TECORP-GROUP

EPS Series
AC SERVO SYSTEM
User's manual of product

TECORP-GROUP

TECORP TECHNOLOGY
WEB:www.tecorp-group.com.tw

- **Thank you for choosing EPS2 series AC servo motor drive.**
- **Please read the manual carefully before using the drive and the following instruction.**

● Safety Notification ●

(Please read carefully before using the drive)

Please read the manual carefully for installation, operation, maintenance and inspection. Make sure learning the related information about the instruments, safety issues and other notifications before using the drive. Please keep this manual properly for command. Please contact us when you cannot solve problems.

- Some modification in the manual may not be notified for product improvement and update.
- Our company is not responsible for the customer's modification to the product without our authorization and the warranty.

Please pay attention to the following cautions to avoid personal injury or device damaged.

- The following "DANGER" and "CAUTION" are listed based on their Hazardous degree.

DANGER **Indicates a potentially hazardous situation which, if not avoided, will result in death or serious injury.**

CAUTION **Indicates a potentially hazardous situation which, if not avoided, will result in minor injury or property damaged.**

The following symbols represent "MUST NOT" or "MUST" operations which you have to observe.

Represents "MUST" operation which has to be executed.

Represents "MUST NOT" operation which is inhibited.

CAUTION

Install an emergency stop circuit externally so that you can stop the operatio and shut off the power immediately.

Failure to observe this instruction could result in injurise electrical sh-ocks, fire breakdowns and damages.

Do not Place water, combustibles or caustics near the driver.

Failure to observe this instru ction could result in fire.

Servo motor driver and servo motor should be 9rounded safelY.

Failure to observe this instruction could result in electrical shocks.

Don 't put your figure inside the driver .

Failure to observe this instruction could result in injuries and electrical shocks.

Wait at least ten minutes after shutting off the power for driver movement , wire connection and inspection.

Failure to observe this instruction could result in electrical shocks.

For the trial run, connect the motor without the load.

Failure to observe this instruction could result in component damage.

Choose and use the correct rated voltage .

Failure to observe this instruction could result in electrical shock ,damage and fire.

Do not modify , disassemble or repair the driver by yourself.

Failure to observe this instruction could result in electrical shock or injury.

Make sure the circuit is connected correctly and properly.

Failure to observe this instruction could result in electrical shock or fire.

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Chapter 1 Functions and Configuration

1.1 Specification of EPS2 Series drive

Table 1.1 EPS2 Drive Specification

Power Supply	AC 220V AC 380V 50 / 60Hz
Allowable Voltage	-15%～+10%
Temperature	Operation：0～55℃ Storage：-20℃～80℃
Humidity	Less than 90%RH (without dew)
Impact load	Less than 0.5G (4.9m/s2), 10~60Hz (non-continue running)
Control Method	SVPWM
Control Mode	① Position control ② Speed control ③ Torque control ④ Position/speed control ⑤ Position/Torque control ⑥ Speed/Torque control ⑦ Internal position control ⑧ Internal speed control ⑨ Internal torque control ⑩ Test running control
Control Input	① Servo control enable ② Alarm clear ③ Counter clear ④ Command pulse effective ⑤ CCW drive effective ⑥ CW drive effective ⑦ Control mode ⑧ Zero speed clamp
Control Output	① Servo ready ② Servo alarm ③ Brake control ④ Position / Speed arrival ⑤ Zero-speed detection ⑥ Torque limit ⑦ Z phase output
Encoder Type	① 2500PPR increment ② 10000PPR increment
Communication mode	① RS232 ② RS485
Display and operation	① 5-bit LED display ② 4 buttons
Brake method	Internal/External braking resistor
Cooling method	Air cooling（Heat conductive material、High speed cooling fan）
Motor model	Compatible for various type of motors (by adjusting the system parameters)

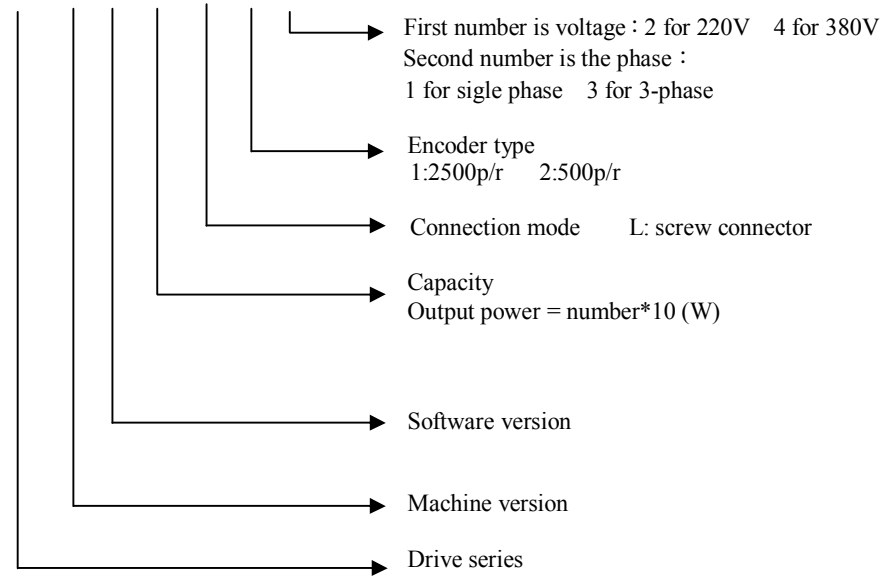
1．2　SC Series Drive Function List

Table 1.2　EPS2 Drive Function

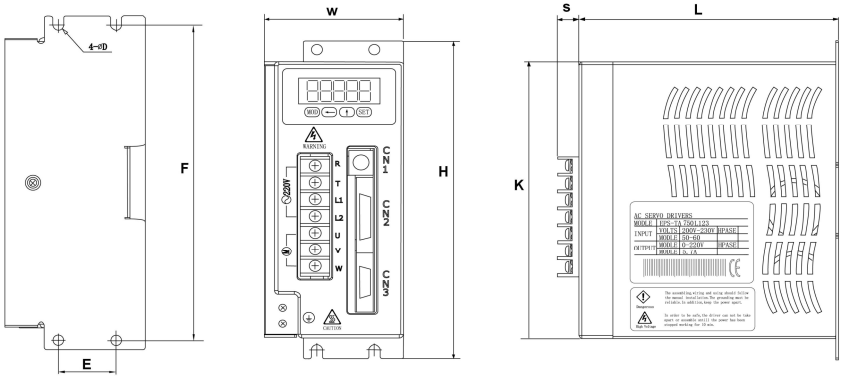
Contro Function	**Position Control**	External input pulse	Pluse + Direct, CW+ CCW pulse，A+B phase
		Maximum command pulse frequency	500Kpps differential mode 200Kpps one way mode
		Electrical gear	1/100≦G≦100
		Feedback compensation / Torque limit	Set by parameters.
		Instuction control mode	External pulse / Internal control
	Speed Control	Analog input	0～±10V DC / 10Kohm / 2.2 u.S
		Command control range	External analog / Internal registor
		Speed control range	1:3000
		Banwidth	More than 300HZ
	Torque Control	Analog input	0～±10V DC / 10Kohm / 2.2 u.S
		Overload time	200% rated output in 3 sec
		Command control range	External analog / Internal registor
		Command smooth mode	Low-pass smooth filter
Drive effective		When signal CCWL/CWL is active，motor keEPS2 zero-speed and maintains the torque in CCW/CW direction.	
Monitoring Function		Speed, position, command pulse accumulation, position error, motor torque, motor current, rotor position, command pulse frequency, operation status, input/output terminal signal	
Protection Function		Over-voltage, low-voltage, over-current, over-speed, over-load, Z-pulse missing, encoder error, EEPROM error, position error exceed.	
Alarm Function		Output alarm signal when abnormal operation happens. All 5 LEDs' decimal points keep blinking at the same time.	
Signal Display		Display ON/OFF status of the I/O signal	
Gain Tuning		The gain tuning can be adjusted to improve the motor performance when motor is running or stops.	
Alarm Record		4 alarm records included the present one is memorized.	

1．3 Name plate for EPS2 series drive

EPS2– T A 075 L 1 21



1. 4 EPS2 series drive dimensions



Voltage	KW	L	W	H	S	K	E	F	D
220V	0.2~0.75KW	139.5	75.1	183	11.5	159	31	173	6
	1.0~2.0KW	191.7	96	190	10.5	162	30	176	6
	2.5~5.5KW	201.9	117.1	277	0	242	50	261	6
380V	1.0~2.5KW	202	100.5	197.4	0	170	30	183.4	6
	3.0~7.5KW	201	117.1	277	0	242	50	261	6

1. 5 EPS2 Series Drive for the Motor (220V)

Drive Code	Motor Code	Drive version	Capacity (kw)	Speed (rpm)	Torque (nm)
EPS2-TA020L121	60HC1A-02DB1AKS	2	0.2	3000	0.64
EPS2-TA040L121	60HC1A-04DB1AKS	3	0.4	3000	1.27
	80HC1A-05DB1AKS	5	0.4	3000	1.59
	90HC1A-05DB1AMS	5	0.5	3000	1.59
	110HC1A-04CB1AKS	10	0.5	2000	1.91
EPS2-TA075L121	130HC1A-06AB1AMS	10	0.6	1000	5.73
	80HC1A-08DB1AKS	5	0.8	3000	2.37
	80HC1A-08CB1AKS	5	0.8	2000	3.5
	90HC1A-08DB1AKS	5	0.8	3000	2.37
	90HC1A-08CB1AKS	5	0.8	2000	3.5
EPS2-TA100L123	110HC1A-09CB1AMS	11	0.9	2000	3.8
	80HC1A-10DB1AKS	5	1.0	3000	3.18
	90HC1A-10DB1AKS	5	1.0	3000	3.18
	130HC1A-10DB1AMS	14	1.0	3000	3.18
	130HC1A-10CB1AMS	16	1.0	2000	4.8
	130HC1A-10BB1AMS	17	1.0	1500	6.37
	130HC1A-10AB1AMS	19	1.0	1000	9.55
PS-TA120L123	110HC1A-12DB1AMS	11	1.2	3000	3.8
	110HC1A-12CB1AMS	13	1.2	2000	5.7
	130HC1A-12CB1AMS	17	1.2	2000	5.7
EPS2-TA150L123	110HC1A-15DB1AMS	14	1.5	3000	4.8
	130HC1A-15CB1AMS	18	1.5	2000	7.16
	130HC1A-15BB1AMS	19	1.5	1500	9.55
	130HC1A-15AB1AMS	21	1.5	1000	14.33
EPS2-TA200L123	110HC1A-18DB1AMS	14	1.8	3000	5.7
	130HC1A-20CB1AMS	20	2.0	2000	9.55
	130HC1A-20BB1AMS	21	2.0	1500	14.33
	180HC1A-20CB1AMS	18	2.0	2000	9.55
	180HC1A-20BB1AMS	21	2.0	1500	14.33
EPS2-TA270L123	180HC1A-27BB1AMS	22	2.7	1500	17.2
EPS2-TA300L123	130HC1A-30DB1AMS	21	3.0	3000	9.55
	130HC1A-30CB1AMS	22	3.0	2000	14.33
	180HC1A-30CB1AMS	22	3.0	2000	14.33
	180HC1A-30BB1AMS	22	3.0	1500	19.1
	180HC1A-30AB1AMS	22	3.0	1000	28.6
EPS2-TA400L123	180HC1A-37AB1AMS	22	3.7	1000	35
	130HC1A-40DB1AMS	22	4.0	3000	12.7
	180HC1A-40CB1AMS	22	4.0	2000	19.1
	180HC1A-40BB1AMS	22	4.0	1500	25.5
EPS2-TA450L123	130HC1A-45DB1AMS	22	4.5	3000	14.33
	180HC1A-45CB1AMS	22	4.5	2000	21.5
	180HC1A-45BB1AMS	23	4.5	1500	28.6
EPS2-TA500L123	180HC1A-50CB1AMS	23	5	2000	23.8
EPS2-TA550L123	180HC1A-55BB1AMS	23	5.5	1500	35

1．6 EPS2 Series Drive for the Motor (380V)

Drive Code	Motor Code	Drive version	Capacity (kw)	Speed (rpm)	Torque (nm)
EPS2-TA100L143	110HC1B-09CB1AMS	10	0.9	2000	3.8
	130HC1B-10DB1AMS	11	1.0	3000	3.18
	130HC1B-10CB1AMS	10	1.0	2000	4.8
	130HC1B-10BB1AMS	10	1.0	1500	6.37
	130HC1B-10AB1AMS	10	1.0	1000	9.55
EPS2-TA120L143	110HC1B-12DB1AMS	11	1.2	3000	3.8
	110HC1B-12CB1AMS	10	1.2	2000	5.7
	130HC1B-12CB1AMS	10	1.2	2000	5.7
EPS2-TA150L143	110HC1B-15DB1AMS	11	1.5	3000	4.8
	130HC1B-15CB1AMS	10	1.5	2000	7.16
	130HC1B-15BB1AMS	10	1.5	1500	9.55
	130HC1B-15AB1AMS	10	1.5	1000	14.33
EPS2-TA200L143	110HC1B-18DB1AMS	11	1.8	3000	5.7
	130HC1B-20CB1AMS	10	2.0	2000	9.55
	130HC1B-20BB1AMS	19	2.0	1500	14.33
	180HC1B-20CB1AMS	10	2.0	2000	9.55
	180HC1B-20BB1AMS	19	2.0	1500	14.33
EPS2-TA270L143	180HC1B-27BB1AMS	21	2.7	1500	17.2
EPS2-TA300L143	130HC1B-30DB1AMS	14	3.0	3000	9.55
	130HC1B-30CB1AMS	18	3.0	2000	14.33
	180HC1B-30CB1AMS	18	3.0	2000	14.33
	180HC1B-30BB1AMS	21	3.0	1500	19.1
	180HC1B-30AB1AMS	21	3.0	1000	28.6
EPS2-TA370L143	180HC1B-37AB1AMS	21	3.7	1000	35
EPS2-TA400L143	130HC1B-40DB1AMS	22	4.0	3000	12.7
	180HC1B-40CB1AMS	20	4.0	2000	19.1
	180HC1B-40BB1AMS	21	4.0	1500	25.5
EPS2-TA450L143	130HC1B-45DB1AMS	22	4.5	3000	14.33
	180HC1B-45CB1AMS	22	4.5	2000	21.5
	180HC1B-45BB1AMS	22	4.5	1500	28.6
EPS2-TA500L143	180HC1B-50CB1AMS	22	5	2000	23.8
EPS2-TA550L143	180HC1B-55BB1AMS	22	5.5	1500	35
EPS2-TA750L143	180HC1B-75BB1AMS	22	5.5	1500	47.7

1.7 Parts Description

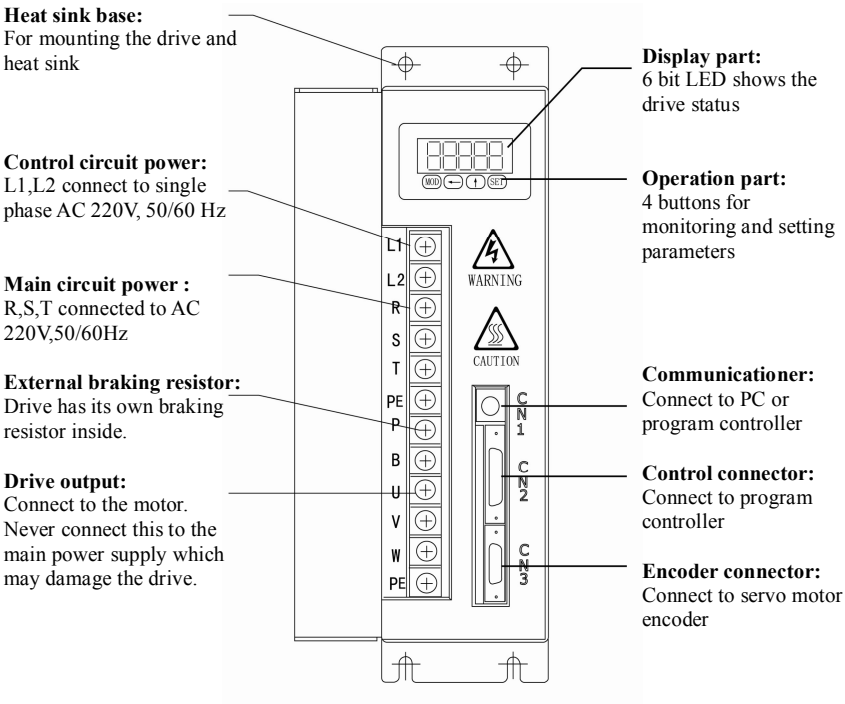


Fig.1-3 SC series drive illustration

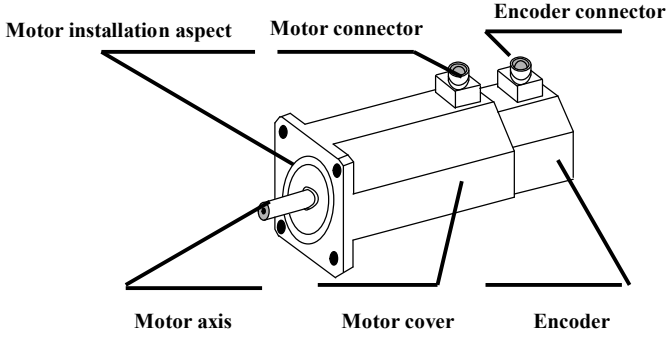


Fig.1-4 Servo motor outer view

Chapter 2 Installation

2.1 Environmental Conditions

Servo motor drive requires operation and storage environmental conditions are shown as in Table 2.1.

Table 2.1 Drive environmental conditions

Environment		Conditions
Temperature	Operation	0ºC～＋55ºC（non-dew）
	Storage	－20ºC～＋85ºC（non-dew）
Humidity	Operation	≤90％RH（non-dew）
	Storage	
Air condition	Indoor（No direct sun beams） No corrosive and combustible atmosphere, no oil liquid, dust-free	
Altitude	Lower than 1000m	
Impact load	6.03m/s2, 10~60Hz	

2.2 Installation Site

1) Installation in cabinet

The drive lifetime is highly related to the conditions. When designing the electrical cabinet, all the components and instruments should be considered together for better allocation to meet the drive environmental and thermal condition requirements.

2) Heat source around the drive

Operation at high temperature may reduce the drive lifetime and cause accident. Make sure the drive ambient temperature is lower than 55ºconsidering thermal convection and thermal radiation.

3) Vibrating instruments around the drive

Try to keep the drive away from the vibration source and keep the vibration below 0.5G(4.9M/S^2).

4) Drive operation under severe conditions

The drive may breakdown when it is opposed to the severe environments such as corrosive gas, humidity, metal dust, water and processing liquids.

Some protection method must be used in the required working environment.

5) Disturbance instruments around the drive

EMI disturbance instruments around the drive may interfere with the power line and signal line, interrupting the drive normal operation. Noise filter and other anti-disturbance method can be used in normal operation. Adding filter may cause extra leakage current which can be avoided by adding isolation transformer to improve the power quality. Note that the control signal may easily be disturbed and proper wiring and shielding is needed.

2.3 Mounting orientation and space

1) Mounting orientation

The drive is supposed to be mounted vertically and kept proper height with the operation panel in front.

2) Mounting method

Use screws for mounting.

3) Mounting space

A certain space should be left between two drives or between one drive and another instrument when mounting two or more drives. The required space is: distance between two drives should be larger than 25mm; distance between one drive and another instrument should be larger than 100mm. Please try to keep enough space to ensure the drive lifetime and performance.

4) Cooling

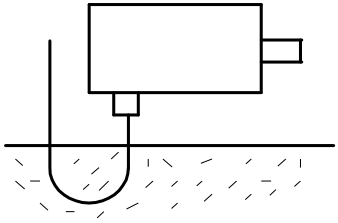
If the drive is mounted inside the electrical cabinet, cooling fans installation will be suggested to provide vertical air flow for cooling the heat sink.

5) Prevent other objects from falling into the drive during mounting

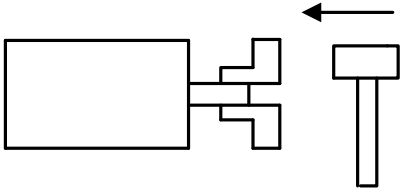
Try to avoid drilling metal dust or cutting pieces falling into the drive when installing the control cabinet. Inspect whether oil, water or metal dust can go inside the drive through the gap or fans. If that happens, please use some protection method to ensure the required environment.

2.4 Motor installation

1) Do not submerge the motor cable to oil or water.



2) Do not apply direct impact to the shaft or encoder while attaching/detaching a coupling to and from the motor shaft, otherwise, the encoder may be damaged. Please align the shaft to the best position.



3) Do not let oil, water or metal dust into the motor connector. Certain protection method should be adopted. Otherwise, the drive may not work properly and the encoder or motor can be damaged permanently.

2.5 Servo motor drive installation figures

〈1〉 **Installation for single drive:**

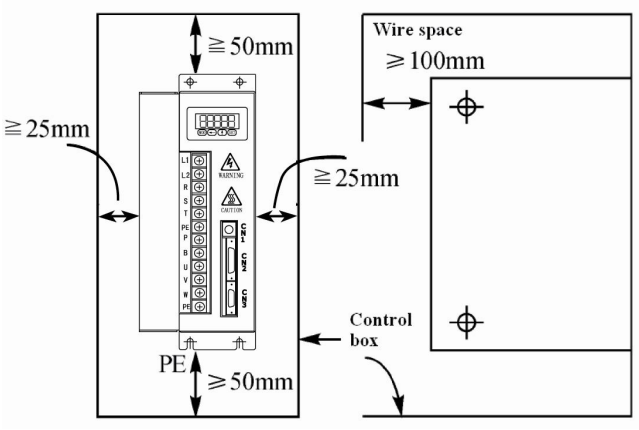


Fig.2-1 Installation for single drive

<2> Installation for more drives

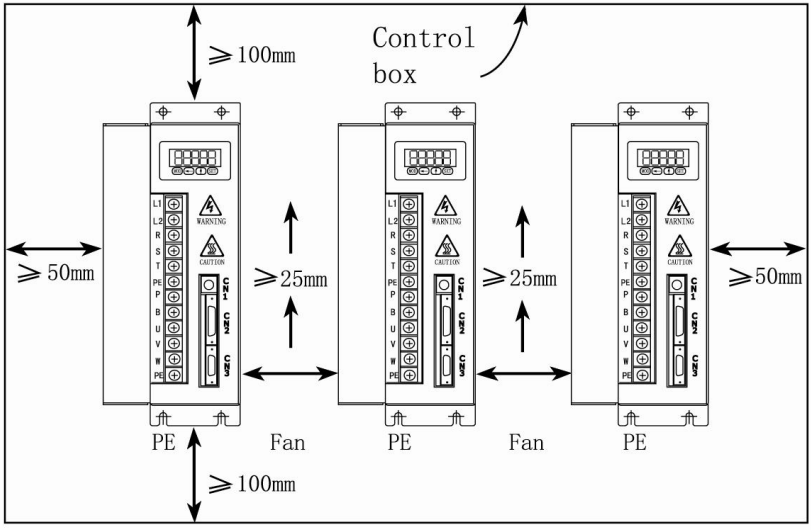


Fig.2-2 Multiple drives installation

2.6 Cable stress

1) Avoid a stress application to the cable outlet and connecting portion by bending or self-weight.

2) Especially in an application where the motor itself travels, the cable should have enough length and bending diameter to minimize the stress.

3) Keep the cable cover away from sharp cutting, mechanical contact and smashing.

Chapter 3 Wiring

【CAUTION】

- Please shut off the power before wiring or inspection. As there are lots of electrolytic capacitors inside the drive which will maintain certain high voltage even if the power is shut off. After shutting off the power, wait at least 10 minutes for the charging indicator LED turning off, then start to wire or inspect the drive or motor to avoid the electrical shock.

- Drive output terminal U,V,W must be connected to the corresponding motor terminal U,V,W correctly. Do not try to change the sequence of the 3-phase terminal to reverse the motor rotation direction and do not short the terminals. Phase sequence fault may cause motor start-up failure, abnormal operation or other unexpected conditions.

- Make sure the connection between the encoder (on the motor shaft) and drive is correct. In order to avoid disturbance, power line and encoder signal line should be wired separately. Shielding wire is suggested for the encoder signal line.

3.1 Drive configuration and connection to peripheral device

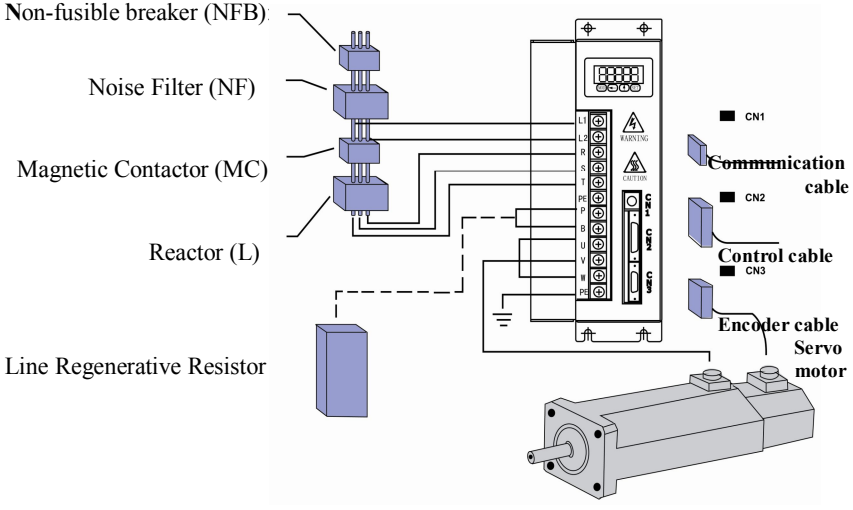


Fig. 3-1 Drive connection to peripheral device:

3.2 Standard connection

1. Wire requirement

(1) Power terminal TB

Wire size: R、S、T、U、V、W、PE terminal wire size≥1.5mm² (AWG14-16)，L1、L2 terminal wire size≥1.0mm² (AWG16-18). Large power drive needs bigger TB terminal wire size.

Grounding: Grounding wire (PE) size should be as large as possible. Drive grounding wire and servo motor grounding wire should be connected to ground at a single point and the grounding resistance should be less than 100Ω.

Terminal connection should be firm and reliable.

3-phase isolation transformer is suggested being used for improving power quality and anti-noise ability.

Please install non-fusible breaker (NFB) to shut off the power during drive fault.

Noise filter (NF), Magnetic contactor (MC) and Reactor (L) are suggested being added for filtering noise and improve EMI.

(2) Communication signal CN1, Control signal CN2, Encoder signal CN3

Wire size: Suggest using shielding wire (better to use twisted-pair shielding wire). Wire size≥0.12mm² (AWG24-26)。

Wire length: Wire length should be as short as possible. Control signal wire CN2 can not exceed 5 meters. Encoder signal wire should be less than 15m. Encoder power wire and grounding wire should be used at least 4 set of wires in parallel connection respectively.

Wiring: Keep away from power line for reducing noise.

Please add inrush current absorber circuit for inductive components (e.g. coil): Dc-coil needs anti-parallel diode and ac-coil needs parallel RC absorber circuit.

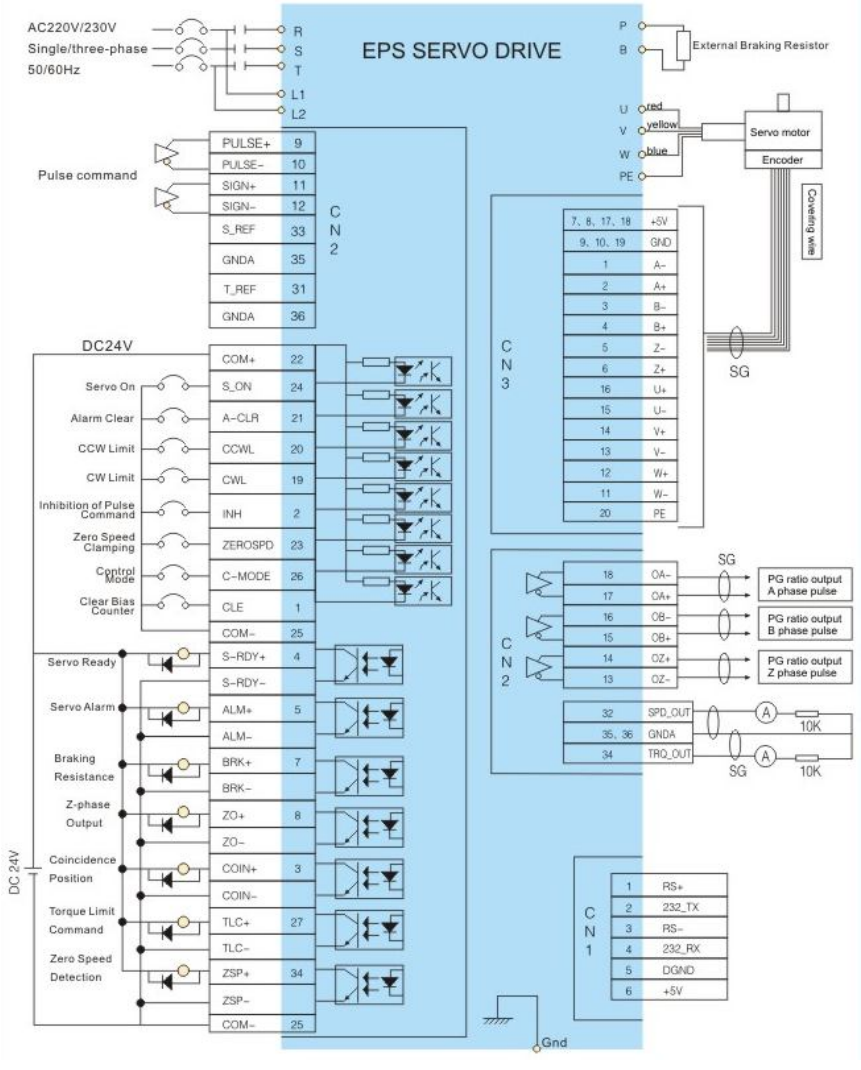
(3) Note

Power line and signal line should be firm and reliable, kept away from the drive heat sink and motor to avoid heat-caused insulation problem.

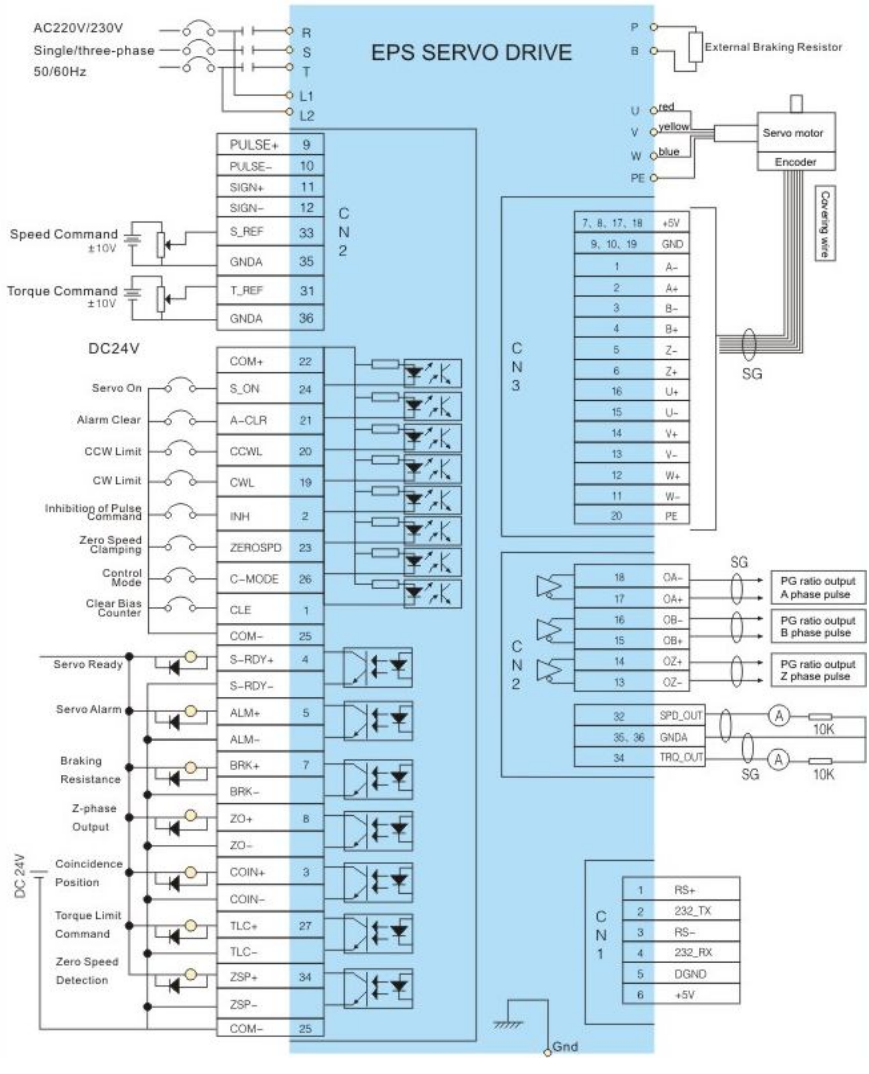
All circuits must be connected correctly before powering on.

2. Typical Wiring

1) position control mode



2) Speed / Torque control mode



3.3 Terminal functions

1. Power terminal TB

Table 3.1.1 EPS2□□-040 drive power terminal

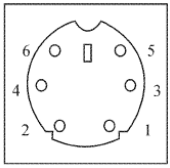
Symbol	Signal Name	Function
R TBT-2	Main circuit power	Main circuit power input terminal AC 220V，50Hz / 60Hz
L1 L2	Control Circuit Power	Control circuit power input terminal AC220V，50 / 60Hz
U V W	Connection to servo motor	These terminals should be connected to compatible servo motor and terminals U,V,W should match between drive and motor.（See Chap. 7.1）.
PE	System grounding	Grounding terminal; Grounding resistance<100Ω; Servo motor and power input should be grounded at single point.

Table 3.1.2 EPS2 EPS2□□-150-- EPS2□□-500 drive power terminal TB

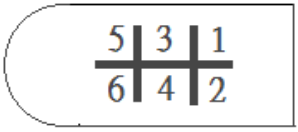
Symbol	Signal name	Function
R S T	Main circuit power（single/three-phase）	Main circuit power input terminal AC220V，50 / 60Hz
L1 L2	Control circuit power（single phase）	Control circuit power input terminal AC 220V，50Hz / 60Hz
P B	External brake resistance	When drive output power is big and the internal braking resistor is not enough for burning the excessive energy, an external braking resistor can be added between terminal P and B.
U V W	Connect to servo motor	Drive output terminals must match the motor terminals U,V,W respectively（see Chap.7.1）.
PE	System grounding	Grounding terminal; grounding resistance<100Ω; servo motor output and power input should be grounded at a single point.

2. Communication terminal CN1

CN1 is communication connector for parameter read and set through RS232 and RS485.



220V Servo

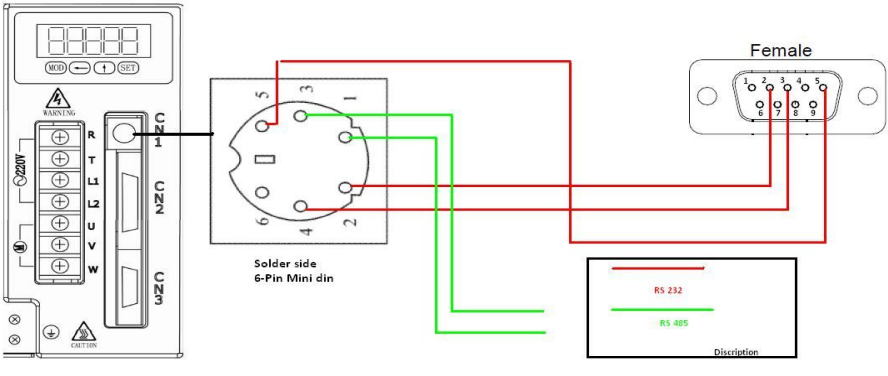


3800V Servo

Table 3.2 Communication terminal CN1

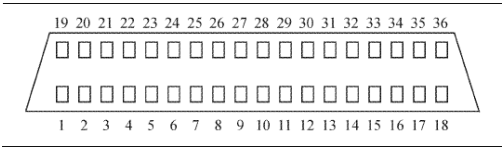
Input	Signal Name	Symbol	Function	I / O
CN1-6	Communication power supply	VCC	+5V	-
CN1-5		GND	GND	-
CN1-4	RS232 communication	R1IN	Signal receiving, connect to RS 232 transmission port of PC	-
CN1-2		T1OUT	Signal transmission, connect to RS 232 receiving port of PC	
CN1-1	RS485 communication	TxOUT/ RxIN+	Signal transmission differential signal +	Type 3
CN1-3		TxOUT/ RxIN-	Signal transmission differential signal -	

Example: connection of 220V servo



3. Control Terminal CN2

CN2 socket is male (needle) and plug is female. It is for communication with upper-level controller.



EPS2 drive control signal terminal

Table 3.3 Control terminal CN2 functions

Pin	Signal	Symbol	Function	I / O
CN2-31	Analog torque command input	T-Ref	Analog torque command input terminal; Range：0~±10V DC.	——
CN2-33	Analog speed command input	S-Ref	Analog speed command input terminal; Range：0~±10V DC. With speed limit	——
CN2-35, 36	Analog ground	GNDA	Analog control signal input ground	——
CN2-17	Phase-A output	OA+	Provide encoder differential signal output from long distance drive（Phase A, B and Z） non-isolated. Parameter No. 25 can be used for changing phase A and B output frequency divider coefficient. Parameter No.26 can be set to change the logic relationship between phase A and B.	Type5
CN2-18		OA-		
CN2-15	Phase B output	OB+		
CN2-16		OB-		
CN2-14	Phase Z output	OZ+		
CN2-13		OZ-		
CN2-22	Control power supply（＋）	COM+	Positive end of the input power supply, which is for driving input optical-coupler. DC12～24V Current≥100mA.	——

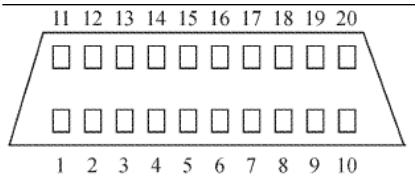
<table>
<tr><th>Pin</th><th>Signal</th><th>Symbol</th><th>Function</th><th>I / O</th></tr>
<tr><td>CN2-1</td><td>Clear bias counter</td><td>CLE / SPD01</td><td rowspan="2">1.In position mode:
When CLE signal(low effective) is ineffective，this will clear the error counter into zero.
When INH signal(low effective) is ineffective，this will disable the pulse command input. No. 29 【effective forbidden command pulse input】for disabling the signal.
2.In speed mode：
<table><tr><th>SPD2 (CN2-2)</th><th>SPD1 (CN2-1)</th><th>Speed mode option</th></tr><tr><td>1</td><td>1</td><td>External analog Speed command</td></tr><tr><td>1</td><td>0</td><td>Internal speed 1 (PA131)</td></tr><tr><td>0</td><td>1</td><td>Internal speed 2 (PA132)</td></tr><tr><td>0</td><td>0</td><td>Internal speed 3 (PA133)</td></tr></table>1：COM-disconnect 0：COM+connect</td><td rowspan="2">Type1</td></tr>
<tr><td>CN2-2</td><td>Inhibition of pulse command</td><td>INH / SPD02</td></tr>
<tr><td rowspan="2">CN2-21</td><td>Alarm clear</td><td>A-CLR</td><td>Alarm clear terminal (low effective)
A-CLR effective: clear system alarm.
A-CLR effective: hold system alarm.</td><td rowspan="2">Type1</td></tr>
<tr><td>Speed inverse</td><td>SPD_INV</td><td>This is for setting if the speed signal gets inverse.
<table><tr><td>Disconnect</td><td>Connect</td></tr><tr><td>Not change</td><td>Inverse</td></tr></table></td></tr>
<tr><td>CN2-26</td><td>Control mode</td><td>C-MODE</td><td>When NO.4【control mode mode】＝3，4 or 5，control modes are shown in the following table：
<table><tr><td>NO.4</td><td>Disconnect</td><td>Connect</td></tr><tr><td>3</td><td>Position control</td><td>Speed control</td></tr><tr><td>4</td><td>Position control</td><td>Torque control</td></tr><tr><td>5</td><td>Speed control</td><td>Torque control</td></tr></table></td><td>Type1</td></tr>
</table>

<table>
<tr><th>Pin</th><th>Signal</th><th>Symbol</th><th>Function</th><th>I / O</th></tr>
<tr><td>CN2-20</td><td>CCW
limit</td><td>CCWL</td><td rowspan="2">When CCWL/CWL is on，motor stops at CCW/CW direction, it will keep zero speed and maintain output torque. When receiving CW/CCW direction from upper level-controller control signal, it will start rormally to run.
☆→Used for mechanical position limit switch; when the signal is low, motor stops by default setting.
☆ → Parameter No.64 is used for setting the logic level.
☆→NO.06【Drive effective input off】is used to shield this signal.</td><td>Type1</td></tr>
<tr><td>CN2-19</td><td>CW
limit</td><td>CWL</td><td>Type1</td></tr>
<tr><td>CN2-24</td><td>Servo on</td><td>S-ON</td><td>ON：enable drive(low on)
OFF：effective drive; output turn off; drive stop running; motor idle.
☆ →When S-ON is on, wait at least 50ms，then start to enter the command.
☆ →Don’t use S-ON to start and stop the motor frequently.。</td><td>Type1</td></tr>
<tr><td>CN2-23</td><td>Zero speed
clamping</td><td>ZEROSPD
/ T-SEL2</td><td rowspan="2">Disconnect with COM; speed command is taken as zero.
Parameter NO.08【zero speed input mode】can effective this signal.
When NO.4【control mode mode】=3，4 or 5，control modes are shown in the following table：
<table>
<tr><td>NO.4</td><td>Disconnect</td><td>Connect</td></tr>
<tr><td>3</td><td>Position control</td><td>Speed control</td></tr>
<tr><td>4</td><td>Position control</td><td>Torque control</td></tr>
<tr><td>5</td><td>Speed control</td><td>Torque control</td></tr>
</table>
1：COM-disconnect 0：COM+connect
<table>
<tr><td>T-SEL1
(CN2-26)</td><td>T-SEL2
(CN2-23)</td><td>Torque mode option</td></tr>
<tr><td>1</td><td>1</td><td>External analog torque command</td></tr>
<tr><td>0</td><td>1</td><td>Internal torque 1
(PA135)</td></tr>
<tr><td>0</td><td>1</td><td>Internal torque 2
(PA136)</td></tr>
<tr><td>0</td><td>0</td><td>Internal torque 3
(PA137)</td></tr>
</table></td><td rowspan="2">Type1</td></tr>
<tr><td>CN2-26</td><td>Control mode</td><td>C-MODE
/ T-SEL1</td></tr>
</table>

Pin	Signal	Symbol	Function	I / O
CN2-25	Control power supply (－)	COM-	Output terminal optical —coupler common point.	——
CN2-7	Breaking release	BRK_ OFF	When mechanical brake release, this output (transistor) will conduct.	Type2
CN2-4	Servo ready	S-RDY	S-RDY on: Control power and main power condition is normal. No drive alarm, servo output ready S-RDY off: drive alarm，servo output not ready (high)	Type2
CN2-5	Servo alarm	ALM	ALM alarm: When drive detects fault, it outputs alarm signal (high). ALM no-alarm: When drive has no fault, no alarm signal output. (low)。	Type2
CN2-8	Z-phase output	ZO	Servo motor encoder Phase-Z pulse output, open collector (OC) output.	Type2
CN2-3	Coincidence position	COIN	When the positioning is complete, this output (transistor) will conduct.	Type2
CN2-27	Torque limit command	TLC	The output will conduct when torque is limiting.	Type2
CN2-34	Zero speed detection	ZSP	When motor speed is below NO.51 (zero speed) setting value, this output will conduct.	Type2
CN2-9	Pulse command	PULS+	Command pulse input terminal. Command pulse can be input in three different forms. Use No.28 to select one of the following forms. 1、Quadruple (A&B) input. 2、CW/CCW pulse input. 3、Command pulse/direction input.	Type3
CN2-10		PULS-		
CN2-11	Pulse command	SIGN+		
CN2-12		SIGN-		

4. Encoder signal terminal CN3

CN3 socket is female and plug is male (needle), which is used to connect the encoder. Twisted-pair shielding wire is suggested. When the length exceeds 10 meters, power and grounding cable is better to use multi-core wires and the wire size should be bigger than 0.15mm².



EPS2 drive encoder signal terminal

Table 3.4 Encoder signal terminal CN3

PIN	Signal	Symbol	Function	I / O
CN3-7 CN3-8 CN3-17 CN3-18	Encoder power supply	VCC	Servo motor encoder uses +5V power supply and the wire size will increase when the cable length exceeds 10m.	——
CN3-9 CN3-10 CN3-19		GND		——
CN3-20	Shielding ground	PE	Motor, drive and cabinet ground should connect together with the encoder ground.	——
CN3-2	Encoder A+ input	A+	Connect to servo motor encoder phase-A	Type4
CN3-1	Encoder A- input	A-		
CN3-4	Encoder B+ Input	B+	Connect to servo motor encoder phase-B	
CN3-3	Encoder B- Input	B-		
CN3-6	Encoder Z+ Input	Z+	Connect to servo motor encoder phase-Z	
CN3-5	Encoder Z- Input	Z-		
CN3-16	Encoder U+ Input	U+	Connect to servo motor encoder phase-U	
CN3-15	Encoder U- Input	U-		
CN3-14	Encoder V+ Input	V+	Connect to servo motor encoder phase-V	
CN3-13	Encoder V- Input	V-		
CN3-12	Encoder W+Input	W+	Connect to servo motor encoder phase-W	
CN3-11	Encoder W- Input	W-		

3.4 I/O interface

1. Switch signal input interface

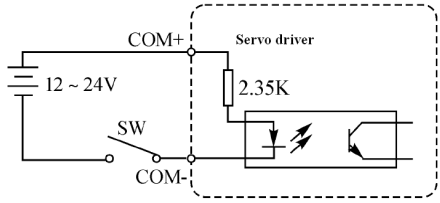


Fig.3－4 Type 1 switch signal input interface

(1) External power source is provided by user. Please note if the power polarity is misconnected, the drive may be damaged.

(2) Power supply requirement: DC 12~24V (Recommend: DC 24V), current≥100mA.

2. Switch signal output interface

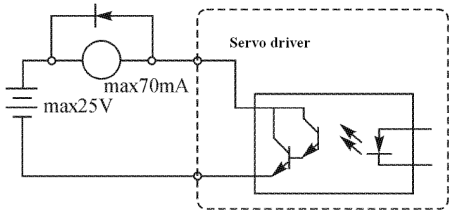


Fig.3-5 Type 2 switch signal output interface

(1) External power source is provided by user. Please note if the power polarity is misconnected, the drive may be damaged.

(2) Open-collector (OC) output, the maximum current is 70mA and maximum external power source voltage is 25V. If the rated value is exceeded or the output is directly connected to power source, the drive may be damaged.

(3) If the load is relay or other inductive load, an anti-parallel diode is needed for current free-wheeling. If the diode polarity is misconnected, the drive may be damaged.

3. Pulse signal input interface

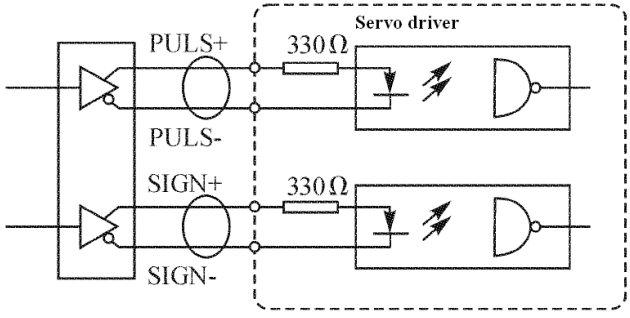


Fig.3-6 Type 3 pulse signal input interface in differential drive mode

1) For differential signal drive, RS422 drive, e.g. AM26LS31 is suggested.

2) In order to improve the pulse data anti-noise ability, the differential drive mode is suggested.

4. Drive optical encoder input interface

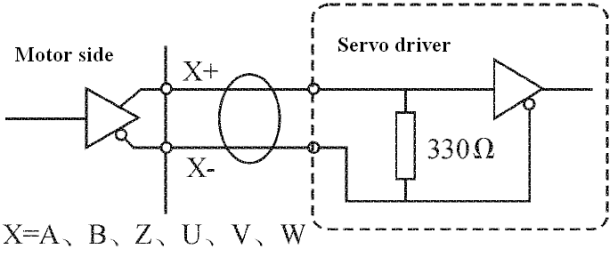


Fig. 3-7 Type 4 servo drive optical encoder input interface

Receiving encoder output A、B、Z、U、V、W signal.

5. Long-wire drive(differential output) interface

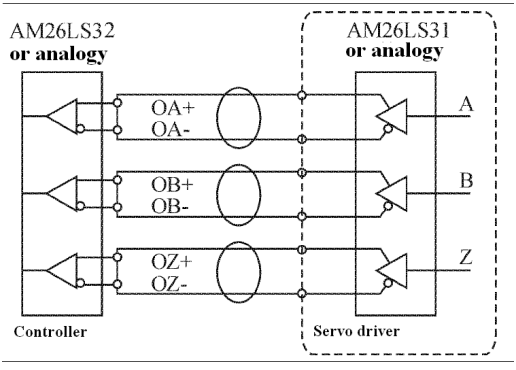


Fig. 3-8 Type 5 long-wire drive output interface

(1) Long-wire drive output signal is non-isolated

(2) For long-wire signal receiver, in this case, a 330Ω resistor is connected at the input.

「NOTE」

- Drive and motor must reliably be grounded reliably. Drive power feeds the motor through power transistors. Improper wiring or grounding may introduce noise to the system. For this, firmly grounding is required.
- To avoid electrical shock, drive protection ground (PE) terminal must be connected to cabinet protection ground (PE).
- Symbol  in this manual represents twisted-pair wires.

3.5 Power supply circuit

The following graph depicts the drive wire connection with 3-phase and single phase power supply.

(1) 3-phase AC 220V power input

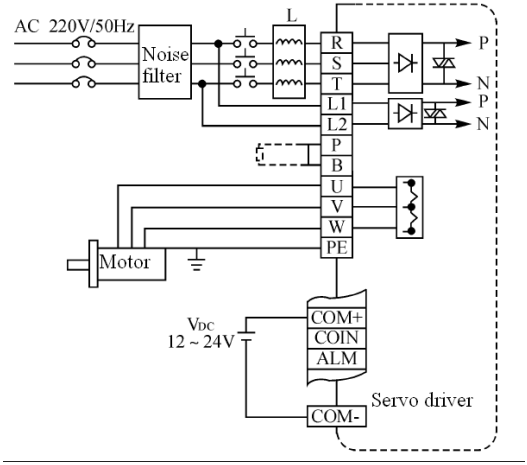


Fig. 3-9 3-phase 220V drive wire connection

(2) Single phase AC 220V power input

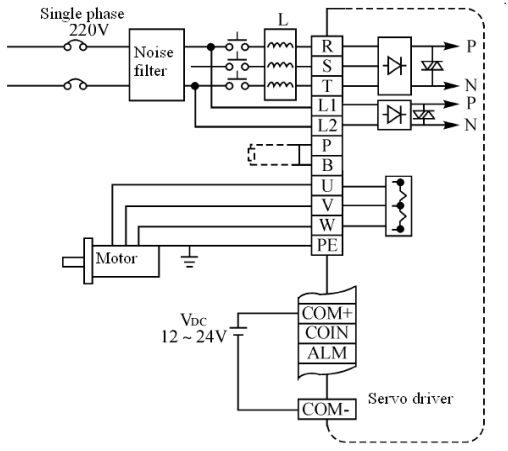


Fig. 3-10 single phase 220V servo drive wire connection

Chap. 4 Parameters

【CAUTION】

- Inappropriate parameter setting may cause the system unstable. Pleases be careful for it.
- Forward rotation means motor rotation is counter-clockwise seen from the motor shaft direction. Reverse rotation means motor rotation is clockwise seen from the motor shaft direction.
- Parameters with "※" can be modified and displayed, but is not on in the control until written into EEPROM and then re-power on. Other parameters value can be changed and become on in the control immediately after changing.
- Parameters with "★" are read-only parameters, writing is effective.
- Parameters with "▲" are under development for future function extension.

4.1 Parameter overview

Table 4.1 User parameters (Password: 58)

	No.	Parameter Name	Range	Default
Basic Function	00	Drive password	0～9999	58
	01	Carrier frequency	5～15	15
	02★	Software version	——	——
	03※	LED display beginning status	0～30	0
	04※	Control mode	0～8	0
	05	Effective limited torque input	0～1	0
	06	Effective forbidden drive input	0～1	1
	07	Zero-speed input signal mode	0～1	1
	08	Zero-speed input mode	0～1	0
	09※	Drive version mode	0～50	15
	10▲	Analog output channel mode	0～8	0

	No.	Parameter Name	Range	Default
Gain and Filter	11	Position loop gain	500～8000	2200
	12	Position feed-forward gain	0～100	0
	13	Position feed-forward filtering time constant	0～8100	2
	14	Speed loop gain	500～8000	3000
	15	Integral time constant of speed loop	500～6000	2000
	16	Speed sampling filtering time constant	0～4096	0
	17	Speed command filter	0～8100	0
Position Control	18▲	Speed loop differential gain	0～100	0
	19	Reserved	——	——
	20	S type enable	0～1	1
	21	S type constant	1～16	1
	23～24	Reserved	——	——
	25※	Feedback frequency-division ratio of motor encoder	1～250	1
	26※	Output pulse logic reverse	0～1	0
	27※	Input pulse logic reverse	0～1	0
	28	Command pulse input mode	0～2	0
	29	Effective forbidden command pulse input	0～1	1
	30	Reserved	——	——
	31	Electrical gear numerator	1～9999	1
	32	Electrical gear denominator	1～9999	1
	33	Reserved	——	——
	34▲	Position command filter coefficient	0～2048	0
	35～36	Reserved	——	——
	37	loop time mode of Internal position register	1～8	0
	38	Gain constant of current loop	400～3000	700

	No.	Parameter Name	Range	Default
Speed and Torque Control	39	Acceleration time constant	10～3000	**200**
	40	Deceleration time constant	10～3000	**200**
	41	Integral time constant of current loop	1～50	**10**
	42	Zero speed clamping	0～1000	**0.1**
	43	Speed input gain	10～1000	**200**
	44	Logic reverse of speed input	0～1	**0**
	45	Zero-flutter compensation of speed input	-2048～2048	**0**
	46	Torque input gain	1～100	**10**
	47	Logic reverse of Torque input	0～1	**0**
	48	Torque limit setting	0～300	**200**
	49	Reserved	——	——
Related Logic Program	50	Positioning complete range	1～9999	**50**
	51	Zero speed	0～2000	**50**
	52	Speed arrival	0～3000	**2000**
	53	Exceeding position error	1～9999	**200**
	54	Unavailable position error	0～1	**0**
	55～57	Reserved	——	——
	58	Brake action time	1～1000	**10**
	59	Reserved	——	——
	60	Brake action speed	0～1000	**10**
	61	Motor speed in the brake action	0～200	**50**
	62	Reserved	——	——
	63	Motor stop mode	0～1	**1**
	64	Input signal logic mode	0～255	**0**
	65	Reserved	——	——
	66	Logic mode of output terminal	0～255	**2**
	67～68	Reserved	——	——

	No.	Parameter Name	Range	Default
Communication Related parameters	**69※**	Communication mode	0～2	**0**
	70※	Communication format	0～1	**0**
	71	Reserved	——	——
	72※	Communication address	0～255	**0**
	73※	Speed ratio of communication port	0～6	**0**
	74※	Protocol of communication port	0～5	**0**
	75～77	Reserved	——	——
	78	Torque command filter	0	**0~8100**
	79～82	Reserved	——	——
Internal Positioning Control	**83**	Internal position command 1 speed setting	- 9999～ 9999	**1**
	84	Internal position command 1 pulse number setting	- 9999～ 9999	**1**
	85	Internal position command 2 speed setting	- 9999～ 9999	**1**
	86	Internal position command 2 pulse number setting	- 9999～ 9999	**1**
	87	Internal position command 3 speed setting	- 9999～ 9999	**1**
	88	Internal position command 3 pulse number setting	- 9999～ 9999	**1**
	89	Internal position command 4 speed setting	- 9999～ 9999	**1**

	No.	Parameter Name	Range	Default
Internal Positioning Control	90	Internal position command 4 pulse number setting	-9999～9999	1
	91	Internal position command 5 speed setting	-9999～9999	1
	92	Internal position command 5 pulse number setting	-9999～9999	1
	93	Internal position command 6 speed setting	-9999～9999	1
	94	Internal position command 6 pulse number setting	-9999～9999	1
	95	Internal position command 7 speed setting	-9999～9999	1
	96	Internal position command 7 pulse number setting	-9999～9999	1
	97	Internal position command 8 speed setting	-9999～9999	1
	98	Internal position command 8 pulse number setting	-9999～9999	1
	99	Internal position command 9 speed setting	-9999～9999	1
	100	Internal position command 9 pulse number setting	-9999～9999	1
	101	Internal position command 9 speed setting	-9999～9999	1
	102	Internal position command 9 pulse number setting	-9999～9999	1
	103	Internal position command 10 speed setting	-9999～9999	1
	104	Internal position command 10 pulse number setting	-9999～9999	1

	No.	Parameter Name	Range	Default
Internal Positioning Control	**105**	Internal position command 11 speed setting	-9999～9999	**1**
	106	Internal position command 11 pulse number setting	-9999～9999	**1**
	107	Internal position command 12 speed setting	-9999～9999	**1**
	108	Internal position command 12 pulse number setting	-9999～9999	**1**
	109	Internal position command 13 speed setting	-9999～9999	**1**
	110	Internal position command 13 pulse number setting	-9999～9999	**1**
	111	Internal position command 14 speed setting	-9999～9999	**1**
	112	Internal position command 14 pulse number setting	-9999～9999	**1**
	113	Internal position command 15 speed setting	-9999～9999	**1**
	114	Internal position command 15 pulse number setting	-9999～9999	**1**
	115	Internal position command 1 moving speed	0～3000	**100**
	116	Internal position command 2 moving speed	0～3000	**100**
	117	Internal position command 3 moving speed	0～3000	**100**
	118	Internal position command 4 moving speed	0～3000	**100**
	119	Internal position command 5 moving speed	0～3000	**100**

	No.	Parameter Name	Range	Default
Internal Positioning Control	120	Internal position command 6 moving speed	0～3000	100
	121	Internal position command 7 moving speed	0～3000	100
	122	Internal position command 8 moving speed	0～3000	100
	123	Internal position command 9 moving speed	0～3000	100
	124	Internal position command 10 moving speed	0～3000	100
	125	Internal position command 11 moving speed	0～3000	100
	126	Internal position command 12 moving speed	0～3000	100
	127	Internal position command 13 moving speed	0～3000	100
	128	Internal position command 14 moving speed	0～3000	100
	129	Internal position command 15 moving speed	0～3000	100
	130	Internal position command 16 moving speed	0～3000	100
Internal Speed Control	131	Internal speed command1	-3000～3000	500
	132	Internal speed command2	-3000～3000	500
	133	Internal speed command3	-3000～3000	500
	134	Internal speed command 4	-3000～3000	500
Internal Torque Control	135	Internal torque command1	－300～300	50
	136	Internal torque command2	－300～300	50
	137	Internal torquecommand3	－300～300	50
	138	Internal torque command4	－300～300	50

	No.	Parameter Name	Range	Default
Positioning Control Delay	139	Delay register 1	0～9999	100
	140	Delay register 2	0～9999	100
	141	Delay register 3	0～9999	100
	142	Delay register 4	0～9999	100
	143	Delay register 5	0～9999	100
	144	Delay register 6	0～9999	100
	145	Delay register 7	0～9999	100
	146	Delay register 8	0～9999	100
	147	Delay register 9	0～9999	100
	148	Delay register 10	0～9999	100
	149	Delay register 11	0～9999	100
	150	Delay register 12	0～9999	100
	151	Delay register 13	0～9999	100
	152	Delay register 14	0～9999	100
	153	Low voltage alarm	——	200
	154	Low voltage alarm (time)	——	100
	155	Reserved	——	——

4.2 Parameter function

Table 4.2 Parameter function (Password: 58)

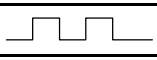
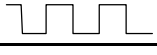
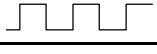
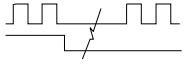
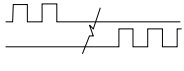
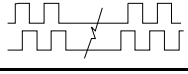
S/N:	Name	Function	Default
00	Password	Prevent the parameters from being changed by mistake. Before changing other parameters, this parameter must be set to 58 first. After setting other parameters, change this parameter to be other values except 58 to avoid other parameters changed by mistake.	0～9999 【 58 】
01	Carrier Frquency	This parameter is for setting carrier frequency	5~15 【 15 】
02★	Software version	This parameter is for checking software version only, can not be modified.	-- --

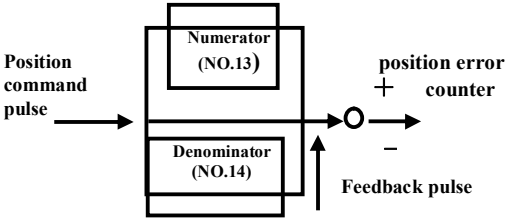
<table>
<tr><th>S/N:</th><th>Name</th><th>Function</th><th>Default</th></tr>
<tr><td>03※</td><td>Initial display status</td><td>Mode for the initial LED display content after power on.
0：Display motor speed；
1：Display motor feedback pulse lower 4 bits；
2：Display motor feedback pulse higher 4 bits；
3：Display position receiving command lower 4 bits;
4：Display position receiving command higher 4 bits;
5：Display position error；
6：Display encoder resolution;
7：Display speed command input value；
9：Display torque command input value percentage[%]；
13：Display motor average current；
15：Display pulse input frequency；
16：Display main circuit voltage；
17：Display rotor position in a circle；
18：Display input terminal status；
19：Display output terminal status；
20：Display encoder status；
21：Display control mode；
22：Display operation status；
23：Display Id；
24：Display Iq；
25：Display alarm record 1；
26：Display alarm record 2；
27：Display alarm record 3；
28：Display alarm record 4；
08，10，12，14，23~24, 29～35 are reserved；</td><td>0～35
【 0 】</td></tr>
<tr><td>04※</td><td>Control mode mode</td><td>Select drive control mode
<table>
<tr><th>Value</th><th>Mode I</th><th>Mode II</th></tr>
<tr><td>0</td><td>Position control mode</td><td>——</td></tr>
<tr><td>1</td><td>Speed control mode</td><td>——</td></tr>
<tr><td>2</td><td>Torque control mode</td><td>——</td></tr>
<tr><td>3</td><td>Position mode</td><td>Speed mode</td></tr>
<tr><td>4</td><td>Position mode</td><td>Torque mode</td></tr>
<tr><td>5</td><td>Speed mode</td><td>Torque mode</td></tr>
<tr><td>6▲</td><td>Internal position control mode</td><td>——</td></tr>
<tr><td>7</td><td>Internal speed control mode</td><td>——</td></tr>
<tr><td>8</td><td>Internal torque control mode</td><td>——</td></tr>
</table>
CN2-26（C-MODE）is used to switch between Mode I / II</td><td>0～8
【 0 】</td></tr>
</table>

<table>
<tr><th>S/N:</th><th>Name</th><th>Function</th><th>Default</th></tr>
<tr><td>05</td><td>Torque limit input disable</td><td>To effective analog torque limit signal input
（counter-clockwise or clockwise）。
1：input ineffective；Response to torque input signal normally；
0： input disable. Mask off the torque input signal.</td><td>0～1
【 1 】</td></tr>
<tr><td>6</td><td>Drive effective input off</td><td>
<table>
<tr><th>Value</th><th>Input</th><th>Control input</th><th>Connect to COM-</th><th>Operation</th></tr>
<tr><td rowspan="4">0</td><td rowspan="4">Ineffective</td><td rowspan="2">CCWL
(CN2-20)</td><td>Connected（L）</td><td>Normal CW limit switch no action</td></tr>
<tr><td>Open（H）</td><td>CCW direction Operation is prohibited, CW direction is allowed</td></tr>
<tr><td rowspan="2">CWL
(CN2-19)</td><td>Connected（L）</td><td>Normal，CW limit switch no action</td></tr>
<tr><td>Open（H）</td><td>CW direction operation is prohibited, CCW direction is allowed.</td></tr>
<tr><td>1</td><td>Effective</td><td colspan="3">CCWL and CWL input are both Off. Clockwise and counter-clockwise operation are both allowed.</td></tr>
</table>
If this parameter is set for zero, and CWL/CCWL are both open circuit（not connect to COM-），drive will have alarm 23 【drive effective abnormal】。
</td><td>0～1
【 1 】</td></tr>
</table>

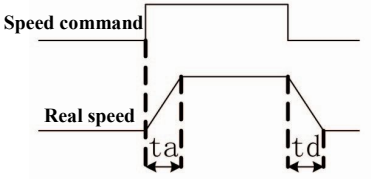
<table>
<tr><th>S/N:</th><th>Name</th><th>Function</th><th>Default</th></tr>
<tr><td>07</td><td>Zero-speed input function mode</td><td>In speed control mode, ZEROSPD signal（Pin CN2-23）function mode.
<table><tr><td>Value</td><td>ZEROSPD signal function</td></tr><tr><td>0</td><td>When ZEROSPD signal is ineffective , motor speed is clamped to be zero.</td></tr><tr><td>1</td><td>When ZEROSPD signal is ineffective, motor speed command is zero.</td></tr></table></td><td>0～1
【 1 】</td></tr>
<tr><td>08</td><td>Zero-speed Signal Ineffective mode</td><td>Enable and effective zero-speed clamp ZEROSPD signal（Pin CN2-23）
Switch between enable and effective， this parameter is ineffective
for speed control mode.
<table><tr><td>Value</td><td>ZEROSPD signal ineffective and effective mode</td></tr><tr><td>0</td><td>ZEROSPD input disable</td></tr><tr><td>1</td><td>ZEROSPD input enable</td></tr></table></td><td>0～1
【 1 】</td></tr>
<tr><td>09※</td><td>Drive version mode</td><td>According to “1．5 SC series drive compatible motor” set proper drive version number to this parameter.
Make sure to choose the compatible drive for the motor, otherwise, unexpected condition may be happened.</td><td>0～50
【 15 】</td></tr>
<tr><td>10▲</td><td>Analog output channel mode</td><td>Analog output monitoring：
0：Motor speed（0～5V，5V for the maximum speed）
1：Motor torque（0～5V，5V for the maximum torque）
2：Motor current（0～5V，5V for the maximum current）
3：input pulse frequency（0～5V corresponding to 0～500K）
4：Speed command（0～5V corresponding to -10V～+10V）
5：Torque command（0～5V corresponding to -10V～+10V ）
6：Main circuit voltage（0～5V corresponding to 0～500V）</td><td>0～8
【 0 】</td></tr>
<tr><td>11</td><td>Position loop gain</td><td>Set the position loop controller proportional gain to define the position control response curve. Larger setting value means higher gain, higher stiffness, less delay. Faster positioning for the same frequency pulse command.
Too large value for this parameter may cause system unstable, oscillation or overshoot.</td><td>500～8000
【2200】</td></tr>
</table>

S/N:	Name	Function	Default
12	Speed feed forward	This parameter can be set to change the speed feed-forward term in the position control（%）. Larger setting value means faster and better position loop response and position tracking. Too large value for this parameter may cause system unstable, oscillation or overshoot.	0～100 【 0 】
13	Feed forward time constant	This parameter can be used to set the time constant of the filter for the speed feed-forward term. This function can reduce the speed overshoot or detuning.	0～8100 【 2 】
14	Speed loop gain	Setting the speed loop controller proportional gain. Larger setting value means higher loop gain, higher fitness. Usually, the bigger the load inertia is, the larger value should be set. The gain is suggested to be set higher, as long as there is no system oscillation.	500～ 8000 【3000】
15	Speed loop integral time constant	The smaller the setting value is, the faster the integration is, And he higher the stiffness is. Usually， the bigger the load inertia is，the bigger the Setting Value should be。The value is suggested to be set smaller, as long as there is no system oscillation.	500～ 6000 【2000】
16	Speed detection filter	When the motor speed error is large, properly increasing the value of this parameter can get better performance. If the load inertia is large, the value can be increased. Too large value will slow down the response and may cause oscillation.	0～4096 【 0 】
17	Speed Command filter	The bigger the setting value is, and the smoother the speed command is. Too large value will slow down the response.	0～8100 【 0 】
18 ▲	Speed loop differential gain	Speed loop differential gain parameter.	0～100 【 0 】
20	S type enable	It is ineffective under the speed control mode.	0～1 【 1 】
21	S type constant	The more value you set, the more speed up/down in S type	1～16 【 1 】
25※	Encoder output Frequency division ratio	This parameter is used for setting the encoder output pulse frequency division ratio. For example, if the encoder is 2500-line resolution, and this parameter is set to be 5, the A/B signal output will be 500 lines.	1～250 【 1 】

<table>
<tr><th>S/N:</th><th>Name</th><th>Function</th><th>Default</th></tr>
<tr><td>26※</td><td>Pulse Output Logic reverse</td><td>
<table>
<tr><th rowspan="2">Value</th><th rowspan="2">Phase A</th><th>CCW rotation</th><th>CW rotation</th></tr>
<tr><td>  </td><td>  </td></tr>
<tr><td>0</td><td>Phase B not reverse</td><td>  </td><td>  </td></tr>
<tr><td>1</td><td>Phase B reverse</td><td>  </td><td>  </td></tr>
</table>
When the motor is rotating clockwise, phase-B pulse is leading phase-A pulse. (When the motor is rotating counter-clockwise, phase-B pulse is lagging phase-A pulse) This parameter can be used for reversing the logic of phase-B pulse, thus changing the phase relationship
</td><td>0～1
【 0 】</td></tr>
<tr><td>27※</td><td>Pulse Input reverse</td><td>
When you want to change the motor rotation direction but do not want to change the polarity of the command signal from the controller, this parameter can be used.
<table>
<tr><th>Value</th><th>Motor rotation direction</th></tr>
<tr><td>0</td><td>（＋） command, counter-clockwise rotation</td></tr>
<tr><td>1</td><td>（＋） command, clockwise rotation</td></tr>
</table>
</td><td>0 ～ 1
【 0 】</td></tr>
<tr><td>28</td><td>Command pulse Input Type mode</td><td>
This parameter is used for setting the command pulse type given by the controller to the drive. There are three kinds of command pulse type showing as follows:
<table>
<tr><th>Value</th><th>Command pulse type</th><th>Signal name</th><th>CCW command</th><th>CW command</th></tr>
<tr><td>0</td><td>Pulse/ direction mode</td><td>PLUS SIGN</td><td colspan="2">  </td></tr>
<tr><td>1</td><td>CW/CCW pulse command mode</td><td>PLUS SIGN</td><td colspan="2">  </td></tr>
<tr><td>2</td><td>A/B pulse command mode</td><td>PLUS SIGN</td><td colspan="2">  </td></tr>
</table>
</td><td>0 ～ 2
【 0 】</td></tr>
</table>

<table>
<tr><th>S/N:</th><th>Name</th><th>Function</th><th>Default</th></tr>
<tr><td>29</td><td>Command Pulse input disable Effective</td><td>This parameter determines the command pulse input disable. Signal (SPD1, Pin CN2-2) is ineffective or effective. When this parameter is set to 1, even SPD1 is low. The command pulse input is not effective.
<table><tr><td>Value</td><td>SPD1 input</td></tr><tr><td>0</td><td>effective</td></tr><tr><td>1</td><td>ineffective</td></tr></table></td><td>0～1
【 1 】</td></tr>
<tr><td>31</td><td>Input Command Pulse Frequency multiplication numerator</td><td rowspan="2">Command pulse frequency multiplication function
（electrical gear）
Purpose：
A. The parameter can be used for setting the corresponding motor speed or position for the unit input command pulse.
B. The controller output frequency is not high enough to get the required speed command; this parameter can be set to multiple the frequency to achieve higher command frequency.
Division/multiplication function diagram
、
 

Electrical gear ratio setting range：1/1800≦G≦1800
Electrical gear ratio recommended range：1/50≦G≦50</td><td>1～9999
【 1 】</td></tr>
<tr><td>32</td><td>Input command pulse frequency multiplication denominator</td><td>1～9999
【 1 】</td></tr>
</table>

<table>
<tr><th>S/N:</th><th>Name</th><th>Function</th><th>Default</th></tr>
<tr><td>34
▲</td><td>Positing command filtering coefficient</td><td>When the position command frequency is divided or multiplied too many times, (more than 10 times or less than 1/10)，this parameter is used for reducing the motor speed jump because of the frequency division or multiplication.
<table><tr><td>Value</td><td>Time con tant</td></tr><tr><td>0</td><td>No filtering function</td></tr><tr><td>1</td><td>↓</td></tr><tr><td>～</td><td>Large time constant</td></tr><tr><td>2048</td><td>↓</td></tr></table></td><td>0～2048
【 0 】</td></tr>
<tr><td>37</td><td>Internal position register loop counter mode</td><td>The mode range for the internal position register loop counter is 1~8.</td><td>1～8
【 0 】</td></tr>
<tr><td>38</td><td>Gain constant of current loop</td><td>The more value you adjust, the higher rigidy motor has</td><td>400～
3000
【700】</td></tr>
<tr><td>39</td><td>Speed up time constant (ms)</td><td rowspan="2">In speed control mode, the time duration for motor accelerating/decelerating from zero to the rated speed (ms).
 

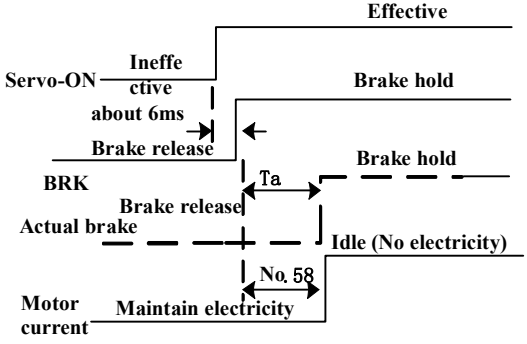
The larger the parameter is, the longer the time duration for accelerating/decelerating is; The smaller the parameter is, the shorter the time duration for accelerating /decelerating is.</td><td>10～
3000
【200】</td></tr>
<tr><td>40</td><td>Speed down time constant (ms)</td><td>10～
3000
【200】</td></tr>
<tr><td>41</td><td>Integral time constant of current loop</td><td>The more value you set, the slower response the motor does. In general, this parameter is not necessary to be set.</td><td>1～50
【10】</td></tr>
</table>

<table>
<tr><th>S/N:</th><th>Name</th><th>Function</th><th>Default</th></tr>
<tr><td>42</td><td>Zero speed clamping</td><td>In setting P4 = 1, if speed command voltage is less than the value of P42, speed of the servo motor will be zero.</td><td>0~1000
【0.1】</td></tr>
<tr><td>43</td><td>Speed command input gain</td><td>This parameter can be used for setting the ratio between motor speed and analog speed command voltage.（ Speed command signal terminal is at pin CN2-33，signal ground is at CN2-35）
Speed control command ＝input voltage × parameter setting value；
No.43 default value is 200. For example, if analog input is 10V, the speed command will be 2000rpm；If analog input is 5V, speed command will be 1000rpm。</td><td>10～500
【200】</td></tr>
<tr><td>44</td><td>Speed Command Input Logic inverse</td><td>When you want to change the motor rotation direction, but not change the analog speed command polarity, this parameter can be used.
<table><tr><th>Value</th><th>Rotation dire tion</th></tr><tr><td>0</td><td>（＋） command, counter-clockwise rotation（viewed from the shaft）</td></tr><tr><td>1</td><td>（＋） command, clockwise rotation (viewed from the shaft)</td></tr></table></td><td>0～1
【 0 】</td></tr>
<tr><td>45</td><td>Speed Command Zero Drift Compensation</td><td>This parameter can be used for adjusting the external analog speed command zero-drift；Changing every unit of this parameter can adjust 5mV of the drift.</td><td>－2048
～2048
【 0 】</td></tr>
<tr><td>46</td><td>Torque command input gain</td><td>This parameter can be used for setting the ratio between motor torque and analog torque command voltage.
（Torque command signal terminal is at pin CN2-31. signal ground is at CN-36）
Torque control command＝input voltage × parameter setting value；
No.46 default value is 10. If input is 10V，torque control command will be 100％；If input is 5V，torque control command will be 50％。</td><td>1～100
【10】</td></tr>
</table>

<table>
<tr><th>S/N:</th><th>Name</th><th>Function</th><th>Default</th></tr>
<tr><td>47</td><td>Torque command input reverse</td><td>This parameter can be set to change the torque command Input polarity.
<table><tr><td>Value</td><td>Motor torque direction</td></tr><tr><td>0</td><td>（＋） command, counter-clockwise torque</td></tr><tr><td>1</td><td>（＋）command, clockwise torque.</td></tr></table></td><td>0～1
【 0 】</td></tr>
<tr><td>48</td><td>Torque limit setting</td><td>This parameter is used for limiting the maximum motor toque. Default value 200 means motor torque is limited within 200% of the rated torque.</td><td>0～300
【200】</td></tr>
<tr><td>50</td><td>Positioning complete range</td><td>·This parameter can be used for setting the positioning complete signal（COIN,CN2-3） output time sequence when motor arrives at the command position is given by the command pulse.
When the rest of the position error counter number is within the value set by this parameter, the position complete signal will output.</td><td>1～9999
【50】</td></tr>
<tr><td>51</td><td>Zero speed</td><td>This parameter is used for setting the zero speed detection （ZSP,CN2-34）output time sequence.
When motor speed is below the setting value, signal ZSP will be sent out.</td><td>0～2000
【50】</td></tr>
<tr><td>52</td><td>Speed arrival</td><td>In speed and torque control mode, this parameter is used for setting the speed arrival signal（COIN,CN2-3）output time sequence.
When motor speed exceeds the setting value, speed arrival signal will be sent out.</td><td>0～3000
【2000】</td></tr>
<tr><td>53</td><td>Position error overlarge setting</td><td>This parameter can be used for setting the threshold value for the position error overlarge.
Parameter value＝[Threshold value for position error overlarge (Pulse number)] / 256
If the position loop gain is small and the setting value of this parameter is also too small, position error overlarge protection (Alarm NO.9）will be activated even there is no position error.</td><td>1～9999
【200】</td></tr>
</table>

<table>
<tr><th>S/N:</th><th>Name</th><th>Function</th><th>Default</th></tr>
<tr><td>54</td><td>Position error overlarge protection off</td><td>Effective the position error overlarge protection.
<table><tr><td>Value</td><td>Position error overlarge protection</td></tr><tr><td>0</td><td>Ineffective</td></tr><tr><td>1</td><td>Effective. Even if the pulse number exceeds the setting value of parameter No.53. the motor will keep running</td></tr></table></td><td>0～1
【 0 】</td></tr>
<tr><td>58</td><td>Mechanical brake Action time for motor stop</td><td>Define the process from mechanical brake break-off signal to motor current cutting off(servo idle) for motor stop.

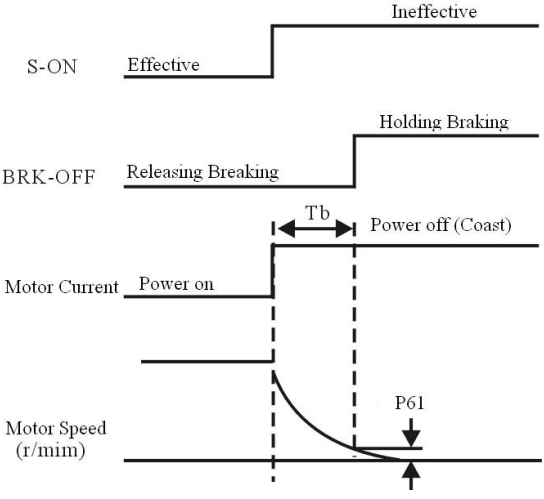
After servo-ON signal turns off, it will take about 6ms for software calculation, then BRK signal will be sent out. As the mechanical brake has delay time, after time duration Ta, then, the brake will actually act. During this period, to avoid motor minor shift or the working panel falling off, the motor must be kept power on by electricity to maintain the torque. Only after he mechanical brake actually acts, the electricity can be turned off.

Value for this parameter should be larger than Ta (Mechanical brake delay time)，to avoid motor minor shift or component falling off.
.
No.58= (Given value) ×2ms.
 
</td><td>0～1000
【10】</td></tr>
</table>

<table>
<tr><th>S/N:</th><th>Name</th><th>Function</th><th>Default</th></tr>
<tr><td>60</td><td>Mechanical brake action time during motor running</td><td rowspan="2">To define the processes from mechanical brake break off signal to motor current cutting off (servo idle) during motor running.

The value of Tb is either the value of parameter NO.60 or the value of the motor speed in parameter NO.61, chosen the smaller one from the above two values.

No.60=(Setting value)×2ms。

 
</td><td>0～1000
【10】</td></tr>
<tr><td>61</td><td>Motor Speed For Mechanical Brake action</td><td>0～200
【50】</td></tr>
<tr><td>63</td><td>Motor stop mode</td><td>When S-ONis effective, motor stop mode：
0：Motor will speed down to P61 ahead of P60
1：Motor will coast down to stop</td><td>0～1
【 1 】</td></tr>
<tr><td>64</td><td>Input signal logic mode</td><td><table>
<tr><td>T7</td><td>T6</td><td>T5</td><td>T4</td><td>T3</td><td>T2</td><td>T1</td><td>T0</td></tr>
<tr><td>R_SPD</td><td>SRV_ON</td><td>SPD1</td><td>C_ ODE</td><td>CWL</td><td>CCWL</td><td>CL</td><td>ZEROSPD</td></tr>
<tr><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td></tr>
</table>
0:input low on 1：input high on

Example：P64 set for 64 when the servo needs internal contral</td><td>0～255
【 0 】</td></tr>
</table>

<table>
<tr><th>S/N:</th><th>Name</th><th>Function</th><th>Default</th></tr>
<tr><td>66</td><td>Output signal logic mode</td><td>
<table>
<tr><td>T7</td><td>T6</td><td>T5</td><td>T4</td><td>T3</td><td>T2</td><td>T1</td><td>T0</td></tr>
<tr><td>ZSP</td><td>TLC</td><td>COIN</td><td>BRK_OFF</td><td>ALM</td><td>S-RDY</td><td></td><td></td></tr>
<tr><td></td><td></td><td>0</td><td>0</td><td>0</td><td>0</td><td>1</td><td>0</td></tr>
</table>
0: output low level 1：Output high level
</td><td>0～255
【 2 】</td></tr>
<tr><td>69※</td><td>Communication mode</td><td>
<table>
<tr><td>Value</td><td>0</td><td>1</td><td>2</td></tr>
<tr><td>Mode</td><td>No</td><td>RS232</td><td>RS485</td></tr>
</table>
</td><td>0～2
【 0 】</td></tr>
<tr><td>70※</td><td>Communication format</td><td>0: RTU format; 1: ASCII format
The start address is Parameter 131 (ADDR131)
The register is from 41001H on</td><td>0～1
【 0 】</td></tr>
<tr><td>72※</td><td>Communication address</td><td>Select for the communication drive address; have to be agreed with the upper-level controller setting.</td><td>0～255
【 0 】</td></tr>
<tr><td>73※</td><td>Speed ration of communication port</td><td>
<table>
<tr><td>Value</td><td>0</td><td>1</td><td>2</td><td>3</td></tr>
<tr><td>Baud</td><td>2400</td><td>4800</td><td>9600</td><td>19200</td></tr>
<tr><td>Value</td><td>4</td><td>5</td><td>6</td><td></td></tr>
<tr><td>Baud</td><td>38400</td><td>5 600</td><td>115200</td><td></td></tr>
</table>
</td><td>0～6
【 0 】</td></tr>
</table>

<table>
<tr><th>S/N:</th><th>Name</th><th>Function</th><th>Default</th></tr>
<tr><td>74※</td><td>Protocol mode of Communication</td><td>
<table>
<tr><td>0</td><td>7bit，no parity check(n)，2 stop bit</td></tr>
<tr><td>1</td><td>7bit，even parity check(e)，1 stop bit</td></tr>
<tr><td>2</td><td>7bit，odd parity check(n)，1 stop bit</td></tr>
<tr><td>3</td><td>8bit，no parity check(n)，2 stop bit</td></tr>
<tr><td>4</td><td>8bit，even parity check(e)，1 stop bit</td></tr>
<tr><td>5</td><td>8bit，odd parity check(n)，1 stop bit</td></tr>
</table>
This parameter value has to correspond with upper controller.
</td><td>0～5
【 0 】</td></tr>
<tr><td>78</td><td>Torque command filter</td><td>The bigger the setting value is, the smoother the torque command is. Too large value will slow down the response.</td><td>0～8100
【 0 】</td></tr>
<tr><td>83</td><td>Internal position command1 speed setting</td><td rowspan="2">Internal position command（pulse number）＝
Internal position command setting value × motor pulse number per rotate＋Internal position command pulse number setting value。</td><td>－9999
～9999
【 1 】</td></tr>
<tr><td>84</td><td>Internal position command1 pulse setting</td><td>－9999
～9999
【 1 】</td></tr>
<tr><td>85</td><td colspan="2">Internal position command 2 speed setting</td><td rowspan="11">－9999～9999
【 1 】
－9999～9999
【 1 】</td></tr>
<tr><td>86</td><td colspan="2">Internal position command 2 pulse number setting</td></tr>
<tr><td>87</td><td colspan="2">Internal position command 3 speed setting</td></tr>
<tr><td>88</td><td colspan="2">Internal position command 3 pulse number setting</td></tr>
<tr><td>89</td><td colspan="2">Internal position command 4 speed setting</td></tr>
<tr><td>90</td><td colspan="2">Internal position command 4 pulse number setting</td></tr>
<tr><td>91</td><td colspan="2">Internal position command 5 speed setting</td></tr>
<tr><td>92</td><td colspan="2">Internal position command 5 pulse number setting</td></tr>
<tr><td>93</td><td colspan="2">Internal position command 6 speed setting</td></tr>
<tr><td>94</td><td colspan="2">Internal position command 6 pulse number setting</td></tr>
<tr><td>95</td><td colspan="2">Internal position command 7 speed setting</td></tr>
</table>

S/N:	Function	Default
96	Internal position command 7 pulse number setting	−9999～9999 【 1 】 −9999～9999 【 1 】
97	Internal position command 8 speed setting	
98	Internal position command 8 pulse number setting	
99	Internal position command 9 speed setting	
100	Internal position command 9 pulse number setting	
101	Internal position command 10 speed setting	
102	Internal position command 10 pulse number setting	
103	Internal position command 11 speed setting	
104	Internal position command 11 pulse number setting	
105	Internal position command 12 speed setting	
106	Internal position command 12 pulse number setting	
107	Internal position command 13 speed setting	
108	Internal position command 13 pulse number setting	
109	Internal position command 14 speed setting	
110	Internal position command 14 pulse number setting	
111	Internal position command 15 speed setting	
112	Internal position command 15 pulse number setting	
113	Internal position command 16 speed setting	
114	Internal position command 16 pulse number setting	
115	Internal position command 1 moving speed	0~ 3000【100】
116	Internal position command 2 moving speed	
117	Internal position command 3 moving speed	
118	Internal position command 4 moving speed	
119	Internal position command 5 moving speed	
120	Internal position command 6 moving speed	
121	Internal position command 7 moving speed	
122	Internal position command 8 moving speed	
123	Internal position command 9 moving speed	
124	Internal position command 10 moving speed	
125	Internal position command 11 moving speed	
126	Internal position command 12 moving speed	
127	Internal position command 13 moving speed	
128	Internal position command 14 moving speed	
129	Internal position command 15 moving speed	
130	Internal position command 16 moving speed	

<table>
<tr><th>S/N:</th><th colspan="2">Function</th><th>Default</th></tr>
<tr><td>131</td><td>Internal speed command 1</td><td rowspan="4">In P4=1 (external speed command mode), combine CN2_2 (SPD1) with CN2_1 (SPD0)
<table><tr><td>SPD1</td><td>SPD0</td><td>Source</td></tr><tr><td>1 (off)</td><td>1 (off)</td><td>External</td></tr><tr><td>1 (off)</td><td>0 (on)</td><td>P131</td></tr><tr><td>0 (on)</td><td>1 (off)</td><td>P132</td></tr><tr><td>0 (on)</td><td>0 (on)</td><td>P133</td></tr></table></td><td rowspan="5">Speed command proportion setting value as No.43
－3000～3000
【500】</td></tr>
<tr><td>132</td><td>Internal speed command 2</td></tr>
<tr><td>133</td><td>Internal speed command 3</td></tr>
<tr><td>134</td><td colspan="2">Internal speed command 4</td></tr>
<tr><td>135</td><td colspan="2">Internal torque command 1</td><td rowspan="4">Torque ommand proportion setting value as No.43
－3000～3000
【50】</td></tr>
<tr><td>136</td><td colspan="2">Internal torque command 2</td></tr>
<tr><td>137</td><td colspan="2">Internal torque command 3</td></tr>
<tr><td>138</td><td colspan="2">Internal torque command 4</td></tr>
<tr><td>139</td><td colspan="2">Delay register 1</td><td rowspan="14">Delay time form Internal position command n to Internal position Command n+1, delay time = setting value * 10ms
0 ～ 9999
【100】</td></tr>
<tr><td>140</td><td colspan="2">Delay register 2</td></tr>
<tr><td>141</td><td colspan="2">Delay register 3</td></tr>
<tr><td>142</td><td colspan="2">Delay register 4</td></tr>
<tr><td>143</td><td colspan="2">Delay register 5</td></tr>
<tr><td>144</td><td colspan="2">Delay register 6</td></tr>
<tr><td>145</td><td colspan="2">Delay register 7</td></tr>
<tr><td>146</td><td colspan="2">Delay register 8</td></tr>
<tr><td>147</td><td colspan="2">Delay register 9</td></tr>
<tr><td>148</td><td colspan="2">Delay register 10</td></tr>
<tr><td>149</td><td colspan="2">Delay register 11</td></tr>
<tr><td>150</td><td colspan="2">Delay register 12</td></tr>
<tr><td>151</td><td colspan="2">Delay register 13</td></tr>
<tr><td>152</td><td colspan="2">Delay register 14</td></tr>
<tr><td>153</td><td colspan="2">Low voltage alarm</td></tr>
<tr><td>154</td><td colspan="2">Low voltage alarm (time)</td><td></td></tr>
</table>

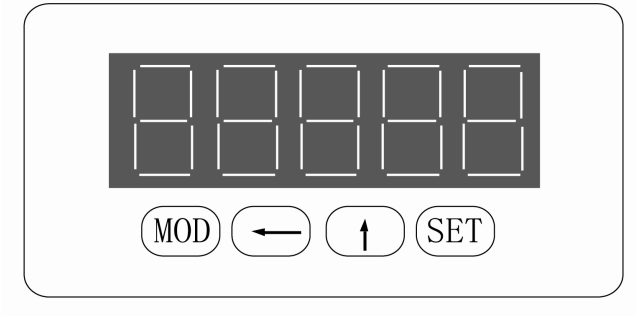
Chapter 5 Monitoring and Operation

5.1 Panel operation

The panel is composed of 5 LEDs and 4 buttons,"MOD""←""↑" and "SET". It is used for displaying the system status and setting parameters.

The operation is based on different levels, which are described level by level as follows:

Level 1: It is used to select one of the 4 operating modes with the button "MOD". Press "SET" to go into the second level. After typing the parameter number, press "SET" going into the third level and the parameter value can be changed. Button "MOD" can be used for returning to the upper level when you are at level 2 or level 3. When setting the parameters, press "MOD", the parameter value will not be changed. In short:



"MOD"：Mode mode/ cancellation
"←" ：Shifting bit position
"↑" ：Value increase
"SET"：Confirm

During operation, the bit where the decimal point is blinking indicates this bit can be modified. If all 5 LEDs' decimal points are blinking, there is alarm and the alarm number will be displayed. If press the same button continuously, the following condition may be happened:

Button	Possible Conditions
MOD	Switch between different control modes or keep going back to the upper level
←	Keep shifting the bit position to the left
↑	Increase the bit value without carrying. After reaching 9, restart from 0.
SET	If the operation is for EEPROM，it will keep writing EEPROM.

The operation mode diagram is shown as follows:

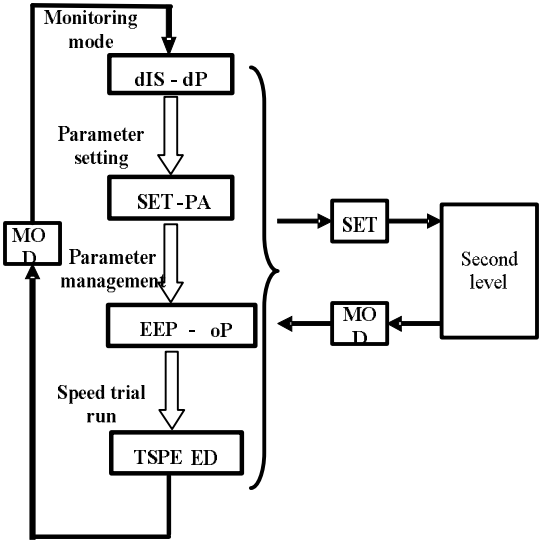


Fig. 5-1 Operation mode mode diagram (The first level)

5.2 Monitoring Mode (DISP)

1. Select the monitoring mode "dISP" from the first level, press "SET" to enter the monitoring mode and LEDs display "dP0".

2. In the monitoring mode, there are 35 monitoring variables. Press "↑" to increase the value, press "←" to change the position. After choosing the needed display number, press "SET" to enter the specific display.

3. If you want to display other variables, press "SET" or "MOD"(In monitoring mode, these two buttons have the same function for return) to exit the present display and return to level 2.

4. If you want to go to other operation modes, press "MOD", and it will go back to the upper level. When arriving at the first level, pressing "MOD" can switch between different modes.

5. If there is alarm happened, the decimal point right to the 5 LEDs will blink. It will not affect the button operation. When the alarm is clear, the display will return to normal.

In monitoring mode, the operation code and corresponding display content is shown in Fig.

Table 5.1 Status Display

Code	Display		Example	Description
dP 0	Motor speed （r/min）		-1000	Motor reverse rotation speed 1000r/min
dP 1	Motor feedback pulse lower 4 bits		13C6	At current position, motor has accumulated 2F13C6 (hexadecimal) pulses in the reverse direction.
dP 2	Motor feedback pulse higher 4 bits		2F	
dP 3	Position command lower four（Pulse）		A023	Position command has accumulated 18A02 （hexadecimal） pulses in the forward direction.
dP 4	Position command higher 4 bi（Pulse）		18	
dP 5	Position error （Pulse）		101	Position error has Accumulated 101 pulses in the positive direction.
dP 6	Motor encoder lines		2500	Motor encoder has 2500-line resolution.
dP 7	Speed command input		50	Speed command is 50（r/min）
dP 9	Torque command input（%）		100	Torque command input is 100%
dP 13	Motor average current（A）	→SET→ ←MOD← ←SET←	4.2	Motor average phase current is 4.2A
dP 15	Command pulse frequency（kHz）		100	Position command pulse frequency is 100 kHz.
dP 16	Main circuit voltage（V）		330	Main circuit voltage is 330V.
dP 17	Rotor absolute position in a circle		1531	Rotor absolute position is 1531 in a circle （a full circle corresponding to 10000）
dP 18	Input terminal status		||||||||	Input terminal signal, light indicates there is input at this bit.
dP 19	Output terminal signal		||||||	Output terminal signal, light indicates there is output at this bit.
dP 20	Encoder status		||||||	Encoder status, light indicates there is input at this bit.
dP 21	Control mode		C1	Control mode is 1
dP 22	Operation status		cn-on	Operation status：running
dP 23	Id		d 0	Current at field direction
dP 24	Iq		8192	Current in vertical to field direction, rated torque operation.
dP 25	Alarm record 1		Err01	Alarm record 1 is No.1 alarm.
dP 26	Alarm record 2		Err01	Alarm record 2 is No.1 alarm.
dP 27	Alarm record 3		Err01	Alarm record 3 is No.1 alarm.
dP 28	Alarm record 4		Err01	Alarm record 4 is No.1 alarm.

Note:

1. Input pulse is the one after the electrical gear.
2. Position command pulse frequency is the actual input pulse frequency before the electrical gear. The minimum unit is 0.1 kHz. Forward rotation is displayed by positive number, and reverse rotation is displayed by negative number.
3. Rotor absolute position represents the rotor position in a circle with respect to the stator. One round is a circle and the value range is 0~9999.
4. Operation status display:

"Cn oFF" : indicates the servo system is not running (Drive is not started, or there is alarm) .

"Cn on": indicates the servo system is running.

5. Terminal input status is shown in Fig. 5-2 and output status is shown in Fig.5-3. Dotted lines at the upper part of the LEDs are the bits for monitoring the terminal status.

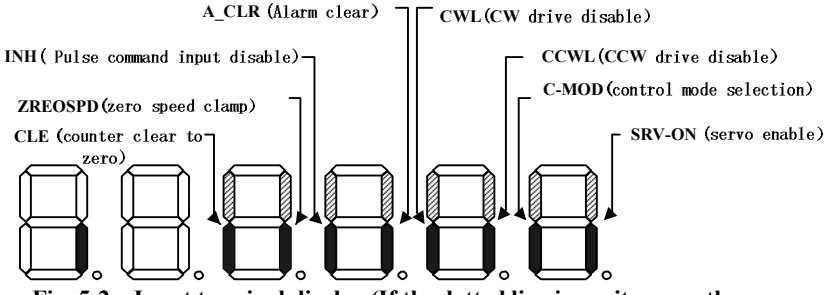


Fig. 5-2 Input terminal display (If the dotted line is on, it means the Corresponding input terminal is ON. If the dotted line is off, it means the corresponding input terminal is OFF.)

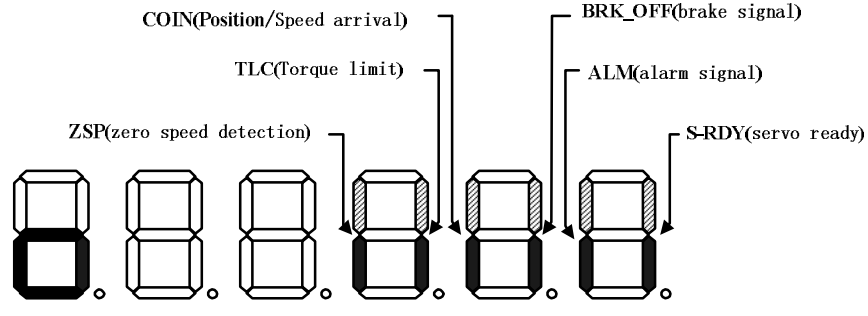


Fig. 5-3 Output terminal display (If the dotted line is on, it means the corresponding output terminal is ON. If the dotted line is off, it means the corresponding output terminal is OFF.)

5.3 Parameter setup (SET-P)

【NOTE】

- **Before changing other parameters, parameter No.0 （NO.0【Password】）must first be set for 58.**
- **Parameter setting will become on immediately after change.（Except for the parameters needed system re-power on）. Wrong parameter settings may cause the abnormal function of the drive and cause accident.**
- **If the changed parameter is not written into EEPROM, it will not be saved after the system power-off.**
- **If the system lost power during the EEPROM written, please set the parameters again.**

At the first level, select “SET-P”, press “SET” button to enter the parameter setting mode. Use “↑”、“←” button to choose the parameter number, then press “SET” to enter the parameter.

Use “↑”、“←” button to set up the parameter value. The decimal point of the right most LED will be blinking. Press “SET” to confirm the parameter change and it will come back to the upper level automatically.

If you are not satisfied with the parameter value, do not press “SET”, but press “MOD” to cancel this operation and return to the upper level. The parameter will remain the same value as before change.

After every change to the parameter value, please re-enter the parameter, double check and make sure the parameter value has been changed.

Note: In the parameter table, the parameter with “※” in front needs to be written into EEPROM after change and re-power on the system to let it on.

5.4 Parameter management (EEPOP)

Parameter management deals with the operation between DSP RAM and EEPROM. At the first level, select “EEPOP”, press “SET” button, and then go into the parameter management mode.

Parameter management has 3 modes, use “↑” to select the mode number, then press “SET” to enter the corresponding parameter management.

Table 5.2 gives a brief explanation to the parameter management.

Table 5.2 Parameter management

Code	Operation	Explanation	Correspondance
EE- 0	Writing	The parameter values in the RAM are written into EEPROM. If the user changes the parameter value, only the value stored in DSP's RAM will change temporarily and will return to the original value after next power on. If want to change the parameter value permanently, you need to use this written command and the parameter will remain the changed value after next power on.	**RAM** ⇩ **EEPROM region**
EE – 1	Reading	Read all the parameters' default value to the RAM and write them into EEPROM parameter region. During next power on, the default parameter values will be used. Please note, different drive version has different parameter values. Make sure the drive version is correct before using the default value.	**Default** ⇩ **RAM** ⇩ **EEPROM region**

The flowchart of parameter management is shown in Fig. 5-4.

1. Press "MOD" button to display "EEPOP".
2. Press "SET" to enter the parameter management and select the operation code. The default operation is parameter writing （"EE—0"）.
3. Press "SET" button again and LED displays "EEP －". Keep pressing button "SET".(About 4 seconds)
4. When LED displays "Finish", indicating the operation is completed, release the button.

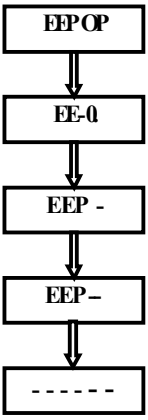


Fig. 5-4 Parameter management operation flowchart

- If you still keep pressing "SET" after the parameters written finished, the operation will start from step 3 again.
- If you release the button before "Finish" is displayed, the operation will be cancelled automatically.

5.5 Speed trial run

- Make sure terminal TB and encoder terminal (CN3) is connected correctly and control terminal (CN2) is disconnected.
- Make sure selecting the correct 【Drive version mode】 parameter and other parameters. Load is removed from the motor shaft.
- After entering the trial run mode, you can press "MOD" to exit the trial run mode.
- Before exiting the trial run, please reduce the motor speed, otherwise, the motor will stop dramatically fast and may cause unexpected problems.
- If the servo enable signal (S-ON) is on, it is impossible to enter trial run mode.
- If speed trial run is OK, meaning the motor and drive status is fine, the connection is good.

(1) At level 1, choose “t-SPd”.

(2) Press “SET” to enter the speed trial run mode and LEDs display “S-rdy”.

(3) Press “SET” to start speed trial run. The speed unit is r/min and the value can be set by button.

(4) Press “←” to increase the speed for reverse rotation and press “↑” to increase the speed for forward rotation. If you release the button, the motor will run at the setting speed.

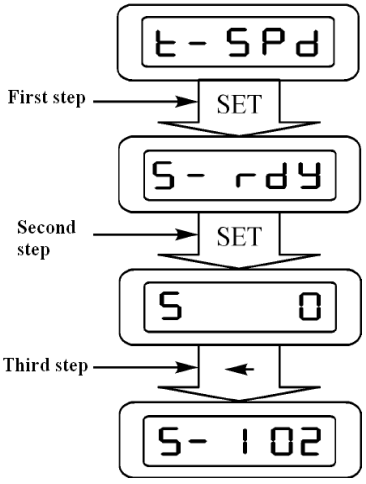


Fig. 5-5 Speed trial run operation diagram

Chapter 6 Alarm and handling

6.I Drive alarm

EPS2 series drive has many protection functions. When one of the protections is triggered, the drive will turn off the output with a certain sequence and generate the alarm at the same time.

- When alarm occurs, LED panel will display an alarm number. The 5 LEDs' decimal points will blink and the servo-on signal is turned off.
- When alarm occurs, please shut off the power immediately and clear the fault according to the alarm number. If the problem is identified to be inside the drive, please contact our company for solution.

Table 6.1 Alarm overview

Number	Alarm name	Reason
--------	Normal	
1	Overload	Motor stator current is overlarge for a long
2	under voltage	Main circuit is under voltage.
3	Over voltage	Main circuit is over voltage.
4	Main circuit power losing phase	Main circuit only has signal phase power input.
8	Motor over-speed	Motor speed is over the rated value for a long time.
9	Position error over-large	Position error counter value exceed the threshold
11	Command pulse frequency abnormal	Command pulse frequency is higher than 500kpps.
12	Serial communication error	Serial communication error
14	CAN communication error	CAN communication error
16	EEPROM parameter error	EEPROM stored data is destroyed.
20	IPM alarm	IPM protection pin is always high.

21	Phase V current abnormal	The measured phase V current is too large
22	Phase W current abnormal	The measured phase W current is too large
23	Drive effective abnormal	Both clockwise and counter-clockwise position limit effective input is disconnected.
25	Encoder AB pulses missing	Encoder AB pulses are lost
26	Encoder Z pulse missing	Encoder Z pulse is lost
27	Encoder UVW signal is wrong	Encoder U、V、W signal is wrong
30	Speed tracking abnormal	The error between motor speed and speed command is too large.

6.2 Alarm handling

The followings list several non-alarm failures and give some handling method to identify the problem.

- Motor do not run.

1. Parameter: Control mode mode is not proper.

2. Wire connection: Not receiving CN2 servo-on signal: CN2 counter clear zero is always ineffective (short circuit). CN2 command pulse input disable is ineffective------Monitoring input signal (dp 13) status via LED panel display, to identify the problem.

3. Shaft is locked permanently: Shut off the power, disconnect the motor, turn the motor shaft by hand to make sure the motor can rotate freely. If the motor has lose-power brake, then, add a 24V DC power to the brake and try to turn the motor shaft by hand.

- **Rotation is not smooth.**

Wire connection：

a) Servo- ON signal keEPS2 appearing intermittently.

b) CW/CCW signal of CN2 keEPS2 appearing intermittently.

c) Counter clear signal is ineffective

d) CN2 command pulse input disable signal is ineffective.

You can use LED panel to monitor input signal status （dp 13） to identify the problem.

- **Motor has noise or vibration.**

  1. Parameter：The gain is too high: speed gain or position gain is too high；Speed detection filter is not set properly.

  2. Installation: Machine and motor have resonance vibrations.

For every alarm, Table 6.3 gives some general handling methods.

Table 6.3 Alarm handling method

NO.	Name	Status	Reason	Handling methods
1	**Over load protection**	During System acceleration or deceleration During system running	Drive has sampled overlarge current several times.	①Increase the acceleration or deceleration time； ②Make sure the drive version is compatible with the motor model. ③Replace the drive and motor with a larger power rating one.
2	**Main circuit under-voltage**	During Drive power-on during system running	Main circuit power converter dc-link voltage is below the setting value.。	①Increase the main power transformer rating, increase the main power voltage； ②Check the main power and control power connection time sequence.

NO.	Name	Status	Reason	Handling methods
3	**Main circuit over-voltage**	During Drive power-on during system running	Main power supply input voltage is higher than the rated acceptable voltage, which causes the dc-link voltage is higher than the rated value.	①Measure the terminal voltage between（R、S and T）to see whether it is within the range. ②Check whether the braking resistor is broken.
4	**Main circuit power losing phase**	During drive power-on during system running	R、T has no input power，or the input power is not enough.	Make sure the main power terminal is connected to 3-phase AC 220V power source or R、T terminal is connected to single phase AC220 power source.
8	**Motor over-sped protection**	During system running	Motor speed exceeds the rated speed for a long time.。	① Reduce the speed command； ② Make sure the motor model is selected correctly. ③Decrease parameter NO.4【Speed command input gain】value； Make sure input pulse frequency ×electrical gear≦500KHz.
9	**Position error protection**	During system running	The number of position error pulses is larger than parameter NO.53【Position error over-large setting 】value.	Increase parameter NO.11【Position loop gain】value； Reduce the load and speed； Increase parameter NO.53【Position error over-large setting 】value.

NO.	Name	Status	Reason	Handling methods
11	**Command pulse frequency abnormal**	During system running	The command pulse frequency at the input of position error counter is larger than 500kpps。	① Set the proper command pulse input frequency； ②Adjust parameter No.31、32 value，reduce the multiplication coefficient, to let the command pulse frequency be lower than 500 kpps.（Command pulse frequency ＝ input command frequency×division/multiplication coefficient）
12	**Serial communication error**	During Communication	The drive received data is found out to be different from the one upper –level controller has sent after CRT check.	Check the communication line； Check the baud rate and serial port parameters setting； Communication chip failure inside the drive
16	**EEPROM parameter error**	During drive power-on During Parameter Management operation	The data stored in EEPROM are destroyed.	Re-set the parameters or re-write the default parameter values. If this alarm happens frequently, the drive may have problem.

NO.	Name	Status	Reason	Handling methods
19	Drive version mode error	During drive power-on	Drive version number is not within the given range.	Re-set the drive motor model mode parameter.
20	IPM alarm	During drive power-on	Drive power module is damaged.	① Check whether motor power line and encoder line are connected properly； ② Check whether the drive motor model mode parameter is correct. ③ Check whether the drive IPM module is ok；after checking, re-power on the system, if the alarm No.20 still exists, please contact our company.
21	Phase V current abnormal	During drive power-on	The reason could be unstable power supply, current sensor damage or AD sampling circuit damage which causes the sampling error.	Drive power supply damage or other damage inside the drive.
22	Phase W current abnormal			

NO.	Name	Status	Reason	Handling methods
23	**Drive effective abnormal**	During system running	Clockwise and counter-clockwise position limit effective inputs are both disconnected.	① Check the related circuit wiring and power. ② Check parameter NO.06 value.
24	**PWM error**	During system running	PWM output waveform abnormal caused by power supply or IPM module damage.	① Check whether there is noise source near the input power and around. ② If this error happens requently, the drive may have problem.
25	**Encoder AB pulse missing**	During system running	There is no Phase-A,B signal between drive and encoder, or the encoder has sent the wrong data.	①Check the encoder Connection wire. ②Do not put the encoder wire and motor cable together, connect the shielding wire to the motor cover. ③Increase the acceleration and deceleration time

NO.	Name	Status	Reason	Handling methods
26	Encoder Z pulse missing	During system running	Z pulse signal generated once every circle is not detected.	①Check the cable connection, don't put the encoder signal wire together with the motor cable. ②Increase acceleration and deceleration time. ③Replace the servo motor.
27	Encoder U、V、W signal error	During drive power-on During system running	The detected encoder U、V、W signal is off. They are 0 or 1 at the same time。	①Check the encoder wire ②Replace the servo motor ③Replace the drive
30	Speed tracking abnormal	During drive power-on During system running	Motor speed can not track the speed command for a long time.	①Check whether the load mechanical part is locked; ②Check whether the motor power line and encoder line is connected properly; ③Check whether the drive IPM module is ok After checking, re-power on the system, if the same No. 30 alarm happens, please contact the company.

「Note」

◆ Explanation：“During diver power-on” means the servo system is under effectived condition（S-ON off）;

“During system running” means the servo system is under enabled condition（S-ON on）.

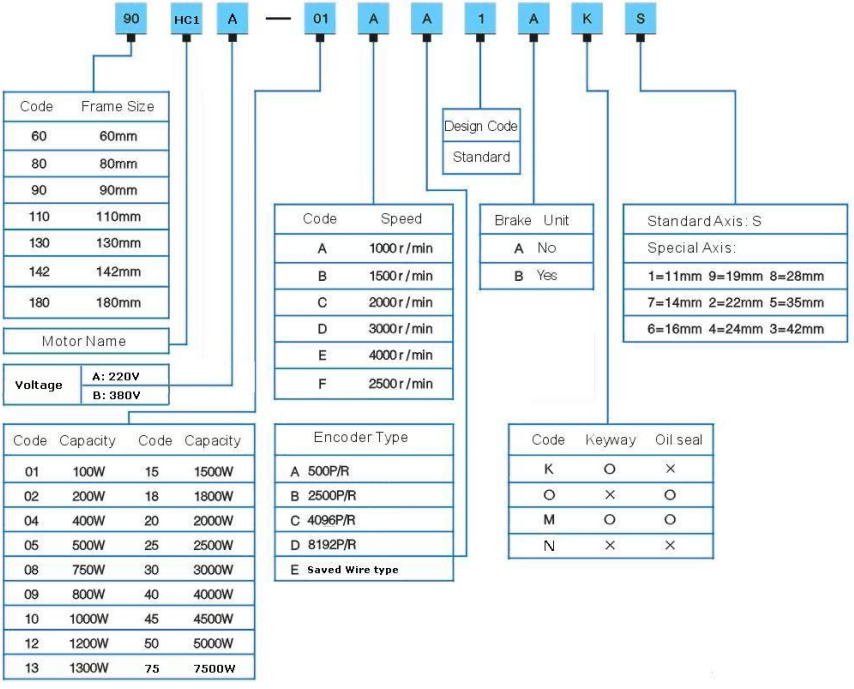
Chapter 7 Servo Motor

【NOTE】

- Servo drive must be compatible with the motor.
- Motor winding U、V、W phase sequence should agree with the drive terminal.
- Servo motor has precise feedback devices inside. Knocking or strong vibration is prohibited during transportation and installation.
- If the user wants to choose the servo motor from other companies, please notified us in the order and we will try our best to meet your requirement.

7.1 Model naming format

Motor model name is composed of frame number, product number and performance specs number:



7.2 Motor installation Dimension

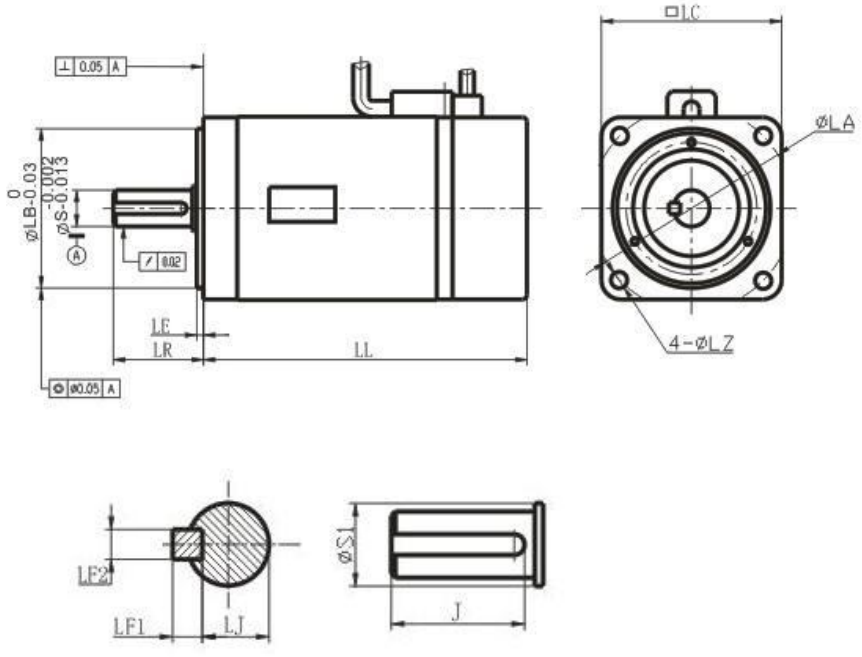


Fig. Servo System for 60, 80, and 90 series

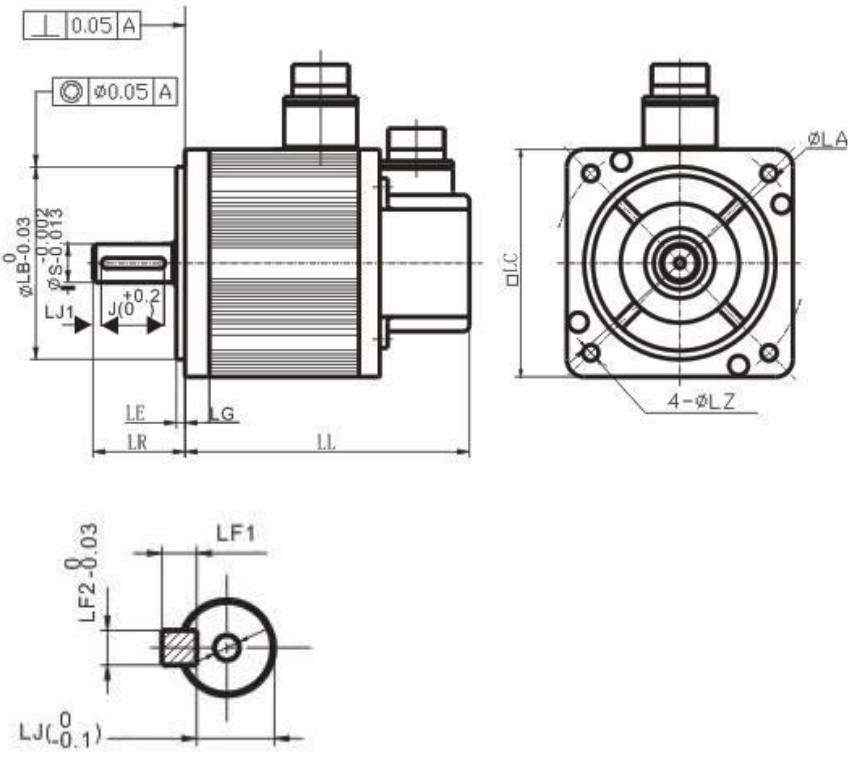


Fig. Servo System for 110 , 130, 180 series

220V Servo Motor

Model		60 Frame		80 Frame			90 Frame			
		60HC1A-02DB1AKS	60HC1A-04DB1AKS	80HC1A-05DB1AKS	80HC1A-08DB1AKS	80HC1A-10DB1AKS	90HC1A-05DB1AKS	90HC1A-08DB1AKS	90HC1A-08CB1AKS	90HC1A-10DB1AKS
Rated Power (W)		200	400	500	750	1000	500	750	750	1000
Rated Torque (nm)		0.64	1.27	1.59	2.37	3.18	1.59	2.37	3.5	3.18
Rated Current (A)		2	2.8	2.3	4	4.5	2.3	4	4.5	4.5
Rated Speed (RPM)		3000	3000	3000	3000	3000	3000	3000	2000	3000
Instant Max Torque		1.92	3.81	4.8	7.2	9.6	4.8	7.2	10.5	9.6
Instant Max Current		3.8	6.7	6.9	11.4	13.6	6.9	11.4	13.5	13.6
Rotor Inertia		$0.21x10^{-4}$	$0.27x10^{-4}$	$1.08x10^{-4}$	$1.4x10^{-4}$	$1.63x10^{-4}$	$2.5x10^{-4}$	$3.0x10^{-4}$	$3.5x10^{-4}$	$1.63x10^{-4}$
Torque Constant		0.455	0.455	0.66	0.8	0.74	0.66	0.7	0.92	0.74
Encoder: 2500 P/r										
Usage Temperature: 0~40℃										
Storage Temperature: Less than 90% RH (non-dew)										
Anti-Vibration: 2.5G										
IP65 (except Axis and connection)										
LL		121	131	145	160	170	154	152	162	162
+ Brake		164	174	183	198	208	191	189	199	199
LR		10		35			35			
LE		3		3			3			
LG		10		18.5			12			
Axis Size	**S**	14		19			16			
	LJ1	0		3			3			
	LJ	11		15.5			13			
	J	20		25			20			
	LF1	5		6			5			
	LF2	5		6			5			
Frame Size	**LA**	70		90			100			
	LB	50		70			80			
	LC	60		80			90			
	LZ	6		6.5			6			

Model		110 Frame Size					
		110HC1A-04 CB1AMS	110HC1A-09 CB1AMS	110HC1A-12 DB1AMS	110HC1A-12 CB1AMS	110HC1A-15 DB1AMS	110HC1A-18 DB1AMS
Rated Power (W)		400	800	1200	1200	1500	1800
Rated Torque (nm)		1.91	3.8	3.82	5.7	4.77	5.7
Rated Current (A)		2.3	3.5	5.6	5.6	6.5	7
Rated Speed (RPM)		2000	2000	3000	2000	3000	3000
Instant Max Torque		5.75	11.4	11.5	15.4	14.3	17.1
Instant Max Current		7	11	16.8	15.7	20	22
Rotor Inertia		0.31×10^{-3}	0.54×10^{-3}	0.54×10^{-3}	0.76×10^{-3}	0.63×10^{-3}	0.76×10^{-3}
Torque Constant		0.8	1.18	0.8	1.33	0.83	1.0
Encoder: 2500 P/r							
Usage Temperature: 0~40℃							
Storage Temperature: Less than 90% RH (non-dew)							
Anti-Vibration: 2.5G							
IP65 (except Axis and connection)							
LL		c	184	184	204	204	204
+Brake		213	233	233	253	253	253
LR		40		55		40	
LE		5					
LG		14					
Axis Size	**S**	19					
	LJ1	3					
	LJ	15.5					
	J	25					
	LF1	6					
	LF2	6					
Frame Size	**LA**	130					
	LB	95					
	LC	110					
	LZ	9					

Model		130 Frame Size							
		130HC1A-06AB1AMS	130HC1A-10DB1AMS	130HC1A-10CB1AMS	130HC1A-10BB1AMS	130HC1A-10AB1AMS	130HC1A-12CB1AMS	130HC1A-15DB1AMS	130HC1A-15CB1AMS
Rated Power (W)		600	1000	1000	1000	1000	1200	1500	1500
Rated Torque (nm)		5.73	3.18	4.77	6.37	9.55	5.73	4.77	7.16
Rated Current (A)		2.8	4.5	4.5	4.5	4.5	5.6	6.5	6.5
Rated Speed (RPM)		1000	3000	2000	1500	1000	2000	3000	2000
Instant Max Torque		18.1	9.6	14.3	19.1	27.2	17.2	14.3	21.5
Instant Max Current		8.6	13.6	13.7	13.6	13.8	17	19.8	19.8
Rotor Inertia		$1.98x10^{-3}$	$1.42x10^{-3}$	$1.42x10^{-3}$	$1.98x10^{-3}$	$2.84x10^{-3}$	$1.98x10^{-3}$	$2.26x10^{-3}$	$2.26x10^{-3}$
Torque Constant		1.0	1.0	1.0	1.2	2.27	1.03	1.0	1.2
Encoder: 2500 P/r									
Usage Temperature: 0~40℃									
Storage Temperature: Less than 90% RH (non-dew)									
Anti-Vibration: 2.5G									
IP65 (except Axis and connection)									
LL		189	168	168	189	223	189	168	203
+Brake		247	226	226	247	281	247	226	261
LR		57							
LE		5							
LG		14							
Axis Size	**S**	22							
	LJ1	5							
	LJ	18.5							
	J	36.5							
	LF1	6							
	LF2	6							
Frame Size	**LA**	145							
	LB	110							
	LC	130							
	LZ	9							

Model		130 Frame Size							
		130HC1A-15BB1AMS	130HC1A-15AB1AMS	130HC1A-20CB1AMS	130HC1A-20BB1AMS	130HC1A-30DB1AMS	130HC1A-30CB1AMS	130HC1A-40DB1AMS	130HC1A-45DB1AMS
Rated Power (W)		1500	1500	2000	2000	3000	3000	4000	4500
Rated Torque (nm)		9.55	14.33	9.55	12.7	9.55	14.33	12.7	14.3
Rated Current (A)		6.5	6.5	7.5	7.5	11.5	11.5	15	17
Rated Speed (RPM)		1500	1000	2000	1500	3000	2000	3000	3000
Instant Max Torque		28.7	42.99	28.7	38	28.7	34.3	38.11	34.3
Instant Max Current		19.8	19.5	22.8	22.8	34.5	28.8	45.8	34.3
Rotor Inertia		$1.94x10^{-3}$	$2.77x10^{-3}$	$1.94x10^{-3}$	$1.94x10^{-3}$	$1.85x10^{-3}$	$2.52x10^{-3}$	$1.94x10^{-3}$	$2.77x10^{-3}$
Torque Constant		1.67	1.5	1.28	1.67	1.0	0.88	1.0	0.88
Encoder: 2500 P/r									
Usage Temperature: 0~40℃									
Storage Temperature: Less than 90% RH (non-dew)									
Anti-Vibration: 2.5G									
IP65 (except Axis and connection)									
LL		223	273	223	273	223	273	273	273
+Brake		281	331	281	331	281	331	331	331
LR		57							
LE		5							
LG		14							
Axis Size	**S**	22							
	LJ1	5							
	LJ	18.5							
	J	36.5							
	LF1	6							
	LF2	6							
Frame Size	**LA**	145							
	LB	110							
	LC	130							
	LZ	9							

380V Servo Motor

Model		130 Frame Size								
		130HC1B-10AB1AMS	130HC1B-10CB1AMS	130HC1B-10BB1AMS	130HC1B-10AB1AMS	130HC1B-12CB1AMS	130HC1B-15DB1AMS	130HC1B-15CB1AMS	130HC1B-15BB1AMS	130HC1B-15AB1AMS
Rated Power (W)		1000	1000	1000	1000	1200	1500	1500	1500	1500
Rated Torque (nm)		3.18	4.77	6.37	9.55	5.73	4.77	7.16	9.55	14.33
Rated Current (A)		2.3	2.3	2.3	2.3	2.7	3.4	3.4	3.4	3.4
Rated Speed (RPM)		3000	2000	1500	1000	2000	3000	2000	1500	1000
Instant Max Torque		9.6	14.3	19.1	27.2	17.2	14.3	21.5	28.7	42.99
Instant Max Current		6.9	9.9	9.9	6.9	8.1	10.2	10.2	10.2	10.2
Rotor Inertia		$0.85x10^{-3}$	$0.85x10^{-3}$	$0.85x10^{-3}$	$1.94x10^{-3}$	$1.94x10^{-3}$	$1.94x10^{-3}$	$1.94 x 10^{-3}$	$1.94x10^{-3}$	$2.77x10^{-3}$
Torque Constant		1.67	2.5	3.3	5	2.4	1.6	2.4	3.2	5
Encoder: 2500 P/r										
Usage Temperature: 0~40℃										
Storage Temperature: Less than 90% RH (non-dew)										
Anti-Vibration: 2.5G										
IP65 (except Axis and connection)										
LL		168	168	189	223	189	168	203	223	273
+Brake		226	226	247	281	247	226	261	281	331
LR		57								
LE		5								
LG		14								
Axis Size	**S**	22								
	LJ1	5								
	LJ	18.5								
	J	36.5								
	LF1	6								
	LF2	6								
Frame Size	**LA**	145								
	LB	110								
	LC	130								
	LZ	9								

Model		130 Frame Size					
		130HC1B-20 CB1AMS	130HC1B-20 BB1AMS	130HC1B-30 DB1AMS	130HC1B-30 CB1AMS	130HC1B-40 DB1AMS	130HC1B-45 DB1AMS
Rated Power (W)		2000	2000	3000	3000	4000	4500
Rated Torque (nm)		9.55	12.7	9.55	14.33	12.7	14.3
Rated Current (A)		4	4	6.8	6.8	9.2	10.3
Rated Speed (RPM)		2000	1500	3000	2000	3000	3000
Instant Max Torque		28.7	38	28.7	34.3	38.11	34.3
Instant Max Current		12	12	28.65	20.4	27.6	30.9
Rotor Inertia		$1.94x\ 10^{-3}$	$2.77x\ 10^{-3}$	$1.94x\ 10^{-3}$	$2.77x\ 10^{-3}$	$2.77x\ 10^{-3}$	$2.77x\ 10^{-3}$
Torque Constant		2.87	3.8	2.24	2.4	1.57	1.53
Encoder: 2500 P/r							
Usage Temperature: 0~40℃							
Storage Temperature: Less than 90% RH (non-dew)							
Anti-Vibration: 2.5G							
IP65 (except Axis and connection)							
LL		223	273	223	273	273	273
+ Brake		281	331	281	331	331	331
LR		57					
LE		5					
LG		14					
Axis Size	**S**	22					
	LJ1	5					
	LJ	18.5					
	J	36					
	LF1	6					
	LF2	6					
Frame Size	**LA**	145					
	LB	110					
	LC	130					
	LZ	9					

Model		180 Frame Size				
		180HC1B-20 BB1AMS	180HC1B-20 CB1AMS	180HC1B-2 7BB1AMS	180HC1B-3 0BB1AMS	180HC1B-37 AB1AMS
Rated Power (W)		2000	2000	2700	3000	3700
Rated Torque (nm)		12.7	9.55	17.2	19.1	35
Rated Current (A)		4	4	6.2	6.8	8.5
Rated Speed (RPM)		1500	2000	1500	1500	1000
Instant Max Torque		38.1	28.65	43	47	88
Instant Max Current		12	12	21.2	24	32
Rotor Inertia		42.5x 10^{-4}	35.4x 10^{-4}	3.4x 10^{-3}	3.8x 10^{-3}	8.4x 10^{-3}
Torque Constant		3.5	2.6	1.62	1.58	2.18
Encoder: 2500 P/r						
Usage Temperature: 0~40℃						
Storage Temperature: Less than 90% RH (non-dew)						
Anti-Vibration: 2.5G						
IP65 (except Axis and connection)						
LL		202	192	212	212	272
+ Brake		277	267	287	287	347
LR		65				
LE		3.2				
LG		18				
Axis Size	**S**	35				
	LJ1	3				
	LJ	30				
	J	51				
	LF1	8				
	LF2	10				
Frame Size	**LA**	200				
	LB	114.3				
	LC	180				
	LZ	13				

Model		180 series				
		180HC1B-45 CB1AMS	180HC1B-45B B1AMS	180HC1B-50 CB1AMS	180HC1B-55 BB1AMS	180HC1B-75A B1AMS
Rated Power (W)		4500	4500	5000	5500	7500
Rated Torque (nm)		21.5	28.6	23.8	35	47.7
Rated Current (A)		10.3	10.3	11.4	12.5	17.5
Rated Speed (RPM)		2000	1500	2000	1500	1500
Instant Max Torque		53	85.8	71.4	88	143.1
Instant Max Current		30.9	30.9	34.2	37.5	52.5
Rotor Inertia		$4.7x\ 10^{-3}$	$77.9x\ 10^{-4}$	$63.7x\ 10^{-4}$	$90x\ 10^{-4}$	$104x\ 10^{-4}$
Torque Constant		1.26	2.67	2.27	3	2.9
Encoder: 2500 P/r						
Usage Temperature: 0~40℃						
Storage Temperature: Less than 90% RH (non-dew)						
Anti-Vibration: 2.5G						
IP65 (except Axis and connection)						
LL		212	252	232	272	332
+ Brake		287	327	307	347	407
LR		65				
LE		3.2				
LG		18				
Axis Size	**S**	35				
	LJ1	3				
	LJ	30				
	J	51				
	LF1	8				
	LF2	10				
Frame Size	**LA**	200				
	LB	114.3				
	LC	180				
	LZ	13				

※ Communication Mode

1. Communication parameter setting

P69：Communication mode

Parameter values	1	2
Communication mode	RS232	RS485

P70：Communication format

Parameter values	0	1
Communication format	RTU	ASCII

P72：Communication address 1~255

P73：Speed ratio of communication port

Parameter values	0	1	2	3	4	5
Speed ratio	2400	4800	9600	19200	38400	57600

P74：Protocol mode of communication port

0	7,N,2
1	7,E,1
2	7,O,1
3	8,N,2
4	8,E,1
5	8,O,1

2. Communication protocol：

When using RS485, it is necessary for each servo system to set the communication address. Therefore, the computer can control the servo system according to the communication address.

2.1 Communication format：

1）RTU（Remote Terminal Unit）mode

RTU mode：

Every 8-bit data consists of two 4-bit Hexadecimal characters, for example: 64H

2）ASCII（American Standard Code for Information Interchange）mode

Character	0	1	2	3	4	5	6	7
ASCII	30H	31H	32H	33H	34H	35H	36H	37H

ASCII mode：
Every 8-bit data consists of two ASCII characters, for example: A 1-bit data 64 （Hexadecimal）represented by ASCII “64” which includes 6（36H）and 4（34H）

Character	8	9	A	B	C	D	E	F
ASCII	38H	39H	41H	42H	34H	44H	45H	46H

2.2 Communication data format

2.2.1 ASCII mode

Communication data format

STX “:” (3AH)	ADDR	FUNC	LEN	DATA(N-1) ‘‘‘‘‘‘‘‘ DATA(0)	LRC	END CR(0DH) LF(0AH)

（1） STX：Start unit “：”（）3AH

（2） ADDR communication address 8-bit includes 2 ASCII。
1~255：Corresponding servo address

（3） FUNC：Function code 8-bit includes 2 ASCII。
03：Read from register
06：Write in register
10：Multi-write in register

2.2.1.1 Function code as 03 mode

03 Read from register
Upper controller format：
“：“ ADDRESS 03 ADDRH ADDRL NUMH NUML LRC 0X0D 0X0A
Servo returning correct data format：
“：“ ADDRESS 03 BYTECOUNT DATA1 DATA2 DATA3 DATAN LRC 0D 0A
Servo returning incorrect data format：
“：“ ADDRESS 0X83 01 or 02 or 03 0r 04 LRC 0X0D 0X0A

For example：read the value **ADDR131** of servo functional code (supposing **500**)
Send the data：“：” **01 03 03E8 0001 01 CR LF**（Hexadecimal）, and change into

ASCII mode
3A 30 31 30 33 30 33 45 38 30 30 30 31 30 31 0D 0A（ASCII）
Return the data：“：” **01 03 03E8 0001 01 CR LF**（Hexadecimal）, and change into ASCII
mode：**3A 30 31 30 33 30 33 45 38 30 30 30 31 30 31 0D 0A**（ASCII）
The returning data is“**01 03 03E8 0001 01F4 CR LF**”（Hexadecimal）and change into decimal number as **3A 30 31 30 33 30 33 45 38 30 30 30 31 30 31 46 34 0D DA**

The returinig data“**01F4**”（Hexadecimal）and change into decimal number as **“500”** means **ADDR131** setting value is **500**.

2.2.1.2 Function code as 06 mode

06 Write in register
Upper controller format：
“：” ADDRESS 06 ADDRH ADDRL DATAH DATAL LRC 0X0D 0X0A
Servo returning correct data format：
” ADDRESS 06 ADDRH ADDRL DATAH DATAL LRC 0X0D 0X0A
Servo returning incorrect data format：
“：” ADDRESS 0X86 01 or 02 or 03 0r 04 LRC 0X0D 0X0A

For example：write servo function code **ADDR131** into **0000**
Send the data：“：” **01 06 03E8 0000 0E 0D 0A**（Hexadecimal）, and change into ASCII
mode as **3A 30 31 30 36 30 33 45 38 30 30 30 30 30 45 0D 0A**（ASCII）
Return the data：“：” **01 06 03E8 0000 0E 0D 0A**（Hexadecimal）, and change into ASCII mode
3A 30 31 30 36 30 33 45 38 30 30 30 30 30 45 0D 0A（ASCII）
The returning data is “**0000**”（Hexadecimal）and change into decimal number as “**000**” means ADDR setting value is **000.**

2.2.1.3 Function code as 10 mode

10 Multi-wrote reserving function

Upper controller data sending mode：

“：”ADDRESS 0x10 ADDRH ADDRL NUMH NUML BYTECOUNT DATAH1 DATAL1 DATA2H DATA2L-------DATANH DATANL LRC 0X0D 0X0A

Under correct situation the servo returning data mode：

“：”ADDRESS 0x10 ADDRH ADDRL NUMH NUML LRC 0X0D 0X0A

Under incorrect situation the servo returning data mode：

“：”ADDRESS 0X90 01 or02 or 03 0r 04 LRC 0X0D 0X0A

As well as ADDR000 to write into at the same time, to write 1100 into ADDR001

To send information：“：”01 10 00 00 00 02 04 0B B8 04 4C D6 0D 0A （Hexadecimal）, and

change to ASCII mode：

3A 30 31 31 30 30 30 30 30 30 30 30 32 30 34 30 42 42 38 30 34 34 43 44 36 0D 0A（ASCII）

Servo return the information：“：“01 10 00 00 00 02 45 44 0D 0A（Hexadecimal）, and

change to ASCII mode：3A 30 31 31 30 30 30 30 30 30 30 30 32 34 35 34 34 0D 0A（ASCII）

Which going to send should be wrote into Hexadecimal number “0BB8”and“04 4C” then change to Decimal number as 3000 and 1100 , means both of ADDR000 and ADDR001 are writing into 3000 and 1100 data.

2.2.2 RTU mode

Communication information format

Mute	ADDR	FUNC	DATAH	DATAL	CRCH	CRCL	Mute
>50ms							>50ms

RTE format have same bit address and function code as ASCII mode

2.2.2.1 Function code as 03 mode

03 Read reserving function

For example：To read the servo function code ADDR000 setting value（suppose is 3000）

To send information：03 00 00 00 01 CRC（Hexadecimal）

Servo return the information：01 03 02 0B B8 CRC（Hexadecimal）

The returning information bit as "0BB8"（ Hexadecimal）and change to decimal number as 3000 means ADDR000 setting value is 3000

2.2.2.2 Function code as 06 mode

06 Write reserving function

For example：To write servo function code ADDR000 into 3000

To send information：01 06 00 00 0B B8 36 0D 0A（Hexadecimal）

Servo return the information：01 06 00 00 0B B8 36 0D 0A（Hexadecimal）

The returning information bit as "0BB8"（ Hexadecimal）and change to decimal number as 3000 means ADDR000 setting value is 3000

2.2.2.3 Function code as 10 mode（Decimal is 16）

10 Multi-wrote reserving function

To write 3000 into ADDR000 at the same time, and to write 1100 into ADD001.

To send information：01 10 00 00 00 02 04 0B B8 04 4C CRC（Hexadecimal）

Servo return the information：01 10 00 00 00 02 45CRC（Hexadecimal）

Which going to send should be wrote into Hexadecimal number "0BB8"and"04 4C" then change to Decimal number as 3000 and 1100 , means both of ADDR000 and ADDR001 are writing into 3000 and 1100 data.

Appendix

1. Motor power calculation

Based on motor rated speed and rated torque, the servo motor power can be calculated by the following equation:

$$W = \frac{2\pi}{60} NM$$

W：Motor power，unit: W；
M：Motor torque，unit : Nm；
N：Motor speed, unit: rpm。
For example：130ST-M10015 motor，its torque is 10N·M and speed is 1500rpm；
Based on the above equation, the power is: W=(10×1500) ×2×3.14÷60÷1000=1.57（KW）

2. Electrical gear ratio

The meaning of electrical gear ratio and its adjustment method:
In position control mode, the load actual speed is:
Command pulse speed ×G × mechanical reduction gear ratio
In the diver with mechanical gears, the electrical gear ratio G is calculated by the following equation:

$$G = \frac{P_{pulse} \times M \times i}{L}$$

P_{pulse}：The number of pulses for every motor cycle; it represents the number of pulses feed back by feedback device for the motor rotating one round. For a 2500 pulse incremental encoder, the number of pulses feed back to the drive is 2500×4=10000 a round；

M： Pulse calculation equivalent (mm). It refers to the upper-level controller resolution；
L： Lead screw pitch (mm)；
i： Mechanical gear ratio

$$i = \frac{\text{driven gear teeth number (machine side)}}{\text{driving gear teeth number(motor side)}}$$

For example：If the upper-level controller pulse equivalent is 0.001mm；Mechanical reduction gear ratio is i=driven gear/ driving gear＝36 / 24；Lead screw pitch is 6mm；Motor encoder is 2500P/r，the number of encoder feedback pulses per round is 2500×4＝10000.

Based on the above equation:

$$G = \frac{10000 \times 0.001 \times \frac{36}{24}}{6} = \frac{5}{2}$$

『**Note**』

- When the electrical gear ratio is not 1, there may be remainder after division operation. In this case, there will be position error; the maximum error will be motor minimum movement. (Minimum resolution 1/10000 per round)
- For direct connection (without mechanical gear), the calculation will be the same as above except that the mechanical gear ratio is i=1.

This manual is not an assurance for the industrial proprietary and not a promise to any execution right. In addition, for the issues concerning the industrial proprietary caused by using this manual, our company will not be responsible for that.

**Revision History

1. In 1.1, added 380V power supply and revised impact load.
2. In 1.2, revised description of control founction
3. In 1.3, revisd product code (43 for 380V with 3-phrase)
4. In 1.4, combine all the pictures into one picture and added new form
5. In 1.5, deleted the items out of production, added new product item
6. In 1.5, added the from of 380V servo
7. Revised terminal name of Fig 3-2 and 3-3 to be identical with 3.3
8. In 3.3-2, added the picture of 380V connector and the example of 220V diagram
9. In 3.3-3, revised CN2-1 & CN2-2, and CN2-21.
10. In 4.1, revised parameter 01.
11. In 4.1, revised name of all the parameters to be proper
12. In 4.1, revised the setting range of parameter 13, 17, 25 and 37.
13. In 4.1, added parameter 34, 38, 41, 42, 63, 70, 78, 153 and 154.

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