

Installation and Wiring for SV-X2E Series Servo Drive

Hardware Instruction

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http://www.hcfa.com.cn

Thank you for purchasing this product. This manual mainly describes the safety use, installation and wiring for SV-X2E series servo drive. For more details, please refer to <SV-X2E Series Servo Drive User Manual>.

Confirm the following items when unpacking:

Number	Name	Quantity
1	Servo drive	1
2	Accessories	1
	Connecting terminal	1
	Cold-pressed terminal	9
	Crowbar	1
3	Installation and Wiring for SV-X2E Series Servo Drive Hardware Instruction	1
4	Certificate of Quality	1

- Check if there are some damage to the products during transportation. Any questions, please contact the HCFA Technology.

Safety precautions (Read carefully before use)

Please pay attention to the following safety precautions anywhere and any time during acceptance, installation, wiring, operation and maintenance. In this manual, the safety precautions are ranked as "DANGER" and "CAUTION".

- DANGER** Indicates that incorrect handling may result in death or severe injury.
- CAUTION** Indicates that incorrect handling may result in medium or slight personal injury or physical damage.
- Indicates "Prohibitions" (Indicates what must not be done.)
- Indicates "Forced" (Indicates what must be done.)

DANGER

Installing and wiring

- Do not connect the motor to the commercial power. To prevent fire or malfunction.
- Do not place the combustibles around the servo motor and drive. To prevent fire.
- Be sure to protect the drives through the case, and leave specified clearances between the case or other equipment and the drive. To prevent electric shock, fire or malfunction.
- Install it at the place free from excessive dust and dirt, water and oil mist. To prevent electric shock, fire, malfunction or damage.
- Install the equipment to incombustibles, such as metal. To prevent fire.
- Any person who is involved in wiring and inspection should be fully competent to do the work. To prevent electric shock.
- FG terminal of motor and drive must be grounded. To prevent electric shock.
- Perform the wiring correctly after cut off the breaker. To prevent electric shock, injury, malfunction or damage.
- Have the insulation processing when connecting cables. To prevent electric shock, fire or malfunction.

Operation and running

- During operation, never touch the internal parts of the drive. To prevent burns or electric shock.
- The cables should not be damaged, stressed loaded, or pinched. To prevent electric shock, fire, malfunction or damage.
- During operation, never touch the rotating parts of the servo motor. To prevent injury.
- Do not install the equipment under the conditions with water, corrosive and flammable gas. To prevent fire.
- Do not use it at the location with great vibration and shock. To prevent electric shock.
- Do not use the servo motor with its cable soaked in oil or water. To prevent electric shock, malfunction or damage.

Operate the switches and wiring with dry hand. To prevent electric shock, injury or fire.

Do not touch the keyway directly when using the motor with shaft-end keyway. To prevent injury.

Do not touch the motor and drive heat sink, as they are very hot. To prevent burns or parts damaged.

Do not drive the motor by external drive. To prevent fire.

Other safety instructions

Confirm the equipment's safety after the earthquake happens. To prevent electric shock, injury or fire.

Installing and setting correctly to prevent the fire and personal injury when earthquake happens. To prevent injury, electric shock, fire, malfunction or damage.

Provide an external emergency stop circuit to ensure that operation can be stopped and power switched off immediately. To prevent injury, electric shock, fire, malfunction or damage.

About maintenance and inspection

As there's dangerous and high-voltage parts inside the drive, before wiring or inspection, turn off the power and wait for 5 minutes or more. Moreover, do not disassemble the drive. To prevent electric shock.

CAUTION

Installing and wiring

Please follow the specified combination of the motor and drive. To prevent fire or malfunction.

Do not touch the terminals of connector directly. To prevent electric shock or malfunction.

Do not block intake and prevent the foreign matters from entering into the motor and drive. To prevent electric shock or fire.

Fix the motor and have the test run away from the mechanical system. After confirming the operation, the motor can be securely mounted to mechanical system. To prevent injury.

The servo motor must be installed in the specified direction. To prevent injury or malfunction.

Install the equipment correctly in accordance with its weight and rated output. To prevent injury or malfunction.

Operation and running

Do not climb or stand on servo equipment. Do not put heavy objects on equipment. To prevent electric shock, injury, fault or damage.

The parameter settings must not be changed excessively. Operation will be unstable. To prevent injury.

Keep it away from the direct sunlight. To prevent malfunction.

Do not put strong impact on the motor, drive and motor shaft. To prevent malfunction.

The electromagnetic brake on the servo motor is designed to hold the servo motor shaft and should not be used for ordinary braking. To prevent injury or malfunction.

When power is restored after an instantaneous power failure, keep away from the machine because the machine may be restarted suddenly (design the machine so that it is secured against hazard if restarted). To prevent injury.

Do not install or operate a faulty servo motor or drive. To prevent injury, electric shock or fire.

Check the power specification. To prevent fault.

The electromagnetic brake may not hold the servo motor shaft. To ensure safety, install a stopper on the machine side. To prevent injury.

A sudden restart is made if an alarm is reset with the run signal on. To prevent injury.

Connect the relay for emergency stop and for brake in series. To prevent injury or malfunction.

Transportation and storage

Do not subject the equipment to the place with rain, waterdrop, poisonous gases or liquids. To prevent malfunction.

Do not carry the servo motor by the cables, shaft or encoder during transportation. To prevent injury or malfunction.

Do not drop or dump the motor during transportation and installation. To prevent injury or malfunction.

If you want to store it for a long time, follow the instruction manual. To prevent malfunction.

Store the unit in a place in accordance with the instruction manual. To prevent malfunction.

Other safety instructions

Please dispose the battery according to your local laws and regulations.

When disposing of the product, handle it as industrial waste.

Maintenance and inspection

Do not disassemble and/or repair the equipment on customer side. To prevent malfunction.

Do not turn on or switch off the main power frequently. To prevent malfunction.

Do not touch the servo drive heat sink, regenerative resistor, servo motor etc. Their temperatures may be high while power is on or for some time after power-off. To prevent burns or electric shock.

When the drive become faulty, switch off the control circuit and main power. To prevent fire.

If the servo motor is to be stored for a long time, switch off the power. To prevent misoperation and injury.

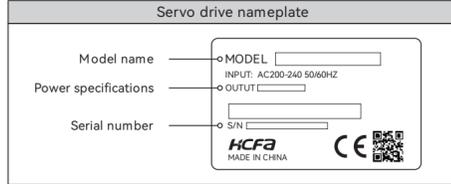
About maintenance and inspection

<Warranty period>
The term of warranty for the product is 18 months from the date of manufacture. It's exceptional to brake motors as they are warranted when acceleration / deceleration times is not beyond the specified service life.

<Warranty coverage>
This warranty applies only when the condition, method, environment, etc. of use are in compliance with the terms and conditions and instructions that are stated in the instruction manual and user manual for the Product.
However, even during warranty period, the repair cost will be charged on customer in the following cases:
1) A failure caused by improper storing or handling, repair and modification.
2) A failure caused by the parts which have dropped down or damaged during transportation
3) A failure caused when the products have been used beyond the product specification
4) A failure caused by external factors such as inevitable accidents, including but not limited to fire, earthquake, lightning stroke, windstorm disaster, flood, salt damage, abnormal fluctuation of voltage and other natural disaster.
5) A failure caused by the intrusion of water, oil, metal and other foreign matters.
The warranty coverage is only for the product itself. We assume no responsibilities for any losses of opportunity and/or profit incurred by you due to a failure of the product

1. Product introduction and model selection

Introduction for servo drive nameplate



Model name identification

SV-X2E A 005 A - A - 2 - 0000

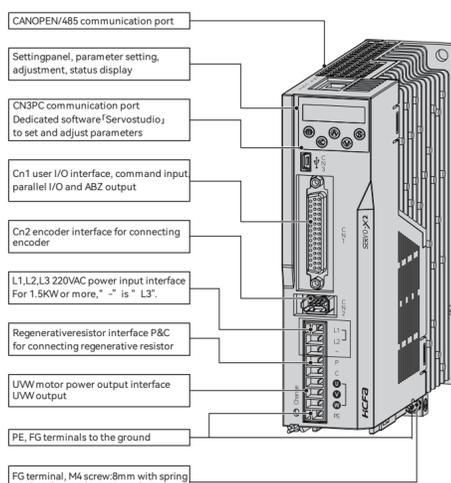
Serial name: SV-X2E A 005 A - A - 2 - 0000

Product power: 005 50W, 010 100W, 020 200W, 040 400W, 075 750W, 100 1kW, 150 1.5kW, 200 2kW, 250 2.5kW

Control power supply: A AC power, D 24V power

Voltage specification: A AC220V, T AC380V, B AC110, L DC48V, M DC24V

Drive parts name



Model selection of peripheral braking resistor

Rated output	50W	100W	200W	400W	750W	1kW	1.5kW	2kW
Resistance	40-50Ω	40-0Ω	40-50Ω	40-50Ω	40-50Ω	40Ω	40Ω	30Ω
Capacity	40W	40W	40W	40W	40W	50W	60W	80W

2. Products specification

Servo drive specification

Items	Specification	
Model Name	SV-X2E(A)A-A-2-0000	
Applicable motor	005 010 020 040 075 100 150 200 250	
Dimension	W(mm)	42 52 65
	H(mm)	165 165 169
	D(mm)	151 151 151
Weight(kg)		0.8 0.9 1.2
	Input power	Single-phase 200~240V ±10% 50/60Hz; Single-phase three-phase 200~240V
Environmental specifications	Temperature for use	0~55℃
	Ambient temperature for storage	-20~65℃
	Ambient humidity for use	20~85%RH or less (Without condensation)
	Ambient humidity for storage	20~85%RH or less (Without condensation)
	Atmosphere for use & storage	Indoors (Not subject to direct sunlight); free from corrosive gas, flammable gas, oil mist, or dust
Altitude	1000m or less above sea level	
Vibration	5.8m/s ² (0.6g) or less, 10-40Hz (No continuous operation allowed at frequency of resonance)	
Dielectric strength	1 minute at 1500 VAC across the primary and FG	
Control type	Three-phase PWM inverting sine-wave	
Encoder feedback	Single-turn absolute 17-bit (multi-turn absolute with battery)	
Digital signal	Input	8 inputs (24VDC photo-coupler insulation) Switch by control mode
	Output	4 outputs (24VDC photo-coupler insulation) I _{max} at on, open-collector output
Pulse signal	Input	2 inputs (photo-coupler or insul at on, RS-422 differential) High-speed input
	Output	2 inputs (HPUL and HSGN) 4 outputs (I _{max} at 2-phase RS-422 differential) I _{max} at on, open-collector output
Communication function	USB	Connection with PC (with "Servostudio" software)
	CAN	CANOPEN
Regeneration function	Optional, external regenerative resistor possible	
Dynamic brake	Provided	
Control mode	4 control modes: Position control, speed control, torque control, position/torque control, position/torque control, speed/torque control	
Digital input signals	Servo ON, alarm reset, deviation counter clear, positive/negative direction over-travel, internal command selector, homing start etc.	
Digital output signals	Alarm state, servo ready, brake release, torque in-limit output, position proximity, homing complete, position reached, motor rotation output, zero-speed output, etc.	
Functions	Max input pulse frequency	General inputs: Up to 500kHz, pulse width larger than 1μs; High-speed inputs: Up to 4MHz, pulse width larger than 125ns; Open-collector input: Up to 200kpps, pulse width larger than 2.5μs
	Input pulse type	Differential input, open-collector
	Input pulse phase	Pulse+ direction, A-Phase + B-Phase, CW+CCW
	Electronic gear ratio	A/B: A: 1-1073741824, B: 1-1073741824, Encoder resolution/1000000 < A/B < Encoder resolution/2.5
	Smoothing	Smoothing filter, FIR filter
	Output pulse form	A-Phase, B-Phase: Differential output or open collector output; Z-Phase: Differential output or open collector output
	Division ratio	Arbitrary frequency division
	Output pulse	Encoder pulse or position pulse instruction (can be set)
	Digital input signals	Servo ON, alarm reset, speed instruction reversal, zero-speed clamp, internal speed control, external forward/reverse torque limit, emergency stop etc.
	Digital output signals	Alarm state, servo ready, brake off, speed reached, torque limiting, speed limiting, zero-speed output, etc.
Digital input signals	Servo ON, alarm reset, torque instruction negation, zero-speed clamp etc.	
Digital output signals	Alarm state, servo ready, brake off, speed reached, torque limiting, speed limiting, zero-speed output, etc.	
Torque command input	Default, setting range adjustable by function codes	
Speed limit	Positive/negative speed limit P03.27, P03.28	
Speed monitoring	Provided	
Vibration control	Provided	
Adaptive notch filter	Provided	
Auto-tuning	Provided	
Encoder output division and multiplication	Provided	
Internal position control	Provided	
PC setting	Adjust by Servostudio software of SV-X2E	
Protective functions	Overvoltage, power supply error, overcurrent, overheat, overtemp, encoder error, user speed, position deviation, large, parameter error	

Note 1) The installation of regenerative resistor is decided by setting panel. For details, refer to "selection of external regenerative resistors". Please select the resistor with higher resistance and power when the temperature is too high.
Note 2) For input pulse forms, refer to the User Manual.

3. Installation and size of servo motor and drive

Installation environment conditions

About the environmental conditions, make sure to follow the company's instructions. If you need to use the product outside the scope of the environmental conditions, please consult hcfa Corporation in advance.
① Keep it away from the direct sunlight.
② Drive must be installed in the cabinet.
③ Keep it away from the water, oil (cutting oil, oil mist) and moisture.
④ Do not install the equipment under the conditions with water, corrosive and flammable gas.
⑤ Free from the dust, iron powder, cutting powder and so on.
⑥ Keep it away from the area with high temperature, excessive vibration and shock.

Installation direction and space

Leave sufficient space around the drive to ensure the heat dissipation and convection in the cabinet when installing the drive.

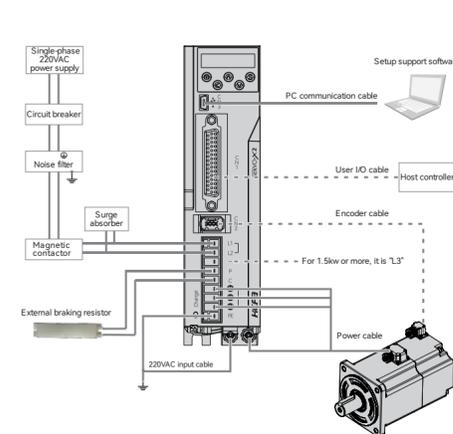
- Install the drives in the vertical direction. Please use two M5 screws to fix the drive and master drive of 1kW or more respectively.
- In order to ensure that surrounding temperature between internal boards is not more than 52°C, cooling fan or cooler is needed to reduce the temperature, when the drives are installed in the sealed cabinet.
- The temperature on the surface of cooling plate would be 30°C higher than the surrounding temperature.
- Use heat-resistant material for the wiring and isolate wiring from the machine and other cables which are easily affected by the temperature.
- The service life of servo drive depends on the temperature around the electrolytic capacitor. When the electrolytic capacitor is close to the service life, the static capacity will decrease and internal resistance will increase. Consequently, it will lead to overvoltage alarm, malfunction caused by noise and components damage. The service life of electrolytic capacitor is approx. 5 to 6 years under the condition (average annual temperature 30°C, load rate 80% and operation of less than 20 hours a day on average)

Drive dimension

Model	Dimension	Weight
SV-X2E(A)A-A-2-0000	W(mm) H(mm) D(mm)	(kg)
005 010 020	42 165 151	0.8
040 075 100	52 165 151	0.9
150 200 250	65 169 151	1.2

4. Wiring explanation for servo motor and drive

Wiring diagram



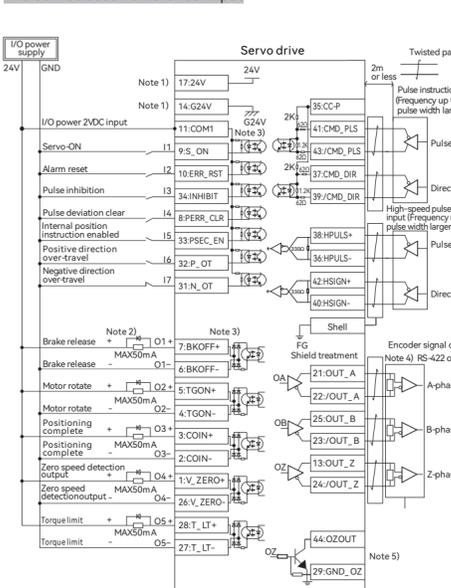
[Points for correct wiring]
* A twisted-pair shielded cable should be used when I/O cable length is over 50cm.
* The encoder cable should be less than 20m.

Caution: Please note that there is high voltage in the solid line of wiring diagram when wiring and using. The broken lines in the wiring diagram indicates the non-dangerous voltage circuit.

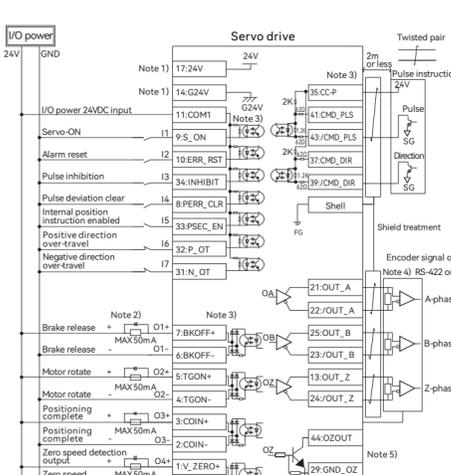
5. Wiring

Wiring for user I/O connector (CN1)

Pulse instruction differential input

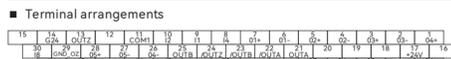


Pulse instruction 24V open collector input



Note 1: Internal 24V power (24V, G24V) can be used as I/O power. But the maximum output current is 150mA, and when driving the output such as relay and brake, please use external independent power.
Note 2: Please connect protective circuit (diode) when driving load with inductive component such as relay.
Note 3: Output pins can output high level or low level, based on different wiring mode. So perform the wiring according to actual needs.
Note 4: The connecting terminal of differential pulse output signal, differential signal of 485 communication circuits and CANOPEN communication circuits need to be connected the terminal resistor.
Note 5: OZOUT is open-collector output and no manual configuration required.
Note 6: Two kinds of wiring according to the pulse generation mode: NPN and PNP.
Note 7: If 5V open-collector circuit is required, be sure to connect an external 300Ω resistor.
Note 8: Please choose one according to the field demands between pulse instruction input and high-speed pulse input.
* DI function can be configured by function code flexibly. DI becomes valid when connected and the positive/negative logic can be changed by function code.
* DO function can be configured by function code flexibly. DO becomes valid when connected and the positive/negative logic can be changed by function code.

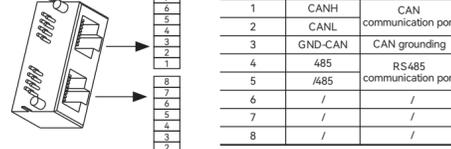
Description of User I/O connector (CN1) terminal arrangements



Terminal arrangements



485 communication / CANOPEN wiring



Appendix

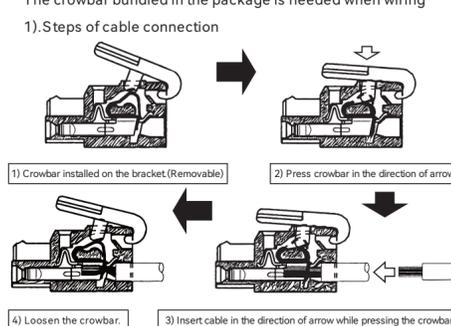
Recommended wire/cable

Cable name	AWG	UL	Heat resistance	Remarks
Motor power cable (750W or less)	18	2517	105°C	
Motor power cable (1KW or more)	14	2501	105°C	
220VAC input (750W or less)	18	1015	105°C	Including FG cable
220VAC input (1KW or more)	14	1015	105°C	Including FG cable
Encoder	Power: 22 Signal: 24	20276	80°C	5P(10-core) shielded cable: max. 20m (when using twisted shielded cable)
User I/O	26	1007	80°C	Twisted shielded cable, Recommended cable: 50m or less
Regenerative resistor connection	18	1015	105°C	
Brake	18	2517	105°C	1P(2-core)
Communication among drives	28	20539	80°C	10-core, accessories (2.54mm space)

The length of cable depends on the actual situation.
Note 1) AWG 16 cable can be used for 1kW motor.
Note 2) For multi-axial drive.

Wiring for power connector (L1/L2/L3,U/W/V) of servo drive

The crowbar bundled in the package is needed when wiring



6. Parameter list

Common Parameters

Parameter No.	Parameter name	Description
P00.00	Motor positive direction definition	Check the positive direction of the motor rotation, generally by default definition
P00.02	Real time auto-tuning	Set the "Real time auto-tuning" to 1 or 2 to change the rigidity, the servo gain parameter adjusting automatically. Set it to 0, adjust the gain parameter by manual
P00.03	Stiffness gear setting	Set up the ratio of the load inertia against the rotor (of the motor) inertia
P00.04	Load inertia ratio	Set up the ratio of the load inertia against the rotor (of the motor) inertia
P00.16	Pulse output positive direction definition	Set the reversal of pulse output B-phase, generally by default
P00.19	Position deviation too large threshold	Set excess range of positional deviation by the command unit (default)
P00.21	Brake resistor setting	Select either to use built-in brake resistor or externally installed the brake resistor. Default setting: 1 (external). No need to change.
P00.22	External regenerative resistor capacity	Set the external resistor capacity and resistance in accordance with the actual condition. For the resistance, please refer to Model selection of peripheral braking resistor in Instruction Manual.
P00.23	External regenerative resistor resistance value	Set the external resistor capacity and resistance in accordance with the actual condition. For the resistance, please refer to Model selection of peripheral braking resistor in Instruction Manual.
P03.08	Torque limit source	Set the torque limit source and setting value, generally internal torque limit by default. Default value 300%.
P03.09	Internal forward torque limit	Set the torque limit source and setting value, generally internal torque limit by default. Default value 300%.
P03.10	Internal reverse torque limit	Set the torque limit source and setting value, generally internal torque limit by default. Default value 300%.
P03.11	External forward torque limit	Set the torque limit source and setting value, generally internal torque limit by default. Default value 300%.
P03.12	External reverse torque limit	Set the torque limit source and setting value, generally internal torque limit by default. Default value 300%.
P09.00	Modbus/CANOPEN axis address	Set the parameters related to the communication.
P09.01	Modbus baud rate	Set the parameters related to the communication.
P09.02	Modbus data format	Set the parameters related to the communication.
P09.03	Communication response delay	Set the parameters related to the communication.
P09.12	Selection of AO function or CAN communication	Hexadecimal, check from the right to left: 1 st digit: CANOPEN communication; 1: AO function 2 nd digit: Allowance message missing value in synchronous mode 3 rd digit: E-therCAT synchronization; 0: strict synchronization; 1: Non-strict synchronization 4 th digit: For manufacturer's use
P09.13	CAN communication configuration 1	Hexadecimal, check from the right to left: 1 st digit: CAN communication baud rate: 0: 20k; 1: 50k; 2: 100k; 3: 125k; 4: 250k; 5: 500k; 6: 800k; 7: 1M 2 nd digit: gear ratio selection: 0: set by the drive; 1: set by the master station. 3 rd digit: gear ratio selection: 0: using internal unit; 1: using user unit; 4 th digit: the unit of acceleration speed: 0: using internal unit; 1: using user unit
P09.14	CAN communication configuration 2	Hexadecimal, check from the right to left: 1 st digit: bus fault detection; 0: OFF; 1: ON 2 nd digit: origin completion flag storage in absolute system 0: No storage; 1: Store

Position control mode - External pulse input

Parameter No.	Parameter name	Description
P00.01	Control mode selection	Set it to 0 - Position control mode
P00.05	Position instruction source	Set it to 0 - Pulse instruction
P00.07	Pulse train form	Select one of the following pulse format: 0: Direction + pulse, positive logic 1: Direction + pulse, negative logic 2: A-phase + B-phase orthogonal pulse, 4 multiplication, positive logic 3: A-phase + B-phase orthogonal pulse, 4 multiplication, negative logic 4: CW + CCW, positive logic 5: CW + CCW, negative logic
P00.27	High-speed pulse train form	0: using internal unit; 1: using user unit
P00.08	Instruction units per motor one revolution (32-bit)	0 Unit/Turn - 1073741824 Unit/Turn
P00.10	Electronic gear numerator 1	1-1073741824 (Electronic gear is valid when setting P00.08 to 0)
P00.12	Electronic gear denominator 1	1-1073741824 (Electronic gear is valid when setting P00.08 to 0)
P00.01	Starting stage number	Set the Start stage No. of internal position command (P08.02)
P00.02	Ending position control 1st stage length	Set the End stage No. of internal position command (P08.01-16)
P08.06	Internal position control 1st stage max speed	-1073741824 - 1073741824
P08.08	Internal position control 1st stage max speed	1 - 9000rpm
P08.09	Internal position control 1st stage acceleration/deceleration time	0 - 65535ms
P08.10	Waiting time after internal position control 1st stage completed	0 - 65535ms
P08.11-P08.85	Arrange by the order of parameter from the 1st stage position command, then from the 2nd stage to 16th stage in turn	

Position control mode - Internal multi-stage position command

Parameter No.	Parameter name	Description
P00.01	Control mode selection	Set it to 0 - Position control mode
P00.05	Position instruction source	Set it to 0 - Internal position command
P00.08	Instruction units per motor one revolution	0 Unit/Turn - 1073741824 Unit/Turn
P00.10	Electronic gear numerator 1	

■ Related parameters for internal multi-speed control

Parameter No.	Parameter name	Description
P00.01	Control mode selection	Set to 1 - Speed control mode
P03.00	Speed command source	Set to 3 - internal multi-stage speed 1-16 switchover
P03.14	Acceleration time 1	Set the acceleration/deceleration time, range is between 0 and 65535ms
P03.15	Deceleration time 1	Set the acceleration/deceleration time, range is between 0 and 65535ms
P03.36- P03.51	Speed from segment 1 to 16	Parameter P03.36 is the 1st stage speed and so on P03.51 the 16th stage speed. Initial value is 0 and make the setting by the actual usage
Notes	When using internal multi-stage speed, set the DI function 6-9 and select the speed by the switch combination	

■ Fault and warning code description

Code and name	Cause	What to do
Err. 001: System parameter error	1. Control circuit power suddenly drops; 2. After updating servo software, some previously saved parameters exceed settings range	1. Make sure input power is within specified range. 2. Set P20.06=1 to initialize system parameters.
Err. 002: Product model selection fault	1. Encoder cable connection broken or loose; 2. Invalid drive or motor model.	1. Check and fasten encoder cable; 2. Replace with valid drive or motor model.
Err. 003: Parameter reading/writing too frequent	1. Parameter reading/writing too frequent; 2. Parameter storage component fault; 3. Control circuit power unstable; 4. Drive fault.	1. Check if upper controller is reading/writing EEPROM too frequent; 2. Check control circuit power cable and ensure control circuit power voltage is within specified range.
Err. 004: FFGA fault	Software version fault.	Check if software version is correct.
Err. 005: Encoder matching fault	1. Encoder cable connection broken or loose; 2. Use the same encoder which is not supported. 3. Motor capacity and drive capacity don't match. Motor capacity class is larger than or two levels of the drive. 4. Product model code doesn't exist	1. Check and fasten encoder cable; 2. Check if motor cable or grounding resistance is abnormal. If so replace the drive. 3. Choose correct encoder type or replace the drive.
Err. 006: Software abnormal	1. System parameter abnormal; 2. Drive internal fault.	Set P20.06=1 to initialize system parameters and restart power.
Err. 007: Internal encoder UVW abnormal	Encoder signal abnormal at power on.	Check or replace encoder cable.
Err. 008: Short circuit to ground or detection fault	1. UVW wiring fault; 2. Motor breakdown; 3. Drive fault.	1. Check if UVW is short circuited to ground. If so replace cable; 2. Check if motor cable or grounding resistance is abnormal. If so replace the motor.
Err. 009: Current limit fault	1. Instruction input is too fast; 2. Regenerative resistor too small or short circuited; 3. Motor cable bad contact; 4. Motor UVW short circuited; 5. Motor UVW short circuited; 6. Motor burnt; 7. Software detected power transistor overcurrent	1. Check instruction input time sequence and input after S-RDY; 2. Replace regenerative resistor; 3. Check and fasten encoder cable; 4. Replace motor if UVW insulation resistor is broken; 5. Check if UVW is short circuited; 6. Replace motor if UVW don't have equal resistance; 7. Reduce load, use bigger drive and motor, increase acceleration/deceleration time.
Err. 010: Overcurrent fault	1. Instruction input is too fast; 2. Regenerative resistor too small or short circuited; 3. Motor cable bad contact; 4. Motor cable grounding; 5. Motor UVW short circuited; 6. Motor burnt; 7. Software detected power transistor overcurrent	1. Check instruction input time sequence and input after S-RDY; 2. Replace regenerative resistor; 3. Check and fasten encoder cable; 4. Replace motor if UVW insulation resistor is broken; 5. Check if UVW is short circuited; 6. Replace motor if UVW don't have equal resistance; 7. Reduce load, use bigger drive and motor, increase acceleration/deceleration time.
Err. 012: Incremental encoder Z breakage or absolute encoder number of turns abnormal	1. Incremental encoder: 2. Phase signal loss due to cable breakage or encoder fault; Absolute encoder: battery shortage, encoder cable plugging & unplugging during power off, or after P06.47=1 not initialize the encoder.	1. Rotate motor shaft manually. If error still occurs, replace cable or encoder; 2. Replace battery if undervoltage; 3. P20.06=7 and initialize.
Err. 013: Encoder communication abnormal	1. Communication encoder cable breakage; 2. Encoder not grounded; 3. Communication verification abnormal.	1. Check or replace encoder cable; 2. Check if encoder is grounded properly.
Err. 014: Encoder data abnormal	1. Serial encoder breakage or bad contact; 2. Serial encoder data reading/writing abnormal	Check or replace encoder cable.
Err. 015: Encoder battery undervoltage	Encoder battery voltage is less than P06.48 and test's place of P06.47 is 1.	Replace encoder battery.
Err. 016: Speed deviation too large	Speed instruction and speed feedback deviation exceeds settings of P06.45.	1. Increase P06.45 value; 2. Increase acceleration/deceleration time or increase system responsiveness; 3. Set P06.45=0 to disable speed deviation too large function.
Err. 017: Torque saturation overtime	Torque maintains saturated for time longer than settings of P06.46.	1. Increase P06.46 value; 2. Check if UVW is broken.
Err. 019: Tripping	Incorrect wiring may make the control circuit diverge and result in motor stall.	1. Check UVW and encoder wiring. 2. Check the motor and drive. Replace it when necessary.
Err. 020: Overvoltage	1. Input power voltage exceeds 280VAC; 2. Regenerative resistor breakage or not matching; 3. Load inertia exceeds allowable range; 4. Drive broken.	1. Check input power voltage; 2. Check or replace regenerative resistor; 3. Increase acceleration/deceleration time or replace more suitable drive/motor.
Err. 021: Undervoltage	1. Input power voltage drops; 2. Instantaneous power off; 3. P06.36 setting is too high; 4. Drive broken (Note: No storage record for this fault by default, but can be set by P07.22.)	1. Make sure input power is stable; 2. Reduce P06.36 value if input power is normal.
Err. 022: Current sampling fault	Drive internal current sampling fault.	Replace servo drive.

DO function description	Value	Sign	Name	Remarks
20	PCOM2		Position 2 comparison trigger signal	Output trigger signal when position 2 reaches the corresponding range
21	PCOM3		Position 3 comparison trigger signal	Output trigger signal when position 3 reaches the corresponding range
22	PCOM4		Position 4 comparison trigger signal	Output trigger signal when position 4 reaches the corresponding range

■ Parameter list

Control modes: P: Position control S: Speed control T: Torque control
● means applicable - means not applicable

Parameter number	Description	Control mode		
		P	S	T
00	Motor positive direction definition	●	●	●
01	Control mode selection	●	●	●
02	Real time auto-tuning	●	●	●
03	Stiffness grade setting	●	●	●
04	Load inertia ratio	●	●	●
05	Position instruction source	●	●	●
07	Pulse train form	●	●	●
08	Instruction units per motor one revolution (32-bit)	●	●	●
10	Electronic gear numerator 1 (32-bit)	●	●	●
12	Electronic gear denominator (32-bit)	●	●	●
14	Pulse output counts per motor one revolution (32-bit)	●	●	●
16	Pulse output positive direction definition	●	●	●
17	Pulse output OZ polarity	●	●	●
18	Pulse output function selection	●	●	●
19	Position deviation too large threshold	●	●	●
21	Braking resistor setting	●	●	●
22	External resistor capacity	●	●	●
23	External resistor resistance value	●	●	●
24	External resistor heating time constant	●	●	●
25	Brake voltage point	●	●	●
26	Step value setting	●	●	●
27	High-speed pulse train format	●	●	●
00	Position loop gain 1	●	●	●
01	Speed loop gain 1	●	●	●
02	Speed loop integral time 1	●	●	●
03	Speed detection filter 1	●	●	●
04	Torque instruction filter 1	●	●	●
05	Position loop gain 2	●	●	●
06	Speed loop gain 2	●	●	●
07	Speed loop integral time 2	●	●	●
08	Speed detection filter 2	●	●	●
09	Torque instruction filter 2	●	●	●
10	Speed regulator PDFF coefficient	●	●	●
11	Speed feedforward control selection	●	●	●
12	Speed feedforward gain	●	●	●
13	Speed feedforward filtering time	●	●	●
14	Torque feedforward control selection	●	●	●
15	Torque feedforward gain	●	●	●
16	Torque feedforward filtering time	●	●	●
17	Digital input GAIN-SWITCH function selection	●	●	●
18	Position control gain switchover mode	●	●	●
19	Position control gain switchover delay	●	●	●
20	Position control gain switchover class	●	●	●
21	Position control gain switchover hysteresis	●	●	●
22	Position control gain switchover time	●	●	●
23	Speed control gain switchover mode	●	●	●
24	Speed control gain switchover delay	●	●	●
25	Speed control gain switchover class	●	●	●
26	Speed control gain switchover hysteresis	●	●	●
27	Torque control gain switchover mode	●	●	●
28	Torque control gain switchover delay	●	●	●
29	Torque control gain switchover class	●	●	●
30	Torque control gain switchover hysteresis	●	●	●
31	Observer enabled	●	●	●
32	Observer cutoff frequency	●	●	●
33	Observer phase compensation time	●	●	●
34	Observer inertia coefficient	●	●	●
00	Position instruction smoothing filter	●	●	●
01	Position instruction FIR filter	●	●	●
02	Adaptive filtering mode	●	●	●
03	Adaptive filter load mode	●	●	●
04	First notch filter frequency (manual)	●	●	●
05	First notch filter width	●	●	●
06	First notch filter depth	●	●	●
07	Second notch filter frequency (manual)	●	●	●
08	Second notch filter width	●	●	●
09	Second notch filter depth	●	●	●
10	Third notch filter frequency	●	●	●
11	Third notch filter width	●	●	●
12	Third notch filter depth	●	●	●
13	Fourth notch filter frequency	●	●	●
14	Fourth notch filter width	●	●	●
15	Fourth notch filter depth	●	●	●
19	Position instruction FIR filter 2	●	●	●

Code and name	Cause	What to do
Err. 024: Overspeed	Not enabled: 1. The drive does not match. 2. Incorrect encoder wiring Enabled: 1. Speed instruction exceeds maximum speed setting value. 2. Wrong UVW phase sequence. 3. Speed response over modulation. 4. Drive faulty	Not enabled: 1. Contact manufacturer 2. Check encoder wiring Enabled: 1. Lower speed instruction 2. Adjust UVW phase sequence is correct. 3. Adjust speed loop gains to reduce over shoot. 4. Replace drive
Err. 025: Electrical angle identification failure	1. Load or inertia too large. 2. Wrong encoder cable wiring	1. Reduce load or increase current loop gains 2. Replace encoder cable.
Err. 026: Load identification failure	1. Load or inertia too large. Motor cannot run at specified curves. 2. Verification process aborted by other faults.	1. Reduce load or increase current loop gains 2. Make sure verification process correct faults.
Err. 027: DI parameter setting fault	1. Different DOs are assigned with same function. 2. Physical DI and communicational DI have definition conflicts	Reassign DI functions
Err. 028: DO parameter setting fault	Different DOs are assigned with same function	Reassign DO functions
Err. 040: S-ON instruction invalid fault	Input S-ON signal after motor is energized by other auxiliary functions	Change incorrect operation.
Err. 042: Pulse division output overspeed	Pulse division output is over upper limit.	Adjust pulse division output settings.
Err. 043: Position deviation too large	1. Servo motor UVW wiring is wrong; 2. Servo drive gain settings are too low; 3. Position instruction pulse frequency is too high; 4. Position instruction acceleration is too large; 5. P06.19 setting is too low; 6. Servo drive/motor faulty;	1. Reconnect the cables 2. Increase servo gains 3. Reduce instruction frequency, acceleration or adjust gear ratio 4. Set up smoothing parameters; 5. Adjust the value of P06.19 6. Replace the drive
Err. 045: Drive output phase loss	1. Motor UVW bad contact; 2. Motor broken	1. Check UVW wiring 2. Replace motor
Err. 046: Drive overload warning	1. Motor UVW or encoder cable bad contact or loose 2. Motor blocked or brake not released 3. Wrong UVW/encoder cable wiring for multiple drives/motors 4. Motor/drive too small for load 5. Phase loss or wrong phase sequence 6. Motor or drive broken	1. Check UVW/encoder cable wiring 2. Check motor is not blocked and brake is released 3. Check there is no wrong UVW/encoder cable wiring for multiple drives/motors 4. Increase acceleration/deceleration time or choose bigger drive/motor 5. Check UVW wiring 6. Replace drive/motor Note: If this fault occurs, please wait for more than 10mins to operate the motor after restarting the power.
Err. 047: Motor overload	1. Motor UVW or encoder cable bad contact or loose 2. Motor blocked or brake not released 3. Wrong UVW/encoder cable wiring for multiple drives/motors 4. Motor/drive too small for load 5. Phase loss or wrong phase sequence 6. Motor or drive broken	1. Check UVW/encoder cable wiring 2. Check motor is not blocked and brake is released 3. Check there is no wrong UVW/encoder cable wiring for multiple drives/motors 4. Increase acceleration/deceleration time or choose bigger drive/motor 5. Check UVW wiring 6. Replace drive/motor
Err. 048: Electronic gear setting fault	Electronic gear ratio exceeds setting range	Set correct electronic gear
Err. 049: Heat sink too hot	1. Fan broken 2. Ambient temperature is too high 3. Too many times of restarting power after overload error. Restart after 30s. 4. Inappropriate installation directions and spacing. 5. Servo drive fault 6. Motor or drive broken	1. Check fan. Replace fan or drive 2. Measure ambient temperature and improved cooling conditions for servo drive 3. Check error records and see if there has been overload error. Restart after 30s. 4. Increase acceleration/deceleration time. 5. Install the servo drive according to specifications in this manual. 6. Power off and wait for 5 minutes. If this error persists, replace drive.
Err. 050: User force fault	1. Input pulse frequency is larger than maximum frequency setting 2. Input pulse is interfered.	1. Adjust P06.38 2. Check wiring grounding conditions. Use twisted-pair shielded cable. Separate UVW cable from encoder cable.
Err. 054: User force fault	User uses DI of function 32 FORCE_ERR to forcibly enter faulty state.	Disconnect DI of function 32.
Err. 055: Absolute position resetting fault	Absolute encoder absolute position resetting faulty.	Contact hcf.
Err. 056: Main circuit outage	Power outage or main circuit abnormal	Check if there is instantaneous power failure. Increase power voltage capacity.
Err. 060: First start after writing customized software	First start after writing customized software	Initialize the servo drive.
Err. 065: CAN bus OFF	CAN bus disconnection or abnormal reception or sending	Check wiring and reconnect
Err. 066: Abnormal NMT command	NMT stop command or reset command received at servo-ON	NMT mode reset. Do not stop or reset CAN node at servo-ON.
Err. 067: CAN bus fault	CAN bus disconnection or abnormal reception or sending	Check wiring and reconnect
Err. 068: External overspeed (reserved)	1. Speed command exceeds max. speed 2. UVW phase sequence is wrong 3. Speed response severely overshoot 4. Servo drive faulty	1. Reduce speed command 2. Check UVW phase sequence 3. Adjust speed loop gain 4. Replace drive

Parameter number	Description	Control mode			
		P	S	T	
20	First vibration attenuation frequency	●	●	●	
21	First vibration attenuation filter setting	●	●	●	
22	Second vibration attenuation frequency	●	●	●	
23	Second vibration attenuation filter setting	●	●	●	
31	Resonance point 1 frequency	●	●	●	
32	Resonance point 1 bandwidth	●	●	●	
33	Resonance point 1 amplitude	●	●	●	
40	Encoder interference detection delay	●	●	●	
41	Input pulse filtering setting	●	●	●	
42	Input pulse inhibition setting	●	●	●	
43	Deviation clearance input setting	●	●	●	
44	High speed DI filtering setting	●	●	●	
45	Speed deviation too large threshold	●	●	●	
46	Torque saturation overtime setting	●	●	●	
47	Absolute system setting	●	●	●	
48	Encoder battery undervoltage threshold	●	●	●	
49	High-speed pulse input filter	●	●	●	

Parameter number	Description	Control mode			
		P	S	T	
00	Speed instruction source selection	●	●	●	
03	Speed instruction digital setting	●	●	●	
04	JOG speed setting	●	●	●	
08	Torque limit source	●	●	●	
09	Internal forward torque limit	●	●	●	
10	Internal reverse torque limit	●	●	●	
11	External forward torque limit	●	●	●	
12	External reverse torque limit	●	●	●	
14	Acceleration time 1	●	●	●	
15	Deceleration time 1	●	●	●	
16	Acceleration time 2	●	●	●	
17	Deceleration time 2	●	●	●	
19	Zero-speed clamp function	●	●	●	
20	Zero-speed clamp threshold value	●	●	●	
22	Torque instruction source	●	●	●	
25	Braking instruction digital setting value	●	●	●	
26	Speed limit source in torque control	●	●	●	
27	Internal positive speed limit	●	●	●	
28	Internal negative speed limit	●	●	●	
29	Hard limit torque limit	●	●	●	
30	Hard limit torque limit detection time	●	●	●	
31	Internal speed instruction segment number selection mode	●	●	●	
32	Acceleration time selection for internal speed segment 1-8	●	●	●	
33	Deceleration time selection for internal speed segment 1-8	●	●	●	
34	Acceleration time selection for internal speed segment 9-16	●	●	●	
35	Deceleration time selection for internal speed segment 9-16	●	●	●	
36-51	Segment 1-16 speed	●	●	●	

Parameter number	Description	Control mode			
		P	S	T	
00	Normal DI filter selection	●	●	●	
01-08	DI1-DI8 terminal function selection	●	●	●	
11-18	DI1-DI8 terminal logic selection	●	●	●	
21-25	DO1-DO5 terminal function selection	●	●	●	
31-35	DO1-DO5 terminal logic selection	●	●	●	
41	FunN signal unassigned state (Hex)	●	●	●	
42	FunNH signal unassigned state (Hex)	●	●	●	
43	Motor rotational signal threshold	●	●	●	
44	Speed conformity signal width	●	●	●	
45	Speed reached designated value	●	●	●	
47	Positioning completion range	●	●	●	
48	Positioning completion output setting	●	●	●	
49	Positioning completion holding time	●	●	●	
50	Positioning near (NEAR) threshold	●	●	●	
51	Servo OFF delay time after holding brake taking action when speed is 0	●	●	●	
52	Speed setting for holding brake to take action in motion	●	●	●	
53	Waiting time for holding brake to take action in motion	●	●	●	
54	Torque reached designated value	●	●	●	
55	Torque reached signal width	●	●	●	
56	Torque reached signal width	●	●	●	
57	Z-pulse width adjustment	●	●	●	
58	Zero-speed output threshold	●	●	●	

Parameter number	Description	Control mode			
		P	S	T	
00	Electronic gear numerator 2(32-bit)	●	●	●	
02	Electronic gear numerator 3(32-bit)	●	●	●	
04	Electronic gear numerator 4(32-bit)	●	●	●	
06	Position deviation clearance function	●	●	●	
09	Electronic gear ratio switchover delay	●	●	●	