

User Manual

AC Servo Spindle System

V3.2

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Catalog

Chapter 1 Product Feature.....	1
1.1 Technical Specifications of Product.....	1
Chapter 2 Introduction of Spindle Servo Driver.....	2
2.1 Model Description of Spindle Servo Driver.....	2
2.2 Series.....	2
Chapter 3 Wiring Description.....	3
3.1 Standard wiring diagram.....	3
3.2 Functions of Main Circuit Terminal.....	4
3.3 Functions of Control Circuit Terminals.....	4
Chapter 4 Instructions of Operation.....	12
4.1 Instructions of operation panel	12
4.2 Operational Process	13
4.3 Commissioning(Dry)	15
Chapter 5 Functional specifications of the Spindle.....	16
5.1 Speed control mode: need to connect I0 or I1 terminal.....	16
5.2 Orientation control: need to connect I2/I9 terminals.....	18
5.3 Analog rigid tapping:Need to connect I3 terminals!.....	20
5.4 Pulse control:Need to connect I4 terminals!.....	20
5.5 Swing control:Need to connect I6 terminals!.....	21
5.6 Inching:Need to connect I8 terminals!.....	21

5.7 Dimension.....	22
Chapter 6 Safety Precautions.....	24
6.1 Failure and Solutions.....	24
6.2 Analysis on Frequent Malfunction.....	26
Chapter 7 Spindle Servo Motor.....	31
7.1 Introduction of Spindle Servo Motor.....	31
7.2 Model Description of Spindle Servo Motor.....	31
7.3 Series.....	31
7.4 Specification of Spindle Servo Motor.....	32
7.5 Using Tips.....	32

Chapter 1 Product Feature

High performance

Control function comprehensive: stable speed control, accurate position control, excellent torque control.

Safe & Reliable

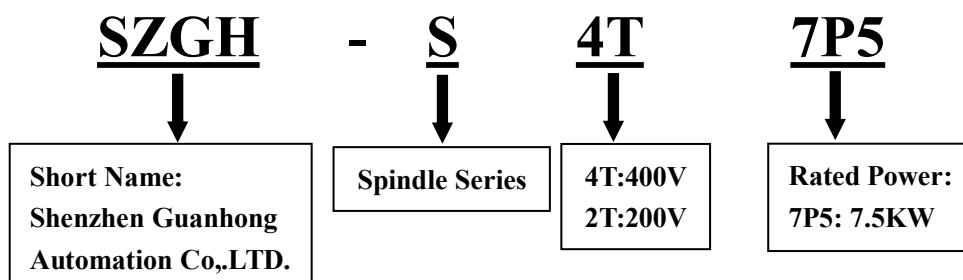
Products comply with international standards, through the CE certification. Set up multiple protection circuit, the comprehensive protection of safety equipment.

1.1 Technical Specifications of Product

Input power	Rated voltage/frequency	Three-phase 380V/480V; 50Hz/60Hz
	Allowable voltage range	+10% , -15%
	allowable frequency fluctuation	±5%
Control features	Control mode	PWM Vector control
	Speed adjustment range	0.01 ~ 500Hz
	Speed stabilization precision	±0.1%
	Acceleration/deceleration time	0.05 ~ 3000Hz/s
	Torque control	200% Rated torque output; Torque precision ±5%
	position control precision	±1 Pulse
	Braking mode	Powered braking
I/O	overload capacity	twice overload
	Digital input	10 point , NPN or PNP
	Digital output	6 point , NPN
	Relay output	1 , DC30V/1A or AC250V/1A
	Analog input	2 , A0 : ±10V ; A1 : 0 ~ +10V or 4 ~ 20mA
	External pulse input	1 , AB、SIGN+PLUS or CW
	Motor encoder input	1 , Receive frequency range:0~1MHz
Motor encoder output	1 , Output frequency range :0~1MHz	
Protection function	Over voltage protection,Low voltage protection,Over current protection Module protection ,Motor encoder failure,Motor over temperature,Motor overload protection	
Environment	Operating site	The product shall be mounted vertically in the electric control cabinet with good ventilation.The product shall be installed in the environment free from direct sunlight, dust, corrosive gas, combustible gas, oil mist, steam and drip.
	Ambient temperature	-10°C ~ +45°C
	Humidity	5 ~ 90% , no condensing
	Altitude	0 ~ 2000m, derated above 1000m, the rated output current shall be decreased by 1% for every rise of 100m
	Vibration	3.5mm,2~9Hz; 10 m/s ² ,9~200Hz; 15 m/s ² ,200~500Hz

Chapter 2 Introduction of Spindle Servo Driver

2.1 Model Description of Spindle Servo Driver

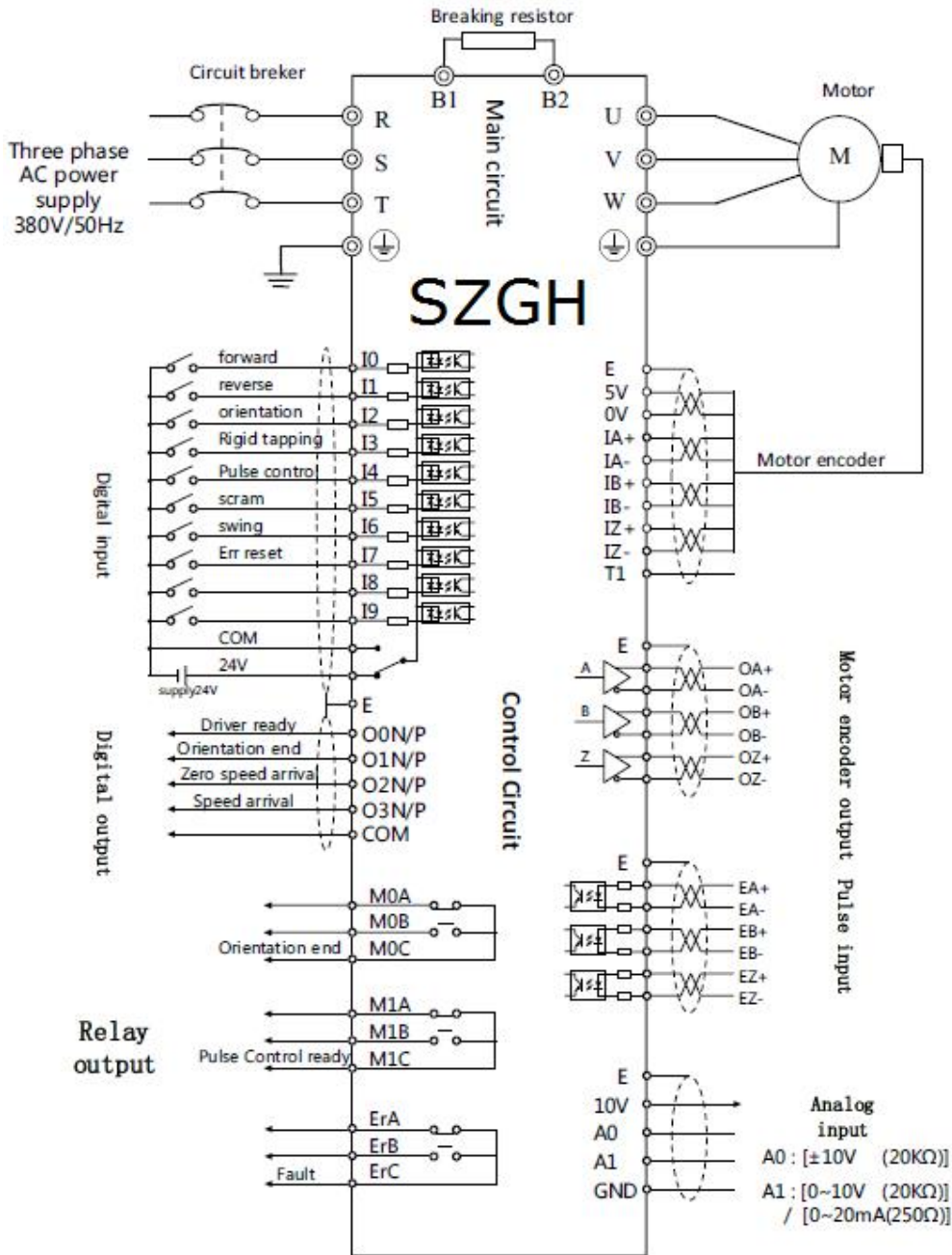


2.2 Series

Product Model	Motor power(kw)	Rated current (A)	KVA	Braking resistor	Wire specification(mm ²)	weight(Kg)
SZGH-S4T1P5	1.5	3.5	2.5	0.5kw / 75Ω	2.5	6
SZGH-S4T2P2	2.2	5	3.8	0.5kw / 75Ω	2.5	6
SZGH-S4T3P7	3.7	8	5.6	1kw / 40Ω	4	6
SZGH-S4T5P5L	5.5	13	8.6	1kw / 40Ω	4	6
SZGH-S4T5P5	5.5	13	8.6	1.5kw/ 32Ω	6	8
SZGH-S4T7P5	7.5	17	11	1.5kw/ 26Ω	6	8
SZGH-S4T011	11	25	17	1.5kw / 26Ω	6	8
SZGH-S4T015	15	32	20	1.5kw / 26Ω	6	8
SZGH-S4T015G	15	38	25	2kw / 40Ω*2	10	16
SZGH-S4T018	18	39	26	2kw / 40Ω*2	10	16
SZGH-S4T022	22	45	30	2kw / 40Ω*2	16	16
SZGH-S4T030	30	60	40	2.5kw / 40Ω*3	25	25
SZGH-S4T037	37	75	50	2.5kw / 40Ω*3	25	25
SZGH-S4T045	45	90	60	2.5kw / 40Ω*4	35	38
SZGH-S4T055	55	110	72	2.5kw / 40Ω*4	50	38
SZGH-S4T075	75	150	99	2.5kw / 40Ω*6	70	55
SZGH-S4T090	90	178	99	2.5kw / 40Ω*8	70	55
SZGH-S4T110	110	210	145	2.5kw / 40Ω*9	90	95
SZGH-S4T132	132	255	145	2.5kw / 40Ω*10	90	95


Chapter 3 Wiring Description

3.1 Standard wiring diagram



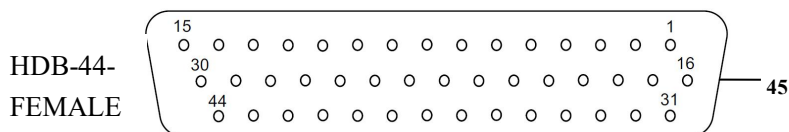
1. 24V-COM need to supply outside 24V, IO could to work, for internal power supply please ordering;
2. The digital quantity input NPN and PNP can be set up by SEL pin, set way to see "digital quantity input type";
3. The digital output at the same time there is open collector output (0 v) when effective, open emitter output (output is valid 24 v);
4. The motor encoder interface default receiving 422 difference signal, photoelectric encoder for rotating transformer, please instructions at ordering

3.2 Functions of Main Circuit Terminal

Terminal symbol	R , S , T	B1 , B2	U , V , W	
function description	Three-phase AC input terminal	Connecting terminal of braking resistor	Three-phase AC output terminal	PE

3.3 Functions of Control Circuit Terminals

Definition of CN1

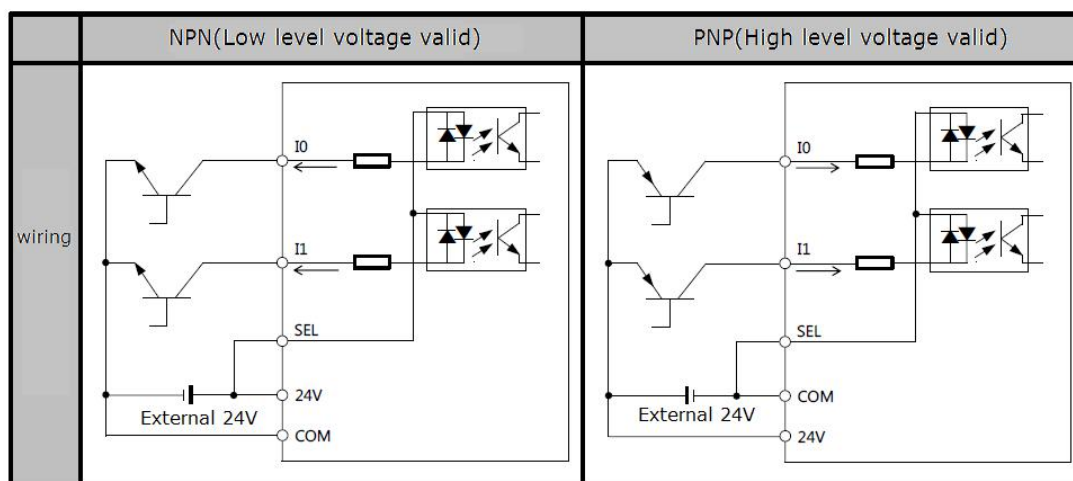


3.3.1 Function description of CN1

	Digital input		Digital output		Analog input		Programming Relay Output		Alarm Relay Output	
	symbol	Stitch	symbol	Stitch	symbol	Stitch	symbol	Stitch	symbol	Stitch
CN1	I0	22	O0N	6	A0	14	M0A	32	ErA	1
	I1	23	O0P	36	A1	15	M0B	33	ErB	17
	I2	7	O1N	21	12V	30	M0C	31	ErC	16
	I3	8	O1P	35	GND	29	M1A	18	E	45
	I4	9	O2N	5	E	45	M1B	3		
	I5	10	O2P	34			M1C	2		
	I6	11	O3N	20			E	45		
	I7	26	O3P	4						
	I8	24	24V	39						
	I9	25	COM	40						
	SEL	12	E	45						
	E	45								
	Expl ain	10Points, NPN/PNP selected by SEL		4 Group 4-NPN Output 4-PNP Output		A0 : ±10V A1 : 0~ +10V or 0~20mA (Optional)		Programming Relay Output A-C : NC B-C : NO		Alarm Relay Output ErA-ErC : NC ErB-ErC : NO

1. COM for the digital input and output of public side, GND for analog input fields, GND and COM isolation
2. 24V-COM need external power supply, 24 v for internal power supply please ordering
3. The digital quantity input type NPN (low level) effectively, PNP (effective) high level two, set way to see "digital quantity input type"
4. The main loop of the control loop cable please with separate cables and other power cable line, otherwise interfere with the control signal;
5. SEL connection 24V, input type NPN, input low level
6. SEL connection 0V ,input type PNP , input high efficient

3.3.2 Digital Input Type Instruction



Note: 1.the digital input type is depend on SEL(Pin12)

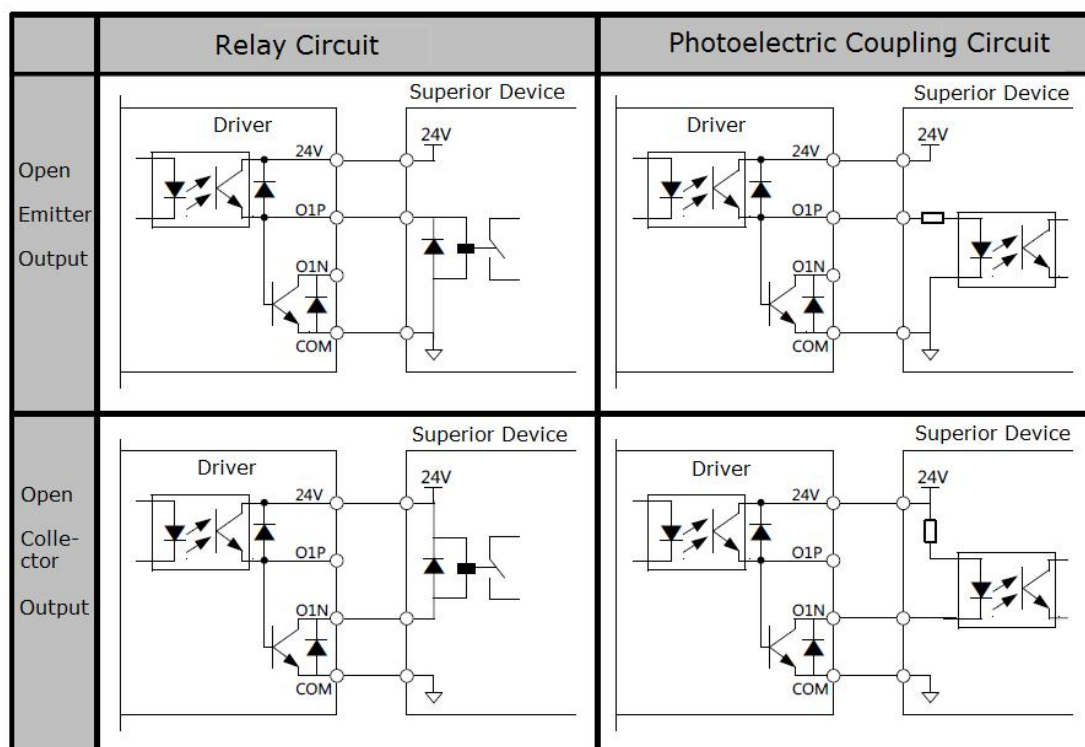
a) SEL connect 24V,input type is NPN,input low level voltage is valid;

b)SEL connect COM,input type is PNP,input high level voltage is valid;

2.if customer ensure the type,the wiring can be connected inner.

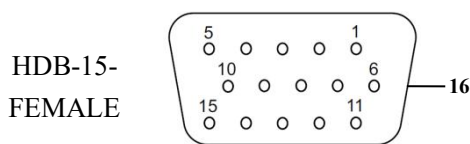
3.digital input need external 24V supply,if need inner 24V,please special mark.

3.3.3 Digital Output Type Instruction



Note:Driving relay,inductive load,please access bypass diode(Rated current>circuit current;voltage>3* ex-voltage)

Definition of CN2 (Motor encoder input)

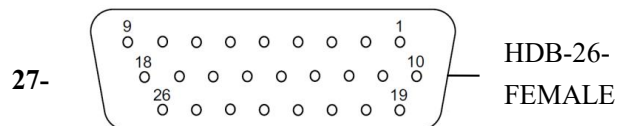


3.3.4 Function description of CN2

	Photoelectric encoder			Rotary transformer			Extended interface	
	Terminal symbol	Stitch	function description	Terminal symbol	Stitch	function description	Terminal symbol	Stitch
CN2	IA+	6	A phase input	COS+	6	COS pulse input	T1	9
	IA-	1		COS-	1		0V	13
	IB+	7	B phase input	SIN+	2	SIN pulse input		
	IB-	2		SIN-	7			
	IZ+	8	Z phase input	EXC+	3	Encoder power		
	IZ-	3		EXC-	8			
	+5V	11	Encoder power	E	16			
	0V	12						
	E	16	Shield GND					
	Technical specifics	5V line drive difference signal input;RS422: Max response frequency is 1MHz			Rotary transformer interface			Protection of motor overheating

Note:The default of motor’s encoder is photoelectric encoder 422 differential signal,if need rotary transformer,please explanation specially.

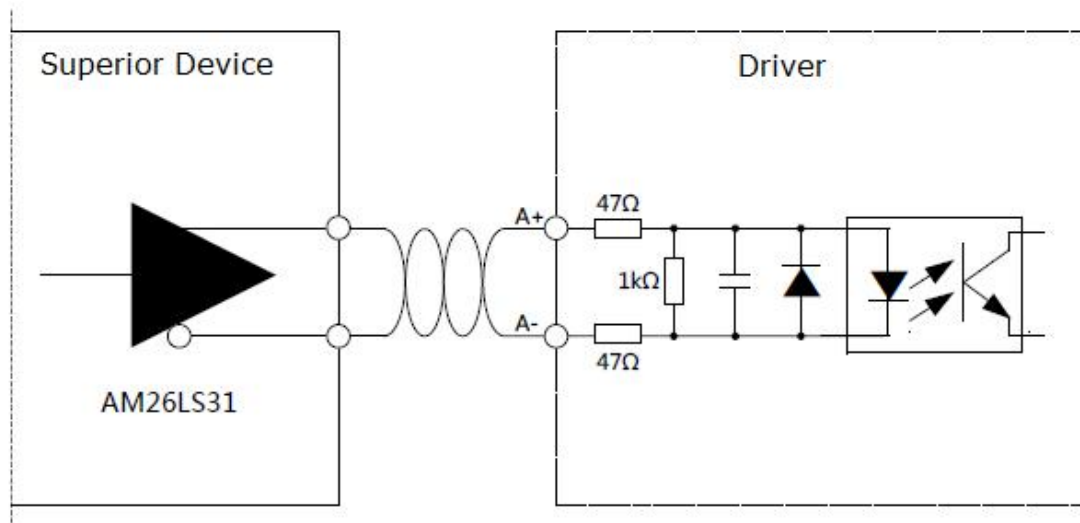
Definition of CN3 (External pulse input)



3.3.5 Function description of CN3

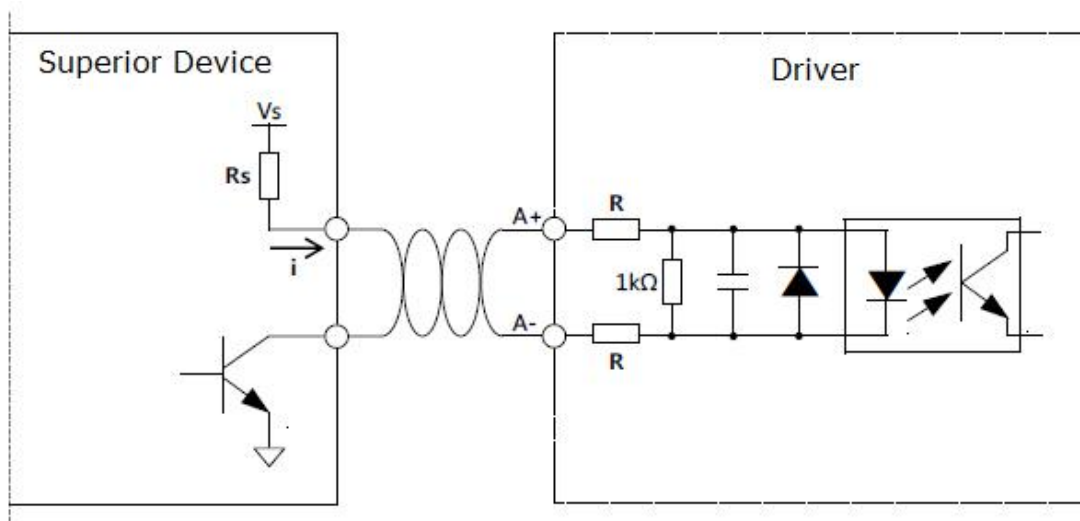
	ABPULSE/ SIGN+PULSE / CW+CCW			Motor encoder feedback output		
	Terminal symbol	Stitch	function description	Terminal	Stitch	explain
CN3	EA+ / EP+ / CW+	2	A phase input/PULSE input/CW Pulse input	OA+	9	A Pulse output
	EA- / EP- / CW-	11		OA-	18	
	EB+ / ES+ / CCW+	4	B phase input/ SIGNinput/CCW Pulse input	OB+	17	B Pulse Output
	EB- / ES- / CCW-	13		OB-	8	
	EZ+	3	common port	OZ+	7	Z Pulse Output
	EZ-	12		OZ-	16	
	+5V	26	Handwheel power supply			
	0V	25				
	E	27	Earth			
	Explain	AB Pulse , Direction+Pulse , CW Pulse choice, Max response frequency is 1MHz			RS422 output,5V drive difference signal output,Max response frequency is 1MHz	

3.3.6 External Input Pulse Type Instruction



RS422 Differential signal drive

Note: 1.the default set of driver is receiving 422 differential signal drive.
 2.this driving way most is used when connected with CNC system.



Open collector signal Driving

Note:1.adopt this connect way,it need an external current limiting resistor R_s ,ensure i ,driving current, is about 10mA;driver's built-in current limiting resistor is 47Ω, V_s & R_s are set as follow:(make sure that driving current less than 18mA,otherwise it will broke down inner circuit.)

- a) $V_s=24V$, $R_s =2k\Omega$;
- b) $V_s=12V$, $R_s =1k\Omega$;
- c) $V_s=5V$, $R_s =200\Omega$.

2.when customer need this way,please tell the sales external voltage,the factory will alter the value of resistance,avoid add external resistance R_s ;
 3.this driving way most is used when connected with PLC system.

3.3.7 Parameter List

Function	Parameter number	Parameter name	Setting range	Default setting	Unit
Motor Parameter	E00	Basic frequency of motor	0.00 ~ 500.00	50.00	Hz
	E01	Rated current of motor	0.0 ~ 500.0	*	A
	E02	Number of motor poles	2 ~ 12	4	-
	E03	rated slip of motor	1 ~ 900	*	r/min
	E04	Motor encoder lines number	1 ~ 60000	1024	-
	E05	Bias value of exciting current	1 ~ 100	50	%
	E06	Motor encoder filtering time	1 ~ 200	30	0.1ms
	E07	Zero speed slip	1 ~ 100	80	%
	E08	Slip compensation	0~150	30	%
	E10	Speed control of slop base	1 ~ 900	60	r/min
	E11	Speed control of slop plus	1~100	0	-
	E12	Position control of slip base	1~900	30	r/min
System Parameter	E20	Torque amplitude limit of	0 ~ 200	100	-
	E21	Torque amplitude limit of	0 ~ 200	100	-
	E22	Current plus coefficient	0 ~ 550	450	-
	E23	Speed S curve time	1 ~ 20000	1000	-
	E24	Integral compensate factor	1 ~ 500.00	*	Hz
	E25	Integral offset value	1 ~ 500.00	*	Hz
	E30	Ratio plus P	0 ~ 100	80	%
E31	Integral plus	0 ~ 150	100	%	

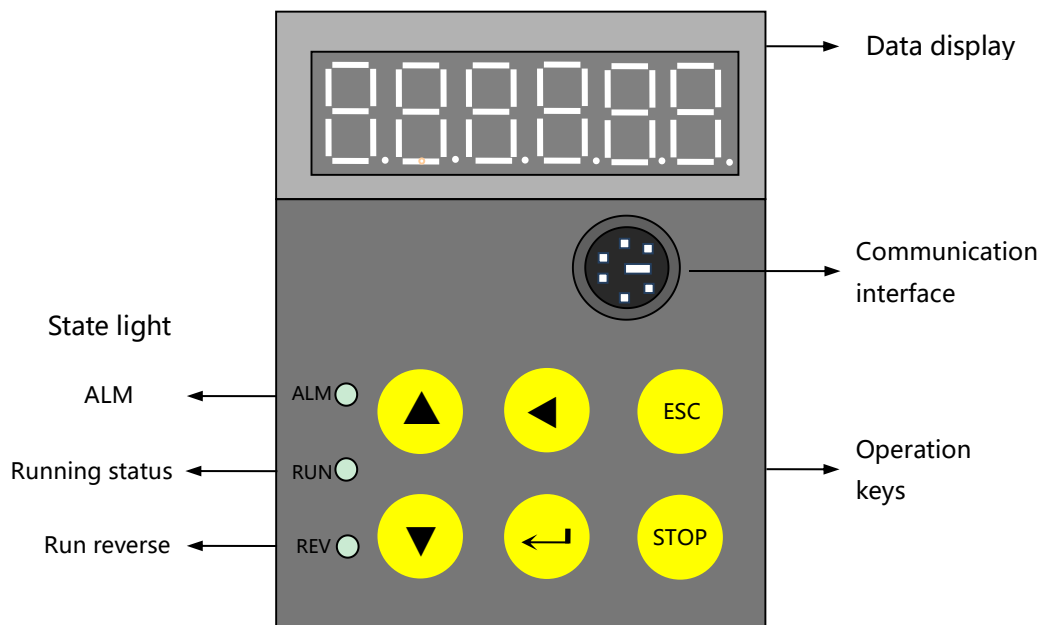
	E32	Current plus offset	0 ~ 100	50	%
	E33	Current plus	0 ~ 150	60	1/10
	E34	Current plus conversion point	1 ~ 300.00	50.00	Hz
	E35	Speed control integral	1 ~ 1000	20	0.1ms
	E36	Steady control integral	1 ~ 20000	200	0.1ms
	E37	Acceleration integral	1 ~ 20000	200	0.1ms
	E38	Deceleration integral	1 ~ 20000	1000	0.1ms
	E39	Position control integral	1 ~ 1000	20	0.1ms
Function selection	E40	Speed command input type	0: 0~10V, 1: ± 10V, 2:External pulse		
	E41	Choice speed control direction	0: default DIR , 1: opposite DIR		
	E42	Forbidden reverse	0: None , 1: forbidden reverse		
	E43	Control mode selection	0:Normal mode,1:High Speed mode		
	E44	Position control mode	0:synchronous mode,1:follow mode		
	E45	Choice the direction of inching	0: Positive , 1: Negative		
	E46	Protect of low voltage	0: Protect , 1: None Protect		
	E60	Motor encoder options	0:Optical encoder,1:Rotating transfer		
	E61	External input pulse option	0:AB Pulse ,1: P+D pulse, 2:CW pulse		
	E62	encoder options of phase sequence	0: A phase leading B phase , 1: B phase leading A phase		
	E63	Motor overheating protection option	0:None protect, 1:open protect switch 2:close protect switch		
	E64	External input pulse direction of choice	0: the default direction, 1: the opposite direction		
	E65	External input pulse Z	0: None ,1: Yes		

Function	Parameter number	Parameter name	Setting range	Default setting	Unit
Speed control	F00	MAX Speed	1~15000	6000	r/min
	F01	MIN Speed	0~100	0	r/min
	F02	Low speed Acceleration	0~10000	1500	0.05Hz/s
	F03	Low speed Deceleration	0~10000	1500	0.05Hz/s
	F04	Deceleration transformation point	0~15000	3000	r/min
	F05	High speed acceleration	0~10000	1500	0.05Hz/s
	F06	High speed deceleration	0~10000	1500	0.05Hz/s
	F07	Reach the range	0~300	45	r/min
	F08	The speed gear ratio of numerator	0~60000	1000	-
	F09	The speed gear ratio of denominator	0~60000	1000	-
Position control	F10	Max speed of position control	1~15000	300	r/min
	F11	Min speed of position control	0~60	1	r/min
	F12	Pulse sync acceleration	0~10000	200	0.05Hz/s
	F13	Pulse sync deceleration	0~10000	100	0.1Hz/s
	F14	External input pulse filtering time	0~60000	20	0.1ms
	F15	Locate inertia modification point	0~60000	200	pulse
	F16	Position control cushion point	1~250	20	pulse
	F17	The position control accuracy	0~60000	2	pulse
	F18	The position control gear ratio of numerator	0~60000	1000	-
	F19	The position control gear ratio of denominator	0~60000	1000	-
Orien-	F20	Orientation deceleration	0~10000	1000	0.05Hz/s
	F21	Position plus at orientation	0~10000	200	0.1Hz/s
	F22	Positive orientation offset	0~60000	0	pulse
	F23	Orientation speed	0~1000	60	r/min

-tation	F24	Time delay of Orientation arrive	0~10000	20	2.5ms
	F25	Orientation signal mode	0:orientation high level is valid 1:orientation pulse is valid		
	F26	Orientation mode selection	0:Positive orientation , 1: Negative orientation,2:Orientation the nearest		
	F27	The second Orientation offset	0~60000	2000	pulse
Emergency Stop	F30	Emergency stop deceleration	0~10000	1500	0.05Hz/s
	F31	The motor power off delay	0~10000	0	2.5ms
Rigid Tapping	F32	Max rotating speed at rigid	1~3000	1500	r/min
	F33	Spindle acceleration at rigid tapping	0~10000	3000	0.05Hz/s
	F34	Rigid tapping order smallest unit	0~1000	1	-
Swing	F35	Swing Angle	0~10000	0	2.5ms
	F36	Swing speed	1~3000	1500	r/min
	F37	Swing torque	0~10000	0	2.5ms
Inching	F38	Inching speed	1~3000	1500	r/min
	F39	Inching acceleration	0~10000	3000	0.05Hz/s
Analog modulation	F40	Speed order smallest unit	0~10000	0	2.5ms
	F41	Analog Filtering time	1~3000	1500	r/min
	F42	Analog calibration parameters	0~10000	3000	0.05Hz/s
	F43	Analog is segmented	0~10000	0	2.5ms
	F44	The first period of bias	1~3000	1500	r/min
	F45	The second period of bias	0~10000	3000	0.05Hz/s
	F46	± 10V Negative piece wise point	0~10000	0	2.5ms
	F47	± 10V Negative for the first period of bias	1~3000	1500	r/min
	F48	± 10V Negative for the second period of bias	0~10000	3000	0.05Hz/s

Chapter 4 Instructions of Operation

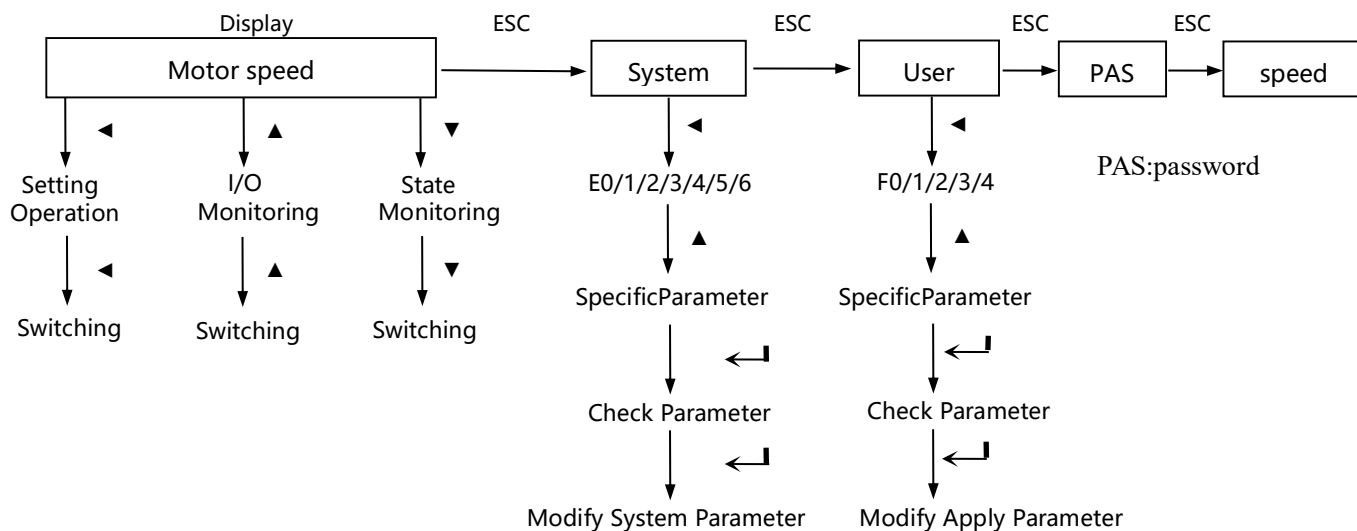
4.1 Instructions of operation panel



4.1.1 Description of Keys on Operation Panel

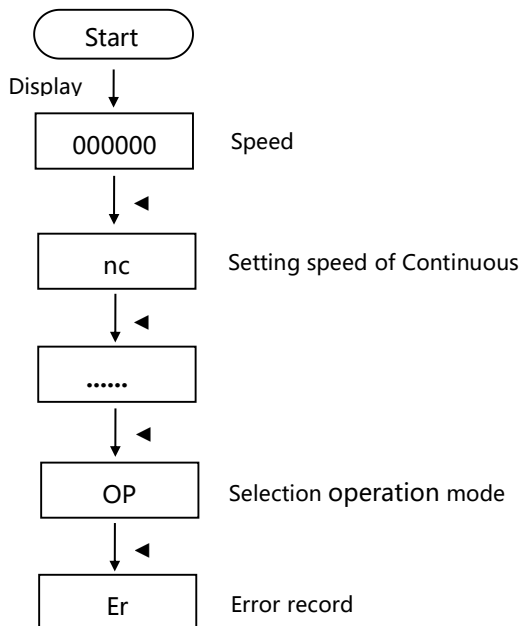
Symbol	Name	Function
▲	Increase Key	Increasing the parameters value
▼	Decrease Key	Decreasing the parameters value
◀	Shift Key	Switching the data bit of parameters number
↵	Enter Key	Finish the modification operation of parameters
ESC	Escape Key	Return to previous menu
STOP	Stop Key	Making motor stop. Replace the driver fault

4.1.2 Description of Parameter display

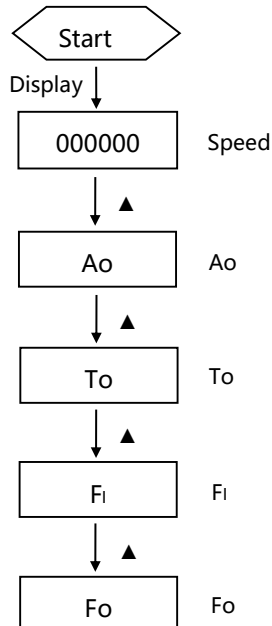


4.2 Operational Process

Operation Panel control



State Monitoring



4.2.1 Description of Operation Panel control and Monitoring Parameter

Parameter number	Operation Panel control	Parameter number	I/O Monitoring	Parameter number	State Monitoring
nc	Setting speed of panel control	d	Digital input	Ao	Output current(A) (show 2.0 means 2.0 A)
ro	Running mode 0:continuous 1: JOG	o	Digital output		
Ac	Operational panel control,the acceleration 0~10000	A0	Analog inputA0	To	Output torque (100%)
		A1	Analog inputA1		
dc	The deceleration 0~10000	P	Motor encoder input	FI	Setting frequency (Hz)
F-E	Setting operation direction 0:forward 1: reverse	H	The absolute position of rotor		
OP	operation mode 0: I/O control 1:Operation Panel control 2:Dry	E	External pulse input	Fo	Output frequency (Hz)
Er	Press “Enter” to check of errors	F	Frequency of external pulse		

Note: ex-factory set dry(OP=2),after ensure the motor run normally,set OP=0.The detailed introduction,please check the Commission Parts.

4.2.2 Description of Operation Panel control

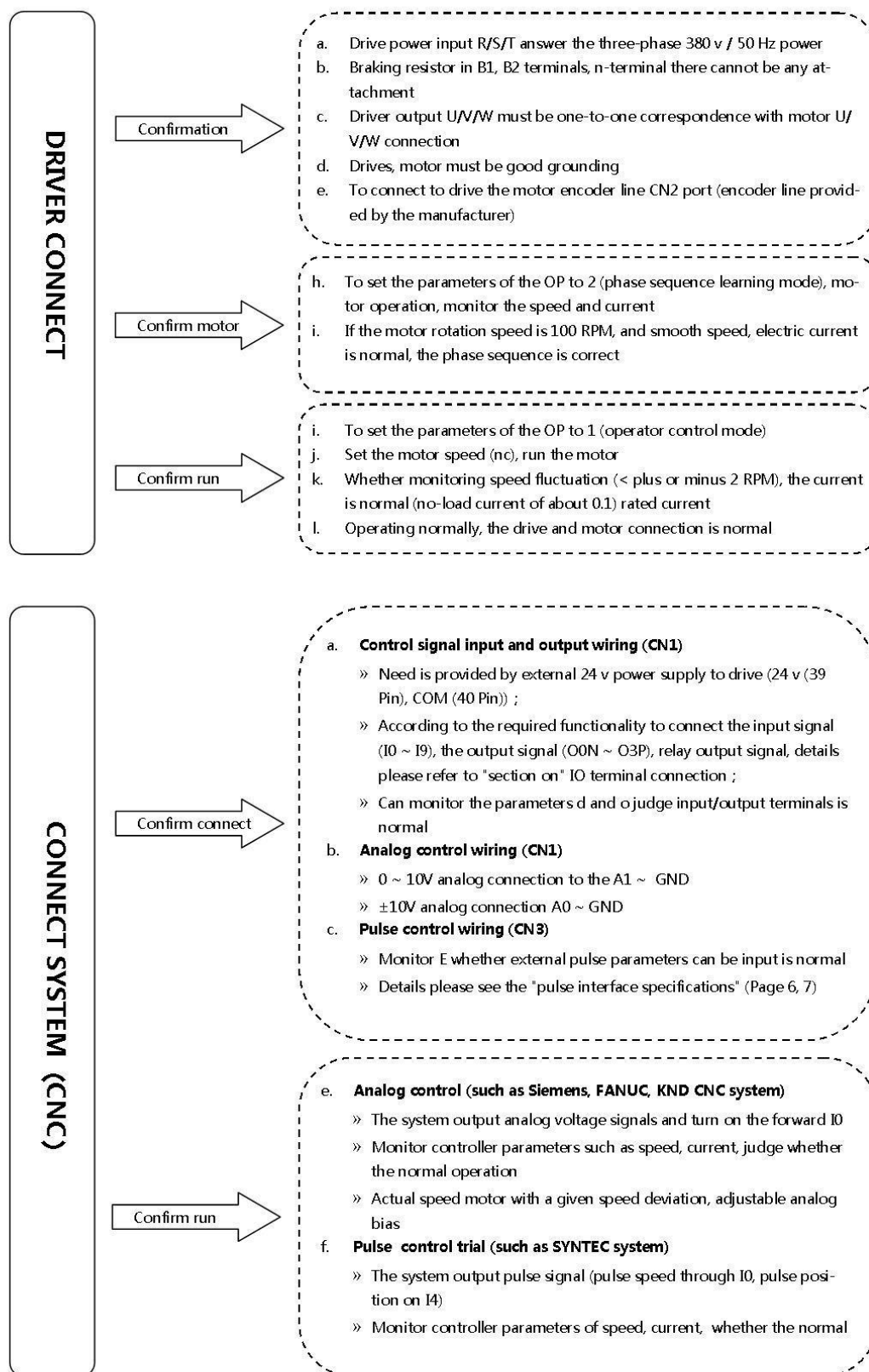
In displaying speed,press ◀ key to set the motor' s speed nc ; press ◀ key again,set the motor running model ro ; press ◀ key again,set the motor' s direction F-E;press ◀ key again,select OP as operational panel control mode.

After Setting Operation Panel control Parameter, Press ← on the State Monitoring,the motor is on zero speed & be on power condition; Press **enter** key (↵) at any monitoring condition ,The motor will run with set value. Press **STOP** Key will stop running when motor is running.after stopping,the motor is on the condition of zero speed & be on power ,press **STOP** key again,the motor is on the condition of Freedom & Off of power,Holding on **STOP** key,the program stop running(The run light will turn off.)

4.2.3 Description of Password (P A S)

To prevent the irrelevant personnel modify manufacturer parameters,Need password into the manufacturer of parameter, if there is a need to amend manufacturer parameters, please contact with our company

4.3 Commissioning(Dry)



Chapter 5 Functional specifications of the Spindle

5.1 Speed control mode: need to connect I0 or I1 terminal

5.1.1 Speed Instruction

Parameters	Definition	instructions
E40	Speed command input type selection	0 : 0~10V , 1 : ±10V , 2 : External pulse
E43	Control mode selection	0 : Normal mode , 1 : High speed mode
F00	The highest speed (speed control)	The maximum speed of control
F08	The speed gear ratio of numerator	Actual speed = Speed order × $\frac{F08}{F09}$
F09	The speed gear ratio of denominator	
F40	Speed resolution	Speed order smallest unit
Analog instruction		
F41	Analog Filtering time	The more large the greater the effect input
F42-F48	Analog calibration parameters	Analog correction
Pulse instruction		
E61	External input pulse option	0 : AB Pulse , 1 : P+D pulse , 2 : CW pulse
E65	input pulse direction of choice	0 :the default direction ,1 :the opposite direction

- a) Control mode by the parameter E43 modification, common mode top speed of 7500 RPM, top speed of 15000 RPM high speed mode ;
- b) Speed control, there are three sources of speed instruction, by the parameter E40 choice ;
- c) Instruction type of 0 ~ 10V analog, ±10V analog, 10V corresponds to the highest speed set by parameter F00 ;
- d) Analog can F42-F48 parameter calibration, A0, A1 monitored by monitoring parameters ;
- e) Instruction type of pulse, pulse type can be chosen by E61 3 types of pulse, pulse direction can be changed by the E65 ;
- f) External sending pulse frequency f (Hz) corresponding to the motor speed n (RPM) relations as follows, which is suitable for motor encoder parameters E04 line number:

$$n = \frac{f * 15}{E04}$$

- g) After speed gear as used in the current actual speed, adjust the speed is not affected by the highest speed limit ;
- h) For example:
 - 1) Using external pulse mode:
 - A. The E40 set to 2
 - B. External pulse for AB type (90° orthogonal pulse),you will need to set the E61 to 0;
 - C. Motor encoder is 2500 lines, expect motor speed is 1500 RPM, the external pulse frequency need be sent 250 KHZ. If F00 set to 1000 RPM, the actual motor speed is 1000 RPM;
 - D. If the gear ratio is set to F08 = 2, F09 = 1, the motor speed is 2000 RPM (not for 3000 RPM).
 - 2) Use ±10V mode

- A. The E40 set to 1 ;
- B. If the highest speed F00 set as 10000, the control mode of E43 set to 1 (high speed) ;
- C. Expect motor speed is 3020 RPM, the external input analog voltage should be 3.02 V.
- D. If speed instruction resolution F40 set to 50, the actual motor speed is 3000 RPM;
- E. If the gear ratio is set to F08 = 4, F09 = 1, motor speed should be 12080 RPM, not limited by F00 ;
- F. Because the speed instruction resolution F40 is 50, so the actual motor speed is 12050 RPM.

5.1.2 Rotating Direction of Spindle

Parameters	definition	Instruction
E41	Speed control direction selection	0 :the default direction , 1 :opposite of default direction
E42	Whether Ban Reverse	0:no ban reverse 1:ban reverse
E65	Direction selection of external input pulse	0 :the default direction , 1 :opposite of default direction

a) 0-10V analog code, I0: CW , I1: CCW.

I0	I1	E42	E41	Rotating Dir
Cancel	Cancel	×	×	Power Failure
Valid	Cancel	0	0	Forward
×	Valid	0	0	Backward
Valid	Cancel	0	1	Backward
×	Valid	0	1	Forward
Anyone is Valid		1	0	Forward
Anyone is Valid		1	1	Backward

b) ±10V analog and pulse code, there is direction signal in the code, only join I0.

Attribute of code	I0	E42	E41	Rotating Dir
×	Cancel	×	×	Power Failure
Positive	Valid	0	0	Forward
Negative	Valid	0	0	Backward
Positive	Valid	0	1	Backward
Negative	Valid	0	1	Forward
×	Valid	1	0	Forward
×	Valid	1	1	Backward

Cautious: 1. × stands for any condition;

2. Adopt pulse mode, alter the direction signal by modifying E65.

5.1.3 Acceleration and deceleration control

Parameters	definition	instruction
F02	Low speed acceleration	1.Speed control, motor's acce&dece -leration can be divided into two sections to control ; 2.transformation point set by F04 ; 3.it controled by F02,F03 in low speed, the bigger the value,the quicker it is; 4.it controlled by F05,F06 in high speed,the bigger the value is,the quicker it is.
F03	Low speed deceleration	
F04	Deceleration transformation	
F05	High speed acceleration	
F06	High speed deceleration	
E23	Speed S curve time	The bigger the E23 is,the more smooth it is,but the longer its time is.
F30	Emergency stop deceleration	I5(emergency stop) is valid or I0/I1 be canceled,it down to 0 in the speed of F30,the motor keep in free.

5.2 Orientation control: need to connect I2/I9 terminals

5.2.1 Parameters Instruction

Parameters	definition	instruction
F20	orientation deceleration	
F21	Position plus at orientation	
F22	Positive orientation offset	
F23	Orientation speed	
F24	Time delay of Orientation arrive	orientation pulse is valid
F25	Orientation signal mode	0: orientation high level is valid 1: orientation pulse is valid
F26	Orientation mode selection	0 : Positive orientation , 1 : Negative orientation , 2 : Orientation the nearest
F27	The second Orientation offset	Through to the I9 according to this parameter specifies the location of Orientation
E65	External input pulse Z phase	0 : None , 1 : Yes
F30	Emergency stop deceleration	Motor with F30 deceleration slowed to zero speed

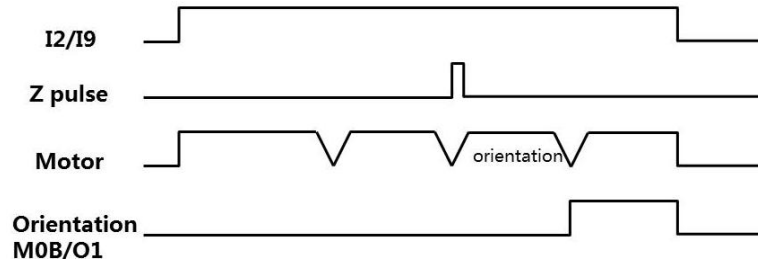
5.2.2 Orientation process diagram

There are two pulse source of origin (reference):

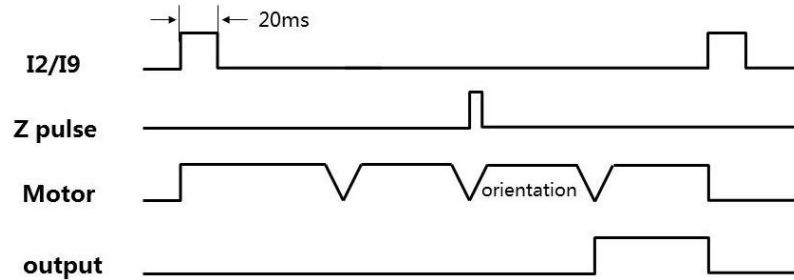
Motor coder location: Motor coder location used in the situation of that transmission ratio is 1:1 or location by magnetic sensing zero position switching: when E65 set to 0 .

External coder location: External coder location used in the spindle which transmission E65 set to 1.

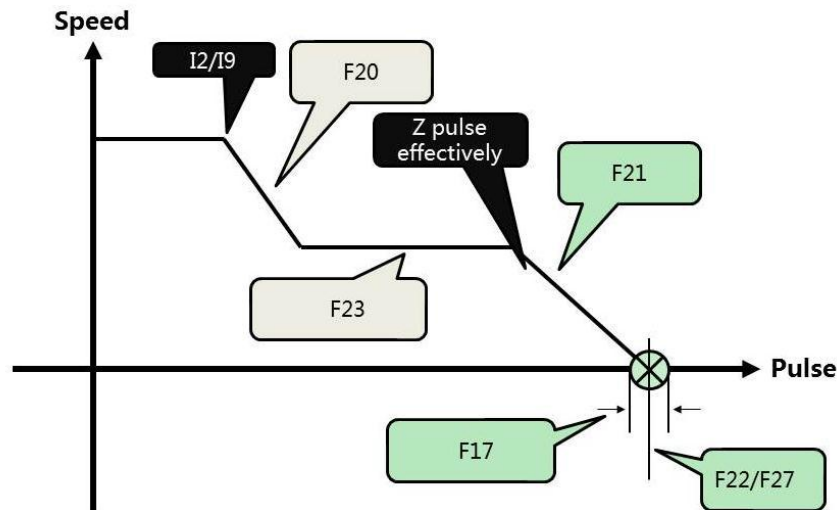
Orientation high level valid (F25=0):



Orientation pulse is valid(F25=1):



5.2.3 Orientation process curve



5.2.4 Setting of spindle orientation position

- a) Perform a spindle must first orientation, then remove the spindle orientation signal, make the motor in a free state;
- b) By manual rotation motor spindle to orientation location;
- c) Check the monitoring parameter P, to fill in the P value orientation location parameter making F22/F27
- d) Perform orientation, and if there is a slight deviation, eliminated by fine-tuning F22/F27.

5.3 Analog rigid tapping:Need to connect I3 terminals!

Parameters	definition	Instruction
E40	Speed command input type selection	0 : 0 ~ 10V , 1 : ±10V , 2 : External pulse
F32	Maximum rotating speed at rigid	Set the maximum rotating speed at rigid
F33	Spindle acceleration at rigid tapping	Set the Spindle acceleration at rigid tapping
F34	rigid tapping order smallest unit	The value is generally set smaller, improve the accuracy of read analog
F30	Emergency stop deceleration	Motor with F30 deceleration slowed to zero speed

- a) when choosing 0 ~ 10V analog instruction (E40 = 0), when the tap exits, motor reversal, need through to I1, I3 terminal at the same time;
- b) Choosing ±10V analog instruction (E40 = 1), only need to connect I3 terminal;
- c) Suggest using pulse rigidity tapping as far as possible.

5.4 Pulse control:Need to connect I4 terminals!

The position control mode, the control instruction is only the external pulse!

Parameters	definition	instruction
E61	Pulse mode selection	0 : AB pulse , 1 : direction pulse , 2 : CW pulse
E64	External input pulse direction of choice	0, the default direction, 1: the opposite direction
E44	Position control mode selection	0 : synchronous mode , 1 : follow mode
F10	Maximum rotating speed	The position control to allow the motor maximum rotating speed
F11	Minimum rotating speed	The position control to allow the motor minimum rotating speed
F12	Pulse sync acceleration	Set the spindle acceleration/ deceleration at Pulse sync control.
F13	Pulse sync deceleration	
F16	position control cushion point	The actual pulse = Receive pulse number $\times \frac{F18}{F19}$
F17	The position control accuracy	
F18	The Position control gear ratio of numerator	
F19	The Position control gear ratio of denominator	
F30	Emergency stop deceleration	Motor with F30 deceleration slowed to zero speed

5.5 Swing control:Need to connect I6 terminals!

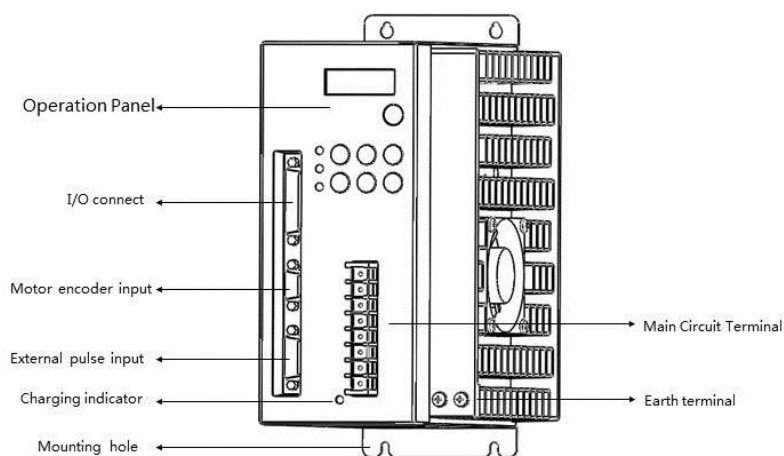
Parameters	definition	instruction
F35	Swing Angle	Set the swing angle
F36	Swing speed	Set the Swing speed
F37	Swing torque	Set the motor torque when swing
F30	Emergency stop deceleration	Motor with F30 deceleration slowed to zero speed

5.6 Inching:Need to connect I8 terminals!

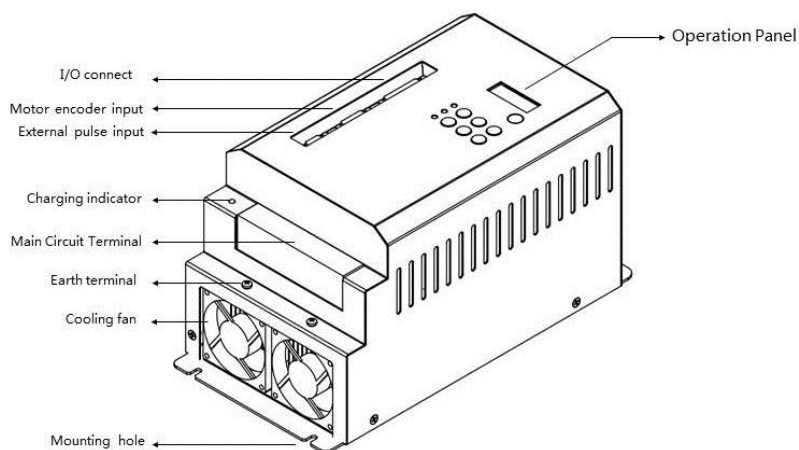
Parameters	definition	instruction
E45	Choice the direction of inching	0 : positive , 1 : Negative
F38	Inching speed	Motor speed of inching
F39	Inching acceleration	The acceleration of inching
F30	Emergency stop deceleration	Motor with F30 deceleration slowed to zero speed

5.7 Dimension

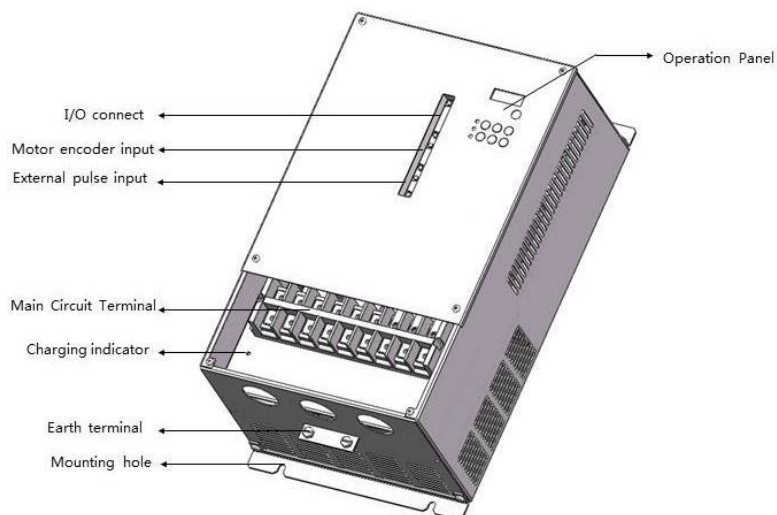
(1.5KW-5.5LKW)

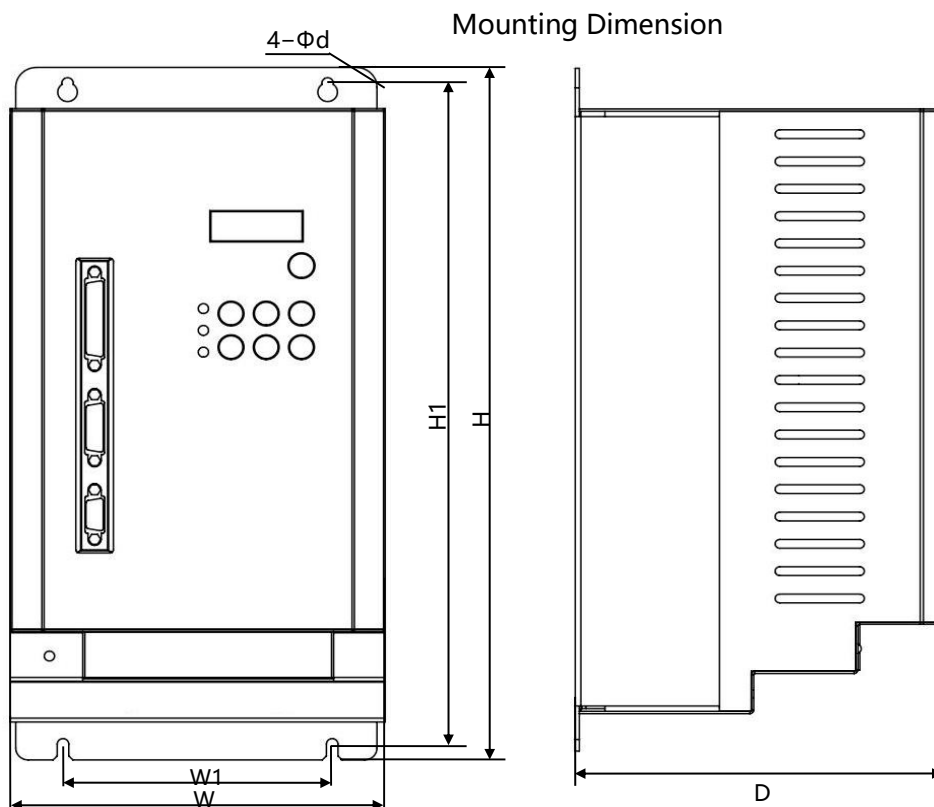


5.5KW-15LKW



15KW-132KW





Product outline and mounting dimension

Drive Model	Outline and mounting dimension (mm)						weight (kg)
	H	H1	W	W1	D	d	
SZGH-S4T1P5	268	255	130	70	212	5	6
SZGH-S4T2P2							
SZGH-S4T3P7							
SZGH-S4T5P5L							
SZGH-S4T5P5	350	334	181	130	184	5	8
SZGH-S4T7P5							
SZGH-S4T011							
SZGH-S4T015L							
SZGH-S4T015	450	430	280	180	225	7	16
SZGH-S4T018							
SZGH-S4T022							
SZGH-S4T030	580	555	320	220	225	10	25
SZGH-S4T037							
SZGH-S4T045	625	600	410	270	240	10	38
SZGH-S4T055							
SZGH-S4T075	840	800	600	520	380	12	65
SZGH-S4T090							
SZGH-S4T110	1100	1050	820	740	380	12	95
SZGH-S4T132							

Chapter 6 Safety Precautions

Our Products is equipped with complete protection functions to provide efficient protection while utilizing its performance sufficiently. Some failure instructions may be displayed during operation. Compare the instructions with the following table and analyze, decide the causes and solve failures.

For damages on units or questions that can't be resolved, please contact with local distributors/agents, service centers or manufacturer for solutions.

6.1 Failure and Solutions

Failure code	Failure description	Potential causes	Solutions
Err-00	Over voltage protection	Deceleration time is too short	Lengthen deceleration time
		Brake resistor is not reasonable	Choose appropriate energy braking components
Err-01	Low voltage protection	The power voltage is lower than the minimum operating voltage of equipment	Check input power supply
Err-02	Over current protection when acceleration operation	Low grid voltage	Check input power supply
		Power level of drive is small	Replace with drive with proper model
		Acceleration time is too Short	Lengthen acceleration time
		Improper setting of system parameters	Set system parameters properly
		output side of the motor was short circuited	Check whether the motor the output connection are short circuited
Err-3	Over current protection when deceleration operation	Low grid voltage	Check input power supply
		Brake resistor is not reasonable	Choose appropriate energy braking components
		Deceleration time is too short	Lengthen deceleration time
		Power level of drive is small	Replace with drive with proper model
		Improper setting of system parameters	Set system parameters properly
		output side of the motor was short circuited	Check whether the motor the output connection are short circuited

Err-4	Module protection	Ambient over-temperature	Lower the ambient temperature and strengthen ventilation and radiation
Err-5	Motor encoder failure	Encoder cabled is connection	Reconnect
		Encoder connection is incorrect	Change the encoder cable connection
		system parametersE04 is incorrect	Check system parameters E04
Err-6	Motor over temperature	The motor temperature signal reaches the alarm setting value	Strengthen ventilation and radiation
Err-7	Current detection fault	Current detection circuit failure	Seek for technical support
Err-8	Program error	Program error	Restore Factory Settings
Err-9	Motor overload protection	Motor phase sequence is incorrect	Exchange output terminals U and V
		Keep overloading for along period of time	Shorten the overloading time
		Motor rotation is blocked or load mutation occurs	Prevent the motor rotation from blocking and reduce the load mutation
Err-10	Motor Phase Sequence failure	Phase Sequence Error	Exchange any two pins of UVW
Err-EP	EEPROM Operate failure	Inner EEPROM Error	Restore Ex-factory set,or replace driver
Err-Co	Operational Panel Communication Failure	Failure of Alter Parameters Error of communication between operational panel & keyboard	Cannot alter parameter during running program Error of Operational Panel&Replace driver
Err-LP	Inner Communication Failure	Failure of Alter Parameters Error of communication between operational panel & keyboard	Cannot alter parameter during running program Error of Operational Panel&Replace driver

6.2 Analysis on Frequent Malfunction

6.2.1 No indication after the driver has been connected to the power

Cause: on indication on the manipulator after the driver has been connected to the power supply. Turn down all the attachment first, and only keep the R/S/T three-phase into line.

Reasons and countermeasures:

- 1.Charging indicator light is not bright, measured with a multimeter R/S/T into the line voltage, normal power supply: $300\text{ V} < \text{power supply voltage} < 440\text{ V}$;
- 2.If the power supply is normal, the rectifier bridge or charging resistance is damaged, return to factory maintenance or professional maintenance;
- 3.Charging indicator: rectifier bridge is normal, normal charging resistance, switch power supply damage or fuse burned down, return to factory maintenance;

6.2.2 Leakage protection switch trips

Cause: the leakage protection switch trips after the servo spindle start-up.

Reasons and countermeasures:

- 1.A plain leakage protection switch with a leakage protection value of 200mA is recommended; otherwise candle the leakage protection switch;
- 2.Use the specified leakage protection switch dedicated to servo(or transducer) with a leakage protection value of 30mA;
- 3.Add an isolating transformer between the plain leakage protection switch and servo driver.

6.2.3 Symptom for coder failure

Cause: 1.Err - 05 encoder fault alarm

2.Spindle rotation at low speed, speed command control

3.Appear coasters phenomenon

4.Running speed uneven, there are obvious impact type mechanical vibration

5.no-load monitoring current A_0 , found that current significantly larger, rated worth when no-load current of about 15%

6.To monitor torque when there is no load torque big or the full torque has been reached

7.Often Err - 02, Err - 03, Err - 09 alarm

Reasons and Countermeasures:

1.Check whether the CN2 terminal and motor encoder is connected encoder line;

2.If already properly connected, can be manually rotating machine, and view the monitoring parameter P, if the motor encoder is 1024 line installation, is a revolution of the motor shaft, 4096 pulse parameter P should change;

3.If no change parameter P, please carefully check the lines to the encoder or replace the encoder. Controller is measured with a multimeter CN2 port encoder on the power supply, if no voltage, drive internal power supply is damaged, need to change the drive;

4.If attachment is correct, the power supply is normal, the encoder may damage, need to change the motor encoder;

5.If parameter P change, but change pulse number for each lap 10000pulses, the actual line number should be 2500 line motor encoder,please contrast encoder on the motor nameplate value, modify the E04 parameters.

6.2.4 Frequent Alarms of Er -01

Cause: 1.unstable or failed power supply, please use the multimeter to measure the controller of R/S/T port, to determine whether the power fluctuation is bigger;

2.Large equipment start may cause instantaneous under voltage, this kind of situation can't use multimeter test;

Reasons and Countermeasures:

- 1.Add a regulated power supply where the power supply is unstable.
- 2.Adjust E46 settings,close under-voltage protection.

6.2.5 Spindle can not be turned

Reasons and countermeasures:

- 1.The spindle speed is not controlled, may cause is the motor phase sequence errors.
- 2.Perform OP = 2 (self-study) operation, after the success of the self learning, and change the OP to 0 (outside the terminal control);
- 3.Spindle don't work, need to check whether the controller receives the correct control instruction;

Example: CNC executes instructions M03 S500, requiring motor at 500 RPM is rotating.

Executes the instruction, the system should be connected to the controller I0 input terminal, whether by monitoring parameter d the vertical bar on the right side of the pop-up, I0 can be confirmed to be correct access:

- 1) If no pop-up, explain the signal is not properly access, check whether the I0 CN1 port terminal is connected correctly, or whether the 24V power supply access, or SEL terminals are connected correctly.
- 2) If other vertical bar pop-up, the 24V power supply and SEL terminal correct, I0 connection to other ports.

Executes the instruction, the system may by pulse, 0 ~ 10V analog or 10V analog to represent the speed command, the following instructions:

- 1) If using pulse wave velocity, setting E40 = 2, set up the E61,depending on the type of pulse by monitoring parameter F(external pulse frequency), determine the correct pulse input;
- 2) If use 0 ~ ± 10V analog, set E40 = 0, by monitoring parametersA1, determine whether or not the correct input;
- 3) If use ± 10V analog, set E40 = 1, A0 by monitoring parameters, determine whether or not the correct input.

If above countermeasures are invalid, please contact technical support.

6.2.6 The spindle speed is not correct

Reasons and countermeasures:

Pulse speed control:

1) Confirm whether encoder line number parameters in CNC system with E04 parameters matching;

2) Whether the spindle drive ratio;

Analog speed control:

1) Confirm whether the highest spindle speed in CNC system with F00 parameters matching;

2) Analog voltage whether receive accurate, and can be through the parameter A0, A1 monitoring;

3) If analog into is proportional to the deviation, such as CNC setting of 1000 RPM, motor speed is 980 RPM, if CNC setting of 2000 RPM, motor speed is 1960 RPM, can be appropriately increase F00;

4) If analog deviation as a fixed value, such as CNC setting of 1000RPM, motor speed is 980 RPM, setting of 2000 RPM, motor speed is 1980 RPM, can adjust the F4X group parameter modification;

If above countermeasures are invalid, please contact technical support.

6.2.7 Inaccurate positioning of spindle

Reasons and countermeasures:

1.For the fist use or replacement of spindle parts. Readjust the positioning angle. Adjust parameter: F22

2.After used for a certain period .check for any loosen synchronous belt and that of spindle motor and for any loosen coder of spindle motor.


3.Occasional inaccurate positioning during the operation. Please contact the manufacture if the followings are confirmed: Coder is connected firmly and the shield is grounded well. Logic of control sequence for positioning is in good order. It remains inaccurate positioning when handling it manually by means of MDI If above countermeasures are invalid, please contact technical support.

Description of safety marks:


Danger: The misuse may cause fire, severe injury, even death.

Note: The misuse may cause medium or minor injury and equipment damage.

◆ **Installation**

 Note
<ul style="list-style-type: none">★ If the drive is found to be damaged or lack parts, the drive cannot be installed. Otherwise, accident may be caused.★ The drive shall be mounted on the fire retardant surface, such as metal, and kept far away from the inflammable and heat source.★ Keep the drilling scraps from falling into the inside of the drive during the installation; otherwise, drive failure may be caused.★ When the drive is installed inside the cabinet, the electricity control cabinet shall be equipped with fan and ventilation port. And ducts for radiation shall be constructed in the cabinet.

◆ **Wiring**

 Danger
<ul style="list-style-type: none">★ Before wiring, confirm that the power supply is disconnected. Otherwise, there exists the risk of electric shock or fire.★ The wiring must be conducted by qualified electricians. Otherwise, there exists the risk of electric shock or drive damage.★ The drive input and output cables with proper sectional area shall be selected according to the drive power.★ Please confirm that the power supply phases, rated voltage are consistent with that of the nameplate, otherwise, the drive may be damaged.★ Do not perform dielectric strength test on the drive, otherwise, the drive may be damaged.★ The grounding terminal E must be reliably grounded, otherwise, the drive enclosure may become live.★ The three-phase power supply cannot connect to output terminals U, V and W, otherwise, the drive will be damaged.★ The wires of the main circuit terminals and the wires of the control circuit terminals shall be laid separately or in a square-crossing mode, otherwise, the control signal may be interfered.

◆ **Operation**



- ★ In the power-on state, please do not touch the drive terminals; otherwise, there exists the risk of electric shock.
- ★ The failure and alarm signal can only be reset after the running command has been cut off. Otherwise, personal injury may be caused.
- ★ Do not start or shut down the drive by switching on or off the power supply, otherwise, the drive may be damaged.
- ★ When it is used on lifting equipment, mechanical contracting brake shall also be equipped.
- ★ Before operation, please confirm if the motor and equipment are in the allowable use range, otherwise, the equipment may be damaged.
- ★ The heat sink and the braking resistor have high temperature. Please do not touch such device; otherwise, you may be burnt.
- ★ Please do not change the drive parameter randomly. Most of the factory set parameters of the drive can meet the operating requirement, and the user only needs to set some necessary parameters. Any random change of the parameter may cause the damage of the mechanical equipment.

◆ **Maintenance, Inspection**



- ★ In the power-on state, please do not touch the drive terminals; otherwise, there exists the risk of electric shock.
- ★ If cover is to be removed, the power supply must be disconnected first.
- ★ Wait for at least 10 minutes after power off or confirm that the CHARGE LED is off before maintenance and inspection to prevent the harm caused by the residual voltage of the main circuit electrolytic capacitor to persons.
- ★ The components shall be maintained, inspected or replaced by qualified electricians.
- ★ The circuit boards have large scale CMOS IC. Please do not touch the board to avoid the circuit board damage caused by electric static.
- ★ It is forbidden to modify the drive unauthorizedly; otherwise, personal injury may be caused.

Chapter 7 Spindle Servo Motor

7.1 Introduction of Spindle Servo Motor

SZGH series spindle servo motor is three-phase AC asynchronous servo motor, it's matching the asynchronous servo drives with excellent dynamic characteristic and wide speed range .Placing the temperature sensor in the three-phase windings motor, using for motor thermal protection. According to customer needs, using optical encoder or rotary transformer as feedback element to detect the motor's position and speed.

SZGH Series AC asynchronous spindle servo motor matched with our servo drive device. Used in machine tools , robot , petroleum,machinery,woodworking machinery,textile , printing,metallurgy,artillery, radar and automatic control equipment.

7.2 Model Description of Spindle Servo Motor

SZGH 10 - 2 - 35 - 5.5/7.5 - 4 - 1500

↓	↓	↓	↓	↓	↓	↓	
Brand	Seat No.	Long No.	Rated Toruque	Power		Poles	Rated Speed
SZGH	10	2	35Nm	Rated	5.5kW	4	1500RPM
				Overload	7.5kW		

7.3 Series

Model of AC Spindle Servo Motor	Rated Power (kW)	Rated Torque (Nm)	Rated Current (A)	Rated Speed (rpm)	Max Speed (rpm)	Rotor inertia (kg.m ²)	Weig ht (KG)
SZGH08-3-9.5-1.5/2.2-4-1500	1.5	9.5	3.7	1500	8000	0.0058	25
SZGH08-4-14-2.2/3.7-4-1500	2.2	14	6	1500	8000	0.0085	30
SZGH09-2-24-3.7/5.5-4-1500	3.7	24	9.5	1500	8000	0.0136	50
SZGH10-2-35-5.5/7.5-4-1500	5.5	35	13	1500	8000	0.0146	57
SZGH10-3-48-7.5/11-4-1500	7.5	48	17	1500	8000	0.0264	75
SZGH10-4-71-11/15-4-1500	11	71	23.5	1500	8000	0.0375	93
SZGH13-2-95-15/18.5-4-1500	15	95	31	1500	8000	0.0650	114
SZGH13-3-117-18.5/22-4-1500	18.5	117	38	1500	8000	0.0780	125
SZGH13-4-140-22/30-4-1500	22	140	45	1500	8000	0.0910	138
SZGH16-1-191-30/37-4-1500	30	191	60	1500	6000	0.1740	232
SZGH16-2-235-37/45-4-1500	37	235	75	1500	6000	0.2150	270
SZGH16-3-286-45/55-4-1500	45	286	90	1500	6000	0.2640	300
SZGH16-4-350-55/75-4-1500	55	350	110	1500	6000	0.3250	350
SZGH18-1-478-75/90-4-1500	75	478	148	1500	4500	0.7440	436
SZGH18-2-573-90/110-4-1500	90	573	176	1500	4500	0.925	500
SZGH18-3-700-110/132-4-1500	110	700	210	1500	4500	1.128	500
SZGH22-1-840-132/160-4-1500	132	840	255	1500	4000	2.409	810

7.4 Speicification of Spindle Servo Motor

Technical Speification	Decription
Type	3 Phase AC Asynchronous Spindle Servo Motor
Rated Voltage	3Phase AC 220V/380V
Rated Power	1.5~315kW
Poles	2 Poles / 4 Poles
Rated Speed	1500/2000/3000 RPM
Encoder	Photoelectric Encoder/Rotary Encoder
Mounting	Floor Mounting/Flange Mounting
Ingress Protection	IP55
Insulation Class	F
Vibration Class	R
Coolant	Air Force Coolant
Operating of Evironmental Condition	Temperature: -20℃ ~ +40 ℃ Humidity: 90%RH (No dewing)
Altitude	≤1000 meters

7.5 Using Tips

Note: The motor should be stored in dry and clean place, should avoid the impact

7.5.1 Installation

Checking the motor structure, protection degree, plate information is consistent with the conditions of use before installation.

A: When installation the motor shaft, should ensure that no liquid (water, coolant, etc.) from the top bearing room into internal motor. It will cause damage.

B: The motor installed prohibited from the shaft percussion or pressure, in order to avoid damage the bearing and optical encoder, etc.

C: The motor should be installed in the ventilation environment.

D: The motor installed in the vertical axis of the flange, the coaxial tolerance, with motor rotating parts, external vibration source of existence will increase the vibration of the motor. Improve the quality of the motor installed, will effectively play motor little vibration advantage.

E: With the motor rotating parts should with the motor rotor dynamic balance.

F: Install or remove with the motor rotation components (such as: coupling, flange, pulley, gear box) should use the right tools, forbid strike.

G: Provided standard motor has been for half keys dynamic balance.

H: Check out whether there is friction between the motor's stator and rotor before the motor is running.

I: The motor installation should be strengthen and coaxial. Avoid the vibration and damage.

J: With the motor rotation components should be adjusted appropriate.

K: Couldn't exceed the maximum speed of the motor nameplate marked.

Note: The improper installation and operating will affect the motor's performance and service life

7.5.2 Wiring

3.1: Each of the motor's terminal boxes comes with a wiring diagram, please check wiring diagram carefully.

3.2: Wiring of the motor's thermal protection and cooling fan power cord in the same terminals, carefully check the wiring diagram, avoid wrong connections, otherwise it will damage the motor's windings and cooling fan.

3.3: the cooling fan power supply voltage might be different according to the requirements of customers, checking the wiring diagram carefully. Avoided errors voltage, otherwise it will damage the cooling fan.

3.4: Prohibit put the cooling fan's power in parallel with the motor's power, otherwise it will damage the motor and cooling fan.

3.5: In order to make the motor get best cooling effect, cooling fan wind direction should be adjusted to the direction of the shaft end.

7.5.3 Repair and Maintenance

4.1: All maintenance must be under the manufacturer or its designated agency's guidance, otherwise the customer should take responsibility of the damage.

4.2: Running 15,000 hours or using three years need to replace the bearing, the bearing should be ordered to the manufacturer, so that the bearing's accuracy and seal special requirements can be ensured.

5: The service and commitment

Our products are free warranty for 12 months.

Customers comply with the conditions of storage and Operating motor rules, our products due to bad manufacture caused damaged or working abnormal from the date of delivery within twelve months .We free of charge to repair or replace the products for customer.

But the following condition exception:

A: The fault caused by incorrect Operating or inobservance the conditions of use.

B: Disassemble the motor non-installation site, influenced the motor's performance, will lose the right of warranty.

Our company has the final interpretation rights of this information