SH series spindle debugging instructions

CONTENTS

Safety Warnings

Security Matters

1. CAUTION	
	**WARNING**
	1. Do not touch inside of the servo drive. Otherwise, you may be electric shocked.
	2. Servo drive and GND terminal of servo motor must be connected to the ground or it may cause electric shock.
	3. Please check wiring at least 5mins later after powered off or it may cause electric shock.
	4. Please do not damage the cable line, cable or impose unnecessary stress, pressure load objects on it. Otherwise, may result in malfunction, damage and electric shock.
	5. During operation, do not touch the rotating part of the servo motor. Otherwise, you may be injured.
	**CAUTION**
	1. Operate servo motor and servo drive under specific order. Otherwise, fire and malfunction may occur.
	2. Do not place the facility in environment which has easy access to splashed water, corrosive gas, flammable gas or flammable materials. Otherwise, fire and fault may occur.
	3. Servo drives, servo motors and peripheral equipment are in high temperature when operated, keep distance or you may be burned.
	4. During a period of time after powered off, the servo drive heat radiator, regenerative resistor, servo motor are in a high temperature state. Do not touch it or you may be burned.
	5. During the using of servo motor in final product ,if the surface temperature exceeds 70℃, please tag a label to inform high temperature.
2. WIRING CAUTION	
	**CAUTION**
	Wire the equipment correctly and securely. Otherwise, the servo motor may operate unexpectedly.

	PROHIBITION
	1．Do not connect servo motor U, V, W terminals with industrial power supply (380V).Otherwise, fire and malfunction may occur.
	2．Connect the servo motor U, V, W terminals with the ground (E), and do not mistake on order of U, V, W terminals. Otherwise, fire and malfunction may occur.
	3．Do not conduct encoder with voltage and resistance testing. If you want to test the voltage and resistance of servo motor side of U, V, W terminals, please cut off the connection with the servo drive.
	4．Do not take the wrong terminal sequence of the encoder. Otherwise, the encoder and the servo drive may be damaged.
	INSTRUCTION
	Ground is used to prevent electric shock in case of accidents. For safety reasons, be sure to install the ground.

3． OPERATION AND RUNNING INSTRUCTION	
	CAUTION
	1．Excessive adjustments and changes will lead to instability, so do not operate it casually. Otherwise, it could be dangerous.
	2．Please fasten the servo motor and disconnect the mechanical equipment before test running. After confirmation of the operation, you can install motor with equipment. Otherwise, it could be dangerous.
	3．Self-protection arrester brake is not a stop equipment to protect facility. Please install safe stop equipment on side of facility. Otherwise, failure, injury and other accidents may occur.
	4．When servo drive alarming, try to find reasons. Reset alarm and run again only after confirming the security. Otherwise, it could be injured.
	5．Please do not be close to the device after following instantaneous power failure because it may restart again suddenly. (Please consider how to ensure the personal safety of re-start within the mechanical
	6．Verify the specifications of power. Otherwise, it may cause fire, failures and injuries.

CHAPTER 1 OVERVIEW

1.1 Servo drive model description

SH	34	150	-	A0
1	2	3		4

1: Indicates the type of controller: SH direct drive spindle dedicated drive;

2: Indicates the power supply voltage level, 34 represents three-phase AC 380V;

3: Indicates the rated output power, the unit is *0.1 kilowatt (kW).

4: Extension bits.

1.2 Servo motor model description

260	SD	-	B	540	M	4	B	-	A2
1	2		3	4	5	6	7		8

1: Indicates the size of the motor;

2: SD: stands for direct drive servo motor;

3: B: Without encoder;

4: Indicates the rated torque of the motor, unit: *0.1Nm;

5: Indicates the rated speed of the motor, M: 900rpm

P: 600rpm;

6: Indicates the rated voltage of the motor, 4: 380V;

7: B: Indicates that the motor does not have a key;

8: Extension bits.

CHAPTER 2 SERVO PARAMETER DESCRIPTION

The parameters can be set through the external dedicated operation panel (optional) of the drive, or through the touch screen.

2.1 Parameter settings (Operation panel)

Setting method：

Use PRG key to select the parameters edit mode, switch to the P0.01, using ∨ ∧ to select the parameter number. Press ENT button for more than 1 second into the parameter setting.

Parameter quick reference table:

No.	Definition	Setting range	Initial value	Change
P0.04	Rotation direction and encoder output direction selection	0：Spindle rotation direction & system display direction are normal; 1：The spindle direction is reversed & the system display is normal; 2：The spindle direction is normal & the system display is reversed; 3：Spindle rotation direction & system display direction are reversed;	1	Outage
P0.07	Compensation factor	0~400 Reducing this parameter will reduce energy consumption, but setting it too low will cause the speed to drop	30	All the time
P0.09	Control mode selection	0: Position mode 1: Speed mode 11: Special function for loom spindle This parameter is initialized to 0, and automatically changes to 11 after the angle self-learning is completed.	0	All the time
P0.23	Zero speed amplitude	10~2000 [r/min] (1 scale)	50	All the time
P0.24	Zero speed judgment time	0.000~1.000 sec (0.001 scale)	0.005	All the time
P0.25	Maximum output torque	0～400%，It is recommended to set no more than 250.	250	All the time
P0.31	Loom jog speed	0.0~3200.0	80.0	All the time
P0.32	Loom running speed	0.0~3200.0	500.0	All the time

P0.33	Loom Preparatory action speed	0.0~3200.0	60.0	All the time
P0.35	Acceleration and deceleration time 1	0.001~9.999 sec (0.001 scale) Applied to start and run variable speed.	0.100	All the time
P0.37	Acceleration time 2	0.001~9.999 sec (0.001 scale) Applied to jog	0.100	All the time
P0.38	Deceleration time 2	0.001~9.999 sec (0.001 scale) Applied to jog. If you need short-distance jog, you can increase PN37 and decrease PN38. For example: PN37-0.500; PN38-0.005.	0.100	All the time
P0.40	Position loop gain parameter	1~1000[rad/sec] (1 scale)	40	All the time
P0.41	Speed loop gain parameter	1~1500[Hz] (1 scale)	35	All the time
P0.42	Speed loop integral parameter	0~4096 (1 scale)	40	All the time
P0.43	S-shaped time constant	0.0~100.0[msec] (0.1ms) The speed curve will be smoother if the parameter is increased.	10	All the time
P0.46	Torque filter time constant	0.00~20.00[msec] (0.01 scale)	2.00	All the time
P0.47	Speed setting filter	0.00~20.00[msec] (0.01 scale)	2.50	All the time
P0.52	Speed loop gain parameter 1	1~1500 (1 scale)	45	All the time
P0.53	Speed loop integral parameter 1	1~4095 (1 scale)	50	All the time
P0.56	Deceleration time	0.001~9.999[msec] (0.001 scale) Applied to fast stop.	0.100	All the time
P0.64	Motor code	The loom spindle needs to be set to 0.	0	All the time
P0.65	Set password for motor code	Before setting the motor code, you need to change PN65 to 11.	0	All the time
P0.66	Loom pre-positioning enable	0: Perform pre-positioning action; 1: Do not perform pre-positioning action.	0	All the time
P0.68	Z-angle self-learning torque	0~300 (1 scale) Increasing the parameters can improve the probability of self-learning success, setting too much will cause over-current (Er.B01) or Er.B09 alarm.	80	All the time

P0.70	Speed loop proportional parameters during stable running.	1~1500 (1 scale)	35	All the time
P0.71	Speed loop integral parameters during stable running.	0~4095 (1 scale)	40	All the time
P0.72	Speed loop gain parameter 2	1~1500 (1 scale)	15	All the time
P0.73	Speed loop integral parameter 2	0~4095 (1 scale)	10	All the time
P0.93	Stop torque limit value	0~100 (1 scale) This parameter mainly prevents excessive static torque and avoids motor heating, over-load, and other faults. If the parameter setting is too small, insufficient parking brake force will cause slipping during parking.	80	All the time
P0.97	Current loop proportional parameter	100~3000 (1 scale)	650	All the time
P0.98	Current loop integral parameters	0.1~100.0 (1 scale)	1.8	All the time
P0.A0	Switching frequency selection	4 8 12 (kHz)	8	Outage
P0.A3	Motor rated speed	0.0~3200.0	600.0	Outage
P0.A4	Motor rated current	0.1~150.00	13.00	Outage
P0.A9	Number of motor pole pairs	1~16	16	Outage
P0.B1	Number of encoder lines	360~2500	2500	Outage
P1.03	End convergence parameter	10~1000.0	1000.0	All the time
P1.05	End convergence limit	0~1000	5	All the time

P1.11	Velocity feedforward 1	0.0000~1.0000	0.4600	All the time
P1.12	Velocity feedforward 2	0.0000~1.0000	0.1000	All the time
P1.38	Control mode	0: Positioning mode; 1: Speed mode; In positioning mode, the motor has a larger holding force and better inching performance; in speed mode, the motor is not prone to oscillation when stopped.	0	All the time
P1.39	Z signal reconstruction position	0~10000	0	All the time
P1.40	MTPA-I D axis setting	0~300	0	All the time
P1.41	MTPA control switch	0: turns off MTPA control 1: turns on MTPA control	0	All the time
P1.42	MTPA filter	0~20.00	2.00	All the time
P1.43	Initial angle detection method	0: Normal mode (With hall start) 1: High frequency injection mode (Without hall start)	0	All the time
P1.44	High frequency injection frequency	1~3000[Hz] (1 scale)	600	All the time
P1.45	High frequency injection amplitude	0~200 Increasing the parameter can improve the identification accuracy of the initial angle.	35	All the time
P1.46	High frequency injection filter	0~300.00	100.00	All the time
P1.47	Magnetic pole discrimination phase injection voltage	0~200	90	All the time
P1.48	Magnetic pole discriminator phase injection time.	0~300	8	All the time
P1.49	Automatic power calibration switch	0: Off; 1: On; When the long-term energy saving is turned on, the machine will reach the best energy saving state in about 10 minutes. Note: When the speed of the loom needs to be changed during operation, it is recommended to turn off this function.	0	All the time

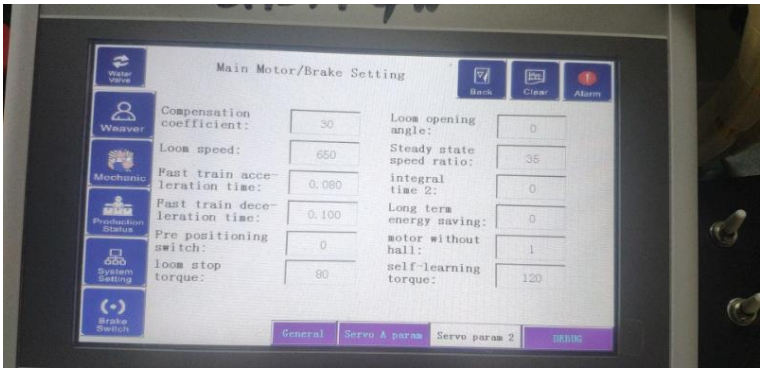
P1.50	High-speed stopping torque compensation	0~300 Reducing the parameters can reduce the speed-up overshoot.	80	All the time
P1.51	Positioning stopping function	reserved, to be added	0	All the time
P1.52	Angle of positioning stop	0~5000	180	All the time
P1.53	Minimum angle of positioning stop	0~5000	180	All the time
P1.54	Speed command format	0: Decimal; 1: Hexadecimal;	0	All the time
P1.86	Starting angle	0~360[degree]	0	All the time
P1.88	IO is reversed	0~31	0	All the time
P1.89	Enable mode selection	0: Level enable; 1: Edge enable; Some systems need to use the edge enable mode: power-on is enabled by default, and after the upper edge signal is received, the system switches between enable and disable.	0	All the time

All the time: Take effect immediately after modification;

Outage: After parameter modification, it will take effect after outage and restart.

2.2 Parameter settings (touch screen)

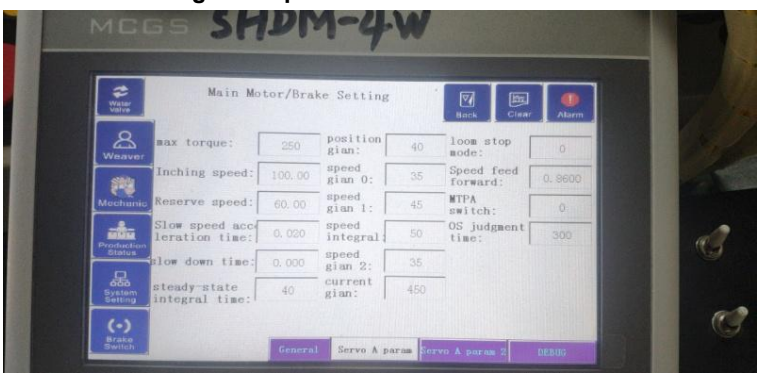
Screen 1: Servo performance parameters



Parameter name	Default value and adjustment range	Definition	Whether to power off
Compensation coefficient	30 (0~400)	Reducing this parameter will reduce energy consumption, but setting it too low will cause the speed to drop.	Not needed
Loom speed	650.0(0.0~3200.0)	The speed of the loom at high speed	Not needed
Fast train acceleration time	0.100(0.001~9.999)	When a tight mark occurs at power-on, increase this parameter appropriately. When a thin mark occurs at power-on, reduce this parameter appropriately	Not needed
Fast train deceleration time	0.100(0.001~9.999)	When the parking angle is lagging, reduce this parameter appropriately.	Not needed
Pre-positioning switch	0 (0~1)	0: Perform pre-positioning action; 1: Do not perform pre-positioning action.	Not needed
Loom stop torque	80 (0~300)	High-speed parking torque compensation, reducing the parameters can reduce the speed-up overshoot.	Not needed
Loom opening angle	0 (0~360)	Starting angle. Unit: degree.	Not needed
Steady state speed ratio	35(1~1500)	Speed loop proportional parameters during stable operation.	Not needed
Integral time 2	10(0~4095)	Speed loop integral parameter 2	Not needed
Long term energy saving	0(0~1)	Automatic power calibration switch.0: Off; 1: On; When the long-term energy saving is turned on, the machine will reach the best energy saving state in about 10 minutes. Note: When the speed of the loom needs to be changed during operation, it is recommended to turn off this function.	Not needed

Motor without hall	0(0~1)	Initial angle detection method. 0: Normal mode; 1: High frequency injection mode. The normal mode is the Hall start mode; the high frequency injection mode is the non-inductive start mode.	Not needed
Self-learning torque	80(0~300)	Z-angle self-learning torque. Increasing the parameters can improve the probability of self-learning success, setting too much will cause over-current (OC1) or over-load (OL) alarm.	Not needed

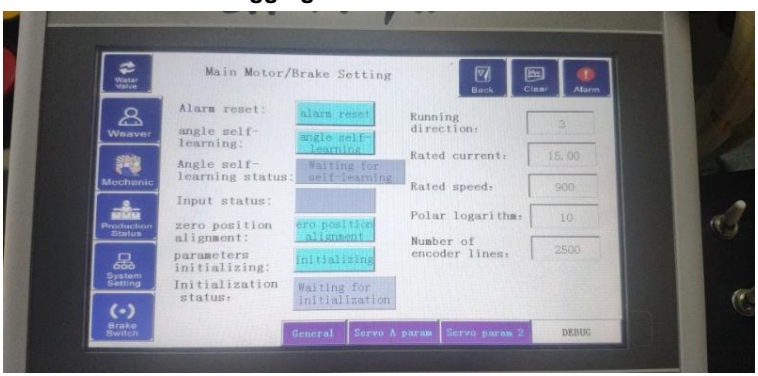
Screen 2: Servo general parameters



Parameter name	Default value and adjustment range	Definition	Whether to power off
Max torque	250 (0~400)	The maximum output torque. It is recommended not to exceed 250.	Not needed
Inching speed	80.0 (0.0~3200.0)	Inching speed	Not needed
Reserve speed	60.0 (0~3200.0)	Reserve speed	Not needed
Slow speed acceleration time	0.100(0.001~9.999)	Jog acceleration time, if short-distance jog is required, reduce this parameter.	Not needed
Slow down time	0.100(0.001~9.999)	Applied to slow speed, if short-distance jog is required, reduce this parameter.	Not needed
Steady-state integral time	40(0~4095)	Speed loop integral parameters during stable operation	Not needed
Position gain	40 (1~1000)	Position loop gain parameter, used to maintain parking torque	Not needed
Speed gain 0	35 (1~1500)	Speed loop gain parameter, used to maintain parking torque	Not needed
Speed gain 1	45（1~1500）		Not needed
Speed integral 1	50（1~4095）		Not needed
Speed gain 2	15(1~1500)	Speed loop gain parameter 2	Not needed

Current gain	100~650(650)	This parameter can be reduced when the motor whistle.	Not needed
Loom stop mode	0 (0~1)	0: Positioning mode; the motor has a larger holding force and better inching performance; 1: Speed mode; the motor is not prone to oscillation when stopped.	Not needed
Speed feed forward	0.46（0.0000~1.0000）		Not needed
MTPA switch	0(0~1)	0: turns off MTPA control; 1: turns on MTPA control. MTPA control is aimed at the IPM motor, turning on the control function can increase the start and stop torque.	Not needed
OS judgement time	300（100-500）	If the parameter is too small, it is easy to report to OS when parking	Not needed

Screen 3: Servo debugging screen



Parameter name	Default value and adjustment range	Definition	Whether to power off
Running direction	3 (0~3)	Change the speed direction and encoder signal output direction. 0：Spindle rotation direction & system display direction are normal; 1：The spindle direction is reversed & the system display is normal; 2：The spindle direction is normal & the system display is reversed; 3：Spindle rotation direction & system display direction are reversed;	Needed
Rated current	13.00 (0.1~15.00)	Motor rated current, increasing this value will appropriately increase the motor torque.	Needed
Rated speed	600.0(0.0~3200.0)	Motor rated speed	Needed

Polar logarithm	16(1~16)	Must be set according to the motor, otherwise it will cause various failures	Needed
Number of encoder lines	2500 (360~2500)	Number of encoder lines, adjusted according to external encoder model	Needed

CHAPTER 3 LIST OF SERVO FUNCTIONS

Settings can be changed on the model of Parameters compilation and location data compilation.

Mode	Subschema	Select subschema	Expressions and setting examples
Sequence monitoring mode	Sequence mode	S0.01	P-SOF
	The current alarm	S0.02	EC
	Alarm record	S0.03	1-EC
	Display station number	S0.04	Ad01
Monitoring mode	Feedback speed	U0.01	1000
	Command speed	U0.02	1000
	Average torque	U0.03	1.00
	Feedback current position	U0.04	H0100
	Command the current position	U0.05	L1000
	Position offset	U0.06	10000
	Dc bus voltage	U0.07	100
	Electrical angle	U0.08	10.0
	Drive internal temperature	U0.09	25
	Analog voltage value	U0.10	10.0
	Input signal	U0.11	10001
	Output signal	U0.12	1001
		U0.13	Reserved
	Peak torque	U0.14	3.00
	Pulse sequence input frequency	U0.15	10.0
	Motor code	U0.16	dJ-06
	Software version number	U0.17	-
		U0.18~24	Reserved
	Motor Hall UVW value	ON27	-
	Number of pulses consumed for acceleration	ON31	-
	Number of pulses consumed for	ON32	-

	deceleration		
Parameters edit mode	Parameters editor	P0.01～P0.B9	
Trial mode operation	Manual operation	F0.01	JOG
	Clear the current command and feedback pulse	F0.02	PRT
	Clear integrating pulse	F0.03	CPCR
	Alarm reset	F0.04	RT
	Clear alarm record	F0.05	ALRT
	Parameters initialization	F0.06	PART
	Automatic adjustment compensation	F0.07	OFFT
	Manufacturers reserved	F0.08、F0.09	
	Test operation	F0.10	ESY.1

CHAPTER 4 SERVO ALARM

4.1 Alarm content

The contents of the alarm detection:

After detection of alarm, the servo drive alarm codes flash automatically on the touch panel.

If there are detections of multiple alarms, the touch panel displays the alarms in the following order of priority.

Priority order	Display	Name
1	Er.B01	Overcurrent 1
2	Er.B02	Overcurrent 2
3	Er.B03	Overspeed
4	Er.B04	Overvoltage
5	Er.B08	Current sampling loop damage
6	Er.B06	Storage error
7	Er.B07	Encoder communication
8	Er.B14	Regeneration resistance
9	Er.B09	Overload
10	Er.B11	Exceed permissible deviation
11	Er.B12	Drive overheating
12	Er.B18	Motor code does not set
13	Er.B17	Overcurrent 1

4.2 Alarm explanation and handling

Alarm code	Alarm name	Running statue	Probable cause	Handling
Er.B03	Over Speed	When the drive is on power	Drive circuit fault	Replace the drive
			Encoder fault	Replace the servo motor
		When the motor first starts	Excessive load inertia	1. Reduce the load inertia 2. Replace more powerful drive and servo motor
			Encoder zero error	1. Replace servo motor 2. Send back to the manufacturers to readjust back to the encoder zero
			Motor U, V, W phase sequence error	Check the wiring and connect the wiring correctly
			Encoder lead error	

		during motor operating	The entered command pulse frequency is too high	Upper computer sets inputted command pulse frequency correctly
			Electronic gear ratio is too large	Set the appropriate electronic gear ratio correctly
			Acceleration and deceleration time constant are too small, so that exceed constant speed is overshoot (speed controlling)	1. Increase the acceleration and deceleration time constant (parameter PN-35, PN-36) 2. S-word time constant (parameter PN-43) set larger 3. Speed of answer (parameter PN-41) set a little higher
			Encoder fault	Replace servo motor
			Servo system parameters are not adjusted well, causing overshoot	1. Reset the gain related to the regulator 2. If gain is difficult to set a suitable value, replace the suitable motor
Er.B04	Main circuit overvoltage	Only control power (S1, S2) is connected and the main power (L1, L2, L3) are not connected	Drive internal circuit board fault	Replace servo drive
		Both control power (S1, S2) and main power (L1, L2, L3) are connected	Drive internal circuit board fault	Replace servo drive
			Power supply voltage is too high	View the drive value of U0.07 is greater than the 380V or not, check the power supply is too large or not.
		during motor operating	Disconnect the brake resistor wiring	Connection again
			Damage to the brake resistor	Under the condition of power off, checking the measurement of the brake resistor is consistent with the label, if judged it's damaged, replace the brake resistor
			Damage to the drive internal brake transistor	Replace servo drive

			Damage to the drive internal brake circuit	
			Braking resistor doesn't enough capacity.	1. Reduce the frequency of start and stop 2. Increase the acceleration / deceleration time constant 3. Reduce the current limit amplitude 4. Reduce the load inertia 5. Reduce speed 6. External braking resistor capacity sufficient
			Servo motor inertia is not enough	Replace servo motor with greater inertia
Er.B10	Main circuit under-voltage	When power is connected	The main power wire contact badly	Terminal drive power between the main power lights is bright, if not bright, check whether connection is right or not
			Unstable power supply, power supply voltage is low	View the drive U0.07 value is less than P0.61 reference value or not, determine whether the stability of power supply or not
			20ms or more power outages	Check the power supply
			Drive internal components fault	Replace servo drive
		During motor operating	Power capacity not enough	Check the power supply
			Power break down instantaneously	
Er.B11	Position deviation exceeds	When connected to control power	Drive circuit board fault	Replace servo drive
		When the motor starts	Motor U, V, W down-lead error	Correct wiring
			Encoder Lead error	
			Position percentage gain is too small	Increase the position percentage gain
			Less output torque	1. Check the torque limit value 2. Reduce the load capacity 3. Replace high-power servo drive and servo motor

			Pulse command frequency is too high	When differential input, view U0.15 is less than 500 or not, and when open collector input, view U0.15 is less than 200 or not, if not, reduce the pulse frequency
		During motor operating	Drive power circuitry failure	Replace servo drive
			Drive parameters are not adjusted well	Increase the position gain
			Pulse command frequency is too high	When differential input, view U0.15 is less than 500 or not, and when open collector input, view U0.15 is less than 200 or not, if not, reduce the pulse frequency
			Input supply voltage is lower	below the operating voltage, select the correct transformers and install voltage regulators
Er.B12	Drive overheat	Power-on, and the servo drive stopped working 1 hour or more, the ambient temperature is normal	Internal circuit and the servo drive fault	Replace servo drive
		During motor operating	Cooling fan does not work	View U0.09 show temperature, over 40° C confirms the cooling fan does not switch on. replace the servo drive
			Environment temperature high, heat dissipation can't work well.	To maximize the ventilated effect in the environment
			Renewable electricity can't be consumed.	Extend the deceleration time
Er.B07	Encoder communication error	When turn on the power. During motor operating.	Encoder cables error	Check the encoder cable wiring is correct or not, and whether there is broken
			Encoder cable bad contact	Check the encoder cable is contact well or not
			Encoder damaged	Replace servo motor
			Detection drive internal circuit fault	Replace servo drive

Er.B08	Current sampling loop damage.	When turn on the power	The drive internal current sampling circuit damaged	Replace servo drive
Er.B06	Storage error	When turn on the power	Storage devices damaged	Replace servo drive
			Communication between storage with the main chip memory abnormal	
Er.B09	Overload	When turn on the power	Drive internal circuit board fault	Replace servo drive
		During motor operating	Exceed the rated torque operation	1. Check the load 2. Reduce the start-stop frequency 3. Replaced by more powerful drive and servo motor
			Drive to power lines U, V, W connect wrong	Check the wiring and confirm U, V, W correct wiring
			Motor operates with oscillation and unstable	1．Increase the gain 2．Increase the acceleration and deceleration time 3．Reduce the load inertia
			Servo motor abnormalities	Replace servo motor
Er.B01	Over-current 1	When turn on the power	Internal circuit of drive fault	Replace servo drive
		During motor operating	Drive power lines U, V, W short-circuit	Check power line
			Acceleration and increase time too short	Increase the acceleration and deceleration time（P0.35，P0.36）
			Excessive rigidity of the control loop parameters	Reduce the rigidity, which reduces the position gain(P0.40),speed gain(P0.41)
			Output current is too large	Reduce the maximum current limit parameter P0.25
			Poorly grounded, external interference	Properly grounded
			Drive internal circuit damage, lack phase, and so on	Replace servo drive
Er.B02	Over-current 2	During motor operating	Drive fault	Replace servo drive

Er.B18	Motor code does not set	When turn on the power	Set corresponding motor code before using drive	Motor code setting method: First set P0.65:11，then P0.64 motor code. Please check instructions or motor nameplate to get motor code
Er.B17	Motor code error	After modifying the motor code	The setting motor code not match drive	Re-confirm motor code

202011