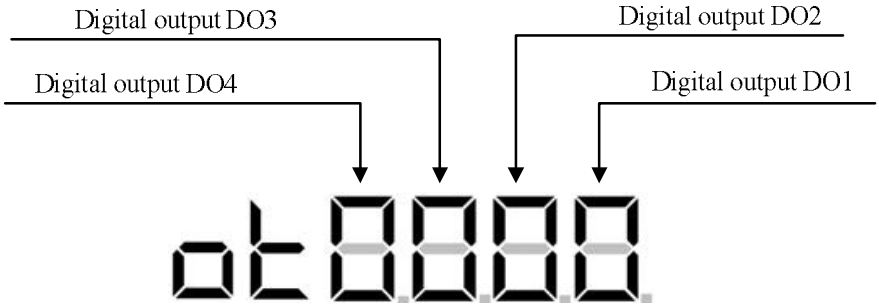


Digital tube definition of ‘dP-InH’:



8. Digital output port (DOn) status as shown below. Output port (DOn) functions can be customized. (1-Invalid; 0-Valid.)

Digital tube definition of ‘dP-oUt’:



9. Display of the encoder UVW status ‘dP-Cod’: Each signal corresponding to a digital tube display, the digital tube is 0 means the terminal is OFF (digital signal 0), while the digital tube is 1 means the terminal is ON (digital signal 1). The detailed correspondence is shown as following table:

Display item	Digital tube display	Meaning
dP-Cod Encoder UVW signal	Cd8880	Encoder U phase
	Cd8808	Encoder V phase
	Cd8088	Encoder W phase

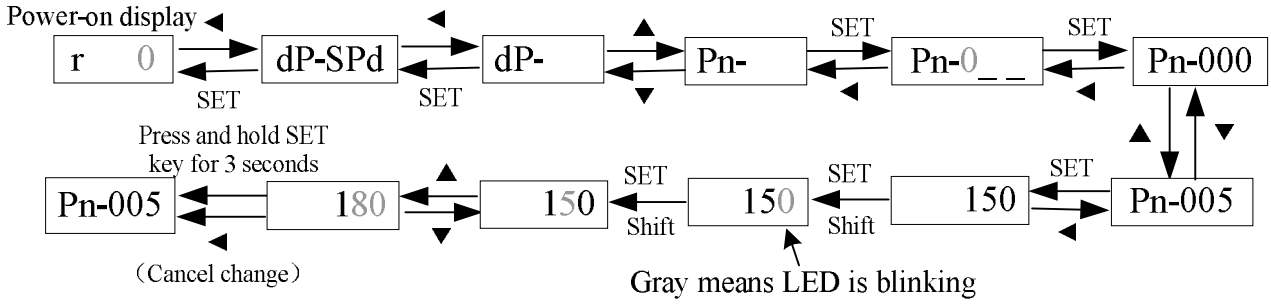
5.2.2 Parameter setting mode

Select ‘Pn-’ in main menu, and press ‘SET’ key to enter parameter setting mode. ‘▲/▼’ key are used to increase/decrease the value of the parameter. Press and hold the ‘SET’ key for 3 seconds to confirm the change of

parameter's value, while the '◄' key cancel the change.

e.g.:Set the value of Pn-005 to 180,as follows.

Figure 5-4 Block diagram of parameter setting



Note: 'Pn-0_ _' segment parameters are password-protected. User password is 288. Correct password can access the segment parameters.

5.2.3 Special function menu

This menu includes save parameters, recover defaults,Sr control,JOG control, analog zero drift compensation and historical alarm.Refer to chapter 7.2.

Chapter 6 Communication

6.1 ModBus overview

Servo driver provides RS485, RS232 and CAN three kinds of communication interface. Adopt of international standard Modbus communication protocol. Through the RS485 interface can simultaneously achieve asynchronous serial half-duplex communication with 32 servo drivers.

The following functions can be realized：

- Read/Write servo driver's parameters.
- Monitor the work status of the servo driver.
- Control the running of the servo driver.

6.2 ModBus protocol

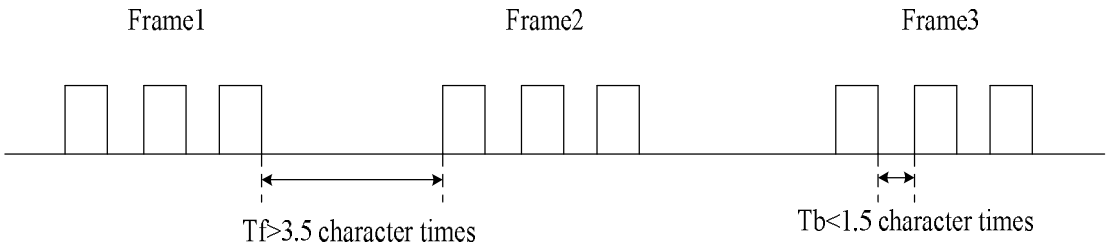
1. Communication mode

Two different serial transmission modes are defined：The ASCII mode and the RTU mode。Through the parameter Pn-102 set the transmission mode and the format for each byte, the parameter's description is specified in next chapters.

(1) The RTU transmission mode:

In RTU mode, message frames are separated by a silent interval of at least 3.5 character times. If a silent interval of more than 1.5 character times occurs between two characters, the message frame is declared incomplete and should be discarded by the receiver. Frame format is shown below.

Figure 6-1 Frame format of RTU mode



MODBUS message

Start	Address	Function	Data	CRC	End
⩾3.5 chars	1 char	1 char	N chars	2 chars	⩾3.5 chars

(2) The ASCII transmission mode:

In ASCII mode, a message is delimited by specific characters as Start-of-frames and End-of-frames. A typical message frame is shown below.

Figure 6-2 Frame format of ASCII mode

Start	Address	Function	Data	LRC	End
1 char :	2 chars	2 chars	2×N chars	2 chars	2 chars CR,LF

Each data byte needs two characters for encoding. For example, the data byte 0x12 (ASCII 0x31 and 0x32).

Table 6-1 ASCII coded table

Character	'0'	'1'	'2'	'3'	'4'	'5'	'6'	'7'
ASCII coded	0x30	0x31	0x32	0x33	0x34	0x35	0x36	0x37
Character	'8'	'9'	'A'	'B'	'C'	'D'	'E'	'F'
ASCII coded	0x38	0x39	0x41	0x42	0x43	0x44	0x45	0x46
Character	':'	'CR'	'LF'					
ASCII coded	0x3A	0x0D	0x0A					

2. Protocol description

Read function code: 0x03.

Write function codes: 0x06 and 0x10.

(1) Read data frame description (0x03).

	RTU	ASCII
START	≥3.5 character times.	Start,'Colon' (:), ASCII 0x3A.
ADDR	Slave address (parameter Pn-100),1 char.	Slave address (parameter Pn-100),2 chars.
CMD	Function code, 0x03.	Function code, 0x30 and 0x33..
DATA1	Read parameters start address,1 word. The high-order byte is appended first, followed by the low-order byte.	Read parameters start address, 4 chars.
DATA2	The number of reading data words (N≤16), 1 word. The high–order byte is appended first, followed by the low–order byte.	The number of reading data words (≤16), 4 chars.
CRC/LRC	CRC Checking, 1 word. The low–order byte is appended first, followed by the high–order byte.	LRC Checking ,2 chars.
END	≥3.5 character times.	End,'Carriage return - line feed' (CR LF), ASCII 0x0D and 0x0A.

Response: The correct communication process returns the following frame. Slave returns error messages if the communication abnormality.(Description in next chapters.)

	RTU	ASCII
START	≥3.5 character times.	Start,'Colon' (:), ASCII 0x3A.
ADDR	Slave address (parameter Pn-100),1 char.	Slave address (parameter Pn-100),2 chars.
CMD	Function code, 0x03.	Function code, 0x30 and 0x33.
DATA LENGTH	The number of returned data bytes, 2 times of N,1 char.	The number of returned data bytes, 2 chars.
DATA	The returned parameter values.	The returned parameter values.
CRC/LRC	CRC Checking, 1 word. The low–order byte is appended first, followed by the high–order byte.	LRC Checking ,2 chars.
END	≥3.5 character times.	End,'Carriage return - line feed' (CR LF), ASCII 0x0D and 0x0A.

(2) Write data frame description (0x06).

	RTU	ASCII
START	≥3.5 character times.	Start,'Colon' (:), ASCII 0x3A.
ADDR	Slave address (parameter Pn-100),1 char.	Slave address (parameter Pn-100),2 chars.
CMD	Function code, 0x06.	Function code, 0x30 and 0x36.
DATA1	Write parameters start address, 1 word. The high-order byte is appended first, followed by the low-order byte.	Write parameters start address, 4 chars.
DATA2	Parameter values (≤16 words).	Parameter values.
CRC/LRC	CRC Checking, 1 word. The low–order byte is appended first, followed by the high–order byte.	LRC Checking ,2 chars.
END	≥3.5 character times.	End,'Carriage return - line feed' (CR LF), ASCII 0x0D and 0x0A.

Response: The correct communication process returns the same frame as received. Slave returns error messages if the communication abnormality. (Description in next chapters.)

(3) Write data frame description (0x10).

	RTU	ASCII
START	≥3.5 character times.	Start,'Colon' (:), ASCII 0x3A.
ADDR	Slave address (parameter Pn-100),1 char.	Slave address (parameter Pn-100),2 chars.
CMD	Function code, 0x10.	Function code, 0x31 and 0x30.
DATA1	Write parameters start address,1 word. The high-order byte is appended first, followed by the low-order byte.	Write parameters start address, 4 chars.
DATA2	The number of writing data words (N≤16), 1 word. The high–order byte is appended first, followed by the low–order byte.	The number of writing data words , 4 chars.
DATA3	The number of writing data bytes (≤2*N), 1 char.	The number of writing data bytes , 2 chars.
DATAn	Parameter Values.	Parameter Values.
CRC/LRC	CRC Checking, 1 word. The low–order byte is appended first, followed by the high–order byte.	LRC Checking ,2 chars.
END	≥3.5 character times.	End,'Carriage return - line feed' (CR LF), ASCII

		0x0D and 0x0A.

Response: The correct communication process returns the frame as follows.

Correct response: Start + Address + Function code (0x10) + Write parameters start address + The number of writing data words + CRC/LRC + End

Slave returns error messages if the communication abnormality. (Description in next chapters.)

(4) Communication abnormality.

Response frame format:

	RTU	ASCII
START	≥3.5 character times.	Start,'Colon' (:), ASCII 0x3A.
ADDR	Slave address (parameter Pn-100),1 char.	Slave address (parameter Pn-100),2 chars.
CMD	Function code, 0x83 or 0x86 or 0x90.	Function code.
ERROR CODE	Error code,1 char.	Error code,2 chars.
CRC/LRC	CRC Checking, 1 word. The low–order byte is appended first, followed by the high–order byte.	LRC Checking ,2 chars.
END	≥3.5 character times.	End,'Carriage return - line feed' (CR LF), ASCII 0x0D and 0x0A.

Error code:

Error Code	Description
0x01	CRC/LRC error.
0x02	Parity error.
0x03	Function code is not valid or unknown.
0x04	Value range of parameter exceeded.
0x05	Unrecognized parameter address.
0x06	Slave busy.
0x07	Frame length error.
0x08	Read-only.
0x09	The number of writing data words greater than 16.
0x0A	The number of reading data words less than 1 or greater than 16.

(5)Special communication address

Address	Definitions	Write	Read
0x1000	Save parameter	1:Start. **Note:**Write other values return an error message.	1:Operatiing. 2:Success. 3:Failure.
0x1001	Recover defaults	1:Start. **Note:**Write other values return an error message.	1:Operatiing. 2:Success. 3:Failure.
0x1002	Sr trial run	Write the address,make servo drive switch to Sr control mode.And the motor speed is the value send by master.	Return the speed of Sr mode.

0x1003	JOG trial run	Write the address,make servo drive switch to JOG control mode. 0:Stop servo drive。 1:Make the servo drive run in CW。 2:Make the servo drive run in CCW。	0:Stop。 1:Run in CW。 2:Run in CCW。
0x1004	Analog speed zero drift compensation	1:Start. **Note:**Write other values return an error message.	1:Operatiing. 2:Success. 3:Failure.
0x1005	Analog torque zero drift compensation	1:Start. **Note:**Write other values return an error message.	1:Operatiing. 2:Success. 3:Failure.
0x1007	Historical alarm information	Read-only.	Returns historical alarm information.

(6)ModBus communication example.

① Read parameters

e.g.: Read the values of 'Pn-004' and 'Pn-005' of servo driver.(Pn-004=1,Pn-005=150.Communication address refer to chapter 7.)

The RTU mode:

Send message format: 0x01 0x03 0x00 0x04 0x00 0x02 0x85 0xCA

Correct response: 0x01 0x03 0x04 0x00 0x01 0x00 0x96 0x2B 0x9D

Error response: 0x01 0x83 0x01 0x80 0xF0(Error code 0x01:CRC error)

The ASCII mode:

Send message format: 0x3A 0x30 0x31 0x30 0x33 0x30 0x30 0x30 0x34 0x30 0x30 0x30 0x32 0x46 0x36 0x0D 0x0A

Correct response: 0x3A 0x30 0x31 0x30 0x33 0x30 0x34 0x30 0x30 0x30 0x31 0x30 0x30 0x39 0x36 0x36 0x31 0x0D 0x0A

Error response: 0x3A 0x30 0x31 0x38 0x33 0x30 0x31 0x37 0x42 0x0D 0x0A (Error code "0x30 0x31"->0x01: LRC error)

② Write parameters

e.g.: Modify the value of 'Pn-200' to 100. (Communication address refer to chapter 7)

The RTU mode (Function code 0x06):

Send message format: 0x01 0x06 0x02 0x00 0x00 0x64 0x89 0x99

Correct response: 0x01 0x06 0x02 0x00 0x00 0x64 0x89 0x99

Error response: 0x01 0x86 0x02 0xC3 0xA1 (Error code 0x02： Parity error)

The RTU mode (Function code 0x10):

Send message format: 0x01 0x10 0x02 0x00 0x00 0x01 0x02 0x00 0x64 0x84 0x7B

Correct response: 0x01 0x10 0x02 0x00 0x00 0x01 0x00 0x71

Error response: 0x01 0x90 0x02 0xCD 0xC1 (Error code 0x02: Parity error)

The ASCII mode:

Send message format: 0x3A 0x30 0x31 0x30 0x36 0x30 0x32 0x30 0x30 0x30 0x30 0x36 0x34 0x39 0x33 0x0D 0x0A

Correct response: 0x3A 0x30 0x31 0x30 0x36 0x30 0x32 0x30 0x30 0x30 0x30 0x36 0x34 0x39 0x33 0x0D 0x0A

Error response: 0x3A 0x30 0x31 0x38 0x36 0x30 0x32 0x37 0x37 0x0D 0x0A (“0x30 0x32”->0x02: Parity error)

Note: The slave address of above instance is 1. (Pn-100=1)

3. Checking

(1) CRC checking

The RTU mode includes an error–checking field that is based on a Cyclical Redundancy Checking (CRC) method performed on the message contents. The CRC field checks the contents of the entire message. It is applied regardless of any parity checking method used for the individual characters of the message. The CRC field contains a 16–bit value implemented as two 8–bit bytes. When this is done, the low–order byte of the field is appended first, followed by the high–order byte.

CRC generation function (Generating polynomial $= x^{16} + x^{15} + x^2 + 1$ **):**

```
unsigned char* ParaDate;
unsigned char DataLen;
unsigned int CRCdat(unsigned char* ParaDate, unsigned char DataLen)
{
    int i;
    unsigned int CRC_reg=0xffff;
    while(DataLen--)
    {
        CRC_reg ^= *ParaDate++;
        for(i=0;i<8;i++)
        {
            if(CRC_reg & 0x01)    CRC_reg=( CRC_reg>>1)^0xa001;
```

```
                else    CRC_reg= CRC_reg>>1;
            }
        }
        return CRC_reg;
}
```

(2) LRC checking

In ASCII mode, messages include an error–checking field that is based on a Longitudinal Redundancy Checking (LRC) calculation that is performed on the message contents, exclusive of the beginning ‘colon’ and terminating CR LF pair characters. It is applied regardless of any parity checking method used for the individual characters of the message. The LRC is calculated by adding together successive 8–bit bytes of the message, discarding any carries, and then two’s complementing the result. In ASCII mode, the resulting LRC is ASCII encoded into two bytes and placed at the end of ASCII mode frame prior to the CR LF.

Chapter 7 Parameters

7.1 Parameter summary

The defaults in the following table apply to 130EMA-060B motor (Pn-001=42). Different model of motors have different parameter values. If there are any differences, please take the display value of servo driver as the standard.'Pn-0_ _' segment parameters are password-protected. User password is "Pn-000=288". Correct password can access the segment parameters.

Symbols of parameters table are described below:

"☆" :Indicates the parameter value can be changed while the servo drive is running or stopping.

"★" :Changes the value of the parameter need to save to non-volatile memory,and re-power.

"●" :Read-only parameter, cannot be changed.

"*" :Factory parameter, prohibit users to operate

"▲" : Special function parameter.

Parameter	Communication address	Name	Range	Unit	Default	Property
Special Function Parameter Group						
EE-SEt	0x1000	Save parameters	—	—	—	▲
EE-dEF	0x1001	Recover defaults	—	—	—	▲
Sr-	0x1002	Sr trail run	—	—	—	▲
Jr-	0x1003	JOG trail run	—	—	—	▲
AU-SPd	0x1004	Analog speed zero drift compensation	—	—	—	▲
AU-trq	0x1005	Analog torque zero drift compensation	—	—	—	▲
CO-rdy	0x1006	Factory parameter	—	—	—	*
Fn-Err	0x1007	Historical alarms	—	—	—	●
Monitoring Group						
dP-SPd	0x2000	Motor speed	—	rpm	—	●
dP -PoS	0x2001	Current position low 5 bits	—	pulse	—	●
dP-PoS.	0x2002	Current position high 5 bits	—	$\times 10^5$ pulse	—	●
dP-CPo	0x2003	Position commamd low 5 bits	—	pulse	—	●
dP-Cpo.	0x2004	Position commamd high 5 bits	—	$\times 10^5$ pulse	—	●

Parameter	Communication address	Name	Range	Unit	Default	Property
dP -EPo	0x2005	Position deviation low 5 bits	—	pulse	—	●
dP-Epo.	0x2006	Position deviation high 5 bits	—	$\times 10^5$ pulse	—	●
dP-trq	0x2007	Motor torque	—	%	—	●
dP- I	0x2008	Motor current	—	A	—	●
dP-InH	0x2009	Digital input status of DI5~DI7	—	—	—	●
dP-InL	0x200A	Digital input status of DI1~DI4	—	—	—	●
dP-oUt	0x200B	Digital input status of DO1~DO4	—	—	—	●
dP-Cnt	0x200C	Contor mode	—	—	—	●
dP-Frq	0x200D	Position command pulse Frequency	—	KHz	—	●
dP-CS	0x200E	Speed command	—	rpm	—	●
dP-Ct	0x200F	Torque command	—	%	—	●
dP-APo	0x2010	Encoder position	—	pulse	—	●
dP-Cod	0x2011	Encoder UVW signals	—	—	—	●
dP-Id	0x2012	FPGA software version	—	—	—	●
dP-Err	0x2013	Alarm code	—	—	—	●
dP-CCr	0x2014	Reserved	—	—	—	●
dP-Cr	0x2015	Reserved	—	—	—	●
dP-rES	0x2016	Reserved	—	—	—	●
dP-ALE	0x2017	Absolute encoder inner alarms	—	—	—	●
dP-Abr	0x2018	Absolute encoder laps Information	—	r	—	●
dP-tn	0x2019	Reserved	—	—	—	●
dP-UdC	0x201A	Reserved	—	—	—	●
Parameters of group 0						
Pn-000	0x0000	Password	0~9999	—	288	☆
Pn-001	0x0001	Motor model	0~103	—	42	★
Pn-002	0x0002	Software version	—	—	—	●
Pn-003	0x0003	Power-on display setting	0~26	—	0	★
Pn-004	0x0004	Control mode	0~10	—	0	☆

Parameter	Communication address	Name	Range	Unit	Default	Property
Pn-005	0x0005	Speed proportional gain	5～1000	Hz	150	☆
Pn-006	0x0006	Speed integral constant	1～1000	ms	30	☆
Pn-007	0x0007	Torque command filter	0～500	—	100	☆
Pn-008	0x0008	Speed feedback filter	1～500	—	100	☆
Pn-009	0x0009	Position proportional gain	1～2000	1/S	40	☆
Pn-010	0x000A	Position loop feed forward gain	0～100	%	0	☆
Pn-011	0x000B	Position feed forward filter coefficient	1～1200	Hz	300	☆
Pn-012	0x000C	Electronic gear ratio numerator 1	1～65535	pulse	1	☆
Pn-013	0x000D	Electronic gear ratio denominator	1～65535	pulse	1	☆
Pn-014	0x000E	Position command input types	0～2	—	0	★
Pn-015	0x000F	Inverse the counting direction of position command	0～1	—	0	☆
Pn-016	0x0010	Reserved	—	—	—	—
Pn-017	0x0011	Reserved	—	—	—	—
Pn-018	0x0012	Reserved	—	—	—	—
Pn-019	0x0013	Position command smooth filter	0~20000	0.1ms	0	☆
Pn-020	0x0014	Drive forbid control	0~2	—	1	☆
Pn-021	0x0015	Reserved	—	—	—	—
Pn-022	0x0016	JOG run speed	0~6000	rpm	100	☆
Pn-023	0x0017	Maximum speed limit	0~6000	rpm	2500	☆
Pn-024	0x0018	Speed command setting	0~2	—	1	☆
Pn-025	0x0019	Position command setting	0~1	—	0	☆
Pn-026	0x001A	Torque command setting	0~2	—	0	☆
Pn-027	0x001B	Torque limit mode	0~2	—	0	☆
Pn-028	0x001C	Speed limit mode	0~2	—	0	☆
Pn-029	0x001D	Speed command filter	1~100	ms	100	☆
Pn-030	0x001E	Reserved	—	—	—	—
Pn-031	0x001F	Analog speed command filter coefficient	1~100	—	100	☆

Parameter	Communication address	Name	Range	Unit	Default	Property
Pn-032	0x0020	Analog torque command filter coefficient	1~100	—	100	☆
Pn-033	0x0021	Processing method of overspeed in torque mode	0~1	—	0	☆
Pn-034	0x0022	Internal CCW torque limit	0~300	%	200	☆
Pn-035	0x0023	Internal CW torque limit	-300~0	%	-200	☆
Pn-036	0x0024	External CCW torque limit	0~300	%	100	☆
Pn-037	0x0025	External CW torque limit	-300~0	%	-100	☆
Pn-038	0x0026	Torque limit for speed trial run and JOG trial run	0~300	%	100	☆
Pn-039	0x0027	Factory parameter	—	—	—	—
Pn-040	0x0028	Factory parameter	—	—	—	—
Pn-041	0x0029	Analog torque command gain	0~1000	—	100	☆
Pn-042	0x002A	Speed command direction of speed mode	0~1	—	0	☆
Pn-043	0x002B	Analog speed zero drift compensation value	-5.000~5.000	V	0.000	★
Pn-044	0x002C	Analog speed zero speed hysteresis threshold	-5.000~5.000	V	0.050	☆
Pn-045	0x002D	Analog torque zero drift compensation value	-5.000~5.000	V	0.000	★
Pn-046	0x002E	Analog torque zero speed hysteresis threshold	-5.000~5.000	V	0.050	☆
Pn-047	0x002F	Input pulse phase control	0~3	—	0	★
Pn-048	0x0030	Factory parameter	0~3000	ms	0	☆
Pn-049	0x0031	Factory parameter	0~3000	rpm	0	☆
Pn-050	0x0032	Encoder type	0~3	—	0	★
Pn-051	0x0033	Analog speed command gain	0~1000	—	100	☆
Pn-052	0x0034	Speed acceleration time	0~30000	100us	10	☆
Pn-053	0x0035	Speed deceleration time	0~30000	100us	10	☆
Pn-054	0x0036	Factory parameter	—	—	—	—
Pn-055	0x0037	Factory parameter	—	—	—	—
Pn-056	0x0038	Factory parameter	—	—	—	—
Pn-057	0x0039	Force enable	1~3	—	3	☆
Parameters of group 1						

Parameter	Communication address	Name	Range	Unit	Default	Property
Pn-100	0x0100	Node ID	0~32	—	1	★
Pn-101	0x0101	Baud rate	0~6	bps	1	★
Pn-102	0x0102	Transmission mode	0~8	—	6	★
Pn-103	0x0103	Reserved	—	—	—	—
Pn-104	0x0104	Communication protocol	0~2	—	0	★
Pn-105	0x0105	Reserved	—	—	—	—
Pn-106	0x0106	Input IO signal control	0~127	—	0	☆
Pn-107	0x0107	Communication response delay time	0~32767	50us	0	☆
Pn-108	0x0108	Reserved	—	—	—	—
Pn-109	0x0109	DI signal status software control	0~127	—	127	☆
Pn-110 ~ **Pn-127**	0x010A ~ 0x011B	Reserved	—	—	—	—
Parameters of group 2						
Pn-200	0x0200	Internal speed 1	-5000~5000	rpm	10	☆
Pn-201	0x0201	Internal speed 2	-5000~5000	rpm	50	☆
Pn-202	0x0202	Internal speed 3	-5000~5000	rpm	100	☆
Pn-203	0x0203	Internal speed 4	-5000~5000	rpm	500	☆
Pn-204	0x0204	Internal speed 5	-5000~5000	rpm	0	☆
Pn-205	0x0205	Internal speed 6	-5000~5000	rpm	0	☆
Pn-206	0x0206	Internal speed 7	-5000~5000	rpm	0	☆
Pn-207	0x0207	Internal speed 8	-5000~5000	rpm	0	☆
Pn-208	0x0208	Laps of the 1st inner position command	-32768~32767	pulse	10	☆
Pn-209	0x0209	Pulses of the 1st inner position command	-32768~32767	pulse	0	☆
Pn-210	0x020A	Speed of the 1st inner position command	0~5000	rpm	100	☆
Pn-211	0x020B	Acc/Dec time of the 1st inner position command	0~30000	ms	100	☆
Pn-212	0x020C	Pause time of the 1st inner position command	0~30000	6ms	100	☆

Parameter	Communication address	Name	Range	Unit	Default	Property
Pn-213	0x020D	Laps of the 2nd inner position command	-32768~32767	pulse	50	☆
Pn-214	0x020E	Pulses of the 2nd inner position command	-32768~32767	pulse	0	☆
Pn-215	0x020F	Speed of the 2nd inner position command	0~5000	rpm	100	☆
Pn-216	0x0210	Acc/Dec time of the 2nd inner position command	0~30000	ms	100	☆
Pn-217	0x0211	Pause time of the 2nd inner position command	0~30000	6ms	100	☆
Pn-218	0x0212	Laps of the 3rd inner position command	-32768~32767	pulse	100	☆
Pn-219	0x0213	Pulses of the 3rd inner position command	-32768~32767	pulse	0	☆
Pn-220	0x0214	Speed of the 3rd inner position command	0~5000	rpm	500	☆
Pn-221	0x0215	Acc/Dec time of the 3rd inner position command	0~30000	ms	100	☆
Pn-222	0x0216	Pause time of the 3rd inner position command	0~30000	6ms	100	☆
Pn-223	0x0217	Laps of the 4th inner position command	-32768~32767	pulse	55	☆
Pn-224	0x0218	Pulses of the 4th inner position command	-32768~32767	pulse	0	☆
Pn-225	0x0219	Speed of the 4th inner position command	0~5000	rpm	1000	☆
Pn-226	0x021A	Acc/Dec time of the 4th inner position command	0~30000	ms	100	☆
Pn-227	0x021B	Pause time of the 4th inner position command	0~30000	6ms	100	☆
Pn-228	0x021C	Laps of the 5th inner position command	-32768~32767	pulse	60	☆
Pn-229	0x021D	Pulses of the 5th inner position command	-32768~32767	pulse	0	☆
Pn-230	0x021E	Speed of the 5th inner position command	0~5000	rpm	1200	☆
Pn-231	0x021F	Acc/Dec time of the 5th inner position command	0~30000	ms	100	☆
Pn-232	0x0220	Pause time of the 5th inner position command	0~30000	6ms	100	☆
Pn-233	0x0221	Laps of the 6th inner position command	-32768~32767	pulse	0	☆
Pn-234	0x0222	Pulses of the 6th inner position command	-32768~32767	pulse	0	☆

Parameter	Communication address	Name	Range	Unit	Default	Property
Pn-235	0x0223	Speed of the 6th inner position command	0~5000	rpm	0	☆
Pn-236	0x0224	Acc/Dec time of the 6th inner position command	0~30000	ms	100	☆
Pn-237	0x0225	Pause time of the 6th inner position command	0~30000	6ms	100	☆
Pn-238	0x0226	Laps of the 7th inner position command	-32768~32767	pulse	0	☆
Pn-239	0x0227	Pulses of the 7th inner position command	-32768~32767	pulse	0	☆
Pn-240	0x0228	Speed of the 7th inner position command	0~5000	rpm	0	☆
Pn-241	0x0229	Acc/Dec time of the 7th inner position command	0~30000	ms	100	☆
Pn-242	0x022A	Pause time of the 7th inner position command	0~30000	6ms	100	☆
Pn-243	0x022B	Laps of the 8th inner position command	-32768~32767	pulse	0	☆
Pn-244	0x022C	Pulses of the 8th inner position command	-32768~32767	pulse	0	☆
Pn-245	0x022D	Speed of the 8th inner position command	0~5000	rpm	0	☆
Pn-246	0x022E	Acc/Dec time of the 8th inner position command	0~30000	ms	100	☆
Pn-247	0x022F	Pause time of the 8th inner position command	0~30000	ms	100	☆
Pn-248	0x0230	Internal position command mode	0~3	—	0	☆
Pn-249	0x0231	Running mode of inner position control	0~3	—	0	☆
Pn-250	0x0232	Pause mode of inner position control	0~1	—	1	☆
Pn-251	0x0233	Number of segments of inner position	1~8	—	1	☆
Pn-252	0x0234	Torque arrival signal filter time	0~6000	10ms	100	☆
Pn-253	0x0235	Undervoltage alarm filter time	0~32767	ms	400	☆
Pn-254	0x0236	Range of positioning completion	0~32767	pulse	100	☆
Pn-255	0x0237	Detection range of position deviation alarm	0~30000	pulse	400	☆
Pn-256	0x0238	Speed arrival signal threshold	-5000~5000	rpm	500	☆
Pn-257	0x0239	Detection range of overspeed	0~6000	rpm	0	☆

Parameter	Communication address	Name	Range	Unit	Default	Property
Pn-258	0x023A	Servo on delay time	0~32767	0.1s	0	☆
Pn-259	0x023B	Torque arrival signal threshold	0~300	%	100	☆
Pn-260	0x023C	Internal torque 1	-300.00~300.00	%	100.00	☆
Pn-261	0x023D	Internal torque 2	-300.00~300.00	%	100.00	☆
Pn-262	0x023E	Internal torque 3	-300.00~300.00	%	100.00	☆
Pn-263	0x023F	Internal torque 4	-300.00~300.00	%	100.00	☆
Pn-264	0x0240	Alarm clear restrictions	0~20	—	5	★
Pn-265	0x0241	Reserved	—	—	—	—
Pn-266	0x0242	Factory parameter	—	—	—	—
Pn-267	0x0243	Reserved	—	—	—	—
Pn-268	0x0244	Torque command direction	0~1	—	0	☆
Pn-269	0x0245	Torque acceleration/ deceleration time	0~16000	0.1ms	10	☆
Pn-270	0x0246	Reserved	—	—	—	—
Pn-271	0x0247	Speed limit of torque mode	0~3000	rpm	1000	☆
Pn-272	0x0248	In torque mode the permitted time for overspeed	0~10000	0.1ms	5000	☆
Pn-273	0x0249	Zero speed	0~3000	rpm	10	☆
Pn-274	0x024A	Zero speed hysteresis	0~1000	rpm	10	☆
Pn-275	0x024B	Zero speed clamp mode	0~2	—	0	☆
Pn-276	0x024C	Offset laps	-32768~32767	pulse	0	☆
Pn-277	0x024D	Offset pulses	-32768~32767	pulse	0	☆
Parameters of group 3						
Pn-300	0x0300	Digital input filter time	0~100	ms	0	☆
Pn-301	0x0301	Digital input DI1 function	0~27	—	1	☆
Pn-302	0x0302	Digital input DI2 function	0~27	—	2	☆
Pn-303	0x0303	Digital input DI3 function	0~27	—	3	☆
Pn-304	0x0304	Digital input DI4 function	0~27	—	4	☆
Pn-305	0x0305	Digital input DI5 function	0~27	—	5	☆
Pn-306	0x0306	Digital input DI6 function	0~27	—	6	☆
Pn-307	0x0307	Digital input DI7 function	0~27	—	7	☆

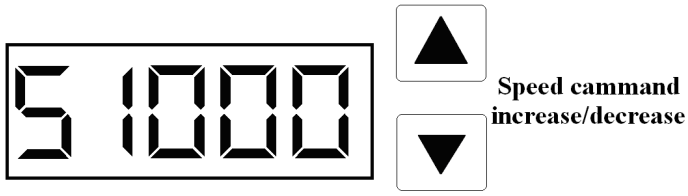
Parameter	Communication address	Name	Range	Unit	Default	Property
Pn-308	0x0308	Reserved	0~27	—	8	☆
Pn-309	0x0309	Digital output DO1 function	0~8	—	1	☆
Pn-310	0x030A	Digital output DO2 function	0~8	—	2	☆
Pn-311	0x030B	Digital output DO3 function	0~8	—	3	☆
Pn-312	0x030C	Digital output DO4 function	0~8	—	4	☆
Pn-313	0x030D	Reverse digital input DI1~DI4	0~15	—	0	☆
Pn-314	0x030E	Reverse digital input DI5~DI7	0~15	—	0	☆
Pn-315	0x030F	Reverse digital output DO1~DO4	0~15	—	0	☆
Pn-316	0x0310	Factory parameter	0~15	—	15	☆
Pn-317	0x0311	Reserved	—	—	—	—
Pn-318	0x0312	Zero speed detection point of electromagnetic brake	0~5000	rpm	15	☆
Pn-319	0x0313	Electromagnetic brake delay time when the motor is stationary	0~30000	ms	0	☆
Pn-320	0x0314	Electromagnetic brake delay time when the motor is running	0~30000	ms	500	☆
Pn-321	0x0315	Electromagnetic brake operation speed when the motor is running	0~5000	rpm	100	☆
Pn-322	0x0316	Position feedback pulse division numerator	1~32767	pulse	1	☆
Pn-323	0x0317	Position feedback pulse division denominator	1~32767	pulse	1	☆
Pn-324	0x0318	The width of Z pulse	0~127	50us	0	★
Pn-325	0x0319	Reverse position feedback pulse	0~1	—	0	☆
Pn-326	0x031A	The 2nd electronic gear ratio numerator	1~32767	pulse	1	☆
Pn-327	0x031B	The 3rd electronic gear ratio numerator	1~32767	pulse	1	☆
Pn-328	0x031C	The 4th electronic gear ratio numerator	1~32767	pulse	1	☆
Pn-329	0x031D	Reserved	—	—	—	—
Pn-330	0x031E	Reserved	—	—	—	—
Pn-331	0x031F	Reserved	—	—	—	—
Pn-332	0x0320	Homing startup mode	0~2	—	0	★

Parameter	Communication address	Name	Range	Unit	Default	Property
Pn-333	0x0321	The homing reference point	0~3	—	0	☆
Pn-334	0x0322	Running mode after find the homing reference point	0~1	—	0	☆
Pn-335	0x0323	Offset laps of homing	-3000~3000	pulse	0	☆
Pn-336	0x0324	Offset pulses of homing	-10000~10000	pulse	0	☆
Pn-337	0x0325	The 1st homing speed	-5000~5000	rpm	500	☆
Pn-338	0x0326	The 2nd homing speed	-5000~5000	rpm	50	☆
Pn-339	0x0327	Acceleration time of homing	0~10000	0.1ms	0	☆
Pn-340	0x0328	Deceleration time of homing	0~10000	0.1ms	0	☆
Pn-341	0x0329	Homing time limit	0~300	S	30.0	☆
Pn-342	0x032A	Reserved	—	—	—	—
Pn-343	0x032B	Reserved	—	—	—	—
Pn-344	0x032C	Function of analog output (DAC1)	0~3	—	2	★
Pn-345	0x032D	Proportional of analog output (DAC1)	-100~100	—	100	☆
Pn-346	0x032E	Function of analog output (DAC2)	0~3	—	2	★
Pn-347	0x032F	Proportional of analog output (DAC2)	-100~100	—	100	☆

7.2 Parameter function explanation

Special Function Parameter

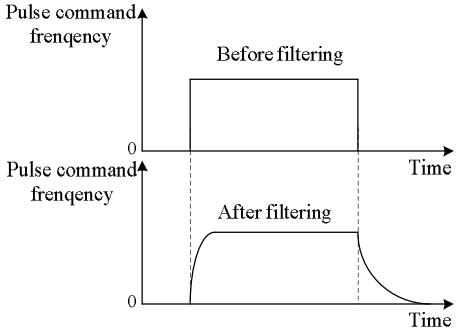
Parameter code	Name	Function
EE-SEt	Save parameters	Save the current parameter values to non-volatile memory, for avoiding losing parameters because of power-off. **Operation Instruction:** Enter into the menu group of 'EE-' and select 'EE- SEt', press 'SET' key. If 'donE' is shown on nixie tube means the driver's parameters have been saved,while if 'Error' is shown, means failure.
EE-dEF	Recover defaults	Recover parameters of parameter table and non-volatile memory to its defaults from factory. **Operation Instruction of recover defaults:** Set motor model parameter **'Pn-001'** according to the motor adapter table (Appendix). Enter into the **'EE-'** menu group and select **'EE-dEF'** , press 'SET' key until display '**StArt**' . If operation

		succeeds, **'donE'** will show in 1~3 seconds, power on again.
Sr-	Sr trail run	Set parameter of 'Pn-004' to 2 to select speed trial run mode.Enter into menu of 'Sr-',press SET key.Set speed command by '▲' and '▼',motor will rotate at the set speed. Positive means motor rotates in the direction of CCW, while negative means in the direction of CW. Minimum given speed is 1rpm. 
Jr-	JOG trail run	Set parameter of 'Pn-004' to 3 to select JOG trial run mode.Modify parameter 'Pn-022', and set suitable JOG speed.Enter into menu of 'Jr-', the nixie tube will display 'J - 120', the numerical part of which is speed value set by parameter 'Pn-022'.At the moment, pressing '▲' key and hold, motor will rotate in the direction of CCW at constant setting speed. Release the button, motor will be in the state of zero-speed locked. While pressing '▼' key and hold, motor will rotate in the direction of CW at constant setting speed. Release the button, motor will be in the state of zero-speed locked.
AU-SPd	Analog speed zero drift compensation	In the analog speed control mode, even if the analog command voltage is 0V, sometimes motor still rotates at tiny speed, because of common ground voltage difference. It can be compensated automatically. **Operation**: Enter into menu of 'AU-'. Choose the submenu of 'AU-SPd', and press 'SET' key, until 'donE' is displayed on nixie tube, compensation value will be write to parameter 'Pn-043'.Then save parameter values to non-volatile memory.
AU-trq	Analog torque zero drift compensation	In the analog torque control mode, even if the analog command voltage is 0V, sometimes motor still rotates at tiny speed, because of common ground voltage difference. It can be compensated automatically. **Operation**: Enter into menu of 'AU-'. Choose the submenu of 'AU-trq', and press 'SET' key, until 'donE' is displayed on nixie tube, compensation value will be write to parameter 'Pn-045'.Then save parameter values to non-volatile memory.
Fn-Err	Historical alarms	The parameter stores the last five alarms.Enter into menu of 'Fn-', choose the submenu of 'Fn- Err',press SET key,the nixie tube will display alarm code.Switching alarm code by '▲' and '▼'.

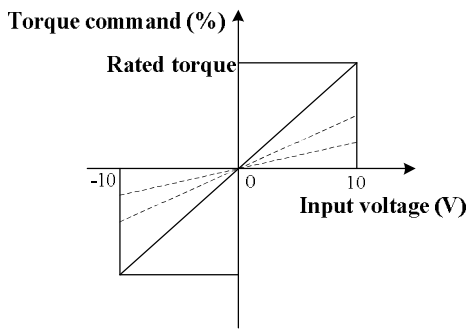
Parameters of group 0

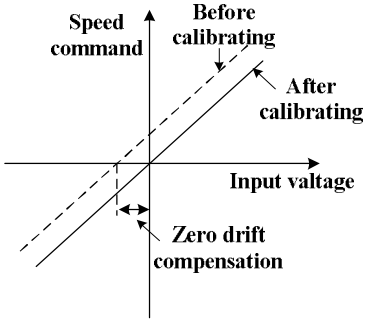
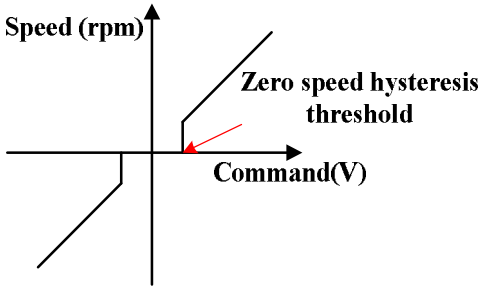
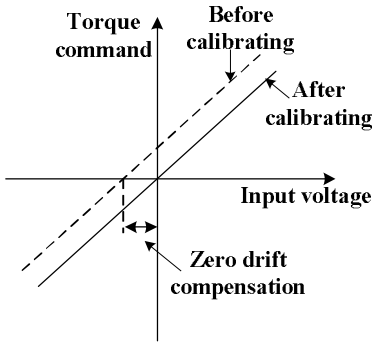
<table>
<tr><th>Parameter code</th><th>Name</th><th>Function</th></tr>
<tr><td>Pn-000</td><td>Password</td><td>User password is 288 which can modify all parameters of group 0.The wrong password can not visit those parameters.</td></tr>
<tr><td>Pn-001</td><td>Motor model</td><td>Set the corresponding motor model code according to the motor adaptation table (Appendix), and it can be used to recover the default settings of the correlated parameters.</td></tr>
<tr><td>Pn-002</td><td>Software version</td><td>The version code for the driver software, it is read-only parameter which can’t be modified.</td></tr>
<tr><td>Pn-003</td><td>Power-on display setting</td><td>Used to select the initial display content when power-on.
<table>
<tr><td>0:Motor speed.</td><td>13:Position command pulse frequency.</td></tr>
<tr><td>1:Current position low 5 bits.</td><td>14:Speed command.</td></tr>
<tr><td>2:Current position high 5 bits.</td><td>15:Torque command.</td></tr>
<tr><td>3:Position command low 5 bits.</td><td>16:Encoder position.</td></tr>
<tr><td>4:Position command high 5 bits.</td><td>17:Encoder UVW signals.</td></tr>
<tr><td>5:Position deviation low 5 bits</td><td>18: FPGA software version.</td></tr>
<tr><td>6:Position deviation high 5 bits</td><td>19: Alarm code.</td></tr>
<tr><td>7:Motor torque.</td><td>20: Reserved</td></tr>
<tr><td>8:Motor current.</td><td>21: Reserved</td></tr>
<tr><td>9:Digital input status of DI5~DI7.</td><td>22: Reserved</td></tr>
<tr><td>10:Digital input status of DI1~DI4.</td><td>23: Absolute encoder inner alarms.</td></tr>
<tr><td>11: Digital output status.</td><td>24:Absolute encoder laps information.</td></tr>
<tr><td>12: Control mode.</td><td></td></tr>
</table></td></tr>
<tr><td>Pn-004</td><td>Control mode</td><td>Used to set control mode. (If the setting value is 8, 9 or 10, refer to the CMODE signal in chapter 7.3.)
<table>
<tr><td>0: Position control mode.</td><td>6: Torque control mode.</td></tr>
<tr><td>1: Speed control mode.</td><td>7: Open-loop control mode.</td></tr>
<tr><td>2:Sr trail run mode.</td><td>8: Position/speed mode.</td></tr>
<tr><td>3:JOG trail run mode.</td><td>9: Speed/torque mode.</td></tr>
<tr><td>4: Reserved</td><td>10:Torque/position mode.</td></tr>
<tr><td>5: Analog speed control mode.</td><td></td></tr>
</table></td></tr>
<tr><td>Pn-005</td><td>Speed proportional gain</td><td>● The higher the speed proportional gain is, the greater the servo stiffness is, the faster the speed response is. If it’s over high, noise and vibration will easily generated.
● Under the condition of not shocking, set the value relatively high as possible.</td></tr>
<tr><td>Pn-006</td><td>Speed integral constant</td><td>● It is the integral time constant for the speed regulator. The lower the value sets，the faster the integral speed is, the greater the stiffness is. If it’s too small, noise and vibration will easily generate.
● Under the condition of not shocking, reduce the value as possible.</td></tr>
</table>

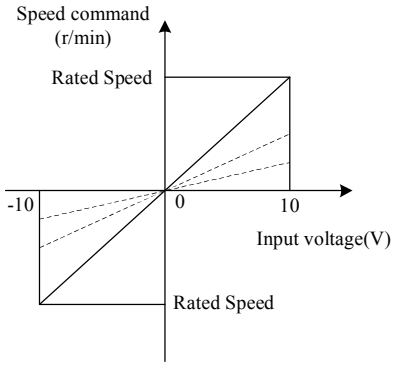
Pn-007	Torque command filter	● Set the features of torque command filter, which can restrain resonance produced by torque fluctuations. (Motor generates shake and sharp noise.) ● If the motor generates vibration and noise, please reduce the parameter value. ● The smaller the value is, the lower the cut-off frequency is, and the lower the noise is. If the load inertia is too big, reduce the parameter value properly. If the value is too small, the response will slow down and cause instability. ● To the contrary, the larger the value is, the higher the cut-off frequency is, and the faster the response is. If you need relatively higher machinery stiffness, increase the setting value properly.
Pn-008	Speed feedback filter	● Set the features of speed detection low pass filter. ● The smaller the value is, the lower the cut-off frequency is, and the lower the noise is. If the load inertia is too big, reduce the parameter value properly. If the value is too small, the response will slow down and cause instability. ● To the contrary, large value will make higher cut-off frequency and faster speed feed response. If you need relatively higher speed response, increase the setting value properly.
Pn-009	Position proportional gain	The proportional gain of position loop adjuster. The larger the value is, the higher the gain proportion is, the larger the stiffness is, and the smaller the position tracking error is. However, the setting value is over large, it may produce vibration and overshoot.
Pn-010	Position loop feed forward gain	● Feed forward gain of position loop. The Larger the parameter value is, the smaller the system position tracking error is, and the faster the response is. When the value is set at 100%, it means position hysteresis is always zero at any command pulse frequency. ● If the feed forward gain of position loop is too large, the system position loop will be unstable and produce shakes. Generally speaking, the position loop feed forward gain is zero.
Pn-011	Position feed forward filter coefficient	The cut-off frequency of position loop feed forward low pass filter. It is used to increase the stability of compound position control.
Pn-012	Electronic gear ratio numerator 1	The following is the example of incremental encoder: ● Take fractional frequency or frequency doubling on position command pulse, to match with various pulse sources conveniently and get the pulse resolution ratio which uses demand. ● P×G=N×C×4 P: Input position pulse. G: Electronic gear ratio G= $\frac{\text{Pn-012}}{\text{Pn-013}}$ N: Rotation numbers of motor. C: Encoder line number，the system: C=2500. Recommended range: 1/50≤G≤50.
Pn-013	Electronic gear ratio denominator	
Pn-014	Position command input types	Set input types of position command pulse: 0:Pulse + Direction. 1:CCW/CW pulse. 2:Two-phase quadrature pulse.

<table>
<tr><td>Pn-015</td><td>Inverse the counting direction of position command</td><td>Adjust the counting direction of pulse input command.
0:Normal.
1:Inverse.</td></tr>
<tr><td>Pn-019</td><td>Position command smooth filter</td><td>● Smooth filter the command pulse with the exponential acceleration and deceleration.
● The filter will not lose input pulse, but the command may be lagged.
● The filter is used:
1.Upper controller don’t have acceleration or deceleration features.
2.Electronic gear ratio is relatively large (>10).
3.Command frequency is relatively low.
4.Jump or jitter when motor runs.
● The filter is out of use when it is set to zero.
 
</td></tr>
<tr><td>Pn-020</td><td>Drive forbid control</td><td>0: CCW+CW input forbid is valid;
1: CCW+CW input forbid is invalid.</td></tr>
<tr><td>Pn-022</td><td>JOG run speed</td><td>It is used to set the value of JOG speed.</td></tr>
<tr><td>Pn-023</td><td>Maximum speed limit</td><td>● Set the maximum speed limit of servo motor.
● It has no relation with rotating direction. If the value exceeds the rated speed, then actual maximum speed limit is the rated speed.</td></tr>
<tr><td>Pn-024</td><td>Speed command setting</td><td>0:Analog speed mode
1 :Internal speed mode. Select respective internal speed by signals SC1,SC2 and SC3.
<table>
<tr><th>SC3</th><th>SC2</th><th>SC1</th><th>Speed command</th></tr>
<tr><td>OFF</td><td>OFF</td><td>OFF</td><td>Internal speed 1: Pn-200</td></tr>
<tr><td>OFF</td><td>OFF</td><td>ON</td><td>Internal speed 2: Pn-201</td></tr>
<tr><td>OFF</td><td>ON</td><td>OFF</td><td>Internal speed 3: Pn-202</td></tr>
<tr><td>OFF</td><td>ON</td><td>ON</td><td>Internal speed 4: Pn-203</td></tr>
<tr><td>ON</td><td>OFF</td><td>OFF</td><td>Internal speed 5: Pn-204</td></tr>
<tr><td>ON</td><td>OFF</td><td>ON</td><td>Internal speed 6: Pn-205</td></tr>
<tr><td>ON</td><td>ON</td><td>OFF</td><td>Internal speed 7: Pn-206</td></tr>
<tr><td>ON</td><td>ON</td><td>ON</td><td>Internal speed 8: Pn-207</td></tr>
</table>
2: Internal speed+Analog speed mode.
<table>
<tr><th>SC3</th><th>SC2</th><th>SC1</th><th>Speed command</th></tr>
<tr><td>OFF</td><td>OFF</td><td>OFF</td><td>Analog speed command input</td></tr>
<tr><td>OFF</td><td>OFF</td><td>ON</td><td>Internal speed 2: Pn-201</td></tr>
</table></td></tr>
</table>

<table>
<tr><td></td><td></td><td>
<table>
<tr><td>OFF</td><td>ON</td><td>OFF</td><td>Internal speed 3: Pn-202</td></tr>
<tr><td>OFF</td><td>ON</td><td>ON</td><td>Internal speed 4: Pn-203</td></tr>
<tr><td>ON</td><td>OFF</td><td>OFF</td><td>Internal speed 5: Pn-204</td></tr>
<tr><td>ON</td><td>OFF</td><td>ON</td><td>Internal speed 6: Pn-205</td></tr>
<tr><td>ON</td><td>ON</td><td>OFF</td><td>Internal speed 7: Pn-206</td></tr>
<tr><td>ON</td><td>ON</td><td>ON</td><td>Internal speed 8: Pn-207</td></tr>
</table>
</td></tr>
<tr><td>Pn-025</td><td>Position command setting</td><td>0: Pulse input position control.
1: Internal position control.</td></tr>
<tr><td>Pn-026</td><td>Torque command setting</td><td>0: Analog torque mode.
1: Internal torque mode. Select internal torque command through TRQ1 and TRQ2.
<table>
<tr><th>TRQ2</th><th>TRQ1</th><th>Torque command</th></tr>
<tr><td>OFF</td><td>OFF</td><td>Internal torque 1: Pn-260</td></tr>
<tr><td>OFF</td><td>ON</td><td>Internal torque 2: Pn-261</td></tr>
<tr><td>ON</td><td>OFF</td><td>Internal torque 3: Pn-262</td></tr>
<tr><td>ON</td><td>ON</td><td>Internal torque 4: Pn-263</td></tr>
</table>
2: Internal torque+ Analog torque mode.
<table>
<tr><th>TRQ2</th><th>TRQ1</th><th>Torque command</th></tr>
<tr><td>OFF</td><td>OFF</td><td>Analog torque command input</td></tr>
<tr><td>OFF</td><td>ON</td><td>Internal torque 2: Pn-261</td></tr>
<tr><td>ON</td><td>OFF</td><td>Internal torque 3: Pn-262</td></tr>
<tr><td>ON</td><td>ON</td><td>Internal torque 4: Pn-263</td></tr>
</table></td></tr>
<tr><td>Pn-027</td><td>Torque limit mode</td><td>0: Basic limit. Whether the external CCW/CW torque limit is valid decided by signals TCCW and TCW.In the Sr and JOG mode, it also be limited by P-038.
<table>
<tr><td>TCCW=ON: Limited by Pn-034 and Pn-036.
TCCW=OFF: Limited by Pn-034.</td><td>TCW=ON: Limited by Pn-035 and Pn-035.
TCW=OF: Limited by Pn-035.</td></tr>
</table>
1: Basic limit +Analog torque limit.
2: Basic limit +Internal torque limit.Select internal torque through TRQ1 and TRQ2.
Note: A plurality of limit occurs , the final limit value is the minimum.
The limit of Pn-034 and Pn-035 are effective at any time.
If the limit value exceeds the maximum allowable torque, the actual torque is limited to a maximum torque.</td></tr>
<tr><td>Pn-028</td><td>Speed limit mode</td><td>Set the speed limit mode in torque control mode.
0: Basic limit. Parameter Pn-023 as the limit.
1: Basic limit + Analog speed limit.
2: Basic limit +Internal speed limit. Select internal speed through SC1,SC2 and SC3.</td></tr>
</table>

Pn-029	Speed command filter	● Set the features of speed command filter. ● If the motor generates vibration and noise, please reduce the parameter value. ● The smaller the value is, the lower the cut-off frequency is, the lower the noise is. If the load inertia is too big, reduce the parameter value properly. If the value is too small, the response will slow down and cause instability. ● To the contrary, the larger the value is, the higher the cut-off frequency is, the faster the response is. If you need relatively higher machinery stiffness, increase the setting value properly.
Pn-031	Analog speed command filter coefficient	Smooth analog speed command, and eliminate the effects of interference. The larger the parameter value is, the stronger the filtering effect is.
Pn-032	Analog torque command filter coefficient	Smooth analog torque command, and eliminate the effects of interference. The larger the parameter value is, the stronger the filtering effect is.
Pn-033	Processing method of overspeed in torque mode	It is used to set the processing method when exceeding the limiting speed in torque mode. 0: Motor speed is controlled at speed limit value. 1: Alarm (Err7) if overspeed.
Pn-034	Internal CCW torque limit	Set internal torque limit at the servo motors' CCW/ CW direction. The value sets the percentage of rated torque, which is effective at any time.
Pn-035	Internal CW torque limit	
Pn-036	External CCW torque limit	Set external torque limit at the servo motors' CCW/CW direction. The value sets the percentage of rated torque.
Pn-037	External CW torque limit	
Pn-038	Torque limit for speed trial run and JOG trial run	● Set the torque limit in the speed trial run mode and JOG run mode. It is independent of rotating direction and effective in two directions. ● The value is the percentage of rated torque. For example, the value should be set at 100 if it is equal to rated torque. Internal and external torque limit are still effective.
Pn-041	Analog torque command gain	● Set the ratio between torque command input voltage and motor actual torque command. ● Analog input voltage range:-10V~+10V. When it is set to 100%, 10V input voltage corresponding to the rated torque. 
Pn-042	Speed command direction of speed mode	0: The direction of speed command is controlled by signal CINV; 1: The direction of speed command is controlled by signals SDIR1 and SDIR2. （Refer to chapter 7.3）

Pn-043	Analog speed zero drift compensation value	● When the speed command input is zero, the speed command analog offset can be eliminated by adjusting this parameter. ● Parameter "AU-SPd" can be used to automatic calibration. ● Manual compensation: Enable the servo driver, motor runs in the analog speed mode. The speed command offset can be observed by 'dP-CS', and then user can manually change the value of 'Pn-043' based on the observed offset. 
Pn-044	Analog speed zero speed hysteresis threshold	If the analog input is smaller than the parameter value, the motor will be locked. 
Pn-045	Analog torque zero drift compensation value	● When the torque command input is zero, the torque command analog offset can be eliminated by adjusting this parameter. ● Parameter "AU-trq" can be used to automatic calibration. ● Manual compensation: Enable the servo driver, the motor runs in the analog torque mode. The torque command offset can be observed by "dP-Ct", and then users can manually change the value of 'Pn-045' based on the observed offset. 
Pn-046	Analog torque zero speed hysteresis threshold	If the analog input is smaller than the parameter value, the motor will be locked.(Refer to parameter Pn-044.)

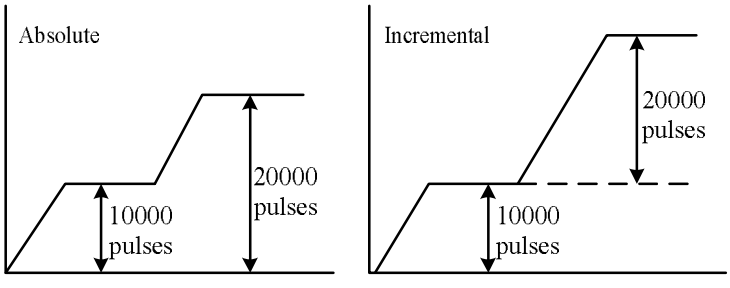
<table>
<tr><td>Pn-047</td><td>Input pulse phase control</td><td>Set the phase of PULS and DIR signals.
<table>
<tr><th>Pn-047</th><th>PULSE</th><th>DIR</th></tr>
<tr><td>0</td><td>In phase</td><td>In phase</td></tr>
<tr><td>1</td><td>Out of phase</td><td>In phase</td></tr>
<tr><td>2</td><td>In phase</td><td>Out of phase</td></tr>
<tr><td>3</td><td>Out of phase</td><td>Out of phase</td></tr>
</table></td></tr>
<tr><td>Pn-050</td><td>Encoder type</td><td>0: Incremental encoder.
1: Wire-saving encode.
2: Reserved.
3: Absolute encoder.
4: Resolver.</td></tr>
<tr><td>Pn-051</td><td>Analog speed command gain</td><td>● Set the ratio between speed command input voltage and motor actual speed command.
● Analog input voltage range:-10V~ +10V. When it is set to 100%, 10V input voltage corresponding to the rated speed.
 
</td></tr>
<tr><td>Pn-052</td><td>Speed acceleration time</td><td rowspan="2">Acc/Dec time of speed control mode.</td></tr>
<tr><td>Pn-053</td><td>Speed deceleration time</td></tr>
<tr><td>Pn-057</td><td>Force enable</td><td>Pn-057=2: Enable the servo drive.
Pn-057=3: Enable the servo drive by external digital IO input signal SV_EN. (Refer to chapter 7.3.)</td></tr>
</table>

Parameters of group 1

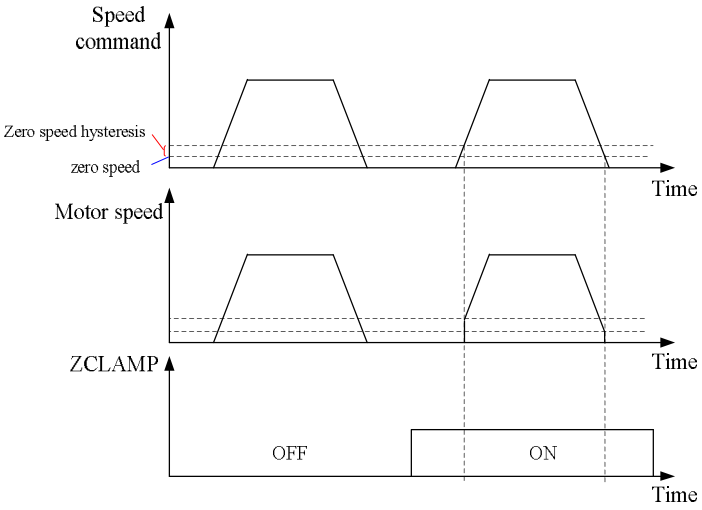
<table>
<tr><th>Parameter code</th><th>Name</th><th>Function</th></tr>
<tr><td>Pn-100</td><td>Node ID</td><td>If it is set to 0 (Broadcast ID), the drive receives datas but does not respond.</td></tr>
<tr><td>Pn-101</td><td>Baud rate</td><td>Modbus baud rate setting,as follows:
<table>
<tr><td>0：4800bps</td><td>1：9600bps</td><td>2：19200bps</td></tr>
<tr><td>3：38400bps</td><td>4：57600bps</td><td>5：115200bps</td></tr>
</table></td></tr>
</table>

<table>
<tr><td>Pn-102</td><td>Transmission mode</td><td>
<table>
<tr><td>0: 7-N-2(ASCII), 7 data bits, no parity, 2 stop bits, ASCII mode.</td></tr>
<tr><td>1: 7-E-1(ASCII), 7 data bits, even parity, 1 stop bit, ASCII mode.</td></tr>
<tr><td>2: 7-O-1(ASCII), 7 data bits, odd parity, 1 stop bit, ASCII mode.</td></tr>
<tr><td>3: 8-N-2(ASCII), 8 data bits, no parity, 2 stop bits, ASCII mode.</td></tr>
<tr><td>4: 8-E-1(ASCII), 8 data bits, even parity, 1 stop bit, ASCII mode.</td></tr>
<tr><td>5: 8-O-1(ASCII), 8 data bits, odd parity, 1 stop bit, ASCII mode.</td></tr>
<tr><td>6: 8-N-2(RTU), 8 data bits, no parity, 2 stop bits, RTU mode.</td></tr>
<tr><td>7: 8-E-1(RTU), 8 data bits, even parity, 1 stop bit, RTU mode.</td></tr>
</table>
</td></tr>
<tr><td>Pn-104</td><td>Communication protocol</td><td>P-104=0: Standard MODBUS communication protocol.</td></tr>
<tr><td>Pn-106</td><td>Input IO signal control</td><td>Bit-controlling.Pn-106=bit6×64+bit5×32+bit4×16+bit3×8+bit2×4+bit1×2+bit0,
bit0~bit6 correspond to DI1~ DI7:
0: The DI signal come from external terminal.
1: The DI signal is controlled by parameter ‘Pn-109’.
<table>
<tr><td></td><td>Bit6</td><td>bit5</td><td>bit4</td><td>bit3</td><td>bit2</td><td>bit1</td><td>bit0</td></tr>
<tr><td></td><td>DI7</td><td>DI6</td><td>DI5</td><td>DI4</td><td>DI3</td><td>DI2</td><td>DI1</td></tr>
<tr><td>Pn-106
(DI1 state is controlled by Pn-109)</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>1</td></tr>
</table>
</td></tr>
<tr><td>Pn-107</td><td>Communication response delay time</td><td>Delay time of response to master.</td></tr>
<tr><td>Pn-109</td><td>DI signal status software control</td><td>Bit-controlling.Pn-109=bit6×64+bit5×32+bit4×16+bit3×8+bit2×4+bit1×2+bit0.
The parameter set DI status when the corresponding DI signal is controlled by parameter ‘Pn-109’. (Refer to Pn-106.)
<table>
<tr><td></td><td>bit6</td><td>bit5</td><td>bit4</td><td>bit3</td><td>bit2</td><td>bit1</td><td>bit0</td></tr>
<tr><td></td><td>DI7</td><td>DI6</td><td>DI5</td><td>DI4</td><td>DI3</td><td>DI2</td><td>DI1</td></tr>
<tr><td>Pn-106
(DI1 state is controlled by bit0 of ‘Pn-109’)</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>1</td></tr>
<tr><td>Pn-109
(The status of DI1 is 0)
(x=0 or 1)</td><td>x</td><td>x</td><td>x</td><td>x</td><td>x</td><td>x</td><td>0</td></tr>
</table>
</td></tr>
</table>

Parameters of group 2

Parameter code	Name	Function
Pn-200	Internal speed 1	In internal speed control mode(Pn-004=1，Pn-024=1), these parameters are used to set running speed. Select respective internal speed by signals SC1,SC2 and SC3.(Refer to chapter 7.3)
Pn-201	Internal speed 2	
Pn-202	Internal speed 3	
Pn-203	Internal speed 4	
Pn-204	Internal speed 5	
Pn-205	Internal speed 6	
Pn-206	Internal speed 7	
Pn-207	Internal speed 8	
Pn-208	Laps of the 1st inner position command	In inner position control mode, the parameters is used for setting the 1st position command.The calculation method of position pluses is set by parameter Pn-248.In inner position control mode, select respective inner position by signals SP1 ,SP2 and SP3.
Pn-209	Pulses of the 1st inner position command	
Pn-210	Speed of the 1st inner position command	The motor speed when running the first position command.
Pn-211	Acc/Dec time of the 1st inner position command	The acceleratio/deceleration time when running the first position command.
Pn-212	Pause time of the 1st inner position command	The pause time when running the first position command.
Pn-213 ~ Pn-247	Internal position 2 ~ Internal position 8	Refer to parameters Pn-208 ~ Pn-212.
Pn-248	Internal position command mode	0: Absolute position. (Laps*10000+ Pulses) 1: Incremental position.(Laps*10000+ Pulses) 2: 32-bit absolute position. (Laps*65536+ Pulses) 3: 32-bit Incremental position.(Laps*65536+ Pulses) The difference of absolute and incremental: 

Pn-249	Running mode of inner position control	0: When CNTR signal is detected a valid jump,servo drive runs once with the number of the position segment set by Pn-251,and finally stopped at the first location. 1: In this mode,if the signal CNTR is valid,the drive will always loop runs with the number of the position segment set by Pn-251 until CNTR becomes invalid. 2: In this mode, SP1, SP2 and SP3 are set to specify the running position, the falling edge of signal CNTR start running.This mode does not controlled by Pn-251. 3: If SP3 signal is detected a valid jump, servo drive runs to the first location; SP2 signal is detected a valid jump, servo drive runs to the previous location,if it is the first location,stop here; SP1 signal is detected a valid jump, servo drive runs to the next location,if it is the last location,stop here.
Pn-250	Pause mode of inner position control	0: When inner position running is suspended and started again, the servo drive will continue running remaining position pluses. 1: When inner position running is suspended and started again, the servo drive will back to the first position. **Note**:This patameter is used to P-249=0 and P-249=1.
Pn-251	Number of segments of inner position	In inner position control mode,the parameter is use for setting the number of running position segments.(Refer to parameter Pn-249 .)
Pn-252	Torque arrival signal filter time	In torque control mode,when the motor torque exceeds the value of Pn-259,and maintains a certain time set by Pn-252, the signal state of SV_S is ON,else OFF.
Pn-253	Undervoltage alarm filter time	When undervoltage signal is detected, servo driver output alarm signal after specified time is delayed.
Pn-254	Range of positioning completion	In the position control mode, servo driver output positioning completion signal 'SV_F' when the position deviation is equal to or less than the value of 'Pn-254'.
Pn-255	Detection range of position deviation alarm	● In position control mode, servo driver will output the alarm signal (Err8) when the position deviation is equal to or greater than the value of 'Pn-255'. ● It will do not alarm when the parameter's value is 0.
Pn-256	Speed arrival signal threshold	● No relation with rotation direction. Comparator has hysteresis effect. ● In speed control mode, if motor speed exceeds this value, the signal 'SV_S' is ON, otherwise OFF.
Pn-257	Detection range of overspeed	● In speed control mode, When the speed deviation surpasses this parameter value, the servo drive will release overspeed alarm signal.(Err7) ● It will not alarm when the parameter's value is 0.
Pn-258	Servo on delay time	Delay time from receiving the enable signal to enable the drive.
Pn-259	Torque arrival signal threshold	In torque control mode, if motor torque exceeds this value, the signal 'SV_T' is ON, otherwise OFF.
Pn-260	Internal torque 1	In internal torque control mode, select respective internal torque command by signals TRQ1 and TRQ2. (Refer to chapter 7.3)
Pn-261	Internal torque 2	
Pn-262	Internal torque 3	
Pn-263	Internal torque 4	

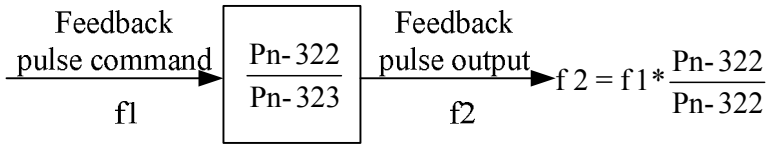
Pn-264	Alarm clear restrictions	Set the number of alarm clearance. Signal RSTSV is used to clear alarms, however, if the number of operations exceed the value of Pn-264, the alarm can not be cleared. (Notice：Parts of the alarms can be cleared.)
Pn-268	Torque command direction	0: Normal. 1: Inverse.
Pn-269	Torque acceleration/ deceleration time	Torque acceleration/deceleration time.
Pn-271	Speed limit of torque mode	Set the speed limit of servo motor of torque control mode.The actual value of the speed limit is the smaller of Pn-271 and Pn-023.
Pn-272	In torque mode the permitted time for overspeed	In torque mode, the parameter is used to set the permitted time of exceeding the speed limit.
Pn-273	Zero speed	Conditions of zero speed clamp: 1.In the speed control mode. 2.The signal ZCLMP is valid (ON). 3.The motor speed less than the zero speed value (Pn-273). 
Pn-274	Zero speed hysteresis	Comparator has hysteresis characteristics, if the speed is clamped,the drive will exit the clamp when motor speed greater than the value of Pn-273 + Pn-274.
Pn-275	Zero speed clamp mode	0: After zero speed clamp is valid,the motor speed is forced to 0,it still in speed control mode,and the motor can be rotated by external force. 1: Motor is fixed in the instant of zero speed clamp,then the drive switch to position control mode, if motor be rotated because of external force,it will back to the fixed position. 2:In this mode, if zero speed clamp is valid ,the stop position of motor is respect to the Z pulse,the position is controlled by parameters Pn-276 and Pn-277. Drive switch to position control mode, if motor be rotated because of external force,it will back to the fixed position.(Refer to parameters Pn-276 and Pn-277.)
Pn-276	Offset laps	These parameters are used to zero speed clamp function.The offset pulses is respect to the Z pulse. Offset pulses = Pn-276*10000+ Pn-277. Set value is positive, motor rotate in CCW. Set value is negative, motor rotate in CW.
Pn-277	Offset pulses	

Parameters of group 3

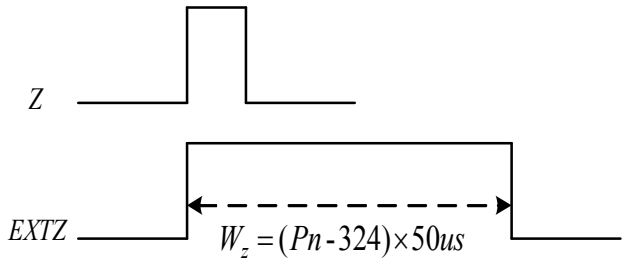
<table>
<tr><th>Parameter code</th><th>Name</th><th>Function</th></tr>
<tr><td>Pn-300</td><td>Digital input filter time</td><td>There are too much noises around environment, increasing the value of Pn-300 can improve reliability. If the value is too large, it will affect the response time.</td></tr>
<tr><td>Pn-301
~
Pn-307</td><td>Digital input DIn function</td><td>These parameters are used to set functions of digital input DI. The function codes refer to chapter 7.3. It will have no function when the parameter’s value is 0.</td></tr>
<tr><td>Pn-309
~
Pn-312</td><td>Digital output DOn function</td><td>The function codes refer to chapter 7.4. It will have no function when the parameter’s value is 0.</td></tr>
<tr><td>Pn-313</td><td>Reverse digital input DI1~DI4</td><td>Binary display. Reverse the state of DIn if the corresponding bit is 1 , as follows.
<table>
<tr><td></td><td>bit3</td><td>bit2</td><td>bit1</td><td>bit0</td></tr>
<tr><td></td><td>DI4</td><td>DI3</td><td>DI2</td><td>DI1</td></tr>
<tr><td>Reverse DI1, DI2</td><td>0</td><td>0</td><td>1</td><td>1</td></tr>
</table></td></tr>
<tr><td>Pn-314</td><td>Reverse digital input DI5~DI7</td><td>Binary display. Reverse the state of DIn if the corresponding bit is 1 , as follows.
<table>
<tr><td></td><td>bit3</td><td>bit2</td><td>bit1</td><td>bit0</td></tr>
<tr><td></td><td>Reserve</td><td>DI7</td><td>DI6</td><td>DI5</td></tr>
<tr><td>Reverse DI5</td><td>0</td><td>0</td><td>0</td><td>1</td></tr>
</table></td></tr>
<tr><td>Pn-315</td><td>Reverse digital output DO1~DO4</td><td>Binary display. Reverse the state of DOn if the corresponding bit is 1.
<table>
<tr><td></td><td>bit3</td><td>bit2</td><td>bit1</td><td>bit0</td></tr>
<tr><td></td><td>DO4</td><td>DO3</td><td>DO2</td><td>DO1</td></tr>
<tr><td>Reverse DO2</td><td>0</td><td>0</td><td>1</td><td>0</td></tr>
</table></td></tr>
<tr><td>Pn-318</td><td>Zero speed detection point of electromagnetic brake</td><td>The parameter is only used to electromagnetic brake operation timing judgment. When the motor’s speed (no relation with direction) is lower than the value of this parameter think the motor is stationary. (Refer to chapter 7.4, the description of signal BRK.)</td></tr>
<tr><td>Pn-319</td><td>Electromagnetic brake delay time when the motor is stationary</td><td>● When the system state changes from enabled to does not or alarm. The parameter is used to set the delay time from the electromagnetic brake signal output(BRK signal OFF) to the motor current is cut off during the motor stationary (Motor speed< Pn-318).
● The function makes sure that motor cut off current after brakes reliable braking to avoid slight displacement of motor or dropping. The parameter’s value should not be less than mechanical braking delay time.
● Timing refers to the description of BRK signal of chapter 7.4.</td></tr>
<tr><td>Pn-320</td><td>Electromagnetic brake delay time when the motor is running</td><td>● When the system state changes from enabled to does not or alarm. The parameter is used to set the delay time from the motor current is cut off to the electromagnetic brake work (BRK signal OFF) during the motor running (Motor speed ≥ Pn-318).</td></tr>
</table>

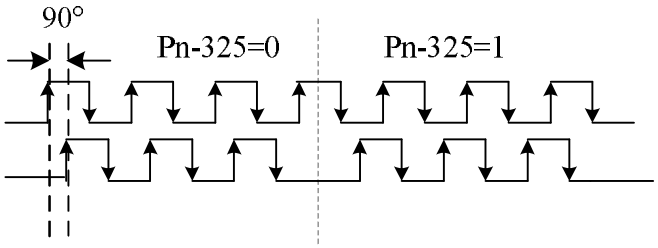
<table>
<tr><td>Pn-321</td><td>Electromagnetic brake operation speed when the motor is running</td><td>

The parameter makes sure that brake works after reducing the speed of the motor from the high rotation speed to low-speed to avoid damage to the brake.
The actual delay time is the shorter of Pn-320 and motor speed decelerates to the value of Pn-321.
Timing refers to the description of BRK signal of chapter 7.4.

</td></tr>
<tr><td>Pn-322</td><td>Position feedback pulse division numerator</td><td rowspan="2">


If Pn-322>Pn-323, the ratio outputs as 1:1.
f1: Encoder feedback pulses.
f2:The output pulses of the driver.(EXTA+/EXTA-, EXTB+ / EXTB -.)

</td></tr>
<tr><td>Pn-323</td><td>Position feedback pulse division denominator</td></tr>
<tr><td>Pn-324</td><td>The width of Z pulse</td><td>The parameter is used to set the width of zero pulse (Z pulse).With the motor speed increases the width of zero pulse narrows, the parameter is set to appropriate value in accordance with motor speed in order to match kinds of upper control.After change the parameter,need to re-power.


</td></tr>
<tr><td>Pn-325</td><td>Reverse position feedback pulse</td><td>Direction of position feedback pulse:
0: Phase relationship of position feedback output signals EXTA and EXTB unchanged.
1: Phase relationship of position feedback output signal EXTA and EXTB reversed.
As shown:


</td></tr>
<tr><td>Pn-326</td><td>The 2nd electronic gear ratio numerator</td><td rowspan="3">Parameter description refer to ‘Pn-012’ and ‘Pn-013’.The selection of electronic gear ratio by input IO signals GEAR1 and GEAR2. (Refer to chapter 7.3.)</td></tr>
<tr><td>Pn-327</td><td>The 3rd electronic gear ratio numerator</td></tr>
<tr><td>Pn-328</td><td>The 4th electronic gear ratio numerator</td></tr>
<tr><td>Pn-332</td><td>Homing startup mode</td><td>0: Close homing function.
1: Start homing when the servo drive is powered on and enabled for the first time.
2: Start homing by IO signal ‘SHOM’.</td></tr>
</table>

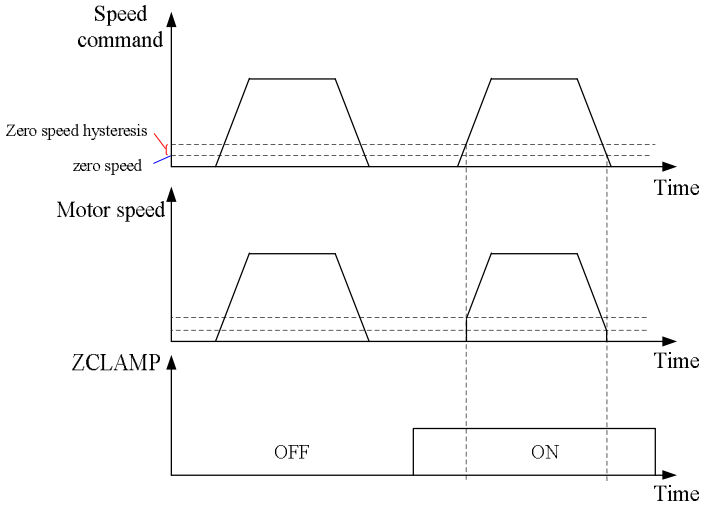
Pn-333	The homing reference point	0: Motor rotates in the direction of CCW, and the signal CCWI as the homing reference point. 1: Motor rotates in the direction of CW, and the signal CWI as the homing reference point. 2: Motor rotates in the direction of CCW, and the signal ORGP as the homing reference point. 3: Motor rotates in the direction of CW, and the signal ORGP as the homing reference point.
Pn-334	Running mode after find the homing reference point	0: After find the homing reference point ,reverse to find the Z pulse. 1: After find the homing reference point ,in the same direction to find the Z pulse. **Note:** If CCWI and CWI signals as the homing reference point,drive will reverse to find Z pulse regardless of the value of the parameter. When reverse to find Z pulse, if the homing reference point signal is still valid,drive does not detect Z pulse until the signal is invalid.
Pn-335	Offset laps of homing	These parameters are used to homing function.The offset pulses is respect to the Z pulse. If Pn-248=0 or Pn-248=1: Offset pulses = Pn-335×10000+ Pn-336. If Pn-248=2 or Pn-248=3: Offset pulses = Pn-335×65536+ Pn-336. Motor rotates in the direction of CCW,after find the Z pulse: a. Set value is positive, motor rotate in CW. b. Set value is negative, motor rotate in CCW. Motor rotates in the direction of CW,after find the Z pulse: a. Set value is positive, motor rotate in CCW. b. Set value is negative, motor rotate in CW.
Pn-336	Offset pulses of homing	
Pn-337	The 1st homing speed	The motor speed of looking for the homing reference point.
Pn-338	The 2nd homing speed	The parameter is used to set motor speed of finding Z pulse after finding the homing reference point.
Pn-339	Acceleration time of homing	Acceleration/Deceleration time of homing.
Pn-340	Deceleration time of homing	
Pn-341	Homing time limit	If within the time set by the parameter Pn-341 , homing operation is not completed , output alarm signal (Err24)
Pn-344	Function of analog output (DAC1)	Pn-344=0: Motor speed(+/-10 V/Rated speed) Pn-344=1: Motor torque (+/-10 V/Rated torque) Pn-344=2: Speed command(+/-10 V/ Rated speed) Pn-344=3: Torque command (+/-10 V/ Rated torque) **e.g.:** Pn-344= 0 (DAC1 output motor speed), Voltage of DAC1 is V1, Motor speed=(Rated speed* V1/10)* Pn-345/100.
Pn-345	Proportional of analog output (DAC1)	
Pn-346	Function of analog output (DAC2)	Pn-346=0: Motor speed(+/-10 V/Rated speed) Pn-346=1: Motor torque (+/-10 V/Rated torque) Pn-346=2: Speed command(+/-10 V/ Rated speed) Pn-346=3: Torque command (+/-10 V/ Rated torque) **e.g.:** Pn-346= 0 (DAC2 output motor speed), Voltage of DAC2 is V2, Motor speed=(Rated speed* V2/10)* Pn-347/100.
Pn-347	Proportional of analog output (DAC2)	

7.3 Digital input DI function explanation

Note: Digital input DI state definition.

OFF - The switch status is opened.

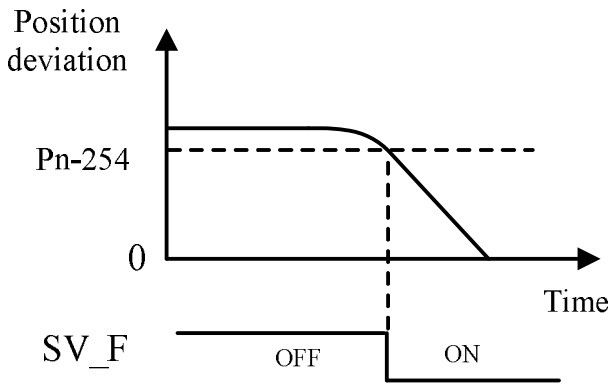
ON - The switch status is turned.

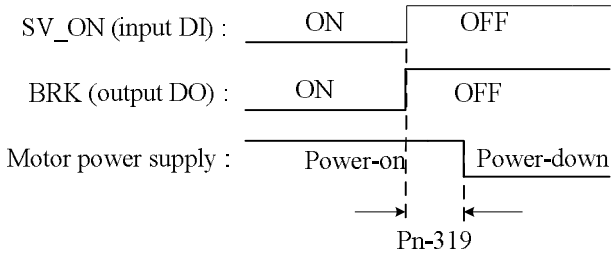
<table>
<tr><th>Value</th><th>Sign</th><th>Function description</th></tr>
<tr><td>1</td><td>SV_ON</td><td>Servo on. Servo enable when the signal is ON.</td></tr>
<tr><td>2</td><td>RSTSV</td><td>Alarms clear. Parts of alarms are cleared when RSTSV signal is ON. (The alarms can be cleared are Err7,Err8,Err9,Err14,Err15,Err16,Err18 and Err24.)</td></tr>
<tr><td>3</td><td>CCWI</td><td>CCW drives prohibition. The function is valid only when the value of Pn-020 is 0. Motor rotates anti-clockwise, when detects CCWI signal is ON the drive capability is inhibited in CCW direction.</td></tr>
<tr><td>4</td><td>CWI</td><td>CW drives prohibition. The function is valid only when the value of Pn-020 is 0. Motor rotates clockwise, when detects CWI signal is ON,the drive capability is inhibited in CW direction.</td></tr>
<tr><td>5</td><td>PECLR</td><td>Position deviation counter clear. In position control mode, turn on the signal reset position deviation counter.</td></tr>
<tr><td>6</td><td>PINH</td><td>Pulse command input prohibition. When PINH signal is ON in position mode, the external pulse input is invalid and the motor is locked.</td></tr>
<tr><td>7</td><td>ZCLAMP</td><td>Zero speed clamp:In speed control mode, when the speed command is less than a certain speed (the speed set by parameter Pn-273), you can make the motor stop and servo lock through the function of ' zero speed clamp '. if the speed is clamped,the drive will exit the clamp when motor speed greater than the value of Pn-273 + Pn-274.(Refer to parameters Pn-273~Pn-277.)
 
</td></tr>
<tr><td>8</td><td>TCCW</td><td>CCW torque limit.</td></tr>
<tr><td>9</td><td>TCW</td><td>CW torque limit.</td></tr>
<tr><td>10</td><td>CMODE</td><td>Control mode switching.
<table>
<tr><th rowspan="2">Pn-004</th><th colspan="2">The state of CMODE</th></tr>
<tr><th>ON</th><th>OFF</th></tr>
<tr><td>8</td><td>Speed control mode</td><td>Position control mode</td></tr>
<tr><td>9</td><td>Torque control mode</td><td>Speed control mode</td></tr>
<tr><td>10</td><td>Torque control mode</td><td>Position control mode</td></tr>
</table></td></tr>
</table>

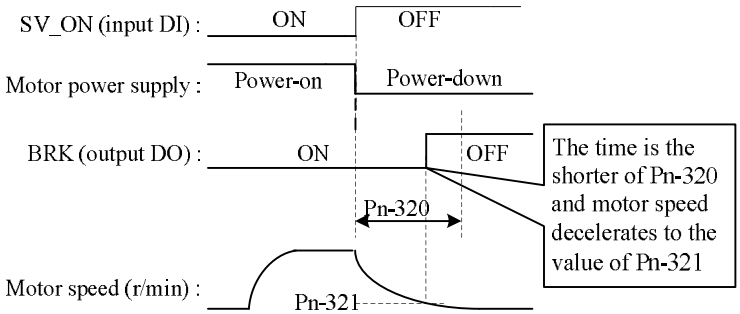
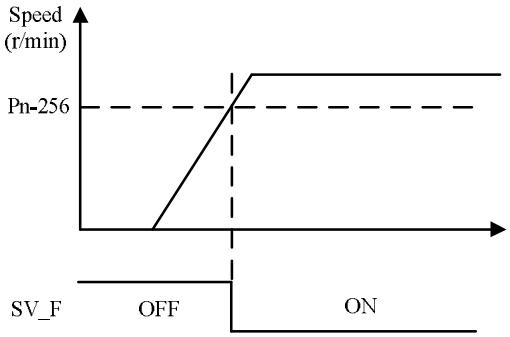
<table>
<tr><td>11</td><td>SP1</td><td rowspan="3">Internal position command selection.
<table><tr><th>SP3</th><th>SP2</th><th>SP1</th><th>Position command</th><th>Speed</th></tr><tr><td>OFF</td><td>OFF</td><td>OFF</td><td>Pn-208，Pn-209</td><td>Pn-210</td></tr><tr><td>OFF</td><td>OFF</td><td>ON</td><td>Pn-213，Pn-214</td><td>Pn-215</td></tr><tr><td>OFF</td><td>ON</td><td>OFF</td><td>Pn-218，Pn-219</td><td>Pn-220</td></tr><tr><td>OFF</td><td>ON</td><td>ON</td><td>Pn-223，Pn-224</td><td>Pn-225</td></tr><tr><td>ON</td><td>OFF</td><td>OFF</td><td>Pn-228，Pn-229</td><td>Pn-230</td></tr><tr><td>ON</td><td>OFF</td><td>ON</td><td>Pn-233，Pn-234</td><td>Pn-235</td></tr><tr><td>ON</td><td>ON</td><td>OFF</td><td>Pn-238，Pn-239</td><td>Pn-240</td></tr><tr><td>ON</td><td>ON</td><td>ON</td><td>Pn-243，Pn-244</td><td>Pn-245</td></tr></table></td></tr>
<tr><td>12</td><td>SP2</td></tr>
<tr><td>13</td><td>SP3</td></tr>
<tr><td>14</td><td>SC1</td><td rowspan="3">Internal speed command selection.
<table><tr><th>SC3</th><th>SC2</th><th>SC1</th><th>Speed command</th></tr><tr><td>OFF</td><td>OFF</td><td>OFF</td><td>Internal speed 1:Pn-200</td></tr><tr><td>OFF</td><td>OFF</td><td>ON</td><td>Internal speed 2:Pn-201</td></tr><tr><td>OFF</td><td>ON</td><td>OFF</td><td>Internal speed 3:Pn-202</td></tr><tr><td>OFF</td><td>ON</td><td>ON</td><td>Internal speed 4:Pn-203</td></tr><tr><td>ON</td><td>OFF</td><td>OFF</td><td>Internal speed 5:Pn-204</td></tr><tr><td>ON</td><td>OFF</td><td>ON</td><td>Internal speed 6:Pn-205</td></tr><tr><td>ON</td><td>ON</td><td>OFF</td><td>Internal speed 7:Pn-206</td></tr><tr><td>ON</td><td>ON</td><td>ON</td><td>Internal speed 8:Pn-207</td></tr></table></td></tr>
<tr><td>15</td><td>SC2</td></tr>
<tr><td>16</td><td>SC3</td></tr>
<tr><td>17</td><td>TRQ1</td><td rowspan="2">Internal torque command selection.
<table><tr><th>TRQ2</th><th>TRQ1</th><th>Torque command</th></tr><tr><td>OFF</td><td>OFF</td><td>Internal torque 1: Pn-260</td></tr><tr><td>OFF</td><td>ON</td><td>Internal torque 2: Pn-261</td></tr><tr><td>ON</td><td>OFF</td><td>Internal torque 3: Pn-262</td></tr><tr><td>ON</td><td>ON</td><td>Internal torque 4: Pn-263</td></tr></table></td></tr>
<tr><td>18</td><td>TRQ2</td></tr>
<tr><td>19</td><td>GEAR1</td><td rowspan="2">Electronic gear ratio selection.
<table><tr><th>GEAR2</th><th>GEAR1</th><th>Electronic gear ratio</th></tr><tr><td>OFF</td><td>OFF</td><td>Pn-012/ Pn-013</td></tr><tr><td>OFF</td><td>ON</td><td>Pn-326/ Pn-013</td></tr><tr><td>ON</td><td>OFF</td><td>Pn-327/ Pn-013</td></tr><tr><td>ON</td><td>ON</td><td>Pn-328/ Pn-013</td></tr></table></td></tr>
<tr><td>20</td><td>GEAR2</td></tr>
<tr><td>21</td><td>SDIR1</td><td>Speed direction selection.
If Pn-042=0, the direction of speed command is controlled by signal CINV;
If Pn-042=1, the direction of speed command is controlled by signals SDIR1 and SDIR2.</td></tr>
</table>

<table>
<tr><td>22</td><td>SDIR2</td><td>
<table>
<tr><th>SDIR2</th><th>SDIR1</th><th>The status of motor</th></tr>
<tr><td>OFF</td><td>OFF</td><td>The motor is locked.</td></tr>
<tr><td>OFF</td><td>ON</td><td>Motor rotates in the direction of CCW.</td></tr>
<tr><td>ON</td><td>OFF</td><td>Motor rotates in the direction of CW.</td></tr>
<tr><td>ON</td><td>ON</td><td>The motor is locked.</td></tr>
</table>
</td></tr>
<tr><td>23</td><td>CINV</td><td>Speed command reverse.
If Pn-042=0, the direction of speed command is controlled by signal CINV. When the signal is OFF, the motor rotates in the direction of speed command .While the signal is ON, the motor rotates in the contrary direction with speed command.
If Pn-042=1, the direction of speed command is controlled by signals SDIR1 and SDIR2.</td></tr>
<tr><td>25</td><td>SHOM</td><td>Start homing.</td></tr>
<tr><td>26</td><td>ORGP</td><td>The homing reference point.</td></tr>
<tr><td>27</td><td>CNTR</td><td>The signal is used to start inner position running.(Refer to parameter Pn-249.)</td></tr>
</table>

7.4 Digital output DO function explanation

Value	Sign	Function description
1	SV_RY	Servo ready. When the main power of servo driver is supplied and the driver has not any alarm, the ON signal is output in 1.5 seconds.
2	ALM	Alarm Output. The signal state of ALM is ON when there is alarm displays in the submenu of ‘dP-Err’.
3	SV_F	Positioning completion. In position control mode, if position deviation is equal to or less than the value of Pn-254, the signal state of SV_F is ON. **Note**: The value of ‘Pn-254’ does not influence the actual location accuracy of servo system. When position deviation is greater than the value of ‘Pn-255’, driver output position excessive deviation alarm (Err8). 

<table>
<tr><td>4</td><td>BRK</td><td>Electromagnetic brake. (Refer to chapter 7.2.)
1.Motor in stationary state (motor speed < Pn-318), timing diagram of BRK is shown below.
 

2.Motor in running state (motor speed ≥ Pn-318), timing diagram of BRK is shown below.
 
</td></tr>
<tr><td>5</td><td>SV_S</td><td>Speed arrival signal. In speed control mode, when motor speed exceeds the value of Pn-256, the signal state of SV_S is ON.
 
</td></tr>
<tr><td>6</td><td>SV_T</td><td>Torque arrival signal. In torque control mode, when motor speed exceeds the value of Pn-259, the signal state of SV_T is ON.</td></tr>
<tr><td>7</td><td>HOME</td><td>The homing completion signal.</td></tr>
</table>

Chapter 8 Alarm

Alarm code	Name	The main reason	Treatment measures
Err 0	Normal	Normal	
Err 1	IPM protection	Alarm after servo on.	Contact the manufacturer.
		Unreasonable parameter setting.	Adjust parameters.
		Driver overheating.	Please change motor and driver for high-power.
		Be disturbed.	Bad grounding.
		Alarm during start-stop process . The load inertia is too large or the acceleration/deceleration time is too short.	Reduce the load inertia. Increase acceleration/deceleration time of upper controller.
Err 2	Overcurrent	Alarm after servo on.Driver output short circuit.	Eliminate short circuit.
		Motor oscillation during operation.	Parameter unreasonable.Adjust parameters.
		Load current is too large.	Change for high-power driver.
		Poor motor insulation.	Change motor.
		Alarm during start-stop process . The load inertia is too large or the acceleration/deceleration time is too short.	Reduce the load inertia. Increase acceleration/deceleration time of upper controller.
Err 3	Undervoltage	Alarm during running .Low power supply voltage.	Check power supply voltage.
		Alarm during power on.Circuit board fault.	Contact the manufacturer.
		There is no input voltage for main circuit.	Reconfirm the power supply.
Err 4	Overvoltage	Brake resistor does not work.	Brake resistor wire break; Brake resistor is broken;
		Brake resistor capacity is too small.	Replacement of large capacity brake resistor.
		Alarm during power on.Power voltage is too high.	Check the power voltage.
Err 5	No current in analog channel A.	Circuit board fault.	Contact the manufacturer.
Err 6	No current in analog channel B.	Circuit board fault.	Contact the manufacturer.
Err 7	Overspeed	Alarm during power on.Circuit board fault.	Replacement of driver/motor.
		Encoder fault.	Replacement of encoder.
		Input command pulse frequency is too high.	Set input pulse correctly.
		Acceleration/deceleration time constant is too small, causing too large speed overshoot.	Increase acceleration/deceleration time of upper controller.
		Input electronic gear ratio is too large.	Set electronic gear ratio correctly.
		Servo motor is unstable, causing overshoot.	Adjusting the associated gain.If gain could not be set to suitable value, please reduce the load inertia.

Alarm code	Name	The main reason	Treatment measures
Err 8	Position excessive deviation	Alarm during power on.Circuit board fault.	Contact the manufacturer.
		Wrong connection of motor U,V,W leads.	Correct wiring.
		Wrong connection of encoder leads.	Change encoder line.
		Motor locked-rotor.	Check mechanism.
		Position overshoot detection range is set too small.	Increase position overshoot detection range.
		Gain value is too small.	Increase gain value.
		Torque limit is too small.	Increase torque setting value.
		External load is too large.	Change for high-power motor and driver.
Err 9	Torque command exceed limit	Torque command exceed limit of time is greater than the allowed time.	Adjust torque command.
		Parameter setting is not reasonable.	Adjust parameters.
Err 10	FPGA chip fault	Chip data-processing transmission fault.	Power-on again.
		Chip or circuit board fault.	Contact with the manufacturer.
Err 11	Encoder fault	Alarm during power on.Bad connection of encoder's wiring.	Reconnect encoder line well.
		Alarm during power on.Encoder line fault.	Change encoder line.
		Alarm during power on.Motor encoder fault.	Change motor.
		Alarm during power on.Encoder does not match witch parameter.	Modify the parameter Pn-050.
		Alarm during running.The encoder's plug gets loose because of mechanical vibration, for it is not screwed well.	Reconnect encoder line well.
		Alarm during Operation.Encoder cable is too long, which cause the power supply voltage of encoder too low.	Shorten the cable. Adopt poly-core cable with parallel connection.
Err 12	Encoder signal transmission fault	Bad connection of encoder's wiring.	Reconnect encoder line well.
		Encoder line suffers from interference.	Shorten encoder line as far as possible, and undertake shielding measures.
		Encoder fault.	Change motor.
Err 13	Z pulse lose	Bad connection of encoder's wiring.	Reconnect encoder line well.
		Encoder fault.	Change motor.
		Circuit board fault.	Change driver.
Err 14	Motor thermal overload	Alarm during power on.Circuit board fault.	Change driver.
		Alarm during power on.Unreasonable parameters setting.	Adjust parameters.
		Motor exceed the rated torque running for a long time	Check load or replace high-power driver&motor.
Err 15	Driver overload protection	Motor power line not connected.Major loop of driver is not power-on.	Wiring as it is requested.
		Motor locked-rotor.	Check whether the motor is seized.
		Output current of driver is too large.	Change driver.

Alarm code	Name	The main reason	Treatment
Err 16	Software overcurrent	The instantaneous current of driver is too large.	Contact the manufacturer.
Err 17	Overload	Alarm during power on.Circuit board fault.	Change drive.
		Motor exceed the rated torque running for a long time	Check load. Reduce start-stop frequency. Reduce the torque limit value. Change for high-power motor and driver.
		Motor shock.	Adjust gain. Increase the acc/dec time. Reduce the load inertia.
		U、V、W break.	Check wire.
Err 18	Brake fault	Alarm during power on.Circuit board fault.	Change drive.
		Braking resistor wiring fault	Check wire.
		Brake resistor does not work.	Change brake resistor.
		Brake resistor capacity is too small.	Reduce start-stop frequency. Increase the acc/dec time. Reduce the load inertia. Change for high-power motor and driver.
		The main circuit power supply is too high.	Check power supply.
Err 24	Homing timeout	Cannot fine the homing reference point	Check the signal of homing is normal or not.
		Unreasonable parameter setting.	Adjust parameters.

Notice: If there is different alarm code from the above table, please contact the manufacturer.

Chapter 9 Running and adjustment

According to the steps of *ELESY servo driver operation manual* make motor normal rotation before connected load to it. Usually, a driver should take the following tests before put into use.

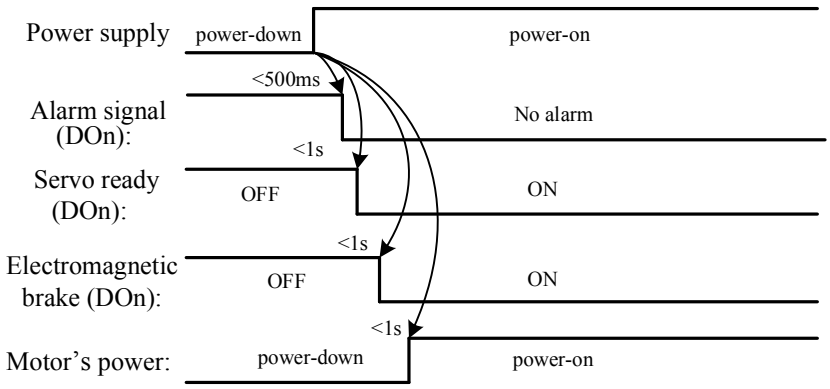
1. Wiring and inspection.
2. Power-on and adjust parameters.
3. No-load operation.
4. Control function debugging.

9.1 Power-on

1. Checking before power on.

- Whether the specifications of driver and motor match each other.
- Wiring of R,S,T and U,V,W cannot be reversed, and the terminal has not loose phenomenon.
- Check the power supply is normal or not: 3-phase 220V or 1-phase 220V..
- Whether the encoder terminal wiring is correct.
- Whether the driver and motor are well grounded.

2. Power-on sequence



Digital input IO (DIn) functions are customized via the parameters 'Pn-301 ~ Pn-307'. Digital output IO (DOn) functions are customized via the parameters 'Pn-309 ~ Pn-312'.

9.2 Trial running without load

1. Sr trail run (Panel operation refer to chapter 5)

1、 Set parameter of 'Pn-004' to 2 to select speed trial run control mode. Enter into menu of 'Sr-',servo drive displays "S 0".

2、 Press '▲' key to increase speed command, then enter into 'dP-SPd' submenu to observe whether the

actual rotate speed of motor is the setting velocity.

3、 Press '▼' key to decrease speed command to a negative, then enter into 'dP-SPd' submenu to observe whether the actual rotate speed of motor is the setting velocity.

2. JOG trial run

a. Modify parameter 'Pn-022' to suitable JOG speed.Set parameter of 'Pn-004' to 3 to select JOG trial run control mode. Enter into menu of 'Jr-'.Servo drive displays "J 0".

b. Press '▲' key and hold, motor will rotate in the direction of CCW at the speed of 'Pn-022'. Release the key, motor will be in the state of zero-speed locked.

c. Press '▼' key and hold, motor will rotate in the direction of CW at the speed of 'Pn-022'.Release the key, motor will be in the state of zero-speed locked.

9.3 Control functions debugging

There are two ways to enable the servo drive:The first,it can be reached by external digital IO input terminal (DIn),For excample set parameter Pn-301=1,DI1 input the servo on signal.Second, it can be inner compelled by setting Pn-057 to 2.

9.3.1 Position control

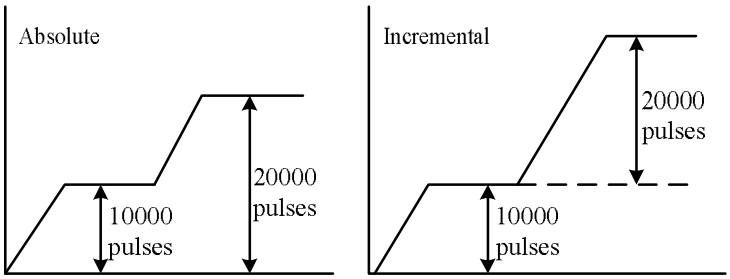
In the position control mode,the position command can be gived by external terminal or parameters. Measuring the power supply of R,S,T(3-phase 220V or 1-phase 220V) is normal or not befor wiring, Make sure there are no problems connect the power cord and power on. Reference to the motor adapter table (Appendix) modifies the parameter of 'Pn-001' as the corresponding motor model code. Enter into the menu group of 'EE-' and select 'EE-dEF', press 'SET' key. If 'donE' is shown on nixie tube means the driver's parameters have been recovered to factory defaults,Power-off. Wiring correct,and no-load test first.

1. Internal position control

(1) Set parameters of "Pn-004=0" and "Pn-025=1" to select internal position control mode.

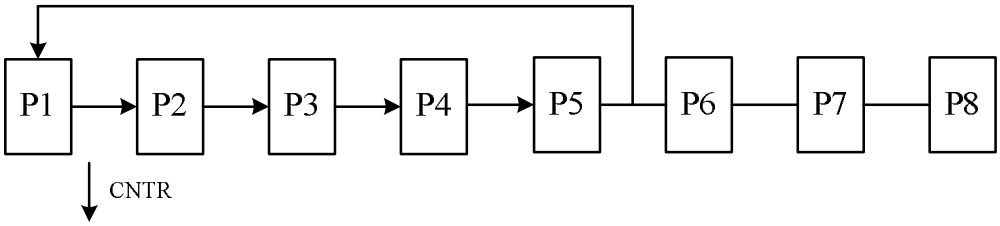
(2) Operating instructions：

① The position command is supplied by parameters (Pn-208,Pn-209)~(Pn-243,Pn-244). Set the position command calculation according to parameter Pn-248,difference is shown below.(e.g.: P1=10000，P2=20000.)

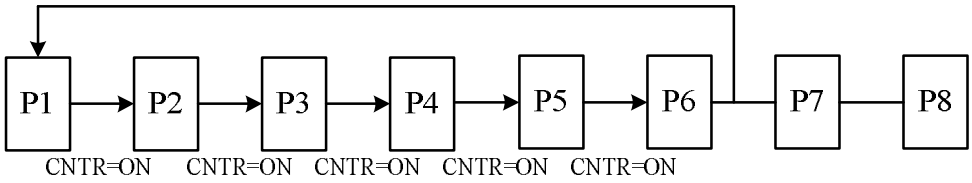


② Select the running mode of internal position control by parameter Pn-249:

a. Pn-249=0(Pn-251=5): When CNTR signal is detected a valid jump,servo drive runs once with the number of the position segment set by Pn-251,and finally stopped at the first location,and output positioning completed signal. It should be noted, the CNTR trigger signal is valid only when the positioning is completed, otherwise the signal CNTR will not be response.



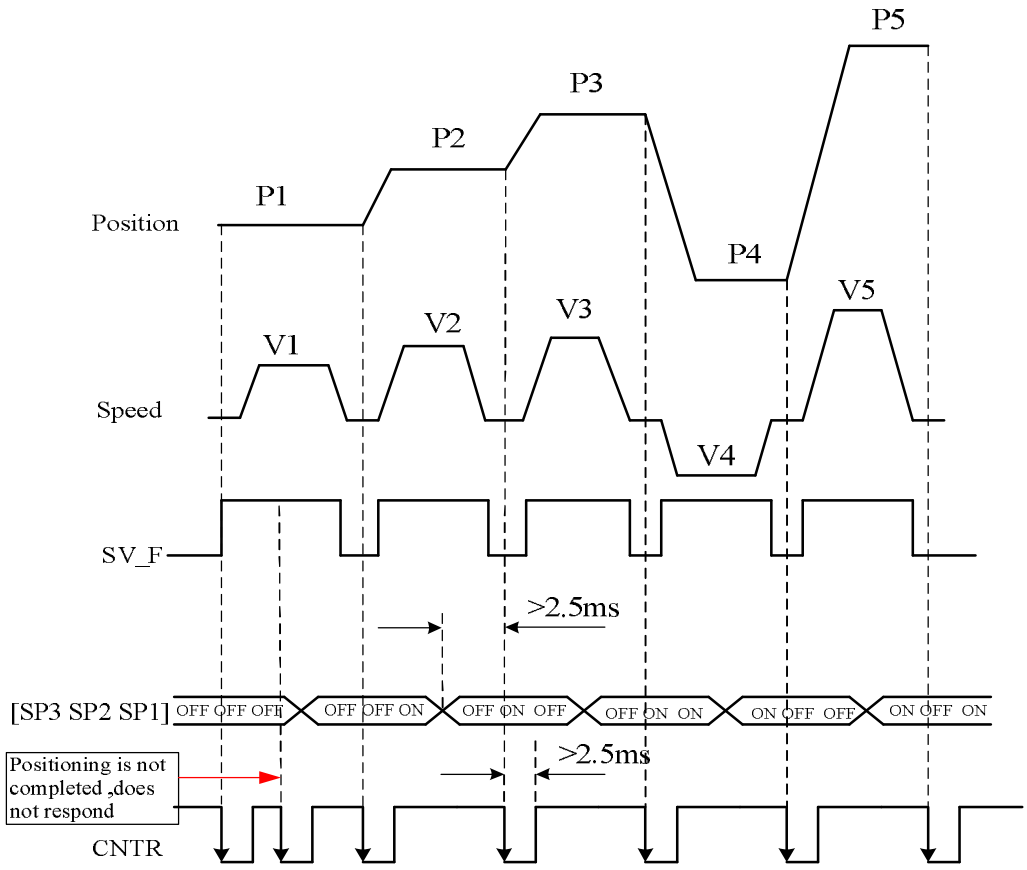
b. Pn-249=1(Pn-251=6): In this mode,the drive will always loop runs with the number of the position segment set by Pn-251 until CNTR becomes invalid.



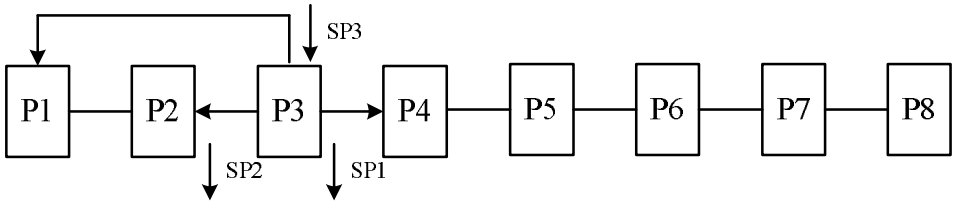
c. Pn-249=2: In this mode, SP1, SP2 and SP3 are set to specify the running position, the falling edge of signal CNTR start running.

e.g.: [SP3, SP2 ,SP1] = [OFF,OFF,OFF], CNTR signal input falling edge,then the drive runs with the position command set by parameters Pn-208 and Pn-209, and positioning complete signal output when the position command is finished.

SP3	SP2	SP1	CNTR	Position command	Speed
OFF	OFF	OFF	↓	Pn-208，Pn-209	Pn-210
OFF	OFF	ON	↓	Pn-213，Pn-214	Pn-215
OFF	ON	OFF	↓	Pn-218，Pn-219	Pn-220
OFF	ON	ON	↓	Pn-223，Pn-224	Pn-225
ON	OFF	OFF	↓	Pn-228，Pn-229	Pn-230
ON	OFF	ON	↓	Pn-233，Pn-234	Pn-235
ON	ON	OFF	↓	Pn-238，Pn-239	Pn-240
ON	ON	ON	↓	Pn-243，Pn-244	Pn-245



d. Pn-249=3(Pn-251=5,Current position is P3): SP3 signal is detected a valid jump, servo drive runs to the first location; SP2 signal is detected a valid jump, servo drive runs to the previous location,if it is the first location,stop here; SP1 signal is detected a valid jump, servo drive runs to the next location,if it is the last location,stop here.



(3) Several key parameters associated with internal position control mode: Pn-004，Pn-005，Pn-006，Pn-009，Pn-010，Pn-025，Pn-208~Pn-251，Pn-301~Pn-307 (Refer to chapter 7). Set the parameter values correct after power on.If there is no problem enable the drive,and give position command by changing the status of signals CNTR,SP1,SP2 and SP3. Observe the dynamic effect of motor and adjust gain for reasonable value.

2.Pulse input position control

(1) Set parameter of 'Pn-004=0' and 'Pn-025=0' to select pulse input position control mode.

(2) According to the input pulse frequency set electronic gear ratio (Pn-012/Pn-013) and set position command input type by parameters Pn-014,Pn-015 and Pn-047. Adjust several key parameters associated with position

control mode: Pn-004，Pn-005，Pn-006，Pn-009，Pn-010，Pn-012，Pn-013，Pn-014，Pn-015，Pn-025，Pn-047 (Refer to chapter 7). Power on if there is no problem and enable the drive.Give pulse command to servo drive.,observe the dynamic effect of motor and adjust gain for reasonable value.

9.3.2 speed control

In the speed control mode,the speed command can be gived by analog input or parameters. Measuring the power supply of R,S,T(3-phase 220V or 1-phase 220V) is normal or not befor wiring, Make sure there are no problems connect the power cord and power on. Reference to the motor adapter table (Appendix) modifies the parameter of 'Pn-001' as the corresponding motor model code. Enter into the menu group of 'EE-' and select 'EE-dEF', press 'SET' key. If 'donE' is shown on nixie tube means the driver's parameters have been recovered to factory defaults,Power-off. Wiring correct,and no-load test first.

1.Internal speed control

(1) Set parameter of 'Pn-004=1' and 'Pn-024=1' to select internal speed control mode.

(2) Operating instructions：

① The speed command is supplied by parameters Pn-200~ Pn-207.

② Set parameters of 'Pn-302=14', 'Pn-303=15' and 'Pn-304=16' which define DI2,DI3 and DI4 input functions for SC1, SC2 and SC3. Select respective internal speed command by signals SC1,SC2 and SC3.The corresponding relationship is as follows. (Refer to chapter 7.3.)

Note: OFF-The switch status is opened. ON-The switch status is turned.

SC3	SC2	SC1	Speed command
OFF	OFF	OFF	Internal speed 1: Pn-200
OFF	OFF	ON	Internal speed 2: Pn-201
OFF	ON	OFF	Internal speed 3: Pn-202
OFF	ON	ON	Internal speed 4: Pn-203
ON	OFF	OFF	Internal speed 5: Pn-204
ON	OFF	ON	Internal speed 6: Pn-205
ON	ON	OFF	Internal speed 7: Pn-206
ON	ON	ON	Internal speed 8: Pn-207

③ Several key parameters associated with internal speed control mode: Pn-004，Pn-005，Pn-006，Pn-024，Pn-042， Pn-052，Pn-053，Pn-200~Pn-207，Pn-301~Pn-307 (Refer to chapter 7). Set the parameter values correct after power on.If there is no problem enable the drive,and give speed command by changing the status of signals SC1,SC2 and SC3. Observe the dynamic effect of motor and adjust gain for reasonable value.

2. Analog speed control mode

(1) Set parameters of 'Pn-004=1' and 'Pn-024=0' to select analog speed control mode.

(2) Several key parameters associated with internal speed control mode: Pn-004，Pn-005，Pn-006，Pn-024，Pn-031，Pn-042，Pn-043， Pn-051，Pn-052，Pn-053 (Refer to chapter 7). Set the parameter values correct after power on. If there is no problem enable the drive. Wait for the 'RUN' indicator light up, perform automatic zero drift compensation operation: Enter into menu of 'AU-'. Choose the submenu of 'AU-SPd', and press 'SET' key, until 'donE' is displayed on nixie tube, compensation value will be write to parameter 'Pn-043'. Upper control output analog instruction to drive after the above steps are completed. Observe the dynamic effect of motor and adjust gain for reasonable value.

9.3.3 Torque control

In the torque control mode,the torque command can be gived by analog input or parameters. Measuring the power supply of R,S,T(3-phase 220V or 1-phase 220V) is normal or not befor wiring, Make sure there are no problems connect the power cord and power on. Reference to the motor adapter table (Appendix) modifies the parameter of 'Pn-001' as the corresponding motor model code. Enter into the menu group of 'EE-' and select 'EE-dEF', press 'SET' key. If 'donE' is shown on nixie tube means the driver's parameters have been recovered to factory defaults,Power-off. Wiring correct,and no-load test first.

1. Internal torque control

(1) Set parameters of 'Pn-004=6' and 'Pn-026=1' to select internal torque control mode.

(2) Operating instructions：

① The torque command is supplied by parameters Pn-260~ Pn-263.

② Set parameters of 'Pn-302=17' and 'Pn-303=18' which define DI2,DI3 input functions for TRQ1 and TRQ2. Select respective internal torque command by signals TRQ1 and TRQ2.The corresponding relationship is as follows. (Refer to chapter 7.3.)

Note: OFF-The switch status is opened. ON-The switch status is turned.

TRQ2	TRQ1	Torque command
OFF	OFF	Internal torque 1: Pn-260
OFF	ON	Internal torque 2: Pn-261
ON	OFF	Internal torque 3: Pn-262
ON	ON	Internal torque 4: Pn-263

③ Several key parameters associated with internal torque control mode: Pn-004，Pn-026，Pn-033，Pn-260~Pn-263，Pn-268，Pn-269，Pn-271，Pn-272，Pn-301~Pn-307 (Refer to chapter 7). Set the parameter

values correct after power on.If there is no problem enable the drive,and give torque command by changing the status of signals TRQ1 and TRQ2. Observe the dynamic effect of motor and adjust gain for reasonable value.

2.Analog torque control

(1) Set parameters of ‘Pn-004=6’ and ‘Pn-026=0’ to select analog torque control mode.

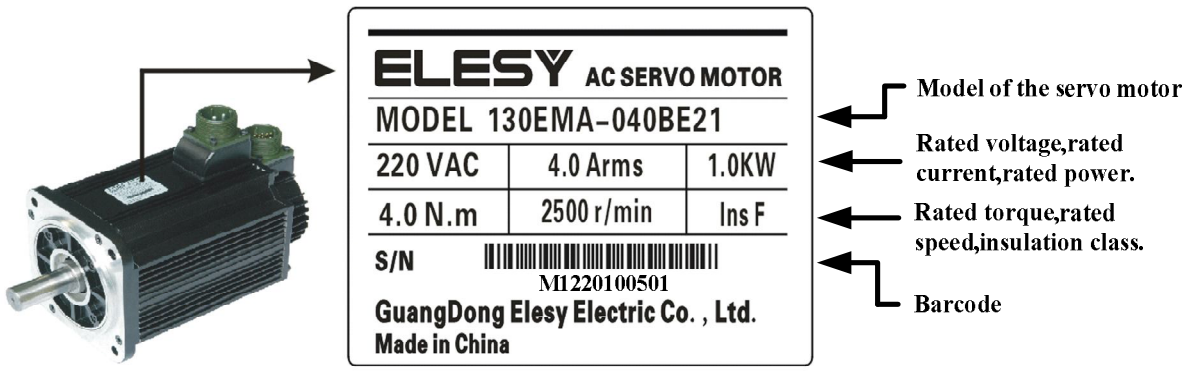
(2) Several key parameters associated with analog torque control mode: Pn-004，Pn-026，Pn-033，Pn-041，Pn-045，Pn-268，Pn-269，Pn-271，Pn-272 (Refer to chapter 7). Set the parameter values correct after power on.If there is no problem enable the drive. Wait for the ‘RUN’ indicator light up, perform automatic zero drift compensation operation: Enter into menu of ‘AU-’,choose the submenu of ‘AU-trq’, and press ‘SET’ key, until ‘donE’ is displayed on nixie tube, compensation value will be write to parameter ‘Pn-045’. Upper control output analog instruction to drive after the above steps are completed. Observe the dynamic effect of motor and adjust gain for reasonable value.

Chapter 10 Servo motor

10.1 Nameplate and model introduction

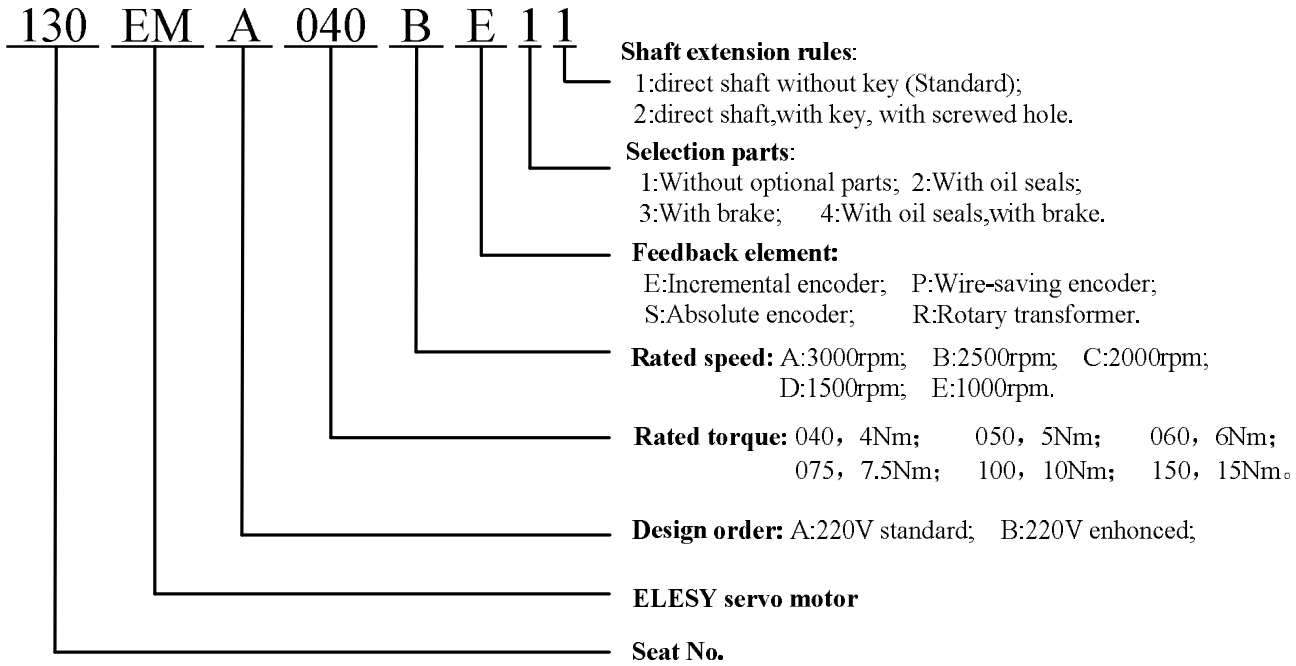
1. Nameplate

Figure 10-1 Servo motor nameplate description



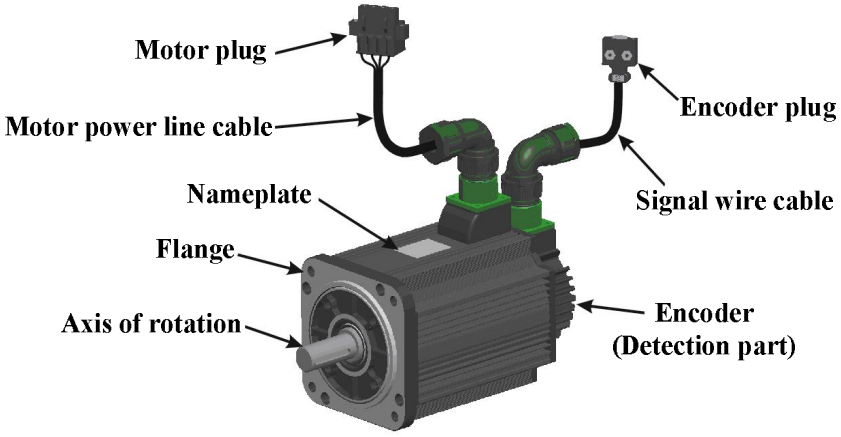
2. Model

Figure 10-2 Servo motor model description



10.2 Each part name of servo Motor

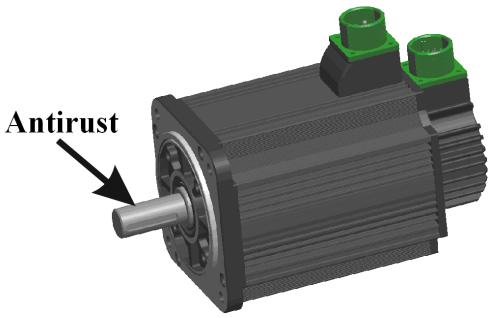
Figure 10-3 Each part name of servo motor



10.3 The installation of the servo motor

The installation of the servo motor should be in accordance with the manual. If motor is installed improperly or in the wrong place, the motor's service life would shorten, even may cause unexpected accident. The shaft end of the servo motor had been daubed with antirust additive, so please clear the antirust additive before installation.

Figure 10-4 The location of antirust



1. Installation site

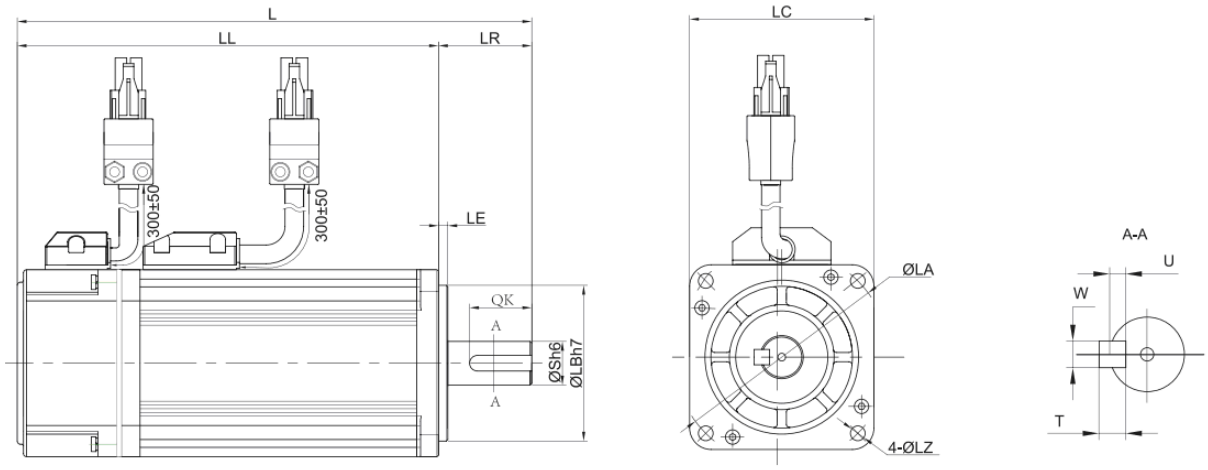
The servo motor should be installed inside the room and the following ambient conditions be satisfied:

- There is no corrosive, inflammable and explosive gas.
- Draughty, no dust and dry.
- The ambient temperature for operation is within the limit of 0～40℃.
- Storage temperature: - 10℃～50℃.
- The relative humidity keeps in the limits of 30%～95%RH; No moisture condensation.
- Be convenient for examining and clearing.

2. Installation dimension

(1) 60、80 series motor dimensions

Figure 10-5 The 60,80 series motor installation dimensions

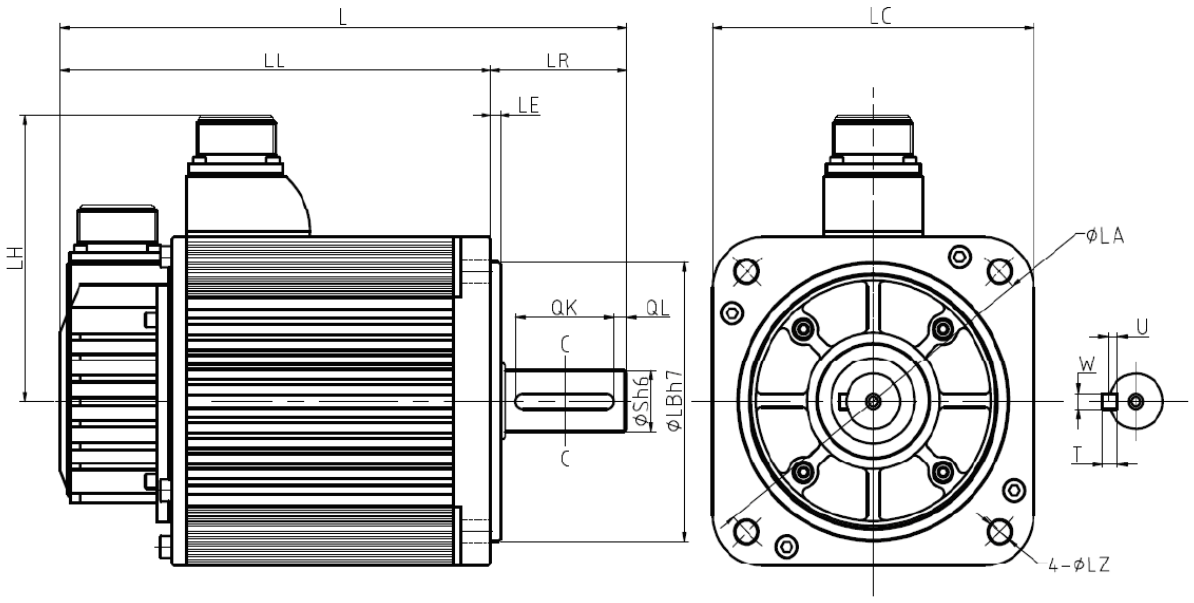


Motor model		60EMA006A	60EMA013A	80EMA016A	80EMA024A	80EMA032A
Rated output power	W	200	400	500	750	1000
Rated torque	N.m	0.64	1.27	1.6	2.4	3.2
Rated current	Arms	1.5	2.5	3.0	4.0	5.2
Rated speed	r/min	3000				
Moment of inertia	$\times 10^{-4} kg \cdot m^2$	0.19(0.26)	0.33(0.40)	1.09(1.29)	1.24(1.44)	1.59(1.79)
L	mm	140(180)	165(205)	158(201)	173(216)	193(236)
LL	mm	110(150)	135(175)	123(166)	138(181)	158(201)
LR	mm	30	30	35	35	35
LA	mm	70	70	90	90	90
LB	mm	50	50	70	70	70
S	mm	14	14	19	19	19
LC	mm	60	60	80	80	80
LE	mm	3	3	3	3	3
LZ	mm	5	5	6	6	6
QK	mm	20	20	25	25	25
W	mm	5	5	6	6	6
T	mm	5	5	6	6	6
U	mm	3	3	3.5	3.5	3.5

Note: The dimensions in brackets is the size of motor with brake.

(2) 110/130 series motor dimensions

Figure 10-6 The 110/130 series motor installation dimensions



Motor model		110EMA-		130EMA-				
		040B	060B	040B	050B	060B	060E	075B
Rated output power	KW	1.0	1.57	1.0	1.3	1.57	0.63	1.96
Rated torque	N•m	4.0	6.0	4.0	5.0	6.0	6.0	7.5
Rated current	Arms	4.0	6.0	4.2	5.0	6.2	3.6	7.8
Rated speed	r/min	2500					1000	2500
Moment of inertia	$\times 10^{-4} kg.m^2$	5.4 (6.0)	7.5 (8.1)	8.9 (9.5)	9.7 (10.3)	12.4 (13.0)	12.4 (13.0)	17.2 (17.8)
L	mm	238(293)	278(333)	215(267)	221(273)	231(283)	231(283)	251(303)
LL	mm	185(240)	225(280)	159(211)	165(217)	175(227)	175(227)	195(247)
LR	mm	53	53	56	56	56	56	56
LA	mm	130	130	145	145	145	145	145
LB	mm	95	95	110	110	110	110	110
S	mm	19	19	22	22	22	22	22
LC	mm	110	110	130	130	130	130	130
LE	mm	5	5	4	4	4	4	4
LH	mm	99	99	113	113	113	113	113
LZ	mm	8.5	8.5	9	9	9	9	9
QK	mm	35	35	35	35	35	35	35
QL	mm	0	0	7.5	7.5	7.5	7.5	7.5
W	mm	6	6	6	6	6	6	6
T	mm	6	6	6	6	6	6	6
U	mm	3.5	3.5	3.5	3.5	3.5	3.5	3.5

Motor model		130EMA-							
		075C	075E	100B	100C	100D	100E	150C	150D
Rated output power	KW	1.57	0.79	2.6	2.1	1.57	1.0	3.1	2.35
Rated torque	N•m	7.5	7.5	10	10	10	10	15	15
Rated current	Arms	6.5	4.5	10.5	9.0	6.5	5.0	11.5	9.0
Rated speed	r/min	2000	1000	2500	2000	1500	1000	2000	1500
Moment of inertia	$\times 10^{-4} kg.m^2$	17.2 (17.8)	17.24 (17.8)	21.9 (22.5)	21.9 (22.5)	21.9 (22.5)	21.9 (22.5)	28.9 (29.5)	28.9 (29.5)
L	mm	251(303)	251(303)	271(323)	271(323)	271(323)	271(323)	301(353)	301(353)
LL	mm	195(247)	195(247)	215(267)	215(267)	215(267)	215(267)	245(297)	245(297)
LR	mm	56	56	56	56	56	56	56	56
LA	mm	145	145	145	145	145	145	145	145
LB	mm	110	110	110	110	110	110	110	110
S	mm	22	22	22	22	22	22	22	22
LC	mm	130	130	130	130	130	130	130	130
LE	mm	4	4	4	4	4	4	4	4
LH	mm	113	113	113	113	113	113	113	113
LZ	mm	9	9	9	9	9	9	9	9
QK	mm	35	35	35	35	35	35	35	35
QL	mm	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5
W	mm	6	6	6	6	6	6	6	6
T	mm	6	6	6	6	6	6	6	6
U	mm	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5

Note: The dimensions in brackets is the size of motor with brake.

3. Installation direction

The servo motor can be installed horizontally, vertically, or in any direction.

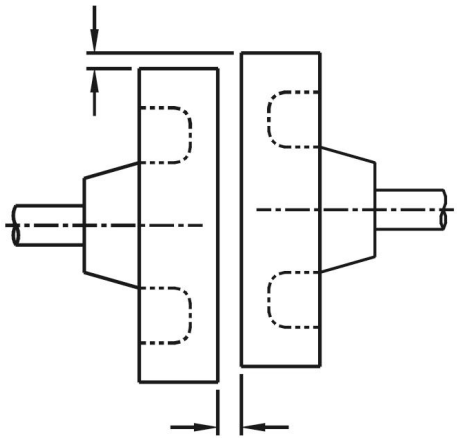
4. Dampproof and dustproof

1. When being used in the place with water-drop dripping, please employ it on the base of confirming the servo motor's protection framework (except the shaft opening part).
2. When being used in the place where there is oil-drop dripping to the shaft opening, please appoint servo motor with oil seal. Please make sure the oil level is lower than the oil seal's lip while using, and the oil seal can keep the splashing oil-foam in good condition. When using servo motor above the shaft, please confirm there is no oil-logged of the oil seal's lip.
3. When the aviation plug (the leads outlet) can only be installed upwards, please keep the cable baggy to prevent oil and water. Meanwhile, the cable mustn't be soaked in water or oil.

5. Coordination with machine

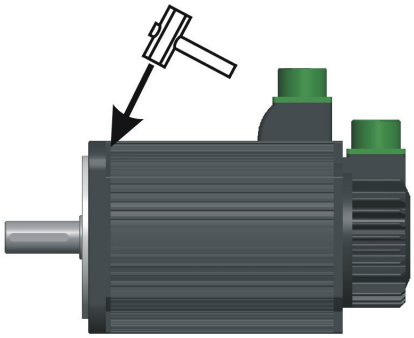
1. When connecting with machine, please use elastic couplings as far as possible, and keep the axle centre of servo motor is in a line with that of mechanical load. The installation of servo motor should meet the demand of concentricity tolerance as the following chart shows.

   To measure in the quartering of a round, the difference of the maximum and the minimum is less than 0.03mm (rotating with coupling).

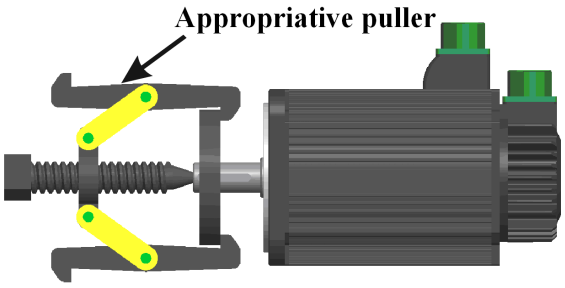


WARNING If the concentricity were out of tolerance, it would cause mechanical vibration which may damage the bearings and encoder.

2. The encoder is installed in the back end cap of the motor, connecting directly with motor shaft. Do not thump the motor. If to knock the motor is inevitable because of positioning or any other reason, please knock the front end of flange plate with rubber hammer or plastic hammer as far as possible

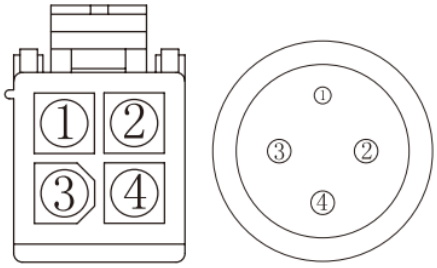


3. For removing wheel and pulley, please use an appropriative puller.



10.4 Terminal signal definition of servo motor

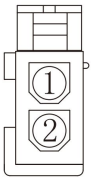
1. Motor connector terminals (4-core)



Pin	1	2	3	4
Signal	PE	U	V	W

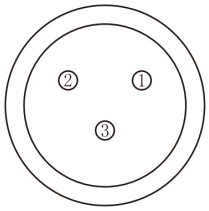
2. Brake connector terminals

(1) 2-core



Pin	1	2
Signal	+24	0V

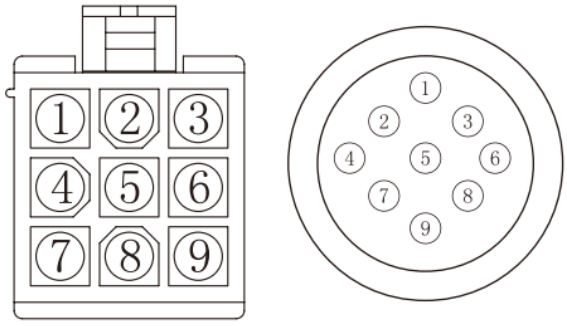
(2) 3 -core



Pin	1	2
Signal	+24	0V

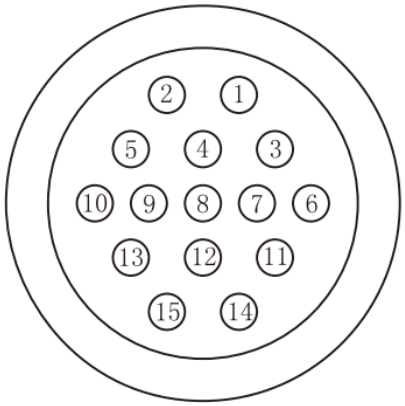
3. Encoder feedbackterminals

(1) 9-core



Pin	Signal definition		
	Wire-saving encoder	Absolute encoder	Resolver
1	FG	FG	FG
2	+5V	+5V	
3	0V	0V	
4	A+		R1
5	B+	SD+	R2
6	Z+	VB+	SIN+
7	A−	VB−	SIN−
8	B−	SD−	COS+
9	Z−		COS−

(2) 15-core



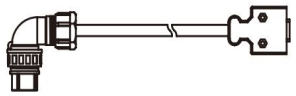
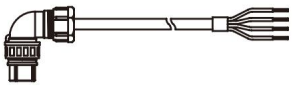
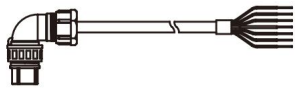
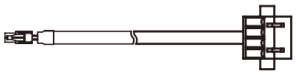
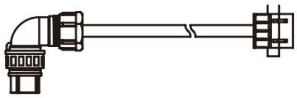
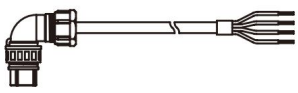
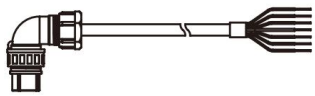
Pin	Signal definition		
	Incremental encoder	**Absolute encoder**	**Resolver**
1	FG	FG	FG
2	+5V	+5V	
3	0V	0V	
4	A+		R1
5	B+	SD+	R2
6	Z+	VB+	SIN+
7	A−	VB−	SIN−
8	B−	SD−	COS+
9	Z−		COS−
10	U+		
11	V+		
12	W+		
13	U−		
14	V−		
15	W−		

Appendix

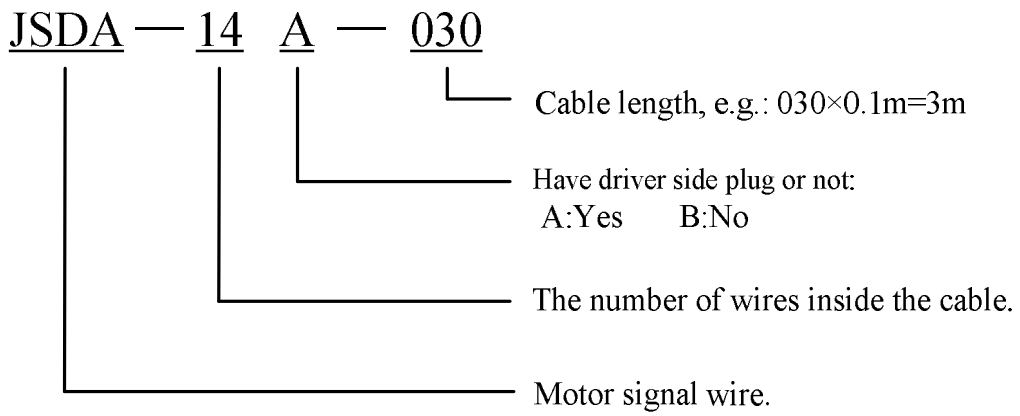
■ Motor adaptation table

Motor model code (Pn-001)	Motor model	Rated torque	Rated speed	Rated current	Rated power	Adapter driver
10	130EMA-075C	7.5Nm	2000rpm	6.5A	1.57KW	ESDB30
11	130EMA-075B	7.5Nm	2500rpm	7.8A	1.96KW	
12	130EMA-075A	7.5Nm	3000rpm	8.8A	2.36KW	
13	130EMA-100D	10Nm	1500rpm	6.5A	1.57KW	
14	130EMA-100C	10Nm	2000rpm	9.0A	2.1KW	
15	130EMA-100B	10Nm	2500rpm	10.5A	2.6KW	
16	130EMA-100A	10Nm	3000rpm	12.5 A	3.14KW	
17	130EMA-150D	15Nm	1500rpm	9.0A	2.35KW	
18	130EMA-150C	15Nm	2000rpm	11.5A	3.1KW	
22	130EMA/B-060E	6Nm	1000rpm	3.6A	630W	ESDA10
23	130EMA-075E	7.5Nm	1000rpm	4.5A	790W	
24	130EMA-100E	10Nm	1000rpm	5.0A	1.0W	
30	60EMA-006A	0.64Nm	3000rpm	1.5A	200W	ESDA05
31	60EMA-013A	1.27Nm	3000rpm	2.5A	400W	
34	80EMA-016A	1.6Nm	3000rpm	3.0A	500W	ESDA08
35	80EMA-024A	2.4Nm	3000rpm	4.0A	750W	
36	80EMA-032A	3.2Nm	3000rpm	5.2A	1.0KW	
37	80EMA-038A	3.8Nm	3000rpm	5.0A	1.2KW	
40	130EMA-040B	4Nm	2500rpm	4.2A	1.0KW	ESDA10 ESDB15
41	130EMA-050B	5Nm	2500rpm	5.0A	1.3KW	
42	130EMA-060B	6Nm	2500rpm	6.2A	1.57KW	
50	110EMA-040B	4Nm	2500rpm	4.2A	1.0KW	
51	110EMA-040A	4Nm	3000rpm	4.6A	1.26KW	
52	110EMA-060B	6Nm	2500rpm	6.4A	1.57KW	
53	110EMA-060A	6Nm	3000rpm	7.5A	1.89KW	
61	130EMA-050A	5Nm	3000rpm	6.8A	1.57KW	
62	130EMA-060A	6Nm	3000rpm	7.3A	1.88KW	
43	130EMA-075C	7.5Nm	2000rpm	6.5A	1.57KW	ESDB25
44	130EMA-100C	10Nm	2000rpm	9.0A	2.1KW	
45	130EMA-100D	10Nm	1500rpm	6.5A	1.57KW	
46	130EMA-150D	15Nm	1500rpm	9.0A	2.35KW	
47	130EMA-075B	7.5Nm	2500rpm	7.8A	1.96KW	
48	130EMA-100B	10Nm	2500rpm	10.5A	2.6KW	
49	130EMA-150C	15Nm	2000rpm	11.5A	3.1KW	

■ Cable model

Name	Model	Specification	Name	Model	Specification
Power cable	JSMA-04A□□□		Encoder cable	JSDA-14A□□□	
	JSMA-04B□□□			JSDA-14B□□□	
	JSMB-04A□□□			JSDB-09A□□□	
	JSMB-04B□□□			JSDB-09B□□□	
	JSMC-04A□□□			JSDC-09A□□□	
	JSMC-04B□□□			JSDC-09B□□□	
	JSMD-04A□□□		Resolver cable	JSRA-09A□□□	
	JSMD-04B□□□			JSRA-09B□□□	
			Absolute encoder cable	JSAB-09A□□□	
				JSAC-09A□□□	

■ Motor signal line (encoder line) cable type description



■ Motor power cable type description