XINJE

DS5B series servo drive

Fast manual

Wuxi Xinje Electric Co., Ltd.

Data No. SC503 20180511 1.0

This manual is suitable for below users

- Servo system installation
- Installation and wiring
- Test run and servo debug
- Maintenance and inspection

Responsibility statement

- the contents of the manual though have been carefully checked, but mistakes is unavoidably, we can't guarantee completely consistent
- we will check the contents of the manual, and carry on the correction in future versions, welcome to put forward valuable opinion
- The contents described in the manual, if there are any changes, please understand we will not prior notice

Contact us

If you have any questions about the use of this product, please contact the agent or xinje company.

- Tel: 0510-85134136
- Fax: 0510-85111290
- Add: 4 / f, building 7, creative industrial park, no. 100, ticui road, wuxi city
- Code: 214072
- Website: www.xinje.com

Related manual

- Please contact us for the DS5B series user manual.

Catalog

►►Confirmation when receive the products

After the arrival of the product, please confirm the integrity of the product in the following aspects.

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.
The panel displays flashing “code”	Please set motor code in P0-33 (the motor code please refer to motor label)
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 screwdrive.
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 P0-33 on the servo drive.

If there is anything wrong with the items listed above, please contact the agent or xinje company.

►►Safety caution

- Confirmation when receive products
  - ✓ DO NOT install any driver which is damaged, lack of accessories or not the same with the model ordered.
- Installation
  - ✓ Cut off external power supply before installation.
- Wiring
  - ✓ Cut off external power supply before wiring.
  - ✓ Connect AC power supply to the corresponding terminals.

- ✓ Do not connect a three-phase power supply to the U, V, or W output terminals.
- ✓ Use $2mm^2$ wire to grounding the ground terminals.
- ✓ For wiring please make sure that the encoder lines, power lines in loose state, not tight, so as to avoid cable damage.

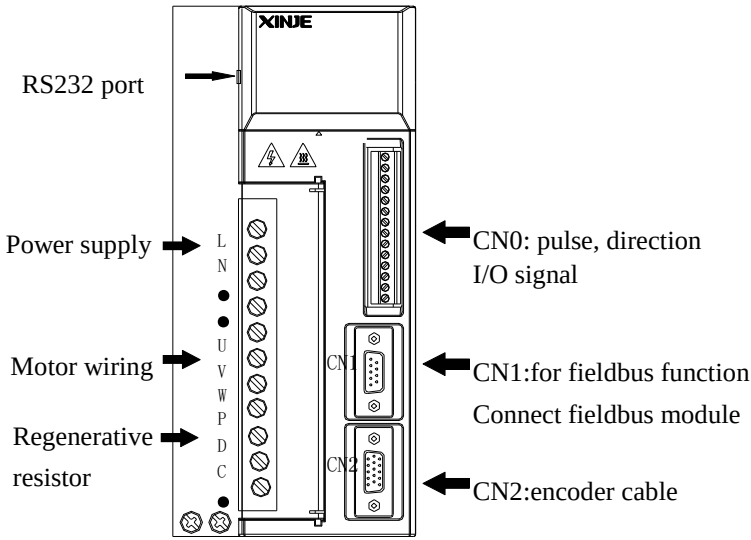
■ Product running and maintenance

- ➢ Do not remove the panel cover while the power is ON.
- ➢ Do not touch terminals for 10 minutes after the power has been turned OFF.
- ➢ Do not connect with any motor when trial operation.
- ➢ Before starting operation with a machine connected, change the settings to match the parameters of the machine.
- ➢ Do not attempt to change wiring while the power is ON.
- ➢ Do not touch the heat sinks during operation.

1.Servo system

1-1.Servo drive

1-1-1.Part description



1-1-2.Model name

DS5B – 2 0P7 – PTA

Series name
DS5B: basic type

Voltage level
2: 220V
4: 380V

Suitable motor capacity
0P1: 0.1KW
0P2: 0.2KW
0P4: 0.4KW
0P7: 0.75KW
1P5: 1.5KW

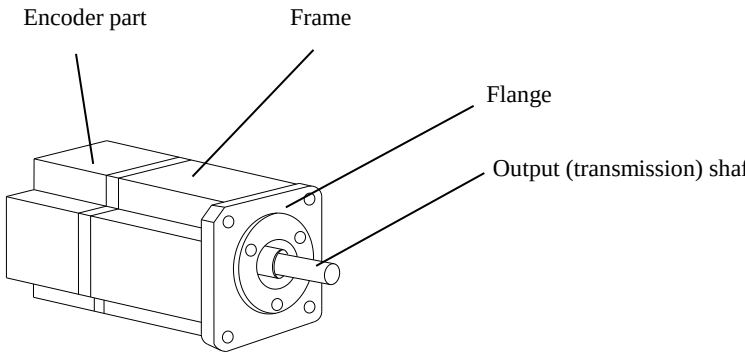
Configuration type:
P-input command type: pulse
Encoder type:
T- communication encoder
A-design order: A

1-1-3.Performance

Servo unit		DS5B series 220V
Suitable encoder		17/23bit encoder
Input power supply		DS5B-2□P□-PTA: single/3-phase AC200~240V, 50/60Hz 【below 1.5KW(except 1.5KW) can use single phase AC200~240V 50/60Hz; 1.5KW and up please use 3-phase AC200~240V 50/60Hz. (for single phase power supply, please connect L1, L3, otherwise it will affect the power-off memory)】
Control method		3-phase full wave rectifier IPM PWM control sine current driving mode
Using condition	Using temperature	0～+50 ℃
	Storage temperature	-20～+85 ℃
	Humidity	Below 90%RH (no condensation)
	Resistance to vibration and impact strength	4.9m/s^2 / 19.6m/s^2
Structure		Base installation

1-2.Servo motor

1-2-1.Part description



1-2-2.Model name

MS5S – 80 ST E – C S 02430 B Z - 2 0P7 – S01

Name	inertia
MS5S	Low inertia
MS5G	Middle inertia
MS5H	High inertia

Name	Base no.
60	60 base
80	80 base

Name	Product name
ST	Sine driven motor

Name	Oil seal
–	–
E	with oil seal

Name	Encoder type
C	Magnetic
T	Optical

Name	Encoder precision
S	Single rotate 17 bits
M	Multi-rotate 17 bits
U	Single rotate 23 bits
L	Multi-rotate 23 bits

Name	Rated torque (N m)	Rated speed (rpm)
00630	0.637	3000
01330	1.3	3000
02430	2.39	3000

Name	Shaft
A	No key
B	With key

Name	Power-off brake
–	–
Z	with

Name	Voltage level
2	220V
4	380V

Name	Rated power (KW)
0P2	0.2
0P4	0.4
0P7	0.75

Name	Design no.
S01	standard

1-3.Cable

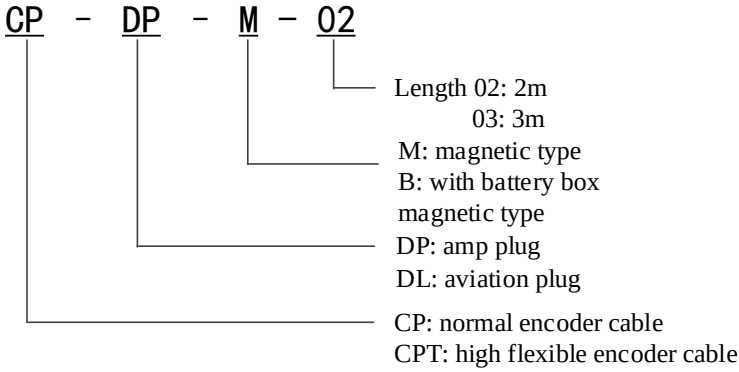
1-3-1.Cable configuration

Servo drive model	Encoder cable	Motor cable	Brake cable
DS5B-20P1-PTA DS5B-20P2-PTA DS5B-20P4-PTA DS5B-20P7-PTA	CP-DP-M(B)-length	CM-P07-length	

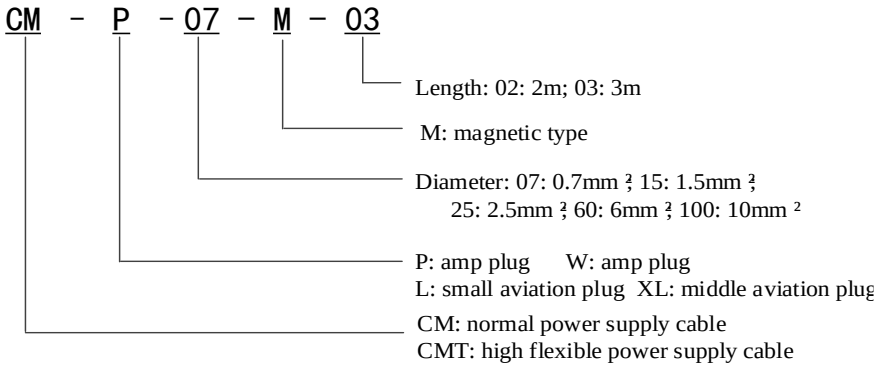
DS5B-21P5-PTA DS5B-22P3-PTA DS5B-22P6-PTA	CP-DL-M(B)-length	CM-L15-length	CB-P03-length CMB-W07-M-length
DS5B-43P0-PTA DS5B-45P5-PTA DS5B-47P5-PTA	CP-DL-M(B)-length	CM-XL60-length	

1-3-2.Model name

■ Encoder cable model



■ Power supply cable model



■ Brake cable model

CB-P03-length (Applicable to 750W and below power motors with suffix S01).

1-4.Other accessories

1-4-1.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 model	Regenerative resistor connection terminals
DS5B-2□P□-PTA	for internal regenerative resistor: short P+ and D, disconnect P+ and C, P0-24=0. for external regenerative resistor: connect resistor between P+ and C, disconnect P+ and D, P0-24=1, P0-25=power value, P0-26=resistor value.

The below table is external regenerative resistor specifications for each motor.

Servo drive	Min resistor (cannot smaller than this value)	External regenerative resistor (recommend value)	External regenerative resistor (recommend power)
DS5B-20P2-PTA	≥50Ω	50Ω—100Ω	≥200W
DS5B-20P4/7-PTA	≥40Ω	40Ω—100Ω	≥500W
DS5B-21P5-PTA DS5B-22P3/6-PTA	≥25Ω	25Ω—50Ω	≥1000W
DS5B-43P0-PTA	≥55Ω	25Ω-65Ω	≥2000W
DS5B-45P5-PTA	≥25Ω	25Ω-50Ω	≥2000W
DS5B-47P5-PTA	≥25Ω	25Ω-50Ω	≥2000W

Note:

1. 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.

2. When you choose the regenerative resistor, please make the resistor value close to the min value of recommend value. The resistor power is decided by the actual consition specially the heat.

2.Product installation

2-1.Servo drive installation

2-1-1.Installation location

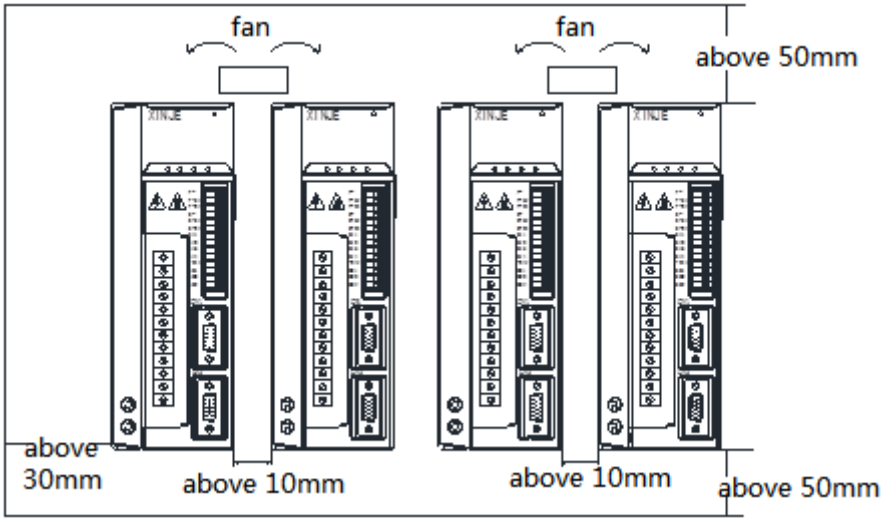
- Please install in the cabinet without sunshine and rain
- Please get away from corrosive and flammable gases
- please do not install in high temperature, humidity, dust, metal dust environment
- No vibration location

2-1-2.Environment conditions

Item	Description
Using temperature	0℃~40℃ (not freeze)
Using humidity	-20%~90%RH (no condensation)
Storage temperature	-20℃~60℃
Storage humidity	-20%~90%RH (no condensation)
Protection level	IP65

2-1-3.Installation standard

Be sure to comply with the installation standard in the control panel shown below, which is applicable for installing multiple servo drives side-by-side in the control panel (hereinafter called "side-by-side installation" for short).



- Servo drive direction

When installing, make the front of the servo drive (the actual installation surface of the operator) facing the operator and make it vertical to the wall. For the drive with regenerated resistance at the bottom, please pay attention to the heat dissipation of the mounting surface to avoid overheating of the drive and causing fire.

- 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.

- The conditions in the control cabinet

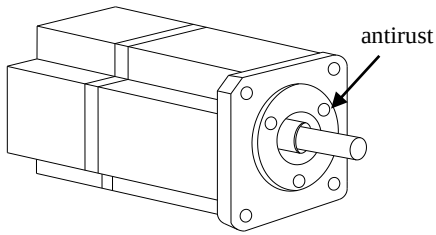
- Ambient Temperature: 0~50 ℃
- Humidity: 90%RH or less
- Vibration: 4.9m/s^2
- Condensation and Freezing: None
- Ambient Temperature for Long-term Reliability: 50 ℃ maximum

2-2.Servo motor installation

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 servo motor.



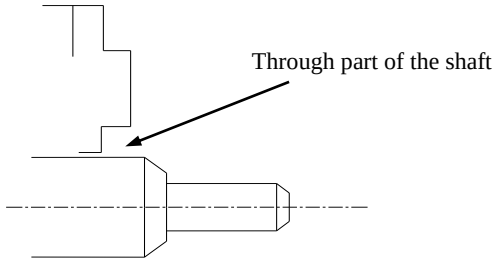
2-2-1.Installation environment

- Free of corrosive or explosive gases
- Please choose oil seal motor in the environment with grinding fluid, oil mist, iron powder, cutting, ect
- Away from the heating source such as stove

- please do not use the motor in a closed environment. Closed environment will lead to motor temperature, shorten service life

2-2-2.Environment conditions

When used in places with water or oil, the protective effect can be achieved through the treatment of the motor. However, when sealing the shaft through part, please specify the motor with an oil seal. Please install the connector downward.

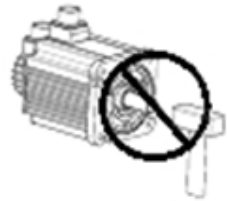


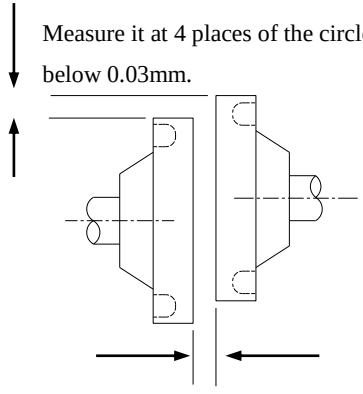
MS series servo motors are for indoor use, please use in the following installation conditions:

Item	Description
Using temperature	0℃~40℃ (not freeze)
Using humidity	-20%~90%RH (no condensation)
Storage temperature	-20℃~60℃
Storage humidity	-20%~90%RH (no condensation)
Protection level	IP65

2-2-3.Installation notes

Item	Description
Rust proofing	◆ Please clean the "anti-rust agent" at the extension end of the shaft of the servo motor before installation, and then do the relevant anti-rust treatment.

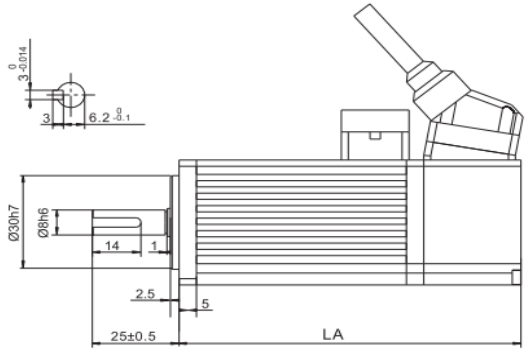
Encoder notes	◆ The installation process is not allowed to impact the shaft extension, otherwise the internal encoder will be broken. 
	◆ When a pulley is mounted on a servo motor shaft with a keyway, screw holes are used at the end of the shaft. To install the pulley, first insert the double-headed nail into the screw hole of the shaft, use the washer on the surface of the coupling end and gradually lock the nut into the pulley. ◆ For the servo motor shaft with a keyway, the shaft end screw hole is used for installation. For a shaft without a keyway, a frictional coupling or similar method is used. ◆ When removing the pulley, a pulley stripper is used to prevent the bearing from being strongly impacted by the load. ◆ To ensure safety, a protective cover or similar device, such as a pulley mounted on a shaft, is installed in the rotating area.

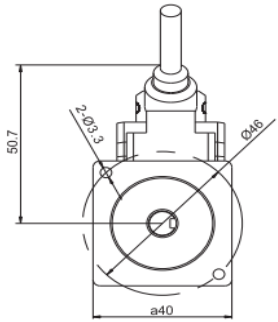
Concentricity	◆ When installing the servo motor, make it meet the centering precision requirements as shown below. If the centering is not sufficient, vibration may occur, and sometimes the bearing and encoder may be damaged. When installing the shaft coupler, please do not directly impact the motor shaft, otherwise it will damage the encoder installed on the load reverse side of shaft end.  Measure it at 4 places of the circle, the difference should be below 0.03mm. Measure it at 4 places of the circle, the difference should be below 0.03mm.
Installation direction	◆ The servo motor can be mounted horizontally or vertically
Oil and water solution	When using in places with drops of water, please use it on the basis of confirming the protection level of the servo motor. Specify a servo motor with an oil seal when there is an oil droplet that drips to the through part of the shaft. Using condition of motor with oil seal: When using, please make sure the oil level is lower than the lip of the oil seal. Please use the motor in a condition where the oil seal keeps the spray

	level in good condition. When installing the servo motor vertically up, please pay attention not to grease the lip of the oil seal.
The stress state of the cable	Do not "bend" the wire or apply "tension" to it. Especially, the core wire of the signal wire is 0.2mm or 0.3mm, very thin.
connector	◆ When the connector is connected, please make sure there is no garbage or metal sheet or other foreign matter in the connector. ◆ When connecting the coupling to the servo motor, it is important to connect the coupling from the side of the main circuit cable of the servo motor first, and the ground wire of the main cable must be connected reliably. If one side of the encoder cable is connected first, the encoder maybe error due to potential difference between PE. ◆ Please make sure that the pins are aligned correctly when engaged. ◆ The fraud connector is made of resin. Do not impact the connector to avoid damage. ◆ When handling operations while the cable remains connected, be sure to hold the servo motor body. If you only hold the cable for handling, you may damage the connector or break the cable. ◆ If a curved cable is used, full attention shall be paid to the distribution of the cables and no stress shall be applied to the connector part. If stress is applied to the connector part, the connector may be damaged.

2-3.Servo motor dimension

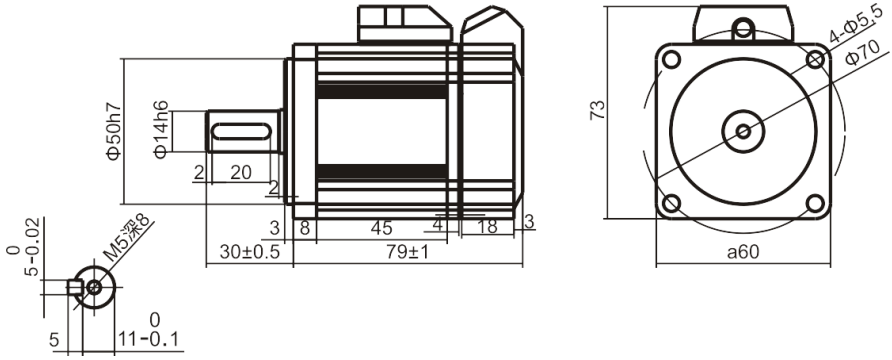
■ 40 series motor dimension Unit: mm





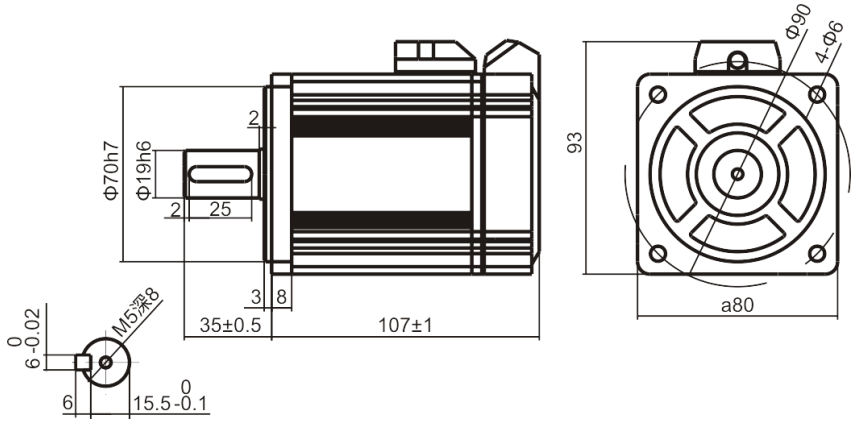
Motor model	Body length		Inertia level
	Normal	With brake	
MS5S-40ST-CS0030□□-20P1-SO1/S02	99±1.5	129.5±1	Low inertia

■ 60 series motor dimension Unit: mm



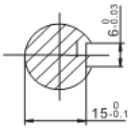
Motor model	Body length		Inertia level
	Normal	With brake	
MS5S-60ST-CS00630□□-20P2-SO1	79±1	114±1	Small inertia
MS5S-60ST-CS01330□□-20P4-S01	99±1	134±1	
MS5S-60ST-TL01330□□-20P4-S01	99±1	134±1	
MS5H-60ST-CS01330□□-20P4-SO1	111±1	146±1	Large inertia
MS5H-60ST-CS00630□□-20P2-SO1	91±1	126±1	

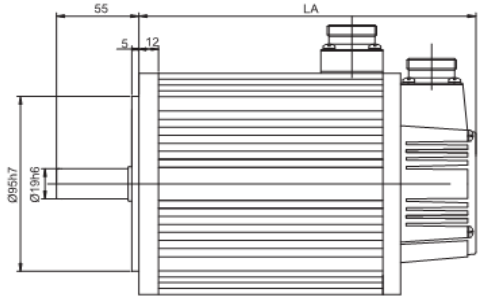
■ 80 series motor dimension Unit: mm

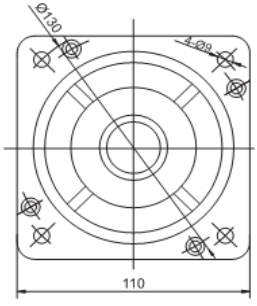


Motor model	Body length		Inertia level
	Normal	With brake	
MS5S-80ST-CS02430□□-20P7-SO1	107±1	144±1	Small inertia
MS5S-80ST-CS03230□□-21P0-SO1	128±1	165±1	
MS5H-80ST-CS02430□□-20P7-SO1	119±1	156±1	Large inertia
MS5H-80ST-CS03230□□-21P0-SO1	140±1	177±1	

■ 110 series motor dimension Unit: mm

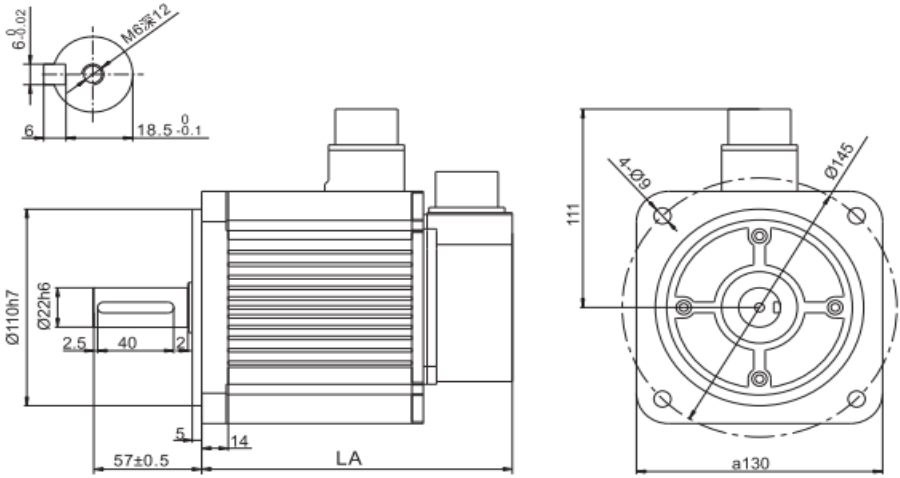






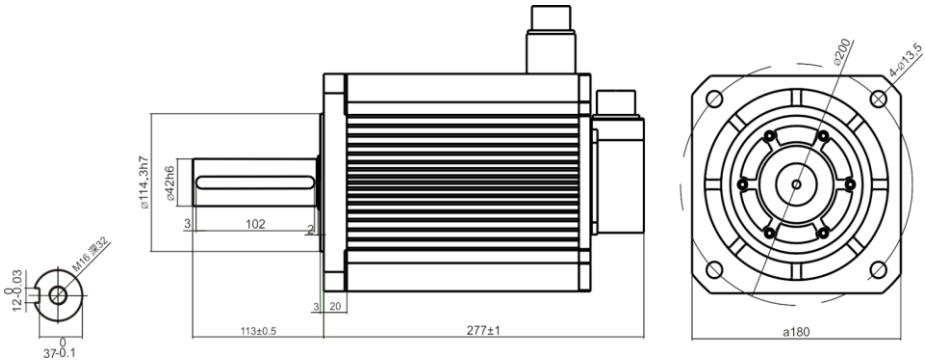
Motor model	Body length		Inertia level
	Normal	With brake	
MS5S-110ST-CS03230□□-21P0-SO1	189	263	Small inertia
MS5S-110ST-CS04830□□-21P5-S01	204	278	
MS5S-110ST-CS06430□□-22P0-S01	181±1	229±1	
MS5S-110ST-TL03230□□-21P0-S01	189	263	
MS5S-110ST-TL04830□□-21P5-S01	204	278	
MS5S-110ST-TL06430□□-22P0-S01	181±1	229±1	
MS-110ST-T04030□□-21P2	189	263	-
MS-110ST-T05030□□-21P2	204	278	

■ 130 series motor dimension Unit: mm



Motor model	Body length		Inertia level
	Normal	With brake	
MS-130ST-C06025□□-21P5	180±1	239±1	-
MS-130ST-C10015□□-21P5	206±1	-	-
MS-130ST-T15015G□□-22P3	235±1	-	-
MS-130ST-CM15015G□□-22P3	235±1	-	-
MS-130ST-T07730□□-22P4	205±1	246±1	-

■ 180 series motor dimension Unit: mm

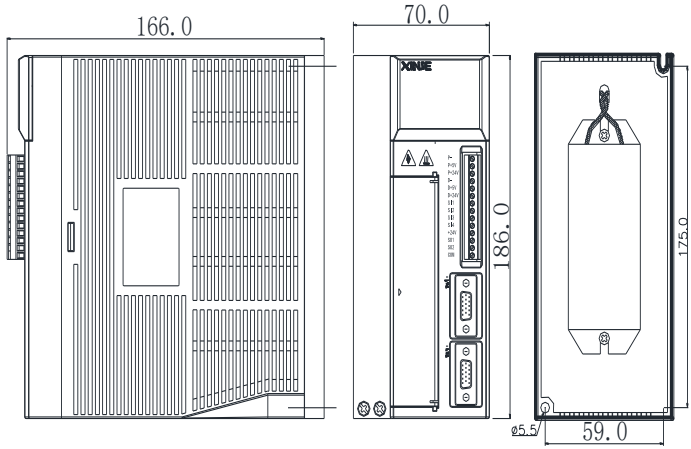


Motor model	Body length		Inertia level
	Normal	With brake	
MS5G-180ST-T19015□□-42P9	221±1	303±1	Middle inertia
MS5G-180ST-T28015□□-44P4	247±1	329±1	
MS5G-180ST-T35015□□-44P4	277±1	359±1	
MS5G-180ST-T48015□□-47P5	308±1	390±1	

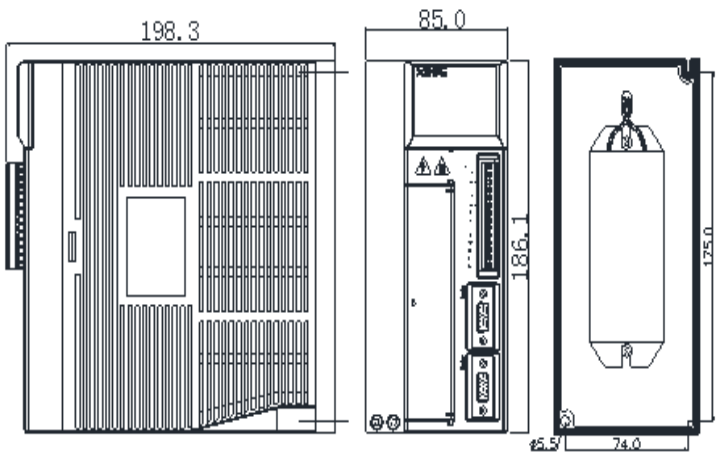
2-4.Servo drive dimension

Unit: mm

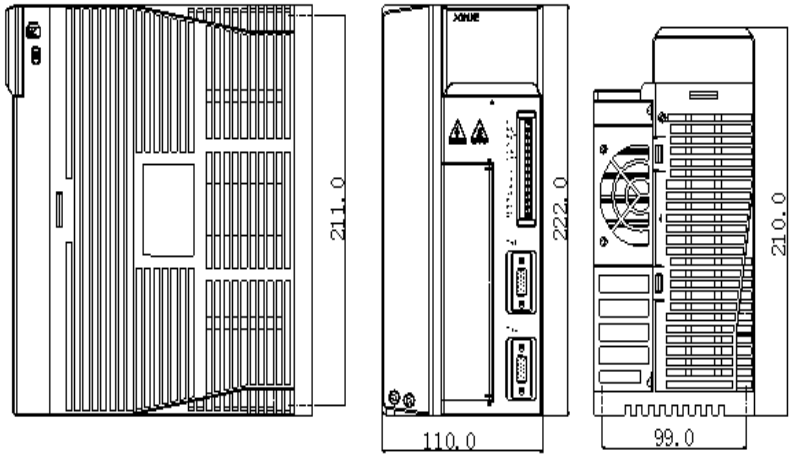
- DS5B-20P1-PTA/DS5B-20P2-PTA/DS5B-20P4-PTA/DS5B-20P7-PTA



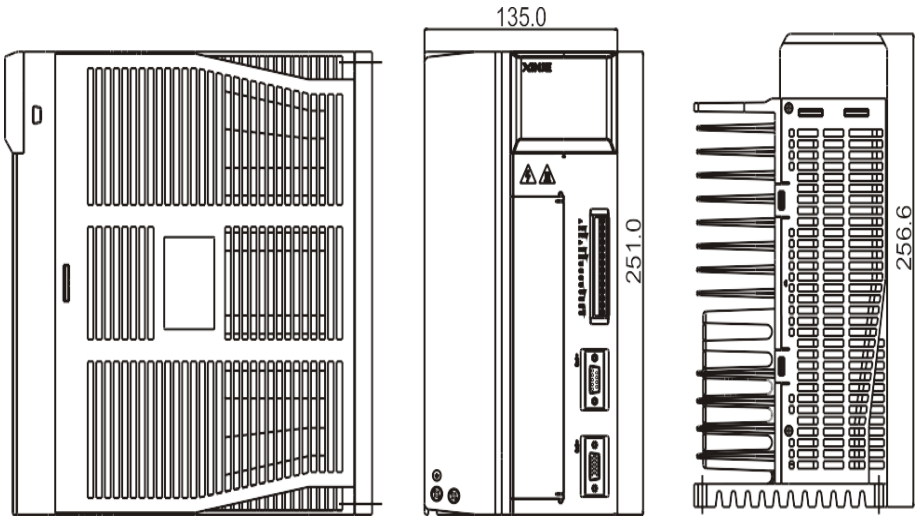
- DS5B-21P5-PTA/DS5B-22P3-PTA/DS5B-22P6-PTA



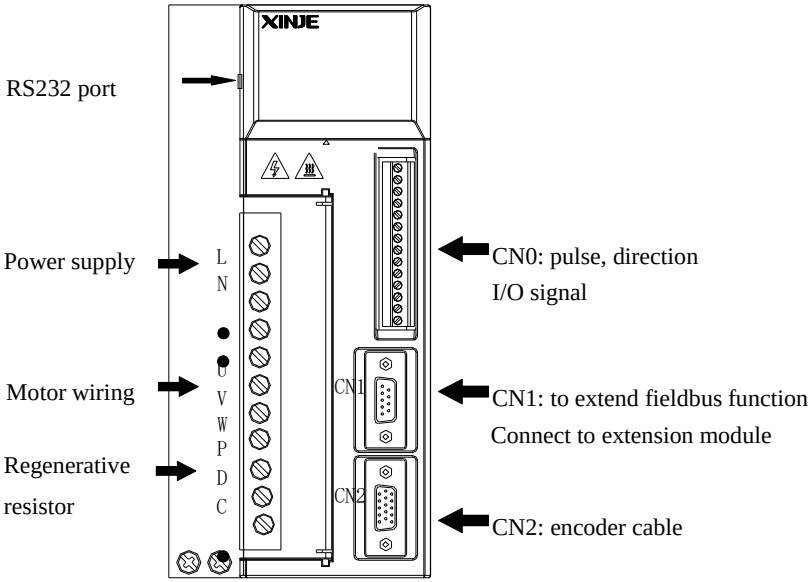
■ DS5B-43P0-PTA



■ DS5B-45P5-PTA/DS5B-47P5-PTA

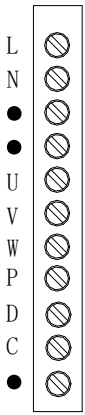


3.Servo drive and motor wiring

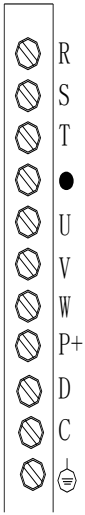


3-1.Main circuit terminals

■ DS5B-2□P□-PTA

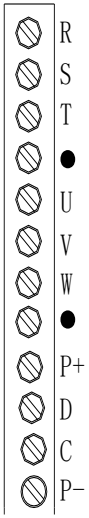


Terminal	Function	Explanation
L/N	Power supply input of main circuit	DS5B-20P1/2/4/7-PTA： Single phase AC200~240V, 50/60Hz
•	Vacant terminal	-
U、V、W	Motor terminals	Connect the motor (Note: the ground line is on the cooling fin, please check it before power on!)
P+、D、C	Internal regenerative resistor	Short P+ and D, disconnect P+ and C, set P0-24=0
	External regenerative resistor	Connect regenerative resistor between P+ and C, disconnect P+ and D, set P0-24=1, P0-25= power value, P0-26= resistor value



■ DS5B-21P5-PTA、DS5B-22P3-PTA、DS5B-41P5-PTA

Terminal	Function	Explanation
R/S/T	Power supply input of main circuit	DS5B-21P5/22P3-PTA： 3-phase AC200~240V, 50/60Hz DS5B-41P5-PTA： 3-phase AC360~400V, 50/60Hz
●	Vacant	-
U、V、W	Motor terminals	Connect the motor (Note: the ground line is on the cooling fin, please check it before power on!)
P+、D、C	Internal regenerative resistor	Short P+ and D, disconnect P+ and C, set P0-24=0
	External regenerative resistor	Connect regenerative resistor between P+ and C, disconnect P+ and D, set P0-24=1, P0-25= power value, P0-26= resistor value
⏚	Ground	Connect to ground terminal of motor, then connect to the ground



■ DS5B-43P0/45P5/47P5-PTA

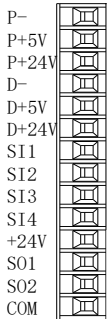
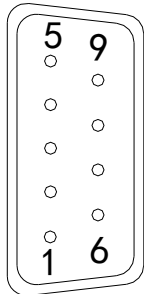
Terminal	Function	Explanation
R/S/T	Power supply input of main circuit	3-phase AC360~400V, 50/60Hz
●	Vacant	-
U、V、W	Motor terminals	Connect the motor (Note: the ground line is on the cooling fin, please check it before power on!)
●	Vacant	-
P+、D、C	Internal regenerative resistor	Short P+ and D, disconnect P+ and C, set P0-24=0
	External regenerative resistor	Connect regenerative resistor between P+ and C, disconnect P+ and D, set P0-24=1, P0-25= power value, P0-26= resistor value
P+/P-	Bus terminal	Real-time check the bus voltage, please take attention of this terminal

■ Wiring terminals of servo motor

Signal	40, 60, 80, 90, 110, 130, 180 series motor
PE	4-yellow green
U	1-brown
V	3-black
W	2-blue

3-2. Control terminals

The serial numbers of the following connectors are in the order of viewing the welding side.

CN0	CN1
	

■ 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 terminals

No.	Name	Explanation	No.	Name	Explanation
1	GND	GND-485	2	A1	RS485+
3	B1	RS485-	4	A2	RS485+
5	B2	RS485-	6	GND	GND-485
7	NC	Reserved	8	NC	Reserved

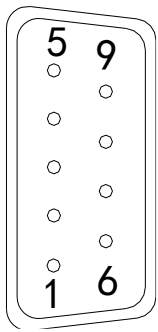
9	NC	Reserved	-	-	-

Note:

The servo motor bus function needs to be equipped with the bus module, which is inserted into the driver CN1 port for the purpose of extending the bus function. Please note that the transfer module should not be hot-pluggable. It is recommended to use the profibus standard cable to achieve the best communication reliability.

■ CN2 terminals

CN2 connector terminal arragement (facing the weld):

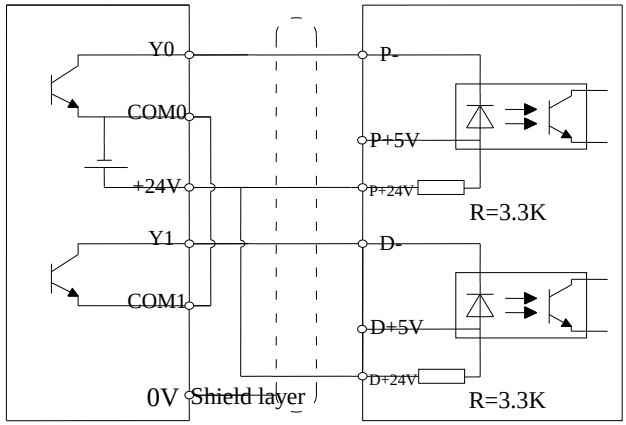


drive interface	Name	Motor encoder interface
		40, 60, 80, 110, 130, 180 series
1	\	\
2	\	\
3	SD-	shield
4	SD+	SD+
5	shield	SD-
6	0V	\
7	\	5V
8	5V	0V
9	\	\

Pulse + direction and AB phase interface circuit:

Open collector（24V）

PLC, SCM, ect. Servo drive

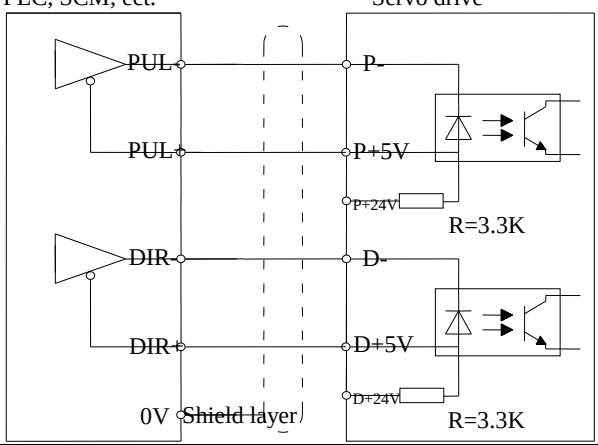


When upper device is open collector output, please use this wiring diagram.

Please note: P+5V and D+5V must be vacant.

Differential mode（5V）

PLC, SCM, ect. Servo drive

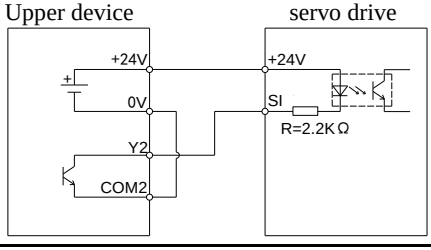
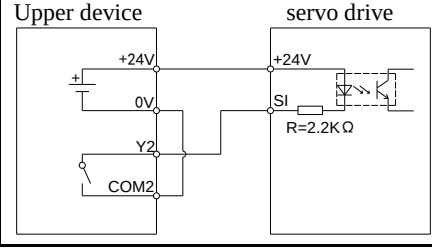


When upper device is 5V differential output, please use this wiring diagram.
Please note: P+24V and D+24V must be vacant.

■ 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.

Signal input	Function	Support model
SI1	S-ON/enable	5B
SI2	ALM-RS/alarm reset	5B
SI3	P-OT/forward run prohibition	5B
SI4	N-OT/reverse run prohibition	5B

Open collector (24V power supply)	Relay (24V power supply)
	

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

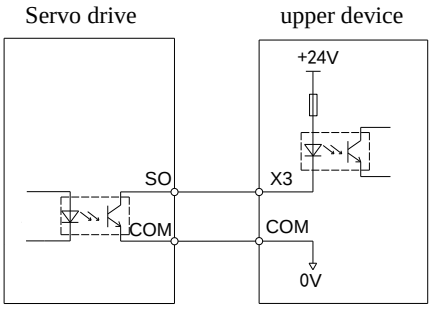
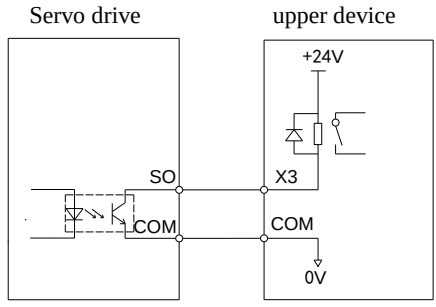
Voltage: max DC30V

Current: max DC50mA

■ SO output terminal

Signal output	Function	Support model
SO1	COIN/positioning complete	5B
SO2	ALM/alarm	5B

■ Output signal wiring diagram

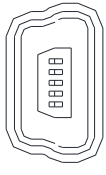
Optocoupler type	Relay type
	

Note: max load current 400mA (if control the brake motor by SO signal, please confirm the brake current, if it is larger than 400mA, please use intermediate relay). 750w and above power motor is recommended to use intermediate relay.

3-3. Communication port

■ RS-232 communication

Connect to PC for debugging.

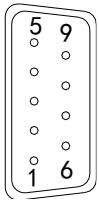


(5-pin port)

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

Note: please use the cable supplied by XINJE Company

■ RS-485 communication



CN1 port: terminals at drive side

Pin no.	Name
CN1-2	A
CN1-3	B

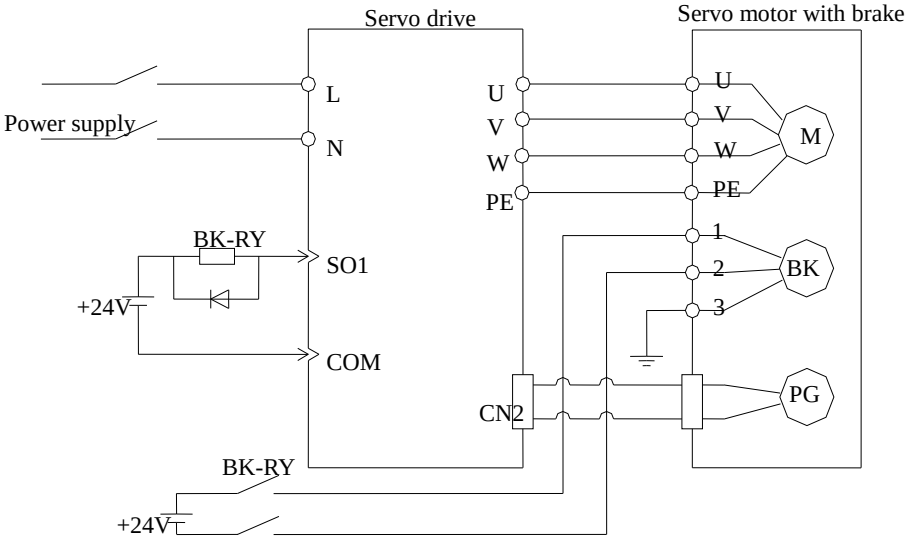
Note: the servo motor bus function needs to be equipped with the bus module, which is inserted into the driver CN1 port for the purpose of extending the bus function. Please note that the transfer module should not be hot-pluggable. It is recommended to use the profibus standard cable to achieve the best communication reliability.

RS485 default communication parameters: baud rate 19200bps, data bit 8, stop bit 1, even parity, Modbus station no.1.

3-4. Power–off brake（BK）

3-4-1. 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: (1) the working voltage of brake is DC 24V.

(2) In the above diagram, BK signal output from SO1, please set P5-44 to n.0001. if it outputs from SO2, please set P5-44 to n.0002.

3-4-2. Brake signal

Parameter	Name	Type	Default setting	Meaning	Modify
P5-44	/BK	Output	n.0000	Not distribute output terminal	Range 0000-0002, distribute to output terminal through P5-44. When P5-44=0001, it means output from SO1.

3-4-3. The switch time between BK and SON

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

P5-07	Servo OFF delay time (brake command)					
	Unit	Default	Range	Suitable mode	Modify	Effective
	1ms	0	0~65535	All the modes	Servo OFF	Immediately

P5-07 Meaning: delay the time P5-07 to release the brake when the enable is ON.

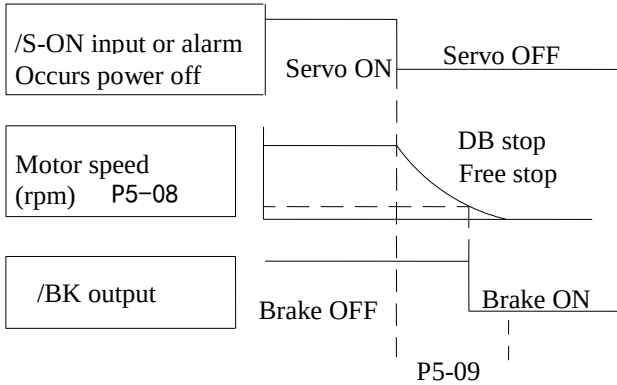
When the enable is OFF and the signal is true, lock the brake and delay the time P5-07 then close the enable.

3-4-4. Brake ON parameters

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

P5-08	Brake command output speed					
	Unit	Default	Range	Suitable mode	Modify	Effective
	rpm	30	0~10000	All the modes	Any	Immedia tely
P5-09	Brake command waiting time					
	Unit	Default	Range	Suitable mode	Modify	Effective
	1ms	500	0~1000	All the modes	Servo OFF	Immedia tely

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.

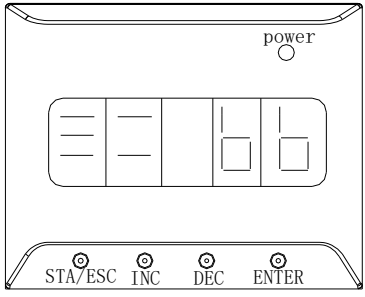
The /BK signal from ON to OFF under either of the following conditions:

1. Motor speed drops below the value of P5-08 after servo OFF.

2. over the time of P5-09 after servo OFF.

4. Operation before using servo system

4-1. Operate panel

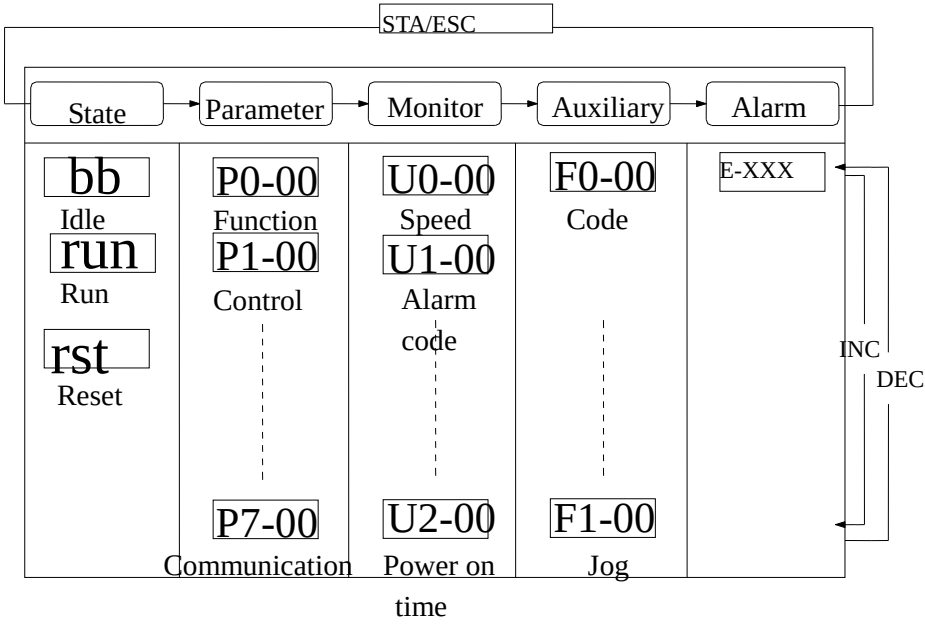


Key Name	Function
STATUS/ESC	Press: Status switch, status return
INC	Press: Increase the value; Press and hold: Increase the value continuously
DEC	Press: Decrease the value; Press and hold: Decrease the value continuously
ENTER	Press: Shift the editing digit; Press and hold: Enter a status, Enter

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.

Status: bb indicates that the servo system is idle; Run indicates that the servo system is running, and RST indicates that the servo needs to be powered on again.



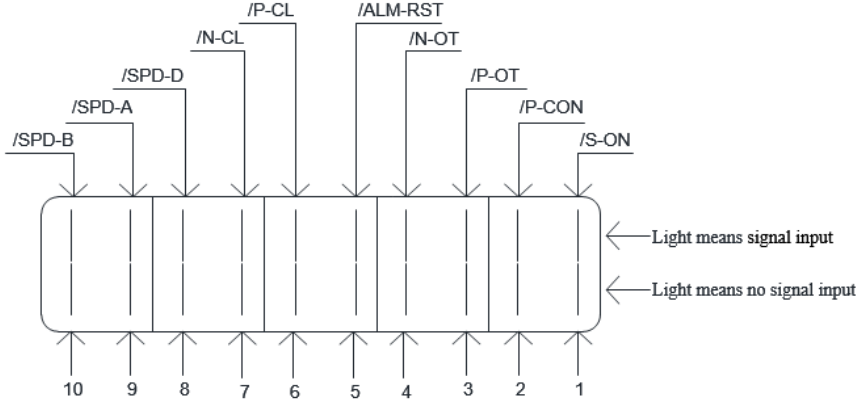
- Monitor Function UX－XX: The first X means group No., the last two X means the member No. in the group.
- Auxiliary Function FX－XX: The first X means group No., the last two X means the member No. in the group.
- Parameter Setting PX－XX: The first X means group No., the last two X means the member No. in the group.
- Alarm E－XXX: XXX means the alarm code.

4-1-1. Group P parameters

Refer to the appendix.

4-1-2. Group U parameters

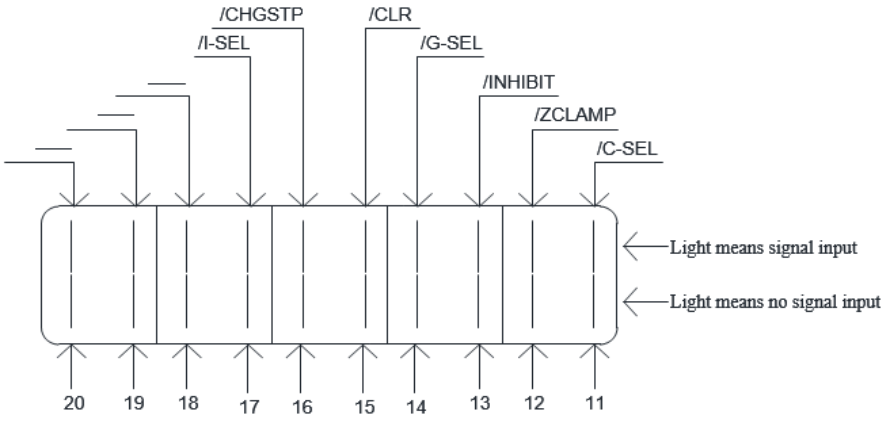
■ U0-21 input signal state



U0-21 input signal 1 distribution

Segment code	Explanation	Segment code	Explanation
1	/S-ON servo enable signal	2	/P-CON proportion action command
3	/P-OT forward run prohibited	4	/N-OT reverse run prohibited
5	/ALM-RST alarm reset	6	/P-CL forward side external torque limit
7	/N-CL reverse side external torque limit	8	/SPD-D internal set speed selection
9	/SPD-A internal set speed selection	10	/SPD-B internal set speed selection
Note: read the status through communication, the binary value from right to left are related to /S-ON, /P-CON. 0 means no input, 1 means has input. For example: 0x0001 means /S-ON has input, 0x0201 means /S-ON and /SPD-B has input.			

■ U0-22 input signal status

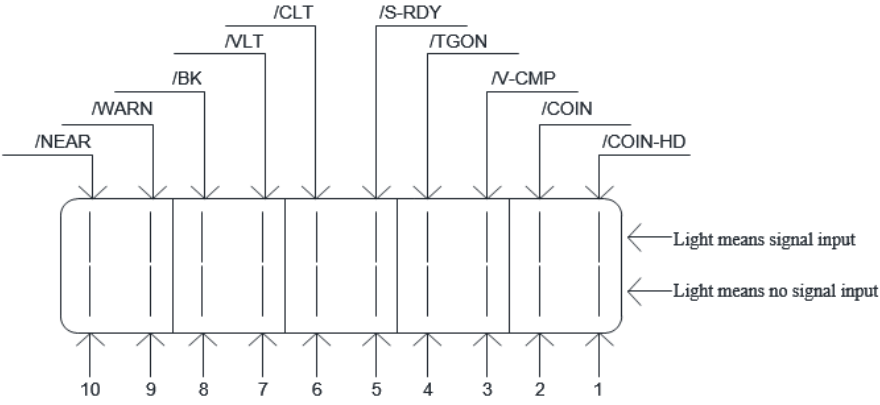


U0-22 input signal 2 distribution

Segment code	Explanation	Segment code	Explanation
11	/C-SEL control mode	12	/ZCLAMP zero clamp
13	/INHIBIT command pulse prohibited	14	/G-SEL gain switch
15	/CLR pulse clear	16	/CHGSTP change step
17	/I-SEL inertia switch	18	—
19	—	20	—
Note: read the status through communication, the binary value from right to left are related to /C-SEL, /ZCLAMP. 0 means no input, 1 means has input. For example: 0x0001 means /C-SEL has input, 0x0041 means /C-SEL and /I-SEL has input.			

Note: "—" is reserved bit, it is always 0.

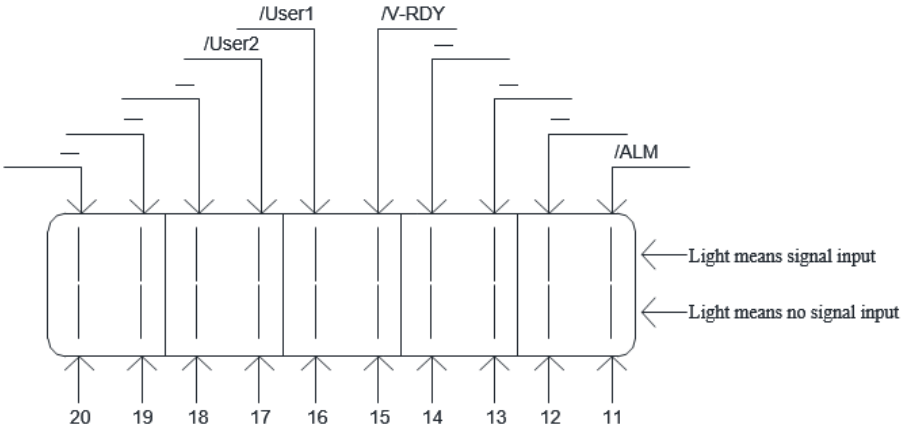
■ U0-23 output signal status



U0-23 output signal 1 distribution

Segment code	Explanation	Segment code	Explanation
1	Positioning complete maintain (/COIN_HD)	2	Positioning end (/COIN)
3	Same speed detection (/V-CMP)	4	Rotate detection (/TGON)
5	Ready (/S-RDY)	6	Torque limit (/CLT)
7	Speed limit detection (/VLT)	8	Brake lock (/BK)
9	Warn (/WARN)	10	Output near (/NEAR)
Note: read the status through communication, the binary value from right to left are related to /COIN_HD, /COIN. 0 means no output, 1 means has output. For example: 0x0001 means /COIN_HD has output, 0x0201 means /COIN_HD and /NEAR has output.			

■ U0-24 output signal status



U0-24 output signal 2 distribution

Segment code	Explanation	Segment code	Explanation
11	Alarm (/ALM)	12	—
13	—	14	—
15	Speed reach (/V-RDY)	16	Self-defined output 1
17	Self-defined output 2	18	—
19	—	20	—
Note: read the status through communication, the binary value from right to left are related to /ALM, "-". 0 means no output, 1 means has output. For example: 0x0001 means /ALM has output, 0x0041 means /ALM and self-defined output 2 has output.			

Note: "—" is reserved bit, it is always 0.

4-1-3. FX-XX auxiliary function

■ F0-XX

Function No.	Description
F0-00	Clean the alarm
F0-01	Back to out of factory settings
F0-02	Clean the offset

1. Clean the alarm

Set F0-00=1 to reset the alarm. When the alarm occurred, please find out the alarm reasons then clean the alarm.

2. Back to out of factory settings

Please power off the servo drive before the operation.

Set F0-01=1, then press ENTER. No need to re-power the servo drive.

3. Clean the offset

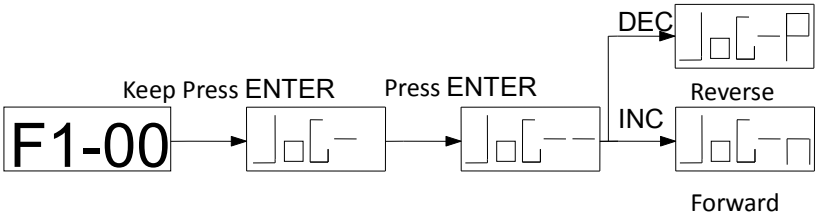
Set F0-02=1 to clean the offset.

■ F1-XX

Function code	Explanation
F1-00	Jog run
F1-01	Test run
F1-02	Current sampling zero calibration
F1-05	Panel enable
F1-06	Absolute encoder clear number of turns

1. **Jog run (F1-00)**

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



When the servo is in jog run mode, gain and other parameters will join the process. Please adjust the parameters according to the jog run status.

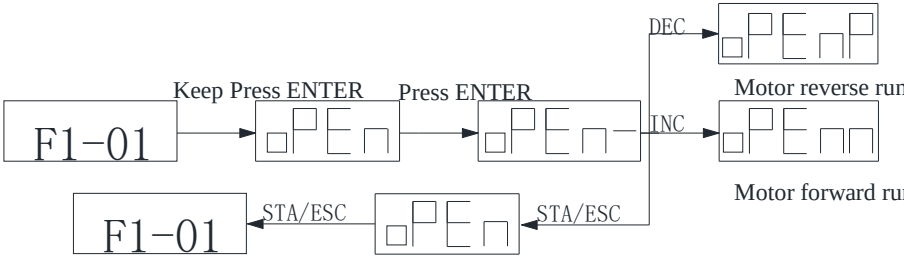
P3-18	JOG speed					
	Unit	Default	Setting range	Suitable mode	Change	Effective
	1Rpm	100	0~1000	JOG	Servo OFF	Immediately

2. Test run (F1-01)

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

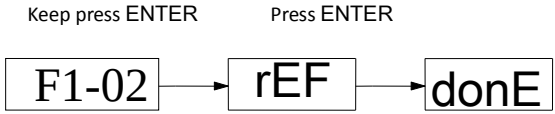
When servo drive is connected with non-original encoder line or power line, test run must be run first to ensure that the encoder line or power line is connected correctly.

Test run can detect the connection of power line and encoder feedback. Please operate the servo as the following steps. If the motor shaft jitter or servo alarm, please cut off the power at once then check the wiring.



3. Current sampling zero calibration (F1-02)

After the servo drive 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, need to power on again.

4. Panel enable

Parameter	Signal name	Setting	Meaning	Modify	Effective
P0-03	Enable mode	0	Not enable	Servo OFF	At once
		1 (default)	I/O enable /S-ON		
		2	Software enable (F1-05 or communication)		
		3	Fieldbus enable (support motion fieldbus model)		
Set P0-03 to 2					

F1-05 = 0: cancel the enable, back to bb state.

F1-05 = 1: forced enable, servo is in RUN state.

Note: forced enable will be ineffective after power on again.

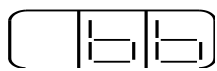
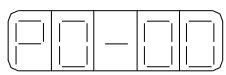
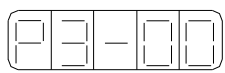
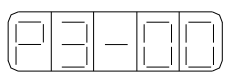
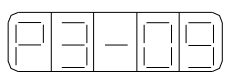
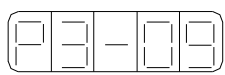
5. Absolute encoder clear number of turns

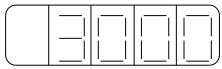
First power off the servo drive, then clear the absolute encoder number of turns. The operation is shown as below:

Set F1-06 to 1 through the operate panel or write 1 to address 0x2106 through Modbus-RTU (be effective in servo bb state, write 0 to 0x2106 after clearing) can clear the number of turns.

4-2. Panel key operation

Take P3-09 as an example:

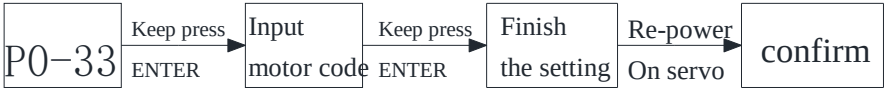
Steps	Operate panel	Key	Operations
1		STA/ESC INC DEC ENTER	No need any operation
2		STA/ESC INC DEC ENTER	Press STA/ESC to enter parameter settings
3		STA/ESC INC DEC ENTER	Press INC once will increase 1, increase the parameter to 3, it will show P3-00
4		STA/ESC INC DEC ENTER	Press ENTER, the last 0 will flash
5		STA/ESC INC DEC ENTER	Press INC to increase to 9
6		STA/ESC INC DEC ENTER	Keep press ENTER, enter

			P3-09 to change the value.
7			Press INC, DEC, ENTER to increase decrease or shift, keep press ENTER to confirm after changing.
8	Operation end		

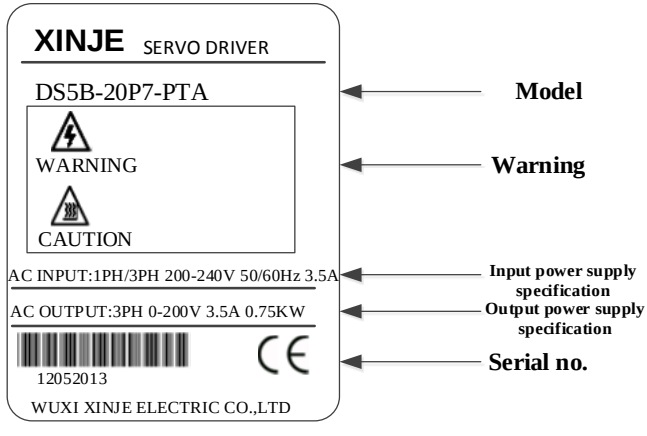
4-3. Change motor code

(1) One servo drive can match several servo motors with same power level. Before using the servo system, please make sure the motor code on the servo motor label is the same to P0-33.

(2) If the motor code setting is error, it will show E-310, please clear the alarm through F0-00, then set the correct code.



Drive lable



5. DS5 series rigidity gain debug

The new generation DS5 series servo has rigidity adaptive, auto-tuning and manual adjustment modes, without complicated parameter adjustment process, which greatly saves the gain adjustment time.

Adaptive function: adaptive function means that no matter the type of machinery and the fluctuation of load, it can get stable response through automatic adjustment.

Auto-tuning function: when running automatically within the setting scope (the reciprocating movement of the forward and reverse) or receive superior equipment operating instructions, the servo can automatical adjust according to the mechanical characteristics.

Manual adjustment function: setting the speed loop, position loop, model loop gain, vibration frequency and other parameters manually in the auto-setting mode to achieve quick response.

5-1. DS5 adaptive mode

When the response requirements are not high, it only needs to set the gear ratio, enable and other functional parameters to start quickly and save the servo adjustment time.

5-1-1. Adaptive mode selection switch parameter

Inertia mode selection switch	Adaptive default parameters	Parameter notes
P2-03.3=0 Small inertia mode	P2-05=400	Adaptive small inertia mode speed loop gain
	P2-11=100	Adaptive small inertia mode position loop gain
	P2-10=500	Adaptive small inertia mode speed loop integral

	P2-07=0	Adaptive small inertia mode inertia ratio
	P2-08=60	Adaptive small inertia mode speed observer gain
	P2-12=30	Adaptive small inertia mode stable max inertia ratio
	P2-19=50	Adaptive small inertia mode control bandwidth
P2-03.3=1 Large inertia mode	P6-05=200	Adaptive large inertia mode speed loop gain
	P2-11=100	Adaptive large inertia mode position loop gain
	P2-10=500	Adaptive large inertia mode speed loop integral
	P6-07=50	Adaptive large inertia mode inertia ratio
	P6-08=40	Adaptive large inertia mode speed observer gain
	P6-12=50	Adaptive large inertia mode stable max inertia ratio
	P2-19=70	Adaptive large inertia mode control bandwidth

Note:

(1) P2-19 default value is different for different power drive.

(2) P2-05 default value is 200 for the drive above 1.5kw.

5-1-2. Recommended inertia ratio for default parameters

Motor flange	Recommended load inertia ratio in small inertia mode	Recommended load inertia ratio in large inertia mode
40	Below 20 times	20 times ~ 80 times
60	Below 20 times	20 times ~ 80 times
80	Below 20 times	20 times ~ 80 times
130	Below 10 times	10 times ~ 20 times
180	Below 5 times	5 times ~ 20 times

If the load inertia is over the recommended value in the table, please change the related parameters of gain. The method is shown as below:

If the inertia is 20 times to 30 times

Increase P2-07 appropriately, decrease P2-05 if necessary. You can also refer to the following super-large inertia debugging methods.

Super-large debugging experience (50-100 times inertia):

Increase P2-12 (40~50 is recommended), reduce P2-08 (40~50 is recommended), reduce P2-05(100~300 is recommended), increase P2-07(10~100 is recommended). Please flexible adjust according to load inertia.

Application example:

(1) 30-times inertia load gain parameters

When it is default value, please set P2-08=50 P2-12=40 P2-07=50

(2) 80-times inertia load gain parameters

When it is default value, please set P2-08=40 P2-12=50 P2-07=50 P2-05=200 P2-10=1000

5-2. DS5 series auto-tuning mode

Auto-tuning parameter setting is based on the current institution, the parameters after auto-tuning is not applicable to empty shaft and other types of load, the auto-tuning is divided into no instruction auto-tuning and auto-tuning with instruction, it needs the servo PC software to adjust, detailed usage please refer to PC software manual.

5-2-1. No instruction auto-tuning

The no-instruction auto-tuning: set the motion range through PC software, then the servo drive will output command to make the motor move forth and back in the travel range, and adjust automatically according to the mechanical properties.

No instruction auto-tuning process:

1. set the left and right travel limit through software jog running
2. assum the load inertia (set by manual or assum automatically)
3. auto-tuning (auto-tune according to the setting travel in step 1)

5-2-2. Auto-tuning with instruction

Auto-tuning with instruction: automatical adjust according to the upper device command(pulse).

Auto-tuning with instruction process:

1. set the left and right travel limit through software jog running
2. assum the load inertia (set by manual or assum automatically)
3. auto-tuning (auto-tune according to the upper device pulse command)

Note: when auto-tuning, the positioning complete width P5-00 should change as the motor pulses per rotate. Too large or small value will cause the auto-tuning result failure. The default value of P5-00 is 11 when motor is 10000 pulses per rotate.

5-3 DS5 series manual adjustment mode

Manual adjustment mode: set the auto-tuning parameters by manual. This can solve these problems: for some occasions, it cannot do auto-tuning through PC software, and the auto-tuning result cannot meet the control requirements, or auto-tuning failure.

5-3-1. Reference value of load inertia gain in manual adjustment mode

Load inertia	P1-00	P1-01	P1-02	P2-49
Below 10 times	400~500	1000~1500	400~500	About 1000
10~30 times	300~400	1500~2000	400~500	About 800
30~50 times	200~300	2000~2500	300~400	About 500
Above 50 times	About 200	About 3000	200~300	100~400

Note: the data in this table is based on 60/80 motor synchronous belt structure.

5-3-2. Manual auto-tuning parameters

Parameter	Name	Explanation
P0-07	Load inertia ratio	The ratio of load and rotor inertia, the value can be deduced by the upper device inertia recognition
P1-00	Speed loop gain	In the absence of noise and vibration, increasing this parameter can speed up the positioning time and bring better speed stability and follow-up. In the case of noise and vibration, reduce the setting value of this parameter
P1-01	Speed loop integral	In the absence of noise and vibration, reducing the value can strengthen the integral function and speed up the positioning time. If this value is too high, it will cause the speed loop deviation return to zero become slowly

P1-02	Position loop gain	In the absence of noise and vibration, increasing this parameter can speed up the positioning time
P2-00.0	Disturbance observer switch	0-OFF 1-ON
P2-00.2	Dead zone compensation switch	0-ON 1-OFF Turn off the dead zone can reduce the sound
P2-01.0	Auto-tuning switch	0-auto-tuning 1-adaptive
P2-35	Torque filter time constant	increase this value can reduce the noise, but the velocity fluctuation will become larger and vibration will easily occur. If this value is reduced, the noise will increase, but the velocity fluctuation will decrease. The greater the load inertia, the greater the value
P2-41	Disturbance observer gain	Set to 85 in auto-tuning mode, be effective after P2-00.0 disturbance observer switch is ON
P2-47.0	Model loop gain switch	0-OFF 1-ON
P2-49	Model loop gain	Be effective after P2-47.0 model loop gain switch is ON When the value is increased, the rigidity level will be improved and the position curve following features will be improved, but it is easy to overshoot. decreasing this value can reduce the overshoot, but the position curve becomes less traceable
P2-69.0	First notch wave switch	0-OFF 1-ON
P2-69.1	second notch	0-OFF 1-ON

	wave switch	
P2-69.3	Fourth notch wave switch	0-OFF 1-ON
P2-71	First notch wave frequency	The vibration frequency of machine itself can suppress the vibration of machine which can be obtained from upper device mechanical properties analysis
P2-74	Second notch wave frequency	
P2-77	Fourth notch wave frequency	

6. Alarm information

		Alarm code	Contents	Reason	Solution
01	0	E-010	Hardware version not match	The hardware version is error	Contact us
	1	E-011	FPGA version not match	FPGA version not match	Contact us
	2	E-012	System loading error	The program damaged	Contact us
	3	E-013	FPGA loading error	1. program damaged 2. hardware damaged	Contact us
	4	E-014	FPGA visiting error	1. program damaged 2. hardware damaged 3. external interference is too serious	Contact us
	5	E-015	Program running error	Program damaged	Contact us

	6	E-016	CPU running error	Hardware damaged	Contact us
	7	E-017	CPU running overtime	Program damaged	Contact us
	8	E-018	FPGA running overtime	Program damaged	Contact us
	9	E-019	System password error	Program damaged	Contact us
02	0	E-020	Parameter loading error	Parameter self-checking cannot pass	Re-power the servo to restore default setting or contact us
	1	E-021	Parameter out of range	The setting value out of range	Check the parameters and set again
	2	E-022	Parameter conflict	TREF or VREF function setting conflict	1. P0-01=4, P3-00=1 will alarm
	3	E-023	Sampling channel setting error	User-defined output trigger channel or data monitor channel setting error	Check the setting parameter
	4	E-024	Parameter lost	Power supply voltage too low	1.for single phase 220V, connect L1, L3 2. set the parameter again
	5	E-025	Erase flash error	Parameter store error when power off	Contact us
	6	E-026	Initialize flash error	Flash chip power supply not stable	Contact us
03	0	E-030	Bus	1. power grid voltage too high	1. check the grid fluctuation

			overvoltage (220V: U0-05 ⩾390 alarm, 380V: U0-05⩾ 780V alarm)	2. not connect regenerative resistor 3. regenerative damaged or resistor too large	2. connect regenerative resistor 3. check if the regenerative resistor matched power
04	0	E-040	Bus undervoltage(220V: U0-05 ⩽ 140. 380V: U0-05⩽ 300)	1. Power grid voltage too low 2. instant power off	1. check the grid fluctuation 2. use constant voltage source
	1	E-041	Drive power off	Drive power cut off	Check the power supply
	3	E-043	Bus voltage charging failure	Hardware damage	Please note if there is relay ON/OFF sound when drive power on
06	0	E-060	Module temperature too high	1. long time running with large load 2. environment temperature too high 3. fan has error	1. consider change the motor capacity(mointor U0-02, motor present torque) decrease the load 2. good ventilation, decrease environment temperature 3. check if the fan works when servo enabled, module temperature U0-06≥45℃, fan will work.
	1	E-061	Motor	1. long time running	1. decrease the load

			temperature too high	with large load 2. environment temperature too high	2. good ventilation
	2	E-062	Drive too cold	1. Environment temperature is too low 2. drive temperature collection chip	The environment must up to 0℃
07	0	E-070	U phase current over limit	1.drive U/V/W output short circuit 2. motor fault 3. Load is blocked	1. change the damaged motor, check UVW wiring 2. suggest to run the motor without load, to troubleshoot load problem
	1	E-071	V phase current over limit	1. drive U/V/W output short circuit 2. motor fault 3. .Load is blocked	1. change the damaged motor, check UVW wiring 2. suggest to run the motor without load, to troubleshoot load problem
	2	E-072	W phase current over limit	1. drive U/V/W output short circuit 2. motor fault 3. Load is blocked	1. change the damaged motor, check UVW wiring 2. suggest to run the motor without load, to troubleshoot load problem
08	0	E-080	overspeed	1. motor speed too fast 2. motor UVW connection error 3. parameters error	1. check if there is external force make the motor over speed 2. check UVW wiring 3. actual speed larger than P3-21/P3-22 will alarm
09	2	E-092	Analog Tref	Analog zero calibration	Please not add analog

			zero calibration over limit	operation error	value when calibrating
	3	E-093	Analog Vref zero calibration over limit	Analog zero calibration operation error	Please not add analog value when calibrating
10	0	E-100	Position offset too large	The difference between setting position and actual position is over the limit	1. check whether the motor stall, decrease the position setting speed 2. increase the offset pulse limit P0-23
11	0	E-110	Motor UVW short circuit	1.external short circuit when self-checking 2. load blocked	1. check motor UVW wiring 2. change drive 3. change motor 4. suggest to run without load, to troubleshoot load problem
12	0	E-120	Current sensor error	Current sensor damaged or external interference too large	Check the ground wiring or contact us
	1	E-121	U phase current sampling zero calibration value error	Current sensor damaged or external interference too large	Check the ground wiring or contact us
	2	E-122	V phase current sampling zero calibration value error	Current sensor damaged or external interference too large	Check the ground wiring or contact us

	3	E-123	V phase current sampling zero calibration value error	Current sensor damaged or external interference too large	Check the ground wiring or contact us
13	0	E-130	Encoder U phase open circuit	AB phase or UVW open circuit when self-checking	1. check encoder cable wiring, use multi-meter to measure the connection 2. change motor
	1	E-131	Encoder V phase open circuit	AB phase or UVW open circuit when self-checking	1. check encoder cable wiring, use multi-meter to measure the connection 2. change motor
	2	E-132	Encoder W phase open circuit	AB phase or UVW open circuit when self-checking	1. check encoder cable wiring, use multi-meter to measure the connection 2. change motor
14	0	E-140	Encoder A phase open circuit	A phase open circuit when self-checking	Cut off the drive power supply, check the connection
	1	E-141	Encoder B phase open circuit	B phase open circuit when self-checking	Cut off the drive power supply, check the connection
	2	E-142	Encoder Z phase open circuit	Z phase open circuit when self-checking	Cut off the drive power supply, check the connection
15	0	E-150	Motor lack of U phase	UVW phase open circuit when self-checking	Check power cable U/V/W connection
	0	E-151	Motor lack of V phase	UVW phase open circuit when	Check power cable U/V/W connection

				self-checking	
	0	E-152	Motor lack of W phase	UVW phase open circuit when self-checking	Check power cable U/V/W connection
16	0	E-160	Motor output power overload	Motor output power over the rated power	1. Change larger power motor 2. Check the motor shaft wiring
	1	E-161	The heating power overload	Motor overheating	1、P0-33 confirm motor code 2. check the motor shaft connection 3. change larger power motor
	4	E-164	The bus capacitor overload	Power supply not stable, motor load too large, cause the bus capacitor charge frequently	1. use 3 phase 220V power supply for 220V drive 2. change larger power motor
	5	E-165	Prevent from blocking alarm	When the blocking time reached P0-74 (S) and motor speed lower than(1rpm), current motor output torque larger than P3-28, P3-29, it will alarm	1. monitor U0-02 motor torque, check if P3-28, P3-29 torque setting is suitable 2. check external mechanical structure and installation
	6	E-166	Motor temperature too high	11KW and 15KW large power motor encoder cover is installed thermistor, will alarm	1. check if the machine has blocked. 2. if the motor is running over speed at high torque

				when the temperature is higher than 85 °	
17	0	E-170	Motor undervoltage when running	Bus voltage too low when running	1. check the power grid voltage fluctuation 2. wait the bus voltage stable, then repower on
20	0	E-200	Regenerative resistor overload	Regenerative resistor discharging power over the rated	Change larger power regenerative resistor
	1	E-201	Regenerative resistor discharge too long time	Regenerative resistor connection error or value too large	Change small value resistor and check the wiring
22	0	E-220	Absolute encoder communication error	Encoder not connect or contactor not good	Cut off drive power, check encoder wiring, use multi-meter test the connection
				recived encoder data error, and error time over encoder error time register P0-56 value	Not put the encoder wire together with the strong power supply cable, install filter at servo drive power supply input side, install magnet ring around encoder wire, far away from large noise equipment
	2	E-222	Absolute encoder battery voltage low	1. The battery voltage is lower than 3.2V 2. new motor alarm	1. Please change new battery when the servo power is on, the battery is

			(version 3.4 can shield this alarm)	when power on	no.5 3.6V 2. if disconnect encoder cable with motor, the motor current position will lose and servo will alarm, set F0-00=1 to clear this alarm
	3	E-223	Absolute encoder data visit alarm	Encoder problem, or power supply is not stable	Unplugging the encoder cable without battery will alarm
	4	E-224	Absolute encoder overspeed	Large change of encoder data	Unplugging the encoder cable without battery will alarm
22	8	E-228	Absolute encoder counting value overflow	Motor run at same direction for long time , the encoder value too large	1. set F1-06=1 clear the encoder rotate numbers 2. set P0-79=1 can shield this alarm
26	0	E-260	Over range alarm	detected the over range signal and the over range mode is alarm	If it no need to alarm after over range, user can change the over range signal mode
	1	E-261	Over range signal connection error	1. motor run forward and encounter the reverse over range signal 2. motor run reverse and encounter the forward over range signal	Check the over range connection and over range terminal distribution

	2	E-262	Control stop over time	1. inertia too big 2. stop overtime too short 3. brake torque too small	1. decrease the inertia or use motor with brake 2. increase stop overtime P0-30 3. increase brake torque P3-32
28	0	E-280	Read motor parameter from encoder, visiting error	Encoder cable broken	Check the encoder cable
30	0	E-300	Motion bus lose synchronization	Motion bus communication error	Check the motion bus connection
31	0	E-310	Motor code error	Motor code error	Set the correct motor code in P0-33
	1	E-311	Motor code lost	Motor code not set	Set motor code in P0-33

7. Parameter list

7-1. Control 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 parameter

P0-	Function	Unit	Default	Range	Effective	Suitable mode
01	Control mode 1 1: torque (command) 3: speed (contactor command) 5: position (internal) 6: position (pulse) 7: speed (pulse) 10: fieldbus position mode	-	6	1～10	○	All
02	Control mode 2 (ditto) When /C-SEL signal is effective, servo will switch to the mode set in P0-02	-	0	1～10	○	All
03	Enable mode: 0: not enable 1: IO/SON input signal 2: software enable(panel/Modbus) panel F1-05 write in 1; Modbus write 1 to register 0x2105. Write 0 cancel enable. 3: bus enable	-	1	0~3	○	All
05	Rotation direction selection	-	0	0~1	●	All
09	Input pulse command positive direction	-	0	0~1	○	6、7
10 x1x□	1：AB 2：P+D	-	2	1~2	○	6、7

10 xx□ x	0: falling edge is effective 1: rising edge is effective	-	0	0~1	○	6、7
11	Pulses per circle low bit×1	-	0	0~9999	√	6
12	Pulses per circle high bit×10000	-	1	0~65535	√	6
13	Numerator of Electronic gear ratio	-	1	1~65535	√	6
14	Denomination of electronic gear ratio	-	1	1~65535	√	6
15	Pulse frequency corresponding to speed mode rated speed	*100 Hz	1000	0~10000	○	7
16	Speed command pulse filter time	0.01 ms	100	0~10000	○	7
23	Pulse offset limit	*256 command unit	1000	0~65535	√	6
24	Discharge resistor type 0: internal 1: external	-	0	0~1	○	All
25	Discharge resistor power	W	Related to servo drive power	0~65535	√	All
26	Discharge resistor value	Ω		0~65535	√	All
27	Servo OFF stop mode 0: inertia running stop, keep the inertia running state after stop 2: deceleration running stop,	-	0	0、2	○	All

	keep inertia running state after stop					
28	Servo over range stop mode 0: deceleration stop, over range direction torque is 0 after stop, receive command 1: inertia stop, over range direction torque is 0 after stop, receive command 2: deceleration stop, over range direction not receive command after stop 3: alarm (E-260)	-	0	0~3	○	All
29	Servo alarm stop mode 0: inertia stop, keep inertia running state after stop 2: deceleration stop, keep inertia running state after stop	-	0	0、2	○	All
30	Stop overtime time	0.1ms	2000	0~65535	○	All
33	Motor code	-		0~65535	●	All
69	Fan switch 0: temperature over 45℃, fan is ON, below 42℃, fan is OFF (hysteresis 3℃) 1: fan is ON after servo enabled, fan is OFF after servo is disable		1	0/1	○	All

74	Block alarm time	1ms	0	0-65535	○	
75	Block alarm speed	1rpm	50	5~9999	○	All
92	The second group of electronic gear ratio numerator low bit	-	1	1~9999	√	6
93	The second group of electronic gear ratio numerator high bit *10000	-	1	1~65535	√	6
94	The second group of electronic gear ratio denominator low bit	-	1	1~9999	√	6
95	The second group of electronic gear ratio denominator high bit *10000	-	1	1~65535	√	6

P1: Control parameter

P1-	Name	Unit	Default	Range	Effective	Suitable mode
00	The gain of speed loop (fit for auto-tuning mode)	1Hz	200	10~20000	√	All
01	speed loop integral time(fit for auto-tuning mode)	0.1ms	3300	15~51200	√	All
02	The gain of position loop (fit for auto-tuning mode)	1/s	200	10~20000	√	All
03	Speed feedback filter time (fit for auto-tuning mode)	1/s	50	0~65535	√	All
22	Speed command filter	0	-	0~1	○	3.4.7
23	Speed command filter time	0	0.1ms	0~65535	○	3.4.7
24	Position command filter	0	-	0~1	○	6.10
25	Position command filter time	0	0.1ms	0~65535	○	6.10

P2: adaptive parameter

P2-	Name	Unit	Default value	Range	Effective	Suitable mode
00.0	Disturbance observer switch	-	0	0000-000f	●	All
00.2	Dead zone compensation switch	-	0	0000-000f	●	All
03.3	Adaptive mode switch	-	0	0/1	●	All
05	Speed loop gain in adaptive mode	-	400	1~65535	●	All
07	Load inertia ratio in adaptive mode	-	0	0~10000	●	All
08	Speed observer gain	-	60	1~10000	●	All
12	Stable max inertia ratio in adaptive mode		30	1~10000	●	All
19	Adaptive control band width	-	50	1~100	●	All
35	Torque filter time	0.01ms	100	0~65535	√	All
41	Disturbance observer gain	-	100	10~1000	√	All
49	Model loop gain	0.1ms	100	10~20000	√	All
69.0	First trapped wave switch (auto-tuning mode)	-	0	0~1	√	All
69.1	Second trapped wave switch (auto-tuning mode)	-	0	0~1	√	All

69.3	Fourth trapped wave switch (auto-tuning mode)	-	0	0~1	√	All
71	First trapped wave frequency (auto-tuning mode)	Hz	5000	50~5000	√	All
74	Second trapped wave frequency (auto-tuning mode)	Hz	5000	50~5000	√	All
77	Fourth trapped wave frequency (auto-tuning mode)	Hz	5000	50~5000	√	All

P3: speed control parameter

P3-XX	Name	Unit	Default value	Range	Effective	Suitable mode
05	Preset speed 1	rpm	0	-9999~+9999	√	3
06	Preset speed 2	rpm	0	-9999~+9999	√	3
07	Preset speed 3	rpm	0	-9999~+9999	√	3
09	Acceleration time	ms	0	0~65535	○	3、4
10	Deceleration time	ms	0	0~65535	○	3、4
11	Reserved	—	—	—	—	—
12	Zero speed clamp mode 0: ZCLAMP input signal is ON, forced speed command is 0. When the	—	0	0~2	○	3、4、7

	speed below P3-13, switch to position mode and the servo locked in this position 1: ZCLAMP input signal is ON, forced set speed command to 0 2: ZCLAMP input signal is ON, speed below P3-13 switch to position mode and the servo locked in this position Note: after entering zero clamp mode, setting speed is higher than P3-13, motor still cannot work, it needs the ZCLAMP input signal to be OFF to exit zero clamp mode, then the motor can work again. 3: ZCLAMP input signal is ON, and the setting speed is below P3-13, switch to position control mode, and servo locked in this position. At this time, when the setting speed is higher than P3-13, motor					

	work again.					
13	Zero speed clamp speed	rpm	10	0~300	○	3、4
14	Forward max speed command limit	rpm	Related to motor	30~10000	○	All
15	Reverse max speed command limit	rpm	Related to motor	30~10000	○	All
16	Internal forward speed limit in torque control mode	rpm	Related to motor	30~10000	√	1、2
17	Internal reverse speed limit in torque control mode	rpm	Related to motor	30~10000	√	1、2
18	Jog speed	rpm	100	0~1000	○	All
19	Forward warning speed	rpm	Related to motor	0~10000	○	All
20	Reverse warning speed	rpm	Related to motor	0~10000	○	All
21	Forward alarm speed	rpm	Related to motor	0~10000	○	All
22	Reverse alarm speed	rpm	Related to motor	0~10000	○	All
28	Internal forward torque limit	%	300	0~300	√	All
29	Internal reverse torque limit	%	300	0~300	√	All
30	External forward torque	%	300	0~300	√	2、3、4、6、7

	limit					
31	External reverse torque limit	%	300	0~300	√	2、3、4、6、7
32	Brake torque	1%	100	0~300	√	All
33	Preset torque	%	0	-300~300	√	1
37	Gravity compensation	0.1% rated current	0	-3000~3000	√	All
38	Gravity compensation coefficient	1% coefficient	100	0~100	√	All
	Note: compensation rated current percentage =(P0-37/1000)*(P3-38/100)					

P4: internal position parameter

P4-	Name	Unit	Default value	Range	Effective	Suitable mode
0.xxx□	Pass Z phase signal times after leaving the limit switch	-	2	1~F	○	5、6
0.xx□x	Find origin function 0: OFF 1: ON	-	0	0~1	○	5、6
01	Hit proximity switch speed	1rpm	600	0~50000	○	5、6
02	Leaving proximity switch speed	1rpm	100	0~50000	○	5、6

03	Internal position mode	-	n.0000		○	5
04	Effective segment number		1	1-35	○	5
10	First segment pulse (low byte)	1 pulse	0	-9999~9999	○	5
11	First segment pulse (high byte)	10000 pulses	0	-32767~32767	○	5
12	First segment speed	0.1rpm	0	0~10000	○	5
13	First segment acceleration time	1ms	0	0~65535	○	5
14	First segment deceleration time	1ms	0	0~65535	○	5
15	Reserved	-	-	-	-	5
16	Adjustment time	1ms	0	0~65535	○	5
P4-17~P4-23 are internal position segment 2 parameters, the following total 35 segments.						
Note: (1) setting pulse number = pulse numbers (high byte)×10000+pulse number(low byte) (2) total 35 segments. Segment 1~12 parameters can be set through operate panel, segment 13~35 can write in parameters through communication (RS232 or RS485).						

P5: signal parameter

P5-	Name	Unit	Default	Range	Effective	Suitable mode
00	Positioning finished width /COIN	Command unit	7	0~65535	○	6
01	Positioning finished checking mode 0: offset absolute value below P5-00, output COIN signal	-	0	0~3	○	6

	1: offset below P5-00 after command finished, output COIN signal 2: command finished, motor speed below P5-03 and offset absolute value below P5-00, output COIN signal 3: command finished, offset absolute value below P5-00, output COIN signal. If COIN keeps the time P5-02, output COIN-HOLD signal.					
02	Positioning finished hold time	ms	0	0~ 65535	○	6
03	Rotation checking speed	rpm	50	0~ 10000	○	All
04	Same speed checking speed	rpm	50	0~ 10000	○	3、4、7
05	Reach checking speed	rpm	1000	0~ 10000	○	3、4、7
06	Positioning near output width	Command unit	50	0~ 65535	○	6
07	Servo OFF delay time	ms	0	0~ 65535	○	All
08	Brake command output speed	rpm	30	0~ 10000	○	All
09	Brake command waiting time	ms	500	0~ 65535	○	All
10	User-defined output 1 trigger condition	-	0	0~ FFFF	○	All

11	comparison value of user-defined output 1 trigger condition and setting	Related to the trigger condition	0	-9999~9999	○	All
12	0: P5-10≥P5-11, output SOx 1: P5-10<P5-11, output SOx 2: P5-10 absolute value≥ P5-11, output SOx 3: P5-10 absolute value <P5-11, output SOx	-	0	0~3	○	All
13	User-defined output 1 hysteresis loop	Related to the trigger condition	0	0~65535	○	All
14	User-defined output 2 trigger condition	-	0	0~FFFF	○	All
15	comparison value of user-defined output 2 trigger condition and setting	Related to the trigger condition	0	-9999~9999	○	All
16	0: P5-14≥P5-15, output SOx 1: P5-14≤ P5-15, SOx output 2: P5-14 absolute value ≥P5-15, output SOx 3: P5-14 absolute value <P5-15, output SOx	-	0	0~3	○	All
17	User-defined output 2 hysteresis loop	Related to the trigger condition	0	0~65535	○	All
18	IO filter time	ms	0	0~10000	○	All
19	Z phase signal pulse width	ms	2	2~20	√	All

20	/S-ON servo signal 0000: signal is always invalid 0001: input positive signal from SI1 0002: input positive signal from SI2 0003: input positive signal from SI3 0004: input positive signal from SI4 0010: signal is always valid 0011: input negative signal from SI1 0012: input negative signal from SI2 0013: input negative signal from SI3 0014: input negative signal from SI4	—	0001	※1	√	All
21	/P-CON proportion action command Ditto	—	0	※1	√	All
22	/P-OT forward drive ban ditto	—	0003	※1	√	All
23	/N-OT reverse drive ban ditto	—	0004	※1	√	All
24	/ALM-RST alarm clean ditto	—	0002	※1	√	All

25	/P-CL forward side external torque limit ditto	—	0	※1	√	All
26	/N-CL reverse side external torque limit ditto	—	0	※1	√	All
27	/SPD-D internal speed direction choice ditto	—	0	※1	√	1、2、3、4
28	/SPD-A internal setting speed choice ditto	—	0000	※1	√	3、6
29	/SPD-B internal setting speed choice ditto	—	0	※1	√	3、6
30	/C-SEL control mode choice ditto	—	0	※1	√	All
31	/ZCLAMP zero clamp ditto	—	0	※1	√	3、4、7
32	/INHIBIT command pulse ban ditto		0	※1	√	6
33	/G-SEL gain switching ditto	—	0	※1	√	All
34	/CLR pulse offset clean ditto	—	0	※1	√	6
37	/COIN_HD positioning finished hold 0000: not output to the terminal		0	※2	√	6

	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 from SO2 0013: output negative signal from SO3					
38	/COIN positioning finished ditto	—	0001	※2	√	6
39	/V-CMP same speed checking ditto	—	0	※2	√	3、4、7
40	/TGON rotation checking ditto	—	0	※2	√	All
41	/S-RDY ready ditto	—	0000	※2	√	All
42	/CLT torque limit ditto	—	0	※2	√	3、4、6、7
43	/VLT speed limit checking ditto	—	0	※2	√	1、2、6
44	/BK brake lock Ditto	—	0	※2	√	All
45	/WARN warning ditto	—	0	※2	√	All

46	/NEAR near ditto	—	0	※2	√	6
47	/ALM alarm ditto	—	0002	※2	√	All
48	/Z phase encoder signal	—	0	※2	√	All
51	/V-RDY speed arrived	—	0	※2	√	3、4、7
52	/user-defined output 1 terminal setting	—	0	※2	○	All
53	/user-defined output 2 terminal setting	—	0	※2	○	All
57	PREFA segment 1 internal position	—	0	※1	√	5
58	PREFB segment 2 internal position	—	0	※1	√	5
59	PREFC segment 3 internal position	—	0	※1	√	5

P6: signal parameters (some parameters are reserved)

P6-	Name	Unit	Default value	Range	Effective	Suitable mode
05	Speed loop gain in adaptive large inertia mode	-	200	1-65535	●	All
07	Load inertia ratio in adaptive large inertia mode	-	50	0-10000	●	All
08	Position loop gain in adaptive large inertia mode	-	40	1-10000	●	All
12	Stable max inertia ratio in adaptive large inertia mode	-	50	1-10000	●	All

P7: communication parameters

P7-	Name		Unit	Default value	Range		Effective	Suitable mode
00	RS485 station no.		-	1	1~255		○	All
01	RS485 parameter	n.xx□□	Baud rate	06	00～10 00：300 01：600 02：1200 03：2400 04：4800 05：9600 06：19200 07：38400 08：57600 09：115200	0A：192000 0B：256000 0C：288000 0D：384000 0E：512000 0F：576000 10：768000 11：1M 12：2M 13：3M 14：4M 15：5M 16：6M	○	All
		n.x□xx	Stop bit	2	0：2 bits 2：1 bit		○	All
		n.□xxx	Parity bit	2	0～2 0：no parity 1：odd parity 2：even parity		○	All
		Note: data bit cannot be selected, it is 8-bit.						
02	RS485 communication protocol		—	1	1：Modbus Rtu 2：Xnet		○	All
03	Xnet synchronous		1ms	9	1~500		○	All

	sampling time					
04	Xnet slave station data	—	15	1~500	○	All
05	Xnet slave station numbers	—	10	1~256	○	All
06	Communication overtime retry times	time	10	1~500	○	All
07	Fieldbus command update period	1us	3000	1~65535	○	All
10	RS232 station no.	—	1	1~255	○	All
11	RS232 parameter	—	2206	Parameter same to P7-01	○	All
20	Back to zero direction (fieldbus)	—	1	-9999~9999	○	All
	Note: the positive and negative value means the direction of back to zero, positive value means finding origin in forward direction, negative value means find origin in reverse direction, absolute value means finding Z phase numbers when backing to zero.					
21	Filter time after backing to zero(fieldbus)	0.25ms	400	1~65535	○	All
	Note: after find the zero position, back to position mode and there is no position offset, the back to zero process is completed after keeping the time of this parameter, then send back to zero complete flag to PLC.					

Table 1 input terminal distribution

input terminal	Servo model	Setting range
P5-20~P5-36 P5-57~P5-59	DS5B series	n.0000~n.0004 n.0010~n.0014

Table 2 output terminal distribution

output terminal	Servo model	Setting range
P5-37~P5-53	DS5B series	n.0000~n.0002 n.0010~n.0012

7-2. Monitoring state

U0-XX：

Number	Contents		Unit
U0-00	Actual speed of motor		Rpm
U0-01	Input speed command		Rpm
U0-02	Torque command		% of rated
U0-03	Rotate angle		1 °
U0-04	Rotate angle		1 °
U0-05	Bus voltage		V
U0-06	IPM temperature		0.1℃
U0-07	Torque feedback		% of rated
U0-08	Pulse offset value	（0000～9999）*1	Command pulse
U0-09		（0000～9999）*10000	
U0-10	Encoder feedback value	0000～9999	encoder pulse
U0-12	Pulse value of input command	（0000～9999）*1	Command pulse
U0-13		（0000～9999）*10000	

U0-14	Position feedback	（0000～9999）*1	Command pulse
U0-15		（0000～9999）*10000	
U0-16	Encoder position (Accumulated)	（0000～9999）*1	encoder pulse
U0-17		（0000～9999）*10000	
U0-18	torque current		0.01A
U0-21	Input signal status 1		
U0-22	Input signal status 2		
U0-23	Output signal status 1		
U0-24	Output signal status 2		
U0-25	Input pulse frequency	（0000～9999）*1	Hz
U0-26		（0000～9999）*10000	
U0-41	Instantaneous output power		1W
U0-42	Average output power		1W
U0-43	Instantaneous thermal power		1W
U0-44	Average thermal power		1W
U0-49	Position feedforward		1 command unit
U0-50	Speed feedforward		rpm
U0-51	Torque feedforward		% of rated
U0-52	Instantaneous bus capacitor power		1W
U0-53	Average bus capacitor power		1W
U0-55	Instantaneous regenerative braking discharge power		1W
U0-56	Average regenerative braking discharge power		1W
U0-57	Absolute encoder present position feedback		Read the address 0x1039 value(dword) through modbus-rtu, which is present encoder position with
U0-58			

		positive or negative pulses.

U1-XX：

Number	Contents	Unit
U1-00	Current alarm code	
U1-01	Current warning code	
U1-02	U phase current when alarming	0.01A
U1-03	V phase current when alarming	0.01A
U1-04	Bus voltage when alarming	V
U1-05	IGBT temperature when alarming	0.1℃
U1-06	Torque current when alarming	0.1A
U1-07	Excitation current when alarming	A
U1-08	Position offset when alarming	Command pulse
U1-09	Speed value when alarming	rpm
U1-10	The alarm occurred time second (low 16 bits), count from the first time power on	s
U1-11	The alarm occurred time second (high 16 bits), count from the first time power on	s
U1-12	Run error times, count from power on this time	
U1-13	Warning times, count from power on this time	
U1-14	History alarm times	
U1-15	History warning times	
U1-16	The second time alarm code recently	
U1-17	The third time alarm code recently	

U1-18	The fourth time alarm code recently	
U1-19	The fifth time alarm code recently	
U1-20	The sixth time alarm code recently	
U1-21	The second time warning code recently	
U1-22	The third time warning code recently	
U1-23	The fourth time warning code recently	
U1-24	The fifth time warning code recently	
U1-25	The sixth time warning code recently	

U2-XX：

Number	Contents	Unit
U2-00	Power on times	
U2-01	Series	
U2-02	Model (low 16-bit)	
U2-03	Model (high 16-bit)	
U2-04	Out of factory: year	
U2-05	Out of factory date: year	
U2-06	Out of factory date: month	
U2-07	Out of factory date: day	
U2-08	Firmware version	
U2-09	Total run time (from the first time power on)	Hour
U2-10	Total run time (from the first time power on)	Minute
U2-11	Total run time (from the first time power on)	Second
U2-12	This time run time (from this time power on)	Hour
U2-13	This time run time (from this time power on)	Minute
U2-14	This time run time (from this time power on)	Second
U2-15	Average output power (count from the first time enable)	1W

U2-16	Average heating power (count from the first time enable)		1W
U2-17	Average bus capacitor filter power(from the first time power on)		1W
U2-18	Motor accumulative circles	（0000～9999）*1	circle
U2-19		（0000～9999）*10000	circle
U2-20	Device serial number: low 16 bits		
U2-21	Device serial number: high 16 bits		
U2-22	Firmware generation date: year		
U2-23	Firmware generation date: month/day		
U2-24	Firmware generation time: hour/minute		

7-3. FX-XX parameters

F0-XX

Code	Explanation
F0-00	Clean the alarm
F0-01	Back to out of factory settings
F0-02	Clean the position offset
F1-00	Jog run
F1-01	Test run
F1-02	Current sampling zero calibration
F1-05	Panel enable
F1-06	Absolute encoder clear the rotate numbers

Appendix

Appendix 1　motor specification table

■ Low inertia motor parameters

Voltage level	220V				
Motor model MS5S	40ST-	60ST-	60ST-	80ST-	80ST-
	CS00330	CS00630	CS01330	CS02430	CS03230
	-20P1-S01	-20P2-S01	-20P4-S01	-20P7-S01	-21P0
Motor code (brake)	5002 （5822）	5003 （5803）	5004 （5804）	5011 （5811）	5012
Encoder bit numbers	17				
Rated speed [rpm]	3000	3000	3000	3000	3000
Max speed [rpm]	6000	6000	6500	5000	4000
Rated torque [Nm]	0.32	0.64	1.27	2.39	3.2
Max torque [Nm]	0.96	1.92	4.45	7.17	8
Overload times	3	3.5	3.5	3	2.5
Rated current [mA]	950	1900	2800	4000	4000
Max current [mA]	2850	6650	9800	12000	10000
Phase resistor [mΩ]	5780	2410	1705	990	1325
Phase inductance [mH]	5675	5150	2910	3300	6000
Rotor inertia [10^{-7}kg.m^2]	44	137	258	902	1286
Back EMF constant [V/krpm]	34	35	42	54	73
Rated output power [W]	100	200	400	750	1000
Protection level	IP65				

Motor insulation level	Class F（155℃）
Ambient temperature	－15℃～＋40℃
Ambient humidity	Relative humidity < 90% (no condensation)

Voltage level	220V				
Motor model MS5S	110STE-				
	CS03230	TL03230	CS04830	TL04830	TL06430
	-21P0	-21P0	-21P5	-21P5	-22P0
Motor code (brake)	5033	9033	5034	9034	9037
Encoder bit numbers	17	23	17	23	
Rated speed [rpm]	3000	3000	3000	3000	3000
Max speed [rpm]	6000	6000	4500	4500	4500
Rated torque [Nm]	3.18	3.18	4.77	4.77	6.37
Max torque [Nm]	7.95	7.95	9.54	9.54	12.74
Overload times	2.5	2.5	2	2	2
Rated current [mA]	7500	7500	7500	7500	9500
Max current [mA]	18750	18750	15000	15000	19000
Phase resistor [mΩ]	278	278	330	330	205
Phase inductance [mH]	5105	5105	6800	6800	4277
Rotor inertia [10^{-7}kg.m^2]	2869	2869	3360	3360	4170
Back EMF constant [V/krpm]	51	51	64	64	62
Rated output power [W]	1200	1200	1500	1500	2000
Protection level	IP65				
Motor insulation level	Class F（155℃）				

Ambient temperature	－15℃～＋40℃
Ambient humidity	Relative humidity < 90% (no condensation)

■ Middle inertia motor parameters

Voltage level	380V			
Motor model MS5S	180STE-			
	TL19015	TL28015	TL35015	TL48015
	-42P9-S01	-44P4-S01	-45P5-S01	-47P5-S01
Motor code (brake)	9166	9161	9162	9163
Encoder bit numbers	23			
Rated speed [rpm]	1500	1500	1500	1500
Max speed [rpm]	2500	2500	2500	2000
Rated torque [Nm]	19	28	35	48
Max torque [Nm]	51.3	56	70	96
Overload times	2.7	2	2	2
Rated current [mA]	9000	14000	16000	16100
Max current [mA]	24300	28000	32000	32200
Phase resistor [mΩ]	330	180	210	200
Phase inductance [mH]	13400	8000	9300	7000
Rotor inertia [10^{-7}kg.m^2]	40443	55139	68342	95424
Back EMF constant [V/krpm]	192	178	219	277
Rated output power [W]	3000	4300	5500	7500
Protection level	IP65			
Motor insulation level	Class F（155℃）			
Ambient temperature	－15℃～＋40℃			
Ambient humidity	Relative humidity < 90% (no condensation)			

■ High inertia motor parameters

Voltage level	220V		
Motor model MS5S	60ST-	60ST-	80ST-
	CS00630-20P2-S01	CS01330-20P4-S01	CS02430-20P7-S01
Motor code (brake)	50C3（58C3）	50C4（58C4）	50D1（58D1）
Encoder bit numbers	17		
Rated speed [rpm]	3000	3000	3000
Max speed [rpm]	6000	6500	5000
Rated torque [Nm]	0.64	1.27	2.39
Max torque [Nm]	1.92	4.45	7.17
Overload times	3.5	3.5	3
Rated current [mA]	1900	2800	4000
Max current [mA]	6650	9800	12000
Phase resistor [mΩ]	2410	1665	990
Phase inductance [mH]	5150	2810	3300
Rotor inertia [10^{-7}kg.m^2]	537	648	1650
Back EMF constant [V/krpm]	35	42	54
Rated output power [W]	200	400	750
Protection level	IP65		
Motor insulation level	Class F（155℃）		
Ambient temperature	－15℃～＋40℃		
Ambient humidity	Relative humidity < 90% (no condensation)		

■ MS series motor

Voltage level	220V				
Motor model MS-	80ST		110ST	130ST	
	T03520	T02430	T05030	T04030	C/CM06025
	-20P7	-20P7	-21P5	21P2	21P5
Motor code (brake)	4012	4011	4032	4031	5042
Encoder bit numbers	17	17	17	17	17/23
Rated speed [rpm]	2000	3000	3000	3000	2500
Max speed [rpm]	2500	4000	3500	3500	3000
Rated torque [Nm]	3.5	2.39	5	4	6
Max torque [Nm]	10.5	7.17	15	12	15
Overload times	3	3	3	3	2.5
Rated current [mA]	3000	3200	6000	5000	7400
Max current [mA]	9000	9600	18000	15000	18500
Phase resistor [mΩ]	1870	1150	525	570	290
Phase inductance [mH]	3950	10300	2005	2025	4400
Rotor inertia [10^{-7}kg.m^2]	2630	1023	6300	5400	7628
Back EMF constant [V/krpm]	114	71	87	85	57
Rated output power [W]	750	750	1500	1200	1500
Protection level	IP65				
Motor insulation level	Class F（155℃）				
Ambient temperature	－15℃～＋40℃				
Ambient humidity	Relative humidity < 90% (no condensation)				

Voltage level	220V				
Motor model MS-	130ST				
	T06025	CM10015	T10015	CM15015G	T15015G
	-21P5	-21P5	-21P5	22P3	22P3
Motor code (brake)	4042	5044	4044	5046	4046
Encoder bit numbers	17	23	17	23	17
Rated speed [rpm]	2500	1500	1500	1500	1500
Max speed [rpm]	3000	2000	2000	2000	2000
Rated torque [Nm]	6	10	10	15	15
Max torque [Nm]	15	25	25	30	30
Overload times	2.5	2.5	2.5	2	2
Rated current [mA]	7400	8000	8000	9000	9000
Max current [mA]	18500	20000	20000	18000	18000
Phase resistor [mΩ]	290	455	455	395	395
Phase inductance [mH]	4400	8450	8450	3500	3500
Rotor inertia [10^{-7}kg.m^2]	7628	10294	10294	24217	24217
Back EMF constant [V/krpm]	57	86	86	160	160
Rated output power [W]	1500	1500	1500	2300	2300
Protection level	IP65				
Motor insulation level	Class F（155℃）				
Voltage level	220V				
Ambient temperature	－15℃～＋40℃				

Ambient humidity	Relative humidity < 90% (no condensation)

Voltage level	220V		380V		
Motor model MS-	130ST-		5G-180ST-		
	T10025	T07730	TL19015	TL28015	TL35015
	-22P6	-22P4	-42P9	-44P4	-45P5
Motor code (brake)	9045	404B	9166	9161	9162
Encoder bit numbers	17		23		
Rated speed [rpm]	2500	3000	1500	1500	1500
Max speed [rpm]	3000	4000	2500	2500	2500
Rated torque [Nm]	10	7.7	19	28	35
Max torque [Nm]	25	19.25	51.3	56	70
Overload times	2.5	2.5	2.7	2	2
Rated current [mA]	10000	10500	9000	14000	16000
Max current [mA]	25000	26250	24300	28000	32000
Phase resistor [mΩ]	330	165	330	180	210
Phase inductance [mH]	1540	3370	13400	8000	9300
Rotor inertia [10^{-7}kg.m^2]	19400	10294	40443	55139	68342
Back EMF constant [V/krpm]	107	76	192	178	219
Rated output power [W]	2600	2400	3000	4300	5500
Protection level	IP65				
Ambient temperature	－15℃～＋40℃				
Ambient humidity	Relative humidity < 90% (no condensation)				

Appendix 2 servo drive and motor matching table

Servo drive	Compatible motor code
DS5B-20P1-PTA	5022/5822
DS5B-20P2-PTA	5003/5803/58C3/50C3
DS5B-20P4-PTA	5004/5804/50C4/58C4
DS5B-20P7-PTA	5011/5811/50D1/58D1/4012/4011/5012
DS5B-21P5-PTA	5033/9033/4031/4032/5034/9034/5042/4042/5044/4044
DS5B-22P3-PTA	9037/5037/5046/4046
DS5B-22P6-PTA	404B/9045
DS5B-43P0-PTA	9166
DS5B-45P5-PTA	9161/9162
DS5B-47P5-PTA	9163

Appendix 3 Parameter Modbus address

■ Parameter address

Parameter	Modbus address		Parameter	Modbus address	
	Hex	Decimal		Hex	Decimal
P0-00	0x0000	0	P0-17	0x0011	17
P0-01	0x0001	1	P0-18	0x0012	18
P0-02	0x0002	2	P0-19	0x0013	19
P0-03	0x0003	3	P0-20	0x0014	20
P0-04	0x0004	4	P0-21	0x0015	21
P0-05	0x0005	5	P0-22	0x0016	22
P0-06	0x0006	6	P0-23	0x0017	23
P0-07	0x0007	7	P0-24	0x0018	24
P0-08	0x0008	8	P0-25	0x0019	25

P0-09	0x0009	9	P0-26	0x001A	26
P0-10	0x000A	10	P0-27	0x001B	27
P0-11	0x000B	11	P0-28	0x001C	28
P0-12	0x000C	12	P0-29	0x001D	29
P0-13	0x000D	13	P0-30	0x001E	30
P0-14	0x000E	14	P0-31	0x001F	31
P0-15	0x000F	15	P0-32	0x0020	32
P0-16	0x0010	16	P0-33	0x0021	33

Parameter	Modbus address		Parameter	Modbus address	
	Hex	Decimal		Hex	Decimal
P1-00	0x0100	256	P1-15	0x010F	271
P1-01	0x0101	257	P1-16	0x0110	272
P1-02	0x0102	258	P1-17	0x0111	273
P1-03	0x0103	259	P1-18	0x0112	274
P1-04	0x0104	260	P1-19	0x0113	275
P1-05	0x0105	261	P1-20	0x0114	276
P1-06	0x0106	262	P1-21	0x0115	277
P1-07	0x0107	263	P1-22	0x0116	278
P1-08	0x0108	264	P1-23	0x0117	279
P1-09	0x0109	265	P1-24	0x0118	280
P1-10	0x010A	266	P1-25	0x0119	281
P1-11	0x010B	267	P1-26	0x011A	282
P1-12	0x010C	268	P1-27	0x011B	283
P1-13	0x010D	269	P1-28	0x011C	284
P1-14	0x010E	270			

Parameter	Modbus address		Parameter	Modbus address	
	Hex	Decimal		Hex	Decimal
P2-00	0x0200	512	P2-15	0x20F	527
P2-01	0x0201	513	P2-16	0x210	528

Parameter	Modbus address		Parameter	Modbus address	
	Hex	Decimal		Hex	Decimal
P3-00	0x0300	768	P3-19	0x0313	787
P3-01	0x0301	769	P3-20	0x0314	788
P3-02	0x0302	770	P3-21	0x0315	789
P3-03	0x0303	771	P3-22	0x0316	790
P3-04	0x0304	772	P3-23	0x0317	791
P3-05	0x0305	773	P3-24	0x0318	792
P3-06	0x0306	774	P3-25	0x0319	793
P3-07	0x0307	775	P3-26	0x031A	794
P3-08	0x0308	776	P3-27	0x031B	795
P3-09	0x0309	777	P3-28	0x031C	796
P3-10	0x030A	778	P3-29	0x031D	797
P3-11	0x030B	779	P3-30	0x031E	798
P3-12	0x030C	780	P3-31	0x031F	799
P3-13	0x030D	781	P3-32	0x0320	800
P3-14	0x030E	782	P3-33	0x0321	801
P3-15	0x030F	783	P3-34	0x0322	802
P3-16	0x0310	784	P3-35	0x0323	803
P3-17	0x0311	785	P3-36	0x0324	804
P3-18	0x0312	786			

Parameter	Modbus address		Parameter	Modbus address	
	Hex	Decimal		Hex	Decimal
P4-00	0x0400	1024	P4-15	0x040F	1039
P4-01	0x0401	1025	P4-16	0x0410	1040

Parameter	Modbus address		Parameter	Modbus address	
	Hex	Decimal		Hex	Decimal
P5-00	0x0500	1280	P5-27	0x051B	1307
P5-01	0x0501	1281	P5-28	0x051C	1308
P5-02	0x0502	1282	P5-29	0x051D	1309
P5-03	0x0503	1283	P5-30	0x051E	1310
P5-04	0x0504	1284	P5-31	0x051F	1311
P5-05	0x0505	1285	P5-32	0x0520	1312
P5-06	0x0506	1286	P5-33	0x0521	1313
P5-07	0x0507	1287	P5-34	0x0522	1314
P5-08	0x0508	1288	P5-35	0x0523	1315
P5-09	0x0509	1289	P5-36	0x0524	1316
P5-10	0x050A	1290	P5-37	0x0525	1317
P5-11	0x050B	1291	P5-38	0x0526	1318
P5-12	0x050C	1292	P5-39	0x0527	1319
P5-13	0x050D	1293	P5-40	0x0528	1320
P5-14	0x050E	1294	P5-41	0x0529	1321
P5-15	0x050F	1295	P5-42	0x052A	1322
P5-16	0x0510	1296	P5-43	0x052B	1323
P5-17	0x0511	1297	P5-44	0x052C	1324
P5-18	0x0512	1298	P5-45	0x052D	1325
P5-19	0x0513	1299	P5-46	0x052E	1326

P5-20	0x0514	1300	P5-47	0x052F	1327
P5-21	0x0515	1301	P5-48	0x0530	1328
P5-22	0x0516	1302	P5-49	0x0531	1329
P5-23	0x0517	1303	P5-50	0x0532	1330
P5-24	0x0518	1304	P5-51	0x0533	1331
P5-25	0x0519	1305	P5-52	0x0534	1332
P5-26	0x051A	1306	P5-53	0x0535	1333

Parameter	Modbus address		Parameter	Modbus address	
	Hex	Decimal		Hex	Decimal
P6-00	0x0600	1536	P6-10	0x060A	1546
P6-01	0x0601	1537	P6-11	0x060B	1547

Parameter	Modbus address		Parameter	Modbus address	
	Hex	Decimal		Hex	Decimal
P7-00	0x0700	1792	P7-10	0x070A	1802
P7-01	0x0701	1793			

■ Monitoring state address group U

Parameter	Modbus address		Parameter	Modbus address	
	Hex	Decimal		Hex	Decimal
U0-00	0x1000	4096	U0-28	0x101C	4124
U0-01	0x1001	4097	U0-29	0x101D	4125
U0-02	0x1002	4098	U0-30	0x101E	4126
U0-03	0x1003	4099	U0-31	0x101F	4127
U0-04	0x1004	4100	U0-32	0x1020	4128
U0-05	0x1005	4101	U0-33	0x1021	4129

U0-06	0x1006	4102	U0-34	0x1022	4130
U0-07	0x1007	4103	U0-35	0x1023	4131
U0-08	0x1008	4104	U0-36	0x1024	4132
U0-09	0x1009	4105	U0-37	0x1025	4133
U0-10	0x100A	4106	U0-38	0x1026	4134
U0-11	0x100B	4107	U0-39	0x1027	4135
U0-12	0x100C	4108	U0-40	0x1028	4136
U0-13	0x100D	4109	U0-41	0x1029	4137
U0-14	0x100E	4110	U0-42	0x102A	4138
U0-15	0x100F	4111	U0-43	0x102B	4139
U0-16	0x1010	4112	U0-44	0x102C	4140
U0-17	0x1011	4113	U0-45	0x102D	4141
U0-18	0x1012	4114	U0-46	0x102E	4142
U0-21	0x1015	4117	U0-49	0x1031	4145
U0-22	0x1016	4118	U0-50	0x1032	4146
U0-23	0x1017	4119	U0-51	0x1033	4147
U0-24	0x1018	4120	U0-52	0x1034	4148
U0-25	0x1019	4121	U0-53	0x1035	4149
U0-26	0x101A	4122	U0-57	0x1039	4153
U0-27	0x101B	4123	U0-58	0x103A	4154

Parameter	Modbus address		Parameter	Modbus address	
	Hex	Decimal		Hex	Decimal
U1-00	0x1100	4352	U2-00	0x1200	4608
U1-01	0x1101	4353	U2-01	0x1201	4609
U1-02	0x1102	4354	U2-02	0x1202	4610
U1-03	0x1103	4355	U2-03	0x1203	4611

U1-04	0x1104	4356	U2-04	0x1204	4612
U1-05	0x1105	4357	U2-05	0x1205	4613
U1-06	0x1106	4358	U2-06	0x1206	4614
U1-07	0x1107	4359	U2-07	0x1207	4615
U1-08	0x1108	4360	U2-08	0x1208	4616
U1-09	0x1109	4361	U2-09	0x1209	4617
U1-10	0x110A	4362	U2-10	0x120A	4618
U1-11	0x110B	4363	U2-11	0x120B	4619
U1-12	0x110C	4364	U2-12	0x120C	4620
U1-13	0x110D	4365	U2-13	0x120D	4621
U1-14	0x110E	4366	U2-14	0x120E	4622
U1-15	0x110F	4367	U2-15	0x120F	4623
U1-16	0x1110	4368	U2-16	0x1210	4624
U1-17	0x1111	4369	U2-17	0x1211	4625
U1-18	0x1112	4370	U2-18	0x1212	4626
U1-19	0x1113	4371	U2-19	0x1213	4627
U1-20	0x1114	4372	U2-20	0x1214	4628
U1-21	0x1115	4373			
U1-22	0x1116	4374			
U1-23	0x1117	4375			
U1-24	0x1118	4376			
U1-25	0x1119	4377			

Parameter	Modbus address		Parameter	Modbus address	
	Hex	Decimal		Hex	Decimal
F0-00	0x2000	8192	F1-00	0x2100	8448
F0-01	0x2001	8193	F1-01	0x2101	8449
F0-02	0x2002	8194	F1-02	0x2102	8450
F2-09	0x2209	8713	F1-03	0x2103	8451
			F1-04	0x2104	8452
			F1-05	0x2105	8453
			F1-06	0x2106	8454

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