

GHA Series Servo

BRIEF USER MANUAL

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Chapter 1 Introduction

1.1 Product Introduction

1. GHA series servos support high resolution encoder which can level down the range of torque pulsation, increase the positioning accuracy and satisfy the demands of accurate positioning control and balanced low speed operation.

2. High-speed response: response speed can reach 1 KHz.

3. There are 3 built-in modes: positioning, speed and torque (Speed and torque modes can be controlled by interior setting and electric voltage).

4. Two pairs of Resonance suppression filter can be arranged together to restrain the vibration in normal operations.

5. Terminal jitter suppression function can decreased the terminal jitters in motor positioning which was easily caused by the elastic link device between motor and loads.

6. Pre-friction compensation parameters is provided to decrease controller loads during the mechanism operations like ball screw.

7. 16-segment point-to-point function is supported and can actualize the 32-segment indexing controls.

Basic Specifications

GHA series servos		750W	1KW	1.5KW
		04	05	06
Power	Phases number/voltage	Three-phases: AC220V+15%, 50/60Hz		
	Output current	4A	5A	6A
Cooling method		Natural cooling		Forced air-cooling
Main circuit control		SVPWM control		
Control mode		Manual operation/automation		
Dynamic brake		None		Built-in
Positioning control	Maximum output impulse frequency	Differential mode: 500K (low speed)/4M (high speed); open collector: 200K		
	Pulse command	Direction + impulse; positive and negative impulse; orthogonal impulse		
	Input positioning control	1: ca1:commanded pulse compensation α selection 2: commanded pulse compensation α selection 1 3: clear deviation		
	Pre-feedback compensation	Parameter setting P1-08		
	Electronic gear ratio	1~100009999/1~100009999 (P0-06 P0-07 P0-08 P0-09)		

Speed control	Simulated commands	Voltage range	0~+10V
		Input impedance	10K
	Speed control range		1:6000
	Speed commanded filtering mode		Low levels and S shaped smooth filtering.
	Torque restrictions		Parameter settings and simulation input
Torque control	Simulated command input	Voltage range	0~+10V
		Input resistance	10K
	Commanded filter form		Low-pass smoothing filter
	Speed restriction		Parameter settings or analogue input
Digital input/output		Input	9-path input: enable/alarm reset/gain switching/pulse scavenging/positive inversion control/speed command control/selection and switch of control modes/emergency stop/positive and negative transfer limit/electronic gear ratio selection
		Output	6-path output: all set/zero velocity/end of positioning/ torque output restriction/servo alarm etc.
Protection function		Overcurrent/over voltage/undervoltage/overheat/overload/over speed/too large positioning deviation/communication anomaly etc.	
Communication port		Standard configuration: S-485 selective configuration: CAN/ EtherCAT	
Enviro	Installation		door(avoid direct sunlight);no corrosive fogs(avoid gas lamp black,

nment al specifi cation	requirements	combustible gas and dust)
	Elevation	Under 1000m
	barometric	86KPa-106KPa
	Environment temperature	0~55℃(please make surrounding air ventilate if environment temperature exceed 45℃
	Storage temperature	-20℃~65℃
	Humidity	0~90%RH(no dew)
	Vibration	Under 49 [m/s ²] (Under 3000r/min 0.75KW) Under 24.5[m/s ²] (Under 3000r/min 1KW)
	IP grade	IP20

1.2 Servo Driver Specification

GHA 32 05 — A T * (***)
 1 2 3 4 5 6 7

1: Controller type: GHA series

2: Power and voltage grade: 32 (single phase or three-phase 220V)

3: Rated output current

04: 4A

05: 5A

06: 6A

4: Coder type: A: absolute encoder V: incremental encoder

5: T: Applied universally

6: Selective configuration of communication C: CAN E: EtherCAT

7: Special requirements are marked in brackets with 3 bites. Others are standard products.

1.3 Servo Motor Specification

130 SF — Z A 050 C 2 A /**
 1 2 3 4 5 6 7 8 9

1: Base number. Currently there are 6 kinds of base: 40/60/80/90/110/130 (mm)

2: motor parameter codes; SF: 5 pole servo motor ST: 4 pole servo motor

3: Braking. "Z" means electromagnetic brake. "Y" means permanent magnet type brake. Default means that there is no braking device (braking voltage: DC 24V)

4: Coder feedback type. A: absolute encoder M: incremental encoder

5: Output torque×0.1NM

6: Rated rotation speed

A: 1500r/min

B: 2000 r/min

C: 2500r/min

D: 3000r/min

E: 1000r/min

7: Rated voltage of motor: "2" denotes three-phases 220V.

8: Output shaft form:

A: denotes straight axle, with keys, spline width: 6mm

B: denotes straight axle, no key

C: denotes straight axle, with keys, spline width: 8mm

D: denotes straight axle, with keys, spline width: 5mm

E: denotes straight axle, with keys, spline width: 10mm

F: denotes straight axle, with keys, spline width: 4mm

H: denotes straight axle, with keys, spline width: 3mm

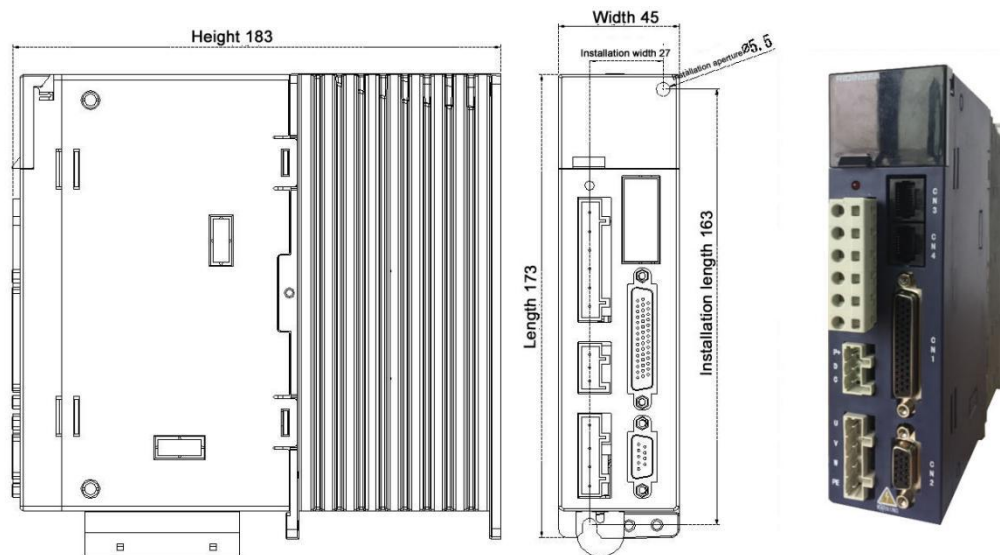
J: denotes straight axle, with keys, spline width: 16mm

9: Derivative number: letters denote special motors and otherwise standard motors.

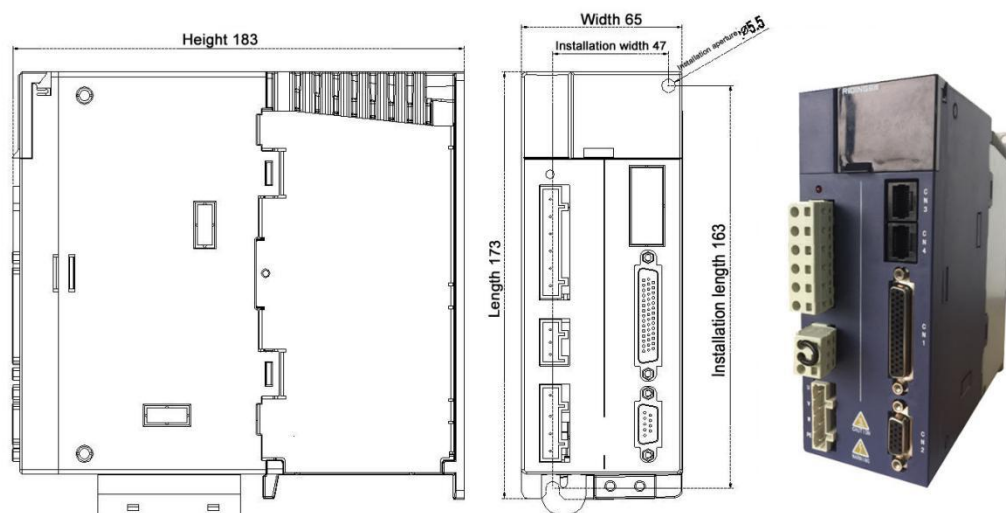
Chapter 2 Installation of Driver and Motor

2.1 Servo Driver Installation Size

GHA3204 (750W):



GHA3205(1KW)/GHA3206(1.5KW):



Chapter 3 Wiring and Detailed Specification

Please be sure to conduct wiring following the next dos and don'ts:



ATTENTION

1. Please DO NOT wiring the power line and signal line in the same tunnel nor binding them together. When wiring, keep them away from each other with interval over 30cm.
2. Signal line and encoder feedback line should be equipped with twisted pair with general insulation. The insulation layer should be connected to the shell of socket connectors. Wire length: keep signal command input line shorter than 3m and encoder feedback line shorter than 20m.
3. When power is turned off, high voltage may get detained inside the servo driver. Please operate the power connectors 5 min later when the *CHARGE* signal light turns off. Please operate wiring or examining works 5 min later when the *CHARGE* signal light turns off.
4. Please DO NOT turn on and turn off the power frequently. If essential, please keep it under 1 time in each minute. Servo driver is equipped with large electric capacity inside. When power is turned on a large charging current flows over. Therefore, internal components of servo driver may encounter accelerated ageing.

3.1 Power Supply

Please supply the servo amplifier with single phase 220v or three-phase 220V commercial power. Under single phase power, connect to any two terminals in R/S/T. Under three-phase power, connect to R, S and T. In both of the two scenario, auxiliary control power S1 and S2 must be connected to main power. Under three-phase power, connect any 2 phase to the auxiliary control power S1 and S2.

Voltage: single phase 220~230V -10%~+10% three-phase 200~230V -15%~+10%

Frequency: 50/60Hz

Phase: single phase (any 2 of driving power R, S and T) / three-phase (driving power R, S and T) / single phase (control power s1 and s2)

※ If supplied power exceeds rated value, the servo amplifier may get damaged.

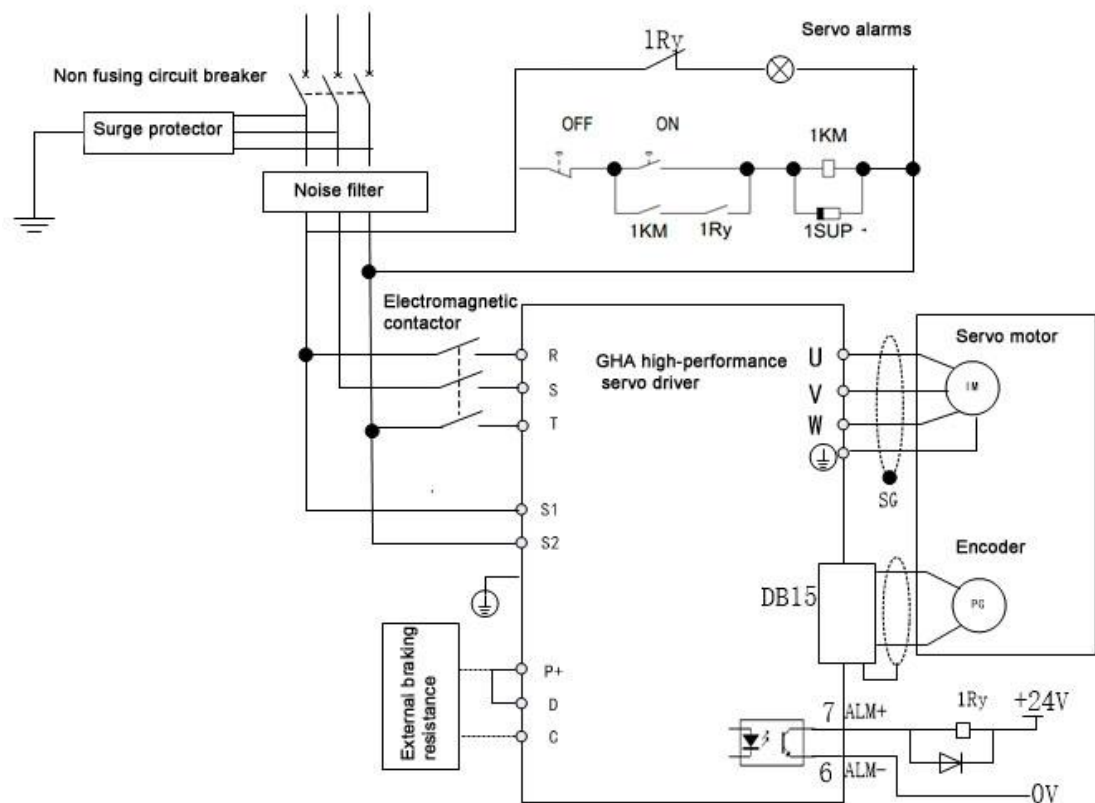
3.2 Driver Connectors and Ports

Port Marks	Name	Specification	
S1/S2	Control loop power input terminal	Connect single phase AC power	
R/S/T	Main loop power input terminal	Connect three-phase AC power	
U/V/W/PG	Motor connect line	Connect to motor	
		Terminal marks	Line color
		U	Red
		V	White
		W	Blue
		PG	Olivine
P+/D/C	Leak resistance terminal	Use internal resistance	P+/ D terminal short circuit and P+/C terminal open circuit
		Use external resistance	Connect resistance to P+/C terminal and P+/D open circuit

	Earthing terminal	Connect to earthing power line
CN1	I/O connector	Connect upper controller
CN2	Encoder connector	Connect motor encoder
CN3 CN4	Communication connector	Connect CANopen /RS485 upper monitor

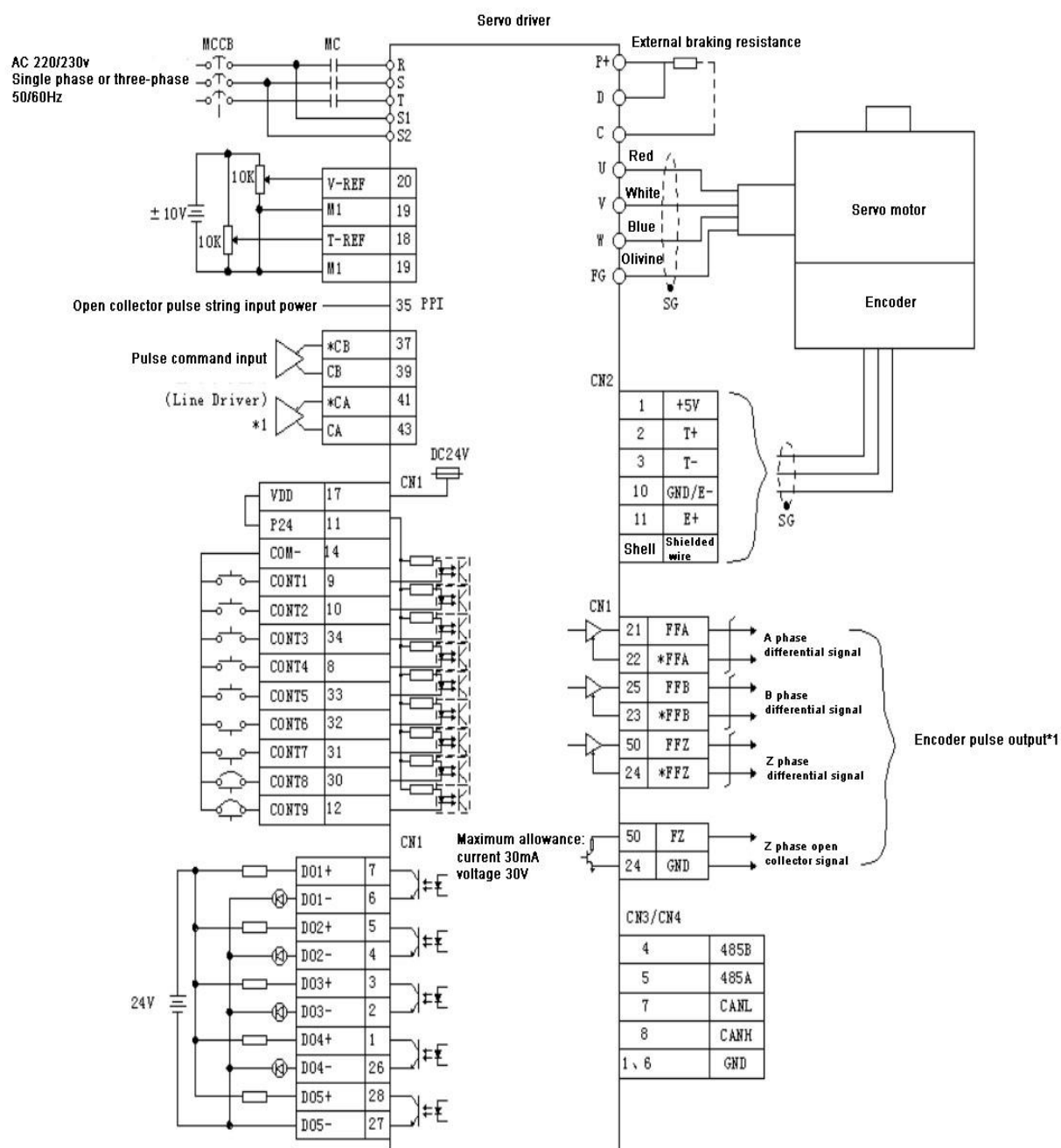
Typical Case of Main Loop Wiring

Three-phase 220V or single phase 220V



Driver Wiring Diagram

Input power: single phase 200~230V or three-phase 200~230V



Attention: CN1 is the female of DB44; CN2 is the female of triple row DB15; CN3 and CN4 are RJ45 connector.

Diodes in the output wiring diagram is the equivalent load of diodes.

3.3 Name Principles of Lines

1. Control line specification

DB 25 L* - XX XX XX**
1 2 3 4 5 6

- 1: port features of servo system
- 2: features of linear joint end
- 3: features of line length
- 4: features of servo upper controller system
- 5: features of customer terminal
- 6: extended feature number

2. Encoder line specification

DB 15 L* - XX XX XX**
1 2 3 4 5 6

- 1: port features of servo system
- 2: features of linear joint end
- 3: features of line length
- 4: features of servo controller system
- 5: defined features of motor terminal ports
- 6: manufacturer features of connector

3. Power line specification

M 4*1.0 L* - DD MM FR**
1 2 3 4 5 6

- 1: port features of servo system
- 2: features of linear joint end
- 3: features of line length
- 4: features of servo controller system
- 5: features of motor terminal ports
- 6: manufacturer features of connector

4. Wire Size of Power Line

Driver		Power Line- Wire Size(mm ²)		
Series	Power(KW)	L1/L2/L3	U/V/W	P+/C
3204	0.75	0.5	0.5	1.0
3205	1.0	0.75	0.75	1.0
3206	1.5	1.0	1.0	1.0

3.4 External Braking Resistance

Referential values are listed below::

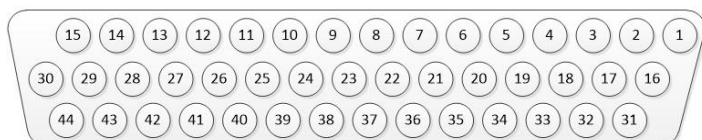
For safety, users should select the most appropriate type to guarantee the safety.

3	8	Driver	Braking Resistance
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	Series	power(KW)	minimum	Recommended	Recommended
1	3204	0.75	60Ω	60Ω	80W
2	3205	1	60Ω	60Ω	80W
3	3206	1.5	60Ω	60Ω	80W

3.5 Command Control Sequence Input/ Output

Connector pin of servo driver controller (triple row DB44)



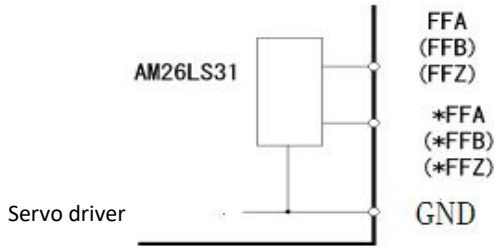
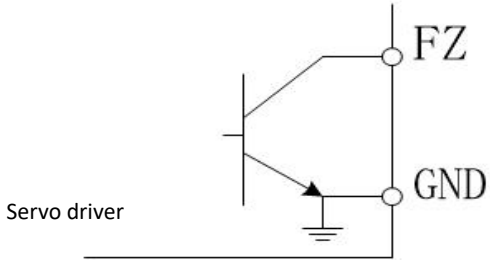
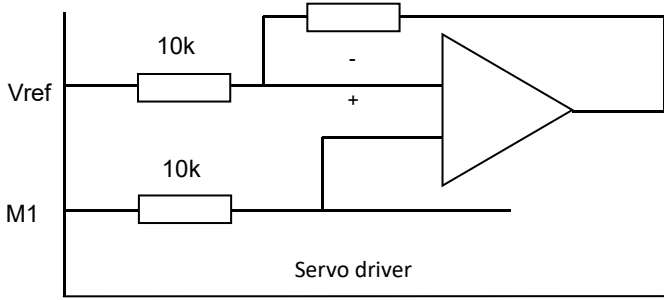
The servo connector 1 (CN1) is connected to the control signal of upper controller. Each signal is defined as below.

Marks	CN1 Plug Number	Signal Name	Function and Definition
OUT 1- OUT 1+	6 7	Output command control sequence	Output command control sequence(MAX: DC30V/50mA) OUT 1 :(factory default 1) OUT 2:(no default) OUT 3:(no default) OUT 4:(no default) OUT 5:(no default) OUT 6:(no default)
OUT 2- OUT 2+	4 5		
OUT 3- OUT 3+	2 3		
OUT 4- OUT 4+	26 1		
OUT 5- OUT 5+	27 28		
OUT 6- OUT 6+	15 16		
CONT 1 CONT 2 CONT 3 CONT 4 CONT 5 CONT 6 CONT 7 CONT 8 CONT 9	9 10 34 8 33 32 31 30 12	Input command control sequence	Input command control sequence(DC24V/10mA) CONT 1: SERVO ENABLE(RUN) CONT 2: (no default) CONT 3: (no default) CONT 4: (no default) CONT 5: (no default) CONT 6: (no default) CONT 7: (no default) CONT 8: (no default) CONT 9: (no default)

PPI	35	Input pulse string differential input or open collector input	PPI: open collector power input (DC24V +5%/-5%)
CA	43		Under differential input CA,*CA,CB*CB: maximum input frequency 500KHZ。
*CA	41		Under open collector input *CA,*CB: maximum input frequency 200KHZ
CB	39		The form of pulse string has 3 kinds of selection: commanded pulse correspondence, forward/backward pulse and 90 degree phase difference signal *CA, *CB
*CB	37		
FFA	21	Encoder frequency division signal output (difference)	Frequency division output terminal. Output 90 degree phase difference path-2 signal that go with rotation of the servo motor (differential output) *FFA、*FFB、*FFZ connect to the negative
*FFA	22		
FFB	25		
*FFB	23		
FFZ	13		
*FFZ	24		
FZ	44	Encoder frequency division signal output (collector)	FZ terminal open collector Z phase pulse output(maximum DC30V/50mA)
GND	29		
V-REF	20	Analog input	PIN 20 is the speed instruction of motor (-10V~+10V), represents -1000r/min~+1000r/min, and range can be adjusted by parameters. PIN 21 is the torque instruction of motor (-10V~+10V), represents -100%~+100% rated torque instruction, and range can be adjusted by parameters.
T-REF	18		
M1	19		
P24	11	Control signal input power supply	P24 is the voltage input terminal of CONT, when voltage adopts VDD, VDD must be connected to P24. If VDD is not adopted, external 24V power should be supplied.
VDD	17	+24V power that supplied by driver	VDD is the +24V power supplied by driver, can offer CONT and OUT signal for usage and can withstand 500mA
COM-	14	Reference of +24V power supply voltage	

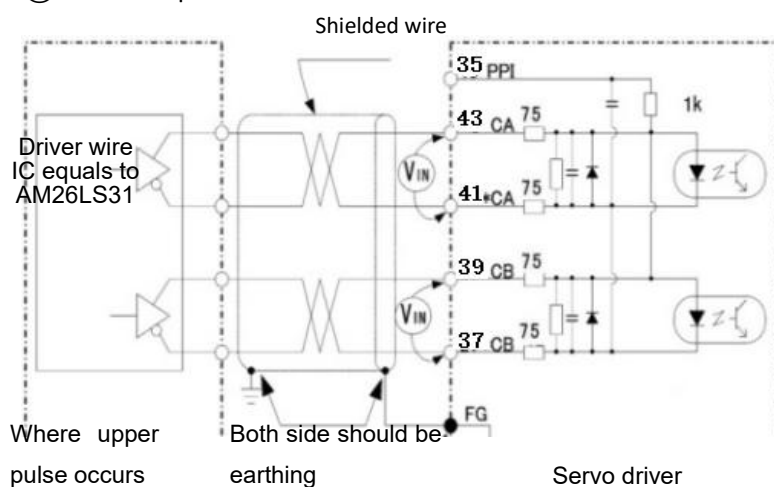
CONNECTION DIAGRAM

Signal name	Circuit
Input command control sequence Exterior power is adopted Connector specification DC24V/10mA (per point)	
Input command control sequence Interior power is adopted Connector specification DC24V/10mA (per point)	
Input command control sequence Connector specification DC5~30V/50mA	
Input pulse string Connector specification Differential input (driver wire)	

Output pulse string Connector specification Differential output (driver wire)	 AM26LS31 Servo driver FFA (FFB) (FFZ) *FFA (*FFB) (*FFZ) GND
Output pulse string (open collector) Connector specification DC5~30V/50mA(MAX)	 Servo driver FZ GND
Analogue input Connector specification Input resistance 10kΩ	 Vref 10k 10k M1 Servo driver

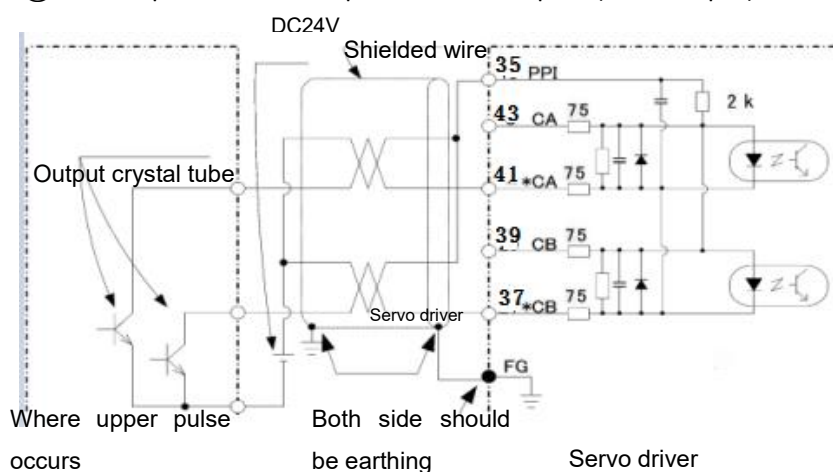
Wiring Case of Input Pulse String

① When output device is moved



V_{in} : Voltage vibration between CA-*CA(CB-*CB) should be in the range of 2.8V~3.7V. (when exceeding the range, input pulse may not be accepted)

② When open collector output device is adopted (DC24V input)

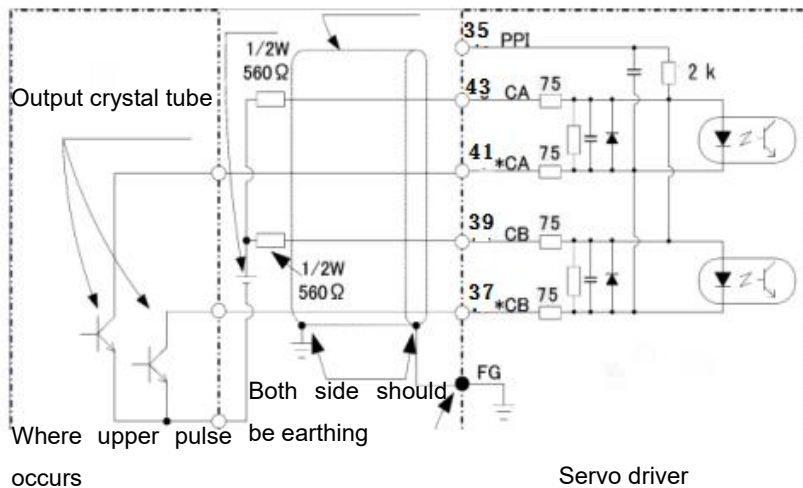


DC24V Power: range of power voltage should be within $DC24 \pm 5\%$. Besides, the power of this circuit stays no more than 40mA. Please get adequate power prepared.

③ When open collector output device is adopted (DC12V input)

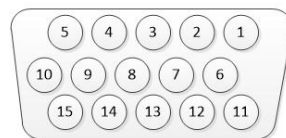
DC12V
Power

DC12V Power: range of power voltage should be within $DC12 \pm 5\%$. Besides, the power of this circuit stays no more than 40mA. Please get adequate power prepared.



3.6 Encoder Connector (CN2)

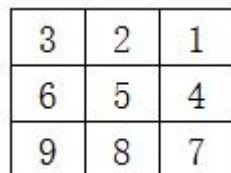
Servo driver side encoder wire plug adaptor (3 row DB15 MALE) pin:



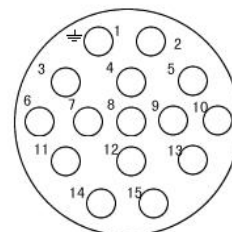
Please connect the signal of servo motor encoder to servo driver connector 2 (CN2).

Servo motor is equipped with encoder in its back; maximum length of encoder wire is 20m, and is confined to the wiring cable conductor.

Definition of incremental encoder motor side (90 flange and below/ 110 flange and over) and encoder (CN2) plug pin:



Plastic plug (90 flange and below)



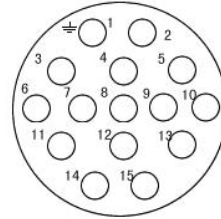
Aeronautical plug (110 flange and over)

Definition of driver side CN2 and motor side absolute encoder wire pin:

CN2 terminal name	Signal name	Motor side absolute encoder output pin (plastic plug)	Motor side absolute encoder output pin (aeronautical plug)
1	+5V (driver output)	7	2
2	T+	4	8
3	T-	5	9
10	GND	1	3
Shell	Shielded wire	3	1

Definition of incremental encoder motor side (90 flange and below/ 110 flange and over) and encoder (CN2) plug pin:

1	2	3	4	5
6	7	8	9	10
11	12	13	14	15



Plastic plug (90 flange and below)

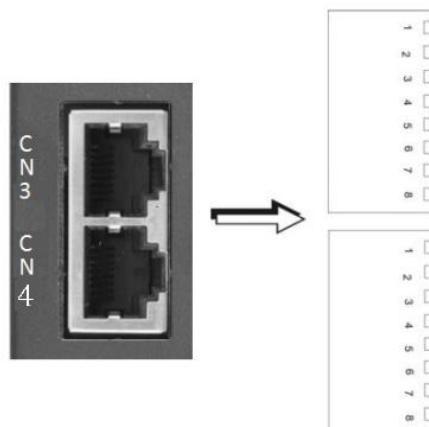
Aeronautical plug (110 flange and over)

Definition of driver side CN2 and motor side encoder wire pin:

CN2 Terminal Name	Signal Name	Motor Side Photoelectricity Encoder Output Pin
1	+5V (driver output)	2
2	Z+	8
3	Z-	9
4	B+	6
5	B-	7
6	A+	4
7	A-	5
8	U+	10
9	U-	11
10	GND (driver output)	3
11		
12	V+	12
13	V-	13
14	W+	14
15	W-	15
Shell	Shielded wire	1

3.7 Communication Ports

CN3/CN4 port is RS-485communication or CAN communication port:



CN3,CN4 pin	Pin definition	Function
4	485B	Driver data transfer differential- end
5	485A	Driver data transfer differential + end
7	CANL	Driver data transfer differential- end

8	CANH	Driver data transfer differential +end
1、 6	GND	Data earthing wire

CN3/CN4 port is EtherCAT communication port:

CN3,CN4 pin	Pin definition	Function
1	TX+	Driver data transfer differential +end
2	TX-	Driver data transfer differential- end
3	RX+	Driver data transfer differential +end
6	RX-	Driver data transfer differential- end
4、 5、 7、 8	N/C	

Chapter 4 Servo Parameter Specification

4.1 Parameter Settings

Settings:

Use  key to select parameter editing mode, switch from P0 to P5; Use  /  key to select parameter group, and then press  to enter the parameter number selection in this group, then use  /  again to select parameter number. In the end press  key and hold on for over 1 second to enter parameter setting.

4.2 Parameter Outline

4.2.1 Basic Function Parameter Group P0

Number	Name	Setting range	Initial value	Alteration validity
00	Control mode selection	0: position 1:speed 2: torque 3: position⇔speed 4: position⇔torque 5: speed⇔torque 7: interior position 8: interior position⇔ speed 9: interior position⇔ torque	0	outage
01	Input pulse string form	0:commanded pulse/commanded symbol 1: forward pulse / reversal pulse 2: 90 degree phase difference 2 path signal	0	outage
02	Rotation direction switch	0: rotates forward in forward direction 1: rotates backward in forward direction	0	outage
03	Output pulse phases switch	0: when CCW rotates B phases starts 1: when CCW rotates A phases starts	0	outage
04~05	Adjusted by Manufacturer	—	—	—
06	Electronic gear numerator myriabit	0~10000	0	always
07	Electronic gear numerator bit	0~9999	4	always
08	Electronic gear denominator myriabit	0~10000	0	always
09	Electronic gear denominator bit	0~9999	1	always
10	Adjusted by Manufacturer	—	—	—
11	Pulse times in each rotation rounds	16~9999[pulse](1 scale)	2500	outage
12~15	Adjusted by Manufacturer	-	-	-
16	MAX speed (for position and speed controlling)	1~60000[r/min](0.1 scale)	3000.0	always
17	MAX speed (for torque controlling)	1~60000[r/min](0.1 scale)	3000.0	always
18	Forward torque limits value	0~300%(1 scale)	300%	always
19	Reversal torque limits value	0~300%(1 scale)	300%	always
20	Speed limits selection in torque controlling	0: parameter 1: multi-gear selection, VREF terminal voltage	0	outage
21	Same speed range	0.1~ Maximum rotation speed [r/min](0.1 scale)	100.0	always

22	Zero speed range	0.1~ Maximum rotation speed [r/min](0.1 scale)	50	always
23	Deviation unit selection	0: pulsed quantity [PLUSE] 1: unit	0	always
24	Deviation zero range/positioning ending range (myriabit)	0~10000 [unit]/[PLUSE]	0	always
25	Deviation zero range/positioning ending range (bit)	0~9999 [unit]/[PLUSE]	100	always
26	Positioning ending output pattern	0: monostable 1: low level	0	outage
27	Minimum OFF time when positioning is ended /1 short circuit ON time	1~1000[ms]	20	always
28	Judge time of positioning ending	0~1000[ms]	0	always
29	Valid speed increase or decrease in speed controlling/invalid	0: valid 1: invalid	0	always
30	Acceleration time 1	0~10000[ms]	100	always
31	Acceleration time 2	0~10000[ms]	500	always
32	Deceleration time 1	0~10000[ms]	100	always
33	Deceleration time 2	0~10000[ms]	500	always
34	Disable deceleration time	0~10000[ms]	500	always
35	S- constant	0~1000[ms]	100	always
36	S-curve type	0: trapezoid curve 1: single S-curve 2: double S-curve	0	outage
37~38	Adjusted by Manufacturer	—	—	—
39	Test given speed FN-10	0~ Maximum rotation speed [r/min]	200.0	always
40	Joggle given speed FN-01	0~Maximum rotation speed[r/min]	50.0	always
41	Test operation form	0: position 1: speed 3: current	1	always
42	OS alarm ratio	1.1~5.00	1.10	always
43	Relevant action over OT	0: stall with maximum torque 1: stall in settled curve 2: lock-in	0	outage
44	Alarm detection when voltage is inefficient	0: not detected 1: detected	1	outage
45	Motor action in undervoltage	0: sudden brake 1: free brake	0	outage
46	Undervoltage point setting	150~210V	160	outage

47	Deviation detected pattern	0: detection alarms when exceeds deviation 1: limits alarms when exceeds deviation	0	outage
48	Deviation detected value	0.1~100.0[rev]	15	always
49	Adjusted by Manufacturer	-	-	-
50	AH alarm temperature selection	40~110℃	80	always
51	Fans temperature	20~70 ℃	40	always
52-74	Adjusted by Manufacturer		-	outage
75	Initial panel display	0~50	0	outage
76	Adjusted by Manufacturer	-	-	-
77	Ec alarm detection time	3~3000ms	5ms	outage
78	motor model selection	0~500	/	outage
79	INC/ABS selection	0: incremental 1: single-ring encoder 2: multi-ring encoder	1	outage
80	Select absolute encoder	0:17 bit 1:20 bit 2:23 bit	0	outage
81	Wiring number of incremental encoder	0~10000	2500	outage
82	Z phase compensation	0~60000	0	outage
83	Motor rated rotation speed	50~6000	2500	outage
84	Motor rated current	0.10~20.00	/	outage
85	Motor rated voltage	110~220	/	outage
86	Motor torque coefficient	0.01~5.00	/	outage
87	Motor polar numbers	1~6	/	outage
88	Motor stator resistance	0.01~100.00	/	outage
89	Motor q-axis inductance	0.50~80.00	/	outage
90	Motor d-axis inductance	0.50~80.00	/	outage
91	Motor back electromotive force	10~1000	/	outage
92	Motor rotor inertia	0.01~30.000	/	outage
93	Motor electrical time constant	0.50~300.00	/	outage

4.2.2 Control Gain / Filter Parameter Group P1

Number	Name	Setting Range	Initial Value	Alteration Validity
00	moving average S time	0ms~500ms	0	outage

01	time lag of first order S-type time constant	0.0~1000.0	0	always
02	Instruction smooth filtering function	0: invalid 1: valid	0	always
03	Positioning instruction response time constant	0.00~250.00	0	always
04	Convergent integral filter	0.00~20.00	0.50	always
05	Position loop convergent integral time	1.0~1000.0	1000.0	always
06	Position loop differential	0.00~1.00	0.05	always
07	End convergence position deviation	0~10000	20	always
08	Position loop feedforward gain 1	0.000~1.200	0.000	always
09	Position loop feedforward gain 2	0.000~1.200	0.100	always
10	Feedforward filter coefficient	0.000~2.500	0.000	always
11	Position loop gain 1	1~2000[rad/sec](1 scale)	25	always
12	Position loop gain 2	30~200%(1 scale)	100	always
13	Filter time coefficient given speed	0.00~20.00[s]	0.00	always
14~19	Adjusted by manufacturer	—	—	—
20	Load inertia ratio	0~100.0	0	always
21	Feedforward coefficient of	0.000~1.500	0.000	always
22	Velocity observer	0: normal 11: inferior 21: superior	0	outage
23	Time constant of speed feedback filter	0.00~10.00[s]	0	always
24	Speed loop PI regulator	0:normal 1: PDFF 2: High rhythm	0	outage
25	PDFF-KF	0.00~2.00	0	always

26~27	Adjusted by the manufacturer	—	—	—
28	Speed loop gain 1	1~30000	25	always
29	Velocity loop integral time constant 1	1~4096	100	always
30	Adjusted by the manufacturer	—	—	—
31	Speed loop gain 2	1~1500	100	always
32	Velocity loop integral time constant 2	1~1500	100	always
33	Adjusted by the manufacturer	—	—	—
34	Torque set filter time constant	0.00~20.00	0.50	always
35~39	Adjusted by the manufacturer	—	—	—
40	Gain switch reason	0~3	1	always
41	Gain switch grade	1~1000	50	always
42	Gain switch time constant	1~100	1	always
43	Initial judge frequency of band trap	50.0~200.0	50.0	always
44	Automatic band trap selection	H0000~H1FF	0	always
45	Notch filter 1 frequency	10~1000	1000	always
46	Notch filter 1 decrement	0~40	40	always
47	Notch filter 1 width	0.00~1.00	0.30	always
48	Notch filter 2 frequency	10~1000	1000	always
49	Notch filter 2 decrement	0~40	40	always
50	Notch filter 2 width	0.00~1.00	0.30	always
51~73	Adjusted by the manufacturer	—	—	—
74	Cut-off frequency of current	100~3000	800	always
75	Integral time of current regulator	0.0~100.0	0.8	always
76	Differential time of current	0.00~1.00	0	always
77	Current loop feedforward ratio	0.00~5.00	0	always
78	Current loop output filter	0.000~1.000	0	always
79	Dead zone compensated low-pass filter	0.000~1.000	0	always

4.2.3 Input/output Function Setting Parameter Group P2

Number	Name	Setting Range	Initial Value	Alteration Validity
00	CONT 1 input signal allocation	0: No designation 1: Servo start [RUN] 2: Manual forward rotation 3: Manual reversal rotation 4: Internal position 5: Origin regression triggers signal 6: external origin signal 7:+OT 8:-OT 9: emergency stop 10: alarm reset 14: acceleration and deceleration time selection 17: gain switching 19: torque limit 0 20: torque limit 1 24: electronic gear selection 0 25: electronic gear selection 1 26: prohibition of command pulses 27: instruction pulse ratio 1	1	outage
01	CONT 2 input signal allocation	28: instruction pulse ratio 1 31: internal position stop signal	0	outage
02	CONT 3 input signal allocation	32: internal position pulse erasing signal 34: external regenerative resistance overheating	0	outage
03	CONT 4 input signal allocation	36: control mode switching 37: position control	0	outage
04	CONT 5 input signal allocation	38: torque control 43: effective tuning	0	outage
05	CONT 6 input signal allocation	44: adjustment 1 45: adjustment 2 46: adjustment 4 47: adjustment 8 50: clearance deviation	0	outage
06	CONT 7 input signal allocation	51: multi-segment speed selection X1 52: multi-segment speed selection X2	0	outage
07	CONT 8 input signal allocation	53: multi-segment speed selection X3 54: multi-segment speed selection X4 65: internal location selection 0	0	outage
08	CONT 9 input signal allocation	66: internal location selection 1 67: internal location selection 2	0	outage

09	CONT 10 input signal allocation		0	outage
10~15	Adjusted by the	—	—	—
16	Constant valid 1	0~78	0	outage
17	Constant valid 2	0~78	0	outage
18	Constant valid 3	0~78	0	outage
19	Constant valid 4	0~78	0	outage
20	CONT input signal inversion	0~0xFFFF	0	outage
21	CONT 1 filtering time	0~22000	0	outage
22	CONT 2 filtering time	0~22000	0	outage
23	CONT 3 filtering time	0~22000	0	outage
24	CONT 4 filtering time	0~22000	0	outage
25	CONT 5 filtering time	0~22000	0	outage
26	CONT 6 filtering time	0~22000	0	outage
27	CONT 7 filtering time	0~22000	0	outage
28	CONT 8 filtering time	0~22000	0	outage
29	CONT 9 filtering time	0~22000	0	outage
30~36	Adjusted by the	—	—	—
37	OUT 1 signal allocation	0: no instruction 1: servo prepared [RDY] 2: positioning end [PSET] 11: speed limiter 12: braking action time 14: braking time output 15: alarm detectable A contact 16: alarm detectable B contact 20: OT detection 22: origin regression completed 23: zero deviation 24: zero velocity 25: speed arrived 26: torque limit 30: gradual output 0 31: gradual output 1 32: gradual output 2 33: gradual output 3	1	outage

38	OUT 2 signal allocation		0	outage
39	OUT 3 signal allocation		0	outage
40	OUT 4 signal allocation		0	outage
41	OUT 5 signal allocation		0	outage
42	OUT 6 signal allocation		0	outage
47	OUT output signal	0~0x03FF	0	outage
49	OC2 alarm value setting	10%~500%	330	outage
50~56	Adjusted by the	→	→	→
57	High-speed pulse low pass	0~255	0	outage
58~67	Adjusted by the	→	→	→
68	Speed command offset	0~4096	2048	outage
69	Speed command gain	0~maximum rotation speed [r/min](0.1scale)	1000.0	always
70	Speed command polar selection	0: unipolar0~10V 1: bipolar-10V~10V	1	always
71	Speed command scale	0~300	100	always
72	Torque command offset	0~4096	2048	outage
73	Torque command gain		1000.0	always
74	Torque command polar selection	0: unipolar0~10V 1: bipolar-10V~10V	1	always
75	Torque command scale	0~300	100	always
76	Zero speed clamping of	0~3000.0	100	always
77	Zero speed clamping of torque	0%~300%	5%	always

78	Analogue filtering	0~3000.0	50.0	always
79~80	Adjusted by the	—	—	—

4.2.4 Extended Function Setting Parameter Group P3

Number	Name	Setting Range	Initial Value	Alteration Validity
00	Indexing function speed/ internal position speed 1	0~maximum rotation speed[r/min](0.1scale)	500.0	always
01	Multi-velocity 1/ internal position speed 2	0~maximum rotation speed[r/min](0.1scale)	500.0	always
02	Multi-velocity 2/ internal position speed 3	0~maximum rotation speed[r/min](0.1scale)	500.0	always
03	Multi-velocity 3/ internal position speed 4	0~maximum rotation speed[r/min](0.1scale)	1000.0	always
04	Multi-velocity 4/ internal position speed 5	0~maximum rotation speed[r/min](0.1scale)	1000.0	always
05	Multi-velocity 5/ internal position speed 6	0~maximum rotation speed[r/min](0.1scale)	1000.0	always
06	Multi-velocity 6/ internal position speed 7	0~maximum rotation speed[r/min](0.1scale)	1000.0	always
07	Multi-velocity 7/ internal position speed 8	0~maximum rotation speed[r/min](0.1scale)	1000.0	always
08	Multi-velocity 8/ internal position speed 9	0~maximum rotation speed[r/min](0.1scale)	1000.0	always
09	Multi-velocity 9/ internal position speed 10	0~maximum rotation speed[r/min](0.1scale)	1000.0	always
10	Multi-velocity 10/ internal position speed 11	0~maximum rotation speed[r/min](0.1scale)	1000.0	always
11	Multi-velocity 11/ internal position speed 12	0~maximum rotation speed[r/min](0.1scale)	1000.0	always
12	Multi-velocity 12/ internal position speed 13	0~maximum rotation speed[r/min](0.1scale)	1000.0	always
13	Multi-velocity 13/ internal position speed 14	0~maximum rotation speed[r/min](0.1scale)	1000.0	always
14	Multi-velocity 14/ internal position speed 15	0~maximum rotation speed[r/min](0.1scale)	1000.0	always
15	Multi-velocity 15/ internal position speed 16	0~maximum rotation speed[r/min](0.1scale)	1000.0	always
16~24	Adjusted by the	—	—	—
25	electronic gear	0~10000	0	always
26	electronic gear	0~9999	1	always
27	electronic gear	0~10000	0	always

28	electronic gear	0~9999	1	always
29	electronic gear	0~10000	0	always
30	electronic gear	0~9999	1	always
31	Command pulse ratio 1	1.00~100.00	1.00	always
32	Command pulse ratio 1	1.00~100.00	1.00	always
33	Torque selection limit	0~1	0	outage
34	Second torque limit	0~300%	300%	always
35	Keep deviation when torque selection limits	0~2	0	outage
36	Third torque limit	0~300%	300%	always
37	Adjusted by the manufacturer	—	—	—
38	Disable instruction sequence	0: emergency stop 1: free stop	0	outage
39	Command sequence when major power is OFF	3: Free rotation in deceleration 5: Emergency deceleration	5	outage
40	Brake action time	0~28000	0	outage
41~42	Adjusted by the	—	—	—
43	Range ratio 1	0.00~1.50	0.10	always
44	Range ratio 2	0.00~1.50	0.20	always
45	Range ratio 4	0.00~1.50	0.40	always
46	Range ratio 8	0.00~1.50	0.80	always
47~48	Adjusted by the	—	—	—
49	Overflow forecast value	10%~500%	300%	always
50~63	Adjusted by the	—	—	—
64	Parameter edition prohibited	0: Rewritable 1: Prohibit rewriting	0	always
65	OL type	0~1	0	outage
66	OL ratio	0~1.5000	1.0000	always

4.2.5 RS485 Communication Setting Parameter Group P4

Number	Name	Setting Range	Initial Value	Alteration Validity
00	RS485 CAN station number	1~31	1	outage

01	RS485 baud rate	0~5	1	outage
02	Odd and even bit /end bit selection(for MODBUS)	0: parity: even/stop bit: 1bit 1: parity: Odd/stop bit: 1bit 2: parity: none/stop bit: 1bit 3: parity: even/stop bit: 2bit 4: parity: Odd/stop bit: 2bit 5: parity: none/stop bit: :2bit	0	outage
03	Reply delay time(for MODBUS)	0~5000ms	0	always
04	Communication overtime	0~20S	0	always
05	Motor action when communication overtime occurs	0: do not detect 1: deceleration top	0	always
06	Whether communication is stored to EEPROM	0: store 1: do not store	1	always
07	CAN baud rate	0~3	3	outage
08~13	Adjusted by the manufacturer	—	—	—
14	virtual CONT 1 input signal	0~78	0	outage
15	virtual CONT 2 input signal		0	outage
16	virtual CONT 3 input signal		0	outage
17	virtual CONT 4 input signal		0	outage
18	virtual CONT 5 input signal		0	outage
19	virtual CONT 6 input signal		0	outage
20	virtual CONT 7 input signal		0	outage
21	virtual CONT 8 input signal		0	outage
22	virtual CONT 9 input signal		0	outage
23	virtual CONT 10 input signal allocation		0	outage
24	virtual CONT 11 input signal		0	outage
25	virtual CONT 12 input signal		0	outage
26	virtual CONT 13 input signal		0	outage
27	virtual CONT 14 input signal		0	outage
28	virtual CONT 15 input signal		0	outage
29	virtual CONT 16 input signal		0	outage
30	virtual CONT signal inversion	0~65535	0	outage
31	Adjusted by the manufacturer	—	—	—
32	virtual OUT 1 signal allocation	0~90	0	outage

33	virtual OUT 2 signal allocation		0	outage
34	virtual OUT 3 signal allocation		0	outage
35	virtual OUT 4 signal allocation		0	outage
36	virtual OUT 5 signal allocation		0	outage
37	virtual OUT 6 signal allocation		0	outage
38	virtual OUT 7 signal allocation		0	outage
39	virtual OUT 8 signal allocation		0	outage
40	virtual OUT 9 signal allocation		0	outage
41	virtual OUT 10 signal		0	outage
42	virtual OUT 11 signal		0	outage
43	virtual OUT 12 signal		0	outage
44	virtual OUT 13 signal		0	outage
45	virtual OUT 14 signal		0	outage
46	virtual OUT 15 signal		0	outage
47	virtual OUT 16 signal		0	outage
48	virtual OUT signal inversion	0~65535	0	outage

4.2.6 Automatic Operation Setting Parameter Group P5

Number	Name	Setting Range	Initial Value	Alteration Validity
00	Adjusted by the manufacturer	—	—	—
01	Speed of origin reversion	1.0~1000.0[r/min]	500.0	always
02	Crawling speed of origin	1.0~1000.0[r/min]	50.0	always
03	Parameter configuration of	0~0x0245	0	outage
04~05	Adjusted by the	—	—	—
06	Origin reversion on-bit delay	0~5000[ms]	50	always
07	Origin reversion complete delay	0~5000[ms]	100	always
08	Upward position deviation of origin	0~0xFFFF	0	outage

09	Downward position deviation of origin	0~0xFFFF	0	outage
10~13	Adjusted by the	—	—	—
14	+software OT high-level position detection	0~0xFFFF	0x7735	outage
15	+software OT high-level position detection	0~0xFFFF	0x9400	outage
16	-software OT high-level position detection	0~0xFFFF	0x88CA	outage
17	-software OT high-level position detection	0~0xFFFF	0x6C00	outage
18	Software OT valid/ invalid	0: invalid 1: valid	0	outage
19~22	Adjusted by the	—	—	—
23	Origin regression acceleration time	0~10000[ms]	100	always
24	Origin regression deceleration time	0~10000[ms]	100	always
25~29	Adjusted by the	—	—	—
30	interior position 1 high-order pulse number	0~0xFFFF	0	always
31	interior position 1 low-order pulse number setting	0~0xFFFF	0	always
32	interior position 2 high-order pulse number	0~0xFFFF	0	always
33	interior position 2 low-order pulse number setting	0~0xFFFF	0	always
34	interior position 3 high-order pulse number	0~0xFFFF	0	always
35	interior position 3 low-order pulse number setting	0~0xFFFF	0	always
36	interior position 4 high-order pulse number	0~0xFFFF	0	always
37	interior position 4 low-order pulse number setting	0~0xFFFF	0	always
38	interior position 5 high-order pulse number	0~0xFFFF	0	always
39	interior position 5 low-order pulse number setting	0~0xFFFF	0	always
40	interior position 6 high-order pulse number	0~0xFFFF	0	always

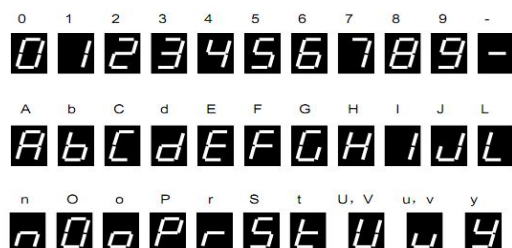
41	interior position 6 low-order pulse number setting	0~0xFFFF	0	always
42	interior position 7 high-order pulse number	0~0xFFFF	0	always
43	interior position 7 low-order pulse number setting	0~0xFFFF	0	always
44	interior position 8 high-order pulse number	0~0xFFFF	0	always
45	interior position 8 low-order pulse number setting	0~0xFFFF	0	always
46	interior position 9 high-order pulse number	0~0xFFFF	0	always
47	interior position 9 low-order pulse number setting	0~0xFFFF	0	always
48	interior position 10 high-order pulse number	0~0xFFFF	0	always
49	interior position 10 low-order pulse number	0~0xFFFF	0	always
50	interior position 11 high-order pulse number	0~0xFFFF	0	always
51	interior position 11 low-order pulse number	0~0xFFFF	0	always
52	interior position 12 high-order pulse number	0~0xFFFF	0	always
53	interior position 12 low-order pulse number	0~0xFFFF	0	always
54	interior position 13 high-order pulse number	0~0xFFFF	0	always
55	interior position 13 low-order pulse number	0~0xFFFF	0	always
56	interior position 14 high-order pulse number	0~0xFFFF	0	always
57	interior position 14 low-order pulse number	0~0xFFFF	0	always
58	interior position 15 low-order pulse number	0~0xFFFF	0	always
59	interior position 15 low-order pulse number	0~0xFFFF	0	always
60	interior position 16 low-order pulse number	0~0xFFFF	0	always
61	interior position 16 low-order pulse number	0~0xFFFF	0	always
62	interior position 1 signal delay	0~5000[ms]	100	always
63	interior position 2 signal delay	0~5000[ms]	100	always
64	interior position 3 signal delay	0~5000[ms]	100	always

65	interior position 4 signal delay	0~5000[ms]	100	always
66	interior position 5 signal delay	0~5000[ms]	100	always
67	interior position 6 signal delay	0~5000[ms]	100	always
68	interior position 7 signal delay	0~5000[ms]	100	always
69	interior position 8 signal delay	0~5000[ms]	100	always
70	interior position 9 signal delay	0~5000[ms]	100	always
71	interior position 10 signal delay	0~5000[ms]	100	always
72	interior position 11 signal delay	0~5000[ms]	100	always
73	interior position 12 signal delay	0~5000[ms]	100	always
74	interior position 13 signal delay	0~5000[ms]	100	always
75	interior position 14 signal delay	0~5000[ms]	100	always
76	interior position 15 signal delay	0~5000[ms]	100	always
77	interior position 16 signal delay	0~5000[ms]	100	always
78	interior position parameter configuration	0~0x1331	0x1001	outage
79	M code output	0: output when start finished 1:output when finished	0	outage
81	Cycle times	1~30000	1	always
82	Adjusted by the	—	—	—
83	Index function single loop high-level setting	0~0xFFFF	0	outage
84	Index function single loop low-level setting	0~0xFFFF	0x2710	outage
85	Index value setting	1~31	15	outage
86~99	Adjusted by the manufacturer	—	—	—

Chapter 5 Servo Major Function

5.1 Panel Introduction

7 gear display



Press Keys

- Switch mode (MODE).
Delete (ESC).
- Shift the setting bite rightward (SHIFT).
Set mode and value (ENT).
When setting please hold on this key for over 1s.
- Select servo mode.
Decrease the value (-1).
- Select servo mode.
Increase the value (+1).

5.2 Parameter Setting

When the wiring work is finished and get power turned on, parameters setting operation can begin without alarms.

1. Press key for times until the panel displays: P0-01;
2. Press key for over 1s, and the panel displays parameter value of P0-0;
3. Press Key to change the value, and press key for shifting bite. When finished editing, press for over 1s, and the edition gets valid when panel display P0-00;
4. Press key, panel displays: P0-02, repeat step 2 to set #2 parameter.
5. Use the same operation to set other parameters.

Attention: For some parameters, please turn off the power when setting is finished, and then turn on the power again.

5.3 Function Outline

Setting values can be changed in the parameter editing mode and positioning data editing mod.

Mode	Sub-mode	Sub-mode Selection	Marks and Setting Examples
Sequential monitoring model	Sequential mode	SN-01	P-SOF
	Current alarm	SN-02	EC
	Alarm record	SN-03	1-EC
	Display station number	SN-04	Ad01
Monitoring mode	Speed feedback	ON-01	1000
	Commanded speed	ON-02	1000
	Average torque	ON-03	1.00
	feedback the current position	ON-04	H0100

	Command the current position	ON-05	L1000
	position deviation	ON-06	10000
	DC Bus Voltage	ON-07	100
	electrical degree	ON-08	10.0
	Driver internal temperature	ON-09	25
		ON-10	spare
	Input signal	ON-11	L0000
	Output signal	ON-12	1
		ON-13	spare
	Peak value of torque	ON-14	3.00
	Pulse string input frequency	ON-15	10.0
	motor code	ON-16	dJ-06
	Version code	ON-17	-
		ON-18	spare
	VREF speed instruction input voltage	ON-24	
	TREF torque instruction input voltage	ON-25	
	Resonant frequency 1	ON-32	
	resonant frequency 2	ON-33	
	Cycle times	ON-34	
Parameters editing mode	Parameter edition	P0-00~P5~85	
Trail operation mode	Manual operation	FN-01	JOG
	Erase current command and feedback pulse	FN-02	PRT
	Erase accumulated pulse	FN-03	CPCR
	Alarm reset	FN-04	RT
	Clear alarm records	FN-05	ALRT
	Parameter initialization	FN-06	PART
	Automatic compensation adjustment	FN-07	OFFT
	Manufacturer reservation	FN-08、FN-09	
	Test runs	FN-10	ESY.1

Chapter 6 Servo Alarm

6.1 Alarm Content

Detected alarm content:

When alarm is detected, alarm code will be displayed on the servo driver panel automatically.

If multiple alarms are detected, the panel will display the content in a priority as below.

Priority	Display	Name
1	OC1	Overcurrent 1
2	OC2	Overcurrent 2
3	OS	Over speed
4	HU	Overvoltage
5	EH	Sampling current flow damaged
6	DE	Memory abnormal
7	EC	Encoder communication abnormal
8	RH1	Regenerate resistance overheat
9	OL	Overload
10	OF	Deviation exceeds
11	AH	Driver overheat
12	ND	Motor code unsettled
13	CE	Wrong motor code

6.2 Alarm Explanation and Troubleshooting

Alarm Code	Alarm Name	Operation Status	Reason	Treatment
OS	Over speed	Appears when driver is connected to power	Driver circuit failure	Replace driver
			Encoder failure	Replace servo motor
		Appears when motor starts	Too large load inertia	1.decrease load inertia 2.replace driver and servo motor with larger power ones
			Encoder zero error	1. Replace servo motor 2.return to manufacturer to adjust the zero point of encoder
			Wrong sequence of U/V/W phases	Check and conduct wiring correctly
			Encoder wiring failure	
		Appears during motor operation	Too large input command pulse frequency	Make sure that upper device has set input command pulse frequency correctly
			Too large electronic gear ratio	Make sure that electronic gear ratio has been set properly
			Acceleration、deceleration time constant so small that speed over adjustment is too large(in speed control)	1.increase acceleration/deceleration time constant(parameter P0-30,P0-32) 2.set larger S-type time constant(parameter P0-35) 3.set higher speed response in action(parameter P1-28)
			Encoder failure	Replace servo motor
			Parameters of servo system are not set correctly, which leads to overshoot	1.reset relevant gain of adjustor 2.If it is too hard to set proper gain, please replace proper motor
HU	Main circuit is overvoltage	Appears when only control power (S1/S2)is connected, and major power(R/S/T)is not	Circuit board inside driver gets failed	Replace servo driver
		Appears when control	Circuit board inside driver is	Replace servo driver

		power(S1/S2 and major power(R/S/T)are connected	failed	
			Power voltage is too high	Check if driver ON-07 value exceeds 400V.Check if supply power is too large.
		Appears during motor operation	Wires of braking resistance is broken	Reconnect the wires
			Braking resistance gets damaged	Measure the braking resistance equals to the marked value in outage. If damaged, please replace braking resistance
			Braking crystal tube inside driver gets damaged	Replace servo driver
			Braking circuit inside driver gets damaged	
			Braking resistance capacity is not enough	1. reduce stop frequency 2. increase the time constant of acceleration / deceleration 3. reduce the amplitude of current limit 4. Reduce load inertia 5. Reduce operation speed 6. Connect external braking resistance with adequate capacity
			Servo motor inertia is inefficient	Replace with servo motor with larger inertia
LU	Main circuit is under voltage	Appears at power connection	Main power line has poor contact	Check if the lights in driver power terminal base is on. If not, please check connection of wires.
			Supply power is not stable, power voltage is low	Check if driver ON-07 value is less than P0-46 value Make sure that power supply is stable
			A temporary blackout longer than 20ms	Check power supply
			Components inside driver is failed.	Replace servo driver
		Appears during motor operation	Inadequate power capacity	Check power supply
			Instantaneous power off	
OF	Position deviation exceeds	Appears at control power connection	Circuit board inside driver is failed	Replace servo driver
		Appears when motor starts	wrong wiring of motor U/V/W phase	Wire correctly
			Wrong wiring of encoder	
			Position proportional gain is too small	Increase position proportional gain
			Inadequate output torque	1.check torque limit value 2.reduce load capacity 3.replace with servo driver and motor that has larger power
			Excessive pulse command frequency	Under differential input, check if ON-15 value stays less than 500. Under open collector input, check if ON-15 value stays less than 200. If not, please reduce pulse frequency.
		Appears during motor operation	Power circuit of driver is failed	Replace servo driver
			Driver parameters are not adjusted properly	Increase position gain
			Excessive pulse command frequency	Under differential input, check if ON-15 value stays less than 500. Under open collector input, check if ON-15 value stays less than 200. If not, please reduce pulse frequency.
			Inefficient input power voltage	Reduce voltage to stay below working voltage when with load, and select right transformer and install pressure regulator
AH	Driver overheat	When power is on and servo cease operation for over 1 hour in normal temperatures	Circuit board inside driver is failed	Replace servo driver

		Appears during motor operation	Radiator fan does not work	Check temperature that displayed in ON-09. If fans are not working at over 40℃, please replace the servo driver
			Environment temperature is too high and gets poor radiated	Improve the ventilation work
			Cannot consume regenerated power	Prolong deceleration time
EC	Abnormal encoder communication	Appears at power connection / during motor operation	Wrong cable wiring of encoder	Check if encoder line is correctly wired or get damaged.
			Poor contact of encoder wires	Check if encoder is connected correctly.
			Encoder is damaged	Replace servo motor
			Detection circuit inside driver is failed	Replace servo driver
EH	current sampling circuit gets damaged	Appears at power connection	Sampling current flow inside driver is damaged	Replace servo driver
DE	Abnormal memory	Appears at power connection	Memory is damaged	Replace servo driver
			Communication between memory and main chip is abnormal	
OL	overload	Appears at power connection	Circuit board inside driver gets failed	Replace servo driver
		Appears during motor operation	Operation exceeds rated torque	1. check loads 2. Lower start and stop frequency 3. replace driver and servo motor with larger-power ones
			Wrong driver power line wiring of U/V/W	Check wiring and keep U/V/W are well connected
			Unstable motor operation. Oscillation occurs	1. Increase gain 2. Increase acceleration /deceleration time 3. Reduce the load inertia
			Abnormal servo motor	Replace servo motor
OC1	Overcurrent 1	Appears at power connection	Circuit inside driver gets damaged	Replace servo driver
		Appears during motor operation	Driver power line gets short-circuit among U/V/W	Check the power line
			Limited acceleration/deceleration time	Increase acceleration/deceleration time(P0-30, P0-32)
			Parameter rigidity of the control ring is too large	Decrease rigidity, lower down position gain(P1-11) and speed gain(P1-28)
			Output current is too large	Decrease the maximum current limit value parameter #P0-18/P0-19
			Not well-grounded. External interference exists	Ground properly
			Circuit inside driver gets damaged, lack phase etc.	Replace driver
OC2	Overcurrent 2	Appears during motor operation	Driver is failed	Replace driver
ND	Motor code unsettled	Appears once power is turned on	Before use the driver, please set down corresponding motor code	Motor code settings: Alter P0-78: Motor code. Please refer to the Code item in manuals or motor nameplates
CE	Wrong motor code	appears after motor code modification	Motor code set is not matched to encoder	Please confirm the motor code again

