



DS2 series servo drive

User manual

WUXI XINJE ELECTRIC CO., LTD.

Serial No. SC2 00 20160526 1.0

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January, 2010

Safety Precautions

Be sure to review this section carefully before use this product. In precondition of security, wire the product correctly.

The following defines the symbols used in this manual to indicate varying degrees of safety precautions and to identify the corresponding level of hazard inherent to each. Failure to follow precautions provided in this manual can result in serious, possibly even fatal, injury, and/or damage to the persons, products, or related equipment and systems.



CAUTION

Indicates a potentially hazardous situation, which, if not heeded, could result in death or serious injury



WARNING

Indicates a potentially hazardous situation, which, if not avoided, may result in minor or moderate injury.

● Checking Products upon Delivery



CAUTION

1. DO NOT install any drive which is damaged, lack of accessories or not the same with the model ordered.
Doing so may result in electric shock.

● Installation



WARNING

1. Cut off external power supply before installation.
Not doing so may result in electric shock.



CAUTION

1. Always use the servomotor and servo amplifier in one of the specified combinations.
Never use the products in an environment subject to water, corrosive gases, inflammable gases, or combustibles.
Doing so may result in electric shock, fire or malfunction.
2. DO NOT touch any metallic part.
Doing so may result in malfunction.

● Wiring



WARNING

1. Cut off external power supply before wiring.
Not doing so may result in electric shock.
2. Connect AC power supply to the corresponding terminals.
Faulty wiring may result in fire.



CAUTION

1. Do not connect a three-phase power supply to the U, V, or W output terminals.
Doing so may result in injury or fire.
2. Use 2mm² wire to grounding the ground terminals.
Not doing so may result in electric shock.
3. Securely fasten the power supply terminal screws and motor output terminal screws.
Not doing so may result in fire.

● Operation



WARNING

1. Never touch any rotating motor parts while the motor is running.
Doing so may result in injury.
2. DO NOT touch the inside the drive.
Doing so may result in electric shock.
3. Do not remove the panel cover while the power is ON.
Doing so may result in electric shock.
4. Do not touch terminals for five minutes after the power has been turned OFF.
Residual voltage may cause electric shock.



CAUTION

1. Conduct trial operation on the servomotor alone with the motor shaft disconnected from machine to avoid any unexpected accidents.
Not doing so may result in injury.
2. Before starting operation with a machine connected, change the settings to match the parameters of the machine.
Starting operation without matching the proper settings may cause the machine to run out of control or malfunction.
3. Before starting operation with a machine connected, make sure that an emergency stop can be applied at any time.
Not doing so may result in injury.
4. Do not touch the heat sinks during operation.
Not doing so may result in burns due to high temperatures.
5. Do not attempt to change wiring while the power is ON.
Doing so may result in electric shock or injury

Catalog

Preface	I
1 Checking Product and Part Names	2
1-1. Checking Products on Delivery	2
1-2. Product appearance and name rule	2
1-3. Adaptation table of servo drive and motor	5
2 Installations	6
2-1. Servo motor	6
2-1-1. Storage Temperature	6
2-1-2. Installation Site	6
2-1-3. Concentricity	7
2-1-4. Orientation	7
2-1-5. Handling Oil and Water	7
2-1-6. Cable Stress	7
2-2. Servo Drive	7
2-2-1. Storage Conditions	8
2-2-2. Installation Site	8
2-2-3. Orientation	8
2-2-4. Installation	8
3 Wiring	10
3-1. Main Circuit Wiring	10
3-1-1. The terminal arrangement	10
3-1-2. Main circuit terminals	11
3-1-3. Winding Terminals on Servo motor	13
3-1-4. CN0, CN1, CN2 terminals	13
3-1-4-1. 220V drive terminals	13
3-1-4-2. 380V drive terminals	14
3-1-5. Communicaion port	16
3-2. Signal terminals	17
3-2-1. Pulse signal	17
3-2-2. SI input signal	18
3-2-3. Analog input circuit	19
3-2-4. Output signal	19
3-2-5. Encoder feedback signal	20
3-3. Standard wiring example	22
3-3-1. Position Control Mode	22
3-4. Regenerative Resistor	25
4 Use the operate panel	27
4-1. Basic Operation	27
4-1-1. Functions of operate panel	27
4-1-2. Basic Mode Switching	27
4-2. Running status mode	28
4-3. Monitoring Mode	29
4-4. Auxiliary Function	31
4-4-1. F0-XX	31
4-4-2. F1-XX	31

4-4-3. Change the motor type (F2-00).....	32
4-4-4. Check Alarm Information (F3-XX).....	33
4-4-5. Reset Parameters to Default (F4-XX).....	33
4-4-6. External monitoring (F5-XX).....	33
4-5. Alarm (E-XX)	33
4-6. Example	33
5 Run the servo system.....	35
5-1. Control mode selection	35
5-2. Basic function setting.....	35
5-2-1. Servo ON setting.....	36
5-2-2. Switch the motor rotate direction	36
5-2-3. Motor stop mode when use overtravel signal	36
5-2-4. Overtravel Limit (P-OT & N-OT)	37
5-2-5. Power-off Brake (BK)	38
5-2-6. Alarm output.....	40
5-2-7. Running time	40
5-2-8. Torque over-limit (anticollision protection)	41
5-3. Position mode (external pulse command).....	41
5-3-1. Control mode selection	41
5-3-2. Pulse command.....	41
5-3-3. Electronic gear ratio.....	42
5-3-4. Position command filter.....	44
5-3-5. Pulse deviation clear (/CLR)	45
5-3-6. Positioning complete (/COIN).....	45
5-3-7. Positioning near (/NEAR).....	46
5-3-8. Command pulse prohibition (/INHIBIT).....	46
5-4. Position mode (internal position mode).....	47
5-4-1. Control mode selection	47
5-4-2. Internal position mode	47
5-4-3. Position parameters from segment 1 to 16.....	50
5-4-4. Change step (/CHGSTP).....	50
5-4-5. Pause current signal (/INHIBIT)	50
5-4-6. Skip current signal (/ZCLAMP)	51
5-4-7. Reference origin.....	51
5-4-8. Set segment through communication.....	53
5-5. Speed control (analog voltage command).....	53
5-5-1. Control mode selection	53
5-5-2. Analog value of rated speed	54
5-5-3. Direction switching.....	54
5-5-4. Speed command offset auto-adjustment (F1-03).....	54
5-5-5. Speed command input dead voltage	54
5-5-6. Soft start.....	55
5-5-7. Filter.....	55
5-5-8. Zero clamp (/ZCLAMP)	56
5-5-9. Speed coincidence checking (/V-CMP).....	56
5-5-10. Torque limit	57
5-5-10-1. Internal torque limit (output torque max value limit).....	57
5-5-10-2. External torque limit (via input signal)	57
5-5-10-3. External torque limit (via analog voltage command).....	57
5-5-10-4. External torque limit (via external input + analog voltage)	58
5-5-10-5. Output torque up to limit value signal.....	58

5-5-11. Proportion action command (/P-CON)	58
5-6. Speed control (internal speed).....	59
5-6-1. Control mode selection	59
5-6-2. Internal speed setting	60
5-6-3. Input signal setting.....	60
5-7. Speed control (pulse frequency command).....	61
5-7-1. Control mode selection	62
5-7-2. Pulse frequency command.....	62
5-7-3. Command pulse frequency at rated speed	62
5-7-4. Speed command pulse filter time.....	62
5-8. Torque control (analog voltage command).....	62
5-8-1. Control mode selection	63
5-8-2. The analog value of rated torque	63
5-8-3. Torque command offset autoadjustment (F1-04)	63
5-8-4. Torque command filter time	63
5-8-5. Torque limit	64
5-8-5-1. Internal speed limit.....	64
5-8-5-2. External speed limit.....	64
5-8-5-3. Speed up to limit value output.....	64
5-8-6. Torque command input dead area voltage.....	64
5-9. Torque control (internal setting)	65
5-9-1. Control mode selection	65
5-9-2. Internal torque command.....	65
5-10. Switch the control mode	65
5-11. Other output signals	66
5-11-1. /ALM and /ALM-RST	66
5-11-2. /WARN	66
5-11-3. Rotation checking (/TGON)	66
5-11-4. Servo ready (/S-RDY)	66
5-11-5. Encoder Z phase output (/Z)	66
5-11-6. AB phase feedback signal of encoder.....	67
5-12. I/O signal distribution	67
5-12-1. Input signal distribution.....	67
5-12-2. Default setting of input terminal.....	68
5-12-3. Output terminal distribution	68
5-12-4. Default setting of output terminal.....	69
6 Servo gain adjustment	70
6-1. Gain setting of speed loop.....	70
6-2. Gain setting of position loop	70
6-3. The experience of parameter adjustment	71
6-4. Proportion action command (P-CON)	71
6-5. Gain switch (G-SEL).....	72
7 Specification and dimension	73
7-1. Servo motor.....	73
7-1-1. Servo motor specification	73
7-1-2. Torque-Speed Feature.....	76
7-1-3. Servo motor dimensions	78
7-2. Servo drives.....	82
7-2-1. General specification	82
7-2-2. Performance specification	83

7-2-3. Servo drive dimensions.....	84
8 Alarm Information.....	87
Appendix 1 Parameter list	90
Appendix 2 Application	98

Preface

This chapter describes the constitution of this manual, the intended user, and how to acquire this manual.

Constitution of This Manual

This manual is divided into 7 chapters.

1. Checking Product and Part Names

This chapter describes the procedure for checking products upon delivery as well as names for product parts.

2. Installation

This chapter describes precautions for servomotor and servo drive installation.

3. Wiring

This chapter describes the procedure used to connect DS2 Series products to peripheral devices and gives typical examples of main circuit wiring as well as I/O signal connections.

4. Parameter Settings and Functions

This chapter describes the procedure for setting and applying parameters.

5. Use Digital Panel

This chapter describes the basic operation of the digital panel and the features it offers.

6. Ratings and Characteristics

This chapter provides the ratings, torque-speed characteristics diagrams, and dimensional drawings of the DS2 series servo drives and MS series servomotors.

7. Alarm Information

This chapter describes the alarm information of DS2 series servo drives.

Intended User

This manual is intended for the following users.

- Those designing DS2 Series servodrive systems.
- Those installing or wiring DS2 Series servodrives.
- Those performing trial operation or adjustments of DS2 Series servodrives.
- Those maintaining or inspecting DS2 Series servodrives.

How to Acquire This Manual

1. Electrical Manual

- (1) Log on Xinje official website www.xinje.com to download.
- (2) Acquire this manual on a CD from an authorized distributor.

1 Checking Product and Part Names

1-1. Checking Products on Delivery

Use the following checklist when products are delivered.

Items	Comments
Are the delivered products the ones that were ordered?	Check the model numbers marked on the nameplates of the servomotor and servo drive.
Does the servomotor shaft rotate smoothly?	The servomotor shaft is normal if it can be turned smoothly by hand. Servomotors with brakes, however, cannot be turned manually.
Is there any damage?	Check the overall appearance, and check for damage or scratches that may have occurred during shipping.
Are there any loose screws?	Check screws for looseness using a screwdriver.
Is the motor code the same with the code in drive?	Check the motor code marked on the nameplates of the servomotor and the parameter F0-00 on the servo drive.

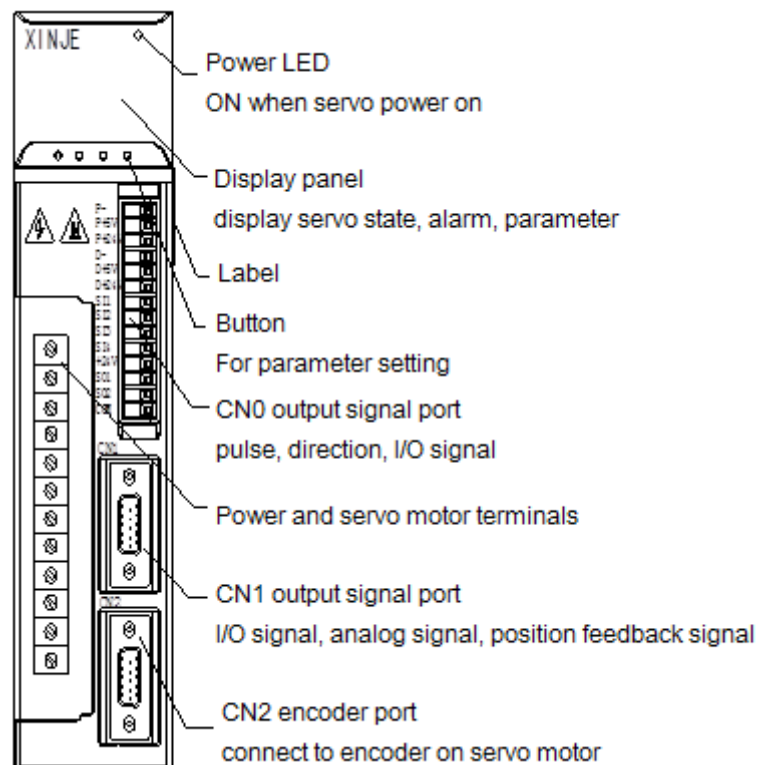
If any of the above is faulty or incorrect, contact Xinje or an authorized distributor.

1-2. Product appearance and name rule

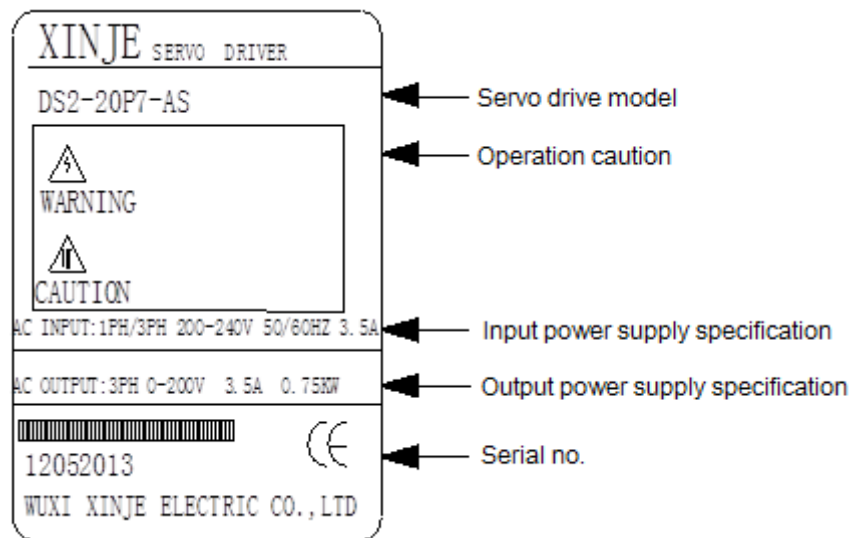
DS2-2□P□-AS/AS6 DS2-20P4-BS/BS6 DS2-20P7-BSW/BSW6 DS2-21P5-AS2

DS2-4□P□-AS/AS6

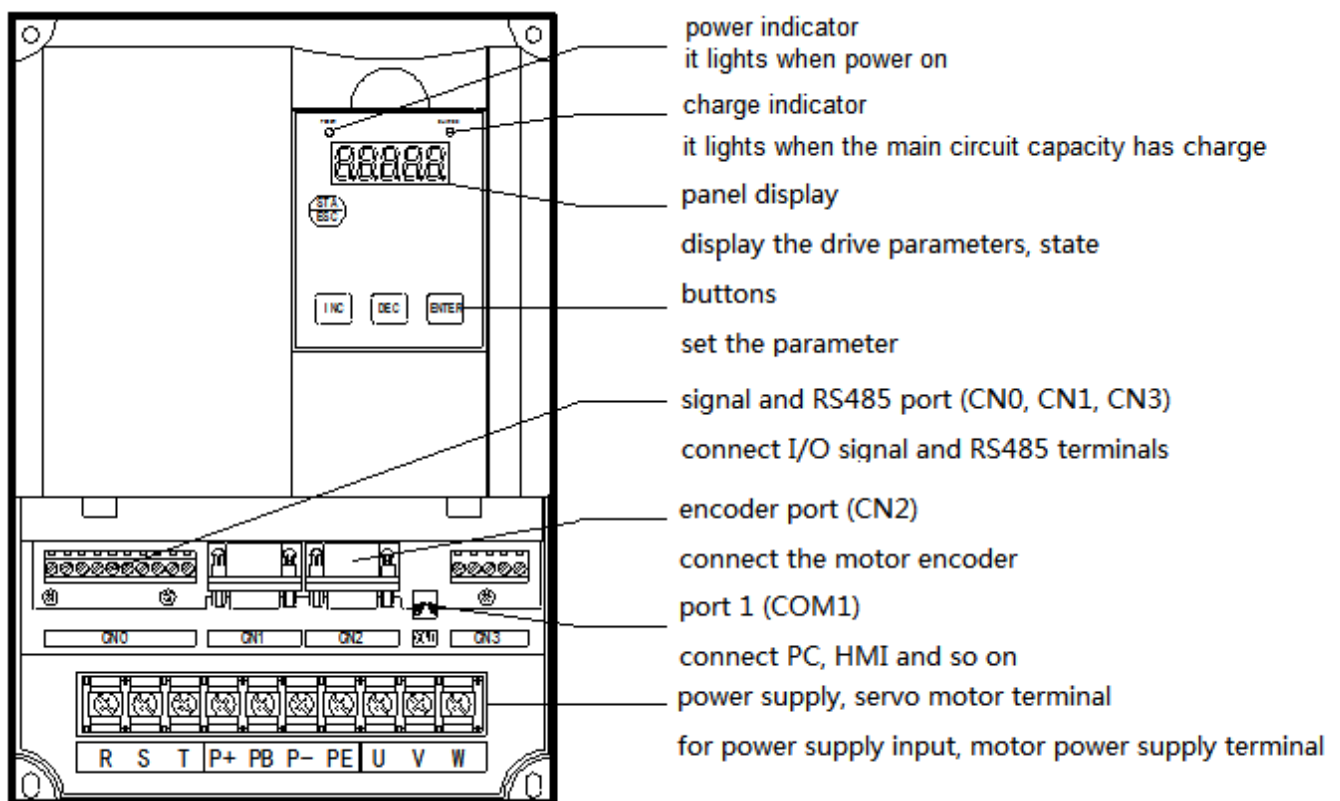
(1) Appearance and nameplate



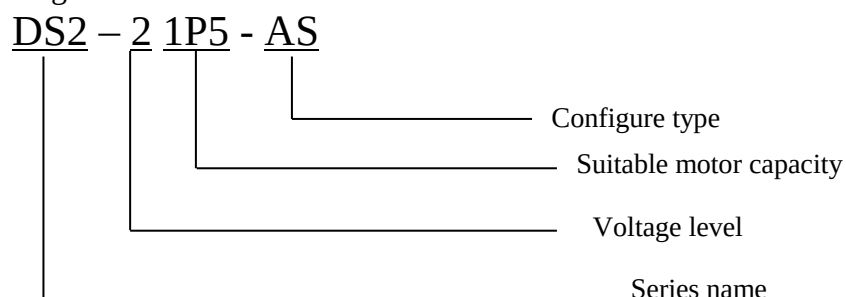
Servo drive nameplate



■ DS2-45P5-A/AS DS2-411P0-AS



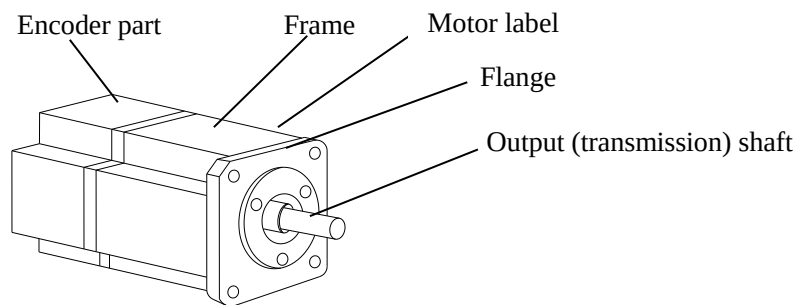
(2) Naming rule



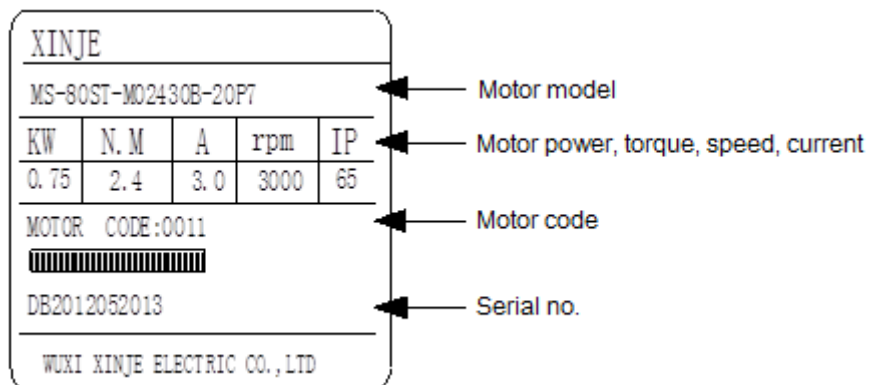
configuration	AS series (differential mode encoder feedback) AS6 series (differential mode encoder feedback, support AB phase pulse input) AS2 series (simple model) BS series (no encoder feedback) BS6 series (no encoder feedback, support AB phase pulse input) BSW series (no encoder feedback) BSW6 series (no encoder feedback, support AB phase pulse input)	
Voltage level	2	220V
	4	380V
Suitable motor capacity	0P2	0.2KW
	0P4	0.4KW
	0P7	0.75KW
	1P5	1.5KW
	2P3	2.3KW
	3P0	3.0KW

■ Servo motor

(1) Appearance and nameplate

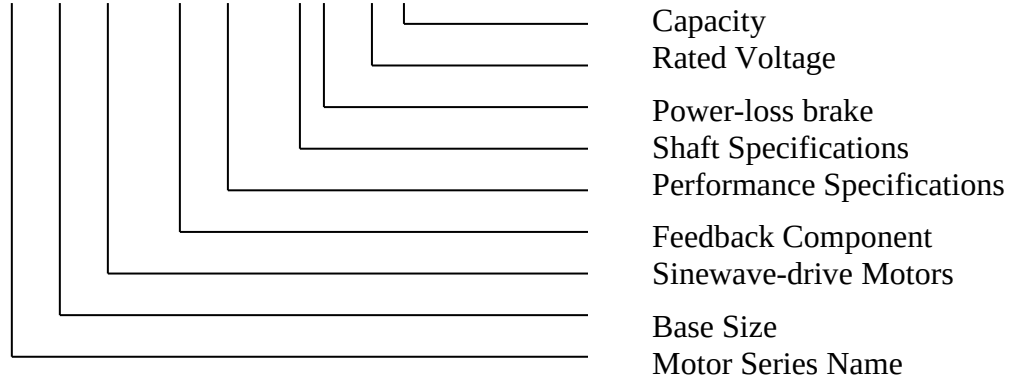


Motor label



(2) Naming rule

MS -80 ST - M 02430 A Z- 2 0P7



Base number	60, 80, 90, 110, 130, 180	
Feedback component no.	M	Optical pulse encoder
Performance parameter no.	First 3 bits mean rated torque, last 2 bits mean rated speed Such as: 00630: rated torque 0.6N.m, rated speed 3000rpm 06025: rated torque 6.0N.m, rated speed 2500rpm 19015: rated torque 19.0N.m, rated speed 1500rpm	
Shaft spec	A	No bond
	B	With bond
Power-loss brake	Vacant	No
	Z	With power-off brake
Voltage level	2	220V
	4	380V
Power	Such as: 0P4: 0.4kW 0P7: 0.75kW 1P5: 1.5KW 2P3: 2.3KW	

1-3. Adaptation table of servo drive and motor

Servo drive	Servo motor	Motor code	Voltage level
DS2-20P2-AS/AS6	MS-60ST-M00630-20P2	1003	Single/3-phase 220V
DS2-20P4-AS/AS6	MS-60ST-M01330-20P4	1004 (0004)	
DS2-20P4-BS/BS6		1011 (0011)	
DS2-20P7-AS/AS6	MS-80ST-M02430-20P7	0012	
DS2-20P7-BSW/BSW6	MS-80ST-M03520-20P7	0021	3-phase 220V
	MS-90ST-M02430-20P7	0031	
	MS-110ST-M04030-21P2	0032	
	MS-110ST-M05030-21P5	1042 (0042)	
DS2-21P5-AS/AS6	MS-130ST-M06025-21P5	1044 (0044)	3-phase 220V
DS2-21P5-AS2	MS-130ST-M10015-21P5		

DS2-22P3-AS/AS6	MS-130ST-M07725-22P0	0043	3-phase 220V
	MS-130ST-M15015-22P3	0046	
DS2-41P5-AS/AS6	MS-110ST-M04030-41P2	0131	3-phase 380V
	MS-110ST-M05030-41P5	0132	
	MS-130ST-M06025-41P5	0142	
	MS-130ST-M10015-41P5	2144 (0144)	
DS2-43P0-AS/AS6	MS-130ST-M10030-43P0	1148	
	MS-130ST-M07725-42P0	1143	
	MS-130ST-M15015-42P3	1146	
	MS-180ST-M19015-43P0	0156 (1052)	
DS2-45P5-A/AS	MS-180ST-M21520-43P0	0150	
	MS-180ST-M27015-44P3	0151/2151	
	MS-180ST-M35015-45P5	0152/1152	
DS2-47P5-A	MS-180ST-M48015-47P5	0153	
DS2-411P0-A	MS-180ST-M70015-411P0	1157	

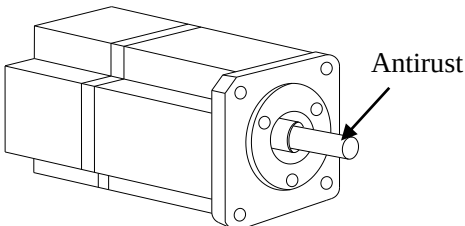
2 Installations

2-1. Servo motor

MS series servomotors can be installed either horizontally or vertically. The service life of the servomotor can be shortened or unexpected problems might occur if it is installed incorrectly or in an inappropriate location. Follow these installation instructions carefully.


CAUTION

1. The end of the motor shaft is coated with antirust. Before installing, carefully remove all of the paint using a cloth moistened with paint thinner.
2. Avoid getting thinner on other parts of the servomotor.



2-1-1. Storage Temperature

Store the servomotor within -20~+60 °C as long as it is stored with the power cable disconnected.

2-1-2. Installation Site

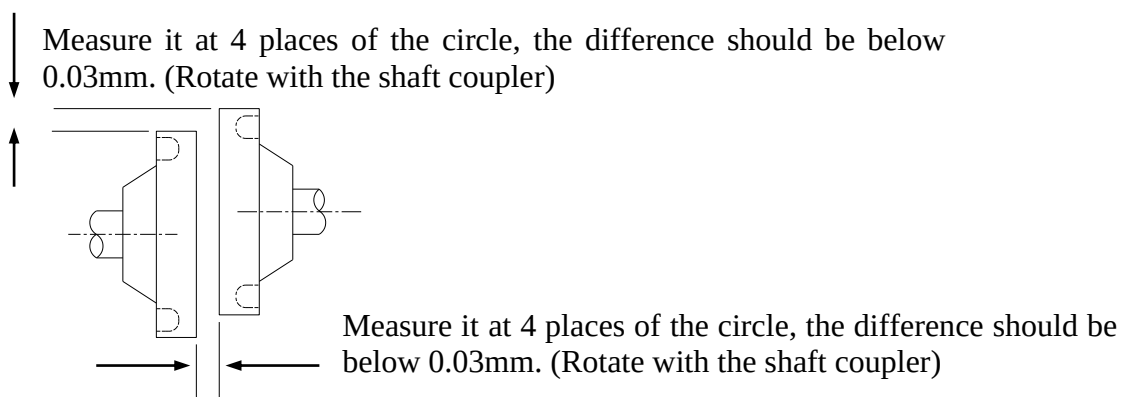
MS series servomotors are designed for indoor use. Install the servomotor in environments that satisfy the following conditions.

- Free of corrosive or explosive gases.
- Well-ventilated and free of dust and moisture.

- Ambient temperature of 0 ° to 50 °C.
- Relative humidity (r.h.) of 20 to 80% with no condensation.
- Accessible for inspection and cleaning.

2-1-3. Concentricity

Please use coupling when connecting to machine; keep the shaft center of servo motor and machine at the same line. It should be accord to the following diagram when installing the servo motor.



Note: (1) If the concentricity is not enough, it will cause the vibration and bearing damage.

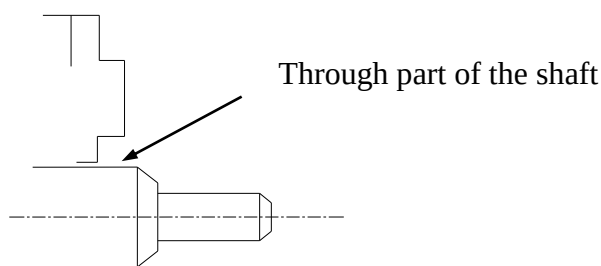
(2) When installing the coupler, prevent direct impact to the shaft. This can damage the encoder mounted on the shaft end at the opposite side of the load.

2-1-4. Orientation

MS series servomotors can be installed either horizontally or vertically.

2-1-5. Handling Oil and Water

Install a protective cover over the servomotor if it is used in a location that is subject to water or oil mist. Also use a servomotor with an oil seal when needed to seal the through-shaft section.



2-1-6. Cable Stress

Make sure that the power lines are free from bends and tension. Be especially careful to wire signal line cables so that they are not subject to stress because the core wires are very thin, measuring only 0.2 to 0.3mm².

2-2. Servo Drive

The DS2-AS series servo drives are compact model. Incorrect installation will cause problems. Follow the installation instructions below

2-2-1. Storage Conditions

Store the servo drive within -20~+85°C, as long as it is stored with the power cable disconnected.

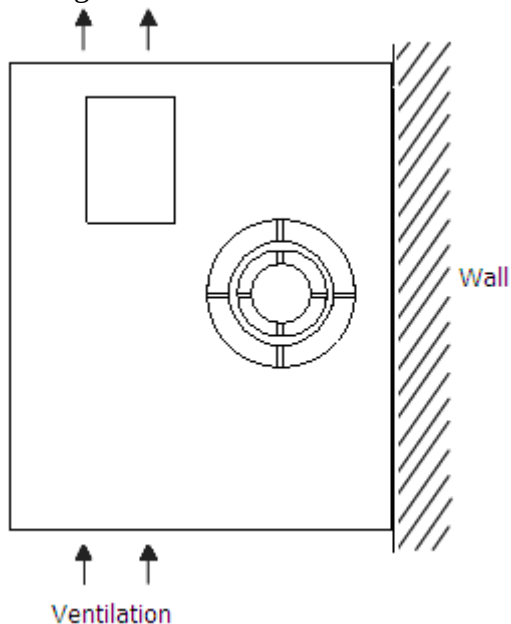
2-2-2. Installation Site

The following precautions apply to the installation site.

Situation	Installation Precaution
Installation in a Control Panel	Design the control panel size, unit layout, and cooling method so the temperature around the servo drives does not exceed 50 °C.
Installation Near a Heating Unit	Minimize heat radiated from the heating unit as well as any temperature rise caused by natural convection so the temperature around the servo drives does not exceed 50 °C.
Installation Near a Source of Vibration	Install a vibration isolator beneath the servo drive to avoid subjecting it to vibration.
Installation at a Site Exposed to Corrosive Gas	Corrosive gas does not have an immediate effect on the servo drives, but will eventually cause electronic components and terminals to malfunction. Take appropriate action to avoid corrosive gas.
Other Situations	Do not install the servo drive in hot and humid locations or locations subject to excessive dust or iron powder in the air.

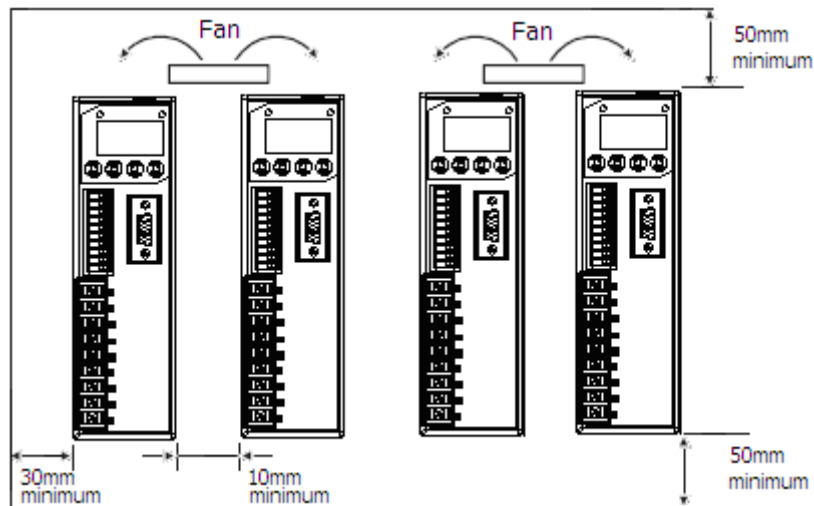
2-2-3. Orientation

Install the servo drive perpendicular to the wall as shown in the figure. The servo drive must be oriented this way because it is designed to be cooled by natural convection or by a cooling fan.



2-2-4. Installation

Follow the procedure below to install multiple servo drives side by side in a control panel.



■ Servo Drive Orientation

Install the servo drive perpendicular to the wall so the front panel containing connectors faces outward.

■ Cooling

As shown in the figure above, allow sufficient space around each servo drive for cooling by cooling fans or natural convection.

■ Side-by-side Installation

When install servo drives side by side as shown in the figure above, make at least 10mm between and at least 50mm above and below each servo drive. Install cooling fans above the servo drives to avoid excessive temperature rise and to maintain even temperature inside the control panel.

■ Environmental Conditions in the Control Panel

- Ambient Temperature: 0~50 °C
- Humidity: 90%RH or less
- Vibration: 4.9m/s²
- Condensation and Freezing: None
- Ambient Temperature for Long-term Reliability: 50 °C maximum

3 Wiring

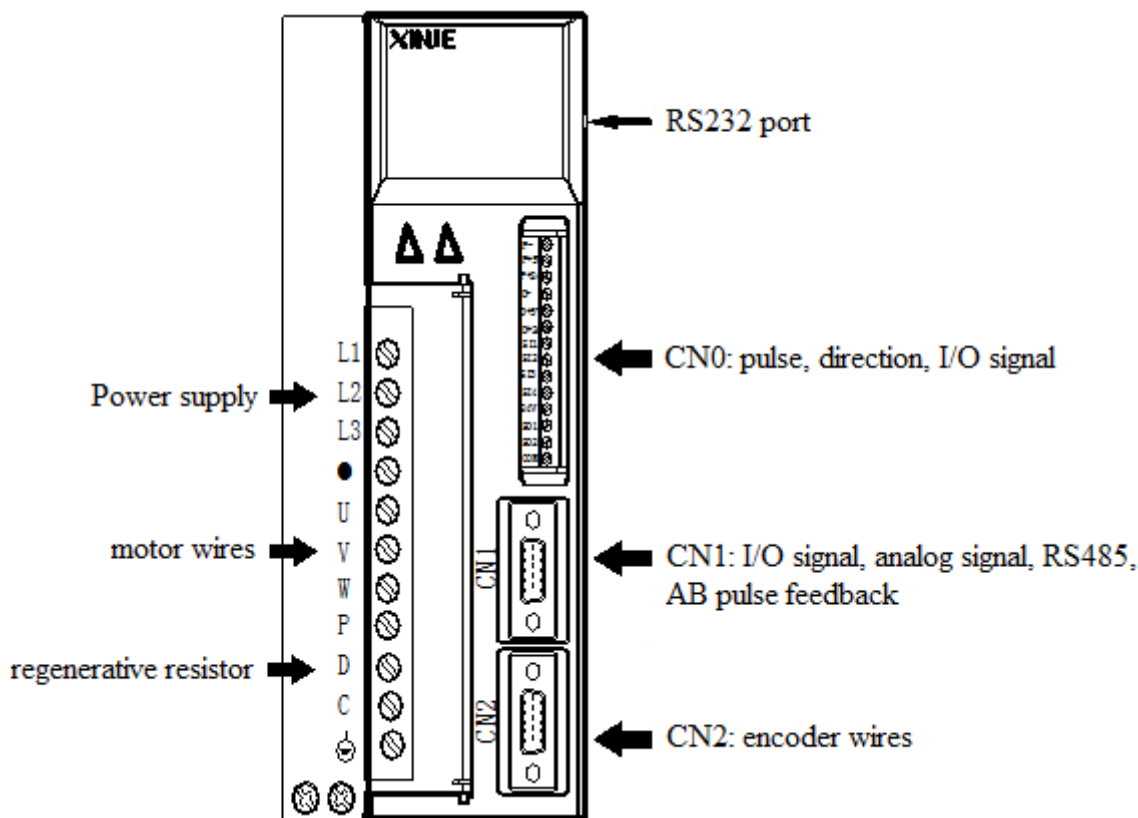
3-1. Main Circuit Wiring



Caution

1. Do not bundle or run power and signal lines together in the same duct. Keep power and signal lines separated by at least 11.81inch(30cm)
2. Use twisted pair wires or multi-core shielded-pair wires for signal and encoder (PG) feedback lines.
The maximum length is 118.11 inch (3m) for reference input lines and is 787.40 inch (20m) for encoder (PG) feedback lines.
3. Do not touch the power terminals for 5 minutes after turning power OFF because high voltage may still remain in the servo amplifier.
Please make sure to check the wiring after the CHARGE light is going off.
4. Avoid frequently turning power ON and OFF. Do not turn power ON or OFF more than once per minute.
Since the servo amplifier has a capacitor in the power supply, a high charging current flows for 0.2s when power is turned ON. Frequently turning power ON and OFF causes main power devices like capacitors and fuses to deteriorate, resulting in unexpected problems.

3-1-1. The terminal arrangement



3-1-2. Main circuit terminals

L1 L2 L3 P+ PB U V W	■ DS2-20P2-AS/AS6, DS2-20P4-AS/AS6, DS2-20P7-AS/AS6 <table><tr><th>Terminal</th><th>Function</th><th>Explanation</th></tr><tr><td>L1/L2/L3</td><td>Power supply input of main circuit</td><td>Single or 3 phase AC 200~240V, 50/60Hz</td></tr><tr><td> </td><td>Ground</td><td>Connect to ground terminal of motor then connect to the ground</td></tr><tr><td>P+, PB</td><td>Regenerative resistor</td><td>Connect regenerative resistor between P+ and PB</td></tr><tr><td rowspan="5">U、V、W</td><td rowspan="5">Motor terminals</td><td>Connect the motor</td></tr><tr><td><table><tr><th>Terminal</th><th>Color</th></tr><tr><td>U</td><td>brown</td></tr><tr><td>V</td><td>black</td></tr><tr><td>W</td><td>blue</td></tr><tr><td>PE</td><td>Yellow green</td></tr></table></td></tr><tr><td colspan="2">Note: ground terminal is on the cooling fin, check it before power on! Do not connect to P+, P-!</td></tr><tr><td> </td><td>Ground</td><td>Connect to ground terminal of motor then connect to the ground</td></tr></table>	Terminal	Function	Explanation	L1/L2/L3	Power supply input of main circuit	Single or 3 phase AC 200~240V, 50/60Hz		Ground	Connect to ground terminal of motor then connect to the ground	P+, PB	Regenerative resistor	Connect regenerative resistor between P+ and PB	U、V、W	Motor terminals	Connect the motor	<table><tr><th>Terminal</th><th>Color</th></tr><tr><td>U</td><td>brown</td></tr><tr><td>V</td><td>black</td></tr><tr><td>W</td><td>blue</td></tr><tr><td>PE</td><td>Yellow green</td></tr></table>	Terminal	Color	U	brown	V	black	W	blue	PE	Yellow green	Note: ground terminal is on the cooling fin, check it before power on! Do not connect to P+, P-!			Ground	Connect to ground terminal of motor then connect to the ground
Terminal	Function	Explanation																														
L1/L2/L3	Power supply input of main circuit	Single or 3 phase AC 200~240V, 50/60Hz																														
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U、V、W	Motor terminals	Connect the motor																														
		<table><tr><th>Terminal</th><th>Color</th></tr><tr><td>U</td><td>brown</td></tr><tr><td>V</td><td>black</td></tr><tr><td>W</td><td>blue</td></tr><tr><td>PE</td><td>Yellow green</td></tr></table>	Terminal	Color	U	brown	V	black	W	blue	PE	Yellow green																				
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Note: ground terminal is on the cooling fin, check it before power on! Do not connect to P+, P-!																																
	Ground	Connect to ground terminal of motor then connect to the ground																														

R S T U V W P+ D C	■ DS2-21P5-AS/AS6/AS2, DS2-22P3-AS/AS6, DS2-41P5-AS/AS6 <table><tr><th>Terminal</th><th>Function</th><th>Explanation</th></tr><tr><td>R/S/T</td><td>Power supply input of main circuit</td><td>3 phase AC 200~240V, 50/60Hz (DS2-2□P□-AS)</td></tr><tr><td>R/S/T</td><td>Power supply input of main circuit</td><td>3 phase AC 360~400V, 50/60Hz (DS2-4□P□-AS)</td></tr><tr><td> </td><td>Vacant</td><td></td></tr><tr><td rowspan="5">U、V、W</td><td rowspan="5">Motor terminals</td><td>Connect the motor</td></tr><tr><td><table><tr><th>Terminal</th><th>Color</th></tr><tr><td>U</td><td>brown</td></tr><tr><td>V</td><td>black</td></tr><tr><td>W</td><td>blue</td></tr><tr><td>PE</td><td>Yellow green</td></tr></table></td></tr><tr><td colspan="2">Note: ground terminal is on the cooling fin, check it before power on! Do not connect to P+, P-!</td></tr><tr><td rowspan="2">P+, D、C</td><td>Internal regenerative resistor</td><td>Short P+ and D, disconnect P+ and C, set P0-10=0</td></tr><tr><td>External regenerative resistor</td><td>Connect regenerative resistor between P+ and C, disconnect P+ and D, set P0-10=1</td></tr><tr><td> </td><td>Ground</td><td>Connect to ground terminal of motor, then connect to the ground</td></tr></table>	Terminal	Function	Explanation	R/S/T	Power supply input of main circuit	3 phase AC 200~240V, 50/60Hz (DS2-2□P□-AS)	R/S/T	Power supply input of main circuit	3 phase AC 360~400V, 50/60Hz (DS2-4□P□-AS)		Vacant		U、V、W	Motor terminals	Connect the motor	<table><tr><th>Terminal</th><th>Color</th></tr><tr><td>U</td><td>brown</td></tr><tr><td>V</td><td>black</td></tr><tr><td>W</td><td>blue</td></tr><tr><td>PE</td><td>Yellow green</td></tr></table>	Terminal	Color	U	brown	V	black	W	blue	PE	Yellow green	Note: ground terminal is on the cooling fin, check it before power on! Do not connect to P+, P-!		P+, D、C	Internal regenerative resistor	Short P+ and D, disconnect P+ and C, set P0-10=0	External regenerative resistor	Connect regenerative resistor between P+ and C, disconnect P+ and D, set P0-10=1		Ground	Connect to ground terminal of motor, then connect to the ground
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	Ground	Connect to ground terminal of motor, then connect to the ground																																			

L

N

U

V

W

P+

D

C

P-

■

DS2-20P7-BSW/BSW6

Terminal	Function	Explanation										
L/N	Power supply input of main circuit	Single phase AC 200~240V, 50/60Hz										
●	Vacant											
U、V、W	Motor terminals	Connect the motor <table> <tr> <th>Terminal</th><th>Color</th></tr> <tr> <td>U</td><td>brown</td></tr> <tr> <td>V</td><td>black</td></tr> <tr> <td>W</td><td>blue</td></tr> <tr> <td>PE</td><td>Yellow green</td></tr> </table> Note: ground terminal is on the cooling fin, check it before power on! Do not connect to P+, P-!	Terminal	Color	U	brown	V	black	W	blue	PE	Yellow green
Terminal	Color											
U	brown											
V	black											
W	blue											
PE	Yellow green											
P+、D、C	Internal regenerative resistor	Short P+ and D, disconnect P+ and C, set P0-10=0										
	External regenerative resistor	Connect regenerative resistor between P+ and C, disconnect P+ and D, set P0-10=1										
P+/P-	Bus terminal	Real-time check the bus voltage, please take attention of this terminal										

3-1-3. Winding Terminals on Servo motor

Symbol	60, 80, 90 Series	110, 130, 180 Series
PE	4-yellow green (yellow green)	1-yellow green
U	1-brown (red)	2-brown
V	3-black (blue)	3-black
W	2-blue (yellow)	4-blue
Terminal for brake	1: +24V 2: GND	

3-1-4. CN0, CN1, CN2 terminals

3-1-4-1. 220V drive terminals

■ CN0 terminals

No.	Name	Explanation	No.	Name	Explanation
1	P-	Pulse input PUL-	8	SI2	Input 2
2	P+5V	5V difference input	9	SI3	Input 3
3	P+24V	Open collector input	10	SI4	Input 4
4	D-	Direction input DIR-	11	+24V	Input +24V
5	D+5V	5V difference input	12	SO1	Output 1
6	D+24V	Open collector input	13	SO2	Output 2
7	SI1	Input 1	14	COM	Ground of output

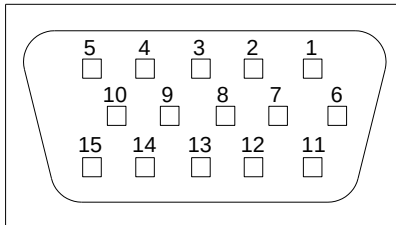
■ CN1 (DB15) terminals

No.	Name	Explanation	No.	Name	Explanation
1	NC	Reserved	9	Z-	Encoder output Z-
2	NC	Reserved	10	B+	Encoder output B+
3	SI5	Input 5	11	T-REF	Torque analog input
4	SO3	Output 3	12	V-REF	Speed analog input
5	B-	Encoder output B-	13	GND	GND for analog input
6	A+	Encoder output A+	14	A	RS485+
7	A-	Encoder output A-	15	B	RS485-
8	Z+	Encoder output Z+			

■ CN1 (DB15) terminals (DS2-20P4-BS/BS6, DS2-20P7-BSW/BSW6, DS2-21P5-AS2)

No.	Name	Explanation
1	NC	Reserved
2	NC	Reserved
3	SI5	Input 5
4	SO3	Output 3

■ CN2 terminals



← CN2: encoder port

Drive port	Motor encoder port		Name	Drive port	Motor encoder port		Name
	60、80、90 series	110、130、180 series			60、80、90 series	110、130、180 series	
1	9	4	A+	2	4	5	B+
3	7	6	Z+	4	6	10	U+
5	11	12	W+	6	13	7	A-
7	14	8	B-	8	5	9	Z-
9	8	13	U-	10	15	15	W-
11	1	1	Connect to shield layer	12	3	3	GND
13	2	2	5V	14	10	11	V+
15	12	14	V-				

3-1-4-2. 380V drive terminals

■ CN0 terminals (DS2-45P5/ 47P5-AS/ DS2-411P0-AS)

No.	Name	Explanation	No.	Name	Explanation
1	P-	Pulse input P-	6	D+24V	Connect +24V for open collector
2	P+5V	Connect P+5V for differential input	7	SI1	Input terminal 1
3	P+24V	Connect +24V for open collector	8	SI2	Input terminal 2
4	D-	Direction input D-	9	SI3	Input terminal 3

5	D+5V	Connect D+5V for differential input	10	+24V	Input +24V
---	------	-------------------------------------	----	------	------------

■ CN1 terminals

(1) DS2-45P5/ 47P5-AS/ DS2-411P0-AS

No.	Name	Explanation	No.	Name	explanation
1	NC	Vacant	9	BO	Encoder output B
2	SI4	Input terminal 4	10	ZO	Encoder output Z
3	SI5	Input terminal 5	11	T-REF	Torque analog input
4	NC	Vacant	12	V-REF	Speed analog input
5	+24V	Input +24V	13	GND	GND for analog input
6	SO3	Output terminal 3	14	GND	AO, BO output ground
7	COM	Ground for output terminal	15	GND	ZO output ground
8	AO	Encoder output A			

(2) DS2-45P5-AS

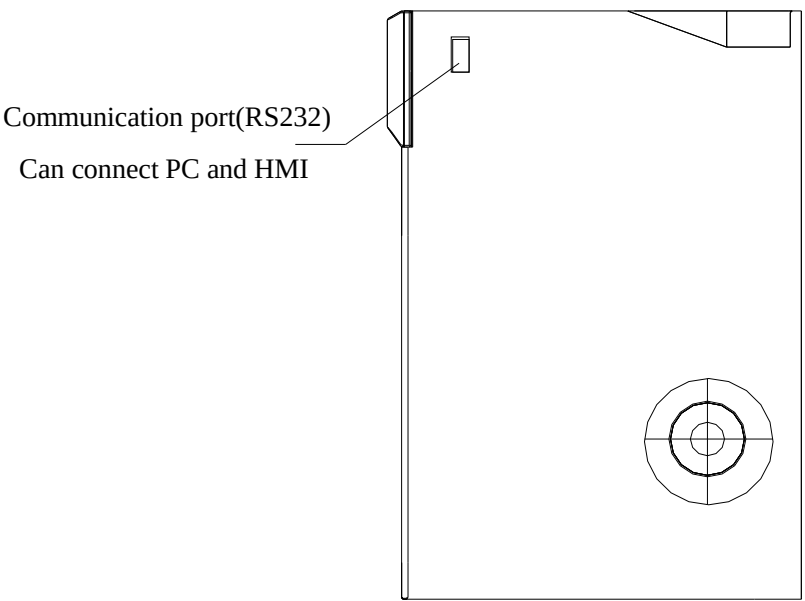
No.	Name	Explanation	No.	Name	Explanation
1	Z+	Encoder output Z+	9	A-	Encoder output A-
2	SI4	Input terminal 4	10	A+	Encoder output A+
3	SI5	Input terminal 5	11	T-REF	Torque analog input
4	NC	Vacant	12	V-REF	Speed analog input
5	+24V	Input +24V	13	GND	GND for analog input
6	SO3	Output terminal 3	14	B-	Encoder output B-
7	COM	Output terminal ground	15	B+	Encoder output B+
8	Z-	Encoder output Z-			

■ CN3 terminals (for 380V servo drives)

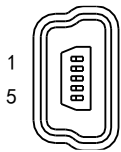
No.	Name	Explanation	No.	Name	Explanation
1	SO1	Output terminal 1	4	A	RS485 +
2	SO2	Output terminal 2	5	B	RS485 -
3	COM	Output terminal ground			

3-1-5. Communicaion port

■ RS-232 communication



DS2-2□P□-AS/AS6, DS2-20P4-BS/BS6, DS2-20P7-BSW/BSW6, DS2-21P5-AS2,
DS2-4□P□-AS/AS6

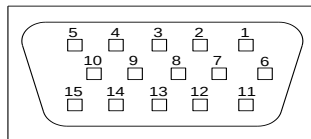


(5-pin port)

Pin no.	Name	Explanation
1	TXD	RS232 send
2	RXD	RS232 receive
3	GND	RS232 ground

■ RS-485 port

DS2-2□P□-AS/AS6, DS2-4□P□-AS/AS6



Pin no.	Name
CN1-14	A
CN1-15	B



- (1) Please use the cable provide by XINJE Company.
- (2) For above servo drives, RS232 (COM1) and RS485 (COM2) cannot be used at the same time.
- (3) The communication parameters of COM1 and COM2 will be changed at the same time.
- (4) 380V large power servo drive RS485 port (COM2) (terminal A: CN3-4, B:CN3-5)

P0-03, P0-04 set communication parameters

Parameter	Function	Default setting	Setting range
P0-04.0	Baud rate	6	0~9 0: 300 1: 600 2: 1200 3: 2400 4: 4800 5: 9600 6: 19200 7: 38400 8: 57600 9: 115200
P0-04.1	Data bit	0	0: 8
P0-04.2	Stop bit	2	0: 2 bits; 2: 1 bit
P0-04.3	Parity bit	2	0~2 0: no parity 1: odd parity 2: even parity

Parameter	Function	Default setting	Setting range	Effective time
P0-03	Modbus station no.	1	1~255	Power on again

3-2. Signal terminals

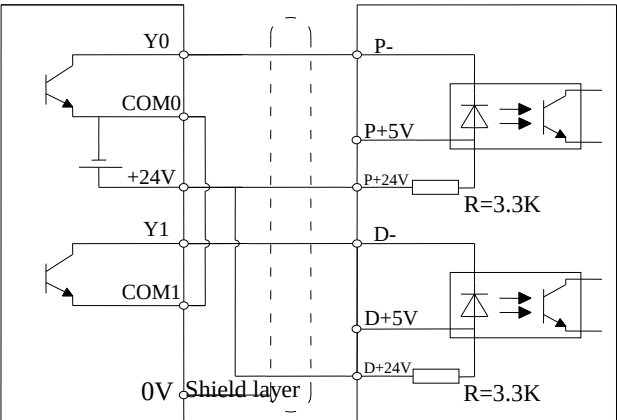
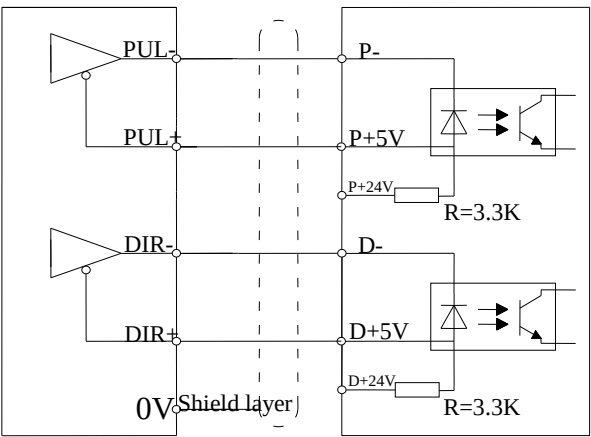
3-2-1. Pulse signal

Input terminal	Function	Reference chapter
P- P+5V P+24V	P2-00=0: CW, CCW two pulses mode P2-00=1: AB phase pulse input P2-00=2: pulse + direction mode	5-3-2
D- D+5V D +24V	P2-00=0: CW, CCW two pulses mode P2-00=1: AB phase pulse input P2-00=2: pulse + direction mode	5-3-2

Note: different models need to set different value, please refer to the following table:

Model	Set value
DS-□P□-AS/AS2/BS/BSW	0, 2
DS-□P□-AS6/BS6/BSW6	1, 2

The interface circuit of CW, CCW, AB phase pulse mode:

Open collector mode max input pulse 200Kpps	Open collector (24V) PLC, SCM, etc  servo drive Note: voltage between D-/D+24V is 18~25V, if it is less than 18V, the direction changing will be error.
Differential mode max input pulse 500Kpps	Difference mode (5V) PLC, SCM, etc  servo drive

When upper device is open collector output, please use this wiring diagram. Please note: P+5V and D+5V must be vacant.

When upper device is 5V difference output, please use this wiring diagram. Please note: P+24V and D+24V must be vacant.

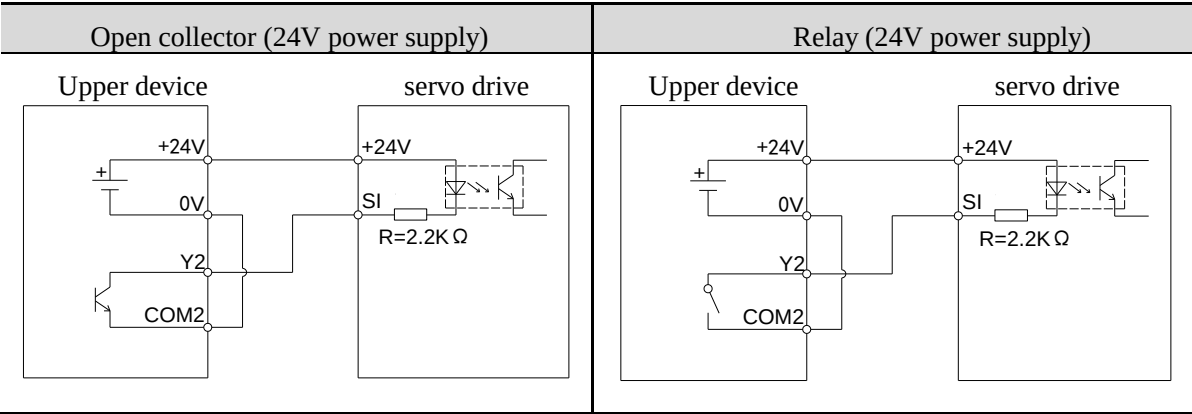
Note:

1. Servo pulse input port will be ON at 10mA.
2. If the controller is XINJE PLC, pulse output port rated current is 50mA, one channel of pulse output can connect 3 servo drives.

3-2-2. SI input signal

Please use relay or open collector transistor to connect. When using relay, please choose micro-current relay. Otherwise, the contact will be not good.

Type	Input terminal	Function	Reference chapter
Digital input	SI1~SI5	Multi-functional input	5-12-1

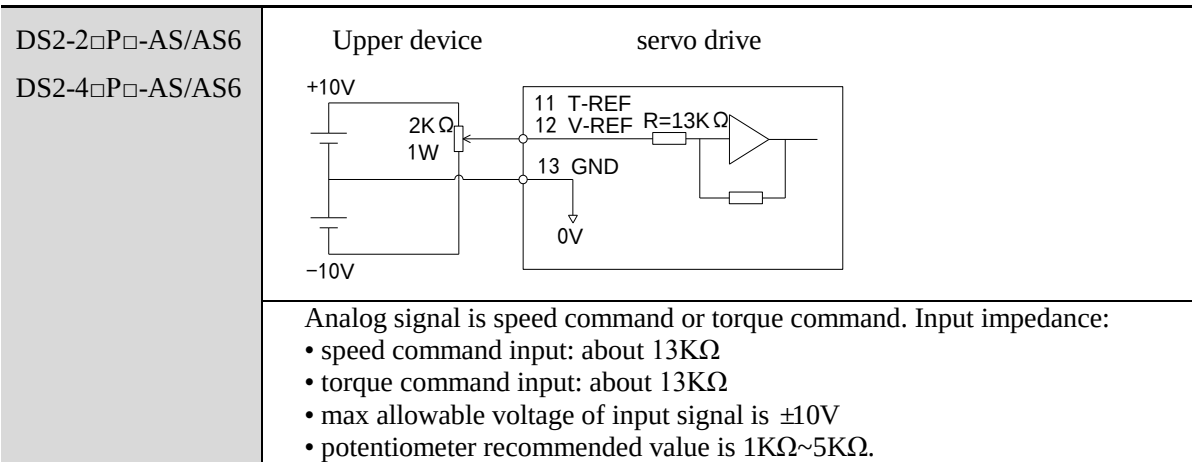


Note: the max allowable voltage and current of open collector output circuit:

Voltage: max DC30V

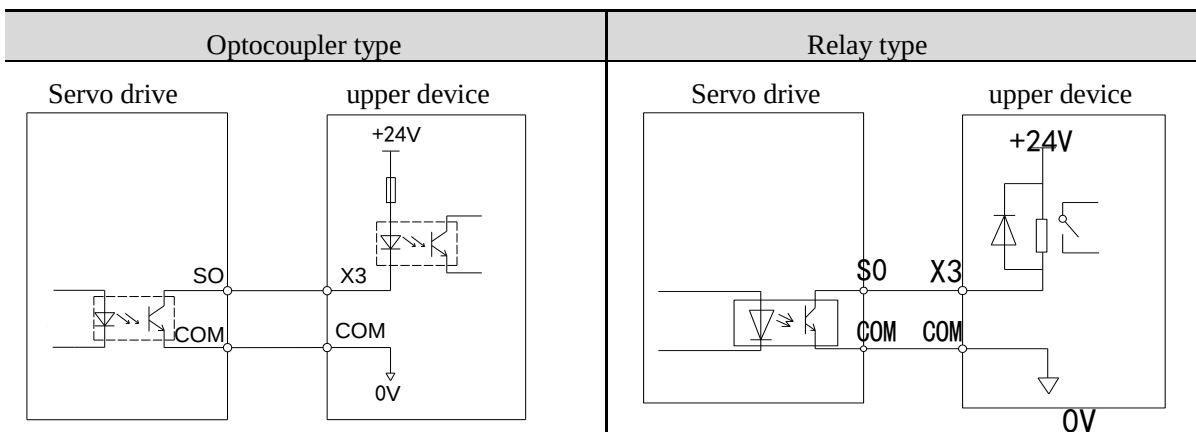
Current: max DC50mA

3-2-3. Analog input circuit

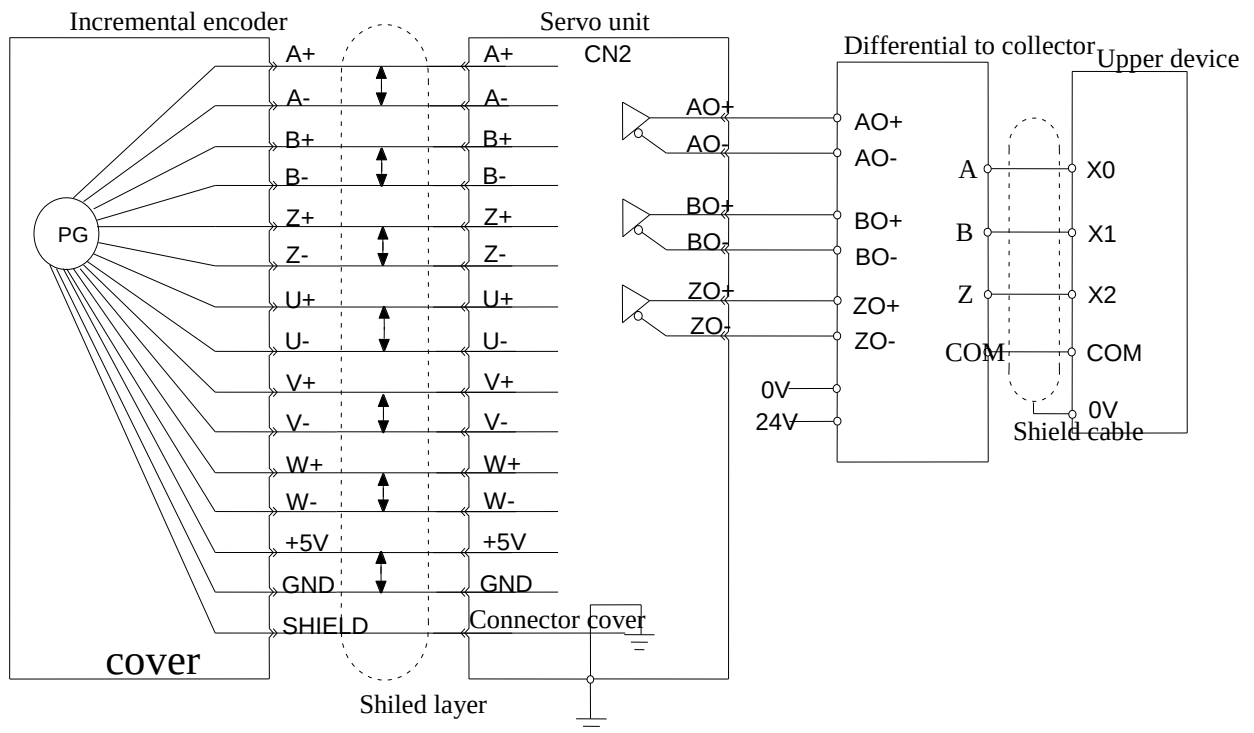


3-2-4. Output signal

Type	Output terminal	Function	Reference chapter
Optocoupler output	SO1~SO3	Multi-functional output terminal	5-12-3



3-2-5. Encoder feedback signal



XINJE servo drive series –AS/AS6 encoder feedback signal is differential signal. If some controllers need open collector signal, it needs to install differential to open collector board DIFF-OC on the servo drive. Servo series BS/BS6/BSW/BSW6/AS2 cannot support encoder feedback. The boards include differential to open collector board DIFF-OC and open collector to differential board OC-DIFF.



OC-DIFF board

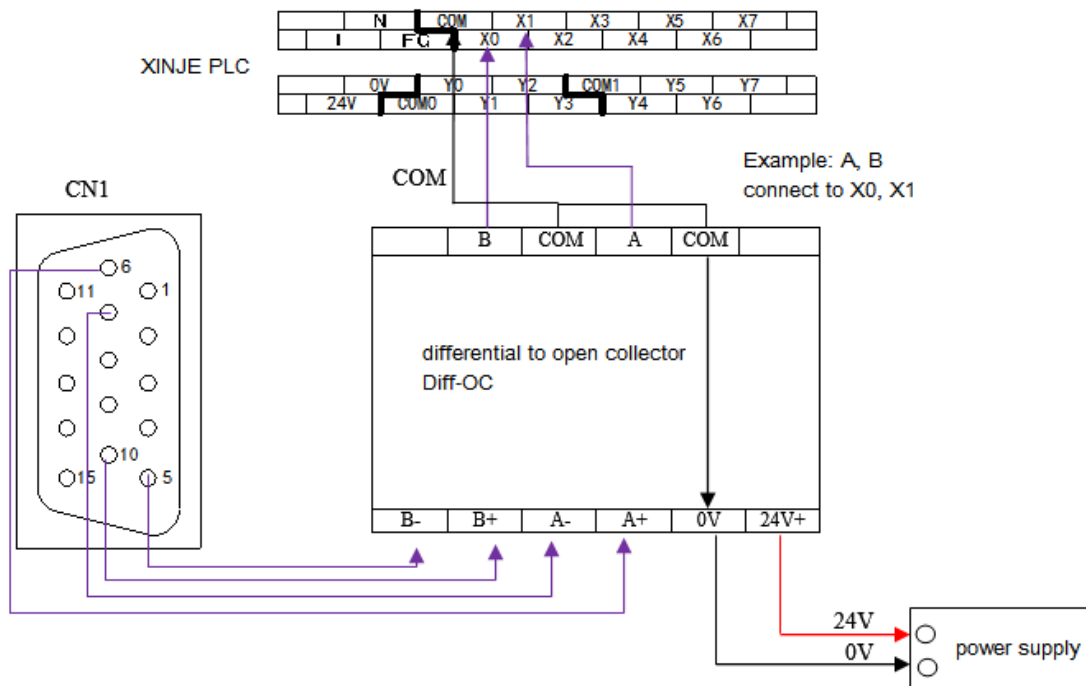


DIFF-OC board

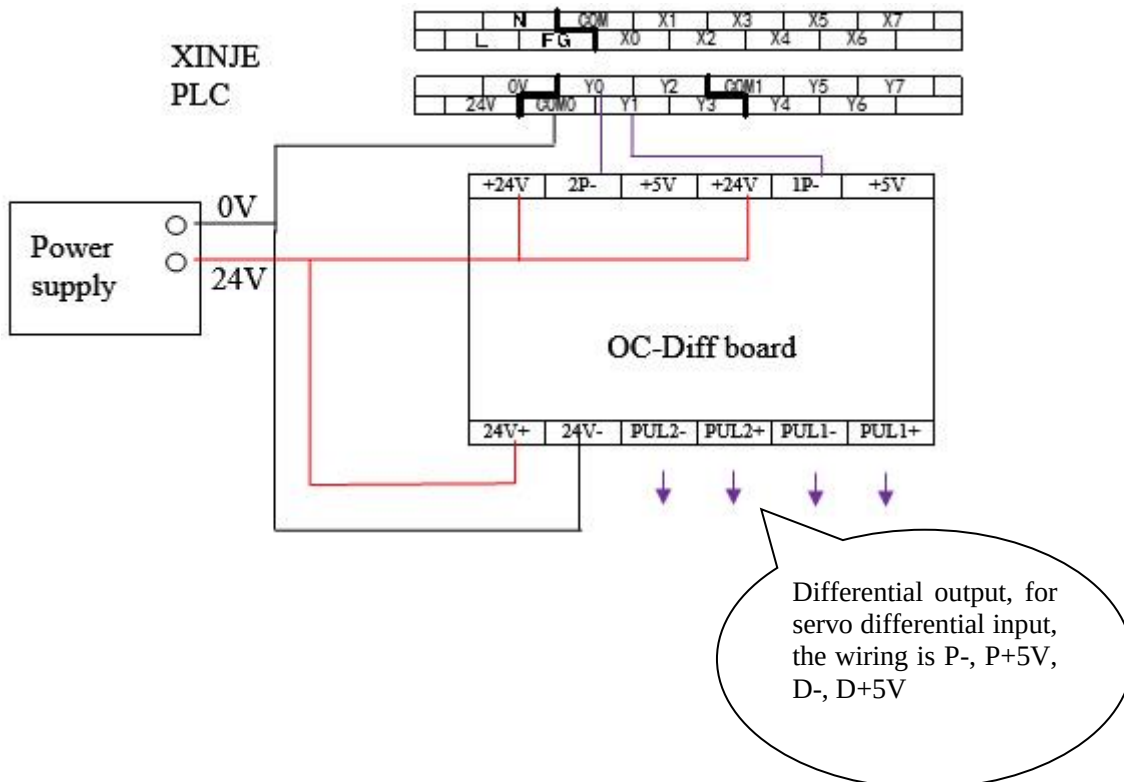
1. Differential to open collector board DIFF-OC: (take DS2-21P5-AS, XINJE PLC as an example)

■ CN1 (DB15)

No.	Name	Explanation	No.	Name	Explanation
1	NC	Reserved	9	Z-	Encoder output Z-
2	NC	Reserved	10	B+	Encoder output B+
3	SI5	Input terminal 5	11	T-REF	Torque analog input
4	SO3	Output terminal 3	12	V-REF	Speed analog input
5	B-	Encoder output B-	13	GND	GND for analog input
6	A+	Encoder output A+	14	A	RS485+
7	A-	Encoder output A-	15	B	RS485-
8	Z+	Encoder output Z+			



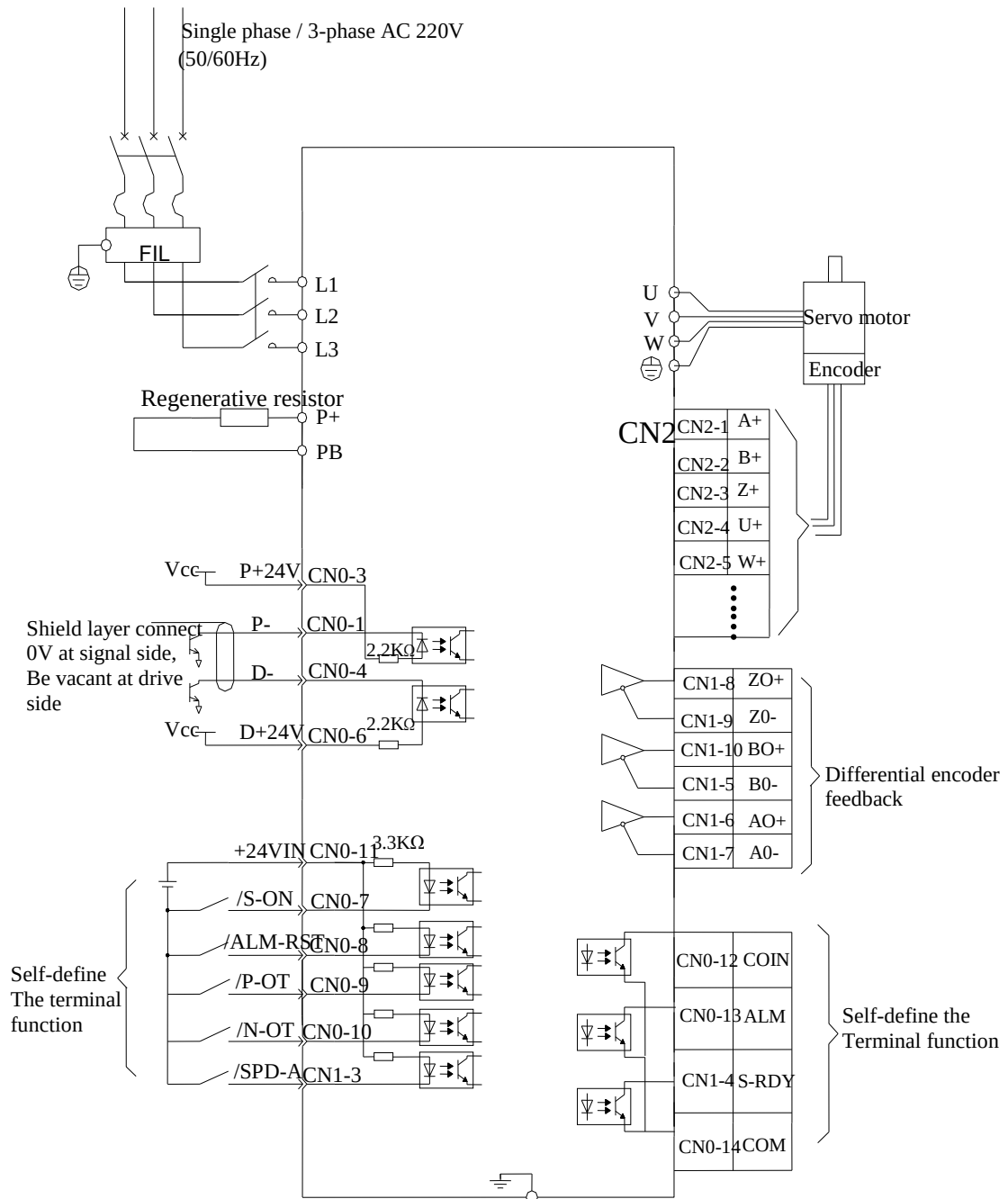
2. Open collector to differential OC-DIFF board, take XINJE PLC as an example



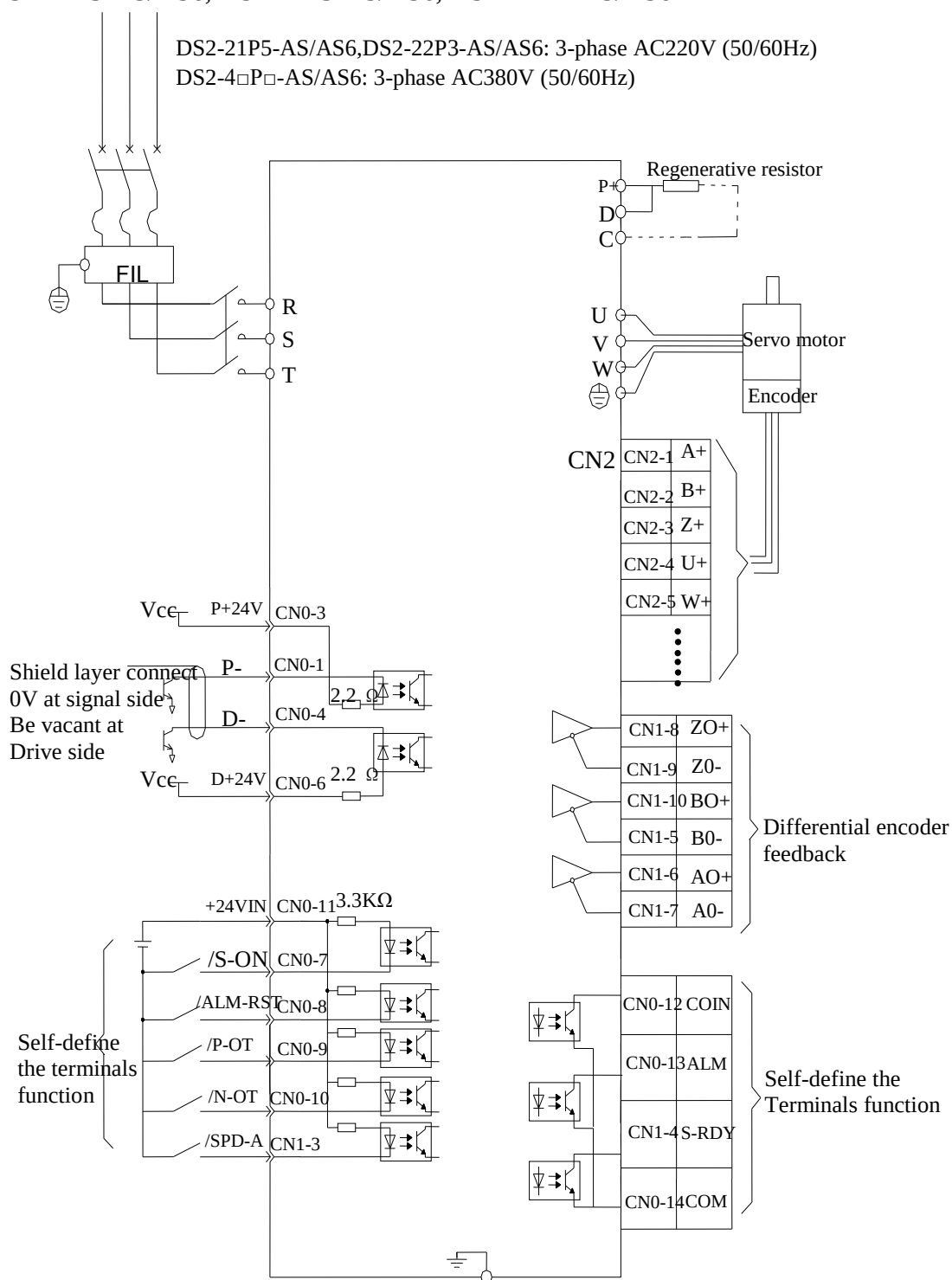
3-3. Standard wiring example

3-3-1. Position Control Mode

■ DS2-20P□-AS/AS6



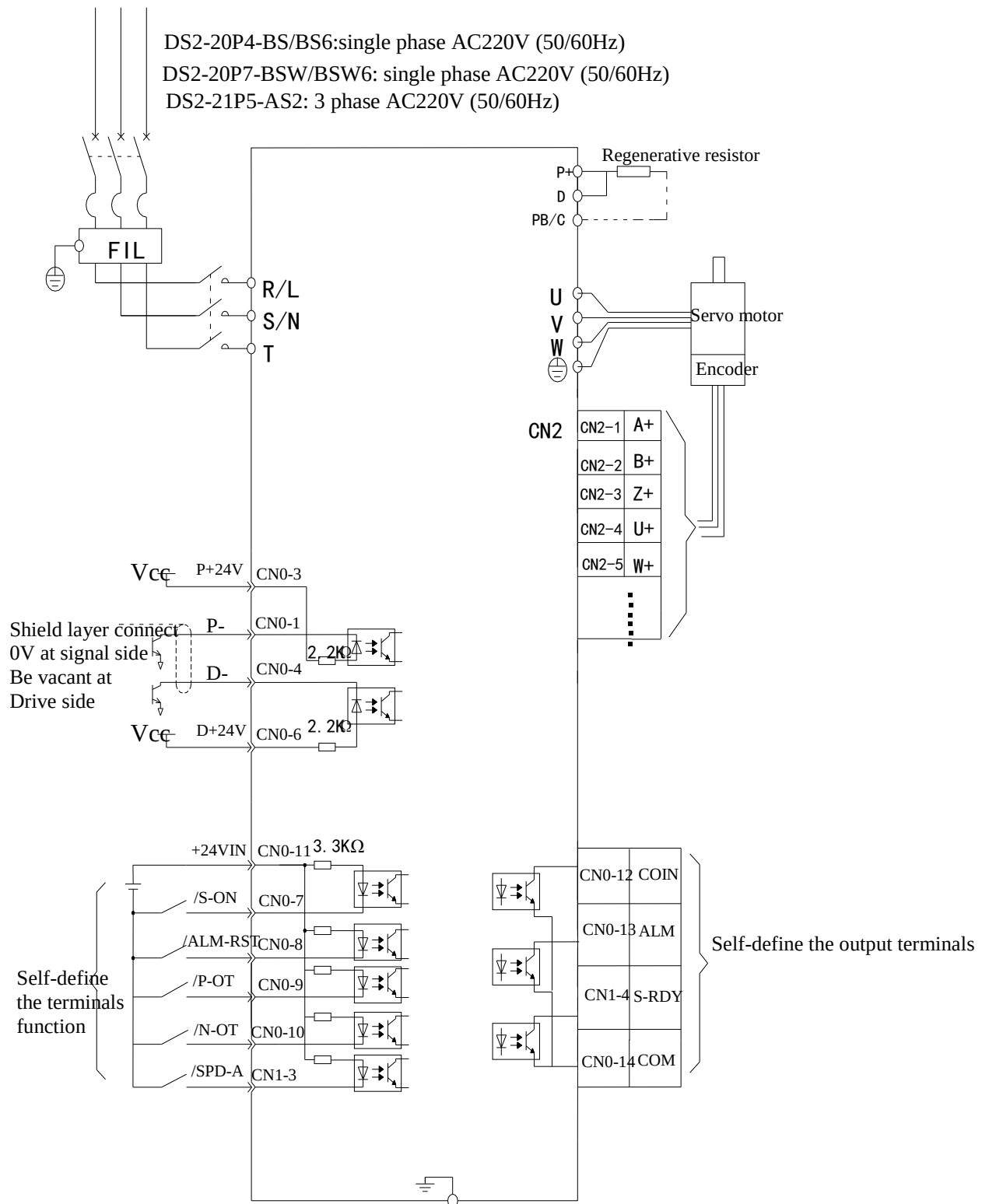
■ DS2-21P5-AS/AS6, DS2-22P3-AS/AS6, DS2-4□P□-AS/AS6



Note:

P+, D connect internal regenerative resistor. P+ and C connect external regenerative resistor.

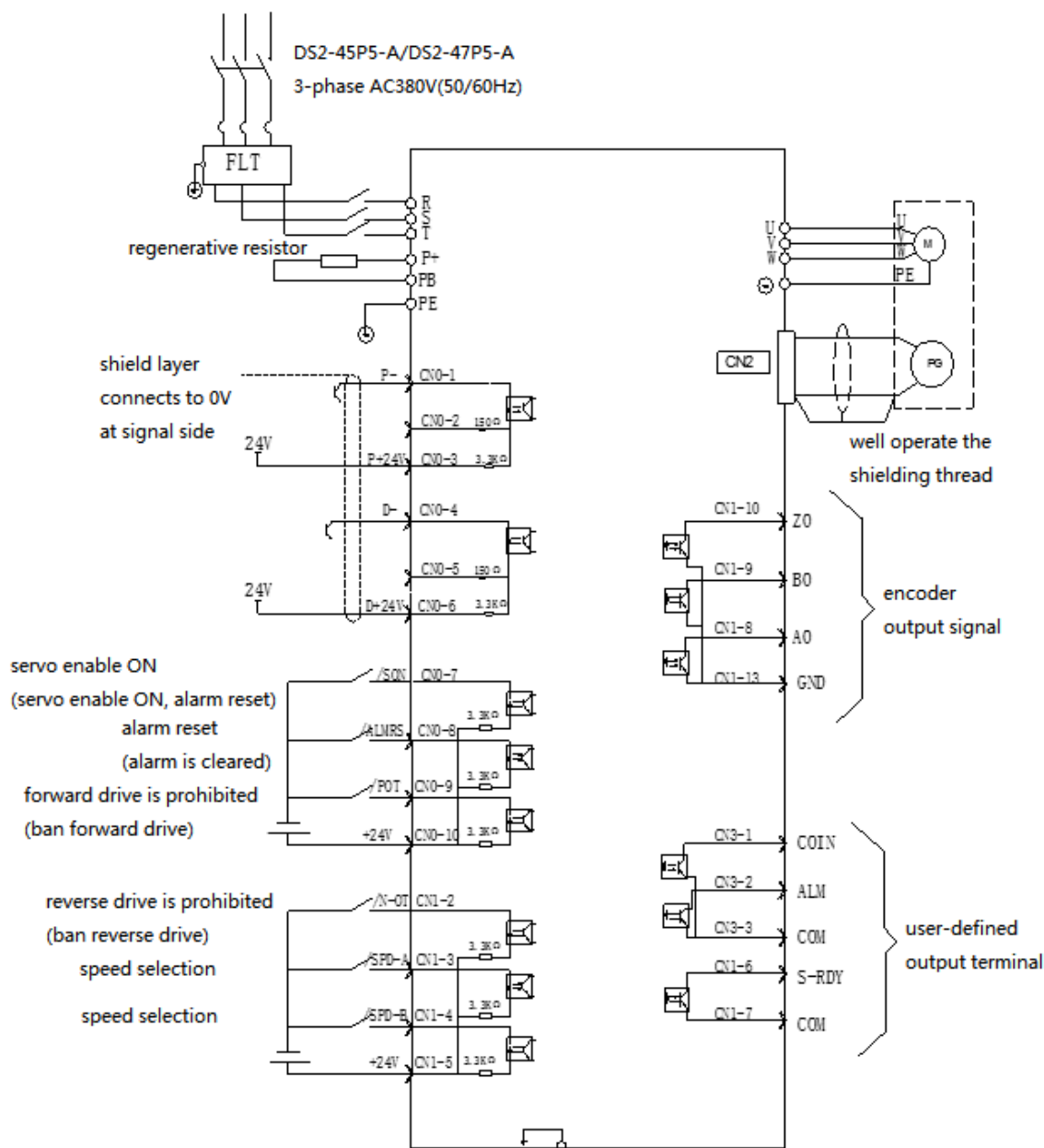
■ DS2-20P4-BS/BS6, DS2-20P7-BSW/BSW6, DS2-21P5-AS2



Note:

P+, D connect internal regenerative resistor. P+ and C(PB) connect external regenerative resistor.

■ DS2-45P5/ 47P5-AS/ DS2-411P0-AS



Note: the above diagram is based on pulse signal 24V open collector

3-4. Regenerative Resistor

When the servo motor operates in generator mode, power is returned to the servo drive side. This is called regenerative power. The regenerative power is absorbed by charging the smoothing capacitor, but when the capacitor's charging limit is exceeded, the regenerative power needs to be reduced by the regenerative resistor.

The servomotor is driven in regeneration (generator) mode in the following conditions:

- From decelerating to stop for acceleration/deceleration operation.
- Move down on the vertical axis.
- The external load drives the motor running

Servo drive	Internal regenerative resistor	External regenerative resistor
DS2-20P4-AS/AS6/BS/BS6 DS2-20P7-AS/AS6 DS2-45P5-A/AS DS2-47P5-A	No internal regenerative resistor	For external regenerative resistor, please connect resistor between P+ and PB
DS2-20P2-AS/AS6 DS2-20P7-BSW/BSW6 DS2-21P5-AS/AS6/AS2 DS2-22P3-AS/AS6 DS2-41P5-AS/AS6	internal regenerative resistor: 100Ω 100W, short P+ and D(connected when out of factory), disconnect P+ and C	for external regenerative resistor: connect resistor between P+ and C, disconnect P+ and D, external resistor needs to purchase
DS2-43P0-AS/AS6 DS2-45P5-A/AS DS2-47P5-A DS2-411P0-A	internal regenerative resistor: 75Ω 150W, short P+ and D(connected when out of factory), disconnect P+ and C	

Parameter	Signal name	Setting	Meaning	Effective
P0-10	Choose regenerative resistor	0	Use internal regenerative resistor	Power on again
		1	Use external regenerative resistor (resistor type please refer to the following table)	

The type of regenerative resistor:

Servo drive	External regenerative resistor	Resistor value	Power value
DS2-20P2-AS/AS6	Larger than 15 Ω	15-40Ω	200W and up
DS2-20P4-AS/AS6/BS/BS6	Larger than 15 Ω	15-40 Ω	500W and up
DS2-20P7-AS/AS6	Larger than 15 Ω	15-40 Ω	500W and up
DS2-20P7-BSW/BSW6	Larger than 15 Ω	15-40 Ω	500W and up
DS2-21P5-AS/AS6/AS2	Larger than 12 Ω	15-40 Ω	500W and up
DS2-22P3-AS/AS6	Larger than 12 Ω	15-40 Ω	1000W and up
DS2-41P5-AS/AS6	Larger than 20 Ω	25-40 Ω	1000W and up
DS2-43P0-AS/AS6	Larger than 25 Ω	25-40 Ω	1000W and up
DS2-45P5-A/AS	Larger than 18 Ω	20-40 Ω	2000W and up
DS2-47P5-A	Larger than 15 Ω	15-40 Ω	2000W and up
DS2-411P0-A	Larger than 10 Ω	15-30 Ω	3000W and up



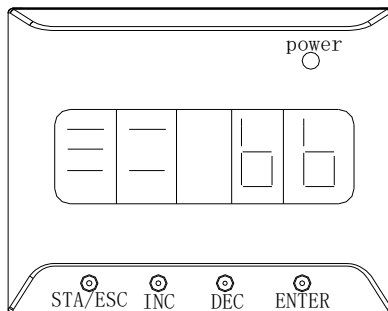
1. When using external regenerative resistor, the resistor value should be close to min value in the recommended range. The resistor power is related to actual conditions.
2. The temperature will be very high when the regenerative resistor is discharging, please using heat-resistant non-flammable wire. Don't touch the regenerative resistor when wiring.

4 Use the operate panel

4-1. Basic Operation

4-1-1. Functions of operate panel

- 5-bit LED: Displaying parameter settings, status or alarm.
- Power LED POWER: The LED is on when the servo drive is powered on.

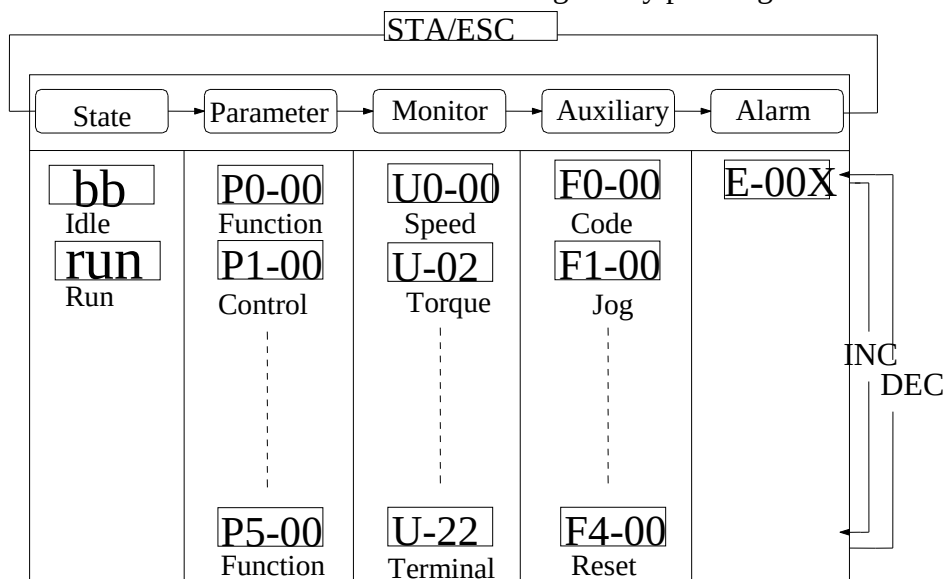


Key Name	Function
STATUS/ESC	Press: Status switch, status return
INC	Press: Increase the value; Press and hold: Increase the value continuously
DEC	Press: Decrease the value; Press and hold: Decrease the value continuously
ENTER	Press: Shift the editing digit; Press and hold: Enter a status, Enter

4-1-2. Basic Mode Switching

The operate panel can display the status, set parameter and run the command by switching the basic mode.

The running status, auxiliary function, parameter setting, and monitoring are the basic modes. The modes switch as the below diagram by pressing STATUS/ESC.



Display mode:

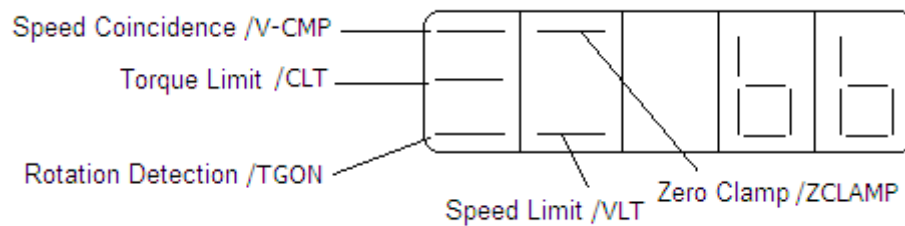
- Monitor Function U—XX: XX means the number of the monitor function.
- Auxiliary Function FX—XX: The first X means group No., the last two X means the

member No. in the group.

- Parameter Setting PX—XX: The first X means group No., the last two X means the member No. in the group.
- Alarm E—XXX: XXX means the alarm code.
- State: bb means the servo is in idle state; run means the servo is in running state.

4-2. Running status mode

➤ Speed and Torque Control Mode



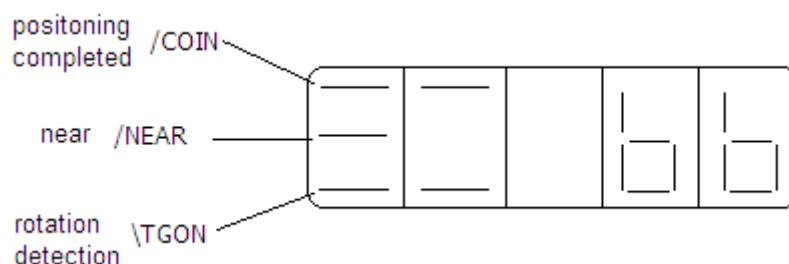
A. Bit contents:

Bit Data	Description
P5-29 Speed Coincidence (/V-CMP)	Light when the motor actual speed and command speed is the same. Speed coincidence signal checking width: P5-03 (unit: rpm)
P5-32 Torque Limit (/CLT)	Light when actual torque exceeds preset value. Forward Torque Limit: P4-02 Reverse Torque Limit: P4-03
P5-30 Rotation Detection (/TGON)	Light when the motor speed exceeds the rotation detection speed. Rotation Detection Speed Level: P5-02(Unit: rpm)
P5-21 Zero Clamp (/ZCLAMP)	Light when zero clamp signal is ON.
P5-33 Speed Limit (/VLT)	Light when actual speed exceeds preset value. Speed Limit during Torque Control: P4-07

B. The code contents:

Code	Description
	Standby Servo OFF (motor power OFF)
	Run Servo ON (motor power ON)
	Forward Run Prohibited P-OT is OFF. Please refer to 5-2-3 “Overtravel Limit”
	Reverse Run Prohibited N-OT is OFF. Please refer to 5-2-3 “Overtravel Limit”

➤ Position Control Mode



A. The bit contents:

Bit Data	Description
P5-28 Positioning Completed (/COIN)	Light when set position and actual position is the same. Positioning accomplishment width: P5-00 (unit: command pulse)
P5-36 Near (/NEAR)	Light when set position and actual position is the same. Near signal width: P5-04
P5-30 Rotation Detection (/TGON)	Light when the motor speed exceeds the rotation detection speed. Rotation detection speed: P5-02(unit: rpm)

B. The code contents:

Code	Description
	Standby Servo OFF (motor power OFF)
	Run Servo ON (motor power ON)
	Forward Run Prohibited P-OT is OFF. Please refer to 5-2-4 "Overtravel Limit"
	Reverse Run Prohibited N-OT is OFF. Please refer to 5-2-4 "Overtravel Limit"

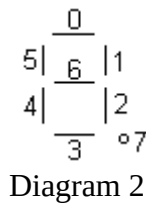
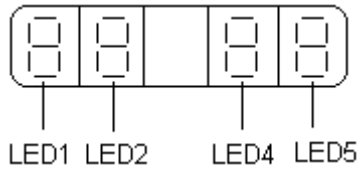
4-3. Monitoring Mode

■ Display contents of Monitoring Mode

Number	Monitor Display	Unit
U-00	Actual speed of motor	Rpm
U-01	Input speed command	Rpm
U-02	Internal torque command	%
U-03	Rotate angle (mechenism angle)	0.1 °
U-04	Rotate angle (electrical angle)	0.1 °
U-05	Bus voltage	V
U-06	Module temperature	0.1°C
U-07	Input command pulse speed	Rpm
U-08	Pulse value of shift	(0000~9999)*1
U-09	command	(0000~9999)*10000
U-10	Rotate angle (encoder	(0000~9999)*1
U-11	value)	(0000~9999)*10000
U-12	Pulse value of input	(0000~9999)*1
U-13	command	(0000~9999)*10000
U-14	Pulse value of	(0000~9999)*1
U-15	feedback command	(0000~9999)*10000
U-16	Current position	(0000~9999)*1
U-17	(Accumulated)	(0000~9999)*10000
U-18	Current, 1-bit decimal	0.1A
U-19	Analog input V-REF	0.01V
U-20	Analog input T-REF	0.01V
U-21	I/O signals status	
U-22	I/O terminals status	

■ U-21 displays I/O signals status

The following diagram describes the input and output signals status displayed in U-21.



In diagram 1, LED4 and LED5 stand for input signals status, and LED1 and LED2 stand for output signals status. In diagram 2 there shows the segment No. of each LED.

➤ Input signals status

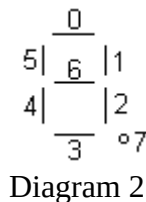
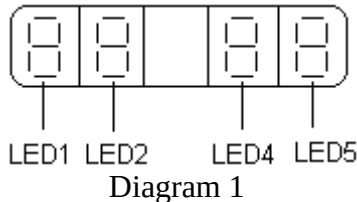
Segment	Description	Segment	Description
LED4_0	/SPD-A internal set speed selection	LED5_0	/S-ON servo signal
LED4_1	/SPD-B internal set speed selection	LED5_1	/P-CON proportion action command
LED4_2	/C-SEL control mode selection	LED5_2	/P-OT forward prohibit
LED4_3	/ZCLAMP zero clamp	LED5_3	/N-OT reverse prohibit
LED4_4	/INHIBIT prohibit pulse command	LED5_4	/ALM-RST clear the alarm
LED4_5	/G-SEL switch the gain	LED5_5	/P-CL external torque limit at forward side
LED4_6	/CLR clear the pulse	LED5_6	/N-CL external torque limit at reverse side
LED4_7	/CHGSTP change the step	LED5_7	/SPD-D internal set speed selection

➤ Output signals status

Segment	Description	Segment	Description
LED1_0	/NEAR near	LED2_0	/COIN positioning completed
LED1_1	/ALM alarm output	LED2_1	/V-CMP speed synchronization checking
LED1_2	/Z encoder Z phase output	LED2_2	/TGON rotate checking
		LED2_3	/S-RDY ready
		LED2_4	/CLT torque limit
		LED2_5	/VLT speed limit checking
		LED2_6	/BK brake lock
		LED2_7	/WARN warn

■ U-22 displays I/O terminals status

The following diagram describes the input and output terminals status:



In diagram 1, LED5 stands for input signals status, and LED2 stands for output signals status. In diagram 2 there shows the segment No. of each LED.

Input terminals		Output terminals	
Segment	Description	Segment	Description
LED5_0	Input status of SI1	LED2_0	Output status of SO1
LED5_1	Input status of SI2	LED2_1	Output status of SO2
LED5_2	Input status of SI3	LED2_2	Output status of SO3
LED5_3	Input status of SI4		
LED5_4	Input status of SI5		

4-4. Auxiliary Function

Use the operate panel to do application in auxiliary function mode.

Group No.	Content
F0-**	Check system information, display the system code and data
F1-**	Auxiliary run mode, display the auxiliary run command and result
F2-**	Set the motor code
F3-**	Check the alarm information, clear the alarm
F4-00	Reset parameters to default value
F5-00	External communication monitoring

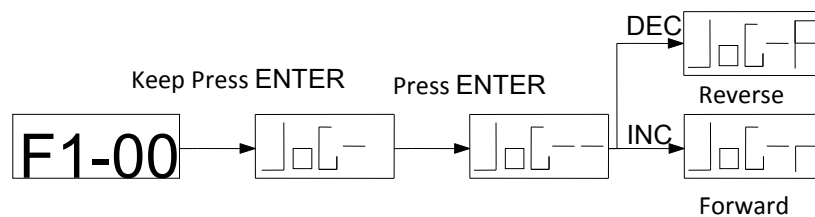
4-4-1. F0-XX

Function No.	Description	Function No.	Description
F0-00	Motor Code	F0-01	Servo Series
F0-02	Servo Model	F0-03	Produce Date: Year
F0-04	Produce Date: Month	F0-05	Produce Date: Day
F0-06	Software Version	F0-07	Hardware Version

4-4-2. F1-XX

1. Jog (F1-00)

Make sure that the motor shaft is not connected to the machine before jogging!



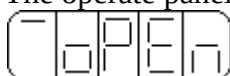
P3-04	JOG speed					
	Unit	Default	Setting range	Suitable mode	Change	Effective
	1Rpm	100	0~1000	JOG	Servo OFF	Immediately

2. Trial Operation (F1-01)

Make sure that the motor shaft is not connected to the machine before trial operation!

When servo drive is connected with non-original encoder line or power line, trial operation must be run first to ensure that the encoder line or power line is connected correctly.

Set the display to F1-01, and press and hold ENTER key to enter trial operation mode. The operate panel displays:



If correctly wired, the motor would rotate in 5 seconds in forward direction (fixed to counter-clockwise), otherwise the motor would shock or vibrate, raising an alarm for worse. In this case the power must be switched off immediately and check the wiring again.

Press STATUS/ESC key to return.

3. Current Offset Auto-Adjustment (F1-02)

After the servo drive is updated to latest software version, or the motor does not revolve smoothly for long time, the current offset auto-adjustment is recommended.



Press STATUS/ESC to exit.

4. Speed command offset auto-adjustment (F1-03)



Press STATUS/ESC key to exit.

5. Torque command offset Auto-Adjustment (F1-04)



Press STATUS/ESC key to exit.

6. Forced Servo enables (F1-05)

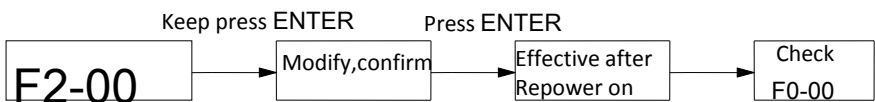
F1-05 = 0: Cancel forced servo enables

F1-05 = 1: Forced servo enables

The forced servo enable will invalid after repower on.

4-4-3. Change the motor type (F2-00)

The servo drive can match multi-servo-motor with close power classes printed on the nameplate of each motor. Please confirm the motor code F0-00 match the nameplate.



Motor nameplate

XINJE					
MS-80ST-M02430B-20P7					← Motor type
KW	N.M	A	rpm	IP	← Power, torque Speed, current
0.7	2.4	3.0	3000	65	
MOTOR CODE:0011					← Motor code
DB2012052013					← Serial no.
Xinje Electronic Co.,LTD					

4-4-4. Check Alarm Information (F3-XX)

Member No.	Description	Unit
F3-00	Current alarm code ※1	
F3-01	Current warn code ※2	
F3-02	Alarm/warn code 1 when alarm	
F3-03	U phase current when alarm	A
F3-04	V phase current when alarm	A
F3-05	DC bus-voltage when alarm	V
F3-06	IGBT module temperature when alarm	°C
F3-07	Speed when alarm	rpm
F3-08	Internal torque command when alarm	%
F3-09	V-REF value when alarm	V
F3-10	T-REF value when alarm	V
F3-11	Alarm/warn code 2 when alarm	
F3-12	Alarm/warn code 3 when alarm	
F3-13	Alarm/warn code 4 when alarm	
F3-14	Alarm/warn code 5 when alarm	
F3-15	Alarm/warn code 6 when alarm	
F3-16	Alarm/warn code 7 when alarm	

※1: F3-00=0 indicates that there is no alarm.

※2: F3-01=0 indicates that there is no warn.

4-4-5. Reset Parameters to Default (F4-XX)

Reset all the parameters to default value: F4-00 = 1.

Please make the servo OFF before the operation.

4-4-6. External monitoring (F5-XX)

Select F5-00 in auxiliary function, the panel displays “C-OUT” which means external monitoring mode, COM1 is effective, operate panel is ineffective. At this time user can debug the servo via PC.

Press STATUS/ESC to return.

4-5. Alarm (E-XX)

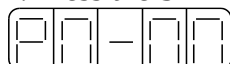
The alarm code will show when there is error in the drive. Press ENTER to reset the alarm. If the servo is OFF caused by alarm, it is no need to reset the alarm.

Note: please find out the alarm reason before reset the alarm.

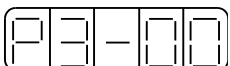
4-6. Example

The example below shows how to change parameter P3-09 from 2000 to 3000.

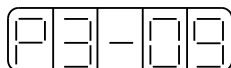
1. Press the STATUS/ESC key to select the parameter setting mode.



2. At this time the second LED is blinking, and press INC or DEC key to set the group No. to 3. Press ENTER key to confirm.



3. At this time the last LED is blinking, and press INC or DEC key to set the member No. to 9. Press and hold ENTER key to confirm.



4. At this time the panel displays the value in P3-09, and the last decimal “0” is blinking. Press ENTER to left shift the blinking decimal. Press INC, DEC or ENTER key to modify the value to 3000, and press and hold ENTER to confirm.



The parameter in P3-09 is changed from 2000 to 3000.

Repeat steps 2 to 4 to change the parameter again.

5. Press STATUS/ESC key to return.

5 Run the servo system

5-1. Control mode selection

DS2 series servo has one main mode and two sub modes. Sub mode 1 and 2 can be switched to each other via /C-SEL signal.

Parameter		Control mode	Reference
P0-00	0	Testing mode, users cannot change!	
P0-01 Sub mode1	0	Idle mode The motor will not power on even if the servo drive enables.	
	1	Torque control (internal setting) Control the output torque of servo motor via operating panel or communication.	5-9
	2	Torque control (analog voltage command) Control the output torque of servo motor via analog voltage command. It is mostly used to close-loop torque control with upper device, such as tension control. (If servo drive doesn't have analog input port, it cannot use this mode.)	5-8
	3	Speed control (internal speed setting) Use /SPD-D, /SPD-A, /SPD-B to select the speed which is set in the servo drive. The servo drive can set 3 speeds.	5-6
	4	Speed control (analog voltage command) Control the speed of servo motor via analog voltage command. It is mostly used to close-loop speed control with upper device.	5-5
	5	Position control (internal position command) Control the position via internal position command; it can set pulse quantity and torque.	5-4
	6 (default setting)	Position control (external pulse command) Control the position of servo motor via pulse command. Control the position via pulse quantity; control the speed via pulse frequency.	5-3
	7	Speed control (pulse frequency command) Control the speed of servo motor via pulse frequency, but not control the position.	5-7
P0-02 Sub mode2	Same as sub mode 1	The servo will enter sub mode2 when /C-SEL signal is effective.	5-10

5-2. Basic function setting

Parameter	Name	Reference
P5-10	Servo ON setting /S-ON	5-2-1
P0-05	Switch the motor rotate direction	5-2-2
P0-06	Motor stop mode setting	5-2-3
P4-06	Servo immediately stop torque	5-2-3
P5-12	Prohibit forward running /P-OT	5-2-4
P5-13	Prohibit reverse running /N-OT	5-2-4
P5-34	Power-loss brake /BK	5-2-5
P5-37	Alarm output	5-2-6
P0-20	Run time	5-2-7
P0-21	Alarm times	

P4-11	Forward torque	5-2-8
P4-12	Reverse torque	
P4-13	Overlimit time	

5-2-1. Servo ON setting

When servo ON signal is ineffective, the servo motor cannot run.

Parameter	Signal	Setting	Explanation	Range
P5-10	/S-ON	n.0001 (default value)	When SI1 is ON, servo motor powers on and enables to run.	0001~0015
		n.0010	Always effective, no need to wiring.	

/S-ON signal can be set to other input via parameter P5-10, please refer to chapter 5-12-1.

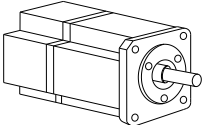
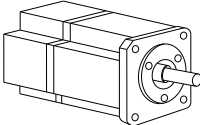
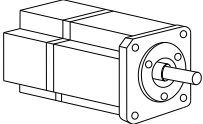
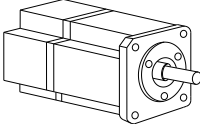


the input terminal assigned by function parameters cannot be duplicated.

5-2-2. Switch the motor rotate direction

Change the motor rotate direction without changing the motor wiring. The standard forward rotate direction is “CCW rotate” look at the load side.

“Reverse mode” will change the motor rotate direction.

Mode	Forward rotate	Reverse rotate
Standard setting: CCW is forward rotate	 CCW	 CW
Reverse mode: CW is forward rotate	 CW	 CCW

■ Set the rotate direction

Parameter	Setting	Explanation
P0-05	0 (default setting)	Standard setting (CCW is forward running)
	1	Reverse mode (CW is forward running)

P0-05 is functional in mode 2, 4, 6, 7.

5-2-3. Motor stop mode when use overtravel signal

When use overtravel signal, please set the motor stop mode as the below table:

Parameter	Function	Setting range	Default value	Modify	Effective
P0-06.H	Motor stop mode when use overtravel signal	0~3	2	Servo OFF	Repower on

P0-06.H value	Explanation
0~1	Inertia stop. Keep on inertia motion after stop.
2	Decelerate stop. Change to zero clamp state after stop. Torque setting: P4-06 urgent stop torque

3	Decelerate stop. Change to inertia motion state after stop. Torque setting: P4-06 urgent stop torque.
Notes: (1) P0-06.H=0,1, servo enable signal will be forced OFF when overtravel signal arrives. P0-06.H=3, servo enable signal will be forced OFF after motor stop when overtravel signal arrives. P0-06.H=2, servo enable signal will not be forced OFF as long as the servo enable signal is always effective. (2) stop condition depends on rotate checking speed P5-02, unit rpm.	

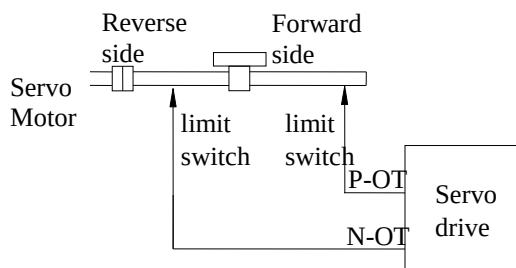
Related parameter settings:

P4-06	Urgent stop torque					
	Unit	Default value	Range	Suitable mode	Modify	Effective
	1% rated torque	300	0~300	All the modes	Servo OFF	Immediately
Notes: if this parameter set too small, the motor will stop slowly.						

5-2-4. Overtravel Limit (P-OT & N-OT)

(1) Use the overtravel signal

Please connect P-OT and N-OT to the limit switch. Make sure to wiring as the following diagram when linear driving to avoid machine damage.



(2) Set the overtravel signal

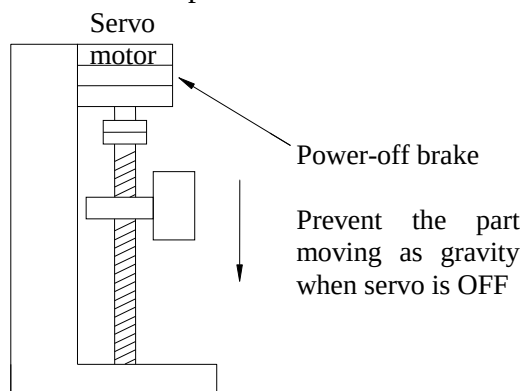
Parameter	Signal	Setting	Meaning	Modify
P5-12	/P-OT	n.0003 (default)	SI3=ON, prohibit the forward running	Range: 0000-0015
		n.0013	SI3=ON, allow the forward running	
P5-13	/N-OT	n.0004 (default)	SI4=ON, prohibit the reverse running	Range: 0000-0015
		n.0014	SI4=ON, allow the reverse running	

Note:

1. /P-OT, /N-OT can be changed to other terminal input via parameter P5-12 and P5-13.
2. In position control, there is position offset pulse when stop the motor via overtravel signal. Please input clear signal /CLR to clear the offset.
3. In position control, if the servo still can receive pulse when stop the motor via overtravel signal, these pulses will accumulate until the servo alarm.
4. The input terminals function cannot be the same. Please refer to chapter 5-12-1.

5-2-5. Power-off Brake (BK)

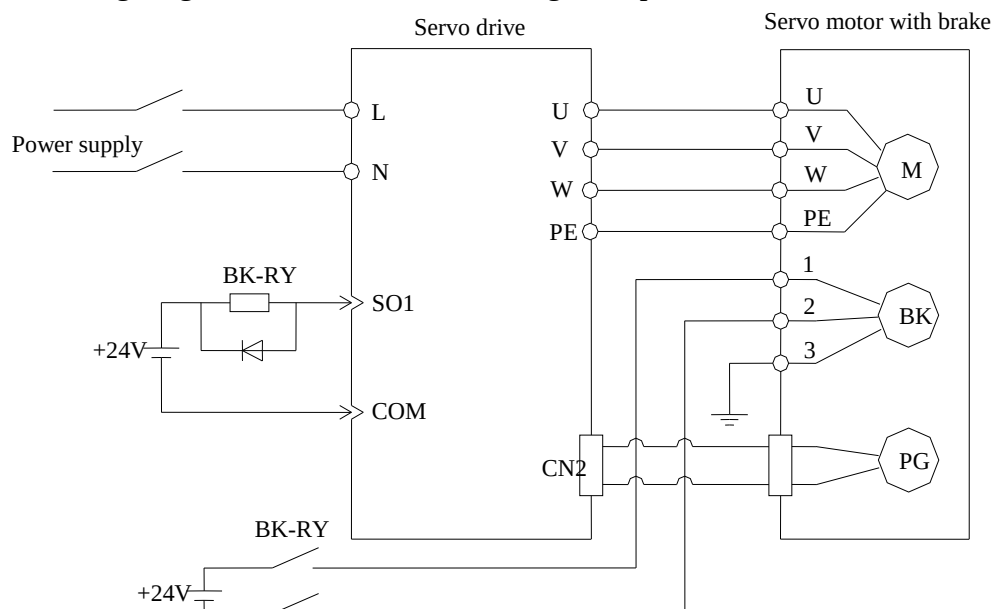
It is used when servo drive controls the vertical shaft. The function of power-off brake is the moveable part will not shift when servo is OFF.



The brake built into the MS series servo motor with brakes is a de-energization brake, which is used only to hold and cannot be used for braking.

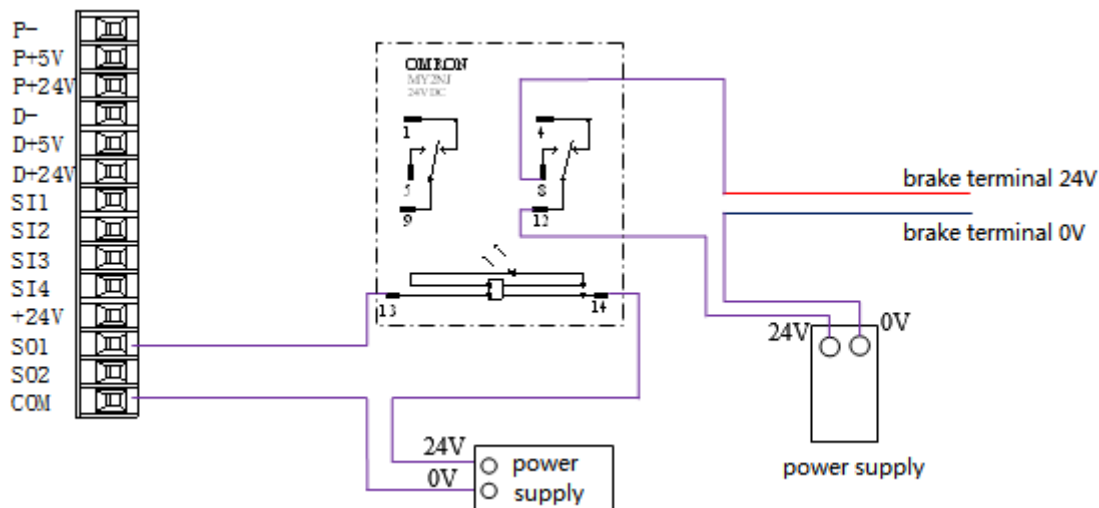
(1) Wiring Example

The ON/OFF circuit of brake includes sequence output signal /BK and brake power. The following diagram shows a standard wiring example.



Note: the working voltage of brake is DC 24V, current is about 0.6A.

The wiring diagram based on OMRON auxiliary relay



(2) Brake signal

Parameter	Signal	Type	Default	Explanation	Modify
P5-34	/BK	Output	n.0000	Servo RUN, the brake ON Servo bb or alarm state, the brake OFF.	Range 0000-0013
/BK signal can output from output terminal via setting parameter P5-34, please refer to chapter 5-12-3. When set P5-34=0001, it means output from SO1 terminal. Note: P5-28 default value is 0001, please change it to 0000 or 0010 to avoid conflict.					

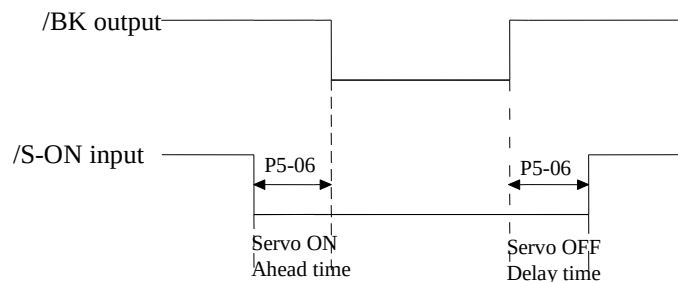
(3) Servo OFF delay time (after servo motor stop)

If the machine moves slightly due to gravity because of the brake has action delay time. Please adjust the time as below parameter.

For example, if the servo power off or enable off or brake loose when alarm, please set the P5-06 larger, the recommended value is 500 (it is effective in position mode)

P5-06	Servo OFF delay time (brake command)					
	Unit	Default	Range	Suitable mode	Modify	Effective
	1ms	0	0~500	All the modes	Servo OFF	Immediately

This parameter is used to set the output time from the brake control signal /BK to the servo OFF operation (servomotor output stop). The setting is under the condition of motor stop and TGON invalid.



The above diagram shows the action time of /BK signal and servo ON signal. Before outputting /BK and brake is OFF, servo motor already power on; after not output /BK and brake is ON, servo motor power OFF.

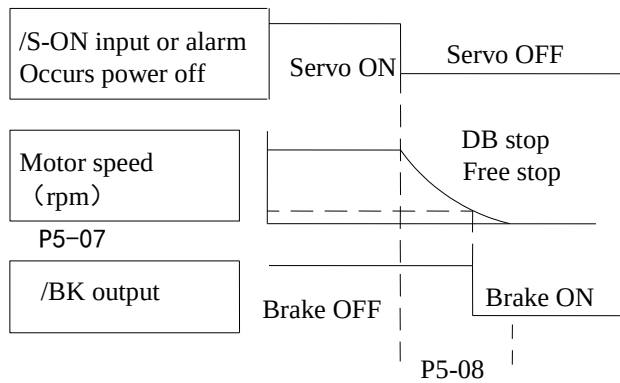
(4) Brake ON parameter (When servo motor is rotating)

The motor will power OFF when alarm occurs. The machine will move as gravity until the brake action.

Set below parameters in order to use brake when motor speed decreases to setting value or waiting time ends.

P5-07	Brake command output speed					
	Unit	Default	Range	Suitable mode	Modify	Effective
	rpm	100	0~5000	All the modes	Servo OFF	Immediately
P5-08	Brake command waiting time					
	Unit	Default	Range	Suitable mode	Modify	Effective
	1ms	500	10~1000	All the modes	Servo OFF	Immediately

Set the brake time when servo OFF caused by /S-ON signal or alarm.



The brake is used to protect the position. The brake must be effective at suitable time when servo motor stop. Users can adjust the parameters according to the machine action.

The /BK signal from ON to OFF under either of the following conditions:

1. Motor speed drops below the value of P5-07 after servo OFF.
2. over the time of P5-08 after servo OFF.

The real speed is max speed (P3-09) even set the speed higher than max in P5-07.

5-2-6. Alarm output

Parameter	Signal	Default	Meaning	Modify
P5-37	Alarm output	n.0002 (default)	SO2 and COM pass through when servo alarm	Range: 0000-0013 Distribute the signal to output terminal through P5-37. P5-37=0001, it outputs from SO1.
		n.0012	SO2 and COM cut off when servo alarm	



- (1) Servo unit is forced OFF when alarm. The motor will move with external force. If the motor needs to hold the position, please choose motor with power loss brake and use /BK signal. Please refer to chapter 5-2-5.
- (2) The output terminals distributed by function parameters cannot be same. Please refer to chapter 5-12-3.

P0-21	Alarm times	
	Default value	Meaning
	0	Record the servo alarm times. (the times of overvoltage, overcurrent, over heat..)

5-2-7. Running time

P0-20	Running time	
	Default value	Meaning
	0	Record the servo running time. It can be cleared when reset.

5-2-8. Torque over-limit (anticollision protection)

P4-11	Forward run anticollision protection (torque percent)
P4-12	Reverse run anticollision protection (torque percent)
P4-13	Anticollision protection time
Note: P4-13>0, this function is effective. Motor output torque U-02>P4-11/12, in the time of P4-13, it shows alarm E-019.	

5-3. Position mode (external pulse command)

Basic parameter		
Parameter	Name	Reference
P0-01	Control mode selection	5-3-1
P2-00	Pulse command mode	5-3-2
P2-02	Electronic gear ratio (numerator)	5-3-3
P2-03	Electronic gear ratio (denominator)	
P5-10	Servo ON signal /S-ON	5-2-1

Other available parameters			
Key words	Parameter	Name	Reference
Command filter	P2-01	Position command filter selection	5-3-4
Clear error pulse	P5-24	Pulse error clear	5-3-5
Positioning finish	P5-28	Positioning finish signal output /COIN	5-3-6
	P5-00	Positioning finish width	
Positioning near	P5-36	Positioning near signal output /NEAR	5-3-7
	P5-04	Positioning near signal width	
Prohibit pulse	P5-22	Command pulse prohibition /INHIBIT	5-3-8

5-3-1. Control mode selection

Parameter	Setting value	Meaning	Modify	Effective
P0-01	6	Control the position by external pulse command	Servo OFF	Immediately

5-3-2. Pulse command

1. Pulse command mode

Parameter	Setting	Command mode	Suitable mode	Modify	Effective
P2-00 xx□x	0	Falling edge is effective	6, 7	Immediately	Repower on
	1	Rising edge is effective			

Note: XINJE XD, XC, XCC series PLC pulse signal falling edge is effective, XCM PLC pulse signal rising edge is effective.

Parameter	Setting	Command mode	Suitable mode	Modify	Effective
P2-00 xxx□	0	CW, CCW mode	6, 7	Immediately	Repower on
	1	AB phase pulse (phase difference 90°)			
	2	Pulse + direction			



DS-□P□-□ support setting value 0 and 2; DS-□P□-□6 support setting value 1 and 2.

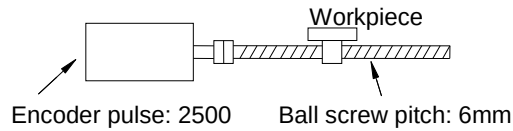
2. Details explanation of pulse command mode

Command pulse mode	Electrical specification	Remark
Direction+pulse (DIR+PUL signal) Max frequency: Bus drive is 500kbps. Transistor open circuit is 200kbps.	$t1, t2 \leq 0.1\mu s$ $t3, t7 \leq 0.1\mu s$ $t4, t5, t6 > 3\mu s$ $\tau \geq 2.5\mu s$ $(\tau/T) \times 100 = 40\% \sim 60\%$	Direction (DIR) 1= forward command 0= reverse command
CW, CCW mode Max frequency: Bus drive is 500kbps. Transistor open circuit is 200kbps.	$t1, t2 \leq 0.1\mu s$ $\tau \geq 2.5\mu s$ $(\tau/T) \times 100 = 40\% \sim 60\%$	CW: PUL=pulses DIR=0 CCW: PUL=0 DIR=pulses
AB phase mode Max frequency: Bus drive is 500kbps Transistor open circuit is 200kbps	$t1, t2 \leq 0.1\mu s$ $\tau \geq 2.5\mu s$ $(\tau/T) \times 100 = 40\% \sim 60\%$	

5-3-3. Electronic gear ratio

The electronic gear function is set any value for motor moving quantity corresponding to input pulse command. The host device which sends command doesn't need to consider the machine deceleration ratio and encoder pulse quantity.

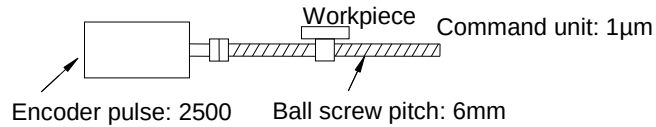
Not use electronic gear



The workpiece moves 10mm

One rotation is 6mm
 $10 \div 6 = 1.6666$
 2500 × 4 pulse finishes one rotation
 Command input 16666 pulses
 Calculate these values in the host controller

Use electronic gear



Define the machine condition and command unit by electronic gear

The workpiece moves 10mm

Command unit is 1 μm

$$\frac{10\text{mm}}{1\mu\text{m}} = 10000 \text{ pulse}$$

P2-02	Electronic gear (numerator)					
	Unit	Default	Range	Suitable mode	Modify	Effective
	—	1	1~65535	6	Any	Immediately
P2-03	Electronic gear (denominator)					
	Unit	Default	Range	Suitable mode	Modify	Effective
	—	1	1~65535	6	Any	Immediately

1. Calculate the electronic gear ratio (B/A) using the following steps:

Step	Content	Explanation
1	Confirm the machine specification	Confirm the deceleration ratio, ball screw distance, pulley diameter
2	Confirm the encoder pulse	Confirm the servo motor encoder pulses
3	Set the reference unit	Set the actual distance or angle corresponding to 1 pulse of the command controller
4	Calculate the moving value the load shaft rotates 1 circle	Calculate the actual unit value the load shaft rotates 1 circle based on reference unit
5	Calculate the electronic gear ratio	Calculate the electronic gear ratio based on the formula (B/A)
6	Set the parameters	Set the result as the electronic gear ratio

1. Formula:

Suppose the machine deceleration ratio of motor shaft and load shaft is m/n, calculate the electronic gear ratio as the below formula:

(when servo motor shaft rotates m circles, load shaft rotates n circles)

$$\begin{aligned} \text{Electronic gear ratio} &= \frac{B}{A} = \frac{\text{P2-02}}{\text{P2-03}} \\ &= \frac{\text{Encoder pulses} \times 4}{\text{unit value of load shaft rotates 1 circle}} \times \frac{m}{n} \end{aligned}$$

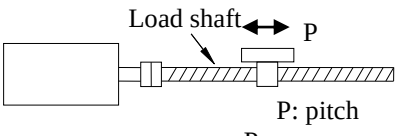
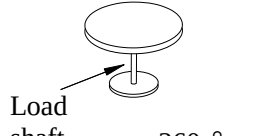
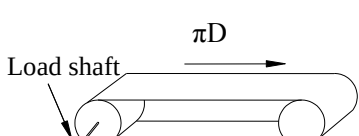
If it exceeds the setting range, please reducible the molecular and denominator in the setting range. The reducible will not affect the using.

2. Reference unit doesn't mean the precision

Refine the reference unit based on machine precision can improve the servo positioning precision. For example: in the application of screw, the machine precision can up to 0.01mm, so the reference unit 0.01mm is more accurate than 0.1mm.

2. Example of setting the electronic gear

The example for different loads:

Step	Ball screw	Round table	Belt + pulley
	 1 rotate = $\frac{P}{p}$ Reference unit	 1 rotate = $\frac{360^\circ}{\text{Reference unit}}$	 1 rotate = $\frac{\pi D}{\text{Reference unit}}$
1	Ball screw pitch: 6mm Machine deceleration ratio: 1/1	1-circle rotate angle: 360 ° Deceleration ratio: 3/1	Pulley diameter: 100mm Deceleration ratio: 2/1
2	2500P/R	2500P/R	2500P/R
3	1 reference unit: 0.001mm	1 reference unit: 0.1 °	1 reference unit: 0.02mm
4	6mm/0.001mm =6000	360/0.1=3600	314mm/0.02mm =15700
5	$\frac{B}{A} = \frac{2500 \times 4}{6000} \times \frac{1}{1}$	$\frac{B}{A} = \frac{2500 \times 4}{3600} \times \frac{3}{1}$	$\frac{B}{A} = \frac{2500 \times 4}{15700} \times \frac{2}{1}$
6	$\frac{P2-02}{P2-03} = \frac{10000}{6000} = \frac{5}{3}$	$\frac{P2-02}{P2-03} = \frac{30000}{3600} = \frac{25}{3}$	$\frac{P2-02}{P2-03} = \frac{20000}{15700} = \frac{200}{157}$

5-3-4. Position command filter

The servo can filter the command pulse at certain frequency.

Filter mode selection: select the filter as the following parameters

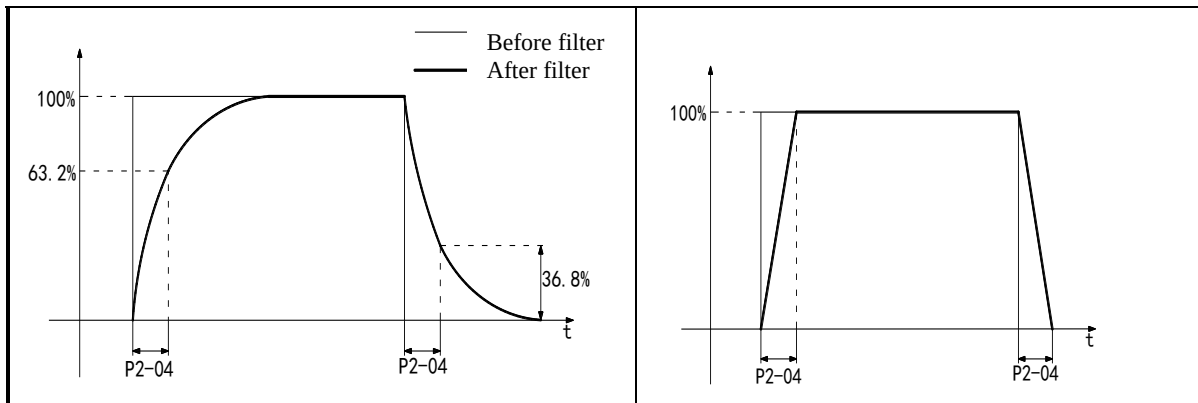
P2-01	Select the position command filter					
	Unit	Default	Range	Suitable mode	Modify	Effective
	—	0	0~1	6	Servo OFF	Re-power on

Select 1-time delay feature or moving average filter.

P2-01	Content
0	First-order inertia filter
1	Smooth filter

Set the filter time:

P2-04	Position command filter time parameters					
	Unit	Default	Range	Suitable mode	Modify	Effective
	1ms	0	0~128	6	Servo OFF	Re-power on
Addition:						
The comparison of P2-04 in First-order inertia filter and smooth filter mode:						
First-order inertia filter				Smooth filter		



5-3-5. Pulse deviation clear (/CLR)

Pulse deviation: the difference between command pulse of controller (such as PLC) and feedback pulse of servo in position mode. Its unit is 1 reference unit; it is related to the reference unit of electronic gear ratio.

Parameter	Signal	Default	Meaning	Modify
P5-24	/CLR	n.0000	Need distribution	Range: 0000-0015. Distribute to output terminal through P5-24. When it set to 0001, output the signal from S11.



The input terminal distributed by function parameter cannot be same. Please refer to chapter 5-12-1.

5-3-6. Positioning complete (/COIN)

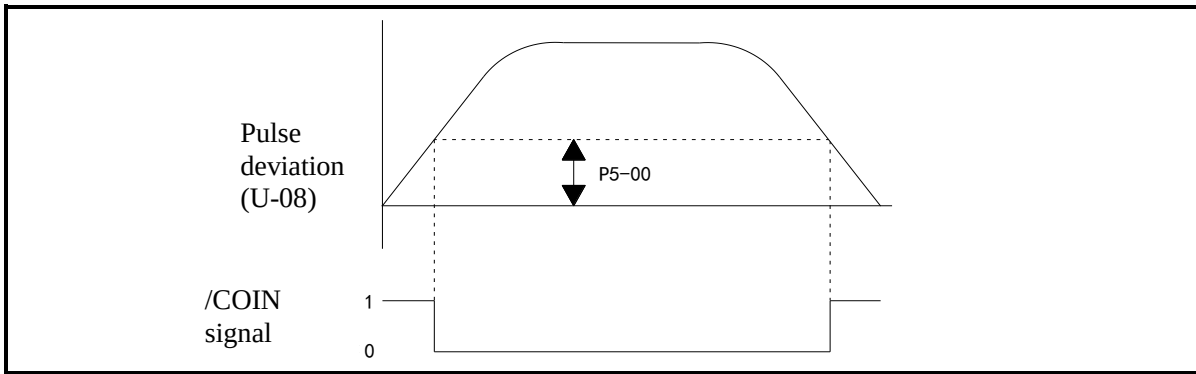
Use the signal when the controller needs to confirm the completion of positioning.

Parameter	Signal	Default	Meaning	Modify
P5-28	/COIN	n.0001	Output positioning complete signal from SO1	Range: 0000-0013, distribute to output terminal through P5-28. When it set to 0002, it means output from SO2.
		n.0011	SO1 and COM cut off when positioning complete	



The output terminal distributed by function parameter cannot be same. Please refer to chapter 5-12-3.

P5-00	Width of positioning complete					
	Unit	Default	Range	Suitable mode	Modify	Effective
	1 reference unit	7	0~250	5, 6	Servo OFF	Immediately
Function: when the pulse deviation value is lower than P5-00, output /COIN signal. Monitor the pulse deviation value via U-08.						



5-3-7. Positioning near (/NEAR)

Positioning near signal means the servo motor is near the positioning complete. It prompts the device to prepare the next operation.

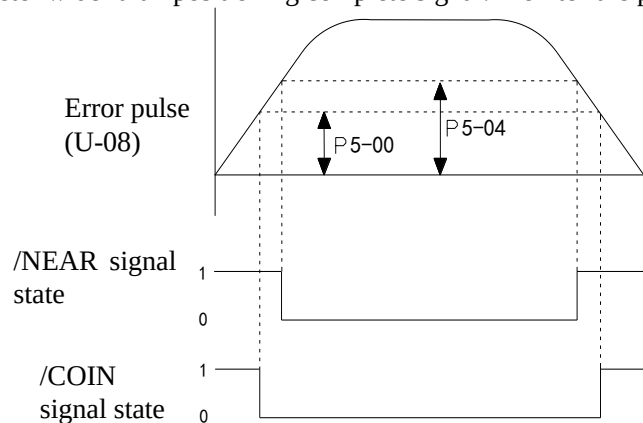
Parameter	Signal	Default	Meaning	Modify
P5-36	/NEAR	n.0000	Need to distribute	Range: 0000-0013, distribute to output terminal via P5-36. When it set to 0001, it means output from SO1.

Note: /NEAR can be output from terminal by setting P5-36, please see chapter 5-12-3.

P5-04	Width of positioning near signal					
	Unit	Default	Range	Suitable mode	Modify	Effective
	1 reference unit	50	0~10000	5, 6	Servo OFF	Immediately

Function: when the pulse error signal is lower than P5-04, output /NEAR signal.

Set the parameter wider than positioning complete signal. Monitor the pulse error value via U-08.



Note: here is signal state, but not terminal state.

5-3-8. Command pulse prohibition (/INHIBIT)

To stop the command pulse input in position control mode. When /INHIBIT signal is ON, the command pulse stop counting.

Input signal setting:

Parameter	Signal	Default	Meaning	Modify
P5-22	/INHIBIT	n.0000	Need to distribute	Range: 0000-0015. When it set to 0001, it means input from SI1.

Note: /INHIBIT can be input from input terminal by setting P5-22. Please refer to chapter 5-12-1

5-4. Position mode (internal position mode)

Parameter		
Parameter	Name	Reference
P0-01	Control mode selection	5-4-1
P2-10	Internal position given mode	5-4-2
P2-11~P2-90	Internal 1~16 segment position parameters	5-4-3
P5-25	Change the step signal /CHGSTP	5-4-4
P5-22	Pause current signal /INHIBIT	5-4-5
P5-21	Skip current signal /Z-CLAMP	5-4-6
P5-10	Servo ON signal /S-ON	5-2-1

Other parameters			
Key words	Parameter	Name	Reference
Find the origin	P2-94	The quantity pass through the Z phase signal after leaving the limit switch	5-4-7
	P2-95	The speed near the limit switch	
	P2-96	The speed leave the limit switch	
	P5-17	/SPD-D: define the origin in position mode	
	P5-18	/SPD-A: find the reference origin at forward side in position mode	
	P5-19	/SPD-B: find the reference origin at reverse side in position mode	
Pulse error clear	P5-24	Pulse error clear	5-3-5
Positioning complete	P5-28	Positioning complete signal output /COIN	5-3-6
	P5-00	Positioning complete width	
Positioning near	P5-36	Positioning near signal output /NEAR	5-3-7
	P5-04	Positioning near signal width	
Set segment no. through communication	P2-97	Any setting of 16 segments position	5-4-8

5-4-1. Control mode selection

Parameter	Default	Meaning	Modify	Effective
P0-01	5	Internal position mode control	Servo OFF	Immediately
Function: control the position with the value in servo internal register				

5-4-2. Internal position mode

Parameter	Content	Unit	Default	Suitable mode	Modify	Effective
P2-10	Internal position mode setting	—	n.0000	5	Servo OFF	Re-power on
	Parameter setting	Function	Default	Range		
	n.□xxx	No meaning				
	n.x□xx	Wait mode	0	0~1		
	n.xx□x	Change step mode	0	0~3		
	n.xxx□	Positioning mode	0	0~1		

Note: when setting the parameters through communication, if P2-10=0010 (P2-10 modbus address is H020A), write in H0010 in address H020A through HMI or PLC.

Mode explanation:

(1) Wait mode

n.X□XX	Meaning
0	Wait for the completion of positioning
1	Not wait for the completion of positioning

Notes: the wait mode means whether the drive is waiting for the completion of positioning in internal position setting mode. This is effective in any change step mode.

Wait mode = 0, adjust time = 0ms	Wait mode = 0, adjust time > 0ms
----------------------------------	----------------------------------

After the drive output 1-segment position command, it will wait for the completion of motor positioning, and then start the next position command at once. T1 is positioning time, which means the time from pulse output complete to the output of positioning completion signal.

After the drive output 1-segment position command, it will wait for the completion of motor positioning, and pass the adjust time, then start the next position command. T1 is positioning time, t2 is adjust time. Refer to parameter P2-14.

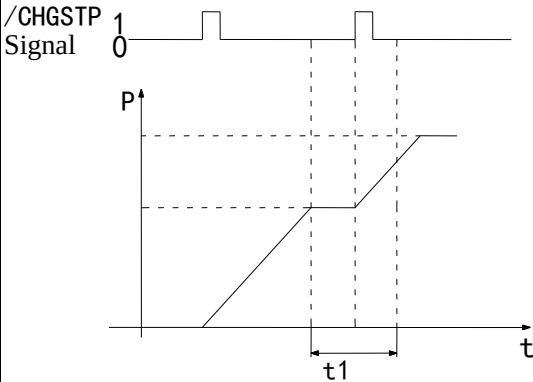
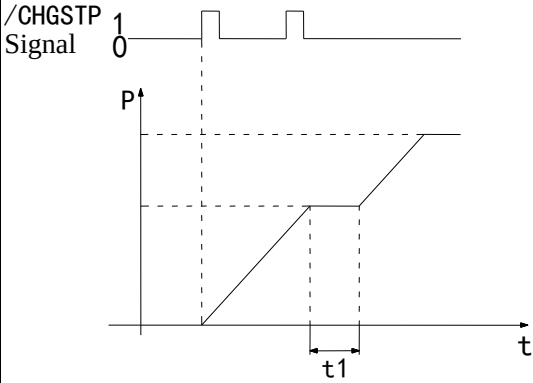
Wait mode = 1, adjust time = 0ms	Wait mode = 1, adjust time > 0ms
----------------------------------	----------------------------------

After the drive output 1-segment position command, it will not wait for the completion of motor positioning, and start the next position command at once.

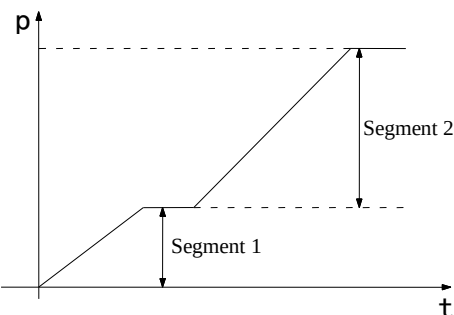
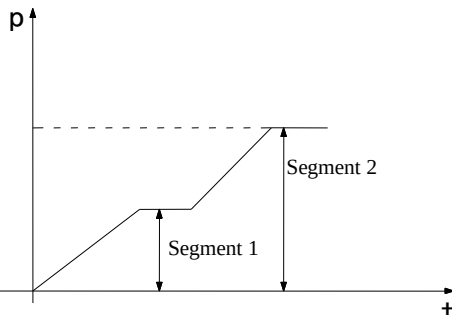
After the drive output 1-segment position command, it will not wait for the completion of motor positioning, but pass the adjust time, and then start the next position command. T2 is adjust time. Refer to parameter P2-14.

(2) Change step mode

n.XX□X	Explanation
0: Change the step when signal is ON, recycling	t1=P2-14, t2=P2-19 - If /CHGSTP is ON, servo will run segment 1 and 2. - If /CHGSTP is OFF in one segment, servo will finish this segment and stop

	running the next segment.
1: Change the step at the rising edge of the signal, single-step run	 Suppose there are 2 segments. $t1=P2-14$ In this mode, the adjust time is ineffective. The servo will run the next command once the current pulse is finished.
2: Start at the rising edge of the signal, sequential run all, not recycling	 Suppose there are 2 segments. $t1=P2-14$ /CHGSTP signal is ineffective when one cycle has not been finished, such as the second /CHNGSTP signal in the diagram.
3: set segment no. through communication	Servo is ON, set parameter P2-97=0, then set the running segment.

(3) Positioning mode

n.XXX□	Meaning
0	Relative positioning
1	Absolute positioning
0: relative positioning	1: absolute positioning (take the accumulate position origin as the absolute positioning origin)
	

5-4-3. Position parameters from segment 1 to 16

P2-5(n+1)+1	Pulse number (low bit)					
	Unit	Default	Range	Suitable mode	Modify	Effective
	1 pulse	0	-9999~9999	5	anytime	Immediately
P2-5(n+1)+2	Pulse number (high bit)					
	Unit	Default	Range	Suitable mode	Modify	Effective
	10000 pulses	0	-9999~9999	5	anytime	Immediately
P2-5(n+1)+3	Speed					
	Unit	Default	Range	Suitable mode	Modify	Effective
	0.1rpm	0	0~50000	5	anytime	Immediately
P2-5(n+1)+4	Adjust time					
	Unit	Default	Range	Suitable mode	Modify	Effective
	1ms	0	0~65535	5	anytime	Immediately
P2-5(n+1)+5	Filter time					
	Unit	Default	Range	Suitable mode	Modify	Effective
	0.1ms	0	0~65535	5	anytime	Immediately
Notes: 1. Set pulse number = pulse number (high bit) ×10000 + pulse number (low bit). 2. In formula P2-5(n+1) + 1, n is the segment no. of internal position; the range is 1~16. 3. If one of the segment speed is zero, servo will skip this segment and run the next segment. 4. In relative positioning mode, if one segment speed is not zero but the pulse number is zero, the motor will not run, but the wait mode is effective. The servo will run the next segment when the adjust time is out. 5. In absolute positioning mode, if one segment speed is not zero but the pulse number is zero, the motor will return to the reference origin with the speed of this segment. 6. In absolute positioning mode, if 2 consecutive segments speed are not zero, but the pulse number is the same, the servo motor will not run but the wait mode is effective.						

5-4-4. Change step (/CHGSTP)

Parameter	Signal	Type	Default	Meaning	Modify
P5-25	/CHGSTP	Input	n.0000	Need distribute	Range: 0000-0015. Distribute to input terminal through P5-25. When it set to 0001, it means input from SI1.
Note: /CHGSTP can be distributed to other input terminal by setting the parameter P5-25. Refer to chapter 5-12-1.					

5-4-5. Pause current signal (/INHIBIT)

When /INHIBIT signal is ON, the internal position pulse will stop in internal position mode. When /INHIBIT signal is OFF, the motor will continue running this stage.

Input signal setting:

Parameter	Signal	Default setting	Meaning	Modify
P5-22	/INHIBIT	n.0000	Need to distribute	Range: 0000-0015. Distribute to input terminal through P5-22. When it set to 0001, it means input from SI1.
/INHIBIT signal is distributed to I/O terminal via P5-22, refer to chapter 5-12-1.				

5-4-6. Skip current signal (/ZCLAMP)

/Z-CLAMP signal	Change step mode	Execution
	0	Cancel current stage, execute the next stage at once
	1	Cancel current stage, execute the next stage when the change step signal is ON
	2	Cancel current stage, execute the next stage at once
	3	Cancel current stage, execute the next stage at once

Parameter	Signal	Default	Meaning	Modify
P5-21	/Z-CLAMP	n.0000	Need to distribute	Range: 0000-0015. Distribute to input terminal through P5-21. When it set to 0001, it means input from SI1.

5-4-7. Reference origin

(1) Find the reference origin

To find out the physical origin of working table and make it as the coordinates origin of point position control. Users can select finding reference origin at forward or reverse side.

Function setting:

P2-94 n.XX□X	Unit	Default	Range	Suitable mode	Modify	Effect
	-	0	0~1	5, 6	ServoOFF	Re-power on

Note: P2-94=0, find reference origin function is invalid. P2-94=n.001x, this function is valid.

Signal setting:

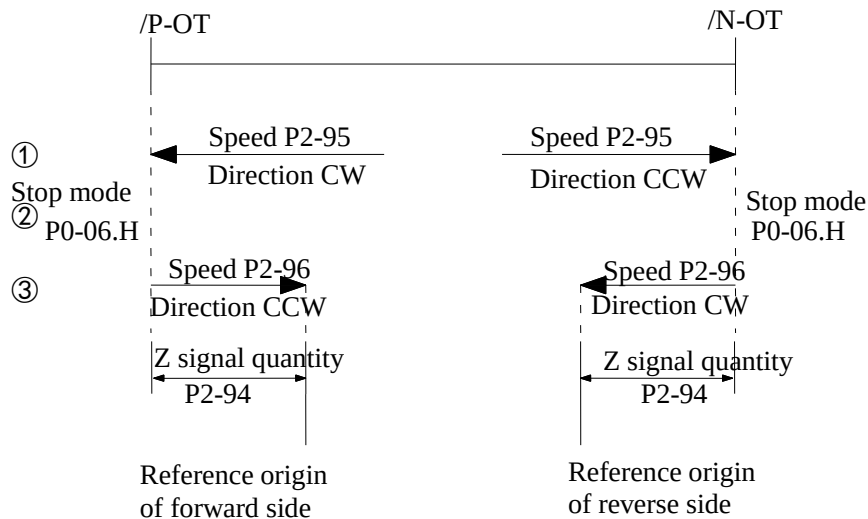
Parameter	Signal	Default	Meaning	Modify
P5-18	/SPD-A	n.0005	Mode 3: input internal speed signal from SI5	Range: 0000-0015, distributes to input terminal through P5-18. When it set to 0001, it means input signal from SI1.
			Mode 5/6: input signal from SI5. Find origin point at forward direction	
P5-19	/SPD-B	n.0000	Mode 3: not distribute the terminal, internal speed signal	Range: 0000-0015, distributes to input terminal through P5-19. When it set to 0001, it means input signal from SI1.
			Mode 5/6: not distribute the terminal, find origin point at forward direction	

Related parameter setting:

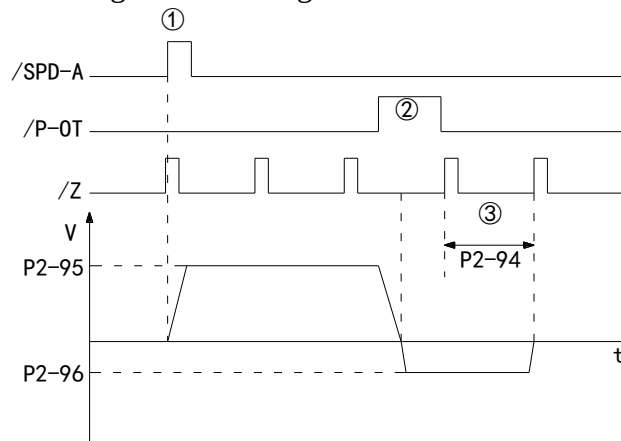
P2-94 n.XXX□	The quantity pass the Z phase signal after leaving the limit switch					
	Unit	Default	Range	Suitable mode	Modify	Effective
	1	2	1~F	5, 6	Servo OFF	Immediately
P2-95	The speed hitting the proximity switch					
	Unit	Default	Range	Suitable mode	Modify	Effective
	0.1rpm	600	0~50000	5, 6	Servo OFF	Immediately
P2-96	The speed leaving the proximity switch					
	Unit	Default	Range	Suitable mode	Modify	Effective
	0.1rpm	100	0~50000	5, 6	Servo OFF	Immediately

Detailed explanation:

Find reference origin diagram:



The timing diagram of finding reference origin of forward side:



Steps:

1. Install limit switch at forward and reverse side. At the rising edge of /SPD-A, motor runs forward at the speed of P2-95 to find the reference origin of forward side.
2. After the working table hit the limit switch, the motor stop as the mode set by parameter P0-06.H.
3. Motor leaves the limit switch at the speed of P2-96. After the working table left the limit switch, the motor run at the Z phase signal position of No.n optical encoder. This position is considered as the coordinates origin, n is decided by parameter P2-94.

(2) Define the reference origin

Parameter	Signal	Default	Meaning	Modify
P5-17	/SPD-D	n.0000	Mode 1,2,3,4, 5: not distribute to the terminal. To switch the rotation direction.	Range: 0000-0015. Distribute to input terminal through P5-17. When it set to 0001, it means input signal from SI1.
			Mode 5,6: not distribute to the terminal. To define the current point to origin.	

5-4-8. Set segment through communication

P2-97 n.xx□□	Unit	Default	Range	Suitable mode	Modify	Effective
	-	0	0~16	5	Anytime	Immediately
This parameter is set to certain segment, it will execute this segment. No need step change signal. This parameter can be changed through communication. For example: execute segment 2. Set P2-97=0, then set P2-97=02.						

5-5. Speed control (analog voltage command)

Basic parameters		
Parameter	Name	Reference
P0-01	Select the control mode	5-5-1
P3-00	Analog value of rated speed	5-5-2
P5-10	Servo ON signal /S-ON	5-2-1

Other parameters			
Key words	Parameter	Name	Reference
Zero drift adjustment	F1-03	Analog voltage speed command offset auto-adjustment	5-5-4
Proportion action	P5-11	P-CON	5-5-10
Zero clamp	P5-21	Zero clamp /ZCLAMP	5-5-8
	P5-01	Zero clamp speed	
Speed coincidence checking	P5-29	/V-CMP speed coincidence checking	5-5-9
	P5-03	Coincidence speed signal checking width/V-CMP	
Torque limit	P4-02	Forward torque limit	5-5-10
	P4-03	Reverse torque limit	
	P0-07	T-REF distribution	
	P4-04	Forward external torque limit	
	P4-05	Reverse external torque limit	
	P5-15	Forward external torque limit /P-CL	
	P5-16	Reverse external torque limit /N-CL	
Soft start	P5-32	Output when torque reaches limit value /CLT	5-5-6
	P3-05	Soft start acceleration time	
Filter	P3-06	Soft start deceleration time	5-5-7
	P3-07	Speed command filter time	
Death area	P3-08	Speed feedback filter time	5-5-5
	P3-10	Speed command death area input voltage	
/SPD-D direction selection	P5-17	Change the direction	5-5-3

5-5-1. Control mode selection

Parameter	Set value	Meaning	Modify	Effective
P0-01	4	Analog voltage command speed control	Servo OFF	Immediately
Function: control the speed by the signal (analog voltage command) input from V-REF terminal				

5-5-2. Analog value of rated speed

P3-00	Analog value of rated speed					
	Unit	Default	Range	Suitable mode	Modify	Effective
	0.01V/rated speed	1000	150~3000	4	Servo OFF	Immediately
Function: the speed command voltage (V-REF) to run the servo motor at rated speed. Such as: P3-00=500 means the motor run at rated speed when analog input voltage = 5.00V P3-00=800 means the motor run at rated speed when analog input voltage = 8.00V.						

Analog command input please refers to chapter 3-2-3.

5-5-3. Direction switching

1. Control the direction through the terminal

P5-17	Direction switching					
	Signal name	Default setting	Range	Suitable mode	Modify	Effective
	/SPD-D	n.0000	0000-0015	1, 2, 3, 4	Any	Re-power on
Distribute to other input terminal through P5-17						

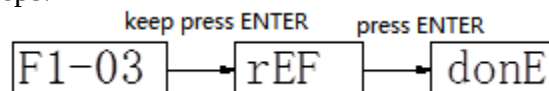
2. control the direction through the analog voltage

The motor will run forward when the voltage is lower than basic voltage, the motor will run reverse when the voltage is higher than basic voltage. The basic voltage please refer to chapter 5-5-4.

5-5-4. Speed command offset auto-adjustment (F1-03)

When the servo is in analog voltage speed mode, even if the command voltage is 0V, motor will run at very low speed. The micro-motion will happen when the command voltage micro-offset (mV) of host controller or external circuit occurs. Auto-adjust the command offset by operate panel of servo.

When the servo enable is off and in bb state, take away the analog signal from CN1 port, and do the following steps:



Press STATUS/ESC to exit this function.

Note:

- (1) Present voltage is 0V, do the above steps, 0V is 0rpm, the motor will run reverse when it is lower than 0V, the motor will run forward when it is higher than 0V. if the present voltage is 5V, do the above steps, 5V is 0rpm, the motor will run reverse when it is lower than 5V, the motor will run forward when it is higher than 5V.
- (2) If there is still micro-motion after doing the F1-03 steps, please increase P3-10 or use zero-clamp function. For example, set P3-10 to 5, it means the dead area voltage is 0.05V. It no need to re-power on after doing F1-03 steps.

5-5-5. Speed command input dead voltage

If doing the F1-03 steps, the motor still has micro-motion, please increase P3-10. For examaple, set P3-10 to 5, it means the dead voltage is 0.05V.

P3-10	Speed command input dead voltage					
	Unit	Default	Range	Suitable mode	Modify	Effective
	0.01V	0	0~100	4	Servo OFF	Immediately

Note: if the input speed command voltage is in the range of this parameter, the input voltage is considered to be 0.

5-5-6. Soft start

Soft start can transform the step speed command to command with acceleration/deceleration.

P3-05	Soft start acceleration time					
	Unit	Default	Range	Suitable mode	Modify	Effective
	1ms	0	0~65535	3, 4, 7	Servo OFF	Immediately

P3-06	Soft start deceleration time					
	Unit	Default	Range	Suitable mode	Modify	Effective
	1ms	0	0~65535	3, 4, 7	Servo OFF	Immediately

1. Enable to do smooth speed control when input step speed command or choose internal speed. Other cases please set to 0.
2. acceleration/deceleration time is from stop state to rated speed but not from current speed to target speed.
P3-05: the time from stop state to rated speed.
P3-06: the time from rated speed to stop state.

5-5-7. Filter

P3-07	speed command filter time					
	Unit	Default	Range	Suitable mode	Modify	Effective
	0.01ms	20	0~65535	3, 4, 5, 6, 7	anytime	Immediately

The speed command passes the 1-time delay filter and become smooth speed command. If set it too large, the response will be slow. If the speed has big fluctuationa at low speed, please increase P3-07, if there is no error, please set it to max value 60000.

P3-08	speed feedback filter time					
	Unit	Default	Range	Suitable mode	Modify	Effective
	0.01ms	20	0~65535	3, 4, 5, 6, 7	anytime	Immediately

Smooth filter the speed feedback. If set it too large, the speed feedback will distort and affect the control result. It no need to change the default value 20.

5-5-8. Zero clamp (/ZCLAMP)

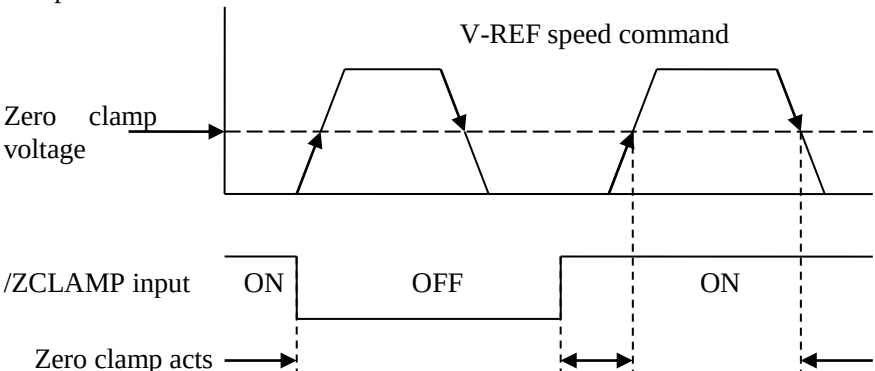
(1) Function

This function is used when host controller uses speed command input and the servo system isn't configured the position loop. In other words, the function will be used when the motor must stop and enter lock state even the V-REF input voltage is not zero. After the zero clamp function is ON, servo will configure the temporary position loop inside, motor will clamp in ± 1 pulse. Motor will return to zero clamp position even the motor is rotating with external force.

(2) Input signal setting

Parameter	Signal	Type	Default	Meaning	Modify
P5-21	/Z-CLAMP	Input	n.0000	Need to distribute	Range: 0000-0015.
Note: /Z-CLAMP signal is distributed to input terminal by parameter P5-21, refer to chapter 5-12-1.					

(3) Parameter setting

P5-01	Speed of zero clamp					
	Unit	Default	Range	Suitable mode	Modify	Effective
	Rpm	10	0~300	3, 4, 7	Servo OFF	Immediately
Zero clamp will act when meets the following conditions:						
➤ Speed control (submode 3, 4, 7) ➤ Set ON /ZCLAMP ➤ Speed command value is less than the value of P5-01						
						

5-5-9. Speed coincidence checking (/V-CMP)

When motor speed is equal to the command speed, servo outputs speed coincidence signal (V-CMP).

Parameter	Signal	Default	Meaning	Modify
P5-29	/V-CMP	n.0000	Need to distribute	Range: 0000-0013. Distribute to output terminal through P5-29. When it set to 0002, it means output from SO2.

P5-03	Speed coincidence signal width					
	Unit	Default	Range	Suitable mode	Modify	Effective
	rpm	10	1~250	3, 4, 7	Servo OFF	Immediately
If the difference between motor speed and command speed is less than the value of P5-03, servo outputs /V-CMP signal.						

5-5-10. Torque limit

5-5-10-1. Internal torque limit (output torque max value limit)

The function is to limit the max output torque by parameters.

P4-02	Forward torque limit					
	Unit	Default	Range	Suitable mode	Modify	Effective
	1%	300	0~300	All modes	Anytime	Immediately
P4-03	Reverse torque limit					
	Unit	Default	Range	Suitable mode	Modify	Effective
	1%	300	0~300	All modes	Anytime	Immediately
1. This parameter is always effective, if this parameter value is less than external torque limit value, the final limit value is this parameter.						
2. The unit is percent of the motor rated torque; the default value is 300%. The real output torque is different for each type.						

5-5-10-2. External torque limit (via input signal)

This function is used in machine motion or timing torque limit. For example: press stop action or robot workpiece protection.

The torque limit value will be effective when the input signal is ON.

P4-04	Forward external torque limit					
	Unit	Default	Range	Suitable mode	Modify	Effective
	1%	100	0~300	3, 4, 5, 6, 7	Anytime	Immediately
P4-05	Reverse external limit					
	Unit	Default	Range	Suitable mode	Modify	Effective
	1%	100	0~300	3, 4, 5, 6, 7	Anytime	Immediately
The unit is the percent of motor rated torque; the default value is 100%.						

Parameter	Signal	Type	Default	Meaning	Modify
P5-15	/P-CL	Input	n.0000	Need to distribute	Range: 0000-0015.
P5-16	/N-CL	Input	n.0000	Need to distribute	Range: 0000-0015.
Notes: /P-CL, /N-CL can be distributed to input terminal by parameter P5-15, P5-16. Refer to chapter 5-12-1.					

Function realization:

Signal	State	Meaning	Effective limit value
/P-CL	0	Forward external torque limit OFF	P4-02
	1	Forward external torque limit ON	Min value between P4-02 and P4-04
/N-CL	0	Reverse external torque limit OFF	P4-03
	1	Reverse external torque limit ON	Min value between P4-03 and P4-05

5-5-10-3. External torque limit (via analog voltage command)

T-REF terminal is used as analog voltage command terminal. Please note in external analog torque control mode, this function cannot be used.

Parameter	Function	Set value	Meaning	Modify	Effective
P0-07	Distribute function to T-REF	1	Make T-REF as external torque limit input	Servo OFF	Re-power on
1. For analog voltage command input of torque limit. Get the absolute value of the voltage, the torque limit value based on the absolute value is suitable for forward and reverse direction.					
2. When it is used as torque limit, the value is related to voltage command and P4-00. For example, P4-00=1000, T-REF voltage command is 5.0V, the torque limit value is 50% of rated torque.					

5-5-10-4. External torque limit (via external input + analog voltage)

External torque limit via external input and analog voltage can be used together.

Input analog voltage signal from T-REF. the torque limit function cannot be used when servo is in analog command torque control mode.

Use /P-CL and /N-CL signal when limit torque via external input.

(1) Parameters

Parameter	Function	Set value	Meaning	Modify	Effective
P0-07	T-REF function distribution	3	When P-CL, N-CL is ON, make T-REF as external torque limit input.	Servo OFF	Immediately

P4-04	Forward external torque limit					
	Unit	Default	Range	Suitable mode	Modify	Effective
	1%	100	0~300	3, 4, 5, 6, 7	Anytime	Immediately
P4-05	Reverse external torque limit					
	Unit	Default	Range	Suitable mode	Modify	Effective
	1%	100	0~300	3, 4, 5, 6, 7	Anytime	Immediately
Note: the unit is the percent of motor rated torque, the default value if 100%.						

(2) Input signal setting

Parameter	Signal	Type	Default	Meaning	Suitable mode	Modify	Effective
P5-15	/P-CL	Input	n.0000	Need to distribute	All modes	Any	Re-power on
P5-16	/N-CL	Input	n.0000	Need to distribute	All modes	Any	Re-power on
Note: /P-CL, /N-CL signal can be distributed to input terminal by parameter P5-15, P5-16. Refer to chapter 5-12-1.							

(3) Function realization

Signal	State	Meaning	Limit value
/P-CL	0	Forward external torque limit OFF	P4-02
	1	Forward external torque limit ON	The min value among P4-02, P4-04 and analog voltage command
/N-CL	0	Reverse external torque limit OFF	P4-03
	1	Reverse external torque limit ON	The min value among P4-03, P4-05 and analog voltage command

5-5-10-5. Output torque up to limit value signal

The signal means the motor output torque reaches limit value.

Parameter	Signal	Type	Default	Meaning	Modify
P5-32	/CLT	Output	n.0000	Need to distribute	Range: 0000-0013.
Note: /CLT signal can be distributed to output terminal by parameter P5-32. Refer to chapter 5-12-3.					

5-5-11. Proportion action command (/P-CON)

Parameter	Signal	Type	Default	State	Meaning	Modify	Effective
P5-11	/P-CON	Input	n.0000	Effective	Run in P control mode	Any	Re-power on
				Ineffective	Run in PI control mode		

1. /P-CON is the speed control mode signal selected from PI (proportion integral) and P (proportion).
2. If set to P control mode, the motor rotate and micro-vibration caused by speed command input drift can be decreased. But the servo stiffness will decrease.
3. /P-CON signal can be distributed to input terminal via parameter P5-11. Refer to chapter 5-12-1.

5-6. Speed control (internal speed)

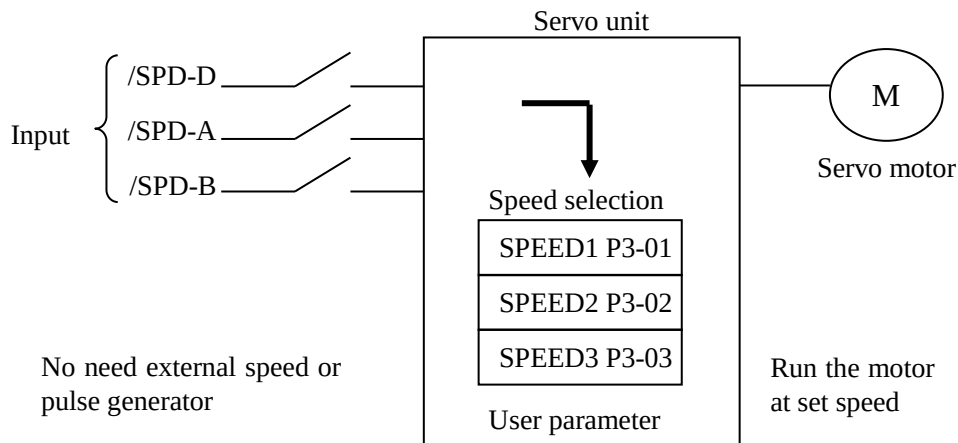
Basic parameter		
Parameter	Name	Reference
P0-01	Control mode selection	5-6-1
P5-10	Servo ON signal /S-ON	5-2-1
P3-01	Internal speed 1	5-6-2
P3-02	Internal speed 2	
P3-03	Internal speed 3	
P5-17	/SPD-D internal speed direction selection	5-6-3
P5-18	/SPD-A internal speed selection	
P5-19	/SPD-B internal speed selection	

Other parameters			
Key word	Parameter	Name	Reference
Proportion action	P5-11	Proportion action command /P-CON	5-5-4
Zero clamp	P5-21	Zero clamp /ZCLAMP	5-5-5
	P5-01	Zero clamp speed	
Speed coincidence checking	P5-29	/V-CMP speed coincidence checking	5-5-6
	P5-03	speed coincidence checking signal width /V-CMP	
Torque limit	P4-02	forward torque limit	5-5-7
	P4-03	reverse torque limit	
	P1-07	T-REF distribution	
	P4-04	Forward external torque limit	
	P4-05	Reverse external torque limit	
	P5-15	Forward external torque limit /P-CL	
	P5-16	Reverse external torque limit /N-CL	
Soft start	P5-32	Torque up to limit value output /CLT	5-5-8
	P3-05	soft start acceleration time	
	P3-06	soft start deceleration time	
Filter	P3-07	Speed command filter time	5-5-9
	P3-08	Speed feedback filter time	

5-6-1. Control mode selection

Parameter	Set value	Meaning	Modify	Effective
P0-01	3	Speed control: internal speed selection	Servo OFF	Immediately

Function: internal speed selection will set 3 motor speeds and select the speed by external signal. It is not need to configure external speed generator or pulse generator.



5-6-2. Internal speed setting

P3-01	Internal speed 1					
	Unit	Default	Range	Suitable mode	Modify	Effective
	1rpm	100	-5000 ~ +5000	3	Any	Immediately
P3-02	Internal speed 2					
	Unit	Default	Range	Suitable mode	Modify	Effective
	1rpm	200	-5000 ~ +5000	3	Any	Immediately
P3-03	Internal speed 3					
	Unit	Default	Range	Suitable mode	Modify	Effective
	1rpm	300	-5000 ~ +5000	3	Any	Immediately

5-6-3. Input signal setting

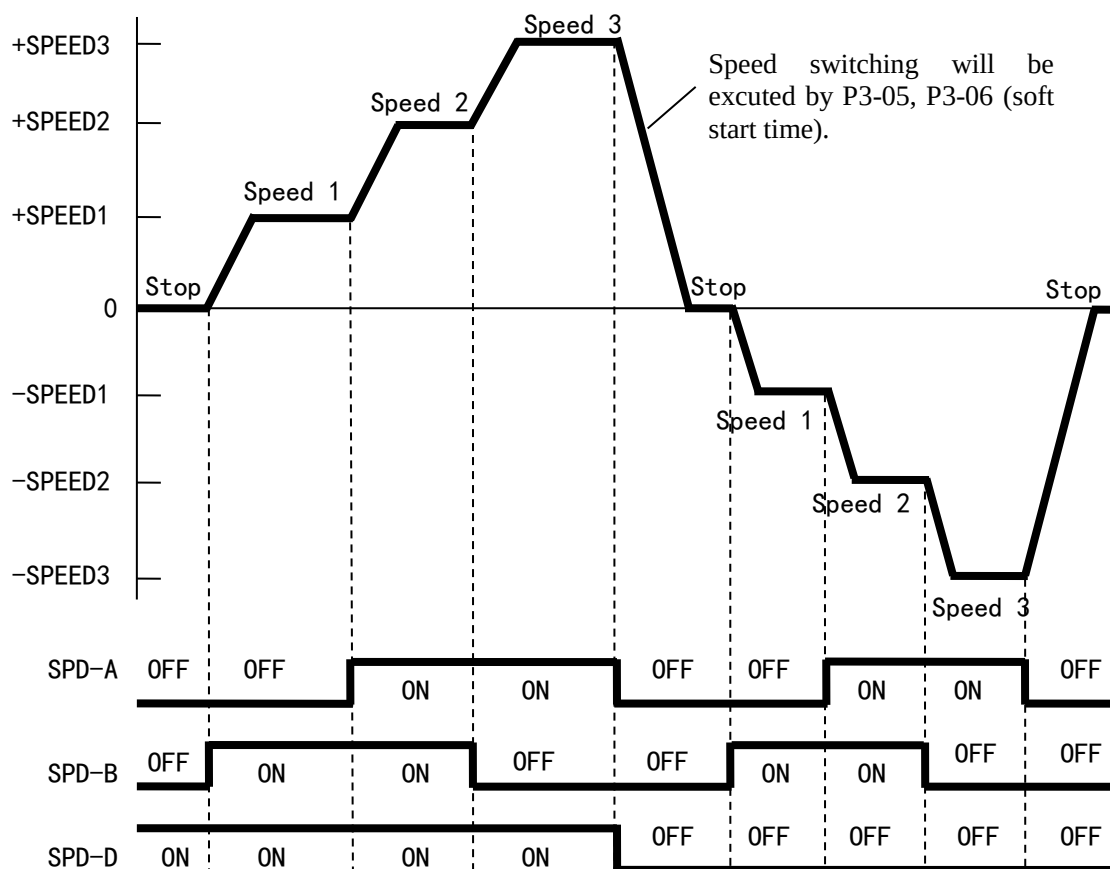
Switch the running speed by below input signal:

Parameter	Signal	Default	Meaning	Modify
P5-17	/SPD-D	n.0000	Need to distribute	Range: 0000-0015. Distribute to input terminal through P5-17.
P5-18	/SPD-A	n.0000	Need to distribute	Range: 0000-0015. Distribute to input terminal through P5-18.
P5-19	/SPD-B	n.0000	Need to distribute	Range: 0000-0015. Distribute to input terminal through P5-19.

(1) Function realization

Input signal			Direction	Running speed
/SPD-D	SPD-A	SPD-B		
0	0	0	Forward	Internal speed is zero
	0	1		P3-01: SPEED1
	1	1		P3-02: SPEED2
	1	0		P3-03: SPEED3
1	0	0	Reverse	Internal speed is zero
	0	1		P3-01: SPEED1
	1	1		P3-02: SPEED2
	1	0		P3-03: SPEED3

(2) Running example



5-7. Speed control (pulse frequency command)

Basic parameter			
Parameter	Name		Reference
P0-01	Control mode selection		5-7-1
P5-10	Servo ON signal /S-ON		5-2-1
P2-00	Pulse command form		5-3-2
P2-06	Command pulse frequency at rated speed		5-7-3
P2-07	Speed command pulse filter time		5-7-4
Other parameters			
Key words	Parameter	Name	Reference
Proportion	P5-11	Proportion action command /P-CON	5-5-4
Zero clamp	P5-21	Zero clamp /ZCLAMP	5-5-5
	P5-01	Zero clamp speed	
Speed coincidence checking	P5-29	Speed coincidence checking /V-CMP	5-5-6
	P5-03	Coincidence speed checking signal width /V-CMP	
Torque limit	P4-02	Forward torque limit	5-5-7
	P4-03	Reverse torque limit	
	P1-07	T-REF distribution	
	P4-04	Forward external torque limit	
	P4-05	Reverse external torque limit	
	P5-15	Forward external torque limit /P-CL	
	P5-16	Reverse external torque limit /N-CL	
	P5-32	Torque up to limit value output /CLT	

Filter	P3-08	Speed feedback filter time	5-5-9
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5-7-1. Control mode selection

Parameter	Set value	Meaning	Modify	Effective
P0-01	7	Speed control: pulse frequency speed command	Servo OFF	Immediately
Function: speed command is decided by external pulse frequency, but not related to pulse quantity. The wiring is the same as position command. Select CW, CCW mode or direction + pulse mode.				

5-7-2. Pulse frequency command

Pulse frequency command is the same as external pulse command position control (mode 6), refer to chapter 5-3-2.

5-7-3. Command pulse frequency at rated speed

P2-06	command pulse frequency at rated speed					
	Unit	Default	Range	Suitable mode	Modify	Effective
	100Hz	5000	1~10000	7	Servo OFF	Immediately
Note: the unit is 100Hz. Example: P2-06=1000, command pulse frequency at rated speed=100kHz; P2-06=300, command pulse frequency at rated speed= 30kHz.						

5-7-4. Speed command pulse filter time

P2-07	speed command pulse filter time					
	Unit	Default	Range	Suitable mode	Modify	Effective
	0.1ms	20	0~1000	7	Anytime	Immediately
When the command pulse frequency is low, setting a suitable value for this parameter can decrease the speed fluctuation.						

5-8. Torque control (analog voltage command)

Parameter		
Parameter	Name	Reference
P0-01	Control mode selection	5-8-1
P4-00	The analog value of rated torque	5-8-2
P5-10	Servo ON signal /S-ON	5-2-1

Other parameters			
Key words	Parameter	Name	Reference
Zero drift adjustment	F1-04	Torque command offset auto-adjustment	5-8-3

Filter	P4-01	Torque command filter time	5-8-4
Speed limit	P4-07	internal speed limit in torque control mode	5-8-5
	P3-09	Max speed control (MAX speed)	
	P0-08	V-REF function distribution	
	P5-33	Speed up to limit value output	
Dead area	P4-10	Torque command input dead area voltage	5-8-6
/SPD-D direction selection	P5-17	Speed direction changing	5-6-3

5-8-1. Control mode selection

Parameter	Set	Function	Modify	Effective
P0-01	2	Torque control: analog voltage command	Servo OFF	Immediately
Function: Control the torque by the analog voltage signal input from T-REF terminal.				

5-8-2. The analog value of rated torque

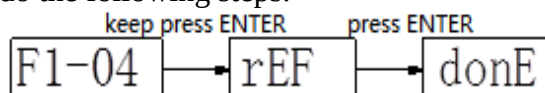
P4-00	The analog value of rated torque					
	Unit	Default	Range	Suitable mode	Modify	Effective
	0.01V/rated torque	1000	150~3000	2	Servo OFF	Immediately
Function: set the speed command voltage (T-REF) to run the servo motor at rated speed Example: P4-00=500, motor run at rated torque when analog input voltage is 5.00V P4-00=800, motor run at rated torque when analog input voltage is 8.00V						

Refer to chapter 3-2-4 for analog torque command input.

5-8-3. Torque command offset autoadjustment (F1-04)

The motor will run at microspeed even the command voltage is 0V in analog voltage torque mode. This situation will happen when host controller or the command voltage of external circuit has micro-offset (mV). Use the operate panel to auto-adjust the offset.

When the servo enable is off and in bb state, take away the analog signal from CN1 port, do the following steps:



Press STATUS/ESC to exit this function.

Note:

- (1) If the present voltage is 0V, doing the F1-04 steps, 0V will be 0% output torque. If the voltage is lower than 0V, the motor will run reverse. If the voltage is higher than 0V, the motor will run forward. If the present voltage is 5V, doing the F1-04 steps, 5V will be 0% output torque. If the voltage is lower than 5V, the motor will run reverse. If the voltage is higher than 5V, the motor will run forward.
- (2) After doing the F1-04 steps, it no needs to repower on.

5-8-4. Torque command filter time

P4-01	torque command filter time					
	Unit	Default	Range	Suitable mode	Modify	Effective
	0.01ms	0	0~65535	1, 3, 4, 5, 6, 7	Servo OFF	Immediately
1-time delay filter will smooth the torque command. If set the value too large, the reponse will be decreased.						

5-8-5. Torque limit

5-8-5-1. Internal speed limit

Limit the speed of torque control by setting below parameters:

P4-07	internal speed limit in torque control mode					
	Unit	Default	Range	Suitable mode	Modify	Effective
	1rpm	2000	0~5000	1, 2	Anytime	Immediately

Note: the actual speed is max speed even this parameter speed is larger than the P3-09.

P3-09	max speed limit					
	Unit	Default	Range	Suitable mode	Modify	Effective
	1rpm	1500:2000 2500:3000 3000:4000	0~5000	All modes	Servo OFF	Immediately

Note: 1. P3-09 is effective in all modes.
2. Default setting is different for each type. For example: max speed is 2000 for rated speed 1500 motor, max speed is 4000 for rated speed 3000 motor.
3. This parameter is related to E-008 and E-010. If motor speed is larger than max speed+200, servo will show E-008 over-speed. If the pulse frequency converts to motor speed, the speed is larger than max speed; but the actual motor speed is max speed. Then the pulse offset will accumulate, servo will show E-010 alarm.

5-8-5-2. External speed limit

Limit the speed output of torque control mode by the analog voltage command input from V-REF terminal.

Parameter	Function	Set value	Meaning	Modify	Effective
P0-08	V-REF function distribution	1	Make V-REF as external speed limit input	Servo OFF	Immediately

1. The analog voltage has no polarity. The absolute value of the voltage is suitable for forward and reverse direction.
2. The parameter value is related to voltage command and P3-00 when it is used as speed limit value. For example: P3-00=500 (voltage of rated speed is 5.0V), T-REF voltage command is 1.0V, the speed limit is 20% of rated speed.
3. P0-08=1, the actual limit value is the smaller value among V-REF speed limit input and P4-07.

5-8-5-3. Speed up to limit value output

Parameter	Signal	Default	Meaning	Modify
P5-33	/VLT	n.0000	Need to distribute	Range: 0000-0013. Distribute to output terminal through P5-33. When it set to 0001, it means output from SO1.

5-8-6. Torque command input dead area voltage

If there is still micro-motion after F1-04 steps, please increase P4-10, if set it to 5, it means the dead area voltage is 0.05V.

P4-10	Torque command input dead area voltage					
	Unit	Default	Range	Suitable mode	Modify	Effective
	0.01V	0	0~100	2	Servo OFF	Immediately

Note: if the input torque command voltage is smaller than this parameter, the torque command is 0.

5-9. Torque control (internal setting)

Basic parameter		
Parameter	Name	Reference
P0-01	Control mode selection	5-9-1
P5-10	Servo ON signal /S-ON	5-2-1
P4-09	Internal torque command	5-9-2

Other parameters			
Key words	Parameter	Name	Reference
Filter	P4-01	Torque command filter time	5-8-4
Speed limit	P4-07	Internal speed limit of torque control	5-8-5
	P3-09	Max speed limit (max speed)	
	P0-08	V-REF function distribution	
	P5-33	Speed up to limit value output	
/SPD-D direction selection	P5-17	Speed direction change	5-6-3

5-9-1. Control mode selection

Parameter	Set value	Function	Modify	Effective
P0-01	1	Torque control: internal setting	Servo OFF	Immediately
Function: Control the torque by internal torque command.				

5-9-2. Internal torque command

P4-09	Internal torque command					
	Unit	Default	Range	Suitable mode	Modify	Effective
	1% rated torque	0	-300~+300	1	anytime	Immediately
The unit of this parameter is 1% of the rated torque. For example: P4-09=50, motor forward run with 50% of the rated torque; P4-09= -20, motor reverse run with 20% of the rated torque.						

5-10. Switch the control mode

Servo can switch between submode 1 and 2 by external input signal.

(1) Switch signal

Parameter	Signal	Type	Default	Meaning	Modify
P5-20	/C-SEL	Input	n.0000	Need to distribute	Range: 0000-0015.
Note: /C-SEL can be distributed to input terminal via parameter P5-20, refer to chapter 5-12-1.					

(2) Function realization

Signal	State	Control mode
/C-SEL	0	P0-01: submode 1
	1	P0-02: submode 2

5-11. Other output signals

5-11-1. /ALM and /ALM-RST

■ Servo alarm output /ALM

Parameter	Signal	Type	Default	Meaning
P5-37	/ALM	Output	n.0002	Output always open signal from SO2

■ Alarm reset /ALM-RST

Parameter	Signal	Type	Default	Meaning	Range
P5-14	/ALM-RST	Input	n.0002	Input always open signal from SI2	0000-0015
- Find the alarm reason and fix it, then clear the alarm via this signal. /ALM-RST can be distributed to input terminal via this parameter. As the alarm signal is related to the safe running of servo, /ALM-RST signal cannot be set to always effective. (n.0010); - The alarm related to encoder such as E-013, E-014 cannot be reset via /ALM-RST. /ALM-RST can be distributed to input terminal via parameter P5-14, refer to chapter 5-12-1.					

5-11-2. /WARN

Parameter	Signal	Type	Default	Meaning	Range
P5-35	/WARN	Output	n.0000	Need to distribute	0000-0013
When the warning happens, servo will not be forced OFF but output the warning. /WARN can be distributed to input terminal via parameter P5-30. Refer to chapter 5-12-3.					

5-11-3. Rotation checking (/TGON)

(1) Signal setting

Parameter	Signal	Type	Default	Meaning	Range
P5-30	/TGON	Output	n.0000	Need to distribute	0000-0013
- The servo will be considered in the rotation when the servo motor speed is higher than P5-02. - The application function related to /TGON is /BK power-off brake. /TGON can be distributed to output terminal via parameter P5-30, refer to chapter 5-12-3.					

(2) Parameter setting

P5-02	Internal torque command setting					
	Unit	Default	Range	Suitable mode	Modify	Effective
	1rpm	20	1~1000	All modes	Servo OFF	Immediately
Set the range of rotation checking output. If servo motor speed is up to P5-02, the servo motor is considered to be running and output rotation checking signal (/TGON).						

5-11-4. Servo ready (/S-RDY)

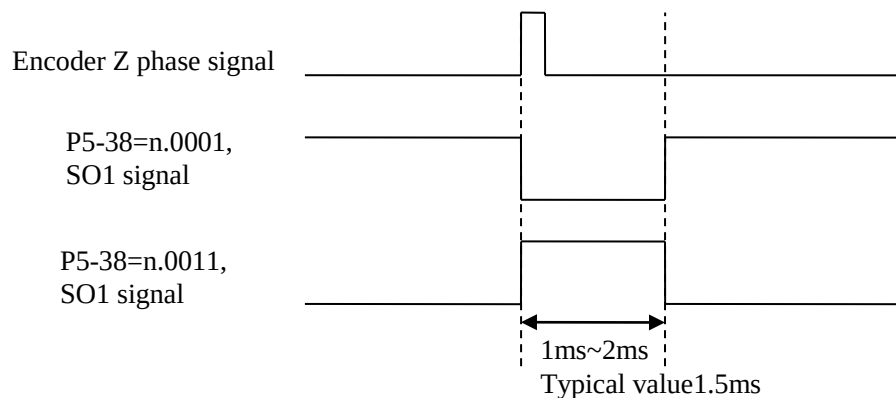
Parameter	Signal	Default	Meaning	Range
P5-31	/S-RDY	n.0003	SO3 and COM pass through when servo is ready	0000-0013 Refer to chapter 5-12-3.
		n.0013	SO3 and COM cut off when servo is ready	

5-11-5. Encoder Z phase output (/Z)

DS2-AS series servo supports encoder (Z phase) signal output.

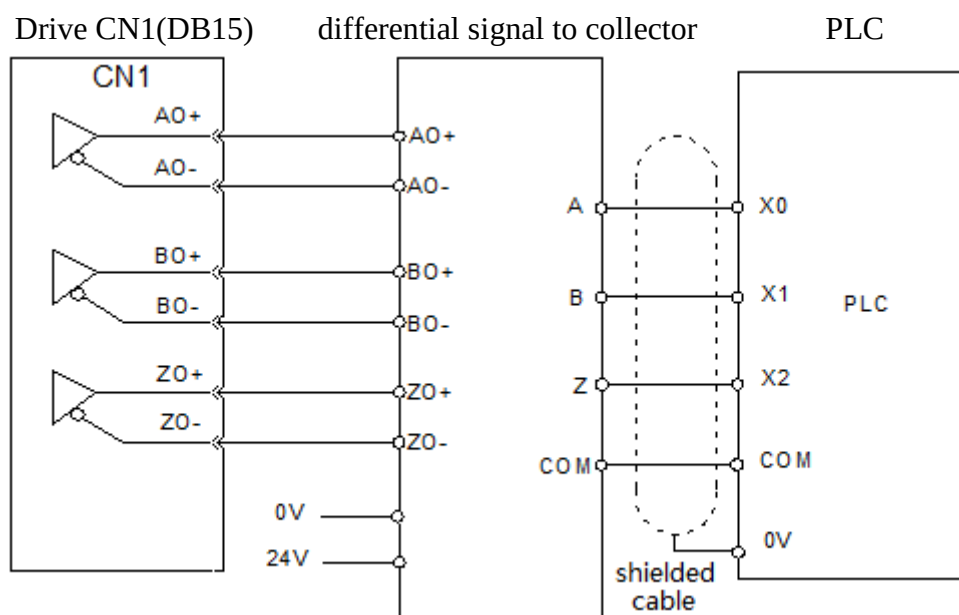
Parameter	Signal	Type	Default	Meaning	Range
P5-38	/Z	Output	n.0000	Need to distribute	0000-0013

1. /Z can be distributed to output terminal via parameter P5-38, refer to chapter 5-12-3.
2. Z phase signal is single pulse output mode. Pulse width is about 1.5ms and not related to motor rotation speed.



5-11-6. AB phase feedback signal of encoder

DS2-2□P□-AS and DS2-4□P□-AS support differential output AB phase feedback signal. Please see the following wiring diagram of DS2-21P5-AS and Xinje PLC XC3-32RT-E.



AB phase feedback signal doesn't have parameters to set; it is motor encoder signal 1:1 output, 2500 pulse/circle.

5-12. I/O signal distribution

5-12-1. Input signal distribution

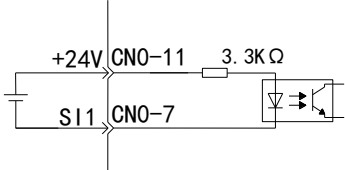
Parameter range: P5-10~P5-25

Parameter meaning	Set value	Meaning	Terminal voltage	Terminal state	Signal state
n.00 y x 00: no meaning	n.0000	Not distribute to terminal input	-	-	0

y: 0 always open 1 always close x: input terminal no.	n.000x	Input always open signal from SIx	H	Disconnect to 0V	0
			L	Connect to 0V	1
	n.0010	Set the signal to be always valid	-	-	1
	n.001x	Input always close signal from SIx	H	Disconnect to 0V	1
			L	Connect to 0V	0
Note: if the distributed terminal has other signal, set the signal to other terminal or set to unused.					

Example: take the input signal /CLR (P5-24) of DS2-21P5-AS as an example to explain the terminal distribution.

Wiring example of input signal



DS2-21P5-AS: CN0-11 is +24V terminal, CN0-7 is SI1 terminal. For the example, distribute /CLR signal to SI1.

Parameter	Set value	Terminal state	Signal state	Meaning
P5-24	n.0001	Disconnect to 0V	0	Clear the pulse offset at the moment of SI2 and 0V pass through
		Connect to 0V	1	
	n.0011	Disconnect to 0V	1	Clear the pulse offset at the moment of SI2 and 0V cut off
		Connect to 0V	0	

Note: the default input of SI1 is /SON, make sure to distribute P5-10(/SON) to other terminal or set to unused.

5-12-2. Default setting of input terminal

Input Type	SI1	SI2	SI3	SI4	SI5
DS2-2□P□-AS DS2-4□P□-AS	/S-ON	/ALM-RST	/P-OT	/N-OT	/SPD-A

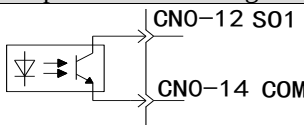
5-12-3. Output terminal distribution

Parameter range: P5-28~P5-38

Parameter meaning	Set value	Meaning	Signal state	Terminal state
n.00 y x	n.0000	Not distribute to terminal input	-	-

00: pointless y: 0 always open 1 always close x: output terminal no.	n.000x	Output always open signal from SOx	0	Cut off with COM
			1	Pass through with COM
	n.0010	Set the signal to be always valid	-	-
	n.001x	output always close signal from SOx	0	Pass through with COM
			1	Cut off with COM
Note: If the distributed terminal has other signal, please set the signal to other terminal or set to unused.				

Example: take /CLT signal of DS2-21P5-AS as an example to explain output terminal distribution.

Output terminal wiring example				
		DS2-21P5-AS: SO1 is CN0-12, COM is CN0-14.		
Parameter	Set value	/CLT	Terminal state	Meaning
P5-32	n.0001	0	SO1 and COM pass through	Output limit signal when motor torque reaches the set value
		1	SO1 and COM cut off	Output limit signal when motor torque reaches the set value
Note: the default output of SO1 is /COIN. Set the P5-28 (/COIN) to other terminal or unused in order to avoid terminal signal conflict.				

5-12-4. Default setting of output terminal

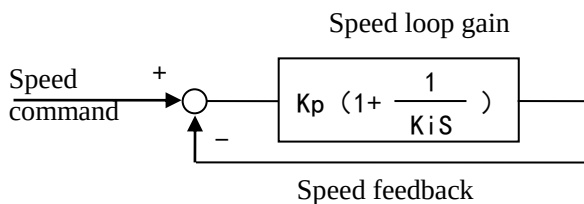
Output terminal	SO1	SO2	SO3
Function	/COIN	/ALM	/S-RDY

6 Servo gain adjustment

6-1. Gain setting of speed loop

Gain parameters about speed loop:

P1-00	Speed loop gain (Kp)					
	Unit	Default	Range	Suitable mode	Modify	Effective
	1Hz	100	1~5000	3, 4, 5, 6, 7	Any	Immediately
P1-01	Speed loop integral time constant (Ki)					
	Unit	Default	Range	Suitable mode	Modify	Effective
	0.1ms	400	1~5000	3, 4, 5, 6, 7	Any	Immediately



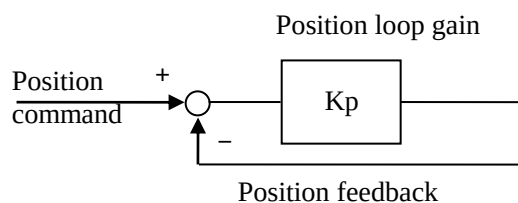
To set the speed loop gain larger and the speed integral time constant smaller can realize high response speed controlling. But servo will restrict by machine performance.

6-2. Gain setting of position loop

Gain parameter about position loop:

P1-02	Position loop gain (Kp)					
	Unit	Default	Range	Suitable mode	Modify	Effective
	1/s	100	1~2000	5, 6	Any	Immediately

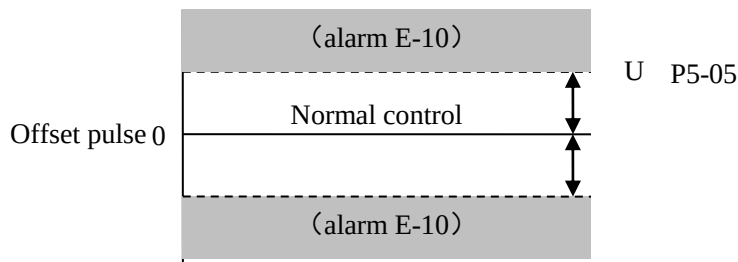
To do position control with high response and less offset needs to set the position loop gain larger. But servo will restrict by machine performance.



In position control mode, the servo will alarm when the offset pulse over the limit value. The value is offset pulse limit parameter:

P5-05	Offset pulse limit					
	Unit	Default	Range	Suitable mode	Modify	Effective
	256*command pulse	1000	0~65535	5, 6	Servo OFF	Immediately

The offset pulse will not be checked when offset pulse limit value is 0.



P1-09	position loop feedforward gain (Kp)					
	Unit	Default	Range	Suitable mode	Modify	Effective
	1%	0	1~100	5, 6	Any	Immediately
The unit is 1% of offset pulse. To increase the feedforward gain of position loop in the case that requires quick response of position loop. If set it too large, the speed loop will overshoot.						
P1-10	feedforward filter time					
	Unit	Default	Range	Suitable mode	Modify	Effective
	0.01ms	0	0~65535	5, 6	Any	Immediately

6-3. The experience of parameter adjustment

First, it is important to know the mechanical structure. Common synchronous machine with driving has less rigidity, decrease the servo rigidity to match it. Large inertia mechanical system has long response time, it needs to decrease the servo rigidity and set more acceleration/deceleration time for speed command. For the mechanical system with small load inertia and strong rigidity such as coupling, it needs to increase the servo rigidity to improve the positioning efficiency.

Servo parameter adjustment method in position mode for typical mechanical system:

(1) Mechanical system: synchronous with coupling, large load inertia.

Servo system: decrease the rigidity, increase speed loop integral time (P1-01), decrease the position loop gain (P1-02). If the response is not enough after adjusting, increase the speed loop gain (P1-00).

Typical setting: P1-00=200, P1-01=2000, P1-02=50.

(2) Mechanical system: synchronous with coupling, small load inertia and load torque.

Servo system: follow the default parameter.

(3) Mechanical system: rigidity coupling, large load inertia.

Servo system: same to (1).

Typical setting: P1-00=100, P1-01=1000, P1-02=80.

(4) Mechanical system: rigidity coupling, small load inertia, strong rigidity.

Servo system: P1-00=100, P1-01=300, P1-02=150. If it cannot meet the requirements, please increase the position loop feedforward, for example set P1-09 to 20.

Note: above typical settings only show the direction to adjust the parameters. The settings cannot be suitable for all the conditions.

6-4. Proportion action command (P-CON)

Input signal /P-CON is switch for P/PI control of speed loop.

P control means proportion control; this mode is called proportion action command.

Input terminal selection of /P-CON:

Parameter	Signal	Type	Default	State	Meaning	Modify	Effective
P5-11	/P-CON	Input	n.0000	1	Run in P control mode	Any	Re-power on
				0	Run in PI control mode		
/P-CON can be distributed to input terminal via parameter P5-11. Refer to chapter 5-12-1.							

This command is suitable for the following cases:

- (1) When the host device sends speed command to the servo and runs with it at the same time, it only selects P mode running under special conditions. The overrange can be deleted by this method and the adjustment time can be shortened.
- (2) When there is command offset in speed controlling, servo will not stop and run at low speed even getting zero speed command in PI control mode. If select P control mode, the servo will stop.

6-5. Gain switch (G-SEL)

This function can switch the gain online.

For example, set different first and second gain by the external signal when the motor is running or stop.

Select the input terminal for /G-SEL signal:

Parameter	Signal	Type	Default	Meaning	Suitable mode	Modify	Effective
P5-23	/G-SEL	Input	n.0000	Need to distribute	3, 4, 5, 6, 7	Any	Re-power on
/G-SEL can be distributed to input terminal via parameter P5-23. Refer to chapter 5-12-1.							

Function realization:

Input signal	Signal state	Gain group
/G-SEL	0	P1-00, P1-01, P1-02
	1	P1-04, P1-05, P1-06
Note: the 0, 1 is signal state but not terminal state.		

7 Specification and dimension

7-1. Servo motor

7-1-1. Servo motor specification

Please refer to this chapter when selecting the servo drive.

Voltage level	220V					
Motor type MS-	60ST-			80ST-		
	M00630	M01330		M02430		M03520
	□□-20P2	□□-20P4		□□-20P7		
Motor code	1003	0004	1004	0011	1011	0012
Rated power (KW)	0.2	0.4	0.4	0.75		
Rated current (A)	1.8	2.5	1.8	3.0	2.6	3.0
Rated speed (rpm)	3000	3000	3000	3000	3000	2000
Max speed (rpm)	4000	4000	4000	4000	4000	2500
Rated torque (N m)	0.637	1.27	1.27	2.39	2.39	3.5
Peak torque (N m)	1.91	3.8	3.8	7.1	7.1	10.5
Back EMF constat (V/krpm)	26	28	162	48	56.6	71
Torque coefficient (N m/A)	0.37	0.5	0.68	0.8	0.92	1.17
Rotor inertia (Kg m ²)	0.18×10 ⁻⁴	0.438×10 ⁻⁴	0.53×10 ⁻⁴	1.82×10 ⁻⁴	0.65×10 ⁻³	2.63×10 ⁻⁴
Winding resistor (Ω)	3.5	3.49	3.8	2.88	2.7	3.65
Winding inductance (mH)	8.32	8.47	11.51	6.40	6.25	8.80
Electrical time constant (ms)	2.38	2.4	3.03	2.22	2.3	2.41
Weight (Kg)	1.1	1.78	1.72	2.9	2.87	3.7
Encoder ppr (PPR)	2500					
Pole pairs	4					
Motor insulation level	Class B (130°C)					
Protection level	IP64	IP65				
Ambient	Temperature	-20°C~+50°C				
	Humidity	Relative humidity < 90% (no condensation)				

Voltage level	220V					
Motor type MS-	90ST-	110ST-		130ST-		
	M02430	M04030	M05030	M04030	M06025	
	□□-20P7	□□-21P2	□□-21P5	□□-21P2	□□-21P5	
Motor code	0021	0031	0032	1031	0042	1042
Rated power (KW)	0.75	1.2	1.5	1.2	1.5	1.5
Rated current (A)	3.0	5.0	6.0	6.7	6.0	7.4
Rated speed (rpm)	3000	3000	3000	3000	2500	2500
Max speed (rpm)	4000	3500	3500	4000	3000	3000
Rated torque (N m)	2.4	4	5	4	6	6

Peak torque (N m)	7.1	12	15	10	18	18
Back EMF constan (V/krpm)	51	54	62	33	65	82
Torque coefficient (N m/A)	0.8	0.8	0.83	0.54	1.0	0.81
Rotor inertia (Kg m ²)	0.24×10 ⁻³	0.54×10 ⁻³	0.63×10 ⁻³	0.54×10 ⁻³	1.26×10 ⁻³	0.84×10 ⁻³
Winding resistor (Ω)	3.20	1.09	1.03	2.6	1.21	0.7
Winding inductance (mH)	7.00	3.30	3.43	12	3.87	5.07
Electrical time constant (ms)	2.19	3.03	3.33	4.62	3.20	7.5
Weight (Kg)	3.4	5.5	6.1	5.9	8.9	7.16
Encoder ppr (PPR)	2500					
Pole pairs	4					
Motor insulation level	Class B (130°C)					
Protection level	IP65					
Ambient	Temperature	-20°C~+50°C				
	Humidity	Relative humidity < 90% (no condensation)				

Voltage level	220V			
Motor type MS-	130ST-			
	M10015		M07725	M15015
	□□-21P5		□□-22P0	□□-22P3
Motor code	0044	1044	0043	0046
Rated power (KW)	1.5	1.5	2.0	2.3
Rated current (A)	6.0	8.0	7.5	9.5
Rated speed (rpm)	1500	1500	2500	1500
Max speed (rpm)	2000	2000	3000	2000
Rated torque (N m)	10	10	7.7	15
Peak torque (N m)	25	25	22	30
Back EMF constan (V/krpm)	103	61	68	114
Torque coefficient (N m/A)	1.67	1.25	1.03	1.58
Rotor inertia (Kg m ²)	1.94×10 ⁻³	1.272×10 ⁻³	1.53×10 ⁻³	2.77×10 ⁻³
Winding resistor (Ω)	1.29	0.3	1.01	1.10
Winding inductance(mH)	5.07	1.29	2.94	4.45
Electrical time constant (ms)	3.93	4.3	2.91	4.05
Weight (Kg)	11.5	9.34	10.0	14.4
Encoder ppr (PPR)	2500			
Pole pairs	4			
Motor insulation level	Class B (130°C)			
Protection level	IP65			
Ambient	Temperature	-20°C~+50°C		
	Humidity	Relative humidity < 90% (no condensation)		

Voltage level	380V					
Motor type MS-	110ST-			130ST-		
	M04030	M05030	M06025	M10015	M07725	
	□□-41P2	□□-41P5	□□-41P5			□□-42P0
Motor code	0131	0132	0142	0144	2144	1143

Rated power (KW)	1.2	1.5	1.5	1.5	1.5	2.0
Rated current (A)	3.0	3.9	3.7	3.5	5.6	6.4
Rated speed (rpm)	3000	3000	2500	1500	1500	2500
Max speed (rpm)	3500	3500	3000	2000	2000	3000
Rated torque (N m)	4	5	6	10	10	7.7
Peak torque (N m)	12	15	18	25	20	19.25
Back EMF constat (V/krpm)	89	90	110	177	61	61
Torque coefficient (N m/A)	1.33	1.11	1.62	2.86	1.25	1.2
Rotor inertia (Kg m ²)	0.54×10 ⁻³	0.63×10 ⁻³	1.26×10 ⁻³	1.94×10 ⁻³	1.272×10 ⁻³	1.272×10 ⁻³
Winding resistor (Ω)	3.30	2.28	3.50	4.37	0.3	0.3
Winding inductance (mH)	8.78	7.40	10.75	15.00	1.29	1.29
Electrical time constant (ms)	2.66	3.25	3.07	3.46	4.3	4.3
Weight (Kg)	5.5	6.1	8.9	11.5	9.34	9.34
Encoder ppr (PPR)	2500					
Pole pairs	4					
Motor insulation level	Class B (130°C)					
Protection level	IP65					
Ambient	Temperature	-20°C~+50°C				
	Humidity	Relative humidity < 90% (no condensation)				

Voltage level	380V				
Motor type MS-	130ST-		180ST-		
	M15015	M10030	M19015		M21520
	□□-42P3	□□-43P0	□□-43P0		□□-44P5
Motor code	1146	1148	0156	1052	0150
Rated power (KW)	2.3	3.0	3.0	3.0	4.5
Rated current (A)	7.3	6.4	7.5	7.8	9.5
Rated speed (rpm)	1500	3000	1500	1500	2000
Max speed (rpm)	2000	3500	2000	2000	3000
Rated torque (N m)	15	10	19	20	21.5
Peak torque (N m)	45	25	47	50	53
Back EMF constat (V/krpm)	124	88.3	158	138	140
Torque coefficient (N m/A)	2	1.56	2.53	2.56	2.26
Rotor inertia (Kg m ²)	2.44×10 ⁻³	1.13×10 ⁻³	3.8×10 ⁻³	2.8×10 ⁻³	4.7×10 ⁻³
Winding resistor (Ω)	1.8	0.46	1.15	0.67	0.71
Winding inductance (mH)	11.6	1.52	6.4	2.68	4.00
Electrical time constant (ms)	6.44	3.33	5.57	4.00	5.63
Weight (Kg)	11.1	11.4	20.5	17.1	22.2
Encoder ppr (PPR)	2500				
Pole pairs	4				
Motor insulation level	Class B (130°C)				
Protection level	IP65				
Ambient	Temperature	-20°C~+50°C			
	Humidity	Relative humidity < 90% (no condensation)			

Voltage level	380V					
Motor type MS-	180ST-					220ST-
	M27015		M35015		M48015	M40015
	□□-43P3		□□-45P5		□□-47P5	□□-411P0
Motor code	2151	0151	1152	0152	0153	1157
Rated power (KW)	4.3	4.3	5.5	5.5	7.5	11.0
Rated current (A)	8.0	10.0	8.5	12.0	20.0	25
Rated speed (rpm)	1500	1500	1500	1500	1500	1500
Max speed (rpm)	2000	2000	2000	2000	2000	2000
Rated torque (N m)	27	27	35	35	48	70
Peak torque (N m)	54	67	87.5	70	96	105
Back EMF constat (V/krpm)	210	172	250	181	156	170
Torque coefficient (N m/A)	3.37	2.7	4.1	2.92	2.4	2.8
Rotor inertia (Kg m ²)	7.2×10^{-3}	6.1×10^{-3}	9.18×10^{-3}	8.6×10^{-3}	9.5×10^{-3}	23.5×10^{-3}
Winding resistor (Ω)	0.59	0.796	1.1	0.62	0.273	0.46
Winding inductance (mH)	14.4	4.83	15.1	4.0	2.14	5.54
Electrical time constant (ms)	24.4	6.07	13.7	6.45	7.84	12
Weight (Kg)	23.3	25.5	27.7	30.5	40.0	55.0
Encoder ppr (PPR)	2500					
Pole pairs	4					
Motor insulation level	Class B (130°C)					
Protection level	IP65					
Ambient	Temperature	-20°C~+50°C				
	Humidity	Relative humidity < 90% (no condensation)				

■ 60, 80 and 90 series servomotors winding connector

Motor Winding connector	Winding Name	U	V	W	PE
	Connector	1	3	2	4

■ 60, 80 and 90 series servo motor encoder connector

Signal	5V	0V	B+	Z-	U+	Z+	U-	A+	V+	W+	V-	A-	B-	W-	PE
Connector	2	3	4	5	6	7	8	9	10	11	12	13	14	15	1

■ 110, 130, 180 series servo motor winding connector

Motor Winding connector	Winding Name	U	V	W	PE
	Connector	2	3	4	1

■ 110, 130, 180 series servo motor encoder connector

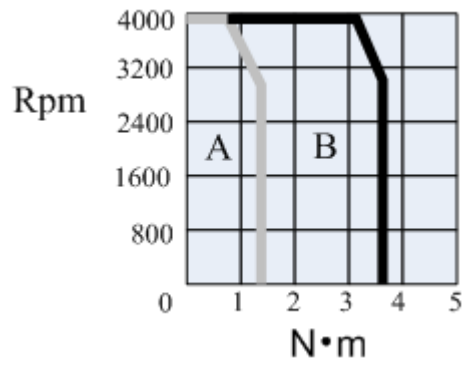
Signal	5V	0V	A+	B+	Z+	A-	B-	Z-	U+	V+	W+	U-	V-	W-	PE
Connector	2	3	4	5	6	7	8	9	10	11	12	13	14	15	1

7-1-2. Torque-Speed Feature

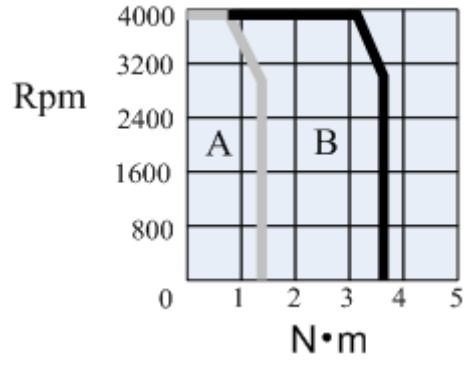
A: continuous using area

B: repeated using area

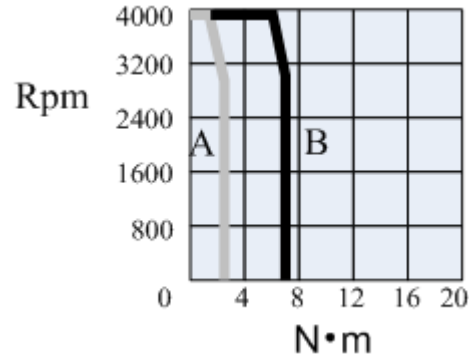
MS-60ST-M00630□□-20P2



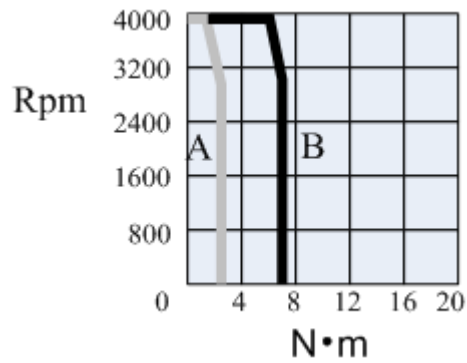
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MS-80ST-M02430□□-20P7

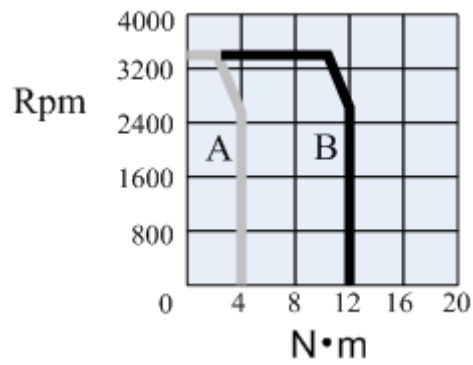


MS-90ST-M02430□□-20P7



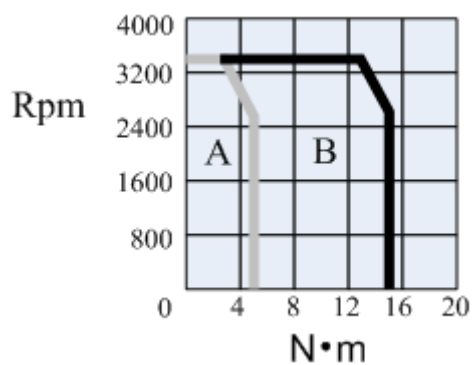
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MS-110ST-M04030□□-41P2



MS-110ST-M05030□□-21P5

MS-110ST-M05030□□-41P5

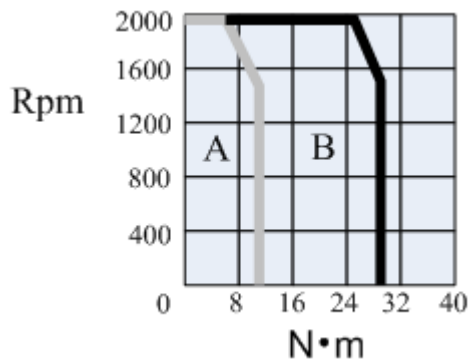
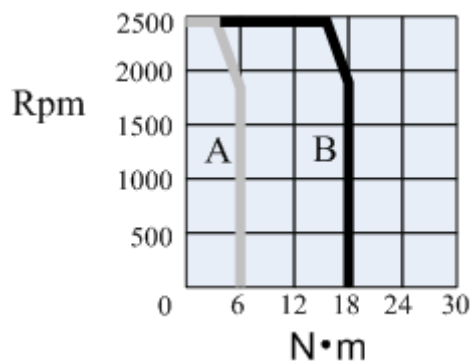


MS-130ST-M06025□□-21P5

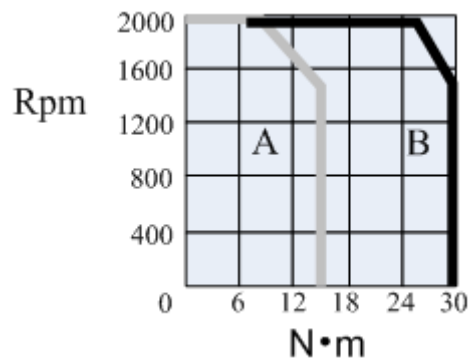
MS-130ST-M06025□□-41P5

MS-130ST-M10015□□-21P5

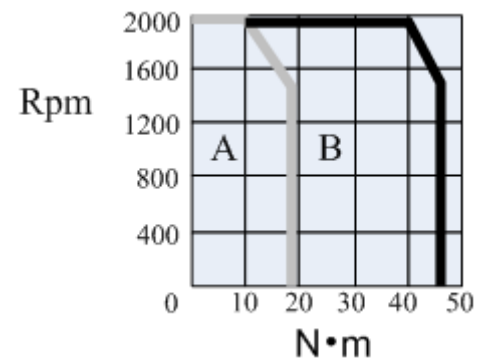
MS-130ST-M10015□□-41P5



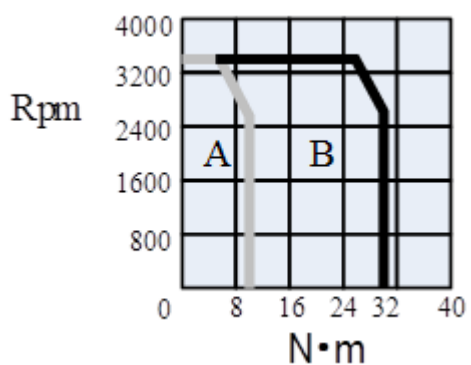
MS-130ST-M15015□□-22P3



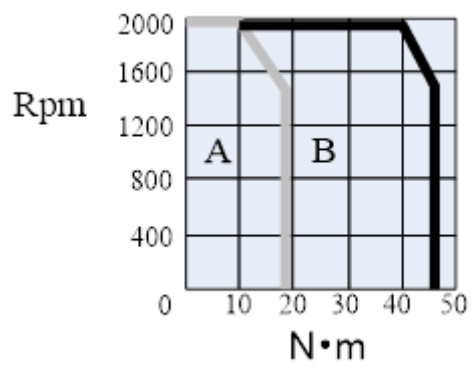
MS-180ST-M19015□□-43P0



MS-130ST-M10030□□-43P0

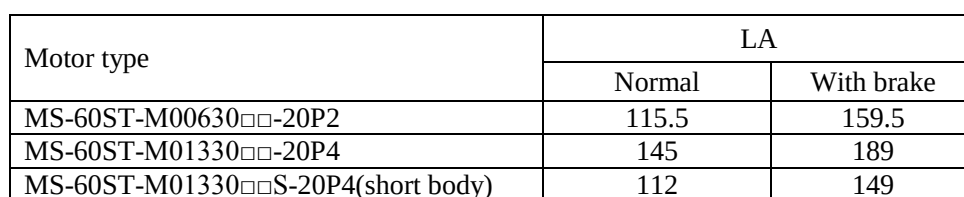


MS-180ST-M20015□□-43P0



7-1-3. Servo motor dimensions

- Dimensions of 60 series servo motors (unit: mm)



Technical drawing of the 1000W motor showing side and front views with dimensions.

Side View Dimensions:

- Total height: $\varnothing 70h7$
- Flange outer diameter: $\varnothing 19h6$
- Flange thickness: 25
- Mounting flange diameter: 32 ± 0.5
- Mounting flange thickness: 8
- Motor body diameter: 3
- Motor body length: LA

Front View Dimensions:

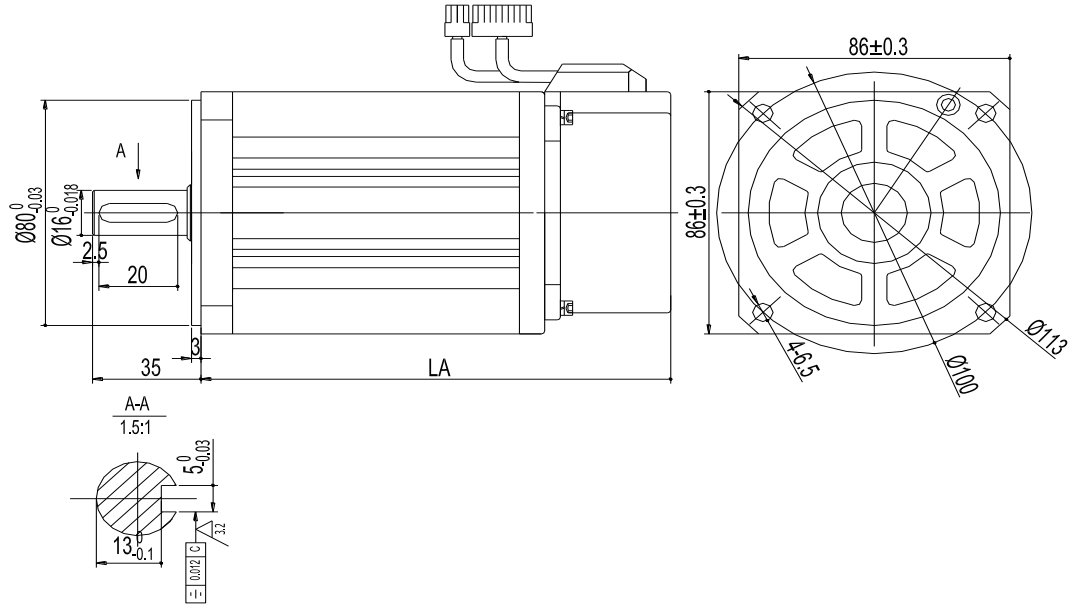
- Outer diameter: $\varnothing 80$
- Inner diameter: $\varnothing 90$
- Number of mounting holes: 4- $\varnothing 6$

Detail View Dimensions:

- Dimension: $6 - 0.018$
- Dimension: $3.5^{+0.2}_0$

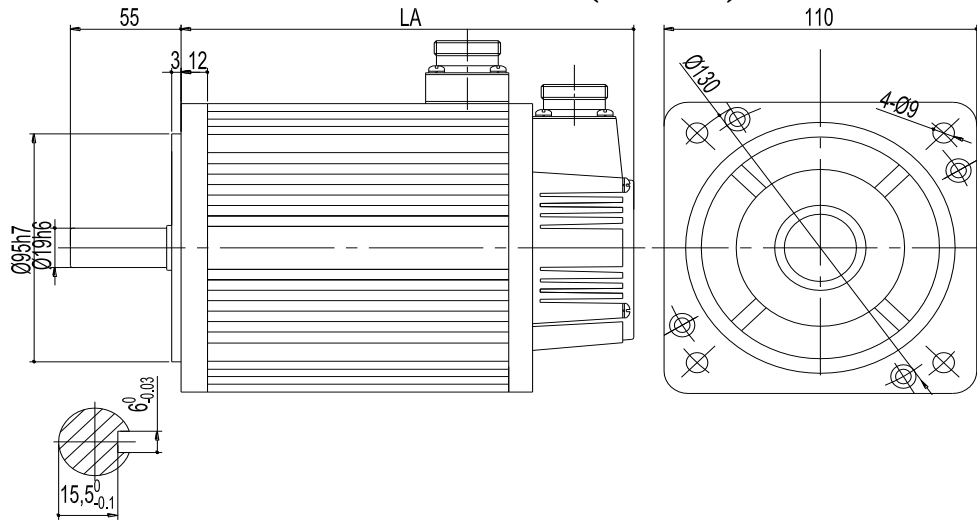
Type	LA	
	Normal	With brake
MS-80ST-M02430□□-20P7	150	199
MS-80ST-M03520□□-20P7	178	219
MS-80ST-M02430□□S-20P7(short body)	121	162

■ Dimensions of 90 series servo motors (unit: mm)



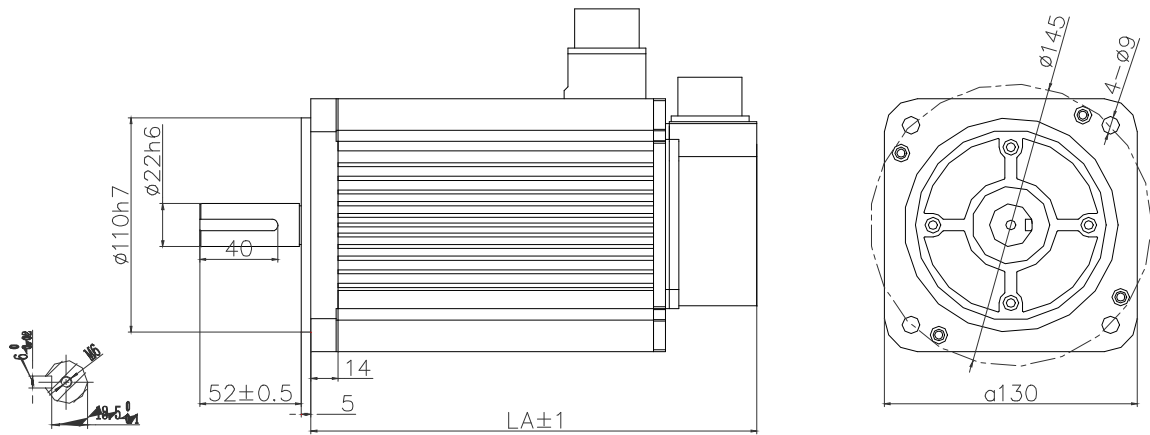
Type	LA	
	Normal	With brake
MS-90ST-M02430□□-20P7	149	194

■ Dimensions of 110 series servo motors (unit: mm)



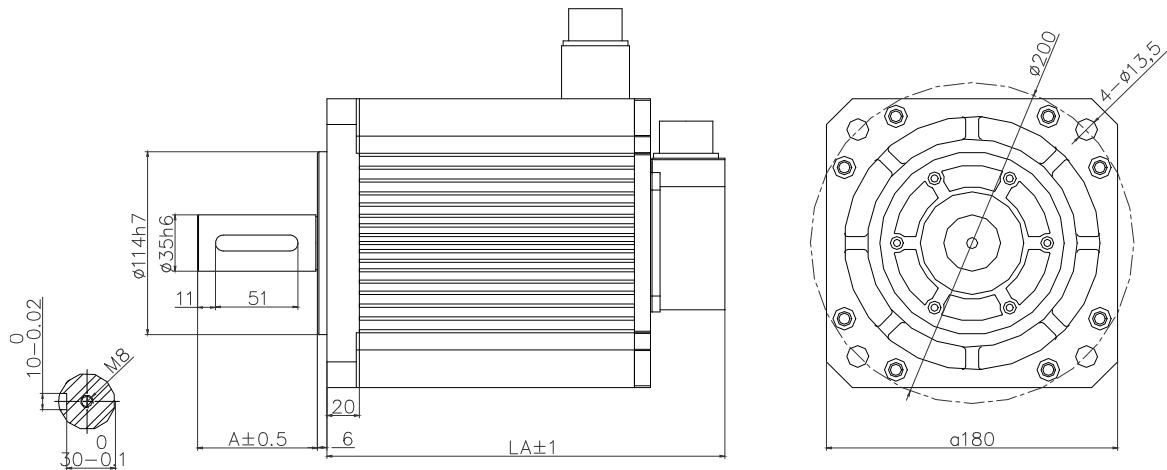
Type	LA	
	Normal	With brake
MS-110ST-M04030□□-21P2 MS-110ST-M04030□□-41P2	189	263
MS-110ST-M05030□□-21P5 MS-110ST-M05030□□-41P5	204	278

■ Dimensions of 130 series servo motors (unit: mm)



Type	LA	
	Normal	With brake
MS-130ST-M04030□□-21P2	165	\
MS-130ST-M06025□□-21P5	165	239
	179	263
MS-130ST-M10015□□-21P5	206	265
		294
MS-130ST-M07725□□-22P0	192	249
MS-130ST-M15015□□-22P3	241	298
		322
MS-130ST-M15015□□-42P3	226	285
MS-130ST-M06025□□-41P5	179	263
MS-130ST-M10015□□-41P5	213	270
		294
MS-130ST-M10030□□-43P0	230	289

■ Dimensions of 180 series servo motors (unit: mm)



Type	Motor code	A	LA	
			Normal	With brake
MS-180ST-M19015□□-43P0	1052	79	221	303
MS-180ST-M19015□□-43P0-S	1052	65	221	303
	0156	65	232	289
MS-180ST-M21520□□-44P5	0150	65	243	300

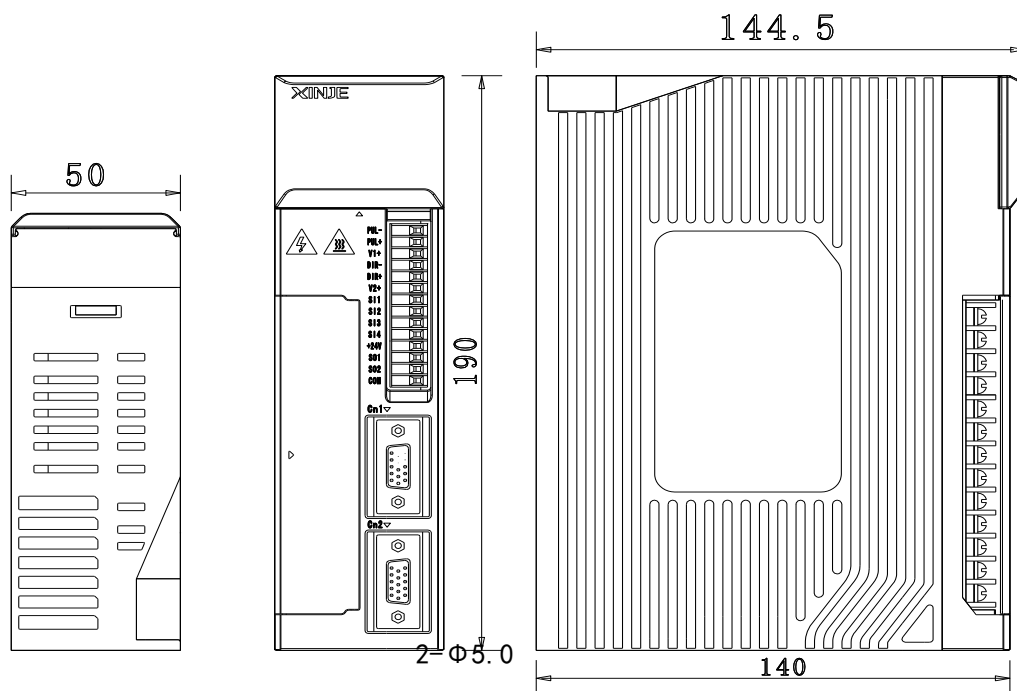
7-2-2. Performance specification

Servo drive type				DS2 series servo drive	
Speed torque control mode	Performance	Speed control range		1: 4000 (the lower limit of speed control range, not stop at rated load torque)	
		Speed change rate	Load change rate	0~100% load: below ±0.01% (rated speed)	
			Voltage change rate	Rated voltage ±10% : 0% (rated speed)	
			Temperature change rate	20±25°C: below ±0.1% (rated speed)	
		Frequency feature		250Hz (JL≤JM)	
		Soft start time		0~65535ms (set acceleration, deceleration individually)	
	Input signal			RS485 (DS2-21P5-AS2/DS2-20P7-BSW/ DS2-20P4-BS don't have this function)	
Position control mode	Performance	Feedforward compensation		0~100% (resolution is 1%)	
		Positioning finished width		0~250 command unit (resolution is 1 command unit)	
	Input signal	Command pulse	Input pulse type	Sign+pulse, CW, CCW mode	
			Input pulse state	Collector (+24V). -A, -B, -AS model support differential signal input	
			Input pulse frequency	Open collector input: 200kbps Differential input: 500kbps	
		Control signal		Clear signal (/CLR)	
I/O signal	Position output		DS2-2□P□-AS/AS6: differential output DS2-4□P□-AS/AS6: differential output DS2-20P4-BS/BS6 DS2-20P7-BSW/BSW6 DS2-21P5-AS2: no		
	Input signal	External input	5		
		Changeable signal distribution	/S-ON, /P-CON, /P-OT, /N-OT, /ALM-RST, /PCL, /NCL, /SPD-D, /SPD-A, /SPD-B, /C-SEL, /ZCLAMP, /CLR, /G-SEL, /CHGSTP		
	Output signal	External output	3		
		Changeable signal distribution	/COIN, /V-CMP, /TGON, /S-RDY, /CLT, /VLT, /BK, /WARN, /NEAR, /ALM, /Z		
Built-in function	Dynamic brake (DB)		No		
	Regeneration		DS2-20P□-AS/AS6, DS2-20P4-BS/BS6: no internal regenerative resistor DS2-20P7-BSW/BSW6, DS2-21P5-AS/AS6, DS2-21P5-AS2, DS2-22P3-AS/AS6, DS2-4□P□-AS/AS6: with internal regenerative resistor		
	Regenerative frequency (s/minute discharging)		DS2-2□P□-AS/AS6, DS2-21P5-AS2: 2.5 s/min DS2-41P5-AS/AS6: 0.6 s/min DS2-43P0-AS/AS6: 0.8s/min DS2-20P7-BSW/BSW6: 1.6 s/min		
	Over range (OT) protection		For P-OT, N-OT action, deceleration stop or inertia stop		
	Electronic gear		0.01≤ B/A≤100		
	Protection		Program error, parameter error, overvoltage, undervoltage, regeneration error, overtemperature, overcurrent, overspeed, analog input error, position offset overflow, output shorting,		

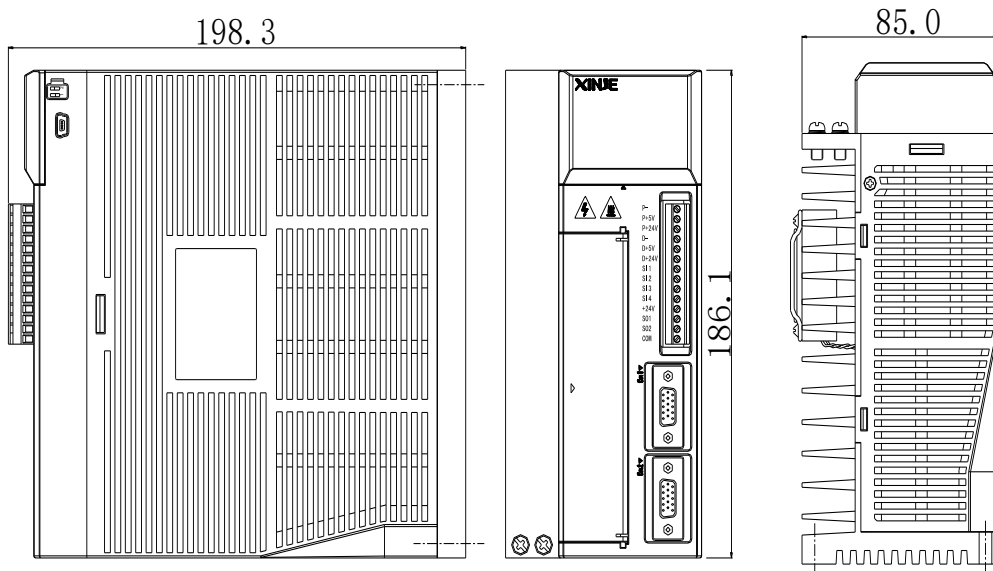
			current error, encoder cut, encoder error, overload, power off when running, write parameter error...	
	LED display		Charge, power supply, 7-segment LED ×5 (built-in digital operate)	
	communication	COM1	Connector	RS232, connect to PC
			Serial parameter	Baud rate 19200; data bit 8; stop bit 1; communication protocol: ModbusRTU slave; Modbus station No.1
			Function	Debug online
		COM2	Connector	RS485, connect to PLC, HMI, PC and other devices
			Serial parameter	Serial parameter can be set; communication protocol: Modbus RTU slave; Modbus station No. can be set
			Function	State display, user constant setting, monitor display, alarm display, alarm display, special control, online debug

7-2-3. Servo drive dimensions

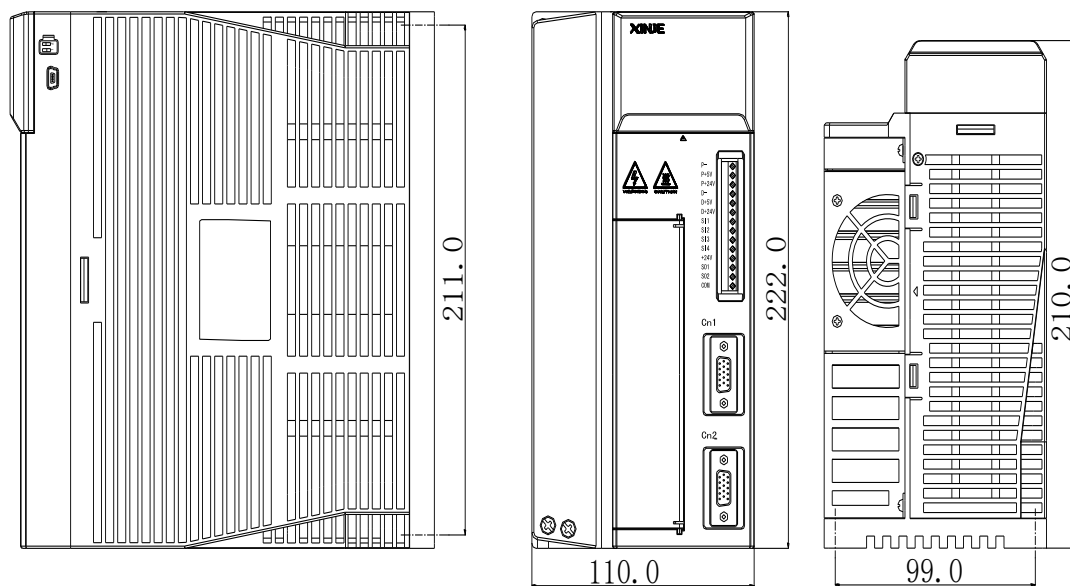
- DS2-20P□-AS/AS6, DS2-20P4-BS/BS6 (unit: mm)



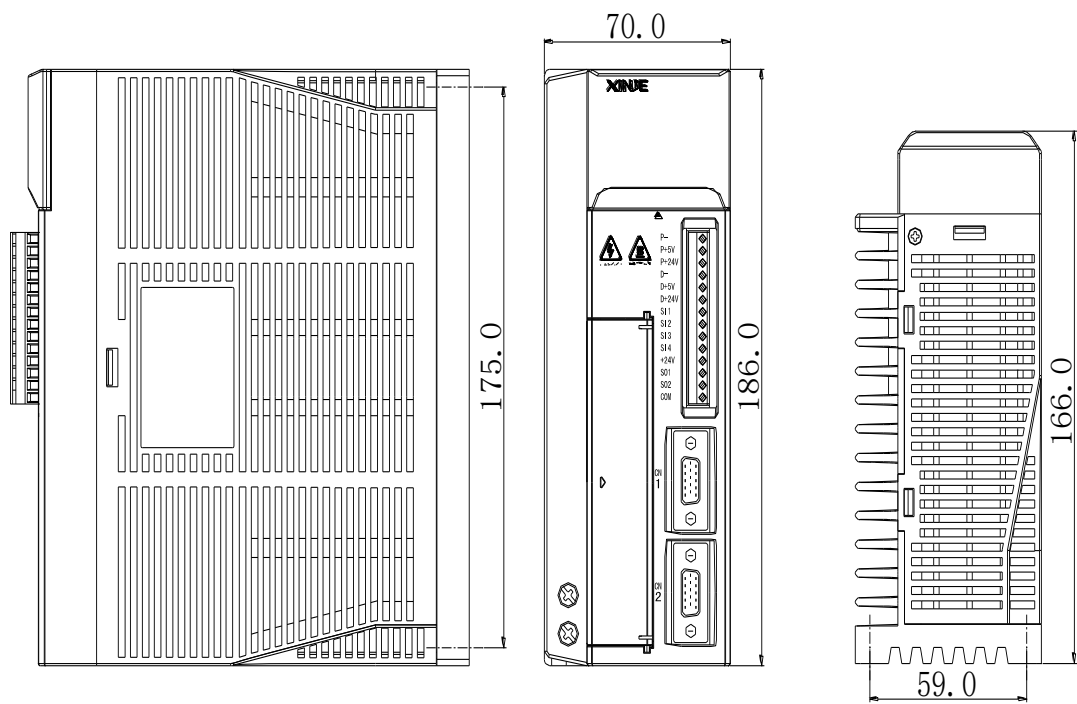
- DS2-21P5-AS/AS6, DS2-21P5-AS2, DS2-22P3-AS/AS6, DS2-41P5-AS/AS6 (unit: mm)



■ DS2-43P0-AS/AS6 (unit: mm)



■ DS2-20P7-BSW/BSW6 (unit: mm)



8 Alarm Information

Alarm Code	Description	Reason	Solution
E-001	Program damage	program self-test failed	Re-download the program or contact Xinje or an authorized distributor
E-002	Parameter damage	Parameter self-test failed	Restart the drive to reset the parameters. If it occurs for many times please contact Xinje or an authorized distributor
E-003	Bus over-voltage (220V: U-05 $\geq$ 380 alarm) (380V: U-05 $\geq$ 780 alarm)	1. Power grid is over votage 2. load rotation inertia is too large (regenerative ability is not enough) 3. the regenerative resistor damage or its value is too large 4. load has stall	1. Connect external regenerative resistor (220V: bus voltage U-05=360 it starts to discharge, U-05=358 the discharge completed. 380V: U-05=700 it starts to discharge, U-05=660 the discharge completed.) 2. Set the acceleration/deceleration time 3. Decrease the load inertia 4. Decrease start/stop frequency 5. Change larger power drive and motor
E-004	Bus under voltage (220V: U-05 $\leq$ 140 380V: U-05 $\leq$ 300)	Power grid is under votage Power off at the moment	1. Check the power grid, 220V drive normal voltage range is 200V~240V, please use voltage regulator if the voltage fluctuation is large. 2. change larger capacity VFD 3. repower on after the voltage is stable
E-005	Regenerative resistor error	Regenerative resistor is ineffective	Check the connection of regenerative resistor
E-006	Module over temperature (module temperature U-06 $\geq$ 85°C alarm)	1. Run with large load for long time 2. Environment temperature is too high 3. UVW of drive has short circuit	1. recheck the motor capacity (monitor motor present torque U-02) 2. Reduce the load, and enhance the cooling system, or check if the fan is revolving when motor is ON (module temperature U-06 $\geq$ 45°C, the fan starts to work); cool down the ambient temperature 3. check the UVW wiring
E-007	Over current	1. not match the motor code 2. UVW wiring error 3. encoder problem	1. F2-00 must same to motor code on the motor label 2. check UVW wiring 3. check the encoder cable

		4. drive UVW has short circuit or motor error 5. load has stall 6. interference	4. change the damaged motor, check motor UVW wiring 5. run the motor without load to except the load problem 6. check if the device has interference
E-008	Over speed (actual speed $\geq$ P3-09+200rpm)	1. not match the motor code 2. UVW and ground wiring error 3. encoder problem 4. motor speed is too fast 5. check P3-09 max speed limit	1. F2-00 must same to motor code on the motor label 2. check UVW wiring 3. check the encoder cable 4. if the external force drives the motor over-speed 5. input frequency is too high 6. electronic gear ratio is too large 7. when the actual speed is larger than 200 of P3-09, it will alarm
E-009	Analog input error	Input voltage error when 2-channe analog zero calibrating	Input correct voltage when zero calibration for analog
E-010	Position offset too large	The difference between set position and actual position exceeds the limit value	1. Check if the motor stalled 2. check the UVW wiring 3. decrease the position setting speed(pulse frequency is too high, over the P3-09 speed) 4. increase offset pulse limit value P5-05
E-011	Motor UVW is short circiut	External is short circuit when fist self-test	Check the UVW wiring of motor, or replace the damaged motor
E-012	Motor UVW current error	1. Current collection circuit error 2. enable ON when motor is rotating	1. Check the UVW wiring of motor, or replace the damaged drive 2. if the terminal enable P5-10=0001, do not let the enable ON when the motor is running
E-013	Encoder UVW wire break	Encoder wiring error, encoder broken, encoder is not connected, Interference	1. Check the wiring of encoder, and re-connect the encoder after power-off, or replace the damaged encoder 2. encoder cable is too long, encoder power supply voltage is too low or has interference 3. separate the encoder cable with the strong electricity device 4. install magnet ring on the encoder cable
E-014	Encoder ABZ wire break	Encoder wiring error, encoder broken, encoder is not connected	Check the wiring of encoder, and re-connect the encoder after power-off, or replace the damaged encoder
E-015	Speed changes too fast (encoder feedback error)	The encoder wiring is error, or the encoder has interference	Check the wiring of encoder, or add shield layer for the encoder wire

E-016	Overload	1. Run overload for long time 2. not match the motor code 3. UVW and ground connection is error 4. encoder problem 5. the brake on the motor is not ON 6. the load has stall	1. Reduce the overload running time, change a motor with larger rated power (see U-02) 2. F2-00 must be the same to the motor code on the motor label 3. check the UVW wiring 4. check the encoder or change the encoder cable 5. the encoder cable is too long, check the encoder power supply voltage, or there is interference
E-017	Power off when running	Bus voltage is too low when running	1. Re-power on after the bus voltage is normal 2. the load has stall
E-018	Erase parameter error	Voltage is too low when power on, cannot erase the parameter	Check the power supply and re-power on
E-019	Torque limit alarm	Present motor output torque is larger than P4-11/12, it will alarm in the time of P4-13	Set P4-11/12, or check U-02 motor torque
E-020	Regenerative resistor error	The internal regenerative resistor discharge power is over this model's discharge ability	Add external regenerative resistor
E-031	Motor code error	Motor code cannot match to drive type	Set the motor code in F2-00 again
E-032	Initialization error	System chip is damaged	Contact Xinje or an authorized distributor

Appendix 1 Parameter list

○ means the parameter can be modified when the servo is OFF, and effective when servo is ON.

● means the parameter can be modified any time, and effective when re-power on the servo.

√ means the parameter can be modified any time, and effective immediately.

Adding “n.” before the parameter means the value is hex.

Parameter: PX—XX = n.×× ××

PX—XX.H ← → PX—XX.L

P0: function selection

Modbus address: 0000~00FF

P0-	Function	Unit	Default	Range	Effective	Suitable mode	Chapter
00	Main mode	-	0	0	○	-	5-1
01	Submode 1 0: idle 1: torque (command) 2: torque (analog) 3: speed (command) 4: speed (analog) 5: position (internal) 6: position (pulse) 7: speed (pulse)	-	6	0~7	○	All the modes	5-1
02	Submode 2 0~7: same as submode 1	-	0	0~7	○	All the modes	5-1
03	Modbus station of serial port 2	-	1	1~255	●	All the modes	3-5-2
04	Parameter of serial port 2	-	n.2206	n.0000 ~ n.2209	●	All the modes	3-5-2
05	Rotation direction selection	-	0	0, 1	●	2,4, 6,7	5-2-2
06	06.L: stop mode when servo OFF or alarm. DS2 series default is inertia stop. Keep the inertia motion after stop.	-	2	0~2	●	All the modes	5-2-4
	06.H: over range (OT) stop mode 0~1: inertia stop. Keep inertia motion after stop. 2: deceleration stop. Change to zero clamp after stop. Torque: P4-06 urgent stop torque. 3: deceleration stop. Change to inertia motion after stop. Torque: P4-06 urgent stop torque.	-	2	0~3	●	All the modes	5-2-3
07	T-REF distribution 0: undefined. 1: make T-REF as external torque limit input 2: undefined. 3: when P-CL, N-CL is ON, make T-REF as external torque limit input.	-	0	0~3	○	3,4,5,6,7	5-5-7
08	V-REF distribution 0: - 1: make V-REF as external speed limit input.	-	0	0, 1	○	1,2	5-8-5
09	Forced input terminal 0:- 1: SO1 terminal has signal output 2: SO2 terminal has signal output 3: SO3 terminal has signal output	-	0	0-3	√	All the modes	5-8-5
16	Forced ON the fan	-	0	0, 1	√	All the	

	0: default fan is OFF 1: fan is ON					modes	
10	Regenerative resistor selection 0: use internal regenerative resistor 1: use external regenerative resistor	-	0	0, 1	●	All the modes	3-4
20	Running time	-	0		Monitor value, cannot change		
21	Alarm times	-	0		Monitor value, cannot change E-007/E-003/E-006 three kinds of alarm amounts		

P1: control parameters

Modbus address: 0100~01FF

P1-	Name	Unit	Default	Range	Effective	Suitable mode	Chapter
00	The gain of speed loop	1Hz	100	1~5000	√	3,4,5,6,7	6-1-1
01	Speed loop integral time	0.1ms	400	1~50000	√	3,4,5,6,7	6-1-1
02	The gain of position loop	1/s	100	1~2000	√	5,6	6-1-2
03	Reserved						
04	The gain of second speed loop	1Hz	250	1~5000	√	3,4,5,6,7	6-1-5
05	Integral time of second speed loop	0.1ms	10000	1~50000	√	3,4,5,6,7	6-1-5
06	The gain of second position loop	1/s	250	1~2000	√	5,6	6-1-5
07	Reserved						
08	Reserved						
09	The gain of position loop feedforward	1%	0	0~100	√	5,6	6-1-2
10	Feedforward filter time	0.01ms	0	0~65535	√	5,6	6-1-2

P2: position control

Modbus address: 0200~02FF

P2-	Function	Unit	Default	Range	Effective	Suitable mode	Chapter
00	Command pulse state	-	2	0, 1, 2	●	6,7	5-3-2
01	Position command filter selection	-	0	0, 1	●	6	5-3-4
02	Electronic gear ratio (molecular)	-	1	1~65535	√	6	5-3-3
03	Electronic gear ratio (denominator)	-	1	1~65535	√	6	5-3-3
04	Position command filter time	1ms	0	0~128	●	6	5-3-4
05	Reserved						
06	Command pulse frequency at rated speed	100Hz	5000	1~10000	○	7	5-7-3
07	Speed command pulse filter time	0.1ms	20	0~1000	√	7	5-7-4
08	Reserved						
09	Reserved						
10	Internal position mode setting	-	n.0000		○	5	5-4-2
11	First segment pulse (low bit)	1	0	-9999~+9999	√	5	5-4-3
12	First segment pulse (high bit)	1	0	-9999~+9999	√	5	5-4-3
13	First segment speed	0.1rpm	0	0~50000	√	5	5-4-3
14	First segment adjustment time	1ms	0	0~65535	√	55	5-4-3

15	First segment command filter time	0.1ms	0	0~65535	√		5-4-3
P2-16~P2-90 are 2~16 segments parameter setting.							
94. xx□ x	Find the original point 0: invalid 1: valid	-	0	0~1	○	5,6	5-4-7
94. xxx □	The signal quantity pass the Z phase signal at the direction of leaving the limit switch	-	2	1~F (Hex)	○	5,6	5-4-7
95	The speed of closing the proximity switch	0.1rpm	600	0~50000	√	5,6	5-4-7
96	The speed of leaving the proximity switch	0.1rpm	100	0~50000	√	5,6	5-4-7
97	Set segment through communication	-	00	00-16	√	5,6	5-4-8

P3: speed control

Modbus address: 0300~03FF

P3-	Name	Unit	Default	Range	Effective	Suitable mode	Chapter
00	Analog value of rated speed	0.01V	1000	150~3000	○	4	5-5-2
01	Internal setting speed 1	rpm	100	-5000~ +5000	√	3	5-6-2
02	Internal setting speed 2	rpm	200	-5000~ +5000	√	3	5-6-2
03	Internal setting speed 3	rpm	300	-5000~ +5000	√	3	5-6-2
04	JOG speed	rpm	100	0~1000	√	All the modes	4-4-2
05	Soft start acceleration time	1ms	0	0~65535	○	3,4, 7	5-5-8
06	Soft start deceleration time	1ms	0	0~65535	○	3,4, 7	5-5-8
07	Speed command filter time	0.01ms	0	0~65535	√	3,4,5,6,7	5-5-9
08	Speed feedback filter time	0.01ms	20	0~65535	√	3,4,5,6,7	5-5-9
09	Max speed limit (MAX speed)	rpm	Different for each type	0~5000	●	All the modes	5-8-5
10	Speed command input dead area voltage	0.01V	0	0~100	○	4	5-5-10

P4: torque control

Modbus address: 0400~04FF

P4-	Name	Unit	Default	Range	Effective	Suitable mode	Chapter
00	Analog value of rated torque	0.01V	1000	150~3000	○	2	5-8-2
01	Torque command filter time	0.01ms	20	0~65535	√	1,2	5-8-4
02	Forward torque limit	1%	300	0~300	√	3, 4, 5, 6, 7	5-5-7

03	Reverse torque limit	1%	300	0~300	√	3, 4, 5, 6, 7	5-5-7
04	Forward external torque limit	1%	100	0~300	√	3, 4, 5, 6, 7	5-5-7
05	Reverse external torque limit	1%	100	0~300	√	3, 4, 5, 6, 7	5-5-7
06	Urgent stop torque	1%	300	0~300	○	3, 4, 5, 6, 7	5-2-3
07	Internal speed limit when torque controlling	rpm	2000	0~5000	√	1	5-8-5
08	Reserved						
09	Internal torque command setting	1%	0	-300~300	√	1	5-9-2
10	Torque command input dead area voltage	0.01V	0	0~100	○	2	5-8-6
11	Forward torque	1%	300	0~300	√	3,4,5,6,7	5-2-8
12	Reverse torque	1%	300	0~300	√	3,4,5,6,7	5-2-8
13	Over limit time	1ms	0	0-60000	√	3,4,5,6,7	5-2-8

P5: signal parameter setting

Modbus address: 0500~05FF

P5-	Name	Unit	Default	Range	Effective	Suitable mode	Chapter
00	Positioning finished width /COIN	Command pulse	7	0~250	○	5,6	5-3-6
01	Zero clamp speed /ZCLAMP	rpm	10	0~300	○	3,4	5-5-5
02	Rotation checking speed /TGON	rpm	20	1~1000	○	All the modes	5-11-3
03	Coincide speed checking signal width /V-CMP	rpm	10	1~250	○	All the modes	5-5-6
04	Near output signal width /NEAR	Command pulse	50	0~10000	○	5,6	5-3-7
05	Offset pulse limit value	256* command pulse	1000	0~65535	○	5,6	6-1-2
06	Servo OFF delay time (brake command)	1ms	0	0~500	○	All the modes	5-2-5
07	Brake command output speed	rpm	100	0~5000	○	All the modes	5-2-5
08	Brake command wait time	1ms	500	10~1000	○	All the modes	5-2-5
09	Input filter time	5ms	0	0~100	√	All the modes	
10	/S-ON servo signal 0000: signal is always ineffective 0001: input positive signal to SI1 0002: input positive signal to SI2 0003: input positive signal to SI3 0004: input positive signal to SI4 0005: input positive signal to SI5 0006: input positive signal to SI6	—	※1	※3	●	All the modes	5-2-1

	0010: signal is always effective 0011: input negative signal to SI1 0012: input negative signal to SI2 0013: input negative signal to SI3 0014: input negative signal to SI4 0015: input negative signal to SI5 0016: input negative signal to SI6						
11	/P-CON proportion action command ditto	—	※1	※3	●	All the modes	5-5-4
12	/P-OT forward drive prohibition ditto	—	※1	※3	●	All the modes	5-2-3
13	/N-OT reverse drive prohibition ditto	—	※1	※3	●	All the modes	5-2-3
14	/ALM-RST alarm reset ditto	—	※1	※3	●	All the modes	5-11-1
15	/P-CL forward external torque limit ditto	—	※1	※3	●	All the modes	5-5-7-2
16	/N-CL reverse external torque limit ditto	—	※1	※3	●	All the modes	5-5-7-2
17	/SPD-D internal speed selection ditto	—	※1	※3	●	1,2,3,4	5-6-3
18	/SPD-A internal speed selection Same to above	—	※1	※3	●	3,5,6	5-6-3
19	/SPD-B internal speed selection ditto	—	※1	※3	●	3,5,6	5-6-3
20	/C-SEL control mode selection ditto	—	※1	※3	●	All the modes	5-10
21	/ZCLAMP zero clamp ditto	—	※1	※3	●	3,4, 7	5-5-5
22	/INHIBIT command pulse prohibition ditto		※1	※3	●	5,6	5-3-8
23	/G-SEL gain switch ditto	—	※1	※3	●	All the modes	6-1-5
24	/CLR clear pulse offset ditto	—	※1	※3	●	5,6	5-3-5
25	/CHGSTP step change signal ditto	—	※1	※3	●	5	5-4-4
26	Reserved						
27	Reserved						
28	/COIN positioning finished 0000: not output to the terminal 0001: output positive signal from SO1 0002: output positive signal from SO2 0003: output positive signal from SO3 0011: output negative signal from SO1 0012: output negative signal	—	※2	※4	●	5,6	5-3-6

	from SO2 0013: output negative signal from SO3						
29	/V-CMP speed coincide checking ditto	—	※2	※4	●	All the modes	5-5-6
30	/TGON rotation checking ditto	—	※2	※4	●	All the modes	5-11-3
31	/S-RDY ready ditto	—	※2	※4	●	All the modes	5-11-4
32	/CLT torque limit ditto	—	※2	※4	●	3,4,5,6,7	5-5-7-5
33	/VLT speed limit checking ditto	—	※2	※4	●	1,2,5,6	5-8-5-3
34	/BK brake lock ditto	—	※2	※4	●	All the modes	5-2-5
35	/WARN warn ditto	—	※2	※4	●	All the modes	5-11-2
36	/NEAR near ditto	—	※2	※4	●	5,6	5-3-7
37	/ALM alarm ditto	—	※2	※4	●	All the modes	5-11-1
38	/Z encoder Z signal ditto		※2	※4	●	All the modes	5-11-5

※1 servo drives input terminal default value: refer to chapter 5-12-2.

※2 servo drive output terminal default value: refer to chapter 5-12-4.

※3 servo drive input terminal distribution: refer to chapter 5-12-1.

※4 servo drive output terminal distribution: refer to chapter 5-12-3.

Modbus address (Hex)

■ Parameter address

Parameter	Modbus Address (hex)	Modbus Address (decimal)	Parameter	Modbus Address (hex)	Modbus Address (decimal)
P0-00	0x0000	0	P1-00	0x0100	256
P0-01	0x0001	1	P1-01	0x0101	257
P0-02	0x0002	2	P1-02	0x0102	258
P0-03	0x0003	3	P1-03	0x0103	259
P0-04	0x0004	4	P1-04	0x0104	260
P0-05	0x0005	5	P1-05	0x0105	261
P0-06	0x0006	6	P1-06	0x0106	262
P0-07	0x0007	7	P1-07	0x0107	263
P0-08	0x0008	8	P1-08	0x0108	264
P0-09	0x0009	9	P1-09	0x0109	265
P0-10	0x000A	10	P1-10	0x010A	266
Parameter	Modbus Address (hex)	Modbus Address (decimal)	Parameter	Modbus Address (hex)	Modbus Address (decimal)
P2-00	0x0200	512	P3-00	0x0300	768
P2-01	0x0201	513	P3-01	0x0301	769
P2-02	0x0202	514	P3-02	0x0302	770
P2-03	0x0203	515	P3-03	0x0303	771
P2-04	0x0204	516	P3-04	0x0304	772
P2-05	0x0205	517	P3-05	0x0305	773
P2-06	0x0206	518	P3-06	0x0306	774
P2-07	0x0207	519	P3-07	0x0307	775

P2-10	0x020A	522	P3-08	0x0308	776
P2-11 至 P2-90	0x020B- 0x025A	523-602	P3-09	0x0309	777
P2-94	0x025E	606	P3-10	0x030A	778
P2-95	0x025F	607			
P2-96	0x0260	608			
P2-97	0x0261	609			
Parameter	Modbus Address (hex)	Modbus Address (decimal)	Parameter	Modbus Address (hex)	Modbus Address (decimal)
P4-00	0x0400	1024	P5-00	0x0500	1280
P4-01	0x0401	1025	P5-01	0x0501	1281
P4-02	0x0402	1026	P5-02	0x0502	1282
P4-03	0x0403	1027	P5-03	0x0503	1283
P4-04	0x0404	1028	P5-04	0x0504	1284
P4-05	0x0405	1029	P5-05	0x0505	1285
P4-06	0x0406	1030	P5-06	0x0506	1286
P4-07	0x0407	1031	P5-07	0x0507	1287
P4-08	0x0408	1032	P5-08	0x0508	1288
P4-09	0x0409	1033	P5-09	0x0509	1289
P4-10	0x040A	1034	P5-10	0x050A	1290
P4-11	0x040B	1035	P5-11	0x050B	1291
P4-12	0x040C	1036	P5-12	0x050C	1292
P4-13	0x040D	1037			
Parameter	Modbus Address (hex)	Modbus Address (decimal)	Parameter	Modbus Address (hex)	Modbus Address (decimal)
P5-13	0x050D	1293	P5-26	0x051A	1306
P5-14	0x050E	1294	P5-27	0x051B	1307
P5-15	0x050F	1295	P5-28	0x051C	1308
P5-16	0x0510	1296	P5-29	0x051D	1309
P5-17	0x0511	1297	P5-30	0x051E	1310
P5-18	0x0512	1298	P5-31	0x051F	1311
P5-19	0x0513	1299	P5-32	0x0520	1312
P5-20	0x0514	1300	P5-33	0x0521	1313
P5-21	0x0515	1301	P5-34	0x0522	1314
P5-22	0x0516	1302	P5-35	0x0523	1315
P5-23	0x0517	1303	P5-36	0x0524	1316
P5-24	0x0518	1304	P5-37	0x0525	1317
P5-25	0x0519	1305	P5-38	0x0526	1318

■ Monitor state address

Explanations	Modbus Address (hex)	Modbus Address (decimal)	Explanations	Modbus address (hex)	Modbus Address (decimal)
U-00 Motor speed	0x0700	1792	F3-00 current alarm code	0x0716	1814
U-01 Speed command	0x0701	1793	F3-01 Current warn code	0x0717	1815
U-02 Internal torque command	0x0702	1794	F3-02 Alarm/warn code 1	0x0718	1816
U-03 Rotation angle (physical angle)	0x0703	1795	F3-03 U phase current when alarming	0x0719	1817

U-04 Rotation angle (electricity angle)	0x0704	1796	F3-04 V phase current when alarming	0x071A	1818
U-05 Bus voltage	0x0705	1797	F3-05 DC bus voltage when alarming	0x071B	1819
U-06 Module temperature	0x0706	1798	F3-06 IGBT temperature when alarming	0x071C	1820
U-07 Input command pulse speed	0x0707	1799	F3-07 The speed when alarming	0x071D	1821
U-08 Offset pulse value (low 16 bits)	0x0708	1800	F3-08 Internal torque command when alarming	0x071E	1822
U-09 Offset pulse value (high 16 bits)	0x0709	1801	F3-09 V-REF value when alarming	0x071F	1823
U-10 Rotation angle (low 16 bits)	0x070A	1802	F3-10 T-REF value when alarming	0x0720	1824
U-11 Rotation angle (high 16 bits)	0x070B	1803	F3-11 Alarm/warn code 2	0x0728	1832
U-12 Input command pulse (low 16 bits)	0x070C	1804	F3-12 Alarm/warn code 3	0x0729	1833
U-13 Input command pulse (high 16 bits)	0x070D	1805	F3-13 Alarm/warn code 4	0x072A	1834
U-14 Feedback pulse (low 16 bits)	0x070E	1806	F3-14 Alarm/warn code 5	0x072B	1835
U-15 Feedback pulse (high 16 bits)	0x070F	1807	F3-15 Alarm/warn code 6	0x072C	1836
U-16 Current accumulated position (low 16 bits)	0x0710	1808	F3-16 Alarm/warn code 7	0x072D	1837
U-17 Current accumulated position (high 16 bits)	0x0711	1809			
U-18 Present current	0x0712	1810			
U-19 Analog input (speed)	0x0713	1811			
U-20 Analog input (torque)	0x0714	1812			

■ Input signal state (can read and write)

Explanation	Address (hex)	Address (decimal)	Explanation	Address (hex)	Address (decimal)
/S-ON servo signal	0x0800	2048	/SPD-A internal speed selection	0x0808	2056
/P-CON proportion action command	0x0801	2049	/SPD-B internal speed selection	0x0809	2057
/P-OT forward drive prohibition	0x0802	2050	/C-SEL control mode selection	0x080A	2058
/N-OT reverse drive prohibition	0x0803	2051	/ZCLAMP zero clamp	0x080B	2059
/ALM-RST reset alarm	0x0804	2052	/INHIBIT command pulse prohibition	0x080C	2060
/P-CL forward external torque limit	0x0805	2053	/G-SEL gain switch	0x080D	2061
/N-CL reverse external torque limit	0x0806	2054	/CLR pulse clear	0x080E	2062
/SPD-D internal speed selection	0x0807	2055	/CHGSTP change step	0x080F	2063

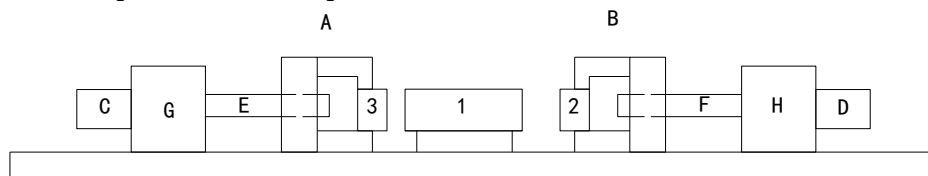
Note: for example, /S-ON signal address 0x0800=1, this function is effective; 0x0800=0, this function is ineffective.

■ Output state signal (can read, cannot write)

Explanation	Address (hex)	Address (decimal)	Explanation	Address (hex)	Address (decimal)
Positioning finished (/COIN)	0x0812	2066	Brake lock (/BK)	0x0818	2072
Coincidence speed checking (/V-CMP)	0x0813	2067	Warn (/WARN)	0x0819	2073
Rotation checking (/TGON)	0x0814	2068	Near (/NEAR)	0x081A	2074
Ready (/S-RDY)	0x0815	2069	Alarm output (/ALM)	0x081B	2075
Torque limit (/CLT)	0x0816	2070	Encoder Z signal (/Z)	0x081C	2076
Speed limit checking (/VLT)	0x0817	2071			

Appendix 2 Application

Mode 6: pulse command position mode



Equipment introduction:

This is a welder. Workpiece 1, 2, 3 are the object to be operated. 2 and 3 is fixed on B and A individually. A and B can whole move and be pushed by ball screw E and F. The screw pitch is 5mm. C and D is servo motor. G and H is reducer. The deceleration ratio is 40.

It needs to adjust the machine with standard dimension workpiece and find the origin of A and B.

Workpiece 1 lies on the worktable and moves left and right. Its dimension is positive tolerance, cannot shorter than standard workpiece. The process to put the workpiece is random. It requires that the left and right soldering is symmetrical.

A and B move toward 1 with 3 and 2 at the same speed. Whatever the position of 1, 2 or 3 will touch 1 at first and push 1 to another side until 2 and 3 all touch 1. The result is the motor torque will increase. At this time, 1 will at the symmetrical position.

A and B will return to the origin position after soldering is finished.

❖ Analysis

1. Make sure the work mode: 6
2. It needs to judge whether 2 and 3 touch 1 when finding the symmetrical point. The sign is servo output torque will increase. It needs to use torque limit (P4-02, P4-03) and torque limit output signal /CLT.
3. As the dimension of workpiece is larger than standard, offset pulse will remain in servo when the symmetrical point is found. /CLR signal can clear the pulse. The servo motor running distance is different from PLC pulse number. If it needs to know the actual distance, servo encoder feedback /A+, /A-, /B+, /B- and AB phase count are needed.

4. The motion direction of A and B.

❖ **Signal and terminal**

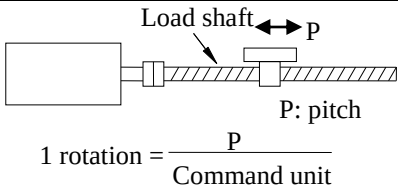
/COIN positioning finished signal: SO1

/CLT torque up to upper limit output: SO2

/CLR pulse offset clear input: SI1

Encoder feedback signal /A+, /A-, /B+, /B-

❖ Calculate the electronic gear ratio

Step	Explanation	Ball screw
	 1 rotation = $\frac{P}{\text{Command unit}}$	
1	Confirm the mechanical specification	Ball screw pitch: 5mm Reduction ratio: 40/1
2	Confirm the encoder pulse number	2500P/R
3	Decide the command unit	1 command unit: 0.001mm
4	Calculate the motion value of load shaft rotate 1 circle	5mm/0.001mm = 5000
5	Calculate the electronic gear ratio	$\frac{B}{A} = \frac{2500 \times 4}{5000} \times \frac{40}{1} = \frac{80}{1}$
6	Set the user parameters	P2-02=80 P2-03=1

❖ Parameter setting

Running mode: P0-01=6

Pulse command state: P2-00=2

Electronic gear ratio: P2-02=80 P2-03=1

Forward torque limit: P4-02=150

Reverse torque limit: P4-03=150

Positioning finished width: P5-00=7

/S-ON: P5-10=0010

/CLR: P5-24=0001

/COIN: P5-28=0001

/CLT: P5-32=0002, P5-37=0000

❖ Debug

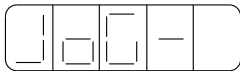
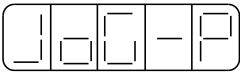
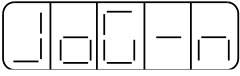
1. Initial debug

(a) Connect the cables correctly. Connect U, V, W, PE one-to-one, don't cross them.

(b) open-loop test-running: power on, set F1-01=1, check if the motor can work normally. If yes, enter F1-00. If not, check the cables.

(c) Jog test-running: enter F1-00. Press ENTER to enable the motor. Press INC for forward jog, press DEC for reverse jog. Press STATUS/ESC to quit the jog running.

4 states when jogging:

State	Panel display	State	Panel display
Idle		Forward run	
Enable		Reverse run	

(d) Current check offset auto-adjustment

Enter F1-02, it shows rEF.

Press ENTER, it shows rEF and flickers.

After 5s the auto-adjustment finished, it shows donE.

Press STATUS/ESC to exit.

-

2. Debug the motor with machine

(a) Check the motor rotation direction, if it is reverse from the actual needs, set F1-05 to 0 (servo force OFF). Then set P0-05 to 1, re-power on the servo.

(b) Check the servo stability and response, adjust the servo gain.

3. Debug with PLC program.

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