# GUIDE Servo Drive SD110-P Series

# Instruction manual version: 1.04

# Foreword

Thank you for choosing Gondi servo drives! At the same time, you will enjoy the comprehensive and sincere service we provide for you!

In order to fully utilize the excellent performance of this product and to ensure the safety of the user and the equipment, please read this manual in detail before use.

This instruction manual is an accessory sent with the product, please make sure to keep it in a safe place after use for future overhaul and maintenance of the product.

For the use of this product if there are questions or special requirements, please feel free to contact our offices or distributors, but also directly with the headquarters of the company's after-sales service center, we will be happy to serve you.

The contents of this manual are subject to change without notice.

Wuhan Guide Technology Co.,Ltd.

# Safety Precautions

## Security Statement

1) Read and follow these safety precautions before installing, operating, or maintaining the product.

2) For personal and equipment safety, follow all safety precautions indicated on the product labeling and in the manual when installing, operating, and maintaining the product.

3) The "CAUTION", "WARNING" and "DANGER" items in this manual do not represent all the safety items to be observed, but are only supplementary to all safety precautions.

4) This product should be used in an environment that complies with the design specifications, otherwise it may cause malfunctions. Abnormal functioning or damage to parts, etc. caused by failure to comply with the relevant regulations are not covered by the product quality warranty.

5) We will not be held legally responsible for any personal safety accidents or property damage caused by non-compliant operation of the product.

## Safety level

| notation | Symbol description |
|---|---|
|  | ◆ "DANGER" means that death or serious bodily injury will result if the operation is not carried out as specified |
|  | ◆ "CAUTION" indicates a critical step, which needs to be operated according to the prompts and specifications |
|  | ◆ "WARNING" means that death or serious bodily injury may result if the operation is not carried out as specified |

# Safety instructions

## Important notes


- Do not touch the radiator by hand after ten minutes of power-on or within a period of time after power-off to prevent burns.
- Do not power on and off the VFD frequently, and do not power on again within five minutes after power off.
- Do not remove the cover of the VFD or touch the printed circuit board when it is powered on to prevent electric shock.
- Wiring, inspection and other operations must be carried out 10 minutes after the power is turned off.
- The grounding terminal of the VFD must be well grounded!
- No foreign matters are allowed to fall into the VFD.


- The VFD must not be installed on flammable materials.
- This series of VFD are not suitable for flammable and explosive environments. If necessary, please order a special VFD from the manufacturer.
- It is forbidden to disassemble, assemble or modify the VFD without permission!
- It is strictly forbidden to connect the AC power supply to the output terminals U, V and W of the VFD.
- When the VFD is powered on, do not open the cover or carry out wiring operations.

## Unpacking acceptance


- Before unpacking, please check whether the outer packaging of the product is intact, whether there is damage, soaking, moisture, deformation, etc.
- Please open the package in accordance with the specified hierarchical order. It is strictly prohibited to handle it with excessive force!
- When unpacking, please check whether there is any damage, rust, or dents on the surface of the product and its accessories.

◆ After unpacking, please carefully check whether the quantity and data of the product and its accessories are complete against the packing list.


◆ Upon unpacking, refrain from installing the product if water has infiltrated the product, any parts are missing, or any parts are damaged!

◆ If the product and its accessories are found to have damage, rust, signs of use and other problems during unpacking, do not install them!

◆ Please carefully check against the packing list, and do not install if the packing list does not match the product name!

## Storage and transportation


◆ Please store and transport the product according to the storage and transportation conditions, and the storage temperature and humidity shall meet the requirements.

◆ Avoid storage and transportation in places where water splashes, rain, direct sunlight, intense electric field, strong magnetic field, strong vibration, etc.

◆ Avoid storing the product for more than 3 months. If the storage time is too long, please carry out closer protection and necessary inspection.

◆ Please pack the product strictly before vehicle transportation. Closed boxes must be used for long-distance transportation.

◆ It is strictly forbidden to transport this product together with equipment or articles that may affect or damage this product.


◆ Be sure to use professional loading and unloading equipment to handle large or heavy equipment and products!

◆ When handling the product by hands, be sure to hold the product housing firmly to avoid falling product parts, otherwise there is a risk of injury!

◆ When handling the product, be sure to lift and place it gently, and always be mindful of objects underfoot to prevent tripping or falling, otherwise there is a risk of injury or product damage!

◆ When the equipment is being lifted by lifting tools, no individuals are permitted to stand or remain beneath the equipment.

## Installation


- Be sure to read the product instruction manual and safety precautions carefully before installation!
- It is strictly forbidden to modify this product!
- It is strictly forbidden to screw the fixing bolts of product parts and components and the bolts marked in red!
- Do not install this product in places with intense electric field or strong electromagnetic wave interference!
- When this product is installed in a cabinet or terminal equipment, the cabinet or terminal equipment shall be provided with corresponding protective devices such as fireproof enclosure, electrical protective enclosure and mechanical protective enclosure, and the protection grade shall meet the requirements of relevant IEC standards and local laws and regulations.


- Non-professionals are strictly prohibited from product installation, wiring, maintenance, inspection or component replacement!
- The installation, wiring, maintenance, inspection or component replacement of this product can only be carried out by professionals who have received relevant training on electrical equipment and have sufficient electrical knowledge.
- The installation personnel must be familiar with the product installation requirements and relevant technical data.
- When it is necessary to install transformers and other equipment with strong electromagnetic interference, please install shielding protection devices to avoid malfunction of this product!

## Wiring


- Non-professionals are strictly prohibited from equipment installation, wiring, maintenance, inspection or component replacement!
- Do not perform wiring operations when the power is on, otherwise there will be a risk of electric shock.
- Before wiring, cut off the power supply of all equipment. After the power is cut off, there is residual voltage in the internal capacitor of the equipment. Please wait at least 10 minutes before wiring.
- Ensure that the equipment and products are properly grounded, otherwise there will be a risk of electric shock.
- Please adhere to the procedures outlined in the Electrostatic Discharge (ESD) prevention guidelines and wear an electrostatic wrist strap during wiring and other operations to prevent damage to the internal circuitry of the equipment or product.


- It is strictly forbidden to connect the input power supply to the output terminals of the equipment or product, as this may cause equipment damage or even lead to a fire.
- When connecting the driver to the motor, be sure to ensure that the phase sequence of the driver and the motor terminals is accurate and consistent to avoid reverse rotation of the motor.
- The cables used in wiring must meet the corresponding requirements for diameter and shielding, and the shielding layer of shielded cables must be reliably grounded at one end!
- After wiring, make sure that there are no falling screws or exposed cables inside the equipment and product.

## Power up


- Before powering up, please confirm that the equipment and products are installed properly, the wiring is firm, and the motor device is allowed to be restarted.
- Before powering up, please confirm that the power supply meets the requirements of the equipment to avoid equipment damage or fire!
- When powering up, the mechanical device of the equipment or product may act suddenly. Please stay away from the mechanical device.

- After powering up, do not open the equipment cabinet door or product protective cover, otherwise there will be a risk of electric shock!
- It is strictly prohibited to touch any wiring terminals of the equipment while it is powered on, otherwise there will be a risk of electric shock!
- It is strictly prohibited to disassemble any devices or components of the equipment and products while they are powered on, otherwise there will be a risk of electric shock!

## Running


- It is strictly prohibited to touch any wiring terminals of the equipment while it is in running state, otherwise there will be a risk of electric shock!
- It is strictly prohibited to disassemble any devices or components of the equipment and products while they are in running state, otherwise there will be a risk of electric shock!
- It is strictly forbidden to touch the equipment housing, fan or resistance to test the temperature, otherwise it may cause burns!
- It is strictly forbidden for non-professional technicians to detect signals during running, otherwise it may cause personal injury or equipment damage!


- During running, avoid other articles or metal objects from falling into the equipment, otherwise the equipment will be damaged!
- Do not use the contactor on-off method to control the start and stop of the equipment, otherwise the equipment will be damaged!

## Maintenance


- Before powering up, please confirm that the equipment and products are installed properly, the wiring is firm, and the motor device is allowed to be restarted.
- Before powering up, please confirm that the power supply meets the requirements of the equipment to avoid equipment damage or fire!
- When powering up, the mechanical device of the equipment or product may act suddenly. Please stay away from the mechanical device.

- After powering up, do not open the equipment cabinet door or product protective cover, otherwise there will be a risk of electric shock!
- It is strictly prohibited to touch any wiring terminals of the equipment while it is powered on, otherwise there will be a risk of electric shock!
- It is strictly prohibited to disassemble any devices or components of the equipment and products while they are powered on, otherwise there will be a risk of electric shock!

**Scrapping**


- Please scrap equipment and products in accordance with relevant national regulations and standards to avoid property losses or casualties!
- Scrapped equipment and products shall be treated and recycled in accordance with industrial waste treatment standards to avoid environmental pollution.

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# 1. Product Information

## 1.1Matching Selection List

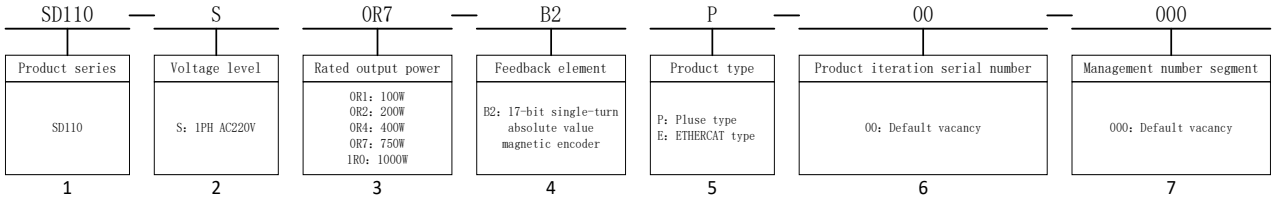
Table1 Selection List

| Servo drive | | Servo motor | | | |
|---|---|---|---|---|---|
| Models | Drive Model | Non-holding brake motor model | Holding brake motor model | saddle | power (output) |
| S1 | SD110-S0R1-B2P | SM1-04B2A0R130-NDAM | SM1-04B2A0R130-BDAM | 40 | 100W |
| | SD110-S0R2-B2P | SM1-06B2A0R230-NDAM | SM1-06B2A0R230-BDAM | 60 | 200W |
| | SD110-S0R4-B2P | SM1-06B2A0R430-NDAM | SM1-06B2A0R430-BDAM | 60 | 400W |
| S2 | SD110-S0R7-B2P | SM1-08B2A0R730-NDAM | SM1-08B2A0R730-BDAM | 80 | 750W |
| | SD110-S1R0-B2P | SM1-08B2A1R030-NDAM | SM1-08B2A1R030-BDAM | 80 | 1000W |

## 1.2Servo Drive Product Information

### 1.2.1Nameplate and model number

#### 1.2.1.1Model Description




| | | |
|---|---|---|
| 1 | Product Series | SD110: SD110 Series Servo Drives |
| 2 | Voltage level | S: Single-phase AC220V |
| 3 | Rated output power | 0R1: 100W<br>0R2: 200W<br>0R4: 400W<br>0R7: 750W<br>1R0: 1000W |
| 4 | Feedback element | B2: 17 bit singleturn absolute magnetic encoder (serial) |
| 5 | Product Type | P: Pulse type<br>E: ETHERCAT communication type |
| 6 | Product Iteration Sequence Number | 00: Default vacancy |

| | | |
|---|---|---|
| 7 | Management Segment | 000: Default vacancy |

### 1.2.1.2Nameplate description

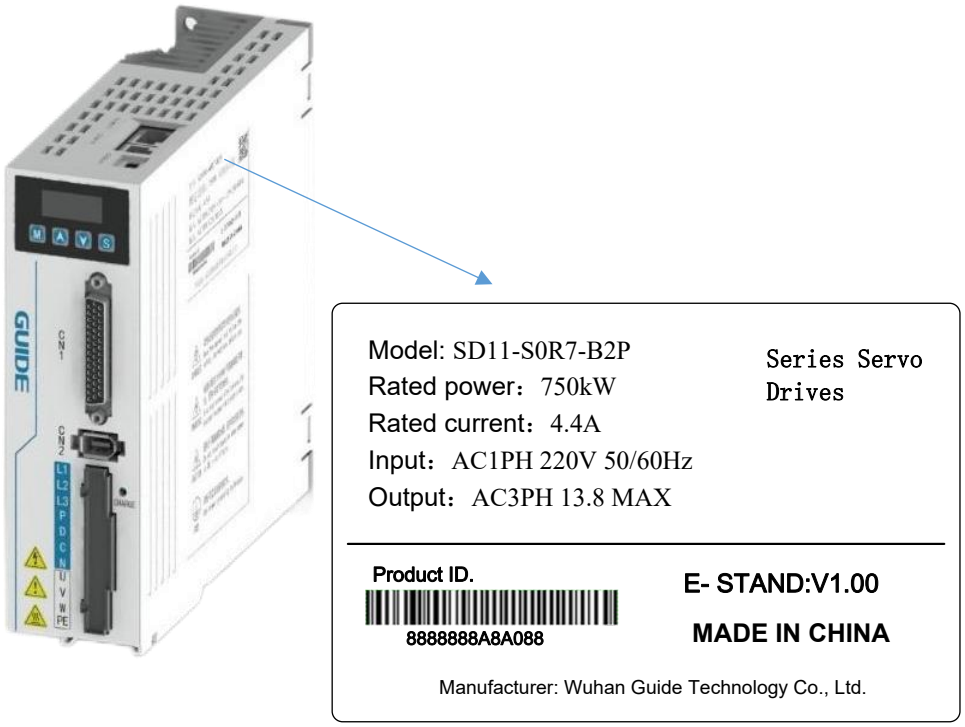



Figure1 Servo Drive Nameplate Description Schematic

### 1.2.2Component Description

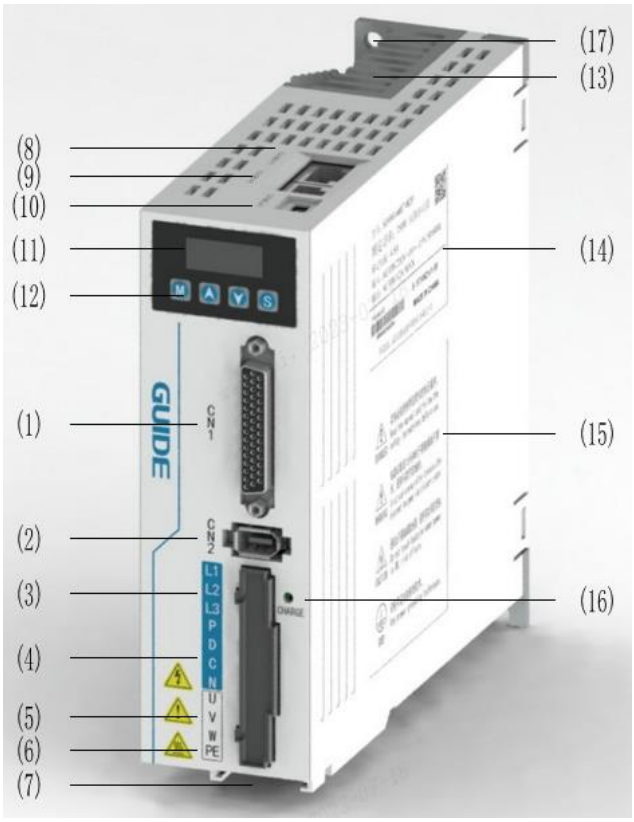



Fig.2 Servo Drive Component Description Schematic Diagram

Table2 Servo Drive Part Description

| Serial number | Grade | Part Name | Instructions |
|---|---|---|---|
| (1) | CN1 | Control terminal | Used for transmission of commands and servo operation status with the host computer. |
| (2) | CN2 | Encoder Terminal | Used to communicate with the motor encoder. |
| (3) | L1, L2, L3 | Main circuit power input terminal | L1 and L2 are connected to a single-phase 220V AC power supply. (L3 reserved) |
| (4) | P, D, C, N | Regenerative Resistor Connection Terminals | If the built-in regenerative resistor is used, short between P and D.<br>When the capacity of the built-in regenerative resistor is insufficient, place an open circuit between P and D (remove the shorting wire) and connect an external regenerative resistor between P and C.<br>DC bus terminals P and N for common bus connection when multiple machines are connected in parallel. |
| (5) | U, V, W | Servo Motor Connection Terminal | Connected to a servo motor. |
| (6) | PE | Servo Ground Terminal | Ground the servo ground terminal by connecting it to the motor ground terminal. |
| (7) | / | Encoder Battery Box Mount | For mounting the encoder battery box. |
| (8) | CN3 | Communication terminal | For RS485 communication with PLC or multiple machines in parallel. |
| (9) | CN4 | Communication terminal | For RS485 communication with PLC or multiple machines in parallel. |
| (10) | CN5 | Commissioning Terminal | For software updates. |
| (11) | / | Digital tube | Used for status display. |
| (12) | / | Keystrokes | For menu switching and parameter setting. |
| (13) | / | Car radiator | For power module heat dissipation. |
| (14) | / | Nameplate | Identifies the main parameters of the servo drive. |
| (15) | / | Warning sign | Servo Drive Safety Precautions. |
| (16) | / | Bus voltage indicator | For busbar voltage indication. |
| (17) | / | Mounting hole | For servo drive mounting. |

## 1.2.3Product Size

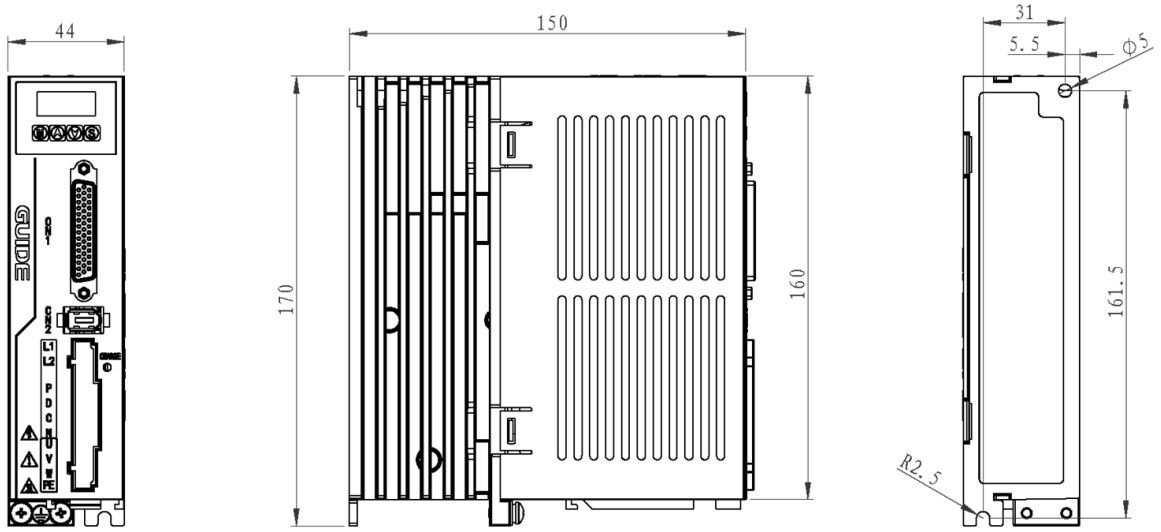



Fig.3 100W～400W servo driver (S1 model) external dimensions

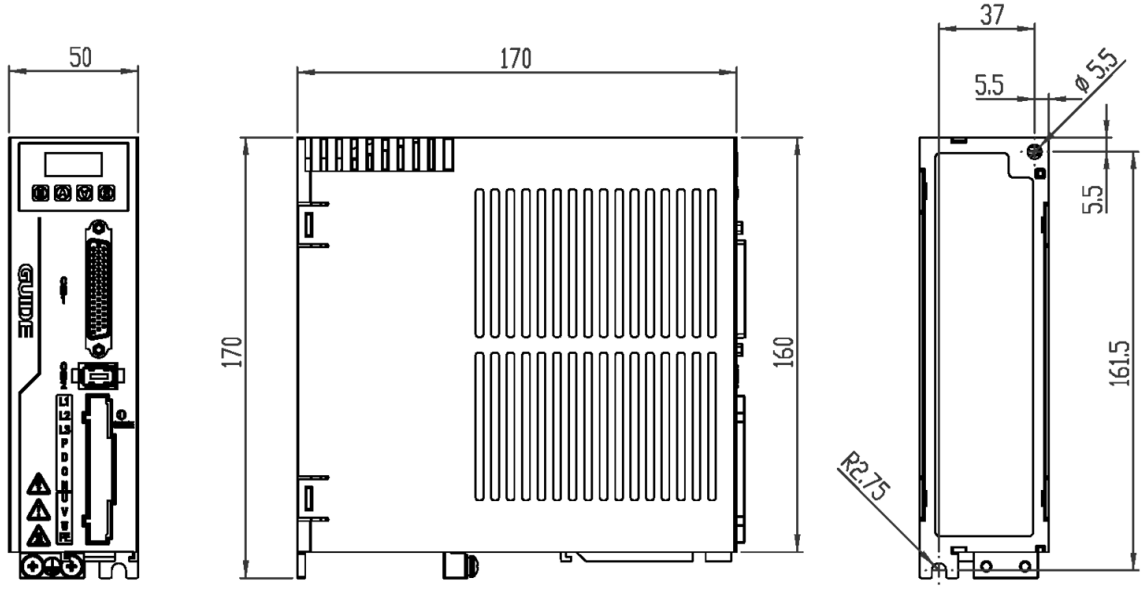
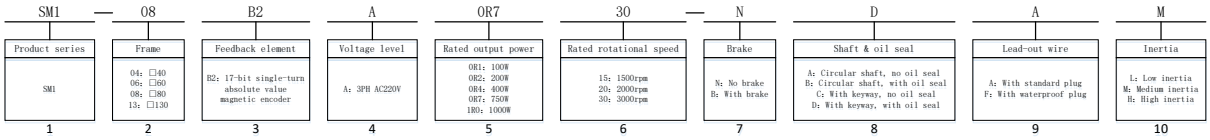



Fig.4 750W～1000W Servo Drive (S2 model) External Dimension Drawing

## 1.3Servo Motor Product Information

### 1.3.1Nameplate and model number

#### 1.3.1.1Model Description




| | | |
|---|---|---|
| 1 | Product Series | SM1: Series servo motor |
| 2 | Seat number | 04: □40 seat<br>06: □60 seat<br>08: □80 seat |
| 3 | Feedback element | B2: 17 bit singleturn absolute magnetic encoder (serial) |
| 4 | Voltage level | A: AC220V |
| 5 | Rated output power | 0R1: 100W<br>0R2: 200W<br>0R4: 400W<br>0R7: 750W<br>1R0: 1000W |
| 6 | Rated speed | 15: 1500rpm<br>20: 2000rpm<br>30: 3000rpm |
| 7 | Holding brake (for locking gear) | N: without holding brake<br>B: with holding brake |
| 8 | Shafts and oil seals | A: Round shaft, no oil seal<br>B: Round shaft with oil seal<br>C: Keyway, no oil seal<br>D: Keyway with oil seal |
| 9 | Exit poll | A: Standard plug<br>F: Waterproof plug |
| 10 | Inertial | L: Low inertia<br>M: Medium Inertia<br>H: High inertia |

### 1.3.1.2Nameplate description

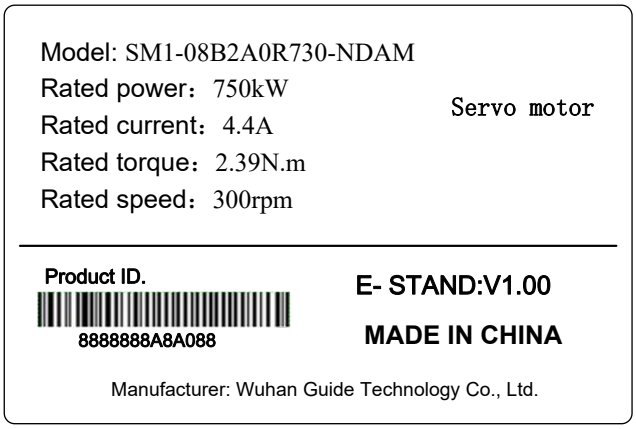



Figure5 Servo Motor Nameplate Description Schematic

### 1.3.2Product Size

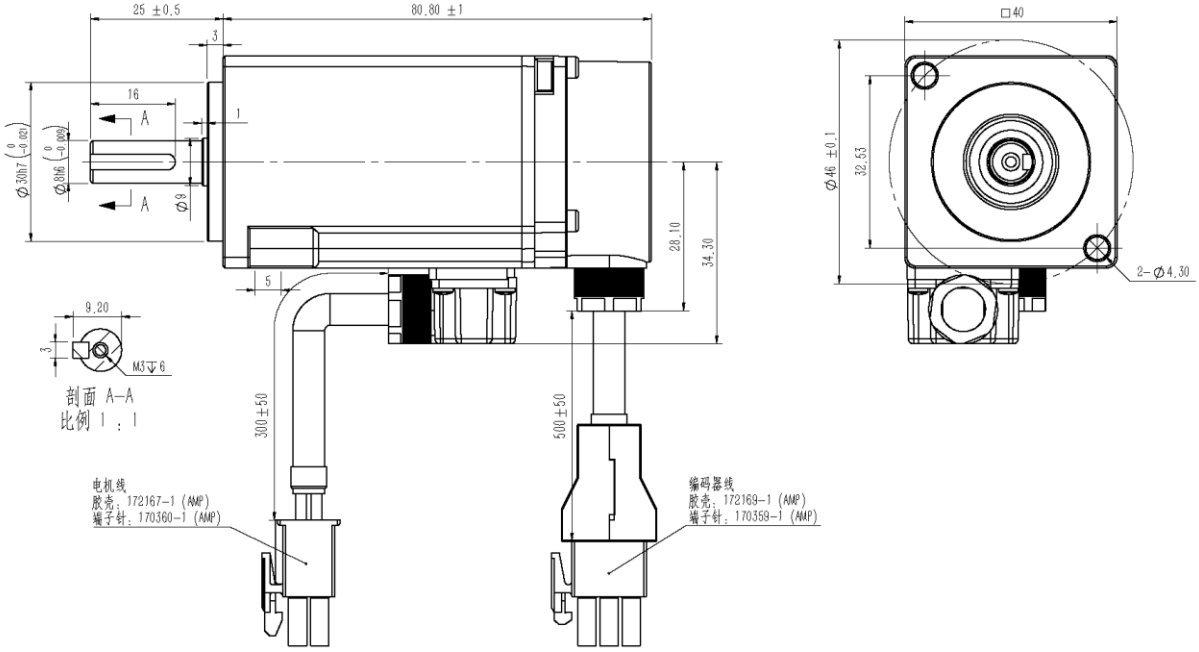



Fig.6 100W servo motor (without holding brake) external dimensions

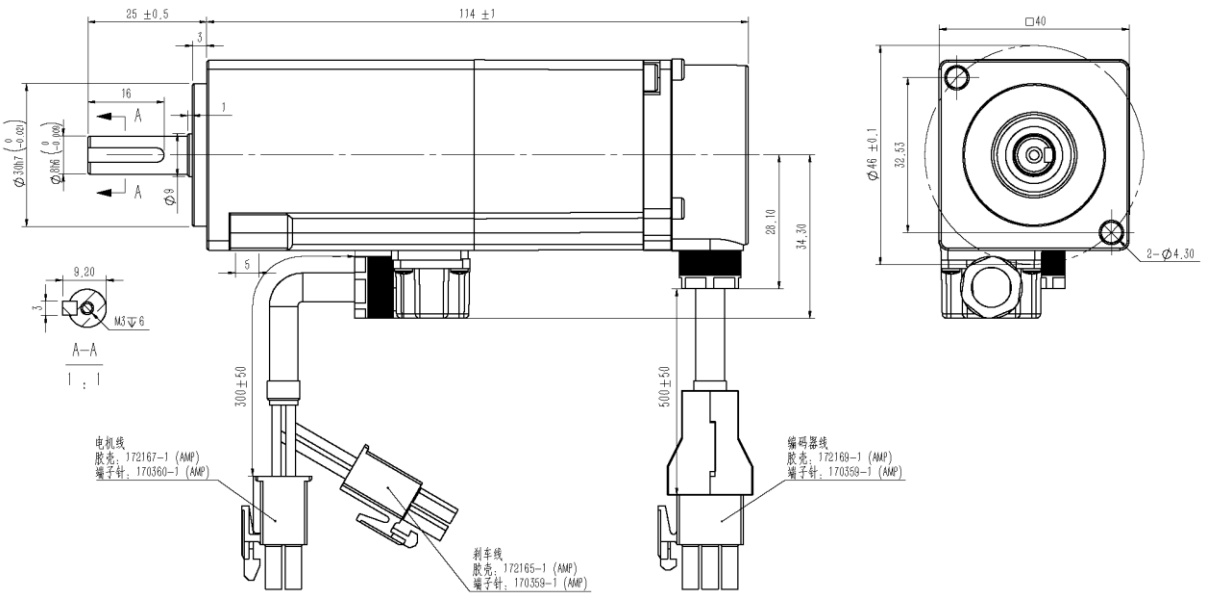



Fig.7 100W servo motor (with holding brake) external dimensions

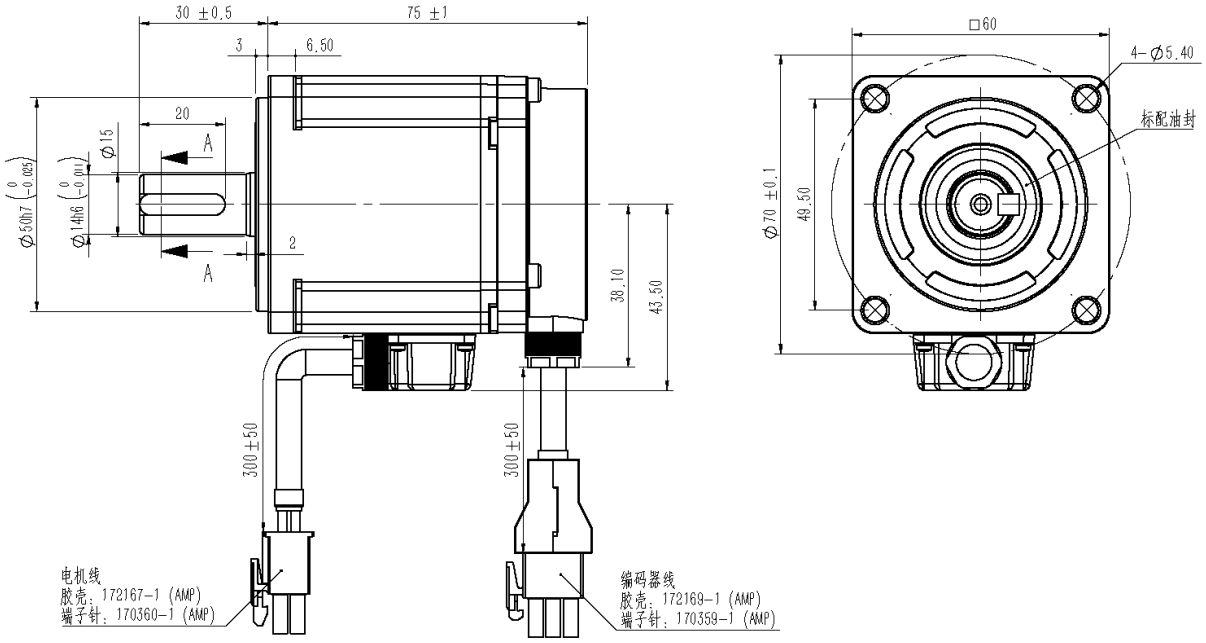



Fig.8 200W servo motor (without holding brake) external dimensions

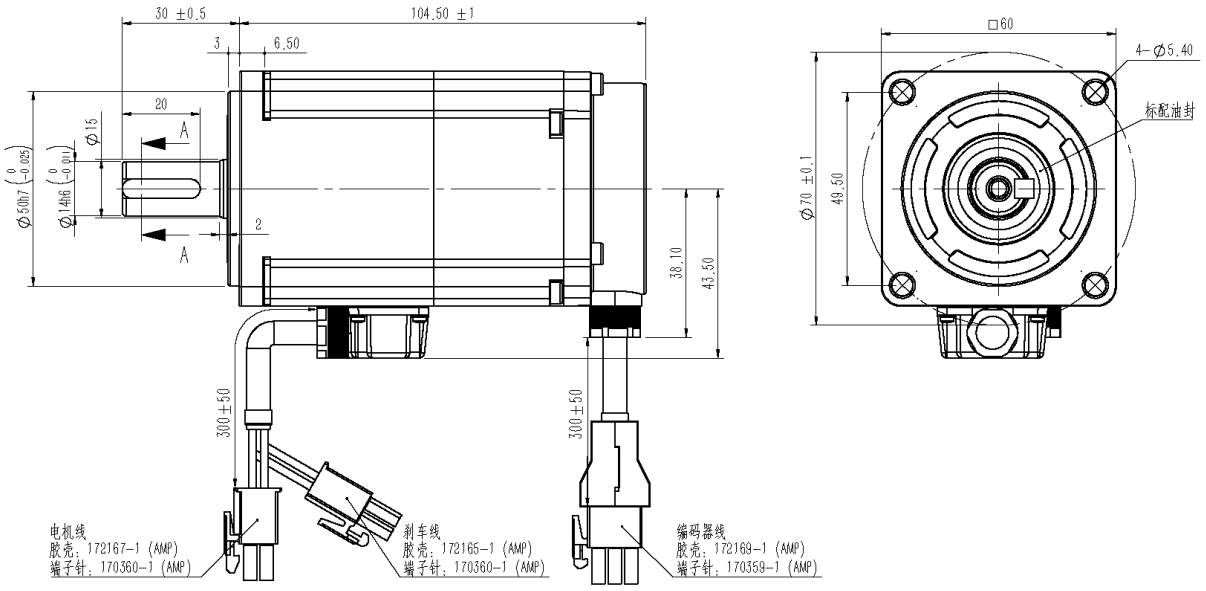



Fig.9 200W servo motor (with holding brake) external dimension drawing

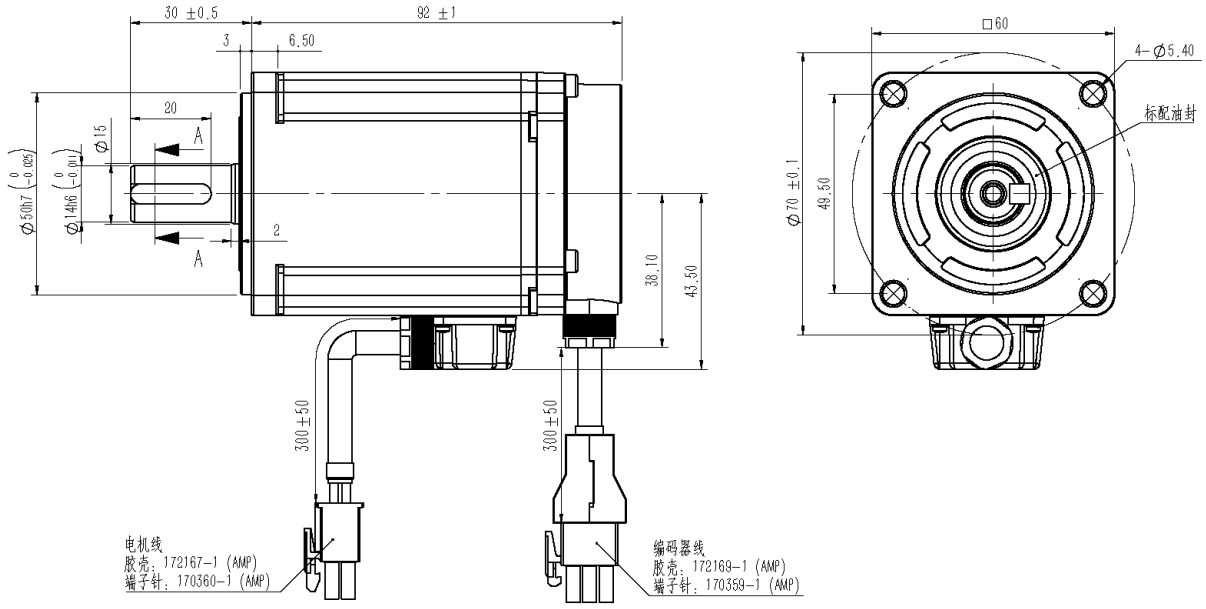



Fig.10 400W servo motor (without holding brake) external dimension drawing

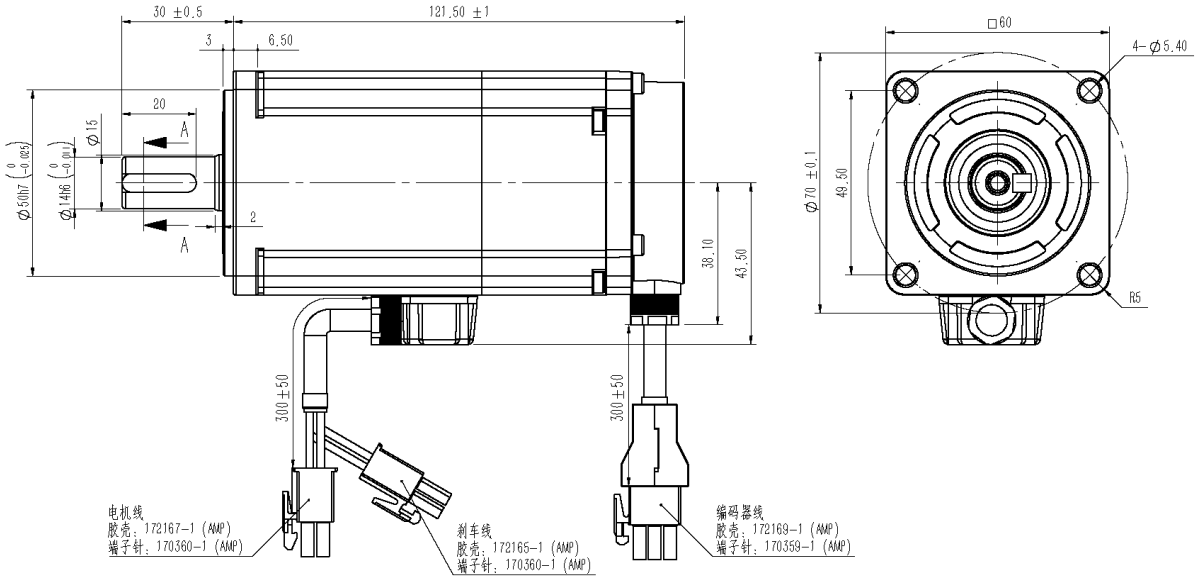



Fig.11 400W servo motor (with holding brake) external dimension drawing

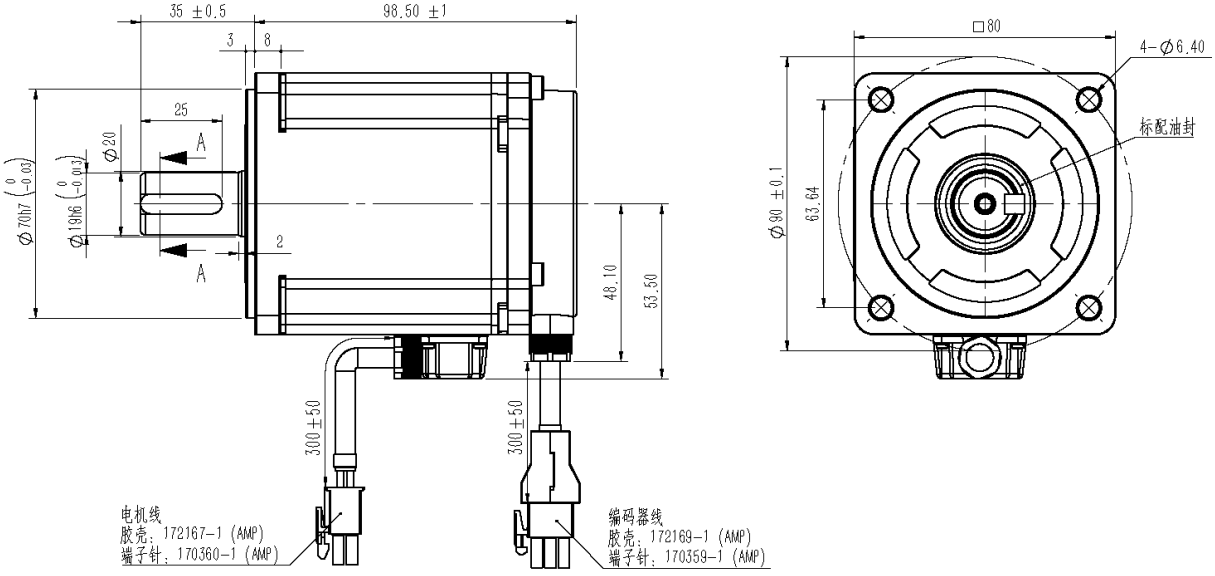



Fig.12 750W servo motor (without holding brake) external dimensions

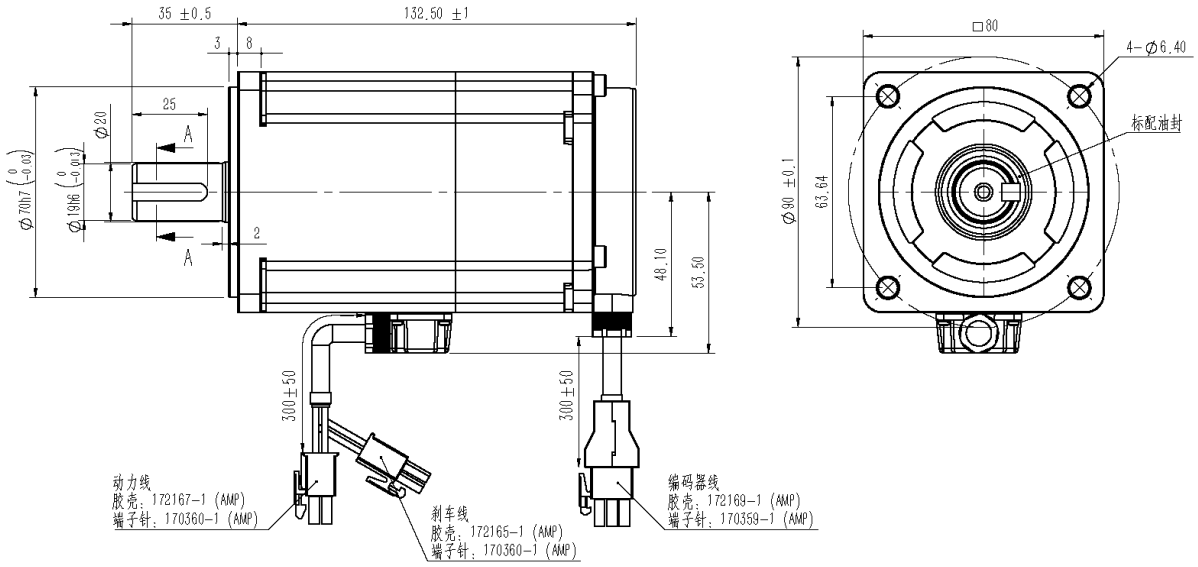



Fig.13 750W servo motor (with holding brake) external dimension drawing

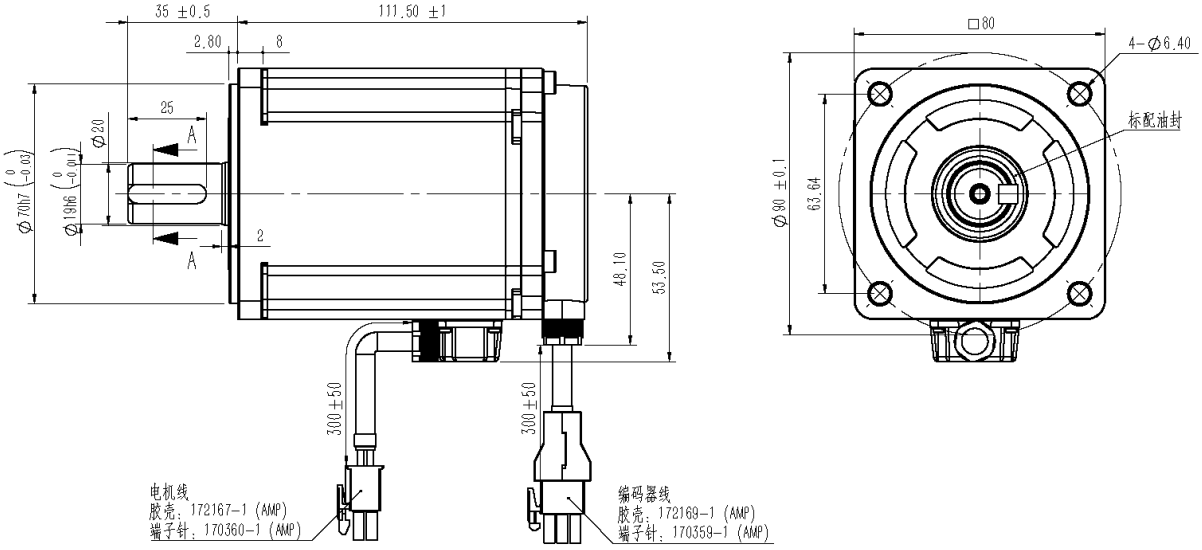



Fig.14 1000W servo motor (without holding brake) external dimension drawing

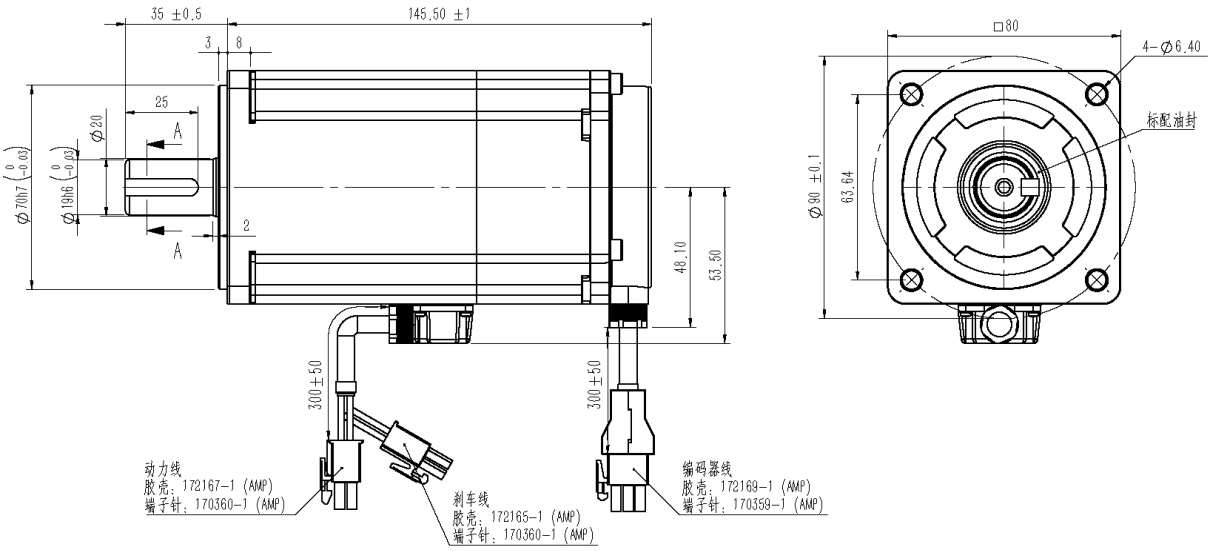



Fig.15 1000W servo motor (with holding brake) external dimension drawing

## 1.3.3Motor Parameter Information

Motor parameters are available atTable3 .

Table3 Motor Parameters

| Model number | Rating (W) | Rated current (A) | Maximum instantaneous current (A) | Rated torque (Nm) | Instantaneous maximum torque (Nm) | Rated speed (rpm) | Peak speed (rpm) |
|---|---|---|---|---|---|---|---|
| 0R130 | 100 | 1.0 | 3.0 | 0.32 | 0.95 | 3000 | 6000 |
| 0R230 | 200 | 1.7 | 5.7 | 0.64 | 1.91 | 3000 | 6000 |
| 0R430 | 400 | 2.5 | 8.4 | 1.27 | 3.81 | 3000 | 6000 |
| 0R730 | 750 | 4.4 | 13.8 | 2.39 | 7.17 | 3000 | 6000 |
| 1R030 | 1000 | 5.8 | 18.1 | 3.18 | 9.54 | 3000 | 6000 |

Table4 Data table of energy produced by a motor from no-load rated speed to standstill

| Capacity (W) | Servo motor model | Rotor inertia J ($10^{-4}$kgm$^2$) | No-load rated speed to standstill Braking energy generated E0(J) |
|---|---|---|---|
| 100 | SM1-04B2A0R130-NDAM | 0.066 | 0.33 |
| | SM1-04B2A0R130-BDAM | 0.07 | 0.35 |
| 200 | SM1-06B2A0R230-NDAM | 0.28 | 1.38 |
| | SM1-06B2A0R230-BDAM | 0.38 | 1.88 |
| 400 | SM1-06B2A0R430-NDAM | 0.52 | 2.57 |
| | SM1-06B2A0R430-BDAM | 0.62 | 3.06 |
| 750 | SM1-08B2A0R730-NDAM | 1.48 | 7.30 |

| | | | |
|---|---|---|---|
| | SM1-08B2A0R730-BDAM | 1.78 | 8.78 |
| 1000 | SM1-08B2A1R030-NDAM | 2.27 | 11.20 |
| | SM1-08B2A1R030-BDAM | 2.72 | 13.42 |

## 1.4Servo Drive Specifications

Table5 Servo Drive Specifications

| Form | Sports event | | Parameters | | | | |
|---|---|---|---|---|---|---|---|
| Electrical Specifications | Drive power (kW) | | 0.1 | 0.2 | 0.4 | 0.75 | 1.0 |
| | Continuous Output Current (Arms) | | 1.0 | 1.7 | 2.5 | 4.4 | 5.8 |
| | Maximum Output Current (Arms) | | 3.0 | 5.7 | 8.4 | 13.8 | 18.1 |
| | Main circuit power supply | | Single-phase 220VAC, +10% to -15%, 50/60Hz | | | | |
| | Braking Resistor Configuration | Built-in Resistance Value (Ω) | 40 | | | | |
| | | Built-in resistor power (W) | 50 | | | | |
| | | Built-in Handleable Power(W) | 25 | | | | |
| | | Minimum external resistance value (Ω) | 40 | | | | |
| | | Braking Resistor Function | Supports built-in braking resistor and external braking resistor | | | | |
| | Maximum energy that can be absorbed by the capacitor (J) | | 6.73 | 6.73 | 13.46 | 19.18 | 22.85 |
| | Cooling method | | air cooling | | | | |
| Overall dimensions | Height (mm) | | 170 (including mounting lugs) | | | 170 (including mounting lugs) | |
| | Depth (mm) | | 150 | | | 170 | |
| | Width (mm) | | 44 | | | 50 | |
| Basic specification | control method | | SVPWM control | | | | |
| | Encoder Feedback | | Serial communication encoder: 17bits absolute magnetic encoder | | | | |

| Form | Sports event | | Parameters |
|---|---|---|---|
| | Operating temperature | | 0° C to +45° C (Do not exceed 80% of the average load ratio when the ambient temperature is 45° C to 55° C). |
| | Storage temperature | | -25℃～+70℃ |
| | Use of humidity | | 95%RH or less (no condensation) |
| | Vibration strength | | 5m/s$^2$ |
| | impact strength | | 15m/s$^2$ |
| | protection class | | IP20 |
| | altitude | | Maximum altitude up to 2,000 m. (No derating required for use at 1,000 m and below; 1% derating for every 100 m above 1,000 m) |
| Position Control Mode | Pulse command input pulse pattern | | Select any of the following: Symbol + Pulse Sequence, CW + CCW Pulse Sequence, 90° Phase Difference 2-Phase Pulse (Phase A + Phase B) |
| | Pulse command input form | | Differential Input; Open Collector |
| | Pulse command input pulse frequency | | Differential input: 500kpps max<br>Open collector: 200kpps max. |
| | positional output pattern | | Phase A, B: Differential output<br>Phase Z: Differential or open collector outputs |
| | crossover ratio | | The number of pulses output per 1 revolution of the motor can be set. |
| Speed Torque control mode | Rate of change in velocity | Load variability | 0 to 100% load: 0.5% or less (at rated speed) |
| | | Rate of change of voltage | Rated voltage ±10%: 0.5% (at rated speed) |
| | | Temperature change rate | 25±25° C: 0.5% or less (at rated speed) |
| | Speed control range | | 1:5000 |
| | Torque control accuracy | | ±3% |
| | Soft start time setting | | 0～10s (Acceleration and deceleration can be set separately) |
| input and output | Digital Input Signal | | 8 digital inputs DI.<br>Operating voltage range: 24VDC±20%. |
| | Digital Output Signal | | 6 digital outputs DO.<br>DO with load capacity 50mA, voltage range 5V to 30V. |
| | Analog Input Signal | | 1 analog input AI, configured as speed or torque signal. |

| Form | Sports event | | Parameters |
|---|---|---|---|
| | | | Voltage input range: -10V to +10V; maximum allowable ±12V. |
| built-in functionality | Electronic Gear Ratios | | Settable. |
| | protective function | | Overspeed/main power overvoltage undervoltage/overcurrent/overload/encoder abnormality/control power abnormality/position overrun. |
| | display function | | Mains CHARGE, 5-digit LED display, 4 operating buttons. |
| | newsletter | connected device | Supports RS485. |
| | | monitoring function | Rotation speed/current position/command pulse accumulation/position deviation/motor torque/motor current/running status, etc. |

## 1.5Optional accessories

### 1.5.1Options List

| Component Type | Component name | Mounting position | Compatible Models | Functional Description |
|---|---|---|---|---|
| Peripheral electrical components | Fuses and Circuit Breakers | Drive Input Side | All models | In order to comply with the requirements of EN 61800-5-1 and UL 61800-5-1, be sure to connect a fuse/circuit breaker on the input side to prevent accidents caused by short circuits in the internal circuit. |
| | AC Input Reactor | Drive Input Side | | Effectively eliminates the high harmonics on the input side and improves the power factor on the input side. |
| | EMC Filters | Drive Input Side | | Reduces conducted and radiated interference to the outside of the drive. |
| | Magnetic rings, magnetic clasps | Drive Output Side | | Reduces external interference and reduces bearing current. |
| | | Signal Cable | | Improve signal anti-interference performance. |

### 1.5.2Mating Cable

#### 1.5.2.1Cable Type

### 1.5.2.1.1Fixed cable

Ordinary fixed wire use requirements can not have bending, movement phenomenon, otherwise it is easy to lead to cable breakage, poor contact and a series of cable-related failures. It should be fixed in a fixed way, and the cable should have a certain bending radius, there can be no stress.

### 1.5.2.1.2Drag chain cable

Drag chain cable is a kind of highly flexible special cable that can follow the drag chain to move back and forth without easy abrasion, usually also known as drag cable, tank chain cable.

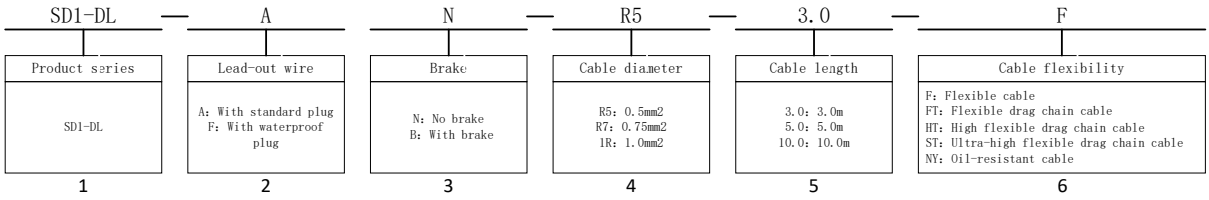
| | |
|---|---|
| CAUTION | ➢ Cables in the drag chain must not be tangled or twisted.<br>➢ Make sure that the cable moves completely within the bending radius and is not forced. The cables may move relative to each other or to the guides.<br>➢ Do not fix or bundle the wiring inside the cable protection chain, but bundle it only at the two immovable ends of the cable protection chain. |

### 1.5.2.1.3Oil Resistant Cable

Oil-resistant cables are suitable for machine tools, cutting fluids, cutting oils and other scenarios that require power line shielding.

### 1.5.2.2Cable Model Description

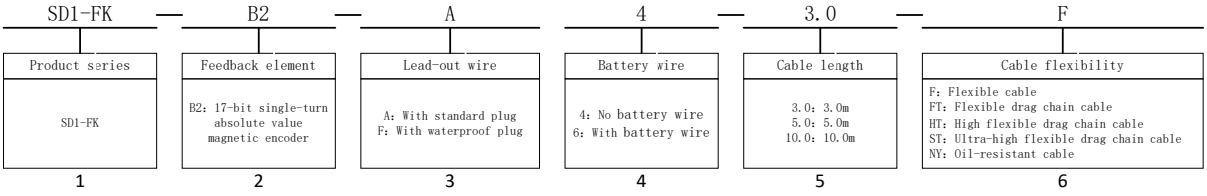
### 1.5.2.2.1power cable




| | | |
|---|---|---|
| 1 | Product Series | SD1-DL: SD1 Series Servo Power Cable |
| 2 | exit poll | A: Standard plug F: Waterproof plug |
| 3 | holding brake (for locking gear) | B: with holding wire N: without holding wire |
| 4 | Cable Specifications | R5: 0.5 flat wire R7: 0.75 flat wire |
| 5 | Cable length | 3.0: 3.0 m 5.0: 5.0 m 10.0: 10.0 m |

| | | |
|---|---|---|
| 6 | Cable Characteristics | F: Flexible cable (fixed cable) FT: Flexible drag chain cable HT: Highly flexible drag chain cable ST: Ultra High Flex Drag Chain Cable NY: Oil Resistant Cable |

### 1.5.2.2.2Feedback Cable




| | | |
|---|---|---|
| 1 | Product Series | SD1-FK: SD1 series servo feedback cable |
| 2 | Feedback element | B2: 17 bit singleturn absolute magnetic encoder (serial) |
| 3 | Exit poll | A: Standard plug F: Waterproof plug |
| 4 | Number of cable cores | 4: without battery cable 6: with battery cable |
| 5 | Cable length | 3.0: 3.0 m 5.0: 5.0 m 10.0: 10.0 m |
| 6 | Cable Characteristics | F: Flexible cable (fixed cable) FT: Flexible drag chain cable HT: Highly flexible drag chain cable ST: Ultra High Flex Drag Chain Cable NY: Oil Resistant Cable |

### 1.5.2.3Cable List

Table6 Cable Packages

| Motor Model | Cable Category | Power cable, L=3.0m | Feedback cable, L=3.0m |
|---|---|---|---|
| SM1-04B2A0R130-NDAM | Flexible Cable (Fixed Cable) | SD1-DL-AN-R5-3.0-F | SD1-FK-B2-A4-3.0-F |
| | Flexible Drag Chain Cable | SD1-DL-AN-R5-3.0-FT | SD1-FK-B2-A4-3.0-FT |
| | Highly Flexible Drag Chain Cable | SD1-DL-AN-R5-3.0-HT | SD1-FK-B2-A4-3.0-HT |
| SM1-04B2A0R130-BDAM | Flexible Cable (Fixed Cable) | SD1-DL-AB-R5-3.0-F | SD1-FK-B2-A4-3.0-F |
| | Flexible Drag Chain Cable | SD1-DL-AB-R5-3.0-FT | SD1-FK-B2-A4-3.0-FT |
| | Highly Flexible Drag Chain Cable | SD1-DL-AB-R5-3.0-HT | SD1-FK-B2-A4-3.0-HT |
| SM1-06B2A0R230-NDAM | Flexible Cable (Fixed Cable) | SD1-DL-AN-R5-3.0-F | SD1-FK-B2-A4-3.0-F |
| | Flexible Drag Chain Cable | SD1-DL-AN-R5-3.0-FT | SD1-FK-B2-A4-3.0-FT |
| | Highly Flexible Drag Chain Cable | SD1-DL-AN-R5-3.0-HT | SD1-FK-B2-A4-3.0-HT |

| Motor Model | Cable Category | Power cable, L=3.0m | Feedback cable, L=3.0m |
|---|---|---|---|
| SM1-06B2A0R230-BDAM | Flexible Cable (Fixed Cable) | SD1-DL-AB-R5-3.0-F | SD1-FK-B2-A4-3.0-F |
| | Flexible Drag Chain Cable | SD1-DL-AB-R5-3.0-FT | SD1-FK-B2-A4-3.0-FT |
| | Highly Flexible Drag Chain Cable | SD1-DL-AB-R5-3.0-HT | SD1-FK-B2-A4-3.0-HT |
| SM1-06B2A0R430-NDAM | Flexible Cable (Fixed Cable) | SD1-DL-AN-R5-3.0-F | SD1-FK-B2-A4-3.0-F |
| | Flexible Drag Chain Cable | SD1-DL-AN-R5-3.0-FT | SD1-FK-B2-A4-3.0-FT |
| | Highly Flexible Drag Chain Cable | SD1-DL-AN-R5-3.0-HT | SD1-FK-B2-A4-3.0-HT |
| SM1-06B2A0R430-BDAM | Flexible Cable (Fixed Cable) | SD1-DL-AB-R5-3.0-F | SD1-FK-B2-A4-3.0-F |
| | Flexible Drag Chain Cable | SD1-DL-AB-R5-3.0-FT | SD1-FK-B2-A4-3.0-FT |
| | Highly Flexible Drag Chain Cable | SD1-DL-AB-R5-3.0-HT | SD1-FK-B2-A4-3.0-HT |
| SM1-08B2A0R730-NDAM | Flexible Cable (Fixed Cable) | SD1-DL-AN-R7-3.0-F | SD1-FK-B2-A4-3.0-F |
| | Flexible Drag Chain Cable | SD1-DL-AN-R7-3.0-FT | SD1-FK-B2-A4-3.0-FT |
| | Highly Flexible Drag Chain Cable | SD1-DL-AN-R7-3.0-HT | SD1-FK-B2-A4-3.0-HT |
| SM1-08B2A0R730-BDAM | Flexible Cable (Fixed Cable) | SD1-DL-AB-R7-3.0-F | SD1-FK-B2-A4-3.0-F |
| | Flexible Drag Chain Cable | SD1-DL-AB-R7-3.0-FT | SD1-FK-B2-A4-3.0-FT |
| | Highly Flexible Drag Chain Cable | SD1-DL-AB-R7-3.0-HT | SD1-FK-B2-A4-3.0-HT |
| SM1-08B2A1R030-NDAM | Flexible Cable (Fixed Cable) | SD1-DL-AN-R7-3.0-F | SD1-FK-B2-A4-3.0-F |
| | Flexible Drag Chain Cable | SD1-DL-AN-R7-3.0-FT | SD1-FK-B2-A4-3.0-FT |
| | Highly Flexible Drag Chain Cable | SD1-DL-AN-R7-3.0-HT | SD1-FK-B2-A4-3.0-HT |
| SM1-08B2A1R030-BDAM | Flexible Cable (Fixed Cable) | SD1-DL-AB-R7-3.0-F | SD1-FK-B2-A4-3.0-F |
| | Flexible Drag Chain Cable | SD1-DL-AB-R7-3.0-FT | SD1-FK-B2-A4-3.0-FT |
| | Highly Flexible Drag Chain Cable | SD1-DL-AB-R7-3.0-HT | SD1-FK-B2-A4-3.0-HT |

# 2.Product inspection and installation

## 2.1Product Inspection

This product has been tested for complete functionality before leaving the factory. In order to prevent the product from being shipped out of order due to negligence, please check the following items in detail after unpacking:

1) Check that the servo drive and servo motor models are the same as the models you ordered.
2) Check whether the servo drive and servo motor have been damaged or scratched during transportation. Do not connect the wires to the power supply if they are damaged during transportation.
3) Check the servo driver and servo motor for loose components. Check if there are loose screws, or if the screws are not locked or have fallen off.
4) Check that the servo motor rotor shaft can be rotated smoothly by hand. Motors with holding brake cannot be rotated directly.
5) Check that the servo operating instructions are included.
6) Check that the drive accessories are included in the box.

## 2.2Product Installation

### 2.2.1Servo Drive Installation Method

1) The normal mounting direction of the servo drive is the vertical upright direction.
2) When mounting, tighten the 2 fixing screws on the rear of the servo drive.
3) Be sure to ground the drive ground terminal, otherwise there may be a risk of electric shock or interference generating false action.
4) When wiring the drive, route the cables downward to avoid flowing into the drive along the cables if there is liquid attached to the cables in the field.

5) To ensure the performance and longevity of the drives, leave as much space as possible between the drives and between them and other equipment.
6) The servo drives are cooled either naturally or by forced cooling.
7) When installing the electrical control cabinet, prevent dust or iron filings from getting inside the Servo Drive.

### 2.2.2Installation environment conditions

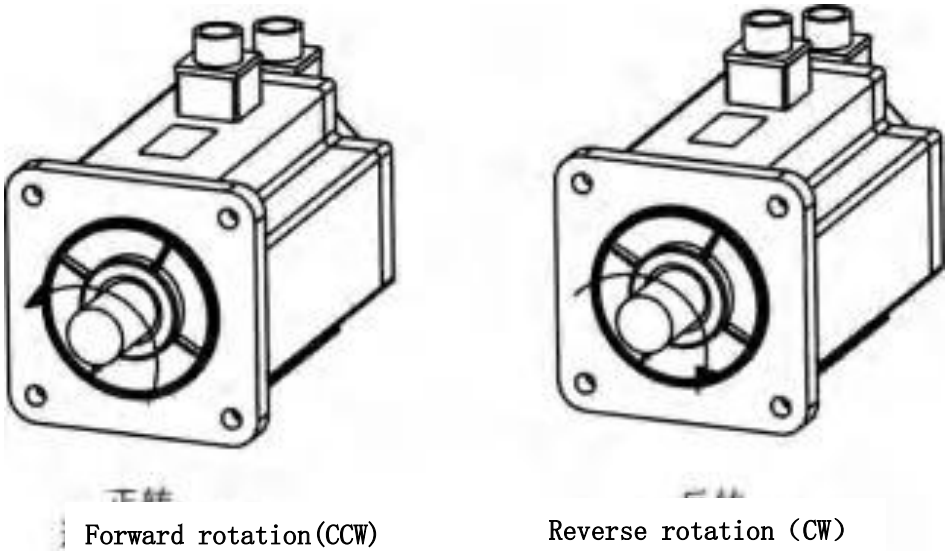
1) Operating ambient temperature:0～45℃; Operating ambient humidity:below 95% (no condensation).
2) Storage ambient temperature: -25～70℃; Storage ambient humidity: 10～100%.
3) Vibration: 0.5G or less.
4) A well-ventilated place with little moisture and dust.
5) No corrosive, ignition gas, oil and gas, cutting fluid, cutting powder, iron powder and other environments.
6) A place free from water vapor and direct sunlight.

### 2.2.3Servo motor mounting method

1) Horizontal installation: To avoid water, oil and other liquids from flowing into the motor from the motor outlet end, place the cable outlet below.
2) Vertical mounting: If the motor is mounted with the motor shaft facing upward and a gearhead is attached, be careful to prevent oil from the gearhead from seeping into the motor via the motor shaft.
3) The extension of the motor shaft must be sufficient, if the extension is insufficient, it will be easy to cause vibration when the motor moves.
4) When mounting and dismounting the motor, do not hit the motor with a hammer, otherwise the motor shaft and encoder will be easily damaged.

### 2.2.4Definition of motor rotation direction

This manual describes the definition of the direction of rotation of the motor: facing the motor shaft, the rotation axis rotates counterclockwise (CCW) for positive rotation, and the rotation axis rotates clockwise (CW) for reverse rotation.



Forward rotation(CCW)　　Reverse rotation (CW)

Figure16　Motor rotation direction definition

# 3.system connection

## 3.1System Components

### 3.1.1System wiring diagram

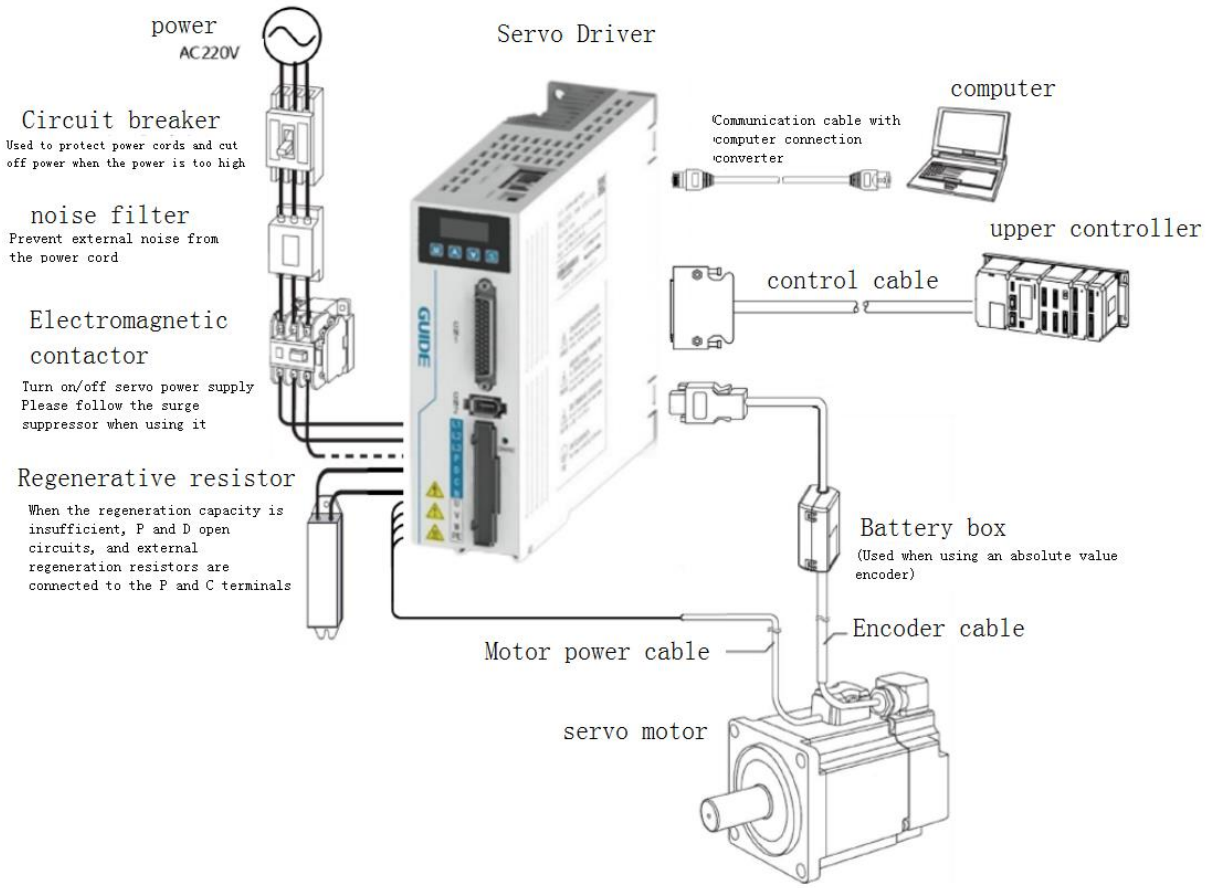



Figure17 Servo System Wiring Diagram

### 3.1.2Wiring Instructions

Wiring Notes:

1) Cable length, command cable within 3m, encoder length within 15m.
2) Check if the power supply and wiring of L1 and L2 are correct, if only single phase 220VAC drive is supported please do not connect to 380VAC power supply.
3) Motor output U, V, W terminal phase sequence, must and drive the corresponding terminal one-to-one correspondence, connect the wrong motor may not turn or fly. Can not be used to switch the three-phase

terminals to make the motor reverse, which is different from the asynchronous motor.

4) Since the servo motor flows high-frequency switching current, the leakage current is relatively large, and the motor ground terminal must be connected together with the servo drive ground terminal PE and well grounded.
5) Relays mounted to output signals with diodes for absorption should be connected in the correct direction, otherwise they will cause malfunctions and fail to output signals.
6) To prevent incorrect operation caused by noise, install an insulating transformer and noise filter on the power supply.
7) Wiring should be done with power lines (motor lines, power lines, etc.) and signal lines more than 30cm apart, and should not be placed in the same wiring duct.
8) Install a non-fused circuit breaker to disconnect the external power supply in case of drive failure.
9) Because the servo driver has a large-capacity electrolytic capacitor inside, there is still a high voltage in the internal circuit even after the power is cut off. Wait at least 15 minutes after disconnecting the power supply before touching the driver and motor.

## 3.2Servo Drive Terminal Description

### 3.2.1Terminal Classification

Servo drive terminals are mainly included:

1) Main circuit terminals
2) CN1 control terminal
3) CN2 Encoder Terminal
4) CN3 & CN4 Communication Terminals
5) CN5 Commissioning Terminal

### 3.2.2Main circuit terminals

#### 3.2.2.1Terminal Function Description

The main circuit terminals are 11PIN plug-in connectors, seeTable7 for terminal function descriptions.

Table7 Functional description of main circuit terminals

| terminal identification | Terminal Name | Terminal Function Description |
|---|---|---|
| L1, L2 | Main circuit power input terminal | L1 and L2 are connected to a single-phase 220V AC power supply. |
| P, D, C, N | Regenerative Resistor Connection Terminals | If the built-in regenerative resistor is used, short between P and D.<br>When the capacity of the built-in regenerative resistor is insufficient, place an open circuit between P and D (remove the shorting wire) and connect an external regenerative resistor between P and C.<br>The DC bus terminals are P and N, allowing common bus connections when multiple machines are connected in parallel. |
| U, V, W | Servo Motor Connection Terminal | Connected to a servo motor. |
| PE | Servo Ground Terminal | Ground the servo ground terminal by connecting it to the motor ground terminal. |

### 3.2.2.2Terminal Wiring

#### 3.2.2.2.1Wiring Precautions


- The input power cable must not be connected to the output terminals U, V, and W, otherwise it causes damage to the servo driver.
- If the cable is bundled and used in piping, etc., the allowable current reduction rate should be taken into consideration because of the deterioration of heat dissipation conditions.
- When the temperature inside the cabinet is higher than the cable temperature limit, please choose the cable with larger temperature limit, and recommend the cable to use Teflon wire; please pay attention to the cable warming measures in the surrounding low temperature environment, the general cable surface is easy to harden and rupture in the low temperature environment.
- Make sure the bending radius of the cable is more than 10 times the outer diameter of the cable itself to prevent the core of the cable from breaking due to

| | |
|---|---|
| | long-term bending.<br>➢ Do not pass power and signal cables through the same pipe or bundle them together; to avoid interference, they should be separated by more than 30cm.<br>➢ High voltage may remain in the Servo Drive even if the power is turned off. Do not touch the power terminals for 15 minutes.<br>➢ Do not ON/OFF the power supply frequently, if the power supply is ON/OFF repeatedly and continuously within 1 second, it may cause the drive to report the following faults E.24/E.25 (for details of the faults, please refer to the section0 ), if the faults are reported, please re-power up the drive according to the required ON/OFF power supply intervals. If you need to turn on/off the power continuously, please limit it to less than 1 time per minute.<br>➢ Since there is a capacitor in the power supply section of the Servo Drive, a large charging current flows when the power supply is turned ON (charging time is about 0.2 seconds). Frequent ON/OFF of the power supply results in degradation of the performance of the main circuit components inside the Servo Drive.<br>➢ Use a ground wire with the same cross-sectional area as that of the main circuit wires. If the cross-sectional area of the main circuit wires is 1.6 $mm^2$or less, use a 2.0 $mm^2$ground wire.<br>➢ Do not apply power with loose terminal block screws or loose cable wires, as it may cause fire. |

### 3.2.2.2.2Main circuit wiring requirements

| | |
|---|---|
| CAUTION | ➢ The terminals (P, D, C, N) are for connecting options. Do not connect these terminals to an AC power source.<br>➢ To protect the main circuits, separate them from surfaces that may come into contact with them and cover them.<br>➢ Be careful not to allow foreign objects to enter the wiring section of the terminal block.<br>➢ Do not solder when using stranded core wires.<br>➢ The tightening torque may vary for each terminal, so tighten the screws according to the specified tightening torque. A torque driver, torque ratchet, or torque wrench may be used.<br>➢ If a power tool is used to tighten the terminal screws, use the low speed setting or the terminal screws may |

| | |
|---|---|
| | be damaged.<br>➢ Do not tighten the terminal screws at an angle of more than 5 degrees or the terminal screws may be damaged. |

Drive power input lines, motor cables will produce strong electromagnetic interference, in order to avoid strong interference cables and control circuits, long-distance parallel line coupling electromagnetic interference. When wiring the main circuit cables and signal cables should be more than 30cm apart. common main circuit cables are input RST line, output UVW line, DC bus and brake cables, signal cables are IO signal lines, communication lines and encoder lines.

Cable raceways must be well connected to each other and well grounded. Aluminum wireways ensure equipotentiality of the equipment. Filters, drives, and motors should all be well lapped to the system (mechanical or device), well protected by spraying on the part where they are mounted, with conductive metals in full contact.

### 3.2.2.2.3Cable Specifications

| servo drive | | | L1, L2 | | P, D, C, N | | U, V, W, PE | | Ground terminal | |
|---|---|---|---|---|---|---|---|---|---|---|
| Models | Model number | Rated input current (A) | ($mm^2$) | AWG | ($mm^2$) | AWG | ($mm^2$) | AWG | ($mm^2$) | AWG |
| S1 | S0R1 | 1.5 | 2 x 0.75 | 18 | 2 x 0.75 | 18 | 4 x 0.5 | 20 | 2.0 | 14 |
| | S0R2 | 2.5 | 2 x 0.75 | 18 | 2 x 0.75 | 18 | 4 x 0.5 | 20 | 2.0 | 14 |
| | S0R4 | 3.6 | 2 x 0.75 | 18 | 2 x 0.75 | 18 | 4 x 0.5 | 20 | 2.0 | 14 |
| S2 | S0R7 | 6.5 | 2 x 1.0 | 17 | 2 x 1.0 | 17 | 4 x 0.75 | 18 | 2.0 | 14 |
| | S1R0 | 8.5 | 2×1.5 | 15 | 2×1.5 | 15 | 4 x 0.75 | 18 | 2.0 | 14 |

### 3.2.2.2.4External EMC Filter Wiring

The filter should be installed close to the input terminals of the drive, and the length of the connecting cable between the filter and the

drive should be less than 30 cm. the ground terminal of the filter and the ground terminal of the drive should be connected together, and make sure that the filter and the drive are installed on the same conductive mounting plane, which is connected to the main ground of the control cabinet.

### 3.2.2.2.5grounding

| | |
|---|---|
|   | ➢ To prevent electric shock, be sure to ground the grounding terminal. For the grounding method, follow the electrical regulations of your country or region.<br>➢ To prevent electric shock, make sure that the protective grounding conductor complies with technical specifications and local safety standards, and keep the grounding wire length as short as possible.<br>➢ Please use the size specified in the technical standards for electrical equipment for the grounding wire and keep the length of the grounding wire as short as possible. Otherwise, the leakage current generated by this product may cause unstable potential at the grounding terminal far from the grounding point, resulting in electric shock. |

Be sure to observe the following precautions in order to ground the product properly.

| | |
|---|---|
|   | ➢ The protective grounding conductor must be a yellow-green copper conductor cable and must not be connected in series with switchgear such as circuit breakers.<br>➢ The grounding terminal must be reliably grounded, otherwise the equipment may work abnormally or even be damaged.<br>➢ Do not share the ground terminal with the power supply zero N terminal.<br>➢ It is recommended to mount on a conductive metal surface to ensure that the entire conductive bottom of the unit is well lapped to the mounting surface.<br>➢ The grounding screw must be fixed in accordance with the recommended torque to avoid loosening or over-tightening of the protective grounding conductor.<br>➢ To use multiple servo drives, follow the instructions for grounding all servo drives. Incorrect grounding of the device can cause the servo drives and the device to malfunction.<br>➢ Do not share grounding wires with other equipment, such as welding machines or high-current electrical |

| | |
|---|---|
| | equipment. Incorrect equipment grounding can cause the servo drive or equipment to malfunction due to electrical interference. |

### 3.2.3CN1 control terminal

#### 3.2.3.1Terminal Function Description

The CN1 control terminal uses a 44PIN D-Sub type connector female chassis, seeTable8 for terminal function description.

Table8 Functional description of control terminals

| Form | Serial number | Terminal identification | Terminal Name | Terminal Function Description |
|---|---|---|---|---|
| 24V Power Supply | 44 | +24V | Driver power supply 24V output | Internal 24V power supply, voltage range +20 to 28V, maximum output current 100mA. |
| | 43 | COM- | Driver power supply GND | |
| Digital quantity importation | 16 | COM+ | DI input terminal common | 8 Digital inputs. Functions are configurable. |
| | 20 | DI1 | Digital Signal Input 1 | |
| | 4 | DI2 | Digital Signal Input 2 | |
| | 19 | DI3 | Digital Signal Input 3 | |
| | 3 | DI4 | Digital Signal Input 4 | |
| | 18 | DI5 | Digital Signal Input 5 | |
| | 2 | DI6 | Digital Signal Input 6 | |
| | 17 | DI7 | Digital Signal Input 7 | |
| | 1 | DI8 | Digital Signal Input 8 | |
| Digital quantity exports | 31 | DO1+ | Digital signal output 1+ | 6 Digital outputs with configurable functions. |
| | 32 | DO1- | Digital signal output 1- | |
| | 33 | DO2+ | Digital signal output 2+ | |
| | 34 | DO2- | Digital signal output 2- | |
| | 35 | DO3+ | Digital signal output 3+ | |

| Form | Serial number | Terminal identification | Terminal Name | Terminal Function Description |
|---|---|---|---|---|
| | 36 | DO3- | Digital signal output 3- | |
| | 37 | DO4+ | Digital signal output 4+ | |
| | 38 | DO4- | Digital signal output 4- | |
| | 39 | DO5+ | Digital signal output 5+ | |
| | 40 | DO5- | Digital signal output 5- | |
| | 41 | DO6+ | Digital signal output 6+ | |
| | 42 | DO6- | Digital signal output 6- | |
| Position command input | 5 | PULSE+ | Pulse command input + | Pulse command input. |
| | 21 | PULSE- | Pulse command input - | |
| | 6 | SIGN+ | Direction command input + | |
| | 22 | SIGN- | Direction Command Input - | |
| | 7 | PULLHI | Command pulse power input | |
| crossover output | 28 | PAO+ | Pulse output A+ | Quadrature divided pulse output signal of A and B. |
| | 13 | PAO- | Pulse output A- | |
| | 29 | PBO+ | Pulse output B- | |
| | 14 | PBO- | Pulse output B+ | |
| | 30 | PZO+ | Pulse output Z+ | Origin pulse output signal. |
| | 15 | PZO- | Pulse output Z- | |
| | 27 | PZ-OUT | Collector output PZOUT | Origin pulse open collector output signal. |

| Form | Serial number | Terminal identification | Terminal Name | Terminal Function Description |
|---|---|---|---|---|
| | 11 | GND | Collector output GND | Internal digital signal ground. |
| | 12 | GND | Collector output GND | |
| Analog importation | 24 | A+ | Analog input + | Analog input signal for speed/torque. Voltage input range: -10V to +10V; Maximum allowable voltage: ±12V. |
| | 9 | A- | Analog Input - | |
| | 25 | AGND | analogically | |
| 5V Power Supply | 8 | +5V | Internal 5V power supply | Internal 5V power supply, maximum output current 200mA. |
| | 23 | DGND | Internal 5V supply ground | |
| grounding | clamshell | PE | screened ground | Shield. |

### 3.2.3.2Digital Input Signal

For digital input signal description, seeTable8 . Take DI1 as an example to illustrate, DI1 to DI8 interface circuit is the same.

When the upper unit is a relay output, the interface circuit is shown inFigure18 andFigure19 .

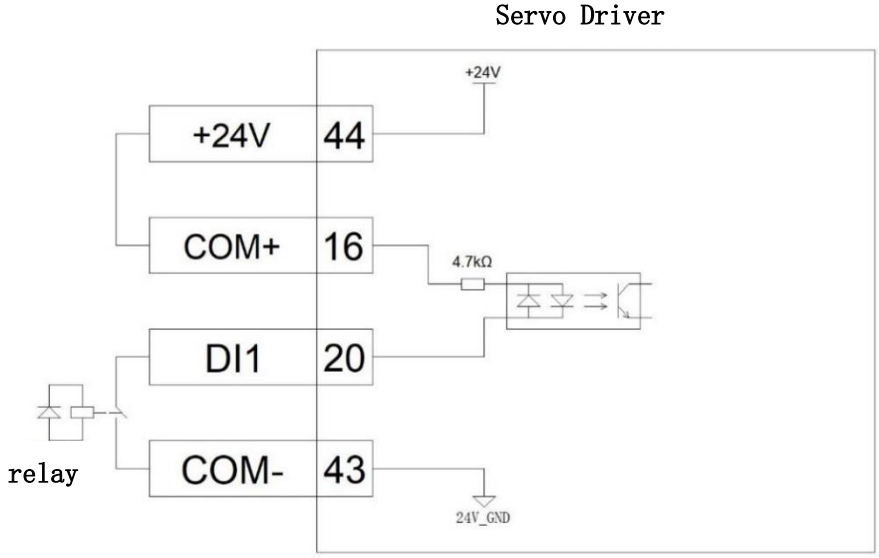



Figure18 When using the servo driver's internal 24V power supply

Servo Driver

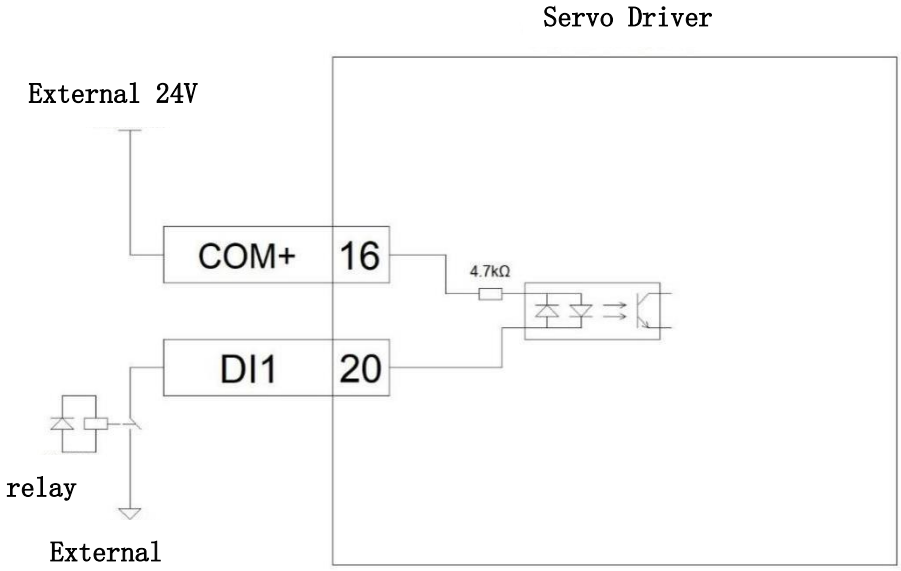



Figure19 When using an external 24V power supply

When the upper unit is an open collector output,the interface circuit is shown inFigure20 andFigure21.

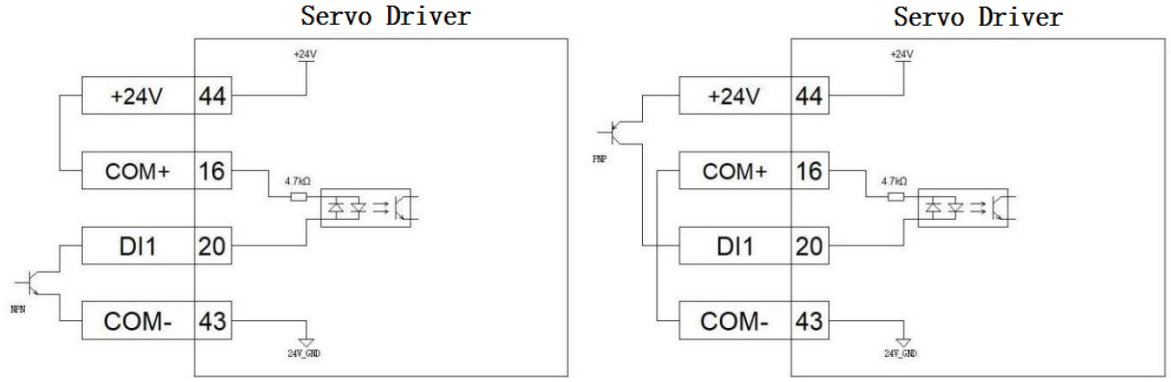



Figure20 When using the servo driver's internal 24V power supply

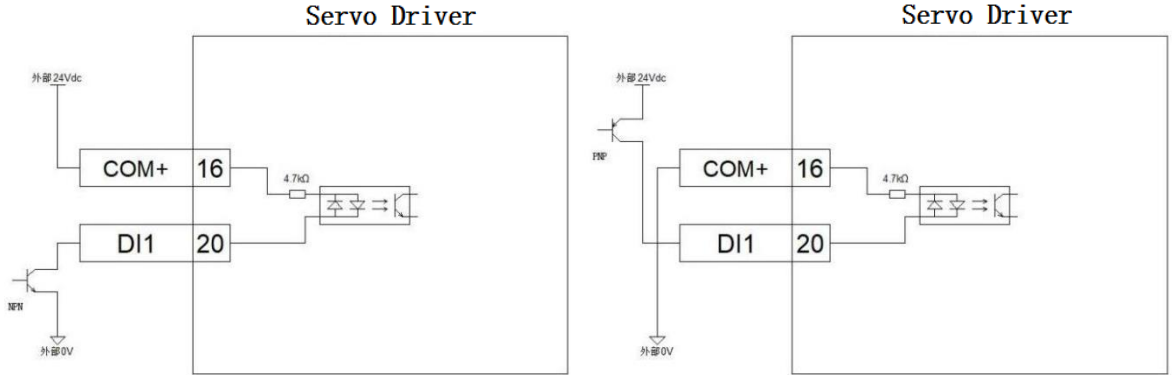



Figure21 When using an external 24V power supply

### 3.2.3.3Digital Output Signal

For digital output signal description, seeTable8 . Take DO1 as an example to illustrate, DO1 to DO6 interface circuit is the same.

When the upper unit is a relay input, the interface circuit is shown inFigure22 .

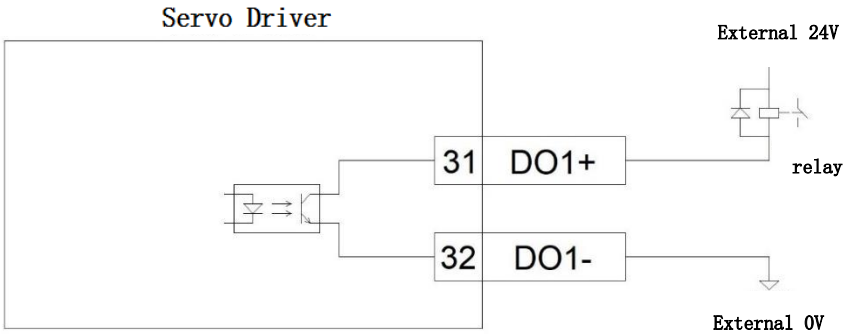



Figure22 Relay Inputs

When the upper unit is an optocoupler input, the interface circuit is shown inFigure23 .

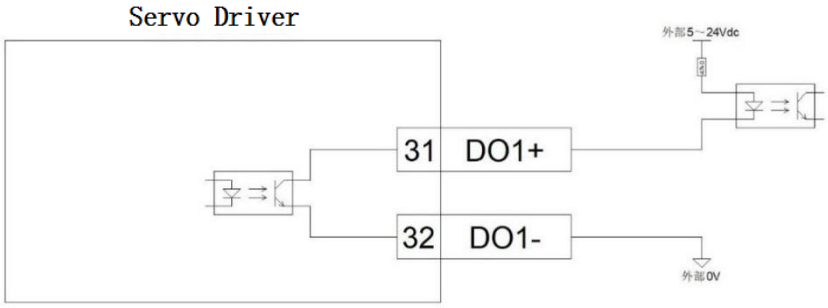



Figure23 Optocoupler Input

### 3.2.3.4Analog Input Signal

Analog input signal descriptions are available atTable8 .

The analog inputs are available in differential and single-ended connections, and the differential input connection is recommended. The speed and torque share a common analog input, input range: -10V ~ +10V, input impedance is about 10KΩ. zero bias in the analog input is normal, and can be compensated through the parameters.

When it is an analog differential input, the interface circuit is shown Figure24 .

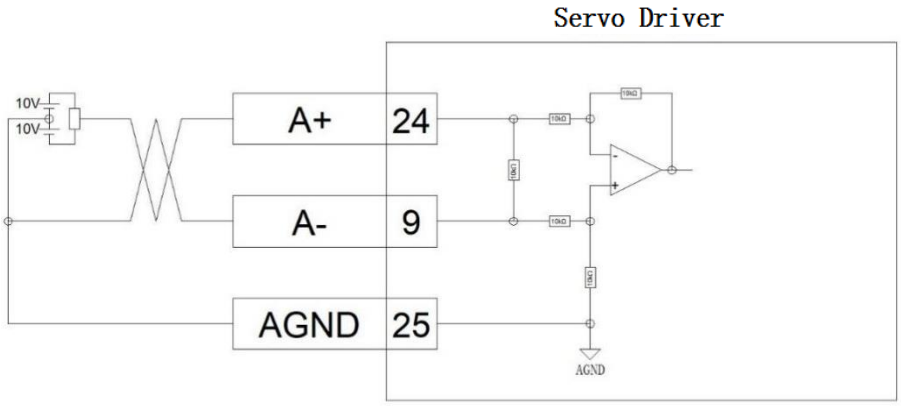



Figure24 Analog Differential Inputs

When it is an analog single-ended input, the interface circuit is shown Figure25 .

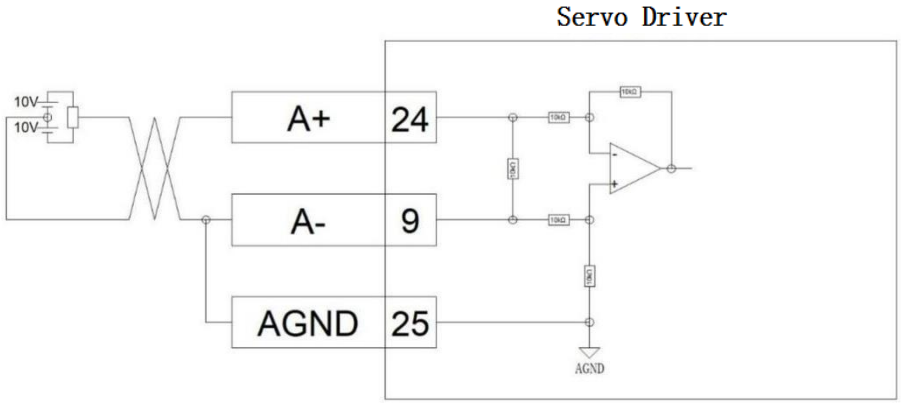



Figure25 Analog Single-Ended Inputs

### 3.2.3.5Position command input signal

The command pulse output circuit on the upper unit side can be selected from two types: differential driver output or open collector output. The maximum input frequency and minimum pulse width are shown inTable9 .

Table9 Maximum Input Frequency and Minimum Pulse Width of Command Pulse Output Circuit on the Upper Unit Side

| Input pulse frequency | Pulse mode | Maximum frequency (Kpps) | Minimum pulse width (us) |
|---|---|---|---|
| Under standard filtering parameters (Parameter F03.01 0=□□□ ) | Increment | 500 | 1 |
| | Open collector | 200 | 2.5 |
| Under high filtering parameters (Parameter F03.01 1=□□□ ) | increment | 100 | 5 |
| | Open collector | 50 | 10 |

| | |
|---|---|
| CAUTION | ➢ An output pulse width of the upper unit that is less than the minimum pulse width value will cause the driver to receive pulses incorrectly.<br>➢ The ports between PULSE+ and PULSE- and between SIGN+ and SIGN- only support signal level inputs up to 5V, signals above 5V must be connected in series with an external resistor, otherwise the driver will be damaged.<br>➢ The symbol in this document indicates a shielded twisted pair. |

When in differential mode, the interface circuit is shown Figure26 .

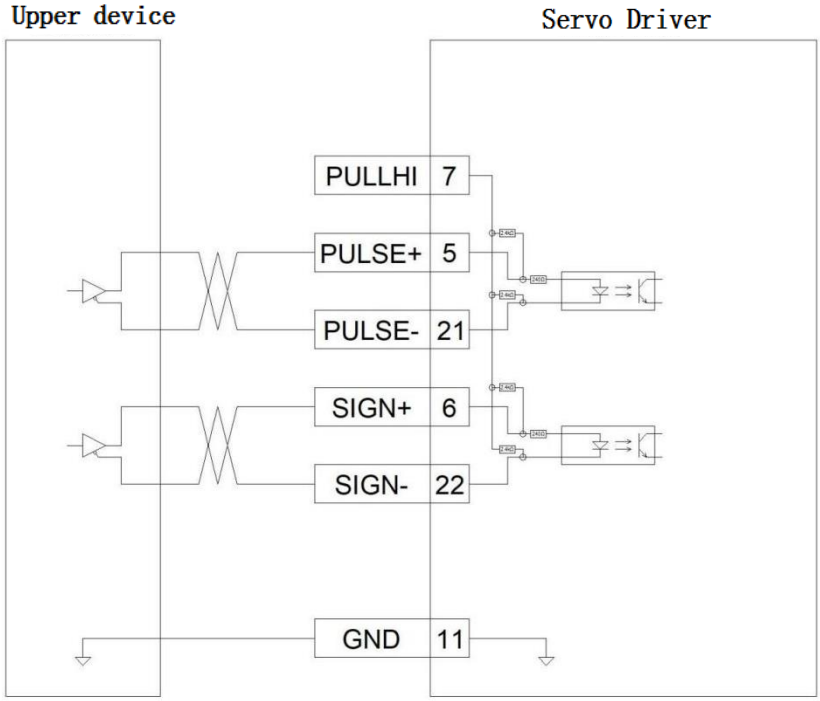



Figure26 Differential mode when

When in open collector mode, using the internal 24V supply, the interface circuit is shown inFigure27 andFig.28 .

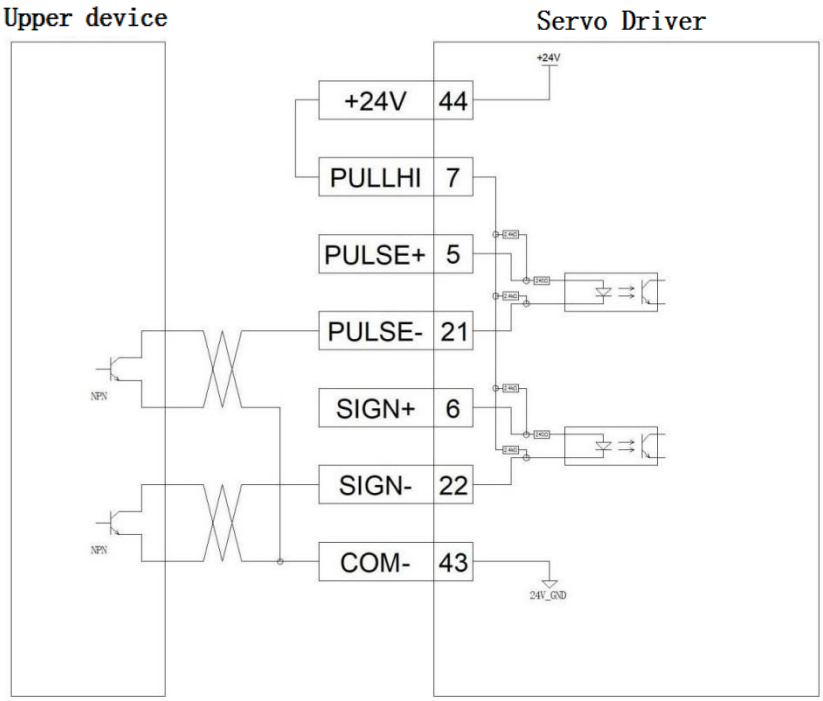



Figure27 Common Positive Connection when using the servo driver's internal 24V power supply

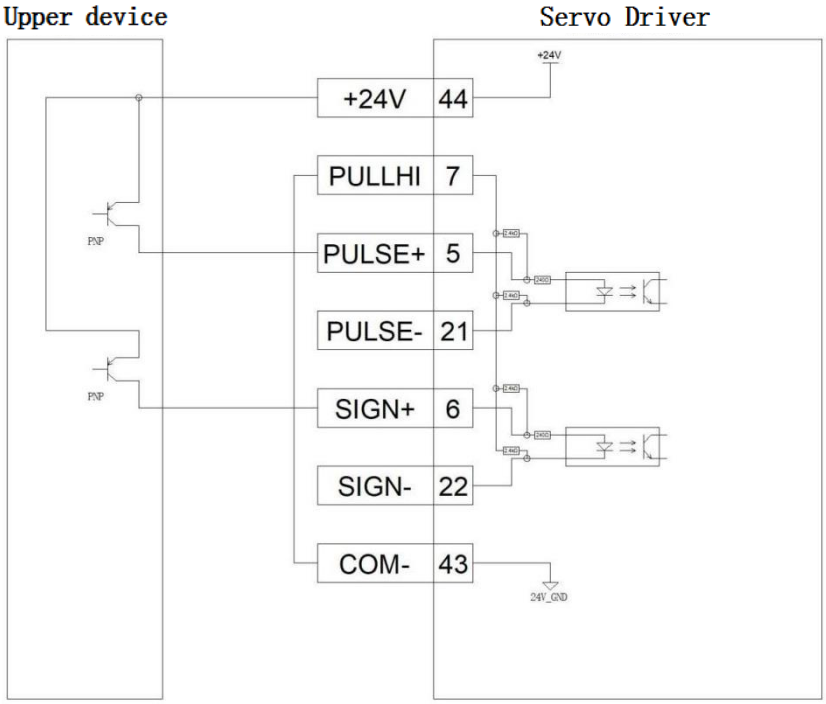



Fig.28 Common negative connection when using the servo driver's internal 24V power supply

When open collector mode is used and an external 24V supply is used, the interface circuit is shown inFigure29 andFigure30 .

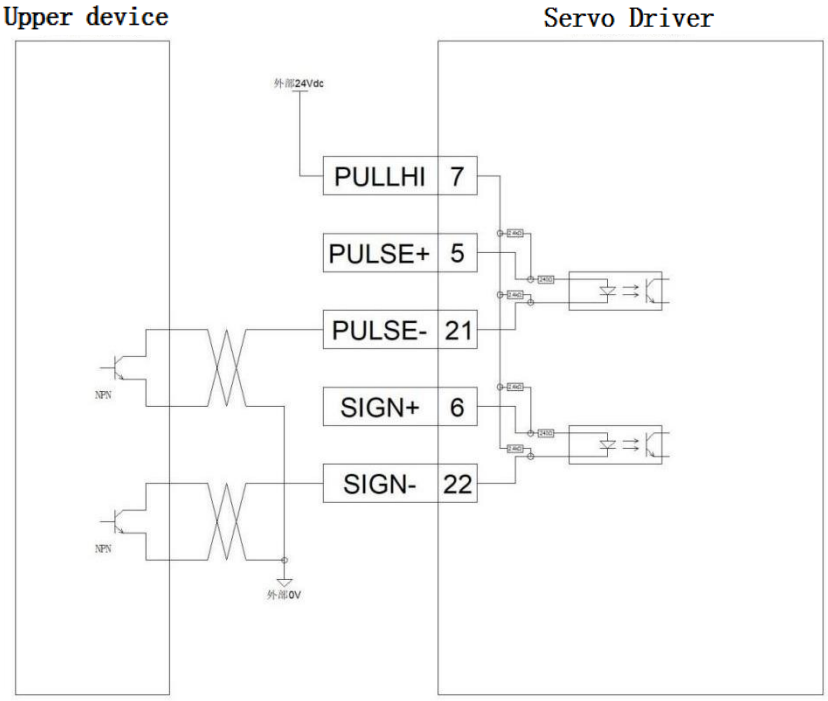



Figure29 Common Positive Connection when using external 24V power supply

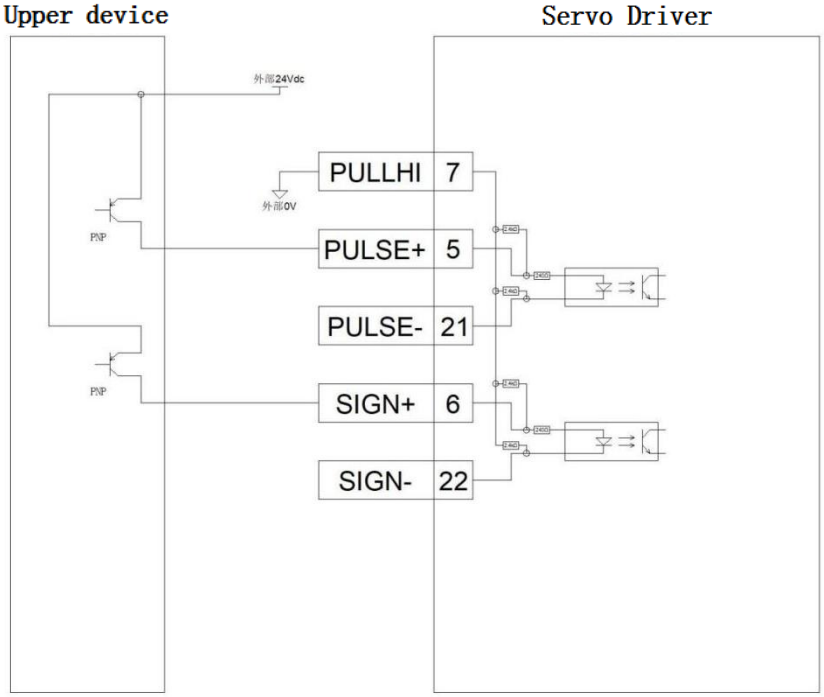



Figure30 Common Negative Connection when using an external 24V power supply

### 3.2.3.6crossover output signal

The encoder crossover output circuit outputs a differential signal through a differential driver. Normally, a feedback signal is provided when a position control system is formed for the upper unit. On the upper unit side, use a differential receiver circuit (as shown inFigure31 ) or an

optocoupler receiver circuit (as shown inFigure32 ) to receive a maximum output current of 20mA.

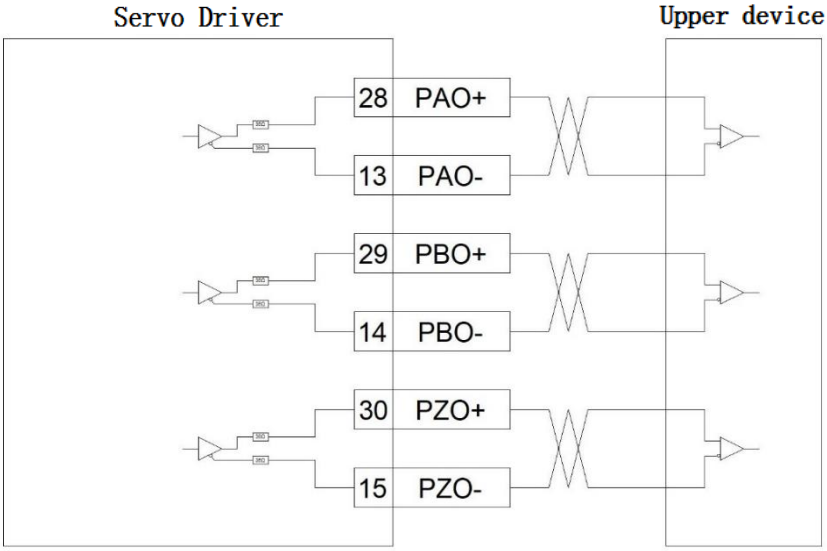



Figure31 Differential Receiver Circuit

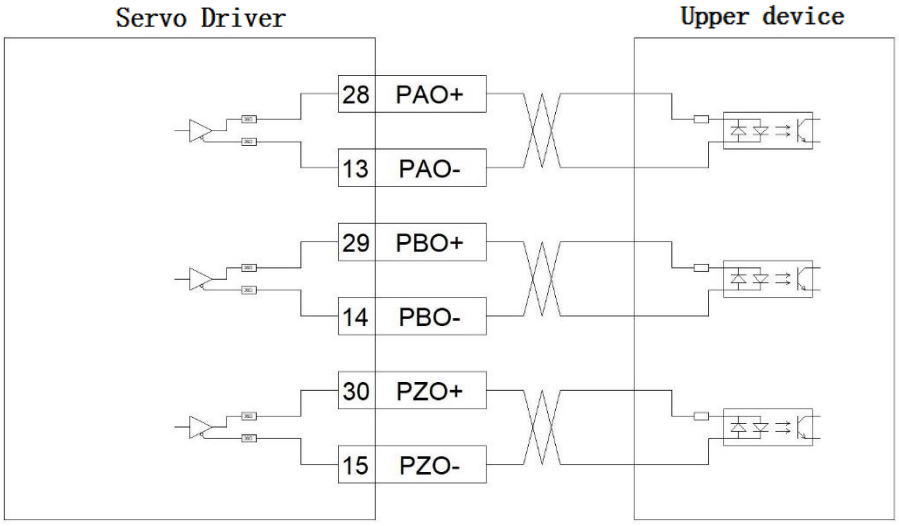



Figure32 Optocoupler Receiver Circuit

The encoder Z-phase crossover output circuit can pass an open collector signal. Normally, a feedback signal is provided when a position control system is constituted for the upper unit. On the upper unit side, use an opto-coupler circuit, relay circuit, or bus receiver circuit to receive it.

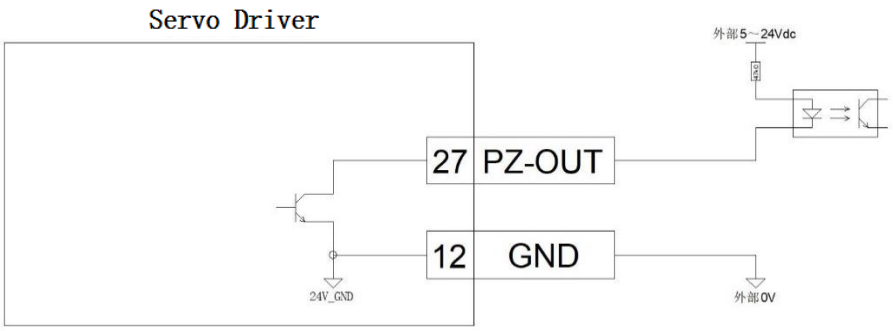



Figure33 Z-phase crossover output circuit

### 3.2.3.7Instructions for use of the holding brake

A holding brake is a mechanism that prevents the servo motor shaft from moving when the servo drive is in a non-operational state, keeping the motor locked in position so that the moving parts of the machinery do not move due to self-weight or external forces.

Holding brake wiring The connection of the holding brake input signal has no polarity and requires the user to prepare a 24V power supply. The standard wiring examples for the holding brake signal BK and the holding brake power supply are shown Figure34 .

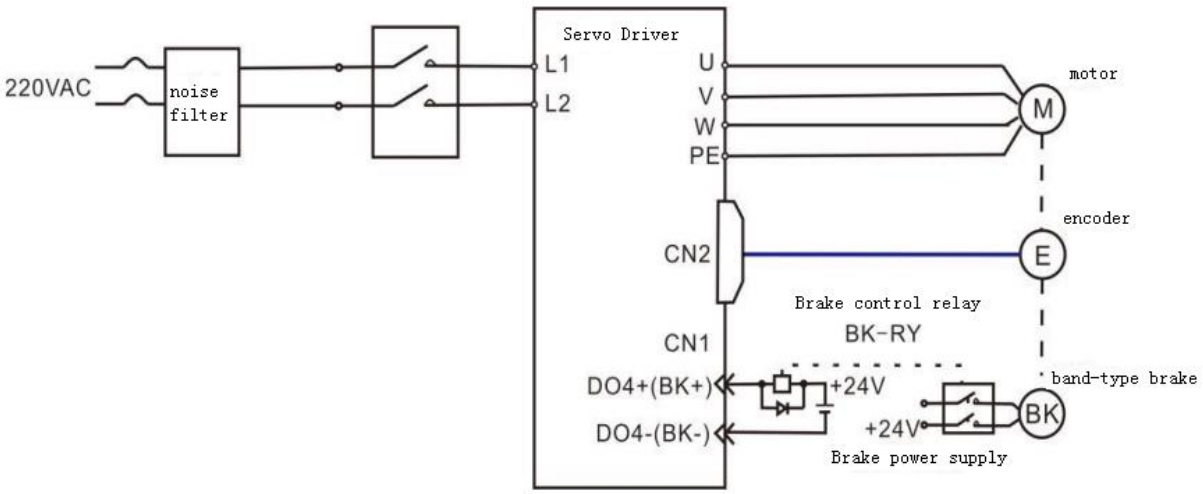



Figure34 Wiring Diagram for Holding Brake

### 3.2.4CN2 Encoder Terminal

The CN2 encoder terminals use 6PIN IEEE1394 female chassis, seeTable10 for terminal function description.

Table10 Encoder Terminal Functional Description

| Serial number | Terminal identification | Terminal Name | Terminal Function Description |
|---|---|---|---|
| 1 | PS+ | Encoder signal + | Encoder Signal |
| 2 | PS- | Encoder signals - | |
| 3 | / | / | reservations |
| 4 | / | / | |
| 5 | +5V | 5V Power Supply | Encoder Power Supplies |
| 6 | 0V | POWER GROUND | |
| clamshell | PE | screened ground | block (sth. or sb) |

### 3.2.5CN3 & CN4 Communication Terminals

#### 3.2.5.1Terminal Function Description

CN3 & CN4 communication terminals use RJ45 connector, terminal function description seeTable11 .

Table11 Communication Terminal Functional Description

| Serial number | Terminal identification | Terminal Name | Terminal Function Description |
|---|---|---|---|
| 1 | / | / | / |
| 2 | / | / | / |
| 3 | / | / | / |
| 4 | RS485B | RS485 communication B | RS485 communication |
| 5 | RS485A | RS485 communication A | |
| 6 | / | / | / |
| 7 | GND | 485 signal ground | RS485 communication ground |
| 8 | / | / | / |
| casings | PE | screened ground | block (sth. or sb) |

#### 3.2.5.2RS485 communication network

When the driver and the upper device (such as PLC, etc.) are networked by 485 communication, use a three-core shielded cable for connection. Connect the three terminals RS485A, RS485B and GND (GND means non-isolated 485 circuit) in turn. RS485A and RS485B are connected by twisted pair, another wire is connected to the 485 signal ground GND, and the shield is connected to the equipment ground (PE). Only 120Ω termination resistors

are connected at the beginning and end of the bus to prevent reflection of the 485 signal.

When the drives are networked in parallel with multiple machines, the connecting cables are network cables with shielding and are daisy-chained. The reference ground of the 485 signals of all nodes is connected together, and up to 16 nodes are connected. Only connect 120Ω termination resistors at the beginning and end of the bus to prevent the 485 signal from reflecting. If more devices are to be connected, repeaters must be used to expand the number of nodes connected.

CN4 of the Servo Drive is always used as a communication input terminal, and CN3 is always used as a communication output terminal (a balancing resistor can be added to this terminal if no other slaves need to be connected).

| | |
|---|---|
| CAUTION | ➢ It is prohibited to connect the ground terminal of the upper unit to the GND of the servo driver, otherwise the machine will be damaged!<br>➢ It is prohibited to directly connect the CN3 terminals of any two Servo Drives. |

## 3.3Electrical Wiring Diagram

### 3.3.1Position Mode Wiring Diagram

#### 3.3.1.1Position Mode Description

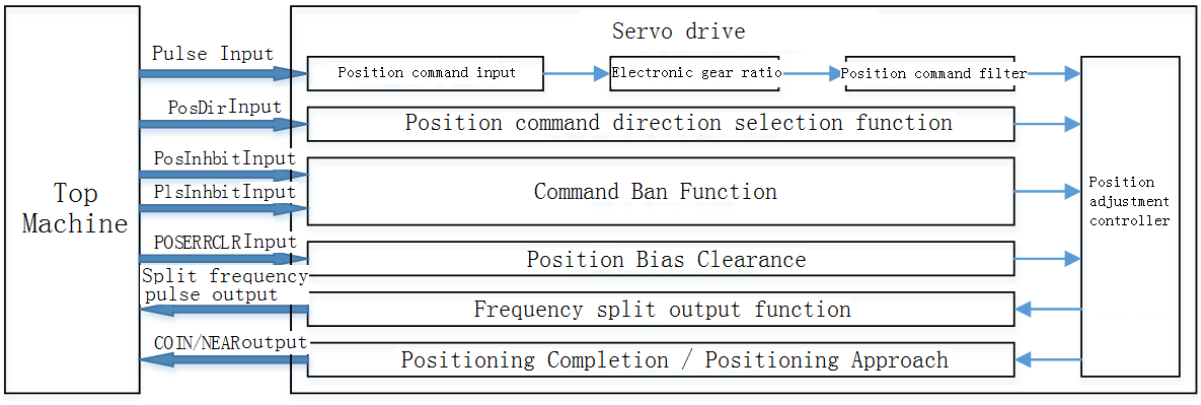



Figure35 Position Control Mode Block Diagram

Position mode is common operating mode for servo drives, and the main steps for its use are shown below:

1) Correctly connect the servo main circuit and control circuit power supply, as well as motor power line and encoder line, after power on

the servo panel display "...rdy" that means the servo power and encoder wiring is correct. .rdy" means that the servo power supply and encoder wiring is correct.

2) Perform a servo JOG test run by pressing the key to confirm that the motor can operate normally.

3) Refer toFigure36 Wiring instructions to connect the pulse direction input and pulse command input in the CN1 terminal as well as the required DI/DO signals, such as servo enable, alarm clear, and positioning completion signals.

4) Perform position mode related settings. Set the DI/DO used according to the actual situation.

5) Servo enable to control the servo motor rotation by sending position commands from the upper computer. First, make the motor rotate at low speed and confirm whether the rotation direction and electronic gear ratio are normal, and then make gain adjustment.

### 3.3.1.2Position Mode Wiring

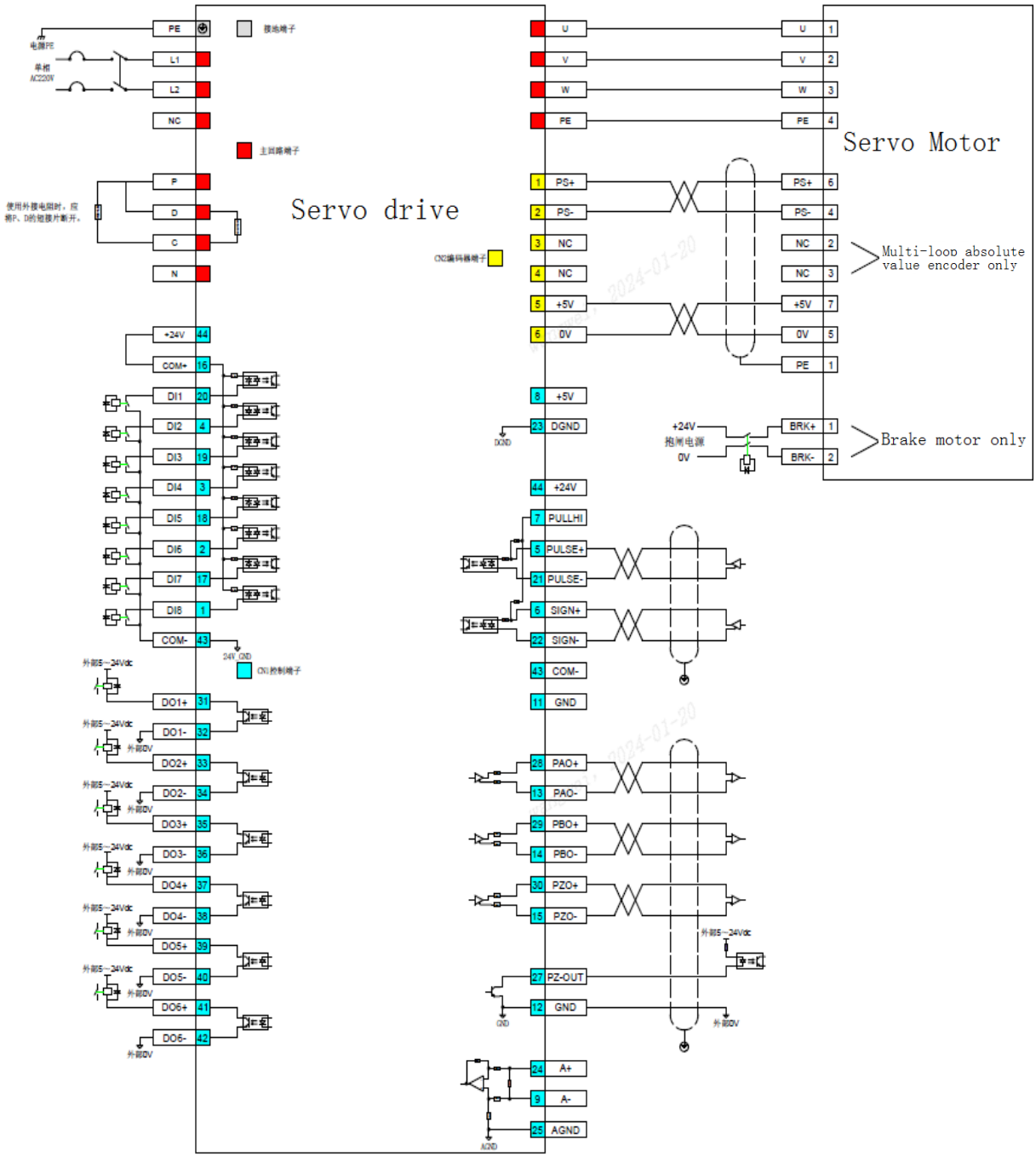



Figure36 Position Mode Wiring Diagram

CAUTION

- Internal +24V supply voltage range 20V to 28V, maximum operating current 100mA.
- DO output power supply user-provided power supply range 5V to 24V. maximum allowable voltage DC30V, maximum allowable current 50mA for DO port.
- Please use twisted shielded cable for the position command input cable, the shielding layer must be connected to PE at both ends, and GND is reliably connected to the signal ground of the upper computer.
- Crossover output cable please use twisted shielded

| | |
|---|---|
| | cable, the shield must be connected to PE at both ends, GND and the upper computer signal ground reliable connection.<br>➢ Internal +5V power supply, maximum allowable current 200mA. |

### 3.3.2Speed Mode Wiring Diagram

#### 3.3.2.1Speed Mode Description

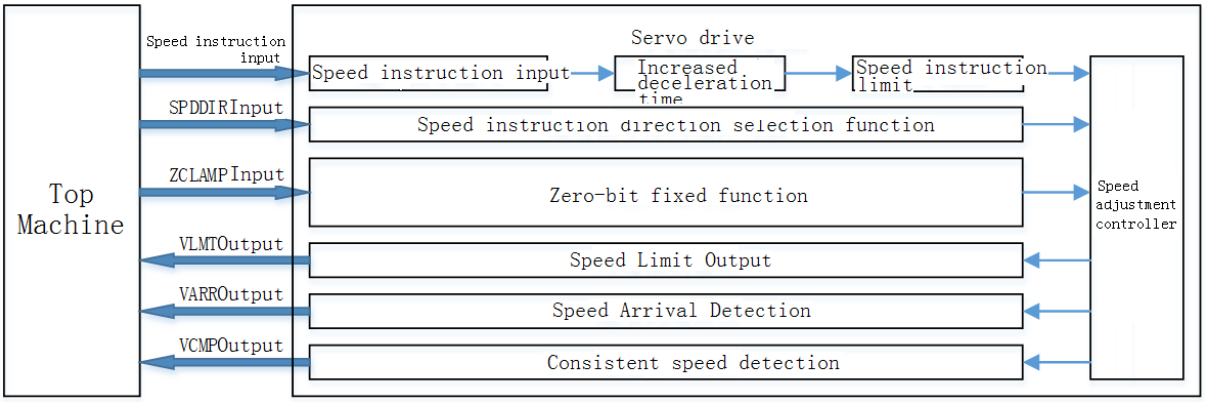



Figure37 Speed Control Mode Block Diagram

The main steps for using the speed mode are shown below:

1) Correctly connect the servo main circuit and control circuit power supply, as well as motor power line and encoder line, after power on the servo panel display "...rdy" that means the servo power and encoder wiring is correct. .rdy" means that the servo power supply and encoder wiring is correct.
2) Perform a servo JOG test run by pressing the button to confirm that the motor can operate normally.
3) Refer toFigure38 Wiring Instructions to connect the required DI/DO signals in the CN1 terminal, such as servo enable, alarm clear, positioning completion signal, etc.
4) Perform speed mode related settings. Set the DI/DO used according to the actual situation.
5) Servo enable to control the servo motor rotation by sending speed command from the upper computer. First, make the motor rotate at low speed and confirm whether the direction of rotation and electronic gear ratio are normal, and then make gain adjustment.

### 3.3.2.2Speed Mode Wiring

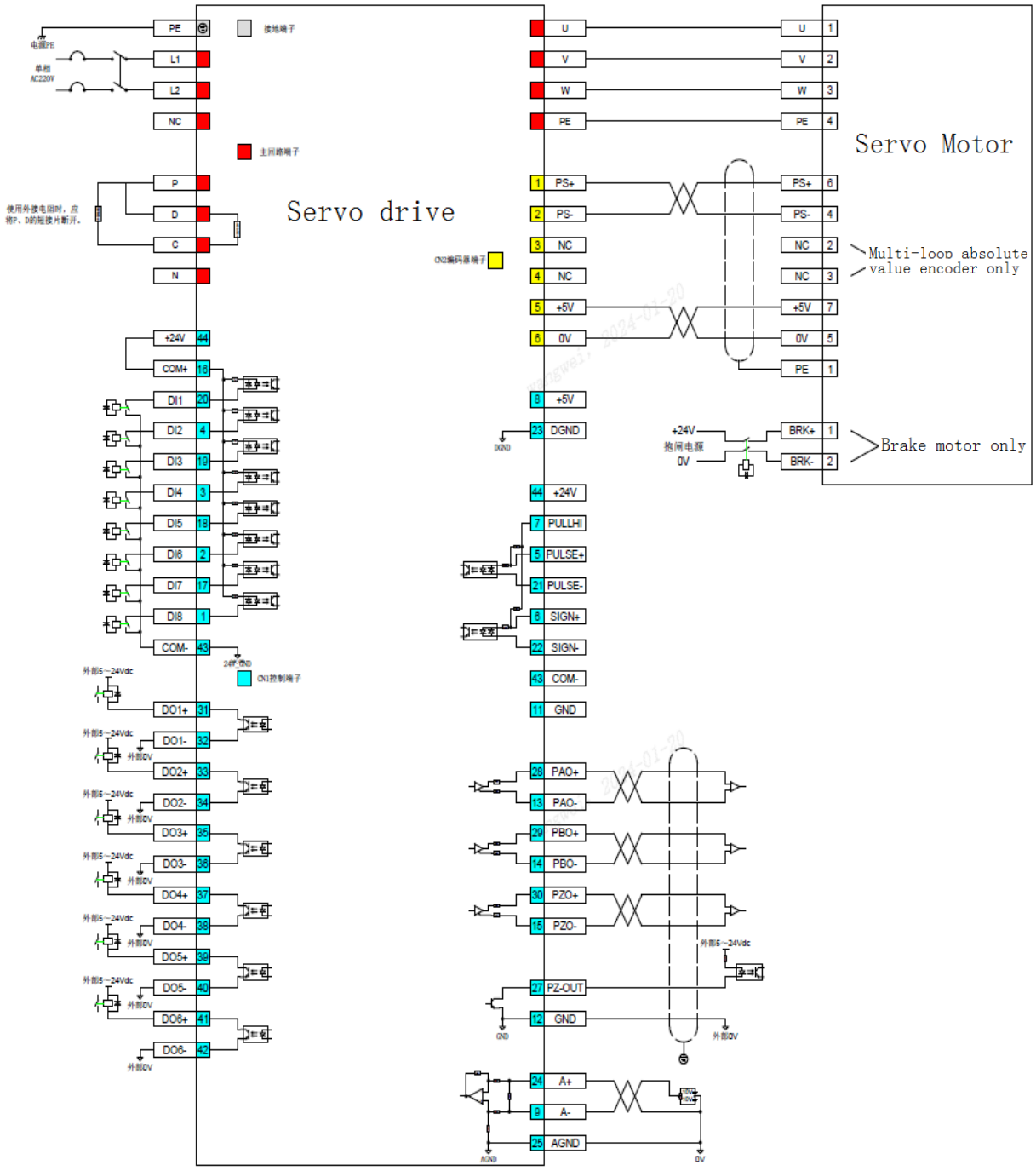



Figure38 Speed Mode Wiring Diagram

| | |
|---|---|
| CAUTION | ➢ Internal +24V supply voltage range 20V to 28V, maximum operating current 100mA.<br>➢ DO output power supply user-provided power supply range 5V to 24V. maximum allowable voltage DC30V, maximum allowable current 50mA for DO port.<br>➢ Crossover output cable please use twisted shielded cable, the shield must be connected to PE at both ends, GND and the upper computer signal ground reliable connection. |

| | |
|---|---|
| | ➢ Use twisted shielded cable for the analog input cable.<br>➢ When using analog, the parameters r01.30 to F01.41 should be adjusted according to the site conditions.<br>➢ Internal +5V power supply, maximum allowable current 200mA. |

### 3.3.3Torque Mode Wiring Diagram

#### 3.3.3.1Torque Mode Description

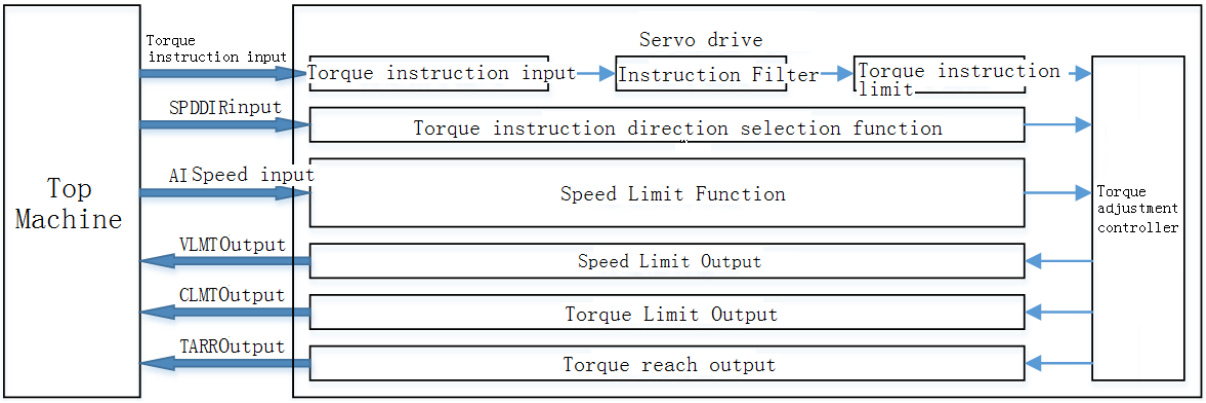



Figure39 Torque Control Mode Block Diagram

The main steps for using the torque mode are shown below:

1) Correctly connect the servo main circuit and control circuit power supply, as well as motor power line and encoder line, after power on the servo panel display "...rdy" that means the servo power and encoder wiring is correct. .rdy" means that the servo power supply and encoder wiring is correct.
2) Perform a servo JOG test run by pressing the key to confirm that the motor can operate normally.
3) Refer toFigure40 Wiring Instructions to connect the required DI/DO signals in the CN1 terminal, such as servo enable, alarm clear, positioning completion signal, etc.
4) Perform torque mode related settings. Set the DI/DO used according to the actual situation.
5) The servo is enabled to control the servo motor rotation by issuing a torque command from the upper computer. First make the motor rotate at low speed and confirm that the direction of rotation and electronic gear ratio are normal, then make gain adjustment.

### 3.3.3.2Torque Mode Wiring

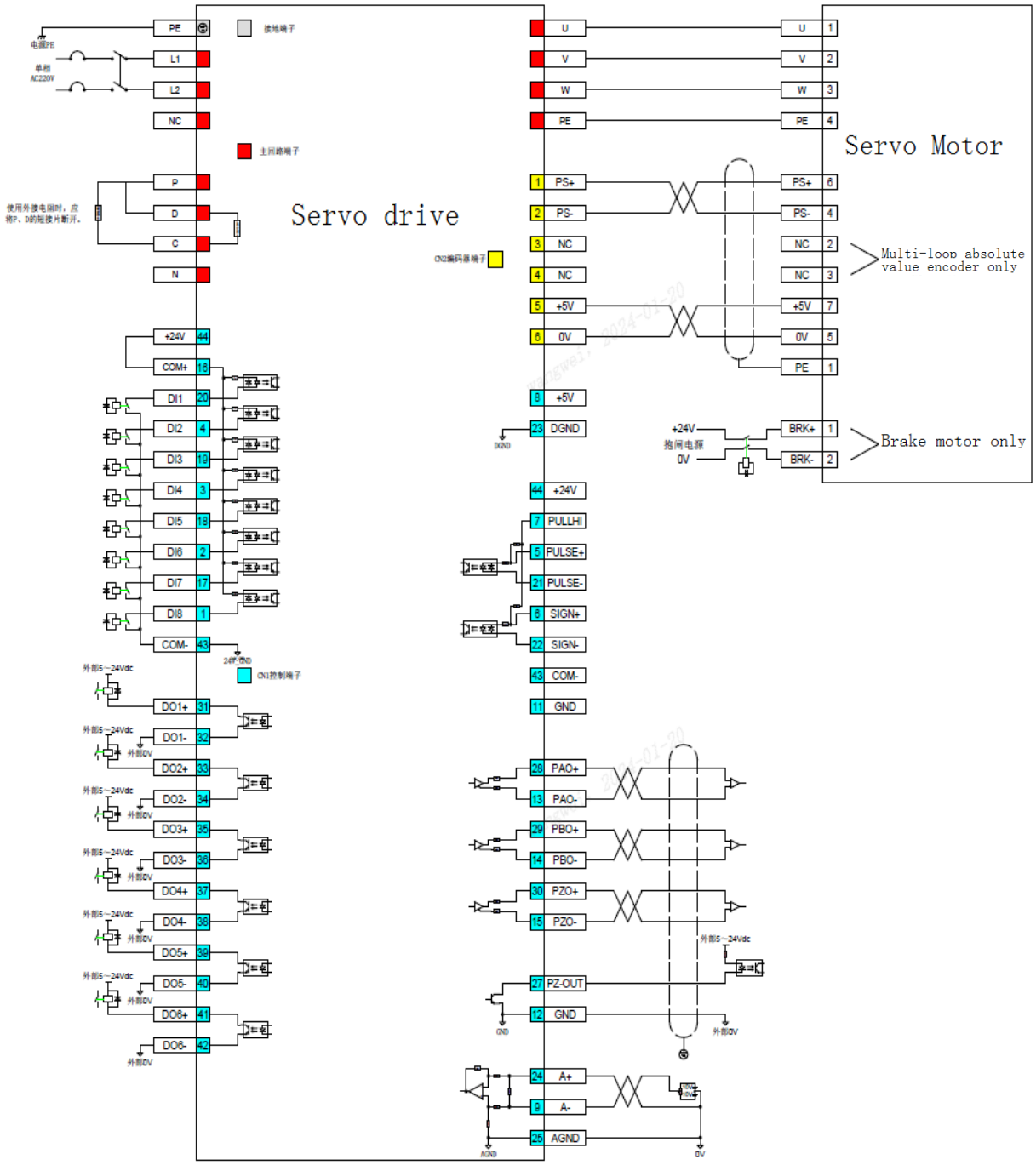



Figure40 Torque Mode Wiring Diagram

| | |
|---|---|
| CAUTION | ➢ Internal +24V supply voltage range 20V to 28V, maximum operating current 100mA.<br>➢ DO output power supply user-provided power supply range 5V to 24V. maximum allowable voltage DC30V, maximum allowable current 50mA for DO port.<br>➢ Crossover output cable please use twisted shielded cable, the shield must be connected to PE at both ends, GND and the upper computer signal ground reliable connection. |

| | |
|---|---|
| | ➢ Use twisted shielded cable for the analog input cable.<br>➢ When using analog, the parameters r01.30 to F01.41 should be adjusted according to the site conditions.<br>➢ Internal +5V power supply, maximum allowable current 200mA. |

# 4.Debugging Tools

## 4.1operation panel

### 4.1.1Panel Description

#### 4.1.1.1Panel Composition

The panel consists of 5 LED digital tube displays and 4 keys "M", "∧", "∨", "S" (as shown in  and ). The panel consists of 5 LED digital tube displays and 4 keys "M", "∧", "∨", "S" (as shown inFigure41 ), which are used to display the system status, setup parameters and execution of auxiliary functions.


Figure41  drive panel

#### 4.1.1.2Key Description

Table12  Key descriptions

| Notation | Name | Functionality |
|---|---|---|
| M | Menu key | Switch between modes; return to the previous menu. |
| ∧ | Add key | Add LED digital tube blinking bit serial number or value; long press has repeat effect. |
| ∨ | Minus key | Decrease LED digital tube blinking bit serial number or value; long press has repeat effect. |
| S | Shift/Confirm key | Short press to shift, long press to confirm. |

### 4.1.2panel display

When the servo drive is running, the digital tube display can be used for servo status display, parameter display, fault display and monitoring display.

#### 4.1.2.1status display

The status display is described as shown inFigure42 .

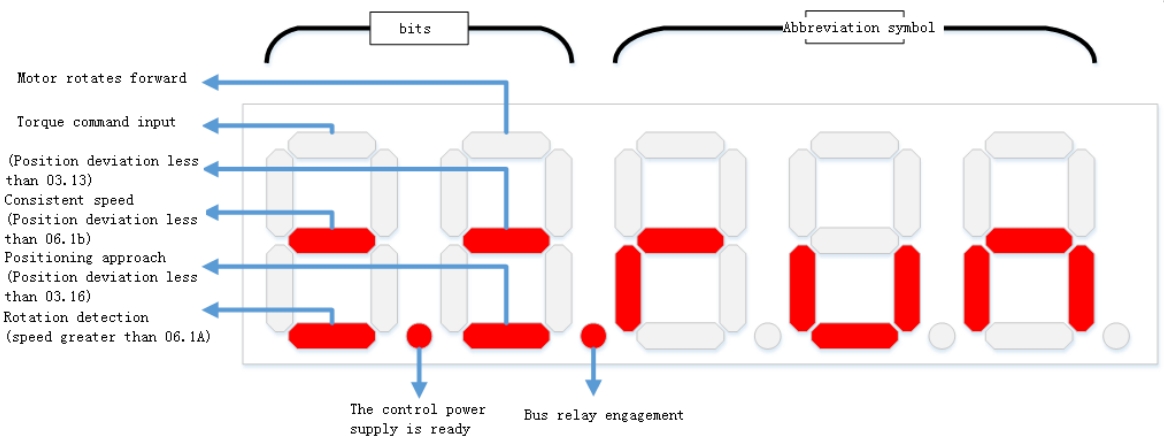
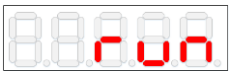
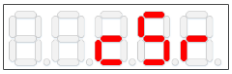



Figure42 Status Display Description

The meanings of the abbreviated symbols can be found in Table13 .

Table13 Meaning of Abbreviations

| Icon | Name | Show occasions | Hidden meaning |
|---|---|---|---|
|  | Servo initialization | Instant servo power-up or software reset. | The drive is in the initialization state or reset state. Wait for the initialization or reset to complete and automatically switch to other states. |
|  | Servo ready. | The drive is ready. | The servo drive is in a runnable state, waiting for the host computer to give a servo enable signal. |
|  | Servo not ready | Servo initialization is complete, but the drive is not ready. | The servo is in a non-operable state because the main circuit is powered up. |
|  | Servo is running | Servo enable signal is active. | The servo drive is in operation. |
|  | Velocity Punctual Operation | The servo drive is in velocity spotting operation. | The servo drive is in velocity spotting mode. |
|  | Position Punctuation Operation | The servo drive is in position-pointing operation. | The servo drive is in position-pointing mode. |
|  | (math.) the origin | The servo drive is in home reset | The servo drive is in home reset mode. |

| | | | |
|---|---|---|---|
| | resumption run | operation. | |
|  | Gravity Compensation | The servo drive is in gravity detection operation. | The servo drive is in position mode. |
|  | Display fault E.01 | The servo drive is faulty. | E: Faulty servo drive<br>01: Fault Code |
|  | Display of warning A.99 | A warning exists for the servo drive. | A: Warning exists for servo drive<br>99: Warning code |

### 4.1.2.2parameter display

Servo drive function codes are divided into "P group", "Fn group" and "Un group", and the parameters of the three groups can be selected by switching the "M" key in the status display mode. The three groups of parameters can be selected by switching with the "M" key in the status display mode, and the position of the function codes can be quickly located according to the function code groups. For the specific meaning of function codes, see 0 8.Detailed description of **parameters** ".

#### 4.1.2.2.1decimal point display

When the parameter or parameter value is displayed, the bright "." of the digital tube indicates the decimal point, and the data 1.00 is displayed as shown in Figure . indicates the decimal point, and the display data 1.00 as shown inFigure43 .

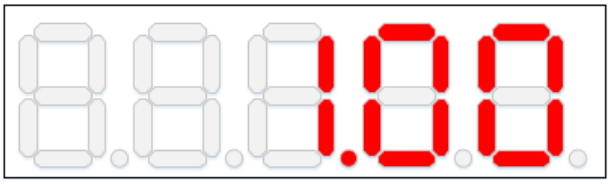


**Figure43 Decimal point display**

#### 4.1.2.2.2Binary parameter value display

Taking r01.00 (DI input status display) as an example,Figure44 shows the value of 01.00 = 0x0025 (0000 0000 0010 0101b).

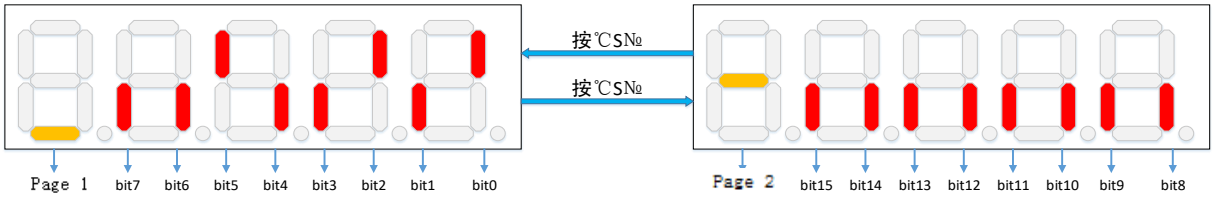



Figure44 Example of Binary Parameter Display

#### 4.1.2.2.3Hexadecimal parameter value display

Taking F01.03 (DI1 function planning) as an example,Figure45 shows the value 01.03 = 0x2002.

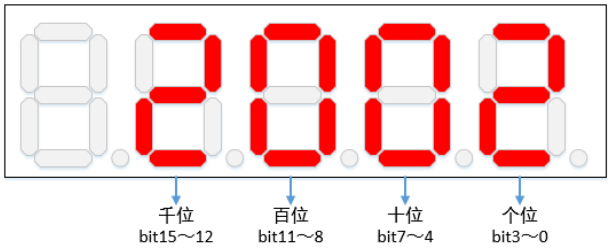



Figure45 Hexadecimal Parameter Value Display Example

#### 4.1.2.2.4Decimal parameter value display (16-bit wide)

Taking F06.01 (speed command digital setting) as an example,Figure46 shows the value of 06.01=1234rpm, andFigure47 shows the value of 06.01=-1234rpm.

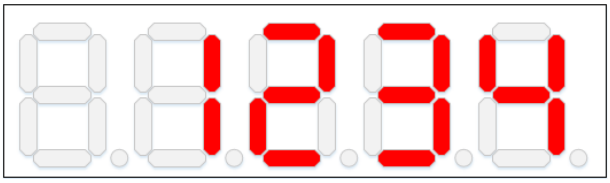


Figure46 Decimal parameter value (16-bit wide) display example 1

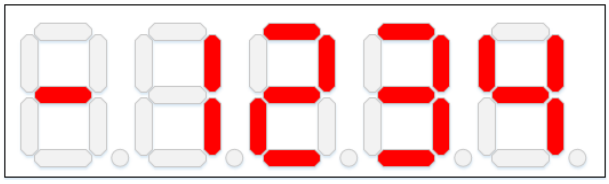


Figure47 Decimal parameter value (16-bit wide) display example 2

Taking F07.01 (torque digit given) as an example,Figure48 shows the value 07.01=150.0% andFigure49 shows the value 07.01=-150.0%.

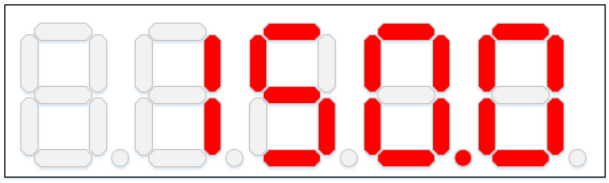


Figure48 Decimal parameter value (16-bit wide) display example 3

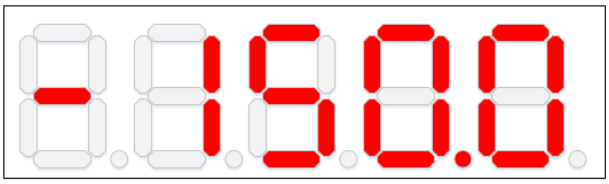


Figure49 Decimal parameter value (16-bit wide) display example 4

#### 4.1.2.2.5Decimal parameter value display (32-bit wide)

Take r0d.2C (external input pulse count) as an example, only one page is displayed when the data is less than 10000,Figure50 shows the value of 0d.2C = 1234 pulses.

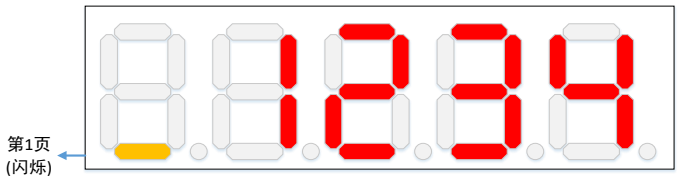



Figure50 Decimal parameter value (32-bit wide) display example 1

Take r0d.2C (external input pulse counting) as an example, the data is greater than or equal to 10,000 and less than 100,000,000 is displayed in two pages,Figure51 shows the value of 0d.2C = 11234567 pulses.

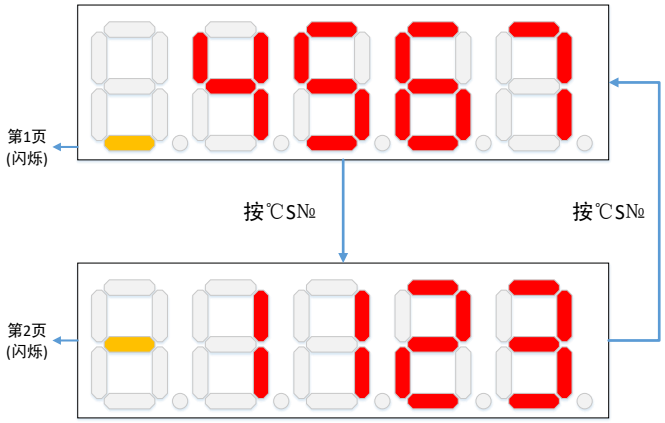



Figure51 Decimal parameter value (32-bit wide) display example 2

Take r0d.2C (external input pulse count) as an example, data greater than 100000000 is displayed in three pages,Figure52 shows the value of 0d.2C = 1234567890 pulses.

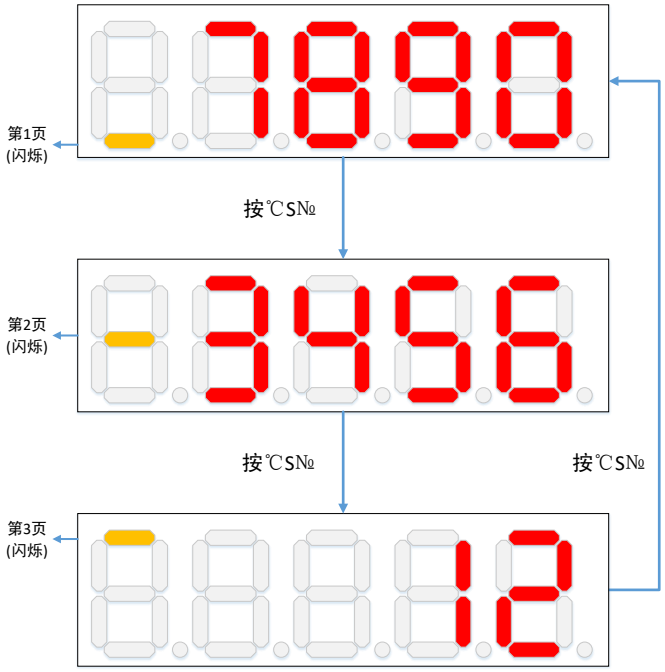



Figure52 Decimal parameter value (32-bit wide) display example 3

Taking r0d.2C (external input pulse count) as an example, only one page is displayed when the data is greater than -10000.Figure53 shows the value of 0d.2C = -1234 pulses.

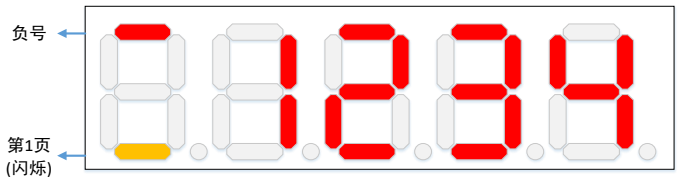



Figure53 Decimal parameter value (32-bit wide) display example 1

Take r0d.2C (external input pulse count) as an example, data less than or equal to -10000 and greater than -100000000 is displayed in two pages,Figure54 shows the value of 0d.2C = -11234567 pulses.

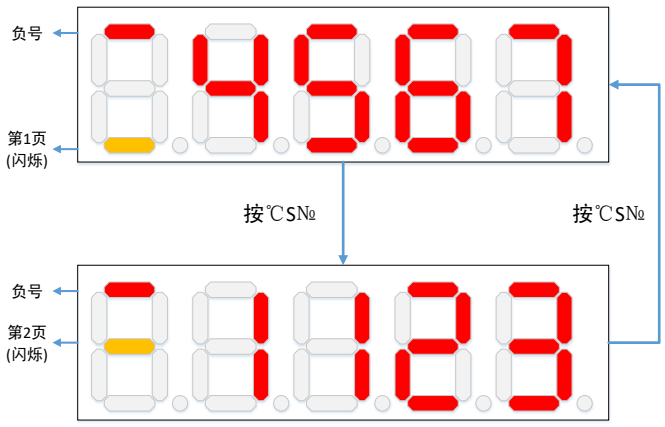



Figure54 Decimal parameter value (32-bit wide) display example 2

Take r0d.2C (external input pulse count) as an example, data less than -100000000 is displayed in three pages,Figure55 shows the value as 0d.2C = -1234567890 pulses.

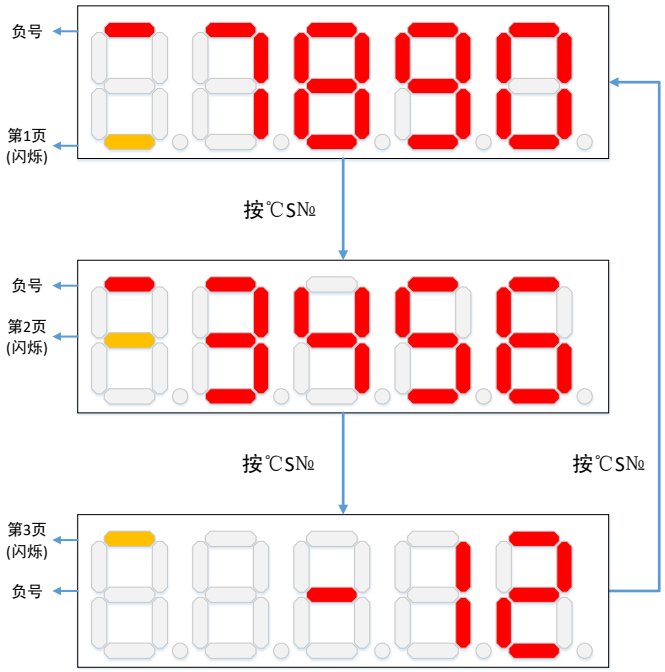



Figure55 Decimal parameter value (32-bit wide) display example 3

### 4.1.2.3Display Mode Switching

When the power is turned on, the digital tube display immediately enters the state display mode. Press "M" key to switch between different display modes, as shown inFigure56 .

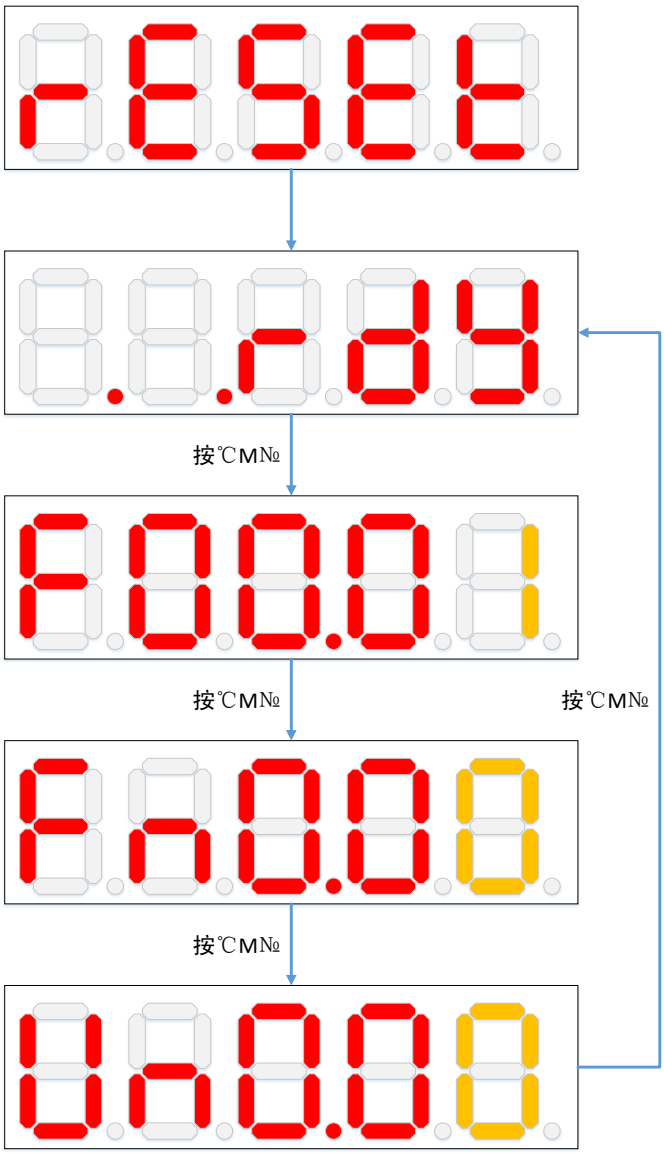



Figure56 Display Mode Switching Operation Block Diagram

In status display mode, press "∧", "∨" key to switch between the target parameters selected for monitoring, as shown inFig.57 .

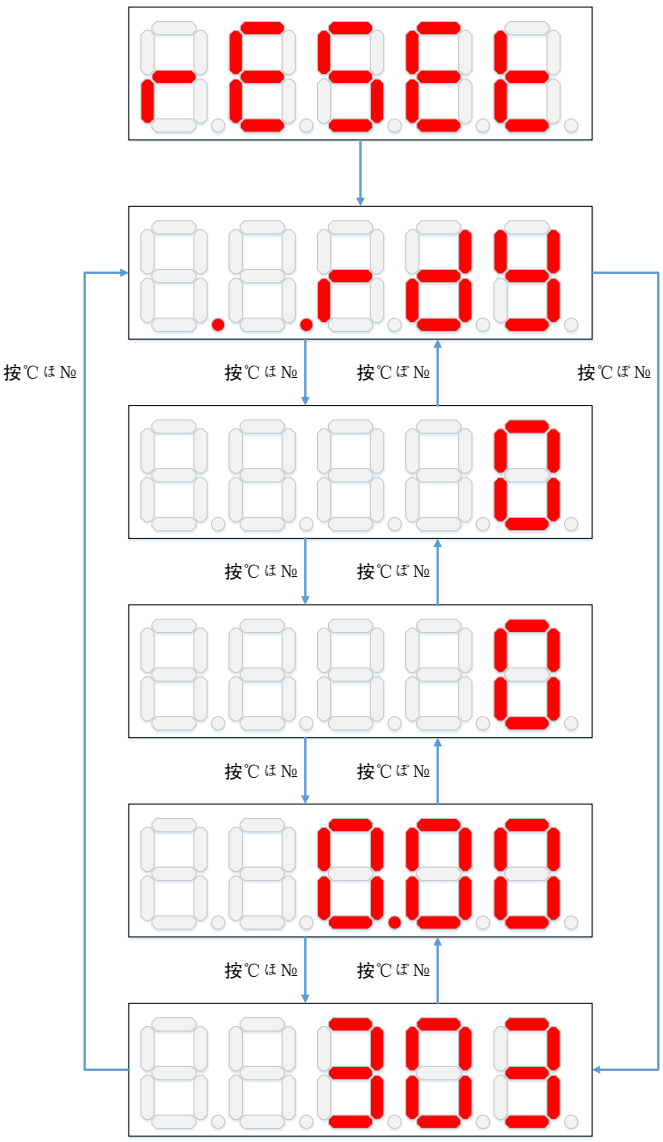



Fig.57 Block diagram of monitoring parameter switching operation in status display mode

In parameter display mode, press "∧", "∨" key to increase/decrease LED digital tube blinking bit number or value, long press has repeat effect, as shown Fig.58 .


Fig.58 Parameter increase/decrease operation in parameter display mode

In the parameter display mode, short press "S" key to shift and long press "S" key to operate the parameter, as shown inFig.59 .


Fig.59 Parameter Modification Operation in Parameter Display Mode

### 4.1.3Monitoring status contents

In monitor display mode, user can use "∧", "∨" key to select the desired display mode, and then long press "S" key to enter the specific monitor state. SeeTable14 for monitoring status.

Table14 Monitoring status contents

| Function code | Name | Unit (of measure) | Instructions |
|---|---|---|---|
| Un0.00 | Motor speed | rpm | The actual running speed of the servo motor is displayed, rounded off, and can be accurate to 1rpm. |
| Un0.01 | Speed command | rpm | Drive current speed command. |

| Function code | Name | Unit (of measure) | Instructions |
|---|---|---|---|
| Un0.02 | Torque command | 0.1% | Percentage of the actual output torque of the servo motor to the rated torque of the motor. |
| Un0.03 | Busbar voltage | V | Main circuit DC bus voltage value. |
| Un0.04 | Positional deviation | unit of command (computing) | Position deviation = total number of input position commands (command units) - total number of encoder feedback pulses (command units) |
| Un0.08 | Output Current | 0.01A | Servo motor phase current RMS value. |
| Un0.09 | Motor load factor | 0.1% | Motor load torque as a percentage of rated motor torque. |
| Un0.0A | Average load factor (calculated every 15s) | 0.1% | Average load torque as a percentage of rated motor torque. |
| Un0.0b | Peak load factor (cleared every 15s) | 0.1% | Peak load torque as a percentage of rated motor torque. |
| Un0.0C | Regenerative braking resistor heat accumulation (internal estimates) | J | Braking resistor heat accumulation. |
| Un0.0E | Electrical Angle | 0.1° | The current electrical angle of the motor. |
| Un0.10 | Number of drive EEPROM writes | - | Number of drive EEPROM writes. |
| Un0.14 | System status word | - | System Status. |
| Un0.15 | Motion status word | - | Motion state. |
| Un0.16 | Monitor Status Word | - | Monitor the status. |
| Un0.17 | Encoder Battery Monitoring | 0.1V | Encoder battery voltage. |
| Un0.18 | Absolute Encoder Fault Message | - | Absolute encoder fault message. |
| Un0.19 | Number of revolutions of absolute encoder (incremental encoder UVW status) | - | The number of revolutions of the absolute encoder. |
| Un0.1A | Single-turn absolute position (incremental encoder position within | Encoder Unit | Lap absolute position. |

| Function code | Name | Unit (of measure) | Instructions |
|---|---|---|---|
| | 1 turn, relative to Z) | | |
| Un0.1C | Current position (lower 32 bits) | Encoder Unit | Current absolute motor position (command unit). |
| Un0.1E | Current position (high 32 bits) | Encoder Unit | Current absolute motor position (command unit). |
| Un0.2C | Low-speed external input pulse command count | Unit of command (computing) | Counts and displays the number of input position commands. |
| Un0.30 | Real-time input position command counter | Unit of command (computing) | Displays the position command counter before it has been multiplied by the electronic gear score, independent of the servo's current state and control mode. |
| Un0.32 | U phase current sampling value | 0.01A | Servo motor phase current RMS value. |
| Un0.33 | V phase current sampling value | 0.01A | Servo motor phase current RMS value. |
| Un0.34 | This system power-up time record | s | Counts and displays the servo drive power-up time. |
| Un0.36 | Cumulative system power-up time | min | Counts and displays the cumulative drive power-up time. |
| Un0.38 | External Input Pulse Frequency | 0.1kHz | External input pulse frequency. |
| Un0.50 | Status monitoring parameter 1 | - | User-defined. |
| Un0.51 | Status monitoring parameter 2 | - | User-defined. |
| Un0.52 | Status monitoring parameter 3 | - | User-defined. |
| Un0.53 | Status monitoring parameter 4 | - | User-defined. |
| Un0.54 | Number of status monitoring parameters | - | Number of user-defined status monitoring parameters. |

## 4.2debugging software

See the Servo Drive Commissioning Software User's Manual.

# 5.Functional Description

## 5.1Basic Functions

### 5.1.1Manipulation of parameters

#### 5.1.1.1How to write parameters

Parameters are expressed as parameter group + parameter number. For example, for parameter F00.01, the parameter group is "F00", the parameter number is "01", and the display shows "F00.01". For read-only parameter, it starts with r, such as parameter r01.00, the display shows "r01.00".

Parameters can be written in two ways, as shown inFigure60 andFig.61 , as "Numerical value setting type" for setting values and "Function selection type" for selecting functions.

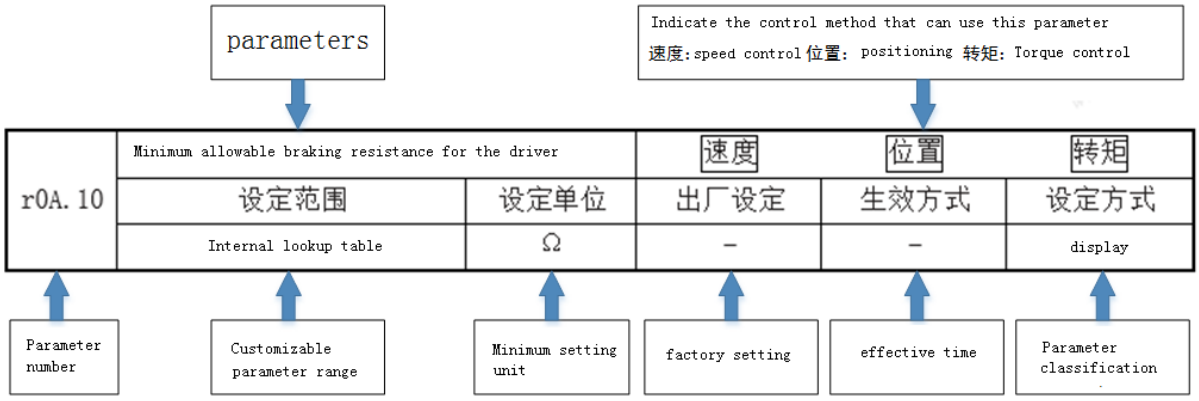



Figure60 Example of numerical setup parameters

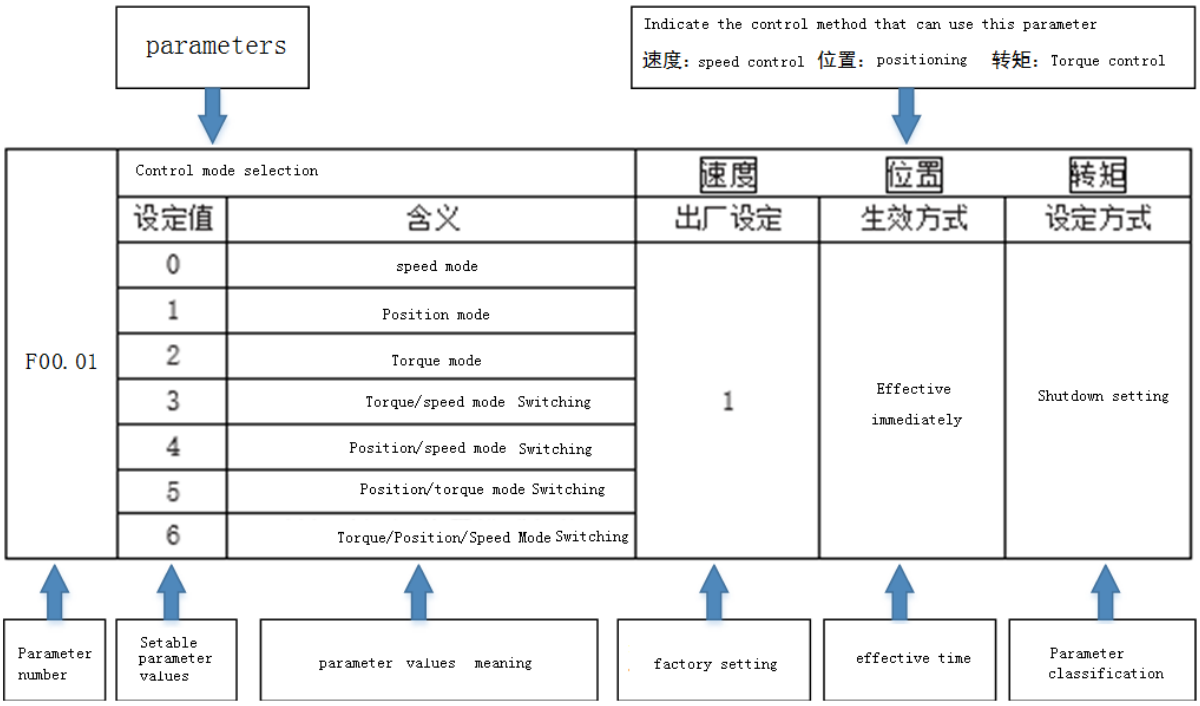



Fig.61 Function Selection Type Parameter Example

### 5.1.1.2Parameter setting method

Parameters can be set using the panel operator or the servo commissioning software ServoTools.

#### 5.1.1.2.1When using the panel operator

Use "∧" or "∨" key to modify parameter value. Press "∧" or "∨" key once, the current flashing bit value of the parameter will be increased or decreased by 1, press and hold "∧" or "∨" key, the value can be increased or decreased continuously. Press and hold "∧" or "∨", the value can be increased or decreased continuously. When the parameter value is modified, press and hold "S" key to return to the previous menu, that is, the modification is completed, and the modified value will be reflected in the control immediately (some parameters need to be saved and re-powered up to work).

##### 5.1.1.2.1.1Binary data setting

Take F01.1A (DI function force valid 1) as an example, force DI function 001-servo ON to be valid, set bit1=1, as shown inFigure44 .

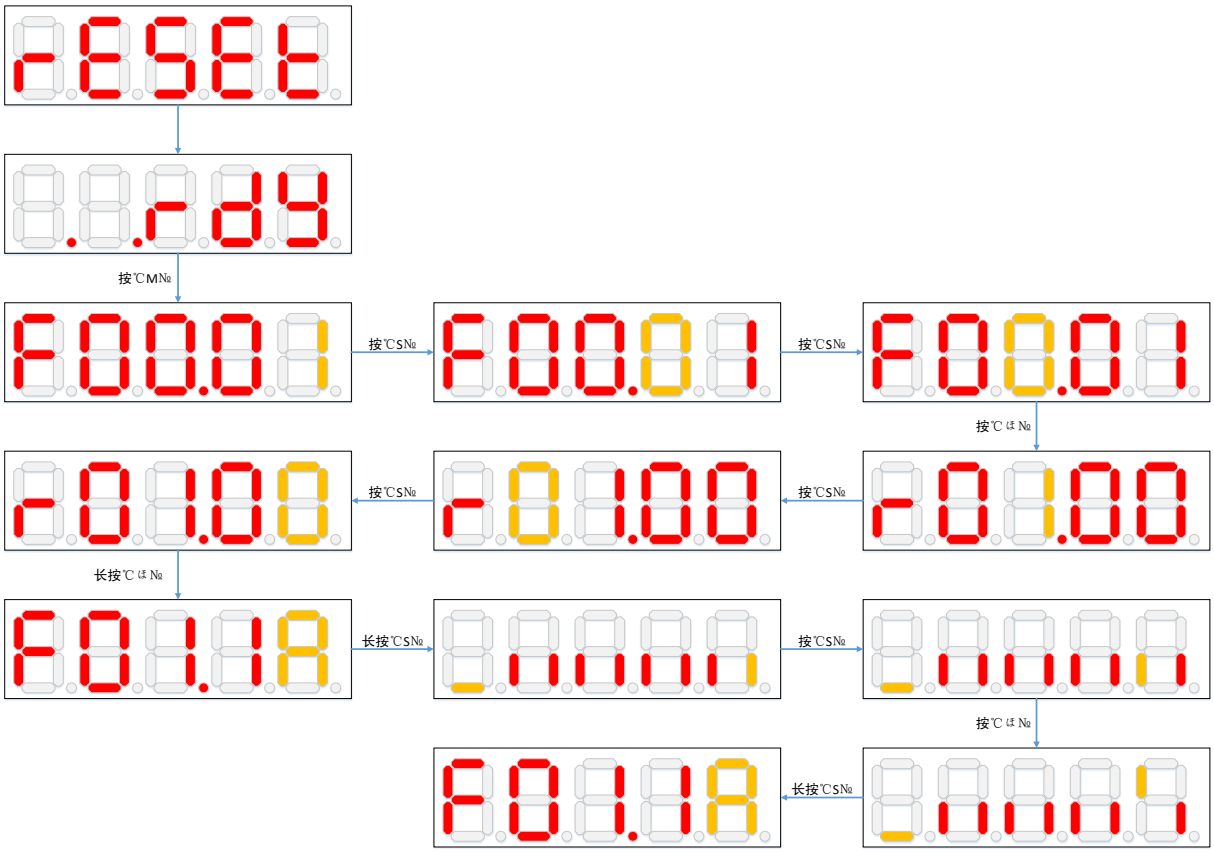



Figure62 Binary Data Setting Example

### 5.1.1.2.1.2Hexadecimal data setting

Take F01.03 (DI1 function planning) as an example, configure the DI1 function as fault and warning reset, falling edge valid, set F01.03=0x2002, and the setting will take effect immediately after it is completed, as shown inFigure63 .

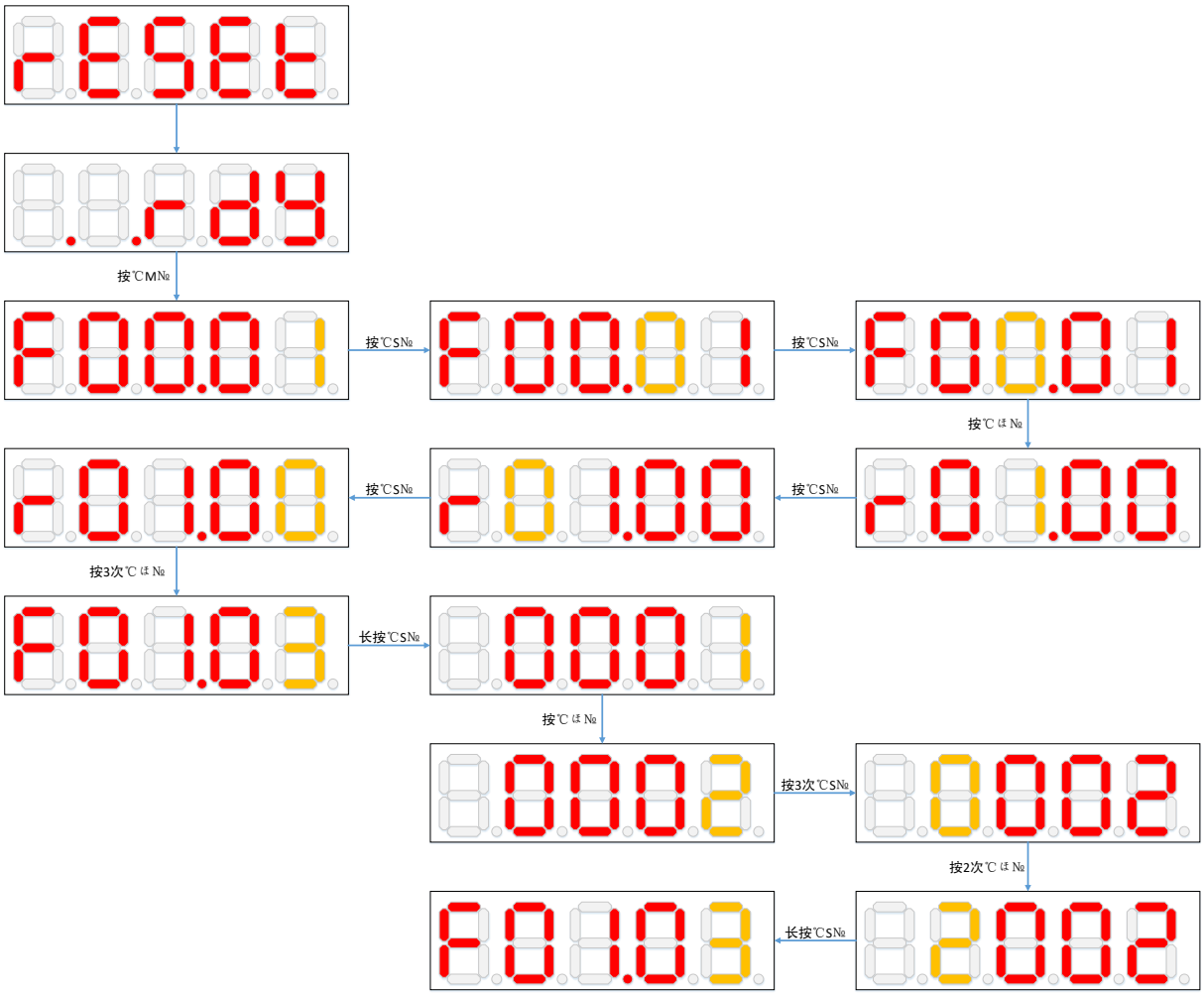



Figure63 Hexadecimal Data Setting Example

### 5.1.1.2.1.3Decimal data setting (unsigned 32-bit width)

Take F03.06 (electronic gear ratio 0: the number of pulses required for one motor revolution) as an example, set the number of pulse commands for one motor revolution to 1010001000, i.e., F03.06=1010001000, and note that this parameter can only be modified when the machine is stopped, as shown inFigure64 .

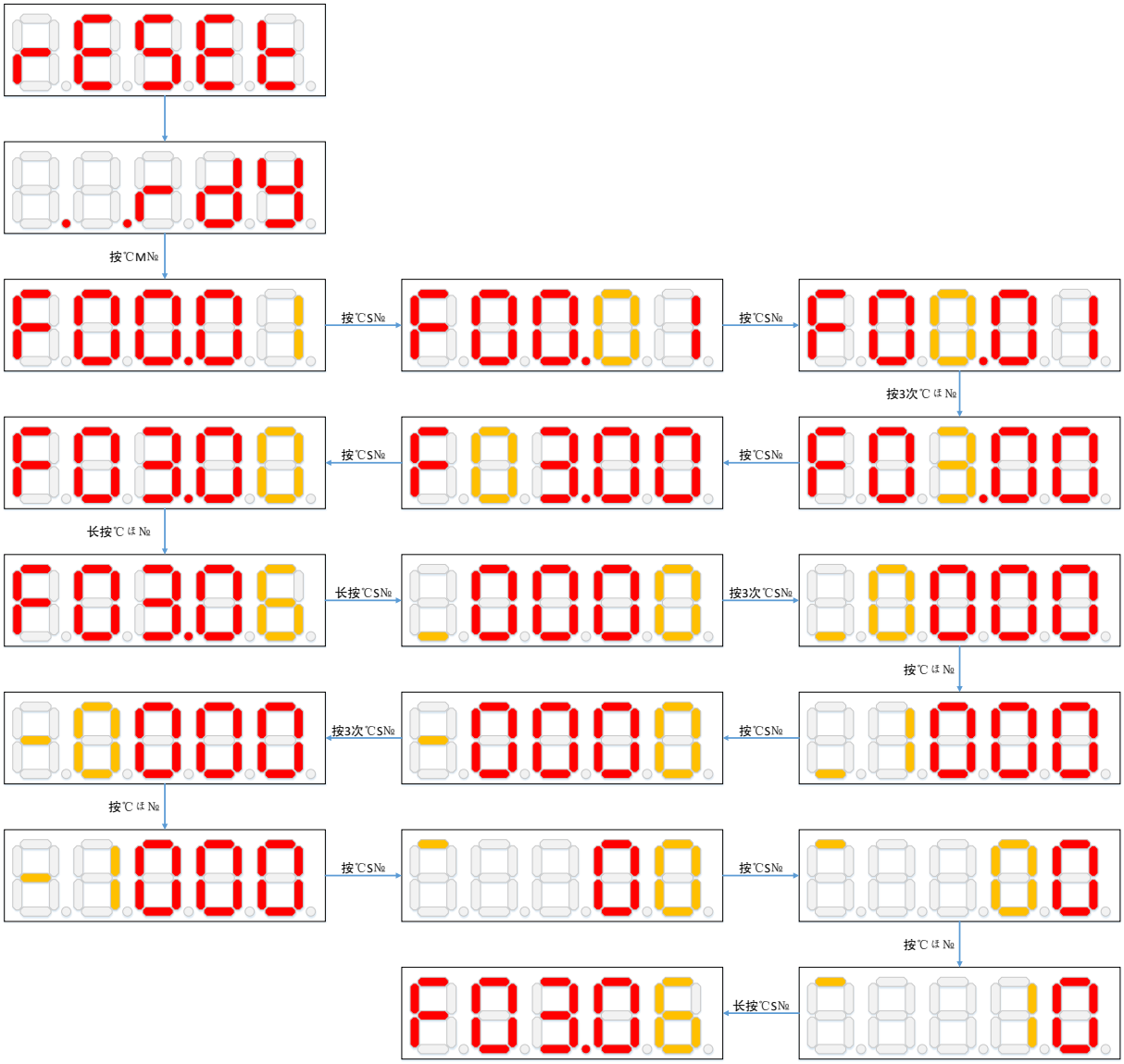



Figure64 Decimal Data Setting (Unsigned 32-bit Width) Example

### 5.1.1.2.1.4Decimal data setting (signed 32-bit width)

Take F03.22 (Mechanical Home Offset) as an example, set the offset position to -1010001000, i.e. F03.22=-1010001000, note that this parameter can only be modified by stopping the machine, as shown Figure65 .

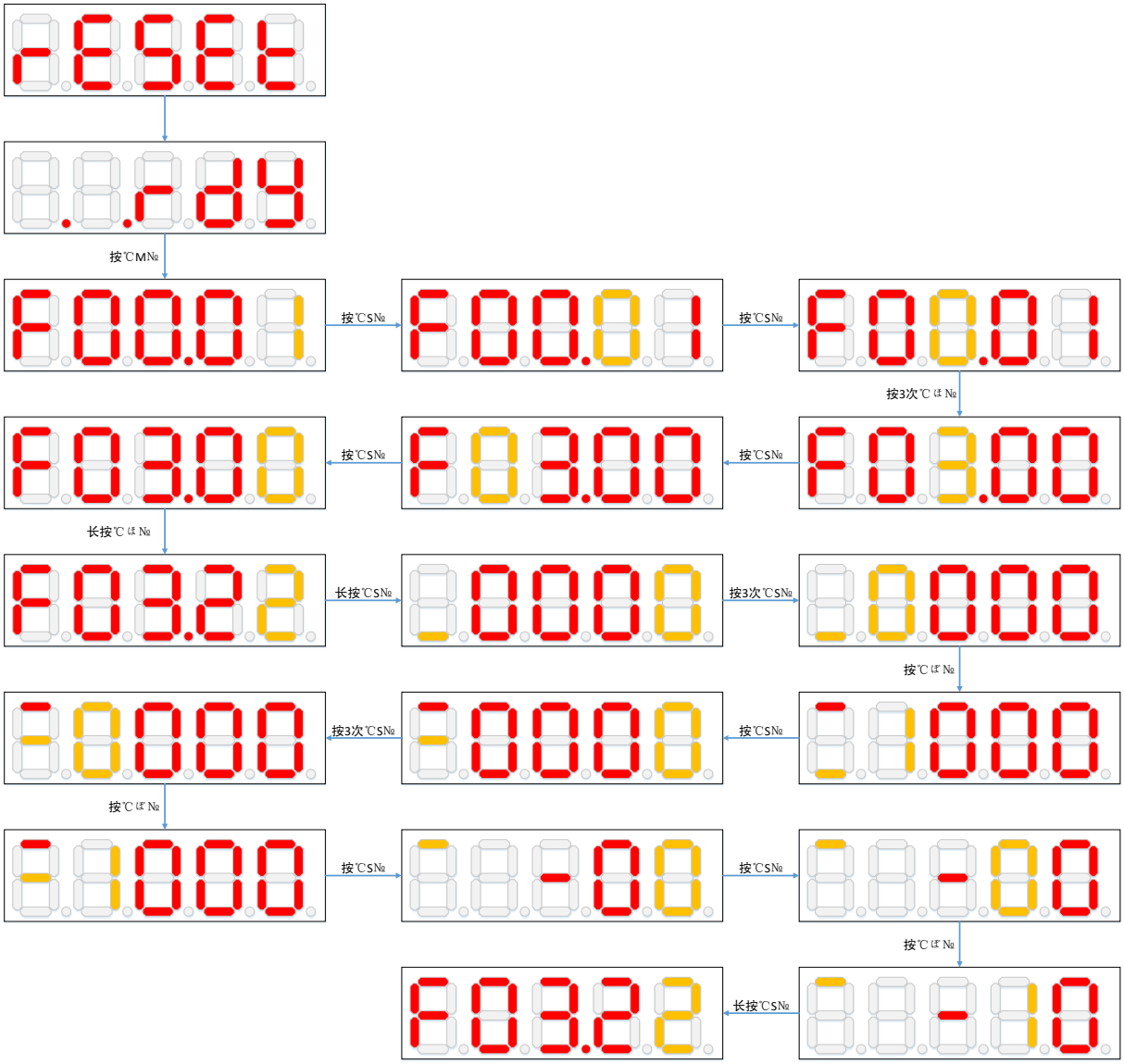



Figure65 Decimal Data Setting (Signed 32-bit Width) Example

### 5.1.1.2.2When using the servo commissioning software

See the Servo Drive Commissioning Software User's Manual.

### 5.1.1.3Initialization of parameter setting values

Restores the parameters to the functions used in the factory settings.

The P0b group parameters are not initialized by the execution of this function.

| | |
|---|---|
| CAUTION | ➢ Parameter set value initialization must be performed in the servo-off state. It cannot be executed in the servo-ON state.<br>➢ For the settings to take effect, the servo drive must be turned on again after operation. |

#### 5.1.1.3.1Pre-implementation confirmations

Be sure to check the following settings before initializing the parameter settings:

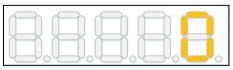
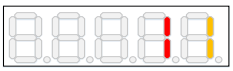
1) Must be in servo-off state.

#### 5.1.1.3.2procedure

##### 5.1.1.3.2.1When using the panel operator

The procedure for parameter initialization is described in Table15 .

Table15 Panel procedure for encoder initialization

| move | Panel display after operation | manipulate |
|---|---|---|
| 1 |  | Press the "M" key to switch to the auxiliary function mode "Fn0.00". |
| 2 |  | Press "∧" key to display "Fn0.07". |
| 3 |  | Press and hold down the "S" key to display "0". |
| 4 |  | Press "∧" to change the parameter to "11". |
| 5 |  | Press and hold down the "S" key, the drive will execute the parameter initialization, and "Fn0.08" will be displayed at the end of the process. |

##### 5.1.1.3.2.2When using the servo commissioning software

See the Servo Drive Commissioning Software User's Manual.

### 5.1.2Control mode selection

Servo drives are available with speed control, position control, torque control and hybrid control methods.

Setting is done by control mode selection (F00.01=X).

Table16 Control Method Selection

| Parameter Setting Value | Control method | Outline |
|---|---|---|
| 0 | Speed Mode | Controls the speed of a servo motor via an analog voltage speed command. It is suitable for the following occasions:<br>When controlling speed;<br>When position control is performed by constructing a position loop through the upper unit using the encoder divided pulse output of the servo driver. |

| | | |
|---|---|---|
| 1 | Position Mode | Controls the position of the machine by means of a pulse sequence position command. Position is controlled by the number of input pulses, and speed is controlled by the frequency of input pulses. Used in applications where positioning movements are required. |
| 2 | Torque mode | The output torque of the servomotor is controlled by an analog voltage torque command. This is used when the necessary torque is to be output (push action, etc.). |
| 3 | Torque/speed mode switching | Torque/speed modes can be combined. |
| 4 | Speed/position mode switching | Speed/position modes can be used in combination. |
| 5 | Position/torque mode switching | Position/torque modes can be combined. |
| 6 | Torque/speed/position mode switching | Torque/speed/position modes can be combined. |

### 5.1.3Motor Enable

The pin CN1-20 (DI1) is factory set as the motor enable signal. The pin function can be configured with parameters F01.03 to F01.0A (see section 8.2.2Group 01 Terminal Input Parameter ").

| | |
|---|---|
| PIE | ➢ Do not frequently switch the servo-ON signal without inputting a command.<br>➢ If the main circuit is energized when the internal servo enable is set to ON (F0C.00/Fn0.00=1) and a PLC command is input, the mechanical system may move unexpectedly, so be sure to take safety measures.<br>➢ If a resettable alarm occurs and the servo-off state is reached, the servo-on state is automatically restored by resetting the alarm. Note that if an alarm reset is performed with the servo-ON signal set to "1: Internal servo-ON", the servomotor or the mechanical system may move unexpectedly. |

### 5.1.4Motor rotation direction selection

The rotation direction of the servomotor can be switched with parameter F00.02 without changing the polarity (command direction) of the speed command or position command. In this case, while the direction of rotation

of the servomotor is changed, the polarity (phase relationship between phase A and phase B) of the encoder crossover pulse output and other output signals is not changed. Setting should be done according to the system requirements.

The factory-set "forward direction" is "counterclockwise rotation (CCW)" from the load side of the servomotor.

### 5.1.5Setting of overtravel

The over-travel prevention function of the servo unit is a safety function that causes the servo motor to be forced to stop by inputting a signal from a limit switch when the moving part of the machine exceeds the safe travel range.

The overtravel signals are the positive overtravel (P-OT) signal and the negative overtravel (N-OT) signal. the P-OT and N-OT signals are used to stop the machine by setting a limit switch at the required limit when the machine is started by the drive of the servomotor.

Since the overtravel function is not required for rotary applications such as circular tables and conveyors, the input signal wiring for overtravel is not required.

| | |
|---|---|
|  | ➢ To prevent accidents caused by poor contact or broken wires, use normally closed contacts for limit switches.<br>➢ When the servomotor is used as a vertical axis, the workpiece may fall because the BRK signal is turned ON (the holding brake is released) after entering the overtravel state. To prevent the workpiece from falling, set the servomotor so that it enters the zero lock state (F00.04=□□1□) after stopping.<br>➢ For other axes subject to external force, after entering the overtravel state, the motor changes to the base blocking state after stopping, and may be pushed back by external force on the loaded axis end. To prevent the servomotor from being pushed back by an external force, set so that the servomotor enters the zero-locked state after stopping (F00.04=□□1□). |

| | |
|---|---|
| PIE | ➢ When the servo motor is stopped due to overtravel during position control, the position deviation remains unchanged. To clear the position deviation, input a clear signal (CLR). |

#### 5.1.5.1Positive Overtravel (P-OT) signal setting

The pin CN1-19 (DI3) under the factory setting is the forward side overtravel signal. The pin function can be configured with parameters F01.03 to F01.0A (see section 8.2.2Group 01 Terminal Input Parameter ").

#### 5.1.5.2Reverse overtravel (N-OT) signal setting

The CN1-3 (DI4) pins under the factory setting are the reverse side overtravel signals. The pin function can be configured with parameters F01.03 to F01.0A (see section 8.2.2Group 01 Terminal Input Parameter ").

#### 5.1.5.3Method of stopping the motor when the over-travel prevention function is activated

The servomotor stopping method when the overtravel prevention function is operated is selected with F00.04 (stopping method selection), and the following three methods are available:

1) Free stop, stays free after stop;
2) Deceleration stop, position remains locked after stop; (factory setting)
3) Decelerates to stop and remains free after stopping.

##### 5.1.5.3.1Free stop, stays free after stopping

When F00.04 is set to "□□0□", the motor stops freely after an overtravel state occurs and remains free after stopping.

##### 5.1.5.3.2Deceleration stops, position remains locked after stopping

When F00.04 is set to "□□1□", the motor decelerates and stops when an overtravel condition occurs, and the position remains locked after stopping. F00.04 is set to "□□1□" at the factory.

The deceleration time of the deceleration stop is determined by F06.21.

##### 5.1.5.3.3Deceleration stops, remains free after stopping

When F00.04 is set to "□□2□", the motor decelerates and stops after an overtravel state occurs, and then remains free after stopping.

The deceleration time of the deceleration stop is determined by F06.21.

### 5.1.5.4overtravel warning function

The overtravel warning function is a function that detects an overtravel warning (A.90, A.91) after entering the overtravel state when the servo is turned ON. This function enables the servo unit to transmit the information that over-travel has been detected to the upper unit even when an over-travel signal is input momentarily. This function is effective only when the servo is ON. When the servo is OFF, an overtravel warning is not detected even if an overtravel state is entered.

| | |
|---|---|
| CAUTION | ➢ The overtravel warning function is only a warning detection action, and does not affect the stopping process of overtravel or the motion control action of the PLC unit. However, the motor has not reached the PLC commanded position, so check the PLC command. |

The timing for detecting warnings is shown inFigure66 .

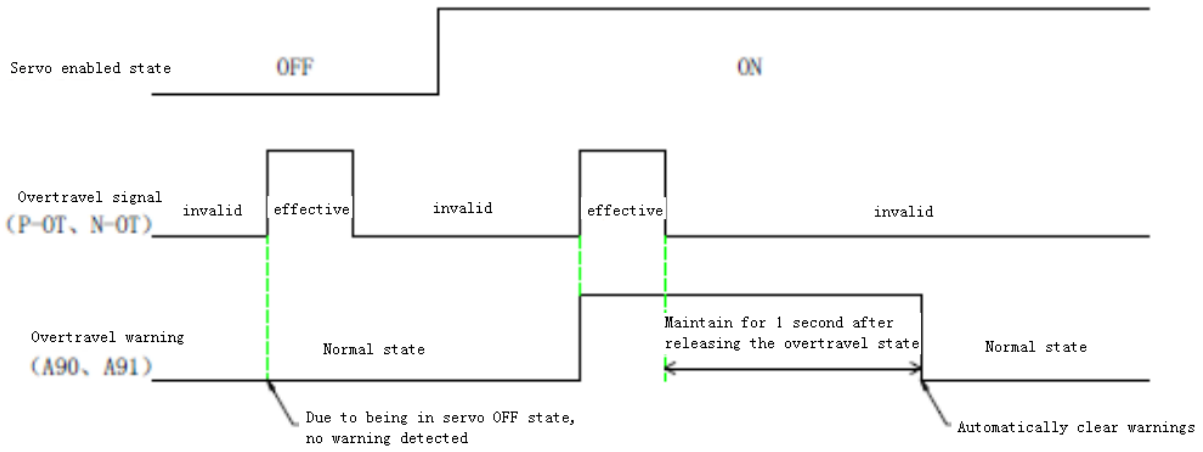



Figure66 Timing diagram for over-travel detection warning

| | |
|---|---|
| PIE | ➢ A warning will be detected for overtravel in the same direction as the instruction.<br>➢ A warning cannot be detected for overtravel in the opposite direction of the command.<br>➢ A warning is detected for overtravel in either the forward or reverse direction without a command.<br>➢ In the overtravel state, no warning is detected when the slave servo enable changes from the OFF state to the ON state. |

| | |
|---|---|
| | ➢ The over-travel status will remain as a warning for 1 second after it is lifted, and then it will clear automatically. |

### 5.1.6Setting of motor holding brake

A gate is a part that keeps the position of a servo unit fixed when the power supply to the unit is turned OFF, so that the movable part of the machine will not move due to self-weight or external force. The brake is built into the servomotor with the brake, so set it on the machine side.

Since the Z-axis direction has the gravity which will cause the mechanism to fall down, so the holding brake is more often used in the Z-axis direction. The use of a brake prevents the mechanism from falling down and prevents the servo motor from continuously exerting a large amount of force (if the servo is continuously exerting force, a large amount of heat will be generated, resulting in a reduction in the life of the motor). Electromagnetic grips can cause unwanted malfunctions and must be applied after the servo is turned off. The drive operates the holding brake by DO (BRK signal), the user can utilize F0A.07, F0A.08, F0A.09, F0A.0A, F0A.0B to set the relevant parameters.

Please use it in the situations shown inFig.67 .

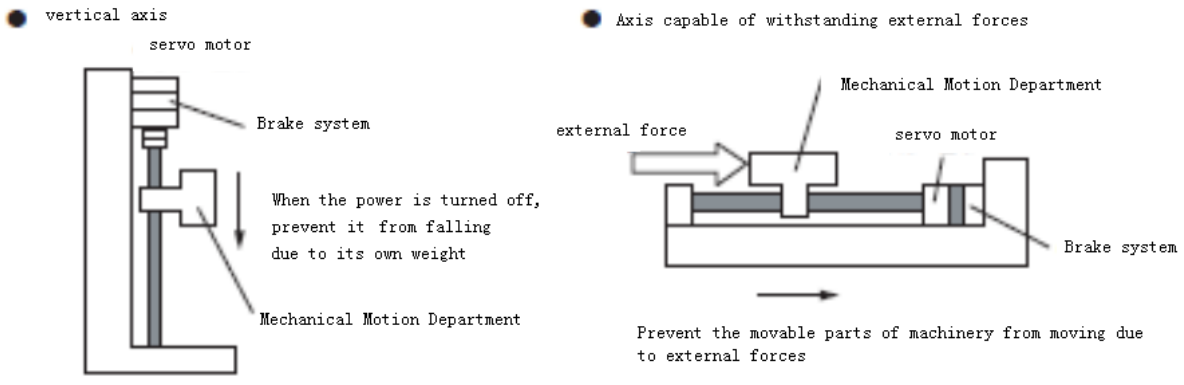



Fig.67 Where to use the brake

| | |
|---|---|
| CAUTION | ➢ The brake built into the servomotor is a fixed special brake with non-excited operation, and should not be used for braking. Use it only when the servomotor is stopped.<br>➢ The holding brake may click when the motor with the holding brake is running, functionally it has no |

| | |
|---|---|
| | effect.<br>➢ The holding brake requires an external 24V power supply, and the power supply for the intermediate relay can be used from the internal power supply of our driver.<br>➢ The work of the holding brake need to ensure that the input voltage of at least 21.5V, do not share the power supply with other electrical appliances, to prevent other electrical appliances lead to a reduction in the voltage or current, and ultimately lead to the holding of the holding brake do not act.<br>➢ When the holding brake coil is energized (holding brake open state), magnetic flux leakage may occur at the shaft end or other areas. Be careful when using instruments such as magnetic sensors in the vicinity of the motor. |

For servo motors with holding brake, you must configure 1 DO terminal of the servo driver as BRK (holding brake control output) and determine the valid logic for the DO terminal.

#### 5.1.6.1Control Timing of Holding Brake

According to the current state of the servo drive, the working sequence of the holding brake mechanism can be divided into the normal state holding brake sequence of the servo drive and the fault state holding brake sequence of the servo drive.

The normal state holding timing can be categorized into two cases: motor stationary and motor rotating:

1) Stationary: The actual motor speed is less than 20rpm.

2) Rotation: The actual speed of the motor reaches 20rpm and above.

##### 5.1.6.1.1Braking timing of servo motors at standstill

If the current motor speed is less than 20rpm when the servo enable is turned from ON to OFF, the driver will act according to the static holding brake timing sequence.

| | |
|---|---|
|  | ➢ After the holding brake output is set from OFF to ON, do not input position/speed/torque commands during the F0A.07 time, or commands will be lost or operation errors will occur.<br>➢ When used in the vertical axis, a slight movement of |

| | |
|---|---|
| | the mechanism may be caused by the self-weight of the mechanical moving part or external force. When the servo motor is stationary, servo enable OFF occurs and the holding brake output becomes OFF immediately, but the motor remains energized for the F0A.08 time to prevent the mechanical moving part from moving due to self-weight or external force. |

Considering the opening delay time and action delay time of the holding brake, the action time of the holding brake should be set according toFig.68 .

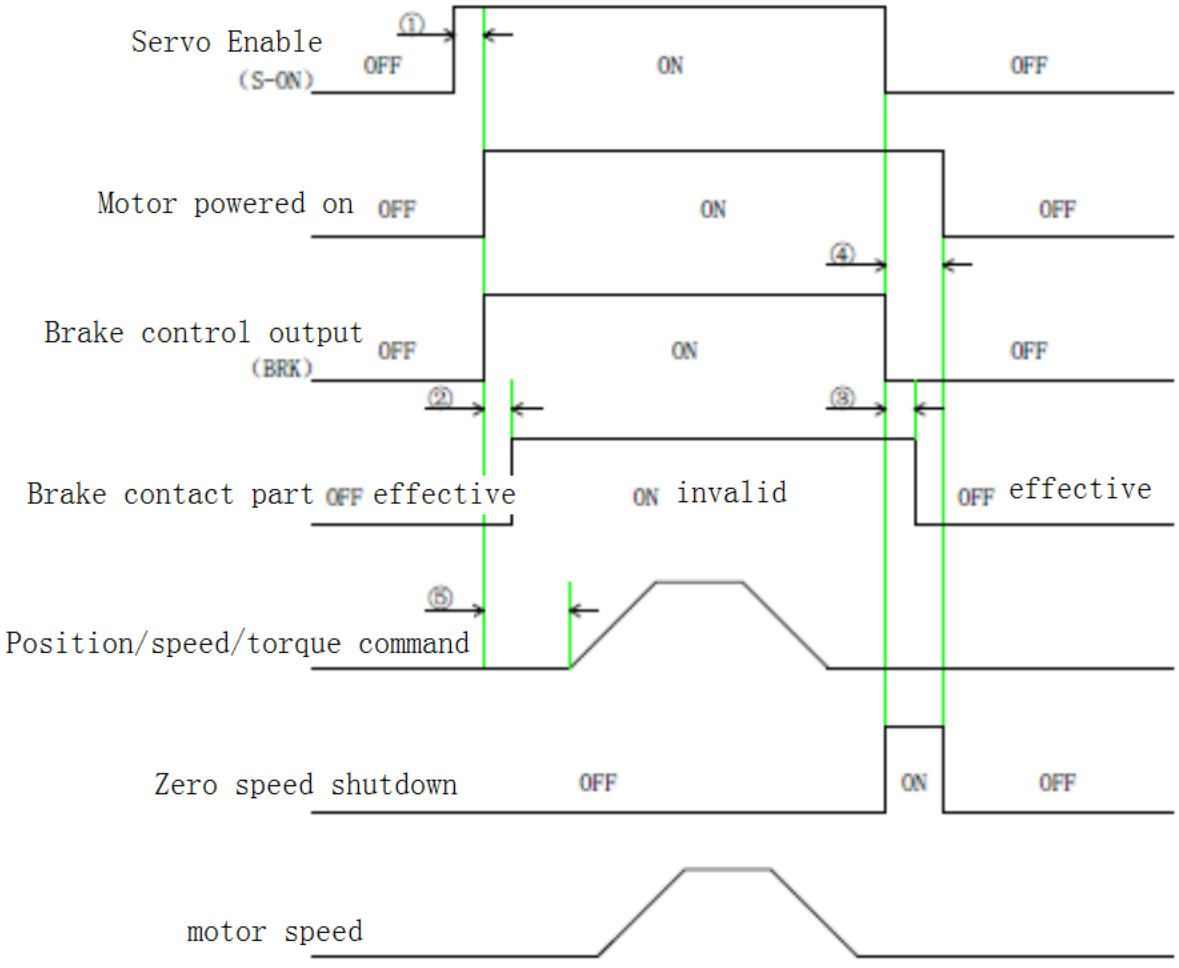



Fig.68 Control timing diagram of holding brake when servomotor is stationary

| | |
|---|---|
| PIE | ➢ When the servo is enabled ON, with a delay of about 100ms, the holding brake output is set ON and the motor enters the energized state at the same time.<br>➢ Refer to the motor specifications for the delay time for release of the holding brake contact.<br>➢ Refer to the motor specifications for the delay time for the holding brake contact to engage. |

| | |
|---|---|
| | ➢ When the servo motor is stationary (motor speed is lower than 20rpm), the holding brake output is set to OFF at the same time when the servo is enabled OFF, and the delay time for the motor to enter the non-energized state after the holding brake output is OFF can be set by F0A.08.<br>➢ Interval F0A.07 time or more from when the holding brake output is set to ON to when the command is input. |

### 5.1.6.1.2Holding brake timing during servo motor rotation

If the current motor speed is greater than or equal to 20rpm when the servo enable is turned from ON to OFF, the driver will act according to the rotary holding brake timing sequence.

| | |
|---|---|
| CAUTION | ➢ After the holding brake output is set from OFF to ON, do not input position/speed/torque commands during the F0A.07 time, or commands will be lost or operating errors will occur.<br>➢ Servo enable OFF occurs when the servomotor rotates and the servomotor enters the zero-speed stopping state, but the holding brake output needs to satisfy any of the following conditions before it is set to OFF:<br>a) The F0A.0A time has not expired, but the motor has decelerated to F0A.09.<br>b) The F0A.0A time has expired, but the motor speed is still higher than F0A.09.<br>➢ After the output of the holding brake changes from ON to OFF, the motor remains energized for a period of 50ms, preventing the mechanical moving part from moving due to self-weight or external force. |

Considering the opening delay time and action delay time of the holding brake, the action time of the holding brake should be set according toFig.69 .

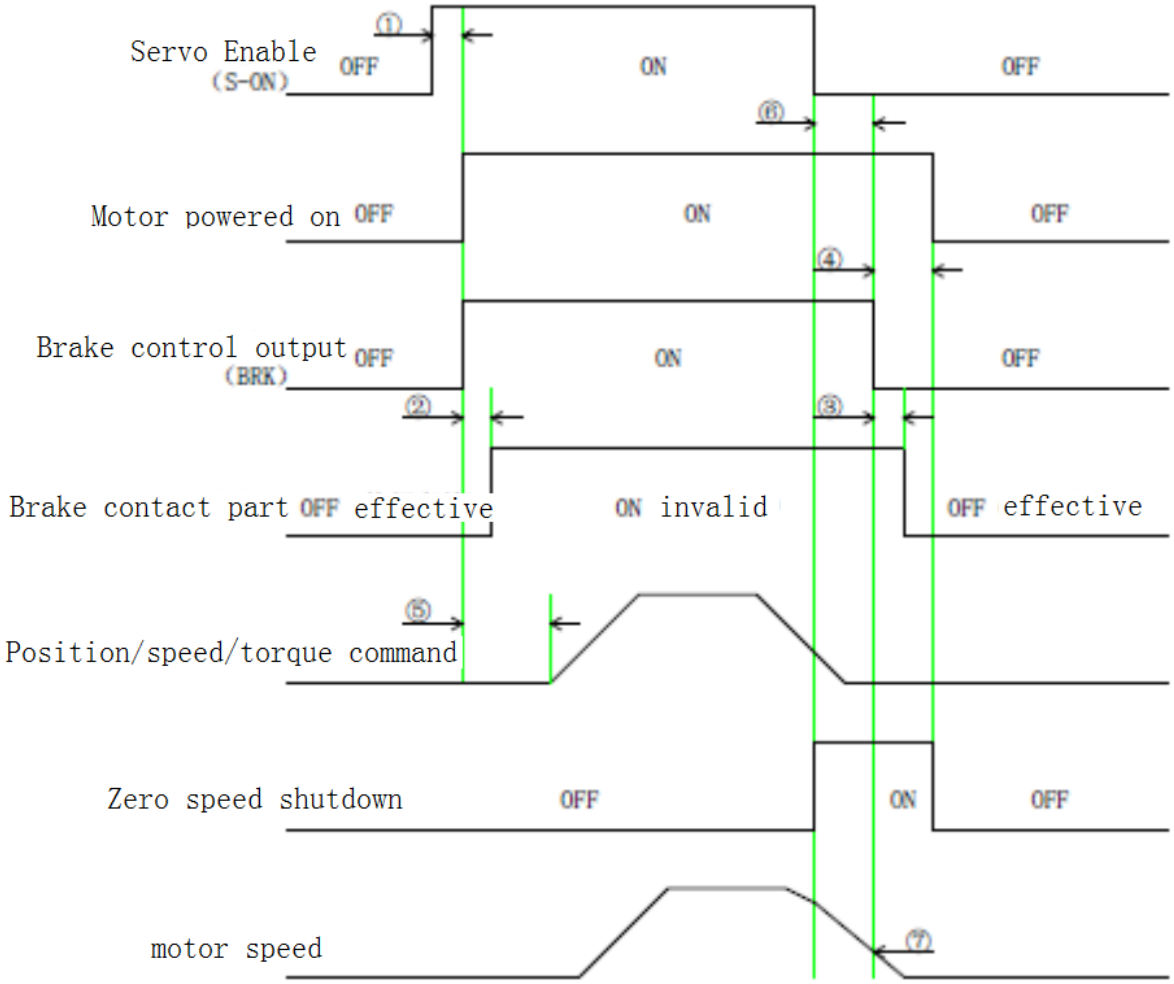



Fig.69 Control timing diagram of holding brake when servomotor rotates

PIE

- When the servo is enabled ON, with a delay of about 100ms, the holding brake output is set ON and the motor enters the energized state at the same time.
- Refer to the motor specifications for the delay time for release of the holding brake contact.
- Refer to the motor specifications for the delay time for the holding brake contact to engage.
- After the holding brake output changes from ON to OFF, the motor remains energized for the F0A.0b (factory setting 50ms) time.
- Interval F0A.07 time or more from when the holding brake output is set to ON to when the command is input.
- In the case of servo motor rotation, when the servo enable is OFF, the delay time of holding brake output OFF after the servo enable is OFF can be set by F0A.09 and F0A.0A.
- In the rotating state, the rotation speed threshold is set by F0A.09 when the holding brake output is OFF. F0A.09 is limited to the maximum speed of the servomotor

| | |
|---|---|
| | even if it is set to a value F06.02 that is greater than the maximum speed of the servomotor used. |

### 5.1.6.1.3Servo Drive Fault Condition Holding Sequence

Servo faults are categorized into Type 1 faults (Fault Level 1) and Type 2 faults (Fault Level 2) according to the method of stopping, see 0 9.Troubleshooting Instructions ". The servo drive fault status holding time sequence can be categorized into the following 2 cases:

1) Type 1 failure occurs

When a Type 1 fault occurs and the holding brake is enabled, the Type 1 fault stopping method is forced to be "free stop and keep free state". At this time, the servomotor first stops freely, and when the actual motor speed is less than 20 rpm, the holding brake DO output condition is the same as the "holding brake timing when the servomotor is stationary under the normal state of the servo driver", i.e., the holding brake output immediately becomes OFF, but the motor is not energized during the F0A.08 time.

2) Type 2 failure occurs

The brake DO output conditions are the same as those in the "Brake Timing for Servomotor Rotation under Normal Servo Driver Condition". In other words, any of the following conditions must be met for the brake output to be set to OFF:

a) The F0A.0A time has not expired, but the motor has decelerated to F0A.09.

b) The F0A.0A time has expired, but the motor speed is still higher than F0A.09.

### 5.1.6.2Brake control output (BRK) signal

Output signal to control the holding brake. The brake signal is not assigned at the factory. When the brake is used, change the setting for assigning the brake control output (BRK) signal.

When the servo is OFF or an alarm is detected, the BRK signal is OFF (brake operation). The time to actuate the brake (the time to turn the BRK signal OFF) is adjusted by the servo-off delay time.

| | |
|---|---|
| CAUTION | ➢ Signals other than the BRK signal are assigned to the output terminals at the factory. When assigning the BRK signal, unassign the original signal.<br>➢ In the overtravel state, the BRK signal remains ON and the brake remains disengaged. |

### 5.1.7servo stop

Depending on the type of stop, it can be categorized into free stop and deceleration stop, seeTable17 . Depending on the stopping state, they can be categorized as free-running and position-holding locked, seeTable18 .

Table17 Comparison of Downtime Methods

| Shutdown mode | Description of downtime | Shutdown characteristics |
|---|---|---|
| Freedom to stop | The servo motor is not energized and decelerates freely to 0. The deceleration time is affected by mechanical inertia and mechanical friction. | Smooth deceleration with low mechanical shock, but slow deceleration process. |
| deceleration stop | The servo drive outputs a reverse braking torque and the motor quickly decelerates to 0. | Rapid deceleration, there is a mechanical shock, but the deceleration process is fast. |

Table18 Comparison of Downtime Status

| downtime | Description of downtime status |
|---|---|
| Free-running state | After the motor stops rotating, the motor is not energized and the motor shaft can rotate freely. |
| Position Hold Lock | When the motor stops rotating, the motor shaft is locked and cannot rotate freely. |

Servo stops can be categorized into "servo-enable (S-ON) OFF stop", "malfunction stop", and "overtravel stop". The following describes each type of servo shutdown in detail.

#### 5.1.7.1Servo Enable (S-ON) OFF Shutdown

Set the servo enable DI terminal to be disabled.

Set F00.04 to "□□□□0", and when the servo enable (S-ON) is OFF, the servo stops freely and remains free after stopping.

Set F00.04 to "□□□□1", and when the servo enable (S-ON) is OFF, the servo decelerates and stops, and remains free after stopping.

#### 5.1.7.2malfunction stoppage

Depending on the type of fault, the servo stops in different ways. Refer to 0 9.Troubleshooting Instructions " for fault classification.

##### 5.1.7.2.1Type 1 failure occurs

Type 1 malfunction shutdown is forced to be a "free shutdown and remain free".

##### 5.1.7.2.2Type 2 failure occurs

By setting F00.04 to "0□□□□", the servo stops freely when a Type 2 fault occurs and remains free after the stop.

Setting F00.04 to "1□□□□□" causes the servo to decelerate and stop when a Type 2 fault occurs, and the servo remains free after stopping.

#### 5.1.7.3overtravel stop

Over-travel stop is a safety function in which the limit switch output level changes and the servo driver causes the servo motor to stop forcibly when the moving part of the machine exceeds the safe moving range.

For details of the over-travel stop method, see section 5.1.5.3Method of stopping the motor when the over-travel prevention function is activated ".

### 5.1.8Setting of regenerative resistance

A regenerative resistor is a resistor that consumes regenerative energy generated in the event of servomotor deceleration or the like.

When the torque and speed of the motor are in opposite directions, the energy is transferred from the motor side back into the drive, causing the bus voltage value to rise, and when it rises to the braking point, the energy can only be consumed through the braking resistor. At this point, the braking energy must be consumed according to the braking requirements, otherwise the servo drive will be damaged. The braking resistor can be

built-in or external. Built-in and external braking resistors cannot be used at the same time.

When connecting an external regenerative resistor, set F0A.15 (external braking resistor power) and F0A.16 (external braking resistor resistance).

For the selection of regenerative resistor, refer to Table5 Servo Drive Specifications ".

| | |
|---|---|
| WARNING | ➢ When connecting the external regeneration resistor, be sure to set the regeneration resistor parameters via F0A.15 and F0A.16. Otherwise, E.08 (regeneration overload alarm) will not be detected properly, which may result in damage to the external regeneration resistor, injury to personnel, and fire.<br>➢ When using an external braking resistor, make sure that the resistance value meets the minimum allowable resistance value limit.<br>➢ When selecting an external regenerative resistor, be sure to check that the capacity is appropriate. Failure to do so may result in injury and fire. |

The regeneration resistor capacity should be set to a value that matches the allowable capacity of the connected external regeneration resistor. The setting value varies depending on the cooling status of the external regenerative resistor.

1) In the self-cooling method (natural convection cooling): Set to a value of 20% or less of the regenerative resistance capacity (W).
2) In the case of the forced air cooling method: Set the value to 50% or less of the regenerative resistance capacity (W).

| | |
|---|---|
| PIE | ➢ When using an external regenerative resistor at the usual rated load rate, the temperature of the resistor will reach 200° C to 300° C, so be sure to reduce the rated value before using it. Please consult the manufacturer for the load characteristics of the resistor.<br>➢ For safety, it is recommended to use an external regenerative resistor with a temperature switch. |

### 5.1.8.1Relevant parameters

Table19 Braking Resistor Related Parameters

| | | | | |
|---|---|---|---|---|
| R0A.10 | Minimum permissible braking | Tempo | Placement | Torque |

| | | | | | |
|---|---|---|---|---|---|
| | resistance of the drive | | | | |
| | Setting range | set unit | Factory setting | Mode of entry into force | Setting method |
| | Internal checklist | Ω | - | - | demonstrate |
| F0A.11 | Built-in braking resistor power | | Tempo | Placement | Torque |
| | Setting range | set unit | Factory setting | Mode of entry into force | Setting method |
| | Internal checklist | W | - | - | demonstrate |
| F0A.12 | Built-in braking resistor resistance value | | Tempo | Placement | Torque |
| | Setting range | set unit | Factory setting | Mode of entry into force | Setting method |
| | Internal checklist | Ω | - | - | demonstrate |
| F0A.13 | Resistance Heat Time Constant | | Tempo | Placement | Torque |
| | Setting range | set unit | Factory setting | Mode of entry into force | Setting method |
| | 0 to 65535 | s | 200 | immediate effect | Shutdown Settings |
| F0A.14 | Braking resistor setting | | Tempo | Placement | Torque |
| | Setting range | set unit | Factory setting | Mode of entry into force | Setting method |
| | 0 to 3 | - | 0 | immediate effect | Shutdown Settings |
| F0A.15 | External braking resistor power | | Tempo | Placement | Torque |
| | Setting range | set unit | Factory setting | Mode of entry into force | Setting method |
| | 1 to 65535 | W | - | immediate effect | Shutdown Settings |
| F0A.16 | External braking resistor resistance value | | Tempo | Placement | Torque |
| | Setting range | set unit | Factory setting | Mode of entry into force | Setting method |
| | 1 to 1000 | Ω | - | immediate effect | Shutdown Settings |

### 5.1.8.2Braking Resistor Selection

The braking resistor selection process is shown inFigure70 .

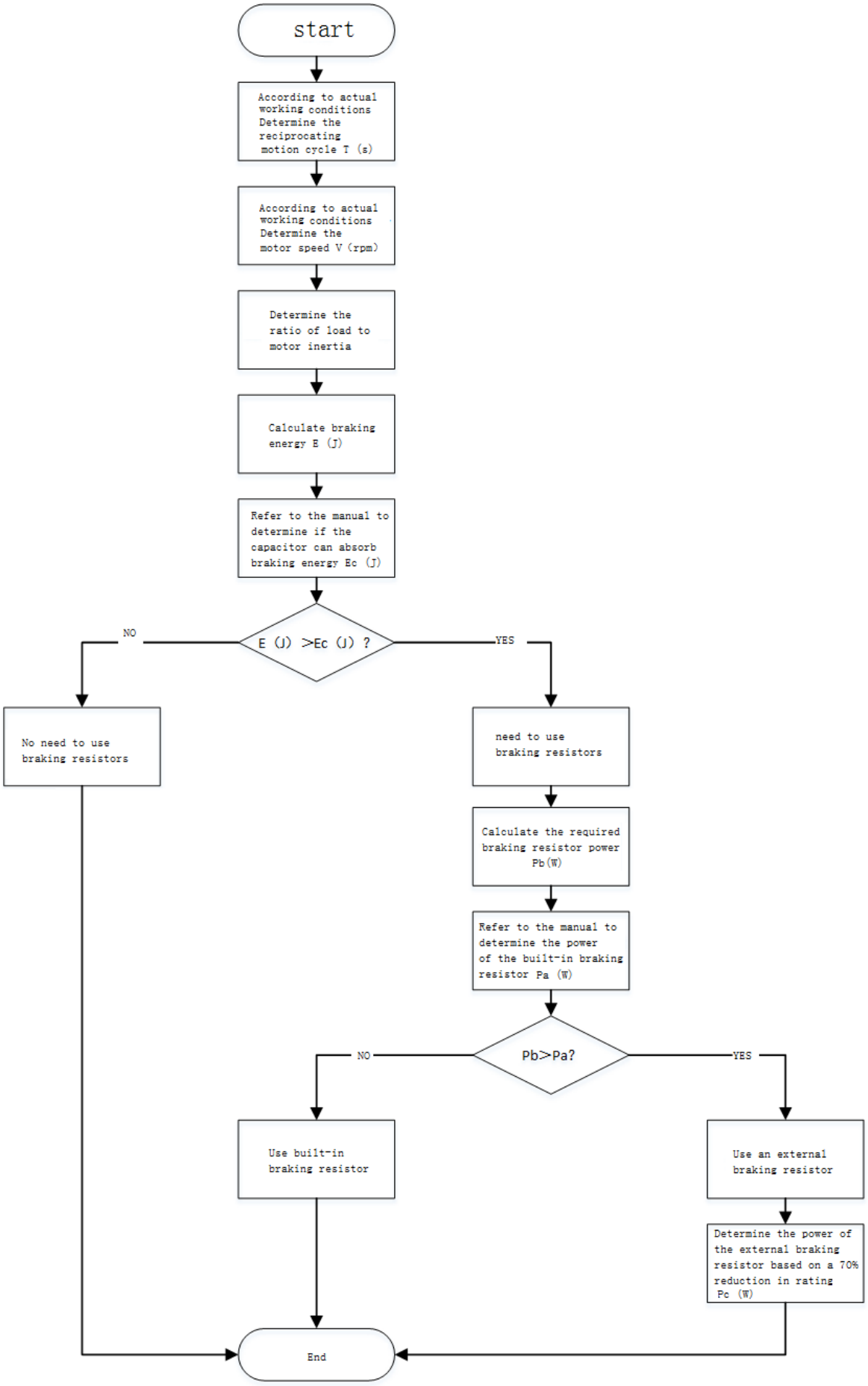

start
According to actual working conditions Determine the reciprocating motion cycle T (s)
According to actual working conditions Determine the motor speed V (rpm)
Determine the ratio of load to motor inertia
Calculate braking energy E (J)
Refer to the manual to determine if the capacitor can absorb braking energy Ec (J)
E (J) >Ec (J) ?
NO
YES
No need to use braking resistors
need to use braking resistors
Calculate the required braking resistor power Pb(W)
Refer to the manual to determine the power of the built-in braking resistor Pa (W)
Pb>Pa?
NO
YES
Use built-in braking resistor
Use an external braking resistor
Determine the power of the external braking resistor based on a 70% reduction in rating Pc (W)
End

Figure70 Braking Resistor Selection Flowchart

Here take the motor from 3000rpm to standstill as an example, the braking energy generated by the motor from no-load rated speed to standstill is$\mathbf{E_0}$ Joule, and assuming that the load inertia is$\mathbf{N}$ times the inertia of the motor, then when decelerating from 3000rpm to 0, the braking energy is$\mathbf{(N+1)\times E_0}$ . Excluding the energy absorbed by the capacitor$\mathbf{E_C}$ , the energy consumed by the required braking resistor is$\mathbf{(N+1)\times E_0 - E_C}$ . Assuming a reciprocating cycle of$\mathbf{T}$ , the braking resistor power required is$\mathbf{2\times[(N+1)\times E_0 - E_C]\div T}$ . Please refer to Table4 Data table of energy produced by a motor from no-load rated speed to standstill ". $\mathbf{E_C}$For the maximum braking energy that can be absorbed by the capacitor, please refer to Table5 Servo Drive Specifications ".

Take the motor SM1-O8B2A0R730-NDAM as an example, assuming that the reciprocating motion cycle$\mathbf{T=2s}$ , the maximum speed of 3000rpm, the load inertia for the motor inertia of 4 times, then the braking resistor power is required:

$$\boldsymbol{P_b = 2\times[(N+1)\times E_0 - E_C]\div T = 2\times[(4+1)\times 7.30 - 19.18]\div 2 = 17.32W}$$

It is smaller than the handling capacity of the built-in braking resistor$\boldsymbol{P_a = 25W}$ , therefore, it is possible to meet the requirements by using the built-in braking resistor.

If the load inertia in the above assumptions is changed from 4 times to 10 times, and other conditions remain unchanged, the braking resistor power is required:

$$\boldsymbol{P_b = 2\times[(N+1)\times E_0 - E_C]\div T = 2\times[(10+1)\times 7.30 - 19.18]\div 2 = 61.12W}$$

Greater than the power that can be handled by the built-in braking resistor$\boldsymbol{P_a = 25W}$ . Therefore, an external braking resistor is required. The recommended power of the external braking resistor is$\boldsymbol{P_r = P_b \div (1-70\%) = 204W}$ .

5.1.8.3parameterization

5.1.8.3.1When using an external braking resistor

$P_b > P_a$When the external braking resistor is connected, it is necessary to connect the external braking resistor. In this case, set F0A.14 to 1 or 2 depending on the cooling method of the braking resistor.

The external braking resistor should be used at 70% derating, i.e.:$P_r = P_b \div (1-70\%)$ and ensure that it is greater than the minimum resistance value allowed for the drive. Connect the two ends of the external braking resistor to "P" and "C" respectively, and remove the wires between terminals "P" and "D". Remove the wires between terminals "P" and "D".

Refer to section 3.2.2.2.3Cable Specifications " for the external braking resistor connection schematic and wire specifications to be used. Depending on the braking resistor cooling method, set F0A.14 to 1 or 2, and confirm and set F0A.15 and F0A.16.

When using an external braking resistor, F0A.13 (resistor thermal time constant) must be set according to the resistor heat dissipation conditions.

| | |
|---|---|
| PIE | ➢ When using an external regenerative resistor at the usual rated load rate, the temperature of the resistor will reach 200° C to 300° C, so be sure to reduce the rated value before using it. Please consult the manufacturer for the load characteristics of the resistor.<br>➢ For safety, it is recommended to use an external regenerative resistor with a temperature switch. |

5.1.8.3.2When using the built-in braking resistor

$P_b < P_a$and$E > E_C$ , the built-in braking resistor is required. In this case, set F0A.14 to 0.

The driver uses a built-in braking resistor, which needs to be connected directly between terminals "P" and "D" with a shorting tab.

5.1.8.3.3No need for braking resistors

$E < E_C$In this case, there is no need to connect a braking resistor, and the braking energy can be absorbed only by the bus capacitor. At this time, set F0A.14 to 3.

5.1.8.3.4There is external load torque and the motor is generating power

The direction of rotation of the motor is the same as the direction of rotation of the shaft, and the motor outputs energy to the outside. However, there are some special occasions when the motor torque output is opposite to the direction of rotation, at which time the motor performs negative work, and the external energy is fed back to the driver through the motor to generate electrical energy.

A common DC bus scheme is recommended when the load is in continuous generation.

Taking the motor SM1-08B2A0R730-NDAM (rated torque 2.39Nm) as an example, when the external load torque is 60% of the rated torque and the rotational speed reaches 1500rpm, the power returned to the drive is:

$$\mathbf{P} = (\mathbf{2.39} \times \mathbf{60\%}) \times (\mathbf{1500} \times \mathbf{2} \times \boldsymbol{\pi} \div \mathbf{60}) = \mathbf{225}\boldsymbol{W}$$

Considering that the braking resistor needs to be derated by 70%, the power of the external braking resistor is$\boldsymbol{P_r} = \mathbf{P} \div (\mathbf{1} - \mathbf{70\%}) = \mathbf{225} \div (\mathbf{1} - \mathbf{70\%}) = \mathbf{750W}$ , and the resistance value is 50Ω.

## 5.2Accessibility

### 5.2.1List of auxiliary functions

Auxiliary functions are functions related to the operation and adjustment of the Servomotor. Table20 lists the list of auxiliary functions.

Table20 List of Accessibility Features

| Serial number | Functionality | Panel operation | Using Servo Commissioning Software | References |
|---|---|---|---|---|
| F0E.0d | soft limit function | √ | See the Servo Drive Commissioning Software User's Manual | 0 |
| F0E.01 | Flying car protection | √ | | 0 |
| F0E.02 | Motor overload protection | √ | | 0 |
| F0E.03 | Motor blocking over-temperature protection | √ | | 0 |
| F0E.05 | Motor overspeed protection | √ | | 0 |
| r0F.00 | Alarm record display | √ | | 0 |
| Fn0.01 | JOG runs | √ | | 0 |

| | | | | |
|---|---|---|---|---|
| Fn0.02 | The program JOG runs | √ | | 0 |
| Fn0.03 | (math.) origin reversion | √ | | 0 |
| Fn0.04 | Gravity Compensation | √ | | 0 |
| Fn0.05 | software reset | √ | | 0 |
| Fn0.06 | fault reset | √ | | 0 |
| Fn0.07 | system initialization | √ | | 0 |
| Fn0.08 | Encoder initialization | √ | | 0 |
| Fn0.09 | Absolute encoder reset enable | √ | | 0 |
| Fn0.0A | External Input Pulse Count Display Clear | √ | | 0 |

### 5.2.2soft limit function

The limit position in the traditional hardware limit function can only be given by an external signal, and the external sensor signal is connected to the CN1 interface of the servo drive. The soft limit function refers to the internal position feedback of the servo drive to compare with the set limit value, when the limit value is exceeded, it will immediately alarm and execute the shutdown operation. This function can be used in both absolute position mode and incremental position mode, incremental position mode needs to set F0E.0d=2, after the servo drive is powered on, first carry out the home return to find the origin of the machine, and then enable the soft limit function.

F0E.0d=0 does not enable the soft limit function.

When F0E.0d=1, the servo drive enables the soft limit function immediately after power-on. When the absolute position counter (F0d.1C) is greater than F0E.0E A.90 warning occurs and positive overtravel stop is executed; when the absolute position counter (F0d.1C) is less than F0E.10 A.91 warning occurs and negative overtravel stop is executed.

When F0E.0d=2, the servo drive does not enable the soft limit before the home return after power-on, when the absolute position counter (F0d.1C) is greater than F0E.0E after the home return, A.90 warning occurs, and the positive overtravel stop is executed; when the absolute position counter (F0d.1C) is less than F0E.10 after the home return, A.91 warning occurs, and the positive overtravel stop is executed.

### 5.2.3Flying car protection function

The servo drive will cause the motor to fly in the following cases:

1) In torque control mode, the torque command direction is opposite to the speed feedback direction;
2) In position or speed control mode, the speed feedback is in the opposite direction of the speed command.

Enabling/disabling the flyer protection function can be selected by setting the flyer protection function selection (F0E.01).F0E.01 is normally left at the default value of 1 to enable the flyer protection function.

| | |
|---|---|
| CAUTION | ➢ Set the Flyer Protection Function Selection (F0E.01) carefully, otherwise motor or mechanical damage may result! |

### 5.2.4Motor overload protection function

When a servo motor is energized, it constantly generates heat due to the thermal effect of the current, and at the same time releases heat to the surroundings. When the heat generated exceeds the heat released, the temperature of the motor rises, and an excessively high temperature will cause the motor to burn out. Therefore, the servo drive needs to provide motor overload protection to prevent the motor from burning due to high temperature.

The time at which the motor overload fault (E.14) is reported can be adjusted by setting the motor overload protection gain (F0E.02).F0E.02 is normally left at the default value, but can be changed according to the actual motor heating when the following conditions occur:

1) Servo motors operate in high ambient temperatures.
2) Servo motor cyclic movement, and a single movement cycle is short, frequent acceleration and deceleration occasions.

| | |
|---|---|
| CAUTION | ➢ Set the motor overload protection gain (F0E.02) carefully, otherwise the motor will burn out! |

### 5.2.5Motor blocking over-temperature protection

The motor speed is almost zero when the servo motor is blocked, while the actual current is very high, at this time the motor is seriously heated! Servo motors have a certain blocking operation ability, but more than the allowable time, the motor will be burned due to high temperature. Therefore, the servo drive to provide motor blocking over-temperature protection function, to prevent the motor blocking over-temperature and burnt.

By setting the motor blocking over-temperature protection time window (F0E.04), you can change the time when the motor blocking over-temperature fault (E.15) is reported, and by F0E.03, you can set whether or not to turn on the motor blocking over-temperature protection, which is turned on by default.


- Use the motor blocking over-temperature protection shielding function with caution, or it will cause the motor to burn out!
- Please use a product-specific motor, otherwise there is a danger of short-circuit due to deterioration of insulation!

### 5.2.6Motor overspeed protection

Excessive servo motor speed will result in motor damage or mechanical damage. Therefore, the product realizes the purpose of preventing excessive motor speed by providing motor overspeed protection function.

By setting the motor overspeed protection percentage setting (F0E.05), you can adjust the time at which the motor overload fault (E.09) is reported.

When F0E.05 = 0, or F0E.05 > maximum motor speed (r0b.09) x 1.2, the overspeed fault threshold is r0b.09 x 1.2.

The overspeed fault threshold is F0E.05 when F0E.05 ≠ 0, or F0E.05 < r0b.09 × 1.2.

In addition to the flying car protection function, the servo drive in speed control mode and torque control mode can set the speed limit to protect the motor and machinery respectively.

| | |
|---|---|
| CAUTION | ➢ The servo drive also provides a fly-by protection function to prevent the motor from losing control and thus stalling.<br>➢ Use the flyer protection shielding function with caution. When in a vertical or towed load application situation, set H0A.12 to zero to shield the flyer fault detection. |

### 5.2.7Alarm Logging Display

The servo drive has a retrospective display function that can retrospectively display up to 3 alarm records that have occurred.

You can confirm the number of the alarm that occurred, the time stamp, and the system status information at the time of the failure.

Alarm logging information can be accessed through the Group 0F parameter.

### 5.2.8JOG runs

JOG operation is a function that drives a servomotor at a pre-set JOG speed (rotational speed) without connecting to an upper unit and confirms the servomotor operation.

| | |
|---|---|
| CAUTION | ➢ The overtravel prevention function is not effective during JOG operation. The operating range of the machine used must be considered while running. |

#### 5.2.8.1Pre-implementation confirmations

The following must be verified in advance before performing a JOG run:

1) The main circuit power shall be ON.
2) No alarms occurred.
3) Must be in servo-off state.
4) The JOG speed is set taking into account the operating range of the machine being used.

#### 5.2.8.2Relevant parameters

Set the JOG operating speed with the parameters listed in Table21 .

Table21 Parameters related to JOG operation

| F06.15 | Tap speed (JOG) | | tempo | placement | torque |
|---|---|---|---|---|---|
| | Setting range | set unit | Factory | Mode of | Setting |

| | | | | | |
|---|---|---|---|---|---|
| | | | setting | entry into force | method |
| | 0 to maximum operating speed | rpm | 100 | immediate effect | Operation Settings |
| F06.1F | Acceleration and deceleration mode | | tempo | | |
| | Setting range | set unit | Factory setting | Mode of entry into force | Setting method |
| | 0 to 2 | - | 0 | immediate effect | Shutdown Settings |
| F06.20 | acceleration time | | tempo | | |
| | Setting range | set unit | Factory setting | Mode of entry into force | Setting method |
| | 0 to 65535 | ms | 100 | immediate effect | Operation Settings |
| F06.21 | deceleration time | | tempo | | |
| | Setting range | set unit | Factory setting | Mode of entry into force | Setting method |
| | 0 to 65535 | ms | 100 | immediate effect | Operation Settings |
| F06.22 | Acceleration start S time | | tempo | | |
| | Setting range | set unit | Factory setting | Mode of entry into force | Setting method |
| | 1 to 3000 | ms | 30 | immediate effect | Operation Settings |
| F06.23 | Accelerated end S time | | tempo | | |
| | Setting range | set unit | Factory setting | Mode of entry into force | Setting method |
| | 1 to 3000 | ms | 30 | immediate effect | Operation Settings |
| F06.24 | Deceleration start S time | | tempo | | |
| | Setting range | set unit | Factory setting | Mode of entry into force | Setting method |
| | 1 to 3000 | ms | 30 | immediate effect | Operation Settings |
| F06.25 | Deceleration end S time | | tempo | | |
| | Setting range | set unit | Factory setting | Mode of entry into force | Setting method |
| | 1 to 3000 | ms | 30 | immediate effect | Operation Settings |

5.2.8.3procedure

### 5.2.8.3.1Panel operation

For the JOG operation procedure when the servomotor rotation direction is set to F00.02=0 (with the CCW direction as the positive rotation direction), seeTable22 .

Table22 Panel Operation Procedures for JOG Operation

| move | Panel display after operation | manipulate |
|---|---|---|
| 1 |  | Press the "M" key to switch to the auxiliary function mode "Fn0.00". |
| 2 |  | Press "∧" key to display "Fn0.01". |
| 3 |  | Press and hold down the "S" key, "JOG" will be displayed, and it will enter the servo ON (motor energized state). |
| 4 |  | Press "∧" key (forward rotation) or "∨" key (reverse rotation), during the key press, the servo motor rotates according to the speed set in F06.15. |
| 5 |  | Press the "M" key or long press the "S" key to return to the display of "Fn0.01" and enter the servo OFF (motor not energized) state. |

### 5.2.8.3.2Servo debugging tool operation

See the Servo Drive Commissioning Software User's Manual.

### 5.2.9The program JOG runs

Program JOG operation is a function that performs continuous operation with a pre-set operation mode (travel distance, travel speed, acceleration and deceleration time, waiting time, and number of moves).

This function is the same as JOG operation, and when set up without connecting to the upper unit, it is possible to confirm servomotor movements and perform simple positioning motions.

| | |
|---|---|
| PIE | ➢ Although program JOG operation is operation under position control, pulse commands input to the servo unit cannot be used.<br>➢ Functions that can be used by position control can be executed.<br>➢ The overtravel prevention function is in effect.<br>➢ The command pulse input multiplier switching function is invalid. |

### 5.2.9.1Pre-implementation confirmations

The following must be verified in advance before performing the program JOG run:

1) The main circuit power shall be ON.
2) No alarms occurred.
3) Must be in servo-off state.
4) Set the correct travel distance and travel speed, taking into account the operating range of the machine being used and the safe travel speed.
5) No overtravel has occurred.

### 5.2.9.2Relevant parameters

Table23 Parameters related to the operation of the program JOG

<table>
<tr><td rowspan="8">F03.3A</td><td colspan="2">Program JOG operation mode selection</td><td>Tempo</td><td>Placement</td><td>Torque</td></tr>
<tr><td>Setpoint</td><td>Hidden meaning</td><td>Factory setting</td><td>Mode of entry into force</td><td>Setting method</td></tr>
<tr><td>0</td><td>(Waiting time -> Positive transfer movement) * Number of movements</td><td rowspan="6">0</td><td rowspan="6">immediate effect</td><td rowspan="6">Operation Settings</td></tr>
<tr><td>1</td><td>(Waiting time -> reverse move) * number of moves</td></tr>
<tr><td>2</td><td>(Waiting time -> Positive transfer movement) * Number of movements<br>(Waiting time -> reverse move) * number of moves</td></tr>
<tr><td>3</td><td>(Waiting time -> reverse move) * number of moves<br>(Waiting time -> Positive transfer movement) * Number of movements</td></tr>
<tr><td>4</td><td>(wait time -> forward move -> wait time -> reverse move) * number of moves</td></tr>
<tr><td>5</td><td>(wait time -> reverse move -> wait time -> forward move) * number of moves</td></tr>
<tr><td rowspan="3">F03.3b</td><td colspan="2">Number of program JOG moves</td><td>Tempo</td><td>Placement</td><td>Torque</td></tr>
<tr><td colspan="2">Setting range</td><td>set unit</td><td>Factory setting</td><td>Mode of entry into force</td><td>Setting method</td></tr>
<tr><td colspan="2">1 to 9999 (always cycle)</td><td>-</td><td>1</td><td>immediate effect</td><td>Operation Settings</td></tr>
</table>

| | | | | | |
|---|---|---|---|---|---|
| 03.3C | Program JOG moving distance | | Tempo | Placement | Torque |
| | Setting range | set unit | Factory setting | Mode of entry into force | Setting method |
| | 1 to 1073741824 | unit of command (computing) | 32768 | immediate effect | Operation Settings |
| 03.3E | Program JOG movement speed | | Tempo | Placement | Torque |
| | Setting range | set unit | Factory setting | Mode of entry into force | Setting method |
| | 1 to 6000 | rpm | 500 | immediate effect | Operation Settings |
| 03.3F | Program JOG acceleration time | | Tempo | Placement | Torque |
| | Setting range | set unit | Factory setting | Mode of entry into force | Setting method |
| | 2 to 10000 | ms | 100 | immediate effect | Operation Settings |
| 03.40 | Program JOG Deceleration Time | | Tempo | Placement | Torque |
| | Setting range | set unit | Factory setting | Mode of entry into force | Setting method |
| | 2 to 10000 | ms | 100 | immediate effect | Operation Settings |
| 03.41 | Program JOG wait time | | Tempo | Placement | Torque |
| | Setting range | set unit | Factory setting | Mode of entry into force | Setting method |
| | 0 to 10000 | ms | 100 | immediate effect | Operation Settings |

## 5.2.9.3procedure

### 5.2.9.3.1Panel operation

The procedure for running the program JOG can be found atTable24 .

Table24 Panel operation steps for program JOG operation

| Move | Panel display after operation | Manipulate |
|---|---|---|
| 1 |  | Press the "M" key to switch to the auxiliary function mode "Fn0.00". |
| 2 |  | Press "∧" key to display "Fn0.02". |
| 3 |  | Press and hold down "S" key, "PJG" will be displayed, and it will enter servo ON (motor energized state). |

| | | |
|---|---|---|
| 4 |  | Press "∧" key to trigger PJOG operation and press "∨" key to release the last PJOG state after operation is finished. The specific operation parameters are determined by the relevant function codes from F03.3A to F03.41. |
| 5 |  | Press the "M" key or long press the "S" key to return to the display of "Fn0.02" and enter the servo OFF (motor not energized) state. |

### 5.2.9.3.2Servo debugging tool operation

See the Servo Drive Commissioning Software User's Manual.

## 5.2.10(math.) origin reversion

Home return is a function that determines the home position within 1 revolution and stops at that position.

This function is used when it is necessary to locate the home position within 1 turn and the home position of the machine.

| | |
|---|---|
| CAUTION | ➢ Perform the home return with the coupling uncoupled.<br>➢ The forward side overtravel (P-OT) signal and the reverse side overtravel (N-OT) signal are invalid when the home return is executed. |

### 5.2.10.1Pre-implementation confirmations

The following must be confirmed in advance before performing origin reversion:

1) The main circuit power shall be ON.

2) No alarms occurred.

3) Must be in servo-off state.

### 5.2.10.2Relevant parameters

Table25 Parameters related to origin reversion

| | | | | | |
|---|---|---|---|---|---|
| r03.1b | Home return enable control | | Placement | | |
| | Setpoint | Hidden meaning | Factory setting | Mode of entry into force | Setting method |
| | 0 | Home return not performed | 0 | Immediate effect | Operation Settings |
| | 1 | Normal return to zero successful | | | |
| | 2 | Electrical return to zero successful | | | |
| | 3 | Zeroing process timeout | | | |
| F03.1C | Home return enable control | | Placement | | |

| | Setpoint | Hidden meaning | Factory setting | Mode of entry into force | Setting method |
|---|---|---|---|---|---|
| | 0 | Close origin reversion | 0 | Immediate effect | Operation Settings |
| | 1 | Input the home return signal through DI to enable the home return function. | | | |
| | 2 | Enable the electrical zero function by inputting a home return signal via DI | | | |
| | 3 | Initiate home return immediately after power-up | | | |
| | 4 | Immediate origin reversion | | | |
| | 5 | Initiate the electrical return-to-zero command | | | |
| | 6 | Take the current position as the origin | | | |
| F03.1d | Home Reset Mode Signal Configuration | | Placement | | |
| | setpoint | Hidden meaning | Factory setting | Mode of entry into force | Setting method |
| | □□□0 | Deceleration point signal selection: Home switch | 0x0000 | Immediate effect | Shutdown Settings |
| | □□□1 | Deceleration point signal selection: Positive rotation limit position | | | |
| | □□□2 | Deceleration point signal selection: reverse limit position | | | |
| | □□□3 | Deceleration point signal selection: mechanical limit | | | |
| | □0□ | Home signal selection: Home switch | | | |
| | □□1□ | Home signal selection: positive rotation limit position | | | |
| | □□2□ | Origin Signal Selection: Reverse Limit Levels | | | |
| | □□3□ | Home signal selection: mechanical limit | | | |
| | □□4□ | Home signal selection: motor Z signal | | | |
| | □0□□ | Initial direction of motion: positive back to the origin | | | |
| | □1□□ | Initial direction of motion: reverse back to the origin | | | |
| | 0□□□ | The origin completes the | | | |

| | | | | | |
|---|---|---|---|---|---|
| | | stopping edge: the leading edge | | | |
| | 1□□□ | Home completion stop edge: back edge | | | |
| F03.1E | High-speed search origin speed | | Placement | | |
| | Setting range | Set unit | Factory setting | Mode of entry into force | Setting method |
| | 1 to 3000 | Rpm | 100 | Immediate effect | Operation Settings |
| F03.1F | Low search origin speed | | Placement | | |
| | Setting range | Set unit | Factory setting | Mode of entry into force | Setting method |
| | 1 to 1000 | rpm | 10 | immediate effect | Operation Settings |
| F03.20 | Acceleration and deceleration times when searching for the origin | | Placement | | |
| | Setting range | Set unit | Factory setting | Mode of entry into force | Setting method |
| | 0 to 1000 | MS | 100 | immediate effect | Shutdown Settings |
| F03.21 | Limit the time to find the origin | | Placement | | |
| | Setting range | Set unit | Factory setting | Mode of entry into force | Setting method |
| | 0.01 to 600.00 | S | 2000 | Immediate effect | Shutdown Settings |
| F03.22 | Mechanical Home Offset | | Placement | | |
| | Setting range | Set unit | Factory setting | Mode of entry into force | Setting method |
| | -1073741824 to 1073741824 | unit of command (computing) | 0 | Immediate effect | Shutdown Settings |

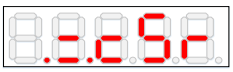
### 5.2.10.3procedure

#### 5.2.10.3.1Panel operation

The procedure for origin reversion is described in Table26 .

Table26 Panel Operation Procedure of Home Return

| Move | Panel display after operation | Manipulate |
|---|---|---|
| 1 |  | Press the "M" key to switch to the auxiliary function mode "Fn0.00". |

| Move | Panel display after operation | Manipulate |
|---|---|---|
| 2 |  | Press "∧" key to display "Fn0.03". |
| 3 |  | Press and hold down the "S" key, "PJG" will be displayed, and it will enter the servo ON (motor energized state). |
| 4 |  | Press "∧" key or "∨" key for forward/reverse home return. The home return related setting is determined by F03.1C to F03.22 related function codes. |
| 5 |  | Press the "M" key or long press the "S" key to return to the display of "Fn0.03" and enter the servo OFF (motor not energized) state. |

### 5.2.10.3.2Servo debugging tool operation

See the Servo Drive Commissioning Software User's Manual.

## 5.2.11Gravity Compensation

The gravity compensation function is a function that prevents the movable part from falling due to mechanical self-weight when the brake is opened when the servomotor is used as a vertical axis.

### 5.2.11.1Relevant parameters

Table27 Parameters related to gravity compensation

| F0E.16 | Holding brake gravity load detection value | | Tempo | Placement | Torque |
|---|---|---|---|---|---|
| | Setting range | Set unit | Factory setting | Mode of entry into force | Setting method |
| | 0 to 3000 | 0.1% | 300 | Immediate effect | Operation Settings |

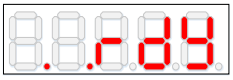
### 5.2.11.2procedure

#### 5.2.11.2.1Panel operation

The procedure for gravity compensation can be found atTable28 .

Table28 Panel Operation Procedure for Gravity Compensation

| Move | Panel display after operation | Manipulate |
|---|---|---|
| 1 |  | Press the "M" key to switch to the auxiliary function mode "Fn0.00". |
| 2 |  | Press "∧" key to display "Fn0.04". |
| 3 |  | Press and hold the "S" key for gravity load detection (this mode cannot be entered when the holding brake is not assigned) |

| | | |
|---|---|---|
| 4 |  | The display shows "xxrun" at the end of the test. |
| 5 |  | After a delay of 0A.0b automatically exit this mode and view the holding brake gravity load detection value at F0E.16. |

### 5.2.11.2.2Servo debugging tool operation

See the Servo Drive Commissioning Software User's Manual.

## 5.2.12software reset

This is a function to reset the servo driver internally by software. This function is used to change parameter settings and reset alarms that require the power to be turned back on. In addition, settings can be made effective without having to turn the power back on.

| | |
|---|---|
| PIE | ➢ Be sure to check that the servo is OFF and the servo motor is stopped before operating this function.<br>➢ This function resets the servo unit without the upper unit. Be sure to confirm that the interlock with the upper unit is released.<br>➢ This function is handled in the same way as when the power is turned on, and the servo unit will output the servo alarm output (ALM) signal, and other output signals may be forcibly changed.<br>➢ When this function is executed, the servo unit does not respond for about 5 seconds. |

### 5.2.12.1Pre-implementation confirmations

Before performing a software reset, be sure to confirm that you are in the following state:

1) Must be in servo-off state.

2) Motor stop in progress.

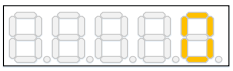
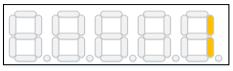
### 5.2.12.2procedure

#### 5.2.12.2.1Panel operation

The procedure for a software reset is described in Table29 .

Table29 Panel Procedure for Software Reset

| Move | Panel display after operation | Manipulate |
|---|---|---|
| 1 |  | Press the "M" key to switch to the auxiliary function mode "Fn0.00". |

| | | |
|---|---|---|
| 2 |  | Press "∧" key to display "Fn0.05". |
| 3 |  | Press and hold down the "S" key to display "0". |
| 4 |  | Press "∧" to change the parameter to "1". |
| 5 |  | Press and hold the "S" key, the drive will reboot automatically and display ". .rdy". |

### 5.2.12.2.2Servo debugging tool operation

See the Servo Drive Commissioning Software User's Manual.

### 5.2.13fault reset

For resettable faults, in the servo non-running state, after the cause of the fault is removed, you can enable the fault reset function to cause the drive to stop the fault display and enter the " . .rdy" state.

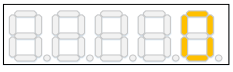
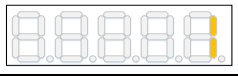
| | |
|---|---|
| PIE | ➢ For some malfunctions or warnings, the cause must be eliminated by changing the settings before they can be reset, but a reset does not mean that the changes take effect.<br>➢ For changes that need to be re-powered to take effect, the power must be re-powered.<br>➢ Servo enable must be turned off for changes that require a shutdown to take effect. The servo drive will not operate normally until the change takes effect. |

### 5.2.13.1procedure

#### 5.2.13.1.1Panel operation

The procedure for fault reset is described in Table30 .

Table30 Panel procedure for fault reset

| Move | Panel display after operation | Manipulate |
|---|---|---|
| 1 |  | Press the "M" key to switch to the auxiliary function mode "Fn0.00". |
| 2 |  | Press "∧" key to display "Fn0.06". |
| 3 |  | Press and hold down the "S" key to display "0". |
| 4 |  | Press "∧" to change the parameter to "1". |
| 5 |  | Press and hold down the "S" key, the drive clears the resettable faults and alarms, and displays "Fn0.06" when finished. |

### 5.2.13.1.2Servo debugging tool operation

See the Servo Drive Commissioning Software User's Manual.

### 5.2.14system initialization

Restores the parameters to the functions used in the factory settings.

| | |
|---|---|
| PIE | ➢ For the setting to take effect, the power to the servo unit must be turned on again after operation. |

### 5.2.14.1Pre-implementation confirmations

Before performing a software reset, be sure to confirm that you are in the following state:

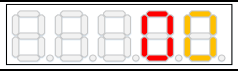
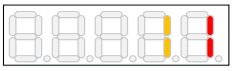
1) Must be in servo-off state.

### 5.2.14.2procedure

### 5.2.14.2.1Panel operation

The procedure for system initialization is described in Table31 .

Table31 Panel Operation Procedures for System Initialization

| Move | Panel display after operation | Manipulate |
|---|---|---|
| 1 |  | Press the "M" key to switch to the auxiliary function mode "Fn0.00". |
| 2 |  | Press "∧" key to display "Fn0.07". |
| 3 |  | Press and hold down the "S" key to display "00". |
| 4 |  | Press "∧" key and "S" key to change the parameter to "11". |
| 5 |  | Press and hold down the "S" key, the drive performs system initialization and displays "EbUSy". |
| 6 |  | When the drive system initialization is completed, "Fn0.07" is displayed. |

### 5.2.14.2.2Servo debugging tool operation

See the Servo Drive Commissioning Software User's Manual.

### 5.2.15Encoder initialization

Write a check code to the motor encoder ROM.

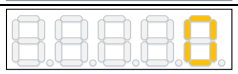
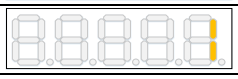
| | |
|---|---|
| CAUTION | ➢ Before initializing the encoder, be sure to confirm that the servo driver is compatible with the servo motor. |

### 5.2.15.1procedure

#### 5.2.15.1.1Panel operation

The procedure for initializing the encoder can be found atTable32 .

Table32 Panel procedure for encoder initialization

| Move | Panel display after operation | Manipulate |
|---|---|---|
| 1 |  | Press the "M" key to switch to the auxiliary function mode "Fn0.00". |
| 2 |  | Press "∧" key to display "Fn0.08". |
| 3 |  | Press and hold down the "S" key to display "0". |
| 4 |  | Press "∧" to change the parameter to "1". |
| 5 |  | Press and hold down the "S" key, the driver executes the encoder initialization and displays "Fn0.08" after the completion. |

#### 5.2.15.1.2Servo debugging tool operation

See the Servo Drive Commissioning Software User's Manual.

### 5.2.16Absolute encoder reset enable

Systems using absolute encoders require initialization of the rotation data when they are put into operation. Therefore, when initialization is required, such as when the power is turned on for the first time, an alarm related to the absolute encoder occurs (E.26). When the absolute encoder is set (initialized) and the rotation data is initialized, the alarms related to the absolute encoder will be cleared.

In the following cases, enable reset for the absolute encoder.

1) When E.24 (Absolute encoder communication CRC check error) occurs;
2) When the rotation data of the absolute encoder needs to be initialized;
3) When the system is first put into operation;
4) After replacing the servo motor.

| | |
|---|---|
| CAUTION | ➢ After setting the absolute encoder, the rotation data is the value within -2 to +2 revolutions. The reference position of the mechanical system may change, so make sure that the reference position of the upper unit is positioned after setting.<br>➢ If the machinery is operated directly without positioning the upper unit, unexpected movements may occur, resulting in injury to personnel or damage to the machinery.<br>➢ E.24 (Absolute encoder communication CRC check error) cannot be deactivated by the servo unit's fault and warning reset input (ERRST) signal. Therefore, be sure to reset enable the absolute encoder. |

### 5.2.16.1Pre-implementation confirmations

Before executing the absolute encoder reset enable, be sure to confirm that the following states are present:

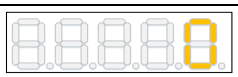
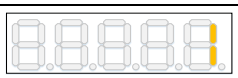
1) Must be in servo-off state.

### 5.2.16.2procedure

#### 5.2.16.2.1Panel operation

The procedure for reset enable of the absolute encoder is described in Table33 .

Table33 Panel operation steps for absolute encoder reset enable

| Move | Panel display after operation | Manipulate |
|---|---|---|
| 1 |  | Press the "M" key to switch to the auxiliary function mode "Fn0.00". |
| 2 |  | Press "∧" key to display "Fn0.09". |
| 3 |  | Press and hold down the "S" key to display "0". |
| 4 |  | Press "∧" to change the parameter to "1". |
| 5 |  | Press and hold down the "S" key, the driver executes the absolute encoder reset enable, and displays "Fn0.09" when finished. |

#### 5.2.16.2.2Servo debugging tool operation

See the Servo Drive Commissioning Software User's Manual.

### 5.2.17External input pulse count clear

This function zeroes the external input pulse command count (r0d.2C) received by the drive.

### 5.2.17.1Pre-implementation confirmations

Before performing external input pulse count clearing, be sure to confirm that the following states are in effect:

1) Must be in servo-off state.

### 5.2.17.2Relevant parameters

Table34 Parameters related to external input pulse count clearing

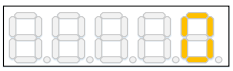
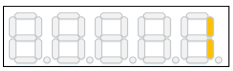
| | | | | | |
|---|---|---|---|---|---|
| r0d.2C | External Input Pulse Command Count | | | | |
| | Setting range | Set unit | Factory setting | Mode of entry into force | Setting method |
| | -2147483648 to 2147483647 | unit of command (computing) | - | - | Demonstrate |

### 5.2.17.3procedure

#### 5.2.17.3.1Panel operation

The procedure for zeroing the external input pulse count is described in Table35 .

Table35 Panel Operation Procedure for Zeroing External Input Pulse Counts

| Move | Panel display after operation | Manipulate |
|---|---|---|
| 1 |  | Press the "M" key to switch to the auxiliary function mode "Fn0.00". |
| 2 |  | Press "∧" key to display "Fn0.0A". |
| 3 |  | Press and hold down the "S" key to display "0". |
| 4 |  | Press "∧" to change the parameter to "1". |
| 5 |  | Press and hold down the "S" key, the driver will execute the external input pulse counting to clear the zero, and display "Fn0.0A" at the end of the process. |

#### 5.2.17.3.2Servo debugging tool operation

See the Servo Drive Commissioning Software User's Manual.

# 6. Test run

## 6.1Trial run process

The flow of the trial run is shown inFigure71 .

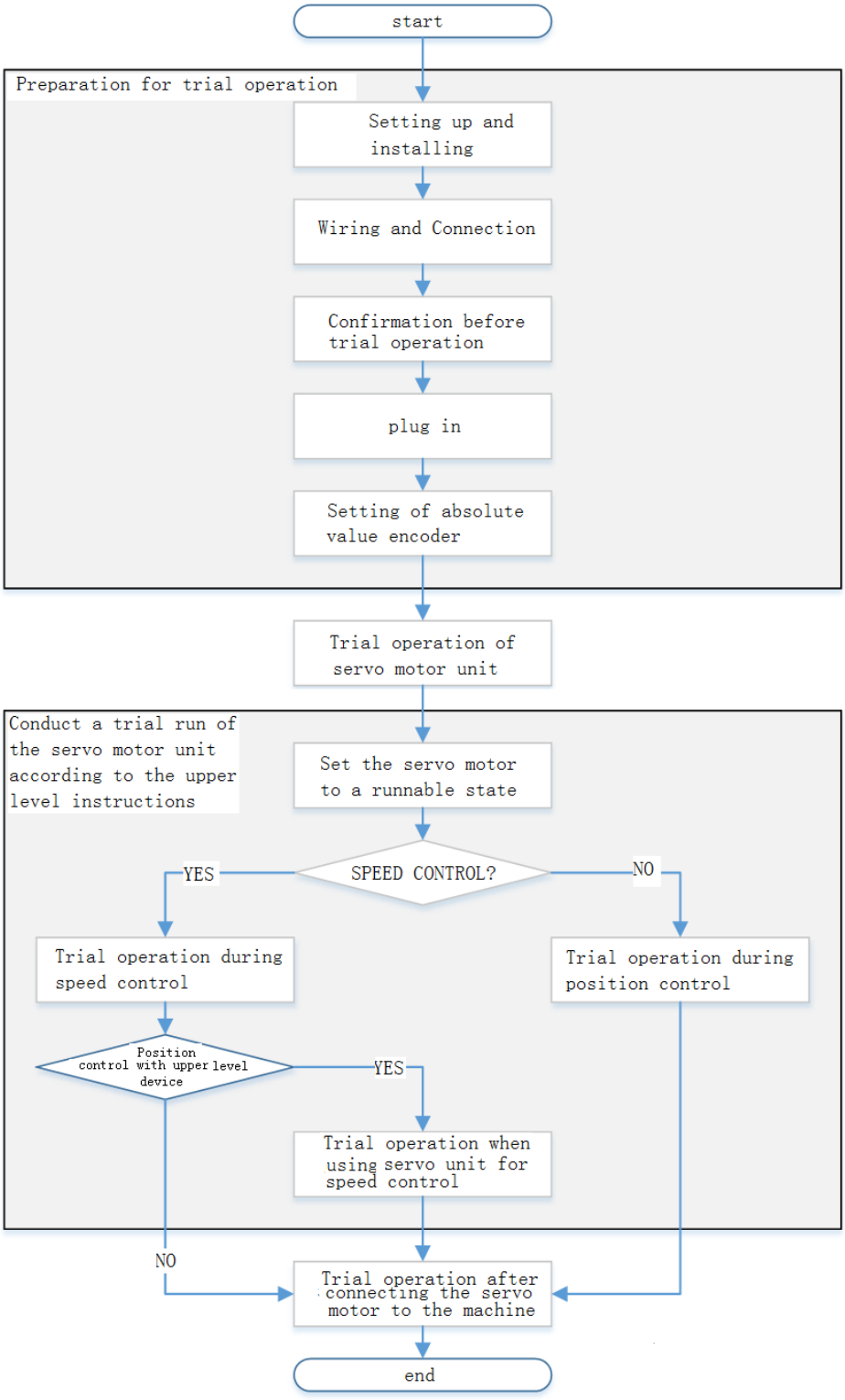



Figure71 Flow of the trial run

## 6.2Preparation for commissioning

### 6.2.1Setup and Installation

Set the servo motor and servo unit according to the setting conditions. First, confirm the movement at no load. The servo motor is not connected to the mechanical system here.

Refer to section 2.2Product Installation ″ for product setup and installation.

### 6.2.2Wiring and Connections

Perform wiring of the servo unit. Confirm the servo motor unit operation. In this case, CN1 of the Servo Unit is not connected.

Refer to 0 3.system connection ″ for wiring and connecting the product.

### 6.2.3Confirmation before commissioning

In order to perform the test run safely and correctly, check the following items before the test run:

1) Setup, wiring and connection of servo units and servo motors were performed correctly.
2) The power supply voltage supplied to the servo unit is normal.
3) There is no looseness in the fastening parts of the servo motor.
4) When using a servomotor with an oil seal, the oil seal part is not damaged. And oil has been applied.
5) When using a servomotor that has been stored for a long period of time, maintenance and inspection of the servomotor are completed. Refer to the manual for using the servomotor for the maintenance and inspection points of the servomotor.
6) Servomotors with holding gates have the gates pre-opened. To open the holding brake, apply the specified voltage (DC24V) to the holding brake.

### 6.2.4Turn on the power

After the input power is turned on, the bus voltage indicator shows no abnormality, and the panel display shows "Reset" → "nry" → "rdy",

indicating that the servo drive is in a runnable state. This indicates that the servo drive is in a runnable state, waiting for the upper computer to give the servo enable signal.

## 6.3Commissioning of servo motor monoblocks

For servo motor single unit test run, please refer to section 5.2.8JOG runs ″ for operation.

## 6.4Trial run of servo motor monoblock according to the command of the host computer

Confirm the following items when performing a test run of the servomotor unit according to the upper command:

1) Confirm that the servomotor movement commands and input/output signals input from the upper unit are set correctly.
2) Verify that the wiring between the upper unit and the servo unit is correct and that the polarity setting is correct.
3) Confirm that the servo unit's motion setting is correct.

The procedure for performing a trial run of the servomotor unit according to the upper command is described below.

| | |
|---|---|
| CAUTION | ➢ To prevent accidents during test operation of the servomotor unit according to the upper command, perform the test operation with the servomotor in the unloaded state (servomotor unit with couplings and belts removed, etc). |

### 6.4.1Setting the servo motor to runnable state

#### 6.4.1.1Pre-implementation confirmations

Be sure to check the following before performing the procedure to set the Servomotor to the runnable state:

1) The pre-commissioning preparations listed in section 6.2Preparation for commissioning ″ have been completed.
2) Chapter 6.3Commissioning of servo motor monoblocks ″ has been completed.

#### 6.4.1.2procedure

The input and output signals required for test operation are described in the factory settings. For details of the input and output signals in the factory settings, refer to the following:

1) Connect the input and output signals of the upper unit.
2) Please confirm the following points:
   a) The servo enable (S-ON) signal is in an inputable state;
   b) Forward side overtravel (P-OT) signal, reverse side overtravel (N-OT) signal off (can be driven forward and reverse);
   c) The input command has not been entered.
3) Connect the input and output signals with cables to the input and output signal connectors (CN1).
4) Turn on the power to the servo unit.
5) Confirm the panel operator display ". .rdy".
6) Confirm the input signal status.
7) Input servo enable (S-ON) signal.
8) Confirm the panel operator display ". .run".
9) Positive Overtravel (P-OT) signal and Negative Overtravel (N-OT) signal settings are restored to the original state.

This concludes the procedure for setting the Servomotor to the runnable state.

### 6.4.2Trial run during speed control

#### 6.4.2.1Pre-implementation confirmations

Be sure to check the following before performing the test run procedure for speed control:

1) The steps listed in section 6.4.1Setting the servo motor to runnable state " have been completed.

#### 6.4.2.2procedure

1) Adjust the speed command input gain (F01.31 to F01.40).
2) Set the speed command inputs (AS+, AS-) from the upper unit to 0V to confirm the rotation status of the servo motor.

3) The servo motor is run by giving certain low speed commands from the upper unit, and the motor speed is confirmed visually.
4) Rise the speed command input from the upper unit slowly from 0V.
5) Verify that the speed command value and the motor speed are the same.
6) Confirm that the servo motor rotation direction is correct.
7) Restores the speed command input from the upper unit to 0V.
8) Disconnect the power supply to the servo unit.

This concludes the trial run procedure for speed control.

### 6.4.3Trial run for position control with an upper unit and speed control with a servo unit.

#### 6.4.3.1Pre-implementation confirmations

Be sure to check the following before performing the test run procedure for servo unit speed control and upper unit position control:

1) The steps listed in section 6.4.2Trial run during speed control " have been completed.

#### 6.4.3.2procedure

1) Turn on the power to the servo unit.
2) Set the number of encoder divided output pulses (F00.07).
3) A simple positioning instruction (e.g., inputting an instruction equivalent to 1 rotation of the servomotor and 1 rotation of the motor shaft) is executed by the upper unit to confirm the rotational speed of the servomotor.
4) Restores the speed command input from the upper unit to 0V.
5) Disconnect the power supply to the servo unit.

This concludes the trial run procedure for position control of the upper unit and speed control of the servo unit.

### 6.4.4Trial run during position control

#### 6.4.4.1Pre-implementation confirmations

Be sure to check the following before performing the trial run procedure for position control:

1) The steps listed in section 6.4.1Setting the servo motor to runnable state ″ have been completed.

### 6.4.4.2procedure

1) Turns off the servo enable (S-ON) signal from the upper unit.
2) Set the pulse output pattern of the upper unit in the command pulse pattern (F03.01).
3) Setting the command unit, the numerator and denominator of the electronic gear ratio (F03.08 and F03.0A) are set according to the upper unit.
4) Turn the power to the servo unit back on.
5) Input the servo enable (S-ON) signal from the upper unit.
6) Input low-speed pulse commands from the upper unit.
7) The number of command pulses input to the servo unit is confirmed by the amount of change in the input command pulse counter before and after the command is issued.
8) The actual rotation amount of the motor is confirmed based on the amount of change in the feedback pulse counter before and after the command.
9) Confirm that the amount of change in the input command pulse counter and the amount of change in the feedback pulse counter (values of steps 7 and 8) should satisfy the following calculation formula: Change in input command pulse counter = Change in feedback pulse counter × (F03.08/F03.0A)
10) Verify that the servomotor rotates in the commanded direction.
11) Inputting pulse commands from the upper unit causes the servo motor to run at a constant speed with a large amount of rotation.
12) The command pulse speed input to the servo unit is checked by monitoring the input command pulse speed.
13) Confirm motor speed monitoring Un0.00.

14) Confirm that the input command pulse speed and the motor speed (values from steps 12 and 13) are the same.

15) Pulse command to stop the upper unit.

16) Turns off the servo enable (S-ON) signal from the upper unit.

This concludes the trial run step in position control.

## 6.5Test run after connecting the servo motor to the machine

This section explains the test run procedure after connecting the servo motor to the machinery.

| | |
|---|---|
|   | ➢ If an operating error occurs while the machine is connected to the servo motor, it can cause not only damage to the machine, but sometimes also personal safety. |

### 6.5.1Pre-implementation confirmations

Before performing the test run procedure after connecting the servo motor to the machine, be sure to confirm the following points:

1) The steps listed in the chapter ″ 06.4Trial run of servo motor monoblock according to the command of **the host computer** ″ have been completed.
2) The connection of the servo unit to the upper unit and the servo unit to the peripheral devices has been completed correctly.

### 6.5.2procedure

1) Make the overtravel signal valid.
2) Setting related to protection functions such as overtravel and holding brake is performed.
3) Set the necessary parameters according to the control method used.
4) Disconnect the power supply to the servo unit.
5) Connects servo motors and machinery.
6) Turn on the power supply of the upper unit and the servo control loop power supply and the main loop power supply.
7) Confirm that the protective functions such as overtravel and holding brake operate normally.

8) Perform a test run according to the section 6.4Trial run of servo motor monoblock according to the command of the host computer ″ and confirm that the test run results are the same as those of the servo motor unit test run.

9) Confirm again that the parameter settings match each control method, and then confirm that the operation of the servo motor meets the action specifications of the machine.

10) Adjust the servo gain as necessary to improve the response characteristics of the servo motor. During trial operation, the servo motor and machinery may not break in sufficiently, so please implement break-in operation sufficiently.

11) For future maintenance, save the set parameters using either of the following methods.

This is the end of the test run procedure after connecting the servo motor to the machine.

## 6.6Test run of servo motors with holding brake

Observe the following precautions for test operation of servomotors with holding brake:

1) When test running a servomotor with a holding brake, be sure to take measures to prevent the machine from falling naturally or vibrating due to external forces before confirming the operation of the holding brake.

2) When test running a servomotor with a brake, check the operation of the servomotor and the brake when the servomotor and the machine are separated. If there is no problem, connect the servo motor to the machine and try the test run again.

Use the brake interlock output (BRK) signal of the servo unit to control the brake operation of the servomotor with brake. For wiring and setting of related parameters, refer to section 5.1.6Setting of motor holding brake ″.

# 7.Correspond (by letter etc)

## 7.1Introduction to Communications

The Modbus protocol is a common language applied to electronic controllers. This protocol enables controllers to communicate with each other and with other devices via a network. It has become a common industrial standard. Based on this communication protocol, control devices from different manufacturers can be connected into an industrial network for centralized monitoring and control.

The drive provides RS485 communication interface and supports Modbus-RTU protocol format, which is suitable for "single-master-multi-slave" communication network with RS485 bus. Users can set drive operation commands, modify or read function code parameters through Modbus communication protocol.

## 7.2interface method

The servo drive uses RS485 asynchronous half-duplex. The interface definition is shown in Table11 Communication Terminal Functional Description ".

The default data format of RS485 terminal is: 1-8-N-1 (1 start bit, 8 data bits, no parity, 1 stop bit), and the default baud rate is: 9600bps. For the parameter setting, see section

| function code | Name | Setting range | unit (of measure) | Factory setting | Mode of entry into force | Setting method | Related modes |
|---|---|---|---|---|---|---|---|
| F10.00 | Drive Axis Address | 1 to 247 | - | 1 | Immediate effect | Operation Settings | PST |
| F10.01 | Modbus baud rate | 0:1200BPS<br>1:2400BPS<br>2:4800BPS<br>3:9600BPS<br>4:19200BPS<br>5:38400BPS | - | 7 | Immediate effect | Operation Settings | PST |

| function code | Name | Setting range | unit (of measure) | Factory setting | Mode of entry into force | Setting method | Related modes |
|---|---|---|---|---|---|---|---|
| | | 6:57600BPS<br>7:115200BPS<br>8:230400BPS<br>9:460800BPS<br>10:921600BPS | | | | | |
| F10.02 | Modbus Data Format | 0:1-8-N-1 (1 start bit + 8 data bits + 1 stop bit)<br>1:1-8-E-1 (1 start bit + 8 data bits + 1 even parity + 1 stop bit)<br>2:1-8-O-1 (1 start bit + 8 data bits + 1 odd parity + 1 stop bit)<br>3:1-8-N-2 (1 start bit + 8 data bits + 2 stop bits)<br>4:1-8-E-2 (1 start bit + 8 data bits + 1 even parity + 2 stop bits)<br>5:1-8-O-2 (1 start bit + 8 data bits + 1 odd parity + 2 stop bits) | - | 0 | Immediate effect | Operation Settings | PST |
| F10.03 | Modbus Answer Delay | 0 to 20 | ms | 0 | Immediate effect | Operation Settings | PST |
| F10.04 | Modbus communication timeout | 0 to 60000 | ms | 0 | Immediate effect | Operation Settings | PST |
| r10.05 | Number of frames received by Modbus | - | - | - | - | Demonstrate | PST |
| r10.06 | Number of Modbus frames sent | - | - | - | - | Demonstrate | PST |
| r10.07 | Number of CRC error frames received by Modbus | - | - | - | - | Demonstrate | PST |
| F10.08 | Modbus Response Feature | Bit: Modbus protocol<br>0: Reply answer frame (standard Modbus protocol)<br>1: No reply to answer frame (non-standard Modbus protocol)<br>Ten bits: store EEPROM control<br>0: communication write address command plus 0x8000 after storing EEPROM<br>1: Communication write address command plus 0x8000 without EEPROM storage | - | 00 | Immediate effect | Operation Settings | PST |

8.2.1610 groups Communication Function Parameters ".

When the host computer is connected to the drive:

1) If the host computer is connected to the drive as a single unit, the CN3 port of the drive is connected to the host computer and CN4 is connected to a terminating resistor of about 120Ω.

2) If the host computer and the drive are connected as multiple units, the CN3 port of drive 1 is connected to the host computer, and CN4 of this drive is connected to CN3 of the next drive, and so on, in a cascade, with the CN4 of the last drive connected to a terminating resistor of about 120Ω.

| | |
|---|---|
| CAUTION | ➢ When using the RS485 serial communication interface, each servo drive must have its servo drive axis number set in advance on the parameter, and the host computer will control the corresponding servo drive according to the axis number. |

## 7.3message format

The Modbus message of the driver includes start flag, RTU message and end flag as shown inFigure72 . Where RTU message includes address code, PDU (Protocol Data Uint, Protocol Data Unit) and CRC checksum.PDU includes command code and data part.

<table>
<tr><td>≥3.5Byte</td><td>1 Byte</td><td>1 Byte</td><td>N Byte</td><td>1 Byte</td><td>1 Byte</td><td>≥3.5Byte</td></tr>
<tr><td rowspan="2">帧起始<br>START</td><td rowspan="2">目标站地址<br>ADDR</td><td rowspan="2">命令码<br>CMD</td><td rowspan="2">数据<br>DATA</td><td colspan="2">CRC校验和</td><td rowspan="2">帧结束<br>END</td></tr>
<tr><td>CRCL</td><td>CRCH</td></tr>
<tr><td rowspan="2">起始标志</td><td>地址码</td><td colspan="2">PDU</td><td colspan="2">CRC校验</td><td rowspan="2">结束标志</td></tr>
<tr><td colspan="5">RTU报文</td></tr>
</table>

Figure72 Modbus message format

## 7.4Command Code Description

The parameters of the servo drive are categorized into 16-bit and 32-bit according to the data length, and the Modbus RTU protocol enables data read/write operations to be performed on the parameters.

When reading or writing parameter data, the command codes are different depending on the data length. The command codes are as follows:

1) Read parameter command code 0x03, reads 16-bit and 32-bit parameters;

2) Write 16-bit parameter command code 0x06;

3) Write 32-bit parameter command code 0x10.

### 7.4.1Command code 0x03 reads 16/32 bit parameters

The Modbus RTU protocol uses the command code: 0x03 for reading both 16-bit and 32-bit parameters.

| | |
|---|---|
|  | ➢ The current Modbus protocol 0x03 command code does not support reading multiple function codes across groups, and will reply with an error frame if it exceeds the number of function codes in the current group! |

Request frame format:

| (be) worth | descriptive |
|---|---|
| START | Greater than or equal to 3.5 characters of idle time indicates the start of a frame. |
| ADDR | Servo axis address: 1 to 247.<br>Note: Here 1 to 247 are decimal numbers and need to be converted to hexadecimal numbers. |
| CMD | Command code: 0x03. |
| DATA[0] | Register start address (high 8 bits): start register parameter group number.<br>If parameter F00.01, 00 is the group number, i.e. DATA[0]=0x00.<br>Note: Here 00 is a hexadecimal number, no conversion is needed. |
| DATA[1] | Register start address (lower 8 bits): bias within the start register parameter group.<br>If parameter F00.01, 01 is the in-group bias. That is, DATA[1]=0x01.<br>Note: Here 01 is a hexadecimal number, no conversion is needed. |
| DATA[2] | Reads the high 8 bits of the parameter number N(H) in hexadecimal. |
| DATA[3] | Reads the lower 8 bits of the parameter number N(L), hexadecimal. |
| CRCL | CRC check valid byte (lower 8 bits). |
| CRCH | CRC checksum valid byte (high 8 bits). |
| END | Greater than or equal to 3.5 characters idle time, end of one frame. |

Response frame format:

| (be) worth | descriptive |
|---|---|
| START | Greater than or equal to 3.5 characters of idle time indicates the start of a frame. |
| ADDR | Servo axis address in hexadecimal. |
| CMD | Command code: 0x03. |
| DATALENGTH | The number of parameter bytes, equal to the number of read parameters N x 2. |
| DATA[0] | Data for the first register parameter, high 8 bits. |

| | |
|---|---|
| DATA[1] | Data for the first register parameter, lower 8 bits. |
| DATA[...] | ... |
| DATA[N*2-2] | Data for the Nth register parameter, high 8 bits. |
| DATA[N*2-1] | Data for the Nth register parameter, lower 8 bits. |
| CRCL | CRC check valid byte (lower 8 bits). |
| CRCH | CRC checksum valid byte (high 8 bits). |
| END | Greater than or equal to 3.5 characters idle time, end of one frame. |

Communication example 1: Read data of 2 word length from servo axis address 01 drive with F01.03 as the start register.

The host sends a request frame:

| START | 01 | 03 | 01 | 03 | 00 | 02 | CRCL | CRCH | END |
|---|---|---|---|---|---|---|---|---|---|

Slave response frame:

| START | 01 | 03 | 04 | 00 | 01 | 00 | 02 | CRCL | CRCH | END |
|---|---|---|---|---|---|---|---|---|---|---|

The response frame indicates that the slave returns 2 words long (4 bytes) of data with F01.03=0x0001 and F01.04=0x0002.

If the slave response frame is:

| START | 01 | 83 | 02 | CRCL | CRCH | END |
|---|---|---|---|---|---|---|

This response frame indicates that an error has occurred in communication with an error code of 0x02; 0x83 indicates an error.

Communication example 2: Reading 32-bit parameter F03.06 from a drive with servo axis address 01.

The host sends a request frame:

| START | 01 | 03 | 03 | 06 | 00 | 02 | CRCL | CRCH | END |
|---|---|---|---|---|---|---|---|---|---|

Slave response frame:

| START | 01 | 03 | 04 | 00 | 00 | 00 | 00 | CRCL | CRCH | END |
|---|---|---|---|---|---|---|---|---|---|---|

This response frame indicates that the value of parameter F03.06 is 0x00000000.

### 7.4.2Command code 0x06 Write 16-bit parameter

The Modbus RTU protocol uses the command code: 0x06 for writing 16-bit parameters.

| | |
|---|---|
|   | ➢ Write operations to 32-bit parameters using 0x06 are prohibited or unpredictable errors will occur! |

Request frame format:

| (Be) Worth | Descriptive |
|---|---|
| START | Greater than or equal to 3.5 characters of idle time indicates the start of a frame. |
| ADDR | Servo axis address: 1 to 247.<br>Note: Here 1 to 247 are decimal numbers and need to be converted to hexadecimal numbers. |
| CMD | Command code: 0x06. |
| DATA[0] | Register start address (high 8 bits): start register parameter group number.<br>If you write the reference F01.03, 01 is the group number, i.e. DATA[0]=0x01.<br>Note: Here 01 is a hexadecimal number, no conversion is needed.<br>When the written parameter needs to be saved by power down, the highest position should be "1", such as writing parameter F01.03 and saving it by power down, then DATA[0]=0x81. |
| DATA[1] | Register start address (lower 8 bits): bias within the start register parameter group.<br>If you write parameter F01.03, 03 is the in-group bias, i.e. DATA[1]=0x03.<br>Note: Here 03 is a hexadecimal number, no conversion is needed. |
| DATA[2] | Write register data high 8 bits, hexadecimal. |
| DATA[3] | Writes the lower 8 bits of register data in hexadecimal. |
| CRCL | CRC check valid byte (lower 8 bits). |
| CRCH | CRC checksum valid byte (high 8 bits). |
| END | Greater than or equal to 3.5 characters idle time, end of one frame. |

Response frame format:

| (be) worth | descriptive |
|---|---|
| START | Greater than or equal to 3.5 characters of idle time indicates the start of a frame. |
| ADDR | Servo axis address in hexadecimal. |
| CMD | Command code: 0x06. |
| DATA[0] | Register start address (high 8 bits): start register parameter group number.<br>If you write parameter F01.03, 01 is the group number, i.e. DATA[0]=0x01.<br>Note: Here 01 is a hexadecimal number, no conversion is needed. |
| DATA[1] | Register start address (lower 8 bits): bias within the start register parameter group.<br>If you write parameter F01.03, 03 is the in-group bias, i.e. |

| | |
|---|---|
| | DATA[1]=0x03.<br>Note: Here 03 is a hexadecimal number, no conversion is needed. |
| DATA[2] | Write register data high 8 bits, hexadecimal. |
| DATA[3] | Writes the lower 8 bits of register data in hexadecimal. |
| CRCL | CRC check valid byte (lower 8 bits). |
| CRCH | CRC checksum valid byte (high 8 bits). |
| END | Greater than or equal to 3.5 characters idle time, end of one frame. |

Communication example 1: Write data 0x2002 to drive parameter F01.04 with servo axis address 01.

The host sends a request frame:

| START | 01 | 06 | 01 | 04 | 20 | 02 | CRCL | CRCH | END |
|---|---|---|---|---|---|---|---|---|---|

Slave response frame:

| START | 01 | 06 | 01 | 04 | 20 | 02 | CRCL | CRCH | END |
|---|---|---|---|---|---|---|---|---|---|

This response frame indicates that drive parameter F01.04 with servo axis address 01 writes data 0x2002.

If the slave response frame is:

| START | 01 | 86 | 02 | CRCL | CRCH | END |
|---|---|---|---|---|---|---|

This response frame indicates that an error has occurred in communication, with an error code of 0x02; 0x86 indicates an error.

### 7.4.3Command Code 0x10 Write 32-bit Parameters

The Modbus RTU protocol uses the command code: 0x10 for writing 32-bit parameters.

| | |
|---|---|
| CAUTION | ➢ Write operations to 16-bit parameters using 0x10 are prohibited or unpredictable errors will occur! |

Request frame format:

| (Be) Worth | Descriptive |
|---|---|
| START | Greater than or equal to 3.5 characters of idle time indicates the start of a frame. |
| ADDR | Servo axis address: 1 to 247.<br>Note: Here 1 to 247 are decimal numbers and need to be converted to hexadecimal numbers. |
| CMD | Command code: 0x10. |
| DATA[0] | Register start address (high 8 bits): start register parameter group number.<br>If you write parameter F03.06, 03 is the group number, i.e. |

| | |
|---|---|
| | DATA[0]=0x03.<br>Note: Here 03 is a hexadecimal number, no conversion is needed. When the written parameter needs to be saved by power down, the highest position should be "1", such as writing parameter F01.03 and saving it by power down, then DATA[0]=0x81. |
| DATA[1] | Register start address (lower 8 bits): bias within the start register parameter group.<br>If you write parameter F03.06, 06 is the group bias, i.e. DATA[1]=0x06.<br>Note: Here 06 is a hexadecimal number, no conversion is needed. |
| DATA[2] | Write parameter number Higher 8 bits M(H): hexadecimal.<br>For example, to write only F03.06, DATA[2] is 00, DATA[3] is 02, and M=H0002.<br>32-bit parameters are counted as 2 words each. |
| DATA[3] | Write parameter number lower 8 bits M(L): hexadecimal. |
| DATA[4] | The data written to the register corresponds to the number of bytes M×2.<br>For example, single write F03.06, DATA[4] is H04. |
| DATA[5] | Write the start register data high 8 bits in hexadecimal. |
| DATA[6] | Writes the lower 8 bits of the start register data in hexadecimal. |
| DATA[7] | Write the data high 8 bits of the start register address + 1 in hexadecimal. |
| DATA[8] | Write the lower 8 bits of data of the start register address + 1 in hexadecimal. |
| CRCL | CRC check valid byte (lower 8 bits). |
| CRCH | CRC checksum valid byte (high 8 bits). |
| END | Greater than or equal to 3.5 characters idle time, end of one frame. |

Response frame format:

| (be) worth | descriptive |
|---|---|
| START | Greater than or equal to 3.5 characters of idle time indicates the start of a frame. |
| ADDR | Servo axis address in hexadecimal. |
| CMD | Command code: 0x10. |
| DATA[0] | Register start address (high 8 bits): bias within the start register parameter group.<br>If the parameter F03.06 is written, DATA[0] is 0x03. |
| DATA[1] | Register start address (lower 8 bits): bias within the start register parameter group.<br>If parameter F03.06 is written, DATA[1] is 0x06. |
| DATA[2] | Write parameter number Higher 8 bits M(H): hexadecimal. |
| DATA[3] | Write parameter number lower 8 bits M(L): hexadecimal. |
| CRCL | CRC check valid byte (lower 8 bits). |

| | |
|---|---|
| CRCH | CRC checksum valid byte (high 8 bits). |
| END | Greater than or equal to 3.5 characters idle time, end of one frame. |

Communication example 1: Write data 0x0200 0000 to drive parameter F03.06 with servo axis address 01.

The host sends a request frame:

| START | 01 | 10 | 03 | 06 | 00 | 02 | 04 | 00 | 00 | 02 | 00 | CRCL | CRCH | END |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|

Slave response frame:

| START | 01 | 10 | 03 | 06 | 00 | 02 | CRCL | CRCH | END |
|---|---|---|---|---|---|---|---|---|---|

This response frame indicates that drive parameter F03.06 with servo axis address 01 writes data 0x00020000.

If the slave response frame is:

| START | 01 | 90 | 02 | CRCL | CRCH | END |
|---|---|---|---|---|---|---|

This response frame indicates that an error has occurred in communication with an error code of 0x02; 0x90 indicates an error.

Communication example 2: Write data 0x0200 0000 to drive parameter F03.06 with servo axis address 01, and write data 0x0100 0000 to drive parameter F03.08 with servo axis address 01.

The host sends a request frame:

| START | 01 | 10 | 03 | 06 | 00 | 04 | 08 | 00 | 00 | 02 | 00 | 00 | 00 | 01 | 00 | CRCL | CRCH | END |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|

Slave response frame:

| START | 01 | 10 | 03 | 06 | 00 | 04 | CRCL | CRCH | END |
|---|---|---|---|---|---|---|---|---|---|

This response frame indicates that drive parameters F03.06 and F03.08 with servo axis address 01 are written to data.

If the slave response frame is:

| START | 01 | 90 | 02 | CRCL | CRCH | END |
|---|---|---|---|---|---|---|

This response frame indicates that an error has occurred in communication with an error code of 0x02; 0x90 indicates an error.

## 7.5Exception Response Information

Abnormal Response Command Code = Normal Response Command Code + 0x80, the value and meaning of the abnormal code is shown in Table36 .

Table36 Exception Code Descriptions

| Exception code | Name | Coding instructions |
|---|---|---|
| 0x01 | Invalid command code | Invalid command code received from slave |
| 0x02 | Illegal register address | The register address received from the slave does not exist;<br>The number of registers read or written is out of range;<br>The number of bytes in the PDU does not equal the number of registers when writing multiple registers. |
| 0x03 | frame format error | CRC checksum failed;<br>Incorrect frame length; |
| 0x04 | Data out of range | The data received from the slave is out of the range of the minimum to maximum values of the corresponding registers. |
| 0x05 | Read and write requests rejected | Write operations to read-only registers;<br>Running state write operations to running read-only registers. |

## 7.6CRC check

CRC (Cyclical Redundancy Check) means that the contents of the message other than the CRC check digit are calculated according to the checksum algorithm to generate a two-byte check digit, which is attached to the transmitted message. The receiving device recalculates the CRC of the received message and compares it with the value in the received CRC field. If the two CRC values are not equal, there is a transmission error.

The host computer and the servo driver communicate and must use a consistent CRC check algorithm, otherwise CRC checksum errors are generated. The servo driver uses a 16-bit CRC with the low byte first and the high byte second.

## 7.7Register Address Distribution

The register address is 16 bits of data, the high 8 bits indicate the function code group number, the low 8 bits indicate the serial number within the group, and the high 8 bits come first when sending.

The 32-bit register occupies two adjacent addresses, with the even address storing the lower 16 bits and the next address in the even address (the odd address) storing the higher 16 bits.

In the register write operation, in order to avoid memory damage caused by frequent EEPROM writes, the highest bit of the register address is used to indicate whether or not to store EEPROM, with the highest bit being 1 for EEPROM, and 0 for RAM only, i.e., if you wish to write a register value to be saved after a power-down, you should add 0x8000 to the original register address.

Register address example 1: Function code 06.01 (speed instruction digital setting) has a hexadecimal address of 0x0601 and a decimal address of 1537.

Register address example 2: Function code 07.01 (torque digit given), when not stored in the EEPROM, its hexadecimal address is 0x0701 and its decimal address is 1793. If you want the communication write to be saved to

the EEPROM after a power-down, its hexadecimal address is 0x8701 (0x0701+0x8000) and its decimal address is 34561 ( 1793+32768).

## 7.8Register Data Type

There are several register data types, and the communication setting method for each type is shown in Table37 .

Table37 Register data type and communication setting method

| Register Data Type | Communication setting method |
|---|---|
| 16-bit unsigned numbers | 0 to 65535 corresponds to 0xFFFF; decimal points need not be processed.<br>Example: Set F01.02 (DI input software filter) to 5ms;<br>Write 0x0005 (i.e., decimal 5) to address 0x0102. |
| 16-bit signed number | -32768 to 32767 corresponds to 0x8000 to 0x7FFF.<br>Example: Set F07.01 (torque digital feed) to -50.0%:<br>Write 0xFE0C (i.e., decimal-500) to address 0x0701. |
| binary number | Indicates a 16-bit value.<br>Example: read the contents of address 0x0100 as 0x0011, indicating: r01.00 has bit1=1 and bit4=1, i.e., DI1 and DI5 optocouplers are on.<br>Note: Optocoupler conduction only indicates that the signal is low, it does not mean that the signal is valid, logic setting is required. |
| "Ten hundred thousand" type | The "digits" to "thousands" correspond to 0 to 3 bits, 4 to 7 bits, 8 to 11 bits, and 12 to 15 bits, respectively.<br>Example: Set the "first digit" of F00.06 (pulse output setting) to encoder split frequency output and the "tenth digit" to phase AB:<br>Write 0x0020 to address 0x0006. |
| 32-bit unsigned number | It is necessary to combine the contents of two registers into a 32-bit number.<br>For example, read the cumulative system energization time F0d.36:<br>Step 1: Read 2 registers from start address 0x0d36<br>Step 2: Cumulative system energization time = ((Uint32) value of 0x0d37 << 16) + value of 0x0d36. |
| 32-bit signed number | Similar to 32-bit unsigned numbers. It is still the case that the value of an even address represents the lower 16 bits, and the value of the next (odd) address of an even address represents the higher 16 bits. |

## 7.9Communication-related parameters

Table38 Communication-related parameters

| F10.00 | Drive Axis Address | | Tempo | Placement | Torque |
|---|---|---|---|---|---|
| | Setting range | set unit | Factory setting | Mode of entry into force | Setting method |

| | | | | | |
|---|---|---|---|---|---|
| | 1 to 247 | - | 1 | immediate effect | Operation Settings |

| | | | | | |
|---|---|---|---|---|---|
| F10.01 | Modbus baud rate | | Tempo | Placement | Torque |
| | setpoint | hidden meaning | Factory setting | Mode of entry into force | Setting method |
| | 0 | 1200BPS | 3 | Immediate effect | Operation Settings |
| | 1 | 2400BPS | | | |
| | 2 | 4800BPS | | | |
| | 3 | 9600BPS | | | |
| | 4 | 19200BPS | | | |
| | 5 | 38400BPS | | | |
| | 6 | 57600BPS | | | |
| | 7 | 115200BPS | | | |
| | 8 | 230400BPS | | | |
| | 9 | 460800BPS | | | |
| | 10 | 921600BPS | | | |

| | | | | | |
|---|---|---|---|---|---|
| F10.02 | Modbus Data Format | | Tempo | Placement | Torque |
| | setpoint | hidden meaning | Factory setting | Mode of entry into force | Setting method |
| | 0 | 1-8-N-1 (1 start bit + 8 data bits + 1 stop bit) | 0 | immediate effect | Operation Settings |
| | 1 | 1-8-E-1 (1 start bit + 8 data bits + 1 even parity + 1 stop bit) | | | |
| | 2 | 1-8-O-1 (1 start bit + 8 data bits + 1 odd parity + 1 stop bit) | | | |
| | 3 | 1-8-N-2 (1 start bit + 8 data bits + 2 stop bits) | | | |
| | 4 | 1-8-E-2 (1 start bit + 8 data bits + 1 even parity + 2 stop bits) | | | |
| | 5 | 1-8-O-2 (1 start bit + 8 data bits + 1 odd parity + 2 stop bits) | | | |

| | | | | | |
|---|---|---|---|---|---|
| F10.03 | Modbus Answer Delay | | Tempo | Placement | Torque |
| | Setting range | set unit | Factory setting | Mode of entry into force | Setting method |
| | 0 to 20 | ms | 0 | immediate effect | Operation Settings |

| | | | | | |
|---|---|---|---|---|---|
| F10.04 | Modbus communication timeout | | Tempo | Placement | Torque |
| | Setting range | set unit | Factory setting | Mode of entry into | Setting method |

| | | | | | |
|---|---|---|---|---|---|
| | | | | force | |
| | 0 to 60000 | ms | 0 | immediate effect | Operation Settings |
| r10.05 | Number of frames received by Modbus | | Tempo | Placement | Torque |
| | Setting range | set unit | Factory setting | Mode of entry into force | Setting method |
| | - | - | - | - | demonstrate |
| r10.06 | Number of Modbus frames sent | | Tempo | Placement | Torque |
| | Setting range | set unit | Factory setting | Mode of entry into force | Setting method |
| | - | - | - | - | demonstrate |
| r10.07 | Number of CRC error frames received by Modbus | | Tempo | Placement | Torque |
| | Setting range | set unit | Factory setting | Mode of entry into force | Setting method |
| | - | - | - | - | demonstrate |

| | | | | | |
|---|---|---|---|---|---|
| F10.08 | Modbus Response Feature | | Tempo | Placement | Torque |
| | setpoint | hidden meaning | Factory setting | Mode of entry into force | Setting method |
| | □0 | Reply to answer frame (standard Modbus protocol) | 00 | immediate effect | Operation Settings |
| | □1 | No reply to answer frames (non-standard Modbus protocol) | | | |
| | 0□ | Communication write address command plus 0x8000 followed by EEPROM storage | | | |
| | 1□ | Communication write address command plus 0x8000 without EEPROM storage | | | |

# 8.Detailed description of parameters

## 8.1Parameter overview

Table39 Summary of Function Codes

| Function code group (computing) | Function Type | Basic description |
|---|---|---|
| Group 00 | Basic parameters | Setting of basic operating characteristics of servo systems |
| Group 01 | Terminal Inputs Parameters | DI, VDI function setup parameters |
| Group 02 | Terminal Outputs Parameters | DO, VDO, AO function setting parameters |
| Group 03 | Position control parameters | Position control mode parameter setting |
| Group 04 | Multi-stage position control parameters | Multi-stage position control mode parameter setting |
| Group 06 | Speed control parameters | Speed control mode parameter setting |
| Group 07 | Torque control parameters | Torque control mode parameter setting |
| Group 08 | Gain parameters | Loop Regulator Parameter Settings |
| Group 09 | Performance Advance Tuning Parameters | High-performance control module parameterization |
| Group 0A | Servo drive parameters | Servo Drive Operation Parameter Setting |
| Group 0B | Servo motor parameters | Servo motor (including encoder) operation parameter setting |
| Group 0C | Auxiliary function parameters | Auxiliary Function Setting |
| Group 0D | Run to monitor parameters | Main operating status monitoring parameters of the servo system |
| Group 0E | Fault and protection parameters | Fault and protection parameterization |
| Group 0F | Fault logging parameters | malfunction log |
| 10 groups | Communication function parameters | MODBUS communication parameters |
| Group Fn | Auxiliary function parameters | Auxiliary Function Setting |

| Un group | Monitoring parameters | Status Monitoring Parameters |
|---|---|---|

## 8.2Parameter description

### 8.2.1Group 00 Basic parameters

| Function code | Name | Setting range | Unit (of measure) | Factory setting | Mode of entry into force | Setting method | (Statistics) correlation paradigm |
|---|---|---|---|---|---|---|---|
| F00.01 | Control mode selection | 0: Speed mode<br>1: Positional mode<br>2: Torque mode<br>3: Torque/speed mode switching<br>4: Speed/position mode switching<br>5: Position/torque mode switching<br>6: Torque/speed/position mode switching | - | 1 | Immediate effect | Shutdown Settings | PST |
| F00.02 | Rotation direction selection | 0: Positive rotation in CCW direction<br>1: With CW direction as the positive direction | - | 0 | Power failure effective | Shutdown Settings | PST |
| F00.04 | Stopping method selection | Position: Servo OFF stop mode selection<br>0: Free stop, remain free<br>1: Zero-speed shutdown to remain free<br>Ten positions: over-travel stop mode selection<br>0: Free stop, remain free<br>1: Zero speed stop, position remains locked<br>2: Zero-speed shutdown to remain free<br>Hundredths: Fault level 1 shutdown mode<br>0: Free stop, remain free<br>Thousands of bits: Failure level 2 shutdown mode<br>0: Free stop, remain free<br>1: Zero-speed shutdown to remain free | - | 0010 | Immediate effect | Operation Settings | PST |
| F00.05 | Deceleration stop zero speed holding time | 0 to 5000 | ms | 10 | Immediate effect | Operation Settings | PST |
| F00.06 | Pulse output setting | Bit: Pulse output source setting<br>0: Encoder crossover output<br>1: Pulse command synchronized output<br>2: Crossover or Synchronized Output Disable<br>Tenth position: pulse output form (only encoder crossover frequency is valid)<br>0: pulse + direction<br>1: CW/CCW<br>2: AB phase<br>Hundredths: Z pulse output polarity selection (valid for encoder crossover output) | - | 0000 | Power failure effective | Shutdown Settings | PST |

| Function code | Name | Setting range | Unit (of measure) | Factory setting | Mode of entry into force | Setting method | (Statistics) correlation paradigm |
|---|---|---|---|---|---|---|---|
| | | 0: Positive polarity (high when Z pulse is active)<br>1: Negative polarity (low when Z pulse is active)<br>Thousand bits: pulse output polarity selection<br>0: positive polarity<br>1: Negative polarity | | | | | |
| F00.07 | Number of encoder divided output pulses | Number of pulses output for one revolution of the encoder | P/rpm | 2500 | Power failure effective | Shutdown Settings | PST |
| r00.10 | CPU Function Software Version Number | - | - | - | - | demonstrate | - |
| F00.11 | CPU Driver Software Version Number | - | - | - | - | demonstrate | - |
| F00.12 | CPLD software version | - | - | - | - | demonstrate | - |
| F00.14 | Non-standard version number | - | - | - | - | demonstrate | - |
| F00.15 | Product Serial Number 1 | - | - | - | - | demonstrate | - |

### 8.2.2Group 01 Terminal Input Parameter

| Function code | Name | Setting range | Unit (of measure) | Factory setting | Mode of entry into force | Setting method | Relevant modalities |
|---|---|---|---|---|---|---|---|
| r01.00 | DI input status display | DI8 to DI1: bit7 to bit0 | - | - | - | Demonstrate | - |
| F01.01 | DI power-up lead time | 0 to 10000 | ms | 1000 | immediate effect | Operation Settings | PST |
| F01.02 | DI input software filtering | 0 to 100 | ms | 3 | immediate effect | Operation Settings | PST |
| F01.03 | DI1 Functional Planning | Hundredth, Tenth, and Individual.<br>DI function selection (see DI menu for details)<br>Thousands: Logic setting<br>0: active low | - | P: 0001<br>S: 0001<br>T: 0001 | Immediate effect | Shutdown Settings | PST |

| Function code | Name | Setting range | Unit (of measure) | Factory setting | Mode of entry into force | Setting method | Relevant modalities |
|---|---|---|---|---|---|---|---|
| | | 1: High level active<br>2: Falling edge active<br>3: Rising edge active<br>4: Valid on both rising and falling edges | | | | | |
| F01.04 | DI2 Functional Planning | Same as DI1 | - | P: 0002<br>S: 0002<br>T: 0002 | Immediate effect | Shutdown Settings | PST |
| F01.05 | DI3 Functional Planning | Same as DI1 | - | P: 0003<br>S: 0003<br>T: 0003 | Immediate effect | Shutdown Settings | PST |
| F01.06 | DI4 Functional Planning | Same as DI1 | - | P: 0004<br>S: 0004<br>T: 0004 | Immediate effect | Shutdown Settings | PST |
| F01.07 | DI5 Functional Planning | Same as DI1 | - | P: 0011<br>S: 0024<br>T: 0005 | Immediate effect | Shutdown Settings | PST |
| F01.08 | DI6 Functional Planning | Same as DI1 | - | P: 0012<br>S: 0027<br>T: 0006 | Immediate effect | Shutdown Settings | PST |
| F01.09 | DI7 Functional Planning | Same as DI1 | - | P: 0013<br>S: 0028<br>T: 0007 | Immediate effect | Shutdown Settings | PST |
| F01.0A | DI8 Functional Planning | Same as DI1 | - | P: 0019<br>S: 0029<br>T: 0025 | Immediate effect | Shutdown Settings | PST |
| F01.1A | DI function mandatory active1 | bit0:DiFunc.000-No function;<br>bit1:DiFunc.001-servo ON;<br>bit2:DiFunc.002-Fault reset;<br>bit3:DiFunc.003-Forward side overtravel;<br>bit4:DiFunc.004-Reverse side overtravel;<br>bit5:DiFunc.005-Positive side torque limit;<br>bit6:DiFunc.006-Reverse side torque limit;<br>bit7:DiFunc.007-Emergency stop;<br>bit8:DiFunc.008-JOG Tap Enable;<br>bit9:DiFunc.009-Positive Tap Inputs<br>bit10:DiFunc.00A - Inverse Tap Input;<br>bit11:DiFunc.00B-PJOG program tap enable;<br>bit12:DiFunc.00C-Program Tap Input;<br>bit13:DiFunc.00D-Mode Selection [0]<br>bit14:DiFunc.00E-Mode selection [1];<br>bit15:DiFunc.00F-Gain switching; | - | 0 | Immediate effect | Operation Settings | PST |

| Function code | Name | Setting range | Unit (of measure) | Factory setting | Mode of entry into force | Setting method | Relevant modalities |
|---|---|---|---|---|---|---|---|
| F01.1b | DI function mandatory active 2 | bit0:DiFunc.010-Disable positional instruction input;<br>bit1:DiFunc.011-Position instruction direction;<br>bit2:DiFunc.012-Position deviation clear;<br>bit3:DiFunc.013-Electronic gear ratio 1/2 selection;<br>bit4:DiFunc.014-Home switch;<br>bit5:DiFunc.015-Home reset enable;<br>bit6:DiFunc.016-Banning in assertion of long;<br>bit7:DiFunc.017- Interrupt long state release input;<br>bit8:DiFunc.018 - Interrupt long trigger enable;<br>bit9:DiFunc.019-Command pulse disable input;<br>bit10:DiFunc.01A-Handwheel pulse command enable;<br>bit11:DiFunc.01B-Handwheel multiplier [0];<br>bit12:DiFunc.01C-Handwheel multiplier [1];<br>bit13:DiFunc.01D-Position stepping instruction enable;<br>bit14:DiFunc.01E-Function reserved;<br>bit15:DiFunc.01F-Multi-segment position enable; | - | 0 | Immediate effect | Operation Settings | PST |
| F01.1C | DI function mandatory effective3 | bit0:DiFunc.020-Multi-segment position instruction selection [0];<br>bit1:DiFunc.021-Multi-segment position instruction selection [1];<br>bit2:DiFunc.022-Multi-segment position instruction selection [2];<br>bit3:DiFunc.023-Multi-segment position instruction selection [3];<br>bit4:DiFunc.024-Speed mode zero fix enable;<br>bit5:DiFunc.025 - Motor rotation direction switching selection;<br>bit6:DiFunc.026-Main and auxiliary speed command toggle;<br>bit7:DiFunc.027-Internal multispeed selection [0];<br>bit8:DiFunc.028-Internal multispeed selection [1];<br>bit9:DiFunc.029-Internal multispeed selection [2];<br>bit10:DiFunc.02A-Internal multispeed selection [3];<br>bit11 to 15: Reserved; | - | 0 | Immediate effect | Operation Settings | PST |

| Function code | Name | Setting range | Unit (of measure) | Factory setting | Mode of entry into force | Setting method | Relevant modalities |
|---|---|---|---|---|---|---|---|
| F01.1d | DI function mandatory valid 4 | bit0 to 15: Reserved; | - | 0 | Immediate effect | Operation Settings | PST |
| r01.30 | AI1 input actual value | -10.00 to 10.00 | V | - | - | demonstrate | - |
| r01.31 | AI1 conversion value | -100.0% to 100.0% | - | - | - | demonstrate | - |
| F01.32 | AI1 input filter time | 0 to 65535 | ms | 10 | Immediate effect | Operation Settings | PST |
| F01.33 | AI1 input min. | -10.00 to 10.00 | V | -10 | Immediate effect | Operation Settings | PST |
| F01.34 | AI1 Minimum Input Setting | -100.0% to 100.0% | - | -100 | immediate effect | Operation Settings | PST |
| F01.35 | AI1 input maximum value | -10.00 to 10.00 | V | 10.00 | Immediate effect | Operation Settings | PST |
| F01.36 | AI1 Maximum Input Setting fixed value | -100.0% to 100.0% | - | 100.0 | Immediate effect | Operation Settings | PST |
| F01.37 | AI1 input deadband setting order | 0.0% to 50.0% | - | 0.1 | immediate effect | Operation Settings | PST |
| F01.40 | AI Input Setting Maximum Corresponding Rotation Speed | 0 to 9000 | rpm | 3000 | Immediate effect | Operation Settings | PST |
| F01.41 | AI input sets the maximum torque. | 0.0% to 800.0% | - | 100.0 | Immediate effect | Operation Settings | PST |

## 8.2.3Group 02 Terminal Outputs Parameters

| Function code | Name | Setting range | Unit (of measure) | Factory setting | Mode of entry into force | Setting method | Relevant modalities |
|---|---|---|---|---|---|---|---|
| r02.00 | DO output status display | DO6 to DO1: bit5 to bit0 | - | - | - | demonstrate | - |
| F02.03 | DO1 output function planning | Hundredths Tenths Digits:DO Function Selection (see DO Function Table for details)<br>000 NoFunc No function<br>001 SRDY Servo ready output (servo ON)<br>002 WARN Warning output<br>003 ERROR Error output<br>004 NEAR Positioning proximity signal output<br>005 COIN positioning completion output signal<br>006 BRK Brake control output<br>007 DB Dynamic Brake Output<br>008 HOME Return of Origin Completion Signal<br>009 ELEHOME Zero Return Completion Signal<br>00A XINT Interrupt Long Completion Signal<br>00B TGON Rotary checkout output<br>00C ZERO Zero speed checkout output<br>00D VARR Velocity Arrival Checkout Signal<br>00E VCMP Velocity Consistency Checkout Output<br>00F VLMT Speed Limit Checkout Output<br>010 TARR Torque Arrival Detect Signal<br>011 CLMT Torque Limit Check Output<br>Thousands: Logic setting<br>0: active low<br>1: High level active<br>Note 1: Due to the ARM and CPLD power-up configuration process needs to consume a certain amount of time, during this period of time its pin state is determined by the hardware, it is recommended to set to a low level, otherwise it will lead to power-up during the DO output level jumps!<br>Note 2: Recommended low level active | - | P: 0001<br>S: 0001<br>T: 0001 | Immediate effect | Shutdown Settings | PST |
| F02.04 | DO2 output function planning | Same as DO1 | - | P: 0004<br>S: 000B<br>T: 000F | Immediate effect | Shutdown Settings | PST |
| F02.05 | DO3 output function planning | Same as DO1 | - | P: 0005<br>S: 000C<br>T: 0010 | Immediate effect | Shutdown Settings | PST |
| F02.06 | DO4 output function planning | Same as DO1 | - | P: 000B<br>S: 000E<br>T: 0011 | Immediate effect | Shutdown Settings | PST |

| Function code | Name | Setting range | Unit (of measure) | Factory setting | Mode of entry into force | Setting method | Relevant modalities |
|---|---|---|---|---|---|---|---|
| F02.07 | DO5 output function planning | Same as DO1 | - | P: 0002<br>S: 0002<br>T: 0002 | Immediate effect | Shutdown Settings | PST |
| F02.08 | DO6 Output Function Planning | Same as DO1 | - | P: 0003<br>S: 0003<br>T: 0003 | Immediate effect | Shutdown Settings | PST |
| F02.13 | DO forced output control enable | bit0: 1-DO1 enable force 0-DO1 disable force<br>bit1: 1-DO2 enable force 0-DO2 disable force<br>bit2: 1-DO3 enable force 0-DO3 disable force<br>bit3: 1-DO4 enable force 0-DO4 disable force<br>bit4: 1-DO5 enable force 0-DO5 disable force<br>bit5: 1-DO6 enable force 0-DO6 disable force<br>bit15:6 Reserved | - | 0000 | Immediate effect | Operation Settings | PST |
| F02.14 | DO forced output state | bit0: DO1 forced output logic state<br>bit1: DO2 forced output logic state<br>bit2: DO3 forced output logic state<br>bit3: DO4 forced output logic state<br>bit4: DO5 Forced output logic state<br>bit5: DO6 Forced output logic state<br>bit15:6 Reserved | - | 0000 | Immediate effect | Operation Settings | PST |

### 8.2.4Group 03 Position Control Parameters

| Function code | Name | Setting range | Unit (of measure) | Factory setting | Mode of entry into force | Setting method | Relevant modalities |
|---|---|---|---|---|---|---|---|
| F03.00 | Location command source | 0: External pulse command<br>1: Internal stepping amount given<br>2: Internal multi-segment position command given | - | 0 | Immediate effect | Shutdown Settings | P |
| F03.01 | Position Command Mode Setting order | Single bit: pulse command pattern<br>0: pulse + direction<br>1: Forward/reverse pulse train<br>2: AB phase pulse train (4X)<br>Ten bits: pulse command logic<br>0: Positive logic<br>1: Negative logic<br>Hundred bits: pulse command rate selection<br>0: low speed<br>1: High speed | - | 2000 | Power failure effective | Shutdown Settings | PS |

| Function code | Name | Setting range | Unit (of measure) | Factory setting | Mode of entry into force | Setting method | Relevant modalities |
|---|---|---|---|---|---|---|---|
| F03.02 | Position deviation clearing action selection | 0: Servo enable OFF to clear position deviation<br>1: Clearing the position deviation when the servo is enabled OFF or a malfunction occurs<br>2: Servo enable OFF or clear by DI input deviation clear signal | - | 0 | Immediate effect | Shutdown Settings | P |
| F03.03 | step size | -9999 to 9999 | unit of command (computing) | 50 | Immediate effect | Operation Settings | P |
| F03.04 | First-order low-pass filtering time constant | 0 to 6553.5 | ms | 0 | Immediate effect | Shutdown Settings | P |
| F03.05 | Mean value filter time constant | 0 to 128.0 | ms | 0 | Immediate effect | Shutdown Settings | P |
| F03.06 | Electronic gear ratio 0: number of pulse commands for 1 motor revolution | 0 to 1073741824<br>Note: Electronic Gear 1 is valid when this value is 0 | unit of command (computing) | 0 | immediate effect | Shutdown Settings | P |
| F03.08 | Electronic gear ratio 1 (molecular) | 1 to 1073741824 | - | 1 | Immediate effect | Shutdown Settings | P |
| F03.0A | Electronic gear ratio 1 (denominator) | 1 to 1073741824 | - | 1 | Immediate effect | Shutdown Settings | P |
| F03.0C | Electronic gear ratio 2 (molecular) | 1 to 1073741824 | - | 1 | Immediate effect | Shutdown Settings | P |
| F03.0E | Electronic gear ratio 2 (denominator) | 1 to 1073741824 | - | 1 | Immediate effect | Shutdown Settings | P |
| F03.10 | Electronic Gear Ratio 1/2 Switching Conditions | 0: F03.06 = 0, position command = 0 and lasts 2.5ms<br>1: F03.06 = 0, real-time switching<br>Note: Switching is performed by configuring the DI port | - | 0 | Immediate effect | Shutdown Settings | P |
| F03.11 | Maximum speed step when switching to position mode | 100-3000 | rpm | 1000 | Immediate effect | Shutdown Settings | P |
| F03.12 | Positioning completion/approach to output condition | 0:Output when absolute value of position deviation <03.13 | - | 0 | Immediate effect | Operation Settings | P |

| Function code | Name | Setting range | Unit (of measure) | Factory setting | Mode of entry into force | Setting method | Relevant modalities |
|---|---|---|---|---|---|---|---|
| | | 1:Absolute value of position deviation < 03.13 and position command is 0 after filtering<br>2:Position deviation absolute value <03.13 and position command is 0 before filtering | | | | | |
| F03.13 | Positioning Completion Threshold | 1 to 65535, command unit | unit of command (computing) | 734 | Immediate effect | Operation Settings | P |
| F03.14 | Positioning Completion Window Time | 0 to 30000 | ms | 1 | Immediate effect | Operation Settings | P |
| F03.15 | Positioning completion hold time | 0 to 30000 | ms | 1 | Immediate effect | Operation Settings | P |
| F03.16 | Positioning close to the threshold | 1 to 65535 | unit of command (computing) | 65535 | Immediate effect | Operation Settings | P |
| F03.18 | localize arrival | -2147483648 to 2147483647 | unit of command (computing) | 0 | Immediate effect | Operation Settings | P |
| r03.1b | Zero state saving | 0:Home return not performed<br>1:Normal return to zero successful<br>2:Electrical return to zero successful<br>3:Zeroing process timeout | - | - | - | demonstrate | - |
| F03.1C | Home return enable control<br>(Return to zero means precise positioning in absolute position)<br>(Back to the original means searching for signal points in a way that roughly locates them) | 0: Close the origin reversion<br>1: Enable home return function by inputting home return signal through DI<br>2: Enable electrical return to zero function by DI input home return signal<br>3: Activate home return immediately after power up<br>4: Immediate origin reversion<br>5: Initiate electrical return-to-zero command<br>6: Take the current position as the origin | - | 0 | Immediate effect | Operation Settings | P |
| F03.1d | (math.) origin reversion model | Position: Deceleration point signal selection<br>0: Home switch<br>1: Positive rotation limit position POT<br>2: Reverse Limit Bit NOT<br>3: Mechanical limits (reserved)<br>Ten position: Home signal selection<br>0: Home switch | - | 00 | Immediate effect | Shutdown Settings | P |

| Function code | Name | Setting range | Unit (of measure) | Factory setting | Mode of entry into force | Setting method | Relevant modalities |
|---|---|---|---|---|---|---|---|
| | | 1: Positive rotation limit position POT (Deceleration point prohibited selection NOT)<br>2: Reverse limit position NOT (POT is prohibited for deceleration point)<br>3: Mechanical limits (reserved)<br>4: Motor Z signal (reserved)<br>Hundredths: initial direction of motion<br>0: Forward back to origin (forward - rising edge; reverse - falling edge)<br>1: Reverse back to the origin (reverse - rising edge; forward - falling edge)<br>Thousandths bit: origin completes the stop along<br>0: leading edge 1: trailing edge | | | | | |
| F03.1E | High-speed search origin speed | 1 to 3000 | rpm | 100 | Immediate effect | Operation Settings | P |
| F03.1F | Low search origin speed | 1 to 1000 | rpm | 10 | Immediate effect | Operation Settings | P |
| F03.20 | Acceleration and deceleration times when searching for the origin | 0 to 1000 | ms | 100 | Immediate effect | Shutdown Settings | P |
| F03.21 | Limit the time to find the origin | 0.01 to 600.00 | s | 20.00 | Immediate effect | Shutdown Settings | P |
| F03.22 | Mechanical Home Offset | -1073741824 to 1073741824 | unit of command (computing) | 0 | Immediate effect | Shutdown Settings | P |
| F03.35 | disjointed and fixed-length alternative (math.), i.e. fractional part of a triangle | Single digit: fixed-length interrupt selection<br>0: Fixed-length interrupt function is not used<br>1: Using the fixed-length interrupt function<br>Tenth position: Selection of fixed-length interrupt state release mode<br>0: Fixed-length interrupt is released directly after the positioning is finished (can receive position commands directly)<br>1: Waiting for Di to input release signal after fixed-length interrupt positioning (the user decides whether to release or not) | - | 00 | Immediate effect | Operation Settings | P |

| Function code | Name | Setting range | Unit (of measure) | Factory setting | Mode of entry into force | Setting method | Relevant modalities |
|---|---|---|---|---|---|---|---|
| F03.36 | Interrupting the long run displacement | -1073741824 to 1073741824 | unit of command (computing) | 10000 | Immediate effect | Operation Settings | P |
| F03.38 | Interruptions to determine long run speeds | 0 to 6000 | rpm | 200 | Immediate effect | Operation Settings | P |
| F03.39 | Interrupts the long run acceleration and deceleration times | 0 to 1000 | ms | 10 | Immediate effect | Operation Settings | P |
| F03.3A | Program JOG operation mode selection | 0: (Waiting time -> positive transfer movement) * number of movements<br>1: (Waiting time -> reverse movement) * number of movements<br>2: (Waiting time -> forward movement) * number of moves -> (Waiting time -> reverse movement) * number of moves<br>3: (wait time -> reverse move) * number of moves -> (wait time -> forward move) * number of moves<br>4: (wait time -> forward move -> wait time -> reverse move) * number of moves<br>5: (wait time -> reverse move -> wait time -> forward move) * number of moves | - | 0 | Immediate effect | Operation Settings | PST |
| F03.3b | Number of program JOG moves | 1 to 9999 (always cycle) | - | 1 | Immediate effect | Operation Settings | PST |
| F03.3C | Program JOG moving distance | 1 to 1073741824 | unit of command (computing) | 32768 | Immediate effect | Operation Settings | PST |
| F03.3E | Program JOG movement speed | 1 to 6000 | rpm | 500 | Immediate effect | Operation Settings | PST |
| F03.3F | Program JOG acceleration time | 2 to 10000 | ms | 100 | Immediate effect | Operation Settings | PST |
| F03.40 | Program JOG Deceleration Time | 2 to 10000 | ms | 100 | Immediate effect | Operation Settings | PST |
| F03.41 | Program JOG wait time (no wait for first run) | 0 to 10000 | ms | 100 | Immediate effect | Operation Settings | PST |

## 8.2.5Group 04 Multi-segment position control parameters

| Function code | Name | Setting range | Unit (of measure) | Factory setting | Mode of entry into force | Setting method | Related modes |
|---|---|---|---|---|---|---|---|
| F04.00 | Multi-stage position operation mode | 0: Single run end stop<br>1: Cyclic operation<br>2: Select switching operation<br>3: Sequential operation | - | 1 | Immediate effect | Shutdown Settings | P |
| F04.01 | Number of End Segments for Bit Shift Instructions | 1 to 16 | - | 1 | Immediate effect | Shutdown Settings | P |
| F04.02 | cope with the residuals (i.e. waste disposal) | 0: Continue through the remaining segments (not the number of pulses remaining in a segment)<br>1: Ignore remaining segments and re-run from first segment | - | 0 | Immediate effect | Shutdown Settings | P |
| F04.03 | waiting time unit | 0:ms<br>1:s | - | 0 | Immediate effect | Shutdown Settings | P |
| F04.04 | Acceleration and deceleration time unit | 0:0.001s<br>1:0.01s<br>2:0.1s<br>3:1s<br>Note: Reference speed: 1000rpm | - | 0 | Immediate effect | Shutdown Settings | P |
| F04.05 | Bit Shift Instruction Type Selection | 0: Incremental displacement command<br>1: Absolute Displacement Command | - | 0 | Immediate effect | Shutdown Settings | P |
| F04.06 | Selection of switching operation mode | 0: External Di select switching operation<br>1: Internal digital selection switching operation | - | 0 | Immediate effect | Operation Settings | P |
| F04.07 | Multi-segment position internal digitally selected | 1 to 16 | - | 1 | Immediate effect | Operation Settings | P |
| F04.08 | Sequential Run Start Segment | 0 to 16<br>0: Single run<br>!0: Loop running | - | 00 | Immediate effect | Shutdown Settings | P |
| F04.10 | Number of displacement pulses in segment 1 | -1073741824 to 1073741824 | unit of command (computing) | 0 | Immediate effect | Shutdown Settings | P |
| F04.12 | Maximum operating speed for segment 1 | 1 to 6000 | rpm | 200 | Immediate effect | Operation Settings | P |
| F04.13 | Acceleration time for segment 1 | 0 to 60000 (*04.04 time unit) | s | 10 | Immediate effect | Operation Settings | P |
| F04.14 | 1st deceleration time | 0 to 60000 (*04.04 time unit) | s | 10 | Immediate effect | Operation | P |

| Function code | Name | Setting range | Unit (of measure) | Factory setting | Mode of entry into force | Setting method | Related modes |
|---|---|---|---|---|---|---|---|
| | | | | | | Settings | |
| F04.15 | Waiting time after completion of paragraph 1 | 0 to 10000 (*04.03 time unit) | s | 10 | Immediate effect | Operation Settings | P |
| F04.16 | Number of displacement pulses in paragraph 2 | -1073741824 to 1073741824 | unit of command (computing) | 0 | Immediate effect | Shutdown Settings | P |
| F04.18 | Maximum operating speed for paragraph 2 | 1 to 6000 | rpm | 200 | Immediate effect | Operation Settings | P |
| F04.19 | Acceleration time for paragraph 2 | 0 to 60000 (*04.04 time unit) | s | 10 | Immediate effect | Operation Settings | P |
| F04.1A | Deceleration time for paragraph 2 | 0 to 60000 (*04.04 time unit) | s | 10 | Immediate effect | Operation Settings | P |
| F04.1b | Waiting time after completion of paragraph 2 | 0 to 10000 (*04.03 time unit) | s | 10 | Immediate effect | Operation Settings | P |
| F04.1C | Number of displacement pulses in paragraph 3 | -1073741824 to 1073741824 | unit of command (computing) | 0 | immediate effect | Shutdown Settings | P |
| F04.1E | Maximum operating speed for paragraph 3 | 1 to 6000 | rpm | 200 | Immediate effect | Operation Settings | P |
| F04.1F | Acceleration time for paragraph 3 | 0 to 60000 (*04.04 time unit) | s | 10 | Immediate effect | Operation Settings | P |
| F04.20 | Deceleration time for paragraph 3 | 0 to 60000 (*04.04 time unit) | s | 10 | Immediate effect | Operation Settings | P |
| F04.21 | Waiting time after completion of paragraph 3 | 0 to 10000 (*04.03 time unit) | s | 10 | Immediate effect | Operation Settings | P |
| F04.22 | Number of displacement pulses in paragraph 4 | -1073741824 to 1073741824 | unit of command (computing) | 0 | Immediate effect | Shutdown Settings | P |
| F04.24 | Maximum operating speed for paragraph 4 | 1 to 6000 | rpm | 200 | Immediate effect | Operation | P |

| Function code | Name | Setting range | Unit (of measure) | Factory setting | Mode of entry into force | Setting method | Related modes |
|---|---|---|---|---|---|---|---|
| | | | | | | Settings | |
| F04.25 | Paragraph 4 acceleration time | 0 to 60000 (*04.04 time unit) | s | 10 | Immediate effect | Operation Settings | P |
| F04.26 | Deceleration time for paragraph 4 | 0 to 60000 (*04.04 time unit) | s | 10 | Immediate effect | Operation Settings | P |
| F04.27 | Waiting time after completion of paragraph 4 | 0 to 10000 (*04.03 time unit) | s | 10 | Immediate effect | Operation Settings | P |
| F04.28 | Number of displacement pulses in paragraph 5 | -1073741824 to 1073741824 | unit of command (computing) | 0 | Immediate effect | Shutdown Settings | P |
| F04.2A | Maximum operating speed for paragraph 5 | 1 to 6000 | rpm | 200 | immediate effect | Operation Settings | P |
| F04.2b | Paragraph 5 acceleration time | 0 to 60000 (*04.04 time unit) | s | 10 | Immediate effect | Operation Settings | P |
| F04.2C | Deceleration time for paragraph 5 | 0 to 60000 (*04.04 time unit) | s | 10 | Immediate effect | Operation Settings | P |
| F04.2d | Waiting time after completion of paragraph 5 | 0 to 10000 (*04.03 time unit) | s | 10 | Immediate effect | Operation Settings | P |
| F04.2E | Number of displacement pulses in paragraph 6 | -1073741824 to 1073741824 | unit of command (computing) | 0 | Immediate effect | Shutdown Settings | P |
| F04.30 | Maximum operating speed for paragraph 6 | 1 to 6000 | rpm | 200 | Immediate effect | Operation Settings | P |
| F04.31 | Paragraph 6 acceleration time | 0 to 60000 (*04.04 time unit) | s | 10 | Immediate effect | Operation Settings | P |
| F04.32 | Deceleration time for paragraph 6 | 0 to 60000 (*04.04 time unit) | s | 10 | Immediate effect | Operation Settings | P |
| F04.33 | Waiting time after completion of paragraph 6 | 0 to 10000 (*04.03 time unit) | s | 10 | Immediate effect | Operation | P |

| Function code | Name | Setting range | Unit (of measure) | Factory setting | Mode of entry into force | Setting method | Related modes |
|---|---|---|---|---|---|---|---|
| | | | | | | Settings | |
| F04.34 | Number of displacement pulses in paragraph 7 | -1073741824 to 1073741824 | unit of command (computing) | 0 | Immediate effect | Shutdown Settings | P |
| F04.36 | Maximum operating speed for paragraph 7 | 1 to 6000 | rpm | 200 | Immediate effect | Operation Settings | P |
| F04.37 | Paragraph 7 acceleration time | 0 to 60000 (*04.04 time unit) | s | 10 | Immediate effect | Operation Settings | P |
| F04.38 | Paragraph 7 Deceleration time | 0 to 60000 (*04.04 time unit) | s | 10 | Immediate effect | Operation Settings | P |
| F04.39 | Waiting time after completion of paragraph 7 | 0 to 10000 (*04.03 time unit) | s | 10 | Immediate effect | Operation Settings | P |
| F04.3A | Number of displacement pulses in paragraph 8 | -1073741824 to 1073741824 | Unit of command (computing) | 0 | Immediate effect | Shutdown Settings | P |
| F04.3C | Paragraph 8 maximum operating speed | 1 to 6000 | rpm | 200 | Immediate effect | Operation Settings | P |
| F04.3d | Paragraph 8 acceleration time | 0 to 60000 (*04.04 time unit) | s | 10 | Immediate effect | Operation Settings | P |
| F04.3E | Paragraph 8 Deceleration time | 0 to 60000 (*04.04 time unit) | s | 10 | Immediate effect | Operation Settings | P |
| F04.3F | Waiting time after completion of paragraph 8 | 0 to 10000 (*04.03 time unit) | s | 10 | Immediate effect | Operation Settings | P |
| F04.40 | Number of displacement pulses in paragraph 9 | -1073741824 to 1073741824 | unit of command (computing) | 0 | Immediate effect | Shutdown Settings | P |
| F04.42 | Para. 9 Maximum operating speed | 1 to 6000 | rpm | 200 | Immediate effect | Operation Settings | P |
| F04.43 | Paragraph 9 acceleration time | 0 to 60000 (*04.04 time unit) | s | 10 | Immediate effect | Operation | P |

| Function code | Name | Setting range | Unit (of measure) | Factory setting | Mode of entry into force | Setting method | Related modes |
|---|---|---|---|---|---|---|---|
| | | | | | | Settings | |
| F04.44 | Paragraph 9 Deceleration time | 0 to 60000 (*04.04 time unit) | s | 10 | Immediate effect | Operation Settings | P |
| F04.45 | Waiting time after completion of paragraph 9 | 0 to 10000 (*04.03 time unit) | s | 10 | Immediate effect | Operation Settings | P |
| F04.46 | Number of displacement pulses in paragraph 10 | -1073741824 to 1073741824 | Unit of command (computing) | 0 | Immediate effect | Shutdown Settings | P |
| F04.48 | Para. 10 Maximum operating speed | 1 to 6000 | rpm | 200 | Immediate effect | Operation Settings | P |
| F04.49 | Paragraph 10 acceleration time | 0 to 60000 (*04.04 time unit) | s | 10 | Immediate effect | Operation Settings | P |
| F04.4A | Paragraph 10 Deceleration time | 0 to 60000 (*04.04 time unit) | s | 10 | Immediate effect | Operation Settings | P |
| F04.4b | Waiting time after completion of paragraph 10 | 0 to 10000 (*04.03 time unit) | s | 10 | immediate effect | Operation Settings | P |
| F04.4C | Number of displacement pulses in paragraph 11 | -1073741824 to 1073741824 | Unit of command (computing) | 0 | Immediate effect | Shutdown Settings | P |
| F04.4E | Paragraph 11 maximum operating speed | 1 to 6000 | rpm | 200 | Immediate effect | Operation Settings | P |
| F04.4F | Paragraph 11 acceleration time | 0 to 60000 (*04.04 time unit) | s | 10 | Immediate effect | Operation Settings | P |
| F04.50 | Paragraph 11 Deceleration time | 0 to 60000 (*04.04 time unit) | s | 10 | immediate effect | Operation Settings | P |
| F04.51 | Waiting time after completion of paragraph 11 | 0 to 10000 (*04.03 time unit) | s | 10 | immediate effect | Operation Settings | P |
| F04.52 | Number of displacement | -1073741824 to 1073741824 | Unit of command | 0 | immediate effect | Shutdown | P |

| Function code | Name | Setting range | Unit (of measure) | Factory setting | Mode of entry into force | Setting method | Related modes |
|---|---|---|---|---|---|---|---|
| | pulses in paragraph 12 | | (computing) | | | Settings | |
| F04.54 | Para. 12 Maximum operating speed | 1 to 6000 | rpm | 200 | immediate effect | Operation Settings | P |
| F04.55 | Paragraph 12 acceleration time | 0 to 60000 (*04.04 time unit) | s | 10 | immediate effect | Operation Settings | P |
| F04.56 | Paragraph 12 Deceleration time | 0 to 60000 (*04.04 time unit) | s | 10 | immediate effect | Operation Settings | P |
| F04.57 | Waiting time after completion of paragraph 12 | 0 to 10000 (*04.03 time unit) | s | 10 | immediate effect | Operation Settings | P |
| F04.58 | Number of displacement pulses in paragraph 13 | -1073741824 to 1073741824 | Unit of command (computing) | 0 | immediate effect | Shutdown Settings | P |
| F04.5A | Paragraph 13 Maximum operating speed | 1 to 6000 | rpm | 200 | immediate effect | Operation Settings | P |
| F04.5b | Paragraph 13 acceleration time | 0 to 60000 (*04.04 time unit) | s | 10 | Immediate effect | Operation Settings | P |
| F04.5C | Paragraph 13 Deceleration time | 0 to 60000 (*04.04 time unit) | s | 10 | Immediate effect | Operation Settings | P |
| F04.5d | Waiting time after completion of paragraph 13 | 0 to 10000 (*04.03 time unit) | s | 10 | Immediate effect | Operation Settings | P |
| F04.5E | Number of displacement pulses in paragraph 14 | -1073741824 to 1073741824 | unit of command (computing) | 0 | Immediate effect | Shutdown Settings | P |
| F04.60 | Paragraph 14 Maximum operating speed | 1 to 6000 | rpm | 200 | Immediate effect | Operation Settings | P |
| F04.61 | Paragraph 14 acceleration time | 0 to 60000 (*04.04 time unit) | s | 10 | Immediate effect | Operation Settings | P |
| F04.62 | Paragraph 14 Deceleration time | 0 to 60000 (*04.04 time unit) | s | 10 | Immediate effect | Operation | P |

| Function code | Name | Setting range | Unit (of measure) | Factory setting | Mode of entry into force | Setting method | Related modes |
|---|---|---|---|---|---|---|---|
| | | | | | | Settings | |
| F04.63 | Waiting time after completion of paragraph 14 | 0 to 10000 (*04.03 time unit) | s | 10 | Immediate effect | Operation Settings | P |
| F04.64 | Number of displacement pulses in paragraph 15 | -1073741824 to 1073741824 | unit of command (computing) | 0 | immediate effect | Shutdown Settings | P |
| F04.66 | Paragraph 15 maximum operating speed | 1 to 6000 | rpm | 200 | Immediate effect | Operation Settings | P |
| F04.67 | Paragraph 15 acceleration time | 0 to 60000 (*04.04 time unit) | s | 10 | Immediate effect | Operation Settings | P |
| F04.68 | Paragraph 15 Deceleration time | 0 to 60000 (*04.04 time unit) | s | 10 | Immediate effect | Operation Settings | P |
| F04.69 | Waiting time after completion of paragraph 15 | 0 to 10000 (*04.03 time unit) | s | 10 | Immediate effect | Operation Settings | P |
| F04.6A | Number of displacement pulses in paragraph 16 | -1073741824 to 1073741824 | unit of command (computing) | 0 | Immediate effect | Shutdown Settings | P |
| F04.6C | Paragraph 16 Maximum operating speed | 1 to 6000 | rpm | 200 | Immediate effect | Operation Settings | P |
| F04.6d | Paragraph 16 acceleration time | 0 to 60000 (*04.04 time unit) | s | 10 | Immediate effect | Operation Settings | P |
| F04.6E | Paragraph 16 Deceleration time | 0 to 60000 (*04.04 time unit) | s | 10 | Immediate effect | Operation Settings | P |
| F04.6F | Waiting time after completion of paragraph 16 | 0 to 10000 (*04.03 time unit) | s | 10 | Immediate effect | Operation Settings | P |

### 8.2.6Group 06 Speed Control Parameters

| function code | Name | Setting range | unit (of measure) | Factory setting | Mode of entry into force | Setting method | Related modes |
|---|---|---|---|---|---|---|---|
| F06.00 | Speed command source setting | Bit: Main speed command source A<br>0: Number given<br>1: AI1<br>2: Internal Multi-Segment Speed<br>3: Manufacturer's reservation<br>4: Pulse given (high and low speed selection is determined by pulse pattern 03.01, corresponding speed is determined by 06.03)<br>Tenth position: auxiliary speed command source B<br>same position<br>Hundredths: Speed command selection<br>0: Main speed command A<br>1: Auxiliary speed command B<br>2: Primary + Secondary<br>3: Primary/Auxiliary switching (Di switching)<br>Thousands of bits: internal multi-speed mode of operation<br>0: External Di terminal selection<br>1: Internal digital selection | - | 0000 | Immediate effect | Shutdown Settings | S |
| F06.01 | Speed command digital setting | -6000 to 6000 | rpm | 200 | Immediate effect | Operation Settings | S |
| F06.02 | Maximum operating speed | 0 to 6000 | rpm | 3000 | Immediate effect | Operation Settings | S |
| F06.03 | Rotational speed corresponding to pulse frequency | 0 to 1000 | rpm/kHz | 10 | Immediate effect | Operation Settings | S |
| F06.04 | Internal Multi-Segment Speed 0 | -Maximum operating speed～Maximum operating speed | - | 0 | Immediate effect | Operation Settings | S |
| F06.05 | Internal Multi-Segment Speed 1 | -Maximum operating speed～Maximum operating speed | - | 0 | Immediate effect | Operation Settings | S |
| F06.06 | Internal Multi-Segment Speed 2 | -Maximum operating speed～Maximum operating speed | - | 0 | Immediate effect | Operation Settings | S |
| F06.07 | Internal Multi-Segment Speed 3 | -Maximum operating speed～Maximum operating speed | - | 0 | Immediate effect | Operation Settings | S |

| function code | Name | Setting range | unit (of measure) | Factory setting | Mode of entry into force | Setting method | Related modes |
|---|---|---|---|---|---|---|---|
| F06.08 | Internal Multi-Segment Speed 4 | -Maximum operating speed～Maximum operating speed | - | 0 | Immediate effect | Operation Settings | S |
| F06.09 | Internal Multi-Segment Speed 5 | -Maximum operating speed～Maximum operating speed | - | 0 | Immediate effect | Operation Settings | S |
| F06.0A | Internal Multi-Segment Speed 6 | -Maximum operating speed～Maximum operating speed | - | 0 | Immediate effect | Operation Settings | S |
| F06.0b | Internal Multi-Segment Speed 7 | -Maximum operating speed～Maximum operating speed | - | 0 | Immediate effect | Operation Settings | S |
| F06.0C | Internal Multi-Segment Speed 8 | -Maximum operating speed～Maximum operating speed | - | 0 | Immediate effect | Operation Settings | S |
| F06.0d | Internal Multi-Segment Speed 9 | -Maximum operating speed～Maximum operating speed | - | 0 | Immediate effect | Operation Settings | S |
| F06.0E | Internal Multi-Segment Speed 10 | -Maximum operating speed～Maximum operating speed | - | 0 | Immediate effect | Operation Settings | S |
| F06.0F | Internal Multi-Segment Speed 11 | -Maximum operating speed～Maximum operating speed | - | 0 | Immediate effect | Operation Settings | S |
| F06.10 | Internal Multi-Segment Speed 12 | -Maximum operating speed～Maximum operating speed | - | 0 | Immediate effect | Operation Settings | S |
| F06.11 | Internal Multi-Segment Speed 13 | -Maximum operating speed～Maximum operating speed | - | 0 | Immediate effect | Operation Settings | S |
| F06.12 | Internal Multi-Segment Speed 14 | -Maximum operating speed～Maximum operating speed | - | 0 | Immediate effect | Operation Settings | S |
| F06.13 | Internal Multi-Segment Speed 15 | -Maximum operating speed～Maximum operating speed | - | 0 | Immediate effect | Operation Settings | S |
| F06.14 | Internal multi-speed digital selection | 0 to 15 | - | 0 | immediate effect | Operation Settings | S |

| function code | Name | Setting range | unit (of measure) | Factory setting | Mode of entry into force | Setting method | Related modes |
|---|---|---|---|---|---|---|---|
| F06.15 | Tap speed (JOG) | 0 to maximum operating speed | rpm | 100 | Immediate effect | Operation Settings | PST |
| F06.19 | Zero Fixed Speed Threshold | 0 to 6000 | rpm | 10 | Immediate effect | Operation Settings | S |
| F06.1A | Motor rotation speed threshold | 0 to 1000 | rpm | 20 | Immediate effect | Operation Settings | PST |
| F06.1b | Velocity Consistent Signal Window Threshold | 0 to 100 | rpm | 10 | Immediate effect | Operation Settings | PST |
| F06.1C | Speed to signal | 10-6000 | rpm | 1000 | Immediate effect | Operation Settings | PST |
| F06.1d | Zero Speed Output Signal Threshold | 1 to 6000 | rpm | 10 | Immediate effect | Operation Settings | PST |
| F06.1F | Acceleration and deceleration mode | 0:Straight line<br>1:S-curve 1 (continuous)<br>2:S-curve 2 (intermittent) | - | 0 | Immediate effect | Shutdown Settings | S |
| F06.20 | acceleration time | 0 to 65535 | ms | 100 | Immediate effect | Operation Settings | S |
| F06.21 | deceleration time | 0 to 65535 | ms | 100 | Immediate effect | Operation Settings | S |
| F06.22 | Acceleration start S time | 1 to 3000 | ms | 30 | Immediate effect | Operation Settings | S |
| F06.23 | Accelerated end S time | 1 to 3000 | ms | 30 | Immediate effect | Operation Settings | S |
| F06.24 | Deceleration start S time | 1 to 3000 | ms | 30 | Immediate effect | Operation Settings | S |
| F06.25 | Deceleration end S time | 1 to 3000 | ms | 30 | Immediate effect | Operation Settings | S |

## 8.2.7Group 07 Torque control parameters

| Function code | Name | Setting range | unit (of measure) | Factory setting | Mode of entry into force | Setting method | Relevant modalities |
|---|---|---|---|---|---|---|---|
| F07.00 | Torque command source | 0: Number given<br>1: AI1<br>2: Manufacturer's reservation | - | 0 | Immediate effect | Shutdown Settings | T |
| F07.01 | Digital Torque Setting | -300.0% to 300.0% | - | 0.0 | Immediate effect | Operation Settings | T |
| F07.02 | Maximum set torque | 10.0% to 300.0% | - | 300.0 | Immediate effect | Operation Settings | T |
| F07.03 | Torque command filter time constant1 | 0.000 to 30.000 | ms | 0.800 | Immediate effect | Operation Settings | PST |
| F07.04 | Torque command filter time constant2 | 0.000 to 30.000 | ms | 0.800 | Immediate effect | Operation Settings | PST |
| F07.06 | Torque Limiting Sources | Position: Motorized torque limit selection (positive torque limit)<br>0: Internal torque limitation (07.07)<br>1: AI1 is the torque limit<br>2: Internal (07.07)/AI1 switching<br>3: Internal (07.07)/external (01.41) switching<br>[switched via DiFunc.005-PCL]<br>Tenth position: Braking torque limit selection (reverse torque limit)<br>0: Internal torque limitation (07.08)<br>1: AI1 is the torque limit<br>2: Internal (07.08)/AI1 switching<br>3: Internal (07.08)/External (01.41) Switching<br>[switched via DiFunc.005-PCL]<br>Note: AI maximum value corresponds to 01.41 | - | 0 | Immediate effect | Shutdown Settings | PS |

| Function code | Name | Setting range | unit (of measure) | Factory setting | Mode of entry into force | Setting method | Relevant modalities |
|---|---|---|---|---|---|---|---|
| F07.07 | Electric internal torque limitation | 0.0% to 300.0% | - | 300.0 | Immediate effect | Operation Settings | PS |
| F07.08 | Brake internal torque limitation | 0.0% to 300.0% | - | 300.0 | Immediate effect | Operation Settings | PS |
| F07.09 | Emergency stop torque limitation | 0.0% to 300.0% | - | 300.0 | Immediate effect | Operation Settings | PS |
| F07.0d | Speed limit source selection | Position: Positive Speed Limit Source<br>0: Internal speed limit (07.0E)<br>1: AI1<br>Tenth position: Reverse speed limit source<br>0: Internal speed limit (07.0F)<br>1: AI1<br>Note: AI maximum value corresponds to 01.40 | - | 0 | Immediate effect | Shutdown Settings | T |
| F07.0E | Torque control (positive) speed limit1 | 0 to 6000 | rpm | 200 | Immediate effect | Operation Settings | T |
| F07.0F | Torque control (negative) speed limit2 | 0 to 6000 | rpm | 200 | Immediate effect | Operation Settings | T |
| F07.11 | DO output torque reaches the effective threshold value | 0.0 to 300.0% | - | 20.0 | Immediate effect | Operation Settings | T |
| F07.12 | DO output torque reaches invalid threshold value | 0.0 to 300.0% | - | 10.0 | Immediate effect | Operation Settings | T |

| Function code | Name | Setting range | unit (of measure) | Factory setting | Mode of entry into force | Setting method | Relevant modalities |
|---|---|---|---|---|---|---|---|
| F07.14 | Torque limiting method after overspeed in torque mode | 0: Moment symmetry mode<br>1: Speed torque limit mode | - | 0 | Immediate effect | Shutdown Settings | PST |

## 8.2.8Group 08 Gain Parameters

| function code | Name | Setting range | unit (of measure) | Factory setting | Mode of entry into force | Setting method | Relevant modalities |
|---|---|---|---|---|---|---|---|
| F08.00 | Velocity loop gain 1 | 1.0 to 2000.0 | Hz | 40.0 | Immediate effect | Operation Settings | PST |
| F08.01 | Velocity loop integration time1 | 0.15 to 512.00 | ms | 30.00 | Immediate effect | Operation Settings | PST |
| F08.02 | Position loop gain 1 | 0.1 to 2000.0 | Hz | 40.0 | immediate effect | Operation Settings | P |
| F08.03 | Velocity loop gain 2 | 1.0 to 2000.0 | Hz | 40.0 | Immediate effect | Operation Settings | PST |
| F08.04 | Velocity loop integration time2 | 0.15 to 512.00 | ms | 30.00 | Immediate effect | Operation Settings | PST |
| F08.05 | Position Loop Gain 2 | 0.1 to 2000.0 | Hz | 40.0 | Immediate effect | Operation Settings | P |
| F08.0A | Load moment of inertia ratio | 0 to 20000% | - | 100 | Immediate effect | Operation Settings | PST |
| F08.0b | Speed feedforward control options | 0: No speed feedforward<br>1: Internal speed feedforward (valid in position mode)<br>2: AI1 is used as speed feed forward input<br>Note: The maximum value of Ai corresponds to the maximum speed of the motor 0b.09 | - | 1 | Immediate effect | Shutdown Settings | P |
| F08.0C | Velocity Feed Forward Gain | 0 to 100.0% | - | 0.0 | Immediate effect | Operation | P |

| function code | Name | Setting range | unit (of measure) | Factory setting | Mode of entry into force | Setting method | Relevant modalities |
|---|---|---|---|---|---|---|---|
| | | | | | | Settings | |
| F08.0d | Velocity feed-forward filtering time constant | 0 to 64.00 | ms | 0.5 | Immediate effect | Operation Settings | P |
| F08.0E | Torque Feed Forward Control Selection | 0: None<br>1: Internal torque feedforward | - | 1 | Immediate effect | Operation Settings | PST |
| F08.0F | Torque Feed Forward Gain | 0 to 200.0% | - | 0.0 | Immediate effect | Operation Settings | PST |
| F08.10 | Torque feed-forward filtering time constant | 0 to 64.00 | ms | 0.5 | Immediate effect | Operation Settings | PST |
| F08.11 | Voltage Feed Forward Selection | Bit: Voltage feed forward source selection<br>0: Current feedback feedforward<br>1: Current command feed forward<br>Ten positions: voltage feed forward selection<br>0: no voltage feedforward<br>1: With voltage feed forward<br>Hundredths: Inductive saturation control selection<br>0: No inductive saturation control<br>1: With inductive saturation control | - | 110 | Immediate effect | Operation Settings | PST |
| F08.14 | Second gain mode selection | 0: Fixed first mode, control of speed loop<br>GSEL = 0: PI control GSEL = 1: P control<br>1: First gain/second gain switching according to 08.15<br>Note: GSEL (DiFunc.00F) selects the switching | - | 0 | Immediate effect | Shutdown Settings | PST |
| F08.15 | Gain switching conditions | 0: Fixed first gain<br>1: Fixed first gain, DI switching speed loop P/PI control<br>2: DI switching, GSEL invalid first gain, valid second gain<br>3: Torque command switching<br>4: Speed command switching<br>5: Speed command rate of change switching in position mode<br>6: Speed command high and low speed threshold switching<br>7: Position deviation (encoder unit)<br>8: With or without position command switching | - | 0 | Immediate effect | Shutdown Settings | PST |

| function code | Name | Setting range | unit (of measure) | Factory setting | Mode of entry into force | Setting method | Relevant modalities |
|---|---|---|---|---|---|---|---|
| | | 9: Positioning completion amplitude (valid only in position mode)<br>10: Actual speed switching (actual speed) | | | | | |
| F08.16 | Gain switching delay | 0 to 65535 | ms | 5 | Immediate effect | Operation Settings | PST |
| F08.17 | Gain switching value | 0 to 20000 | - | 50 | Immediate effect | Operation Settings | PST |
| F08.18 | Gain switching hysteresis | 0 to 20000 | - | 30 | Immediate effect | Operation Settings | PST |
| F08.19 | Position gain switching time | 0 to 65535 | ms | 3 | Immediate effect | Operation Settings | PST |
| F08.1E | Number of velocity feedback mean filters | 0 to 16 | | 0 | Immediate effect | Shutdown Settings | PST |
| F08.1F | Velocity feedback low-pass filter cutoff frequency | 100 to 4000 | Hz | 4000 | Immediate effect | Shutdown Settings | PST |
| F08.21 | Speed regulator PDFF feedforward factor | 0 to 100.0% | - | 100.0 | Immediate effect | Shutdown Settings | PST |

## 8.2.9Group 09 Performance Advance Tuning Parameters

| function code | Name | Setting range | unit (of measure) | Factory setting | Mode of entry into force | Setting method | Related modes |
|---|---|---|---|---|---|---|---|
| F09.00 | Automatic adjustment mode selection | 0: Parameter self-adjustment is invalid, manually adjust the gain parameter<br>1: Parameter adjustment mode, automatic gain adjustment with a rigid meter<br>2: Positioning mode, automatic adjustment of gain parameters with a rigid meter | - | 0 | Immediate effect | Operation Settings | PST |
| F09.01 | Rigidity level selection | 0 to 31 | - | 12 | Immediate effect | Operation Settings | PST |
| F09.11 | Online Inertia Recognition Setting | 0: Disable online inertia recognition<br>1: Enable online inertia recognition, inertia changes slowly occasions | - | 0 | Immediate effect | Shutdown | PST |

| function code | Name | Setting range | unit (of measure) | Factory setting | Mode of entry into force | Setting method | Related modes |
|---|---|---|---|---|---|---|---|
| | | 2: On-line inertia recognition, inertia changes in general occasions<br>3: Enable online inertia recognition, where inertia changes rapidly | | | | Settings | |
| F09.12 | Offline Inertia Recognition Mode Selection | 0: Forward and reverse triangle wave mode<br>1: Jog Pointing Mode | - | 0 | Immediate effect | Shutdown Settings | PST |
| F09.13 | Inertia Recognition Maximum Speed | 100 to 1000 | rpm | 500 | Immediate effect | Shutdown Settings | PST |
| F09.14 | Inertia Recognition Acceleration Time Constant | 20 to 800 | ms | 125 | Immediate effect | Shutdown Settings | PST |
| F09.15 | Waiting time after single inertia recognition is completed | 50 to 10000 | ms | 800 | Immediate effect | Shutdown Settings | PST |
| r09.16 | Identify the number of motor revolutions in a single pass | 0.00 to 2.00 | r | 0.00 | - | Demonstrate | - |
| r09.18 | Resonance frequency test results show | 0 to 4000 | Hz | 4000 | - | demonstrate | - |
| F09.19 | Adaptive Trap Filter Mode Selection | 0: The third and fourth traps are not automatically updated and can be modified manually<br>1: The third set of traps is automatically updated and cannot be modified manually<br>2: The third and fourth sets of traps are updated automatically and cannot be modified manually.<br>3: Test resonant frequency, shown in 09.18<br>4: Initialize the third and fourth traps | - | - | Immediate effect | Operation Settings | - |
| F09.1A | Band 1 trap filter frequency | 50-4000 | Hz | 4000 | Immediate effect | Operation Settings | PST |
| F09.1b | Paragraph 1 Trap Filter Rating | 0 to 20 | - | 2 | Immediate effect | Operation Settings | PST |
| F09.1C | Depth of the 1st trap filter | 0 to 99 | - | 0 | Immediate effect | Operation Settings | PST |

| function code | Name | Setting range | unit (of measure) | Factory setting | Mode of entry into force | Setting method | Related modes |
|---|---|---|---|---|---|---|---|
| F09.1d | Band 2 trap filter frequency | 50-4000 | Hz | 4000 | Immediate effect | Operation Settings | PST |
| F09.1E | Q value of the 2nd segment trap filter | 0 to 20 | - | 2 | Immediate effect | Operation Settings | PST |
| F09.1F | Trap depth of the segment 2 trap filter | 0 to 99 | - | 0 | Immediate effect | Operation Settings | PST |
| F09.20 | Band 3 trap filter frequency | 50 to 4000 | Hz | 4000 | Immediate effect | Operation Settings | PST |
| F09.21 | Paragraph 3 trap filter Q | 0 to 20 | - | 2 | Immediate effect | Operation Settings | PST |
| F09.22 | Trap depth of the segment 3 trap filter | 0 to 99 | - | 00 | Immediate effect | Operation Settings | PST |
| F09.23 | Band 4 trap filter frequency | 50 to 4000 | Hz | 4000 | immediate effect | Operation Settings | PST |
| F09.24 | Paragraph 4 trap filter Q | 0 to 20 | - | 2 | Immediate effect | Operation Settings | PST |
| F09.25 | Trap depth of the segment 4 trap filter | 0 to 99 | - | 0 | Immediate effect | Operation Settings | PST |
| F09.26 | End jitter auto-test option | 0: Manual setting 09.27～09.28<br>1: Automatic setting 09.27～09.28 | - | 0 | Immediate effect | Operation Settings | P |
| F09.27 | End jitter suppression frequency | 1.0 to 100.0 | Hz | 100.0 | Immediate effect | Operation Settings | P |
| F09.28 | End jitter suppression filter setting | 0 to 10 | - | 2 | Immediate effect | Operation Settings | P |
| F09.29 | End jitter suppression judgment threshold | 0 to 65535 | Encoder Unit | 5 | Immediate effect | Operation Settings | P |

| function code | Name | Setting range | unit (of measure) | Factory setting | Mode of entry into force | Setting method | Related modes |
|---|---|---|---|---|---|---|---|
| F09.2b | Torque Disturbance Compensation Gain | 0.0% to 100.0% | - | 0.0 | Immediate effect | Operation Settings | PST |
| F09.2C | Torque Disturbance Observer Filtering Time Constant | 0.00 to 25.00 | ms | 0.5 | Immediate effect | Operation Settings | PST |

## 8.2.10Group 0A Drive Parameters

| Function code | Name | Setting range | Unit (of measure) | Factory setting | Mode of entry into force | Setting method | Relevant modalities |
|---|---|---|---|---|---|---|---|
| r0A.00 | Drive power rating display | 0.01 to 655.35 | kW | - | - | demonstrate | - |
| r0A.01 | Drive Rated Voltage Display | 220 to 380 | V | - | - | demonstrate | - |
| r0A.02 | Drive rated current display | 0.01 to 655.35 | A | - | - | demonstrate | - |
| F0A.07 | DO Brake ON Command Delay | 0 to 500 | ms | 250 | immediate effect | Operation Settings | PST |
| F0A.08 | DO holding brake OFF static power failure delay | 1 to 1000 | ms | 150 | immediate effect | Operation Settings | PST |
| F0A.09 | DO brake servo OFF dynamic speed thresholds | 0 to 3000 | rpm | 30 | immediate effect | Operation Settings | PST |
| F0A.0A | DO brake OFF dynamic brake delay | 1 to 1000 | ms | 500 | immediate effect | Operation Settings | PST |
| F0A.0b | DO Holding brake OFF Dynamic power failure delay | 1 to 1000 | ms | 50 | immediate effect | Operation Settings | PST |

| Function code | Name | Setting range | Unit (of measure) | Factory setting | Mode of entry into force | Setting method | Relevant modalities |
|---|---|---|---|---|---|---|---|
| r0A.10 | Minimum permissible braking resistance of the drive | Internal checklist | Ω | - | - | demonstrate | - |
| F0A.11 | Built-in braking resistor power | Internal checklist | W | - | - | demonstrate | - |
| F0A.12 | Built-in braking resistor resistance value | Internal checklist | Ω | - | - | demonstrate | - |
| F0A.13 | Resistance Heat Time Constant | 0 to 65535 | s | 200 | immediate effect | Shutdown Settings | PST |
| F0A.14 | Braking resistor setting | 0: Using built-in braking resistor<br>1: Use external braking resistor, natural cooling<br>2: Use of external braking resistor, forced cooling<br>3: No braking resistor, all rely on capacitor absorption | - | 0 | immediate effect | Shutdown Settings | PST |
| F0A.15 | External braking resistor power | 1 to 65535 | W | - | immediate effect | Shutdown Settings | PST |
| F0A.16 | External braking resistor resistance value | 1 to 1000 | Ω | 1 | immediate effect | Shutdown Settings | PST |
| F0A.17 | Fan control method | 0: Enable when servo ON, hold 10s when OFF<br>1: Enable on power-up<br>2: Automatic adjustment according to the drive temperature | - | 0 | immediate effect | Operation Settings | PST |
| r0A.1F | Current access rights (set automatically by the type of password entered) | 0: End user<br>1: Standard users<br>2: Expert commissioning | - | - | - | demonstrate | - |
| F0A.20 | user password | 0 to 65535<br>1. In the state of no user password (F0A.1F=1 after power-on): Entering the same non-zero twice in a row sets the user password once and enters the lockout state, and F0A.1F is automatically set to zero;<br>2. In password locked state: Enter the password to enter the unlocked state; | - | 0 | immediate effect | Operation Settings | PST |

| Function code | Name | Setting range | Unit (of measure) | Factory setting | Mode of entry into force | Setting method | Relevant modalities |
|---|---|---|---|---|---|---|---|
| | | 3. In the unlocked state: enter the original password to enter the locked state; enter two consecutive times you want to notify to change the password (if you enter two consecutive times 0 to clear the password); | | | | | |
| F0A.22 | Manufacturer Definition | | - | - | immediate effect | Operation Settings | PST |

## 8.2.11Group 0B Servo Motor Parameters

| Function code | Name | Setting range | Unit (of measure) | Factory setting | Mode of entry into force | Setting method | Relevant modalities |
|---|---|---|---|---|---|---|---|
| r0b.00 | Motor Model | 0: 100W<br>1: 200W<br>2: 400W<br>3: 750W<br>4: 1KW | - | 1 | - | read-only (computing) | PST |
| r0b.02 | Motor rated power | 0.01 to 75.00 | kW | 0.40 | - | Read-only (computing) | PST |
| r0b.03 | Motor rated voltage | 10 to 500 | V | 220 | - | Read-only (computing) | PST |
| r0b.04 | Motor rated current | 0.01 to 655.35 | A | 2.60 | - | Read-only (computing) | PST |
| r0b.05 | Maximum instantaneous motor current | 0.01 to 655.35 | A | 7.80 | - | Read-only (computing) | PST |
| r0b.06 | Rated motor torque | 0.01 to 655.35 | Nm | 1.27 | - | Read-only (computing) | PST |
| r0b.07 | Maximum motor torque (torque rating) | 0.01 to 655.35 | Nm | 3.81 | - | Read-only (computing) | PST |
| r0b.08 | Motor rating | 100-6000 | rpm | 3000 | - | Read-only | PST |

| Function code | Name | Setting range | Unit (of measure) | Factory setting | Mode of entry into force | Setting method | Relevant modalities |
|---|---|---|---|---|---|---|---|
| | number of revolutions per minute | | | | | (computing) | |
| r0b.09 | Maximum motor speed (torque rating) | 100-6000 | rpm | 6000 | - | Read-only (computing) | PST |
| r0b.0A | motor moment of inertia | 0.01 to 655.35 | kgCm^2 | 0.41 | - | Read-only (computing) | PST |
| r0b.0b | Motor pole pair number | 2 to 100 | - | 4 | - | Read-only (computing) | PST |
| r0b.0C | Stator resistance | 0.001 to 65.535 | Ω | 2.276 | - | Read-only (computing) | PST |
| r0b.0d | Stator inductance Ld | 0.01 to 655.35 | mH | 13.00 | - | Read-only (computing) | PST |
| r0b.0E | Stator inductance Lq | 0.01 to 655.35 | mH | 13.00 | - | Read-only (computing) | PST |
| r0b.0F | Reverse electromotive force coefficient | 0.01 to 655.35 | mV/rpm | 30.00 | - | Read-only (computing) | PST |
| r0b.10 | Torque coefficient Kt | 0.01 to 655.35 | Nm/Arms | 0.48 | - | Read-only (computing) | PST |
| r0b.11 | Electrical constant Te | 0.01 to 655.35 | ms | 5.05 | - | Read-only (computing) | PST |
| r0b.12 | Mechanical constant Tm | 0.01 to 655.35 | ms | 0.50 | - | Read-only (computing) | PST |
| r0b.1b | Encoder Selection | Digits: Encoder type selection<br>0: Serial communication encoder<br>1: Incremental encoder<br>2: Analog encoder (Sin/Cos)<br>3: Magnetic encoder<br>Ten bits: serial encoder type<br>0: None<br>1: 23 Tamagawa<br>2: 17 Tamagawa | - | 001 | - | Read-only (computing) | PST |

| Function code | Name | Setting range | Unit (of measure) | Factory setting | Mode of entry into force | Setting method | Relevant modalities |
|---|---|---|---|---|---|---|---|
| | | Hundredths: Absolute encoder single-turn multi-turn<br>0: Multi-turn absolute<br>1: Absolute value of single turn | | | | | |
| r0b.1C | Number of encoder lines | 1 to 1073741824 | - | 8388608 | - | Read-only (computing) | PST |
| r0b.1E | Encoder mounting angle (Z/zero) | 0.0 to 359.9° | - | 0 | - | Read-only (computing) | PST |
| r0b.1F | Encoder mounting and motor rotation direction | Position: motor rotation direction (automatic change)<br>0: Internal non-switching motor power line UVW phase sequence<br>1: Internal forced switching motor power line UVW phase sequence<br>Tenth position: encoder feedback direction (manual change)<br>0: current CCW direction is positive counting direction, do not change encoder counting direction<br>1: Current CCW direction is negative counting direction, force to change internal encoder counting direction to positive counting direction<br>Hundredths: Incremental encoder Z signal polarity<br>0: Positive logic ("1" when Z is valid)<br>1: Negative logic<br>Thousands of bits: Incremental encoder UVW signal polarity<br>0: Positive logic (UVW is "001" or "101" when Z is valid)<br>1: Negative logic<br>Note: Encoder feedback direction change requires a new self-tuning!!!! | | 0000 | | Read-only (computing) | PST |

## 8.2.12Group 0C Auxiliary function parameters

| Function code | Name | Setting range | unit (of measure) | Factory setting | Mode of entry into force | Setting method | Related modes |
|---|---|---|---|---|---|---|---|
| F0C.00 | Internal servo ON/OFF | 1: Internal servo ON<br>0: Internal servo OFF<br>Note: Lost after power down after setting | - | 0 | Immediate effect | Operation Settings | PST |

| Function code | Name | Setting range | unit (of measure) | Factory setting | Mode of entry into force | Setting method | Related modes |
|---|---|---|---|---|---|---|---|
| F0C.01 | JOG runs (Keyboard operation only) | The speed is running on tap, displaying "xxJoG".<br>Press UP and DOWN to perform forward and reverse rotation spotting, the spotting speed is determined by F06.15 | - | 0 | Immediate effect | Shutdown Settings | PST |
| F0C.02 | PJOG operation (Keyboard operation only) | Position-controlled JOG operation with "xxPJG" display.<br>Press UP to trigger PJOG operation, and press DOWN to release the last PJOG state after the operation is finished, the specific operation parameter is decided by the relevant function code of F03.3C. | - | 0 | Immediate effect | Shutdown Settings | PST |
| F0C.03 | Origin Search (Keyboard operation only) | Position-controlled origin search, displaying "xxcSr".<br>Press UP and DOWN keys for forward and reverse search for home position, home position search related settings are determined by F03.1C related function codes | - | 0 | Immediate effect | Shutdown Settings | PST |
| F0C.04 | Gravity load detection operation (Keyboard operation only) | Display "xxGSr" (only valid for brake assignment) Display "xxrun" at the end of the test and exit automatically after a delay of 0A.0b, this mode is not available when the brake is not assigned. | - | 0 | Immediate effect | Shutdown Settings | PST |
| F0C.05 | software reset | 0->1 Software reset (ARM only) | - | 0 | immediate effect | Shutdown Settings | PST |
| F0C.06 | fault reset | 0->1 Fault reset (ARM only) | - | 0 | Immediate effect | Shutdown Settings | PST |
| F0C.07 | system initialization | 0: No operation<br>11: Restore factory parameters (except factory parameters motor parameter set)<br>12: Clearing the fault log | - | 0 | immediate effect | Shutdown Settings | PST |
| F0C.08 | Encoder initialization | 0->1, initialization (write checksum code) | - | 0 | immediate effect | Shutdown Settings | PST |

| Function code | Name | Setting range | unit (of measure) | Factory setting | Mode of entry into force | Setting method | Related modes |
|---|---|---|---|---|---|---|---|
| F0C.09 | Absolute encoder reset enable | 0->1, absolute encoder reset multiturn data and faults | - | 0 | immediate effect | Shutdown Settings | PST |
| F0C.0A | External Input Pulse Count 0d.2C/0d.2E Zeroing | 0: No operation<br>1: Low-speed pulse count clear (0d.2C) | - | 0 | immediate effect | Operation Settings | PST |
| F0C.1A | Offline Inertia Recognition | Automatically display the load inertia ratio (unit: %, excluding the motor's own inertia), according to F09.12 to select the identification mode, UP/DOWN key for the identification of the enable key, identification is complete, long press the "S" key to save, the panel will sequentially display "-End The panel will display "-End" sequentially, and the function code will be exited after saving. | - | 0 | immediate effect | Shutdown Settings | PST |

### 8.2.13Group 0D Operation monitoring parameters

| Function code | Name | Setting range | Unit (of measure) | Factory setting | Mode of entry into force | Setting method | Relevant modalities |
|---|---|---|---|---|---|---|---|
| r0d.00 | Motor speed | -6000 to 6000 | rpm | - | - | Demonstrate | - |
| r0d.01 | speed command | -6000 to 6000 | rpm | - | - | demonstrate | - |
| r0d.02 | Torque command | -300.0 to 300.0% | - | - | - | Demonstrate | - |
| r0d.03 | busbar voltage | 0 to 999 | V | - | - | demonstrate | - |
| r0d.04 | positional deviation | -2147483648 to 2147483647 | unit of command (computing) | - | - | Demonstrate | - |
| r0d.06 | Full closed-loop deviation | -2147483648 to 2147483647 | | - | - | Demonstrate | - |
| r0d.08 | Output Current | 0.00 to 655.35 | A | - | - | Demonstrate | - |
| r0d.09 | Motor load factor | 0 to 300.0% | - | - | - | demonstrate | - |

| Function code | Name | Setting range | Unit (of measure) | Factory setting | Mode of entry into force | Setting method | Relevant modalities |
|---|---|---|---|---|---|---|---|
| r0d.0A | Average load factor (calculated every 15s) | 0 to 300.0% | - | - | - | Demonstrate | - |
| r0d.0b | Peak load rate (cleared every 15s) | 0 to 300.0% | - | - | - | Demonstrate | - |
| r0d.0C | Thermal accumulation of regenerative braking resistors (internal estimation) | - | J (joules) | - | - | Demonstrate | - |
| r0d.0E | Electrical Angle | 0.1° | - | - | - | Demonstrate | - |
| r0d.10 | Number of drive EEPROM writes | 0～4294967295 | - | - | - | Demonstrate | - |
| r0d.14 | system status word | bit0:System ready<br>bit1:Fault status<br>bit2:Warning status<br>bit3:Operation status<br>bit4:Direction of operation<br>bit5:Motor rotation status<br>bit6: consistent speed<br>bit7:Positioning complete<br>bit8:Positioning proximity<br>bit9:Control power input<br>bit10: Torque command input<br>bit11:Bus voltage establishment complete<br>bit12:CPLD configuration is complete.<br>bit13: Speed Arrival<br>bit14:Zero speed signal<br>bit15:Torque arrival | - | - | - | Demonstrate | - |
| r0d.15 | Motion status word | bit0:Used Mechanical Limit Return to Origin<br>bit1:Home return working state flag<br>bit2:Positioning complete<br>bit4/3: Return to status<br>bit5: Return of origin completed<br>bit6:Electrical return to zero complete<br>bit7: Reserved<br>bit8:Internal flag<br>bit10:Internal flag<br>bit11:Internal flag<br>bit12: Reserved<br>bit13: in program Jog<br>bit14:Speed control zero lock<br>bit15: Reserved | - | - | - | Demonstrate | - |
| r0d.16 | Monitor Status Word | bit0:Response overtravel in Home<br>bit1:Offline inertia recognition<br>bit2:One-touch tuning enable<br>bit4/3: position saving | - | - | - | Demonstrate | - |

| Function code | Name | Setting range | Unit (of measure) | Factory setting | Mode of entry into force | Setting method | Relevant modalities |
|---|---|---|---|---|---|---|---|
| | | bit6/5: Command Status<br>0/3-instruction = 0; 1-positive instruction; 2-negative instruction<br>bit7:Over-travel zero lock state<br>bit8:Gravity load detection status<br>0 - not detected; 1 - detected; | | | | | |
| r0d.17 | Encoder Battery Monitoring | Unit: 0.1 | V | - | - | Demonstrate | - |
| r0d.19 | Number of revolutions of absolute encoder (incremental encoder UVW status) | -32768 to 32767 (0 to 7, 0 or 7 indicates UVW error status) | - | - | - | Demonstrate | - |
| r0d.1A | Absolute encoder position within 1 revolution (incremental encoder position within 1 revolution, relative to Z) | 0～4294967295 | Encoder Unit | - | - | Demonstrate | |
| r0d.1C | Absolute encoder absolute position (lower 32 bits) | 0～4294967295 | Encoder Unit | - | - | demonstrate | - |
| r0d.1E | Absolute encoder absolute position (high 32 bits) | 0～4294967295 | - | - | - | Demonstrate | - |
| r0d.2C | External Input Pulse Command Count | -2147483648 to 2147483647 | unit of command (computing) | - | - | Demonstrate | - |
| r0d.30 | Real-time input position command counting | -2147483648 to 2147483647 | unit of command (computing) | - | - | Demonstrate | - |
| r0d.32 | U phase current sampling value | 0 to 16384 | - | - | - | Demonstrate | - |
| r0d.33 | V phase current sampling value | 0 to 16384 | - | - | - | Demonstrate | - |
| r0d.34 | This system power-up time record | 0～4294967295 | s | - | - | demonstrate | - |
| r0d.36 | Cumulative system power-up time | 0～4294967295 | min | - | - | Demonstrate | - |
| r0d.38 | External Input Pulse Frequency | 0 to 6553.5 | kHz | | | Demonstrate | |
| 0d.50 | Monitoring variable 1 | visible function code | - | 0x0d00. | immediate effect | Operation Settings | |
| 0d.51 | Monitoring variable 2 | visible function code | - | 0x0d01. | immediate | Operation | |

| Function code | Name | Setting range | Unit (of measure) | Factory setting | Mode of entry into force | Setting method | Relevant modalities |
|---|---|---|---|---|---|---|---|
| | | | | | effect | Settings | |
| 0d.52 | Monitoring variable 3 | visible function code | - | 0x0d08. | immediate effect | Operation Settings | |
| 0d.53 | Monitoring variable 4 | visible function code | - | 0x0d03. | immediate effect | Operation Settings | |
| 0d.54 | Number of surveillance | 0 to 4 | | 4 | immediate effect | Operation Settings | |

### 8.2.14Group 0E Fault and Protection Parameters

| Function code | Name | Setting range | Unit (of measure) | Factory setting | Mode of entry into force | Setting method | Related modes |
|---|---|---|---|---|---|---|---|
| F0E.00 | Power input and output phase loss protection | Bit:<br>0: Enable phase loss protection fault<br>1: Prohibition of phase loss protection faults<br>Ten bits:<br>0: Three-phase power input<br>1: Single-phase power input<br>Hundreds:<br>0: Enable output phase loss protection<br>1: Prohibition of output phase loss protection | - | 110 | Immediate effect | Operation Settings | PST |
| F0E.01 | Flying car protection function selection | 0: not enabled<br>1: Enabling | - | 1 | Immediate effect | Operation Settings | PST |
| F0E.02 | Motor overload protection gain | 50-300% | - | 100 | Immediate effect | Shutdown Settings | PST |
| F0E.03 | Motor blocking over-temperature protection enable | 0: not enabled<br>1: Enabling | - | 1 | Immediate effect | Operation Settings | PST |
| F0E.04 | Motor blocking over-temperature protection time window | - | ms | 100 | Immediate effect | Operation Settings | PST |
| F0E.05 | Percentage setting for motor overspeed protection | 0 to 200% | - | 100 | Immediate effect | Operation Settings | PST |

| Function code | Name | Setting range | Unit (of measure) | Factory setting | Mode of entry into force | Setting method | Related modes |
|---|---|---|---|---|---|---|---|
| F0E.06 | Warning value for excessive position deviation | 1 to 1073741824 (2^30) | unit of command (computing) | 2673868 | Immediate effect | Operation Settings | PST |
| F0E.08 | Position deviation too large fault value | 1 to 1073741824 (2^30) | unit of command (computing) | 3145728 | Immediate effect | Operation Settings | PST |
| F0E.0A | Maximum position pulse frequency | 100 to 4000 | kHz | 4000 | Immediate effect | Shutdown Settings | PST |
| F0E.0b | Encoder Multiturn Overflow Fault Selection | 0: not enabled<br>1: Enabling | - | 0 | Immediate effect | Operation Settings | PST |
| F0E.0C | DI positive and negative overtravel signal marker processing | 0: do not mark the absolute position when the overtravel is coming<br>1: Mark the absolute position of the incoming overtrip<br>Note: Prevents failure of stopping by crossing the over-travel switch during an over-travel stop (deceleration stop). | - | 1 | Immediate effect | Operation Settings | PST |
| F0E.0d | Soft Limit Selection | 0: soft limit not enabled<br>1: Enable soft limit immediately after power-up<br>2: Enable soft limit after home return to zero | - | 2 | Immediate effect | Shutdown Settings | PST |
| F0E.0E | Soft Limit Maximum | -2147483648 to 2147483647 | unit of command (computing) | 2147483647 | Immediate effect | Shutdown Settings | PST |
| F0E.10 | Soft Limit Min. | -2147483648 to 2147483647 | unit of command (computing) | -2147483647 | Immediate effect | Shutdown Settings | PST |
| F0E.12 | Vibration Detection Switch | 0: No vibration detected<br>1: Warning when vibration is detected<br>2: Detecting vibration and then sending out a fault | - | 0 | Immediate effect | Operation Settings | PST |
| F0E.13 | Vibration Detection Sensitivity | 50-500% | - | 100 | Immediate effect | Operation Settings | PST |
| F0E.14 | Vibration Detection Value | 0 to 5000 | rpm | 50 | Immediate effect | Operation Settings | PST |
| F0E.15 | Holding brake protection detection | 0: not enabled; 1: enabled<br>Note: Protect the holding brake mechanism from damage | - | 0 | Immediate effect | Operation | PST |

| Function code | Name | Setting range | Unit (of measure) | Factory setting | Mode of entry into force | Setting method | Related modes |
|---|---|---|---|---|---|---|---|
| | | | | | | Settings | |
| F0E.16 | Holding brake gravity load detection value | 0 to 300.0% | - | 30.0 | Immediate effect | Operation Settings | PST |
| F0E.17 | Incremental position power-down save option | 0: No function<br>1: Save the position information when the incremental system is powered down (valid when 00.03=0) | - | 0 | Immediate effect | Operation Settings | PST |
| F0E.18 | LED warning display selection | 0: Output warning message immediately<br>1: No warning message is output<br>Note: Output = panel pop-up warning message, some function codes need to be re-powered to be effective, blocking the warning output will result in no prompts | - | 0 | Immediate effect | Operation Settings | PST |
| F0E.19 | Incremental Encoder Z Interference Determination Thresholds | 0 to 65535 | Encoder Unit | 16 | Immediate effect | Operation Settings | PST |
| F0E.1A | Incremental Encoder ABZUVW Fault Selection | Bit:<br>0: Prohibition of abnormal UVW faults (Er.21)<br>1: Enabling UVW abnormal fault (Er.21)<br>Ten bits:<br>0: ABZ disconnection fault prohibited (Er.22)<br>1: Enabling ABZ disconnection fault (Er.22) | - | 11 | Immediate effect | Operation Settings | PST |
| F0E.1b | Drive EEPROM Write Erase Count Limitation | 0 to 65535 | 100 | 500 | Immediate effect | Operation Settings | PST |

## 8.2.15Group 0F Fault logging parameters

| Function code | Name | Setting range | Unit (of measure) | Factory setting | Mode of entry into force | Setting method | Related modes |
|---|---|---|---|---|---|---|---|
| r0F.00 | Current fault/warning status | Tenth digit, first digit: fault code<br>Hundreds:<br>0 - Fault level 1<br>1 - Fault level 2<br>2-Warning<br>Thousands of bits:<br>0 - Failure not resettable<br>1-Fault resettable<br>Note: 0x0000 means no fault | - | - | - | Demonstrate | PST |
| r0F.01 | Recent Fault Codes | 0 to 99 | - | - | - | Demonstrate | PST |
| r0F.02 | Time of the most recent failure | 0～4294967296 | s | - | - | Demonstrate | PST |
| r0F.04 | Motor speed at the time of the most recent fault | -6000 to 6000 | rpm | - | - | Demonstrate | PST |
| r0F.05 | Output current at last fault | 0.00 to 655.35 | A | - | - | Demonstrate | PST |
| r0F.06 | Busbar voltage at the time of the most recent fault | - | V | - | - | Demonstrate | PST |
| r0F.07 | Mode of operation in case of recent failure | 0 - Speed<br>1-Position<br>2-Torque<br>99-Servo OFF | - | - | - | Demonstrate | PST |
| r0F.08 | System status word at the time of the most recent failure | bit0:System ready<br>bit1:Fault status<br>bit2:Warning status<br>bit3:Operation status<br>bit4:Direction of operation<br>bit5:Motor rotation status<br>bit6: consistent speed<br>bit7:Positioning complete<br>bit8:Positioning proximity<br>bit9:Control power input<br>bit10: Torque command input<br>bit11:Bus voltage establishment complete<br>bit12:CPLD configuration is complete.<br>bit13: Speed Arrival<br>bit14:Zero speed signal<br>bit15:Torque arrival | - | - | - | Demonstrate | PST |
| r0F.09 | Input terminal status at last fault | 0 to 65535 | - | - | - | Demonstrate | PST |
| r0F.0A | Drive Temperature at Latest Failure | -40.0 to 200.0 | ℃ | - | - | Demonstrate | PST |
| r0F.0d | Previous fault code | 0 to 99 | - | - | - | Demonstrate | PST |

| Function code | Name | Setting range | Unit (of measure) | Factory setting | Mode of entry into force | Setting method | Related modes |
|---|---|---|---|---|---|---|---|
| r0F.0E | Time of previous failure | 0～4294967296 | s | - | - | Demonstrate | PST |
| r0F.10 | Electrical speed at previous failure | -6000 to 6000 | rpm | - | - | Demonstrate | PST |
| r0F.11 | Output current at previous fault | 0.00 to 655.35 | A | - | - | Demonstrate | PST |
| r0F.12 | Busbar voltage at previous fault | - | V | - | - | Demonstrate | PST |
| r0F.13 | Mode of operation at previous failure | 0 - Speed<br>1-Position<br>2-Torque<br>99-Servo OFF | - | - | - | Demonstrate | PST |
| r0F.14 | System status word at previous failure | Same as 0d.14 | - | - | - | Demonstrate | PST |
| r0F.15 | Input terminal status at previous fault | 0 to 65535 | - | - | - | Demonstrate | PST |
| r0F.19 | The first two fault codes | 0 to 99 | - | - | - | Demonstrate | PST |
| r0F.1A | Time of occurrence of the first two failures | 0～4294967296 | s | - | - | Demonstrate | PST |
| r0F.1C | Motor speed during the first two failures | -6000 to 6000 | rpm | - | - | Demonstrate | PST |
| r0F.1d | Output current at first two faults | 0.00 to 655.35 | A | - | - | Demonstrate | PST |
| r0F.1E | Bus voltage during the first two faults | - | V | - | - | Demonstrate | PST |
| r0F.1F | Mode of operation during the first two failures | 0 - Speed<br>1-position<br>2-Torque<br>99-Servo OFF | - | - | - | Demonstrate | PST |
| r0F.20 | System status word at the time of the first two failures | Same as 0d.14 | - | - | - | Demonstrate | PST |
| r0F.21 | Input terminal status during the first two faults | 0 to 65535 | - | - | - | Demonstrate | PST |

| function code | Name | Setting range | unit (of measure) | Factory setting | Mode of entry into force | Setting method | Related modes |
|---|---|---|---|---|---|---|---|
| F10.00 | Drive Axis Address | 1 to 247 | - | 1 | Immediate effect | Operation | PST |

| function code | Name | Setting range | unit (of measure) | Factory setting | Mode of entry into force | Setting method | Related modes |
|---|---|---|---|---|---|---|---|
| | | | | | | Settings | |
| F10.01 | Modbus baud rate | 0:1200BPS<br>1:2400BPS<br>2:4800BPS<br>3:9600BPS<br>4:19200BPS<br>5:38400BPS<br>6:57600BPS<br>7:115200BPS<br>8:230400BPS<br>9:460800BPS<br>10:921600BPS | - | 7 | Immediate effect | Operation Settings | PST |
| F10.02 | Modbus Data Format | 0:1-8-N-1 (1 start bit + 8 data bits + 1 stop bit)<br>1:1-8-E-1 (1 start bit + 8 data bits + 1 even parity + 1 stop bit)<br>2:1-8-O-1 (1 start bit + 8 data bits + 1 odd parity + 1 stop bit)<br>3:1-8-N-2 (1 start bit + 8 data bits + 2 stop bits)<br>4:1-8-E-2 (1 start bit + 8 data bits + 1 even parity + 2 stop bits)<br>5:1-8-O-2 (1 start bit + 8 data bits + 1 odd parity + 2 stop bits) | - | 0 | Immediate effect | Operation Settings | PST |
| F10.03 | Modbus Answer Delay | 0 to 20 | ms | 0 | Immediate effect | Operation Settings | PST |
| F10.04 | Modbus communication timeout | 0 to 60000 | ms | 0 | Immediate effect | Operation Settings | PST |
| r10.05 | Number of frames received by Modbus | - | - | - | - | Demonstrate | PST |
| r10.06 | Number of Modbus frames sent | - | - | - | - | Demonstrate | PST |
| r10.07 | Number of CRC error frames received by Modbus | - | - | - | - | Demonstrate | PST |
| F10.08 | Modbus Response Feature | Bit: Modbus protocol<br>0: Reply answer frame (standard Modbus protocol)<br>1: No reply to answer frame (non-standard Modbus protocol)<br>Ten bits: store EEPROM control<br>0: communication write address command plus 0x8000 after storing EEPROM | - | 00 | Immediate effect | Operation Settings | PST |

| function code | Name | Setting range | unit (of measure) | Factory setting | Mode of entry into force | Setting method | Related modes |
|---|---|---|---|---|---|---|---|
| | | 1: Communication write address command plus 0x8000 without EEPROM storage | | | | | |

## 8.2.1610 groups Communication Function Parameters

## 8.2.17Group Fn Auxiliary function parameters

| Function code | Name | Setting range | Unit (of measure) | Factory setting | Mode of entry into force | Setting method | Related modes |
|---|---|---|---|---|---|---|---|
| Fn0.00 | Internal servo ON/OFF | 1: Internal servo ON<br>0: Internal servo OFF<br>Note: No loss of power down after setting | - | 0 | Immediate effect | Operation Settings | PST |
| Fn0.01 | JOG runs (Keyboard operation only) | The speed is running on tap, displaying "xxJoG".<br>Press UP and DOWN to perform forward and reverse rotation spotting, the spotting speed is determined by F06.15 | - | 0 | Immediate effect | Shutdown Settings | PST |
| Fn0.02 | PJOG operation (Keyboard operation only) | Position-controlled JOG operation with "xxPJG" display.<br>Press UP to trigger PJOG operation, and press DOWN to release the last PJOG state after the operation is finished, the specific operation parameter is decided by the relevant function code of F03.3C. | - | 0 | Immediate effect | Shutdown Settings | PST |
| Fn0.03 | Origin Search (Keyboard operation only) | Position-controlled origin search, displaying "xxcSr".<br>Press UP and DOWN keys for forward and reverse search for home position, home position search related settings are determined by F03.1C related function codes | - | 0 | Immediate effect | Shutdown Settings | PST |
| Fn0.04 | Gravity load detection operation (Keyboard operation only) | Display "xxGSr" (only valid for brake assignment) Display "xxrun" at the end of the test and exit automatically after a delay of 0A.0b, this mode is not available when the brake is not assigned. | - | 0 | Immediate effect | Shutdown Settings | PST |
| Fn0.05 | software reset | 0->1 Software reset (ARM only) | - | 0 | Immediate effect | Shutdown Settings | PST |
| Fn0.06 | fault reset | 0->1 Fault reset (ARM only) | - | 0 | Immediate effect | Shutdown Settings | PST |
| Fn0.07 | system initialization | 00: No operation<br>11: Restore factory parameters (except factory parameters motor parameter set)<br>12: Clearing the Fault Log | - | 0 | Immediate effect | Shutdown Settings | PST |

| Function code | Name | Setting range | Unit (of measure) | Factory setting | Mode of entry into force | Setting method | Related modes |
|---|---|---|---|---|---|---|---|
| Fn0.08 | Encoder initialization | 0->1, initialization (write checksum code) | - | 0 | Immediate effect | Shutdown Settings | PST |
| Fn0.09 | Absolute encoder reset enable | 0->1, Absolute Encoder Reset Multiturn Data and Faults | - | 0 | Immediate effect | Shutdown Settings | PST |
| Fn0.0A | External input pulse count 0d.2C/0d.2E display clearing | 0: No operation<br>1: Low-speed pulse count clear (0d.2C)<br>2: High-speed pulse count clear (0d.2E)<br>3: All clear | - | 0 | Immediate effect | Operation Settings | PST |
| Fn0.1A | Offline Inertia Recognition | Automatically display the load inertia ratio (unit: %, excluding the motor's own inertia), according to F09.12 to select the identification mode, UP/DOWN key for the identification of the enable key, identification is complete, long press the "S" key to save, the panel will sequentially display "-End The panel will display "-End" sequentially, and the function code will be exited after saving. | - | 0 | Immediate effect | Shutdown Settings | PST |

## 8.2.18Un Group Monitoring Parameters

| Function code | Name | Setting range | Unit (of measure) | Factory setting | Mode of entry into force | Setting method | Related modes |
|---|---|---|---|---|---|---|---|
| Un0.00 | Motor speed | -6000 to 6000 | rpm | - | - | Demonstrate | - |
| Un0.01 | speed command | -6000 to 6000 | rpm | - | - | Demonstrate | - |
| Un0.02 | Torque command | -300.0 to 300.0% | - | - | - | Demonstrate | - |
| Un0.03 | busbar voltage | 0 to 999 | V | - | - | Demonstrate | - |
| Un0.04 | positional deviation | -2147483648 to 2147483647 | unit of command (computing) | - | - | Demonstrate | - |
| Un0.06 | Full closed-loop deviation | -2147483648 to 2147483647 | | - | - | Demonstrate | - |
| Un0.08 | Output Current | 0.00 to 655.35 | A | - | - | Demonstrate | - |
| Un0.09 | Motor load factor | 0 to 300.0% | - | - | - | Demonstrate | - |
| Un0.0A | Average load factor (calculated every 15s) | 0 to 300.0% | - | - | - | Demonstrate | - |

| Function code | Name | Setting range | Unit (of measure) | Factory setting | Mode of entry into force | Setting method | Related modes |
|---|---|---|---|---|---|---|---|
| Un0.0b | Peak load rate (cleared every 15s) | 0 to 300.0% | - | - | - | Demonstrate | - |
| Un0.0C | Thermal accumulation of regenerative braking resistors (internal estimation) | - | J (joules) | - | - | Demonstrate | - |
| Un0.0E | Electrical Angle | 0.1° | - | - | - | Demonstrate | - |
| Un0.10 | Number of EEPROM writes | 0～4294967295 | - | - | - | Demonstrate | - |
| Un0.14 | system status word | bit0:System ready<br>bit1:Fault status<br>bit2:Warning status<br>bit3:Operation status<br>bit4:Direction of operation<br>bit5:Motor rotation status<br>bit6: consistent speed<br>bit7:Positioning complete<br>bit8:Positioning proximity<br>bit9:Control power input<br>bit10: Torque command input<br>bit11:Bus voltage establishment complete<br>bit12:CPLD configuration is complete.<br>bit13: Speed Arrival<br>bit14:Zero speed signal<br>bit15:Torque arrival | - | - | - | Demonstrate | - |
| Un0.15 | Motion status word | bit0:Use mechanical limit return to origin<br>bit1:Home return working state flag<br>bit2:Positioning complete<br>bit4/3: Return to status<br>bit5: Return of origin completed<br>bit6:Electrical return to zero complete<br>bit7: Reserved<br>bit8:Internal flag<br>bit10:Internal flag<br>bit11:Internal flag<br>bit12: Reserved<br>bit13: Program In Jog<br>bit14:Speed control zero lock<br>bit15: Reserved | - | - | - | Demonstrate | - |
| Un0.16 | Monitor Status Word | bit0:Response overtravel in Home<br>bit1:Offline inertia recognition<br>bit2:One-touch tuning enable<br>bit4/3: position saving<br>bit6/5: Command Status<br>0/3-instruction = 0; 1-positive instruction; 2-negative instruction<br>bit7:Over-travel zero lock state | - | - | - | Demonstrate | - |

| Function code | Name | Setting range | Unit (of measure) | Factory setting | Mode of entry into force | Setting method | Related modes |
|---|---|---|---|---|---|---|---|
| | | bit8:Gravity load detection status<br>0 - not detected; 1 - detected; | | | | | |
| Un0.17 | Encoder Battery Monitoring | Unit: 0.1 | V | - | - | Demonstrate | - |
| Un0.19 | Number of revolutions of absolute encoder (incremental encoder UVW status) | -32768 to 32767<br>(0 to 7, 0 or 7 indicates UVW error status) | - | - | - | Demonstrate | - |
| Un0.1A | Absolute encoder position within 1 revolution (incremental encoder position within 1 revolution, relative to Z) | 0～4294967295 | Encoder Unit | - | - | Demonstrate | |
| Un0.1C | Absolute encoder absolute position (low 32 bits) | 0～4294967295 | Encoder Unit | - | - | Demonstrate | - |
| Un0.1E | Absolute encoder absolute position (high 32 bits) | 0～4294967295 | | - | - | Demonstrate | - |
| Un0.2C | External Input Pulse Command Count | -2147483648 to 2147483647 | unit of command (computing) | - | - | Demonstrate | - |
| Un0.30 | Real-time input position command counting | -2147483648 to 2147483647 | unit of command (computing) | - | - | Demonstrate | - |
| Un0.32 | U phase current sampling value | 0 to 16384 | - | - | - | Demonstrate | - |
| Un0.33 | V phase current sampling value | 0 to 16384 | - | - | - | Demonstrate | - |
| Un0.34 | This system power-up time record | 0～4294967295 | s | - | - | Demonstrate | - |
| Un0.36 | Cumulative system power-up time | 0～4294967295 | min | - | - | Demonstrate | - |
| Un0.38 | External Input Pulse Frequency | 0 to 6553.5 | kHz | | | Demonstrate | |

## 8.2.19DI Menu

| Functional planning (Hundred and ten digits) | Functional name | Descriptive | Marginal notes |
|---|---|---|---|
| 000 | NoFunc | Non-functional | Not have |
| 001 | SON | Servo ON command<br>Effective-servo operation<br>Invalid - servo stop | The logic selection of the corresponding terminal must be set: level active |

| Functional planning (Hundred and ten digits) | Functional name | Descriptive | Marginal notes |
|---|---|---|---|
| 002 | ERRST | Fault and warning reset active-enable<br>Invalid - incapacitated | The logic selection of the corresponding terminal must be set: edge active, if set level active, it will cause some faults or warnings to be generated and reset repeatedly |
| 003 | POT | forward lateral overtravel<br>Valid - Forward drive disabled<br>Invalid - Positive drive allowed | When the mechanical movement exceeds the movable range, the servo unit enters the over-travel stop state, and the logic selection of the corresponding terminal is recommended to be set: level active |
| 004 | NOT | inversion side overtravel<br>Valid - reverse drive prohibited<br>Invalid - allows reverse drive | |
| 005 | PCL | Positive side external torque limit input (electric torque limit switching input)<br>Switching of the torque limiting source on the forward side is performed according to the selection in 07.06:<br>When the 07.06 digit shows 2:<br>Valid - AI1 external torque limit is valid (AI1 input maximum value corresponds to 01.41);<br>Invalid - Electric internal torque limitation is valid (07.07);<br>When the 07.06 digit shows 3:<br>Valid-External torque limit is valid (01.41);<br>Invalid - Electric internal torque limitation is valid (07.07); | Recommended setting for logic selection of the corresponding terminal: level active |
| 006 | NCL | Reverse-side external torque limit input (braking torque limit switching input)<br>Switching of the reverse side torque limiting source is performed according to the selection in 07.06:<br>When the 07.06 digit shows 2:<br>Valid - AI1 external torque limit is valid (AI1 input maximum value corresponds to 01.41);<br>Invalid - Electric internal torque limitation is valid (07.07);<br>When the 07.06 digit shows 3:<br>Valid-External torque limit is valid (01.41); | Recommended setting for logic selection of the corresponding terminal: level active |

| Functional planning (Hundred and ten digits) | Functional name | Descriptive | Marginal notes |
|---|---|---|---|
| | | Invalid - Electric internal torque limitation is valid (07.07); | |
| 007 | EMGSTOP | emergency stop<br>Effective - immediate free stop<br>Invalid - no effect on the current operating status | Recommended setting for logic selection of the corresponding terminal: level active |
| 008 | JOGEN | Tap enable, needs to be set active before SON<br>Effective - drive internally forced to operate in velocity spotting mode<br>Invalid - does not affect the current mode of operation | Recommended setting for logic selection of the corresponding terminal: level active |
| 009 | JOGSTS0 | Forward/reverse rotation spotting, spotting speed 06.15 (1 means valid, 0 means invalid)<br>JOGSTS1:JOGSTS0 = 00/11 Zero speed;<br>JOGSTS1:JOGSTS0 = 01 Positive point movement;<br>JOGSTS1:JOGSTS0 = 10 Reverse Tap; | Recommended setting for logic selection of the corresponding terminal: level active |
| 00A | JOGSTS1 | | |
| 00B | PJogEn | Program Tap (Position Control) Enable<br>Effective - drive internally forced to operate in position mode (pointing)<br>Invalid - does not affect the current mode of operation | Recommended setting for logic selection of the corresponding terminal: level active |
| 00C | PJog | Programmed pointing, pointing parameters 03.3A to 03.41<br>Valid - run programmed pointing according to pointing parameters<br>Invalid - Position Locked | Recommended setting for logic selection of the corresponding terminal: level active |
| 00D | MSEL0 | Control mode switching selection (1 for valid, 0 for invalid)<br>00.01=3 to 5 Valid for MSEL0 only.<br>00.01=6<br>MSEL1:MSEL0=00 Speed Mode<br>MSEL1:MSEL0=01 Position Mode<br>MSEL1:MSEL0=10/11 Torque Mode | Recommended setting for logic selection of the corresponding terminal: level active |
| 00E | MSEL1 | | |
| 00F | GSEL | Gain switching input<br>08.14 equals 0 when Effective-speed loop P control<br>Invalid-speed loop PI control<br>08.14 When not equal to 0. Selection of switching the first/second set of gain parameters according to 08.15 (position loop proportional, speed loop proportional and integral, torque command filtering) | Recommended setting for logic selection of the corresponding terminal: level active |

| Functional planning (Hundred and ten digits) | Functional name | Descriptive | Marginal notes |
|---|---|---|---|
| 010 | PosInhbit | Prohibit position command input (prohibit position command from taking effect)<br>Valid - Position lock, position command invalid<br>Invalid - Position command is valid | The logic selection of the corresponding terminal must be set: level active |
| 011 | PosDir | Position Command Direction<br>Effective - reverse direction<br>Invalid - positive direction | Recommended setting for logic selection of the corresponding terminal: level active |
| 012 | POSERRCLR | Position deviation removal<br>Valid-position ring deviation clearing<br>Invalid - position ring deviation not cleared | Recommended setting for logic selection of the corresponding terminal: Edge active |
| 013 | GearSel | Electronic gear selection (valid for one motor revolution command pulse count = 0)<br>Effective-electronic gear ratio 2 (numerator 03.0C, denominator 03.0E)<br>Invalid-electronic gear ratio 1 (numerator 03.08, denominator 03.0A) | Recommended setting for logic selection of the corresponding terminal: level active |
| 014 | HomeSw | Home switch signal input<br>Effective - Capture to Origin<br>Invalid - Origin not captured | The logic selection of the corresponding terminal must be set: level active |
| 015 | HomeEn | Home return trigger enable<br>Effective - triggers a home search action<br>Invalid - does not trigger the origin search action | Recommended setting for logic selection of the corresponding terminal: Edge active |
| 016 | XintBan | Determine the length in the ban<br>Effective-disable interrupt-length function<br>Invalid-Allowed to interrupt the long function | The logic selection of the corresponding terminal must be set: level active |
| 017 | XintFree | Interrupt long state release input, select whether to release the interrupt long state by DI according to 03.35.<br>Effective-Release determines the long completion state<br>Invalid - not released from the assertion of a long completion state | Recommended setting for logic selection of the corresponding terminal: Edge active |
| 018 | XintTrig | Interrupt long trigger enable (internal special logic processing)<br>Valid - Trigger in the assertion of a long run<br>Invalid - does not trigger interruptions for long runs | Recommended setting for logic selection of the corresponding terminal: Edge active |

| Functional planning (Hundred and ten digits) | Functional name | Descriptive | Marginal notes |
|---|---|---|---|
| 019 | PlsInhbit | External command pulse inhibit input (valid in external pulse command mode)<br>Valid-External pulse command is invalid<br>Invalid-External pulse command is valid | The logic selection of the corresponding terminal must be set: level active |
| 01A | HxEn | Handwheel external pulse command enable<br>Valid-enable handwheel external pulse command mode<br>Invalid - not capable handwheel external pulse command mode | The logic selection of the corresponding terminal must be set: level active |
| 01B | HXSEL0 | Handwheel external pulse command multiplier (1 for valid, 0 for invalid).<br>HXSEL1:HXSEL0=01 10x;<br>HXSEL1:HXSEL0=10 100 times;<br>HXSEL1:HXSEL0=00/11 1x; | Recommended setting for logic selection of the corresponding terminal: level active |
| 01C | HXSEL1 | | |
| 01D | PosStep | Position stepping instruction enable, rising edge active during operation<br>Valid-enable stepping instruction<br>Invalid - does not enable stepping instructions | Recommended setting for logic selection of the corresponding terminal: Edge active |
| 01F | PosInSen | Multi-segment position signal enable, rising edge active during operation<br>Valid-Enable Multi-Segment Position Command<br>Invalid - does not enable multi-segment position commands | Recommended setting for logic selection of the corresponding terminal: level active |
| 020 | MultPos[0] | Multi-segment position command selection:<br>MultPos[3]:[2]:[1]:[0] = 0000 1st segment position<br>MultPos[3]:[2]:[1]:[0] = 0001 2nd segment position<br>...<br>MultPos[3]:[2]:[1]:[0] = 1111 16th segment position | Recommended setting for logic selection of the corresponding terminal: level active |
| 021 | MultPos[1] | | |
| 022 | MultPos[2] | | |
| 023 | MultPos[3] | | |
| 024 | ZCLAMP | Speed mode zero fixed input signal (internal special logic processing)<br>Effective - Position lock in speed mode<br>Invalid - no effect | Recommended setting for logic selection of the corresponding terminal: level active |
| 025 | SPDDIR | Speed and torque command direction switching<br>Effective - reverse direction<br>Invalid - positive direction | Recommended setting for logic selection of the corresponding terminal: level active |
| 026 | SPDSRC | Primary and secondary speed command switching (valid for 06.00=x3xx) | Recommended setting for logic selection of the |

| Functional planning (Hundred and ten digits) | Functional name | Descriptive | Marginal notes |
|---|---|---|---|
| | | Valid - Run Auxiliary Speed Command<br>Invalid-Run the main speed command | corresponding terminal: level active |
| 027 | SPD[0] | Internal multi-speed switching input:<br>SPD[3]:[2]:[1]:[0] = 0000 Zero Speed Lockout<br>SPD[3]:[2]:[1]:[0] = 0001 1st speed command<br>...<br>SPD[3]:[2]:[1]:[0] = 1111 15th speed command | Recommended setting for logic selection of the corresponding terminal: level active |
| 028 | SPD[1] | | |
| 029 | SPD[2] | | |
| 02A | SPD[3] | | |

## 8.2.20DO Functional Planning

| Functional planning (hundredths of a digit) | Descriptive | Marginal notes |
|---|---|---|
| 000 | NoFunc | Non-functional |
| 001 | SRDY | Servo ready output to accept commands<br>Valid - servo drive ready<br>Invalid - servo drive not ready to complete |
| 002 | WARN | Warning output<br>Valid - servo drive presence warning<br>Invalid - servo drive not present warning |
| 003 | ERROR | Fault output<br>Valid - Faulty servo drive<br>Invalid - servo drive is not faulty |
| 004 | NEAR | Positioning proximity signal output (according to condition 03.12)<br>Effective-position deviation (0d.04) absolute value less than or equal to localization proximity threshold (03.16)<br>Invalid - position deviation (0d.04) absolute value greater than localization proximity threshold (03.16) |
| 005 | COIN | Positioning completion output (according to conditions 03.12 to 03.15)<br>Effective-position deviation (0d.04) absolute value less than or equal to localization proximity threshold (03.13)<br>Invalid - position deviation (0d.04) absolute value greater than localization proximity threshold (03.13) |
| 006 | BRK | Brake control output<br>Effective - release the gate, the servo can receive the run command<br>Invalid - closed gate, mechanically locked shaft |
| 007 | DB | Dynamic brake output (reserved)<br>Effective - DB Brake<br>Invalid - DB does not brake |
| 008 | HOME | Return of Origin Completion Signal<br>Effective - return to origin completed<br>Invalid - incomplete return to origin |
| 009 | ELEHOME | Zero return completion signal<br>Effective - zero regression completed<br>Invalid - incomplete return to zero |
| 00A | XINT | Interrupt long completion signal (interrupt long positioning completion)<br>Effective - Completed Medium Determined Long<br>Invalid - not completed in the finalization of the long |
| 00B | TGON | Rotary Detect Output<br>Effective - motor speed (0d.00) absolute value greater than or equal to motor rotation speed threshold (06.1A)<br>Invalid - Motor speed (0d.00) absolute value less than motor rotation speed threshold (06.1A) |
| 00C | ZERO | Zero Speed Detect Output<br>Effective-motor speed (0d.00) absolute value less than or equal to zero speed output threshold (06.1d) |

| Functional planning (hundredths of a digit) | Descriptive | Marginal notes |
|---|---|---|
| | | Invalid - Motor speed (0d.00) absolute value greater than zero speed output threshold (06.1d) |
| 00D | VARR | Velocity Arrival Detect Signal<br>Valid - motor speed (0d.00) absolute value is greater than or equal to speed arrival threshold (06.1C)<br>Invalid - motor speed (0d.00) absolute value less than speed reach threshold (06.1C) |
| 00E | VCMP | Velocity Consistency Detect Output<br>Effective - absolute value of velocity deviation less than or equal to the velocity uniformity threshold (06.1b)<br>Invalid - absolute value of speed deviation greater than speed consistency threshold (06.1b) |
| 00F | VLMT | Speed limit detection output (valid in torque mode)<br>Valid - motor speed (0d.00) absolute value greater than or equal to (speed limit absolute value 0 - speed consistency threshold 06.1b)<br>Invalid - motor speed (0d.00) absolute value less than (speed limit absolute value 0 - speed consistency threshold 06.1b) |
| 010 | TARR | Torque Reach Detect Signal<br>Valid-Torque Command (0d.02) Absolute value greater than or equal to the torque arriving at the valid value (07.11)<br>Invalid-Torque Command (0d.02) Absolute value less than torque reaching invalid value (07.12) |
| 011 | CLMT | Torque Limit Detect Output<br>Valid - Torque command (0d.02) absolute value is greater than or equal to the torque limit value<br>Invalid - torque command (0d.02) absolute value less than torque limit value |

# 9.Troubleshooting Instructions

## 9.1Classification of faults and warnings

Servo Drive failures and warnings are graded according to severity and can be categorized into three levels: Type I, Type II, and Type III. Severity level: Class I > Class II > Class III. The specific classification is as follows:

Thousand bits 0: Failure not resettable

Thousand bits 1: Fault resettable

Hundredths 0: Fault level 1

Hundred 1: Fault level 2

Hundred 2: Warning

"Resettable" means that the panel stops the fault display state by giving a "reset signal".

Examples are as follows: drive jump fault "E.07" output phase loss, through the function code "r0F.00" to see the fault code for "1007", through the fault code can be See thousands of bits for "1", then this fault is a resettable fault.

Specific operation: Setting parameter F0C.06=1 or using DI function 2 (DiFunc.2: Fault reset) and setting it as logic valid can make the panel stop fault display.

## 9.2Troubleshooting

### 9.2.1Fault Code List

Table40 List of Fault Codes

| Trouble code | Fault description | Can it be reset |
|---|---|---|
| E.01 | Hardware overcurrent | Clogged |
| E.02 | Software overcurrent | Clogged |
| E.03 | overpressurization | Be |
| E.04 | phase sequence | Clogged |
| E.05 | Main circuit soft start not engaged | Be |
| E.06 | Power input out of phase | Be |

| Trouble code | Fault description | Can it be reset |
|---|---|---|
| E.07 | Driver output out of phase | Be |
| E.08 | Regeneration overload | Clogged |
| E.09 | Motor overspeed | Be |
| E.10 | flying car | Clogged |
| E.13 | Drive Overload | Clogged |
| E.14 | Motor overload | Clogged |
| E.15 | motor stalling | Be |
| E.16 | Radiator overheating | Be |
| E.18 | Absolute encoder battery failure | Be |
| E.19 | Absolute (incremental) encoder overspeed | Clogged |
| E.20 | Absolute encoder overheating | Clogged |
| E.21 | Incremental encoder UVW exception | Clogged |
| E.22 | Incremental encoder ABZ disconnection | Clogged |
| E.23 | Incremental encoder Z subject to interference | Clogged |
| E.24 | Absolute Encoder Communication CRC Checksum Failure | Clogged |
| E.25 | Absolute encoder communication timeout | Clogged |
| E.26 | Absolute encoder not initialized | Clogged |
| E.28 | Absolute encoder multi-turn data overflow | Be |
| E.34 | U-phase current detection fault | Clogged |
| E.35 | V-phase current detection fault | Clogged |
| E.36 | System failure 1 (no answer, read/write timeout, validation error) | Clogged |
| E.37 | Electronic gear 0 abnormal | Be |
| E.38 | Electronic gear 1 abnormal | Be |
| E.39 | Electronic Gear 2 Abnormal | Be |
| E.40 | Pulse Command Overspeed | Clogged |
| E.41 | Pulse input abnormality | Clogged |
| E.42 | Encoder pulse division output overspeed | Be |
| E.44 | Excessive positional deviation | Be |
| E.50 | Parameter Formatting Exception | Clogged |
| E.51 | Parameter setting abnormality | Clogged |
| E.52 | Parameter combination anomaly | Clogged |
| E.53 | CPLD synchronization signal interrupt exception | Clogged |
| E.54 | CPLD power-up configuration failure | Clogged |
| E.57 | Home return timeout (also triggered by simultaneous positive and negative limits) | Be |
| E.58 | Absolute system encoder matching error | Clogged |
| E.59 | Duplicate assignment of DI functions | Be |

| Trouble code | Fault description | Can it be reset |
|---|---|---|
| E.61 | Abnormal holding brake output OFF (closed brake) | Be |
| E.62 | Brake output ON (release) abnormality | Be |

## 9.2.2Troubleshooting

Table41 Troubleshooting

| Malfunctions encodings | Fault description | Production mechanism | Causes | Confirmation method | Cure |
|---|---|---|---|---|---|
| E.01 | Hardware overcurrent | Hardware generated, exceeding hardware overcurrent point thresholds | (1) UVW wiring is incorrect or poorly wired; | (1) Check that the UVW wiring is correct and stable; | (1) Please refer to the instruction manual for proper wiring; |
| | | | (2) Input instructions change too dramatically; | (2) Confirm that the instructions have not changed too drastically; | (2) Increase the command filtering time constant or increase the acceleration and deceleration time of the drive if conditions allow; |
| | | | (3) Drive parameters are set abnormally; | (3) Confirm that the parameters related to the driver gain category are not too large or abnormal; | (3) Appropriately reduce the relevant gain class parameters or restore the factory setting default parameters; |
| | | | (4) External braking resistor is too small or short-circuited; | (4) Check whether the external braking resistor resistance value is appropriate and whether the related wiring is correct and stable; | (4) Please refer to the instruction manual for proper wiring and selection of suitable braking resistors; |
| | | | (5) Overloading; | (5) Confirm that the actual load is much greater than the maximum value that the motor can withstand; | (5) Replace the drive with a larger capacity; |
| | | | (6) Drive UVW output shorted; | (6) Remove the motor power cord and check the drive UVW output for a phase-to-phase short or a short to ground; | (6) If the drive UVW is short-circuited, it is necessary to remove the short-circuit condition and prevent the metal conductor from being exposed while |

| Malfunctions encodings | Fault description | Production mechanism | Causes | Confirmation method | Cure |
|---|---|---|---|---|---|
| | | | | | replacing the drive; |
| | | | (7) Motor burnout; | (7) Remove the motor power cord and check that the motor phase resistance is balanced; | (7) If unbalanced, the motor will need to be replaced again; |
| | | | (8) Motor insulation is too poor; | (8) After ensuring that the power line is stably connected, measure the insulation resistance between the UVW and PE separately to see if it is too small; | (8) Replace the motor if insulation is poor; |
| | | | (9) Drive hardware problems; | (9) Troubleshooting the above problems and re-powering up still report the fault; | (9) Send to dealer or factory for service; |
| E.02 | software overcurrent | Sampling current values higher than 3 times the peak current rating of the drive | (1) UVW wiring is incorrect or poorly wired; | (1) Check that the UVW wiring is correct and stable; | (1) Please refer to the instruction manual for proper wiring; |
| | | | (2) Input instructions change too dramatically; | (2) Confirm that the instructions have not changed too drastically; | (2) Increase the command filtering time constant or increase the acceleration and deceleration time of the drive if conditions allow; |
| | | | (3) Drive parameters are set abnormally; | (3) Confirm that the parameters related to the driver gain category are not too large or abnormal; | (3) Appropriately reduce the relevant gain class parameters or restore the factory setting default parameters; |
| | | | (4) Overloading; | (4) Confirm that the actual load is much greater than the maximum value that the motor can withstand; | (4) Replace the drive with a larger capacity; |
| | | | (5) Driver UVW output shorted; | (5) Remove the motor power cord and check the drive UVW output for a phase-to-phase short or a short to ground; | (5) If the drive UVW is short-circuited, it is necessary to remove the short-circuit condition and |

| Malfunctions encodings | Fault description | Production mechanism | Causes | Confirmation method | Cure |
|---|---|---|---|---|---|
| | | | | | prevent the metal conductor from being exposed while replacing the drive; |
| | | | (6) Motor burnout; | (6) Remove the motor power cable and check that the motor phase resistance is balanced; | (6) If unbalanced, the motor will need to be replaced again; |
| | | | (7) Motor insulation is too poor; | (7) After ensuring that the power line is stably connected, measure the insulation resistance between the UVW and PE separately to see if it is too small; | (7) Replace the motor if insulation is poor; |
| | | | (8) Drive hardware problems; | (8) Troubleshooting the above problems after re-powering still report faults; | (8) Send to dealer or factory for service; |
| E.03 | Overpressurization | DC bus voltage is higher than 400V (AC220V); | (1) Main circuit voltage is too high; | (1) Check whether the main circuit voltage is too high under servo OFF; | (1) Use the correct power supply; |
| | | | (2) The motor decelerates too quickly, causing the main circuit regenerative energy to gather too quickly and the voltage to be too high; | (2) Confirm that the system inertia is not too large and decelerating too quickly; | (2) Increase the deceleration time or select a suitable external braking resistor if allowed; |
| | | | (3) The power supply is unstable or affected by the external environment; | (3) Check to see if 0d.03 is changing too much and exceeding the limits, and confirm that the power supply is stable; | (3) Access to a surge suppressor to ensure that the power supply works stably; |
| | | | (4) The braking resistor is disconnected; | (4) Use a multimeter to measure the resistance of the external resistor between P+ and C to confirm whether the resistor is disconnected; | (4) Replace the braking resistor; |

| Malfunctions encodings | Fault description | Production mechanism | Causes | Confirmation method | Cure |
|---|---|---|---|---|---|
| | | | (5) External braking resistor resistance is too large; | (5) Confirm that the selected braking resistor resistance value is appropriate; | (5) Select a suitable braking resistor; |
| | | | (6) Drive hardware failure; | (6) Troubleshooting the above problems and re-powering still report faults; | (6) Send to dealer or factory for service; |
| E.04 | phase sequence | DC bus voltage below 180V (AC220V); | (1) Main circuit voltage is too low; | (1) Check whether the main circuit input voltage and wiring are normal; | (1) Reconfirm power supply and wire correctly; |
| | | | (2) Input power supply error or insufficient power; | (2) Check that the input power supply meets the requirements; | (2) Use the correct power supply; |
| | | | (3) The power supply is unstable or affected by the external environment; | (3) Check to see if 0d.03 is changing too much and exceeding the limits, and confirm that the power supply is stable; | (3) Access to a surge suppressor to ensure that the power supply works stably; |
| | | | (4) Drive hardware failure; | (4) Troubleshooting the above problems and re-powering still report faults; | (4) Send to dealer or original factory for service; |
| E.05 | Main circuit soft start not engaged | DC bus voltage below 150V (AC220V); | (1) Main circuit voltage is too low; | (1) Check whether the main circuit input voltage and wiring are normal; | (1) Reconfirm the power supply and wire it correctly; |
| | | | (2) Input power supply error or insufficient power; | (2) Check that the input power supply meets the requirements; | (2) Use the correct power supply; |
| | | | (3) The power supply is unstable or affected by the external environment; | (3) Check to see if 0d.03 is changing too much and exceeding the limits, and confirm that the power supply is stable; | (3) Access to a surge suppressor to ensure that the power supply works stably; |
| | | | (4) Drive hardware failure; | (4) Troubleshooting the above problems and re-powering still report faults; | (4) Send to dealer or original factory for service; |
| E.06 | Power input out of phase | Hardware generated, three-phase input has phase loss; | (1) Abnormal main circuit power supply; | (1) Check if the main circuit wiring or power supply is adapted to the driver; | (1) Ensure that the wiring is correct and reliable and the power supply is correct; |

| Malfunctions encodings | Fault description | Production mechanism | Causes | Confirmation method | Cure |
|---|---|---|---|---|---|
| | | | (2) Abnormal parameter setting; | (2) Check 0E.00 to verify that the single-phase powered drive is set to three-phase power; | (2) Set the parameters correctly; |
| | | | (3) The drive is disturbed and misdetected; | (3) Random faults are still reported after the power is reconnected; | (3) When it is confirmed that the fault does not affect the use, the 0E.00 bit can be set to 1 to shield the fault; |
| | | | (4) Drive hardware failure; | (4) Troubleshooting the above problems after reconnecting the power supply still reports a malfunction; | (4) Send to dealer or original factory for service; |
| E.07 | Driver output out of phase | The internal torque command of the drive is too large and the current feedback is abnormal;<br>RPM feedback is too low; | (1) Poor or broken drive UVW wiring; | (1) Check the UVW wiring; | (1) Please connect the power cord correctly; |
| | | | (2) Motor burnout; | (2) Check that the motor phase resistance is balanced; | (2) If unbalanced, the motor will need to be replaced again; |
| | | | (3) The drive is disturbed and misdetected; | (3) Re-connecting the power still randomly reports faults; | (3) When it is confirmed that the fault does not affect the use, you can set 0E.00 hundred to 1 to shield the fault; |
| | | | (4) Drive hardware failure; | (4) Troubleshooting the above problems after reconnecting the power supply still reports a malfunction; | (4) Send to dealer or original factory for service; |
| E.08 | regeneration overload | Abnormal bus voltage or excessive heat accumulation in the braking resistor; | (1) Braking resistor wiring is abnormal; | (1) Check the wiring related to the braking resistor; | (1) Please connect the wiring correctly; |
| | | | (2) Power supply voltage input is too high; | (2) Confirm that the DC bus voltage 0d.03 is abnormal (actual AC220V input rectified is greater than 370V, AC380V input rectified is greater than 710V); | (2) Please use the correct power supply; |
| | | | (3) Insufficient power of built-in | (3) Confirm that the system inertia is not | (3) Increase the deceleration time |

| Malfunctions encodings | Fault description | Production mechanism | Causes | Confirmation method | Cure |
|---|---|---|---|---|---|
| | | | or external braking resistor; | too large or the deceleration time is not too small; | or select a suitable external braking resistor if allowed; |
| | | | (4) External braking resistor-related parameter settings do not match the actual resistance parameters or the resistance thermal time constant OA.13 parameter setting is unreasonable; | (4) Verify that the external braking resistor parameter setting is correct and verify that OA.13 is appropriate; | (4) Please set the resistor parameters correctly, if the resistor or driver temperature is not high appropriately increase the resistor thermal time constant OA.13; |
| | | | (5) External braking resistor resistance is too large; | (5) Confirm that the external braking resistor resistance value and the braking resistor specification table are appropriate; | (5) Select a suitable external braking resistor; |
| | | | (6) Drive hardware failure; | (6) After troubleshooting the above problems and re-energizing the power supply is still reporting a fault; | (6) Send to dealer or factory for service; |
| E.09 | Motor overspeed | The command or feedback speed is higher than (0E.05)% of the maximum motor speed; | (1) UVW phase sequence error; | (1) Check that the UVW wiring is correct; | (1) Please connect the wiring correctly; |
| | | | (2) The input commanded speed exceeds the fault threshold; | (2) Verify that the actual motor speed is greater than 0E.05 after inputting the command; | (2) Reduce the input speed command or set the appropriate overspeed protection threshold if allowed; |
| | | | (3) Motor speed overshoot; | (3) Confirm that the relevant gain class parameters are appropriate; | (3) Set the parameters correctly; |
| | | | (4) Motor encoder feedback is abnormal; | (4) Check if the motor encoder wiring is normal or if the encoder wiring is in a strong magnetic interference environment; | (4) Select a suitable external braking resistor; |

| Malfunctions encodings | Fault description | Production mechanism | Causes | Confirmation method | Cure |
|---|---|---|---|---|---|
| | | | (5) Drive hardware failure; | (5) Troubleshooting the above problems after reconnecting the power supply is still reported; | (5) Send to dealer or factory for service; |
| E.10 | flying car | Command in a certain operating mode is in the opposite direction to the speed feedback and the time exceeds the limit (1.5s); | (1) UVW phase sequence error; | (1) Check that the UVW wiring is correct; | (1) Please connect the power cord correctly; |
| | | | (2) Motor encoder feedback is abnormal; | (2) Check whether the motor encoder wiring is normal or whether the encoder wiring is in a strong magnetic interference environment. | (2) Correct wiring and reasonable distribution of encoder alignment; |
| | | | (3) Abnormal gravity loading under vertical working conditions; | (3) Check whether the gravity load is abnormal and whether the parameters related to the holding brake are reasonable; | (3) Reconfirm the gravity load and set the holding brake parameters correctly; |
| | | | (4) Drive hardware failure; | (4) Troubleshooting the above problems after reconnecting the power supply still reports a malfunction; | (4) Send to dealer or original factory for service; |
| E.13 | Drive Overload | Based on our drive overload curve; | (1) Bad motor or encoder wiring; | (1) Check that the wiring is stable and reliable; | (1) Please connect the wiring correctly; |
| | | | (2) Motor blocking; | (2) Confirm that the motor blocking protection is shielded (0E.03=0). | (2) Please refer to Motor Blocking Er.015 Solution; |
| | | | (3) The drive is overloaded; | (3) Verify that the drive load (0d.0A) is not greater than 100% for an extended period of time or exceeds the maximum limit; | (3) Replace the drive with higher capacity or reduce the load, increase the acceleration and deceleration time, and the conditions are suitable to increase the drive overload protection gain 0E.23; |
| E.14 | Motor overload | The motor output current is above the | (1) Bad motor or encoder wiring; | (1) Check that the wiring is stable and reliable; | (1) Please connect the wiring correctly; |

| Malfunctions encodings | Fault description | Production mechanism | Causes | Confirmation method | Cure |
|---|---|---|---|---|---|
| | | overload point (determined by the overload protection gain 0E.02) and the time exceeds the limit; | (2) The motor is overloaded; | (2) Confirm that the motor load factor (0d.09) is greater than 100% for an extended period of time; | (2) Replace the drive with a higher capacity or reduce the load and increase the acceleration and deceleration times; |
| | | | (3) The relevant gain parameter setting is not appropriate; | (3) Confirm that the relevant gain parameters are appropriate; | (3) Set the parameters correctly; |
| | | | (4) Increased friction and excessive load due to mechanical factors; | (4) Confirm whether mechanical factors are having a greater impact; | (4) Reasonable exclusion of mechanical factors; |
| | | | (5) The motor is being driven by an external force; | (5) Confirm the external status of the motor at the time of operation; | (5) Do not drive the motor by external force; |
| | | | (6) Drive hardware failure; | (6) Troubleshooting the above problems after reconnecting the power supply is still reported; | (6) Send to dealer or factory for service; |
| E.15 | motor stalling | Speed loop saturation, speed feedback less than 5rpm; Feedback current reaches more than 90% of the limit; Exceeds judgment time (0E.04); | (1) Wrong motor or encoder wiring; | (1) Check whether the wiring related to the motor and encoder is stable and reliable; | (1) Please connect the wiring correctly; |
| | | | (2) Motor blocking due to mechanical factors; | (2) Confirm that the relevant command is not zero and the motor speed is zero when the servo is ON; | (2) Reasonable exclusion of mechanical factors; |
| | | | (3) Excessive system load; | (3) Verify that the system load is much greater than the drive rating; | (3) Please replace the drive with a higher capacity; |
| E.16 | Radiator overheating | IGBT module temperature exceeds 90° C; | (1) High ambient temperature; | (1) Confirm that the drive is in an environment where the temperature is too high for the heat to dissipate from the radiator; | (1) Improve drive cooling conditions; |
| | | | (2) Damaged fan; | (2) Set 0A.17 to 0. Turn the power back on and verify that the fan is working properly; | (2) Replace the driver if the fan is damaged; |

| Malfunctions encodings | Fault description | Production mechanism | Causes | Confirmation method | Cure |
|---|---|---|---|---|---|
| | | | (3) The drive operates for a long time with overload or overload intermittent operation, while the heat dissipation is not good; | (3) Check if the drive load is not installed properly resulting in poor heat dissipation, and also if the load is normal; | (3) Please install the driver reasonably or reduce the load or increase the acceleration and deceleration time appropriately; |
| | | | (4) The installation direction of the drive and the interval with other drives are not reasonable; | (4) Confirm the installation status of the drive; | (4) Install the drive according to its installation standards; |
| | | | (5) Drive hardware failure; | (5) Troubleshooting the above problems after power off for 5 minutes and restart still report the fault; | (5) Send to dealer or factory for service; |
| E.18 | Absolute encoder battery failure | Multi-turn absolute encoder battery voltage below 2.8V; | (1) Encoder battery voltage is below 2.8V; | (1) Verify that the encoder battery voltage 0d.17 is below 2.8V; | (1) Replace the encoder battery with a new one that matches its voltage; |
| | | | (2) The absolute encoder was not connected to the battery during the drive power failure or the battery was replaced; | (2) Verify that the encoder battery wiring has not been disconnected during the power failure; | (2) Re-connect the encoder battery and ensure that the battery is reliably connected, and set 0C.09 = 1 to reset the absolute encoder; |
| | | | (3) Drive hardware failure; | (3) After troubleshooting the above problems and reconnecting the power supply several times, the malfunction is still reported; | (3) Send to dealer or original factory for service; |
| E.19 | Absolute (incremental) encoder overspeed | Encoder feedback overspeed; Absolute encoder internal status detection; | (1) Poor or disturbed encoder wiring; | (1) Check whether the encoder wiring or alignment is stable and reliable; | (1) Please wire and distribute the encoder alignment correctly; |
| | | | (2) The absolute encoder rotates at a speed exceeding | (2) Confirm the encoder shaft rotation speed when | (2) Make sure that the encoder shaft speed does not |

| Malfunctions encodings | Fault description | Production mechanism | Causes | Confirmation method | Cure |
|---|---|---|---|---|---|
| | | | the specified value when it is powered up; | the power is turned on; | exceed the specified value when the power is turned on; |
| | | | (3) Is the speed-related gain parameter unreasonable causing the speed feedback to be greater than the maximum motor speed of 0b.09; | (3) Reduce the gain parameter appropriately; | (3) Please set the parameters reasonably; |
| | | | (4) Drive hardware failure; | (4) Excluding the above problems after replacing the new encoder reconnected to the power supply is still reporting a fault; | (4) Send to dealer or original factory for service; |
| E.20 | Absolute encoder overheating | Absolute encoder internal status detection; | (1) The ambient temperature of the servo motor is too high; | (1) Measure the ambient temperature of the servo motor; | (1) Reduce the ambient temperature of the servo motor to 40° C or less; |
| | | | (2) The servo motor is running at a load that exceeds the rated value and the servo motor is not dissipating heat well; | (2) Check the system load and confirm the servo motor heat dissipation at the same time; | (2) Ensure that the load is within the rated value or enhance the heat dissipation capacity of the motor; |
| | | | (3) Absolute encoder internal status detection fault; | (3) After troubleshooting the above problems and reconnecting the power supply several times, the malfunction is still reported; | (3) Replace the absolute encoder or motor; |
| E.21 | Incremental encoder UVW exception | There is rotation of the motor shaft when the drive is powered up to obtain rotor information; | (1) Poor or disturbed encoder wiring; | (1) Check whether the encoder wiring or alignment is stable and reliable, and check whether the incremental encoder UVW status 0d.19 is equal to 0 or 7; | (1) Please connect the wires and distribute the encoder alignment correctly. If it is confirmed that the interference is random, you can set 0E.1A bit to 0 to shield the fault; |

| Malfunctions encodings | Fault description | Production mechanism | Causes | Confirmation method | Cure |
|---|---|---|---|---|---|
| | | | (2) There is rotation of the motor shaft when power is applied; | (2) Check whether the load changes or machinery causes the motor shaft to rotate during power-up; | (2) Ensure that the servo system is at rest when powering up; |
| | | | (3) The encoder UVW signal is incorrectly matched to Z; | (3) Confirm the UVW combination status when the motor shaft is turned near the Z signal; | (3) Ensure that the encoder wiring is correct, stable and reliable; |
| | | | (4) Drive hardware failure; | (4) Troubleshooting the above problems after several times to reconnect the power supply is still reported; | (4) Send to dealer or original factory for service; |
| E.22 | Incremental encoder ABZ disconnection | Hardware Detection; | (1) Poor or disturbed encoder wiring; | (1) Check whether the encoder wiring or alignment is stable and reliable, and confirm whether the incremental encoder single-turn position 0d.1A value is counted normally; | (1) Please correctly wiring and distribution of the encoder alignment, if confirmed as random interference, you can set 0E.1A ten bits to 0 shielding the fault; |
| | | | (2) Incorrect encoder matching and drive matching; | (2) Confirm that the current actual motor encoder is the same as the drive set encoder 0b.1b; | (2) Please match the driver and motor correctly; |
| | | | (3) Drive hardware failure; | (3) After troubleshooting the above problems and reconnecting the power supply several times, the malfunction is still reported; | (3) Send to dealer or original factory for service; |
| E.23 | Incremental encoder Z subject to interference | The position information obtained from two adjacent Z signals deviates too much; | (1) Poor or disturbed encoder wiring; | (1) Check whether the encoder wiring or alignment is stable and reliable; | (1) Please wire and distribute the encoder alignment correctly, or increase the fault determination threshold 0E.19; |
| | | | (2) Encoder failure; | (2) Excluding the above problems after replacing the new encoder and then reconnected to the | (2) Replace the encoder with a new one; |

| Malfunctions encodings | Fault description | Production mechanism | Causes | Confirmation method | Cure |
|---|---|---|---|---|---|
| | | | | power supply does not report faults; | |
| | | | (3) Drive hardware failure; | (3) Excluding the above problems after replacing the new encoder and then reconnected to the power supply is still reporting a fault; | (3) Send to dealer or original factory for service; |
| E.24 | Absolute Encoder Communication CRC Checksum Failure | CRC checksum error; | (1) Poor or disturbed encoder wiring; | (1) Check whether the encoder wiring or alignment is stable and reliable; | (1) Please wire and distribute the encoder alignment correctly; |
| | | | (2) Encoder failure; | (2) Excluding the above problems after replacing the new encoder and then reconnected to the power supply does not report faults; | (2) Replace the encoder with a new one; |
| | | | (3) Drive hardware failure; | (3) Excluding the above problems after replacing the new encoder and then reconnected to the power supply is still reporting a fault; | (3) Send to dealer or original factory for service; |
| E.25 | Absolute encoder communication timeout | Serial encoder communication timeout; | (1) Poor or disturbed encoder wiring; | (1) Check whether the encoder wiring or alignment is stable and reliable; | (1) Please wire and distribute the encoder alignment correctly; |
| | | | (2) Encoder matching and drive matching error; | (2) Confirm that the current time motor encoder is consistent with the drive setting encoder 0b.1b; | (2) Please match the driver and motor correctly; |
| | | | (3) Encoder failure; | (3) Excluding the above problems after replacing the new encoder and then reconnected to the power supply does not report faults; | (3) Replace the encoder with a new one; |
| | | | (4) Drive hardware failure; | (4) After eliminating the above problems, replace the new encoder and then reconnect the power supply is still reporting a fault; | (4) Send to dealer or original factory for service; |

| Malfunctions encodings | Fault description | Production mechanism | Causes | Confirmation method | Cure |
|---|---|---|---|---|---|
| E.26 | Absolute encoder not initialized | The serial encoder has not been used; | (1) Poor or disturbed encoder wiring; | (1) Check whether the encoder wiring or alignment is stable and reliable; | (1) Please wire and distribute the encoder alignment correctly; |
| | | | (2) Absolute encoder is not initialized; | (2) Confirm that the encoder has not been initialized; | (2) Setting 0C.08 to 1 initializes the absolute encoder; |
| | | | (3) Encoder failure; | (3) Excluding the above problems after replacing the new encoder and then reconnected to the power supply does not report faults; | (3) Replace the encoder with a new one; |
| | | | (4) Drive hardware failure; | (4) After eliminating the above problems, replace the new encoder and then reconnect the power supply is still reporting a fault; | (4) Send to dealer or original factory for service; |
| E.28 | Absolute encoder multi-turn data overflow | Multi-turn absolute encoder multi-turn data overflow (-32768 to 32767); | (1) Encoder multiturn data overflow is detected when 0E.0b=1, and the multiturn data is not credible; | (1) Confirm that the multiturn count 0d.19 is not overflowed; | (1) Set 0C.09=1 to reset the encoder multi-turn data and multi-turn data overflow faults, or set 0E.0b=0 to mask the fault; |
| E.34 | U-phase current detection fault | The U-phase current detection zero drift is too large; | (1) Drive U-phase output wiring is incorrect or disturbed; | (1) Check that the relevant wiring is correct; | (1) Please connect the wiring correctly; |
| | | | (2) Drive hardware failure; | (2) Remove the U-phase connecting wire, reapply power and check to see if 0d.32 is outside 6963 to 9420; | (2) Send to dealer or factory for service; |
| E.35 | V-phase current detection fault | V-phase current detection zero drift is too large; | (1) Driver V-phase output wired incorrectly or disturbed; | (1) Check that the relevant wiring is correct; | (1) Please connect the wiring correctly; |
| | | | (2) Drive hardware failure; | (2) Remove the V-phase connecting wire, reapply power and check to see if 0d.33 is outside 6963 to 9420; | (2) Send to dealer or factory for service; |

| Malfunctions encodings | Fault description | Production mechanism | Causes | Confirmation method | Cure |
|---|---|---|---|---|---|
| E.36 | System failure 1 (no answer, read/write timeout, validation error) | EEPROM read/write timeout; | (1) Parameters are stored or read too frequently; | (1) Confirm whether the upper computer modifies the function code frequently and quickly, and writes to the RRPROM for each operation, and check whether the EEPROM write count 0d.10 is greater than the 0E.1b set value; | (1) Appropriately reduce the frequency of function code modification by the host computer, or do not save into the EEPROM when modifying, or set the 10.08 decimal place to 1, and all write ROM operations are changed to write RAM operations; |
| | | | (2) 0E.17 = 1 when the power supply is frequently powered down and up, but the drive is not fully powered down due to capacitor energy storage; | (2) Verify that the power supply drops and powers up frequently, and the duration may be at the millisecond level; | (2) Use the correct power supply; |
| | | | (3) Drive hardware failure; | (3) Troubleshooting the above problems are still reported after repeated power on; | (3) Send to dealer or original factory for service; |
| E.37 | Electronic gear 0 abnormal | Number of command pulses (03.06) < (10000/4000) for 1 motor revolution; The number of command pulses for 1 motor revolution (03.06) > 10000000; | (1) The electronic gear ratio is out of limits; | (1) Check that the electronic gear ratio parameters are not out of limits; | (1) Set the electronic gear ratio parameters correctly; |
| | | | (2) Electronic gear ratio parameter change sequence problem; | (2) When 03.06 = 0, the numerator or denominator was preferentially changed during the change of the electronic gear ratio resulting in an internal calculation overrun; | (2) After changing the appropriate electronic gear ratio parameters you can set 0C.05=1 direct software reset or 0C.06=1 fault reset to clear the fault; |
| | | | (3) The encoder resolution is not set properly; Note: incremental encoder internal use of the resolution of 4 times the frequency, for | (3) Confirm that the encoder resolution 0b.1C is normal; | (3) Set the relevant parameters correctly; |

| Malfunctions encodings | Fault description | Production mechanism | Causes | Confirmation method | Cure |
|---|---|---|---|---|---|
| | | | example, the actual installation of 2500 lines incremental encoder, but the internal use of 10000 lines to calculate the | | |
| E.38 | Electronic gear 1 abnormal | Electronic gear ratio 1 < (encoder resolution/10,000,000); Electronic gear ratio 1> (encoder resolution * 4000/10000); | (1) Electronic gear ratios are out of limits; | (1) Check that the electronic gear ratio parameters are not out of limits; | (1) Set the electronic gear ratio parameters correctly; |
| | | | (2) Problems with the sequence of electronic gear ratio parameter changes; | (2) When 03.06 = 0, the numerator or denominator was preferentially changed during the change of the electronic gear ratio resulting in an internal calculation overrun; | (2) After changing the appropriate electronic gear ratio parameters you can set 0C.05=1 direct software reset or 0C.06=1 fault reset to clear the fault; |
| | | | (3) The encoder resolution is not set properly; Note: incremental encoder internal use of the resolution of 4 times the frequency, for example, the actual installation of 2500 lines incremental encoder, but the internal use of 10000 lines to calculate the | (3) Confirm that the encoder resolution 0b.1C is normal; | (3) Set the relevant parameters correctly; |
| E.39 | Electronic Gear 2 Abnormal | Electronic gear ratio 2 < (encoder resolution/10,000,000); Electronic gear ratio 2> (encoder resolution * 4000/10000); | (1) The electronic gear ratio is out of limits; | (1) Check that the electronic gear ratio parameters are not out of limits; | (1) Set the electronic gear ratio parameters correctly; |
| | | | (2) Electronic gear ratio parameter change sequence problem; | (2) When 03.06 = 0, the numerator or denominator was preferentially changed during the change of the electronic gear ratio | (2) After changing the appropriate electronic gear ratio parameters you can set 0C.05=1 direct software reset or 0C.06=1 |

| Malfunctions encodings | Fault description | Production mechanism | Causes | Confirmation method | Cure |
|---|---|---|---|---|---|
| | | | | resulting in an internal calculation overrun; | fault reset to clear the fault; |
| | | | (3) The encoder resolution is not set properly; Note: Incremental encoders internally use a resolution of 4x, e.g. a 2500 line incremental encoder is actually installed, but 10,000 lines are used internally for the calculation. | (3) Confirm that the encoder resolution 0b.1C is normal; | (3) Set the relevant parameters correctly; |
| E.40 | Pulse Command Overspeed | The input pulse command frequency is greater than the maximum position pulse frequency setting (0E.0A); | (1) Poor or disturbed pulse input wiring; | (1) Check the relevant wiring and see if the drive receives external command pulse count 0d.2C equal to the number of command pulses output from the host computer; | (1) Select the appropriate signal line and correctly wired in accordance with the instructions, while the alignment wiring needs to reduce the possibility of interference, appropriate adjustment of the pulse input filter 0E.21 (low-speed) and 0E.22 (high-speed); |
| | | | (2) The actual input pulse frequency is greater than the maximum pulse frequency (0E.0A); | (2) Confirm that the input pulse frequency is greater than the set value 0E.0A; | (2) Reduce the input pulse frequency or increase the maximum pulse frequency by 0E.0A if permitted; |
| | | | (3) Drive hardware failure; | (3) After troubleshooting the above problems and reconnecting the power supply several times, the malfunction is still reported; | (3) Send to dealer or original factory for service; |

| Malfunctions encodings | Fault description | Production mechanism | Causes | Confirmation method | Cure |
|---|---|---|---|---|---|
| E.41 | Pulse input abnormality | The frequency of the sampled pulses varies continuously between 0 and 0E.0A in a very short period of time; | (1) Poor or disturbed pulse input wiring; | (1) Check the relevant wiring and see if the drive receives the external command pulse count 0d.2C equal to the number of command pulses output from the host computer when the external output pulse display is not cleared (0C.0A); | (1) Select the appropriate signal line and correctly wired in accordance with the instructions, while the alignment wiring needs to reduce the possibility of interference, appropriate adjustment of the pulse input filter 0E.21 (low-speed) and 0E.22 (high-speed); |
| | | | (2) The command pulse frequency output from the upper computer is assigned a large value and jumps continuously for a short period of time; | (2) Confirm that the output pulse frequency of the upper computer is normal; | (2) Set the upper computer output command pulse frequency correctly; |
| | | | (3) Drive hardware failure; | (3) After troubleshooting the above problems and reconnecting the power supply several times, the malfunction is still reported; | (3) Send to dealer or original factory for service; |
| E.42 | Encoder pulse division output overspeed | Crossover output pulse frequency is greater than 4MHz; | (1) The output pulse frequency is greater than the maximum hardware output limit frequency (4M); | (1) Confirm the motor speed recorded at the time of the fault, and calculate whether the output pulse frequency is greater than the hardware limit frequency (4M) from the formula: motor speed * 00.07/60; | (1) Reduce the number of crossover output pulses by 00.07 if permitted making the output pulse frequency less than the hardware limit value; |
| | | | (2) Poor or disturbed encoder wiring; | (2) Check whether the encoder wiring or alignment is stable and reliable; | (2) Please wire and distribute the encoder alignment correctly; |
| | | | (3) Encoder failure; | (3) Troubleshooting the above problems after replacing the | (3) Replace the encoder or motor with a new one; |

| Malfunctions encodings | Fault description | Production mechanism | Causes | Confirmation method | Cure |
|---|---|---|---|---|---|
| | | | | new encoder reconnected to the power supply does not report faults; | |
| | | | (4) Drive hardware failure; | (4) Troubleshooting the above problems after several times to reconnect the power is still reported; | (4) Send to dealer or original factory for service; |
| E.44 | Excessive positional deviation | Position loop deviation under position mode control is greater than the Position Deviation Excessive Fault value (0E.08); | (1) The drive UVW output is out of phase causing the motor not to rotate; | (1) Check UVW wiring and perform motor test run; | (1) Please connect the wiring correctly; |
| | | | (2) Encoder feedback abnormality; | (2) Check encoder wiring and feedback (0d.1A); | (2) Please connect the wiring correctly; |
| | | | (3) Intermittent motor operation due to mechanical factors; | (3) Confirm that the position command and motor speed are 0 in the position mode; | (3) Troubleshooting mechanical factors; |
| | | | (4) Driver-related gain parameters are low; | (4) Check that the velocity and position loop gain parameters are appropriate; | (4) Set the appropriate velocity loop and position loop gain parameters and adjust the time window 0E.24; |
| | | | (5) The rate of change of the input command in the position mode is too large; | (5) Check that the input position command is not too large relative to the system its rate of change; | (5) Reduce the rate of command change appropriately where permitted; |
| | | | (6) The positional deviation threshold 0E.08 is too small relative to the system operating conditions; | (6) Verify that the position deviation excessive fault value 0E.08 is not set too small; | (6) Set the appropriate position deviation excessive fault value; |
| | | | (7) Motor failure; | (7) Troubleshooting the above problems after replacing the motor and then reconnecting the power supply does not report faults; | (7) Replace the servo motor; |

| Malfunctions encodings | Fault description | Production mechanism | Causes | Confirmation method | Cure |
|---|---|---|---|---|---|
| | | | (8) Drive hardware failure; | (8) Troubleshooting the above problems after several times to reconnect the power supply is still reported; | (8) Send to dealer or factory for service; |
| E.50 | Parameter Formatting Exception | The number or form of function codes is mobilized; | (1) Function side software version change; | (1) Confirm that the servo drive software has been updated; | (1) Set 0C.07=11 to restore factory settings; |
| | | | (2) Drive hardware failure; | (2) After troubleshooting the above problems and reconnecting the power supply several times, the malfunction is still reported; | (2) Send to dealer or factory for service; |
| E.51 | Parameter setting abnormality | The settings related to the drive model have been changed, and the drive power, voltage, and current are less than the motor value; Communication settings are not supported at this time; | (1) Parameters related to the driver power or motor power are set and the parameters match abnormally; | (1) Confirm that 0A.00, 0A.01, and 0A.02 match 0b.02, 0b.03, and 0b.04; | (1) Set the real drive and motor power parameters; |
| | | | (2) The parameter changed by the upper computer is beyond the limit of the function code; | (2) Confirm the function codes changed by the upper unit and their ranges; | (2) Set the function code parameters correctly; |
| | | | (3) Drive hardware failure; | (3) After troubleshooting the above problems and reconnecting the power supply several times, the malfunction is still reported; | (3) Send to dealer or original factory for service; |
| E.52 | Parameter combination exception | Internal drive information mismatch; Motor information does not match; | (1) A parameter related to the driver power is set and the parameter matches the internal information abnormally; | (1) Confirm that the drive power parameters are set correctly; | (1) Set the drive power parameters correctly; |
| | | | (2) Abnormal matching of motor model and motor parameters; | (2) Confirm the parameters of motor set 0b; | (2) Set the motor parameters correctly; |

| Malfunctions encodings | Fault description | Production mechanism | Causes | Confirmation method | Cure |
|---|---|---|---|---|---|
| E.53 | CPLD synchronization signal interrupt exception | The synchronization signal for internal sampling is abnormal; | (1) Environmental interference; | (1) Place the drive in a normal environment and reconnect the power supply does not report a fault; | (1) Connect the drive PE reliably to earth; |
| | | | (2) Communication change parameters are too frequent resulting in repeated interruptions of the internal synchronization interrupt signal; | (2) Confirm that the host computer changes function codes frequently; | (2) Reasonable modification of function code parameters; |
| | | | (3) Drive hardware failure; | (3) After troubleshooting the above problems and reconnecting the power supply several times, the malfunction is still reported; | (3) Send to dealer or original factory for service; |
| E.54 | CPLD power-up configuration failure | Power-up initialization process ARM-CPLD interaction failed; | (1) Environmental interference; | (1) Place the drive in a normal environment and reconnect the power supply does not report a fault; | (1) Connect the drive PE reliably to earth; |
| | | | (2) Communication change parameters during power-up are too frequent resulting in repeated interruptions of the internal synchronization interrupt signal; | (2) Confirm that the host computer changes the function code frequently during power-up of the drive; | (2) Reasonable modification of function code parameters; |
| | | | (3) Drive hardware failure; | (3) After troubleshooting the above problems and reconnecting the power supply several times, the malfunction is still reported; | (3) Send to dealer or original factory for service; |
| E.57 | Home return timeout (also | The origin was not searched for in time 03.21 after | (1) Search time 03.21 is too short or search speed 03.1E, 03.1F is | (1) Confirm search time, speed, and travel; | (1) Reasonable setting of search parameters related |

| Malfunctions encodings | Fault description | Production mechanism | Causes | Confirmation method | Cure |
|---|---|---|---|---|---|
| | triggered by simultaneous positive and negative limits) | initiating the origin reset operation; Positive and negative overtravel are valid at the same time; | too small or search trip is too long; | | to origin reversion; |
| | | | (2) No input of home switch signal at 03.1d=X0; | (2) Check that the home switch (DiFunc.14) is assigned and that the related settings and wiring are normal; | (2) Set the relevant functions correctly and ensure that the wiring meets the requirements of the manual; |
| | | | (3) Encoder Z signal abnormality at 03.1d=X1, X2, X4, X6; | (3) Check whether the encoder wiring is bad and whether the encoder Z signal crossover output is normal; | (3) Replace the encoder; |
| | | | (4) Mechanical limit parameters such as 03.25, 03.26, and 03.27 at 03.1d=X5 are not set reasonably; | (4) Confirm that the parameters related to the mechanical limits are set appropriately; | (4) Correctly set parameters related to mechanical limits; |
| | | | (5) Positive and negative limits are valid at the same time during home return; | (5) Check whether the DI input positive and negative overtravel signals are normal and confirm whether the current absolute position 0d.24 has triggered the soft limit maximum and minimum values at the same time (the maximum and minimum values are not set reasonably); | (5) Set the positive and negative limit signals and parameters correctly; |
| | | | (6) Drive hardware failure; | (6) Troubleshooting the above problems after several times to reconnect the power supply is still reported; | (6) Send to dealer or factory for service; |
| E.58 | Absolute system encoder matching error | 00.03 > 0, the encoder is incremental; | (1) The drive is configured with an incremental encoder when 00.03>0; | (1) Confirm the setting of parameters related to 00.03 and 0b.1b; | (1) Incremental encoders are not allowed for absolute value systems, so please set the relevant parameters correctly; |

| Malfunctions encodings | Fault description | Production mechanism | Causes | Confirmation method | Cure |
|---|---|---|---|---|---|
| E.59 | Duplicate assignment of DI functions | Two or more DI ports are assigned the same function at the same time; | (1) There are multiple DI ports assigned the same function; | (1) Check that DI and VDI are not repeatedly assigned the same function; | (1) Set the relevant parameters correctly; |
| E.61 | Abnormal holding brake output OFF (closed brake) | When the holding brake protection is on (OE.15=1), the motor rotates two revolutions after closing the gate (holding brake output OFF); | (1) Holding brake output (DoFunc. 6) is assigned but wired incorrectly; | (1) Confirm that the wiring is correct; | (1) Please connect the wiring correctly; |
| | | | (2) The holding brake parameters OA.07, OA.08, OA.09, OA.0A, OA.0b are set unreasonably, resulting in the motor being powered off and rotating more than two revolutions before the brake is actually closed; | (2) Check to make sure that the parameters related to the rotary holding brake are in accordance with the mechanical time constant of the holding brake; | (2) Please set the relevant parameters correctly; |
| | | | (3) The motor holding torque is insufficient when the drive is not running (not power down), and the motor shaft rotates more than two revolutions under the influence of vertical working conditions or external factors; | (3) Verify that the system load is not beyond what the holding brake can handle; | (3) Reduce the load, eliminate external factors or choose a higher specification of the holding brake motor and drive; |
| | | | (4) Mechanical damage to the holding brake; | (4) Disconnect the holding brake wiring and check if the motor shaft can rotate; | (4) Replace the holding motor; |
| | | | (5) Drive hardware failure; | (5) Troubleshooting the above problems after several times to reconnect the power supply is still reported; | (5) Send to dealer or factory for service; |

| Malfunctions encodings | Fault description | Production mechanism | Causes | Confirmation method | Cure |
|---|---|---|---|---|---|
| E.62 | Brake output ON (release) abnormality | When the holding brake protection is on (0E.15=1), the drive does not output torque to match the load (0E.16) when the brake is released; | (1) Holding brake output (DoFunc.6) is assigned but wired incorrectly; | (1) Confirm that the wiring is correct; | (1) Please connect the wiring correctly; |
| | | | (2) The holding brake parameter servo ON command delay 0A.07 is set unreasonably, resulting in the first 100 to 500ms of the input command being 0 the motor is not really released; | (2) Check to make sure that the servo ON command delay time 0A.07 is in accordance with the holding brake mechanical time constant; | (2) Please set the relevant parameters correctly; |
| | | | (3) Gravity compensation value 0E.16 Error in manual setting or automatic detection; | (3) Verify that the gravity compensation value matches the actual load; | (3) Please set the relevant parameters correctly or set 0C.04 to re-test the gravity load; |
| | | | (4) Mechanical damage to the holding brake; | (4) Confirm that the holding brake mechanism is working properly; | (4) Replace the holding motor; |
| | | | (5) Drive hardware failure; | (5) Troubleshooting the above problems after several times to reconnect the power supply and start is still reported; | (5) Send to dealer or factory for service; |

## 9.3Alarm description and handling

### 9.3.1List of Alarm Codes

Table42 List of alarm codes

| Alarm Code | fault description | Can it be reset |
|---|---|---|
| A.04 | undervoltage warning | Clogged |
| A.08 | Early warning of regenerative failures | Be |
| A.13 | Drive overload warning | Be |
| A.14 | Motor overload warning | Be |
| A.18 | Absolute encoder battery warning | Be |
| A.44 | Excessive positional deviation warning | Be |
| A.56 | Servo ON command redundancy | Be |
| A.90 | Positive overtravel warning | Be |

| | | |
|---|---|---|
| A.91 | Reverse overtravel warning | Be |
| A.92 | emergency stop warning | Be |
| A.99 | Parameter changes that require power to be reconnected | Clogged |

## 9.3.2Alarm Handling Methods

Table43 Alarm Processing Methods

| Give a warning encodings | Fault description | Production mechanism | Causes | Confirmation method | Cure |
|---|---|---|---|---|---|
| A.04 | Undervoltage warning | DC bus voltage below 200V (AC220V); | (1) Main circuit voltage is less than 200V (AC220V); | (1) Check whether the main circuit input voltage and wiring are normal; | (1) Reconfirm the power supply and wire it correctly; |
| | | | (2) Input power supply error or insufficient power; | (2) Check that the input power supply meets the requirements; | (2) Use the correct power supply; |
| | | | (3) The power supply is unstable or affected by the external environment; | (3) Check to see if 0d.03 is changing too much and exceeding the limits, and confirm that the power supply is stable; | (3) Access to a surge suppressor to ensure that the power supply works stably; |
| | | | (4) Drive hardware failure; | (4) Troubleshooting the above problems and re-powering still report faults; | (4) Send to dealer or original factory for service; |
| A.08 | Early warning of regenerative failures | The braking resistance is less than the minimum value allowed for the drive; | (1) The braking resistor resistance value is less than the minimum value allowed for the drive 0A.10; | (1) Based on the braking resistor selection 0A.14, check to make sure that the built-in braking resistor resistance value 0A.12 or external braking resistor resistance value 0A.16 is less than the minimum allowable value 0A.10; | (1) Please set the relevant parameters correctly; |
| | | | (2) External braking resistor short circuit; | (2) Use a multimeter to measure the resistance between P+ and C to determine if the resistance is shorted; | (2) Please replace the braking resistor; |
| A.13 | Drive overload warning | Drive output current is greater than the drive's rated load, but the duration does not fully exceed the | (1) Motor blocking; | (1) Confirm that the motor blocking protection is shielded (0E.03=0). | (1) Please refer to motor blocking E.15 Solution; |
| | | | (2) The drive is overloaded; | (2) Verify that the drive load (0d.0A) is not greater than 100% for an extended period | (2) Replace the drive with a higher capacity or reduce the |

| Give a warning encodings | Fault description | Production mechanism | Causes | Confirmation method | Cure |
|---|---|---|---|---|---|
| | | internal drive overload curve limits (set internally by the program); | | of time or exceeds the maximum limit; | load and increase the acceleration and deceleration times; |
| A.14 | Motor overload warning | The drive output current is greater than the rated motor current, but the duration has not fully exceeded the internal motor overload curve limit (set by the overload protection gain of 0E.02); | (1) Bad motor or encoder wiring; | (1) Check that the wiring is stable and reliable; | (1) Please connect the wiring correctly; |
| | | | (2) The motor is overloaded; | (2) Confirm that the motor load factor 0d.0A is greater than 100% for an extended period of time; | (2) Replace the drive with a higher capacity or reduce the load and increase the acceleration and deceleration times; |
| | | | (3) The relevant gain parameter setting is not appropriate; | (3) Confirm that the relevant gain parameters are appropriate; | (3) Set the parameters correctly; |
| | | | (4) Increased friction and excessive load due to mechanical factors; | (4) Confirm whether mechanical factors are having a greater impact; | (4) Reasonable exclusion of mechanical factors; |
| | | | (5) Drive hardware failure | (5) Troubleshooting the above problems after reconnecting the power supply is still reported; | (5) Send to dealer or factory for service; |
| A.18 | Absolute encoder battery warning | Multi-turn absolute encoder battery voltage below 3.0V; | (1) Encoder battery voltage is below 3.0V; | (1) Verify that the encoder battery voltage 0d.17 is below 3.0V; | (1) Replace the encoder battery with a new one that matches its voltage; |
| | | | (2) The encoder battery is wired incorrectly; | (2) Confirm that the encoder is not connected to the battery or wired poorly; | (2) Re-connect the encoder battery and ensure that the battery is reliably connected; |
| | | | (3) Drive hardware failure; | (3) After troubleshooting the above problems and reconnecting the power supply several times, | (3) Send to dealer or original factory for service; |

| Give a warning encodings | Fault description | Production mechanism | Causes | Confirmation method | Cure |
|---|---|---|---|---|---|
| | | | | the malfunction is still reported; | |
| A.44 | Excessive positional deviation warning | The position ring deviation is greater than the excessive position deviation warning value 0E.06; | (1) The drive UVW output is out of phase causing the motor not to rotate; | (1) Check that the UVW wiring is reliable; | (1) Please connect the wiring correctly; |
| | | | (2) Encoder feedback abnormality; | (2) Check encoder wiring and feedback (0d.1A); | (2) Troubleshooting mechanical factors; |
| | | | (3) Intermittent motor operation due to mechanical factors; | (3) Confirm that the position command and motor speed are 0 in the position mode; | (3) Set the appropriate velocity loop and position loop gain parameters; |
| | | | (4) Driver-related gain parameters are low; | (4) Check that the velocity and position loop gain parameters are appropriate; | (4) Reduce the rate of change of instructions appropriately where permitted; |
| | | | (5) The rate of change of the input command in the position mode is too large; | (5) Check that the input position command is not too large relative to the system its rate of change; | (5) Set the appropriate position deviation excessive fault value; |
| | | | (6) The position deviation threshold 0E.06 is too small relative to the system operating conditions; | (6) Verify that the position deviation excessive fault value 0E.06 is not set too small; | (6) Replace the servo motor; |
| | | | (7) Motor failure; | (7) Troubleshooting the above problems after replacing the motor and then reconnecting the power supply does not report faults; | (7) Send to dealer or factory for service; |
| | | | (8) Drive hardware failure; | (8) Troubleshooting the above problems after several times to reconnect the power supply is still reported; | |
| A.56 | Servo ON command redundancy | The driver has a servo-ON command received simultaneously from the | (1) The servo drive has received a run command from the panel, DI or upper computer at the same time; | (1) Confirm that the servo ON command is triggered in multiple ways; | (1) Please run the servo drive with proper control; |

| Give a warning encodings | Fault description | Production mechanism | Causes | Confirmation method | Cure |
|---|---|---|---|---|---|
| | | panel and DI signals (communication is not processed for the time being); | (2) Drive hardware failure; | (2) After troubleshooting the above problems and reconnecting the power supply several times, the malfunction is still reported; | (2) Send to dealer or factory for service; |
| A.90 | Positive overtravel warning | After overtravel assignment, the DI inputs the corresponding overtravel signal or the current position exceeds the value of the overtravel position marker at the time of DI input;<br>When the soft limit is on, the absolute position recorded inside the drive is greater than the soft limit maximum or less than the soft limit minimum; | (1) The physical Di or virtual VDI is input with a positive and negative overtravel valid level; | (1) Confirm that a valid level has been input to the Di terminal that has been assigned a positive and negative overtravel, and you can check the status of the terminal via 01.00; | (1) In the case of safety (to determine whether the servo is enabled or not), you can input a command in the opposite direction or manually move the motor shaft position in the reverse direction; |
| | | | (2) Soft limit trigger at 0E.0d>0; | (2) Verify that the internal absolute position 0d.24 is greater than the soft limit maximum value 0E.24 or less than the minimum value 0E.10; | (2) In the case of safety (to determine whether the servo is enabled or not), you can input a command in the opposite direction or manually move the motor shaft position; |
| A.91 | Reverse overtravel warning | After overtravel assignment, the DI inputs the corresponding overtravel signal or the current position exceeds the value of the overtravel position marker at the | (1) The physical Di or virtual VDI is input with a positive and negative overtravel valid level; | (1) Confirm that a valid level has been input to the Di terminal that has been assigned a positive and negative overtravel, and you can check the status of the terminal via 01.00; | (1) In the case of safety (to determine whether the servo is enabled or not), you can input a command in the opposite direction or manually move the motor shaft position in the reverse direction; |

| Give a warning encodings | Fault description | Production mechanism | Causes | Confirmation method | Cure |
|---|---|---|---|---|---|
| | | time of DI input;<br>When the soft limit is on, the absolute position recorded inside the drive is greater than the soft limit maximum or less than the soft limit minimum; | (2) Soft limit trigger at 0E.0d>0; | (2) Verify that the internal absolute position 0d.24 is greater than the soft limit maximum value 0E.24 or less than the minimum value 0E.10; | (2) In the case of safety (to determine whether the servo is enabled or not), you can input a command in the opposite direction or manually move the motor shaft position; |
| A.92 | emergency stop warning | hardware generation | DI terminal emergency stop signal generation | (1) Detect whether the DI function code is configured as 007 (EMGSTOP);<br>(2) Whether the signal is a valid level; | (1) Remove the source of the problem and release the emergency stop signal input; |
| A.99 | Parameter changes that require power to be reconnected | There are parameters that need to be re-powered to take effect that have been modified; | (1) Changed function codes need to be re-powered to take effect; | (1) Confirm when the function code takes effect; | (1) Re-power up or set 0C.05=1 software reset to make this parameter effective; |

# 10.Care and Maintenance

## 10.1routine maintenance

### 10.1.1Daily Inspection Program

The routine inspection program is implemented in accordance with the points listed in Table44 .

Table44 List of Daily Inspection Items

| Serial number | Sports event | Recognize |
|---|---|---|
| 1 | Check that the ambient temperature and humidity are normal and free of dust and foreign matter. | ☐ |
| 2 | Check that there is no abnormal vibration or noise. | ☐ |
| 3 | Check that the power supply voltage is normal. | ☐ |
| 4 | Check for no odors. | ☐ |
| 5 | Check that there are no fiber threads adhering to the vents. | ☐ |
| 6 | Check that no foreign matter enters at the load end. | ☐ |

### 10.1.2Daily Cleaning Program

The daily cleaning program is implemented according to the points listed in Table45 .

Table45 List of Daily Cleaning Items

| Serial number | Sports event | Recognize |
|---|---|---|
| 1 | Effectively removes dust accumulated on the surface of the equipment and prevents it from entering the interior of the equipment, especially metal dust. | ☐ |
| 2 | Keep the front of the drive and connectors clean. | ☐ |

| | |
|---|---|
|   | ➢ To clean the unit, disconnect the power supply and clean with an air gun or dry rag.<br>➢ Do not use gasoline, thinner, alcohol, acidic and alkaline detergents to avoid discoloration or breakage of the shell. |

## 10.2maintenance

### 10.2.1Regular Checkup Program

The periodic inspection program is performed according to Table46 highlights.

Table46 List of Periodic Inspection Items

| Serial number | Sports event | Recognize |
|---|---|---|
| 1 | Check that the fixing screws in the connection areas between the devices are not loose. | □ |
| 2 | Check for no signs of overheating. | □ |
| 3 | Check that the terminal block is undamaged. | □ |
| 4 | Check that the fastening parts of the terminal block are not loose. | □ |

## 10.2.2Regular Maintenance Program

The electrical and electronic components inside the Servo Drive are subject to mechanical wear and aging. To prevent and maintain the servo driver and motor, replace them according to the criteria in theTable47 . When replacing them, contact us or our distributor, and we will judge whether to replace the parts after investigation.

Table47 List of Standard Replacement Cycles for Components

| Boyfriend | Character radical | Standard Replacement Cycle | Note |
|---|---|---|---|
| Drives | Busbar Filter Capacitor | About 5 years | Standard replacement intervals are for reference only. Even if the standard replacement cycle has not been completed, it needs to be replaced once an abnormality occurs. |
| | cooling fan | 2 to 3 years (10 to 30,000 hours) | |
| | Aluminum electrolytic capacitors for circuit boards | About 5 years | |
| | Power-up Buffer Relay | About 100,000 times (Life expectancy varies according to conditions of use) | |
| | Buffer resistance | About 20,000 times (Life expectancy varies according to conditions of use) | |
| Electrical machinery | Bear | 3 to 5 years (20 to 30,000 hours) | |
| | Oil seal | 5000 hours | |
| | Encoders | 3 to 5 years (20 to | |

| | | | |
|---|---|---|---|
| | | 30,000 hours) | |

# GUIDE Servo Drive SD110-P Series

## Instruction manual version: 1.04

### Precautions

1. **Be sure to read this manual before using the inverter product.**
2. **For safety, ask professionals to carry out commissioning and wiring.**
3. **The contents of this manual are subject to change without prior notice.**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